## 47 CFR PART 15 SUBPART C - BLUETOOTH

# TEST REPORT

of

**GSM 850/900/1800/1900 GPRS Mobile Phone**

Model Name: PAM
Trade Name: TechFaith Wireless
FCC ID: UJQ-05838T

*prepared for*

**TechFaith Wireless Technology Limited.**
2/F M8 West, No.1 Jiu Xian Qiao Dong Road, Chao Yang District,
Beijing, 100016 P. R. China

*prepared by*

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Date of Issue: December 30, 2006
Report No.: SZ_07_06044_E_004

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# 1. Test Result Certification

| | |
|---|---|
| Equipment under Test: | GSM 850/900/1800/1900 GPRS Mobile Phone |
| Trade Name: | TechFaith Wireless |
| Model Name: | PAM |
| FCC ID: | UJQ-05838T |
| Applicant: | TechFaith Wireless Technology Limited.<br>2/F M8 West, No.1 Jiu Xian Qiao Dong Road, Chao Yang District, Beijing, 100016 P. R. China |
| Manufacturer: | TechFaith Wireless Technology Limited.<br>2/F M8 West, No.1 Jiu Xian Qiao Dong Road, Chao Yang District, Beijing, 100016 P. R. China |
| Test Standards: | 47 CFR Part 15 Subpart C |
| Test Result: | PASS |

*** We hereby certify that:**

The equipment under test was tested by Shenzhen Morlab Communications Technology Co., Ltd. The test data, data evaluation, test procedures and equipment configurations shown in this report were made in accordance with the requirement of related FCC rules.

The test results of this report only apply for the tested sample equipment identified above. The test report shall be invalid without all the signatures of the test engineer, the reviewer and the approver.

Tested by: ..... Dated: 2006.12.30

Zhang Weimin

Reviewed by: ..... Dated: 2006.12.30

Yang Bo

Approved by: ..... Dated: 2006.12.30

Shu Luan

# 2. General Information

## 2.1 Equipment under Test (EUT) Description

| | | |
|---|---|---|
| Description | : | GSM 850/900/1800/1900 GPRS Mobile Phone |
| Model Name | : | PAM |
| IMEI | : | --- |
| Serial No. | : | 1051608000000207 |
| Hardware Version | : | P1 |
| Software Version | : | TF_WM5_PAM_VER_01.04_CE |
| Modulation | : | FHSS Note 1 |
| Frequency | : | 2402MHz - 2480MHz Note 1 |
| Number of Channel | : | 79 Note 1 |
| Power | : | ≤ 6dBm |
| Bluetooth Antenna | : | Permanent Attached, Gain = -2.8dBi |

NOTE:

1. The EUT is a GSM Mobile Phone, it supports Bluetooth function, operating at 2.4GHz ISM band. The Bluetooth modulation is Frequency Hopping Spread Spectrum (FHSS). The frequencies allocated is F(MHz)=2401+1*n ($1 \leq n \leq 79$).
2. For detailed features about the EUT, please see user manual supplied by the applicant

## 2.2 Test Standards and Results

The objective of the report is to perform tests according to 47 CFR Part 15 Subpart C (Bluetooth, 2.4GHz ISM band radiators):

| No. | Identity | Document Title |
|---|---|---|
| 1 | 47 CFR Part 15 (10-1-05 Edition) | Radio Frequency Devices |

Test detailed items and the results are as below:

| No. | Rules | Test Type | Result | Date of Test |
|---|---|---|---|---|
| 1 | §15.207 | Conducted Emission | PASS | 2006-12-25 |
| 2 | §15.209<br>§15.247(c) | Radiated Emission | PASS | 2006-11-27<br>2006-12-25 |
| 3 | §15.247(a) | Bandwidth and Carrier Frequency Separation | PASS | 2006-11-23 |
| 4 | §15.247(a) | Number of Hopping Frequency | PASS | 2006-11-23 |
| 5 | §15.247(a) | Time of Occupancy (Dwell time) | PASS | 2006-11-23 |
| 6 | §15.247(b) | Peak Output Power | PASS | 2006-11-23 |
| 7 | §15.247(c) | Band Edge | PASS | 2006-11-23<br>2006-11-27<br>2006-12-25 |
| 8 | §15.247(c) | Conducted Spurious Emission | PASS | 2006-11-23 |

## 2.3 Facilities and Accreditations

### 2.3.1 Facilities

Shenzhen Electronic Product Quality Testing Center (Morlab) is a testing organization accredited by China National Accreditation Board for Laboratories (CNAL) according to ISO/IEC 17025. The accreditation certificate number is L1659.

All measurement facilities used to collect the measurement data are located at Electronic Testing Building, Shahe Road, Xili, Nanshan District, Shenzhen, P. R. China. The site was constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22, the FCC registration number is 741109.

### 2.3.2 Test Equipments

| No. | Description | Specification |
|---|---|---|
| 1 | System Simulator | Manufacturer: Rohde&Schwarz<br>Model No.: CMU200<br>Serial No.: 100448 |
| 2 | System Simulator | Manufacturer: Agilent Telecoms<br>Model No.: E5515C<br>Serial No.: GB43130131 |
| 3 | Spectrum Analyzer | Manufacturer: Agilent Telecoms<br>Model No.: E7405A<br>Serial No.: US44210471 |
| 4 | Telecommunication Antenna | Manufacturer: European Antennas<br>Model No.: PSA-45010R/356<br>Serial No.: 403688-001 |
| 5 | Loop Antenna | Manufacturer: Rohde & Schwarz<br>Model No.: HFH2-Z2<br>Serial No.: A0304220 |
| 6 | Trilogy Antenna | Manufacturer: Schwarzbeck<br>Model No.: VULB 9163<br>Serial No.: 9163-274 |
| 7 | Horn Antenna | Manufacturer: Schwarzbeck<br>Model No.: BBHA 9120C<br>Serial No.: 9120C-384 |
| 8 | Power Meter (Probe) | Manufacturer: Rohde & Schwarz<br>Model No.: NRVS (NRVS-Z2)<br>Serial No.: 100729 (100254) |

| No. | Description | Specification |
|---|---|---|
| 9 | Power Splitter | Manufacturer: WEINSCHEL<br>Model No.: 1506A<br>Serial No.: NW521 |
| 10 | Shield Room | Manufacturer: Albatross Projects GmbH |
| 11 | Anechoic Chamber | Manufacturer: Albatross Projects GmbH |

NOTE:

1. Equipments listed above have been calibrated and are in the period of validation.

### 2.3.3 Test Environment Conditions

During the measurement, the environmental conditions were within the listed ranges:

| | |
|---|---|
| Temperature: | 20 - 25°C |
| Relative Humidity: | 40 - 50% |
| Atmospheric Pressure: | 96kPa |

# 3. 47 CFR Part 15C Requirements

## 3.1 Conducted Emission

### 3.1.1 Requirement

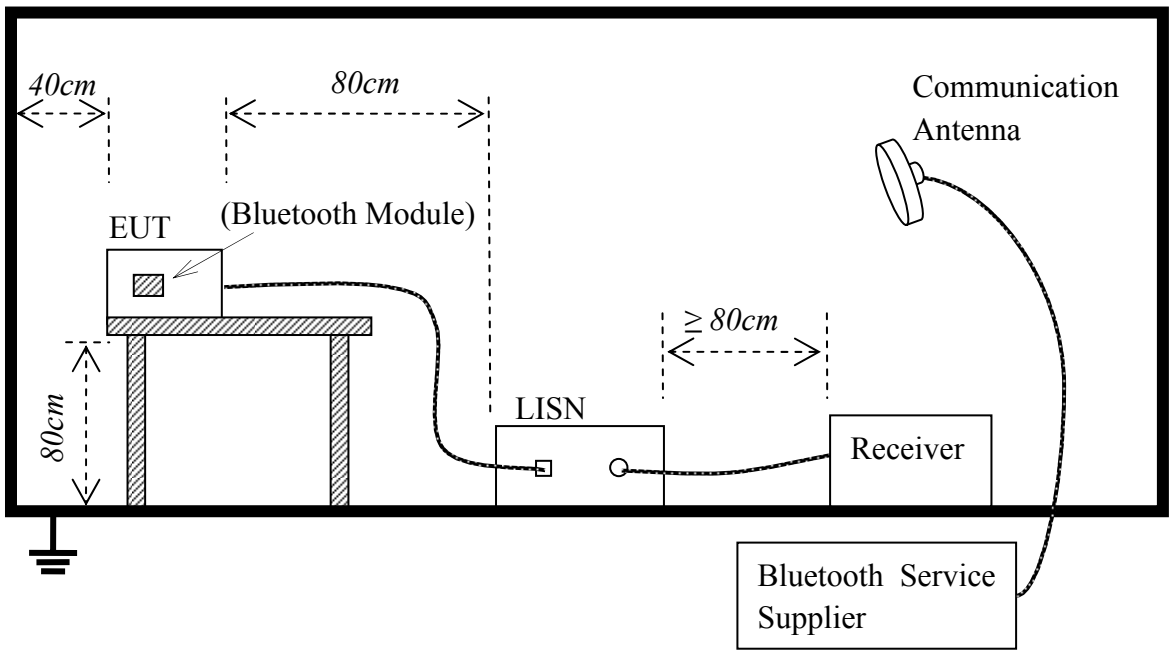
According to FCC §15.207, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency within the band 150kHz to 30MHz shall not exceed the limits in the following table, as measured using a 50μH/50Ω line impedance stabilization network (LISN).

| Frequency range (MHz) | Conducted Limit (dBμV) | |
|---|---|---|
| | Quai-peak | Average |
| 0.15 - 0.50 | 66 to 56 | 56 to 46 |
| 0.50 - 5 | 56 | 46 |
| 0.50 - 30 | 60 | 50 |

NOTE:

1. The lower limit shall apply at the band edges.
2. The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.50MHz.

### 3.1.2 Test Setup



1. The test is performed in a shield room; the factors of the test system are calibrated to correct the reading.
2. The EUT is The EUT is configured as Bluetooth Module + Battery + Charger. During the measurement, the EUT keeps charging empty Battery. The Charger is powered by 120V, 60Hz AC mains supply.
3. The EUT is placed on a 0.8m high insulating table and kept 0.4m away from the conducting wall of the shield room. The EUT is connected to the power mains through a Line Impedance Stabilization Network (LISN) which provides a 50μH/50Ω of coupling impedance for the measuring instrument (Receiver).
4. During the measurement, the Bluetooth function of the EUT is activated and a communication link is established between the EUT and a Bluetooth Service Supplier of System Simulator.

### 3.1.3 Test Procedure

1. Check via Receiver in the frequency range from 150kHz to 30MHz for searching for maximum conducted interference using Quasi-peak and Average detectors. If the emission levels measured with Quasi-peak detector are lower than Average Conducted Limits, the measurement with Average detector will be skipped. Record several suspicious points and plots.
2. Tests for L phase and N phase lines of the power mains connected to the EUT are performed.

### 3.1.4 Test Result

**The Recorded Suspicious Points:**

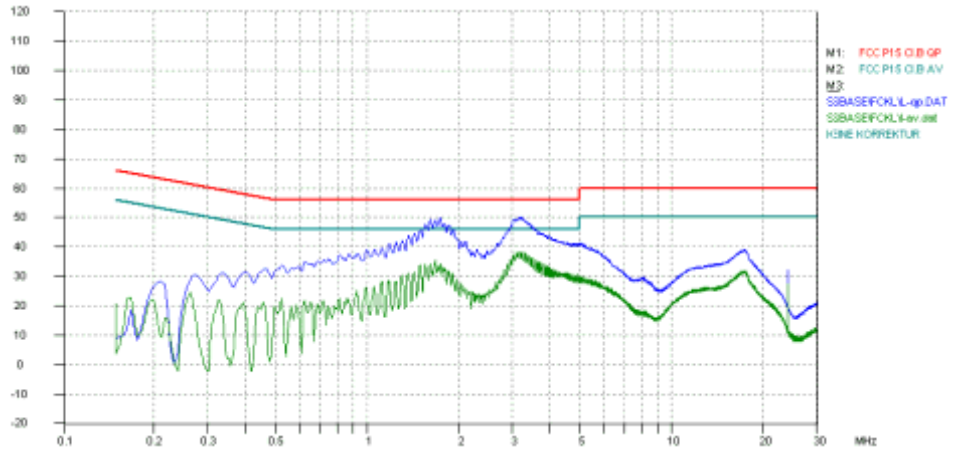
| No. | Frequency (MHz) | Limit (dBμV) | | Measured Emission Level (dBμV) | | | Verdict |
|---|---|---|---|---|---|---|---|
| | | Quasi-peak | Average | Quasi-peak | Average | Phase | |
| 1 | 1.1625 | 56.0 | 46.0 | 49.4 | 34.9 | L | PASS |
| 2 | 1.7405 | 56.0 | 46.0 | 49.7 | 35.6 | L | PASS |
| 3 | 3.2350 | 56.0 | 46.0 | 50.3 | 38.5 | L | PASS |
| 4 | 5.0350 | 60.0 | 50.0 | 41.4 | 30.6 | L | PASS |
| 5 | 17.4000 | 60.0 | 50.0 | 38.9 | 32.0 | L | PASS |

NOTE:

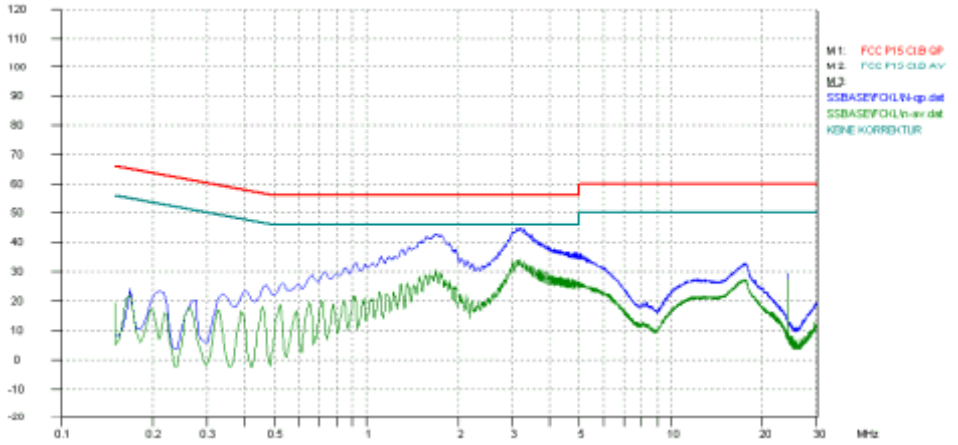
1. The emission levels recorded above is the larger ones of both L phase and N phase.

**The Test Plots:**

1. Test plot at L phase:




2. Test plot at N phase:



## 3.2 Radiated Emission

### 3.2.1 Requirement

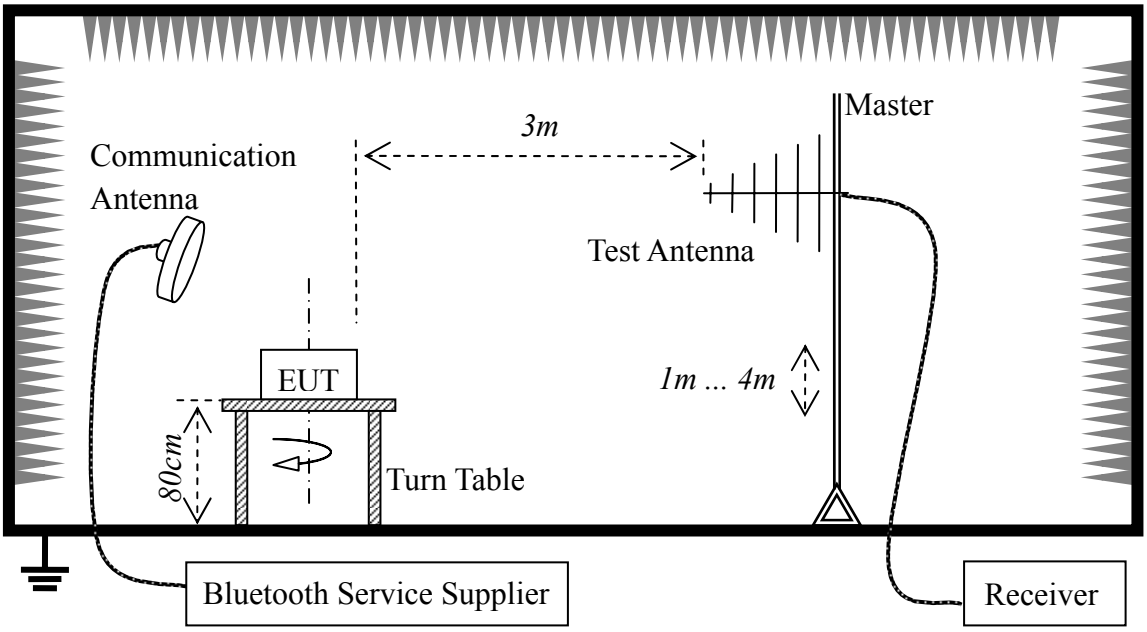
According to 47 CFR §15.247(c), radiated emission outside the frequency band attenuation below the general limits specified in section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in section 15.205(a), must also comply with the radiated emission limits specified in section 15.209(a).

According to 47 CFR §15.209 (a), except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

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

As shown in 47 CFR §15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector. When average radiated emission measurements are specified in this part, including emission measurements below 1000MHz, there also is a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit for the frequency being investigated unless a different peak emission limit is otherwise specified in the rules.

### 3.2.2 Test Setup




1. The test is performed in a semi-anechoic chamber; the factors of the test system are calibrated to correct the reading.
2. The EUT is The EUT is configured as Bluetooth Module + Battery + Charger. During the measurement, the EUT keeps charging empty Battery. The Charger is powered by 120V, 60Hz AC mains supply. The EUT is placed on the top of a turn Table 0.8m above the ground.
3. During the measurement, the Bluetooth function of the EUT is activated and a communication link is established between the EUT and a Bluetooth Service Supplier of System Simulator. The Bluetooth Module of the EUT is set to operate under test mode transmitting 339 bytes DH5 packages at maximum power.

### 3.2.3 Test Procedure

1. In the frequency range of 9kHz to 30MHz, magnetic field was measured with Loop Test Antenna. The Test Antenna is positioned with its plane vertical at 1m distance from the EUT. The center of the Loop Test Antenna is 1m above the ground. During the measurement the Loop Test Antenna rotates about its vertical axis for maximum response at each azimuth about the EUT.
2. In the frequency range above 30MHz, ultra-broadband Bi-log Test Antenna (30MHz to 1GHz) and Horn Test Antenna (above 1GHz) are used. Test Antenna is 3m away from the EUT. Test Antenna height is varied from 1m to 4m above the ground to determine the maximum value of the field strength. The emission levels at both horizontal and vertical polarizations should be tested.
3. The Receiver is set to Peak Detector function and specified bandwidth with maximum hold mode.

If the emission level of the EUT in peak mode is 6dB lower than the limit specified, then testing could be stopped and the peak values would be reported; otherwise the emission less than 6dB margins would be retested one by one using the quasi-peak method.

4. The lowest channel (2402MHz), middle channel (2441MHz) and highest channel (2480MHz) are measured respectively. Record the test plots.

### 3.2.4 Test Result

**The Fundamental Emissions:**

The Field strength of fundamental emissions as listed below are measured and recorded as a reference for the calculation of the band edge emissions, please see section 3.7.4.

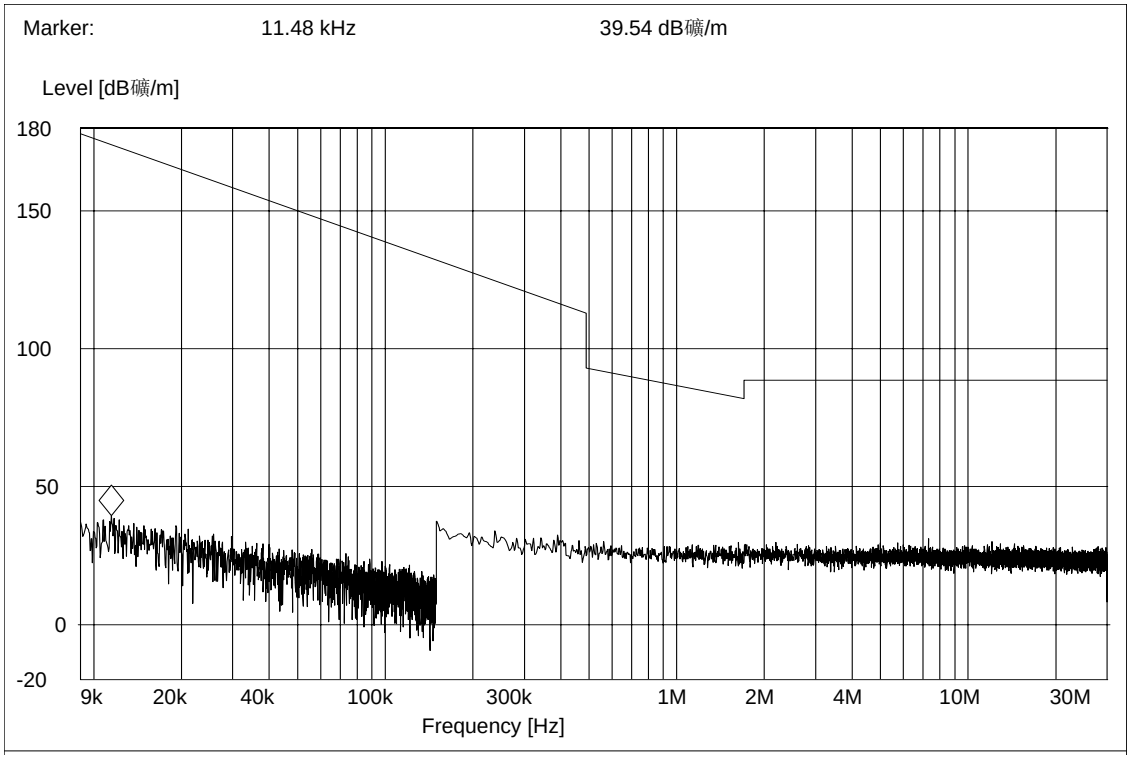
| No. | Channel | Frequency (MHz) | Antenna Polarization | Emission (dBμV/m) | |
|---|---|---|---|---|---|
| | | | | PK | AV |
| 1 | Lowest | 2402 | Vertical | 91.65 | 76.49 |
| 2 | | | Horizontal | 91.79 | 76.23 |
| 3 | Middle | 2441 | Vertical | 91.82 | 75.93 |
| 4 | | | Horizontal | 91.09 | 75.84 |
| 5 | Highest | 2480 | Vertical | 92.16 | 76.14 |
| 6 | | | Horizontal | 92.57 | 76.37 |

**The Radiated Emissions Fall In The Restricted Bands:**

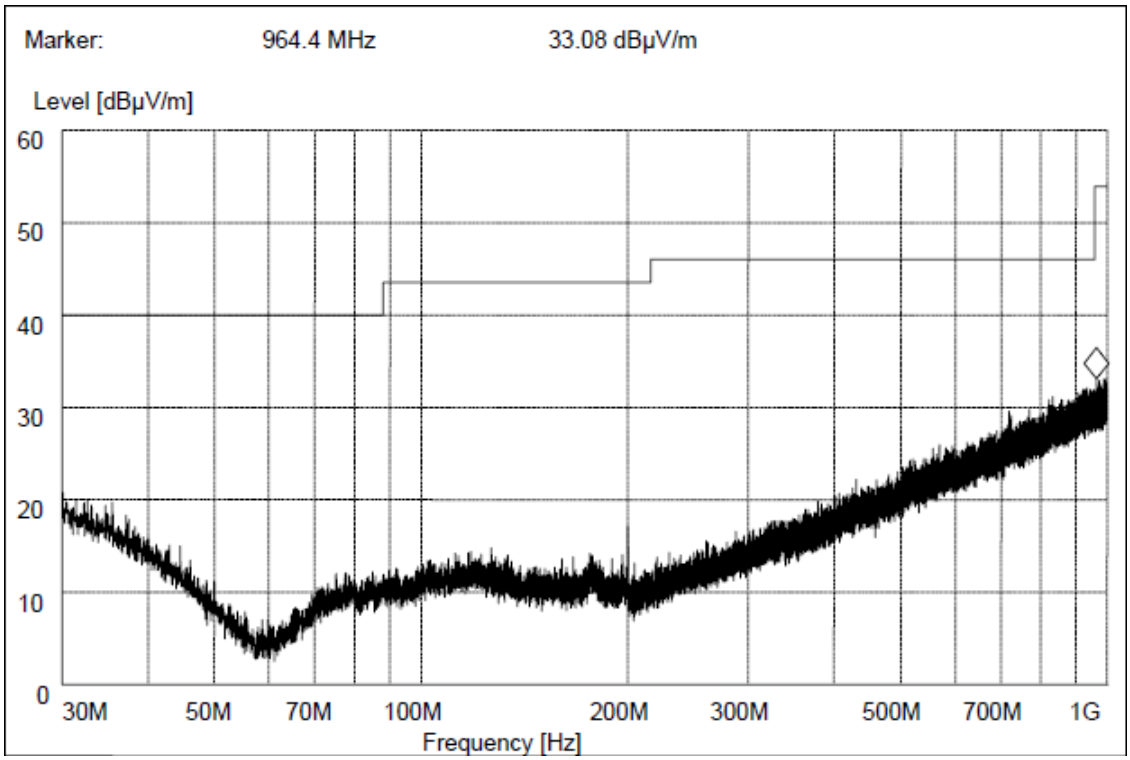
| No. | Channel | Frequency (MHz) | Emissions in Restrict Band (MHz) | Antenna Polarization | Emission (dBμV/m) | | Limit (dBμV/m) | | Verdict |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | PK | AV | PK | AV | |
| 1 | Lowest | 2402 | No peak found | Vertical | --- | --- | 74 | 54 | PASS |
| 2 | | | No peak found | Horizontal | --- | --- | 74 | 54 | PASS |
| 3 | Middle | 2441 | No peak found | Vertical | --- | --- | 74 | 54 | PASS |
| 4 | | | No peak found | Horizontal | --- | --- | 74 | 54 | PASS |
| 5 | Highest | 2480 | No peak found | Vertical | --- | --- | 74 | 54 | PASS |
| 6 | | | No peak found | Horizontal | --- | --- | 74 | 54 | PASS |

**The Test Plots:**

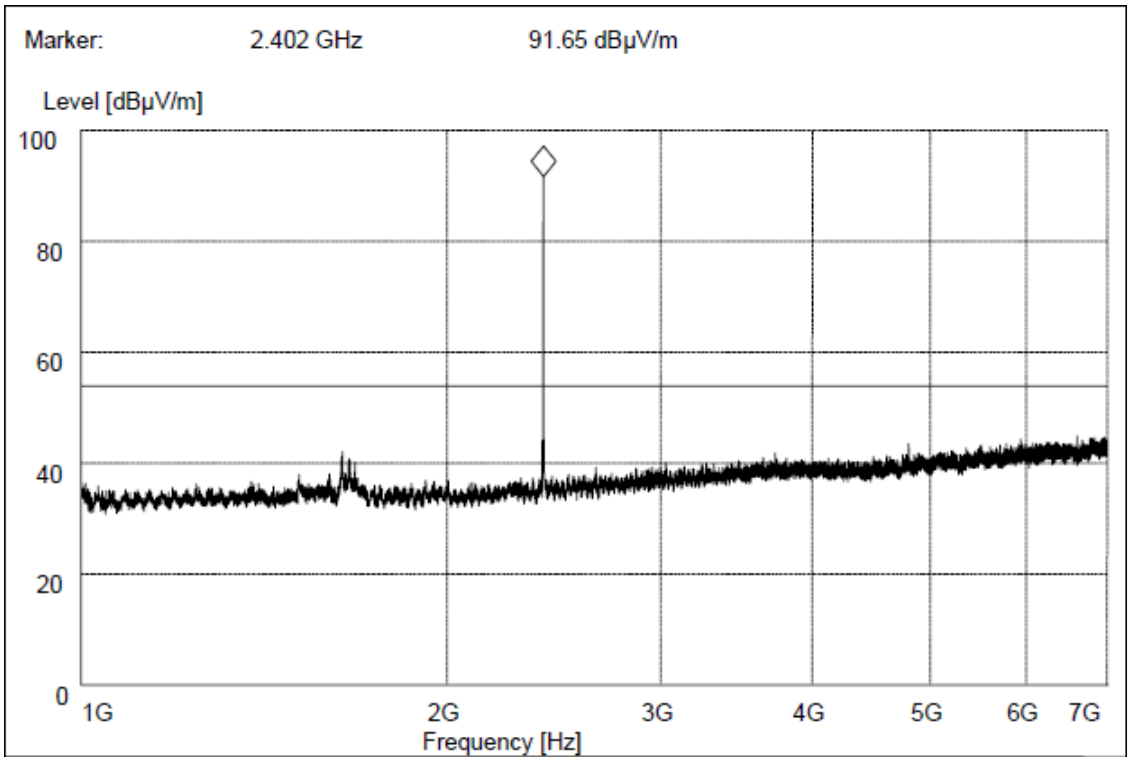
1. Plot for 2402MHz Channel:



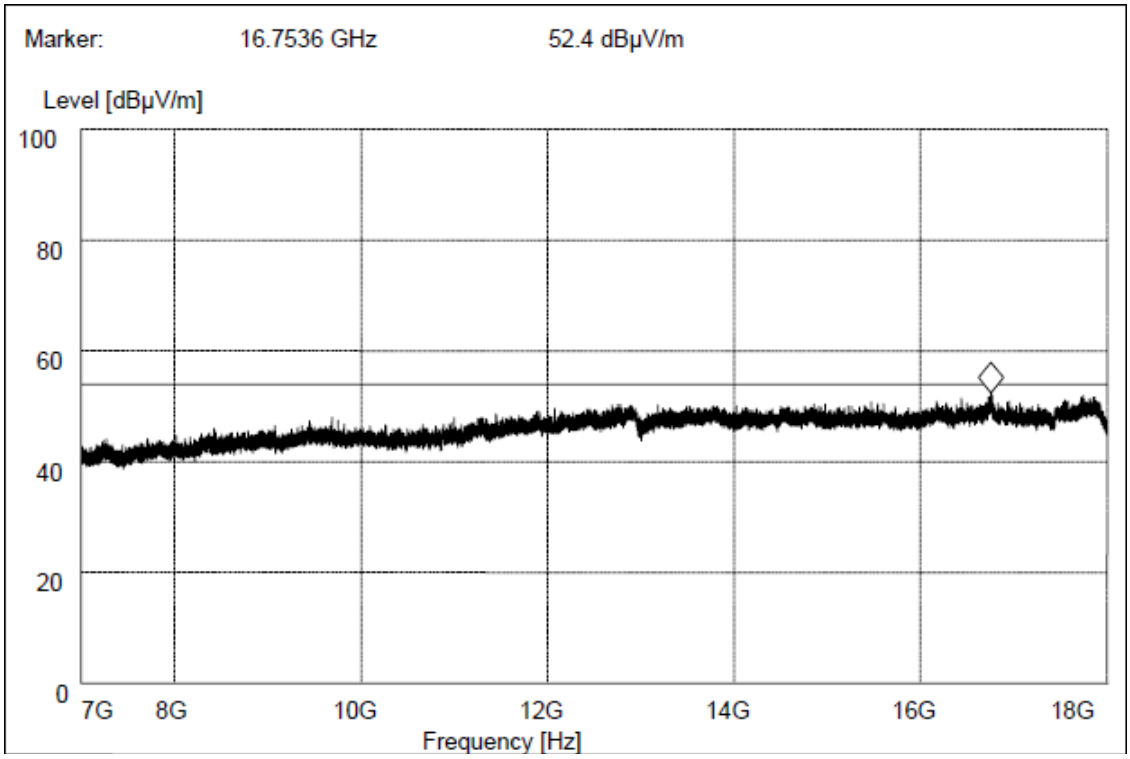

(9kHz to 30MHz)



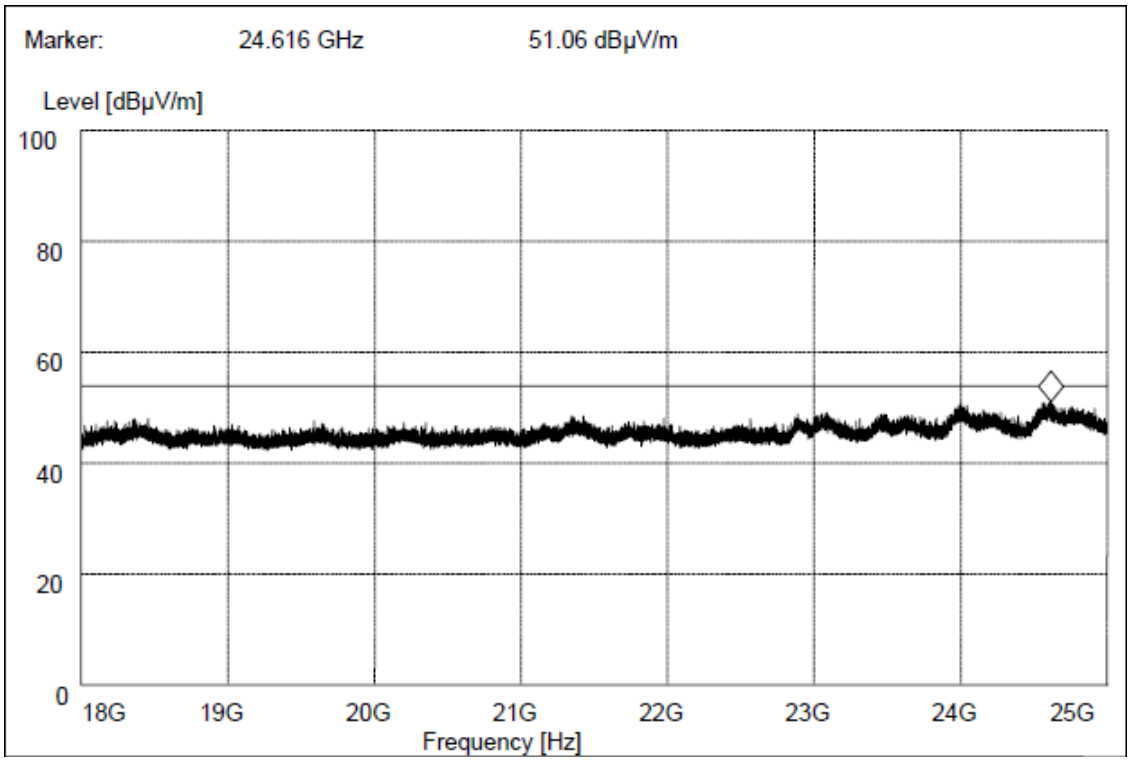

(30MHz to 1GHz, Antenna Vertical)



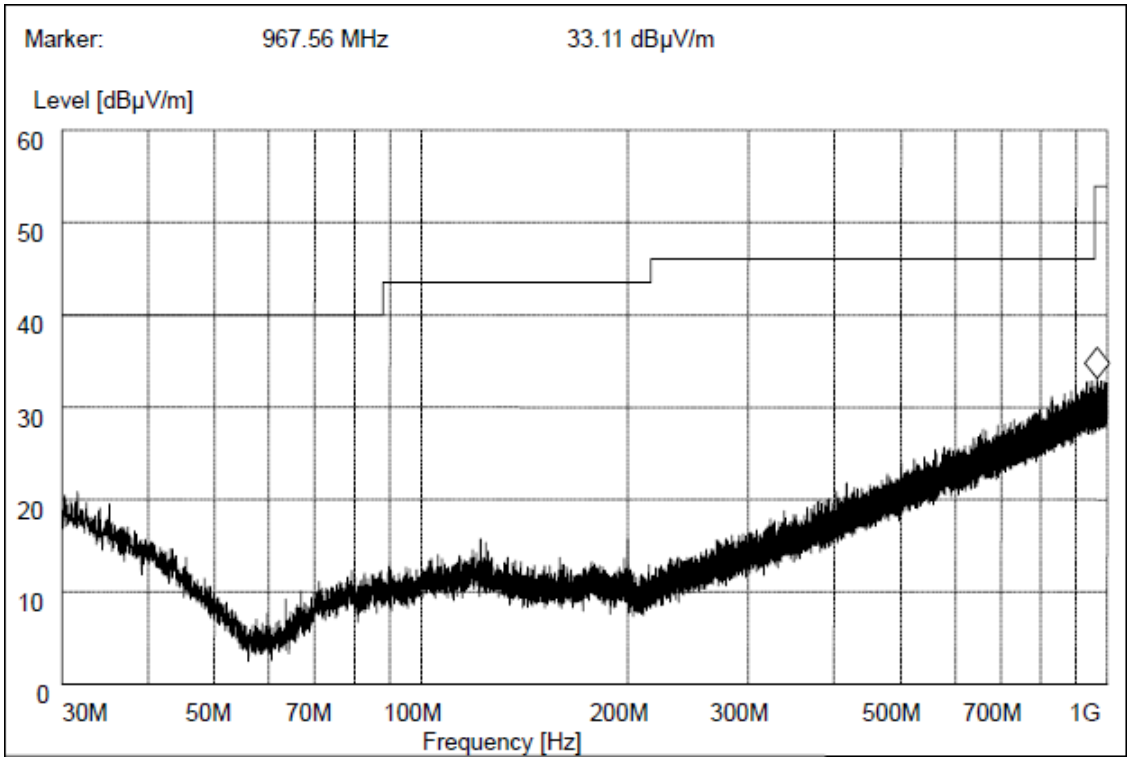

(1GHz to 7GHz, Antenna Vertical)



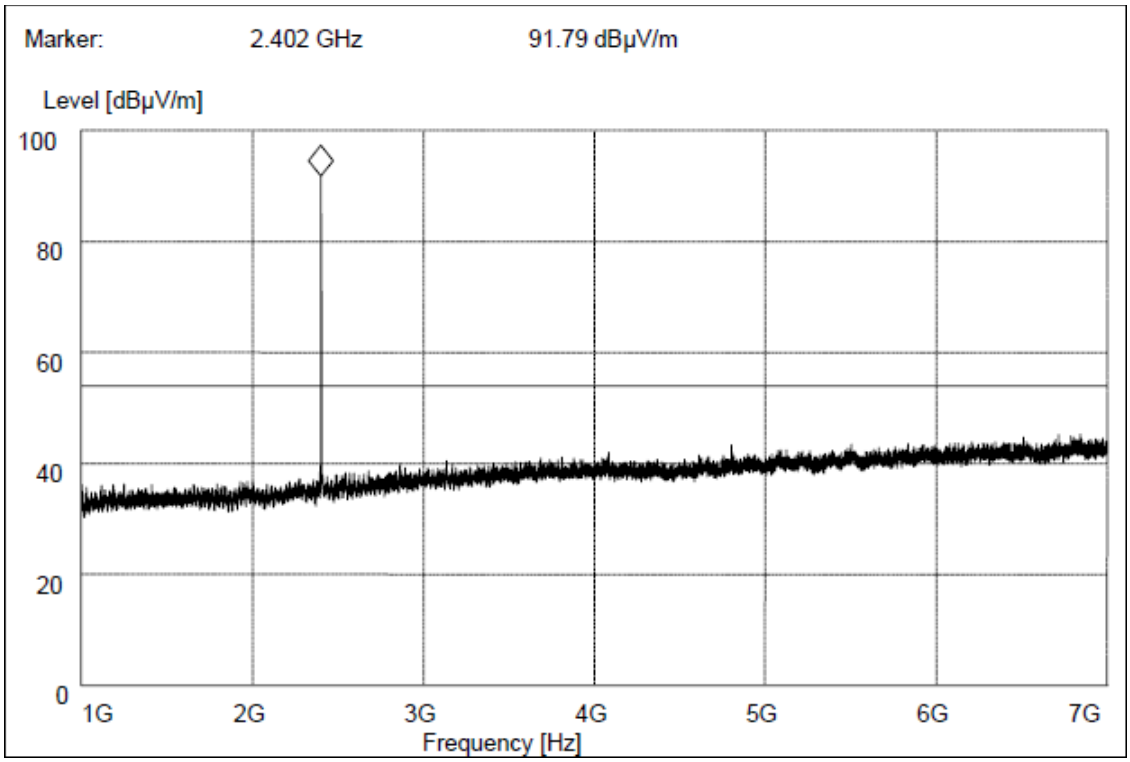

(7GHz to 18GHz, Antenna Vertical)



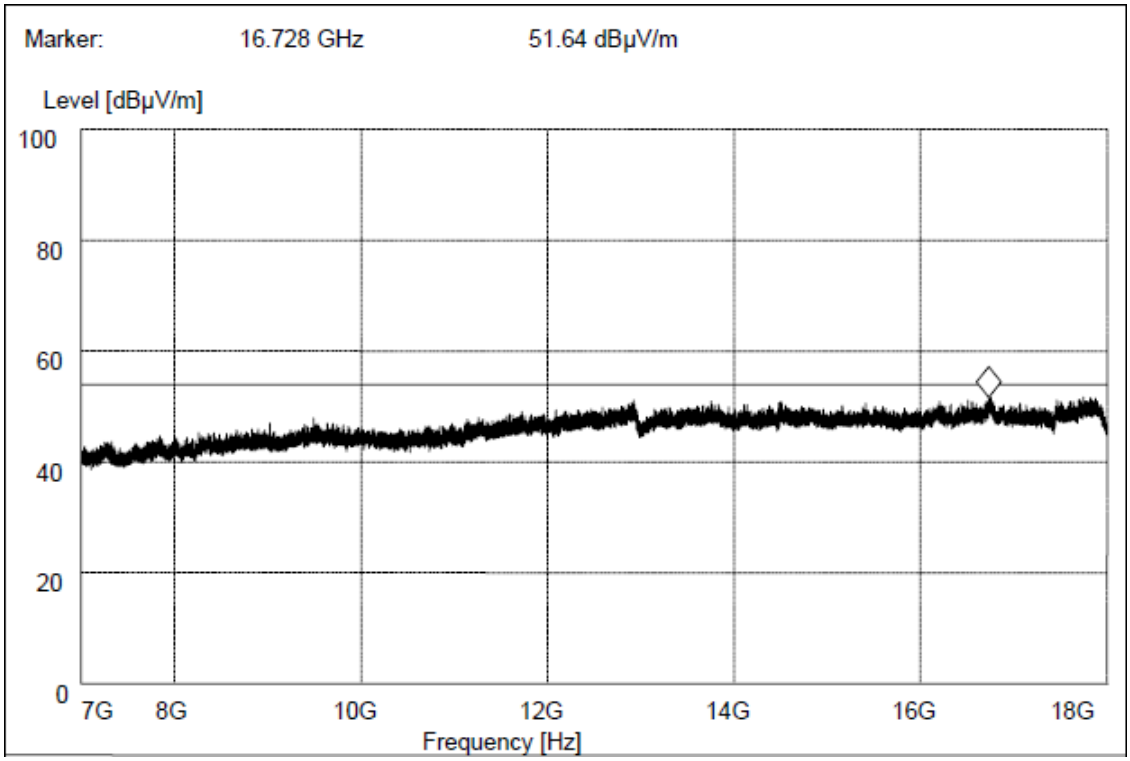

(18GHz to 25GHz, Antenna Vertical)



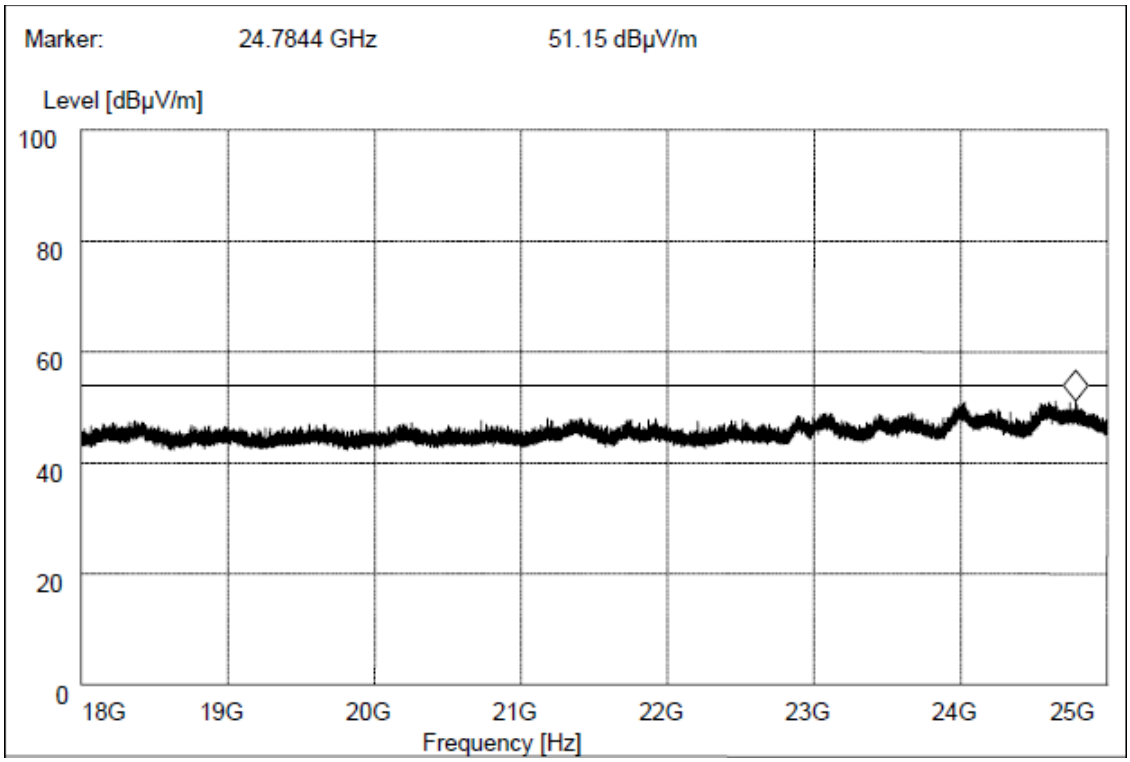

(30MHz to 1GHz, Antenna Horizontal)




(1GHz to 7GHz, Antenna Horizontal)

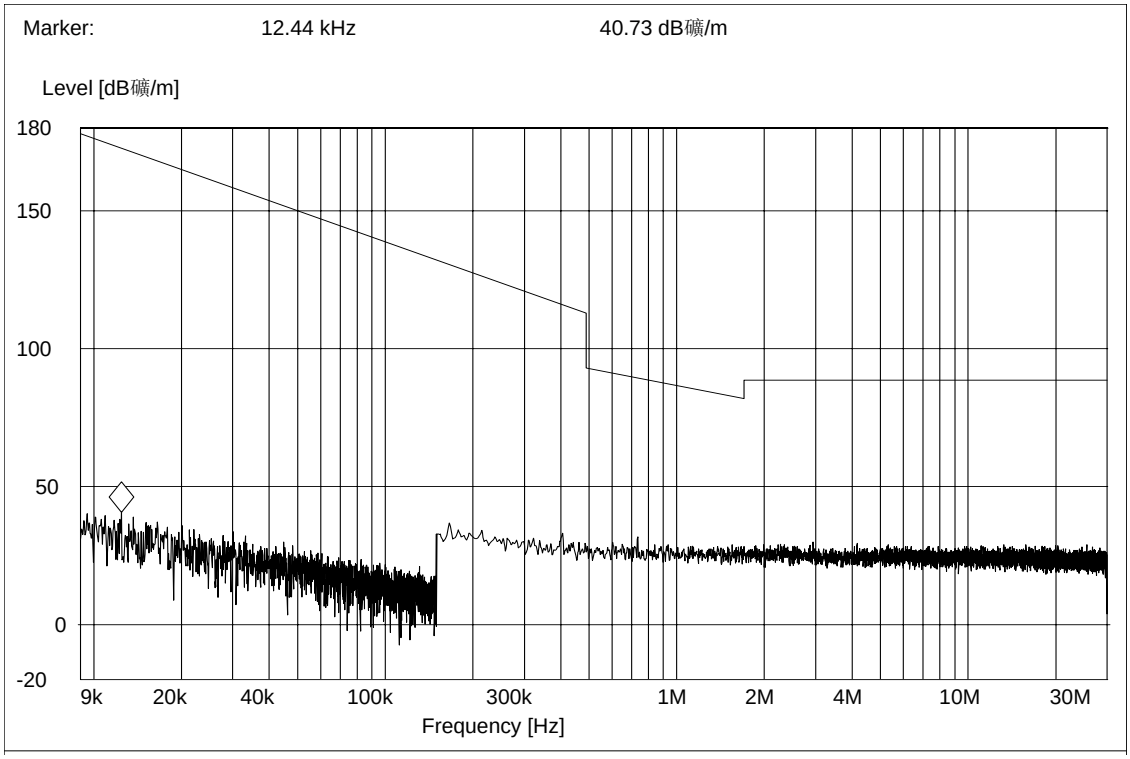



(7GHz to 18GHz, Antenna Horizontal)

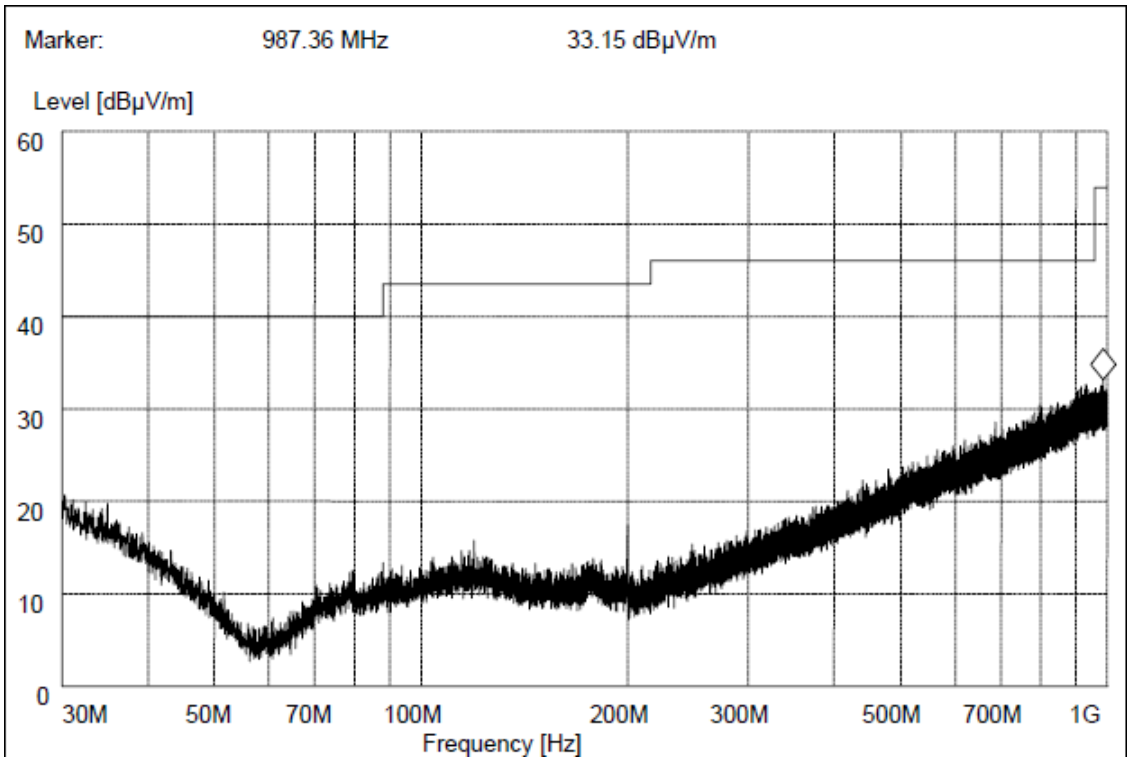



(18GHz to 25GHz, Antenna Horizontal)

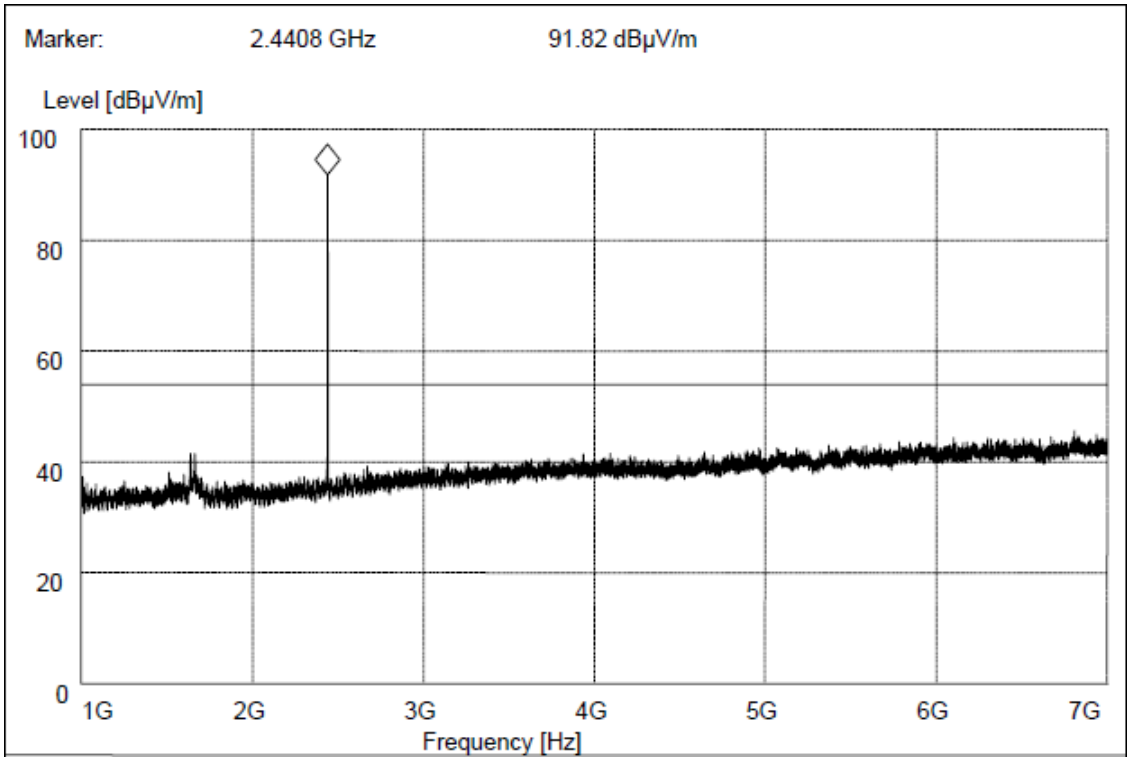
2. Plot for 2441MHz Channel:



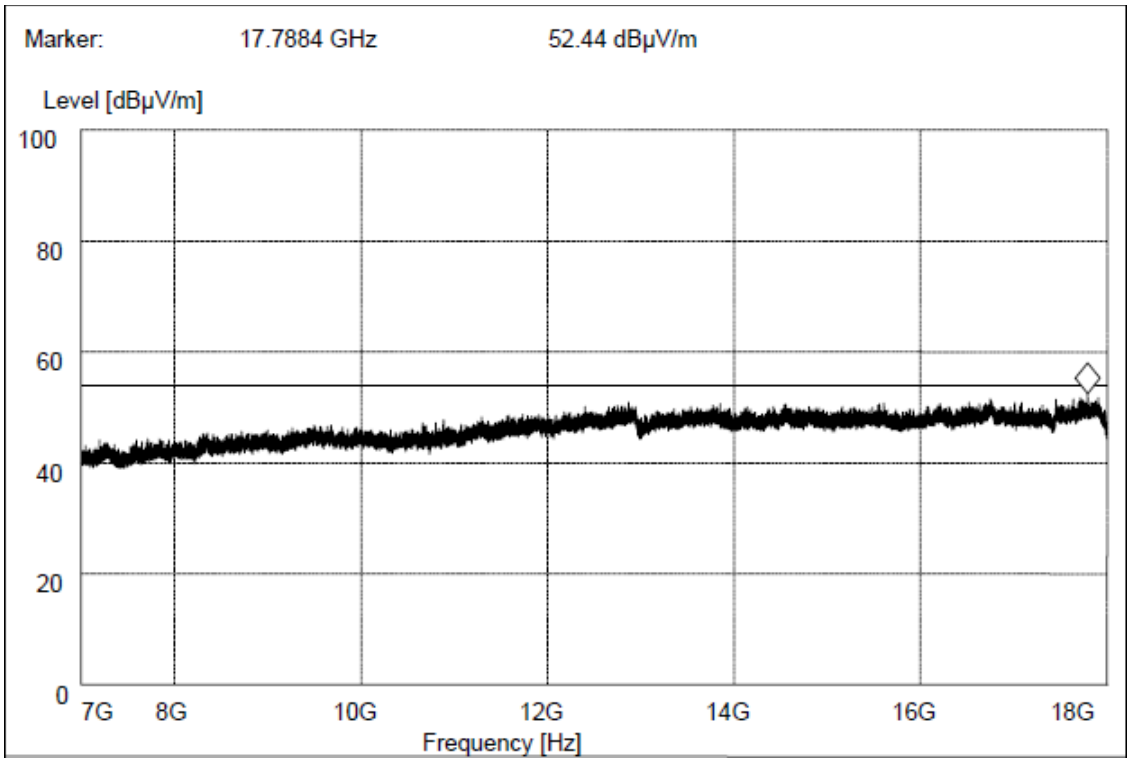

(9kHz to 30MHz)



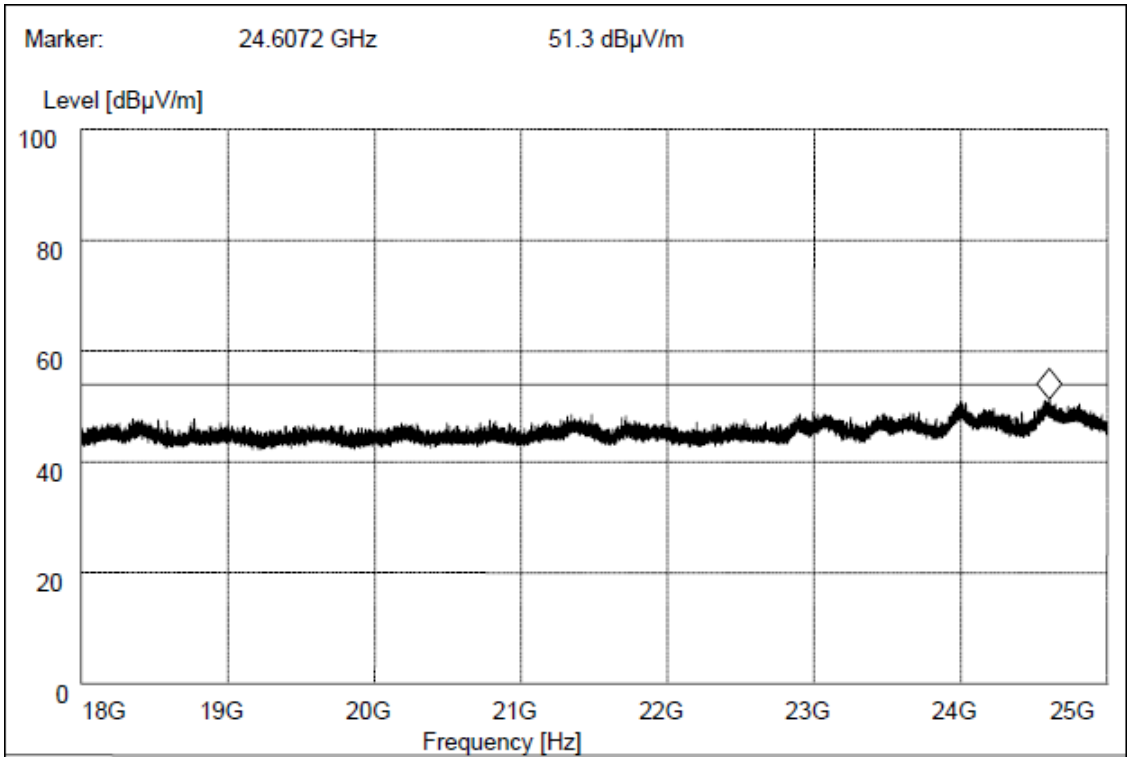

(30MHz to 1GHz, Antenna Vertical)



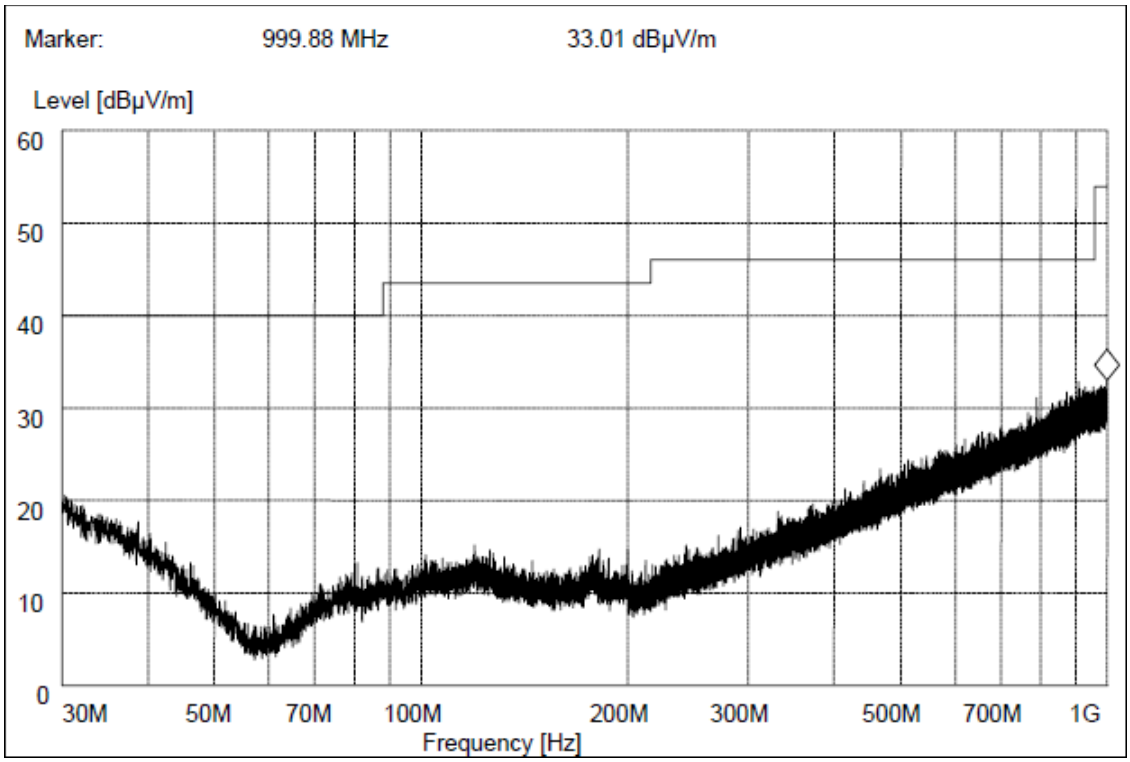

(1GHz to 7GHz, Antenna Vertical)



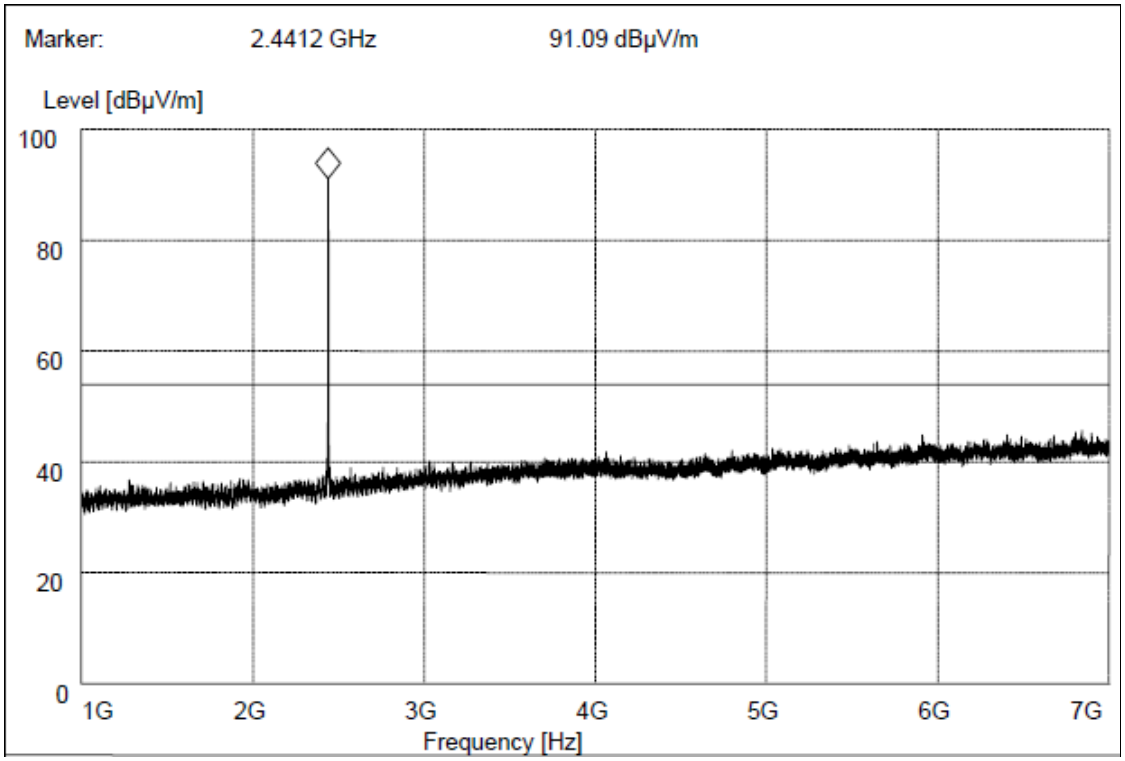

(7GHz to 18GHz, Antenna Vertical)



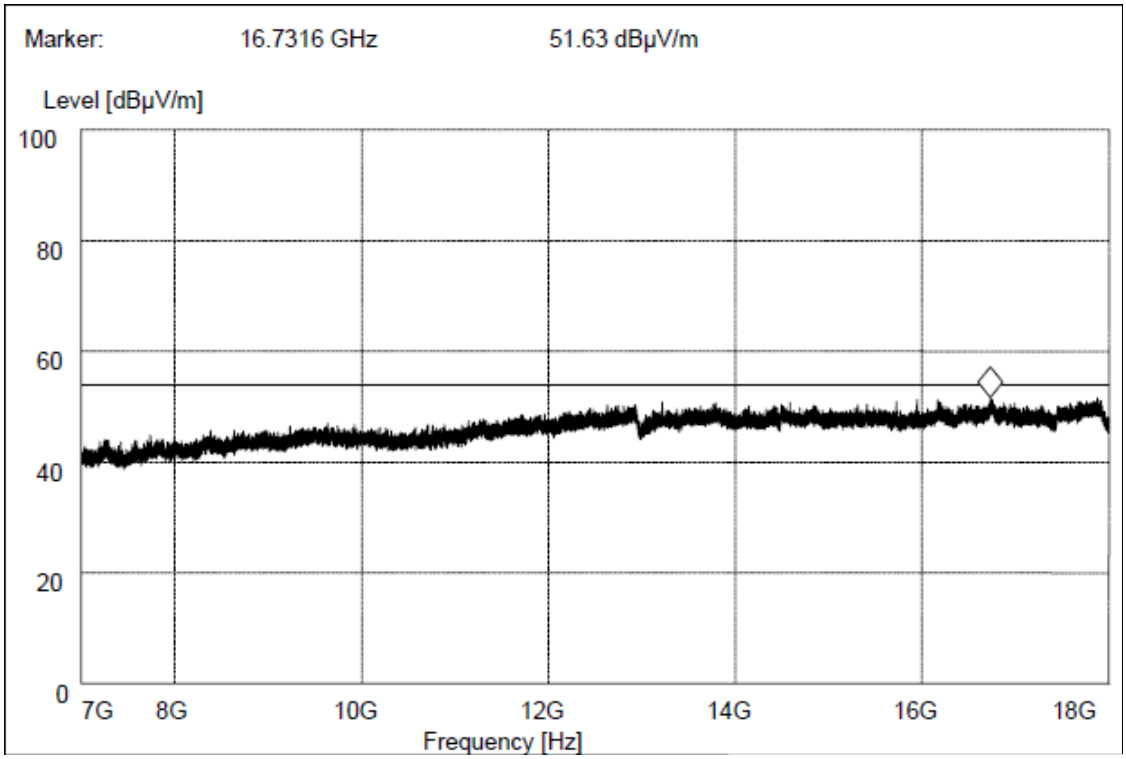

(18GHz to 25GHz, Antenna Vertical)



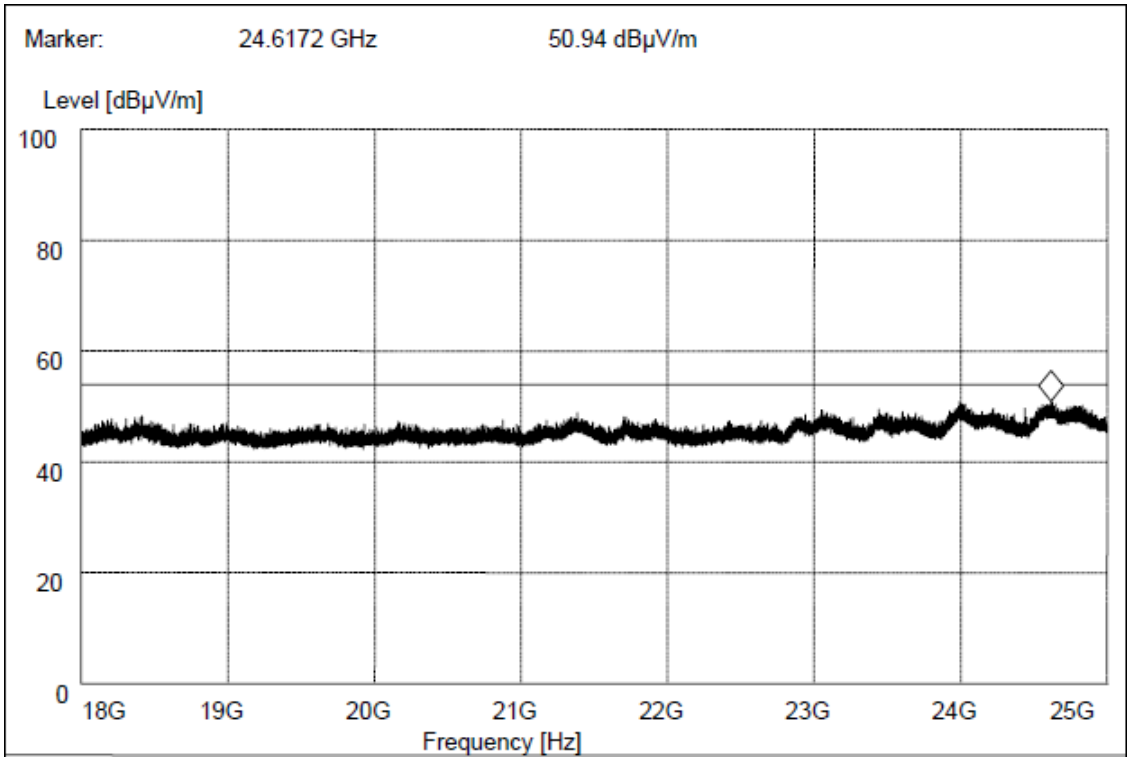

(30MHz to 1GHz, Antenna Horizontal)




(1GHz to 7GHz, Antenna Horizontal)

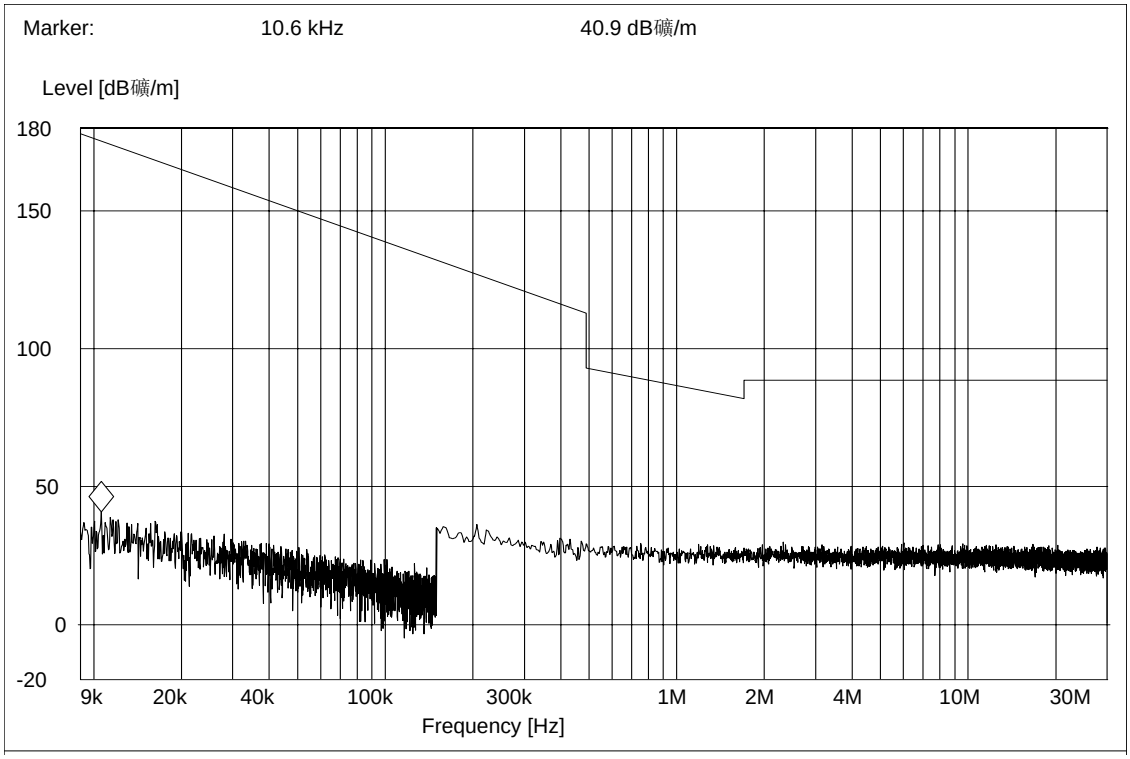



(7GHz to 18GHz, Antenna Horizontal)

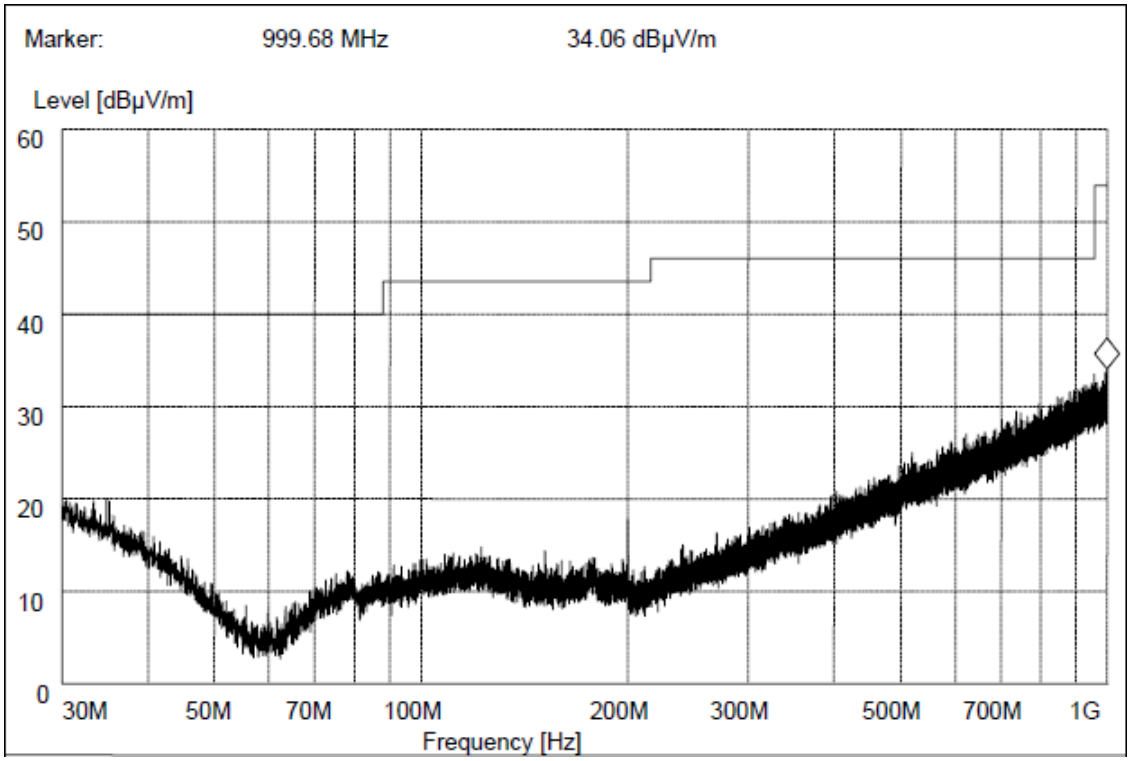



(18GHz to 25GHz, Antenna Horizontal)

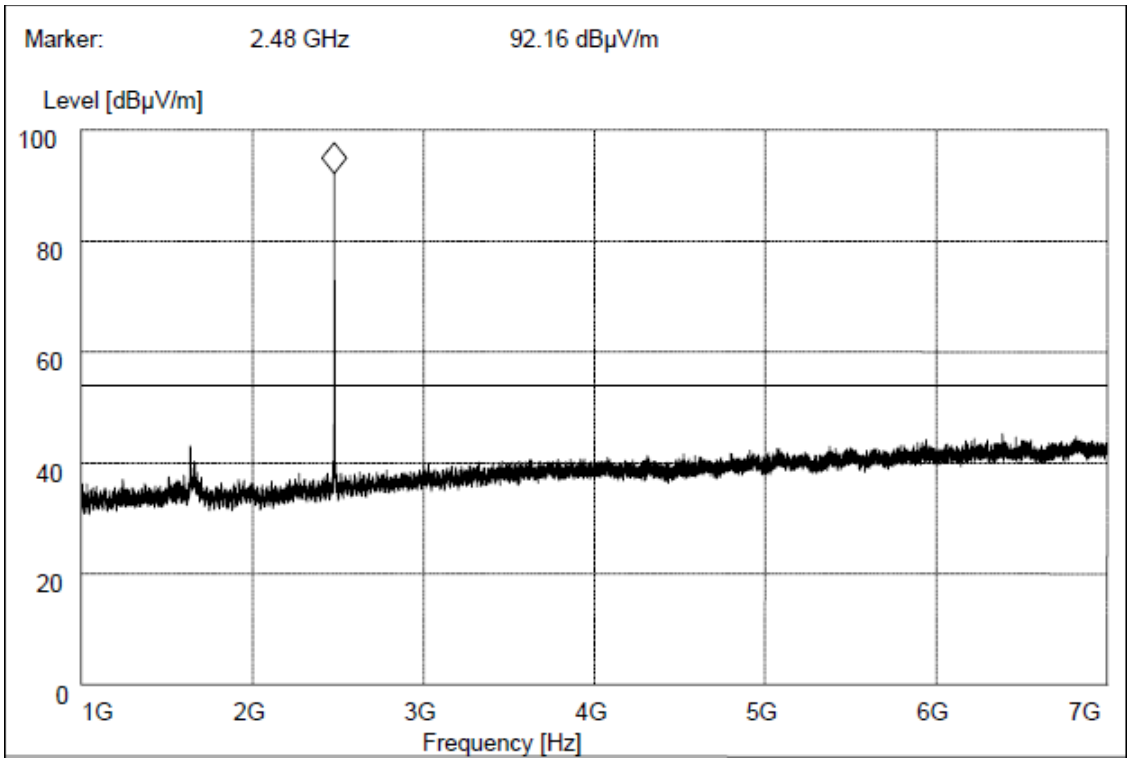
3. Plot for 2480MHz Channel:



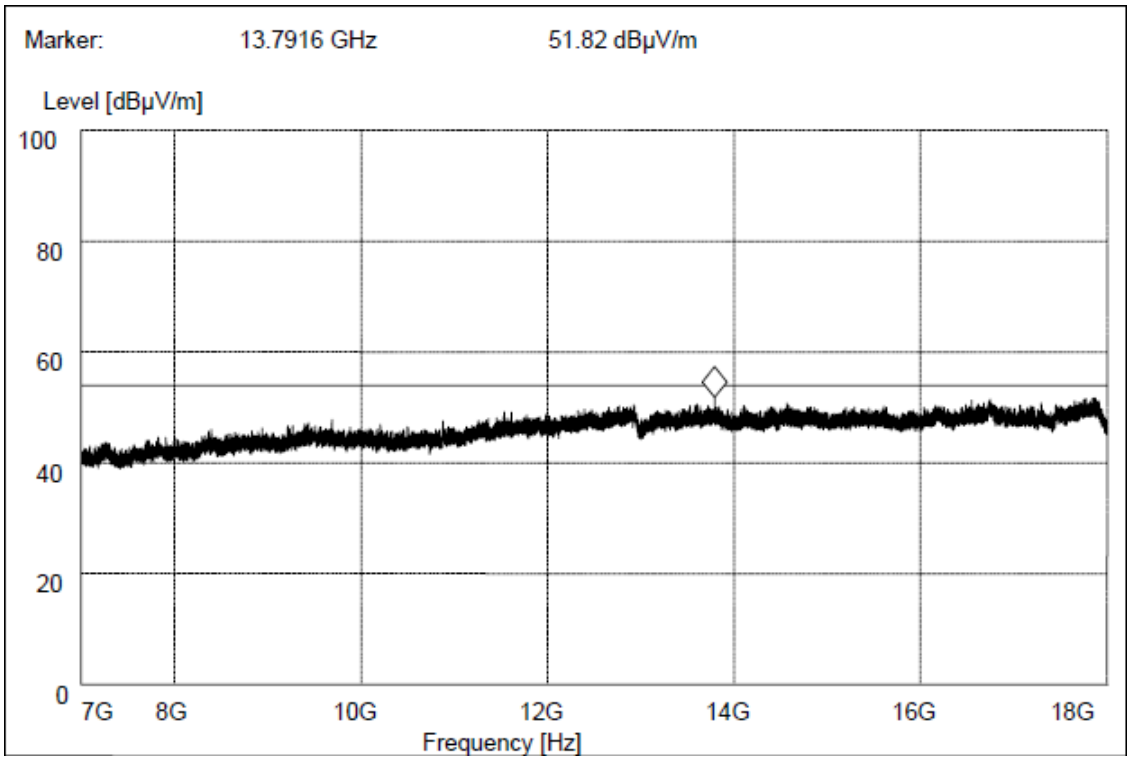

(9kHz to 30MHz)



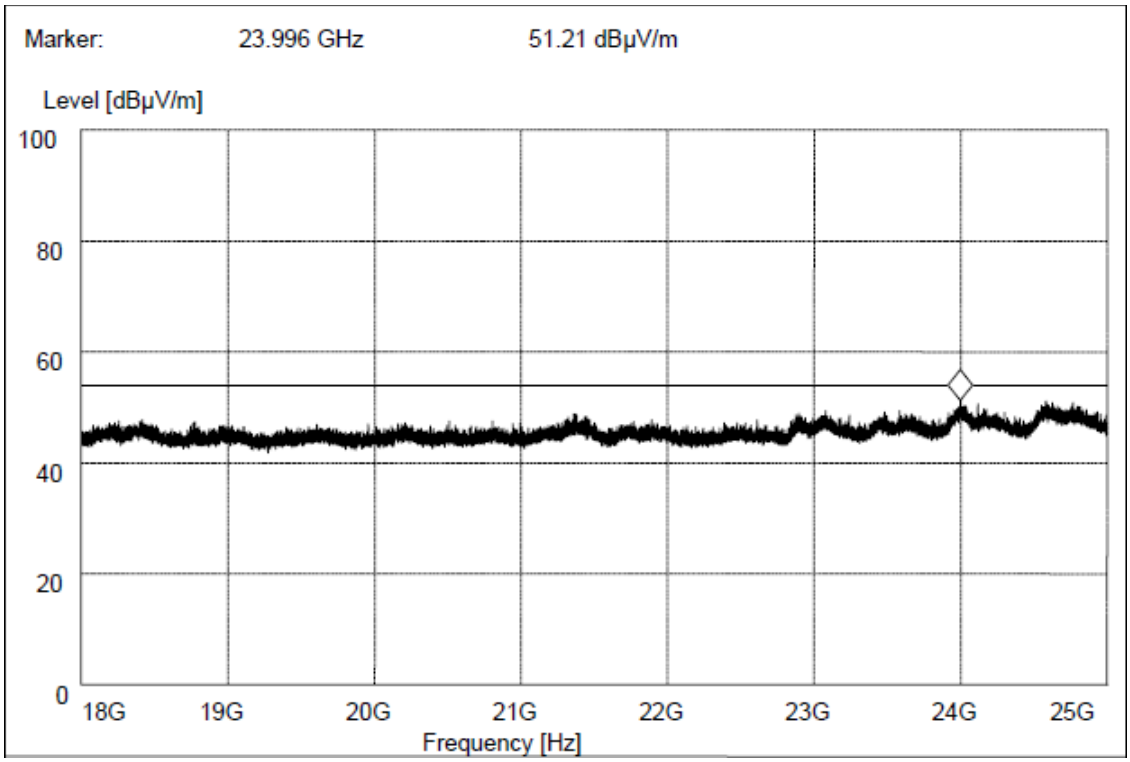

(30MHz to 1GHz, Antenna Vertical)



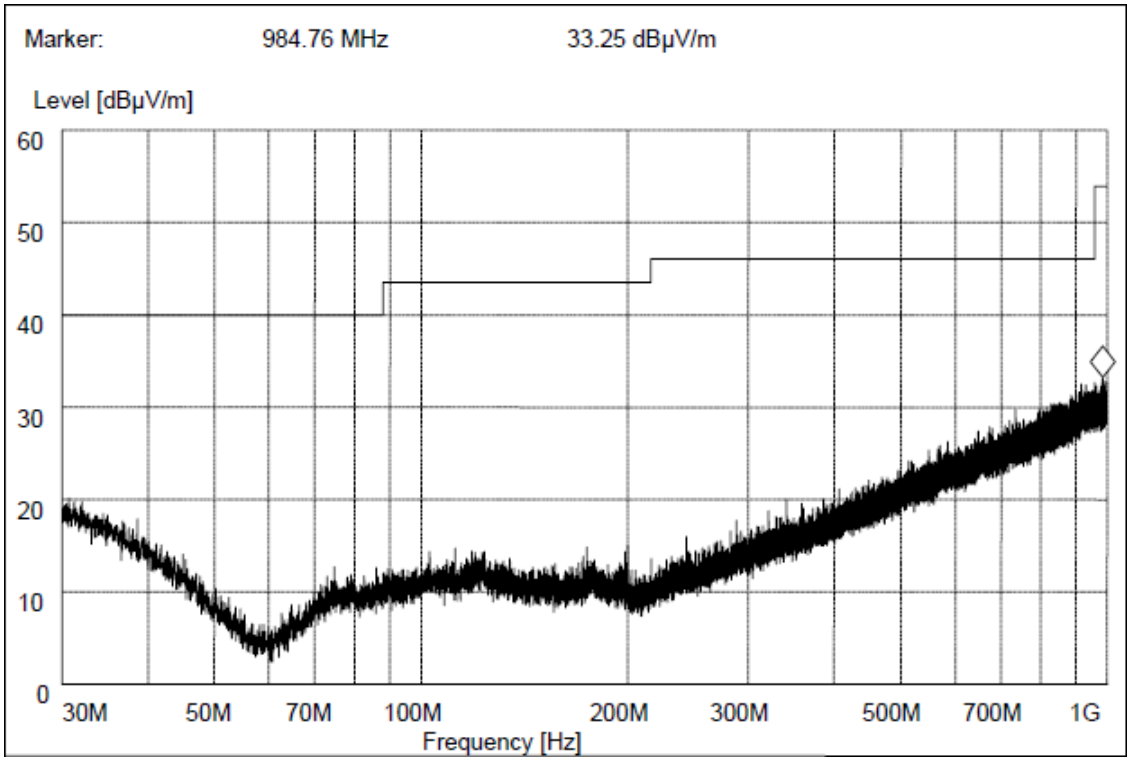

(1GHz to 7GHz, Antenna Vertical)



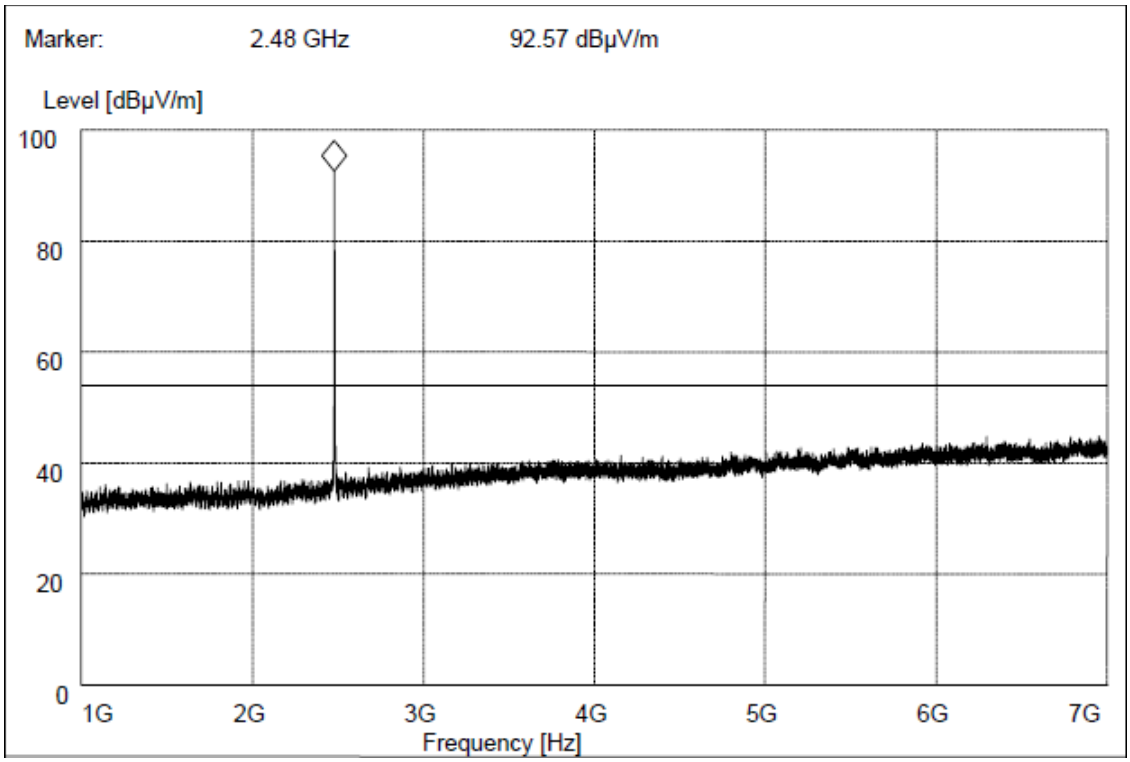

(7GHz to 18GHz, Antenna Vertical)



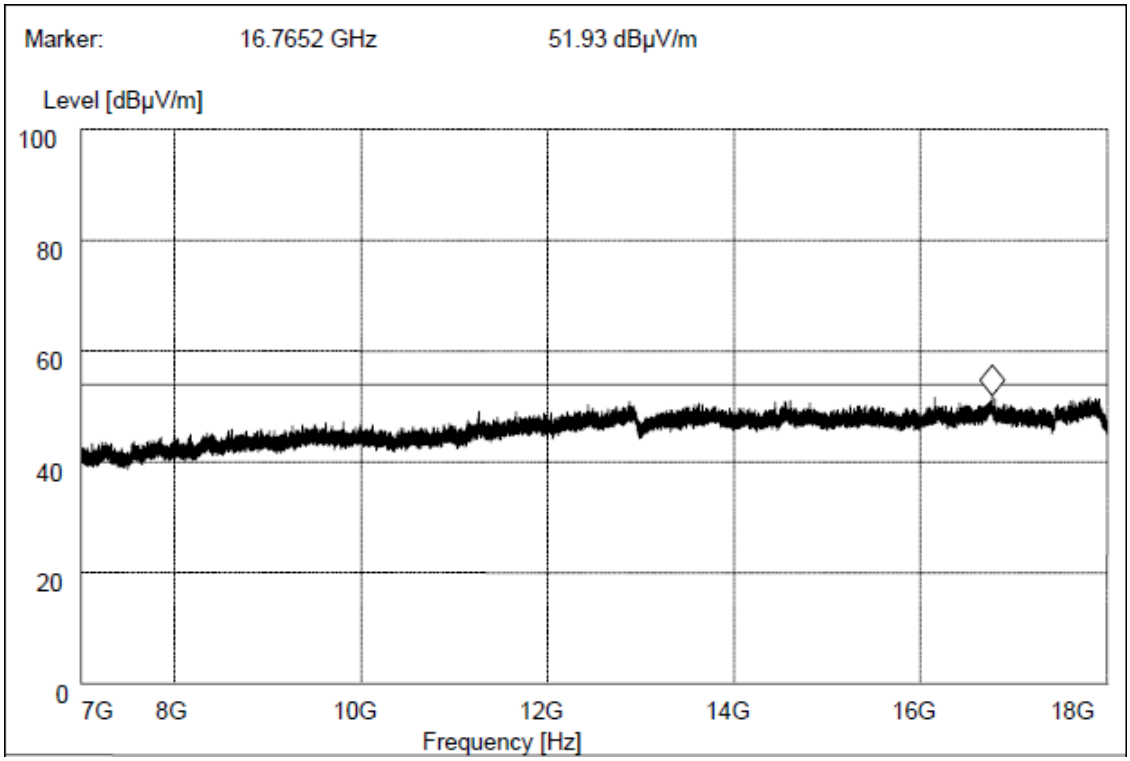

(18GHz to 25GHz, Antenna Vertical)



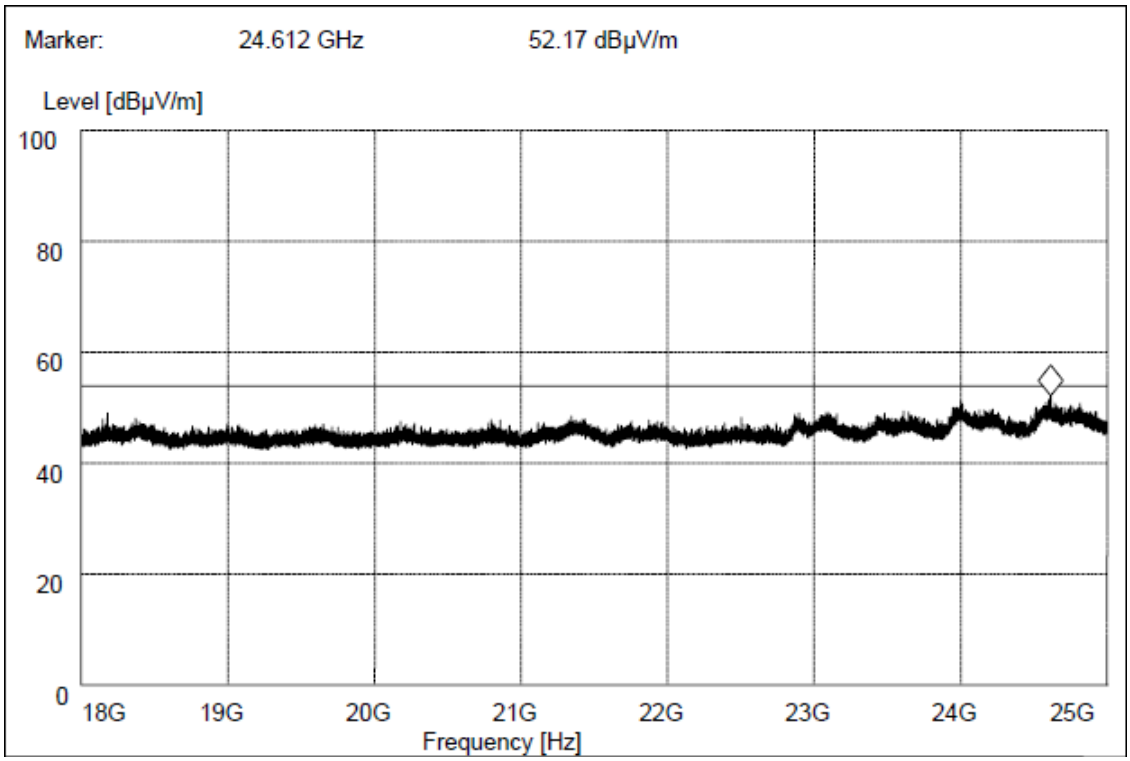

(30MHz to 1GHz, Antenna Horizontal)




(1GHz to 7GHz, Antenna Horizontal)




(7GHz to 18GHz, Antenna Horizontal)



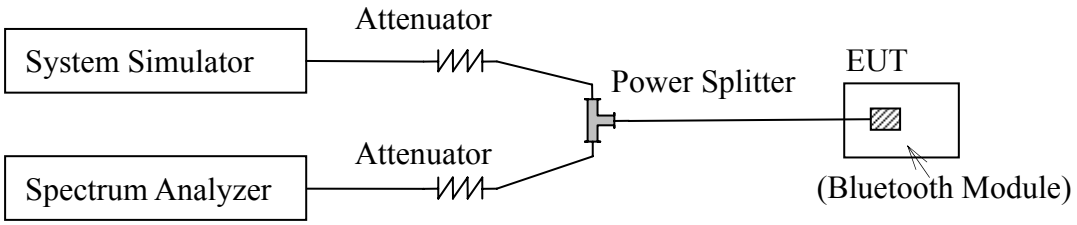

(18GHz to 25GHz, Antenna Horizontal)

## 3.3 Bandwidth and Carried Frequency Separation

### 3.3.1 Definition

According to FCC §15.247(a)(1), frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25kHz or the 20dB bandwidth of the hopping channel, whichever is greater.

### 3.3.2 Test Setup




1. The antenna port of the Bluetooth module of the EUT is coupled to the spectrum analyzer and the system simulator with attenuators through the power splitter; the loss is calibrated to correct the reading.
2. The System Simulator can activate and control the Bluetooth module of the EUT. During the measurement, the Bluetooth function of the EUT is activated and a communication link is established between the EUT and a Bluetooth Service Supplier of System Simulator. The Bluetooth Module of the EUT is set to operate under test mode transmitting 339 bytes DH5 packages at maximum power.
3. The Spectrum Analyzer is set to max-peak detector function and maximum hold mode.
4. The EUT is configured as Bluetooth Module + Battery.

### 3.3.3 Test Procedure

**20dB Bandwidth Measurement:**

1. Set the Bluetooth Module of the EUT to operate at hopping off mode.
2. Set the resolution bandwidth of the Spectrum Analyzer to: RBW=10kHz, VBW=10kHz.
3. The lowest channel (2402MHz), middle channel (2441MHz) and highest channel (2480MHz) are measured respectively.
4. Set the frequency range of the Spectrum Analyzer suitably to capture the waveform, search peak; yield a line whose value is 20dB lower than the peak; mark the points which the line intersected

the waveform at, the delta of the two points is the 20dB bandwidth. Record the delta as the 20dB bandwidth and measured plot.

**Carrier Frequency Separation:**

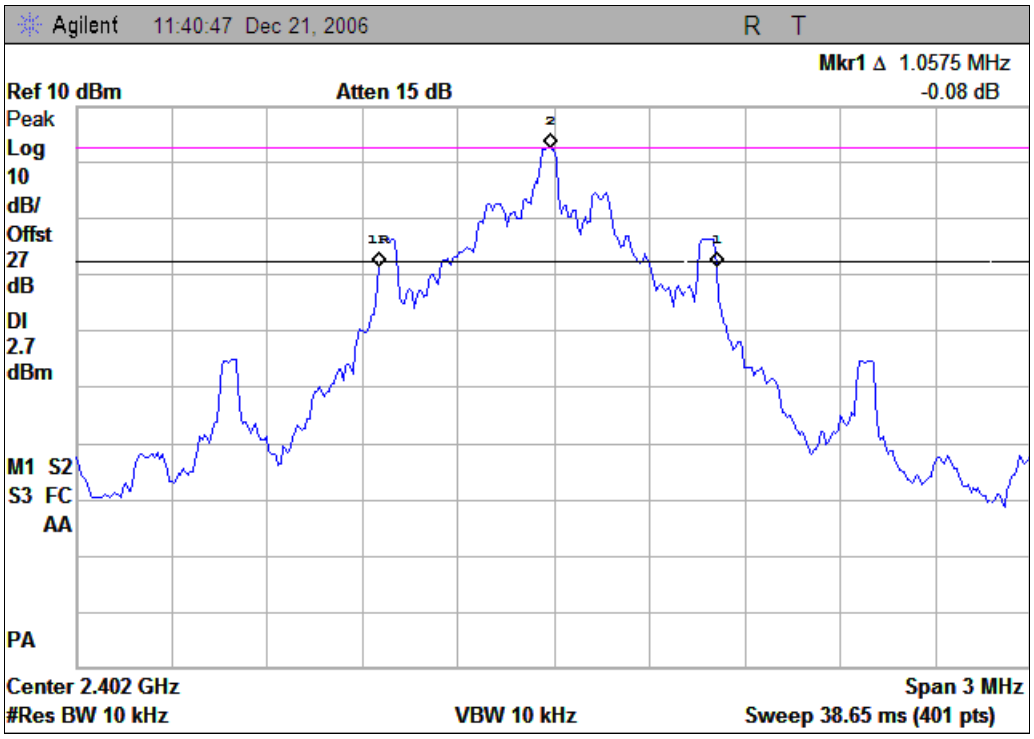
5. Set the Bluetooth Module of the EUT to operate at hopping on mode.
6. Set the resolution bandwidth of the Spectrum Analyzer to: RBW=300kHz, VBW=300kHz.
7. The middle channel (2441MHz) is measured respectively.
8. Set the frequency range of the Spectrum Analyzer suitably to capture the waveform; mark two peaks of hopping channels, the delta of the two points is the channel frequency separation. Record the delta and measured plot.

### 3.3.4 Test Result

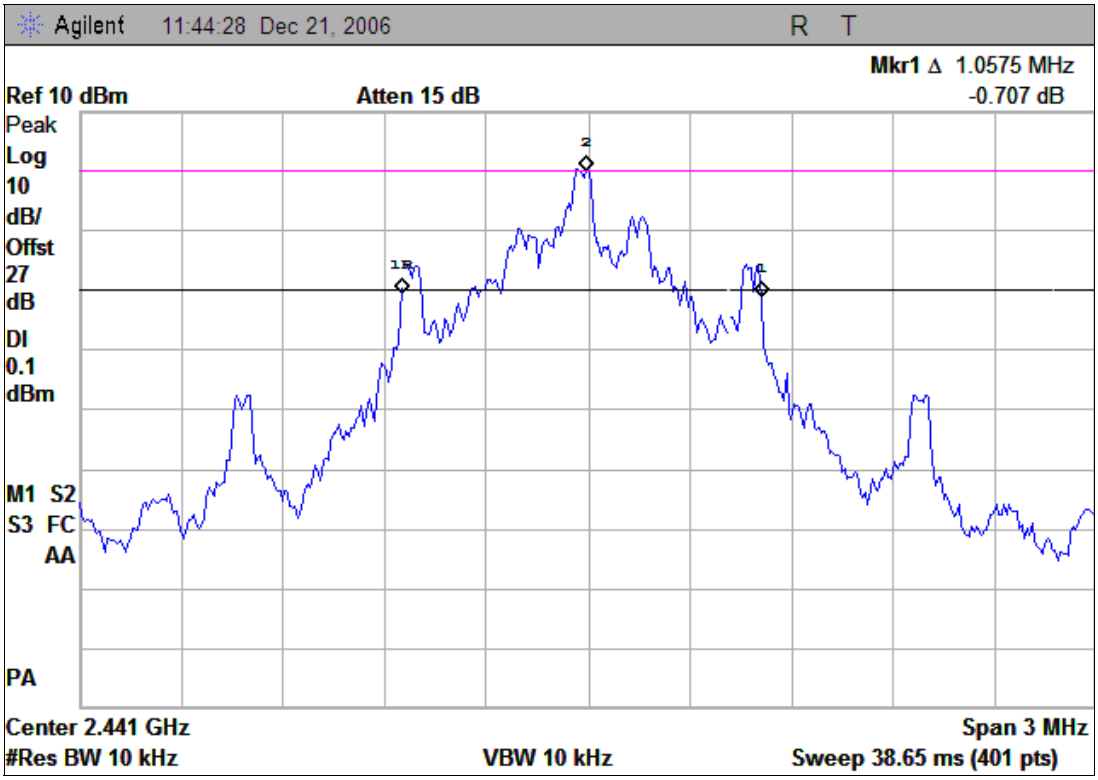
**The 20dB Bandwidth Measurement:**

| No. | Channel | Frequency (MHz) | 20dB Bandwidth (kHz) |
|---|---|---|---|
| 1 | Lowest | 2402 | 1057.5 |
| 2 | Middle | 2441 | 1057.5 |
| 3 | Highest | 2480 | 1057.5 |

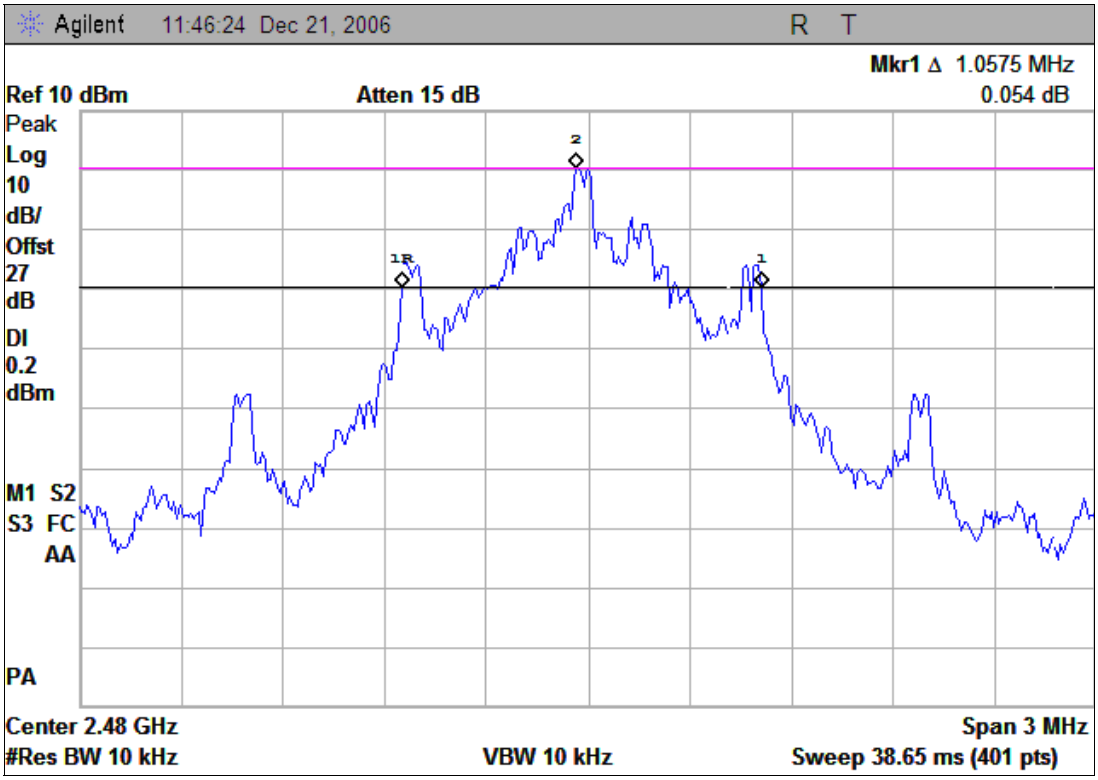
1. Plot for 2402MHz:



2. Plot for 2441MHz:



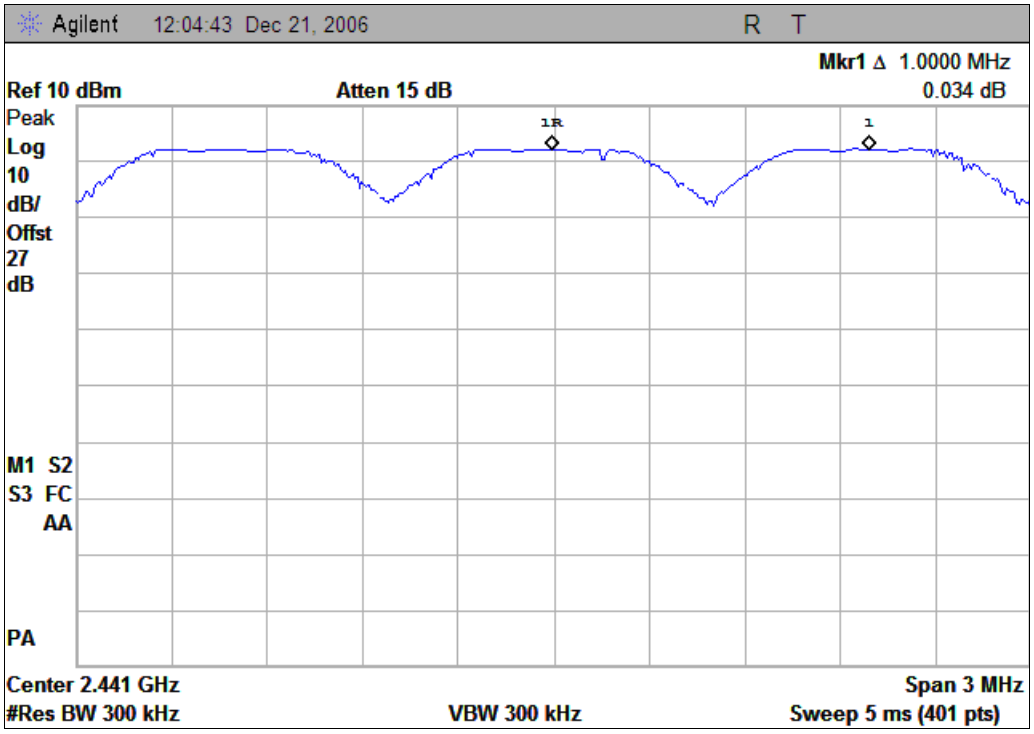

3. Plot for 2480MHz:



**The Carrier Frequency Separation Measurement:**

The EUT has hopping channel carrier frequencies separated by a minimum of 25kHz or the 20dB bandwidth of the hopping channel (about 1MHz), whichever is greater as below:

| No. | Channel | Frequency (MHz) | 20dB Bandwidth (kHz) | Limit (kHz) | Verdict |
|---|---|---|---|---|---|
| 1 | Lowest | 2402 | 1057.5 | > 25 | PASS |
| 2 | Middle | 2441 | 1057.5 | > 25 | PASS |
| 3 | Highest | 2480 | 1057.5 | > 25 | PASS |

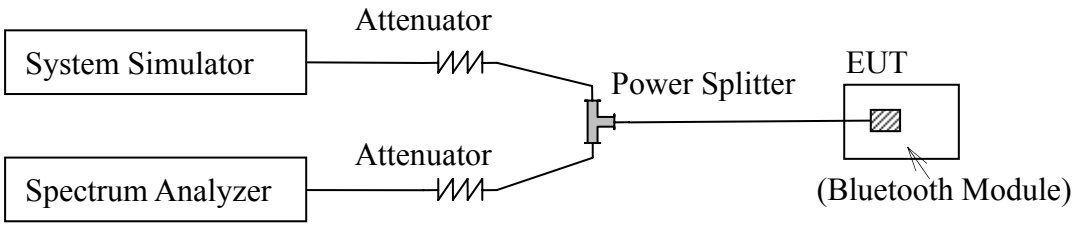


## 3.4 Number of Hopping Frequency

### 3.4.1 Requirement

According to FCC §15.247(a)(1)(ii), frequency hopping systems operating in the 2400 - 2483.5MHz bands shall use at least 75 hopping frequencies.

### 3.4.2 Test Setup



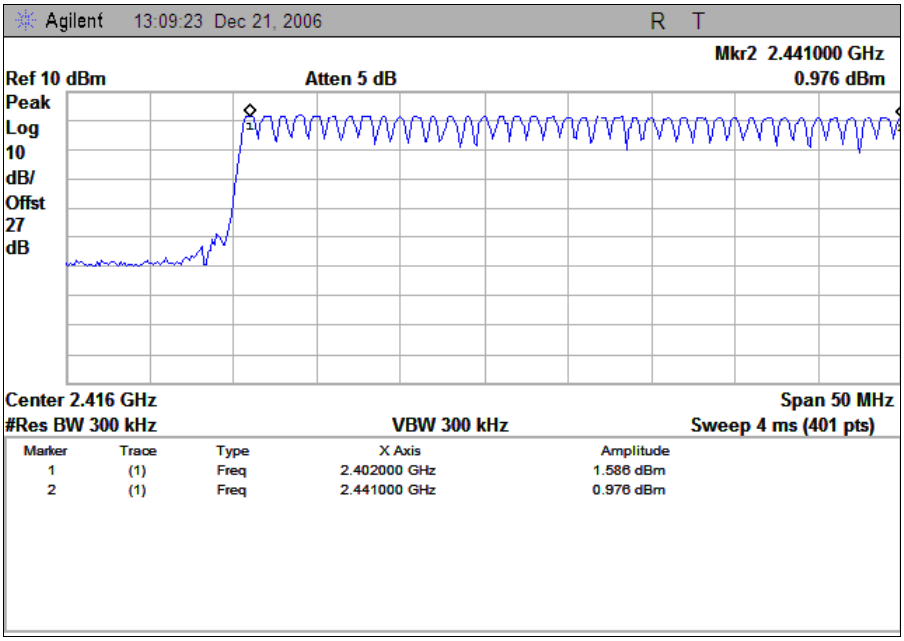

1. The antenna port of the Bluetooth module of the EUT is coupled to the spectrum analyzer and the system simulator with attenuators through the power splitter; the loss is calibrated to correct the reading.
2. The System Simulator can activate and control the Bluetooth module of the EUT. During the measurement, the Bluetooth function of the EUT is activated and a communication link is established between the EUT and a Bluetooth Service Supplier of System Simulator. The Bluetooth Module of the EUT is set to operate under test mode transmitting 339 bytes DH5 packages at maximum power.
3. The Spectrum Analyzer is set to max-peak detector function and maximum hold mode.
4. The EUT is configured as Bluetooth Module + Battery.

### 3.4.3 Test Procedure

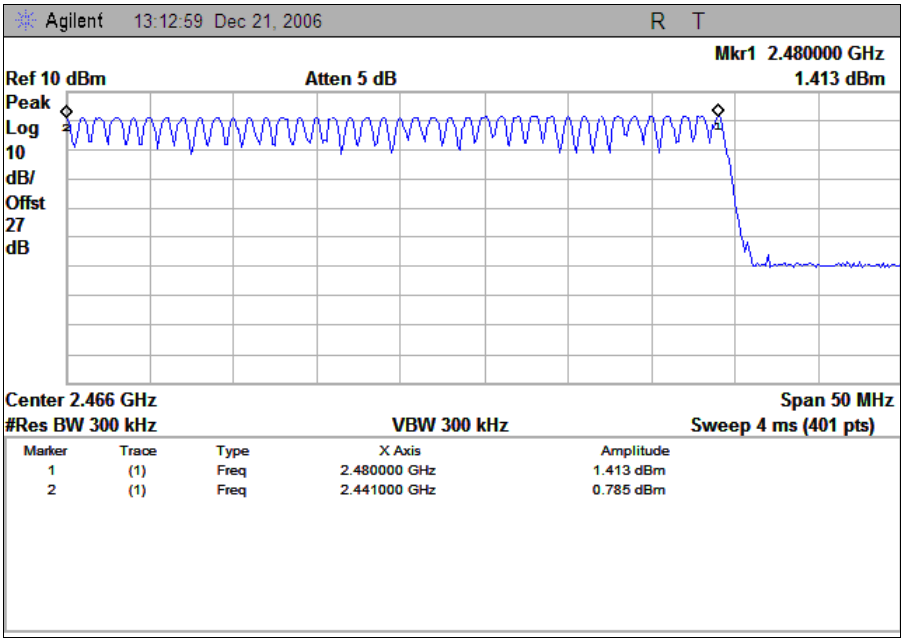
1. Set the Bluetooth Module of the EUT to operate at hopping on mode.
2. Set the resolution bandwidth of the Spectrum Analyzer to: RBW=300kHz, VBW=300kHz.
3. Set the frequency range of the Spectrum Analyzer suitably to capture the waveform; count peaks of hopping channels. Record the count number and measured plot.

### 3.4.4 Test Result

| Frequency Block (MHz) | Measured Used Channel Numbers | Limit of Channels | Verdict |
|---|---|---|---|
| 2402 - 2480 | 79 | > 75 | PASS |




(2402MHz to 2441MHz)



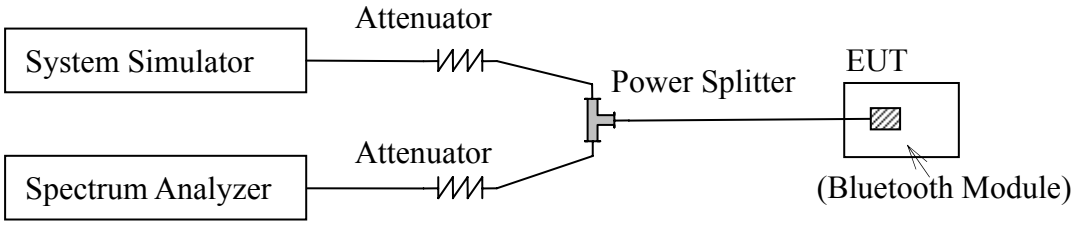

(2441MHz to 2480MHz)

## 3.5 Time of Occupancy (Dwell Time)

### 3.5.1 Requirement

According to FCC §15.247(a)(1)(iii), frequency hopping systems in the 2400 - 2483.5MHz band shall use at least 15 non-overlapping channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

### 3.5.2 Test Setup




1. The antenna port of the Bluetooth module of the EUT is coupled to the spectrum analyzer and the system simulator with attenuators through the power splitter; the loss is calibrated to correct the reading.
2. The System Simulator can activate and control the Bluetooth module of the EUT. During the measurement, the Bluetooth function of the EUT is activated and a communication link is established between the EUT and a Bluetooth Service Supplier of System Simulator. The Bluetooth Module of the EUT is set to operate under test mode transmitting 339 bytes DH5 packages at maximum power.
3. The Spectrum Analyzer is set to max-peak detector function and maximum hold mode.
4. The EUT is configured as Bluetooth Module + Battery.

### 3.5.3 Test Procedure

1. Set the Bluetooth Module of the EUT to operate at hopping on mode.
2. Set the resolution bandwidth of the Spectrum Analyzer to: RBW=300kHz, VBW=300kHz.
3. The middle channel (2441MHz) is measured respectively.
4. Record the dwell time of each occupation in the channel and count that the number the channel is used.

### 3.5.4 Test Result

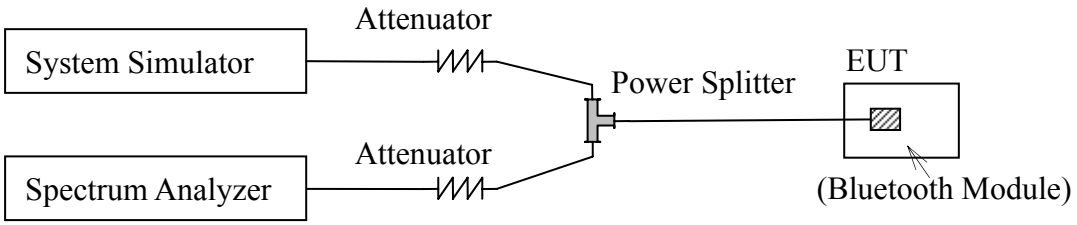
According to the number of hopping channels = 79, the measure time is within 0.4s * 79 = *31.6s*. The channel is used *106times* within measure time 31.6s, and the dwell time of each occupation measured in this channel is *2.9ms*, so the average time of occupancy on this channel is 2.9ms * 106 = *0.307s* which is less than the limit 0.4s, the verdict is PASS.

## 3.6 Peak Output Power

### 3.6.1 Requirement

According to FCC §15.247(b)(1), for frequency hopping systems operating in the 2400 - 2483.5MHz band employing at least 75 hopping channels, the maximum peak output power of the intentional radiator shall not exceed 1Watt. For all other frequency hopping systems in the 2400 - 2483.5MHz band: 0.125Watts.

### 3.6.2 Test Setup




1. The antenna port of the Bluetooth module of the EUT is coupled to the spectrum analyzer and the system simulator with attenuators through the power splitter; the loss is calibrated to correct the reading.
2. The System Simulator can activate and control the Bluetooth module of the EUT. During the measurement, the Bluetooth function of the EUT is activated and a communication link is established between the EUT and a Bluetooth Service Supplier of System Simulator. The Bluetooth Module of the EUT is set to operate under test mode transmitting 339 bytes DH5 packages at maximum power.
3. The Spectrum Analyzer is set to max-peak detector function and maximum hold mode.
4. The EUT is configured as Bluetooth Module + Battery.

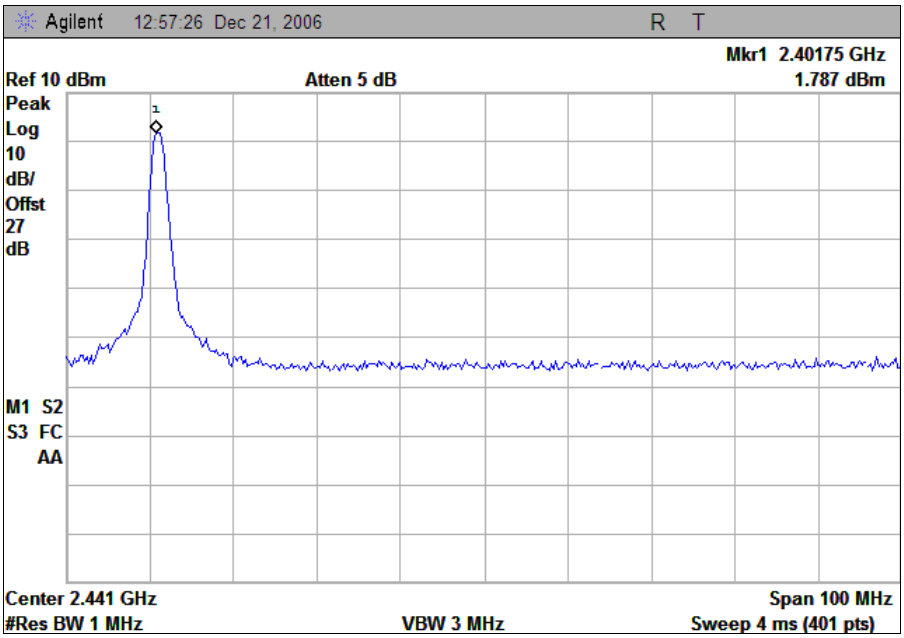
### 3.6.3 Test Procedure

1. Set the Bluetooth Module of the EUT to operate at hopping off mode.
2. Set the resolution bandwidth of the Spectrum Analyzer to: RBW=1MHz, VBW=3MHz.
3. The lowest channel (2402MHz), middle channel (2441MHz) and highest channel (2480MHz) are measured respectively.
4. Set the frequency range of the Spectrum Analyzer suitably to capture the waveform; search peak. Record the peak and measured plot.

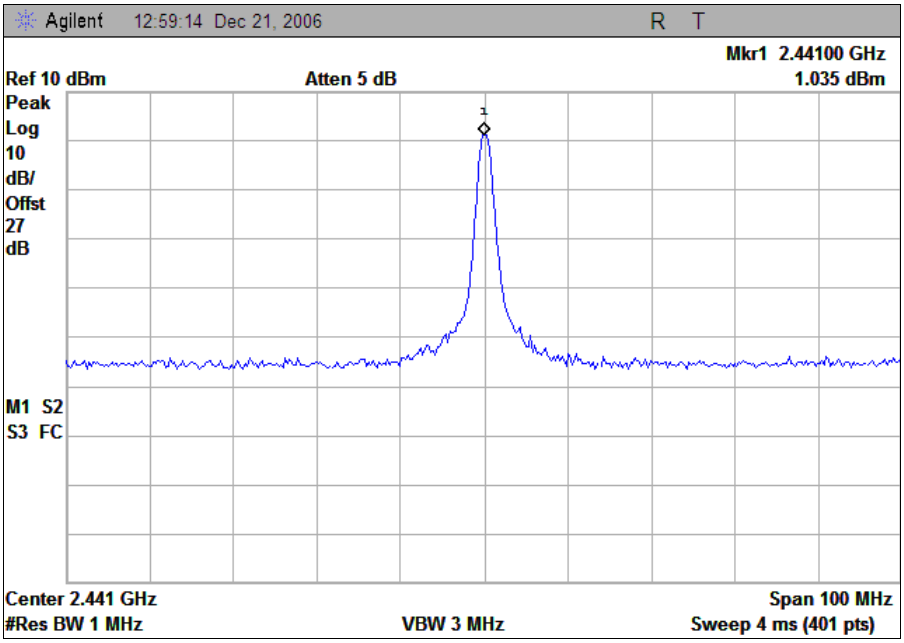
### 3.6.4 Test Result

| No. | Channel | Frequency (MHz) | Peak Output Power | | Limit | | Verdict |
|---|---|---|---|---|---|---|---|
| | | | dBm | W | dBm | W | |
| 1 | Lowest | 2402 | 1.787 | 1.51E-3 | 30 | 1 | PASS |
| 2 | Middle | 2441 | 1.035 | 1.27E-3 | 30 | 1 | PASS |
| 3 | Highest | 2480 | 1.668 | 1.47E-3 | 30 | 1 | PASS |

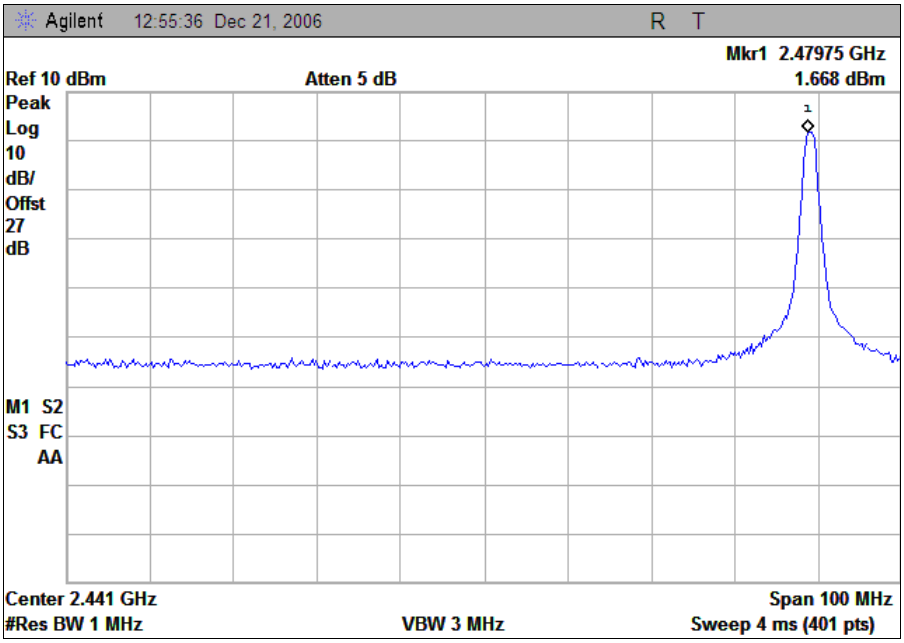
1. Plot for 2402MHz:




2. Plot for 2441MHz:



3. Plot for 2480MHz:

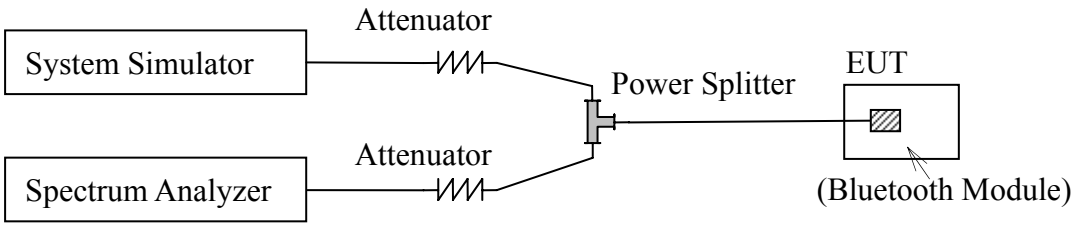


## 3.7 Band Edge

### 3.7.1 Requirement

According to FCC §15.247(c), in any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. 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).

### 3.7.2 Test Setup




1. The antenna port of the Bluetooth module of the EUT is coupled to the spectrum analyzer and the system simulator with attenuators through the power splitter; the loss is calibrated to correct the reading.
2. The System Simulator can activate and control the Bluetooth module of the EUT. During the measurement, the Bluetooth function of the EUT is activated and a communication link is established between the EUT and a Bluetooth Service Supplier of System Simulator. The Bluetooth Module of the EUT is set to operate under test mode transmitting 339 bytes DH5 packages at maximum power.
3. The Spectrum Analyzer is set to max-peak detector function and maximum hold mode.
4. The EUT is configured as Bluetooth Module + Battery.

### 3.7.3 Test Procedure

1. Set the Bluetooth Module of the EUT to operate at hopping off mode.
2. Set the resolution bandwidth of the Spectrum Analyzer to: RBW=100kHz, VBW=100kMHz.
3. The lowest channel (2402MHz) and highest channel (2480MHz) are measured respectively. Measurement is taken at the highest point located outside of the emission bandwidth.

4. Set the frequency range of the Spectrum Analyzer suitably to capture the waveform; search peak. Record the peak and measured plot.

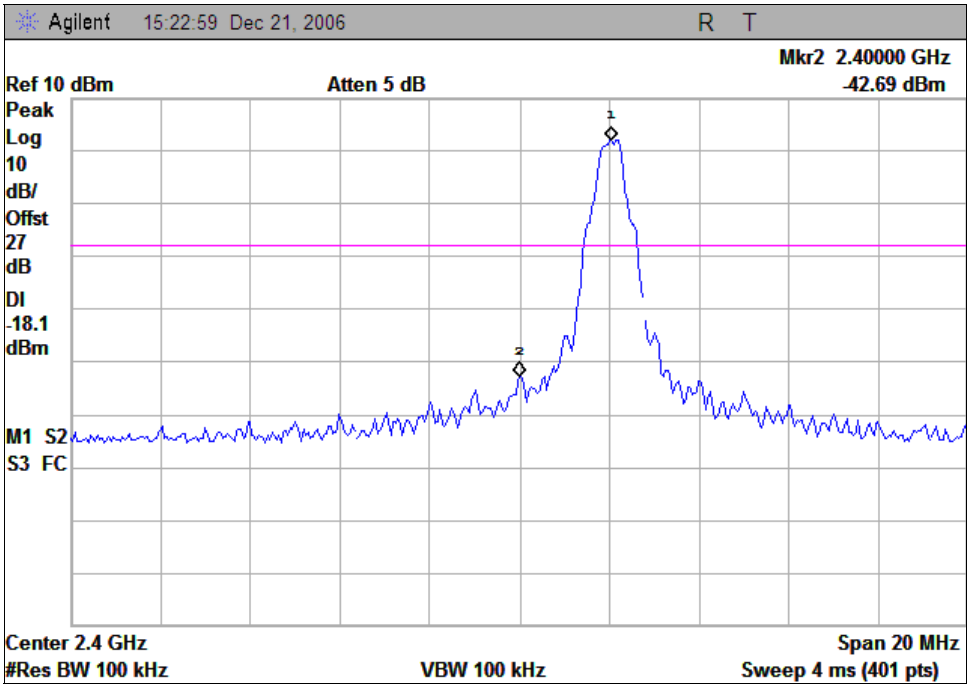
### 3.7.4 Test Result

The radio frequency power beyond the band edge is 20dB below the peak output power, measured with 100kHz resolution bandwidth. Refer to the following plots.

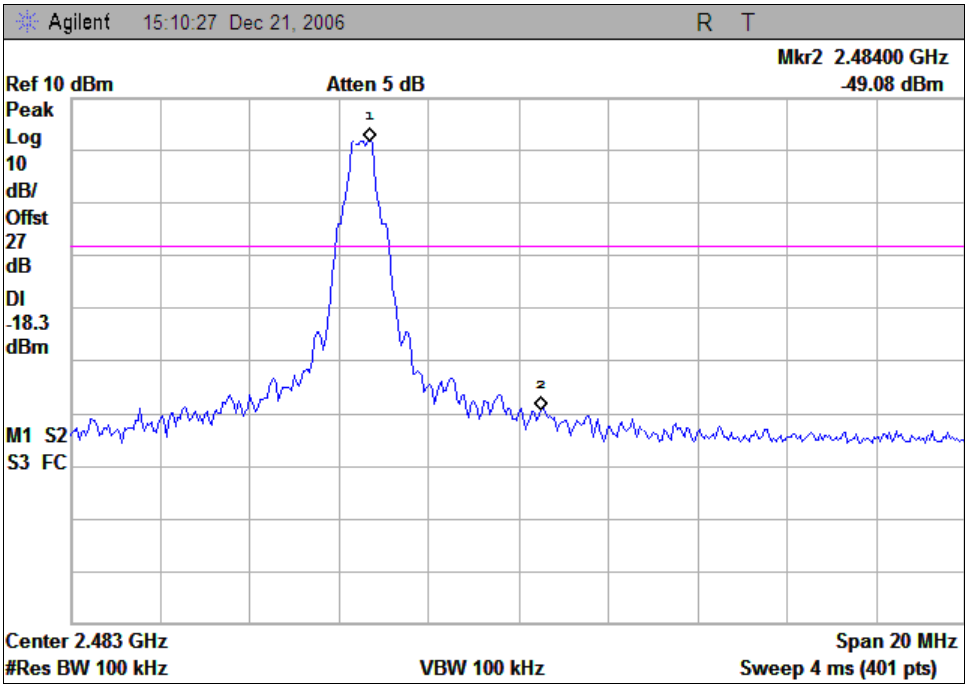
Field strength of band edge emission falling in adjacent restricted bands (2310MHz-2390MHz and 2483.5MHz-2500MHz) per section 15.205(a) is calculated according to Marker-Delta Method. Refer to section 3.2.4 for step "The Fundamental Emissions" in-band field strength measurement. The following test plots gave the "Delta Marker" of maximum band edge emissions falling in restricted bands relevant to the fundamental emissions. Calculation results in the following table shows compliance with the radiated emission limits specified in Section 15.209(a).

| No. | Channel | Fundamental Emission | | Frequency of Max Band Edge (MHz) | Delta Marker (dB) | Calculated Max Band Edge Emission (dBμV/m) | Limit (dBμV/m) | Verdict |
|---|---|---|---|---|---|---|---|---|
| | | Field Strength (dBμV/m) | Detector | | | | | |
| 1 | Lowest | 91.79 | PK | 2400.00 | 44.59 | 47.2 | < 74 | PASS |
| 2 | | 74.49 | AV | 2400.00 | 44.59 | 29.9 | < 54 | PASS |
| 3 | Highest | 92.57 | PK | 2484.00 | 50.78 | 41.79 | < 74 | PASS |
| 4 | | 76.37 | AV | 2484.00 | 50.78 | 25.59 | < 54 | PASS |

1. Plot for 2402MHz:



2. Plot for 2480MHz:

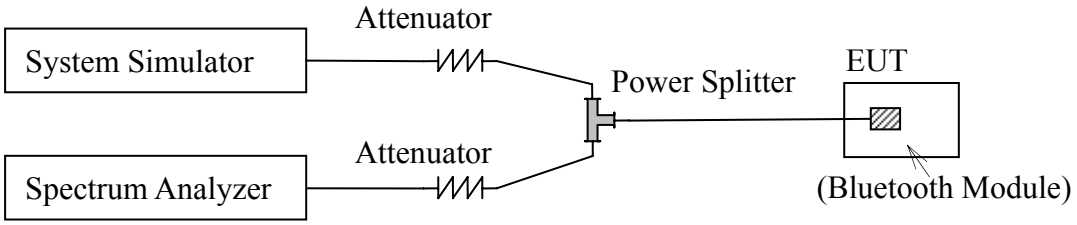


## 3.8 Conducted Spurious Emission

### 3.8.1 Requirement

According to FCC §15.247(c), in any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

### 3.8.2 Test Setup




1. The antenna port of the Bluetooth module of the EUT is coupled to the spectrum analyzer and the system simulator with attenuators through the power splitter; the loss is calibrated to correct the reading.
2. The System Simulator can activate and control the Bluetooth module of the EUT. During the measurement, the Bluetooth function of the EUT is activated and a communication link is established between the EUT and a Bluetooth Service Supplier of System Simulator. The Bluetooth Module of the EUT is set to operate under test mode transmitting 339 bytes DH5 packages at maximum power.
3. The Spectrum Analyzer is set to max-peak detector function and maximum hold mode.
4. The EUT is configured as Bluetooth Module + Battery.

### 3.8.3 Test Procedure

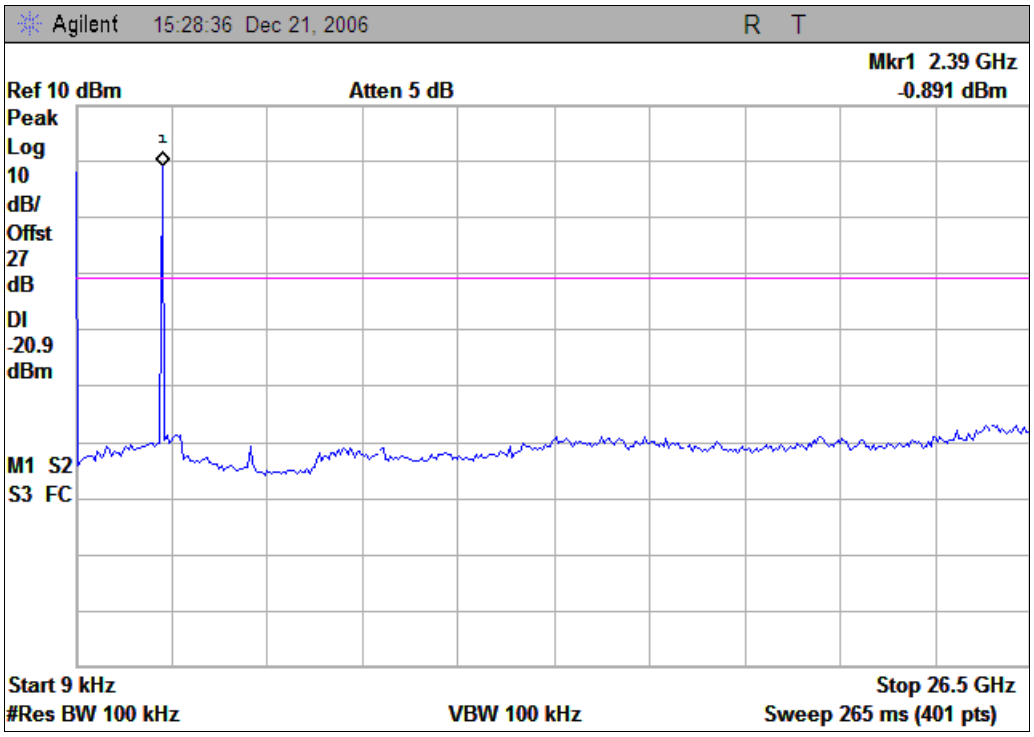
1. Set the Bluetooth Module of the EUT to operate at hopping off mode.
2. Set the resolution bandwidth of the Spectrum Analyzer to: RBW=100kHz, VBW=100kMHz.
3. The lowest channel (2402MHz), middle channel (2441MHz) and highest channel (2480MHz) are measured respectively.
4. Set the frequency range of the Spectrum Analyzer from 30MHz to 10$^{th}$ harmonic (here used 25.6GHz) of the fundamental frequency; mark the fundamental frequency, and then make a limit

line whose value is -20dB lower than the marker point. Record the measured plot.

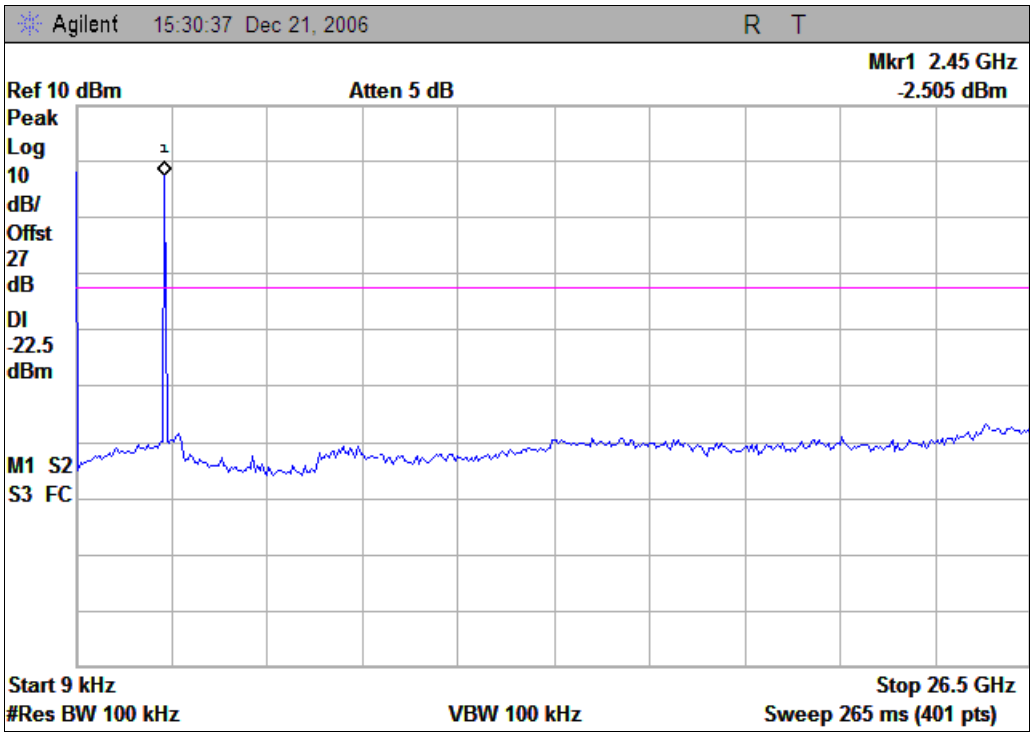
### 3.8.4 Test Result

| No. | Channel | Frequency (MHz) | Limit | | Spurious Emission (dBm) | Verdict |
|---|---|---|---|---|---|---|
| | | | Carrier Level (dBm) | Calculated -20dBc Limit (dBm) | | |
| 1 | Lowest | 2402 | -0.9 | -20.9 | --- | PASS |
| 2 | Middle | 2441 | -2.5 | -22.5 | --- | PASS |
| 3 | Highest | 2480 | -4.9 | -24.9 | --- | PASS |

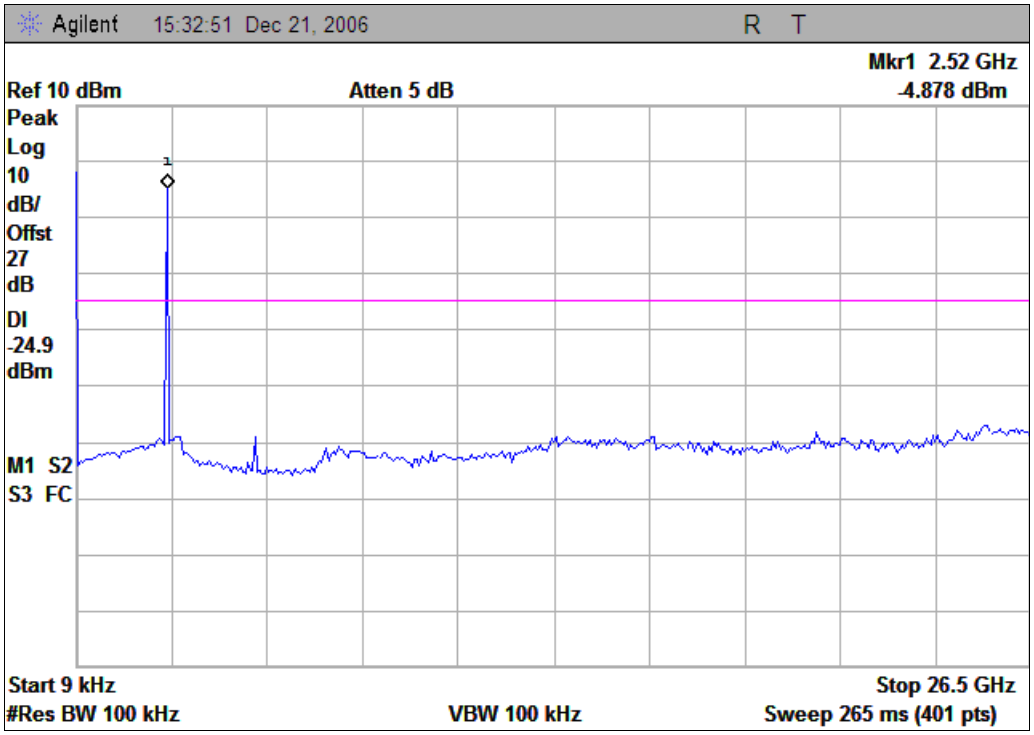
1. Plot for 2402MHz:




2. Plot for 2441MHz:




3. Plot for 2480MHz:



** END OF REPORT **