



Test Report

Product Name	MOXA IEEE802.11 a/b/g mini PCI module
Model No	WAPA004
FCC ID	SLE-WAPA004

Applicant	MOXA Inc.
Address	4TH FL 135 LANE 235 PAO CHIAO RD SHING TIEN DISTRICT NEW TAIPEI CITY

Date of Receipt	Nov. 22, 2012
Issued Date	Jan. 31, 2013
Report No.	12B363R-RFUSP36V01
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

Issued Date: Jan. 31, 2013

Report No.: 12B363R-RFUSP36V01



Product Name	MOXA IEEE802.11 a/b/g mini PCI module
Applicant	MOXA Inc.
Address	4TH FL 135 LANE 235 PAO CHIAO RD SHING TIEN DISTRICT NEW TAIPEI CITY
Manufacturer	MOXA Inc.
Model No.	WAPA004
FCC ID.	SLE-WAPA004
EUT Rated Voltage	DC 3.3V (Power by PCI-E)
EUT Test Voltage	AC 120V/60Hz
Trade Name	MOXA
Applicable Standard	FCC CFR Title 47 Part 90.350 Subpart M
Test Result	Complied

The Test Results relate only to the samples tested.

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

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

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

Tested By : 
(Engineer / Alan Chen)

Approved By : 
(Manager / Vincent Lin)

TABLE OF CONTENTS

Description	Page
1. GENERAL INFORMATION	5
1.1. EUT Description.....	5
1.2. Operational Description	7
1.3. Tested System Details.....	8
1.4. Configuration of tested System	8
1.5. EUT Exercise Software	8
1.6. Test Facility	9
2. Modulation Characteristics	10
2.1. Test Equipment.....	10
2.2. Test Setup	10
2.3. Limits	10
2.4. Test Procedur	10
2.5. Uncertainty	10
2.6. Test Result of Modulation Characteristics.....	11
3. Emission Bandwidth.....	12
3.1. Test Equipment.....	12
3.2. Test Setup	12
3.3. Limits	12
3.4. Test Procedur	12
3.5. Uncertainty	12
3.6. Test Result of Emission Bandwidth	13
4. Transmitter output power and Conclusion of worst-case	15
4.1. Test Equipment.....	15
4.2. Test Setup	15
4.3. Limits	15
4.4. Test Procedur	16
4.5. Uncertainty	16
4.6. Test Result of Peak Transmit Power and Conclusion of worst-case	17
5. Transmit Spectrum Mask	18
5.1. Test Equipment.....	18
5.2. Test Setup	18
5.3. Limits	18
5.4. Test Procedure	19
5.5. Uncertainty	19
5.6. Test Result of Transmit Spectrum Mask	20
6. Transmitter Conducted Unwanted Emissions	22
6.1. Test Equipment.....	22
6.2. Test Setup	22
6.3. Limits	22
6.4. Test Procedure	22
6.5. Uncertainty	22
6.6. Test Result of Transmitter Conducted Unwanted Emissions	23
7. Frequency Stability.....	32

7.1.	Test Equipment.....	32
7.2.	Test Setup	32
7.3.	Limits	32
7.4.	Test Procedure	33
7.5.	Uncertainty	33
7.6.	Test Result of Frequency Stability.....	34
8.	Radiated Spurious Emission.....	37
8.1.	Test Equipment.....	37
8.2.	Test Setup	37
8.3.	Limits	39
8.4.	Test Procedure	39
8.5.	Uncertainty	39
8.6.	Test Result of Radiated Emission.....	40
9.	EMI Reduction Method During Compliance Testing	46
Attachment 1: EUT Test Photographs		
Attachment 2: EUT Detailed Photographs		

1. GENERAL INFORMATION

1.1. EUT Description

Product Name	MOXA IEEE802.11 a/b/g mini PCI module
Trade Name	MOXA
FCC ID.	SLE-WAPA004
Model No.	WAPA004
Frequency Range	5860-5900MHz
Number of Channels	10MHz: 5CH
Data Rate	up to 27Mbps
Channel Control	Auto
Type of Modulation	OFDM: BPSK, QPSK, 16QAM, 64QAM
Antenna type	Dipole
Antenna Gain	Refer to the table "Antenna List"

Antenna List

No.	Manufacturer	Model No.	Peak Gain
1	KINSUN	ANT-WDB-O-2 BK (main) ANT-WDB-O-2 BK (aux)	2.34dBi in 5.9GHz
2	KINSUN	ANT-WDB-ANM-0502 (main) ANT-WDB-ANM-0502 (aux)	1.41dBi in 5.9GHz

- 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.

Center Working Frequency of Each Channel: (10MHz Bandwidth)

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
Channel 172:	5860MHz	Channel 174:	5870MHz	Channel 176:	5880MHz	Channel 178:	5890MHz
Channel 180:	5900MHz						

Note:

1. This device is a mini PCI module with a built-in WLAN transceiver.
2. The device is applied for modular approval.
3. Regarding to the operation frequency, the lowest and highest frequency are selected to perform the test. Lowest and highest data rates are tested in each mode. Only worst case is shown in the report.
4. These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with FCC Part 90.350 Subpart M.

Test Mode	Mode 1: Transmit (10MHz Bandwidth)+Antenna 1
-----------	--

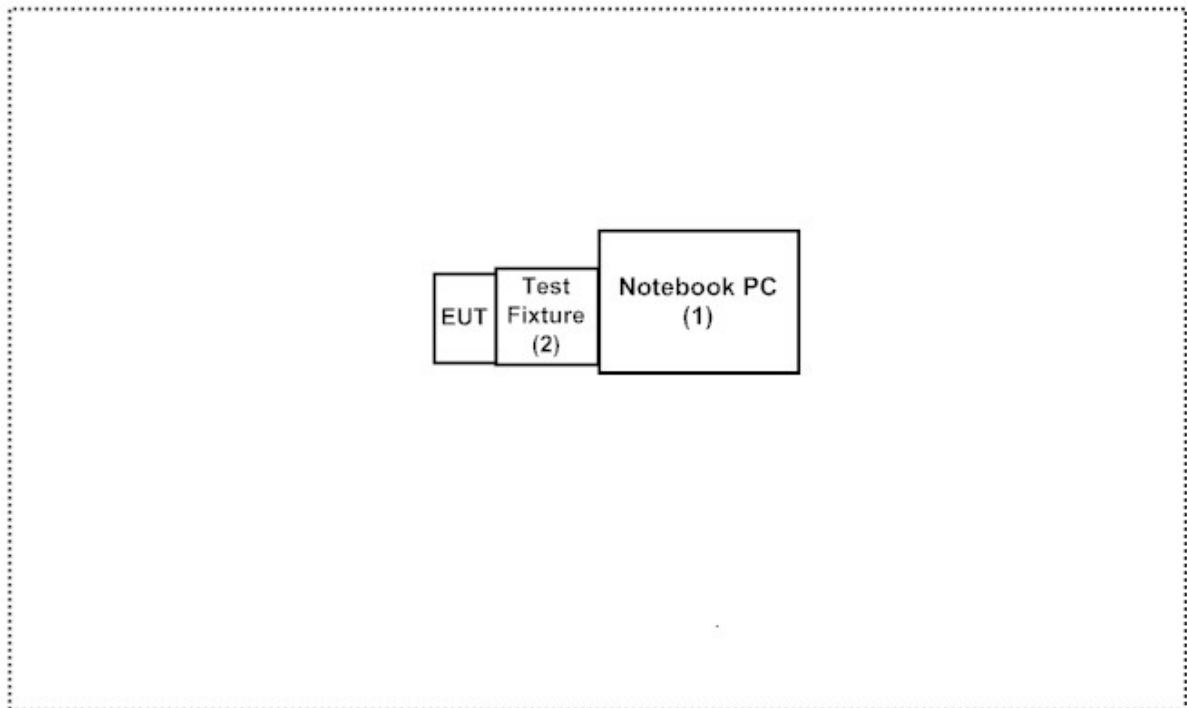
1.3. Tested System Details

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

Product	Manufacturer	Model No.	Serial No.	Power Cord
1 Notebook PC	DELL	PPT	N/A	Non-Shielded, 0.8m
2 Test Fixture	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 ("ART.EXE") 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://tw.quietek.com/modules/myalbum/>

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. Modulation Characteristics

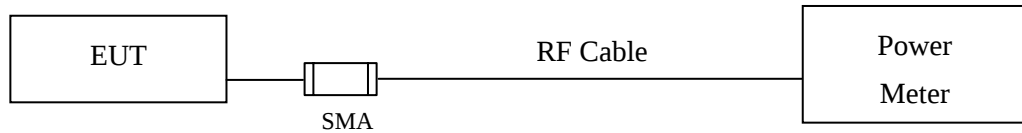
2.1. Test Equipment

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

Note:

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

2.2. Test Setup



2.3. Limits

N/A

2.4. Test Procedure

The EUT was setup according to ASTM E2213-03 DSRC Table3, 2.1047 and 90.207 requirements.

2.5. Uncertainty

± 1.27 dB

2.6. Test Result of Modulation Characteristics

Product : MOXA IEEE802.11 a/b/g mini PCI module
Test Item : Modulation Characteristics
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit (10MHz Bandwidth)+Antenna 1

Data Rate (M bits/s)	Modulation
3	BPSK
4.5	BPSK
6	QPSK
9	QPSK
12	16QAM
18	16QAM
24	64QAM
27	64QAM

3. Emission Bandwidth

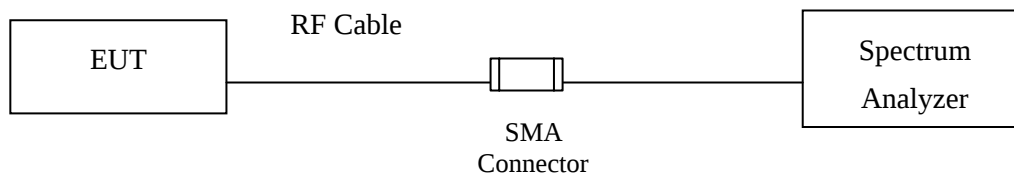
3.1. Test Equipment

	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.

3.2. Test Setup



3.3. Limits

N/A

3.4. Test Procedure

The EUT was setup according to ASTM E2213-03 DSRC and FCC 47CFR 2.1049 requirements.

3.5. Uncertainty

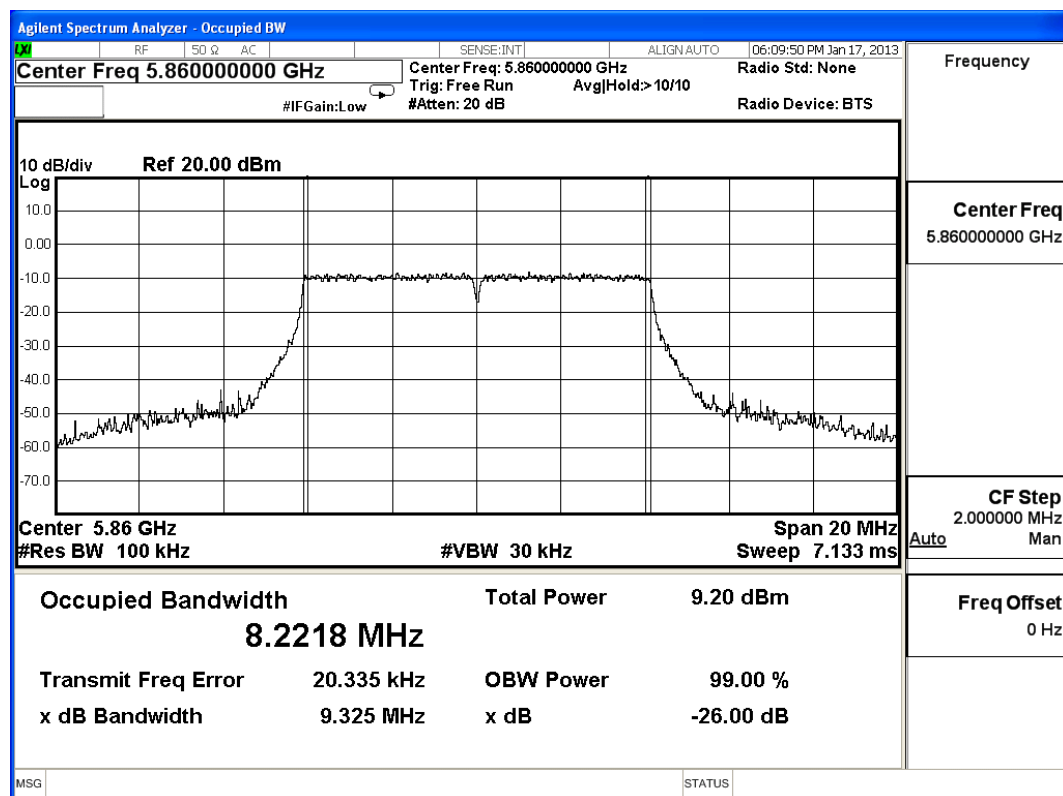
± 1.27 dB

3.6. Test Result of Emission Bandwidth

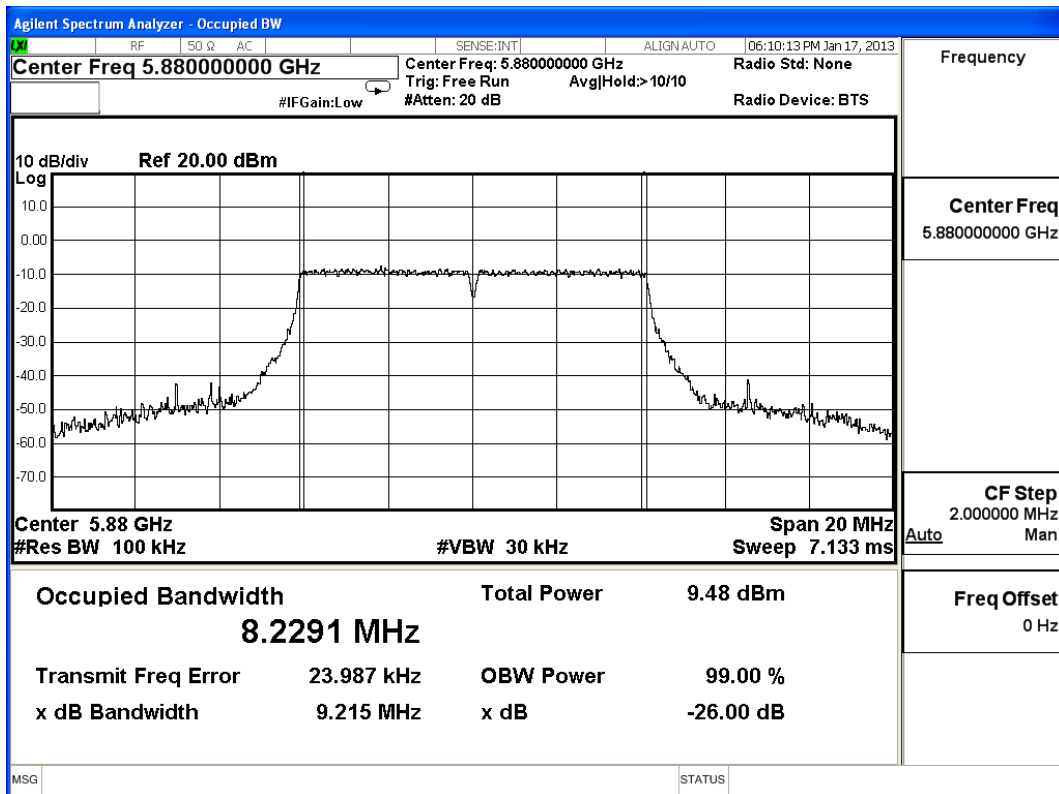
Product : MOXA IEEE802.11 a/b/g mini PCI module
 Test Item : Emission Bandwidth
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit (10MHz Bandwidth)+Antenna 1

Channel No.	Frequency (MHz)	Measurement Level (MHz)
172	5860	8.2218
176	5880	8.2291
180	5900	8.2230

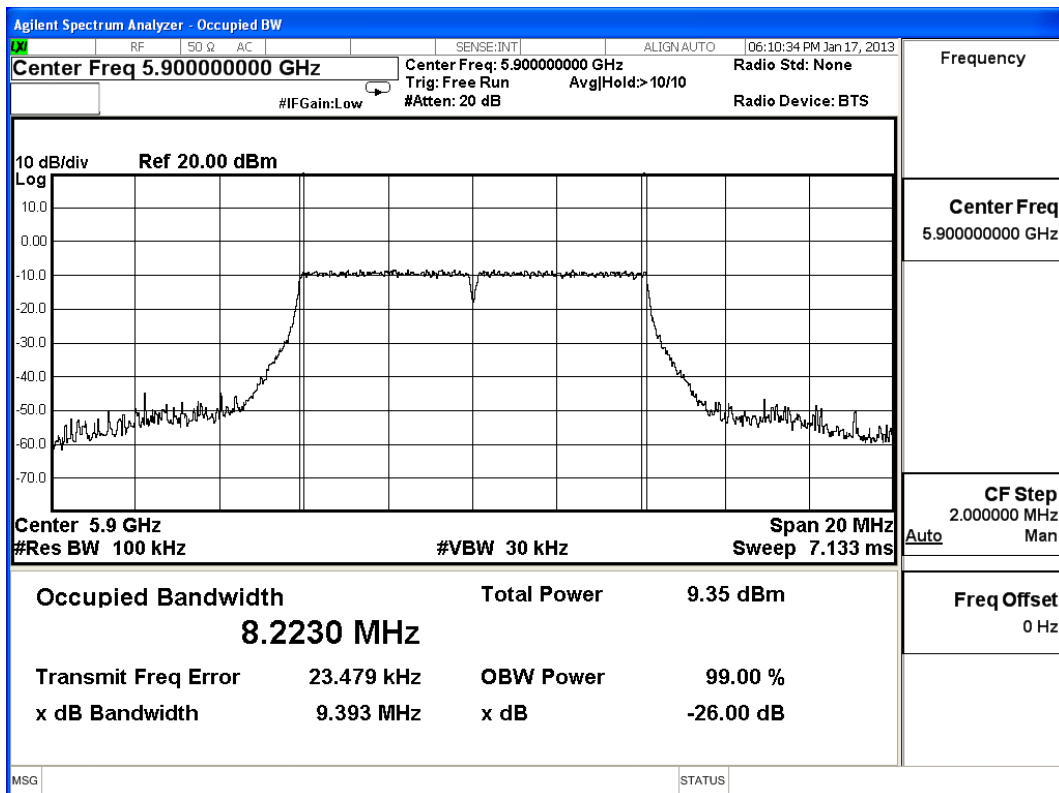
5860MHz



5880MHz



5900MHz



4. Transmitter output power and Conclusion of worst-case

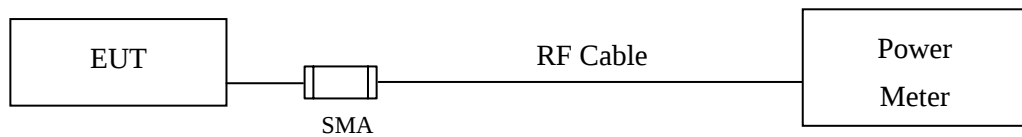
4.1. Test Equipment

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

Note:

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

4.2. Test Setup



4.3. Limits

§ 90.377: The transmitting power of stations operating in the 5855-5915 MHz band must not exceed the maximum limits in this section.

Channel bandwidth (MHz)	Band width	Limit (dBm)
5855-5885	10	33(e.i.r.p)
5885-5895	10	33(e.i.r.p)
5895-5915	10	23(e.i.r.p)
5855-5875	20	20(e.i.r.p)

*Refer as ASTM E2213-03 Clause 8.9.1 and FCC Part 90.377.

4.4. Test Procedur

The peak transmit power is measured as a conducted emission over any interval of continuous transmission calibrated in terms of an RMS-equivalent voltage. Data for the measured power is shown here. There is only one antenna intended for this application.

The antenna gain is entered into the table and the maximum EIRP levels computed against the limit

4.5. Uncertainty

± 1.27 dB

4.6. Test Result of Peak Transmit Power and Conclusion of worst-case

Product : MOXA IEEE802.11 a/b/g mini PCI module
 Test Item : Peak Transmit Power and Conclusion of worst-case
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit (10MHz Bandwidth)+Antenna 1

Peak Transmit Power - 10MHz Bandwidth

Antenna port A

Cable loss=1dB		Maximum conducted output power								
Channel No.	Frequency (MHz)	Data Rate (Mbps)								Required Limit
		3	4.5	6	9	12	18	24	27	
		Measurement Level (dBm)								
172	5860	11.35	--	--	--	--	--	--	--	<20dBm
176	5880	11.32	11.28	11.1	10.89	10.55	10.21	9.88	9.56	<20dBm
180	5900	11.21	--	--	--	--	--	--	--	<20dBm

Antenna port B

Cable loss=1dB		Maximum conducted output power								
Channel No.	Frequency (MHz)	Data Rate (Mbps)								Required Limit
		3	4.5	6	9	12	18	24	27	
		Measurement Level (dBm)								
172	5860	10.90	--	--	--	--	--	--	--	<20dBm
176	5880	10.84	10.58	10.43	10.14	10.02	9.88	9.64	9.32	<20dBm
180	5900	10.75	--	--	--	--	--	--	--	<20dBm

E.I.R.P (Antenna port A)

Channel No.	Frequency (MHz)	Measurement Level (dBm)	E.I.R.P. (dBm)	Required Limit (dBm)	Result
172	5860	11.35	13.69	<33	Pass
176	5880	11.32	13.66	<33	Pass
180	5900	11.21	13.55	<23	Pass

5. Transmit Spectrum Mask

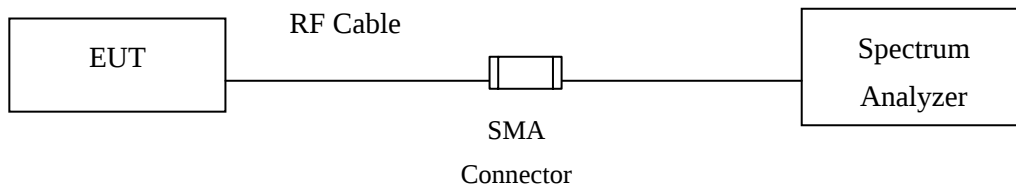
5.1. Test Equipment

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
X	Spectrum Analyzer	R&S	FSP40 / 100170	Jun, 2013
	Spectrum Analyzer	Agilent	E4407B / US39440758	Jun, 2012
	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



5.3. Limits

The EUT was setup according to ASTM E2213-03 DSRC and 90.379.

TABLE 9 DSRC Device Classes and Transmit Power Levels^A

Device Class	Maximum Device Output Power, dBm
A	0
B	10
C	20
D	28.8 or more

^A From IEEE 802.11a. Copyright 1999 IEEE. All rights reserved.

TABLE 10 DSRC Spectrum Mask^A

NOTE—Reduction in Power Spectral Density, dBr.

Class	± 4.5-MHz Offset	± 5.0-MHz Offset	± 5.5-MHz Offset	± 10-MHz Offset	± 15-MHz Offset
Class A	0	-10	-20	-28	-40
Class B	0	-16	-20	-28	-40
Class C	0	-26	-32	-40	-50
Class D	0	-35	-45	-55	-65

^A From IEEE 802.11a. Copyright 1999 IEEE. All rights reserved.

5.4. Test Procedure

The 0 dBr level is the maximum power spectral density measured in the channel. The measurements of transmit spectral density are made using 100 kHz resolution bandwidth and 30 kHz video bandwidth.

5.5. Uncertainty

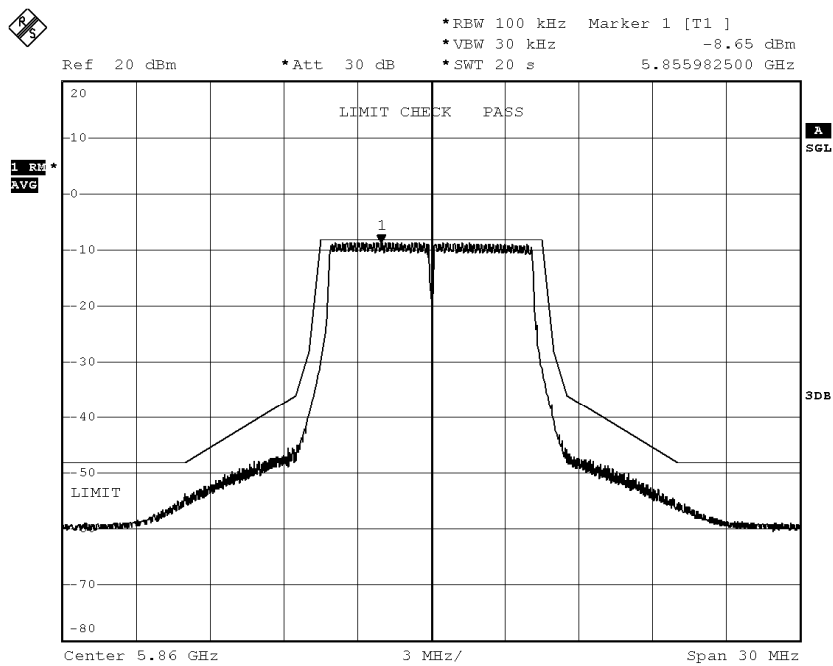
± 1.27 dB

5.6. Test Result of Transmit Spectrum Mask

Product : MOXA IEEE802.11 a/b/g mini PCI module
 Test Item : Transmit Spectrum Mask
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit (10MHz Bandwidth)+Antenna 1

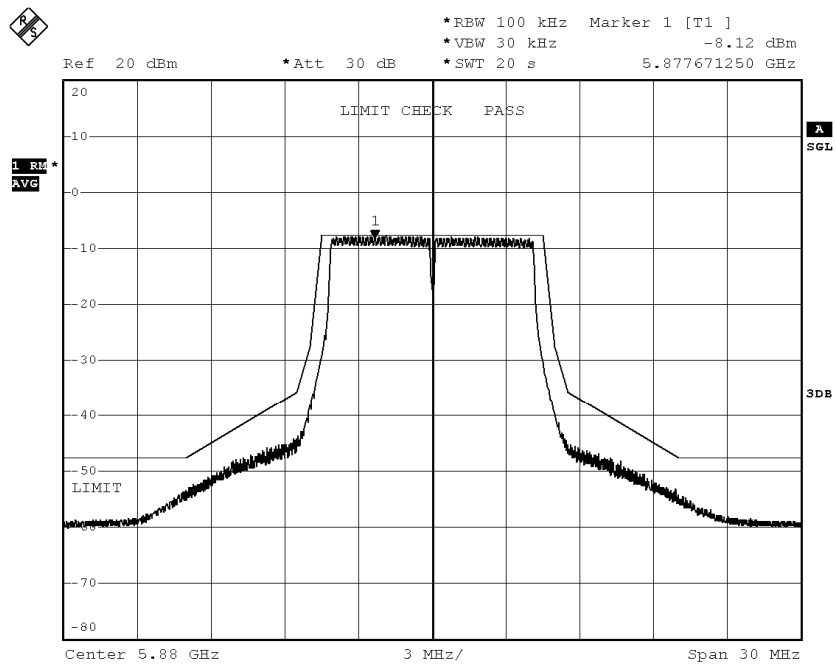
Transmit Spectrum Mask - 10MHz Bandwidth

Channel 172



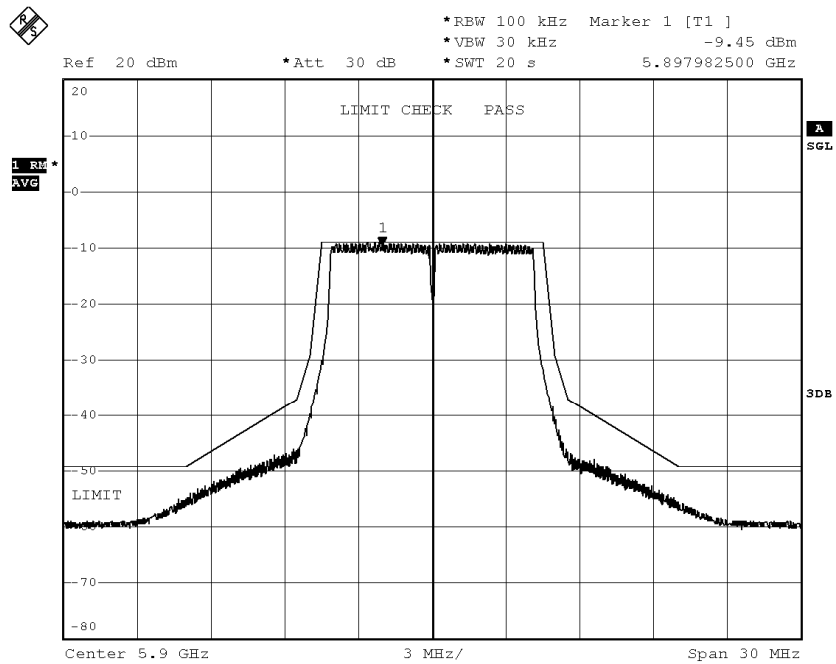
Date: 11.JAN.2003 05:33:12

Channel 176



Date: 11.JAN.2003 05:21:36

Channel 180



Date: 11.JAN.2003 05:34:51

6. Transmitter Conducted Unwanted Emissions

6.1. Test Equipment

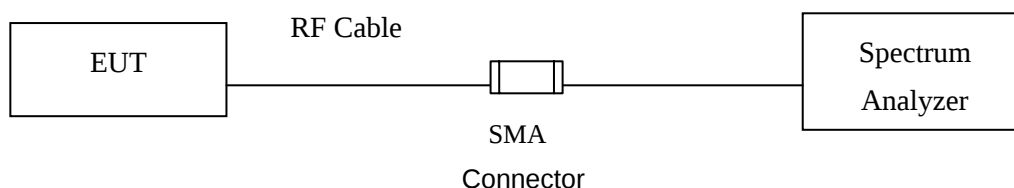
	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
X	Spectrum Analyzer	R&S	FSP40 / 100170	Jun, 2013
	Spectrum Analyzer	Agilent	E4407B / US39440758	Jun, 2012
X	Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2012

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.

6.2. Test Setup

Conduction Power Measurement



6.3. Limits

The power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least $[55 + 10 \log (P)]$ (-25dBm).

Note. Refer as ASTM E2213-03 Clause 8.9.2.

6.4. Test Procedure

Refer as ASTM E2213-03 Clause 8.9.2 for conducted measurement

6.5. Uncertainty

± 1.27 dB

6.6. Test Result of Transmitter Conducted Unwanted Emissions

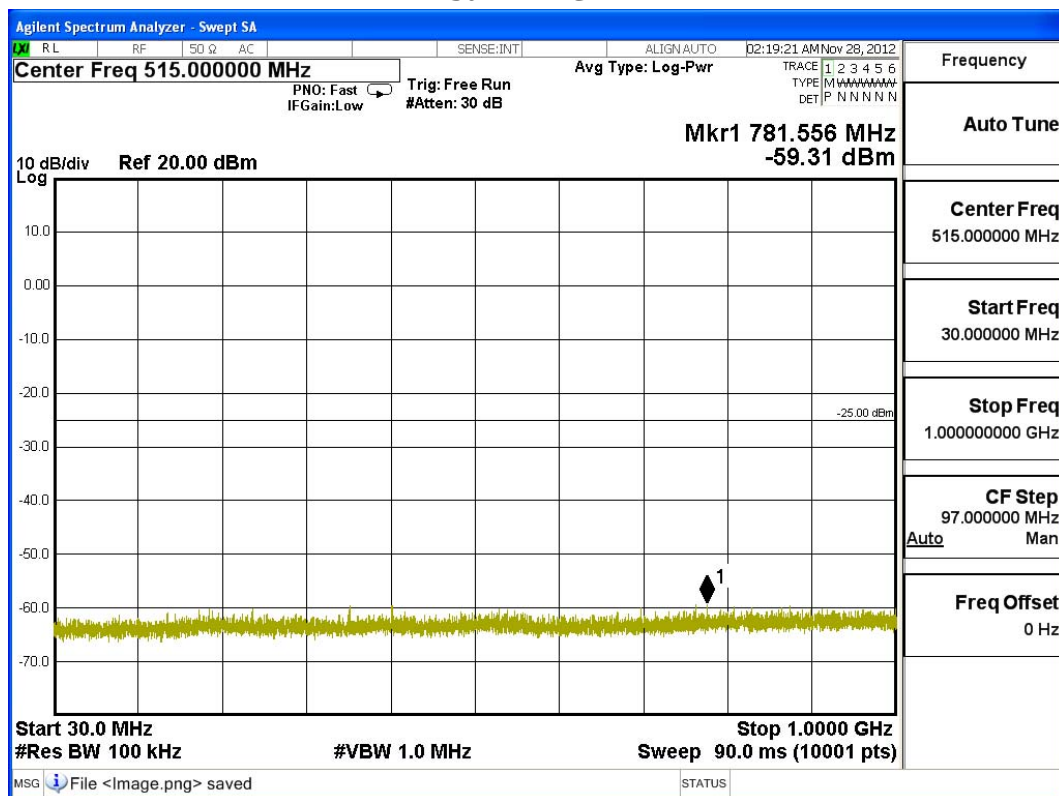
Product : MOXA IEEE802.11 a/b/g mini PCI module
 Test Item : Transmitter Conducted Unwanted Emissions
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit (10MHz Bandwidth)+Antenna 1

Transmitter Conducted Unwanted Emissions - 10MHz Bandwidth

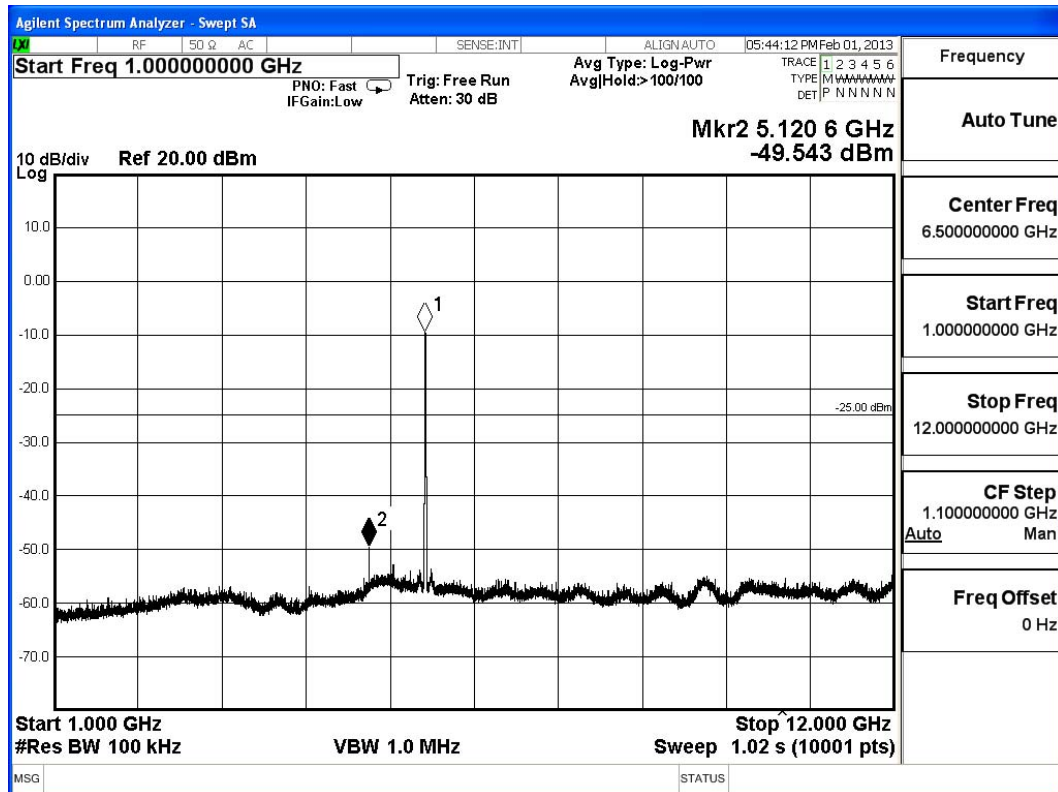
Channel No.	Frequency (MHz)	Measurement Level (dBm)	Required Limit (dBm)	Result
172	30-1000	-59.31	< -25	Pass
	1000-12000	-49.543	< -25	Pass
	12000-25000	-48.08	< -25	Pass
	25000-40000	-37.40	< -25	Pass

Channel 172

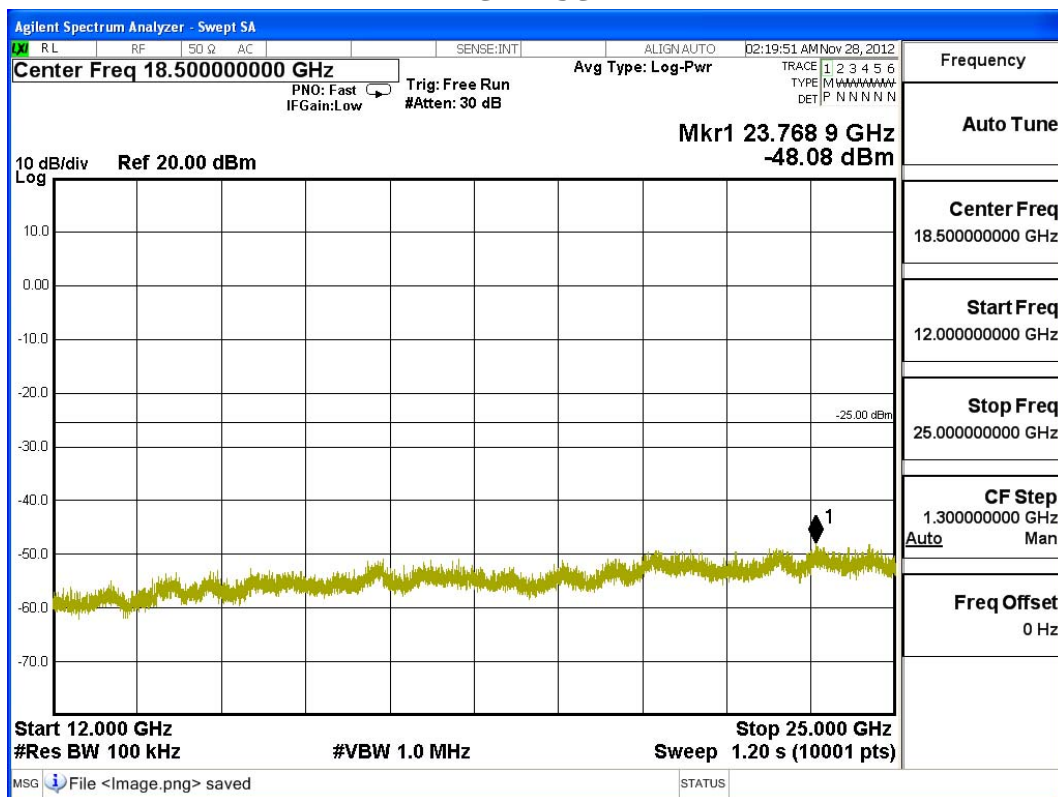
30MHz-1GHz



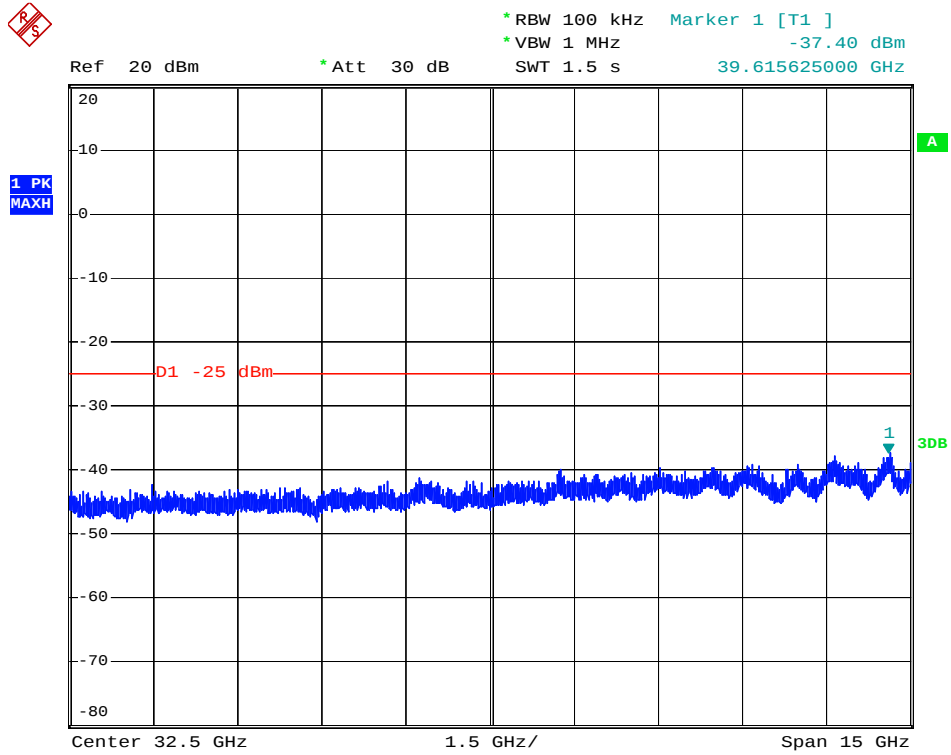
1GHz-12GHz



12GHz-25GHz



25GHz-40GHz

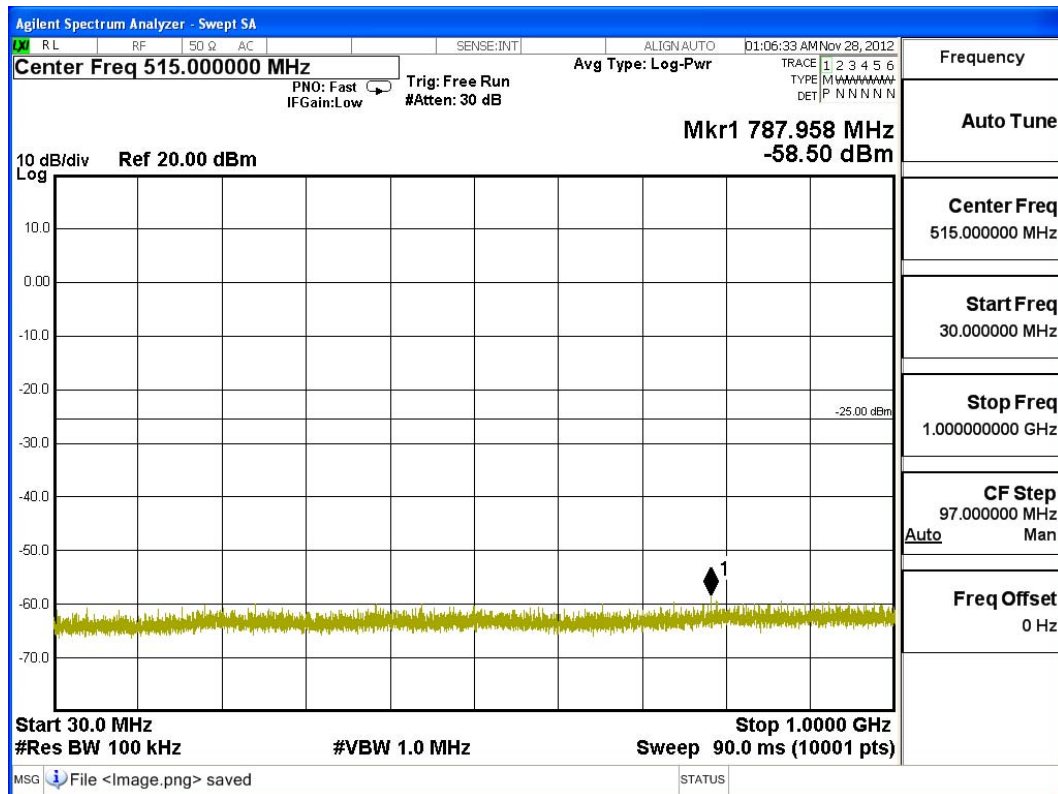


Date: 24.FEB.2003 05:42:14

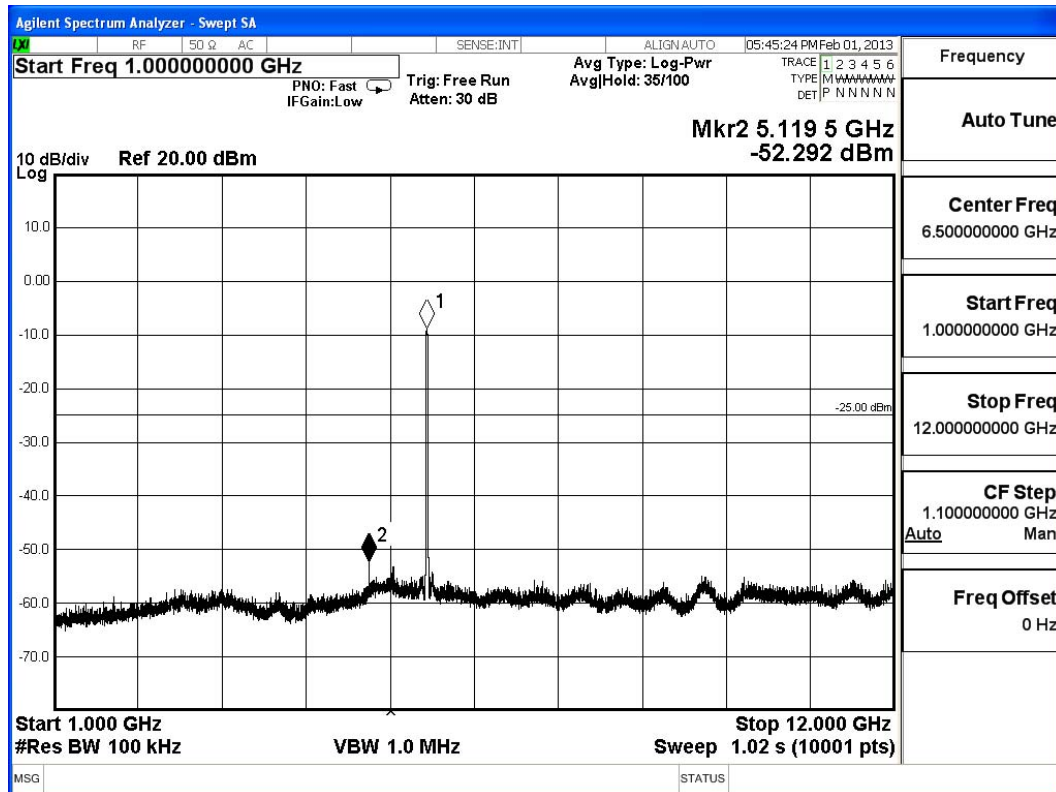
Channel No.	Frequency (MHz)	Measurement Level (dBm)	Required Limit (dBm)	Result
176	30-1000	-58.5	< -25	Pass
	1000-12000	-52.292	< -25	Pass
	12000-25000	-47.95	< -25	Pass
	25000-40000	-37.60	< -25	Pass

Channel 176

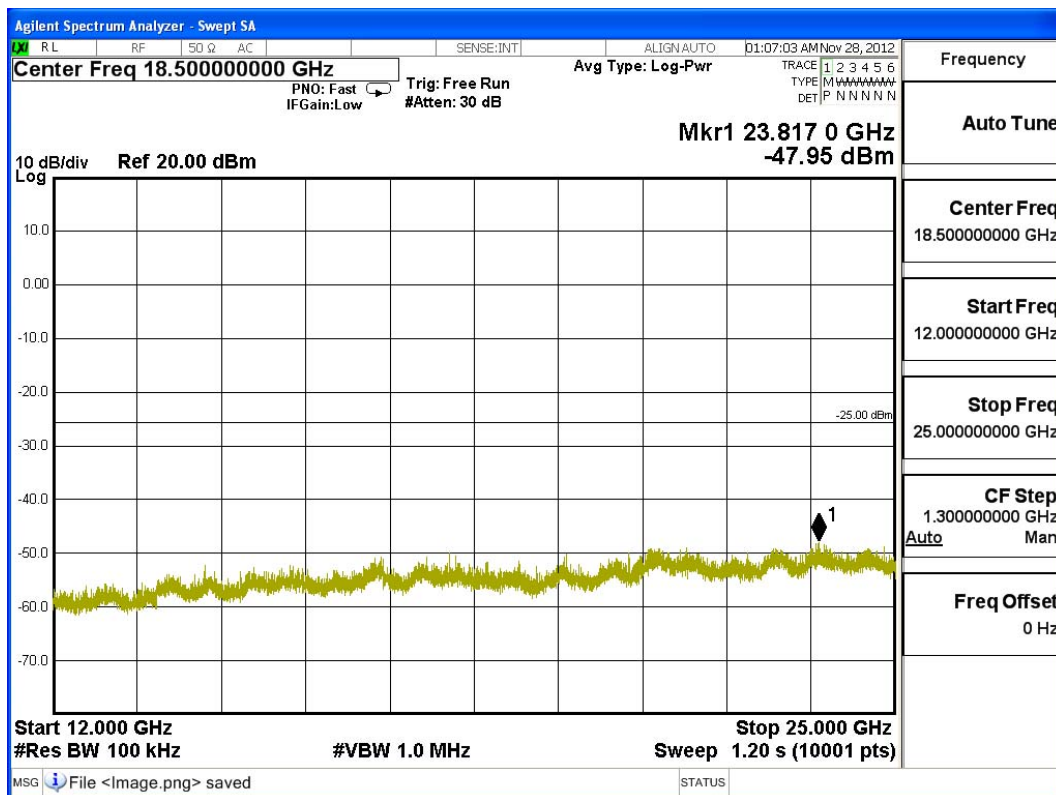
30MHz-1GHz

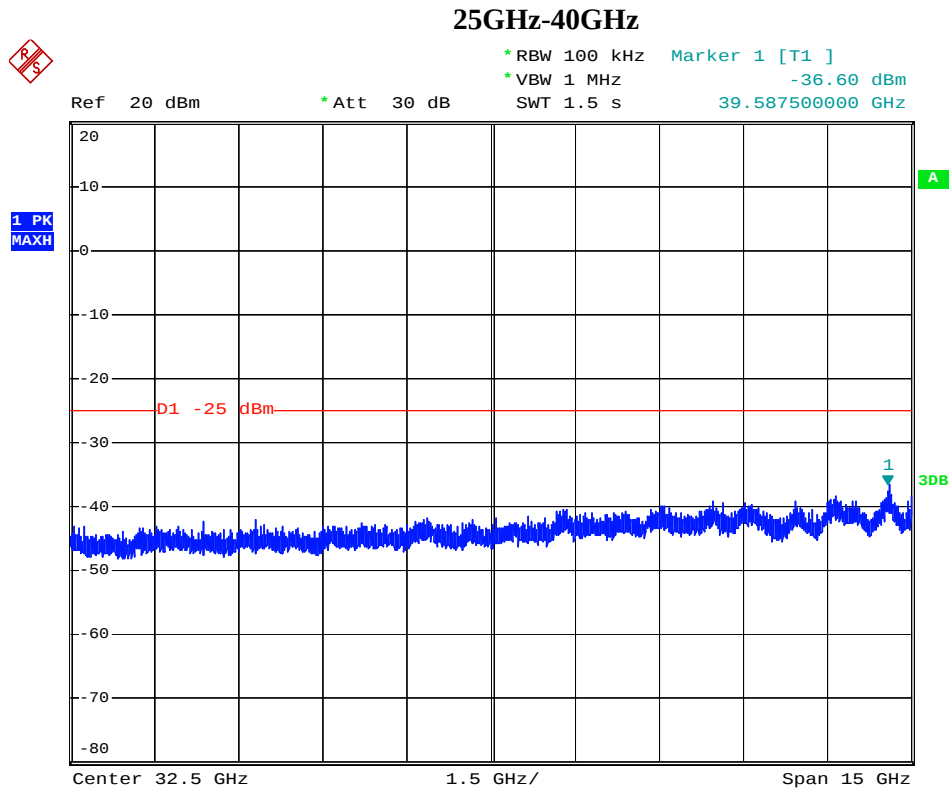


1GHz-12GHz



12GHz-25GHz



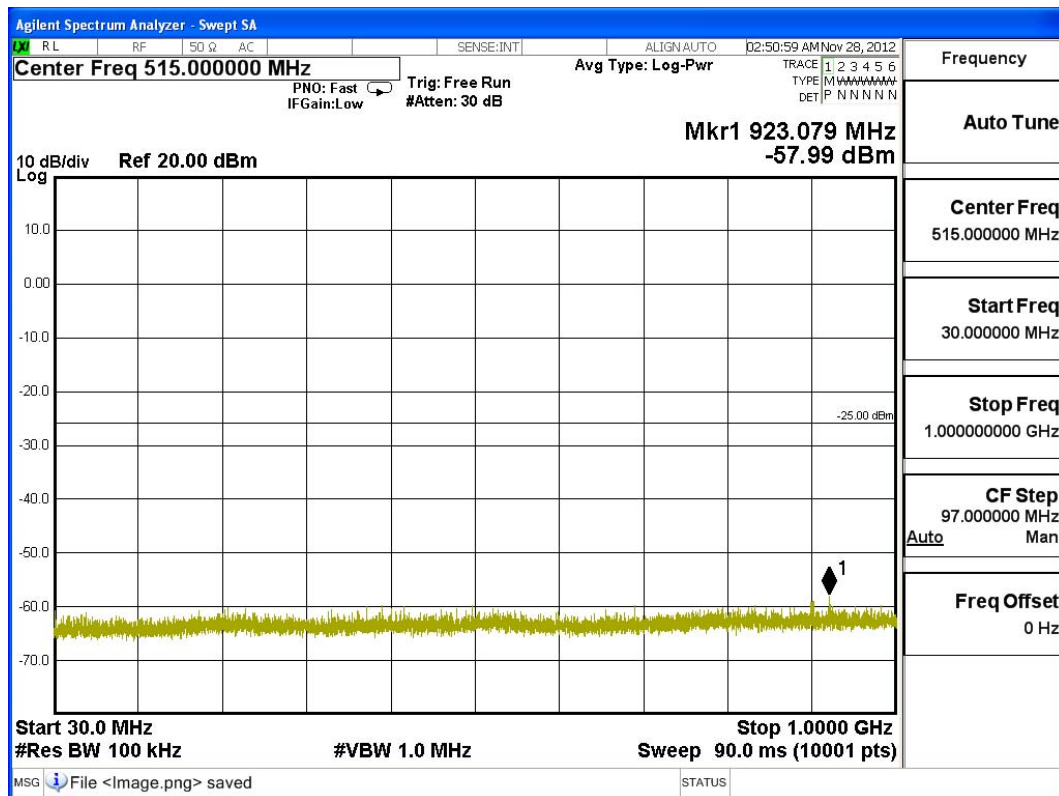


Date: 24.FEB.2003 05:43:37

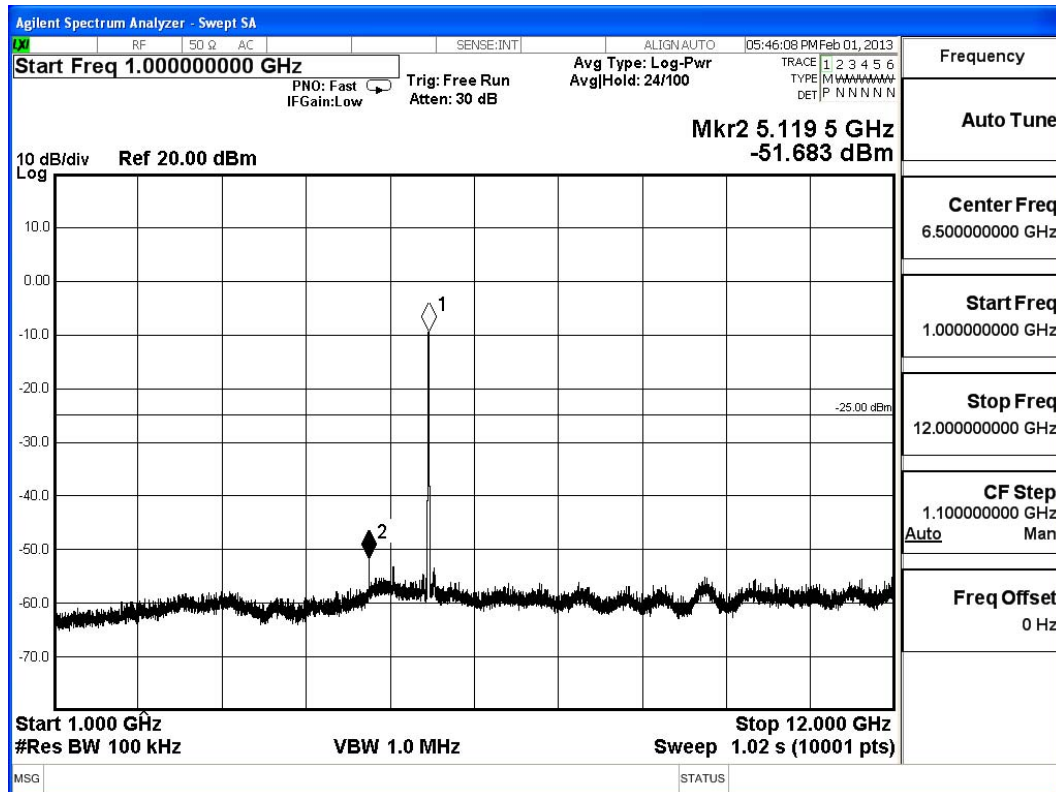
Channel No.	Frequency (MHz)	Measurement Level (dBm)	Required Limit (dBm)	Result
180	30-1000	-57.99	< -25	Pass
	1000-12000	-51.683	< -25	Pass
	12000-25000	-48.2	< -25	Pass
	25000-40000	-36.6	< -25	Pass

Channel 180

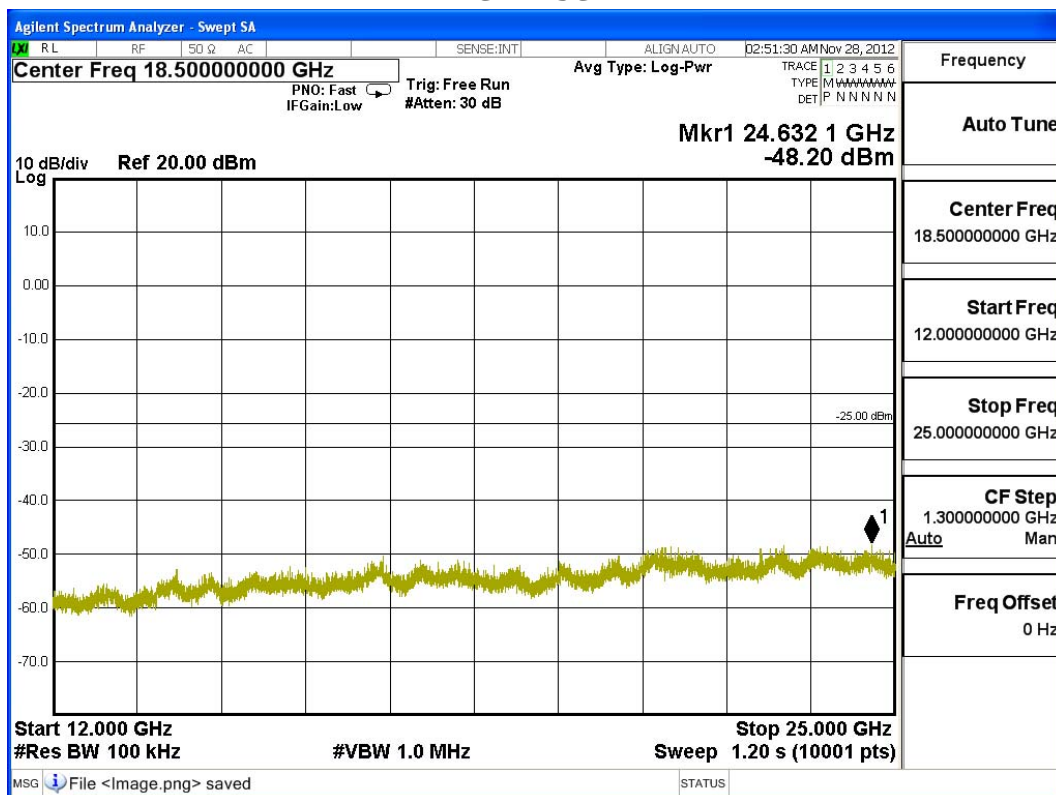
30MHz-1GHz

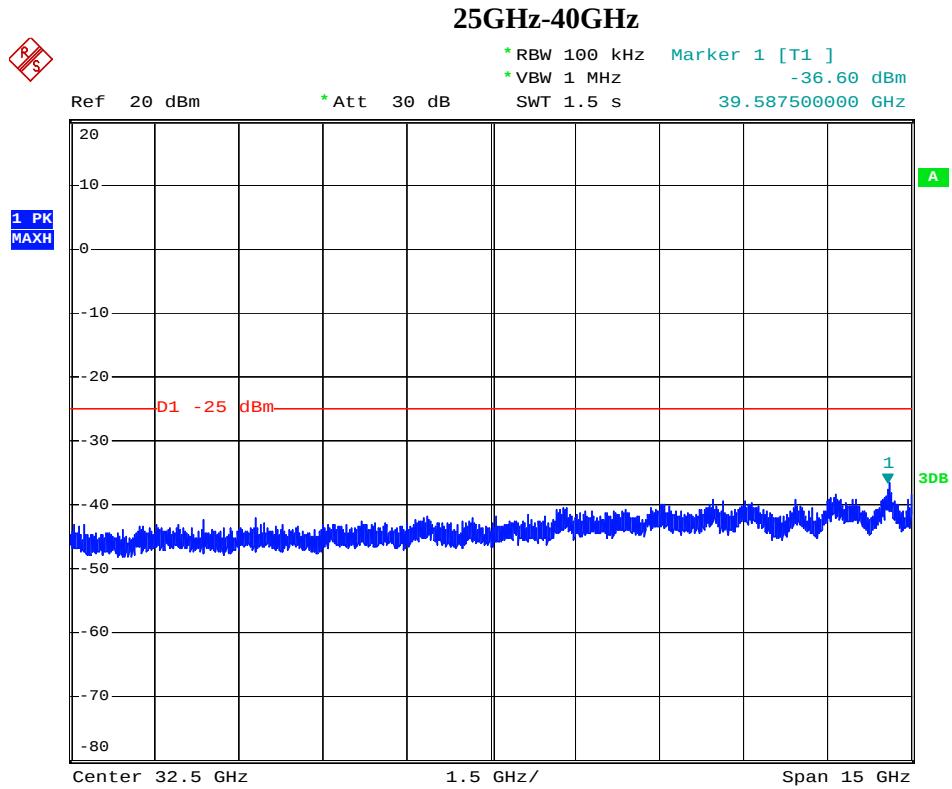


1GHz-12GHz



12GHz-25GHz





Date: 24.FEB.2003 05:43:37

7. Frequency Stability

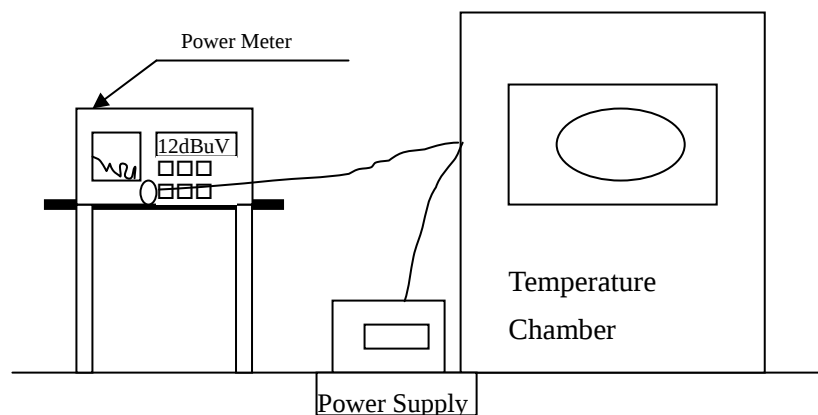
7.1. Test Equipment

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
	Spectrum Analyzer	R&S	FSP40 / 100170	Jun, 2013
	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.

7.2. Test Setup



7.3. Limits

Transmit frequency tolerance is specified in section 8.9.4 of ASTM E22213-03 and is reproduced below.

ASTM E22213-03 section 8.9.4 Transmit Center Frequency Tolerance—The transmitted center frequency tolerance shall be ± 10 ppm maximum for RSUs and ± 10 ppm maximum for OBUs.

7.4. Test Procedure

ASTM E22213-03 section 8.9.4, Part 90.1055

The carrier frequency stability is the ability of the transmitter to maintain an assigned carrier frequency.

The EUT was evaluated over the temperature range -30°C to +50°C.

The temperature was initially set to -30°C and a 2-hour period was observed for stabilization of the EUT. The frequency stability was measured within one minute after application of primary power to the transmitter. The temperature was raised at intervals of 10°C through the range. A ½ hour period was observed to stabilize the EUT at each measurement step, and the frequency stability was measured within one minute after application of primary power to the transmitter. Additionally, the power supply voltage of the EUT was varied +/-15% nominal and range of input voltages.

7.5. Uncertainty

± 150 Hz

7.6. Test Result of Frequency Stability

Product : MOXA IEEE802.11 a/b/g mini PCI module
 Test Item : Frequency Stability
 Test Site : Temperature Chamber
 Test Mode : Mode 1: Transmit (10MHz Bandwidth)+Antenna 1

Channel 172:

Test Conditions		Measure Level (MHz)	Delta Frequency (MHz)	ppm
T _{nom} 20 °C	V _{nom} 110.00 V	5859.9480	0.062	-8.873
T _{nom} 20 °C	V _{max} 138.00 V	5858.9780	0.062	-3.754
T _{nom} 20 °C	V _{min} 102.00 V	5859.9480	0.062	-8.873
T _{max} 50 °C	V _{max} 138.00 V	5859.9850	0.015	-2.559
T _{min} -30 °C	V _{min} 102.00 V	5860.02	-0.02	3.412
T _{max} 50 °C	V _{max} 138.00 V	5859.9850	0.015	-2.559
T _{min} -30 °C	V _{min} 102.00 V	5860.02	-0.02	3.412

Frequency Tolerance Limit

± 10ppm

Channel 176:

Test Conditions		Measure Level (MHz)	Delta Frequency (MHz)	ppm
T _{nom} 20 °C	V _{nom} 110.00 V	5879.955	0.045	-7.653
T _{nom} 20 °C	V _{max} 138.00 V	5879.956	0.044	7.482
T _{nom} 20 °C	V _{min} 102.00 V	5879.955	0.045	-7.653
T _{max} 50 °C	V _{max} 138.00 V	5879.964	0.036	-6.122
T _{min} -30 °C	V _{min} 102.00 V	5879.981	0.019	-3.231
T _{max} 50 °C	V _{max} 138.00 V	5879.964	0.036	-6.122
T _{min} -30 °C	V _{min} 102.00 V	5879.981	0.019	-3.231

Frequency Tolerance Limit
± 10ppm

Channel 180:

Test Conditions		Measure Level (MHz)	Delta Frequency (MHz)	ppm
T _{nom} 20 °C	V _{nom} 110.00 V	5899.951	0.049	-8.305
T _{nom} 20 °C	V _{max} 138.00 V	5899.951	0.049	-8.305
T _{nom} 20 °C	V _{min} 102.00 V	5899.961	0.039	-6.610
T _{max} 50 °C	V _{max} 138.00 V	5899.956	0.044	-7.457
T _{min} -30 °C	V _{min} 102.00 V	5899.949	0.051	-8.644
T _{max} 50 °C	V _{max} 138.00 V	5899.956	0.044	-7.457
T _{min} -30 °C	V _{min} 102.00 V	5899.955	0.045	-7.627

Frequency Tolerance Limit	± 10ppm
----------------------------------	----------------

8. Radiated Spurious Emission

8.1. Test Equipment

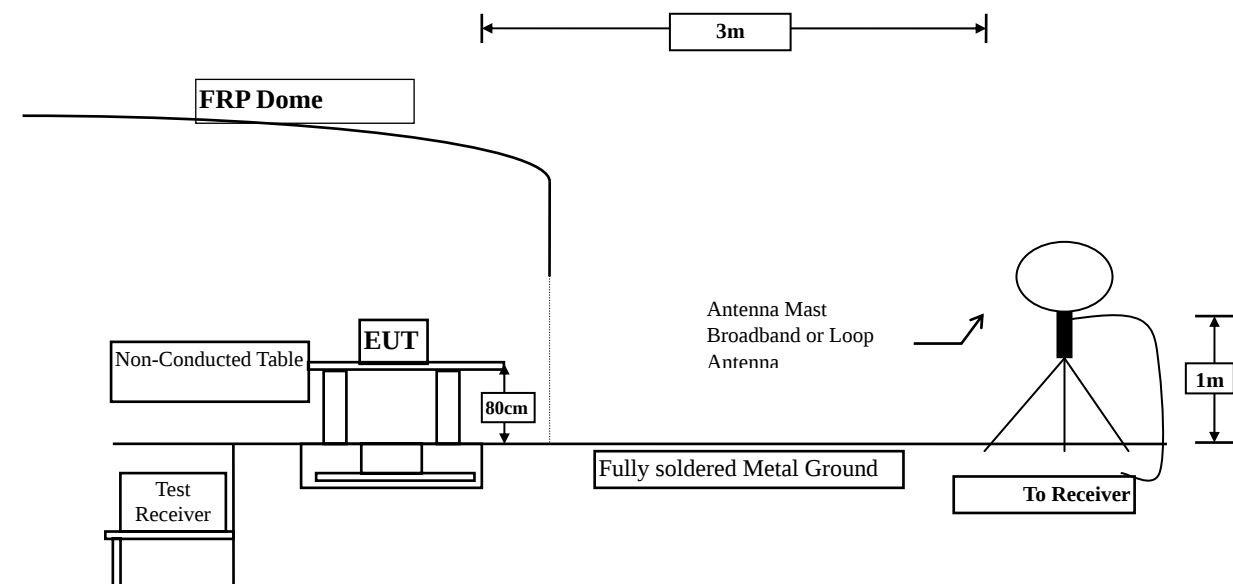
The following test equipments are used during the radiated emission test:

Test Site		Equipment	Manufacturer	Model No./Serial No.	Last Cal.
Site # 3	X	Loop Antenna	Teseq	HLA6120 / 26739	Jul., 2012
	X	Bilog Antenna	Schaffner Chase	CBL6112B/2673	Sep., 2012
	X	Horn Antenna	Schwarzbeck	BBHA9120D/D305	Sep., 2012
	X	Horn Antenna	Schwarzbeck	BBHA9170/208	Jul., 2012
	X	Pre-Amplifier	QTK	QTK-AMP-03 / 0003	May, 2012
	X	Pre-Amplifier	QTK	AP-180C / CHM_0906076	Sep., 2012
	X	Pre-Amplifier	MITEQ	AMF-4D-180400-45-6P/ 925975	Mar, 2012
	X	Spectrum Analyzer	Agilent	E4407B / US39440758	May, 2012

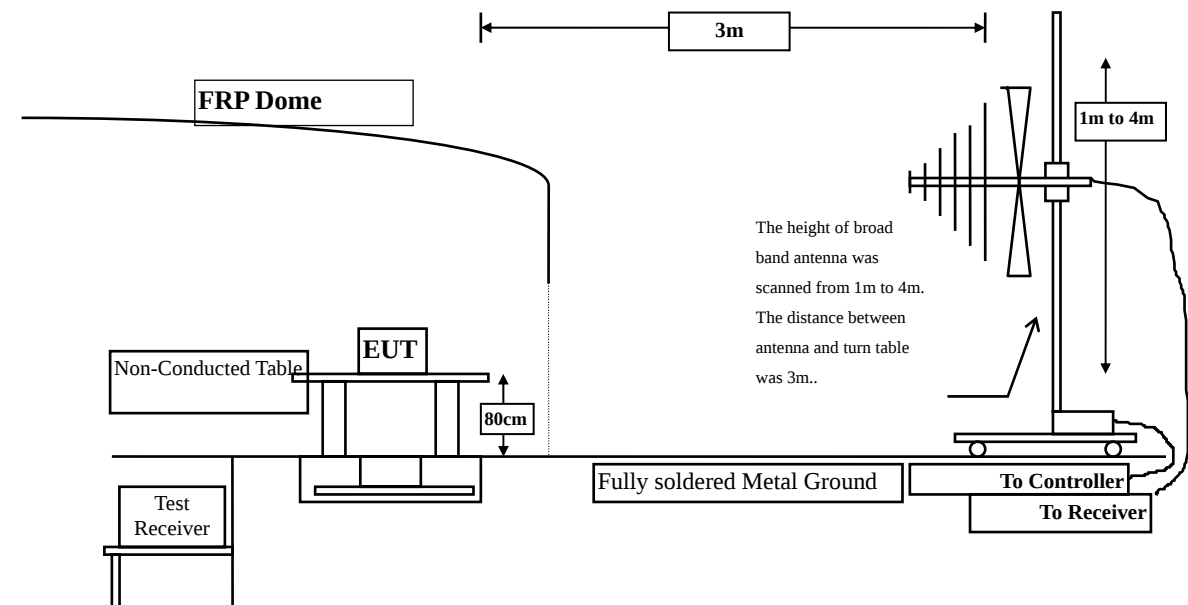
- Note: 1. All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.
2. The test instruments marked with "X" are used to measure the final test results.

8.2. Test Setup

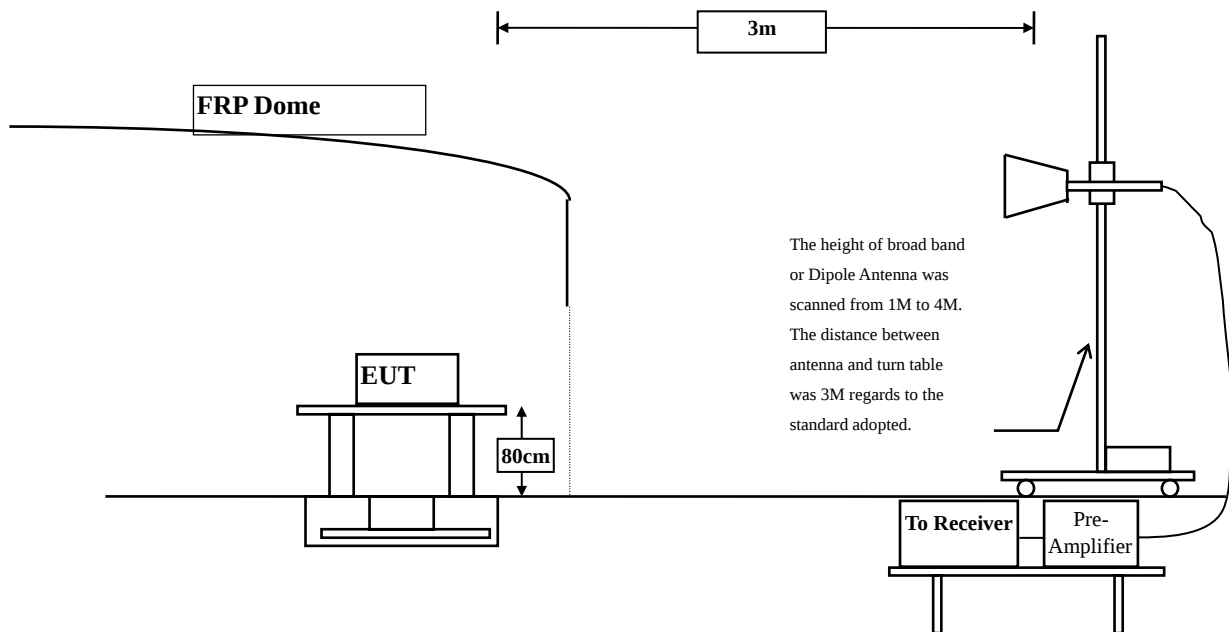
Radiated Emission Below 30MHz



Radiated Emission Below 1GHz



Radiated Emission Above 1GHz



8.3. Limits

ASTM E2213-03 DSRC 8.9.3

The power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least $[55 + 10 \log (P)]$ (e.i.r.p. -25dBm [70.2 dBuV/m at 3m]).

8.4. Test Procedure

The EUT is placed on a turn table which is 0.8 meters above ground. The turn table can rotate 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 can move up and down between 1 meter and 4 meters to find out the maximum emission level.

Broadband antenna (calibrated bi-log and horn antenna) are used as a receiving antenna.

Both horizontal and vertical polarization of the antenna are set on measurement. And a high frequency preamplifier were used increase the sensitivity of the measuring. The additional notch filter below 1GHz was used to measure the level of harmonics radiated emission during field strength of harmonics measurement.

The frequency range from 9kHz to 40GHz is checked.

8.5. Uncertainty

± 3.8 dB below 1GHz

± 3.9 dB above 1GHz

8.6. 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 (10MHz Bandwidth)+Antenna 1 (5860MHz)

Frequency	Correct	Reading	Measurement	Margin	Limit
	Factor	Level	Level		
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal					
Peak Detector:					
11720.000	12.477	38.590	51.067	-19.133	70.200
Vertical					
Peak Detector:					
11720.000	14.012	38.870	52.882	-17.318	70.200

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 (10MHz Bandwidth)+Antenna 1 (5880MHz)

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

Horizontal

Peak Detector:

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
11760.000	12.951	38.480	51.431	-18.769	70.200

Vertical

Peak Detector:

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
11760.000	14.339	38.560	52.898	-17.302	70.200

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 (10MHz Bandwidth)+Antenna 1 (5900MHz)

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

Horizontal

Peak Detector:

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
11800.000	13.438	38.950	52.388	-17.812	70.200

Vertical

Peak Detector:

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
11800.000	14.688	38.560	53.248	-16.952	70.200

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 : Radiated Emission Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit (10MHz Bandwidth)+Antenna 1 (5860MHz)

Frequency	Correct	Reading	Measurement	Margin	Limit
MHz	Factor	Level	Level		
	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal					
Peak Detector:					
144.460	-10.377	47.768	37.391	-6.109	43.500
297.720	-3.633	40.533	36.901	-9.099	46.000
466.500	0.794	34.163	34.956	-11.044	46.000
658.560	2.115	33.251	35.366	-10.634	46.000
796.300	5.161	30.001	35.162	-10.838	46.000
934.040	6.612	28.180	34.792	-11.208	46.000
Vertical					
Peak Detector:					
72.680	-5.622	41.414	35.791	-4.209	40.000
231.760	-8.848	50.161	41.313	-4.687	46.000
396.660	-4.356	34.084	29.728	-16.272	46.000
660.500	-2.233	41.795	39.562	-6.438	46.000
800.180	2.801	33.808	36.609	-9.391	46.000
959.260	6.964	27.118	34.082	-11.918	46.000

Note:

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

Product : MOXA IEEE802.11 a/b/g mini PCI module
 Test Item : Radiated Emission Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit (10MHz Bandwidth)+Antenna 1 (5880MHz)

Frequency	Correct	Reading	Measurement	Margin	Limit
MHz	Factor	Level	Level		
	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal					
Peak Detector:					
132.820	-10.230	48.563	38.333	-5.167	43.500
245.340	-6.346	47.746	41.400	-4.600	46.000
355.920	-2.528	38.810	36.282	-9.718	46.000
528.580	1.848	35.557	37.405	-8.595	46.000
705.120	2.635	34.747	37.382	-8.618	46.000
846.740	5.741	32.037	37.778	-8.222	46.000
Vertical					
Peak Detector:					
113.420	-1.849	39.144	37.295	-6.205	43.500
245.340	-8.406	47.746	39.340	-6.660	46.000
355.920	-3.488	38.810	35.322	-10.678	46.000
528.580	-0.462	35.557	35.095	-10.905	46.000
705.120	0.115	34.747	34.862	-11.138	46.000
846.740	2.601	32.037	34.638	-11.362	46.000

Note:

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

Product : MOXA IEEE802.11 a/b/g mini PCI module
 Test Item : Radiated Emission Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit (10MHz Bandwidth)+Antenna 1 (5900MHz)

Frequency	Correct	Reading	Measurement	Margin	Limit
MHz	Factor	Level	Level		
	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal					
Peak Detector:					
144.460	-10.377	47.768	37.391	-6.109	43.500
297.720	-3.633	40.533	36.901	-9.099	46.000
466.500	0.794	34.163	34.956	-11.044	46.000
658.560	2.115	33.251	35.366	-10.634	46.000
796.300	5.161	30.001	35.162	-10.838	46.000
934.040	6.612	28.180	34.792	-11.208	46.000
Vertical					
Peak Detector:					
72.680	-5.622	41.414	35.791	-4.209	40.000
231.760	-8.848	50.161	41.313	-4.687	46.000
396.660	-4.356	34.084	29.728	-16.272	46.000
660.500	-2.233	41.795	39.562	-6.438	46.000
800.180	2.801	33.808	36.609	-9.391	46.000
959.260	6.964	27.118	34.082	-11.918	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.

9. EMI Reduction Method During Compliance Testing

No modification was made during testing.

Attachment 1: EUT Test Photographs

Attachment 2: EUT Detailed Photographs