

## FCC 47 CFR PART 15 SUBPART C

### TEST REPORT

For

**WLAN Module**

**Model: WCBN4511R(12)**

**Trade Name: LITE-ON**

*Issued to*

**Lite-On Technology Corp.  
Bldg. C, 90, Chien 1 Road, Chung Ho, New Taipei City 23585, Taiwan,  
R.O.C**

*Issued by*

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Issued Date: September 12, 2016**



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**Revision History**

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## 1. TEST RESULT CERTIFICATION

**Applicant:** Lite-On Technology Corp.  
Bldg. C, 90, Chien 1 Road, Chung Ho, New Taipei City 23585,  
Taiwan, R.O.C

**Equipment Under Test:** WLAN Module

**Model Number:** WCBN4511R(12)

**Trade Name:** LITE-ON

**Date of Test:** June 21 ~ September 10, 2016

| APPLICABLE STANDARDS         |                         |
|------------------------------|-------------------------|
| STANDARD                     | TEST RESULT             |
| FCC 47 CFR Part 15 Subpart C | No non-compliance noted |

### We hereby certify that:

The above equipment was tested by Compliance Certification Services Inc. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10: 2013 and the energy emitted by the sample EUT tested as described in this report is in compliance with the requirements of FCC Rules Part 15.207, 15.209, 15.247.

The test results of this report relate only to the tested sample EUT identified in this report.

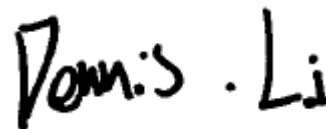
*Approved by:*



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Miller Lee  
Manager  
Compliance Certification Services Inc.

*Tested by:*



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Dennis Li  
Engineer  
Compliance Certification Services Inc.

## 2. EUT DESCRIPTION

|                              |                                                                                                                         |                        |                           |                         |
|------------------------------|-------------------------------------------------------------------------------------------------------------------------|------------------------|---------------------------|-------------------------|
| <b>Product</b>               | WLAN Module                                                                                                             |                        |                           |                         |
| <b>Model Number</b>          | WCBN4511R(12)                                                                                                           |                        |                           |                         |
| <b>Trade Name</b>            | LITE-ON                                                                                                                 |                        |                           |                         |
| <b>Model Discrepancy</b>     | N/A                                                                                                                     |                        |                           |                         |
| <b>Received Date</b>         | August 4, 2016                                                                                                          |                        |                           |                         |
| <b>Power supply</b>          | Powered from host device.                                                                                               |                        |                           |                         |
| <b>Frequency Range</b>       | 2412 ~ 2462 MHz                                                                                                         |                        |                           |                         |
| <b>Transmit Power</b>        | <b>Mode</b>                                                                                                             | <b>Frequency Range</b> | <b>Output Power (dBm)</b> | <b>Output Power (W)</b> |
|                              | IEEE 802.11b                                                                                                            | 2412 - 2462            | 22.67                     | 0.1849                  |
|                              | IEEE 802.11g                                                                                                            | 2412 - 2462            | 25.18                     | 0.3296                  |
|                              | IEEE 802.11n HT 20 MHz                                                                                                  | 2412 - 2462            | 24.98                     | 0.3148                  |
|                              | IEEE 802.11n HT 40 MHz                                                                                                  | 2422 - 2452            | 22.94                     | 0.1968                  |
| <b>Number of Channels</b>    | IEEE 802.11b/g mode: 11 Channels<br>IEEE 802.11n HT 20 MHz mode: 11 Channels<br>IEEE 802.11n HT 40 MHz mode: 7 Channels |                        |                           |                         |
| <b>Antenna Specification</b> | LITE-ON / WCBN4511R<br>PIFA Antenna<br>ANT-L: Gain: 2.54dBi<br>ANT-R: Gain: 0.93dBi                                     |                        |                           |                         |
| <b>Product SW/HW version</b> | V02/V02                                                                                                                 |                        |                           |                         |
| <b>Radio SW version</b>      | V02/V02                                                                                                                 |                        |                           |                         |
| <b>Radio HW version</b>      | V1.0.3.19                                                                                                               |                        |                           |                         |

**Remark:**

1. The sample selected for test was engineering sample that approximated to production product and was provided by manufacturer.
2. This submittal(s) (test report) is intended for FCC ID: **PPQ-WCBN4511R12** filing to comply with FCC Part 15C, Section 15.207, 15.209.

### **3. TEST METHODOLOGY**

The tests documented in this report were performed in accordance with ANSI C63.10: 2013 and FCC CFR 47 Part 15.207, 15.209, 15.247, KDB 558074 D01 DTS Meas Guidance v03r05

#### **3.1 EUT CONFIGURATION**

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

#### **3.2 EUT EXERCISE**

The EUT was operated in the engineering mode to fix the TX frequency that was for the purpose of the measurements.

According to its specifications, the EUT must comply with the requirements of the Section 15.207, 15.209 and 15.247 under the FCC Rules Part 15 Subpart C.

#### **3.3 GENERAL TEST PROCEDURES**

##### **Conducted Emissions**

According to the requirements in ANSI C63.10: 2013 Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-peak and average detector modes.

##### **Radiated Emissions**

The EUT is placed on a turn table, which is 1.5 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in ANSI C63.10: 2013.

### 3.4 FCC PART 15.205 RESTRICTED BANDS OF OPERATIONS

- (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

| MHz                        | MHz                 | MHz             | GHz              |
|----------------------------|---------------------|-----------------|------------------|
| 0.090 - 0.110              | 16.42 - 16.423      | 399.9 - 410     | 4.5 - 5.15       |
| <sup>1</sup> 0.495 - 0.505 | 16.69475 - 16.69525 | 608 - 614       | 5.35 - 5.46      |
| 2.1735 - 2.1905            | 16.80425 - 16.80475 | 960 - 1240      | 7.25 - 7.75      |
| 4.125 - 4.128              | 25.5 - 25.67        | 1300 - 1427     | 8.025 - 8.5      |
| 4.17725 - 4.17775          | 37.5 - 38.25        | 1435 - 1626.5   | 9.0 - 9.2        |
| 4.20725 - 4.20775          | 73 - 74.6           | 1645.5 - 1646.5 | 9.3 - 9.5        |
| 6.215 - 6.218              | 74.8 - 75.2         | 1660 - 1710     | 10.6 - 12.7      |
| 6.26775 - 6.26825          | 108 - 121.94        | 1718.8 - 1722.2 | 13.25 - 13.4     |
| 6.31175 - 6.31225          | 123 - 138           | 2200 - 2300     | 14.47 - 14.5     |
| 8.291 - 8.294              | 149.9 - 150.05      | 2310 - 2390     | 15.35 - 16.2     |
| 8.362 - 8.366              | 156.52475 -         | 2483.5 - 2500   | 17.7 - 21.4      |
| 8.37625 - 8.38675          | 156.52525           | 2655 - 2900     | 22.01 - 23.12    |
| 8.41425 - 8.41475          | 156.7 - 156.9       | 3260 - 3267     | 23.6 - 24.0      |
| 12.29 - 12.293             | 162.0125 - 167.17   | 3332 - 3339     | 31.2 - 31.8      |
| 12.51975 - 12.52025        | 167.72 - 173.2      | 3345.8 - 3358   | 36.43 - 36.5     |
| 12.57675 - 12.57725        | 240 - 285           | 3600 - 4400     | ( <sup>2</sup> ) |
| 13.36 - 13.41              | 322 - 335.4         |                 |                  |

<sup>1</sup> Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

<sup>2</sup> Above 38.6

- (b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

### 3.5 DESCRIPTION OF TEST MODES

The EUT (model: WCBN4511R(12)) had been tested under operating condition.

The EUT is a 2x2 configuration spatial MIMO (2Tx & 2Rx) without beam forming function that operate in double TX chains and double RX chains. The 2x2 configuration is implemented with two outside TX & RX chains (Chain 0 and 1).

Software used to control the EUT for staying in continuous transmitting and receiving mode was programmed.

After verification, all tests carried out are with the worst-case test modes as shown below except radiated spurious emission below 1GHz and power line conducted emissions below 30MHz, which worst case was in normal link mode and receiving radiated spurious emission above 1GHz, which worst case was in CH Mid mode only.

#### **IEEE 802.11b mode:**

Channel Low (2412MHz), Channel Mid (2437MHz) and Channel High (2462MHz) with 1Mbps data rate were chosen for full testing.

#### **IEEE 802.11g mode:**

Channel Low (2412MHz), Channel Mid (2437MHz) and Channel High (2462MHz) with 6Mbps data rate were chosen for full testing.

#### **IEEE 802.11n HT 20 MHz mode:**

Channel Low (2412MHz), Channel Mid (2437MHz) and Channel High (2462MHz) with 6.5Mbps data rate were chosen for full testing.

#### **IEEE 802.11n HT 40 MHz mode:**

Channel Low (2422MHz), Channel Mid (2437MHz) and Channel High (2452MHz) with 13.5Mbps data rate were chosen for full testing.

The field strength of spurious emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X, Y axis). The worst emission was found in lie-down position (Y axis) and the worst case was recorded.

### 3.6 THE WORST CASE POWER SETTING PARAMETER

#### IEEE 802.11b mode

| Channel | Frequency (MHz) | RF power setting in TEST SW (Chin 0) | RF power setting in TEST SW (Chin 1) |
|---------|-----------------|--------------------------------------|--------------------------------------|
| Low     | 2412            | 20                                   | 20                                   |
| Mid     | 2437            | 21                                   | 21                                   |
| High    | 2462            | 22                                   | 22                                   |

#### IEEE 802.11g mode

| Channel | Frequency (MHz) | RF power setting in TEST SW (Chin 0) | RF power setting in TEST SW (Chin 1) |
|---------|-----------------|--------------------------------------|--------------------------------------|
| Low     | 2412            | 18                                   | 18                                   |
| Mid     | 2437            | 25                                   | 25                                   |
| High    | 2462            | 1A                                   | 1A                                   |

#### IEEE 802.11n HT 20 MHz mode

| Channel | Frequency (MHz) | RF power setting in TEST SW (Chin 0) | RF power setting in TEST SW (Chin 1) |
|---------|-----------------|--------------------------------------|--------------------------------------|
| Low     | 2412            | 17                                   | 17                                   |
| Mid     | 2437            | 25                                   | 25                                   |
| High    | 2462            | 19                                   | 19                                   |

#### IEEE 802.11n HT 40 MHz mode

| Channel | Frequency (MHz) | RF power setting in TEST SW (Chin 0) | RF power setting in TEST SW (Chin 1) |
|---------|-----------------|--------------------------------------|--------------------------------------|
| Low     | 2422            | 13                                   | 13                                   |
| Mid     | 2437            | 1A                                   | 1A                                   |
| High    | 2452            | 13                                   | 13                                   |

## 4. INSTRUMENT CALIBRATION

### 4.1 MEASURING INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

### 4.2 MEASUREMENT EQUIPMENT USED

#### Equipment Used for Emissions Measurement

**Remark:** Each piece of equipment is scheduled for calibration once a year and Loop Antenna is scheduled for calibration once three years.

| Conducted Emissions Test Site   |              |           |               |                  |                 |
|---------------------------------|--------------|-----------|---------------|------------------|-----------------|
| Name of Equipment               | Manufacturer | Model     | Serial Number | Calibration Date | Calibration Due |
| DC Power Supplies               | GW Instek    | SPS-3610  | GPE880163     | 01/19/2016       | 01/18/2017      |
| Power Meter                     | Anritsu      | ML2495A   | 1012009       | 07/04/2016       | 07/03/2017      |
| Power Sensor                    | Anritsu      | MA2411B   | 917072        | 07/04/2016       | 07/03/2017      |
| Signal Analyzer                 | R&S          | FSV 40    | 101073        | 07/20/2015       | 07/19/2016      |
| Spectrum Analyzer               | Agilent      | E4446A    | US42510268    | 02/15/2016       | 02/14/2017      |
| Thermostatic/Hrgrosatic Chamber | TAICHY       | MHG-150LF | 930619        | 10/08/2015       | 10/07/2016      |
| Vector Signal Generator         | R&S          | SMU 200A  | 102239        | 03/10/2016       | 03/09/2017      |
| AC Power Source                 | EXTECH       | 6205      | 1140845       | N.C.R            | N.C.R           |

| Wugu 966 Chamber A |                    |                     |               |                  |                 |
|--------------------|--------------------|---------------------|---------------|------------------|-----------------|
| Name of Equipment  | Manufacturer       | Model               | Serial Number | Calibration Date | Calibration Due |
| Bilog Antenna      | Sunol Sciences     | JB3                 | A030105       | 08/06/2015       | 08/05/2016      |
| EMI Test Receiver  | R&S                | ESCI                | 100064        | 05/31/2016       | 05/30/2017      |
| Horn Antenna       | EMCO               | 3117                | 55165         | 02/24/2016       | 02/23/2017      |
| Horn Antenna       | EMCO               | 3116                | 26370         | 01/15/2016       | 01/14/2017      |
| K Type Cable       | Huber+Suhner       | SUCOFLEX 102        | 29406/2       | 01/12/2016       | 01/11/2017      |
| K Type Cable       | Huber+Suhner       | SUCOFLEX 102        | 22470/2       | 01/12/2016       | 01/11/2017      |
| Pre-Amplifier      | MITEQ              | AMF-6F-260400-40-8P | 985646        | 01/14/2016       | 01/13/2017      |
| Pre-Amplifier      | EMCI               | EMC 012635          | 980151        | 06/23/2016       | 06/22/2017      |
| Pre-Amplifier      | EMCI               | EM330               | N/A           | 06/08/2016       | 06/07/2017      |
| Spectrum Analyzer  | Agilent            | E4446A              | US42510252    | 12/08/2015       | 12/07/2016      |
| Antenna Tower      | CCS                | CC-A-1F             | N/A           | N.C.R            | N.C.R           |
| Controller         | CCS                | CC-C-1F             | N/A           | N.C.R            | N.C.R           |
| Turn Table         | CCS                | CC-T-1F             | N/A           | N.C.R            | N.C.R           |
| Software           | EZ-EMC (CCS-3A1RE) |                     |               |                  |                 |

| Conducted Emission Room # B |              |           |               |                  |                 |
|-----------------------------|--------------|-----------|---------------|------------------|-----------------|
| Name of Equipment           | Manufacturer | Model     | Serial Number | Calibration Date | Calibration Due |
| EMI Test Receiver           | R&S          | ESCI      | 101073        | 09/09/2015       | 09/08/2016      |
| LISN                        | SCHWARZBECK  | NSLK 8127 | 8127-541      | 11/23/2015       | 11/22/2016      |
| LISN                        | R&S          | ENV216    | 101054        | 05/11/2016       | 05/10/2017      |
| Capacitive Voltage Probe    | FCC          | F-CVP-1   | 100185        | 03/09/2016       | 03/08/2017      |
| Test S/W                    | CCS-3A1-CE   |           |               |                  |                 |

### 4.3 MEASUREMENT UNCERTAINTY

| PARAMETER                             | UNCERTAINTY |
|---------------------------------------|-------------|
| Powerline Conducted Emission          | +/- 1.2575  |
| 3M Semi Anechoic Chamber / 30M~200M   | +/- 4.0138  |
| 3M Semi Anechoic Chamber / 200M~1000M | +/- 3.9483  |
| 3M Semi Anechoic Chamber / 1G~8G      | +/- 2.5975  |
| 3M Semi Anechoic Chamber / 8G~18G     | +/- 2.6112  |
| 3M Semi Anechoic Chamber / 18G~26G    | +/- 2.7389  |
| 3M Semi Anechoic Chamber / 26G~40G    | +/- 2.9683  |

**Remark:** This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of  $k=2$ .

## 5. FACILITIES AND ACCREDITATIONS

### 5.1 FACILITIES

All measurement facilities used to collect the measurement data are located at

- ☐ No.199, Chunghsen Road, Hsintien City, Taipei Hsien, Taiwan, R.O.C.  
Tel: 886-2-2217-0894 / Fax: 886-2-2217-1029
- ☒ No.11, Wugong 6th Rd., Wugu Dist., New Taipei City 24891, Taiwan. (R.O.C.)  
Tel: 886-2-2299-9720 / Fax: 886-2-2298-4045
- ☐ No.81-1, Lane 210, Bade 2nd Rd., Lujhu Township, Taoyuan County 33841, TAIWAN, R.O.C.  
Tel: 886-3-324-0332 / Fax: 886-3-324-5235

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.10: 2013 and CISPR Publication 22.

### 5.2 EQUIPMENT

Radiated emissions are measured with one or more of the following types of linearly polarized antennas: tuned dipole, biconical, log periodic, bi-log, ridged waveguide, horn and/or Loop. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements.

Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers.

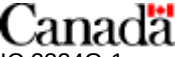
Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

### 5.3 LABORATORY ACCREDITATIONS AND LISTING

The test facilities used to perform radiated and conducted emissions tests are accredited by American Association for Laboratory Accreditation Program for the specific scope accreditation under Lab Code: 0824-01 to perform Electromagnetic Interference tests according to FCC Part 15 and CISPR 22 requirements. In addition, the test facilities are listed with Industry Canada, Certification and Engineering Bureau, IC 2324G-1 for 3M Semi Anechoic Chamber A, 2324G-2 for 3M Semi Anechoic Chamber B.

## 5.4 TABLE OF ACCREDITATIONS AND LISTINGS

| Country | Agency          | Scope of Accreditation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Logo                                                                                                            |
|---------|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|
| USA     | FCC             | 3M Semi Anechoic Chamber (FCC MRA: TW1039) to perform FCC Part 15 measurements                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <br>FCC MRA: TW1039          |
| Taiwan  | TAF             | LP0002, RTTE01, FCC Method-47 CFR Part 15 Subpart C, D, E, RSS-210, RSS-310<br>IDA TS SRD, AS/NZS 4268, AS/NZS 4771, TS 12.1 & 12.2, ETSI EN 300 440-1, ETSI EN 300 440-2, ETSI EN 300 328, ETSI EN 300 220-1, ETSI EN 300 220-2, ETSI EN 301 893, ETSI EN 301 489-1/3/7/17<br>FCC OET Bulletin 65 + Supplement C, EN 50360, EN 50361, EN 50371, RSS 102, EN 50383, EN 50385, EN 50392, IEC 62209, CNS 14958-1, CNS 14959<br>FCC Method –47 CFR Part 15 Subpart B<br>IEC / EN 61000-3-2, IEC / EN 61000-3-3, IEC / EN 61000-4-2/3/4/5/6/8/11 |                              |
| Canada  | Industry Canada | 3M Semi Anechoic Chamber (IC 2324G-1 / IC 2324G-2) to perform                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <br>IC 2324G-1<br>IC 2324G-2 |

\* No part of this report may be used to claim or imply product endorsement by A2LA or any agency of the US Government.

## 6. SETUP OF EQUIPMENT UNDER TEST

### 6.1 SETUP CONFIGURATION OF EUT

See test photographs attached in Appendix II for the actual connections between EUT and support equipment.

### 6.2 SUPPORT EQUIPMENT

| No | Equipment   | Brand | Model   | Series No.   | FCC ID      | Data Cable | Power Cord                                                                |
|----|-------------|-------|---------|--------------|-------------|------------|---------------------------------------------------------------------------|
| 1  | Notebook PC | ASUS  | M5200AE | 5BN0AG019631 | PD9WM3B2100 | N/A        | AC I/P:<br>Unshielded, 1.8m<br>with a core<br>DC O/P:<br>Unshielded, 1.8m |

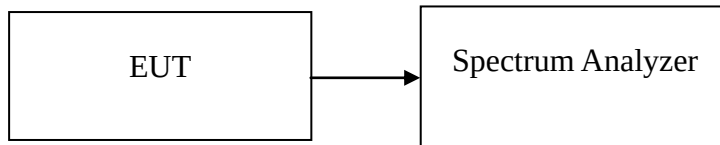
**Remark:**

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

## 7. FCC PART 15.247 REQUIREMENTS

### 7.1 99% BANDWIDTH

#### Test Configuration



#### TEST PROCEDURE

The resolution bandwidth shall be set to as close to 1% of the selected span as is possible without being below 1%. The video bandwidth shall be set to 3 times the resolution bandwidth. Video averaging is not permitted. Where practical, a sampling detector shall be used since a peak or, peak hold.

## **Test Data**

### **IEEE 802.11b mode / Chain 0**

| Channel | Frequency (MHz) | 99% Bandwidth (MHz) |
|---------|-----------------|---------------------|
| Low     | 2412            | 12.1997             |
| Mid     | 2437            | 12.1562             |
| High    | 2462            | 12.1562             |

### **IEEE 802.11b mode / Chain 1**

| Channel | Frequency (MHz) | 99% Bandwidth (MHz) |
|---------|-----------------|---------------------|
| Low     | 2412            | 12.2865             |
| Mid     | 2437            | 12.3733             |
| High    | 2462            | 12.3733             |

### **IEEE 802.11g mode/ Chain 0**

| Channel | Frequency (MHz) | 99% Bandwidth (MHz) |
|---------|-----------------|---------------------|
| Low     | 2412            | 16.4109             |
| Mid     | 2437            | 16.5412             |
| High    | 2462            | 16.4978             |

### **IEEE 802.11g mode/ Chain 1**

| Channel | Frequency (MHz) | 99% Bandwidth (MHz) |
|---------|-----------------|---------------------|
| Low     | 2412            | 16.4978             |
| Mid     | 2437            | 16.6280             |
| High    | 2462            | 16.4544             |

**IEEE 802.11n HT 20 MHz mode / Chain 0**

| Channel | Frequency (MHz) | 99% Bandwidth (MHz) |
|---------|-----------------|---------------------|
| Low     | 2412            | 17.5832             |
| Mid     | 2437            | 17.5832             |
| High    | 2462            | 17.5832             |

**IEEE 802.11n HT 20 MHz mode / Chain 1**

| Channel | Frequency (MHz) | 99% Bandwidth (MHz) |
|---------|-----------------|---------------------|
| Low     | 2412            | 17.5832             |
| Mid     | 2437            | 17.7134             |
| High    | 2462            | 17.5397             |

**IEEE 802.11n HT 40 MHz mode / Chain 0**

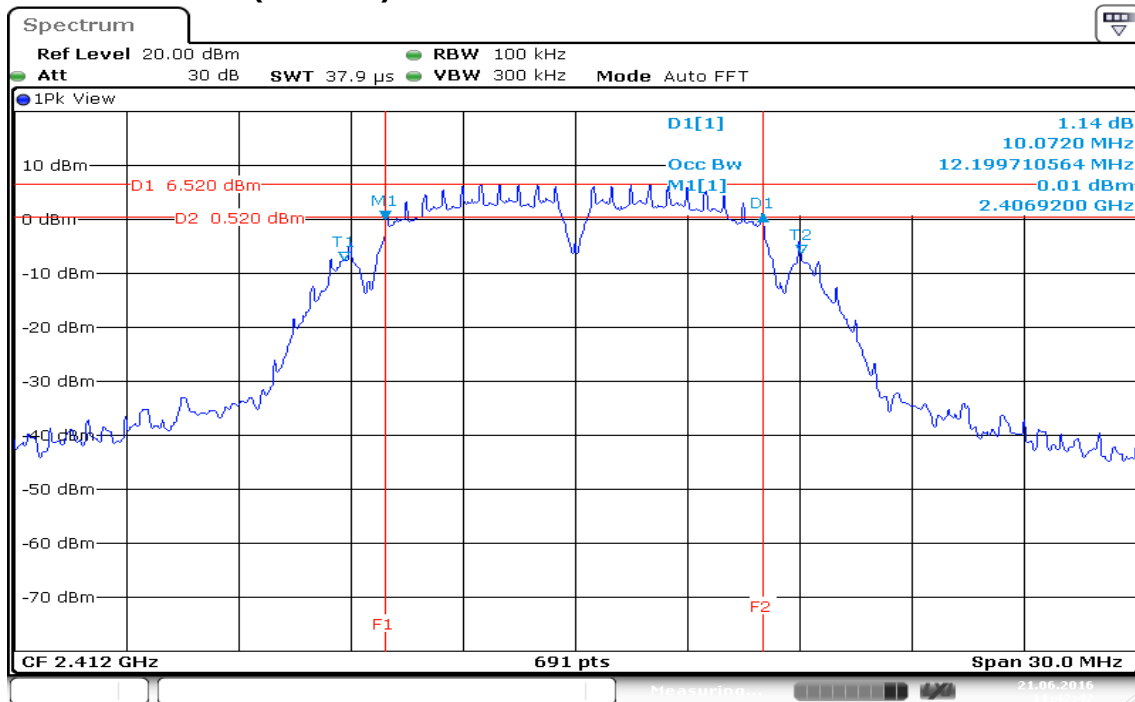
| Channel | Frequency (MHz) | 99% Bandwidth (MHz) |
|---------|-----------------|---------------------|
| Low     | 2422            | 35.7742             |
| Mid     | 2437            | 35.8900             |
| High    | 2452            | 36.0057             |

**IEEE 802.11n HT 40 MHz mode / Chain 1**

| Channel | Frequency (MHz) | 99% Bandwidth (MHz) |
|---------|-----------------|---------------------|
| Low     | 2422            | 35.7742             |
| Mid     | 2437            | 35.8900             |
| High    | 2452            | 35.8900             |

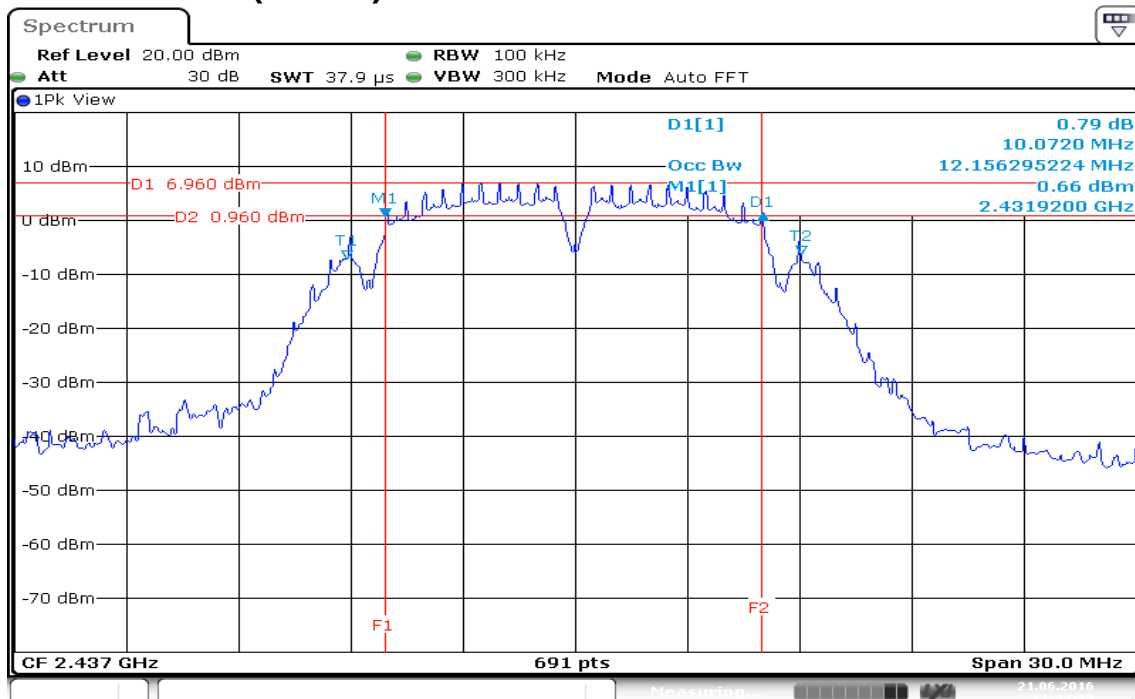
## Test Plot

### IEEE 802.11b mode/ Chain 0 99% Bandwidth (CH Low)



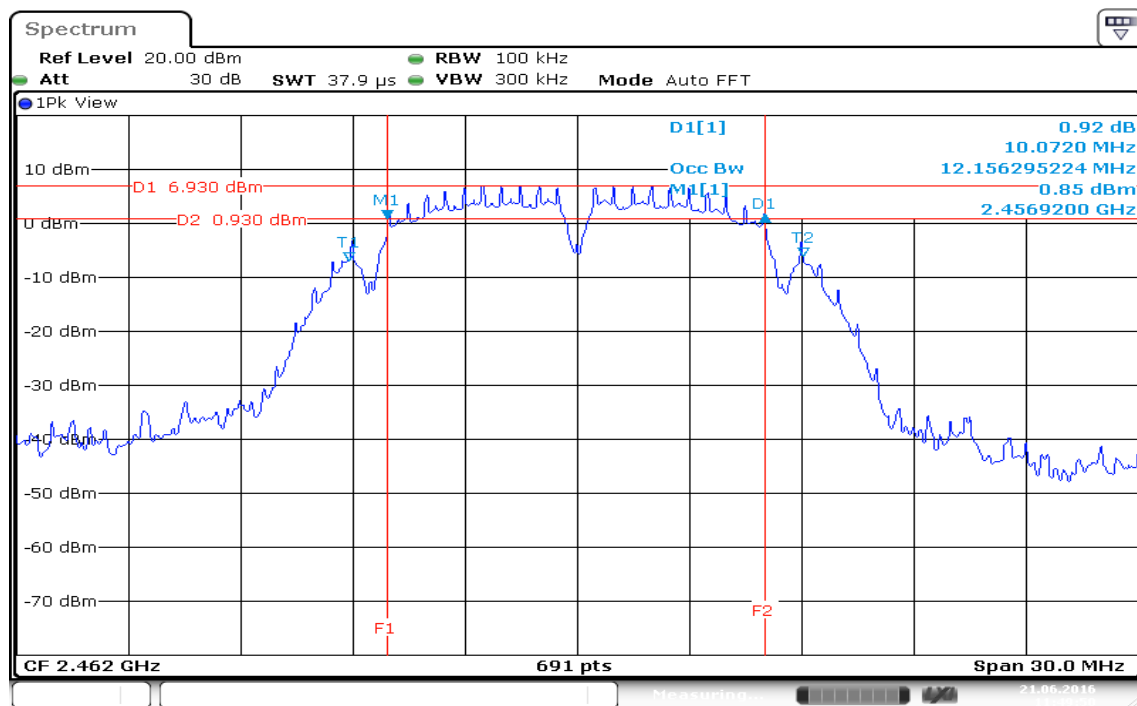
Date: 21.JUN.2016 11:42:43

### 99% Bandwidth (CH Mid)



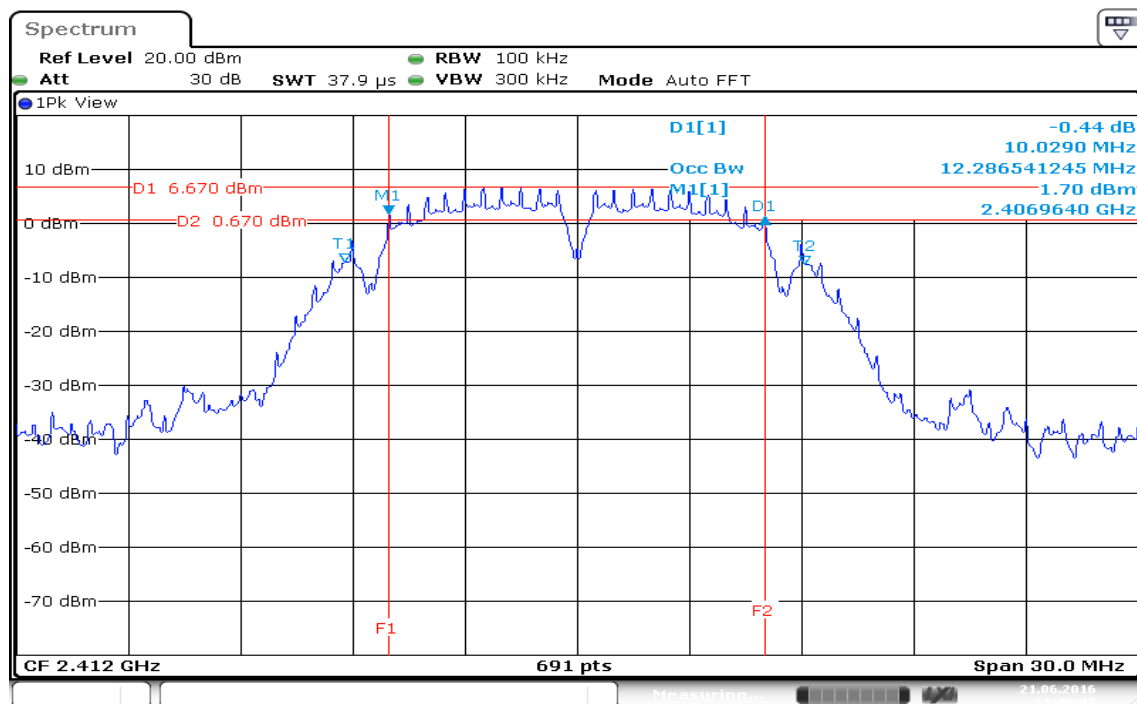
Date: 21.JUN.2016 11:44:30

## 99% Bandwidth (CH High)



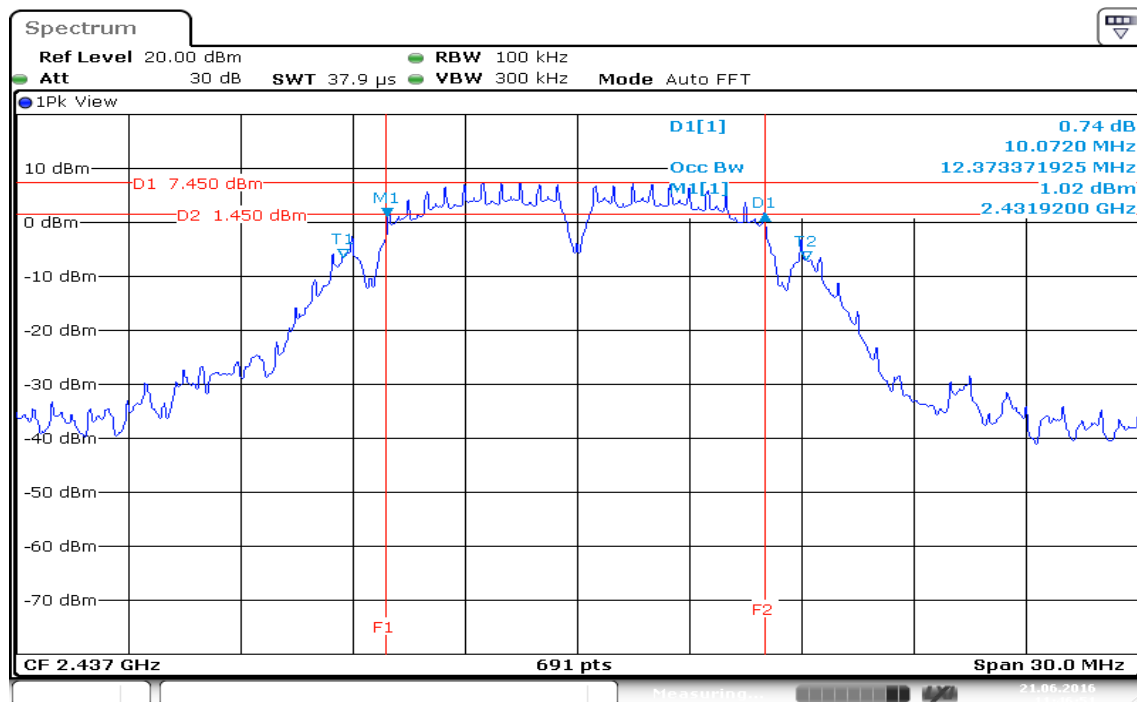
Date: 21.JUN.2016 11:49:50

## IEEE 802.11b mode/ Chain 1



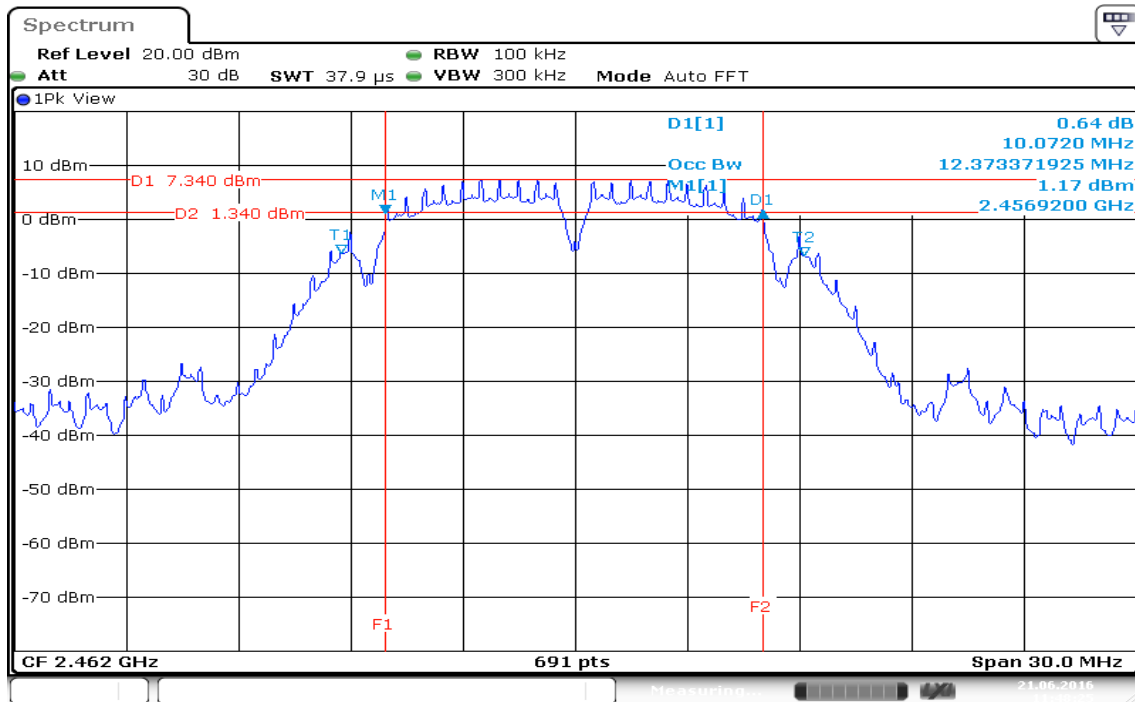
Date: 21.JUN.2016 11:40:38

### 99% Bandwidth (CH Mid)



Date: 21.JUN.2016 11:46:51

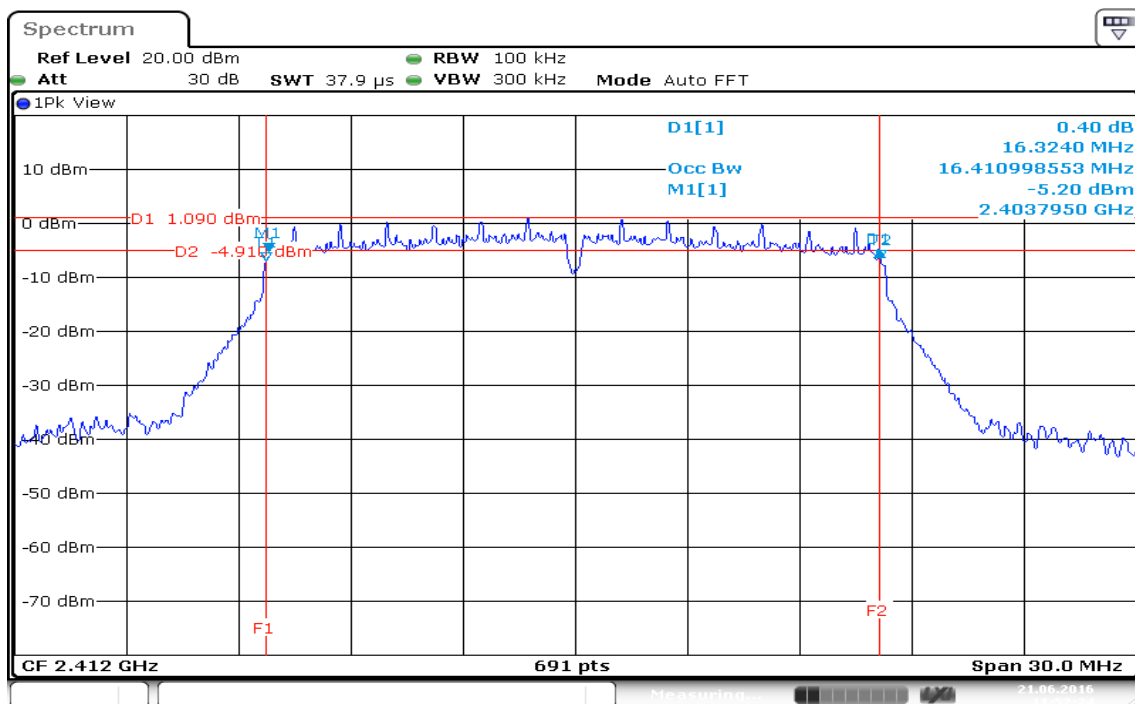
## 99% Bandwidth (CH High)



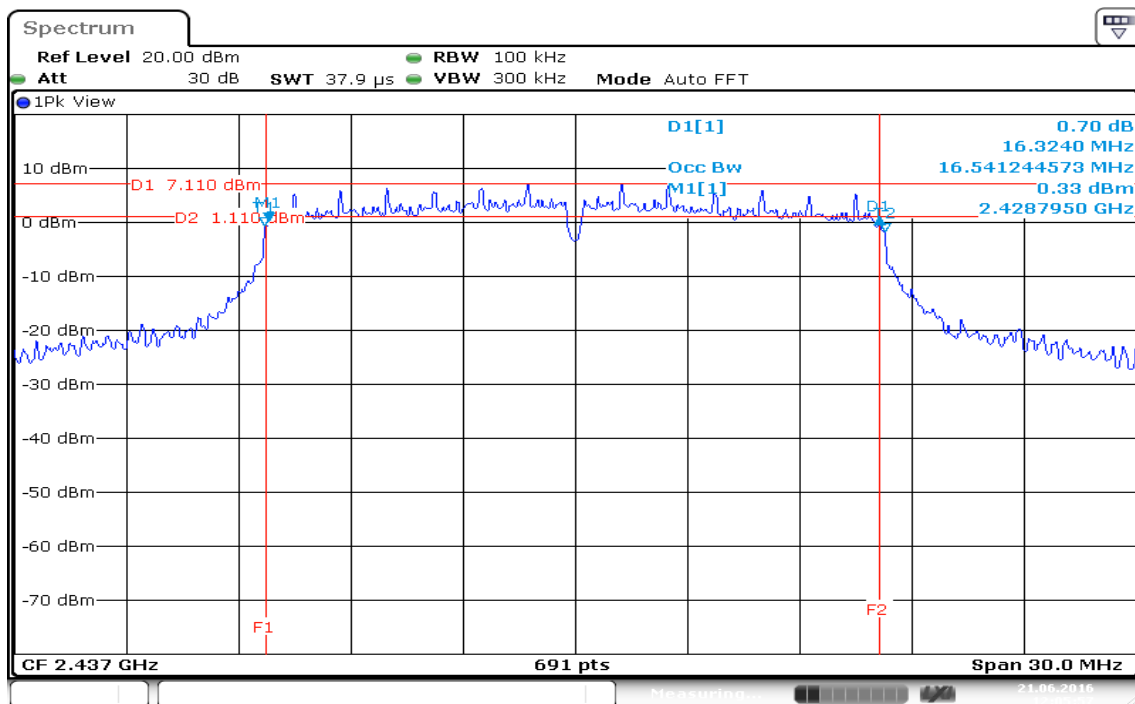
Date: 21.JUN.2016 11:48:26

## IEEE 802.11g mode / Chain 0

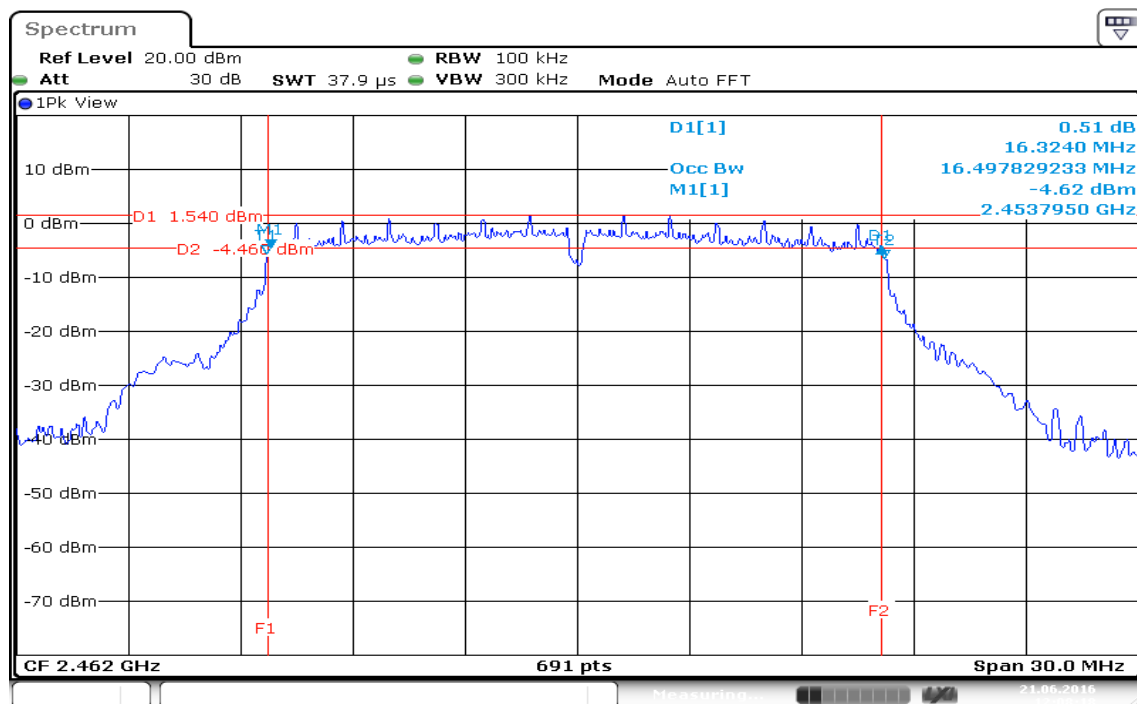
### 99% Bandwidth (CH Low)



### 99% Bandwidth (CH Mid)



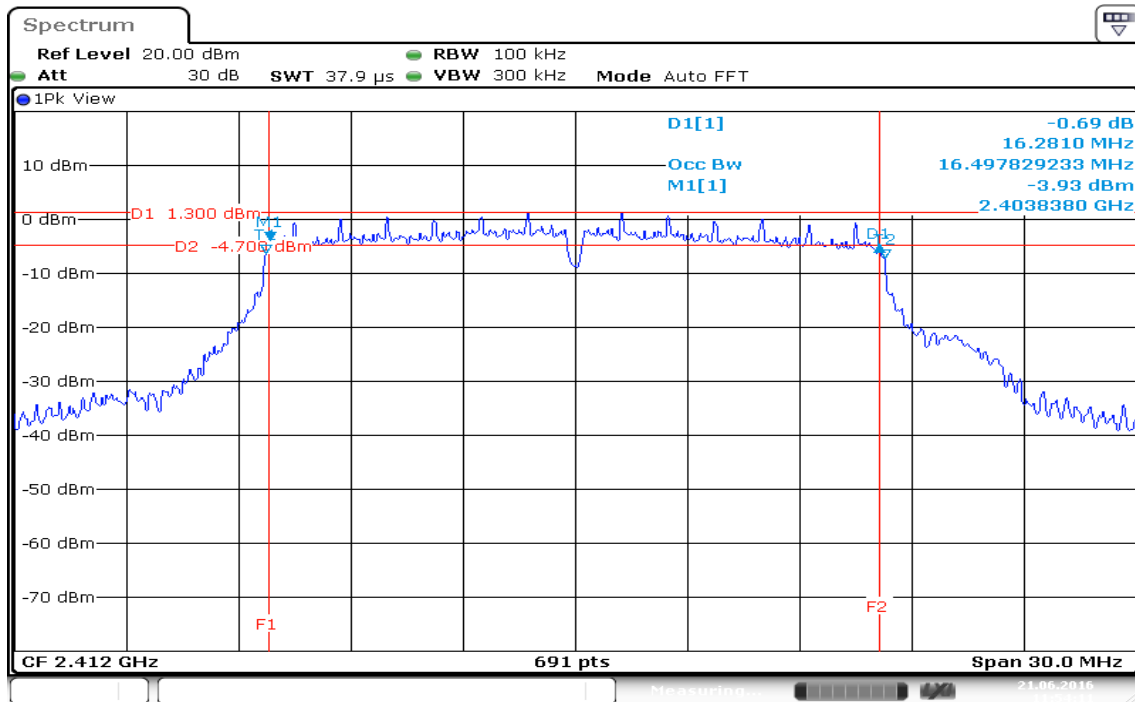
## 99% Bandwidth (CH High)



Date: 21.JUN.2016 12:08:19

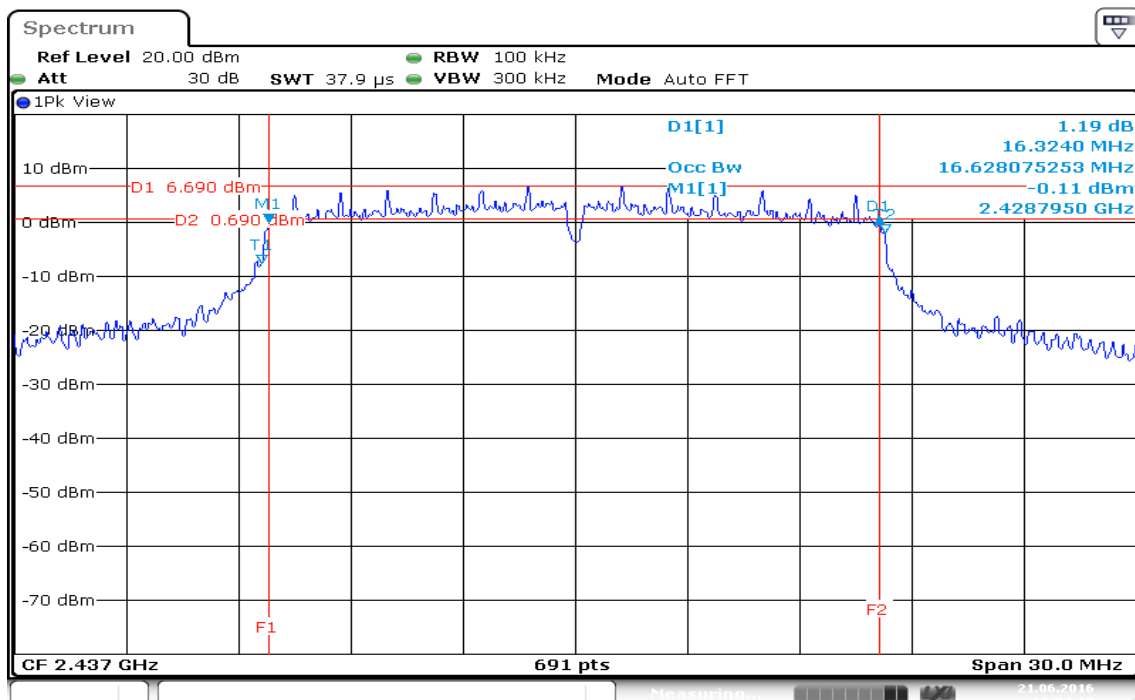
## IEEE 802.11g mode / Chain 1

### 99% Bandwidth (CH Low)



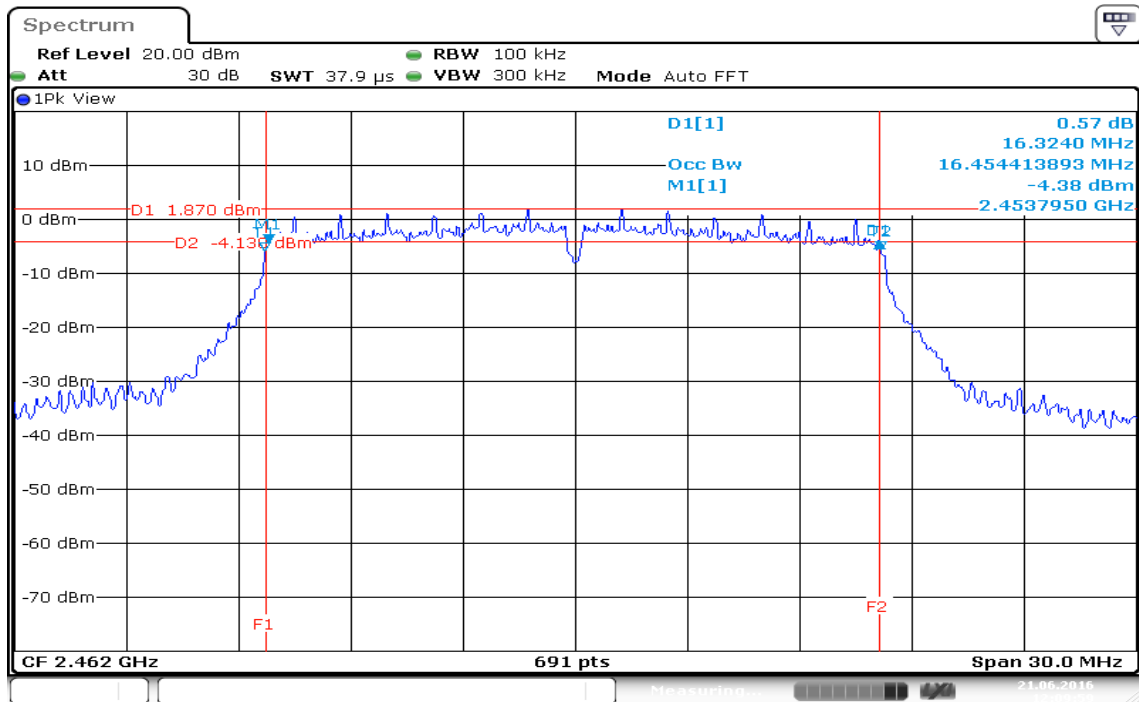
Date: 21.JUN.2016 11:54:11

### 99% Bandwidth (CH Mid)



Date: 21.JUN.2016 12:04:11

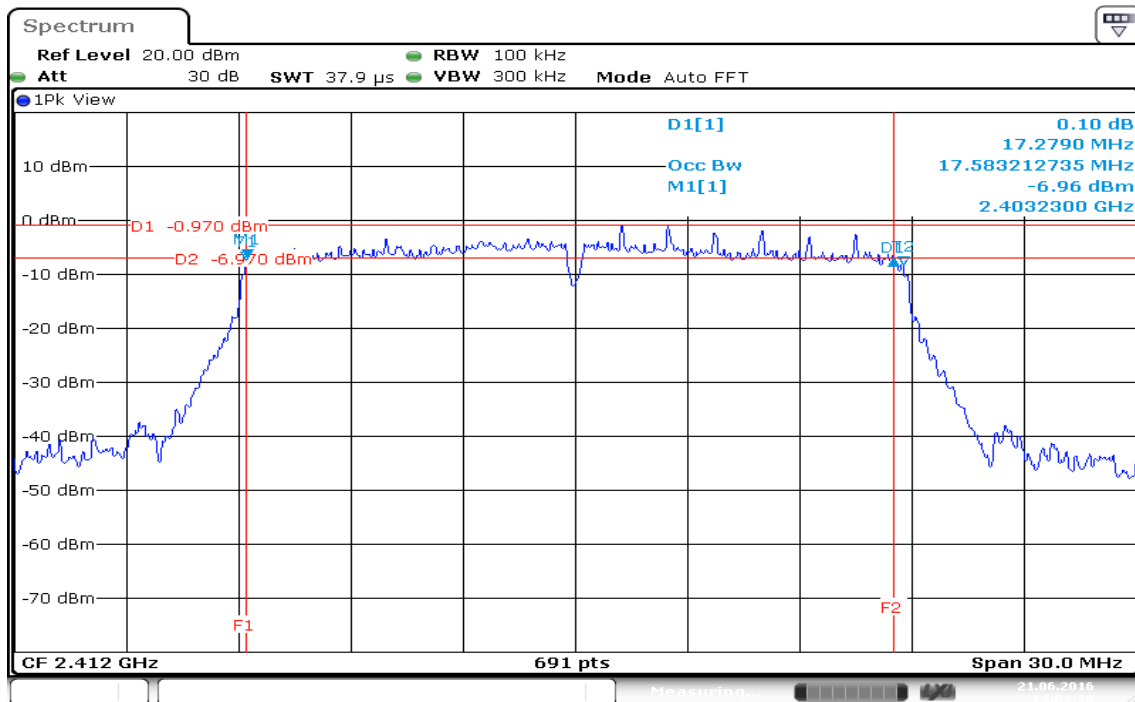
## 99% Bandwidth (CH High)



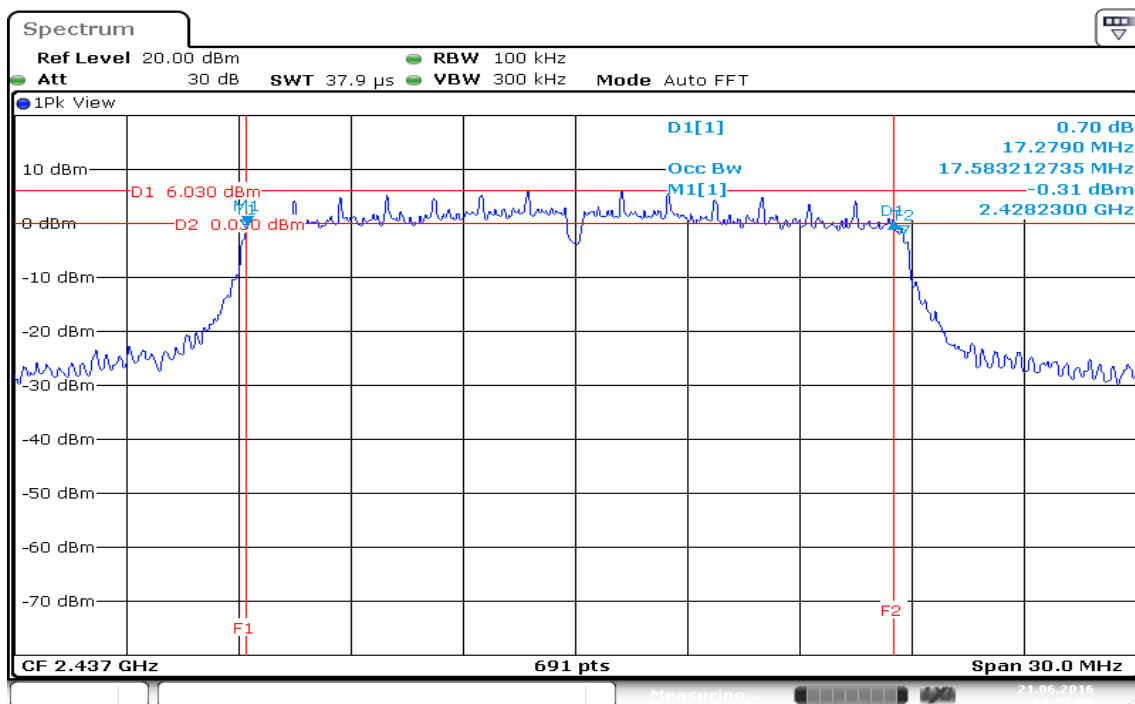
Date: 21.JUN.2016 12:09:59

## IEEE 802.11n HT 20 MHz mode/ Chain 0

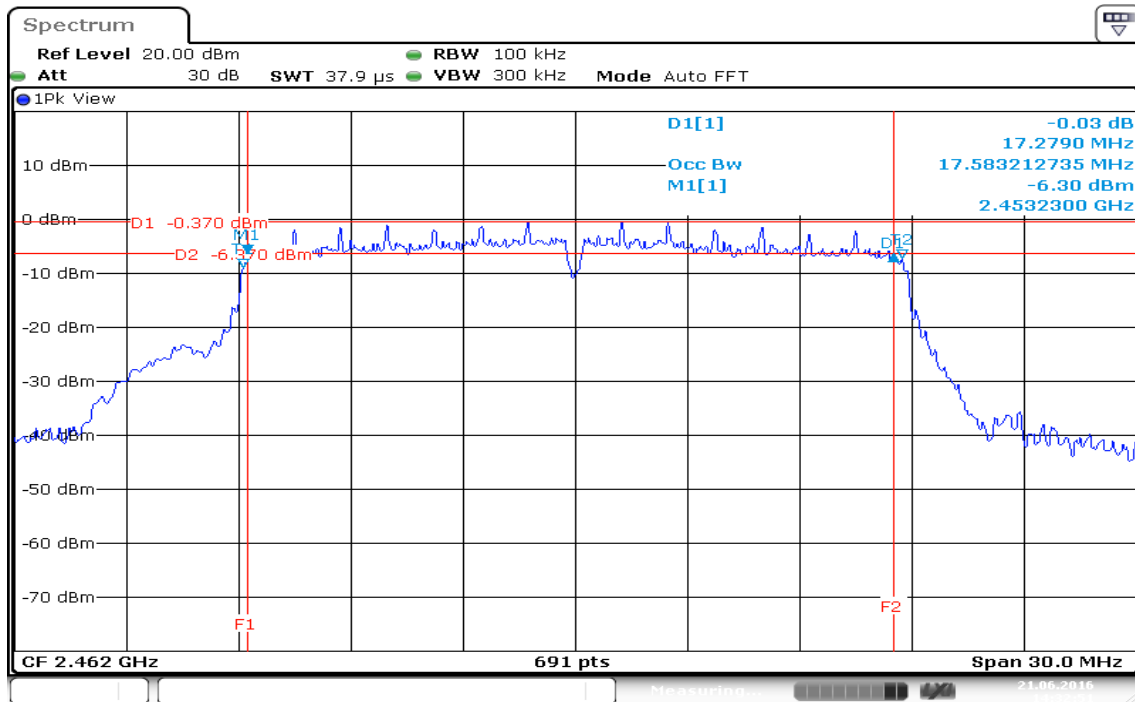
### 99% Bandwidth (CH Low)



### 99% Bandwidth (CH Mid)



## 99% Bandwidth (CH High)



Date: 21.JUN.2016 14:32:51

**Spectrum**

Ref Level 20.00 dBm RBW 100 kHz  
 Att 30 dB SWT 37.9  $\mu$ s VBW 300 kHz Mode Auto FFT

1Pk View

D1[1] -0.21 dB  
 17.1490 MHz  
 Occ Bw 17.583212735 MHz  
 M1[1] -3.36 dBm  
 2.4032300 GHz

D1 2.460 dBm  
 D2 -3.340 dBm

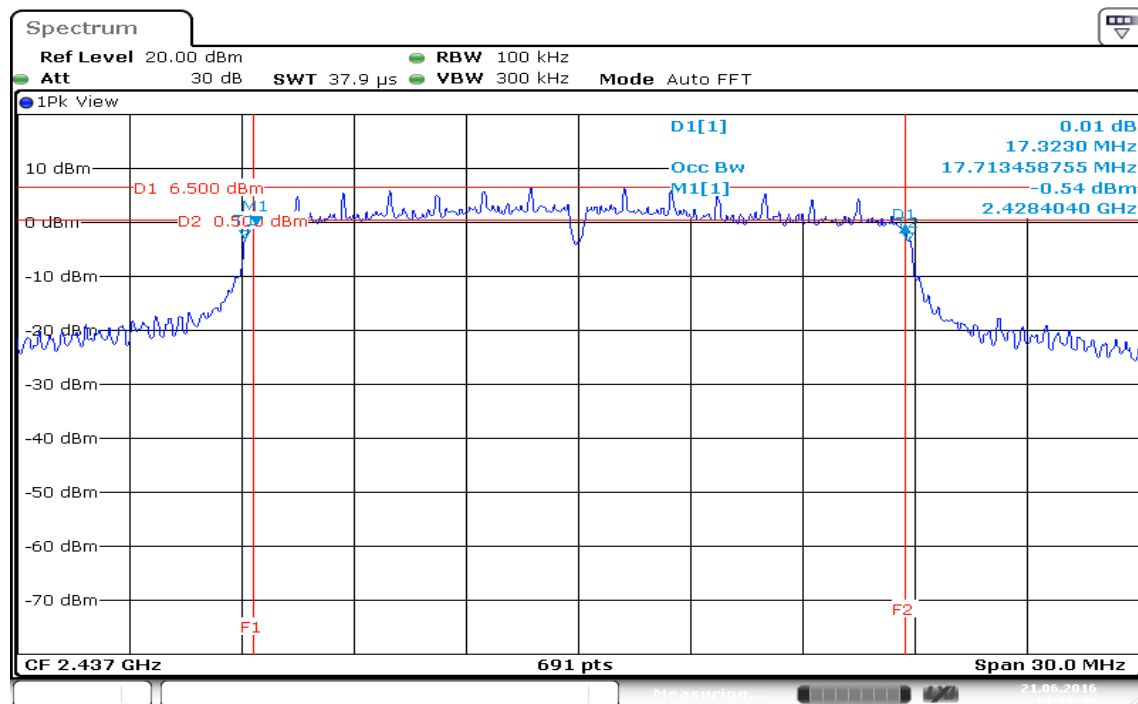
F1 F2

CF 2.412 GHz 691 pts Span 30.0 MHz

Measuring...

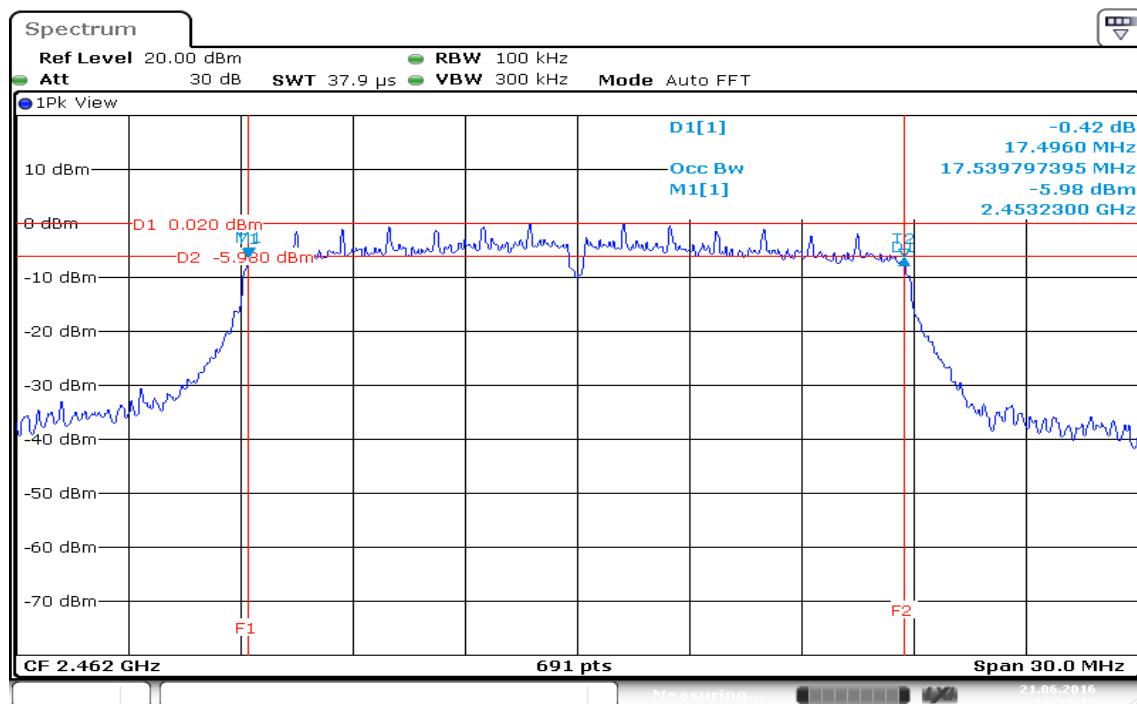
21.06.2016

### 99% Bandwidth (CH Mid)



Rev.00

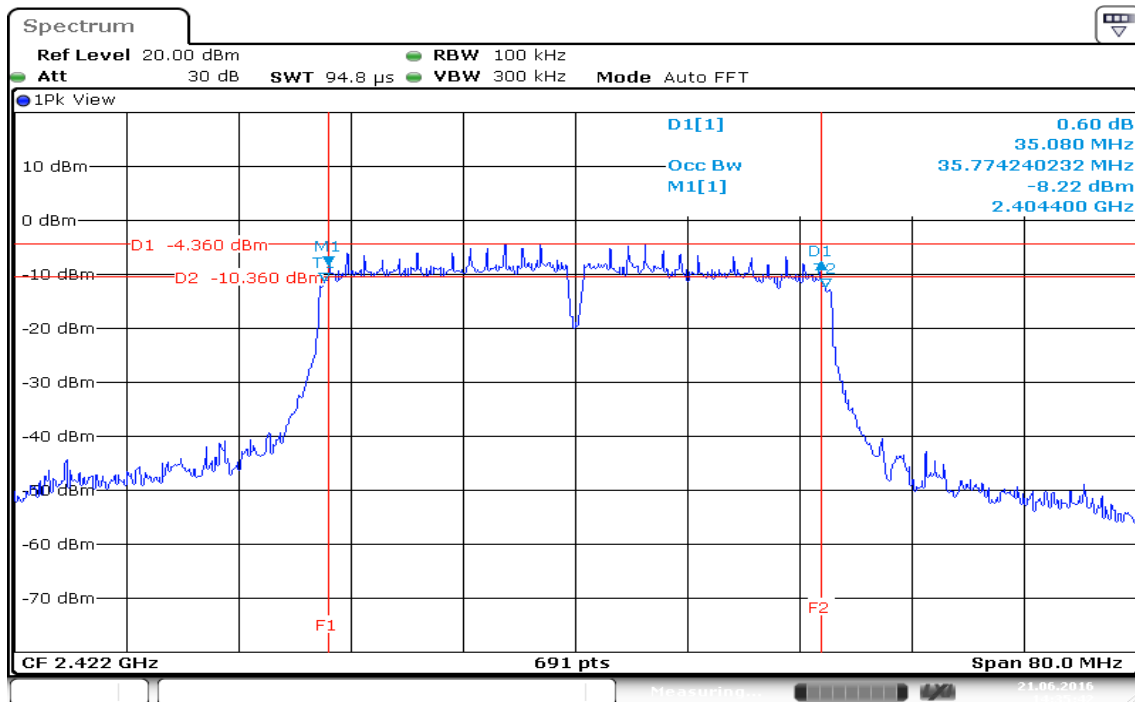
## 99% Bandwidth (CH High)



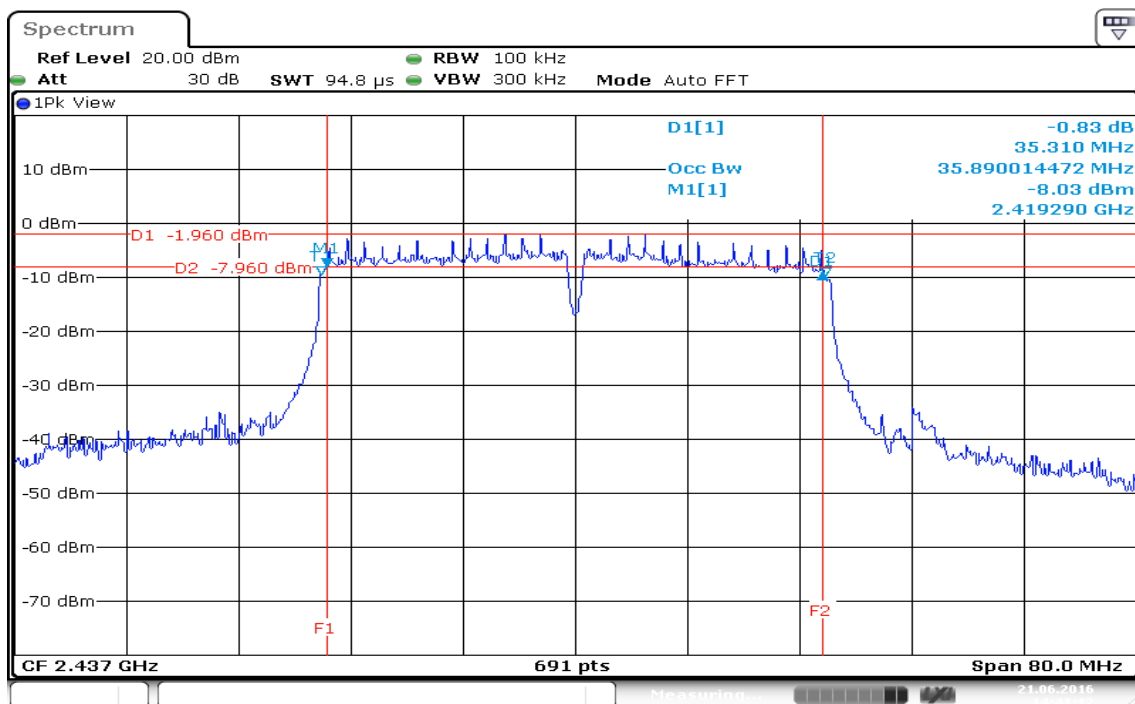
Date: 21.JUN.2016 14:31:13

## IEEE 802.11n HT 40 MHz mode/ Chain 0

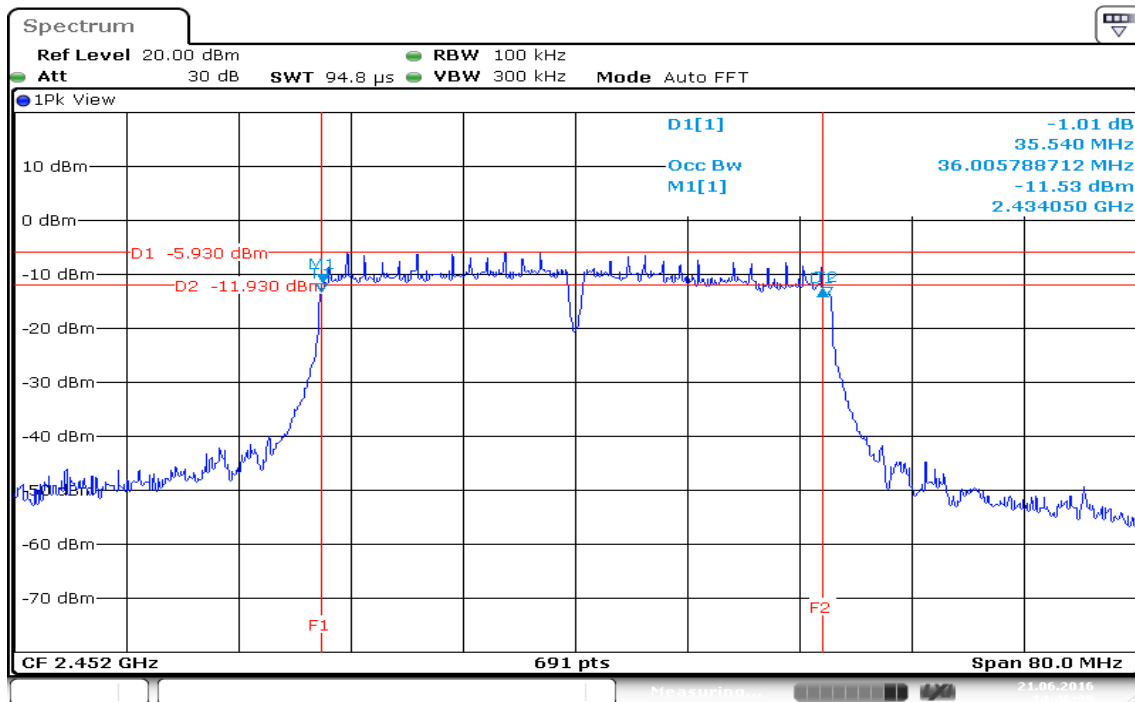
### 99% Bandwidth (CH Low)



### 99% Bandwidth (CH Mid)



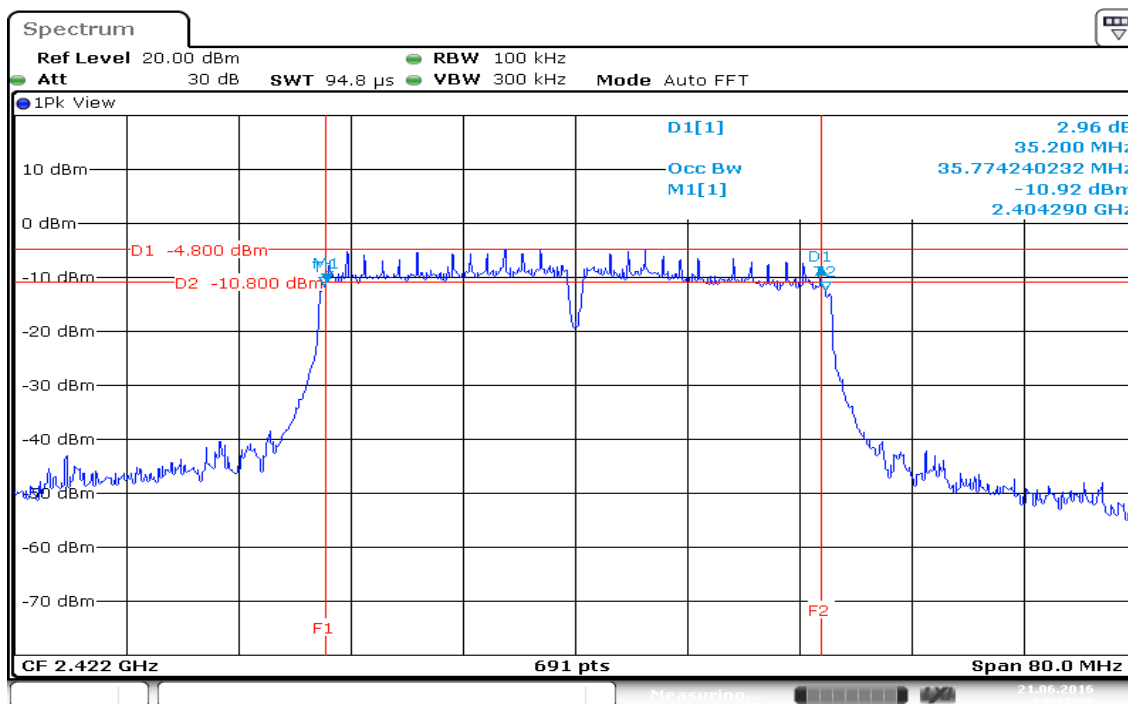
## 99% Bandwidth (CH High)



Date: 21.JUN.2016 14:46:29

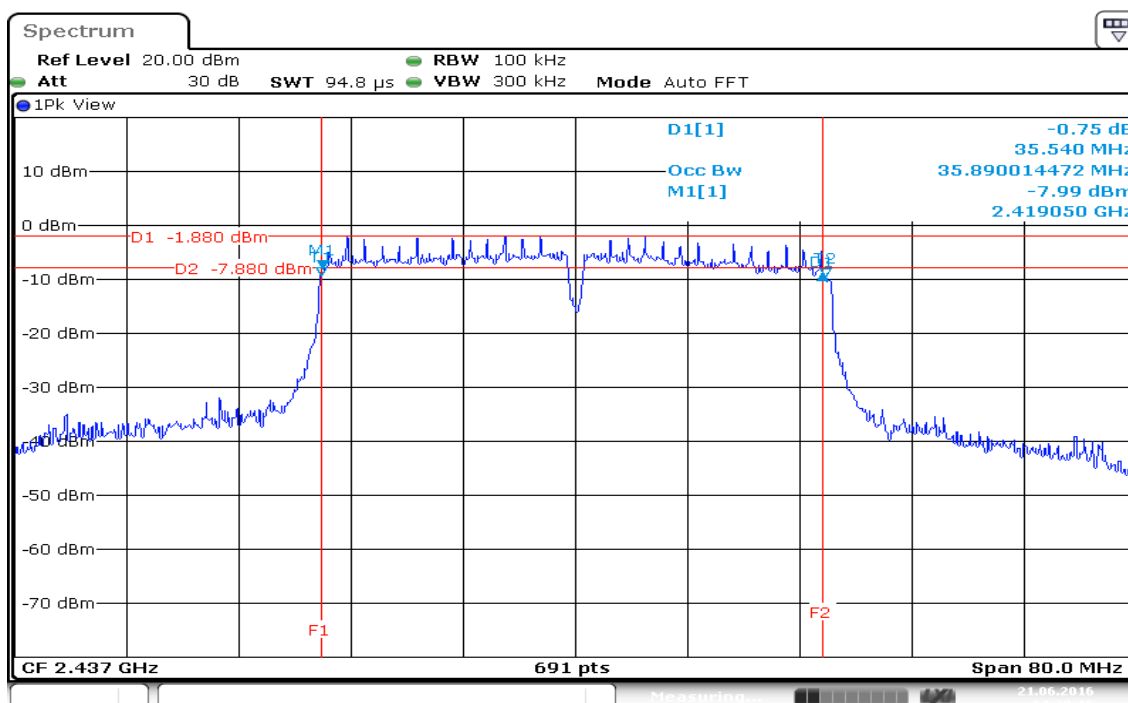
## IEEE 802.11n HT 40 MHz mode / Chain 1

### 99% Bandwidth (CH Low)



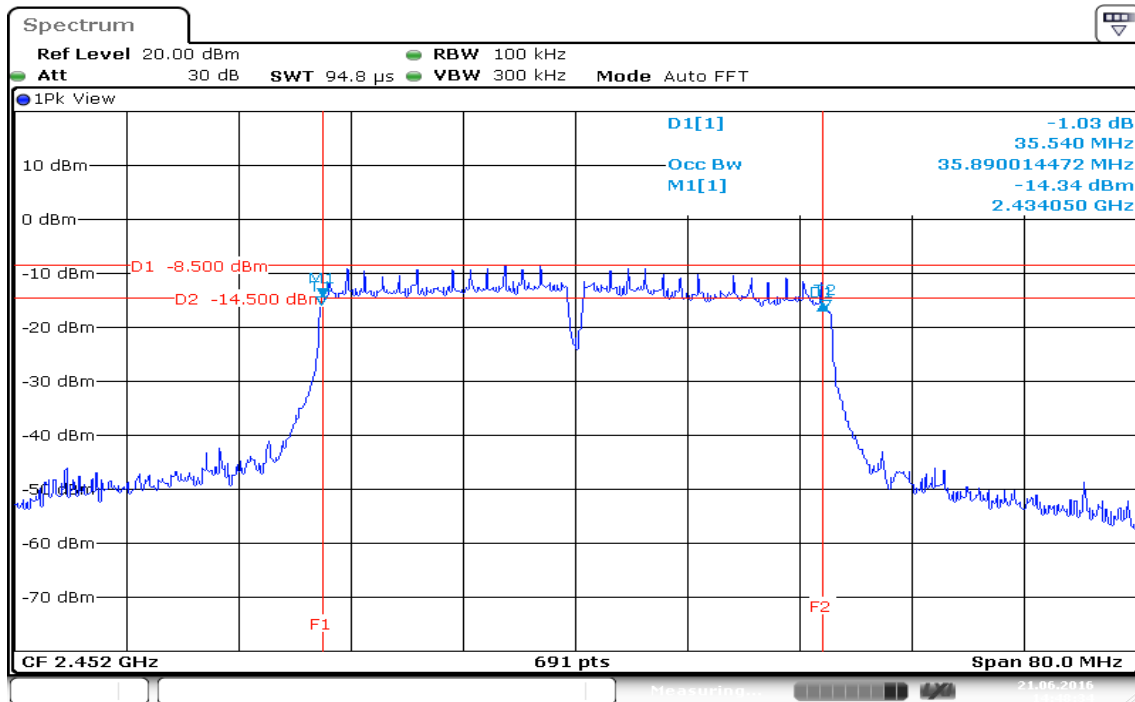
Date: 21.JUN.2016 14:37:26

### 99% Bandwidth (CH Mid)



Date: 21.JUN.2016 14:39:16

## 99% Bandwidth (CH High)



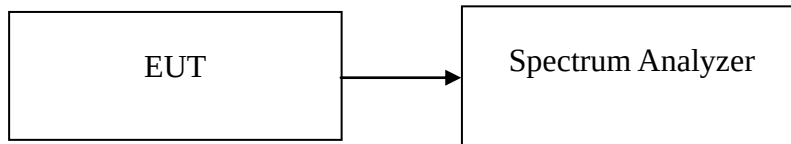
Date: 21.JUN.2016 14:48:34

## 7.2 6DB BANDWIDTH

### LIMIT

According to §15.247(a)(2), systems using digital modulation techniques may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz, and 5725 - 5850 MHz bands. The minimum 6dB bandwidth shall be at least 500 kHz.

### Test Configuration



### TEST PROCEDURE

1. Place the EUT on the table and set it in the transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as RBW = 100 kHz, VBW= 300kHz, Span = 50 MHz, Sweep = auto.
4. Mark the peak frequency and –6dB (upper and lower) frequency.
5. Repeat until all the rest channels are investigated.

### TEST RESULTS

*No non-compliance noted*

## **Test Data**

### **IEEE 802.11b mode / Chain 0**

| Channel | Frequency (MHz) | 6dB Bandwidth (MHz) | Limit (kHz) | Result |
|---------|-----------------|---------------------|-------------|--------|
| Low     | 2412            | 10.0720             | >500        | PASS   |
| Mid     | 2437            | 10.0720             |             | PASS   |
| High    | 2462            | 10.0720             |             | PASS   |

### **IEEE 802.11b mode / Chain 1**

| Channel | Frequency (MHz) | 6dB Bandwidth (MHz) | Limit (kHz) | Result |
|---------|-----------------|---------------------|-------------|--------|
| Low     | 2412            | 10.0290             | >500        | PASS   |
| Mid     | 2437            | 10.0720             |             | PASS   |
| High    | 2462            | 10.0720             |             | PASS   |

### **IEEE 802.11g mode / Chain 0**

| Channel | Frequency (MHz) | 6dB Bandwidth (MHz) | Limit (kHz) | Result |
|---------|-----------------|---------------------|-------------|--------|
| Low     | 2412            | 16.3240             | >500        | PASS   |
| Mid     | 2437            | 16.3240             |             | PASS   |
| High    | 2462            | 16.3240             |             | PASS   |

### **IEEE 802.11g mode / Chain 1**

| Channel | Frequency (MHz) | 6dB Bandwidth (MHz) | Limit (kHz) | Result |
|---------|-----------------|---------------------|-------------|--------|
| Low     | 2412            | 16.2810             | >500        | PASS   |
| Mid     | 2437            | 16.3240             |             | PASS   |
| High    | 2462            | 16.3240             |             | PASS   |

**IEEE 802.11n HT 20 MHz mode / Chain 0**

| Channel | Frequency (MHz) | 6dB Bandwidth (MHz) | Limit (kHz) | Result |
|---------|-----------------|---------------------|-------------|--------|
| Low     | 2412            | 17.2790             | >500        | PASS   |
| Mid     | 2437            | 17.2790             |             | PASS   |
| High    | 2462            | 17.2790             |             | PASS   |

**IEEE 802.11n HT 20 MHz mode / Chain 1**

| Channel | Frequency (MHz) | 6dB Bandwidth (MHz) | Limit (kHz) | Result |
|---------|-----------------|---------------------|-------------|--------|
| Low     | 2412            | 17.1490             | >500        | PASS   |
| Mid     | 2437            | 17.3230             |             | PASS   |
| High    | 2462            | 17.4960             |             | PASS   |

**IEEE 802.11n HT 40 MHz mode / Chain 0**

| Channel | Frequency (MHz) | 6dB Bandwidth (MHz) | Limit (kHz) | Result |
|---------|-----------------|---------------------|-------------|--------|
| Low     | 2422            | 35.0800             | >500        | PASS   |
| Mid     | 2437            | 35.3100             |             | PASS   |
| High    | 2452            | 35.5400             |             | PASS   |

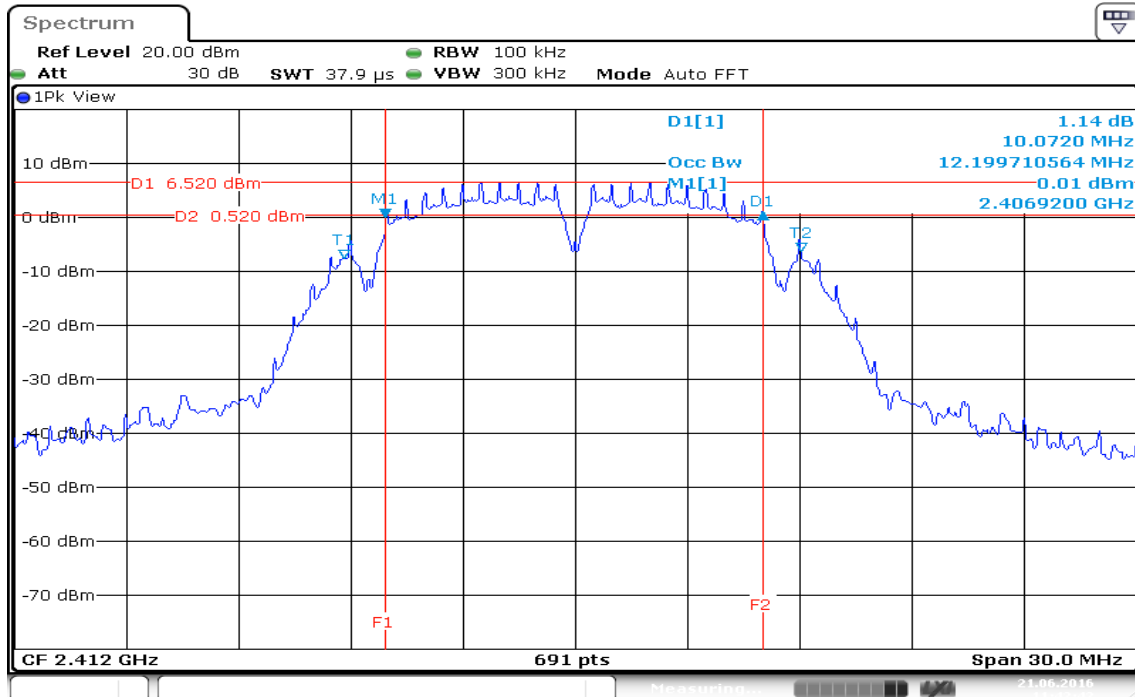
**IEEE 802.11n HT 40 MHz mode / Chain 1**

| Channel | Frequency (MHz) | 6dB Bandwidth (MHz) | Limit (kHz) | Result |
|---------|-----------------|---------------------|-------------|--------|
| Low     | 2422            | 35.2000             | >500        | PASS   |
| Mid     | 2437            | 35.5400             |             | PASS   |
| High    | 2452            | 35.5400             |             | PASS   |

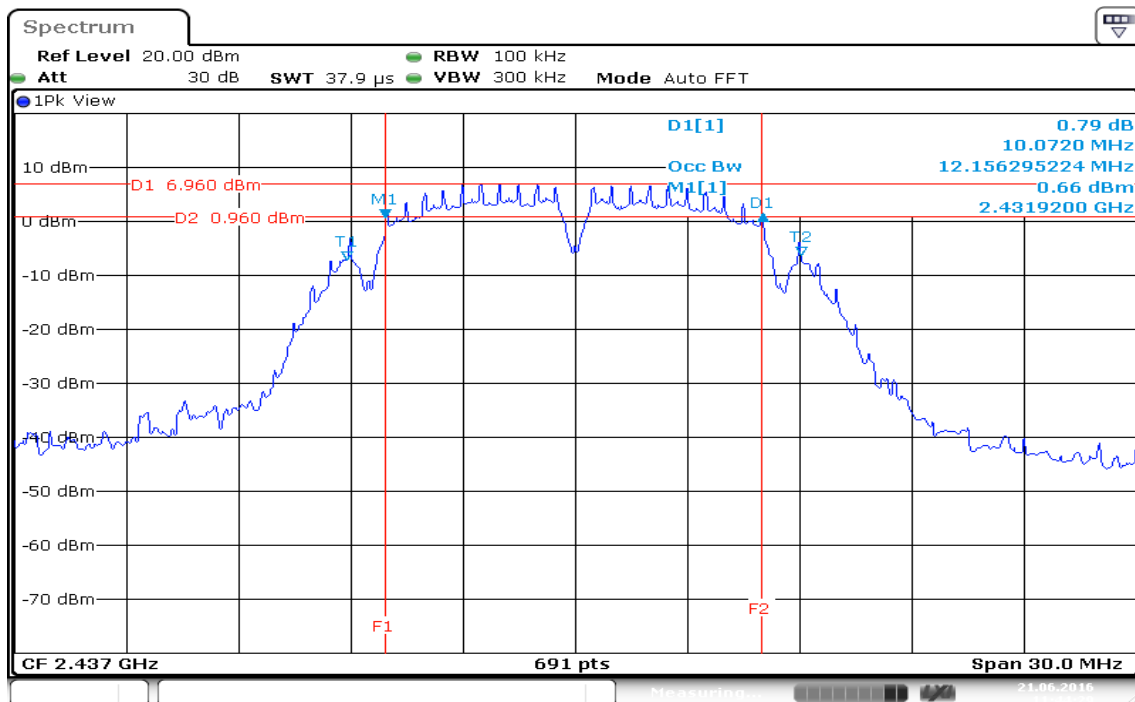
## Test Plot

IEEE 802.11b mode/ Chain 0

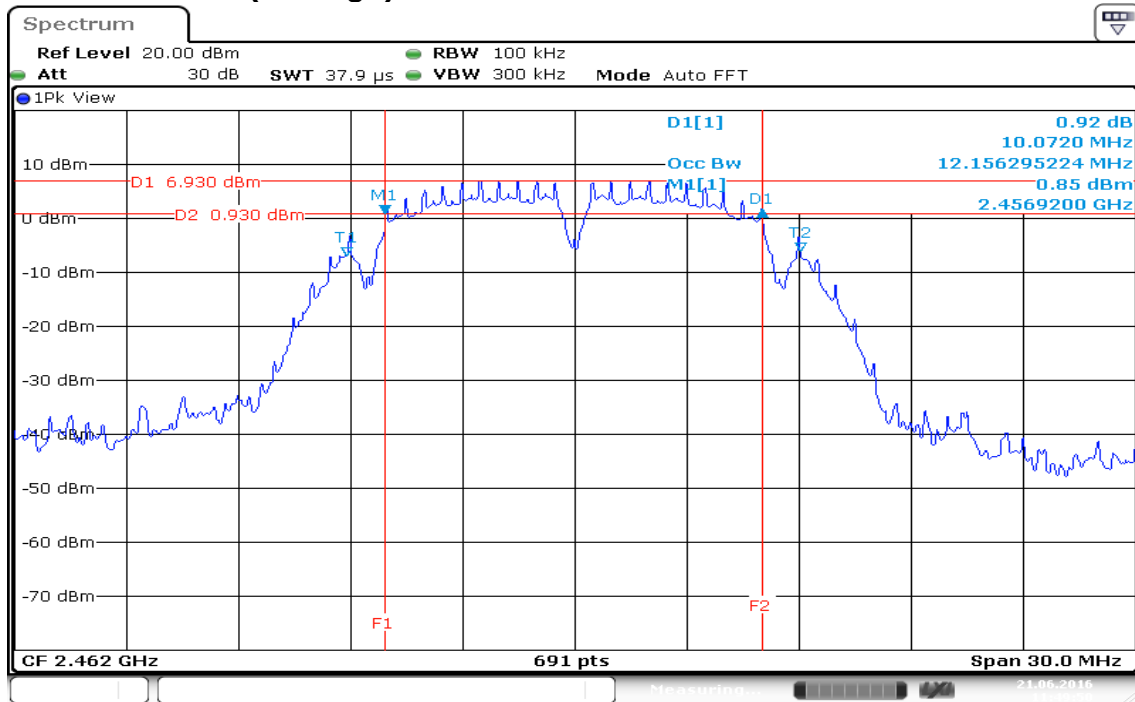
6dB Bandwidth (CH Low)



6dB Bandwidth (CH Mid)



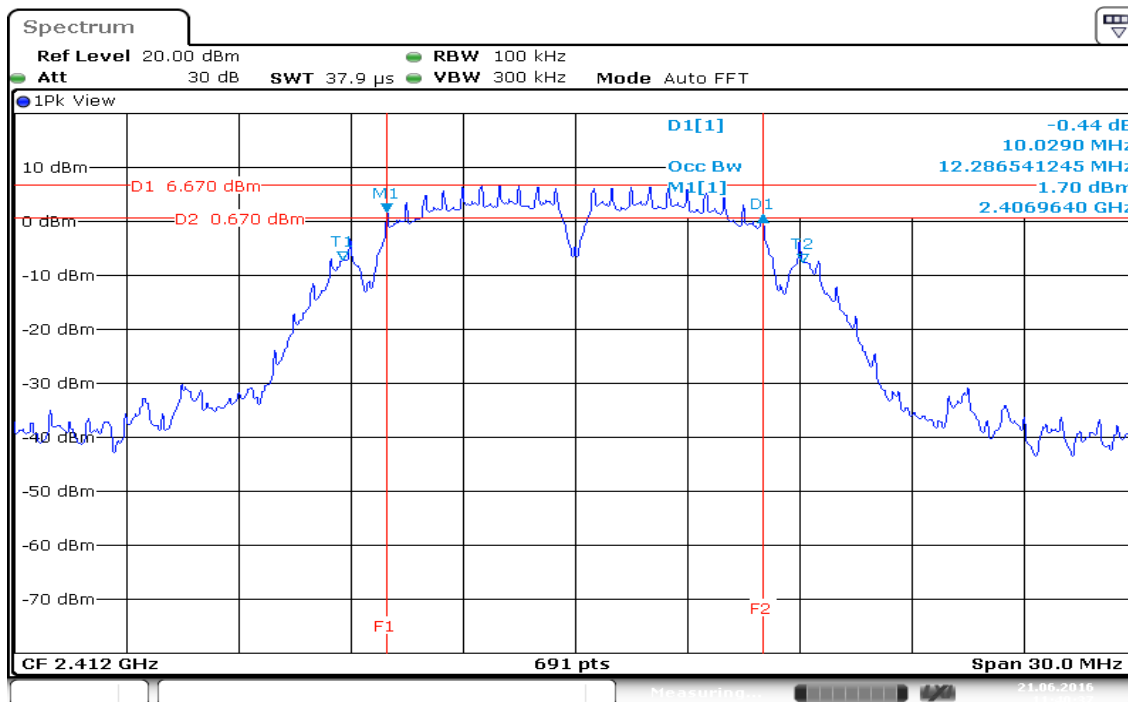
## 6dB Bandwidth (CH High)



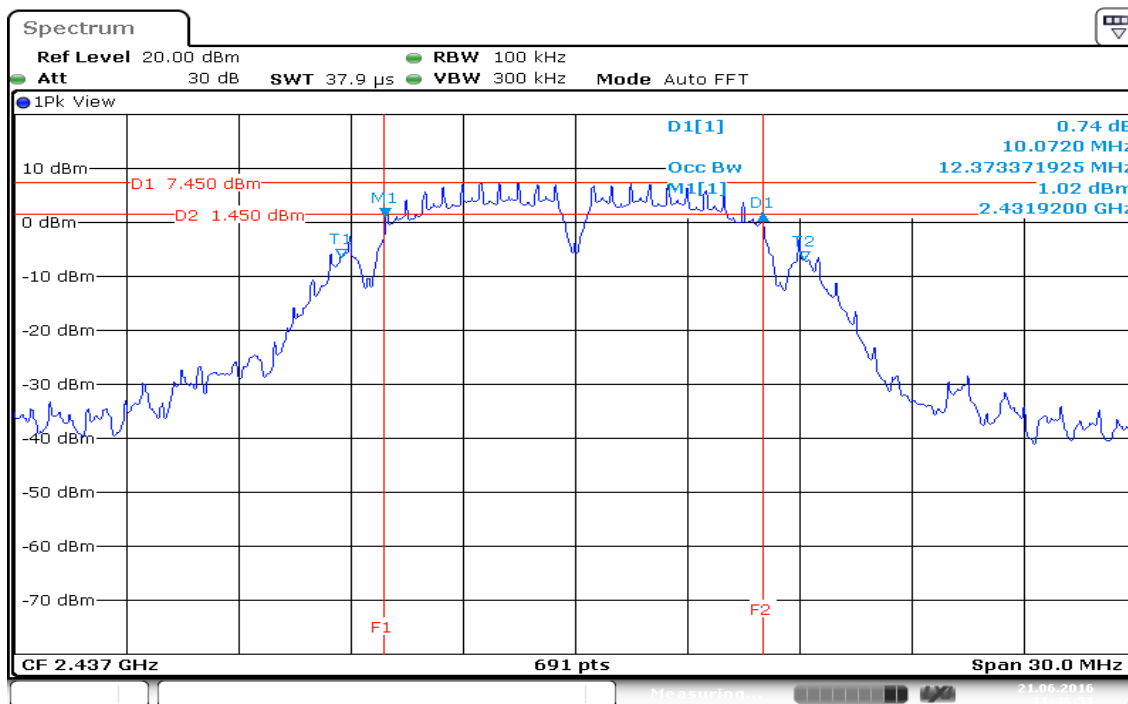
Date: 21.JUN.2016 11:49:50

## IEEE 802.11b mode/ Chain 1

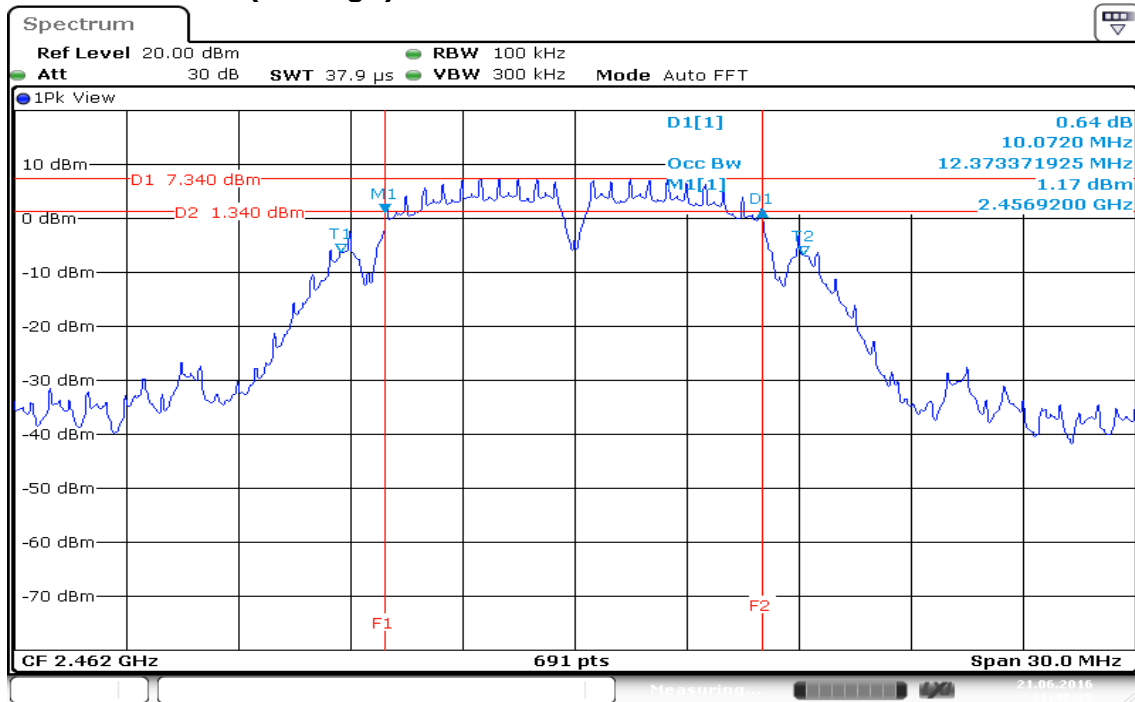
### 6dB Bandwidth (CH Low)



### 6dB Bandwidth (CH Mid)



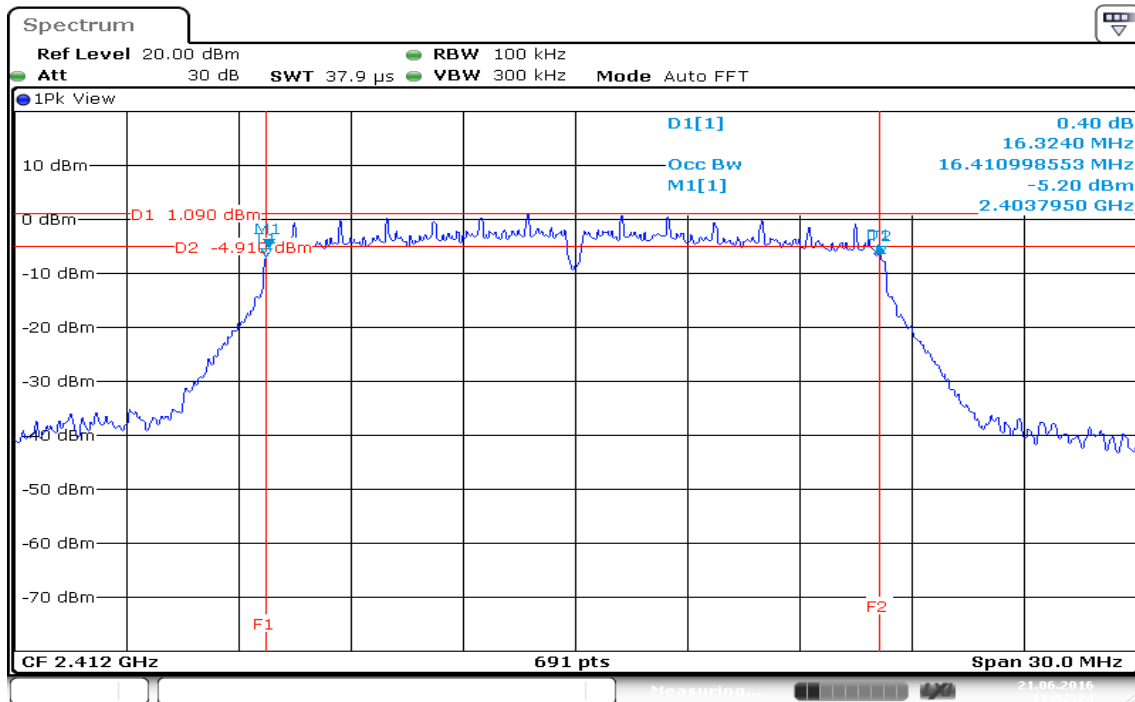
## 6dB Bandwidth (CH High)



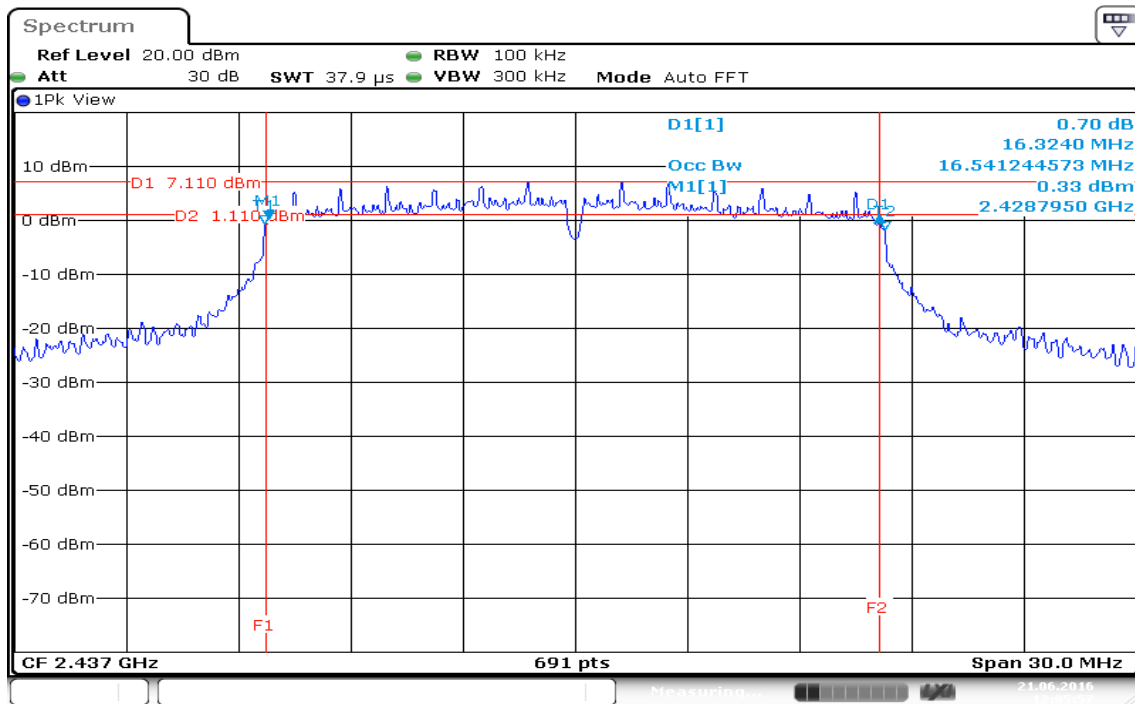
Date: 21.JUN.2016 11:48:26

## IEEE 802.11g mode / Chain 0

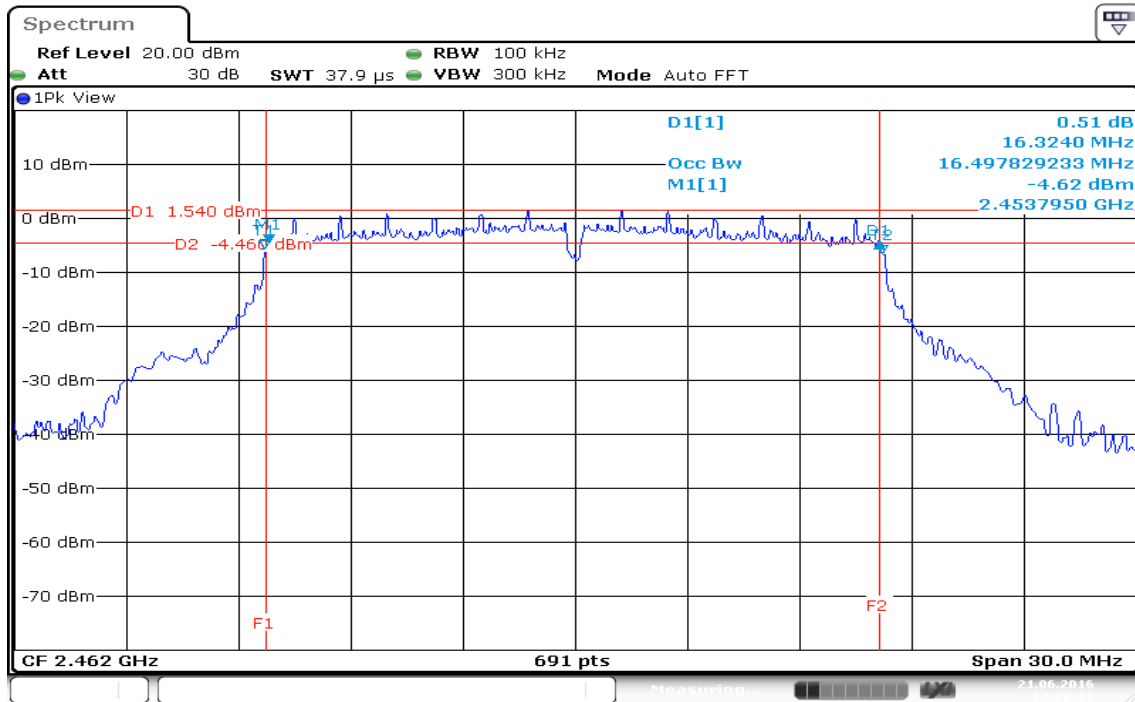
### 6dB Bandwidth (CH Low)



### 6dB Bandwidth (CH Mid)



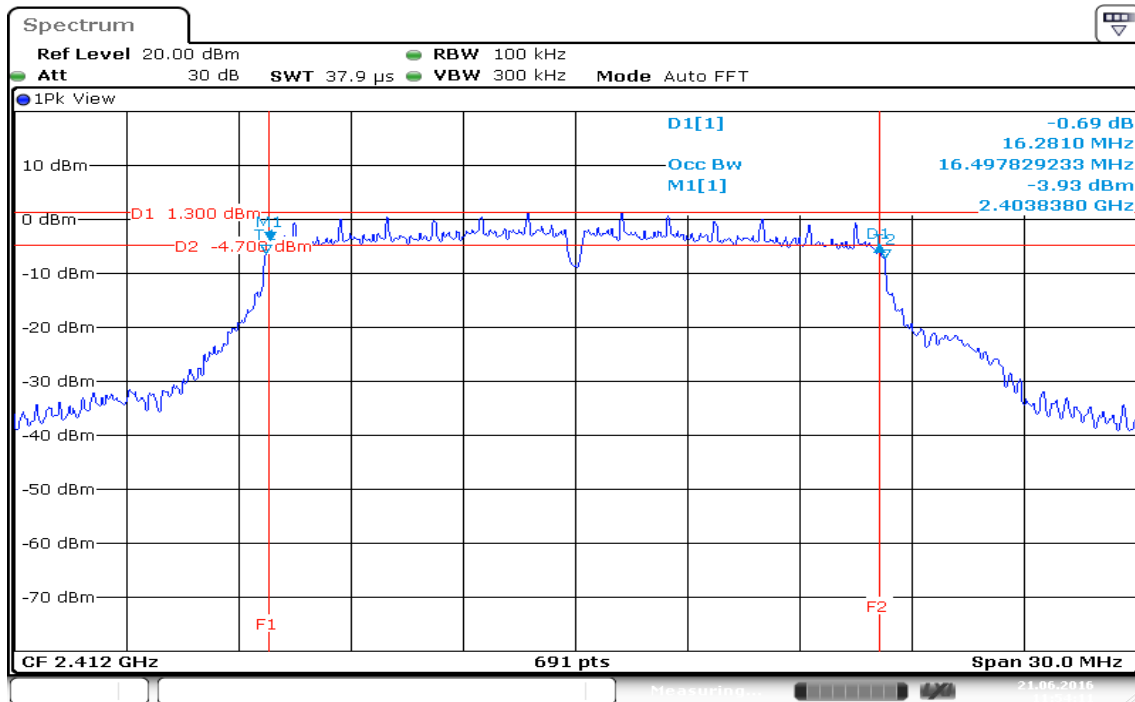
## 6dB Bandwidth (CH High)



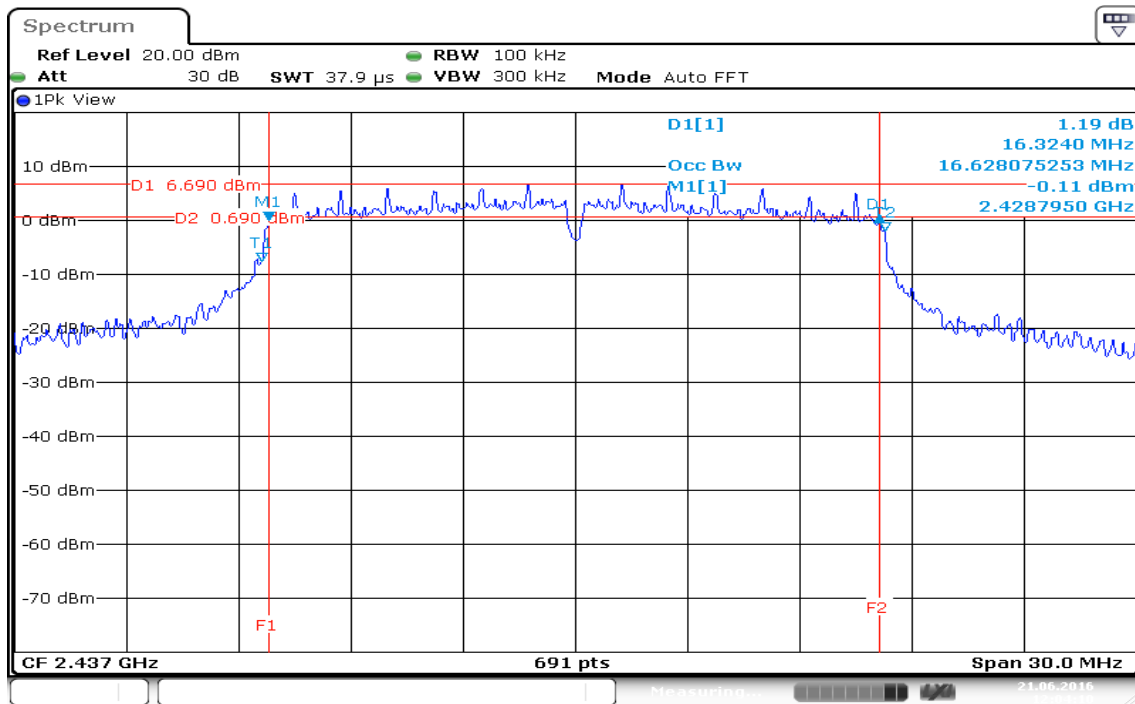
Date: 21.JUN.2016 12:08:19

## IEEE 802.11g mode / Chain 1

### 6dB Bandwidth (CH Low)



### 6dB Bandwidth (CH Mid)



**Spectrum**

Ref Level 20.00 dBm RBW 100 kHz  
 Att 30 dB SWT 37.9  $\mu$ s VBW 300 kHz Mode Auto FFT

1Pk View

10 dBm  
 0 dBm  
 -10 dBm  
 -20 dBm  
 -30 dBm  
 -40 dBm  
 -50 dBm  
 -60 dBm  
 -70 dBm

D1[1] 0.57 dB  
 16.3240 MHz  
 16.454413893 MHz  
 -4.38 dBm  
 2.4537950 GHz

D1 1.870 dBm  
 D2 -4.13 dBm

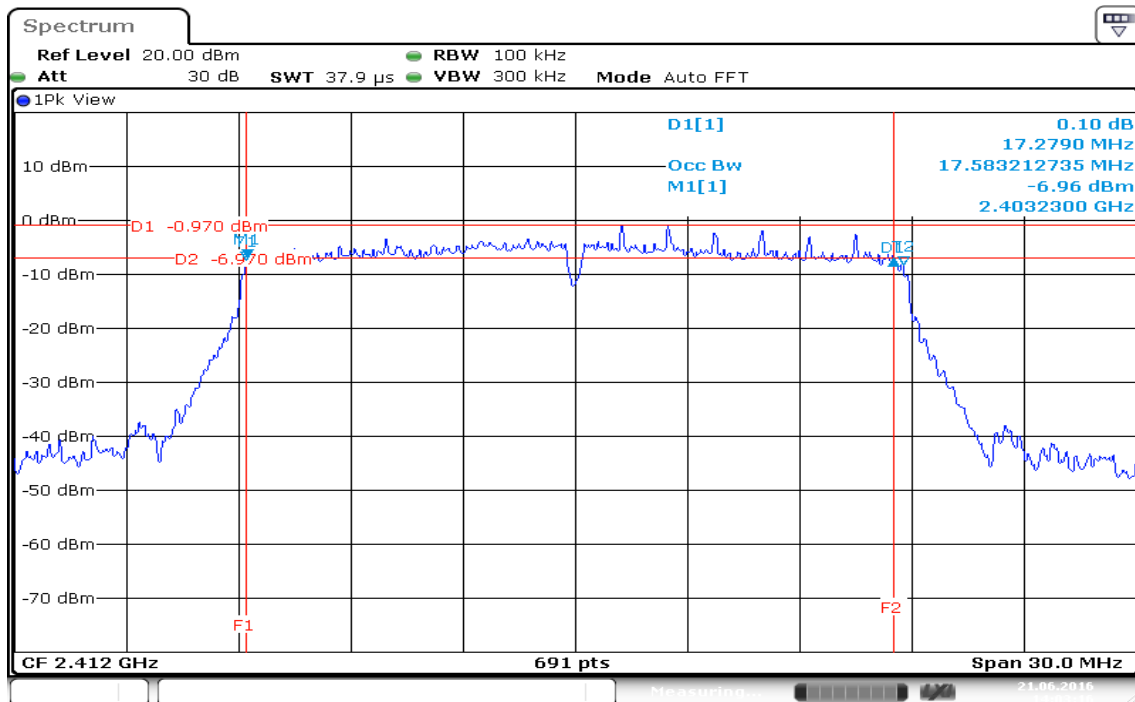
F1 F2

CF 2.462 GHz 691 pts Span 30.0 MHz

Date: 21.JUN.2016 12:09:59

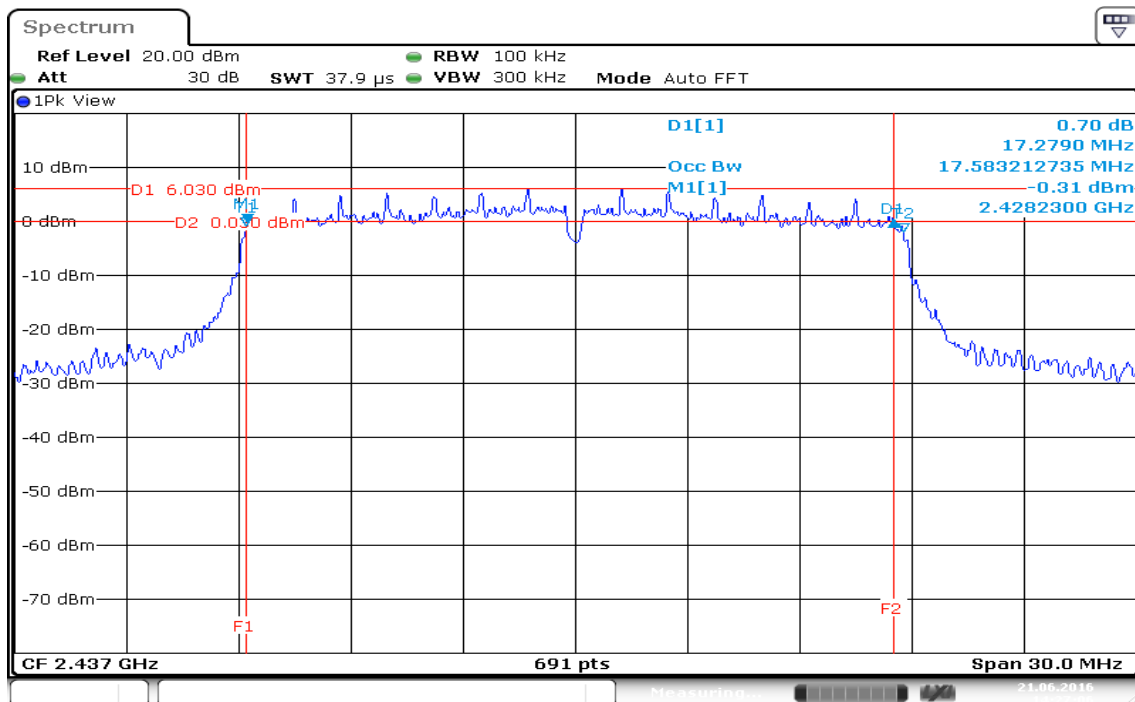
## IEEE 802.11n HT 20 MHz mode / Chain 0

### 6dB Bandwidth (CH Low)



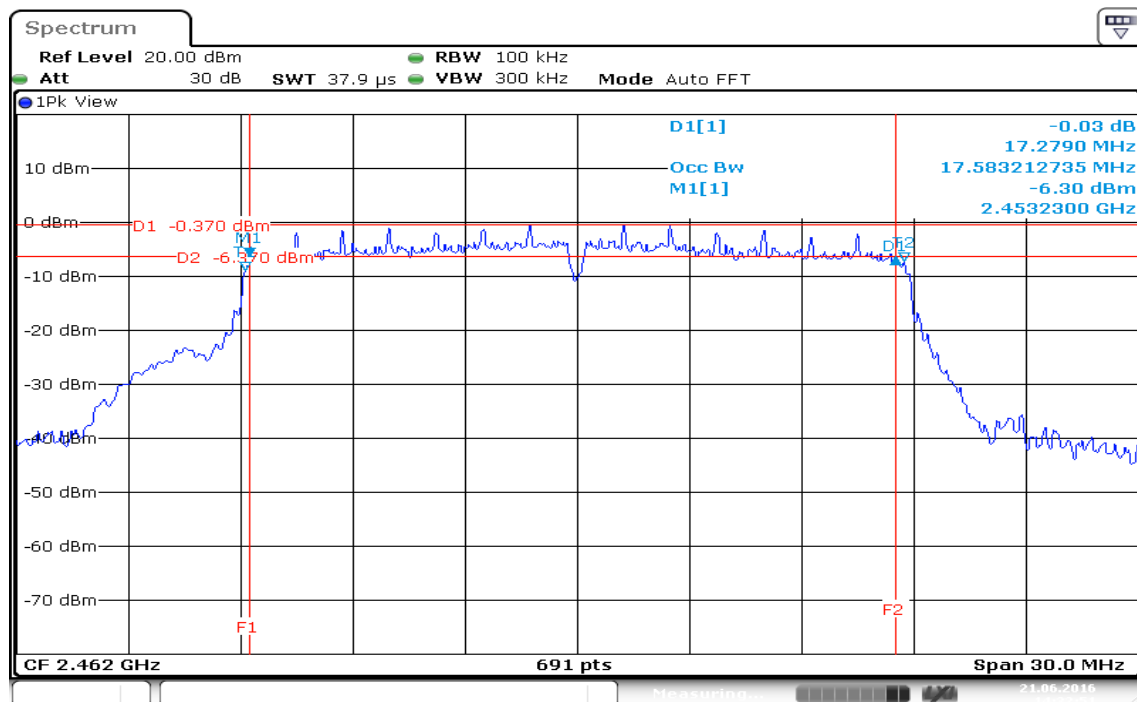
Date: 21.JUN.2016 14:03:16

### 6dB Bandwidth (CH Mid)



Date: 21.JUN.2016 14:27:07

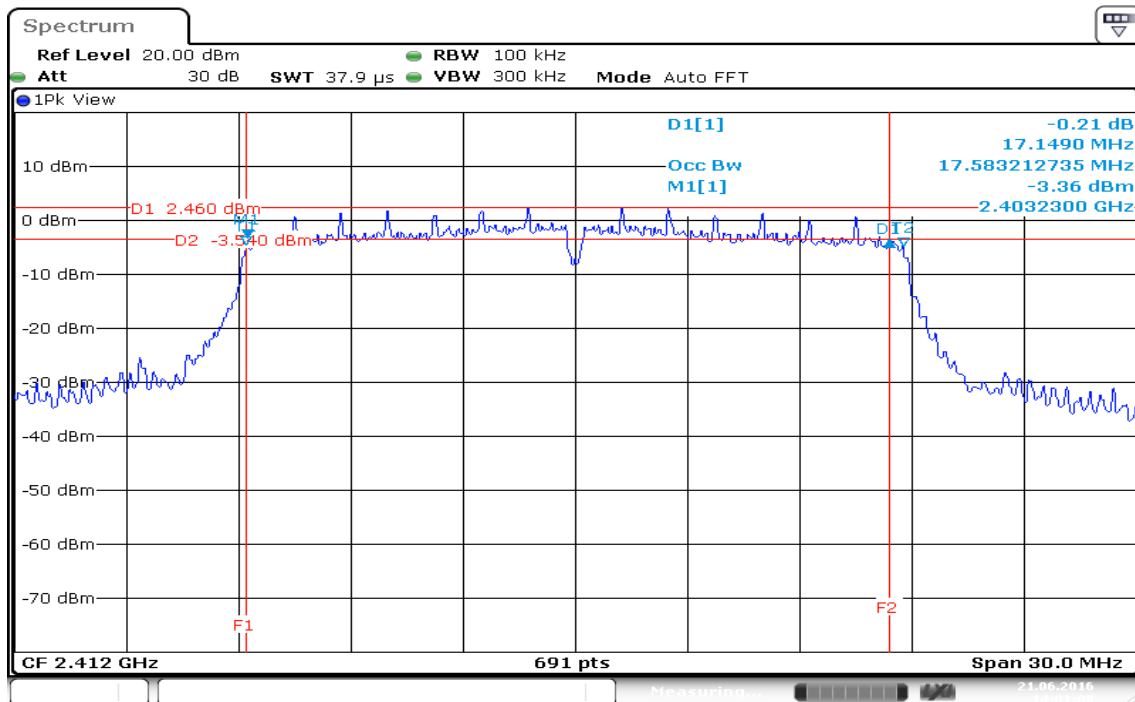
## 6dB Bandwidth (CH High)



Date: 21.JUN.2016 14:32:51

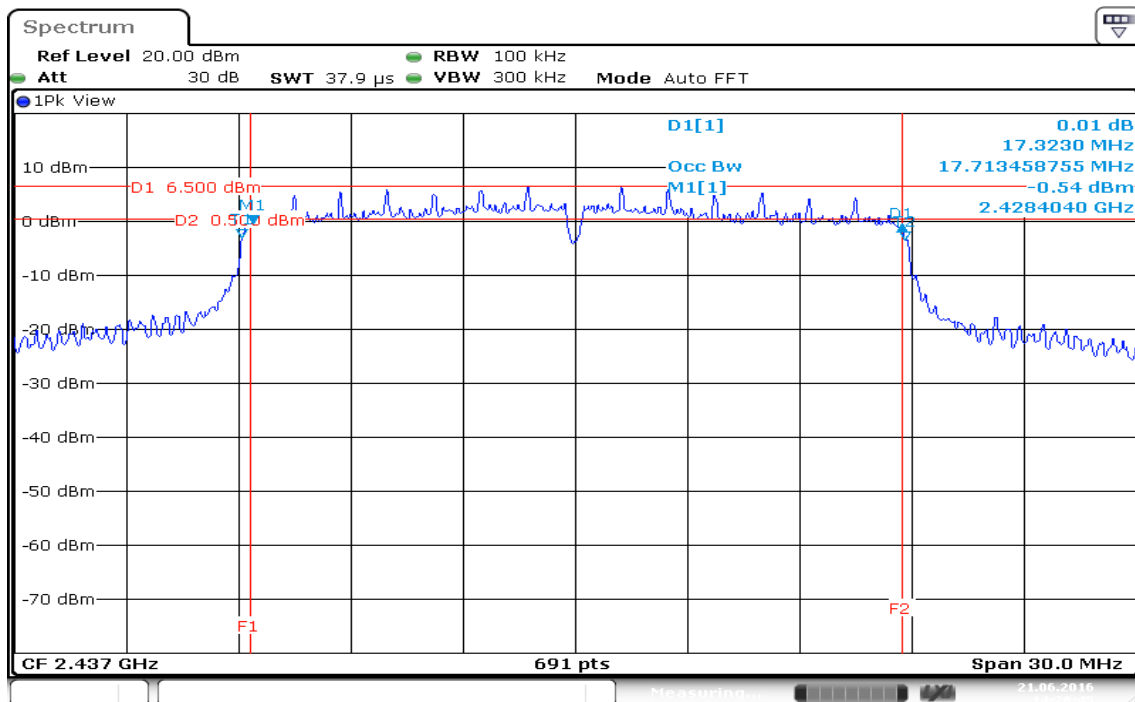
## IEEE 802.11n HT 20 MHz mode / Chain 1

### 6dB Bandwidth (CH Low)



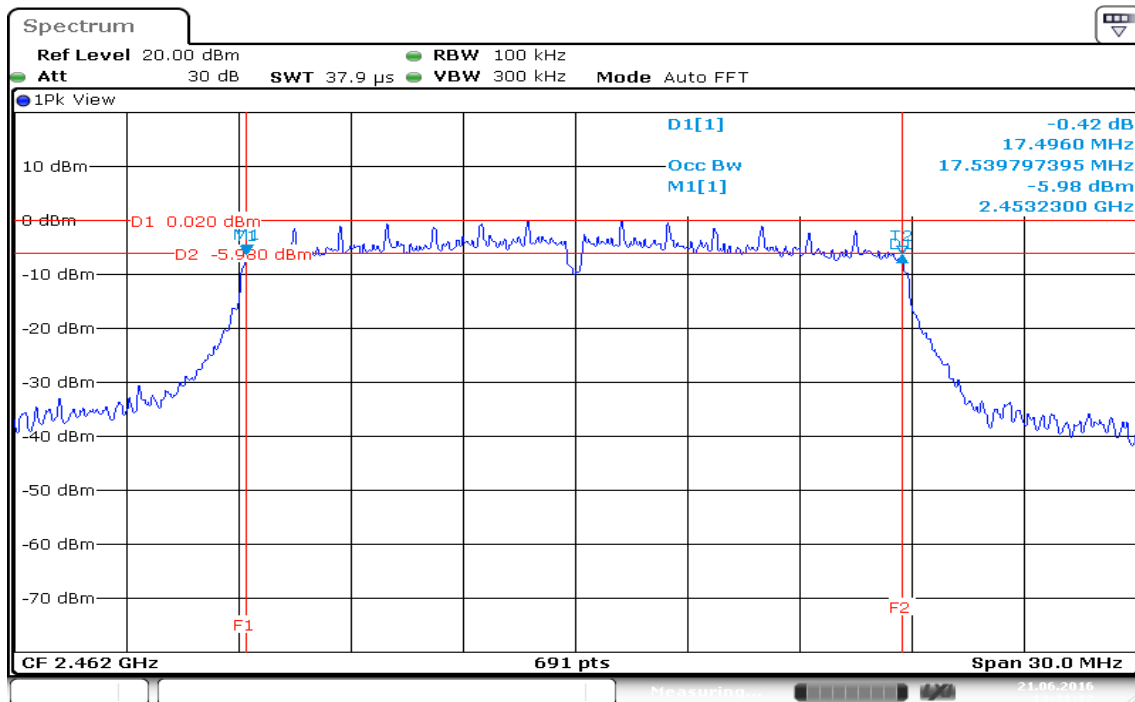
Date: 21.JUN.2016 14:01:08

### 6dB Bandwidth (CH Mid)



Date: 21.JUN.2016 14:28:46

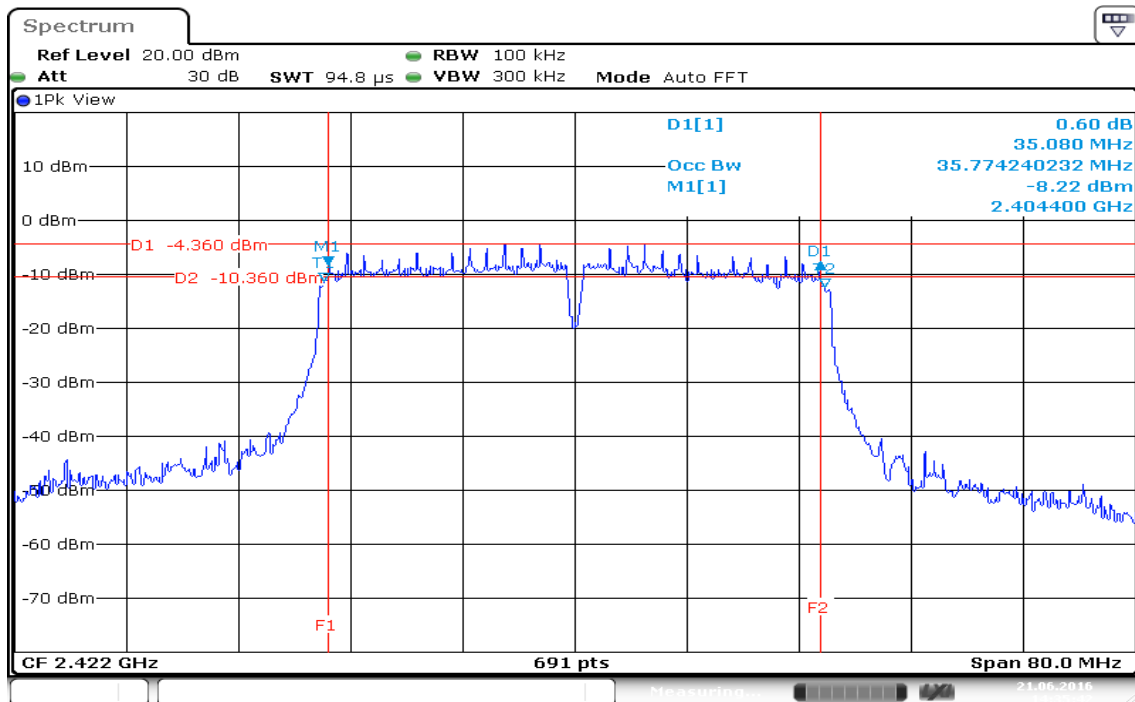
## 6dB Bandwidth (CH High)



Date: 21.JUN.2016 14:31:13

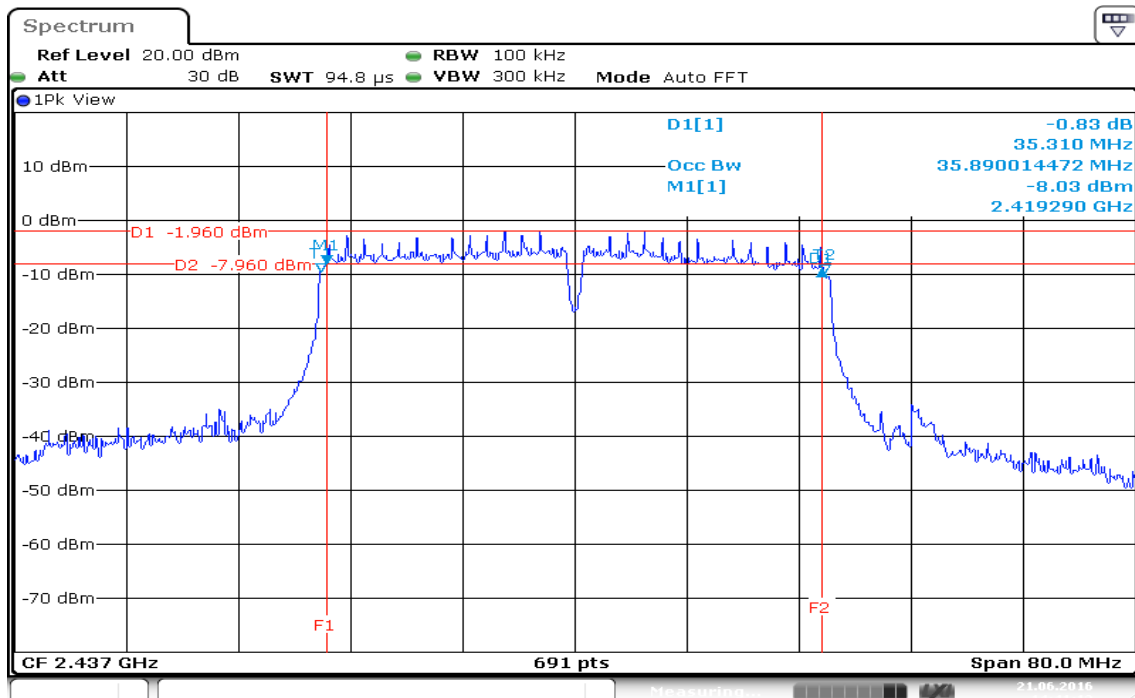
## IEEE 802.11n HT 40 MHz mode / Chain 0

### 6dB Bandwidth (CH Low)



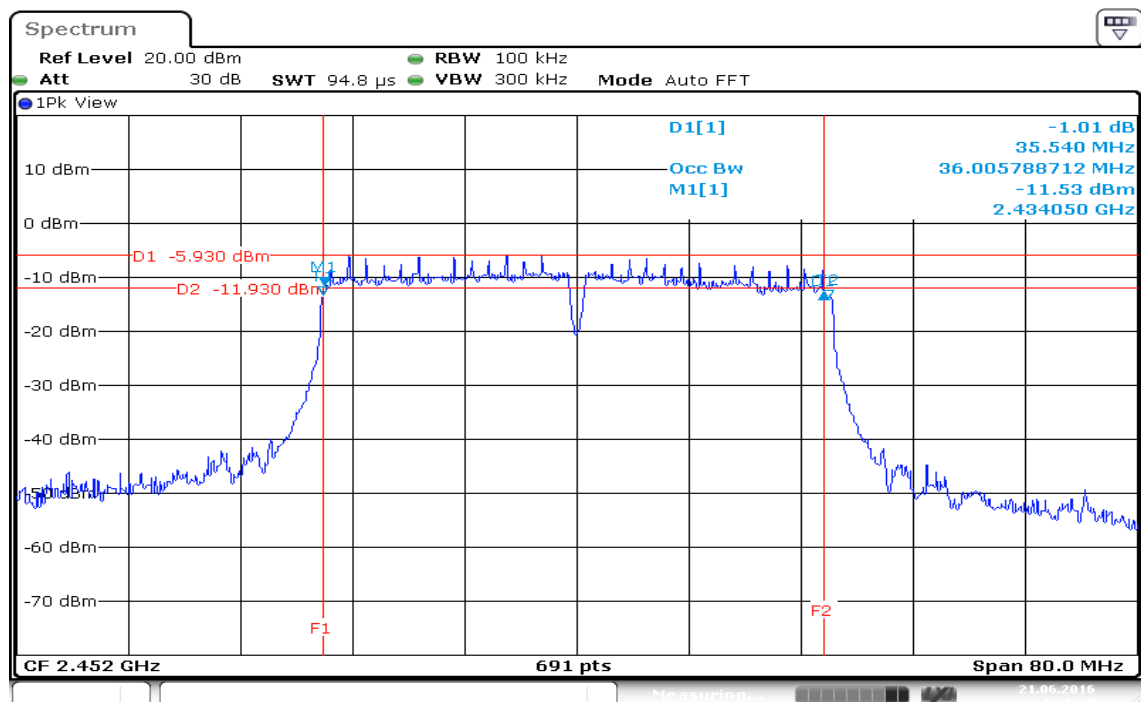
Date: 21.JUN.2016 14:35:42

### 6dB Bandwidth (CH Mid)



Date: 21.JUN.2016 14:41:12

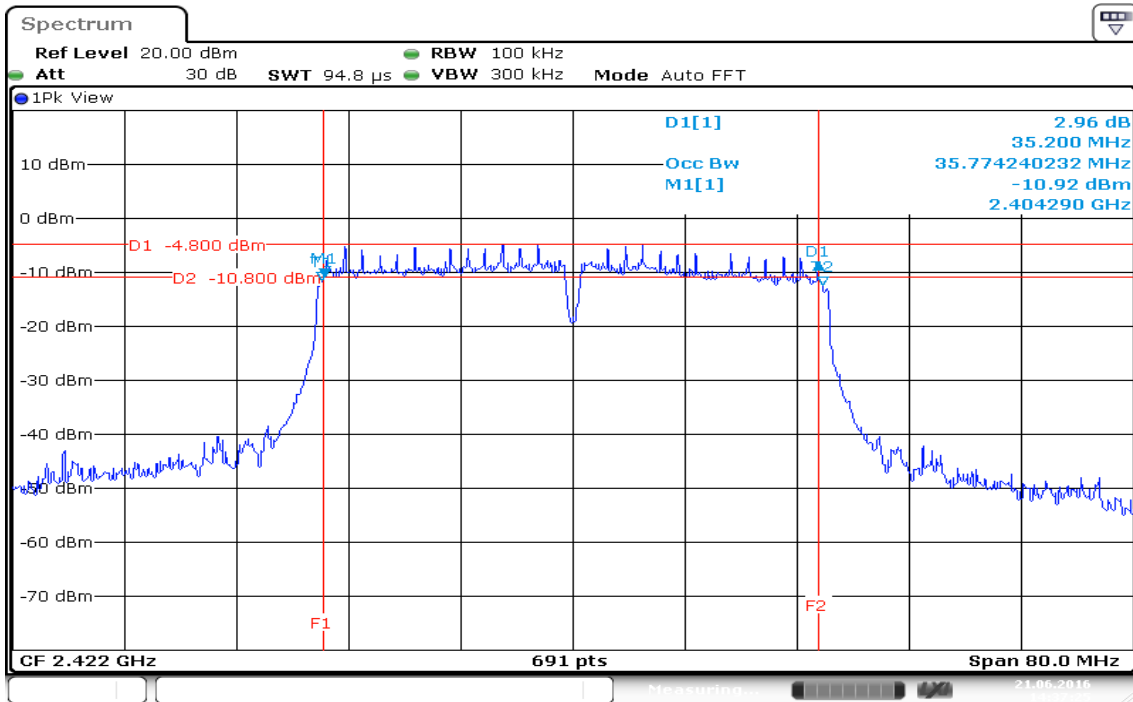
## 6dB Bandwidth (CH High)



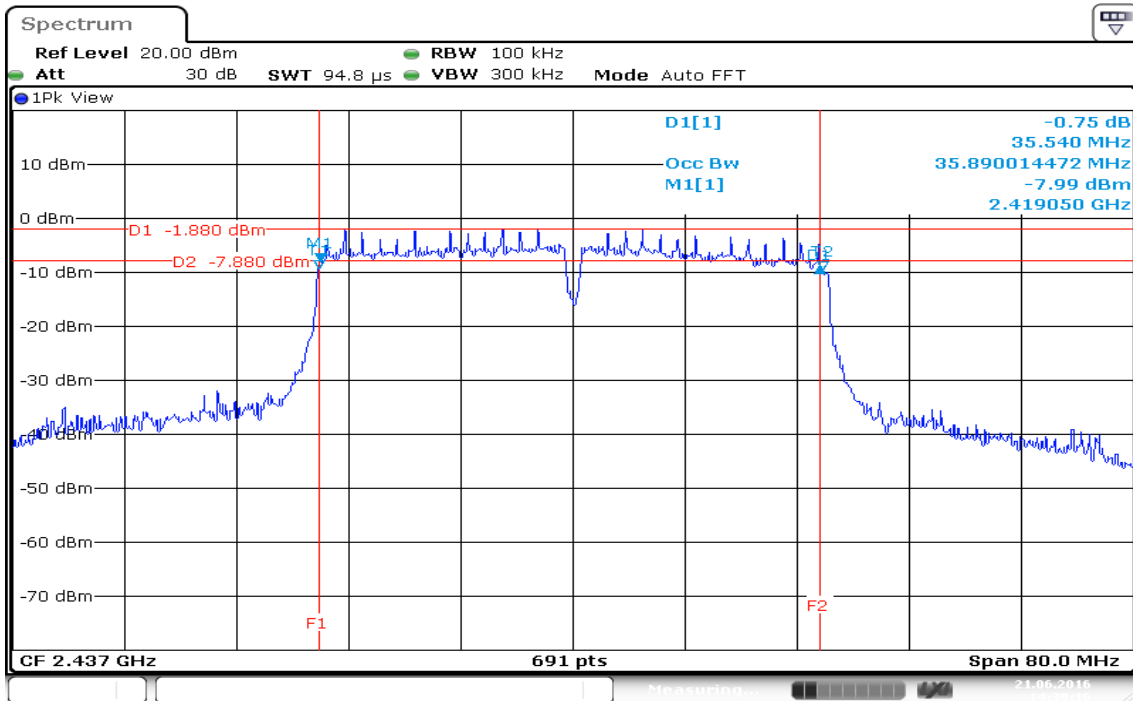
Date: 21.JUN.2016 14:46:29

## IEEE 802.11n HT 40 MHz mode / Chain 1

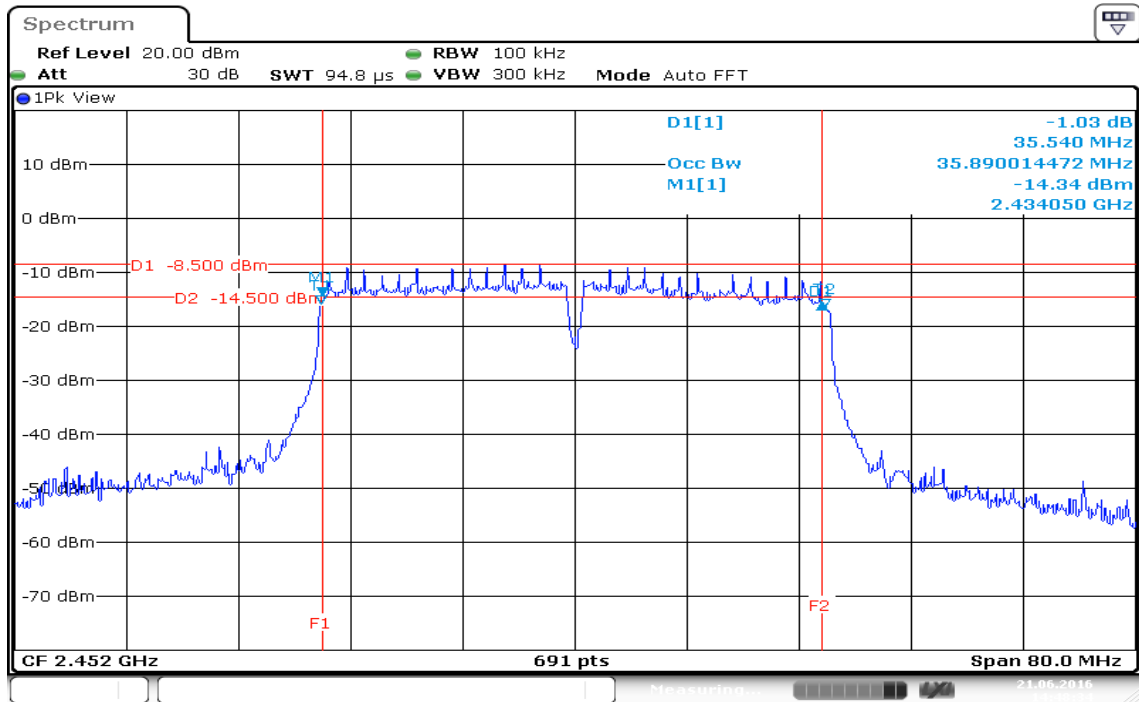
### 6dB Bandwidth (CH Low)



### 6dB Bandwidth (CH Mid)



## 6dB Bandwidth (CH High)



Date: 21.JUN.2016 14:48:34

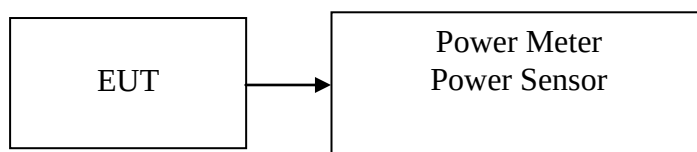
## 7.3 PEAK POWER

### LIMIT

The maximum peak output power of the intentional radiator shall not exceed the following:

1. According to §15.247(b)(3), for systems using digital modulation in the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz: 1 Watt.
2. According to §15.247(b)(4), the conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

### Test Configuration



### TEST PROCEDURE

The transmitter output is connected to the Power Meter. The Power Meter is set to the peak power detection.

### TEST RESULTS

*No non-compliance noted*

## Test Data

### IEEE 802.11b mode

| Channel | Frequency (MHz) | Chain 0 Output Power (dBm) | Chain 1 Output Power (dBm) | Total Output Power (dBm) | Output Power (W) | Limit (dBm) | Result |
|---------|-----------------|----------------------------|----------------------------|--------------------------|------------------|-------------|--------|
| Low     | 2412            | 18.24                      | 18.83                      | 21.56                    | 0.1432           | 30          | PASS   |
| Mid     | 2437            | 18.87                      | 19.09                      | 21.99                    | 0.1581           |             | PASS   |
| High    | 2462            | 19.26                      | 20.02                      | <b>*22.67</b>            | 0.1849           |             | PASS   |

### IEEE 802.11g mode

| Channel | Frequency (MHz) | Chain 0 Output Power (dBm) | Chain 1 Output Power (dBm) | Total Output Power (dBm) | Output Power (W) | Limit (dBm) | Result |
|---------|-----------------|----------------------------|----------------------------|--------------------------|------------------|-------------|--------|
| Low     | 2412            | 20.25                      | 19.97                      | 23.12                    | 0.2051           | 30          | PASS   |
| Mid     | 2437            | 21.85                      | 22.46                      | <b>*25.18</b>            | 0.3296           |             | PASS   |
| High    | 2462            | 21.12                      | 20.58                      | 23.87                    | 0.2438           |             | PASS   |

### IEEE 802.11n HT 20 MHz mode

| Channel | Frequency (MHz) | Chain 0 Output Power (dBm) | Chain 1 Output Power (dBm) | Total Output Power (dBm) | Output Power (W) | Limit (dBm) | Result |
|---------|-----------------|----------------------------|----------------------------|--------------------------|------------------|-------------|--------|
| Low     | 2412            | 18.53                      | 19.32                      | 21.95                    | 0.1567           | 30          | PASS   |
| Mid     | 2437            | 21.64                      | 22.27                      | <b>*24.98</b>            | 0.3148           |             | PASS   |
| High    | 2462            | 19.31                      | 19.82                      | 22.58                    | 0.1811           |             | PASS   |

### IEEE 802.11n HT 40 MHz mode

| Channel | Frequency (MHz) | Chain 0 Output Power (dBm) | Chain 1 Output Power (dBm) | Total Output Power (dBm) | Output Power (W) | Limit (dBm) | Result |
|---------|-----------------|----------------------------|----------------------------|--------------------------|------------------|-------------|--------|
| Low     | 2422            | 17.56                      | 18.03                      | 20.81                    | 0.1205           | 30          | PASS   |
| Mid     | 2437            | 19.73                      | 20.13                      | <b>*22.94</b>            | 0.1968           |             | PASS   |
| High    | 2452            | 17.65                      | 17.39                      | 20.53                    | 0.1130           |             | PASS   |

#### Remark:

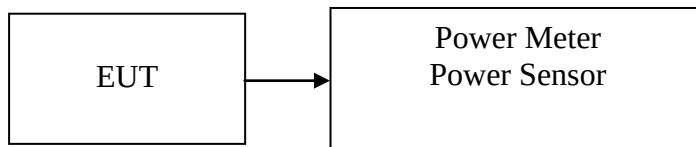
1. Total Output Power (w) = Chain 0 ( $10^{(\text{Output Power}/10)}/1000$ ) + Chain 1 ( $10^{(\text{Output Power}/10)}/1000$ )

## 7.4 AVERAGE POWER

### LIMIT

None; for reporting purposes only.

### Test Configuration



### TEST PROCEDURE

The transmitter output is connected to the Power Meter. The Power Meter is set to the peak power detection.

### TEST RESULTS

*No non-compliance noted*

## Test Data

### Test mode: IEEE 802.11b mode

| Channel | Frequency (MHz) | Chain 0 Output Power (dBm) | Chain 1 Output Power (dBm) | Total Output Power (dBm) | Output Power (W) |
|---------|-----------------|----------------------------|----------------------------|--------------------------|------------------|
| Low     | 2412            | 15.12                      | 15.75                      | 18.46                    | 0.0701           |
| Mid     | 2437            | 15.51                      | 15.92                      | 18.73                    | 0.0746           |
| High    | 2462            | 15.83                      | 16.26                      | 19.06                    | 0.0805           |

### Test mode: IEEE 802.11g mode

| Channel | Frequency (MHz) | Chain 0 Output Power (dBm) | Chain 1 Output Power (dBm) | Total Output Power (dBm) | Output Power (W) |
|---------|-----------------|----------------------------|----------------------------|--------------------------|------------------|
| Low     | 2412            | 10.74                      | 11.37                      | 14.08                    | 0.0256           |
| Mid     | 2437            | 16.34                      | 16.74                      | 19.55                    | 0.0902           |
| High    | 2462            | 11.66                      | 11.59                      | 14.64                    | 0.0291           |

### Test mode: IEEE 802.11n HT 20 MHz mode

| Channel | Frequency (MHz) | Chain 0 Output Power (dBm) | Chain 1 Output Power (dBm) | Total Output Power (dBm) | Output Power (W) |
|---------|-----------------|----------------------------|----------------------------|--------------------------|------------------|
| Low     | 2412            | 9.27                       | 9.87                       | 12.59                    | 0.0182           |
| Mid     | 2437            | 15.62                      | 16.05                      | 18.85                    | 0.0767           |
| High    | 2462            | 9.87                       | 10.23                      | 13.06                    | 0.0202           |

### Test mode: IEEE 802.11n HT 40 MHz mode

| Channel | Frequency (MHz) | Chain 0 Output Power (dBm) | Chain 1 Output Power (dBm) | Total Output Power (dBm) | Output Power (W) |
|---------|-----------------|----------------------------|----------------------------|--------------------------|------------------|
| Low     | 2422            | 7.39                       | 7.65                       | 10.53                    | 0.0113           |
| Mid     | 2437            | 10.28                      | 10.74                      | 13.53                    | 0.0225           |
| High    | 2452            | 7.11                       | 7.29                       | 10.21                    | 0.0105           |

**Remark:** Total Output Power (w) = Chain 0 ( $10^{(\text{Output Power}/10)/1000}$ ) + Chain 1 ( $10^{(\text{Output Power}/10)/1000}$ )

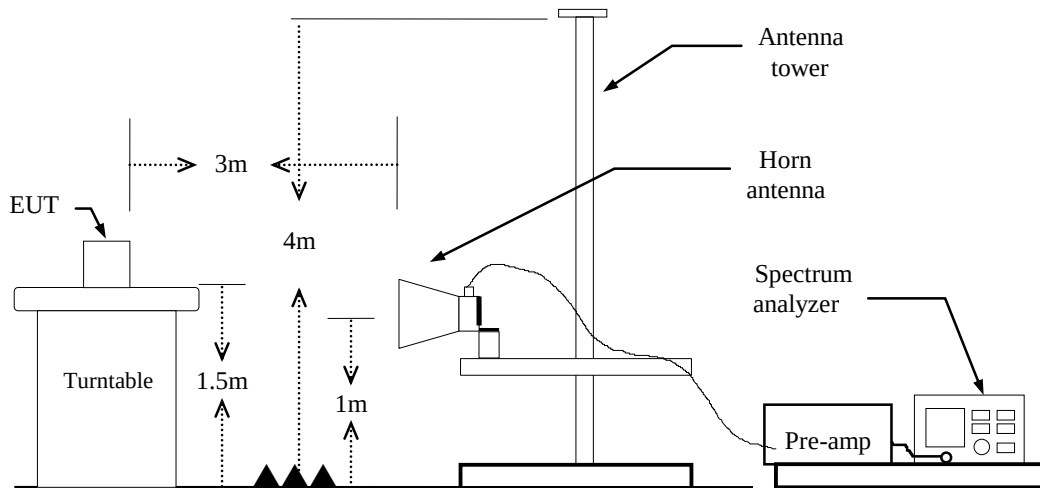
## 7.5 BAND EDGES MEASUREMENT

### LIMIT

According to §15.247(d), in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum 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. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in 15.209(a) (see Section 15.205(c)).

### Test Configuration

#### For Radiated



## **TEST PROCEDURE**

### **For Radiated**

1. The EUT is placed on a turntable, which is 1.5m above the ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission.
4. Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of the emission:
  - (a) PEAK: RBW=1MHz / VBW=3MHz / Sweep=AUTO
  - (b) AVERAGE: RBW=1MHz,  
if duty cycle  $\geq 98\%$ , VBW=10Hz.  
if duty cycle  $< 98\%$  VBW=1/T.  
**IEEE 802.11b mode:** =98%, VBW=300Hz  
**IEEE 802.11g mode:** =90%, VBW=600Hz  
**IEEE 802.11n HT 20 MHz mode:** =88%, VBW=750Hz  
**IEEE 802.11n HT 40 MHz mode:** =79%, VBW=1.5kHz
5. Repeat the procedures until all the PEAK and AVERAGE versus POLARIZATION are measured.
6. Result = Spectrum Reading + cable loss(spectrum to Amp) - Amp Gain + Cable loss(Amp to receive Ant)+ Receive Ant

### **For Un-restricted Band Emissions**

The peak output power procedure is used to measure the fundamental emission power to demonstrate compliance to requirements, then the peak conducted output power measured within any 100 kHz outside the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum measured in-band peak PSD level.

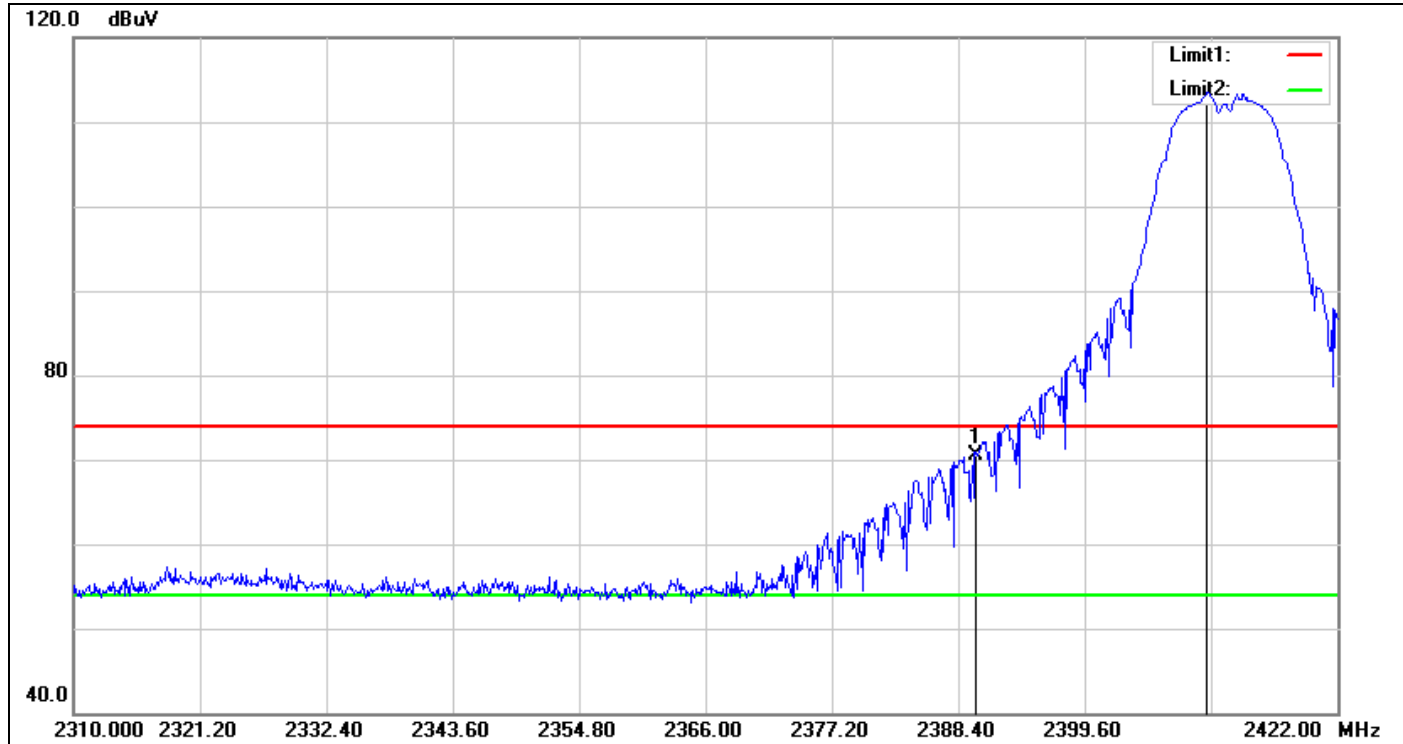
## **TEST RESULTS**

Refer to attach spectrum analyzer data chart.

## Band Edges

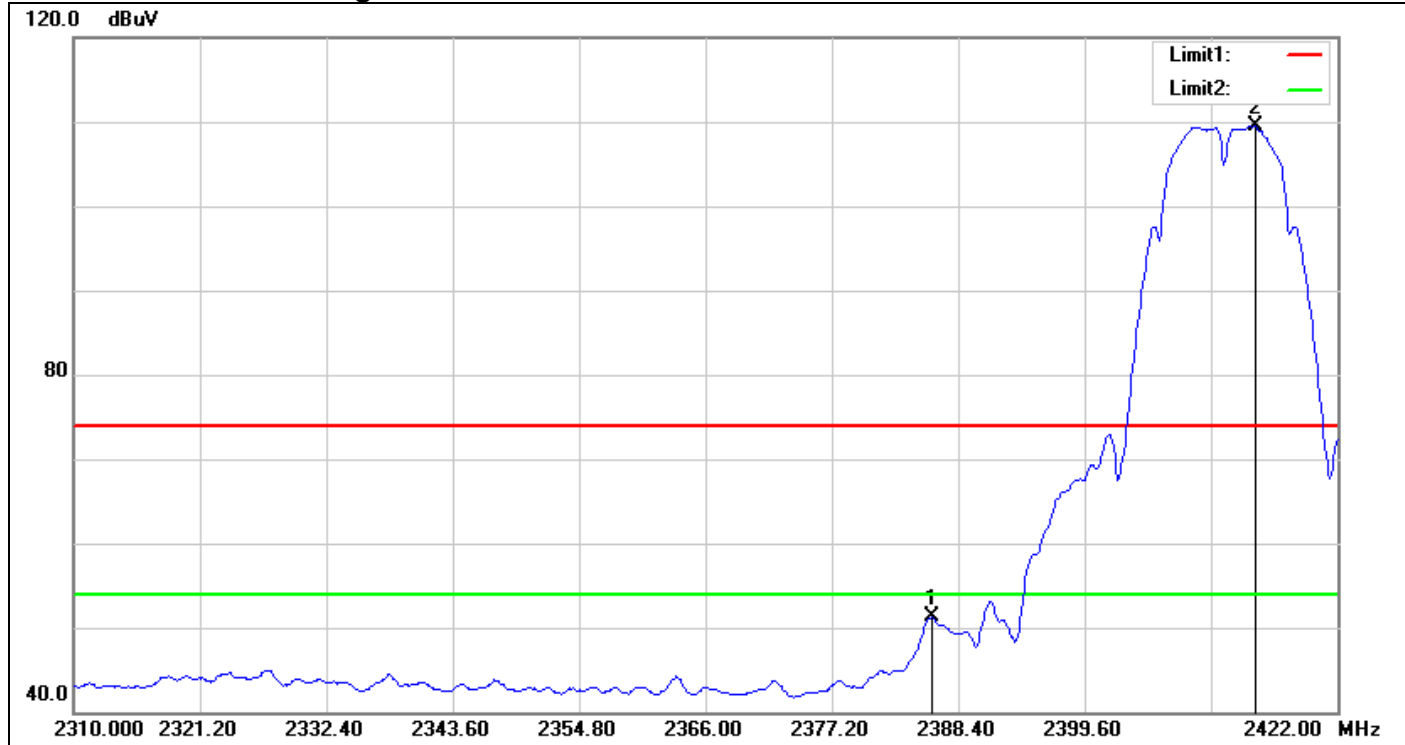
### IEEE 802.11b Mode / CH Low

Detector mode: Peak



| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB) | Result (dBuV) | Limit (dBuV) | Margin (dB) | Remark |
|-----|-----------------|----------------|--------------------|---------------|--------------|-------------|--------|
| 1   | 2390.000        | 72.98          | -2.49              | 70.49         | 74.00        | -3.51       | peak   |
| 2   | 2410.464        | 115.95         | -2.43              | 113.52        | -            | -           | peak   |

**Detector mode: Average**

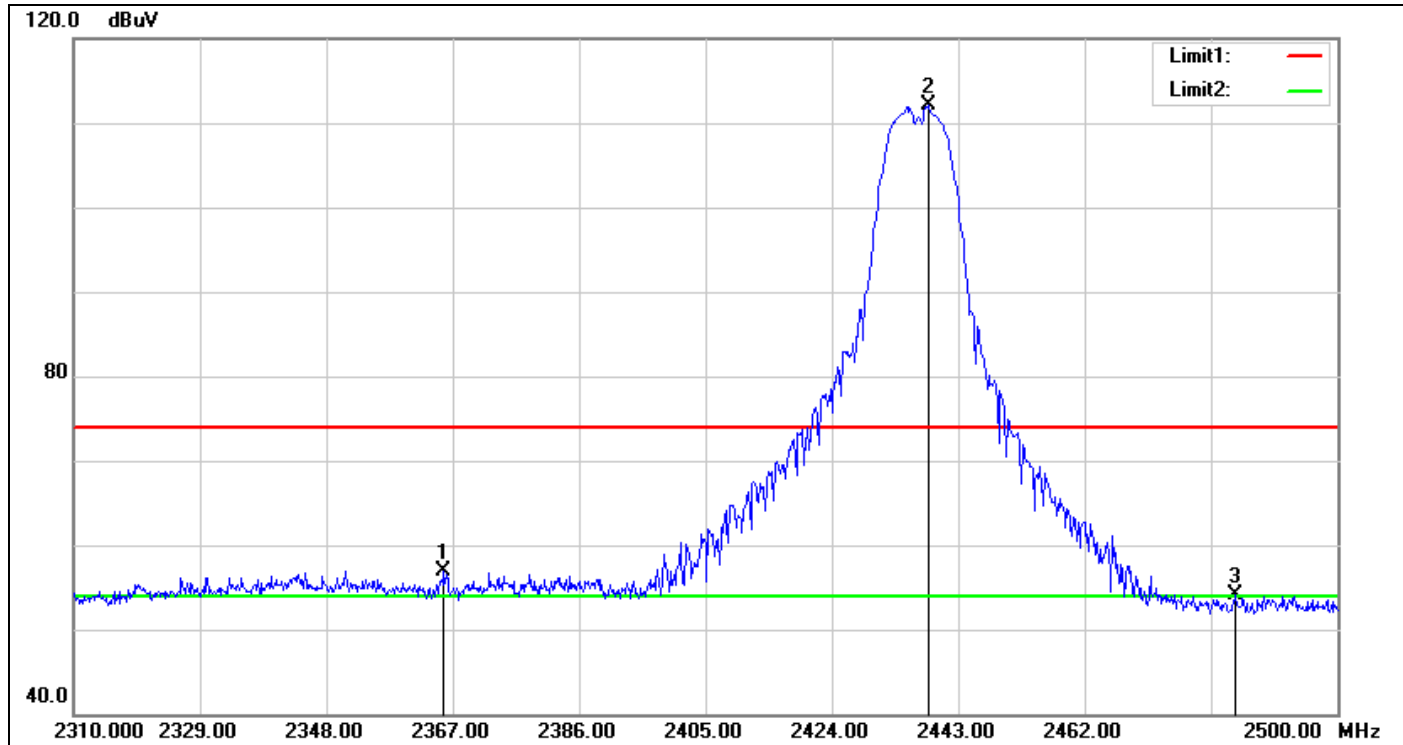


| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB) | Result (dBuV) | Limit (dBuV) | Margin (dB) | Remark |
|-----|-----------------|----------------|--------------------|---------------|--------------|-------------|--------|
| 1   | 2386.048        | 53.77          | -2.53              | 51.24         | 54.00        | -2.76       | AVG    |
| 2   | 2414.720        | 111.86         | -2.40              | 109.46        | -            | -           | AVG    |

## Band Edges

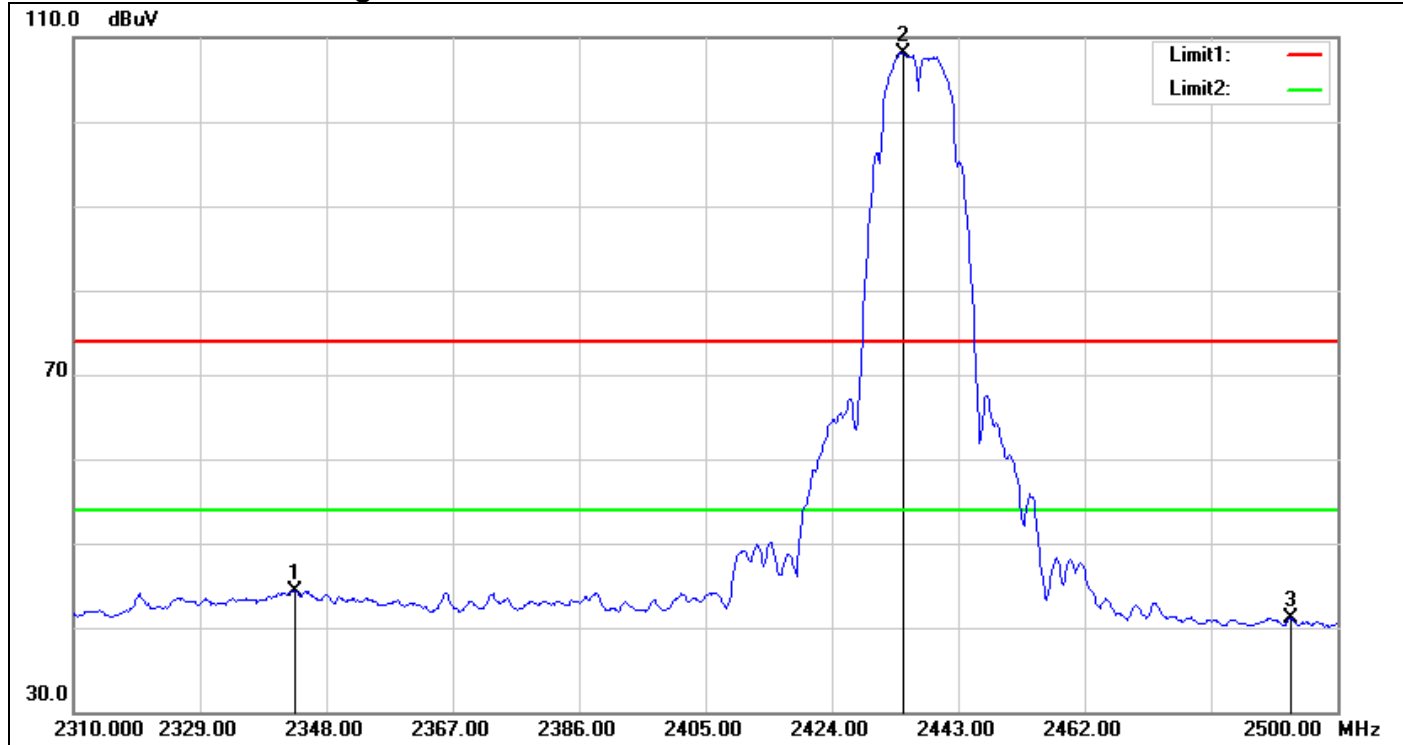
### IEEE 802.11b Mode / CH Mid

Detector mode: Peak



| No. | Frequency<br>(MHz) | Reading<br>(dBuV) | Correct<br>Factor(dB) | Result<br>(dBuV) | Limit<br>(dBuV) | Margin<br>(dB) | Remark |
|-----|--------------------|-------------------|-----------------------|------------------|-----------------|----------------|--------|
| 1   | 2365.670           | 59.56             | -2.72                 | 56.84            | 74.00           | -17.16         | peak   |
| 2   | 2438.440           | 114.23            | -2.22                 | 112.01           | -               | -              | peak   |
| 3   | 2484.610           | 56.12             | -1.98                 | 54.14            | 74.00           | -19.86         | peak   |

**Detector mode: Average**

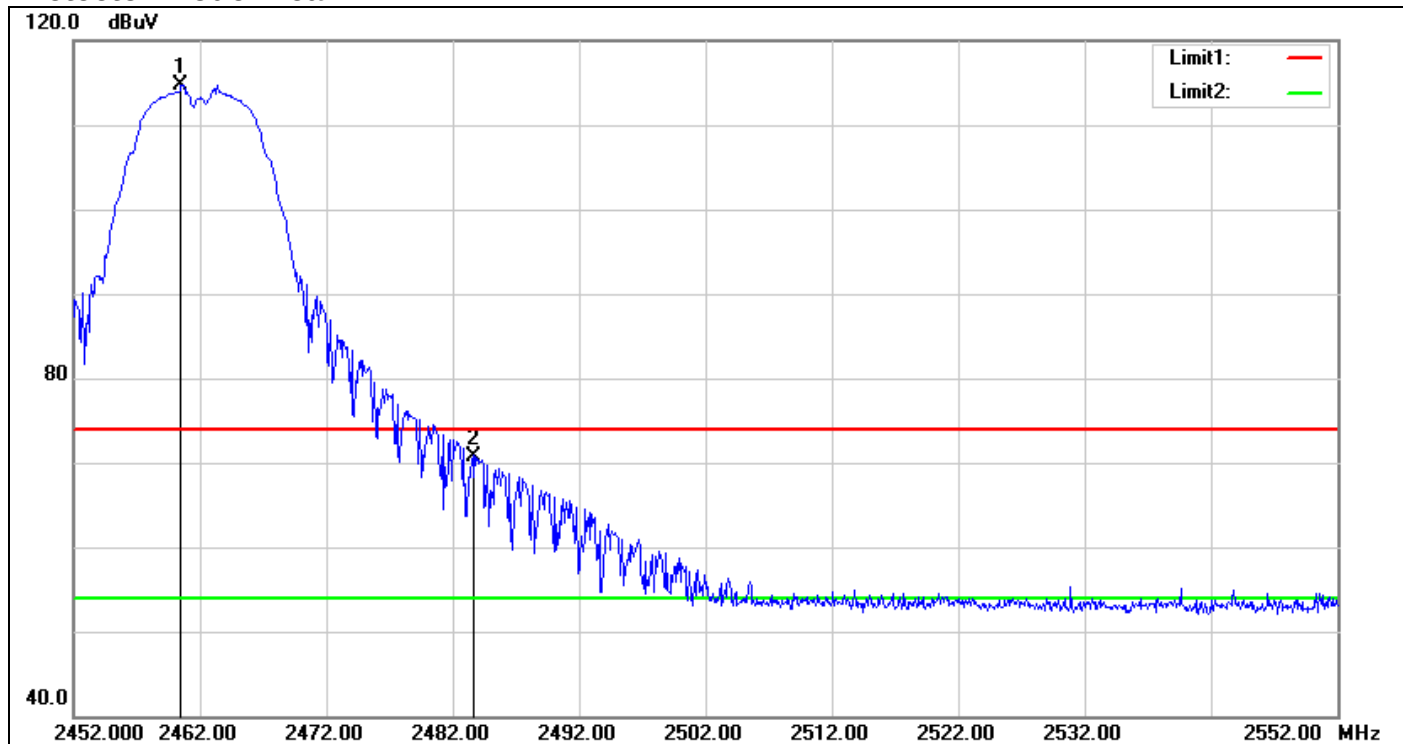


| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB) | Result (dBuV) | Limit (dBuV) | Margin (dB) | Remark |
|-----|-----------------|----------------|--------------------|---------------|--------------|-------------|--------|
| 1   | 2343.250        | 47.30          | -2.91              | 44.39         | 54.00        | -9.61       | AVG    |
| 2   | 2434.640        | 110.42         | -2.25              | 108.17        | -            | -           | AVG    |
| 3   | 2492.970        | 42.98          | -1.91              | 41.07         | 54.00        | -12.93      | AVG    |

## Band Edges

### IEEE 802.11b Mode / CH High

Detector mode: Peak



| No. | Frequency<br>(MHz) | Reading<br>(dBuV) | Correct<br>Factor(dB) | Result<br>(dBuV) | Limit<br>(dBuV) | Margin<br>(dB) | Remark |
|-----|--------------------|-------------------|-----------------------|------------------|-----------------|----------------|--------|
| 1   | 2460.500           | 116.85            | -2.10                 | 114.75           | -               | -              | peak   |
| 2   | 2483.600           | 72.79             | -1.99                 | 70.80            | 74.00           | -3.20          | peak   |

**Detector mode: Average**

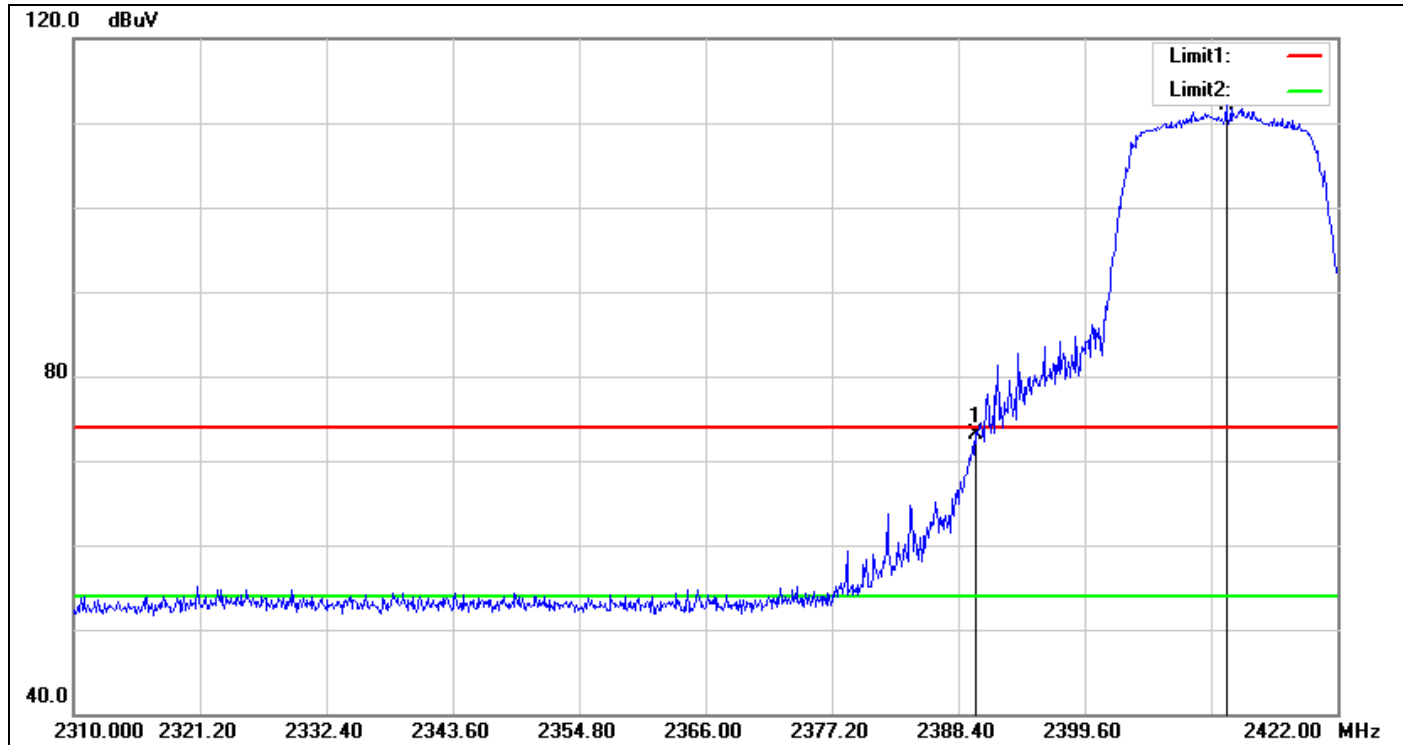


| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB) | Result (dBuV) | Limit (dBuV) | Margin (dB) | Remark |
|-----|-----------------|----------------|--------------------|---------------|--------------|-------------|--------|
| 1   | 2459.700        | 113.12         | -2.10              | 111.02        | -            | -           | AVG    |
| 2   | 2486.900        | 53.19          | -1.96              | 51.23         | 54.00        | -2.77       | AVG    |

## Band Edges

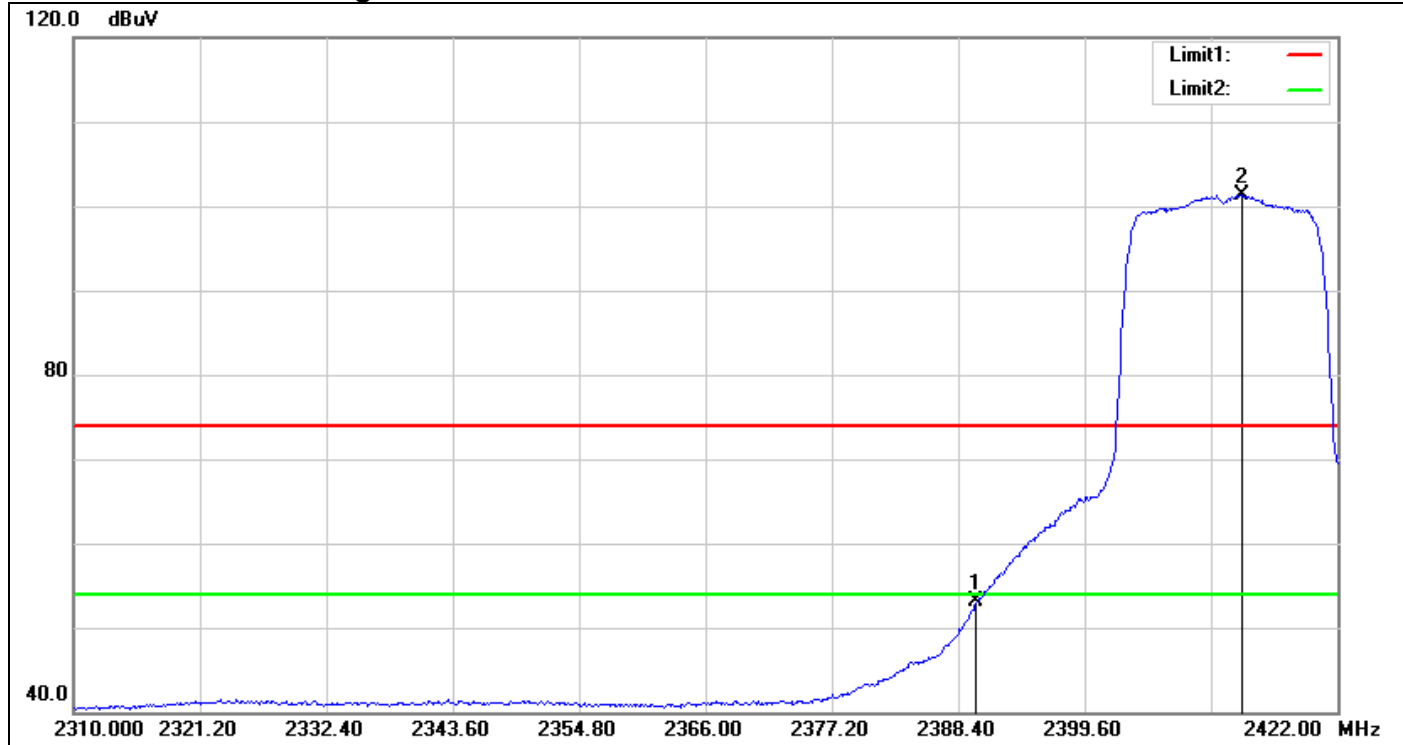
### IEEE 802.11g Mode / CH Low

Detector mode: Peak



| No. | Frequency<br>(MHz) | Reading<br>(dBuV) | Correct<br>Factor(dB) | Result<br>(dBuV) | Limit<br>(dBuV) | Margin<br>(dB) | Remark |
|-----|--------------------|-------------------|-----------------------|------------------|-----------------|----------------|--------|
| 1   | 2390.000           | 75.58             | -2.49                 | 73.09            | 74.00           | -0.91          | peak   |
| 2   | 2412.144           | 114.52            | -2.41                 | 112.11           | -               | -              | peak   |

**Detector mode: Average**

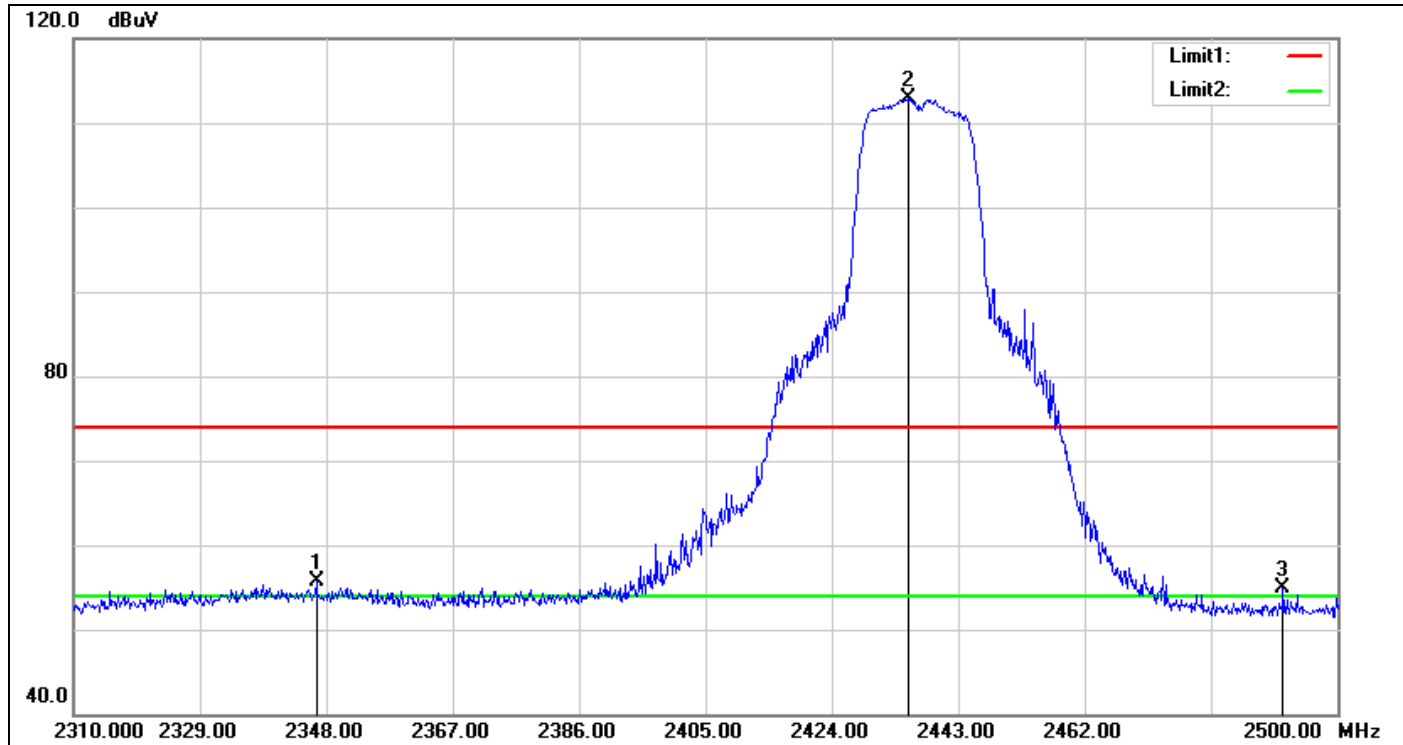


| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB) | Result (dBuV) | Limit (dBuV) | Margin (dB) | Remark |
|-----|-----------------|----------------|--------------------|---------------|--------------|-------------|--------|
| 1   | 2390.000        | 55.62          | -2.49              | 53.13         | 54.00        | -0.87       | AVG    |
| 2   | 2413.488        | 103.66         | -2.40              | 101.26        | -            | -           | AVG    |

## Band Edges

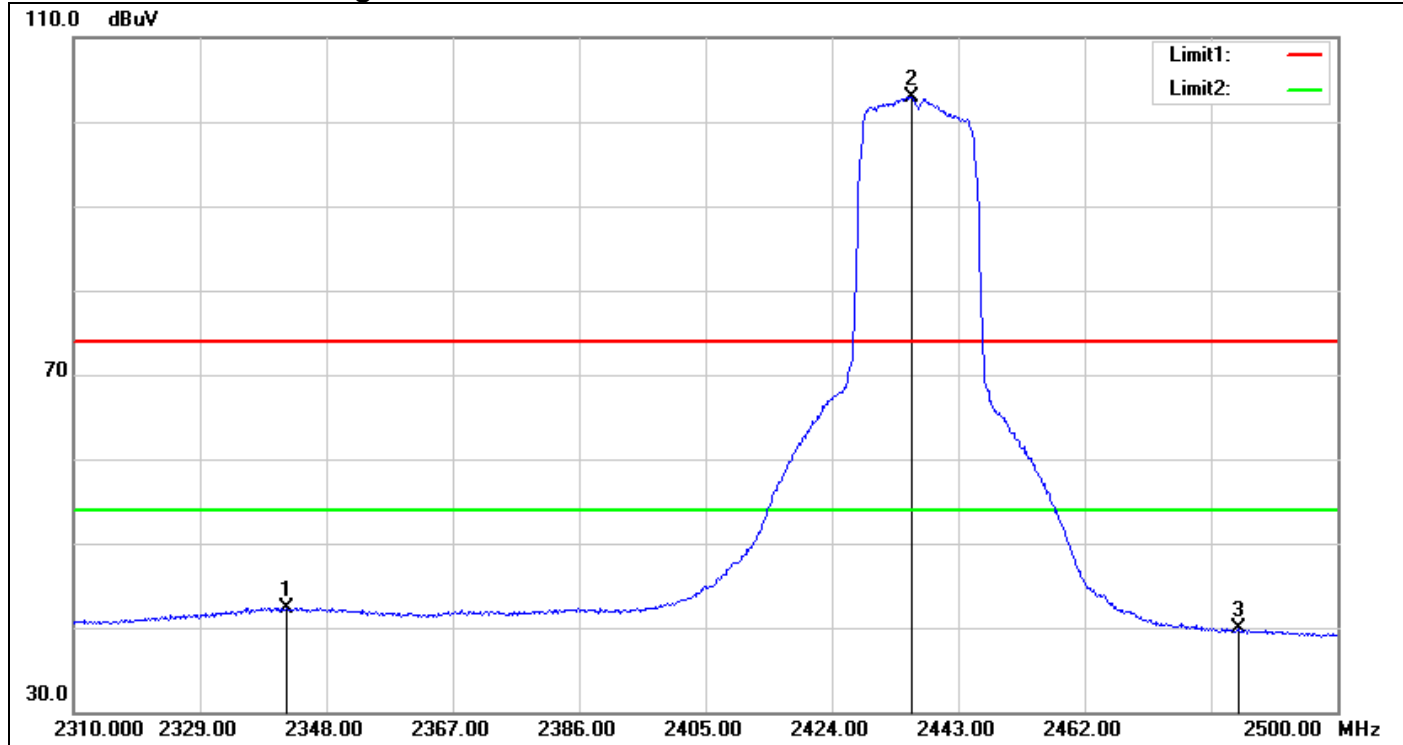
### IEEE 802.11g Mode / CH Mid

Detector mode: Peak



| No. | Frequency<br>(MHz) | Reading<br>(dBuV) | Correct<br>Factor(dB) | Result<br>(dBuV) | Limit<br>(dBuV) | Margin<br>(dB) | Remark |
|-----|--------------------|-------------------|-----------------------|------------------|-----------------|----------------|--------|
| 1   | 2346.480           | 58.58             | -2.86                 | 55.72            | 74.00           | -18.28         | peak   |
| 2   | 2435.400           | 115.17            | -2.25                 | 112.92           | -               | -              | peak   |
| 3   | 2491.830           | 56.81             | -1.92                 | 54.89            | 74.00           | -19.11         | peak   |

**Detector mode: Average**

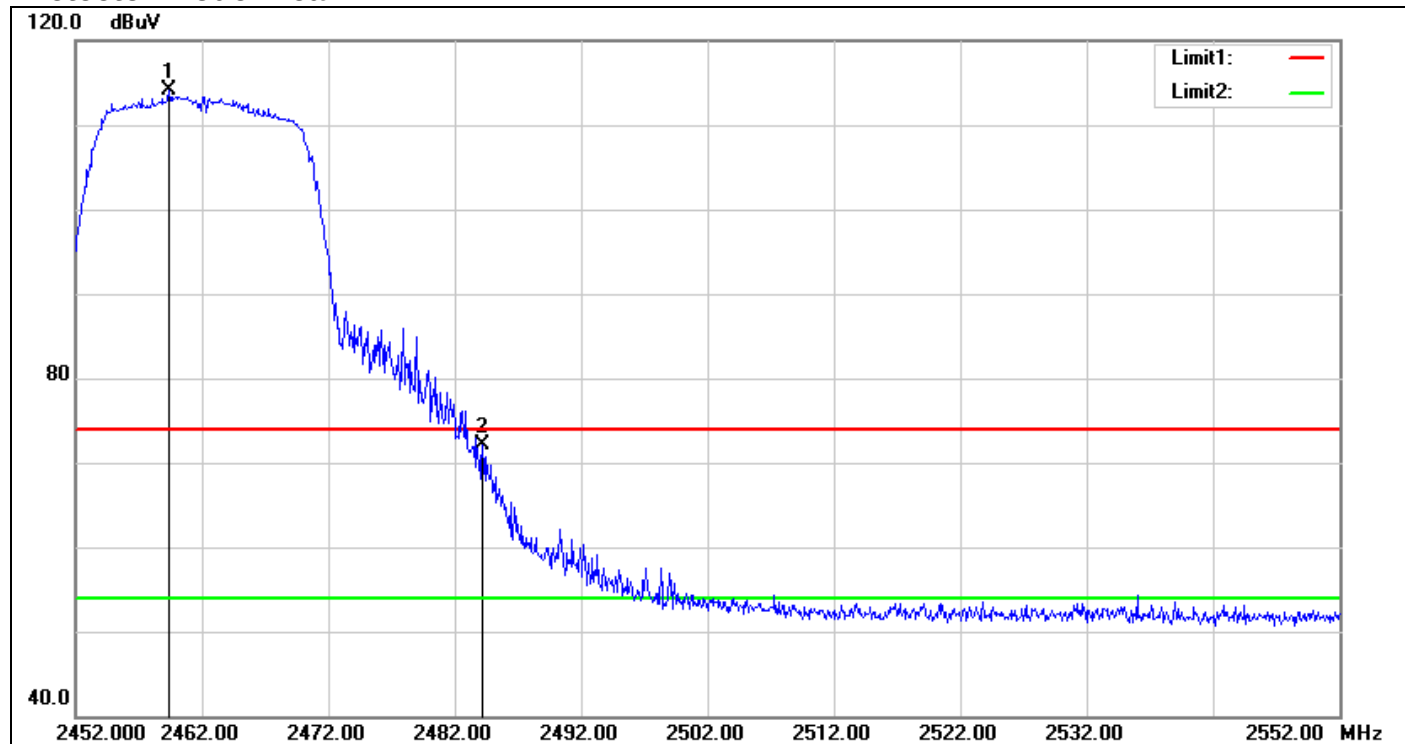


| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB) | Result (dBuV) | Limit (dBuV) | Margin (dB) | Remark |
|-----|-----------------|----------------|--------------------|---------------|--------------|-------------|--------|
| 1   | 2342.110        | 45.30          | -2.93              | 42.37         | 54.00        | -11.63      | AVG    |
| 2   | 2435.970        | 105.17         | -2.24              | 102.93        | -            | -           | AVG    |
| 3   | 2485.180        | 41.80          | -1.98              | 39.82         | 54.00        | -14.18      | AVG    |

## Band Edges

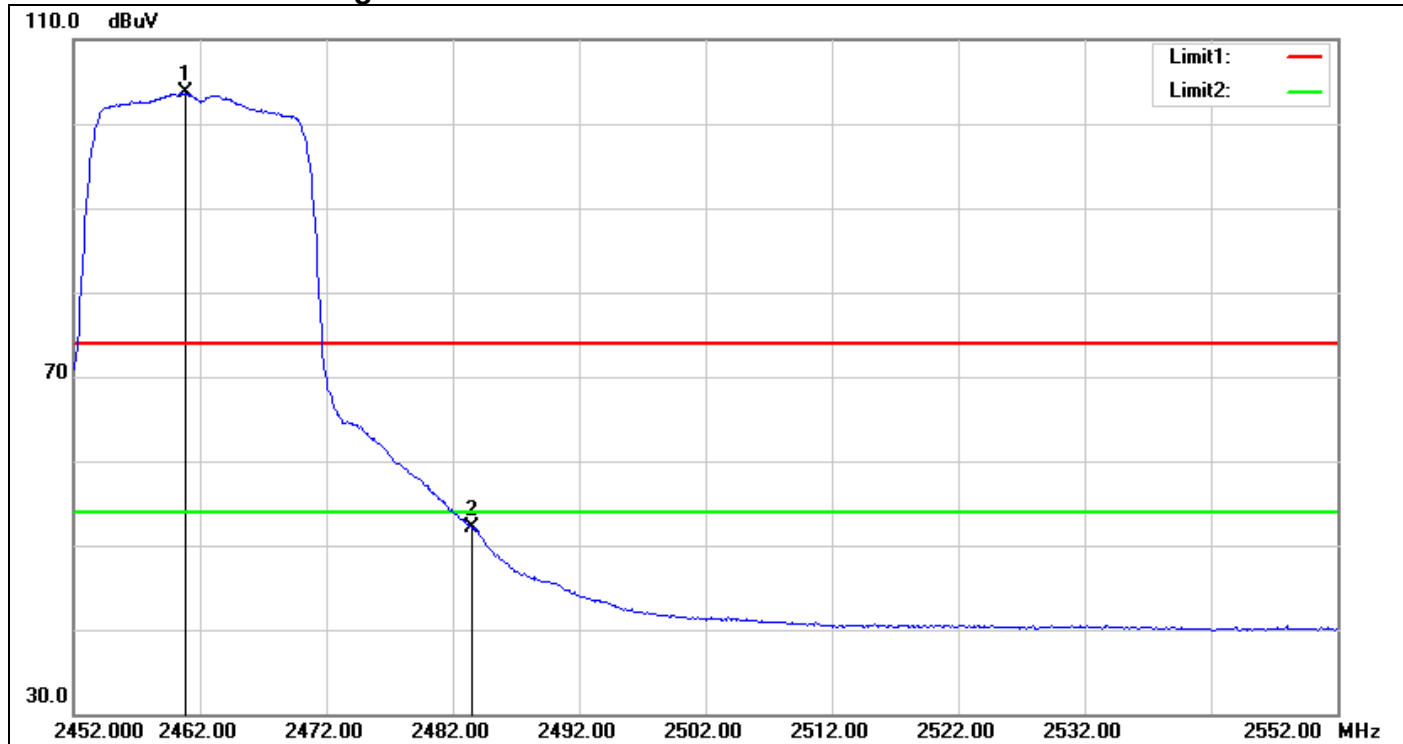
### IEEE 802.11g Mode / CH High

Detector mode: Peak



| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB) | Result (dBuV) | Limit (dBuV) | Margin (dB) | Remark |
|-----|-----------------|----------------|--------------------|---------------|--------------|-------------|--------|
| 1   | 2459.400        | 116.14         | -2.11              | 114.03        | -            | -           | peak   |
| 2   | 2484.200        | 74.01          | -1.99              | 72.02         | 74.00        | -1.98       | peak   |

**Detector mode: Average**

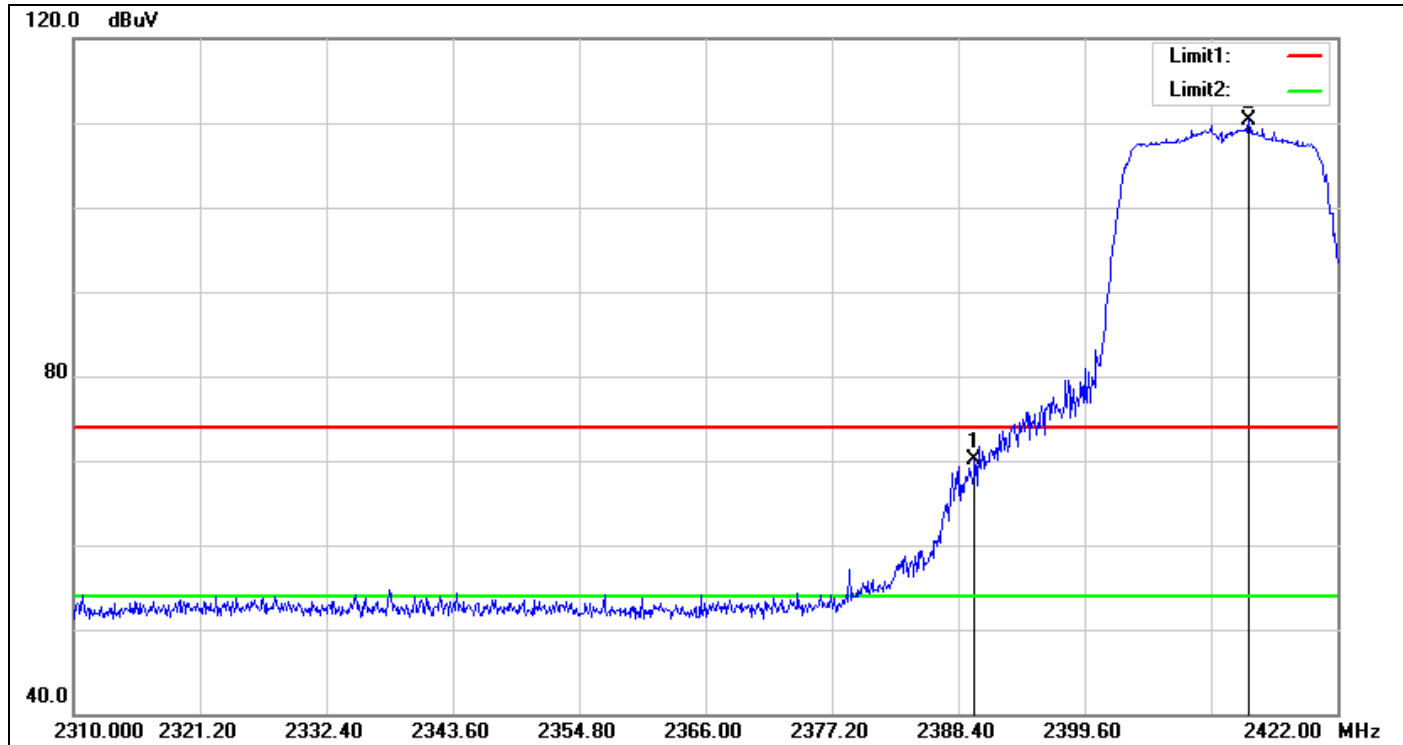


| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB) | Result (dBuV) | Limit (dBuV) | Margin (dB) | Remark |
|-----|-----------------|----------------|--------------------|---------------|--------------|-------------|--------|
| 1   | 2460.900        | 105.79         | -2.10              | 103.69        | -            | -           | AVG    |
| 2   | 2483.500        | 54.11          | -1.99              | 52.12         | 54.00        | -1.88       | AVG    |

## Band Edges

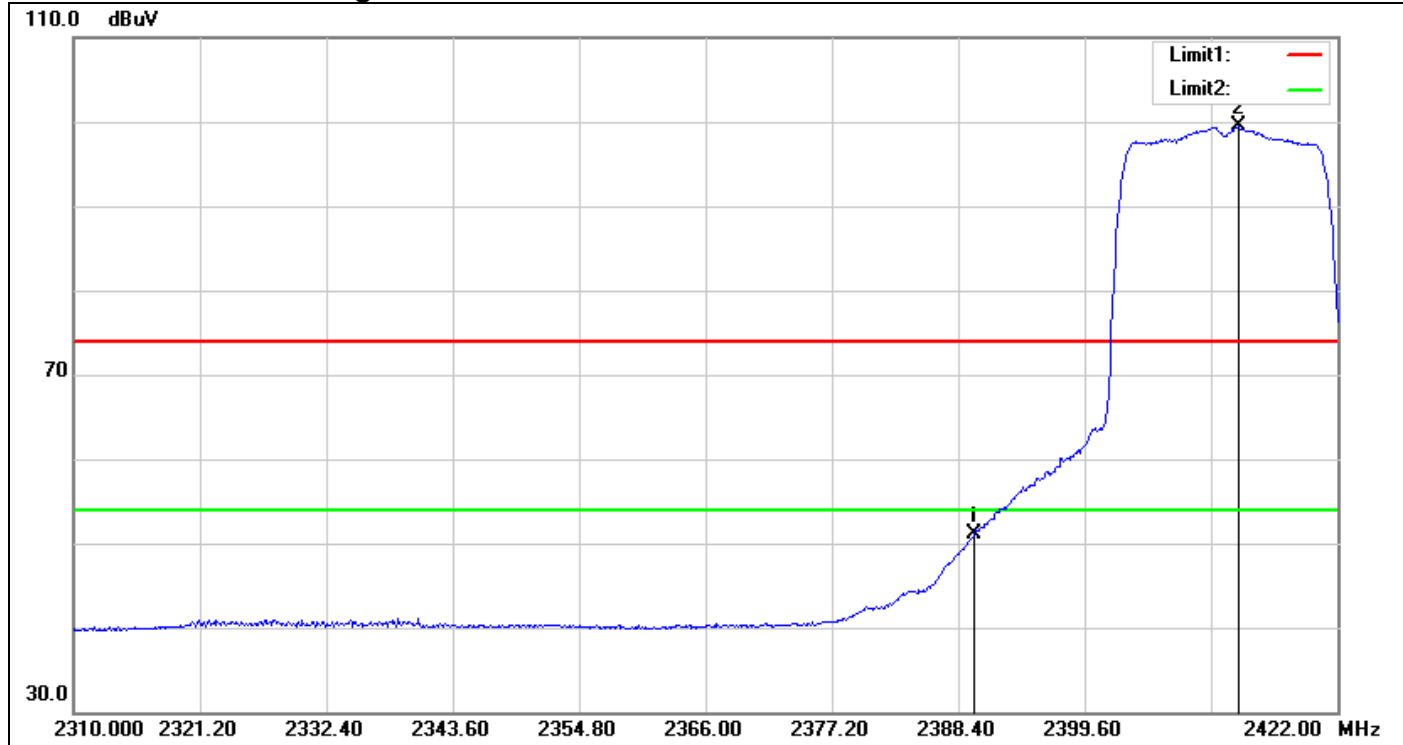
### IEEE 802.11n HT 20 MHz Channel Mode / CH Low

Detector mode: Peak



| No. | Frequency<br>(MHz) | Reading<br>(dBuV) | Correct<br>Factor(dB) | Result<br>(dBuV) | Limit<br>(dBuV) | Margin<br>(dB) | Remark |
|-----|--------------------|-------------------|-----------------------|------------------|-----------------|----------------|--------|
| 1   | 2389.856           | 72.54             | -2.49                 | 70.05            | 74.00           | -3.95          | peak   |
| 2   | 2414.160           | 112.73            | -2.40                 | 110.33           | -               | -              | peak   |

**Detector mode: Average**

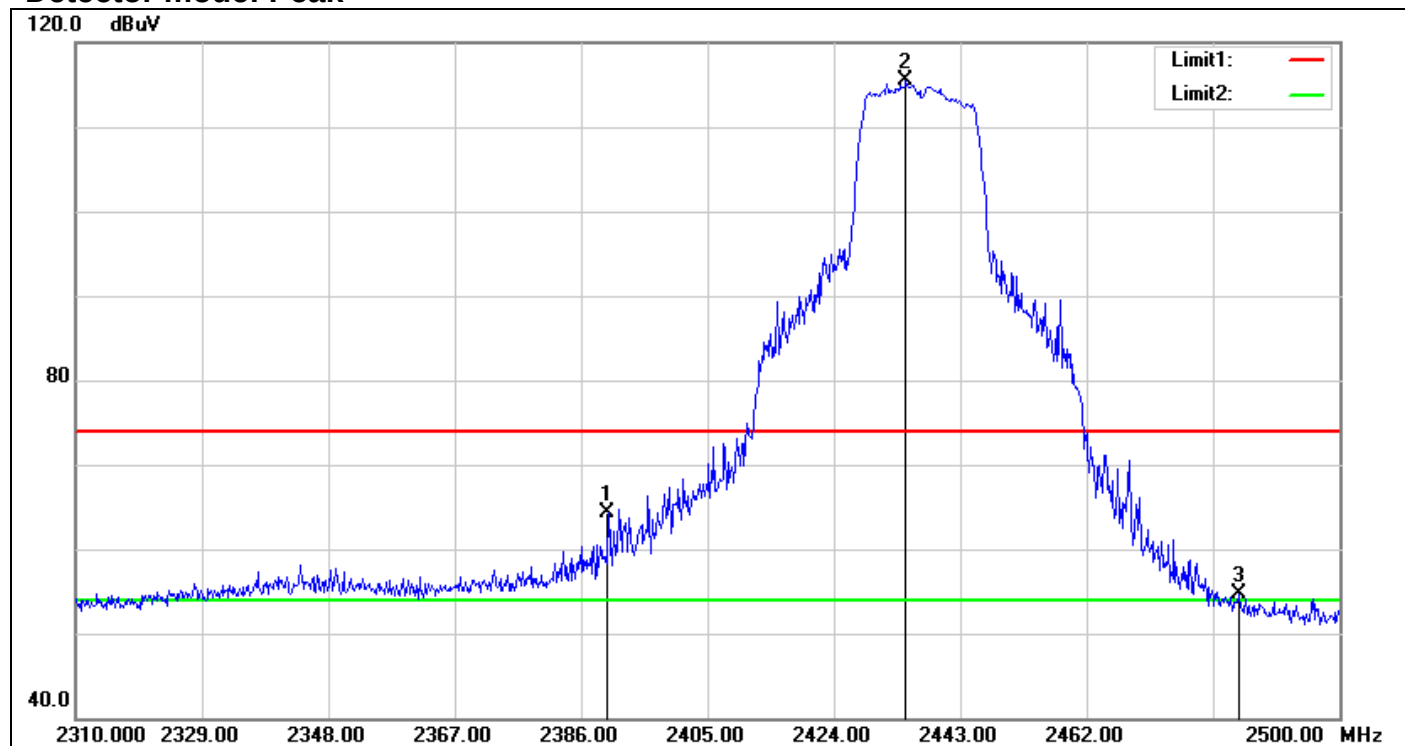


| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB) | Result (dBuV) | Limit (dBuV) | Margin (dB) | Remark |
|-----|-----------------|----------------|--------------------|---------------|--------------|-------------|--------|
| 1   | 2389.856        | 53.63          | -2.49              | 51.14         | 54.00        | -2.86       | AVG    |
| 2   | 2413.264        | 101.92         | -2.41              | 99.51         | -            | -           | AVG    |

## Band Edges

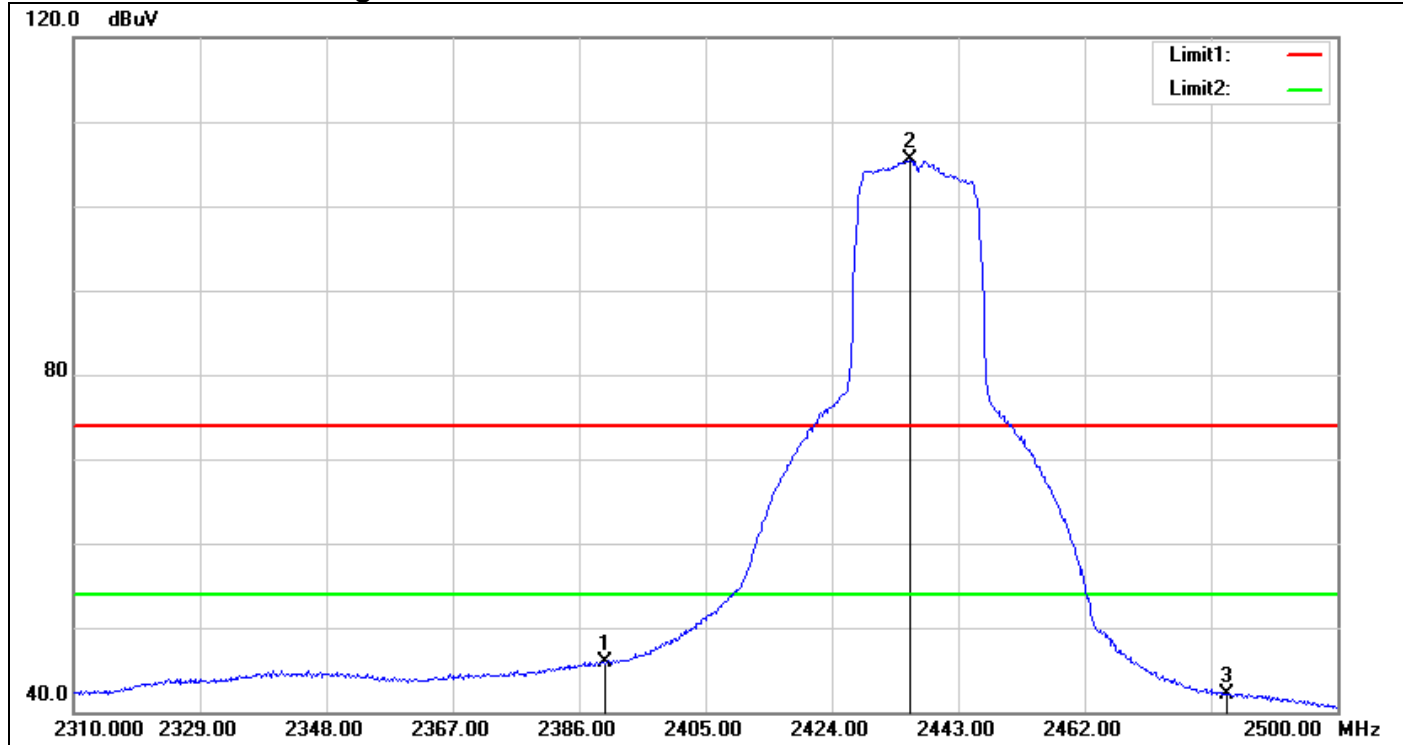
### IEEE 802.11n HT 20 MHz Channel Mode / CH Mid

Detector mode: Peak



| No. | Frequency<br>(MHz) | Reading<br>(dBuV) | Correct<br>Factor(dB) | Result<br>(dBuV) | Limit<br>(dBuV) | Margin<br>(dB) | Remark |
|-----|--------------------|-------------------|-----------------------|------------------|-----------------|----------------|--------|
| 1   | 2390.000           | 66.82             | -2.49                 | 64.33            | 74.00           | -9.67          | peak   |
| 2   | 2434.830           | 117.72            | -2.25                 | 115.47           | -               | -              | peak   |
| 3   | 2484.800           | 56.70             | -1.98                 | 54.72            | 74.00           | -19.28         | peak   |

**Detector mode: Average**

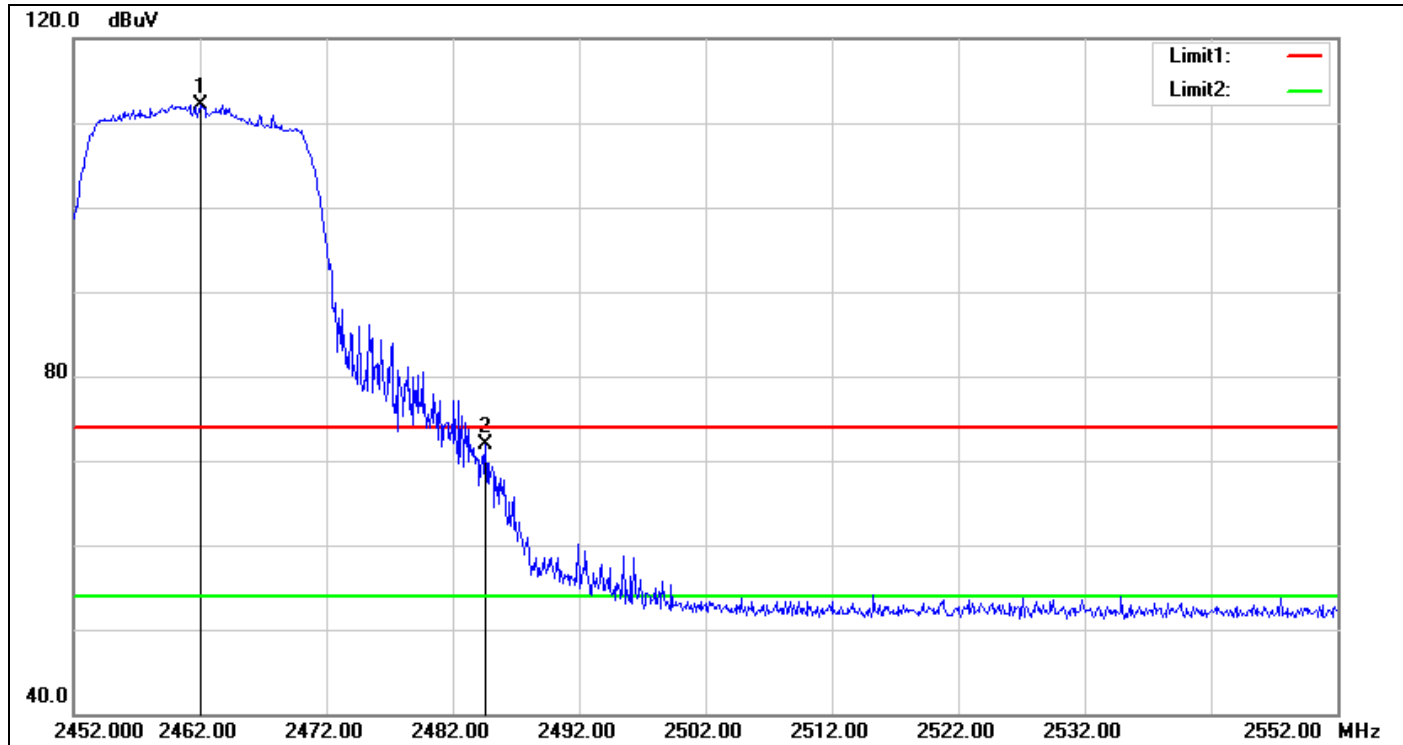


| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB) | Result (dBuV) | Limit (dBuV) | Margin (dB) | Remark |
|-----|-----------------|----------------|--------------------|---------------|--------------|-------------|--------|
| 1   | 2390.000        | 48.46          | -2.49              | 45.97         | 54.00        | -8.03       | AVG    |
| 2   | 2435.780        | 107.71         | -2.24              | 105.47        | -            | -           | AVG    |
| 3   | 2483.500        | 44.03          | -1.99              | 42.04         | 54.00        | -11.96      | AVG    |

## Band Edges

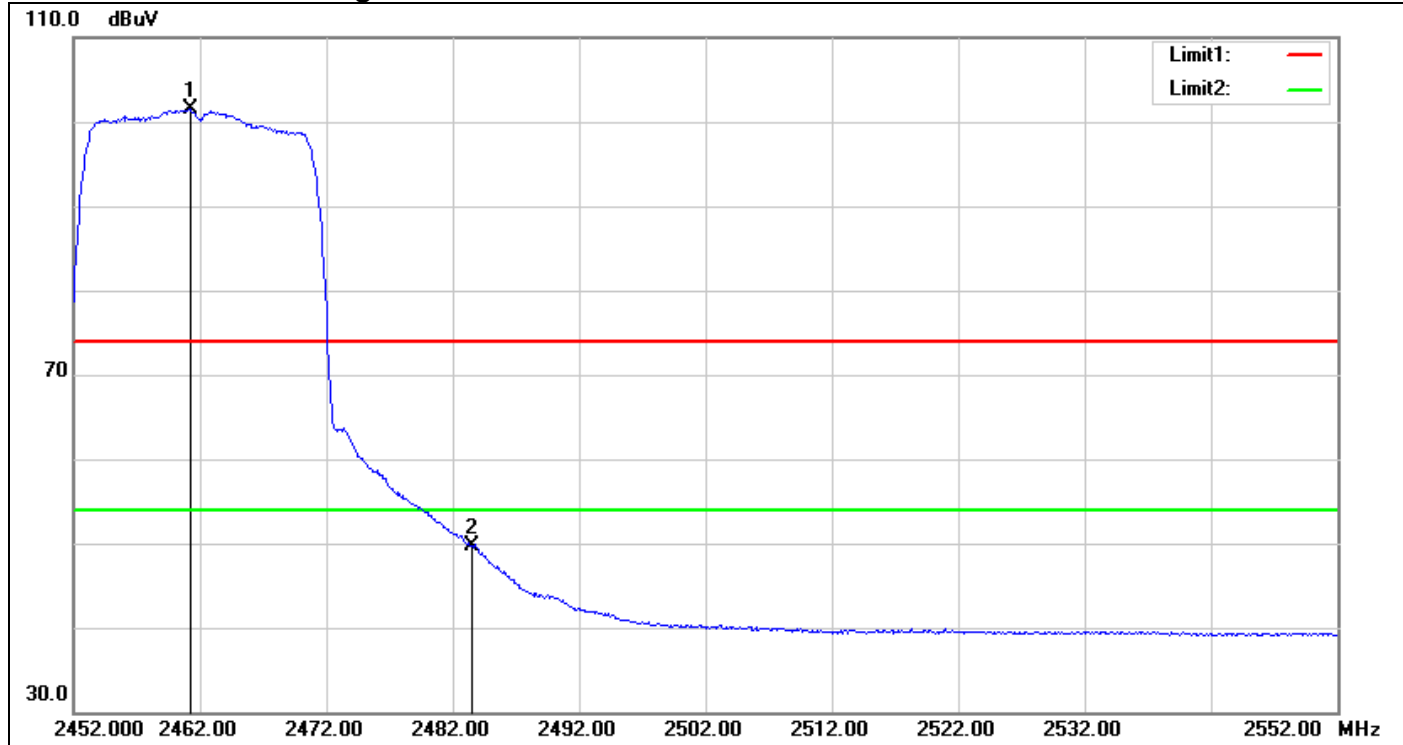
### IEEE 802.11n HT 20 MHz Channel Mode / CH High

Detector mode: Peak



| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB) | Result (dBuV) | Limit (dBuV) | Margin (dB) | Remark |
|-----|-----------------|----------------|--------------------|---------------|--------------|-------------|--------|
| 1   | 2462.100        | 114.29         | -2.10              | 112.19        | -            | -           | peak   |
| 2   | 2484.600        | 73.91          | -1.98              | 71.93         | 74.00        | -2.07       | peak   |

**Detector mode: Average**

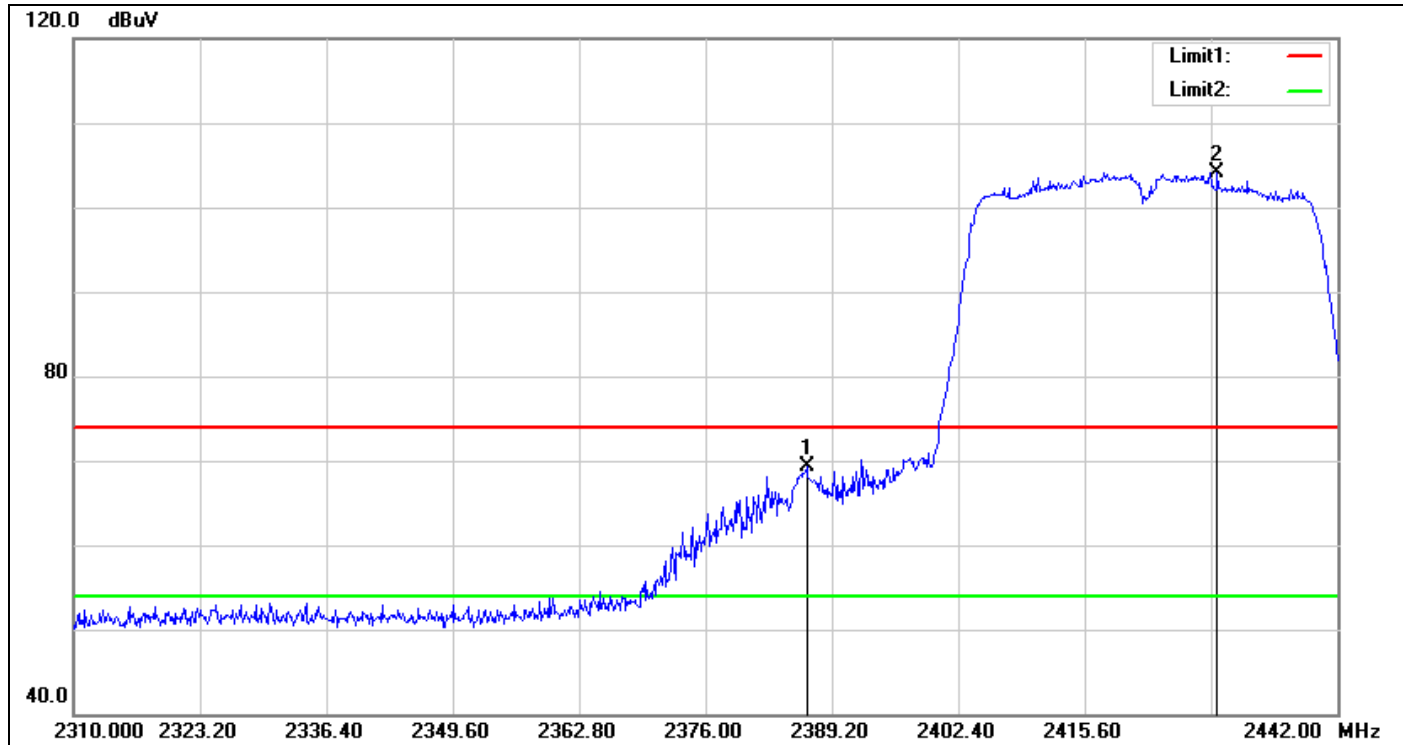


| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB) | Result (dBuV) | Limit (dBuV) | Margin (dB) | Remark |
|-----|-----------------|----------------|--------------------|---------------|--------------|-------------|--------|
| 1   | 2461.200        | 103.61         | -2.10              | 101.51        | -            | -           | AVG    |
| 2   | 2483.500        | 51.62          | -1.99              | 49.63         | 54.00        | -4.37       | AVG    |

## Band Edges

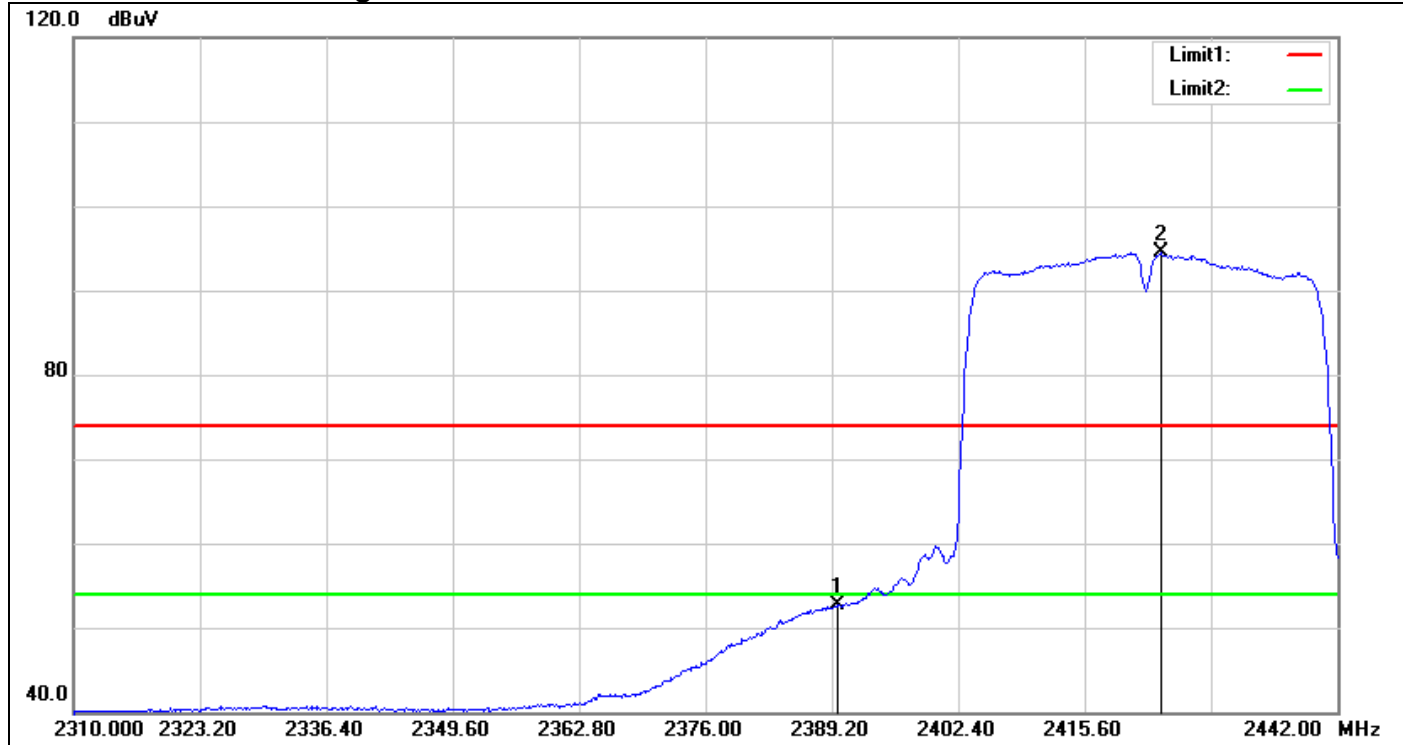
### IEEE 802.11n HT 40 MHz Channel Mode / CH Low

Detector mode: Peak



| No. | Frequency<br>(MHz) | Reading<br>(dBuV) | Correct<br>Factor(dB) | Result<br>(dBuV) | Limit<br>(dBuV) | Margin<br>(dB) | Remark |
|-----|--------------------|-------------------|-----------------------|------------------|-----------------|----------------|--------|
| 1   | 2386.560           | 71.77             | -2.52                 | 69.25            | 74.00           | -4.75          | peak   |
| 2   | 2429.460           | 106.34            | -2.29                 | 104.05           | -               | -              | peak   |

**Detector mode: Average**

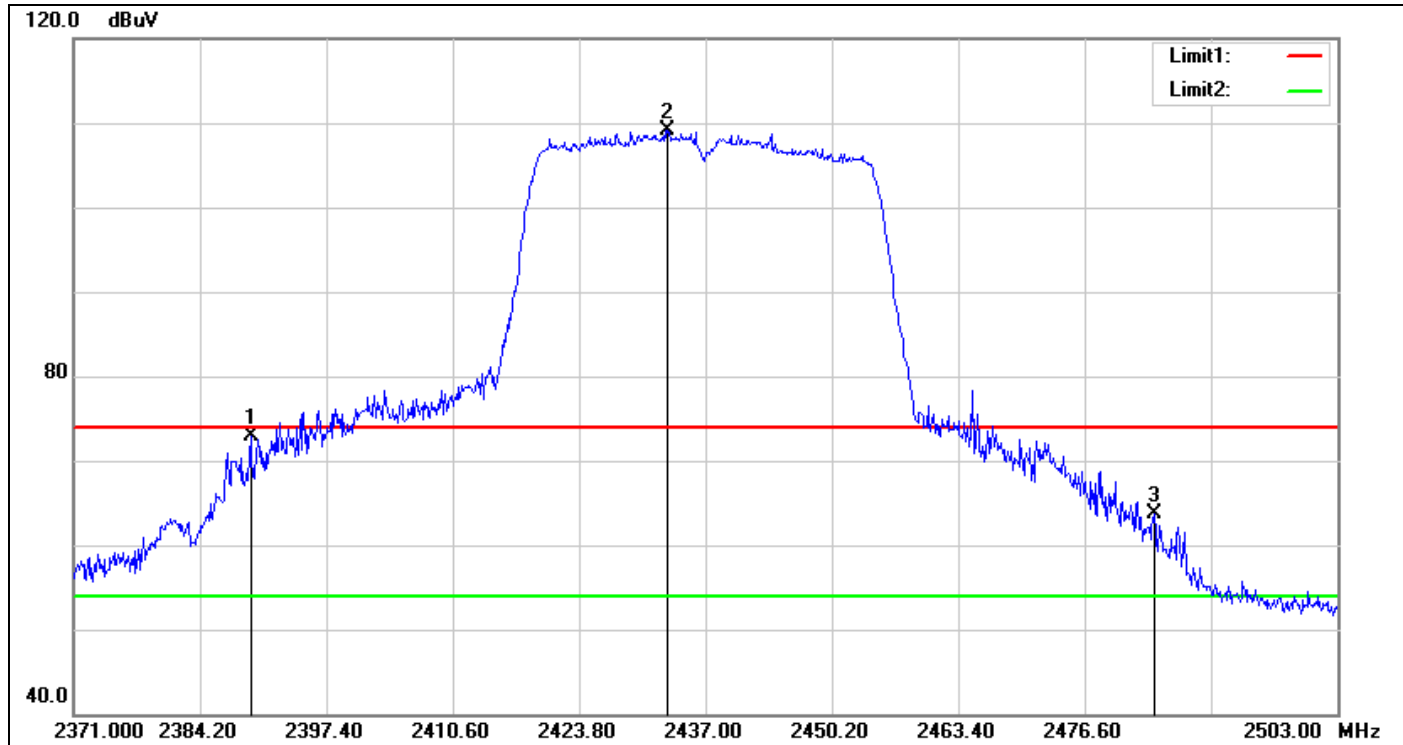


| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB) | Result (dBuV) | Limit (dBuV) | Margin (dB) | Remark |
|-----|-----------------|----------------|--------------------|---------------|--------------|-------------|--------|
| 1   | 2389.728        | 55.12          | -2.49              | 52.63         | 54.00        | -1.37       | AVG    |
| 2   | 2423.520        | 96.75          | -2.33              | 94.42         | -            | -           | AVG    |

## Band Edges

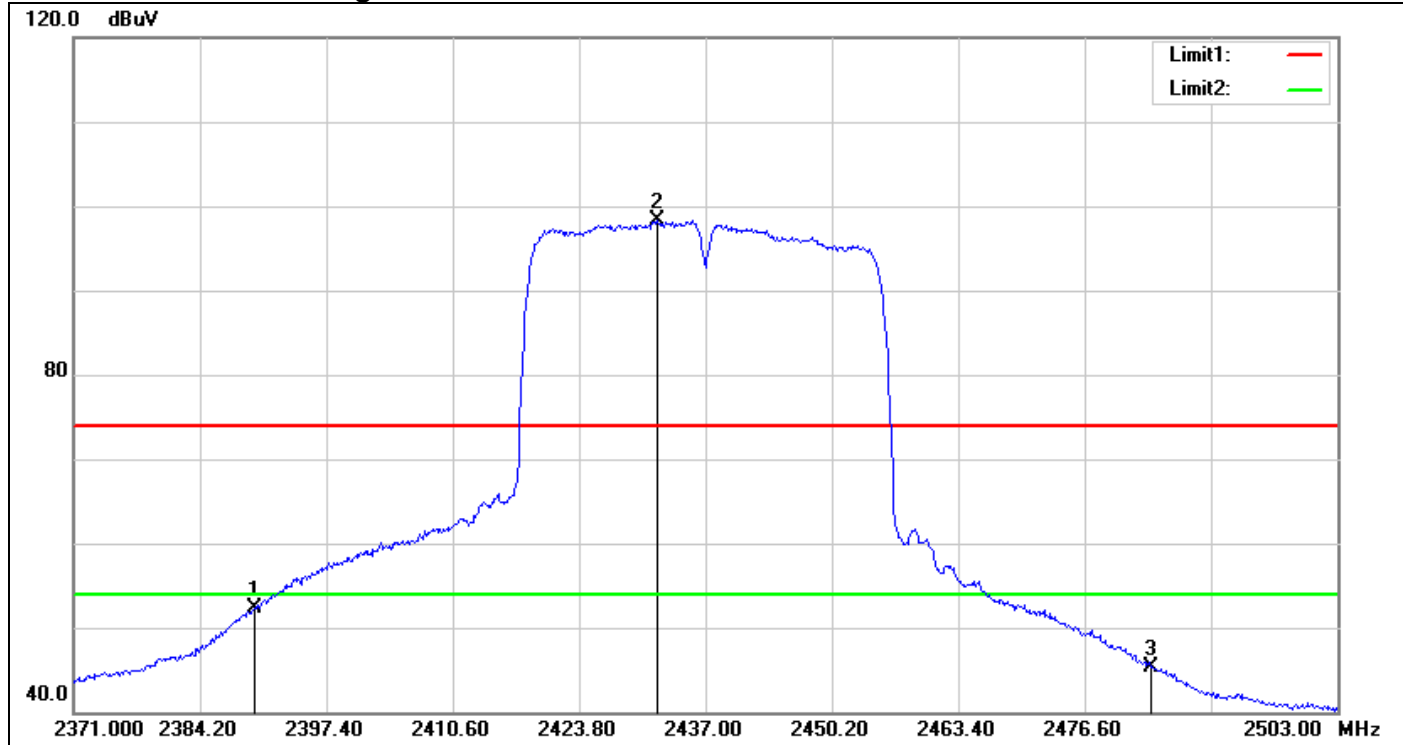
### IEEE 802.11n HT 40 MHz Channel Mode / CH Mid

Detector mode: Peak



| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB) | Result (dBuV) | Limit (dBuV) | Margin (dB) | Remark |
|-----|-----------------|----------------|--------------------|---------------|--------------|-------------|--------|
| 1   | 2389.480        | 75.30          | -2.49              | 72.81         | 74.00        | -1.19       | peak   |
| 2   | 2433.040        | 111.31         | -2.26              | 109.05        | -            | -           | peak   |
| 3   | 2483.860        | 65.62          | -1.99              | 63.63         | 74.00        | -10.37      | peak   |

**Detector mode: Average**

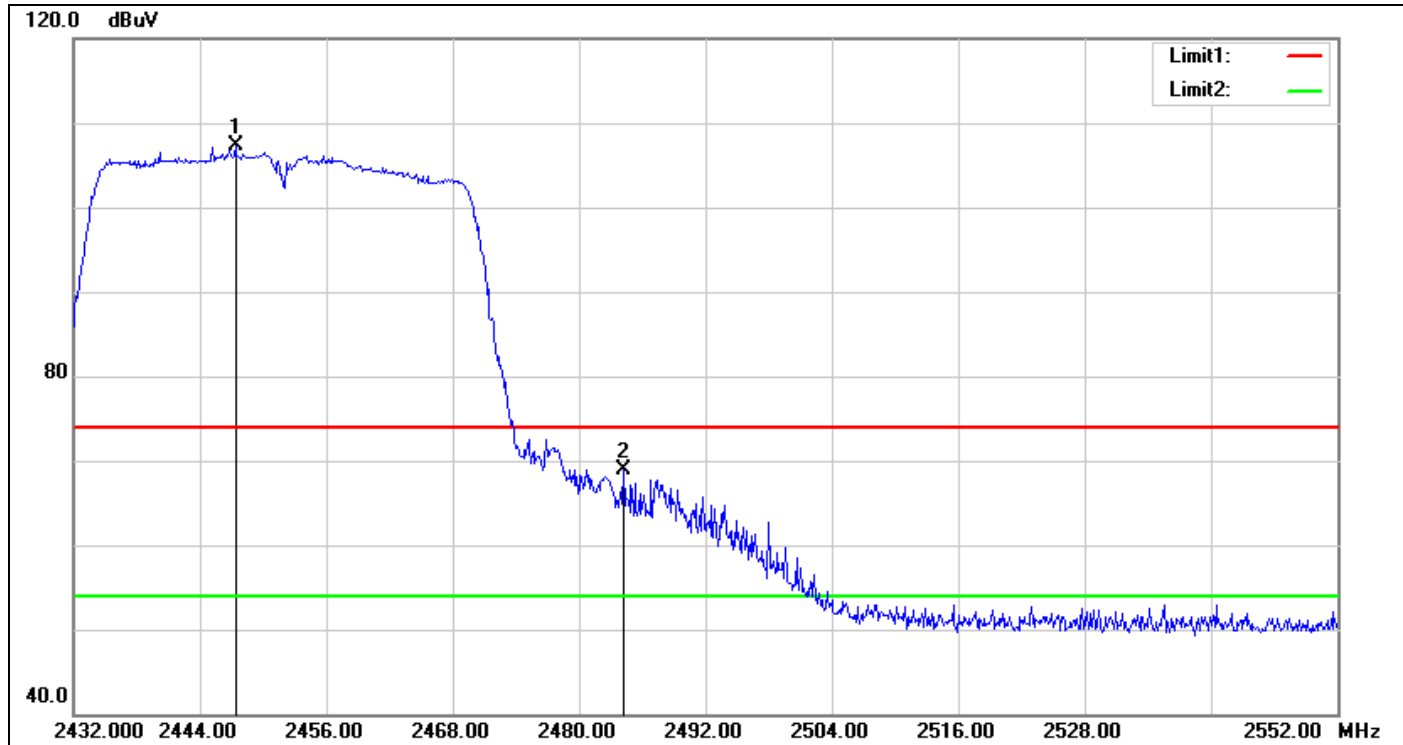


| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB) | Result (dBuV) | Limit (dBuV) | Margin (dB) | Remark |
|-----|-----------------|----------------|--------------------|---------------|--------------|-------------|--------|
| 1   | 2389.876        | 54.85          | -2.49              | 52.36         | 54.00        | -1.64       | AVG    |
| 2   | 2431.984        | 100.64         | -2.27              | 98.37         | -            | -           | AVG    |
| 3   | 2483.500        | 47.20          | -1.99              | 45.21         | 54.00        | -8.79       | AVG    |

## Band Edges

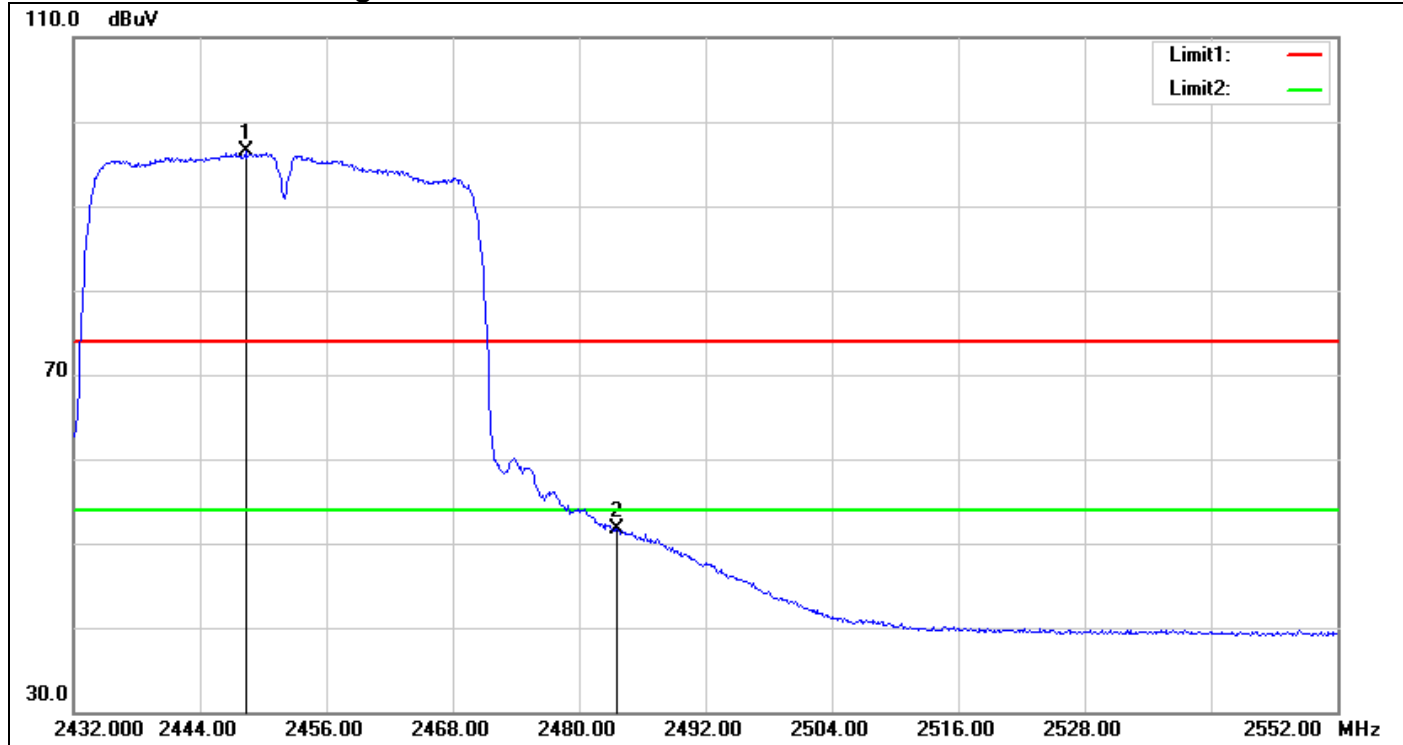
### IEEE 802.11n HT 40 MHz Channel Mode / CH High

Detector mode: Peak



| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB) | Result (dBuV) | Limit (dBuV) | Margin (dB) | Remark |
|-----|-----------------|----------------|--------------------|---------------|--------------|-------------|--------|
| 1   | 2447.360        | 109.39         | -2.16              | 107.23        | -            | -           | peak   |
| 2   | 2484.200        | 70.80          | -1.99              | 68.81         | 74.00        | -5.19       | peak   |

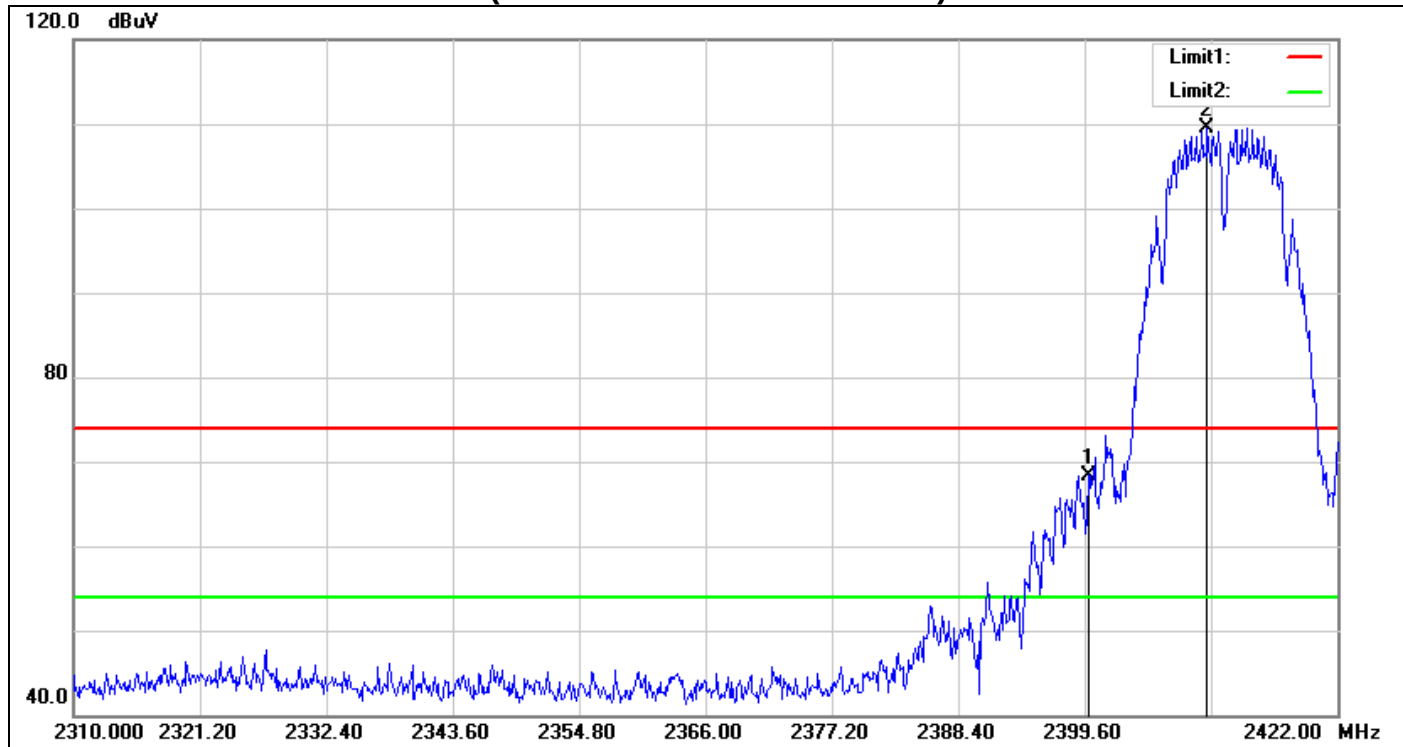
**Detector mode: Average**



| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB) | Result (dBuV) | Limit (dBuV) | Margin (dB) | Remark |
|-----|-----------------|----------------|--------------------|---------------|--------------|-------------|--------|
| 1   | 2448.320        | 98.64          | -2.15              | 96.49         | -            | -           | AVG    |
| 2   | 2483.600        | 53.67          | -1.99              | 51.68         | 54.00        | -2.32       | AVG    |

## Test Plot

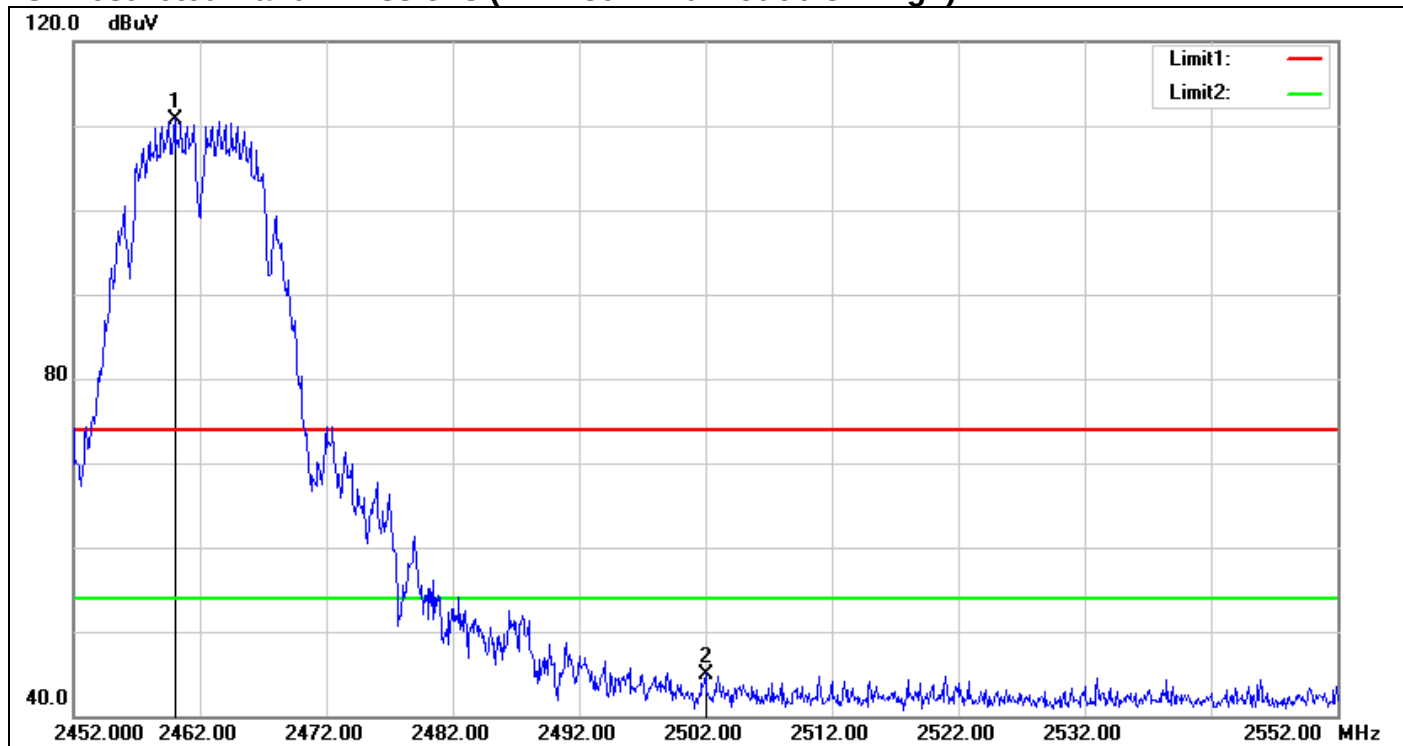
### Un-restricted Band Emissions (IEEE 802.11b mode / CH Low)



| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB) | Result (dBuV) | Remark |
|-----|-----------------|----------------|--------------------|---------------|--------|
| 1   | 2400.000        | 70.64          | -2.41              | 68.23         | peak   |
| 2   | 2410.464        | 111.90         | -2.43              | 109.47        | peak   |

**Note:** Spurious emission levels that exceed the level of 20 dB below the applicable limit.

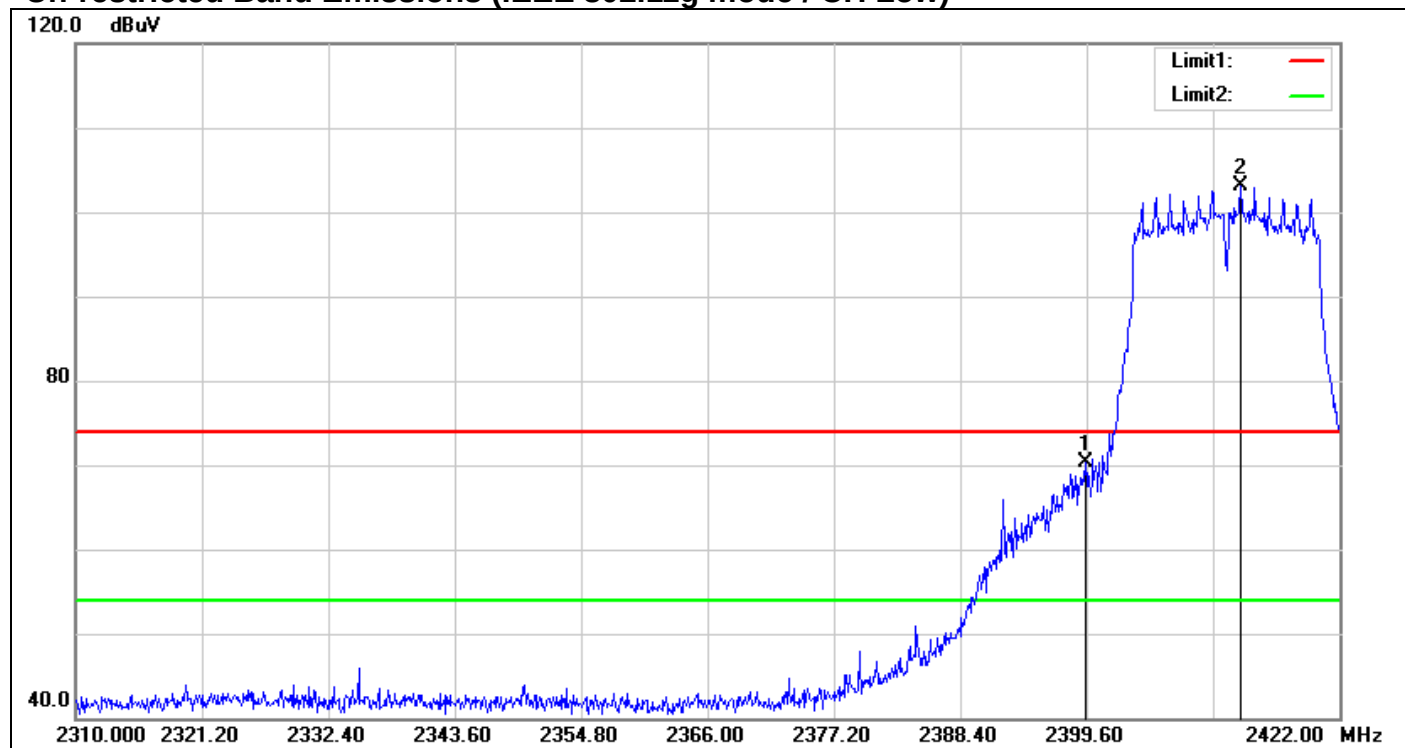
### Un-restricted Band Emissions (IEEE 802.11b mode / CH High)



| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB) | Result (dBuV) | Remark |
|-----|-----------------|----------------|--------------------|---------------|--------|
| 1   | 2460.000        | 112.90         | -2.10              | 110.80        | peak   |
| 2   | 2502.000        | 46.85          | -1.85              | 45.00         | peak   |

**Note:** Spurious emission levels that exceed the level of 20 dB below the applicable limit.

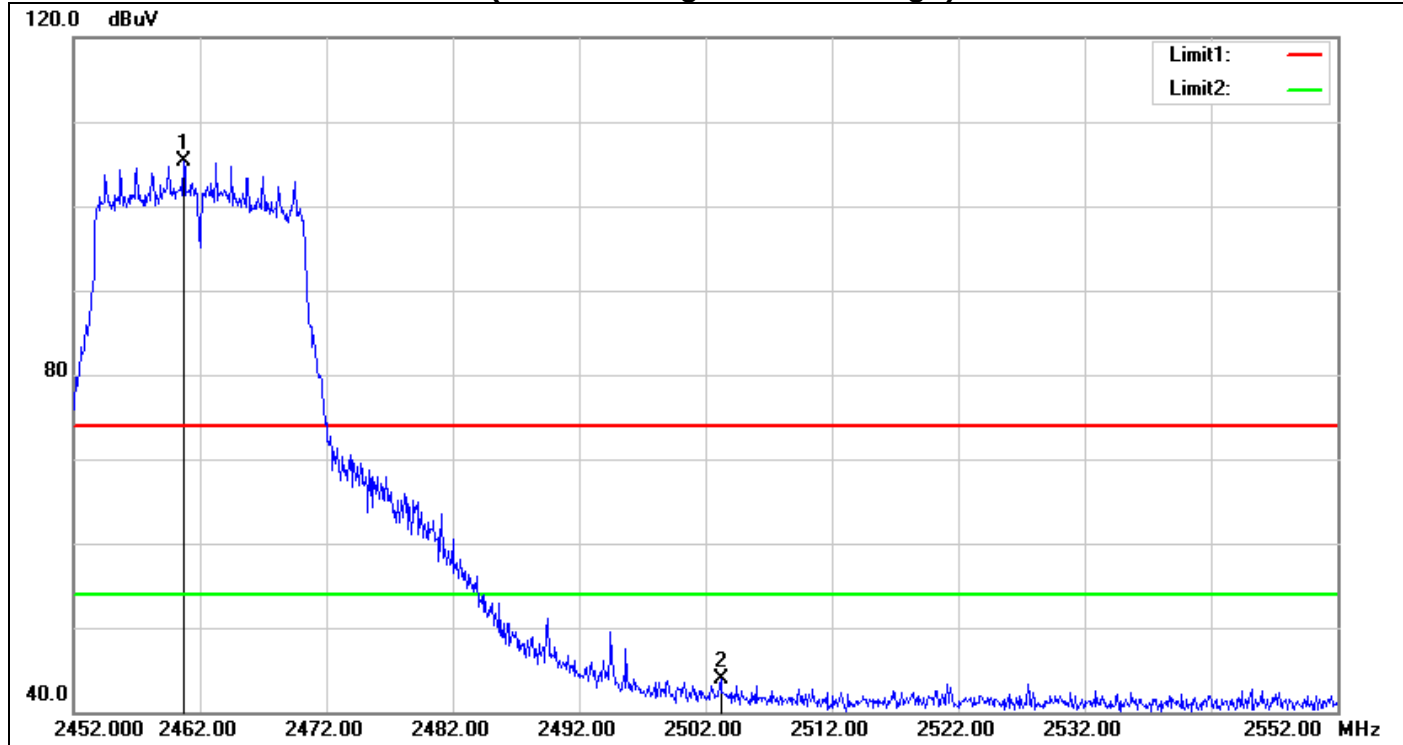
### Un-restricted Band Emissions (IEEE 802.11g mode / CH Low)



| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB) | Result (dBuV) | Remark |
|-----|-----------------|----------------|--------------------|---------------|--------|
| 1   | 2399.488        | 72.65          | -2.41              | 70.24         | peak   |
| 2   | 2413.264        | 105.42         | -2.41              | 103.01        | peak   |

**Note:** Spurious emission levels that exceed the level of 20 dB below the applicable limit.

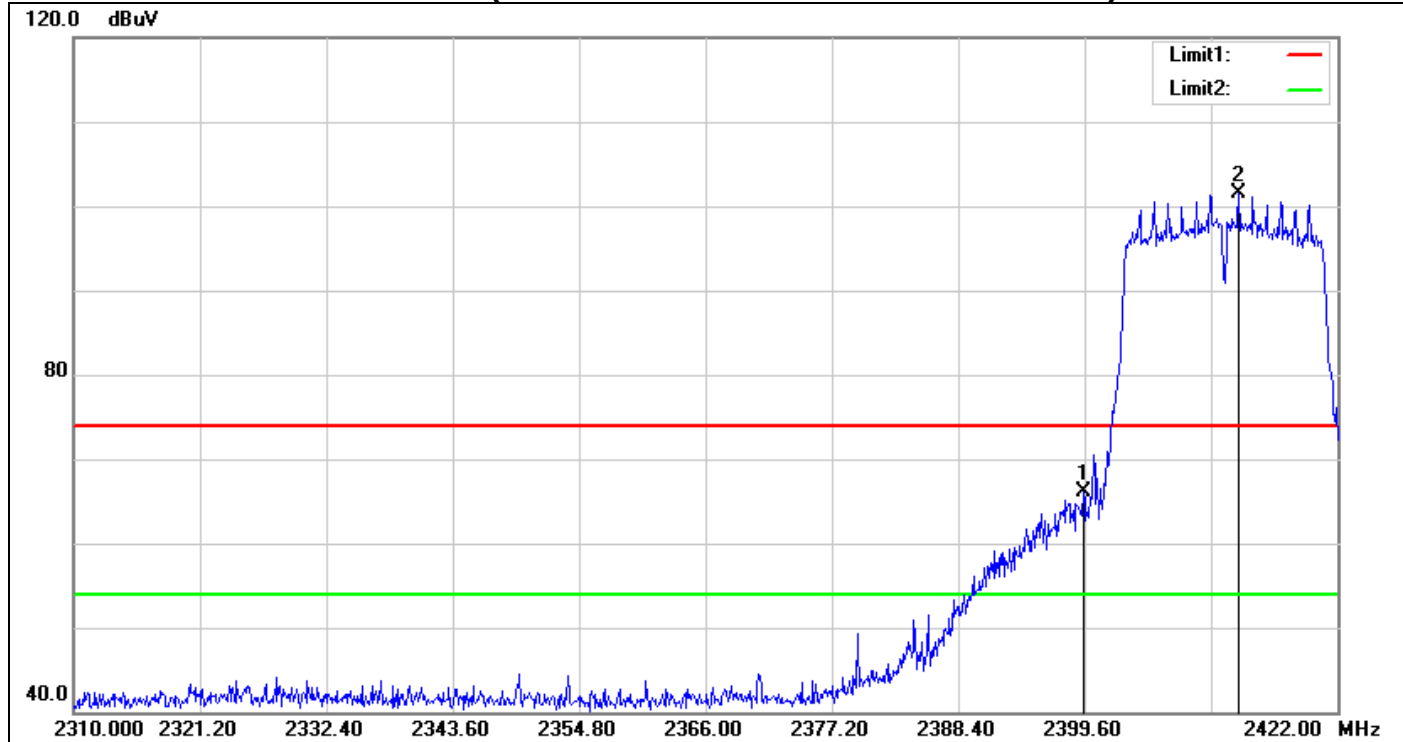
### Un-restricted Band Emissions (IEEE 802.11g mode / CH High)



| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB) | Result (dBuV) | Remark |
|-----|-----------------|----------------|--------------------|---------------|--------|
| 1   | 2460.700        | 107.45         | -2.10              | 105.35        | peak   |
| 2   | 2503.200        | 45.71          | -1.85              | 43.86         | peak   |

**Note:** Spurious emission levels that exceed the level of 20 dB below the applicable limit.

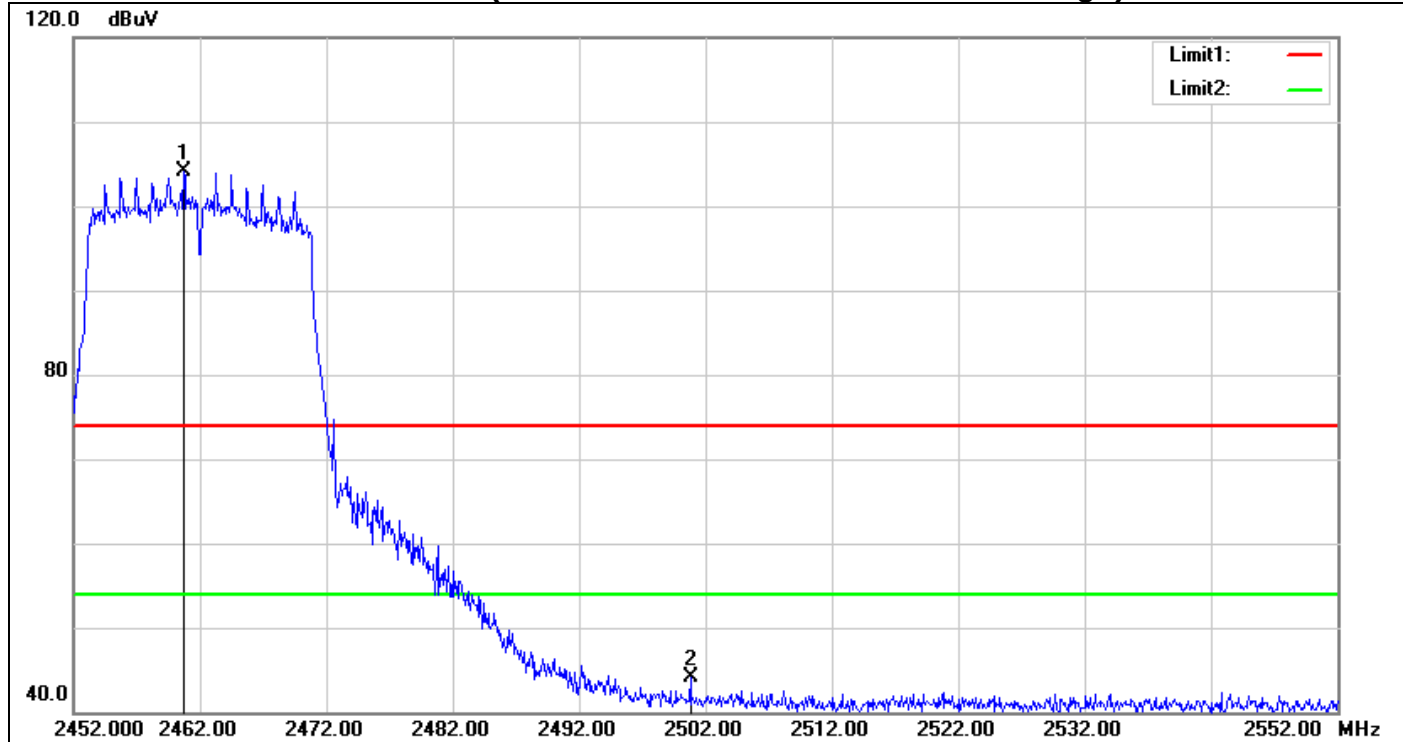
### Un-restricted Band Emissions (IEEE 802.11n HT 20 MHz mode / CH Low)



| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB) | Result (dBuV) | Remark |
|-----|-----------------|----------------|--------------------|---------------|--------|
| 1   | 2399.488        | 68.44          | -2.41              | 66.03         | peak   |
| 2   | 2413.264        | 103.96         | -2.41              | 101.55        | peak   |

**Note:** Spurious emission levels that exceed the level of 20 dB below the applicable limit.

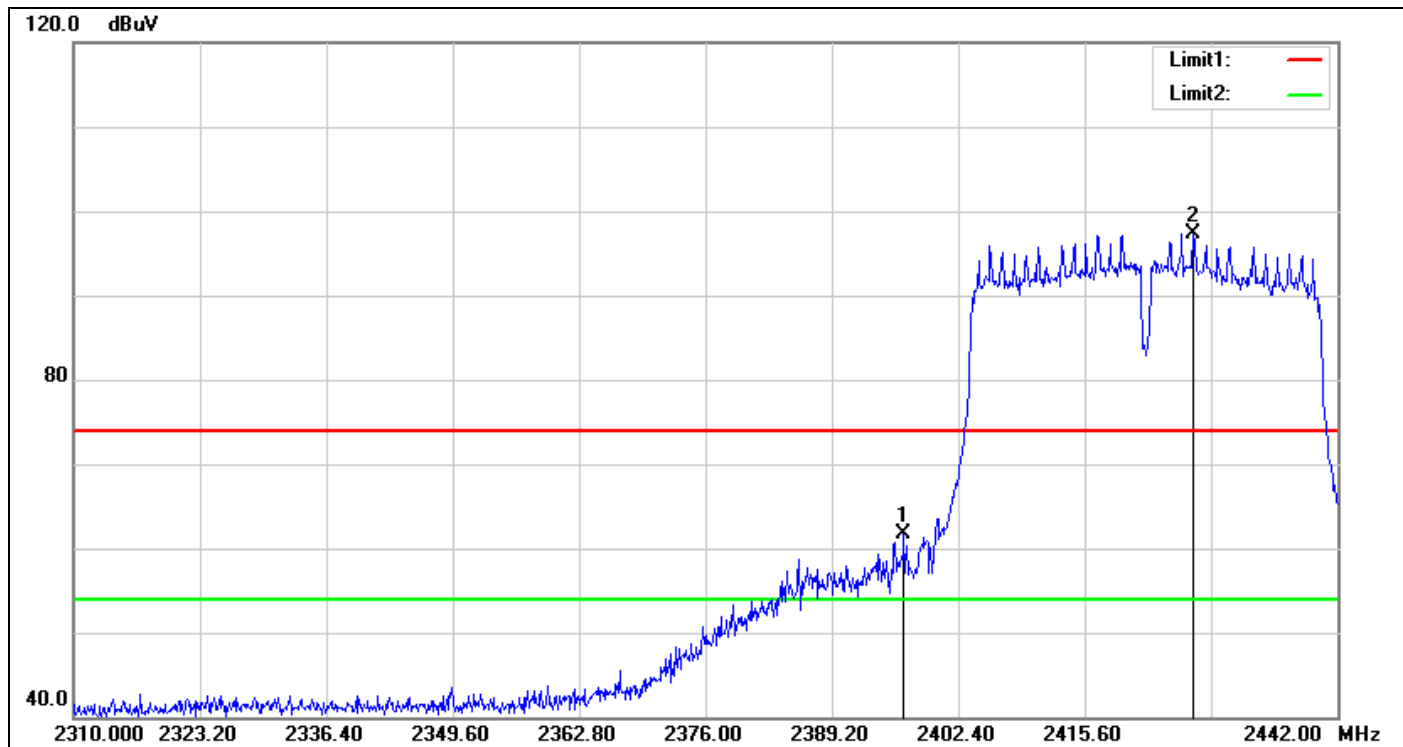
### Un-restricted Band Emissions (IEEE 802.11n HT 20 MHz mode / CH High)



| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB) | Result (dBuV) | Remark |
|-----|-----------------|----------------|--------------------|---------------|--------|
| 1   | 2460.700        | 106.14         | -2.10              | 104.04        | peak   |
| 2   | 2500.800        | 45.88          | -1.86              | 44.02         | peak   |

**Note:** Spurious emission levels that exceed the level of 20 dB below the applicable limit.

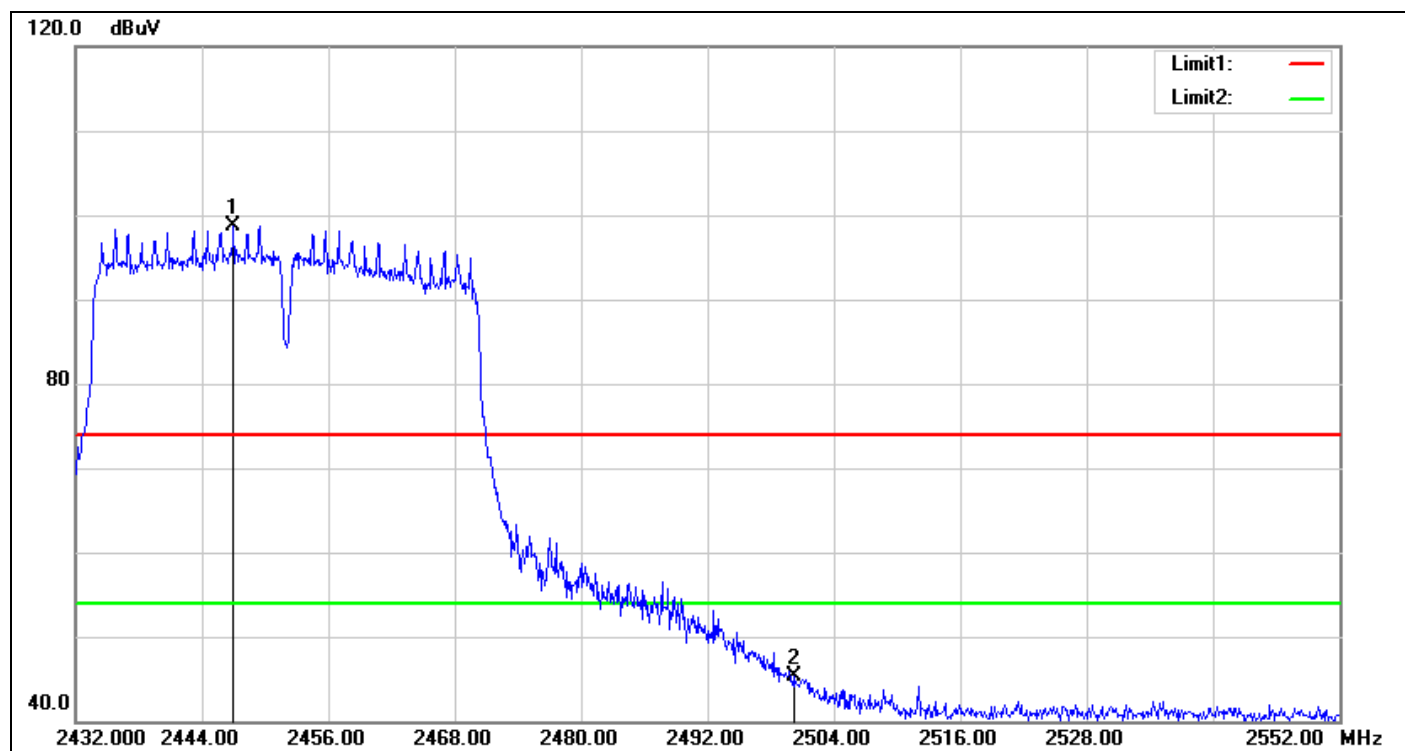
### Un-restricted Band Emissions (IEEE 802.11n HT 40 MHz mode / CH Low)



| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB) | Result (dBuV) | Remark |
|-----|-----------------|----------------|--------------------|---------------|--------|
| 1   | 2396.724        | 64.12          | -2.44              | 61.68         | peak   |
| 2   | 2426.952        | 99.64          | -2.31              | 97.33         | peak   |

**Note:** Spurious emission levels that exceed the level of 20 dB below the applicable limit.

## Un-restricted Band Emissions (IEEE 802.11n HT 40 MHz mode / CH High)



| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB) | Result (dBuV) | Remark |
|-----|-----------------|----------------|--------------------|---------------|--------|
| 1   | 2447.000        | 100.95         | -2.16              | 98.79         | peak   |
| 2   | 2500.160        | 47.14          | -1.86              | 45.28         | peak   |

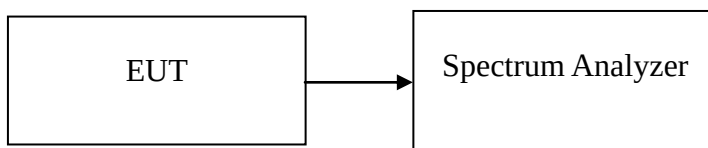
**Note:** Spurious emission levels that exceed the level of 20 dB below the applicable limit.

## 7.6 PEAK POWER SPECTRAL DENSITY

### LIMIT

1. According to §15.247(e), for digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.
2. According to §15.247(f), the digital modulation operation of the hybrid system, with the frequency hopping turned off, shall comply with the power density requirements of paragraph (d) of this section.

### Test Configuration



### TEST PROCEDURE

1. Place the EUT on the table and set it in transmitting mode.  
Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
2. Set the spectrum analyzer as RBW = 3 kHz, VBW = 30 kHz, Span = 300 kHz, Sweep time = 100 s
3. Record the max reading.
4. Repeat the above procedure until the measurements for all frequencies are completed.

### TEST RESULTS

*No non-compliance noted*

## Test Data

### IEEE 802.11b mode

Duty Cycle = 98.37%      Duty Factor = 0.07

| Channel | Frequency (MHz) | Chain 0 PPSD (dBm) | Chain 1 PPSD (dBm) | PPSD (dBm) | Limit (dBm) | Result |
|---------|-----------------|--------------------|--------------------|------------|-------------|--------|
| Low     | 2412            | -5.56              | -5.84              | -2.62      | 8.00        | PASS   |
| Mid     | 2437            | -5.24              | -5.97              | -2.51      |             | PASS   |
| High    | 2462            | -5.66              | -5.09              | -2.28      |             | PASS   |

### IEEE 802.11g mode

Duty Cycle = 89.47%      Duty Factor = 0.48

| Channel | Frequency (MHz) | Chain 0 PPSD (dBm) | Chain 1 PPSD (dBm) | PPSD (dBm) | Limit (dBm) | Result |
|---------|-----------------|--------------------|--------------------|------------|-------------|--------|
| Low     | 2412            | -11.28             | -10.77             | -7.52      | 8.00        | PASS   |
| Mid     | 2437            | -4.74              | -5.49              | -1.61      |             | PASS   |
| High    | 2462            | -11.03             | -10.64             | -7.34      |             | PASS   |

### IEEE 802.11n HT 20 MHz mode

Duty Cycle = 88.79%      Duty Factor = 0.52

| Channel | Frequency (MHz) | Chain 0 PPSD (dBm) | Chain 1 PPSD (dBm) | PPSD (dBm) | Limit (dBm) | Result |
|---------|-----------------|--------------------|--------------------|------------|-------------|--------|
| Low     | 2412            | -12.88             | -11.81             | -8.79      | 8.00        | PASS   |
| Mid     | 2437            | -5.14              | -5.96              | -2.00      |             | PASS   |
| High    | 2462            | -12.45             | -12.76             | -9.08      |             | PASS   |

### IEEE 802.11n HT 40 MHz mode

Duty Cycle = 79.98%      Duty Factor = 0.97

| Channel | Frequency (MHz) | Chain 0 PPSD (dBm) | Chain 1 PPSD (dBm) | PPSD (dBm) | Limit (dBm) | Result |
|---------|-----------------|--------------------|--------------------|------------|-------------|--------|
| Low     | 2422            | -18.64             | -18.41             | -14.54     | 8.00        | PASS   |
| Mid     | 2437            | -14.83             | -14.93             | -10.90     |             | PASS   |
| High    | 2452            | -18.41             | -21.13             | -15.58     |             | PASS   |

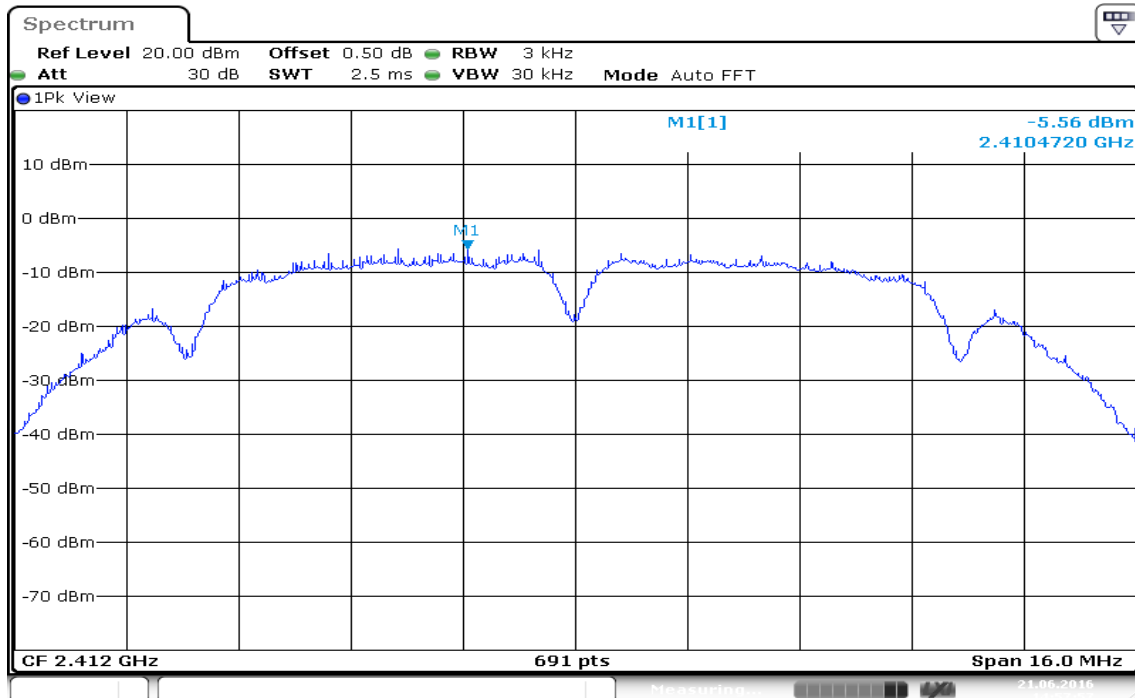
**Remark:**

1. Total PPSD (dBm) =  $10 \cdot \log(10^{\text{Chain 0 PPSD} / 10} + 10^{\text{Chain 1 PPSD} / 10})$

## Test Plot

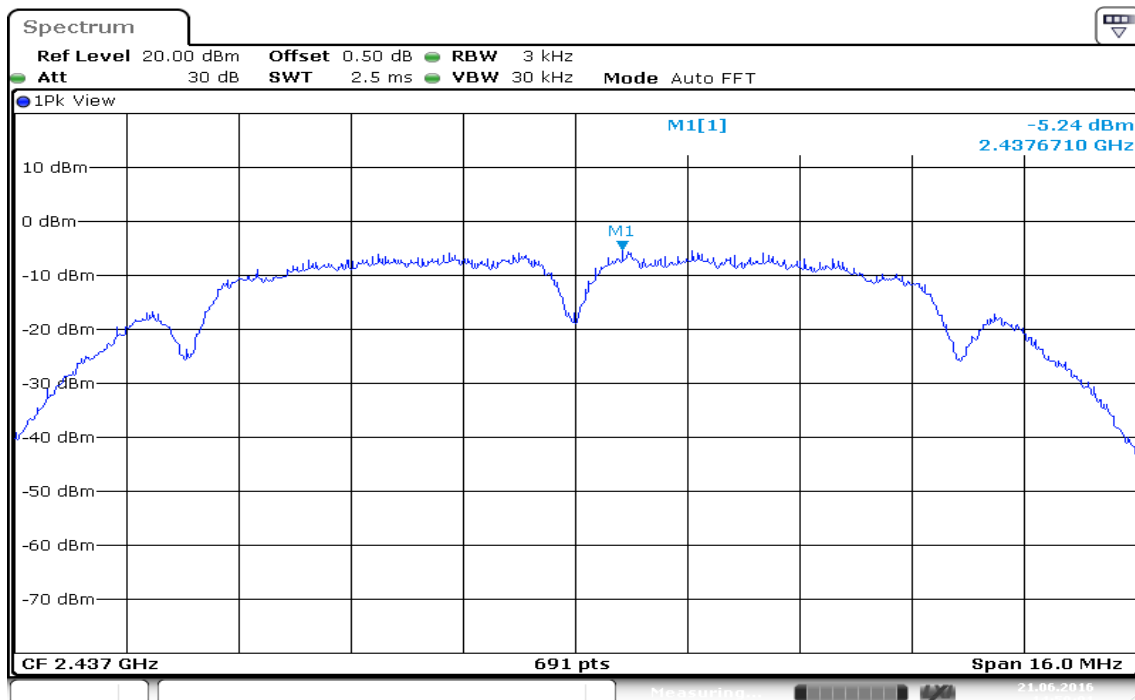
### IEEE 802.11b mode / Chain 0

### PPSD (CH Low)



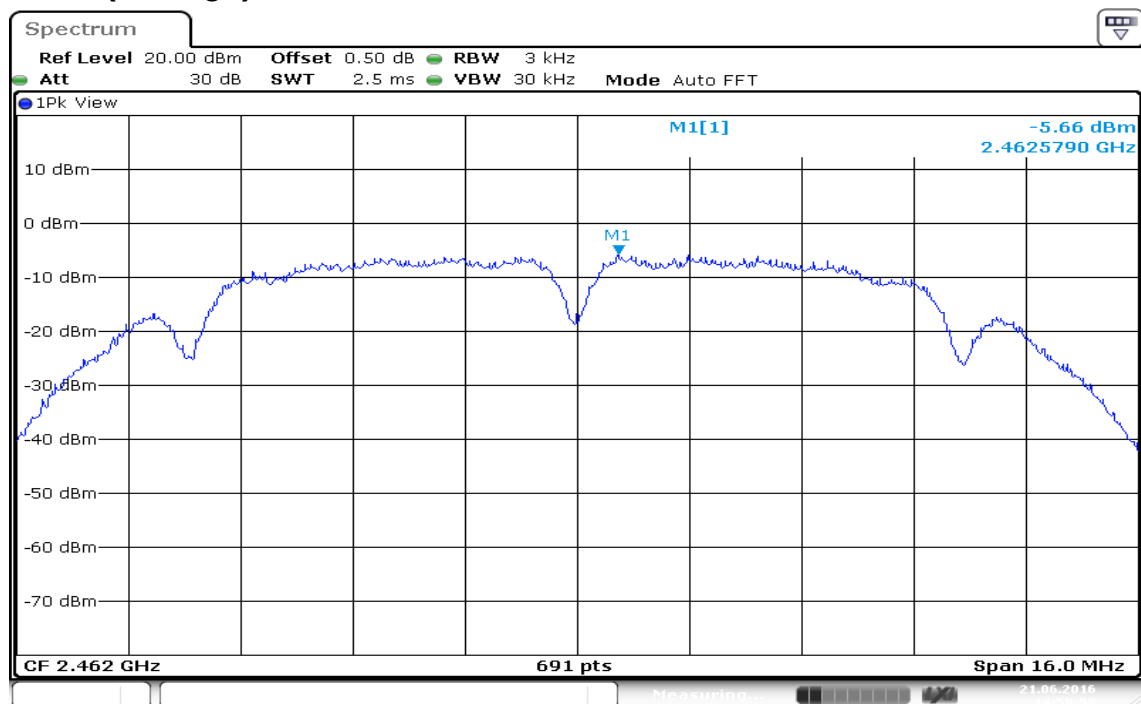
Date: 21.JUN.2016 14:57:57

### PPSD (CH Mid)



Date: 21.JUN.2016 14:59:01

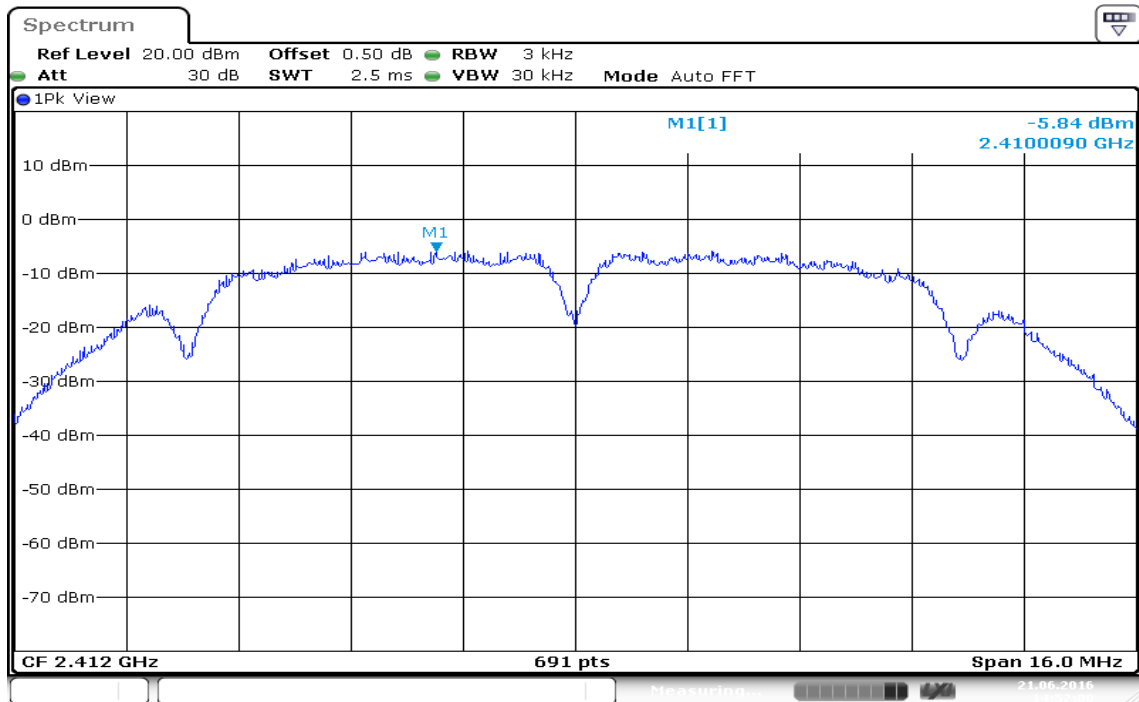
## PPSD (CH High)



Date: 21.JUN.2016 14:59:59

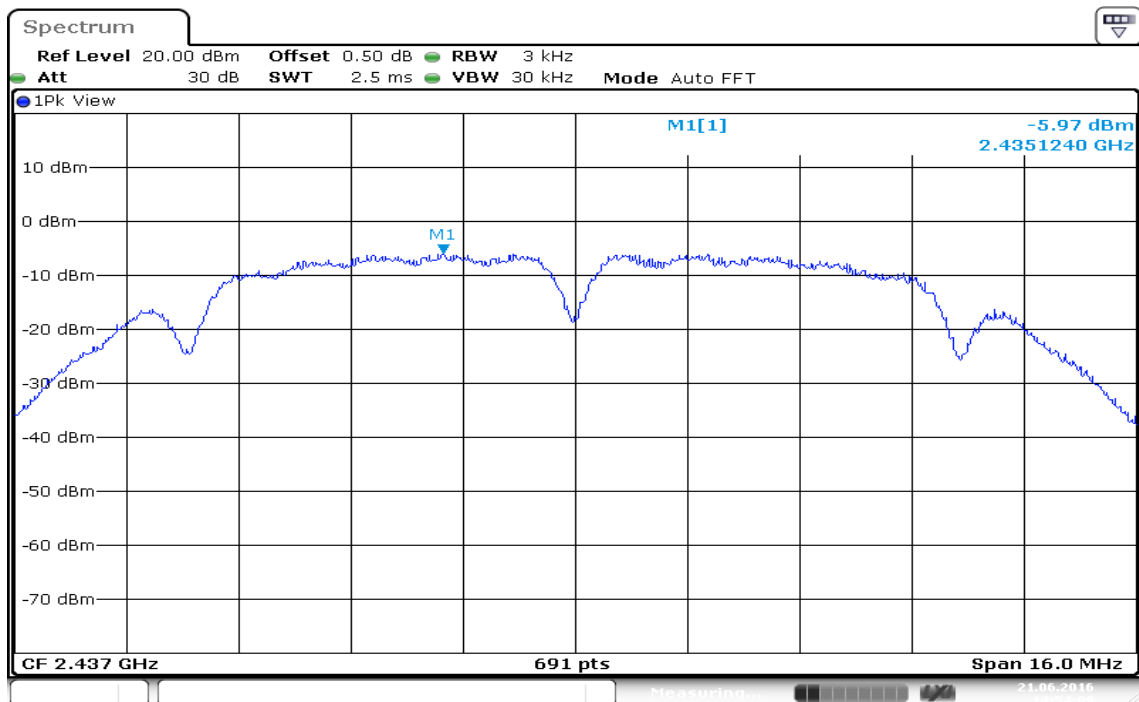
## IEEE 802.11b mode / Chain 1

### PPSD (CH Low)



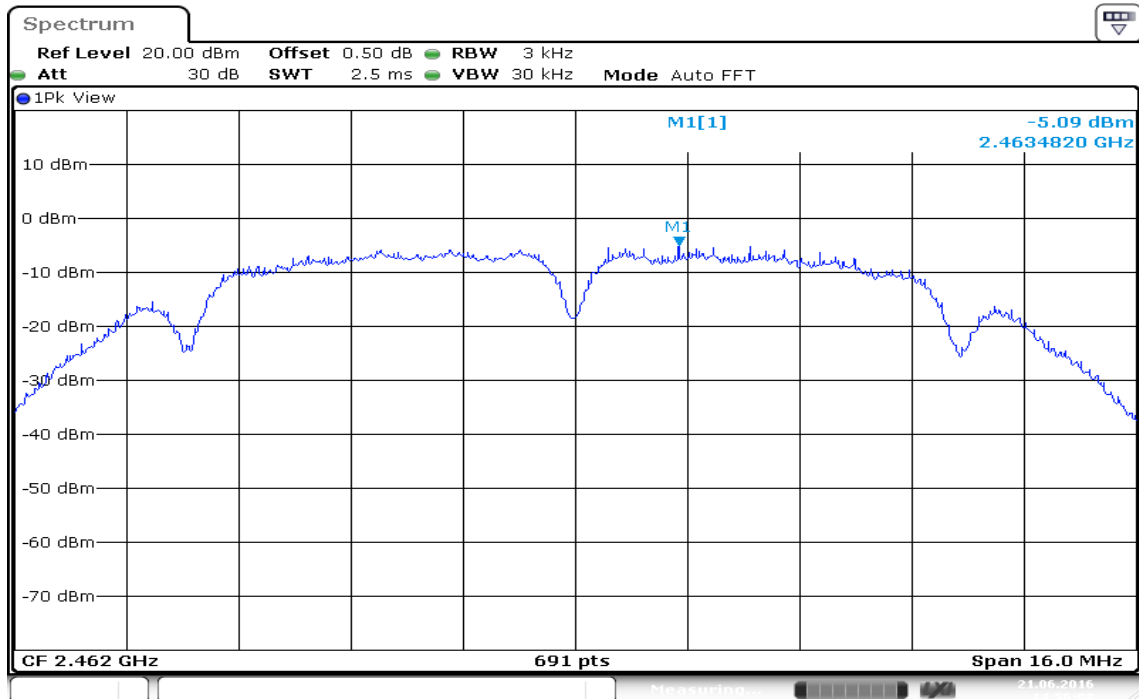
Date: 21.JUN.2016 14:52:01

### PPSD (CH Mid)



Date: 21.JUN.2016 14:54:09

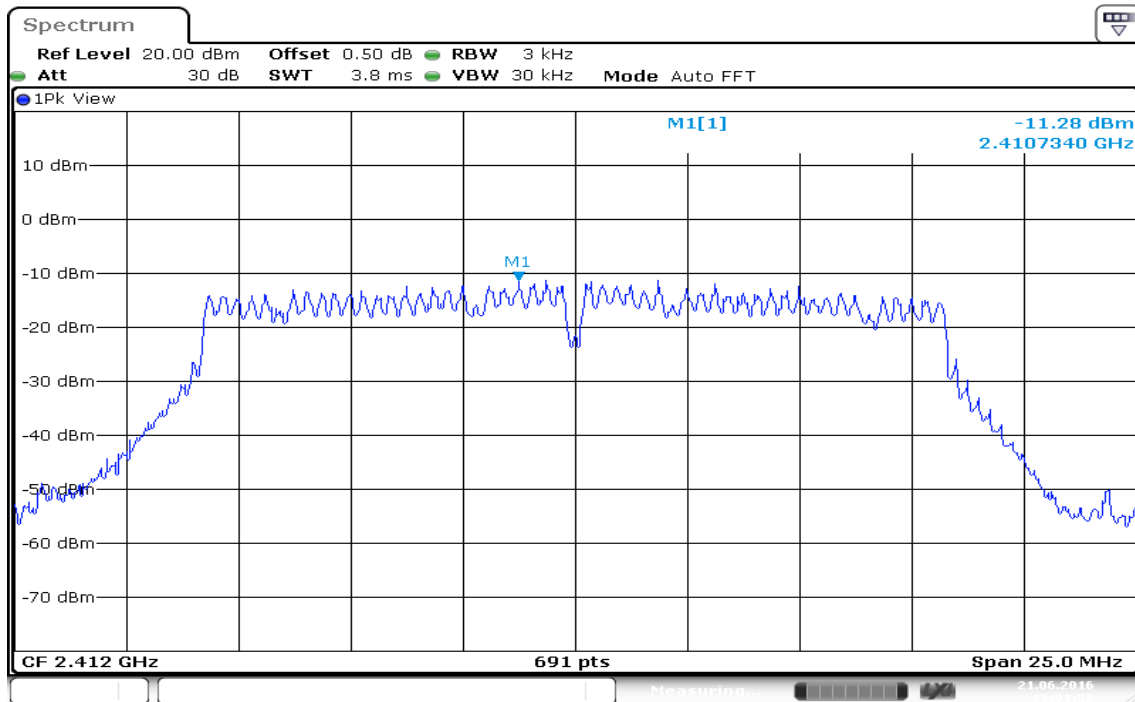
## PPSD (CH High)



Date: 21.JUN.2016 14:56:08

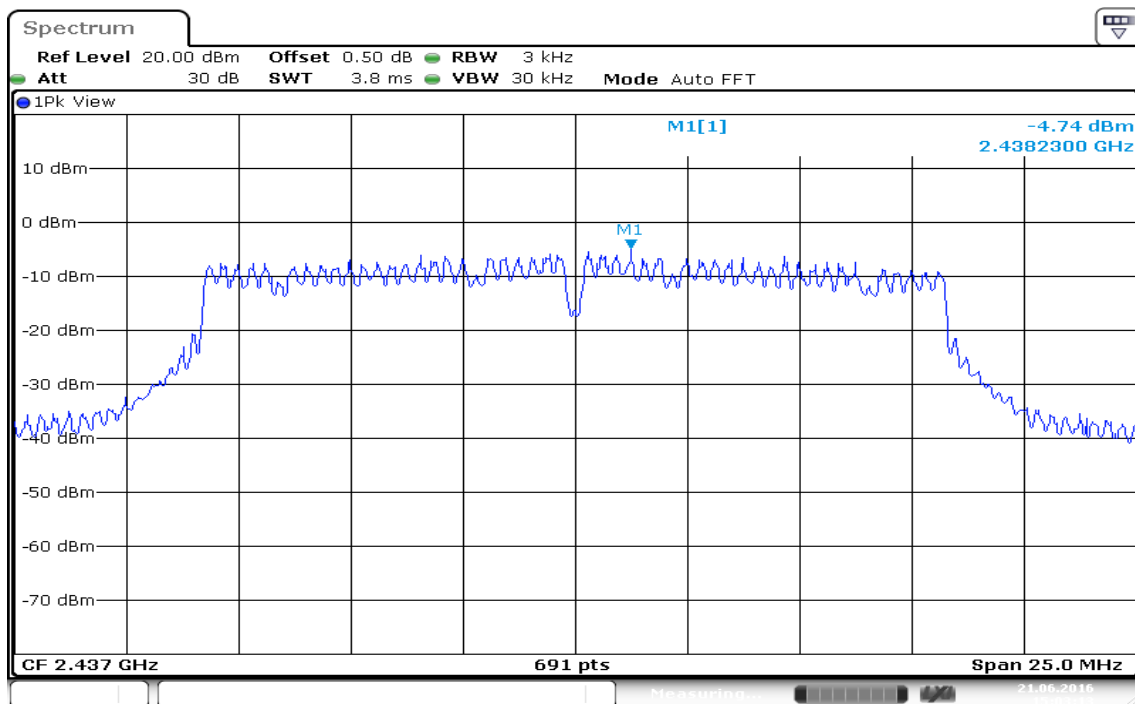
## IEEE 802.11g mode / Chain 0

### PPSD (CH Low)



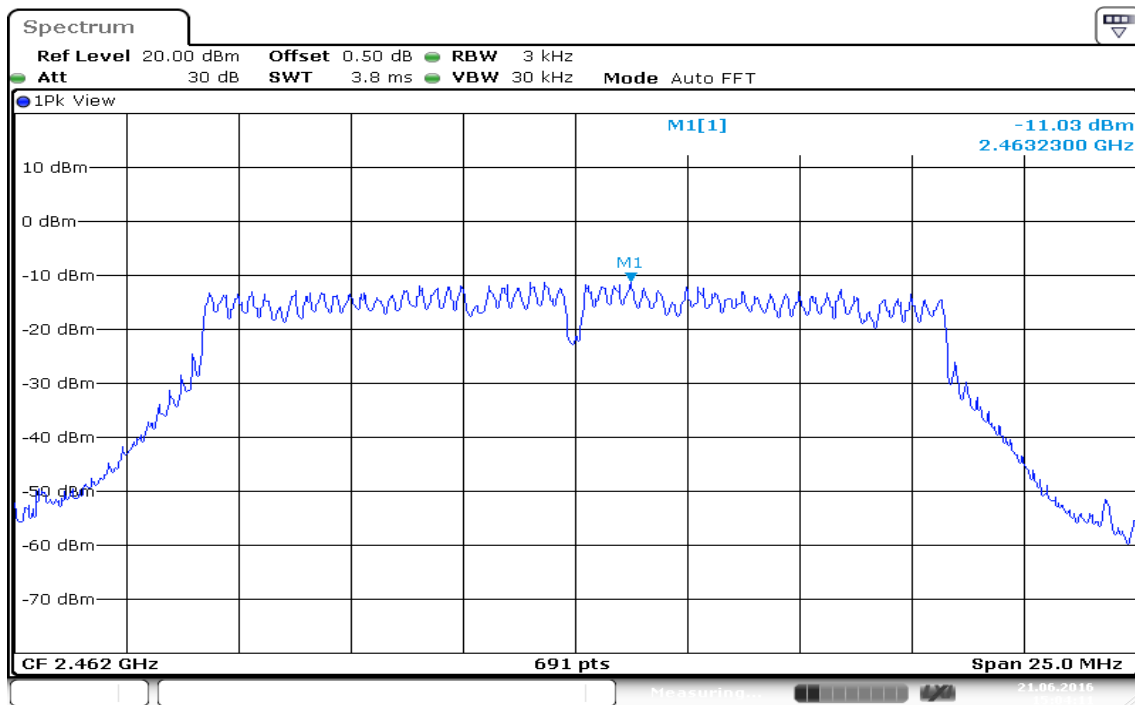
Date: 21.JUN.2016 15:01:53

### PPSD (CH Mid)



Date: 21.JUN.2016 15:03:13

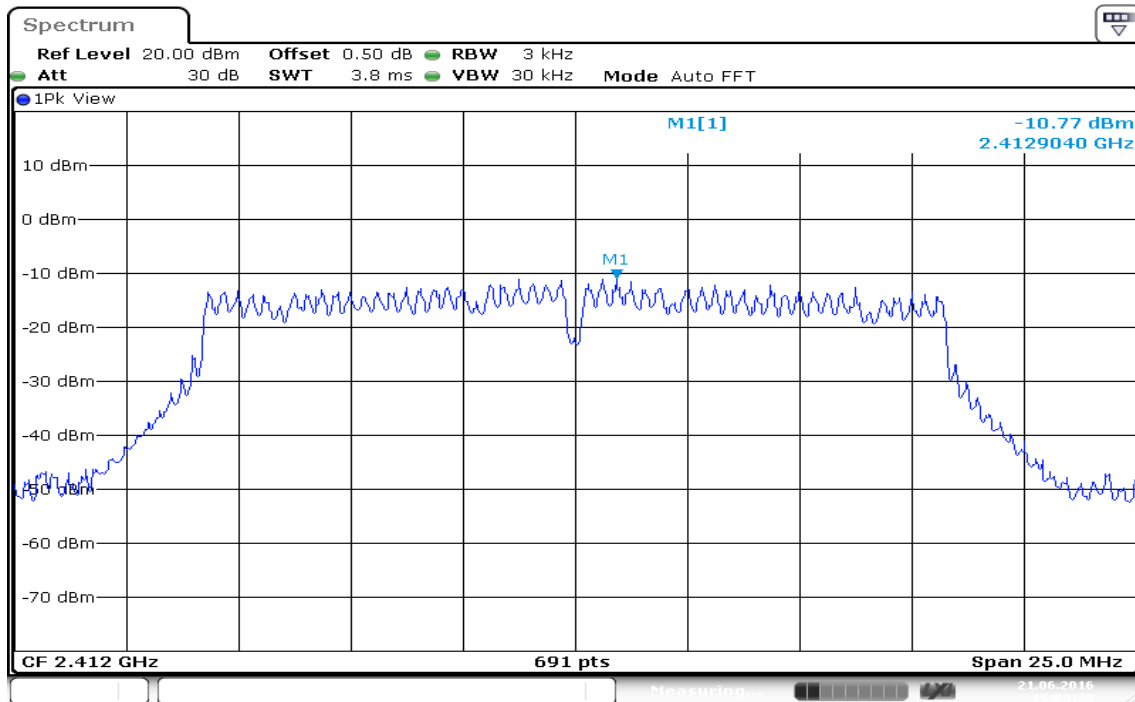
## PPSD (CH High)



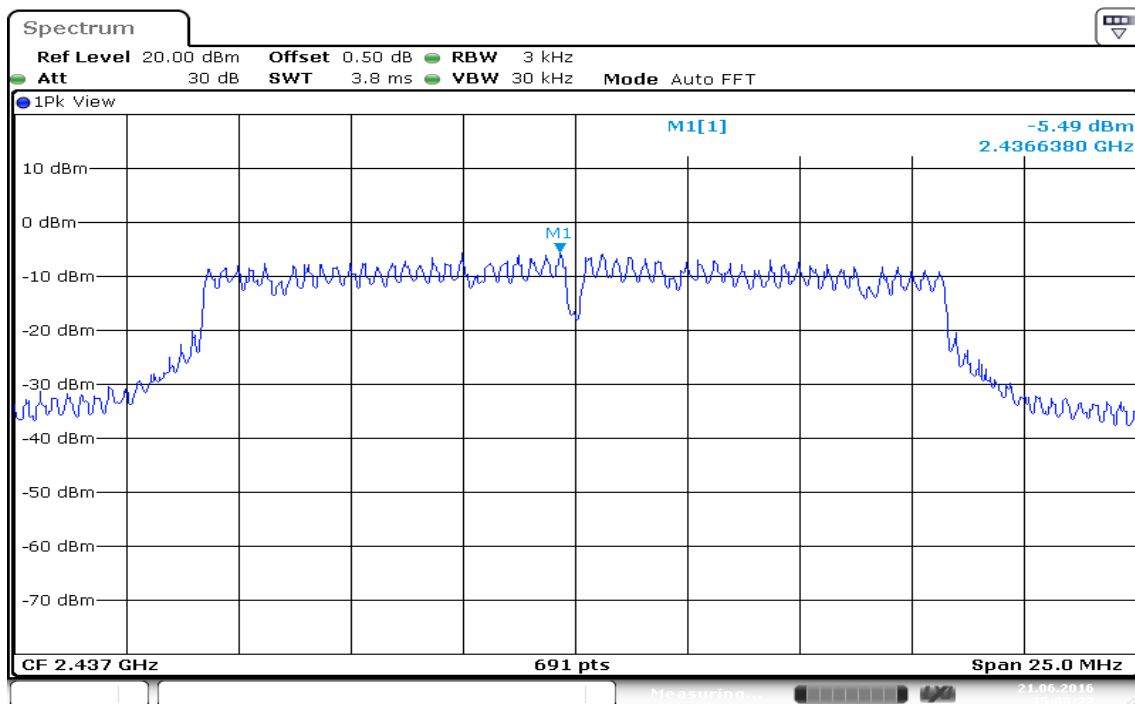
Date: 21.JUN.2016 15:04:11

## IEEE 802.11g mode / Chain 1

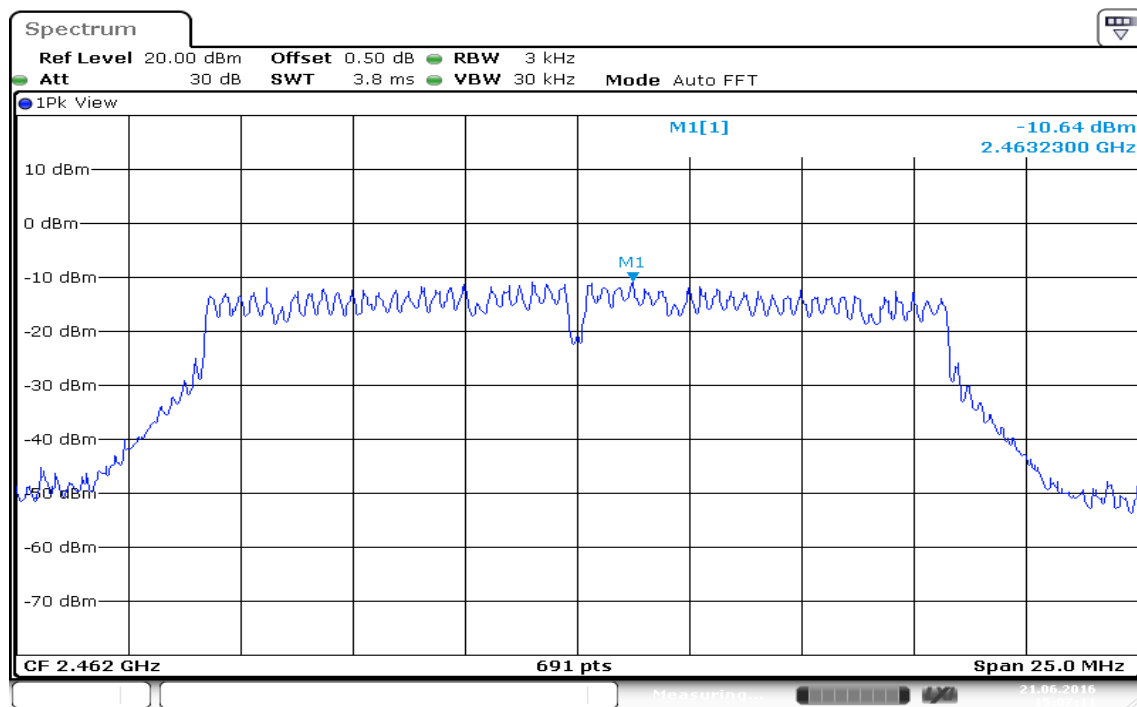
### PPSD (CH Low)



### PPSD (CH Mid)



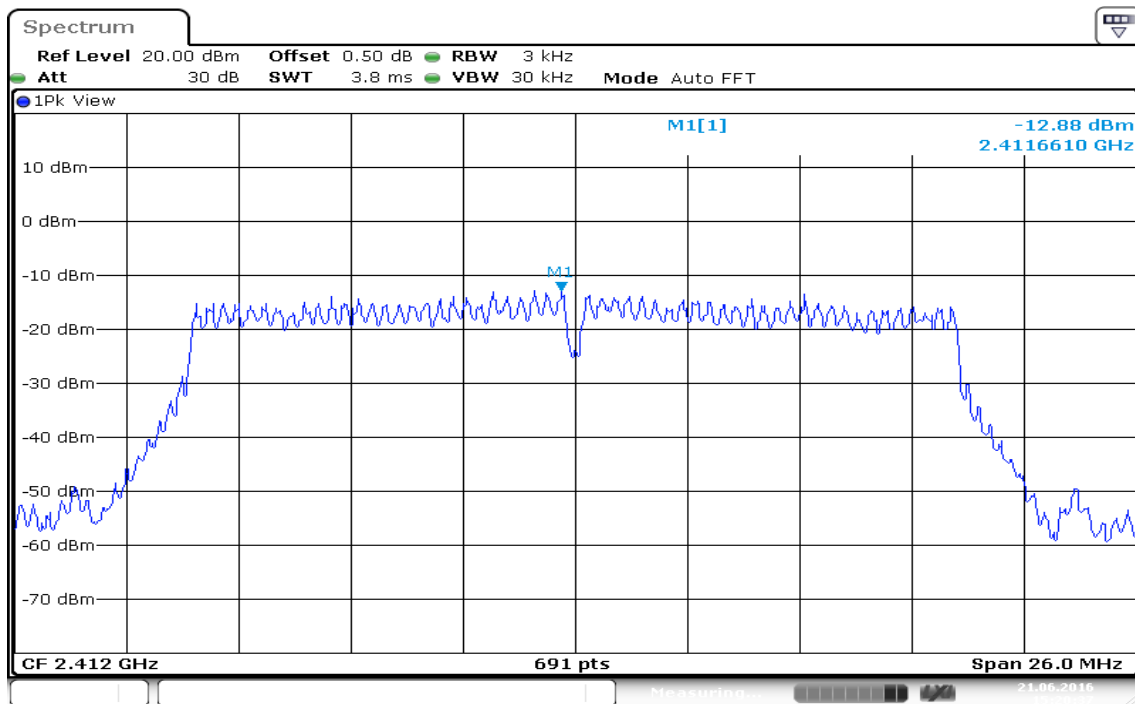
## PPSD (CH High)



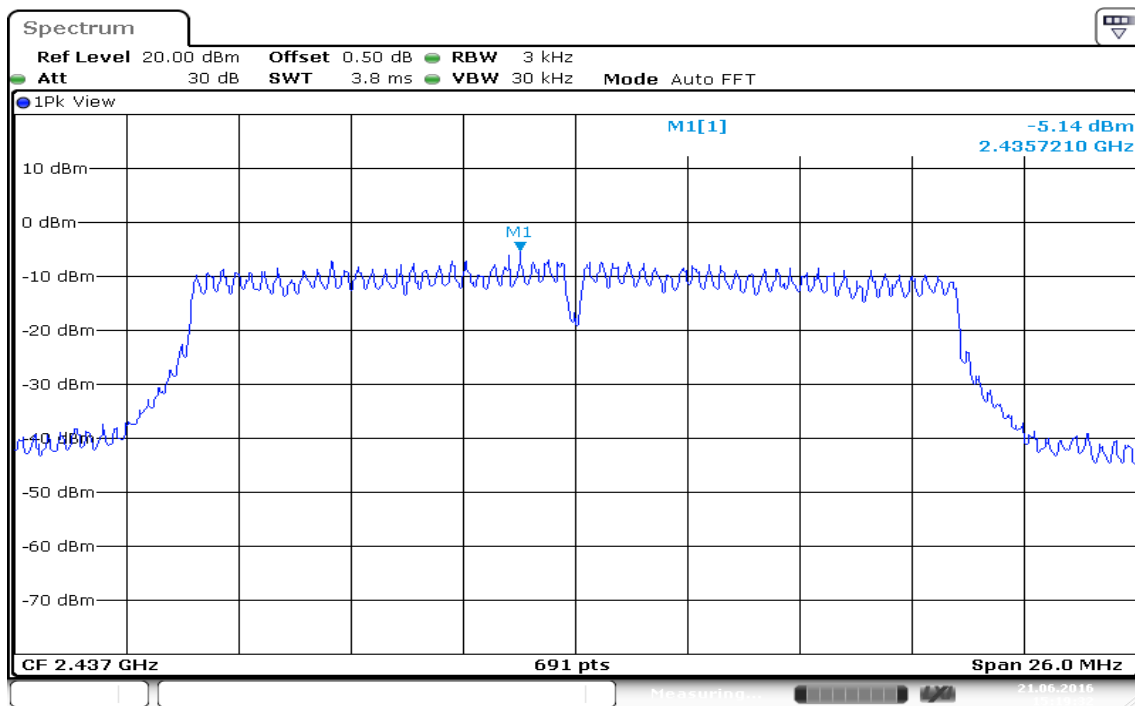
Date: 21.JUN.2016 15:07:11

## IEEE 802.11n HT 20 MHz mode / Chain 0

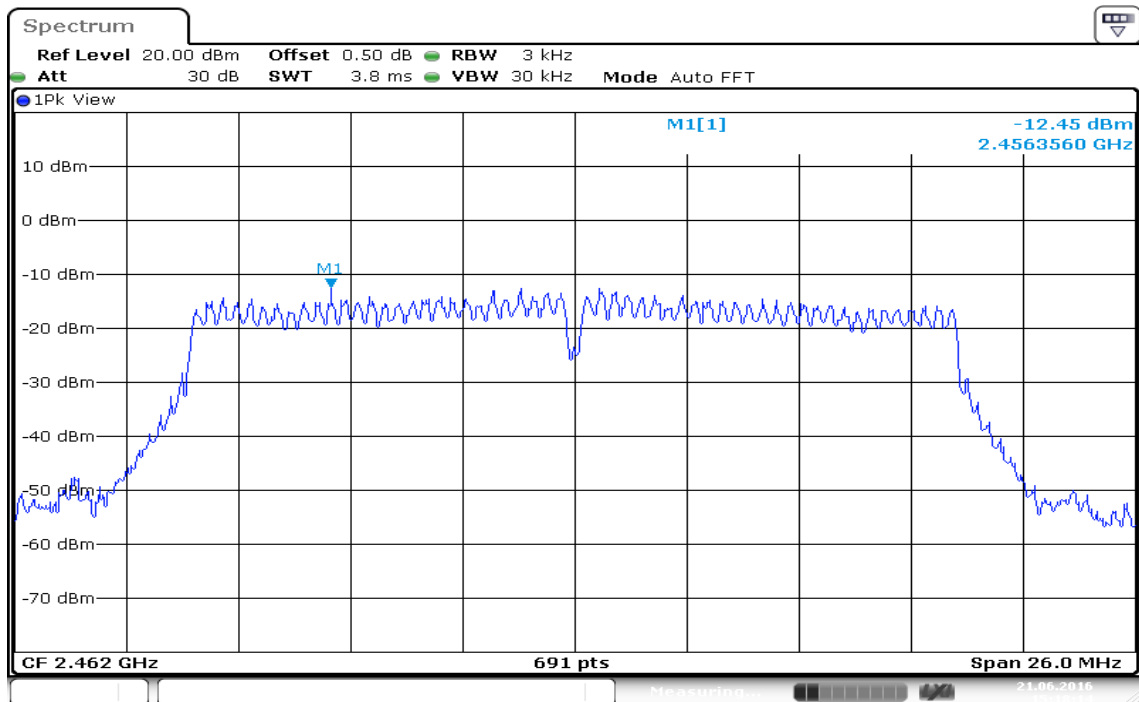
### PPSD (CH Low)



### PPSD (CH Mid)



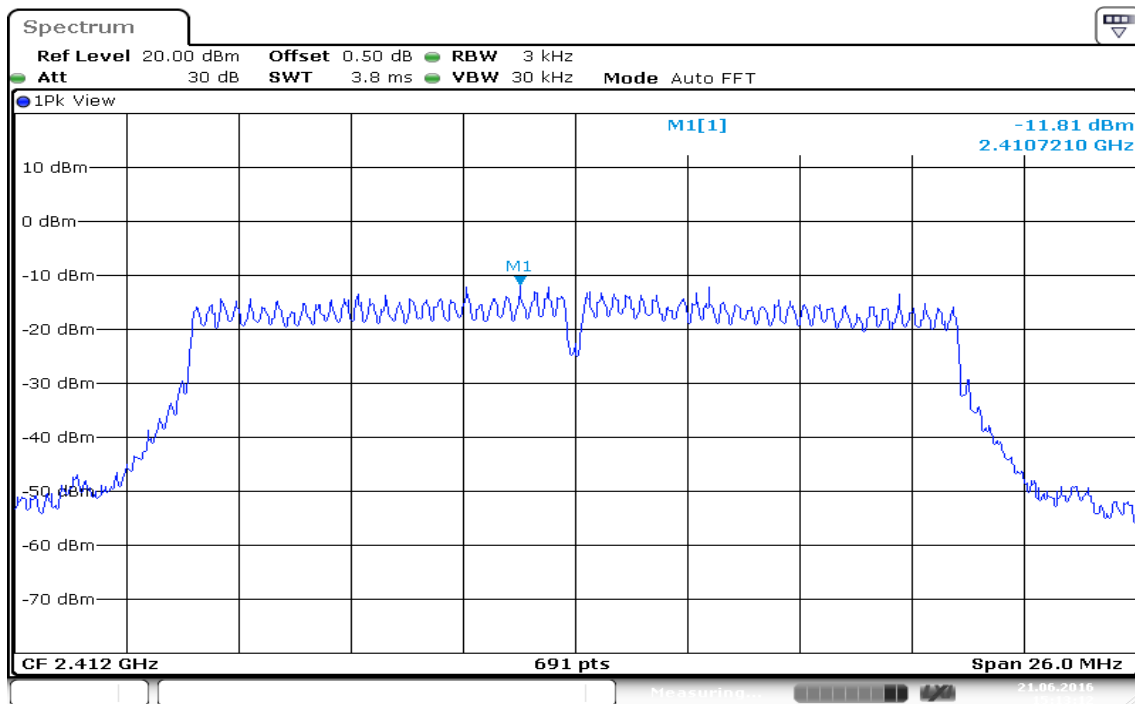
## PPSD (CH High)



Date: 21.JUN.2016 15:18:14

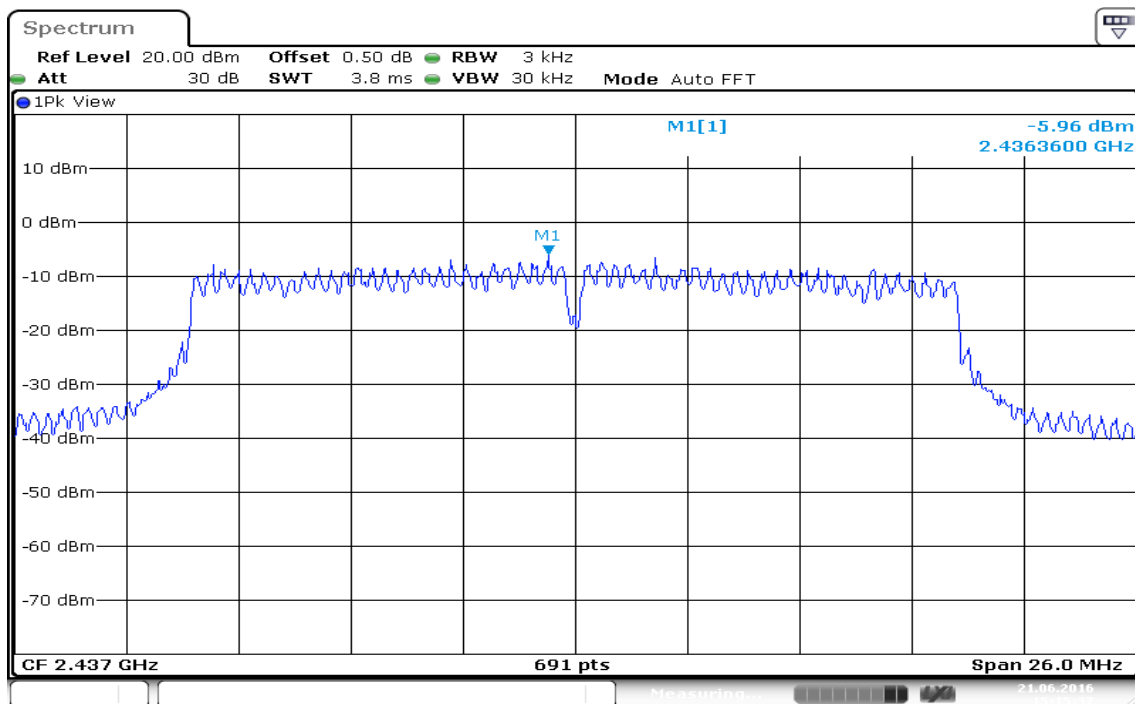
## IEEE 802.11n HT 20 MHz mode / Chain 1

### PPSD (CH Low)



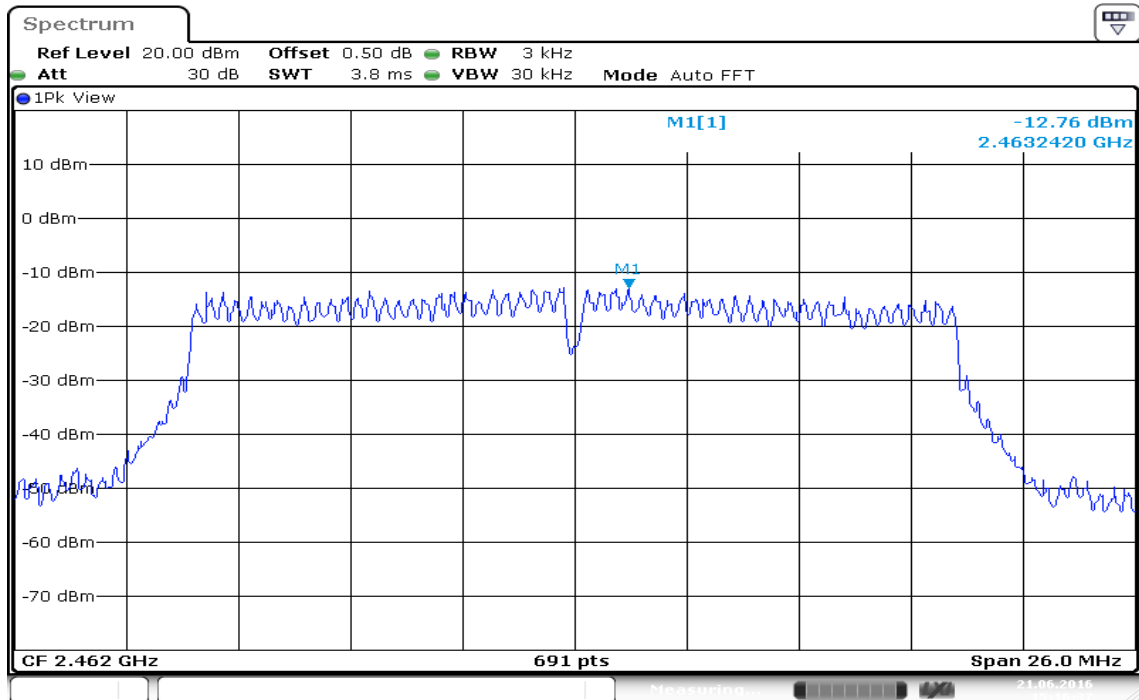
Date: 21.JUN.2016 15:13:13

### PPSD (CH Mid)



Date: 21.JUN.2016 15:15:37

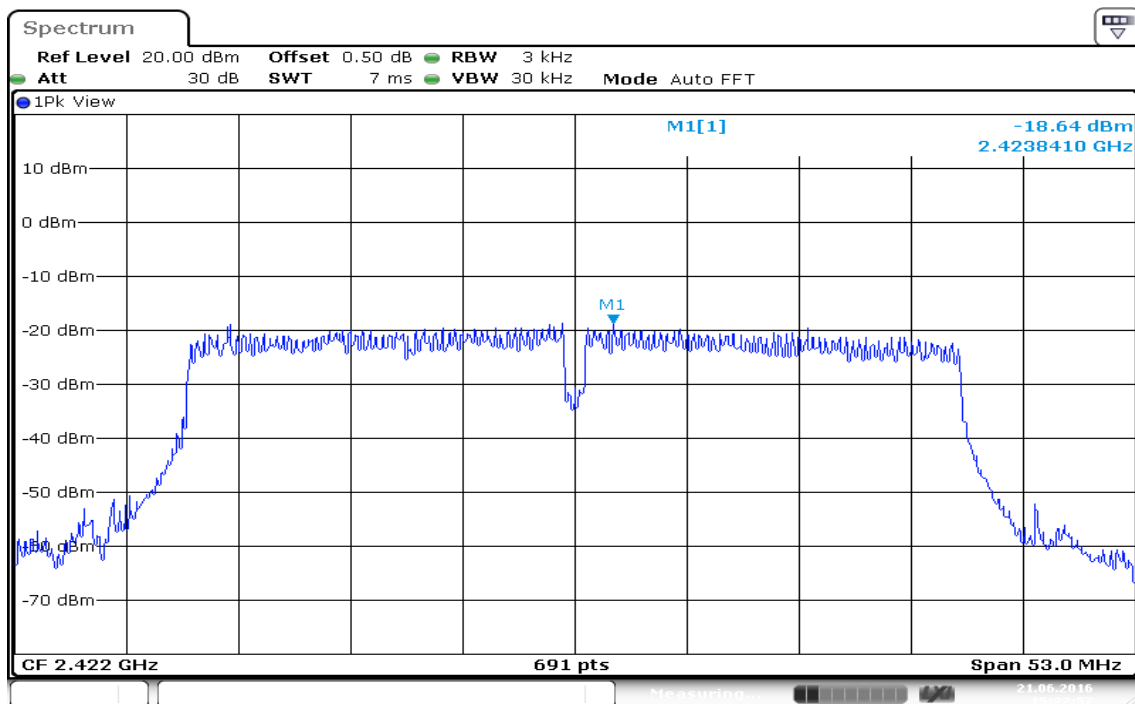
## PPSD (CH High)



Date: 21.JUN.2016 15:16:38

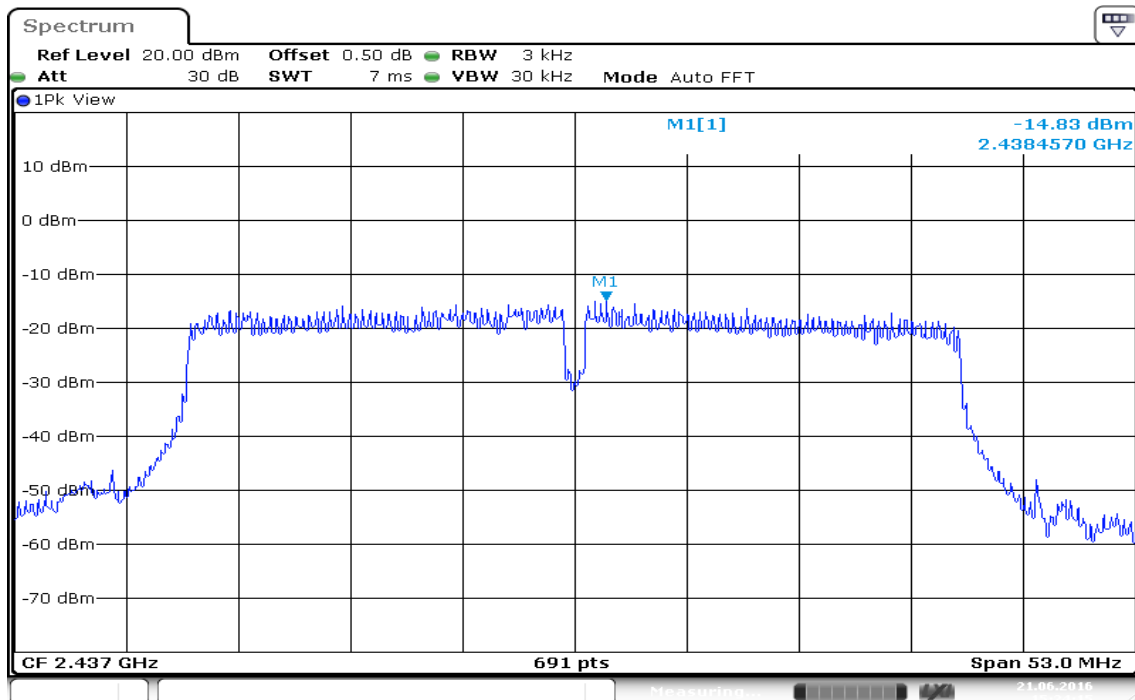
## IEEE 802.11n HT 40 MHz mode / Chain 0

### PPSD (CH Low)



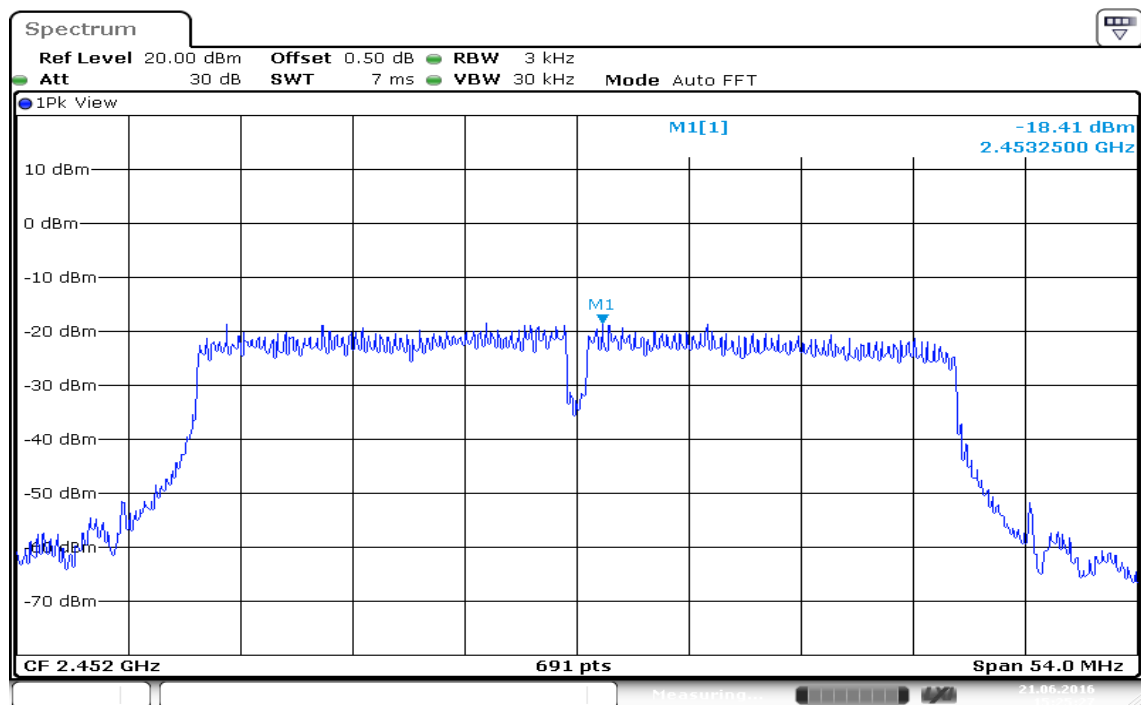
Date: 21.JUN.2016 15:22:57

### PPSD (CH Mid)



Date: 21.JUN.2016 15:24:15

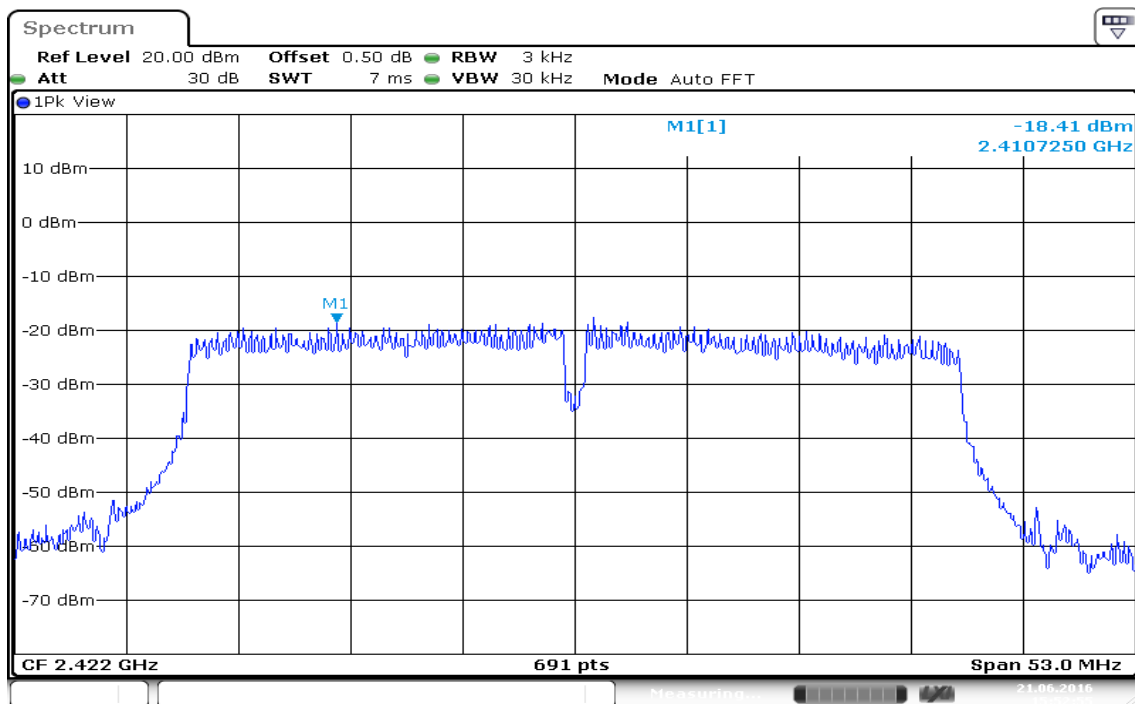
## PPSD (CH High)



Date: 21.JUN.2016 15:25:28

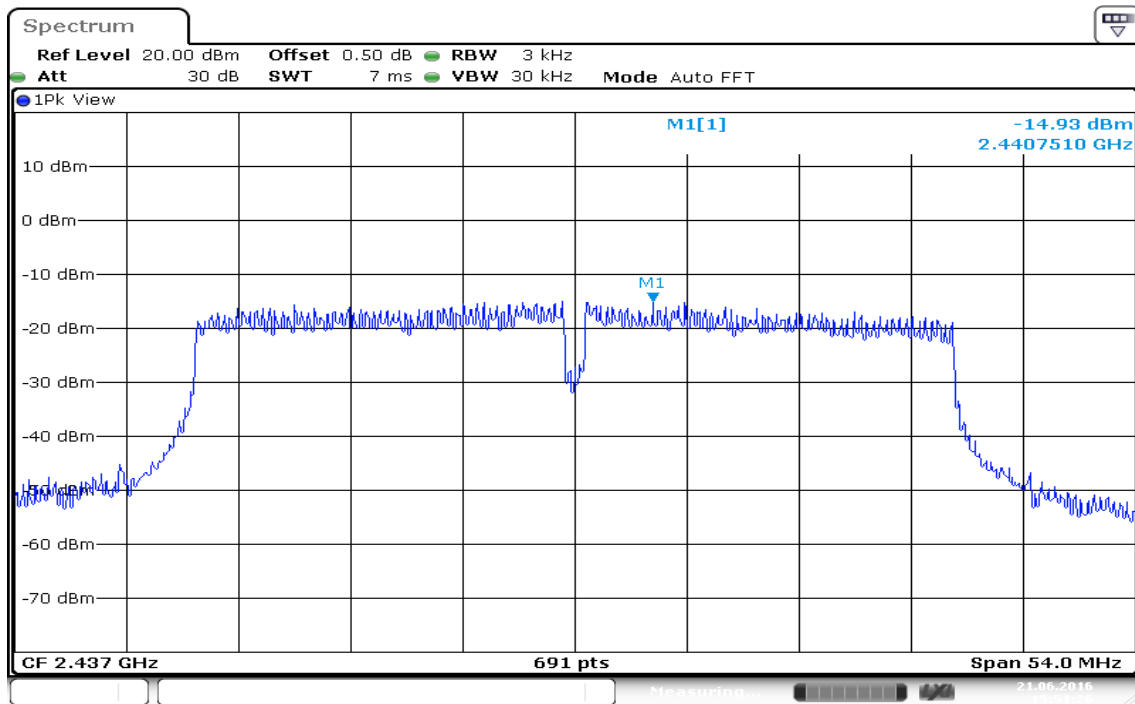
## IEEE 802.11n HT 40 MHz mode / Chain 1

### PPSD (CH Low)



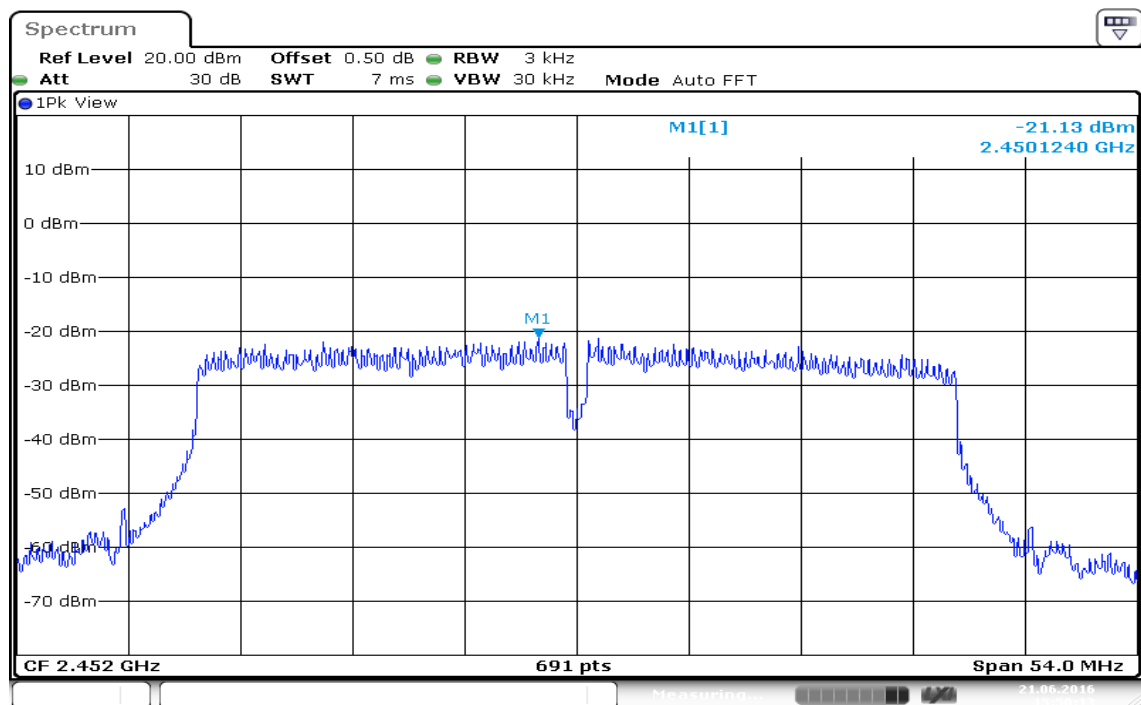
Date: 21.JUN.2016 15:52:55

### PPSD (CH Mid)



Date: 21.JUN.2016 15:51:27

## PPSD (CH High)



Date: 21.JUN.2016 15:50:13

## 7.7 RADIATED EMISSIONS

### LIMIT

1. According to §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                        |

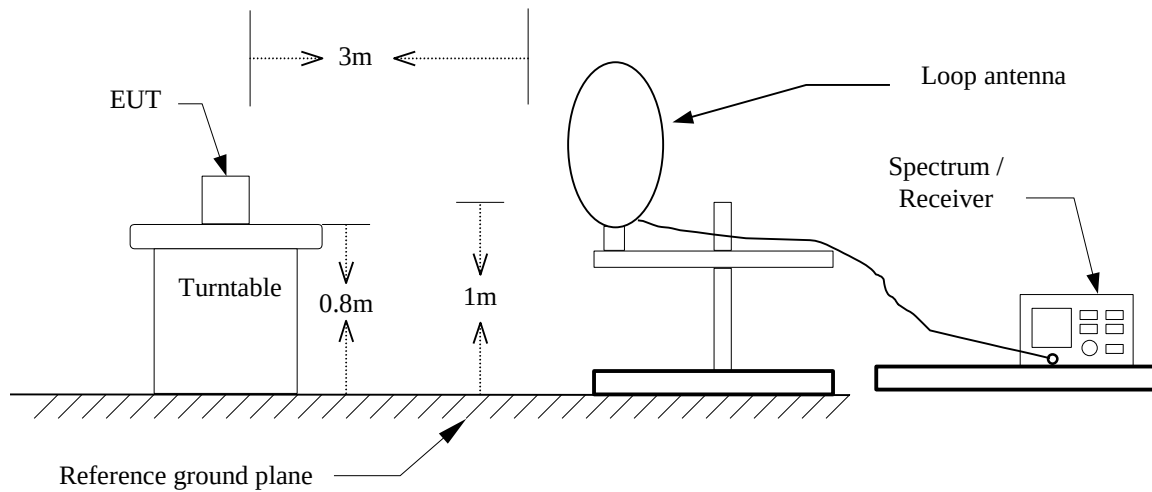
**Remark:** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

2. In the emission table above, the tighter limit applies at the band edges.

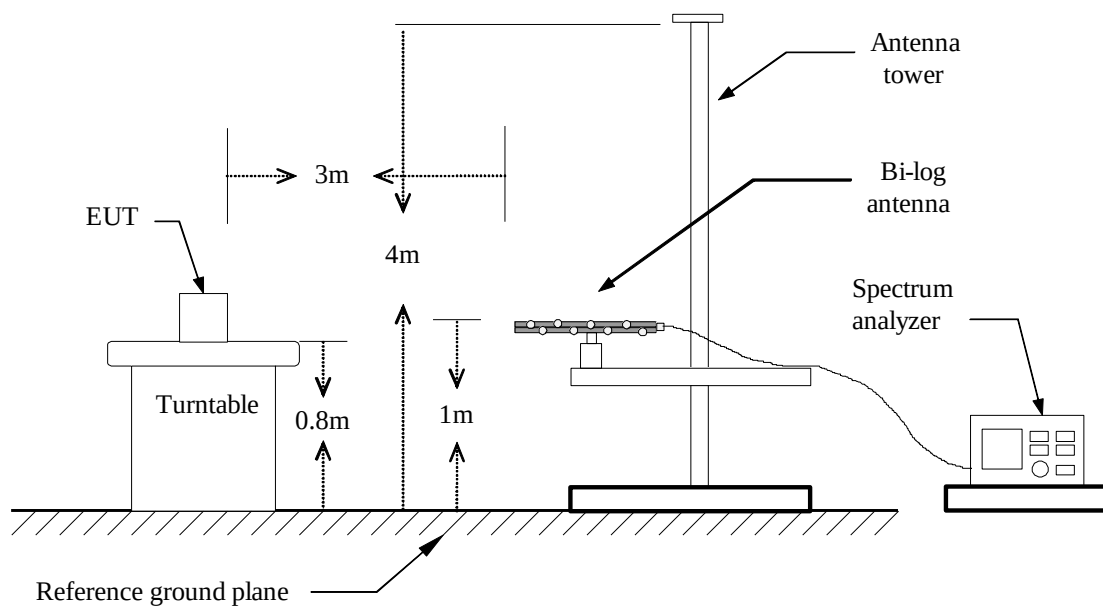
| Frequency (MHz) | Field Strength (μV/m at 3-meter) | Field Strength (dBμV/m at 3-meter) |
|-----------------|----------------------------------|------------------------------------|
| 0.009 - 0.490   | 2400/F(kHz) +80                  | 20LOG((2400/F(kHz))+80)            |
| 0.490 - 1.705   | 24000/F(kHz) +40                 | 20LOG((24000/F(kHz))+40)           |
| 1.705 – 30.0    | 30                               | 69.54                              |
| 30-88           | 100                              | 40                                 |
| 88-216          | 150                              | 43.5                               |
| 216-960         | 200                              | 46                                 |
| Above 960       | 500                              | 54                                 |

## Test Configuration

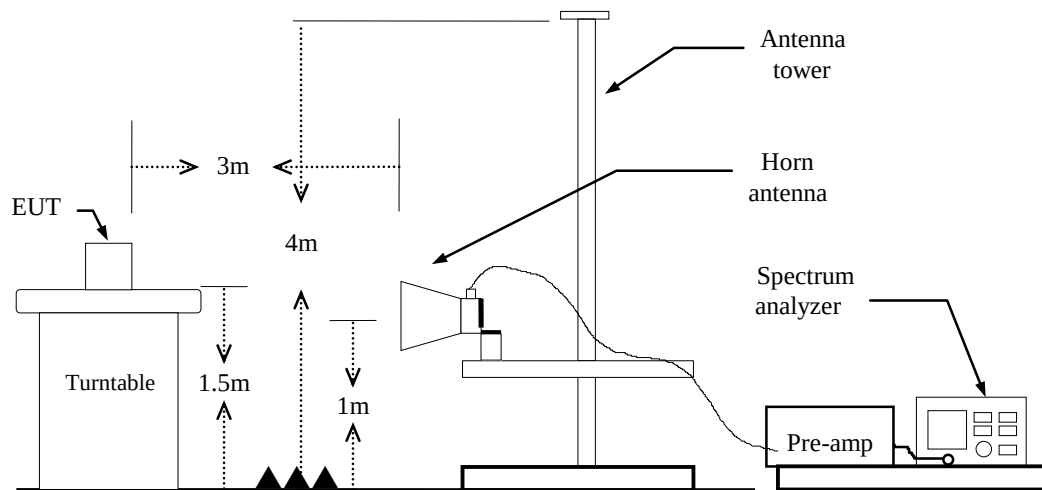
### 9kHz ~ 30MHz



### 30MHz ~ 1GHz



## Above 1 GHz



## **TEST PROCEDURE**

1. The EUT is placed on a turntable, Above 1 GHz is 1.5m high and below 1 GHz is 0.8m high above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Set the spectrum analyzer in the following setting as:

Below 1GHz:

RBW=100kHz / VBW=300kHz / Sweep=AUTO

Above 1GHz:

(a) PEAK: RBW=1MHz / VBW=3MHz / Sweep=AUTO

(b) AVERAGE: RBW=1MHz,

if duty cycle  $\geq 98\%$ , VBW=10Hz.

if duty cycle  $< 98\%$  VBW=1/T.

**IEEE 802.11b mode:** =98%, VBW=300Hz

**IEEE 802.11g mode:** =90%, VBW=600Hz

**IEEE 802.11n HT 20 MHz mode:** =88%, VBW=750Hz

**IEEE 802.11n HT 40 MHz mode:** =79%, VBW=1.5kHz

7. Repeat above procedures until the measurements for all frequencies are complete.
8. Result = Spectrum Reading + cable loss(spectrum to Amp) - Amp Gain + Cable loss(Amp to receive Ant)+ Receive Ant

**Note:** We checked every harmonics frequencies from Fundamental frequencies with reduced VBW, and we mark a point to prove pass or not if we find any emission. For this case, there are no emissions hidden in the noise floor.

## Below 1GHz

**Operation Mode:** Normal Link

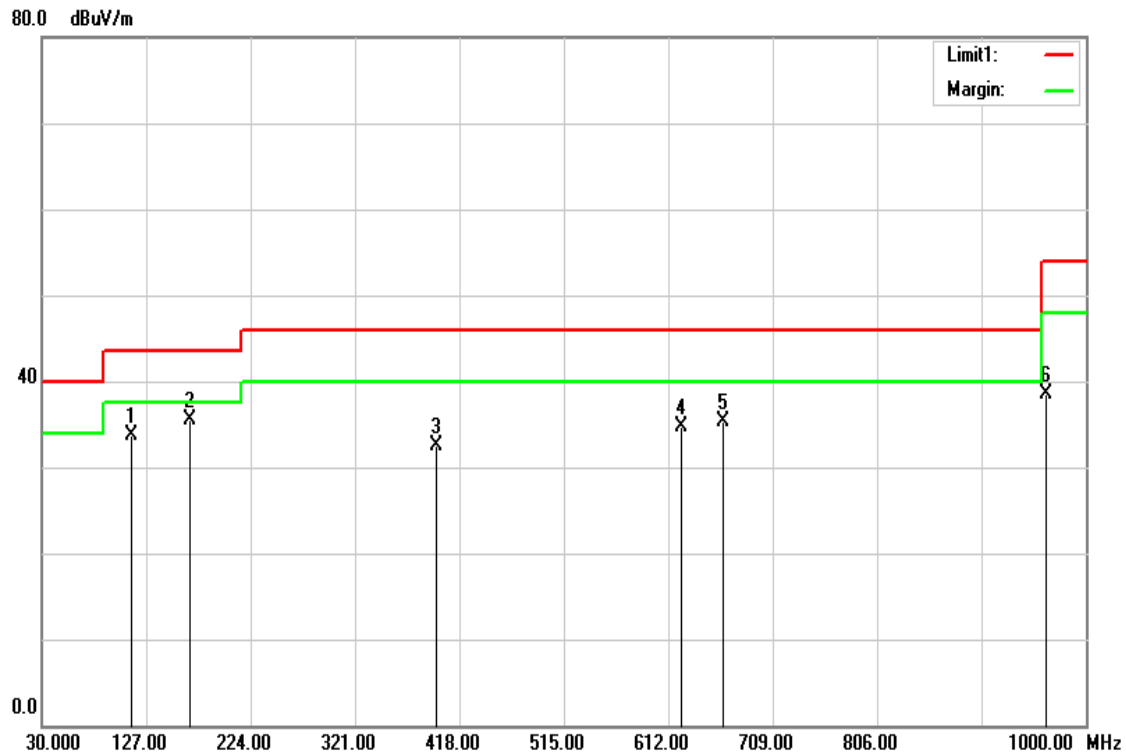
**Test Date:** September 10, 2016

**Temperature:** 27°C

**Tested by:** Dennis Li

**Humidity:** 53% RH

**Polarity:** Ver.



| Frequency (MHz) | Reading (dBuV) | Correction Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark | Ant. Pol. (H/V) |
|-----------------|----------------|--------------------------|-----------------|----------------|-------------|--------|-----------------|
| 113.4200        | 50.32          | -16.66                   | 33.66           | 43.50          | -9.84       | peak   | V               |
| 167.7400        | 52.21          | -16.74                   | 35.47           | 43.50          | -8.03       | peak   | V               |
| 396.6600        | 44.37          | -11.78                   | 32.59           | 46.00          | -13.41      | peak   | V               |
| 623.6400        | 41.91          | -7.20                    | 34.71           | 46.00          | -11.29      | peak   | V               |
| 663.4100        | 41.82          | -6.44                    | 35.38           | 46.00          | -10.62      | peak   | V               |
| 963.1400        | 40.74          | -2.18                    | 38.56           | 54.00          | -15.44      | peak   | V               |

### Remark:

1. Measuring frequencies from 30 MHz to the 1GHz.
2. Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using peak/quasi-peak detector mode.
3. Quasi-peak test would be performed if the peak result were greater than the quasi-peak limit or as required by the applicant.
4. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
5. Margin (dB) = Result (dBuV/m) – Limit (dBuV/m).

**Operation Mode:** Normal Link

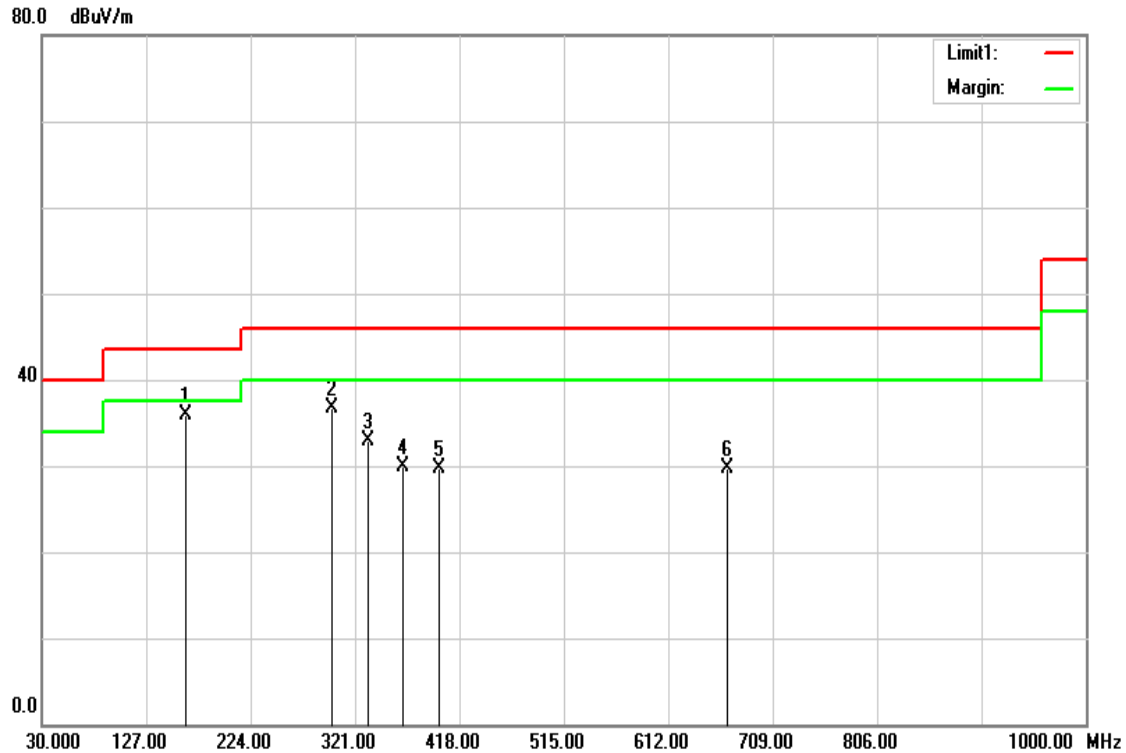
**Test Date:** September 10, 2016

**Temperature:** 27°C

**Tested by:** Dennis Li

**Humidity:** 53% RH

**Polarity:** Hor.



| Frequency (MHz) | Reading (dBuV) | Correction Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark | Ant. Pol. (H/V) |
|-----------------|----------------|--------------------------|-----------------|----------------|-------------|--------|-----------------|
| 163.8600        | 52.39          | -16.55                   | 35.84           | 43.50          | -7.66       | peak   | H               |
| 299.6600        | 51.04          | -14.25                   | 36.79           | 46.00          | -9.21       | peak   | H               |
| 332.6400        | 46.20          | -13.36                   | 32.84           | 46.00          | -13.16      | peak   | H               |
| 365.6200        | 42.36          | -12.52                   | 29.84           | 46.00          | -16.16      | peak   | H               |
| 398.6000        | 41.51          | -11.73                   | 29.78           | 46.00          | -16.22      | peak   | H               |
| 666.3200        | 36.10          | -6.41                    | 29.69           | 46.00          | -16.31      | peak   | H               |

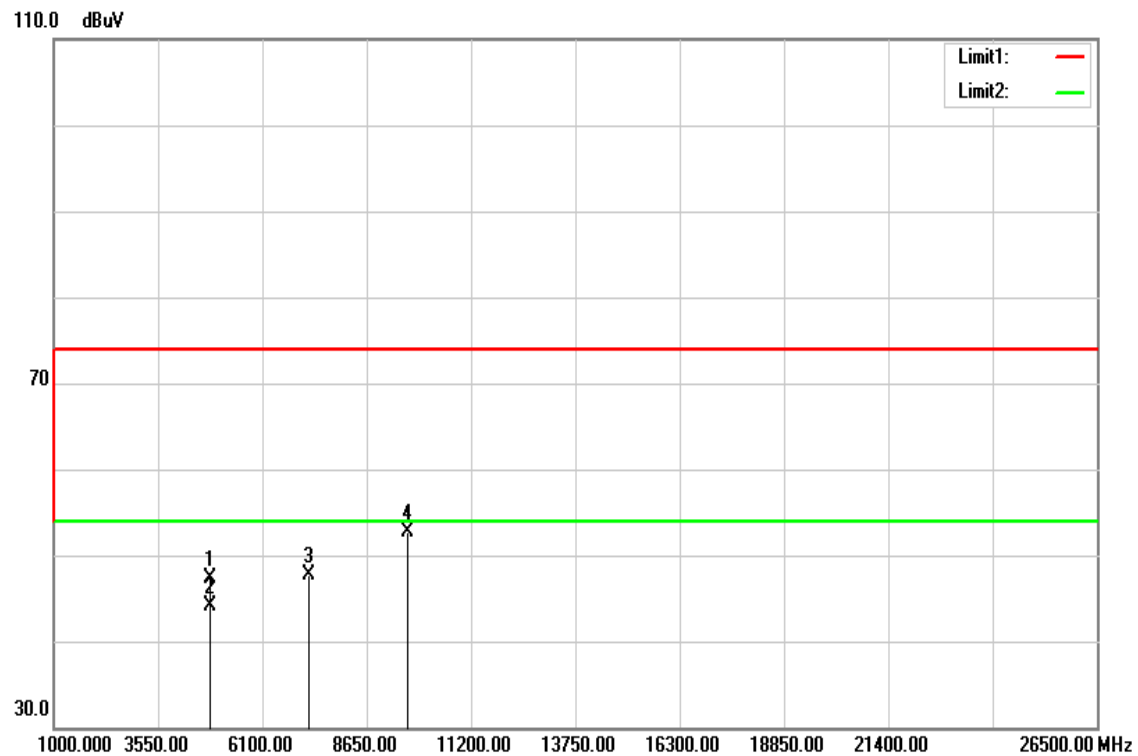
**Remark:**

1. Measuring frequencies from 30 MHz to the 1GHz.
2. Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using peak/quasi-peak detector mode.
3. Quasi-peak test would be performed if the peak result were greater than the quasi-peak limit or as required by the applicant.
4. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
5.  $\text{Margin (dB)} = \text{Result (dBuV/m)} - \text{Limit (dBuV/m)}$ .

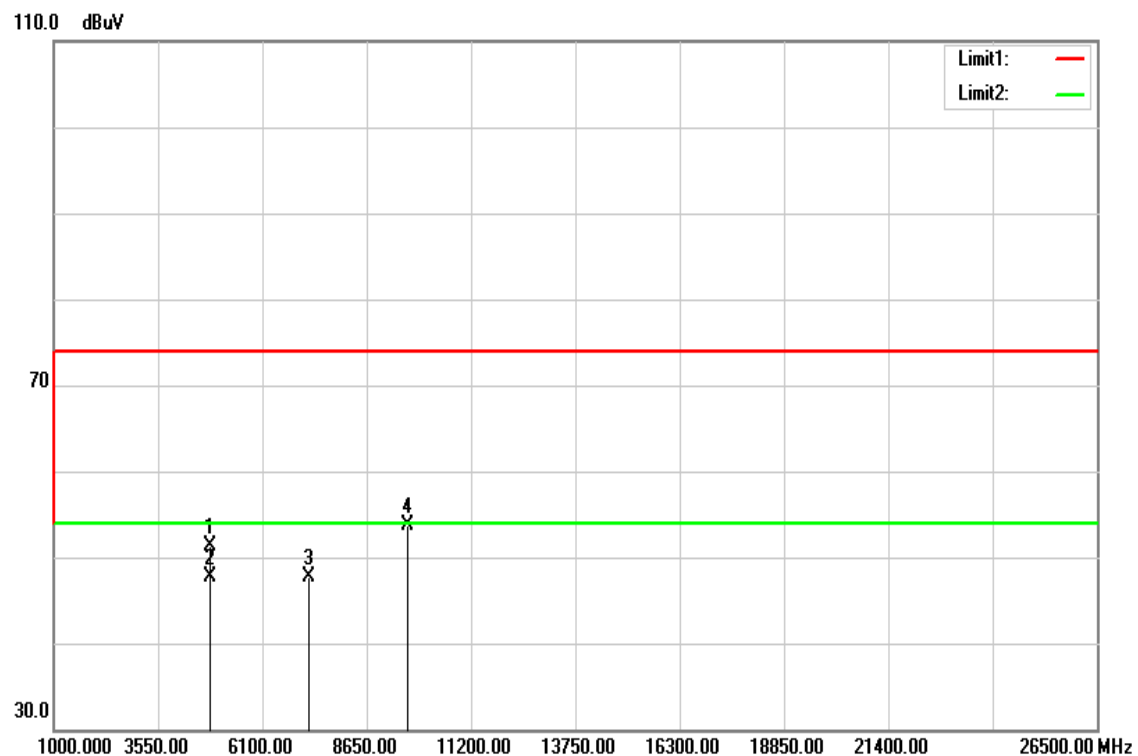
**Above 1 GHz**

**TX / IEEE 802.11b / CH Low**

**Polarity: Vertical**



**Polarity: Horizontal**



## Above 1 GHz

**Operation Mode:** TX / IEEE 802.11b / CH Low

**Test Date:** June 22, 2016

**Temperature:** 27°C

**Tested by:** Dennis Li

**Humidity:** 53% RH

**Polarity:** Ver. / Hor.

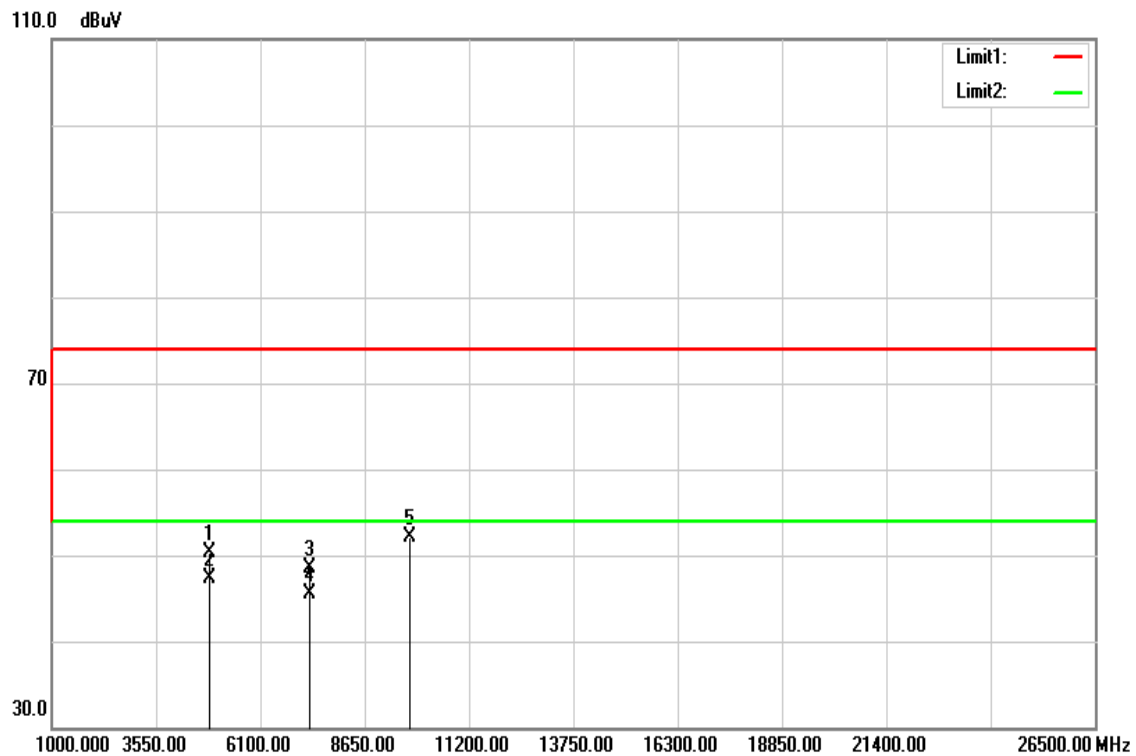
| Frequency (MHz) | Reading (dBuV) | Correction Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark | Ant. Pol. (H/V) |
|-----------------|----------------|--------------------------|-----------------|----------------|-------------|--------|-----------------|
| 4824.000        | 43.35          | 4.01                     | 47.36           | 74.00          | -26.64      | peak   | V               |
| 4824.000        | 40.11          | 4.01                     | 44.12           | 54.00          | -9.88       | AVG    | V               |
| 7236.000        | 37.06          | 10.64                    | 47.70           | 74.00          | -26.30      | peak   | V               |
| 9648.000        | 38.56          | 14.22                    | 52.78           | 74.00          | -21.22      | peak   | V               |
| N/A             |                |                          |                 |                |             |        |                 |
|                 |                |                          |                 |                |             |        |                 |
| 4824.000        | 47.35          | 4.01                     | 51.36           | 74.00          | -22.64      | peak   | H               |
| 4824.000        | 43.70          | 4.01                     | 47.71           | 54.00          | -6.29       | AVG    | H               |
| 7236.000        | 36.97          | 10.64                    | 47.61           | 74.00          | -26.39      | peak   | H               |
| 9648.000        | 39.50          | 14.22                    | 53.72           | 74.00          | -20.28      | peak   | H               |
| N/A             |                |                          |                 |                |             |        |                 |
|                 |                |                          |                 |                |             |        |                 |

### **Remark:**

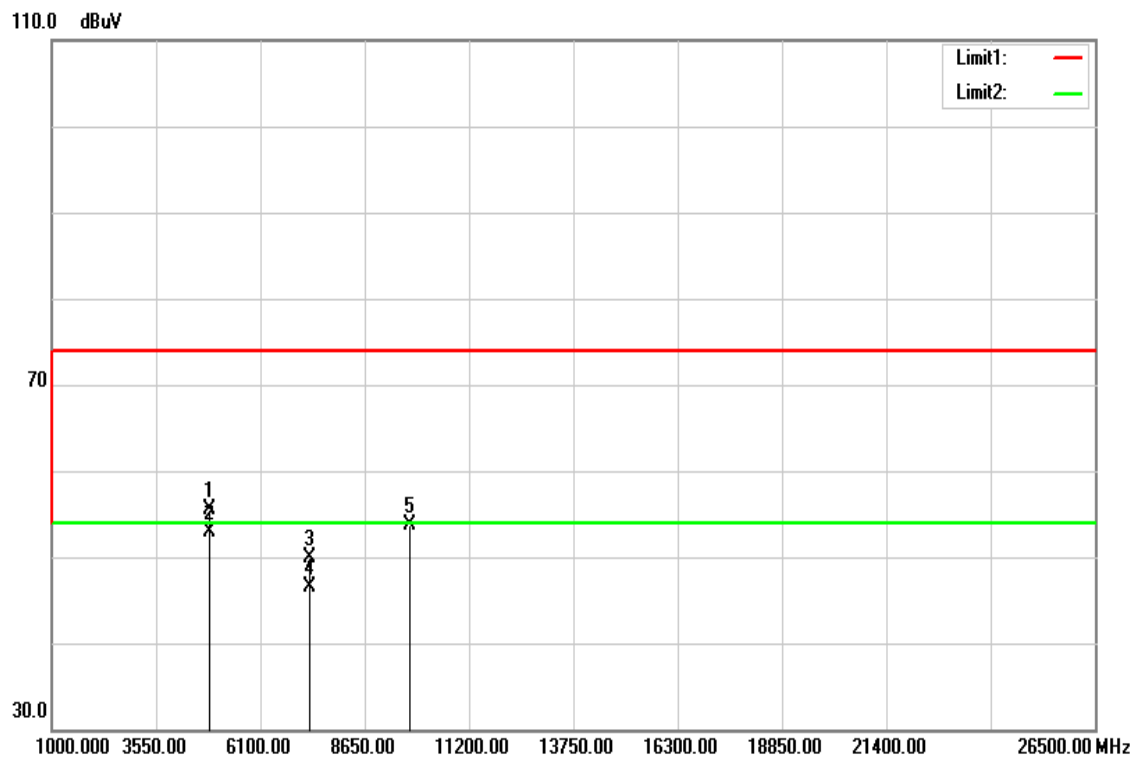
1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

**TX / IEEE 802.11b / CH Mid**

**Polarity: Vertical**



**Polarity: Horizontal**



**Operation Mode:** TX / IEEE 802.11b / CH Mid

**Test Date:** June 22, 2016

**Temperature:** 27°C

**Tested by:** Dennis Li

**Humidity:** 53% RH

**Polarity:** Ver. / Hor.

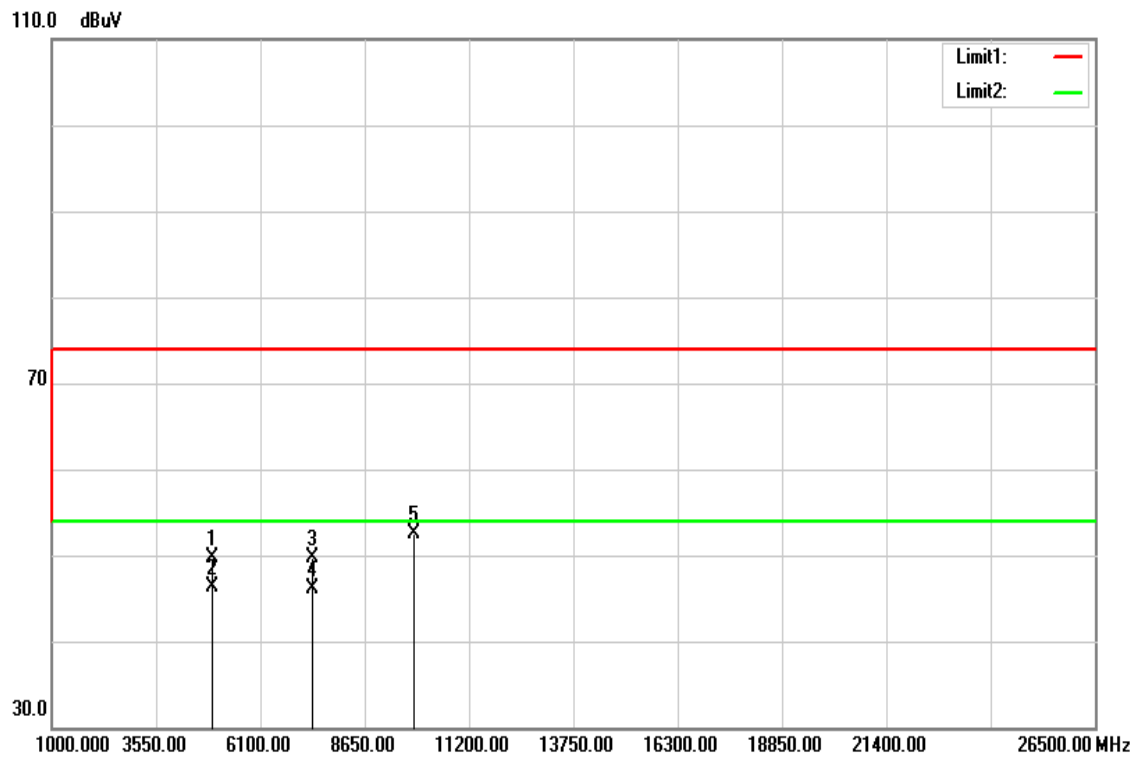
| Frequency (MHz) | Reading (dBuV) | Correction Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark | Ant. Pol. (H/V) |
|-----------------|----------------|--------------------------|-----------------|----------------|-------------|--------|-----------------|
| 4874.000        | 46.38          | 3.92                     | 50.30           | 74.00          | -23.70      | peak   | V               |
| 4874.000        | 43.39          | 3.92                     | 47.31           | 54.00          | -6.69       | AVG    | V               |
| 7311.000        | 37.86          | 10.71                    | 48.57           | 74.00          | -25.43      | peak   | V               |
| 7311.000        | 34.80          | 10.71                    | 45.51           | 54.00          | -8.49       | AVG    | V               |
| 9748.000        | 37.67          | 14.41                    | 52.08           | 74.00          | -21.92      | peak   | V               |
| N/A             |                |                          |                 |                |             |        |                 |
| 4874.000        | 51.54          | 3.92                     | 55.46           | 74.00          | -18.54      | peak   | H               |
| 4874.000        | 49.05          | 3.92                     | 52.97           | 54.00          | -1.03       | AVG    | H               |
| 7311.000        | 39.19          | 10.71                    | 49.90           | 74.00          | -24.10      | peak   | H               |
| 7311.000        | 35.83          | 10.71                    | 46.54           | 54.00          | -7.46       | AVG    | H               |
| 9748.000        | 39.39          | 14.41                    | 53.80           | 74.00          | -20.20      | peak   | H               |
| N/A             |                |                          |                 |                |             |        |                 |

**Remark:**

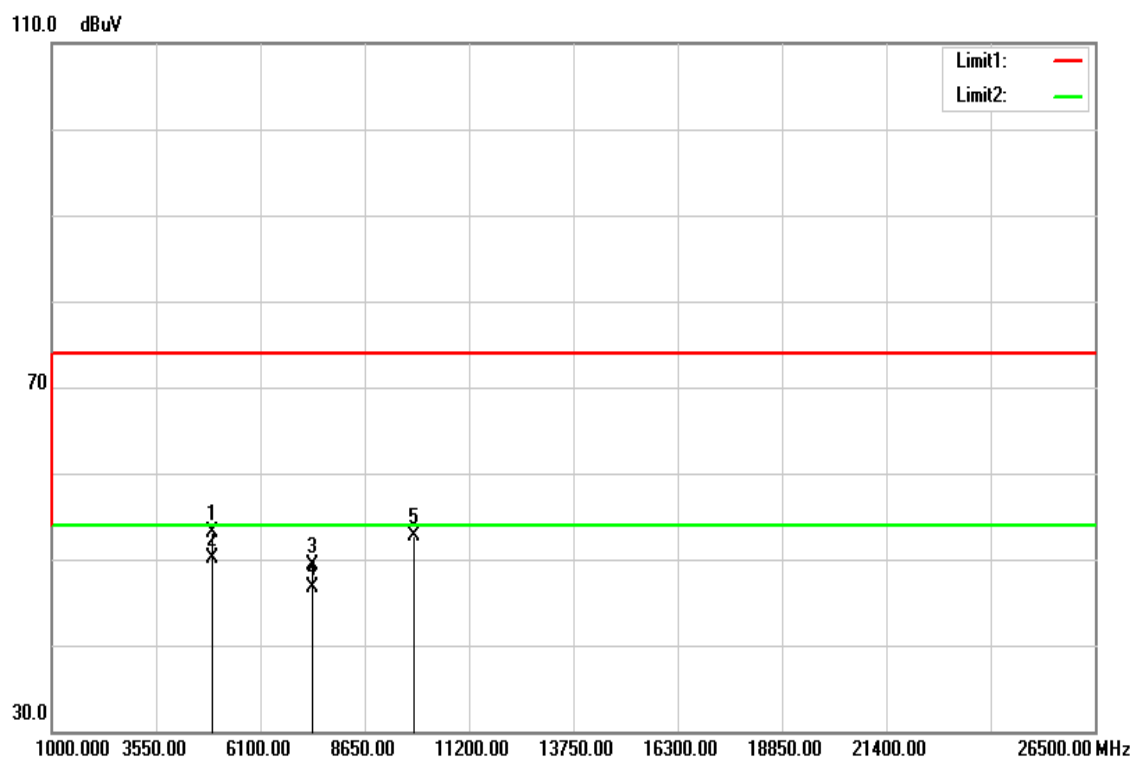
1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

**TX / IEEE 802.11b / CH High**

**Polarity: Vertical**



**Polarity: Horizontal**



**Operation Mode:** TX / IEEE 802.11b / CH High

**Test Date:** June 22, 2016

**Temperature:** 27°C

**Tested by:** Dennis Li

**Humidity:** 53% RH

**Polarity:** Ver. / Hor.

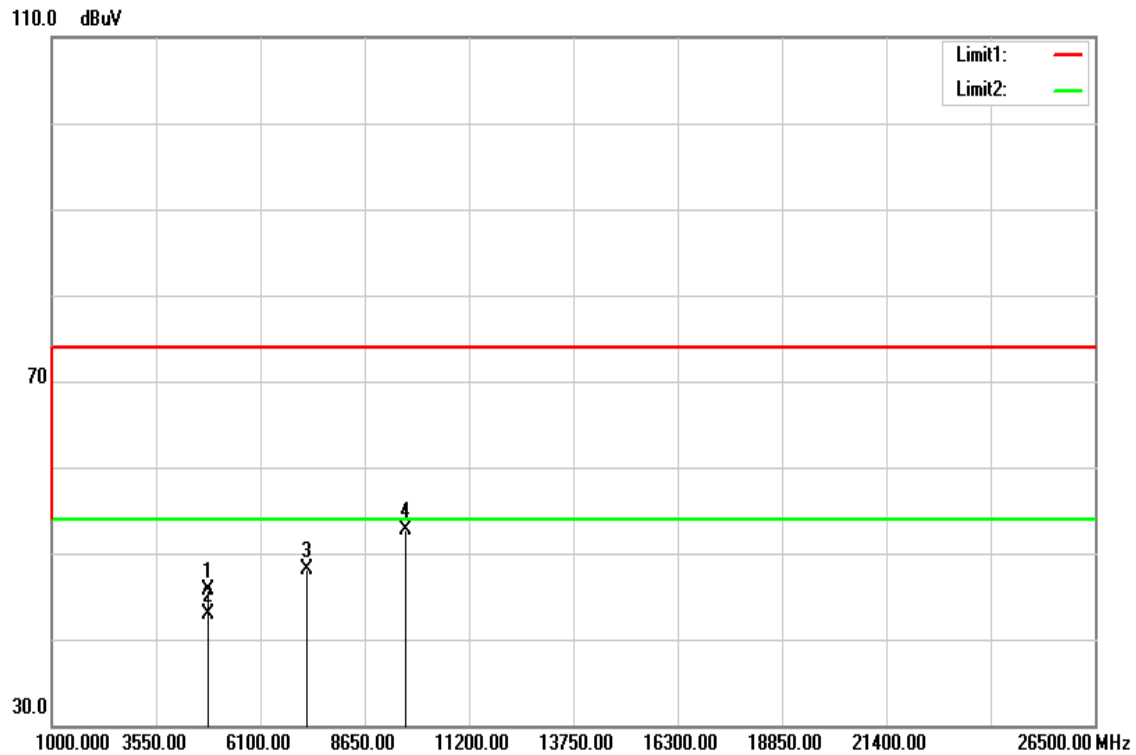
| Frequency (MHz) | Reading (dBuV) | Correction Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark | Ant. Pol. (H/V) |
|-----------------|----------------|--------------------------|-----------------|----------------|-------------|--------|-----------------|
| 4924.000        | 45.87          | 3.90                     | 49.77           | 74.00          | -24.23      | peak   | V               |
| 4924.000        | 42.41          | 3.90                     | 46.31           | 54.00          | -7.69       | AVG    | V               |
| 7386.000        | 38.89          | 10.79                    | 49.68           | 74.00          | -24.32      | peak   | V               |
| 7386.000        | 35.32          | 10.79                    | 46.11           | 54.00          | -7.89       | AVG    | V               |
| 9848.000        | 37.95          | 14.60                    | 52.55           | 74.00          | -21.45      | peak   | V               |
| N/A             |                |                          |                 |                |             |        |                 |
| 4924.000        | 49.18          | 3.90                     | 53.08           | 74.00          | -20.92      | peak   | H               |
| 4924.000        | 46.26          | 3.90                     | 50.16           | 54.00          | -3.84       | AVG    | H               |
| 7386.000        | 38.54          | 10.79                    | 49.33           | 74.00          | -24.67      | peak   | H               |
| 7386.000        | 35.98          | 10.79                    | 46.77           | 54.00          | -7.23       | AVG    | H               |
| 9848.000        | 38.16          | 14.60                    | 52.76           | 74.00          | -21.24      | peak   | H               |
| N/A             |                |                          |                 |                |             |        |                 |

**Remark:**

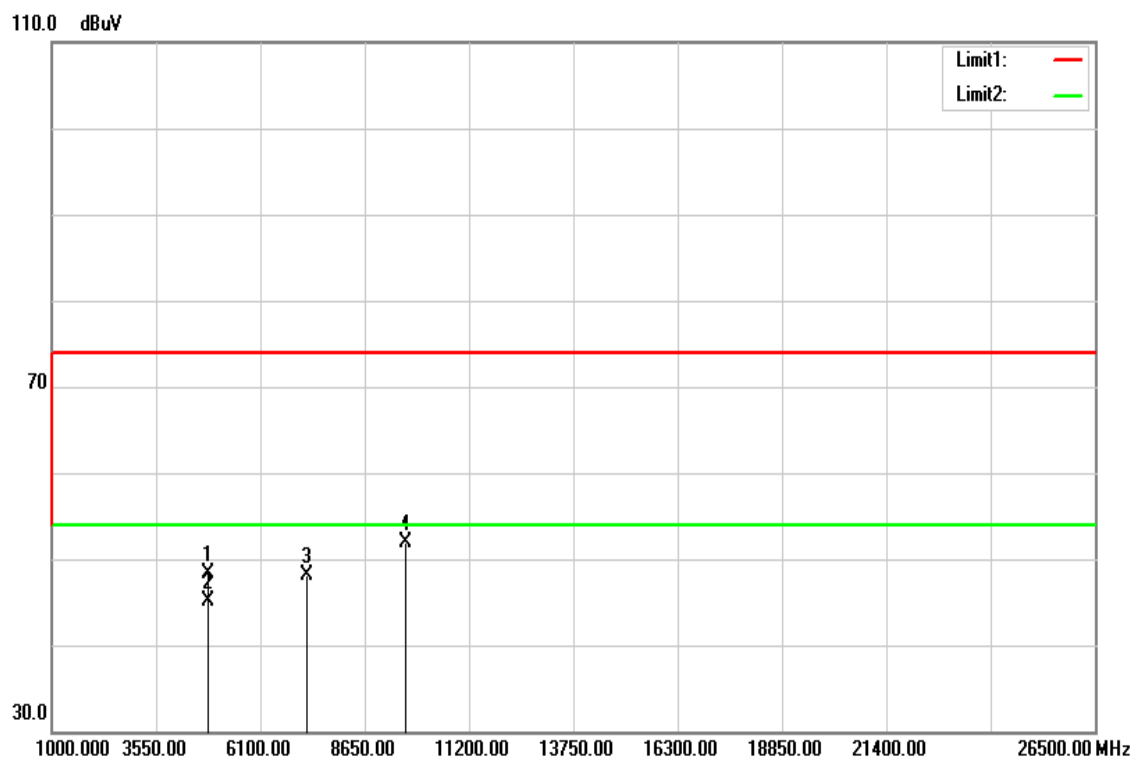
1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

**TX / IEEE 802.11g / CH Low**

**Polarity: Vertical**



**Polarity: Horizontal**



**Operation Mode:** TX / IEEE 802.11g / CH Low

**Test Date:** June 22, 2016

**Temperature:** 27°C

**Tested by:** Dennis Li

**Humidity:** 53% RH

**Polarity:** Ver. / Hor.

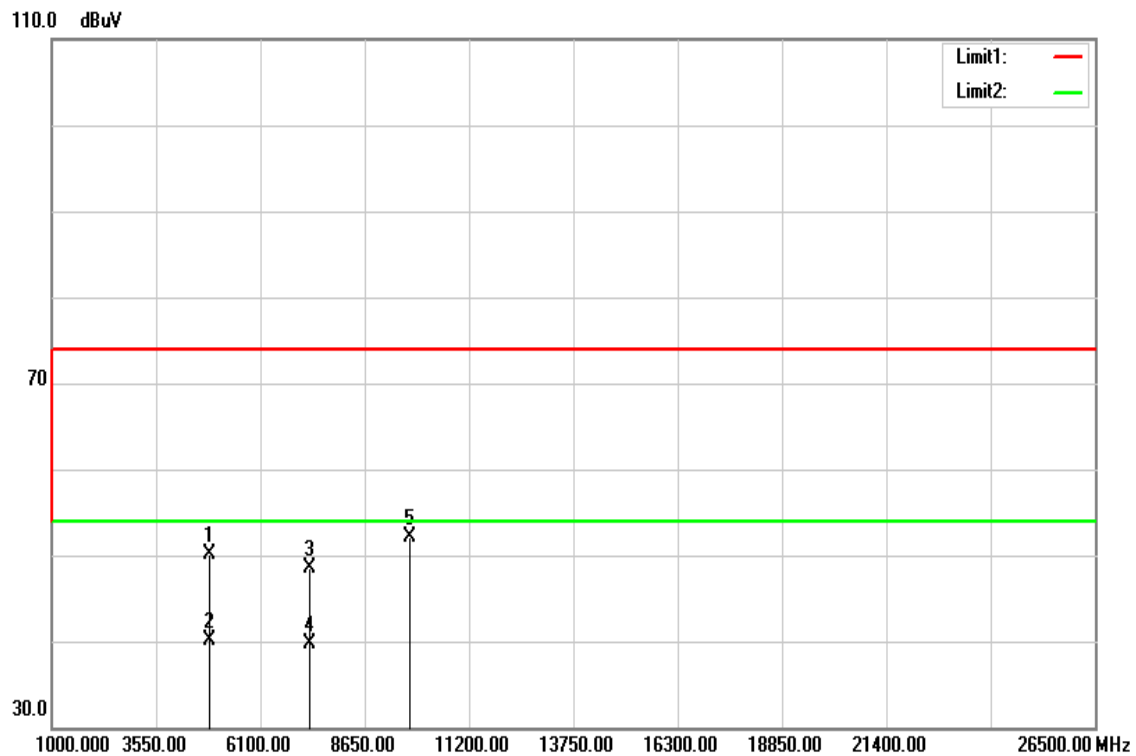
| Frequency (MHz) | Reading (dBuV) | Correction Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark | Ant. Pol. (H/V) |
|-----------------|----------------|--------------------------|-----------------|----------------|-------------|--------|-----------------|
| 4824.000        | 41.73          | 4.01                     | 45.74           | 74.00          | -28.26      | peak   | V               |
| 4824.000        | 38.98          | 4.01                     | 42.99           | 54.00          | -11.01      | AVG    | V               |
| 7236.000        | 37.45          | 10.64                    | 48.09           | 74.00          | -25.91      | peak   | V               |
| 9648.000        | 38.56          | 14.22                    | 52.78           | 74.00          | -21.22      | peak   | V               |
| N/A             |                |                          |                 |                |             |        |                 |
|                 |                |                          |                 |                |             |        |                 |
| 4824.000        | 44.29          | 4.01                     | 48.30           | 74.00          | -25.70      | peak   | H               |
| 4824.000        | 41.10          | 4.01                     | 45.11           | 54.00          | -8.89       | AVG    | H               |
| 7236.000        | 37.46          | 10.64                    | 48.10           | 74.00          | -25.90      | peak   | H               |
| 9648.000        | 37.62          | 14.22                    | 51.84           | 74.00          | -22.16      | peak   | H               |
| N/A             |                |                          |                 |                |             |        |                 |
|                 |                |                          |                 |                |             |        |                 |

**Remark:**

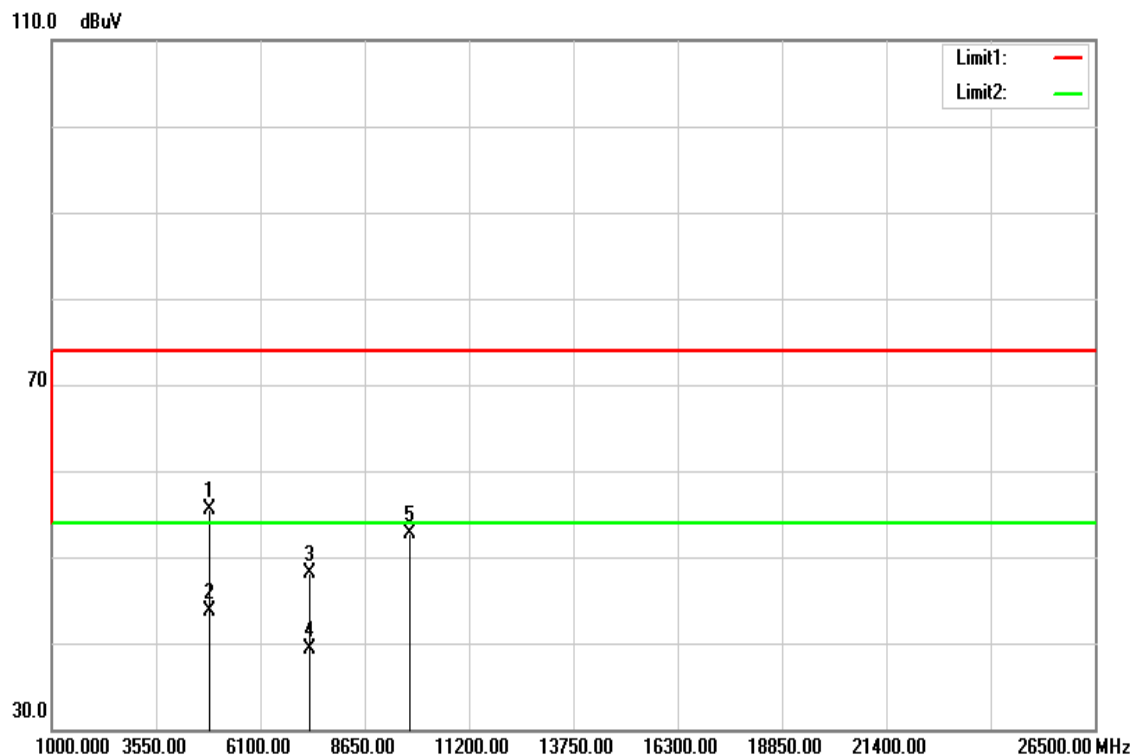
1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

**TX / IEEE 802.11g / CH Mid**

**Polarity: Vertical**



**Polarity: Horizontal**



**Operation Mode:** TX / IEEE 802.11g / CH Mid

**Test Date:** June 22, 2016

**Temperature:** 27°C

**Tested by:** Dennis Li

**Humidity:** 53% RH

**Polarity:** Ver. / Hor.

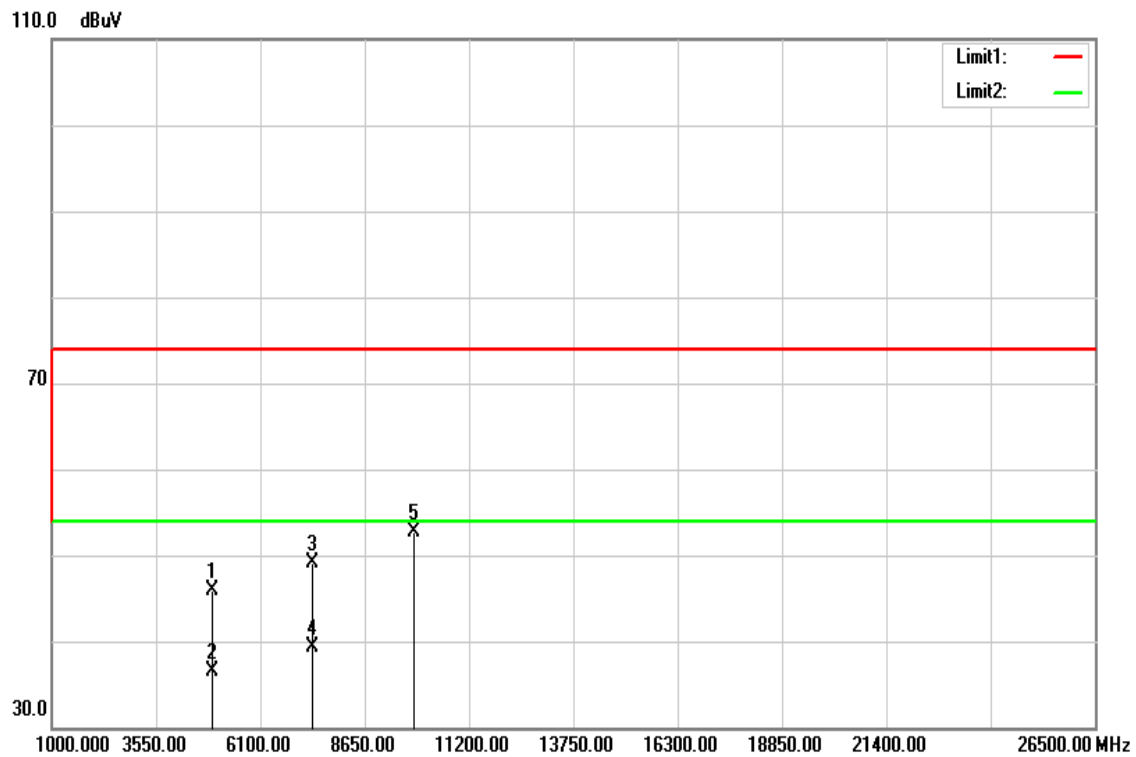
| Frequency (MHz) | Reading (dBuV) | Correction Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark | Ant. Pol. (H/V) |
|-----------------|----------------|--------------------------|-----------------|----------------|-------------|--------|-----------------|
| 4874.000        | 46.15          | 3.92                     | 50.07           | 74.00          | -23.93      | peak   | V               |
| 4874.000        | 36.23          | 3.92                     | 40.15           | 54.00          | -13.85      | AVG    | V               |
| 7311.000        | 37.89          | 10.71                    | 48.60           | 74.00          | -25.40      | peak   | V               |
| 7311.000        | 28.94          | 10.71                    | 39.65           | 54.00          | -14.35      | AVG    | V               |
| 9748.000        | 37.61          | 14.41                    | 52.02           | 74.00          | -21.98      | peak   | V               |
| N/A             |                |                          |                 |                |             |        |                 |
| 4874.000        | 51.54          | 3.92                     | 55.46           | 74.00          | -18.54      | peak   | H               |
| 4874.000        | 39.71          | 3.92                     | 43.63           | 54.00          | -10.37      | AVG    | H               |
| 7311.000        | 37.32          | 10.71                    | 48.03           | 74.00          | -25.97      | peak   | H               |
| 7311.000        | 28.50          | 10.71                    | 39.21           | 54.00          | -14.79      | AVG    | H               |
| 9748.000        | 38.27          | 14.41                    | 52.68           | 74.00          | -21.32      | peak   | H               |
| N/A             |                |                          |                 |                |             |        |                 |

**Remark:**

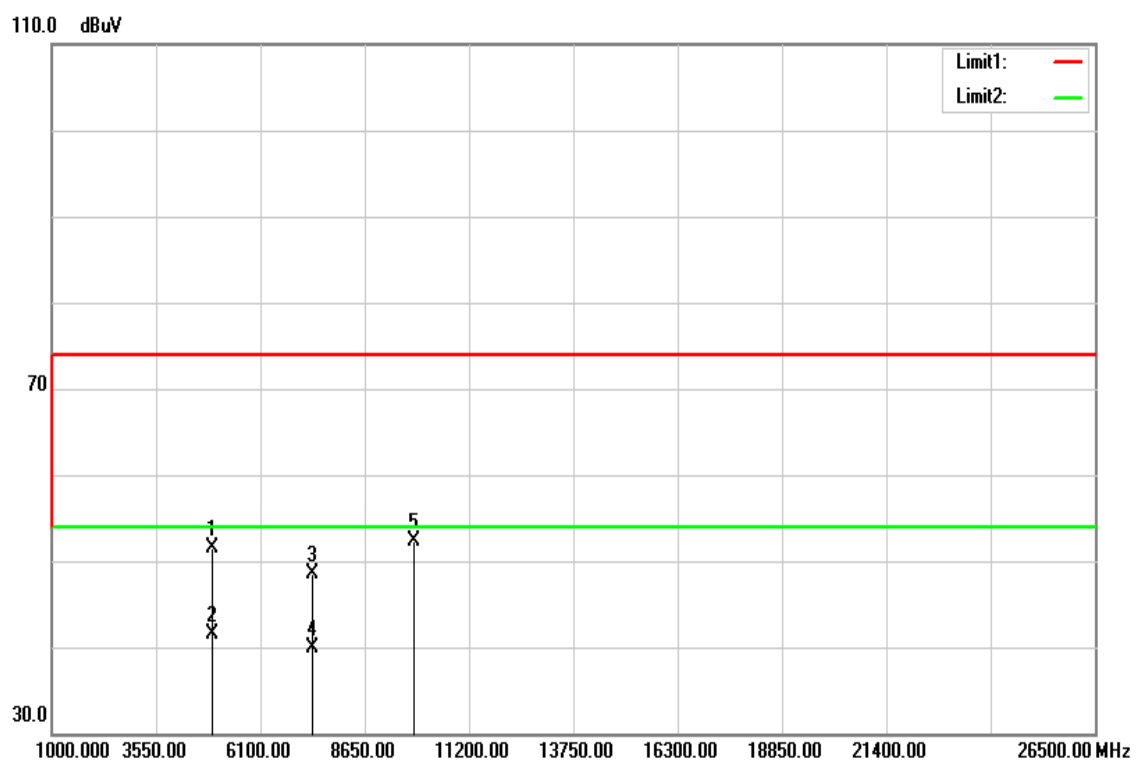
1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

**TX / IEEE 802.11g / CH High**

**Polarity: Vertical**



**Polarity: Horizontal**



**Operation Mode:** TX / IEEE 802.11g / CH High

**Test Date:** June 22, 2016

**Temperature:** 27°C

**Tested by:** Dennis Li

**Humidity:** 53% RH

**Polarity:** Ver. / Hor.

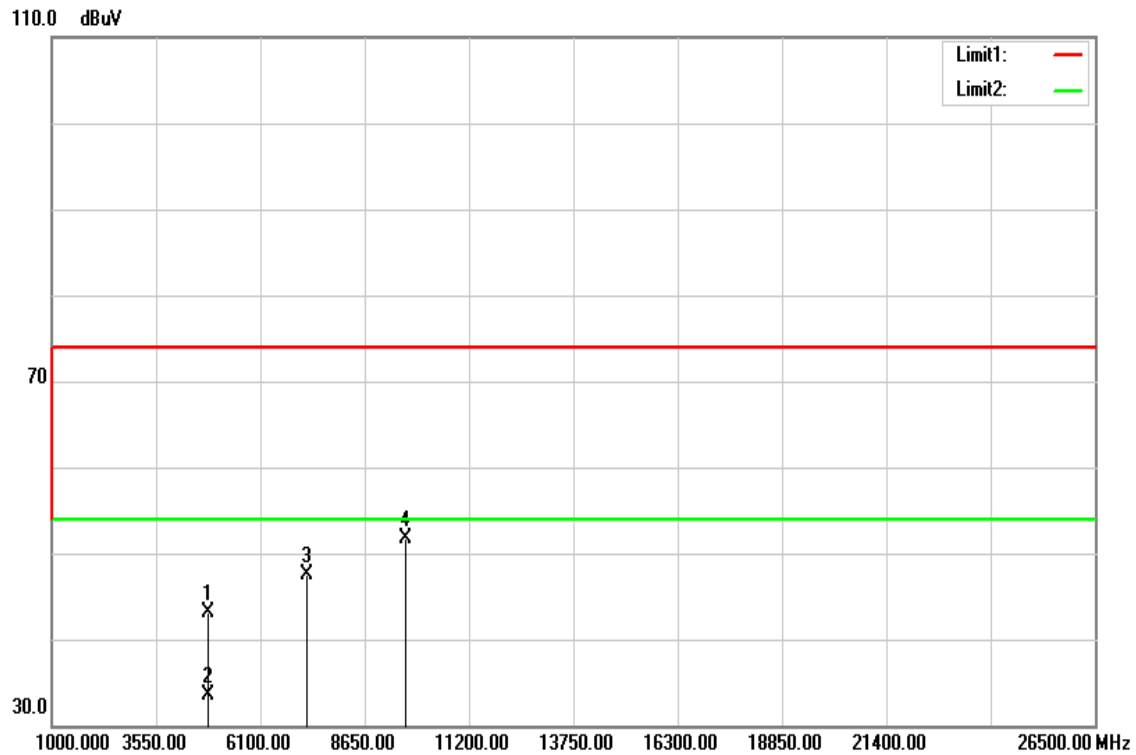
| Frequency (MHz) | Reading (dBuV) | Correction Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark | Ant. Pol. (H/V) |
|-----------------|----------------|--------------------------|-----------------|----------------|-------------|--------|-----------------|
| 4924.000        | 41.98          | 3.90                     | 45.88           | 74.00          | -28.12      | peak   | V               |
| 4924.000        | 32.56          | 3.90                     | 36.46           | 54.00          | -17.54      | AVG    | V               |
| 7386.000        | 38.26          | 10.79                    | 49.05           | 74.00          | -24.95      | peak   | V               |
| 7386.000        | 28.53          | 10.79                    | 39.32           | 54.00          | -14.68      | AVG    | V               |
| 9848.000        | 38.12          | 14.60                    | 52.72           | 74.00          | -21.28      | peak   | V               |
| N/A             |                |                          |                 |                |             |        |                 |
| 4924.000        | 47.53          | 3.90                     | 51.43           | 74.00          | -22.57      | peak   | H               |
| 4924.000        | 37.68          | 3.90                     | 41.58           | 54.00          | -12.42      | AVG    | H               |
| 7386.000        | 37.80          | 10.79                    | 48.59           | 74.00          | -25.41      | peak   | H               |
| 7386.000        | 29.08          | 10.79                    | 39.87           | 54.00          | -14.13      | AVG    | H               |
| 9848.000        | 37.73          | 14.60                    | 52.33           | 74.00          | -21.67      | peak   | H               |
| N/A             |                |                          |                 |                |             |        |                 |

**Remark:**

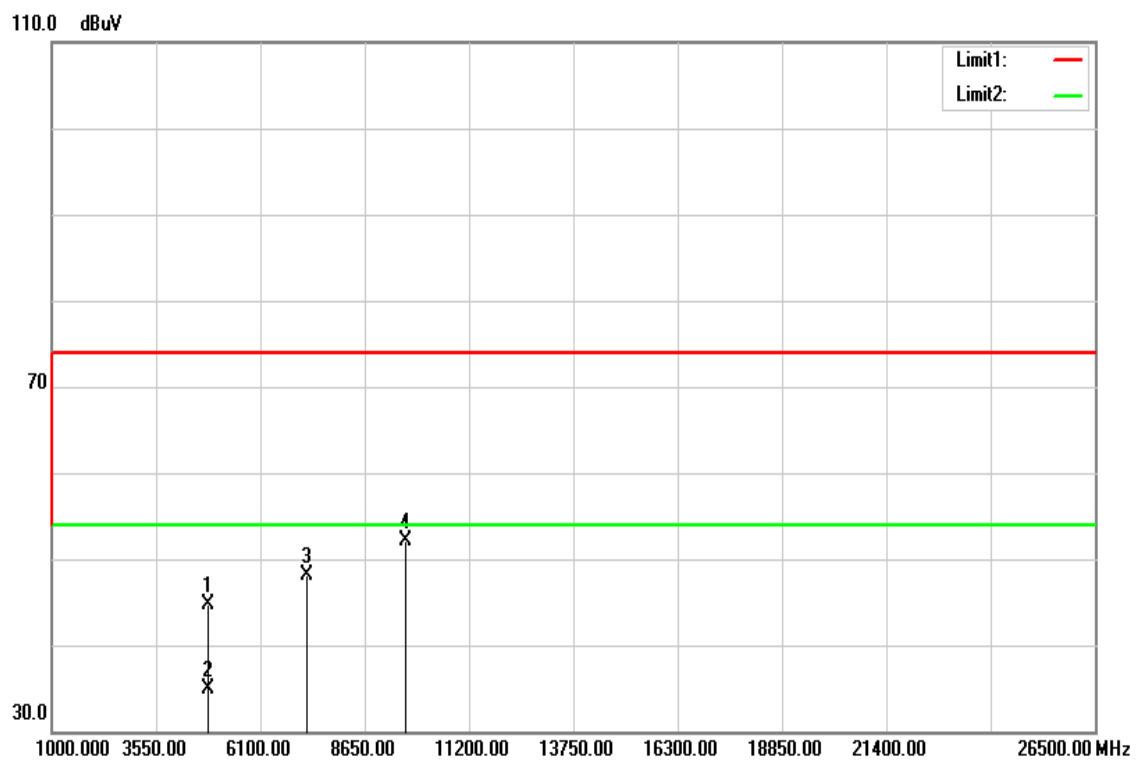
1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

**TX / IEEE 802.11n HT 20 MHz mode / CH Low**

**Polarity: Vertical**



**Polarity: Horizontal**



**Operation Mode:** TX / IEEE 802.11n HT 20 MHz mode / CH Low **Test Date:** June 22, 2016

**Temperature:** 27°C

**Tested by:** Dennis Li

**Humidity:** 53% RH

**Polarity:** Ver. / Hor.

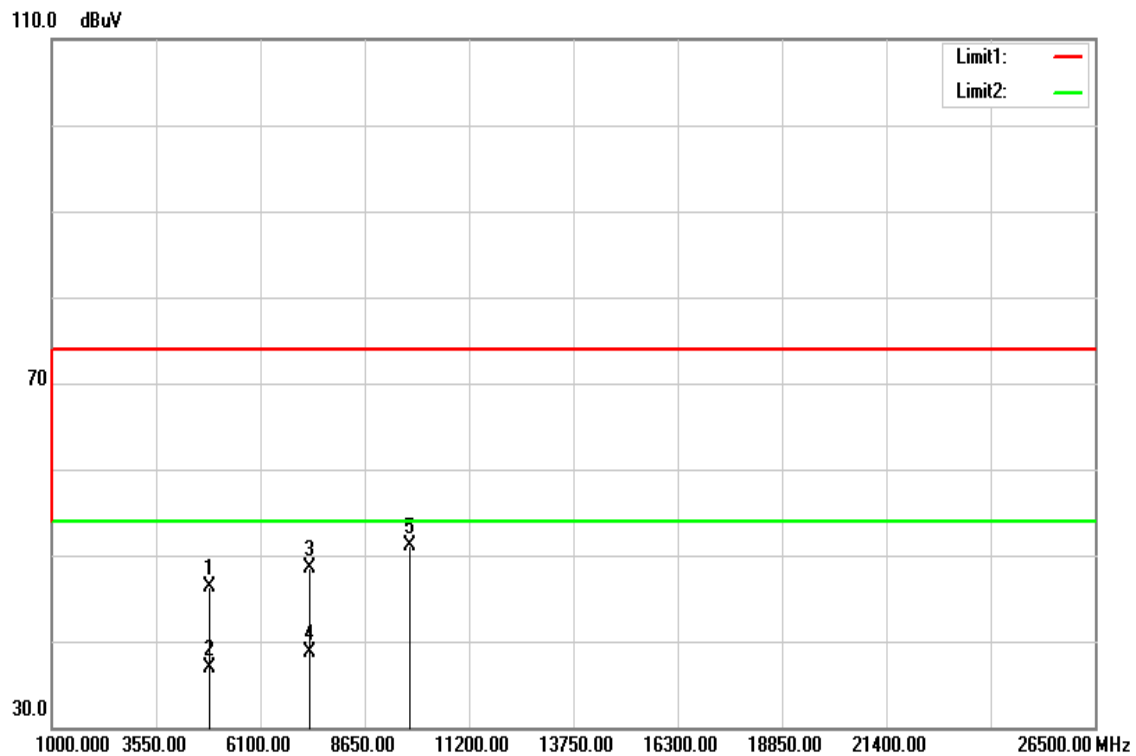
| Frequency (MHz) | Reading (dBuV) | Correction Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark | Ant. Pol. (H/V) |
|-----------------|----------------|--------------------------|-----------------|----------------|-------------|--------|-----------------|
| 4824.000        | 39.16          | 4.01                     | 43.17           | 74.00          | -30.83      | peak   | V               |
| 4824.000        | 29.55          | 4.01                     | 33.56           | 54.00          | -20.44      | AVG    | V               |
| 7236.000        | 36.92          | 10.64                    | 47.56           | 74.00          | -26.44      | peak   | V               |
| 9648.000        | 37.41          | 14.22                    | 51.63           | 74.00          | -22.37      | peak   | V               |
| N/A             |                |                          |                 |                |             |        |                 |
|                 |                |                          |                 |                |             |        |                 |
| 4824.000        | 40.79          | 4.01                     | 44.80           | 74.00          | -29.20      | peak   | H               |
| 4824.000        | 30.84          | 4.01                     | 34.85           | 54.00          | -19.15      | AVG    | H               |
| 7236.000        | 37.55          | 10.64                    | 48.19           | 74.00          | -25.81      | peak   | H               |
| 9648.000        | 37.86          | 14.22                    | 52.08           | 74.00          | -21.92      | peak   | H               |
| N/A             |                |                          |                 |                |             |        |                 |
|                 |                |                          |                 |                |             |        |                 |

**Remark:**

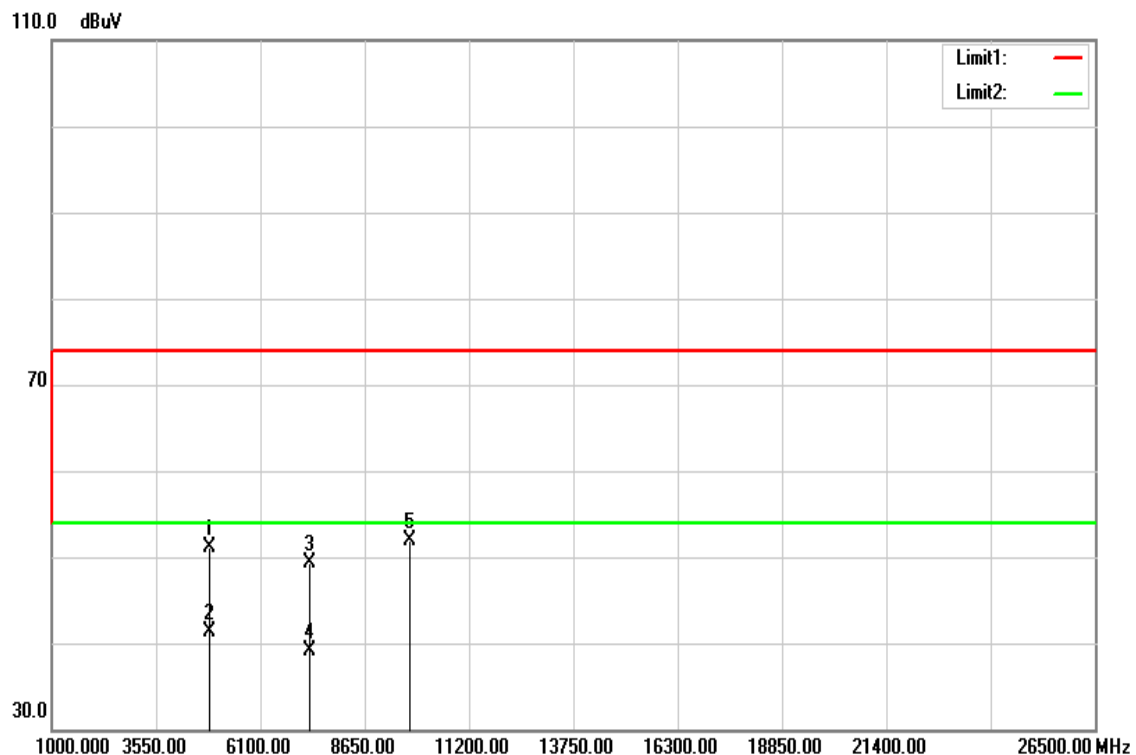
1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

**TX / IEEE 802.11n HT 20 MHz mode / CH Mid**

**Polarity: Vertical**



**Polarity: Horizontal**



**Operation Mode:** TX / IEEE 802.11n HT 20 MHz mode / CH Mid **Test Date:** June 22, 2016

**Temperature:** 27°C

**Tested by:** Dennis Li

**Humidity:** 53% RH

**Polarity:** Ver. / Hor.

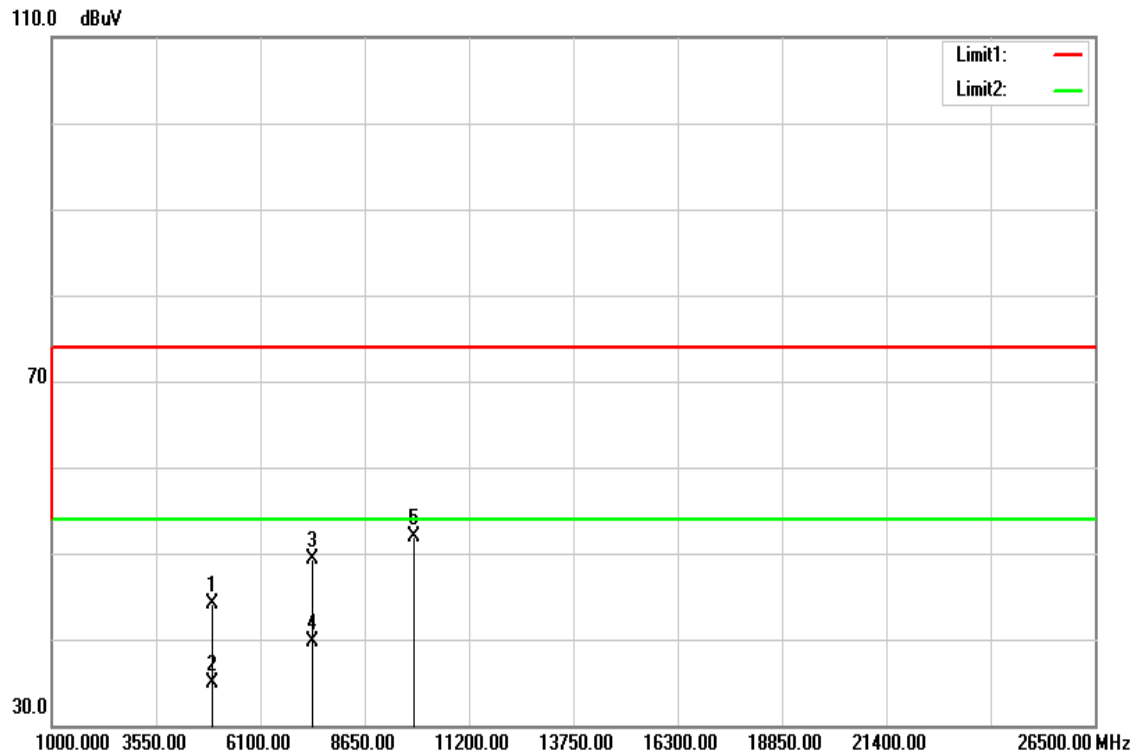
| Frequency (MHz) | Reading (dBuV) | Correction Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark | Ant. Pol. (H/V) |
|-----------------|----------------|--------------------------|-----------------|----------------|-------------|--------|-----------------|
| 4874.000        | 42.47          | 3.92                     | 46.39           | 74.00          | -27.61      | peak   | V               |
| 4874.000        | 33.06          | 3.92                     | 36.98           | 54.00          | -17.02      | AVG    | V               |
| 7311.000        | 37.86          | 10.71                    | 48.57           | 74.00          | -25.43      | peak   | V               |
| 7311.000        | 28.08          | 10.71                    | 38.79           | 54.00          | -15.21      | AVG    | V               |
| 9748.000        | 36.64          | 14.41                    | 51.05           | 74.00          | -22.95      | peak   | V               |
| N/A             |                |                          |                 |                |             |        |                 |
| 4874.000        | 47.11          | 3.92                     | 51.03           | 74.00          | -22.97      | peak   | H               |
| 4874.000        | 37.40          | 3.92                     | 41.32           | 54.00          | -12.68      | AVG    | H               |
| 7311.000        | 38.52          | 10.71                    | 49.23           | 74.00          | -24.77      | peak   | H               |
| 7311.000        | 28.44          | 10.71                    | 39.15           | 54.00          | -14.85      | AVG    | H               |
| 9748.000        | 37.49          | 14.41                    | 51.90           | 74.00          | -22.10      | peak   | H               |
| N/A             |                |                          |                 |                |             |        |                 |

**Remark:**

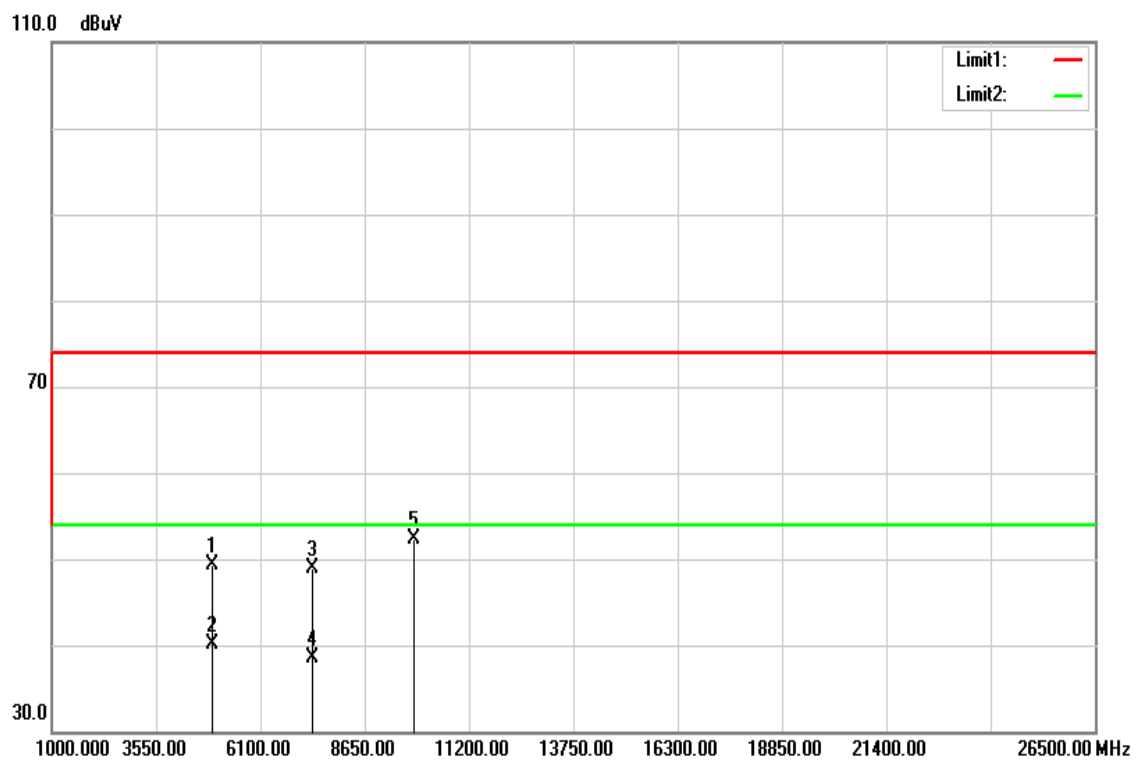
1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

**TX / IEEE 802.11n HT 20 MHz mode / CH High**

**Polarity: Vertical**



**Polarity: Horizontal**



**Operation Mode:** TX / IEEE 802.11n HT 20 MHz mode / CH High  
**Temperature:** 27°C  
**Humidity:** 53% RH

**Test Date:** June 22, 2016  
**Tested by:** Dennis Li  
**Polarity:** Ver. / Hor.

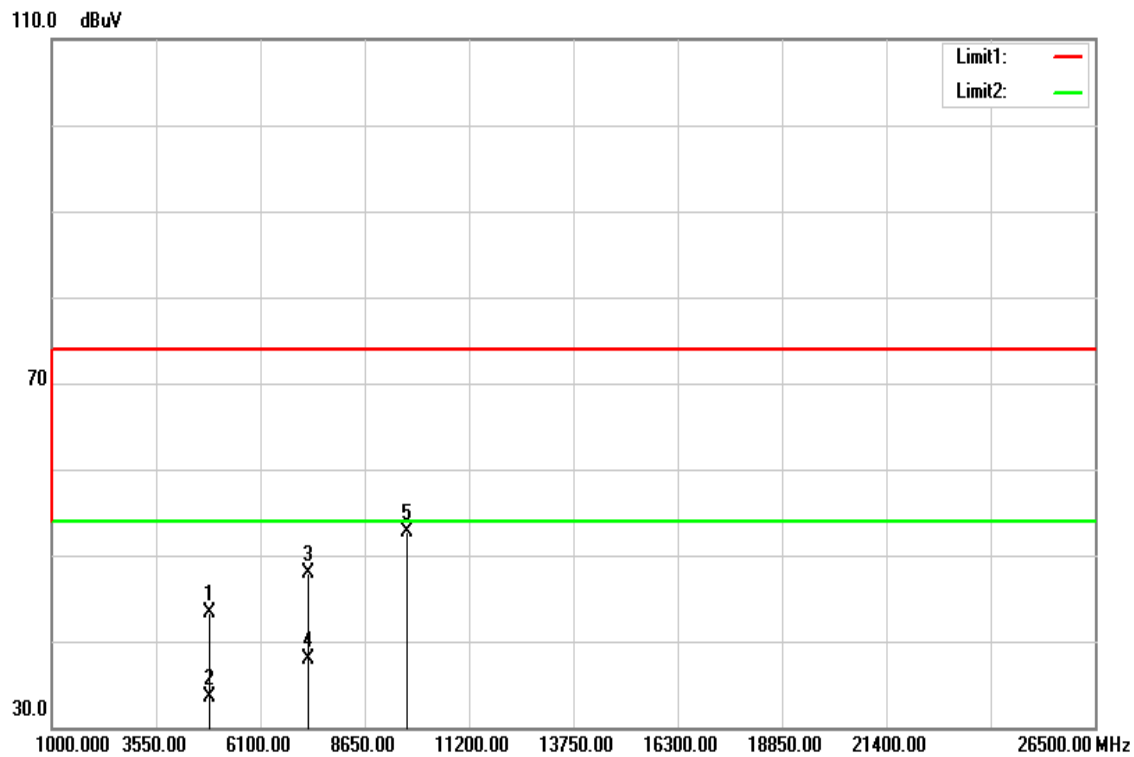
| Frequency (MHz) | Reading (dBuV) | Correction Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark | Ant. Pol. (H/V) |
|-----------------|----------------|--------------------------|-----------------|----------------|-------------|--------|-----------------|
| 4924.000        | 40.18          | 3.90                     | 44.08           | 74.00          | -29.92      | peak   | V               |
| 4924.000        | 31.06          | 3.90                     | 34.96           | 54.00          | -19.04      | AVG    | V               |
| 7386.000        | 38.53          | 10.79                    | 49.32           | 74.00          | -24.68      | peak   | V               |
| 7386.000        | 28.99          | 10.79                    | 39.78           | 54.00          | -14.22      | AVG    | V               |
| 9848.000        | 37.37          | 14.60                    | 51.97           | 74.00          | -22.03      | peak   | V               |
| N/A             |                |                          |                 |                |             |        |                 |
| 4924.000        | 45.36          | 3.90                     | 49.26           | 74.00          | -24.74      | peak   | H               |
| 4924.000        | 36.22          | 3.90                     | 40.12           | 54.00          | -13.88      | AVG    | H               |
| 7386.000        | 38.04          | 10.79                    | 48.83           | 74.00          | -25.17      | peak   | H               |
| 7386.000        | 27.66          | 10.79                    | 38.45           | 54.00          | -15.55      | AVG    | H               |
| 9848.000        | 37.75          | 14.60                    | 52.35           | 74.00          | -21.65      | peak   | H               |
| N/A             |                |                          |                 |                |             |        |                 |

**Remark:**

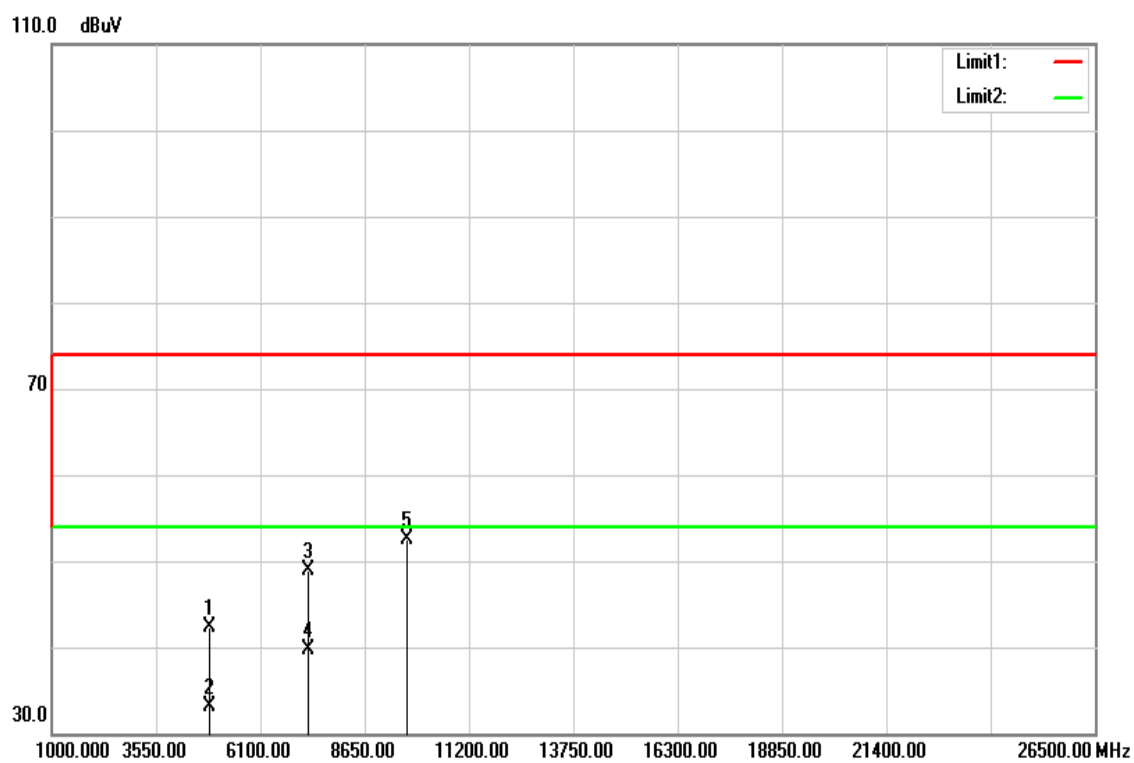
1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

**TX / IEEE 802.11n HT 40 MHz mode / CH Low**

**Polarity: Vertical**



**Polarity: Horizontal**



**Operation Mode:** TX / IEEE 802.11n HT 40 MHz mode  
/ CH Low

**Test Date:** June 22, 2016

**Temperature:** 27°C

**Tested by:** Dennis Li

**Humidity:** 53% RH

**Polarity:** Ver. / Hor.

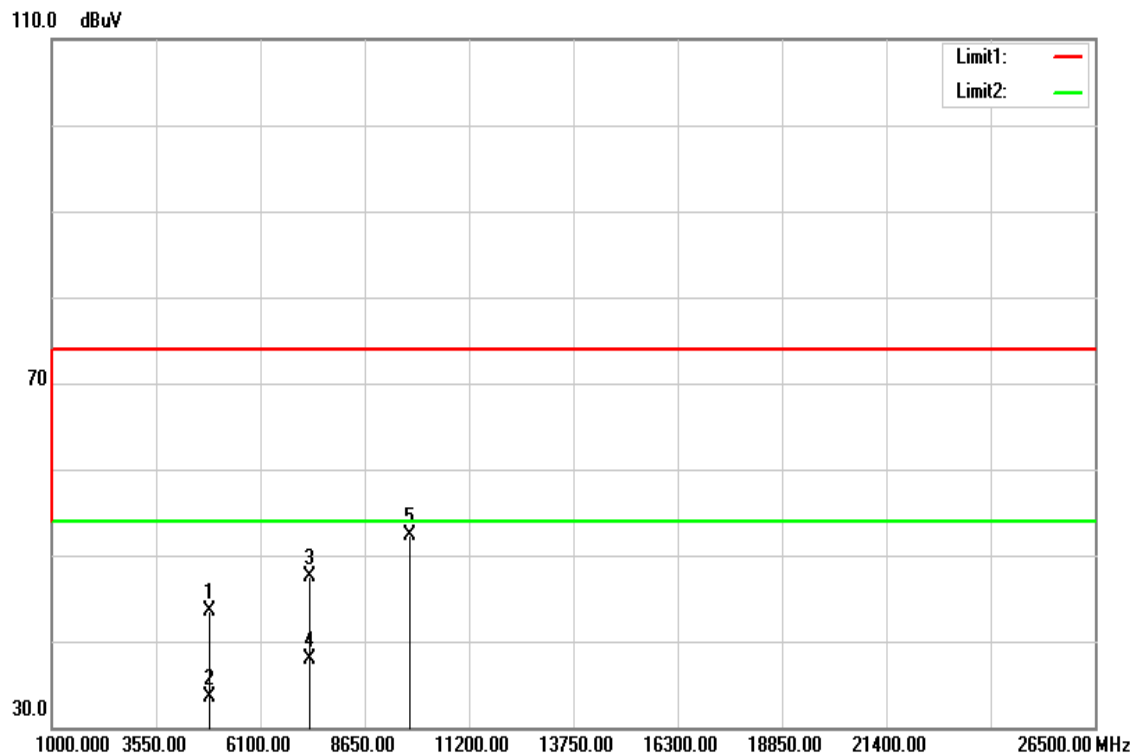
| Frequency (MHz) | Reading (dBuV) | Correction Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark | Ant. Pol. (H/V) |
|-----------------|----------------|--------------------------|-----------------|----------------|-------------|--------|-----------------|
| 4844.000        | 39.23          | 3.98                     | 43.21           | 74.00          | -30.79      | peak   | V               |
| 4844.000        | 29.47          | 3.98                     | 33.45           | 54.00          | -20.55      | AVG    | V               |
| 7266.000        | 37.29          | 10.67                    | 47.96           | 74.00          | -26.04      | peak   | V               |
| 7266.000        | 27.27          | 10.67                    | 37.94           | 54.00          | -16.06      | AVG    | V               |
| 9688.000        | 38.32          | 14.30                    | 52.62           | 74.00          | -21.38      | peak   | V               |
| N/A             |                |                          |                 |                |             |        |                 |
| 4844.000        | 38.26          | 3.98                     | 42.24           | 74.00          | -31.76      | peak   | H               |
| 4844.000        | 29.17          | 3.98                     | 33.15           | 54.00          | -20.85      | AVG    | H               |
| 7266.000        | 38.20          | 10.67                    | 48.87           | 74.00          | -25.13      | peak   | H               |
| 7266.000        | 28.98          | 10.67                    | 39.65           | 54.00          | -14.35      | AVG    | H               |
| 9688.000        | 38.15          | 14.30                    | 52.45           | 74.00          | -21.55      | peak   | H               |
| N/A             |                |                          |                 |                |             |        |                 |

**Remark:**

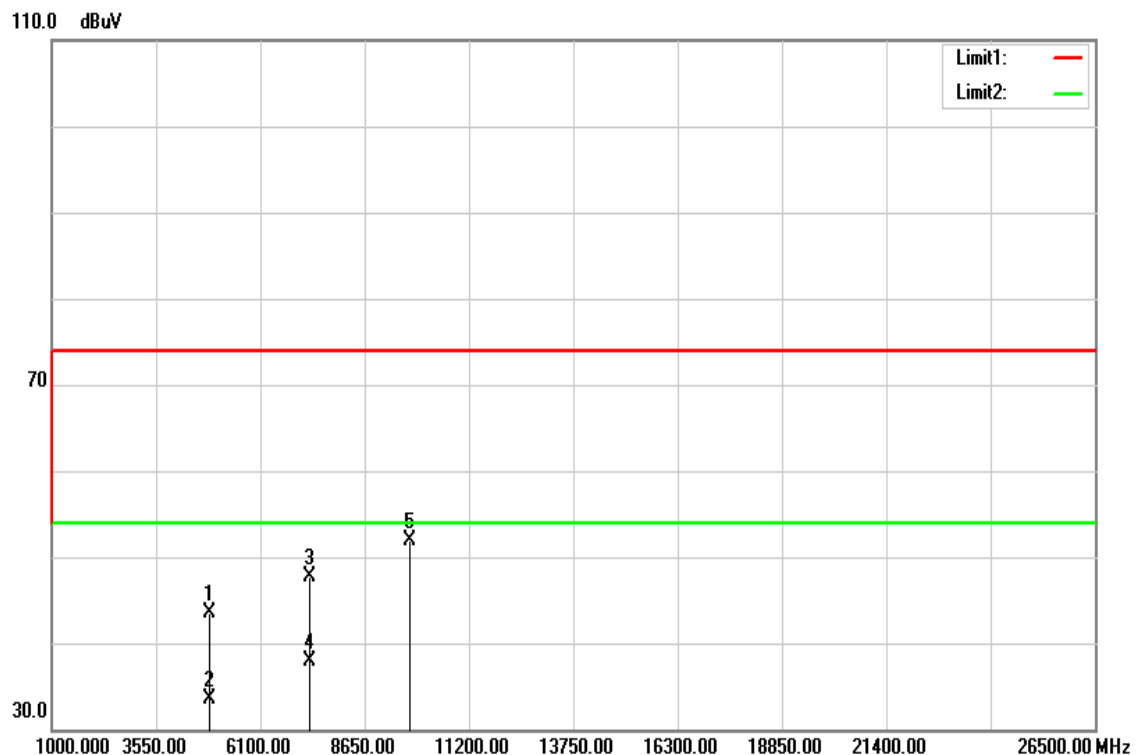
1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

**TX / IEEE 802.11n HT 40 MHz mode / CH Mid**

**Polarity: Vertical**



**Polarity: Horizontal**



**Operation Mode:** TX / IEEE 802.11n HT 40 MHz mode  
/ CH Mid  
**Temperature:** 27°C  
**Humidity:** 53% RH

**Test Date:** June 22, 2016  
**Tested by:** Dennis Li  
**Polarity:** Ver. / Hor.

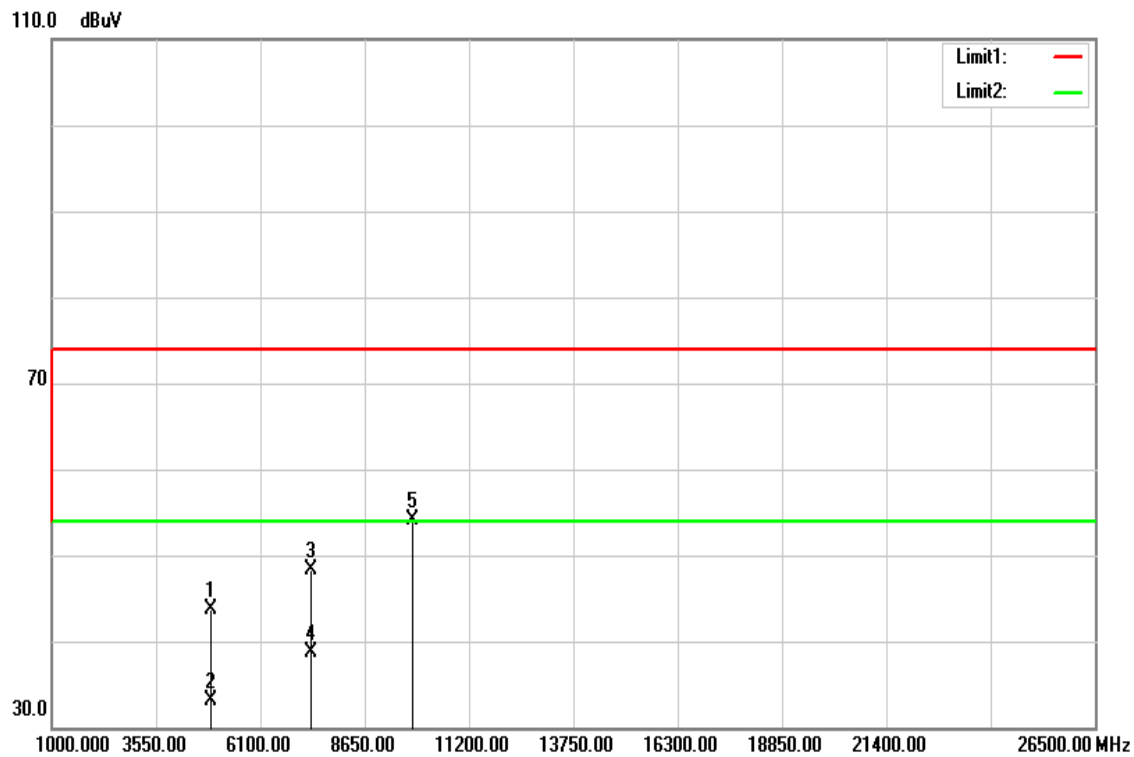
| Frequency (MHz) | Reading (dBuV) | Correction Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark | Ant. Pol. (H/V) |
|-----------------|----------------|--------------------------|-----------------|----------------|-------------|--------|-----------------|
| 4874.000        | 39.49          | 3.92                     | 43.41           | 74.00          | -30.59      | peak   | V               |
| 4874.000        | 29.64          | 3.92                     | 33.56           | 54.00          | -20.44      | AVG    | V               |
| 7311.000        | 36.83          | 10.71                    | 47.54           | 74.00          | -26.46      | peak   | V               |
| 7311.000        | 27.13          | 10.71                    | 37.84           | 54.00          | -16.16      | AVG    | V               |
| 9748.000        | 37.93          | 14.41                    | 52.34           | 74.00          | -21.66      | peak   | V               |
| N/A             |                |                          |                 |                |             |        |                 |
| 4874.000        | 39.53          | 3.92                     | 43.45           | 74.00          | -30.55      | peak   | H               |
| 4874.000        | 29.54          | 3.92                     | 33.46           | 54.00          | -20.54      | AVG    | H               |
| 7311.000        | 37.04          | 10.71                    | 47.75           | 74.00          | -26.25      | peak   | H               |
| 7311.000        | 27.27          | 10.71                    | 37.98           | 54.00          | -16.02      | AVG    | H               |
| 9748.000        | 37.44          | 14.41                    | 51.85           | 74.00          | -22.15      | peak   | H               |
| N/A             |                |                          |                 |                |             |        |                 |

**Remark:**

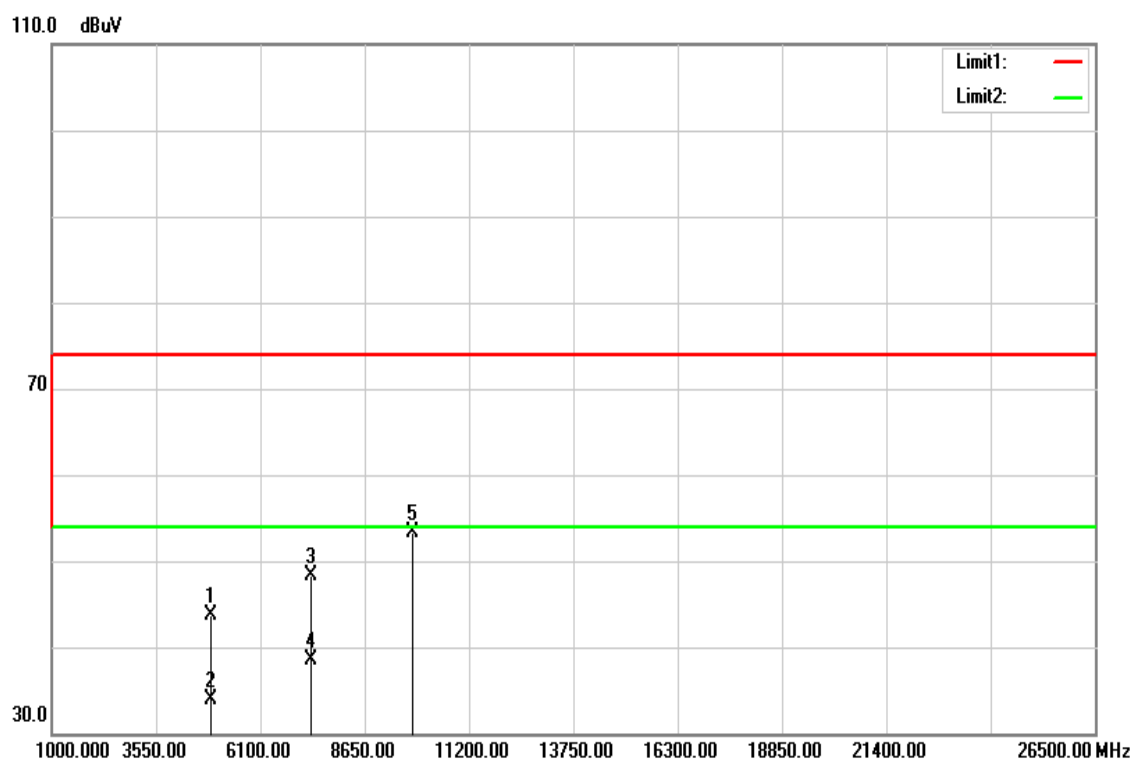
1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

**TX / IEEE 802.11n HT 40 MHz mode / CH High**

**Polarity: Vertical**



**Polarity: Horizontal**



**Operation Mode:** TX / IEEE 802.11n HT 40 MHz mode  
/ CH High

**Test Date:** June 22, 2016

**Temperature:** 27°C

**Tested by:** Dennis Li

**Humidity:** 53% RH

**Polarity:** Ver. / Hor.

| Frequency (MHz) | Reading (dBuV) | Correction Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark | Ant. Pol. (H/V) |
|-----------------|----------------|--------------------------|-----------------|----------------|-------------|--------|-----------------|
| 4904.000        | 39.75          | 3.88                     | 43.63           | 74.00          | -30.37      | peak   | V               |
| 4904.000        | 29.26          | 3.88                     | 33.14           | 54.00          | -20.86      | AVG    | V               |
| 7356.000        | 37.58          | 10.76                    | 48.34           | 74.00          | -25.66      | peak   | V               |
| 7356.000        | 27.86          | 10.76                    | 38.62           | 54.00          | -15.38      | AVG    | V               |
| 9808.000        | 39.65          | 14.53                    | 54.18           | 74.00          | -19.82      | peak   | V               |
| N/A             |                |                          |                 |                |             |        |                 |
| 4904.000        | 39.80          | 3.88                     | 43.68           | 74.00          | -30.32      | peak   | H               |
| 4904.000        | 30.10          | 3.88                     | 33.98           | 54.00          | -20.02      | AVG    | H               |
| 7356.000        | 37.57          | 10.76                    | 48.33           | 74.00          | -25.67      | peak   | H               |
| 7356.000        | 27.76          | 10.76                    | 38.52           | 54.00          | -15.48      | AVG    | H               |
| 9808.000        | 38.75          | 14.53                    | 53.28           | 74.00          | -20.72      | peak   | H               |
| N/A             |                |                          |                 |                |             |        |                 |

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

## 7.8 POWERLINE CONDUCTED EMISSIONS

### LIMIT

According to §15.207(a), except as shown in paragraphs (b) and (c) of this section, 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 or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50  $\mu$ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

| Frequency Range<br>(MHz) | Limits<br>(dB $\mu$ V) |           |
|--------------------------|------------------------|-----------|
|                          | 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        |

\* Decreases with the logarithm of the frequency.

### Test Configuration

See test photographs attached in Appendix II for the actual connections between EUT and support equipment.

### TEST PROCEDURE

1. The EUT was placed on a table, which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured were complete.

## **TEST RESULTS**

The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range. Significant peaks are then marked as shown on the following data page, and these signals are then quasi-peaked.

### **Test Data**

**Operation Mode:** Normal Link      **Test Date:** July 6, 2016  
**Temperature:** 24°C      **Tested by:** Dennis Li  
**Humidity:** 50% RH

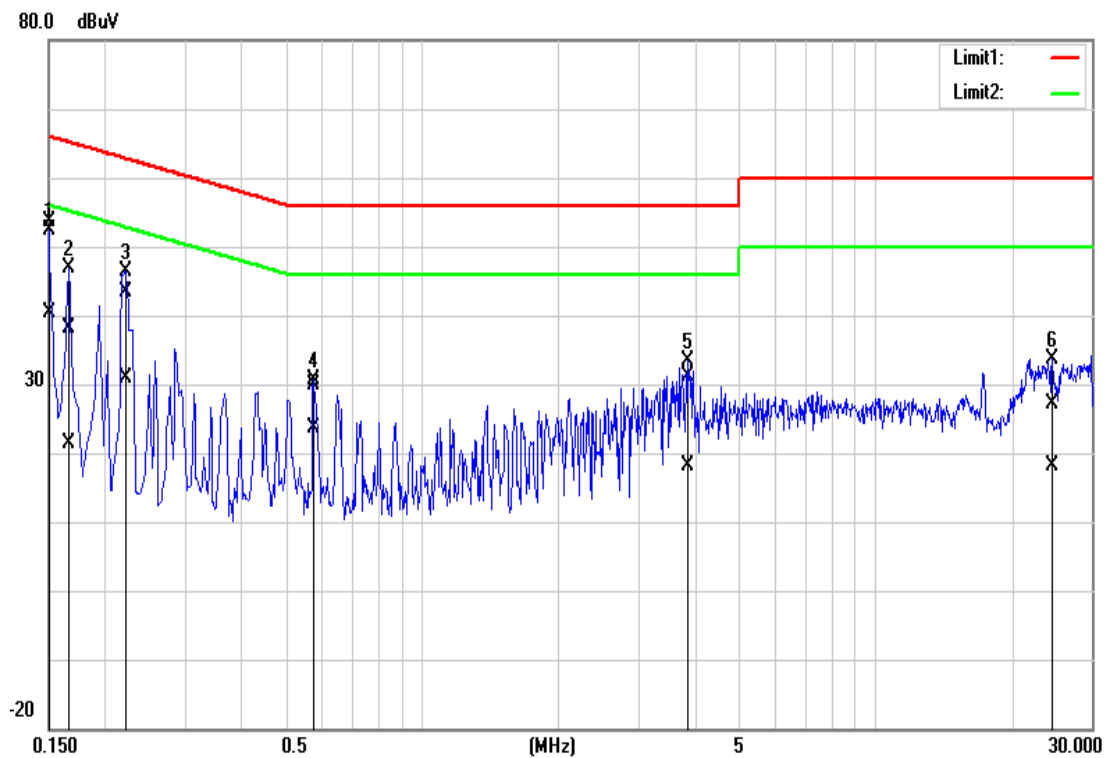
| Freq. (MHz) | QP Reading (dBuV) | AV Reading (dBuV) | Corr. factor (dB/m) | QP Result (dBuV/m) | AV Result (dBuV/m) | QP Limit (dBuV) | AV Limit (dBuV) | QP Margin (dB) | AV Margin (dB) | Note |
|-------------|-------------------|-------------------|---------------------|--------------------|--------------------|-----------------|-----------------|----------------|----------------|------|
| 0.1500      | 43.90             | 30.72             | 9.71                | 53.61              | 40.43              | 66.00           | 56.00           | -12.39         | -15.57         | L1   |
| 0.1660      | 28.46             | 11.57             | 9.71                | 38.17              | 21.28              | 65.16           | 55.16           | -26.99         | -33.88         | L1   |
| 0.2220      | 33.57             | 21.20             | 9.70                | 43.27              | 30.90              | 62.74           | 52.74           | -19.47         | -21.84         | L1   |
| 0.5780      | 20.18             | 13.94             | 9.70                | 29.88              | 23.64              | 56.00           | 46.00           | -26.12         | -22.36         | L1   |
| 3.8780      | 21.39             | 8.34              | 9.74                | 31.13              | 18.08              | 56.00           | 46.00           | -24.87         | -27.92         | L1   |
| 24.5540     | 17.31             | 8.34              | 9.83                | 27.14              | 18.17              | 60.00           | 50.00           | -32.86         | -31.83         | L1   |
| 0.1700      | 27.84             | 9.88              | 9.78                | 37.62              | 19.66              | 64.96           | 54.96           | -27.34         | -35.30         | L2   |
| 0.2220      | 33.94             | 22.10             | 9.77                | 43.71              | 31.87              | 62.74           | 52.74           | -19.03         | -20.87         | L2   |
| 0.3700      | 22.19             | 13.24             | 9.76                | 31.95              | 23.00              | 58.50           | 48.50           | -26.55         | -25.50         | L2   |
| 0.6580      | 20.91             | 15.78             | 9.76                | 30.67              | 25.54              | 56.00           | 46.00           | -25.33         | -20.46         | L2   |
| 3.6620      | 16.40             | 2.97              | 9.82                | 26.22              | 12.79              | 56.00           | 46.00           | -29.78         | -33.21         | L2   |
| 29.9220     | 19.39             | 11.12             | 10.38               | 29.77              | 21.50              | 60.00           | 50.00           | -30.23         | -28.50         | L2   |

### **Remark:**

1. Measuring frequencies from 0.15 MHz to 30MHz.
2. The emissions measured in frequency range from 0.15 MHz to 30MHz were made with an instrument using Quasi-peak detector and average detector.
3. The IF bandwidth of SPA between 0.15MHz and 30MHz was 10 kHz; the IF bandwidth of Test Receiver between 0.15MHz and 30MHz was 9 kHz;
4. L1 = Line One (Live Line) / L2 = Line Two (Neutral Line)

## Test Plots

### Conducted emissions (Line 1)



### Conducted emissions (Line 2)

