



Test Report

Product Name	MiiNePort W1 series Embedded Serial Device Server
Model No	MiiNePort W1
FCC ID.	SLE-W1

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

Date of Receipt	Jan. 09, 2012
Issue Date	Feb. 06, 2012
Report No.	121211R-RFUSP28V01
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: Feb. 06, 2012

Report No.: 121211R-RFUSP28V01


Accredited by NIST (NVLAP)

NVLAP Lab Code: 200533-0

Product Name	MiiNePort W1 series Embedded Serial Device Server
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.	MiiNePort W1
FCC ID.	SLE-W1
EUT Rated Voltage	DC 3.3V
EUT Test Voltage	AC 120V/60Hz
Trade Name	MOXA
Applicable Standard	FCC CFR Title 47 Part 15 Subpart C: 2010 ANSI C63.4: 2003
Test Result	Complied

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Documented By :



(Adm. Specialist / Joanne Lin)

Tested By :



(Engineer / Vincent Chu)

Approved By :



(Manager / Vincent Lin)

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Attachment 1: EUT Test Photographs

Attachment 2: EUT Detailed Photographs

1. GENERAL INFORMATION

1.1. EUT Description

Product Name	MiiNePort W1 series Embedded Serial Device Server
Trade Name	MOXA
Model No.	MiiNePort W1
FCC ID.	SLE-W1
Frequency Range	2412-2462MHz for 802.11b/g
Number of Channels	802.11b/g: 11
Data Speed	802.11b: 1-11Mbps, 802.11g: 6-54Mbps
Type of Modulation	802.11b:DSSS (DBPSK, DQPSK, CCK) 802.11g:OFDM (BPSK, QPSK, 16QAM, 64QAM)
Antenna Type	Dipole
Antenna Gain	Refer to the table “Antenna List”
Channel Control	Auto

Antenna List

No.	Manufacturer	Model No.	Peak Gain
1	WANSHIH	ANT-WDB-O-2 BK	2 dBi for 2.4GHz
2	KINSUN	ANT-WDB-ARM-02	1.21 dBi for 2.4GHz

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

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		

Note:

1. The EUT is a MiiNePort W1 series Embedded Serial Device Server 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)
4. These tests are conducted on a sample for the purpose of demonstrating compliance of 802.11b/g 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)

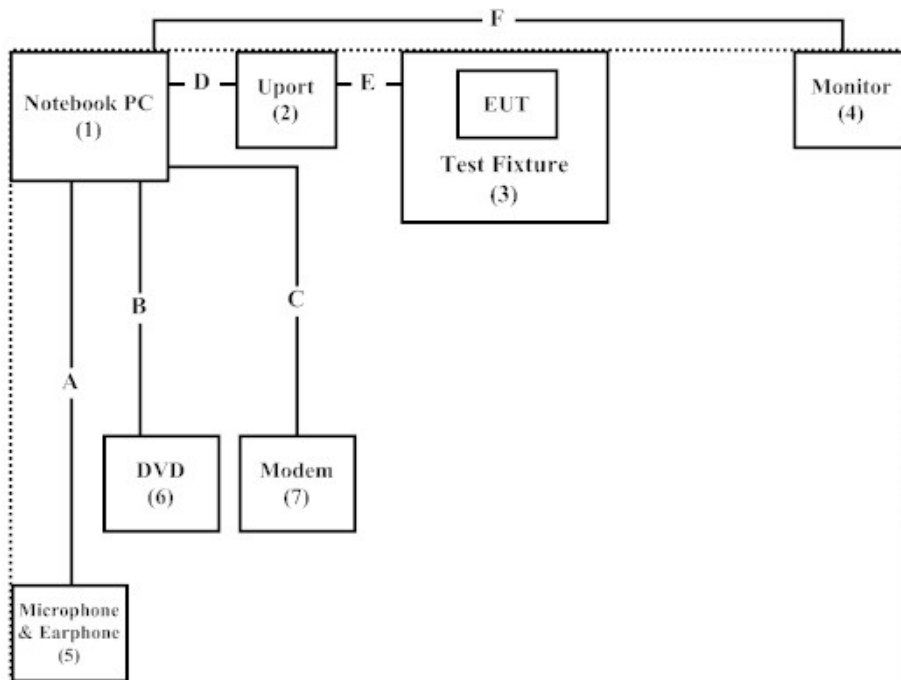
1.3. Tested System Details

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.	FCC ID	Power Cord
1 Notebook PC	DELL	PPT	N/A	DoC	Non-Shielded, 0.8m
2 Uport	MOXA	N/A	N/A	N/A	N/A
3 Test Fixture	MOXA	N/A	N/A	N/A	N/A
4 Monitor	LG	W2261VT	907YHPB07296	DoC	Non-Shielded, 1.8m
5 Microphone & Earphone	PCHOME	N/A	N/A	N/A	N/A
6 DVD	DELL	PD01S	N/A	N/A	N/A
7 Modem	ACEEX	DM-1414	0102027558	IFAXDM1414	Non-Shielded, 1.8m

Signal Cable Type	Signal cable Description
A Microphone & Earphone Cable	Non-Shielded, 2.0m
B USB Cable	Non-Shielded, 0.5m
C Modem Cable	Non-Shielded, 1.5m
D USB Cable	Non-Shielded, 0.5m
E RS-232 Cable	Non-Shielded, 0.3m
F VGA Cable	Non-Shielded, 1.8m, with one ferrite core bonded.

1.4. Configuration of Tested System



1.5. EUT Exercise Software

- (1) Setup the EUT as shown in section 1.4.
- (2) Execute command on the notebook.
- (3) Configure the test mode, the test channel, and the data rate.
- (4) Start the continuous transmission.
- (5) Verify that the EUT works properly.

1.6. Test Facility

Ambient conditions in the laboratory:

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

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

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

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

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

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

Accreditation on NVLAP
NVLAP Lab Code: 200533-0

Site Name: Quietek Corporation
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E-Mail : service@quietek.com

FCC Accreditation Number: TW1014

2. Conducted Emission

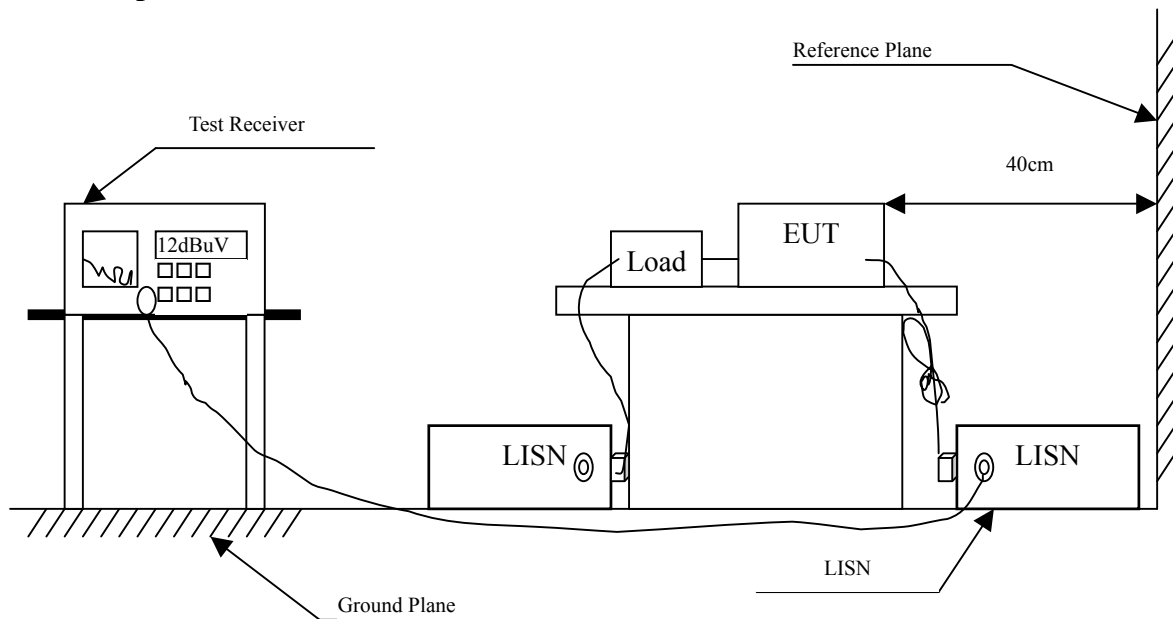
2.1. Test Equipment

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

Item	Instrument	Manufacturer	Type No./Serial No	Last Cal.	Remark
1	Test Receiver	R & S	ESCS 30/825442/17	May, 2011	
2	L.I.S.N.	R & S	ESH3-Z5/825016/6	May, 2011	EUT
3	L.I.S.N.	Kyoritsu	KNW-407/8-1420-3	May, 2011	Peripherals
4	Pulse Limiter	R & S	ESH3-Z2	May, 2011	
5	No.1 Shielded Room			N/A	

Note: All instruments are calibrated every one year.

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 : MiiNePort W1 series Embedded Serial Device Server
 Test Item : Conducted Emission Test
 Power Line : Line 1
 Test Mode : Mode 2: Transmit (802.11g 6Mbps) (2437MHz)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV	Margin dB	Limit dBuV
Line 1					
Quasi-Peak					
0.220	9.840	33.240	43.080	-20.920	64.000
0.431	9.840	36.170	46.010	-11.961	57.971
0.490	9.840	37.620	47.460	-8.826	56.286
0.517	9.840	35.020	44.860	-11.140	56.000
2.916	9.860	11.950	21.810	-34.190	56.000
16.693	10.130	25.760	35.890	-24.110	60.000
Average					
0.220	9.840	31.060	40.900	-13.100	54.000
0.431	9.840	26.950	36.790	-11.181	47.971
0.490	9.840	27.590	37.430	-8.856	46.286
0.517	9.840	25.940	35.780	-10.220	46.000
2.916	9.860	7.720	17.580	-28.420	46.000
16.693	10.130	21.750	31.880	-18.120	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 : MiiNePort W1 series Embedded Serial Device Server
 Test Item : Conducted Emission Test
 Power Line : Line 2
 Test Mode : Mode 2: Transmit (802.11g 6Mbps) (2437MHz)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV	Margin dB	Limit dBuV
Line 2					
Quasi-Peak					
0.158	9.841	31.060	40.901	-24.870	65.771
0.220	9.840	31.820	41.660	-22.340	64.000
0.494	9.840	29.820	39.660	-16.511	56.171
0.689	9.840	23.040	32.880	-23.120	56.000
6.779	9.941	20.570	30.511	-29.489	60.000
17.423	10.260	25.730	35.990	-24.010	60.000
Average					
0.158	9.841	17.750	27.591	-28.180	55.771
0.220	9.840	31.060	40.900	-13.100	54.000
0.494	9.840	21.190	31.030	-15.141	46.171
0.689	9.840	15.030	24.870	-21.130	46.000
6.779	9.941	19.790	29.731	-20.269	50.000
17.423	10.260	22.480	32.740	-17.260	50.000

Note:

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

3. Peak Power Output

3.1. Test Equipment

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
X	Power Meter	Anritsu	ML2495A/6K00003357	May, 2011
X	Power Sensor	Anritsu	MA2411B/0738448	Jun, 2011

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

Conducted Measurement



3.3. Limits

The maximum peak power shall be less 1 Watt.

3.4. Test Procedure

The EUT was tested according to DTS test procedure of Mar. 2005 KDB558074 for compliance to FCC 47CFR 15.247 requirements.

3.5. Uncertainty

± 1.27 dB

3.6. Test Result of Peak Power Output

Product : MiiNePort W1 series Embedded Serial Device Server
 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	14	--	--	--	16.68	<30dBm	Pass
06	2437	12.65	12.51	12.21	12.08	15.38	<30dBm	Pass
11	2462	12.84	--	--	--	15.58	<30dBm	Pass

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

Product : MiiNePort W1 series Embedded Serial Device Server
 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	13.86	--	--	--	--	--	--	--	22.49	<30dBm	Pass
06	2437	13.28	13.15	13.07	12.87	12.81	12.75	12.71	12.66	22.13	<30dBm	Pass
11	2462	13.83	--	--	--	--	--	--	--	22.25	<30dBm	Pass

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

4. Radiated Emission

4.1. Test Equipment

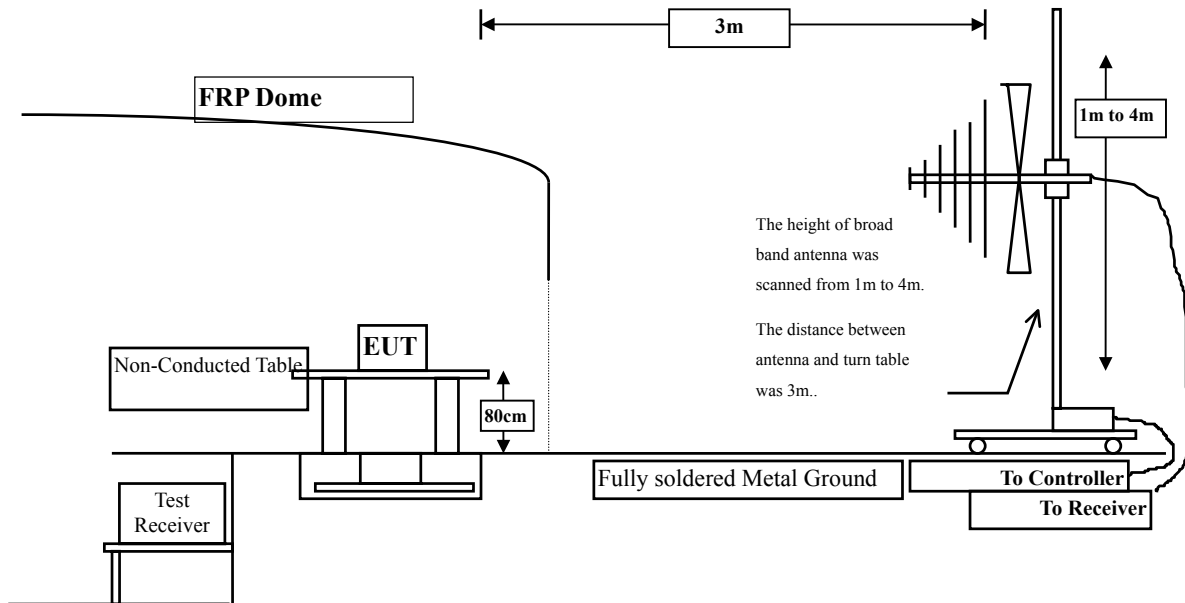
The following test equipment are used during the radiated emission test:

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, 2011
	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

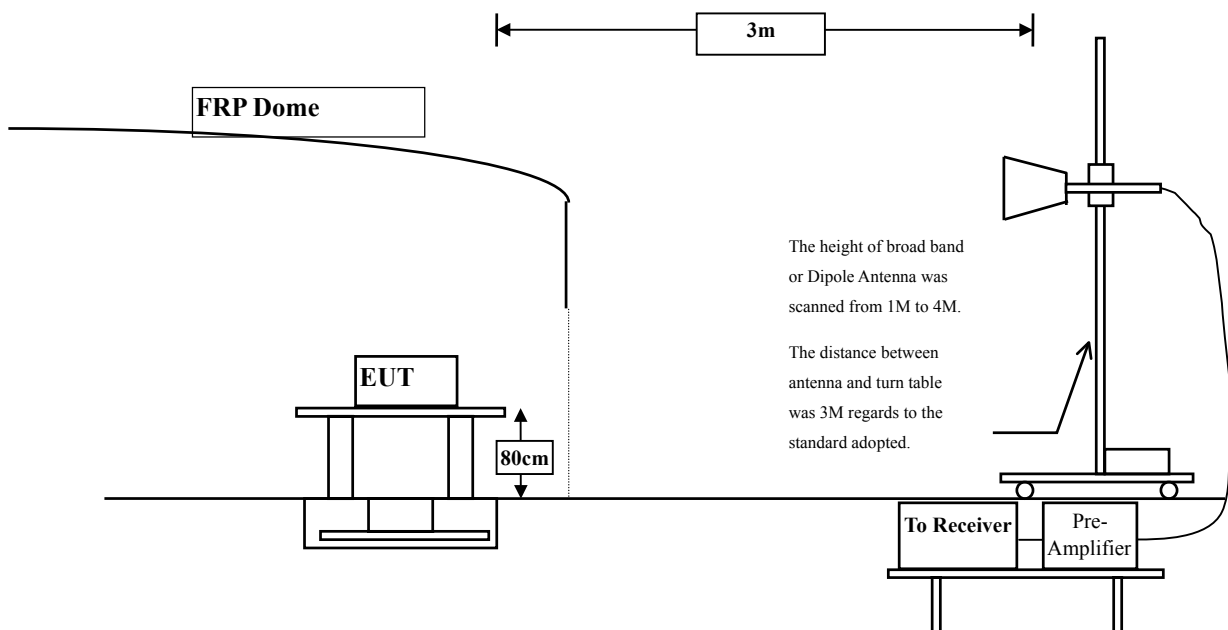
- Note:
1. All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.
 2. The test instruments marked with “X” are used to measure the final test results.

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.

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 Mar. 2005 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 : MiiNePort W1 series Embedded Serial Device Server
 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
Horizontal					
Peak Detector:					
4824.000	3.261	38.080	41.341	-32.659	74.000
7236.000	10.650	35.740	46.390	-27.610	74.000
9648.000	13.337	35.610	48.946	-25.054	74.000
Average Detector:					
--					
Vertical					
Peak Detector:					
4824.000	6.421	45.210	51.631	-22.369	74.000
7236.000	11.495	36.000	47.495	-26.505	74.000
9648.000	13.807	35.900	49.706	-24.294	74.000
Average Detector:					
--					

Note:

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

Product : MiiNePort W1 series Embedded Serial Device Server
 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
Horizontal					
Peak Detector:					
4874.000	3.038	36.930	39.967	-34.033	74.000
7311.000	11.795	35.010	46.804	-27.196	74.000
9748.000	12.635	36.460	49.095	-24.905	74.000
Average Detector:					
--					
Vertical					
Peak Detector:					
4874.000	5.812	42.330	48.141	-25.859	74.000
7311.000	12.630	35.280	47.909	-26.091	74.000
9748.000	13.126	36.290	49.416	-24.584	74.000
Average Detector:					
--					

Note:

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

Product : MiiNePort W1 series Embedded Serial Device Server
 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
Horizontal					
Peak Detector:					
4924.000	2.858	37.140	39.997	-34.003	74.000
7386.000	12.127	34.780	46.908	-27.092	74.000
9848.000	12.852	36.670	49.523	-24.477	74.000
Average Detector:					
--					
Vertical					
Peak Detector:					
4924.000	5.521	41.530	47.050	-26.950	74.000
7386.000	13.254	34.560	47.814	-26.186	74.000
9848.000	13.367	36.840	50.207	-23.793	74.000
Average Detector:					
--					

Note:

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

Product : MiiNePort W1 series Embedded Serial Device Server
 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
------------------	-------------------------	--------------------------	--------------------------------	--------------	-----------------

Horizontal

Peak Detector:

4824.000	3.261	37.120	40.381	-33.619	74.000
7236.000	10.650	36.350	47.000	-27.000	74.000
9648.000	13.337	35.820	49.156	-24.844	74.000

Average Detector:

--

Vertical

Peak Detector:

4824.000	6.421	44.890	51.311	-22.689	74.000
7236.000	11.495	36.260	47.755	-26.245	74.000
9648.000	13.807	35.420	49.226	-24.774	74.000

Average Detector:

--

Note:

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

Product : MiiNePort W1 series Embedded Serial Device Server
 Test Item : Harmonic Radiated Emission Data
 Test Site : No.3 OATS
 Test Mode : Mode 2: Transmit (802.11g 6Mbps) (2437 MHz)

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

Horizontal

Peak Detector:

4874.000	3.038	36.820	39.857	-34.143	74.000
7311.000	11.795	35.160	46.954	-27.046	74.000
9748.000	12.635	36.460	49.095	-24.905	74.000

Average Detector:

--

Peak Detector:

4874.000	5.812	39.340	45.151	-28.849	74.000
7311.000	12.630	35.110	47.739	-26.261	74.000
9748.000	13.126	36.500	49.626	-24.374	74.000

Average Detector:

--

Note:

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

Product : MiiNePort W1 series Embedded Serial Device Server
 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
Horizontal					
Peak Detector:					
4924.000	2.858	38.240	41.097	-32.903	74.000
7386.000	12.127	34.410	46.538	-27.462	74.000
9848.000	12.852	36.290	49.143	-24.857	74.000
Average Detector:					
--					
Vertical					
Peak Detector:					
4924.000	5.521	37.850	43.370	-30.630	74.000
7386.000	13.254	34.380	47.634	-26.366	74.000
9848.000	13.367	36.340	49.707	-24.293	74.000

Average Detector:

--

Note:

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

Product : MiiNePort W1 series Embedded Serial Device Server
 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
Horizontal					
86.260	-9.948	46.723	36.775	-3.225	40.000
241.460	-6.531	45.315	38.784	-7.216	46.000
507.240	0.759	36.776	37.535	-8.465	46.000
687.660	3.294	39.157	42.451	-3.549	46.000
776.900	4.183	36.227	40.410	-5.590	46.000
1000.000	9.119	38.473	47.592	-6.408	54.000
Vertical					
70.740	-6.151	40.871	34.720	-5.280	40.000
255.040	-7.648	49.061	41.413	-4.587	46.000
507.240	-0.471	36.910	36.439	-9.561	46.000
687.660	2.444	32.033	34.477	-11.523	46.000
776.900	2.373	36.268	38.641	-7.359	46.000
1000.000	4.329	40.299	44.628	-9.372	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 : MiiNePort W1 series Embedded Serial Device Server
 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
Horizontal					
101.780	-7.141	44.347	37.206	-6.294	43.500
142.520	-10.427	44.934	34.507	-8.993	43.500
598.420	3.991	32.744	36.735	-9.265	46.000
687.660	3.294	39.320	42.614	-3.386	46.000
776.900	4.183	37.905	42.088	-3.912	46.000
996.120	7.669	40.360	48.029	-5.971	54.000
Vertical					
51.340	-7.145	42.357	35.212	-4.788	40.000
142.520	-6.267	46.160	39.893	-3.607	43.500
532.460	-0.563	32.517	31.954	-14.046	46.000
687.660	2.444	29.509	31.953	-14.047	46.000
776.900	2.373	34.263	36.636	-9.364	46.000
955.380	6.657	28.242	34.899	-11.101	46.000

Note:

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

5. RF antenna conducted test

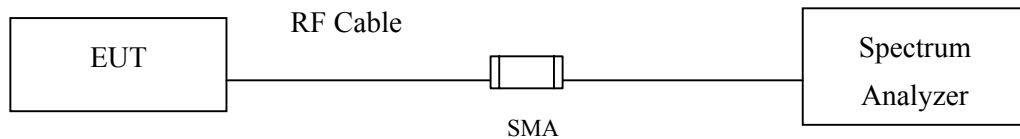
5.1. Test Equipment

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

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 Mar. 2005 KDB558074 for compliance to FCC 47CFR 15.247 requirements.

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

5.5. Uncertainty

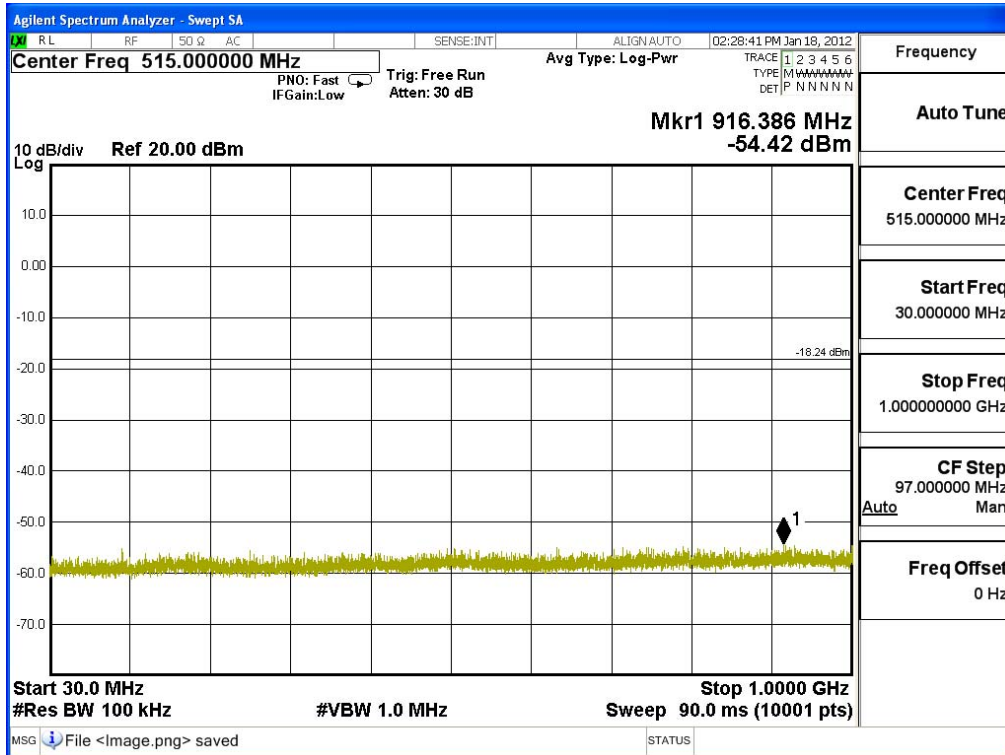
The measurement uncertainty

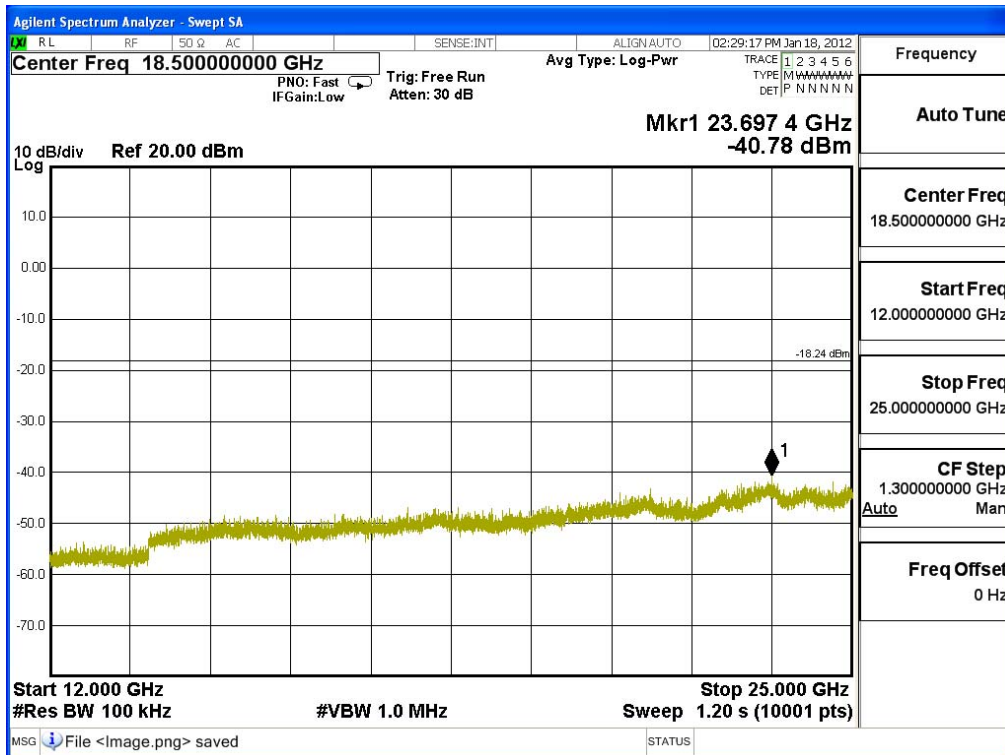
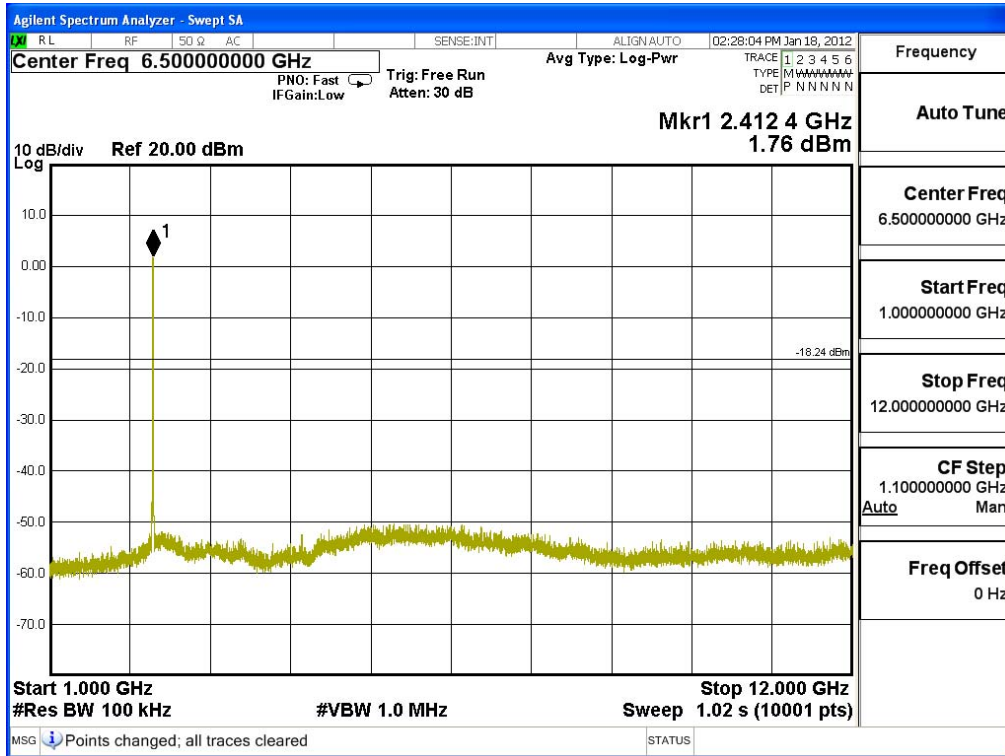
Conducted is defined as $\pm 1.27\text{dB}$

5.6. Test Result of RF antenna conducted test

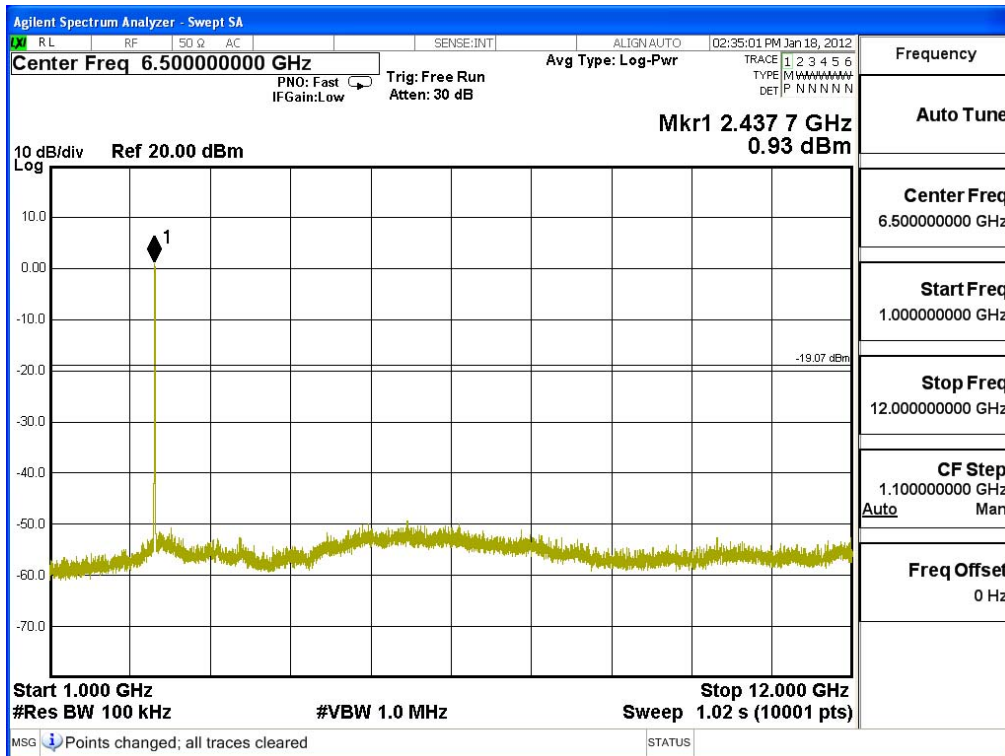
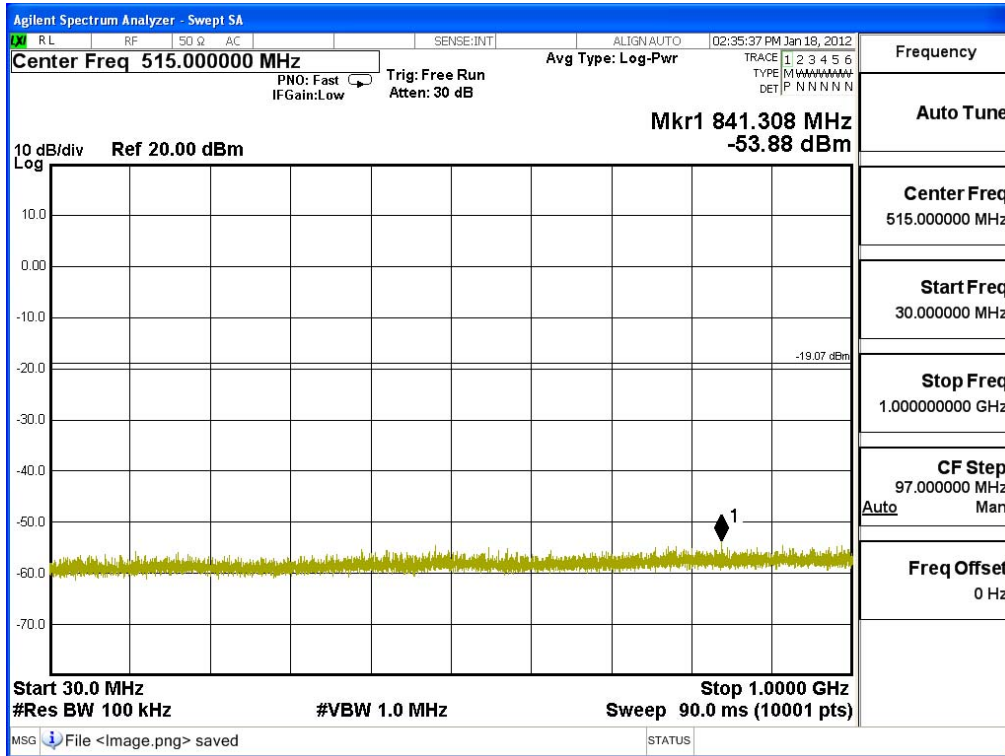
Product : MiiNePort W1 series Embedded Serial Device Server
 Test Item : RF antenna conducted test
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit (802.11b 1Mbps)

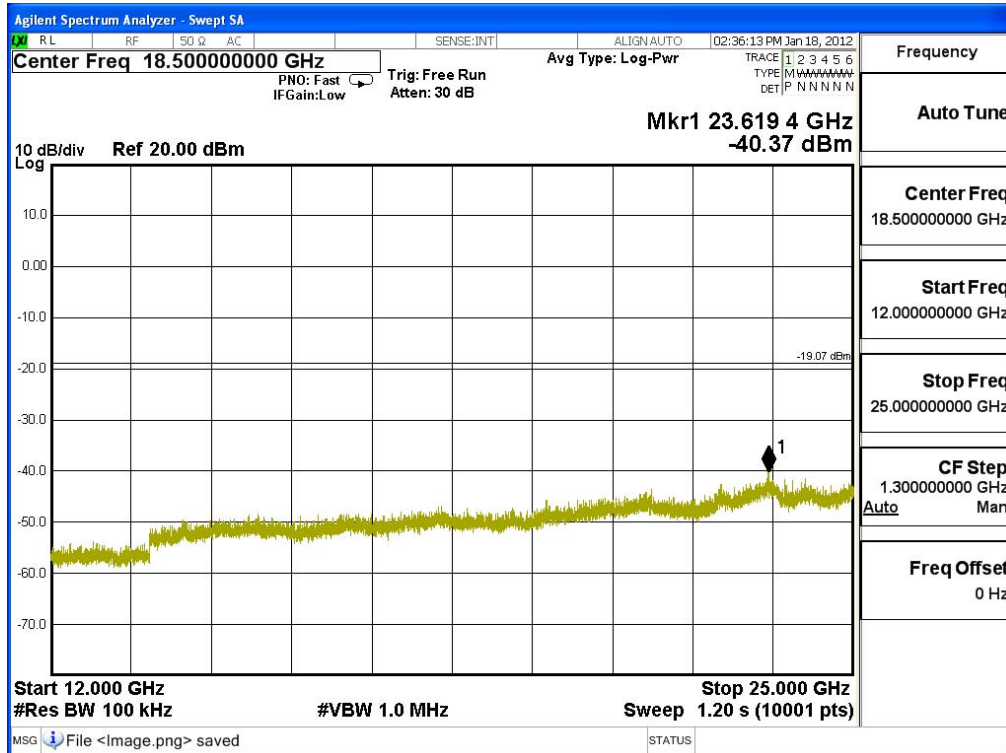
Channel 01 (2412MHz)



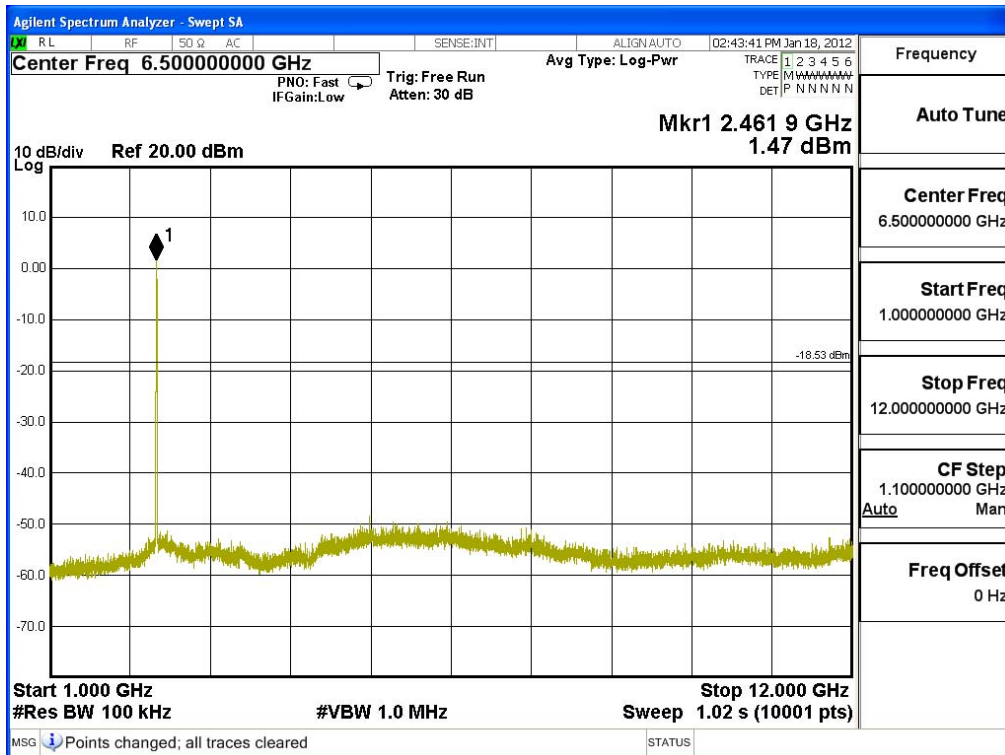
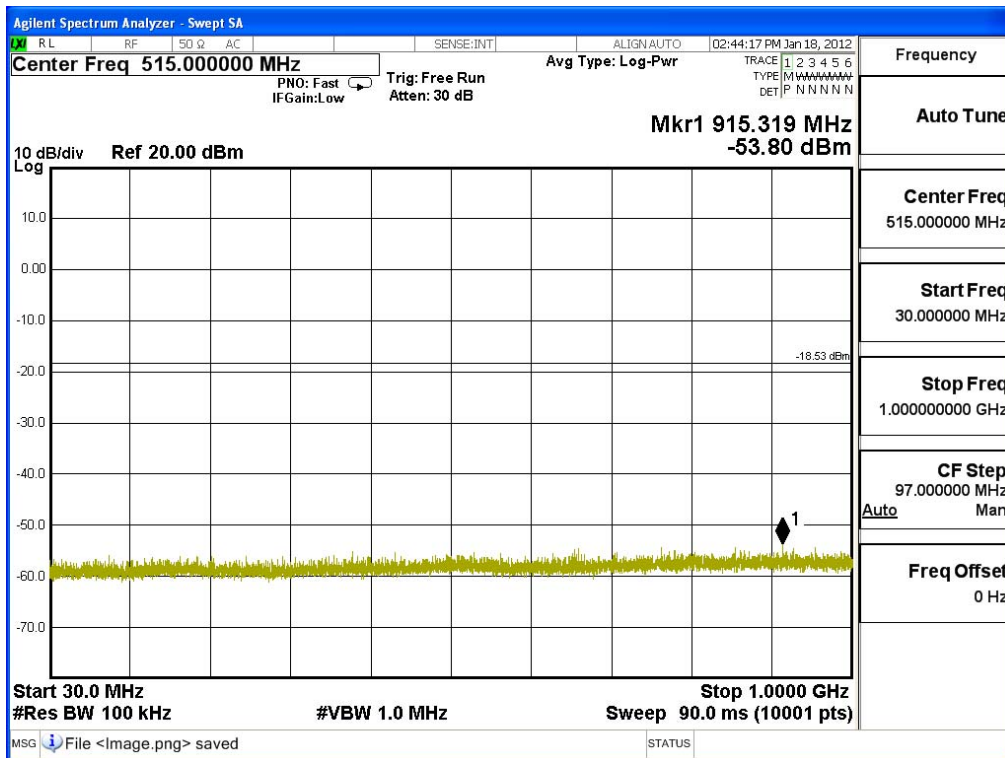


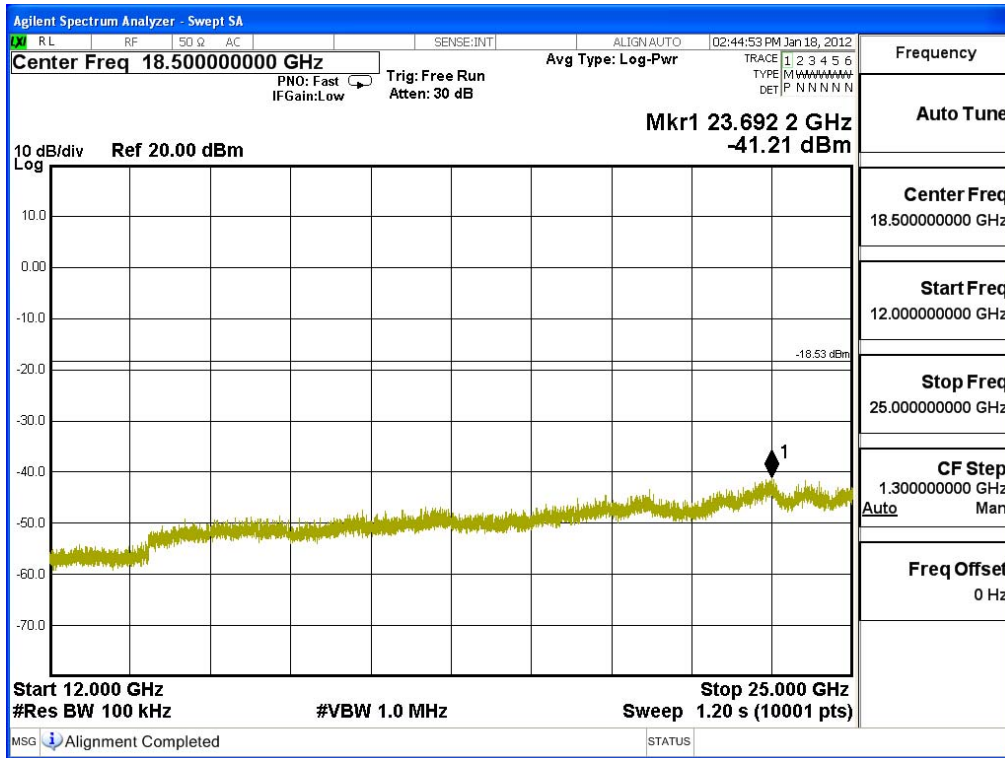
Channel 06 (2437MHz)





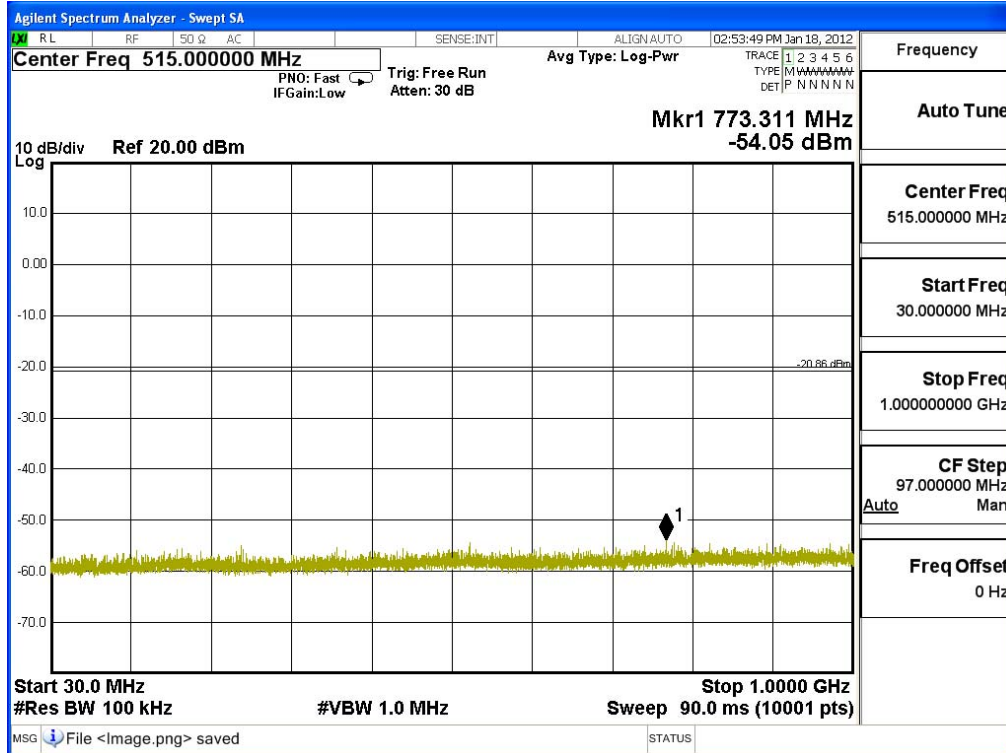
Channel 11 (2462MHz)

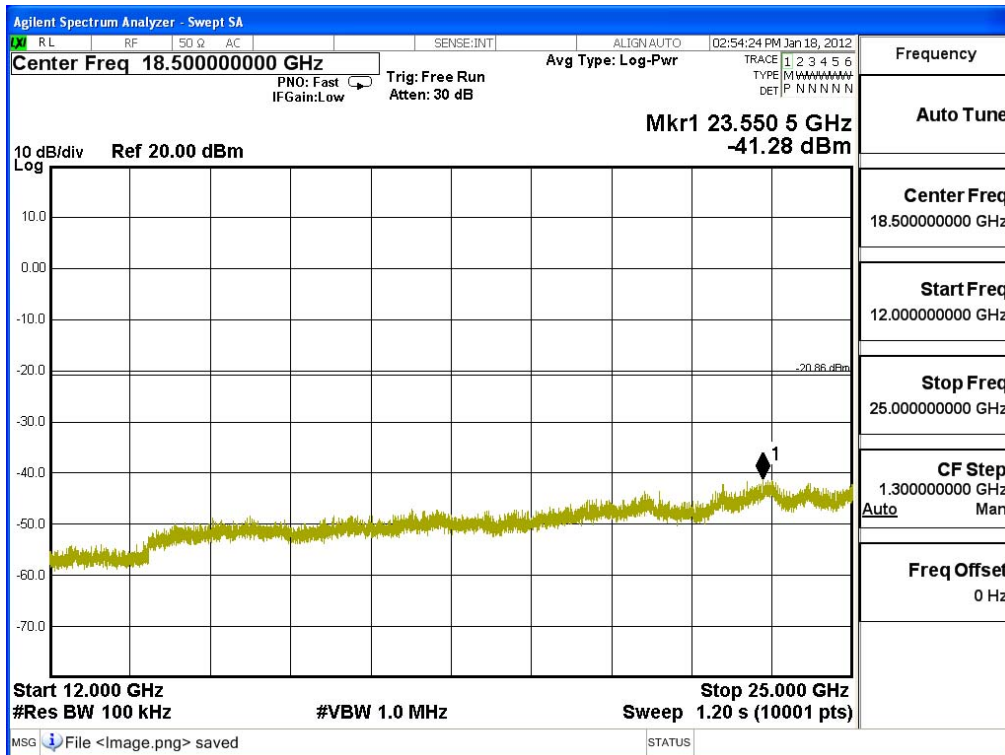
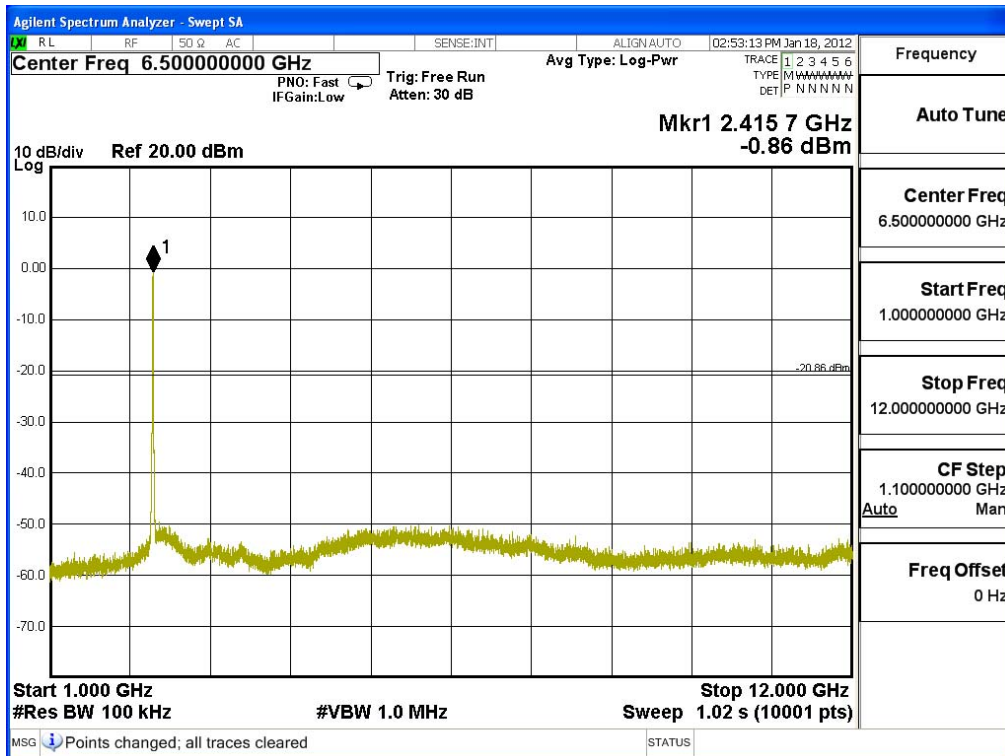




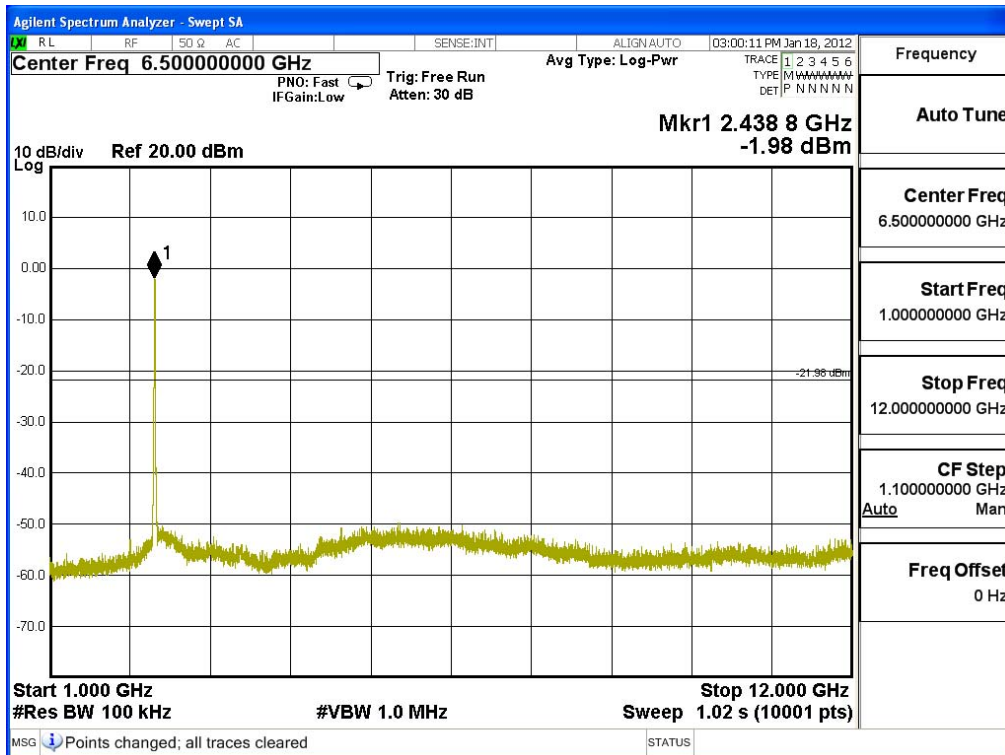
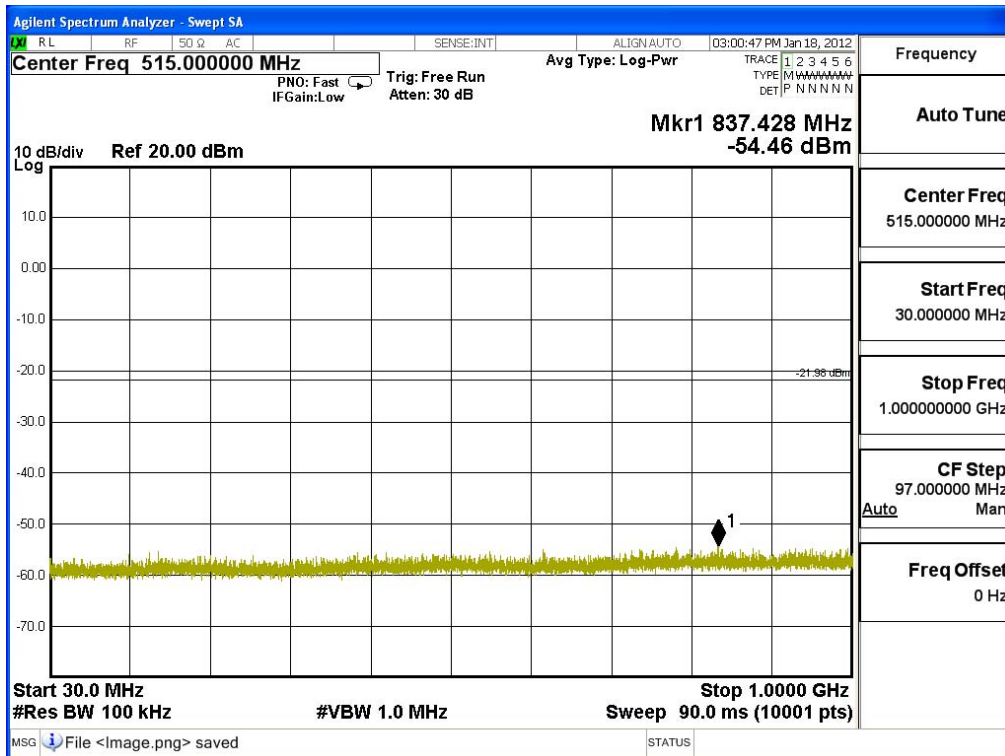
Product : MiiNePort W1 series Embedded Serial Device Server
 Test Item : RF Antenna Conducted Spurious
 Test Site : No.3 OATS
 Test Mode : Mode 2: Transmit (802.11g 6Mbps)

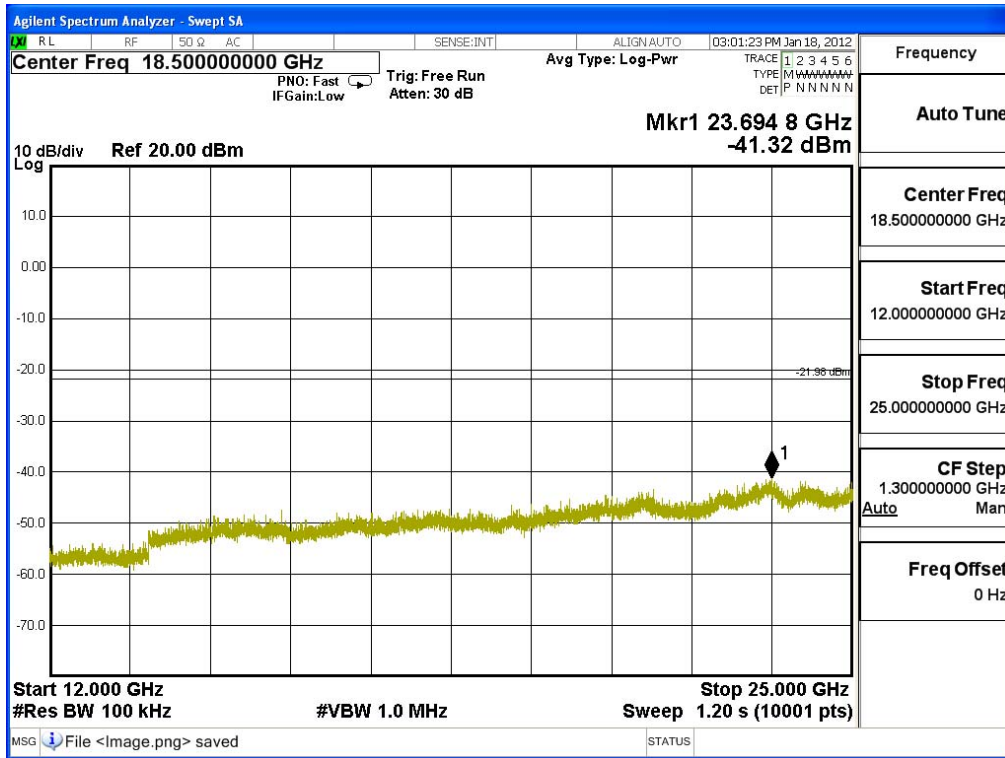
Channel 01 (2412MHz)



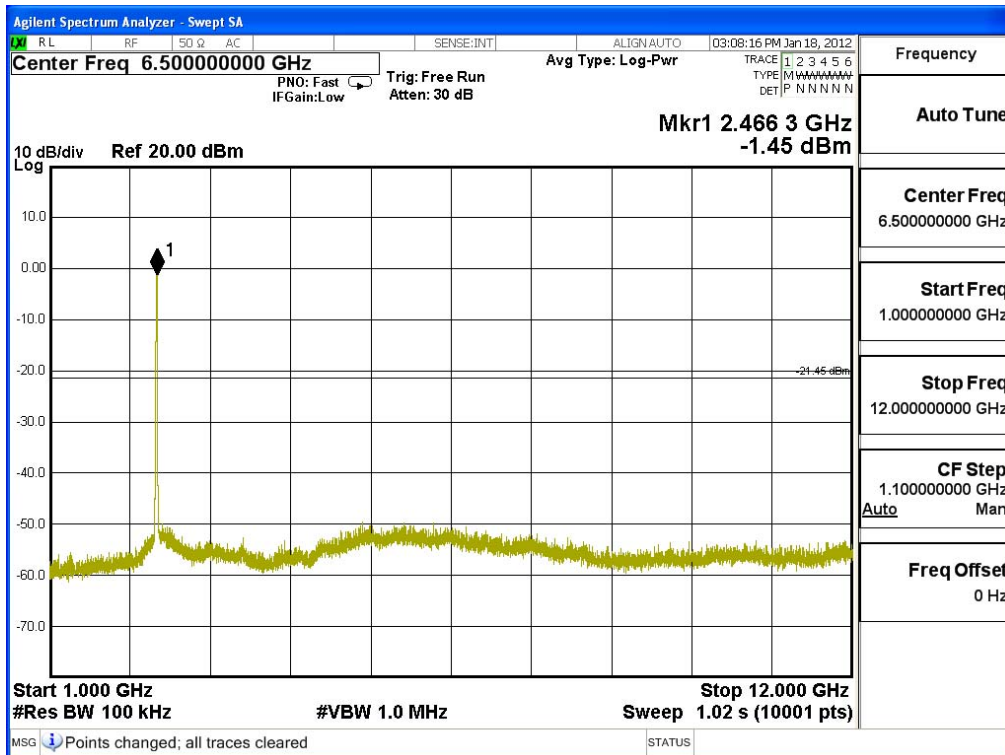
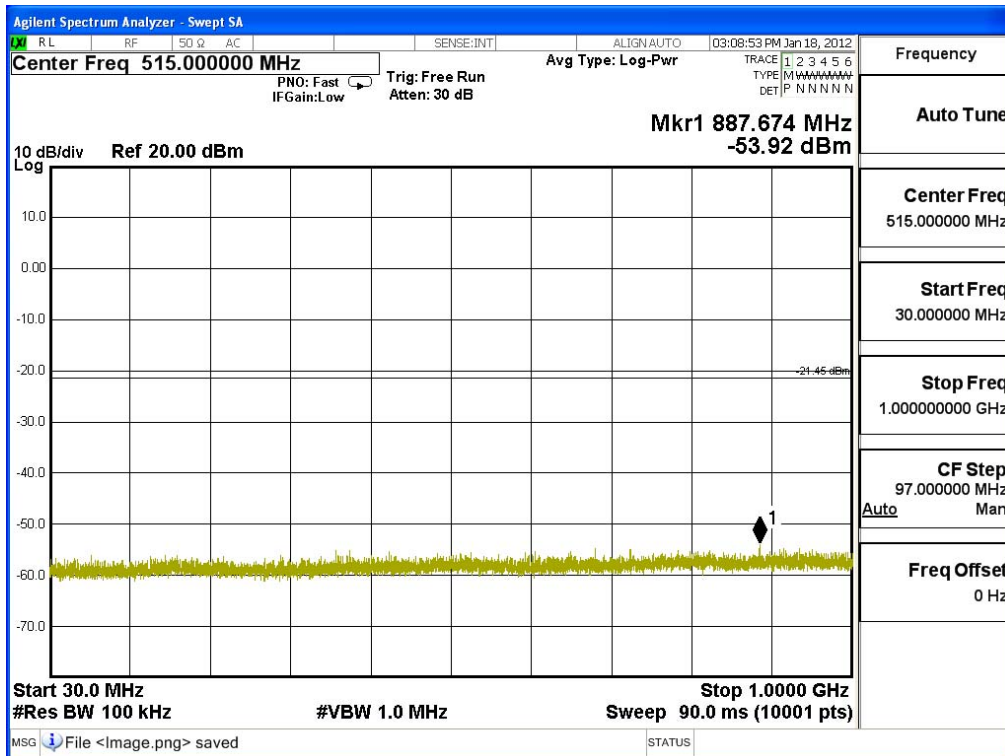


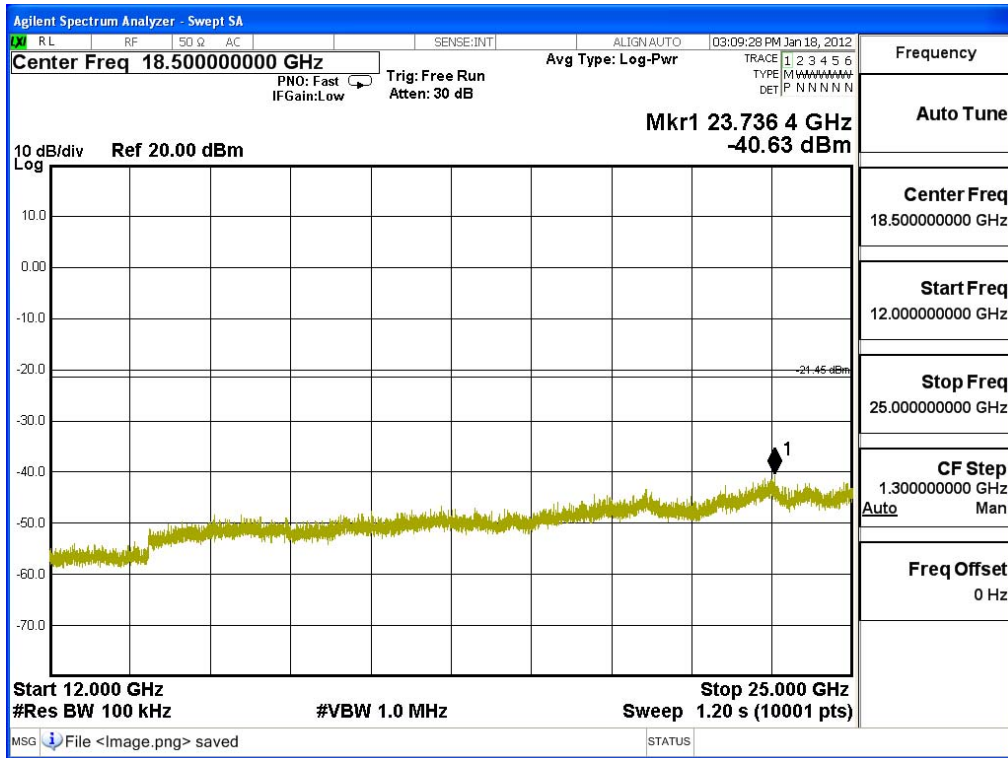
Channel 06 (2437MHz)





Channel 11 (2462MHz)





6. Band Edge

6.1. Test Equipment

RF Conducted Measurement

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

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

Note:

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

RF Radiated Measurement:

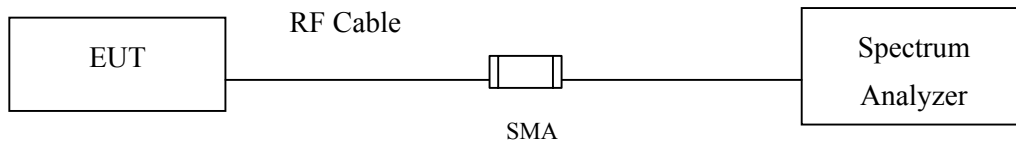
The following test equipments are used during the band edge tests:

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

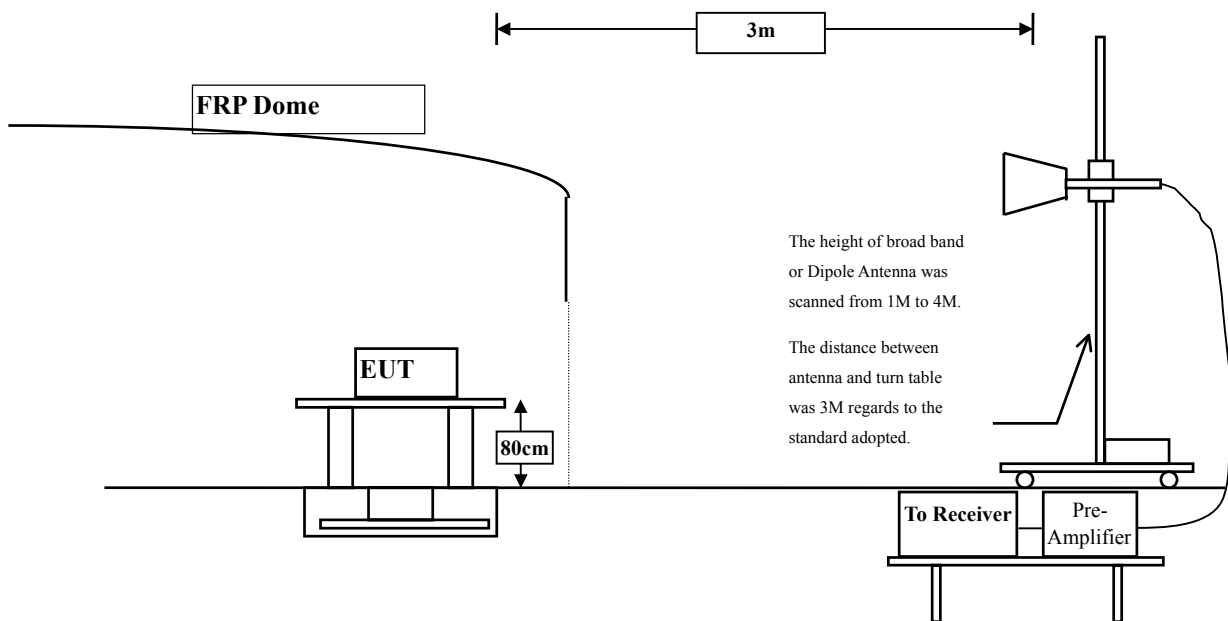
- Note:
1. All instruments are calibrated every one year.
 2. The test instruments marked by “X” are used to measure the final test results.

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 Mar. 2005 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 : MiiNePort W1 series Embedded Serial Device Server
 Test Item : Band Edge Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit (802.11b 1Mbps)

Fundamental Filed Strength

Antenna Pole	Frequency [MHz]	Correction Factor [dB/m]	Reading Level [dBuV]	Emission Level [dBuV/m]	Detector
Horizontal	2412	31.639	60.73	92.368	Peak
Horizontal	2412	31.639	56.71	88.348	Average
Vertical	2412	30.95	72.4	103.349	Peak
Vertical	2412	30.95	68.54	99.489	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	2388.8	92.368	49.07	43.298	74.000	Peak
Horizontal	2386.3	88.348	59.18	29.168	54.000	Average
Vertical	2388.8	103.349	49.07	54.279	74.000	Peak
Vertical	2386.3	99.489	59.18	40.309	54.000	Average

Note:

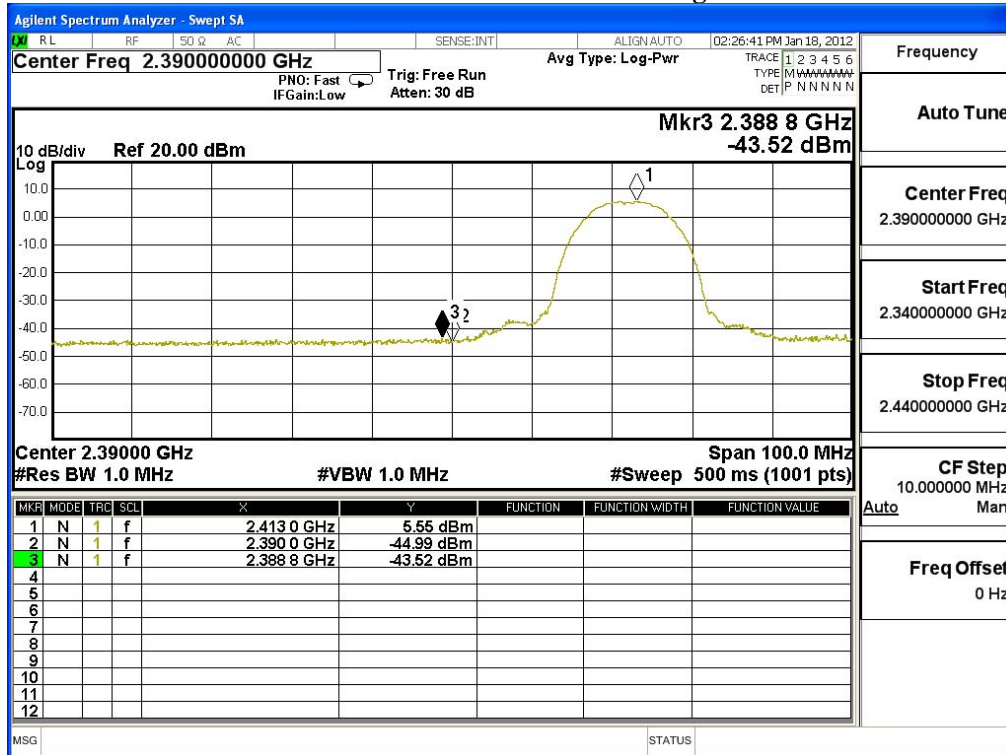
The Band Edge Field Strength was calculated using the Fundamental and Conducted Band Edge measurements per the Marker-Delta Method with the following formula:

Band Edge field Strength = F - Δ

F = Fundamental field Strength (Peak or Average)

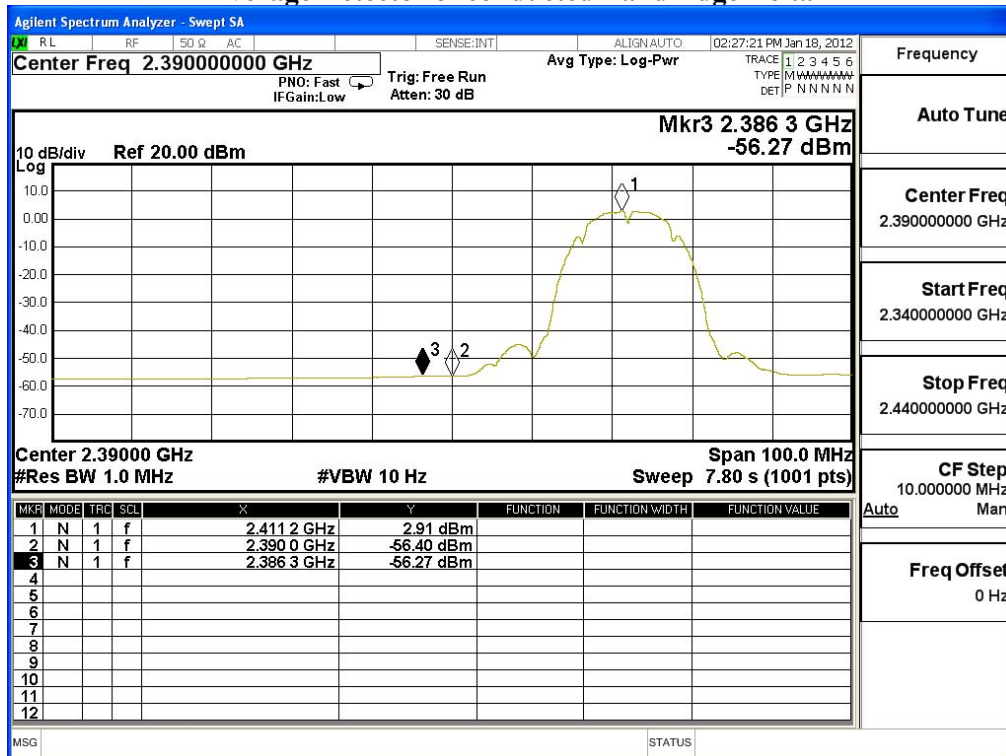
Δ = Conducted Band Edge Delta (Peak or Average)

Peak Detector of conducted Band Edge Delta



Frequency	
Auto Tune	
Center Freq	2.390000000 GHz
Start Freq	2.340000000 GHz
Stop Freq	2.440000000 GHz
CF Step	10.000000 MHz
Auto	Man
Freq Offset	0 Hz

Average Detector of conducted Band Edge Delta



Frequency	
Auto Tune	
Center Freq	2.390000000 GHz
Start Freq	2.340000000 GHz
Stop Freq	2.440000000 GHz
CF Step	10.000000 MHz
Auto	Man
Freq Offset	0 Hz

Product : MiiNePort W1 series Embedded Serial Device Server
 Test Item : Band Edge Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit (802.11b 1Mbps)

Fundamental Filed Strength

Antenna Pole	Frequency [MHz]	Correction Factor [dB/m]	Reading Level [dBuV]	Emission Level [dBuV/m]	Detector
Horizontal	2462	32.019	59.5	91.519	Peak
Horizontal	2462	32.019	55.6	87.619	Average
Vertical	2462	31.29	72.2	103.49	Peak
Vertical	2462	31.29	68.31	99.6	Average

Note: 1:Spectrum Analyzer setting:

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

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

Band Edge Test Data

Antenna Pole	Test Frequency (MHz)	Fundamental (dBuV/m)	Δ (dB)	Band Edge Field Strength (dBuV/m)	Limit (dBuV/m)	Detector
Horizontal	2483.5	91.519	48.98	42.539	74.000	Peak
Horizontal	2483.5	87.619	58.17	29.449	54.000	Average
Vertical	2483.5	103.49	48.98	54.51	74.000	Peak
Vertical	2483.5	99.6	58.17	41.43	54.000	Average

Note:

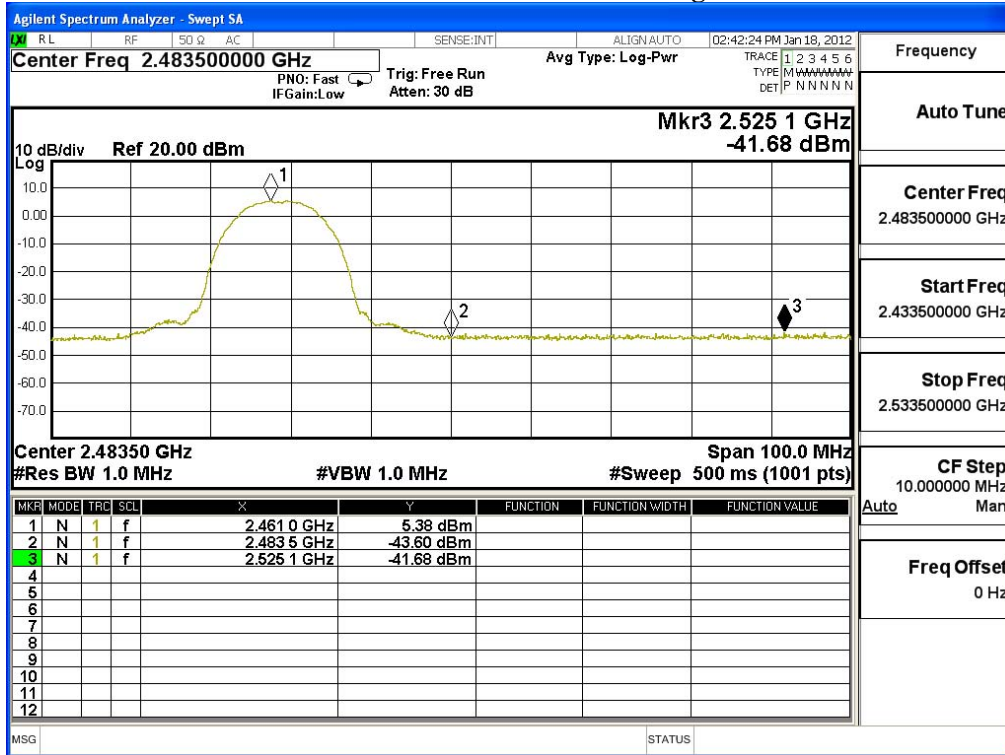
The Band Edge Field Strength was calculated using the Fundamental and Conducted Band Edge measurements per the Marker-Delta Method with the following formula:

Band Edge field Strength = F - Δ

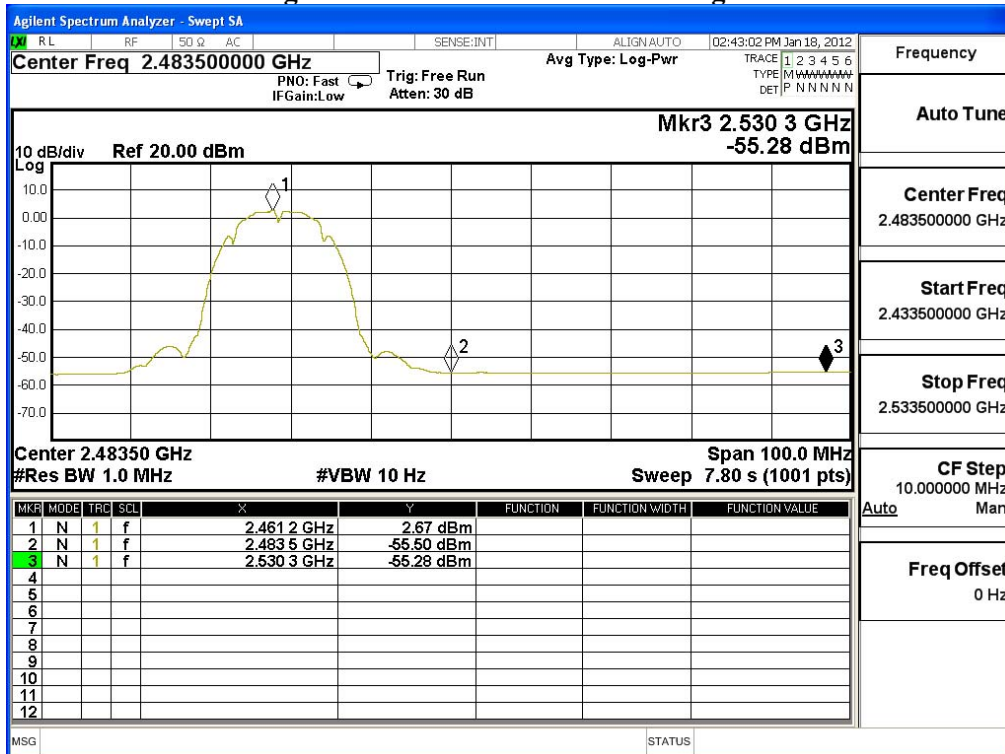
F = Fundamental field Strength (Peak or Average)

Δ = Conducted Band Edge Delta (Peak or Average)

Peak Detector of conducted Band Edge Delta



Average Detector of conducted Band Edge Delta



Product : MiiNePort W1 series Embedded Serial Device Server
 Test Item : Band Edge Data
 Test Site : No.3 OATS
 Test Mode : Mode 2: Transmit (802.11g 6Mbps)

Fundamental Filed Strength

Antenna Pole	Frequency [MHz]	Correction Factor [dB/m]	Reading Level [dBuV]	Emission Level [dBuV/m]	Detector
Horizontal	2412	31.639	62.83	94.468	Peak
Horizontal	2412	31.639	53.39	85.028	Average
Vertical	2412	30.95	74	104.949	Peak
Vertical	2412	30.95	64.52	95.469	Average

Note: 1: Spectrum Analyzer setting:

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

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

Band Edge Test Data

Antenna Pole	Test Frequency (MHz)	Fundamental (dBuV/m)	Δ (dB)	Band Edge Field Strength (dBuV/m)	Limit (dBuV/m)	Detector
Horizontal	2390	94.468	36.51	57.958	74.000	Peak
Horizontal	2390	85.028	47.53	37.498	54.000	Average
Vertical	2390	104.949	36.51	68.439	74.000	Peak
Vertical	2390	95.469	47.53	47.939	54.000	Average

Note:

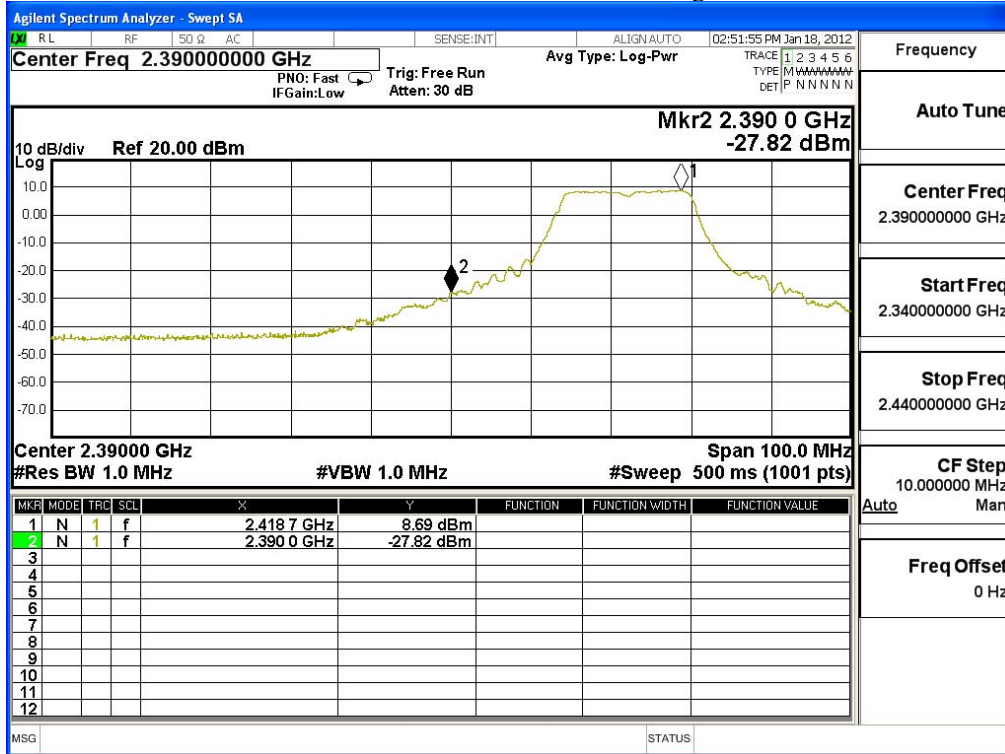
The Band Edge Field Strength was calculated using the Fundamental and Conducted Band Edge measurements per the Marker-Delta Method with the following formula:

Band Edge field Strength = F - Δ

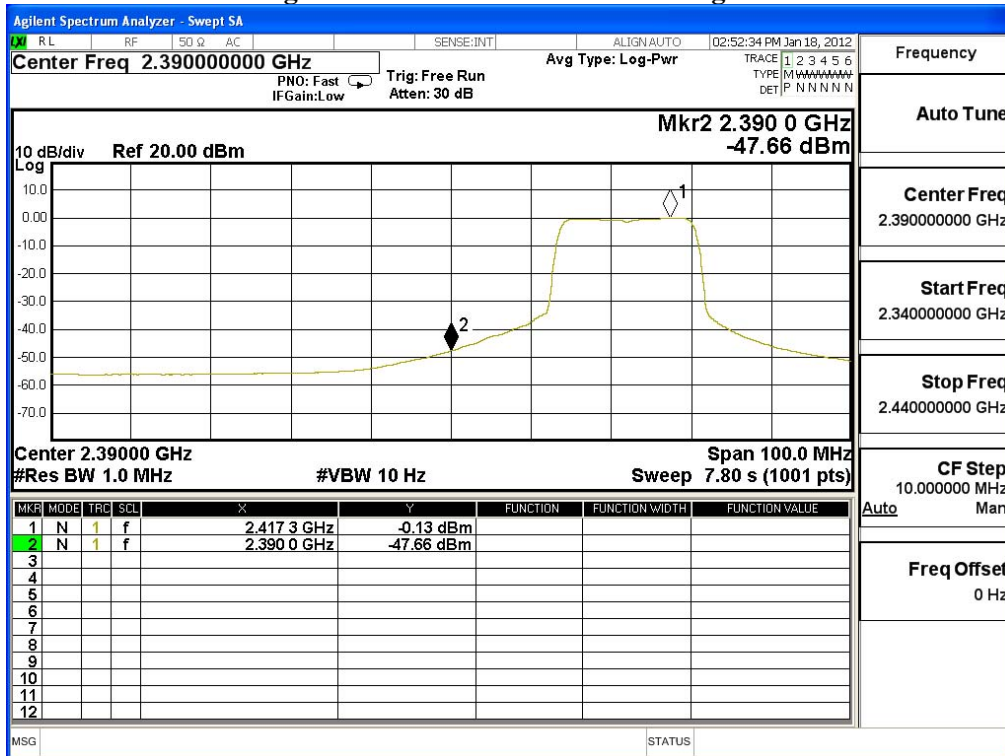
F = Fundamental field Strength (Peak or Average)

Δ = Conducted Band Edge Delta (Peak or Average)

Peak Detector of conducted Band Edge Delta



Average Detector of conducted Band Edge Delta



Product : MiiNePort W1 series Embedded Serial Device Server
 Test Item : Band Edge Data
 Test Site : No.3 OATS
 Test Mode : Mode 2: Transmit (802.11g 6Mbps)

Fundamental Filed Strength

Antenna Pole	Frequency [MHz]	Correction Factor [dB/m]	Reading Level [dBuV]	Emission Level [dBuV/m]	Detector
Horizontal	2462	32.019	61.88	93.899	Peak
Horizontal	2462	32.019	52.38	84.399	Average
Vertical	2462	32.019	74.61	106.629	Peak
Vertical	2462	32.019	65.1	97.119	Average

Note: 1: Spectrum Analyzer setting:

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

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

Band Edge Test Data

Antenna Pole	Test Frequency (MHz)	Fundamental (dBuV/m)	Δ (dB)	Band Edge Field Strength (dBuV/m)	Limit (dBuV/m)	Detector
Horizontal	2483.5	93.899	38.15	55.749	74.000	Peak
Horizontal	2483.5	84.399	49.89	34.509	54.000	Average
Vertical	2483.5	106.629	38.15	68.479	74.000	Peak
Vertical	2483.5	97.119	49.89	47.229	54.000	Average

Note:

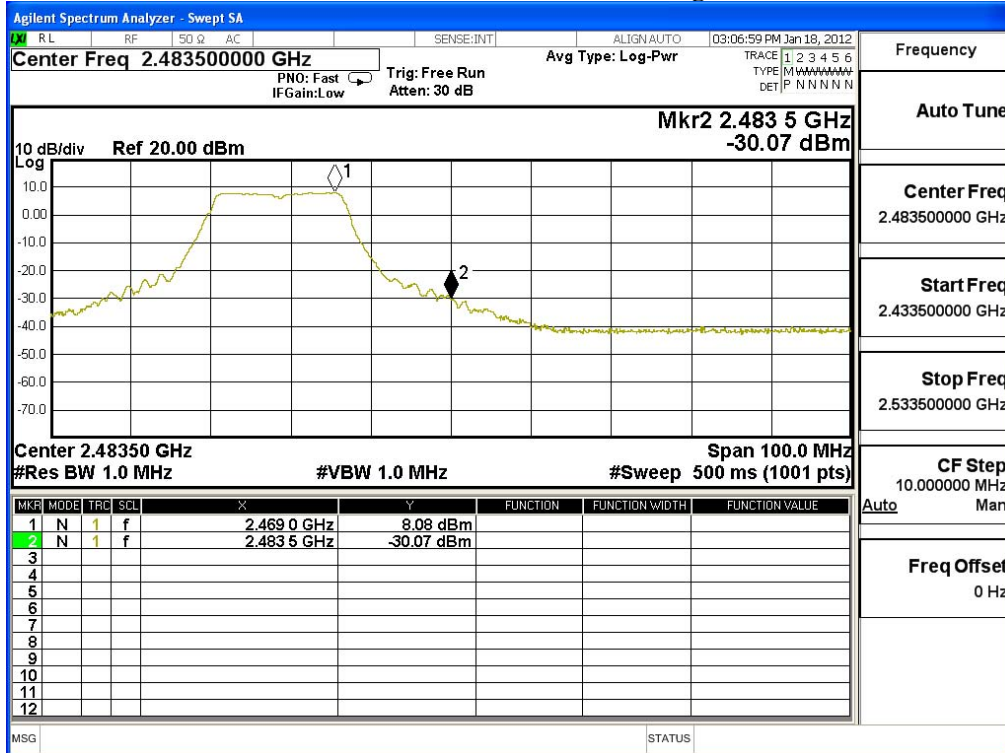
The Band Edge Field Strength was calculated using the Fundamental and Conducted Band Edge measurements per the Marker-Delta Method with the following formula:

Band Edge field Strength = F - Δ

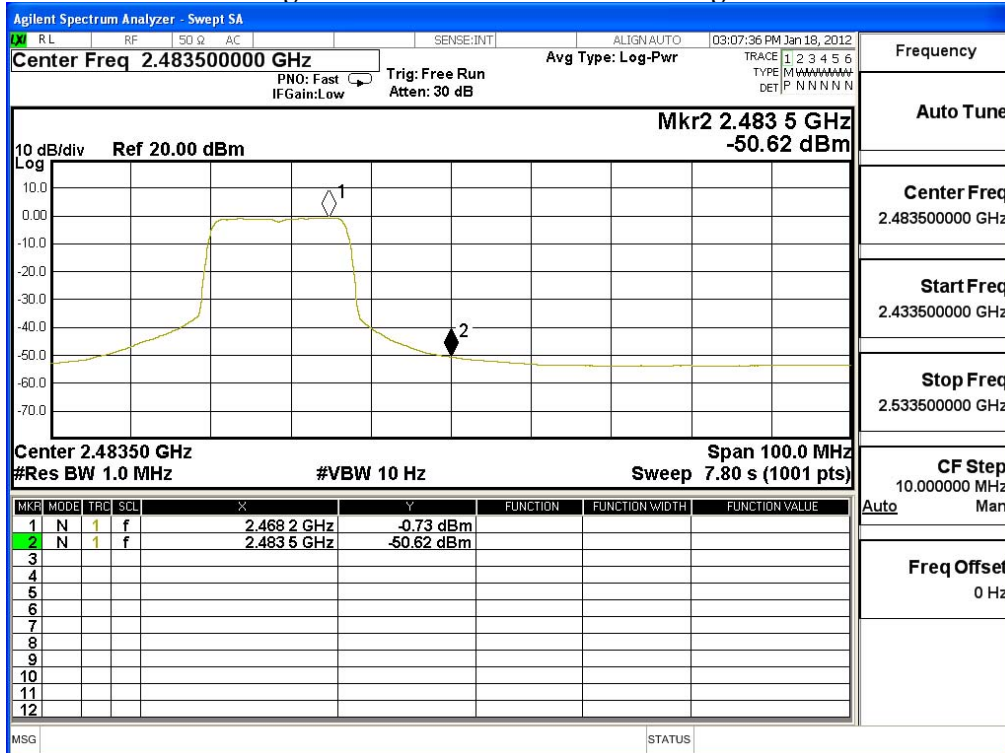
F = Fundamental field Strength (Peak or Average)

Δ = Conducted Band Edge Delta (Peak or Average)

Peak Detector of conducted Band Edge Delta



Average Detector of conducted Band Edge Delta



7. Occupied Bandwidth

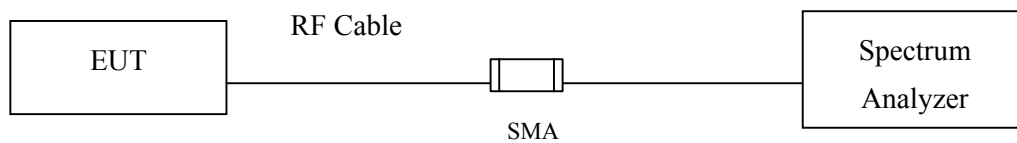
7.1. Test Equipment

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

Note:

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

7.2. Test Setup



7.3. Limits

The minimum bandwidth shall be at least 500 kHz.

7.4. Test Procedure

The EUT was setup according to ANSI C63.4, 2003; tested according to DTS test procedure of Mar. 2005 KDB558074 for compliance to FCC 47CFR 15.247 requirements.

Set RBW = 100 kHz, Span greater than RBW.

7.5. Uncertainty

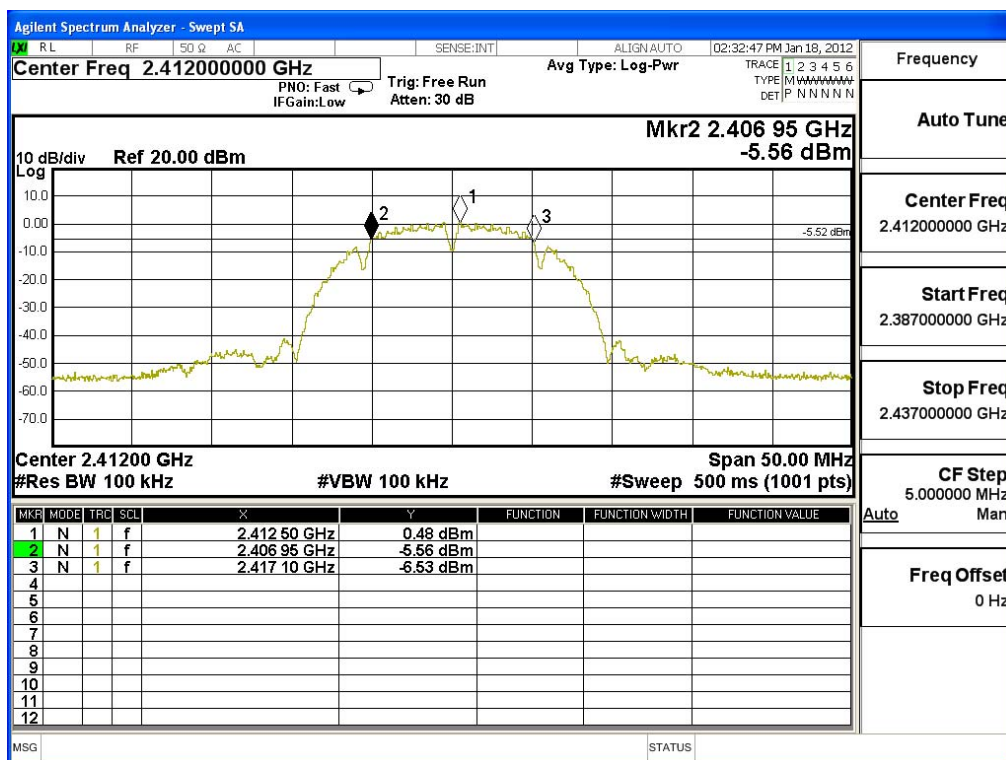
± 150Hz

7.6. Test Result of Occupied Bandwidth

Product : MiiNePort W1 series Embedded Serial Device Server
 Test Item : Occupied Bandwidth Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit (802.11b 1Mbps) (2412MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
1	2412	10150	>500	Pass

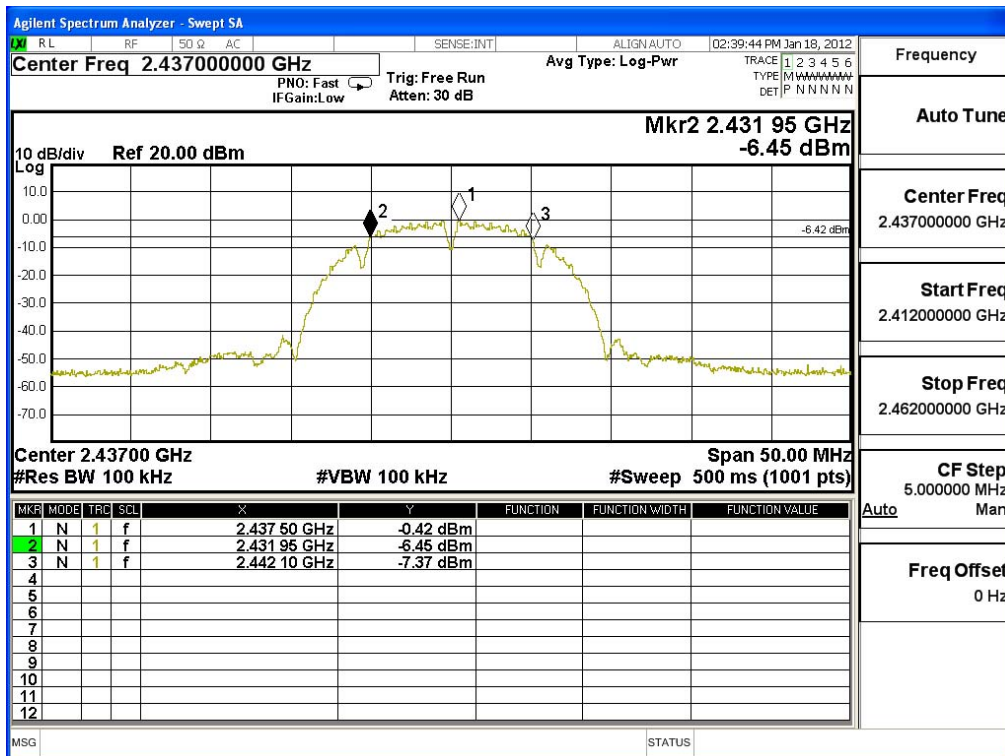
Figure Channel 1:



Product : MiiNePort W1 series Embedded Serial Device Server
 Test Item : Occupied Bandwidth Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit (802.11b 1Mbps) (2437MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
6	2437	10150	>500	Pass

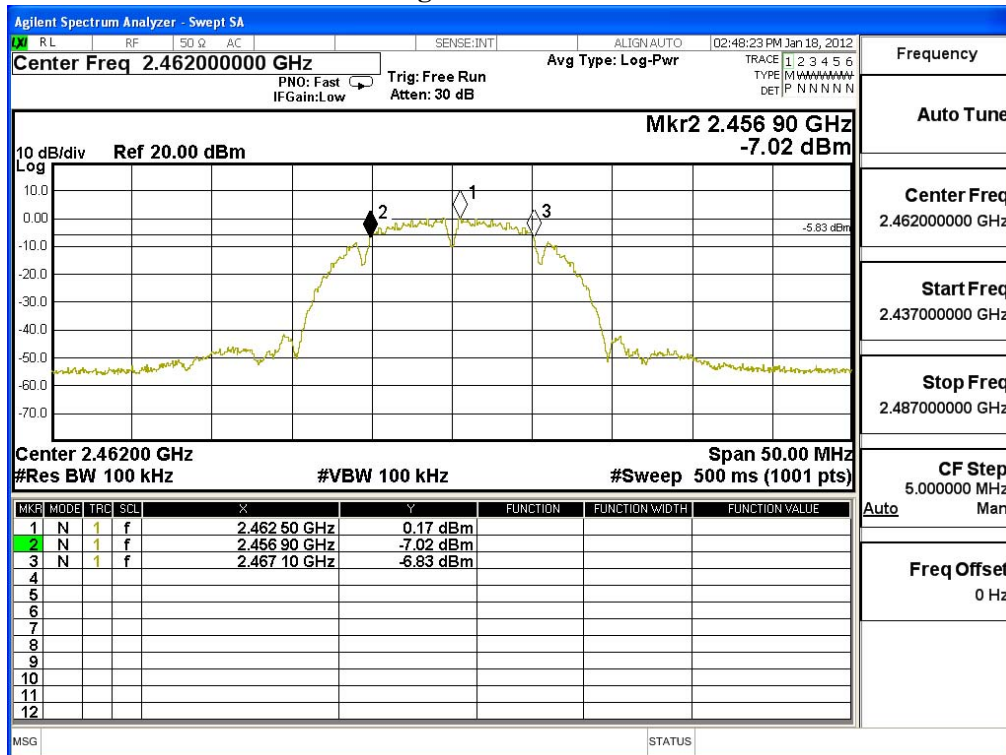
Figure Channel 6:



Product : MiiNePort W1 series Embedded Serial Device Server
 Test Item : Occupied Bandwidth Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit (802.11b 1Mbps) (2462MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
11	2462	10200	>500	Pass

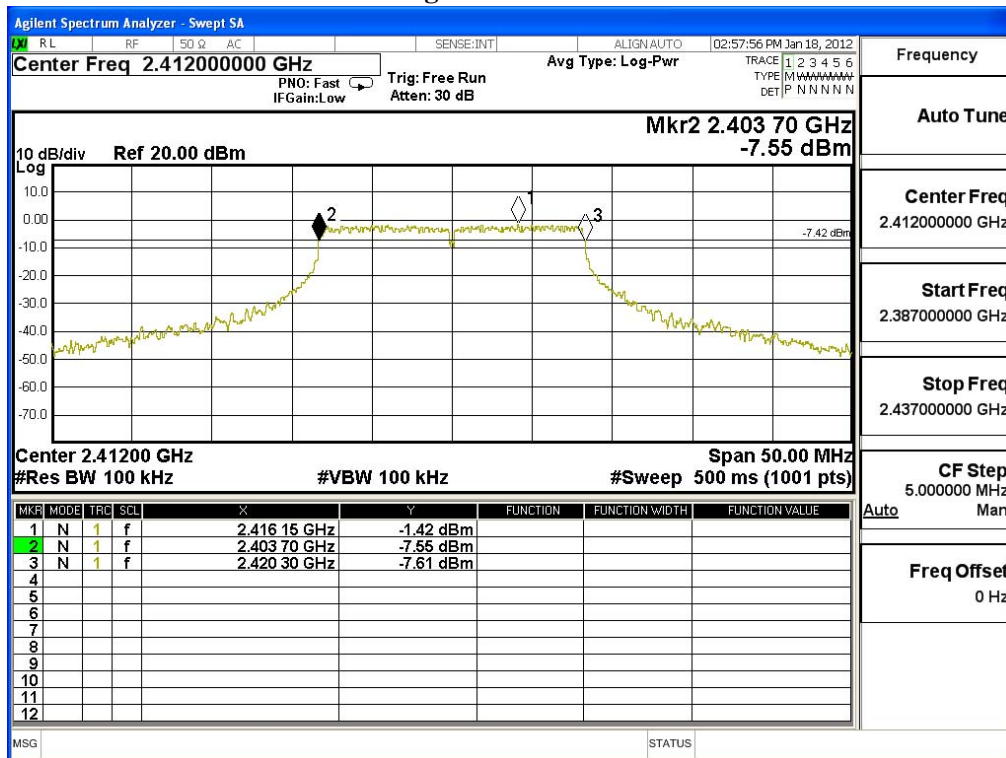
Figure Channel 11:



Product : MiiNePort W1 series Embedded Serial Device Server
 Test Item : Occupied Bandwidth Data
 Test Site : No.3 OATS
 Test Mode : Mode 2: Transmit (802.11g 6Mbps) (2412MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
1	2412	16600	>500	Pass

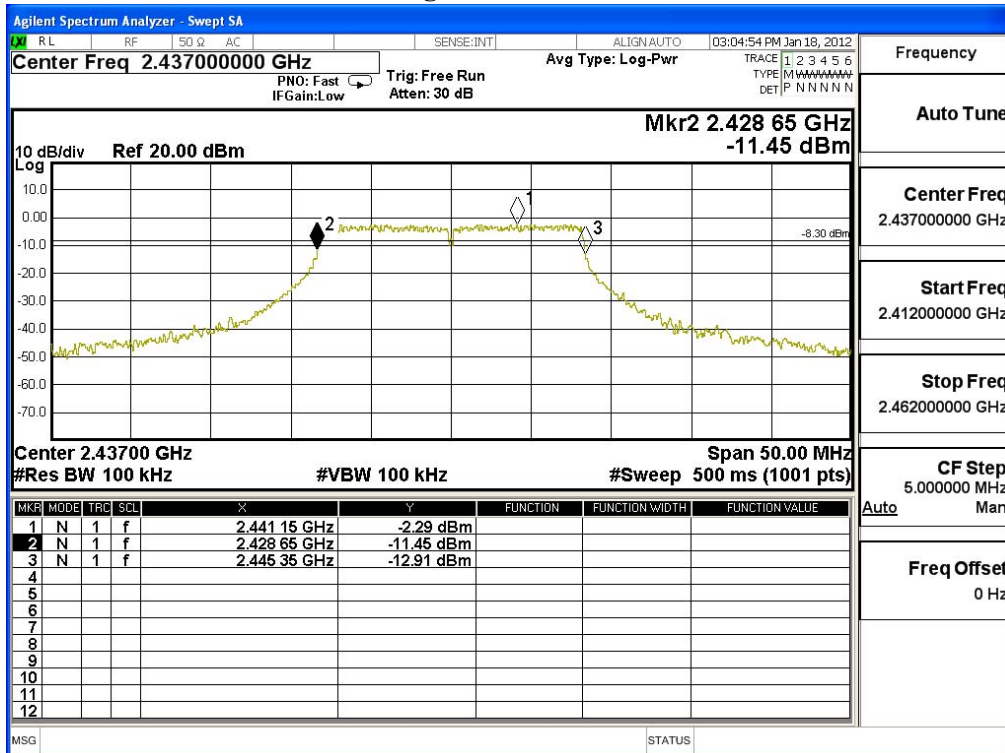
Figure Channel 1:



Product : MiiNePort W1 series Embedded Serial Device Server
 Test Item : Occupied Bandwidth Data
 Test Site : No.3 OATS
 Test Mode : Mode 2: Transmit (802.11g 6Mbps) (2437MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
6	2437	16700	>500	Pass

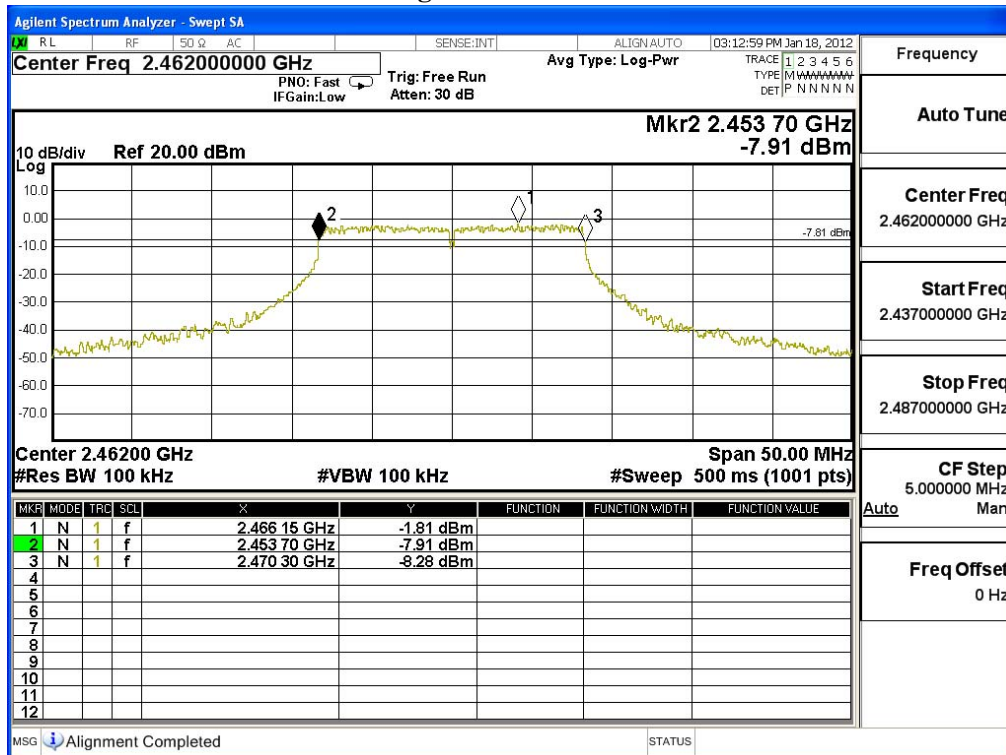
Figure Channel 6:



Product : MiiNePort W1 series Embedded Serial Device Server
 Test Item : Occupied Bandwidth Data
 Test Site : No.3 OATS
 Test Mode : Mode 2: Transmit (802.11g 6Mbps) (2462MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
11	2462	16600	>500	Pass

Figure Channel 11:



8. Power Density

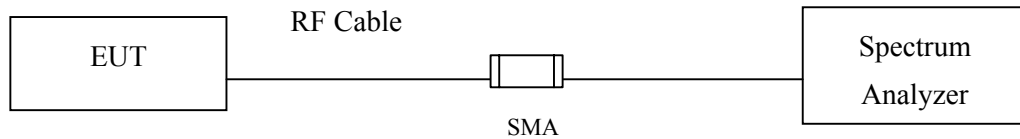
8.1. Test Equipment

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

Note:

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

8.2. Test Setup



8.3. Limits

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

8.4. Test Procedure

The EUT was setup according to ANSI C63.4, 2003; tested according to DTS test procedure of Mar. 2005 KDB558074 for compliance to FCC 47CFR 15.247 requirements.

Set RBW= 3 kHz, VBW=10KHz, Sweep time=(SPAN/3KHz), detector=Peak detector

8.5. Uncertainty

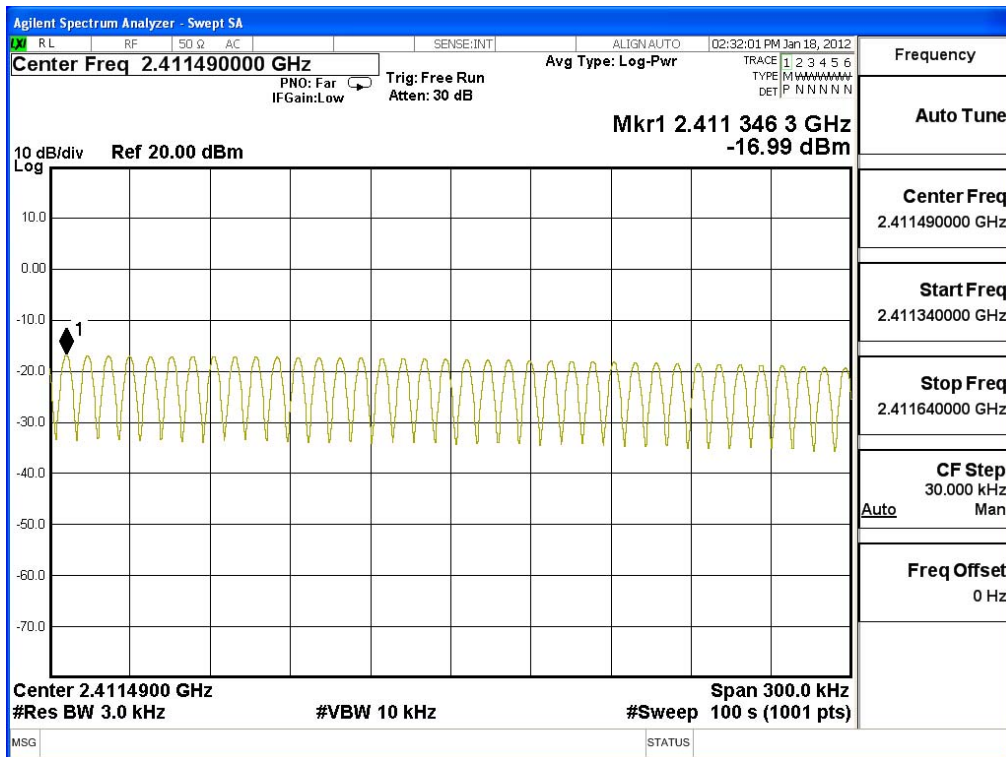
± 1.27 dB

8.6. Test Result of Power Density

Product : MiiNePort W1 series Embedded Serial Device Server
 Test Item : Power Density Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit (802.11b 1Mbps) (2412MHz)

Channel No.	Frequency (MHz)	Measure Level (dBm)	Limit (dBm)	Result
1	2412	-16.990	< 8dBm	Pass

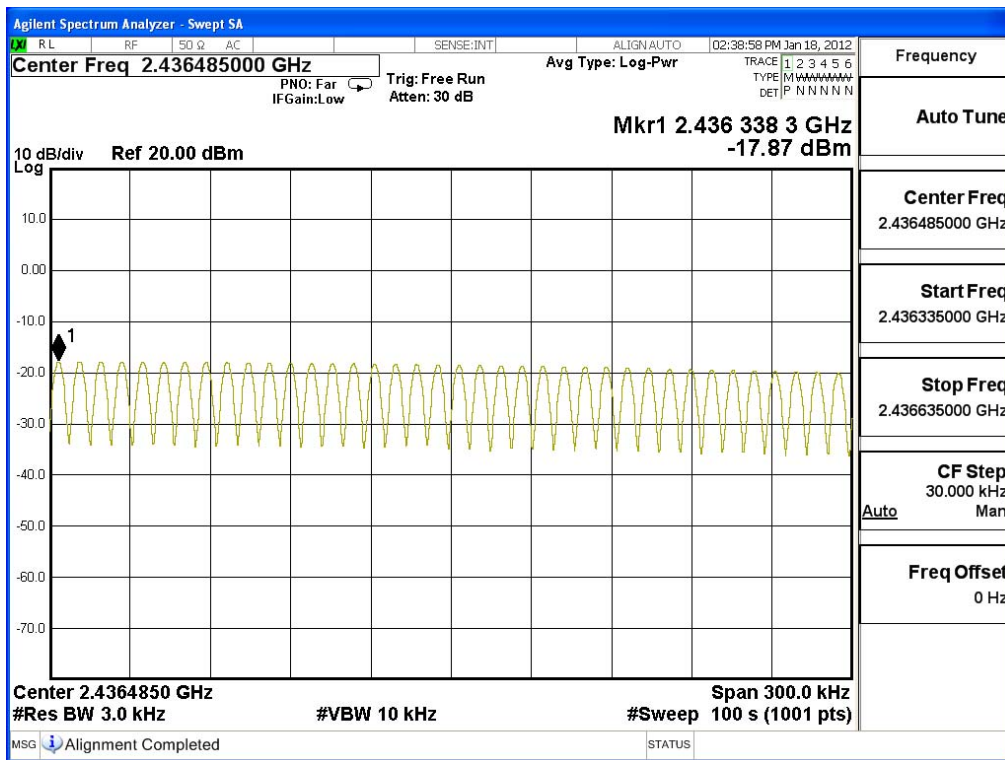
Figure Channel 1:



Product : MiiNePort W1 series Embedded Serial Device Server
 Test Item : Power Density Data
 Test Site : No.3OATS
 Test Mode : Mode 1: Transmit (802.11b 1Mbps) (2437MHz)

Channel No.	Frequency (MHz)	Measurement Level (dBm)	Required Limit (dBm)	Result
6	2437	-17.870	< 8dBm	Pass

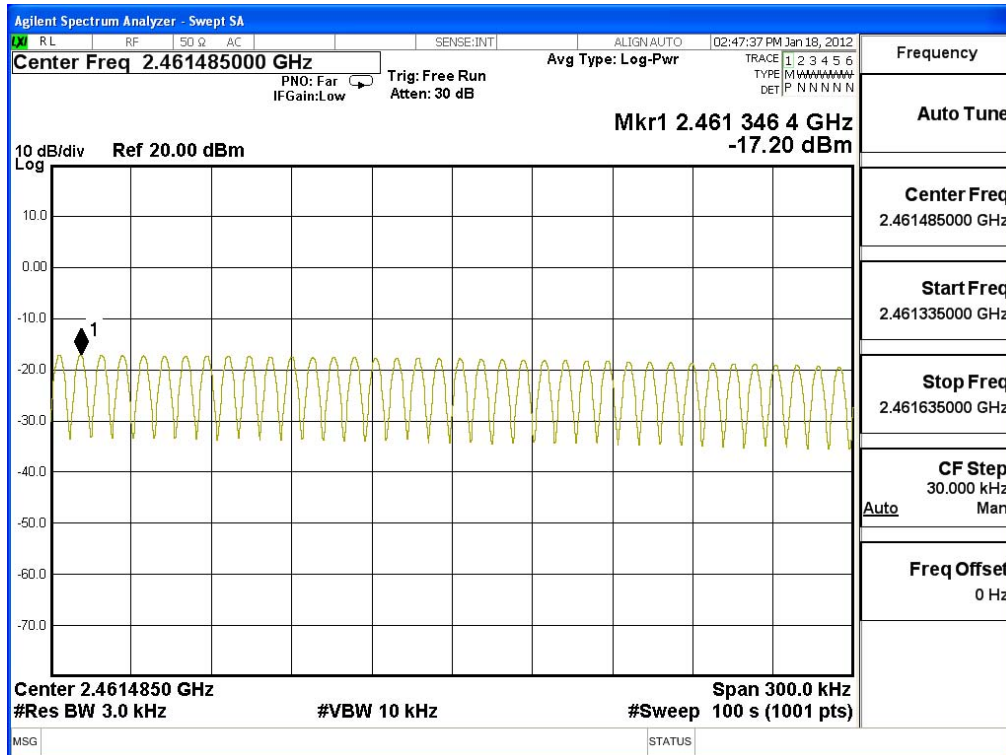
Figure Channel 6:



Product : MiiNePort W1 series Embedded Serial Device Server
 Test Item : Power Density Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit (802.11b 1Mbps) (2462MHz)

Channel No.	Frequency (MHz)	Measurement Level (dBm)	Required Limit (dBm)	Result
11	2462	-17.200	< 8dBm	Pass

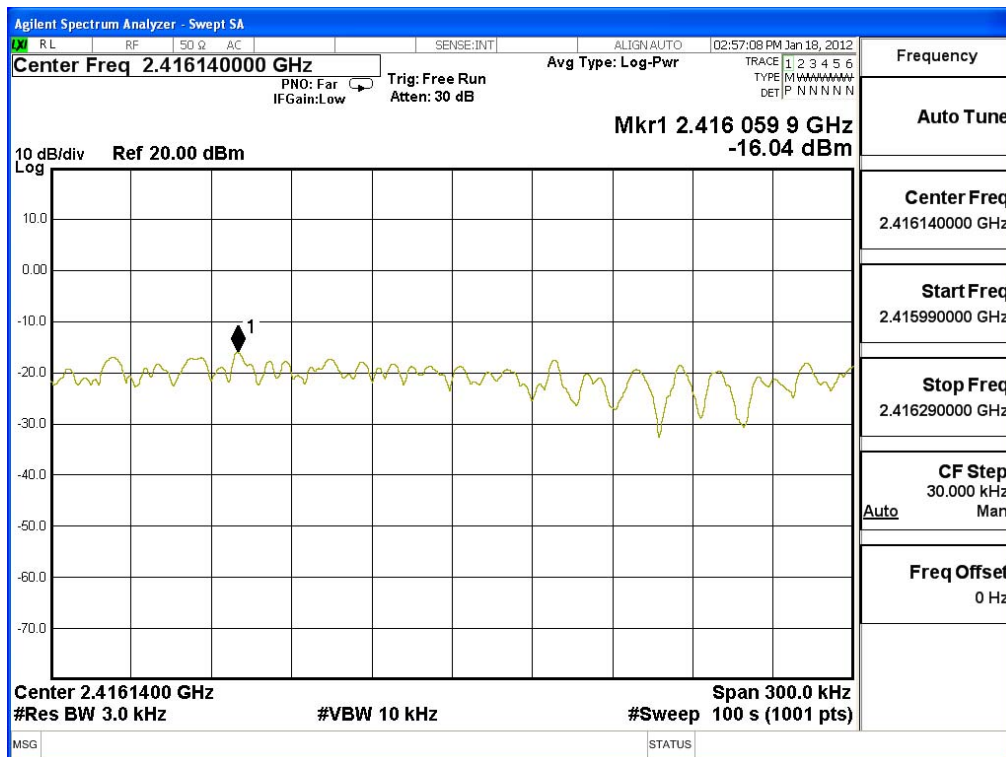
Figure Channel 11:



Product : MiiNePort W1 series Embedded Serial Device Server
 Test Item : Power Density Data
 Test Site : No.3 OATS
 Test Mode : Mode 2: Transmit (802.11g 6Mbps) (2412MHz)

Channel No.	Frequency (MHz)	Measure Level (dBm)	Limit (dBm)	Result
1	2412	-16.040	< 8dBm	Pass

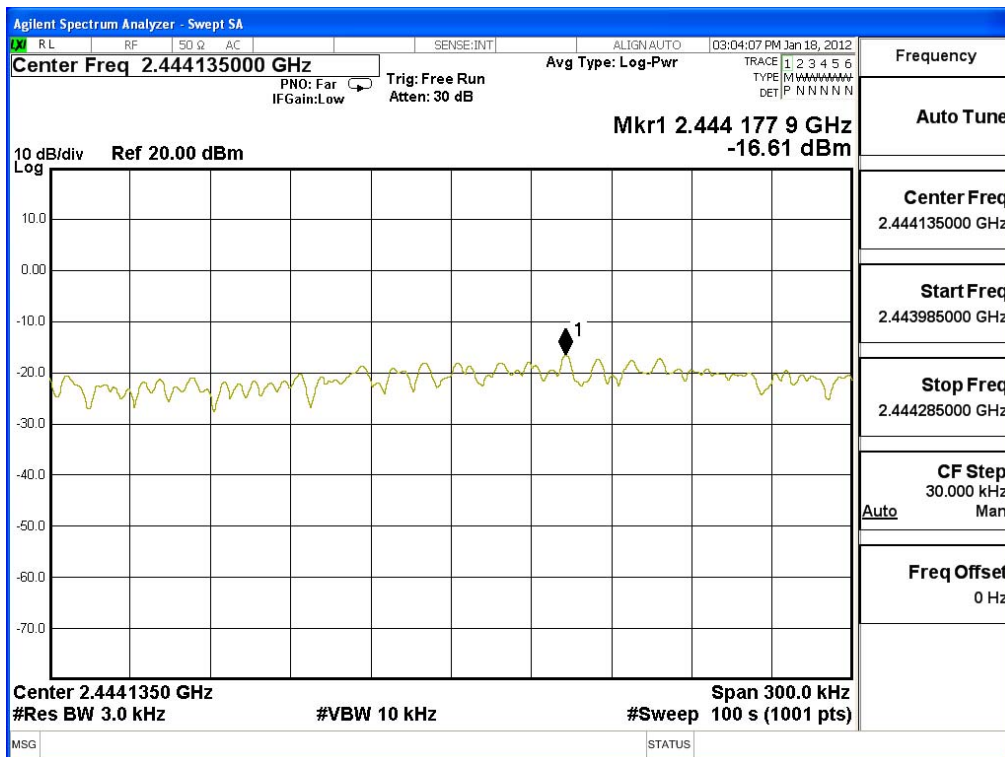
Figure Channel 1:



Product : MiiNePort W1 series Embedded Serial Device Server
 Test Item : Power Density Data
 Test Site : No.3OATS
 Test Mode : Mode 2: Transmit (802.11g 6Mbps) (2437MHz)

Channel No.	Frequency (MHz)	Measurement Level (dBm)	Required Limit (dBm)	Result
6	2437	-16.610	< 8dBm	Pass

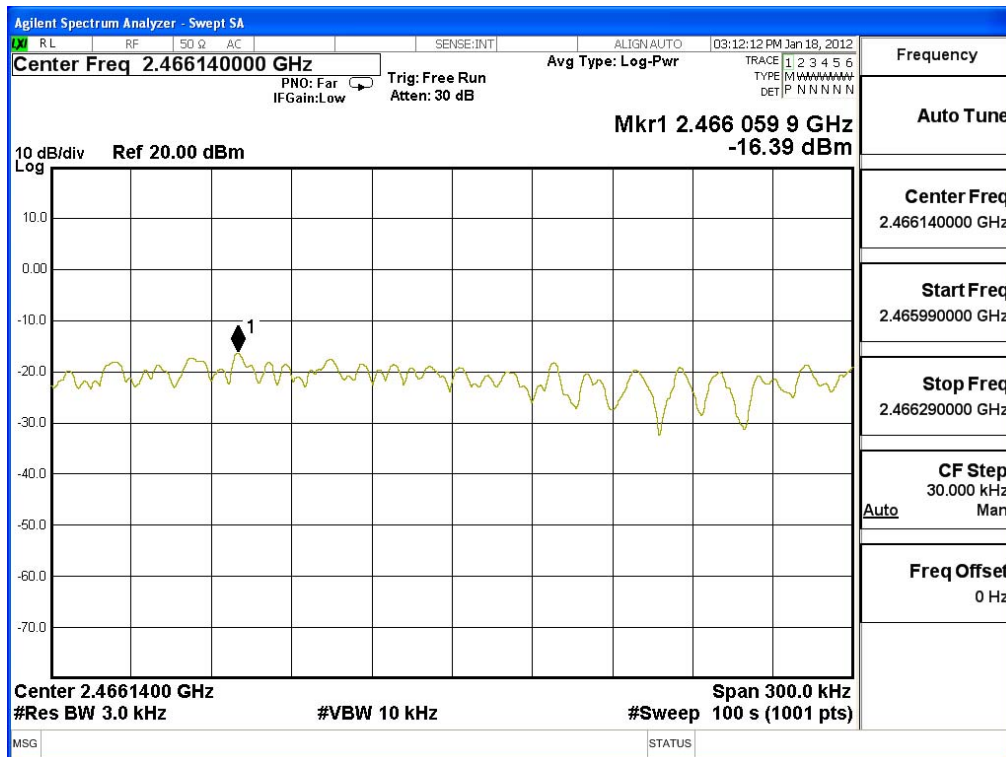
Figure Channel 6:



Product : MiiNePort W1 series Embedded Serial Device Server
 Test Item : Power Density Data
 Test Site : No.3 OATS
 Test Mode : Mode 2: Transmit (802.11g 6Mbps) (2462MHz)

Channel No.	Frequency (MHz)	Measurement Level (dBm)	Required Limit (dBm)	Result
11	2462	-16.390	< 8dBm	Pass

Figure Channel 11:



9. EMI Reduction Method During Compliance Testing

No modification was made during testing.

Attachment 1: EUT Test Photographs

Attachment 2: EUT Detailed Photographs