



# FCC PART 15C

# IC RSS-210, ISSUE 8, DEC 2010 TEST AND MEASUREMENT REPORT

For

# **TruePath Wireless, LLC**

2620 Augustine Drive, Suite # 260,

Santa Clara, CA 95054, USA

# FCC ID: ZJ3-TPW24-B-4AM IC: 9698A-TPW24B4AM

Report Type:		Product Type:
Original Report		2.4 GHz Single Band Wireless Access Point
Test Engineers:	Jarry Huano	Jong Hung
Report Number:		
Report Date:	2011-09-26	
	Victor Zhan	00 8
<b>Reviewed By:</b>	EMC/RF Le	ead
Prepared By: (84)	1274 Anvily	

**Note**: This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. This report **must not** be used by the customer to claim product certification, approval, or endorsement by NVLAP\*, NIST, or any agency of the Federal Government. \* This report may contain data that are not covered by the NVLAP accreditation and are marked with an asterisk "\*"

# **TABLE OF CONTENTS**

1	GEN	NERAL DESCRIPTION	. 6
	1.1	PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT)	. 6
	1.2	MECHANICAL DESCRIPTION OF EUT	. 6
	1.3	OBJECTIVE	
	1.4	RELATED SUBMITTAL(S)/GRANT(S)	
	1.5	TEST METHODOLOGY	
	1.6	MEASUREMENT UNCERTAINTY	
	1.7	TEST FACILITY	. 7
2	SYS	TEM TEST CONFIGURATION	. 8
	2.1	JUSTIFICATION	. 8
	2.2	EUT EXERCISE SOFTWARE	
	2.3	EQUIPMENT MODIFICATIONS	
	2.4	SPECIAL ACCESSORIES	
	2.5	LOCAL SUPPORT EQUIPMENT	. 8
	2.6	POWER SUPPLY	
	2.7	EUT INTERNAL CONFIGURATION	
	2.8	INTERFACE PORTS AND CABLING	. 9
3	SUN	IMARY OF TEST RESULTS	10
4	FCC	C §15.247(I), §2.1091 & IC RSS-102 - RF EXPOSURE INFORMATION	11
	4.1	APPLICABLE STANDARD	
	4.1	MPE PREDICTION	
	4.3	MPE RESULTS	
_			
5		2 §15.203 & IC RSS-GEN §7.1.4 – ANTENNA REQUIREMENTS	
	5.1	APPLICABLE STANDARD	
	5.2	ANTENNAS LIST	13
6	FCC	C §15.207 & RSS-GEN §7.2.2 – AC LINE CONDUCTED EMISSIONS	14
	6.1	APPLICABLE STANDARD	14
	6.2	TEST SETUP	14
	6.3	CORRECTED AMPLITUDE & MARGIN CALCULATION	14
	6.4	TEST SETUP BLOCK DIAGRAM	
	6.5	TEST EQUIPMENT LIST AND DETAILS	
	6.6	TEST ENVIRONMENTAL CONDITIONS	
	6.7	SUMMARY OF TEST RESULTS	
	6.8	CONDUCTED EMISSIONS TEST PLOTS AND DATA	16
7	FCC	C §15.247(D) & IC RSS-210 §A8.5 - SPURIOUS EMISSIONS AT ANTENNA TERMINALS	19
	7.1	APPLICABLE STANDARD	19
	7.2	MEASUREMENT PROCEDURE	
	7.3	TEST SETUP BLOCK DIAGRAM	19
	7.4	TEST EQUIPMENT LIST AND DETAILS	
	7.5	TEST ENVIRONMENTAL CONDITIONS	20
	7.6	TEST RESULTS	20
8	FCC	C §15.205, §15.209, §15.247(D) & IC RSS-210 §A8.5 – UNWANTED EMISSIONS	41
	8.1	APPLICABLE STANDARD	41
	8.2	EUT AND TEST SETUP	
R	enort Ni	mber: R1108253-2.4G Page 2 of 127 FCC Part 15C/IC RSS-210 Test Report	

FCC ID: 7.13-TPW24-B-4AM\_IC: 9698A-TPW24B4AM

iiuci a	III WHEE55, LEC I CC ID. 255-11 W2+-D-+AIN, IC. 707	5/1 11 W 2-D-7/11VI
8.3	TEST PROCEDURE	
8.4	CORRECTED AMPLITUDE & MARGIN CALCULATION	
8.5	TEST SETUP BLOCK DIAGRAM	43
8.6	TEST EQUIPMENT LIST AND DETAILS	
8.7	TEST ENVIRONMENTAL CONDITIONS	
8.8	SUMMARY OF TEST RESULTS	
8.9	RADIATED EMISSIONS TEST RESULT DATA	
0 54		50
9 F	CC §15.247(A)(2) & IC RSS-210 §A8.2 – 6 DB & 99% EMISSION BANDWIDTH	
9.1	Applicable Standard	52
9.2	MEASUREMENT PROCEDURE	
9.3	TEST SETUP BLOCK DIAGRAM	
9.4	TEST EQUIPMENT LIST AND DETAILS	
9.5	Test Environmental Conditions	
9.6	TEST RESULTS	
10	FCC §15.247(B) & IC RSS-210 §A8.4 - PEAK OUTPUT POWER MEASUREMENT	
10.1	APPLICABLE STANDARD	
10.2	Measurement Procedure	
10.3	Test Equipment List and Details	
10.4	Test Environmental Conditions	
10.5	TEST RESULTS	
11	FCC §15.247(D) & IC RSS-210 §A8.5 - 100 KHZ BANDWIDTH OF BAND EDGES	
11.1	Applicable Standard	84
11.2	MEASUREMENT PROCEDURE	
11.3	TEST SETUP BLOCK DIAGRAM	
11.4	6	
11.5	Test Environmental Conditions	
12	FCC §15.247(E) & IC RSS-210 §A8.2(B) - POWER SPECTRAL DENSITY	
12.1	Applicable Standard	98
12.1		
	MEASUREMENT PROCEDURE	
12.3	TEST EQUIPMENT LIST AND DETAILS	
12.4	Test Environmental Conditions	
12.5	TEST RESULTS	
12	IC RSS-GEN §4.10 & §6 - RECEIVER SPURIOUS RADIATED EMISSIONS	110
13		
13.1	Applicable Standard	
13.2	EUT SETUP	
13.3	Test Procedure	
13.4	CORRECTED AMPLITUDE & MARGIN CALCULATION	
13.5	TEST EQUIPMENT LISTS AND DETAILS	
13.6		
13.7	SUMMARY OF TEST RESULTS	
13.8	RADIATED EMISSION TEST PLOTS AND DATA	
14	EXHIBIT A - FCC & IC EQUIPMENT LABELING REQUIREMENTS	
14.1	FCC ID LABEL REQUIREMENTS	117
14.2		
14.3	FCC ID & IC LABEL CONTENTS.	
14.4	FCC ID & IC LABEL LOCATION	
15	EXHIBIT B - TEST SETUP PHOTOGRAPHS	
15.1	AC LINE CONDUCTED EMISSIONS – FRONT VIEW	110
15.1	AC LINE CONDUCTED EMISSIONS – FRONT VIEW	
15.3	RADIATED EMISSIONS BELOW 1 GHz FRONT VIEW	
15.4	RADIATED EMISSIONS BELOW 1 GHZ REAR VIEW	
15.5	RADIATED EMISSIONS ABOVE 1 GHZ FRONT VIEW	
15.6	RADIATED EMISSIONS BELOW 1 GHZ REAR VIEW	

Page 3 of 127FCC Part 15C/IC RSS-210 Test Report

FCC ID: ZJ3-TPW24-B-4AM, IC: 9698A-TPW24B4AM

16	EXHIBIT C - EUT PHOTOGRAPHS	
16.1	EUT – TOP VIEW	
16.2	EUT-BOTTOM VIEW	
16.3	EUT-BOTTOM VIEW 2	
16.4	EUT – Adapter for POE	
16.5	EUT – AC/DC Power Adapter	
16.6	EUT- COVER OFF VIEW 1	
16.7	EUT- COVER OFF VIEW 2	
16.8	EUT – INTERNAL COVER OFF VIEW 3	
16.9	EUT – INTERNAL COVER OFF VIEW 4	
16.10	) EUT – INTERNAL COVER OFF VIEW 5	
16.1	EUT – 2.4 GHz Patch Antenna Internal View	

Revision Number	Report Number	Description of Revision	Date of Revision
0	R1108253-2.4G	Original Report	2011-09-22
1	R1108253A-2.4G	Updated EUT photos	2011-09-26

# **DOCUMENT REVISION HISTORY**

# **1** General Description

#### **1.1 Product Description for Equipment under Test (EUT)**

This test and measurement report was prepared on behalf of *TruePath Wireless, LLC* and their product FCC ID: ZJ3-TPW24-B-4AM, Model: TPW24-B-4A/M or the "EUT" as referred to in this report. The EUT is a 2.4 GHz wireless access point. Configuration is shown below:

Frequency Range	EIRP Power Setting	Modulation	Bandwidth
(MHz)	(dBm)		(MHz)
2412~2462	+20, +30, +36	BPSK/QPSK/16QAM/64QAM	5, 20

## **1.2** Mechanical Description of EUT

The "EUT" measures approximately 70cm (L) x 50cm (W) x 15 cm (H), and weighs approximately 15.3 kg.

The test data gathered are from typical production sample, serial number 000065, provided by the manufacturer.

## 1.3 Objective

This report is prepared on behalf of *TruePath Wireless LLC* in accordance with Part 2, Subpart J, and Part 15, Subparts B and C of the Federal Communication Commissions rules.

The objective is to determine compliance with FCC standards, rules and limits for this device including:

- RF Exposure
- Antenna Requirement
- Conducted Emissions
- Spurious Emissions at Antenna Port
- Radiated Spurious Emissions
- Restricted Band
- Receiver Spurious Emissions
- 6 dB Bandwidth & 99% Bandwidth
- Maximum Peak Output Power
- 100 kHz Bandwidth of Frequency Band Edge
- Power Spectral Density

#### **1.4** Related Submittal(s)/Grant(s)

No Related Submittals.

## 1.5 Test Methodology

All measurements contained in this report were conducted in accordance with ANSI C63.4-2003, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

#### **1.6 Measurement Uncertainty**

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are: spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the values range from +2.0 for Conducted Emissions tests and +4.0 dB for Radiated Emissions tests are the most accurate estimates pertaining to uncertainty of EMC measurements at BACL.

Detailed instrumentation measurement uncertainties can be found in BACL report QAP-018. All radiated and conducted emissions measurement was performed at Bay Area Compliance Laboratory, Corp. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

## 1.7 Test Facility

The test site used by BACL Corp. to collect radiated and conducted emissions measurement data is located at its facility in Sunnyvale, California, USA.

The test sites at BACL have been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports has been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 11 and December 10, 1997, and Article 8 of the VCCI regulations on December 25, 1997. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2003.

The Federal Communications Commission, Industry Canada, and Voluntary Control Council for Interference has the reports on file and is listed under FCC registration number: 90464, IC registration number: 3062A, and VCCI Registration Number: R-2463 and C-2698. The test site has been approved by the FCC, IC, and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, BACL is a National Institute of Standards and Technology (NIST) accredited laboratory, under the National Voluntary Laboratory Accredited Program (Lab Code 200167-0). The current scope of accreditations can be found at <u>http://ts.nist.gov/Standards/scopes/2001670.htm</u>

# 2 System Test Configuration

# 2.1 Justification

The EUT was configured for testing according to ANSI C63.4-2003.

The EUT was tested in a testing mode to represent worst-case results during the final qualification test.

#### 2.2 EUT Exercise Software

The Exercise Firm Ware Version was 1.0.0.223.2011.05.13.0148 with Engineering TX Utility tx\_ofdm\_wb (md5sum = d9a038f79a6e6893d9a652914743d952).

#### 2.3 Equipment Modifications

No modifications were made to the EUT.

#### 2.4 Special Accessories

N/A

#### 2.5 Local Support Equipment

Manufacturer	Description	Model No.	Serial No.
Toshiba	Laptop	-	-

#### 2.6 Power Supply

Manufacturer	Description	Model No.	Serial No.
TruePath Wireless	PoE Adaptor	TPW-PS-001US	000078

#### 2.7 EUT Internal Configuration

Manufacturer	Description Model No		Serial No.
TruePath Wireless	Jumper Board	Jumper Board -	
TruePath Wireless	STACK Module -		B22
TruePath Wireless	XCVR Module	-	C23
TruePath Wireless	CPU	-	C28
TruePath Wireless	FPGA	-	C28

#### Interface Ports and Cabling 2.8

Cable Description	Length (m)	From	То
Ethernet cable	< 10m	EUT	Laptop
Ethernet cable	< 10m	EUT	PoE

# **3** Summary of Test Results

Results reported relate only to the product tested.

FCC & IC Rules	Description of Test	Results
FCC §15.247(i), §2.1091 IC RSS-102	RF Exposure Information	Compliant
FCC §15.203 IC RSS-Gen §7.1.4	Antenna Requirement	Compliant
FCC §15.207(a) IC RSS-Gen §7.2.2	AC Line Conducted Emissions	Compliant
FCC §15.247(d) IC RSS-210 §2.6	Spurious Emissions at Antenna Port	Compliant
FCC §15.205 IC RSS-210 §2.2	Restricted Bands	Compliant
FCC §15.209, §15.247 IC RSS-210 §2.6	Radiated Spurious Emissions	Compliant
FCC §15.247(a)(2) IC RSS-210 §A8.2	6 dB Emission Bandwidth	Compliant
FCC §15.247(b)(3) IC RSS-210 §A8.4	Maximum Peak Output Power	Compliant
FCC §15.247(d) IC RSS-210 §A8.5	Band Edge	Compliant
FCC §15.247(e) IC RSS-210 §A8.2 (b)	Power Spectral Density	Compliant
IC RSS-Gen §4.10, §6	Receiver Spurious Emission	Compliant

# 4 FCC §15.247(i), §2.1091 & IC RSS-102 - RF Exposure Information

#### 4.1 Applicable Standard

According to FCC §15.247(i) and §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm <sup>2</sup> )	Averaging Time (minutes)	
	Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	30	
1.34-30	824/f	2.19/f	*(180/f <sup>2</sup> )	30	
30-300	27.5	0.073	0.2	30	
300-1500	/	/	f/1500	30	
1500-100,000	/	/	1.0	30	

f = frequency in MHz

\* = Plane-wave equivalent power density

Before equipment certification is granted, the procedure of IC RSS-102 must be followed concerning the exposure of humans to RF fields.

According to RSS-102 Issue 4 section 4.2, RF limits used for general public will be applied to the EUT.

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m <sup>2</sup> )	Time Averaging (min)
0.003 - 1	280	2.19	-	6
1 - 10	280 / f	2.19 / f	-	6
10 - 30	28	2.19 / f	-	6
30 - 300	28	0.073	2*	6
300 - 1 500	1.585 f <sup>0.5</sup>	0.0042 f <sup>0.5</sup>	f / 150	6
1 500 - 15 000	61.4	0.163	10	6
15 000 - 150 000	61.4	0.163	10	616000 / f <sup>1.2</sup>
150 000- 300 000	0.158 f <sup>0.5</sup>	4.21 x 10 -4 f <sup>0.5</sup>	6.67 x 10 <sup>-5</sup> f	616000 / f <sup>1.2</sup>

**Note:** *f* is frequency in MHz

\* Power density limit is applicable at frequencies greater than 100 MHz

## 4.2 MPE Prediction

Predication of MPE limit at a given distance, Equation from OET Bulletin 65, Edition 97-01

$$S = PG/4\pi R^2$$

Where: S = power density

P = power input to antenna

G = power gain of the antenna in the direction of interest relative to an isotropic radiator

 $\mathbf{R}$  = distance to the center of radiation of the antenna

#### 4.3 MPE Results

2.4 GHz Band, Worst case Legacy mode 4 correlated signal with 14.48 dBm output, and the direction antenna gain is 14 dBi + 10 \*Log (4) dBi = 20 dBi, so the MPE result will be:

Maximum peak output power at antenna input terminal (dBm):	14.48
Maximum peak output power at antenna input terminal (mW):	28.05
Prediction distance (cm):	20
Prediction frequency (MHz):	2412
Maximum Antenna Gain, typical (dBi):	20
Maximum Antenna Gain (numeric):	100
Power density of prediction frequency at 20.0 cm (mW/cm <sup>2</sup> , W/m <sup>2</sup> ):	0.5580/5.580
MPE limit for uncontrolled exposure at prediction frequency (mW/cm <sup>2</sup> , W/m <sup>2</sup> ):	1.0/10

2.4 GHz Band, Worst case 4xMIMO with 21.5 dBm output, and the direction antenna gain is 14 dBi + 10 \*Log (4/4) dBi = 14 dBi, so the MPE result will be:

Maximum peak output power at antenna input terminal (dBm):	21.50
Maximum peak output power at antenna input terminal (mW):	141.25
Prediction distance (cm):	20
Prediction frequency (MHz):	2412
Maximum Antenna Gain, typical (dBi):	14
Maximum Antenna Gain (numeric):	25.12
Power density of prediction frequency at 20.0 cm (mW/cm <sup><math>2</math></sup> , W/m <sup><math>2</math></sup> ):	0.7059/7.059
MPE limit for uncontrolled exposure at prediction frequency $(mW/cm^2, W/m^2)$ :	1.0/10

The device is compliant with the requirement MPE limit for uncontrolled exposure.

# 5 FCC §15.203 & IC RSS-Gen §7.1.4 – Antenna Requirements

#### 5.1 Applicable Standard

According to FCC §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

And according to FCC §15.247 (b)(4), if transmitting antennas of directional gain greater than 6 dBi are used the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

#### As per IC RSS-Gen §7.1.4: Transmitter Antenna

A transmitter can only be sold or operated with antennas with which it was certified. A transmitter may be certified with multiple antenna types. An antenna type comprises antennas having similar in-band and out-ofband radiation patterns. Testing shall be performed using the highest-gain antenna of each combination of transmitter and antenna type for which certification is being sought, with the transmitter output power set at the maximum level. Any antenna of the same type and having equal or lesser gain as an antenna that had been successfully tested for certification with the transmitter, will also be considered certified with the transmitter, and may be used and marketed with the transmitter. The manufacturer shall include with the application for certification a list of acceptable antenna types to be used with the transmitter.

When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's antenna shall be stated, based on measurement or on data from the antenna manufacturer. Any antenna gain in excess of 6 dBi (6 dB above isotropic gain) shall be added to the measured RF output power before using the power limits specified in RSS-210 or RSS-310 for devices of RF output powers of 10 milliwatts or less. For devices of output powers greater than 10 milliwatts, except devices subject to RSS-210 Annex 8 (Frequency Hopping and Digital Modulation Systems Operating in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz Bands) or RSS-210 Annex 9 (Local Area Network Devices), the total antenna gain shall be added to the measured RF output power before using the specified power limits. For devices subject to RSS-210 Annex 8 or Annex 9, the antenna gain shall not be added.

#### 5.2 Antennas List

The device has two antennas; the antennas are installed by the licensed professionals.

Frequency Band	Antenna Gain (dBi)	
2.4 GHz	14 (Internal)	

# 6 FCC §15.207 & RSS-Gen §7.2.2 – AC Line Conducted Emissions

#### 6.1 Applicable Standard

As per FCC §15.207 & RSS-Gen §7.2.2 AC Power Line Conducted Emissions limits:

For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50  $\mu$ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequencies ranges.

Frequency of Emission	Conducted Limit (dBuV)		
(MHz)	Quasi-peak	Average	
0.15-0.5	66 to 56 *	56 to 46 *	
0.5-5	56	46	
5-30	60	50	

\* Decreases with the logarithm of the frequency.

#### 6.2 Test Setup

The measurement was performed at shield room, using the setup per ANSI C63.4-2003 measurement procedure. The specification used was FCC and IC limits.

External I/O cables were draped along the edge of the test table and bundle when necessary. The AC/DC power adapter of the EUT was connected with LISN-1 which provided 120 V / 60 Hz AC power.

#### 6.3 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Cable Loss, and Attenuator Factor adding to the Indicated Reading. The basic equation is as follows:

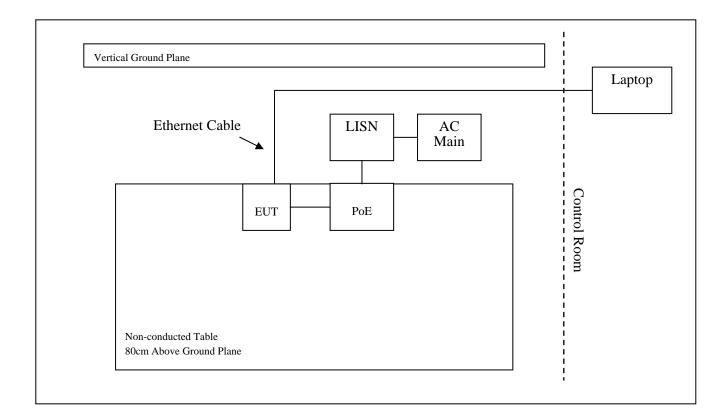
Corrected Amplitude = Indicated Reading + Cable Loss + Attenuator Factor

For example, a Corrected Amplitude of 34.08 dBuV/m = Indicated Reading (23.85 dBuV) + Cable Factor (0.22 dB) + Attenuator Factor (10 dB)

The "**Margin**" column of the following data tables indicates the degree of compliance within the applicable limit. For example, a margin of -7 dB means the emission is 7 dB below the maximum limit. The equation for margin calculation is as follows:

Margin = Corrected Amplitude - Limit

## 6.4 Test Setup Block Diagram



#### 6.5 Test Equipment List and Details

Manufacturers	Descriptions	Models	Serial Numbers	Calibration Dates
Solar Electronics	tronics LISN 9252-50-R-24-N		511213	2010-06-28
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.595 0K03	10037	2011-03-24

*Statement of Traceability:* **BACL Corp.** attests that all calibrations have been performed according to NVLAP requirements, traceable to the NIST.

#### 6.6 Test Environmental Conditions

Temperature:	16~23° C	
<b>Relative Humidity:</b>	35~63%	
ATM Pressure:	101.2~103.5kPa	

Testing was performed by Jerry Huang on 2011-05-06 in 5 meter chamber 3.

#### 6.7 Summary of Test Results

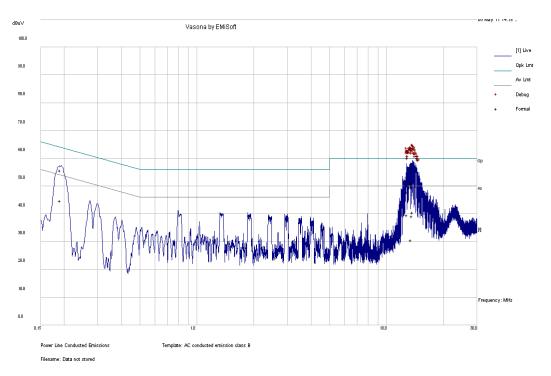
According to the recorded data, the EUT complied with FCC Part 15C and IC RSS-Gen limits, and had the worst margin reading of:

2.4 GHz Band, Transmitting					
Margin (dB)Frequency (MHz)Conductor (Line/Neutral)Test Range					
-2.24	12.80907	Neutral	0.15-30 MHz		

Please refer to the following plots and tables for detailed results.

## 6.8 Conducted Emissions Test Plots and Data

Please refer to the following tables and plots.



# 2.4 GHz, EIRP +36 dBm, 20 MHz Bandwidth – 2437 MHz

# 120 V, 60 Hz - Line

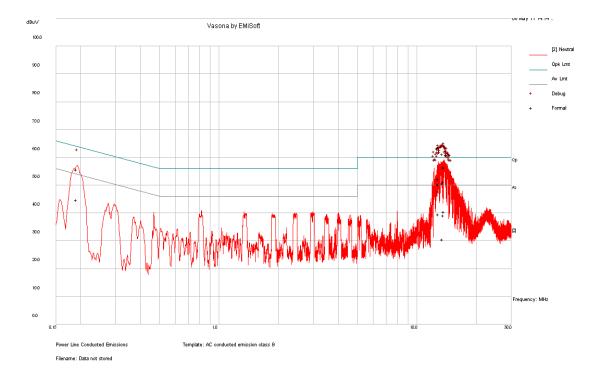
Quasi-Peak Measurement:

Frequency (MHz)	Corrected Amplitude (dBuV)	Measurement Type	Conductor (L/N)	Limit (dBuV)	Margin (dB)
13.733	56.63	Quasi Peak	L	60	-3.37
13.79374	52.63	Quasi Peak	L	60	-7.37
12.74871	51.09	Quasi Peak	L	60	-8.91
13.90284	51.08	Quasi Peak	L	60	-8.92
13.30276	51.08	Quasi Peak	L	60	-8.92
13.9631	50.34	Quasi Peak	L	60	-9.66

Average Measurement:

Frequency (MHz)	Corrected Amplitude (dBuV)	Measurement Type	Conductor (L/N)	Limit (dBuV)	Margin (dB)
12.74871	47.1	Average	L	50	-2.90
13.733	39.77	Average	L	50	-10.23
13.79374	32.55	Average	L	50	-17.45
13.90284	32.35	Average	L	50	-17.65
13.30276	31.41	Average	L	50	-18.59
13.9631	31.05	Average	L	50	-18.95

# 120 V, 60 Hz – Neutral



# Quasi-Peak Measurement:

Frequency (MHz)	Corrected Amplitude (dBuV)	Measurement Type	Conductor (L/N)	Limit (dBuV)	Margin (dB)
13.72811	56.35	Quasi Peak	Ν	60	-3.65
12.80907	52.21	Quasi Peak	Ν	60	-7.79
0.190668	55.63	Quasi Peak	Ν	64.01	-8.38
13.60384	51.26	Quasi Peak	Ν	60	-8.74
13.50297	50.68	Quasi Peak	Ν	60	-9.32
12.87196	50.23	Quasi Peak	Ν	60	-9.77

Average Measurement:

Frequency (MHz)	Corrected Amplitude (dBuV)	Measurement Type	Conductor (L/N)	Limit (dBuV)	Margin (dB)
12.80907	47.76	Average	Ν	50	-2.24
0.190668	44.65	Average	Ν	54.01	-9.36
13.72811	40.46	Average	Ν	50	-9.54
12.87196	39.65	Average	Ν	50	-10.35
13.60384	39.25	Average	Ν	50	-10.75
13.50297	30.64	Average	Ν	50	-19.36

# 7 FCC §15.247(d) & IC RSS-210 §A8.5 - Spurious Emissions at Antenna Terminals

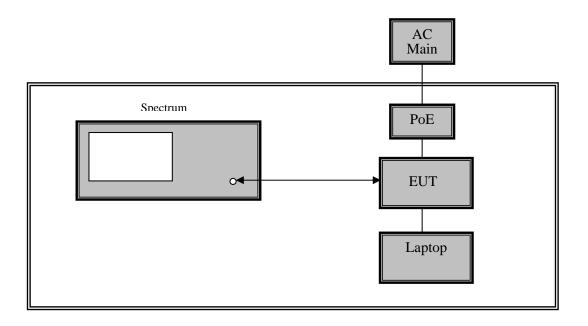
# 7.1 Applicable Standard

For FCC §15.247(d) and IC RSS-210 § A8.5 in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated 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, provided the transmitter demonstrates compliance with the peak conducted power limits.

## 7.2 Measurement Procedure

The RF output of the EUT was connected to a spectrum analyzer through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set at 100 kHz. Sufficient scans were taken to show any out of band emissions up to 10th harmonic.

# 7.3 Test Setup Block Diagram



#### 7.4 Test Equipment List and Details

Manufacturers Descriptions		Models	Serial Numbers	Calibration Dates
Agilent	Analyzer, Spectrum	E4446A	US44300386	2010-08-18

*Statement of Traceability:* **BACL Corp.** attests that all calibrations have been performed according to NVLAP requirements, traceable to the NIST.

#### 7.5 Test Environmental Conditions

Temperature:	16~23° C
Relative Humidity:	35~40%
ATM Pressure:	101.2~103.5kPa

Testing was performed by Jerry Huang on 2011-05-05 to 2011-05-13 in RF site.

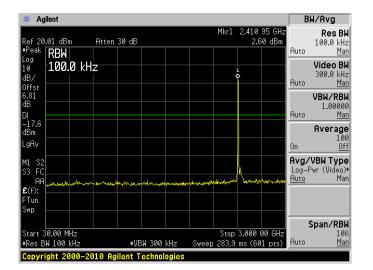
#### 7.6 Test Results

All the results are represent the worse case of EUT working mode; please refer to following plots of spurious emissions.

## 2.4 GHz Band (2412–2462 MHz): BPSK with 5 MHz bandwidth, EIRP +36 dBm

#### 2.4 GHz, Antenna #1:

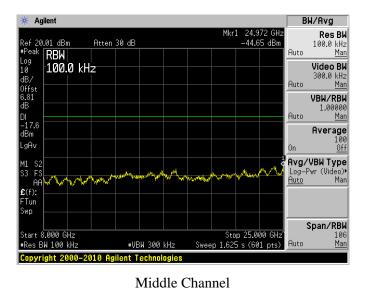
Low Channel



Agilent BW/Avg Mkr1 7.108 GH: -48.44 dBm Res BW Atten 30 dB 20.01 dBm 100.0 kHz RBW 100.0 kHz Auto Man Log 10 dB/ Video BW 300.0 kHz Auto Öffst 6.81 dB VBW/RBW 1.00000 Auto Man -17.6 Average 100 gAv Ûn <u>Off</u> **Avg/VBWType** Log-Pwr (Video)► <u>Auto</u>Man M1 \$3 10  $\mathbf{f}(\mathbf{f})$ Tun ٧p Span/RBW Stop 8.000 GHz Sweep 477.9 ms (601 pts) Start 3.000 GHz 106 <u>Man</u> Res BW 100 kHz ∗VBW 300 kHz Auto Copyright 2000-2010 Agilent Tech

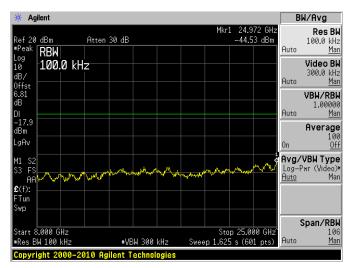
Low Channel

#### Low Channel

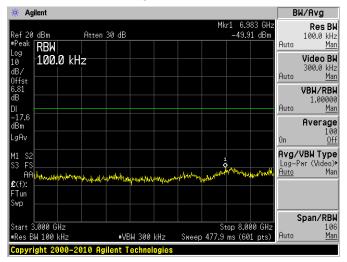


#### Mkr1 2.435 70 GHz Res BW Atten 30 dB Ref 20.01 dBm 2.09 dBm 100.0 kHz <u>Man</u> #Peak Auto RBW Log 10 100.0 kHz Video BW 300.0 kHz dB/ Offst 6.81 dB Auto Man VBW/RBW 1.00000 <u>Man</u> Auto DI –17.9 dBm Average 100 <u>Off</u> lαĤv Ûn Avg/VBW Type Μ1 M1 S2 S3 FC Avg/vom (Video)) Log-Pwr (Video)) Man Auto ÂÂ £(f): Tun òwp Span/RBW 30.00 MHz Stop 3.000 00 GHz 106 <u>Man</u> tart Auto ∎Res BW 100 kHz #VBW 300 kHz Sweep 283.9 ms (601 pts) Copyright 2000-2010 Agilent Technologies

#### Middle Channel

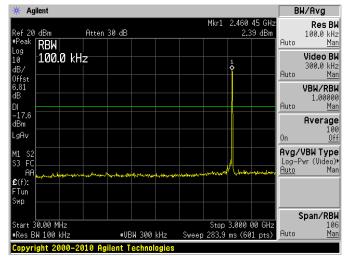


#### High Channel



🔆 Agilent BW/Avg Mkr1 7.133 GH: \_48.68 dBm Res BW Atten 30 dB 20 dBm 100.0 kHz <u>Man</u> #Peal Auto RBW Log 10 100.0 kHz Video BW 300.0 kHz <u>Man</u> dB/ Offst 6.81 dB Auto VBW/RBW 1.00000 <u>Man</u> Auto –17.9 dBm Average 100 Off .aAv Ûn Avg/VBW Type M1 S2 S3 FC 1 Log-Pwr (Video)) Auto Man **£**(f): FTun WD Span/RBW 106 Man 3.000 GHz Stop 8.000 GHz Sweep 477.9 ms (601 pts) Auto ∗VBW 300 kHz ∎Res BW 100 kHz Copyright 2000–2010 Agilent Technologies

High Channel



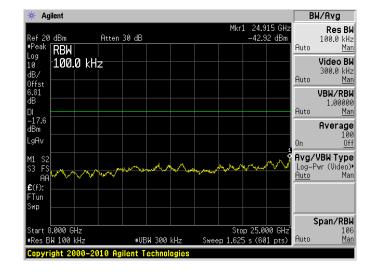
Report Number: R1108253-2.4G

FCC Part 15C/IC RSS-210 Test Report

# Middle Channel

🔆 Agilent

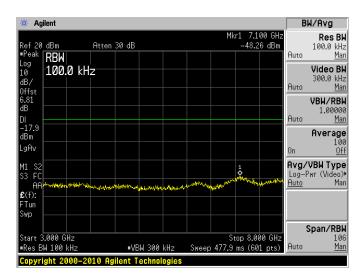
BW/Avg



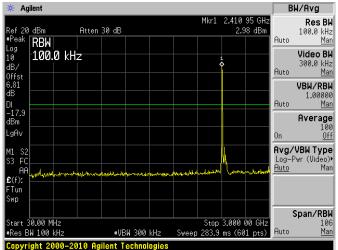
# High Channel

# 2.4 GHz, Antenna #2:

#### Low Channel



#### Low Channel



🔆 Agilent

#### TruePath Wireless, LLC

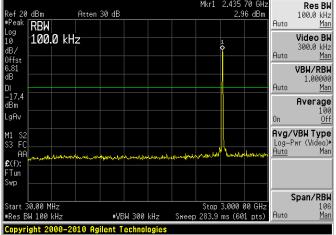
#### 🔆 Agilent BW/Avg Mkr1 24.292 GH: Res BW Ref 20 dBm Atten 30 dB -45.06 dBm 100.0 kHz <u>Man</u> #Peal RBW Auto Log 10 100.0 kHz Video BW 300.0 kHz <u>Man</u> dB/ Offst 6.81 dB Auto VBW/RBW 1.00000 Man Auto –17.9 dBm Average 100 <u>Off</u> .gAv 0n 2 Avg/VBW Type M1 \$3 Log-Pwr (Video) Auto Man Â £(f): FTun wp Span/RBW Stop 25.000 GHz Sweep 1.625 s (601 pts) Auto itart 8.000 GHz 106 Man #VBW 300 kHz #Res BW 100 kHz Copyright 2000–2010 Agilent Technologies

Low Channel

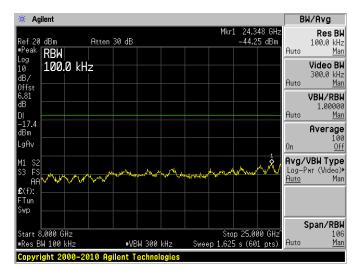
# Mkr1 2.435 70 GH: 2.96 dBm

Middle Channel

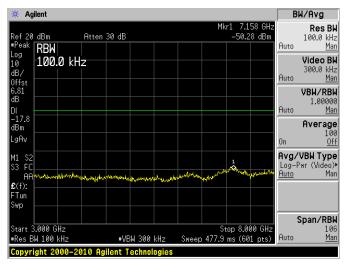
BW/Avg



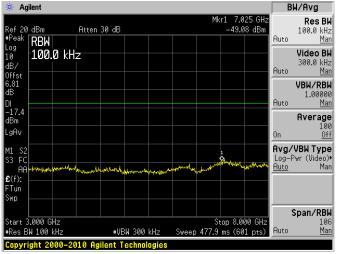
## Middle Channel



#### High Channel



#### Middle Channel

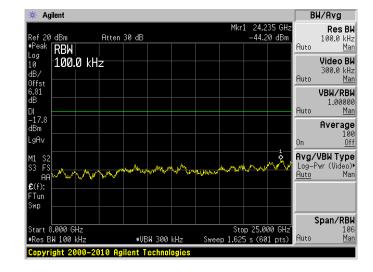


#### High Channel

BW/Avg Agilent Mkr1 2.460 45 GHz Res BW 20 dBm Ref 20 #Peak Atten 30 dB 2.36 dBm 100.0 kHz <u>Man</u> Auto RBW Log 10 Video BW 100.0 kHz 300.0 kHz <u>Man</u> dB. Auto 0ffst 6.81 dB VBW/RBW 1.00000 DI -17.8 dBm Auto Man Average 100.gAv 0n Off Avg/VBW Type M1 \$3 Log-Pwr (Video)• <u>Auto</u> Man AA £(f): Tun awi Span/RBW Stop 3.000 00 GHz Sweep 283.9 ms (601 pts) Start 30.00 MHz 106 <u>Man</u> Auto Res BW 100 kHz ∗VBW 300 kHz pyright 2000–2010 Agilent Technologies

Report Number: R1108253-2.4G

FCC Part 15C/IC RSS-210 Test Report



# High Channel





#VBW 300 kHz

Atten 30 dB

Mkr1 2.410 95 GHz 1.74 dBm

Stop 3.000 00 GHz Sweep 283.9 ms (601 pts)

Auto

Auto

Auto

0n

Auto

Agilent

RBW

100.0 kHz

Ref 20 dBm #Peak 🗖 🗖

Log 10

dB/ Offst 6.81 dB

–19.7 dBm

.aAv

M1 83 \$2 FC

£(f):

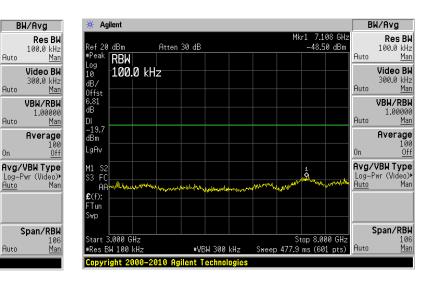
Tun

wp

AF

tart 30.00 MHz

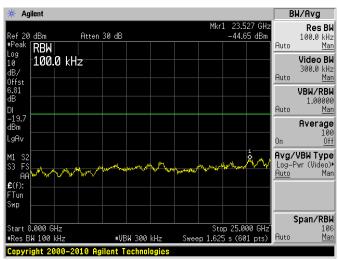
ŧRes BW 100 kHz



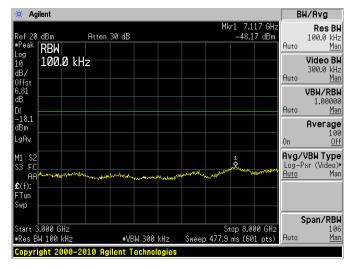


yright 2000-2010 Agilent Technologies

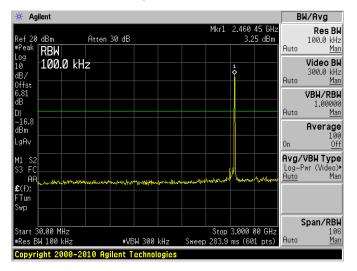
# Low Channel



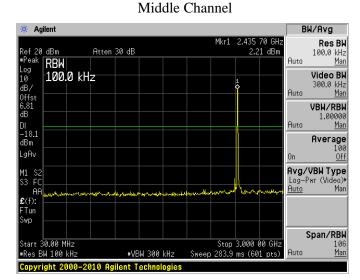
#### Middle Channel



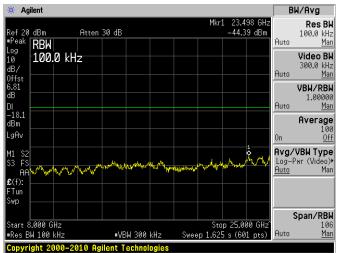
#### High Channel



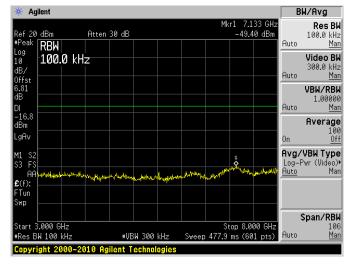
#### Report Number: R1108253-2.4G



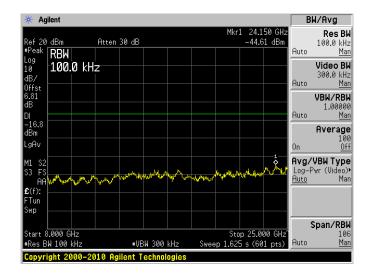
## Middle Channel



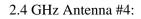
#### High Channel



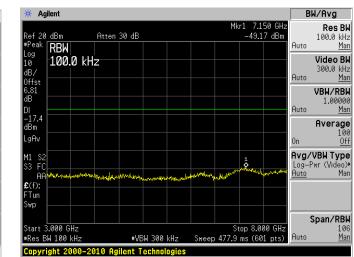
FCC Part 15C/IC RSS-210 Test Report



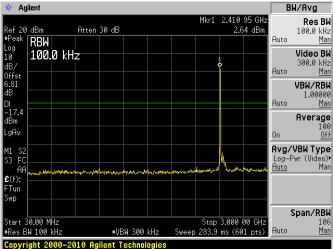
# High Channel



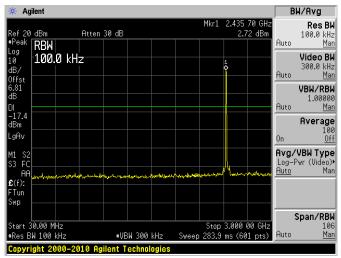
Low Channel



#### Low Channel



# Low Channel



# Middle Channel Mkr1 7.067 GH: \_49.37 dBm Atten 30 dB Auto 100.0 kHz

BW/Avg

Res BW

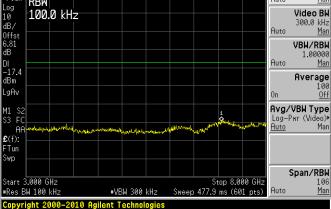
Man

100.0 kHz

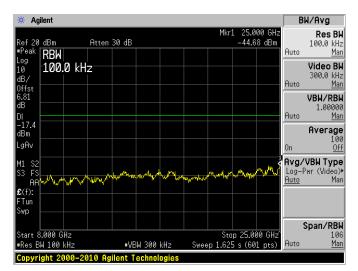
🔆 Agilent

Ref 20 dBm #Peak **DD** 

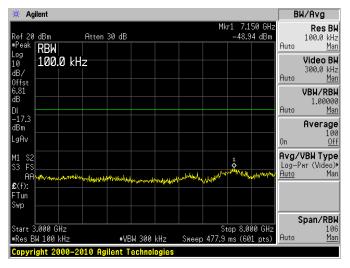
RBW



#### Middle Channel



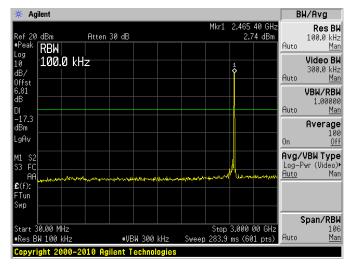
#### High Channel



#### Middle Channel

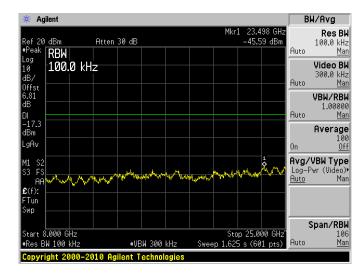


#### High Channel

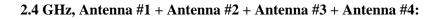


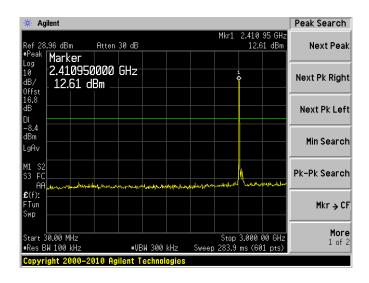
Report Number: R1108253-2.4G

FCC Part 15C/IC RSS-210 Test Report



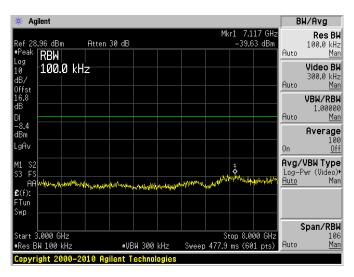
# High Channel





Low Channel

Low Channel



BW/Avg

Auto

Res BW

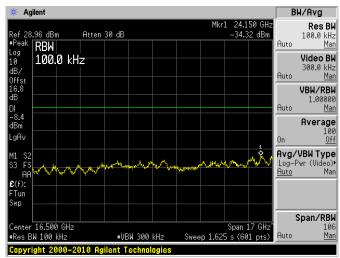
Man

100.0 kHz

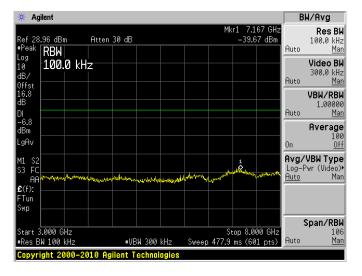
2.440 65 GHz

13.96 dBm

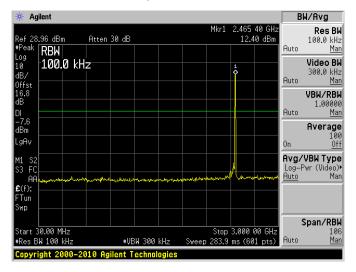
# Low Channel



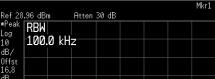
#### Middle Channel



#### High Channel



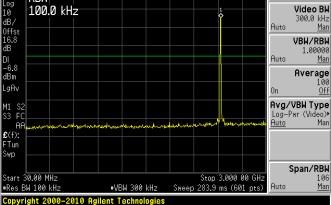
Report Number: R1108253-2.4G



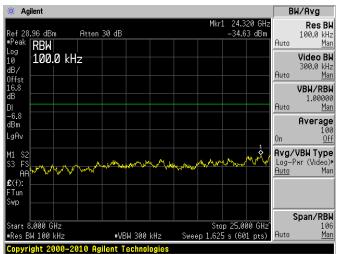
🔆 Agilent

Log 10 dB/

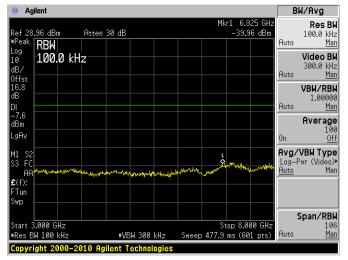
Middle Channel



#### Middle Channel



#### High Channel



FCC Part 15C/IC RSS-210 Test Report

#### Agilent BW/Avg Mkr1 24.292 GH: –34.34 dBm Res BW Atten 30 dB 28.96 dBm 100.0 kHz Peak RBW Auto Man .0g 100.0 kHz Video BW Ĥ 300.0 kHz <u>Man</u> Auto )ffst 16.8 VBW/RBW 1.0000 Auto Man 7.6 Average Вm 100 gAv 0n <u>Off</u> \$ **Avg/VBWType** Log-Pwr (Video)► <u>Auto</u> Man AĤ £(f): Tun WD Span/RBW Stop 25.000 GHz Sweep 1.625 s (601 pts) tart 8.000 GHz 106 <u>Man</u> Res BW 100 kHz #VBW 300 kHz Auto opyright 2000–2010 Agilent Tech

# High Channel

# 2.4 GHz Band (2412-2462 MHz): BPSK with 20 MHz bandwidth, EIRP +36 dBm



Auto

Auto

Auto

0n

Auto

Stop 3.000 00 GHz Sweep 283.9 ms (601 pts)

Video BW

300.0 kHz <u>Man</u>

VBW/RBW

Average 100 <u>Off</u>

Span/RBW

106 <u>Man</u>

Avg/VBW Type Log-Pwr (Video) <u>Auto</u> Man

1.00000 <u>Man</u>

#### 2.4 GHz, Antenna #1:



#### Low Channel

Copyright 2000–2010 Agilent Technologies

∗VBW 300 kHz

🔆 Agilent

#Peak

Log 10

dB.

Offst 6.81 dB

.gAv

M1 S3

£(f):

Tun

iwp

ĤĤ

Start 30.00 MHz

#Res BW 100 kHz

DI –19.3 dBm

Ref 20.01 dBm

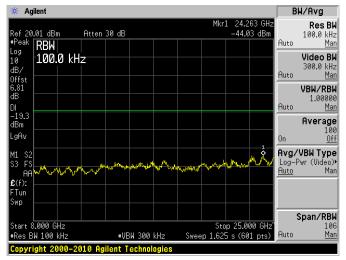
RBW

100.0 kHz

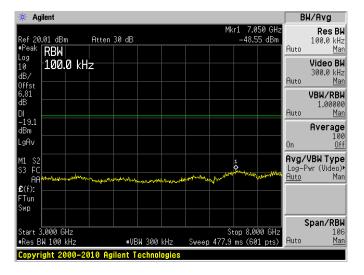
Atten 30 dB



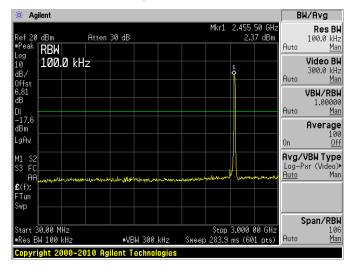
# Low Channel



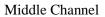
#### Middle Channel

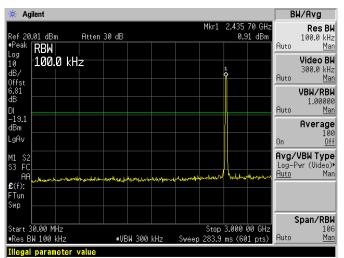


#### High Channel

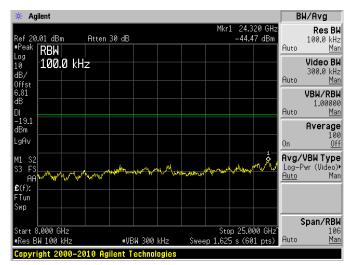


Report Number: R1108253-2.4G

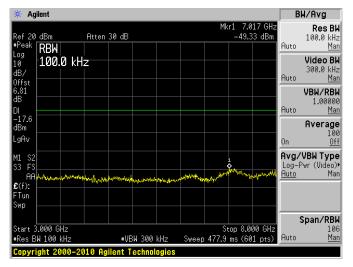




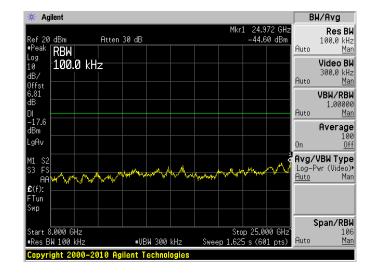
## Middle Channel



#### High Channel



FCC Part 15C/IC RSS-210 Test Report



# High Channel



BW/Avg

Auto

Auto

Res BW

100.0 kHz Man

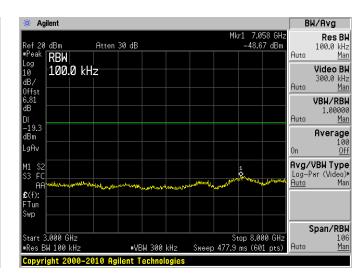
Video BW

300.0 kHz <u>Man</u>

2.406 00 GHz 0.71 dBm

Mkr1

#### Low Channel



#### Low Channel

# RBW 100.0 kHz

Atten 30 dB

Offst 6.81 dB VBW/RBW 1.00000 <u>Man</u> Auto -19.3 Average 100 <u>Off</u> dBm .gAv 0n Avg/VBW Type Log-Pwr (Video) Auto Man M1 S3 S2 FC Ĥ £(f): Tun awô Span/RBW 106 <u>Man</u> Stop 3.000 00 GHz Sweep 283.9 ms (601 pts) Start 30.00 MHz Auto

#Res BW 100 kHz ₩VBW 300 kHz Copyright 2000–2010 Agilent Technologies

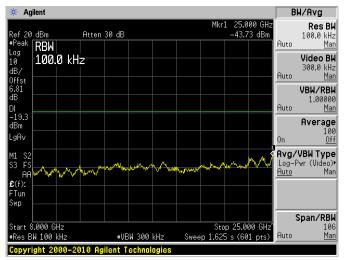
🔆 Agilent

Ref 20 dBm #Peak **RP** 

Log 10 dB/



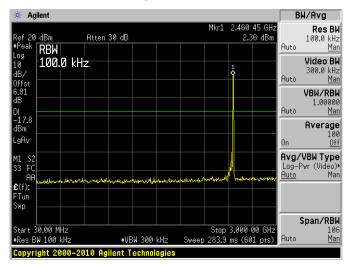
# Low Channel



#### Middle Channel

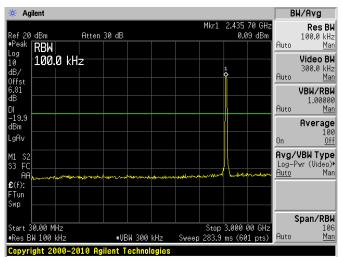


#### High Channel

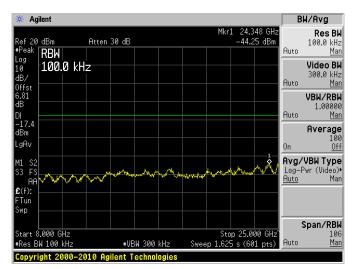


Report Number: R1108253-2.4G

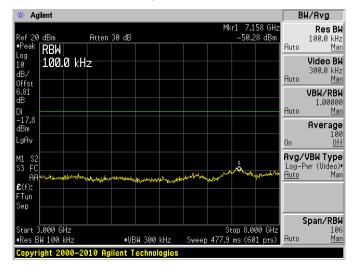
# Middle Channel



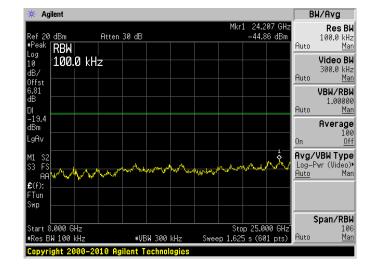
#### Middle Channel



#### High Channel



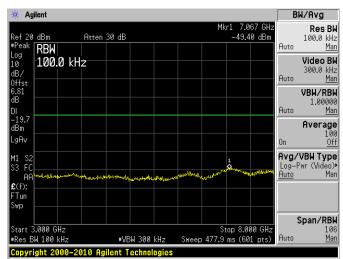
FCC Part 15C/IC RSS-210 Test Report



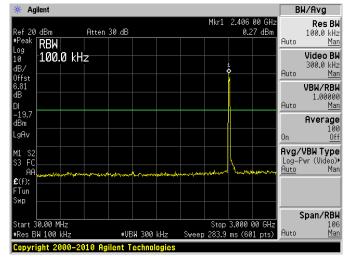
# High Channel



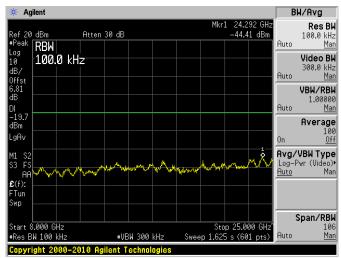
Low Channel



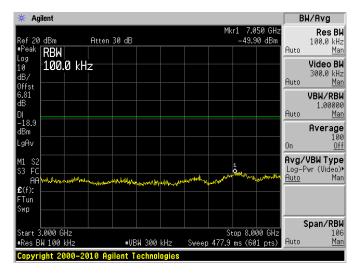




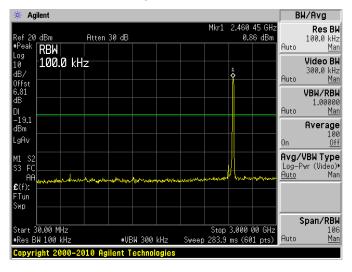
# Low Channel



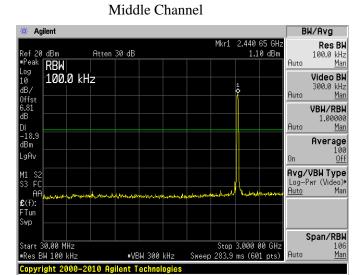
# Middle Channel



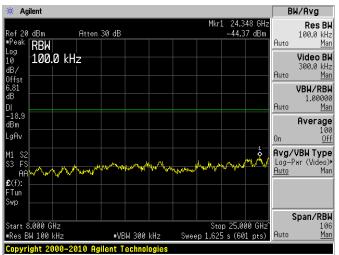




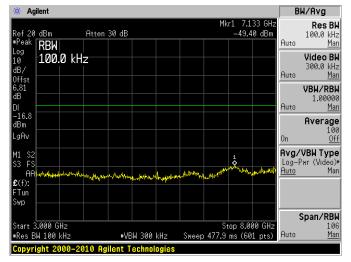
Report Number: R1108253-2.4G



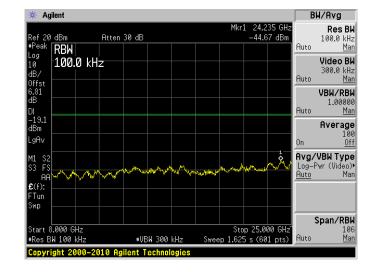
#### Middle Channel



#### High Channel



FCC Part 15C/IC RSS-210 Test Report



# High Channel



BW/Avg

Res BW

100.0 kHz <u>Man</u>

Video BW

300.0 kHz Man

VBW/RBW 1.00000 <u>Man</u>

Average

Avg/VBW Type Log-Pwr (Video) Auto Man

Span/RBW

106 <u>Man</u>

100 <u>Off</u>

Mkr1 2.410 95 GHz

Stop 3.000 00 GHz Sweep 283.9 ms (601 pts)

2.64 dBm

Auto

Auto

Auto

0n

Auto

Low Channel

∗VBW 300 kHz

Copyright 2000-2010 Agilent Technologies

Atten 30 dB

🔆 Agilent

Ref 20 dBm #Peak **pp**l

Log 10

dB/ Offst 6.81 dB

DI -17.4 dBm

gAv

AP

Start 30.00 MHz #Res BW 100 kHz

M1 S3

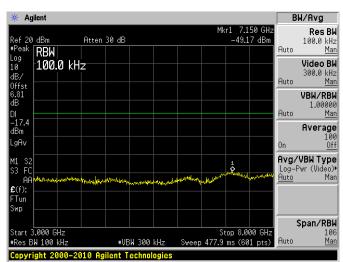
**£**(f):

FTun

wn

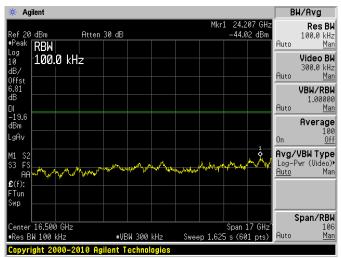
RBW

100.0 kHz

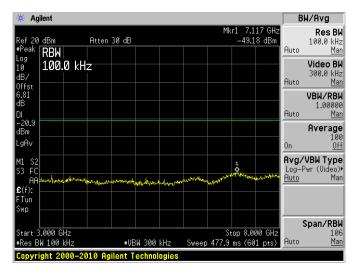


#### Low Channel

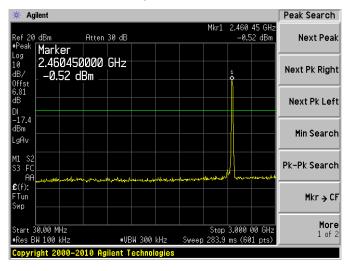
### Low Channel



### Middle Channel



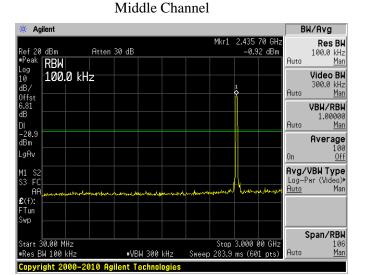
#### High Channel



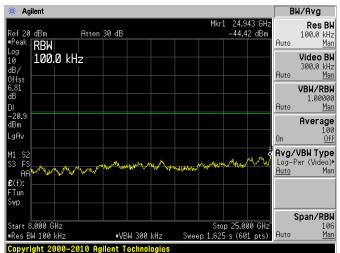
Report Number: R1108253-2.4G



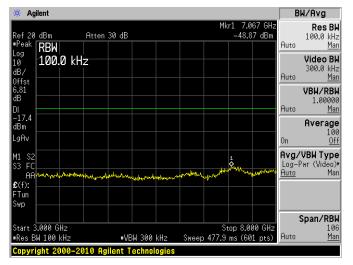




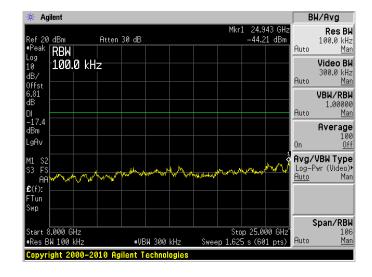
### Middle Channel



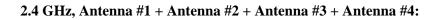
#### High Channel

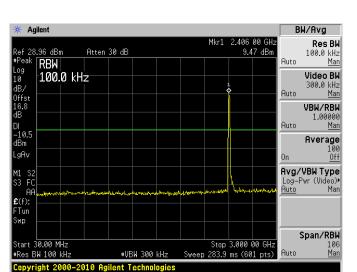


TruePath Wireless, LLC

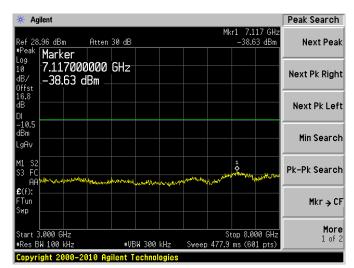


### High Channel





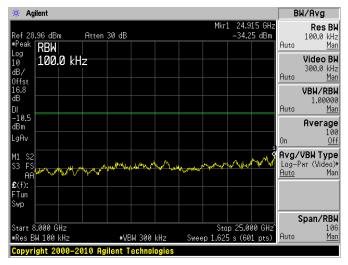
Low Channel



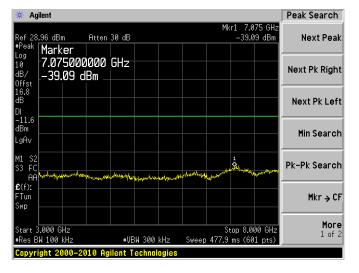
Low Channel

### Low Channel

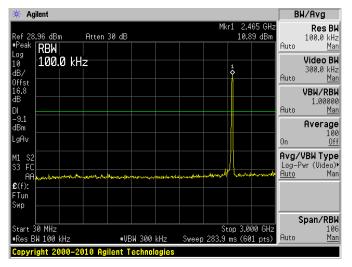
TruePath Wireless, LLC



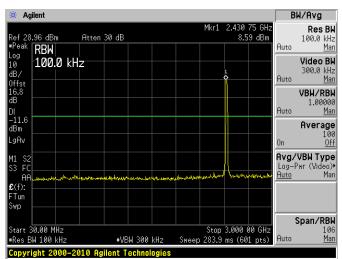
### Middle Channel



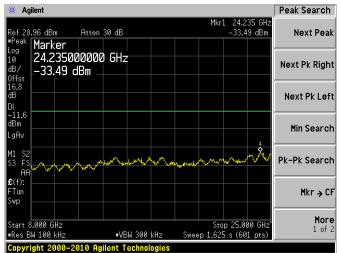
#### High Channel



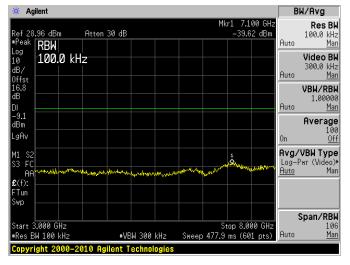
#### Middle Channel



### Middle Channel



#### High Channel



#### Report Number: R1108253-2.4G

FCC Part 15C/IC RSS-210 Test Report

🔆 Agilent					B	W/Avg
Ref 28.96 dBm Atten <sup>#Peak</sup> <b>RBW</b>	30 dB		Mkr1 24.3 -35.1	1 dBm	Auto	Res Bl 100.0 kH Mai
-og 10 <b>100.0 kHz</b> dB/ Offst					Auto	Video BI 300.0 kH <u>Ma</u>
L6.8					Auto	VBW/RBI 1.0000 <u>Ma</u>
-9.1 dBm					On	Average 10 <u>Of</u>
M1 S2 S3 FS AA ¢(f):	hand the second and the second s	1 Mary May Mary Mary Mary Mary Mary Mary	handharthartad	MV AV		<b>VBW Type</b> ?wr (Video) Ma
Swp						Span/RBI
Start 8.000 GHz ⊭Res BW 100 kHz	#VBW 300 kł	Hz Swee	Stop 25.0 1.625 s (60		Auto	<u>1</u> 0

### High Channel

### 8 FCC §15.205, §15.209, §15.247(d) & IC RSS-210 §A8.5 – Unwanted Emissions

### 8.1 Applicable Standard

As per FCC §15.35(d): Unless otherwise specified, on any frequency or frequencies above 1000 MHz, the radiated emission limits are based on the use of measurement instrumentation employing an average detector function. Unless otherwise specified, measurements above 1000 MHz shall be performed using a minimum resolution bandwidth of 1 MHz.

As per FCC §15.209(a) and RSS-210: Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table

Frequency (MHz)	Field Strength (micro volts/meter)	Measurement Distance (meters)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100**	3
88 - 216	150**	3
216 - 960	200**	3
Above 960	500	3

\*\* Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

As Per FCC §15.205(a) except as show in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
$\begin{array}{c} 0.090 - 0.110\\ 0.495 - 0.505\\ 2.1735 - 2.1905\\ 4.125 - 4.128\\ 4.17725 - 4.17775\\ 4.20725 - 4.20775\\ 6.215 - 6.218\\ 6.26775 - 6.26825\\ 6.31175 - 6.31225\\ 8.291 - 8.294\\ 8.362 - 8.366\\ 8.37625 - 8.38675\\ 8.41425 - 8.41475\\ 12.29 - 12.293\\ 12.51975 - 12.52025\\ 12.57675 - 12.57725\\ 13.36 - 13.41\\ \end{array}$	$\begin{array}{c} 16.42 - 16.423 \\ 16.69475 - 16.69525 \\ 25.5 - 25.67 \\ 37.5 - 38.25 \\ 73 - 74.6 \\ 74.8 - 75.2 \\ 108 - 121.94 \\ 123 - 138 \\ 149.9 - 150.05 \\ 156.52475 - 156.52525 \\ 156.7 - 156.9 \\ 162.0125 - 167.17 \\ 167.72 - 173.2 \\ 240 - 285 \\ 322 - 335.4 \\ 399.9 - 410 \\ 608 - 614 \end{array}$	$\begin{array}{r} 960-1240\\ 1300-1427\\ 1435-1626.5\\ 1645.5-1646.5\\ 1660-1710\\ 1718.8-1722.2\\ 2200-2300\\ 2310-2390\\ 2483.5-2500\\ 2690-2900\\ 3260-3267\\ 3.332-3.339\\ 33458-3358\\ 3.600-4.400\\ \end{array}$	$\begin{array}{c} 4.5-5.15\\ 5.35-5.46\\ 7.25-7.75\\ 8.025-8.5\\ 9.0-9.2\\ 9.3-9.5\\ 10.6-12.7\\ 13.25-13.4\\ 14.47-14.5\\ 15.35-16.2\\ 17.7-21.4\\ 22.01-23.12\\ 23.6-24.0\\ 31.2-31.8\\ 36.43-36.5\\ Above 38.6 \end{array}$

As per FCC §15.247 (d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated 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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the

conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in \$15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in \$15.205(a), must also comply with the radiated emission limits specified in \$15.209(a) (see \$15.205(c).

### 8.2 EUT and Test Setup

The radiated emissions tests were performed using the setup accordance with the ANSI C63.4-2003. The specification used was the FCC 15C and IC RSS-210/RSS-Gen limits.

The spacing between the peripherals was 10 centimeters.

External I/O cables were draped along the edge of the test table and bundle when necessary.

### 8.3 Test Procedure

For the radiated emissions test, the EUT host, and all support equipment power cords was connected to the AC floor outlet.

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

The EUT is set 3 meter away from the testing antenna, which is varied from 1-4 meter, and the EUT is placed on a turntable, which is 0.8 meter above ground plane, the table shall be rotated for 360 degrees to find out the highest emission. The receiving antenna should be changed the polarization both of horizontal and vertical.

The spectrum analyzer or receiver is set as:

Below 1000 MHz:

RBW = 100 kHz/VBW = 300 kHz/Sweep = Auto

Above 1000 MHz:

- (1) Peak: RBW = 1MHz/VBW = 1MHz/Sweep = Auto
- (2) Average: RBW = 1MHz/VBW = 10Hz/Sweep = Auto

### 8.4 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Cable Loss, and Attenuator Factor adding to the Indicated Reading. The basic equation is as follows:

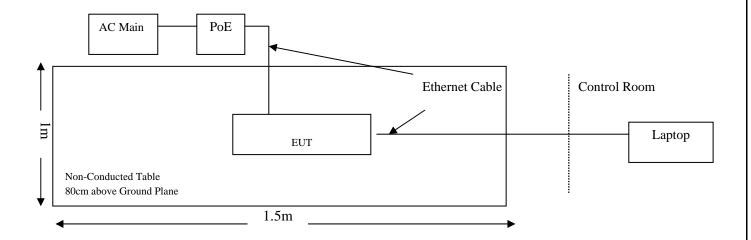
Corrected Amplitude = Indicated Reading + Cable Loss + Attenuator Factor

For example, a Corrected Amplitude of 34.08 dBuV/m = Indicated Reading (23.85 dBuV) + Cable Factor (0.22 dB) + Attenuator Factor (10 dB)

The "**Margin**" column of the following data tables indicates the degree of compliance within the applicable limit. For example, a margin of -7 dB means the emission is 7 dB below the maximum limit. The equation for margin calculation is as follows:

Margin = Corrected Amplitude – Limit

### 8.5 Test Setup Block Diagram



Manufacturer	Description	Model	Serial Number	Calibration Date
Sunol Science Corp	Combination Antenna	JB1	A020106-1	2010-05-28
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.5950K03	100337	2011-03-21
Sunol Science Corp	System Controller	SC99V	122303-1	N/R
A.R.A Inc	Horn antenna	DRG-1181A	1132	2010-11-29
Agilent	PSA Series Spectrum Analyzer	E4446A	US44300386	2010-08-18
Mini-Circuits	Pre Amplifier	ZVA-183-S	570400946	2011-05-09

### 8.6 Test Equipment List and Details

**Statement of Traceability: BACL** attests that all calibrations have been performed per the NVLAP requirements, traceable to NIST.

### 8.7 Test Environmental Conditions

Temperature:	18~21 °C
<b>Relative Humidity:</b>	30~35 %
ATM Pressure:	101.2-102.2kPa

The testing was performed by Jerry Huang on2011-05-02 ~ 2011-05-10 in 5 meter chamber 3.

### 8.8 Summary of Test Results

According to the data hereinafter, the EUT <u>complied with the FCC Part 15, Subpart C, section 15.205, 15.209</u> and 15.247 & IC RSS-210, RSS-Gen standard's radiated emissions limits, and had the worst margin of:

2.4 GHz Band:

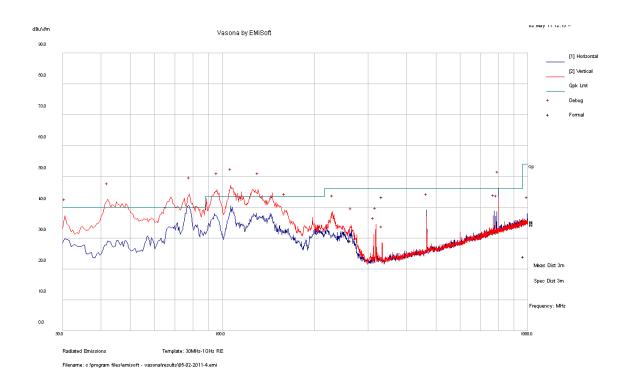
Mode: Transmitting			
Margin (dB)	Frequency (MHz)	Polarization (Horizontal/Vertical)	Channel, Range
-2.54	333.36	Vertical	30 MHz-1 GHz
-	-	-	Above 1GHz

Please refer to the following table and plots for specific test result details

#### TruePath Wireless, LLC

### 8.9 Radiated Emissions Test Result Data

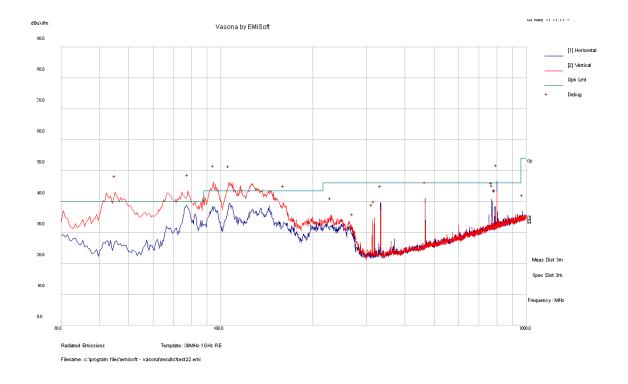
### 1) Radiated Emission at 3 meters, 30 MHz – 1 GHz





### **Quasi-Peak Measurements**

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
131.119	39.26	114	V	342	43.5	-4.24
263.8515	29.07	204	V	38	46	-16.93
333.3153	28.25	132	V	203	46	-17.75
995.942	24.3	217	Н	175	54	-29.70



### 2.4 GHz Band, 20 MHz Bandwidth, EIRP +36 dBm

### **Quasi-Peak Measurements**

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
333.36	43.46	118	V	191	46	-2.54
125.6843	40.59	141	V	82	43.5	-2.91
162.445	32.09	141	V	143	43.5	-11.41
263.0565	29.2	220	V	37	46	-16.80
966.4188	24.01	110	V	331	54	-29.99

### 2) Radiated Emission at 3 meters, above 1GHz

### 2.4 GHz Band, EIRP +36 dBm

### 5 MHz Bandwidth:

Frequency	S.A.	Turntable	Т	est Anten	na	Cable	Pre-	Cord.	FCC	C/IC	
(MHz)	Reading (dBµV)	Azimuth (degrees)	Height (m)	Polarity (H/V)	Factor (dB/m)	Loss (dB)	Amp. (dB)	Reading (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Comments
	Low Channel 2412 MHz, measured at 3 meters										
-	-	-	-	-	-	-	-	-	-	-	-1
			Middl	e Channe	1 2437 M	Hz meas	sured at	3 meters			
-	-	-	-	-	-	-	-	-	-	-	-1
High Channel 2462 MHz measured at 3 meters											
-	-	-	-	-	-	-	-	-	-	-	_1

20 MHz Bandwidth:

Frequency	S.A.	Turntable	Т	est Anten	na	Cable	Pre-	Cord.	FCC	/IC	
(MHz)	Reading (dBµV)	Azimuth (degrees)	Height (m)	Polarity (H/V)	Factor (dB/m)	Loss (dB)	Amp. (dB)	Reading (dBµV/m)	Limit (dBµV/m)	Margin	Comments
	Low Channel 2412 MHz, measured at 3 meters										
-	-	-	-	-	-	-	-	-	-	-	-1
			Middl	e Channe	el 2437 M	Hz meas	sured at 2	3 meters			
-	-	-	-	-	-	-	-	-	-	-	-1
High Channel 2462 MHz measured at 3 meters											
-	-	-	-	_	_	-	-	_	-	-	_1

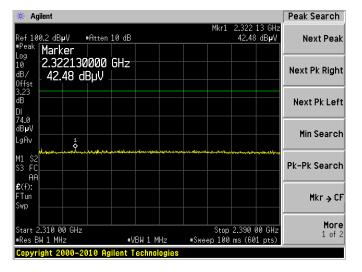
 $^{\rm 1}$  Note: All the Restricted Band Frequencies are more than 20 dB below the margin

### 3) Restricted Band Emissions

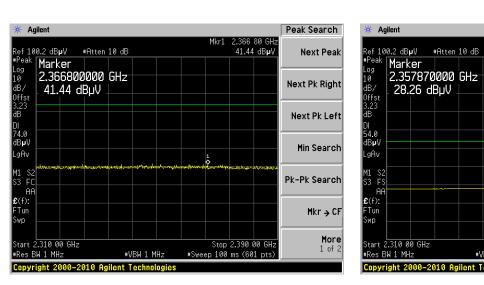
### 2.4 GHz Band

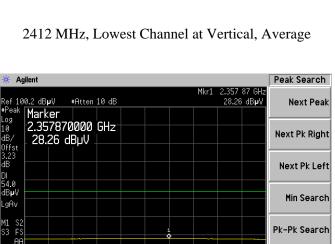
### 5 MHz Bandwidth

### 2412 MHz, Lowest Channel at Horizontal, Peak



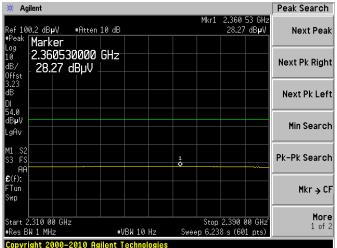
### 2412 MHz, Lowest Channel at Vertical, Peak





∗VBW 10 Hz

### 2412 MHz, Lowest Channel at Horizontal, Average



Tun

wp

Start 2.310 00 GHz

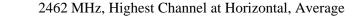
Stop 2.390 00 GHz Sweep 6.238 s (601 pts)

Mkr → CF

More

1 of 2

2462 MHz, Highest Channel at Horizontal, Peak



Peak Search

Next Pk Right

Next Pk Left

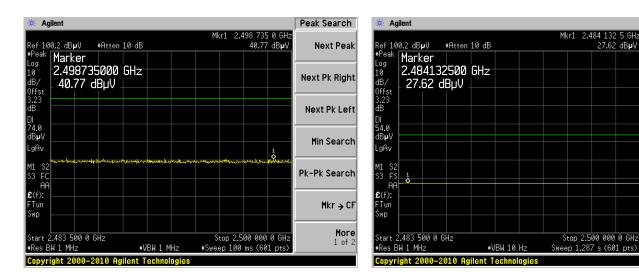
Min Search

Pk-Pk Search

Mkr→CF

More 1 of 2

Next Peak



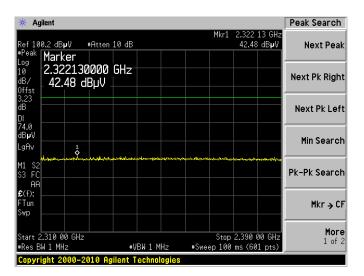
### 2462 MHz, Highest Channel at Vertical, Peak

### 2462 MHz, Highest Channel at Vertical, Average

🔆 Agilent	Peak Search	🔅 Agilent		Peak Search
Mkr1         2.484         517         5 GHz           ∎Peak         40.65 dBµV         40.65 dBµV           ∎Pak         Marker         40.65 dBµV		Ref100.2 dBµV ■Atten 10 dB Peak Marker	Mkr1 2.483 500 0 GHz 27.62 dB <b>µ</b> V	Next Peak
Log 104 2.484517500 GHz 40.65 dBμV 40.65 dBμV 40.65 dBμV 40.65 dBμV	Next Pk Right	<sup>.09</sup> 2.483500000 GHz <sup>BE</sup> ∕ 27.62 dBµV		Next Pk Right
	Next Pk Left	3.23 IB DI		Next Pk Left
DI 74.9 dBpV LgAv	Min Search	94.0 BPV 9Av		Min Search
M1 52 Hall Hall And Marken a	Pk-Pk Search	11 S2 33 F5 AA		Pk-Pk Search
£(f): FTun Swp	Mkr → CF	8(f): Tun Dwp		Mkr → Cl
Start 2.483 500 0 GHz         Stop 2.500 000 0 GHz           •Res BW 1 MHz         •VBW 1 MHz         Sweep 1 ms (601 pts)		Start 2.483 500 0 GHz Res BW 1 MHz #VBW 10	Stop 2.500 000 0 GHz Hz Sweep 1.287 s (601 pts)	More 1 of 2

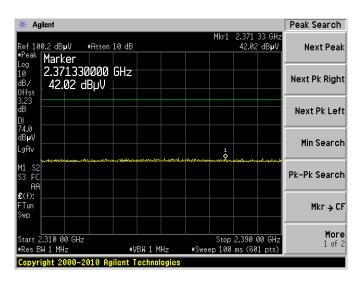
20 MHz Bandwidth

TruePath Wireless, LLC

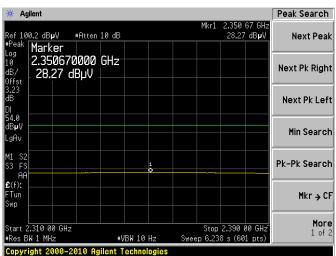


## 2412 MHz, Lowest Channel at Horizontal, Peak

2412 MHz, Lowest Channel at Vertical, Peak



## 2412 MHz, Lowest Channel at Vertical, Average



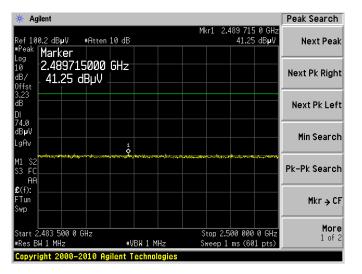
### 2412 MHz, Lowest Channel at Horizontal, Average

Peak Search

FCC ID: ZJ3-TPW24-B-4AM, IC: 9698A-TPW24B4AM

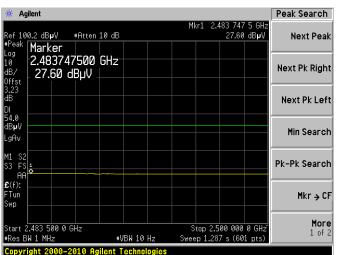
Mkr1 2.360 93 GH tef 100.2 dBµV #Atten 10 dB 28.26 dBµV Next Peak #Peak Marker .0g 2.360930000 GHz Next Pk Right lΒ, 28.26 dBµV Offst 3.23 dB Next Pk Left 4.0 dB**µ**V **Min Search** αĤv \$2 F\$ Pk-Pk Search AA £(f): Tun Mkr → CF wр More Stop 2.390 00 GHz Sweep 6.238 s (601 pts) Start 2.310 00 GHz 1 of 2 #Res BW 1 MHz ∗VBW 10 Hz Copyright 2000-2010 Agilent Technologies

🔆 Agilent



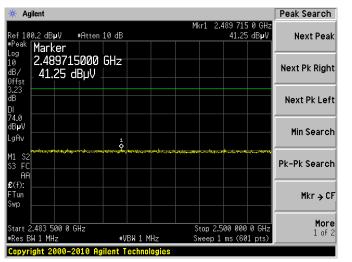
### 2462 MHz, Highest Channel at Horizontal, Peak

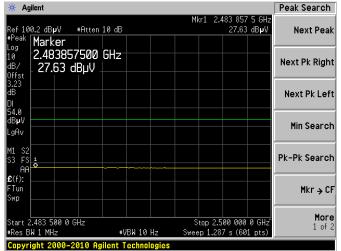
### 2462 MHz, Highest Channel at Horizontal, Average



### 2462 MHz, Highest Channel at Vertical, Peak

### 2462 MHz, Highest Channel at Vertical, Average





### 9 FCC §15.247(a)(2) & IC RSS-210 §A8.2 – 6 dB & 99% Emission Bandwidth

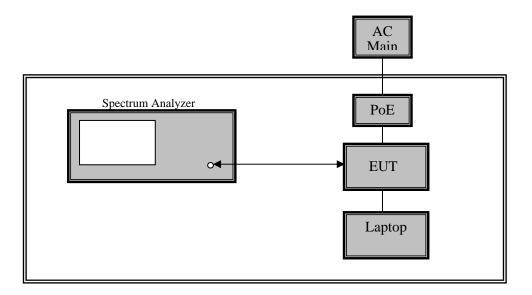
### 9.1 Applicable Standard

According to FCC §15.247(a)(2) and IC RSS-210 A8.2 (a), systems using digital modulation techniques may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz, and 5725 - 5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz

### 9.2 Measurement Procedure

- 1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- 2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
- 3. Measure the frequency difference of two frequencies that were attenuated 6 dB from the reference level. Record the frequency difference as the emissions bandwidth.
- 4. Repeat above procedures until all frequencies measured were complete.

### 9.3 Test Setup Block Diagram



### 9.4 Test Equipment List and Details

Manufacturers	Description	Models	Serial Numbers	Calibration Dates	
Agilent	Spectrum Analyzer	E4445A	MY44020562	2011-04-05	

**Statement of Traceability: BACL Corp.** attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

### 9.5 Test Environmental Conditions

Temperature:	16.5~27°C
<b>Relative Humidity:</b>	30.9~43.3 %
ATM Pressure:	101-103 kPa

*The testing was performed by Brian Fox on 2011-05-13 ~ 2011-05-20.* 

### 9.6 Test Results

#### 2.4 GHz Band (2412–2462 MHz) - BPSK at 5 MHz Bandwidth

(Test results are represented in worse-case):

Antenna #1:

Radio Mode	Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)	99% Emission Bandwidth (MHz)	Limit (MHz)	Results
	Low	2412	4.3955	4.201	> 0.5	Compliance
BPSK, EIRP +20 dBm	Middle	2437	4.3949	4.166	> 0.5	Compliance
	High	2462	4.4122	4.174	> 0.5	Compliance

Antenna #2:

Radio Mode	Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)	99% Emission Bandwidth (MHz)	Limit (MHz)	Results
	Low	2412	4.4056	4.170	> 0.5	Compliance
BPSK, EIRP +20 dBm	Middle	2437	4.4108	4.223	> 0.5	Compliance
	High	2462	4.4044	4.130	> 0.5	Compliance

Antenna #3:

Radio Mode	Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)	99% Emission Bandwidth (MHz)	Limit (MHz)	Results
	Low	2412	4.4013	4.285	> 0.5	Compliance
BPSK, EIRP +20 dBm	Middle	2437	4.4043	4.333	> 0.5	Compliance
	High	2462	4.4044	4.130	> 0.5	Compliance

Antenna #4:

Radio Mode	Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)	99% Emission Bandwidth (MHz)	Limit (MHz)	Results
	Low	2412	4.3978	4.343	> 0.5	Compliance
BPSK, EIRP +20 dBm	Middle	2437	4.4093	4.412	> 0.5	Compliance
	High	2462	4.4033	4.343	> 0.5	Compliance

### 2.4 GHz Band (2412-2462 MHz) - BPSK at 20 MHz Bandwidth:

(Test results are represented in worse-case):

Antenna #1:

Radio Mode	Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)	99% Emission Bandwidth (MHz)	Limit (MHz)	Results
	Low	2412	17.5361	16.104	> 0.5	Compliance
BPSK, EIRP +20 dBm	Middle	2437	17.4897	15.187	> 0.5	Compliance
	High	2462	17.4955	15.745	> 0.5	Compliance

Antenna #2:

Radio Mode	Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)	99% Emission Bandwidth (MHz)	Limit (MHz)	Results
	Low	2412	17.5658	16.352	> 0.5	Compliance
BPSK, EIRP +20 dBm	Middle	2437	17.5240	16.023	> 0.5	Compliance
	High	2462	17.5170	16.346	> 0.5	Compliance

Antenna #3:

Radio Mode	Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)	99% Emission Bandwidth (MHz)	Limit (MHz)	Results
	Low	2412	17.5168	15.186	> 0.5	Compliance
BPSK, EIRP +20 dBm	Middle	2437	17.4784	15.194	> 0.5	Compliance
	High	2462	17.4519	15.205	> 0.5	Compliance

Antenna #4:

Radio Mode	Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)	99% Emission Bandwidth (MHz)	Limit (MHz)	Results
	Low	2412	17.5488	16.154	> 0.5	Compliance
BPSK, EIRP +20 dBm	Middle	2437	17.5110	16.165	> 0.5	Compliance
	High	2462	17.5212	16.171	> 0.5	Compliance

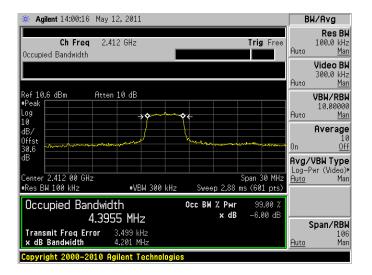
Please refer to the following plots for detailed test results

TruePath Wireless, LLC

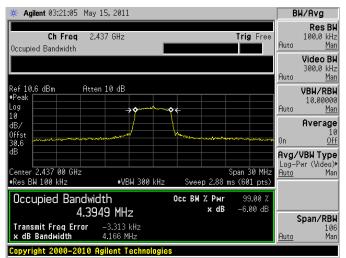
### 2.4 GHz Band (2412-2462 MHz): BPSK with 5 MHz bandwidth

#### Antenna #1:

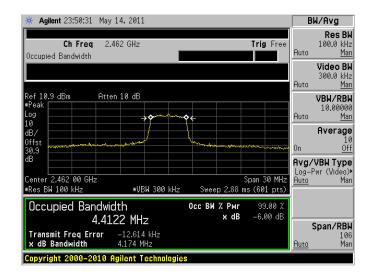
#### EIRP +20 dBm ~ Low Channel



### EIRP +20 dBm ~ Middle Channel



EIRP +20 dBm ~ High Channel



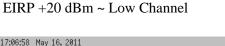
Report Number: R1108253-2.4G

Agilent 17:06:58 May 16, 2011

Ch Frea 2.412 GHz

Atten 10 dB

4.4056 MHz



₩VBW 300 kHz

Trig Free

Span 30 MHz

99.00 %

-6.00 dB

Sweep 2.88 ms (601 pts)

Осс ВМ % Рмг х dB

Auto

Auto

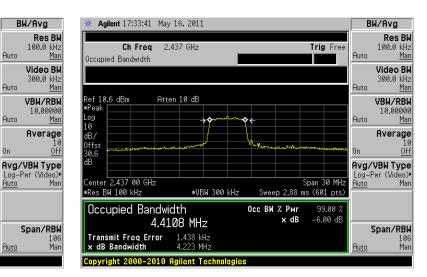
Auto

0n

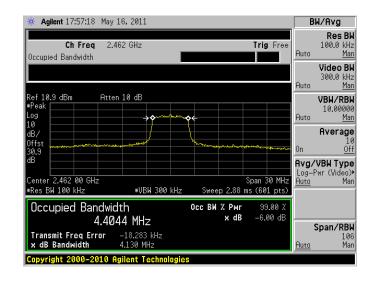
<u>Auto</u>

### EIRP +20 dBm ~ Middle Channel

FCC ID: ZJ3-TPW24-B-4AM, IC: 9698A-TPW24B4AM



EIRP +20 dBm ~ High Channel



Antenna #2:

Occupied Bandwidth

2.412 00 GHz

Occupied Bandwidth

Transmit Freq Error-3.421 kHzx dB Bandwidth4.170 MHz

Copyright 2000-2010 Agilent Technologies

Ref 10.6 dBm

₽.

.og 10

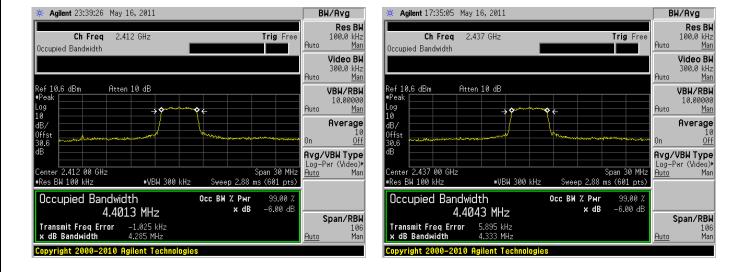
lffst

ente #Res BW 100 kHz

Report Number: R1108253-2.4G

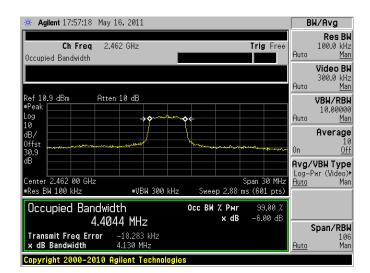
### Antenna #3:

### EIRP +20 dBm ~ Low Channel



### EIRP +20 dBm ~ Middle Channel

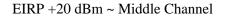
# EIRP +20 dBm ~ High Channel

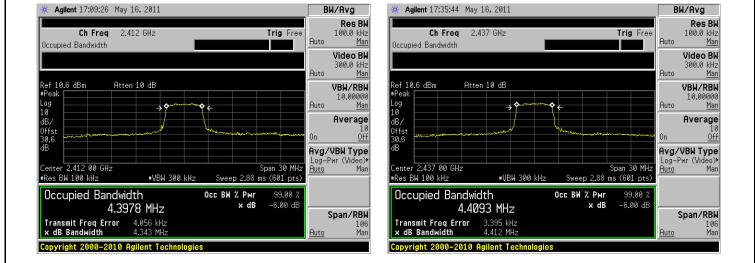


Report Number: R1108253-2.4G

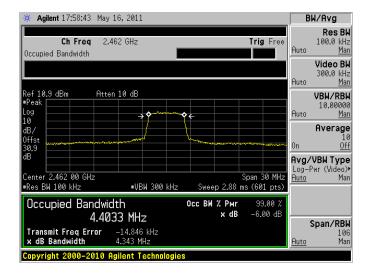
### Antenna #4:

EIRP +20 dBm ~ Low Channel





### EIRP +20 dBm ~ High Channel



#### TruePath Wireless, LLC

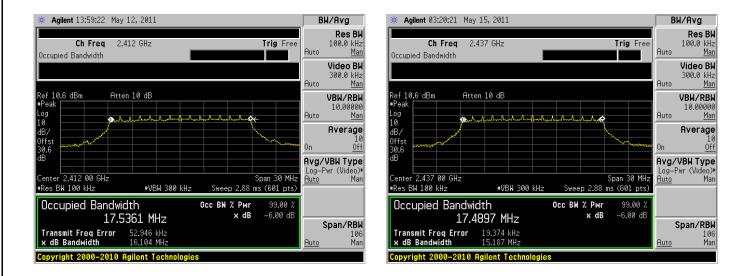
FCC ID: ZJ3-TPW24-B-4AM, IC: 9698A-TPW24B4AM

### 2.4 GHz Band (2412-2462 MHz): BPSK with 20 MHz bandwidth

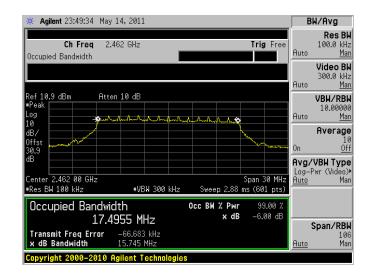
Antenna #1:

#### EIRP +20 dBm ~ Low Channel

#### EIRP +20 dBm ~ Middle Channel



EIRP +20 dBm ~ High Channel



Report Number: R1108253-2.4G

Report Number: R1108253-2.4G

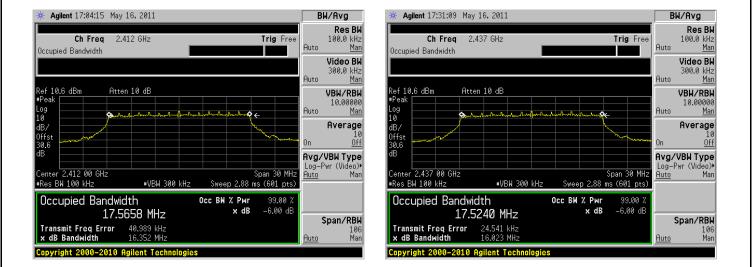
#### TruePath Wireless, LLC

### Antenna #2:

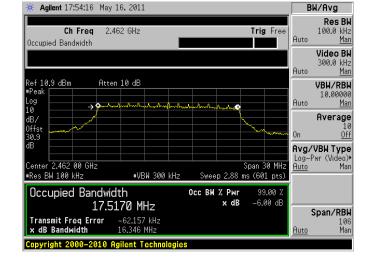
### EIRP +20 dBm ~ Low Channel



EIRP +20 dBm ~ High Channel

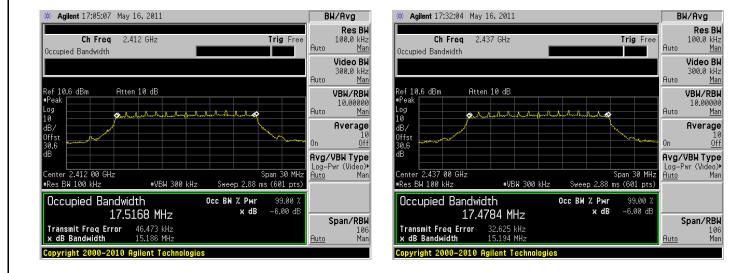


### EIRP +20 dBm ~ Middle Channel



FCC ID: ZJ3-TPW24-B-4AM, IC: 9698A-TPW24B4AM

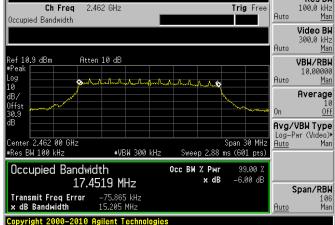
Antenna #3:



### EIRP $+20 \text{ dBm} \sim \text{Low Channel}$

Agilent 17:55:17 May 16, 2011

EIRP +20 dBm ~ High Channel



### EIRP +20 dBm ~ Middle Channel

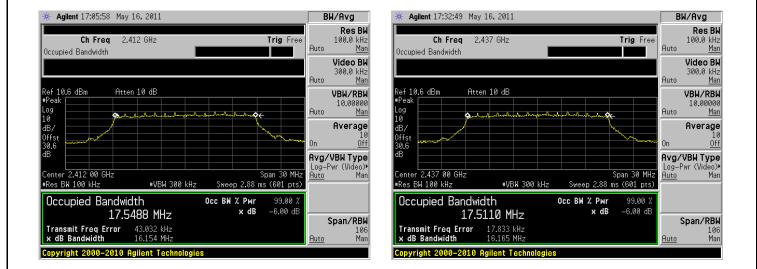
BW/Avg Res BW

FCC ID: ZJ3-TPW24-B-4AM, IC: 9698A-TPW24B4AM

Report Number: R1108253-2.4G

FCC Part 15C/IC RSS-210 Test Report

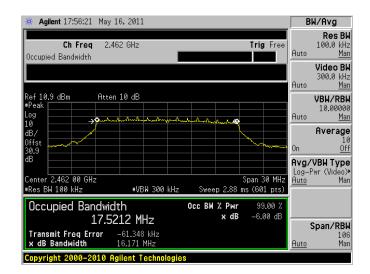
### EIRP +20 dBm ~ Low Channel



### EIRP +20 dBm ~ Middle Channel

FCC ID: ZJ3-TPW24-B-4AM, IC: 9698A-TPW24B4AM

### EIRP +20 dBm ~ High Channel



#### TruePath Wireless, LLC

### 10 FCC §15.247(b) & IC RSS-210 §A8.4 - Peak Output Power Measurement

### 10.1 Applicable Standard

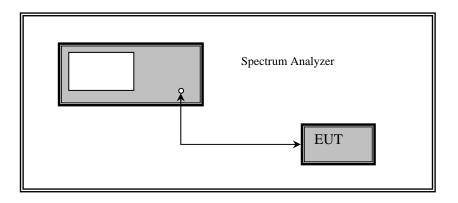
According to \$15.247(b) (3) and RSS210 \$ A8.4 (4) for systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt.

According to FCC 15.247(c)(2)(ii)(B) - "A lower value for the directional gain than that calculated in paragraph (c)(2)(ii)(A) of this section will be accepted if sufficient evidence is presented, e.g., due to shading of the array or coherence loss in the beam forming."

According to FCC KDB Doc "662911 D01 Multiple Transmitter Output v01" 4/4/2011 - "Emissions Testing of Transmitters with Multiple Outputs in the Same Band (e.g., MIMO, Smart Antenna, etc)" - "Directional Gain Calculations: If all transmit signals are completely uncorrelated with each other, Directional Gain = Gant"

#### **10.2 Measurement Procedure**

- 1. Place the EUT on a bench and set it in transmitting mode.
- 2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to a spectrum analyzer.
- 3. Add a correction factor to the display.



### **10.3 Test Equipment List and Details**

Manufacturers	Manufacturers Description		Serial Numbers	Calibration Dates
Agilent	Spectrum Analyzer	E4445A	MY44020562	2011-04-05

**Statement of Traceability: BACL Corp.** attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

### **10.4 Test Environmental Conditions**

Temperature:	16.5~27°C
<b>Relative Humidity:</b>	30.9~43.3 %
ATM Pressure:	101-103 kPa

*The testing was performed by Brian Fox on 2011-05-13 ~ 2011-05-20.* 

#### 10.5 Test Results

#### (1) 2.4 GHz Band, BPSK with 5 MHz Bandwidth, +20 dBm EIRP Power setting

Antenna Gain 14 dBi (4 x Directional Array): Directional gain = 14 dBi + 10 \*Log (4) = 20 dBi, so the Power limit should be 30 dBm-(20-6) dBi = 16 dBm

Frequency	Сог	nducted Outp	Total Power	Limit		
(MHz)	Ant 1	Ant 2	Ant 3	Ant 4	(dBm)	(dBm)
2412	-0.4	-0.8	-0.8	-0.7	4.11	16
2437	-0.9	-0.4	-1.0	-0.7	4.01	16
2462	-0.6	-0.5	-0.3	-0.6	4.31	16

### (2) 2.4 GHz Band, BPSK with 20 MHz Bandwidth, +20 dBm EIRP Power setting

Antenna Gain 14 dBi (4 x Directional Array): Directional gain = 14 dBi + 10 \*Log(4) = 20 dBi, so the Power limit should be 30 dBm-(20-6) dBi = 16 dBm

Frequency	Сог	nducted Outp	Total Power	Limit		
(MHz)	Ant 1	Ant 2	Ant 3	Ant 4	(dBm)	(dBm)
2412	-0.5	-0.7	-0.7	-0.4	4.14	16
2437	-0.7	-0.8	-0.8	-0.9	4.00	16
2462	-0.3	-0.3	-0.3	-0.8	4.47	16

(3) 2.4 GHz Band, BPSK with 5 MHz Bandwidth, +30 dBm EIRP Power setting

Antenna Gain 14dBi (4 x Directional Array): Directional gain = 14 dBi + 10 \*Log(4) = 20 dBi, so the Power limit should be 30 dBm-(20-6) dBi = 16 dBm

Frequency	Сог	nducted Outp	Total Power	Limit		
(MHz)	Ant 1	Ant 2	Ant 3	Ant 4	(dBm)	(dBm)
2412	9.8	9.5	9.2	9.3	14.28	16
2437	9.1	9.3	9.3	9.2	14.01	16
2462	9.4	9.1	9.6	9.4	14.14	16

Report Number: R1108253-2.4G

### (4) 2.4 GHz Band, BPSK with 20 MHz Bandwidth, +30 dBm EIRP Power setting

Antenna Gain 14 dBi (4 x Directional Array): Directional gain = 14 dBi + 10 \*Log (4) = 20 dBi, so the Power limit should be 30 dBm-(20-6) dBi = 16 dBm

Frequency	Co	nducted Outp	Total Power	Limit		
(MHz)	Ant 1	Ant 2	Ant 3	Ant 4	(dBm)	(dBm)
2412	9.8	9.9	9.4	9.4	14.48	16
2437	9.3	9.6	9.6	9.2	14.27	16
2462	9.2	9.5	9.6	9.4	14.21	16

### (5) 2.4 GHz Band, BPSK with 5 MHz Bandwidth, MIMO +36 dBm EIRP Power setting

Antenna Gain 14 dBi (4 x Directional Array): 4xMIMO Directional gain = 14 dBi + 10 \*Log (4/4) = 14 dBi, so the power limit should be 30 dBm-(14-6) dBi = 22 dBm

Frequency	Cor	nducted Outp	Total Power	Limit		
(MHz)	Ant 1	Ant 2	Ant 3	Ant 4	(dBm)	(dBm)
2412	15.5	15.2	15.6	15.4	21.4	22
2437	15.3	15.2	15.4	15.5	21.4	22
2462	15.4	15.1	15.5	15.6	21.4	22

### (6) 2.4 GHz Band, BPSK with 20 MHz Bandwidth, MIMO +36 dBm EIRP Power setting

Antenna Gain 14 dBi (4 x Directional Array): 4xMIMO Directional gain = 14 dBi + 10 \*Log (4/4) = 14 dBi, so the power limit should be 30 dBm-(14-6) dBi = 22 dBm

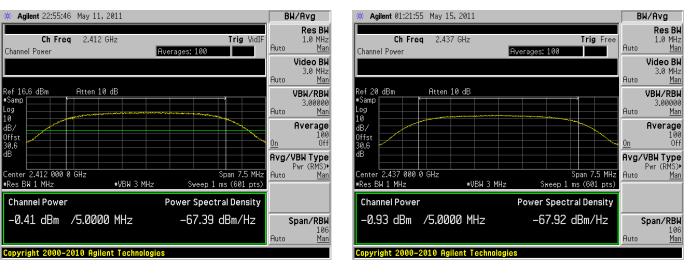
Frequency	Сог	nducted Outp	Total Power	Limit		
(MHz)	Ant 1	Ant 2	Ant 3	Ant 4	(dBm)	(dBm)
2412	15.4	15.3	15.8	15.4	21.5	22
2437	15.4	15.5	15.6	15.3	21.5	22
2462	15.1	15.4	15.6	15.5	21.4	22

Please refer to the following plots for detailed results

TruePath Wireless, LLC

### EIRP +20 dBm ~ Low Channel

### EIRP +20 dBm ~ Middle Channel

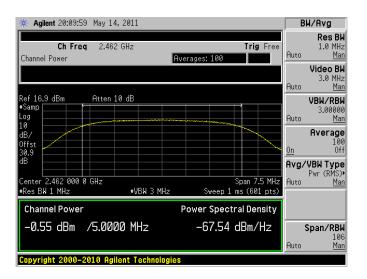


2.4 GHz (2412-2462 MHz) Band

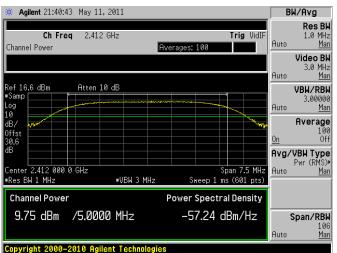
2.4 GHz, Antenna #1:

**BPSK with 5 MHz Bandwidth** 

EIRP +20 dBm ~ High Channel



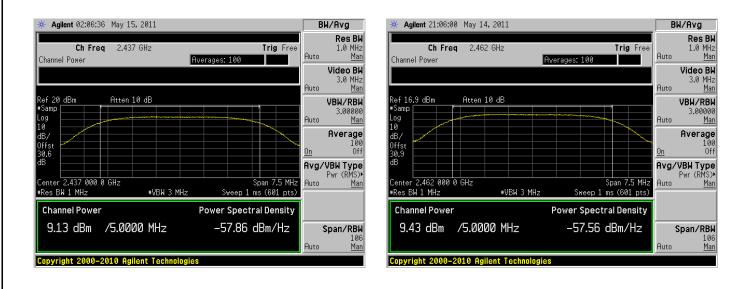
### EIRP $+30 \text{ dBm} \sim \text{Low Channel}$



FCC ID: ZJ3-TPW24-B-4AM, IC: 9698A-TPW24B4AM

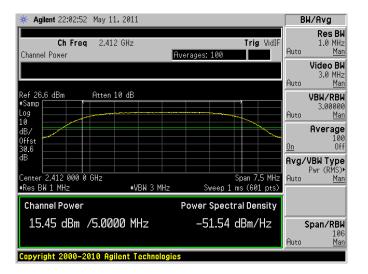
### EIRP +30 dBm ~ Middle Channel

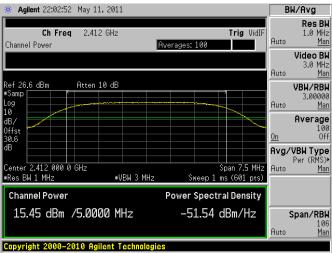
### EIRP +30 dBm ~ High Channel

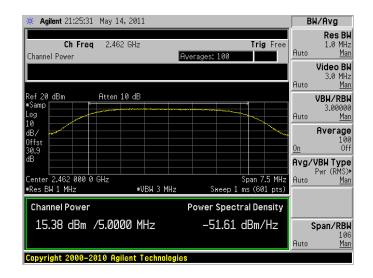


### EIRP MIMO +36 dBm ~ Low Channel

### EIRP MIMO +36 dBm ~ Middle Channel



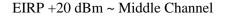


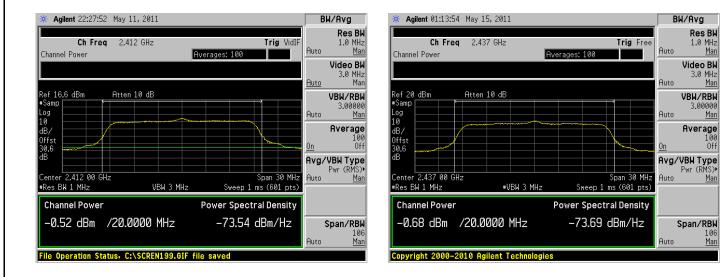


### EIRP MIMO +36 dBm ~ High Channel



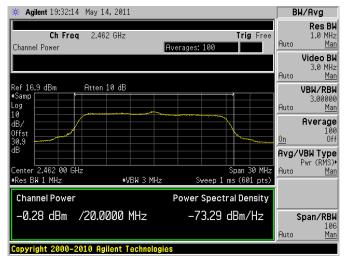
### EIRP +20 dBm ~ Low Channel



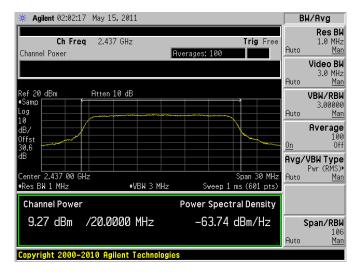


#### TruePath Wireless, LLC

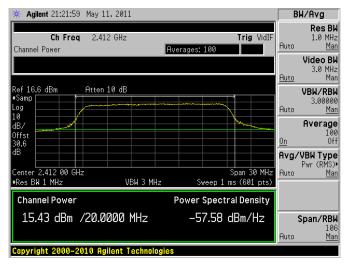
### EIRP +20 dBm ~ High Channel



### EIRP +30 dBm ~ Middle Channel

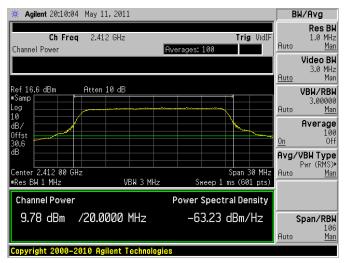


EIRP MIMO +36 dBm ~ Low Channel

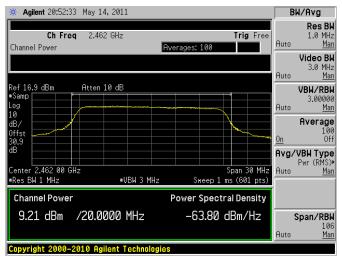


Report Number: R1108253-2.4G

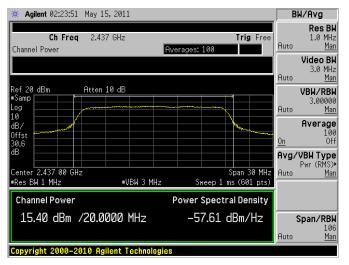
### EIRP +30 dBm ~ Low Channel



EIRP +30 dBm ~ High Channel



### EIRP MIMO +36 dBm ~ Middle Channel



Page 70 of 127

TruePath Wireless, LLC

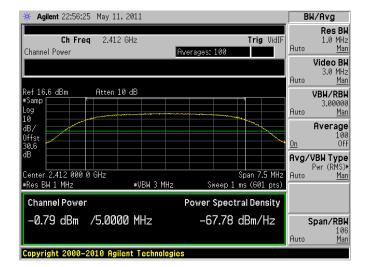
🔆 Agilent 21:14:22 May 1	4,2011		BW/Avg
Ch Freq 2.46 Channel Power	2 GHz Ave	<b>Trig</b> Fr erages: 100	ree <b>Res Bl</b> 1.0 MH Auto <u>Ma</u>
			Video B 3.0 MH Auto <u>Ma</u>
Ref 16.9 dBm Atten #Samp Log 10	10 dB		VBW/RB 3.0000 Auto <u>Ma</u>
dB/ Offst 30.9			Average 10 <u>On</u> Of
dB Center 2.462 00 GHz		Span 30 M	
*Res BW 1 MHz Channel Power	#VBW 3 MHz	Sweep 1 ms (601 p ower Spectral Densit	
15.09 dBm /20.0	000 MHz	-57.92 dBm/Hz	Span/RB
Copyright 2000–2010 Ag			Auto <u>Ma</u>

### EIRP MIMO +36 dBm ~ High Channel

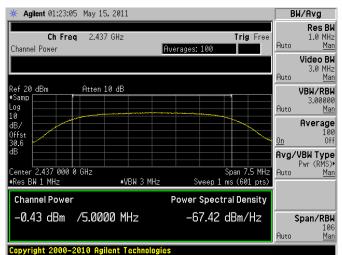
### 2.4 GHz, Antenna #2:



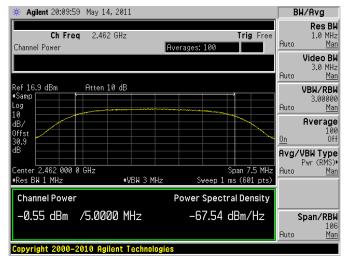
### EIRP +20 dBm ~ Low Channel



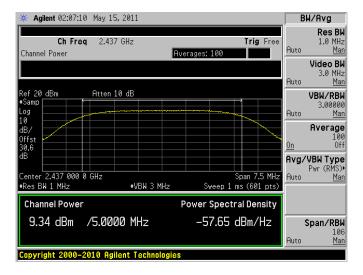
### EIRP +20 dBm ~ Middle Channel



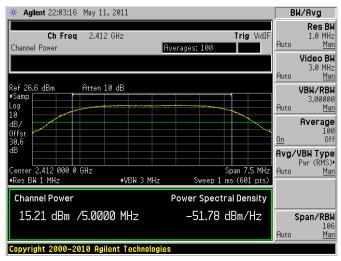
### EIRP +20 dBm ~ High Channel



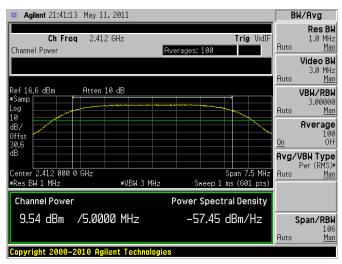
### EIRP +30 dBm ~ Middle Channel



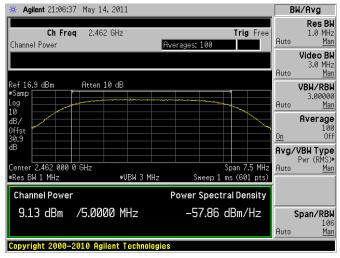
EIRP MIMO +36 dBm ~ Low Channel

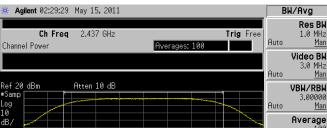


#### EIRP +30 dBm ~ Low Channel

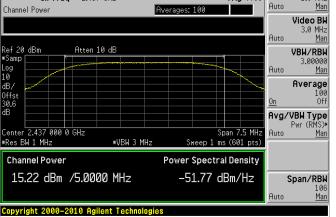


### EIRP +30 dBm ~ High Channel



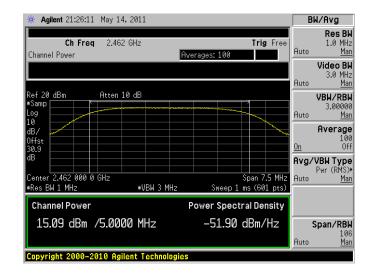


#### EIRP MIMO +36 dBm ~ Middle Channel



Report Number: R1108253-2.4G

TruePath Wireless, LLC

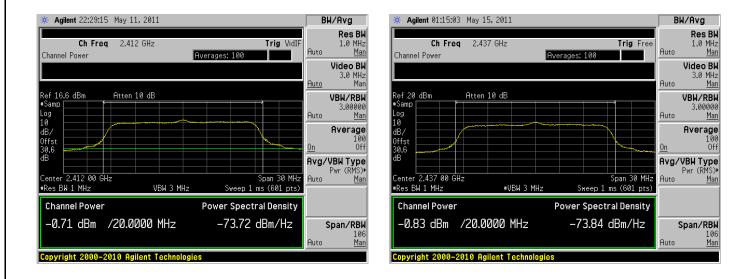


### EIRP MIMO +36 dBm ~ High Channel

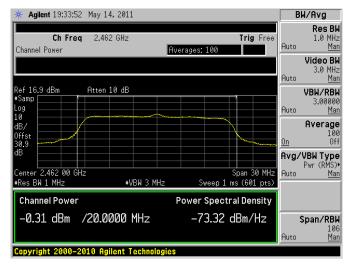
# **BPSK with 20 MHz Bandwidth**

### EIRP +20 dBm ~ Low Channel

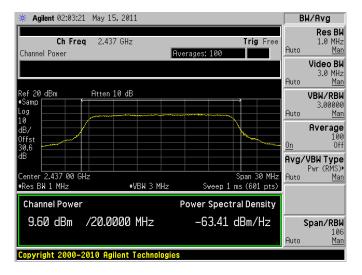
# EIRP +20 dBm ~ Middle Channel



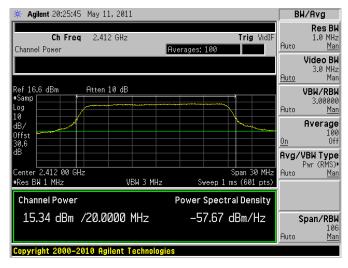
### EIRP +20 dBm ~ High Channel



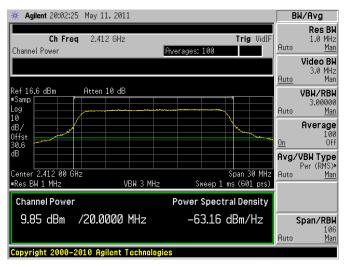
### EIRP +30 dBm ~ Middle Channel



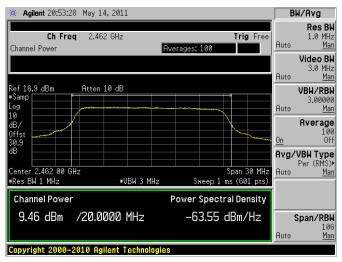
EIRP MIMO +36 dBm ~ Low Channel



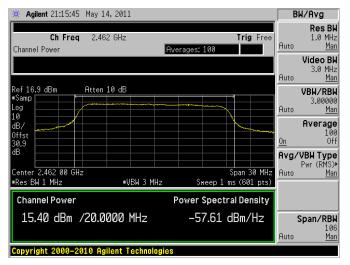
### EIRP +30 dBm ~ Low Channel



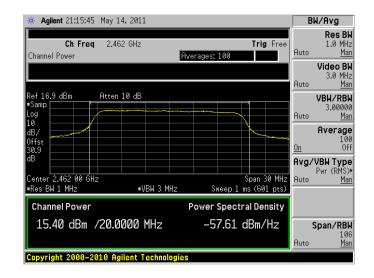
EIRP +30 dBm ~ High Channel



# EIRP MIMO +36 dBm ~ Middle Channel

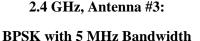


Report Number: R1108253-2.4G



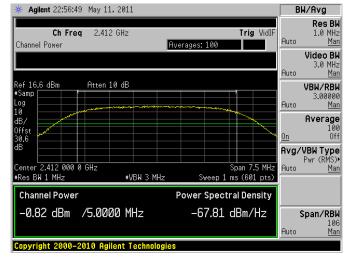
EIRP MIMO +36 dBm ~ High Channel

# 2.4 GHz, Antenna #3:



# EIRP +20 dBm ~ Low Channel

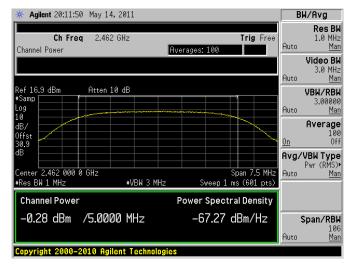
### gilent 01:23:55 May 15, 2011 BW/Avg Res BW Ch Freq 2.437 GHz Trig Free 1.0 MHz <u>Man</u> Auto Channel Power Averages: 100 Video BW 3.0 MHz Man Auto Ref 20 dBm Atten 10 dB VBW/RBW #Samr 3.00000 Dg Auto Mar 10 Average dB/ Offst 100 Off <u>0n</u> 30.6 Avg/VBW Type Pwr (RMS)> Center 2.437 000 0 GHz #Res BW 1 MHz Span 7.5 MHz Sweep 1 ms (601 pts) Auto Man ∗VBW 3 MHz **Power Spectral Density Channel Power** -0.96 dBm /5.0000 MHz -67.95 dBm/Hz Span/RBW 100 Auto Mar Copyright 2000-2010 Agilent Technologies



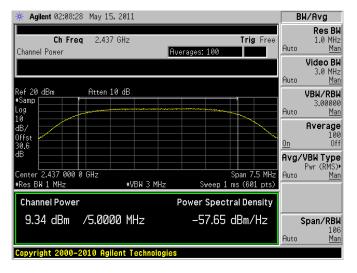


# EIRP +20 dBm ~ Middle Channel

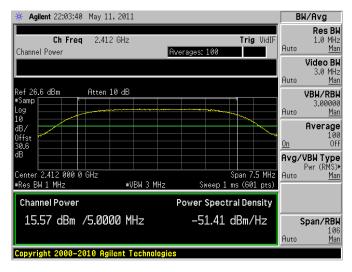
## EIRP +20 dBm ~ High Channel



### EIRP +30 dBm ~ Middle Channel

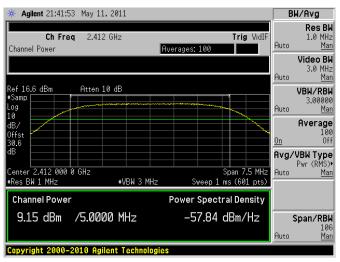


EIRP MIMO +36 dBm ~ Low Channel

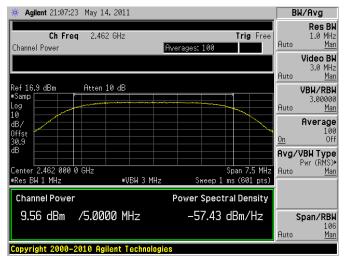


Report Number: R1108253-2.4G

# EIRP +30 dBm ~ Low Channel



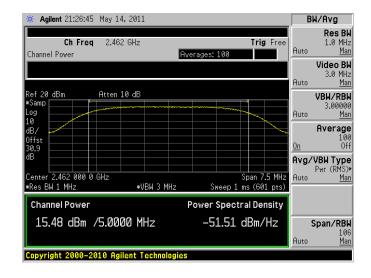
EIRP +30 dBm ~ High Channel



# EIRP MIMO +36 dBm ~ Middle Channel



Page 76 of 127



# EIRP MIMO +36 dBm ~ High Channel



EIRP +20 dBm ~ Low Channel

VBW 3 MHz

Averages: 100

Trig VidIF

Span 30 MHz Sweep 1 ms (601 pts)

**Power Spectral Density** 

-73.68 dBm/Hz

Auto

<u>Auto</u>

Auto

0n

Auto

🔆 Agilent 22:30:30 May 11, 2011

Channel Power

Ref 16.6 dBm

enter 2.412 00 GHz

**Channel Power** 

-0.67 dBm /20.0000 MHz

Copyright 2000-2010 Agilent Technologies

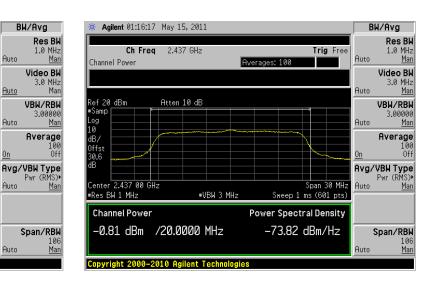
#Res BW 1 MHz

Samp

lffst

Ch Freq 2.412 GHz

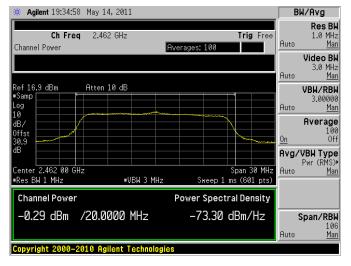
Atten 10 dB



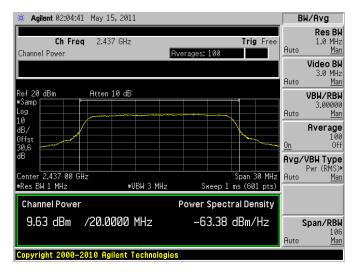
### EIRP +20 dBm ~ Middle Channel

### TruePath Wireless, LLC

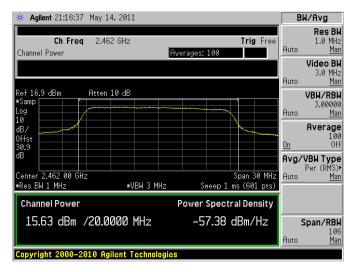
# EIRP +20 dBm ~ High Channel



# EIRP +30 dBm ~ Middle Channel

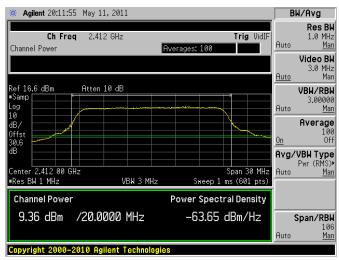


### EIRP MIMO +36 dBm ~ Low Channel

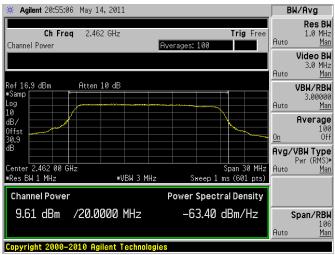


### Report Number: R1108253-2.4G

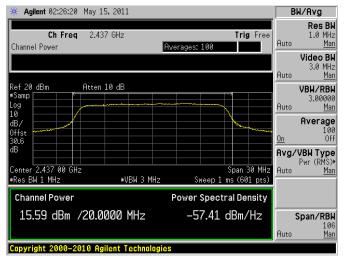
# EIRP +30 dBm ~ Low Channel



EIRP +30 dBm ~ High Channel



### EIRP MIMO +36 dBm ~ Middle Channel



Page 78 of 127

TruePath Wireless, LLC

🔆 Agilent 21:16:37 May	14,2011		B	W/Avg
Ch Freq 2.4 Channel Power	162 GHz	Trig Free Averages: 100	Auto	Res Bl 1.0 MHz <u>Mar</u>
			Auto	Video Bl 3.0 MHz <u>Mar</u>
Ref 16.9 dBm Atte #Samp Log 10	n 10 dB		Auto	VBW/RBI 3.0000 <u>Ma</u>
dB/ 0ffst 30.9			<u>0n</u>	Average 100 Of
dB Center 2.462 00 GHz		Span 30 MHz		<b>VBWType</b> Pwr(RMS) Ma
#Res BW 1 MHz	∗VBW 3 MHz			<u>na</u>
Channel Power		Power Spectral Density	Í	
15.63 dBm /20.	0000 MHz	-57.38 dBm/Hz		Span/RBI
			Auto	<u>Ma</u>
Copyright 2000-2010 F	igilent Technolog	ies		

# EIRP MIMO +36 dBm ~ High Channel

# 2.4 GHz, Antenna #4:

# **BPSK with 5 MHz Bandwidth**

# EIRP +20 dBm ~ Low Channel

∗VBW 3 MHz

Averages: 100

Trig VidIF

Span 7.5 MHz Sweep 1 ms (601 pts)

**Power Spectral Density** 

-67.64 dBm/Hz

Auto

Auto

Auto

<u>0n</u>

Auto

Auto

Agilent 22:57:15 May 11, 2011

Channel Power

Ref 16.6 dBm

Center 2.412 000 0 GHz #Res BW 1 MHz

-0.65 dBm /5.0000 MHz

Copyright 2000–2010 Agilent Technolo

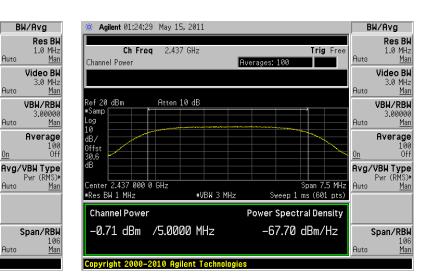
**Channel Power** 

09

ffs

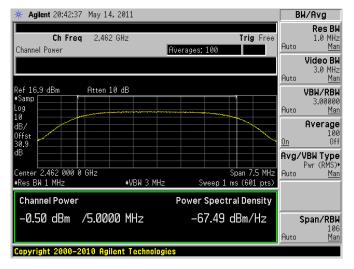
Ch Freq 2.412 GHz

Atten 10 dB

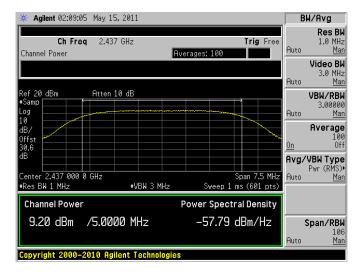


# EIRP +20 dBm ~ Middle Channel

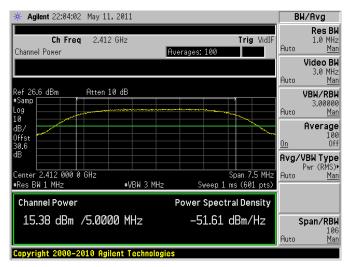
## EIRP +20 dBm ~ High Channel



### EIRP +30 dBm ~ Middle Channel

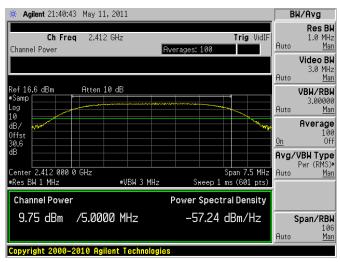


### EIRP MIMO +36 dBm ~ Low Channel



### Report Number: R1108253-2.4G

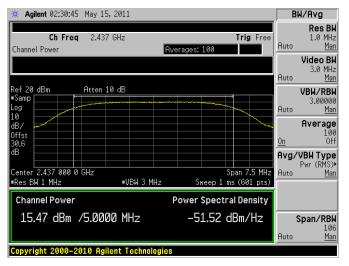
# EIRP +30 dBm ~ Low Channel



EIRP +30 dBm ~ High Channel

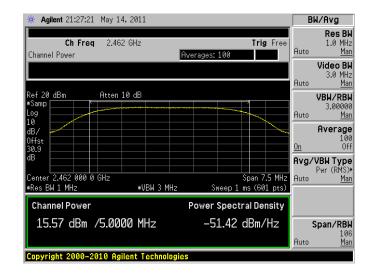


### EIRP MIMO +36 dBm ~ Middle Channel



### Page 80 of 127

TruePath Wireless, LLC



### EIRP MIMO +36 dBm ~ High Channel

# **BPSK with 20 MHz Bandwidth**

### EIRP +20 dBm ~ Low Channel

Averages: 100

Trig VidIF

Span 30 MHz Sweep 1 ms (601 pts)

**Power Spectral Density** 

-73.42 dBm/Hz

Auto

<u>Auto</u>

Auto

<u>0n</u>

Auto

Auto

3.00000

100

Off

106 <u>Mar</u>

Agilent 22:31:58 May 11, 2011

Channel Power

Ref 16.6 dBm

Center 2.412 00 GHz •Res BW 1 MHz

**Channel Power** 

-0.41 dBm /20.0000 MHz

Copyright 2000-2010 Agilent Technolog

⊧Samp

.09

ĺ Ø

ΗB.

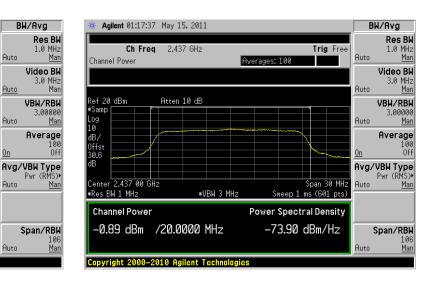
Offst

ЙĤ

Ch Freq 2.412 GHz

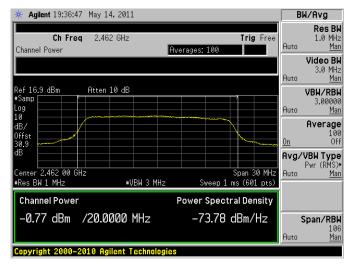
Atten 10 dB

VBW 3 MHz

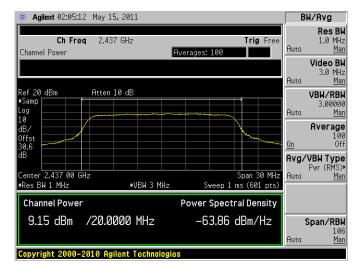


### EIRP +20 dBm ~ Middle Channel

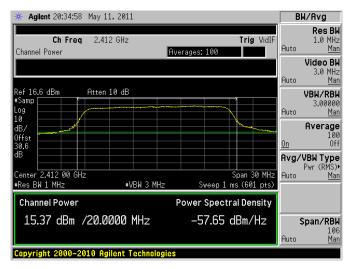
## EIRP +20 dBm ~ High Channel



### EIRP +30 dBm ~ Middle Channel

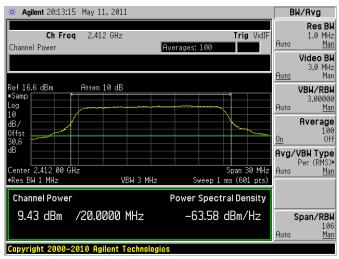


### EIRP MIMO +36 dBm ~ Low Channel

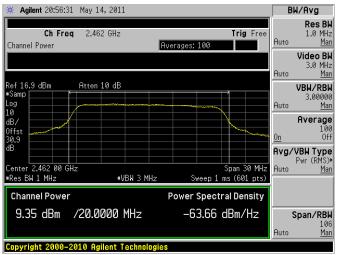


### Report Number: R1108253-2.4G

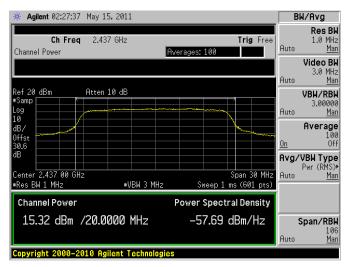
# EIRP +30 dBm ~ Low Channel



### EIRP +30 dBm ~ High Channel



### EIRP MIMO +36 dBm ~ Middle Channel



Page 82 of 127

🔆 Agilent 21:17:19 May 14	, 2011		BW/Avg
Ch Freq 2.462 Channel Power	? GHz	Trig Averages: 100	Free 1.0 MHz Auto Mar
			Video Bl- 3.0 MHz Auto Mar
Ref 16.9 dBm Atten : #Samp Log 10	LØ dB		VBW/RBP 3.00000 Auto Mar
dB/ Offst 30.9			Average 100 <u>On</u> Off
dB Center 2.462 00 GHz		Span 30	
*Res BW 1 MHz Channel Power	#VBW 3 MHz	Sweep 1 ms (601 Power Spectral Den	
15.52 dBm /20.00	000 MHz	–57.49 dBm/ł	
Copyright 2000–2010 Agi	lent Technologi	ies	

# EIRP MIMO +36 dBm ~ High Channel

# 11 FCC §15.247(d) & IC RSS-210 §A8.5 - 100 kHz Bandwidth of Band Edges

# **11.1 Applicable Standard**

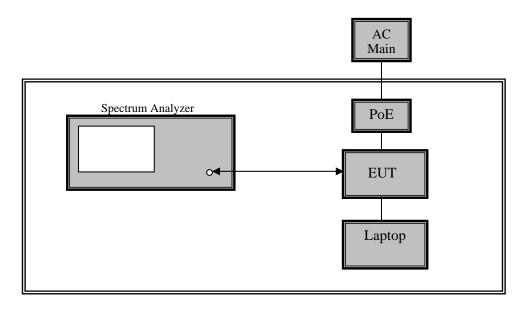
According to FCC §15.247(d), in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emissions limits specified in §15.209(a) see §15.205(c).

According to IC RSS-210 §A8.5, in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the radio frequency power that is produced 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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under section A8.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Tables 2 and 3 is not required.

# **11.2 Measurement Procedure**

- 1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- 2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
- 3. Set both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
- 4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
- 5. Repeat above procedures until all measured frequencies were complete.

# 11.3 Test Setup Block Diagram



# 11.4 Test Equipment List and Details

Manufacturers	Description	Models	Serial Numbers	Calibration Dates
Agilent	Spectrum Analyzer	E4445A	MY44020562	2011-04-05

**Statement of Traceability: BACL Corp.** attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

# 11.5 Test Environmental Conditions

Temperature:	16.5~27°C		
<b>Relative Humidity:</b>	30.9~43.3 %		
ATM Pressure:	101-103 kPa		

The testing was performed by Brian Fox on 2011-05-13 ~ 2011-05-20.

Please refer to the following plots for detailed results

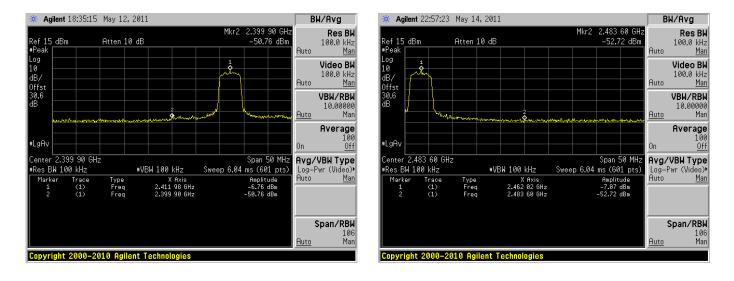
# 2.4 GHz (2412–2462 MHz) Band

# 2.4 GHz, Antenna #1:

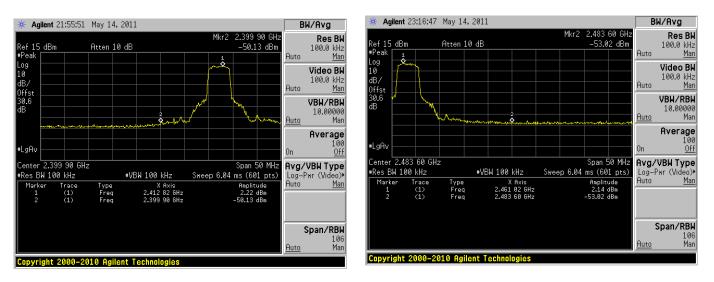
### BPSK with 5 MHz Bandwidth

EIRP +20 dBm ~ Low Band Edge

EIRP +20 dBm ~ High Band Edge



# EIRP +30 dBm ~ Low Band Edge



# EIRP MIMO +36 dBm ~ Low Band Edge

# EIRP MIMO +36 dBm ~ High Band Edge



# EIRP +30 dBm ~ High Band Edge

🔆 Agilent 18:30:11 May 12, 2011

Atten 10 dB

Type Freq Freq

Copyright 2000–2010 Agilent Technolo

Ref 15 dBm

.09

Ŵ

dВ

Offst 30.6

ŧLgAv

Marker

Center 2.399 90 GHz ≢Res BW 100 kHz

Trace (1) (1)

### BPSK with 20 MHz Bandwidth

BW/Avg

Auto

Auto

Auto

On

Auto

-47.37 dBm

Span 50 MHz Sweep 6.04 ms (601 pts)

Amplitude -9.84 dBm -47.37 dBm

Res BW

Man

Man

Man

100

<u>0ff</u>

100.0 kHz

Video BW 100.0 kHz

VBW/RBW

10.00000

Average

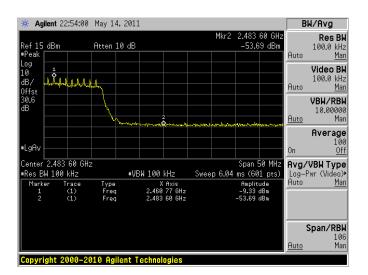
Avg/VBW Type

Log-Pwr (Video)) Auto <u>Man</u>

Span/RBW

106 Man

### EIRP +20 dBm ~ Low Band Edge



11.1.1

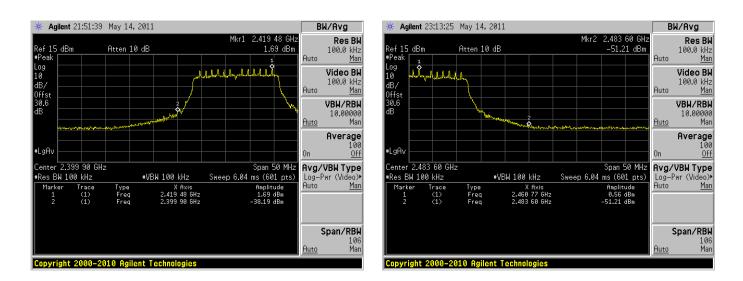
# EIRP +20 dBm ~ High Band Edge

# EIRP +30 dBm ~ Low Band Edge

#VBW 100 kHz

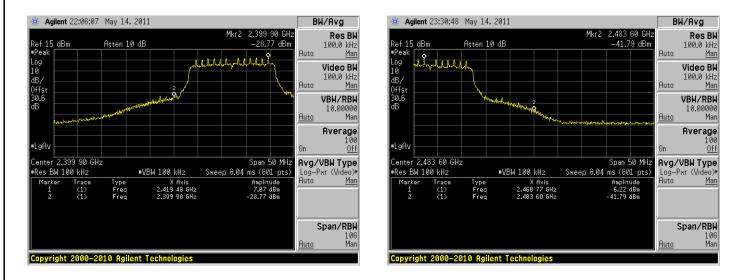
X Axis 2.411 98 GHz 2.399 90 GHz

# EIRP +30 dBm ~ High Band Edge



# EIRP MIMO +36 dBm ~ Low Band Edge

### EIRP MIMO +36 dBm ~ High Band Edge



# 2.4 GHz, Antenna #2:

# BPSK with 5 MHz Bandwidth

BW/Avg

Auto

Auto

Auto

0n

Auto

Res BW

Man

Man

Man

100

<u>Off</u>

100.0 kHz

Video BW

100.0 kHz

VBW/RBW

10.00000

Average

Avg/VBW Type

Log-Pwr (Video)• Auto <u>Man</u>

Span/RBW

106 Man

2.399

Span 50 MHz Sweep 6.04 ms (601 pts)

Amplitude -6.76 dBm -51.09 dBm

-51.09 dBm

# EIRP +20 dBm ~ Low Band Edge

#VBW 100 kHz

X Axis 2.411 98 GHz 2.399 90 GHz

🔆 Agilent 18:35:57 May 12, 2011

Ref 15 dBm

∎Pea

.09

ĺЙ

dB,

0ffst 30.6

∎LgAv

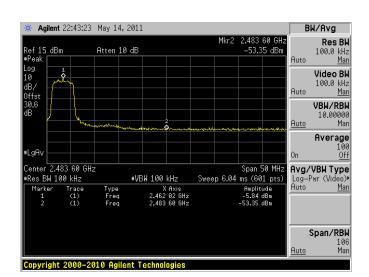
Marker

Center 2.399 90 GHz #Res BW 100 kHz

Trace (1) (1) Atten 10 dB

Type Freq Freq

Copyright 2000–2010 Agilent Technolo



# EIRP +20 dBm ~ High Band Edge

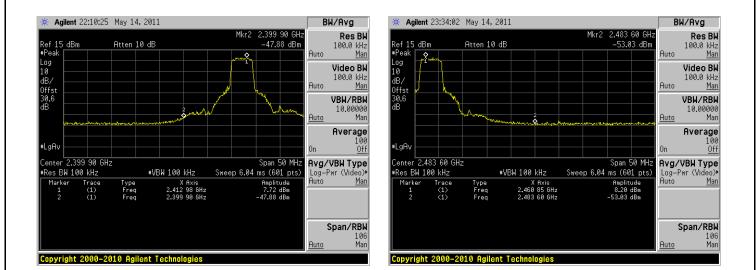
# EIRP $+30 \text{ dBm} \sim \text{Low Band Edge}$

# EIRP +30 dBm ~ High Band Edge



# EIRP MIMO +36d Bm ~ Low Band Edge

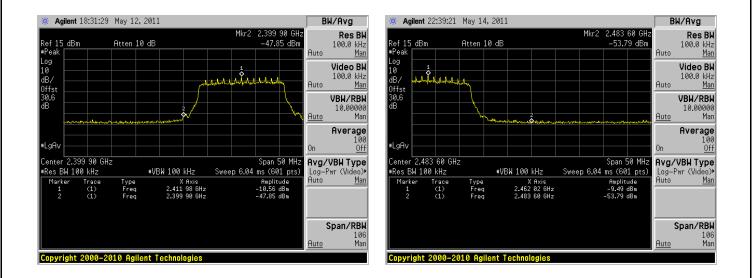
### EIRP MIMO +36 dBm ~ High Band Edge



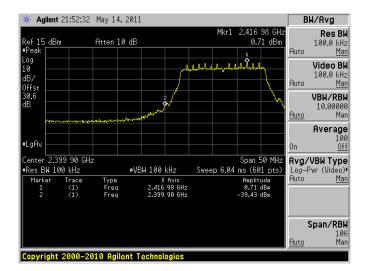
# BPSK with 20 MHz Bandwidth

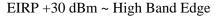
### EIRP +20 dBm ~ Low Band Edge

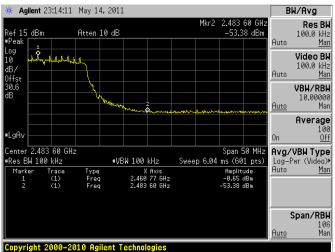
# EIRP +20 dBm ~ High Band Edge



### EIRP +30 dBm ~ Low Band Edge

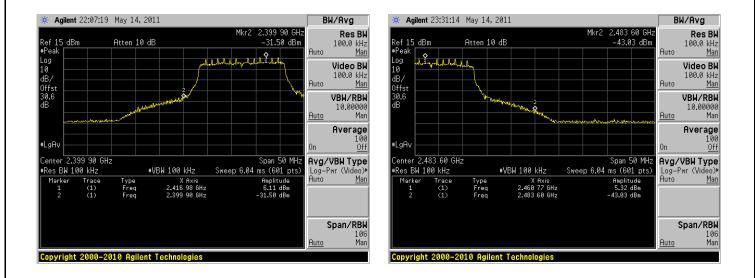






# EIRP MIMO +36 dBm ~ Low Band Edge

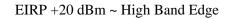
### EIRP MIMO +36 dBm ~ High Band Edge

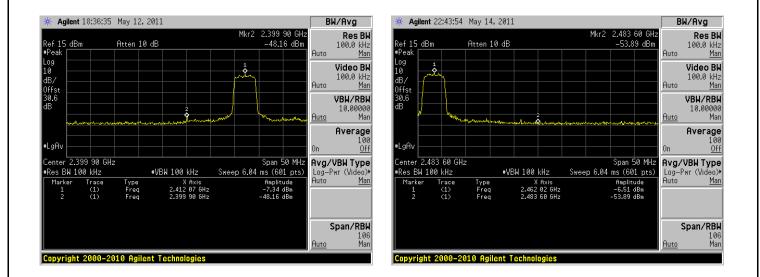


# 2.4 GHz, Antenna #3:



# EIRP +20 dBm ~ Low Band Edge





Ref 15 dBm

ŧPeal

.og 10

dB/

0ffst 30.6 dB

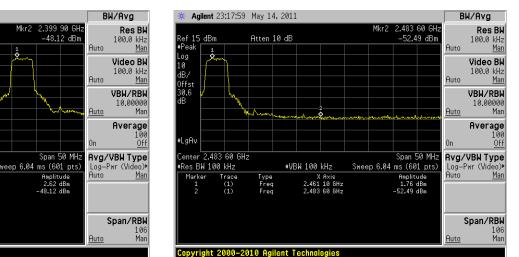
LaAv

Marker 1

Res BW 100 kHz

Trace (1) (1)

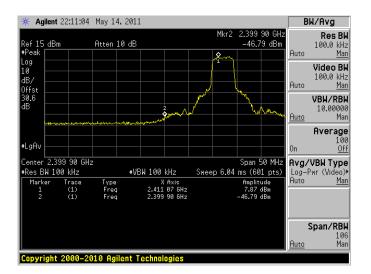
### EIRP +30 dBm ~ Low Band Edge



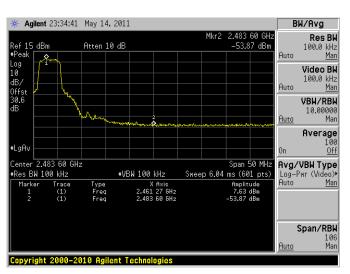
# K Agilent 21:58:04 May 14, 2011 Atten 10 dB Center 2.399 90 GHz #VBW 100 kHz Sweep 6.04 ms (601 pts) Type Freq Freq X Axis 2.410 98 GHz 2 399 90 GHz

Copyright 2000-2010 Agilent Technologie

# EIRP MIMO +36 dBm ~ High Band Edge



EIRP MIMO +36 dBm ~ Low Band Edge



# EIRP +30 dBm ~ High Band Edge

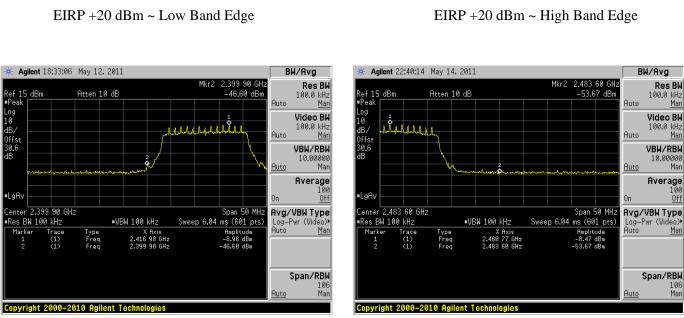
Ref 1 #Peal

Log 10

Offst 30.6

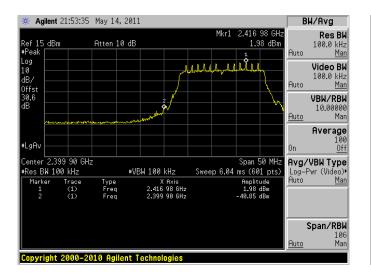
⊧LgA∿

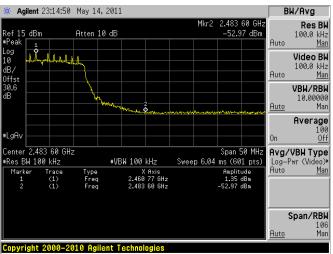
dΒ



# BPSK with 20 MHz Bandwidth

### EIRP +30 dBm ~ Low Band Edge





EIRP +30 dBm ~ High Band Edge

Res BW

<u>Man</u>

Man

100.0 kHz

Video BW 100.0 kHz

VBW/RBW

10.00000 Man

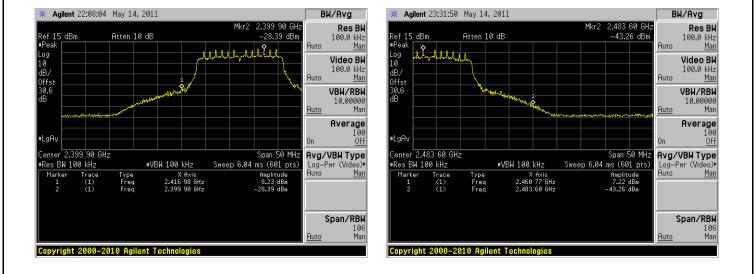
Average 100 <u>Off</u>

Span/RBW

<u>Man</u>

106 Man

EIRP MIMO +36 dBm ~ High Band Edge



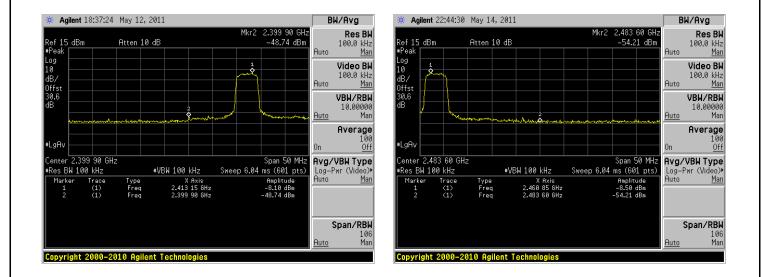
# EIRP MIMO +36 dBm ~ Low Band Edge

# 2.4 GHz, Antenna #4:

# BPSK with 5 MHz Bandwidth

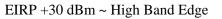
# EIRP +20 dBm ~ Low Band Edge

# EIRP +20 dBm ~ High Band Edge



Report Number: R1108253-2.4G

EIRP +30 dBm ~ Low Band Edge



Atten 10 dB

A. 65

Type Freq Freq

Trace (1) (1)

#VBW 100 kHz

X Axis 2.463 02 GHz 2.483 60 GHz

Mkr2 2.483 60 GH;

-54.20 dBm

Span 50 MHz

Amplitude 1.92 dBm -54.20 dBm

Sweep 6.04 ms (601 pts)

BW/Ava

Auto

Auto

Auto

0n

Auto

Res BW

Man

Man

100.0 kHz

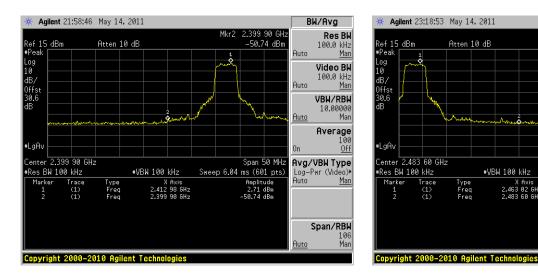
Video BW 100.0 kHz

VBW/RBW 10.00000 Man

Average 100 <u>Off</u>

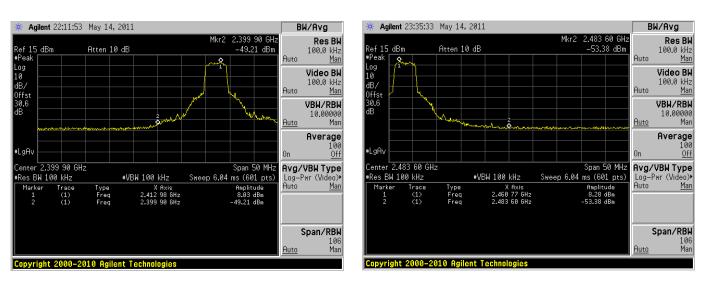
Span/RBW 106 Man

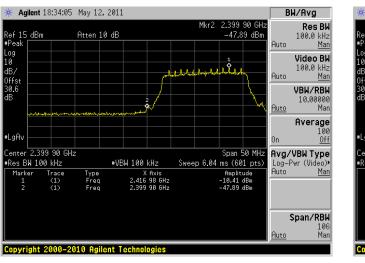
Avg/VBW Type Log-Pwr (Video) Auto <u>Man</u>



# EIRP MIMO +36 dBm ~ High Band Edge

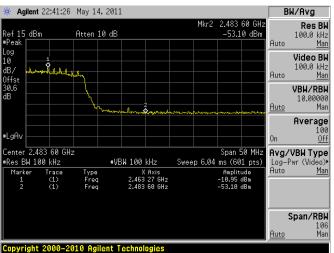
# EIRP MIMO +36 dBm ~ Low Band Edge





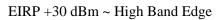
# BPSK with 20 MHz Bandwidth

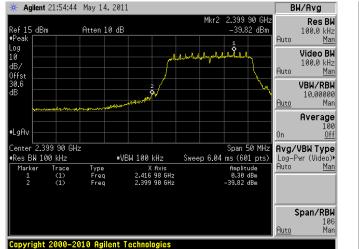
# EIRP +20 dBm ~ High Band Edge

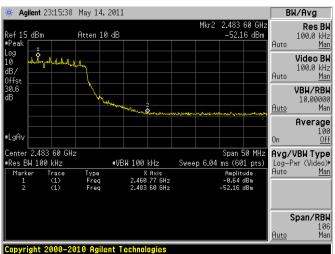


# EIRP +20 dBm ~ Low Band Edge

# EIRP +30 dBm ~ Low Band Edge

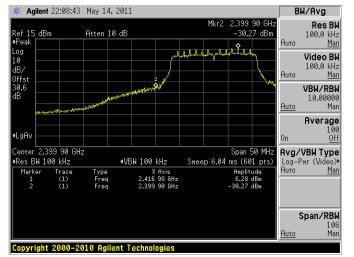






# EIRP MIMO +36 dBm ~ Low Band Edge

# EIRP MIMO +36 dBm ~ High Band Edge





# 12 FCC §15.247(e) & IC RSS-210 §A8.2(b) - Power Spectral Density

# 12.1 Applicable Standard

According to FCC §15.247 (e) and IC RSS-210 §A8.2(b), for digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

# **12.2 Measurement Procedure**

- 1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- 2. Position the EUT was set without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
- 3. Adjust the center frequency of SA on any frequency be measured and set SA to 1.5MHz span mode. And then, set RBW and VBW of spectrum analyzer to proper value.
- 4. Repeat above procedures until all frequencies measured were complete.

# 12.3 Test Equipment List and Details

Manufacturers	Description	Models	Serial Numbers	Calibration Dates	
Agilent	Spectrum Analyzer	E4445A	MY44020562	2011-04-05	

**Statement of Traceability: BACL Corp.** attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

### **12.4 Test Environmental Conditions**

Temperature:	16.5~27°C		
<b>Relative Humidity:</b>	30.9~43.3 %		
ATM Pressure:	101-103 kPa		

*The testing was performed by Brian Fox on 2011-05-13 ~ 2011-05-20.* 

# 12.5 Test Results

Please refer to the following tables and plots.

Radio	Channel	honnel Frequency		Power Spectral Density (dBm)			Total PSD	FCC/IC Limit	Result
Mode	Channel	(MHz)	Ant #1	Ant #2	Ant #3	Ant #4	(dBm)	(dBm)	Kesuit
EIRP	Low	2412	-10.81	-11.4	-12.37	-15.58	-6.18	8	Compliance
+20	Mid	2437	-11.23	-10.53	-12.39	-15.65	-6.04	8	Compliance
dBm	High	2462	-10.84	-10.92	-11.63	-15.82	-5.88	8	Compliance
EIRP	Low	2412	-4.73	-6.17	-5.02	-6.48	0.48	8	Compliance
+30	Mid	2437	-5.84	-7.15	-5.22	-6.57	-0.11	8	Compliance
dBm	High	2462	-5.54	-7.37	-4.78	-6.83	0.01	8	Compliance

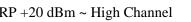
# 2.4 GHz Band, BPSK with 5 MHz Bandwidth:

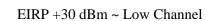
2.4 GHz Band, BPSK with 20 MHz Bandwidth:

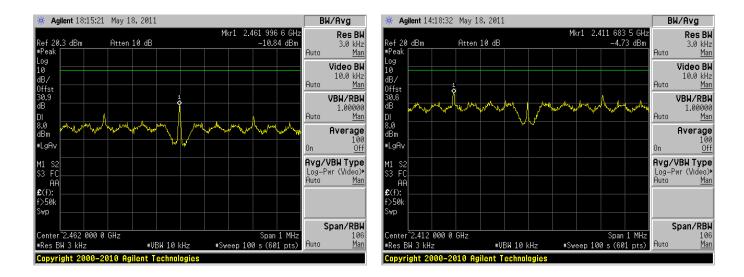
Radio	Channel Frequency		Power Spectral Density (dBm)			Total PSD	FCC/IC Limit	Result	
Mode	Channel	(MHz)	Ant #1	Ant #2	Ant #3	Ant #4	(dBm)	(dBm)	Kesuit
EIRP	Low	2412	-10.9	-11.63	-12.78	-16.02	-6.43	8	Compliance
+20	Mid	2437	-11.31	-11.68	-12.72	-15.98	-6.56	8	Compliance
dBm	High	2462	-10.93	-10.92	-11.68	-16.22	-5.96	8	Compliance
EIRP	Low	2412	-12.05	-10.65	-10.74	-14.89	-5.76	8	Compliance
+30	Mid	2437	-11.35	-11.36	-11.47	-13.84	-5.87	8	Compliance
dBm	High	2462	-12.05	-11.68	-11.06	-14.33	-6.10	8	Compliance

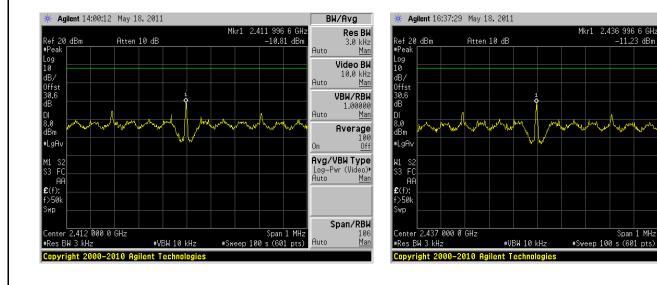
EIRP +20 dBm ~ Low Channel

# EIRP +20 dBm ~ High Channel









2.4 GHz Band (2412-2462 MHz): BPSK with 5 MHz bandwidth

2.4 GHz, Antenna #1:

EIRP +20 dBm ~ Middle Channel

BW/Avg

Auto

Auto

Auto

Auto

Res BW

3.0 kHz

Video BW

10.0 kHz

VBW/RBW

Average

Span/RBW

Аvg/VBW Туре

Log-Pwr (Vid Auto

1.00000

Man

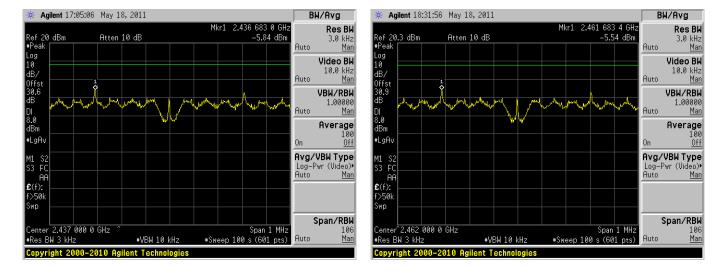
Man

Man

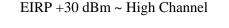
100 <u>Off</u>

<u>Man</u>

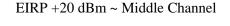
106 <u>Man</u>

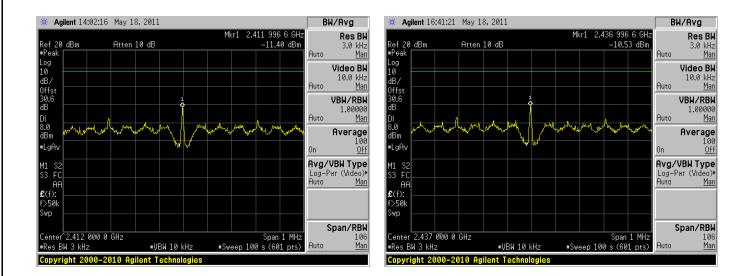


### EIRP +30 dBm ~ Middle Channel



### 2.4 GHz, Antenna #2:





# EIRP +20 dBm ~ Low Channel

🔆 Agilent 18:17:15 May 18, 2011

Atten 10 dB

Ref 20.3 dBm

₽ea

Log 10

dB/ Offst 30.9 dB

DI 8.0 dBm

∎LaAv

Af

Res BW 3 kHz

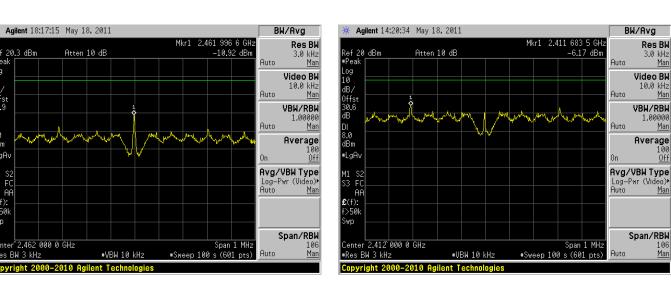
2.462 000 0 GHz

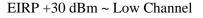
M1 \$3 S2 FC

**£**(f): >50k

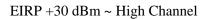
WD

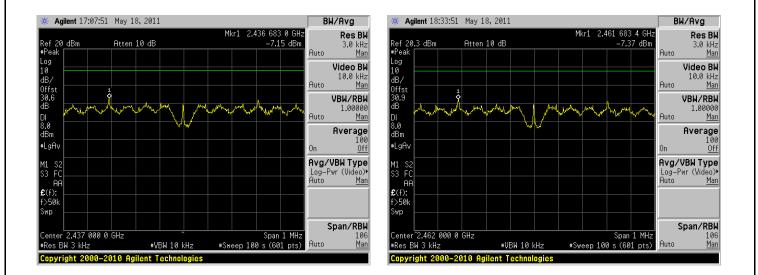
EIRP +20 dBm ~ High Channel





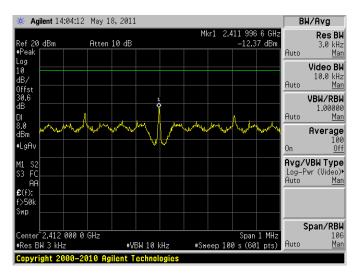
EIRP +30 dBm ~ Middle Channel



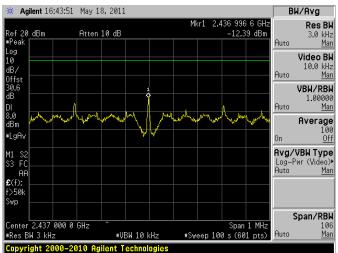


# 2.4 GHz, Antenna #3:

### EIRP +20 dBm ~ Low Channel

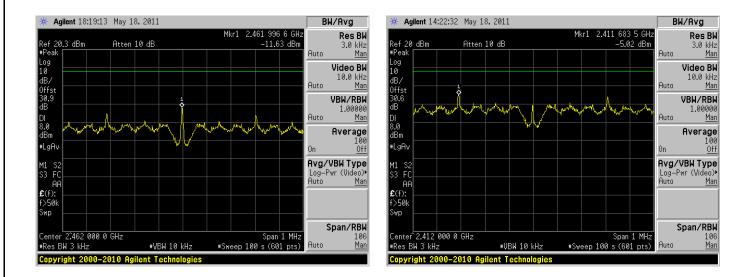


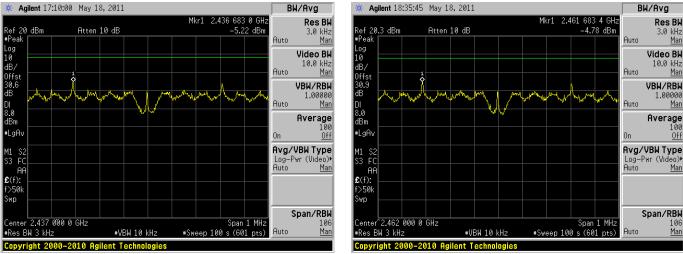
# EIRP +20 dBm ~ High Channel



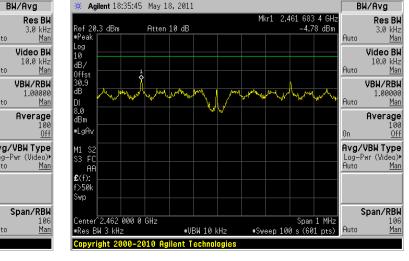
# EIRP +20 dBm ~ Middle Channel







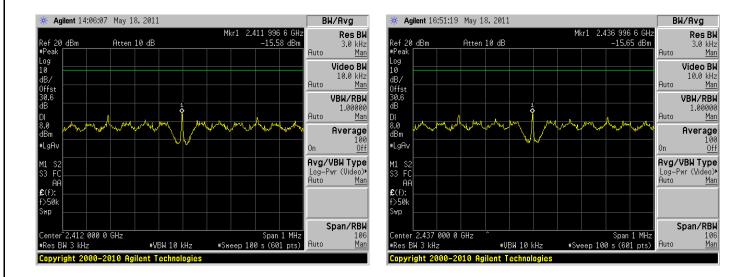
### EIRP +30 dBm ~ Middle Channel



### EIRP +30 dBm ~ High Channel



### EIRP +20 dBm ~ Low Channel



EIRP +20 dBm ~ Middle Channel

🔆 Agilent 18:21:43 May 18, 2011

2.462 000 0 GHz

Copyright 2000–2010 Agilent Technologies

Atten 10 dB

Ref 20.3 dBm

≢Pea

.og 10

dB.

dB Offst 30.9 dB

DI 8.0 dBm

∎LgA\

M1 S3 S2 FC AA

**£**(f):

WD

>5ûk

Res BW 3 kHz

### EIRP +20 dBm ~ High Channel

Mkr1 2.461 996 6 GHz —15.82 dBm

Auto

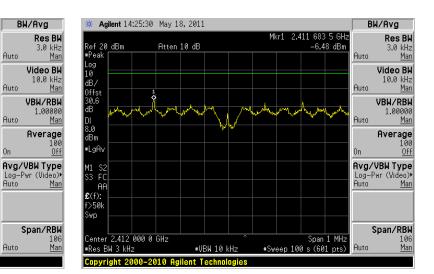
Auto

Auto

0n

Span 1 MHz

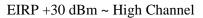
#Sweep 100 s (601 pts) Auto

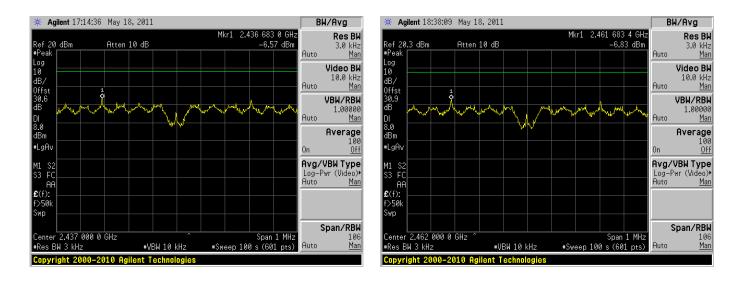


### EIRP +30 dBm ~ Low Channel

# EIRP +30 dBm ~ Middle Channel

₩VBW 10 kHz





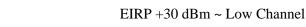
# EIRP +20 dBm ~ Low Channel

Agilent 13:49:19 May 18, 2011

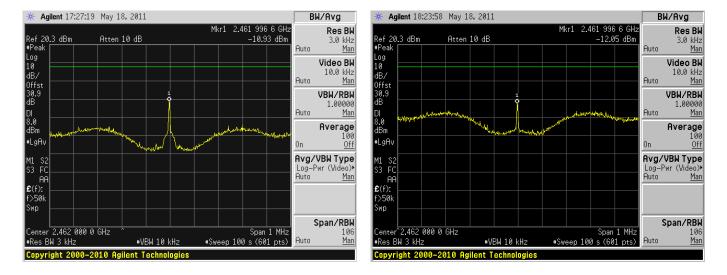
### 2.411 996 6 GHz -10.90 dBm Ref 20 dBm #Peak Atten 10 dB 3.0 kHz <u>Man</u> Ref 20 dBm #Peak Atten 10 dB -11.31 dBm 3.0 kHz <u>Man</u> Auto Auto Log 10 Log 10 Video BW Video BW 10.0 kHz <u>Man</u> 10.0 kHz lΒ, dB/ Auto Auto 0ffst 30.6 dB Man Offst 30.6 dB VBW/RBW 1.00000 <u>Man</u> VBW/RBW 1.00000 DI 8.0 dBm DI 8.0 Auto Auto Mar Average 100 <u>Off</u> Average dBm 100 <u>Off</u> #LgA∖ #LgA∖ 0n 0n Avg/VBW Type Avg/VBW Type Μ1 M1 \$3 Log—Pwr (Vide Auto Log-Pwr (Vide Auto leo)∙ <u>Man</u> Man AF ĤΑ **£**(f): £(f): 5AL >50 WD Span/RBW Span/RBW Center 2.412 000 0 GHz •Res BW 3 kHz Center 2.437 000 0 GHz #Res BW 3 kHz Span 1 MHz´ #Sweep 100 s (601 pts) Span 1 MHz 106 <u>Man</u> 106 <u>Man</u> ₩VBW 10 kHz #Sweep 100 s (601 pts) Auto #VBW 10 kHz Auto Copyright 2000–2010 Agilent Technologies Copyright 2000–2010 Agilent Technologies

# EIRP +20 dBm ~ High Channel





🔆 Agilent 16:24:50 May 18, 2011



EIRP +20 dBm ~ Middle Channel

BW/Avg

Res BW

2.436 996 6 GH

Mkr1

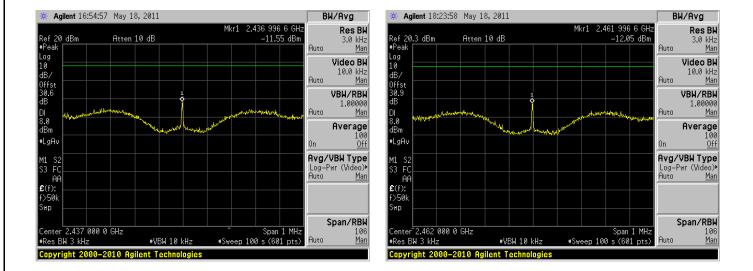
Report Number: R1108253-2.4G

# 2.4 GHz Band (2412-2462 MHz): BPSK with 20 MHz bandwidth

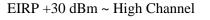
2.4 GHz, Antenna #1:

BW/Avg

Res BW

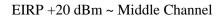


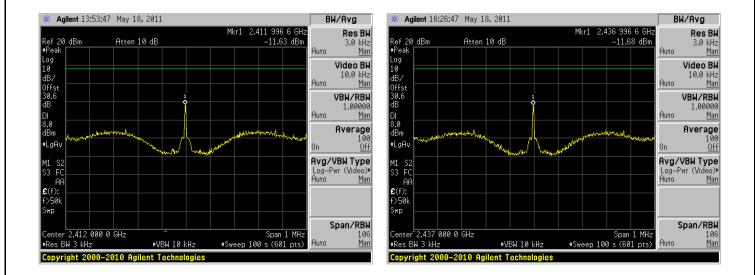
### EIRP +30 dBm ~ Middle Channel



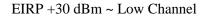
# 2.4 GHz, Antenna #2:

EIRP +20 dBm ~ Low Channel

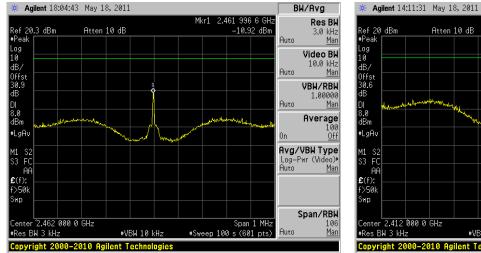




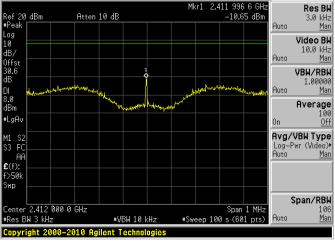
EIRP +20 dBm ~ High Channel



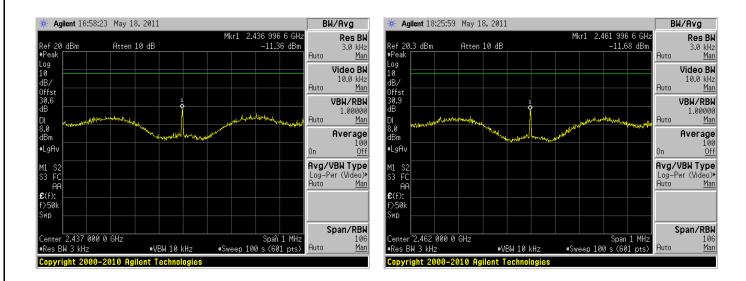
BW/Avg



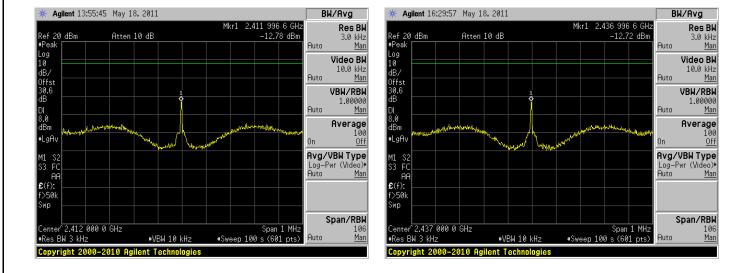
EIRP +30 dBm ~ Middle Channel



EIRP +30 dBm ~ High Channel



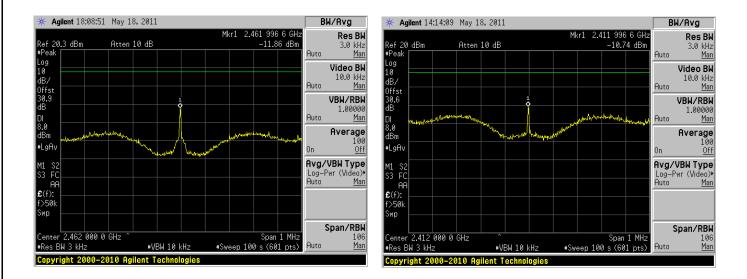
### 2.4 GHz, Antenna #3:



### EIRP +20 dBm ~ Low Channel

EIRP +20 dBm ~ High Channel

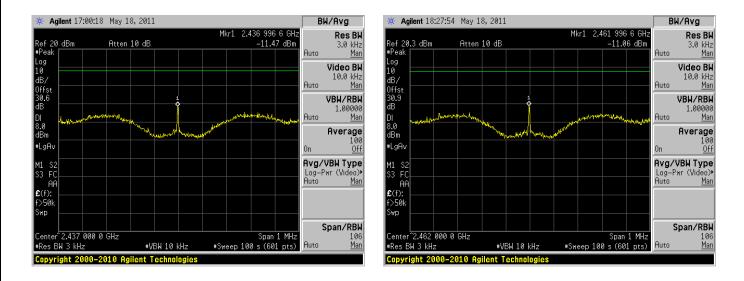
EIRP +30 dBm ~ Low Channel



### EIRP +20 dBm ~ Middle Channel

# EIRP +30 dBm ~ Middle Channel

### EIRP +30 dBm ~ High Channel





BW/Avg

Auto

Auto

Auto

0n

Auto

Mkr1 2.411 996 6 GHz

a barn tomate

Span 1 MHz #Sweep 100 s (601 pts)

-16.02 dBm

# EIRP +20 dBm ~ Low Channel

🔆 Agilent 13:57:42 May 18, 2011

Ref 20 dBm ≢Peak

Log 10

iΒ/

Offst 30.6 dB

DI 8.0

dBm #LgA∖

M1 \$3

AF

enter 2.412 000 0 GHz

Copyright 2000–2010 Agilent Technologies

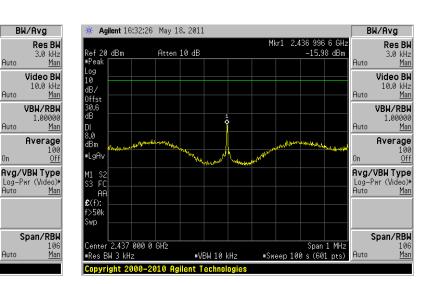
∎Res BW 3 kHz

**£**(f):

wn

SAL

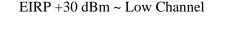
Atten 10 dB



# EIRP +20 dBm ~ Middle Channel

∗VBW 10 kHz

EIRP +20 dBm ~ High Channel



Atten 10 dB

 $\diamond^1$ 

AF

2.412 000 0 GHz

Mkr1

2.411 714 3 GHz

-14.89 dBm

Span 1 MHz

#Sweep 100 s (601 pts)

BW/Avg

Auto

Auto

Auto

Ûn

Auto

Res BW

3.0 kHz

Video BW

10.0 kHz

VBW/RBW

Average

**Avg/VBWType** Log-Pwr(Video)∙ Auto <u>Man</u>

Span/RBW

106 <u>Man</u>

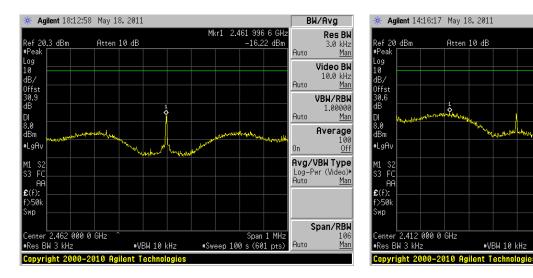
1.00000

Man

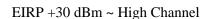
Man

Man

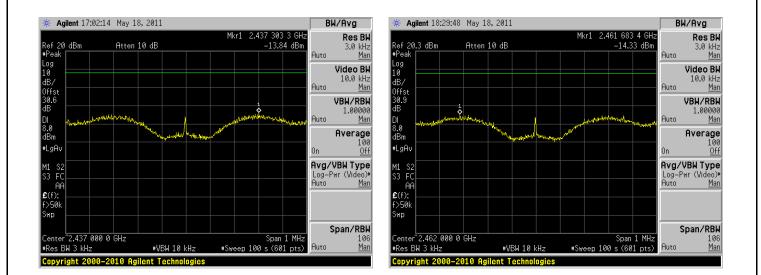
100 <u>Off</u>



# EIRP +30 dBm ~ Middle Channel



₩VBW 10 kHz



# 13 IC RSS-Gen §4.10 & §6 - Receiver Spurious Radiated Emissions

# 13.1 Applicable Standard

According to IC RSS-Gen §4.10, the receiver shall be operated in the normal receive mode near the mid-point of the band over which the receiver is designed to operate.

Unless otherwise specified in the applicable RSS, the radiated emission measurement is the standard measurement method (with the device's antenna in place) to measure receiver spurious emissions.

Radiated emission measurements are to be performed using a calibrated open-area test site.

For either method, the search for spurious emissions shall be from the lowest frequency internally generated or used in the receiver (e.g. local oscillator, intermediate or carrier frequency), or 30 MHz, whichever is the higher, to at least 3 times the highest tuneable or local oscillator frequency, whichever is the higher, without exceeding 40 GHz.

For emissions below 1 GHz, measurements shall be performed using a CISPR quasi-peak detector and the related measurement bandwidth. As an alternative to CISPR quasi-peak measurement, compliance with the emission limit can be demonstrated using measuring equipment employing a peak detector with the same measurement bandwidth as that for CISPR quasi-peak measurements. Above 1 GHz, measurements shall be performed using an average detector and a resolution bandwidth of 300 kHz to 1 MHz.

According to RSS-210 §6, If a radiated measurement is made, all spurious emissions shall comply with the limits of Table 1. The resolution bandwidth of the spectrum analyzer shall be 100 kHz for spurious emission measurements below 1.0 GHz, and 1.0 MHz for measurements above 1.0 GHz.

Spurious Frequency (MHz)	Field Strength (microvolt/m at 3 metres)
30-88	100
88-216	150
216-960	200
Above 960	500

### Table 1 - Spurious Emission Limits for Receivers

### 13.2 EUT Setup

The radiated emissions tests were performed in the 3 meter chamber, using the setup in accordance with ANSI C63.4-2003.

### 13.3 Test Procedure

Maximizing procedure was performed on the six (6) highest emissions to ensure EUT compliance is with all installation combinations.

All data were recorded in the peak detection mode. Quasi-peak readings was performed only when an emissions was found to be marginal (within -4 dB of specification limits), and are distinguished with a "**QP**" in the data table.

### 13.4 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

Corrected Amplitude = Indicated Reading + Antenna Factor + Cable Factor - Amplifier Gain

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7 dB means the emission is 7 dB below the maximum limit. The equation for margin calculation is as follows:

Margin = Corrected Amplitude - Limit

Manufacturer	Description	Model	Serial Number	Calibration Date
Sunol Science Corp	Combination Antenna	JB1	A020106-1	2010-05-28
Rohde & Schwarz	Rohde & Schwarz EMI Test Receiver		100337	2011-03-21
Sunol Science Corp	System Controller	SC99V	122303-1	N/R
A.R.A Inc	Horn antenna	DRG-1181A	1132	2010-11-29
Agilent	PSA Series Spectrum Analyzer	E4446A	US44300386	2010-08-18
Mini-Circuits	Pre Amplifier	ZVA-183-S	570400946	2011-05-09

### 13.5 Test Equipment Lists and Details

**Statement of Traceability:** BACL attests that all calibrations have been performed per the NVLAP requirements, traceable to NIST.

### **13.6 Test Environmental Conditions**

Temperature:	18~21 °C
<b>Relative Humidity:</b>	30~35 %
ATM Pressure:	101.2-102.2kPa

The testing was performed by Jerry Huang on2011-05-02 ~ 2011-05-10 in 5 meter chamber 3.

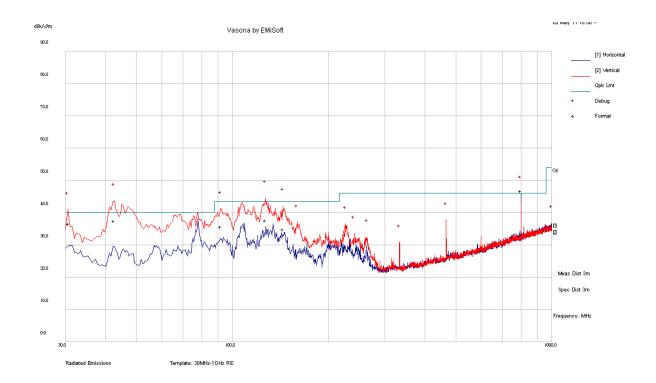
# **13.7** Summary of Test Results

According to the test data,, the EUT <u>complied with the with the RSS-210/RSS-Gen</u>, with the closest margins from the limit listed below:

Mode: 2.4 GHz Band (2412–2462 MHz):						
Margin (dB)Frequency (MHz)Polarization (Horizontal/Vertical)R (M						
-2.56	42.57075	Vertical	30 to 1000			
-28.74	2461.311	Horizontal	Above 1000			

# 13.8 Radiated Emission Test Plots and Data

### (1) Radiated Emission measured at 3 meters - Below 1 GHz



# 2.4 GHz Band (2412–2462 MHz)

### **Quasi-Peak Measurements**

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
42.57075	37.44	115	V	82	40	-2.56
30.62625	36.6	144	V	198	40	-3.40
799.971	41.57	203	Н	227	46	-4.43
126.7715	37.7	110	V	29	43.5	-5.80
92.05375	35.77	147	V	152	43.5	-7.73
144.0625	34.92	100	V	2	43.5	-8.58