# TEST RESULT SUMMARY

## FCC PART 15 SUBPART E
## Industry Canada RSS-210: Issue 5: 2001
## A1: Nov. 2002, A2: Apr. 2003, A3: 2004, A4: 2004
## Section 6.2.2(q1)

| | |
|---|---|
| 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 | **CA 500003 (AeS 1500)** |
| MANUFACTURER'S ADDRESS | 1401 N. Rice Avenue<br>Oxnard CA 93030 |
| TEST REPORT NUMBER | WC500164.1 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 E and also with RSS-210, section 6.2.2(q1).

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 E and also with RSS-210, section 6.2.2(q1).

Date: 22 March 2005

| | | |
|---|---|---|
| Location: Taylors Falls MN USA | J. C. Sausen<br>Tested By | T. K. Swanson<br>Reviewed By |

**Not Transferable**

# EMC EMISSION - T E S T  R E P O R T

| | | | | |
|---|---|---|---|---|
| Test Report File No. | : | **WC500164.1 RevA** | Date of issue: | 22 March 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) | : | **WC500164.1 RevA** |
| Total pages | | 113 |

*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*



TÜV PRODUCT SERVICE INC 19333 Wild Mountain Road Taylors Falls MN 55084-1758 Tel: 651 638 0297 Fax: 651 638 0298 Rev.No 1.0

# REVISION RECORD

| REVISION | TOTAL NUMBER OF PAGES | DATE | DESCRIPTION |
|---|---|---|---|
| | 122 | 24 February 2005 | Initial Release |
| A | 113 | 22 March 2005 | Revisions include:<br>▪ Added test setup diagram and equipment information for conducted emissions setup – Page 19.<br>▪ Updated the conducted out of band emissions data to show the conducted limit – Pages 60 - 87.<br>▪ Added radiated emissions in the restricted bands with both transmitters operating simultaneously – Pages 99 - 102. |



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## EMISSIONS TEST REGULATIONS :

**The emissions tests were performed according to following regulations:**

---

☐ - EN 50081-1 / 1991

☐ - EN 55011 / 1998 w/Amendment A1:1999 — ☐ - Group 1 ☐ - Class A — ☐ - Group 2 ☐ - Class B

☐ - EN 55013 / 1990

☐ - EN 55014 / 1987 — ☐ - Household appliances and similar ☐ - Portable tools ☐ - Semiconductor devices

☐ - EN 55014 / A2:1990

☐ - EN 55014 / 1993 — ☐ - Household appliances and similar ☐ - Portable tools ☐ - Semiconductor devices

☐ - EN 55015 / 1987

☐ - EN 55015 / A1:1990

☐ - EN 55015 / 1993

☐ - EN 55022 / 1987 — ☐ - Class A ☐ - Class B

■ - FCC Part 15 Subpart E

■ - FCC Part 15 Subpart C Section 15.207 Conducted Emission Requirements

■ - RSS-210, Issue 5, 2001 – Section 6.2.2(q1)



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## Emission Test Results:

**Peak Power Out [FCC 15.407 (a)], [RSS-210 6.2.2(q1)]**

The requirements are ■ - MET ☐ - NOT MET

Band 1 Limit equals 17 dBm, 23 dBm EIRP.

Remarks: Max peak output power is shown to be 13 dBm and 21 dBm EIRP.

Band 2 Limit equals 24 dBm, 30 dBm EIRP.

Remarks: Max peak output power is shown to be 19.3 dBm and 27.3 dBm EIRP.

ISM Band Limit equals 30 dBm, 36 dBm EIRP.

Remarks: Max peak output power is shown to be 16.7 dBm and 23.7 dBm EIRP.

**20 dB / 26dB Bandwidth [FCC 15.407 (a)], [RSS-210 6.2.2(q1)]**

The requirements are ■ - MET ☐ - NOT MET

Remarks: Occupied Bandwidth is 16.4 MHz. Emission bandwidth is 21.9 MHz.

**Power Spectral Density – [FCC 15.407 (a)(5)], [RSS-210 6.2.2(q1)]**

The requirements are ■ - MET ☐ - NOT MET

Remarks:

Limit for 5.15 – 5.25 = 4dBm/MHz.

Limit for 5.25 – 5.35 = 11dBm/MHz.

Limit for 5.725 – 5.825 = 17dBm/MHz.



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## Emission Test Results Continued:

**Conducted Out of Band Emissions [FCC 15.407 (b)], [RSS-210 6.2.2(q1)]**

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 15.407(b)(7)], [RSS-210 6.2.2(q1)]**

The requirements are ■ - MET ☐ - NOT MET

Minimum margin of compliance >10 dB at _____ MHz

Maximum margin of non-compliance _____ dB at _____ MHz

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

**Spurious radiated emissions 1 GHz – 25 GHz (restricted bands) [FCC 15.407(b)(7)], [RSS-210 6.2.2(q1)]**

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:



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# MEASUREMENT PROTOCOL

## GENERAL INFORMATION

**Environmental conditions in the lab: TUV 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 ±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 dBμV, is arrived at by taking the reading directly from the EMI receiver. This level is compared directly to the CISPR limit.

To convert between dBμV and μV, the following conversions apply:

dBμV = 20(log μV)

μV = Inverse log(dBμV/20)

**RADIATED EMISSIONS**

The final level, expressed in dBμV/m, is arrived at by taking the reading from the spectrum analyzer (Level dBμV), 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 (dBuV) | | CABLE/ANT/PREAMP (dB) | | (dB/m) | | (dB) | | FINAL (dBuV/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 Ω/50 μH (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



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**Constructional Data Form(s)**

**and/or**

**Product Information Form(s)**



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Form

# EMC Test Plan and Constructional Data Form

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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**

| | | | | | | |
|---|---|---|---|---|---|---|
| ☐ EMC Directive 89/336/EEC (EMC) | ☒ FCC: | Class | ☒ A | ☐ B | Part | 15 |
| Std: | ☐ VCCI: | Class | ☐ A | ☐ B | | |
| ☐ Machinery Directive 89/392/EEC (EMC | ☐ BCIQ: | Class | ☐ A | ☐ B | | |
| Std: | ☒ Canada: | Class | ☒ A | ☐ B | | |
| ☐ Medical Device Directive 93/42/EEC (EMC) | ☐ Australia: | Class | ☐ A | ☐ B | | |
| Std: | ☐ Other: | | | | | |
| ☐ Vehicle Directive 72/245/EEC (EMC) Std: | | | | | | |
| ☐ FDA Reviewers Guidance for Premarket Notification Submissions (EMC) | | | | | | |

**TÜV Product Service Certification Requested**

☐ Attestation of Conformity (AoC) ☐ International EMC Mark (IEM)

☒ Certificate of Conformity (CoC) ☐ Compliance Document

Protection Class (N/A for vehicles) ☐ Class I ☐ Class II ☐ Class III

Form

# EMC Test Plan and Constructional Data Form

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(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

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## EUT Interface Ports and Cables

| Interface | | | | Shielding | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Type | Analog | Digital | Qty | Yes | No | Type | Termination | Connector Type | Port Termination | Length (in meters) | Removable | Permanent |
| ***EXAMPLE:*** *RS232* | ☐ | ☒ | *2* | ☒ | ☐ | *Foil over braid* | *Coaxial* | *Metallized 9-pin D-Sub* | *Characteristic Impedance* | *6* | ☒ | ☐ |
| Ethernet | ☐ | ☒ | 1 | ☐ | ☒ | NA | CAT-5 | RJ-45 | 100 Ohm | 10 | ☒ | ☐ |
| 48 Volt DC | ☒ | ☐ | 1 | ☐ | ☒ | NA | NA | 2.5mm x 5.5mm DC Plug | NA | 1 | ☒ | ☐ |
| | ☐ | ☐ | | ☐ | ☐ | | | | | | ☐ | ☐ |
| | ☐ | ☐ | | ☐ | ☐ | | | | | | ☐ | ☐ |
| | ☐ | ☐ | | ☐ | ☐ | | | | | | ☐ | ☐ |
| | ☐ | ☐ | | ☐ | ☐ | | | | | | ☐ | ☐ |
| | ☐ | ☐ | | ☐ | ☐ | | | | | | ☐ | ☐ |
| | ☐ | ☐ | | ☐ | ☐ | | | | | | ☐ | ☐ |
| | ☐ | ☐ | | ☐ | ☐ | | | | | | ☐ | ☐ |
| | ☐ | ☐ | | ☐ | ☐ | | | | | | ☐ | ☐ |
| | ☐ | ☐ | | ☐ | ☐ | | | | | | ☐ | ☐ |
| | ☐ | ☐ | | ☐ | ☐ | | | | | | ☐ | ☐ |

# EMC Test Plan and Constructional Data Form

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**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

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

| *Description* | *Model #* | *Serial #* | *FCC ID #* |
|---|---|---|---|
| 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**

| *Frequency* | *Derived Frequency* | *Component # / Location* | *Description of Use* |
|---|---|---|---|
| 80 MHz | | OS1 / PCB surface mount | Digital Clock |
| 25 MHz | | Y1 / PCB surface mount | Digital Clock |
| | | | |
| | | | |
| | | | |
| | | | |

**Power Supply**

| *Manufacturer* | *Model #* | *Serial #* | *Type* |
|---|---|---|---|
| NA | | | ☐ Switched-mode: (Frequency) _____<br>☐ Linear ☐ Other: _____ |
| | | | ☐ Switched-mode: (Frequency) _____<br>☐ Linear ☐ Other: _____ |

**Power Line Filters**

| *Manufacturer* | *Model #* | *Location in EUT* |
|---|---|---|
| NA | | |
| | | |

# EMC Test Plan and Constructional Data Form

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**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. | 2-25-05<br>Date |
| Donald Bosch<br>Test Plan/CDF Prepared By (please print) | 2-25-05<br>Date |
| Reviewed by TÜV Product Service Associate | Date |

Form

# EMC Block Diagram Form

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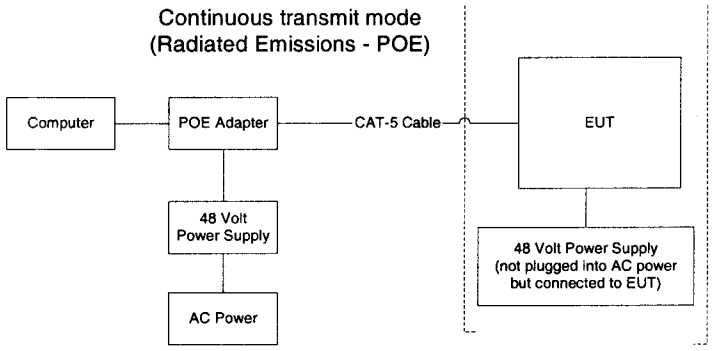
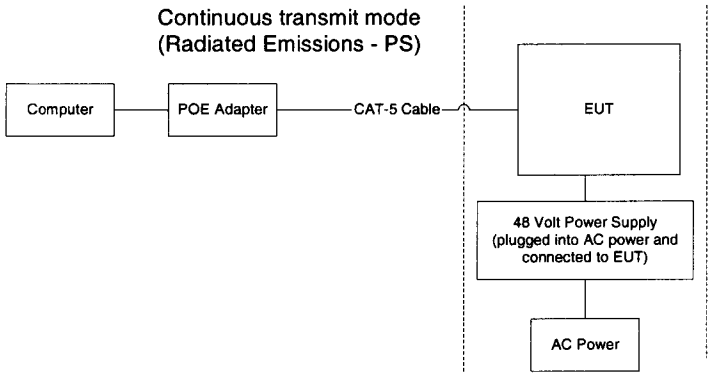
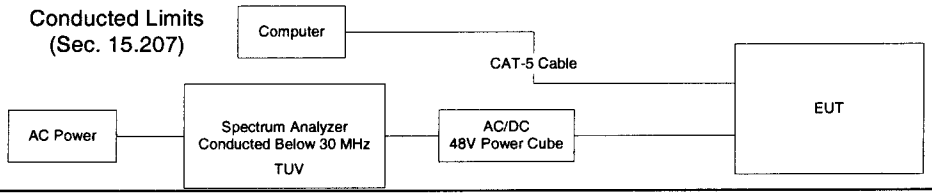
**System Configuration Block Diagram --** Provide a line drawing identifying the EUT, simulators, support equipment, I/O cables, power cables, and any other pertinent components to be used during testing. Use a dashed line to separate the equipment in the testing field versus equipment outside testing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




## Authorization Signatures

| | |
|---|---|
| Customer authorization to perform tests according to this test plan. | 2-25-05<br>Date |
| Donald Bosch<br>Test Plan/CDF Prepared By (please print) | 2-25-05<br>Date |
| Reviewed by TÜV Product Service Associate | Date |

## Test Setup Diagrams

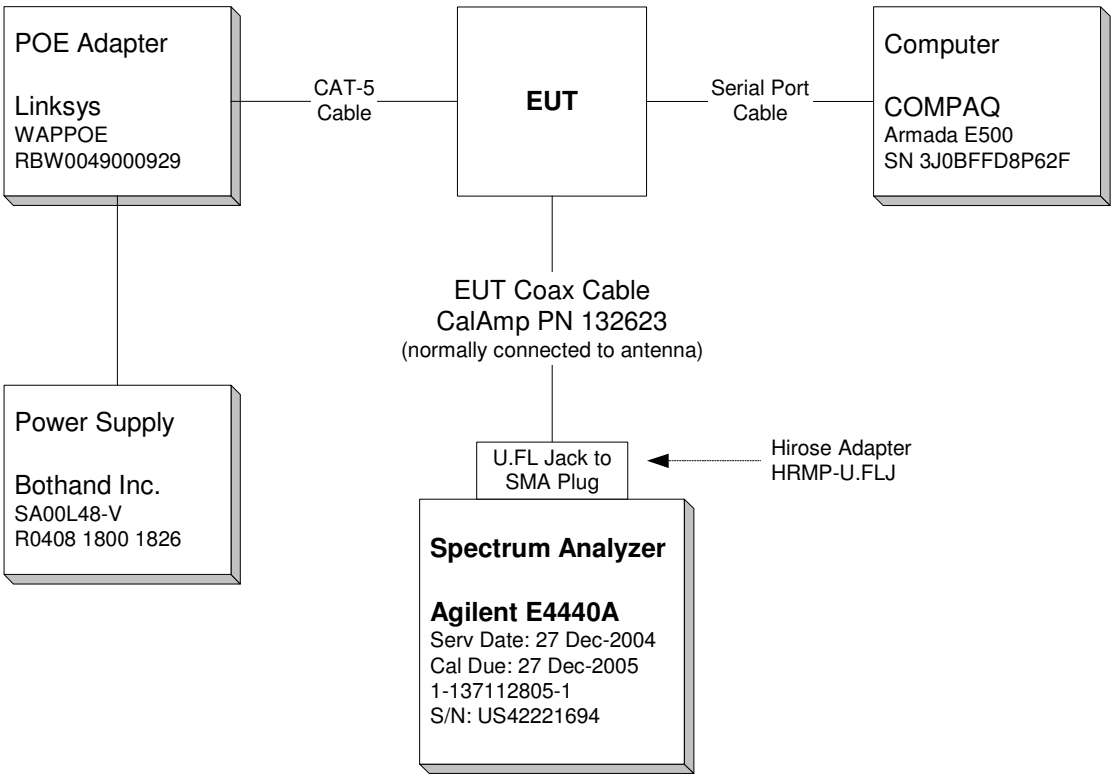


TÜV PRODUCT SERVICE INC 19333 Wild Mountain Road Taylors Falls MN 55084-1758 Tel: 651 638 0297 Fax: 651 638 0298 Rev.No 1.0

2-25-05

TŰV 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



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# Maximum Power Output

**Specifications:**
FCC Specification: Paragraph: 15.407 (a)
IC Specification: RSS-210, 6.2.2(q1)

**The *MAXIMUM POWER OUTPUT* 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



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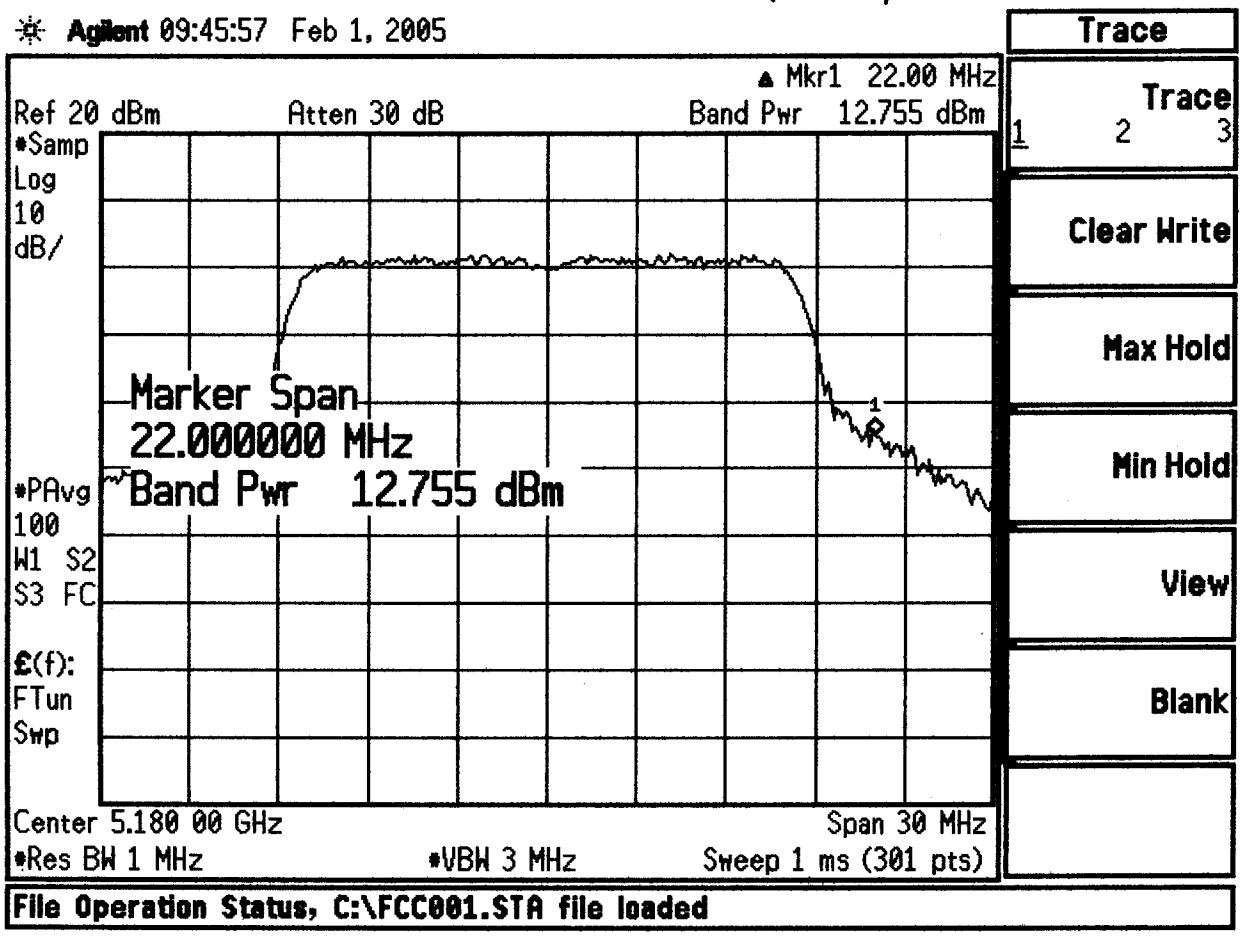
BAND 1

Tx Conducted Output Power.




Continuous Tx

CTL 14 dBm

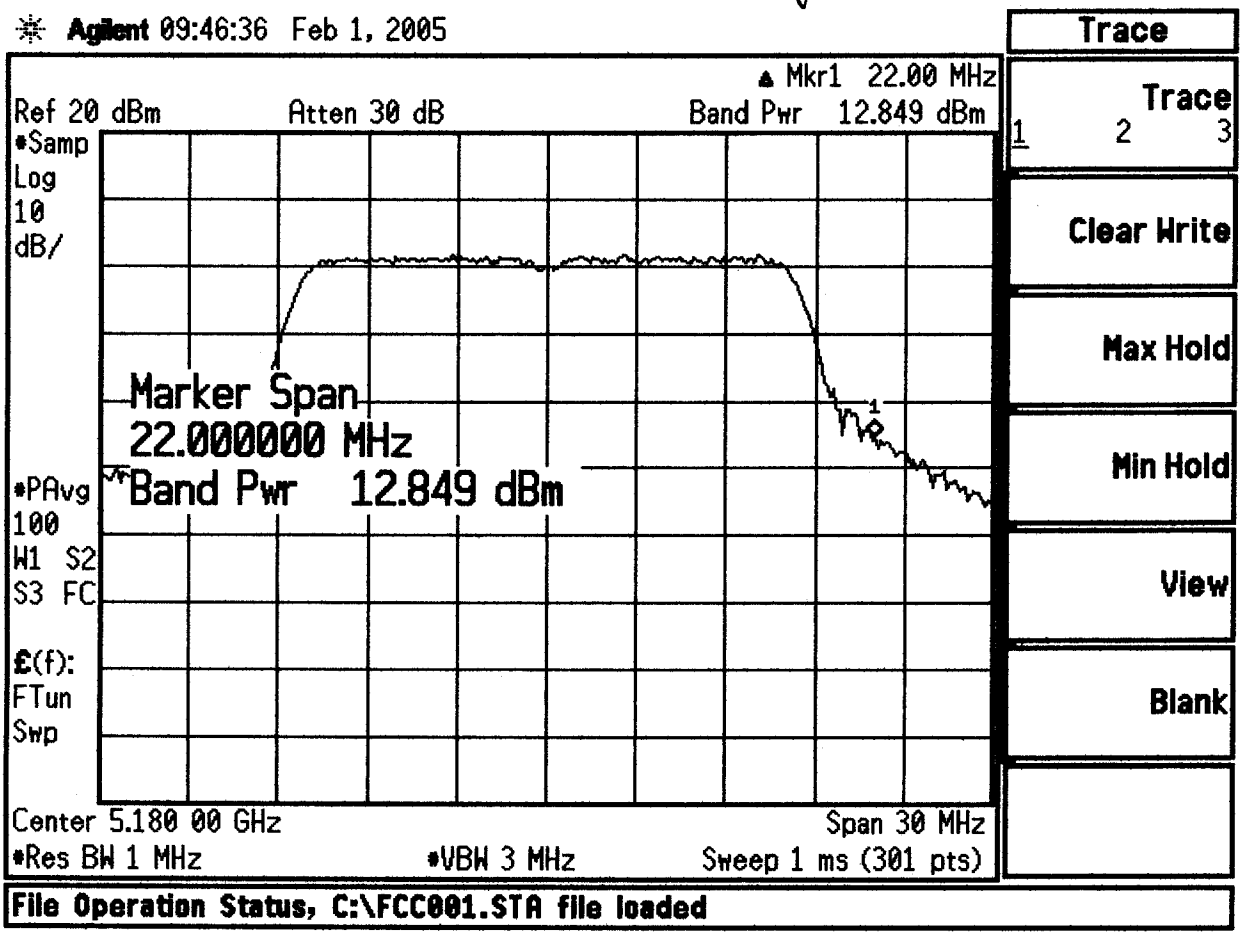
54 MBit rate

Limit= 17dBm and 23dBm EIRP

Measured= 12.8dBm and 20.8dBm EIRP

BAND 1

Tx Conducted Output Power




Continuous Tx

CTL 14 dBm

6 MBit rate

FCC 15.407 (a).1 power limits

Limit = 17 dBm. conducted

= 23 dBm EIRP

measured Conducted = 12.9 dBm

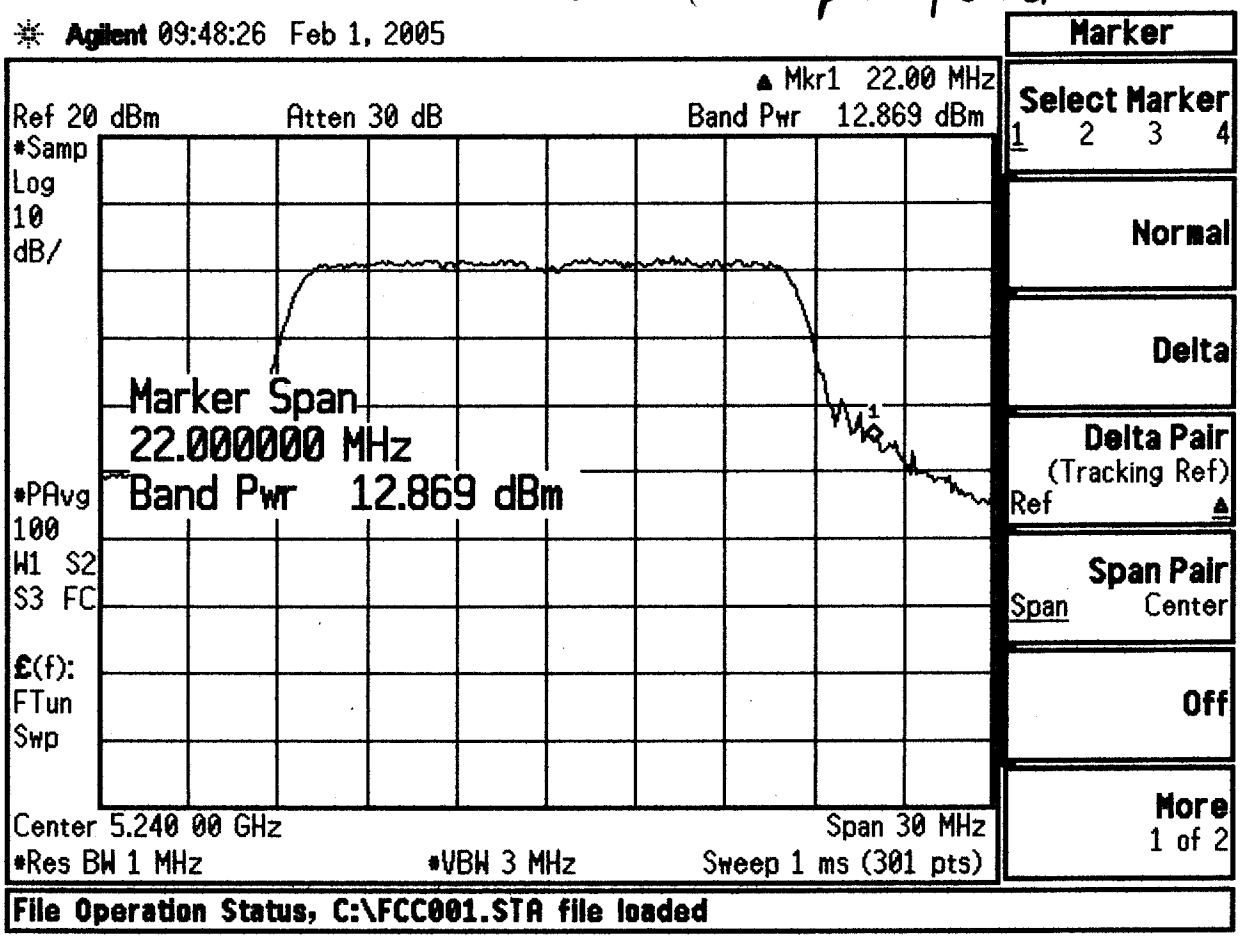
Calculated EIRP = 12.9 + 8 dBi = 20.9 dBm EIRP

ANT gain

note: Test Procedure per Public Notice DA 02-2138 Aug. 2002

BAND 1

Tx Conducted Output Power




Continuous Tx

CTL 14dBm

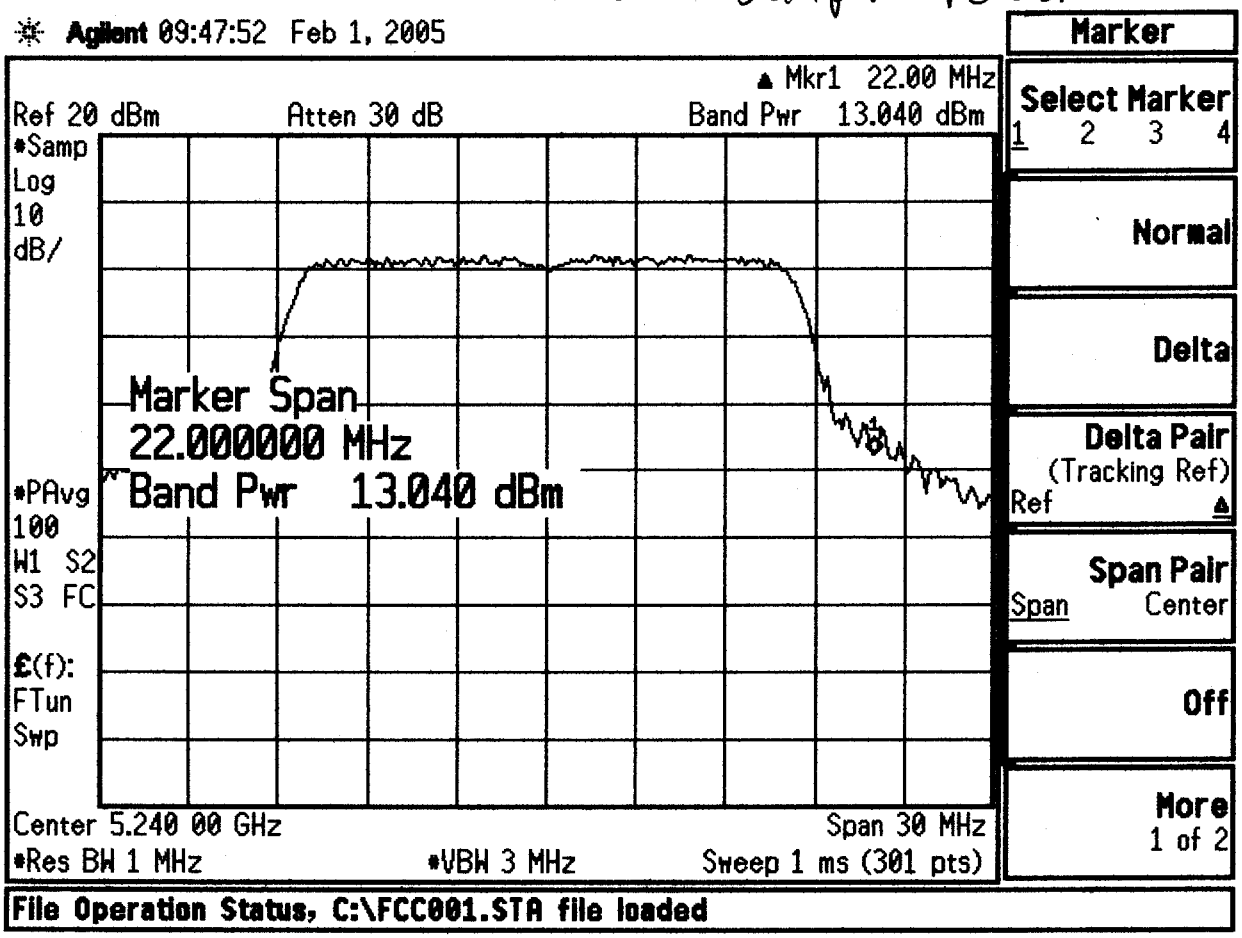
54 Mbit rate

Limit = 17dBm and 23dB EIRP

measured = 12.9dBm and 20.9 dBm EIRP

BAND 1

Tx Conducted output Power




Continuous Tx

CTL 14dBm

6 MBit rate

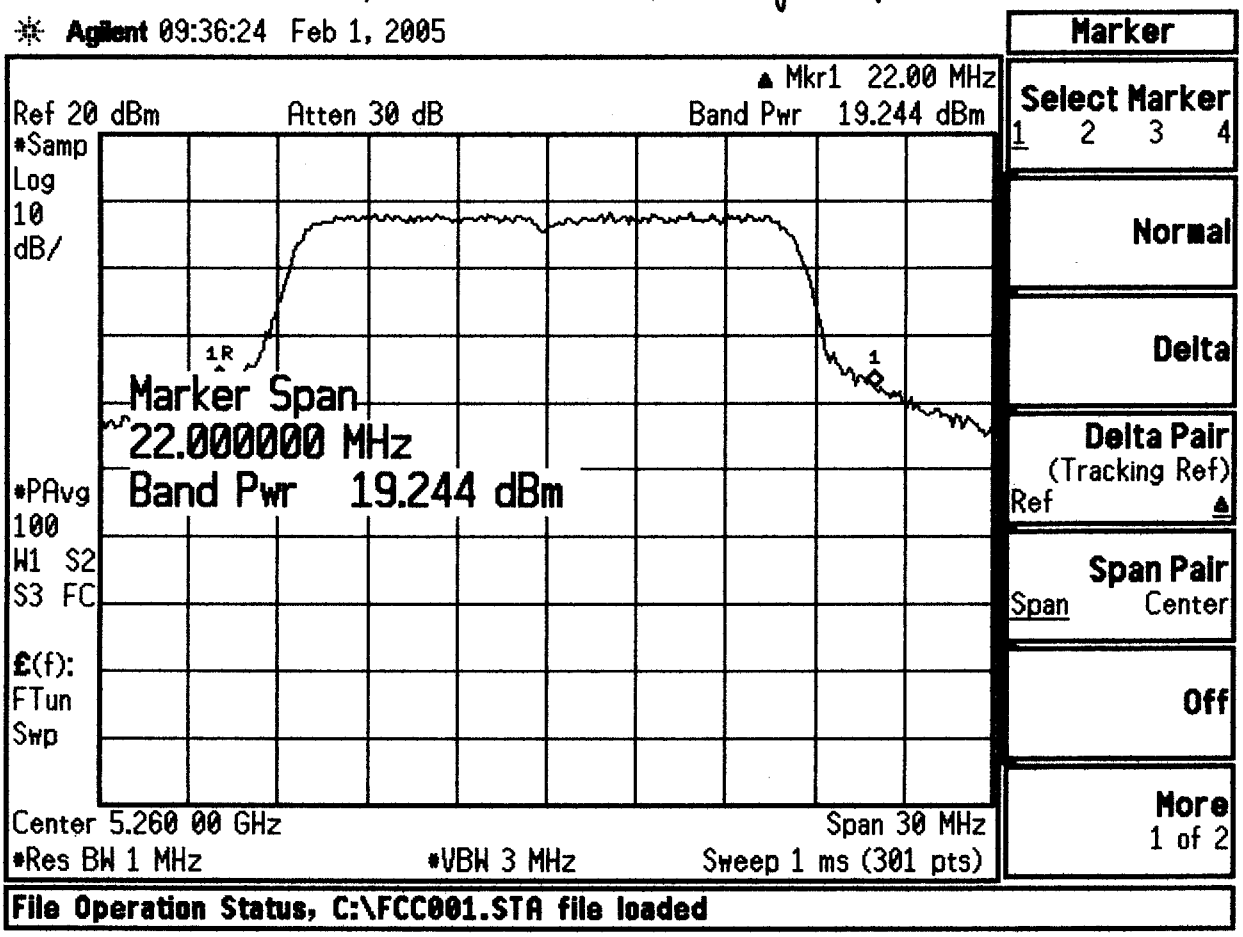
Fcc 15.407 (a).1

Limit = 17dBm and 23dBm EIRP

measured = 13dBm and 21dBm EIRP

BAND 2

Tx conducted Output Power




Continuous Tx

CTL 20dBm

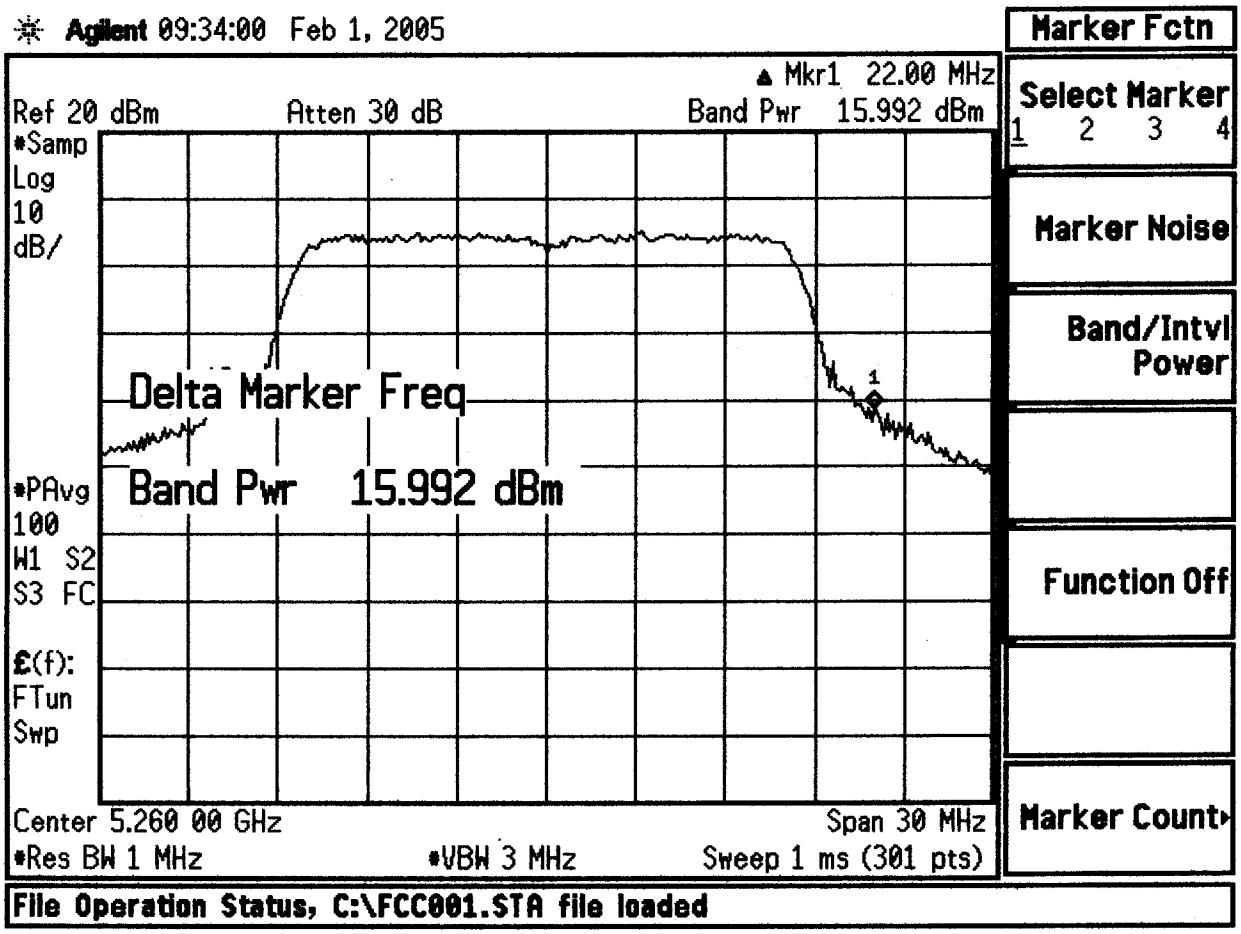
24MBit rate

Limit = 24dBm and 30dBm EIRP

Measured = 19.2dBm and 27.2 dBm EIRP

BAND 2

Tx Conducted Output Power




Continuous Tx

CTL 17dBm

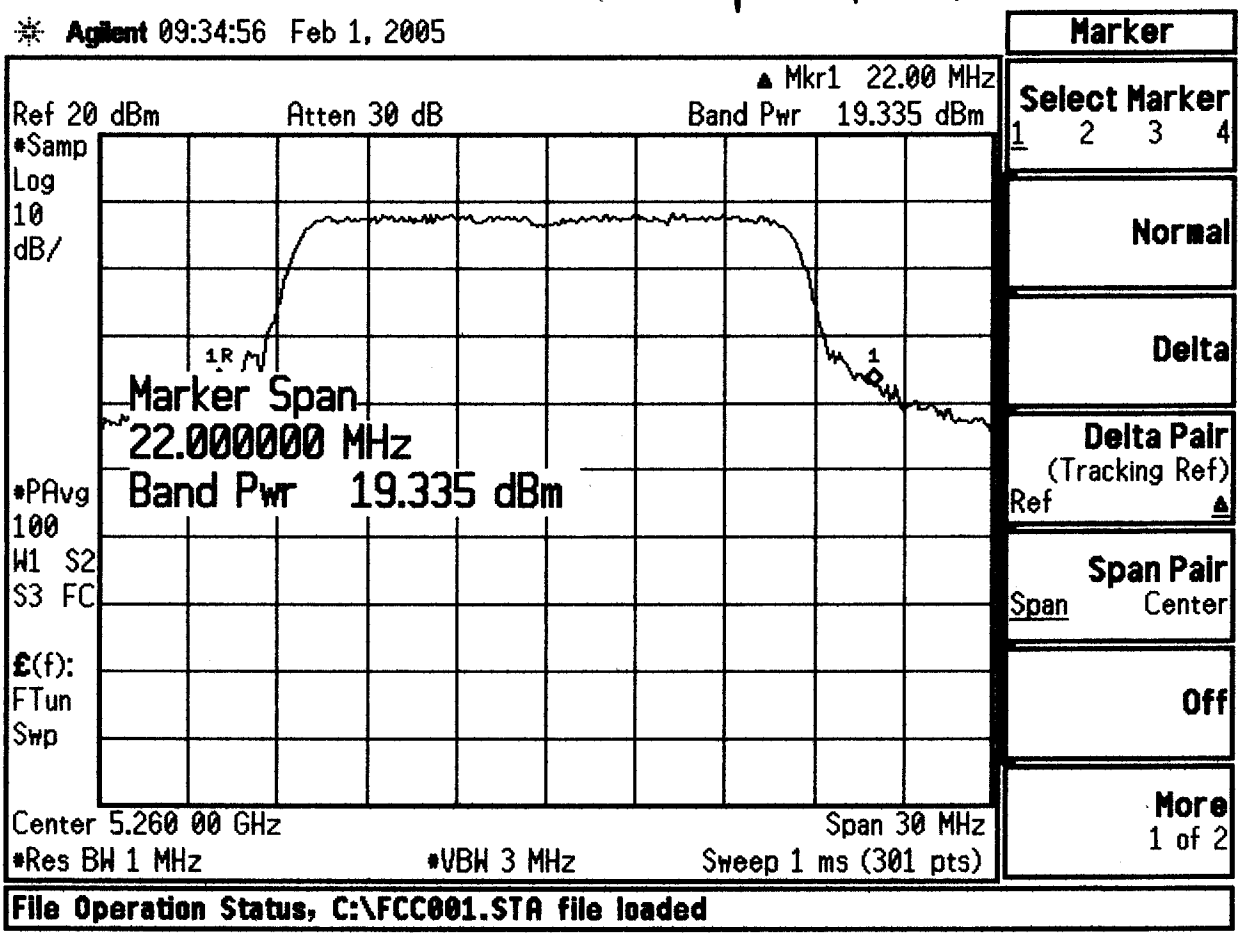
54Mbit rate

Limit = 24dBm. Conducted

measured = 16dBm (back-off for EVM)

BAND 2

Tx Conducted Output Power




Continuous Tx

CTL 20dBm

6 Mbit rate

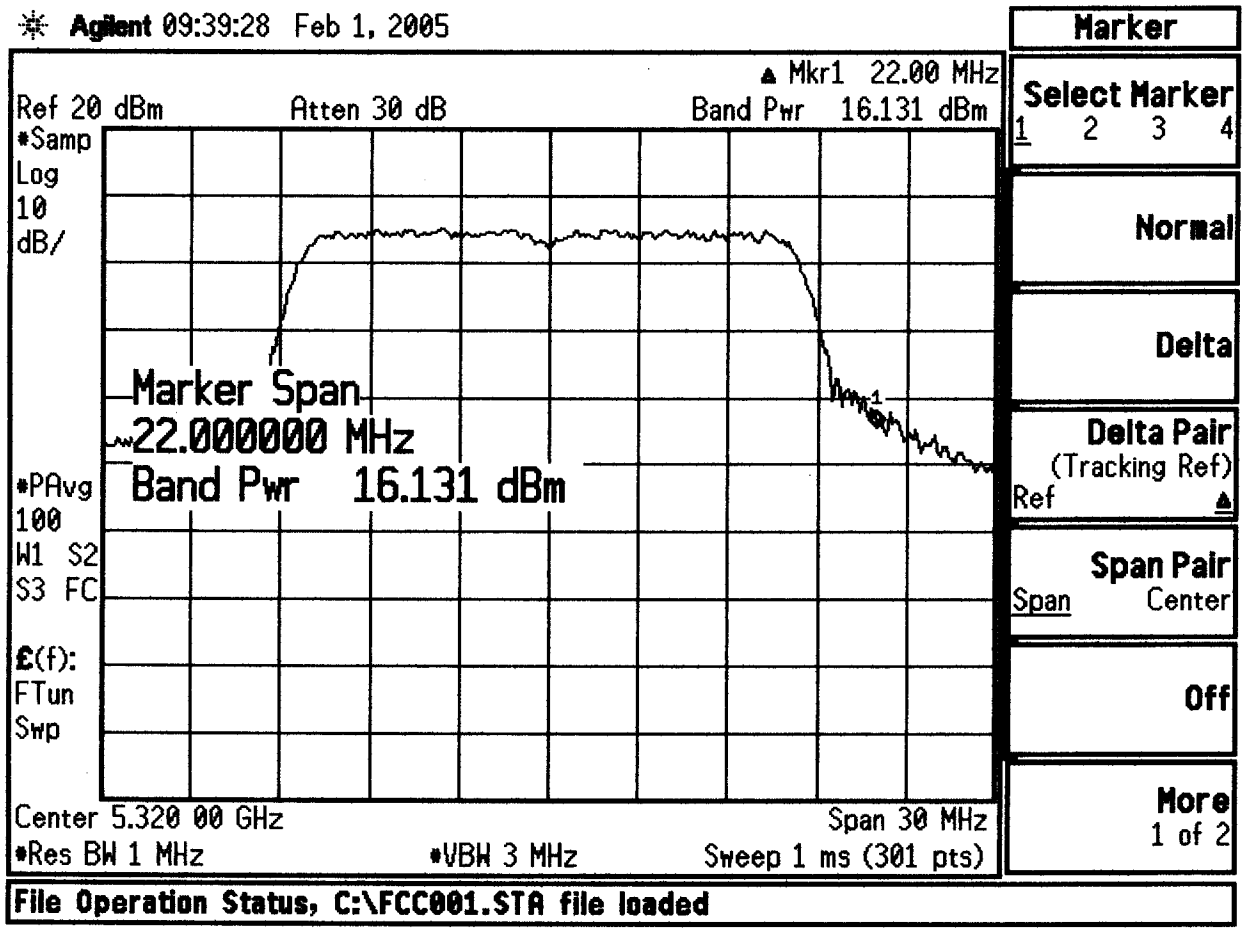
FCC 15.407 (a).2

Limit = 24dBm conducted
= 30dBm EIRP

Measured Conducted = 19.3 dBm

Calculated EIRP = 19.3 dBm + 8dBi = 27.3dBm EIRP

BAND 2




Continuous Tx

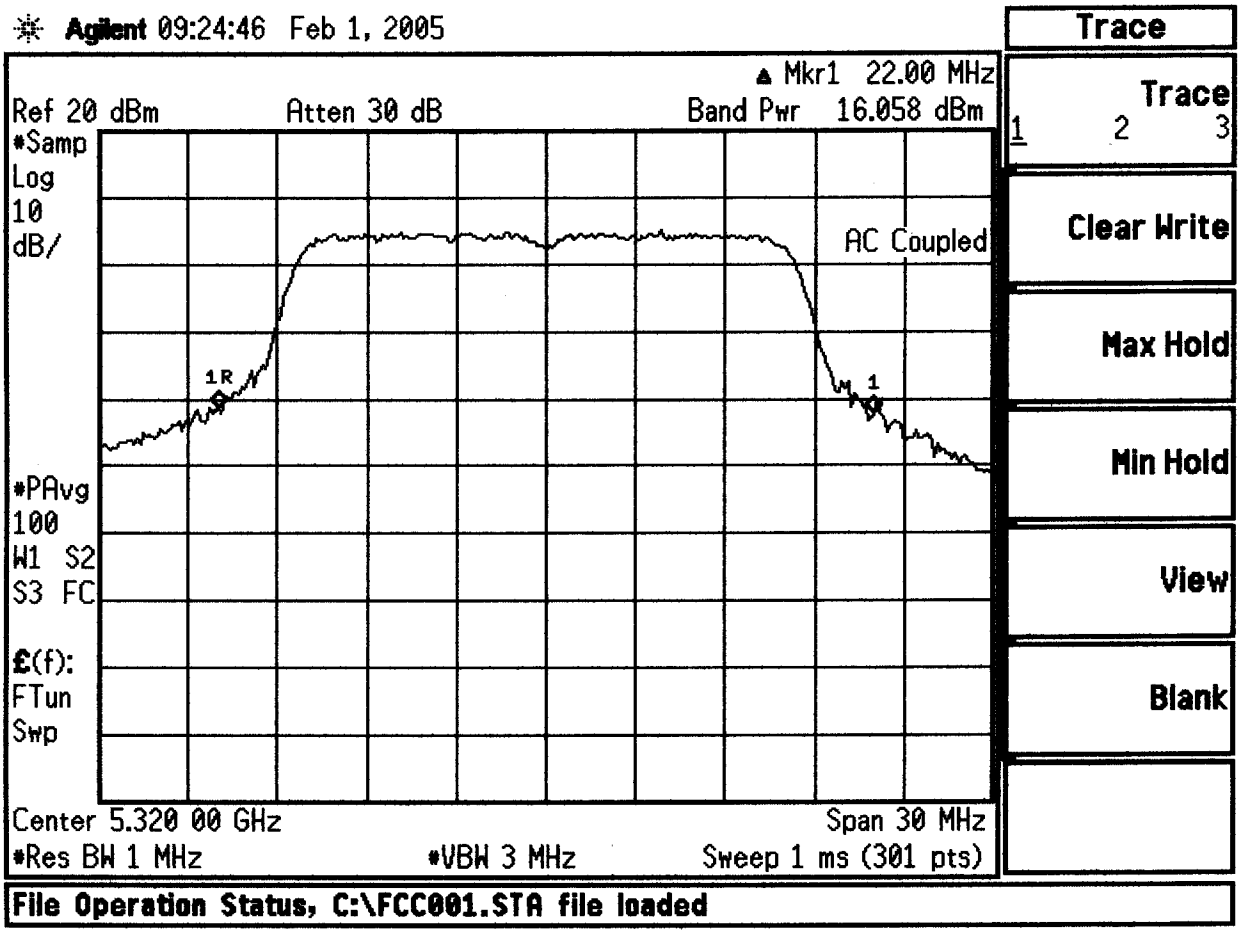
CTL 17dBm

24MBit rate

Limit = 24dBm conducted and 30dBm EIRP

measured = 16.1dBm (BO to meet Adj ch. Restricted band)

BAND 2




Continuous Tx

CTL 17dBm

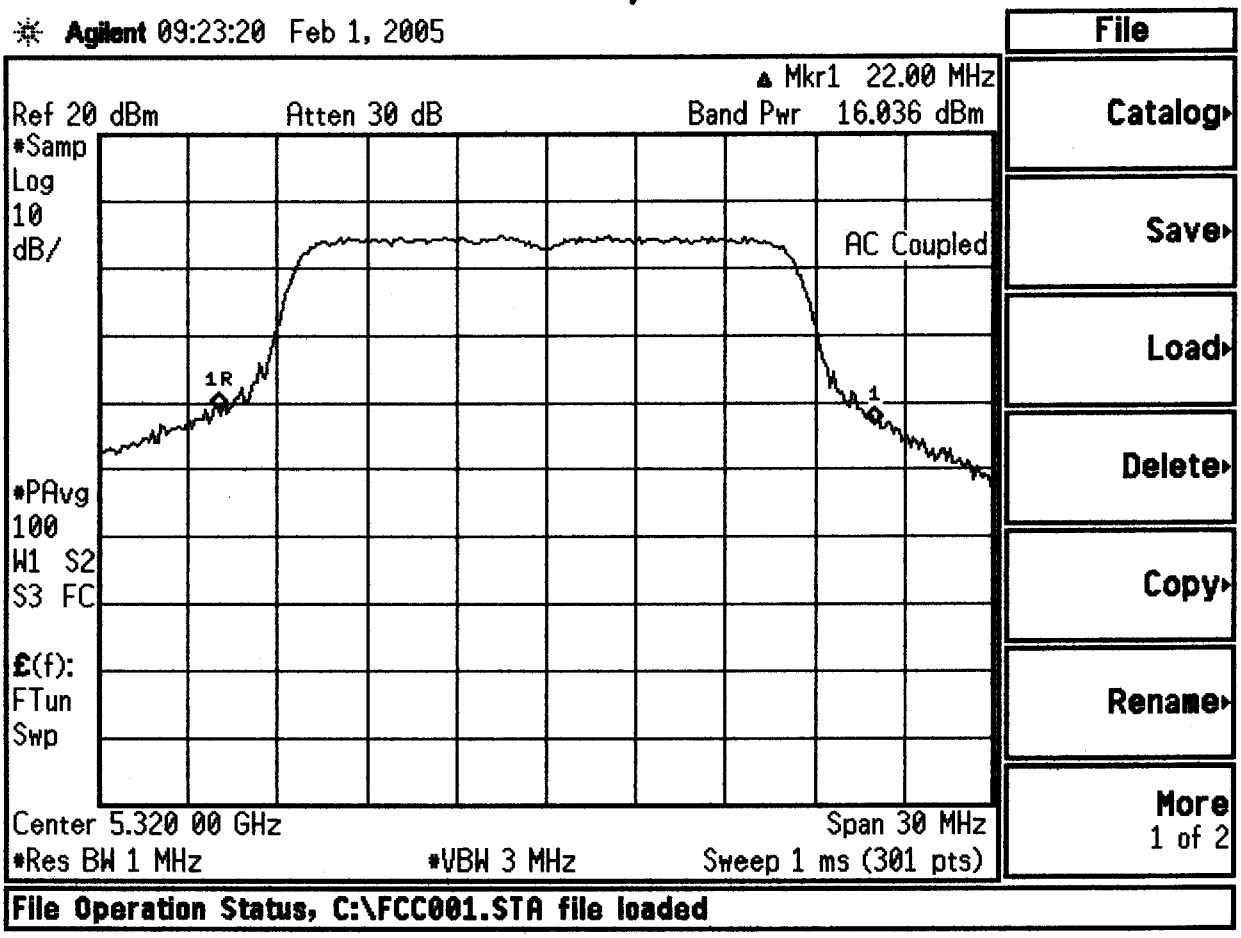
54 MBit rate

Limit = 24 dBm Conducted and 30 dBm EIRP

Measured = 16.1 dBm

BAND 2

# Transmit Output Power



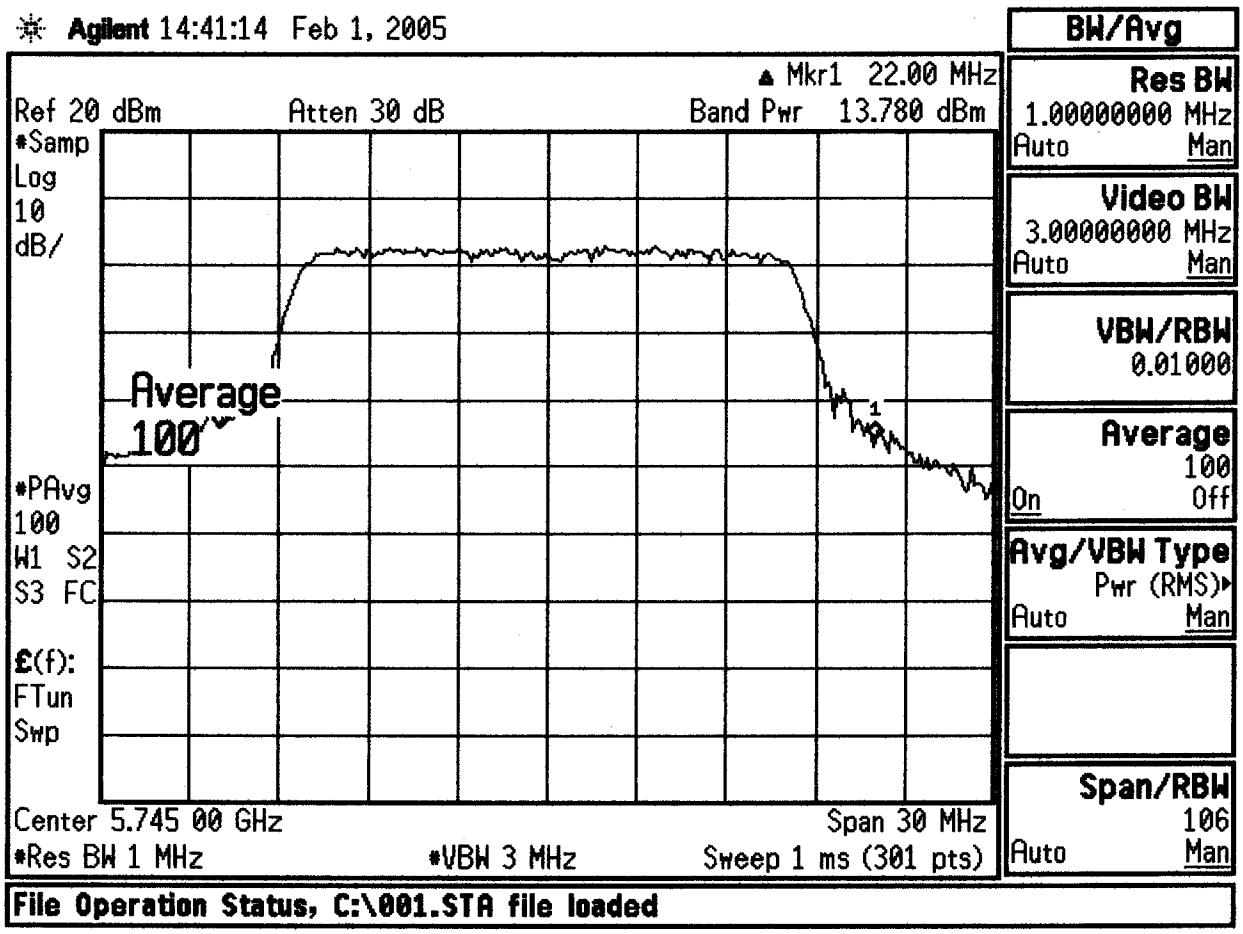

Continuous Tx
CTL 17 dBm
6mBit rate

Limit = 24dBm conducted and 30dBm EIRP

measured = 16dBm (Back-off for Adj channel Restricted Band)

Calculated EIRP = 16dBm + 8dBi = 24dBm EIRP.

BAND 3



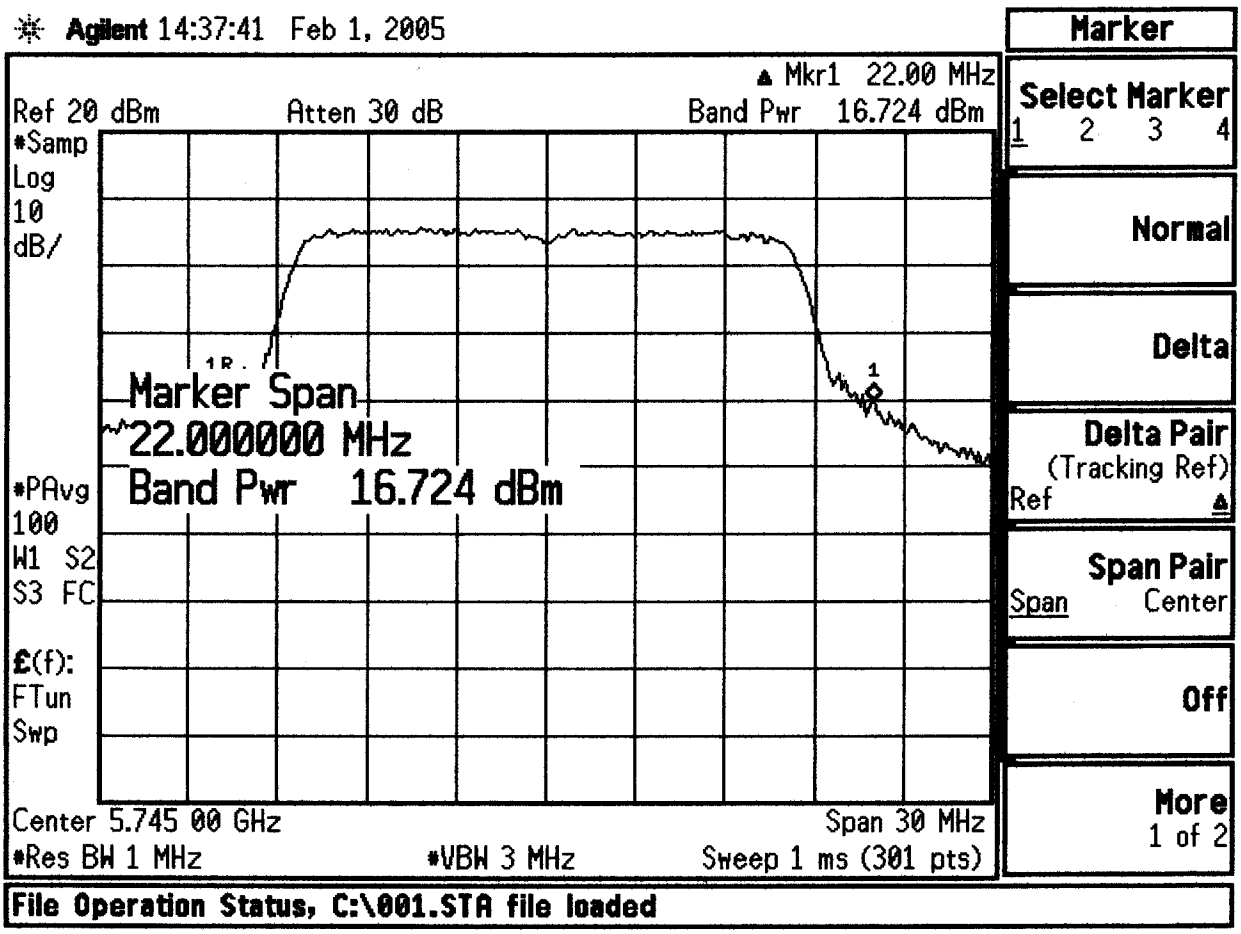

Continuous TX
CTL 15dBm

54MBit rate

Limit = 30dBm conducted

BAND 3

# Tx conducted output Power




Continuous TX

CTL 18dBm

6MBit rate

FCC 15.407 (a).3 and FCC 15.247 (b)

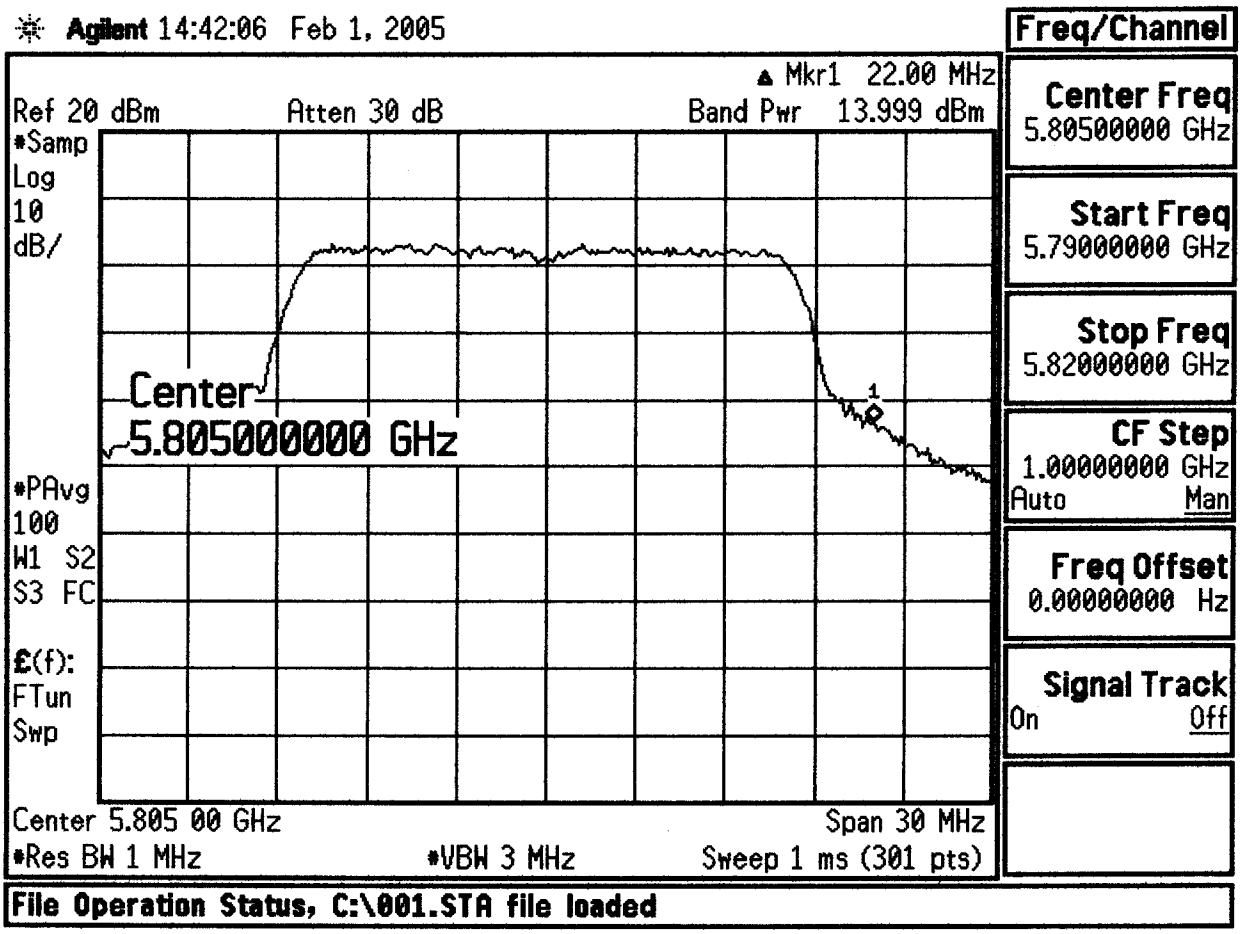
Limit = 30dBm conducted and 36dBm EIRP

Measured = 16.7dBm conducted

Calculated = 16.7dBm + 7dBi = 23.7dBm EIRP

Note: Antenna Gain = 7dBi in UNII Band 3

BAND 3




Continuous Tx

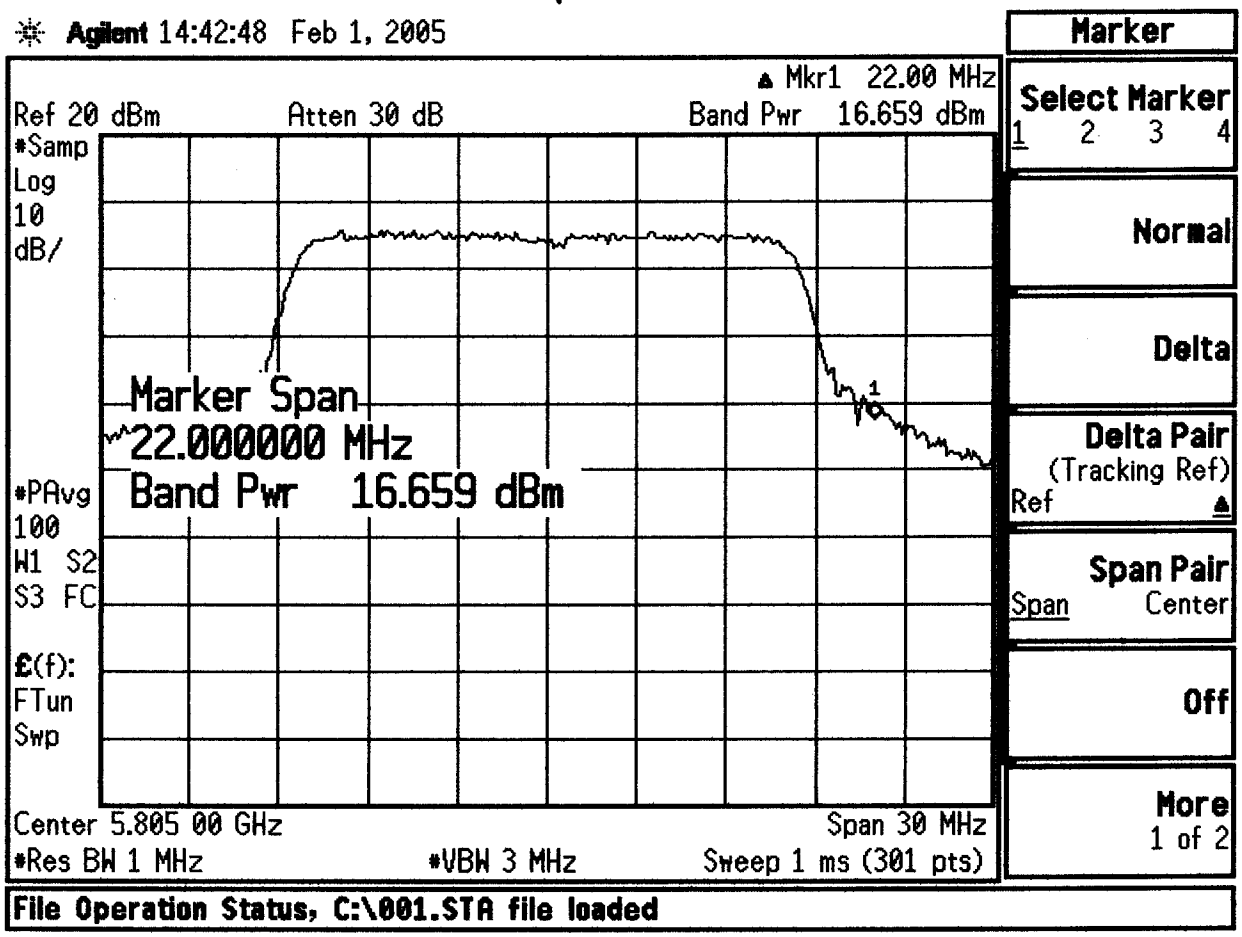
CTL 15dBm

54MBit rate

Limit= 30dBm Conducted

BAND 3

Tx output Power




Continuous Tx
CTL 18dBm
6 MBit rate

Limit = 30dBm Conducted

## 20dB / 26 dB Bandwidth

**Specifications:**
FCC Specification: Paragraph: 15.407 (a)
IC Specification: RSS-210, 6.2.2(q1)

**The 20*dB / 26dB 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

## 99% Bandwidth

**Specifications:**
IC Specification: RSS-210, 6.2.2(q1)

**The *99% 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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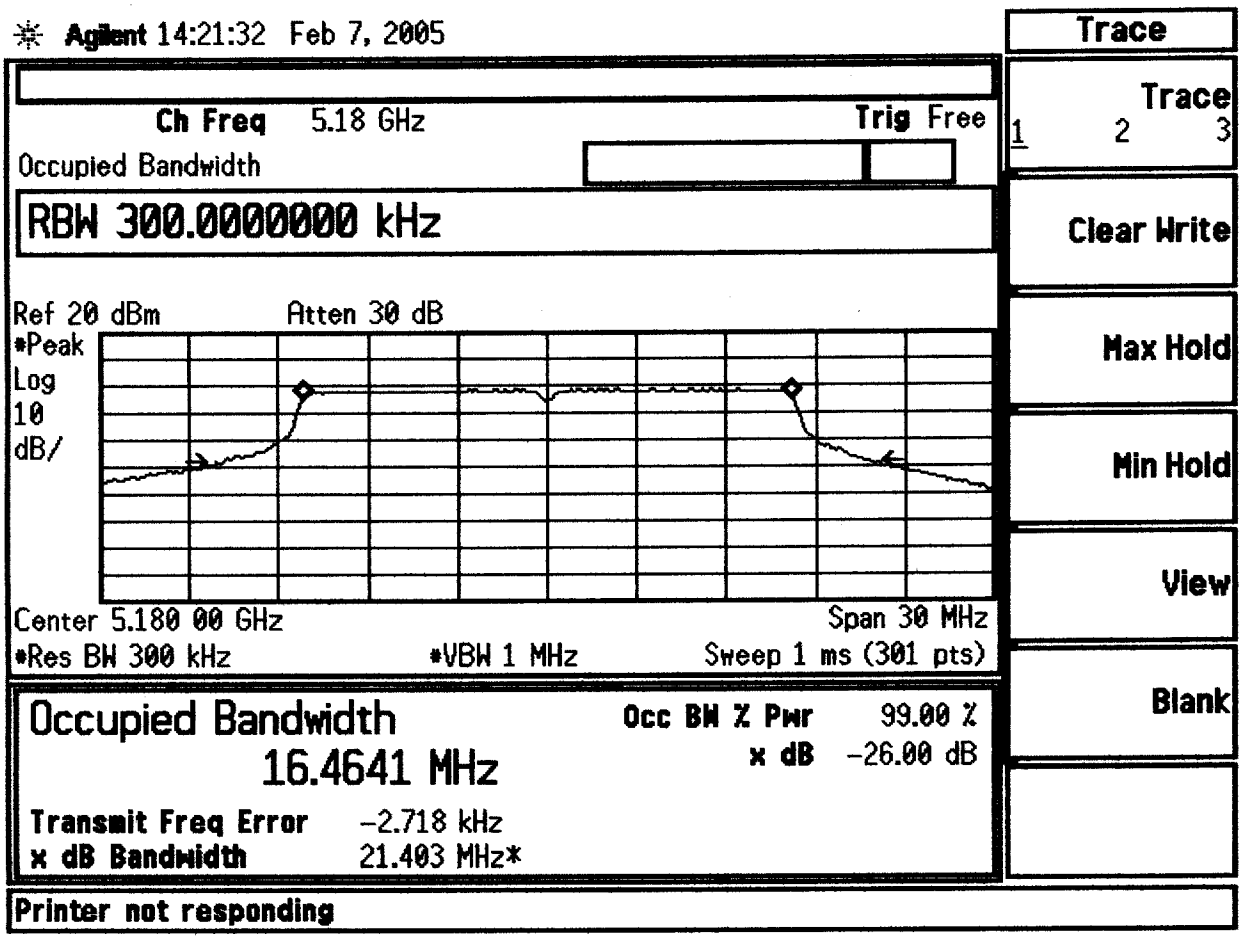
Fcc Emissions BW, Canada Occupied BW




Cont TX

6 mBits.

CTL = 14

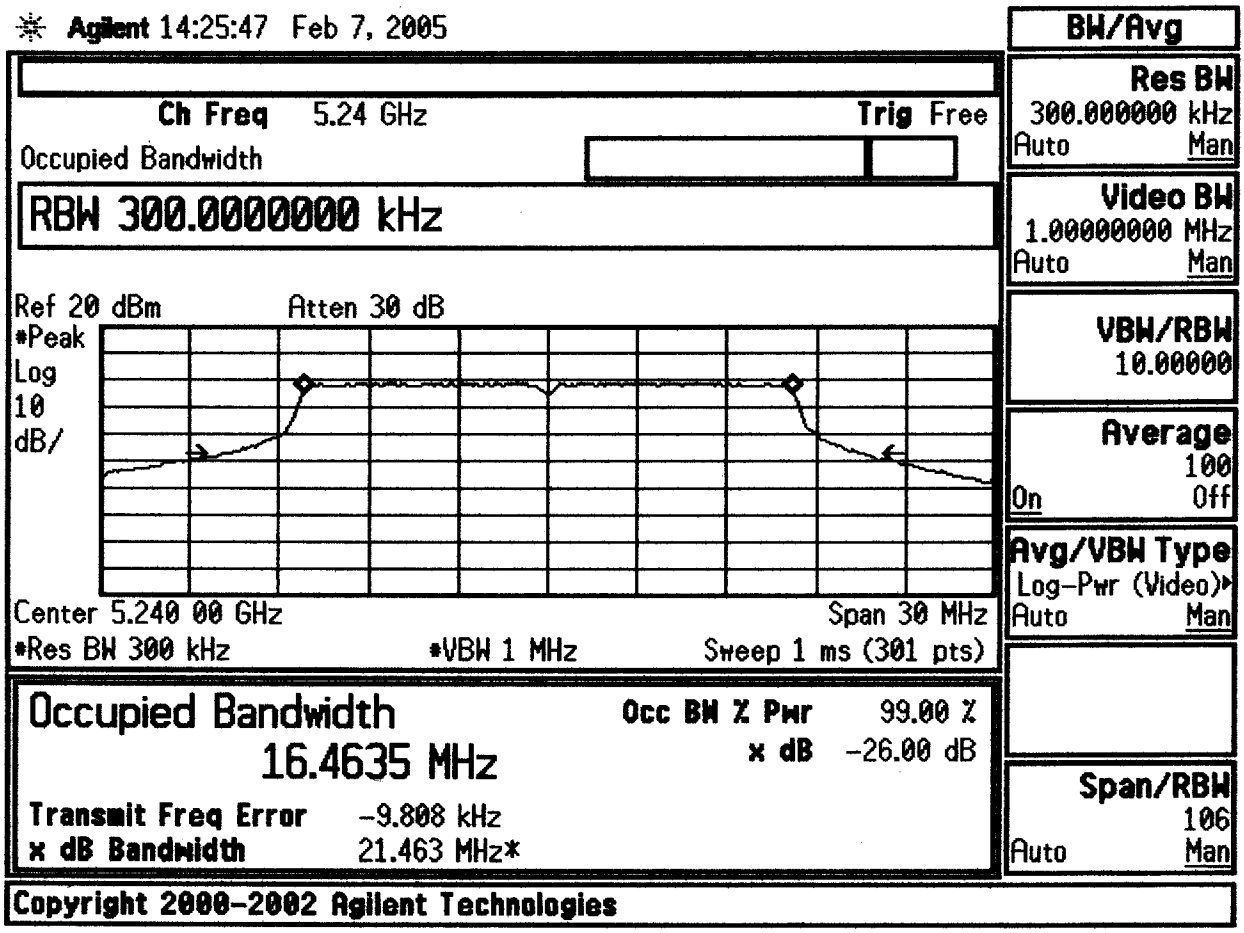
Emissions Bandwidth per FCC Public Notice DA 02-2138 Aug 30, 2002

Occupied Bw = 16.5 mHz

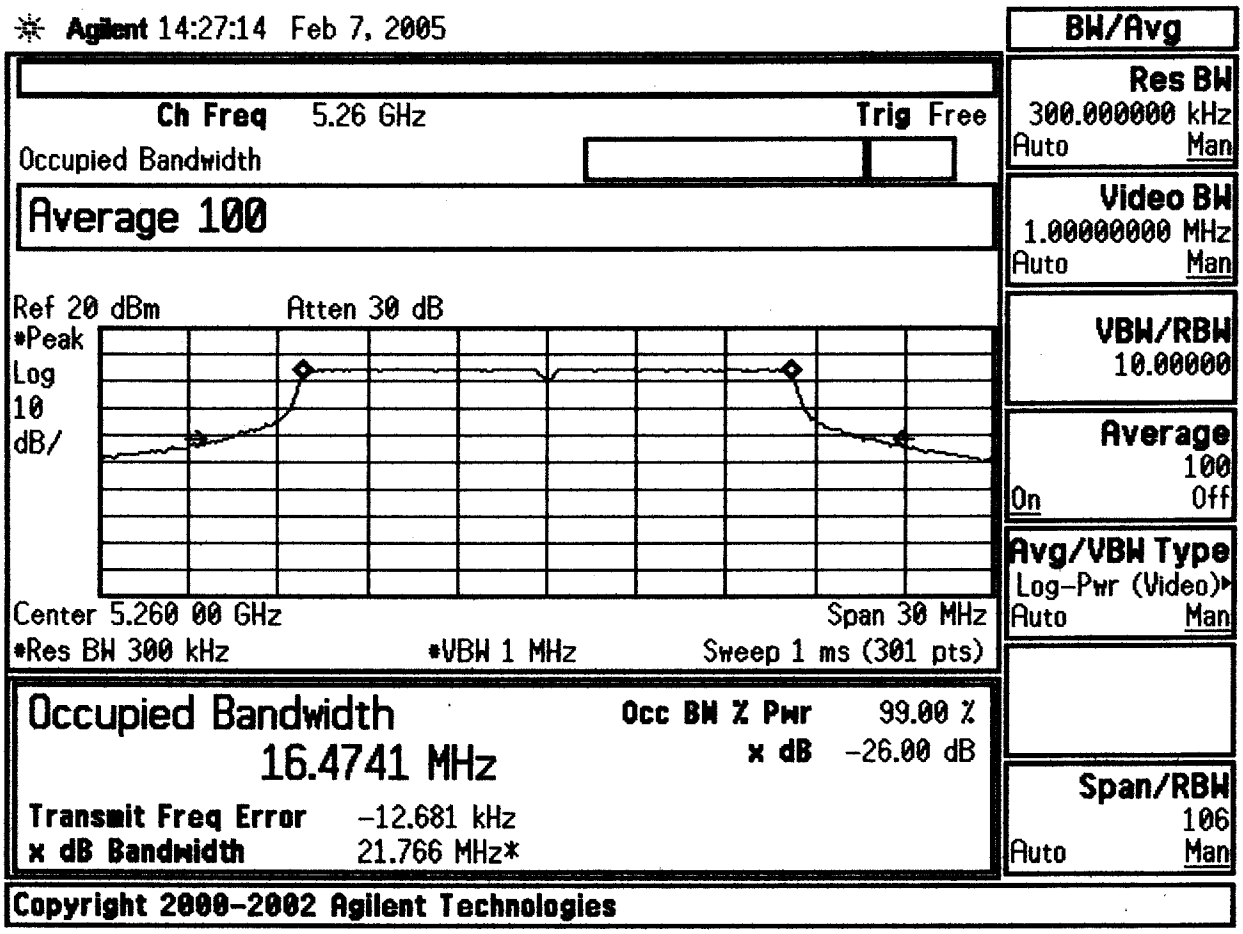
Emissions BW = 21.4 mHz.

X = -26dB

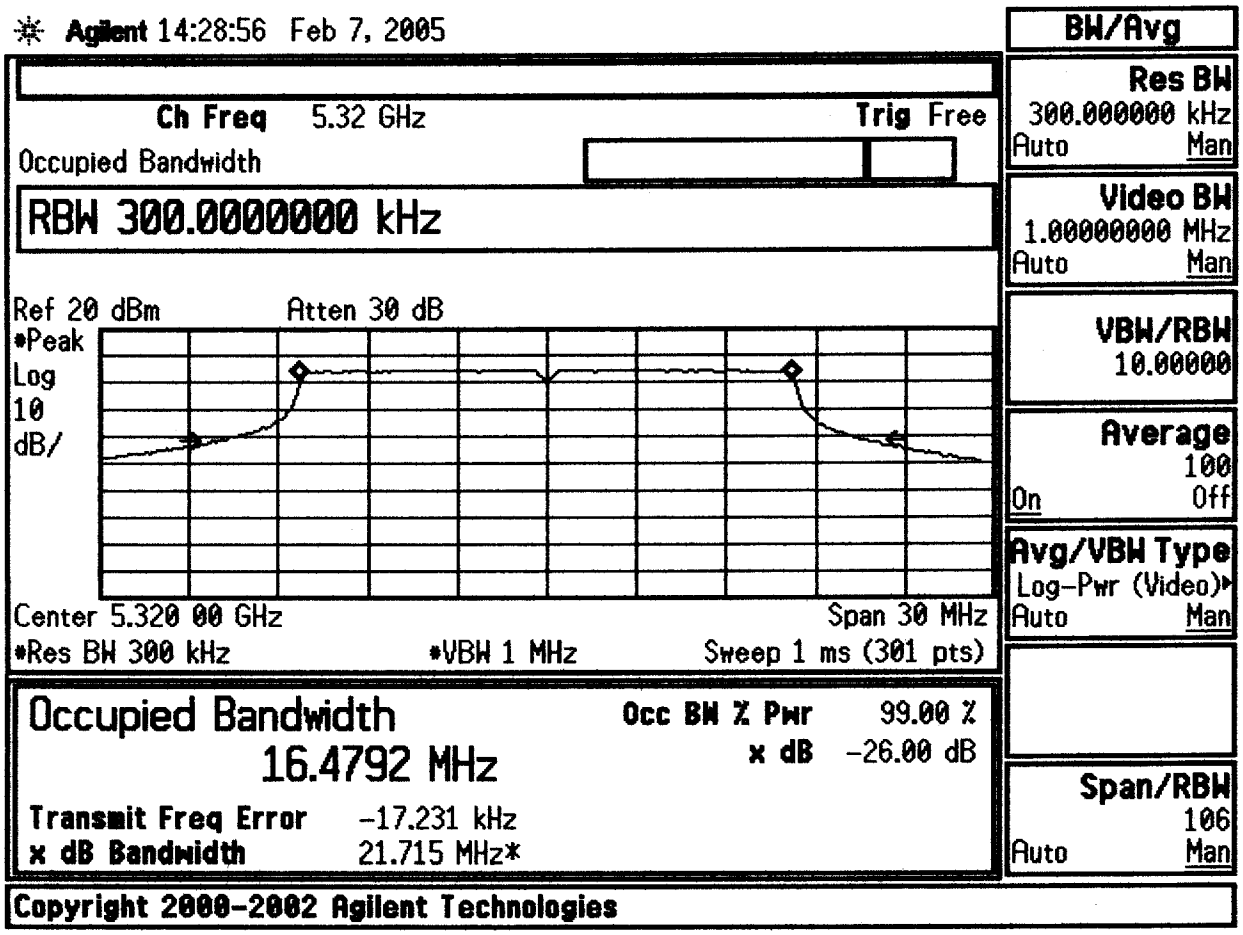
FCC Emissions BW, Canada Occupied BW



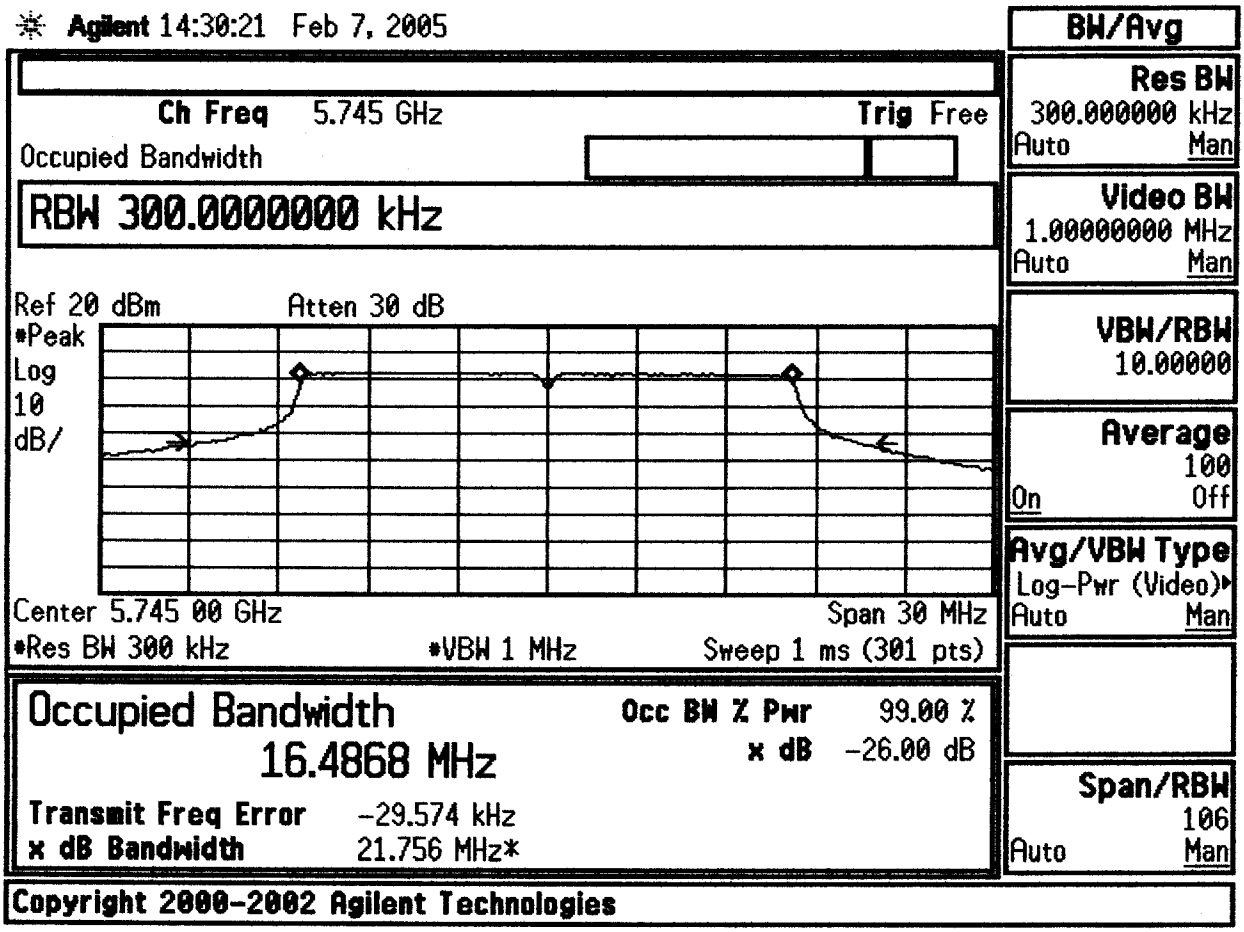
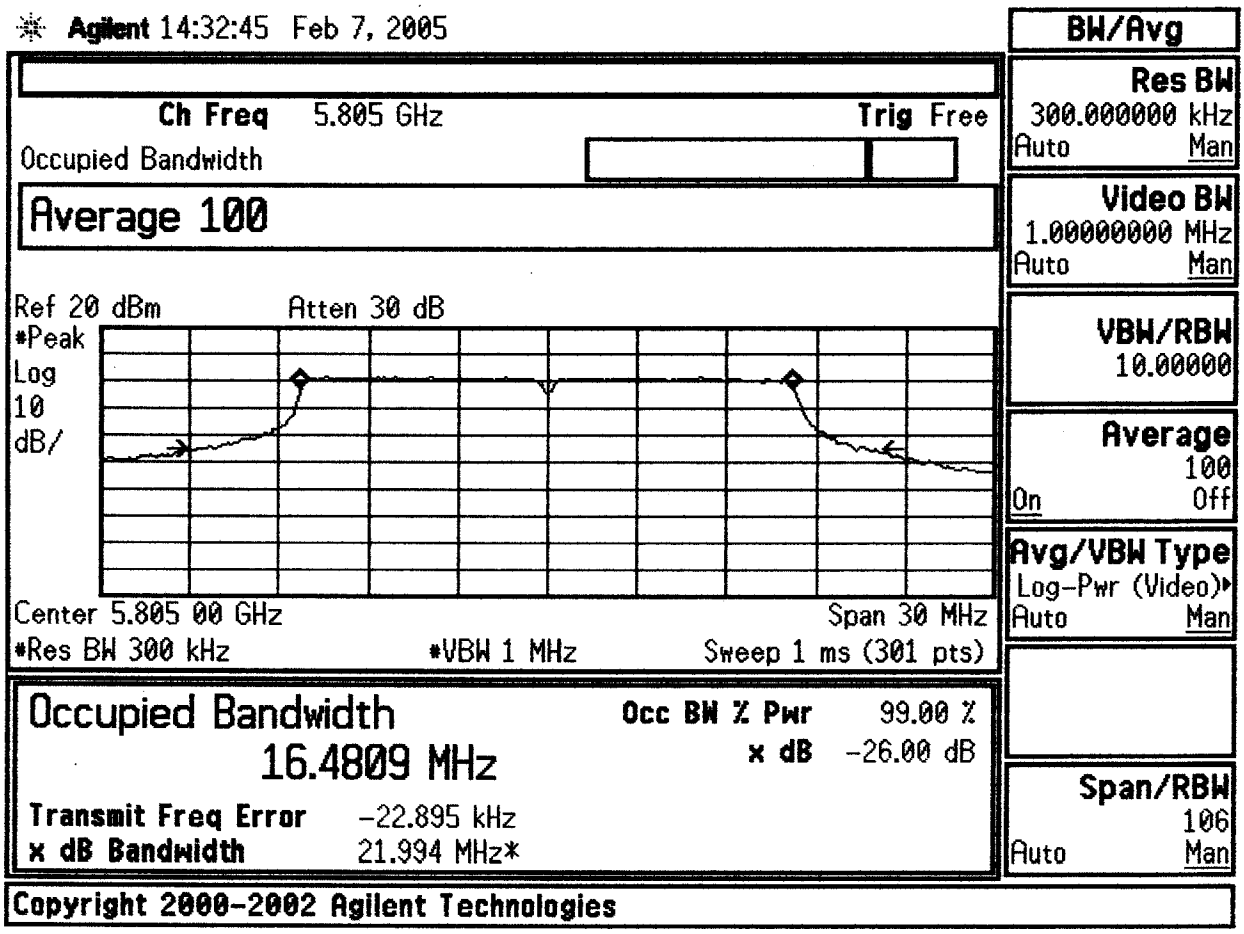
FCC Emissions BW and Canada Occupied BW



FCC Emissions BW and Canada Occupied BW



FCC Emissions BW, Canada Occupied BW



FCC Emissions BW, Canada Occupied BW