

# TEST RESULT SUMMARY

## FCC PART 15 SUBPART C

Section 15.247

## FCC PART 15 SUBPART C

Section 15.207 Conducted Emission Requirements

Industry Canada RSS-210: Issue 5: 2001

A1: Nov. 2002, A2: Apr. 2003, A3: 2004, A4: 2004

## Section 6.2.2(o)

MANUFACTURER'S NAME	CalAmp Corporation
NAME OF EQUIPMENT	CalAmp Corp. (CA) Directed AP (Airespace AeS IRAP)
TYPE OF EQUIPMENT	Wireless LAN Access Point
MODEL NUMBER	<b>CA 500003 (AeS 1500)</b>
MANUFACTURER'S ADDRESS	1401 N. Rice Avenue Oxnard CA 93030
TEST REPORT NUMBER	WC500164 RevA
TEST DATE	27 January 2005, 01, 02, 03, 05 February 2005, 17 March 2005

According to testing performed at TÜV Product Service Inc, the above-mentioned unit is in compliance with the electromagnetic compatibility requirements defined in FCC Part 15 Subpart C Sections 15.207 and 15.247, and also with RSS-210, section 6.2.2(o).

It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical characteristics. Any modifications necessary for compliance made during testing on the above mentioned date(s) must be implemented in all production units for compliance to be maintained.

TÜV Product Service Inc, as an independent testing laboratory, declares that the equipment tested as specified above conforms to the requirements of FCC Part 15 Subpart C Sections 15.207 and 15.247, and also with RSS-210, section 6.2.2(o).

Date: 21 February 2005



Location: Taylors Falls MN  
USA

J. C. Sausen  
Tested By

T. K. Swanson  
Reviewed By

# EMC EMISSION - TEST REPORT

Test Report File No. : **WC500164 RevA** Date of issue: 21 February 2005

Model No. : **CA 500003 (AeS 1500)**

Product Name : **CalAmp Corp. (CA) Directed AP (Airespace AeS IRAP)**

Product Type : **Wireless LAN Access Point**

Applicant : **CalAmp Corporation**

Manufacturer : **CalAmp Corporation**

License holder : **CalAmp Corporation**

Address : **1401 N. Rice Avenue**  
: **Oxnard CA 93030**

Test Result : ☒ **Positive** ☐ **Negative**

Test Project Number :  
Reference(s) : **WC500164 RevA**

Total pages : **128**

*TÜV Product Service Inc is a subcontractor to TÜV Product Service, GmbH according to the principles outlined in ISO/IEC Guide 25 and EN 45001.*

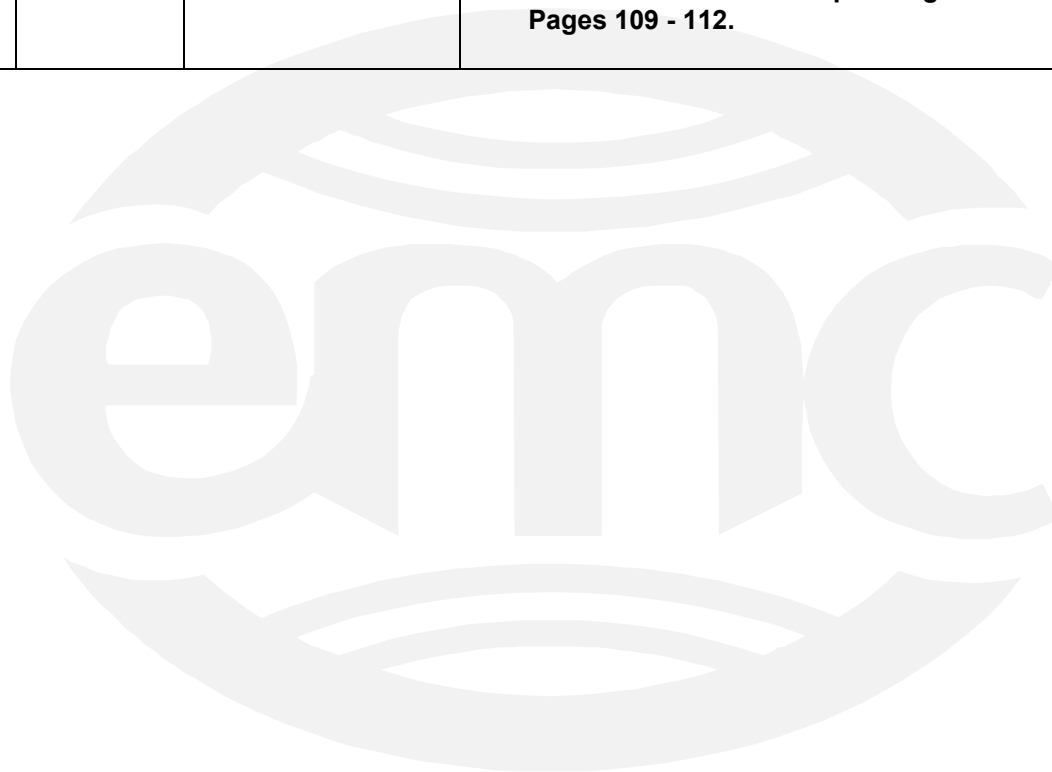
*TÜV Product Service Inc reports apply only to the specific samples tested under stated test conditions. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. TÜV Product Service Inc shall have no liability for any deductions, inferences or generalizations drawn by the client or others from TÜV Product Service Inc issued reports.*

*This report is the confidential property of the client. As a mutual protection to our clients, the public and ourselves, extracts from the test report shall not be reproduced except in full without our written approval. This report shall not be used by the client to claim product endorsement by NVLAP or any agency of the US government.*

*TÜV Product Service Inc and its professional staff hold government and professional organization certifications and are members of AAMI, ACIL, AEA, ANSI, IEEE, NVLAP, and VCCI*

**REVISION RECORD**

REVISION	TOTAL NUMBER OF PAGES	DATE	DESCRIPTION
	112	21 February 2005	Initial Release
A	128	21 March 2005	Revisions include: <ul style="list-style-type: none"><li>▪ Added test setup diagram and equipment information for conducted emissions setup – Page 19.</li><li>▪ Updated the conducted out of band emissions data to show the conducted limit – Pages 50 - 92.</li><li>▪ Added radiated emissions in the restricted bands with both transmitters operating simultaneously – Pages 109 - 112.</li></ul>



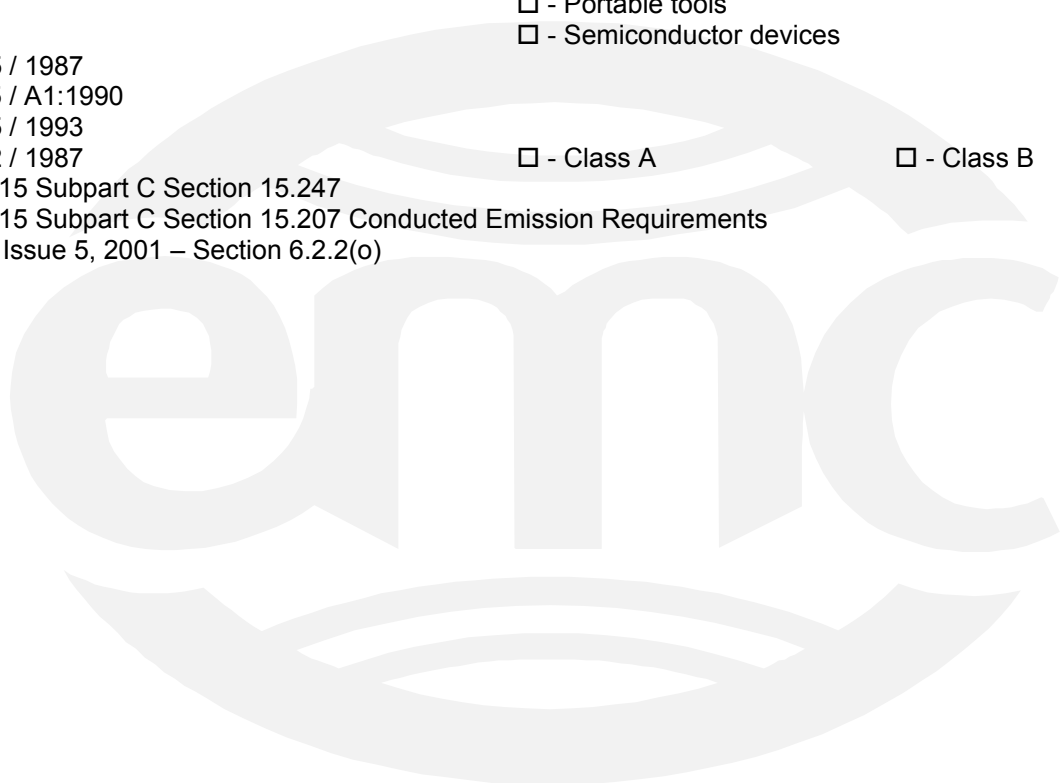
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## EMISSIONS TEST REGULATIONS :

The emissions tests were performed according to following regulations:

- |  |   |                                    |
|--|---|------------------------------------|
| <input type="checkbox"/> - EN 50081-1 / 1991                             | <input type="checkbox"/> - Group 1                          | <input type="checkbox"/> - Group 2 |
| <input type="checkbox"/> - EN 55011 / 1998<br>w/Amendment A1:1999        | <input type="checkbox"/> - Class A                          | <input type="checkbox"/> - Class B |
| <input type="checkbox"/> - EN 55013 / 1990                               | <input type="checkbox"/> - Household appliances and similar |                                    |
| <input type="checkbox"/> - EN 55014 / 1987                               | <input type="checkbox"/> - Portable tools                   |                                    |
|  | <input type="checkbox"/> - Semiconductor devices            |                                    |
| <br>   |   |                                    |
| <input type="checkbox"/> - EN 55014 / A2:1990                            | <input type="checkbox"/> - Household appliances and similar |                                    |
| <input type="checkbox"/> - EN 55014 / 1993                               | <input type="checkbox"/> - Portable tools                   |                                    |
|  | <input type="checkbox"/> - Semiconductor devices            |                                    |
| <br>   |   |                                    |
| <input type="checkbox"/> - EN 55015 / 1987                               | <input type="checkbox"/> - Class A                          | <input type="checkbox"/> - Class B |
| <input type="checkbox"/> - EN 55015 / A1:1990                            |   |                                    |
| <input type="checkbox"/> - EN 55015 / 1993                               |   |                                    |
| <input type="checkbox"/> - EN 55022 / 1987                               |   |                                    |
| ■ - FCC Part 15 Subpart C Section 15.247                                 |   |                                    |
| ■ - FCC Part 15 Subpart C Section 15.207 Conducted Emission Requirements |   |                                    |
| ■ - RSS-210, Issue 5, 2001 – Section 6.2.2(o)                            |   |                                    |



## Emission Test Results:

### Peak Power Out [FCC 15.247 (b)(3)], [RSS-210 6.2.2(o)(b)]

The requirements are

☒ - MET

☐ - NOT MET

Maximum peak power output shall be 1 watt.

Remarks: Max peak output power is shown to be 21.4 dBm (138 mW).

### 6 dB Bandwidth [FCC 15.247 (a)(2)], [RSS-210 6.2.2(o) Amd 1(IV)]

The requirements are

☒ - MET

☐ - NOT MET

The minimum 6 dB bandwidth shall be at least 500 kHz.

Remarks: Bandwidths are shown to be 19.0 to 21.4 MHz.

### 99% Bandwidth [RSS-210 5.9.1]

The requirements are

☒ - MET

☐ - NOT MET

Remarks: Bandwidths are shown to be 19.0 to 21.4 MHz.

### Power Spectral Density – [FCC 15.247 (e)], [RSS-210 6.2.2(o) Amd 1(IV)]

The requirements are

☒ - MET

☐ - NOT MET

Peak power spectral density shall not be greater than 8 dBm in any 3 kHz band.

Remarks: Maximum peak power spectral density is –4.6 dBm/3 kHz.

## Emission Test Results Continued:

### Conducted Out of Band Emissions [FCC 15.247 (d)], [RSS-210 6.2.2(o)(e1)]

The requirements are

☒ - MET

☐ - NOT MET

Remarks: The limit is -20 dBc in any 100 kHz band outside the operating band.

Special attention is paid to ensure band edge compliance.

### Spurious radiated emissions (electric field) 30 MHz - 1000 MHz (restricted bands) [FCC 15.247(d)]

The requirements are

☒ - MET

☐ - NOT MET

Minimum margin of compliance \_\_\_\_\_ dB at \_\_\_\_\_ MHz

Maximum margin of non-compliance \_\_\_\_\_ dB at \_\_\_\_\_ MHz

Remarks: Meets FCC 15.209 limit. No emissions detected from the transmitter above the noise level of the measuring system.

### Spurious radiated emissions 1 GHz – 25 GHz (restricted bands) [FCC 15.247(d)]

The requirements are

☒ - MET

☐ - NOT MET

Minimum margin of compliance \_\_\_\_\_ 3 dB at \_\_\_\_\_ 15.956 GHz

Maximum margin of non-compliance \_\_\_\_\_ dB at \_\_\_\_\_ MHz

Remarks: Meets FCC 15.209 limit.

### AC Line Conducted emissions 150 kHz - 30 MHz [FCC 15.207], [RSS-210 (CISPR 22)]

The requirements are

☒ - MET

☐ - NOT MET

Minimum margin of compliance \_\_\_\_\_ 3 dB at \_\_\_\_\_ 19.4 MHz

Maximum margin of non-compliance \_\_\_\_\_ dB at \_\_\_\_\_ MHz

Remarks: \_\_\_\_\_

### Receiver Spurious Radiated Emissions [FCC 15.109]

The requirements are

☒ - MET

☐ - NOT MET

Minimum margin of compliance \_\_\_\_\_ 1 dB at \_\_\_\_\_ 160.0 MHz

Maximum margin of non-compliance \_\_\_\_\_ dB at \_\_\_\_\_ MHz

Remarks: \_\_\_\_\_

## MEASUREMENT PROTOCOL

### GENERAL INFORMATION

#### Environmental conditions in the lab: TÜV America Large Test Site

	Actual
Temperature	: 23 °C
Relative Humidity	: 20 %
Atmospheric pressure	: 99.0 kPa
Power supply system	: 48 VDC

Typically powered over Ethernet (POE), but can be powered with a 48V DC power supply which is not included with the Directed AP. CalAmp requires an FCC approved supply if not powered over the Ethernet.

#### Test Methodology

Conducted and radiated emission testing is performed according to the procedures in International Special Committee on Radio Interference (CISPR) Publication 22 (1993), European Standard EN 55022 and Australian Standard AS 3548 (which are based on CISPR 22).

The Japanese standard, "Voluntary Control Council for Interference (VCCI) by Data Processing Equipment and Electronic Office Machines, Technical Requirements" is technically equivalent to CISPR 22 (1993). For official compliance, a conformance report must be sent to and accepted by the VCCI.

In compliance with FCC Docket 92-152, "Harmonization of Rules for Digital Devices Incorporate International Standards", testing for FCC compliance may be done following the ANSI C63.4-2001 procedures and using the CISPR 22 Limits.

#### Measurement Uncertainty

The test system for conducted emissions is defined as the LISN, tuned receiver or spectrum analyzer, and coaxial cable. The test system for radiated emissions is defined as the antenna, the pre-amplifier, the spectrum analyzer and the coaxial cable. These test systems have a measurement uncertainty of  $\pm 4.8$  dB. The equipment comprising the test systems are calibrated on an annual basis.

#### Justification

The Equipment Under Test (EUT) is configured in a typical user arrangement in accordance with the manufacturer's instructions. A cable is connected to each available port and either terminated with a peripheral into it's characteristic impedance or left unterminated. When appropriate, the cables are manually manipulated with respect to each other to obtain maximum emissions from the unit.

### CONDUCTED EMISSIONS

The final level, expressed in dB $\mu$ V, is arrived at by taking the reading directly from the EMI receiver. This level is compared directly to the CISPR limit.

To convert between dB $\mu$ V and  $\mu$ V, the following conversions apply:

$$\text{dB}\mu\text{V} = 20(\log \mu\text{V})$$

$$\mu\text{V} = \text{Inverse log}(\text{dB}\mu\text{V}/20)$$

## RADIATED EMISSIONS

The final level, expressed in dB $\mu$ V/m, is arrived at by taking the reading from the spectrum analyzer (Level dB $\mu$ V), adding the antenna correction factor and cable loss factor (Factor dB) to it, then subtracting the preamp gain. This result then has the CISPR limit subtracted from it to provide the Delta which gives the tabular data as shown in the data sheets in Attachment A.

Example:

FREQ (MHz)	LEVEL (dB $\mu$ V)	CABLE/ANT/PREAMP (dB) (dB/m) (dB)	FINAL (dB $\mu$ V/m)	POL/HGT/AZ (m) (deg)	DELTA1 EN 55022 A
60.80	42.5Qp	+ 1.2 + 10.9 - 25.5 =	29.1	V 1.0 0.0	-10.9

## DETAILS OF TEST PROCEDURES

### General Standard Information

The test methods used comply with ANSI C63.4-2001 - "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz."

### Conducted Emissions

Conducted emissions on the 50 Hz and/or 60 Hz power interface of the EUT are measured in the frequency range of 150 kHz to 30 MHz. The measurements are performed using a receiver, which has CISPR characteristic bandwidth and quasi-peak detection, and a Line Impedance Stabilization Network (LISN), with 50  $\Omega$ /50  $\mu$ H (CISPR 16) characteristics. Table top equipment is placed on a non-conducting table 80 centimeters above the floor and is positioned 40 centimeters from the vertical ground plane (wall) of the screen room. In some cases, a pre-scan using a spectrum analyzer is initially performed on the units comprising the system under test to locate the highest emissions. If the minimum passing margin appears to be less than 20 dB with a peak mode measurement, the emissions are re-measured using a tuned receiver or spectrum analyzer with quasi-peak and average detection and recorded on the data sheets.

### Radiated Emissions

Radiated emissions from the EUT are measured in the frequency range of 30 to 25000 MHz using a spectrum analyzer and appropriate broadband linearly polarized antennas. Measurements between 30 MHz and 1000 MHz are made with 120 kHz/6 dB bandwidth and quasi-peak detection and measurements above 1000 MHz are made with a 1 MHz/6 dB bandwidth and peak detection. Table top equipment is placed on a 1.0 X 1.5 meter non-conducting table 80 centimeters above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. Interface cables that are closer than 40 centimeters to the ground plane are bundled in the center in a serpentine fashion so they are at least 40 centimeters from the ground plane. Cables to simulators/testers (if used in this test) are routed through the center of the table and to a screen room located outside the test area. The antenna is positioned 3, 10 or 30 meters horizontally from the EUT. To locate maximum emissions from the test sample the antenna is varied in height from 1 to 4 meters, measurement scans are made with both horizontal and vertical antenna polarizations and the EUT are rotated 360 degrees. The transmitter is rotated through 3 orthogonal axes in order to determine the maximum emission levels.

**DEVIATIONS FROM STANDARD:**

None

**GENERAL REMARKS:****SUMMARY:**

The requirements according to the technical regulations are

☒ - met

☐ - **not** met.

The device under test does

☒ - fulfill the general approval requirements mentioned on page 3.

☐ - **not** fulfill the general approval requirements mentioned on page 3.

Testing Start Date: 27 January 2005

Testing End Date: 17 March 2005

- TÜV PRODUCT SERVICE INC -

*Thomas K. Swanson*

Reviewed By:  
T. K. Swanson

*J. C. Sausen*

Tested By:  
J. C. Sausen

**Constructional Data Form(s)**

**and/or**

**Product Information Form(s)**



## Form

## EMC Test Plan and Constructional Data Form



PLEASE COMPLETE THIS DOCUMENT IN FULL, ENTERING N/A IF THE FIELD IS NOT APPLICABLE.

**Applicant -- NOTE: This information will be input into your test report as shown below.**  
**Press the F1 key at any time to get HELP for the current field selected.**

Company: CalAmp Corp.  
 Address: 1401 N. Rice Avenue  
Oxnard, CA 93030  
 Contact: Mark Anderson Position: Principal Systems Engineer  
 Phone: 952-380-5881 x205 Fax: 952-380-4823  
 E-mail Address: manderson@calamp.com

**General Equipment Description -- NOTE: This information will be input into your test report as shown below.**

EUT Description Wireless LAN Access Point  
 EUT Name CalAmp Corp. (CA) "DirectedAP" or Airespace (AeS) "IRAP"  
 Model No.: CA "500003" or AeS "1500" Serial No.: NA  
 Product Options: NA  
 Configurations to be tested: 1

**Test Objective**

- |  |   |
|--|---|
| <input type="checkbox"/> EMC Directive 89/336/EEC (EMC)                                      | <input checked="" type="checkbox"/> FCC: Class <input checked="" type="checkbox"/> A <input type="checkbox"/> B Part 15 |
| Std: _____   | <input type="checkbox"/> VCCI: Class <input type="checkbox"/> A <input type="checkbox"/> B                              |
| <input type="checkbox"/> Machinery Directive 89/392/EEC (EMC)                                | <input type="checkbox"/> BCIC: Class <input type="checkbox"/> A <input type="checkbox"/> B                              |
| Std: _____   | <input checked="" type="checkbox"/> Canada: Class <input checked="" type="checkbox"/> A <input type="checkbox"/> B      |
| <input type="checkbox"/> Medical Device Directive 93/42/EEC (EMC)                            | <input type="checkbox"/> Australia: Class <input type="checkbox"/> A <input type="checkbox"/> B                         |
| Std: _____   | <input type="checkbox"/> Other: _____   |
| <input type="checkbox"/> Vehicle Directive 72/245/EEC (EMC)                                  |   |
| Std: _____   |   |
| <input type="checkbox"/> FDA Reviewers Guidance for Premarket Notification Submissions (EMC) |   |

**TÜV Product Service Certification Requested**

- |   |   |
|---|---|
| <input type="checkbox"/> Attestation of Conformity (AoC)            | <input type="checkbox"/> International EMC Mark (IEM)   |
| <input checked="" type="checkbox"/> Certificate of Conformity (CoC) | <input type="checkbox"/> Compliance Document  |
| Protection Class (N/A for vehicles)                                 | <input type="checkbox"/> Class I <input type="checkbox"/> Class II <input type="checkbox"/> Class III |

Form

## EMC Test Plan and Constructional Data Form



(Press F1 when field is selected to show additional information on Protection Class.)

### Attendance

Test will be: ☒ Attended by the customer ☐ Unattended by the customer

### Failure - Complete this section if testing will not be attended by the customer.

If a failure occurs, TUV Product Service should:

- ☒ Call contact listed above, if not available then stop testing. (After hrs phone): 952-380-5881  
☐ Continue testing to complete test series.  
☐ Continue testing to define corrective action.  
☐ Stop testing.

### EUT Specifications and Requirements

Length: 8.5" Width: 7" Height: 5" Weight: 2 lbs

### Power Requirements

*Regulations require testing to be performed at typical power ratings in the countries of intended use. (i.e., European power is typically 230 VAC 50 Hz or 400 VAC 50 Hz, single and three phase, respectively)*

Voltage: 48 Volt DC (If battery powered, make sure battery life is sufficient to complete testing.)

# of Phases: NA

Current (Amps/phase(max)): NA Current (Amps/phase(nominal)): NA

Other 13 Watts maximum and 11 Watts typical DC Power

### Other Special Requirements

### Typical Installation and/or Operating Environment

(ie. Hospital, Small Business, Industrial/Factory, etc.)

Ceiling or wall mounted in an office environment, powered over Ethernet.

### EUT Power Cable

☐ Permanent OR ☒ Removable Length (in meters): 10 meters over POE  
☐ Shielded OR ☒ Unshielded  
☐ Not Applicable

Form

## EMC Test Plan and Constructional Data Form



## EUT Interface Ports and Cables

Interface				Shielding						Length (in meters)	Removable	Permanent
Type	Analog	Digital	Qty	Yes	No	Type	Termination	Connector Type	Port Termination			
<b>EXAMPLE:</b>												
RS232	<input type="checkbox"/>	<input checked="" type="checkbox"/>	2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Foil over braid	Coaxial	Metallized 9-pin D-Sub	Characteristic Impedance	6	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Ethernet	<input type="checkbox"/>	<input checked="" type="checkbox"/>	1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	NA	CAT-5	RJ-45	100 Ohm	10	<input checked="" type="checkbox"/>	<input type="checkbox"/>
48 Volt DC	<input checked="" type="checkbox"/>	<input type="checkbox"/>	1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	NA	NA	2.5mm x 5.5mm DC Plug	NA	1	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
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	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>

## EMC Test Plan and Constructional Data Form

**EUT Software.**

Revision Level: 1.3

Description: VxWorks operating system based real time software for typical operational mode  
Atheros Radio Test (ART) software for continuous transmit modes

**EUT Operating Modes to be Tested** -- list the operating modes to be used during test. It is recommended the equipment be tested while operating in a typical operation mode. FCC testing of personal computers and/or peripherals requires that a simple program generate a complete line of upper case H's. Provide a general description of all software, firmware, and PLD algorithms used in the equipment. List all code modules as described above, with the revision level used during testing. Consult with your TÜV Product Service Representative if additional assistance is required.

1. Continuous transmit mode for Radiated Emissions in Restricted Bands  
Software: Atheros Radio Test version 48  
Firmware: FPGA version 56r.  
ART is a client-server based radio test software, which provides the ability to perform various tests for wireless LANs. The server software runs on a PC and the client software resides on the target. The server sends commands to the client to perform the tests and gets the response from the client over the TCP/IP socket.
2. Typical operational mode for Class A FCC testing and Conducted Emissions  
Software: CalAmp Corp. AP - Version 1.3 AP. Software is a real-time event driven software which performs the 802.11 a/b/g wireless LAN operations. The AP software controls the various wireless client services like authentication, de-authentication, association, disassociation, re-association, privacy and data delivery.
3. The FPGA logic has two primary functions: automatic gain control (AGC) and spatial processing. AGC monitors the incoming digitized RF energy, detects 802.11 a/b/g packets by applying correlation techniques, and sets the final RF gain levels to predetermined levels. Spatial processing monitors the dual channel receiver, calculates an optimal set of spatial weights, and applies the weights to each channel to best maximize SNR while attempting to minimize the effects of interference.

**EUT System Components** -- List and describe all components which are part of the EUT. For FCC testing a minimum configuration is required. (ie. Mouse, Printer, Monitor, External Disk Drive, Motherboard, etc.)

Description	Model #	Serial #	FCC ID #
Quantity 1 Directed AP	500003	NA	

Form

## EMC Test Plan and Constructional Data Form

**Support Equipment** -- List and describe all support equipment which is not part of the EUT. (i.e. peripherals, simulators, etc)

<i>Description</i>	<i>Model #</i>	<i>Serial #</i>	<i>FCC ID #</i>
CAT-5 Cable with RJ-45 Jack	NA	NA	NA
Power over Ethernet Adapter	WAPPOE	RBW0049000929	PKW-WAPPOE
48 Volt DC Power Supply	SA00L48-V	R0408 1800 1826	FCC and CE
COMPAQ Computer	Armada E500	3J0BFFD8P62F	FCC and CE

**Oscillator Frequencies**

<i>Frequency</i>	<i>Derived Frequency</i>	<i>Component # / Location</i>	<i>Description of Use</i>
80 MHz		OS1 / PCB surface mount	Digital Clock
25 MHz		Y1 / PCB surface mount	Digital Clock

**Power Supply**

<i>Manufacturer</i>	<i>Model #</i>	<i>Serial #</i>	<i>Type</i>
NA			<input type="checkbox"/> Switched-mode: (Frequency) _____ <input type="checkbox"/> Linear <input type="checkbox"/> Other: _____
			<input type="checkbox"/> Switched-mode: (Frequency) _____ <input type="checkbox"/> Linear <input type="checkbox"/> Other: _____

**Power Line Filters**

<i>Manufacturer</i>	<i>Model #</i>	<i>Location in EUT</i>
NA		

Form

## EMC Test Plan and Constructional Data Form



### Critical EMI Components (Capacitors, ferrites, etc.)

Description	Manufacturer	Part # or Value	Qty	Component # / Location
Shielded RJ-45 Jack with Integrated Magnetic	Speed Tech	P65-A0Z-1HQ9	1	P4 / PCB Thru-hole mount device
Capacitor 1000pF, 2kV	TDK	C4520X7R3D10 2KT	2	C15, C9 / PCB surface mount device
Termination Resistor 75 Ohm	Dale	CRCW0805-750JT	4	R97, R257, R270, R271 / PCB surface mount device
Capacitor 1000 pF, 50V	Johanson	500R07W102JV 4t	4	C8, C10, C332, C333 / PCB surface mount device

### EMC Critical Detail -- Describe other EMC Design details used to reduce high frequency noise.

Aluminum shield enclosure  
Shielded RJ-45 Jack with integrated magnetics

(PLEASE INSERT "ELECTRONIC SIGNATURE" BELOW IF POSSIBLE)

### Authorization Signatures

Customer authorization to perform tests according to this test plan.

Donald Bosch

Test Plan/CDF Prepared By (please print)

Reviewed by TÜV Product Service Associate

2-25-05

Date

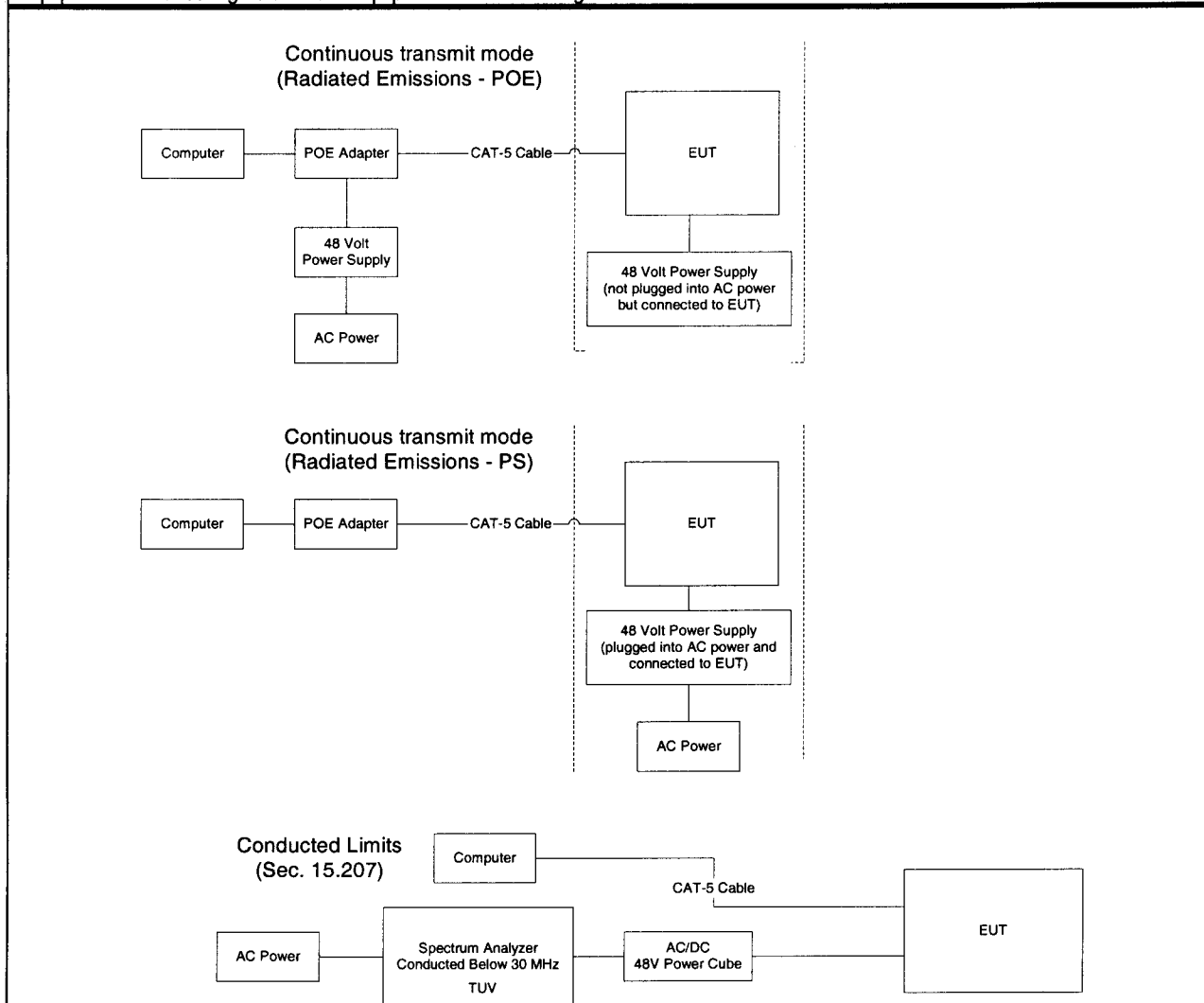
2-25-05

Date

Date

## EMC Block Diagram Form

**System Configuration Block Diagram** -- Provide a line drawing identifying the EUT, simulators, support equipment, I/O cables, power cables, and any other pertinent components to be used during testing. Use a dashed line to separate the equipment in the testing field versus equipment outside testing field.


**Authorization Signatures**

Customer authorization to perform tests according to this test plan.

Donald Bosch

Test Plan/CDF Prepared By (please print)

Reviewed by TÜV Product Service Associate

2-25-05

Date

2-25-05

Date

Date

## Test Setup Diagrams

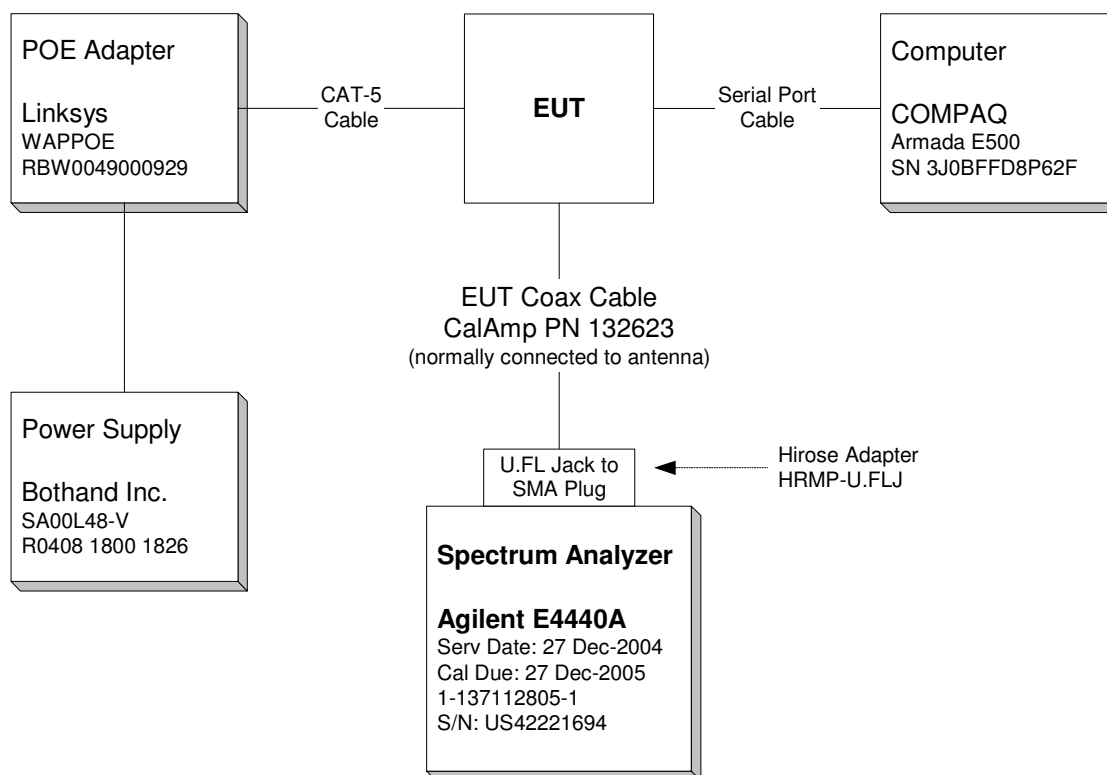




2-25-05

TÜV America Inc. FCB  
10040 Mesa Rim Road  
San Diego CA 92121 USA

## CalAmp Conducted Emissions Test Set-up



### CalAmp Conducted Emissions Test Procedures:

- FCC Public Notice DA 02-2138 August 30, 2002
- Atheros Regulatory Compliance Guide March 2003

## Test Data



## Maximum Power Output

**Specifications:**

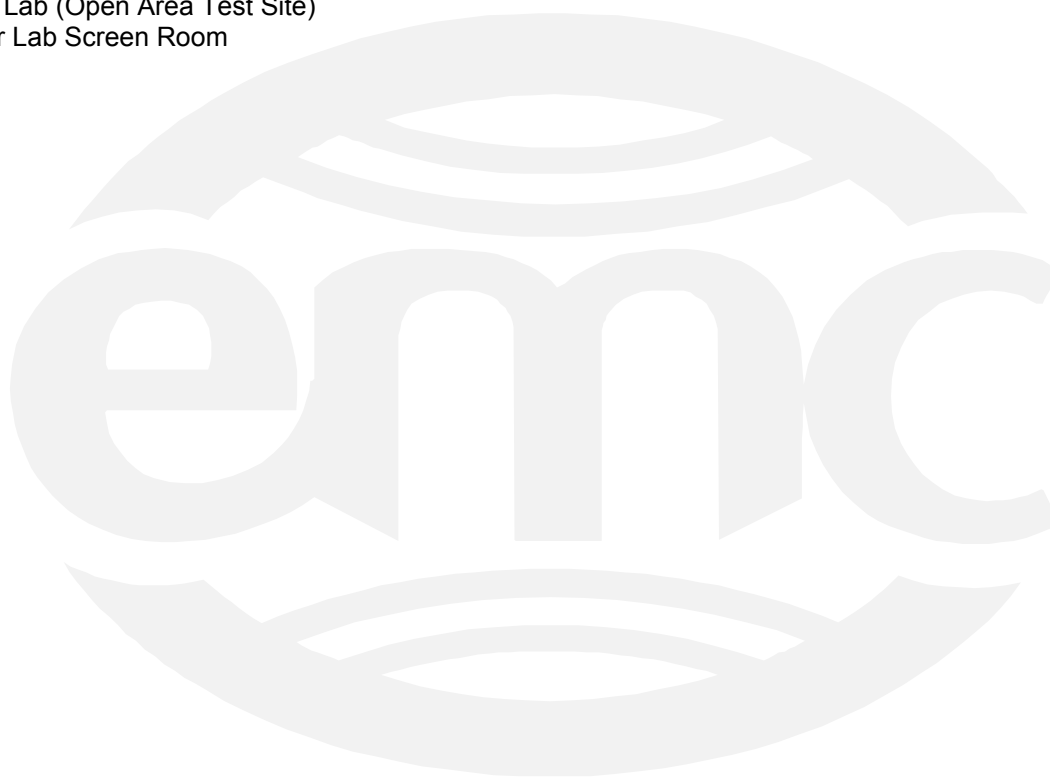
FCC Specification: Paragraph: 15.247 (b)(3)

IC Specification: RSS-210, 6.2.2(o)(b)

The <b>MAXIMUM POWER OUTPUT</b> measurements were performed at the following test location:
---

<input type="checkbox"/> - Test not applicable
--

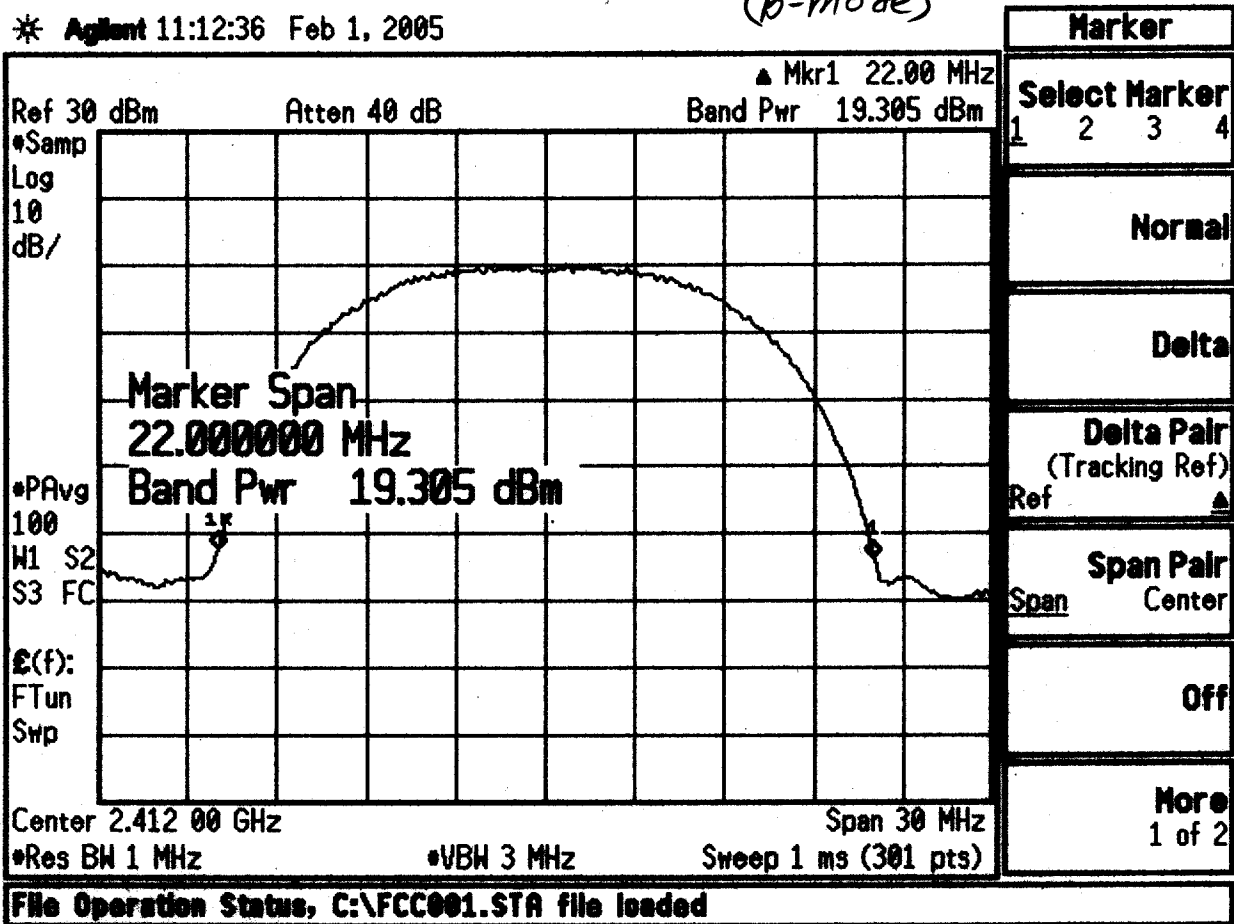
- ☐ - Wild River Lab Large Test Site (Open Area Test Site)
- ☐ - Wild River Lab Small Test Site (Open Area Test Site)
- ☐ - Oakwood Lab (Open Area Test Site)
- ☐ - Wild River Lab Screen Room
- ☒ - Cal Amp



FCC 15.247 (b).3

Tx Conducted Output Power  
(B-mode)

\* Agilent 11:12:36 Feb 1, 2005



Continuous TX

CTL 20 dBm

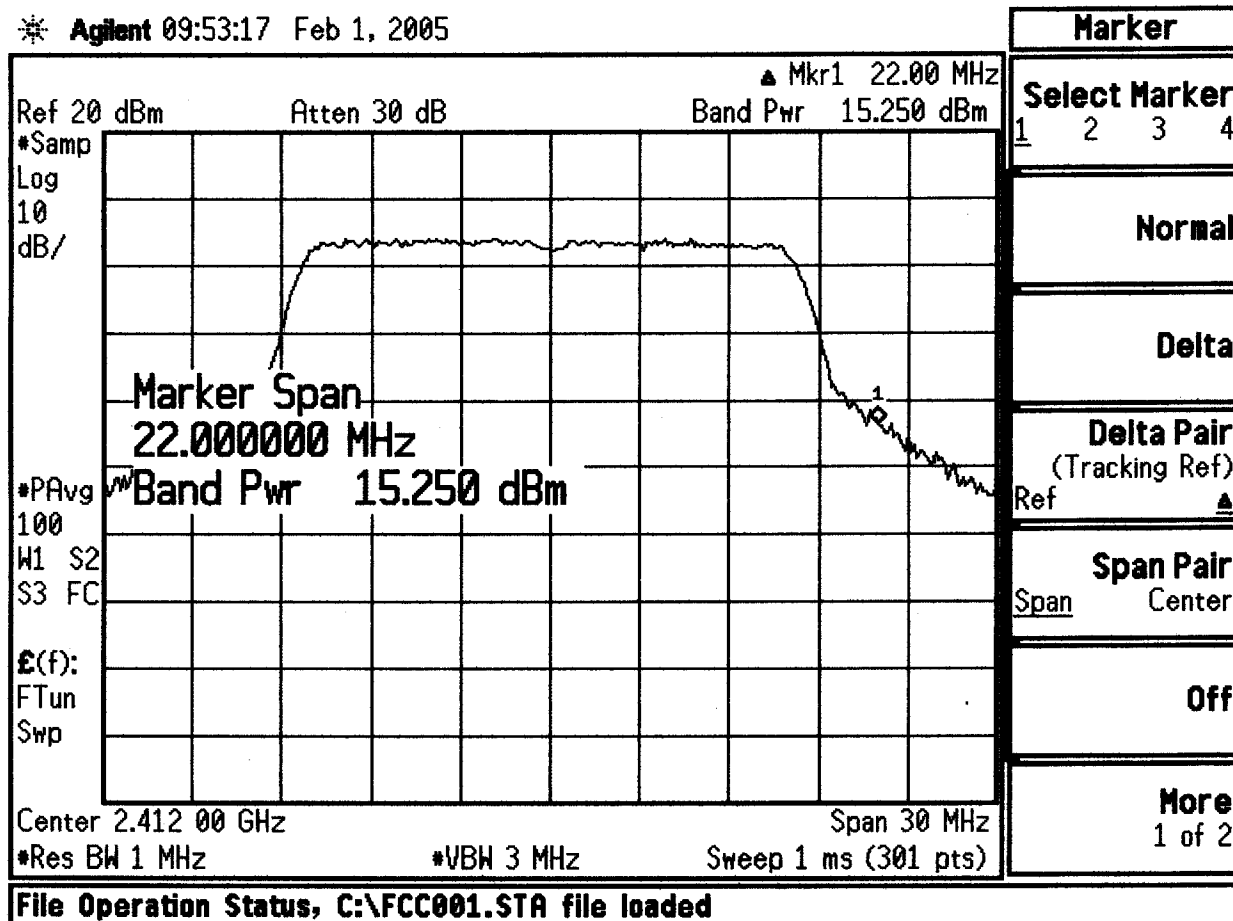
B-mode (DSS)

FCC 15.247 (b).3

Limit = 1 Watt (30 dBm)

measured = 19.3 dBm

\* Agilent 09:53:17 Feb 1, 2005



Continuous TX

CTL 16 dBm

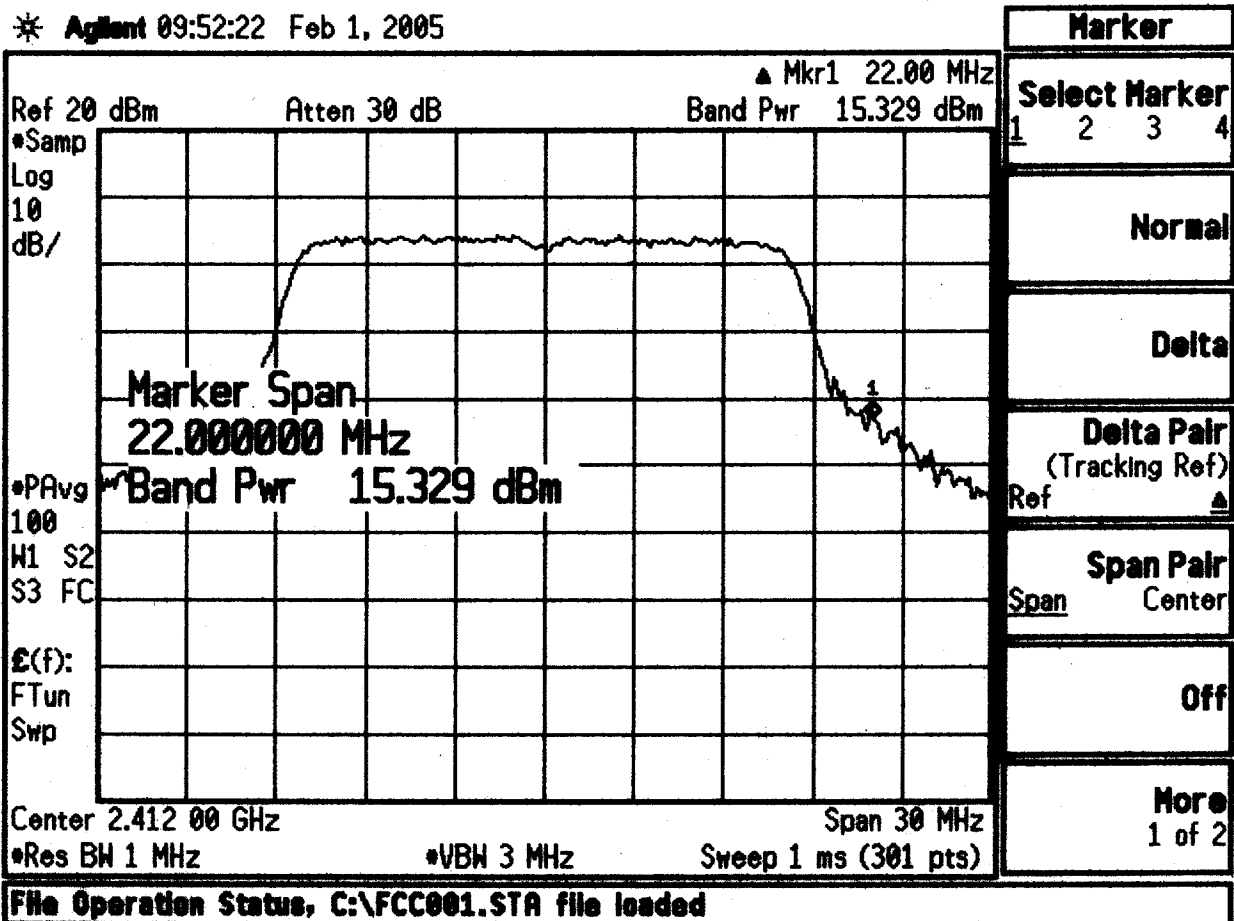
54MBit rate

Limit = 1 Watt (30 dBm)

measured = 15.3 dBm

# FCC 15.247 (b).3 Tx output power (G-mode)

\* Agilent 09:52:22 Feb 1, 2005



Continuous TX

CTL 16 dBm

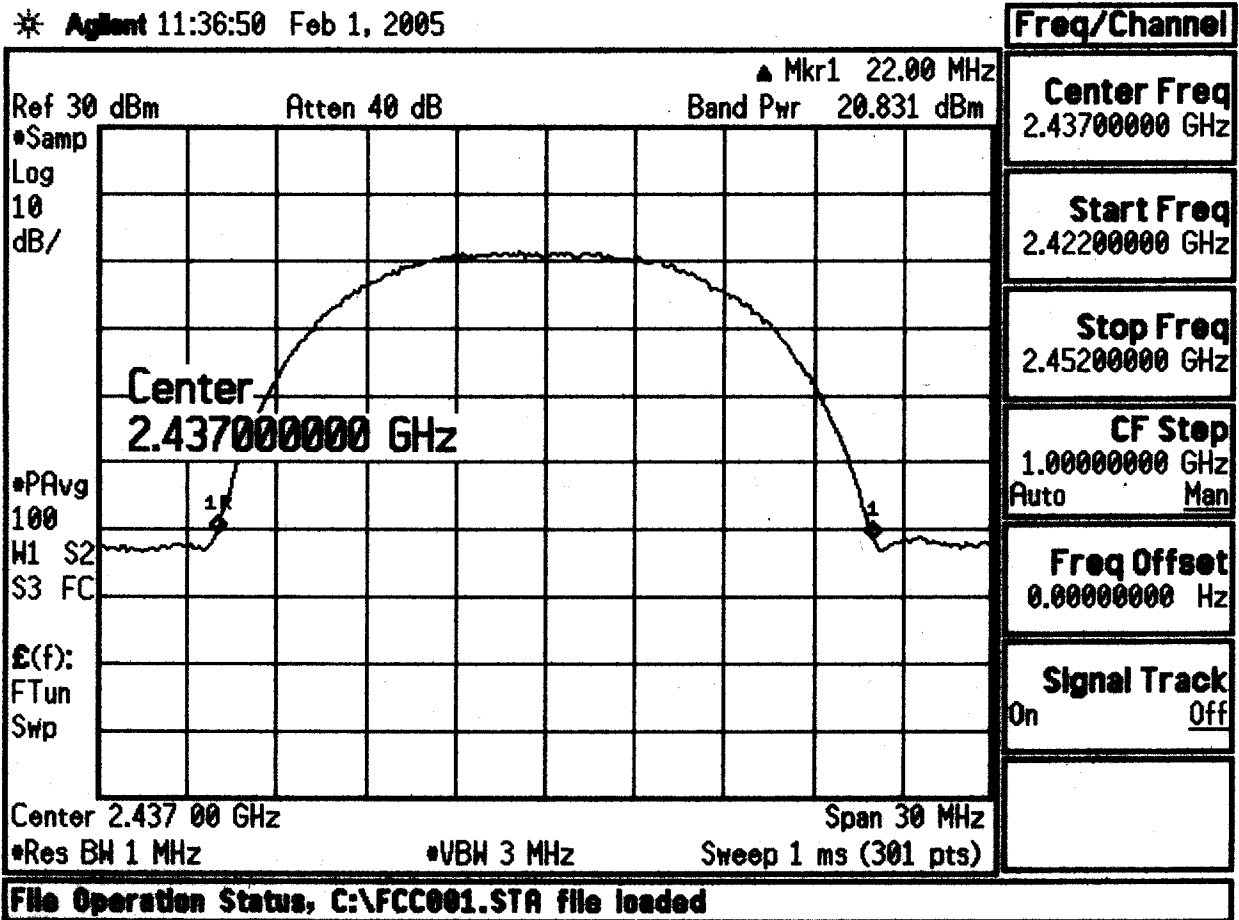
6 MBit rate

Limit = 1 Watt (30 dBm)

measured = 15.3 dBm (back-off too meet restricted band)

# FCC 15.247 (b).3 Tx output power (B-mode)

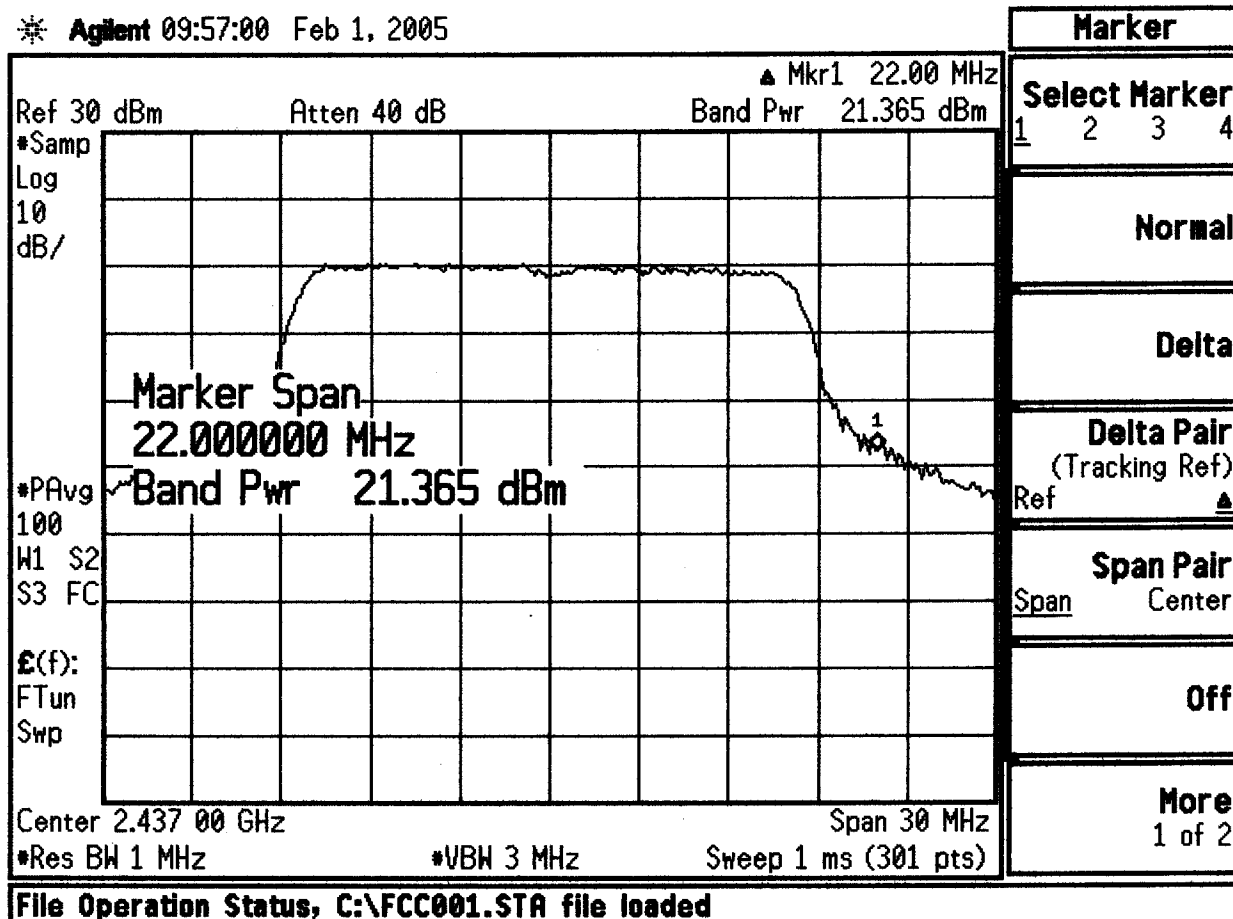
\* Agilent 11:36:50 Feb 1, 2005



Continuous Tx  
 CTL 22dBm  
 B-mode (DSS)

Limit = 1 Watt (30dBm)  
 measured = 20.8dBm

\* Agilent 09:57:00 Feb 1, 2005



Continuous Tx

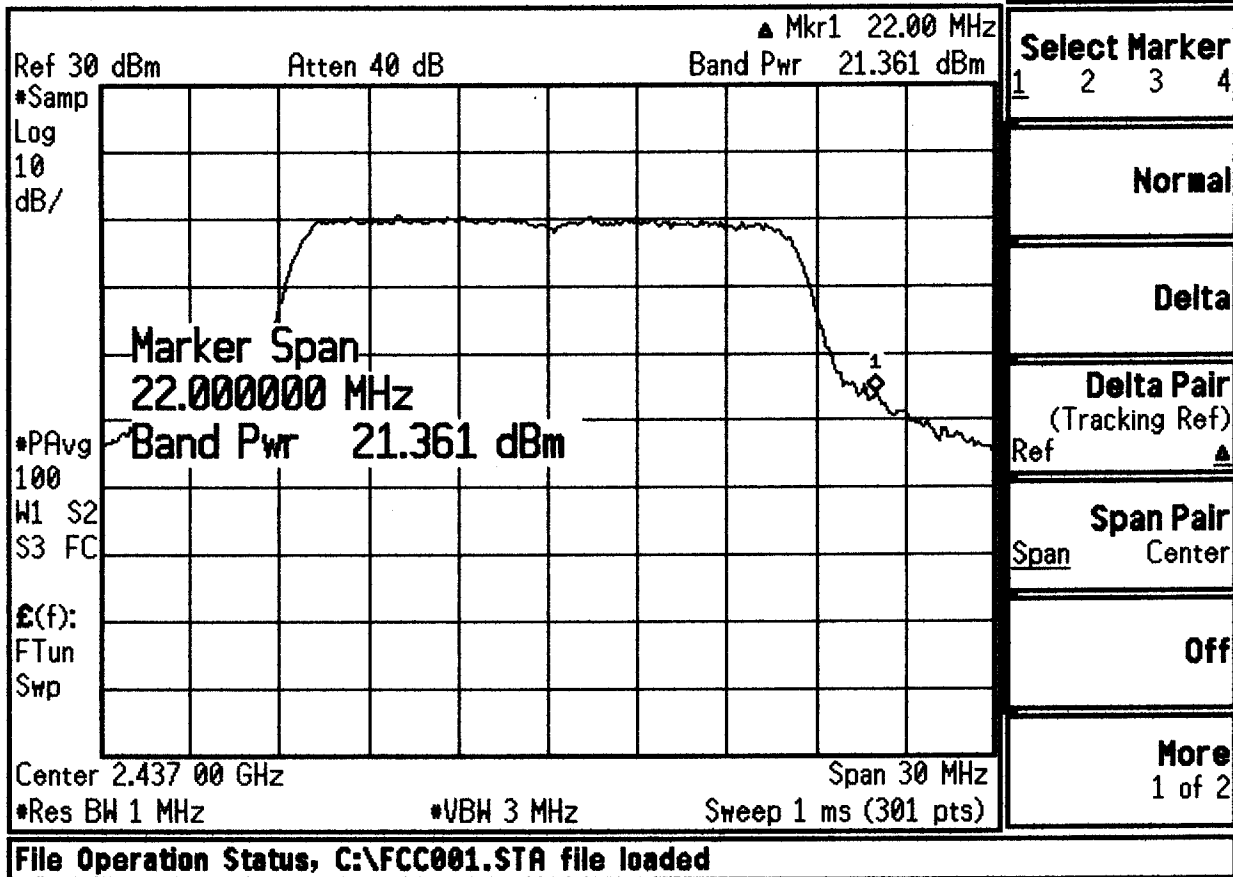
CTL 22dBm

6MBit rate

Limit = 30dBm

measured = 21.4 dBm

\* Agilent 09:58:01 Feb 1, 2005



Continuous Tx

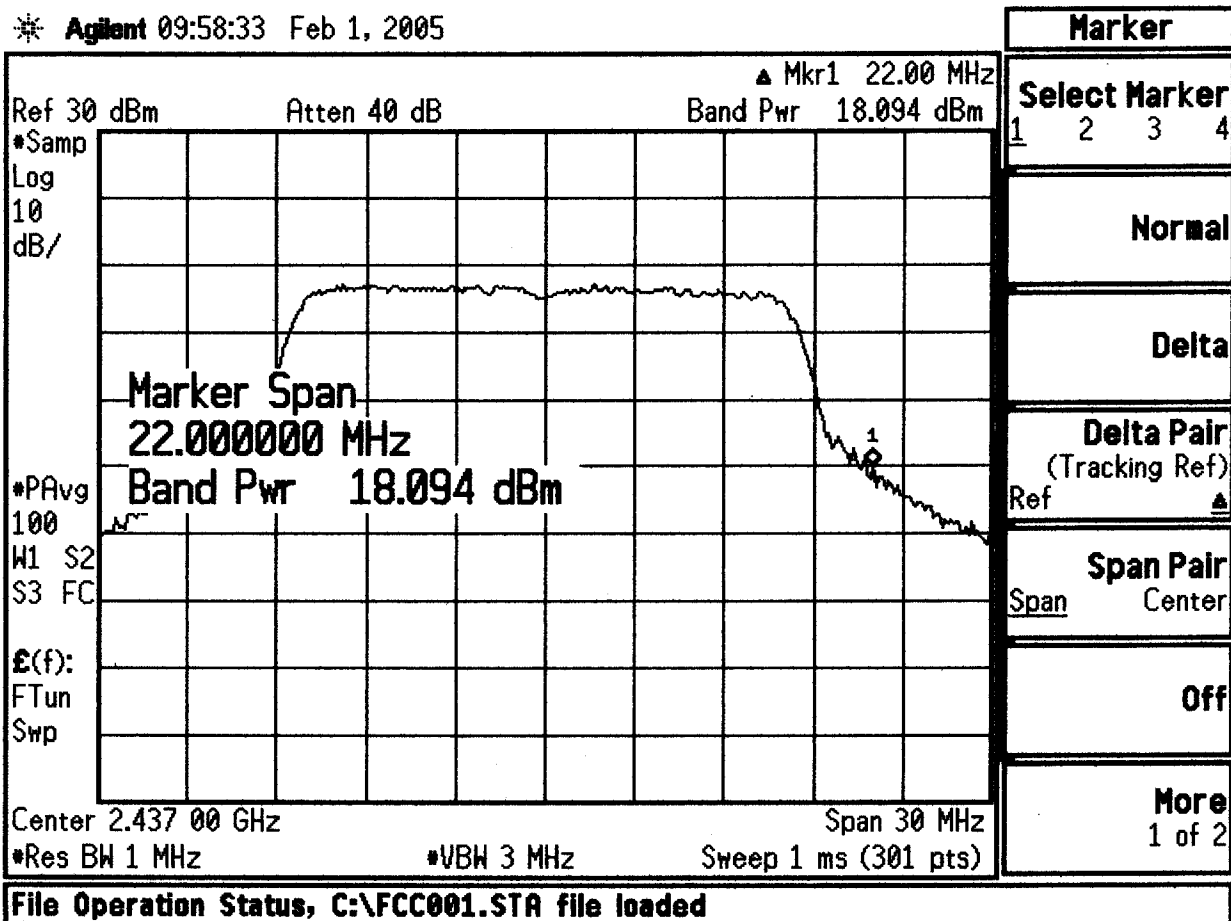
CTL 22dBm

24MBit rate

Limit = 1Watt (30dBm)

measured = 21.4dBm

Agilent 09:58:33 Feb 1, 2005



Continuous Tx

CTL 19dBm

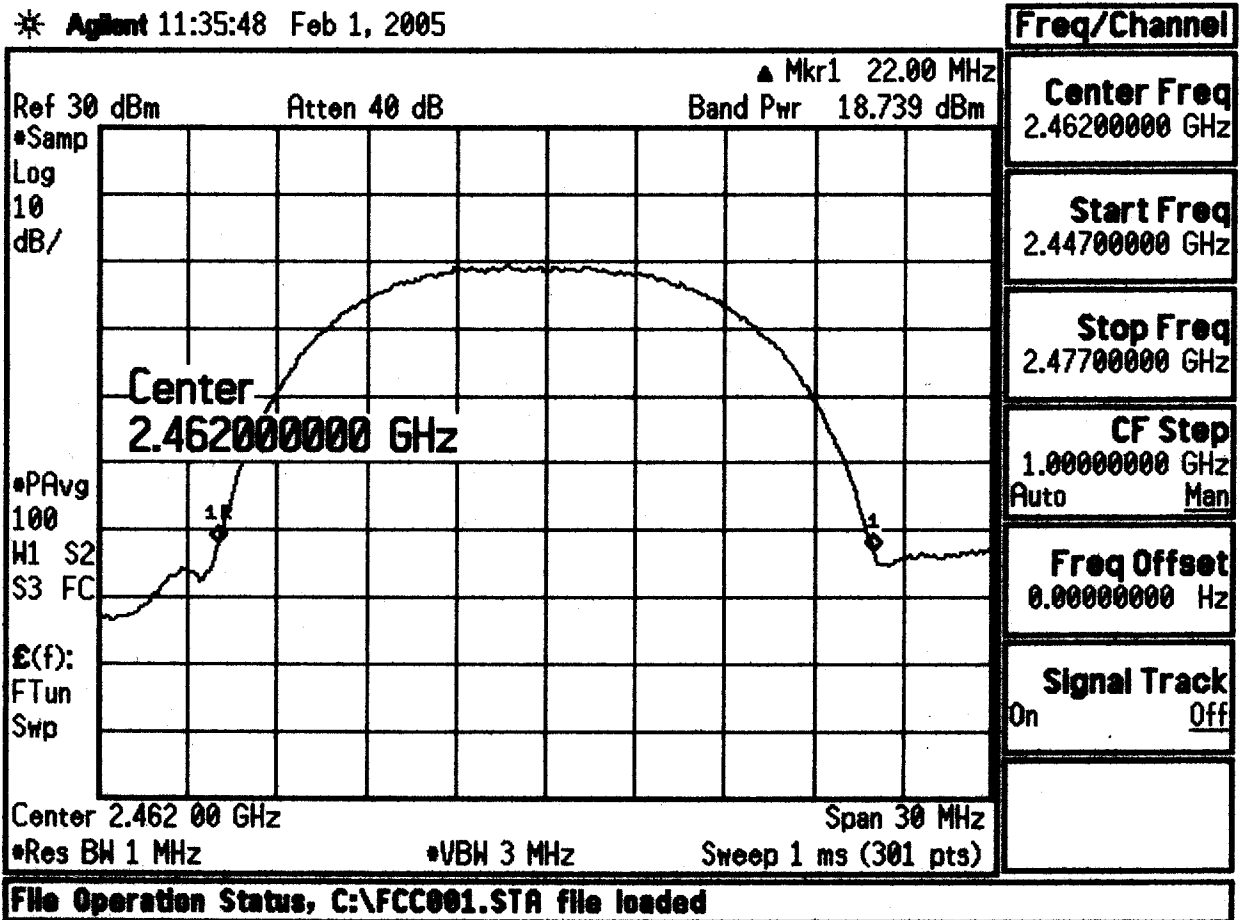
54MBit rate

Limit = 1Watt (30dBm)

measured = 18.1 dBm

# Fcc 15.247 (b).3 Tx output power (B-mode)

\* Agilent 11:35:48 Feb 1, 2005



Continuous TX

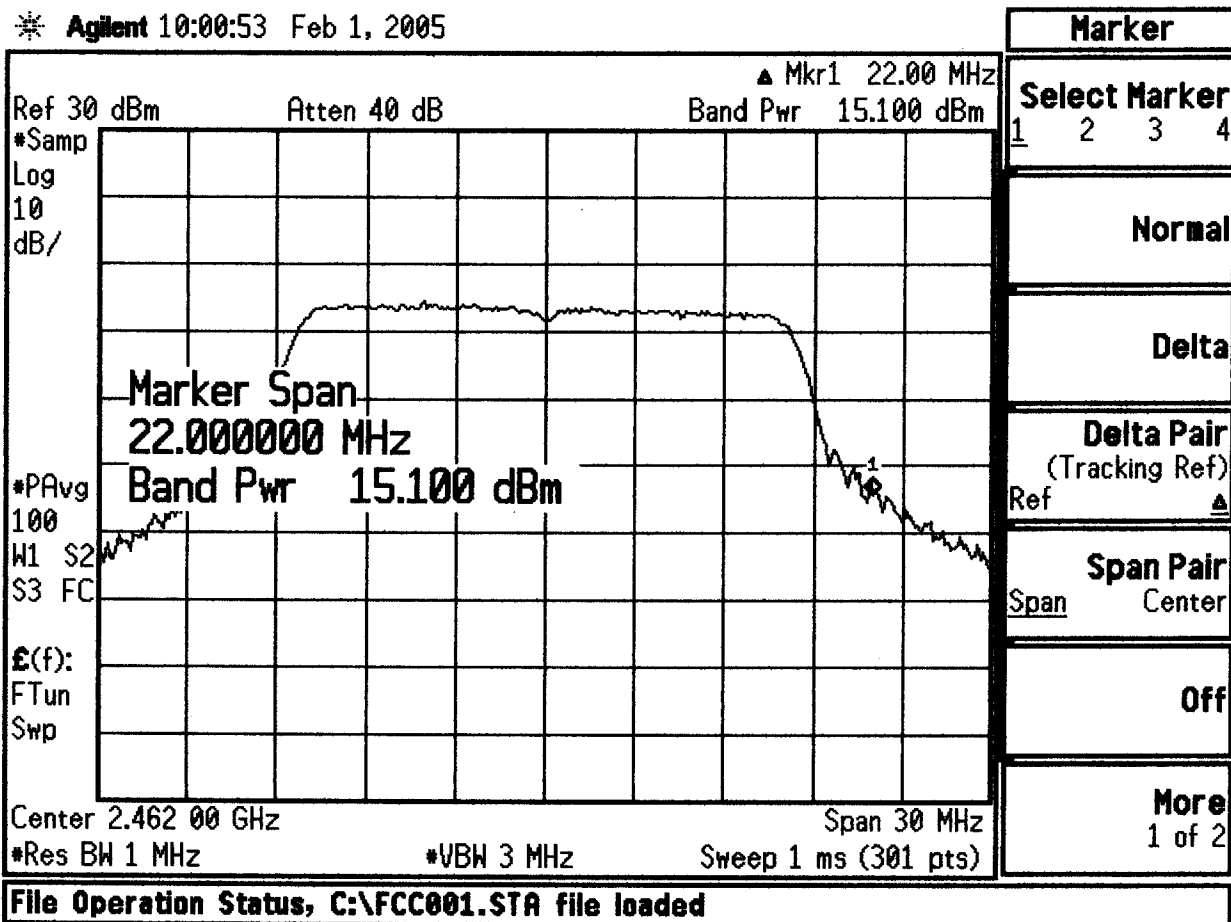
CTL 20 dBm

B-mode (DSS)

Limit 1 Watt (30 dBm)

measured 18.7 dBm

Agilent 10:00:53 Feb 1, 2005

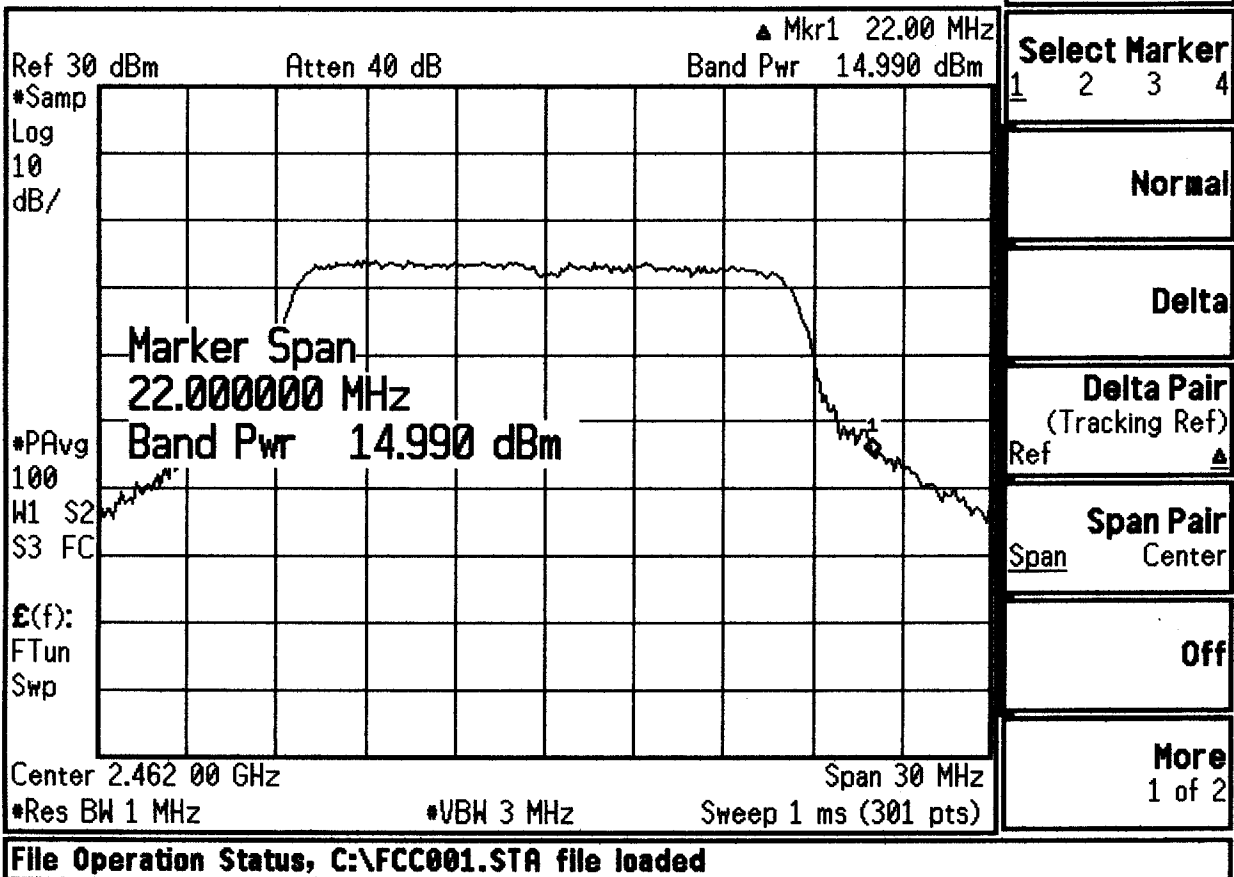


Continuous TX  
 CTL 16 dBm  
 6 MBit rate

Limit = 30 dBm

measured = 15.1 dBm

Agilent 09:59:56 Feb 1, 2005



Continuous Tx

CTL 16 dBm

54 Mbit rate

Limit = 30 dBm

measured = 15 dBm

## 6 dB Bandwidth

### Specifications:

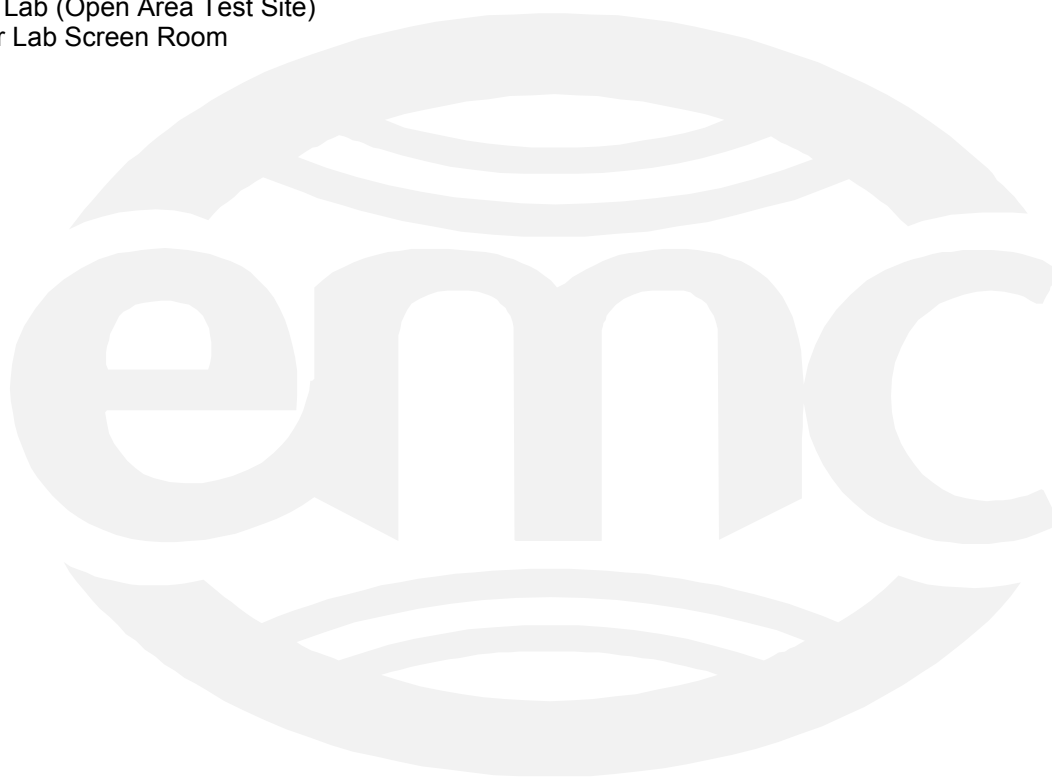
FCC Specification: Paragraph: 15.247 (a)(2)

IC Specification: RSS-210, 6.2.2(o) Amd. 1 (IV)

The 6 dB Bandwidth measurements were performed at the following test location:

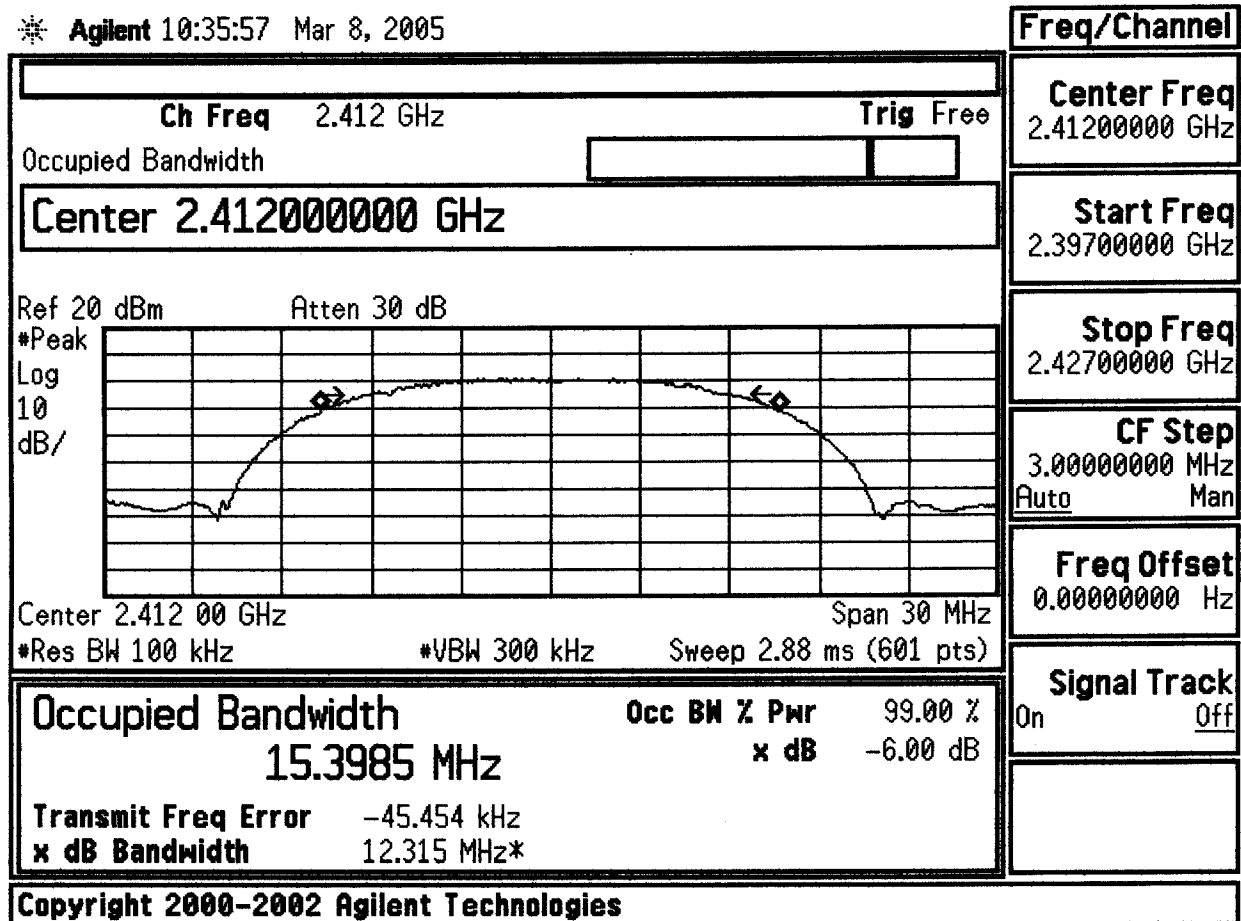
☐ - Test not applicable

- ☐ - Wild River Lab Large Test Site (Open Area Test Site)
- ☐ - Wild River Lab Small Test Site (Open Area Test Site)
- ☐ - Oakwood Lab (Open Area Test Site)
- ☐ - Wild River Lab Screen Room
- ☒ - Cal Amp



FCC 6dB Band width (B-mode) 15.247(2)

\* Agilent 10:35:57 Mar 8, 2005



Cont, Tx

CTL = 20dBm

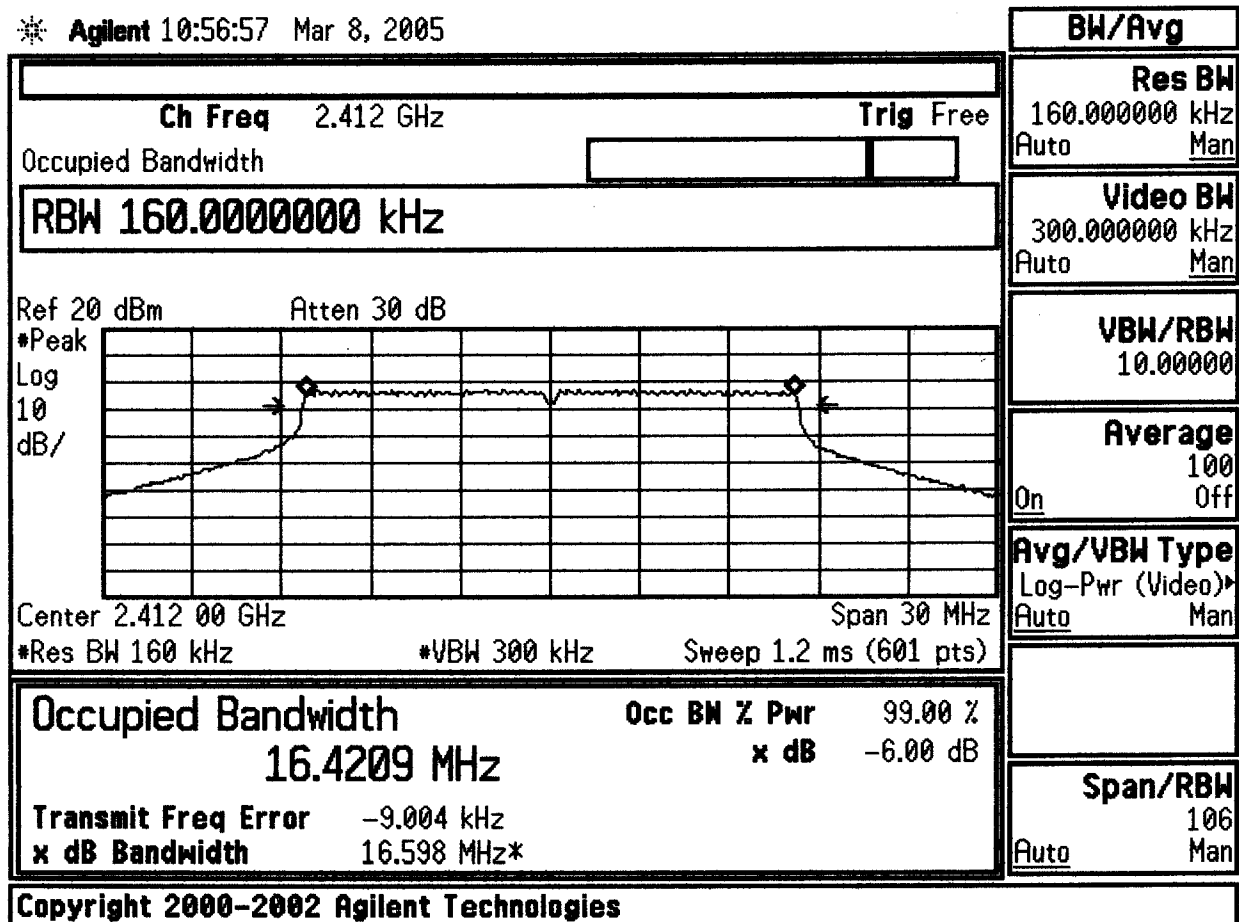
Limit

6dB BW > 500 kHz

measured = 12.3 MHz

FCC 15.247(2) 6dB Band width (G-mode)

\* Agilent 10:56:57 Mar 8, 2005



Cont. TX

CTL = 16dBm

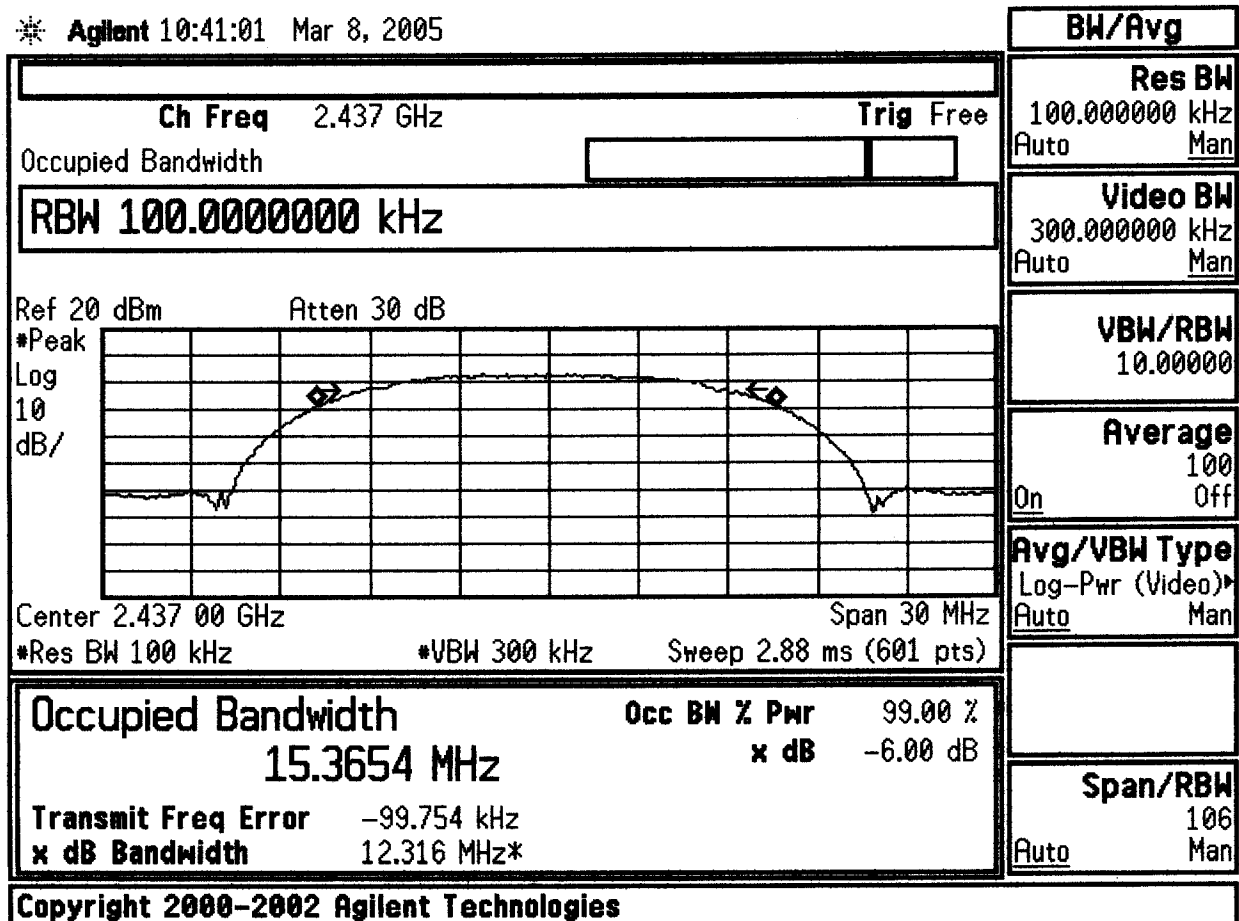
Limit

6dB BW > 500 kHz

measured = 16.6 MHz

FLC 15.247(2) 6dB Band width (B-mode)

\* Agilent 10:41:01 Mar 8, 2005



Cont. TX

CTL = 22 dBm

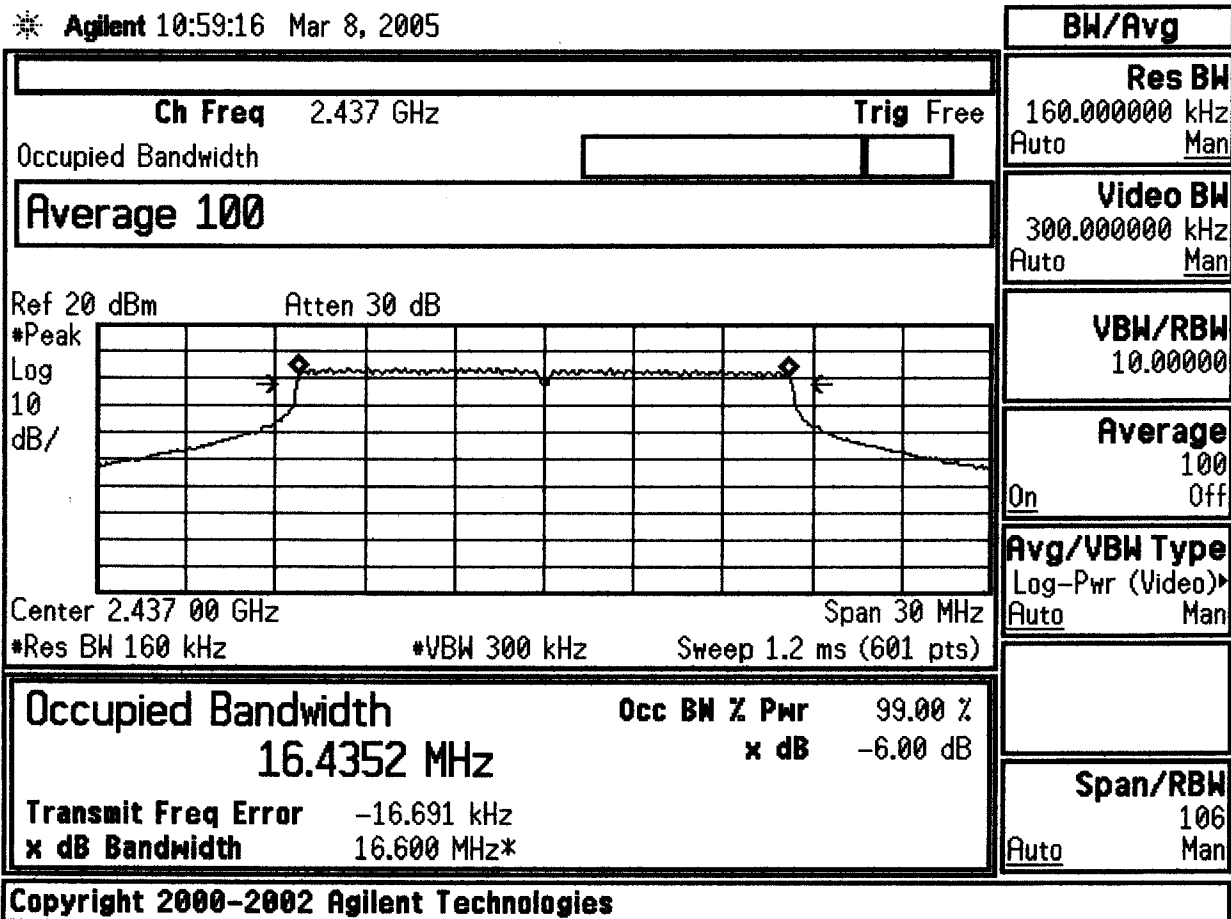
Limit

6 dB BW > 500 kHz

measured = 12.3 MHz

# FCC 15.247(2) 6dB Band width (G-mode)

\* Agilent 10:59:16 Mar 8, 2005



Cont. TX

CTL = 22 dBm

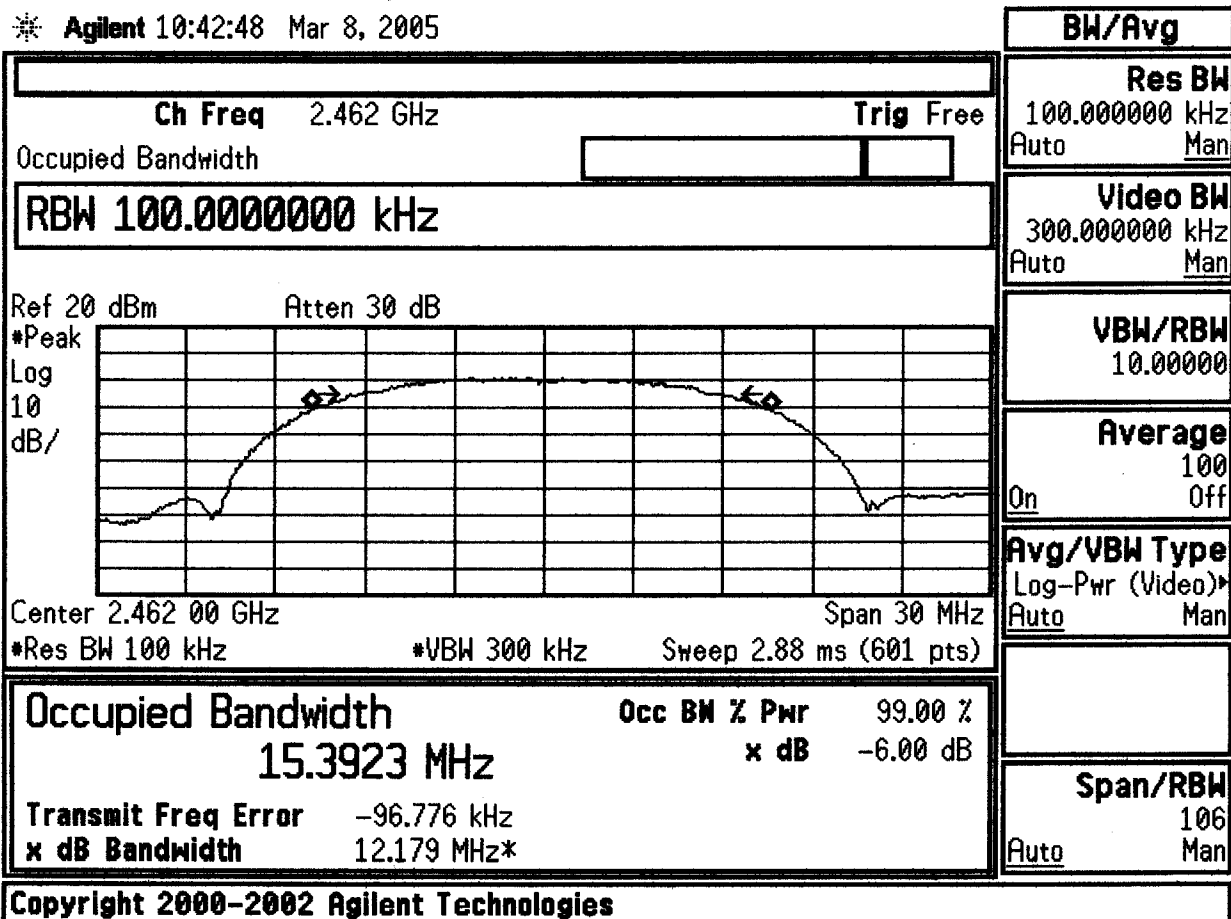
Limit

6dB BW > 500 kHz

measured = 16.6 MHz

FCC 15.247(2) 6dB Band Width (B-mode)

\* Agilent 10:42:48 Mar 8, 2005



Cont. TX

CTL = 20dBm

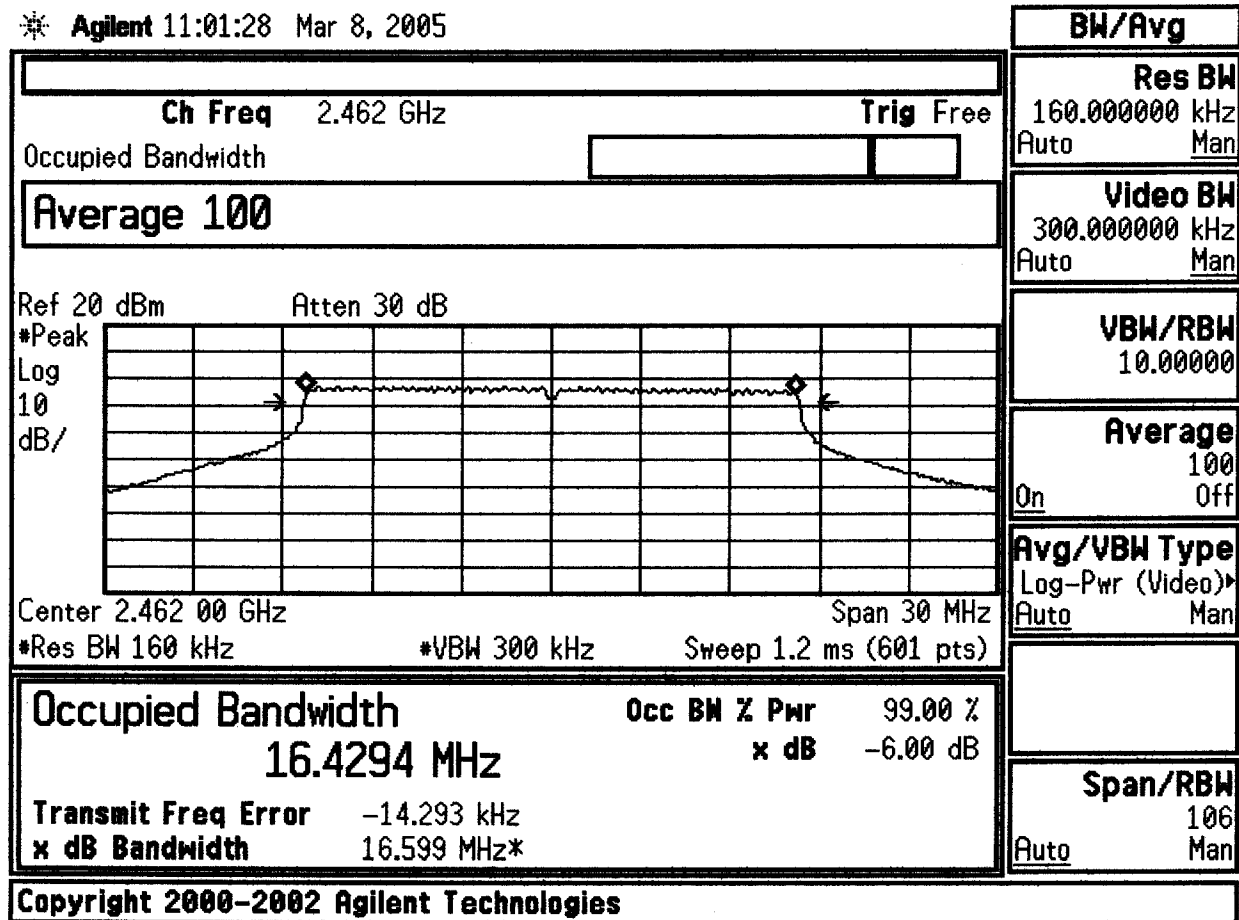
Limit

6dB BW > 500 kHz

measured = 12.2 MHz

# FCC 15.247(2) 6dB Band width (G-mode)

Agilent 11:01:28 Mar 8, 2005



Cont. TX

CTL = 16 dBm

Limit

6dB BW > 500 kHz

measured = 16.6 MHz

## 99% Bandwidth

**Specifications:**

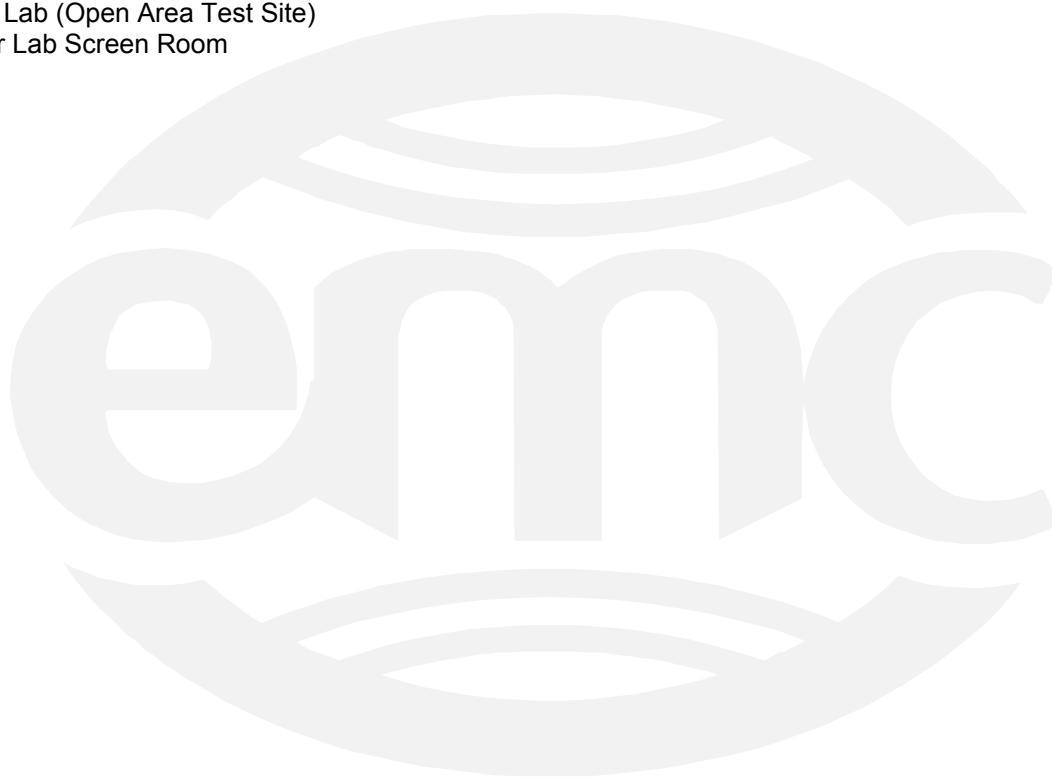
FCC Specification: N/A

IC Specification: RSS-210, 5.9.1

The 99% <i>Bandwidth</i> measurements were performed at the following test location:
--

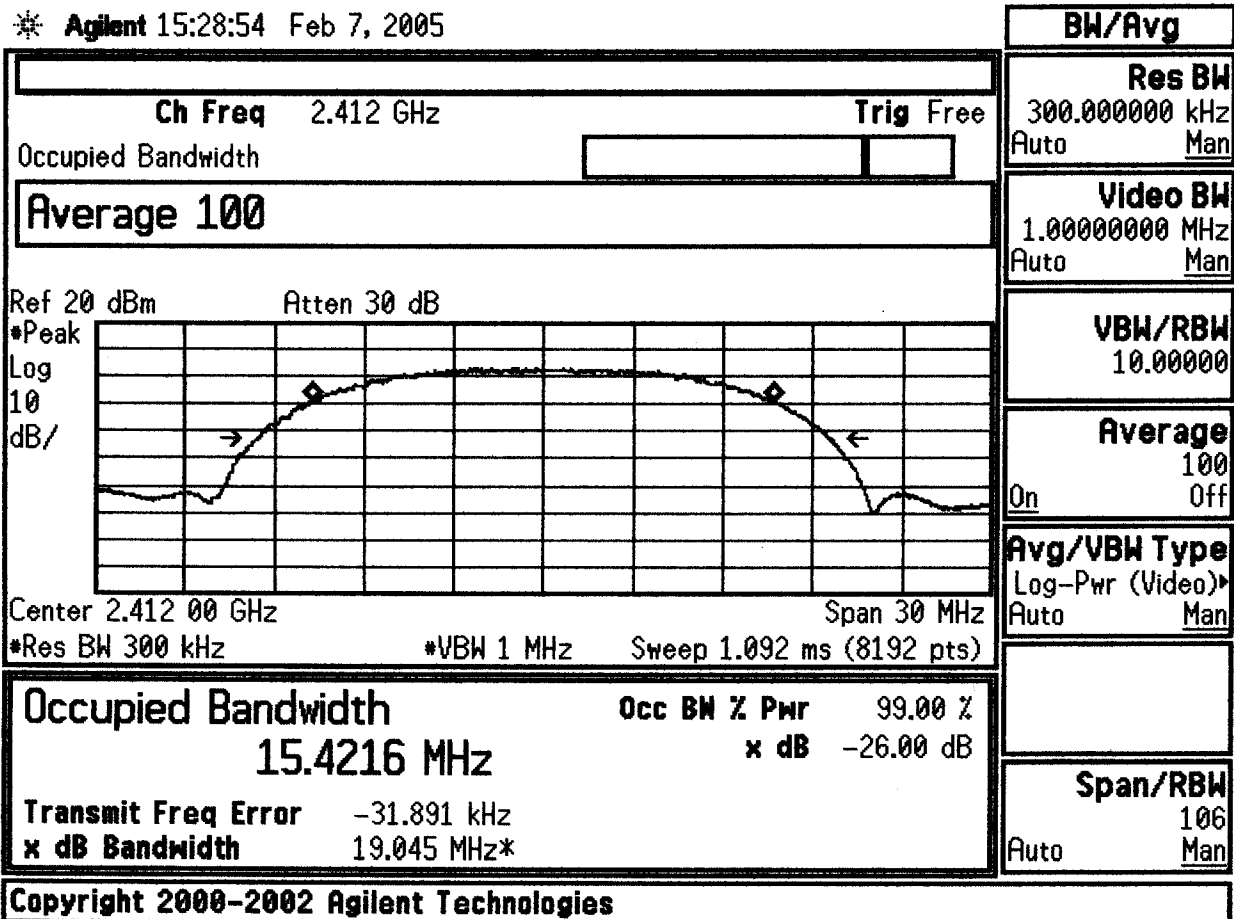
<input type="checkbox"/> - Test not applicable
--

- ☐ - Wild River Lab Large Test Site (Open Area Test Site)
- ☐ - Wild River Lab Small Test Site (Open Area Test Site)
- ☐ - Oakwood Lab (Open Area Test Site)
- ☐ - Wild River Lab Screen Room
- ☒ - Cal Amp



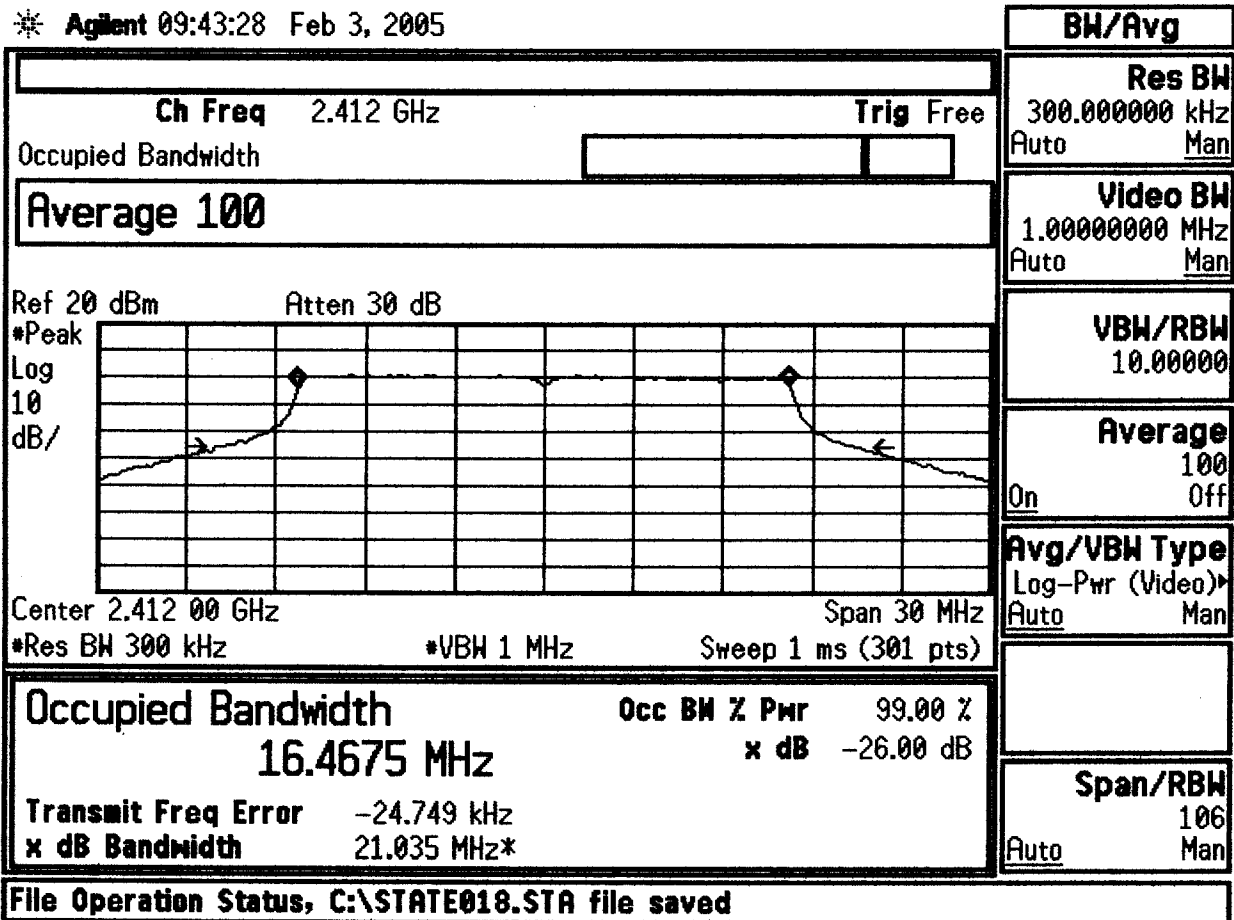
# FCC Emissions Band width (B-mode) Canada OBU

✱ Agilent 15:28:54 Feb 7, 2005



# Canada OBW and FCC Emissions Bandwidth (G-mode)

\* Agilent 09:43:28 Feb 3, 2005



occupied BW mode

x dB = -26 dB

RBW = 300 kHz

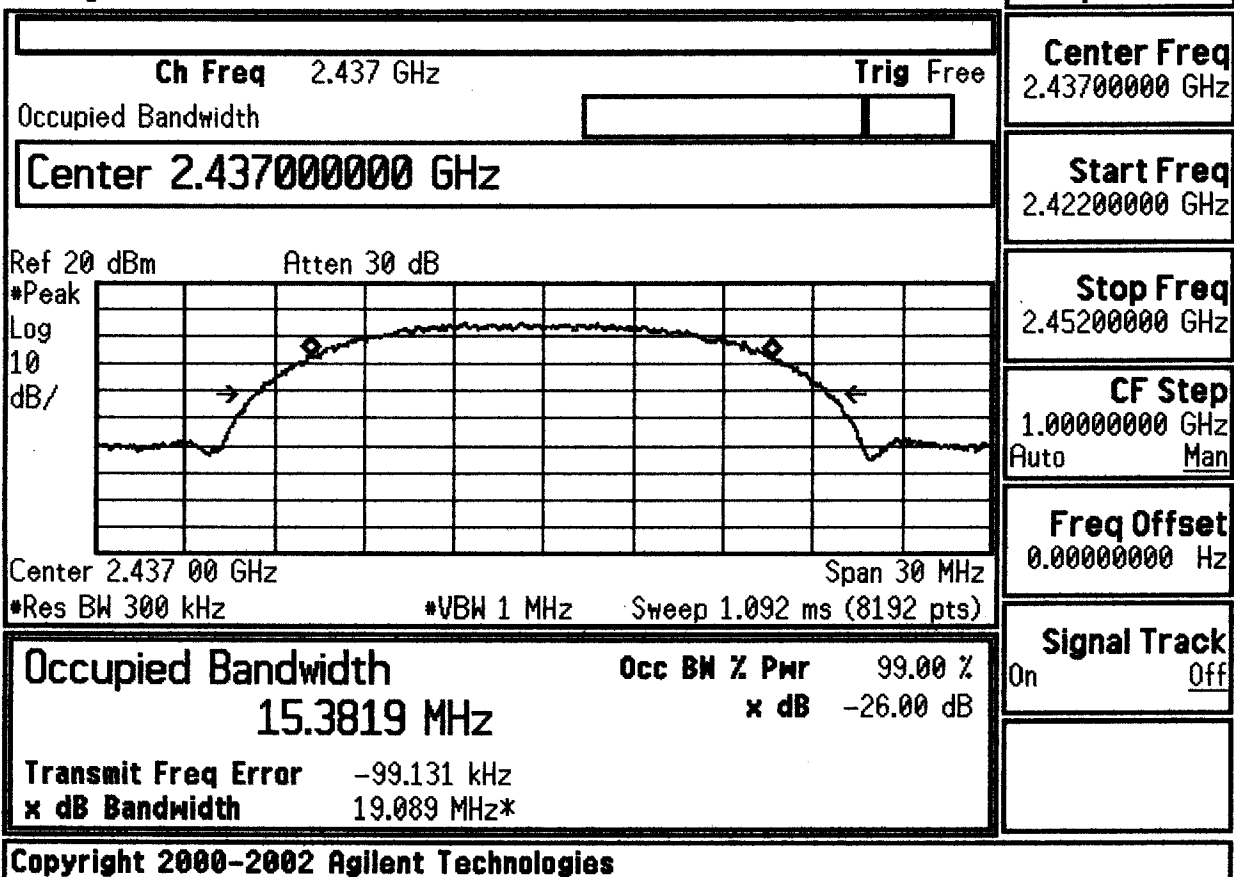
VBW = 1 MHz

Det = peak

100 Averages

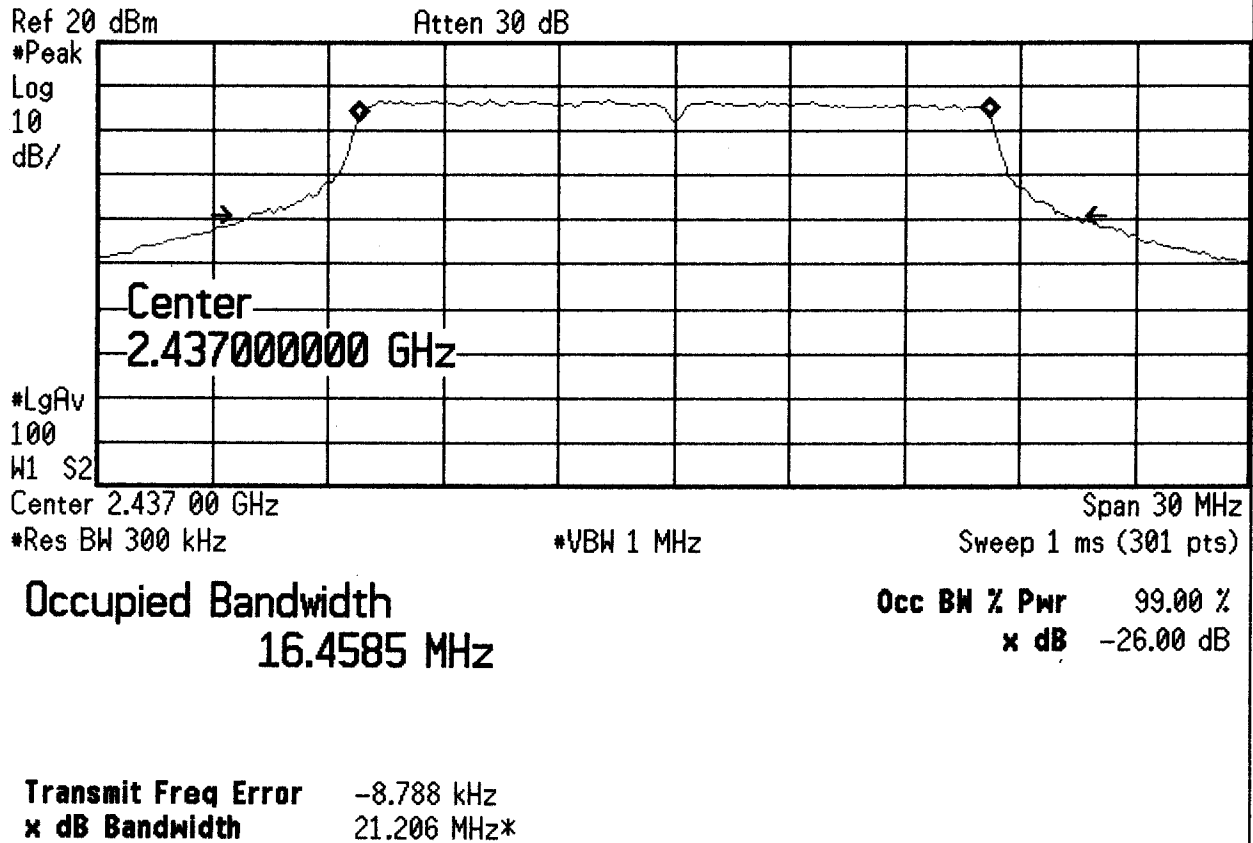
# FCC Emissions Bandwidth (B-mode) Canada OBW

Agilent 15:29:34 Feb 7, 2005



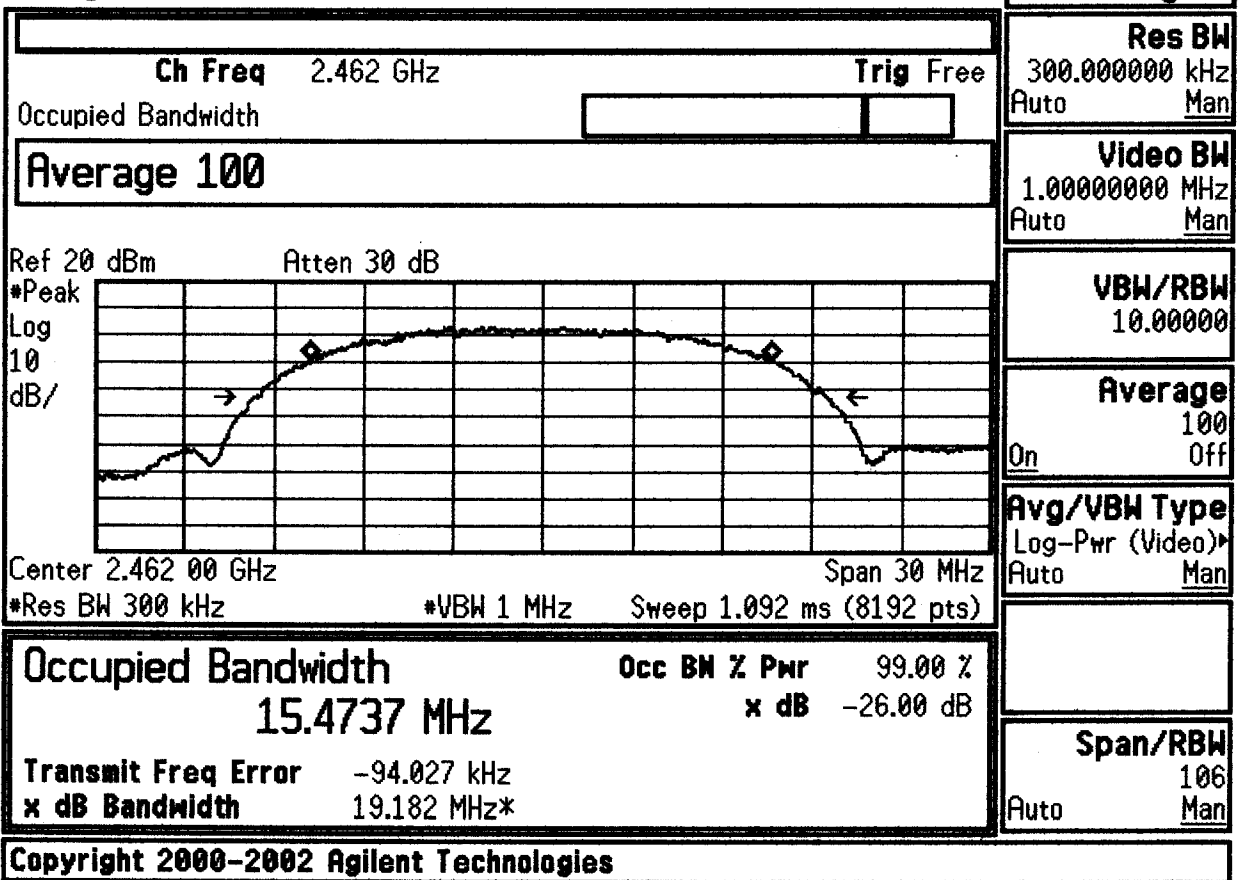
# Canada OBW and FCC Emissions Bw (G-mode)

\* Agilent 14:43:02 Feb 7, 2005



# FCC Emissions Bandwidth (B-mode) Canada OBU

Agilent 15:30:07 Feb 7, 2005



# Canada OBW and FCC Emissions BW (G-mode)

Agilent 14:36:48 Feb 7, 2005

Ch Freq 2.462 GHz Trig Free  
Occupied Bandwidth

Average 100

Ref 20 dBm

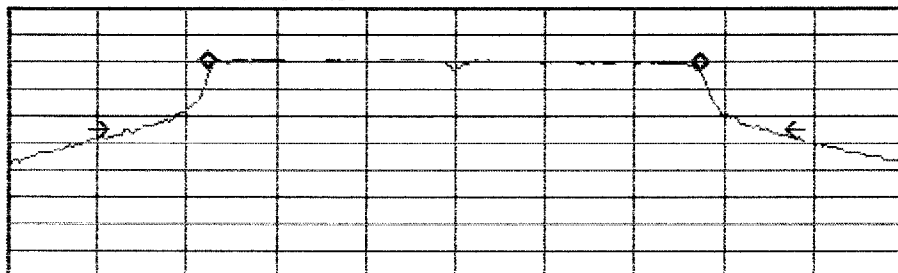
Atten 30 dB

#Peak

Log

10

dB/



Center 2.462 00 GHz

Span 30 MHz

#Res BW 300 kHz

#VBW 1 MHz

Sweep 1 ms (301 pts)

Occupied Bandwidth

16.4570 MHz

Occ BW % Pwr

99.00 %

x dB

26.00 dB

Transmit Freq Error

-22.440 kHz

x dB Bandwidth

21.437 MHz\*

BW/Avg

Res BW

300.000000 kHz

Auto Man

Video BW

1.00000000 MHz

Auto Man

VBW/RBW

10.00000

Average

100

On Off

Avg/VBW Type

Log-Pwr (Video)

Auto Man

Span/RBW

100

Auto Man

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## Power Spectral Density

### Specifications:

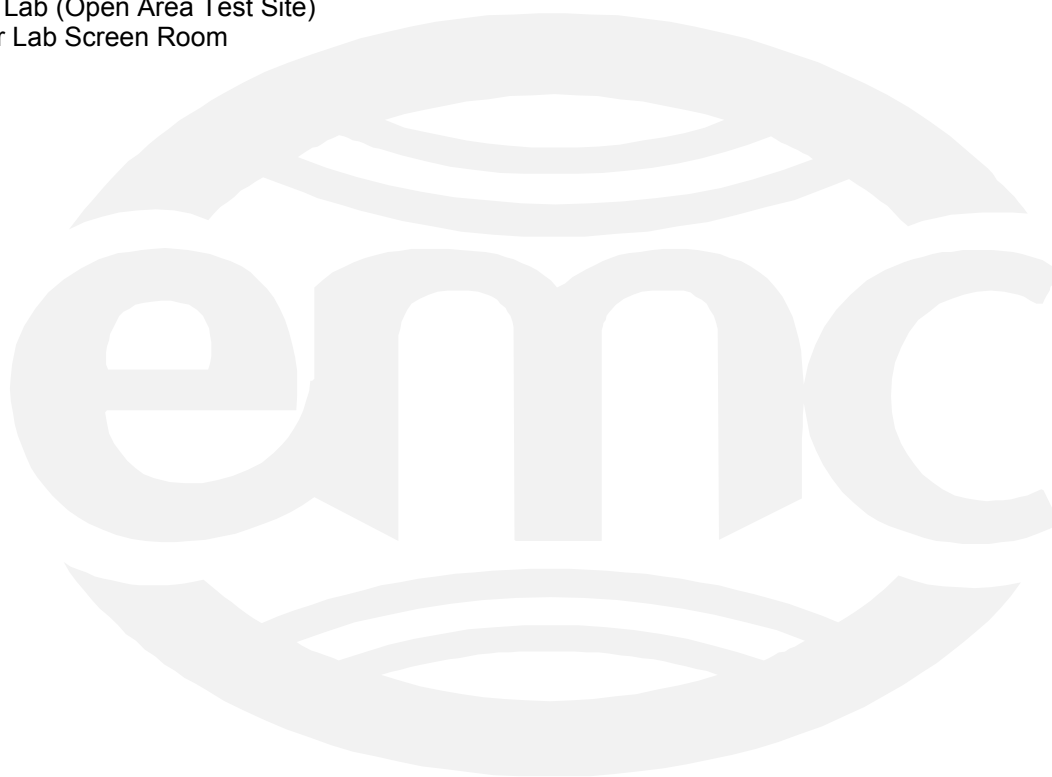
FCC Specification: Paragraph: 15.247 (e)

IC Specification: RSS-210, 6.2.2(o) Amd. 1(IV)

The *Power Spectral Density* measurements were performed at the following test location:

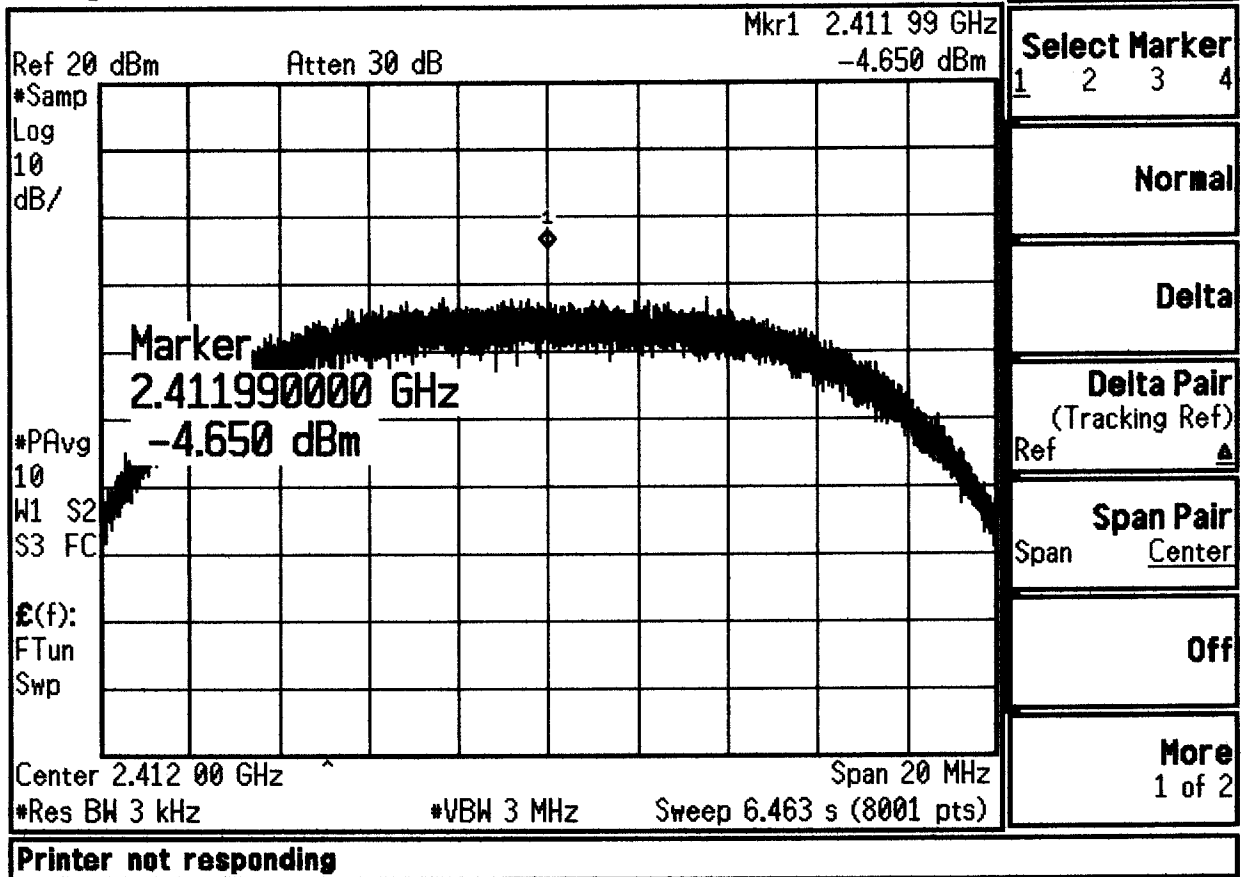
☐ - Test not applicable

- ☐ - Wild River Lab Large Test Site (Open Area Test Site)
- ☐ - Wild River Lab Small Test Site (Open Area Test Site)
- ☐ - Oakwood Lab (Open Area Test Site)
- ☐ - Wild River Lab Screen Room
- ☒ - Cal Amp



PPSD FCC 15.247

\* Agilent 11:00:31 Feb 8, 2005



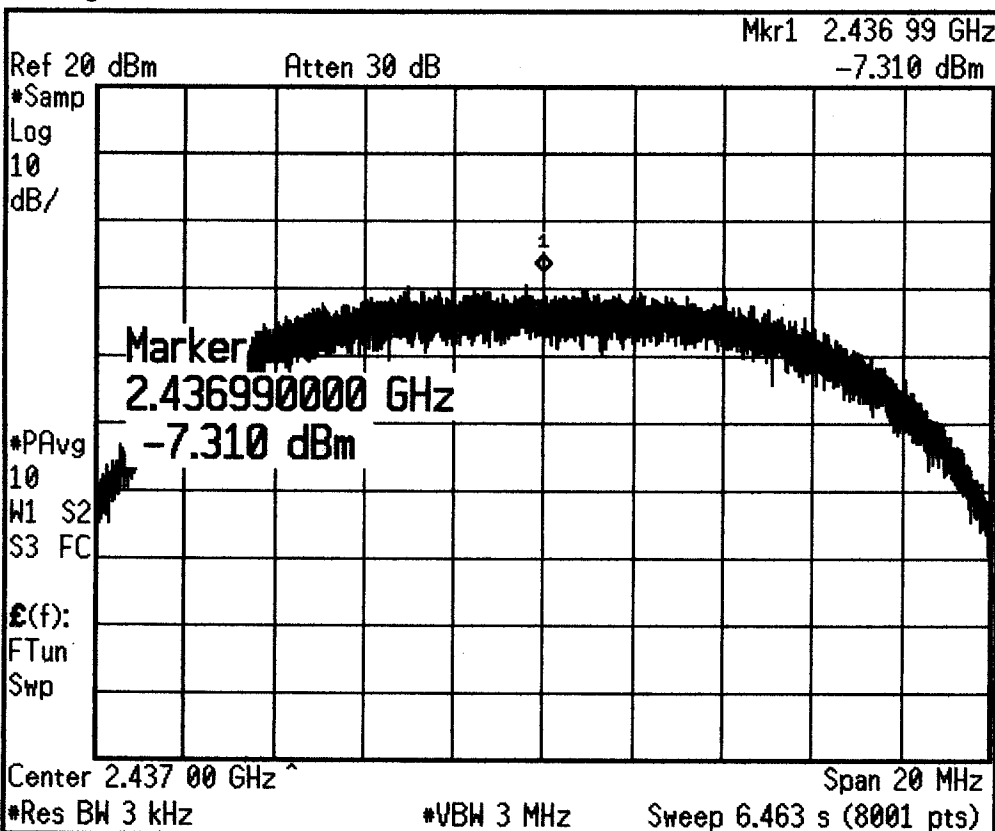
2412 MHz

CTL 70 dBm

B-mode (DSS)

PPSD FCC 15.247

\* Agilent 11:01:49 Feb 8, 2005



Peak Search

Next Peak

Next Pk Right

Next Pk Left

Min Search

Pk-Pk Search

Mkr → CF

More  
1 of 2

Printer not responding

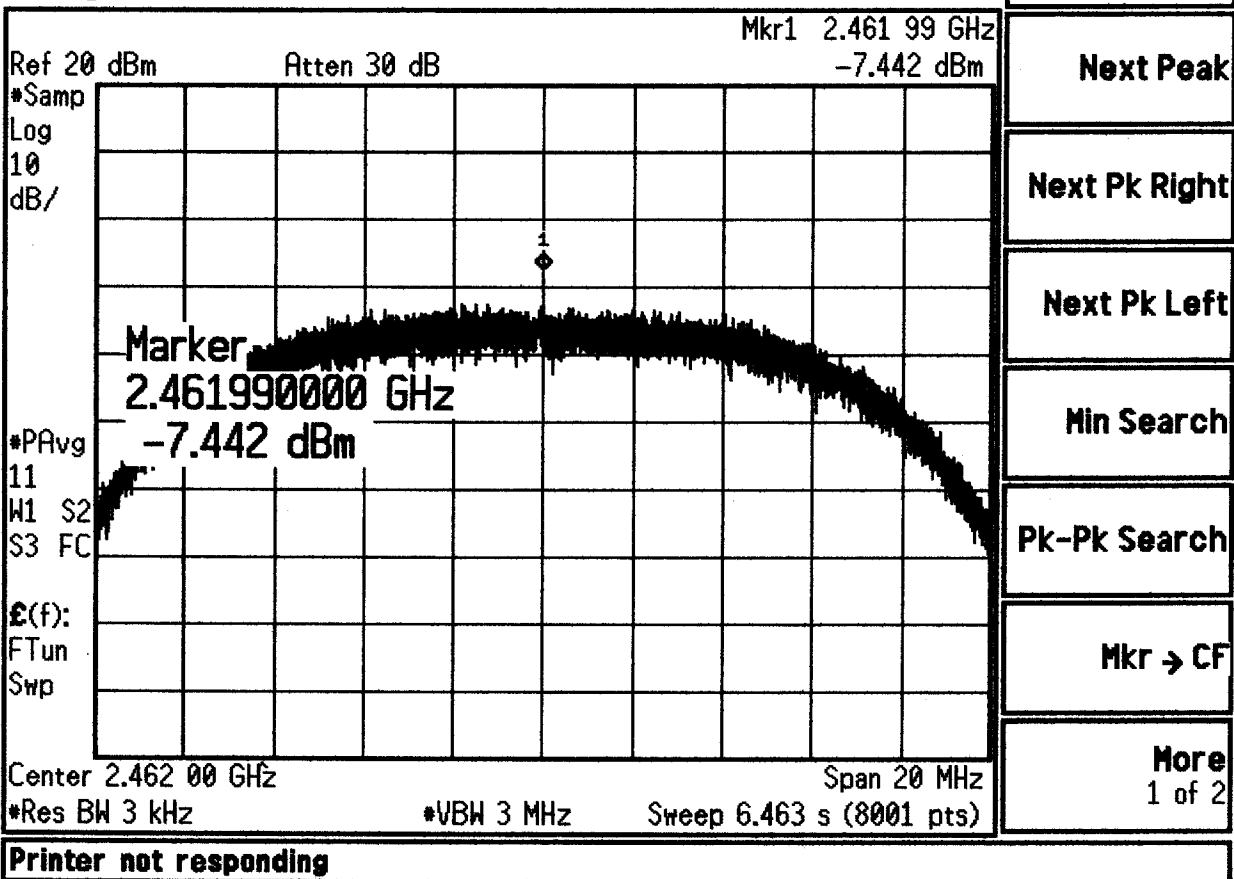
2437 MHz

22 dBm CTL

B-mode (DSS)

# Peak Power Spectral Density for DSS systems FCC 15.247

Agilent 10:50:41 Feb 8, 2005



2462 MHz  
20 dBm CTL  
B-mode (DSS)

used Public Notice DA-02-2138 Aug 30, 2002  
Test procedure

- Sample Detector mode
- Power Averaging (Not Video)
- used 3 kHz Res BW per 15.247(d) instead of 1 MHz.

PPSD Limit 8 dBm / 3 kHz band

measured = -7.4 dBm / 3 kHz band