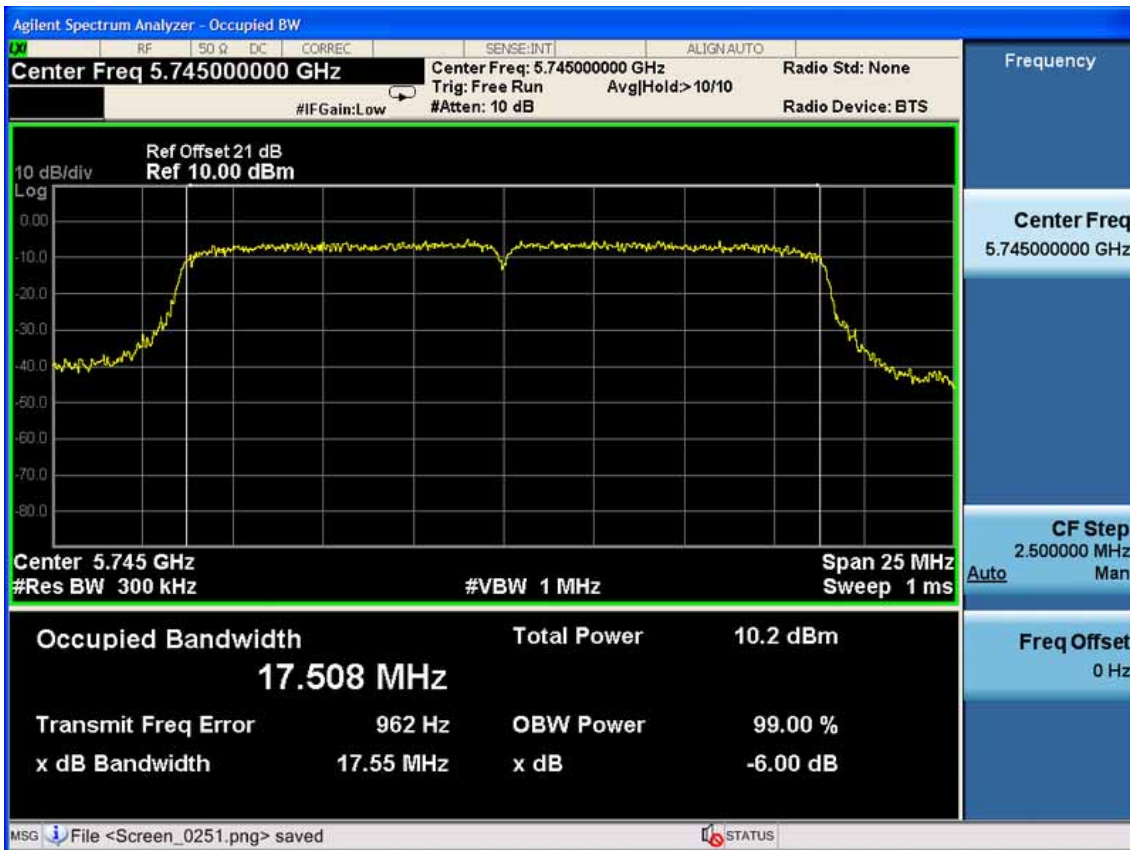Test CH165: 5825MHz



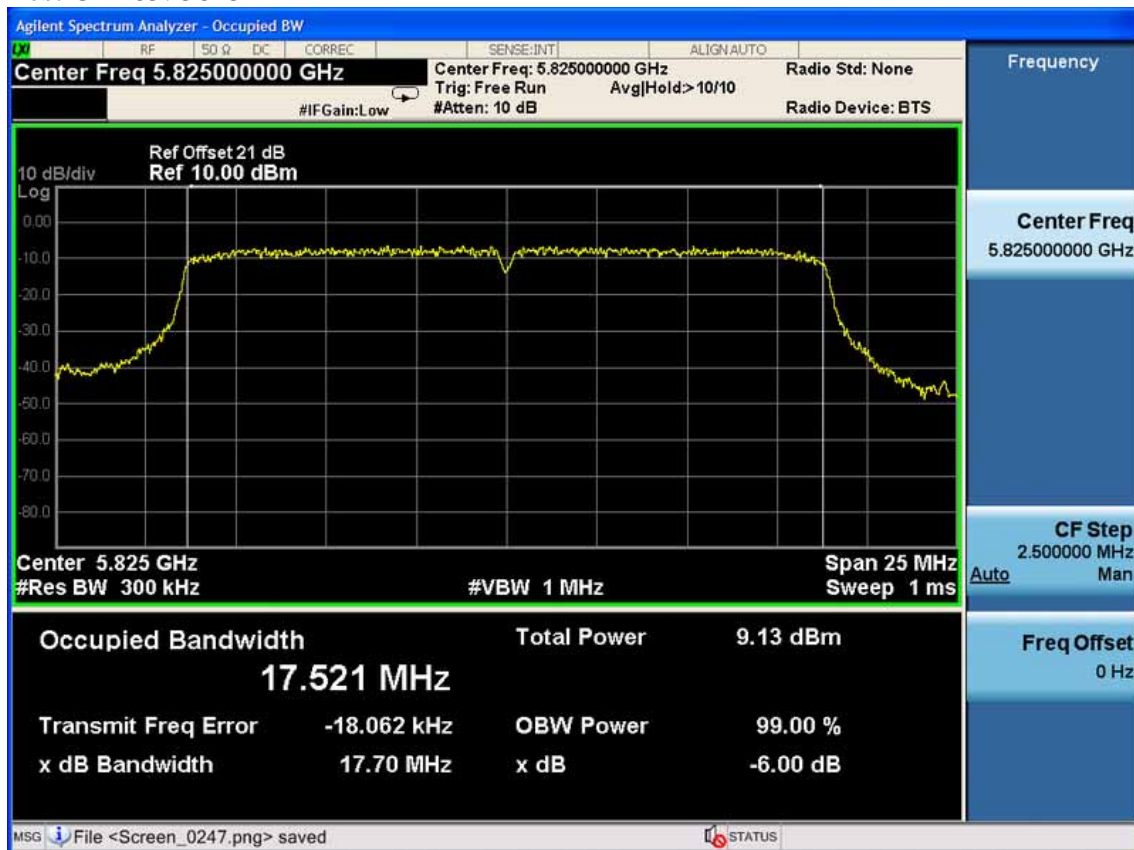Test Mode: IEEE 802.11n HT20 TX
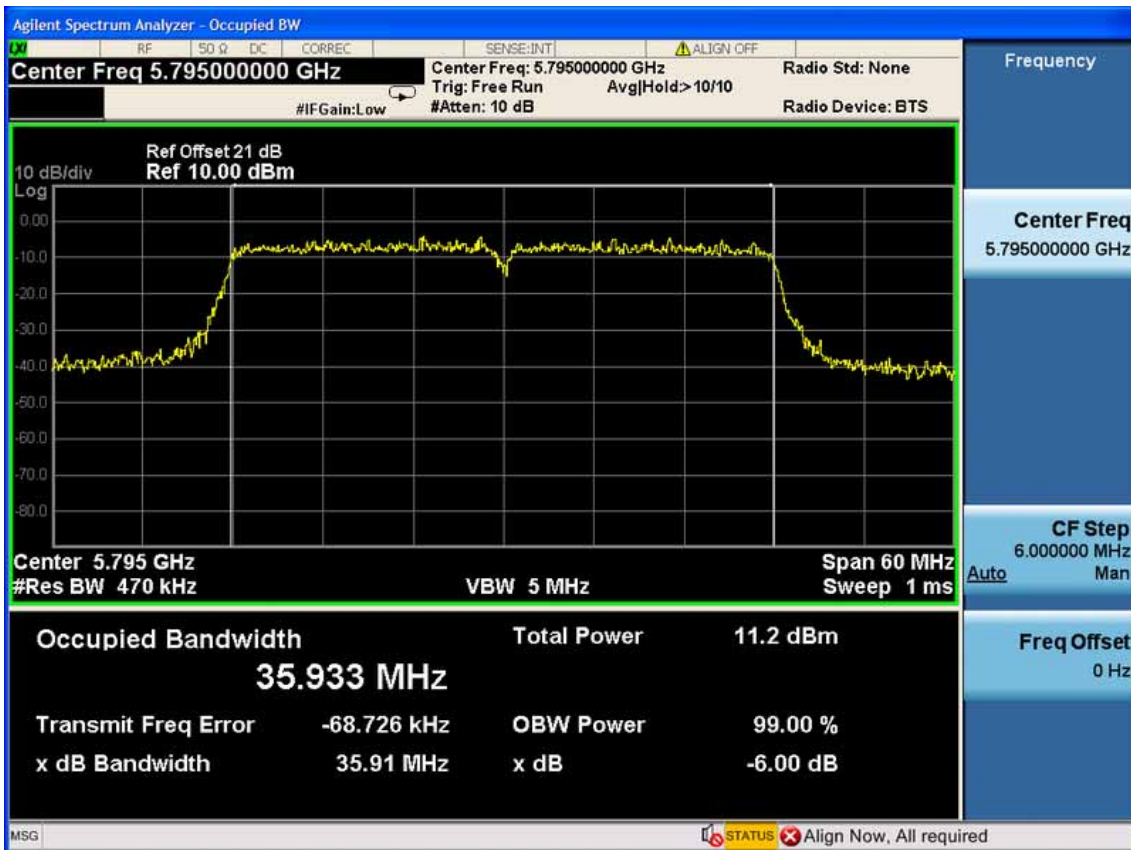Test CH149: 5745MHz

Test CH157: 5785MHz



Test CH165: 5825MHz

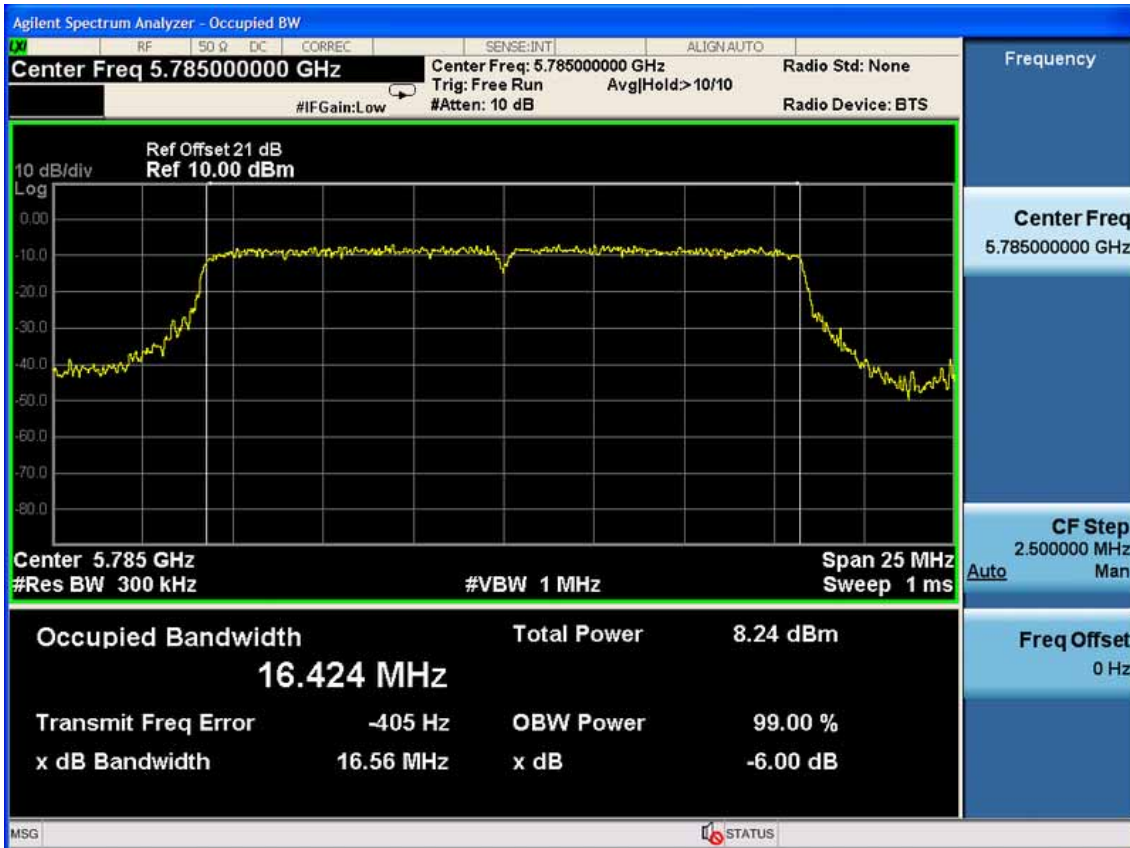Test Mode: IEEE 802.11n HT40 TX
Test CH151: 5755MHz



Test CH159: 5795MHz

Chain 1:
Test Mode: IEEE 802.11a TX
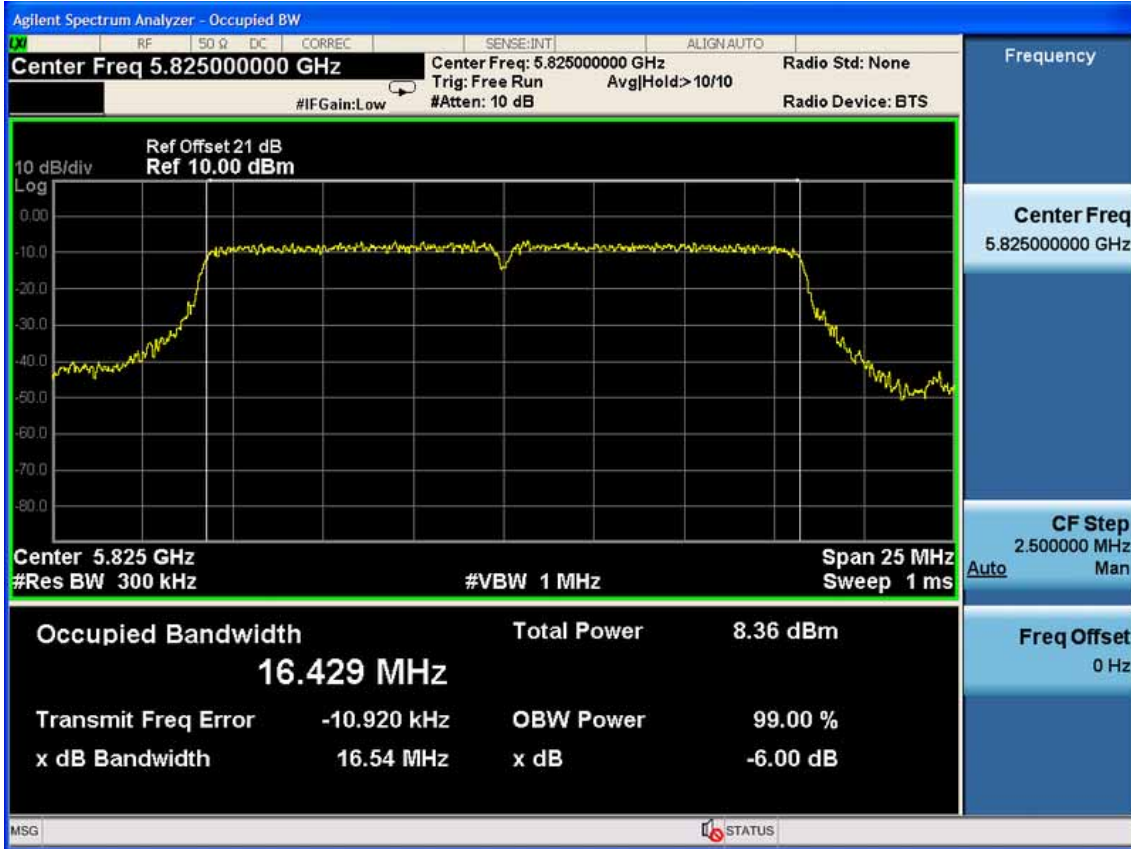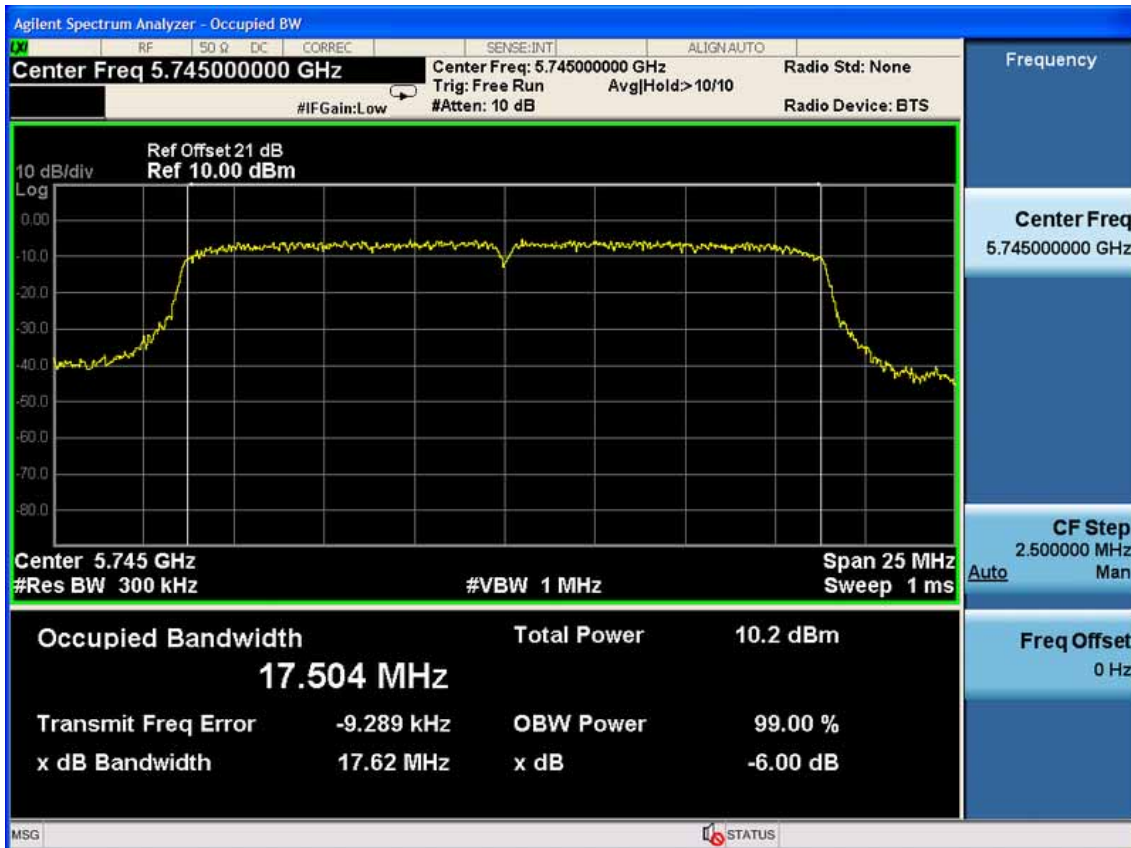Test CH149: 5745MHz



Test CH157: 5785MHz

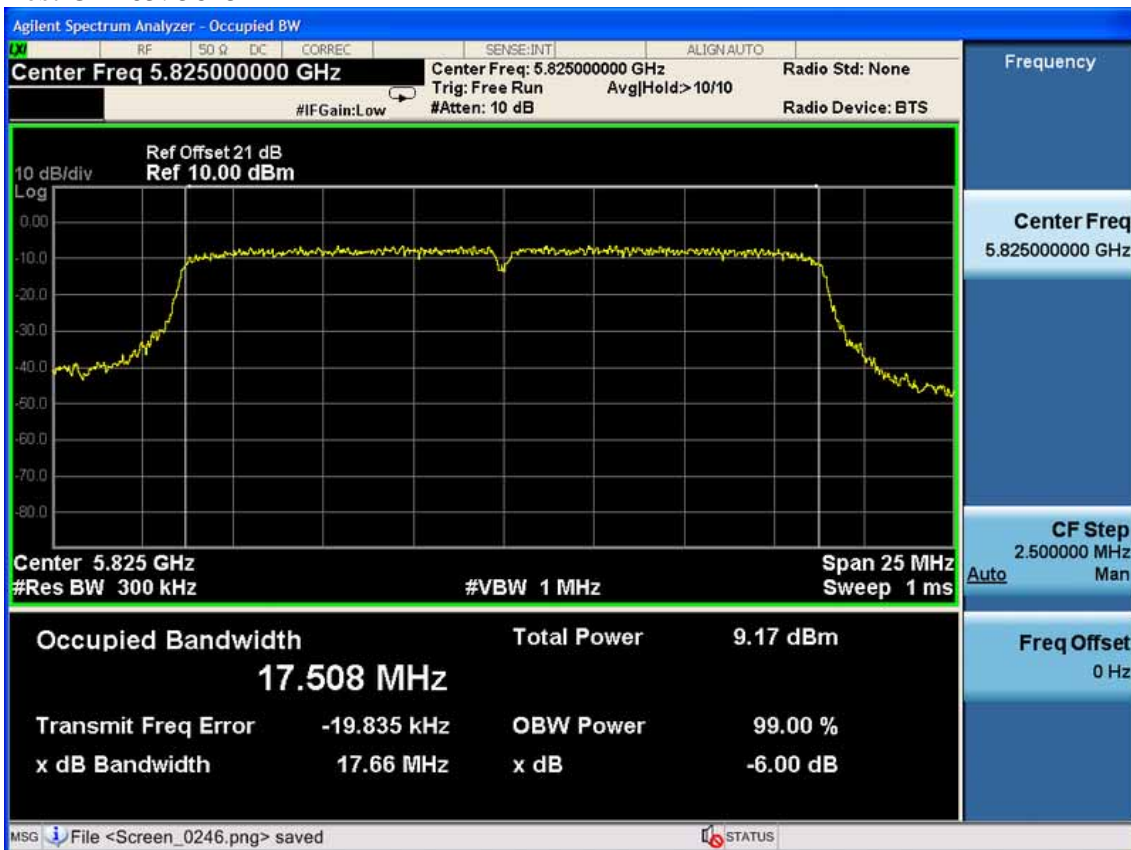Test CH165: 5825MHz



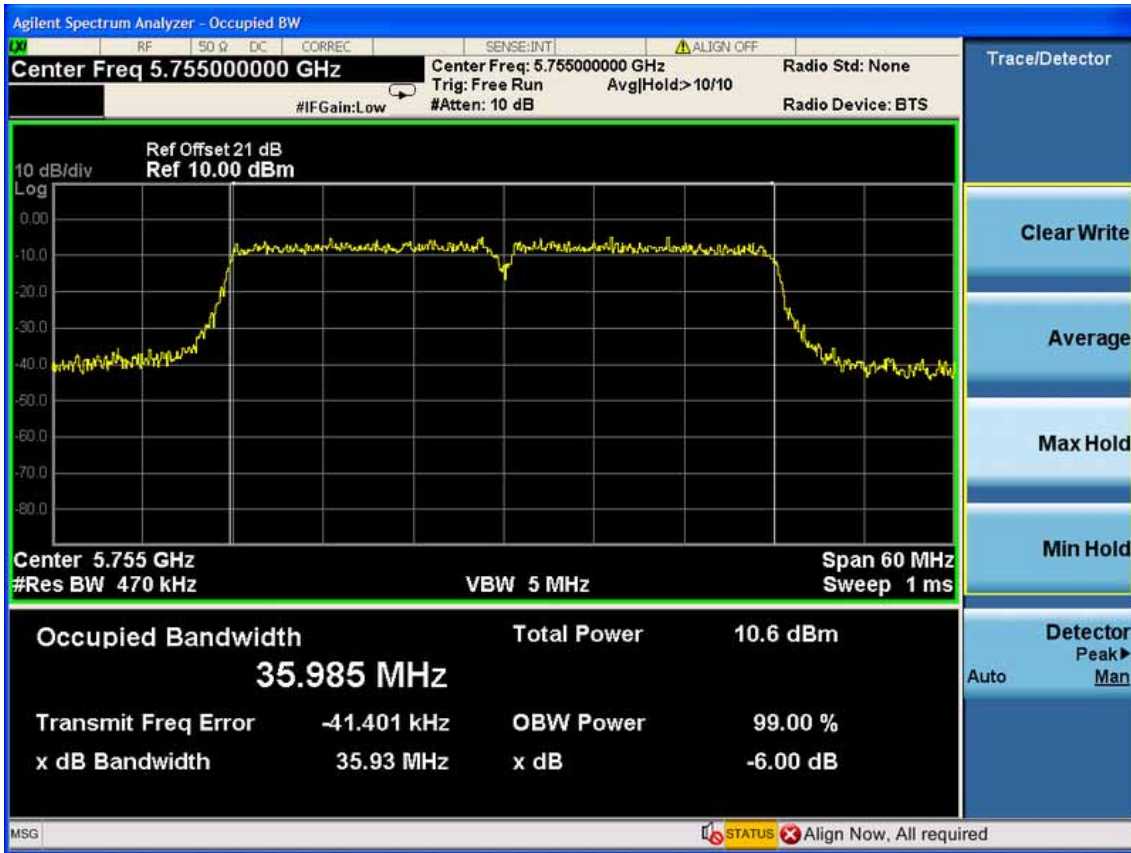Test Mode: IEEE 802.11n HT20 TX
Test CH149: 5745MHz
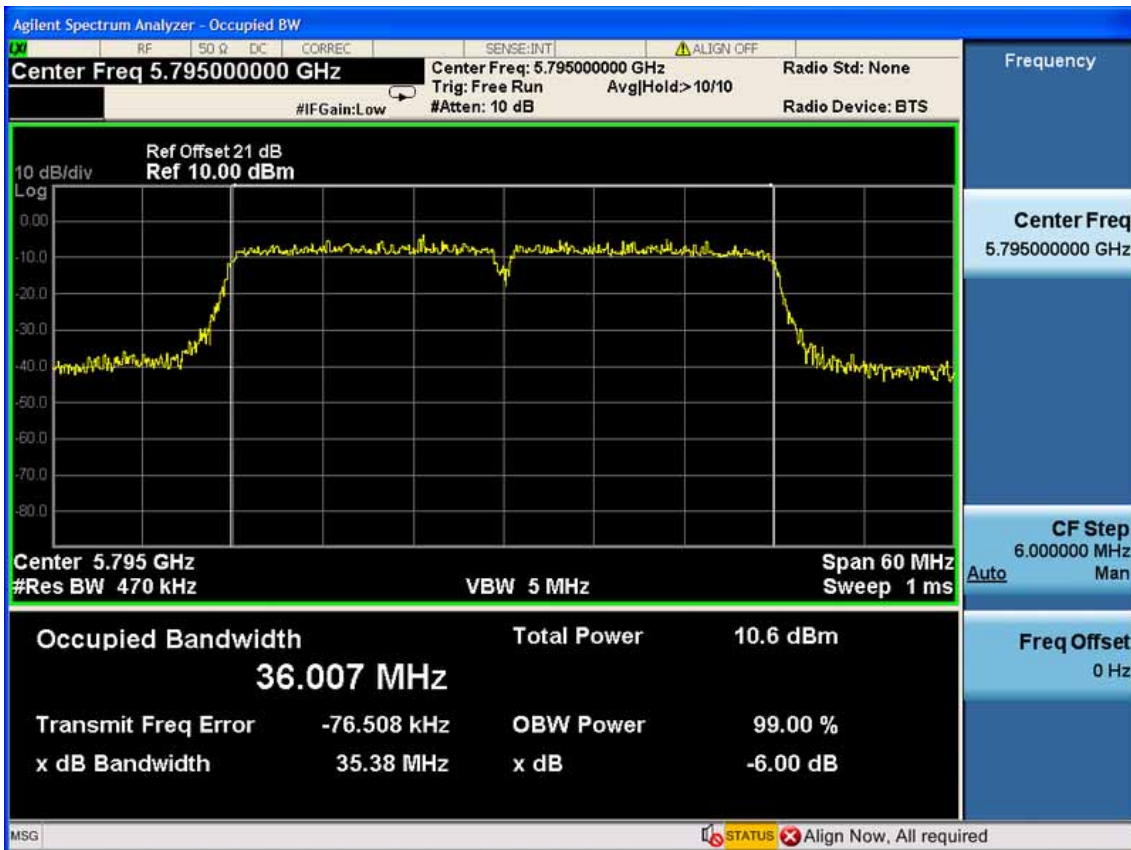
Test CH157: 5785MHz



Test CH165: 5825MHz

Test Mode: IEEE 802.11n HT40 TX
Test CH151: 5755MHz



Test CH159: 5795MHz

# 8. OUTPUT POWER TEST

## 8.1. Test Equipment

| Item | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval |
|------|-----------|--------------|-----------|------------|-----------|---------------|
| 1. | PXA Signal Analyzer | Agilent | N9030A | MY51380221 | Oct.31, 12 | 1 Year |
| 2. | Amp | HP | 8449B | 3008A08495 | May.08, 13 | 1 Year |
| 3. | Horn Antenna | EMCO | 3115 | 9510-4580 | May.28, 13 | 1 Year |
| 4. | HF Cable | Hubersuhne | Sucoflex104 | - | May.08, 13 | 1 Year |
| 5. | Power Meter | Anritsu | ML2487A | 6K00002472 | May.08, 13 | 1Year |
| 6. | Power Sensor | Anritsu | MA2491A | 033005 | May.08, 13 | 1Year |

## 8.2. Limit (FCC Part 15C 15.247 b(3))

For systems using digital modulation in the 2400—2483.5MHz, 5725-5850MHz, The Peak out put Power shall not exceed 1W(30dBm)

## 8.3. Test Procedure

1, Connected the EUT's antenna port to measure device by 26dB attenuator.

2, For IEEE 802.11b/g and IEEE802.11n HT20 mode, use a PK power meter which's bandwidth is 20MHz and above 26dB bandwidth of signal to measure out each test modes' PK output power.

3, For IEEE802.11n HT40 mode, because the signal's bandwidth is about 40MHz and above 20MHz bandwidth of power sensor ML2491A. So Bandwidth correction method according to ANSI C63.10 clause 6.10.2.1 part (c) was used:
1) Set the RBW=3MHz and VBW =8MHz
2) Turn averaging off
3) Set sweep to automatic
4) Set the span just large enough to capture the emission
5) Use a peak detector on max hold
6) Record the measured power
7) Calculate Output power of EUT use the formula:

Peak output power =measured power+ 10log[(26dB bandwidth of emission)/(analyzer RBW)]

Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

8.4.Test Results

**2.4G:**

| EUT: WIFI Module | | | | | | |
|---|---|---|---|---|---|---|
| M/N:WAE22-DF01-AR | | | | | | |
| Test date:2013-09-13 | | Pressure: 101.3±1.0    kpa | | Humidity: 49.4±3.0% | | |
| Tested by: Leo-Li | | Test site: RF site | | Temperature:20.9±0.6 ℃ | | |

| Cable loss: 1 dB | | Attenuator loss: 20 dB | | | |
|---|---|---|---|---|---|
| Test Mode | CH | Peak output Power（dBm） | | | Limit (dBm) |
| | | Chain 0 | Chain 1 | Total | |
| 11b | CH1 | 16.26 | 16.98 | N/A | 30 |
| | CH6 | 15.16 | 15.57 | N/A | 30 |
| | CH11 | 16.34 | 16.56 | N/A | 30 |
| 11g | CH1 | 20.46 | 20.94 | N/A | 30 |
| | CH6 | 22.07 | 22.64 | N/A | 30 |
| | CH11 | 19.83 | 20.14 | N/A | 30 |
| 11n HT20 | CH1 | 18.33 | 18.74 | 21.55 | 30 |
| | CH6 | 20.09 | 22.60 | 24.53 | 30 |
| | CH11 | 19.89 | 20.06 | 22.99 | 30 |

| Test Mode | CH | Result | | | | | Limit |
|---|---|---|---|---|---|---|---|
| | | Measured power(dBm)/3MHz | | PK Output power (dBm) | | | (dBm) |
| | | Chain 0 | Chain 1 | Chain 0 | Chain 1 | Total | |
| 11n HT40 | CH3 | 1.51 | 1.58 | 17.64 | 17.92 | 20.79 | 30 |
| | CH6 | 5.04 | 5.24 | 21.17 | 21.58 | 24.39 | 30 |
| | CH9 | 2.73 | 2.70 | 18.86 | 19.04 | 21.96 | 30 |
| Chain 0    26dB Bandwidth for 11n HT40:48.38MHz | | | | | | | |
| Chain 1    26dB Bandwidth for 11n HT40:49.03MHz | | | | | | | |
| Chain 0    BW correction factor = 10log[(48.38MHz)/(3MHz)] = 16.13dB | | | | | | | |
| Chain 1    BW correction factor = 10log[(49.03MHz)/(3MHz)] = 16.34dB | | | | | | | |
| Conclusion: PASS | | | | | | | |

**5.8G:**

| EUT: WIFI Module | | |
|---|---|---|
| M/N:WAE22-DF01-AR | | |
| Test date: 2013-09-14 | Pressure: 101.3±1.0 kpa | Humidity: 49.4±3.0% |
| Tested by: Kevin_Hu | Test site: RF site | Temperature:20.9±0.6 ℃ |

| Cable loss: 1 dB | | Attenuator loss: 20 dB | | | |
|---|---|---|---|---|---|
| Test Mode | CH | Peak output Power（dBm） | | | Limit (dBm) |
| | | Chain 0 | Chain 1 | Total | |
| 11a | CH149 | 8.18 | 8.56 | N/A | 30 |
| | CH157 | 9.35 | 9.68 | N/A | 30 |
| | CH165 | 8.65 | 9.01 | N/A | 30 |
| 11n HT20 | CH149 | 7.82 | 8.24 | 11.05 | 30 |
| | CH157 | 11.16 | 11.64 | 14.42 | 30 |
| | CH165 | 8.54 | 8.83 | 11.70 | 30 |

| Test Mode | CH | Result | | | | | Limit (dBm) |
|---|---|---|---|---|---|---|---|
| | | Measured power(dBm)/3MHz | | PK Output power (dBm) | | | |
| | | Chain 0 | Chain 1 | Chain 0 | Chain 1 | Total | |
| 11n HT40 | CH151 | -6.49 | -6.27 | 8. 47 | 8.69 | 11.59 | 30 |
| | CH159 | -5.09 | -4.8 | 9. 87 | 10.16 | 13.03 | 30 |
| Chain 0　26dB Bandwidth for 11n HT40:44.89MHz | | | | | | | |
| Chain 1　26dB Bandwidth for 11n HT40:44.87MHz | | | | | | | |
| Chain 0　BW correction factor = 10log[(44.89MHz)/(3MHz)] =14.96 dB | | | | | | | |
| Chain 1　BW correction factor = 10log[(44.87MHz)/(3MHz)] = 14.96dB | | | | | | | |
| Conclusion: PASS | | | | | | | |

 **2.4G**
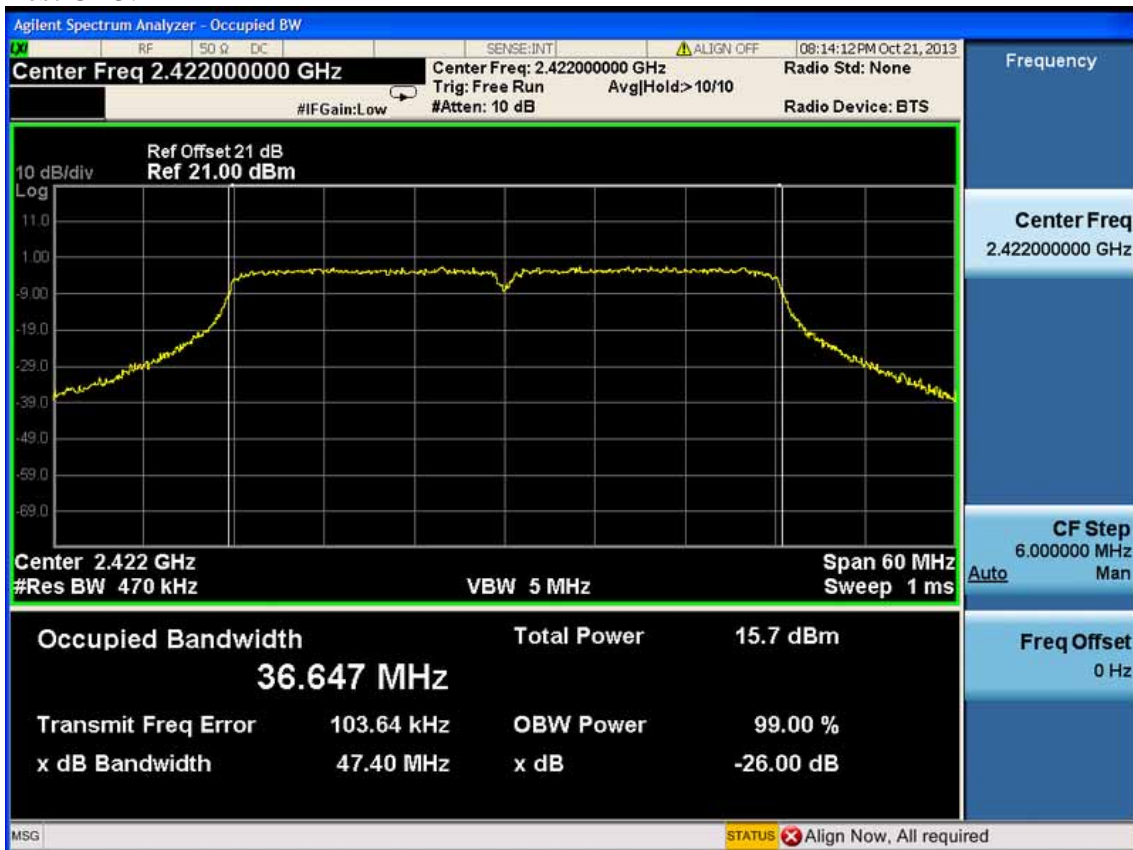**26dB Bandwidth**
**ANT 0**
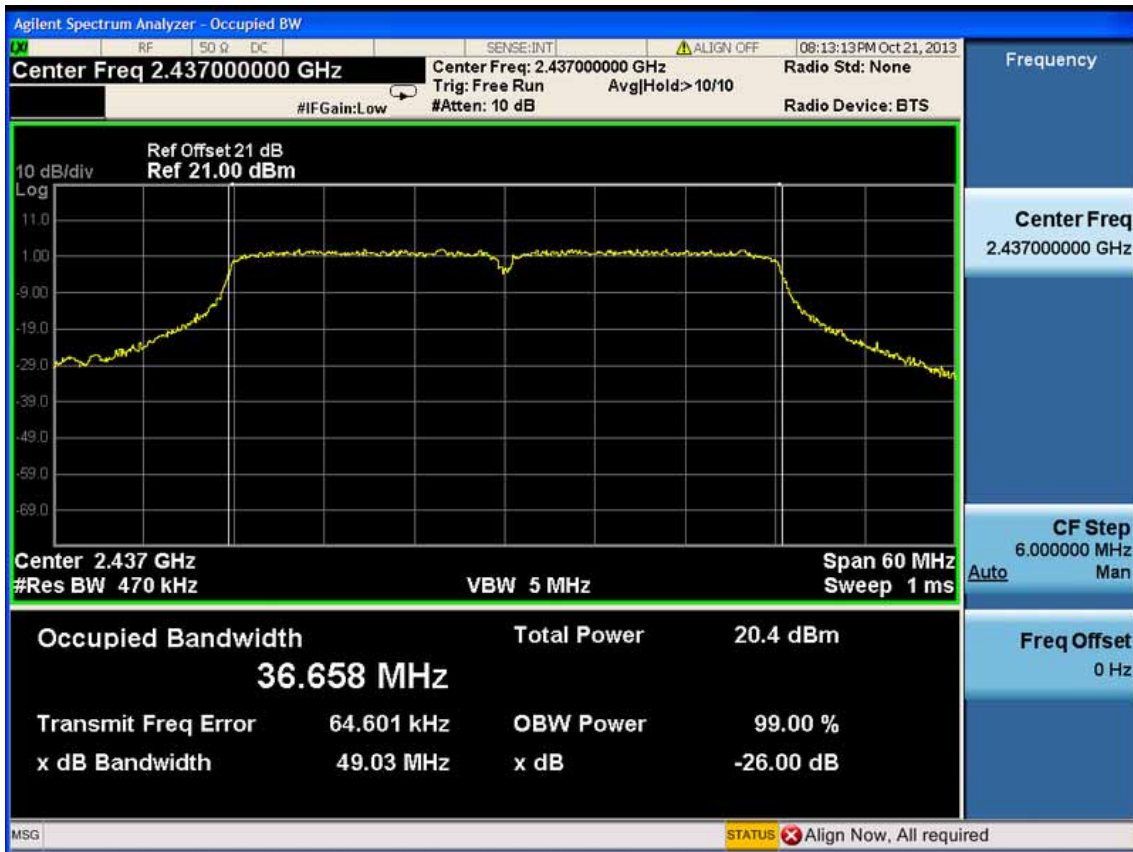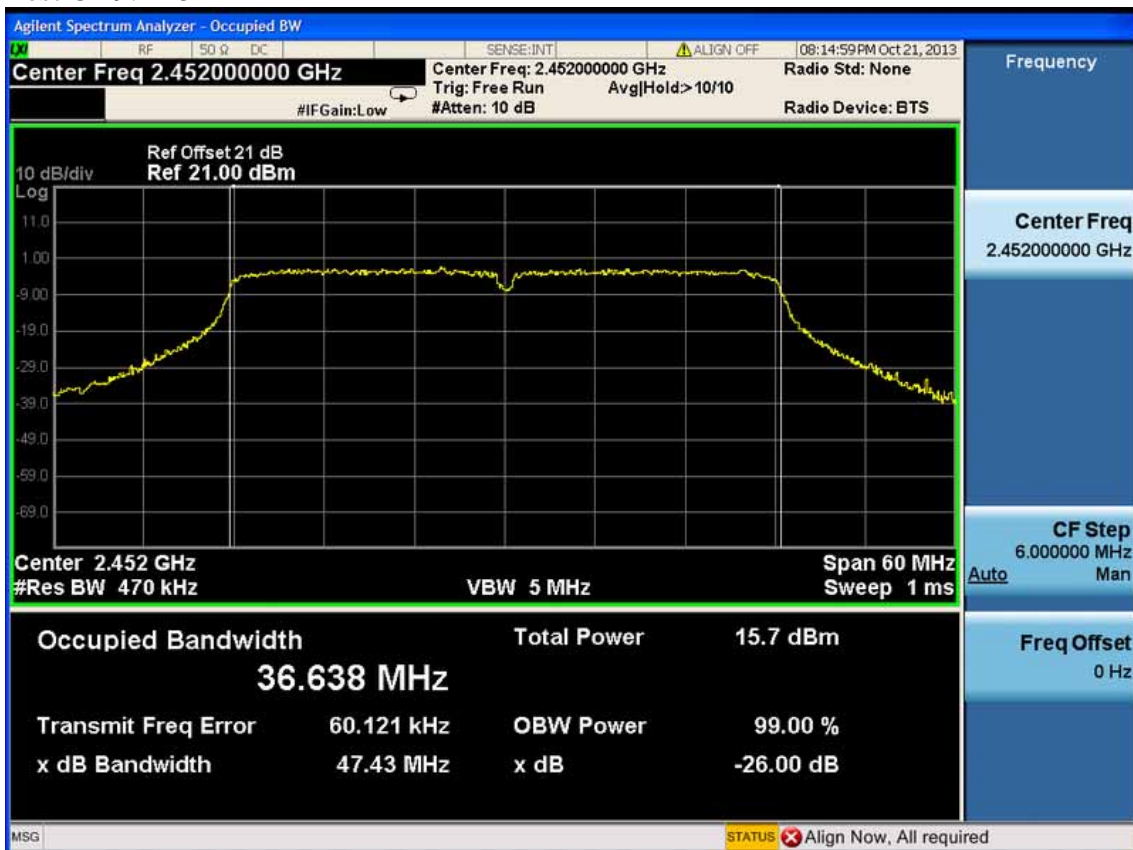Test CH3: 2422MHz
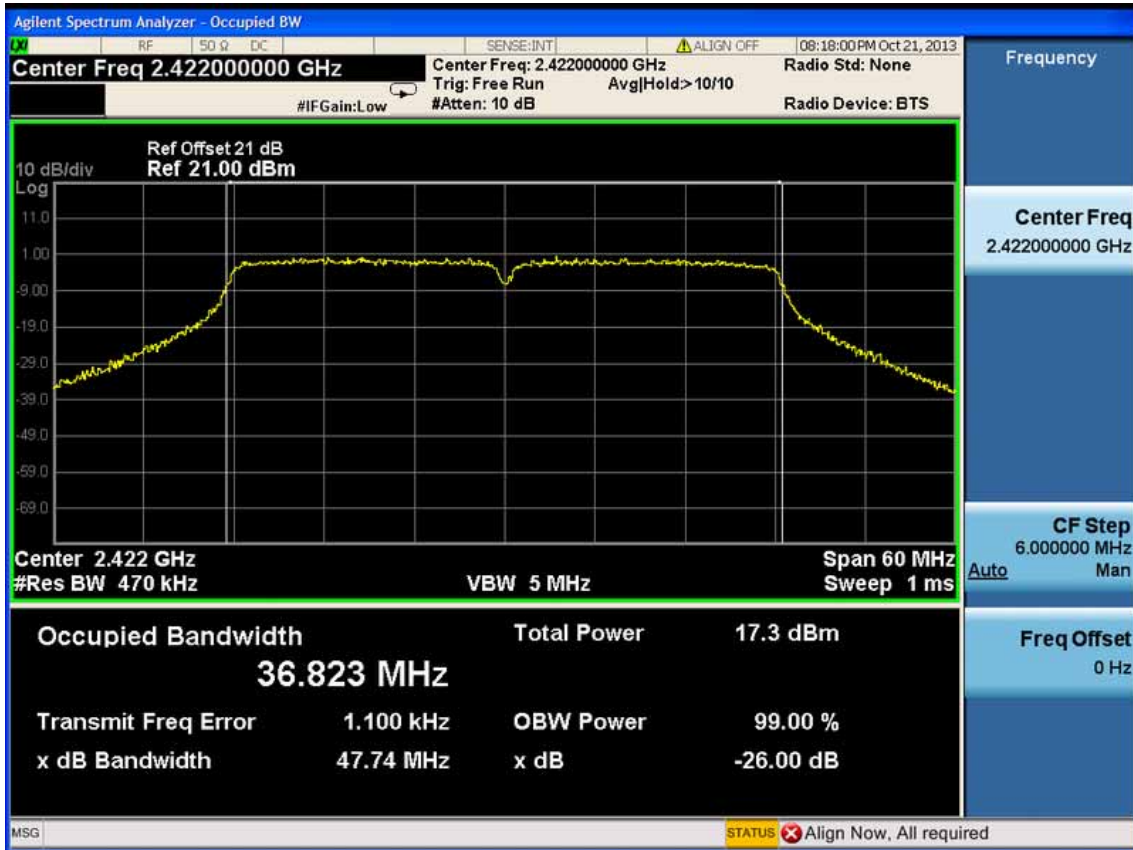


Test CH6: 2437MHz
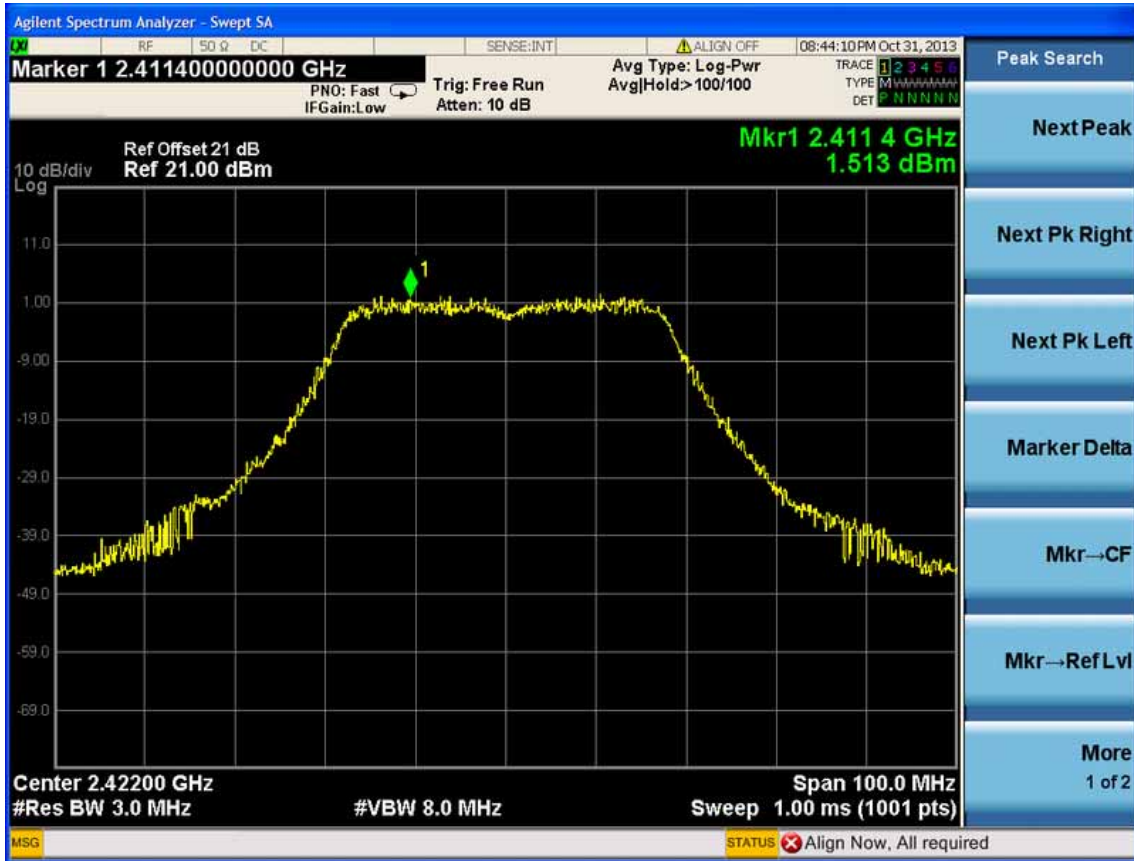
Test CH9: 2452MHz



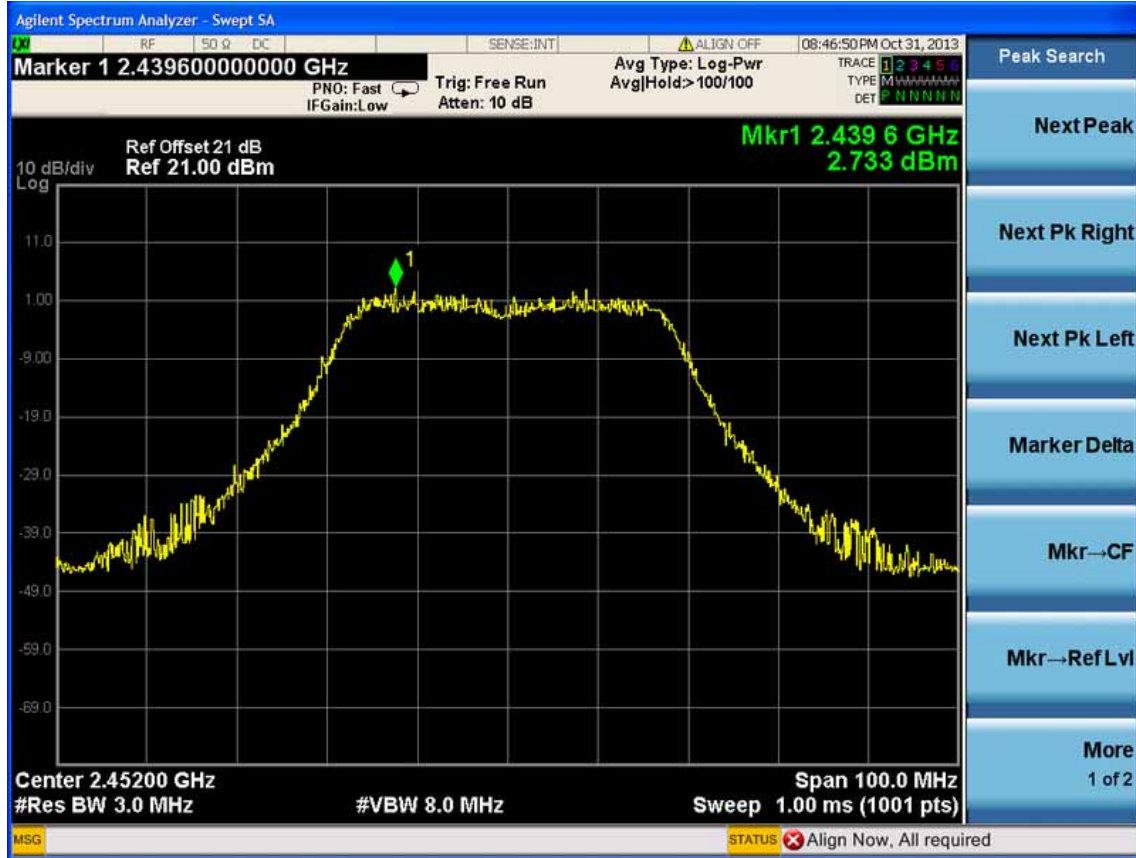**ANT 1**
Test CH3: 2422MHz

Test CH6: 2437MHz



Test CH9: 2452MHz

**AUDIX Technology (Shenzhen) Co., Ltd.**
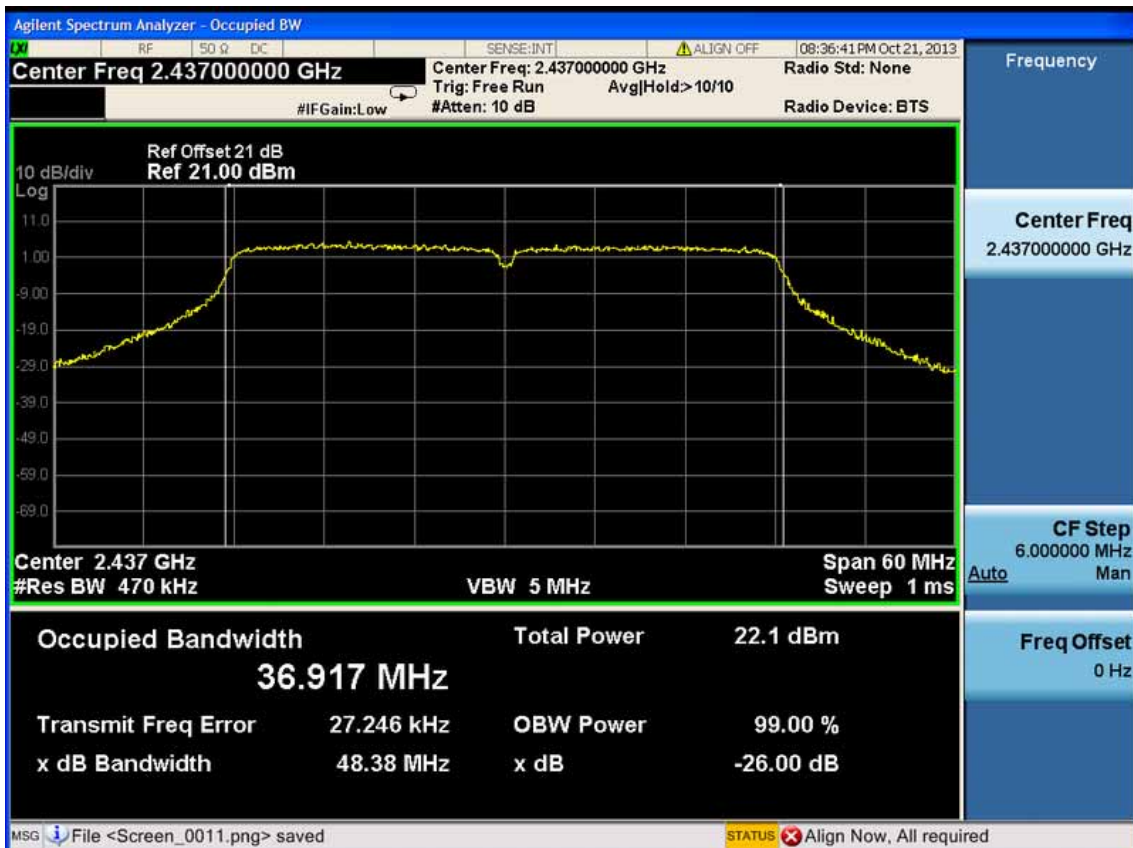
**HT40**
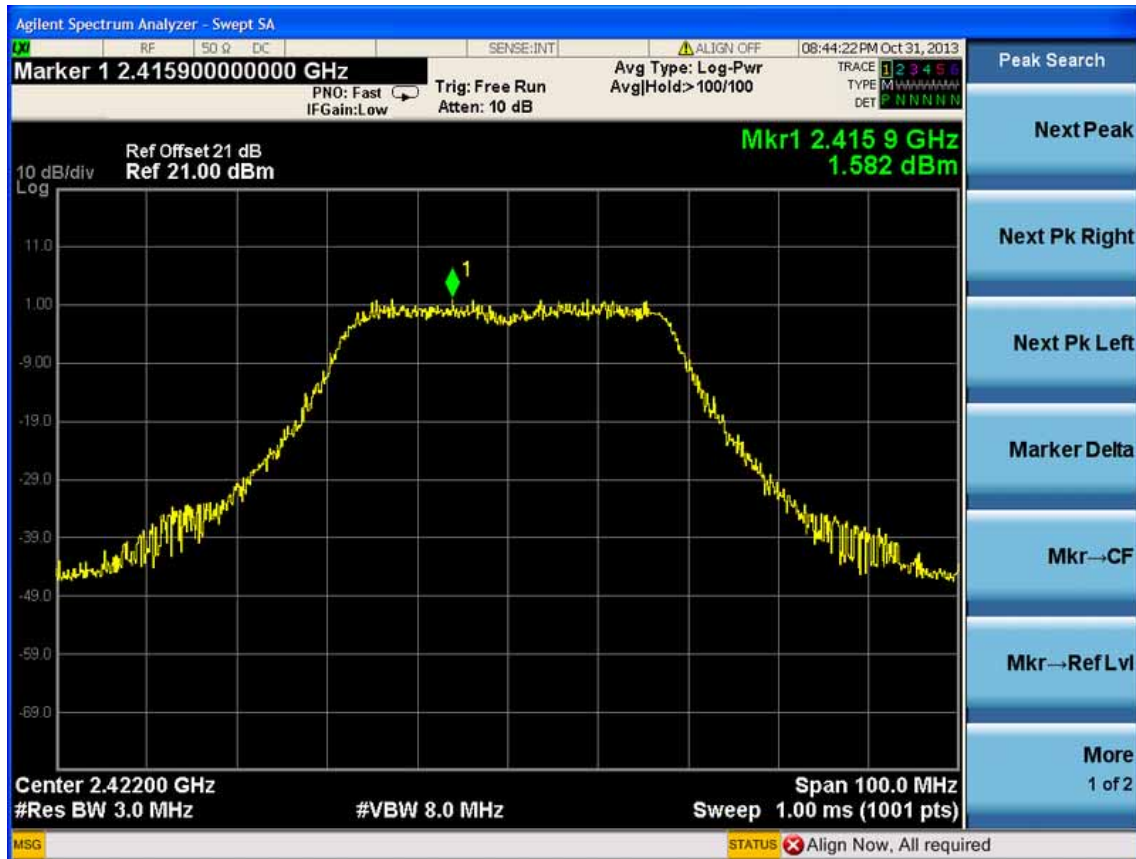**ANT 0**
Test CH3: 2422MHz



Test CH6: 2437MHz

Test CH9: 2452MHz



**ANT 1**

Test CH3: 2422MHz

Test CH6: 2437MHz
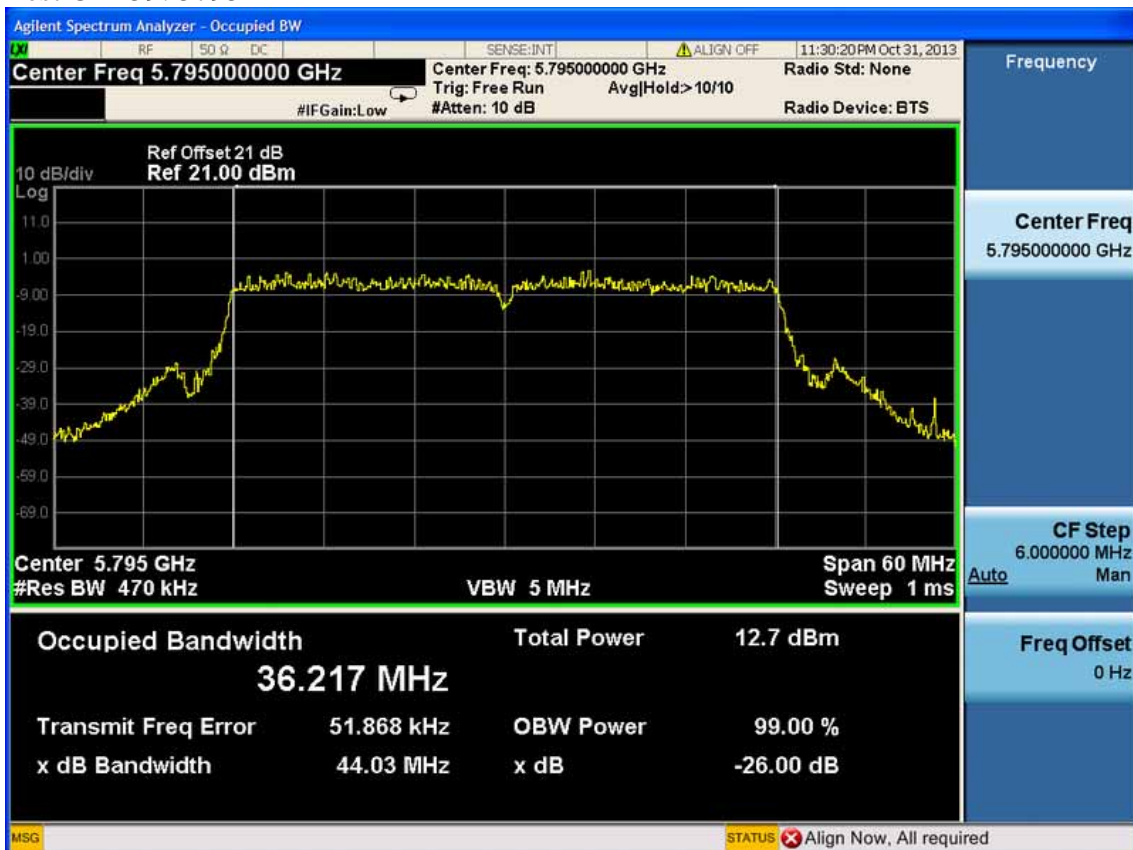


Test CH9: 2452MHz

**5.8G**
**26dB Bandwidth**
**ANT 0**
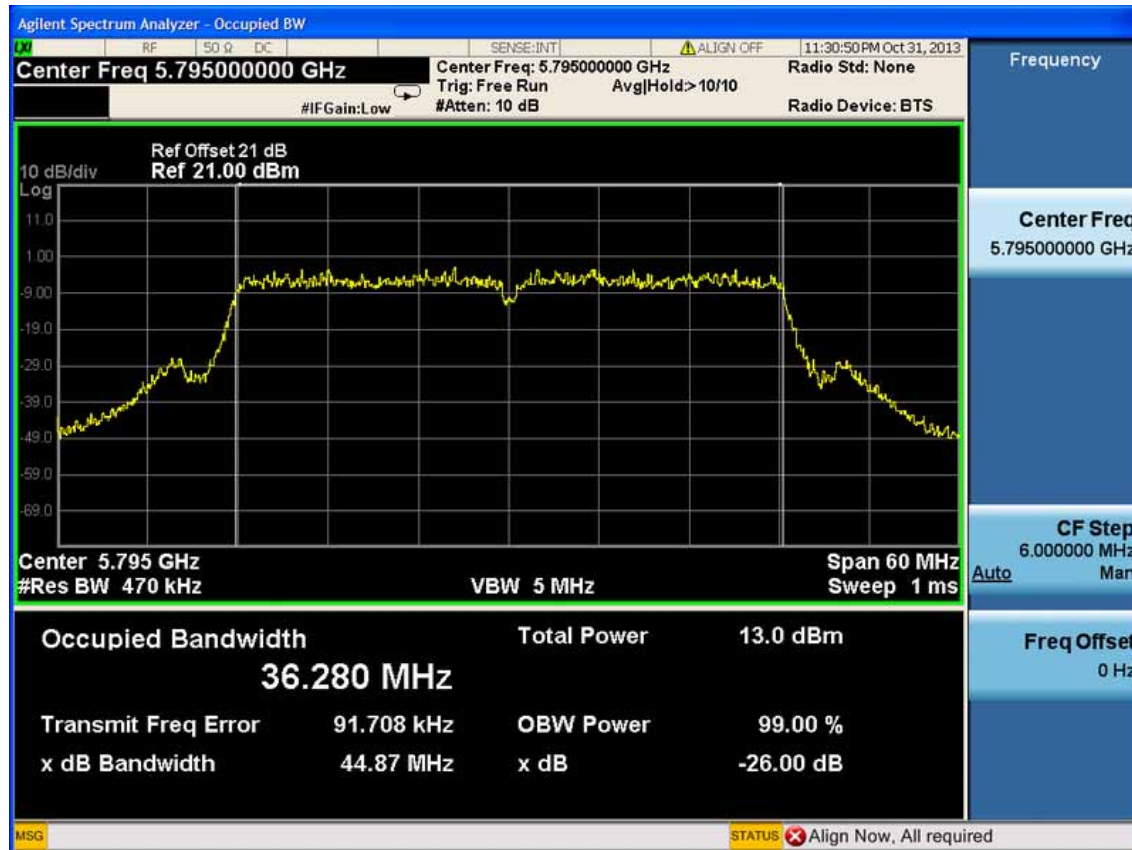Test CH151: 5755MHz
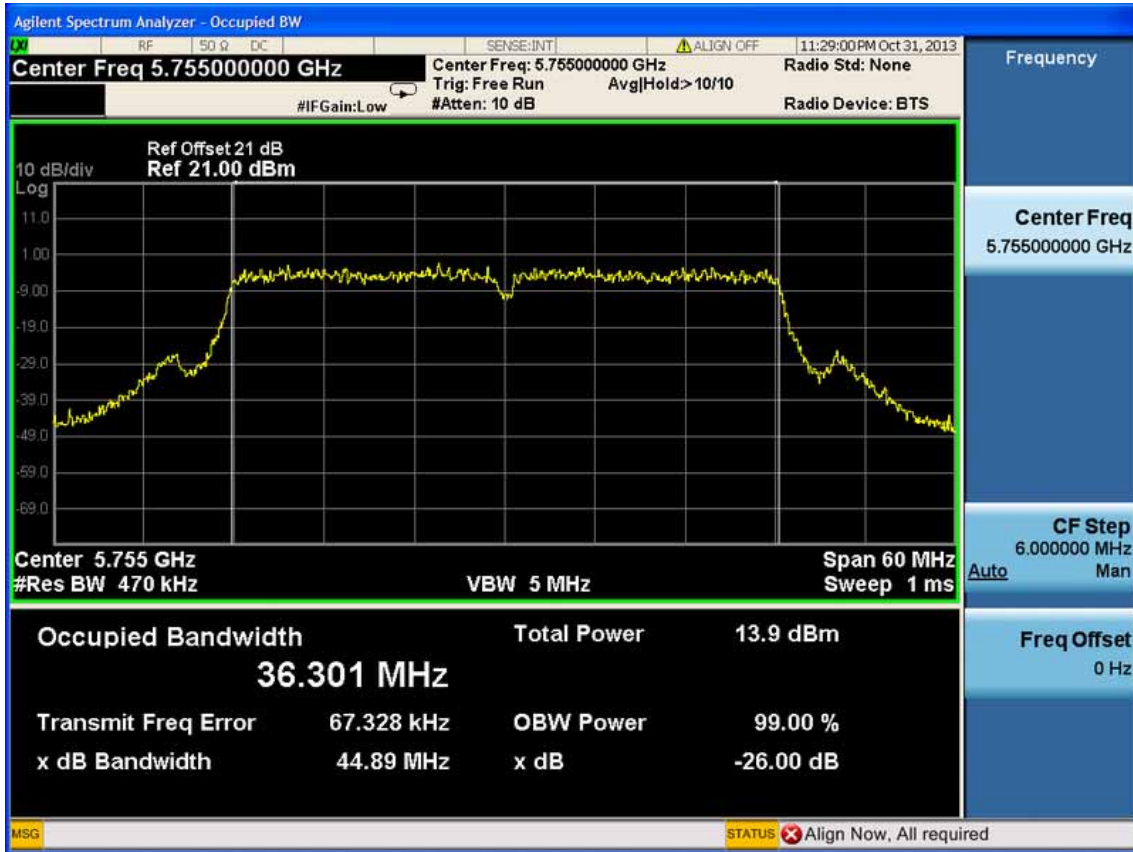


Test CH159: 5795MHz

**ANT 1**
Test CH151: 5755MHz



Test CH159: 5795MHz

**HT40**
**ANT 0**
Test CH151: 5755MHz



Test CH159: 5795MHz

**ANT 1**
Test CH151: 5755MHz



Test CH159: 5795MHz

# 9. POWER SPECTRAL DENSITY TEST

## 9.1. Test Equipment

| Item | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval |
|------|-----------|--------------|-----------|------------|-----------|---------------|
| 1. | PXA Signal Analyzer | Agilent | N9030A | MY51380221 | Oct.31, 12 | 1 Year |
| 2. | Amp | HP | 8449B | 3008A08495 | May.08, 13 | 1 Year |
| 3. | Horn Antenna | EMCO | 3115 | 9510-4580 | May.28, 13 | 1 Year |
| 4. | HF Cable | Hubersuhne | Sucoflex104 | - | May.08, 13 | 1 Year |

## 9.2. Limit

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3kHz band during any time interval of continuous transmission.

## 9.3. Test Procedure

1. Connected the EUT's antenna port to spectrum analyzer device by 20dB attenuator.

2. Set the test frequency as center frequency,Set RBW=3KHz,VBW=10KHz,Span large enough capture the entire frequency,Read out maximum peak leval frequency

3. Set the frequency read from produce 2 as center frequency,then set the span= 300KHz, Sweep time=Span/RBW,Then Max hold,read out each mode and each chain's Power density.

Note: The cable loss and attenuator loss were offset into measure device as an amplitude

### 9.4.Test Results

**2.4G:**

| EUT:WIFI Module | | |
|---|---|---|
| M/N:WAE22-DF01-AR | | |
| Test date:2013-09-13 | Pressure: 101.2±1.0 kpa | Humidity: 52.4±3.0% |
| Tested by: Leo-Li | Test site: RF Site | Temperature: 23.4±0.6℃ |

| Cable loss: 1 dB | | Attenuator loss: 20 dB | | | |
|---|---|---|---|---|---|
| Test Mode | CH | Power density（dBm/3KHz） | | | Limit (dBm/3KHz) |
| | | ANT 0 | ANT 1 | Total | |
| 11b | CH1 | -8.596 | -9.096 | N/A | 8 |
| | CH6 | -9.846 | -12.397 | N/A | 8 |
| | CH11 | -10.262 | -9.812 | N/A | 8 |
| 11g | CH1 | -11.358 | -11.117 | N/A | 8 |
| | CH6 | -10.219 | -10.006 | N/A | 8 |
| | CH11 | -11.644 | -13.305 | N/A | 8 |

11n Mode

| Test Mode | CH | Power density（dBm/3KHz） | | | Limit (dBm/3KHz) |
|---|---|---|---|---|---|
| | | ANT 0 | ANT 1 | Total | |
| 11n HT20 | CH1 | -12.919 | -12.489 | -9.69 | 8 |
| | CH6 | -8.372 | -9.836 | -6.03 | 8 |
| | CH11 | -12.509 | -12.844 | -9.66 | 8 |
| 11n HT40 | CH1 | -16.423 | -13.930 | -11.99 | 8 |
| | CH4 | -13.981 | -16.531 | -12.06 | 8 |
| | CH7 | -15.849 | -14.359 | -12.03 | 8 |
| Conclusion：PASS | | | | | |

**5.8G:**

| EUT：WIFI Module | | |
|---|---|---|
| M/N：WAE22-DF01-AR | | |
| Test date:2013-09-15 | Pressure:101.1±1.0kpa | Humidity:51.7±3.0% |
| Tested by:Kevin_Hu | Test site:RF Site | Temperature:21.6±0.6℃ |

| Cable loss: 1 dB | | Attenuator loss:   20 dB | | | |
|---|---|---|---|---|---|
| Test Mode | CH | Power density（dBm/3KHz） | | | Limit (dBm/3KHz) |
| | | ANT A | ANT B | Total | |
| 11a | CH149 | −17.04 | −19.782 | N/A | 8 |
| | CH157 | −17.804 | −21.033 | N/A | 8 |
| | CH165 | −16.497 | −20.613 | N/A | 8 |
| 11n HT20 | CH149 | −18.702 | −18.311 | −15.49 | 8 |
| | CH157 | −19.307 | −18.706 | −15.99 | 8 |
| | CH165 | −18.145 | −20.613 | −16.2 | 8 |
| 11n HT40 | CH151 | −23.343 | −21.145 | −19.1 | 8 |
| | CH159 | −21.62 | −23.625 | −19.5 | 8 |
| Conclusion：PASS | | | | | |

**2.4G:**
**Chain 0:**
Test Mode: IEEE 802.11b TX
Test CH1: 2412MHz
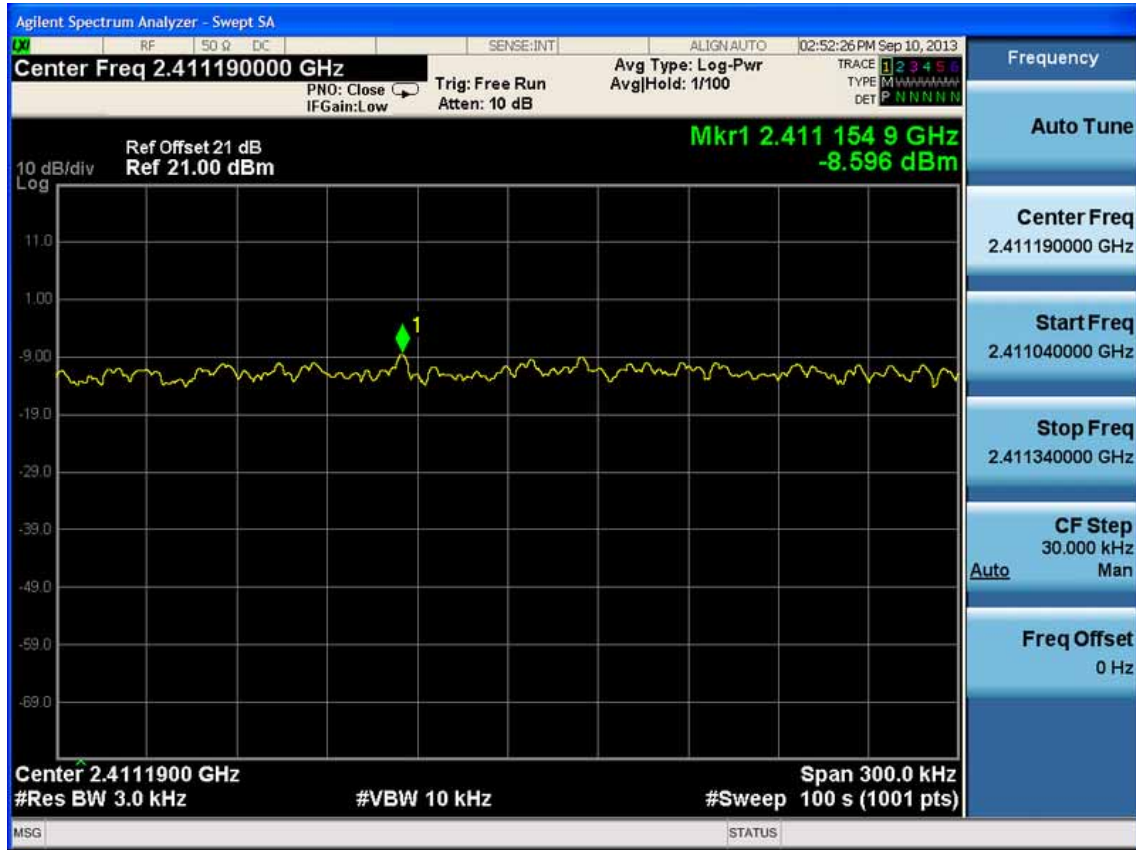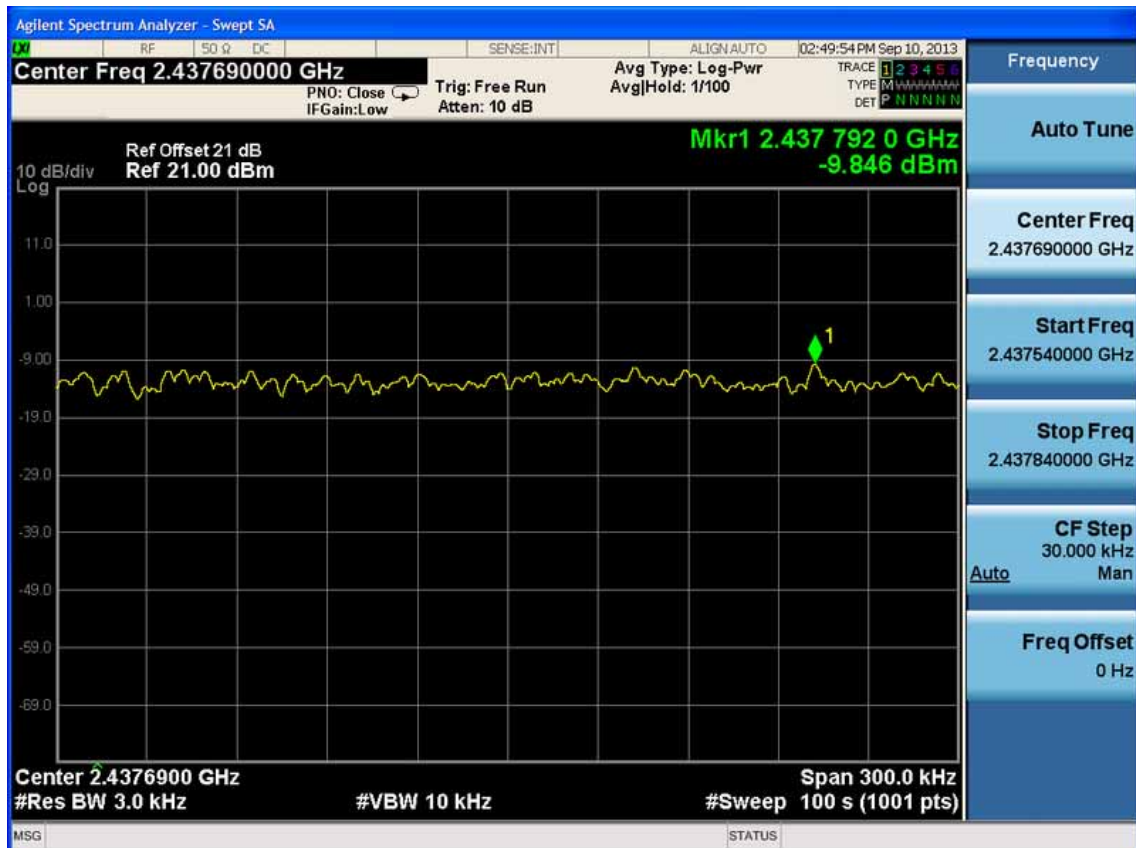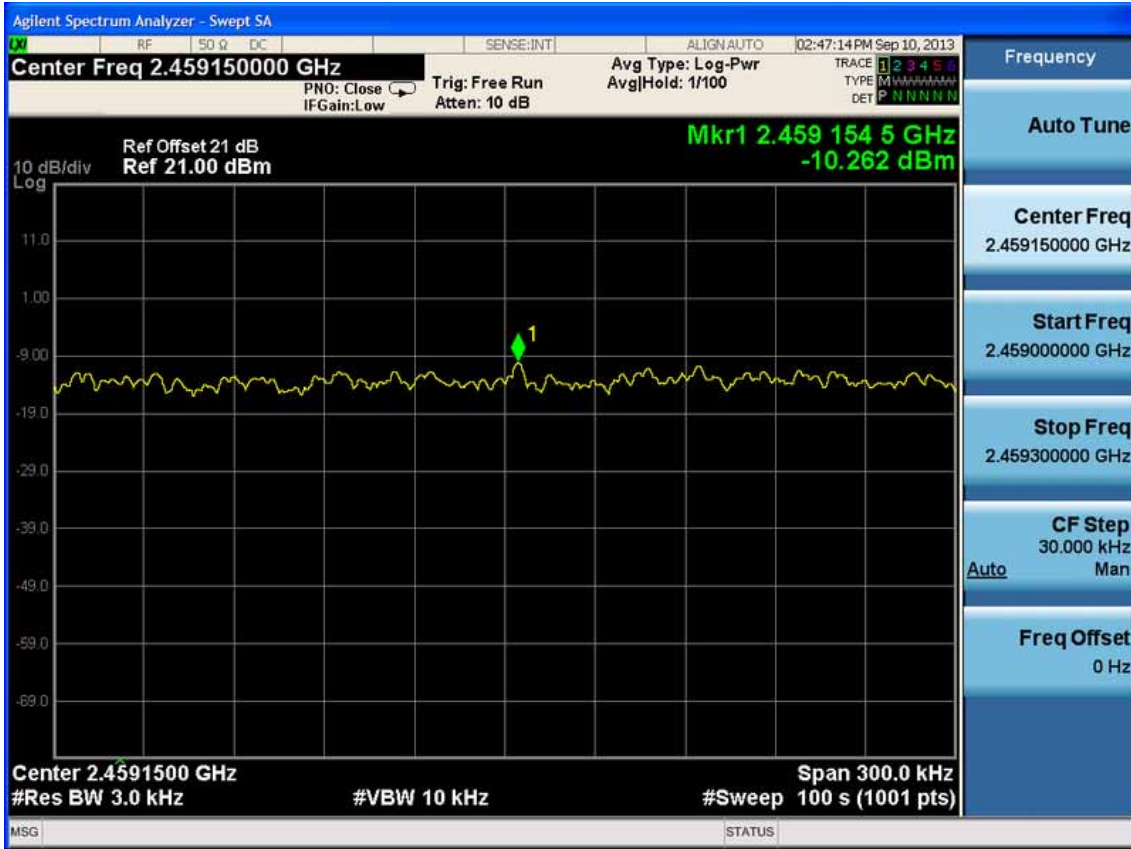
Test CH6: 2437MHz

Test CH11: 2462MHz



Test Mode: IEEE 802.11g TX
Test CH1: 2412MHz

Test CH6: 2437MHz
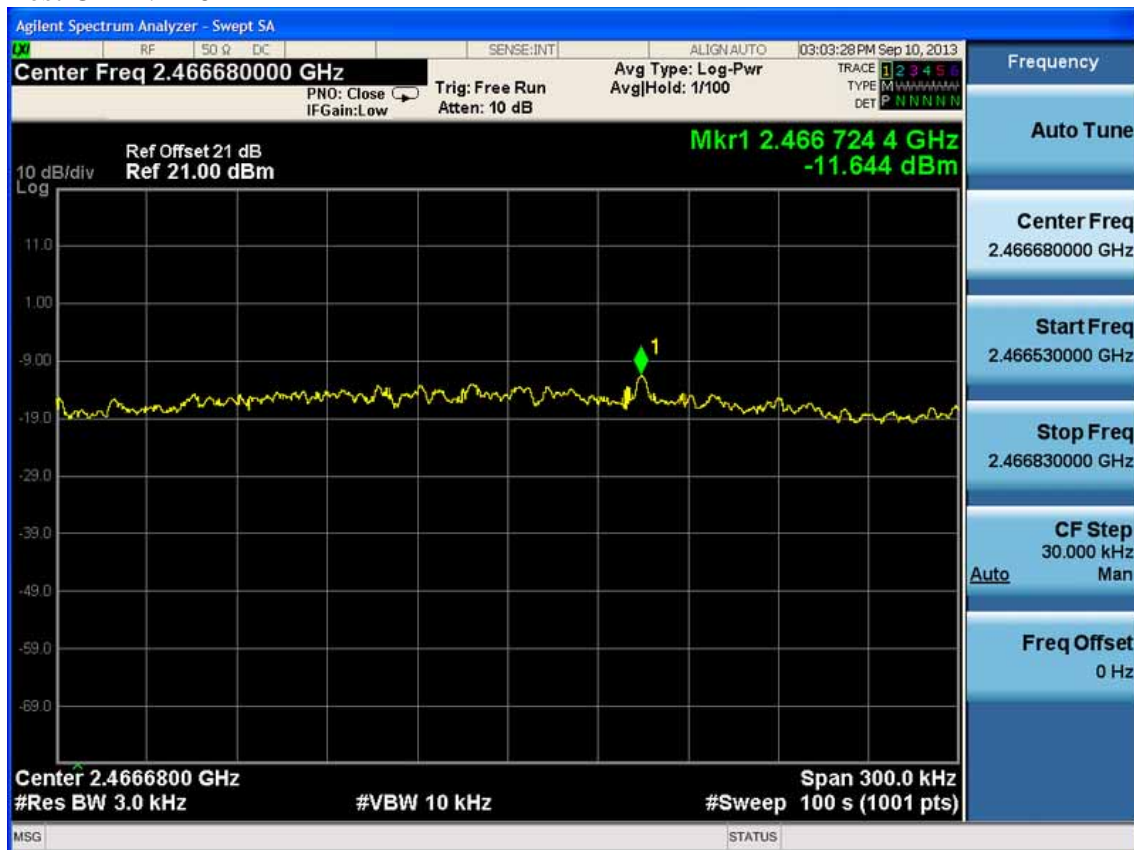


Test CH11: 2462MHz

Test Mode: IEEE 802.11n HT20 TX
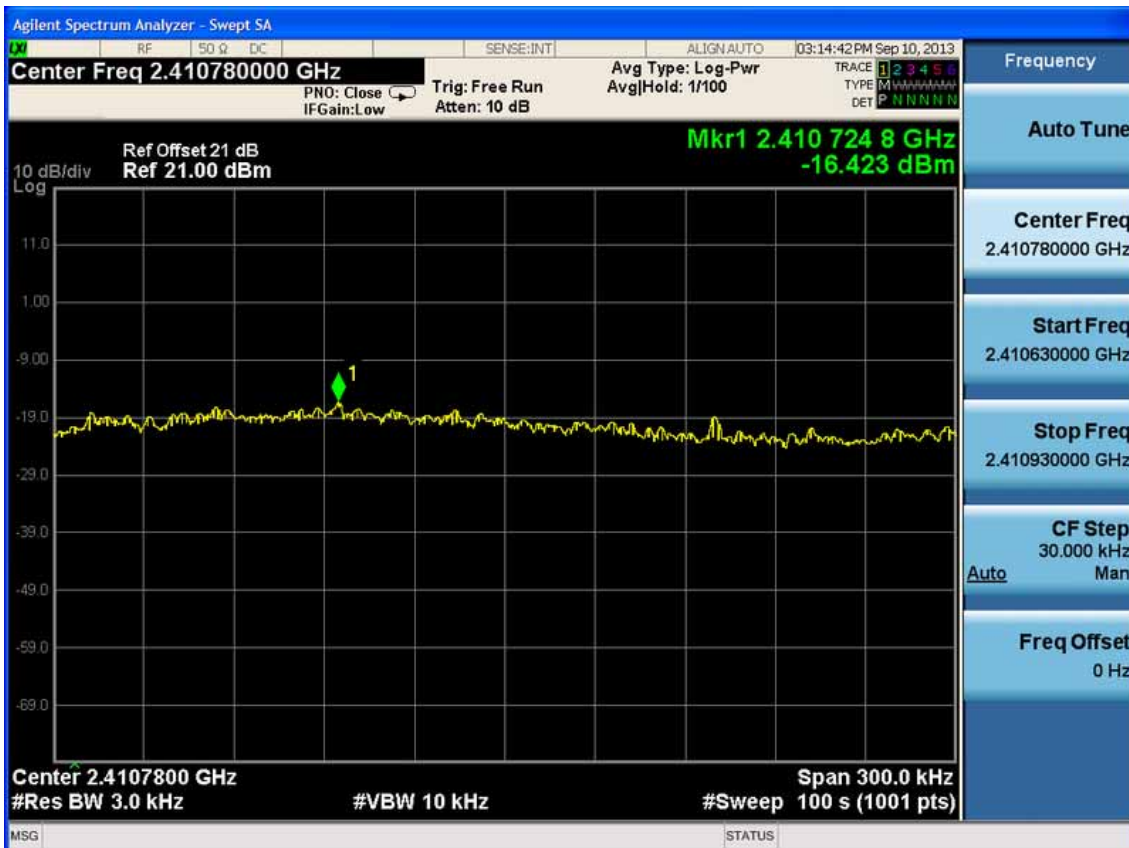Test CH1: 2412MHz
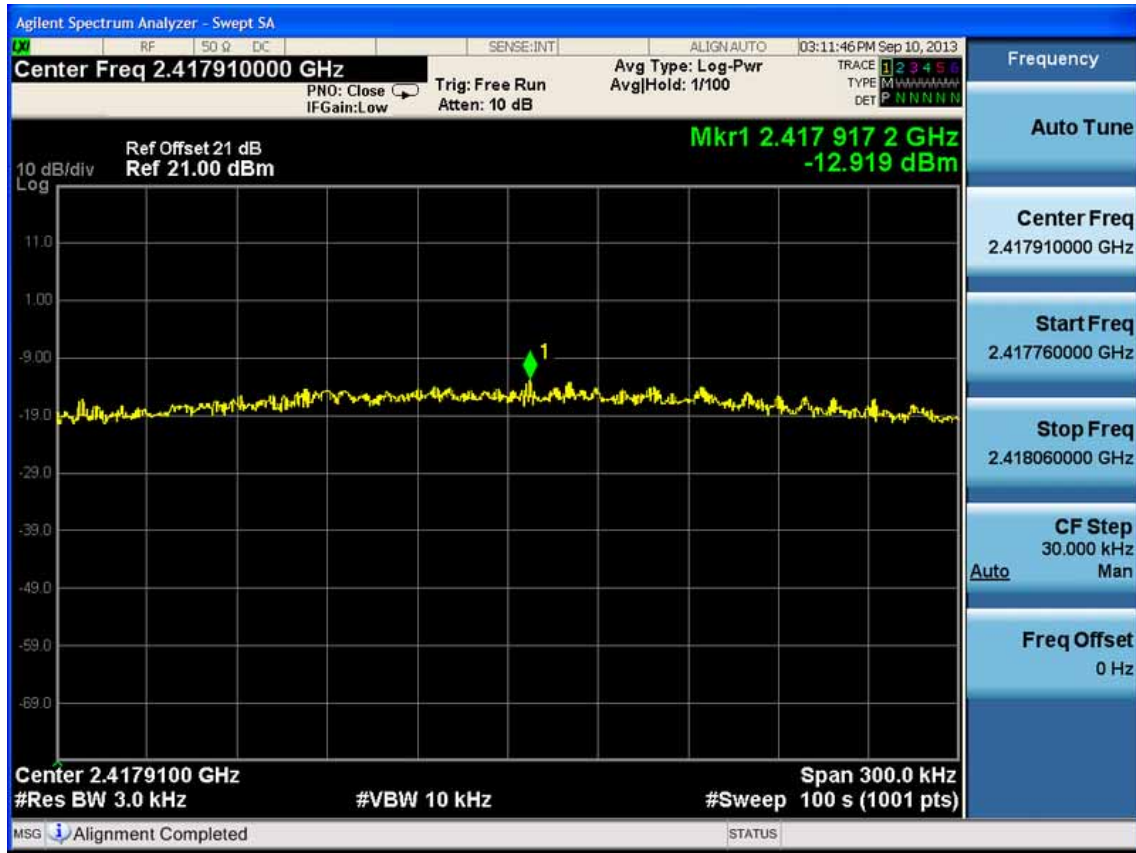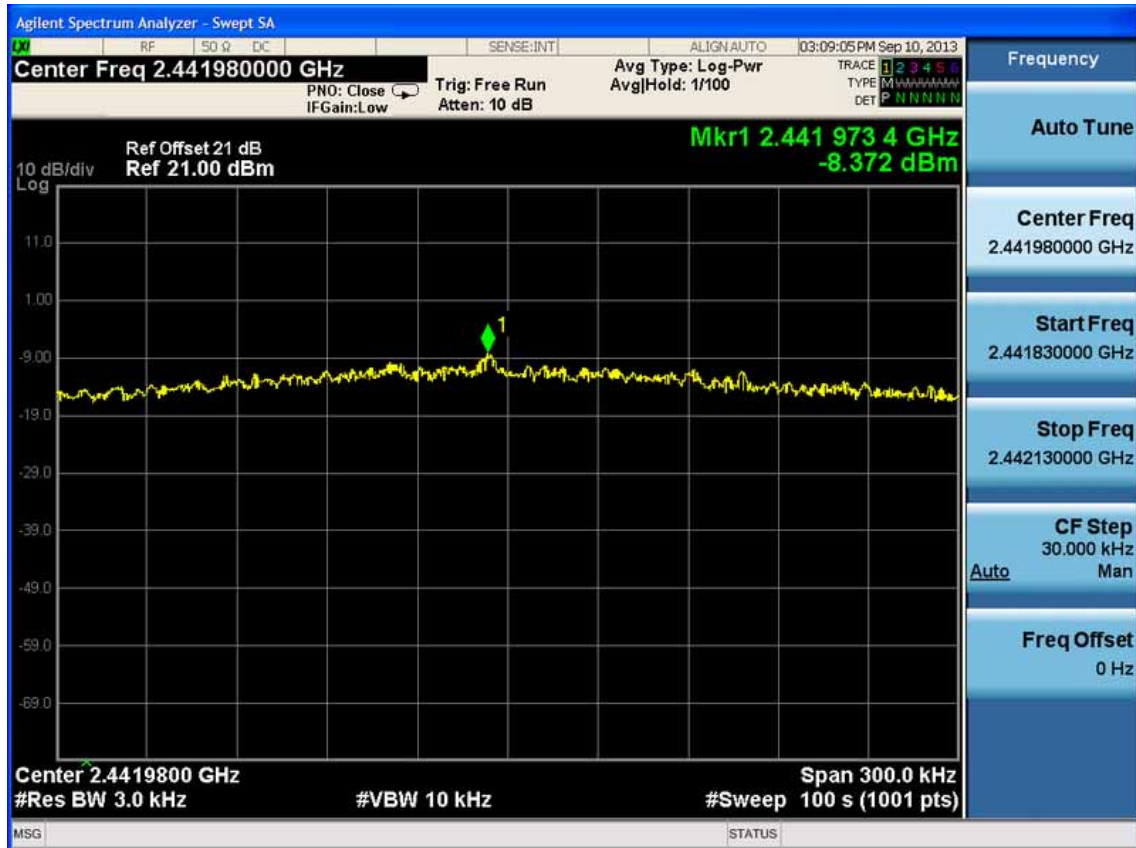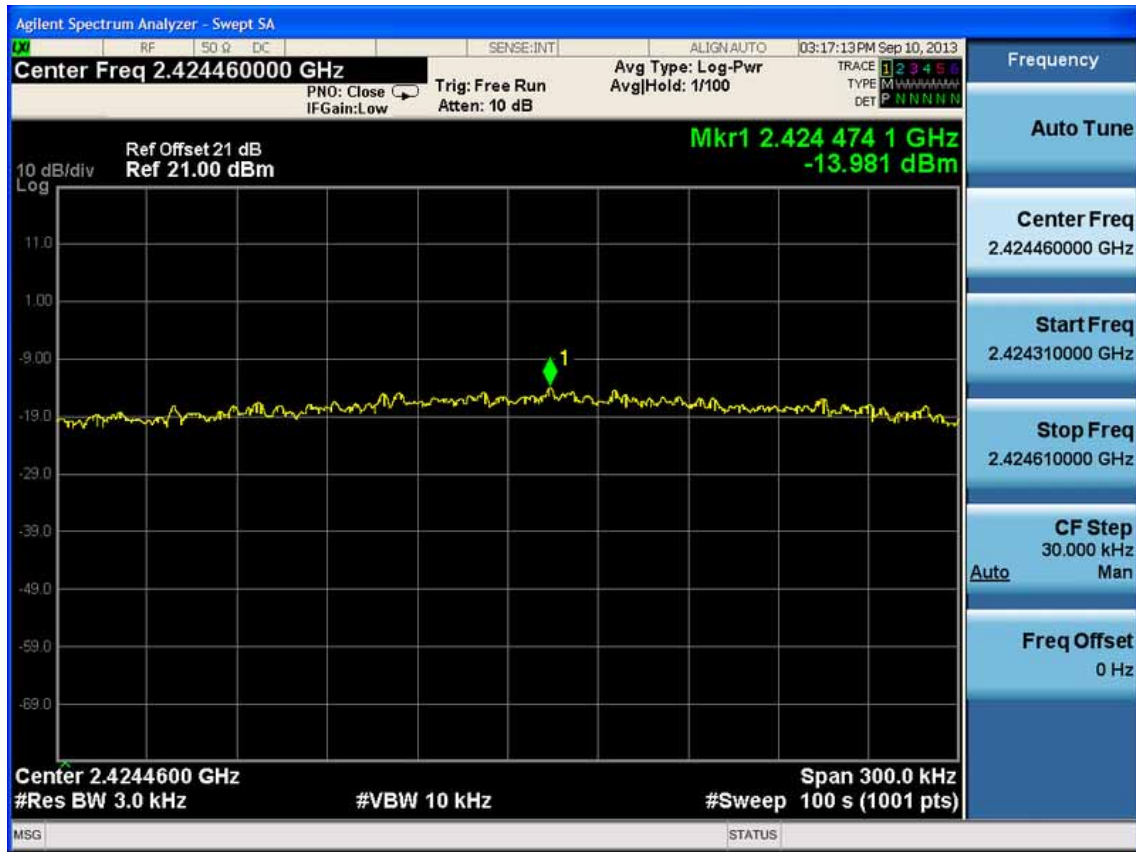


Test CH6: 2437MHz

Test CH11: 2462MHz



Test Mode: IEEE 802.11n HT40 TX
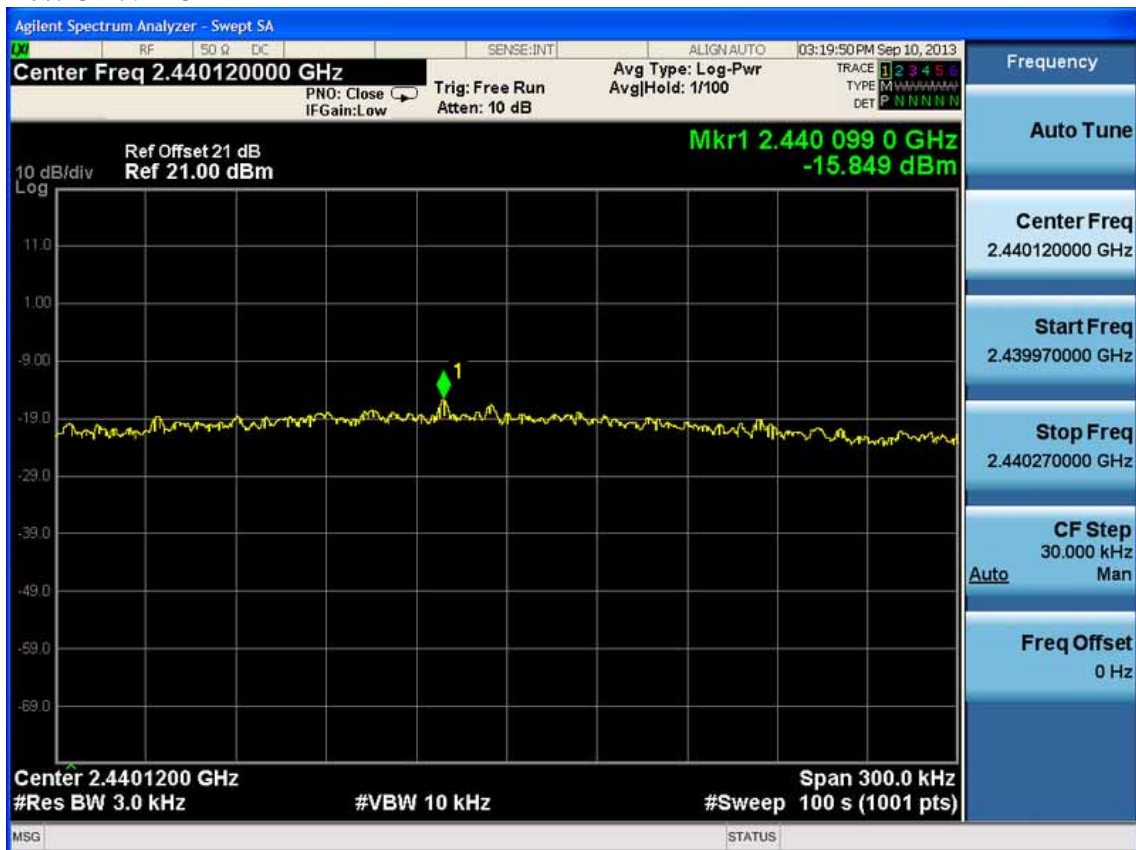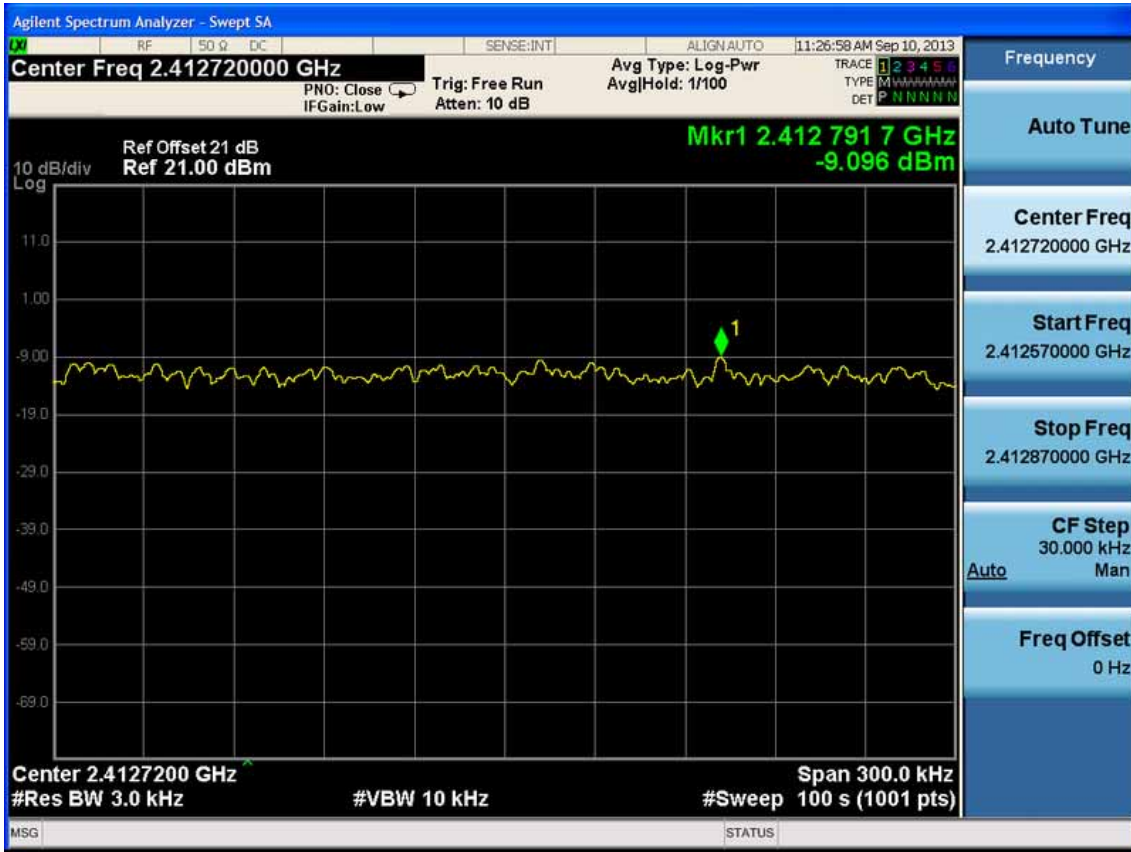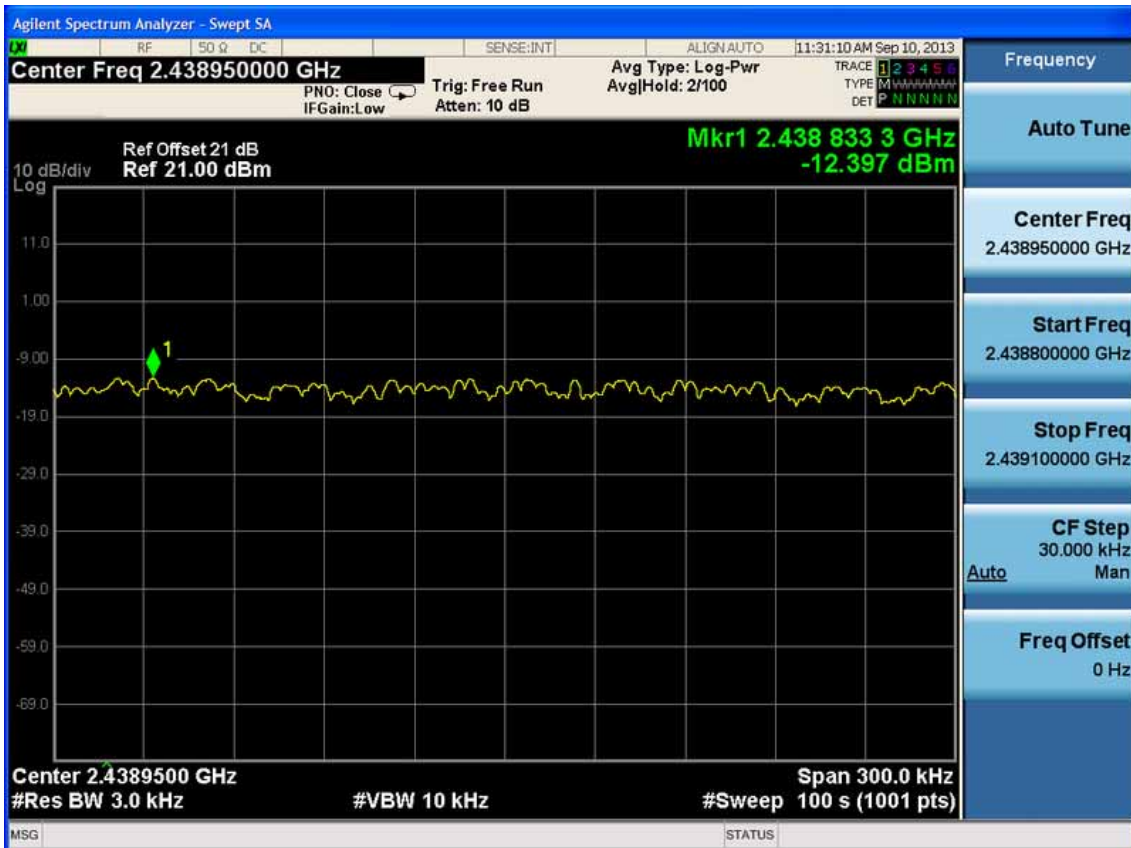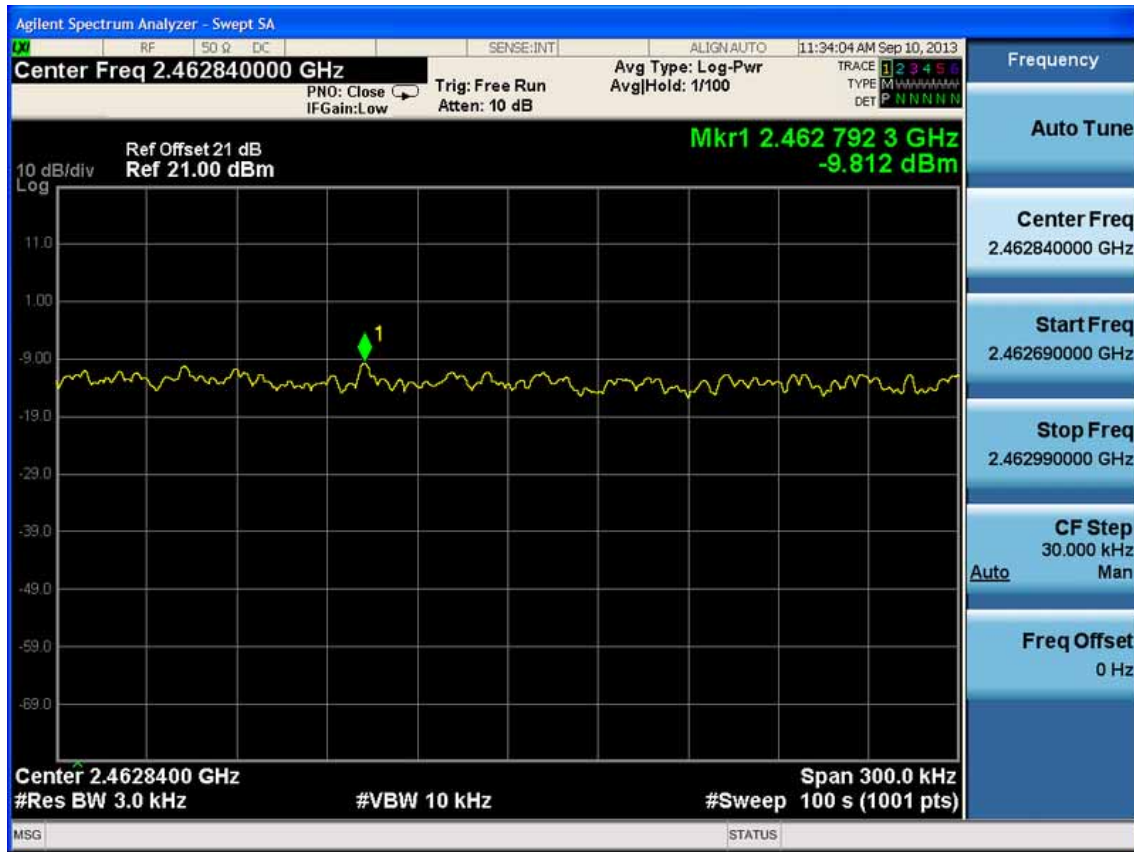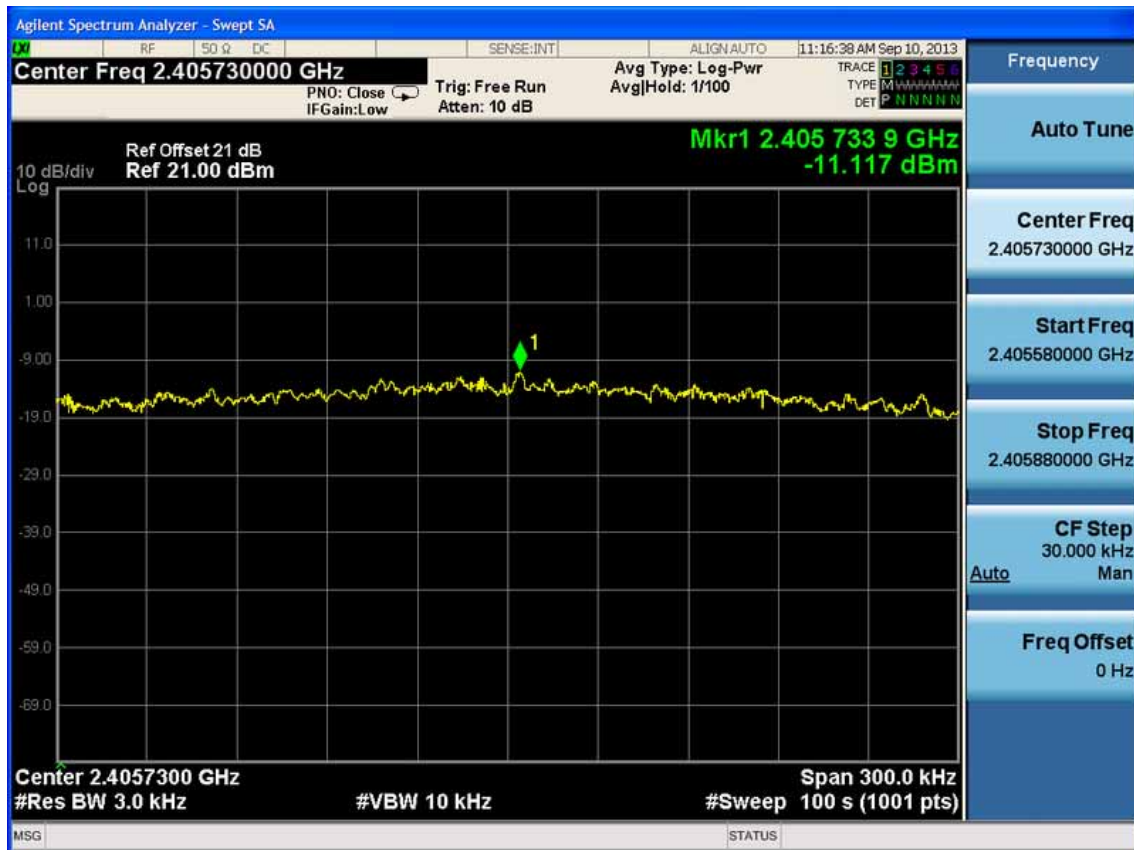Test CH1: 2422MHz

Test CH4: 2437MHz



Test CH7: 2452MHz

**Chain 1:**
Test Mode: IEEE 802.11b TX
Test CH1: 2412MHz
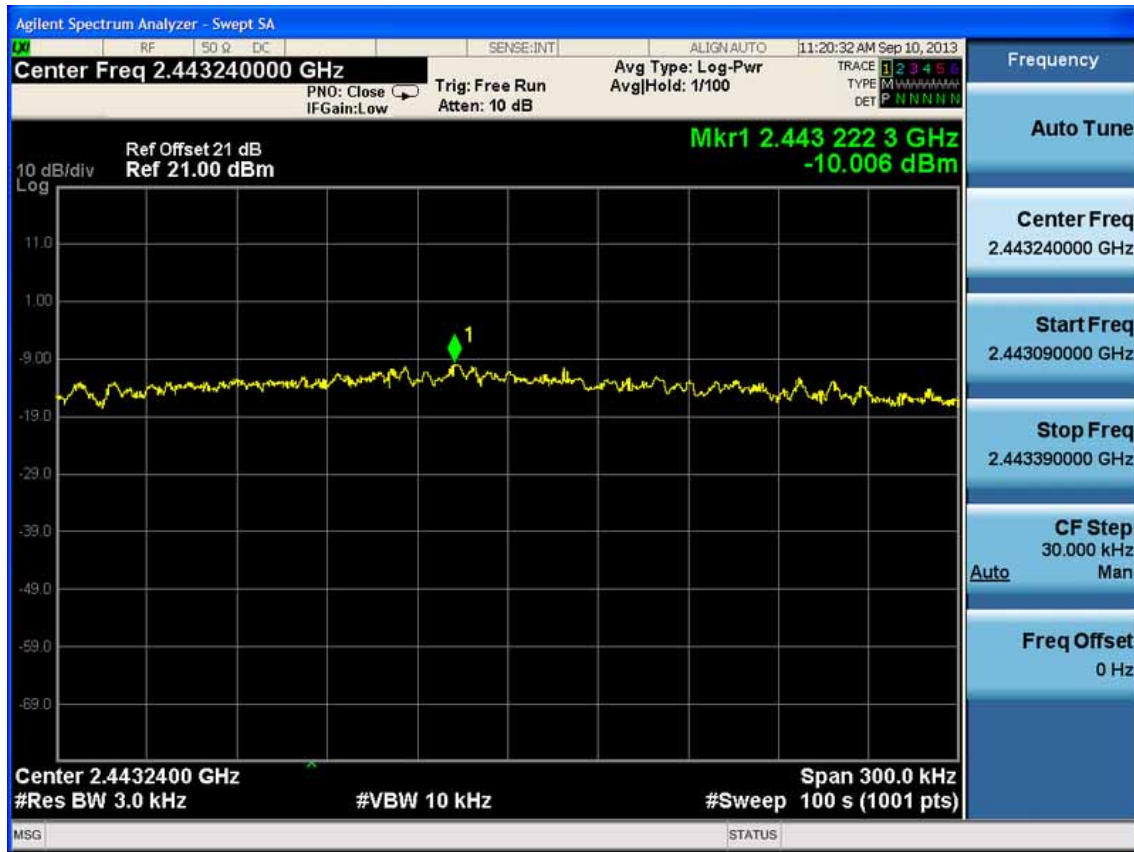


Test CH6: 2437MHz

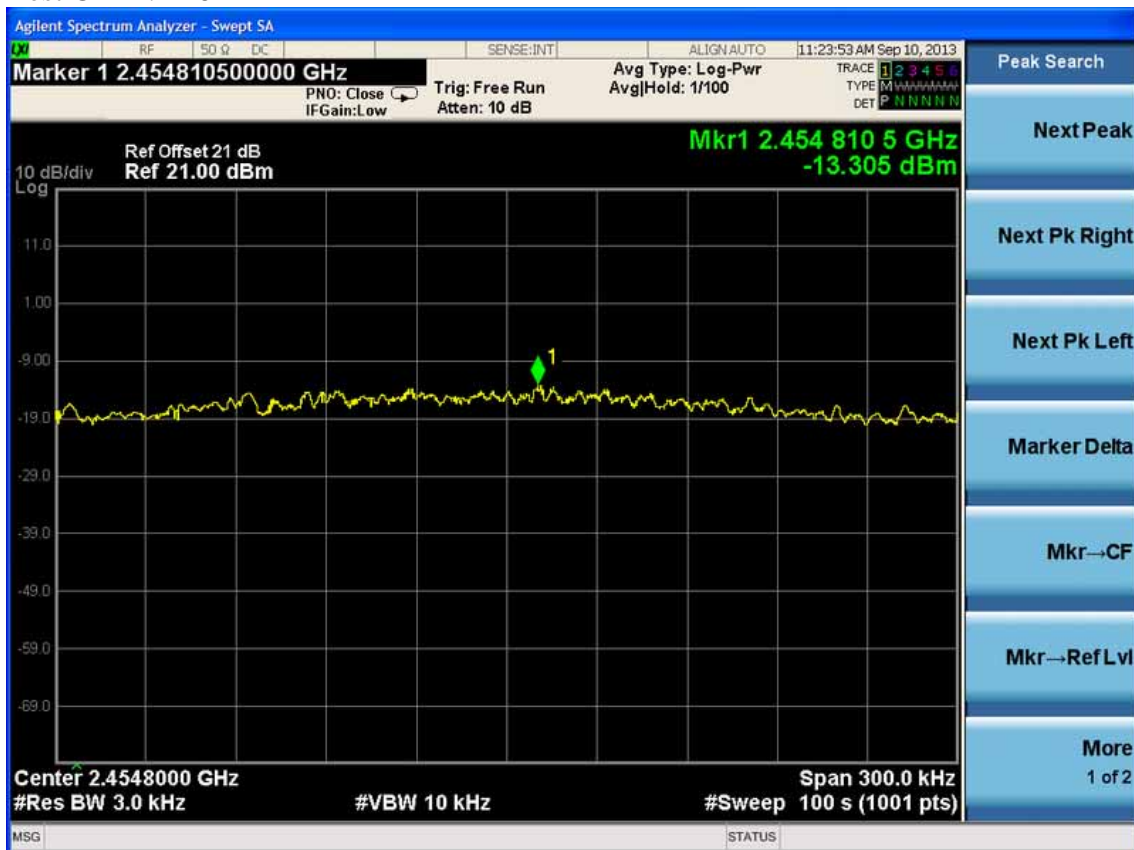Test CH11: 2462MHz



Test Mode: IEEE 802.11g TX
Test CH1: 2412MHz

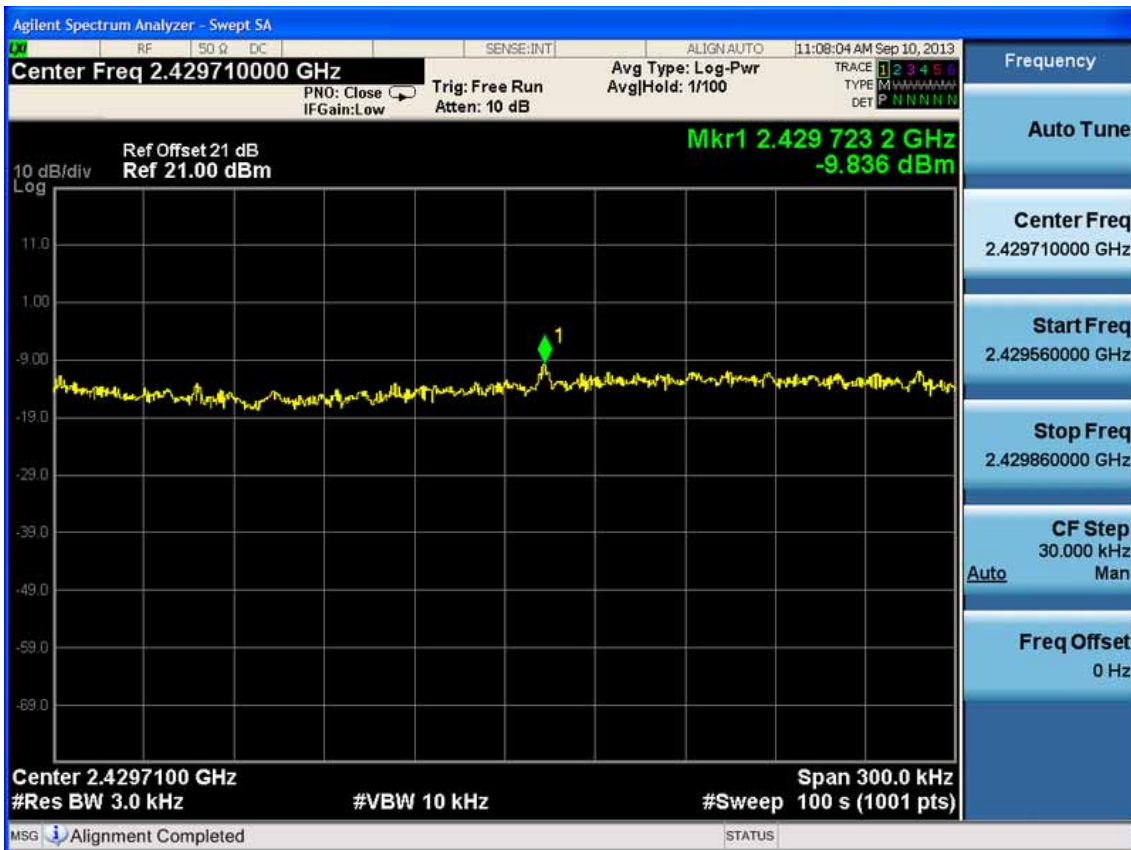Test CH6: 2437MHz



Test CH11: 2462MHz

Test Mode: IEEE 802.11n HT20 TX
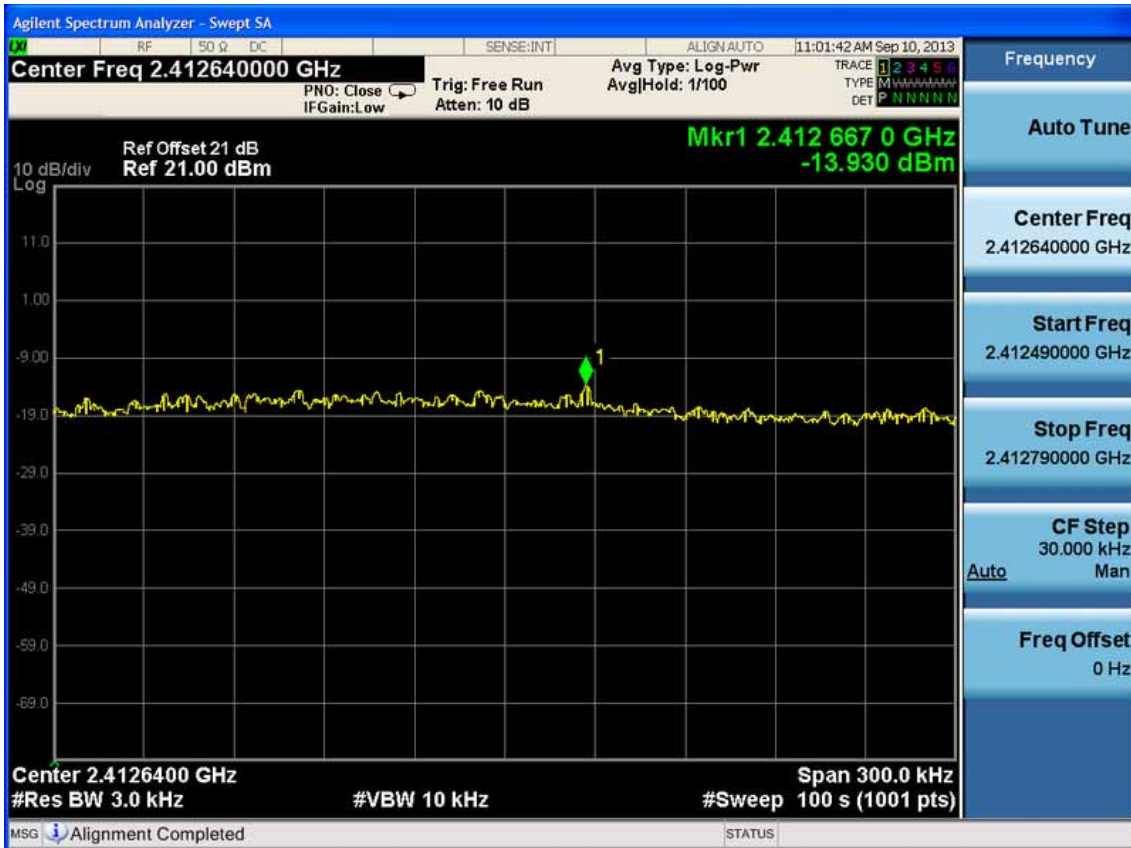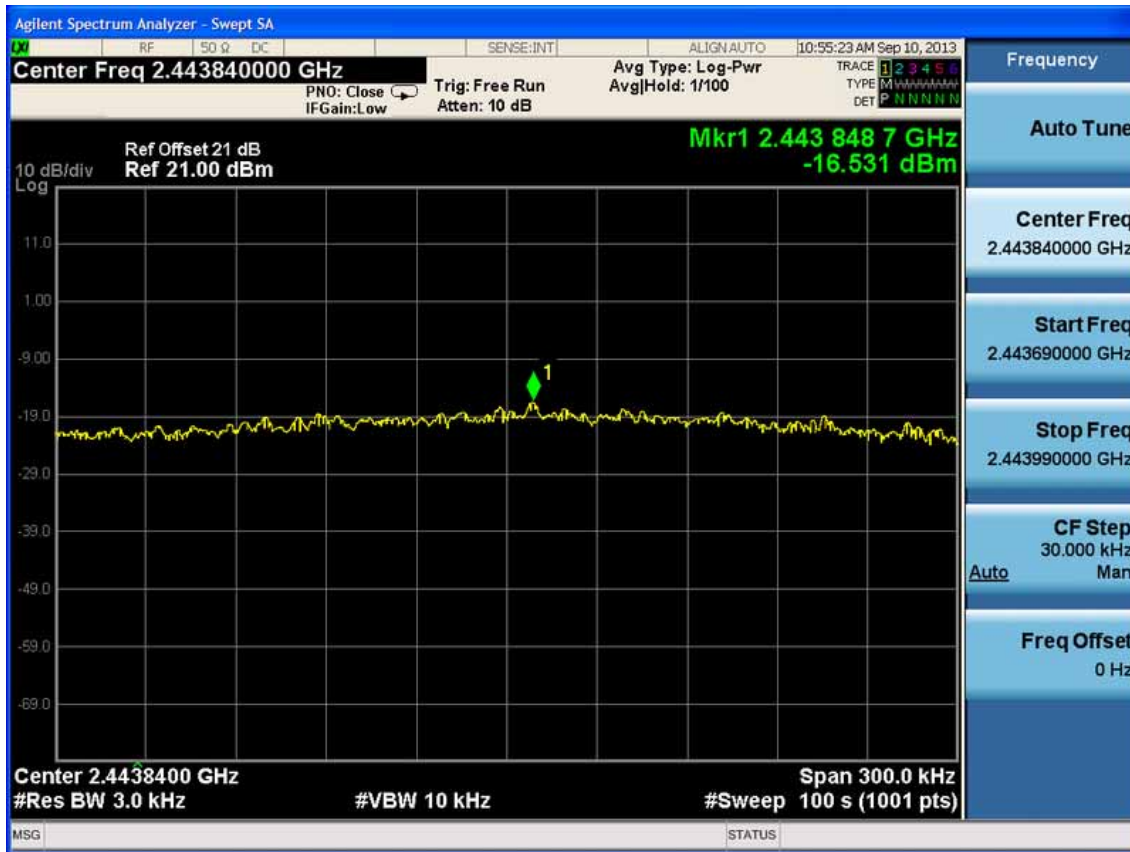Test CH1: 2412MHz



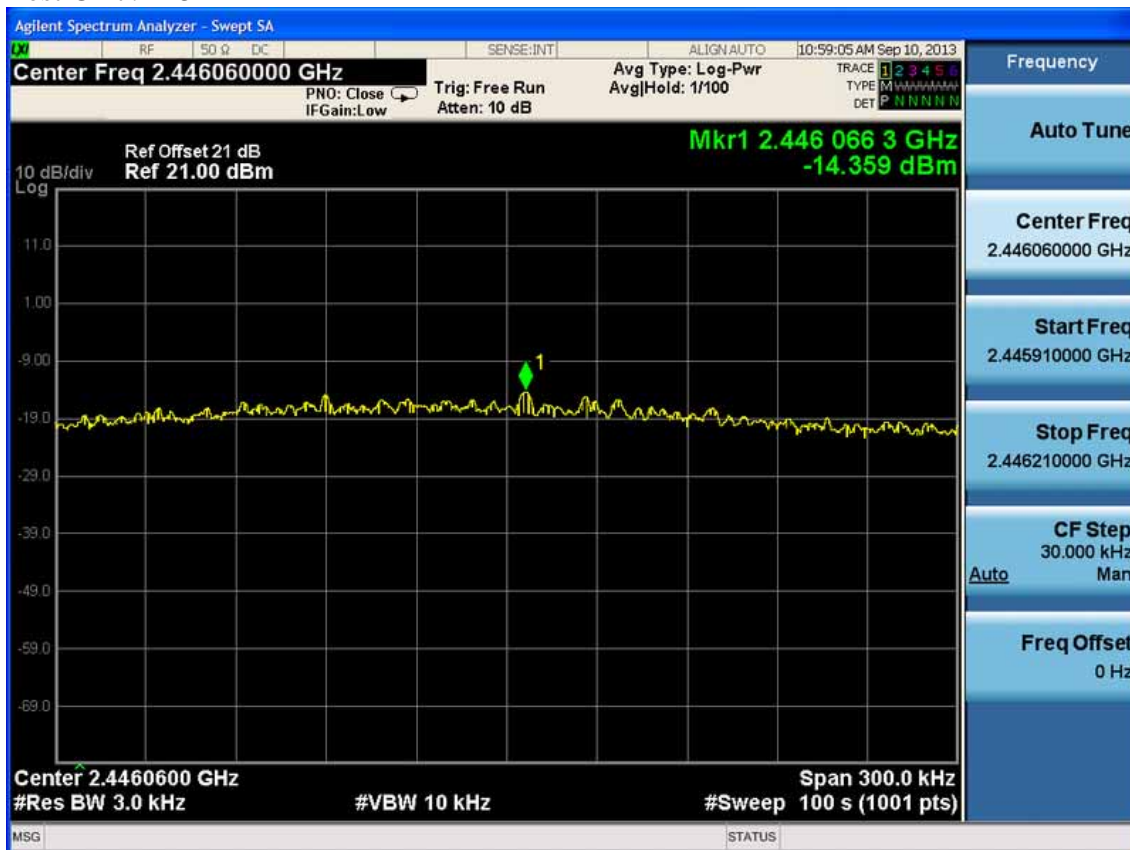Test CH6: 2437MHz

Test CH11: 2462MHz



Test Mode: IEEE 802.11n HT40 TX
Test CH1: 2422MHz

Test CH4: 2437MHz
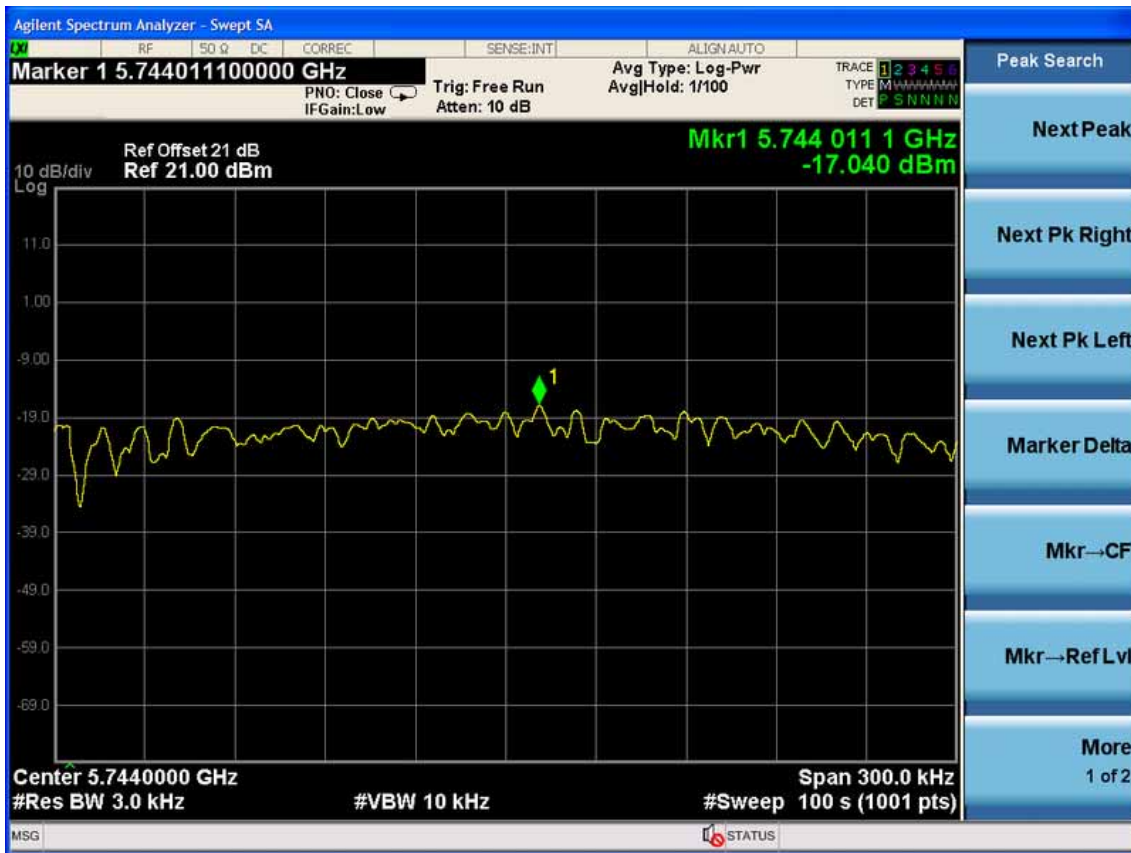


Test CH7: 2452MHz

**5.8G:**
**Chain 0:**
Test Mode: IEEE 802.11a TX
Test CH149: 5745MHz



Test CH157: 5785MHz

Test CH165: 5825MHz



Test Mode: IEEE 802.11n HT20 TX
Test CH149: 5745MHz

Test CH157: 5785MHz



Test CH165: 5825MHz

Test Mode: IEEE 802.11n HT40 TX
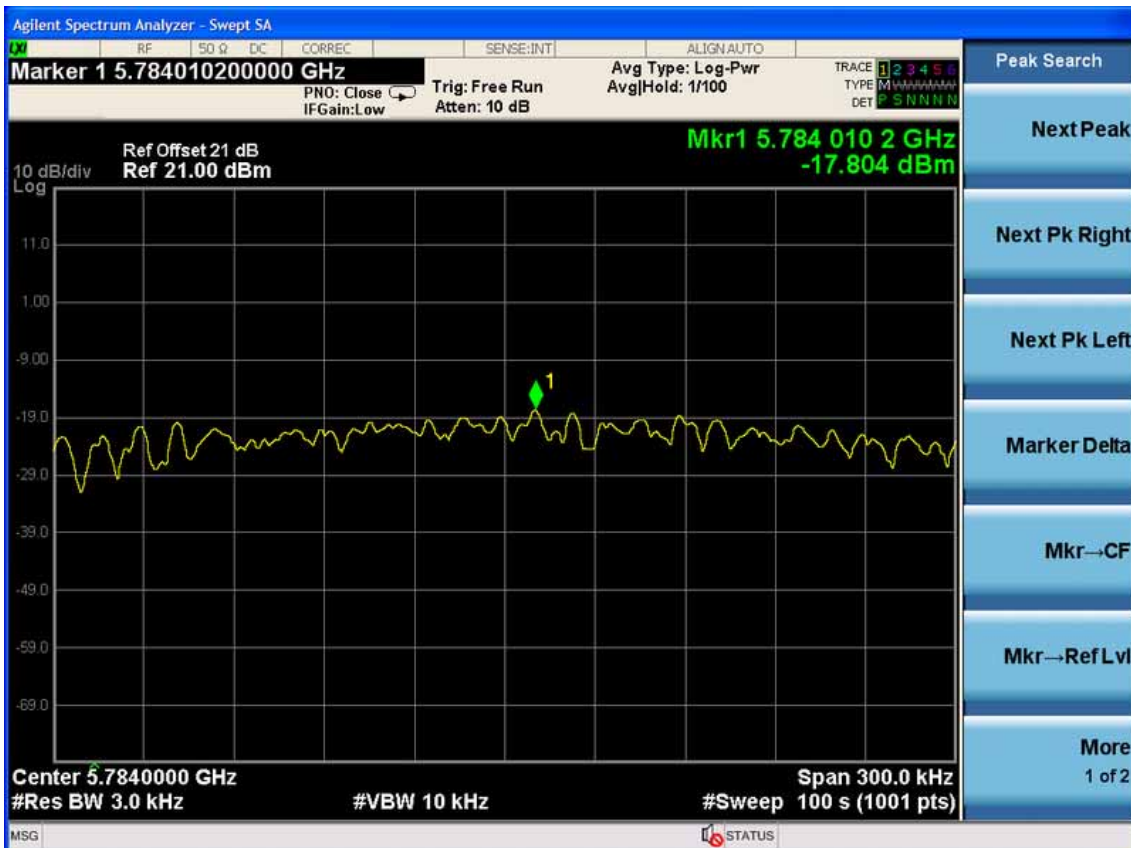Test CH151: 5755MHz



Test CH159: 5795MHz

Chain 1:
Test Mode: IEEE 802.11a TX
Test CH149: 5745MHz

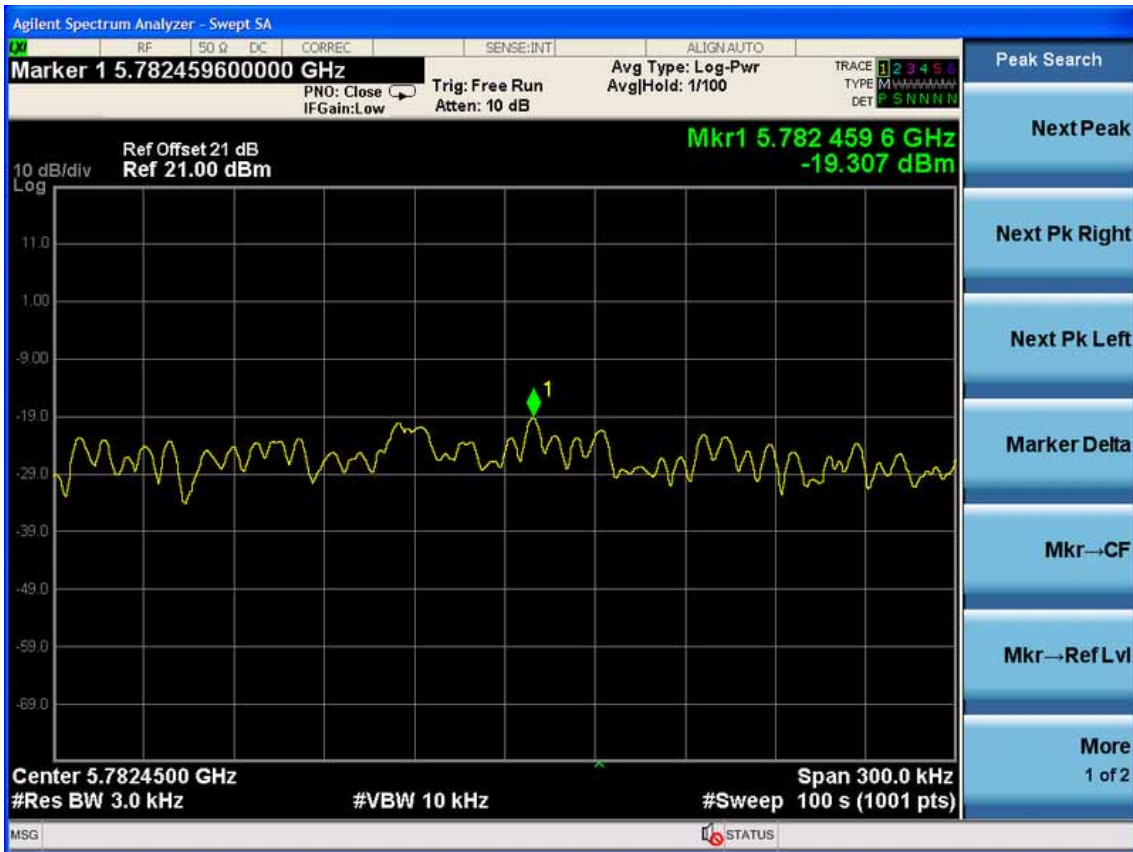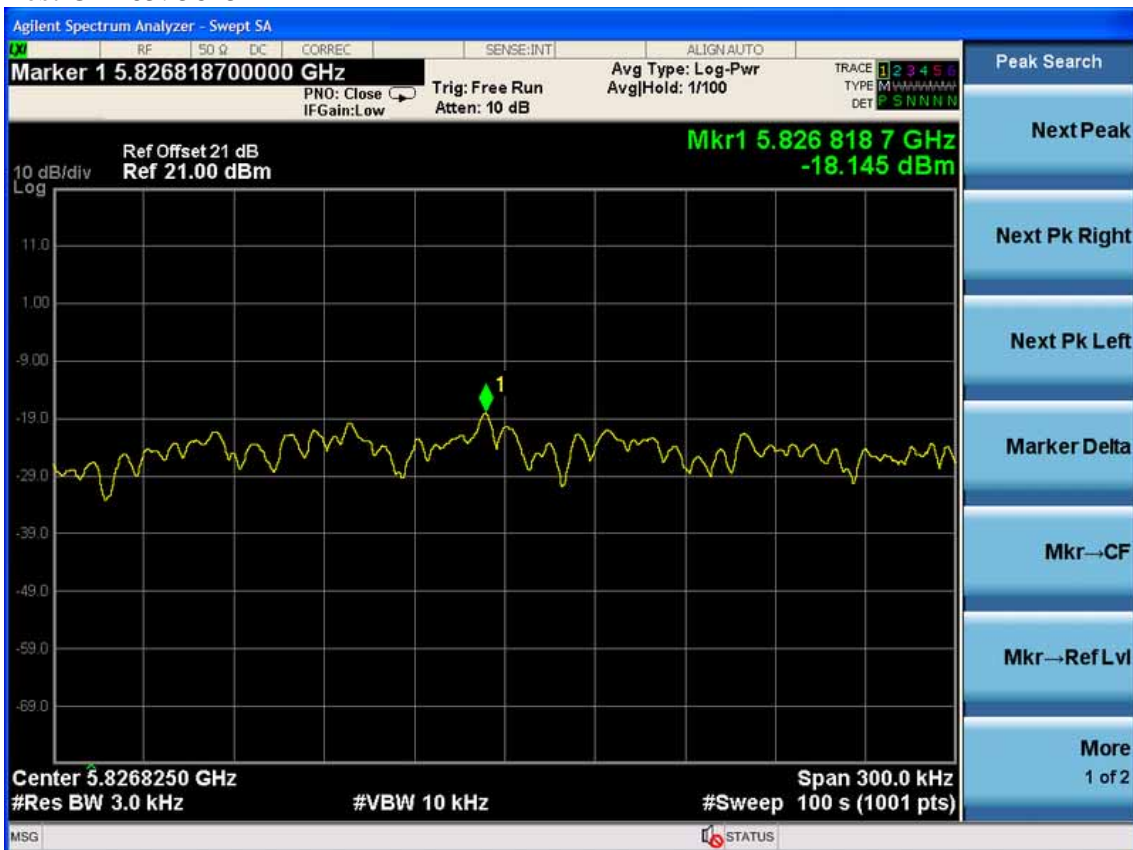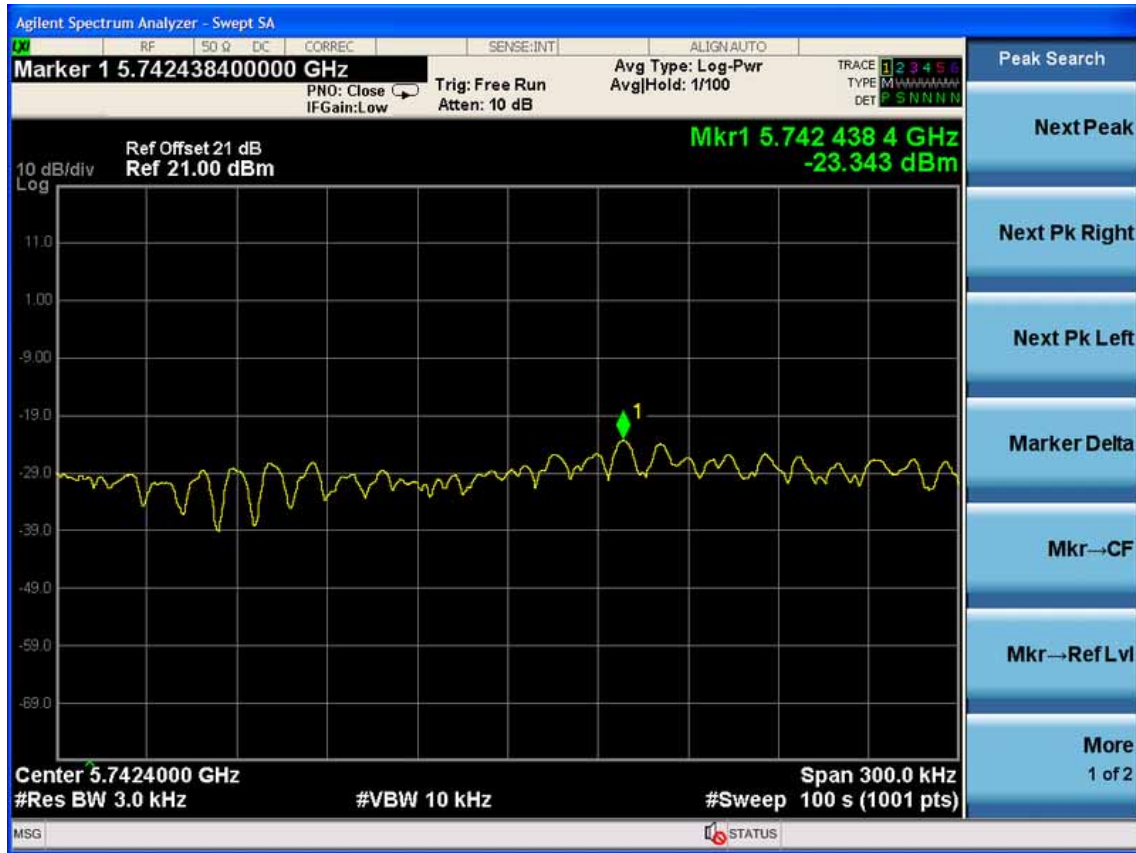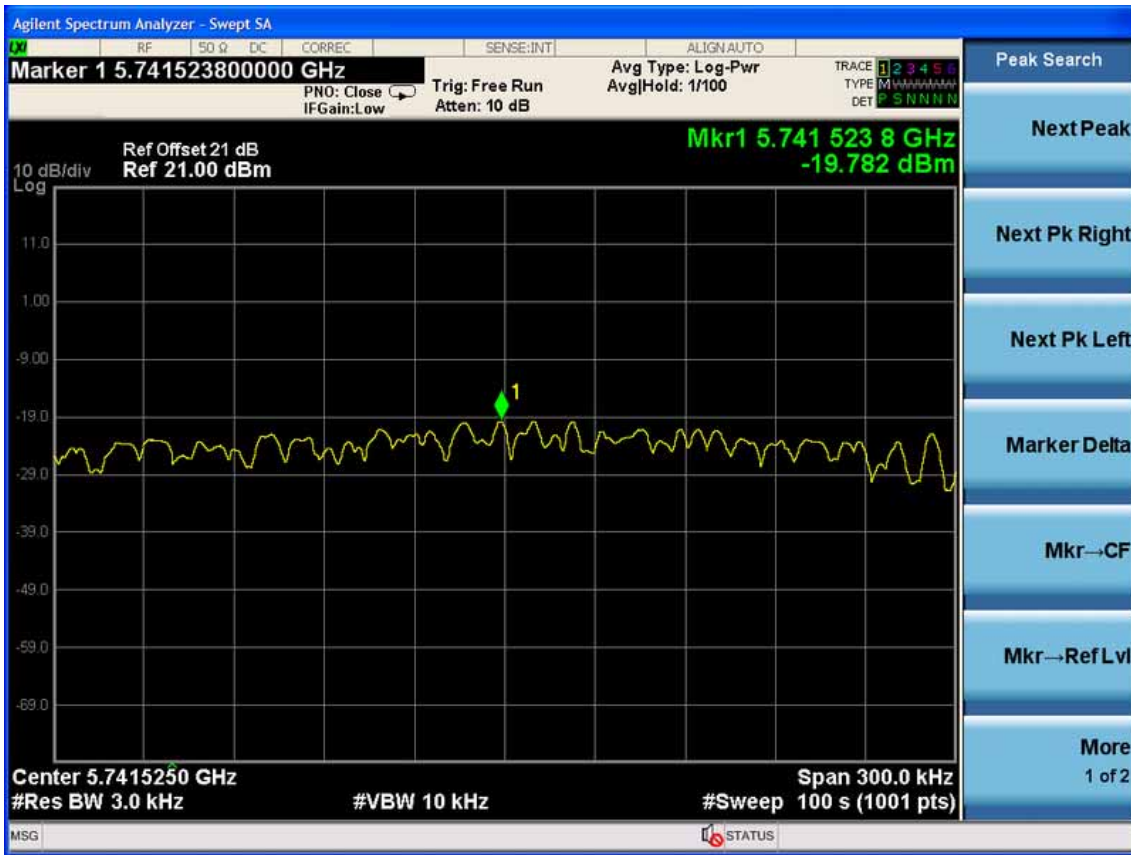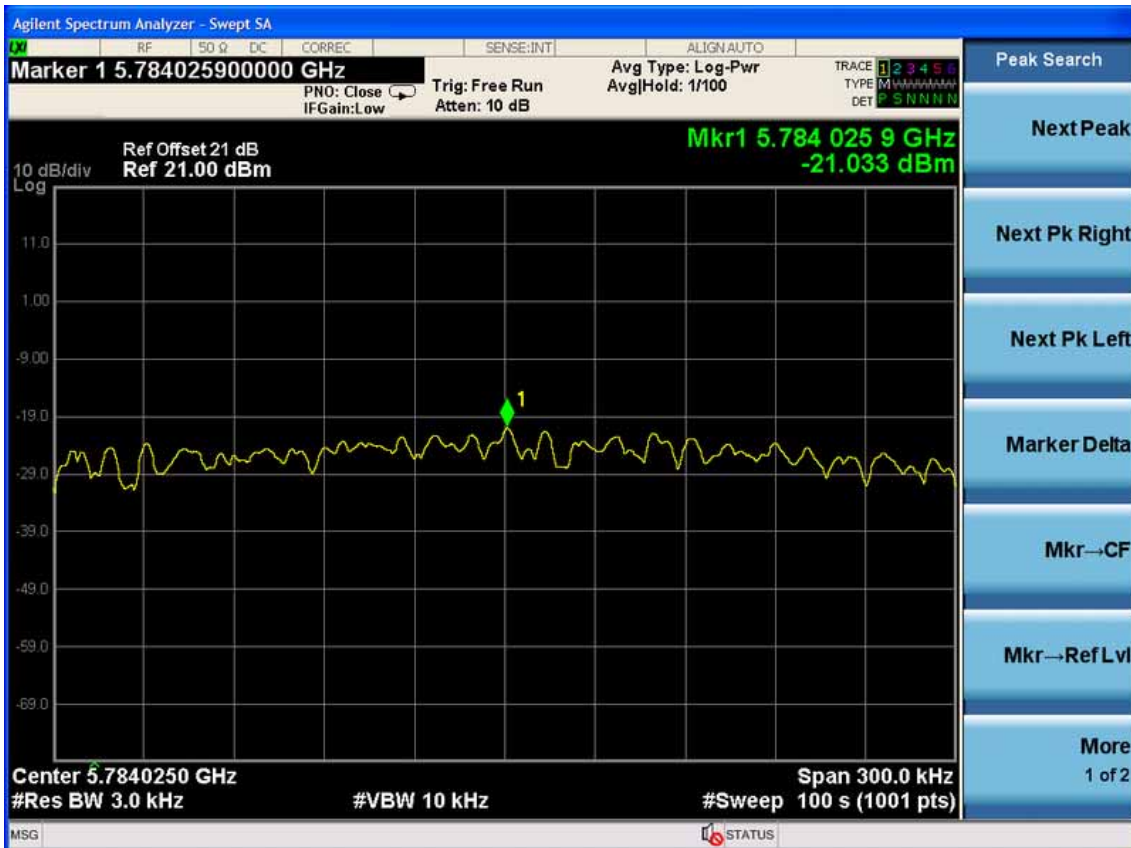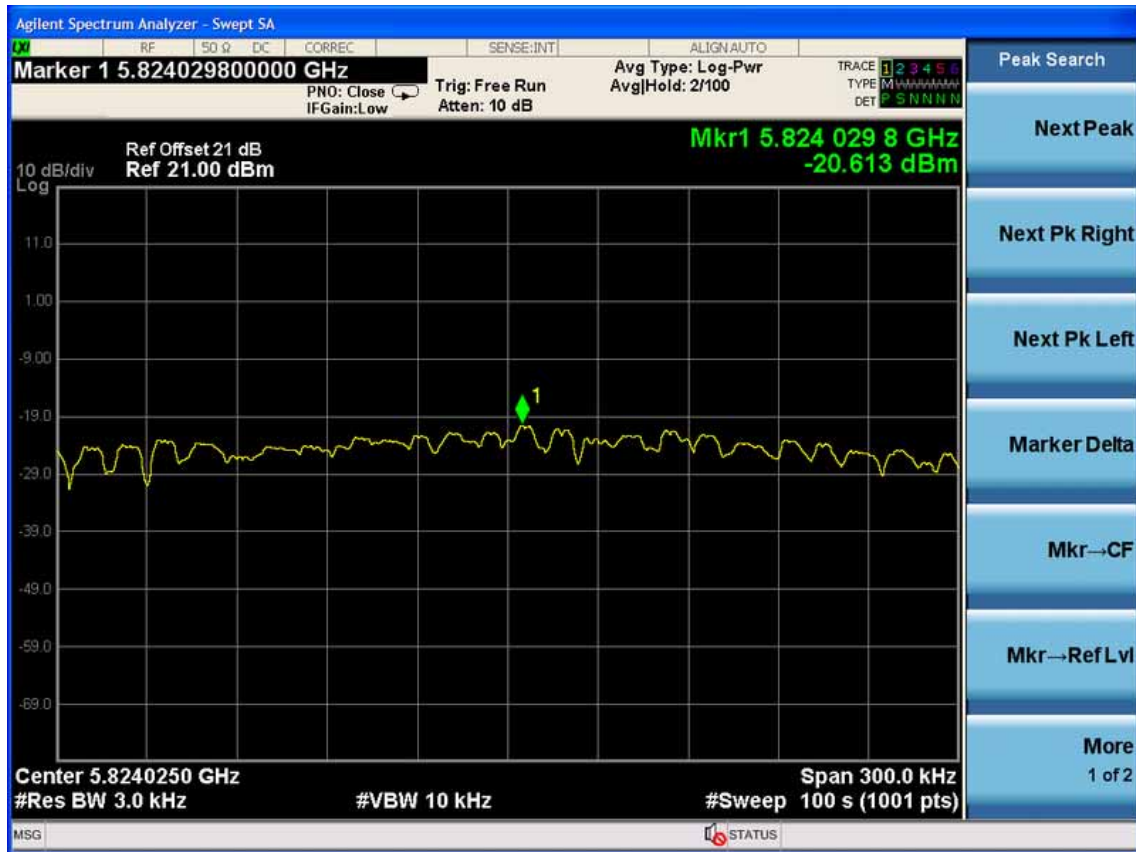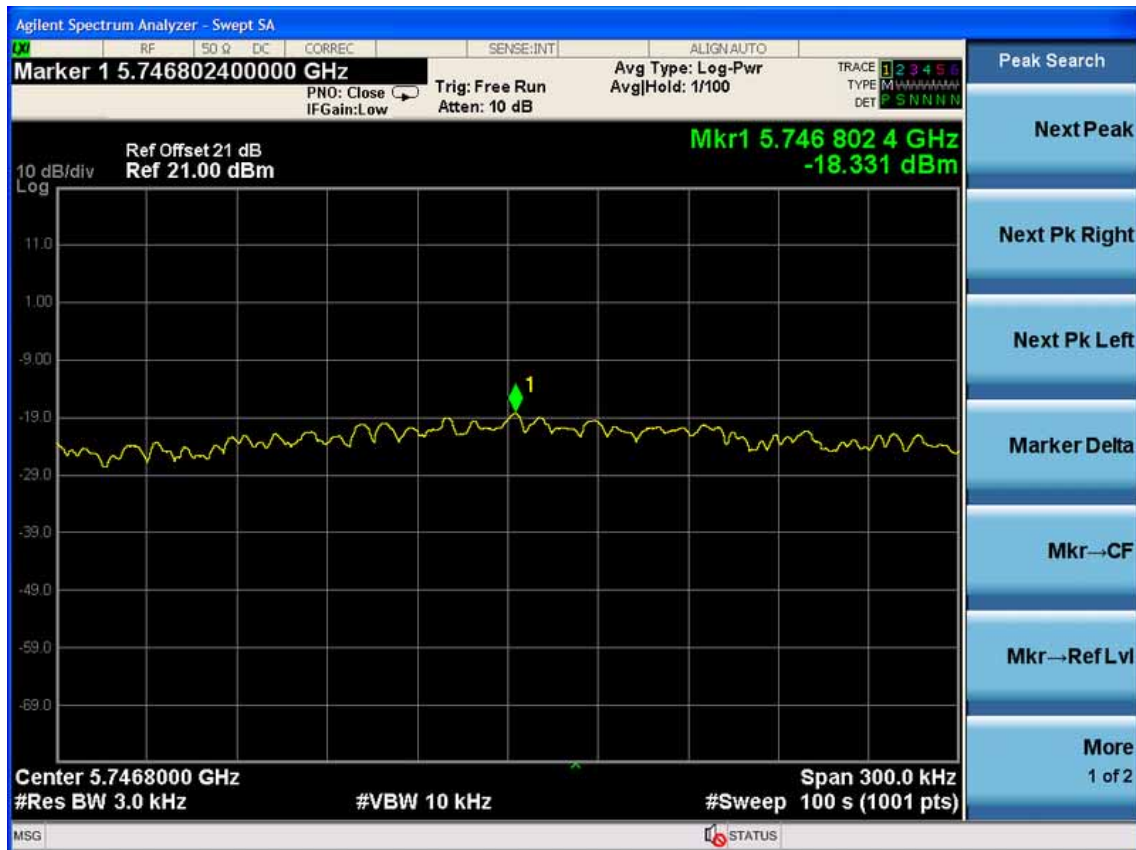

Test CH157: 5785MHz

Test CH165: 5825MHz



Test Mode: IEEE 802.11n HT20 TX
Test CH149: 5745MHz

Test CH157: 5785MHz



Test CH165: 5825MHz
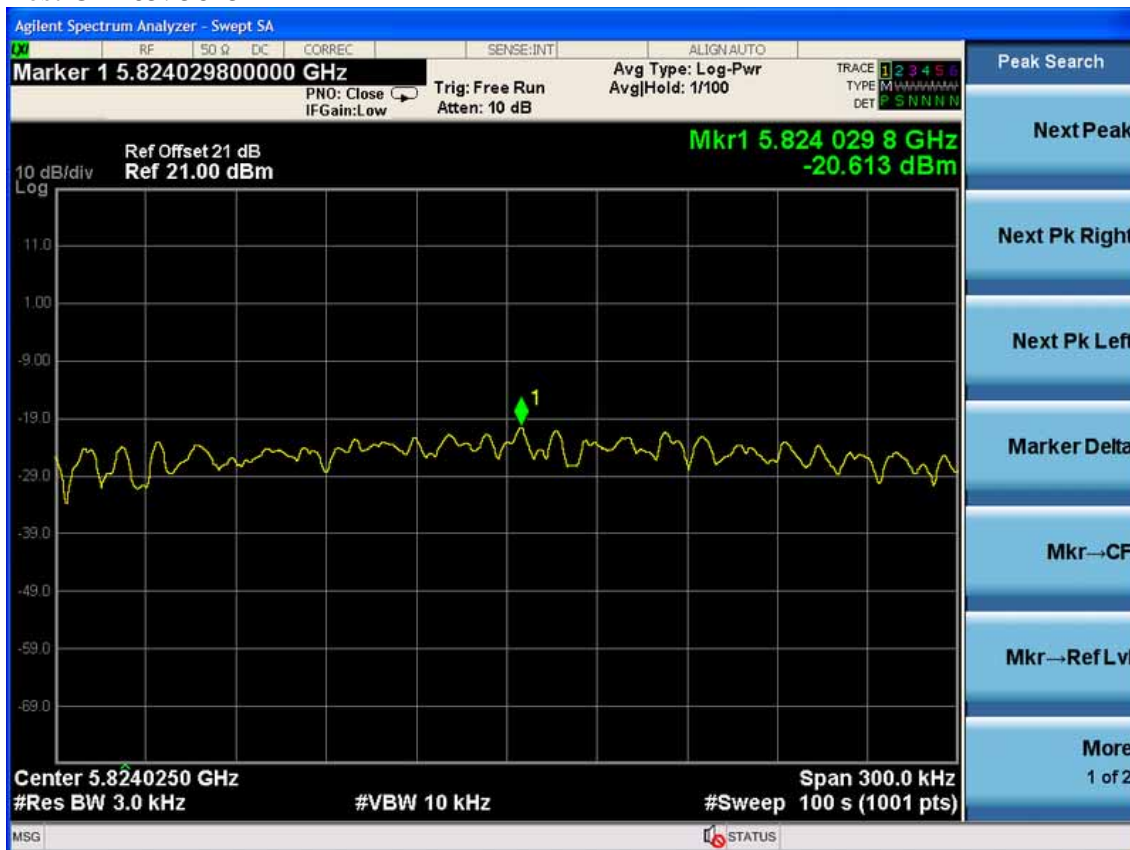
Test Mode: IEEE 802.11n HT40 TX
Test CH151: 5755MHz



Test CH159: 5795MHz

## 10.MPE ESTIMATION

### 10.1.Limit for General Population/ Uncontrolled Exposures

| Frequency | Power density (mW/ cm$^2$ ) | Averaging time(minutes) |
|---|---|---|
| 300MHz----1.5GHz | F/1500 | 30 |
| 1.5GHz---100GHz | 1.0 | 30 |

| Frequency(MHz) | Power density (mW/ cm$^2$ ) | Averaging time(minutes) |
|---|---|---|
| 2412 | 1 | 30 |
| 2437 | 1 | 30 |
| 2462 | 1 | 30 |

Note: F= Frequency in MHz

### 10.2.  Estimation Result

| EUT: WIFI Module | | |
|---|---|---|
| M/N:WAE22-DF01-AR | | |
| Test date: 2013-09-13 | Pressure: 101.2±1.0 kpa | Humidity: 48.4±3.0% |
| Tested by: Leo-Li | Test site: RF site | Temperature:20.7±0.6 ℃ |

**2.4G:**

| Cable loss: 1 dB | | Attenuator loss:   20 dB | | | | Antenna Gain: 3.3dBi | |
|---|---|---|---|---|---|---|---|
| Test Mode | CH | Frequency （MHz） | Peak Output Power (dBm) | Output Power (mW) | Antenna Gain (dBi) | Antenna Gain (Linear) | MPE |
| 11b | CH1 | 2412 | 16.98 | 49.89 | 3.3 | 2.14 | 0.0212 |
| | CH6 | 2437 | 15.57 | 36.06 | 3.3 | 2.14 | 0.0153 |
| | CH11 | 2462 | 16.56 | 45.29 | 3.3 | 2.14 | 0.0193 |
| 11g | CH1 | 2412 | 20.94 | 124.17 | 3.3 | 2.14 | 0.0528 |
| | CH6 | 2437 | 22.64 | 183.65 | 3.3 | 2.14 | 0.0782 |
| | CH11 | 2462 | 20.14 | 103.28 | 3.3 | 2.14 | 0.0439 |
| 11n HT20 | CH1 | 2412 | 21.55 | 142.89 | 3.3 | 2.14 | 0.0608 |
| | CH6 | 2437 | 24.53 | 283.79 | 3.3 | 2.14 | 0.1208 |
| | CH11 | 2462 | 22.99 | 199.07 | 3.3 | 2.14 | 0.0847 |
| 11n HT40 | CH1 | 2422 | 20.79 | 119.95 | 3.3 | 2.14 | 0.0510 |
| | CH4 | 2437 | 24.39 | 274.79 | 3.3 | 2.14 | 0.1169 |
| | CH7 | 2452 | 21.96 | 157.04 | 3.3 | 2.14 | 0.0668 |

**5.8G:**

| | Attenuator loss:   20 dB | | | | | Antenna Gain: 3.7dBi | |
|---|---|---|---|---|---|---|---|
| Cable loss: 1 dB | | | | | | | |
| Test Mode | CH | Frequency（MHz） | Peak Output Power (dBm) | Output Power (mW) | Antenna Gain (dBi) | Antenna Gain (Linear) | MPE |
| 11a | CH149 | 5745 | 8.56 | 7.18 | 3.7 | 2.34 | 0.0033 |
| | CH157 | 5785 | 9.68 | 9.29 | 3.7 | 2.34 | 0.0043 |
| | CH165 | 5825 | 9.01 | 7.96 | 3.7 | 2.34 | 0.0037 |
| 11n HT20 | CH149 | 5745 | 11.05 | 12.74 | 3.7 | 2.34 | 0.0059 |
| | CH157 | 5785 | 14.42 | 27.67 | 3.7 | 2.34 | 0.0129 |
| | CH165 | 5825 | 11.70 | 14.79 | 3.7 | 2.34 | 0.0069 |
| 11n HT40 | CH151 | 5755 | 11.59 | 14.42 | 3.7 | 2.34 | 0.0067 |
| | CH159 | 5795 | 13.03 | 20.09 | 3.7 | 2.34 | 0.0094 |

# 11. ANTENNA REQUIREMENT

## 11.1. STANDARD APPLICABLE

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

## 11.2. ANTENNA CONNECTED CONSTRUCTION

The antennas used for this product are PCB antenna that no antenna other than that furnished by the responsible party shall be used with the device, the maximum peak gain of the transmit antenna is 3.7dBi.

# 12.DEVIATION TO TEST SPECIFICATIONS

[ NONE]