



## Test Report

Product Name	imp
Model No	IMP001
FCC ID.	PPQ-IMP001

Applicant	LITE-ON TECHNOLOGY CORP.
Address	4F, 90, Chien 1 Road, Chung Ho, Taipei Hsien 235, Taiwan, R.O.C.

Date of Receipt	May. 22, 2012
Issue Date	June. 20, 2012
Report No.	125392R-RFUSP42V01
Report Version	V1.0



The test results relate only to the samples tested.

The test report shall not be reproduced except in full without the written approval of Quietek Corporation.

This report must not be used to claim product endorsement by NVLAP any agency of the U.S. Government

# Test Report Certification

Issue Date: June. 20, 2012

Report No.: 125392R-RFUSP42V01



**Accredited by NIST (NVLAP)**

NVLAP Lab Code: 200533-0

Product Name	imp
Applicant	LITE-ON TECHNOLOGY CORP.
Address	4F, 90, Chien 1 Road, Chung Ho, Taipei Hsien 235, Taiwan, R.O.C.
Manufacturer	electric imp, inc.
Model No.	IMP001
FCC ID.	PPQ-IMP001
EUT Rated Voltage	DC 3.3V
EUT Test Voltage	AC 120V/60Hz
Trade Name	electric imp
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.

The test report shall not be reproduced except in full without the written approval of Quietek Corporation.

This report must not be used to claim product endorsement by NVLAP any agency of the U.S. Government

Documented By : Leven Huang  
(Senior Adm. Specialist / Leven Huang )

Tested By : Vincent chu  
( Engineer / Vincent Chu )

Approved By : [Signature]  
( Manager / Vincent Lin )

## TABLE OF CONTENTS

Description	Page
<b>1. GENERAL INFORMATION .....</b>	<b>5</b>
1.1. EUT Description.....	5
1.2. Operational Description .....	7
1.3. Tested System Details.....	8
1.4. Configuration of Tested System .....	8
1.5. EUT Exercise Software .....	8
1.6. Test Facility .....	9
<b>2. Conducted Emission.....</b>	<b>10</b>
2.1. Test Equipment.....	10
2.2. Test Setup .....	10
2.3. Limits .....	11
2.4. Test Procedure .....	11
2.5. Uncertainty .....	11
2.6. Test Result of Conducted Emission.....	12
<b>3. Peak Power Output .....</b>	<b>14</b>
3.1. Test Equipment.....	14
3.2. Test Setup .....	14
3.3. Limits .....	14
3.4. Test Procedure .....	14
3.5. Uncertainty .....	14
3.6. Test Result of Peak Power Output.....	15
<b>4. Radiated Emission.....</b>	<b>18</b>
4.1. Test Equipment.....	18
4.2. Test Setup .....	19
4.3. Limits .....	20
4.4. Test Procedure .....	21
4.5. Uncertainty .....	21
4.6. Test Result of Radiated Emission.....	22
<b>5. RF antenna conducted test.....</b>	<b>34</b>
5.1. Test Equipment.....	34
5.2. Test Setup .....	34
5.3. Limits .....	34
5.4. Test Procedure .....	34
5.5. Uncertainty .....	35
5.6. Test Result of RF antenna conducted test.....	36
<b>6. Band Edge .....</b>	<b>54</b>
6.1. Test Equipment.....	54
6.2. Test Setup .....	55
6.3. Limits .....	55
6.4. Test Procedure .....	56
6.5. Uncertainty .....	56
6.6. Test Result of Band Edge .....	57

---

<b>7.</b>	<b>Occupied Bandwidth .....</b>	<b>69</b>
7.1.	Test Equipment .....	69
7.2.	Test Setup .....	69
7.3.	Limits .....	69
7.4.	Test Procedure .....	69
7.5.	Uncertainty .....	69
7.6.	Test Result of Occupied Bandwidth .....	70
<b>8.</b>	<b>Power Density .....</b>	<b>79</b>
8.1.	Test Equipment .....	79
8.2.	Test Setup .....	79
8.3.	Limits .....	79
8.4.	Test Procedure .....	79
8.5.	Uncertainty .....	79
8.6.	Test Result of Power Density .....	80
<b>9.</b>	<b>EMI Reduction Method During Compliance Testing .....</b>	<b>89</b>

Attachment 1: EUT Test Photographs

Attachment 2: EUT Detailed Photographs

## 1. GENERAL INFORMATION

### 1.1. EUT Description

Product Name	.imp
Trade Name	electric imp
Model No.	IMP001
FCC ID.	PPQ-IMP001
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 65Mbps
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	Model No.	Antenna Type	Peak Gain
1	electric imp	N/A	Printed on PCB	2.85dBi 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 an imp 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 and )
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)

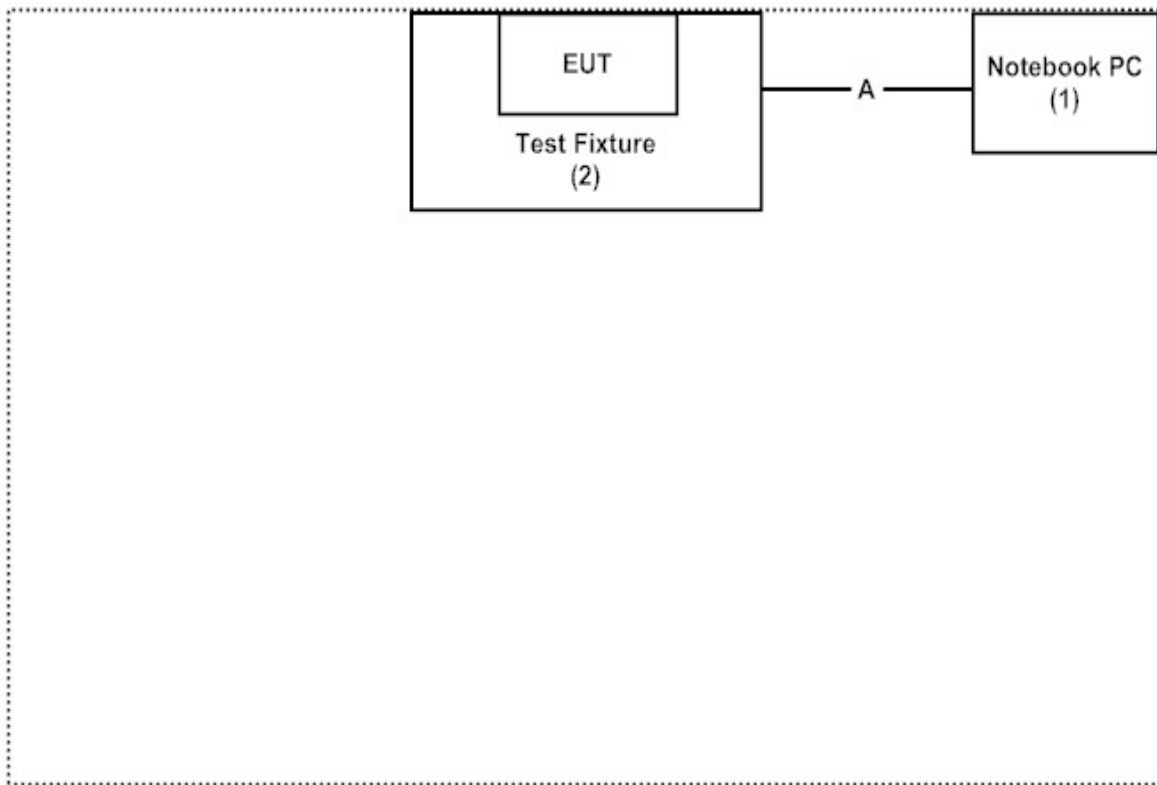
### 1.3. Tested System Details

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	PPT	N/A	Non-Shielded, 0.8m
2	Test Fixture	LITE-ON	N/A	N/A	N/A

Signal Cable Type	Signal cable Description
A	Test Fixture Cable
	Non-Shielded, 1.5m

### 1.4. Configuration of Tested System



### 1.5. EUT Exercise Software

- (1) Setup the EUT as shown in Section 1.4
- (2) Execute software on the EUT.
- (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  
 Site Address: No.5-22, Ruishukeng,  
 Linkou Dist. New Taipei City 24451,  
 Taiwan, R.O.C.  
 TEL: 886-2-8601-3788 / FAX : 886-2-8601-3789  
 E-Mail : [service@quietek.com](mailto:service@quietek.com)

FCC Accreditation Number: TW1014



## 2. Conducted Emission

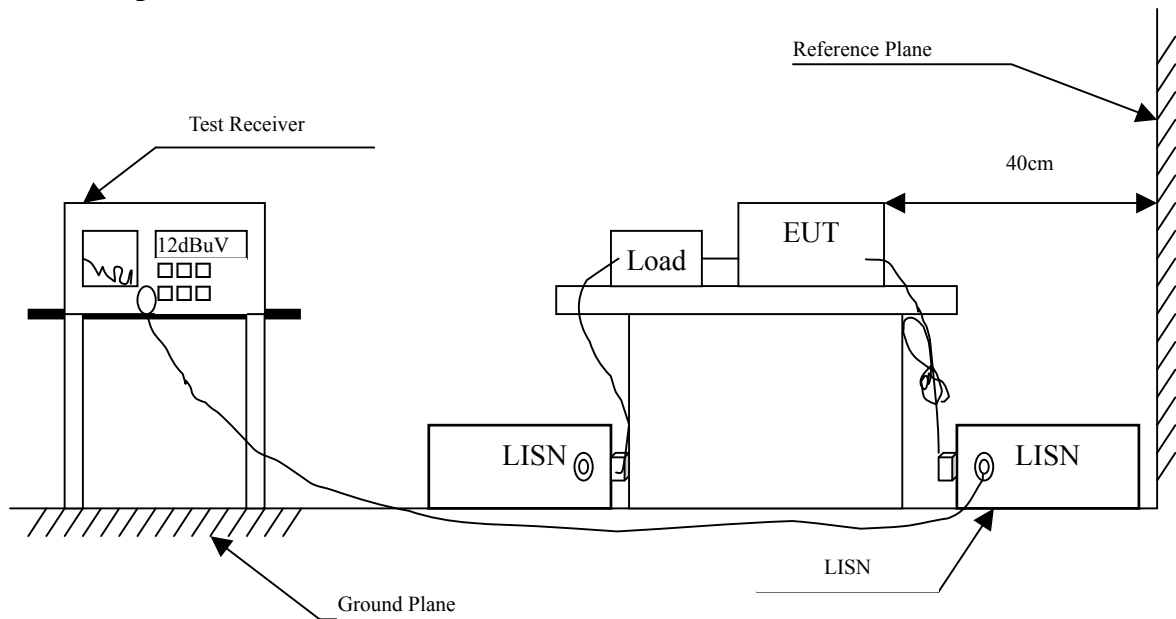
### 2.1. Test Equipment

	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**

<b>FCC Part 15 Subpart C Paragraph 15.207 (dBuV) Limit</b>		
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 : imp  
 Test Item : Conducted Emission Test  
 Power Line : Line 1  
 Test Mode : Mode 3: Transmit (802.11n MCS0 7.2Mbps 20M-BW) (2437MHz)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV	Margin dB	Limit dBuV
<b>Line 1</b>					
<b>Quasi-Peak</b>					
0.162	9.712	37.220	46.932	-18.725	65.657
0.189	9.694	34.320	44.014	-20.872	64.886
0.255	9.655	28.840	38.495	-24.505	63.000
0.291	9.643	32.400	42.043	-19.928	61.971
0.443	9.640	21.310	30.950	-26.679	57.629
0.588	9.640	24.590	34.230	-21.770	56.000
<b>Average</b>					
0.162	9.712	19.060	28.772	-26.885	55.657
0.189	9.694	18.230	27.924	-26.962	54.886
0.255	9.655	20.270	29.925	-23.075	53.000
0.291	9.643	29.700	39.343	-12.628	51.971
0.443	9.640	14.280	23.920	-23.709	47.629
0.588	9.640	21.770	31.410	-14.590	46.000

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

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV	Margin dB	Limit dBuV
<b>Line 2</b>					
<b>Quasi-Peak</b>					
0.267	9.651	30.080	39.731	-22.926	62.657
0.298	9.646	31.930	41.576	-20.195	61.771
0.345	9.650	21.560	31.210	-29.219	60.429
0.447	9.650	23.680	33.330	-24.184	57.514
0.584	9.650	22.430	32.080	-23.920	56.000
0.865	9.689	15.970	25.659	-30.341	56.000
<b>Average</b>					
0.267	9.651	26.210	35.861	-16.796	52.657
0.298	9.646	28.930	38.576	-13.195	51.771
0.345	9.650	13.140	22.790	-27.639	50.429
0.447	9.650	14.760	24.410	-23.104	47.514
0.584	9.650	17.170	26.820	-19.180	46.000
0.865	9.689	8.510	18.199	-27.801	46.000

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

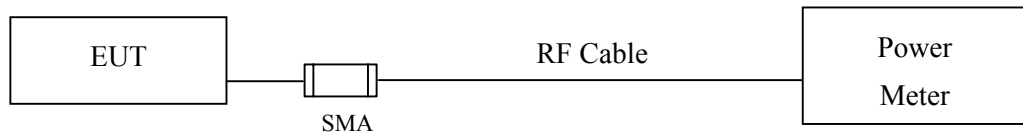
#### 3.1. Test Equipment

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
X	Power Meter	Anritsu	ML2495A/6K00003357	May, 2012
X	Power Sensor	Anritsu	MA2411B/0738448	Jun, 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



#### 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

± 1.27 dB

### 3.6. Test Result of Peak Power Output

Product : imp  
 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	15.78	--	--	--	19.91	<30dBm	Pass
06	2437	15.84	15.8	14.98	14.95	20.02	<30dBm	Pass
11	2462	15.91	--	--	--	20.1	<30dBm	Pass

Note: Peak Power Output Value = Reading value on peak power meter + cable loss

Product : imp  
 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	11.41	--	--	--	--	--	--	--	24.72	<30dBm	Pass
06	2437	14.01	13.98	13.95	13.91	13.89	13.84	13.81	13.79	25.12	<30dBm	Pass
11	2462	13.97	--	--	--	--	--	--	--	24.57	<30dBm	Pass

Note: Peak Power Output Value = Reading value on peak power meter + cable loss

Product : imp  
 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	11.95	--	--	--	--	--	--	--	24.26	<30dBm	Pass
06	2437	13.3	13.25	13.12	13.02	12.95	12.87	12.63	12.51	24.43	<30dBm	Pass
11	2462	12.84	--	--	--	--	--	--	--	23.36	<30dBm	Pass

Note: Peak Power Output Value = Reading value on peak power meter + cable loss



#### 4. Radiated Emission

##### 4.1. Test Equipment

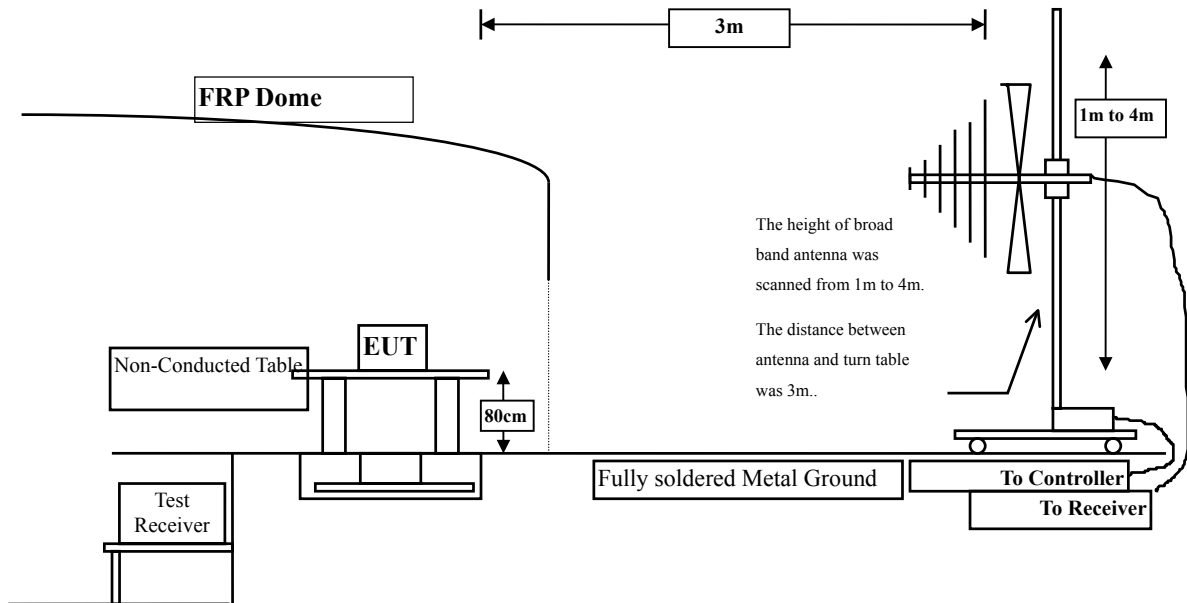
The following test equipment are used during the radiated emission test:

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

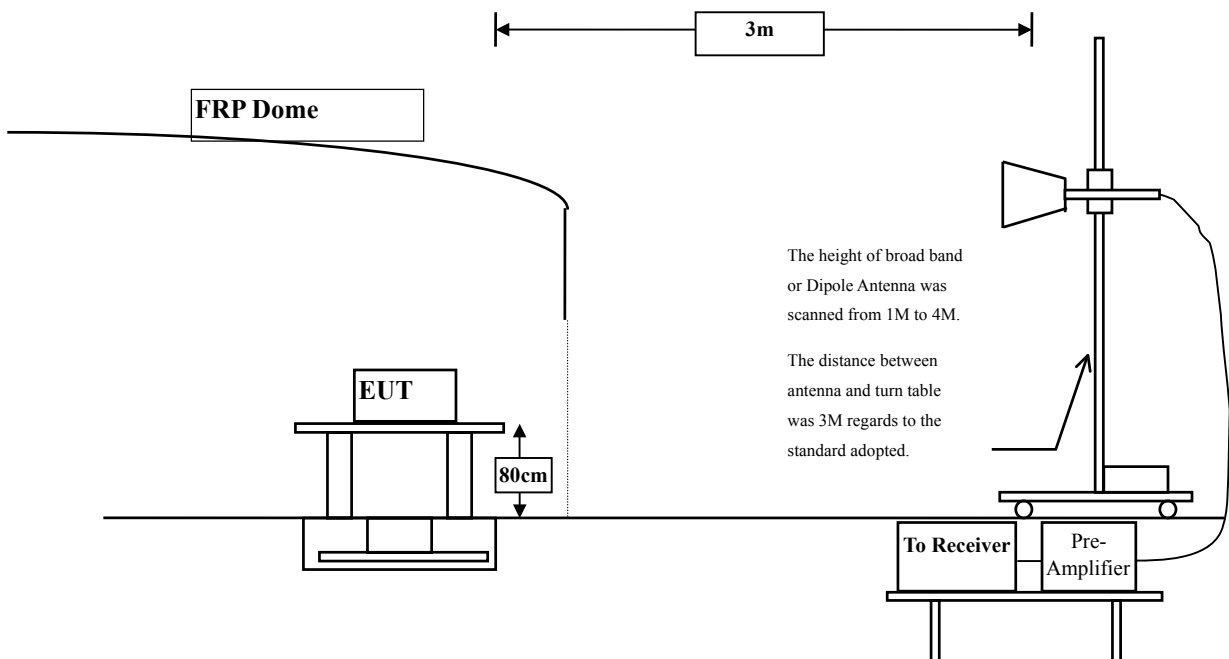
- Note:
1. All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.
  2. The test instruments marked with “X” are used to measure the final test results.

## 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 : imp  
 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	0.428	53.622	54.051	-19.949	74.000
7236.000	7.177	48.680	55.857	-18.143	74.000
9648.000	8.019	44.610	52.630	-21.370	74.000
<b>Average Detector:</b>					
4824.000	0.428	45.182	45.611	-8.389	54.000
7236.000	7.177	38.440	45.617	-8.383	54.000
<b>Vertical</b>					
<b>Peak Detector:</b>					
4824.000	0.836	57.924	58.761	-15.239	74.000
7236.000	7.676	51.111	58.787	-15.213	74.000
9648.000	8.556	44.540	53.097	-20.903	74.000
<b>Average Detector:</b>					
4824.000	0.836	49.904	50.741	-3.259	54.000
7236.000	7.676	41.170	48.846	-5.154	54.000

Note:

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

Product : imp  
 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	0.076	53.620	53.697	-20.303	74.000
7311.000	7.512	48.970	56.482	-17.518	74.000
9748.000	7.630	44.210	51.840	-22.160	74.000
<b>Average Detector:</b>					
4874.000	0.076	45.360	45.437	-8.563	54.000
7311.000	7.512	38.610	46.122	-7.878	54.000
<b>Vertical</b>					
<b>Peak Detector:</b>					
4874.000	0.532	55.589	56.121	-17.879	74.000
7311.000	8.089	50.690	58.779	-15.221	74.000
9748.000	8.266	38.460	46.727	-27.273	74.000
<b>Average Detector:</b>					
4874.000	0.532	47.319	47.851	-6.149	54.000
7311.000	8.089	40.400	48.489	-5.511	54.000

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 : imp  
 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	0.191	53.816	54.007	-19.993	74.000
7386.000	8.373	46.720	55.094	-18.906	74.000
9848.000	7.964	38.990	46.954	-27.046	74.000
<b>Average Detector:</b>					
4924.000	0.191	45.796	45.987	-8.013	54.000
7386.000	8.373	36.570	44.944	-9.056	54.000
<b>Vertical</b>					
<b>Peak Detector:</b>					
4924.000	0.805	57.315	58.120	-15.880	74.000
7386.000	9.180	49.060	58.240	-15.760	74.000
9848.000	8.801	39.860	48.661	-25.339	74.000
<b>Average Detector:</b>					
4924.000	0.805	49.015	49.820	-4.180	54.000
7386.000	9.180	38.870	48.050	-5.950	54.000

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 : imp  
 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
<b>Horizontal</b>					
<b>Peak Detector:</b>					
4824.000	0.428	56.290	56.719	-17.281	74.000
7236.000	7.177	52.390	59.567	-14.433	74.000
9648.000	8.019	39.910	47.930	-26.070	74.000
<b>Average Detector:</b>					
4824.000	0.428	36.860	37.289	-16.711	54.000
7236.000	7.177	30.530	37.707	-16.293	54.000
<b>Vertical</b>					
<b>Peak Detector:</b>					
4824.000	0.836	56.660	57.497	-16.503	74.000
7236.000	7.676	44.960	52.636	-21.364	74.000
9648.000	8.556	39.690	48.247	-25.753	74.000
<b>Average Detector:</b>					
4824.000	0.836	36.950	37.787	-16.213	54.000

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 : imp  
 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
<b>Horizontal</b>					
<b>Peak Detector:</b>					
4874.000	0.076	57.630	57.707	-16.293	74.000
7311.000	7.512	49.940	57.452	-16.548	74.000
9748.000	7.630	39.000	46.630	-27.370	74.000
<b>Average Detector:</b>					
4874.000	0.076	38.060	38.137	-15.863	54.000
7311.000	7.512	29.930	37.442	-16.558	54.000
<b>Peak Detector:</b>					
4874.000	0.532	55.200	55.732	-18.268	74.000
7311.000	8.089	55.380	63.469	-10.531	74.000
9748.000	8.266	38.930	47.197	-26.803	74.000
<b>Average Detector:</b>					
4874.000	0.532	36.530	37.062	-16.938	54.000
7311.000	8.089	31.680	39.769	-14.231	54.000

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 : imp  
 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	0.191	58.280	58.471	-15.529	74.000
7386.000	8.373	48.560	56.934	-17.066	74.000
9848.000	7.964	39.560	47.524	-26.476	74.000
<b>Average Detector:</b>					
4924.000	0.191	38.150	38.341	-15.659	54.000
7386.000	8.373	29.840	38.214	-15.786	54.000
<b>Vertical</b>					
<b>Peak Detector:</b>					
4924.000	0.805	54.760	55.565	-18.435	74.000
7386.000	9.180	53.870	63.050	-10.950	74.000
9848.000	8.801	38.840	47.641	-26.359	74.000
<b>Average Detector:</b>					
4924.000	0.805	35.360	36.165	-17.835	54.000
7386.000	9.180	31.360	40.540	-13.460	54.000

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 : imp  
 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
<b>Horizontal</b>					
<b>Peak Detector:</b>					
4824.000	0.428	56.060	56.489	-17.511	74.000
7236.000	7.177	54.190	61.367	-12.633	74.000
9648.000	8.019	39.830	47.850	-26.150	74.000
<b>Average Detector:</b>					
4824.000	0.428	36.810	37.239	-16.761	54.000
7236.000	7.177	30.960	38.137	-15.863	54.000
<b>Vertical</b>					
<b>Peak Detector:</b>					
4824.000	0.836	53.990	54.827	-19.173	74.000
7236.000	7.676	56.530	64.206	-9.794	74.000
9648.000	8.556	39.320	47.877	-26.123	74.000
<b>Average Detector:</b>					
4824.000	0.836	35.530	36.367	-17.633	54.000
7236.000	7.676	33.630	41.306	-12.694	54.000

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 : imp  
 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	0.076	56.690	56.767	-17.233	74.000
7311.000	7.512	52.140	59.652	-14.348	74.000
9748.000	7.630	38.870	46.500	-27.500	74.000
<b>Average Detector:</b>					
4874.000	0.076	37.220	37.297	-16.703	54.000
7311.000	7.512	27.680	35.192	-18.808	54.000
<b>Vertical</b>					
<b>Peak Detector:</b>					
4874.000	0.532	56.110	56.642	-17.358	74.000
7311.000	8.089	55.260	63.349	-10.651	74.000
9748.000	8.266	38.710	46.977	-27.023	74.000
<b>Average Detector:</b>					
4874.000	0.532	37.640	38.172	-15.828	54.000
7311.000	8.089	32.210	40.299	-13.701	54.000

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 : imp  
 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
<b>Horizontal</b>					
<b>Peak Detector:</b>					
4924.000	0.191	57.040	57.231	-16.769	74.000
7386.000	8.373	51.590	59.964	-14.036	74.000
9848.000	7.964	38.790	46.754	-27.246	74.000
<b>Average Detector:</b>					
4924.000	0.191	37.820	38.011	-15.989	54.000
7386.000	8.373	30.290	38.664	-15.336	54.000
<b>Vertical</b>					
<b>Peak Detector:</b>					
4924.000	0.805	53.860	54.665	-19.335	74.000
7386.000	9.180	49.800	58.980	-15.020	74.000
9848.000	8.801	39.490	48.291	-25.709	74.000
<b>Average Detector:</b>					
4924.000	0.805	35.200	36.005	-17.995	54.000
7386.000	9.180	29.630	38.810	-15.190	54.000

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 : imp  
 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>					
136.700	-7.491	40.222	32.731	-10.769	43.500
353.980	-1.274	39.486	38.212	-7.788	46.000
427.700	0.210	37.962	38.172	-7.828	46.000
499.480	1.991	33.742	35.732	-10.268	46.000
747.800	3.915	28.495	32.410	-13.590	46.000
941.800	6.790	26.151	32.941	-13.059	46.000
<b>Vertical</b>					
142.520	-5.547	43.300	37.753	-5.747	43.500
485.900	-2.324	41.190	38.866	-7.134	46.000
582.900	-2.259	41.599	39.340	-6.660	46.000
613.940	1.782	36.175	37.957	-8.043	46.000
749.740	2.023	32.661	34.684	-11.316	46.000
963.140	3.581	30.473	34.054	-19.946	54.000

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 : imp  
 Test Item : General 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
<b>Horizontal</b>					
158.040	-9.272	41.943	32.671	-10.829	43.500
377.260	1.107	38.480	39.587	-6.413	46.000
499.480	1.991	36.419	38.409	-7.591	46.000
800.180	6.417	28.152	34.569	-11.431	46.000
877.780	6.207	31.322	37.529	-8.471	46.000
916.580	6.470	28.956	35.426	-10.574	46.000
<b>Vertical</b>					
37.760	-11.879	44.994	33.116	-6.884	40.000
299.660	-4.061	41.592	37.531	-8.469	46.000
584.840	-2.229	34.322	32.093	-13.907	46.000
749.740	2.023	32.112	34.135	-11.865	46.000
788.540	2.714	33.524	36.238	-9.762	46.000
934.040	2.986	30.374	33.360	-12.640	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 : imp  
 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 MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
<b>Horizontal</b>					
128.940	-7.390	35.984	28.594	-14.906	43.500
365.620	0.382	38.962	39.344	-6.656	46.000
528.580	3.074	33.094	36.168	-9.832	46.000
693.480	3.608	35.040	38.648	-7.352	46.000
852.560	7.106	29.470	36.576	-9.424	46.000
996.120	8.107	36.691	44.798	-9.202	54.000
<b>Vertical</b>					
109.540	-3.507	40.816	37.308	-6.192	43.500
321.000	-4.153	45.379	41.226	-4.774	46.000
507.240	0.429	39.196	39.625	-6.375	46.000
608.120	2.175	35.051	37.226	-8.774	46.000
840.920	2.284	35.699	37.983	-8.017	46.000
998.060	-1.242	40.767	39.525	-14.475	54.000

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**

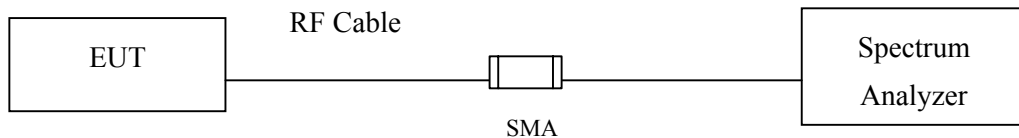
**5.1. Test Equipment**

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

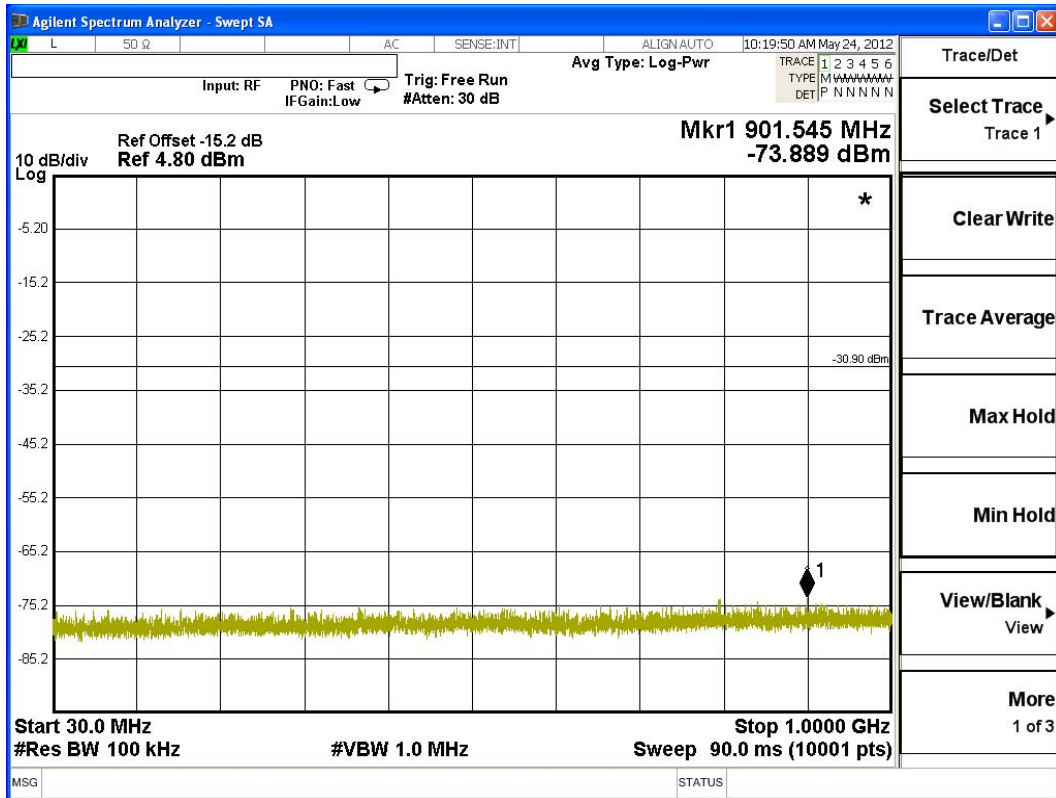
The measurement uncertainty

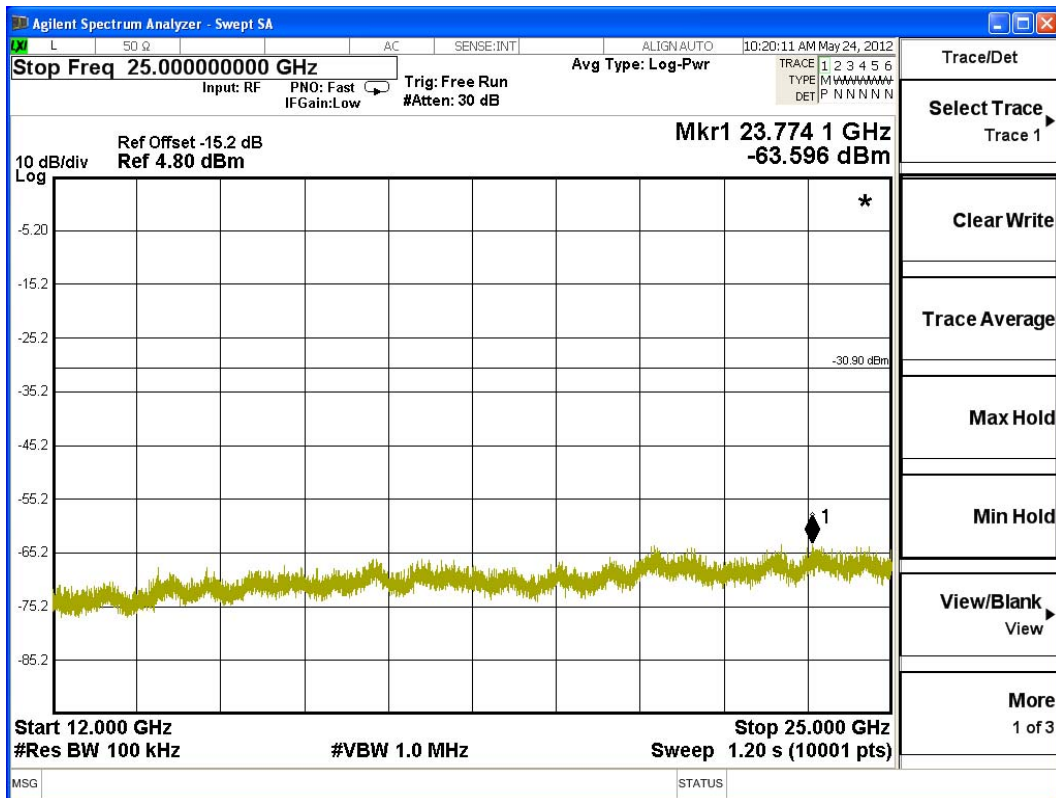
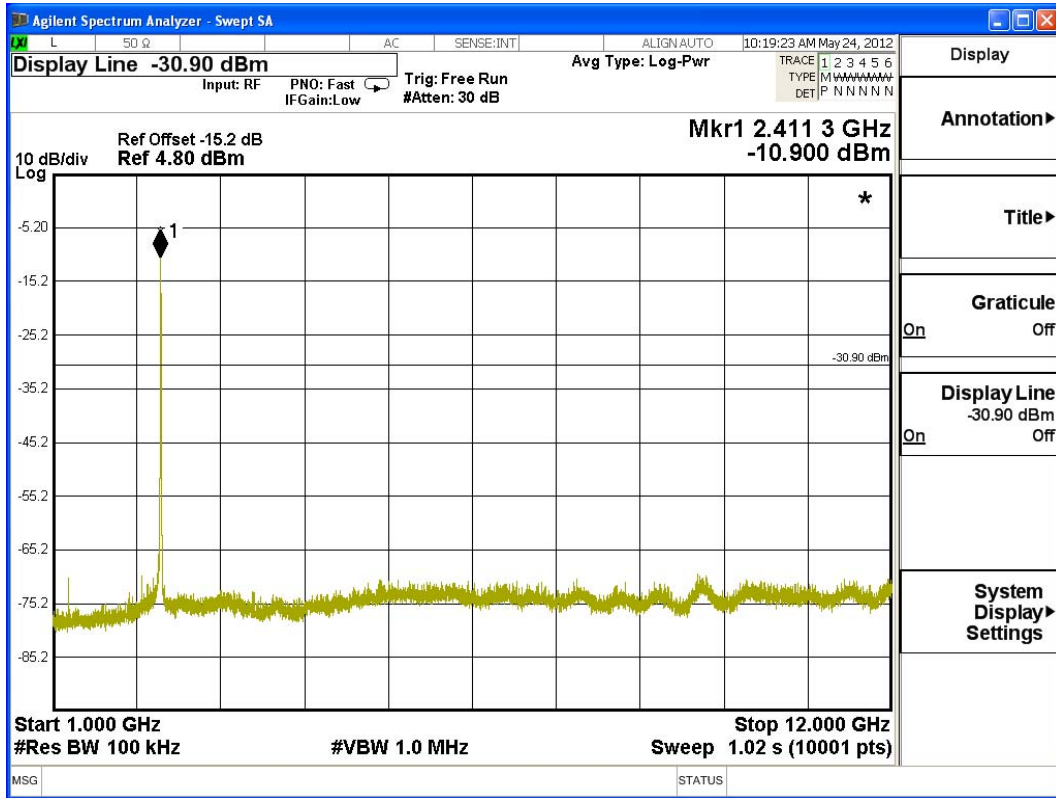
Conducted is defined as  $\pm 1.27\text{dB}$

**5.6. Test Result of RF antenna conducted test**

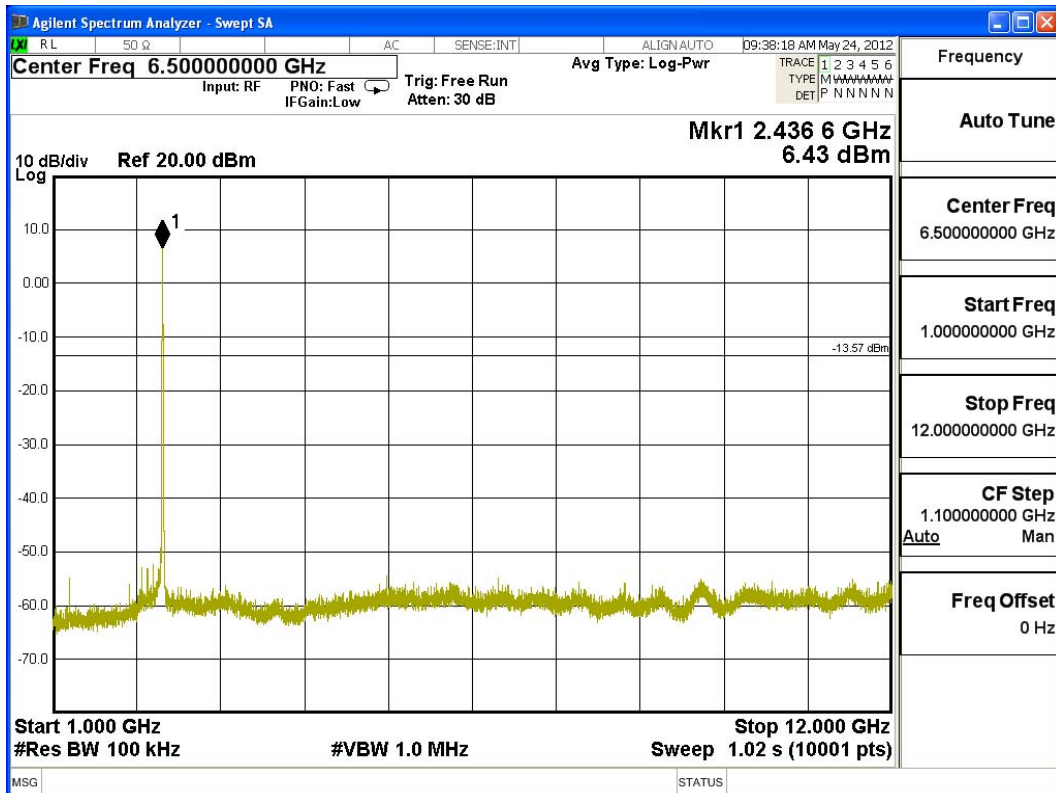
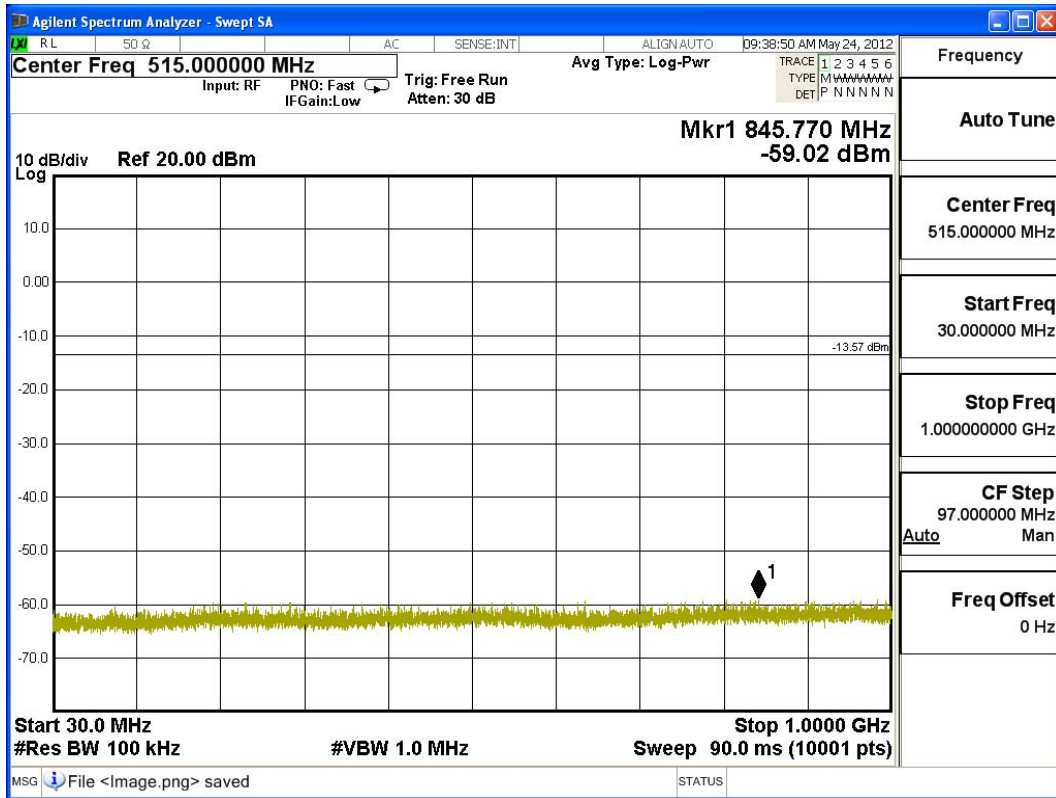
Product : imp  
 Test Item : RF antenna conducted test  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmit (802.11b 1Mbps)

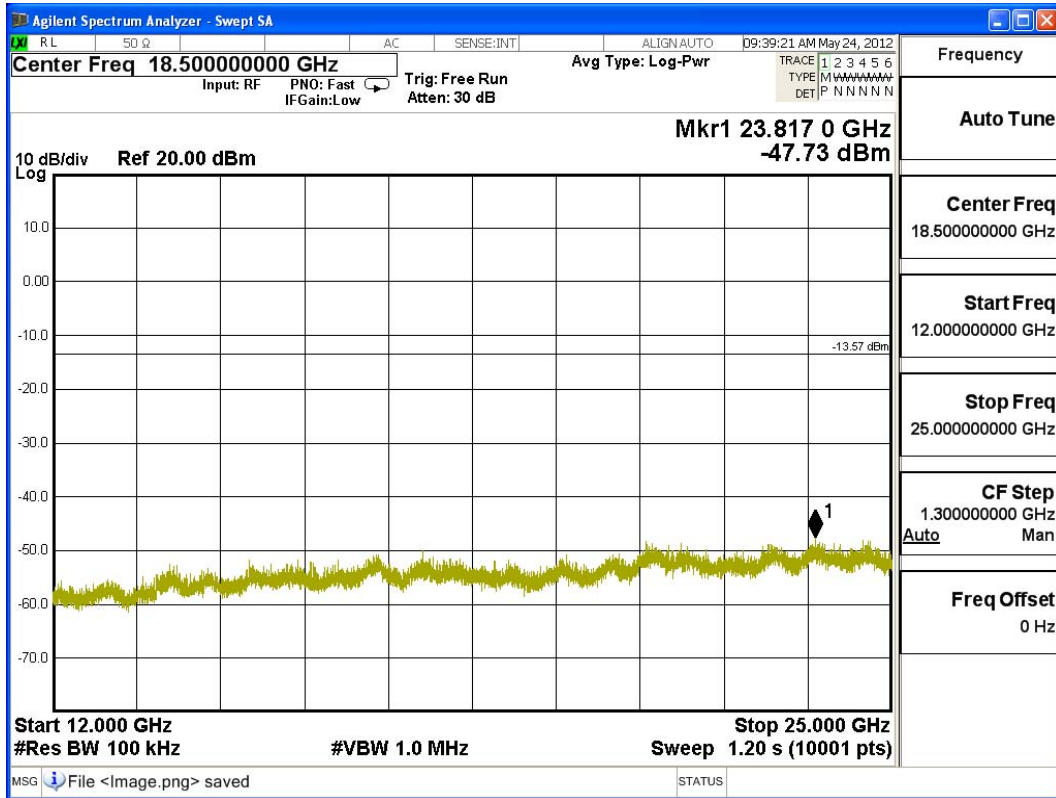
**Channel 01 (2412MHz)**



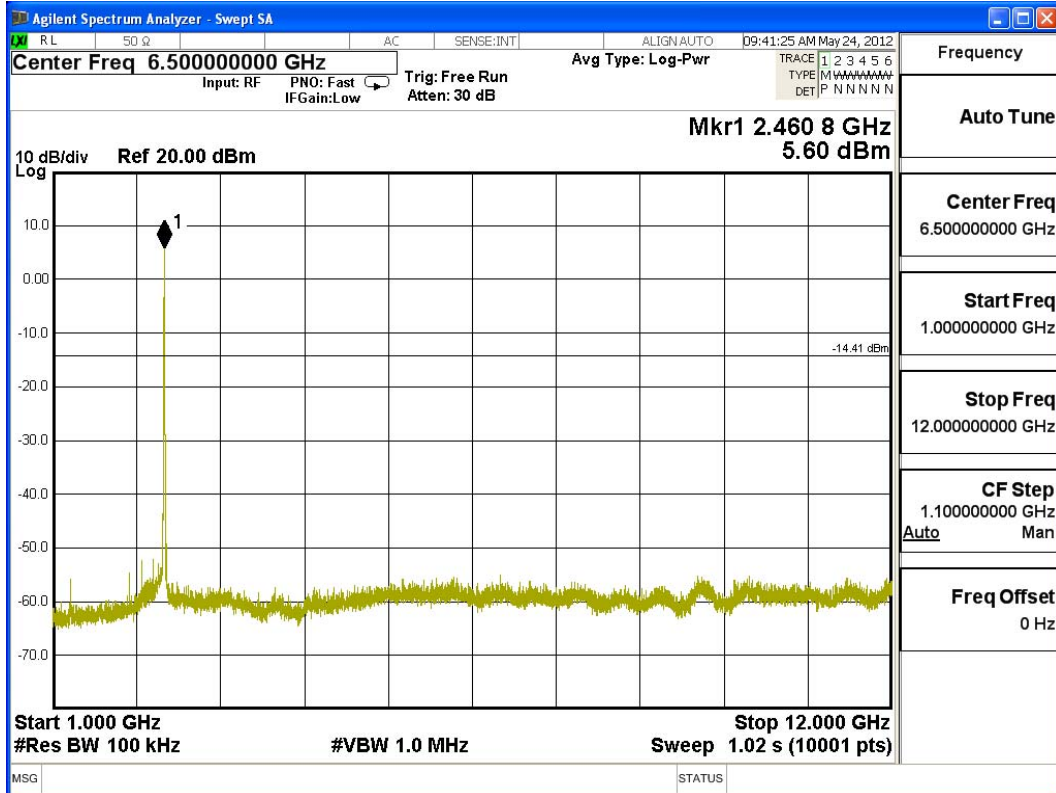
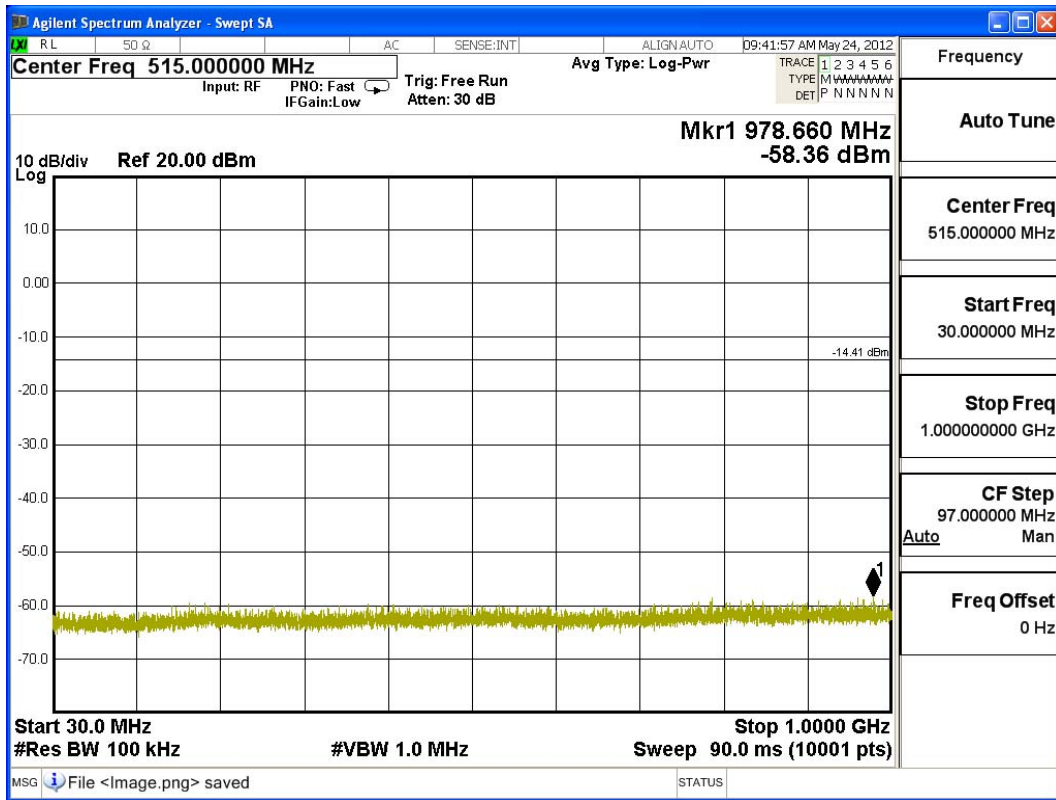


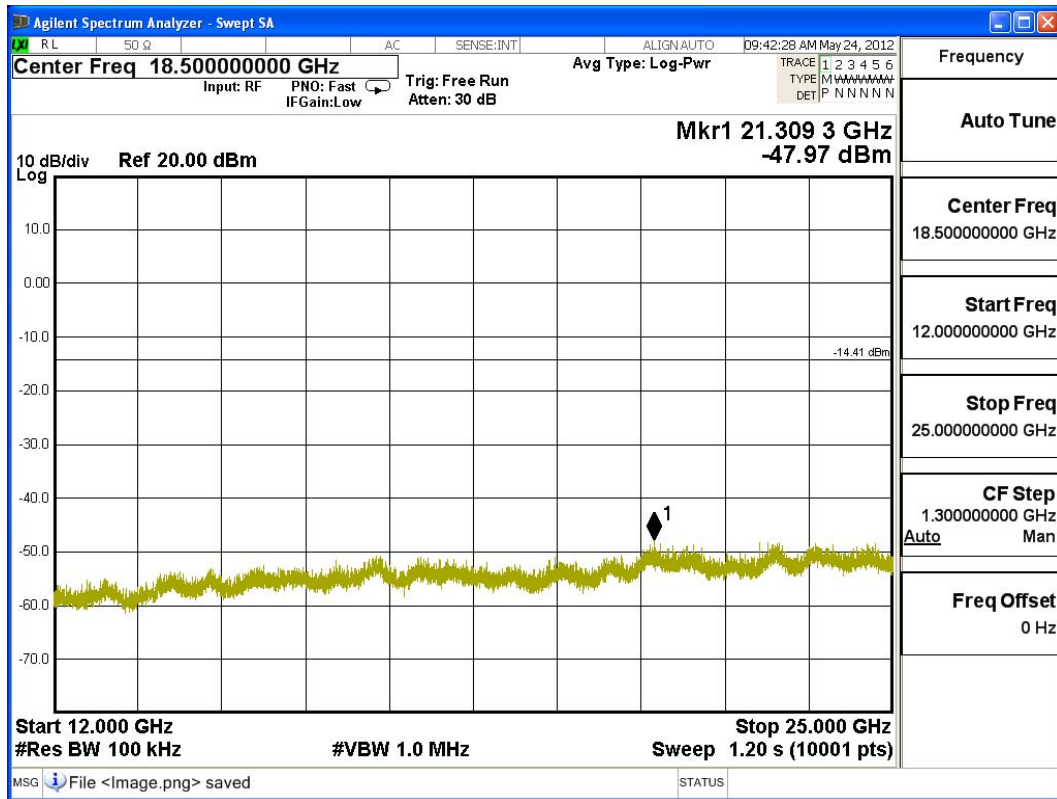
**Channel 06 (2437MHz)**





Channel 11 (2462MHz)

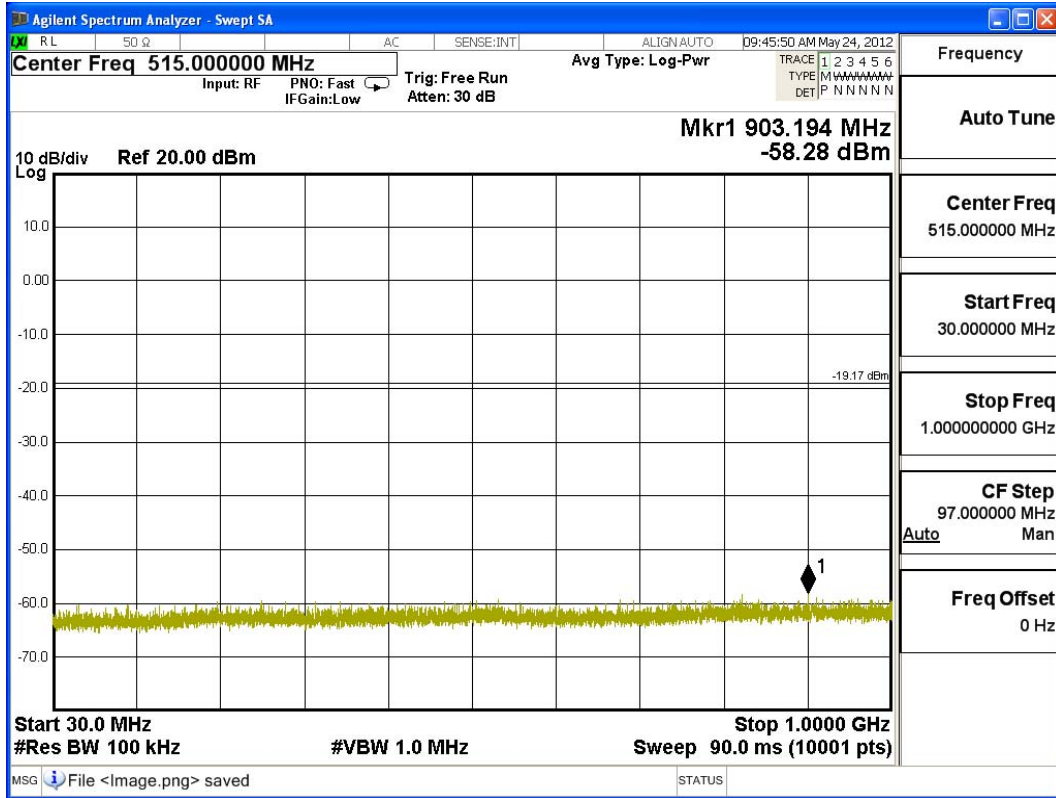


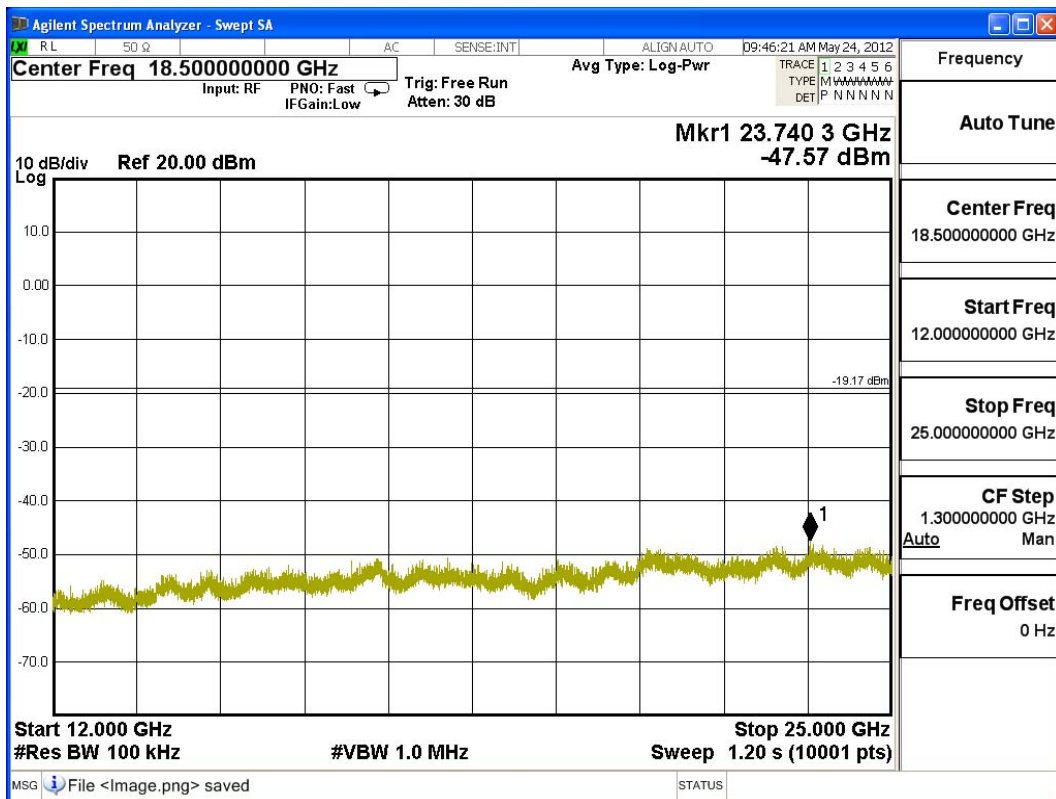
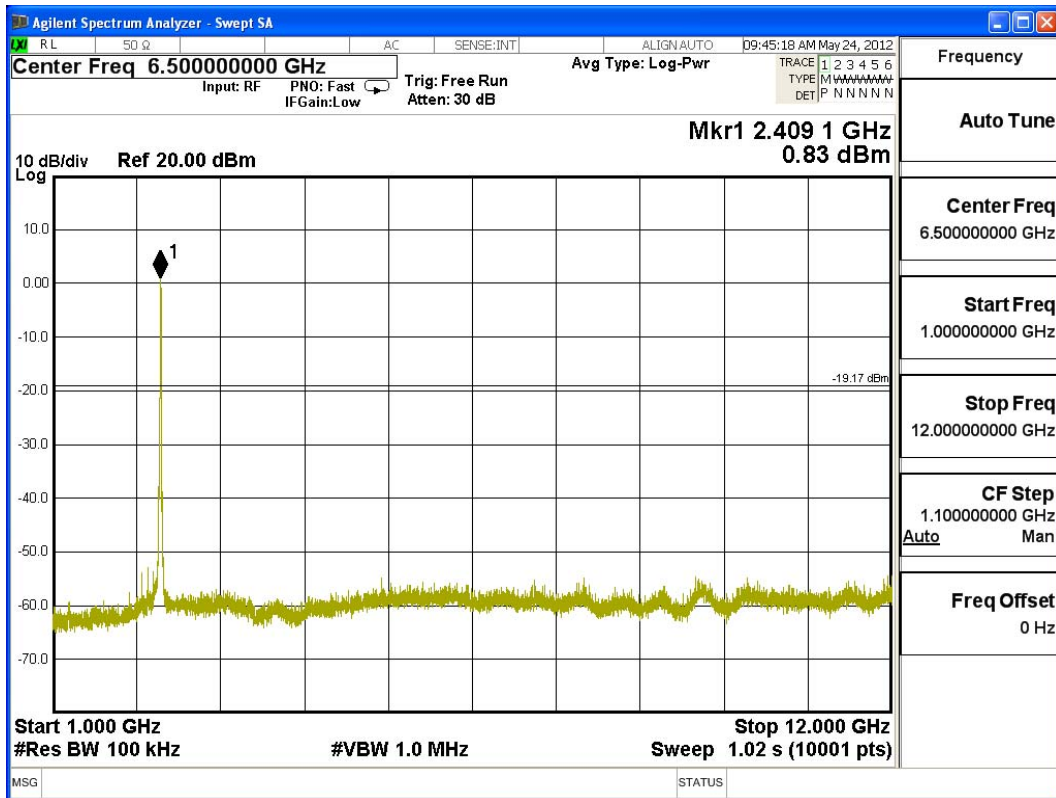




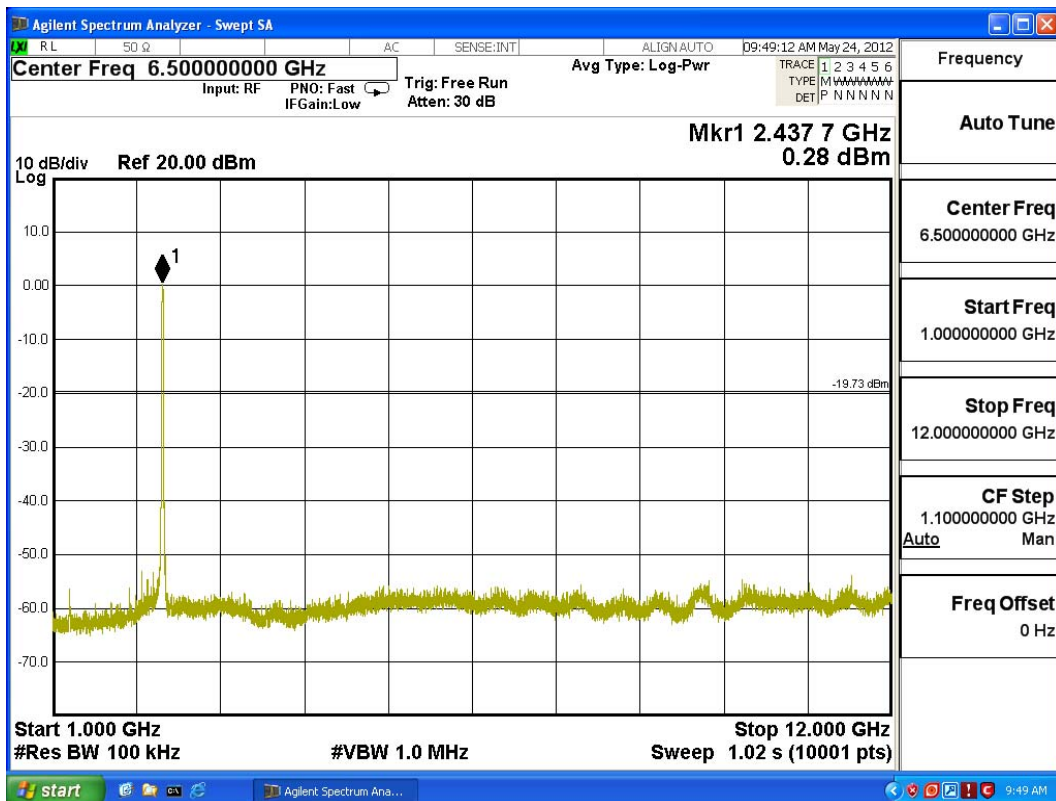
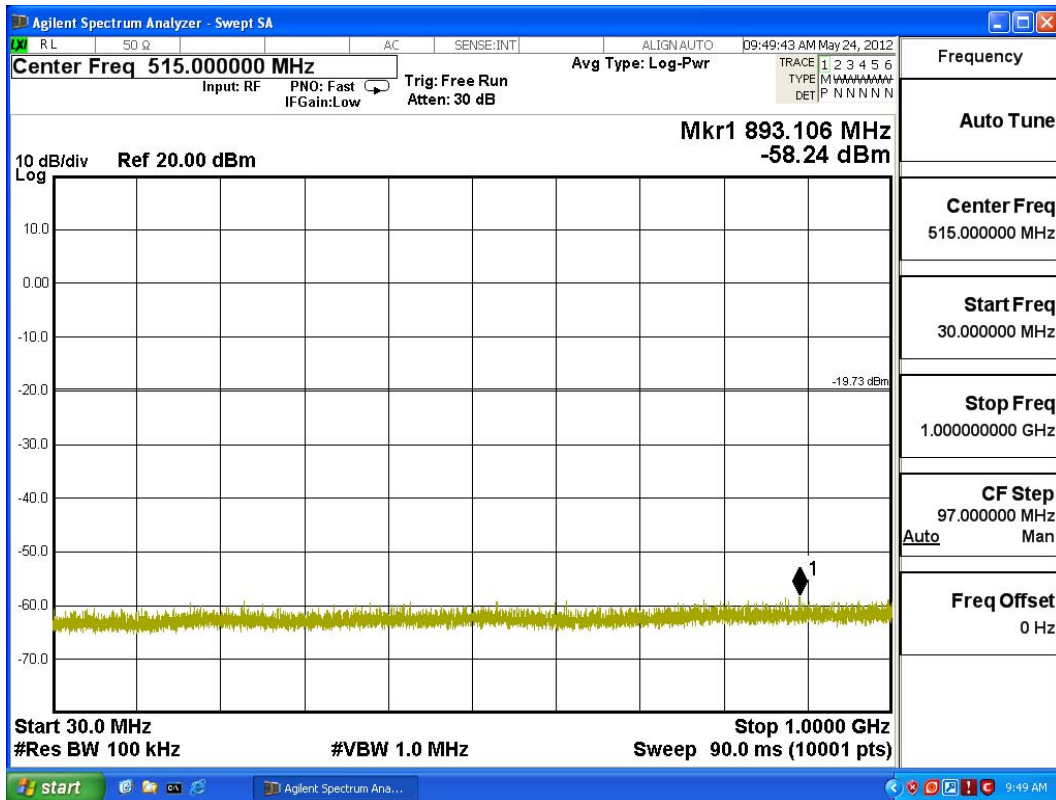
Product : imp  
 Test Item : RF Antenna Conducted Spurious  
 Test Site : No.3 OATS  
 Test Mode : Mode 2: Transmit (802.11g 6Mbps)

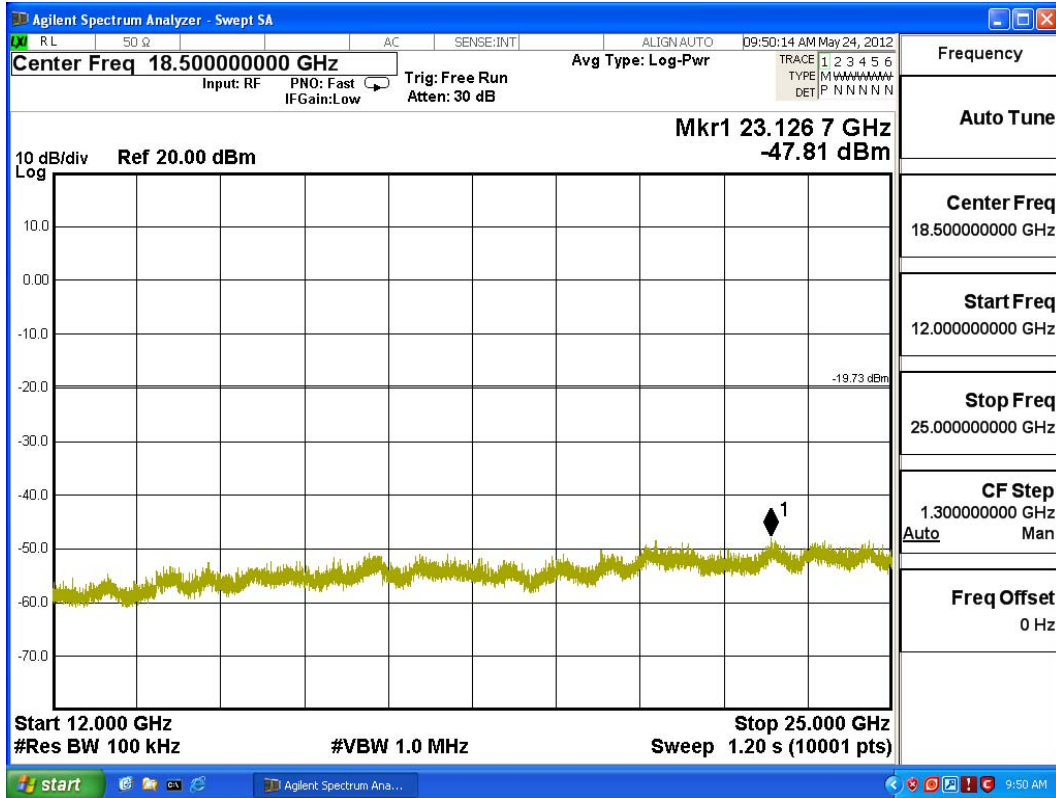
**Channel 01 (2412MHz)**



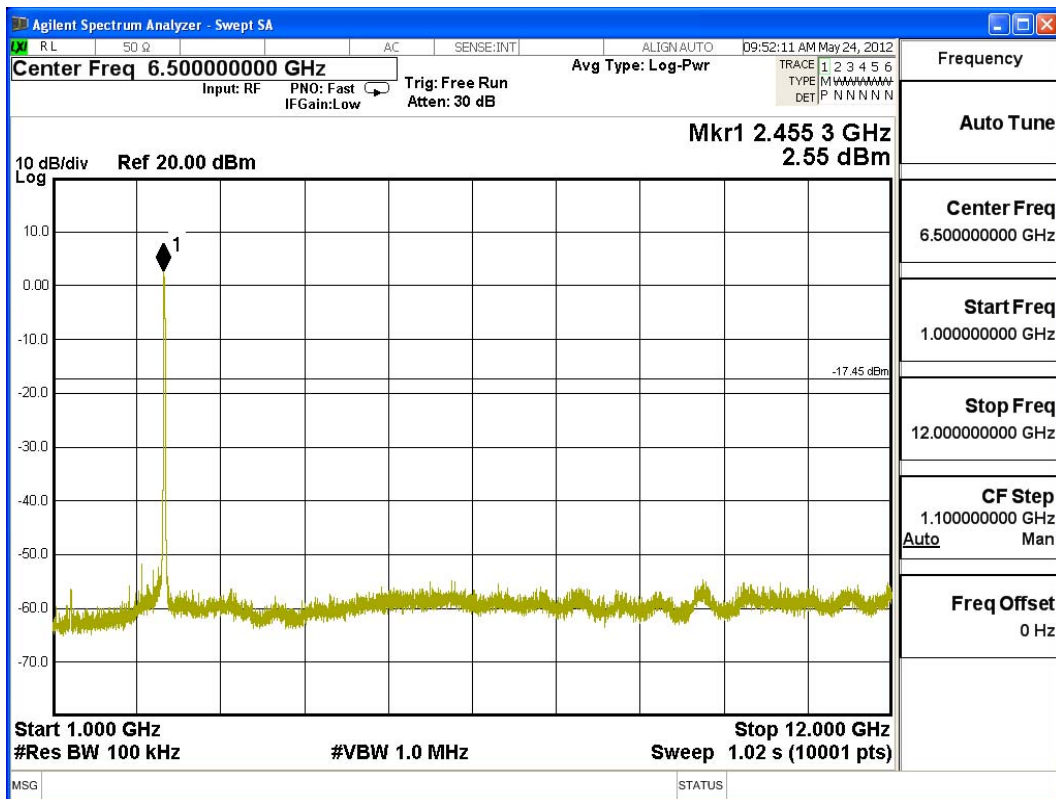
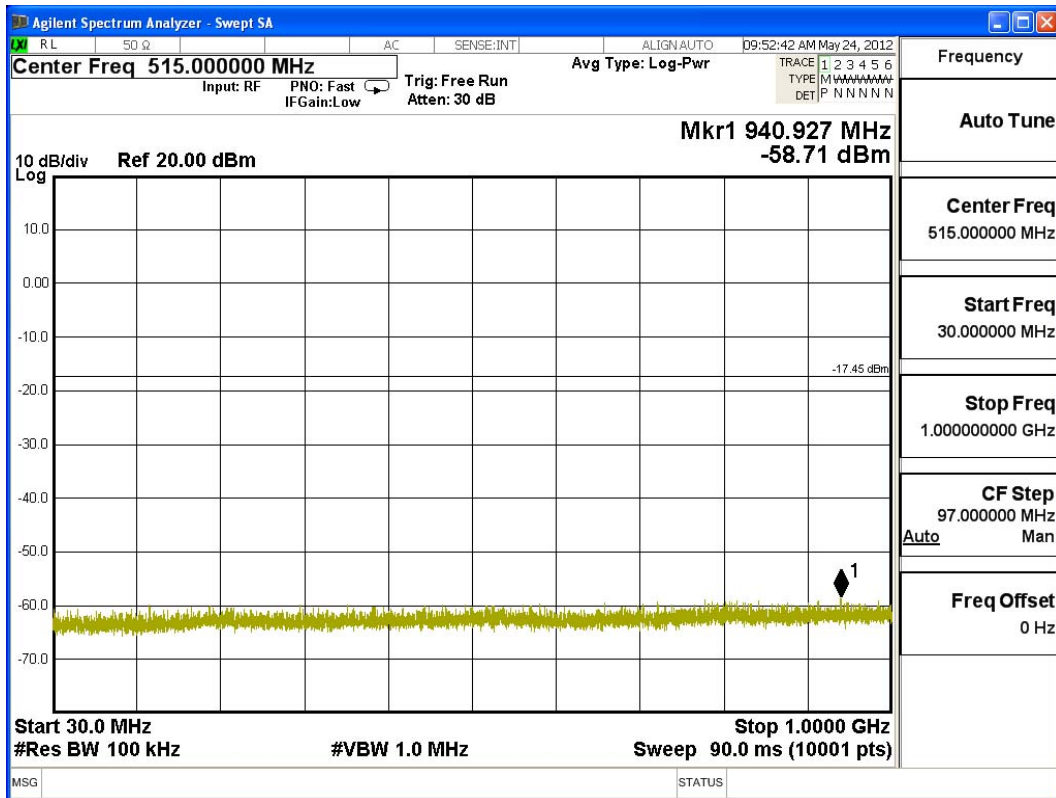


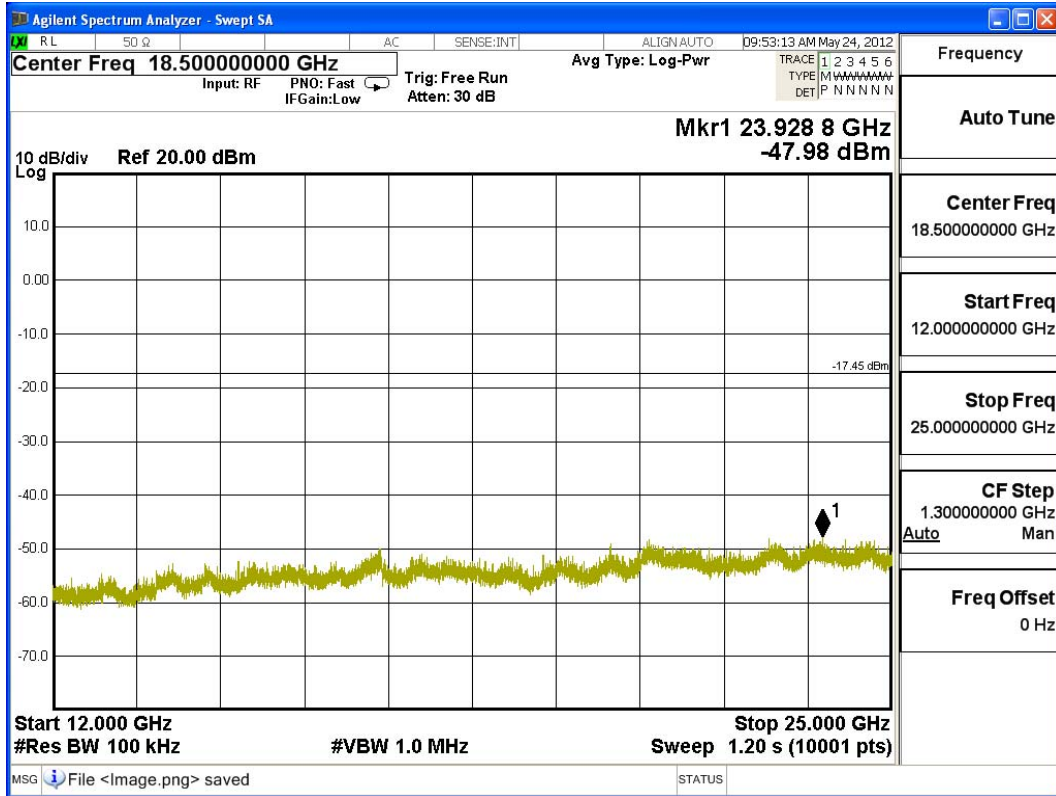
**Channel 06 (2437MHz)**





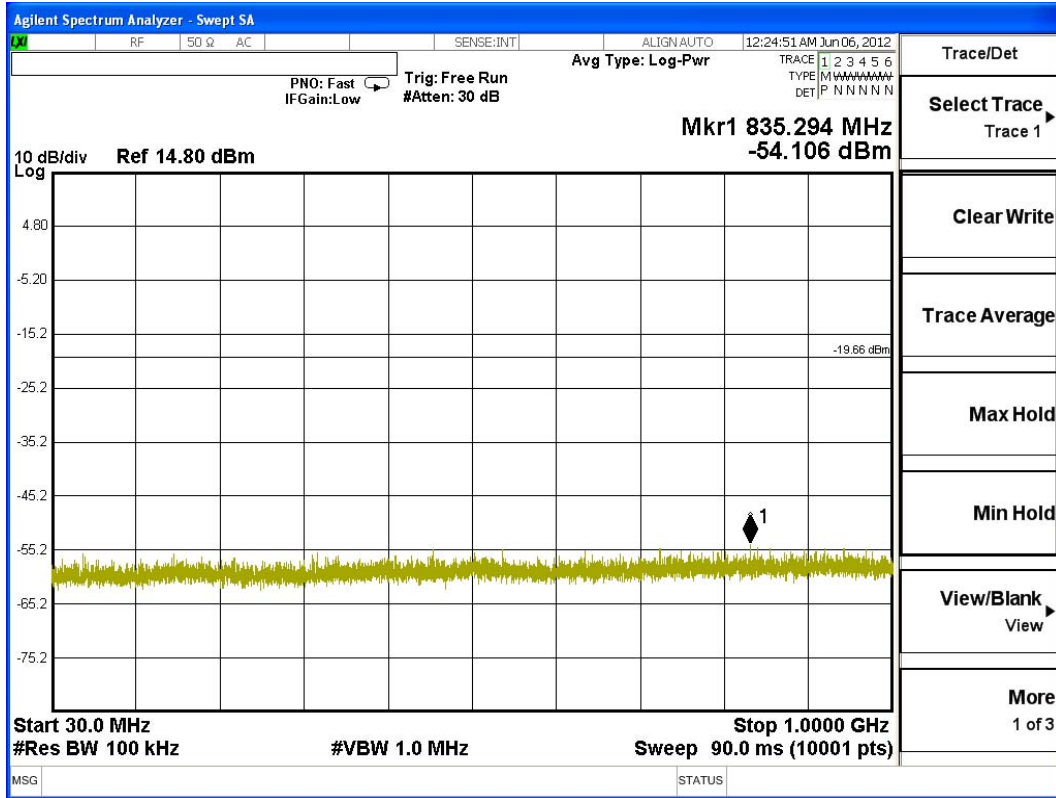
**Channel 11 (2462MHz)**



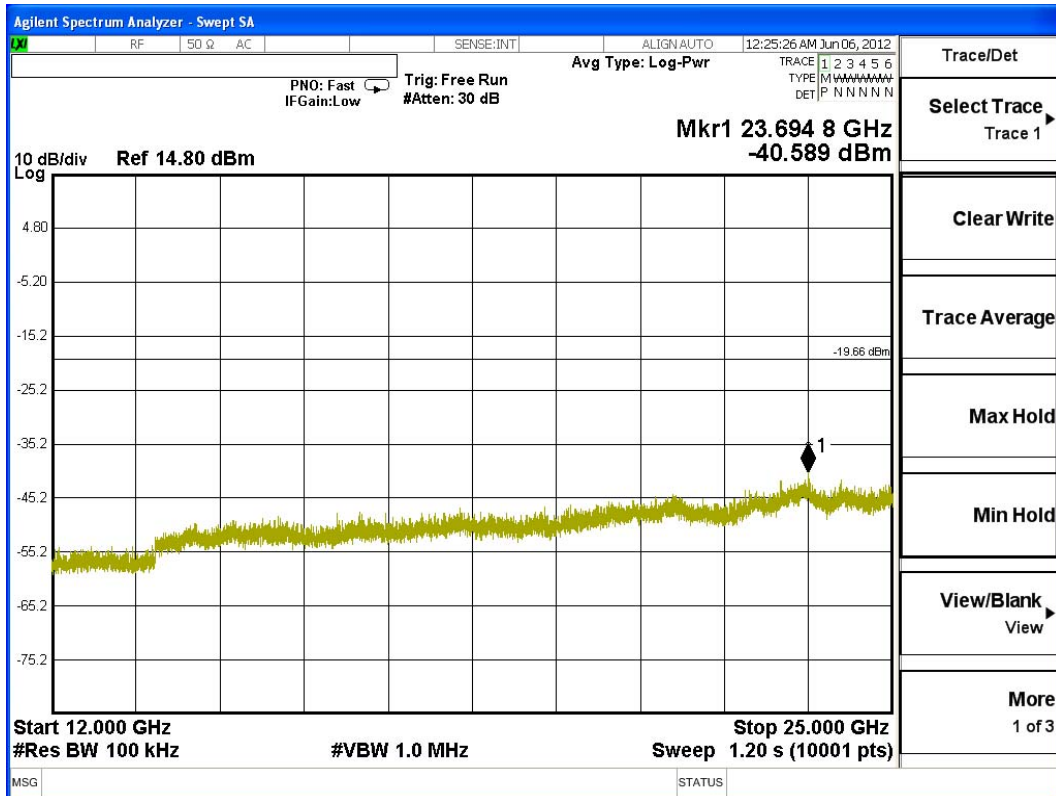
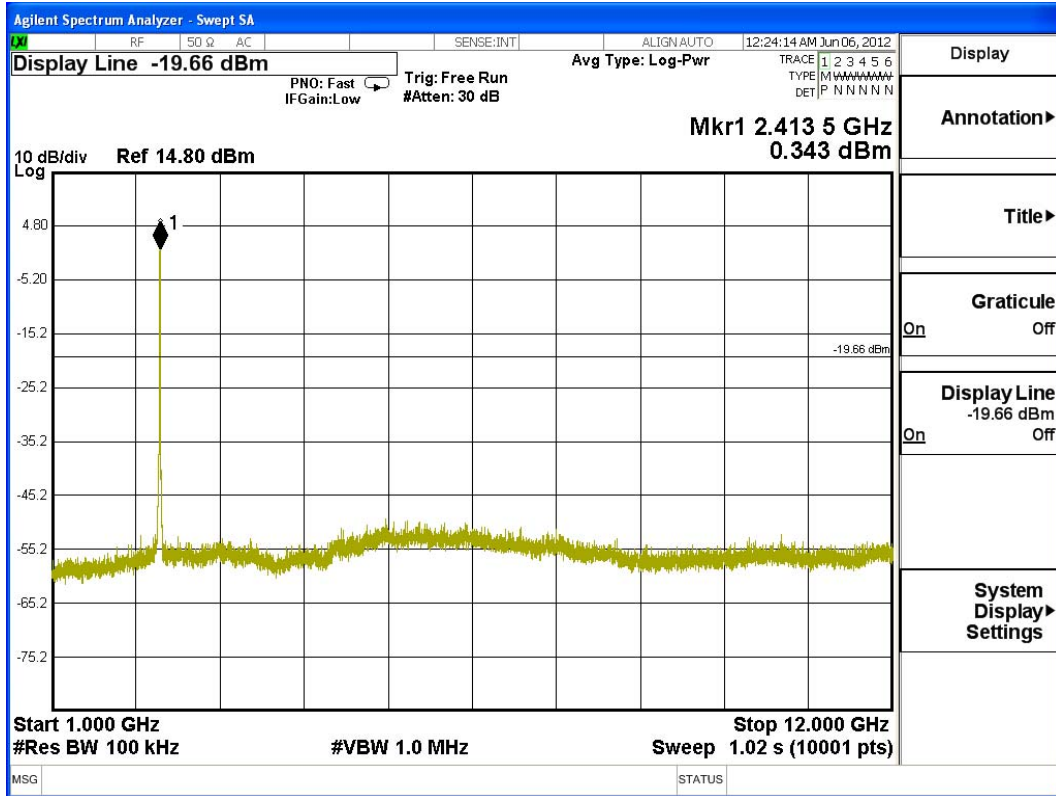


Product : imp  
 Test Item : RF Antenna Conducted Spurious  
 Test Site : No.3 OATS  
 Test Mode : Mode 3: Transmit (802.11n MCS0 7.2Mbps 20M-BW)

**Channel 01 (2412MHz)**

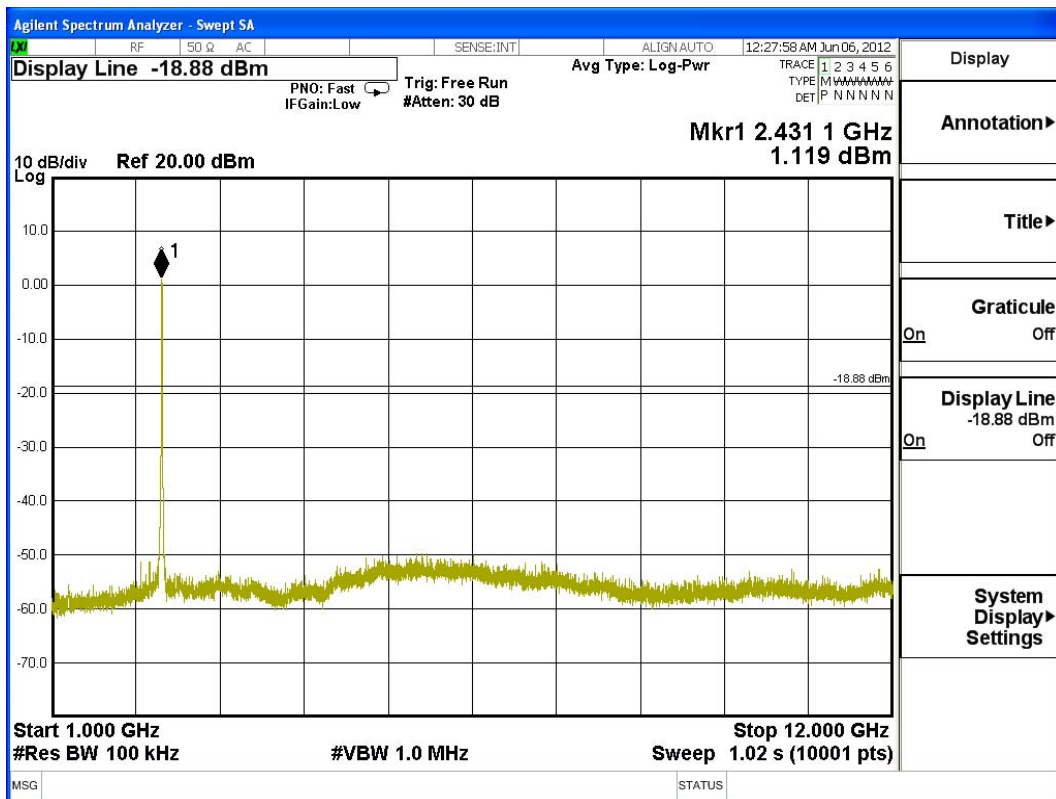
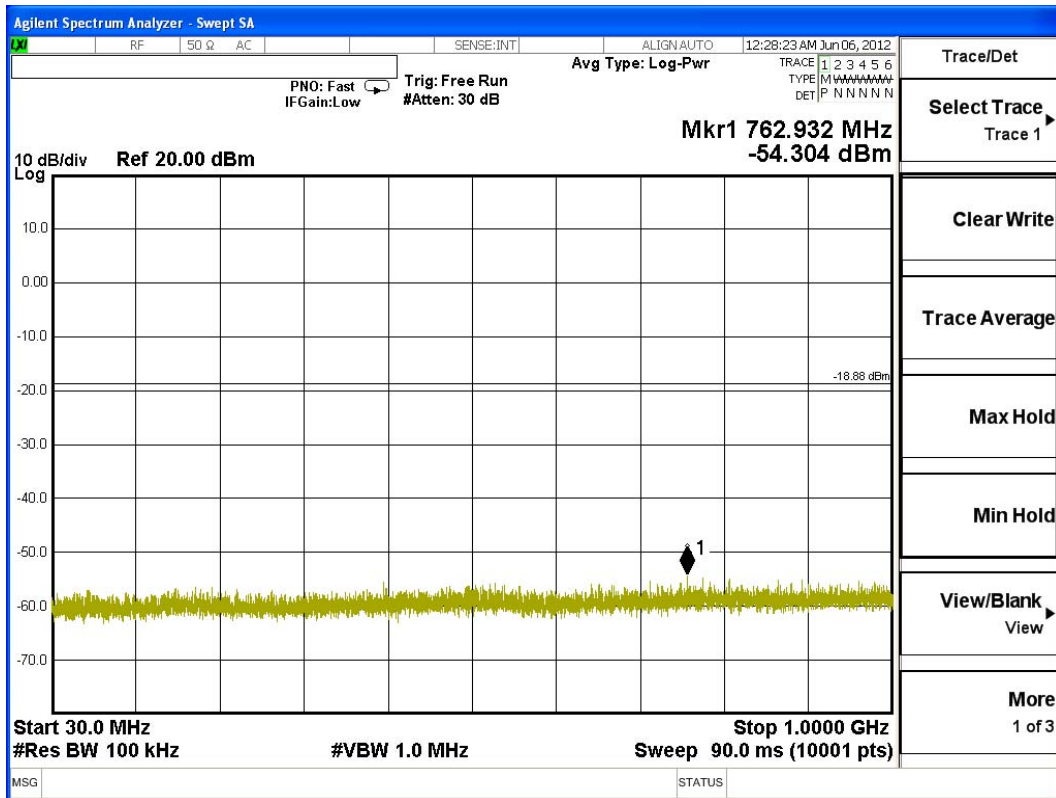








**Channel 06 (2437MHz)**





Channel 11 (2462MHz)

