6. Band Edge

6.1. Test Equipment

RF Conducted Measurement

The following test equipments are used during the band edge tests:

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
	Spectrum Analyzer	R&S	FSP40 / 100170	Jun, 2011
	Spectrum Analyzer	Agilent	E4407B / US39440758	Jun, 2011
X	Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2012

Note:
1. All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.
2. The test instruments marked with "X" are used to measure the final test results.
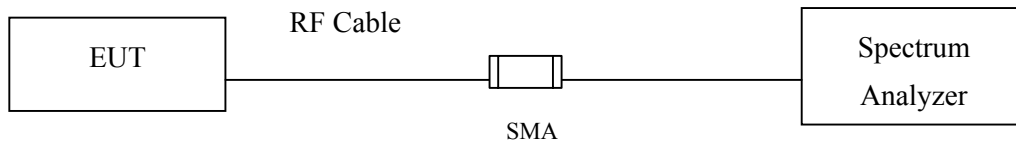
RF Radiated Measurement:

The following test equipments are used during the band edge tests:

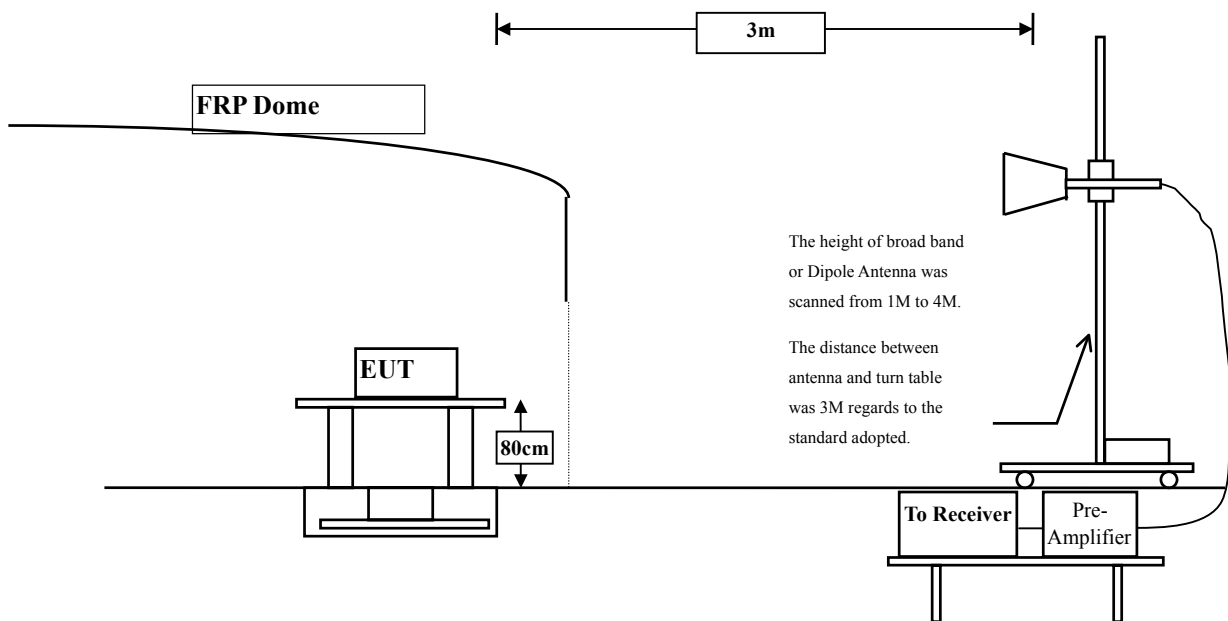| Test Site		Equipment	Manufacturer	Model No./Serial No.	Last Cal.
☒Site # 3		Bilog Antenna	Schaffner Chase	CBL6112B/2673	Sep., 2011
	X	Horn Antenna	Schwarzbeck	BBHA9120D/D305	Sep., 2011
		Horn Antenna	Schwarzbeck	BBHA9170/208	Jul., 2011
	X	Pre-Amplifier	Agilent	8447D/2944A09549	Sep., 2011
	X	Spectrum Analyzer	Agilent	E4407B / US39440758	May, 2012
		Test Receiver	R & S	ESCS 30/ 825442/018	Sep., 2011
	X	Coaxial Cable	QuieTek	QTK-CABLE/ CAB5	Feb., 2012
	X	Controller	QuieTek	QTK-CONTROLLER/ CTRL3	N/A
	X	Coaxial Switch	Anritsu	MP59B/6200265729	N/A

Note: 1. All instruments are calibrated every one year.
2. The test instruments marked by "X" are used to measure the final test results.

6.2.   Test Setup

RF Conducted Measurement

RF Radiated Measurement:

6.3.   Limits

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 20dB below the level of the fundamental or to the general radiated emission limits in paragraph 15.209, whichever is the lesser attenuation.

6.4. Test Procedure

The EUT was setup according to ANSI C63.4: 2003 and tested according to DTS test procedure of Jan. 2012 KDB558074 for compliance to FCC 47CFR 15.247 requirements.

The EUT is placed on a turn table which is 0.8 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.4: 2003 on radiated measurement.

6.5. Uncertainty

± 3.9 dB above 1GHz

± 3.8 dB below 1GHz

6.6.   Test Result of Band Edge

Product : WiFi Module
Test Item : Band Edge Data
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit (802.11b 1Mbps)

Fundamental Filed Strength

Antenna Pole	Frequency [MHz]	Correction Factor [dB/m]	Reading Level [dBuV]	Emission Level [dBuV/m]	Detector
Horizontal	2412	31.771	62.6	94.372	Peak
Horizontal	2412	31.771	58.61	90.382	Average
Vertical	2412	28.802	61.26	91.509	Peak
Vertical	2412	28.802	57.29	87.539	Average

Note: 1:Spectrum Analyzer setting:

   Peak detector: RBW=1MHz, VBW=1MHz

   Average detector: RBW=1MHz, VBW=10Hz

Band Edge Test Data

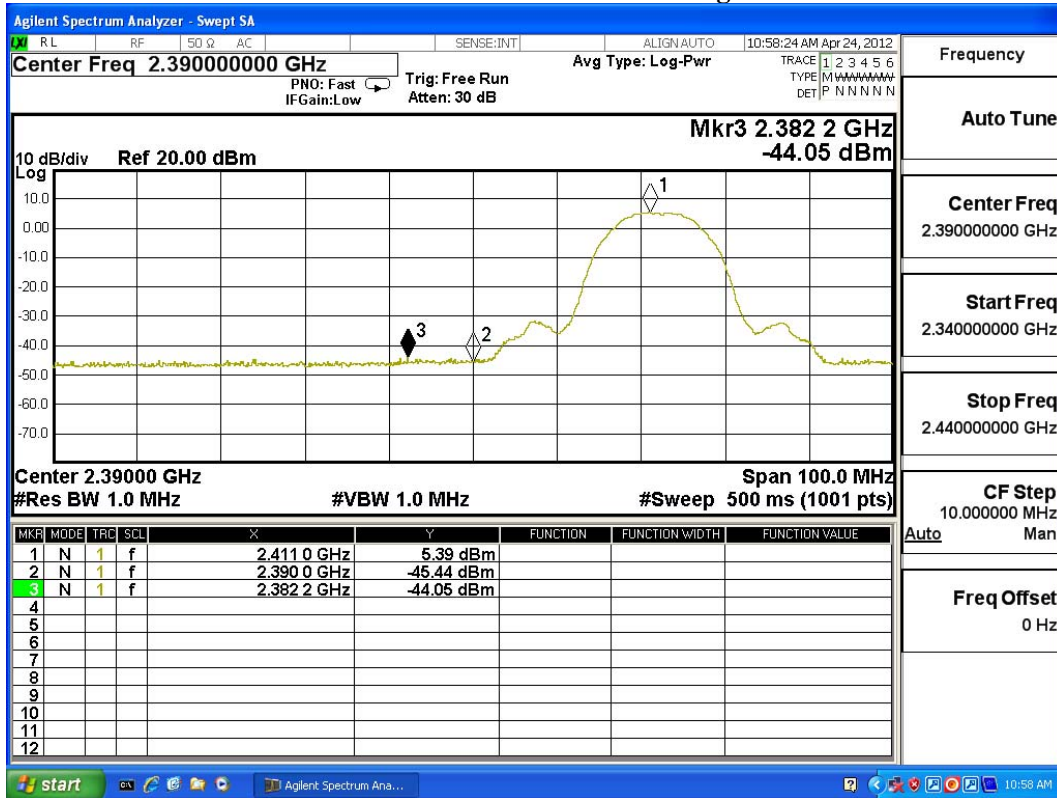| Antenna Pole	Test Frequency (MHz)	Fundamental (dBuV/m)	Δ (dB)	Band Edge Field Strength (dBuV/m)	Limit (dBuV/m)	Detector
Horizontal	2382.2	94.372	49.44	44.932	74.000	Peak
Horizontal	2388.8	90.382	59.51	30.872	54.000	Average
Vertical	2382.2	91.509	49.44	42.069	74.000	Peak
Vertical	2388.8	87.539	59.51	28.029	54.000	Average

Note:

  The Band Edge Field Strength was calculated using the Fundamental and Conducted Band Edge

  measurements per the Marker-Delta Method with the following formula:
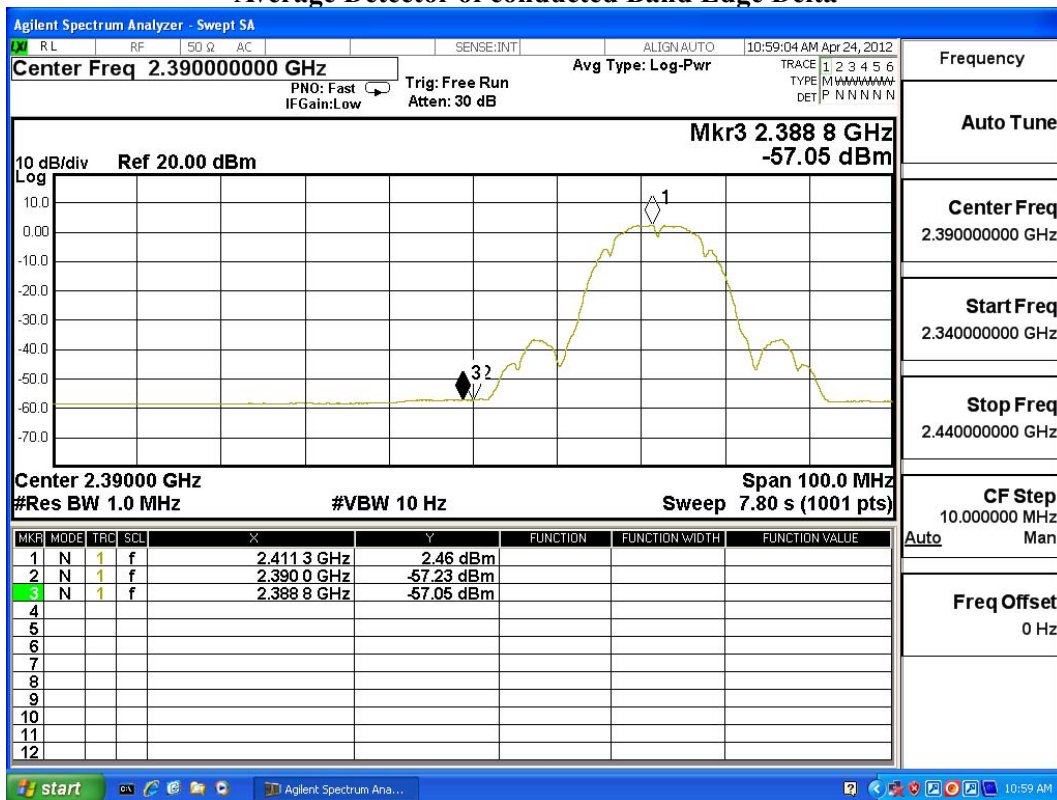
  Band Edge field Strength = F - Δ

  F = Fundamental field Strength (Peak or Average)

  Δ = Conducted Band Edge Delta (Peak or Average)

Peak Detector of conducted Band Edge Delta

Average Detector of conducted Band Edge Delta

Product   :   WiFi Module
Test Item   :   Band Edge Data
Test Site   :   No.3 OATS
Test Mode :   Mode 1: Transmit (802.11b 1Mbps)

Fundamental Filed Strength

Antenna Pole	Frequency [MHz]	Correction Factor [dB/m]	Reading Level [dBuV]	Emission Level [dBuV/m]	Detector
Horizontal	2462	31.892	60.11	92.002	Peak
Horizontal	2462	31.892	56.1	87.992	Average
Vertical	2462	28.968	58.49	88.97	Peak
Vertical	2462	28.968	54.48	84.96	Average

Note: 1:Spectrum Analyzer setting:

     Peak detector: RBW=1MHz, VBW=1MHz

     Average detector: RBW=1MHz, VBW=10Hz

Band Edge Test Data

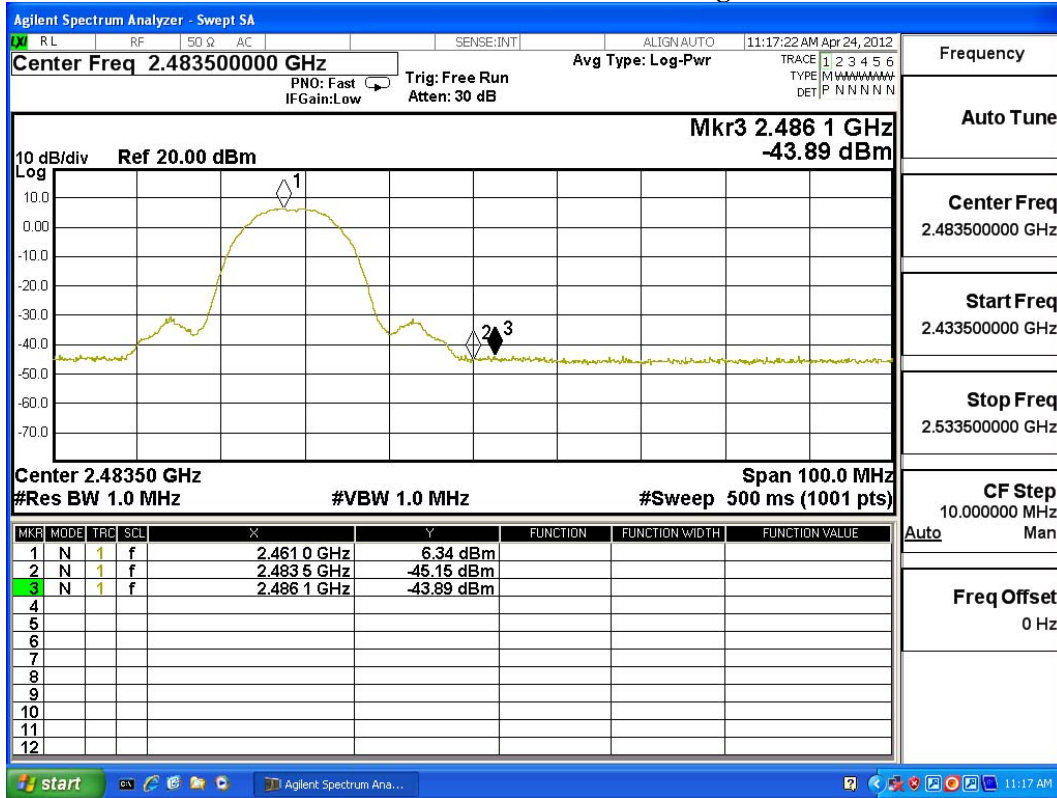| Antenna Pole	Test Frequency (MHz)	Fundamental (dBuV/m)	Δ (dB)	Band Edge Field Strength (dBuV/m)	Limit (dBuV/m)	Detector
Horizontal	2486.1	92.002	50.23	41.772	74.000	Peak
Horizontal	2485	87.992	60.18	27.812	54.000	Average
Vertical	2486.1	88.97	50.23	38.74	74.000	Peak
Vertical	2485	84.96	60.18	24.78	54.000	Average

Note:

    The Band Edge Field Strength was calculated using the Fundamental and Conducted Band Edge

    measurements per the Marker-Delta Method with the following formula:

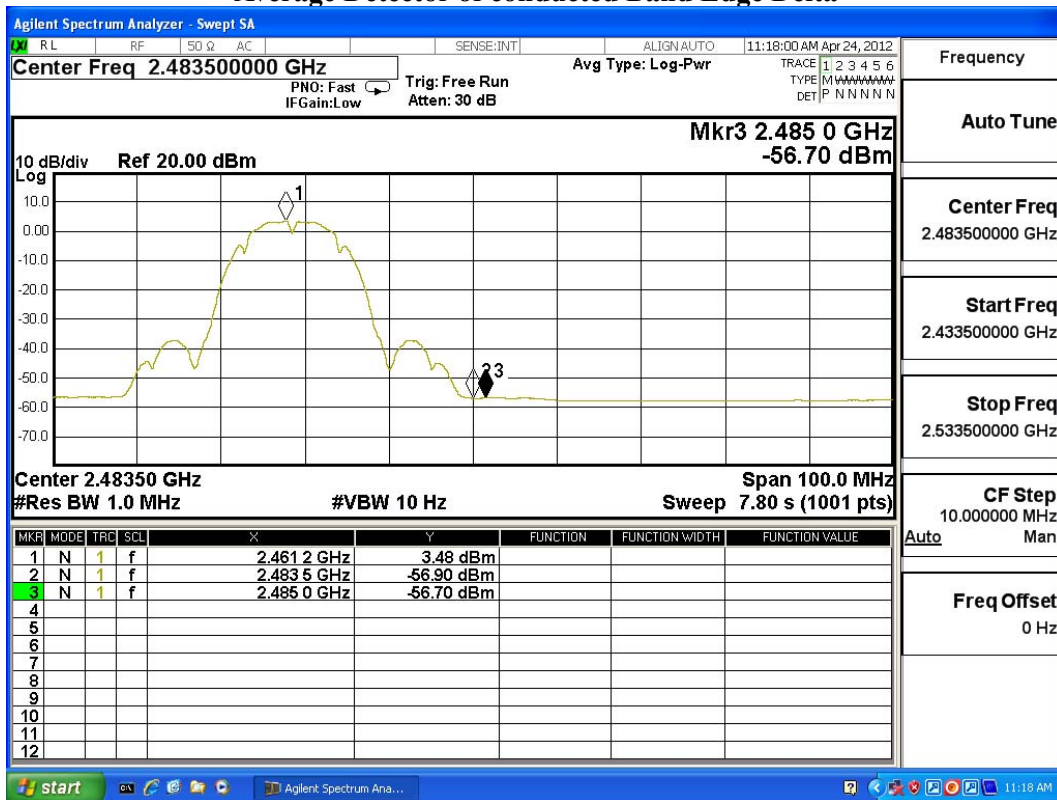   Band Edge field Strength = F - Δ

    F = Fundamental field Strength (Peak or Average)

    Δ = Conducted Band Edge Delta (Peak or Average)

Peak Detector of conducted Band Edge Delta

Average Detector of conducted Band Edge Delta

Product   :   WiFi Module
Test Item   :   Band Edge Data
Test Site   :   No.3 OATS
Test Mode   :   Mode 2: Transmit (802.11g 6Mbps)

Fundamental Filed Strength

Antenna Pole	Frequency [MHz]	Correction Factor [dB/m]	Reading Level [dBuV]	Emission Level [dBuV/m]	Detector
Horizontal	2412	31.771	64.98	96.752	Peak
Horizontal	2412	31.771	53.69	85.462	Average
Vertical	2412	30.248	64.13	94.379	Peak
Vertical	2412	30.248	52.88	83.129	Average

Note: 1:Spectrum Analyzer setting:

Peak detector: RBW=1MHz, VBW=1MHz

Average detector: RBW=1MHz, VBW=10Hz

Band Edge Test Data

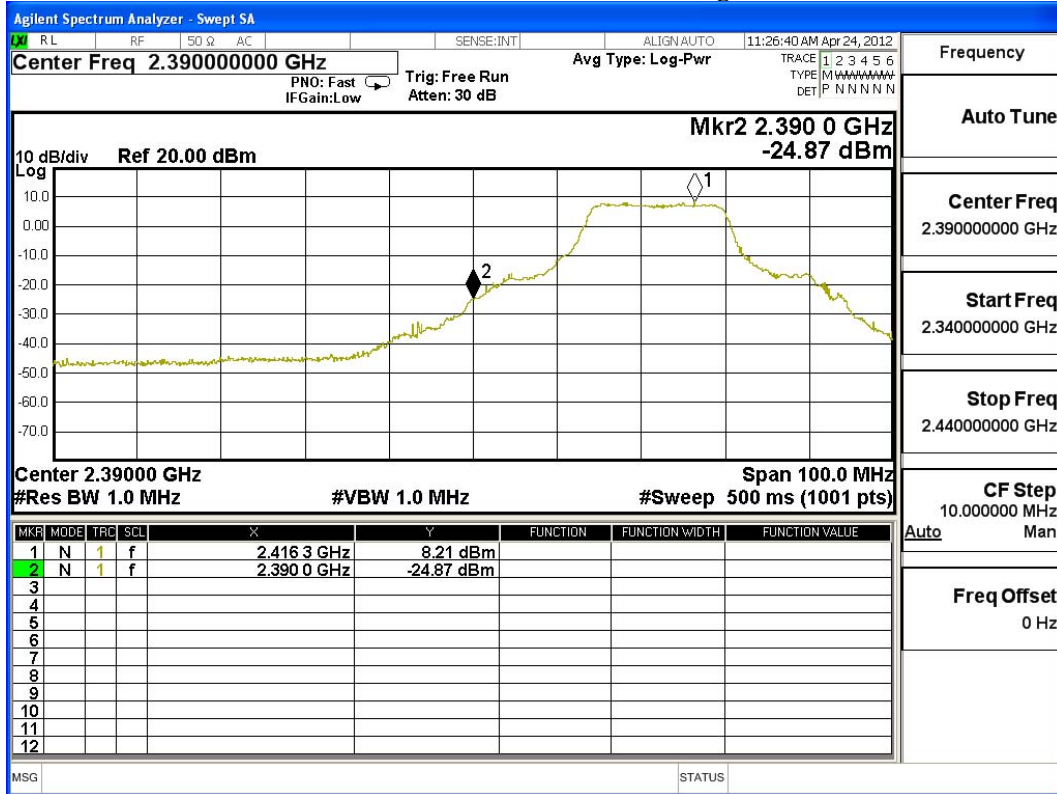| Antenna Pole	Test Frequency (MHz)	Fundamental (dBuV/m)	Δ (dB)	Band Edge Field Strength (dBuV/m)	Limit (dBuV/m)	Detector
Horizontal	2390	96.752	33.09	63.662	74.000	Peak
Horizontal	2390	85.462	41.51	43.952	54.000	Average
Vertical	2390	94.379	33.09	61.289	74.000	Peak
Vertical	2390	83.129	41.51	41.619	54.000	Average

Note:

The Band Edge Field Strength was calculated using the Fundamental and Conducted Band Edge

measurements per the Marker-Delta Method with the following formula:
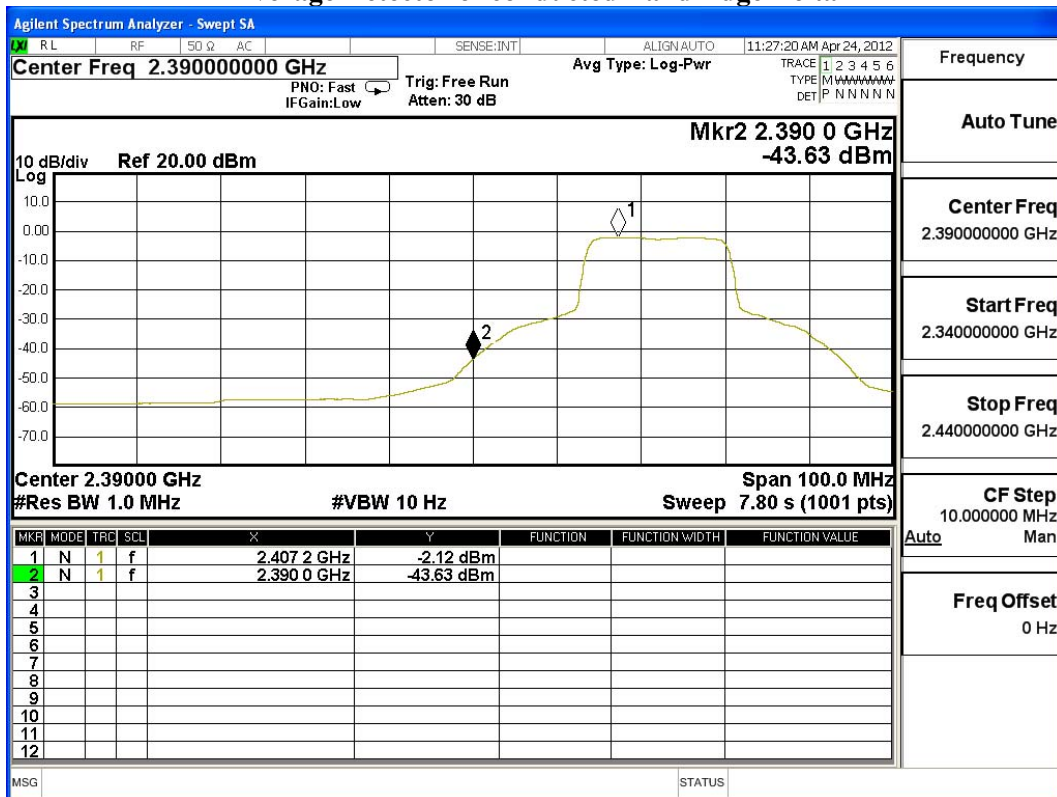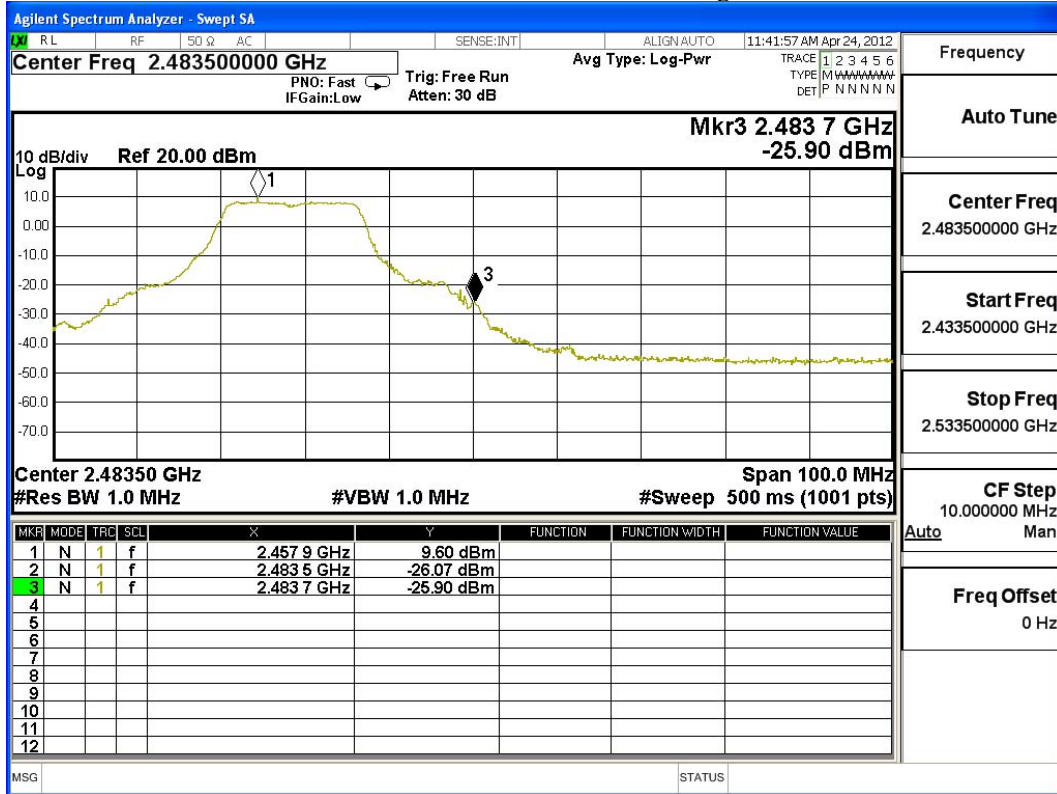
Band Edge field Strength = F - Δ

F = Fundamental field Strength (Peak or Average)

Δ = Conducted Band Edge Delta (Peak or Average)

Peak Detector of conducted Band Edge Delta

Average Detector of conducted Band Edge Delta

Product	:	WiFi Module
Test Item	:	Band Edge Data
Test Site	:	No.3 OATS
Test Mode	:	Mode 2: Transmit (802.11g 6Mbps)

Fundamental Filed Strength

Antenna Pole	Frequency [MHz]	Correction Factor [dB/m]	Reading Level [dBuV]	Emission Level [dBuV/m]	Detector
Horizontal	2462	31.892	62.91	94.802	Peak
Horizontal	2462	31.892	51.57	83.462	Average
Vertical	2462	30.48	60.84	91.32	Peak
Vertical	2462	30.48	49.58	80.06	Average

Note: 1:Spectrum Analyzer setting:

Peak detector: RBW=1MHz, VBW=1MHz

Average detector: RBW=1MHz, VBW=10Hz

Band Edge Test Data

Antenna Pole	Test Frequency (MHz)	Fundamental (dBuV/m)	Δ (dB)	Band Edge Field Strength (dBuV/m)	Limit (dBuV/m)	Detector
Horizontal	2483.7	94.802	35.5	59.302	74.000	Peak
Horizontal	2483.5	83.462	43.35	40.112	54.000	Average
Vertical	2483.7	91.32	35.5	55.82	74.000	Peak
Vertical	2483.5	80.06	43.35	36.71	54.000	Average

Note:

The Band Edge Field Strength was calculated using the Fundamental and Conducted Band Edge

measurements per the Marker-Delta Method with the following formula:
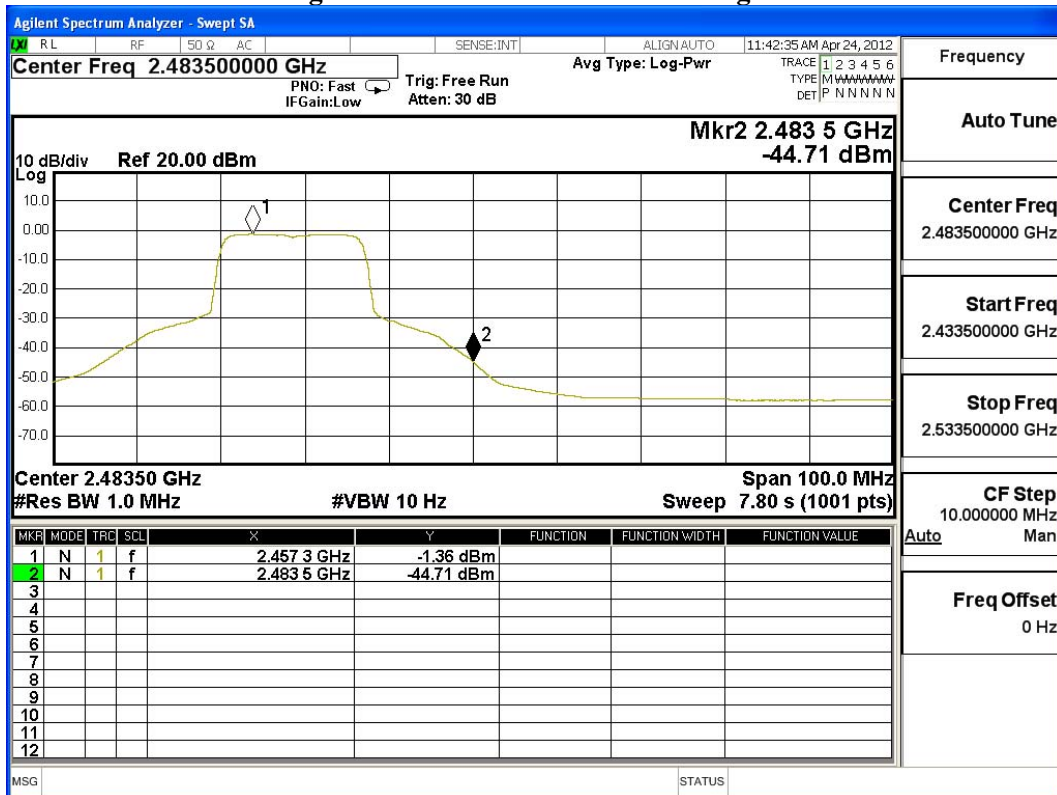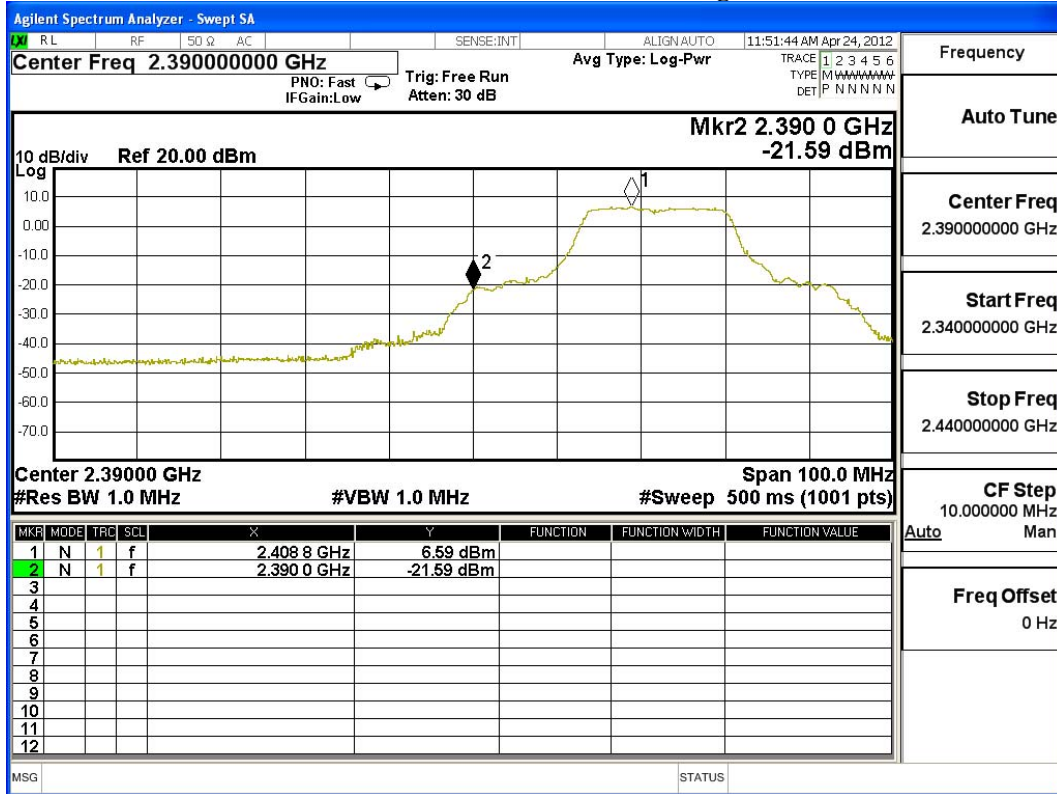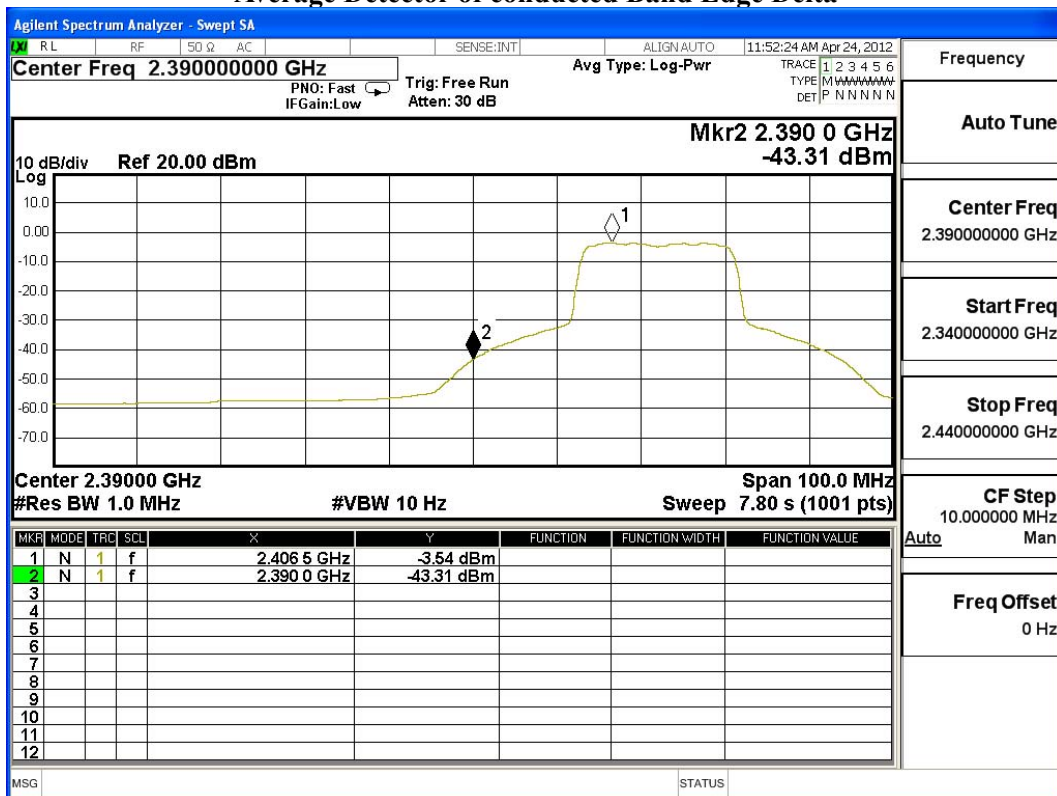
Band Edge field Strength = F - Δ

F = Fundamental field Strength (Peak or Average)

Δ = Conducted Band Edge Delta (Peak or Average)

Peak Detector of conducted Band Edge Delta

Average Detector of conducted Band Edge Delta

Product : WiFi Module
Test Item : Band Edge Data
Test Site : No.3 OATS
Test Mode : Mode 3: Transmit (802.11n MCS0 7.2Mbps 20M-BW)

Fundamental Filed Strength

Antenna Pole	Frequency [MHz]	Correction Factor [dB/m]	Reading Level [dBuV]	Emission Level [dBuV/m]	Detector
Horizontal	2412	31.771	54.44	86.212	Peak
Horizontal	2412	31.771	43.99	75.762	Average
Vertical	2412	30.248	62.46	92.709	Peak
Vertical	2412	31.771	51.92	83.692	Average

Note: 1:Spectrum Analyzer setting:

Peak detector: RBW=1MHz, VBW=1MHz

Average detector: RBW=1MHz, VBW=10Hz

Band Edge Test Data

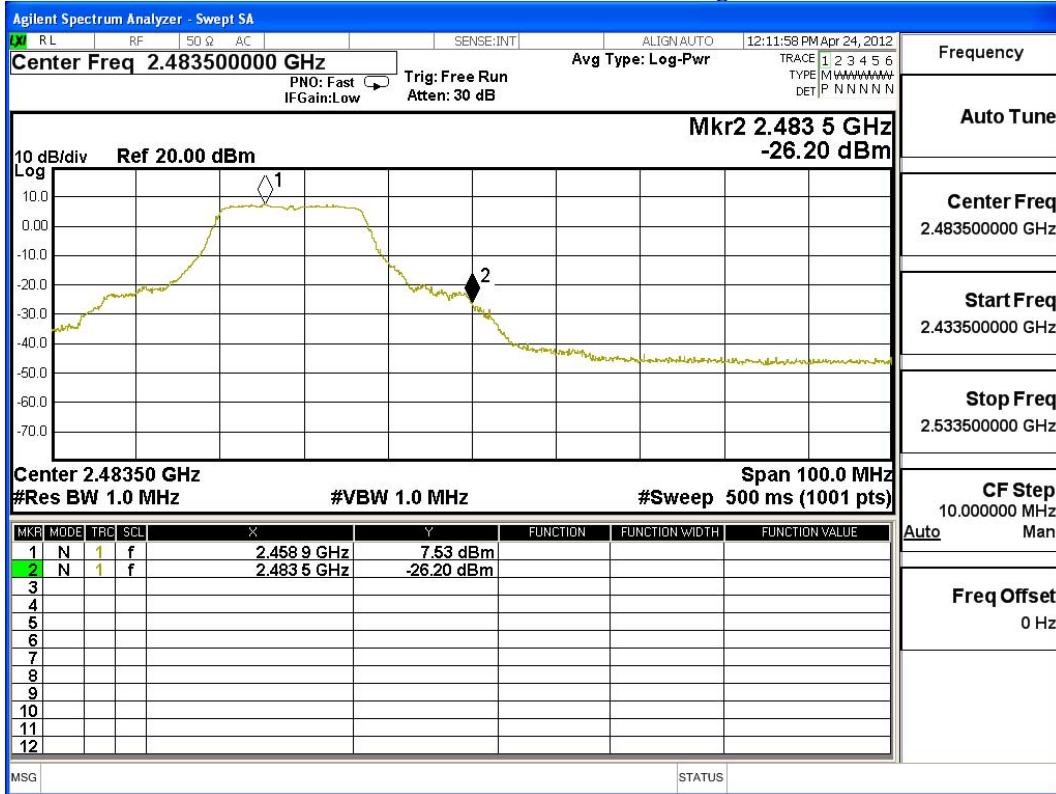| Antenna Pole	Test Frequency (MHz)	Fundamental (dBuV/m)	Δ (dB)	Band Edge Field Strength (dBuV/m)	Limit (dBuV/m)	Detector
Horizontal	2390	86.212	28.18	58.032	74.000	Peak
Horizontal	2390	75.762	39.77	35.992	54.000	Average
Vertical	2390	92.709	28.18	64.529	74.000	Peak
Vertical	2390	83.692	39.77	43.922	54.000	Average

Note:

The Band Edge Field Strength was calculated using the Fundamental and Conducted Band Edge

measurements per the Marker-Delta Method with the following formula:
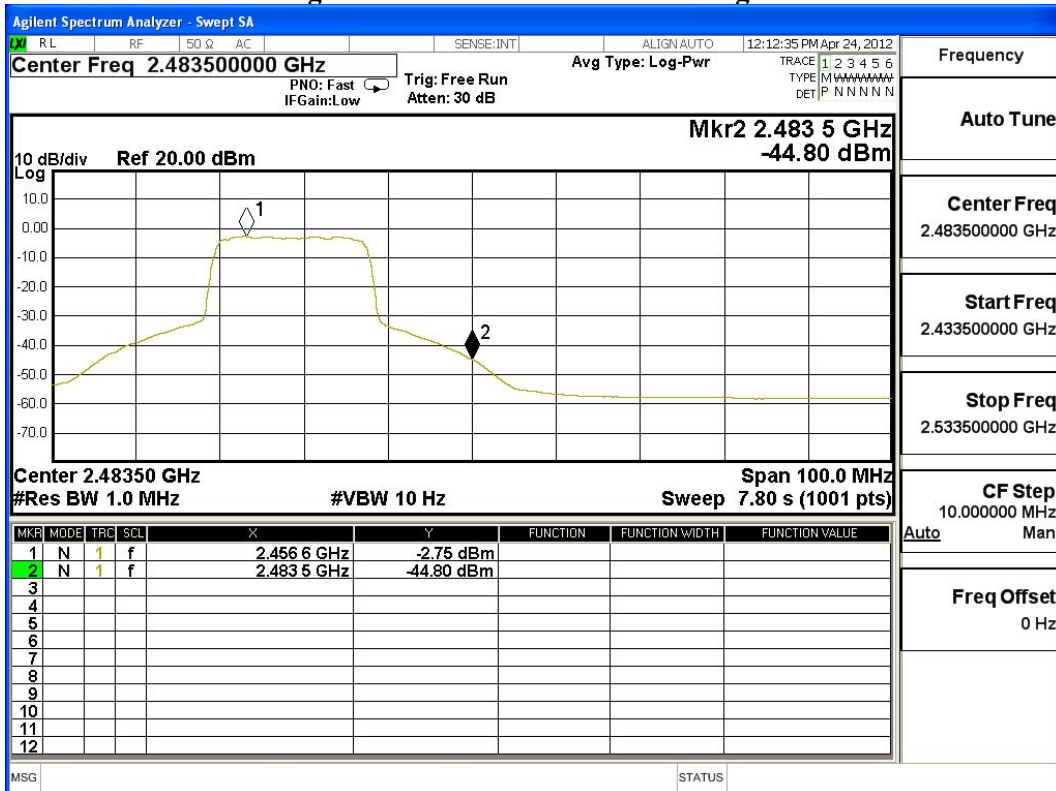
Band Edge field Strength = F - Δ

F = Fundamental field Strength (Peak or Average)

Δ = Conducted Band Edge Delta (Peak or Average)

Peak Detector of conducted Band Edge Delta

Average Detector of conducted Band Edge Delta

Product　　　:　WiFi Module
Test Item　　:　Band Edge Data
Test Site　　　:　No.3 OATS
Test Mode　　:　Mode 3: Transmit (802.11n MCS0 7.2Mbps 20M-BW)

Fundamental Filed Strength

Antenna Pole	Frequency [MHz]	Correction Factor [dB/m]	Reading Level [dBuV]	Emission Level [dBuV/m]	Detector
Horizontal	2462	31.892	61.37	93.262	Peak
Horizontal	2462	31.892	50.39	82.282	Average
Vertical	2462	30.48	59.41	89.89	Peak
Vertical	2462	30.48	48.64	79.12	Average

Note: 1:Spectrum Analyzer setting:

　　　Peak detector: RBW=1MHz, VBW=1MHz

　　　Average detector: RBW=1MHz, VBW=10Hz

Band Edge Test Data

Antenna Pole	Test Frequency (MHz)	Fundamental (dBuV/m)	Δ (dB)	Band Edge Field Strength (dBuV/m)	Limit (dBuV/m)	Detector
Horizontal	2483.5	93.262	33.73	59.532	74.000	Peak
Horizontal	2483.5	82.282	42.05	40.232	54.000	Average
Vertical	2483.5	89.89	33.73	56.16	74.000	Peak
Vertical	2483.5	79.12	42.05	37.07	54.000	Average

Note:

　　The Band Edge Field Strength was calculated using the Fundamental and Conducted Band Edge

　　measurements per the Marker-Delta Method with the following formula:

　　Band Edge field Strength = F - Δ

　　F = Fundamental field Strength (Peak or Average)

　　Δ = Conducted Band Edge Delta (Peak or Average)

Peak Detector of conducted Band Edge Delta

Average Detector of conducted Band Edge Delta
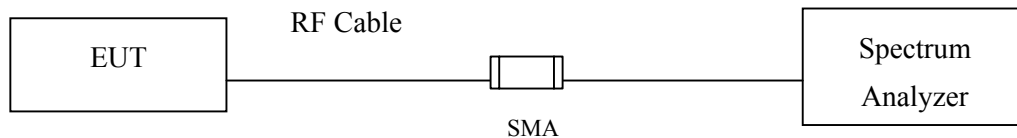
7. Occupied Bandwidth

7.1. Test Equipment

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
	Spectrum Analyzer	R&S	FSP40 / 100170	Jun, 2011
	Spectrum Analyzer	Agilent	E4407B / US39440758	Jun, 2011
X	Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2012

Note:
1. All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.
2. The test instruments marked with "X" are used to measure the final test results.

7.2. Test Setup

7.3. Limits

The minimum bandwidth shall be at least 500 kHz.

7.4. Test Procedure

The EUT was setup according to ANSI C63.4: 2003; tested according to DTS test procedure of Jan. 2012 KDB558074 for compliance to FCC 47CFR 15.247 requirements.
Set RBW = 1-5% of the emission bandwidth, VBW≥3*RBW

7.5. Uncertainty

± 150Hz
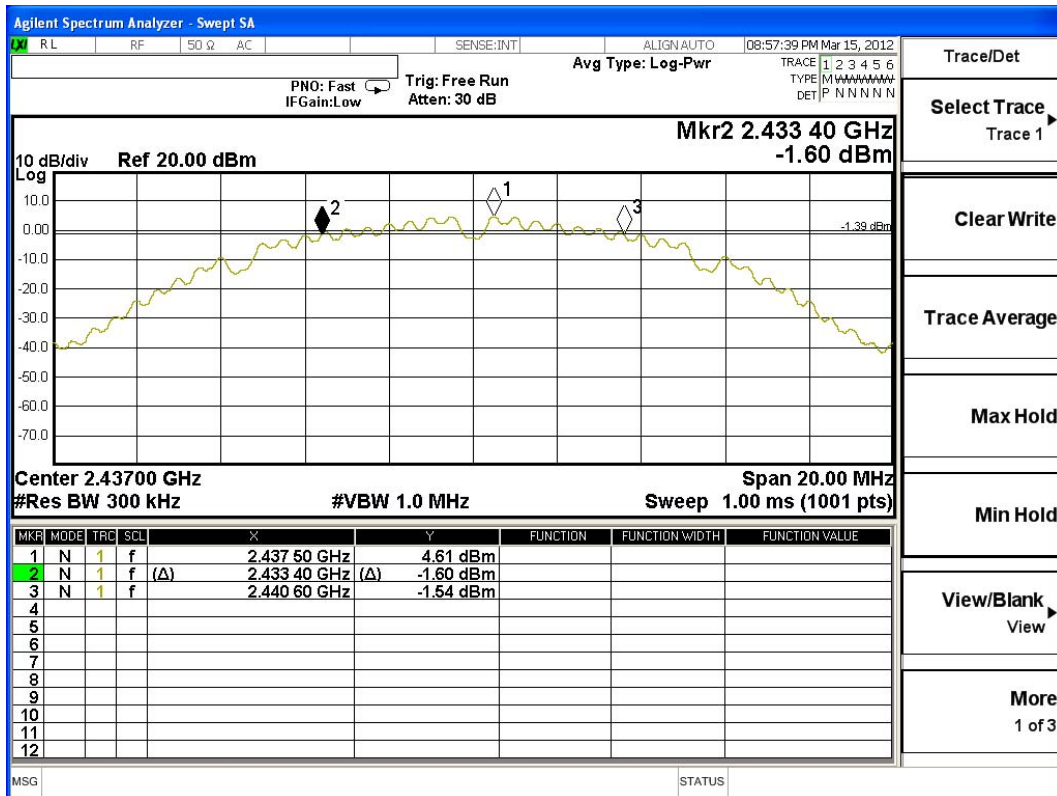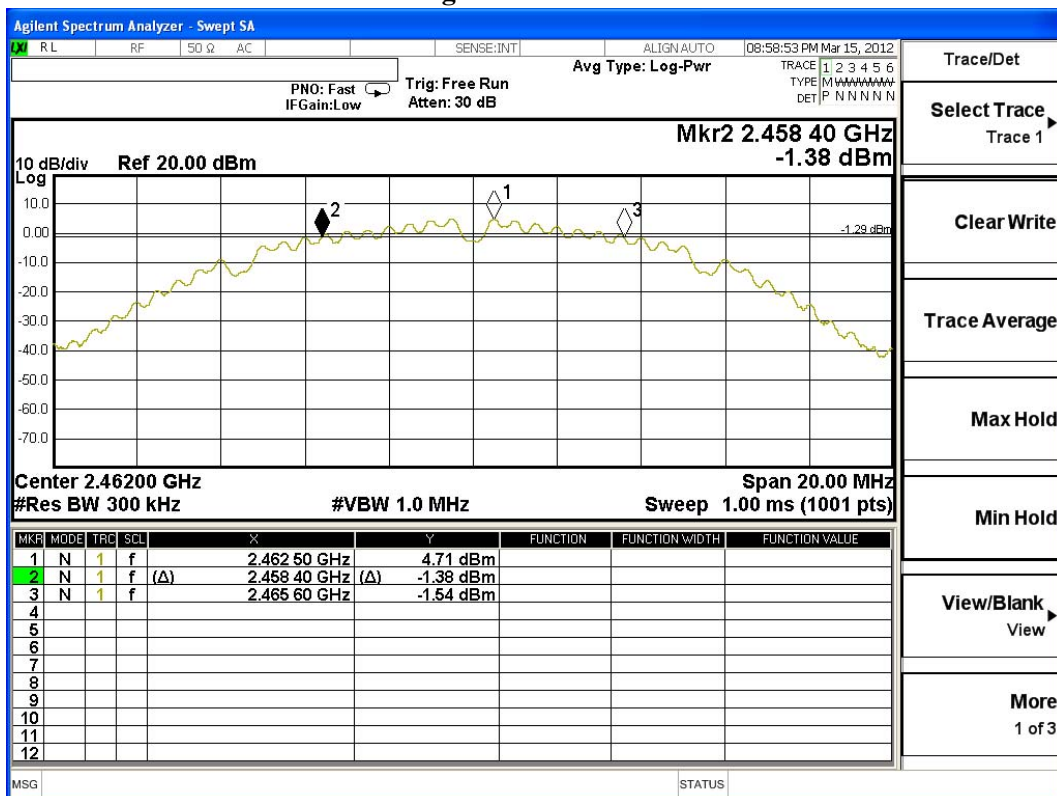
7.6.   Test Result of Occupied Bandwidth

Product   :   WiFi Module
Test Item   :   Occupied Bandwidth Data
Test Site   :   No.3 OATS
Test Mode   :   Mode 1: Transmit (802.11b 1Mbps) (2412MHz)

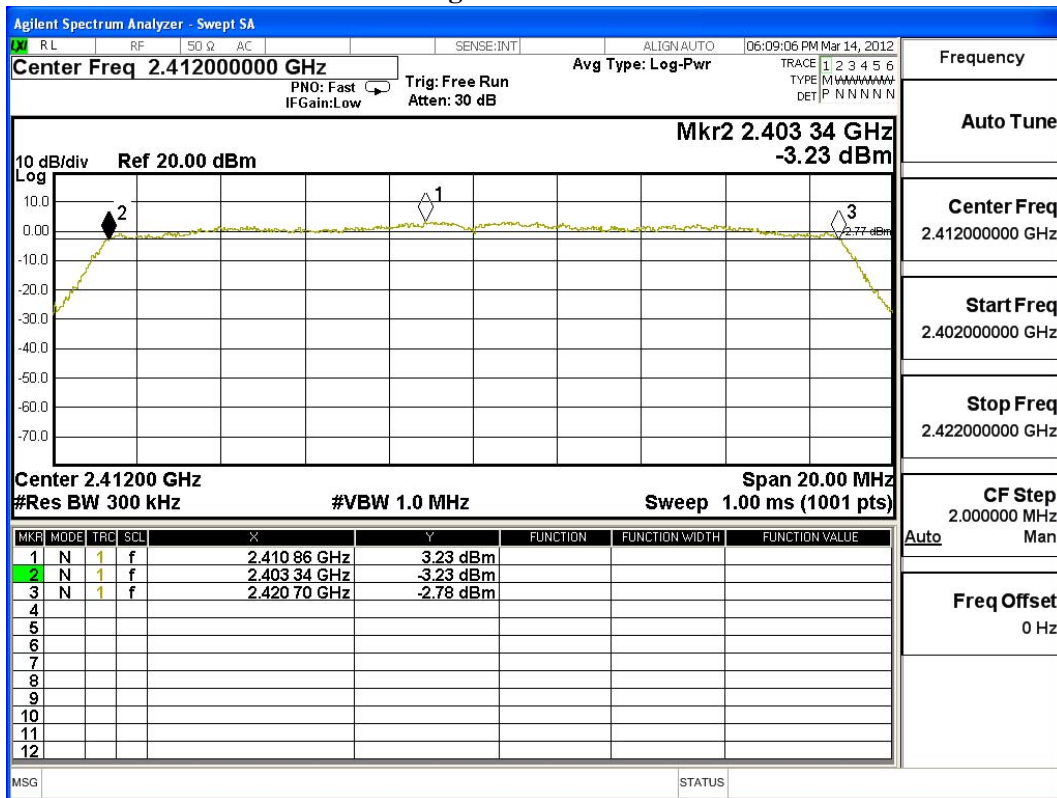| Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
1	2412	7200	>500	Pass

Figure Channel 1:

Product   :   WiFi Module
Test Item   :   Occupied Bandwidth Data
Test Site   :   No.3 OATS
Test Mode   :   Mode 1: Transmit (802.11b 1Mbps) (2437MHz)

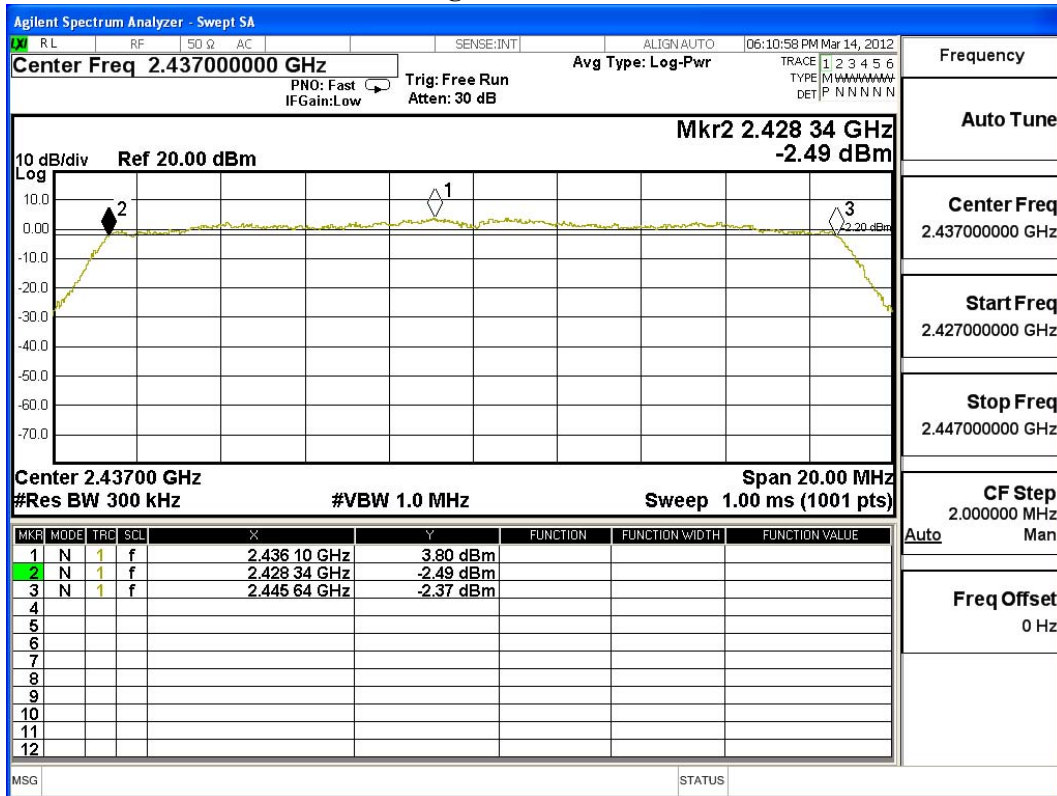| Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
6	2437	7200	>500	Pass

Figure Channel 6:

Product   :   WiFi Module

Test Item   :   Occupied Bandwidth Data

Test Site   :   No.3 OATS

Test Mode   :   Mode 1: Transmit (802.11b 1Mbps) (2462MHz)

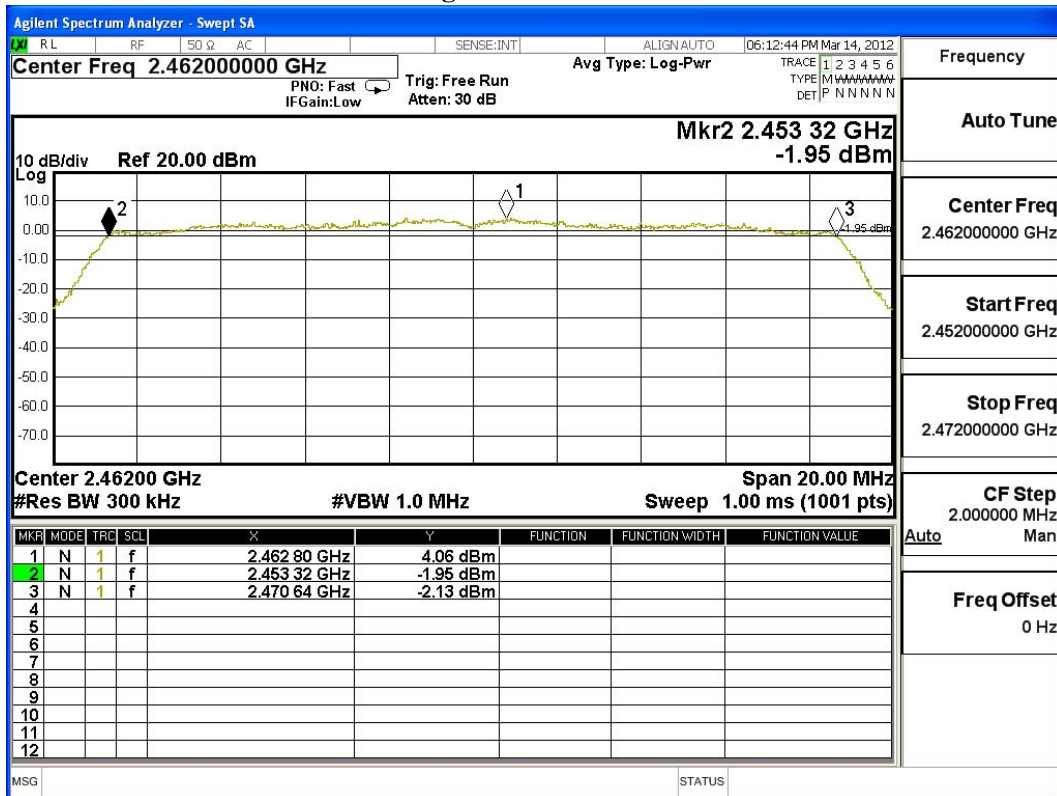| Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
11	2462	7200	>500	Pass

Figure Channel 11:

Product : WiFi Module
Test Item : Occupied Bandwidth Data
Test Site : No.3 OATS
Test Mode : Mode 2: Transmit (802.11g 6Mbps) (2412MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
1	2412	17360	>500	Pass

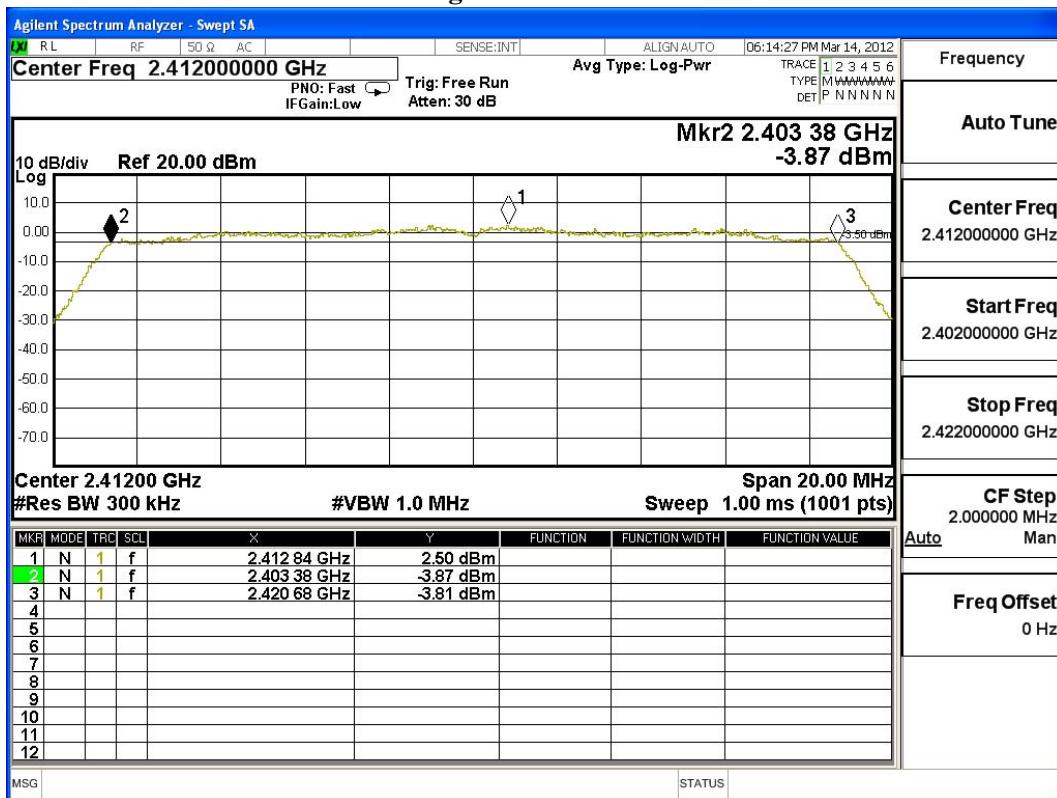**Figure Channel 1:**

Product : WiFi Module
Test Item : Occupied Bandwidth Data
Test Site : No.3 OATS
Test Mode : Mode 2: Transmit (802.11g 6Mbps) (2437MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
6	2437	17300	>500	Pass

Figure Channel 6:

Product : WiFi Module

Test Item : Occupied Bandwidth Data

Test Site : No.3 OATS

Test Mode : Mode 2: Transmit (802.11g 6Mbps) (2462MHz)

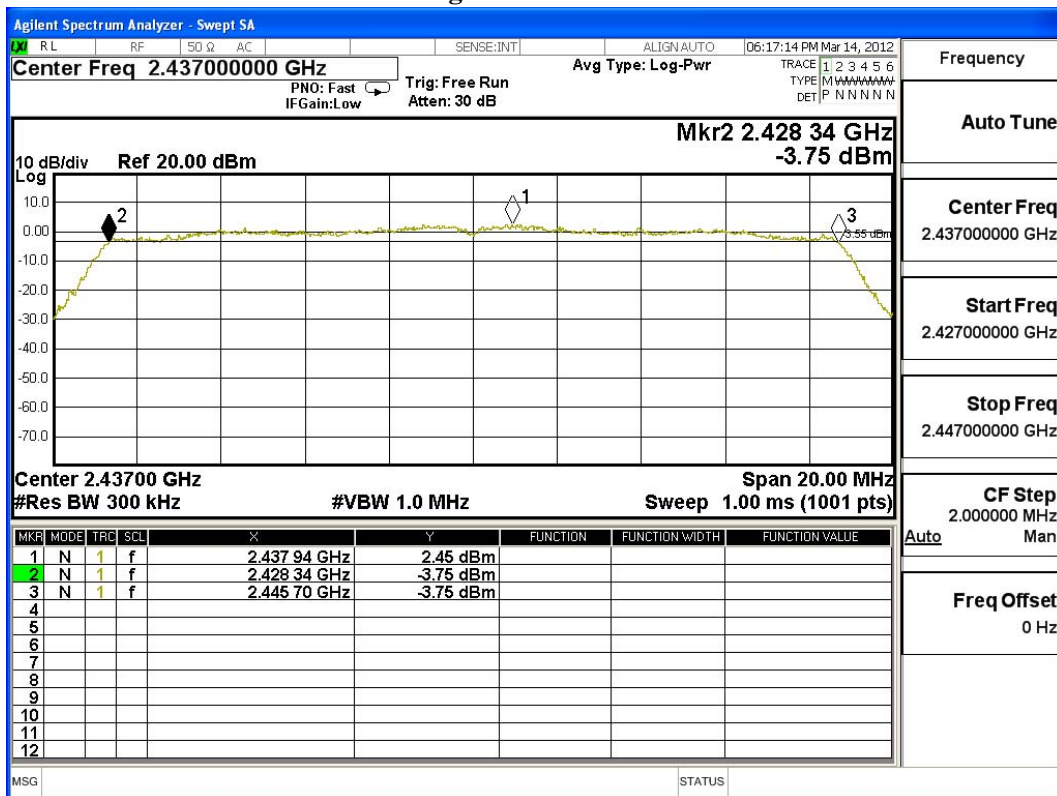| Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
11	2462	17320	>500	Pass

Figure Channel 11:

Product : WiFi Module
Test Item : Occupied Bandwidth Data
Test Site : No.3 OATS
Test Mode : Mode 3: Transmit (802.11n MCS0 7.2Mbps 20M-BW) (2412MHz)

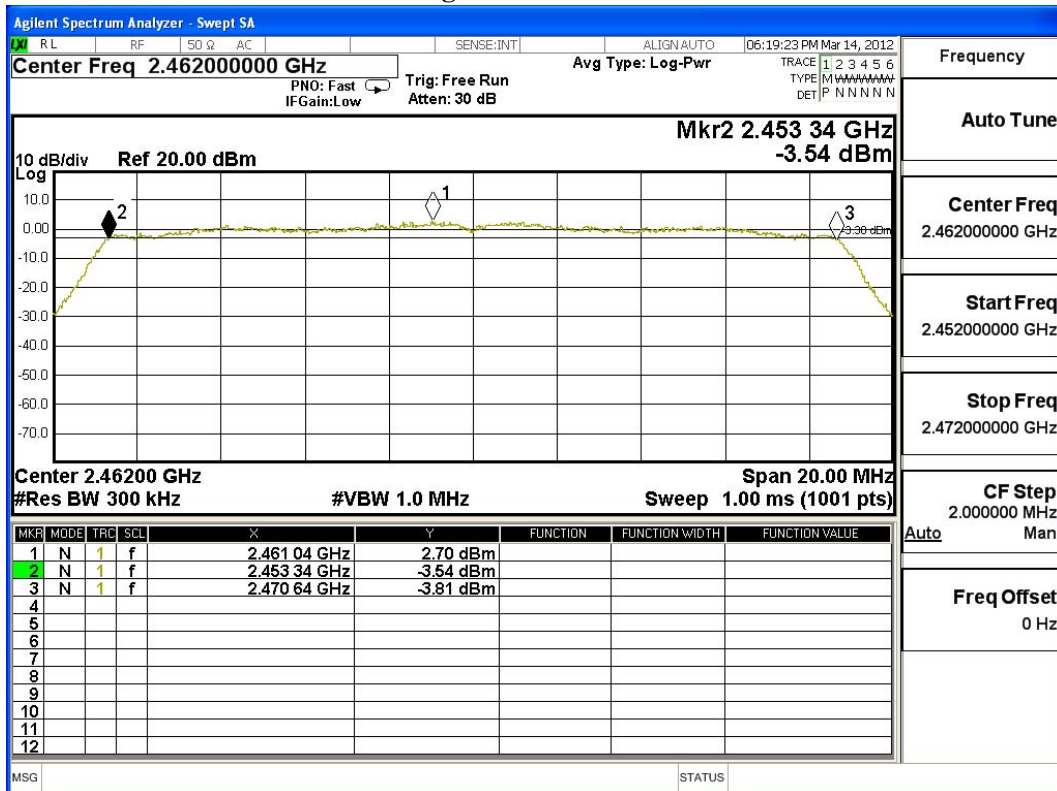| Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
1	2412	17300	>500	Pass

Figure Channel 1:

Product : WiFi Module

Test Item : Occupied Bandwidth Data

Test Site : No.3 OATS

Test Mode : Mode 3: Transmit (802.11n MCS0 7.2Mbps 20M-BW) (2437MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
6	2437	17360	>500	Pass

Figure Channel 6:

Product : WiFi Module

Test Item : Occupied Bandwidth Data

Test Site : No.3 OATS

Test Mode : Mode 3: Transmit (802.11n MCS0 7.2Mbps 20M-BW) (2462MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
11	2462	17300	>500	Pass

Figure Channel 11:

8. Power Density

8.1. Test Equipment

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
	Spectrum Analyzer	R&S	FSP40 / 100170	Jun, 2011
	Spectrum Analyzer	Agilent	E4407B / US39440758	Jun, 2011
X	Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2012

Note:
1. All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.
2. The test instruments marked with "X" are used to measure the final test results.

8.2. Test Setup

8.3. Limits

The transmitted power density averaged over any 1 second interval shall not be greater +8dBm in any 3kHz bandwidth.

8.4. Test Procedure

The EUT was setup according to ANSI C63.4, 2003; tested according to DTS test procedure of Jan. 2012 KDB558074 for compliance to FCC 47CFR 15.247 requirements.
Set RBW= 100 kHz, VBW≥300KHz, SPAN to 5-30 % greater than the EBW,
Scale the observed power level to an equivalent value in 3 kHz by adjusting (reducing) the measured power by a bandwidth correction factor (BWCF) where BWCF = 10log (3 kHz/100 kHz = -15.2 dB).
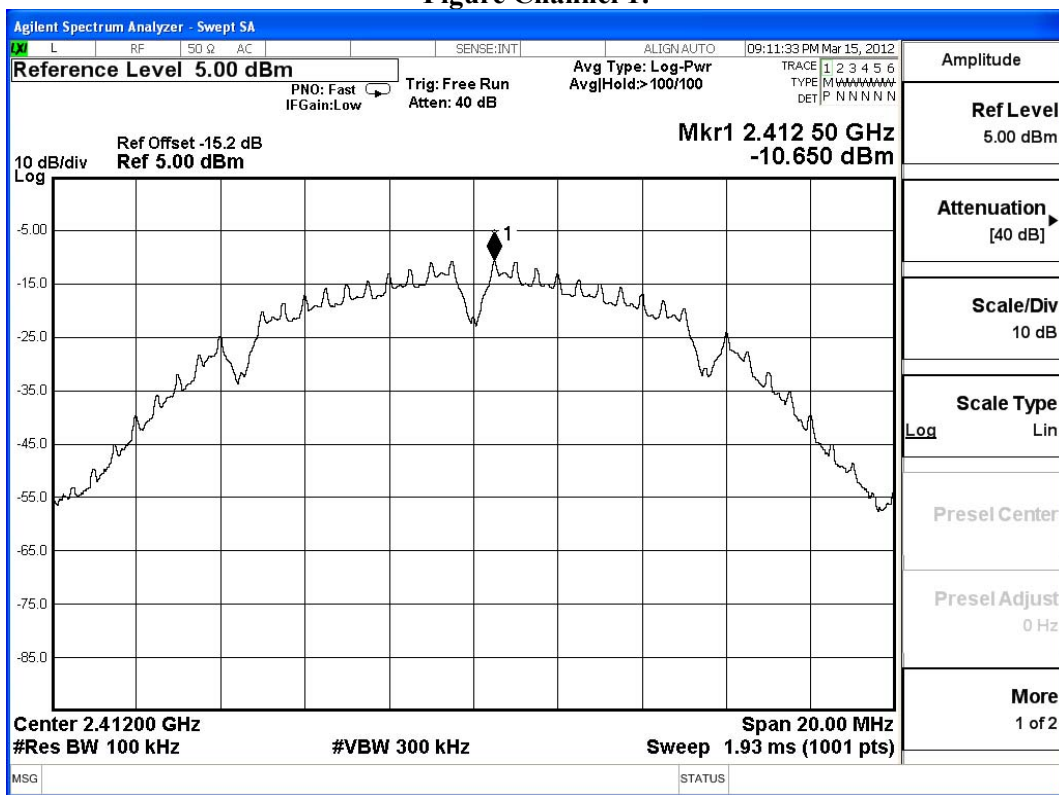
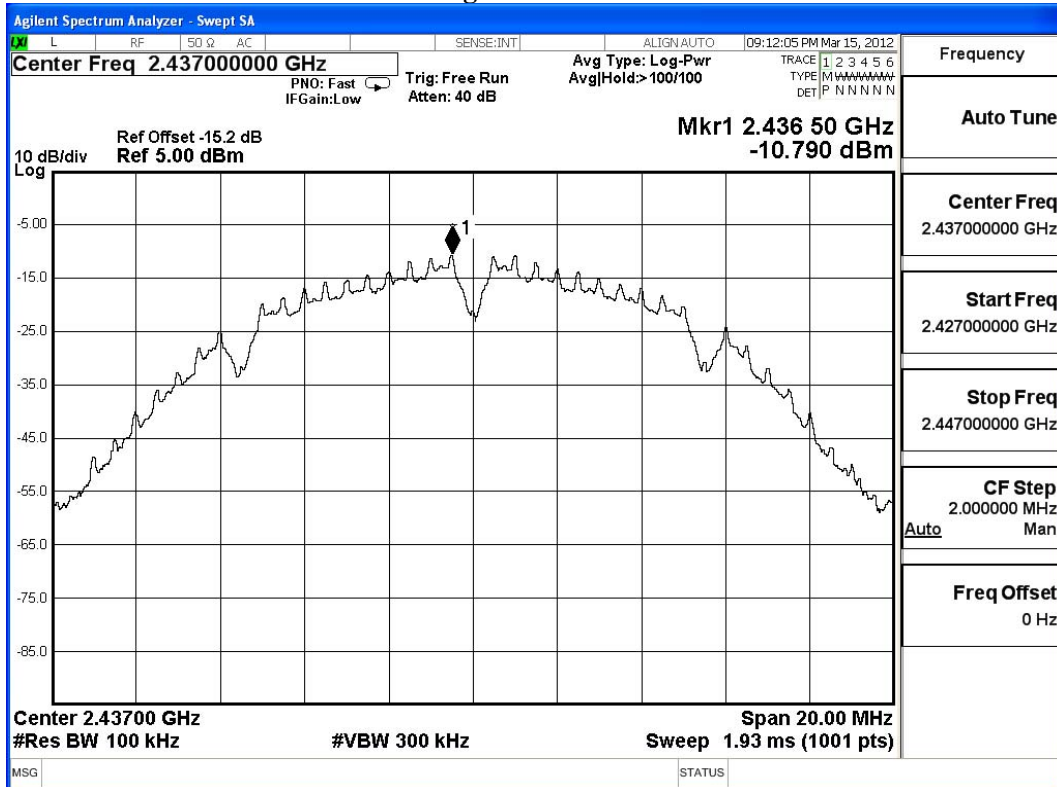### 8.5. Uncertainty

± 1.27 dB

8.6. Test Result of Power Density

Product : WiFi Module

Test Item : Power Density Data

Test Site : No.3 OATS

Test Mode : Mode 1: Transmit (802.11b 1Mbps) (2412MHz)

Channel No.	Frequency (MHz)	Measure Level (dBm)	Limit (dBm)	Result
1	2412	-10.650	< 8dBm	Pass

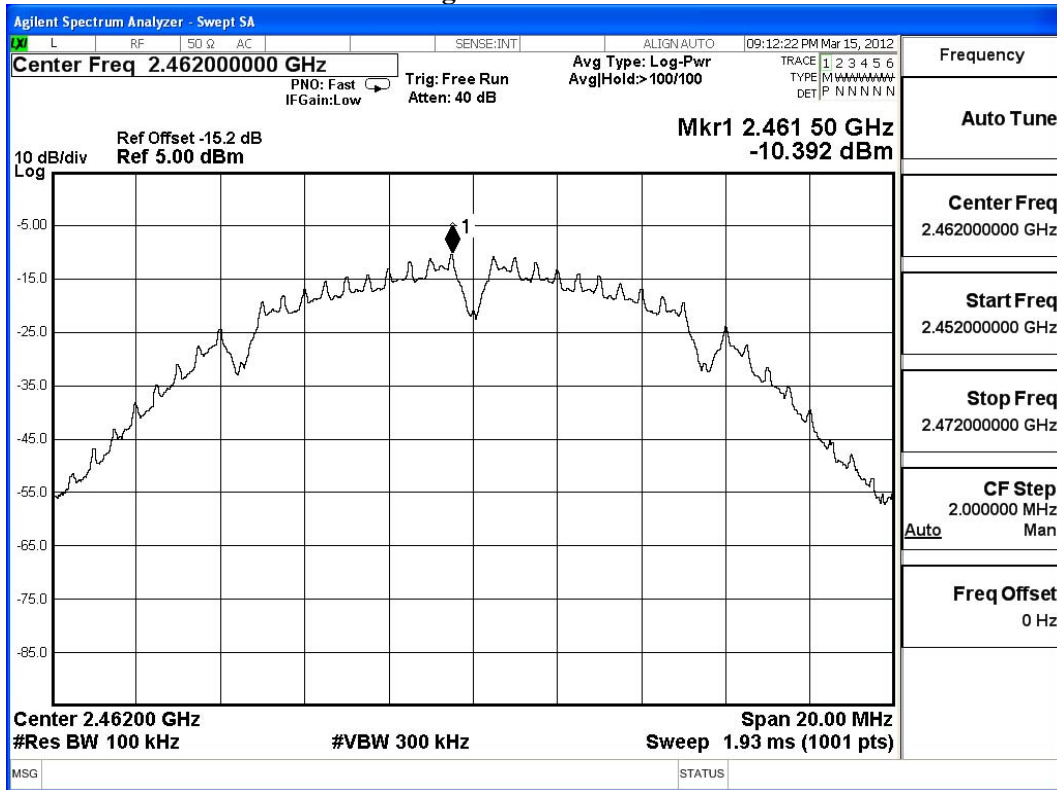**Figure Channel 1:**

Product　　　:　WiFi Module
Test Item　　:　Power Density Data
Test Site　　　:　No.3OATS
Test Mode　　:　Mode 1: Transmit (802.11b 1Mbps) (2437MHz)

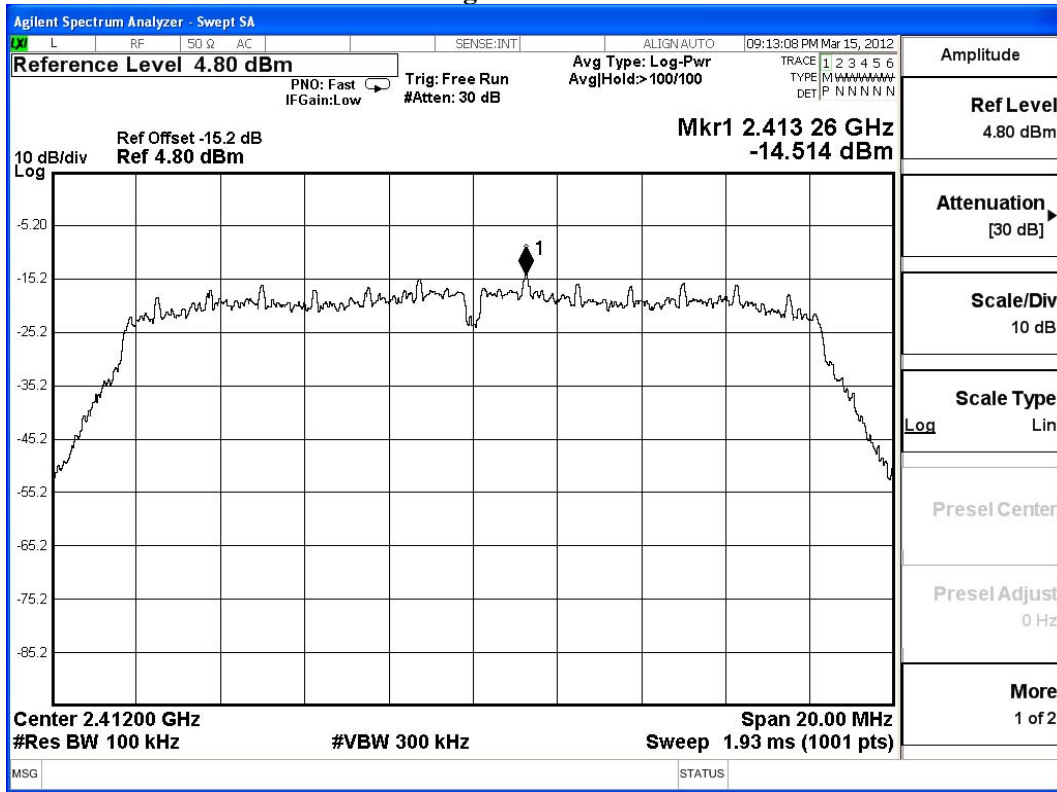| Channel No.	Frequency (MHz)	Measurement Level (dBm)	Required Limit (dBm)	Result
6	2437	-10.790	< 8dBm	Pass

Figure Channel 6:

Product : WiFi Module
Test Item : Power Density Data
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit (802.11b 1Mbps) (2462MHz)

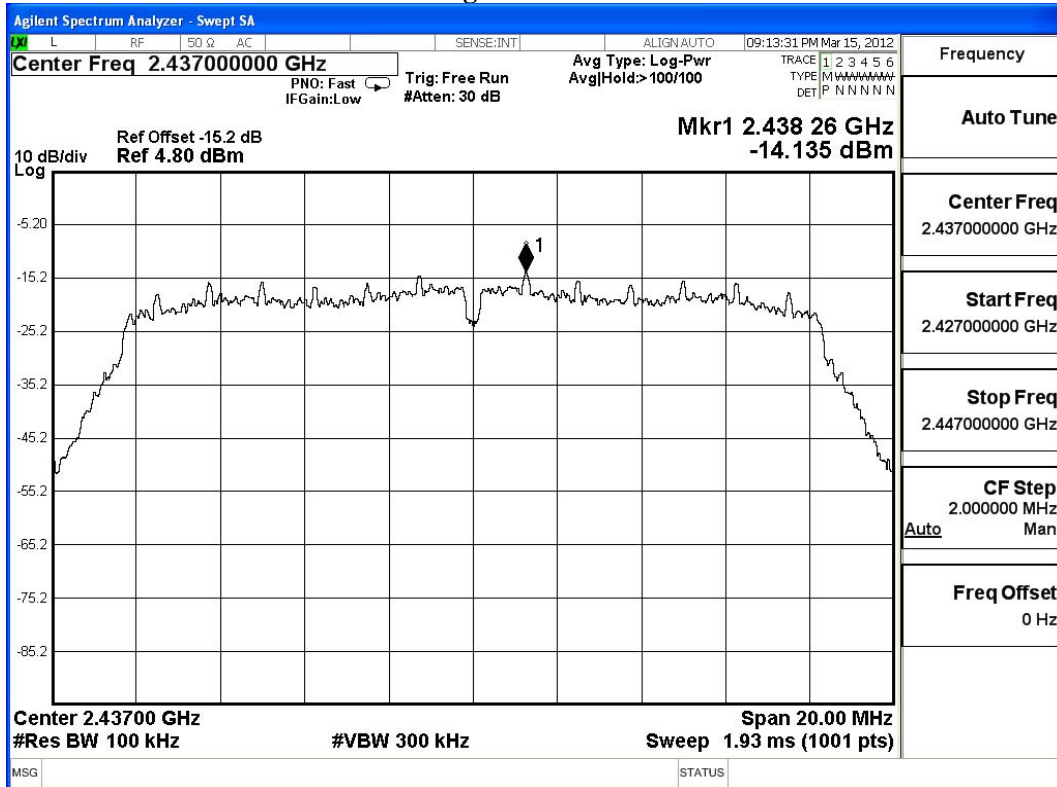| Channel No.	Frequency (MHz)	Measurement Level (dBm)	Required Limit (dBm)	Result
11	2462	-10.392	< 8dBm	Pass

Figure Channel 11:

Product   :   WiFi Module
Test Item   :   Power Density Data
Test Site   :   No.3 OATS
Test Mode   :   Mode 2: Transmit (802.11g 6Mbps) (2412MHz)

Channel No.	Frequency (MHz)	Measure Level (dBm)	Limit (dBm)	Result
1	2412	-14.514	< 8dBm	Pass

Figure Channel 1:

Product   :   WiFi Module
Test Item   :   Power Density Data
Test Site   :   No.3OATS
Test Mode   :   Mode 2: Transmit (802.11g 6Mbps) (2437MHz)

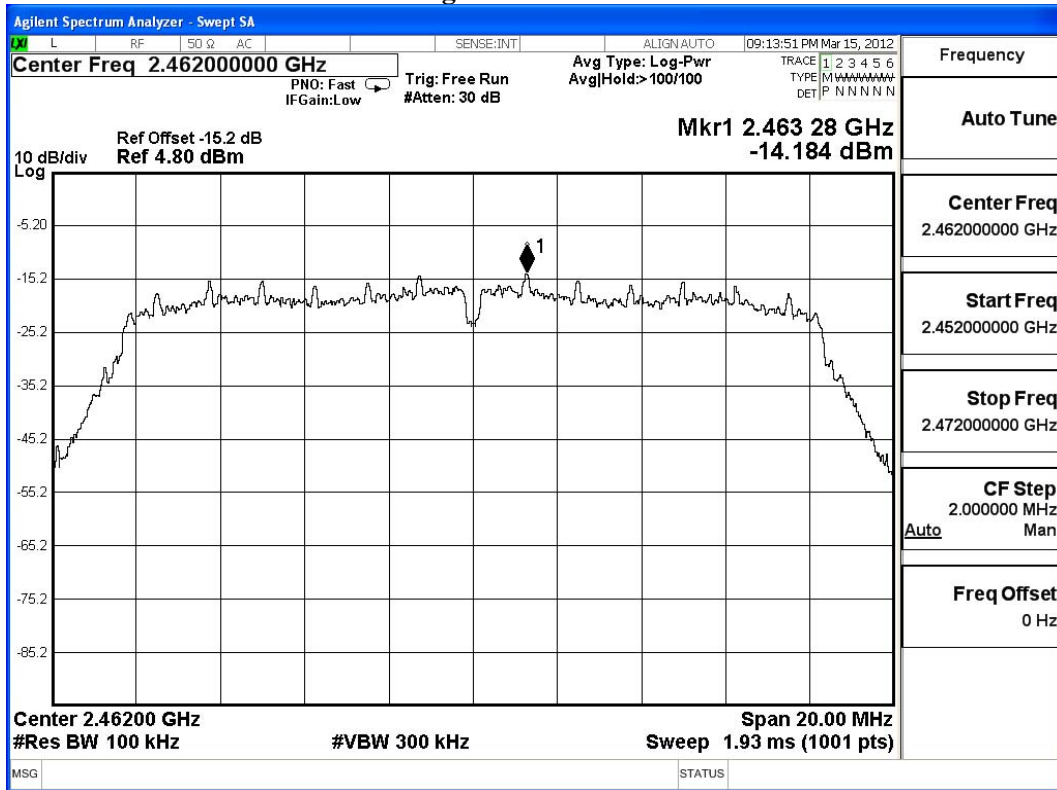| Channel No.	Frequency (MHz)	Measurement Level (dBm)	Required Limit (dBm)	Result
6	2437	-14.135	< 8dBm	Pass

Figure Channel 6:

Product : WiFi Module
Test Item : Power Density Data
Test Site : No.3 OATS
Test Mode : Mode 2: Transmit (802.11g 6Mbps) (2462MHz)

Channel No.	Frequency (MHz)	Measurement Level (dBm)	Required Limit (dBm)	Result
11	2462	-14.184	< 8dBm	Pass

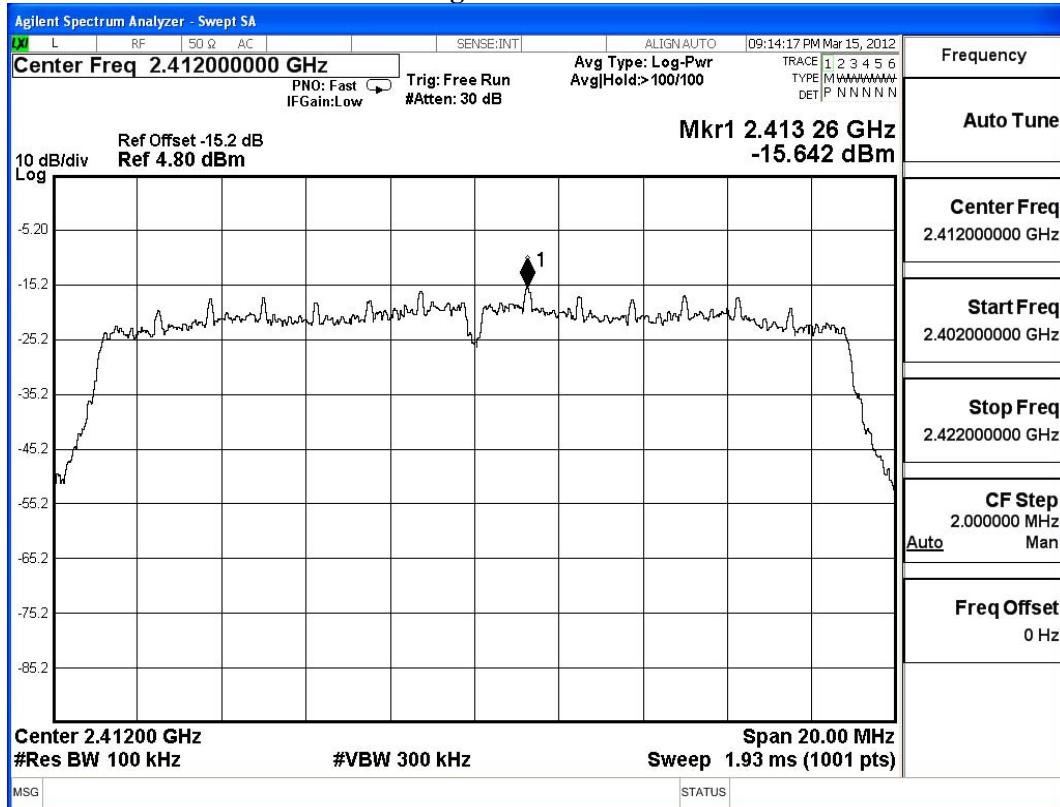**Figure Channel 11:**

Product   :   WiFi Module
Test Item   :   Power Density Data
Test Site   :   No.3 OATS
Test Mode   :   Mode 3: Transmit (802.11n MCS0 7.2Mbps 20M-BW) (2412MHz)

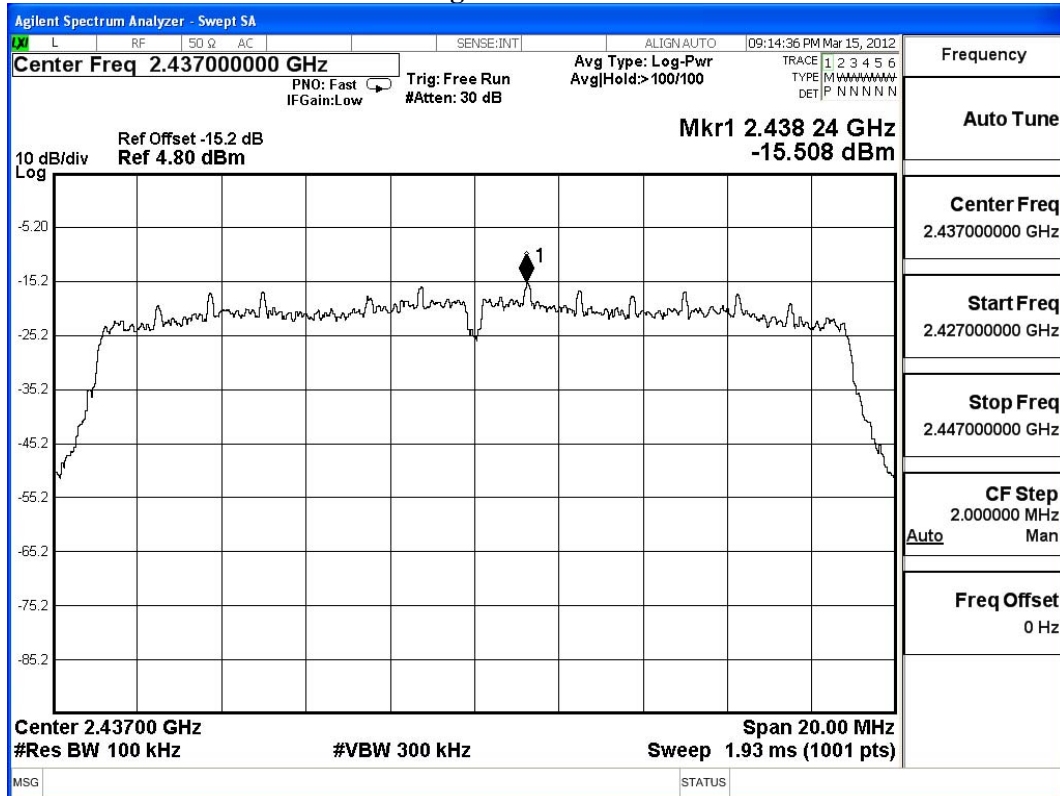| Channel No.	Frequency (MHz)	Measure Level (dBm)	Limit (dBm)	Result
1	2412	-15.642	< 8dBm	Pass

Figure Channel 1:

Product   :   WiFi Module
Test Item   :   Power Density Data
Test Site   :   No.3OATS
Test Mode   :   Mode 3: Transmit (802.11n MCS0 7.2Mbps 20M-BW) (2437MHz)

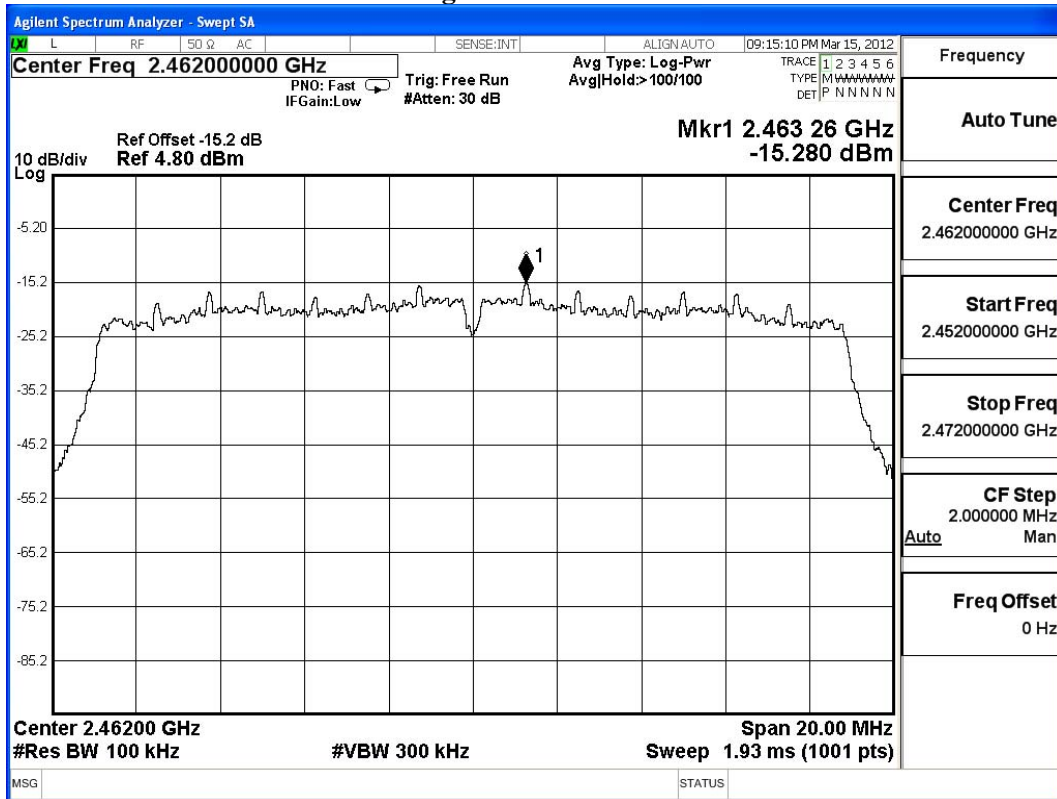| Channel No.	Frequency (MHz)	Measurement Level (dBm)	Required Limit (dBm)	Result
6	2437	-15.508	< 8dBm	Pass

Figure Channel 6:

Product : WiFi Module
Test Item : Power Density Data
Test Site : No.3 OATS
Test Mode : Mode 3: Transmit (802.11n MCS0 7.2Mbps 20M-BW) (2462MHz)

Channel No.	Frequency (MHz)	Measurement Level (dBm)	Required Limit (dBm)	Result
11	2462	-15.280	< 8dBm	Pass

Figure Channel 11:

9.   EMI Reduction Method During Compliance Testing
     No modification was made during testing.