



## Test Report

Product Name	WiFi Module
Model No	WIFI-EM01, WIFI-EM101
FCC ID.	VTV2012001

Applicant	TSC Auto ID Technology Co., Ltd.
Address	No. 35, Sec. 2, Ligong 1st Rd., Wujie Town (Li Tse Industrial Park), I-lan County 268, Taiwan R.O.C.

Date of Receipt	Apr. 19, 2012
Issue Date	May 08, 2012
Report No.	124410R-RFUSP42V01
Report Version	V1.0



The test results relate only to the samples tested.

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# Test Report Certification

Issue Date: May 08, 2012

Report No.: 124410R-RFUSP42V01



**Accredited by NIST (NVLAP)**  
NVLAP Lab Code: 200533-0

Product Name	WiFi Module
Applicant	TSC Auto ID Technology Co., Ltd.
Address	No. 35, Sec. 2, Ligong 1st Rd., Wujie Town (Li Tse Industrial Park), I-lan County 268, Taiwan R.O.C.
Manufacturer	TSC Auto ID Technology Co., Ltd.
Model No.	WIFI-EM01, WIFI-EM101
FCC ID.	VTV2012001
EUT Rated Voltage	DC 3.3V
EUT Test Voltage	AC 120V/60Hz
Trade Name	TSC
Applicable Standard	FCC CFR Title 47 Part 15 Subpart C: 2010 ANSI C63.4: 2003
Test Result	Complied

The test results relate only to the samples tested.

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( Engineer / Alan Chen )

Approved By :

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( Manager / Vincent Lin )

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## 1. GENERAL INFORMATION

### 1.1. EUT Description

Product Name	WiFi Module
Trade Name	TSC
Model No.	WIFI-EM01, WIFI-EM101
FCC ID.	VTV2012001
Frequency Range	2412-2462MHz for 802.11b/g/n-20BW
Number of Channels	802.11b/g/n-20MHz: 11
Data Speed	802.11b: 1-11Mbps, 802.11g: 6-54Mbps, 802.11n: up to 150Mbps
Type of Modulation	802.11b:DSSS (DBPSK, DQPSK, CCK) 802.11g/n:OFDM (BPSK, QPSK, 16QAM, 64QAM)
Antenna Type	Printed on PCB
Antenna Gain	Refer to the table "Antenna List"
Channel Control	Auto

#### Antenna List

No.	Manufacturer	Part No.	Antenna Type	Peak Gain
1	GainSpan	GS-AN042	Printed on PCB	2.26 dBi for 2.4 GHz

Note: The antenna of EUT is conform to FCC 15.203.

## 802.11b/g/n-20MHz Center Frequency of Each Channel:

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
Channel 01:	2412 MHz	Channel 02:	2417 MHz	Channel 03:	2422 MHz	Channel 04:	2427 MHz
Channel 05:	2432 MHz	Channel 06:	2437 MHz	Channel 07:	2442 MHz	Channel 08:	2447 MHz
Channel 09:	2452 MHz	Channel 10:	2457 MHz	Channel 11:	2462 MHz		

## Note:

1. The EUT is a WiFi Module with a built-in 2.4GHz WLAN transceiver.
2. Regarding to the operation frequency, the lowest, middle and highest frequency are selected to perform the test.
3. Lowest and highest data rates are tested in each mode. Only worst case is shown in the report.  
(802.11b is 1Mbps 、802.11g is 6Mbps 、802.11n(20M-BW) is 7.2Mbps)
4. These tests are conducted on a sample for the purpose of demonstrating compliance of 802.11b/g/n transmitter with Part 15 Subpart C Paragraph 15.247 of spread spectrum devices.
5. The radiation measurements are performed in X, Y, Z axis positioning. Only the worst case is shown in the report.

Test Mode:	Mode 1: Transmit (802.11b 1Mbps)
	Mode 2: Transmit (802.11g 6Mbps)
	Mode 3: Transmit (802.11n MCS0 7.2Mbps 20M-BW)

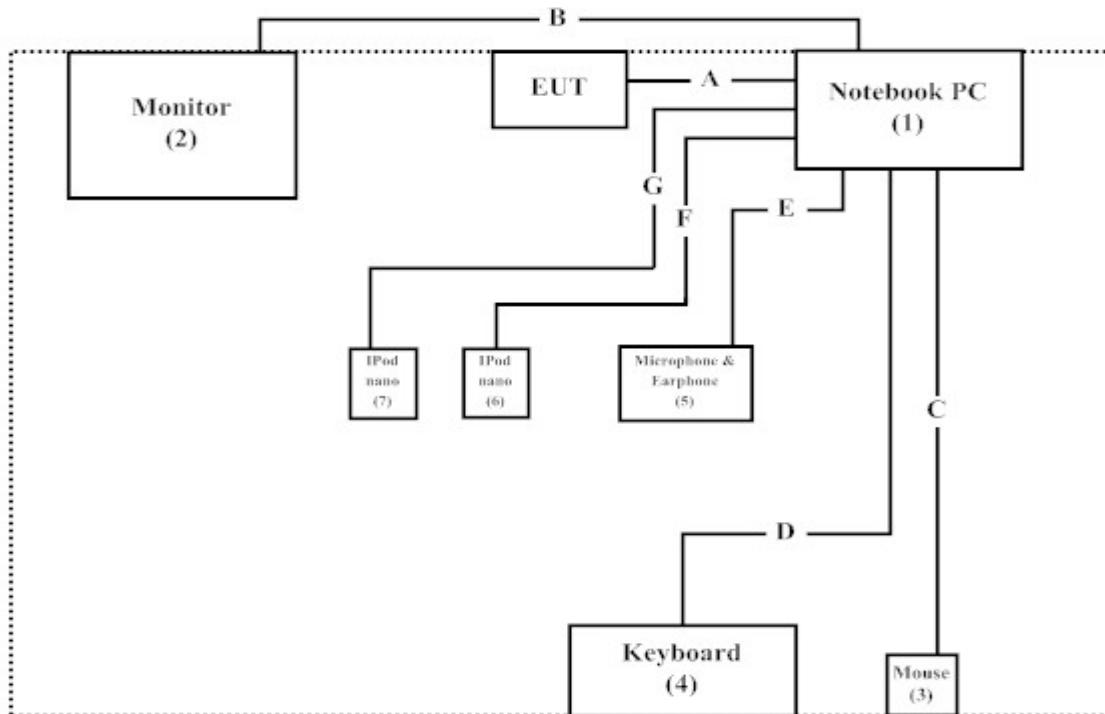
### 1.3. Tested System Details

The types for all equipment, plus descriptions of all cables used in the tested system (including inserted cards) are:

Product	Manufacturer	Model No.	Serial No.	Power Cord
1 Notebook PC	DELL	PP18L	36119001664	Non-Shielded, 0.8m
2 Monitor	LG	W2261VT	907YHZK07373	Non-Shielded, 1.8m
3 Mouse	N/A	SWW-25	A4SWW250702	N/A
4 Keyboard	DELL	SK-8115	MY-0DJ325-71619-7A2-0330	N/A
5 Microphone & Earphone	PCHOME	N/A	N/A	N/A
6 iPod nano	Apple	A1199	YM7088TVVQ5	N/A
7 iPod nano	Apple	A1199	YM7333SUVQ5	N/A

Signal Cable Type	Signal cable Description
A RS-232 Cable	Non-Shielded, 1.0m
B VGA Cable	Non-Shielded, 1.6m, with two ferrite cores bonded.
C Mouse Cable	Non-Shielded, 1.5m
D USB Keyboard Cable	Non-Shielded, 2.0m
E Microphone & Earphone Cable	Non-Shielded, 1.5m
F iPod Cable	Non-Shielded, 1.2m
G iPod Cable	Non-Shielded, 1.2m

### 1.4. Configuration of Tested System



## 1.5. EUT Exercise Software

- (1) Setup the EUT as shown in Section 1.4
- (2) Execute software “Tera Term (v4.67)” on the Notebook.
- (3) Configure the test mode, the test channel, and the data rate.
- (4) Press “OK” to start the continuous Transmit.
- (5) Verify that the EUT works properly.

## 1.6. Test Facility

Ambient conditions in the laboratory:

Items	Required (IEC 68-1)	Actual
Temperature (°C)	15-35	20-35
Humidity (%RH)	25-75	50-65
Barometric pressure (mbar)	860-1060	950-1000

The related certificate for our laboratories about the test site and management system can be downloaded from

QuieTek Corporation's Web Site: <http://www.quietek.com/tw/ctg/cts/accreditations.htm>

The address and introduction of QuieTek Corporation's laboratories can be founded in our Web site:

<http://www.quietek.com/>

Site Description: File on  
Federal Communications Commission  
FCC Engineering Laboratory  
7435 Oakland Mills Road  
Columbia, MD 21046  
Registration Number: 92195

Accreditation on NVLAP  
NVLAP Lab Code: 200533-0

Site Name: Quietek Corporation  
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E-Mail : [service@quietek.com](mailto:service@quietek.com)

FCC Accreditation Number: TW1014

## 2. Conducted Emission

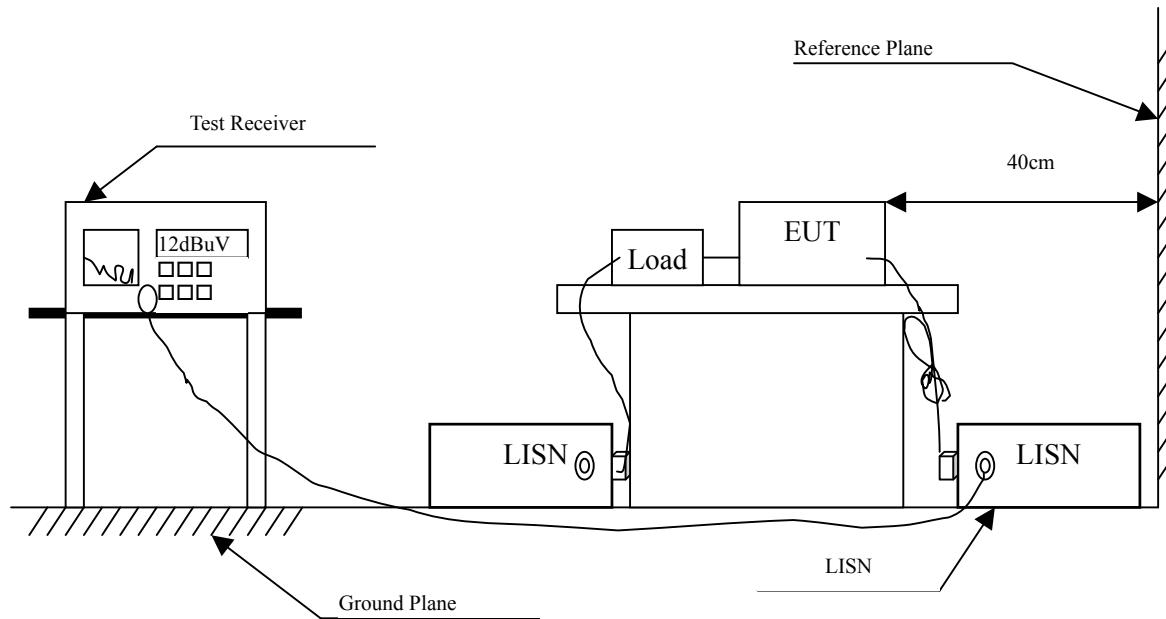
### 2.1. Test Equipment

	Equipment	Manufacturer	Model No. / Serial No.	Last Cal.	Remark
X	Test Receiver	R & S	ESCS 30 / 825442/018	Sep., 2011	
X	Artificial Mains Network	R & S	ENV4200 / 848411/10	Feb., 2012	Peripherals
X	LISN	R & S	ESH3-Z5 / 825562/002	Feb., 2012	EUT
	DC LISN	Schwarzbeck	8226 / 176	Mar, 2012	EUT
X	Pulse Limiter	R & S	ESH3-Z2 / 357.8810.52	Feb., 2012	
	No.1 Shielded Room				

Note:

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

### 2.2. Test Setup



### 2.3. Limits

FCC Part 15 Subpart C Paragraph 15.207 (dBuV) Limit		
Frequency MHz	Limits	
	QP	AVG
0.15 - 0.50	66-56	56-46
0.50-5.0	56	46
5.0 - 30	60	50

### 2.4. Test Procedure

The EUT and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm /50uH coupling impedance with 50ohm termination. (Please refers to the block diagram of the test setup and photographs.)

Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4: 2003 on conducted measurement.

Conducted emissions were invested over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

### 2.5. Uncertainty

± 2.26 dB

## 2.6. Test Result of Conducted Emission

Product : WiFi Module  
 Test Item : Conducted Emission Test  
 Power Line : Line 1  
 Test Mode : Mode 3: Transmit (802.11n MCS0 7.2Mbps 20M-BW) (2437MHz)

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV	dB	dBuV
<b>Line 1</b>					
<b>Quasi-Peak</b>					
0.185	9.782	48.510	58.292	-6.708	65.000
0.216	9.835	44.860	54.695	-9.419	64.114
0.283	9.830	38.220	48.050	-14.150	62.200
0.369	9.820	34.080	43.900	-15.843	59.743
1.236	9.830	25.900	35.730	-20.270	56.000
5.880	9.878	28.490	38.368	-21.632	60.000
<b>Average</b>					
0.185	9.782	31.480	41.262	-13.738	55.000
0.216	9.835	30.050	39.885	-14.229	54.114
0.283	9.830	28.100	37.930	-14.270	52.200
0.369	9.820	23.340	33.160	-16.583	49.743
1.236	9.830	19.300	29.130	-16.870	46.000
5.880	9.878	21.550	31.428	-18.572	50.000

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. “ ” means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product : WiFi Module  
 Test Item : Conducted Emission Test  
 Power Line : Line 2  
 Test Mode : Mode 3: Transmit (802.11n MCS0 7.2Mbps 20M-BW) (2437MHz)

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV	dB	dBuV
<b>Line 2</b>					
<b>Quasi-Peak</b>					
0.158	9.792	51.760	61.552	-4.219	65.771
0.189	9.771	47.190	56.961	-7.925	64.886
0.244	9.778	41.580	51.358	-11.956	63.314
0.388	9.806	33.190	42.996	-16.204	59.200
1.681	9.860	27.240	37.100	-18.900	56.000
6.252	9.893	28.020	37.913	-22.087	60.000
<b>Average</b>					
0.158	9.792	35.310	45.102	-10.669	55.771
0.189	9.771	30.770	40.541	-14.345	54.886
0.244	9.778	28.430	38.208	-15.106	53.314
0.388	9.806	21.210	31.016	-18.184	49.200
1.681	9.860	21.830	31.690	-14.310	46.000
6.252	9.893	22.130	32.023	-17.977	50.000

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. “ ” means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

### 3. Peak Power Output

#### 3.1. Test Equipment

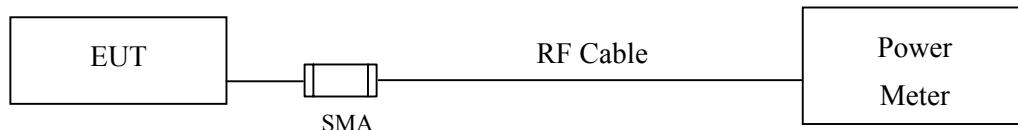
	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
X	Power Meter	Anritsu	ML2495A/6K00003357	May, 2012
X	Power Sensor	Anritsu	MA2411B/0738448	Jun, 2011
	Spectrum Analyzer	R&S	FSP40 / 100170	Jun, 2011
	Spectrum Analyzer	Agilent	E4407B / US39440758	Jun, 2011
X	Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2012

Note:

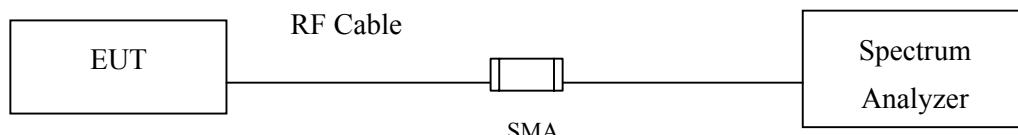
1. All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.
2. The test instruments marked with “X” are used to measure the final test results.

#### 3.2. Test Setup

Average Power For different Data Rate (Mbps)



Peak Power Measurement



#### 3.3. Limits

The maximum peak power shall be less 1 Watt.

### **3.4. Test Procedure**

The EUT was tested according to DTS test procedure of Jan. 2012 KDB558074 for compliance to FCC 47CFR 15.247 requirements.

### **3.5. Uncertainty**

$\pm$  1.27 dB

### 3.6. Test Result of Peak Power Output

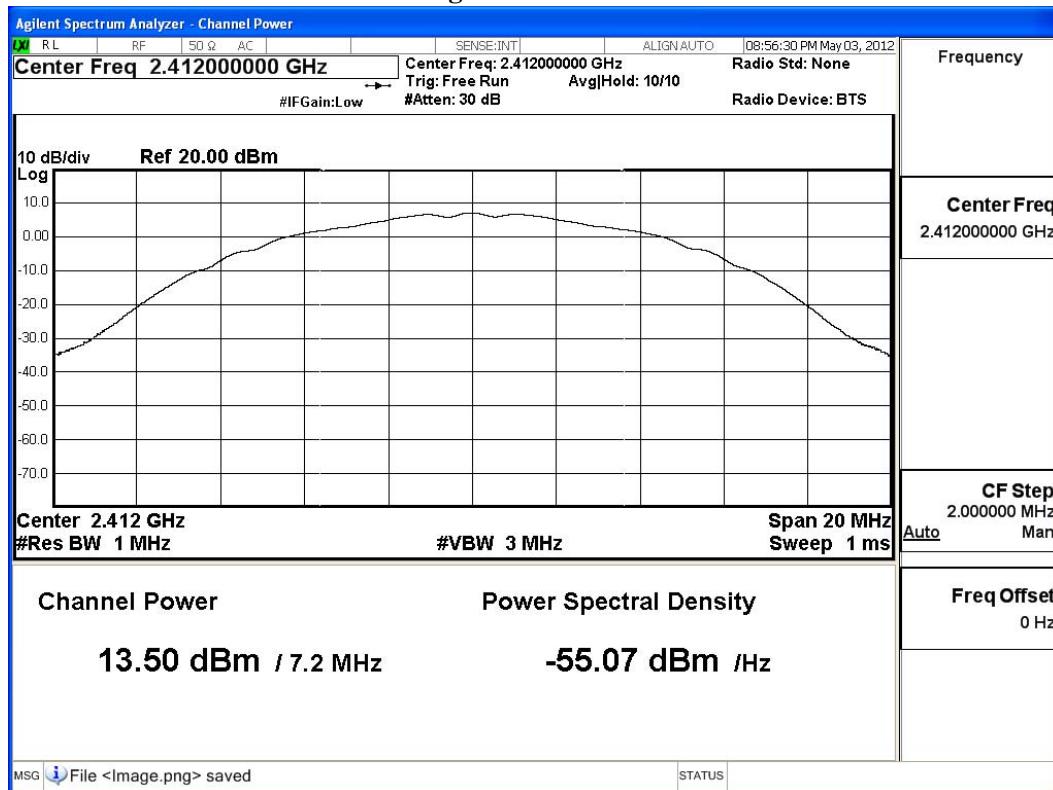
Product : WiFi Module  
 Test Item : Peak Power Output Data  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmit (802.11b 1Mbps)

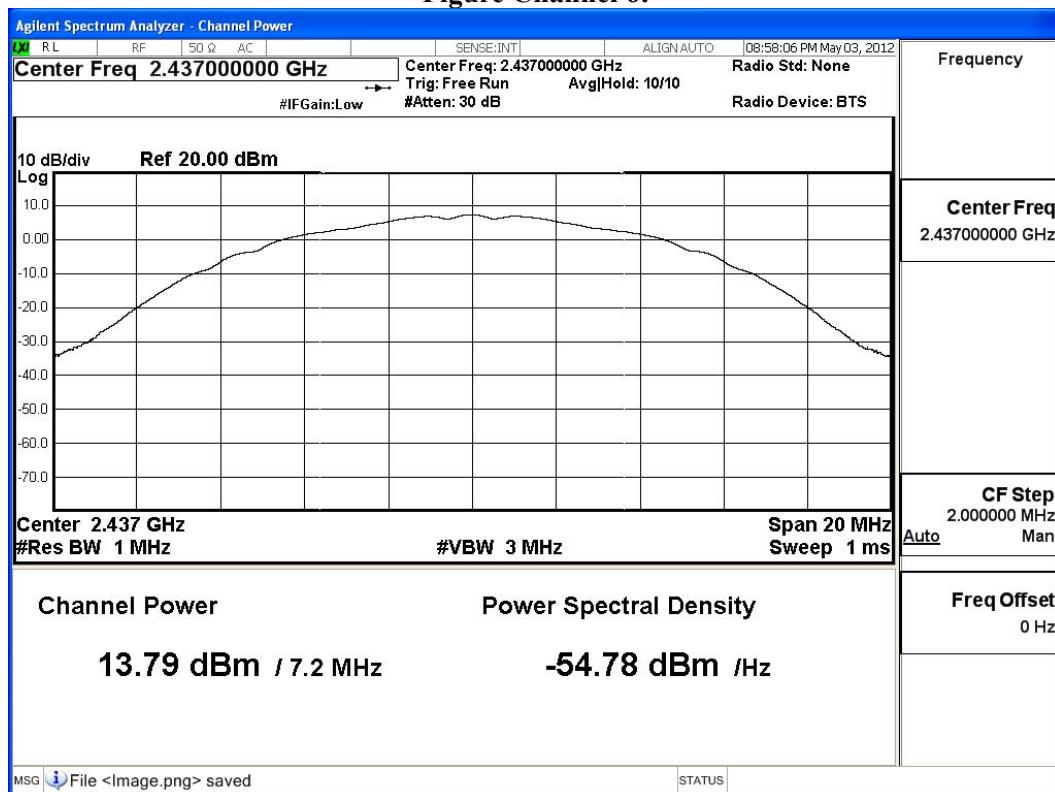
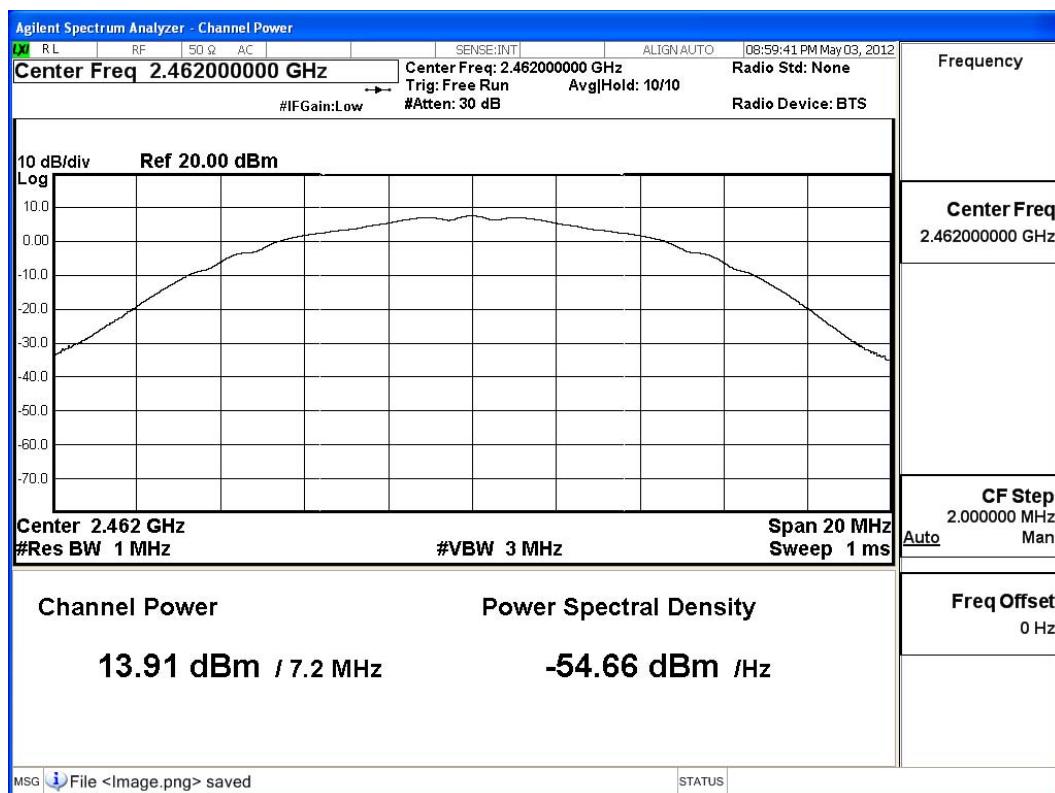
Channel No	Frequency (MHz)	Average Power For different Data Rate (Mbps)				Peak Power	Required Limit	Result
		1	2	5.5	11			
		Measurement Level (dBm)						
01	2412	12.61	--	--	--	13.50	<30dBm	Pass
06	2437	12.50	12.48	12.46	12.45	13.79	<30dBm	Pass
11	2462	12.82	--	--	--	13.91	<30dBm	Pass

Note:

1. Peak Power Output Value =Reading value on Spectrum Analyzer + cable loss  
(Use the spectrum analyzer's integrated channel power measurement function)
2. Average Power for different data rate = Reading value on Power Meter +cable loss

**Figure Channel 1:**



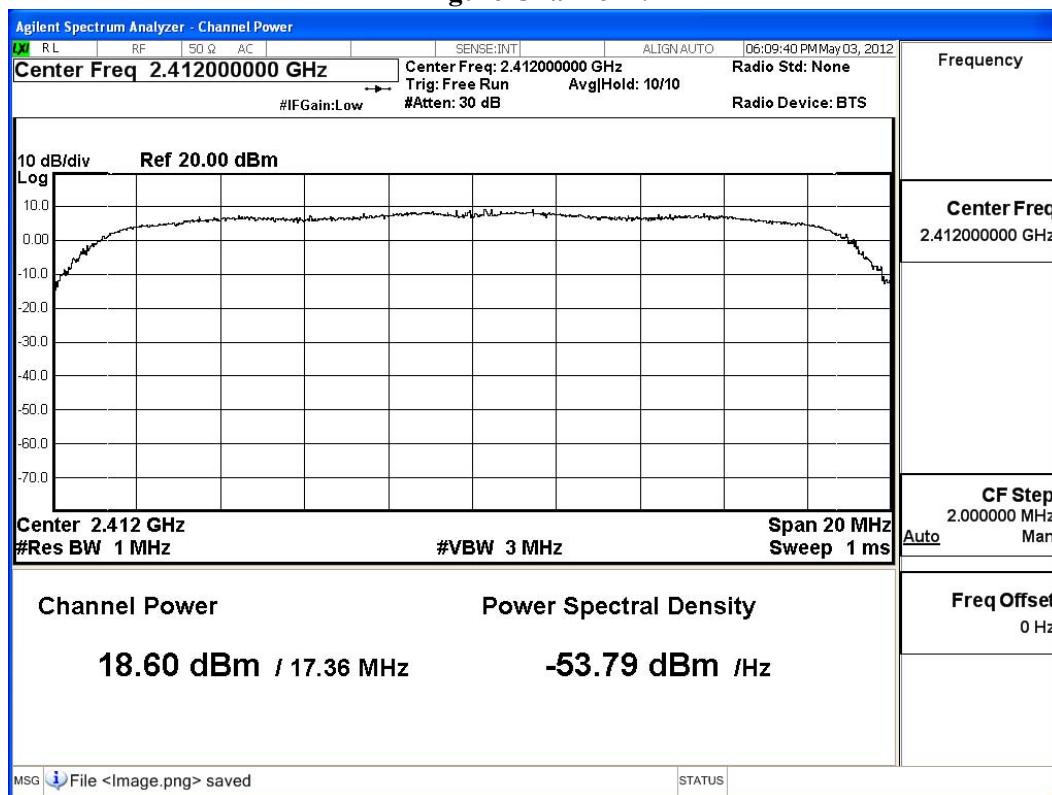
**Figure Channel 6:**

**Figure Channel 11:**


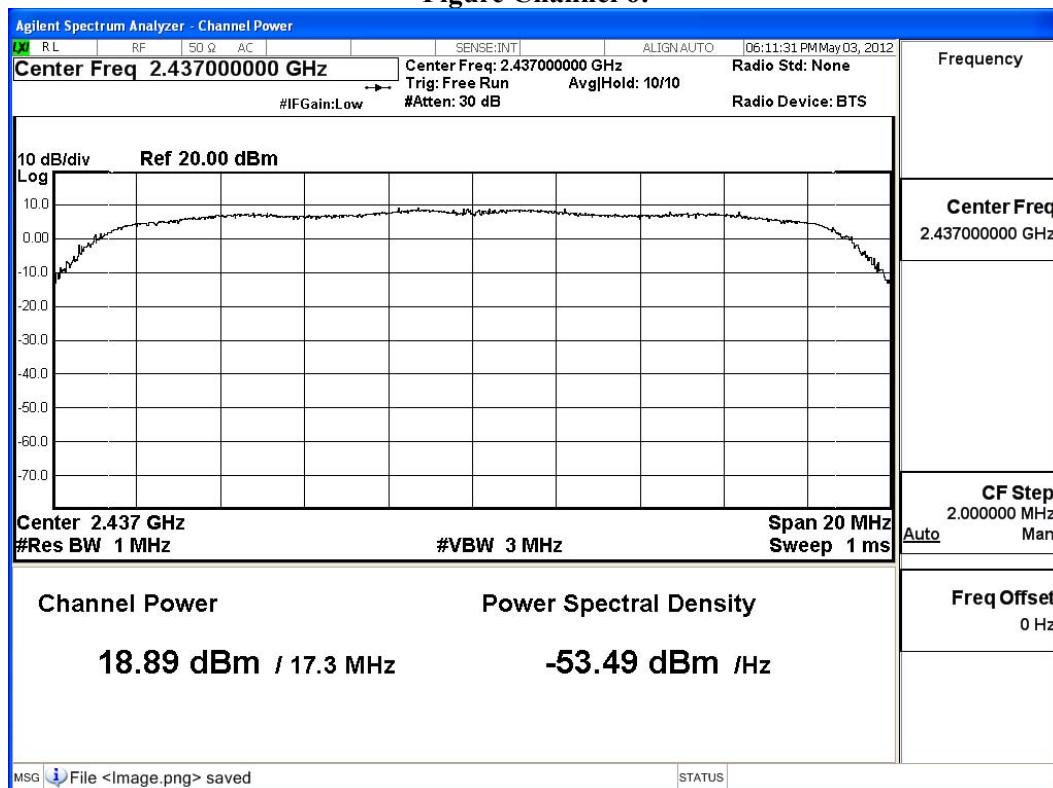
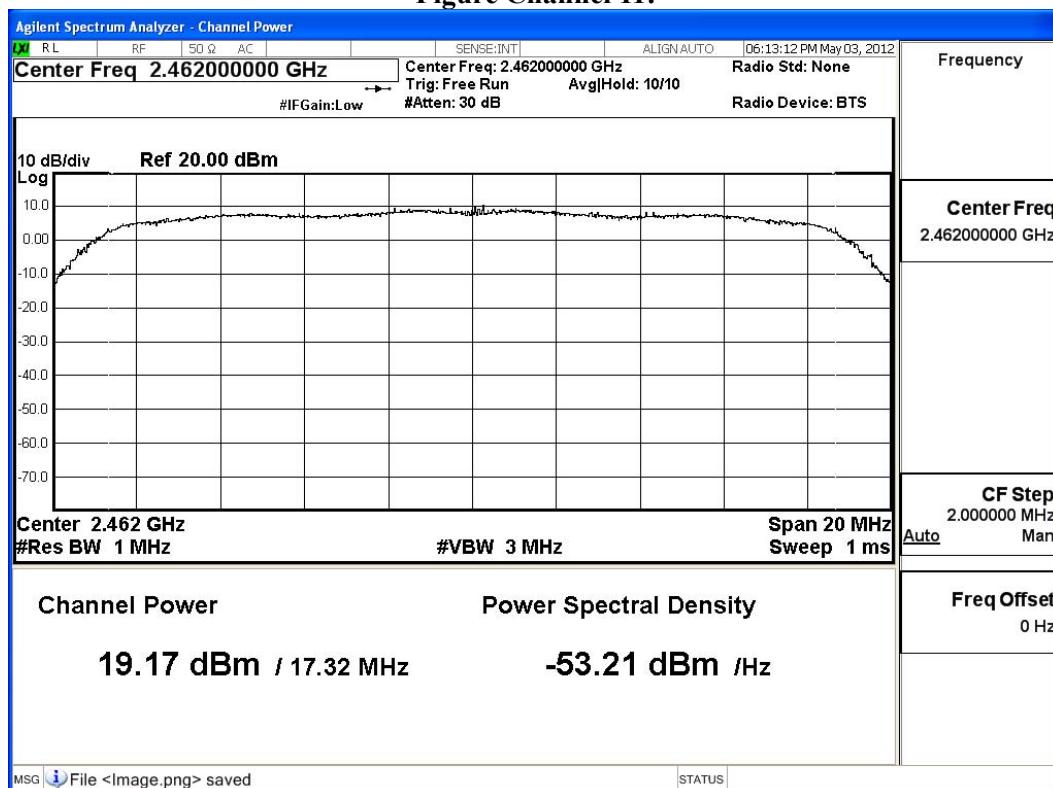
Product : WiFi Module  
 Test Item : Peak Power Output Data  
 Test Site : No.3 OATS  
 Test Mode : Mode 2: Transmit (802.11g 6Mbps)

Channel No	Frequency (MHz)	Average Power For different Data Rate (Mbps)								Peak Power	Required Limit	Result
		6	9	12	18	24	36	48	54			
		Measurement Level (dBm)										
01	2412	12.90	--	--	--	--	--	--	--	18.60	<30dBm	Pass
06	2437	13.02	12.98	12.94	12.91	12.89	12.87	12.85	12.83	18.89	<30dBm	Pass
11	2462	12.51	--	--	--	--	--	--	--	19.17	<30dBm	Pass

**Note:**

1. Peak Power Output Value =Reading value on Spectrum Analyzer + cable loss  
(Use the spectrum analyzer's integrated channel power measurement function)
2. Average Power for different data rate = Reading value on Power Meter +cable loss

**Figure Channel 1:**


**Figure Channel 6:**

**Figure Channel 11:**


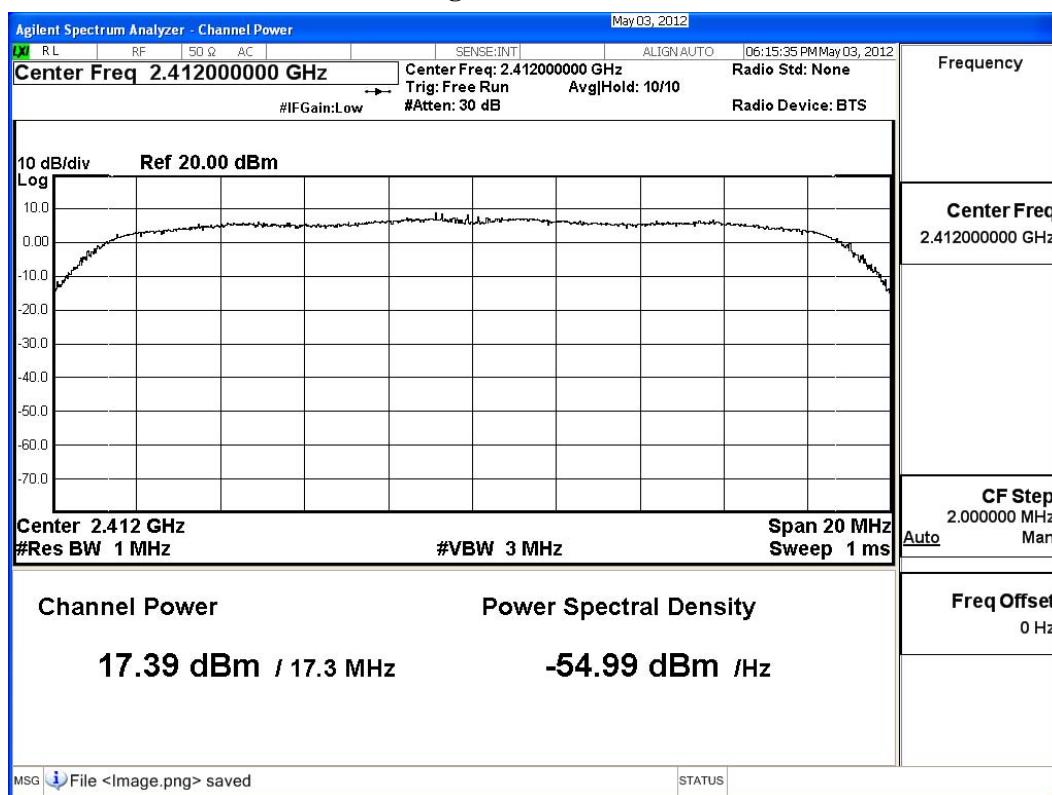
Product : WiFi Module  
 Test Item : Peak Power Output Data  
 Test Site : No.3 OATS  
 Test Mode : Mode 3: Transmit (802.11n MCS0 7.2Mbps 20M-BW)

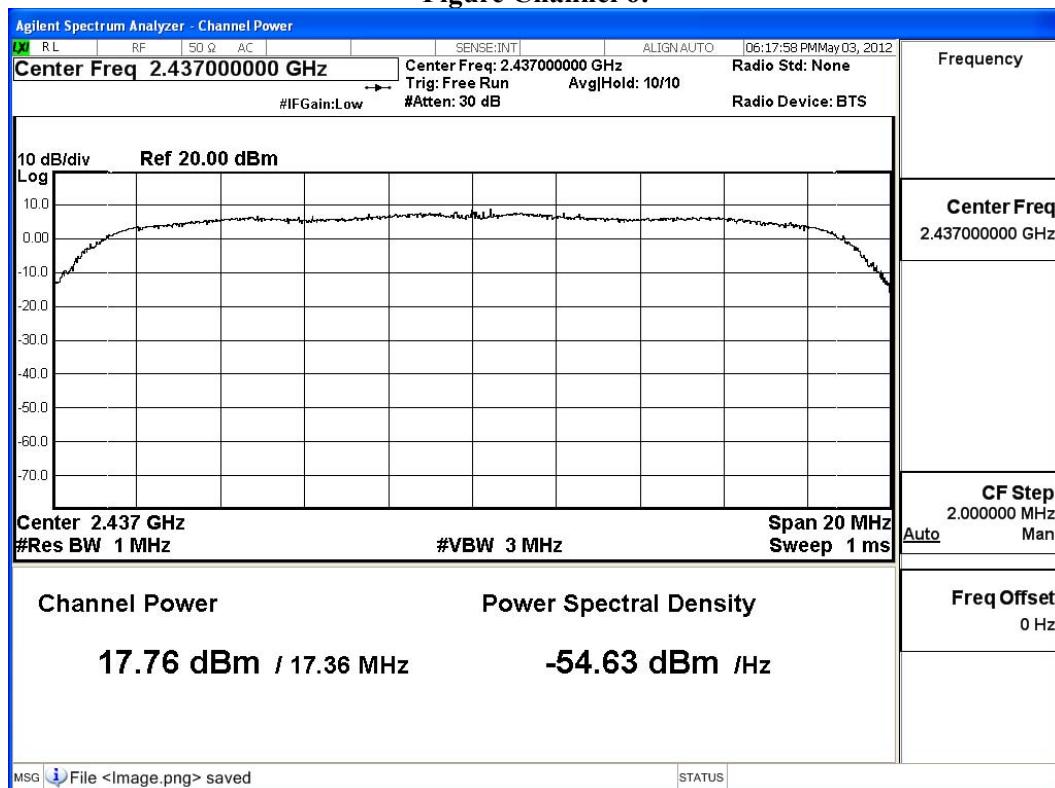
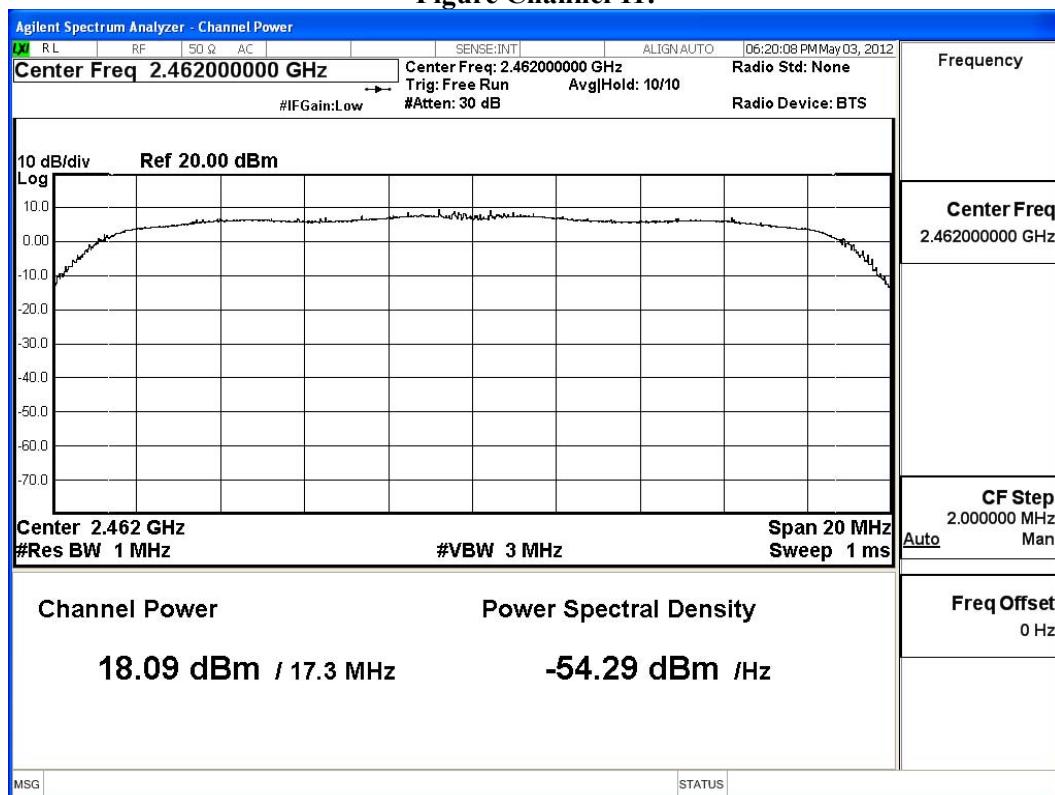
Channel No	Frequency (MHz)	Average Power For different Data Rate (Mbps)								Peak Power	Required Limit	Result
		7.2	14.4	21.7	28.9	43.3	57.8	65	72.2			
		Measurement Level (dBm)										
01	2412	12.04	--	--	--	--	--	--	--	17.39	<30dBm	Pass
06	2437	12.04	12.03	12.01	11.99	11.97	11.96	11.95	11.94	17.76	<30dBm	Pass
11	2462	11.93	--	--	--	--	--	--	--	18.09	<30dBm	Pass

Note:

1. Peak Power Output Value =Reading value on Spectrum Analyzer + cable loss  
(Use the spectrum analyzer's integrated channel power measurement function)
2. Average Power for different data rate = Reading value on Power Meter +cable loss

**Figure Channel 1:**



**Figure Channel 6:****Figure Channel 11:**

## 4. Radiated Emission

### 4.1. Test Equipment

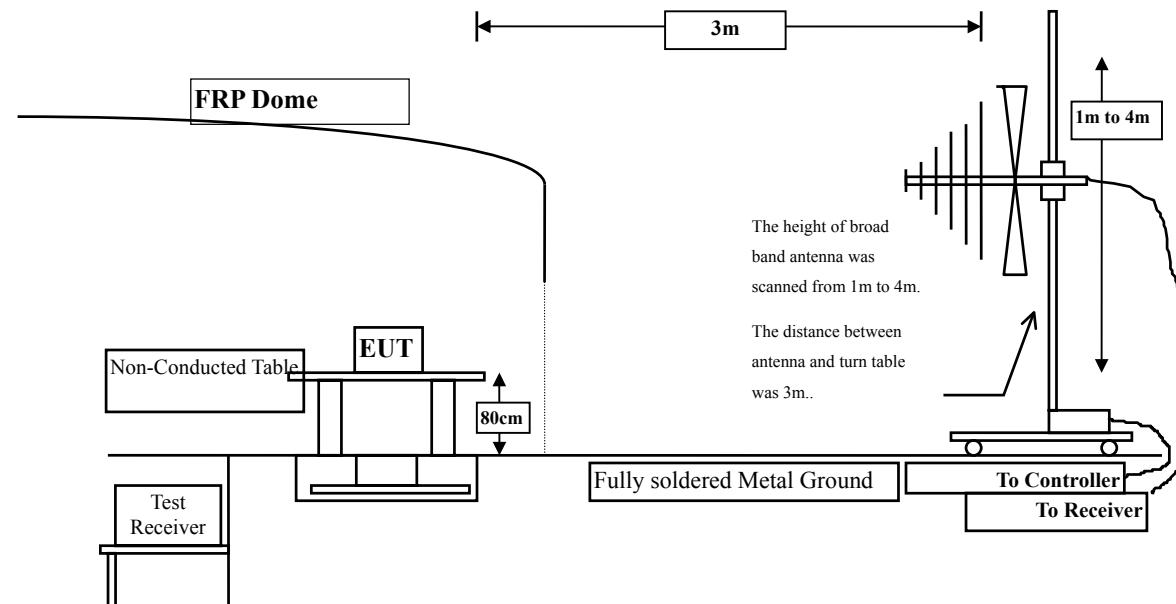
The following test equipment are used during the radiated emission test:

Test Site	Equipment		Manufacturer	Model No./Serial No.	Last Cal.
☒Site # 3	X	Bilog Antenna	Schaffner Chase	CBL6112B/2673	Sep., 2011
	X	Horn Antenna	Schwarzbeck	BBHA9120D/D305	Sep., 2011
	X	Horn Antenna	Schwarzbeck	BBHA9170/208	Jul., 2011
	X	Pre-Amplifier	Agilent	8447D/2944A09549	Sep., 2011
	X	Spectrum Analyzer	Agilent	E4407B / US39440758	May, 2012
	X	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

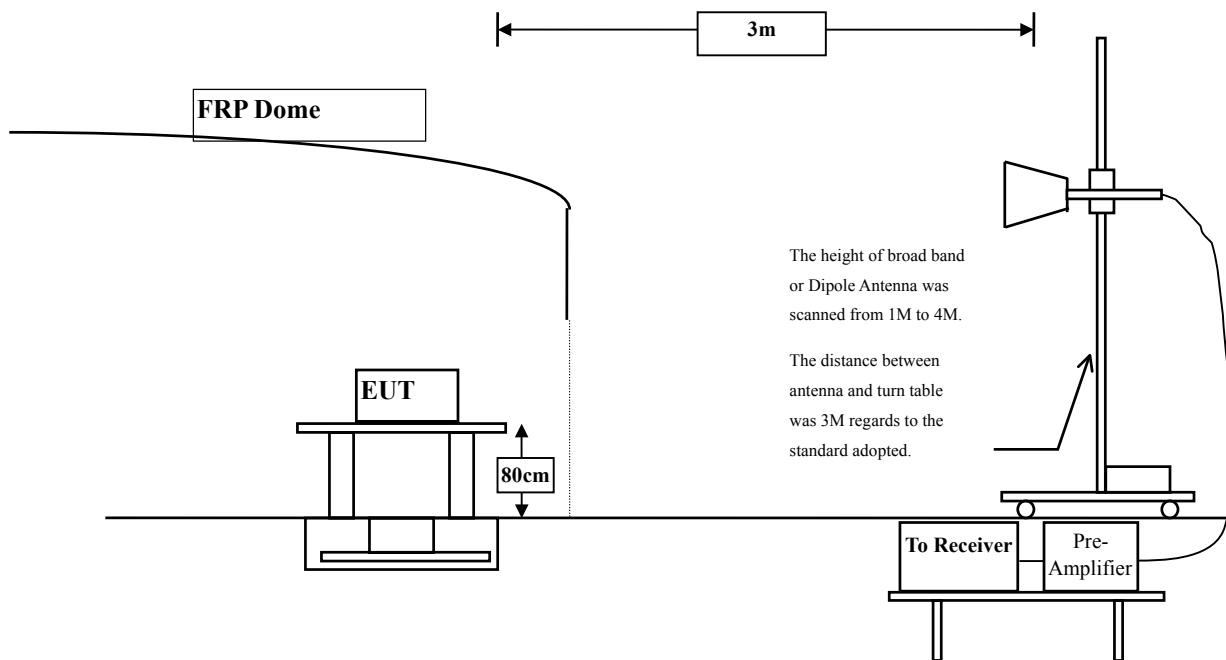
Note: 1. All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.  
2. The test instruments marked with "X" are used to measure the final test results.

## 4.2. Test Setup

### Radiated Emission Below 1GHz



### Radiated Emission Above 1GHz



#### 4.3. 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.

<b>FCC Part 15 Subpart C Paragraph 15.209(a) Limits</b>		
Frequency MHz	uV/m @3m	dBuV/m@3m
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

Remarks: E field strength (dBuV/m) = 20 log E field strength (uV/m)

#### **4.4. 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 between 1 meter and 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.

The resolution bandwidth below 1GHz setting on the field strength meter is 120 kHz and above 1GHz is 1MHz.

Radiated emission measurements below 1GHz are made using broadband Bilog antenna and above 1GHz are made using Horn Antennas.

The measurement is divided into the Preliminary Measurement and the Final Measurement.

The suspected frequencies are searched for in Preliminary Measurement with the measurement antenna kept pointed at the source of the emission both in azimuth and elevation, with the polarization of the antenna oriented for maximum response. The antenna is pointed at an angle towards the source of the emission, and the EUT is rotated in both height and polarization to maximize the measured emission. The emission is kept within the illumination area of the 3 dB bandwidth of the antenna.

The worst radiated emission is measured in the Open Area Test Site on the Final Measurement.

The frequency range from 30MHz to 10th harmonics is checked.

#### **4.5. Uncertainty**

± 3.9 dB above 1GHz

± 3.8 dB below 1GHz

#### 4.6. Test Result of Radiated Emission

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

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
<b>Horizontal</b>					
<b>Peak Detector:</b>					
4824.000	3.261	37.350	40.611	-33.389	74.000
7236.000	10.650	36.790	47.440	-26.560	74.000
9648.000	13.337	36.340	49.676	-24.324	74.000
<b>Average Detector:</b>					
--					
<b>Vertical</b>					
<b>Peak Detector:</b>					
4824.000	6.421	37.160	43.581	-30.419	74.000
7236.000	11.495	35.850	47.345	-26.655	74.000
9648.000	13.807	36.510	50.316	-23.684	74.000
<b>Average Detector:</b>					
--					

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss -Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

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

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
<b>Horizontal</b>					
<b>Peak Detector:</b>					
4874.000	3.038	37.650	40.687	-33.313	74.000
7311.000	11.795	35.660	47.454	-26.546	74.000
9748.000	12.635	36.920	49.555	-24.445	74.000
<b>Average Detector:</b>					
--					
<b>Vertical</b>					
<b>Peak Detector:</b>					
4874.000	5.812	37.390	43.201	-30.799	74.000
7311.000	12.630	35.070	47.699	-26.301	74.000
9748.000	13.126	36.100	49.226	-24.774	74.000
<b>Average Detector:</b>					
--					

**Note:**

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss -Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

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

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
<b>Horizontal</b>					
<b>Peak Detector:</b>					
4924.000	2.858	36.310	39.167	-34.833	74.000
7386.000	12.127	35.040	47.168	-26.832	74.000
9848.000	12.852	36.360	49.213	-24.787	74.000
<b>Average Detector:</b>					
--					
<b>Vertical</b>					
<b>Peak Detector:</b>					
4924.000	5.521	36.400	41.920	-32.080	74.000
7386.000	13.254	34.320	47.574	-26.426	74.000
9848.000	13.367	36.250	49.617	-24.383	74.000
<b>Average Detector:</b>					
--					

## Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss -Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

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

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
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### Horizontal

#### Peak Detector:

4824.000	3.261	36.820	40.081	-33.919	74.000
7236.000	10.650	35.720	46.370	-27.630	74.000
9648.000	13.337	35.350	48.686	-25.314	74.000

#### Average Detector:

--

### Vertical

#### Peak Detector:

4824.000	6.421	36.190	42.611	-31.389	74.000
7236.000	11.495	35.990	47.485	-26.515	74.000
9648.000	13.807	35.650	49.456	-24.544	74.000

#### Average Detector:

--

### Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss -Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

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

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
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**Horizontal****Peak Detector:**

4874.000	3.038	39.790	42.827	-31.173	74.000
7311.000	11.795	36.030	47.824	-26.176	74.000
9748.000	12.635	36.440	49.075	-24.925	74.000

**Average Detector:**

--

**Peak Detector:**

4874.000	5.812	39.430	45.241	-28.759	74.000
7311.000	12.630	34.600	47.229	-26.771	74.000
9748.000	13.126	36.320	49.446	-24.554	74.000

**Average Detector:**

--

## Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss -Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

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

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
<b>Horizontal</b>					
<b>Peak Detector:</b>					
4924.000	2.858	42.160	45.017	-28.983	74.000
7386.000	12.127	34.410	46.538	-27.462	74.000
9848.000	12.852	36.660	49.513	-24.487	74.000
<b>Average Detector:</b>					
--					
<b>Vertical</b>					
<b>Peak Detector:</b>					
4924.000	5.521	42.320	47.840	-26.160	74.000
7386.000	13.254	34.510	47.764	-26.236	74.000
9848.000	13.367	36.510	49.877	-24.123	74.000
<b>Average Detector:</b>					
--					

**Note:**

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss -Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

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

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
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### Horizontal

**Peak Detector:**

4824.000	3.261	37.480	40.741	-33.259	74.000
7236.000	10.650	36.370	47.020	-26.980	74.000
9648.000	13.337	35.900	49.236	-24.764	74.000

**Average Detector:**

--

### Vertical

**Peak Detector:**

4824.000	6.421	36.840	43.261	-30.739	74.000
7236.000	11.495	35.930	47.425	-26.575	74.000
9648.000	13.807	35.040	48.846	-25.154	74.000

**Average Detector:**

--

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss -Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

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

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
<b>Horizontal</b>					
<b>Peak Detector:</b>					
4874.000	3.038	36.770	39.807	-34.193	74.000
7311.000	11.795	35.110	46.904	-27.096	74.000
9748.000	12.635	35.560	48.195	-25.805	74.000
<b>Average Detector:</b>					
--					
<b>Vertical</b>					
<b>Peak Detector:</b>					
4874.000	5.812	36.940	42.751	-31.249	74.000
7311.000	12.630	34.890	47.519	-26.481	74.000
9748.000	13.126	36.040	49.166	-24.834	74.000
<b>Average Detector:</b>					
--					

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss -Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

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

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
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### Horizontal

#### Peak Detector:

4924.000	2.858	40.220	43.077	-30.923	74.000
7386.000	12.127	35.190	47.318	-26.682	74.000
9848.000	12.852	36.440	49.293	-24.707	74.000

#### Average Detector:

--

### Vertical

#### Peak Detector:

4924.000	5.521	41.280	46.800	-27.200	74.000
7386.000	13.254	34.930	48.184	-25.816	74.000
9848.000	13.367	36.510	49.877	-24.123	74.000

#### Average Detector:

--

#### Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss -Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

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

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
<b>Horizontal</b>					
194.900	-11.012	47.415	36.403	-7.097	43.500
282.200	-5.211	37.794	32.583	-13.417	46.000
472.320	0.637	34.162	34.799	-11.201	46.000
625.580	1.770	37.736	39.506	-6.494	46.000
802.120	5.091	36.061	41.152	-4.848	46.000
912.700	6.132	34.010	40.142	-5.858	46.000
<b>Vertical</b>					
107.600	-0.318	36.273	35.955	-7.545	43.500
224.000	-8.699	41.584	32.885	-13.115	46.000
472.320	-4.613	40.868	36.255	-9.745	46.000
662.440	-2.026	34.534	32.508	-13.492	46.000
817.640	3.272	34.699	37.971	-8.029	46.000
912.700	1.762	34.476	36.238	-9.762	46.000

## Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss -Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

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

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
<b>Horizontal</b>					
194.900	-11.012	46.968	35.956	-7.544	43.500
336.520	-3.860	37.889	34.029	-11.971	46.000
528.580	1.848	34.380	36.228	-9.772	46.000
625.580	1.770	36.759	38.529	-7.471	46.000
782.720	4.325	35.096	39.421	-6.579	46.000
912.700	6.132	33.642	39.774	-6.226	46.000
<b>Vertical</b>					
61.040	-4.316	35.126	30.810	-9.190	40.000
194.900	-9.322	46.147	36.825	-6.675	43.500
472.320	-4.613	38.369	33.756	-12.244	46.000
687.660	2.444	31.245	33.689	-12.311	46.000
782.720	3.035	37.954	40.989	-5.011	46.000
928.220	6.203	32.236	38.439	-7.561	46.000

## Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss -Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

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

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
<b>Horizontal</b>					
97.900	-7.650	43.451	35.800	-7.700	43.500
194.900	-11.012	47.561	36.549	-6.951	43.500
336.520	-3.860	37.005	33.145	-12.855	46.000
460.680	1.589	32.522	34.111	-11.889	46.000
625.580	1.770	37.216	38.986	-7.014	46.000
848.680	5.776	35.372	41.147	-4.853	46.000
<b>Vertical</b>					
57.160	-4.403	38.266	33.863	-6.137	40.000
194.900	-9.322	45.799	36.477	-7.023	43.500
472.320	-4.613	39.831	35.218	-10.782	46.000
782.720	3.035	37.631	40.666	-5.334	46.000
848.680	1.066	38.459	39.524	-6.476	46.000
941.800	6.585	29.941	36.526	-9.474	46.000

## Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss -Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

## 5. RF antenna conducted test

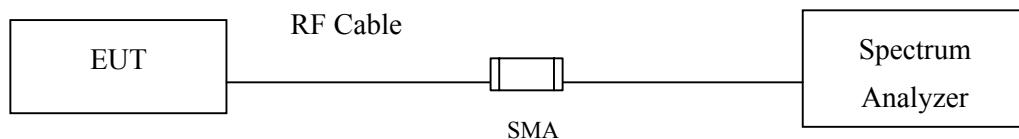
### 5.1. Test Equipment

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.

### 5.2. Test Setup

#### RF antenna Conducted Measurement:



### 5.3. Limits

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. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

### 5.4. Test Procedure

The EUT was tested according to DTS test procedure of Jan. 2012 KDB558074 for compliance to FCC 47CFR 15.247 requirements.

Set RBW = 100 kHz, Set VBW > RBW, scan up through 10th harmonic.

## 5.5. Uncertainty

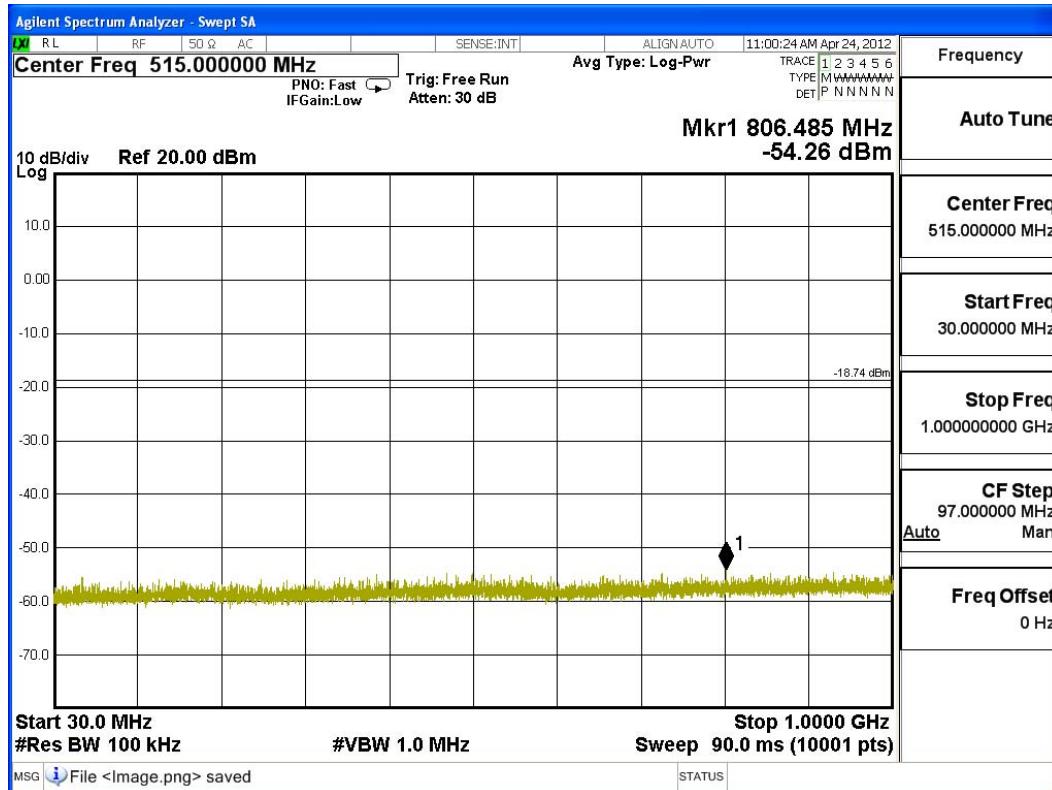
The measurement uncertainty

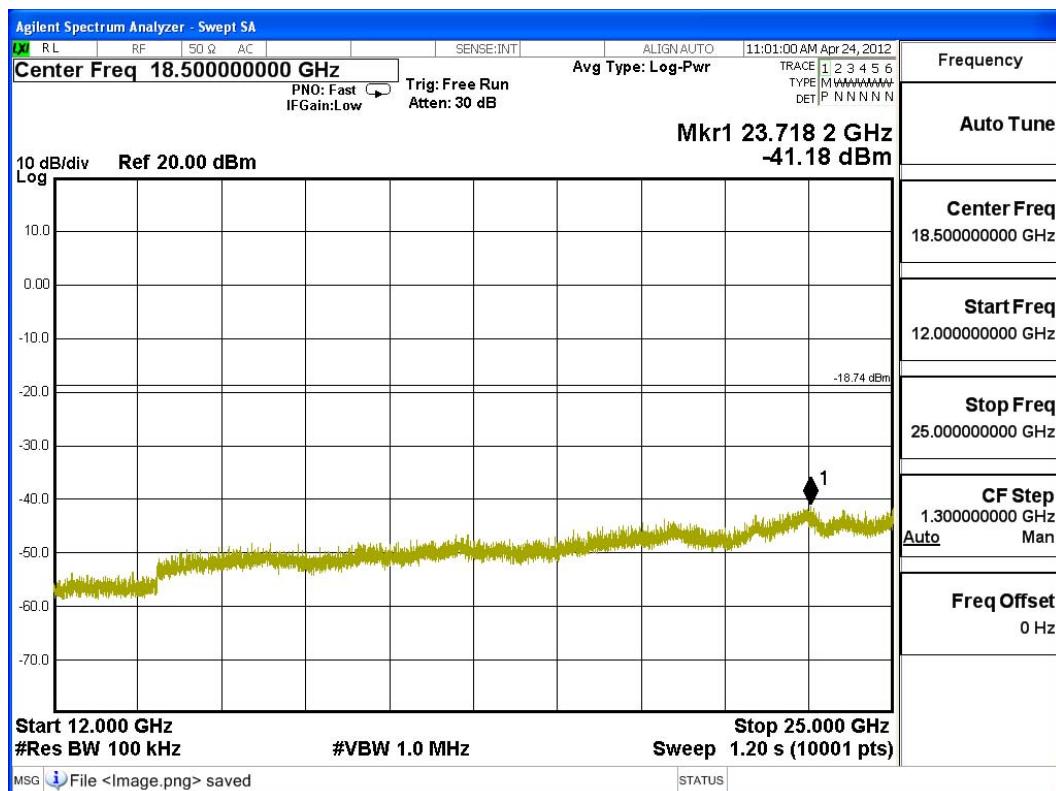
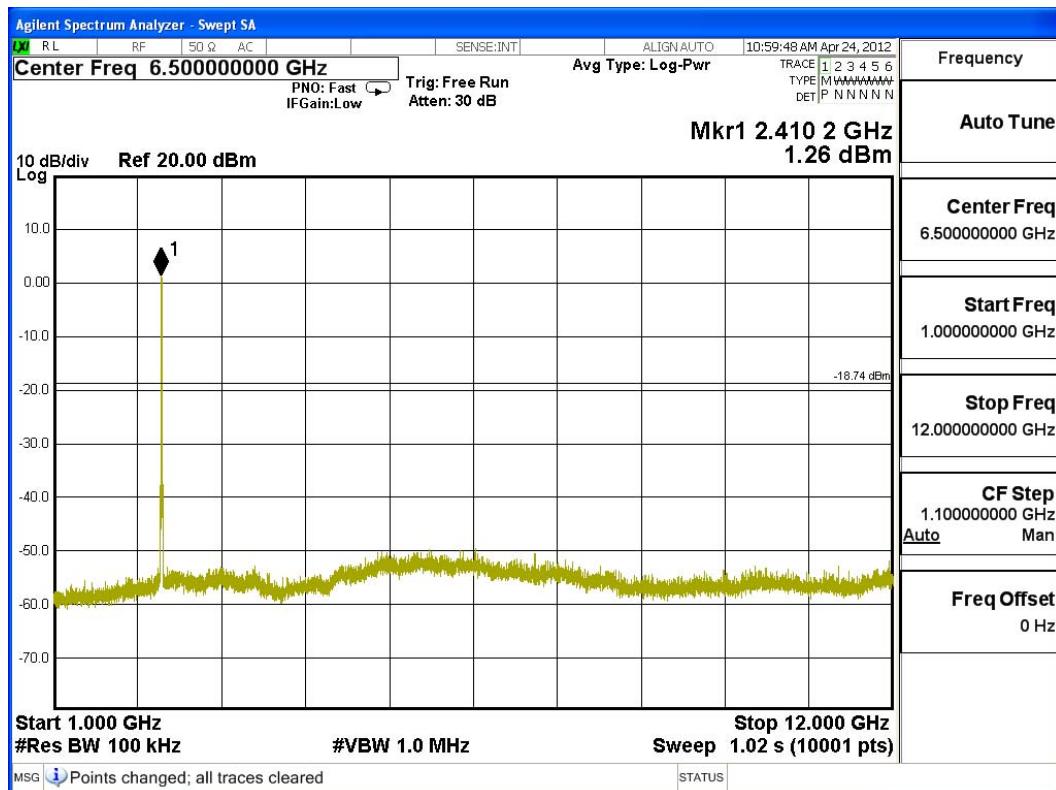
Conducted is defined as  $\pm 1.27\text{dB}$

## 5.6. Test Result of RF antenna conducted test

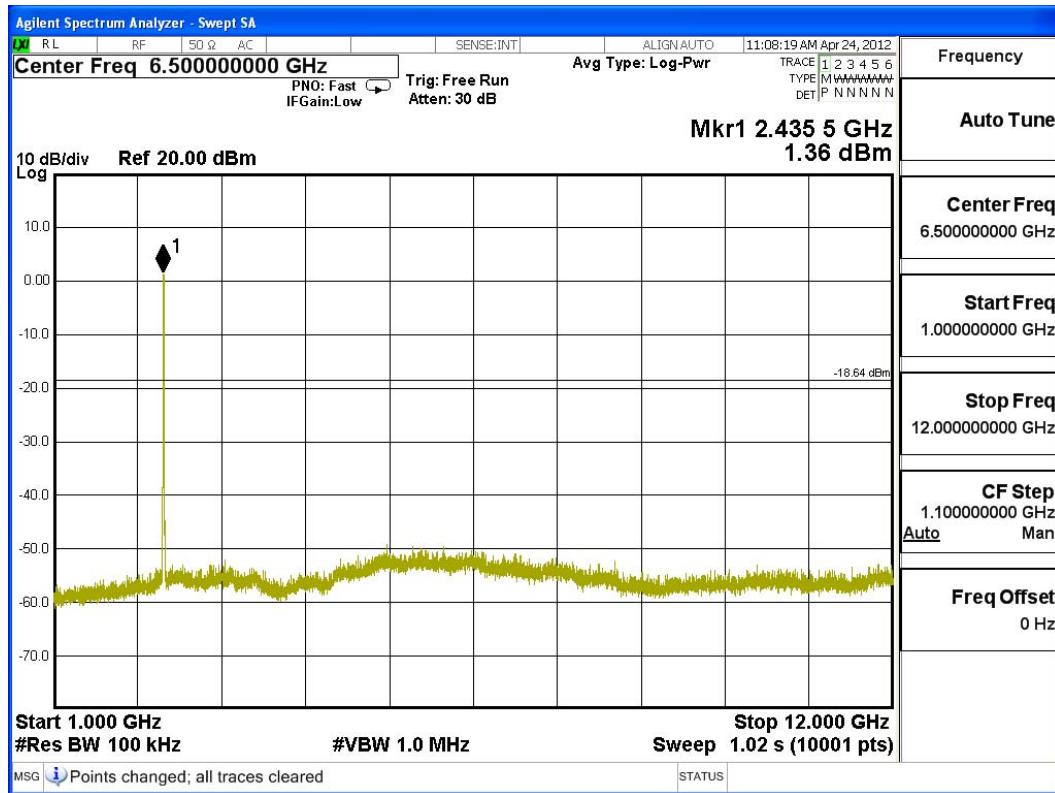
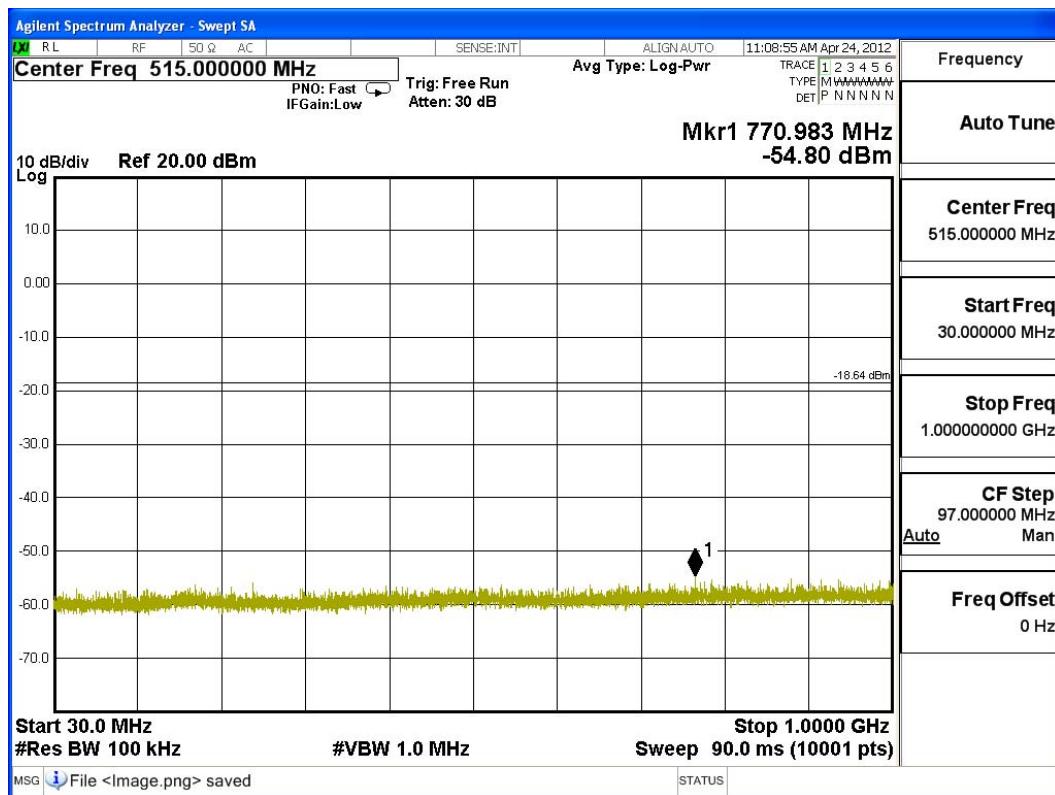
Product : WiFi Module  
 Test Item : RF antenna conducted test  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmit (802.11b 1Mbps)

### Channel 01 (2412MHz)



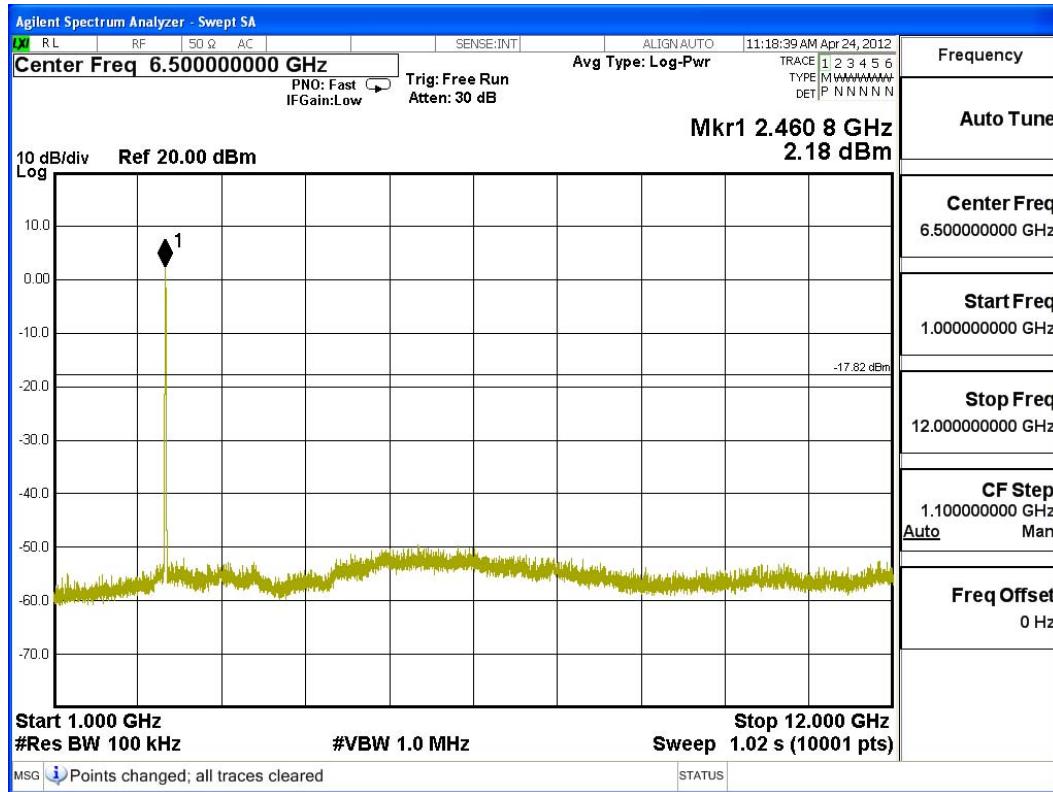
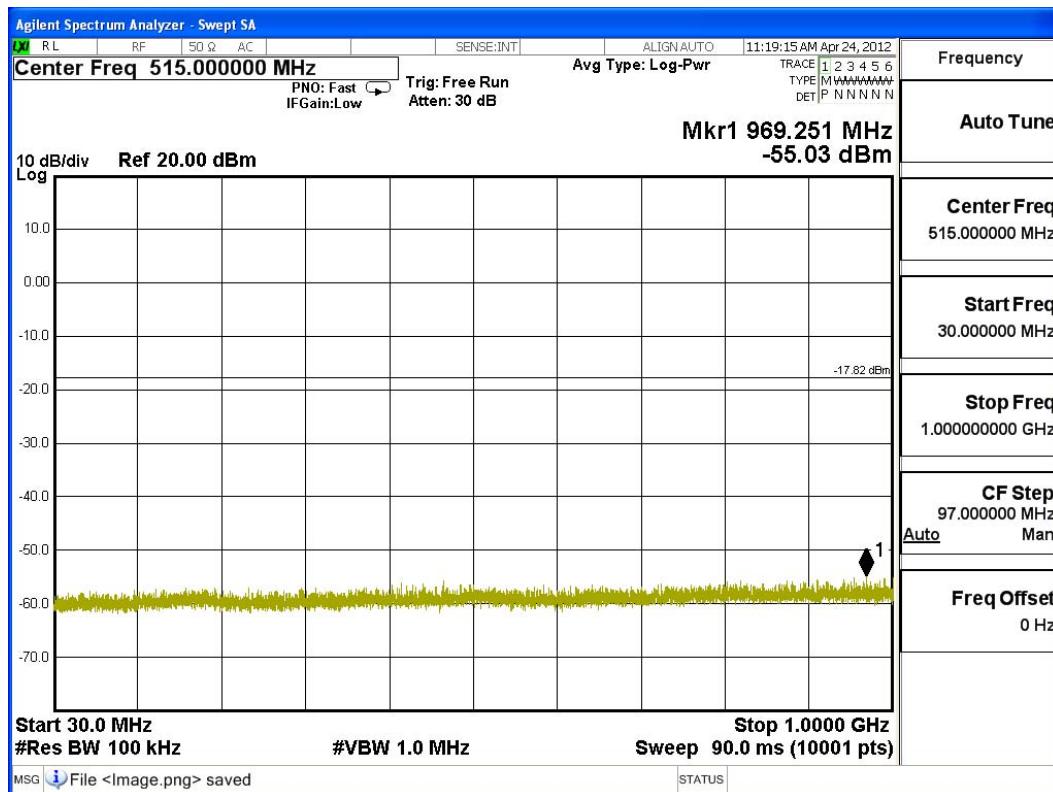


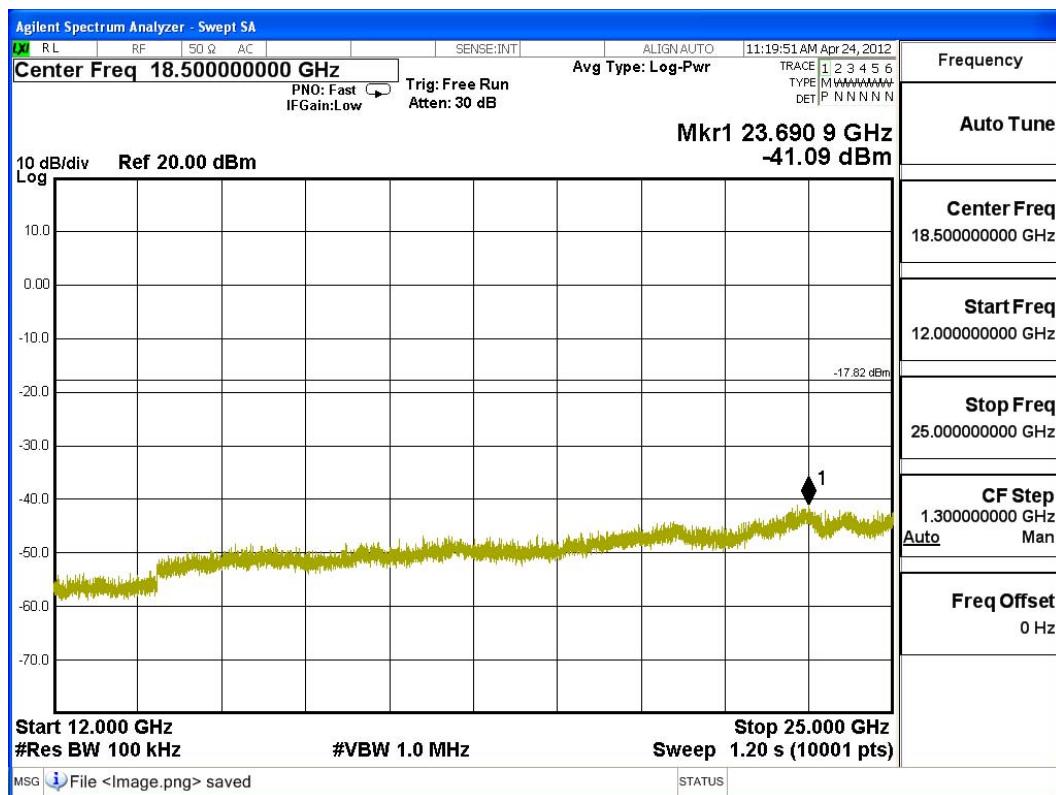
### Channel 06 (2437MHz)





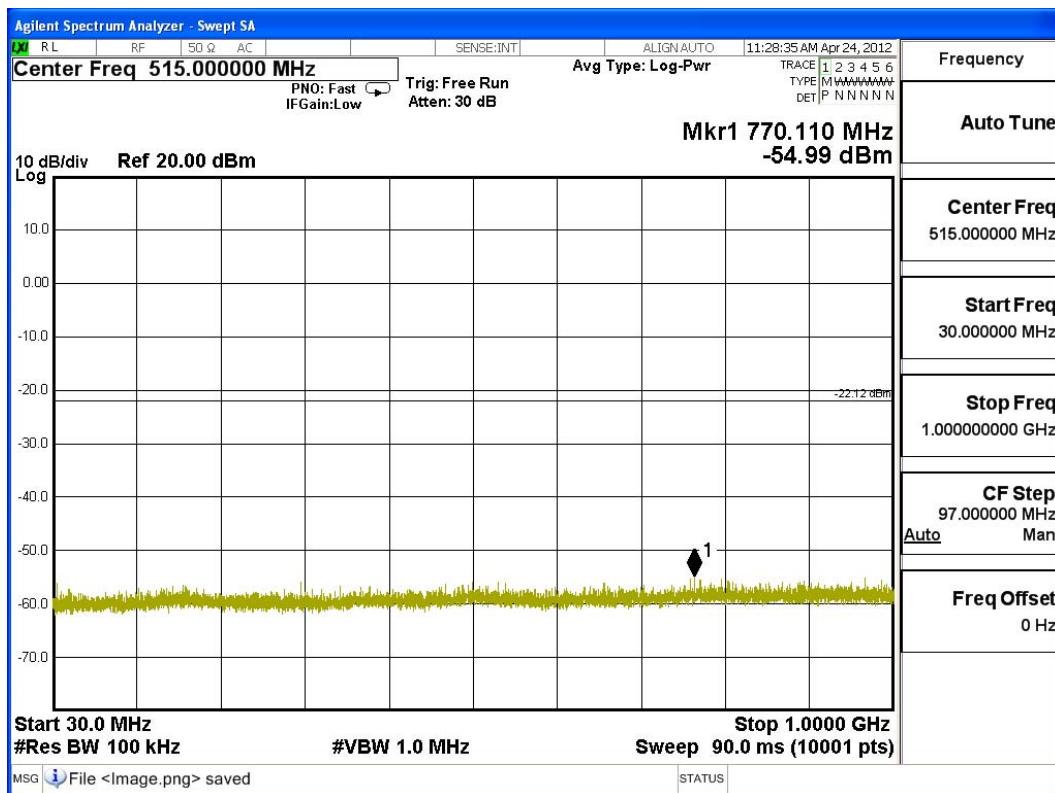
### Channel 11 (2462MHz)

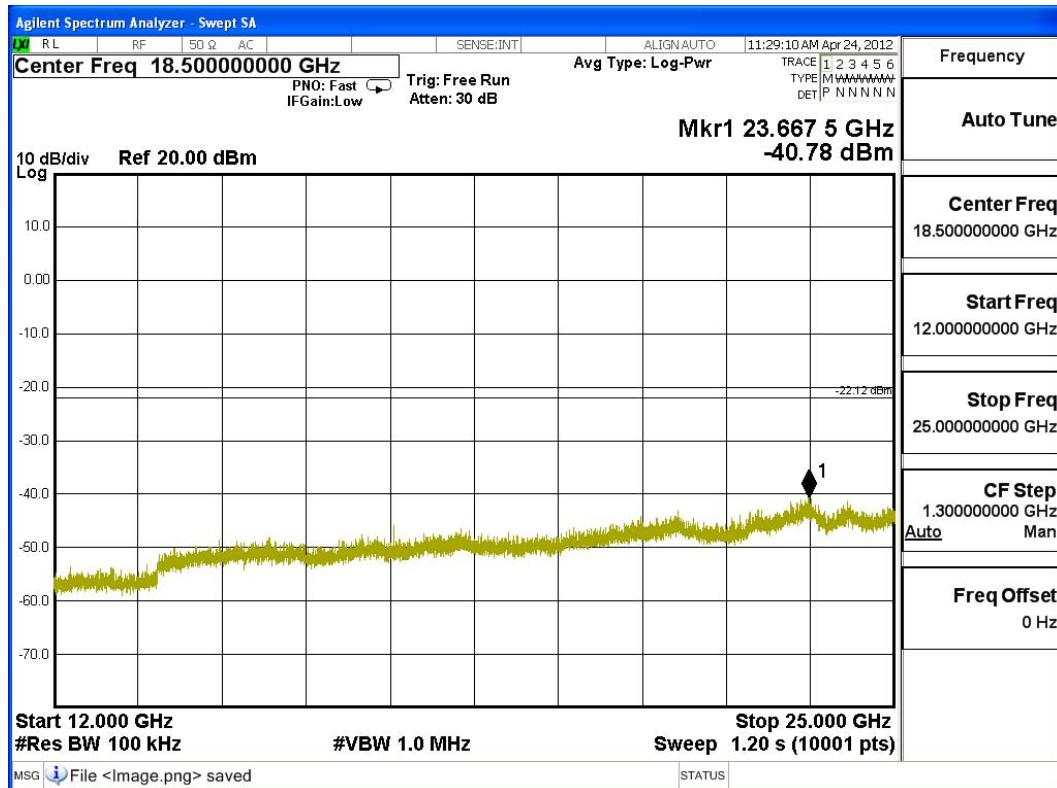
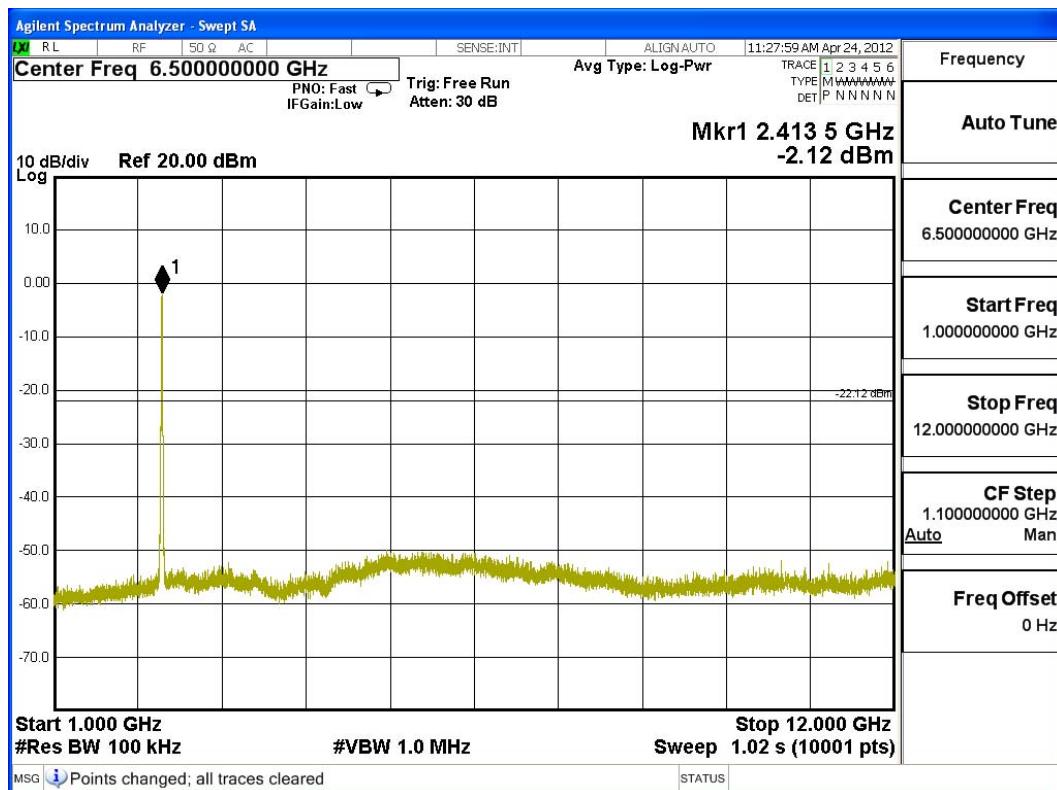




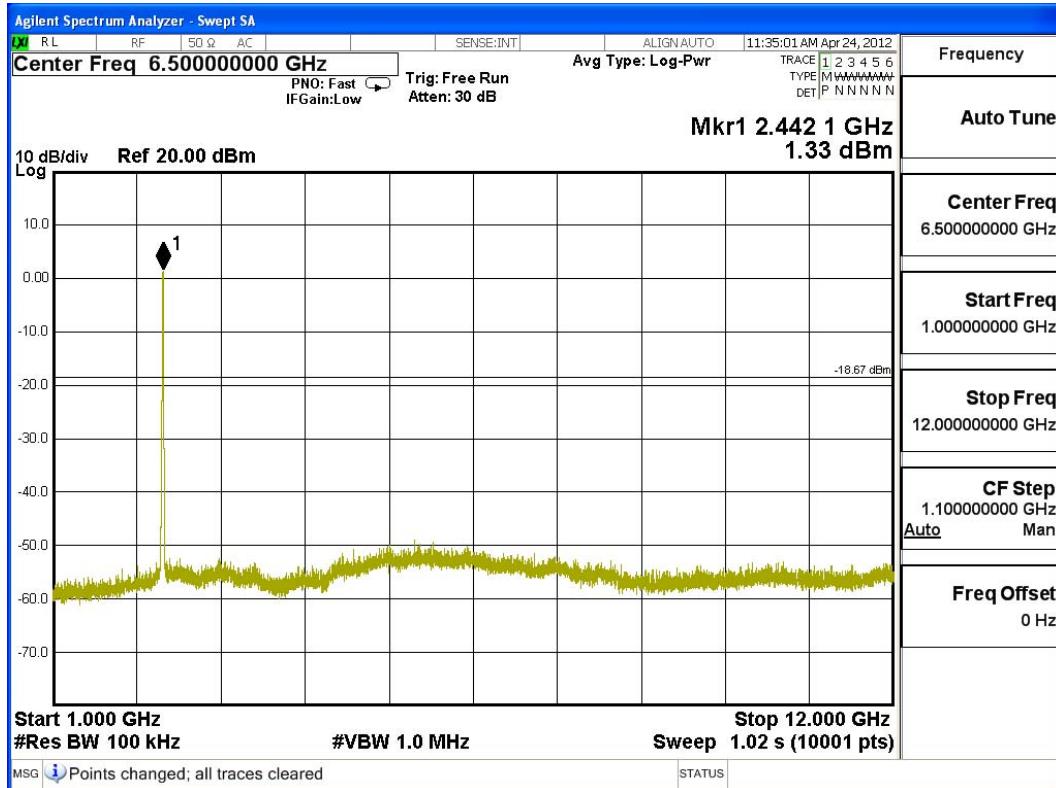
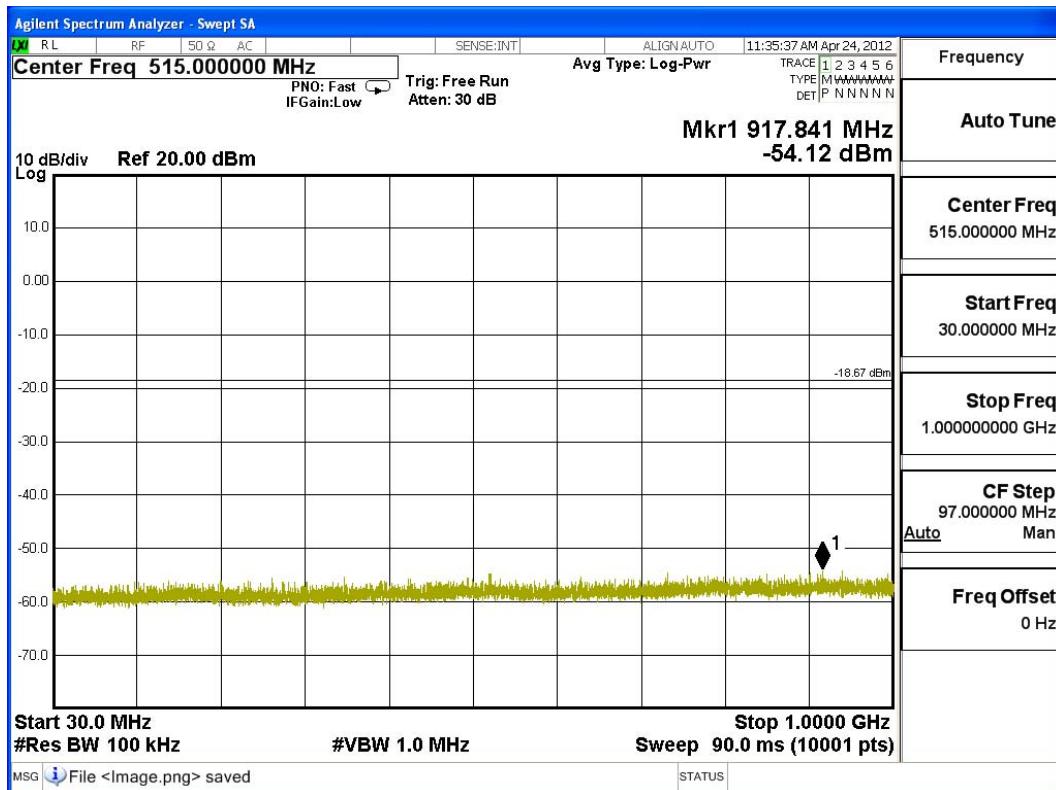
Product : WiFi Module  
 Test Item : RF Antenna Conducted Spurious  
 Test Site : No.3 OATS  
 Test Mode : Mode 2: Transmit (802.11g 6Mbps)

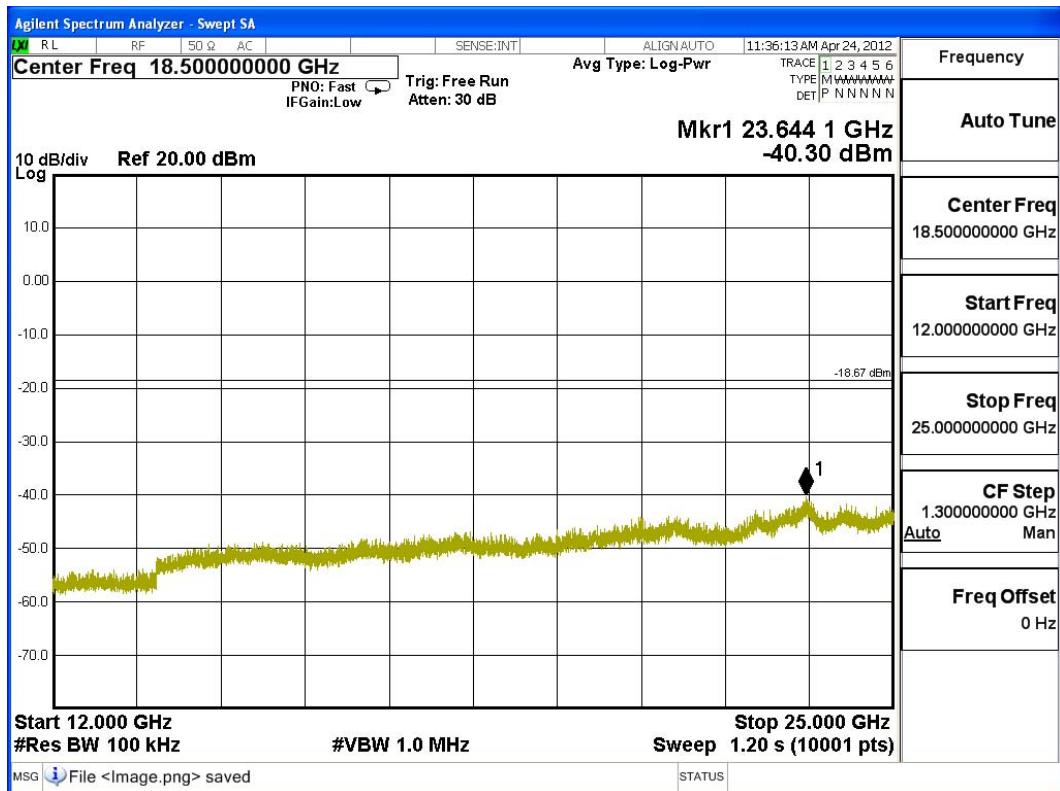
### Channel 01 (2412MHz)



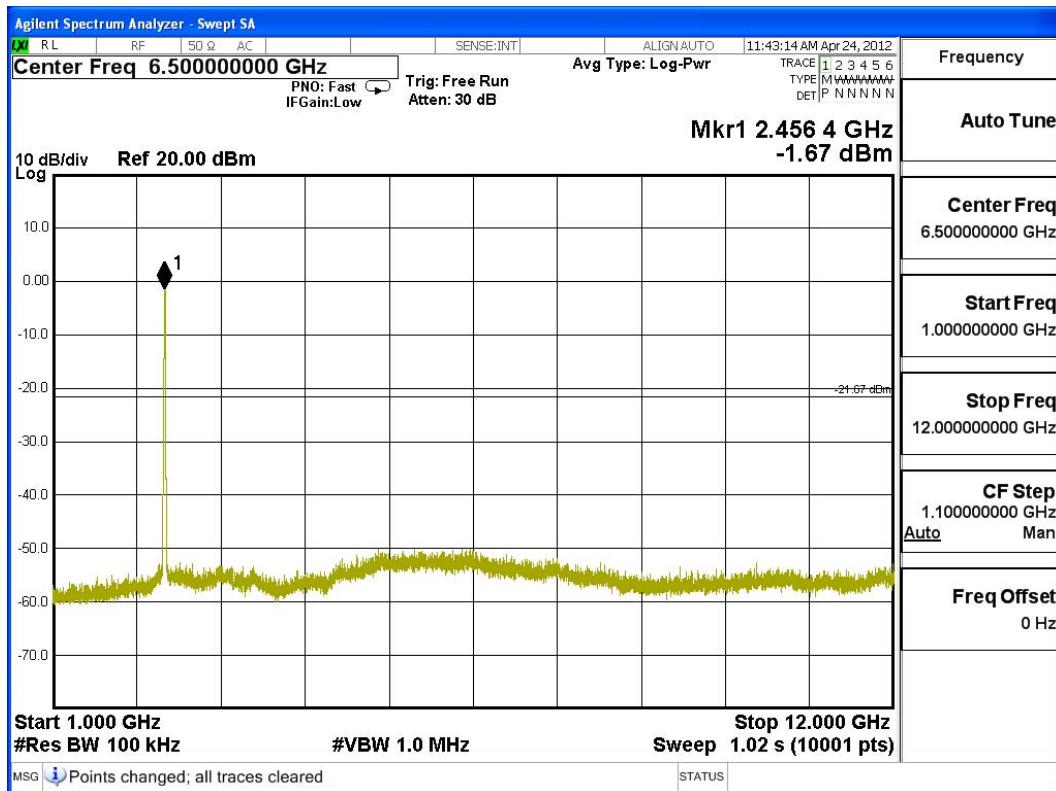
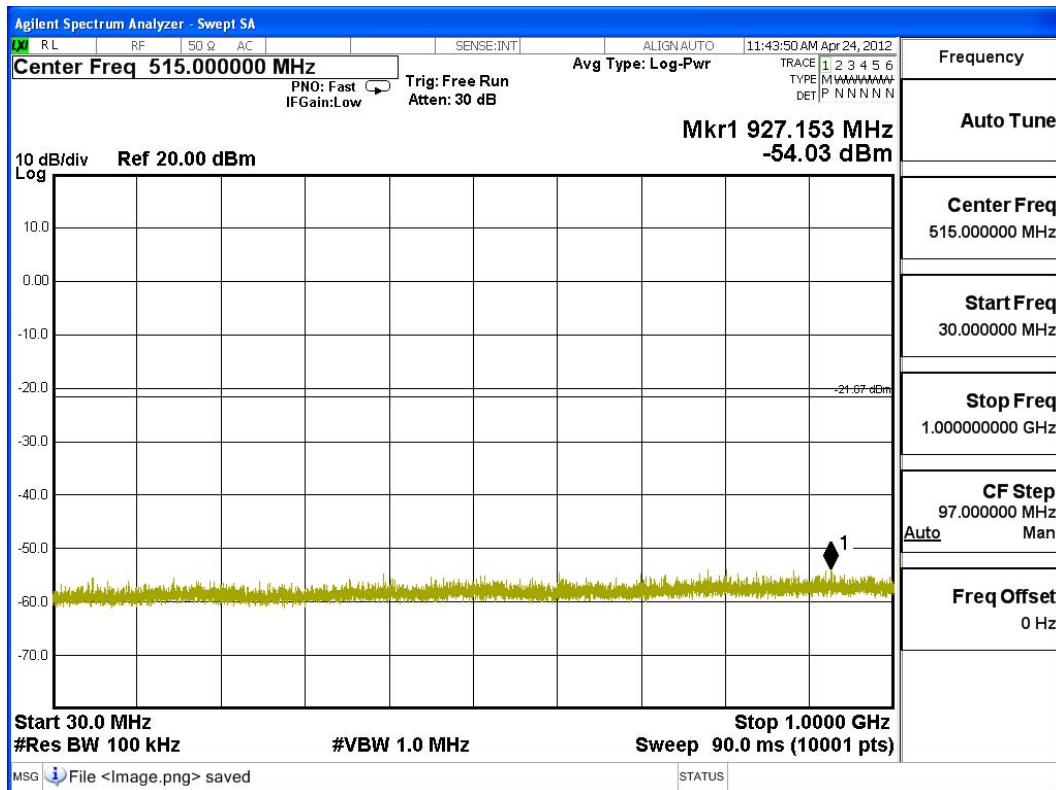


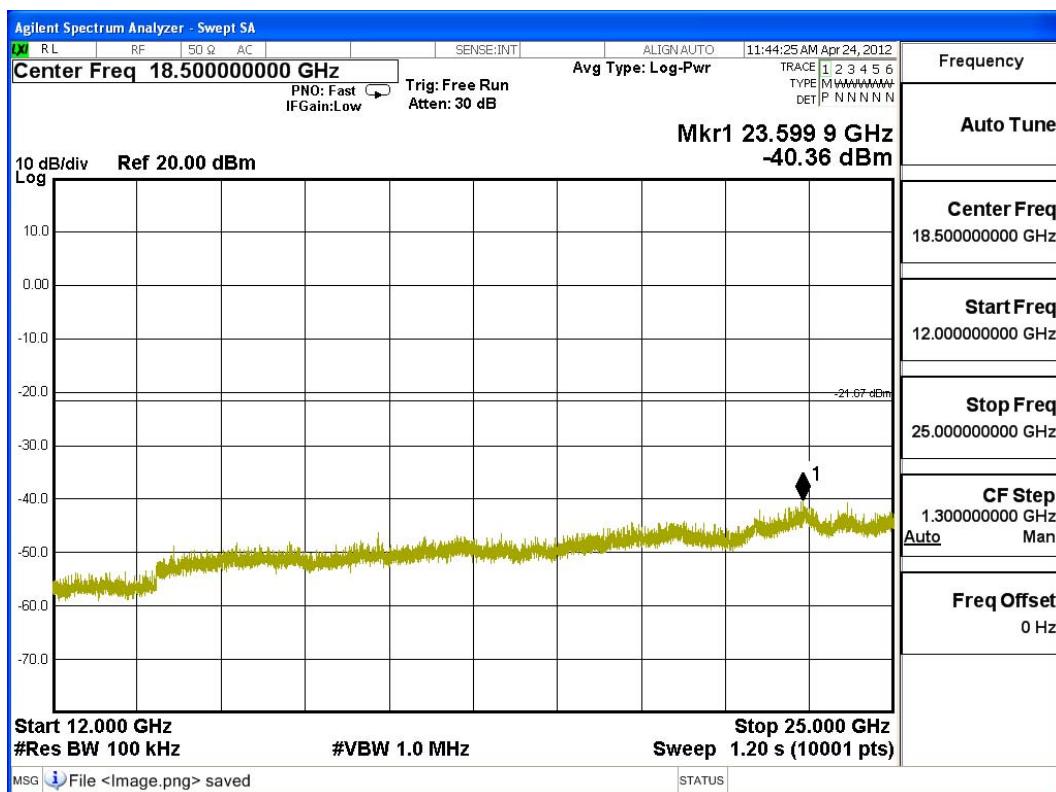
### Channel 06 (2437MHz)





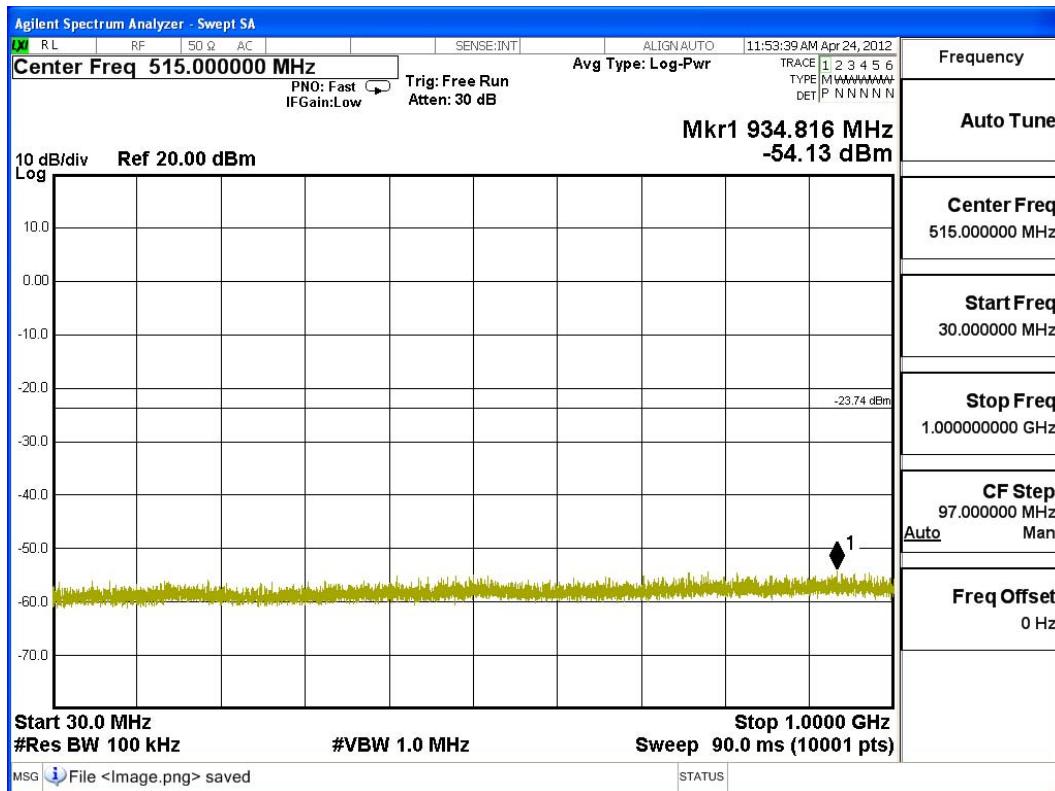
### Channel 11 (2462MHz)

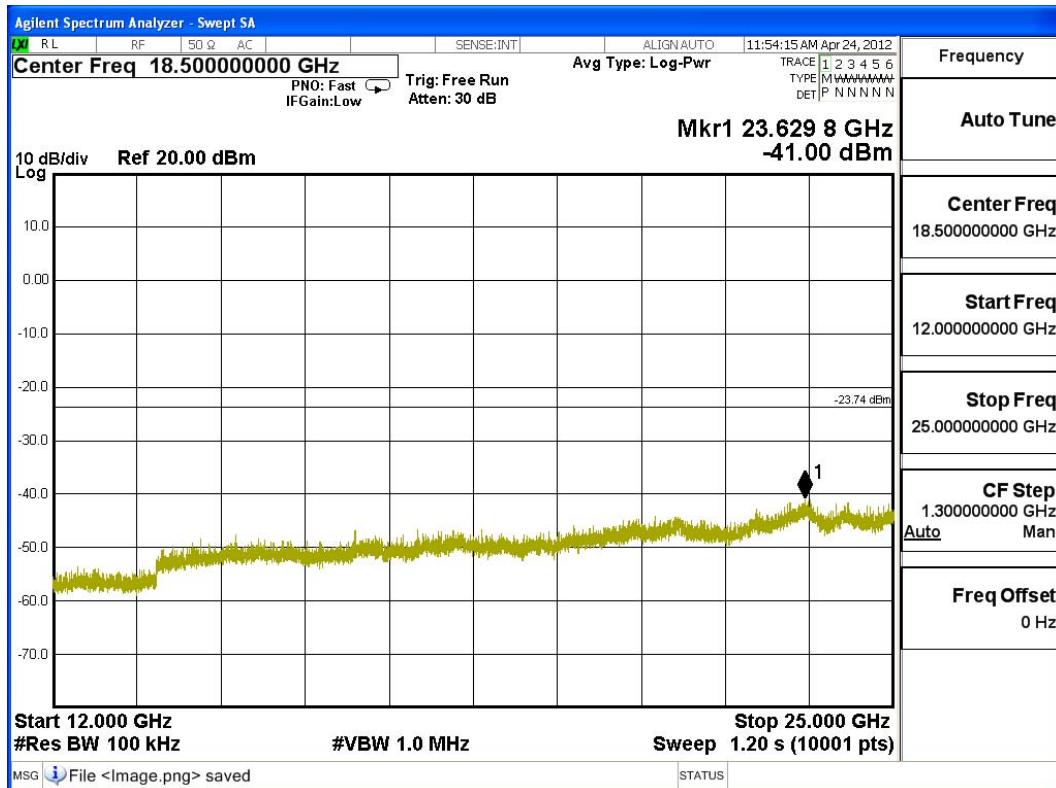
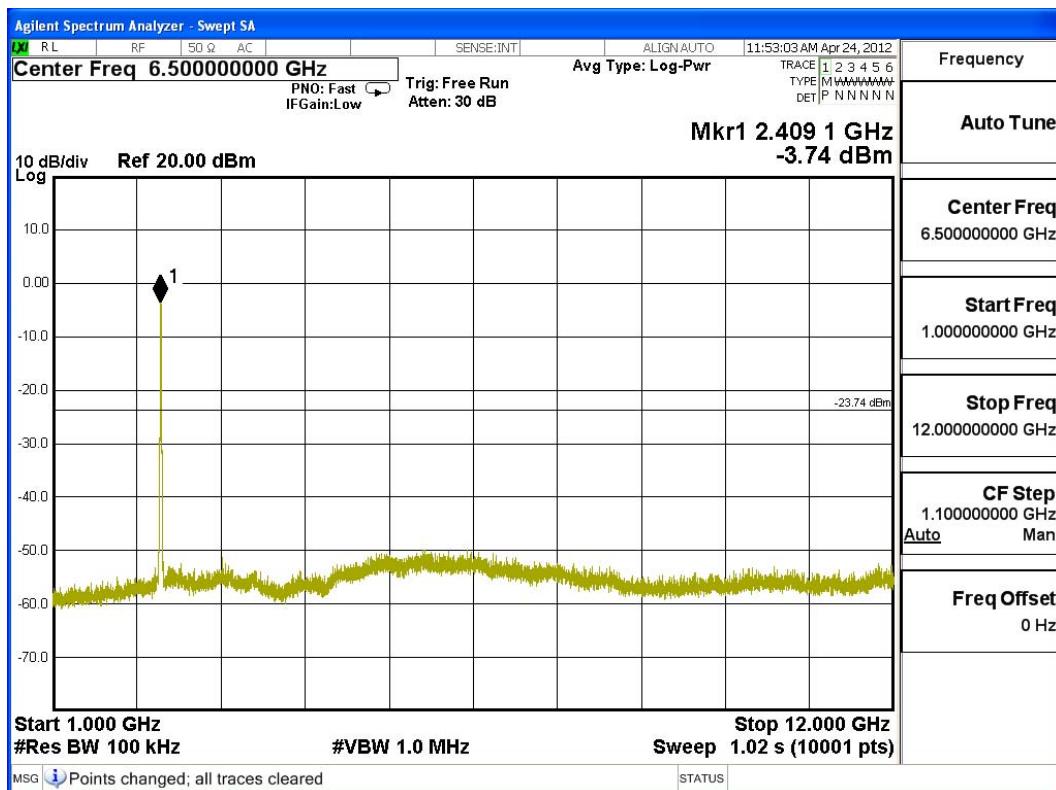




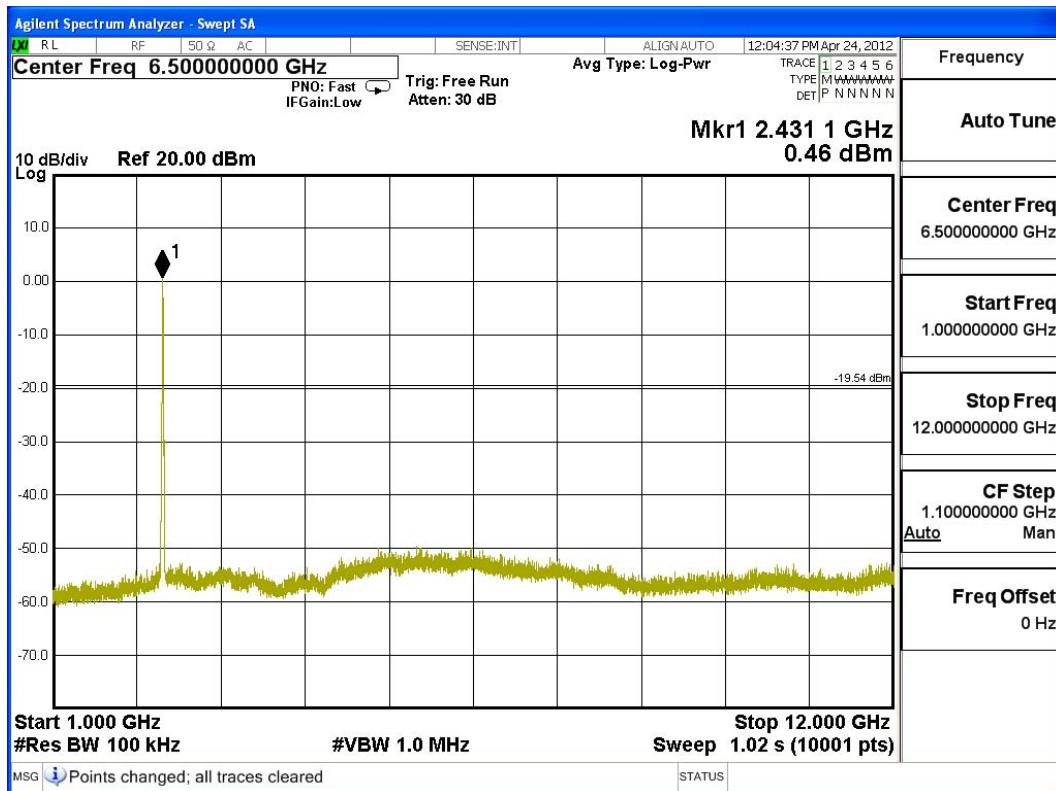
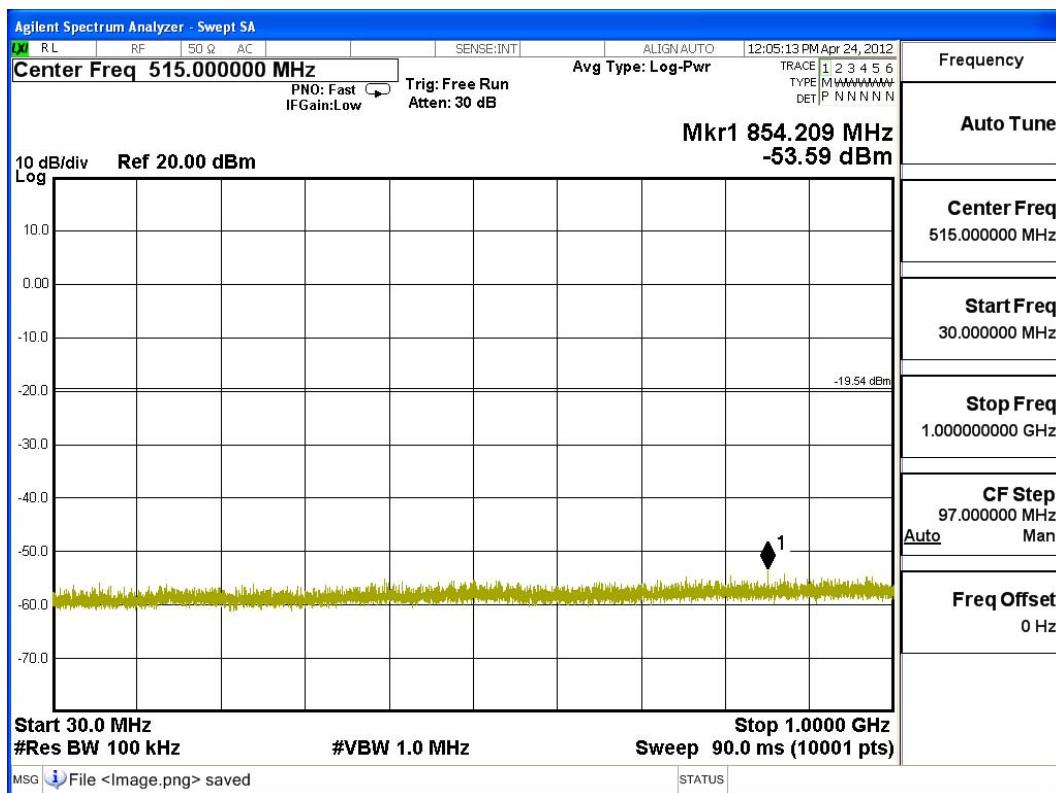
Product : WiFi Module  
 Test Item : RF Antenna Conducted Spurious  
 Test Site : No.3 OATS  
 Test Mode : Mode 3: Transmit (802.11n MCS0 7.2Mbps 20M-BW)

### Channel 01 (2412MHz)





### Channel 06 (2437MHz)





## Channel 11 (2462MHz)

