Test Report

Product Name	MOXA IEEE802.11 a/b/g mini PCI module
Model No	WAPA003
FCC ID.	SLE-WAPA003-1

Applicant	Moxa Inc.
Address	Fl.4, No. 135, Lane 235, Pao-Chiao Rd., Shing Tien City, Taipei, Taiwan, R.O.C.

Date of Receipt	Apr. 12, 2012
Issue Date	Jun. 05, 2012
Report No.	124286R-RFUSP42V01
Report Version	V1.0

Testing Laboratory
0914

Test Report Certification

Issue Date: Jun. 05, 2012
Report No.: 124286R-RFUSP42V01

Product Name	MOXA IEEE802.11 a/b/g mini PCI module
Applicant	Moxa Inc.
Address	Fl.4, No. 135, Lane 235, Pao-Chiao Rd., Shing Tien City, Taipei, Taiwan, R.O.C.
Manufacturer	Moxa Inc.
Model No.	WAPA003
EUT Rated Voltage	DC 3.3V(Power by PCI-E)
EUT Test Voltage	DC 3.3V(Power by PCI-E)
Trade Name	MOXA
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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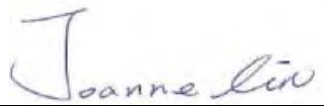
This report must not be used to claim product endorsement by NVLAP any agency of the U.S. Government

Documented By : 

(Adm. Specialist / Joanne Lin)

Tested By : 

(Engineer / Jack Hsu)

Approved By : 

(Manager / Vincent Lin)

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1. GENERAL INFORMATION

1.1. EUT Description

Product Name	MOXA IEEE802.11 a/b/g mini PCI module
Trade Name	MOXA
Model No.	WAPA003
FCC ID.	SLE-WAPA003-1
Frequency Range	802.11b/g:2412-2462MHz (Turbo mode: 2437MHz) 802.11a:5745-5825MHz (Turbo mode: 5760MHz, 5800MHz)
Number of Channels	802.11b/g: 11 (Turbo mode: 1) 802.11a: 5 (Turbo mode: 2)
Data Speed	802.11b: 1-11Mbps, 802.11a/g: 6-54Mbps, Turbo mode: up to 108Mbps
Channel separation	802.11b/g: 5 MHz, 802.11a: 20MHz
Type of Modulation	802.11b:DSSS DBPSK, DQPSK, CCK 802.11a/g: OFDM BPSK, QPSK, 16QAM, 64QAM
Antenna Type	Dipole
Antenna Gain	Refer to the table “Antenna List”
Channel Control	Auto

Antenna List

No.	Manufacturer	Part No.	Peak Gain
1	KINSUN	ANT-WDB-O-2 BK (main)(aux)	2.9dBi in 2.4GHz 2.34dBi in 5GHz
2	KINSUN	ANT-WDB-ANM-0502 (main)(aux)	4.62 dBi in 2.4GHz 1.41dBi in 5GHz

Note: 1. The antenna of EUT is conform to FCC 15.203

2. Only the higher gain antenna was tested and recorded in this report.

802.11b/g 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		

802.11a Center Working Frequency of Each Channel:

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
Channel 149:	5745 MHz	Channel 153:	5765 MHz	Channel 157:	5785 MHz	Channel 161:	5805 MHz
Channel 165:	5825 MHz						

Turbo Mode (2.4G Band) Center Working Frequency of Each Channel:

Channel	Frequency
Channel 6:	2437 MHz

Turbo Mode (5G Band) Center Working Frequency of Each Channel:

Channel	Frequency	Channel	Frequency
Channel 152:	5760 MHz	Channel 160:	5800 MHz

Note:

1. This device is an MOXA IEEE802.11 a/b/g mini PCI module with a built-in 2.4GHz and 5GHz WLAN transceiver.
2. The device is applied for modular approval.
3. Regarding to the operation frequency, the lowest, middle and highest frequency are selected to perform the test.
4. Lowest and highest data rates are tested in each mode. Only worst case is shown in the report. (802.11b is 1Mbps、802.11a/g is 6Mbps and turbo mode is 12Mbps).
5. These tests are conducted on a sample for the purpose of demonstrating compliance of 802.11a/b/g/n transmitter with Part 15 Subpart C Paragraph 15.247 of spread spectrum devices.

Test Mode:	Mode 1: Transmit (802.11b 1Mbps)
	Mode 2: Transmit (802.11g 6Mbps)
	Mode 3: Transmit (802.11a 6Mbps)
	Mode 4: Transmit Turbo Mode (2.4G Band)
	Mode 5: Transmit Turbo Mode (5G Band)

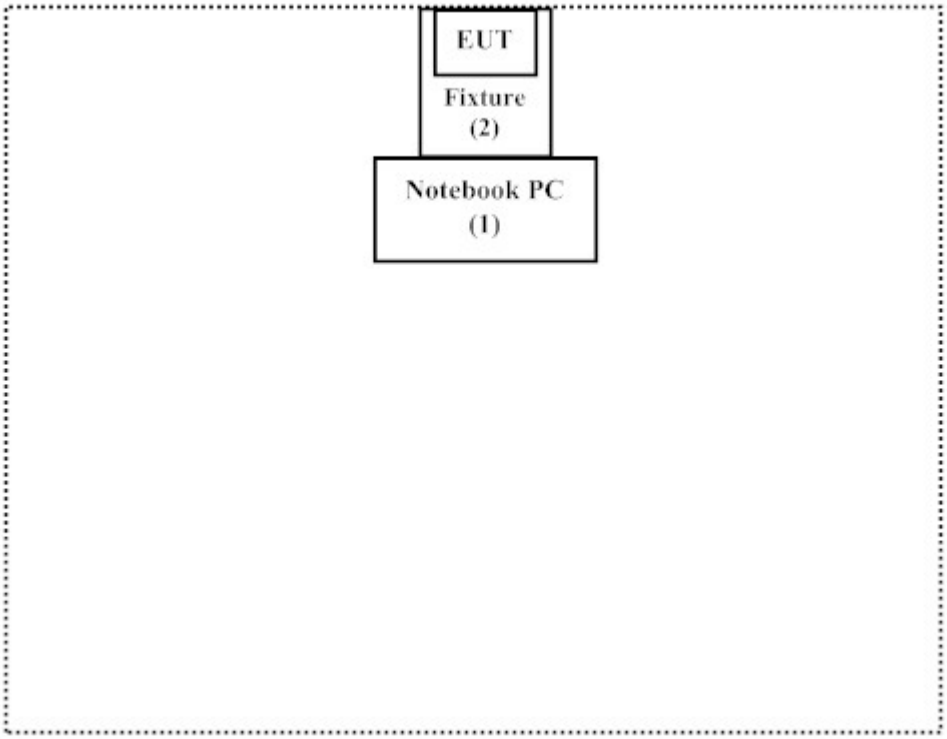
1.3. Tested System Details

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	Fixture	MOXA	N/A	N/A	N/A

Signal Cable Type	Signal cable Description
N/A	

1.4. Configuration of Tested System



1.5. EUT Exercise Software

(1) Setup the EUT as shown in Section 1.4

(2) Execute program 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
Site Address: No. 5-22, Rueishu Keng, 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

FCC Accreditation Number: TW1014

2. Conducted Emission

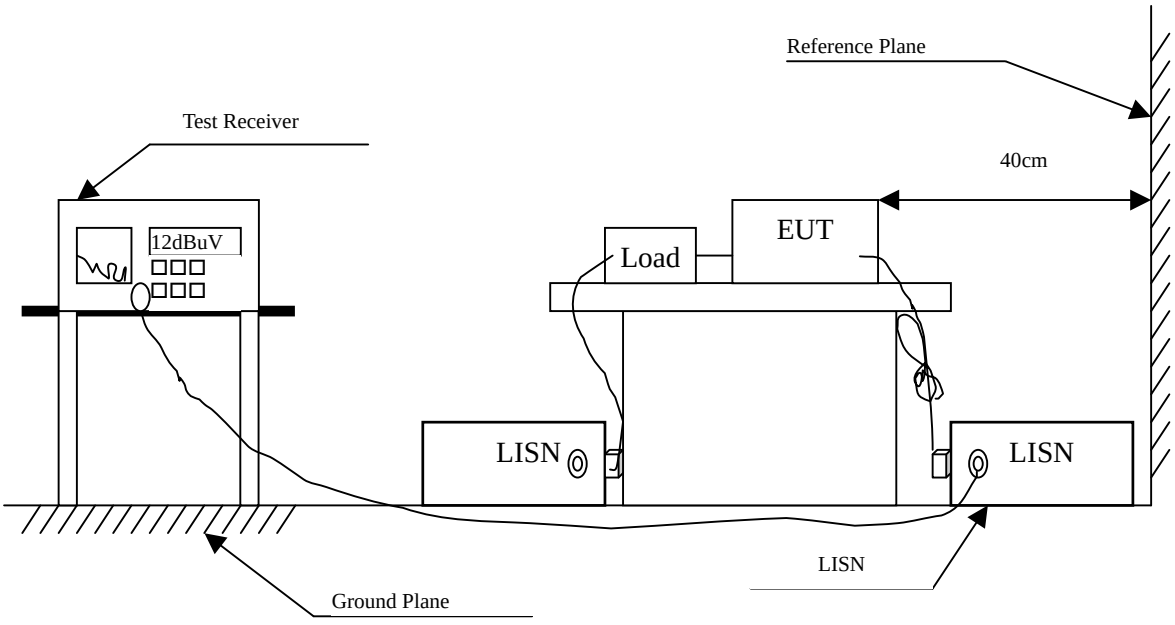
2.1. Test Equipment

	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 : MOXA IEEE802.11 a/b/g mini PCI module
Test Item : Conducted Emission Test
Power Line : Line 1
Test Mode : Mode 2: Transmit (802.11g 6Mbps)

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV	dB	dBuV
Line 1					
Quasi-Peak					
0.162	9.712	39.380	49.092	-16.565	65.657
0.173	9.704	38.540	48.244	-17.099	65.343
0.232	9.665	33.120	42.785	-20.872	63.657
0.267	9.651	30.120	39.771	-22.886	62.657
0.302	9.640	30.820	40.460	-21.197	61.657
0.466	9.640	23.960	33.600	-23.371	56.971
Average					
0.162	9.712	25.210	34.922	-20.735	55.657
0.173	9.704	22.060	31.764	-23.579	55.343
0.232	9.665	17.600	27.265	-26.392	53.657
0.267	9.651	17.310	26.961	-25.696	52.657
0.302	9.640	19.040	28.680	-22.977	51.657
0.466	9.640	14.650	24.290	-22.681	46.971

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 : MOXA IEEE802.11 a/b/g mini PCI module
Test Item : Conducted Emission Test
Power Line : Line 2
Test Mode : Mode 2: Transmit (802.11g 6Mbps)

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV	dB	dBuV
Line 2					
Quasi-Peak					
0.185	9.698	28.530	38.228	-26.772	65.000
0.271	9.649	26.880	36.529	-26.014	62.543
0.295	9.647	27.550	37.196	-24.661	61.857
0.349	9.650	22.640	32.290	-28.024	60.314
0.459	9.650	26.060	35.710	-21.461	57.171
0.537	9.650	20.860	30.510	-25.490	56.000
Average					
0.185	9.698	13.590	23.288	-31.712	55.000
0.271	9.649	24.450	34.099	-18.444	52.543
0.295	9.647	18.740	28.386	-23.471	51.857
0.349	9.650	11.170	20.820	-29.494	50.314
0.459	9.650	18.740	28.390	-18.781	47.171
0.537	9.650	11.400	21.050	-24.950	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 : MOXA IEEE802.11 a/b/g mini PCI module
Test Item : Conducted Emission Test
Power Line : Line 1
Test Mode : Mode 3: Transmit (802.11a 6Mbps)

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV	dB	dBuV
Line 1					
Quasi-Peak					
0.162	9.712	40.440	50.152	-15.505	65.657
0.205	9.683	35.940	45.623	-18.806	64.429
0.263	9.652	30.710	40.362	-22.409	62.771
0.306	9.640	30.510	40.150	-21.393	61.543
0.416	9.640	24.550	34.190	-24.210	58.400
0.798	9.660	21.880	31.540	-24.460	56.000
Average					
0.162	9.712	24.650	34.362	-21.295	55.657
0.205	9.683	18.450	28.133	-26.296	54.429
0.263	9.652	22.140	31.792	-20.979	52.771
0.306	9.640	29.430	39.070	-12.473	51.543
0.416	9.640	14.440	24.080	-24.320	48.400
0.798	9.660	20.280	29.940	-16.060	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 : MOXA IEEE802.11 a/b/g mini PCI module
Test Item : Conducted Emission Test
Power Line : Line 2
Test Mode : Mode 3: Transmit (802.11a 6Mbps)

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV	dB	dBuV
Line 2					
Quasi-Peak					
0.150	9.730	40.850	50.580	-15.420	66.000
0.173	9.710	32.600	42.310	-23.033	65.343
0.275	9.648	29.520	39.168	-23.261	62.429
0.306	9.649	29.500	39.149	-22.394	61.543
0.338	9.650	22.860	32.510	-28.119	60.629
0.486	9.650	22.860	32.510	-23.890	56.400
Average					
0.150	9.730	25.880	35.610	-20.390	56.000
0.173	9.710	17.530	27.240	-28.103	55.343
0.275	9.648	23.930	33.578	-18.851	52.429
0.306	9.649	24.240	33.889	-17.654	51.543
0.338	9.650	14.130	23.780	-26.849	50.629
0.486	9.650	13.530	23.180	-23.220	46.400

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 : MOXA IEEE802.11 a/b/g mini PCI module
Test Item : Conducted Emission Test
Power Line : Line 1
Test Mode : Mode 4: Transmit Turbo Mode (2.4G Band) (2437MHz)

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV	dB	dBuV
Line 1					
Quasi-Peak					
0.166	9.710	45.450	55.160	-10.383	65.543
0.181	9.699	39.340	49.039	-16.075	65.114
0.291	9.643	37.310	46.953	-15.018	61.971
0.459	9.640	26.820	36.460	-20.711	57.171
0.920	9.670	24.820	34.490	-21.510	56.000
6.767	9.720	15.740	25.460	-34.540	60.000
Average					
0.166	9.710	28.290	38.000	-17.543	55.543
0.181	9.699	26.630	36.329	-18.785	55.114
0.291	9.643	34.620	44.263	-7.708	51.971
0.459	9.640	19.620	29.260	-17.911	47.171
0.920	9.670	17.020	26.690	-19.310	46.000
6.767	9.720	10.320	20.040	-29.960	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 : MOXA IEEE802.11 a/b/g mini PCI module
Test Item : Conducted Emission Test
Power Line : Line 2
Test Mode : Mode 4: Transmit Turbo Mode (2.4G Band) (2437MHz)

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV	dB	dBuV
Line 2					
Quasi-Peak					
0.295	9.647	37.390	47.036	-14.821	61.857
0.380	9.650	29.590	39.240	-20.189	59.429
0.439	9.650	28.650	38.300	-19.443	57.743
0.638	9.650	24.610	34.260	-21.740	56.000
0.857	9.687	22.650	32.337	-23.663	56.000
7.060	9.770	16.130	25.900	-34.100	60.000
Average					
0.295	9.647	32.480	42.126	-9.731	51.857
0.380	9.650	16.430	26.080	-23.349	49.429
0.439	9.650	14.440	24.090	-23.653	47.743
0.638	9.650	12.060	21.710	-24.290	46.000
0.857	9.687	11.610	21.297	-24.703	46.000
7.060	9.770	10.440	20.210	-29.790	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 : MOXA IEEE802.11 a/b/g mini PCI module
Test Item : Conducted Emission Test
Power Line : Line 1
Test Mode : Mode 5: Transmit Turbo Mode (5G Band) (5760MHz)

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV	dB	dBuV
Line 1					
Quasi-Peak					
0.177	9.702	32.920	42.622	-22.607	65.229
0.287	9.644	40.230	49.874	-12.212	62.086
0.474	9.640	27.500	37.140	-19.603	56.743
0.880	9.670	22.000	31.670	-24.330	56.000
2.701	9.690	11.550	21.240	-34.760	56.000
5.908	9.710	11.510	21.220	-38.780	60.000
Average					
0.177	9.702	22.490	32.192	-23.037	55.229
0.287	9.644	32.580	42.224	-9.862	52.086
0.474	9.640	13.900	23.540	-23.203	46.743
0.880	9.670	16.760	26.430	-19.570	46.000
2.701	9.690	4.370	14.060	-31.940	46.000
5.908	9.710	6.420	16.130	-33.870	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 : MOXA IEEE802.11 a/b/g mini PCI module
Test Item : Conducted Emission Test
Power Line : Line 2
Test Mode : Mode 5: Transmit Turbo Mode (5G Band) (5760MHz)

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV	dB	dBuV
Line 2					
Quasi-Peak					
0.201	9.686	36.950	46.636	-17.907	64.543
0.232	9.665	33.760	43.425	-20.232	63.657
0.287	9.646	40.190	49.836	-12.250	62.086
0.392	9.650	28.880	38.530	-20.556	59.086
0.603	9.650	19.640	29.290	-26.710	56.000
3.564	9.710	11.420	21.130	-34.870	56.000
Average					
0.201	9.686	20.070	29.756	-24.787	54.543
0.232	9.665	21.920	31.585	-22.072	53.657
0.287	9.646	37.780	47.426	-4.660	52.086
0.392	9.650	14.250	23.900	-25.186	49.086
0.603	9.650	12.710	22.360	-23.640	46.000
3.564	9.710	4.360	14.070	-31.930	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

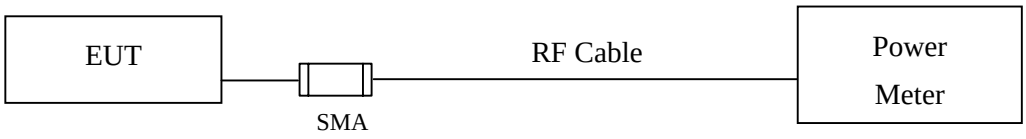
3.1. Test Equipment

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

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 : MOXA IEEE802.11 a/b/g mini PCI 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	1		
		Measurement Level (dBm)						
01	2412	15.79	--	--	--	18.27	<30dBm	Pass
06	2437	15.51	15.5	15.48	15.45	17.43	<30dBm	Pass
11	2462	12.76	--	--	--	15.22	<30dBm	Pass

Product : MOXA IEEE802.11 a/b/g mini PCI 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	6		
		Measurement Level (dBm)										
01	2412	12.41	--	--	--	--	--	--	--	20.91	<30dBm	Pass
06	2437	12.72	12.7	12.68	12.64	12.64	12.64	12.63	12.6	22.15	<30dBm	Pass
11	2462	12.4	--	--	--	--	--	--	--	20.76	<30dBm	Pass

Product : MOXA IEEE802.11 a/b/g mini PCI module
Test Item : Peak Power Output Data
Test Site : No.3 OATS
Test Mode : Mode 3: Transmit (802.11a 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	6		
		Measurement Level (dBm)										
149	5745	13.01	--	--	--	--	--	--	--	19.43	<30dBm	Pass
157	5785	12.79	12.78	12.75	12.74	12.74	12.72	12.71	12.68	18.75	<30dBm	Pass
165	5825	12.57	--	--	--	--	--	--	--	18.24	<30dBm	Pass

Product : MOXA IEEE802.11 a/b/g mini PCI module
Test Item : Peak Power Output Data
Test Site : No.3 OATS
Test Mode : Mode 4: Transmit Turbo Mode (2.4G Band)

Channel No	Frequency (MHz)	Average Power For different Data Rate (Mbps)								Peak Power	Required Limit	Result
		12	18	24	36	48	72	96	108	12		
		Measurement Level (dBm)										
06	2437	14.13	14.12	14.1	14.09	14.08	14.08	14.07	14.05	20.85	<30dBm	Pass

Product : MOXA IEEE802.11 a/b/g mini PCI module
Test Item : Peak Power Output Data
Test Site : No.3 OATS
Test Mode : Mode 5: Transmit Turbo Mode (5G Band)

Channel No	Frequency (MHz)	Average Power For different Data Rate (Mbps)								Peak Power	Required Limit	Result
		12	18	24	36	48	72	96	108	12		
		Measurement Level (dBm)										
152	5760	13.52	13.5	13.49	13.49	13.47	13.45	13.44	13.43	19.13	<30dBm	Pass
160	5800	13.34	--	--	--	--	--	--	--	18.51	<30dBm	Pass

4. Radiated Emission

4.1. Test Equipment

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

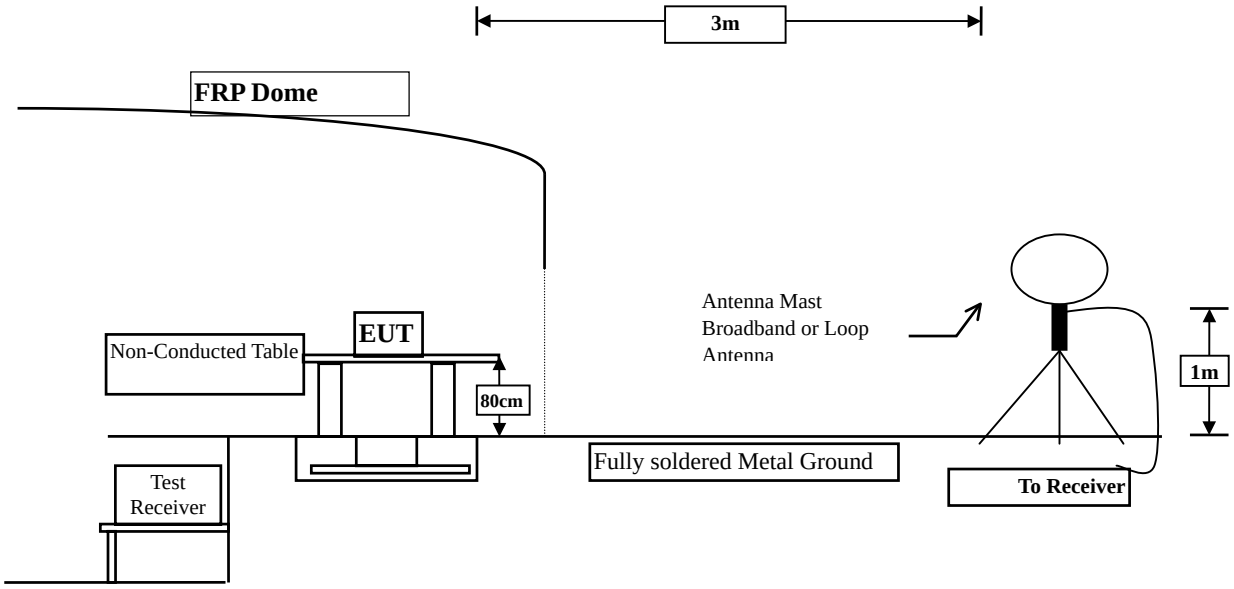
Test Site		Equipment	Manufacturer	Model No./Serial No.	Last Cal.
☒Site # 3	X	Loop Antenna	Teseq	HLA6120 / 26739	Jul., 2011
	X	Bilog Antenna	Schaffner Chase	CBL6112B/2673	Sep., 2011
	X	Horn Antenna	Schwarzbeck	BBHA9120D/D305	Sep., 2011
	X	Horn Antenna	Schwarzbeck	BBHA9170/208	Jul., 2011
	X	Pre-Amplifier	QTK	QTK-AMP-03 / 0003	May, 2012
	X	Pre-Amplifier	QTK	AP-180C / CHM_0906076	Sep., 2011
	X	Pre-Amplifier	MITEQ	AMF-4D-180400-45-6P/ 925975	Mar, 2012
	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.

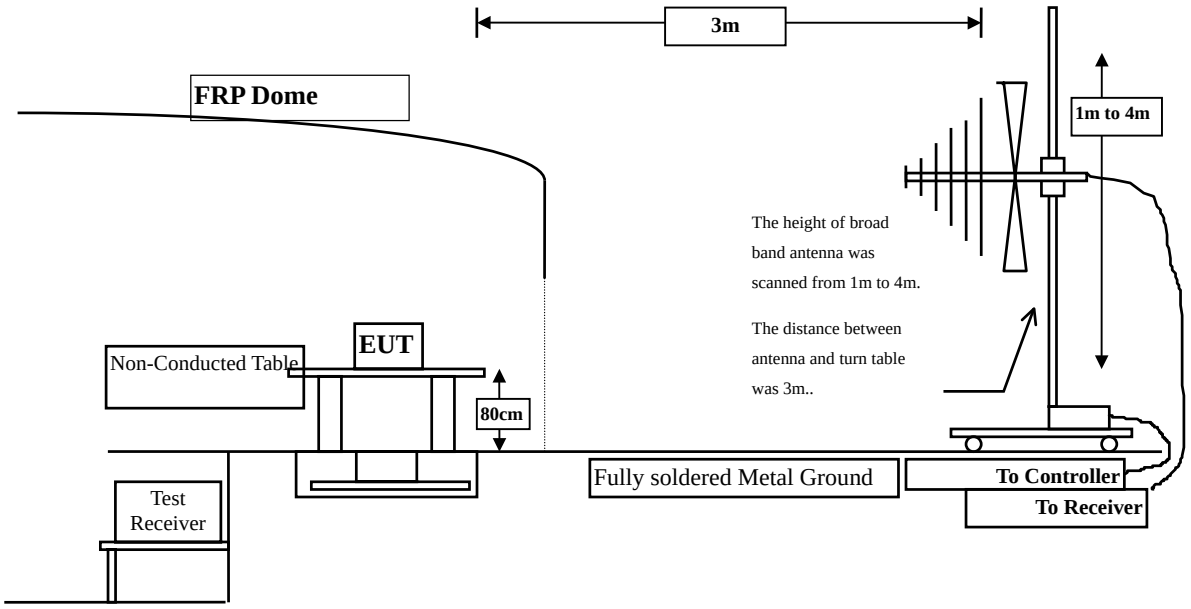
2. The test instruments marked with “X” are used to measure the final test results.

4.2. Test Setup

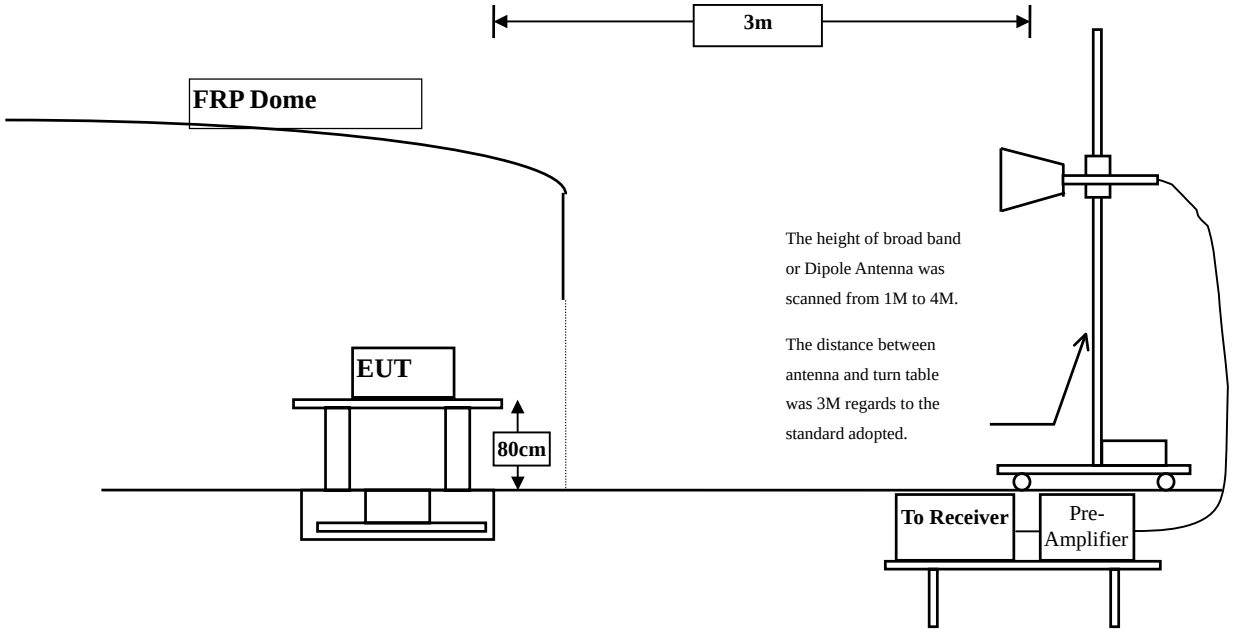
Radiated Emission Below 30MHz



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.

FCC Part 15 Subpart C Paragraph 15.209(a) Limits		
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 measurement frequency range form 9kHz - 10th Harmonic of fundamental was investigated.

4.5. Uncertainty

± 3.9 dB above 1GHz
± 3.8 dB below 1GHz

4.6. Test Result of Radiated Emission

Product : MOXA IEEE802.11 a/b/g mini PCI module
Test Item : Harmonic Radiated Emission Data
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit (802.11b 1Mbps) (2412MHz)

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal					
Peak Detector:					
4824.000	0.428	51.330	51.759	-22.241	74.000
7236.000	7.177	36.970	44.147	-29.853	74.000
9648.000	8.019	36.190	44.210	-29.790	74.000
Average Detector:					
--					
Vertical					
Peak Detector:					
4824.000	0.836	53.270	54.107	-19.893	74.000
7236.000	7.676	40.320	47.996	-26.004	74.000
9648.000	8.556	37.260	45.817	-28.183	74.000
Average Detector:					
4824.000	0.836	51.580	52.417	-1.583	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 : MOXA IEEE802.11 a/b/g mini PCI module
Test Item : Harmonic Radiated Emission Data
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit (802.11b 1Mbps) (2437 MHz)

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal					
Peak Detector:					
4874.000	0.076	50.270	50.347	-23.653	74.000
7311.000	7.512	36.390	43.902	-30.098	74.000
9748.000	7.630	36.360	43.990	-30.010	74.000
Average Detector:					
--					
Vertical					
Peak Detector:					
4874.000	0.532	54.670	55.202	-18.798	74.000
7311.000	8.089	39.610	47.699	-26.301	74.000
9748.000	8.266	37.580	45.847	-28.153	74.000
Average Detector:					
4874.000	0.532	51.980	52.512	-1.488	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 : MOXA IEEE802.11 a/b/g mini PCI module
Test Item : Harmonic Radiated Emission Data
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit (802.11b 1Mbps) (2462 MHz)

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal					
Peak Detector:					
4924.000	0.191	47.280	47.471	-26.529	74.000
7386.000	8.373	37.830	46.204	-27.796	74.000
9848.000	7.964	38.210	46.174	-27.826	74.000
Average					
Detector:					
--					
Vertical					
Peak Detector:					
4924.000	0.805	54.650	55.455	-18.545	74.000
7386.000	9.180	38.640	47.820	-26.180	74.000
9848.000	8.801	38.330	47.131	-26.869	74.000
Average					
Detector:					
4924.000	0.805	51.670	52.475	-1.525	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 : MOXA IEEE802.11 a/b/g mini PCI module
Test Item : Harmonic Radiated Emission Data
Test Site : No.3 OATS
Test Mode : Mode 2: Transmit (802.11g 6Mbps) (2412MHz)

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal					
Peak Detector:					
4824.000	0.428	52.760	53.189	-20.811	74.000
7236.000	7.676	41.260	48.936	-25.064	74.000
9648.000	8.556	37.940	46.497	-27.503	74.000
Average					
Detector:					
--					
Vertical					
Peak Detector:					
4824.000	0.836	56.590	57.427	-16.573	74.000
7236.000	7.676	44.240	51.916	-22.084	74.000
9648.000	8.556	38.340	46.897	-27.103	74.000
Average					
Detector:					
4824.000	0.836	37.470	38.307	-15.693	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 : MOXA IEEE802.11 a/b/g mini PCI module
Test Item : Harmonic 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
Horizontal					
Peak Detector:					
4874.000	0.076	50.850	50.927	-23.073	74.000
7311.000	7.512	36.310	43.822	-30.178	74.000
9748.000	7.630	36.280	43.910	-30.090	74.000
Average Detector:					
--					
Vertical					
Peak Detector:					
4874.000	0.532	55.840	56.372	-17.628	74.000
7311.000	8.089	38.340	46.429	-27.571	74.000
9748.000	8.266	35.860	44.127	-29.873	74.000
Average Detector:					
4874.000	0.532	38.180	38.712	-15.288	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 : MOXA IEEE802.11 a/b/g mini PCI module
Test Item : Harmonic Radiated Emission Data
Test Site : No.3 OATS
Test Mode : Mode 2: Transmit (802.11g 6Mbps) (2462 MHz)

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal					
Peak Detector:					
4924.000	0.191	51.220	51.411	-22.589	74.000
7386.000	8.373	35.960	44.334	-29.666	74.000
9848.000	7.964	37.050	45.014	-28.986	74.000
Average					
Detector:					
--					
Vertical					
Peak Detector:					
4924.000	0.805	61.970	62.775	-11.225	74.000
7386.000	9.180	37.280	46.460	-27.540	74.000
9848.000	8.801	37.370	46.171	-27.829	74.000
Average					
Detector:					
4924.000	0.805	44.540	45.345	-8.655	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 : MOXA IEEE802.11 a/b/g mini PCI module
Test Item : Harmonic Radiated Emission Data
Test Site : No.3 OATS
Test Mode : Mode 3: Transmit (802.11a 6Mbps) (5745MHz)

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal Peak Detector:					
11490.000	17.106	50.370	67.477	-6.523	74.000
Average Detector:					
11490.000	17.106	34.730	51.837	-2.163	54.000
Vertical Peak Detector:					
11490.000	18.034	50.360	68.395	-5.605	74.000
Average Detector:					
11490.000	18.034	34.610	52.645	-1.355	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 : MOXA IEEE802.11 a/b/g mini PCI module
Test Item : Harmonic Radiated Emission Data
Test Site : No.3 OATS
Test Mode : Mode 3: Transmit (802.11a 6Mbps) (5785MHz)

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal Peak Detector:					
11570.000	16.809	50.570	67.379	-6.621	74.000
Average Detector:					
11570.000	16.809	34.700	51.509	-2.491	54.000
Vertical Peak Detector:					
11570.000	17.698	51.360	69.058	-4.942	74.000
Average Detector:					
11570.000	17.698	35.290	52.988	-1.012	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 : MOXA IEEE802.11 a/b/g mini PCI module
Test Item : Harmonic Radiated Emission Data
Test Site : No.3 OATS
Test Mode : Mode 3: Transmit (802.11a 6Mbps) (5825MHz)

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal					
Peak Detector:					
11650.000	16.158	48.330	64.488	-9.512	74.000
Average					
Detector:					
11650.000	16.158	31.360	47.518	-6.482	54.000
Vertical					
Peak Detector:					
11650.000	17.274	50.970	68.245	-5.755	74.000
Average					
Detector:					
11650.000	17.274	34.510	51.785	-2.215	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 : MOXA IEEE802.11 a/b/g mini PCI module
Test Item : Harmonic Radiated Emission Data
Test Site : No.3 OATS
Test Mode : Mode 4: Transmit Turbo Mode (2.4G Band) (2437 MHz)

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal					
Peak Detector:					
4884.000	0.013	48.640	48.652	-25.348	74.000
7311.000	7.512	38.887	46.399	-27.601	74.000
9748.000	7.630	38.700	46.330	-27.670	74.000
Average					
Detector:					
--					
Vertical					
Peak Detector:					
4874.000	0.532	56.970	57.502	-16.498	74.000
7311.000	8.089	39.250	47.339	-26.661	74.000
9748.000	8.266	38.110	46.377	-27.623	74.000
Average					
Detector:					
4874.000	0.532	42.010	42.542	-11.458	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 : MOXA IEEE802.11 a/b/g mini PCI module
Test Item : Harmonic Radiated Emission Data
Test Site : No.3 OATS
Test Mode : Mode 5: Transmit Turbo Mode (5G Band) (5760MHz)

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal Peak Detector:					
11520.000	12.440	49.920	62.361	-11.639	74.000
Average Detector:					
11520.000	12.440	36.690	49.131	-4.869	54.000
Vertical Peak Detector:					
5164.000	1.398	54.640	56.038	-17.962	74.000
6343.000	3.425	48.480	51.905	-22.095	74.000
11520.000	13.912	52.690	66.602	-7.398	74.000
Average Detector:					
5164.000	1.398	42.620	43.798	-10.202	54.000
11520.000	13.912	38.810	52.722	-1.278	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 : MOXA IEEE802.11 a/b/g mini PCI module
Test Item : Harmonic Radiated Emission Data
Test Site : No.3 OATS
Test Mode : Mode 5: Transmit Turbo Mode (5G Band) (5800MHz)

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal Peak Detector:					
11600.000	13.042	50.750	63.792	-10.208	74.000
Average Detector:					
11600.000	13.042	36.160	49.202	-4.798	54.000
Vertical Peak Detector:					
11600.000	14.366	53.130	67.495	-6.505	74.000
Average Detector:					
11600.000	14.366	38.430	52.795	-1.205	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 : MOXA IEEE802.11 a/b/g mini PCI module
Test Item : General Radiated Emission Data
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit (802.11b 1Mbps) (2437 MHz)

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal					
165.800	-11.079	53.747	42.668	-0.832	43.500
365.620	-1.329	40.849	39.520	-6.480	46.000
664.380	2.062	38.631	40.693	-5.307	46.000
697.360	3.171	37.076	40.247	-5.753	46.000
854.500	6.626	30.092	36.718	-9.282	46.000
961.200	6.450	29.089	35.539	-18.461	54.000
Vertical					
165.800	-7.719	50.416	42.697	-0.803	43.500
365.620	-2.179	42.584	40.405	-5.595	46.000
563.500	-5.335	47.172	41.837	-4.163	46.000
600.360	-2.833	44.024	41.191	-4.809	46.000
784.660	3.012	35.068	38.080	-7.920	46.000
967.020	8.071	29.161	37.232	-16.768	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 9kHz~30MHz are very lower than the limit and not show in test report.

Product : MOXA IEEE802.11 a/b/g mini PCI 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
Horizontal					
165.800	-11.079	53.740	42.661	-0.839	43.500
365.620	-1.329	40.878	39.549	-6.451	46.000
664.380	2.062	39.747	41.809	-4.191	46.000
699.300	2.875	38.408	41.283	-4.717	46.000
763.320	4.301	33.889	38.191	-7.809	46.000
930.160	7.187	30.887	38.074	-7.926	46.000
Vertical					
165.800	-7.719	50.393	42.674	-0.826	43.500
365.620	-2.179	42.631	40.452	-5.548	46.000
563.500	-5.335	46.698	41.363	-4.637	46.000
600.360	-2.833	43.580	40.747	-5.253	46.000
800.180	2.801	31.556	34.357	-11.643	46.000
961.200	7.260	30.858	38.118	-15.882	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 9kHz~30MHz are very lower than the limit and not show in test report.

Product : MOXA IEEE802.11 a/b/g mini PCI module
Test Item : General Radiated Emission Data
Test Site : No.3 OATS
Test Mode : Mode 3: Transmit (802.11a 6Mbps) (5785MHz)

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal					
165.800	-11.079	53.734	42.655	-0.845	43.500
365.620	-1.329	40.902	39.573	-6.427	46.000
466.500	0.794	37.295	38.088	-7.912	46.000
664.380	2.062	39.161	41.223	-4.777	46.000
699.300	2.875	38.635	41.510	-4.490	46.000
800.180	5.141	33.581	38.722	-7.278	46.000
Vertical					
165.800	-7.719	50.328	42.609	-0.891	43.500
365.620	-2.179	43.247	41.068	-4.932	46.000
563.500	-5.335	46.810	41.475	-4.525	46.000
600.360	-2.833	43.707	40.874	-5.126	46.000
840.920	2.961	30.085	33.046	-12.954	46.000
967.020	8.071	30.142	38.213	-15.787	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 9kHz~30MHz are very lower than the limit and not show in test report.

Product : MOXA IEEE802.11 a/b/g mini PCI module
Test Item : General Radiated Emission Data
Test Site : No.3 OATS
Test Mode : Mode 4: Transmit Turbo Mode (2.4G Band) (2437 MHz)

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal					
165.800	-11.079	53.734	42.655	-0.845	43.500
365.620	-1.329	39.925	38.596	-7.404	46.000
466.500	0.794	36.631	37.424	-8.576	46.000
763.320	4.301	31.664	35.966	-10.034	46.000
829.280	6.344	28.710	35.054	-10.946	46.000
961.200	6.450	25.675	32.125	-21.875	54.000
Vertical					
165.800	-7.719	50.203	42.484	-1.016	43.500
365.620	-2.179	42.193	40.014	-5.986	46.000
596.480	-3.113	43.447	40.334	-5.666	46.000
749.740	2.510	31.381	33.891	-12.109	46.000
840.920	2.961	30.621	33.582	-12.418	46.000
961.200	7.260	30.121	37.381	-16.619	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 9kHz~30MHz are very lower than the limit and not show in test report.

Product : MOXA IEEE802.11 a/b/g mini PCI module
Test Item : General Radiated Emission Data
Test Site : No.3 OATS
Test Mode : Mode 5: Transmit Turbo Mode (5G Band) (5760MHz)

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal					
165.800	-11.079	53.764	42.685	-0.815	43.500
365.620	-1.329	41.573	40.244	-5.756	46.000
466.500	0.794	40.345	41.138	-4.862	46.000
697.360	3.171	38.170	41.341	-4.659	46.000
800.180	5.141	33.224	38.365	-7.635	46.000
864.200	5.671	33.418	39.089	-6.911	46.000
Vertical					
165.800	-7.719	50.230	42.511	-0.989	43.500
332.640	-4.914	44.711	39.797	-6.203	46.000
365.620	-2.179	42.645	40.466	-5.534	46.000
697.360	1.311	34.208	35.519	-10.481	46.000
840.920	2.961	30.097	33.058	-12.942	46.000
967.020	8.071	29.889	37.960	-16.040	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 9kHz~30MHz are very lower than the limit and not show in test report.

Product : MOXA IEEE802.11 a/b/g mini PCI module
Test Item : General Radiated Emission Data
Test Site : No.3 OATS
Test Mode : Mode 5: Transmit Turbo Mode (5G Band) (5800MHz)

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal					
165.800	-11.079	53.785	42.706	-0.794	43.500
365.620	-1.329	40.688	39.359	-6.641	46.000
466.500	0.794	39.521	40.314	-5.686	46.000
767.200	4.235	34.058	38.293	-7.707	46.000
868.080	5.401	32.919	38.320	-7.680	46.000
930.160	7.187	30.406	37.593	-8.407	46.000
Vertical					
165.800	-7.719	50.207	42.488	-1.012	43.500
342.340	-3.542	46.271	42.729	-3.271	46.000
365.620	-2.179	42.733	40.554	-5.446	46.000
763.320	2.311	29.894	32.206	-13.794	46.000
840.920	2.961	30.920	33.881	-12.119	46.000
961.200	7.260	28.932	36.192	-17.808	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 9kHz~30MHz are very lower than the limit and not show in test report.

5. RF antenna conducted test

5.1. Test Equipment

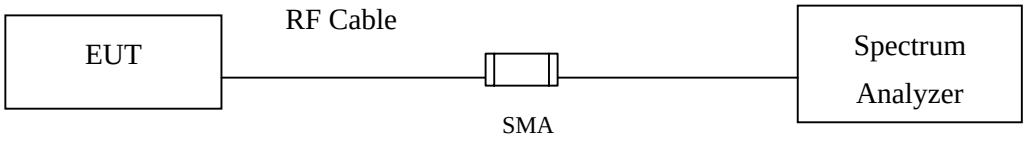
	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
	Spectrum Analyzer	R&S	FSP40 / 100170	Jun, 2012
	Spectrum Analyzer	Agilent	E4407B / US39440758	Jun, 2012
X	Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2012

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.

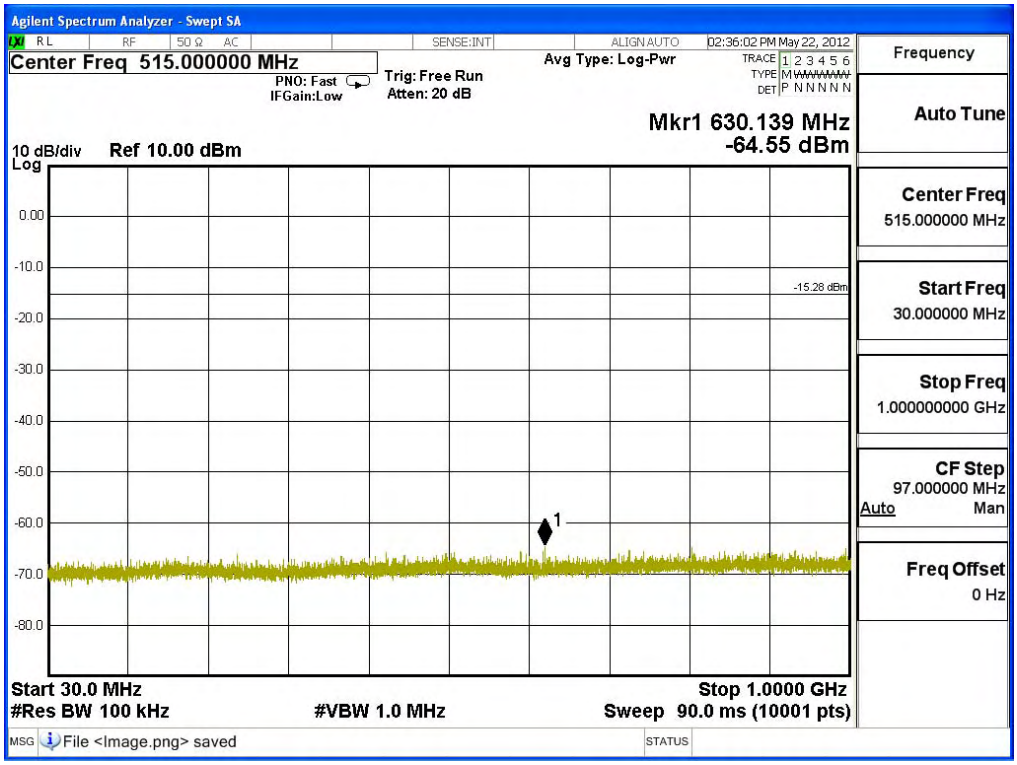
5.5. Uncertainty

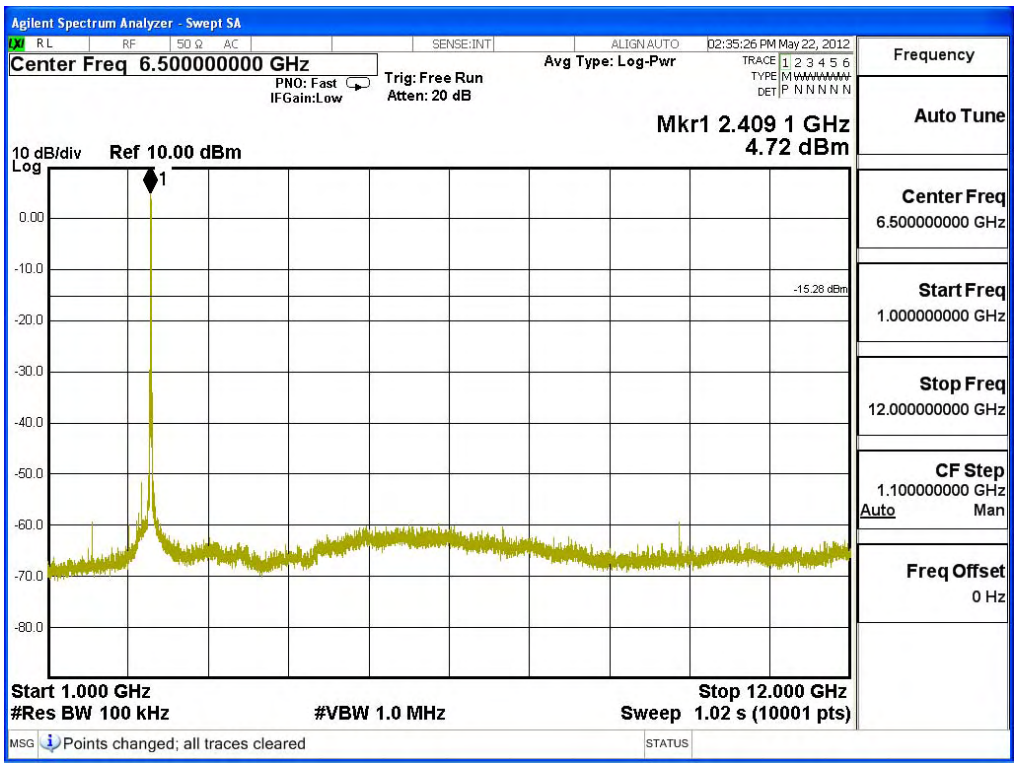
The measurement uncertainty
Conducted is defined as ± 1.27dB

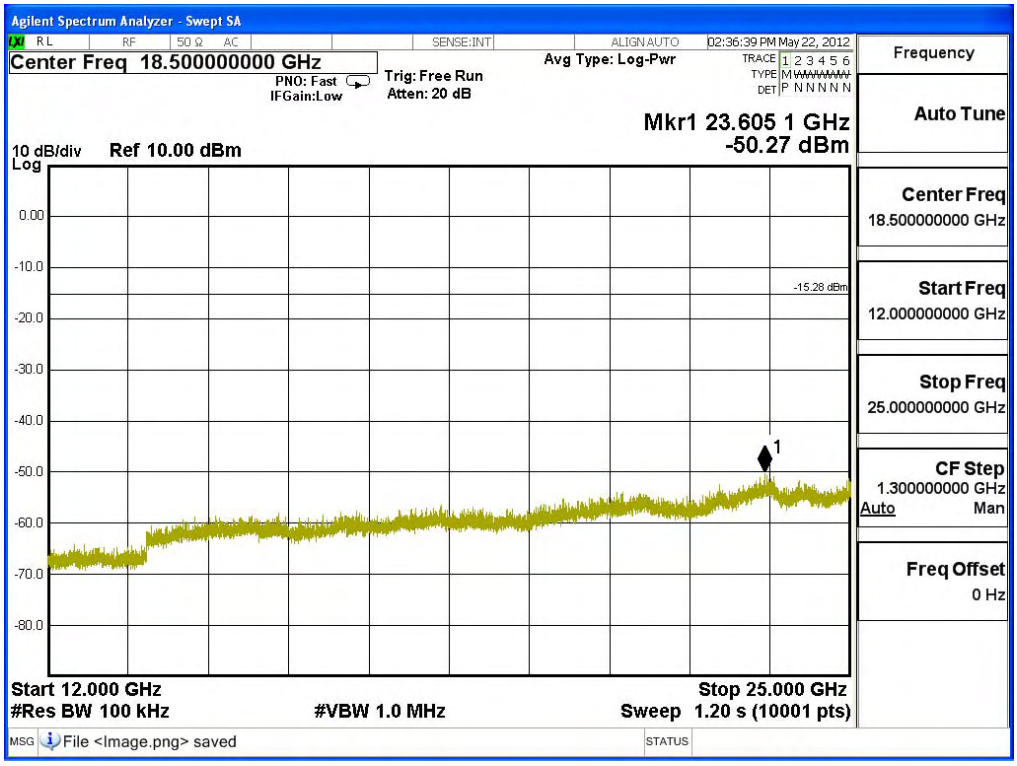
5.6. Test Result of RF antenna conducted test

Product : MOXA IEEE802.11 a/b/g mini PCI module
Test Item : RF antenna conducted test
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit (802.11b 1Mbps)

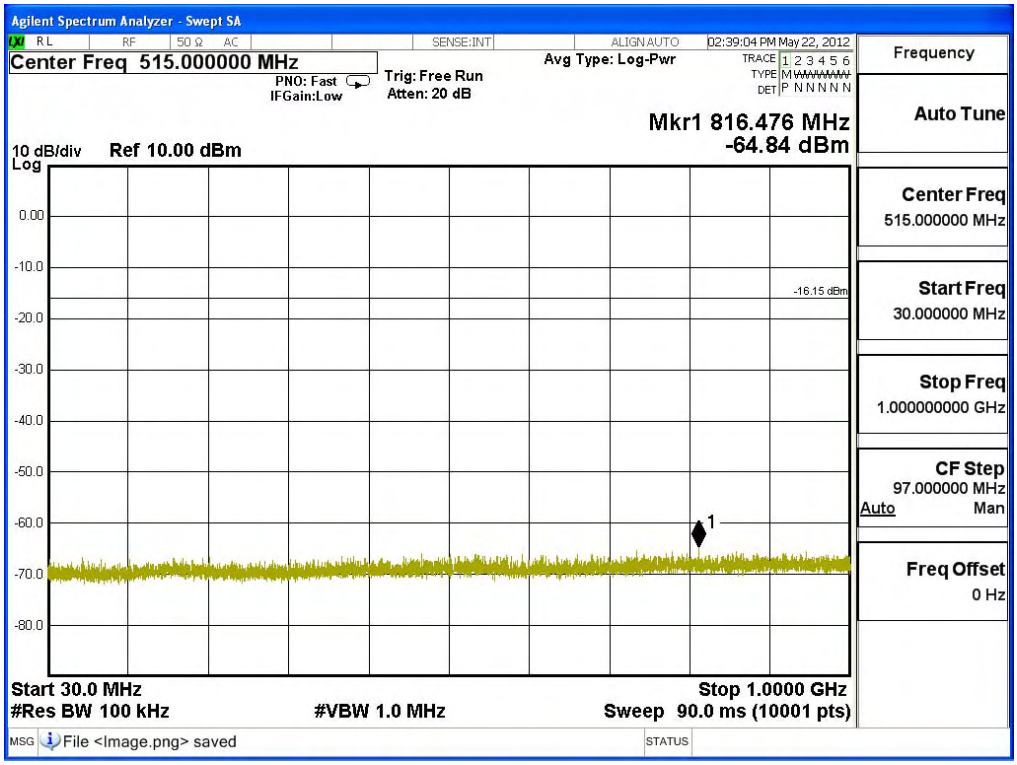
Channel 01 (2412MHz) 30MHz-25GHz

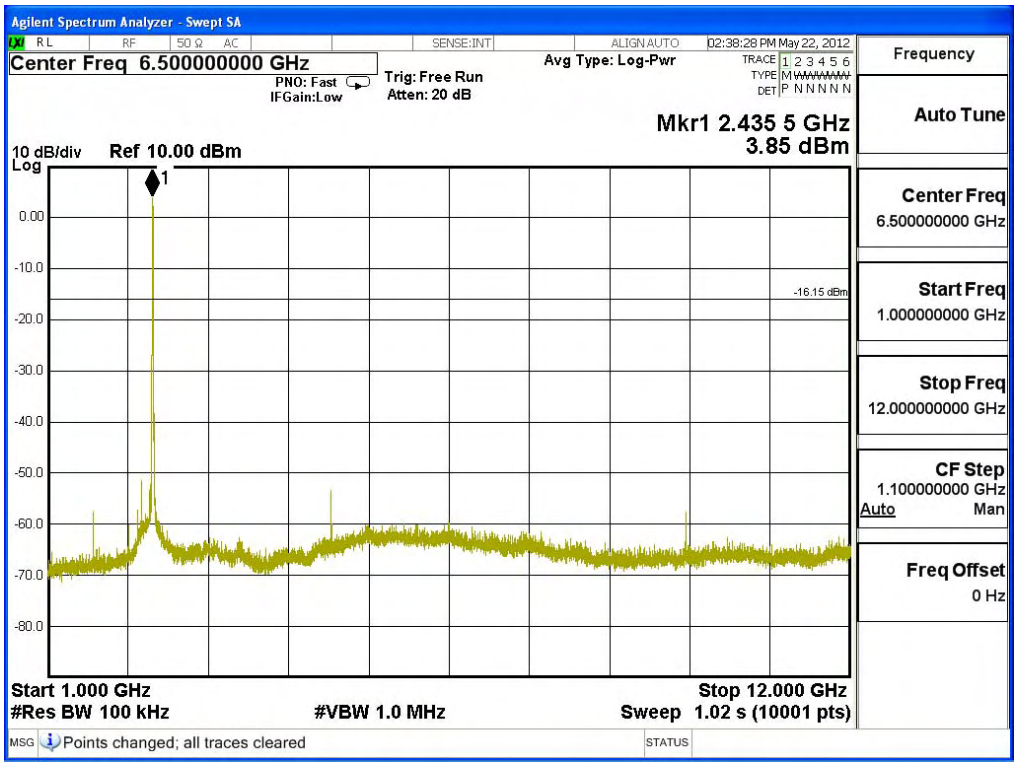


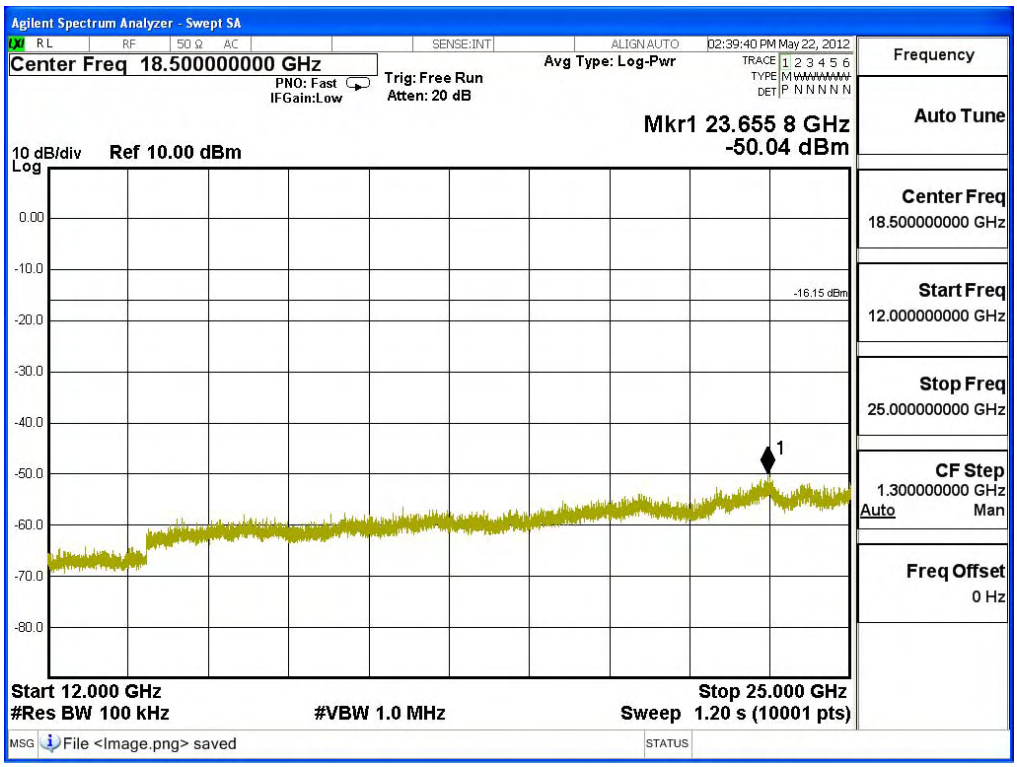

Agilent Spectrum Analyzer - Swept SA
Center Freq 6.500000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
02:35:26 PM May 22, 2012
Mkr1 2.409 1 GHz
4.72 dBm
10 dB/div
Log
Ref 10.00 dBm
-15.28 dBm
Start 1.000 GHz
#Res BW 100 kHz
#VBW 1.0 MHz
Stop 12.000 GHz
Sweep 1.02 s (10001 pts)
Points changed; all traces cleared
Frequency
Auto Tune
Center Freq
6.500000000 GHz
Start Freq
1.000000000 GHz
Stop Freq
12.000000000 GHz
CF Step
1.100000000 GHz
Auto
Man
Freq Offset
0 Hz


Agilent Spectrum Analyzer - Swept SA
Center Freq 18.500000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
02:36:39 PM May 22, 2012
Mkr1 23.605 1 GHz
-50.27 dBm
10 dB/div
Log
Ref 10.00 dBm
-15.28 dBm
Start 12.000 GHz
#Res BW 100 kHz
#VBW 1.0 MHz
Stop 25.000 GHz
Sweep 1.20 s (10001 pts)
File <Image.png> saved
Frequency
Auto Tune
Center Freq
18.500000000 GHz
Start Freq
12.000000000 GHz
Stop Freq
25.000000000 GHz
CF Step
1.300000000 GHz
Auto
Man
Freq Offset
0 Hz

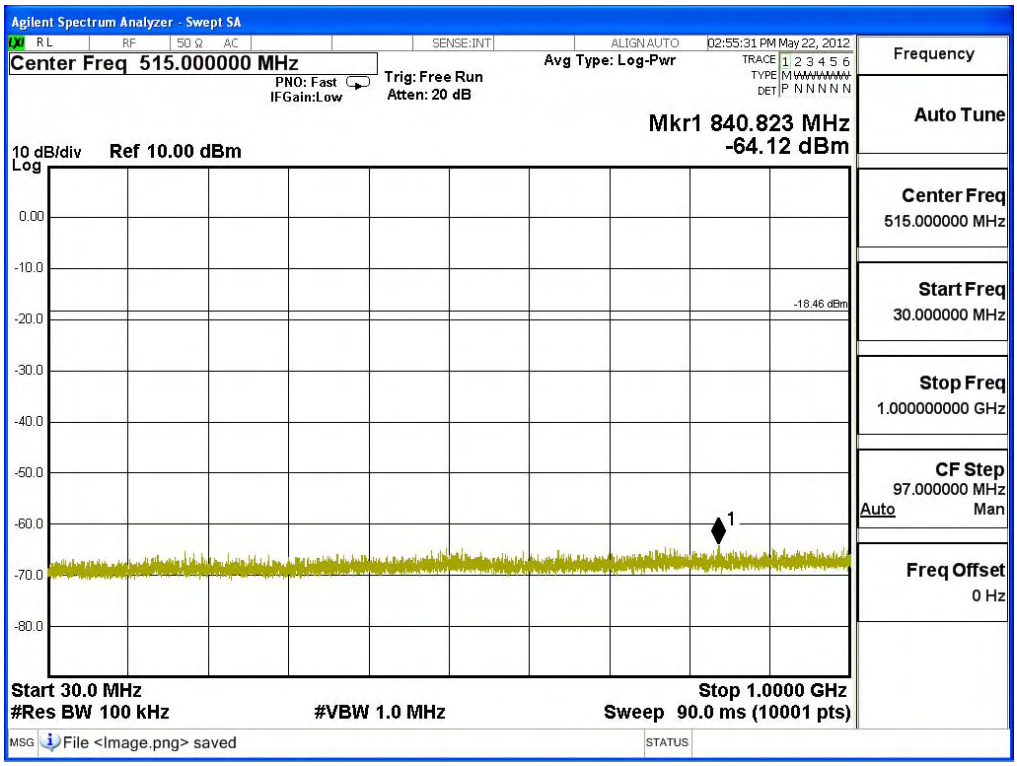
Channel 06 (2437MHz) 30MHz -25GHz

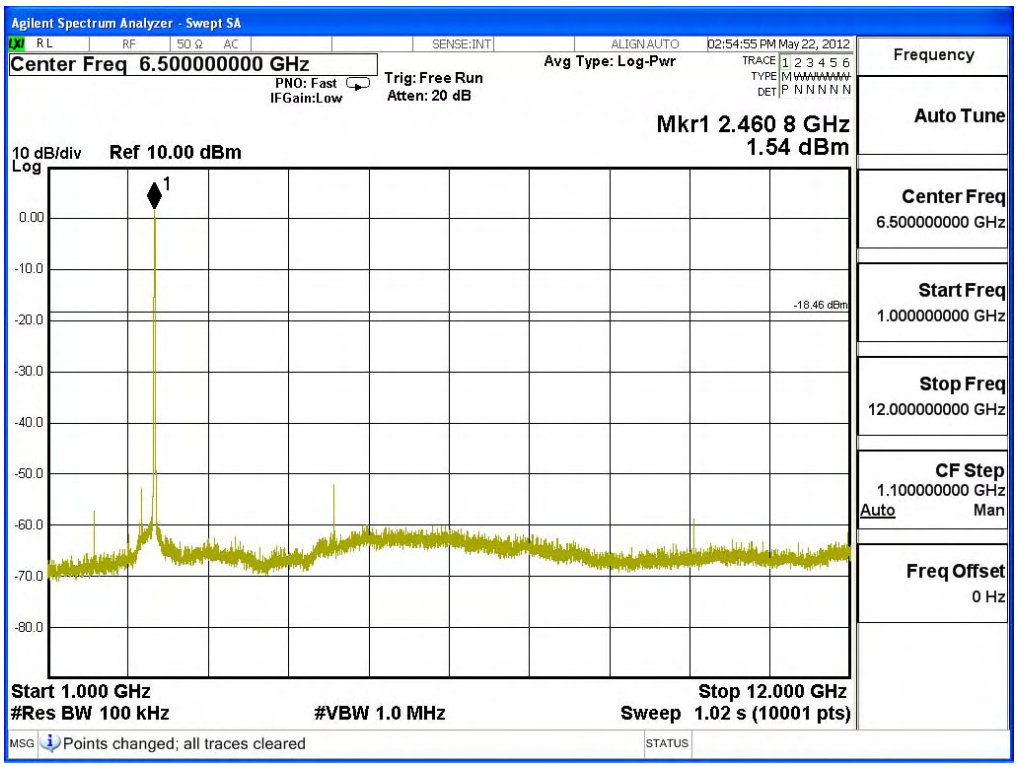


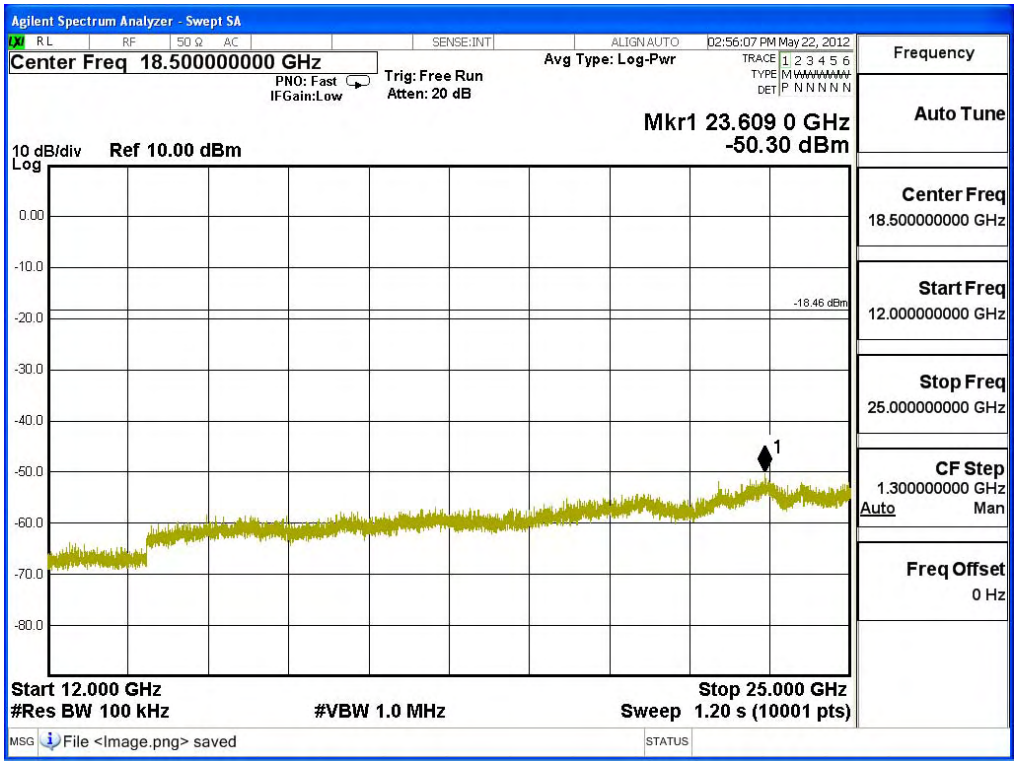




Channel 11 (2462MHz) 30MHz -25GHz

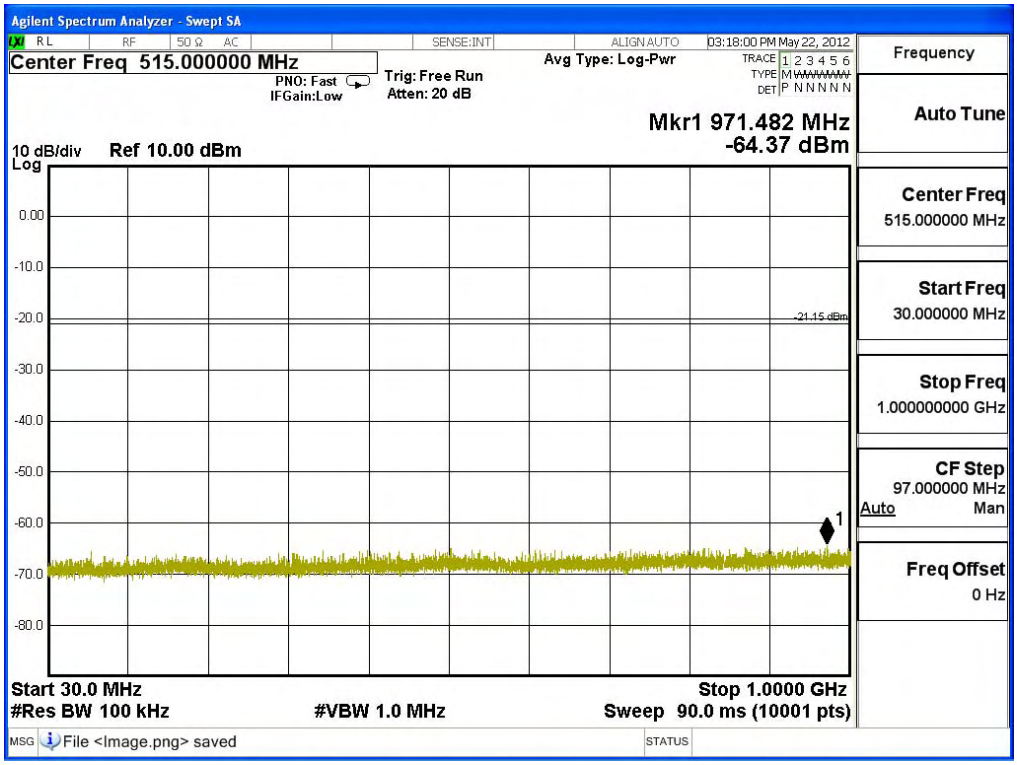


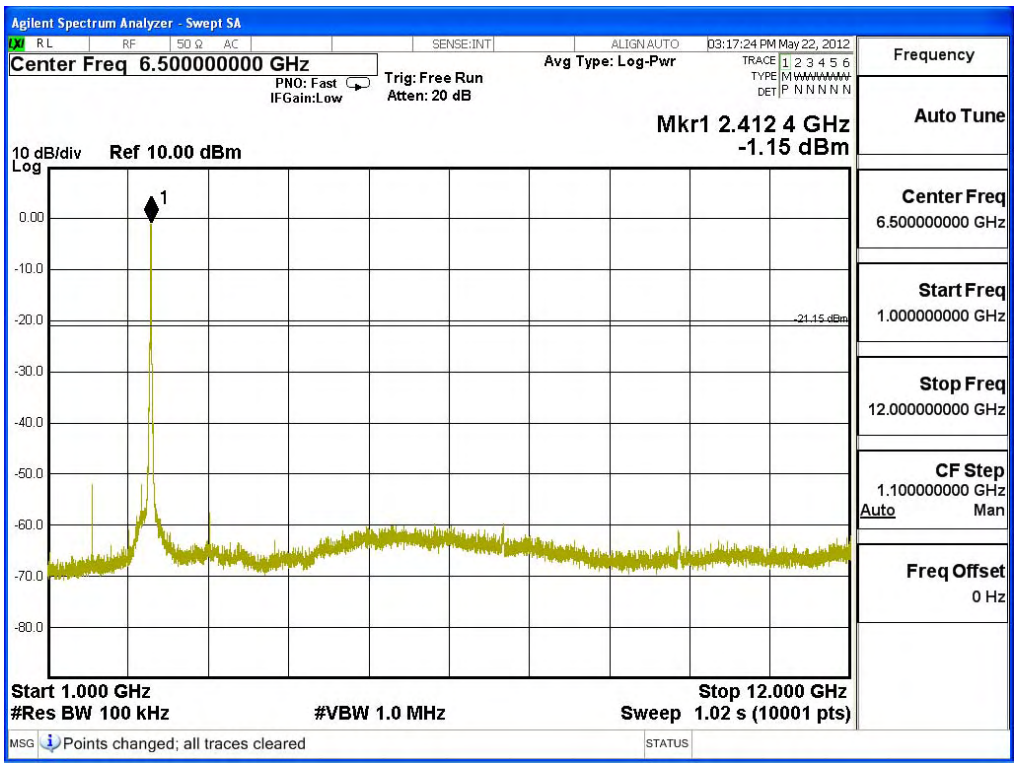

Agilent Spectrum Analyzer - Swept SA
Center Freq 6.500000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
02:54:55 PM May 22, 2012
Mkr1 2.460 8 GHz
1.54 dBm
10 dB/div
Log
Ref 10.00 dBm
-18.46 dBm
Start 1.000 GHz
#Res BW 100 kHz
#VBW 1.0 MHz
Stop 12.000 GHz
Sweep 1.02 s (10001 pts)
Points changed; all traces cleared
Frequency
Auto Tune
Center Freq
6.500000000 GHz
Start Freq
1.000000000 GHz
Stop Freq
12.000000000 GHz
CF Step
1.100000000 GHz
Auto
Man
Freq Offset
0 Hz

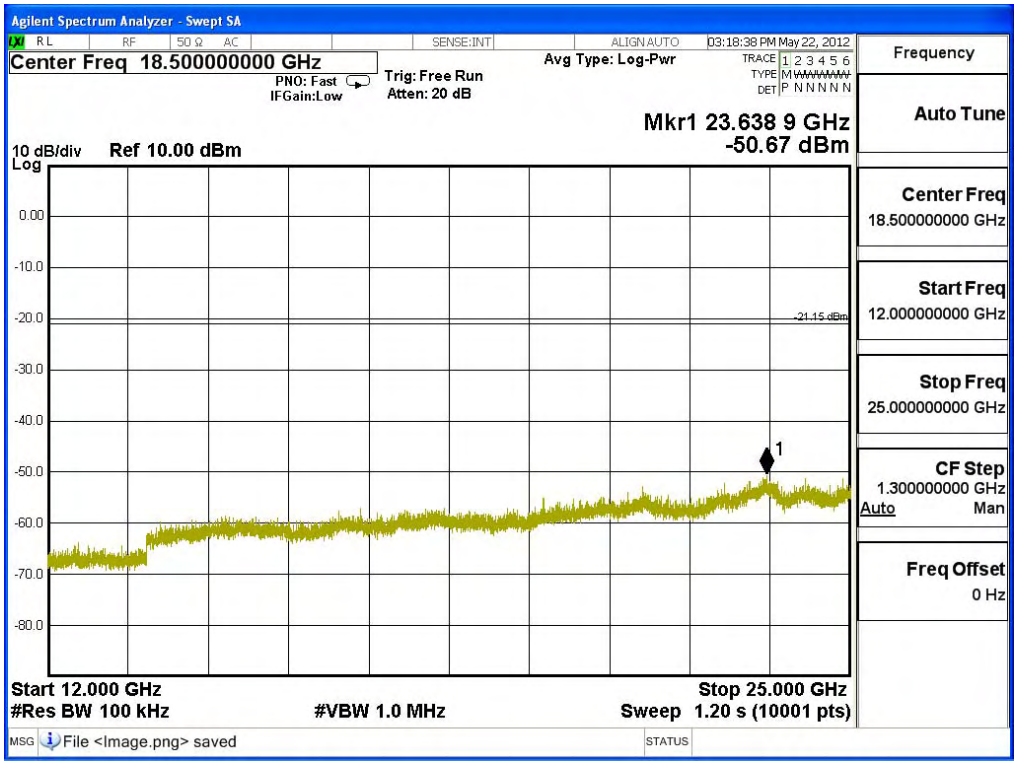

Agilent Spectrum Analyzer - Swept SA
Center Freq 18.500000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
02:56:07 PM May 22, 2012
Mkr1 23.609 0 GHz
-50.30 dBm
10 dB/div
Log
Ref 10.00 dBm
-18.46 dBm
Start 12.000 GHz
#Res BW 100 kHz
#VBW 1.0 MHz
Stop 25.000 GHz
Sweep 1.20 s (10001 pts)
File <Image.png> saved
Frequency
Auto Tune
Center Freq
18.500000000 GHz
Start Freq
12.000000000 GHz
Stop Freq
25.000000000 GHz
CF Step
1.300000000 GHz
Auto
Man
Freq Offset
0 Hz

Product : MOXA IEEE802.11 a/b/g mini PCI module
Test Item : RF Antenna Conducted Spurious
Test Site : No.3 OATS
Test Mode : Mode 2: Transmit (802.11g 6Mbps)

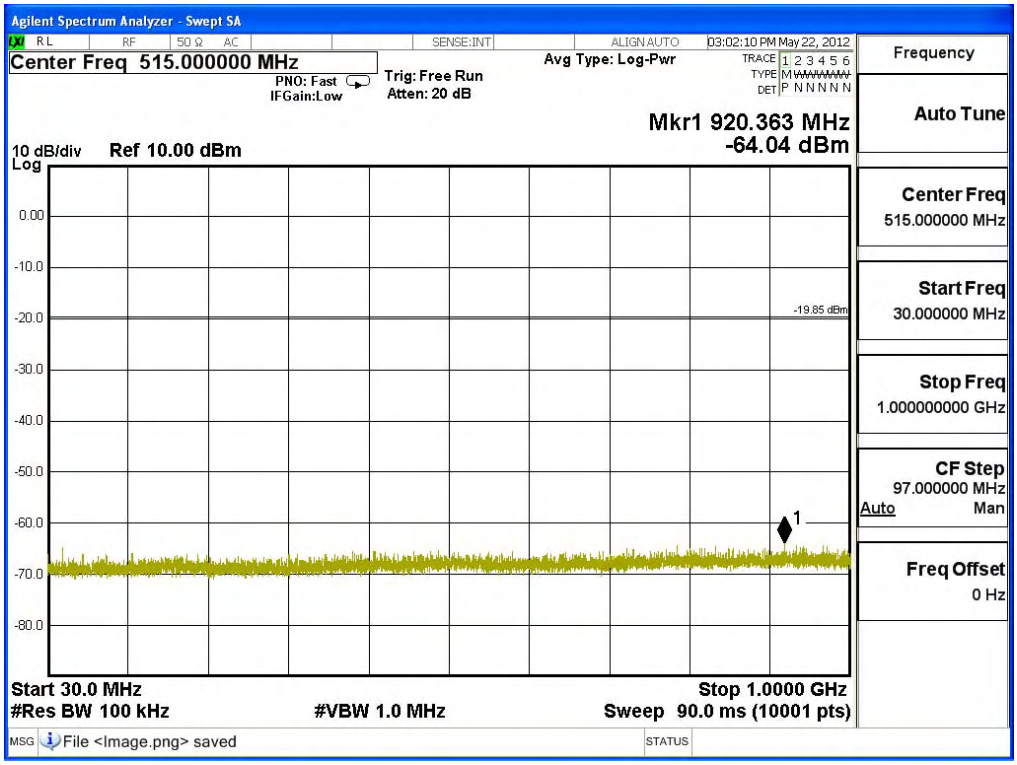
Channel 01 (2412MHz) 30MHz -25GHz

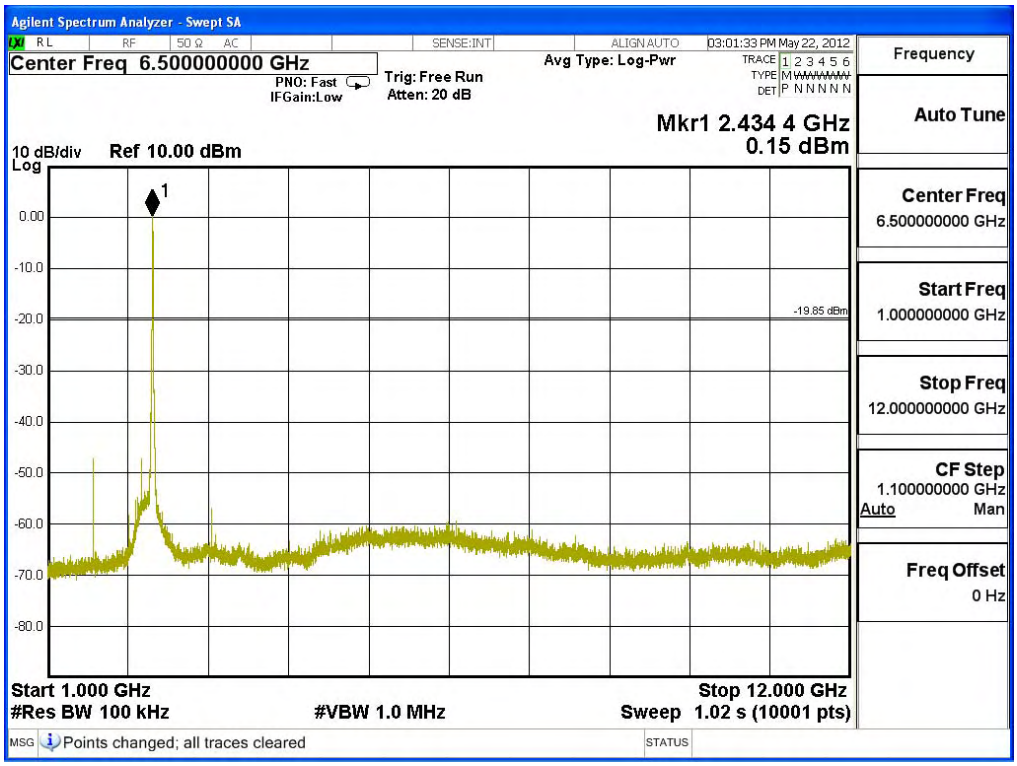


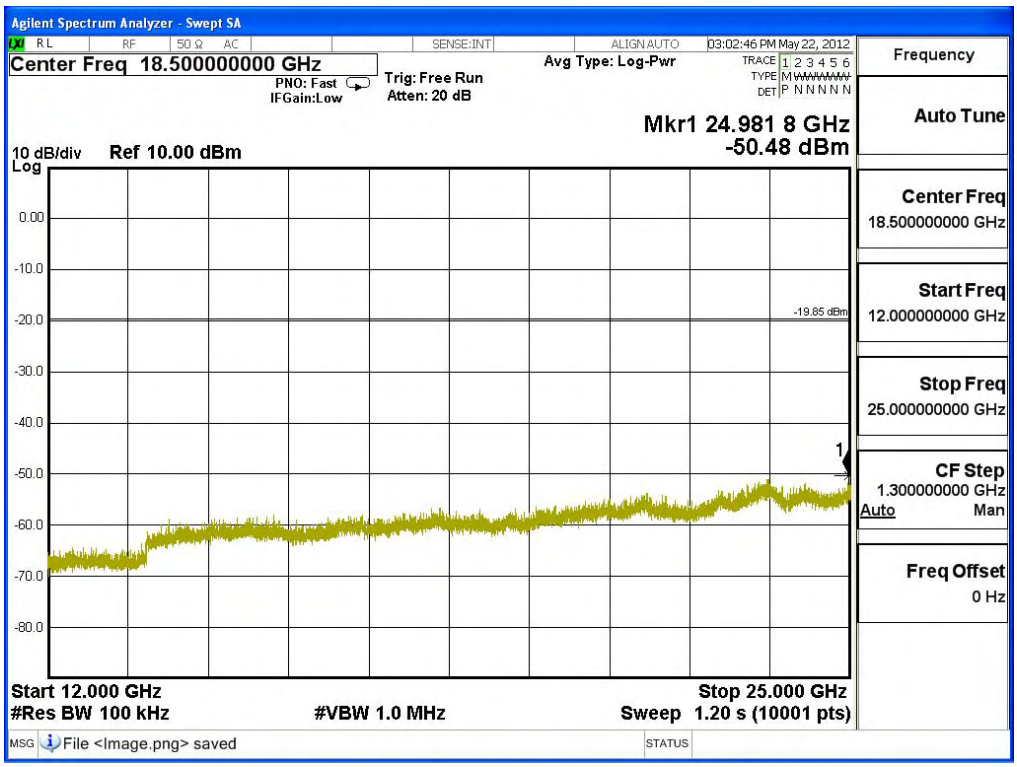

Agilent Spectrum Analyzer - Swept SA
Center Freq 6.500000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
03:17:24 PM May 22, 2012
Mkr1 2.412 4 GHz
-1.15 dBm
10 dB/div
Log
Ref 10.00 dBm
-21.15 dBm
Start 1.000 GHz
#Res BW 100 kHz
#VBW 1.0 MHz
Stop 12.000 GHz
Sweep 1.02 s (10001 pts)
Points changed; all traces cleared
Frequency
Auto Tune
Center Freq
6.500000000 GHz
Start Freq
1.000000000 GHz
Stop Freq
12.000000000 GHz
CF Step
1.100000000 GHz
Auto
Man
Freq Offset
0 Hz


Agilent Spectrum Analyzer - Swept SA
Center Freq 18.500000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
03:18:38 PM May 22, 2012
Mkr1 23.638 9 GHz
-50.67 dBm
10 dB/div
Log
Ref 10.00 dBm
-21.15 dBm
Start 12.000 GHz
#Res BW 100 kHz
#VBW 1.0 MHz
Stop 25.000 GHz
Sweep 1.20 s (10001 pts)
File <Image.png> saved
Frequency
Auto Tune
Center Freq
18.500000000 GHz
Start Freq
12.000000000 GHz
Stop Freq
25.000000000 GHz
CF Step
1.300000000 GHz
Auto
Man
Freq Offset
0 Hz

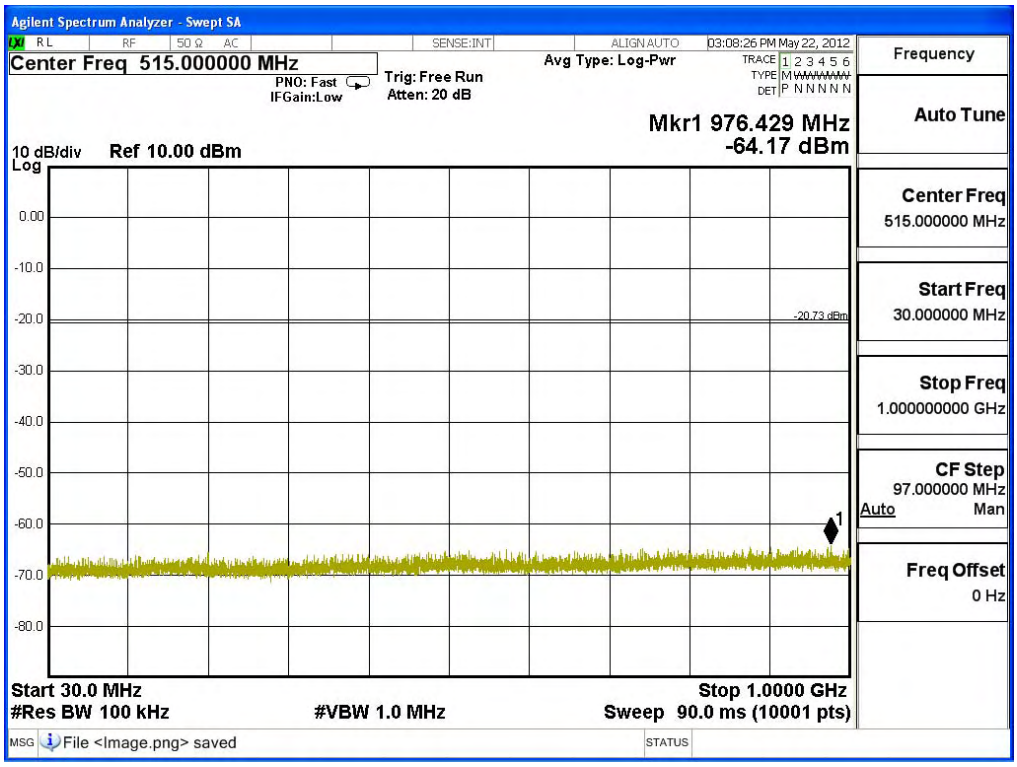
Channel 06 (2437MHz) 30MHz -25GHz

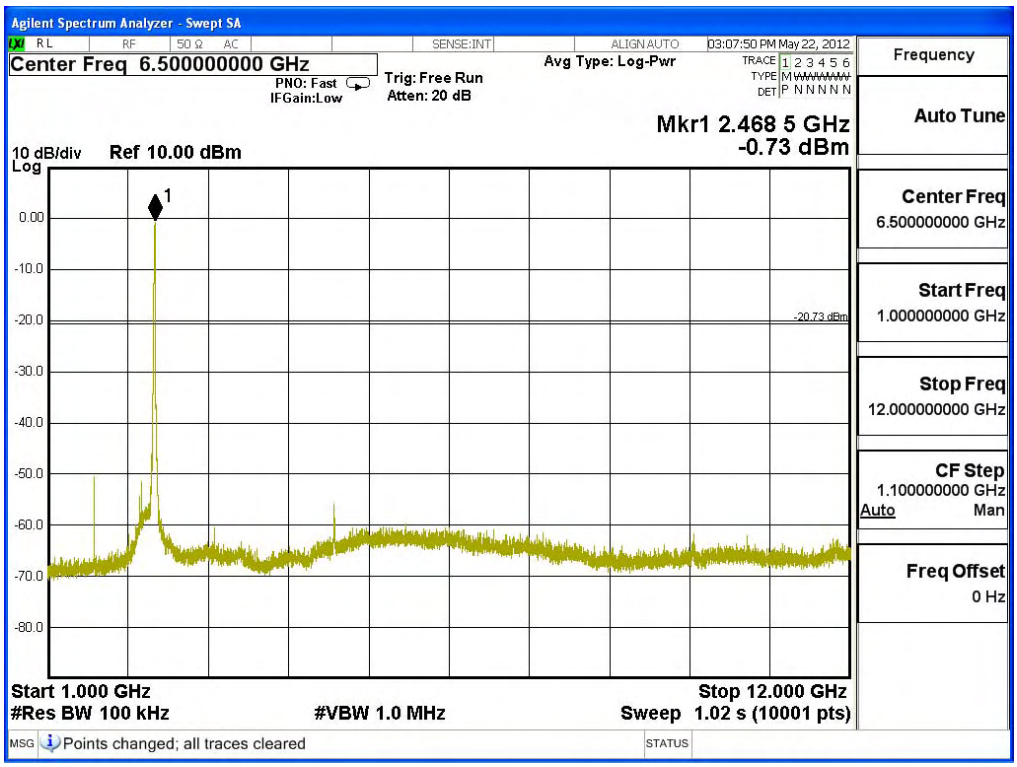


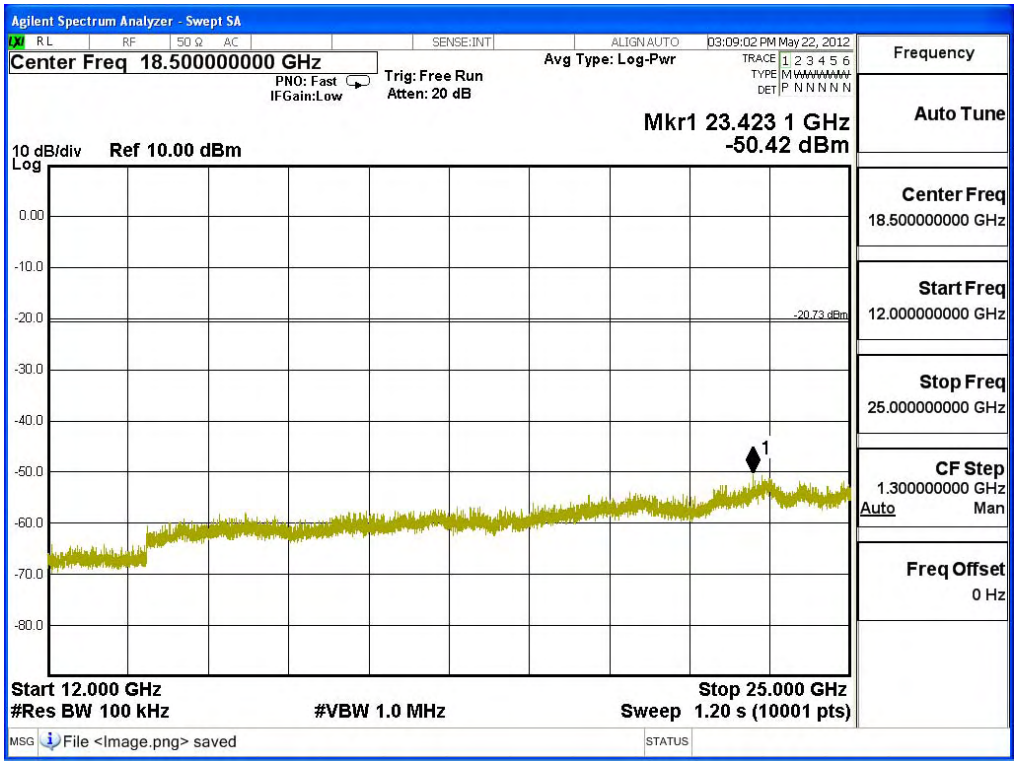




Channel 11 (2462MHz) 30MHz -25GHz




Agilent Spectrum Analyzer - Swept SA
Center Freq 6.500000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
03:07:50 PM May 22, 2012
Mkr1 2.468 5 GHz
-0.73 dBm
10 dB/div
Log
Ref 10.00 dBm
-20.73 dBm
Start 1.000 GHz
#Res BW 100 kHz
#VBW 1.0 MHz
Stop 12.000 GHz
Sweep 1.02 s (10001 pts)
Points changed; all traces cleared
Frequency
Auto Tune
Center Freq
6.500000000 GHz
Start Freq
1.000000000 GHz
Stop Freq
12.000000000 GHz
CF Step
1.100000000 GHz
Auto
Man
Freq Offset
0 Hz


Agilent Spectrum Analyzer - Swept SA
Center Freq 18.500000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
03:09:02 PM May 22, 2012
Mkr1 23.423 1 GHz
-50.42 dBm
10 dB/div
Log
Ref 10.00 dBm
-20.73 dBm
Start 12.000 GHz
#Res BW 100 kHz
#VBW 1.0 MHz
Stop 25.000 GHz
Sweep 1.20 s (10001 pts)
File <Image.png> saved
Frequency
Auto Tune
Center Freq
18.500000000 GHz
Start Freq
12.000000000 GHz
Stop Freq
25.000000000 GHz
CF Step
1.300000000 GHz
Auto
Man
Freq Offset
0 Hz

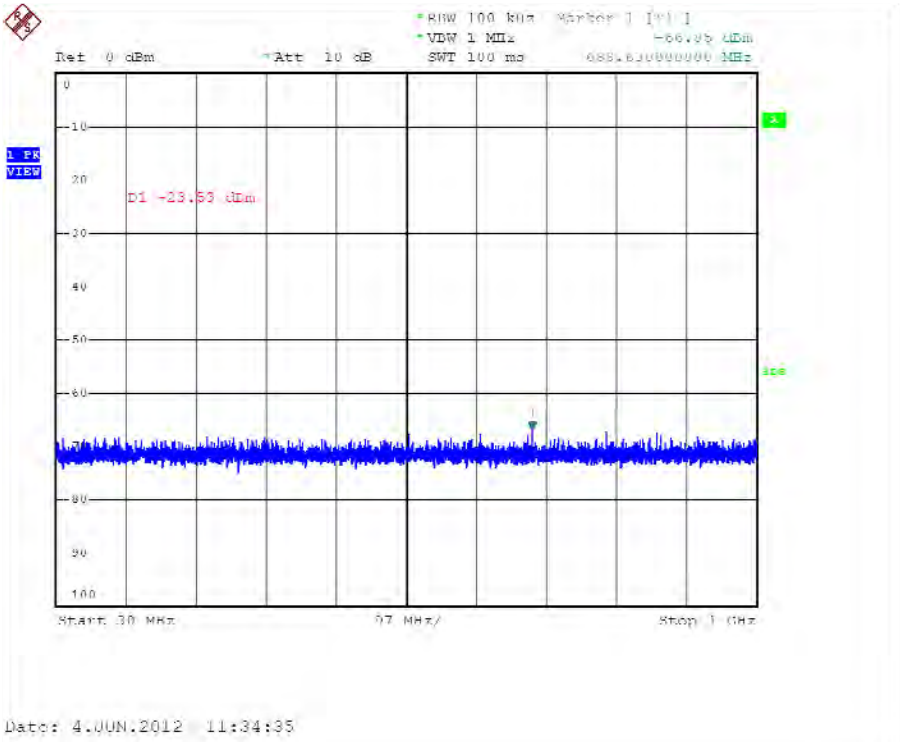
Product : MOXA IEEE802.11 a/b/g mini PCI module

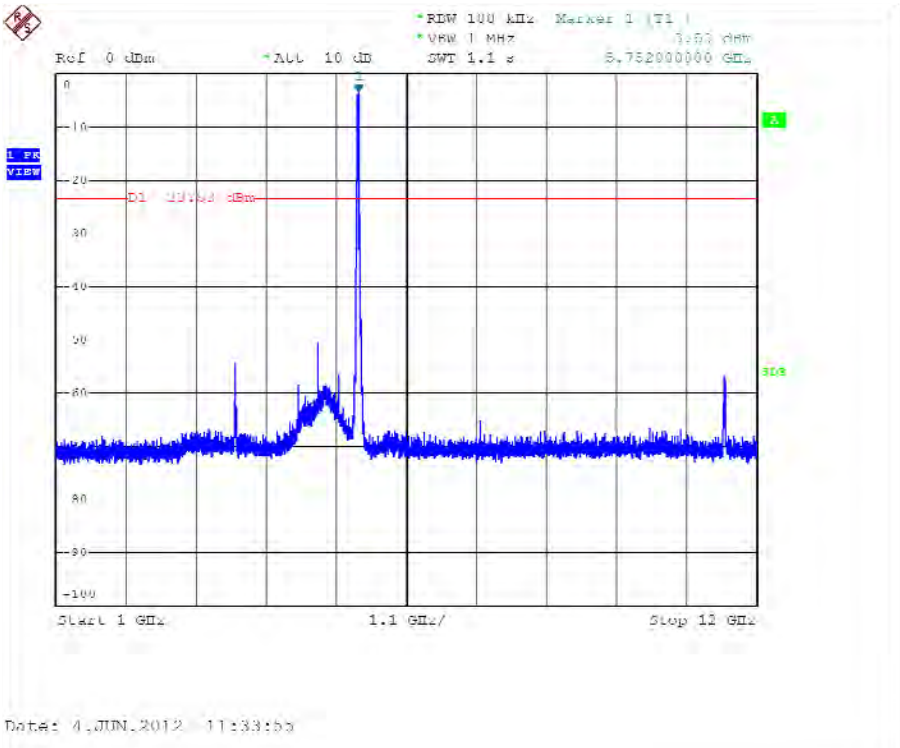
Test Item : RF Antenna Conducted Spurious

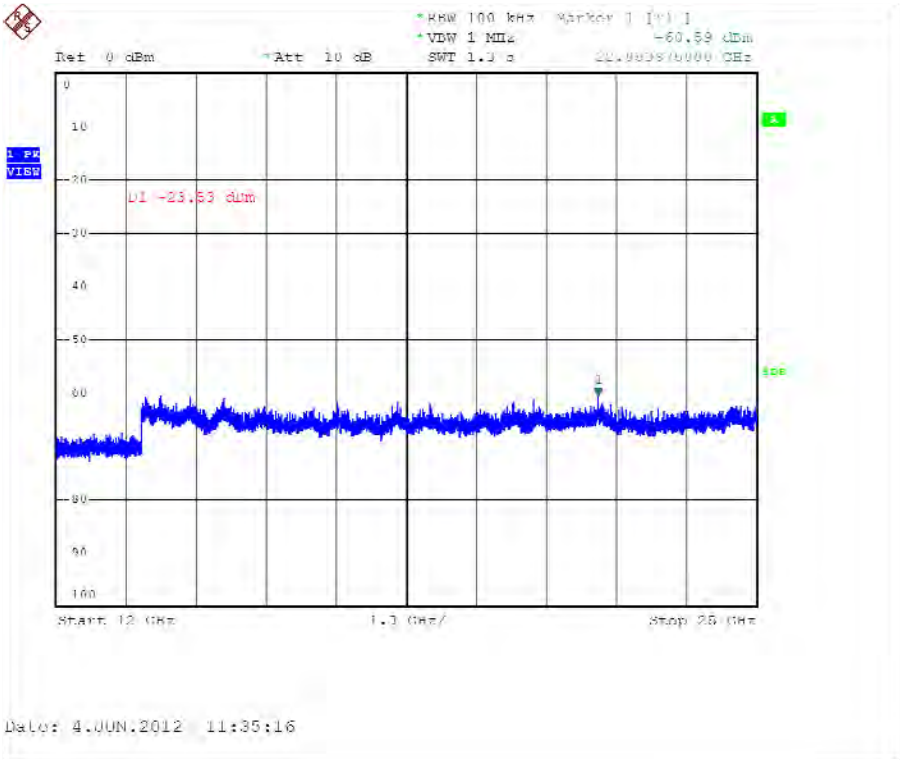
Test Site : No.3 OATS

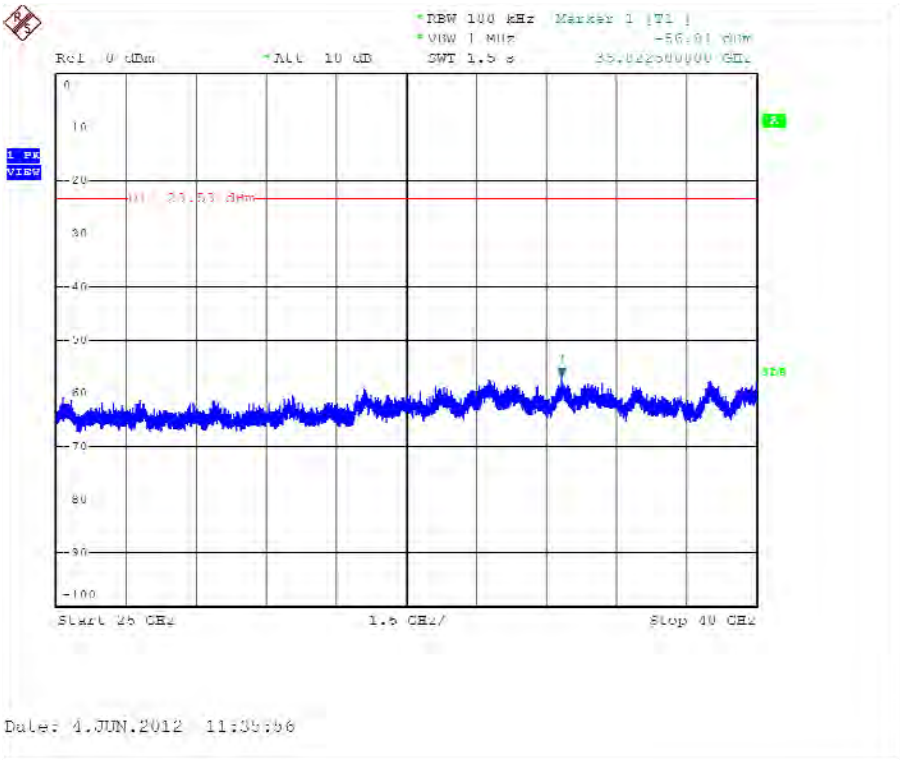
Test Mode : Mode 3: Transmit (802.11a 6Mbps)

Channel 149 (5745MHz) 30MHz -40GHz

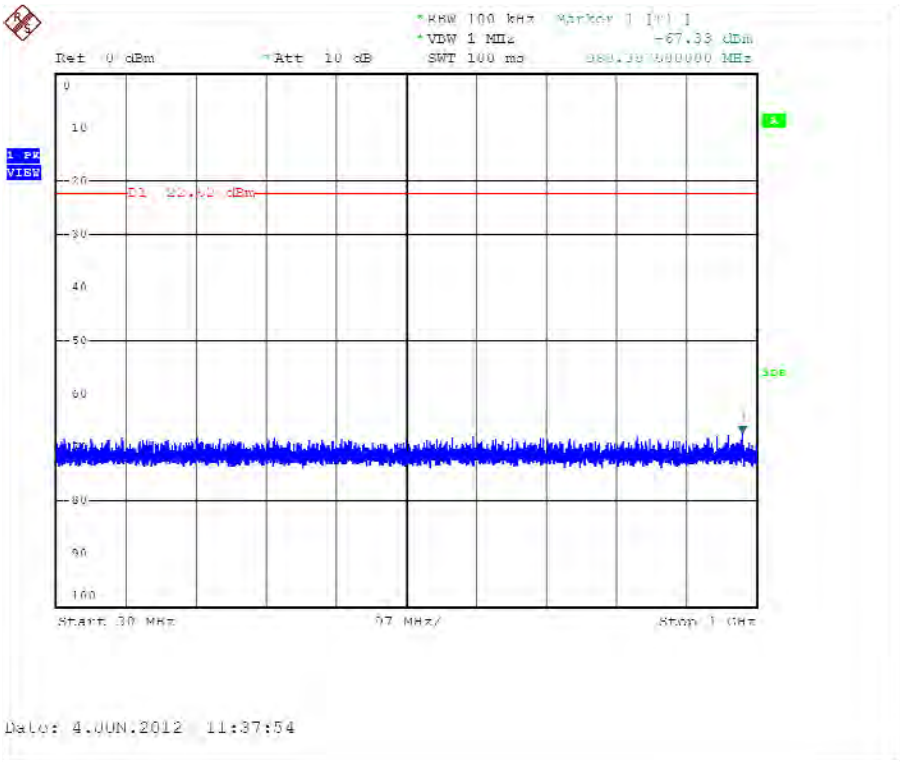


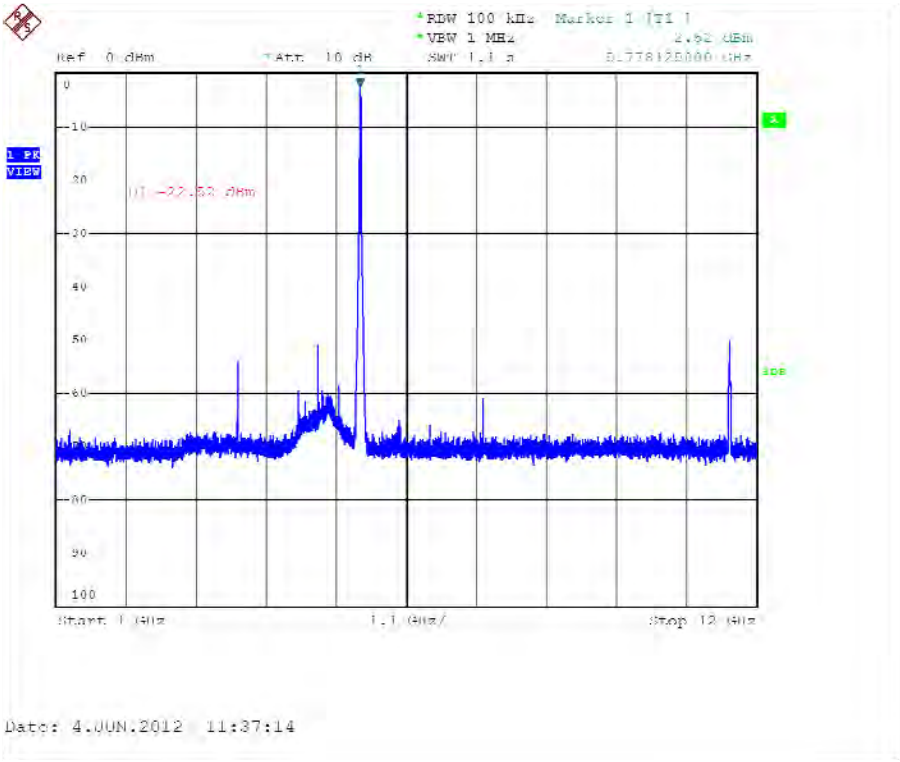


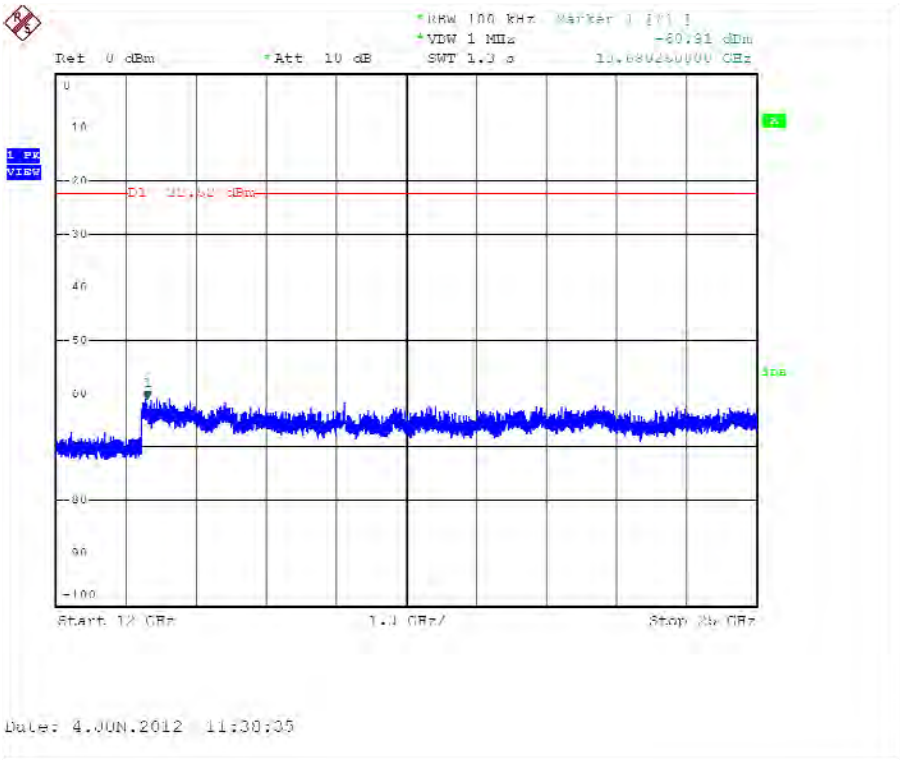

RBW 100 kHz
VBW 1 MHz
SWT 1.5 s
Ref 0 dBm
Att 10 dB
-60.59 dBm
D1 -23.53 dBm
Start 12 GHz
1.3 GHz/
Stop 25 GHz
Date: 4.JUN.2012 11:35:16

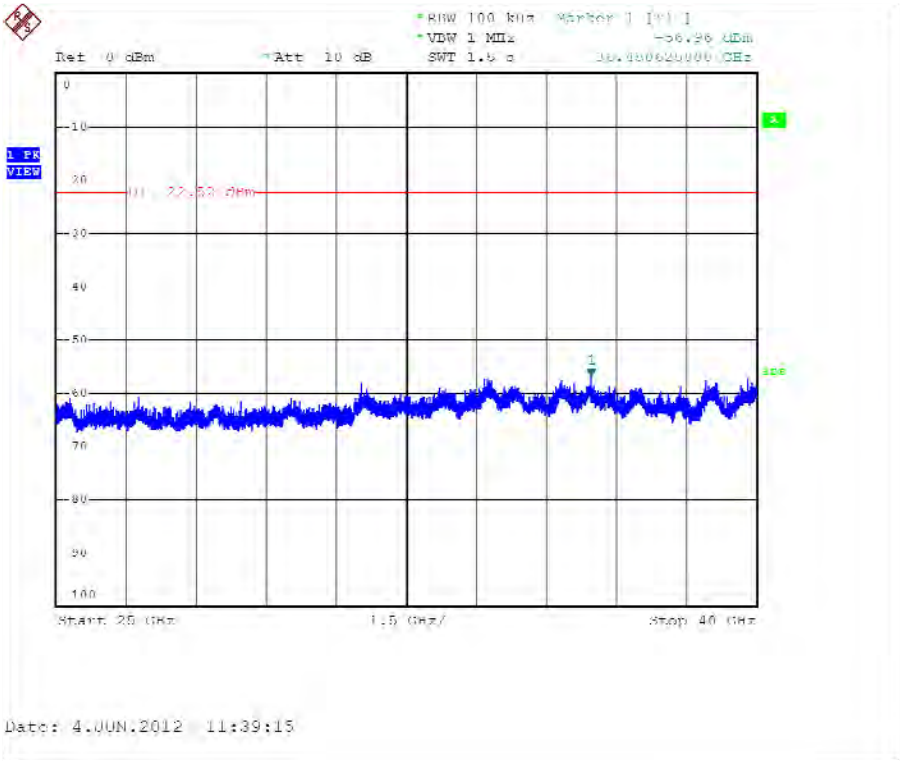

RBW 100 kHz
VBW 1 MHz
SWT 1.5 s
Ref 0 dBm
Att 10 dB
-56.01 dBm
D1 -23.53 dBm
Start 25 GHz
1.5 GHz/
Stop 40 GHz
Date: 4.JUN.2012 11:36:56

Channel 157 (5785MHz) 30MHz -40GHz

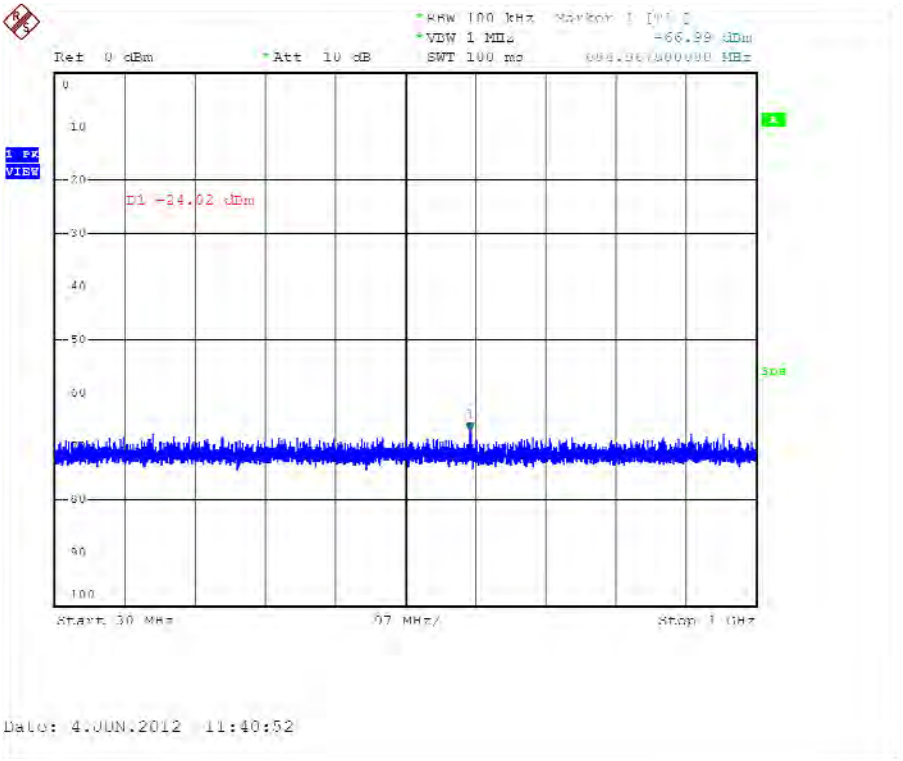


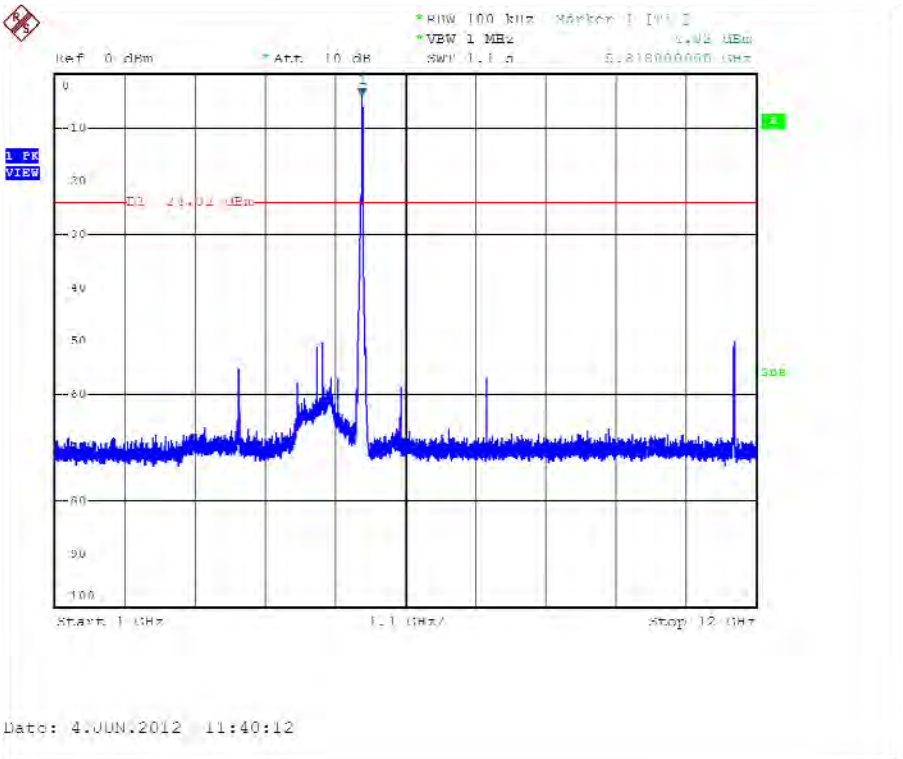


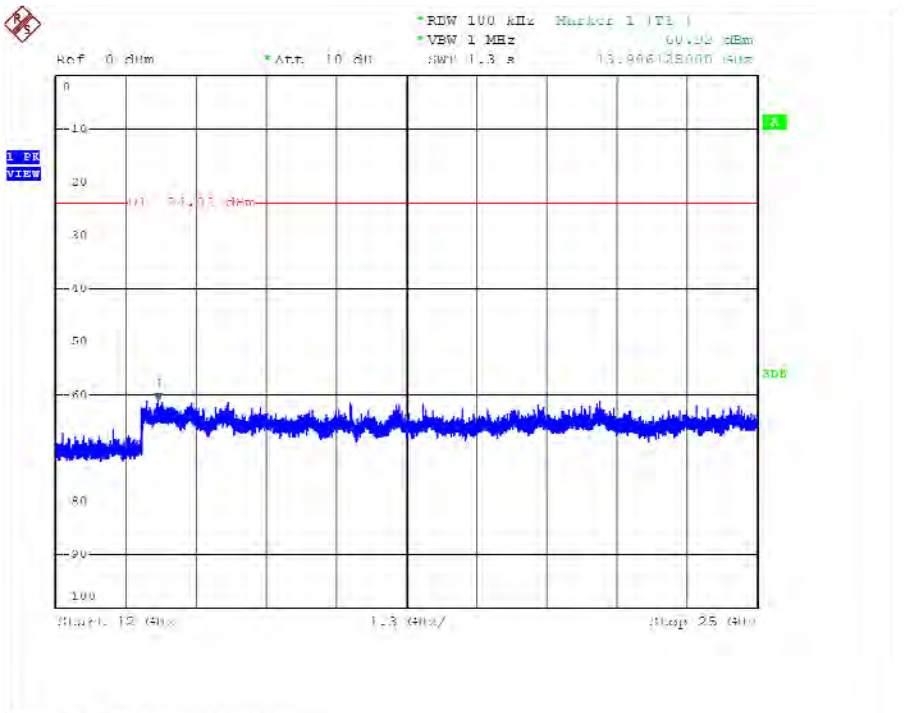

RBW 100 kHz
VBW 1 MHz
SWT 1.3 s
Ref 0 dBm
Att 10 dB
1 PK
VIEW
Start 12 GHz
1.3 GHz/
Stop 25 GHz
Date: 4.JUN.2012 11:30:35


RBW 100 kHz
VBW 1 MHz
SWT 1.5 s
Ref 0 dBm
Att 10 dB
1 PK
VIEW
Start 25 GHz
1.5 GHz/
Stop 40 GHz
Date: 4.JUN.2012 11:39:15

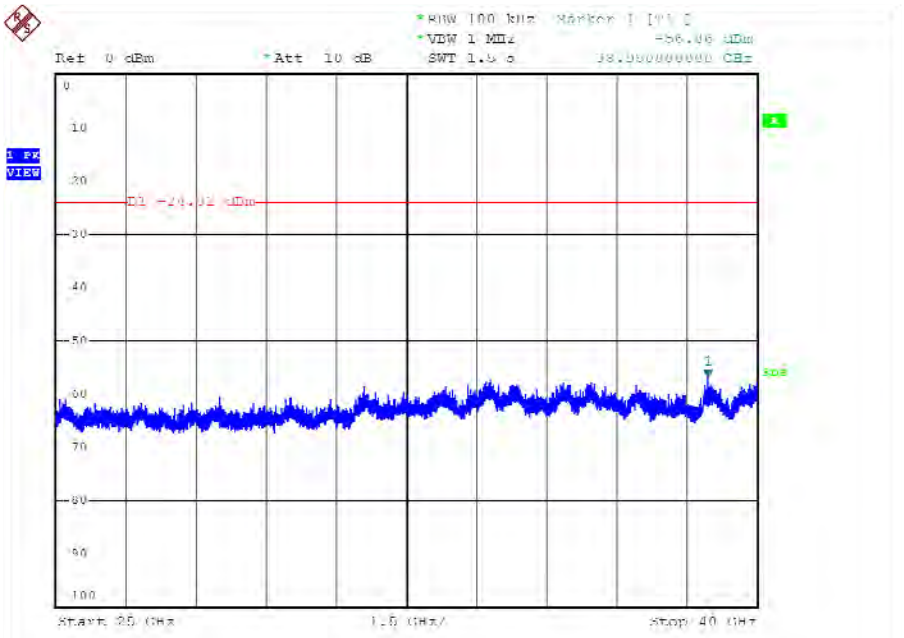
Channel 165 (5825MHz) 30MHz -40GHz







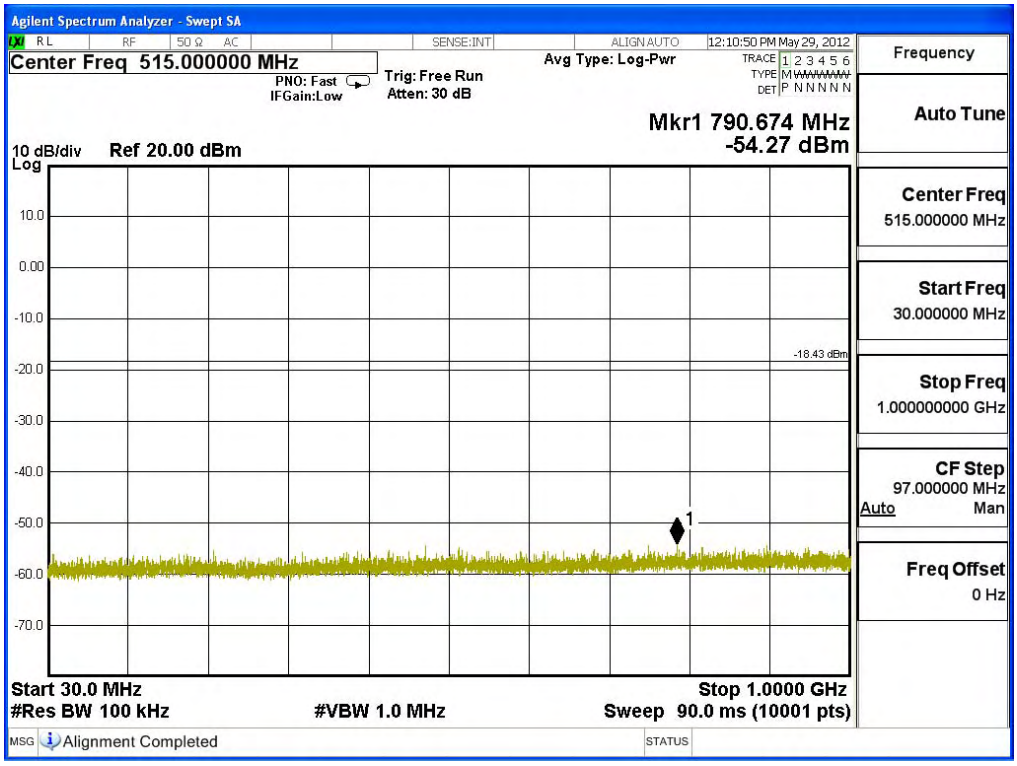
Date: 4.JUN.2012 11:41:32

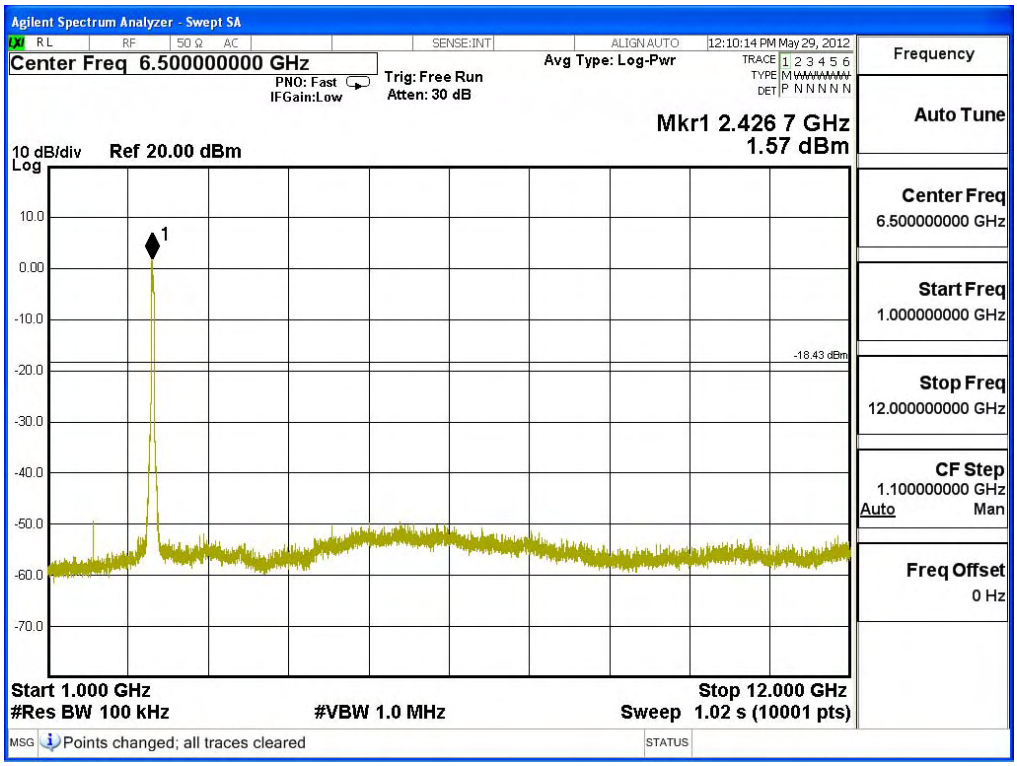


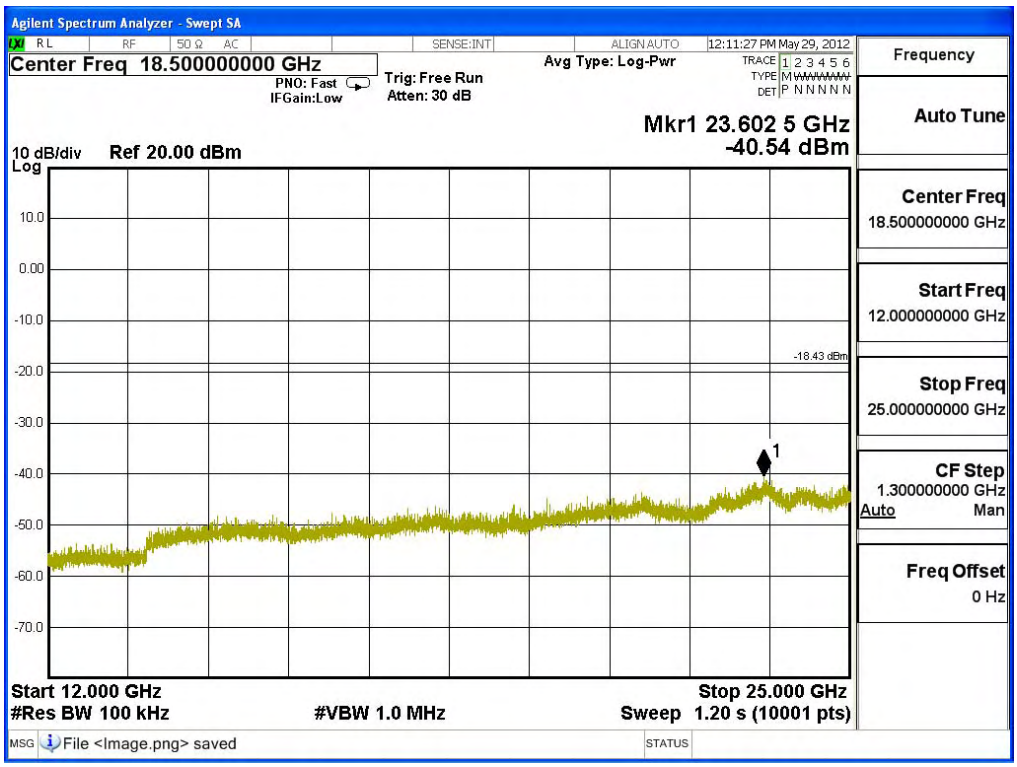
Date: 4.JUN.2012 11:42:13

Product : MOXA IEEE802.11 a/b/g mini PCI module
Test Item : RF Antenna Conducted Spurious
Test Site : No.3 OATS
Test Mode : Mode 4: Transmit Turbo Mode (2.4G Band)

Channel 06 (2437MHz) 30MHz -25GHz

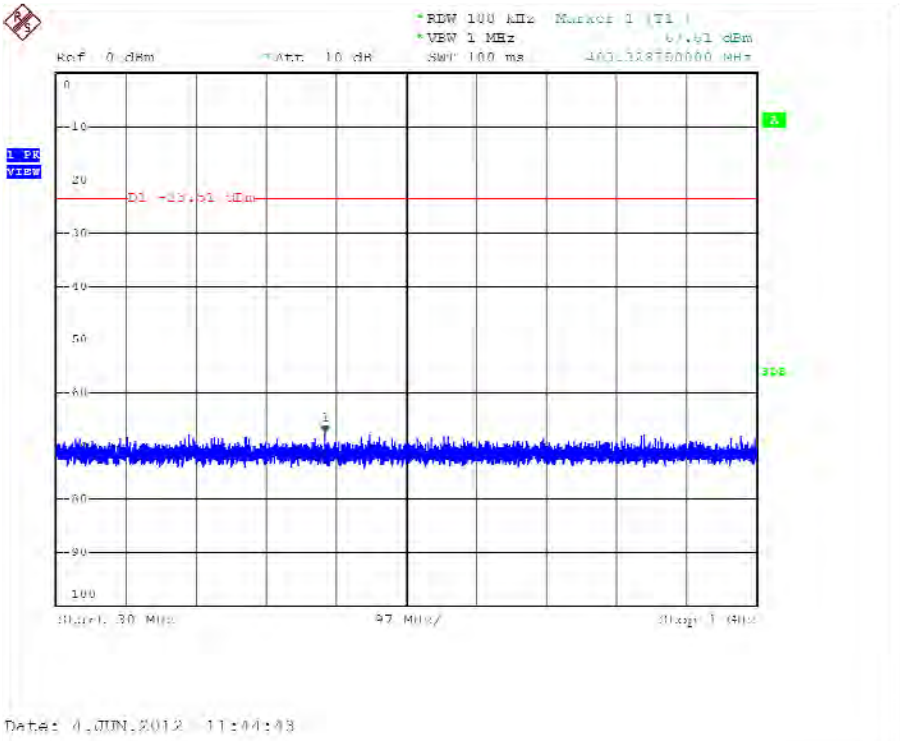




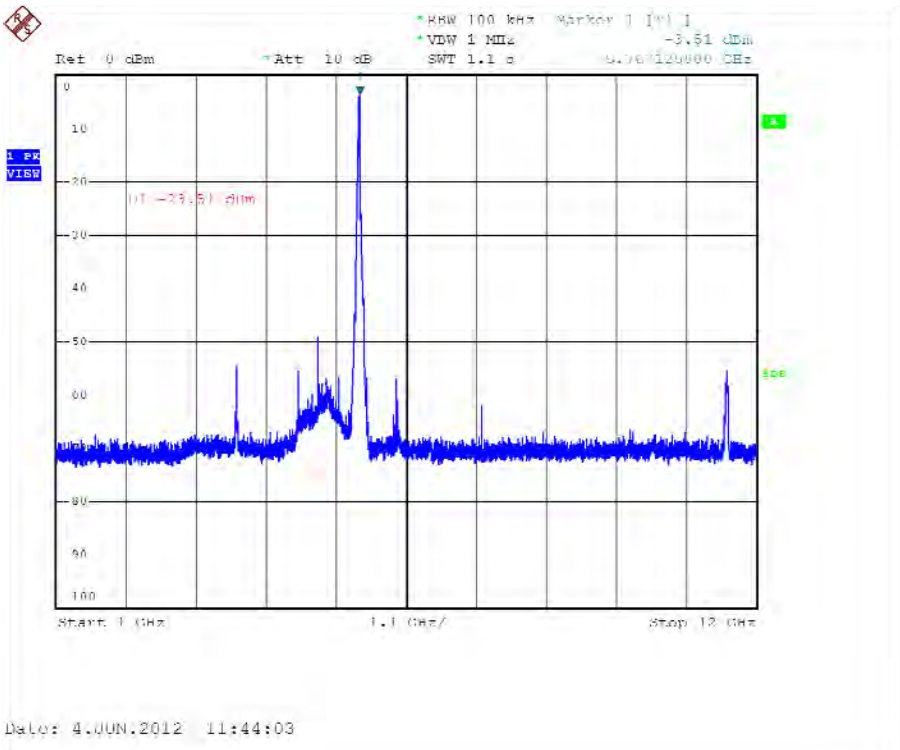

Agilent Spectrum Analyzer - Swept SA
Center Freq 18.500000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
12:11:27 PM May 29, 2012
Mkr1 23.602 5 GHz
-40.54 dBm
10 dB/div
Log
Ref 20.00 dBm
-18.43 dBm
Start 12.000 GHz
#Res BW 100 kHz
#VBW 1.0 MHz
Stop 25.000 GHz
Sweep 1.20 s (10001 pts)
File <Image.png> saved
Frequency
Auto Tune
Center Freq
18.500000000 GHz
Start Freq
12.000000000 GHz
Stop Freq
25.000000000 GHz
CF Step
1.300000000 GHz
Auto
Man
Freq Offset
0 Hz

Product : MOXA IEEE802.11 a/b/g mini PCI module
Test Item : RF Antenna Conducted Spurious
Test Site : No.3 OATS
Test Mode : Mode 5: Transmit Turbo Mode (5G Band)

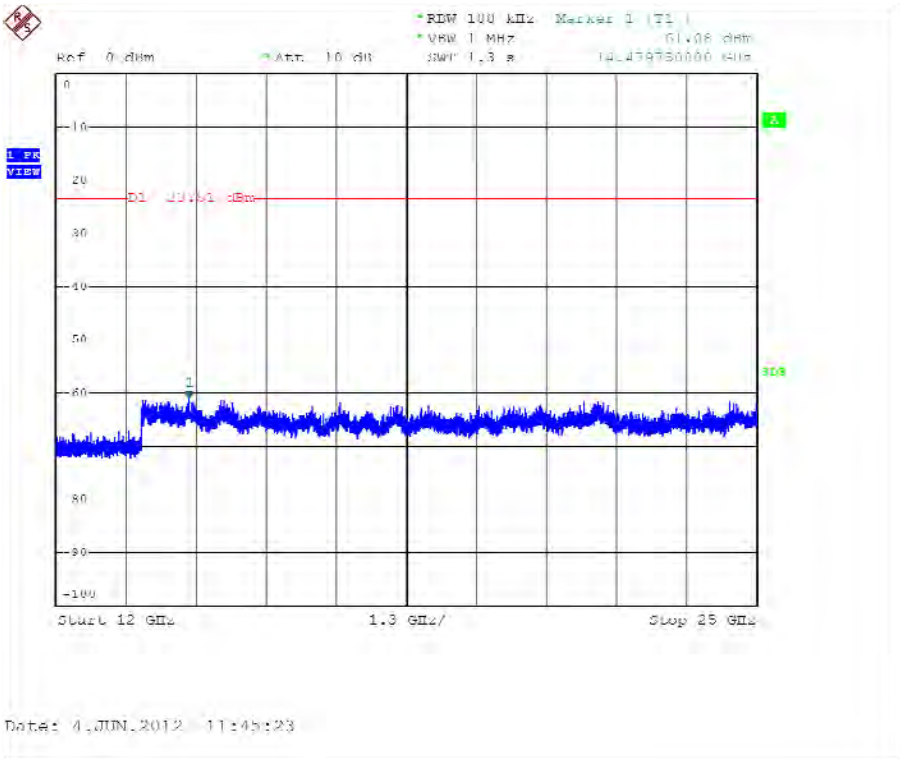
Channel 152 (5760MHz) 30MHz -40GHz

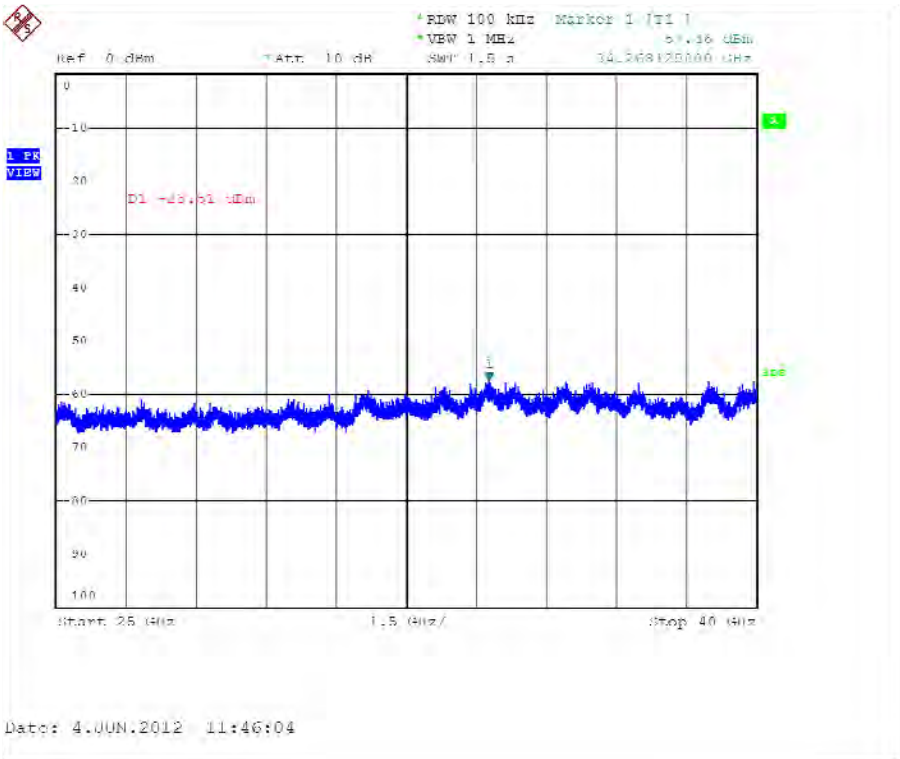


Date: 4.JUN.2012 11:44:03

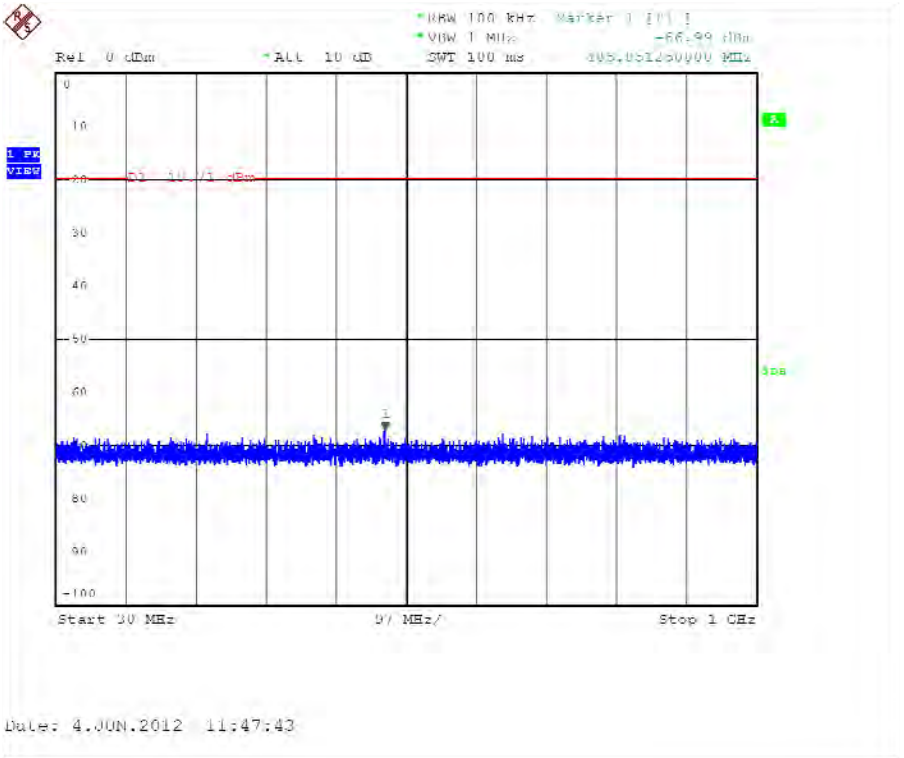


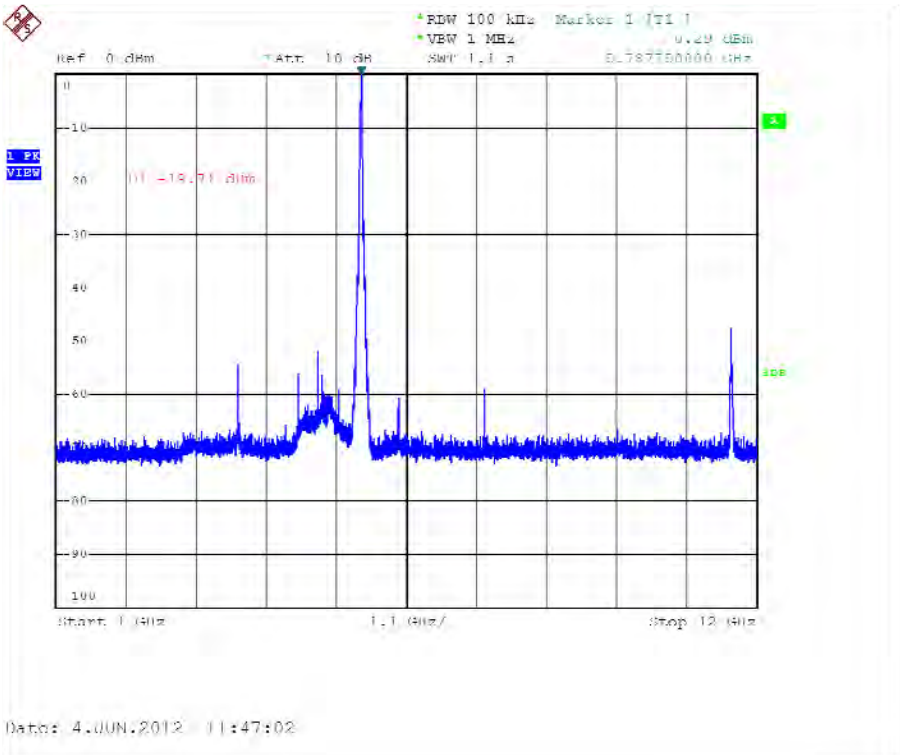
Date: 4.JUN.2012 11:44:03

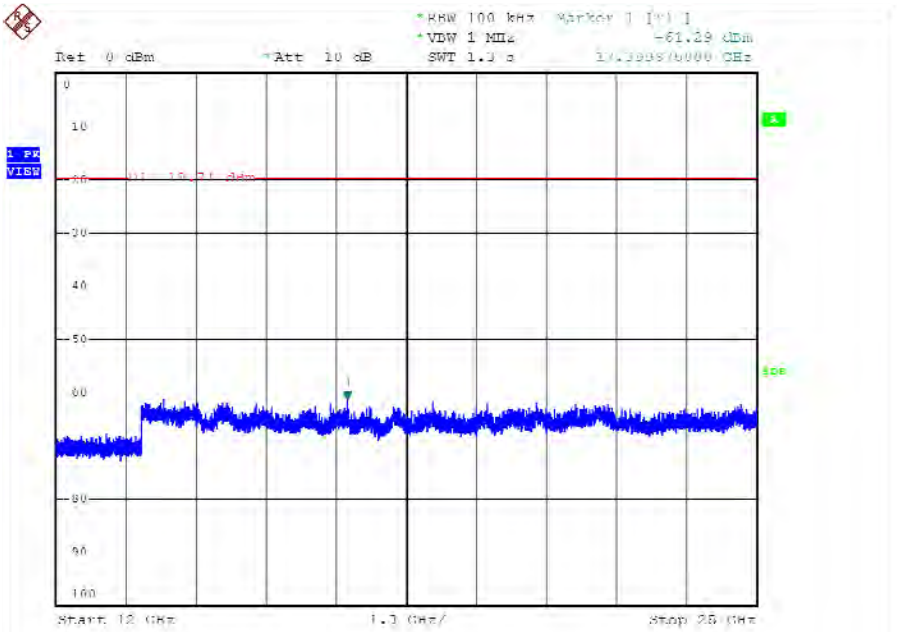

RBW 100 kHz
VBW 1 MHz
Ref 0 dBm
Att 10 dB
1 PK
VIEW
D1
Start 12 GHz
1.3 GHz/
Stop 25 GHz
Date: 4.JUN.2012 11:45:23


RBW 100 kHz
VBW 1 MHz
Ref 0 dBm
Att 10 dB
1 PK
VIEW
D1
Start 25 GHz
1.5 GHz/
Stop 40 GHz
Date: 4.JUN.2012 11:46:04

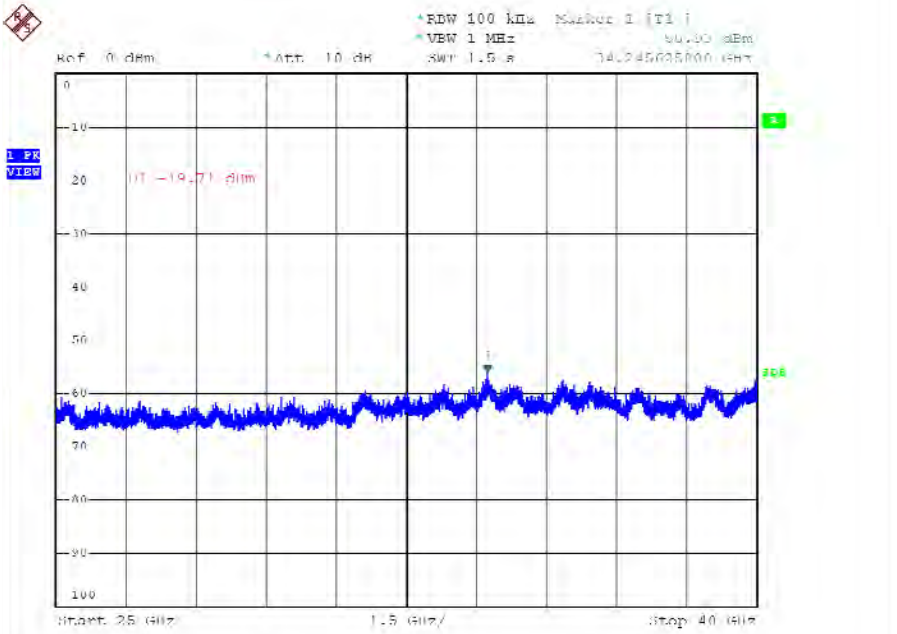
Channel 160 (5800MHz) 30MHz -40GHz







Date: 4.JUN.2012 11:48:23



Date: 4.JUN.2012 11:49:03

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, 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.

RF Radiated Measurement:

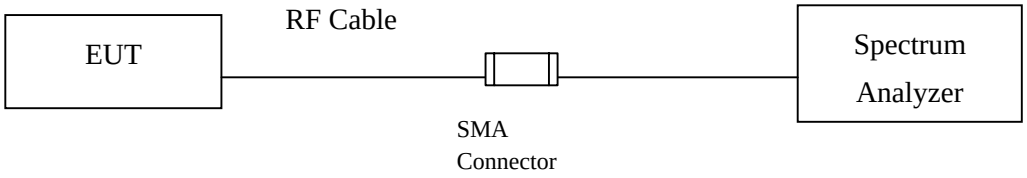
The following test equipments are used during the band edge tests:

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
		Pre-Amplifier	QTK	QTK-AMP-03 / 0003	May, 2012
	X	Pre-Amplifier	QTK	AP-180C / CHM_0906076	Sep., 2011
		Pre-Amplifier	MITEQ	AMF-4D-180400-45-6P/ 925975	Mar, 2012
	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

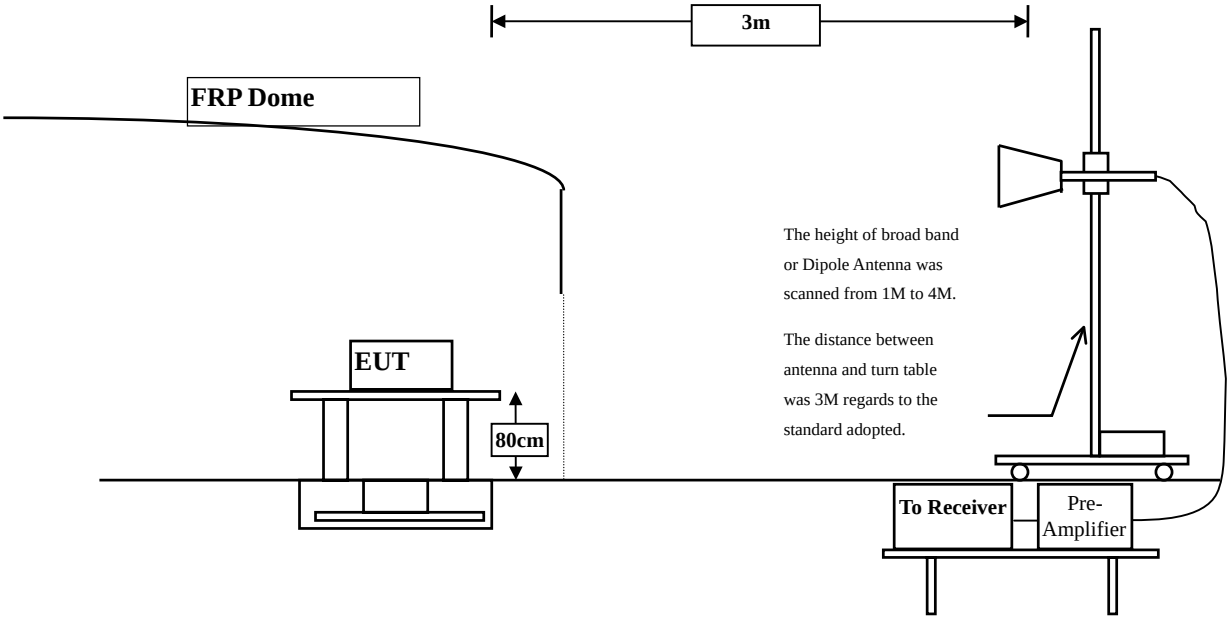
Note: 1. All instruments are calibrated every one year.
2. The test instruments marked by "X" are used to measure the final test results.

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 : MOXA IEEE802.11 a/b/g mini PCI module
Test Item : Band Edge
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	31.639	58.13	89.768	Peak
Horizontal	2412	31.639	54.08	85.718	Average
Vertical	2412	30.95	73.27	104.219	Peak
Vertical	2412	30.95	68.77	99.719	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	2386.1	89.768	47.8	41.968	74.000	Peak
Horizontal	2386.6	85.718	52.88	32.838	54.000	Average
Vertical	2386.1	104.219	47.8	56.419	74.000	Peak
Vertical	2386.6	99.719	52.88	46.839	54.000	Average

Note:

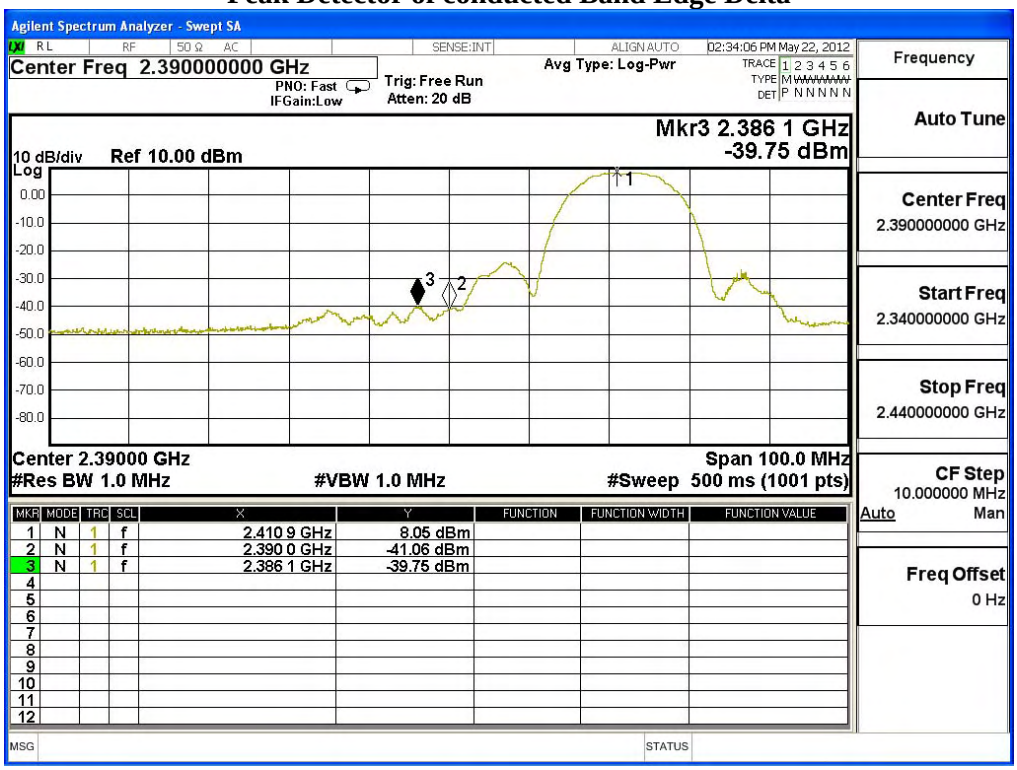
The Band Edge Field Strength was calculated using the Fundamental and Conducted Band Edge measurements per the Marker-Delta Method with the following formula:

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