

# TEST REPORT

|                                 |   |
|---------------------------------|---|
| <b>Applicant:</b>               | Ngai Lik Electronics Enterprises Limited  |
| <b>Address of Applicant:</b>    | Flat 29-32, 8/F., Block B, Focal Industrial Centre, 21 Man Lok Street, Hung Hom, Kowloon, Hong Kong.      |
| <b>Manufacturer:</b>            | Ngai Lik Electronics Enterprises Limited  |
| <b>Address of Manufacturer:</b> | Flat 29-32, 8/F., Block B, Focal Industrial Centre, 21 Man Lok Street, Hung Hom, Kowloon, Hong Kong.      |
| <b>Product name:</b>            | FM STEREO RADIO WITH BLUETOOTH/CD/USB/MP3/SD CARD/AUX IN PLAYER   |
| <b>Model:</b>                   | For main: BTU280AM-FM; PBBT2702<br>For AC Adapter: APX915A  |
| <b>Rating(s):</b>               | For main: Input DC 9V, 13W;<br>For AC Adapter: Input 100-240V~, 50/60Hz, 0.5A max.<br>Output: DC 9V, 1.5A |
| <b>Trademark:</b>               | AXESS for PBBT2702  |
| <b>Standards:</b>               | FCC Part 15.247 :2011   |
| <b>FCC ID:</b>                  | Y8ABTU280AM-FM  |
| <b>Data of Receipt:</b>         | 2013-03-08  |
| <b>Date of Test:</b>            | 2013-03-08~2013-04-03   |
| <b>Date of Issue:</b>           | 2013-04-11  |
| <b>Test Result</b>              | <b>Pass*</b>  |

\* In the configuration tested, the test item complied with the standards specified above.

## Authorized for issue by:

Test by:

*Jumy Qiu*

Reviewed by:

*Pauler Li*

Apr.11.2013 Jumy Qiu

Apr.11.2013

Pauler Li

Project Engineer

Project Manager

Date

Name/Position

Signature

Date

Name/Position

Signature

**Possible test case verdicts:**

test case does not apply to the test object ...: N/A

test object does meet the requirement .....: P (Pass)

test object does not meet the requirement ...: F (Fail)

**Testing Laboratory information:**

Testing Laboratory Name .....: I-Test Laboratory

Address.....: 1-2 floor, South Block, Building A2 , No 3 Keyan Lu,  
Science City, Guangzhou, Guangdong Province, P.R. China

Testing location : Same as above

Tel : 0086-20-32209330

Fax : 0086-20-62824387

E-mail : itl@i-testlab.com

**General remarks:**

**The test results presented in this report relate only to the object tested.**

**The results contained in this report reflect the results for this particular model and serial number. It is the responsibility of the manufacturer to ensure that all production models meet the intent of the requirements detailed within this report.**

**This report would be invalid test report without all the signatures of testing technician and approver.**

**This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.**

**General product information:**

/

## 1 Test Summary

| Test   | Test Requirement  | Test method   | Result |
|--|---|---|--------|
| Antenna Requirement  | FCC PART 15 C<br>section 15.247 (c) and<br>Section 15.203 | FCC PART 15 C<br>section 15.247 (c) and<br>Section 15.203 | PASS   |
| Occupied Bandwidth<br>( -20dB)   | FCC PART 15 C<br>section 15.247 (a)(1);                   | ANSI C63.10: Clause 6.9<br>& DA 00-705                    | PASS   |
| Carrier Frequencies<br>Separated   | FCC PART 15 C<br>section 15.247(a)(1);                    | DA 00-705   | PASS   |
| Hopping Channel Number   | FCC PART 15 C<br>section 15.247(a)(1)(iii)                | DA 00-705   | PASS   |
| Dwell Time   | FCC PART 15 C<br>section 15.247(a)(1)(iii);               | DA 00-705   | PASS   |
| Maximum Peak Output Power  | FCC PART 15 C<br>section 15.247(b)(1);                    | ANSI C63.10: Clause 6.10<br>& DA 00-705                   | PASS   |
| Conducted Spurious<br>Emission<br>(30 MHz to 25 GHz)   | FCC PART 15 C<br>section 15.247(d);                       | ANSI C63.10: Clause 6.7<br>& DA 00-705                    | PASS   |
| Radiated Spurious Emission<br>(9 kHz to 25 GHz)  | FCC PART 15 C<br>section 15.247(d);                       | ANSI C63.10: Clause 6.4,<br>6.5 and 6.6 & DA 00-705       | PASS   |
| Band Edges Measurement   | FCC PART 15 C<br>section 15.247 (d)<br>&15.205            | ANSI C63.10: Clause 6.9<br>& DA 00-705                    | PASS   |
| Conducted Emissions at<br>Mains Terminals  | FCC PART 15 C<br>section 15.207;                          | ANSI C63.10: Clause 6.2<br>& DA 00-705                    | PASS   |
| <b>Remark:</b>   |   |   |        |
| <p>N/A: not applicable. Refer to the relative section for the details.<br/> EUT: In this whole report EUT means Equipment Under Test.<br/> Tx: In this whole report Tx (or tx) means Transmitter.<br/> Rx: In this whole report Rx (or rx) means Receiver.<br/> RF: In this whole report RF means Radio Frequency.<br/> ANSI C63.10: the detail version is ANSI C63.10:2009 in the whole report.<br/> DA 00-705: "Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems"</p> |   |   |        |

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### 3 General Information

#### 3.1 Client Information

Applicant: Ngai Lik Electronics Enterprises Limited  
Address of Applicant: Flat 29-32, 8/F., Block B, Focal Industrial Centre, 21 Man Lok Street, Hung Hom, Kowloon, Hong Kong.

#### 3.2 General Description of E.U.T.

Name: FM STEREO RADIO WITH BLUETOOTH/CD/USB/MP3/SD CARD/AUX IN PLAYER  
Model No.: BTU280AM-FM  
Trade Mark: AXESS for PBBT2702  
Operating Frequency: 2402 MHz to 2480 MHz for Bluetooth.  
Channels: 79 channels with 1MHz step for Bluetooth  
Type of Modulation: GFSK, ( $\pi/4$ ) DQPSK, 8DPSK for Bluetooth  
Dwell time: Per channel is less than 0.4s.  
Antenna Type: PCB Antenna  
Antenna gain: 3dBi max  
Speciality: Bluetooth 2.1with EDR  
Function: Audio speaker system with Bluetooth function.

#### 3.3 Details of E.U.T.

EUT Power Supply: AC Power, Class II  
Rated power: 9Vdc 1.5A for main; AC 100-240V, 50/60Hz, 0.5A for adapter  
Test mode: The program used to control the EUT for staying in continuous transmitting and receiving mode is programmed. Channel lowest (2402MHz), middle (2441MHz) and highest (2480MHz) are chosen for Bluetooth full testing.  
Normal mode: the Bluetooth has been tested on the Modulation of GFSK;  
EDR mode: the Bluetooth has been tested on the Modulation of ( $\pi/4$ )DQPSK and 8DPSK, compliance test and record the worst case on ( $\pi/4$ )DQPSK and 8DPSK  
Power cord: /

#### 3.4 Description of Support Units

The EUT has been tested as an independent unit for fixed frequency by testing lab.

### 3.5 Test Location

All tests were performed at:

Guangzhou ITL Co., Ltd.

1-2 floor, South Block, Building A2 , No 3 Keyan Lu, Science City, Guangzhou, Guangdong Province, P.R. China

0086-20-32209330

itl@i-testlab.com

No tests were sub-contracted.

### 3.6 Deviation from Standards

Biconical and log periodic antennas were used instead of dipole antennas.

### 3.7 Abnormalities from Standard Conditions

None.

### 3.8 Other Information Requested by the Customer

None.

### 3.9 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

- CNAS( Lab code:L4957)
- FCC ( Registration No.:935596)
- IC (Registration NO.:8368A)

### 3.10 Measurement Uncertainty

The below measurement uncertainties given below are based on a 95% confidence level (base on a coverage factor (k=2).)

| Parameter                     | Uncertainty               |
|-------------------------------|---------------------------|
| Radio frequency               | $\pm 1.06 \times 10^{-7}$ |
| total RF power, conducted     | 1.37 dB                   |
| RF power density , conducted  | 2.89 dB                   |
| All emissions, radiated       | $\pm 3.35$ dB             |
| Temperature                   | $\pm 0.23$ °C             |
| Humidity                      | $\pm 0.3$ %               |
| DC and low frequency voltages | $\pm 0.3$ %               |

#### 4 Instruments Used during Test

| No | Test Equipment        | Manufacturer  | Model No        | Serial No          | Cal. Date  | Cal. Due Date |
|----|-----------------------|---------------|-----------------|--------------------|------------|---------------|
| 1  | Spectrum Analyzer     | Agilent       | N9010A          | MY51250936         | 2013.02.01 | 2014.01.31    |
| 2  | Pre Amplifier         | HP            | 8447F           | 3113A05905         | 2012.09.07 | 2013.09.06    |
| 3  | Pre Amplifier         | Mini-circuits | MLA-0120-A02-34 | 2648A04738         | 2012.06.08 | 2013.06.07    |
| 4  | Biconilog Antenna     | ETS•Lindgren  | 3142D           | 00108096           | 2013.01.29 | 2014.01.28    |
| 5  | Horn Antenna          | A-INFOMW      | JXTXLB-10180-N  | J203109061213<br>3 | 2012.12.18 | 2013.12.17    |
| 6  | EMI Test Receiver     | R&S           | ESCI            | 100124             | 2012.06.08 | 2013.06.07    |
| 7  | LISN                  | R&S           | ENV216          | 100120             | 2012.06.08 | 2013.06.07    |
| 8  | 50Ω Coaxial Cable     | Mini-circuits | CBL             | ITL-115            | 2012.09.07 | 2013.09.06    |
| 9  | Semi-Anechoic chamber | ETS•Lindgren  | FACT3 2.0       | ITL-100            | 2012.04.11 | 2013.04.10    |
| 10 | Loop Antenna          | ZHINAN        | ZN30900A        | 002489             | 2013.01.23 | 2014.01.22    |
| 11 | Horn Antenna          | Schwarzbeck   | BBHA 9170       | ITL-118            | 2012.06.08 | 2013.06.07    |

## 5 Test Results

### 5.1 E.U.T. test conditions

**Test Voltage:** Input: AC 120V, 60 Hz

**Temperature:** 20.0 -25.0 °C

**Humidity:** 38-50 % RH

**Atmospheric Pressure:** 1000 -1010 mbar

**Test frequencies and frequency range:** According to the 15.31(m) Measurements on intentional radiators or receivers, other than TV broadcast receivers, shall be performed and, if required, reported for each band in which the device can be operated with the device operating at the number of frequencies in each band specified in the following table:

According to the 15.33 (a) For an intentional radiator, the spectrum shall be investigated from the lowest radio frequency signal generated in the device, without going below 9 kHz, up to at least the frequency shown in the following table:

**Number of fundamental frequencies to be tested in EUT transmit band**

| Frequency range in which | Number of | Location in frequency range                 |
|--------------------------|-----------|---|
| 1 MHz or less            | 1         | Middle                                      |
| 1 MHz to 10 MHz          | 2         | 1 near top and 1 near bottom                |
| More than 10 MHz         | 3         | 1 near top, 1 near middle and 1 near bottom |

**Frequency range of radiated emission measurements**

| Lowest frequency generated  | Upper frequency range of measurement                         |
|-----------------------------|--|
| 9 kHz to below 10 GHz       | 10th harmonic of highest fundamental frequency or to 40 GHz, |
| At or above 10 GHz to below | 5th harmonic of highest fundamental frequency or to 100 GHz, |
| At or above 30 GHz          | 5th harmonic of highest fundamental frequency or to 200 GHz, |



EUT channels and frequencies list for bluetooth:

| Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---------|-----------------|---------|-----------------|---------|-----------------|
| 0       | 2402            | 11      | 2413            | 22      | 2424            |
| 1       | 2403            | 12      | 2414            | 23      | 2425            |
| 2       | 2404            | 13      | 2415            | 24      | 2426            |
| 3       | 2405            | 14      | 2416            | 25      | 2427            |
| 4       | 2406            | 15      | 2417            | 26      | 2428            |
| 5       | 2407            | 16      | 2418            | 27      | 2429            |
| 6       | 2408            | 17      | 2419            | 28      | 2430            |
| 7       | 2409            | 18      | 2420            | 29      | 2431            |
| 8       | 2410            | 19      | 2421            | 30      | 2432            |
| 9       | 2411            | 20      | 2422            | 31      | 2433            |
| 10      | 2412            | 21      | 2423            | 32      | 2434            |
| 33      | 2435            | 49      | 2451            | 65      | 2467            |
| 34      | 2436            | 50      | 2452            | 66      | 2468            |
| 35      | 2437            | 51      | 2453            | 67      | 2469            |
| 36      | 2438            | 52      | 2454            | 68      | 2470            |
| 37      | 2439            | 53      | 2455            | 69      | 2471            |
| 38      | 2440            | 54      | 2456            | 70      | 2472            |
| 39      | 2441            | 55      | 2457            | 71      | 2473            |
| 40      | 2442            | 56      | 2458            | 72      | 2474            |
| 41      | 2443            | 57      | 2459            | 73      | 2475            |
| 42      | 2444            | 58      | 2460            | 74      | 2476            |
| 43      | 2445            | 59      | 2461            | 75      | 2477            |
| 44      | 2446            | 60      | 2462            | 76      | 2478            |
| 45      | 2447            | 61      | 2463            | 77      | 2479            |
| 46      | 2448            | 62      | 2464            | 78      | 2480            |
| 47      | 2449            | 63      | 2465            |         |                 |
| 48      | 2450            | 64      | 2466            |         |                 |

Test frequencies are the lowest channel: 0 channel(2402 MHz), middle channel: 39 channel(2441 MHz) and highest channel: 78 channel(2480 MHz)

## 5.2 Antenna equipment

### Standard requirement

15.203 requirement:

For intentional device. According to 15.203. an intentional radiator shall be designed to Ensure that no antenna other than that furnished by the responsible party shall be used with the device.

15.247(c) (1)(i) requirement:

(i) Systems operating in the 2400-2483.5 MHz bands that are used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

### EUT Antenna

The antenna is a Printed antenna and no consideration of replacement. The best case gain of the antenna is 3dBi.

**Test result: The unit does meet the FCC requirements.**

### 5.3 Occupied Bandwidth

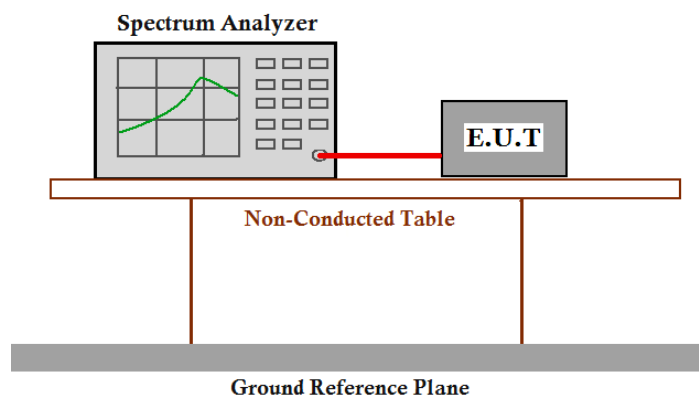
**Test Requirement:** FCC Part 15 C section 15.247

(a)(1) Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

**Test Method:** ANSI C63.10: Clause 6.9 & DA 00-705

**Test Status:** Pre-test the EUT in continuous transmitting mode at the lowest, middle and highest channel with different data package. Compliance test in normal mode (DH5), EDR mode (2DH5) and EDR mode (3DH5) as the worst case was found.

**Test Configuration:**



**Test Procedure:**

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer: Span = approximately 2 to 3 times the 20dB bandwidth, centring on a hopping channel;
3. Set the spectrum analyzer: RBW  $\geq$  1% of the 20dB bandwidth VBW  $\geq$  RBW. Sweep = auto; Detector Function = Peak. Trace = Max Hold.
4. Mark the peak frequency and -20dB points bandwidth.

**Test result (-20dB bandwidth), For bluetooth****Normal mode:**

| Test Channel | Bandwidth(MHz) | 2/3 bandwidth(MHz) |
|--------------|----------------|--------------------|
| Lowest       | 1.12           | 0.75               |
| Middle       | 1.11           | 0.74               |
| Highest      | 1.11           | 0.74               |

**EDR mode (2DH5):**

| Test Channel | Bandwidth(MHz) | 2/3 bandwidth(MHz) |
|--------------|----------------|--------------------|
| Lowest       | 1.41           | 0.94               |
| Middle       | 1.40           | 0.93               |
| Highest      | 1.41           | 0.94               |

**EDR mode (3DH5):**

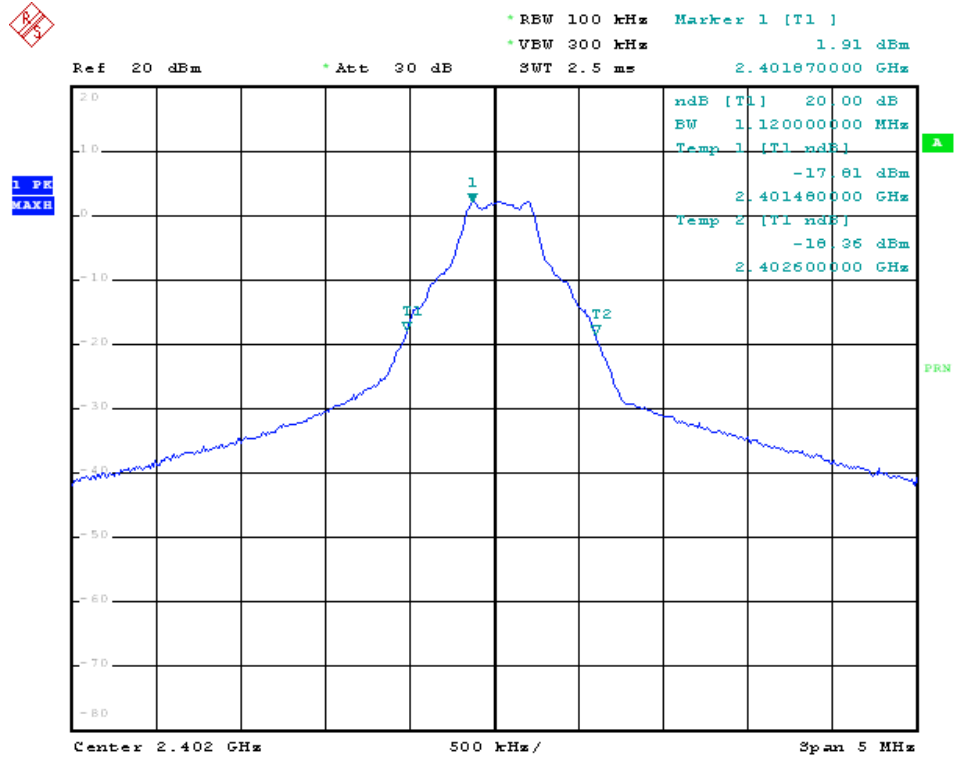
| Test Channel | Bandwidth(MHz) | 2/3 bandwidth(MHz) |
|--------------|----------------|--------------------|
| Lowest       | 1.41           | 0.94               |
| Middle       | 1.40           | 0.93               |
| Highest      | 1.39           | 0.93               |

For bluetooth

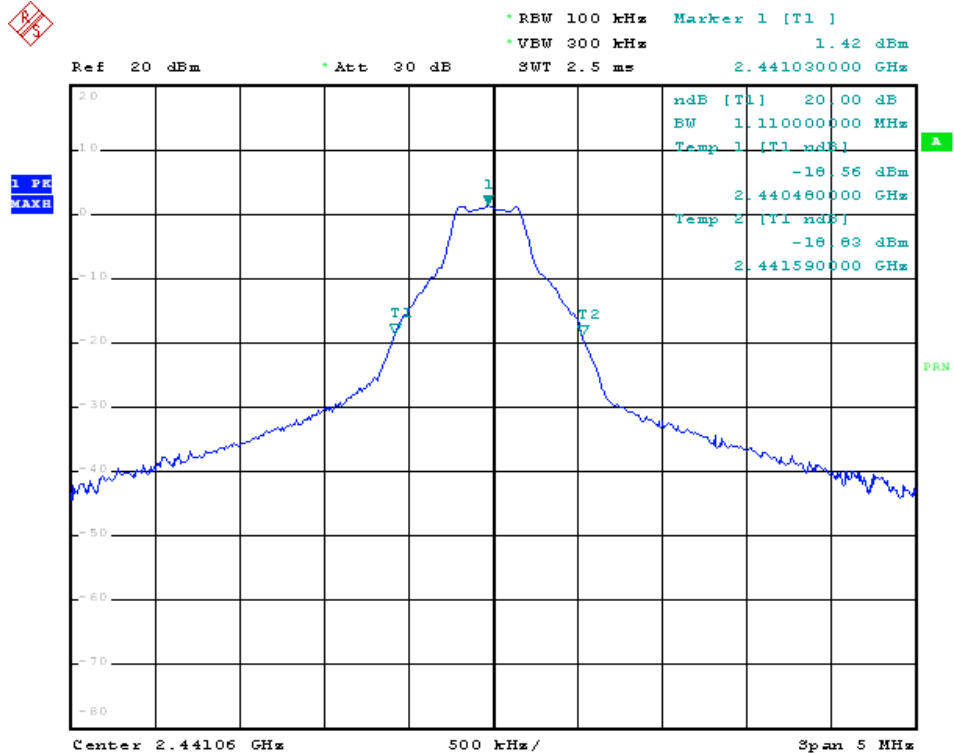
Result plot as follows:

DH5:

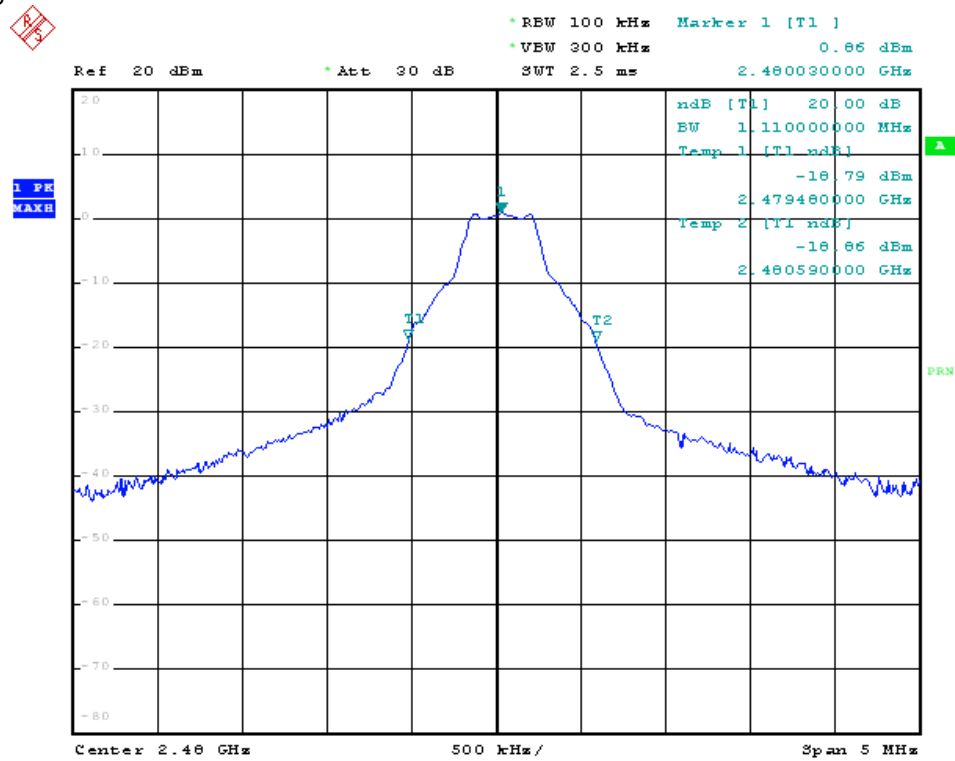
Lowest Channel:



Middle Channel:

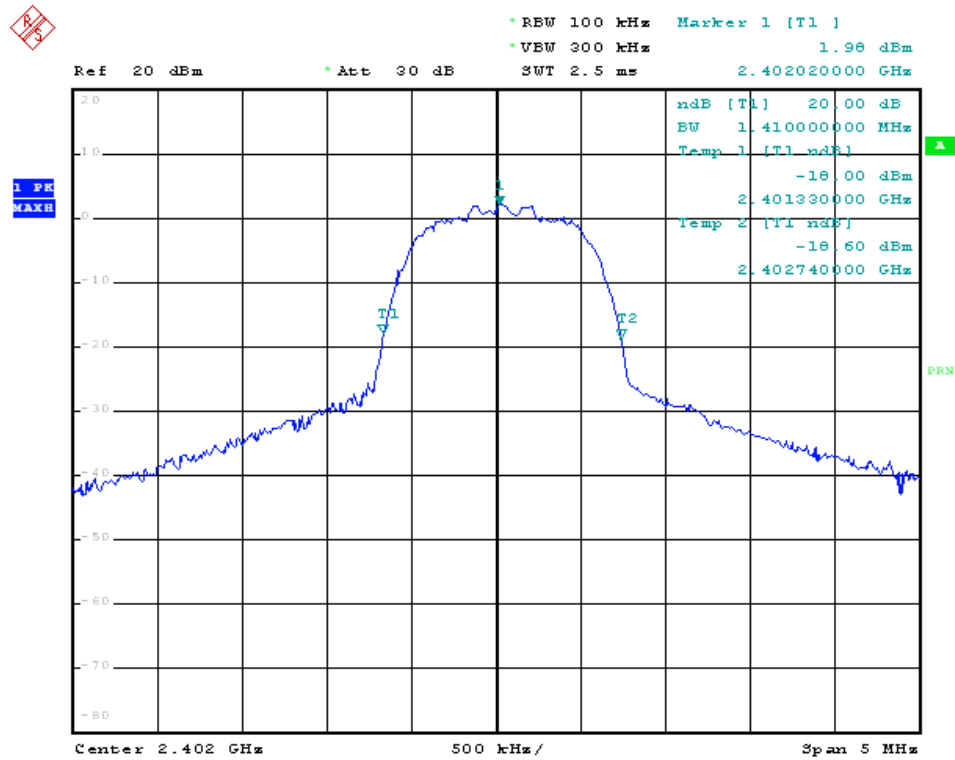


Highest Channel:

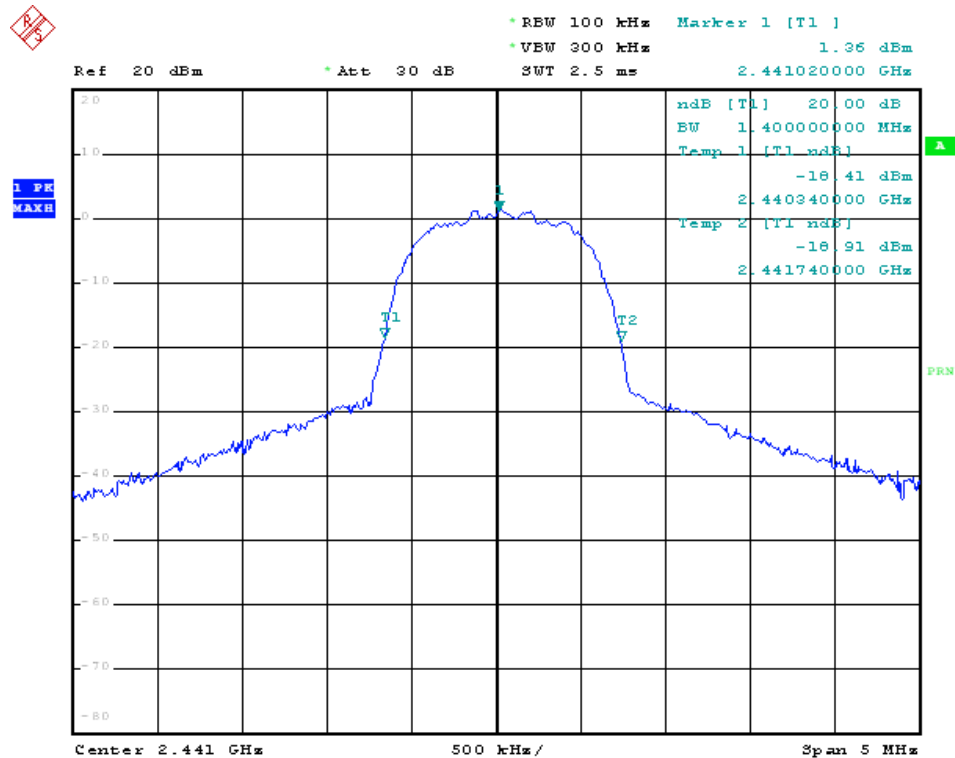


2DH5:

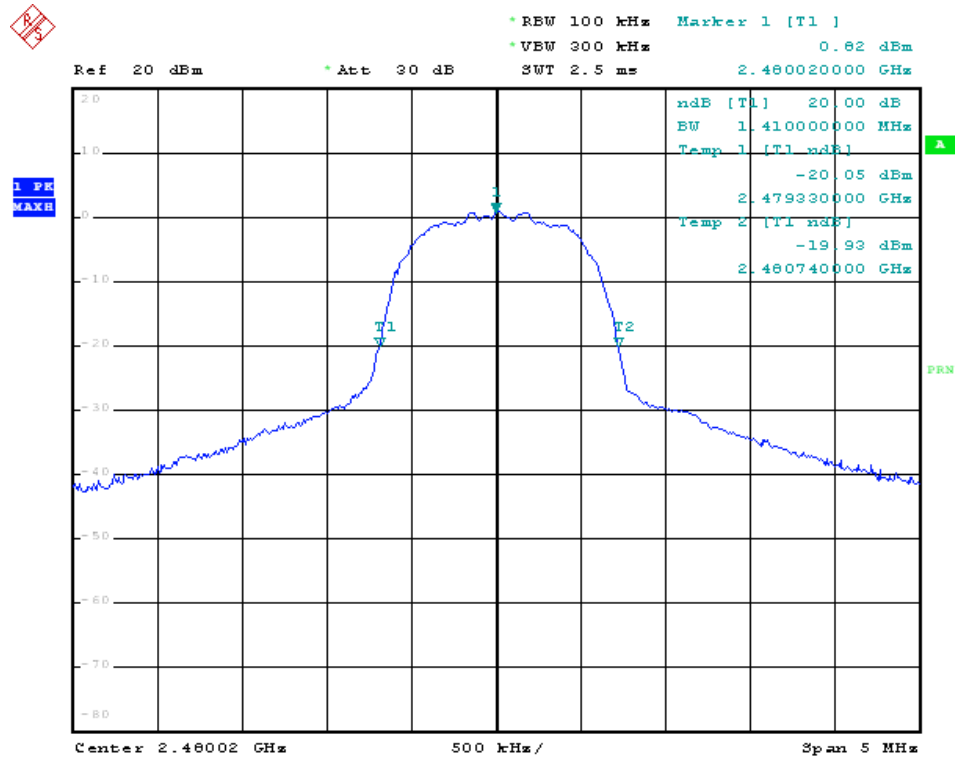
Lowest channel:



Middle channel:

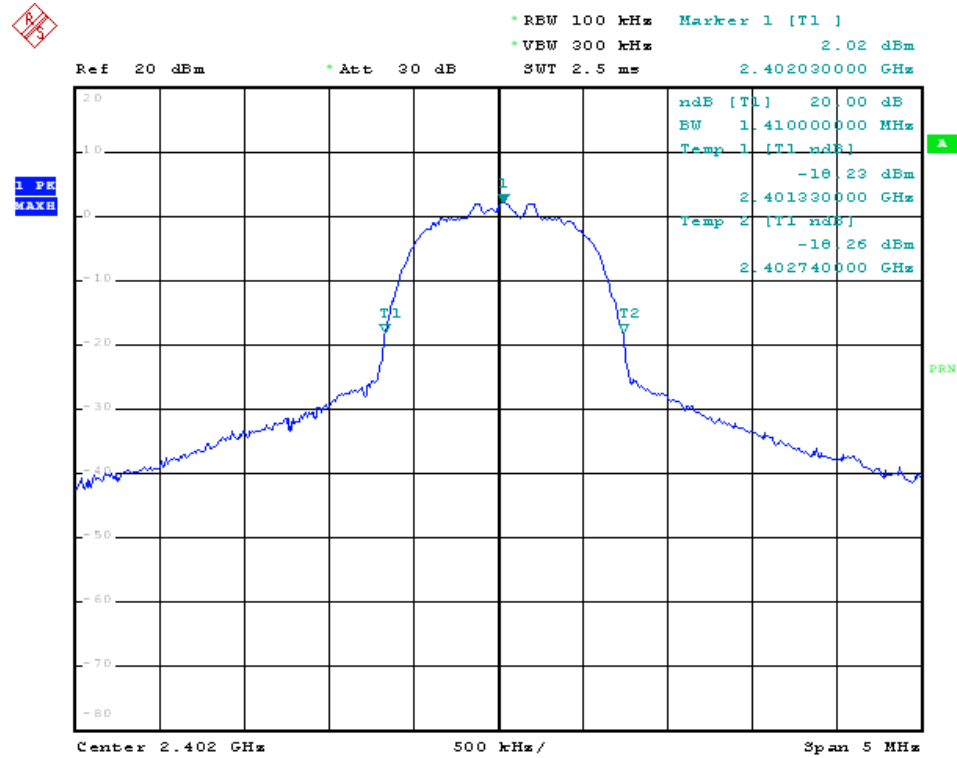


Highest channel:

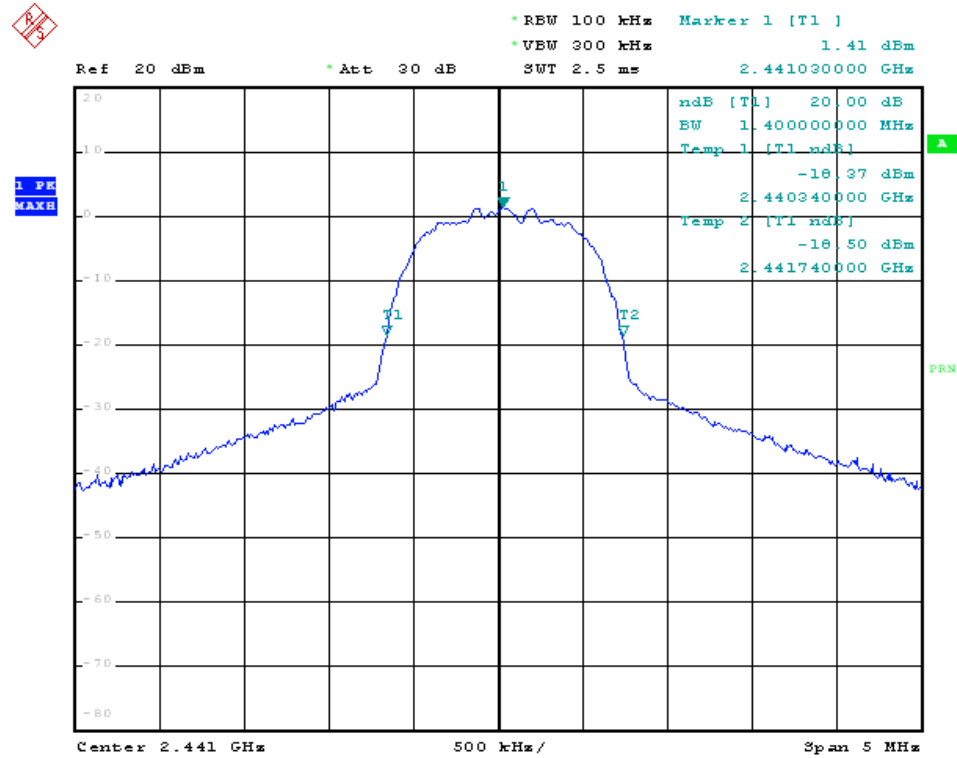


3DH5:

Lowest channel:

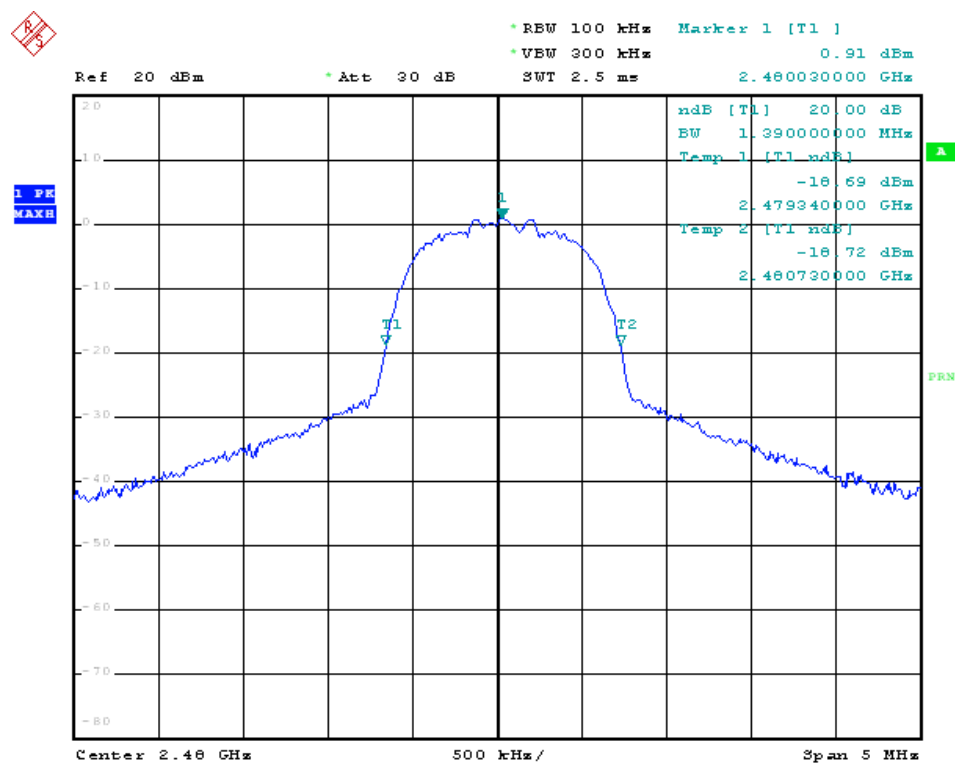


Middle channel:





Highest channel:



## 5.4 Carrier Frequencies Separated

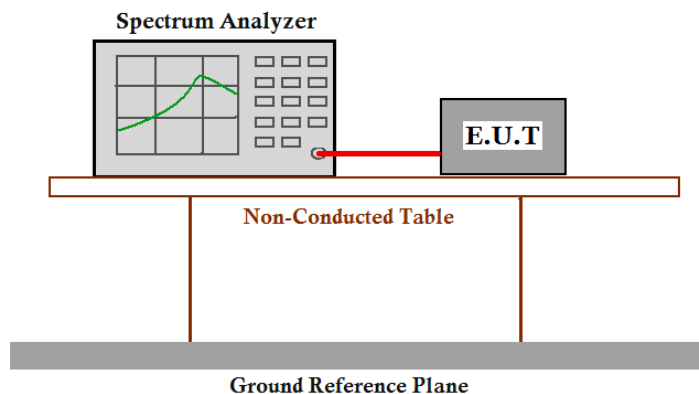
**Test Requirement:** FCC Part 15 C section 15.247

(a),(1) Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

**Test Method:** DA 00-705

**Test Status:** Pre-test the EUT in continuous transmitting mode at the lowest, middle and highest channel with different data package. Compliance test in normal mode (DH5), EDR mode (2DH5) and EDR mode (3DH5) as the worst case was found.

**Test Configuration:**



**Test Procedure:**

1. Remove the antenna from the EUT and then connect a low attenuation RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW  $\geq$  1% of the span, VBW  $\geq$  RBW, Sweep = auto; Detector Function = Peak. Trace = Max, hold.
3. Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The limit is specified in one of the subparagraphs of this Section. Submit this plot.

**Test result:****For Bluetooth****DH5**

| Test Channel  | Carrier Frequencies Separated | Pass/Fail |
|---|-------------------------------|-----------|
| Lower Channels<br>(channel 0 and channel 1)                                     | 1.00 MHz                      | Pass      |
| Middle Channels<br>(channel 39 and channel 40)                                  | 1.00 MHz                      | Pass      |
| Upper Channels<br>(channel 77 and channel 78)                                   | 1.00 MHz                      | Pass      |
| Remark:<br><br>The limit is maximum two-thirds of the 20 dB bandwidth: 0.75 MHz |                               |           |

**2DH5**

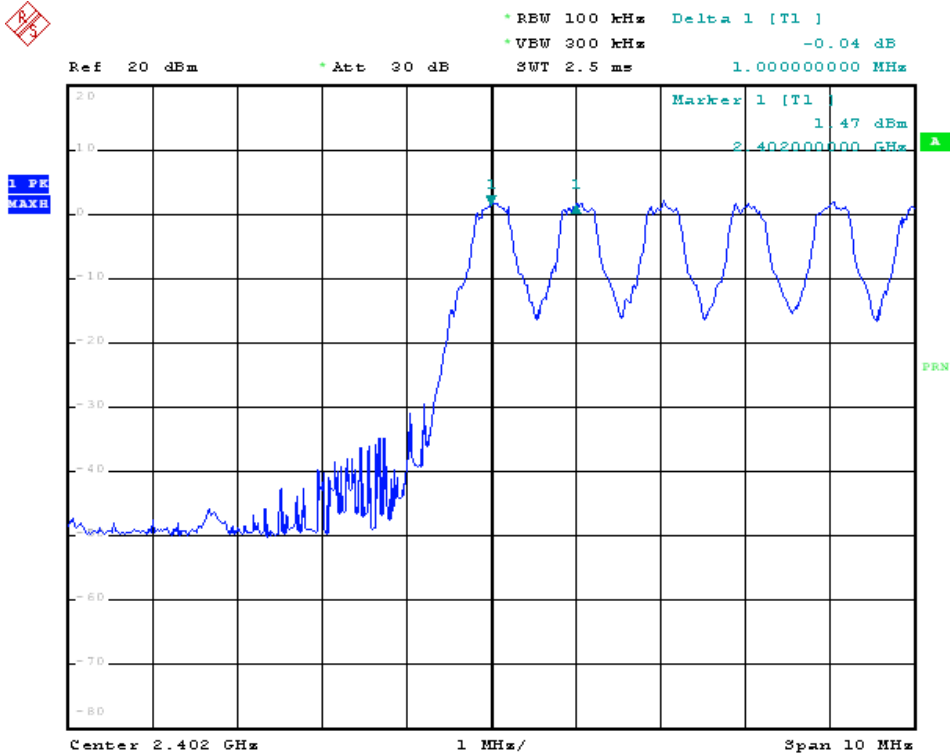
| Test Channel  | Carrier Frequencies Separated | Pass/Fail |
|---|-------------------------------|-----------|
| Lower Channels<br>(channel 0 and channel 1)                                   | 1.00 MHz                      | Pass      |
| Middle Channels<br>(channel 39 and channel 40)                                | 1.00 MHz                      | Pass      |
| Upper Channels<br>(channel 77 and channel 78)                                 | 1.00 MHz                      | Pass      |
| Remark:<br><br>The limit is maximum two-thirds of the 20 dB bandwidth:0.94MHz |                               |           |

## 3DH5

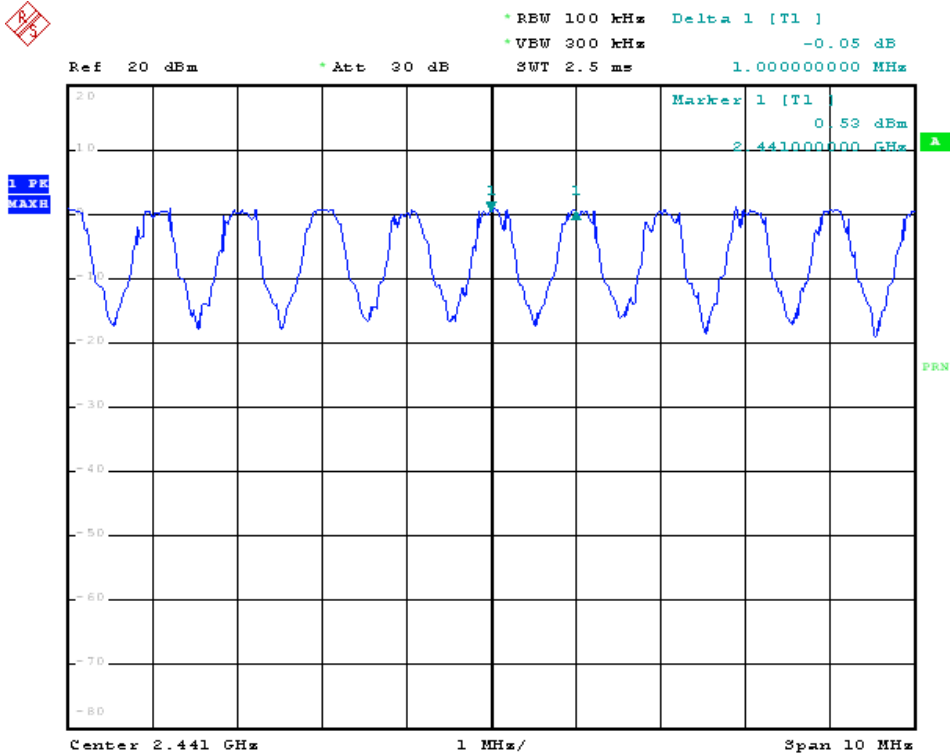
| Test Channel   | Carrier Frequencies Separated | Pass/Fail |
|--|-------------------------------|-----------|
| Lower Channels<br>(channel 0 and channel 1)                                    | 1.00 MHz                      | Pass      |
| Middle Channels<br>(channel 39 and channel 40)                                 | 1.00 MHz                      | Pass      |
| Upper Channels<br>(channel 77 and channel 78)                                  | 1.00 MHz                      | Pass      |
| Remark:<br><br>The limit is maximum two-thirds of the 20 dB bandwidth: 0.94MHz |                               |           |

For buletooth  
Carrier Frequencies Separated plot:  
DH5

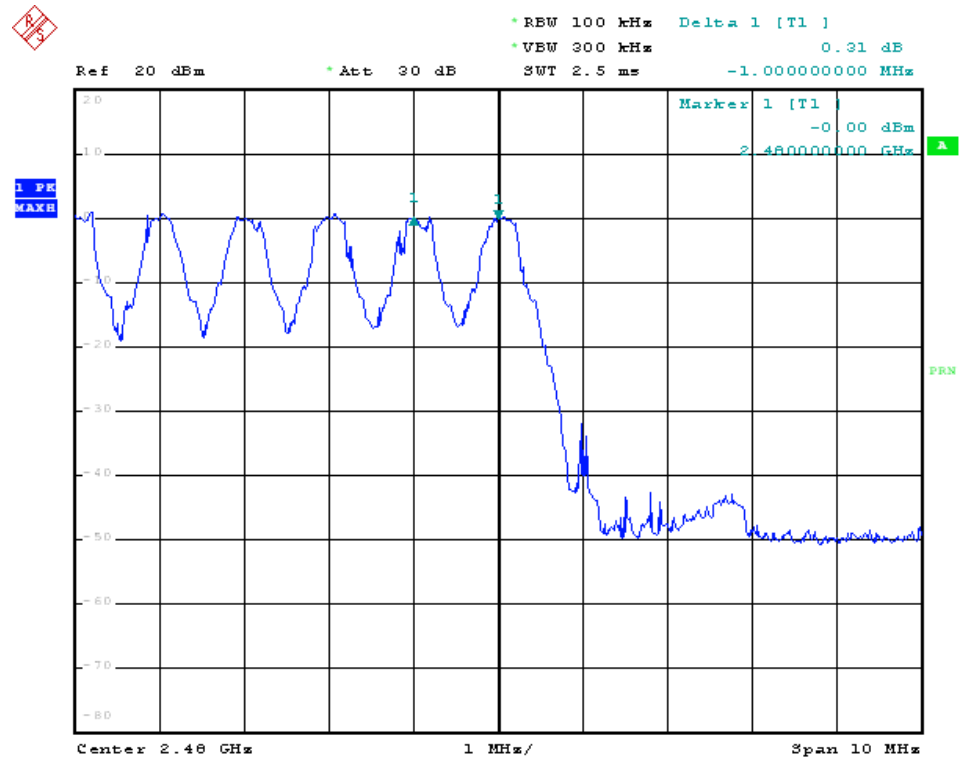
1. Lowest Channels:



2. Middle Channels:

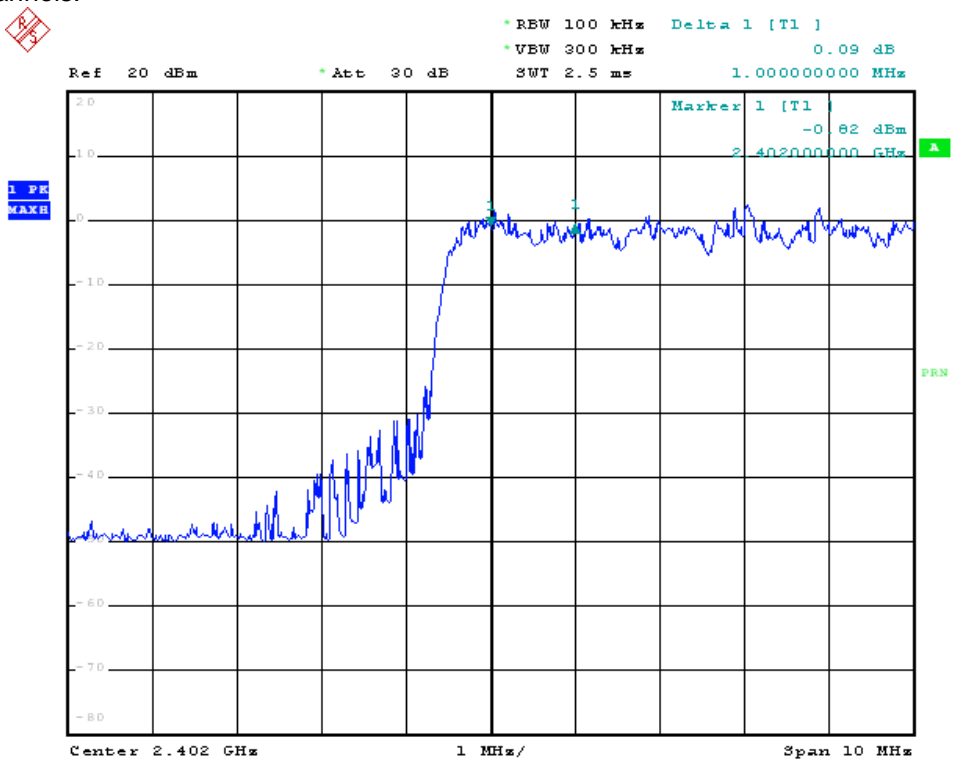


3. Highest Channels

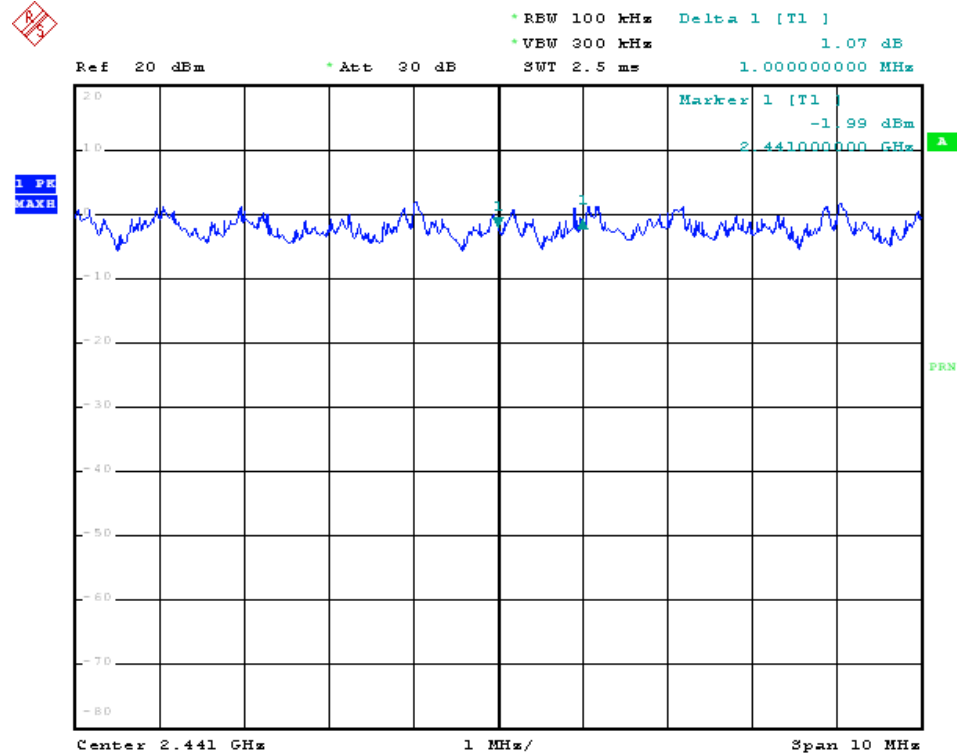


2DH5

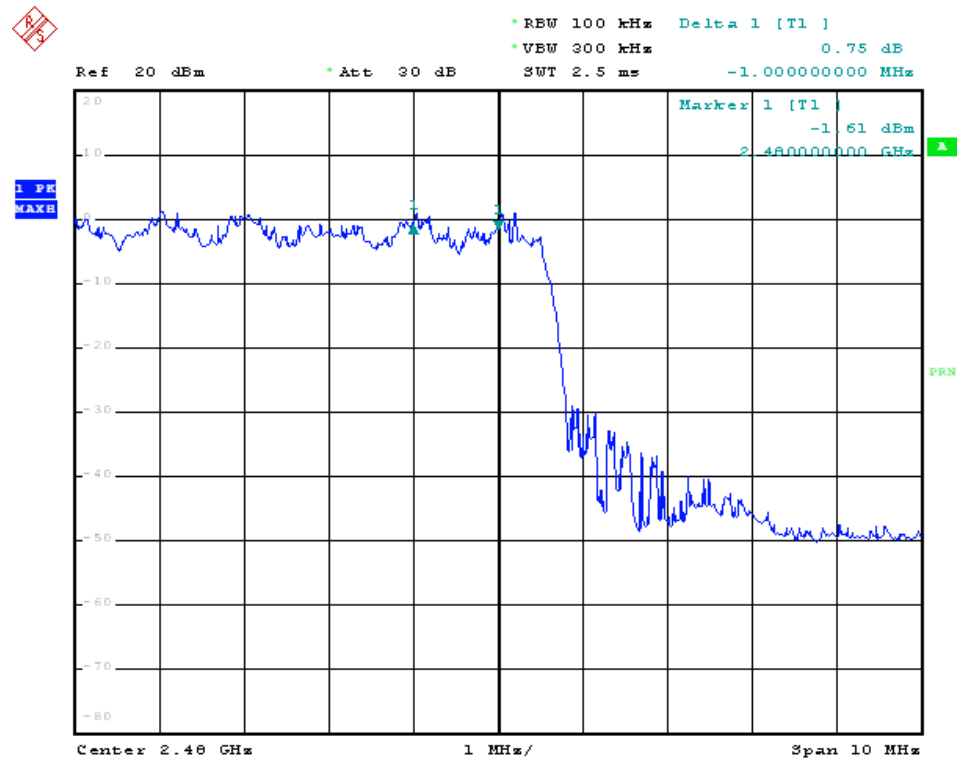
1. Lowest Channels:



2. Middle Channels:

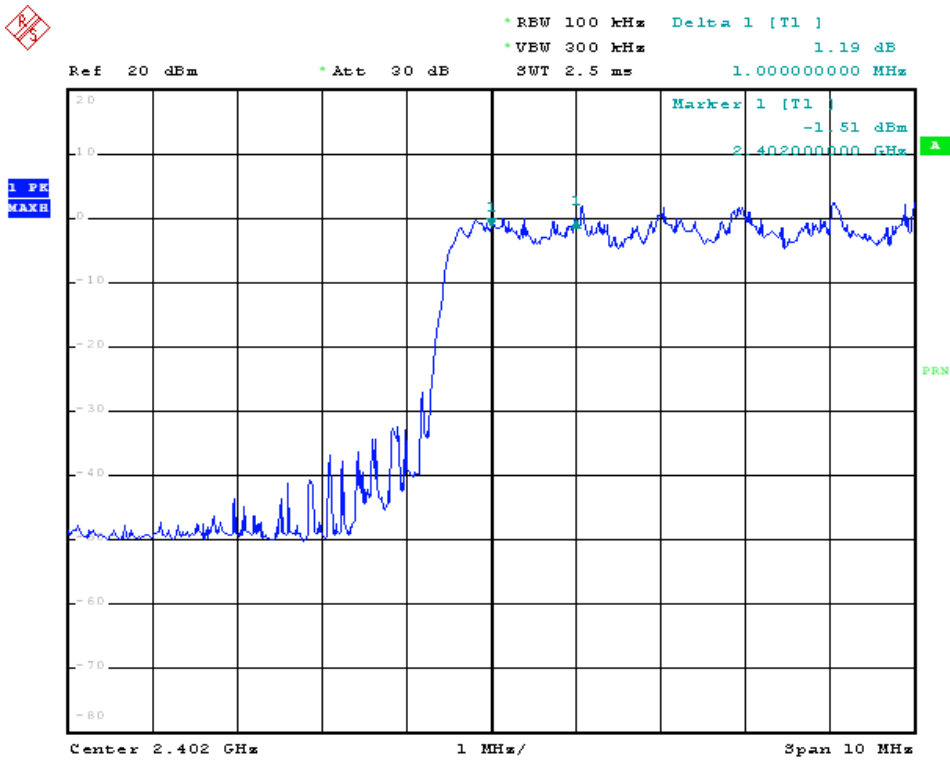


3. Highest Channels

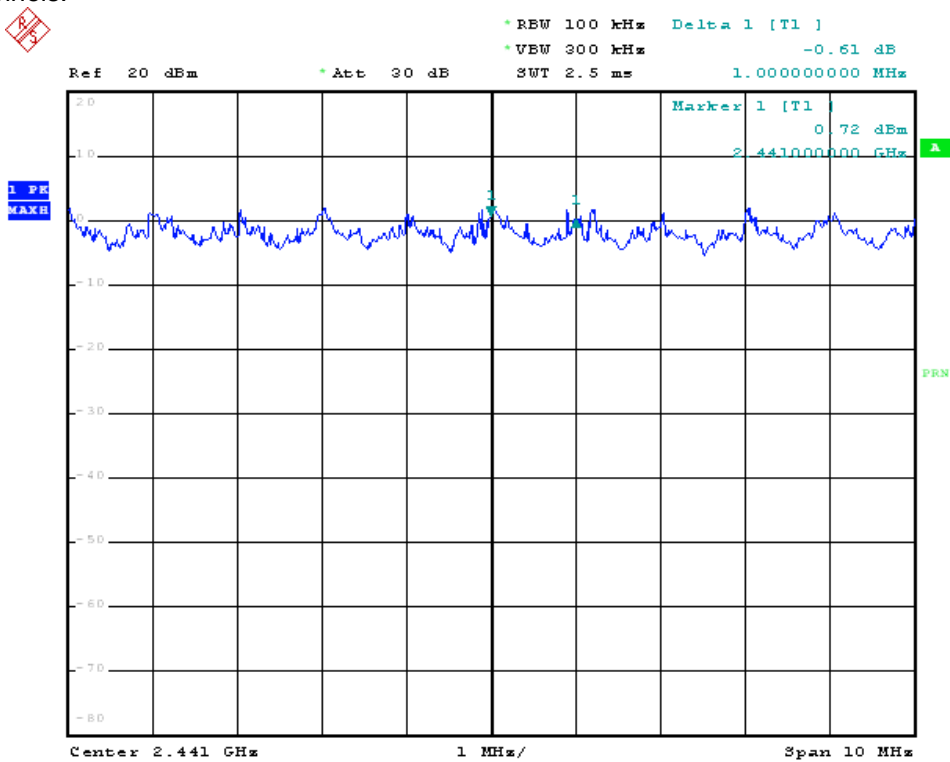


3DH5

1. Lowest Channels:

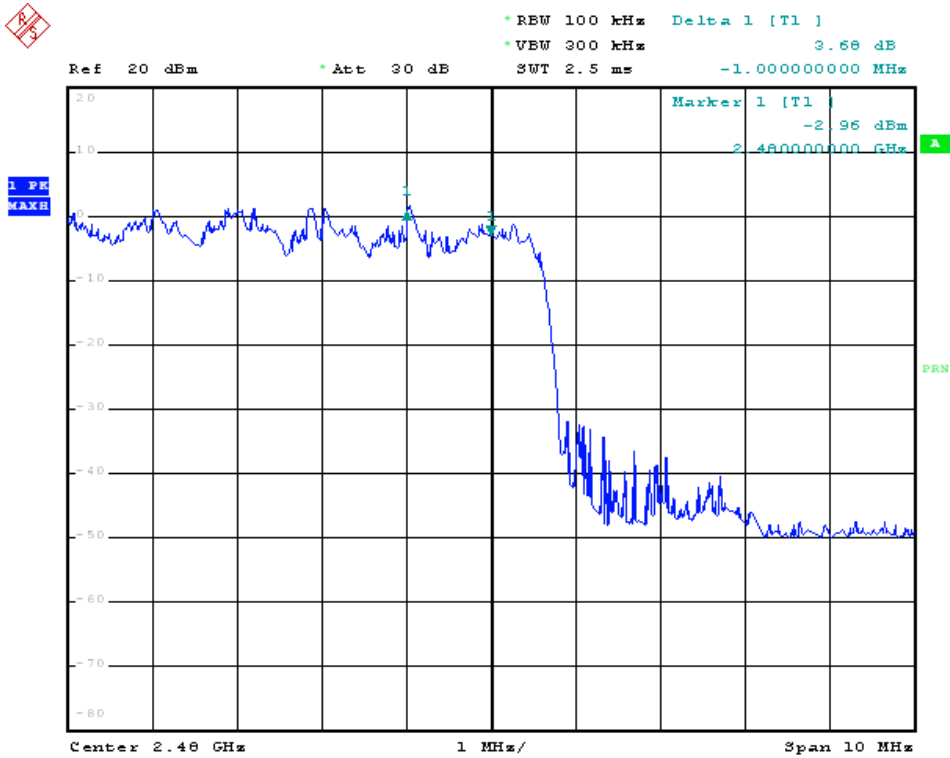


2. Middle Channels:





3. Highest Channels



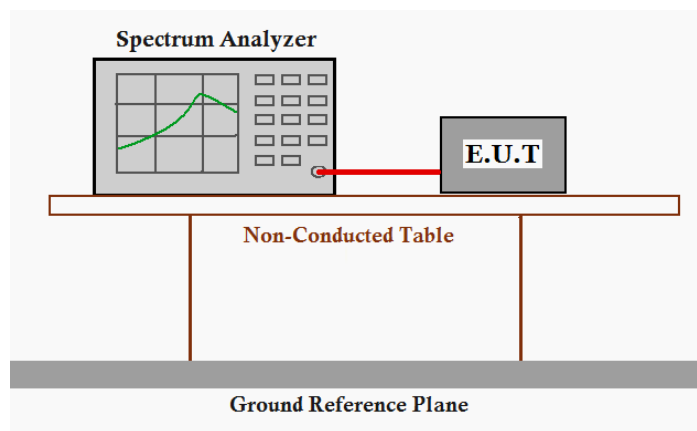
## 5.5 Hopping Channel Number

**Test Requirement:** FCC Part15 C section 15.247  
(a)(1)(iii) Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

**Test Method:** DA 00-705

**Test Status:** Pre-test the EUT in hopping mode with different data packet. Compliance test in hopping with normal mode (DH5), EDR mode (2DH5) and EDR mode (3DH5) as the worst case was found.

**Test Configuration:**

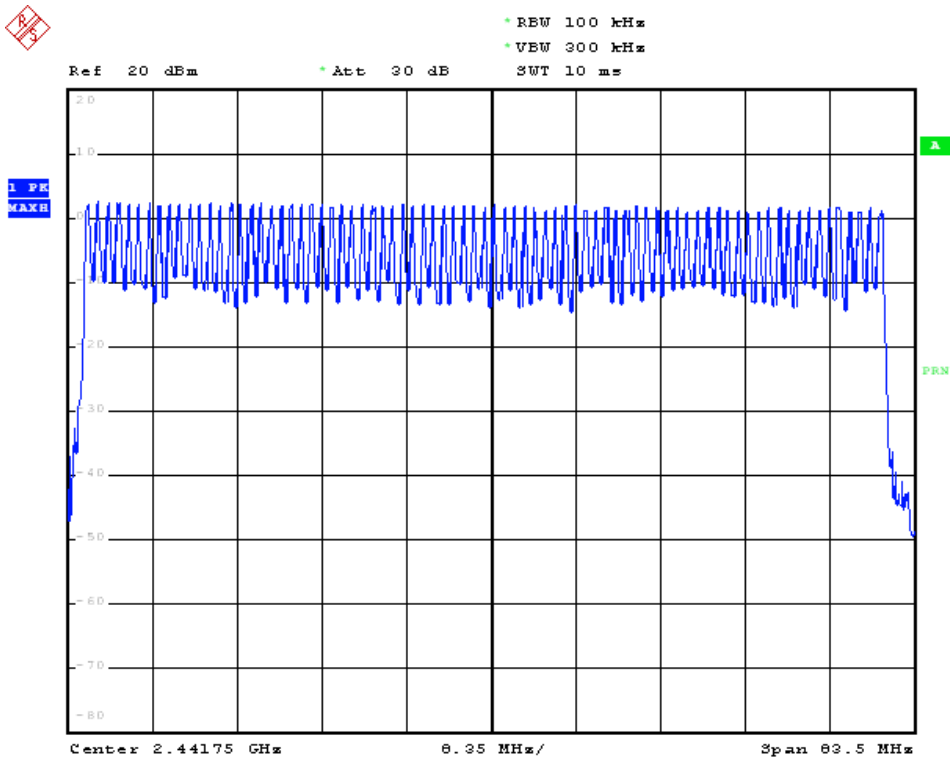


**Test Procedure:**

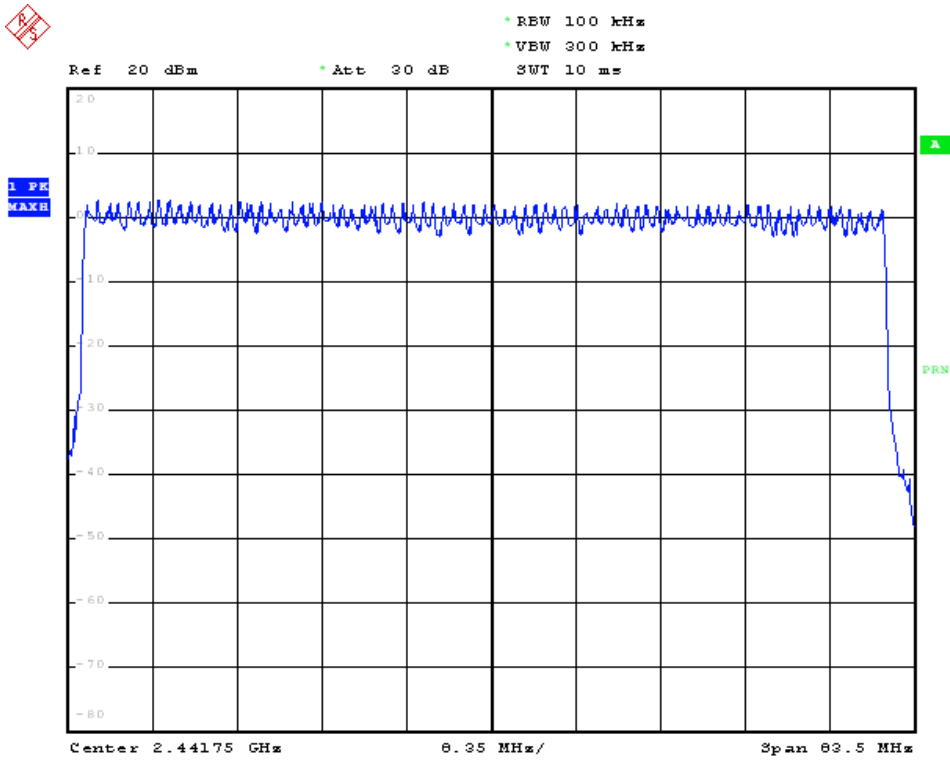
1. Remove the antenna from the EUT and then connect a low attenuation RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 100 kHz. VBW = 300 kHz. Sweep = auto; Detector Function = Peak. Trace = Max hold.
3. Allow the trace to stabilize. It may prove necessary to break the span up to sections. in order to clearly show all of the hopping frequencies. The limit is specified in one of the subparagraphs of this Section.
4. Set the spectrum analyzer: start frequency = 2400 MHz. stop frequency = 2483.5 MHz. Submit the test result graph.

For buletooth

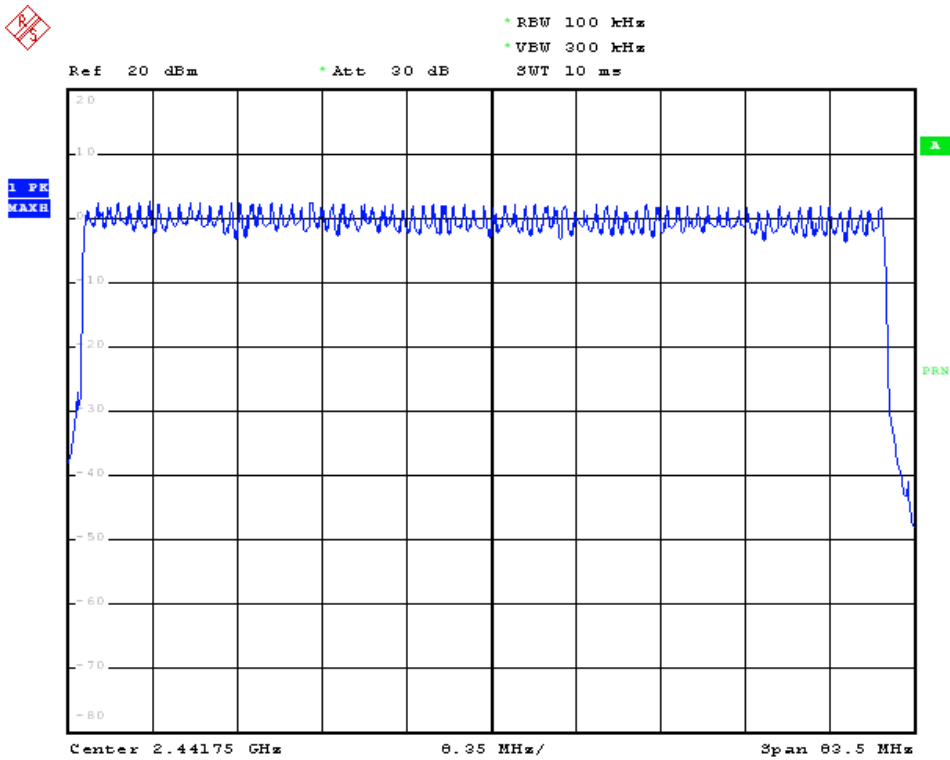
Test result: Total channels are 79 channels.  
DH5:



2DH5:



3DH5:



Test result: The unit does meet the FCC requirements.

## 5.6 Dwell Time

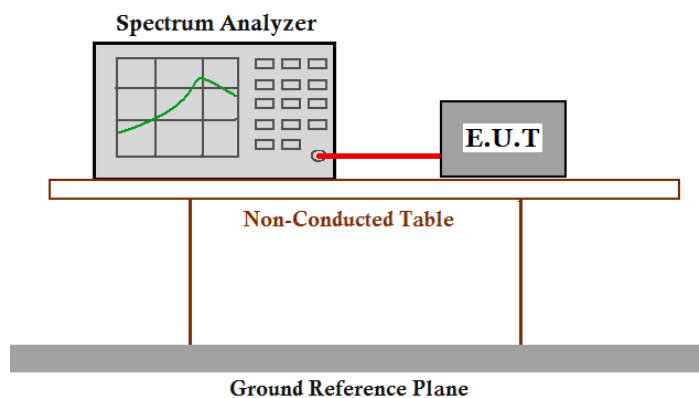
**Test Requirement:** FCC Part 15 C section 15.247

(a)(1)(iii) Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 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.

**Test Method:** DA 00-705

**Test Status:** Pre-test the EUT in continuous transmitting mode at the lowest, middle and highest channel with different data packet. Compliance test in hopping with Normal mode (DH1, DH3 and DH5) and EDR mode (2DH1, 2DH3 and 2DH5; 3DH1, 3DH3 and 3DH5) as the worst case was found.

**Test Configuration:**



**Test Procedure:**

1. Remove the antenna from the EUT and then connect a low attenuation RF cable from the antenna port to the spectrum.
  2. Set spectrum analyzer span = 0. centered on a hopping channel;
  3. Set RBW = 1 MHz and VBW = 1 MHz. Sweep = as necessary to capture the entire dwell time per hopping channel. Detector Function = Peak. Trace = View;
  4. Use the marker-delta function to determine the dwell time. If this value varies with different modes of operation (e.g., data rate, modulation format, etc.). Repeat this test for each variation.
- The limit is specified in one of the subparagraphs of this Section. Submit this plot(s). An oscilloscope may be used instead of a spectrum analyzer.

**Test Result:****For bluetooth**

The test period:  $T = 0.4 \text{ Second/Channel} \times 79 \text{ Channel} = 31.6 \text{ s}$

**1. Channel 0: 2.402GHz**

DH1 time slot =  $0.40(\text{ms}) * (1600/(2*79)) * 31.6 = 127.9\text{ms}$

DH3 time slot =  $1.66 (\text{ms}) * (1600/(4*79)) * 31.6 = 265.6\text{ms}$

DH5 time slot =  $2.90 (\text{ms}) * (1600/(6*79)) * 31.6 = 309.3\text{ms}$

**2. Channel 39: 2.441GHz**

DH1 time slot =  $0.40(\text{ms}) * (1600/(2*79)) * 31.6 = 127.9\text{ms}$

DH3 time slot =  $1.65(\text{ms}) * (1600/(4*79)) * 31.6 = 264.0\text{ms}$

DH5 time slot =  $2.91(\text{ms}) * (1600/(6*79)) * 31.6 = 310.3\text{ms}$

**3. Channel 78: 2.480GHz**

DH1 time slot =  $0.40(\text{ms}) * (1600/(2*79)) * 31.6 = 127.9\text{ms}$

DH3 time slot =  $1.66 (\text{ms}) * (1600/(4*79)) * 31.6 = 265.6\text{ms}$

DH5 time slot =  $2.91(\text{ms}) * (1600/(6*79)) * 31.6 = 310.3\text{ms}$

**4. Channel 0: 2.402GHz**

2DH1 time slot =  $0.40(\text{ms}) * (1600/(2*79)) * 31.6 = 127.9\text{ms}$

2DH3 time slot =  $1.66 (\text{ms}) * (1600/(4*79)) * 31.6 = 265.6\text{ms}$

2DH5 time slot =  $2.91(\text{ms}) * (1600/(6*79)) * 31.6 = 310.3\text{ms}$

**5. Channel 39: 2.441GHz**

2DH1 time slot =  $0.40(\text{ms}) * (1600/(2*79)) * 31.6 = 127.9\text{ms}$

2DH3 time slot =  $1.66 (\text{ms}) * (1600/(4*79)) * 31.6 = 265.6\text{ms}$

2DH5 time slot =  $2.91(\text{ms}) * (1600/(6*79)) * 31.6 = 310.3\text{ms}$

**6. Channel 78: 2.480GHz**

2DH1 time slot =  $0.40(\text{ms}) * (1600/(2*79)) * 31.6 = 127.9\text{ms}$

2DH3 time slot =  $1.66 (\text{ms}) * (1600/(4*79)) * 31.6 = 265.6\text{ms}$

2DH5 time slot =  $2.90 (\text{ms}) * (1600/(6*79)) * 31.6 = 309.3\text{ms}$

**7 Channel 0: 2.402GHz**

$$3DH1 \text{ time slot} = 0.40(\text{ms}) * (1600/(2*79)) * 31.6 = 128.0\text{ms}$$

$$3DH3 \text{ time slot} = 1.66 (\text{ms}) * (1600/(4*79)) * 31.6 = 265.6\text{ms}$$

$$2DH5 \text{ time slot} = 2.91(\text{ms}) * (1600/(6*79)) * 31.6 = 310.3\text{ms}$$

**8. Channel 39: 2.441GHz**

$$3DH1 \text{ time slot} = 0.40 (\text{ms}) * (1600/(2*79)) * 31.6 = 128.0\text{ms}$$

$$3DH3 \text{ time slot} = 1.66 (\text{ms}) * (1600/(4*79)) * 31.6 = 265.6\text{ms}$$

$$3DH5 \text{ time slot} = 2.90 (\text{ms}) * (1600/(6*79)) * 31.6 = 309.3\text{ms}$$

**9. Channel 78: 2.480GHz**

$$3DH1 \text{ time slot} = 0.40(\text{ms}) * (1600/(2*79)) * 31.6 = 127.9\text{ms}$$

$$3DH3 \text{ time slot} = 1.65(\text{ms}) * (1600/(4*79)) * 31.6 = 264.0\text{ms}$$

$$3DH5 \text{ time slot} = 2.91(\text{ms}) * (1600/(6*79)) * 31.6 = 310.3\text{ms}$$

The results are not greater than 0.4 seconds

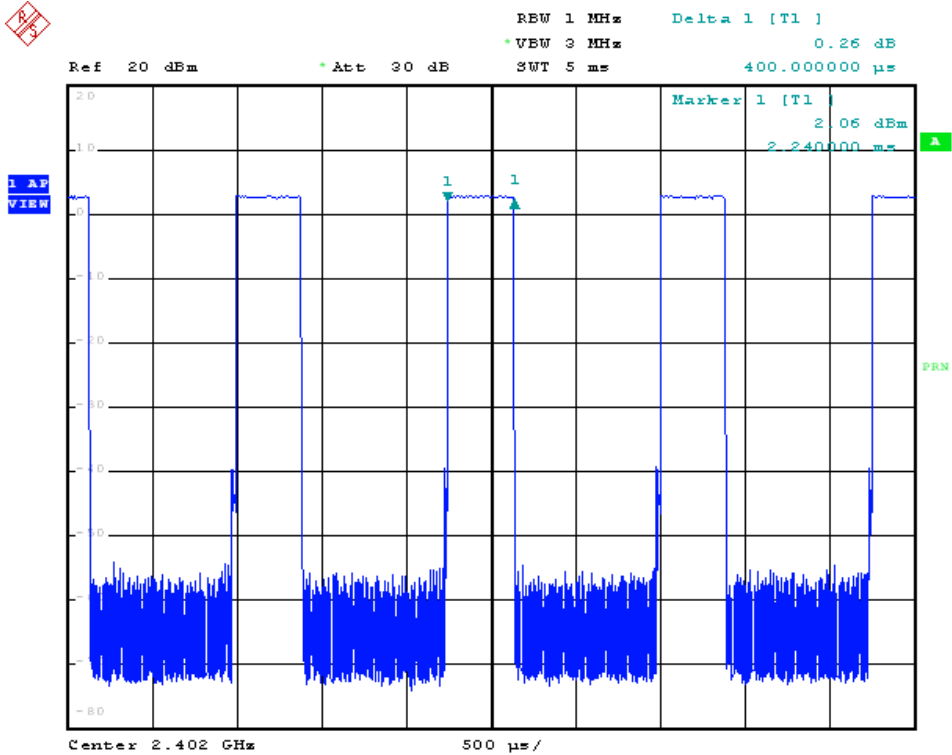
**The unit does meet the FCC requirements.**

For buletooth

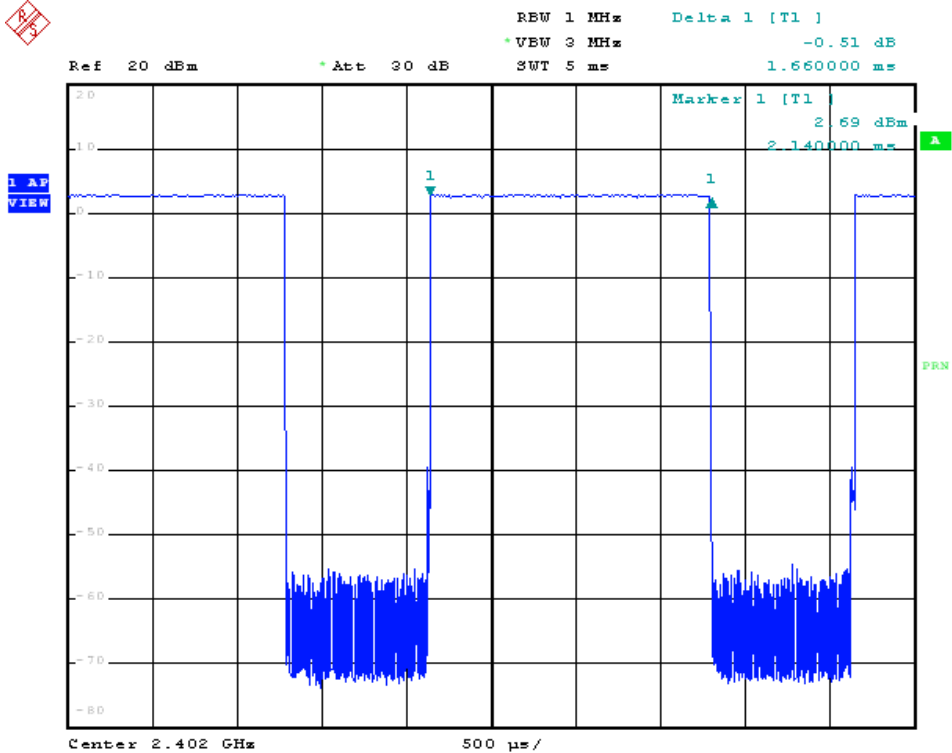
Please refer the graph as below:

1. Lowest channel (2.402 GHz):

(1) DH1

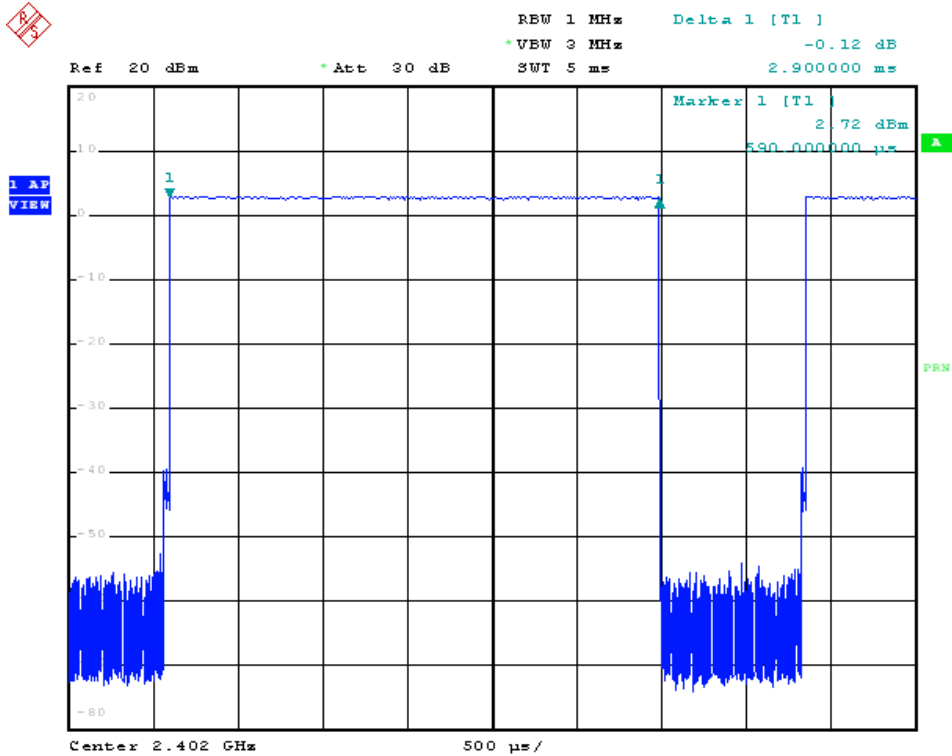


(2) DH3



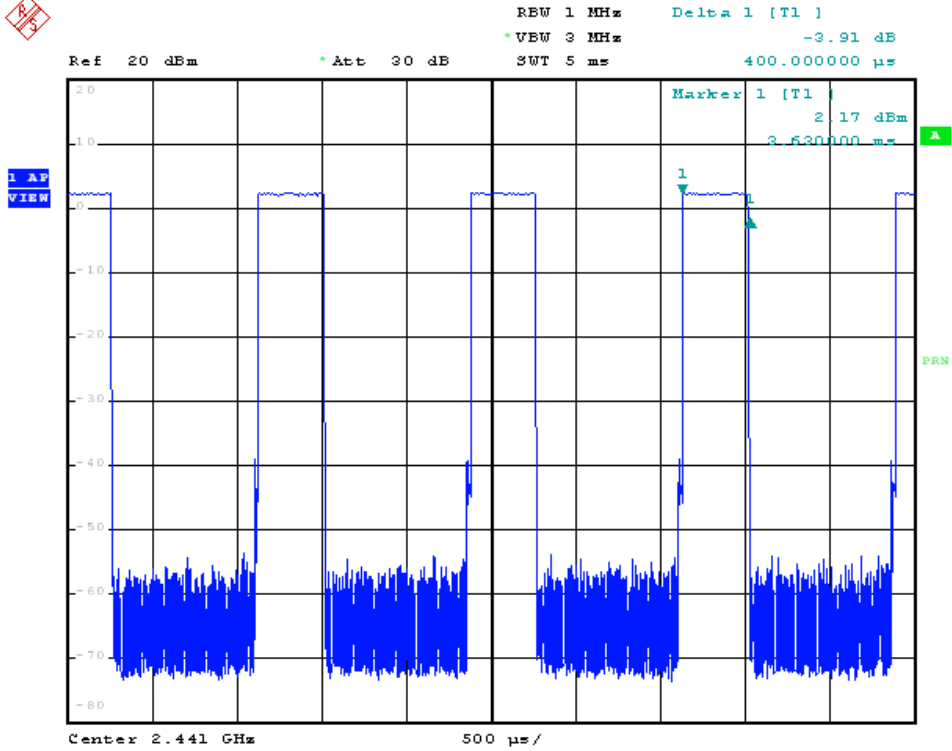


(3) DH5

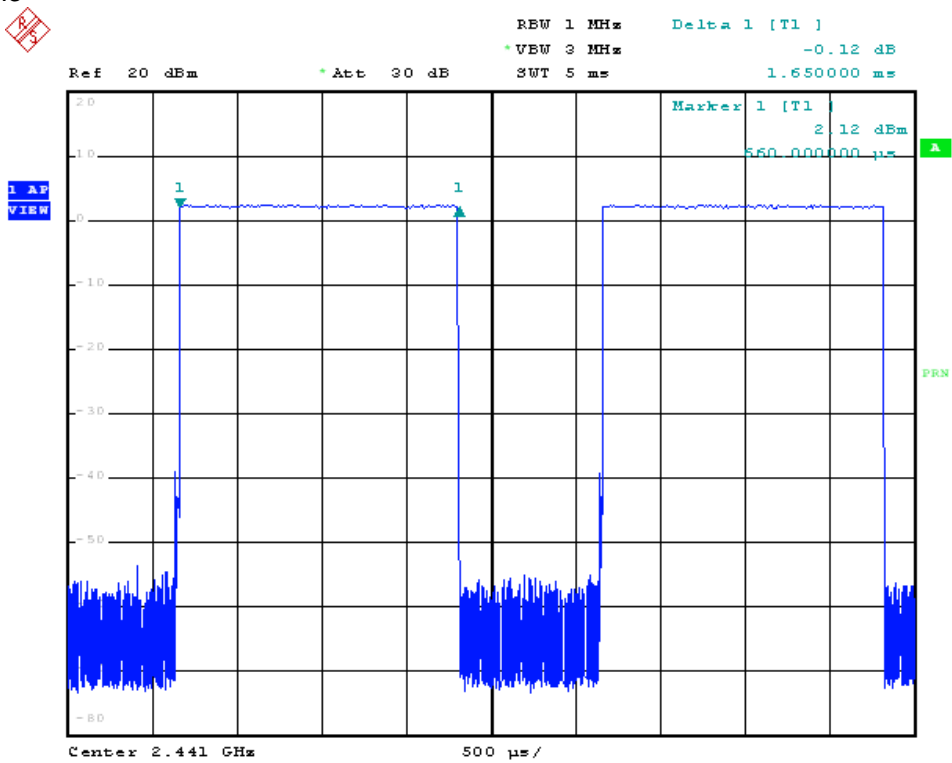


2. Middle channel (2.441 GHz):

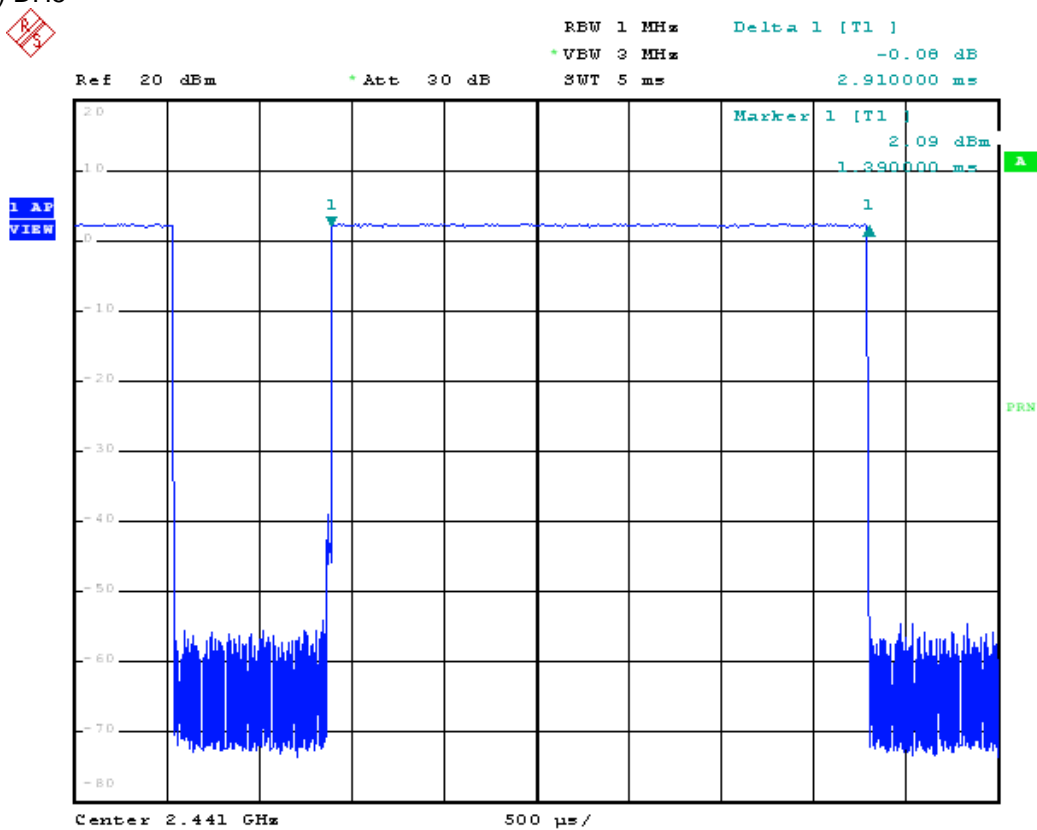
(1) DH1



(2) DH3

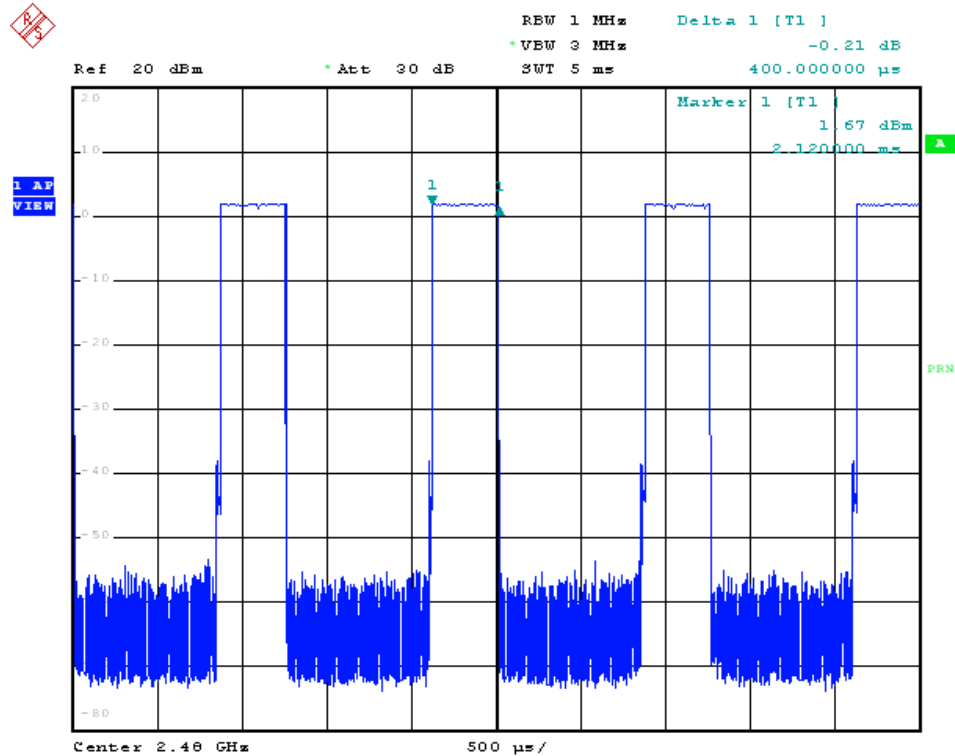


(3) DH5

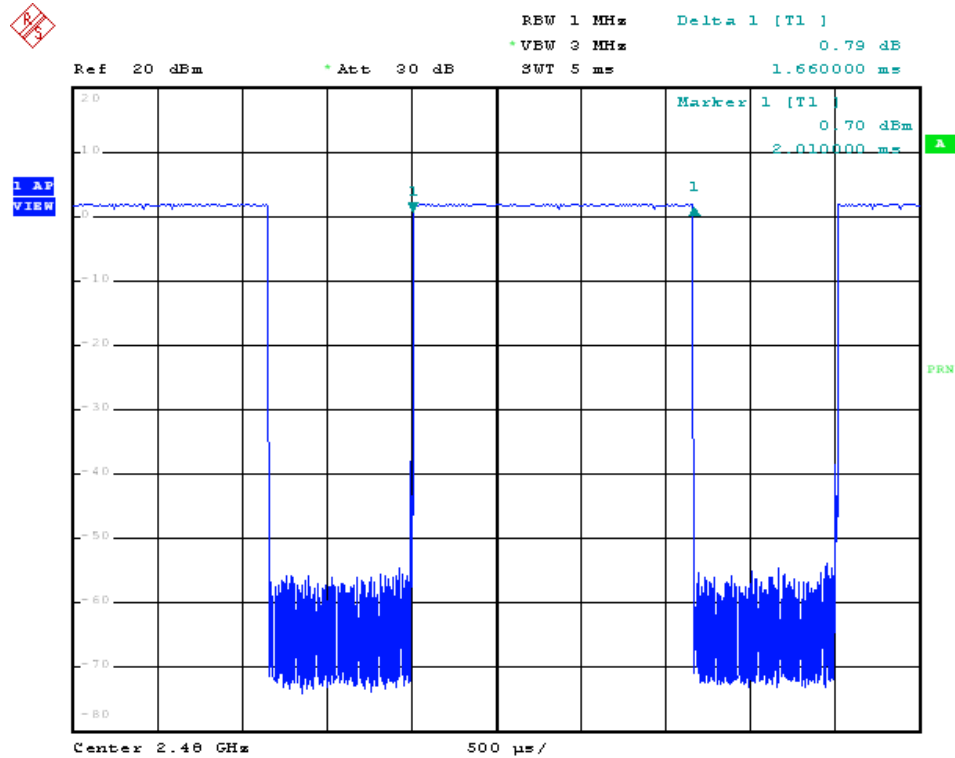


3. Highest channel (2.480 GHz):

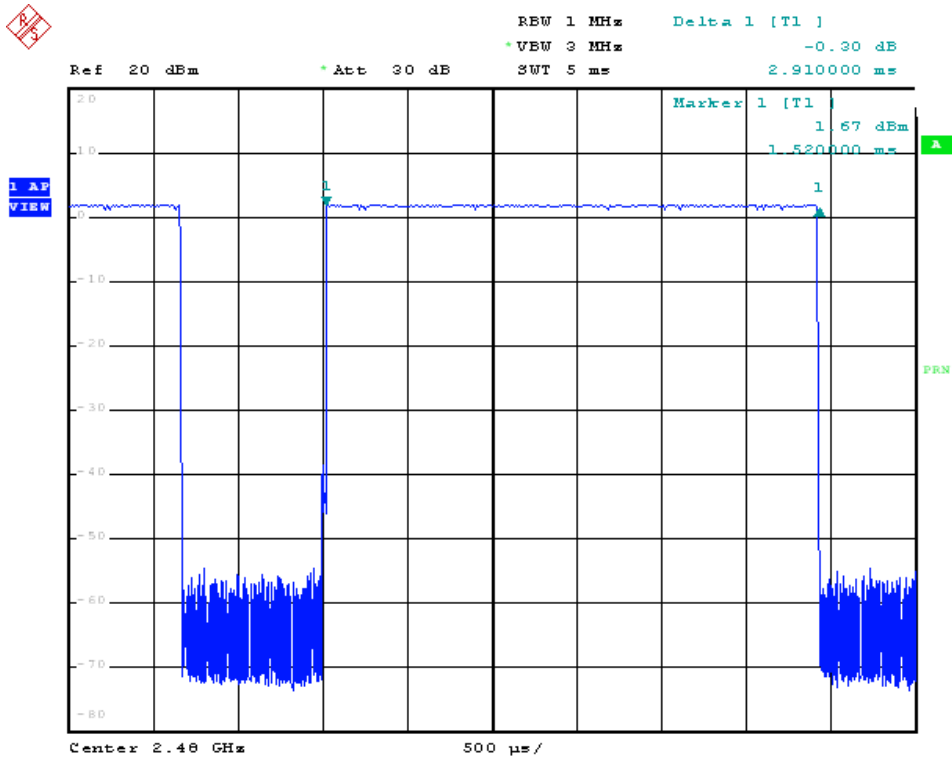
(1) DH1



(2) DH3

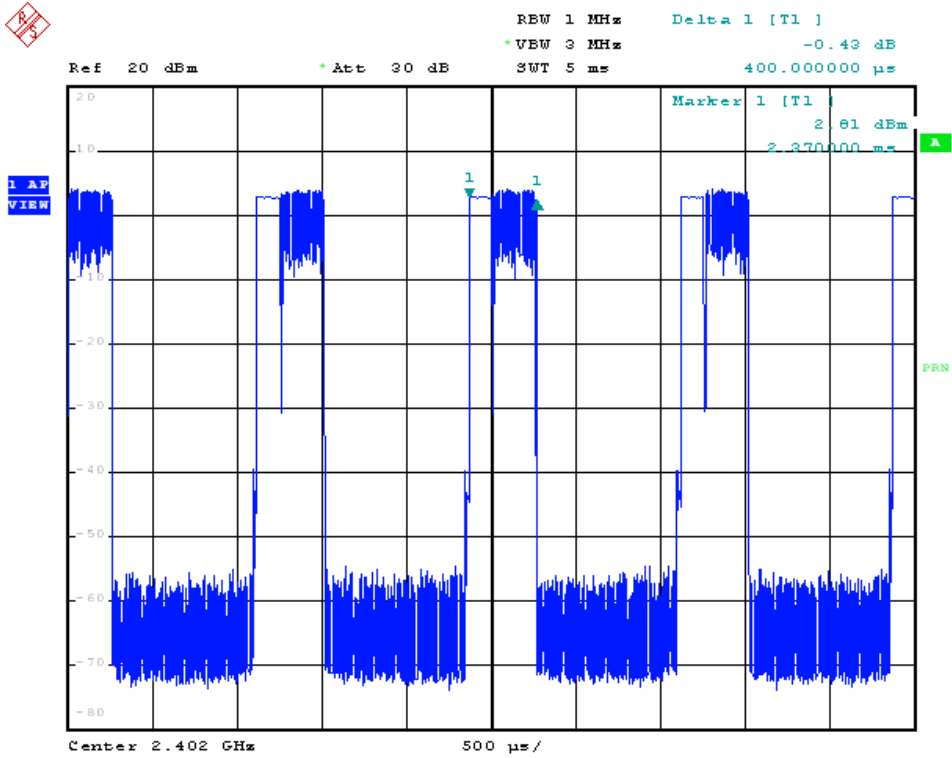


(3) DH5

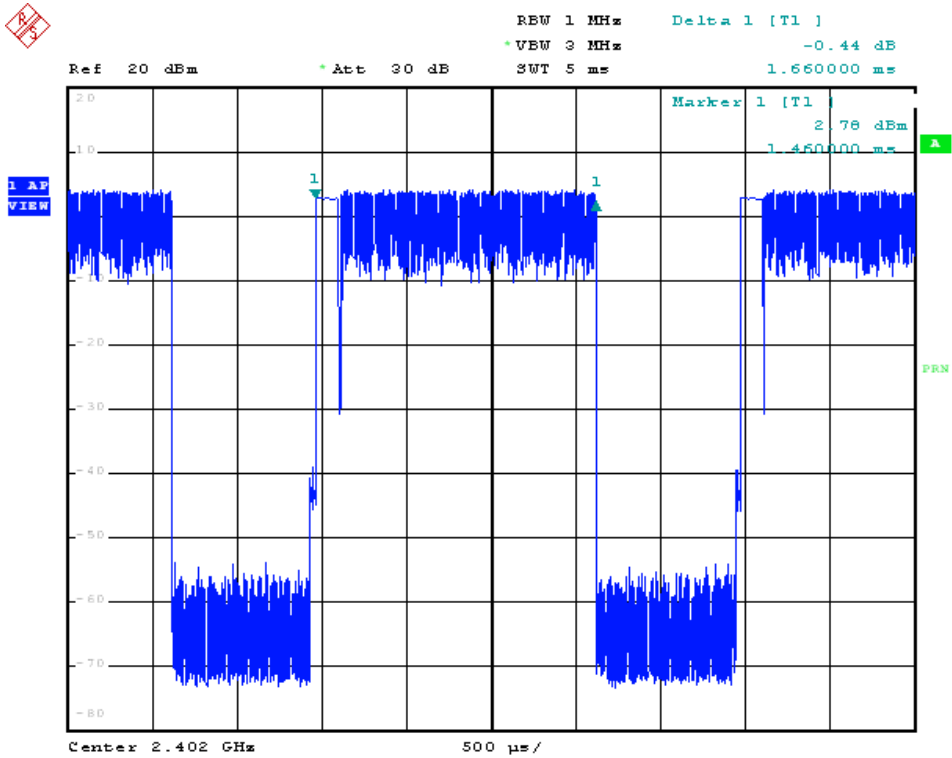


4. Lowest channel (2.402 GHz):

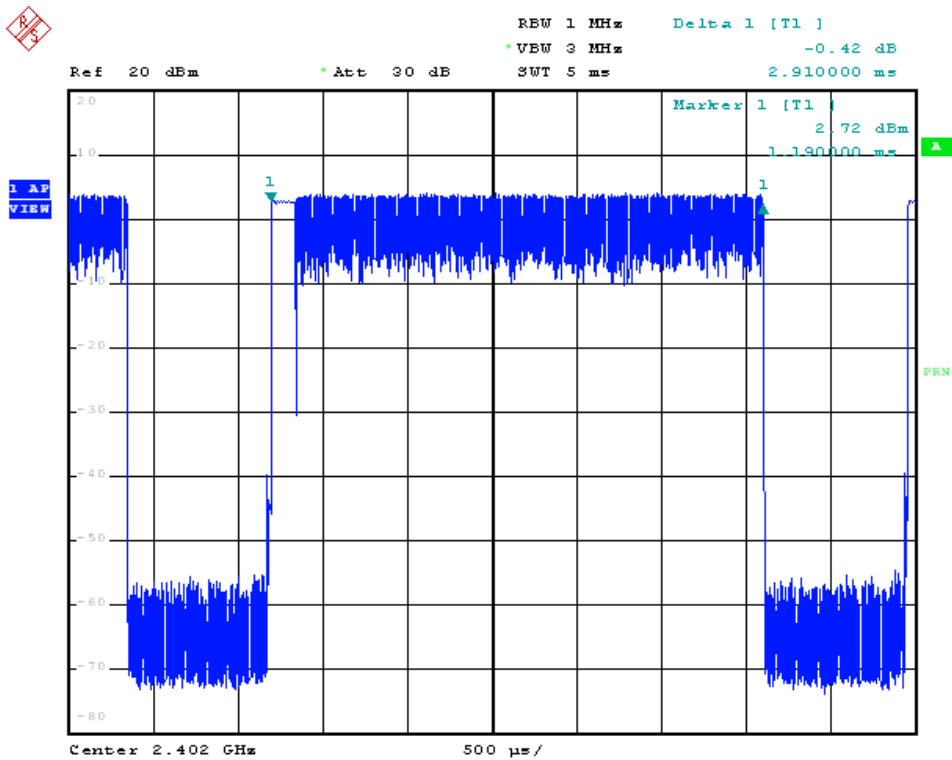
(1) 2DH1



(2) 2DH3

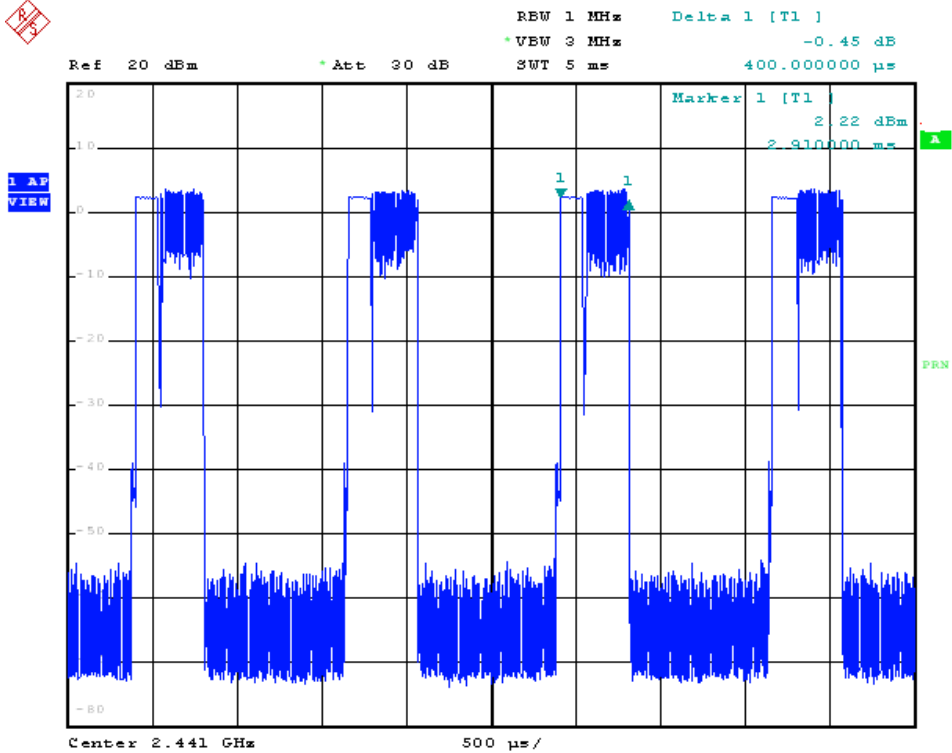


(3) 2DH5

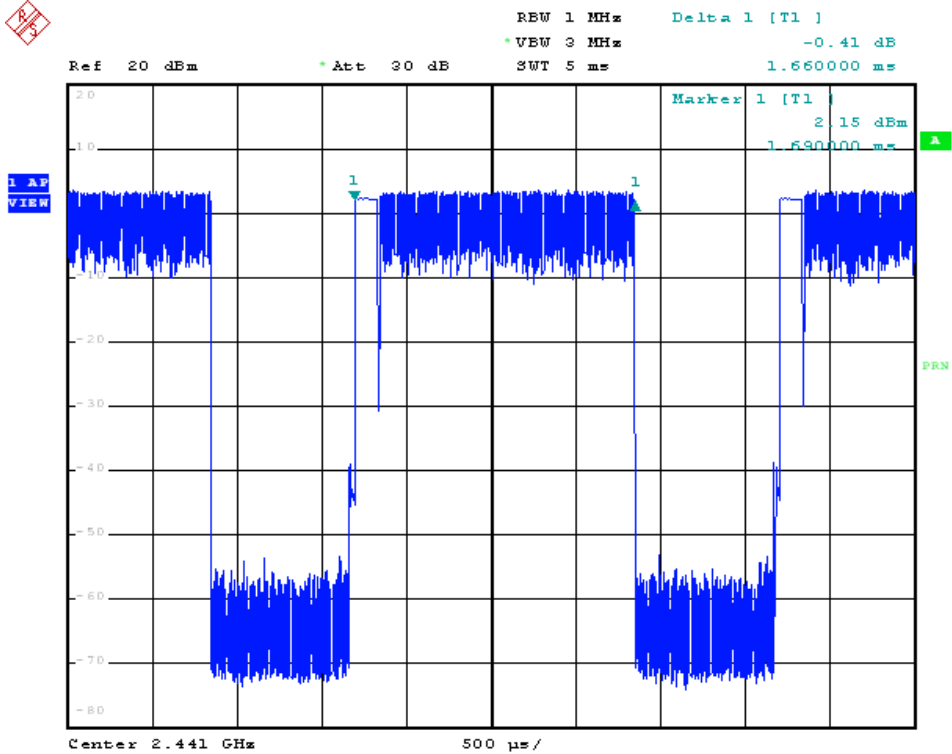


5. Middle channel (2.441 GHz):

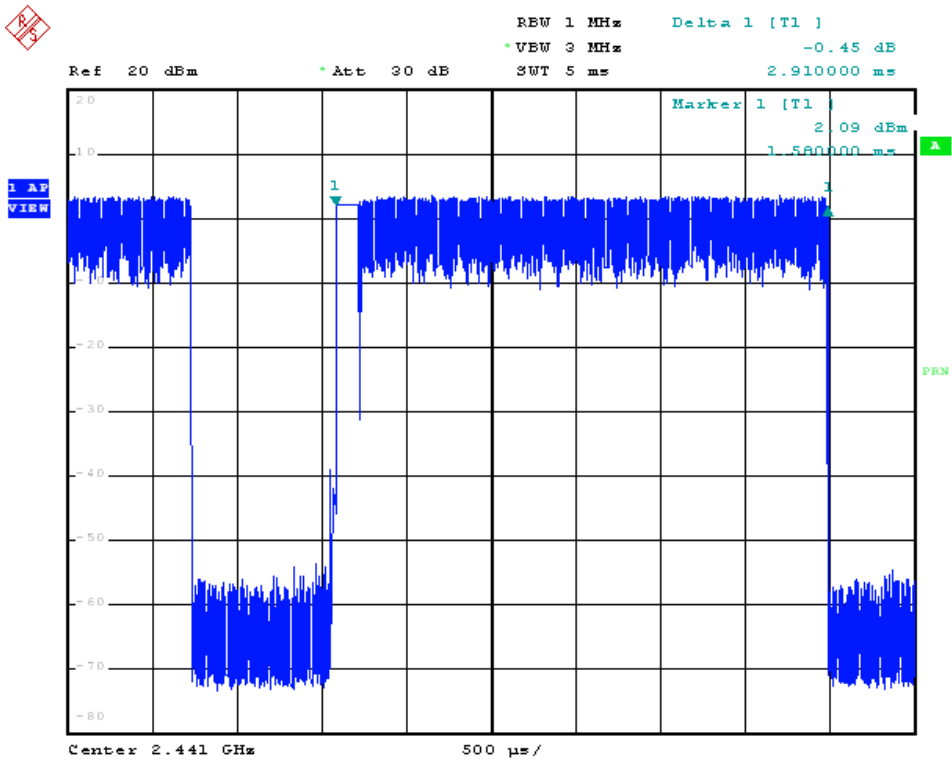
(1) 2DH1



(2) 2DH3

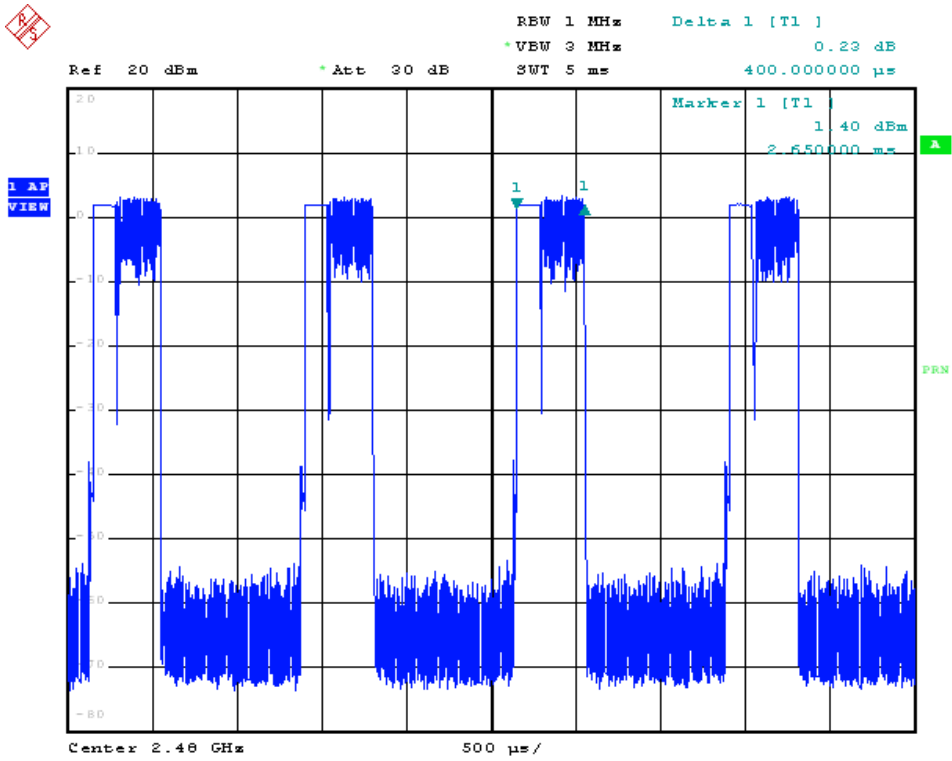


(3) 2DH5

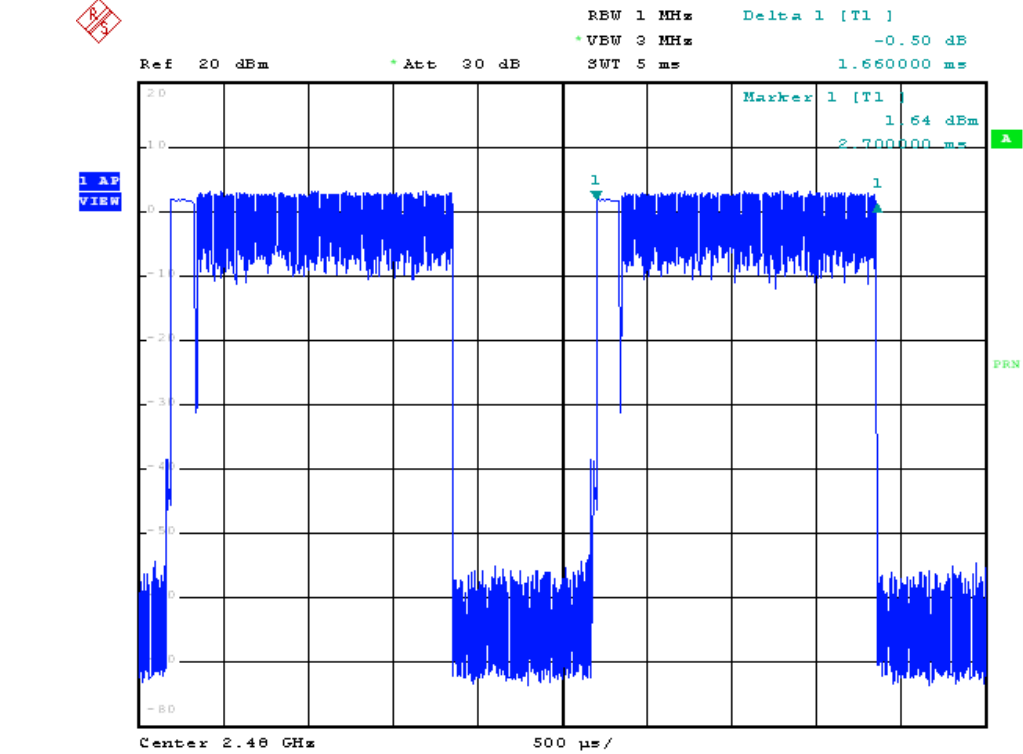


6. Highest channel (2.480 GHz):

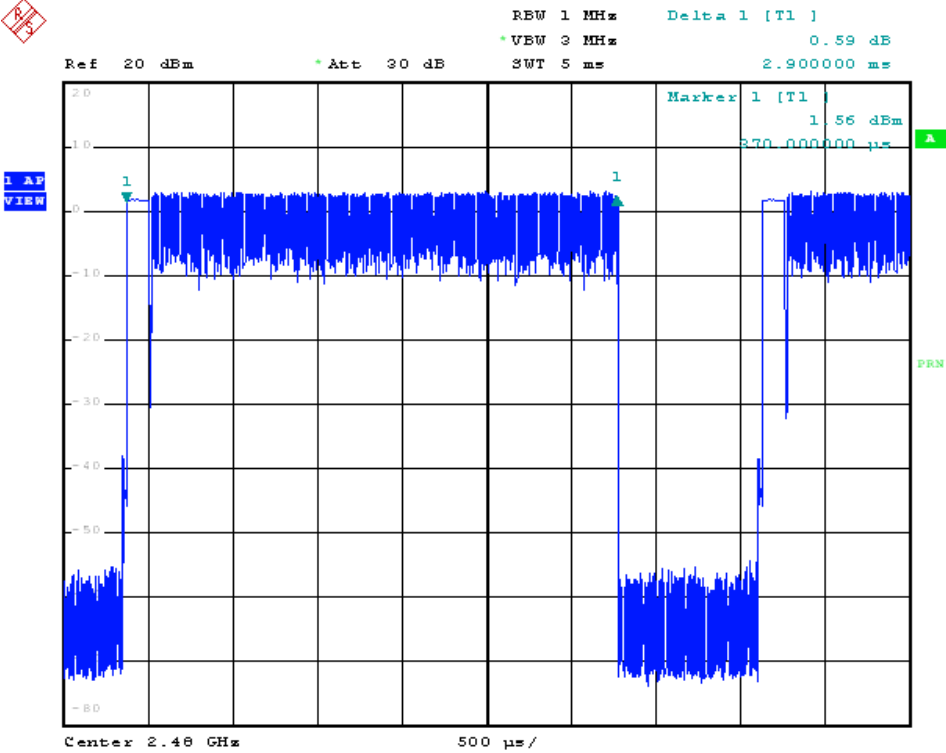
(1) 2DH1



(2) 2DH3



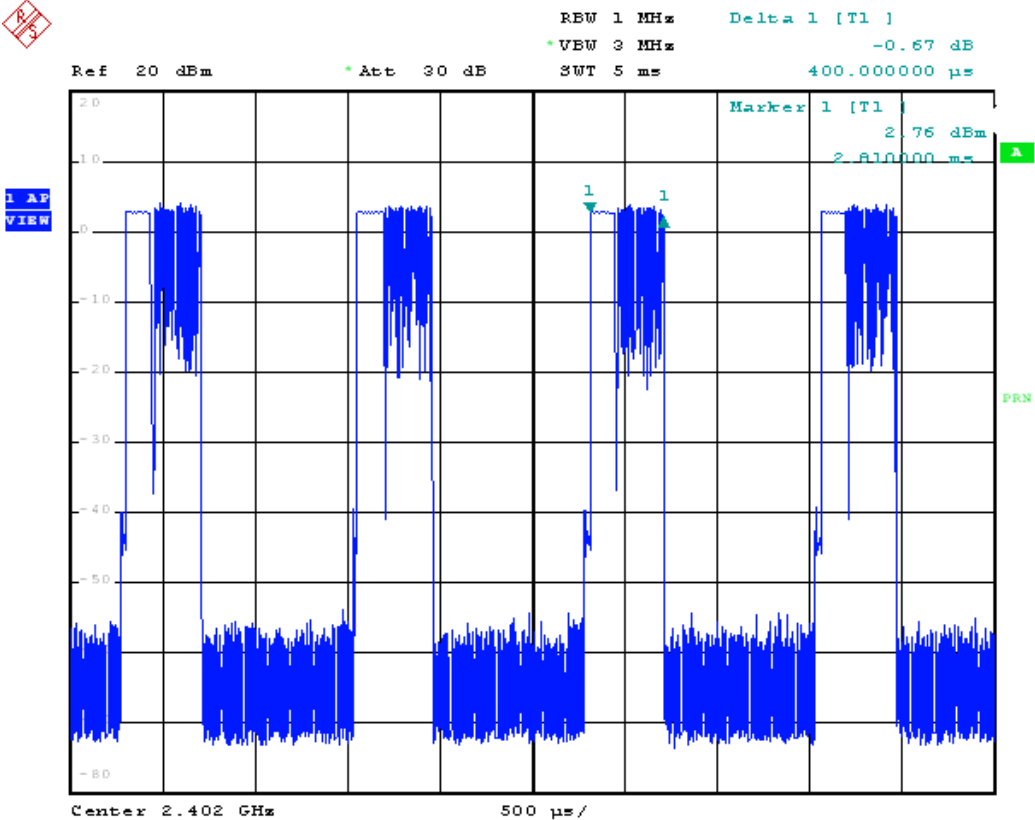
(3) 2DH5



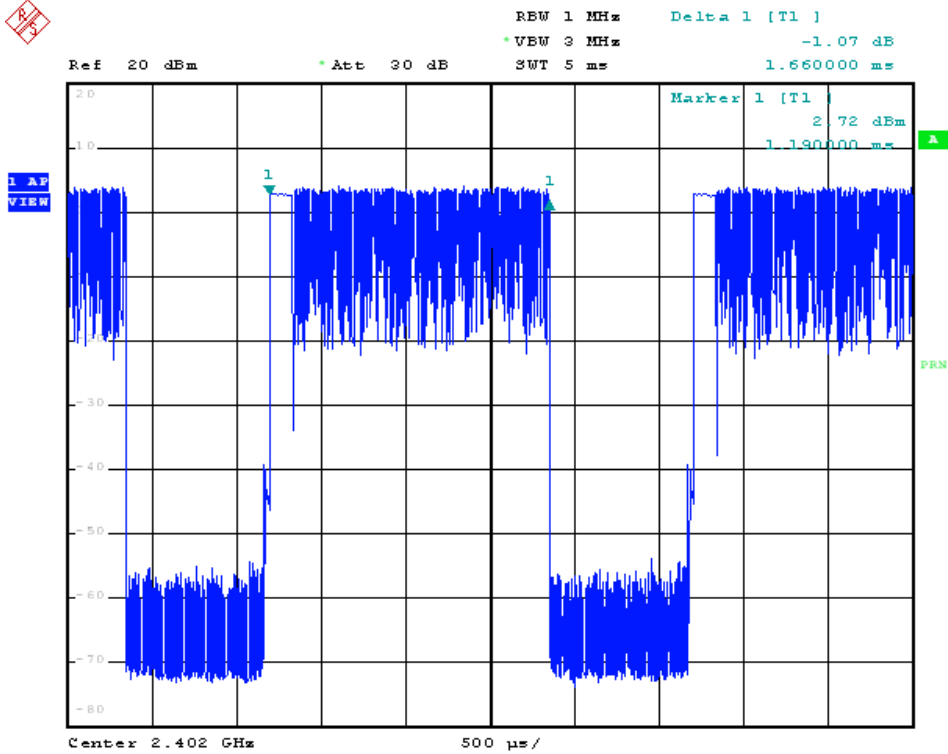


7. Lowest channel (2.402 GHz):

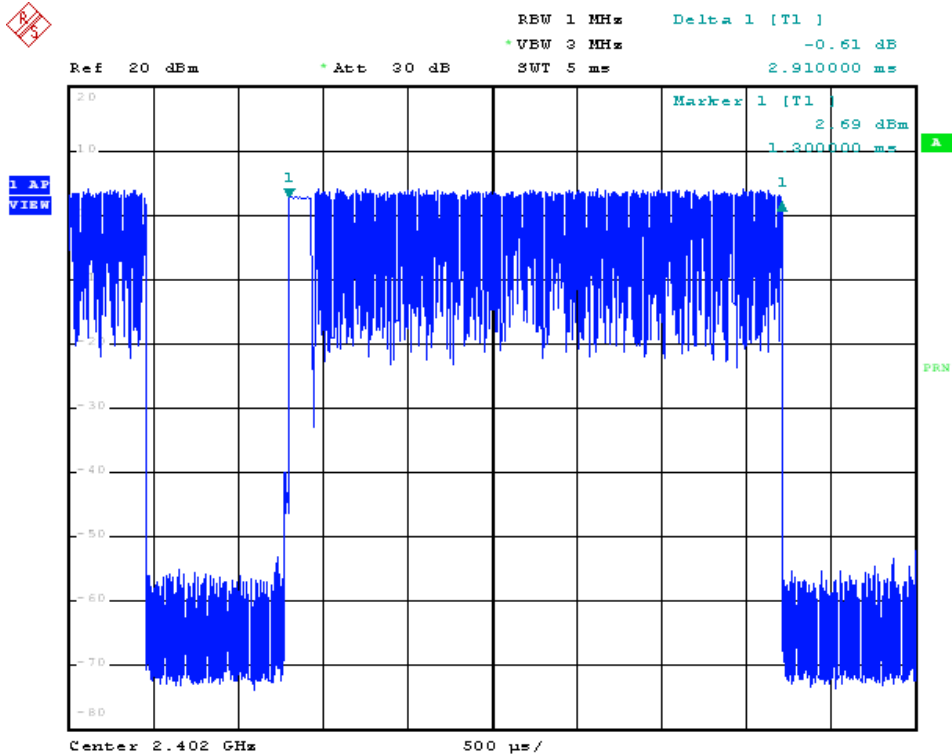
(1). 3DH1



(2) 3DH3

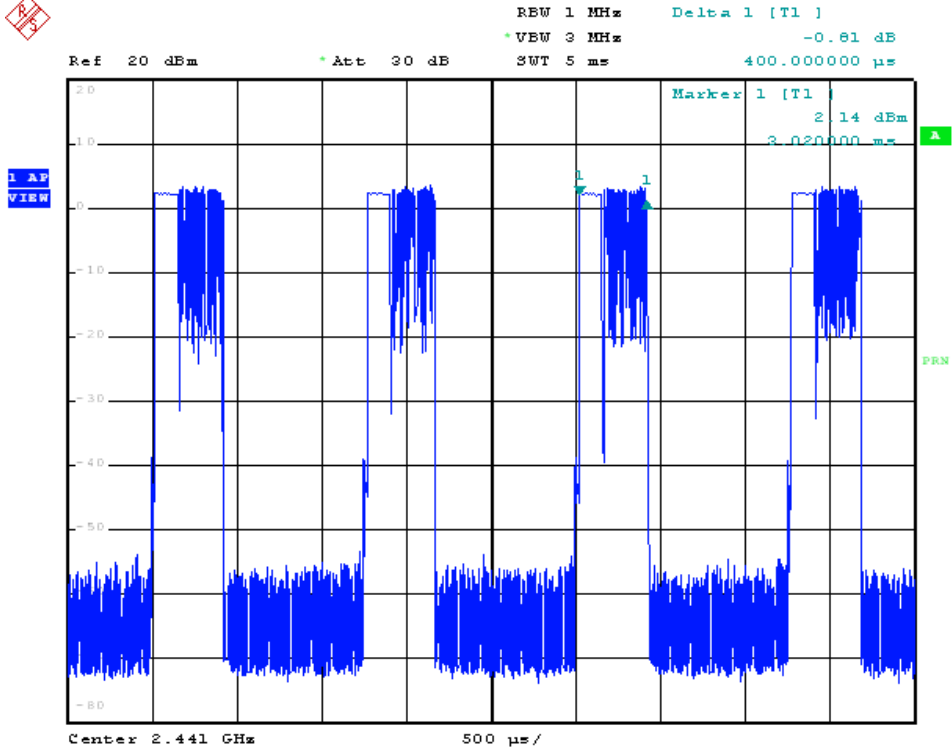


(3) 3DH5

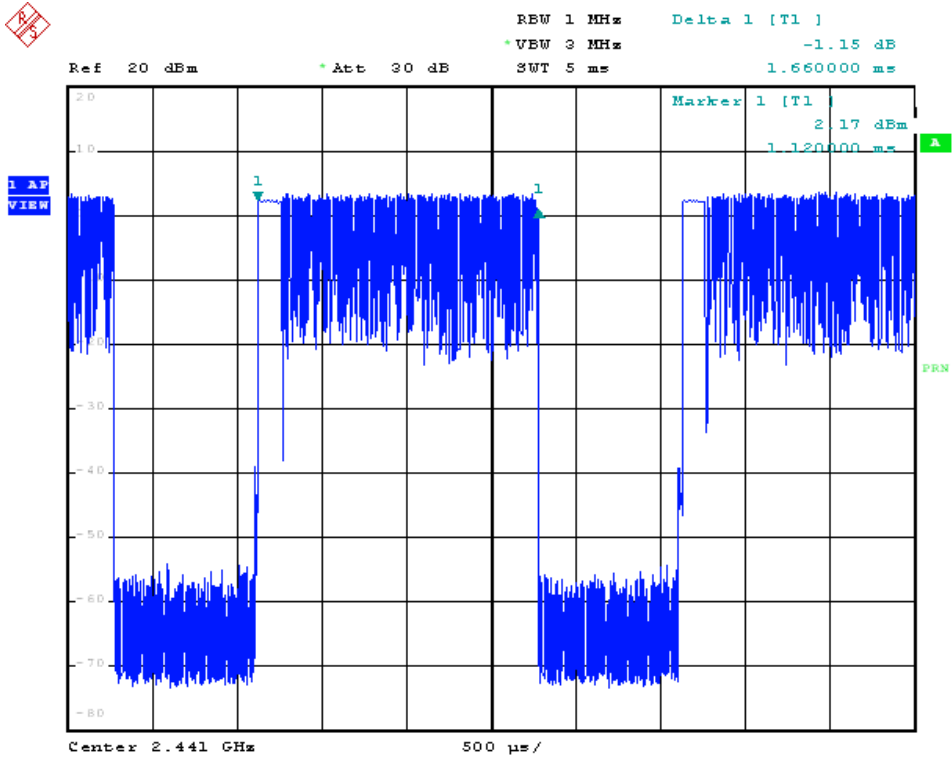


8. Middle channel (2.441 GHz):

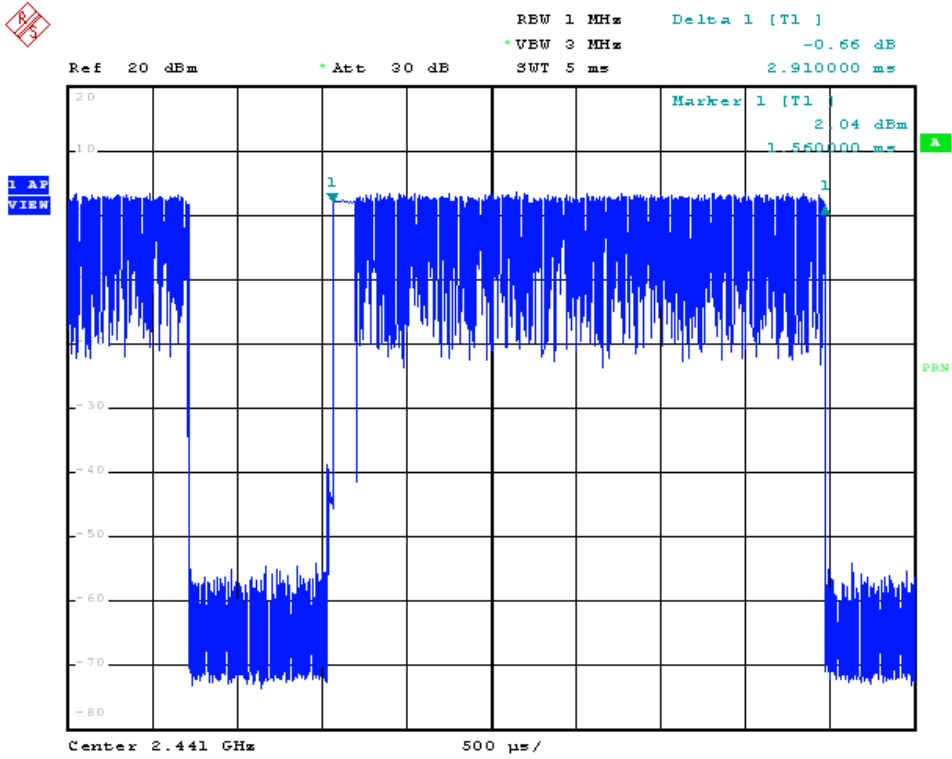
(1). 3DH1



(2) 3DH3

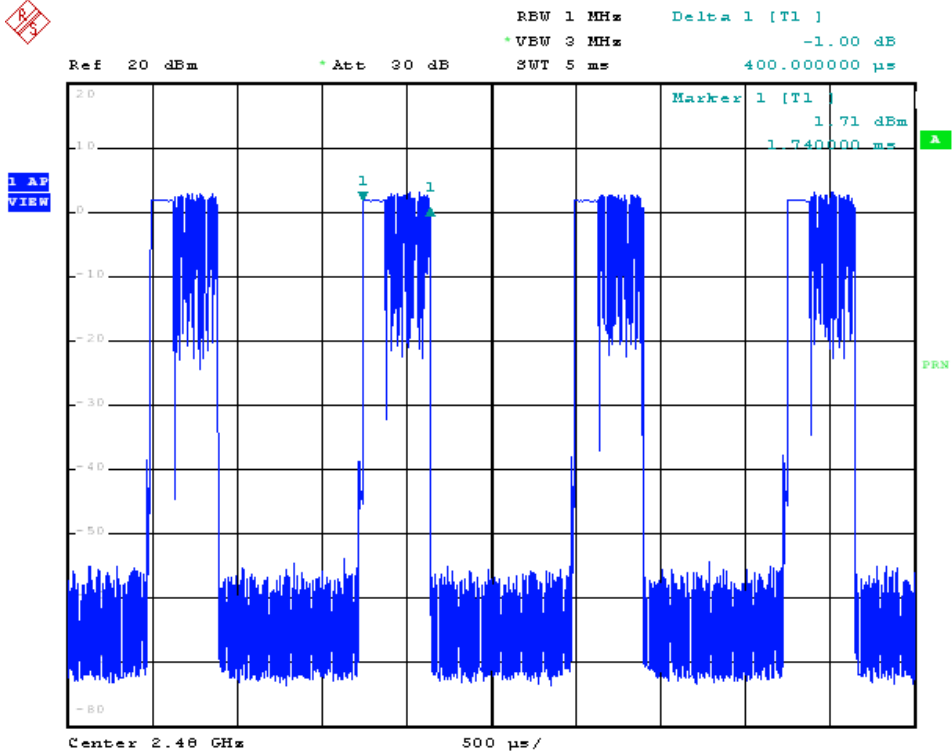


(3) 3DH5

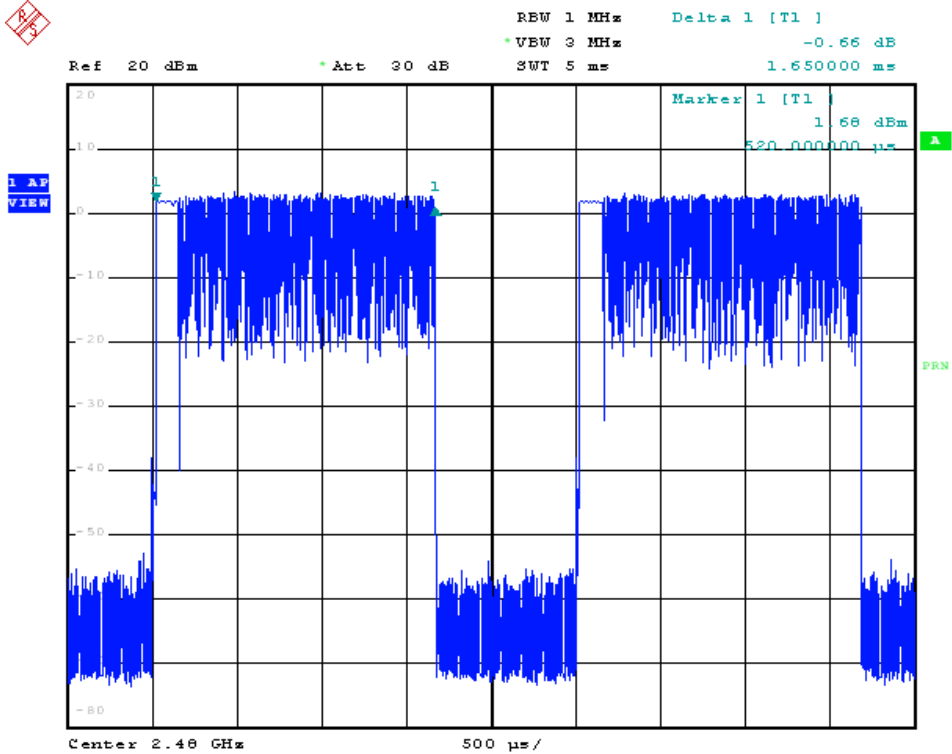


9. Highest channel (2.480 GHz):

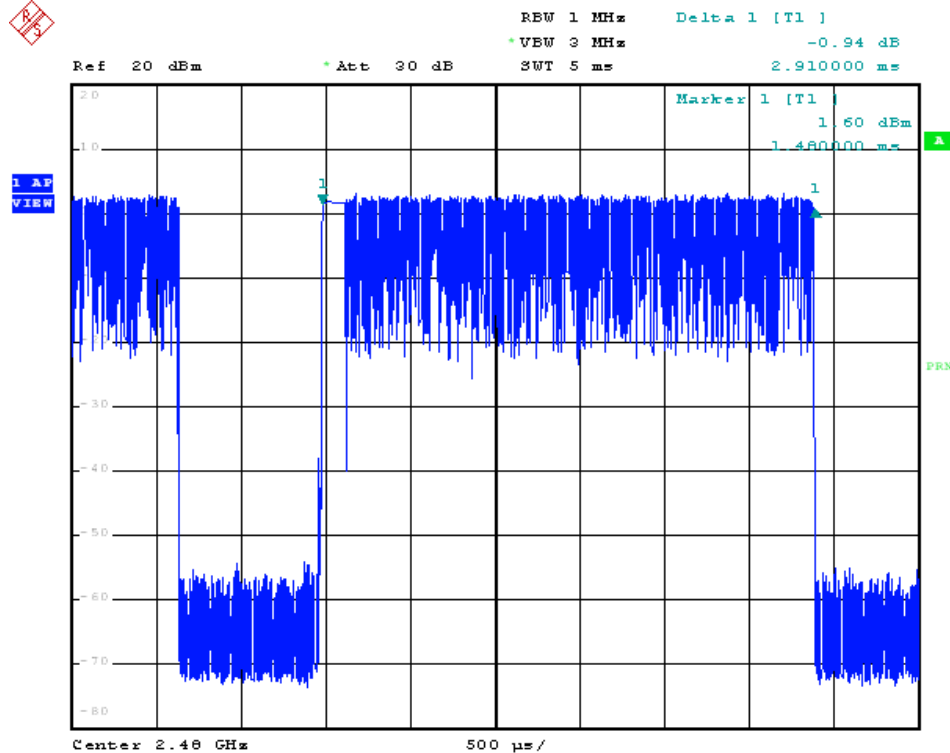
(1). 3DH1



(2) 3DH3



## (3) 3DH5



## Remark:

In communication data link mode (expect inquiry or page mode) the hopping rate is 1600 per second, the 79 channels will be randomly selected for RF channel, and each channel have equal probability to be selected. The hop selection scheme is defined in Clause 2.6 of Part B of Volume 2 of core specification of Bluetooth.

The Dwell time must be calculated via following formula:

Dwell time = Pulse wide x (Hopping rate / Number of channels) x Period

Period = 0.4 (seconds/ channel) x 79 (channel) = 31.6 seconds

So

Dwell time DH1= slot time \* (1600/2/79) \* 31.6

Dwell time DH3= slot time \* (1600/4/79) \* 31.6

Dwell time DH5= slot time \* (1600/6/79) \* 31.6

The RF channel will remain fixed for duration of a packet, that means for DH3 packet the RF frequency will remain unchanged during 3 slots (1slot=1/1600=625us), and for DH5 packet the RF frequency will remain unchanged during 5 slots, illustrated the principle as below:

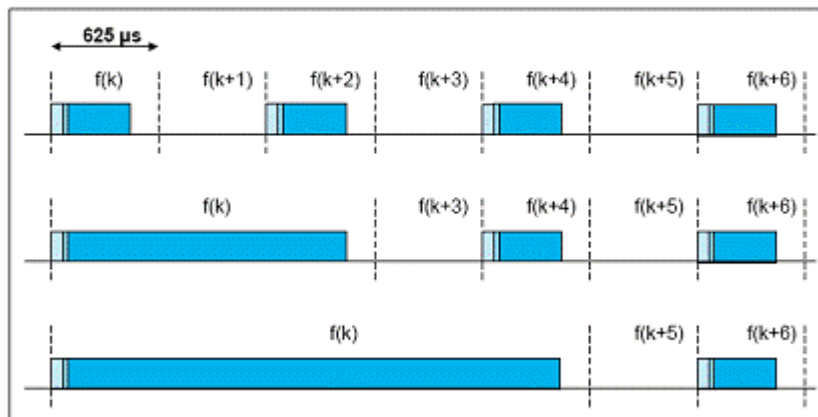


Figure 2.14: Single- and multi-slot packets.

Therefore, in a certain period for different packet types, the quantities of hops (not hopping rate 1600) are different, accurately, the quantity of hops for DH1 is double of DH3's and triple of DH5's. "for DH1 packet, 1 hop in 1 slot; for DH3 packet,  $\frac{1}{2}$  hop in 1 slot; for DH5 packet,  $\frac{1}{3}$  hop in 1 slot.", explained as below:

From the illustrated hopping scheme:

For DH1, in two slots, there are two hops, i.e.  $f(k)$  in Slot(k),  $f(k+1)$  in Slot(k+1), means DH1 1 hop in 1 slot;

For DH3, in four slots, there are two hops, i.e.  $f(k)$  in Slot(k) & Slot(k+1) & Slot(k+2),  $f(k+3)$  in Slot(k+3), means DH3 2 hops in four slots  $\rightarrow \frac{1}{2}$  hop in 1 slot;

For DH5, in six slots, there are two hops, i.e.  $f(k)$  in Slot(k) & Slot(k+1) & Slot(k+2) & Slot(k+3) & Slot(k+4),  $f(k+5)$  in Slot(k+5), means DH3 2 hops in six slots  $\rightarrow \frac{1}{3}$  hop in 1 slot.

The Hopping rate in the formula should not be fixed value, for DH1, it is  $1600/2$ ; for DH3, it is  $1600/4$ ; for DH5, it is  $1600/6$ .

To calculate Dwell time of data transmission of Bluetooth system, the worst case is for Bluetooth PICONET that contains two devices only (although Bluetooth PICONET can support up to eight devices), and for Bluetooth data transmission, after device A sending a packet to device B, device A must get response packet from device B to continue data transmission;

For DH1 packet: assume device A is EUT, the worst case is after device A sending a DH1 packet to device B, device A gets a DH1 response packet from device B, that means device A needs 1 time slot for transmitting and 1 time slot for receiving, therefore, the actual hopping rate of device A is half of 1600, i.e. 800 hops per second for EUT;

For DH3 packet: assume device A is EUT, the worst case is after device A sending a DH3 packet to device B, device A gets a DH1 response packet from device B, that means device A needs 3 time slots for transmitting and 1 time slot for receiving, therefore, the actual hopping rate of device A is quarter of 1600, i.e. 400 hops per second for EUT;

For DH5 packet: assume device A is EUT, the worst case is after device A sending a DH5 packet to device B, device A gets a DH1 response packet from device B, that means device A needs 5 time slots for transmitting and 1 time slot for receiving, therefore, the actual hopping rate of device A is sixth of 1600, i.e.  $1600/6=266.7$  hops per second for EUT;

## 5.7 Maximum Peak Output Power

**Test Requirement:** FCC Part 15 C section 15.247

(b)(1) For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band:

0.125 watts.

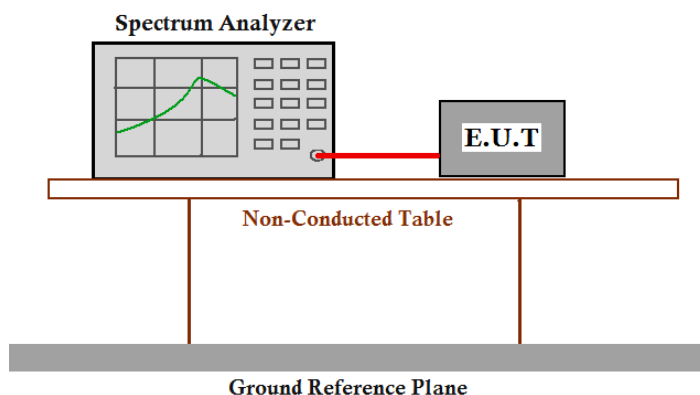
Refer to the result "Hopping channel number" of this document. The 1 watt (30.0 dBm) limit applies.

**Test Method:** ANSI C63.10: Clause 6.10 & DA 00-705

**Test Limit:**

**Test mode:** Pre-test the EUT in continuous transmitting mode at the lowest, middle and highest channel with different data packet. Compliance test in continuous transmitting mode with normal (DH5), EDR mode (2DH5) and EDR mode (3DH5) as the worst case was found.

**Test Configuration:**



**Test Procedure:**

1. Remove the antenna from the EUT and then connect a low attenuation RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 3 MHz. VBW = 3 MHz. Sweep = auto; Detector Function = Peak.
3. Keep the EUT in transmitting at lowest, medium and highest channel individually. Record the max value.

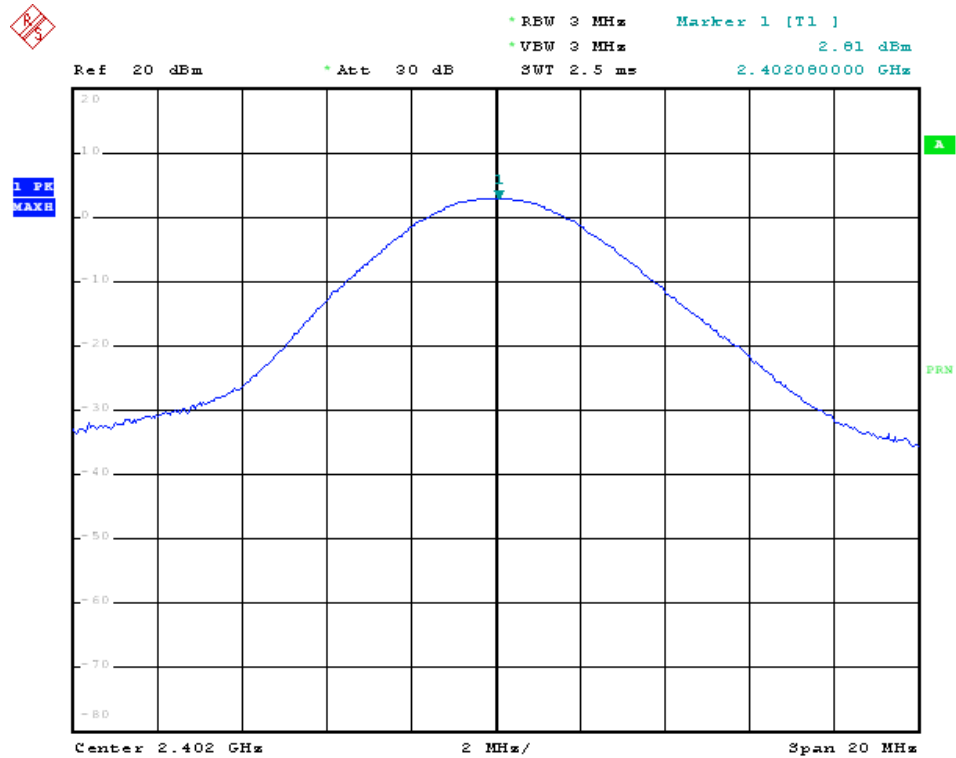


| <b>Test Result: (For Bluetooth)</b>                          |                                    |                           |                    |               |
|--|------------------------------------|---------------------------|--------------------|---------------|
| <b>Normal mode:</b>  |                                    |                           |                    |               |
| <b>Test Channel</b>  | <b>Fundamental Frequency (MHz)</b> | <b>Output Power (dBm)</b> | <b>Limit (dBm)</b> | <b>Result</b> |
| Lowest   | 2402                               | 3.31                      | 21.0               | Pass          |
| Middle   | 2441                               | 2.68                      | 21.0               | Pass          |
| Highest  | 2480                               | 2.21                      | 21.0               | Pass          |
| <b>EDR mode(2DH5):</b>                                       |                                    |                           |                    |               |
| <b>Test Channel</b>  | <b>Fundamental Frequency (MHz)</b> | <b>Output Power (dBm)</b> | <b>Limit (dBm)</b> | <b>Result</b> |
| Lowest   | 2402                               | 4.95                      | 21.0               | Pass          |
| Middle   | 2441                               | 4.38                      | 21.0               | Pass          |
| Highest  | 2480                               | 3.95                      | 21.0               | Pass          |
| <b>EDR mode(3DH5):</b>                                       |                                    |                           |                    |               |
| <b>Test Channel</b>  | <b>Fundamental Frequency</b>       | <b>Output Power (dBm)</b> | <b>Limit (dBm)</b> | <b>Result</b> |
| Lowest   | 2402                               | 5.04                      | 21.0               | Pass          |
| Middle   | 2441                               | 4.46                      | 21.0               | Pass          |
| Highest  | 2480                               | 3.99                      | 21.0               | Pass          |
| <b>Remark: cable lose=0.5dB</b>                              |                                    |                           |                    |               |
| <b>Test result: The unit does meet the FCC requirements.</b> |                                    |                           |                    |               |
| <b>Test result plot as follows:</b>                          |                                    |                           |                    |               |

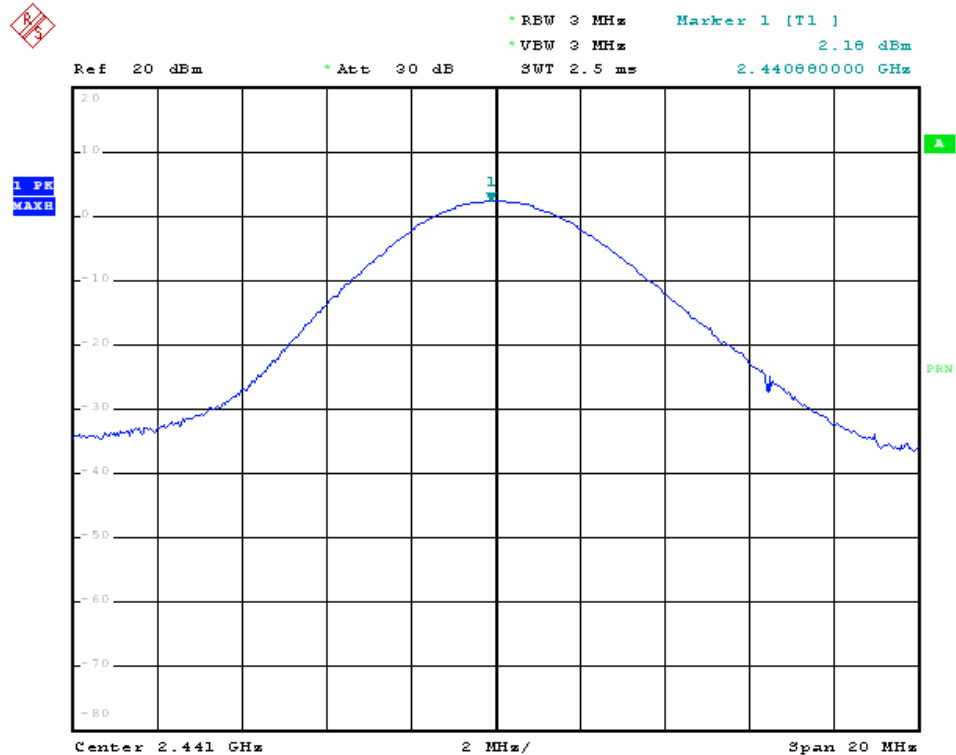
For bluetooth

Normal mode:

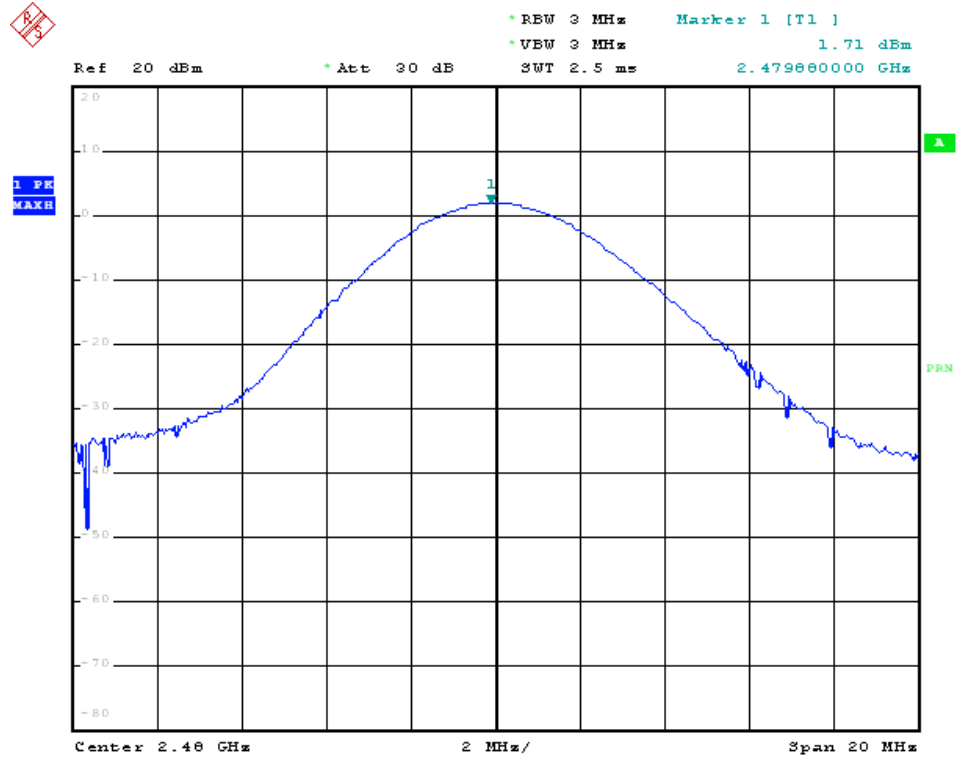
Lowest Channel:



Middle Channel:

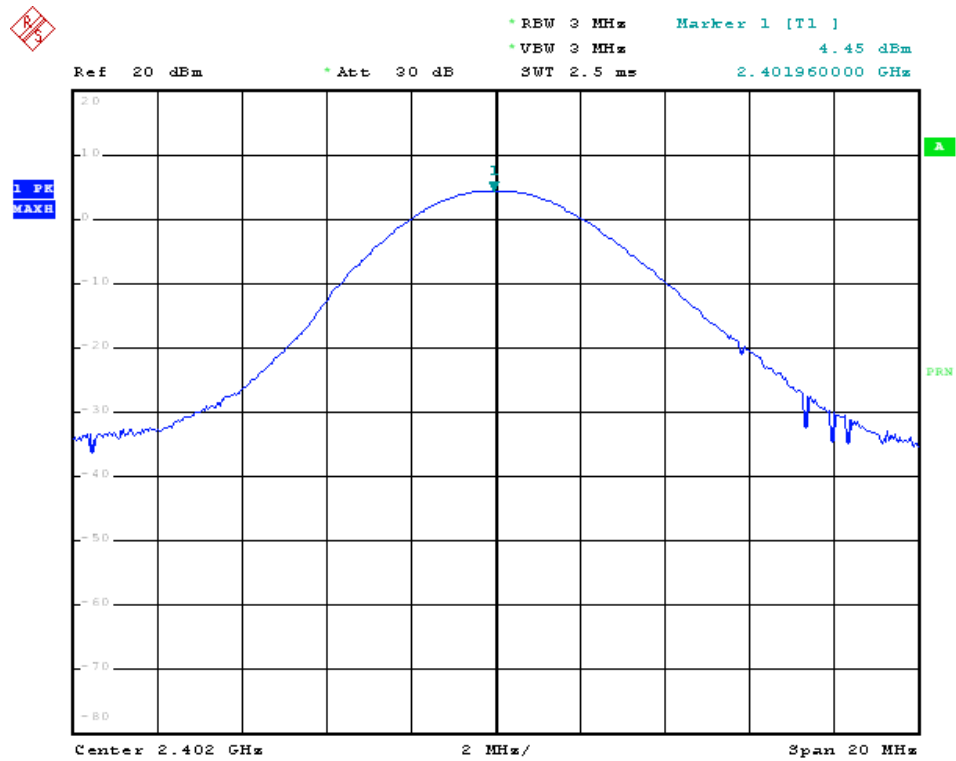


## Highest Channel:

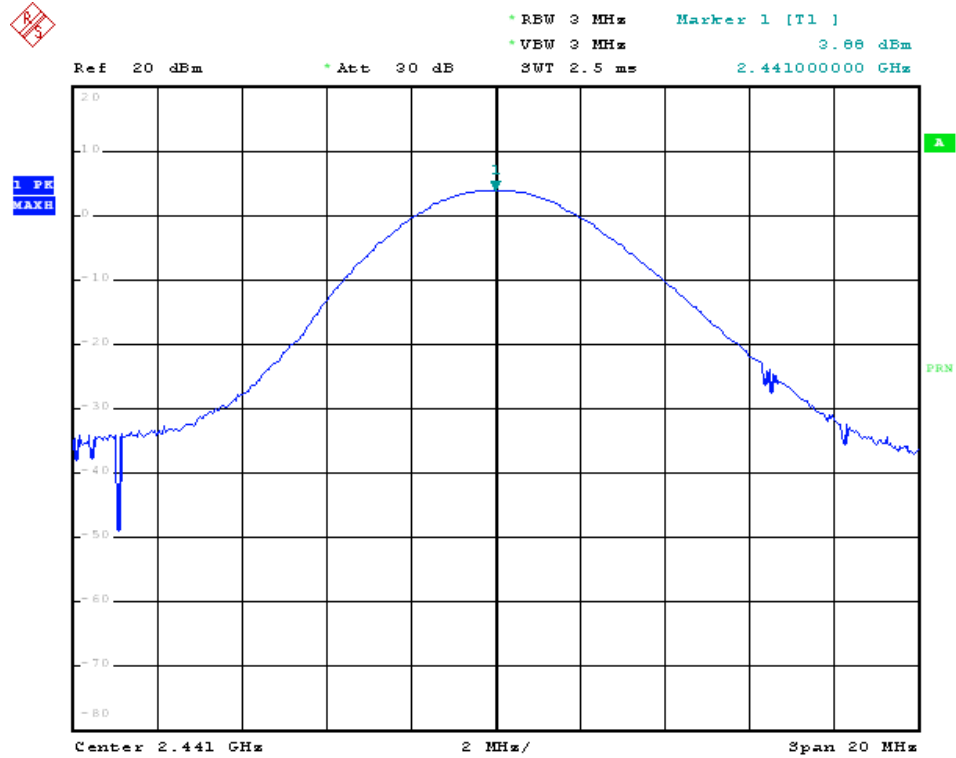


## EDR mode (2DH5):

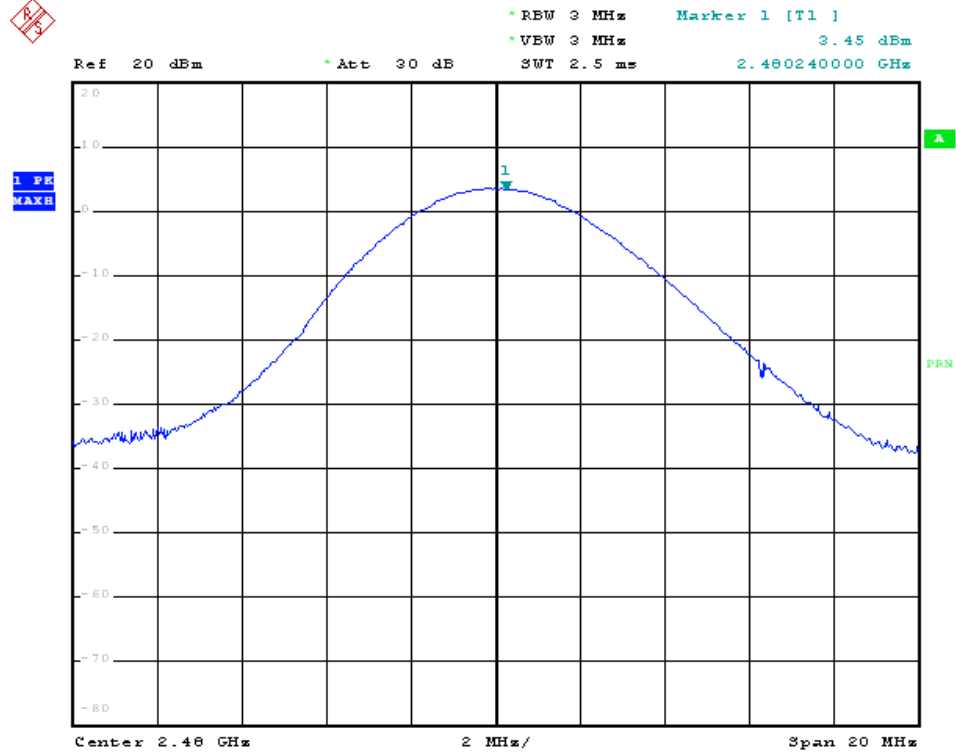
## Lowest Channel:

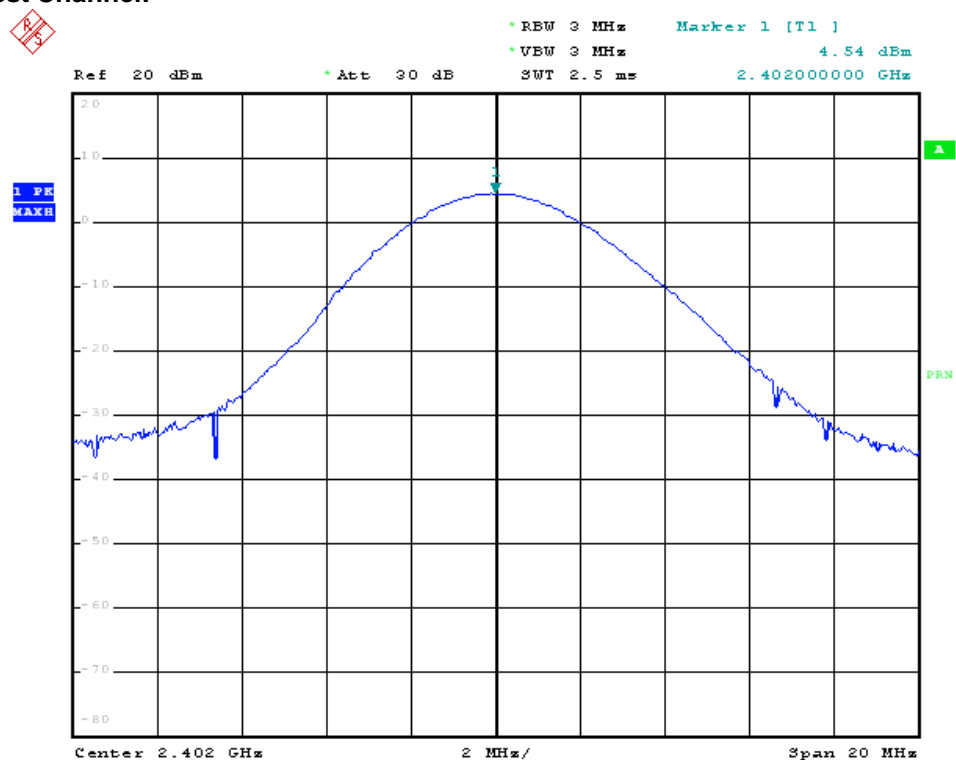
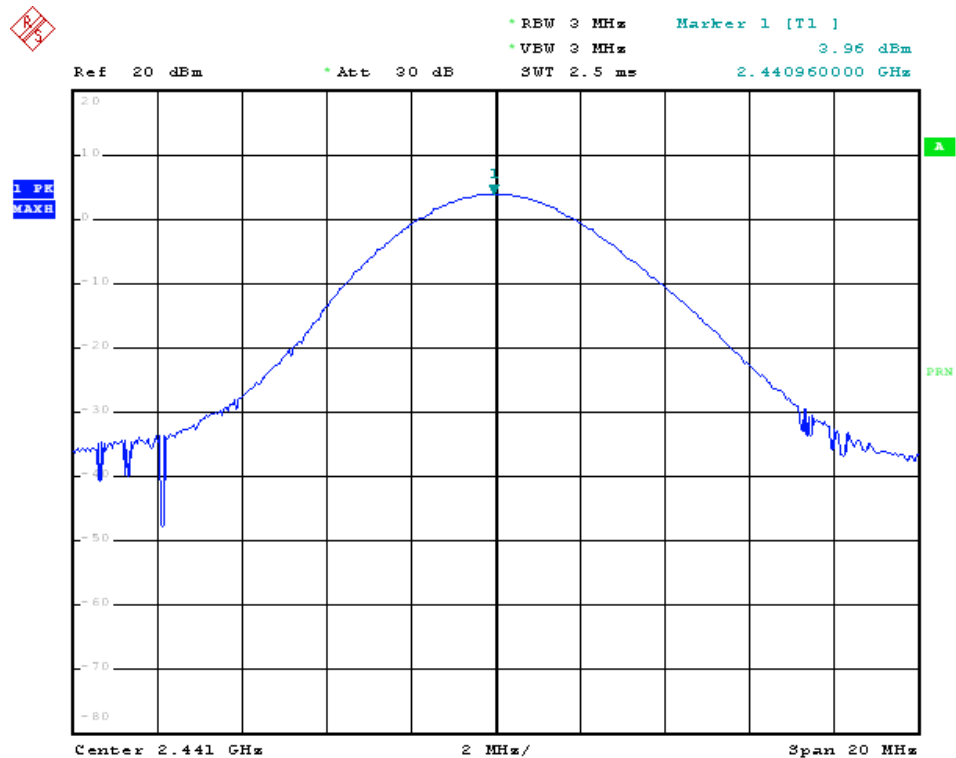


## Middle Channel:

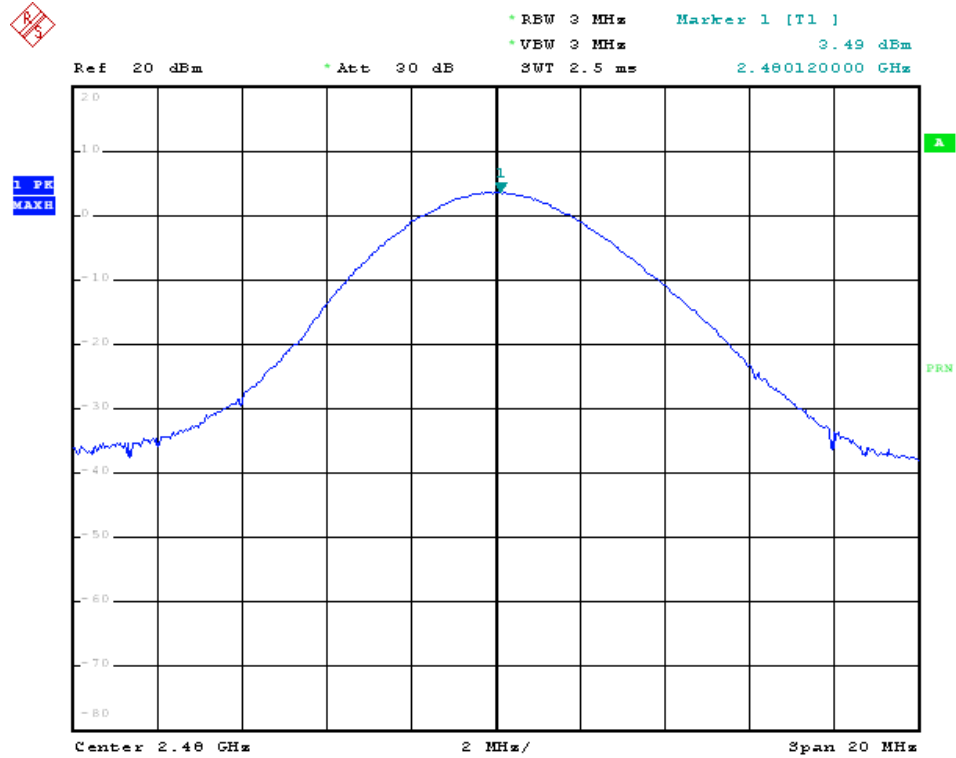


## Highest Channel:



**EDR mode (3DH5):**  
**Lowest Channel:****Middle Channel:**

## Highest Channel:



## 5.8 Conducted Spurious Emissions

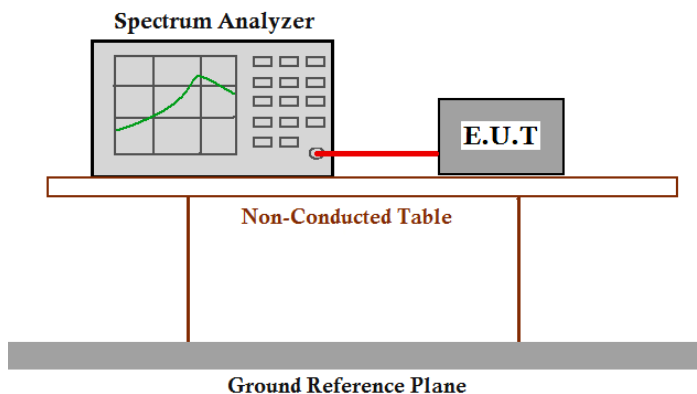
**Test Requirement:** FCC Part15 C section 15.247

(d) In any 100 kHz 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 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power. Based on either an RF conducted or a radiated measurement. Provided the transmitter demonstrates compliance with the peak conducted power limits.

**Test Method:** ANSI C63.10: Clause 6.7 & DA 00-705

**Test Status:** Pre-test the EUT in continuous transmitting mode at the lowest, middle and highest channel with different data packet. Compliance test in continuous transmitting mode with normal (DH5), EDR mode (2DH5) and EDR mode (3DH5) as the worst case was found.

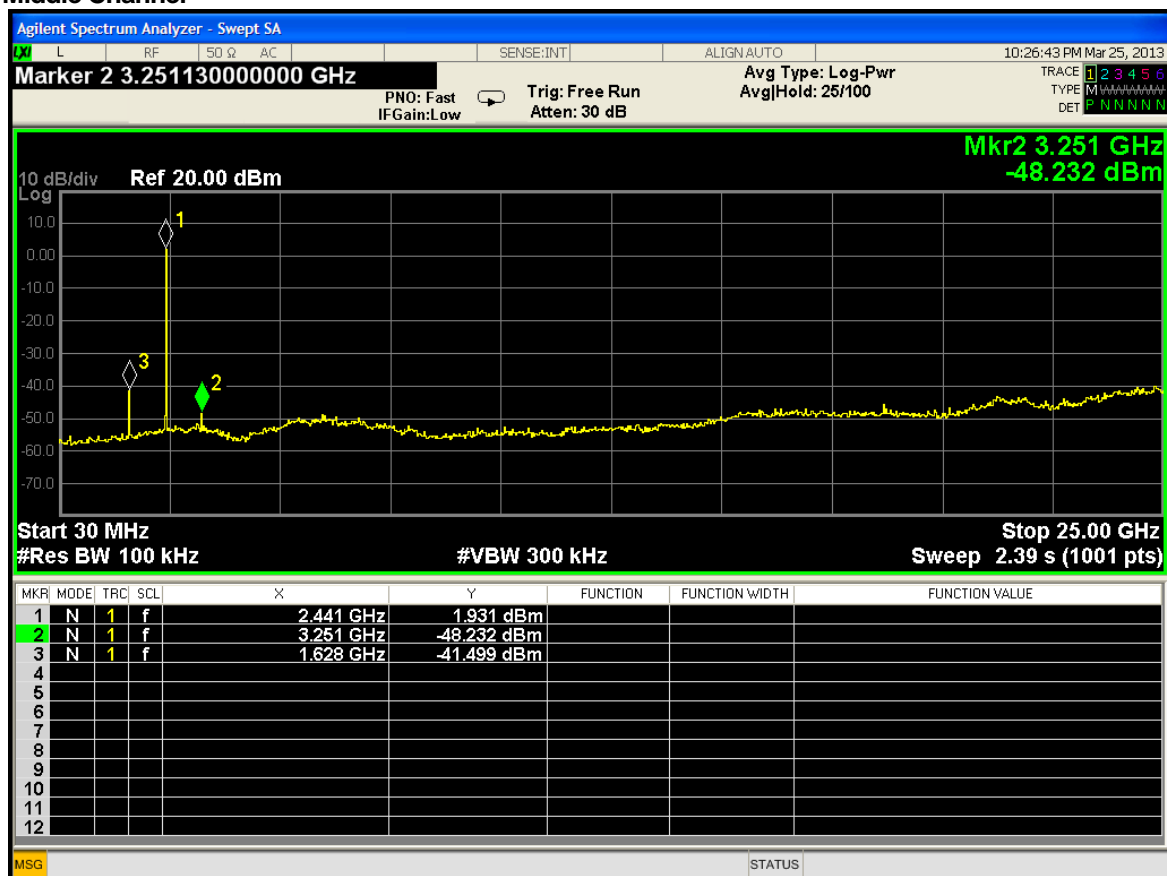
**Test Configuration:**



**Test Procedure:**

1. Remove the antenna from the EUT and then connect a low attenuation RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 100 kHz. VBW  $\geq$  RBW. Sweep = auto; Detector Function = Peak (Max. hold).

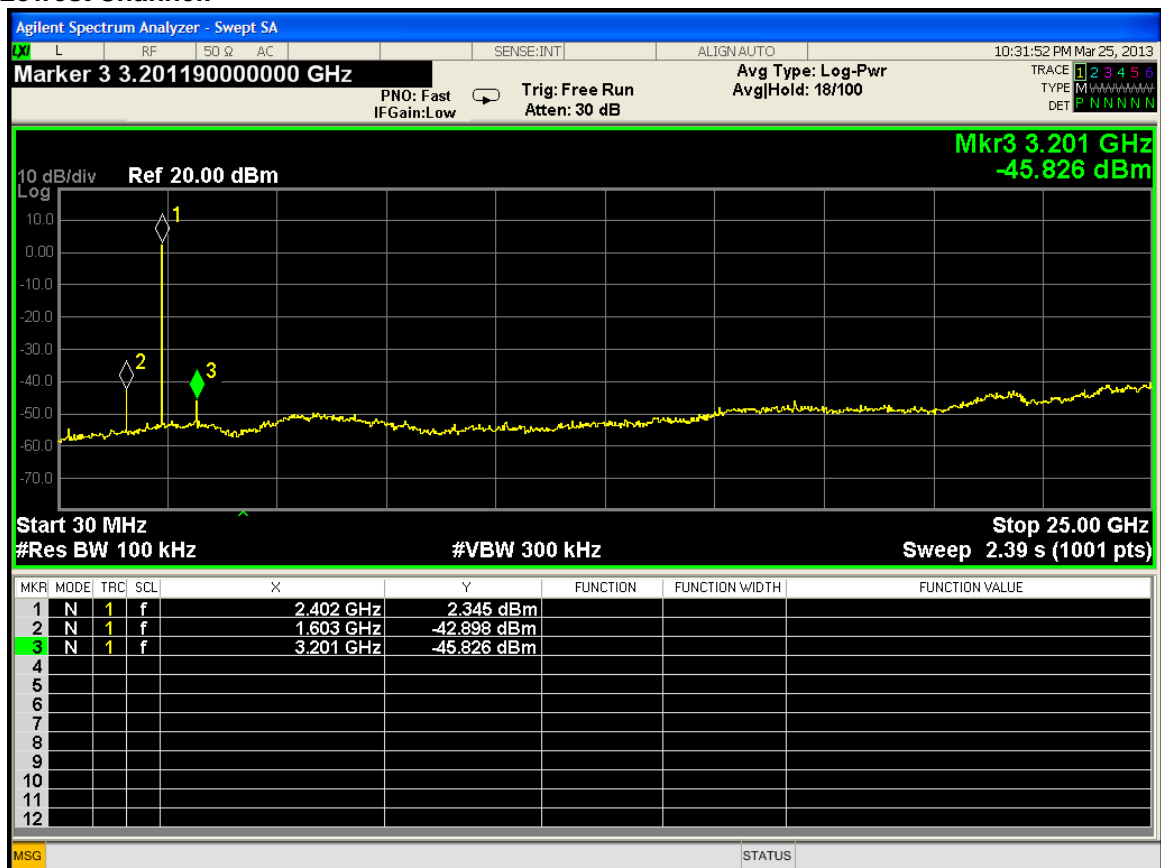
**Lowest Channel:**





[illegible]

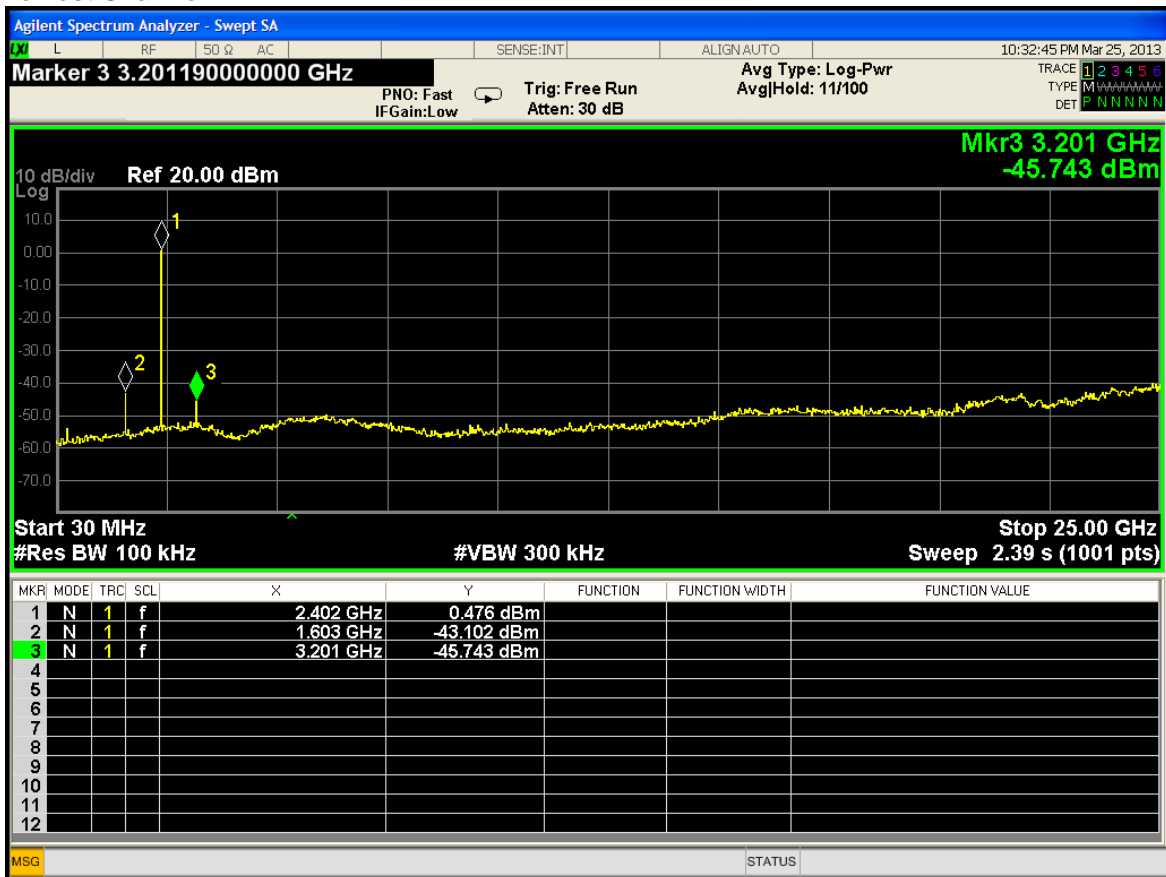
**Lowest Channel:**



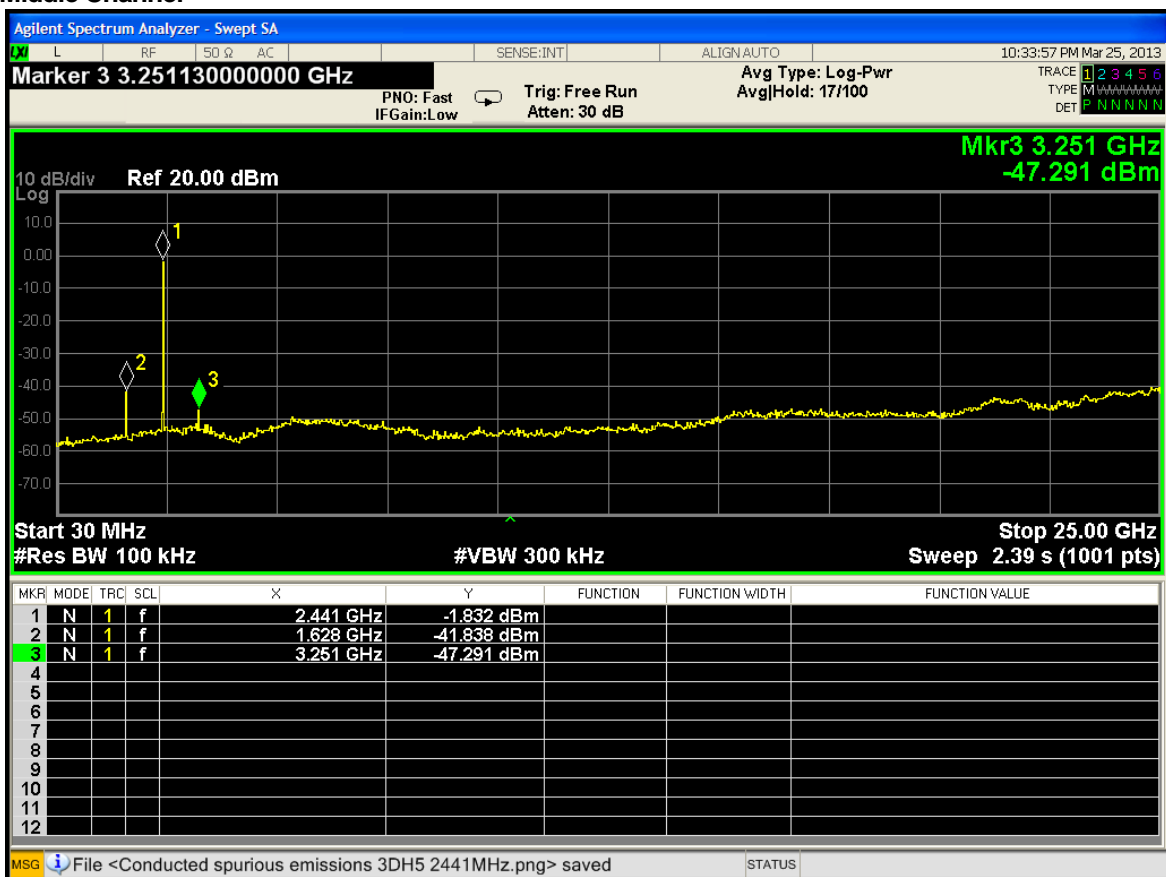


Test result plot as follows (EDR mode-3DH5):

## Lowest Channel:



## Middle Channel



[illegible]

## 5.9 Radiated Spurious Emissions

**Test Requirement:** FCC Part15 C section 15.247

(d) In any 100 kHz 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 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, and provided the transmitter demonstrates compliance with the peak conducted power limits.

**Test Method:** ANSI C63.10: Clause 6.4, 6.5 and 6.6 & DA 00-705

**Test Status:** Pre-test the EUT in continuous transmitting mode at the lowest, middle and highest channel with different data packet. Compliance test in continuous transmitting mode with normal mode (DH5) as the worst case was found.

**Detector:** For PK value:

RBW = 1 MHz for  $f \geq 1$  GHz, 100 kHz for  $f < 1$  GHz, 9kHz for  $<30$ MHz

VBW  $\geq$  RBW

Sweep = auto

Detector function = peak

Trace = max hold

For AV value:

RBW = 1 MHz for  $f \geq 1$  GHz, 100 kHz for  $f < 1$  GHz, 9kHz for  $<30$ MHz

VBW =10 Hz

Sweep = auto

Detector function = peak

Trace = max hold

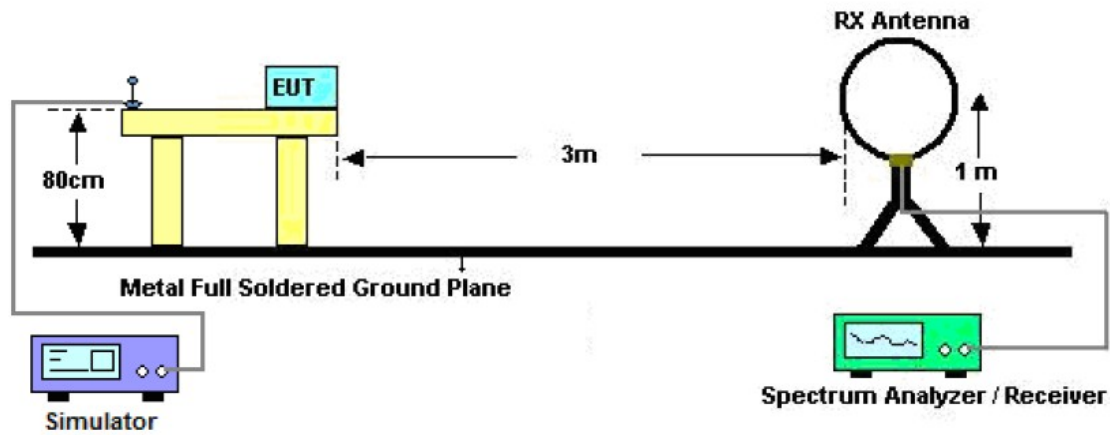
**15.209 Limit:** Section 15.209(a)

(\*\*) 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:

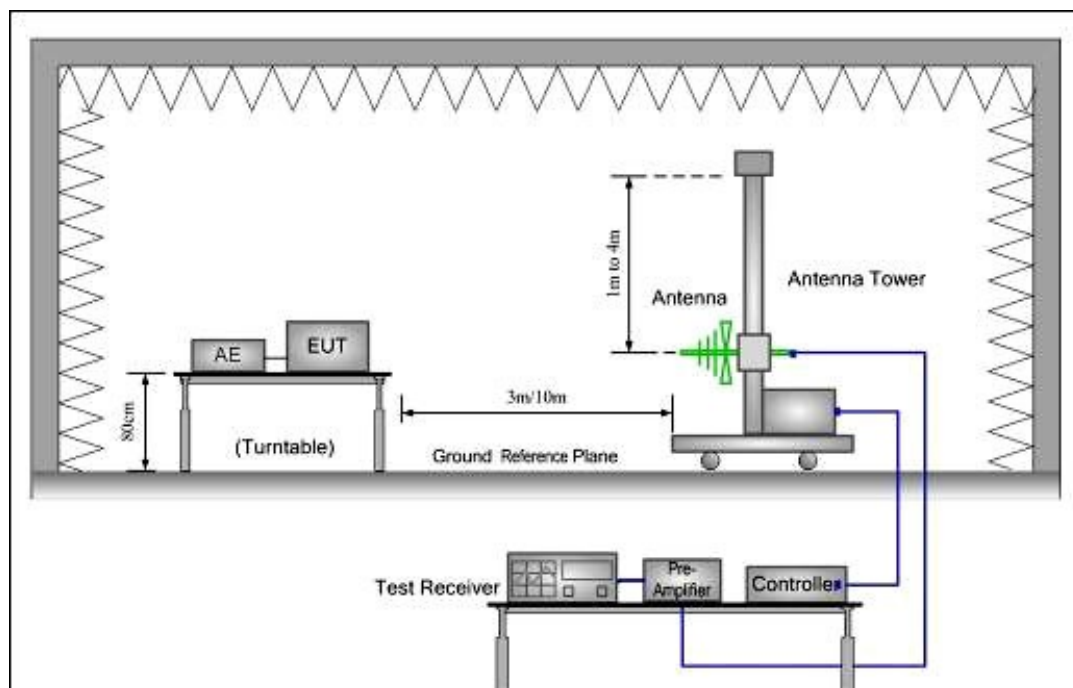
| Frequency (MHz) | Field Strength (microvolts/meter) | Measurement Distance (meters) |
|-----------------|-----------------------------------|-------------------------------|
| 0.009 - 0.490   | 2400/F(kHz)                       | 300                           |
| 0.490 - 1.705   | 24000/F(kHz)                      | 30                            |
| 1.705 - 30.0    | 30                                | 30                            |
| 30 - 88         | 100 **                            | 3                             |
| 88 - 216        | 150 **                            | 3                             |
| 216 - 960       | 200 **                            | 3                             |
| Above 960       | 500                               | 3                             |

**Test Configuration:**

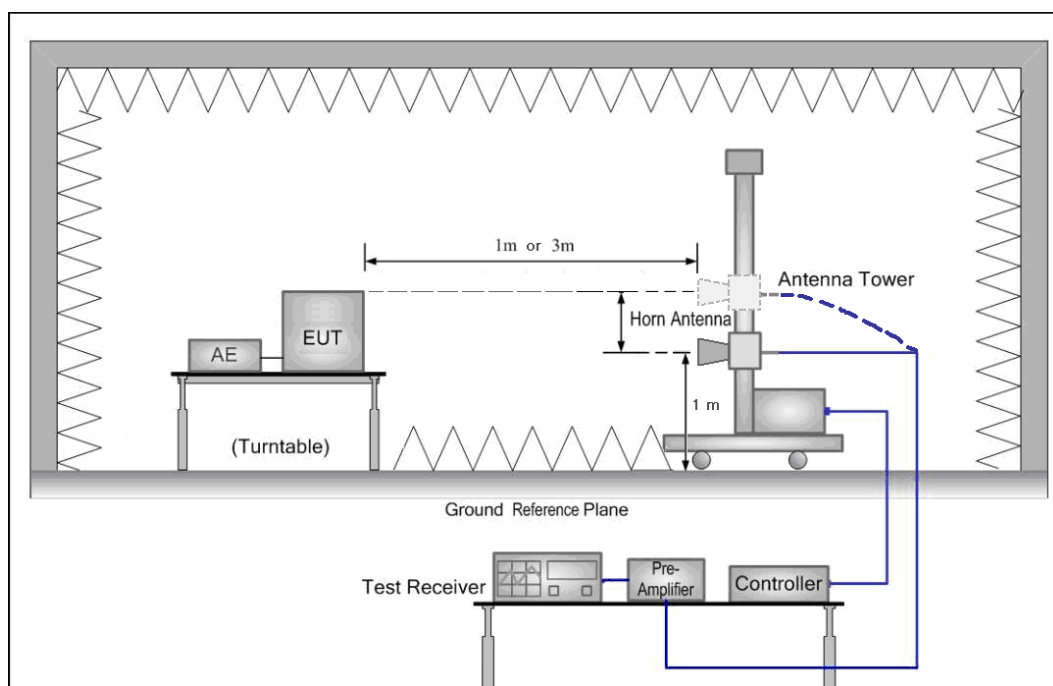
- 1) 9kHz to 30MHz emissions:



- 2) 30 MHz to 1 GHz emissions:



## 3) 1 GHz to 40 GHz emissions:



**Test Procedure:** The procedure used was ANSI Standard C63.4:2003. The receiver was scanned from 30MHz to 25GHz. When an emission was found, the table was rotated to produce the maximum signal strength. An initial pre-scan was performed for in peak detection mode using the receiver. The EUT was measured for both the Horizontal and Vertical polarities and performed a pre-test three orthogonal planes. For intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage. The worst case emissions were reported.

Now set the VBW to 10 Hz, while maintaining all of the other instrument settings. This peak level, once corrected, must comply with the limit specified in Section 15.209. If the dwell time per channel of the hopping signal is less than 100 ms, then the reading obtained with the 10 Hz VBW may be further adjusted by a "duty cycle correction factor", derived from  $20\log(\text{dwell time}/100 \text{ ms})$ , in an effort to demonstrate compliance with the 15.209 limit.

Submit this data.

### 5.9.1 Harmonic and other spurious emissions

#### Test at low Channel in transmitting status

9kHz~30MHz Test result

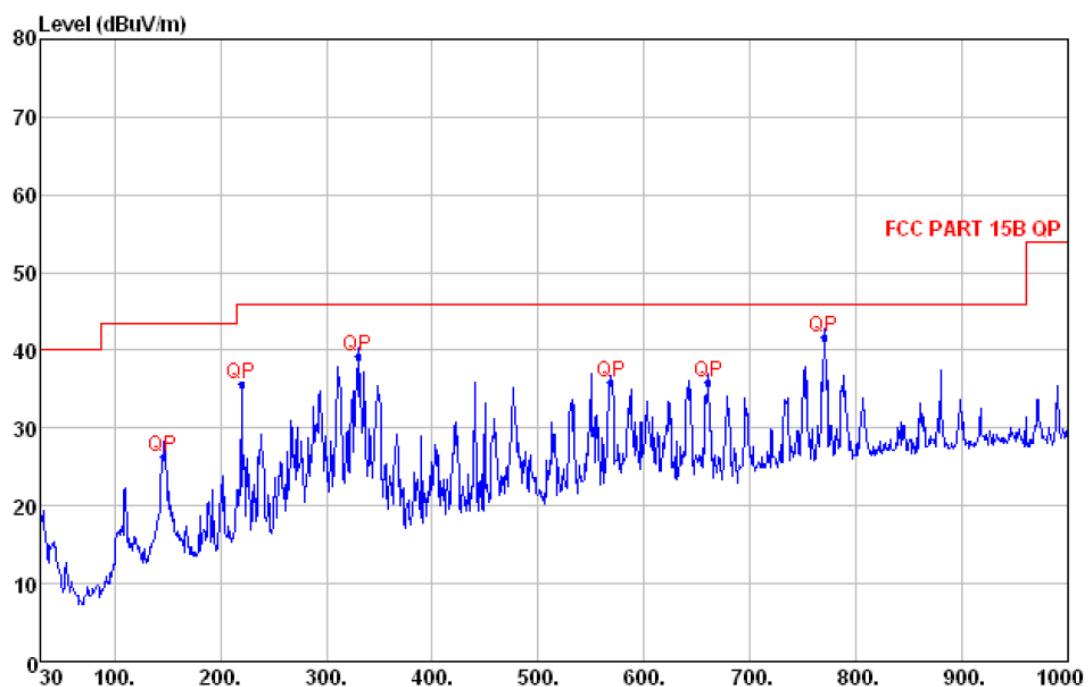
The Low frequency, which started from 9kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not report

30 MHz~1 GHz Spurious Emissions .Quasi-Peak Measurement

Horizontal:

Peak scan

Level (dBμV/m)



Quasi-peak measurement

| No. | Freq<br>MHz | Level<br>dBμV/m | Remark | Antenna<br>Factor<br>dB/m | Cable<br>Loss<br>dB | Limit<br>Line<br>dBμV/m | Margin<br>dB | A/pos<br>cm | T/pos<br>deg |
|-----|-------------|-----------------|--------|---------------------------|---------------------|-------------------------|--------------|-------------|--------------|
| 1   | 146.400     | 26.36           | QP     | 7.31                      | 1.44                | 43.50                   | -17.14       | 100         | 194          |
| 2   | 220.120     | 35.62           | QP     | 10.11                     | 1.80                | 46.00                   | -10.38       | 100         | 74           |
| 3   | 329.730     | 39.25           | QP     | 14.00                     | 2.22                | 46.00                   | -6.75        | 100         | 288          |
| 4   | 568.350     | 35.79           | QP     | 19.55                     | 2.97                | 46.00                   | -10.21       | 200         | 236          |
| 5   | 660.500     | 35.93           | QP     | 20.71                     | 3.23                | 46.00                   | -10.07       | 200         | 154          |
| 6   | 770.110     | 41.76           | QP     | 22.10                     | 3.49                | 46.00                   | -4.24        | 200         | 101          |

**Level=Read Level + Antenna Factor + Cable Loss**



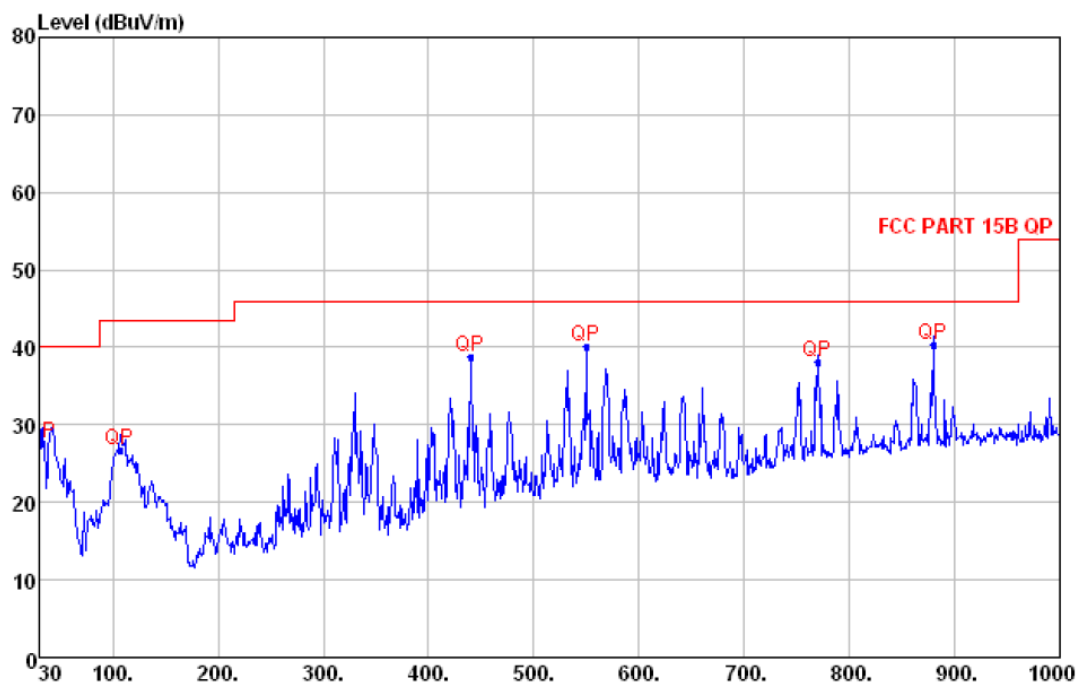
**Test at low Channel in transmitting status**

30 MHz~1 GHz Spurious Emissions .Quasi-Peak Measurement

**Vertical:**

Peak scan

Level (dBuV/m)



Quasi-peak measurement

| No. | Freq<br>MHz | Level<br>dBuV/m | Remark | Antenna<br>Factor<br>dB/m | Cable<br>Loss<br>dB | Limit<br>Line<br>dBuV/m | Margin<br>dB | A/pos<br>cm | T/pos<br>deg |
|-----|-------------|-----------------|--------|---------------------------|---------------------|-------------------------|--------------|-------------|--------------|
| 1   | 32.910      | 27.62           | QP     | 16.24                     | 0.66                | 40.00                   | -12.38       | 100         | 141          |
| 2   | 106.630     | 26.64           | QP     | 8.50                      | 1.21                | 43.50                   | -16.86       | 100         | 120          |
| 3   | 440.310     | 38.74           | QP     | 16.61                     | 2.59                | 46.00                   | -7.26        | 100         | 184          |
| 4   | 549.920     | 40.09           | QP     | 19.80                     | 2.92                | 46.00                   | -5.91        | 200         | 247          |
| 5   | 770.110     | 38.01           | QP     | 22.10                     | 3.49                | 46.00                   | -7.99        | 200         | 108          |
| 6   | 879.720     | 40.39           | QP     | 23.21                     | 3.75                | 46.00                   | -5.61        | 200         | 222          |

**Level=Read Level + Antenna Factor + Cable Loss**

## 1~25 GHz Harmonics &amp; Spurious Emissions. Peak &amp; Average Measurement

**Peak Measurement:**

| Frequency (MHz) | Antenna factors (dB/m) | Cable loss (dB) | Preamplifier factor (dB) | Reading Level (dBμV) | Emission Level (dBμV/m) | Limit (dBμV/m) | Antenna polarization |
|-----------------|------------------------|-----------------|--------------------------|----------------------|-------------------------|----------------|----------------------|
| 4804.000        | 34.32                  | 9.59            | 27.62                    | 35.61                | 51.9                    | 74.00          | V                    |
| 7206.000        | 34.88                  | 12.15           | 27.33                    | 34.21                | 53.91                   | 74.00          | V                    |
| 9608.000        | 37.72                  | 14.41           | 27.14                    | 38.22                | 63.21                   | 74.00          | V                    |
| 4804.000        | 34.32                  | 9.59            | 27.62                    | 35.45                | 51.74                   | 74.00          | H                    |
| 7206.000        | 34.88                  | 12.15           | 27.33                    | 35.28                | 54.98                   | 74.00          | H                    |
| 9608.000        | 37.72                  | 14.41           | 27.14                    | 38.43                | 63.42                   | 74.00          | H                    |

**Average Measurement:**

| Frequency (MHz) | Antenna factors (dB/m) | Cable loss (dB) | Preamplifier factor (dB) | Reading Level (dBμV) | Emission Level (dBμV/m) | Limit (dBμV/m) | Antenna polarization |
|-----------------|------------------------|-----------------|--------------------------|----------------------|-------------------------|----------------|----------------------|
| 4804.000        | 34.32                  | 9.59            | 27.62                    | 20.36                | 36.65                   | 54.00          | V                    |
| 7206.000        | 34.88                  | 12.15           | 27.33                    | 19.68                | 39.38                   | 54.00          | V                    |
| 9608.000        | 37.72                  | 14.41           | 27.14                    | 23.63                | 48.62                   | 54.00          | V                    |
| 4804.000        | 34.32                  | 9.59            | 27.62                    | 20.65                | 36.94                   | 54.00          | H                    |
| 7206.000        | 34.88                  | 12.15           | 27.33                    | 20.87                | 40.57                   | 54.00          | H                    |
| 9608.000        | 37.72                  | 14.41           | 27.14                    | 23.50                | 48.49                   | 54.00          | H                    |

**Test at Middle Channel in transmitting status**

9kHz~30MHz Test result

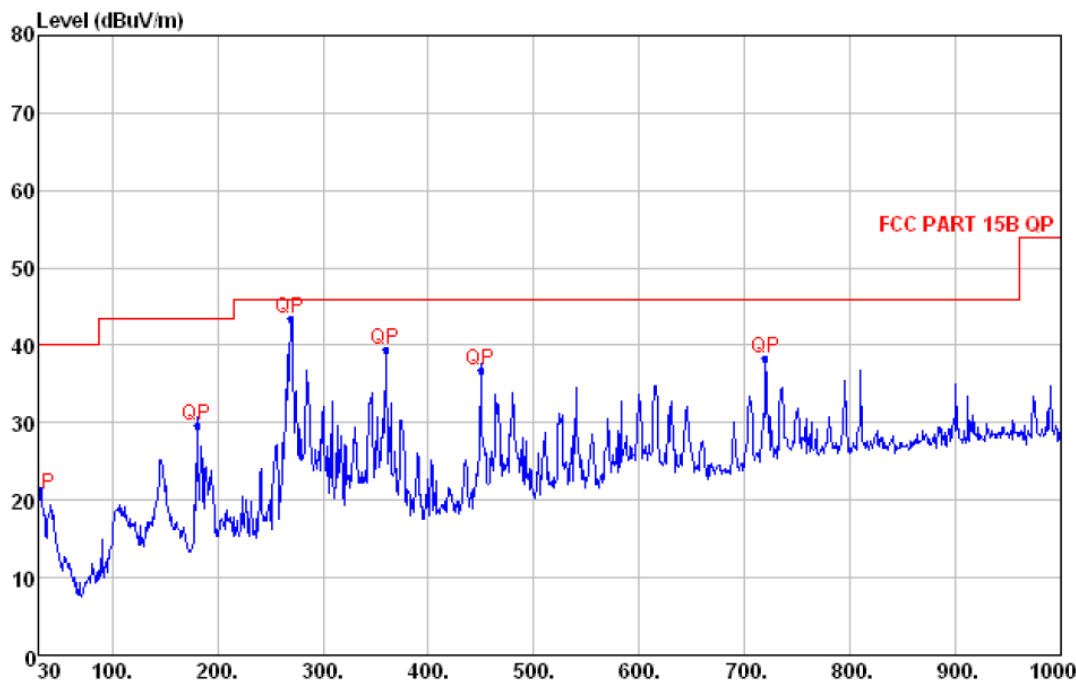
The Low frequency, which started from 9kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not report

30 MHz~1 GHz Spurious Emissions .Quasi-Peak Measurement

**Horizontal:**

Peak scan

Level (dBμV/m)



Quasi-peak measurement

| No. | Freq<br>MHz | Level<br>dBuV/m | Remark | Antenna<br>Factor<br>dB/m | Cable<br>Loss<br>dB | Limit<br>Line<br>dBuV/m | Margin<br>dB | A/pos<br>cm | T/pos<br>deg |
|-----|-------------|-----------------|--------|---------------------------|---------------------|-------------------------|--------------|-------------|--------------|
| 1   | 31.940      | 20.70           | QP     | 16.83                     | 0.65                | 40.00                   | -19.30       | 100         | 124          |
| 2   | 180.350     | 29.72           | QP     | 8.30                      | 1.61                | 43.50                   | -13.78       | 100         | 158          |
| 3   | 269.590     | 43.43           | QP     | 12.95                     | 2.01                | 46.00                   | -2.57        | 100         | 74           |
| 4   | 359.800     | 39.50           | QP     | 14.39                     | 2.31                | 46.00                   | -6.50        | 200         | 215          |
| 5   | 450.010     | 36.73           | QP     | 16.80                     | 2.62                | 46.00                   | -9.27        | 200         | 261          |
| 6   | 719.670     | 38.32           | QP     | 21.19                     | 3.37                | 46.00                   | -7.68        | 200         | 101          |

Level=Read Level + Antenna Factor + Cable Loss

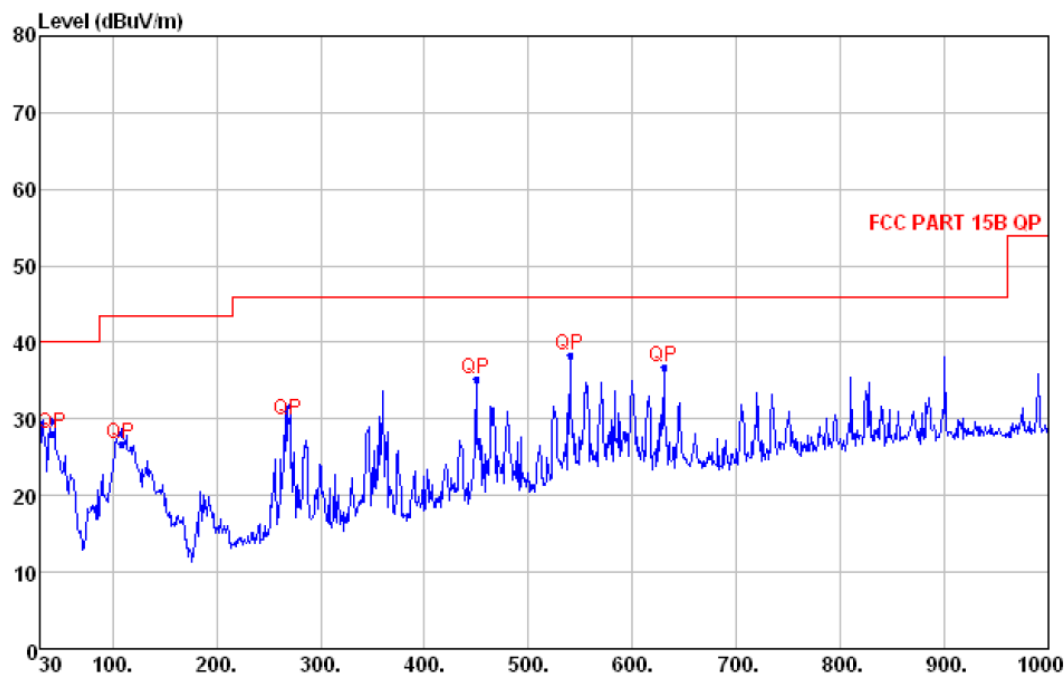
Test at Middle Channel in transmitting status

30 MHz~1 GHz Spurious Emissions .Quasi-Peak Measurement

Vertical:

Peak scan

Level (dBuV/m)



Quasi-peak measurement

| No. | Freq<br>MHz | Level<br>dBuV/m | Remark | Antenna<br>Factor<br>dB/m | Cable<br>Loss<br>dB | Limit<br>Line<br>dBuV/m | Margin<br>dB | A/pos<br>cm | T/pos<br>deg |
|-----|-------------|-----------------|--------|---------------------------|---------------------|-------------------------|--------------|-------------|--------------|
| 1   | 41.640      | 28.03           | QP     | 11.52                     | 0.73                | 40.00                   | -11.97       | 100         | 121          |
| 2   | 108.570     | 26.82           | QP     | 8.50                      | 1.22                | 43.50                   | -16.68       | 100         | 147          |
| 3   | 269.590     | 29.77           | QP     | 12.95                     | 2.01                | 46.00                   | -16.23       | 100         | 169          |
| 4   | 450.010     | 35.32           | QP     | 16.80                     | 2.62                | 46.00                   | -10.68       | 200         | 202          |
| 5   | 540.220     | 38.28           | QP     | 19.31                     | 2.89                | 46.00                   | -7.72        | 200         | 265          |
| 6   | 630.430     | 36.85           | QP     | 20.21                     | 3.14                | 46.00                   | -9.15        | 200         | 227          |

Level=Read Level + Antenna Factor + Cable Loss

## 1~25 GHz Harmonics &amp; Spurious Emissions. Peak &amp; Average Measurement

**Peak Measurement:**

| Frequency (MHz) | Antenna factors (dB/m) | Cable loss (dB) | Preamp factor (dB) | Reading Level (dBμV) | Emission Level (dBμV/m) | Limit (dBμV/m) | Antenna polarization |
|-----------------|------------------------|-----------------|--------------------|----------------------|-------------------------|----------------|----------------------|
| 4882.000        | 34.33                  | 9.59            | 27.60              | 35.51                | 51.83                   | 74.00          | V                    |
| 7323.000        | 34.92                  | 12.17           | 27.31              | 34.63                | 54.41                   | 74.00          | V                    |
| 9764.000        | 37.91                  | 14.49           | 27.13              | 37.85                | 63.12                   | 74.00          | V                    |
| 4882.000        | 34.33                  | 9.59            | 27.60              | 35.15                | 51.47                   | 74.00          | H                    |
| 7323.000        | 34.92                  | 12.17           | 27.31              | 35.48                | 55.26                   | 74.00          | H                    |
| 9764.000        | 37.91                  | 14.49           | 27.13              | 38.21                | 63.48                   | 74.00          | H                    |

**Average Measurement:**

| Frequency (MHz) | Antenna factors (dB/m) | Cable loss (dB) | Preamp factor (dB) | Reading Level (dBμV) | Emission Level (dBμV/m) | Limit (dBμV/m) | Antenna polarization |
|-----------------|------------------------|-----------------|--------------------|----------------------|-------------------------|----------------|----------------------|
| 4882.000        | 34.33                  | 9.59            | 27.60              | 22.63                | 38.95                   | 54.00          | V                    |
| 7323.000        | 34.92                  | 12.17           | 27.31              | 22.63                | 42.41                   | 54.00          | V                    |
| 9764.000        | 37.91                  | 14.49           | 27.13              | 23.65                | 48.92                   | 54.00          | V                    |
| 4882.000        | 34.33                  | 9.59            | 27.60              | 20.36                | 36.68                   | 54.00          | H                    |
| 7323.000        | 34.92                  | 12.17           | 27.31              | 21.83                | 41.61                   | 54.00          | H                    |
| 9764.000        | 37.91                  | 14.49           | 27.13              | 22.56                | 47.83                   | 54.00          | H                    |

Test at high Channel in transmitting status

9kHz~30MHz Test result

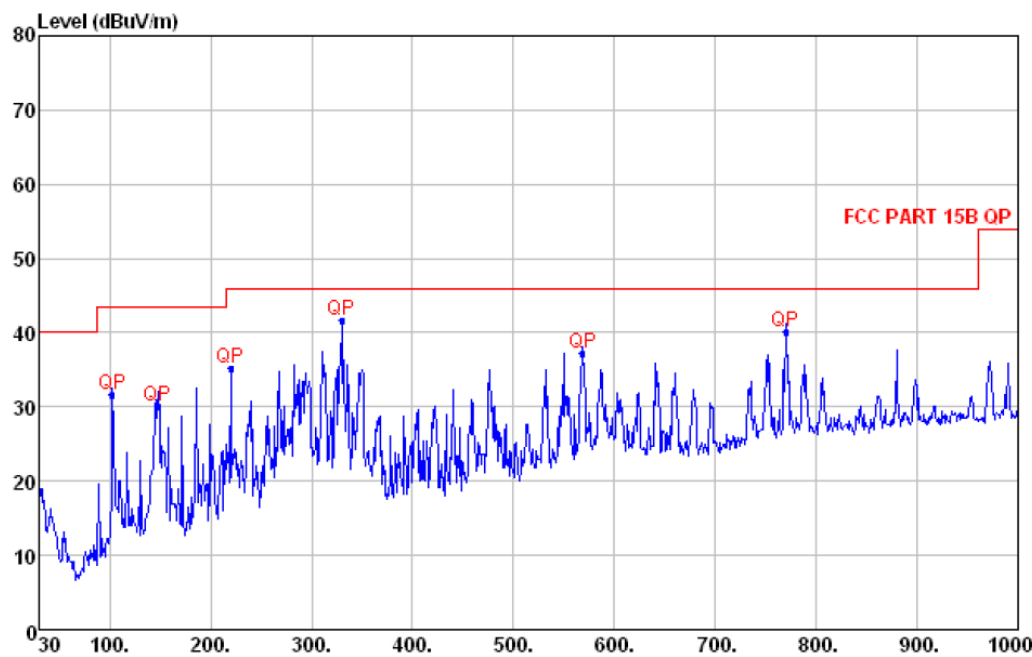
The Low frequency, which started from 9kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not report

30 MHz~1 GHz Spurious Emissions .Quasi-Peak Measurement

Horizontal:

Peak scan

Level (dBμV/m)



Quasi-peak measurement

| No. | Freq<br>MHz | Level<br>dBμV/m | Remark | Antenna<br>Factor<br>dB/m | Cable<br>Loss<br>dB | Limit<br>Line<br>dBμV/m | Margin<br>dB | A/pos<br>cm | T/pos<br>deg |
|-----|-------------|-----------------|--------|---------------------------|---------------------|-------------------------|--------------|-------------|--------------|
| 1   | 102.750     | 31.60           | QP     | 8.59                      | 1.19                | 43.50                   | -11.90       | 100         | 271          |
| 2   | 147.370     | 30.14           | QP     | 7.26                      | 1.45                | 43.50                   | -13.36       | 100         | 224          |
| 3   | 220.120     | 35.29           | QP     | 10.11                     | 1.80                | 46.00                   | -10.71       | 100         | 169          |
| 4   | 329.730     | 41.64           | QP     | 14.00                     | 2.22                | 46.00                   | -4.36        | 200         | 147          |
| 5   | 568.350     | 37.13           | QP     | 19.55                     | 2.97                | 46.00                   | -8.87        | 200         | 121          |
| 6   | 770.110     | 40.16           | QP     | 22.10                     | 3.49                | 46.00                   | -5.84        | 200         | 72           |

Level=Read Level + Antenna Factor + Cable Loss

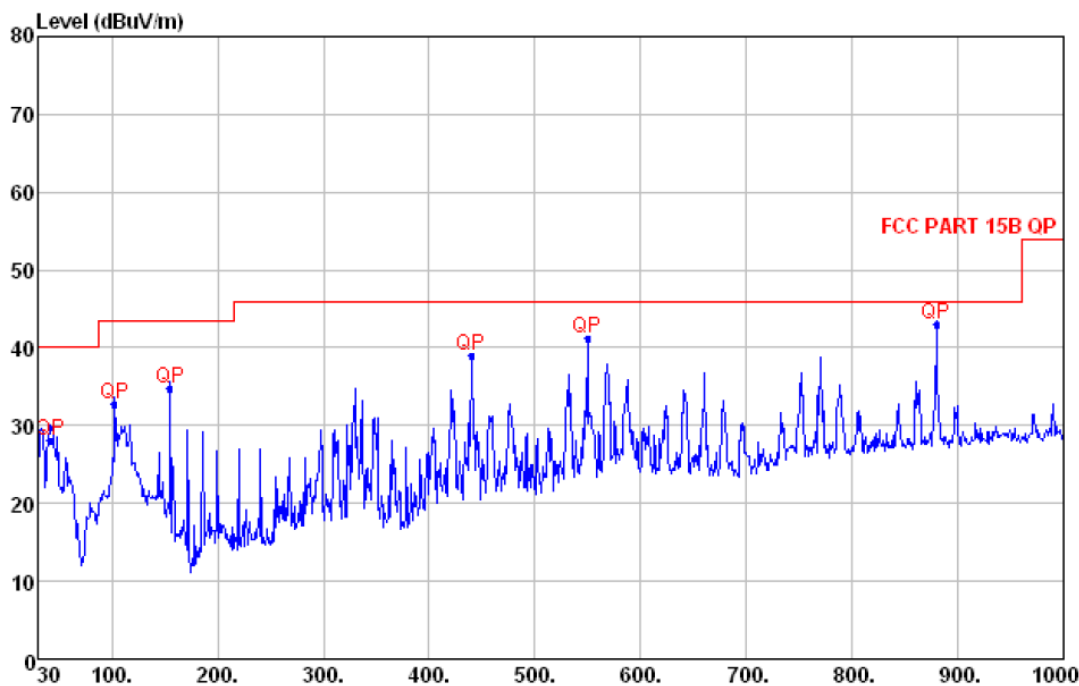
Test at High Channel in transmitting status

30 MHz~1 GHz Spurious Emissions .Quasi-Peak Measurement

Vertical:

Peak scan

Level (dBμV/m)



Quasi-peak measurement

| No. | Freq<br>MHz | Level<br>dBμV/m | Remark | Antenna<br>Factor<br>dB/m | Cable<br>Loss<br>dB | Limit<br>Line<br>dBμV/m | Margin<br>dB | A/pos<br>cm | T/pos<br>deg |
|-----|-------------|-----------------|--------|---------------------------|---------------------|-------------------------|--------------|-------------|--------------|
| 1   | 41.640      | 27.99           | QP     | 11.52                     | 0.73                | 40.00                   | -12.01       | 100         | 124          |
| 2   | 102.750     | 32.74           | QP     | 8.59                      | 1.19                | 43.50                   | -10.76       | 100         | 211          |
| 3   | 155.130     | 34.67           | QP     | 7.61                      | 1.49                | 43.50                   | -8.83        | 100         | 241          |
| 4   | 440.310     | 39.02           | QP     | 16.61                     | 2.59                | 46.00                   | -6.98        | 200         | 77           |
| 5   | 549.920     | 41.30           | QP     | 19.80                     | 2.92                | 46.00                   | -4.70        | 200         | 288          |
| 6   | 879.720     | 43.05           | QP     | 23.21                     | 3.75                | 46.00                   | -2.95        | 200         | 302          |

**Level=Read Level + Antenna Factor + Cable Loss**

## 1~25 GHz Harmonics &amp; Spurious Emissions. Peak &amp; Average Measurement

**Peak Measurement:**

| Frequency (MHz) | Antenna factors (dB/m) | Cable loss (dB) | Preamp factor (dB) | Reading Level (dBμV) | Emission Level (dBμV/m) | Limit (dBμV/m) | Antenna polarization |
|-----------------|------------------------|-----------------|--------------------|----------------------|-------------------------|----------------|----------------------|
| 4960.000        | 34.36                  | 9.60            | 27.61              | 35.81                | 52.16                   | 74.00          | V                    |
| 7440.000        | 34.98                  | 12.19           | 27.30              | 34.42                | 54.29                   | 74.00          | V                    |
| 9920.000        | 37.96                  | 14.52           | 27.11              | 37.63                | 63                      | 74.00          | V                    |
| 4960.000        | 34.36                  | 9.60            | 27.61              | 35.33                | 51.68                   | 74.00          | H                    |
| 7440.000        | 34.98                  | 12.19           | 27.30              | 35.61                | 55.48                   | 74.00          | H                    |
| 9920.000        | 37.96                  | 14.52           | 27.11              | 38.01                | 63.38                   | 74.00          | H                    |

**Average Measurement:**

| Frequency (MHz) | Antenna factors (dB/m) | Cable loss (dB) | Preamp factor (dB) | Reading Level (dBμV) | Emission Level (dBμV/m) | Limit (dBμV/m) | Antenna polarization |
|-----------------|------------------------|-----------------|--------------------|----------------------|-------------------------|----------------|----------------------|
| 4960.000        | 34.36                  | 9.60            | 27.61              | 20.36                | 36.71                   | 54.00          | V                    |
| 7440.000        | 34.98                  | 12.19           | 27.30              | 19.68                | 39.55                   | 54.00          | V                    |
| 9920.000        | 37.96                  | 14.52           | 27.11              | 23.63                | 49                      | 54.00          | V                    |
| 4960.000        | 34.36                  | 9.60            | 27.61              | 20.65                | 37                      | 54.00          | H                    |
| 7440.000        | 34.98                  | 12.19           | 27.30              | 20.87                | 40.74                   | 54.00          | H                    |
| 9920.000        | 37.96                  | 14.52           | 27.11              | 23.50                | 48.87                   | 54.00          | H                    |



## 5.10 Radiated Emissions which fall in the restricted bands

**Test Requirement:** FCC Part15 C Section 15.247

(d) In addition, radiated emissions which fall in the restricted bands. as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

**Test Method:** ANSI C63.10: Clause 6.4, 6.5 and 6.6 & DA 00-705

**Test Status:** Pre-test the EUT in continuous transmitting mode at the lowest (2402 MHz), middle (2441 MHz) and highest (2480 MHz) channel with different data packet. Compliance test in continuous transmitting mode with normal mode (DH5) as the worst case was found.

**Measurement Distance:** 3m (Semi-Anechoic Chamber)

**Limit:** 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 (microvolts/meter) | Measurement Distance (meters) |
|-----------------|-----------------------------------|-------------------------------|
| 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                             |

**Detector:** For PK value:

RBW = 1 MHz for  $f \geq 1$  GHz, 100 kHz for  $f < 1$  GHz

VBW  $\geq$  RBW

Sweep = auto

Detector function = peak

Trace = max hold

For AV value:

RBW = 1 MHz for  $f \geq 1$  GHz, 100 kHz for  $f < 1$  GHz

VBW =10 Hz

Sweep = auto

Detector function = peak

Trace = max hold

**Test Result:****For bluetooth****1. Low Channel (2402MHz)**

Antenna polarization: Vertical

| Frequency (MHz) | Antenna factors (dB/m) | Cable loss(dB) | Preamp factor(dB) | Peak Reading Level (dBμV) | Average Reading Level (dBμV) | Peak Emission Level (dBμV/m) | Average Emission Level (dBμV/m) |
|-----------------|------------------------|----------------|-------------------|---------------------------|------------------------------|------------------------------|---------------------------------|
| 2310.000        | 26.65                  | 6.45           | 27.78             | 35.19                     | 21.29                        | 40.51                        | 26.61                           |
| 2390.000        | 26.56                  | 6.46           | 27.79             | 35.23                     | 21.48                        | 40.46                        | 26.71                           |
| 2500.000        | 25.70                  | 6.62           | 27.80             | 35.51                     | 21.68                        | 40.03                        | 26.2                            |
| 2483.500        | 25.79                  | 6.61           | 27.80             | 35.35                     | 21.7                         | 39.95                        | 26.3                            |

Antenna polarization: Horizontal

| Frequency (MHz) | Antenna factors (dB/m) | Cable loss(dB) | Preamp factor(dB) | Peak Reading Level (dBμV) | Average Reading Level (dBμV) | Peak Emission Level (dBμV/m) | Average Emission Level (dBμV/m) |
|-----------------|------------------------|----------------|-------------------|---------------------------|------------------------------|------------------------------|---------------------------------|
| 2310.000        | 26.65                  | 6.45           | 27.78             | 35.38                     | 21.92                        | 40.7                         | 27.24                           |
| 2390.000        | 26.56                  | 6.46           | 27.79             | 35.72                     | 21.42                        | 40.95                        | 26.65                           |
| 2500.000        | 25.70                  | 6.62           | 27.80             | 35.62                     | 21.61                        | 40.14                        | 26.13                           |
| 2483.500        | 25.79                  | 6.61           | 27.80             | 35.92                     | 21.72                        | 40.52                        | 26.32                           |

**2. Middle Channel(2441MHz)**

Antenna polarization: Vertical

| Frequency (MHz) | Antenna factors (dB/m) | Cable loss(dB) | Preamp factor(dB) | Peak Reading Level (dBμV) | Average Reading Level (dBμV) | Peak Emission Level (dBμV/m) | Average Emission Level (dBμV/m) |
|-----------------|------------------------|----------------|-------------------|---------------------------|------------------------------|------------------------------|---------------------------------|
| 2310.000        | 26.65                  | 6.45           | 27.78             | 35.38                     | 21.32                        | 40.7                         | 26.64                           |
| 2390.000        | 26.56                  | 6.46           | 27.79             | 35.82                     | 21.52                        | 41.05                        | 26.75                           |
| 2500.000        | 25.70                  | 6.62           | 27.80             | 35.49                     | 21.46                        | 40.01                        | 25.98                           |
| 2483.500        | 25.79                  | 6.61           | 27.80             | 35.77                     | 21.81                        | 40.37                        | 26.41                           |

Antenna polarization: Horizontal

| Frequency (MHz) | Antenna factors (dB/m) | Cable loss(dB) | Preamp factor(dB) | Peak Reading Level (dBμV) | Average Reading Level (dBμV) | Peak Emission Level (dBμV/m) | Average Emission Level (dBμV/m) |
|-----------------|------------------------|----------------|-------------------|---------------------------|------------------------------|------------------------------|---------------------------------|
| 2310.000        | 26.65                  | 6.45           | 27.78             | 35.31                     | 21.63                        | 40.63                        | 26.95                           |
| 2390.000        | 26.56                  | 6.46           | 27.79             | 35.42                     | 21.29                        | 40.65                        | 26.52                           |
| 2500.000        | 25.70                  | 6.62           | 27.80             | 35.61                     | 21.62                        | 40.13                        | 26.14                           |
| 2483.500        | 25.79                  | 6.61           | 27.80             | 35.41                     | 21.75                        | 40.01                        | 26.35                           |

**3. High Channel(2480MHz)**

Antenna polarization: Vertical

| Frequency (MHz) | Antenna factors (dB/m) | Cable loss(dB) | Preamp factor(dB) | Peak Reading Level (dB $\mu$ V) | Average Reading Level (dB $\mu$ V) | Peak Emission Level (dB $\mu$ V/m) | Average Emission Level (dB $\mu$ V/m) |
|-----------------|------------------------|----------------|-------------------|---------------------------------|------------------------------------|------------------------------------|---------------------------------------|
| 2310.000        | 26.65                  | 6.45           | 27.78             | 35.3                            | 21.23                              | 40.62                              | 26.55                                 |
| 2390.000        | 26.56                  | 6.46           | 27.79             | 35.52                           | 21.38                              | 40.75                              | 26.61                                 |
| 2500.000        | 25.70                  | 6.62           | 27.80             | 35.68                           | 21.46                              | 40.2                               | 25.98                                 |
| 2483.500        | 25.79                  | 6.61           | 27.80             | 35.73                           | 21.08                              | 40.33                              | 25.68                                 |

Antenna polarization: Horizontal

| Frequency (MHz) | Antenna factors (dB/m) | Cable loss(dB) | Preamp factor(dB) | Peak Reading Level (dB $\mu$ V) | Average Reading Level (dB $\mu$ V) | Peak Emission Level (dB $\mu$ V/m) | Average Emission Level (dB $\mu$ V/m) |
|-----------------|------------------------|----------------|-------------------|---------------------------------|------------------------------------|------------------------------------|---------------------------------------|
| 2310.000        | 26.65                  | 6.45           | 27.78             | 35.28                           | 21.29                              | 40.6                               | 26.61                                 |
| 2390.000        | 26.56                  | 6.46           | 27.79             | 35.63                           | 21.5                               | 40.86                              | 26.73                                 |
| 2500.000        | 25.70                  | 6.62           | 27.80             | 35.49                           | 21.83                              | 40.01                              | 26.35                                 |
| 2483.500        | 25.79                  | 6.61           | 27.80             | 35.91                           | 21.64                              | 40.51                              | 26.24                                 |

Remark: No any other emission which falls in restricted bands can be detected and be reported.

**Test result: The unit does meet the FCC requirements.**

## 5.11 Band Edges Requirement

**Test Requirement:** FCC Part15 C section 15.247

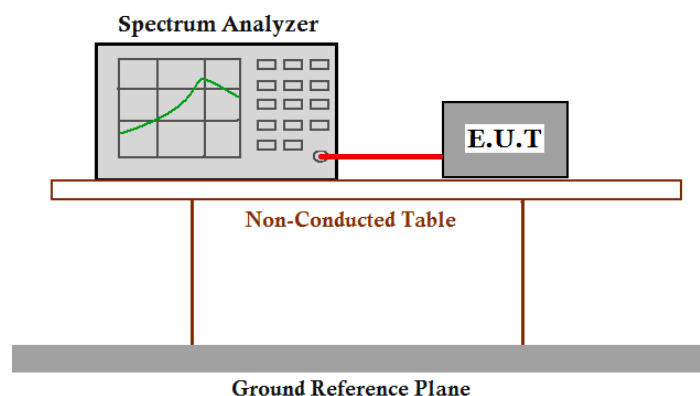
(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

**Frequency Band:** 2400 MHz to 2483.5 MHz

**Test Method:** ANSI C63.10: Clause 6.9 & DA 00-705

**Test Status:** Pre-test the EUT in continuous transmitting mode at the lowest (2402 MHz), and highest (2480 MHz) channel and hopping mode with different data packet. Compliance test in continuous transmitting mode with normal (DH5) EDR mode (2DH5) and EDR mode (3DH5) as the worst case was found.

**Test Configuration:**



**Test Procedure:**

Set RBW of spectrum analyzer to 100 kHz and VBW of spectrum analyzer to 300 kHz with suitable frequency span including 100 kHz bandwidth from band edge.

The band edges was measured and recorded Result:

The Lower Edges attenuated more than 20dB.

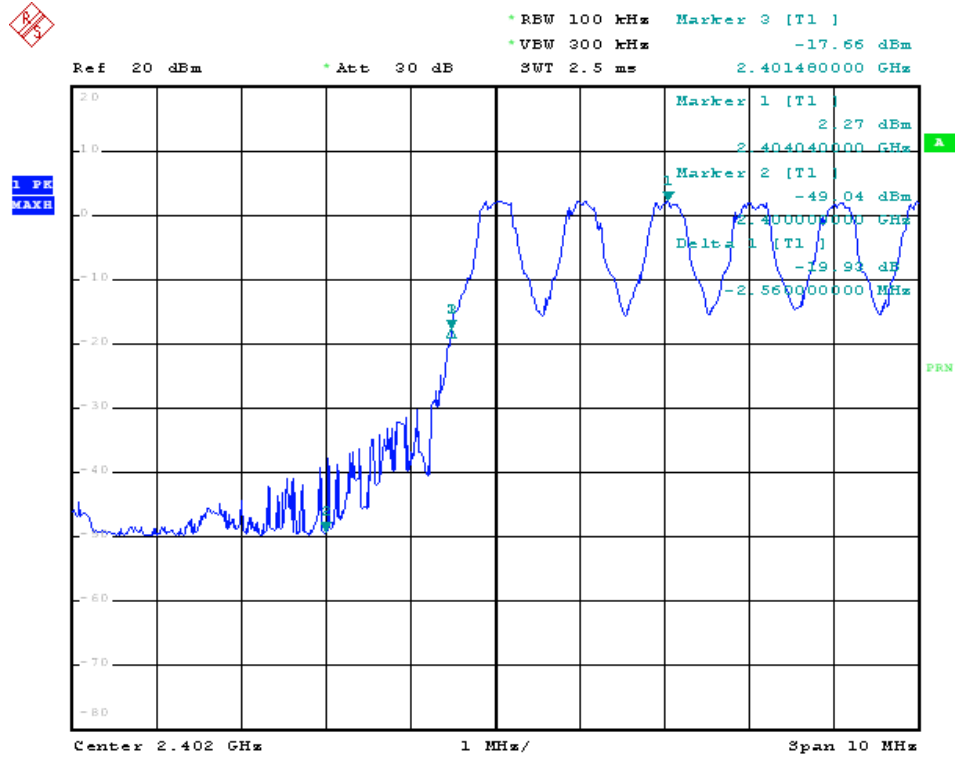
The Upper Edges attenuated more than 20dB.

The graph as below. Represents the emissions take for this device.

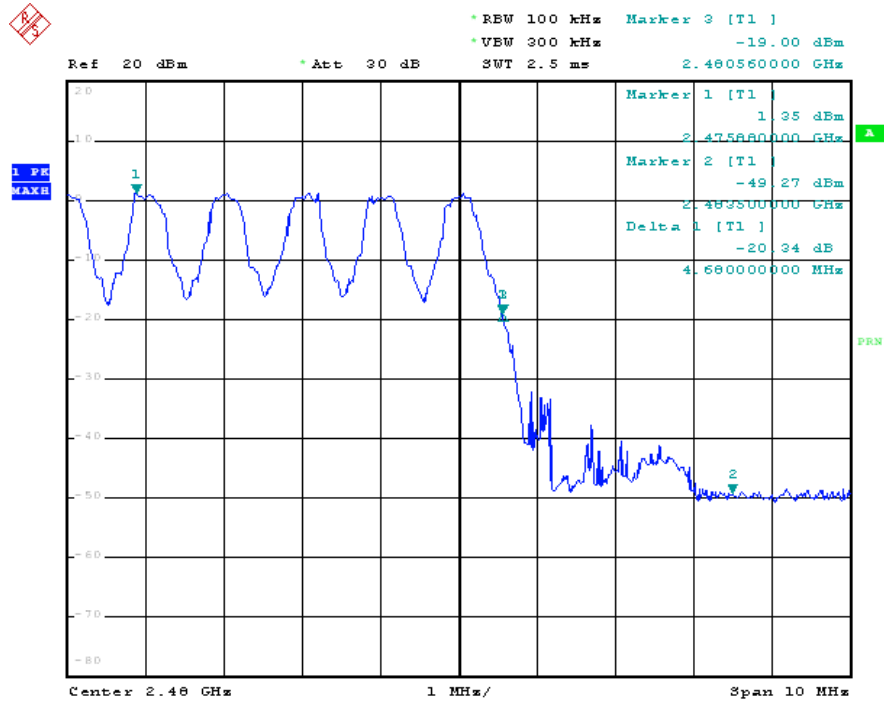
For Bluetooth

DH5:

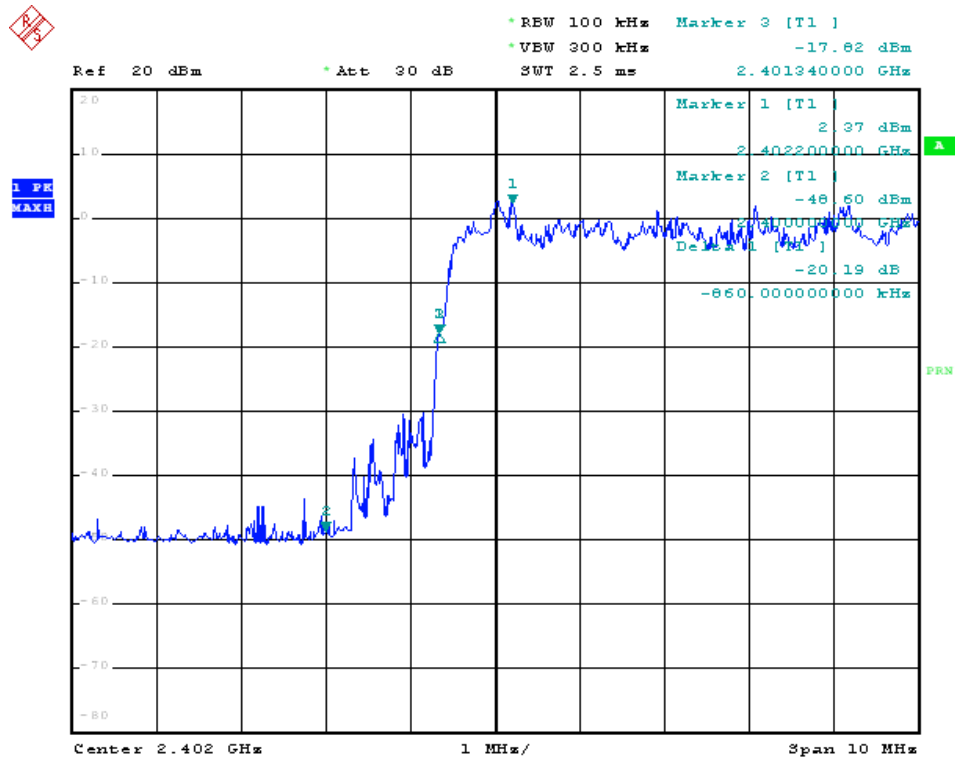
Low channel:



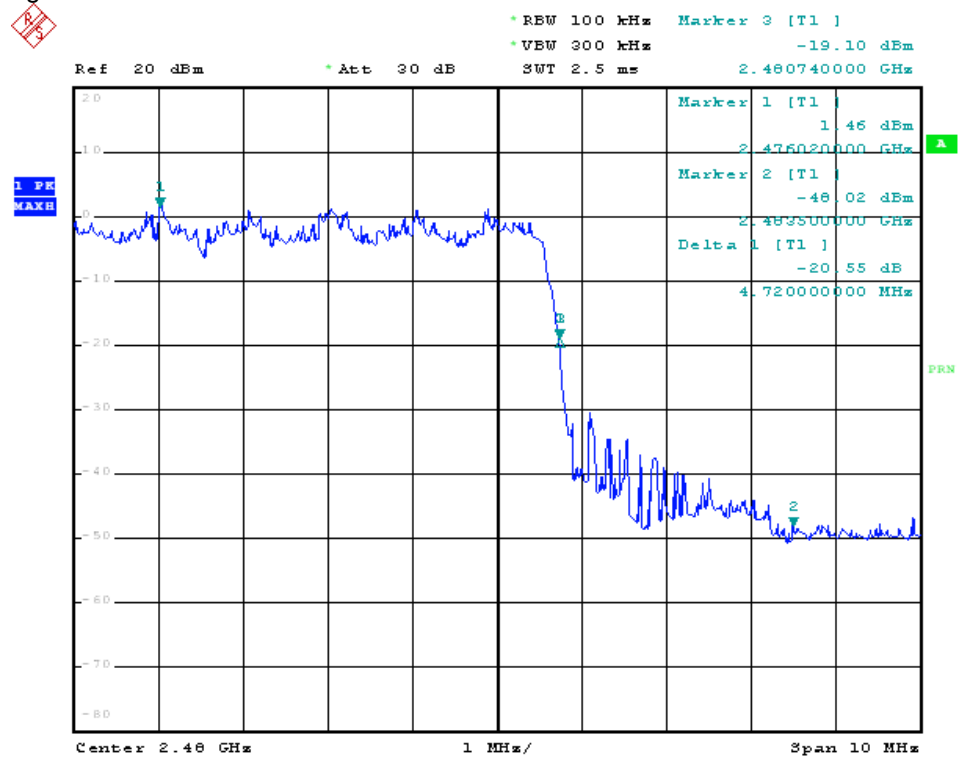
High channel:



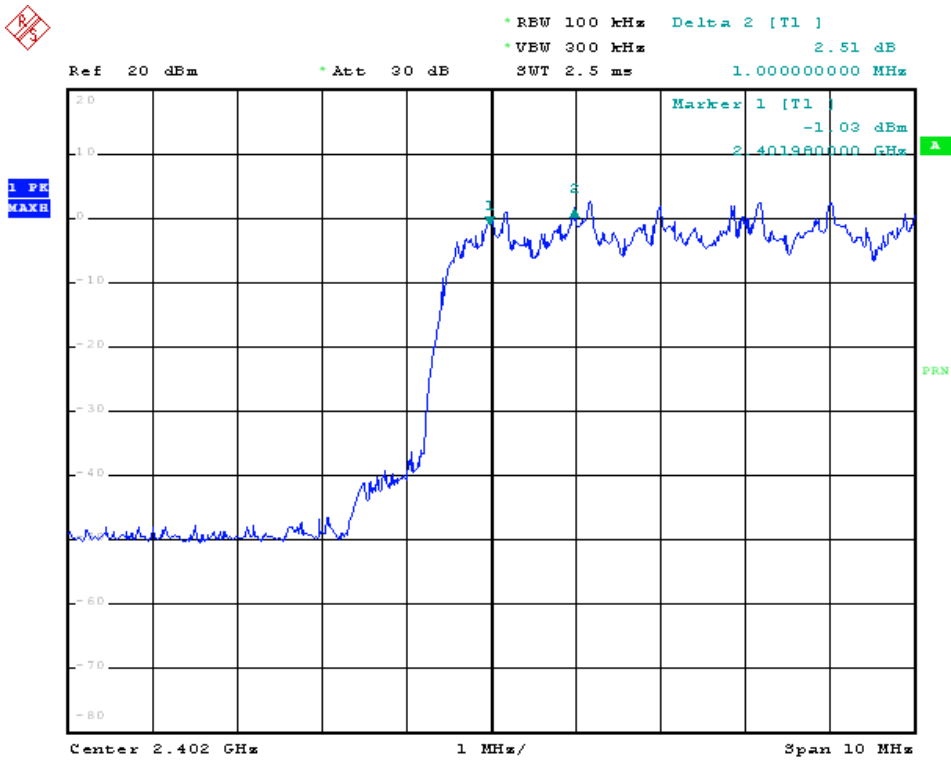
2DH5:  
Low channel:



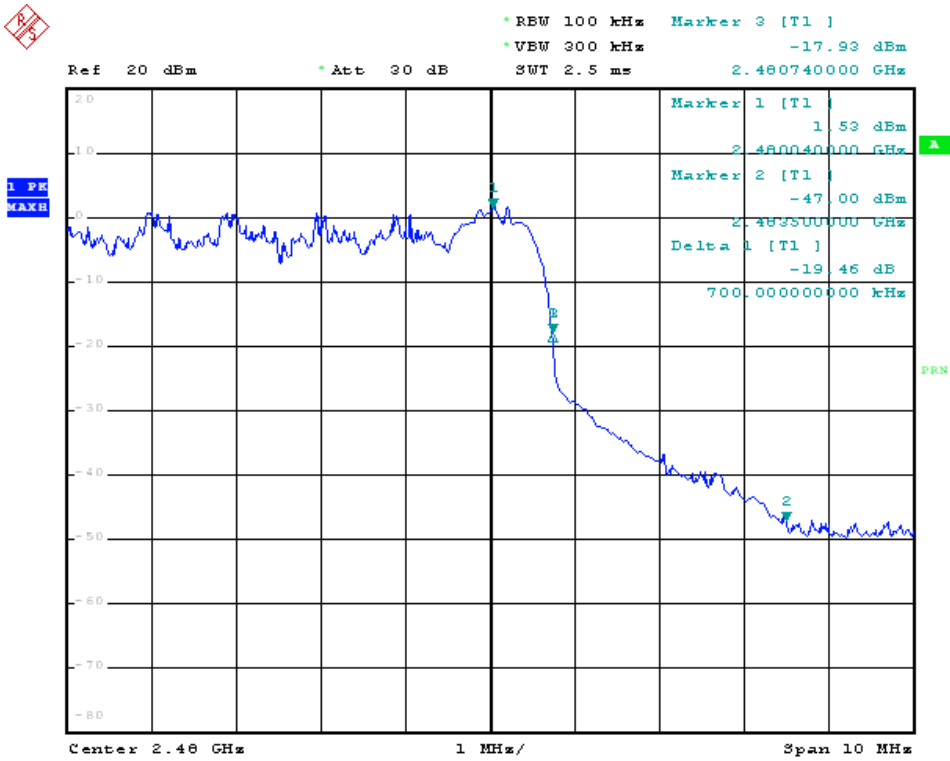
High channel:



3DH5:  
Low channel:

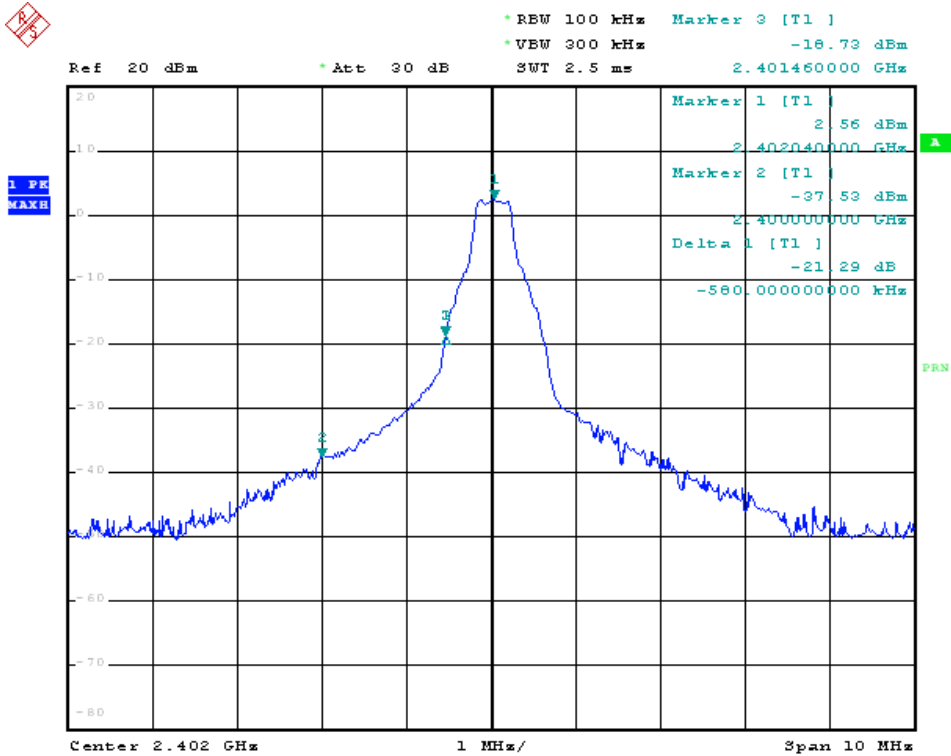


High channel:

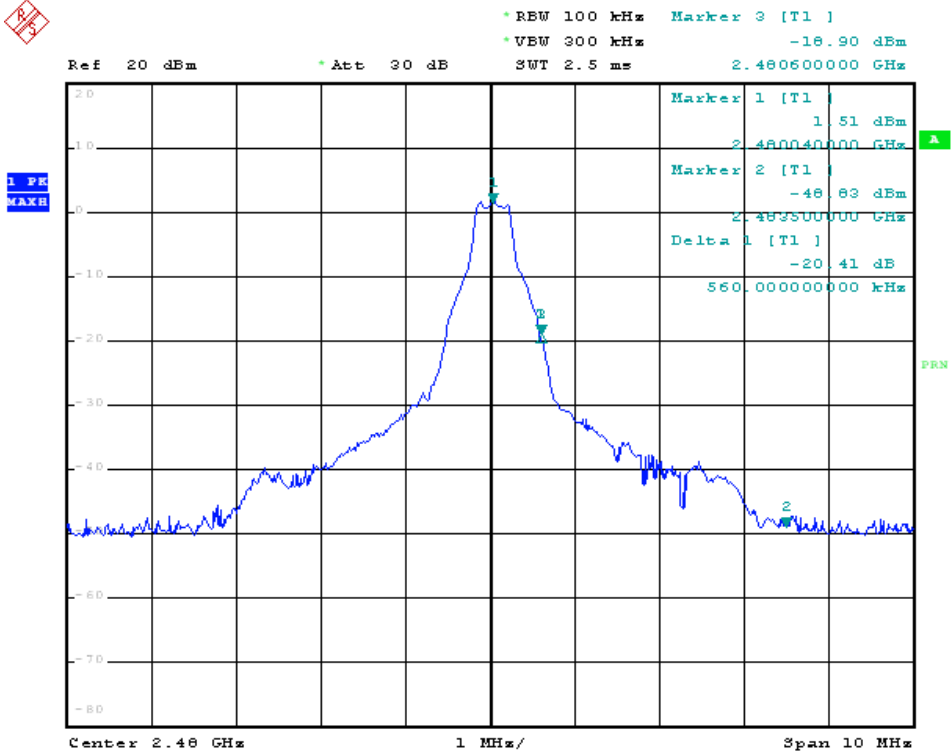


DH5:

Low channel:



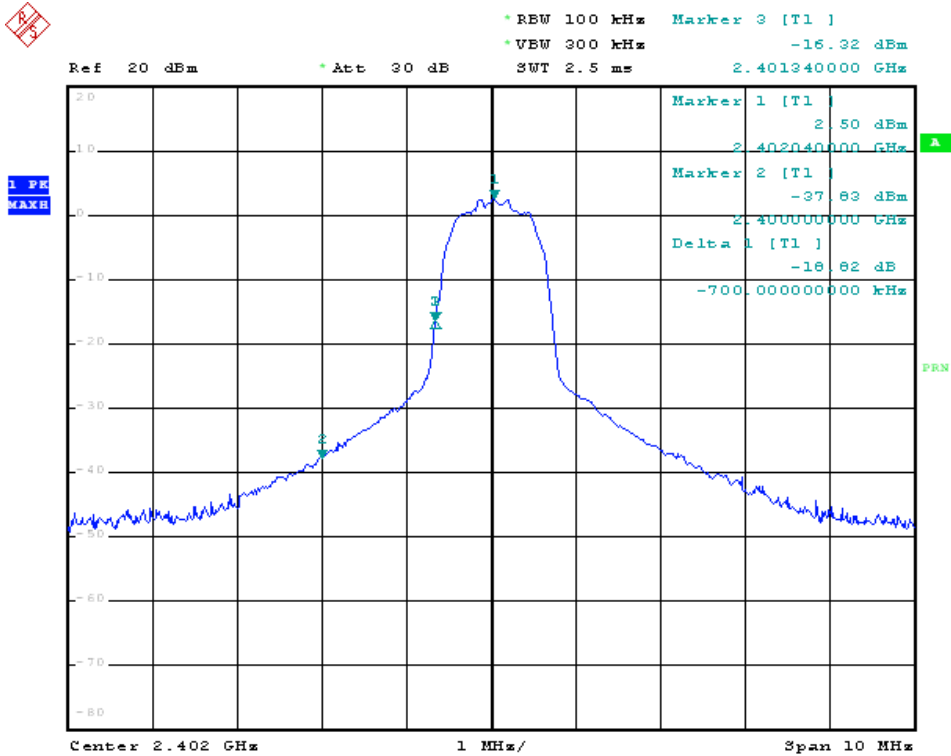
High channel:



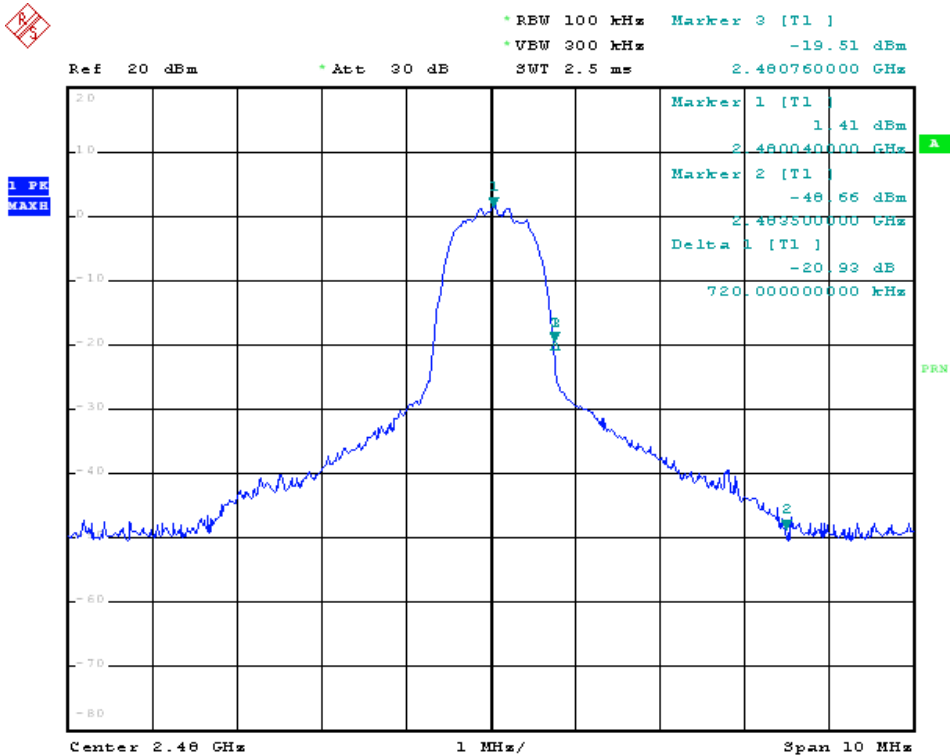


2DH5:

Low channel:

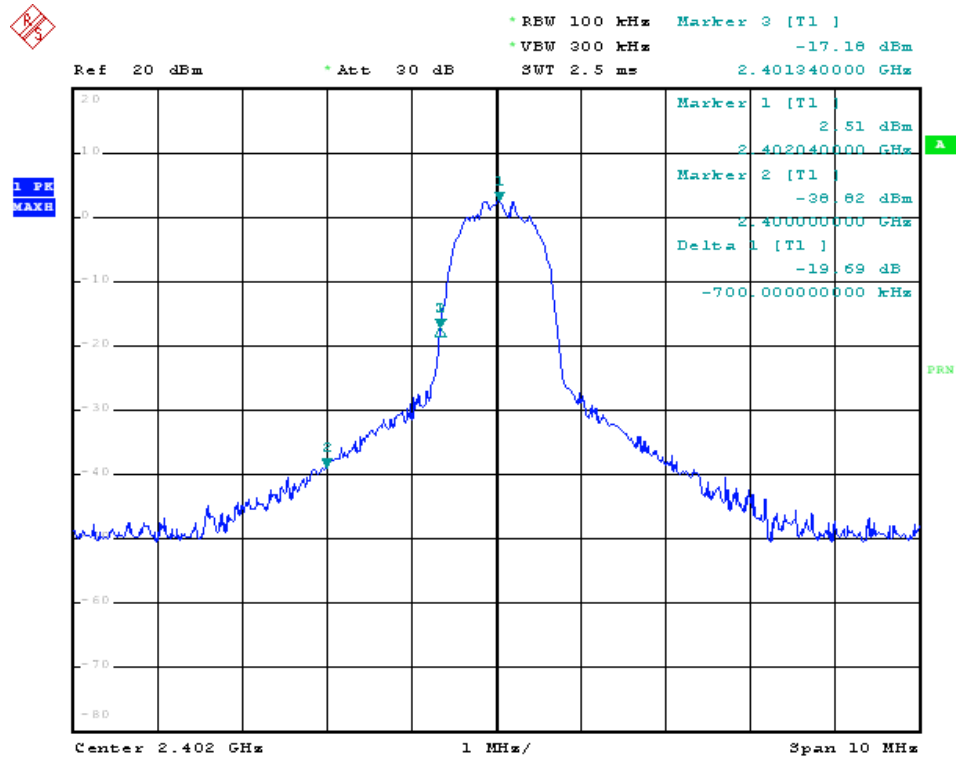


High channel:

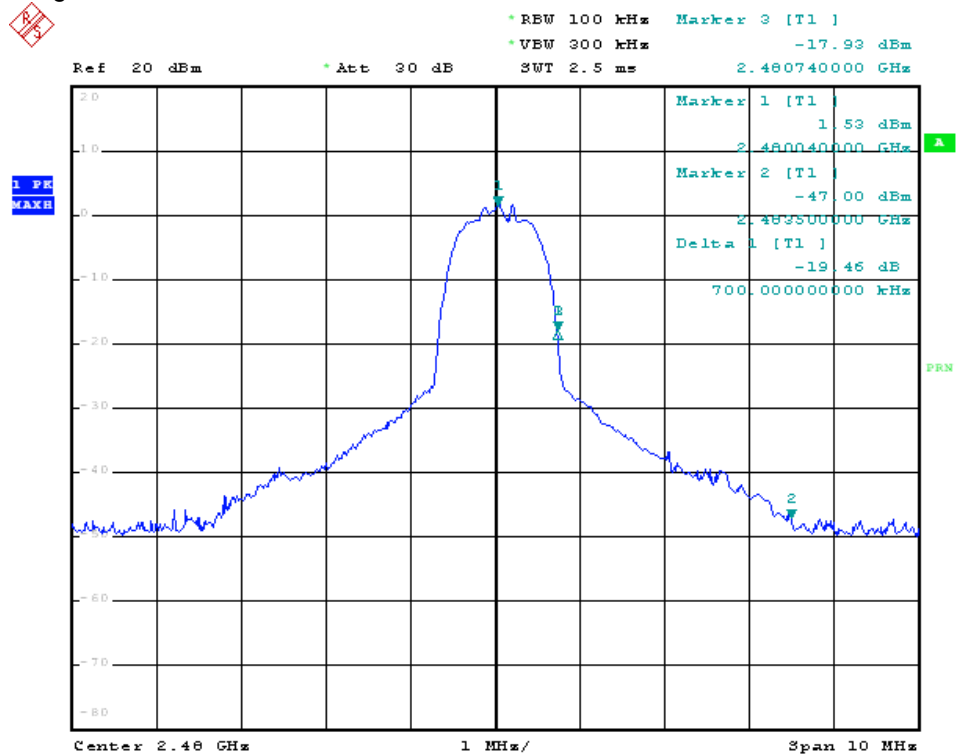


3DH5:

Low channel:



High channel:



Test result: The unit does meet the FCC requirements.

## 5.12 Conducted Emissions at Mains Terminals 150 kHz to 30 MHz

**Test Requirement:** FCC Part 15 C section 15.207

**Test Method:** ANSI C63.10: Clause 6.2 & DA 00-705

**Frequency Range:** 150 kHz to 30 MHz

**Detector:** Peak for pre-scan (9 kHz Resolution Bandwidth)

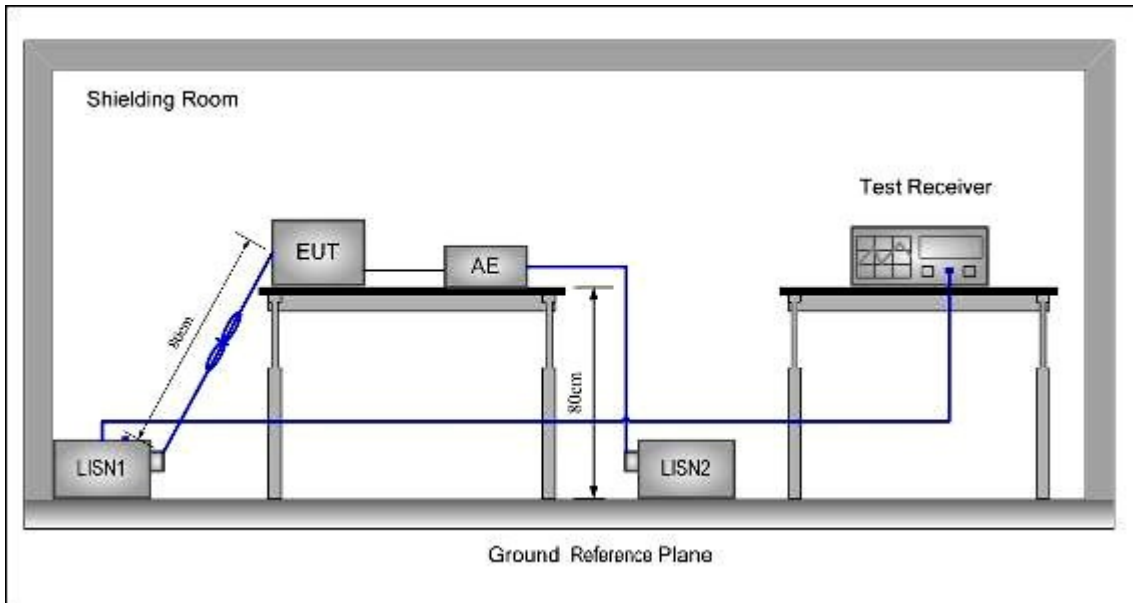
### Test Limit

**Limits for conducted disturbance at the mains ports of class B**

| Frequency Range  | Class B Limit dB(μV) |          |
|--|----------------------|----------|
|  | Quasi-peak           | Average  |
| 0.15 to 0.50   | 66 to 56             | 56 to 46 |
| 0.50 to 5  | 56                   | 46       |
| 5 to 30  | 60                   | 50       |
| NOTE 1 The limit decreases linearly with the logarithm of the frequency in the range 0,15 MHz to 0,50 MHz. |                      |          |

### EUT Operation:

Test in normal operating mode. For intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage. Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

**Test Configuration:****Test procedure:**

1. The mains terminal disturbance voltage test was conducted in a shielded room.
2. The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a  $50\Omega/50\mu\text{H} + 5\Omega$  linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.
3. The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane, but separated from metallic contact with the ground reference plane by 0.1m of insulation.
4. The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0,4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0,8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0,8 m from the LISN 2.

### 5.12.1 Measurement Data

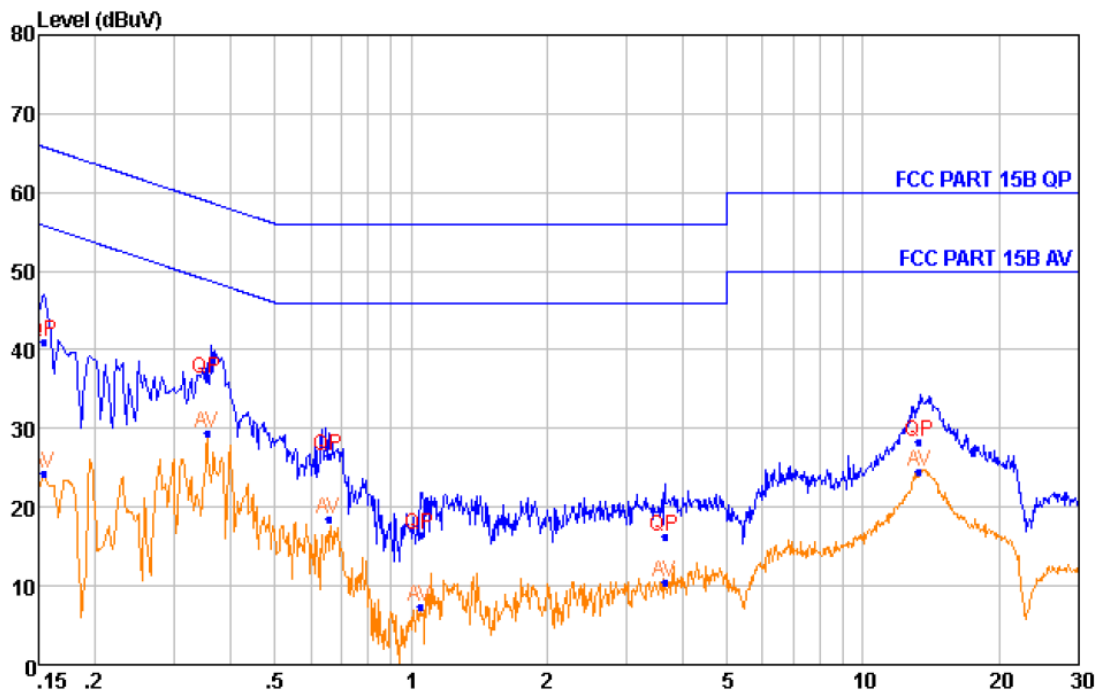
An initial pre-scan was performed on the live and neutral lines with peak detector.

Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected. For EUT the communicating was worst case mode.

The following Quasi-Peak and Average measurements were performed on the EUT Live line

Peak Scan:

Level (dBμV)



Quasi-peak and Average measurement

| NO. | Freq<br>MHz | Level<br>dBμV | Remark  | LISN Factor<br>dB | Cable Loss<br>dB | Limit Line<br>dBμV | Margin<br>dB |
|-----|-------------|---------------|---------|-------------------|------------------|--------------------|--------------|
| 1   | 0.154       | 41.00         | QP      | 9.70              | 0.20             | 65.78              | -24.78       |
| 2   | 0.154       | 24.22         | Average | 9.70              | 0.20             | 55.78              | -31.56       |
| 3   | 0.354       | 36.39         | QP      | 9.66              | 0.25             | 58.87              | -22.48       |
| 4   | 0.354       | 29.39         | Average | 9.66              | 0.25             | 48.87              | -19.48       |
| 5   | 0.658       | 26.41         | QP      | 9.70              | 0.28             | 56.00              | -29.59       |
| 6   | 0.658       | 18.41         | Average | 9.70              | 0.28             | 46.00              | -27.59       |
| 7   | 1.046       | 16.40         | QP      | 9.67              | 0.31             | 56.00              | -39.60       |
| 8   | 1.046       | 7.39          | Average | 9.67              | 0.31             | 46.00              | -38.61       |
| 9   | 3.635       | 16.20         | QP      | 9.62              | 0.38             | 56.00              | -39.80       |
| 10  | 3.635       | 10.53         | Average | 9.62              | 0.38             | 46.00              | -35.47       |
| 11  | 13.307      | 28.38         | QP      | 9.69              | 0.45             | 60.00              | -31.62       |
| 12  | 13.307      | 24.52         | Average | 9.69              | 0.45             | 50.00              | -25.48       |

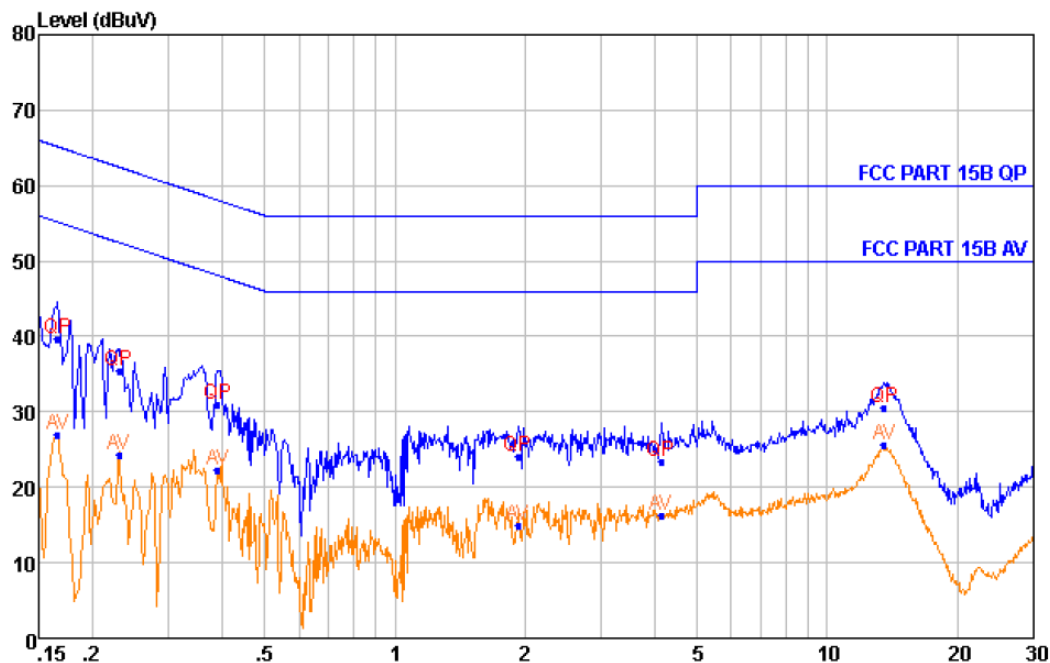
Note: 1. Margin = Limit Line - Level

2. Level = Read level + LISN Factor + Cable Loss

**Neutral Line**

Peak Scan:

Level (dBμV)



Quasi-peak and Average measurement

| NO. | Freq<br>MHz | Level<br>dBμV | Remark  | LISN Factor<br>dB | Cable Loss<br>dB | Limit Line<br>dBμV | Margin<br>dB |
|-----|-------------|---------------|---------|-------------------|------------------|--------------------|--------------|
| 1   | 0.166       | 39.76         | QP      | 9.68              | 0.21             | 65.16              | -25.40       |
| 2   | 0.166       | 27.05         | Average | 9.68              | 0.21             | 55.16              | -28.11       |
| 3   | 0.230       | 35.33         | QP      | 9.64              | 0.22             | 62.44              | -27.11       |
| 4   | 0.230       | 24.33         | Average | 9.64              | 0.22             | 52.44              | -28.11       |
| 5   | 0.388       | 31.00         | QP      | 9.66              | 0.25             | 58.10              | -27.10       |
| 6   | 0.388       | 22.27         | Average | 9.66              | 0.25             | 48.10              | -25.83       |
| 7   | 1.924       | 24.00         | QP      | 9.62              | 0.34             | 56.00              | -32.00       |
| 8   | 1.924       | 14.86         | Average | 9.62              | 0.34             | 46.00              | -31.14       |
| 9   | 4.125       | 23.49         | QP      | 9.62              | 0.39             | 56.00              | -32.51       |
| 10  | 4.125       | 16.30         | Average | 9.62              | 0.39             | 46.00              | -29.70       |
| 11  | 13.528      | 30.56         | QP      | 9.63              | 0.45             | 60.00              | -29.44       |
| 12  | 13.528      | 25.62         | Average | 9.63              | 0.45             | 50.00              | -24.38       |

**Note:** 1. **Margin** = **Limit Line** - **Level**2. **Level** = **Read level** + **LISN Factor** + **Cable Loss****--End of Report--**