# FCC TEST REPORT

| | |
|---|---|
| **Application No:** | HR/2019/90003 |
| **Applicant:** | Unimax communications |
| **Address of Applicant:** | 18201 McDurmott St.West Suite E,Irvine,CA 92614. |
| **Manufacturer:** | Unimax communications |
| **Address of Manufacturer** | 18201 McDurmott St.West Suite E,Irvine,CA 92614. |
| **Factory:** | Unimax communications |
| **Address of Factory:** | 18201 McDurmott St.West Suite E,Irvine,CA 92614. |
| **EUT Description:** | Smartphone |
| **Model No.:** | U693CL |
| **Trade Mark:** | UMX |
| **FCC ID:** | P46-U693CL |
| **Standards:** | 47 CFR FCC Part 2, Subpart J<br>47 CFR Part 15, Subpart C |
| **Test Method:** | KDB558074 D01 15.247 Meas Guidance v05r02<br>ANSI C63.10 (2013) |
| **Date of Receipt:** | 2019/11/5 |
| **Date of Test:** | 2019/11/6 to 2019/11/20 |
| **Date of Issue:** | 2019/11/20 |
| **Test Result:** | **PASS *** |

. * In the configuration tested, the EUT complied with the standards specified above.

Derek Yang

Derek Yang
Wireless Laboratory Manager

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# 1 Version

| Revision Record | | | | |
|---|---|---|---|---|
| **Version** | **Chapter** | **Date** | **Modifier** | **Remark** |
| 00 | | 2019/11/20 | | Original |
| | | | | |
| | | | | |

| | | | | |
|---|---|---|---|---|
| **Authorized for issue by:** | | | | |
| **Tested By** | | Mike Hu<br>**(Mike Hu) /Project Engineer** | | 2019/11/20<br>**Date** |
| **Checked By** | | David Chen<br>**(David Chen) /Reviewer** | | 2019/11/20<br>**Date** |

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# 2 Test Summary

| Test Item | Test Requirement | Test method | Test Result | Result |
|---|---|---|---|---|
| AC Power Line Conducted Emission | 15.207 | ANSI C63.10 2013 | Clause 4.2 | PASS |
| Duty Cycle | -- | -- | Clause 4.3 | PASS |
| Conducted Output Power | 15.247 (b)(3) | ANSI C63.10 2013 | Clause 4.4 | PASS |
| DTS (6 dB) Bandwidth & 99% Occupied Bandwidth | 15.247 (a)(2) | ANSI C63.10 2013 | Clause 4.5 | PASS |
| Power Spectral Density | 15.247 (e) | ANSI C63.10 2013 | Clause 4.6 | PASS |
| Band-edge for RF Conducted Emissions | 15.247(d) | ANSI C63.10 2013 | Clause 4.7 | PASS |
| RF Conducted Spurious Emissions | 15.247(d) | ANSI C63.10 2013 | Clause 4.8 | PASS |
| Radiated Spurious Emissions | 15.247(d);15.205/15.209 | ANSI C63.10 2013 | Clause 4.9 | PASS |
| Restricted bands around fundamental frequency (Radiated Emission) | 15.247(d);15.205/15.209 | ANSI C63.10 2013 | Clause 4.10 | PASS |

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# 3 General Information

## 3.1 Client Information

| | |
|---|---|
| Applicant: | Unimax communications |
| Address of Applicant: | 18201 McDurmott St.West Suite E,Irvine,CA 92614. |
| Manufacturer: | Unimax communications |
| Address of Manufacturer: | 18201 McDurmott St.West Suite E,Irvine,CA 92614. |
| Factory: | Unimax communications |
| Address of Factory: | 18201 McDurmott St.West Suite E,Irvine,CA 92614. |

## 3.2 Test Location

| | |
|---|---|
| Company: | SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch |
| Address: | No. 1 Workshop, M-10, Middle section, Science & Technology Park, Shenzhen, Guangdong, China |
| Post code: | 518057 |
| Telephone: | +86 (0) 755 2601 2053 |
| Fax: | +86 (0) 755 2671 0594 |
| E-mail: | ee.shenzhen@sgs.com |

## 3.3 Test Facility

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

**• CNAS (No. CNAS L2929)**

CNAS has accredited SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC Lab to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.

**• A2LA (Certificate No. 3816.01)**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 3816.01.

**• VCCI**

The 3m Fully-anechoic chamber for above 1GHz, 10m Semi-anechoic chamber for below 1GHz, Shielded Room for Mains Port Conducted Interference Measurement and Telecommunication Port Conducted Interference Measurement of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-20026, R-14188, C-12383 and T-11153 respectively.

**• FCC –Designation Number: CN1178**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized as an accredited testing laboratory.

Designation Number: CN1178. Test Firm Registration Number: 406779.

**• Industry Canada (IC)**

Two 3m Semi-anechoic chambers and the 10m Semi-anechoic chamber of SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC Lab have been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 4620C-1, 4620C-2, 4620C-3.

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## 3.4 General Description of EUT

| | |
|---|---|
| EUT Description: | Smartphone |
| Model No.: | U693CL |
| Trade Mark: | UMX |
| Hardware Version: | Q5009-V1.0 |
| Software Version: | U693CL_01.01.01.182518 |
| IEEE 802.11 WLAN Mode Supported | ☒ 802.11B (20 MHz channel bandwidth),<br>☒ 802.11G (20 MHz channel bandwidth)<br>☒ 802.11N (20 MHz channel bandwidth) |
| Operation Frequency: | 2400 MHz -2483.5MHz<br>fc = 2407 MHz + N * 5 MHz, where:<br>-fc = "Operating Frequency" in MHz,<br>-N = "Channel Number" with the range from 1 to 11 for the 20 MHz channel bandwidth, or 3 to 9 for the 40 MHz channel bandwidth. |
| Type of Modulation: | IEEE for 802.11B: DSSS<br>IEEE for 802.11G : OFDM<br>IEEE for 802.11N(HT20) : OFDM |
| Sample Type: | ☒ Portable Device, ☐Module |
| Antenna Type: | ☐ External, ☒ Integrated |
| Antenna Ports | ☒ Ant 1, ☐ Ant 2, ☐ Ant 3 |
| Smart System | ☒ SISO (for 802.11B/G/N),<br>☐ MIMO (for 802.11N): 2 Tx & 2 Rx,<br>☐ Diversity (for 802.11B/G) : Tx & Rx |
| Antenna Gain: | 0.8dBi |
| Power Supply | ☐ AC/DC Adapter; ☒ Battery ☐ PoE:; ☐ Other: |

| Operation Frequency of each channel (802.11B/G/N HT20) | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Channel** | **Frequency** | **Channel** | **Frequency** | **Channel** | **Frequency** | **Channel** | **Frequency** |
| 1 | 2412MHz | 4 | 2427MHz | 7 | 2442MHz | 10 | 2457MHz |
| 2 | 2417MHz | 5 | 2432MHz | 8 | 2447MHz | 11 | 2462MHz |
| 3 | 2422MHz | 6 | 2437MHz | 9 | 2452MHz | | |

Remark:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

| Channel | Frequency for 802.11B/G/N (HT20) |
|---|---|
| The Lowest channel | 2412MHz |
| The Middle channel | 2437MHz |
| The Highest channel | 2462MHz |

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## 3.5 Test Environment and Mode

| Operating Environment: | |
|---|---|
| Temperature: | 25.0 °C |
| Humidity: | 50 % RH |
| Atmospheric Pressure: | 101.30 KPa |
| **Test mode:** | |
| Transmitting mode: | Keep the EUT in transmitting mode with all kind of modulation and all kind of data rate. |

## 3.6 Description of Support Units

The EUT has been tested independent unit.

# 4 Test results and Measurement Data

## 4.1 Antenna Requirement

| Standard requirement: | 47 CFR Part 15C Section 15.203 /247(c) |
|---|---|
| 15.203 requirement:<br>An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.<br>15.247(b) (4) requirement:<br>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. | |
| The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is 0.8dBi. | |

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## 4.2 AC Power Line Conducted Emissions

| | | | |
|---|---|---|---|
| Test Requirement: | 47 CFR Part 15C Section 15.207 | | |
| Test Method: | ANSI C63.10: 2013 | | |
| Test Frequency Range: | 150kHz to 30MHz | | |
| Limit: | Frequency range (MHz) | Limit (dBuV) | |
| | | Quasi-peak | Average |
| | 0.15-0.5 | 66 to 56* | 56 to 46* |
| | 0.5-5 | 56 | 46 |
| | 5-30 | 60 | 50 |
| | * Decreases with the logarithm of the frequency. | | |
| Test Procedure: | 1) The mains terminal disturbance voltage test was conducted in a shielded room.<br>2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50Ω/50μH + 5Ω linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.<br>3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane,<br>4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.<br>5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10: 2013 on conducted measurement. | | |

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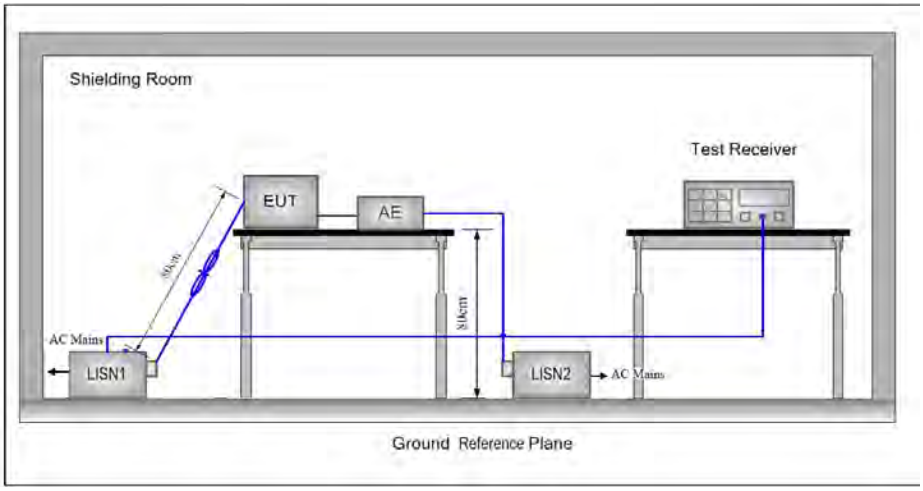
| | |
|---|---|
| Test Setup: |  |
| Exploratory Test Mode: | Transmitting with all kind of modulations, data rates at lowest, middle and highest channel.<br>Charge + Transmitting mode. |
| Final Test Mode: | Through Pre-scan, find the 1Mbps of rate of 802.11B at lowest channel is the worst case.<br>Charge + Transmitting mode.<br>Only the worst case is recorded in the report. |
| Instruments Used: | Refer to section 5.10 for details |
| Test Results: | Pass |

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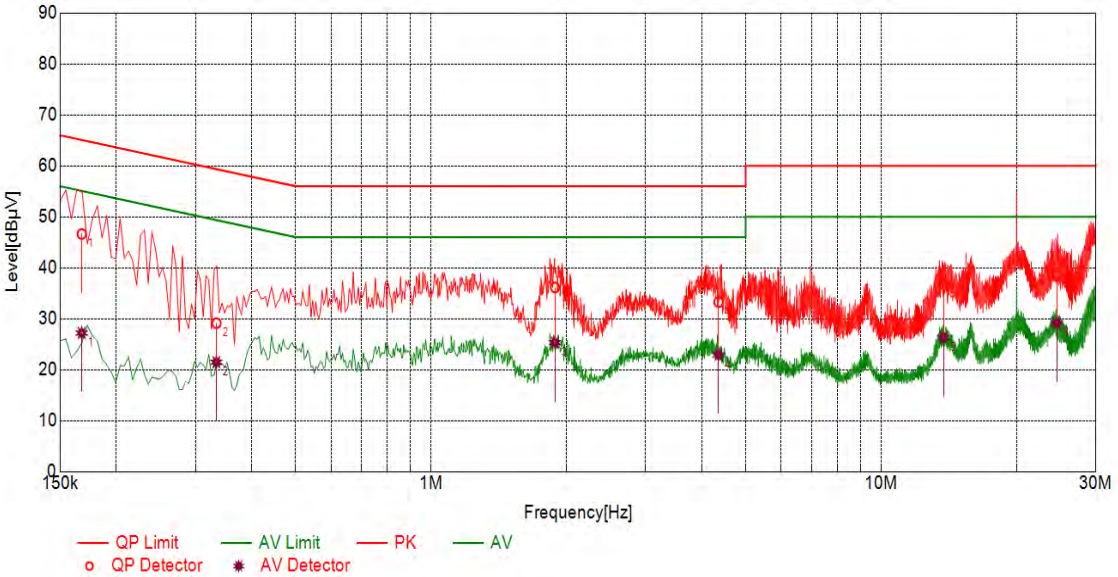
Measurement Data

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

Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected.

Live Line:




| Final Data List | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| NO. | Freq. [MHz] | Factor [dB] | QP Value [dBµV] | QP Limit [dBµV] | QP Margin [dB] | AV Value [dBµV] | AV Limit [dBµV] | AV Margin [dB] | Type |
| 1 | 0.1676 | 10.10 | 46.62 | 65.08 | 18.46 | 27.20 | 55.08 | 27.88 | L |
| 2 | 0.3338 | 10.10 | 29.13 | 59.36 | 30.23 | 21.47 | 49.36 | 27.89 | L |
| 3 | 1.8870 | 10.10 | 36.13 | 56.00 | 19.87 | 25.31 | 46.00 | 20.69 | L |
| 4 | 4.3513 | 10.10 | 33.27 | 56.00 | 22.73 | 22.93 | 46.00 | 23.07 | L |
| 5 | 13.7592 | 10.11 | 36.67 | 60.00 | 23.33 | 26.32 | 50.00 | 23.68 | L |
| 6 | 24.5635 | 10.11 | 38.56 | 60.00 | 21.44 | 29.17 | 50.00 | 20.83 | L |

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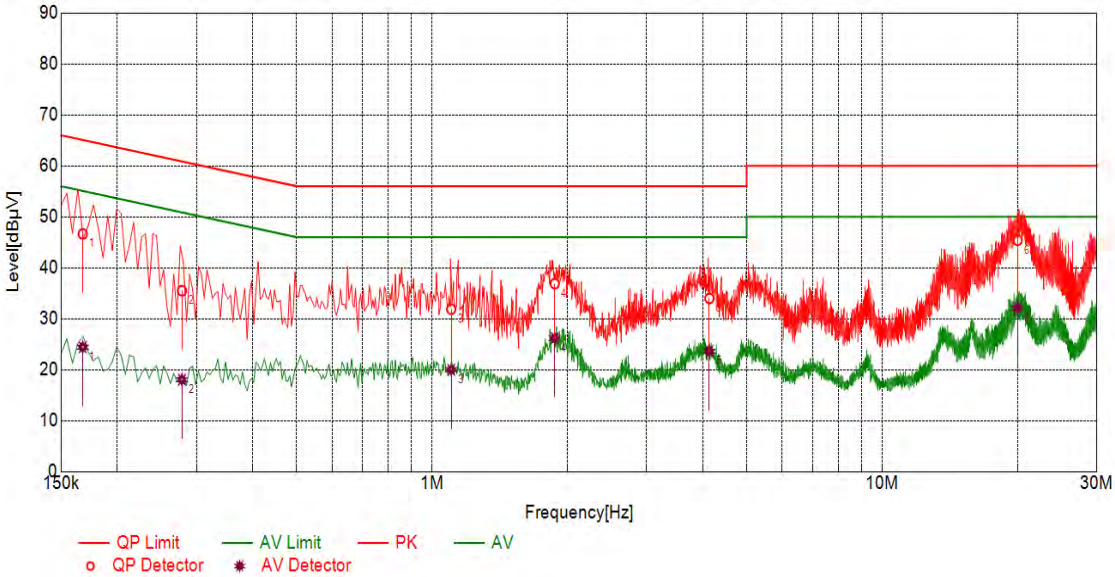
Neutral Line:




| Final Data List | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| NO. | Freq. [MHz] | Factor [dB] | QP Value [dBµV] | QP Limit [dBµV] | QP Margin [dB] | AV Value [dBµV] | AV Limit [dBµV] | AV Margin [dB] | Type |
| 1 | 0.1676 | 10.10 | 46.65 | 65.08 | 18.43 | 24.42 | 55.08 | 30.66 | N |
| 2 | 0.2784 | 10.10 | 35.49 | 60.86 | 25.37 | 18.04 | 50.86 | 32.82 | N |
| 3 | 1.1036 | 10.10 | 31.87 | 56.00 | 24.13 | 19.99 | 46.00 | 26.01 | N |
| 4 | 1.8744 | 10.10 | 36.89 | 56.00 | 19.11 | 26.17 | 46.00 | 19.83 | N |
| 5 | 4.1339 | 10.10 | 33.99 | 56.00 | 22.01 | 23.63 | 46.00 | 22.37 | N |
| 6 | 19.9996 | 10.11 | 45.41 | 60.00 | 14.59 | 32.09 | 50.00 | 17.91 | N |

*Remarks:*

*1. The following Quasi-Peak and Average measurements were performed on the EUT:*

*2. Final Test Level =Receiver Reading + LISN Factor + Cable Loss.*

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## 4.3 Duty Cycle

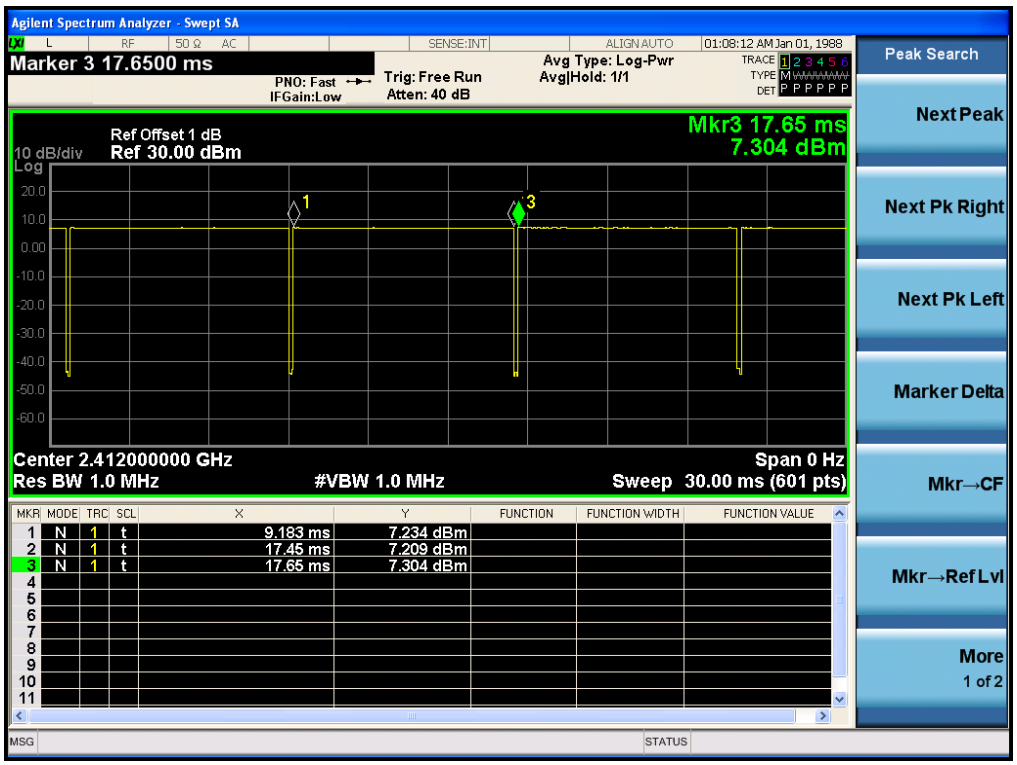
### 4.3.1 Test Results

| Test Mode | TX Freq. [MHz] | Duty cycle [%] |
|---|---|---|
| 11B | Ant 1: CH1 | 97.64 |
| 11G | Ant 1: CH1 | 86.15 |
| 11N20 | Ant 1: CH1 | 85.38 |

### 4.3.1 Test Plots

#### 4.3.1.1 ANT1

##### 4.3.1.1.1 11B

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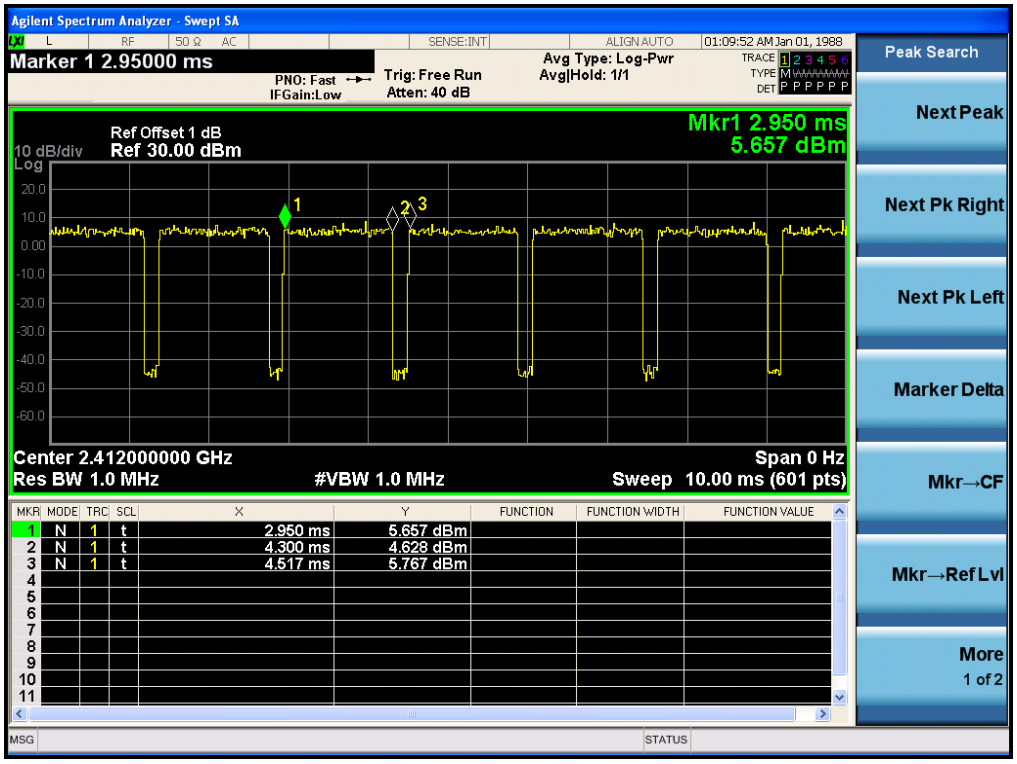
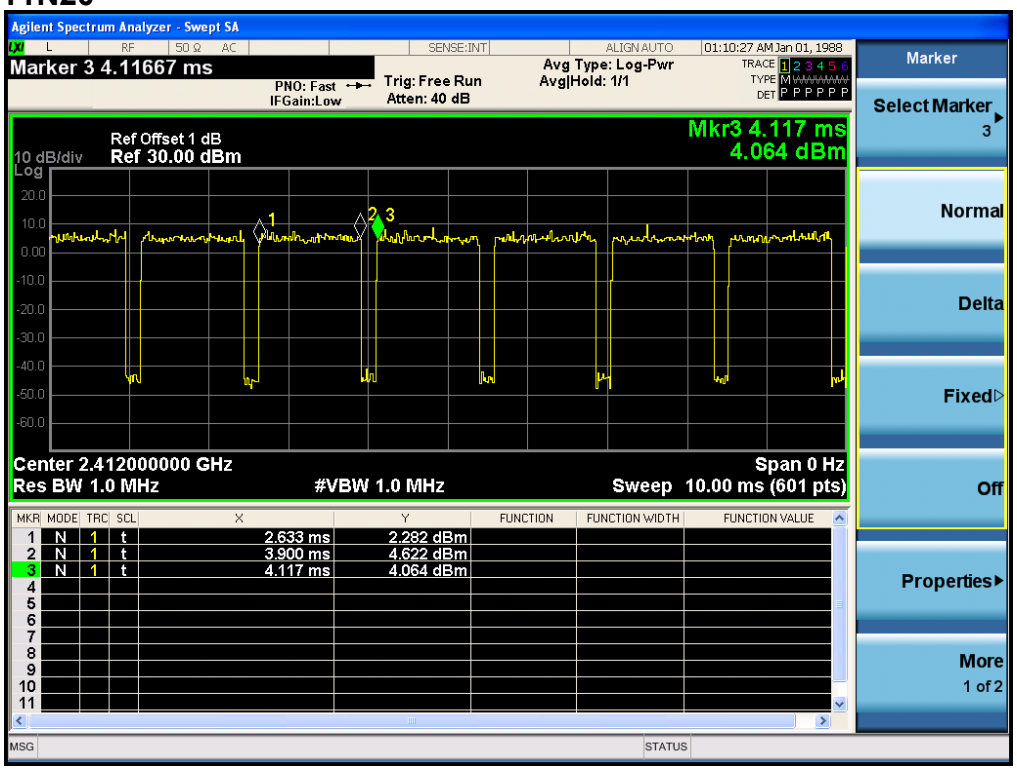
### 4.3.1.1.2 11G




### 4.3.1.1.3 11N20

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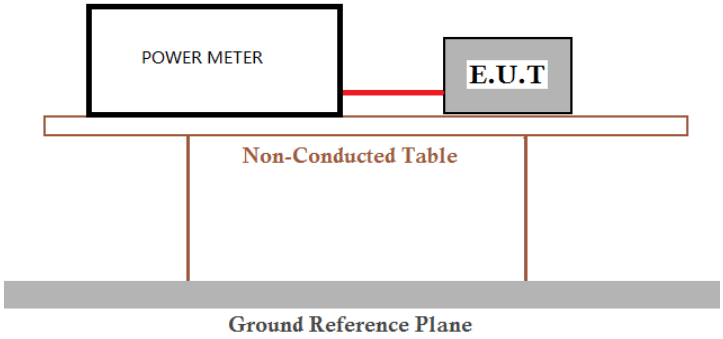
## 4.4 Conducted Output Power

| | |
|---|---|
| Test Requirement: | 47 CFR Part 15C Section 15.247 (b)(3) |
| Test Method: | ANSI C63.10 :2013 Section 11.9.1.3 |
| Test Setup: |  |
| Test Instruments: | Refer to section 5.10 for details |
| Exploratory Test Mode: | Transmitting with all kind of modulations, data rates |
| Final Test Mode: | Through Pre-scan, find the<br>1Mbps of rate is the worst case of 802.11B;<br>6Mbps of rate is the worst case of 802.11G ;<br>6.5Mbps of rate is the worst case of 802.11N(HT20); |
| Limit: | 30dBm |
| Test Results: | Pass |

### 4.4.1 Test Results

**Measurement Data of Peak Power:**

| Mode | Test Channel | Peak Output Power (dBm) | Limit (dBm) | Result |
|---|---|---|---|---|
| 802.11B | Lowest | 18.24 | 30.00 | Pass |
| | Middle | 18.25 | 30.00 | Pass |
| | Highest | 19.94 | 30.00 | Pass |
| 802.11G | Lowest | 20.90 | 30.00 | Pass |
| | Middle | 19.13 | 30.00 | Pass |
| | Highest | 20.48 | 30.00 | Pass |
| 802.11N20 | Lowest | 20.93 | 30.00 | Pass |
| | Middle | 19.28 | 30.00 | Pass |
| | Highest | 20.56 | 30.00 | Pass |

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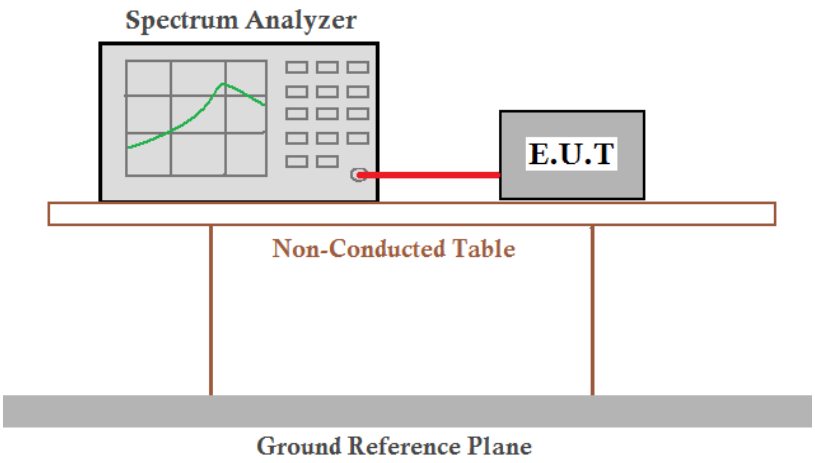
## 4.5 DTS (6 dB) Bandwidth & 99% Occupied Bandwidth

| | |
|---|---|
| Test Requirement: | 47 CFR Part 15C Section 15.247 (a)(2) |
| Test Method: | ANSI C63.10: 2013 Section 11.8.1 Option 1 |
| Test Setup: |  |
| Instruments Used: | Refer to section 5.10 for details |
| Exploratory Test Mode: | Transmitting with all kind of modulations, data rates |
| Final Test Mode: | Through Pre-scan, find the<br>1Mbps of rate is the worst case of 802.11B;<br>6Mbps of rate is the worst case of 802.11G;<br>6.5Mbps of rate is the worst case of 802.11N(HT20); |
| Limit: | ≥ 500 kHz |
| Test Results: | Pass |

### 4.5.1 Test Results

| Mode | Test Channel | Occupied Bandwidth (MHz) | 6dB Emission Bandwidth (MHz) | Limit (kHz) | Result |
|---|---|---|---|---|---|
| 802.11B | Lowest | 12.74 | 12.72 | ≥500 | Pass |
| | Middle | 12.96 | 12.93 | ≥500 | Pass |
| | Highest | 12.72 | 12.71 | ≥500 | Pass |
| 802.11G | Lowest | 16.75 | 16.53 | ≥500 | Pass |
| | Middle | 17.07 | 16.70 | ≥500 | Pass |
| | Highest | 16.70 | 16.52 | ≥500 | Pass |
| 802.11N20 | Lowest | 17.82 | 17.70 | ≥500 | Pass |
| | Middle | 18.02 | 17.80 | ≥500 | Pass |
| | Highest | 17.76 | 17.67 | ≥500 | Pass |

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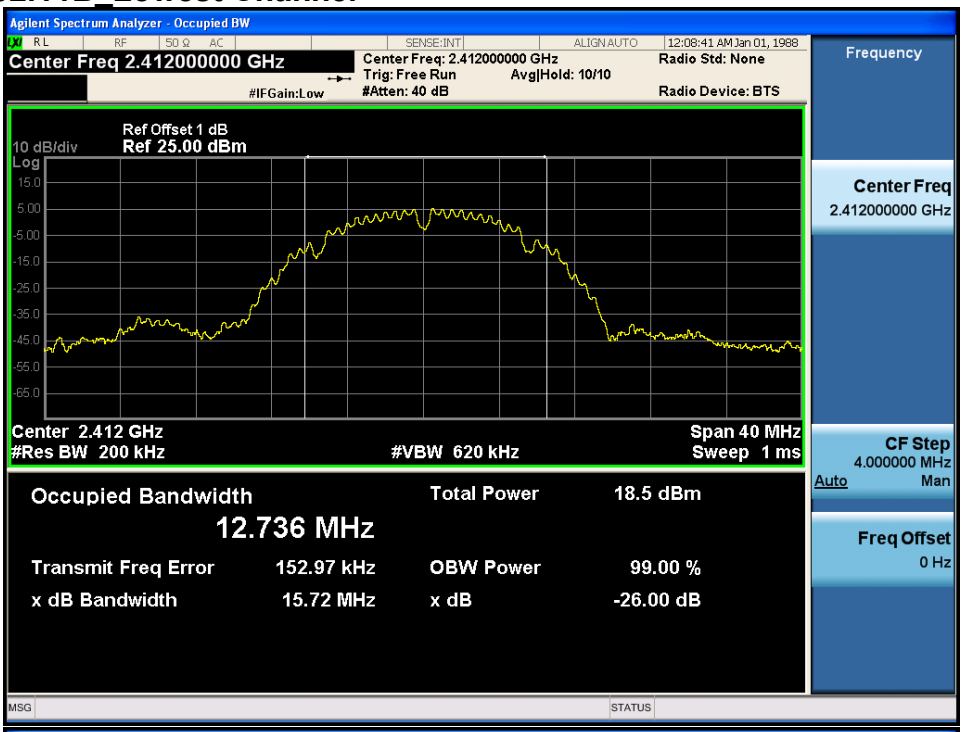
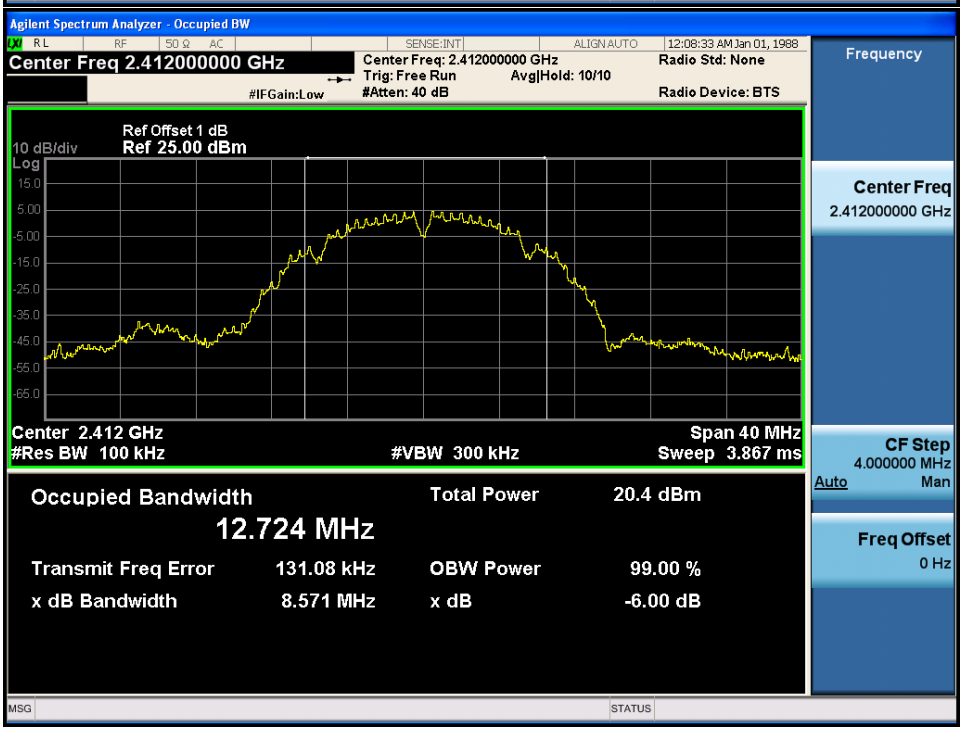
### 4.5.2 Test plots

#### 4.5.2.1 ANT1

#### 4.5.2.1.1 802.11B_Lowest Channel

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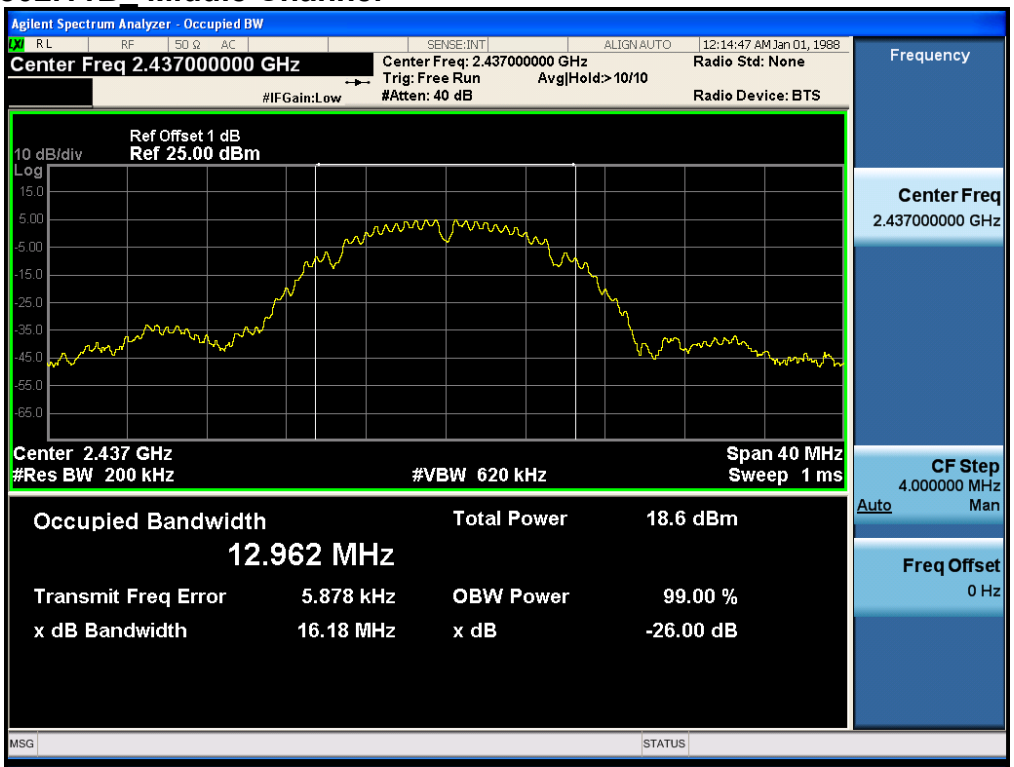
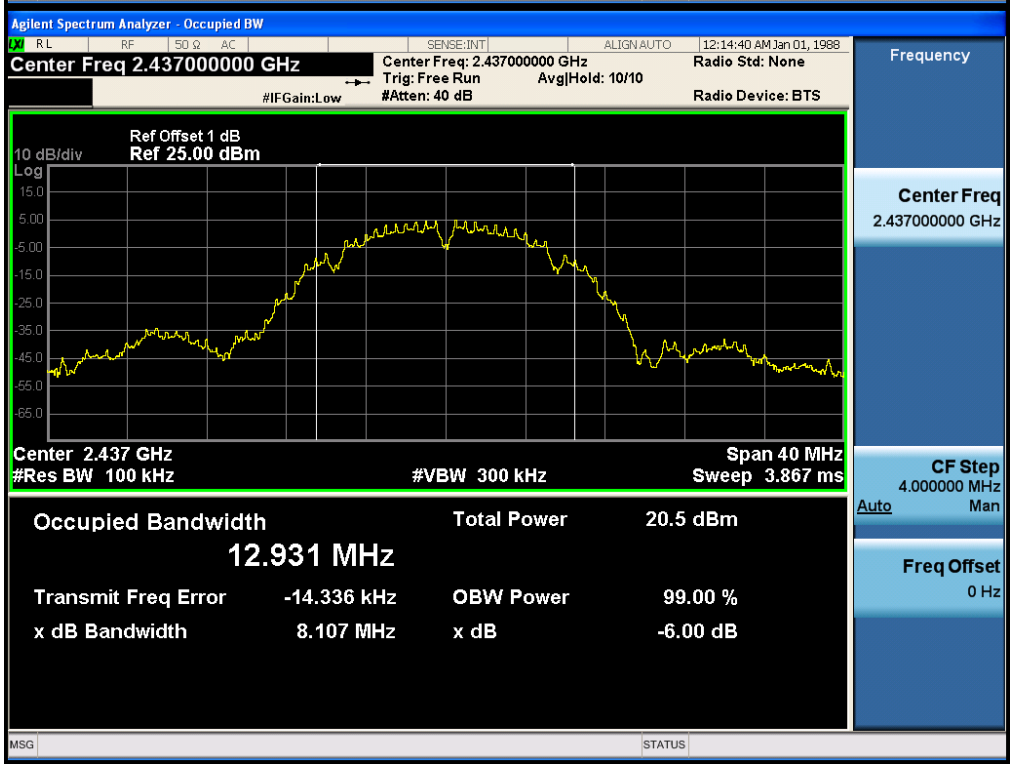
### 4.5.2.1.2 802.11B_ Middle Channel

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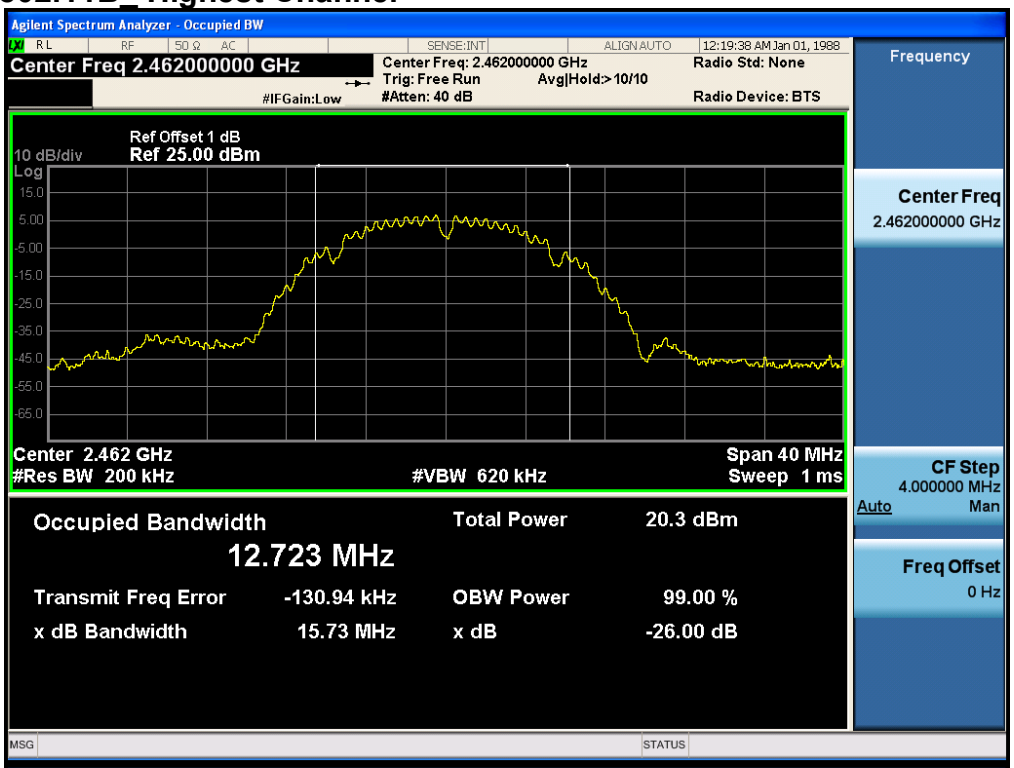
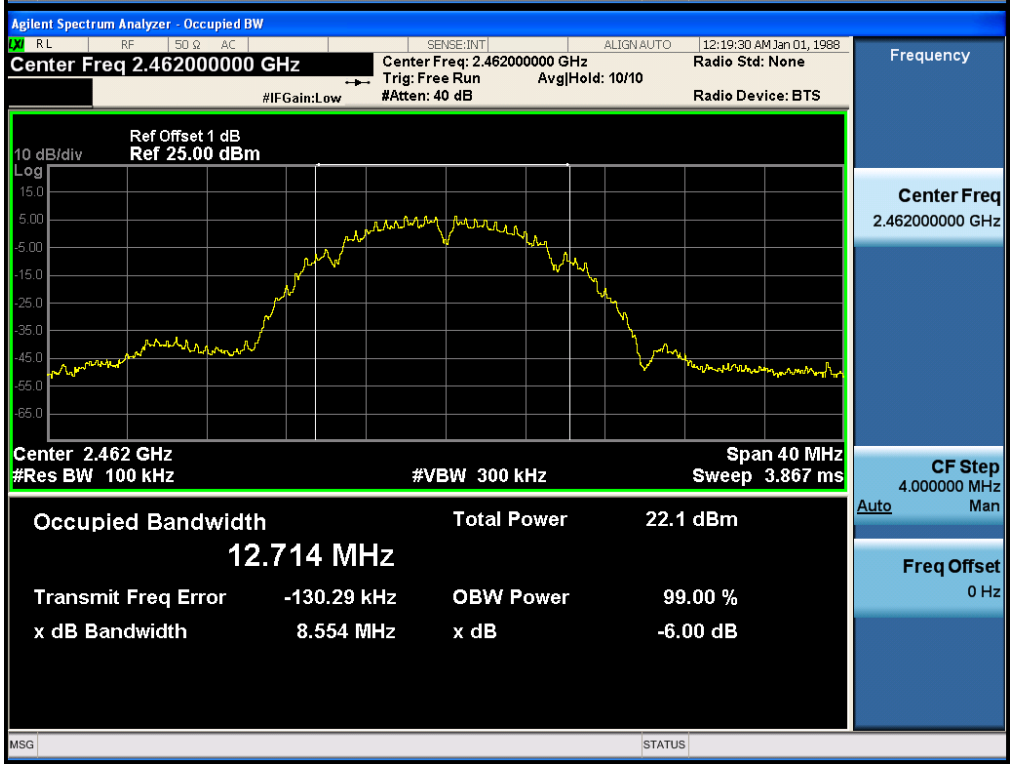
### 4.5.2.1.3 802.11B_ Highest Channel

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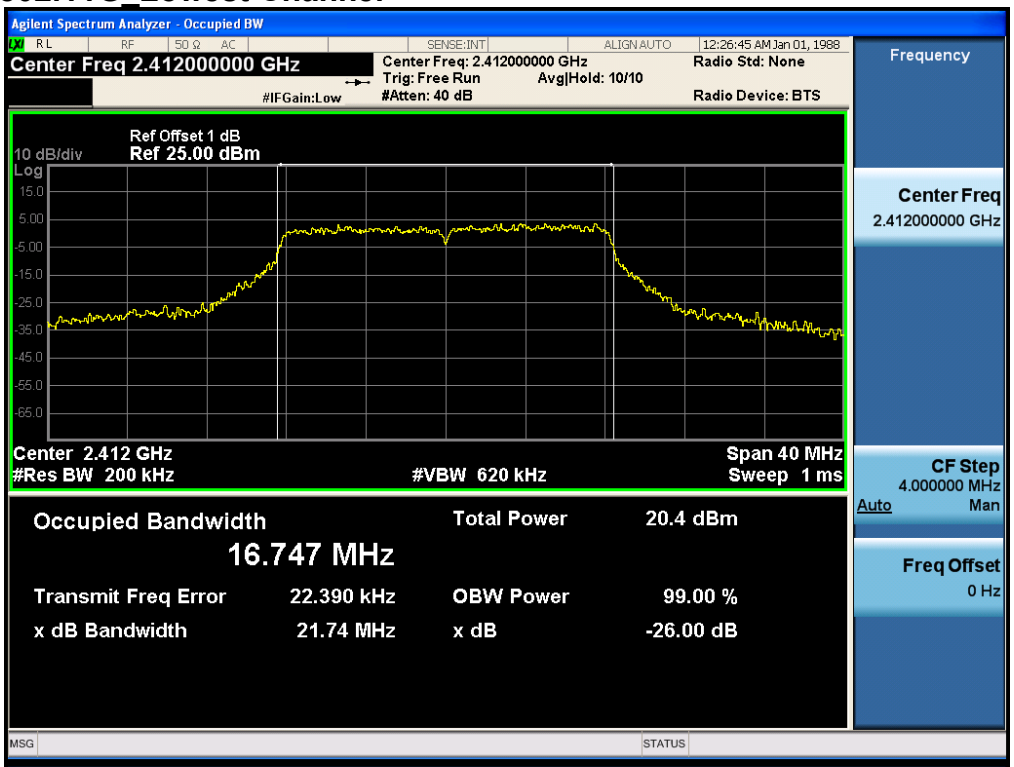
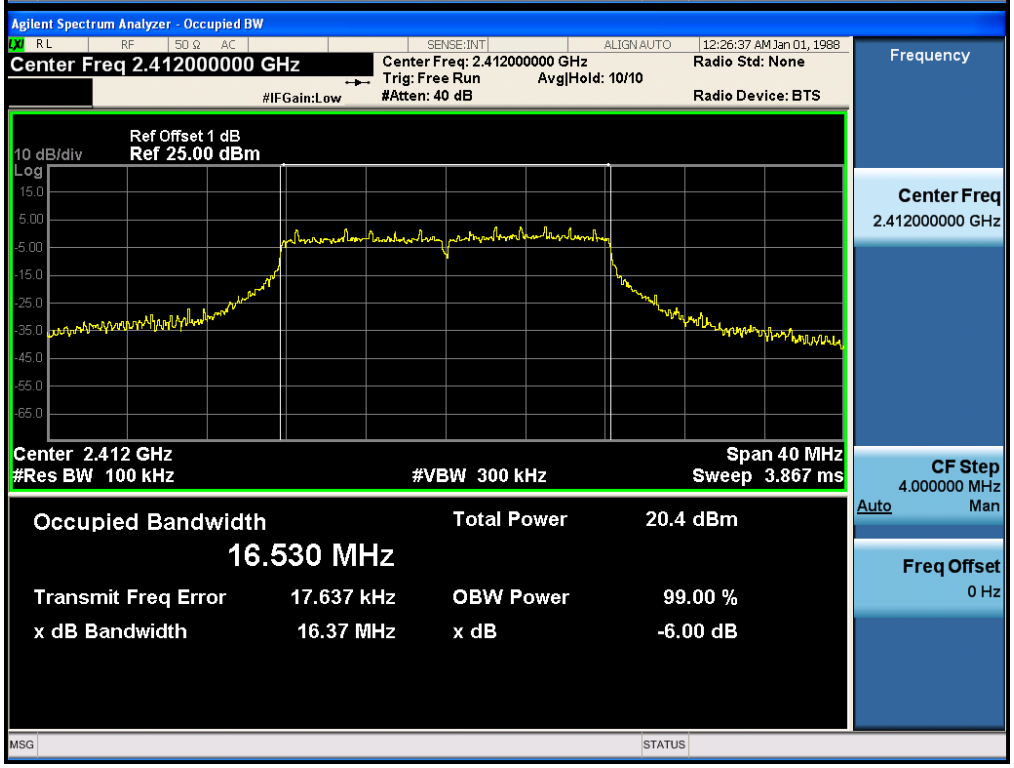
### 4.5.2.1.4 802.11G_Lowest Channel

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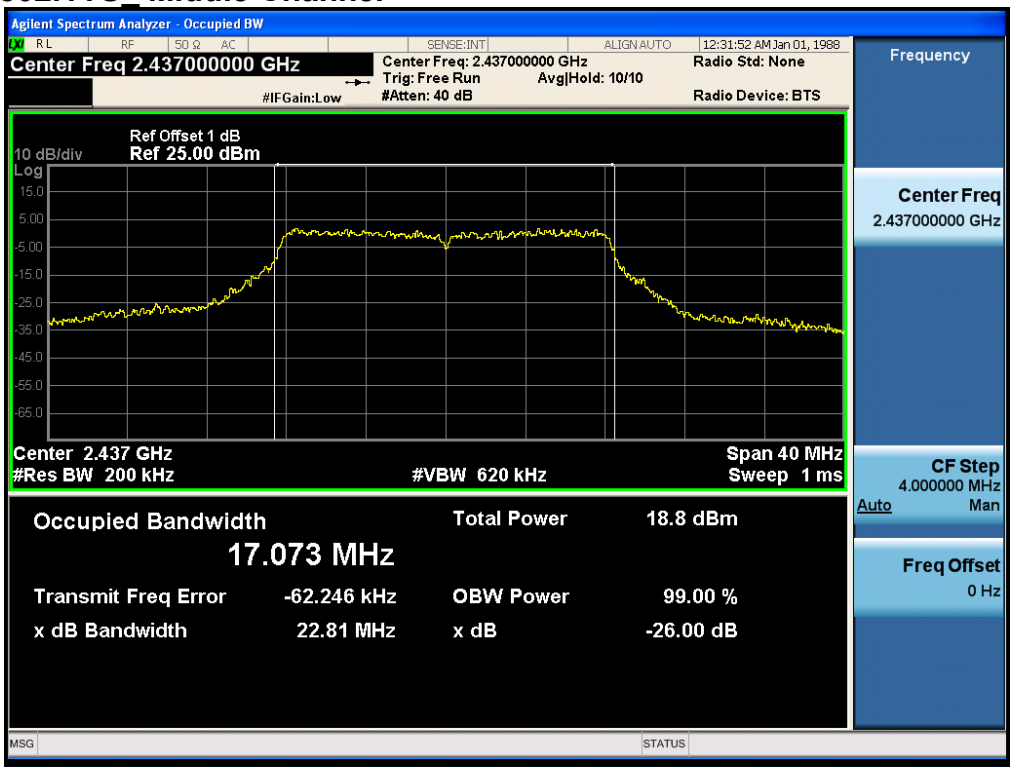
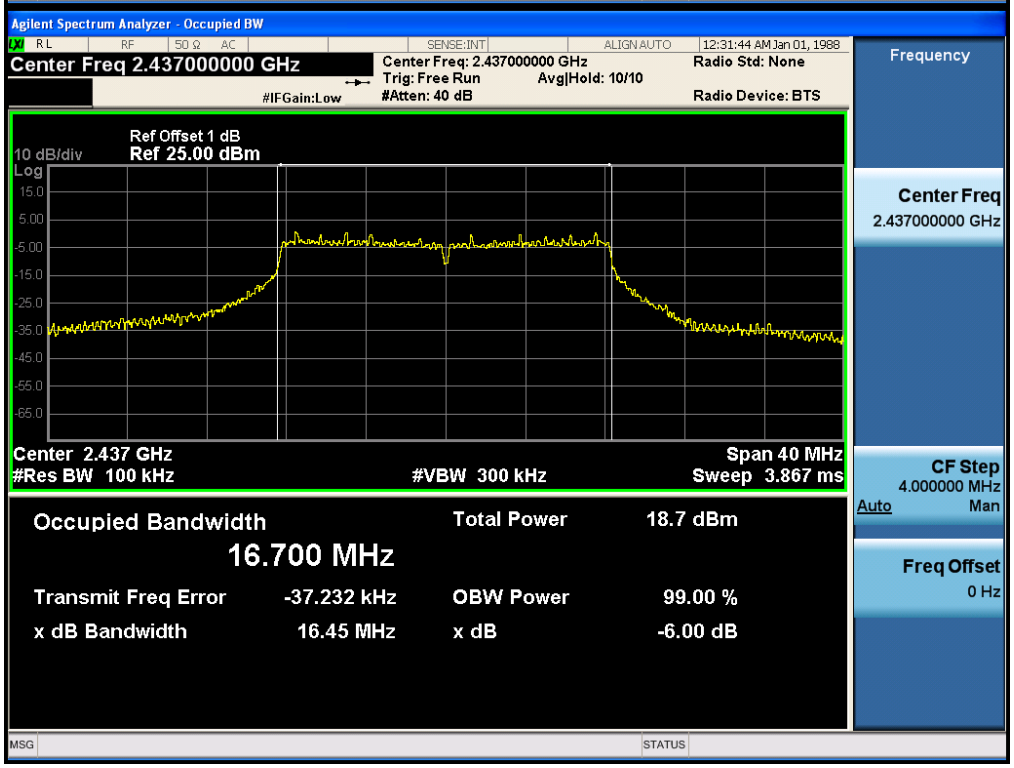
### 4.5.2.1.5 802.11G_ Middle Channel

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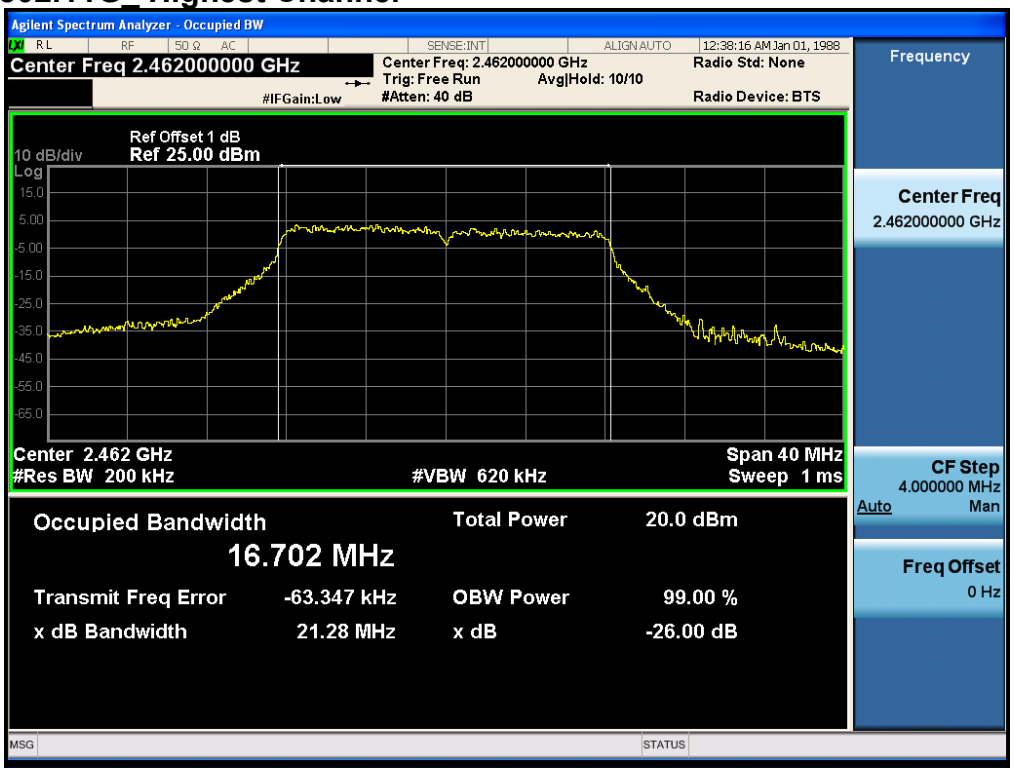
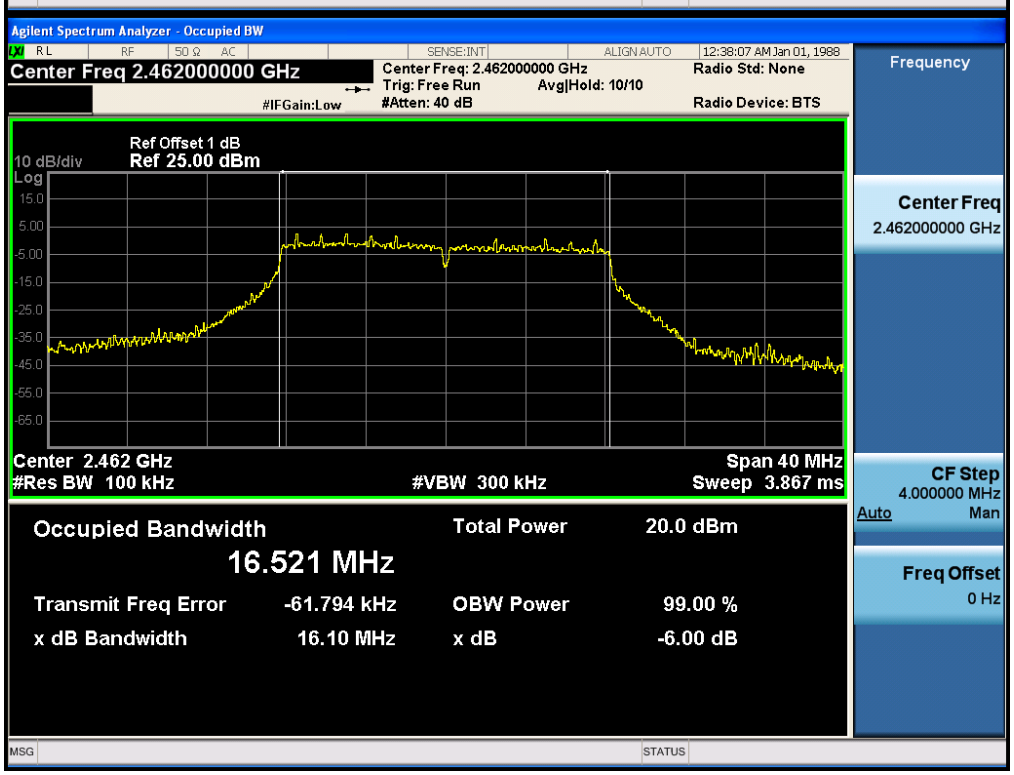
### 4.5.2.1.6 802.11G_ Highest Channel

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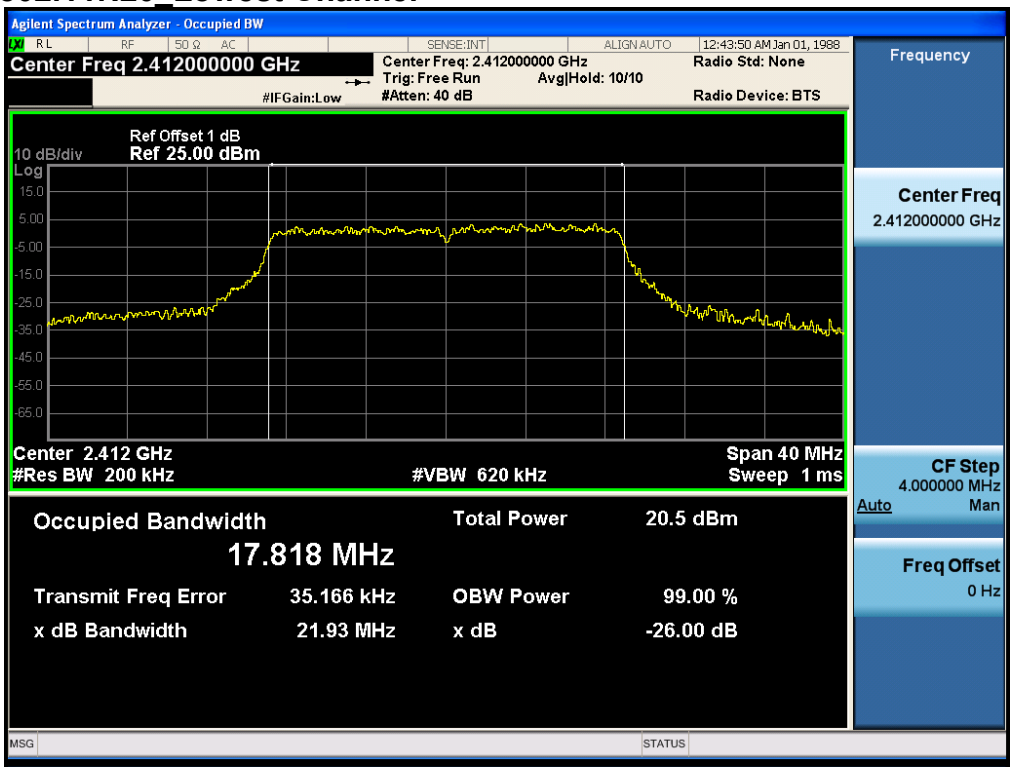
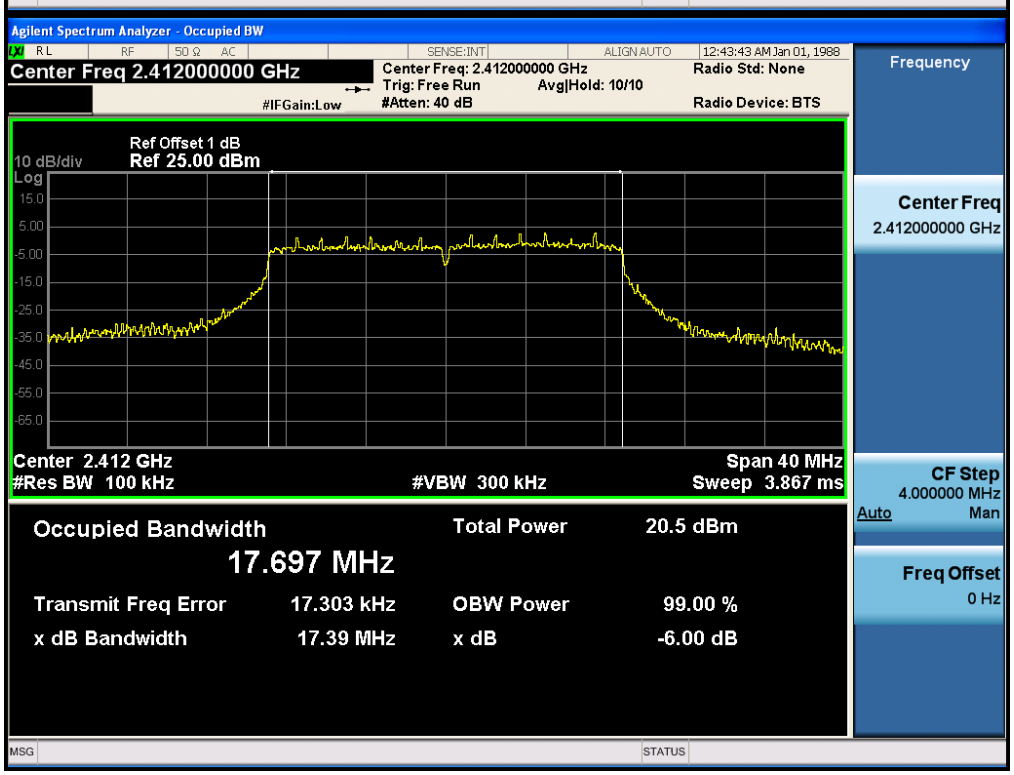
### 4.5.2.1.7 802.11N20_Lowest Channel

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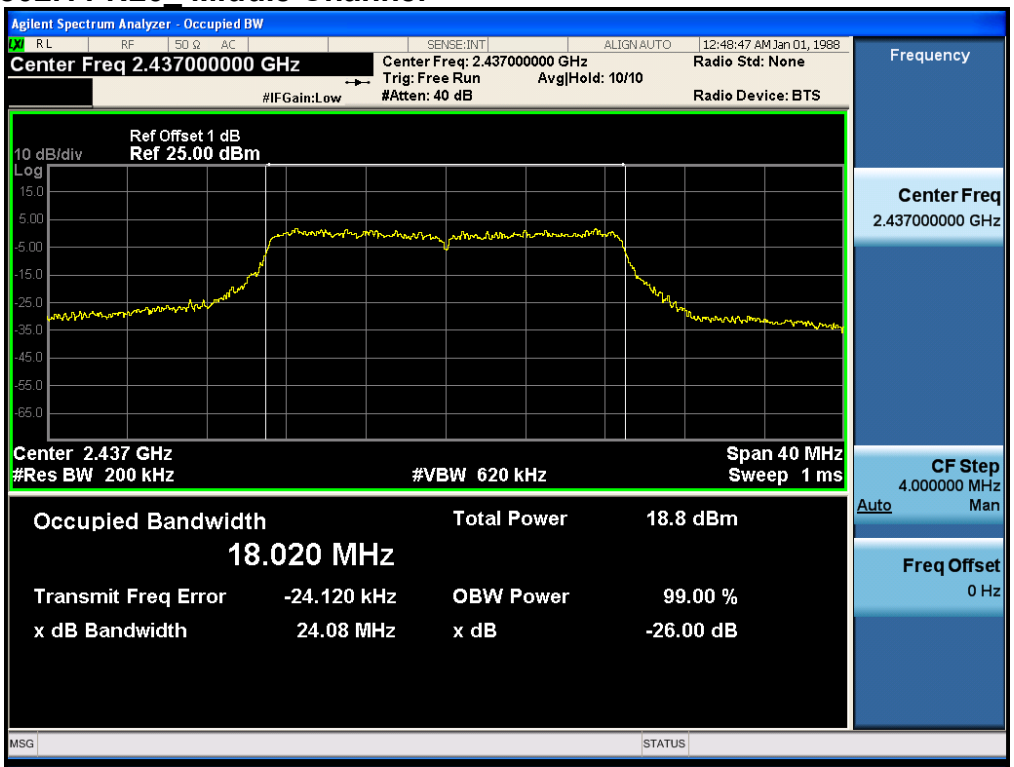
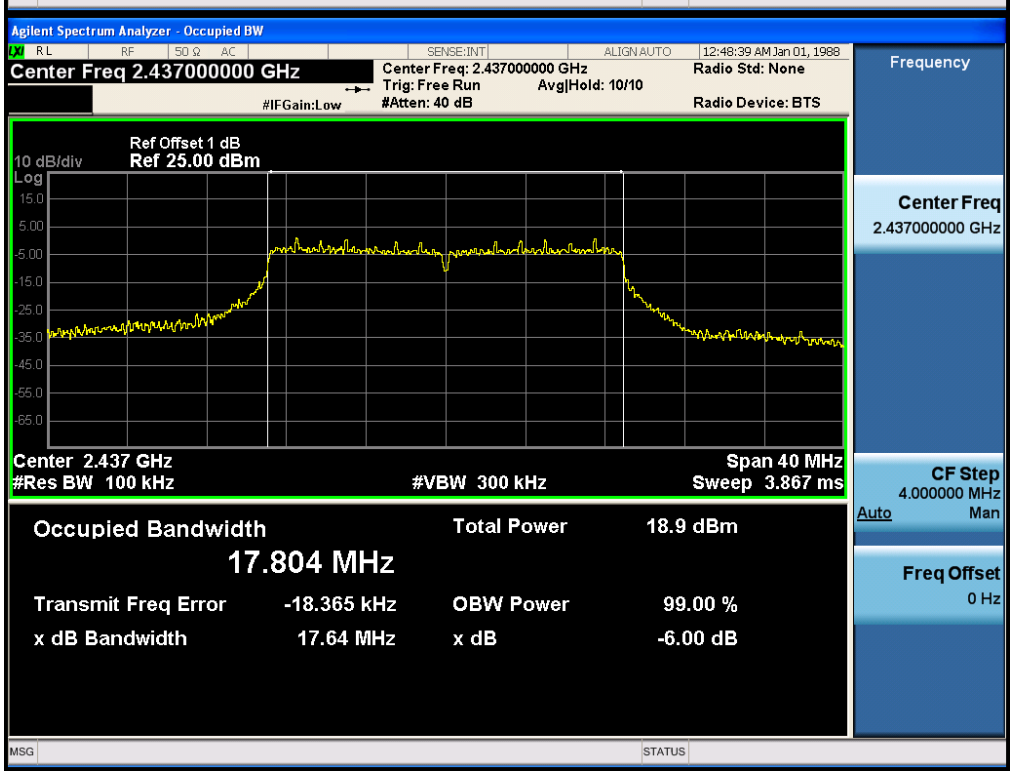
### 4.5.2.1.8 802.11 N20_ Middle Channel

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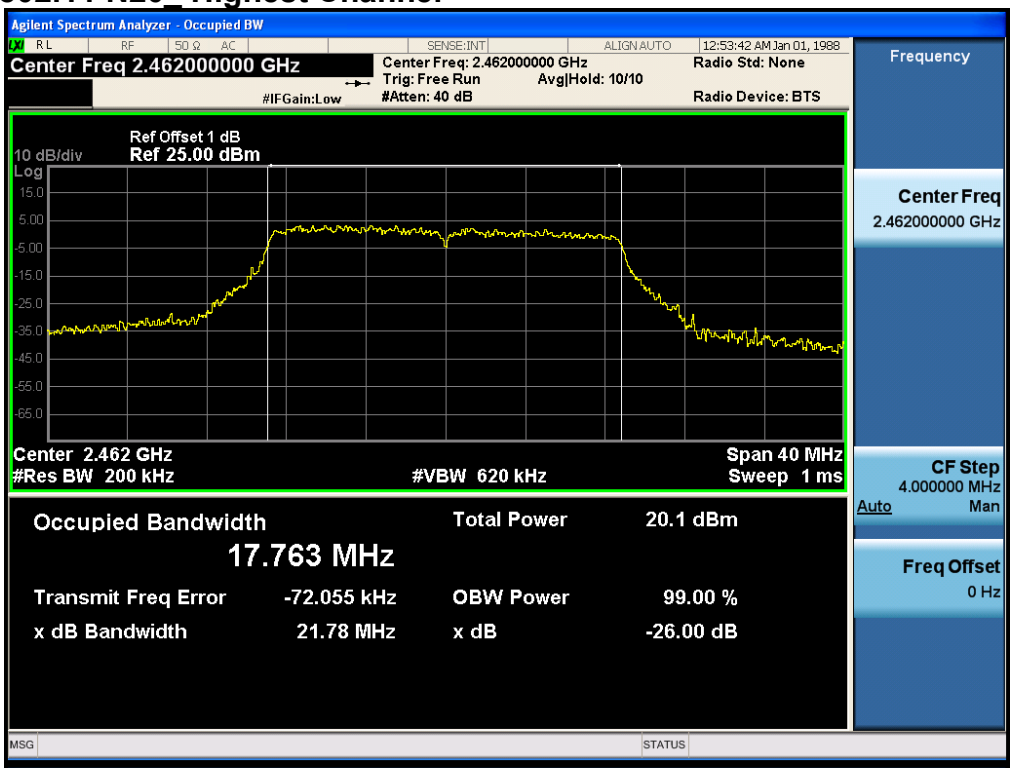
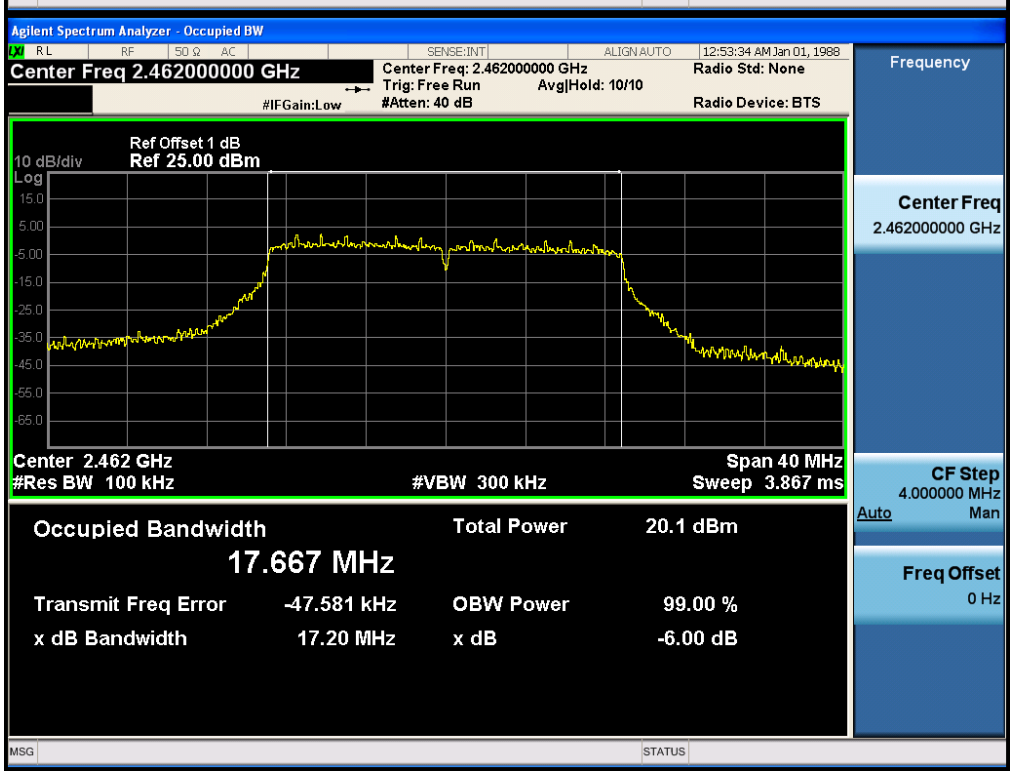
### 4.5.2.1.9 802.11 N20_ Highest Channel

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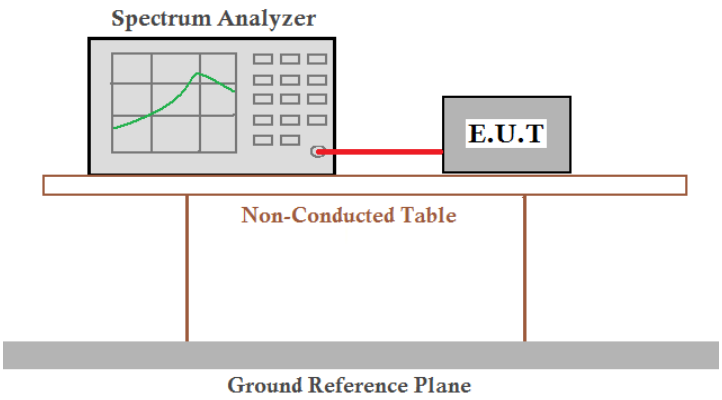
## 4.6 Power Spectral Density

| | |
|---|---|
| Test Requirement: | 47 CFR Part 15C Section 15.247 (e) |
| Test Method: | ANSI C63.10 :2013 Section 11.10.2 |
| Test Setup: |  |
| Test Instruments: | Refer to section 5.10 for details |
| Exploratory Test Mode: | Transmitting with all kind of modulations, data rates |
| Final Test Mode: | Through Pre-scan, find the<br>1Mbps of rate is the worst case of 802.11B;<br>6Mbps of rate is the worst case of 802.11G ;<br>6.5Mbps of rate is the worst case of 802.11N(HT20); |
| Limit: | ≤8.00dBm/3kHz |
| Test Results: | Pass |

### 4.6.1 Test Result

| Mode | Test Channel | Power Spectral Density (dBm/3kHz) | Limit (dBm/3kHz) | Result |
|---|---|---|---|---|
| 802.11B | Lowest | -7.51 | ≤8.00 | Pass |
| | Middle | -8.46 | ≤8.00 | Pass |
| | Highest | -6.68 | ≤8.00 | Pass |
| 802.11G | Lowest | -10.80 | ≤8.00 | Pass |
| | Middle | -12.42 | ≤8.00 | Pass |
| | Highest | -10.39 | ≤8.00 | Pass |
| 802.11N20 | Lowest | -11.95 | ≤8.00 | Pass |
| | Middle | -13.04 | ≤8.00 | Pass |
| | Highest | -11.28 | ≤8.00 | Pass |

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### 4.6.2 Test plots

#### 4.6.2.1 ANT1

#### 4.6.2.1.1 802.11B_Lowest Channel

#### 4.6.2.1.2 802.11B_ Middle Channel

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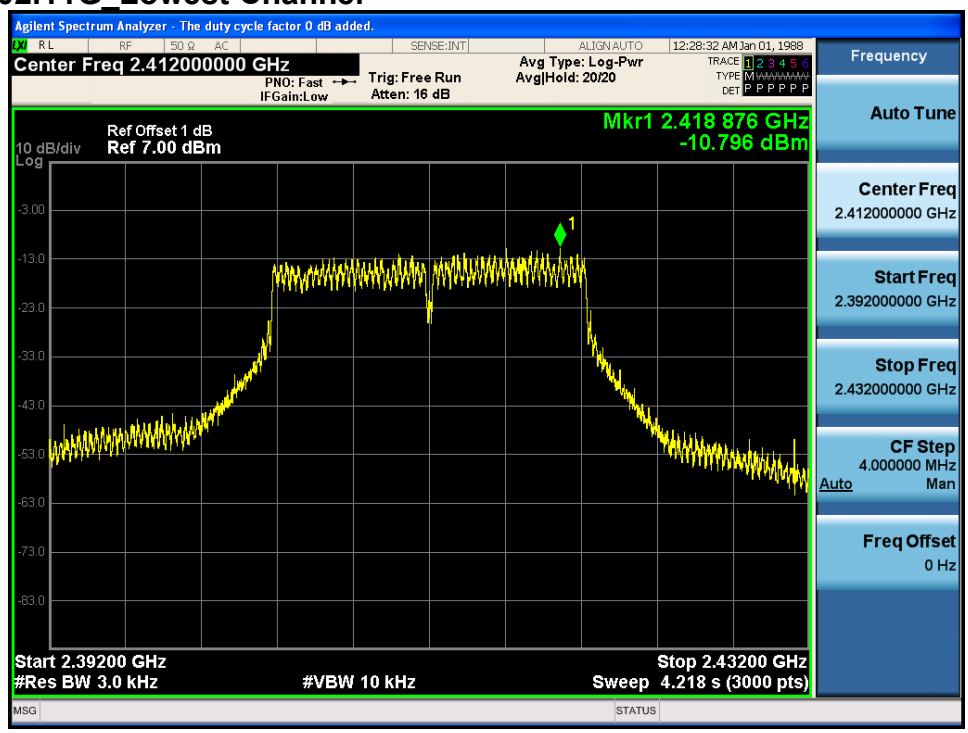
### 4.6.2.1.3 802.11B_ Highest Channel

### 4.6.2.1.4 802.11G_Lowest Channel

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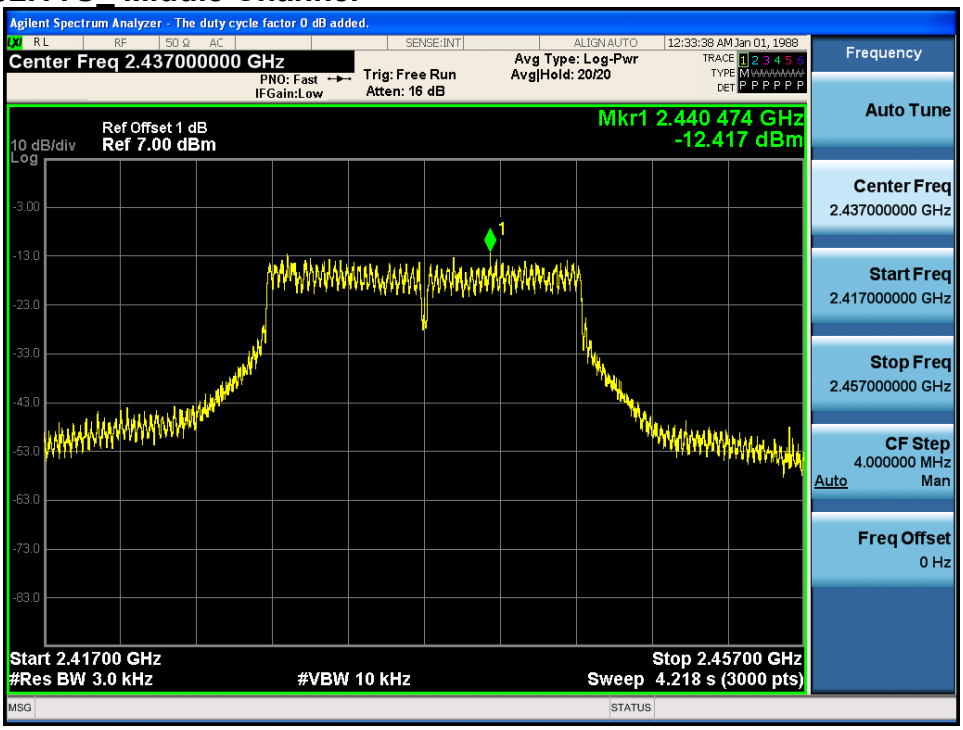
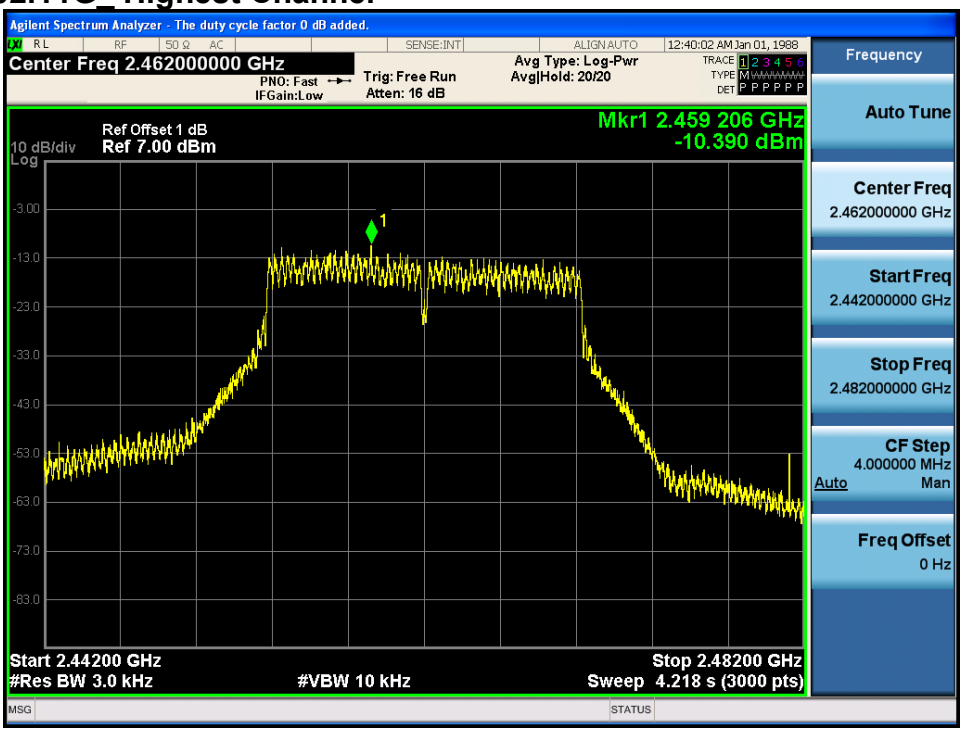
### 4.6.2.1.5 802.11G_ Middle Channel




### 4.6.2.1.6 802.11G_ Highest Channel

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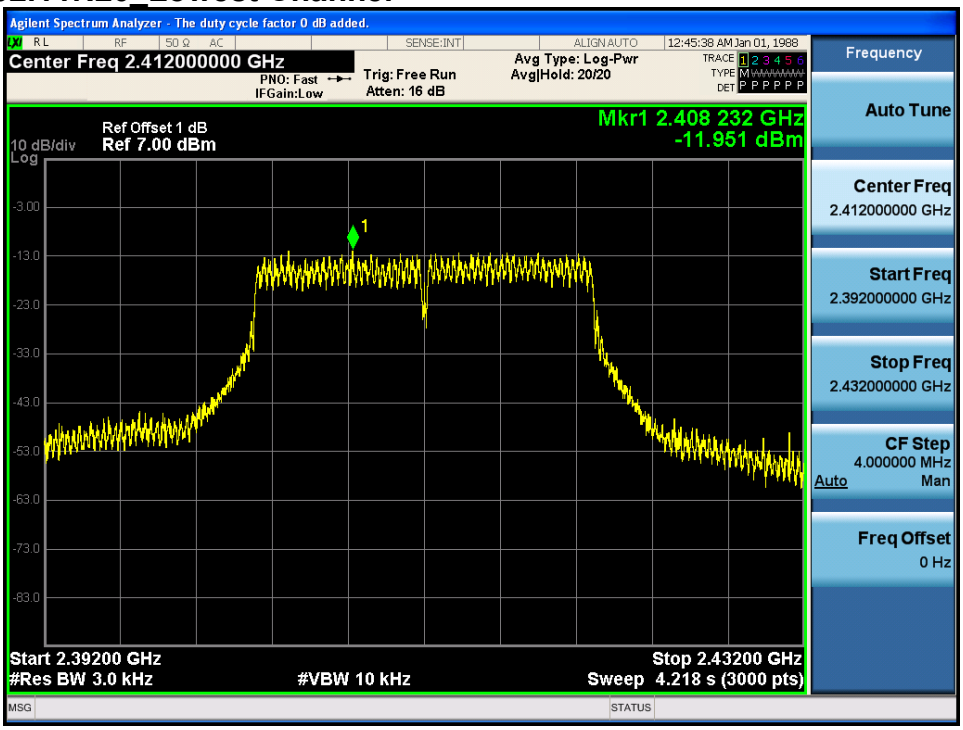
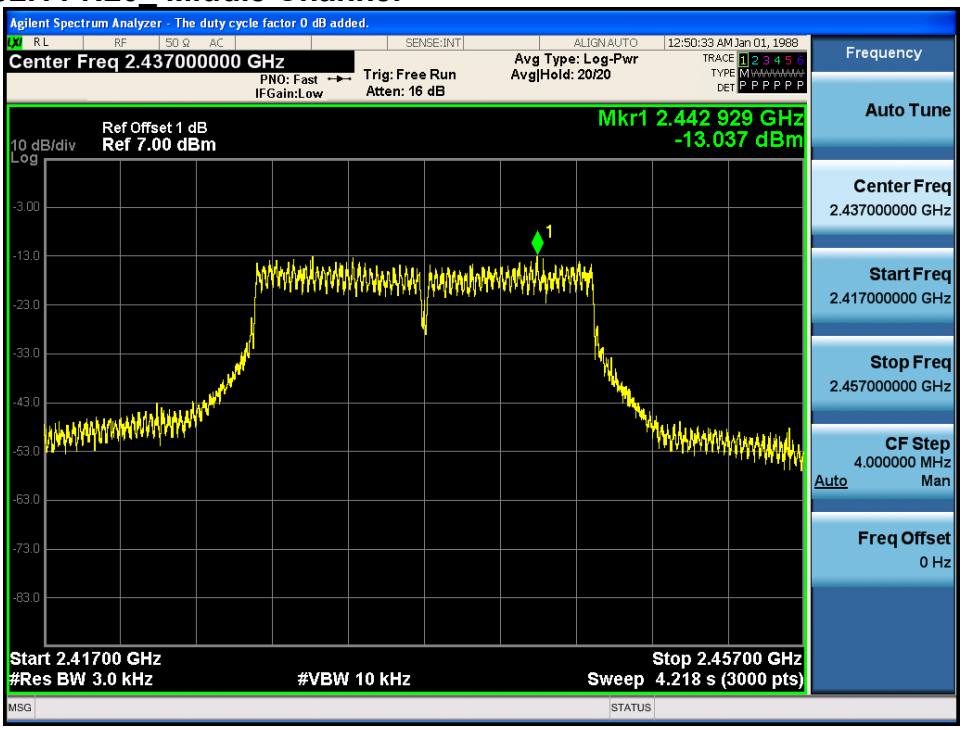
### 4.6.2.1.7 802.11N20_Lowest Channel




### 4.6.2.1.8 802.11 N20_ Middle Channel

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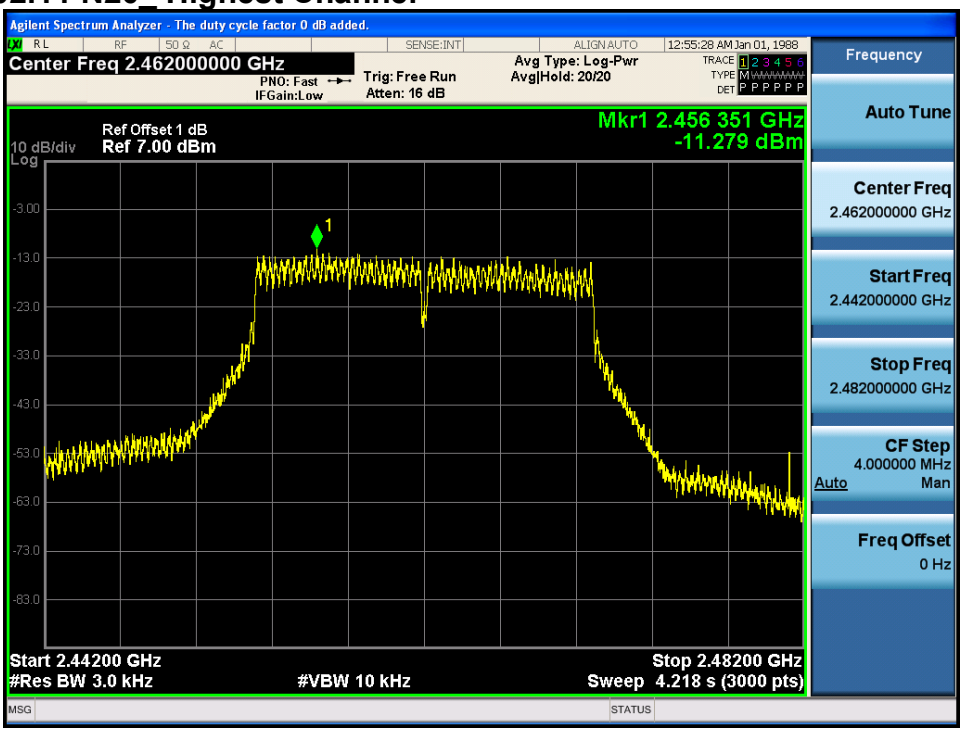
### 4.6.2.1.9 802.11 N20_ Highest Channel

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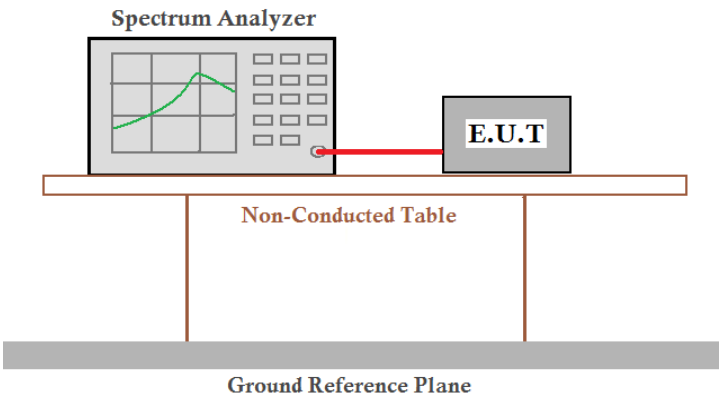
## 4.7 Band-edge for RF Conducted Emissions

| | |
|---|---|
| Test Requirement: | 47 CFR Part 15C Section 15.247 (d) |
| Test Method: | ANSI C63.10: 2013 Section 11.13 |
| Test Setup: |  |
| Exploratory Test Mode: | Transmitting with all kind of modulations, data rates |
| Final Test Mode: | Through Pre-scan, find the<br>1Mbps of rate is the worst case of 802.11B;<br>6Mbps of rate is the worst case of 802.11G ;<br>6.5Mbps of rate is the worst case of 802.11N(HT20) ; |
| Limit: | In any 100 kHz bandwidth outside the frequency band 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. |
| Instruments Used: | Refer to section 5.10 for details |
| Test Results: | Pass |

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### 4.7.1 Test plots

#### 4.7.1.1 ANT1

##### 4.7.1.1.1 802.11B_Lowest Channel

##### 4.7.1.1.2 802.11B_ Highest Channel

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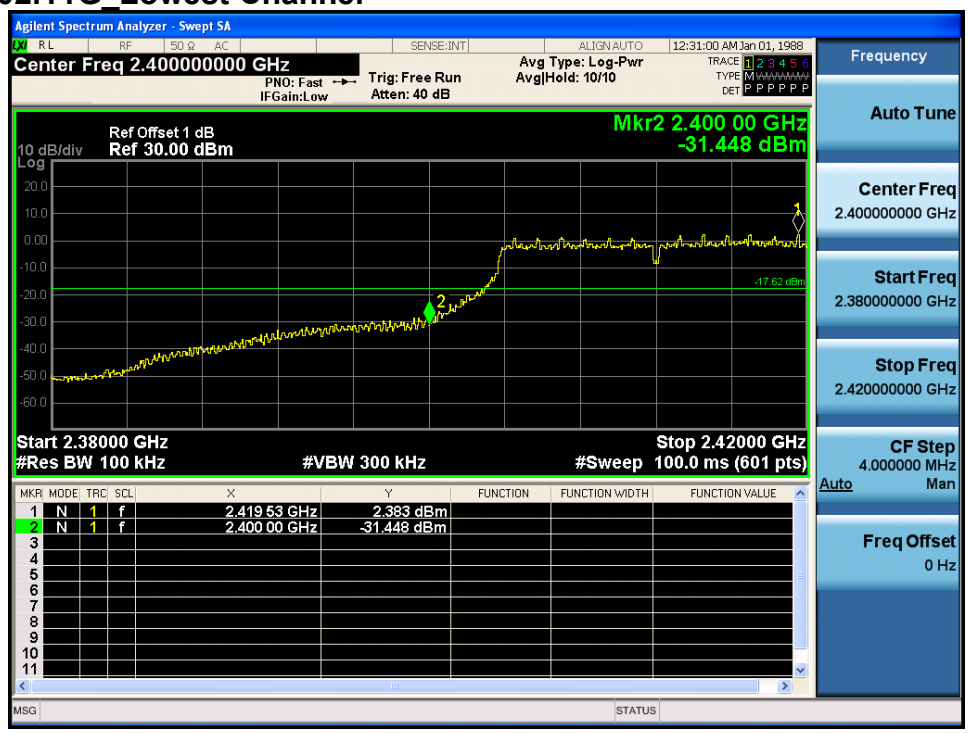
### 4.7.1.1.3 802.11G_Lowest Channel




### 4.7.1.1.4 802.11G_ Highest Channel

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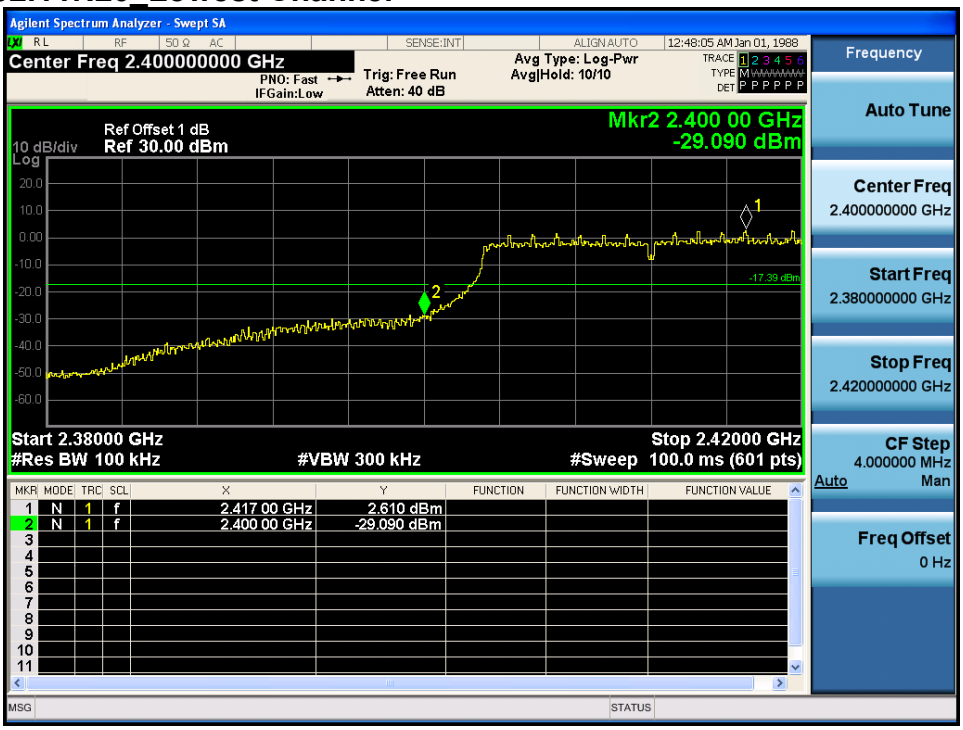
### 4.7.1.1.5 802.11N20_Lowest Channel




### 4.7.1.1.6 802.11 N20_ Highest Channel

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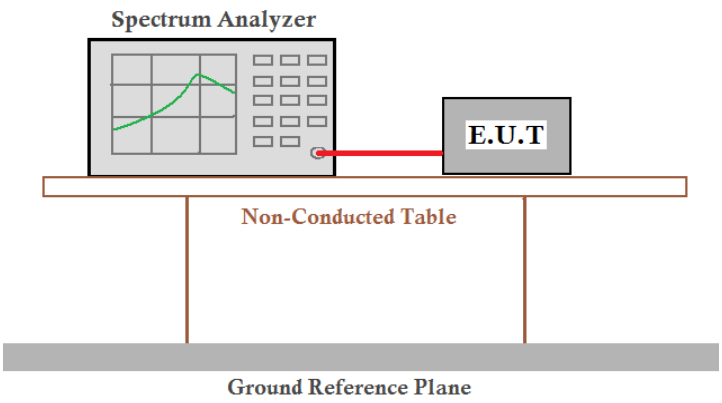
## 4.8 RF Conducted Spurious Emissions

| | |
|---|---|
| Test Requirement: | 47 CFR Part 15C Section 15.247 (d) |
| Test Method: | ANSI C63.10: 2013 Section 11.11 |
| Test Setup: |  |
| Exploratory Test Mode: | Transmitting with all kind of modulations, data rates |
| Final Test Mode: | Through Pre-scan, find the<br>1Mbps of rate is the worst case of 802.11B;<br>6Mbps of rate is the worst case of 802.11G;<br>6.5Mbps of rate is the worst case of 802.11N(HT20); |
| Limit: | In any 100 kHz bandwidth outside the frequency band 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. |
| Instruments Used: | Refer to section 5.10 for details |
| Test Results: | Pass |

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### 4.8.1 Test plots

#### 4.8.1.1 ANT1

**4.8.1.1.1** 802.11B_Lowest Channel

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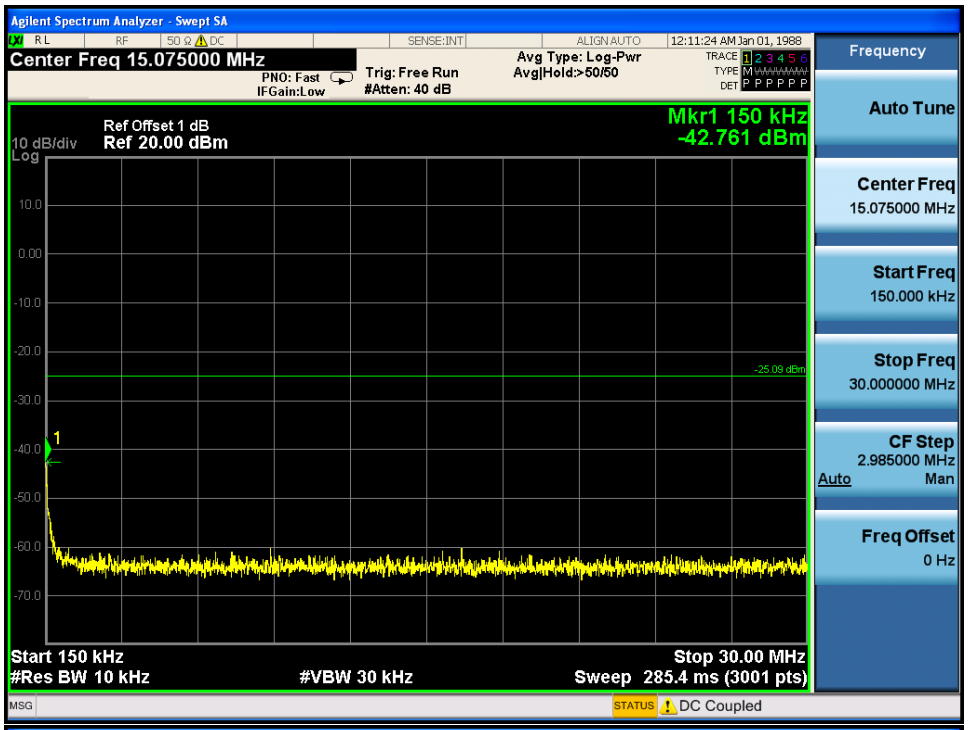


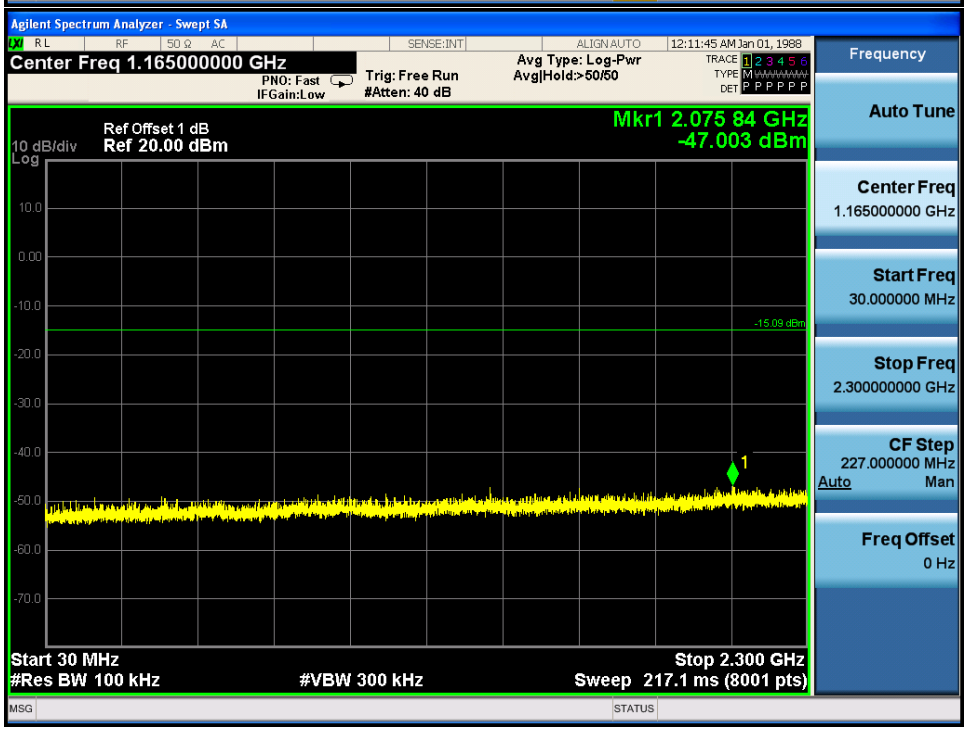


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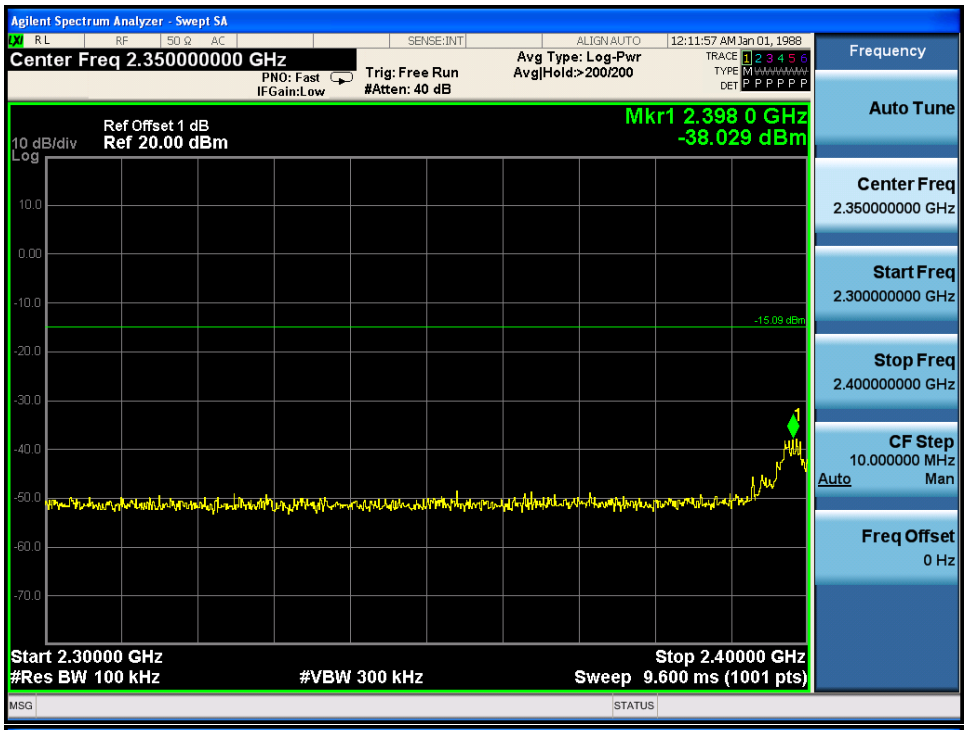


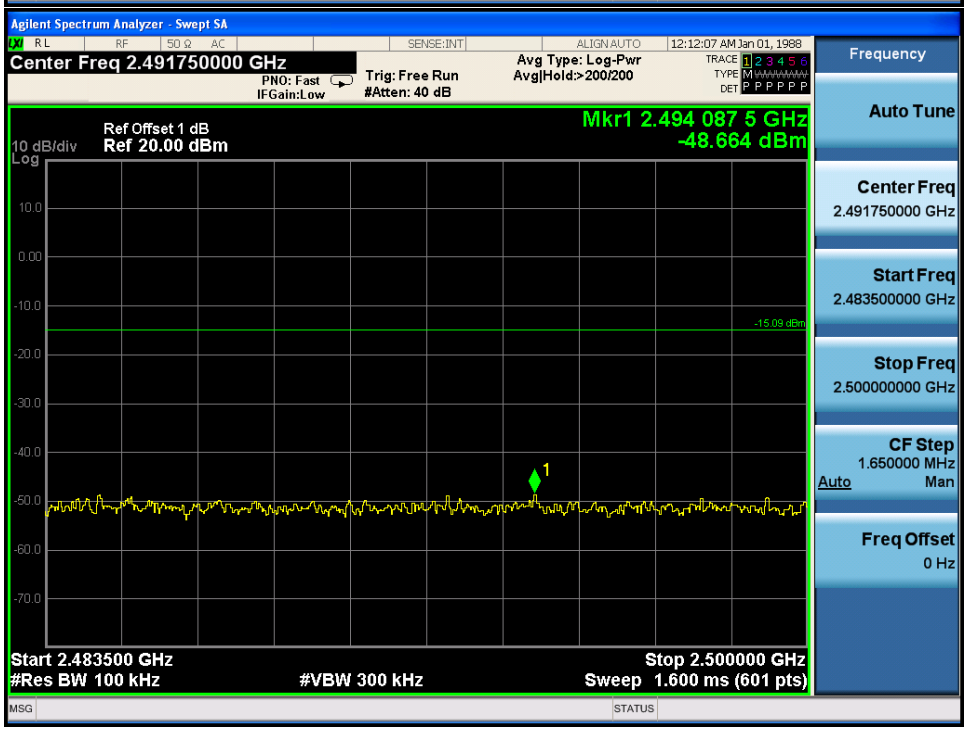


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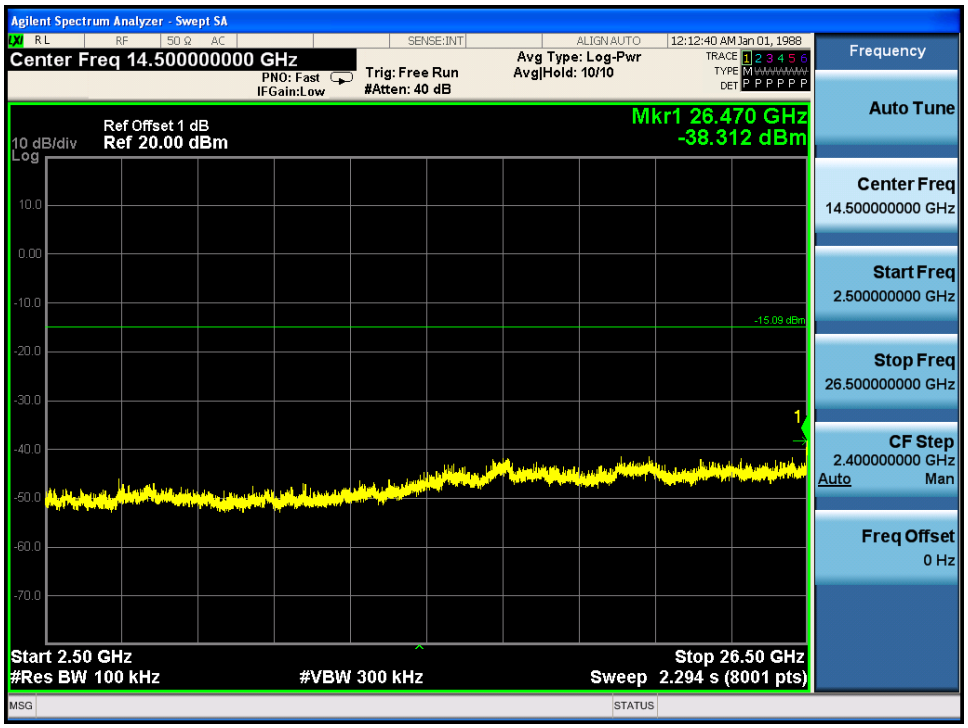


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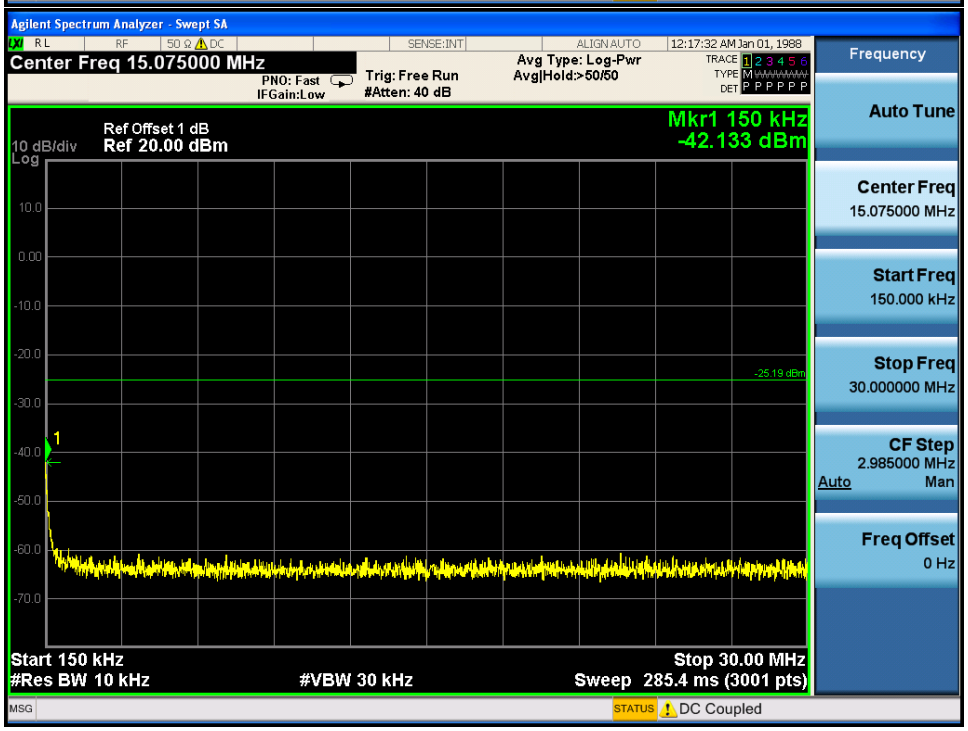


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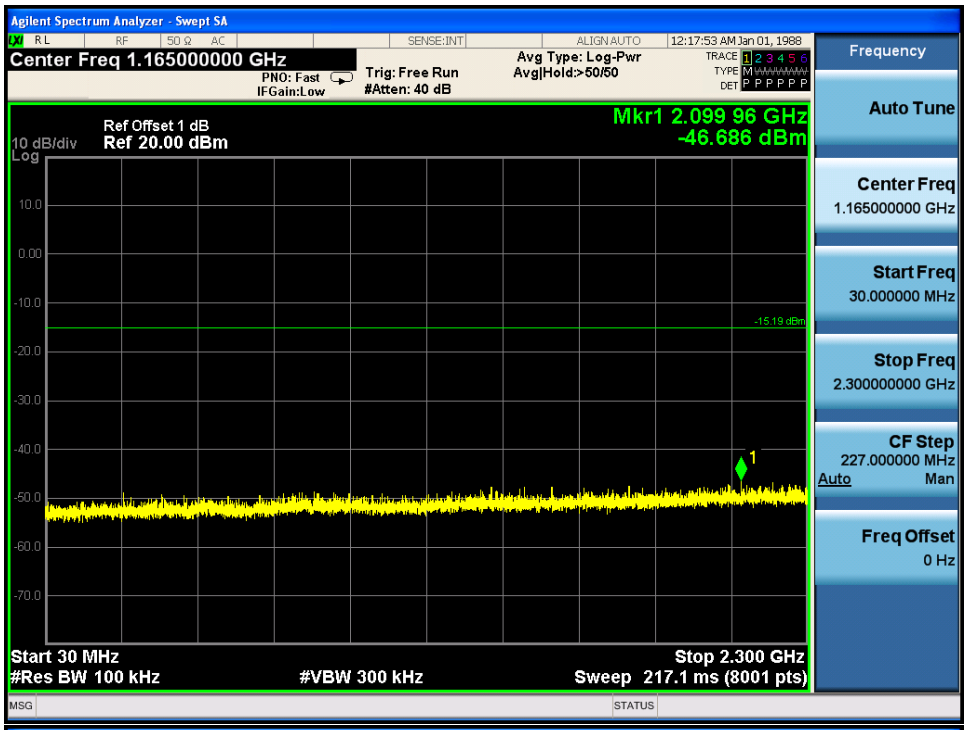


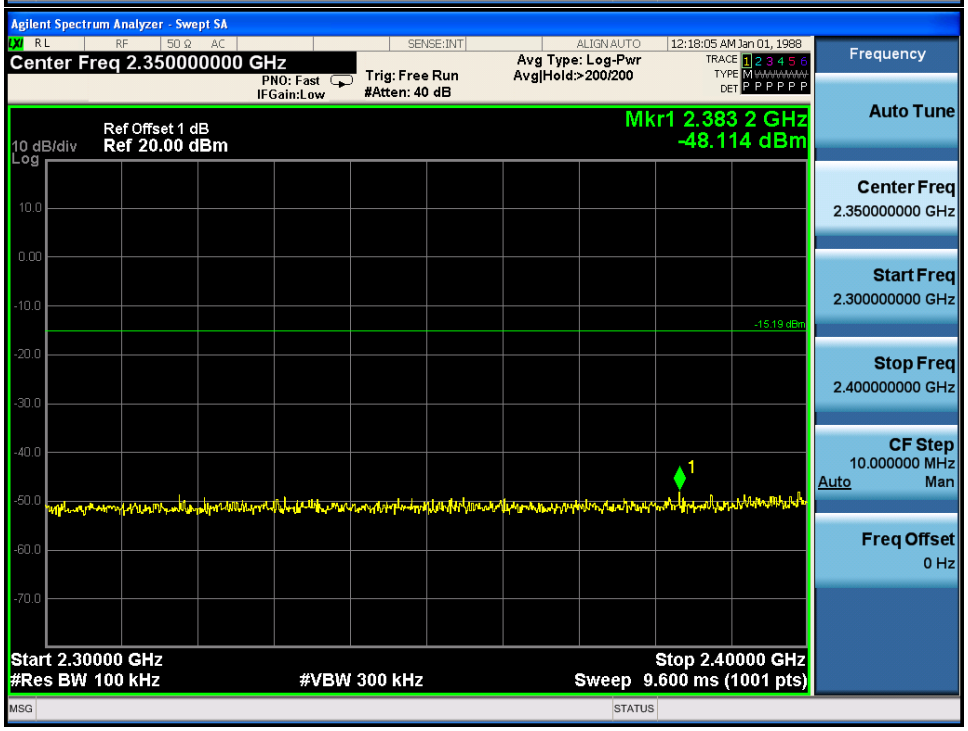


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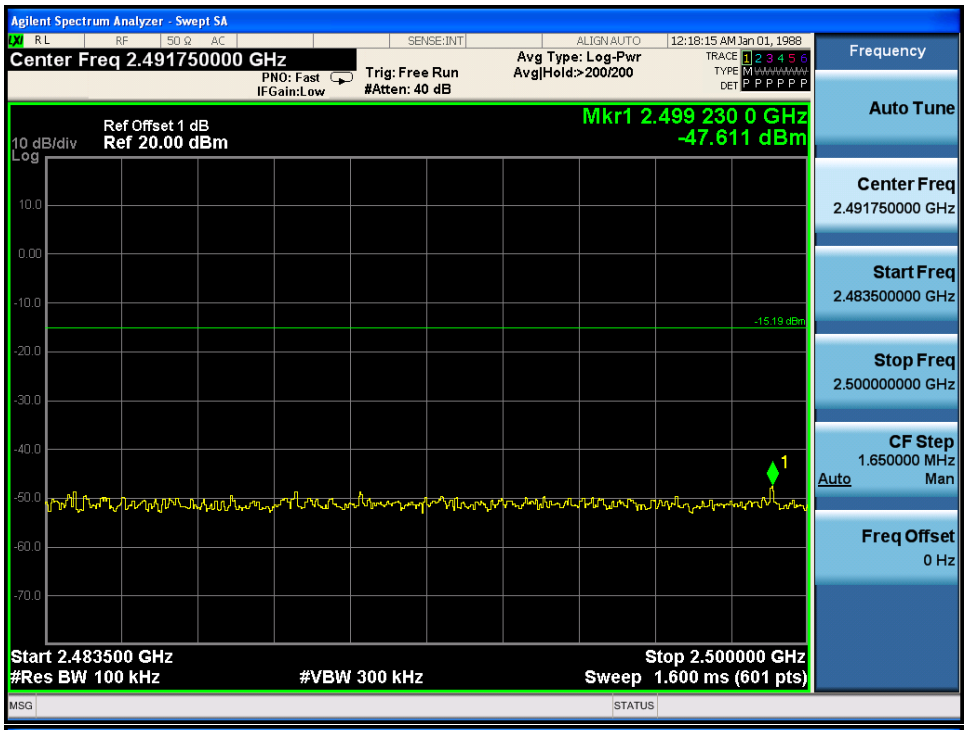


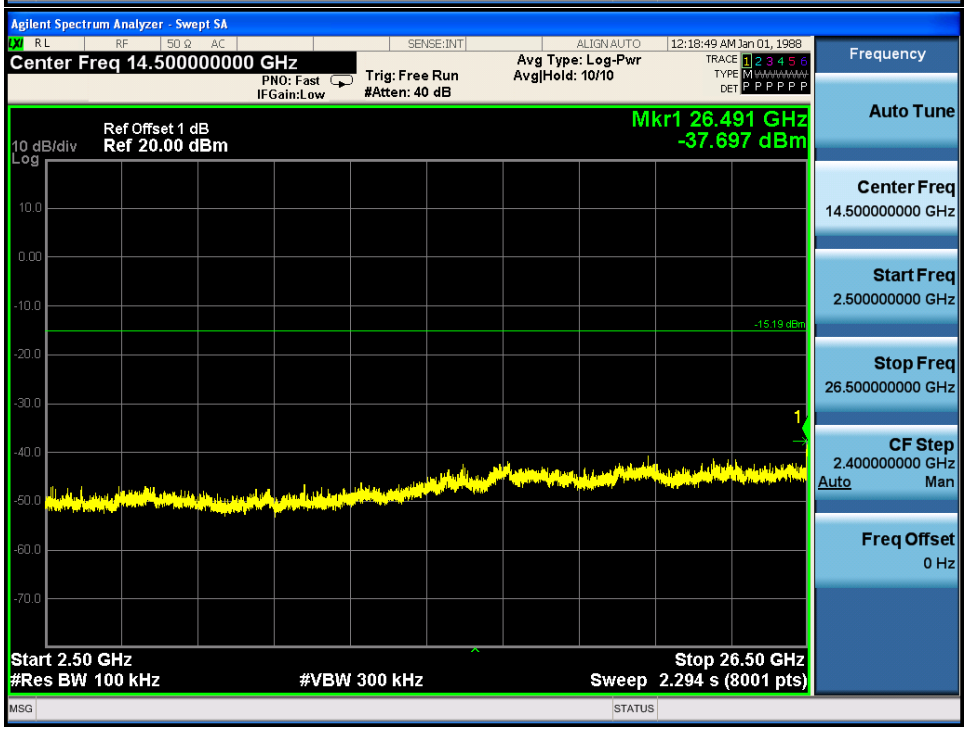


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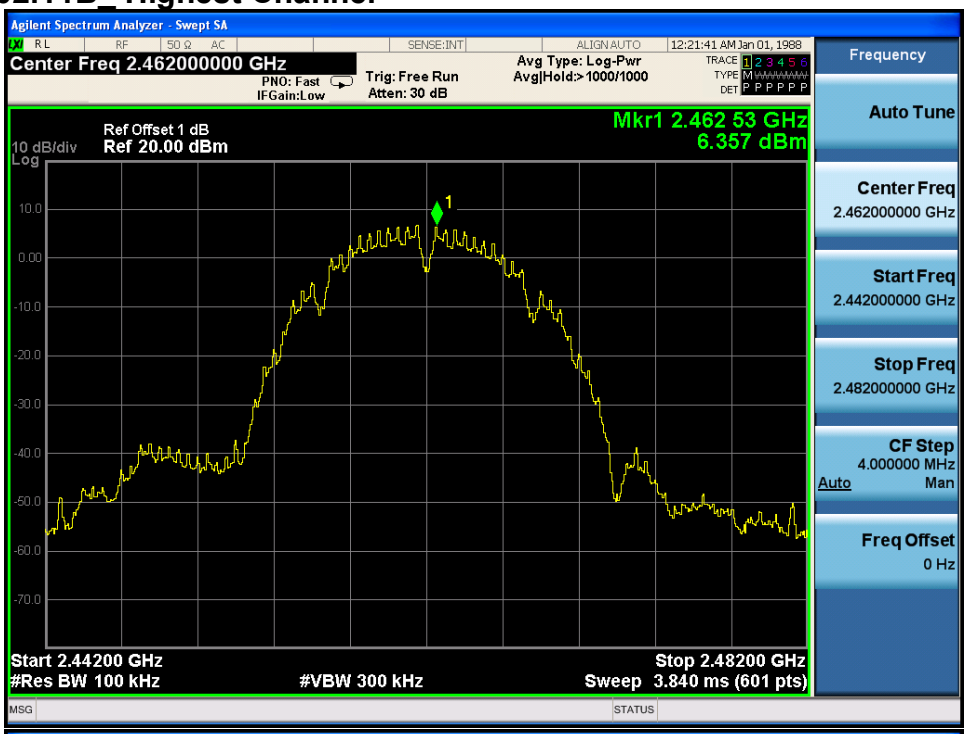
### 4.8.1.1.3 802.11B_ Highest Channel



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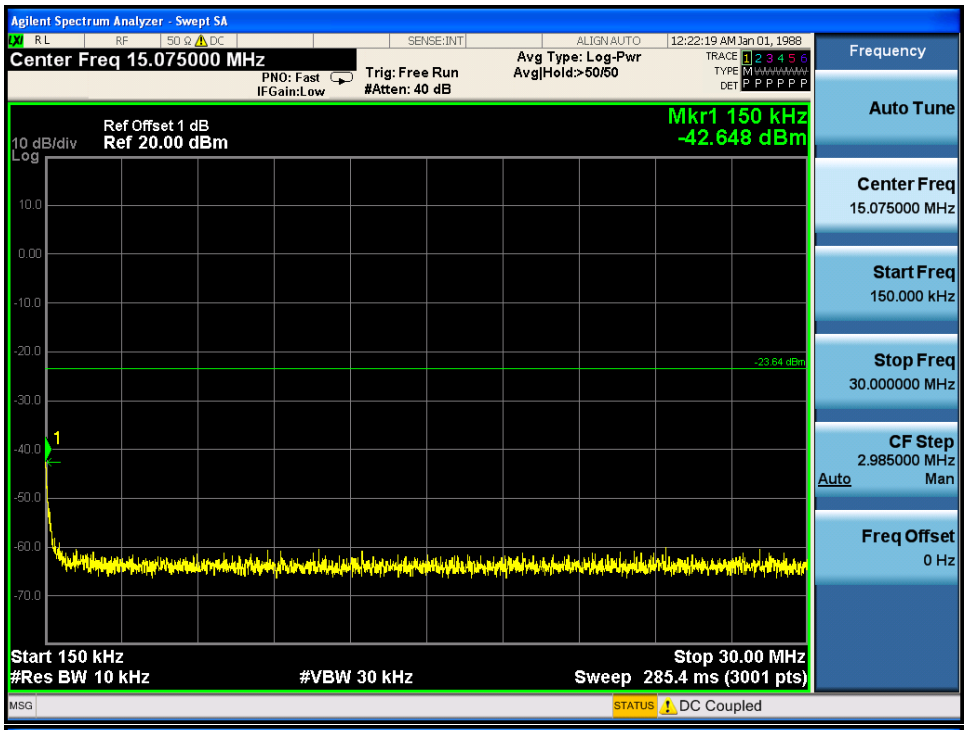


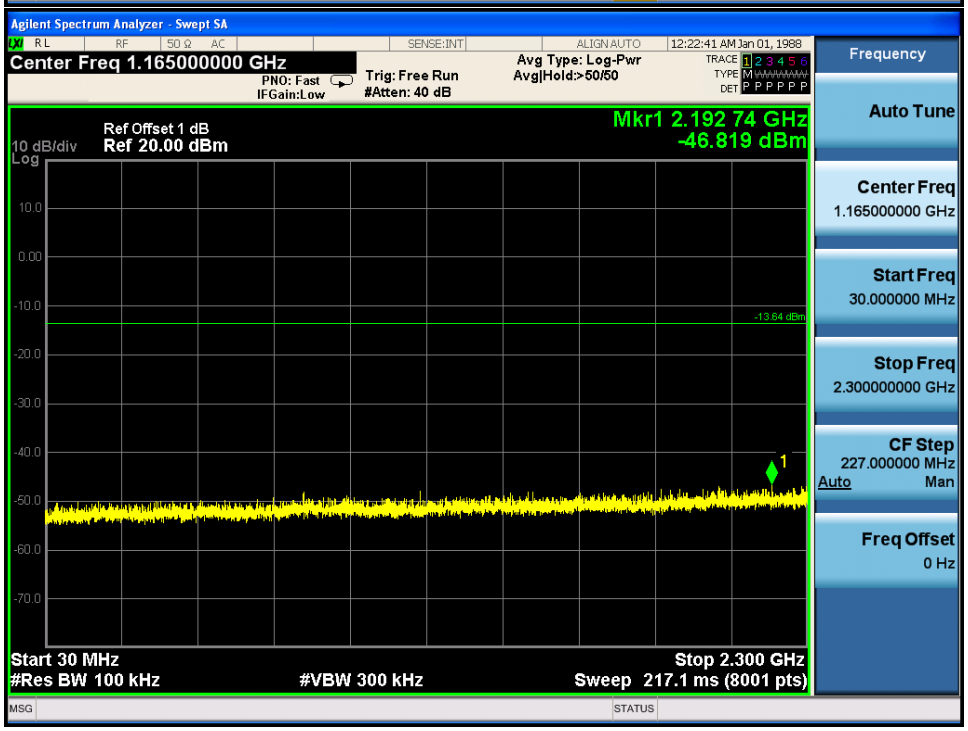


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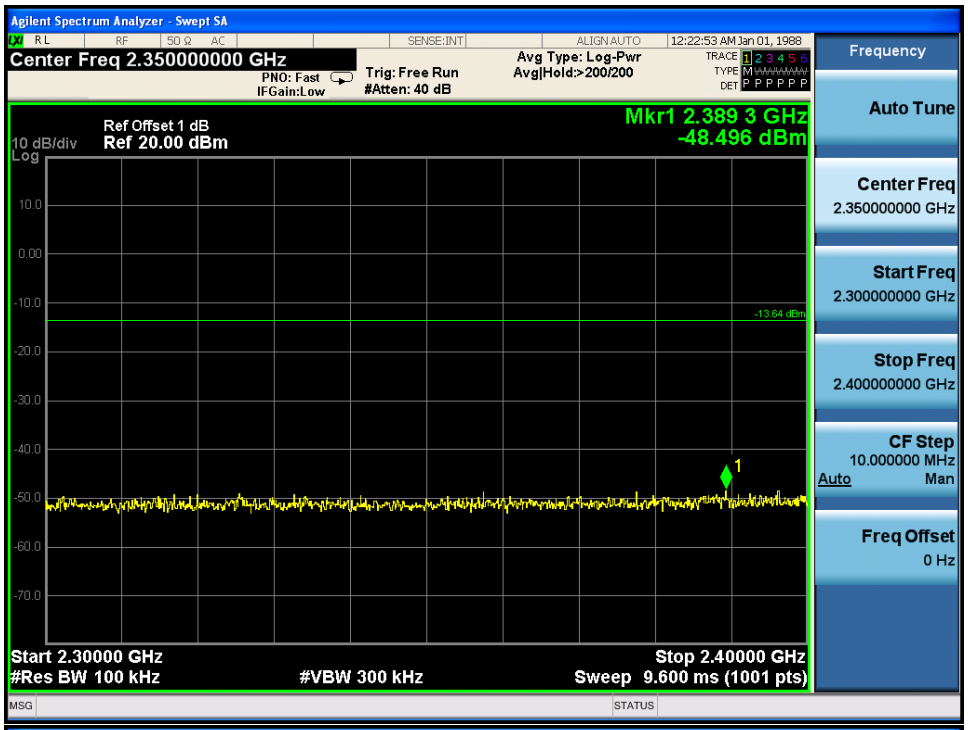


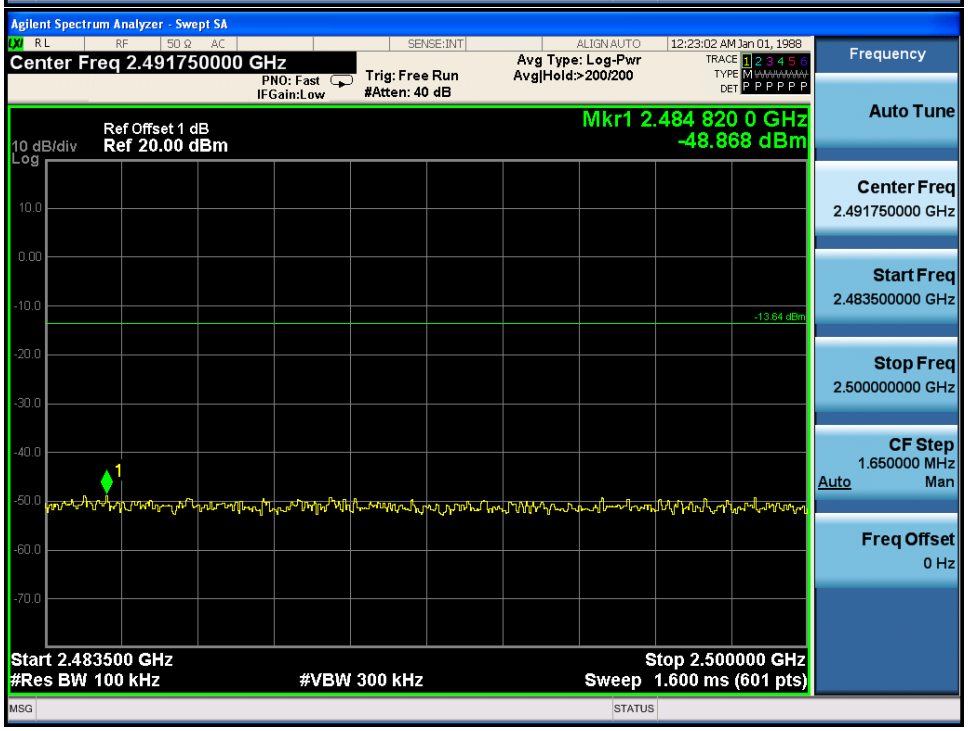


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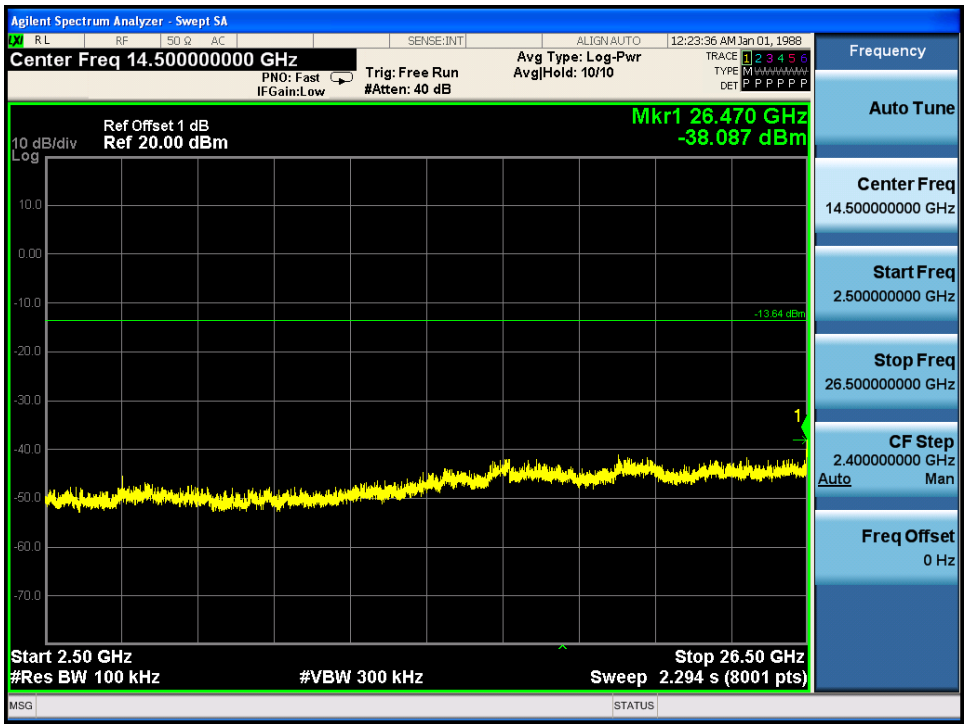
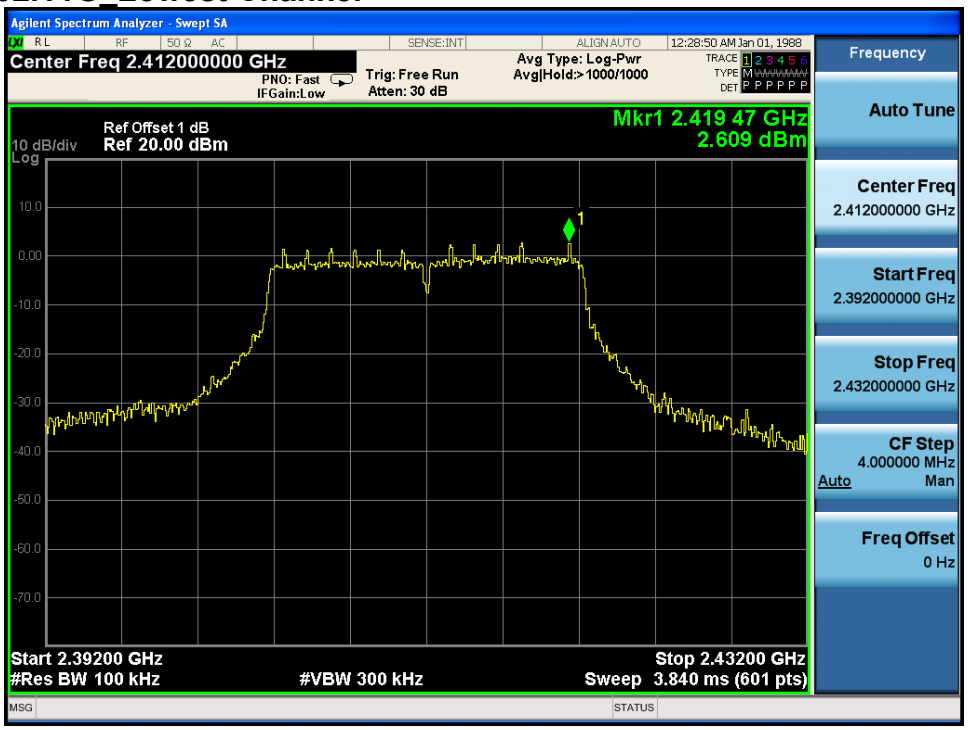



## 4.8.1.1.4 802.11G_Lowest Channel

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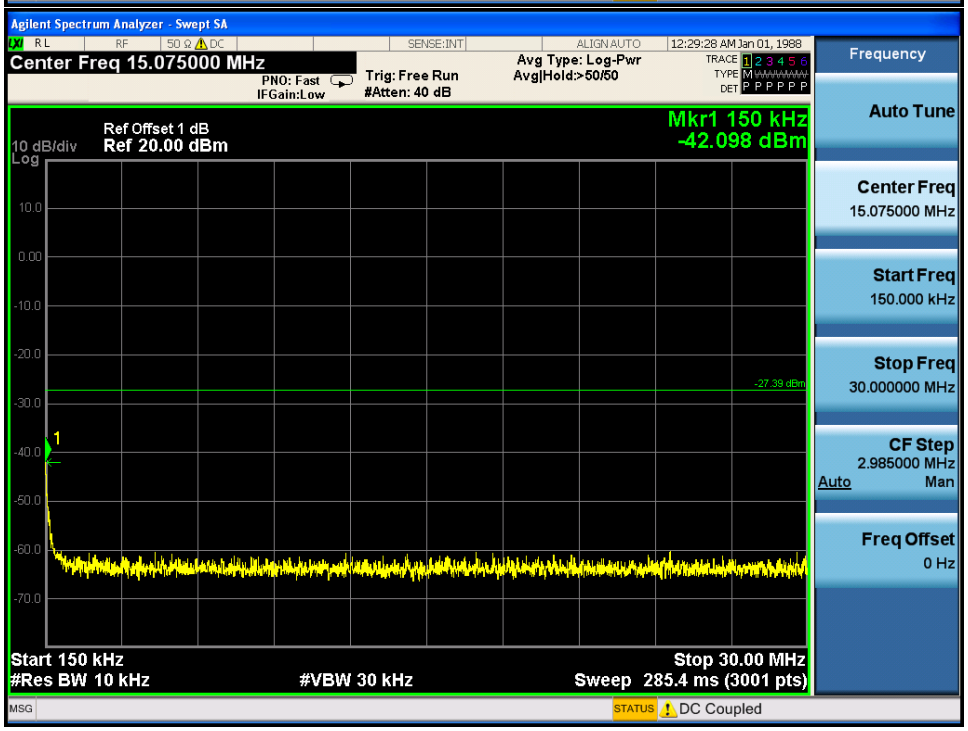


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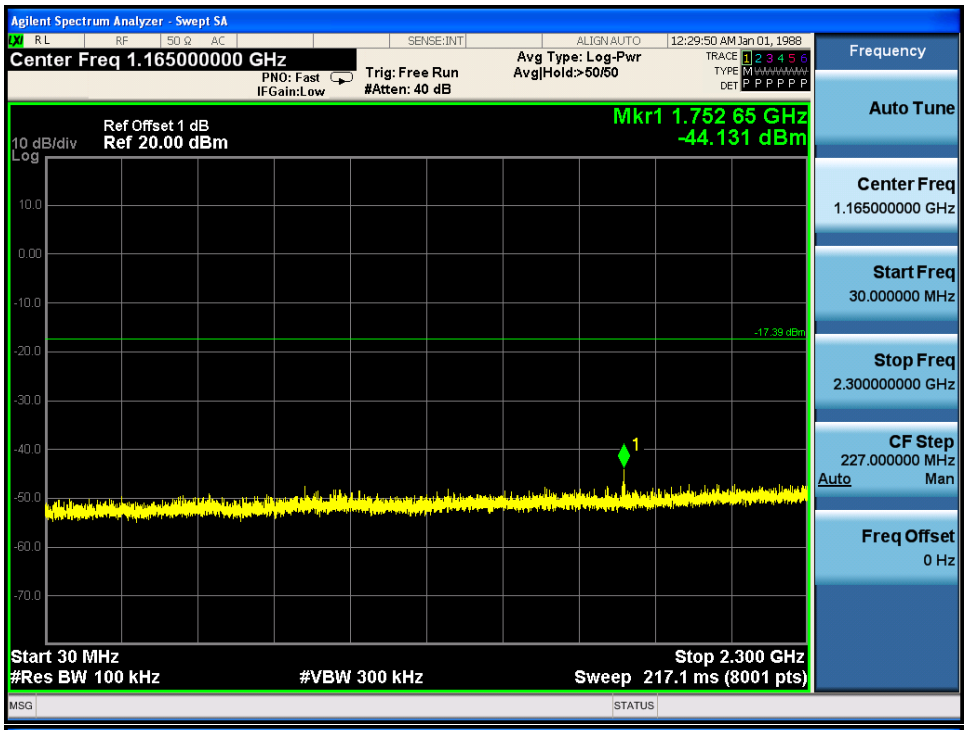


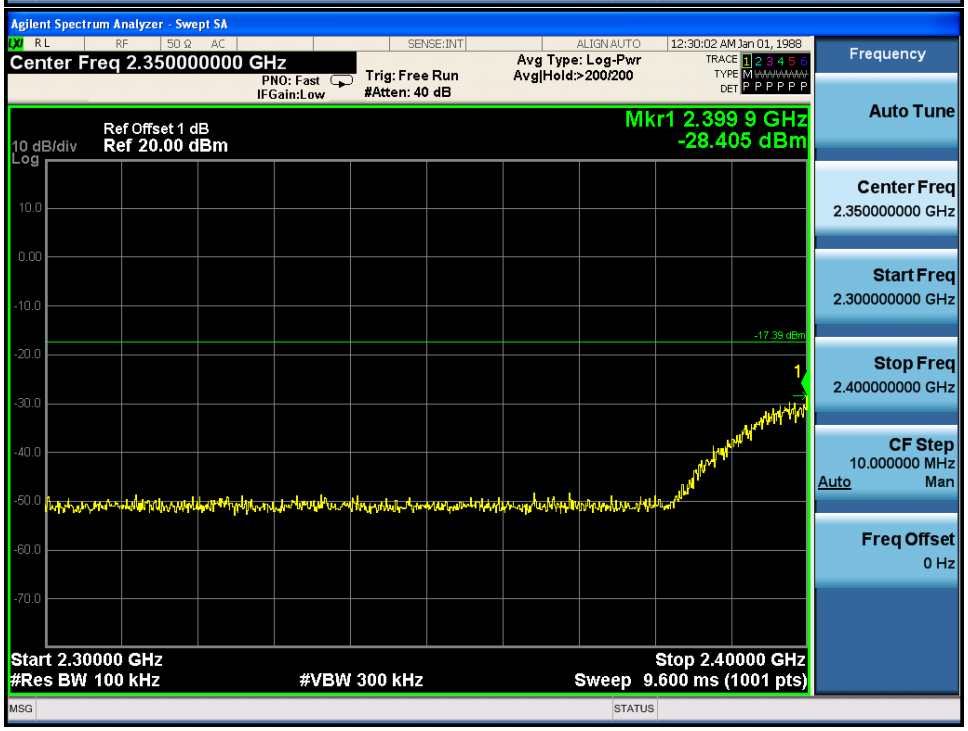


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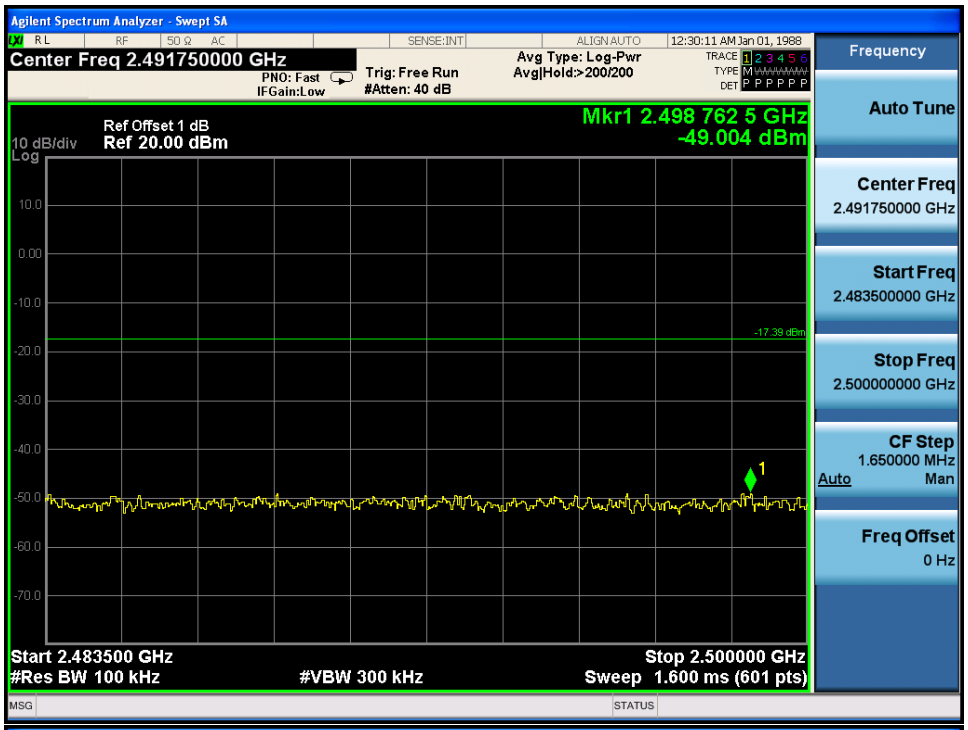


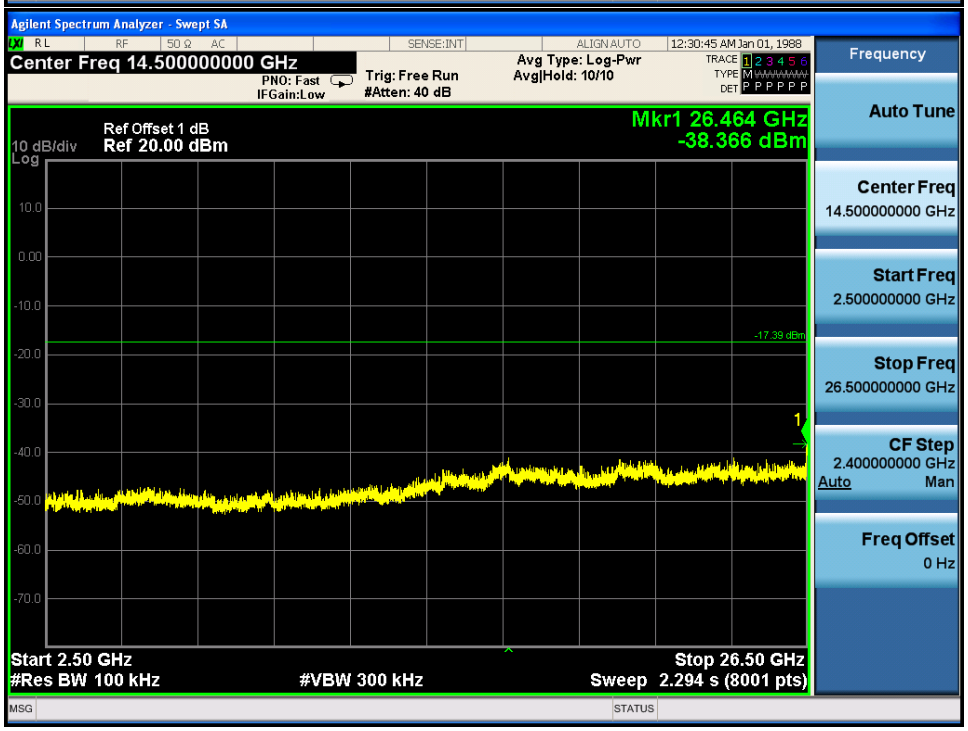


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### 4.8.1.1.5 802.11G_ Middle Channel

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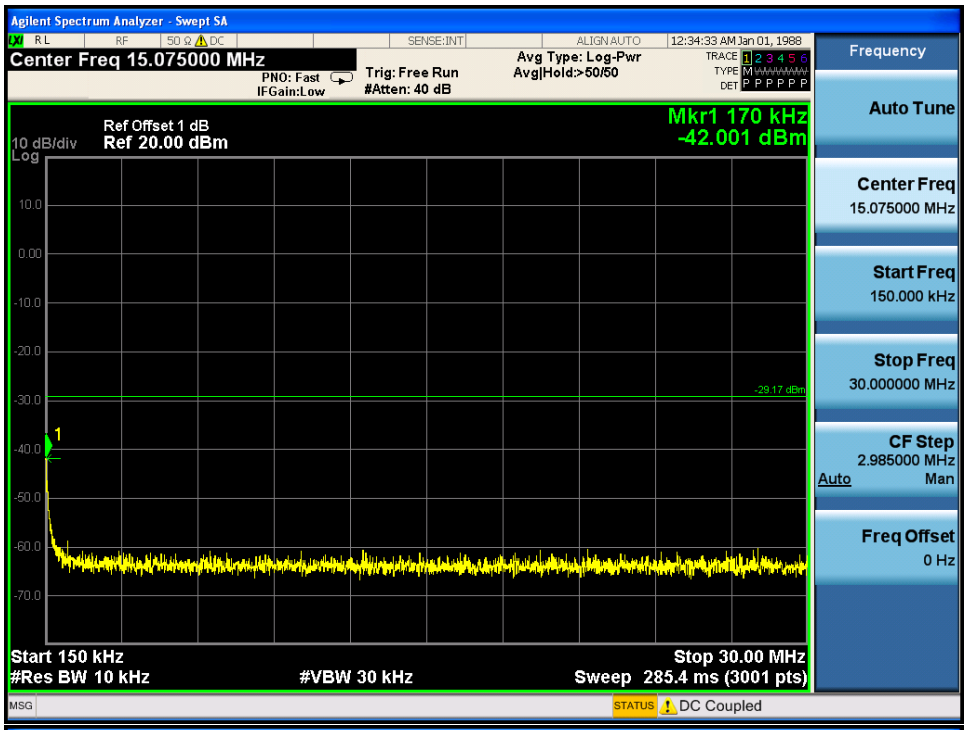


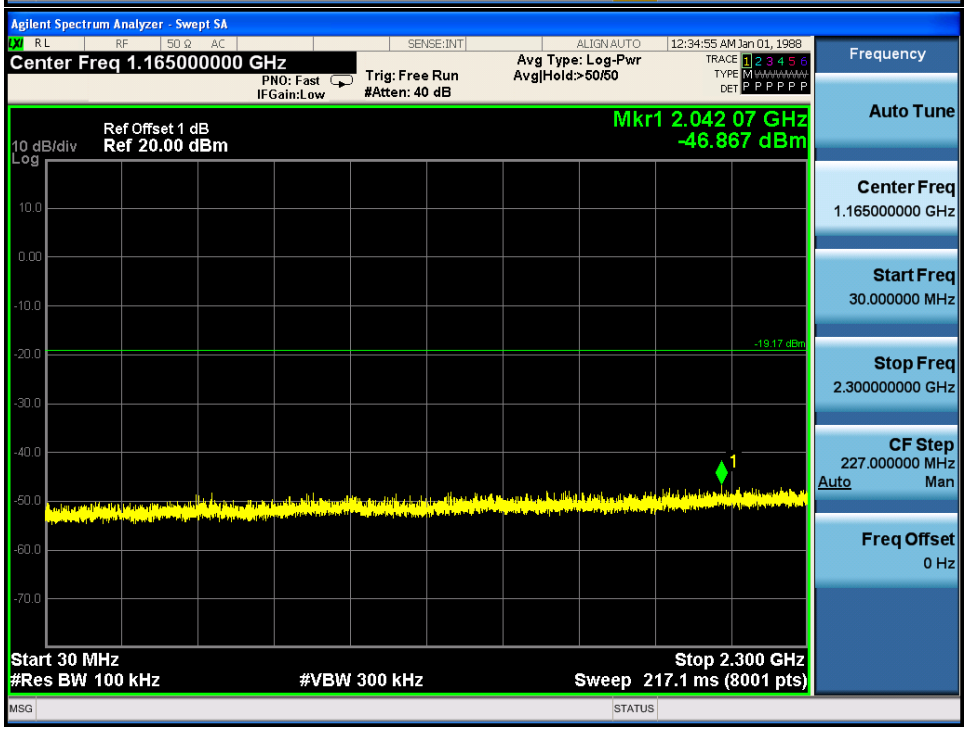


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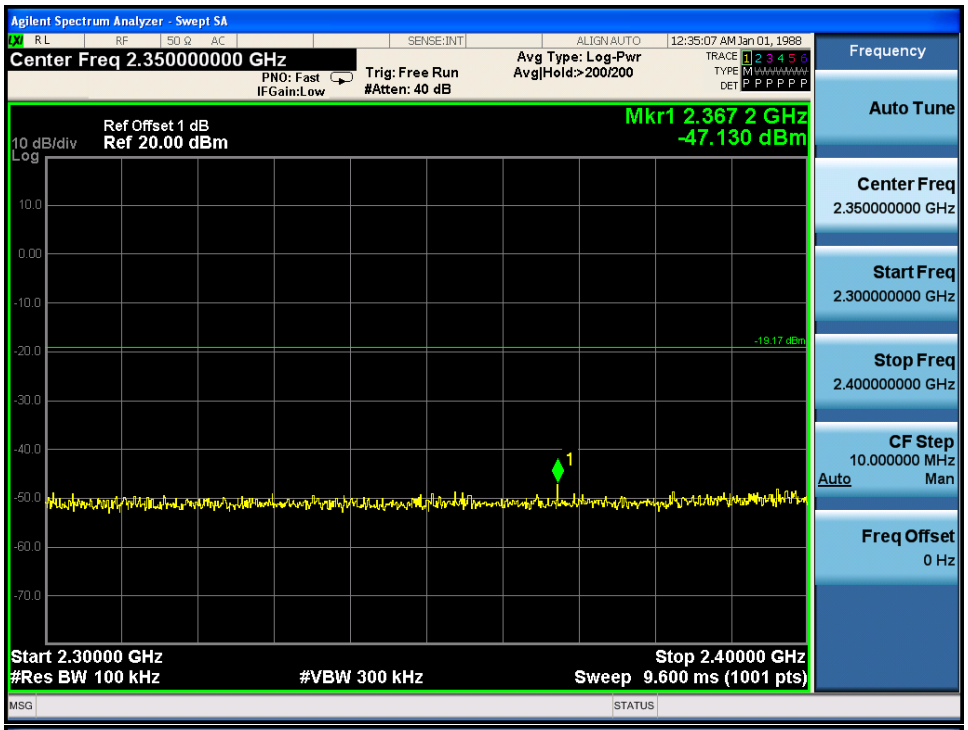


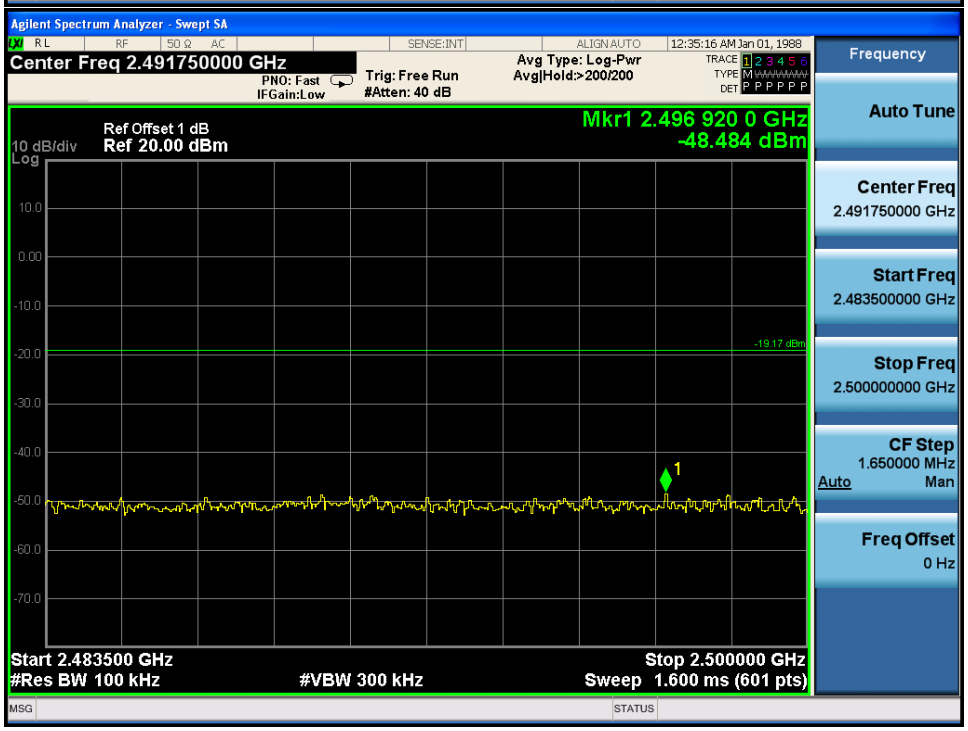


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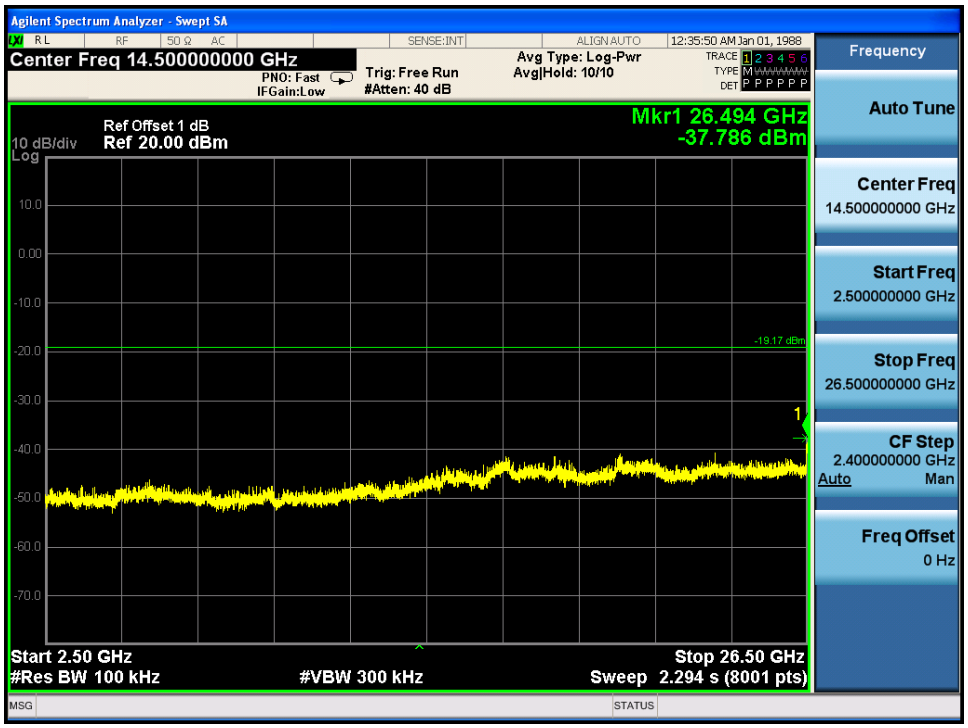


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