

## MEASUREMENT AND TECHNICAL REPORT

AVALON RF  
344 Coogan Way  
El Cajon, CA 92020

**DATE: 16 June 2003**

|                                                                                                                                                                                                                                     |                                                                                                                                                    |                                            |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|
| <b>This Report Concerns:</b>                                                                                                                                                                                                        | Original Grant: <input checked="" type="checkbox"/> X                                                                                              | Class II Change: <input type="checkbox"/>  |
| <b>Equipment Type:</b>                                                                                                                                                                                                              | Wireless Video & Audio Transmitter,<br>Model TX600, TX618, TX623, TX630                                                                            |                                            |
| <b>Deferred grant requested per 47 CFR 0.457(d)(1)(ii)?</b>                                                                                                                                                                         | Yes: <input type="checkbox"/><br><b>Defer until:</b> <input type="text"/>                                                                          | No: <input checked="" type="checkbox"/> X  |
| <b>Company Name agrees to notify the Commission by:</b><br><b>of the intended date of announcement of the product so that the grant can be issued on that date.</b>                                                                 | <input type="text" value="N/A"/>                                                                                                                   |                                            |
| <b>Transition Rules Request per 15.37?</b>                                                                                                                                                                                          | Yes: <input type="checkbox"/>                                                                                                                      | No: <input checked="" type="checkbox"/> X* |
| (*) FCC Part 2, Paragraph(s) <b>2.1051</b><br>(*) FCC Part 15, Paragraph(s) <b>15.209(a)</b><br>(*) FCC Part 74, Paragraph(s) <b>74.636, 74.661</b><br>(*) FCC Part 90, Paragraph(s) <b>90.205(l), 90.209(b), 90.210(b), 90.213</b> |                                                                                                                                                    |                                            |
| <b>Report Prepared by:</b>                                                                                                                                                                                                          | <b>TÜV AMERICA, INC</b><br><b>10040 Mesa Rim Road</b><br><b>San Diego, CA 92121-2912</b><br><b>Phone: 858 546 3999</b><br><b>Fax: 858 546 0364</b> |                                            |

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Report No. SC301679-03

## 1.0 GENERAL INFORMATION

### 1.1 Product Description

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

EUT Description: Wireless Video & Audio Transmitter

EUT Name: Wireless Video & Audio Transmitter

Model No.: TX600/TX618/TX623/TX630 Serial No.: --

Product Options: Input Connectors: LEMO/FCI type or DB15 type

Configurations to be tested: TX630 with LEMO Connector

#### 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: 12 VDC (If battery powered, make sure battery life is sufficient to complete testing.)

# of Phases: --

Current (Amps/phase(max)): 0.7A Max Current (Amps/phase(nominal)): 0.6A Typ

Other: --

#### Other Special Requirements

--

#### Typical Installation and/or Operating Environment

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

Installed on high pole/roof for typical wireless security application.

#### EUT Power Cable

☐ Permanent OR ☒ Removable Length (in meters): 2 m

☒ Shielded OR ☐ Unshielded

☐ Not Applicable

| EUT Interface Ports and Cables |                                     |                                     |     |                                     |                                     |                                 |              |                        |                          |                    |                                     |                          |
|--------------------------------|-------------------------------------|-------------------------------------|-----|-------------------------------------|-------------------------------------|---------------------------------|--------------|------------------------|--------------------------|--------------------|-------------------------------------|--------------------------|
| Interface                      |                                     |                                     |     | Shielding                           |                                     |                                 |              |                        |                          |                    |                                     |                          |
| Type                           | Analog                              | Digital                             | Qty | Yes                                 | No                                  | Type                            | Termination  | Connector Type         | Port Termination         | Length (in meters) | Removable                           | Permanent                |
| <b>EXAMPLE:</b><br>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"/> |
| Video                          | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | 1   | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | Coax                            | Coaxial      | BNC (m)                | 75 ohm                   | 2                  | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| Audio                          | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | 2   | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | Multi-conductor shielded cable  | Coaxial      | BNC (m) or XLR         | 600 ohm                  | 2                  | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| Antenna (RF output)            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | 1   | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | Microwave quality low loss coax | Coaxial      | Reverse thread SMA (f) | 50 ohm                   | 1                  | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| Power                          | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | 1   | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | Standard 2 wire cable           | Flying leads | Flying leads           | Power input              | 2                  | <input checked="" type="checkbox"/> | <input type="checkbox"/> |

|                      |
|----------------------|
| <b>EUT Software.</b> |
|----------------------|

Revision Level:    --

Description:        --

**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. The unit shall be tested with the video & audio inputs present. The presence of video turns on the power amplifier at rated power output. The output power is attenuated by at least 23 dB if no video is present.
2. The wireless link is analog FM with the main RF carrier modulated by the video & 2 audio sub-carriers. Maximum deviation is 8 MHz p-p.
3. The firmware resides on a flash memory of the Micro-controller and reads the switches periodically and sets the RF synthesizer accordingly. It also monitors the presence of video to turn on/off the power amplifiers.  
Firmware Rev. No is - 1.6

**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 # |
|---------------------|---------|----------|-------|
| Transmitter         | TX630   | --       | --    |
| Antenna             | AX 605  | --       | --    |
| Power cable         | --      | --       | --    |
| Video & audio cable | --      | --       | --    |

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

| Description                  | Model #      | Serial # | FCC # |
|------------------------------|--------------|----------|-------|
| Video Test Pattern Generator | TSG90/ TSG95 | --       | --    |

| Oscillator Frequencies |                   |                        |                                                                              |
|------------------------|-------------------|------------------------|------------------------------------------------------------------------------|
| Frequency              | Derived Frequency | Component # / Location | Description of Use                                                           |
| 10 MHz                 | 2.15 - 2.5 GHz    | Y1                     | Reference crystal for synthesizing the RF carrier & the 2 audio sub-carriers |
| 11.2 MHz               | --                | U9                     | Internal oscillator of the Micro controller                                  |

| Power Supply |         |          |                                        |                                |
|--------------|---------|----------|----------------------------------------|--------------------------------|
| Manufacturer | Model # | Serial # | Type                                   |                                |
| --           |         |          | <input type="checkbox"/> Switched-mode | (Frequency)                    |
|              |         |          | <input type="checkbox"/> Linear        | <input type="checkbox"/> Other |

| Power Line Filters |         |                 |
|--------------------|---------|-----------------|
| Manufacturer       | Model # | Location in EUT |
| --                 |         |                 |

| Critical EMI Components (Capacitors, ferrites, etc.) |                     |                 |     |                        |
|------------------------------------------------------|---------------------|-----------------|-----|------------------------|
| Description                                          | Manufacturer        | Part # or Value | Qty | Component # / Location |
| 2.5 GHz Low Pass Filter                              | AVX                 | LP0805A2442AW   | 1   | FL1                    |
| Ferrite beads on Connector pcb                       | Steward             | HI1206N101R-00  | 6   | L1 - L6                |
| Filter capacitors on Connector pcb                   | Kemet or equivalent | 12 pF           | 8   | C1 - C8                |

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

- 1) The enclosure is a milled aluminum with tight control over all mating components.
- 2) To minimize the modulated spectrum from harmonics & spurious signals, both video & the audio sub-carriers are double filtered post-modulation.
- 3) All incoming/outgoing signals are filtered by 'pi' type ferrite filters.

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## 1.2 Related Submittal Grant

None

## 1.3 Tested System Details

The FCC ID's for all equipment, plus descriptions of all cables used in the tested system are:

None

## 1.4 Test Methodology

Purpose of Test: To demonstrate compliance with the following tests.

| TEST                                    | FCC CFR 47# | PASS/FAIL |
|-----------------------------------------|-------------|-----------|
| Spurious Emissions at Antenna Terminals | 2.1051      | Pass      |
| Radiated Emissions                      | 15.209(a)   | Pass      |
| Output Power                            | 74.636      | Pass      |
| Frequency Stability                     | 74.661      | Pass      |
| Output Power                            | 90.205(l)   | Pass      |
| Bandwidth to be Determined              | 90.209(b)   | Pass      |
| Emission Mask                           | 90.210(b)   | Pass      |
| Frequency Stability                     | 90.213      | Pass      |

Both Conducted and Radiated testing were performed according to the procedures in FCC/ANSI C63.4 and CSA 108.8-M1983. Radiated testing was performed at an antenna-to-EUT distance of 3 meters (1 - 25 GHz).

## 1.5 Test Facility

The open area test site and conducted measurement data were tested by:

TÜV AMERICA, INC  
10040 Mesa Rim Road  
San Diego, CA 92121-2912  
Phone: 858 546 3999  
Fax: 858 546 0364

The Test Site Data and performance comply with ANSI C63.4 and are registered with the FCC, 7435 Oakland Mills Road, Columbia Maryland 21046. All Measurement Data is acquired according to the content of FCC Measurement Procedure and ANSI C63.4, unless supplemented with additional requirements as noted in the test report.

## 1.6 Part 2 Requirements (Remove if Part 15 or 18)

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## **2.0 SYSTEM TEST CONFIGURATION**

### **2.1 Justification**

The EUT was initially tested for FCC emissions in the following configuration:

See Block Diagram

### **2.2 EUT Exercise Software**

None

### **2.3 Special Accessories**

None

### **2.4 Equipment Modifications**

None

### **2.5 Configuration of Test System**

See Block Diagram

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**3.0 SPURIOUS EMISSIONS AT ANTENNA TERMINALS EQUIPMENT/DATA**  
**RADIATED EMISSIONS EQUIPMENT/DATA**  
**OUTPUT POWER EQUIPMENT/DATA**  
**BANDWIDTH TO BE DETERMINED EQUIPMENT/DATA**  
**EMISSION MASK EQUIPMENT/DATA**  
**FREQUENCY STABILITY EQUIPMENT/DATA**

See following page(s).

**Test Conditions: SPURIOUS EMISSIONS AT ANTENNA TERMINALS EQUIPMENT/DATA: FCC 2.1051**  
**RADIATED EMISSIONS EQUIPMENT/DATA: FCC 15.209(a)**  
**OUTPUT POWER EQUIPMENT/DATA: FCC 74.636 and 90.205(l)**  
**BANDWIDTH TO BE DETERMINED EQUIPMENT/DATA: FCC 90.209(b)**  
**EMISSION MASK EQUIPMENT/DATA: FCC 90.210(b)**  
**FREQUENCY STABILITY EQUIPMENT/DATA: FCC 74.661 and 90.213**

**The CONDUCTED EMISSIONS measurements were performed at the San Diego Testing Facility:**

☐ - Test not applicable

- - SR-2, Shielded Room, 12' x 24' x 10', Metal Chamber
- - TR-2, Test Room
- - Canyon #1 (10- and 30-Meter Open Area Test Site), Carroll Canyon, San Diego

**Test Equipment Used:**

| Model No.  | Prop. No. | Description               | Manufacturer         | Serial No. | Date Cal'ed |
|------------|-----------|---------------------------|----------------------|------------|-------------|
| 83640B     | 791       | Signal Generator          | Hewlett Packard      | 3844A00726 | 04/03       |
| HP85662A   | 744       | Spectrum Analyzer Display | Hewlett Packard      | 2403A08402 | 12/02       |
| CBL6111    | 460       | Bilog Antenna             | Chase                | 1013       | NCR*        |
| 3115       | 453       | Horn Antenna              | Electro Mechanics Co | 3564       | 01/03       |
| 11970K     | 652       | Harmonic Mixer            | Hewlett Packard      | 3003A05400 | NCR*        |
| 12A-18     | 6377      | Horn Antenna              | MI Technologies      | 21554MB    | NCR*        |
| 23-40-34   | 762       | 20 dB Attenuator          | Weinschel            | BF4808     | NCR*        |
| 622B       | 6485      | Power Supply              | Hewlett Packard      | 3441A05771 | NCR*        |
| 34401A     | 776       | Multimeter                | Hewlett Packard      | US36086974 | 12/02       |
| 11975A     | 6381      | Amplifier                 | Hewlett Packard      | 2517A00639 | NCR*        |
| ESVS30     | 427       | EMC Receiver              | Rhode & Schwarz      | 830350/006 | 12/02       |
| LPB 2520/A | 738       | Bilog Antenna             | Antenna Research     | 1169       | 08/02       |
| VHAP       | 6649      | Dipole Antenna            | Schwarzbeck          | 298        | NCR*        |
| 8648C      | 789       | Signal Generator          | Hewlett Packard      | 3642U01074 | 12/02       |
| T30RC      | 6225      | Environmental Chamber     | Tenney Environmental | 27244-02   | 04/03       |

**Remarks:** One year calibration cycle for all test equipment and sites. (\*) No Calibration Required.

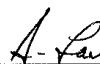
## SPURIOUS EMISSIONS AT ANTENNA TERMINALS



Project Number: SC3001697      Test Area: SR2  
 Reference Standard: FCC 2.1051      Date: May 22, 2003  
 Standard Clause: 74.637(a)  
 EUT Model #: TX630      EUT POWER: 12 Vdc  
 EUT Serial #: 4002      Temperature: 23 °C  
 Manufacturer: Avalon RF      Air Pressure: 100.0 kPa  
 EUT Description: Video Transmitter      Relative Humidity: 50 %  
 Notes:    Test mode: Transmit      Page: 1 of 5

| Test Conditions:<br>Transmit Frequency 2170 MHz<br>Authorized Bandwidth = 16 MHz<br><br>Limits 74.637(a) (1—3)<br>30 MHz to 2146 MHz -13 dBm<br>2146 MHz to 2154 MHz -35 dBc<br>2154 MHz to 2162 MHz -25 dBc<br>2178 MHz to 2186 MHz -25 dBc<br>2186 MHz to 2194 MHz -35 dBc<br>2194 MHz to 25 GHz -13 dBm |                                            |                                           |           |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|-------------------------------------------|-----------|
| Frequency MHz                                                                                                                                                                                                                                                                                              | Emission Level<br>High Power Mode<br>(dBm) | Emission Level<br>Low Power Mode<br>(dBm) | Complies? |
| 30 MHz – 1 GHz                                                                                                                                                                                                                                                                                             | No Emissions*                              | No Emissions*                             | Yes       |
| 1 GHz – 25 GHz                                                                                                                                                                                                                                                                                             | No Emissions*                              | No Emissions*                             | Yes       |

\*No other emissions greater than 10 dB below the limit were detected.

  
 \_\_\_\_\_  
 Printed

  
 \_\_\_\_\_  
 Signature

## SPURIOUS EMISSIONS AT ANTENNA TERMINALS



Project Number: SC3001697 Test Area: SR2  
 Reference Standard: FCC 2.1051 Date: May 22, 2003  
 Standard Clause: 74.637(a)  
 EUT Model #: TX630 EUT POWER: 12 Vdc  
 EUT Serial #: 4002 Temperature: 23 °C  
 Manufacturer: Avalon RF Air Pressure: 100.0 kPa  
 EUT Description: Video Transmitter Relative Humidity: 50 %  
 Notes: Test mode: Transmit Page: 3 of 5

| Test Conditions:<br>Transmit Frequency 2413 MHz<br>Authorized Bandwidth = 16 MHz<br><br>Limits<br>30 MHz to 2381 MHz -13 dBm<br>2381 MHz to 2397 MHz -35 dBc<br>2397 MHz to 2405 -25 dBc<br>2421 MHz to 2421 MHz -35 dBc<br>2421 MHz to 25 GHz -13 dBm |                                            |                                           |           |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|-------------------------------------------|-----------|
| Frequency MHz                                                                                                                                                                                                                                          | Emission Level<br>High Power Mode<br>(dBm) | Emission Level<br>Low Power Mode<br>(dBm) | Complies? |
| 30 MHz – 1 GHz                                                                                                                                                                                                                                         | No Emissions*                              | No Emissions*                             | Yes       |
| 1 GHz – 25 GHz                                                                                                                                                                                                                                         | No Emissions*                              | No Emissions*                             | Yes       |
| 4826.4 MHz                                                                                                                                                                                                                                             | -14.8                                      | -57.2                                     | Yes       |

\*No other emissions greater than 10 dB below the limit *were detected.*

Alex L...  
Printed

A. L...  
Signature

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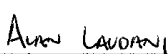
## SPURIOUS EMISSIONS AT ANTENNA TERMINALS

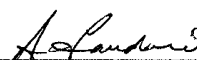


Project Number: SC3001697 Test Area: SR2  
 Reference Standard: FCC 2.1051 Date: May 22, 2003  
 Standard Clause: 74.637(a)  
 EUT Model #: TX630 EUT POWER: 12 Vdc  
 EUT Serial #: 4002 Temperature: 23 °C  
 Manufacturer: Avalon RF Air Pressure: 100.0 kPa  
 EUT Description: Video Transmitter Relative Humidity: 50 %  
 Notes: Test mode: Transmit Page: 2 of 5

| Test Conditions:<br>Transmit Frequency 2190 MHz<br>Authorized Bandwidth = 16 MHz<br><br>Limits<br>30 MHz to 2166 MHz -13 dBm<br>2166 MHz to 2174 MHz -35 dBc<br>2174 MHz to 2182 -25 dBc<br>2206 MHz to 2198 MHz -25 dBc<br>2198 MHz to 2214 MHz -35 dBc<br>2214 MHz to 25 GHz -13 dBm |                                            |                                           |           |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|-------------------------------------------|-----------|
| Frequency MHz                                                                                                                                                                                                                                                                          | Emission Level<br>High Power Mode<br>(dBm) | Emission Level<br>Low Power Mode<br>(dBm) | Complies? |
| 30 MHz – 1 GHz                                                                                                                                                                                                                                                                         | No Emissions*                              | No Emissions*                             | Yes       |
| 1771.1 MHz                                                                                                                                                                                                                                                                             | -29.4                                      | --                                        | Yes       |
| 2609.1 MHz                                                                                                                                                                                                                                                                             | -15.1                                      | --                                        | Yes       |
| 4380.5 MHz                                                                                                                                                                                                                                                                             | -24.4                                      | -52.2                                     | Yes       |
| 6570.5 MHz                                                                                                                                                                                                                                                                             | -21.5                                      | --                                        | Yes       |
| 8760.4 MHz                                                                                                                                                                                                                                                                             | -28.9                                      | --                                        | Yes       |

\*No other emissions greater than 10 dB below the limit were detected.

  
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 Signature

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## SPURIOUS EMISSIONS AT ANTENNA TERMINALS



Project Number: SC3001697 Test Area: SR2  
 Reference Standard: FCC 2.1051 Date: May 22, 2003  
 Standard Clause: 74.637(a)  
 EUT Model #: TX630 EUT POWER: 12 Vdc  
 EUT Serial #: 4002 Temperature: 23 °C  
 Manufacturer: Avalon RF Air Pressure: 100.0 kPa  
 EUT Description: Video Transmitter Relative Humidity: 50 %  
 Notes: Test mode: Transmit Page: 4 of 5

| Test Conditions:<br>Transmit Frequency 2451 MHz<br>Authorized Bandwidth = 16 MHz<br><br>Limits<br>30 MHz to 2427 MHz -13 dBm<br>2427 MHz to 2435 MHz -35 dBc<br>2435 MHz to 2443 MHz -25 dBc<br>2459 MHz to 2467 MHz -25 dBc<br>2467 MHz to 2475 MHz -35 dBc<br>2475 MHz to 25 GHz -13 dBm |                                            |                                           |           |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|-------------------------------------------|-----------|
| Frequency MHz                                                                                                                                                                                                                                                                              | Emission Level<br>High Power Mode<br>(dBm) | Emission Level<br>Low Power Mode<br>(dBm) | Complies? |
| 30 MHz – 1 GHz                                                                                                                                                                                                                                                                             | No Emissions*                              | No Emissions*                             | Yes       |
| 1 GHz – 25 GHz                                                                                                                                                                                                                                                                             | No Emissions*                              | No Emissions*                             | Yes       |
| 2604.5 MHz                                                                                                                                                                                                                                                                                 | --                                         | -63.6                                     | Yes       |
| 4902.4 MHz                                                                                                                                                                                                                                                                                 | -16.3                                      | -60.9                                     | Yes       |
| 7353.4 MHz                                                                                                                                                                                                                                                                                 | -19.9                                      | --                                        | Yes       |
| 9804.8 MHz                                                                                                                                                                                                                                                                                 | -26.5                                      | --                                        | Yes       |

\*No other emissions greater than 10 dB below the limit *were detected.*

Amm Luvani  
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A. Luvani  
Signature

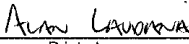
## SPURIOUS EMISSIONS AT ANTENNA TERMINALS

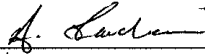


Project Number: SC3001697 Test Area: SR2  
 Reference Standard: FCC 2.1051 Date: May 22, 2003  
 Standard Clause: 74.637(a)  
 EUT Model #: TX630 EUT POWER: 12 Vdc  
 EUT Serial #: 4002 Temperature: 23 °C  
 Manufacturer: Avalon RF Air Pressure: 100.0 kPa  
 EUT Description: Video Transmitter Relative Humidity: 50 %  
 Notes: Test mode: Transmit Page: 5 of 5

| Test Conditions:<br>Transmit Frequency 2470 MHz<br>Authorized Bandwidth = 16 MHz<br><br>Limits<br>30 MHz to 2446 MHz -13 dBm<br>2446 MHz to 2456 MHz -35 dBc<br>2456 MHz to 2462 MHz -25 dBc<br>2478 MHz to 2486 MHz -25 dBc<br>2486 MHz to 2494 MHz -35 dBc<br>2494 MHz to 25 GHz -13 dBm |                                            |                                           |           |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|-------------------------------------------|-----------|
| Frequency MHz                                                                                                                                                                                                                                                                              | Emission Level<br>High Power Mode<br>(dBm) | Emission Level<br>Low Power Mode<br>(dBm) | Complies? |
| 30 MHz – 1 GHz                                                                                                                                                                                                                                                                             | No Emissions*                              | No Emissions*                             | Yes       |
| 1 GHz – 25 GHz                                                                                                                                                                                                                                                                             | No Emissions*                              | No Emissions*                             | Yes       |
| 4940.3 MHz                                                                                                                                                                                                                                                                                 | -17.8                                      | --                                        | Yes       |
| 7410.5 MHz                                                                                                                                                                                                                                                                                 | -18.1                                      | --                                        | Yes       |
| 9889.7 MHz                                                                                                                                                                                                                                                                                 | -28.5                                      | --                                        | Yes       |

\*No other emissions greater than 10 dB below the limit *were detected.*

  
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REPORT NO. SC301679

SPEC: FCC Part 15 para 15.109(a)

COMPANY: Avalon RF

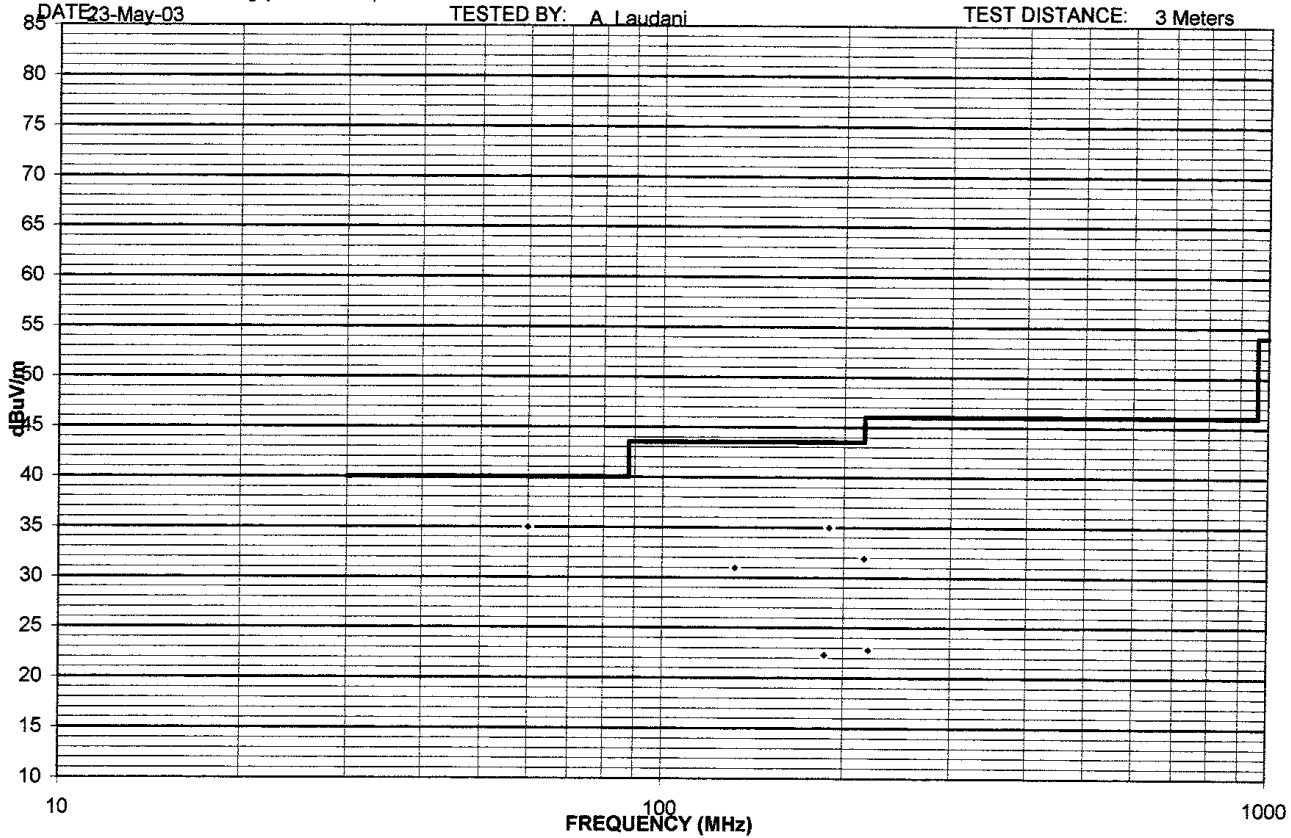
EUT: TX600, TX630

EUT MODE: Transmitting (no receiver) 2451

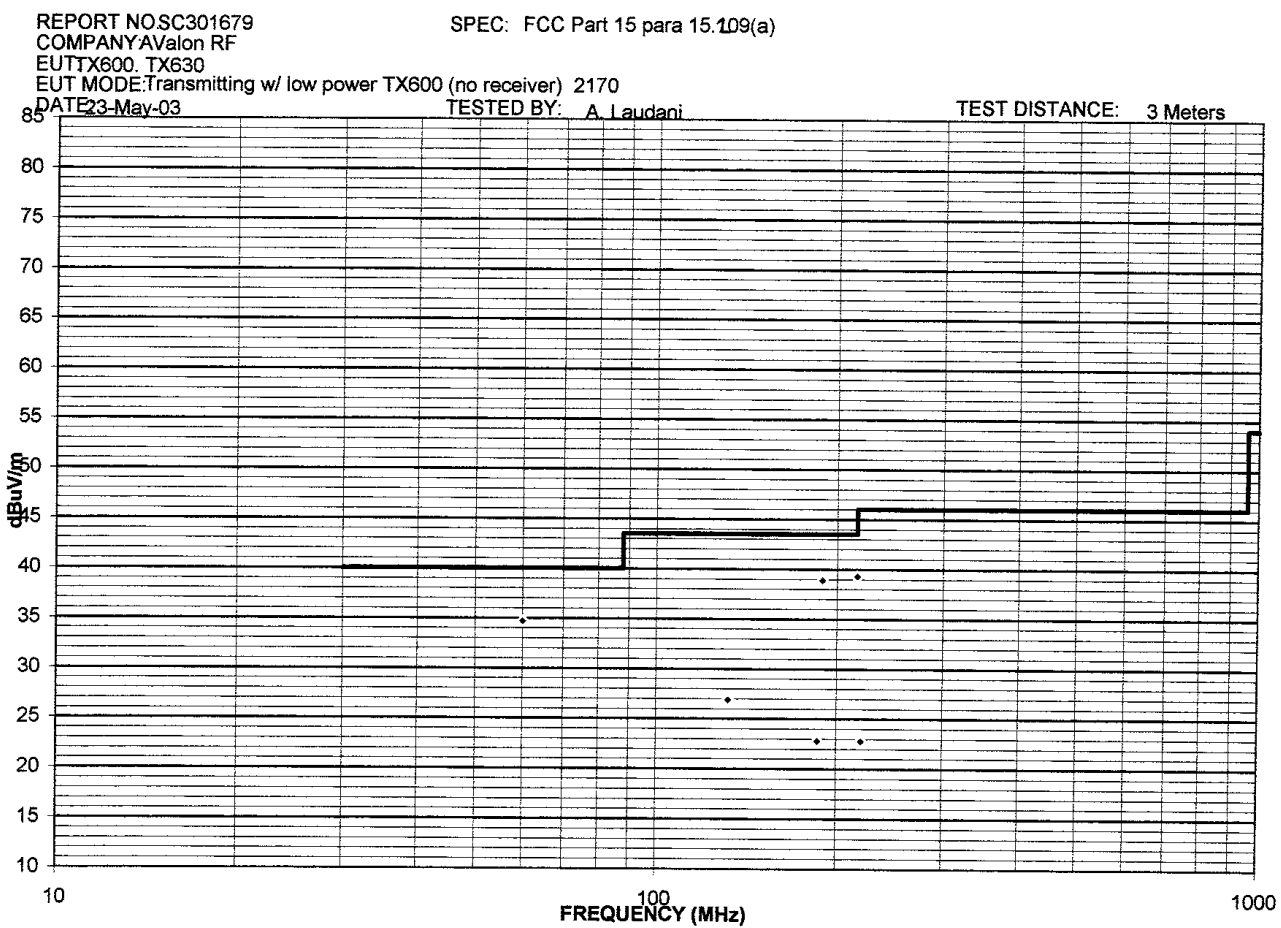
DATE: 23-May-03

TESTED BY: A. Laudani

TEST DISTANCE: 3 Meters







SPEC: FCC Part 15 para 15.109(a)

TEST DIST: 3 Meters

TEST SITE: 1

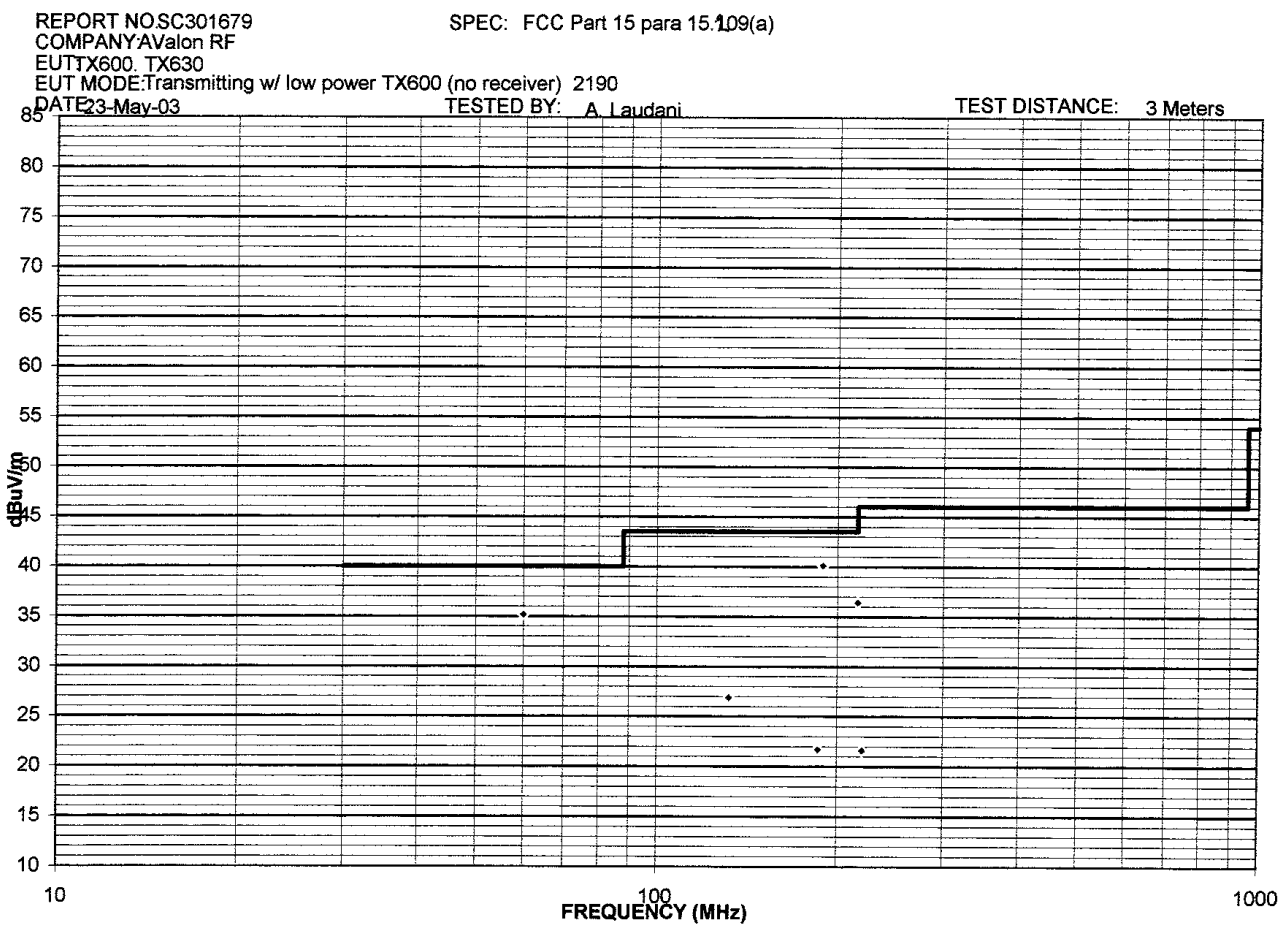
BICONICAL: 738

LOG PERIODIC: 738

RCVR: 427

Temperature: 22 C      Relative Humidity: 50%

Page 19 of 74



SPEC: FCC Part 15 para 15.109(a)

TEST DIST: 3 Meters

TEST SITE: 1

BICONICAL: 738

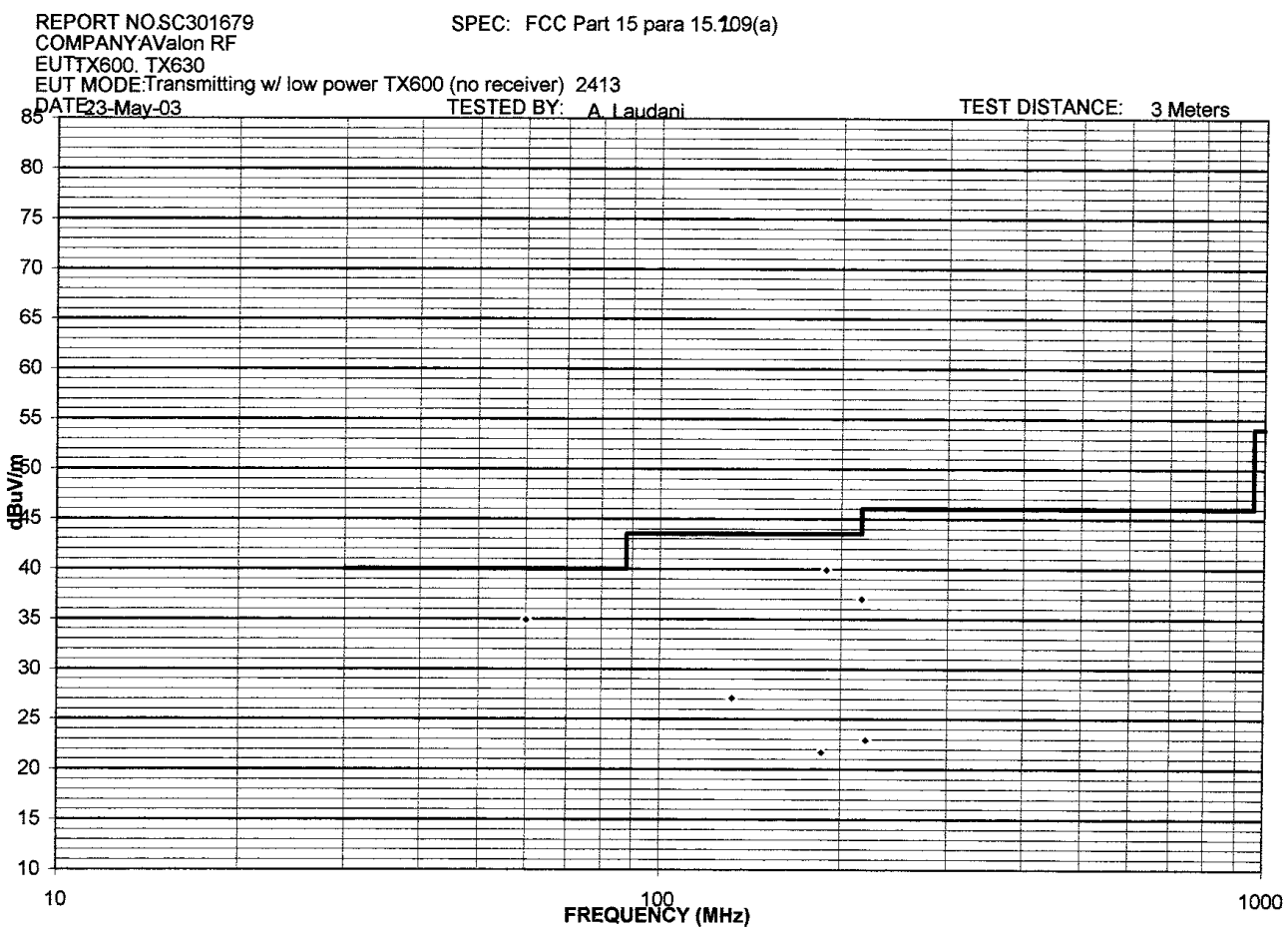
LOG PERIODIC: 738

RCVR: 427

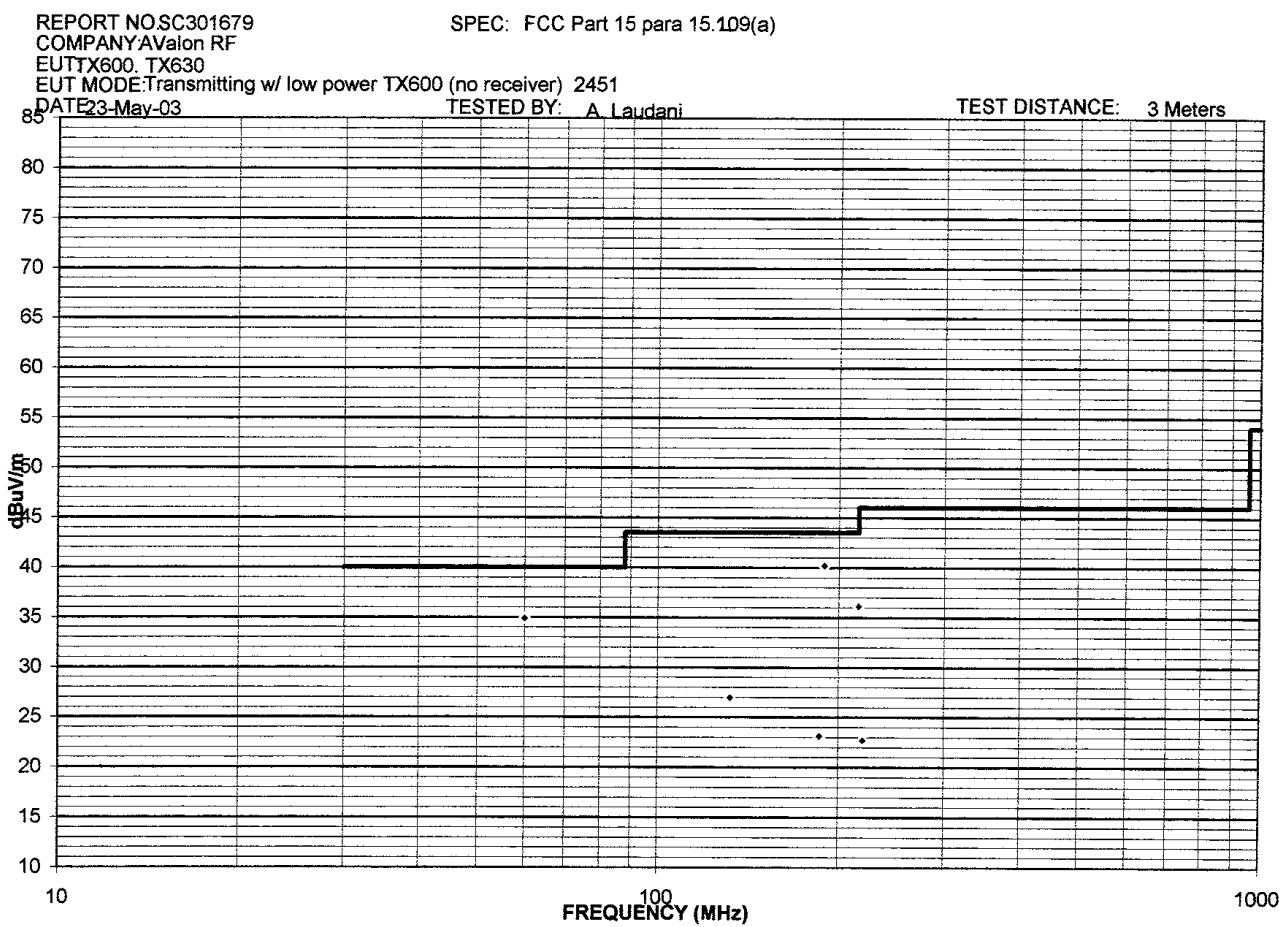
Temperature: 22 C      Relative Humidity: 50%

ver 1.8a

Page 21 of 74  
Rev.No 1.0



[illegible]



SPEC: FCC Part 15 para 15.109(a)

TEST DIST: 3 Meters

TEST SITE: 1

BICONICAL: 738

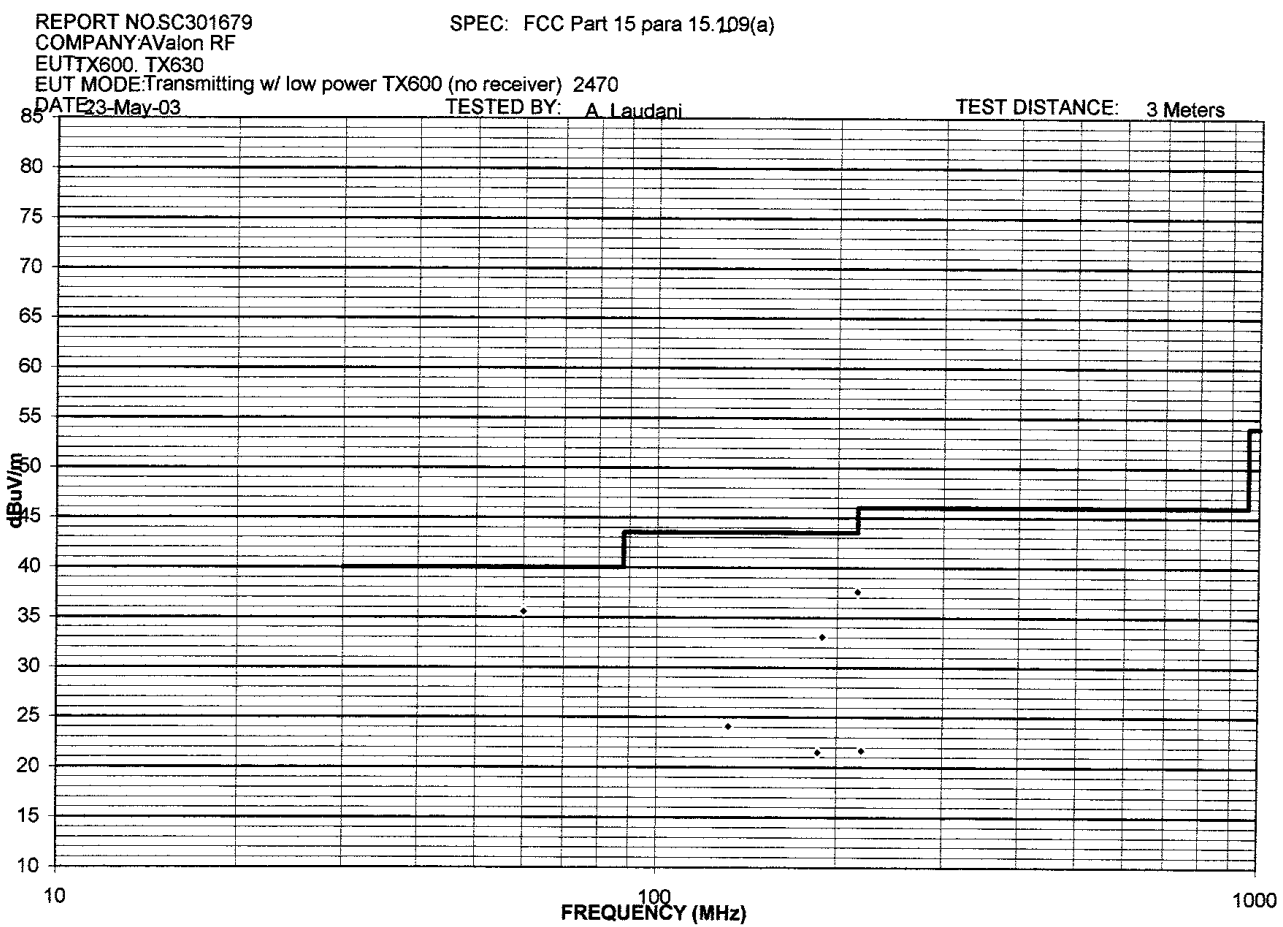
LOG PERIODIC: 738

RCVR: 427

-3.3 dB at 189 MHz

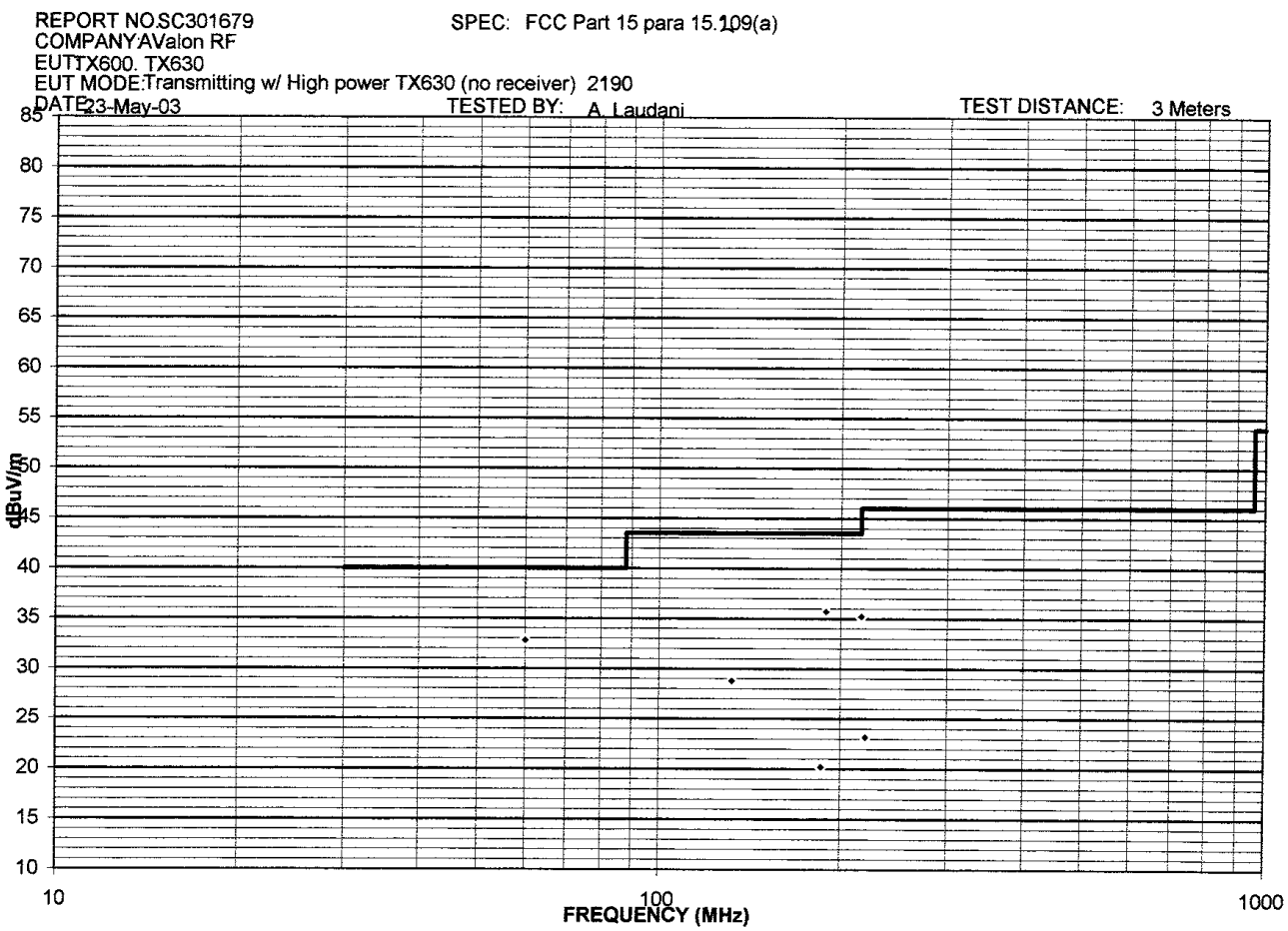
ver 1.8a

[illegible]



ver 1.8a

**TÜV AMERICA, INC.** 10040 Mesa Rim Road San Diego, CA 92121-2912 Phone 858 546 3999 FAX 858 546 0364



SPEC: FCC Part 15 para 15.109(a)

TEST DIST: 3 Meters

TEST SITE: 1

BICONICAL: 738

LOG PERIODIC: 738

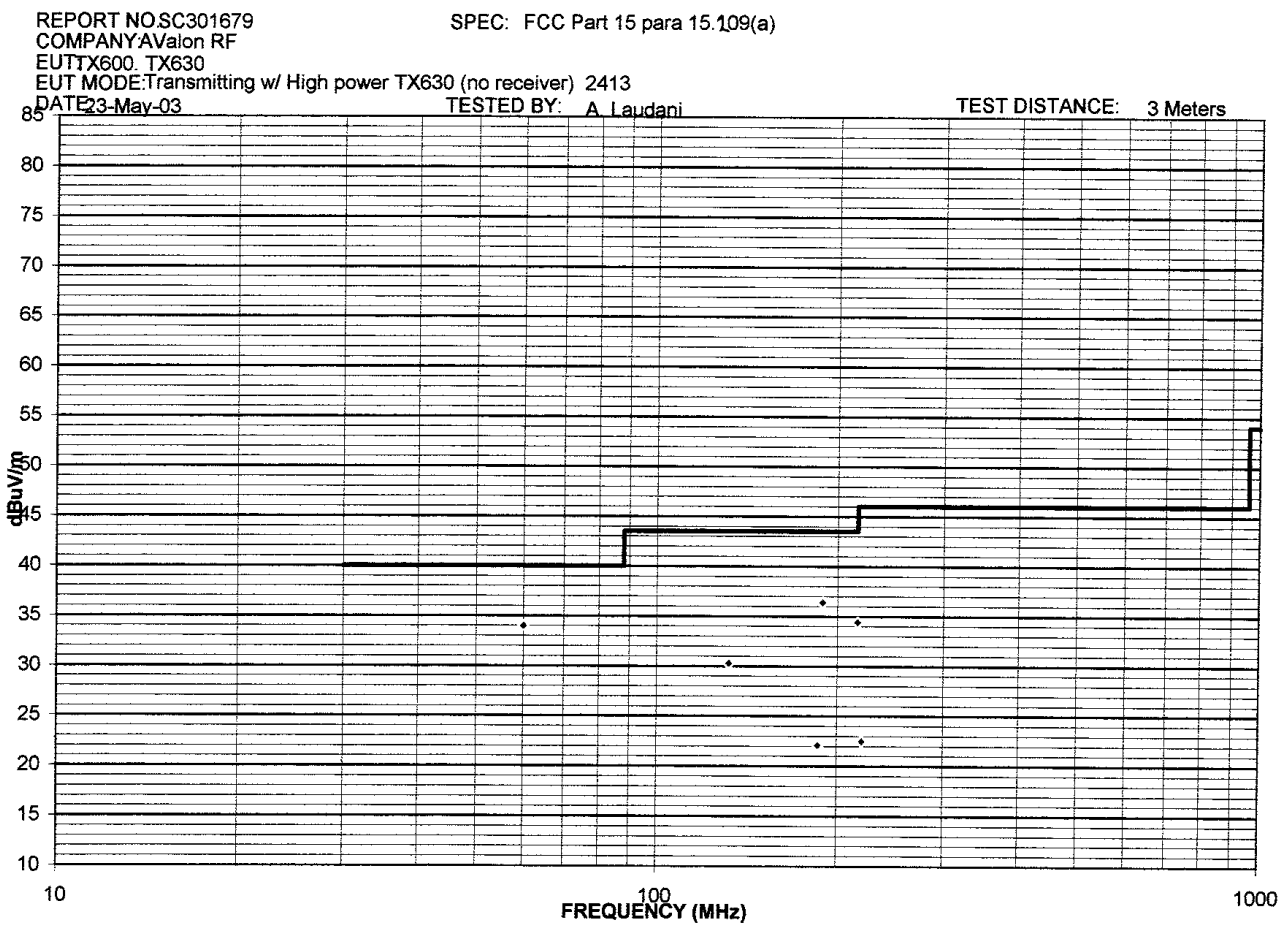
RCVR: 427

-7.2 dB at 60 MHz

|          |            |
|----------|------------|
| VERTICAL | HORIZONTAL |
|----------|------------|

ver 1.8a

Page 29 of 74



SPEC: FCC Part 15 para 15.109(a)

TEST DIST: 3 Meters

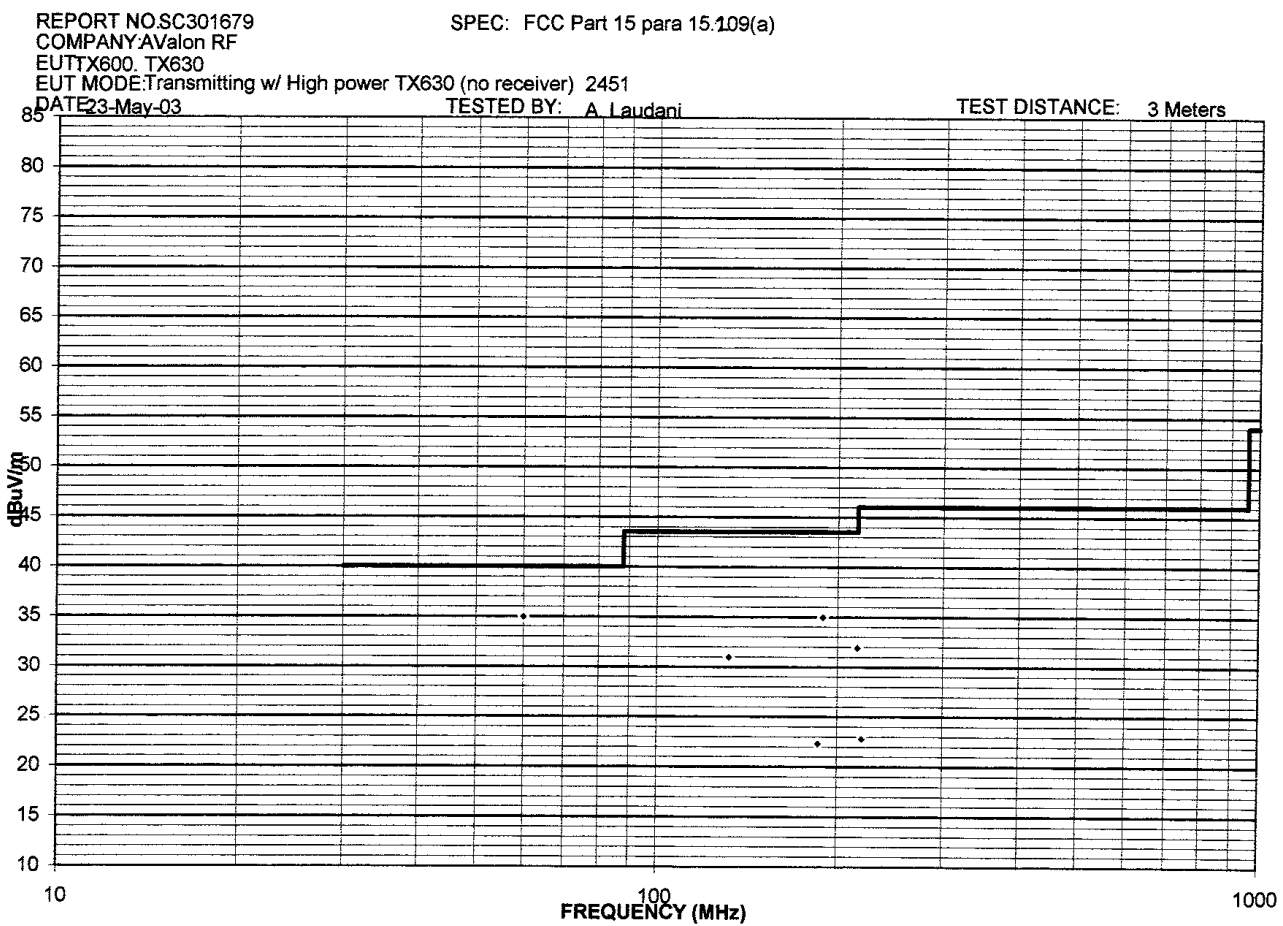
TEST SITE: 1

BICONICAL: 738

LOG PERIODIC: 738

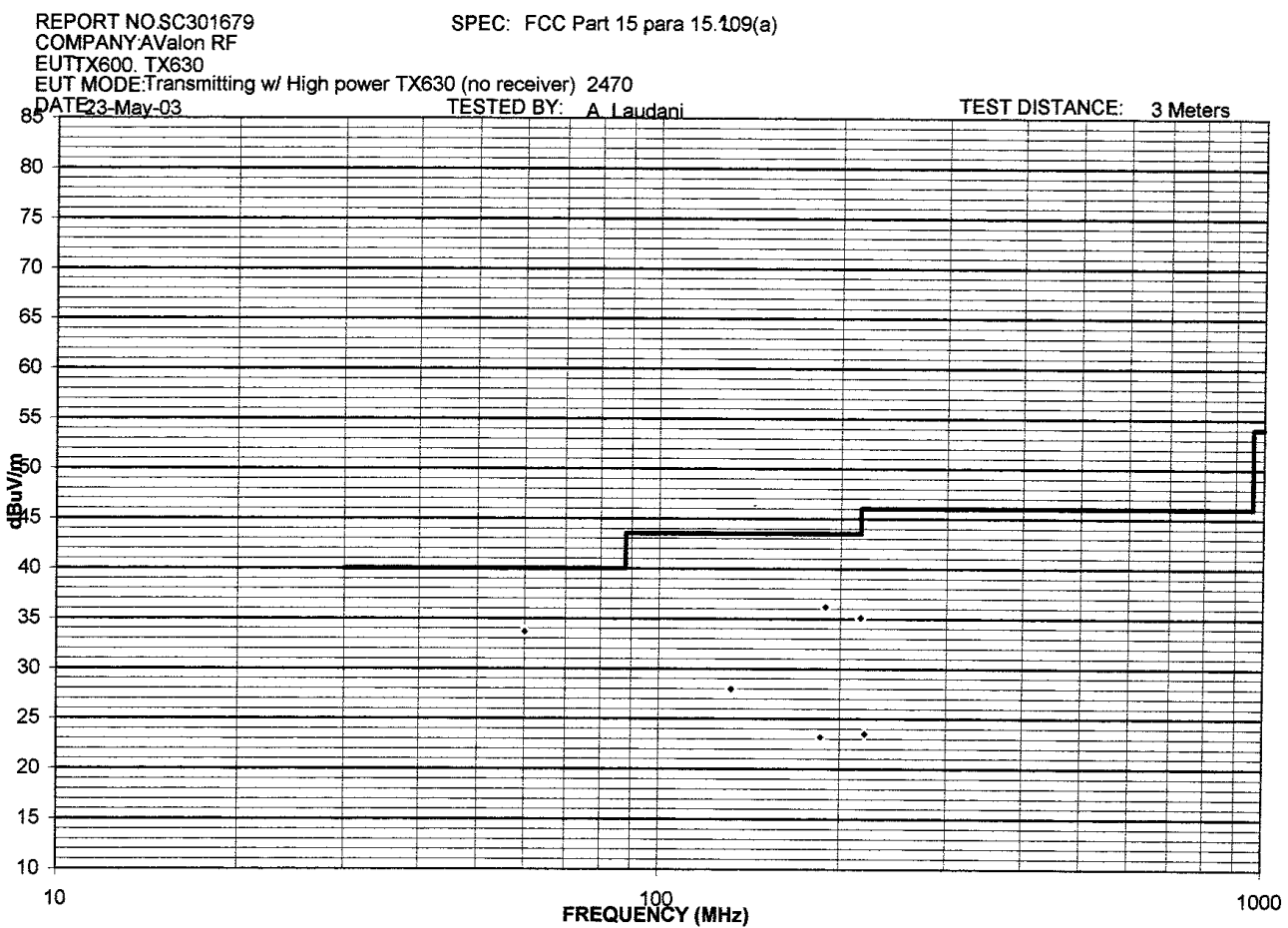
RCVR: 427

**EUT MARGIN**[illegible]

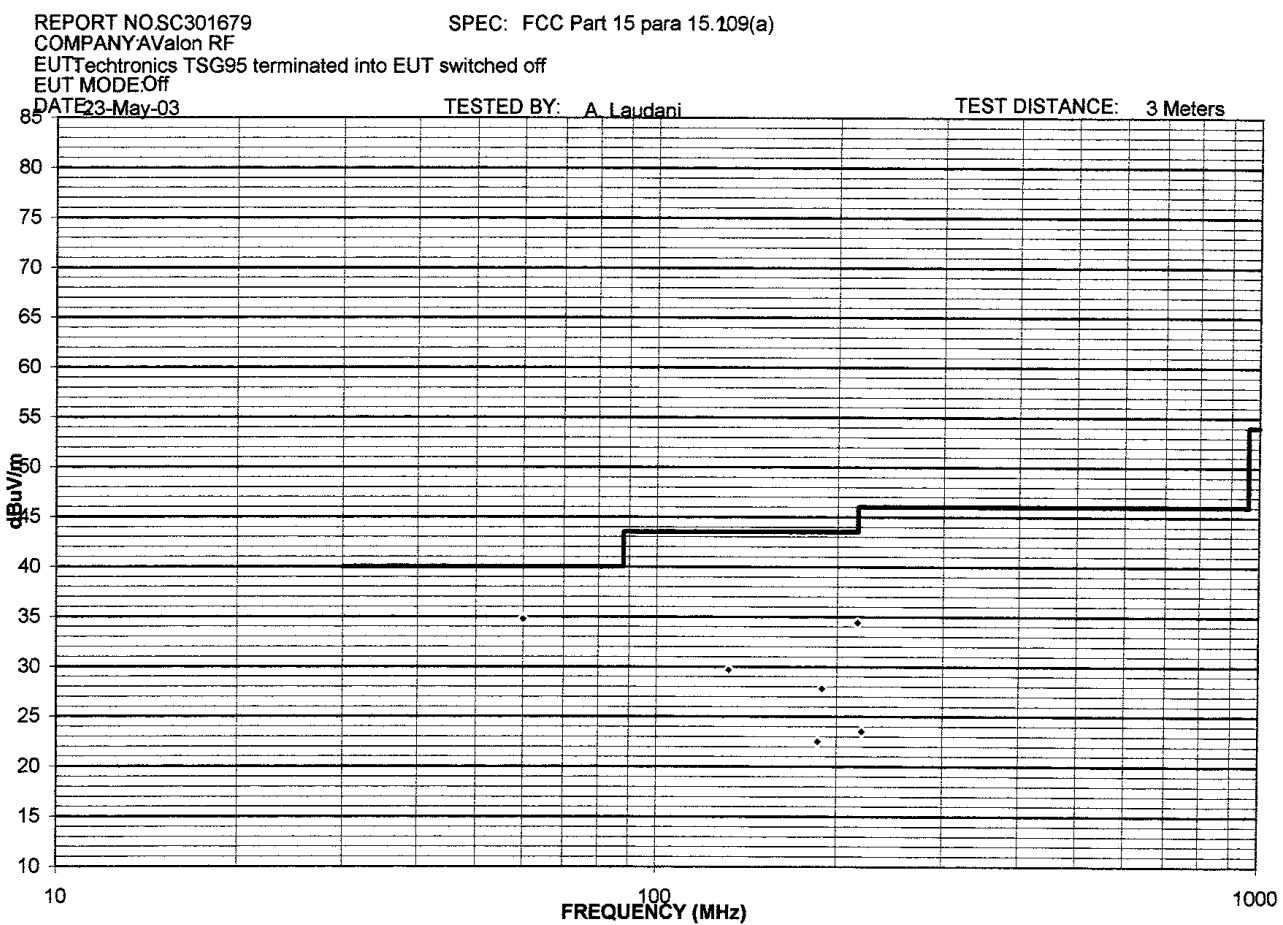


ver 1.8a

Rev.No 1.0



[illegible]



[illegible]

Report No. SC301679-03

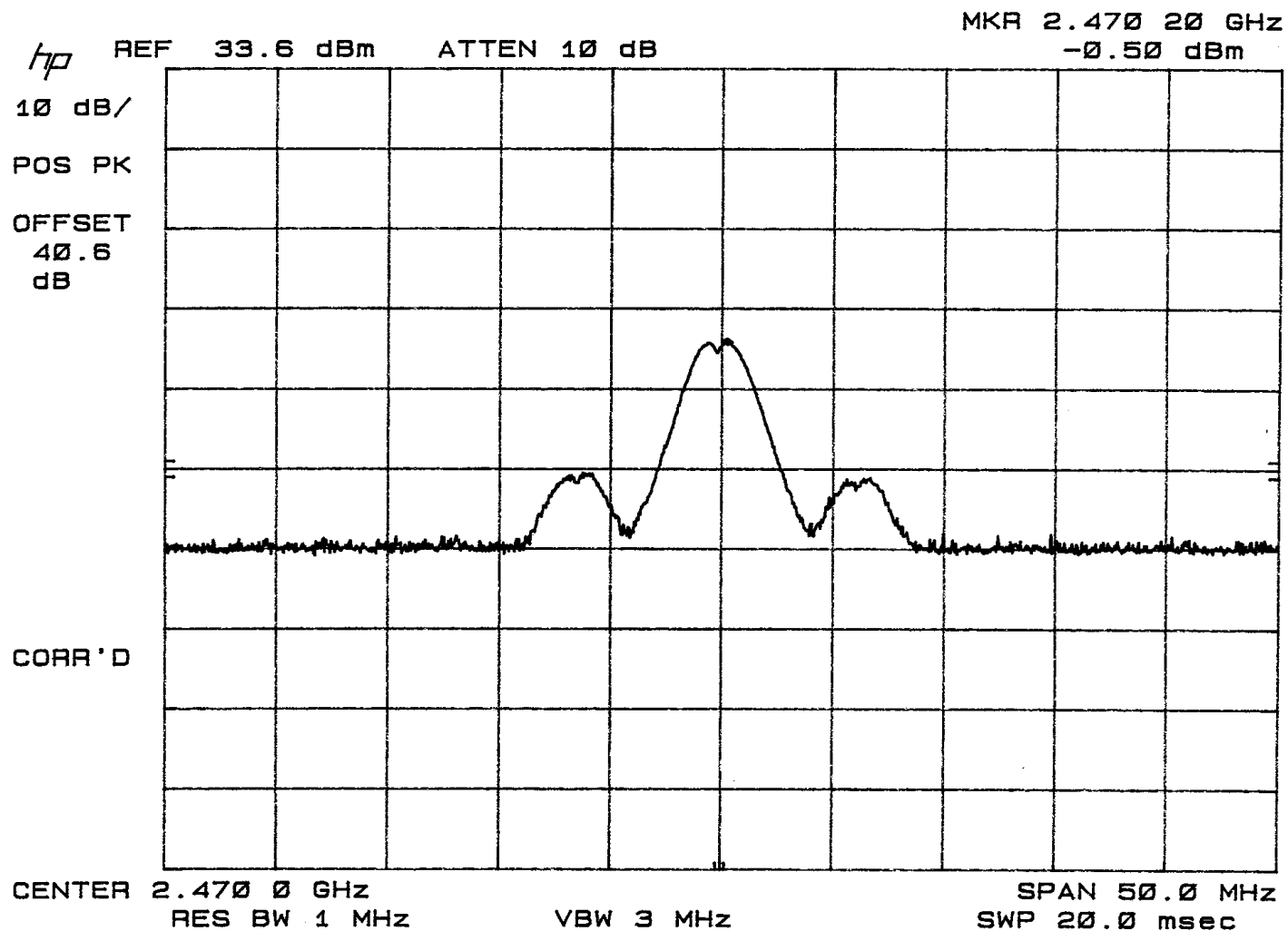
Avalon RF SC301679

74.636 <12W  
 90.205 <5 W  
 RSS-210 6.2.2(o)(e) < 1 Watt

| Model                | TX 600          | TX630            |           |
|----------------------|-----------------|------------------|-----------|
| F <sub>o</sub> (GHz) | Low Power (dBm) | High Power (dBm) | Complies* |
| 2.470                | -0.5            | 27.7             | Yes       |
| 2.451                | -0.4            | 25.3             | Yes       |
| 2.413                | -0.6            | 27.7             | Yes       |
| 2.190                | -0.3            | 21.2             | Yes       |
| 2.170                | -0.6            | 20.6             | Yes       |

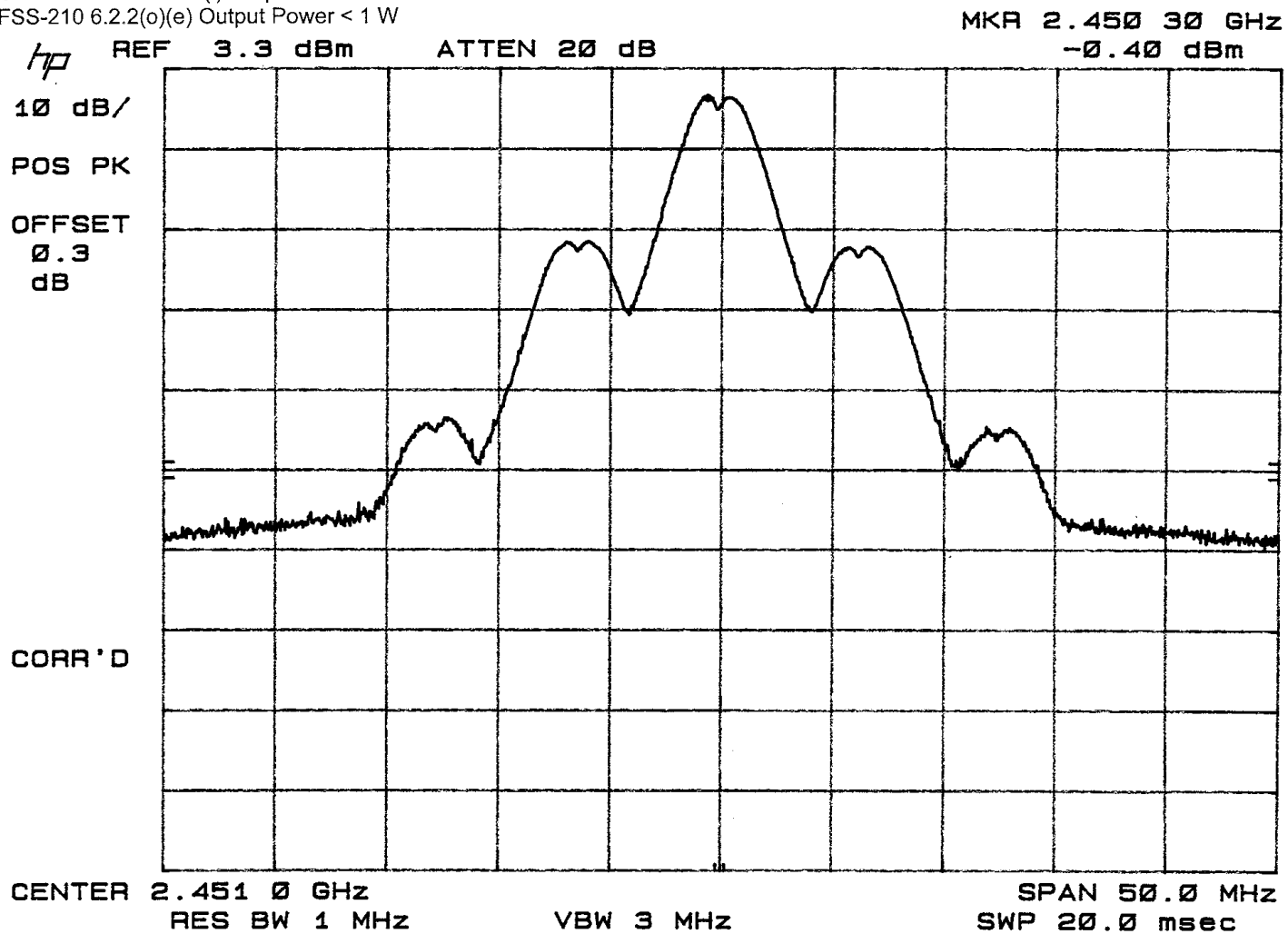
(\*) 1 Watt - 30 dBm

SC3001679      Avalon RF      Model TX600 (Low Power)      May 22, 2003    LOCATION:SR2    TECH/ENGR: AAL  
 CFR 47 FCC 74.636 Output Power < 12 W  
 CFR 47 FCC 90.205 (I) Output Power < 5 W  
 FSS-210 6.2.2(o)(e) Output Power < 1 W



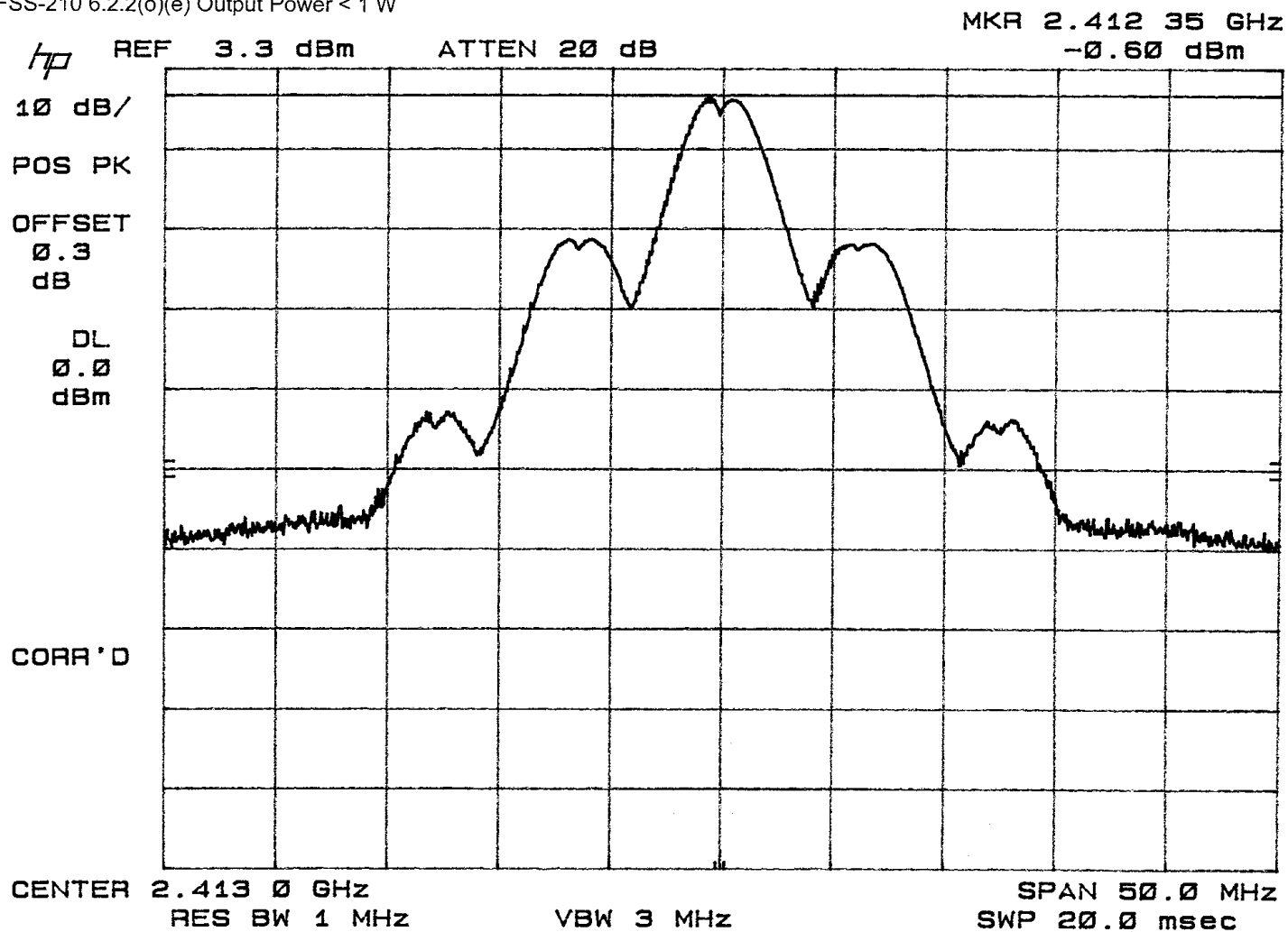
SC3001679 Avalon RF Model TX600 (Low Power)  
 CFR 47 FCC 74.636 Output Power < 12 W  
 CFR 47 FCC 90.205 (I) Output Power < 5 W  
 FSS-210 6.2.2(o)(e) Output Power < 1 W

May 22, 2003 LOCATION:SR2 TECH/ENGR: AAL



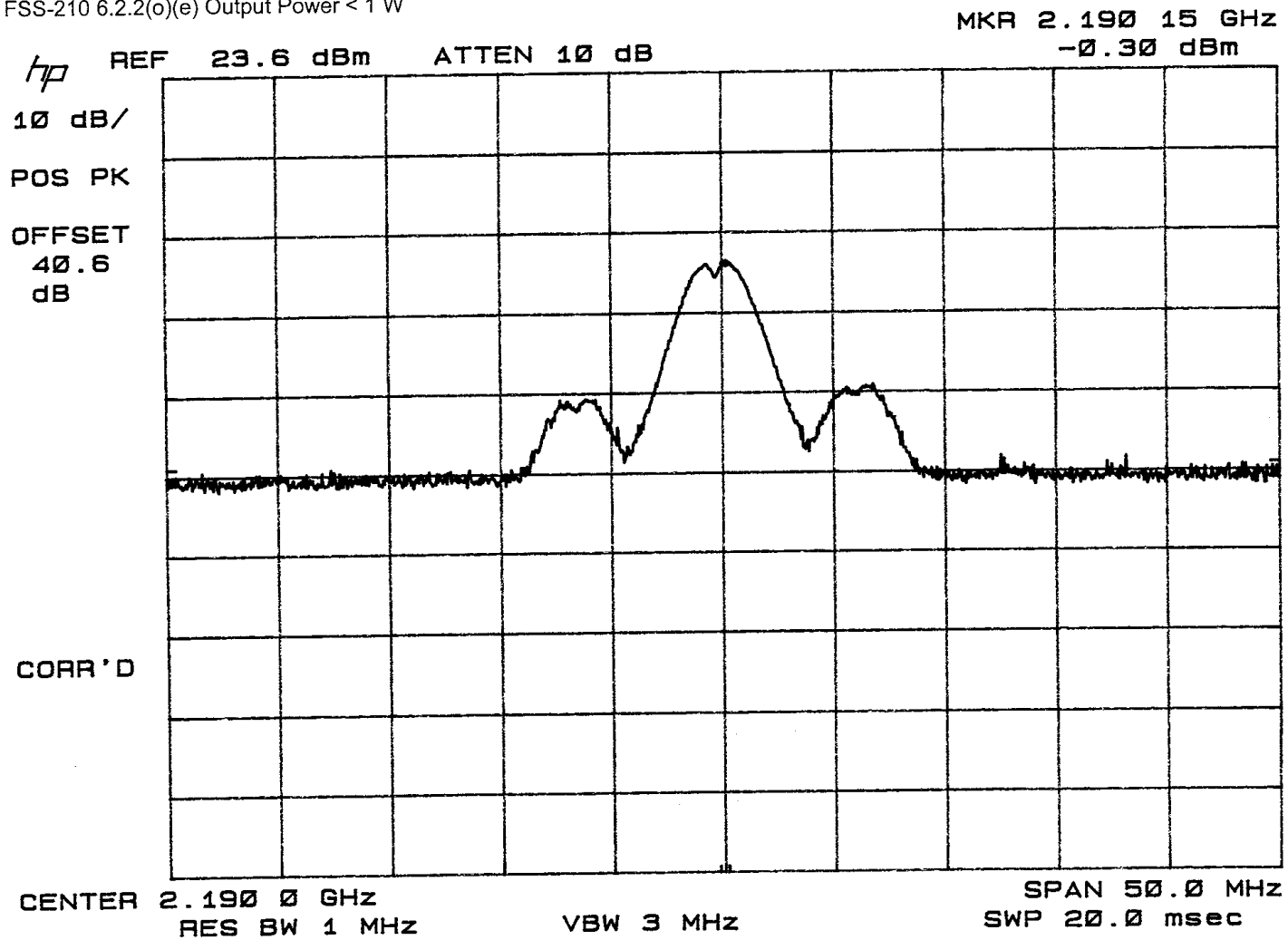
SC3001679 Avalon RF Model TX600 (Low Power)  
 CFR 47 FCC 74.636 Output Power < 12 W  
 CFR 47 FCC 90.205 (I) Output Power < 5 W  
 FSS-210 6.2.2(o)(e) Output Power < 1 W

May 22, 2003 LOCATION:SR2 TECH/ENGR: AAL



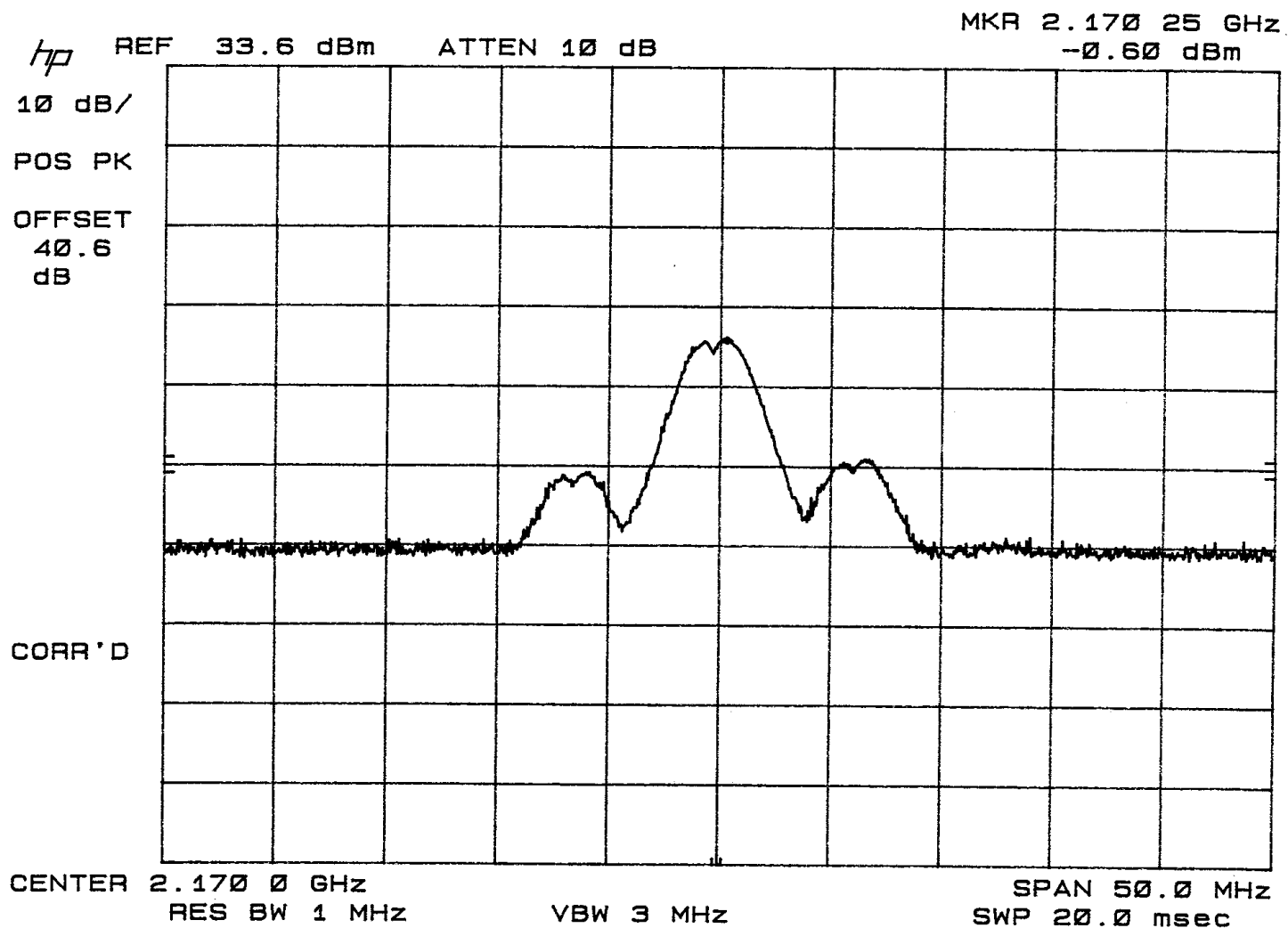
SC3001679 Avalon RF Model TX600 (Low Power)  
 CFR 47 FCC 74.636 Output Power < 12 W  
 CFR 47 FCC 90.205 (l) Output Power < 5 W  
 FSS-210 6.2.2(o)(e) Output Power < 1 W

May 22, 2003 LOCATION:SR2 TECH/ENGR: AAL

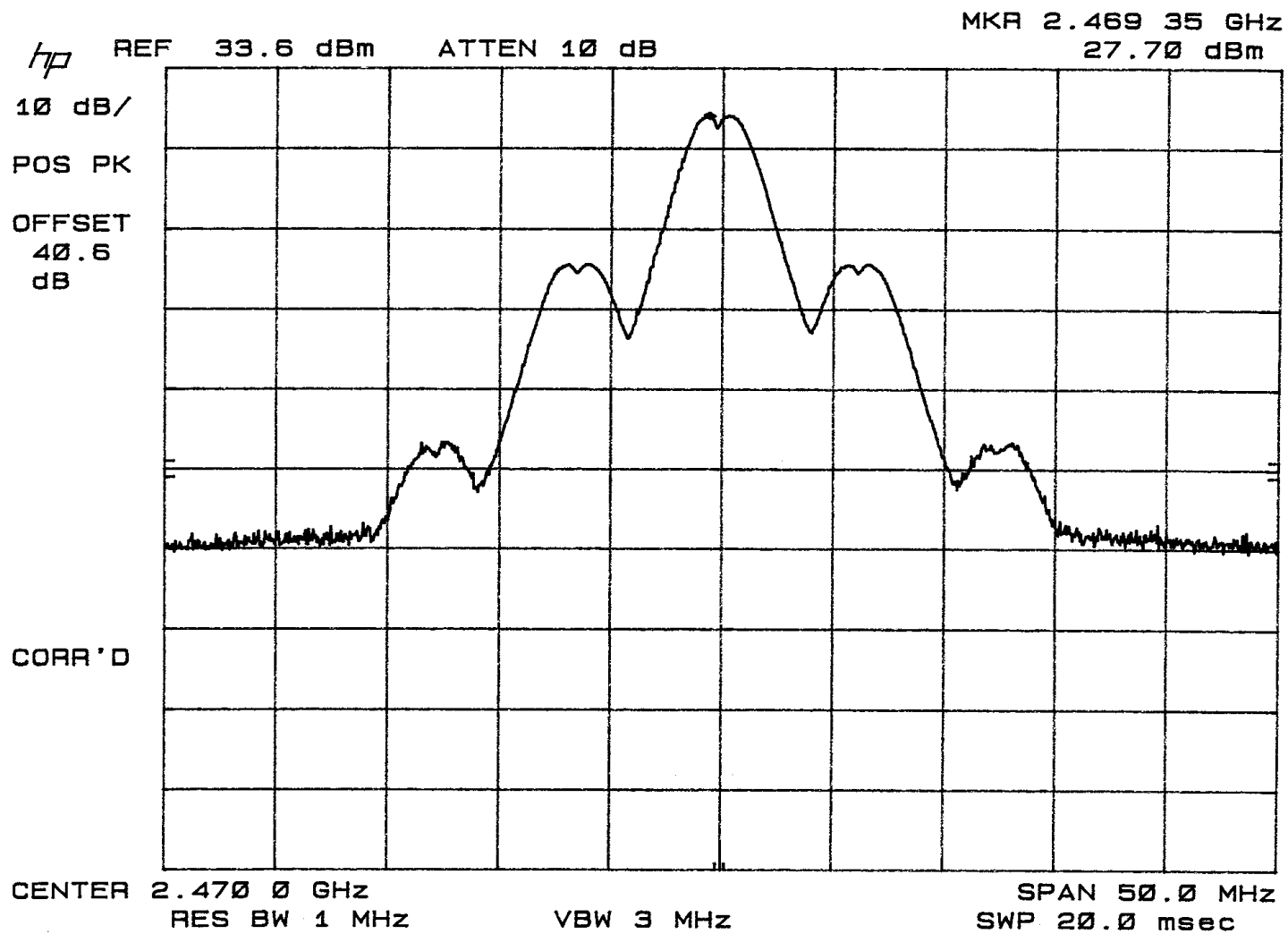


SC3001679 Avalon RF Model TX600 (Low Power)  
 CFR 47 FCC 74.636 Output Power < 12 W  
 CFR 47 FCC 90.205 (I) Output Power < 5 W  
 FSS-210 6.2.2(o)(e) Output Power < 1 W

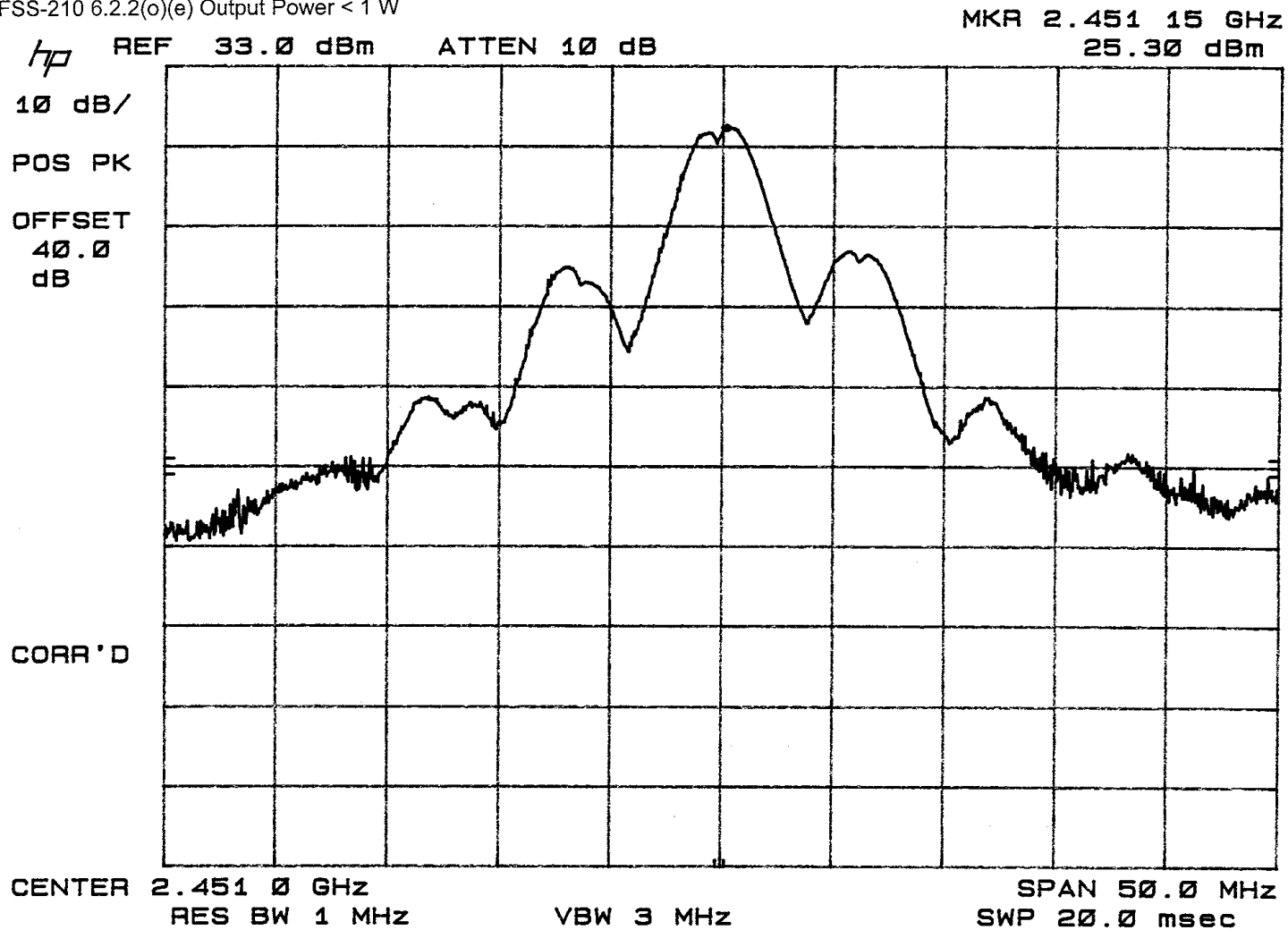
May 22, 2003 LOCATION:SR2 TECH/ENGR: AAL



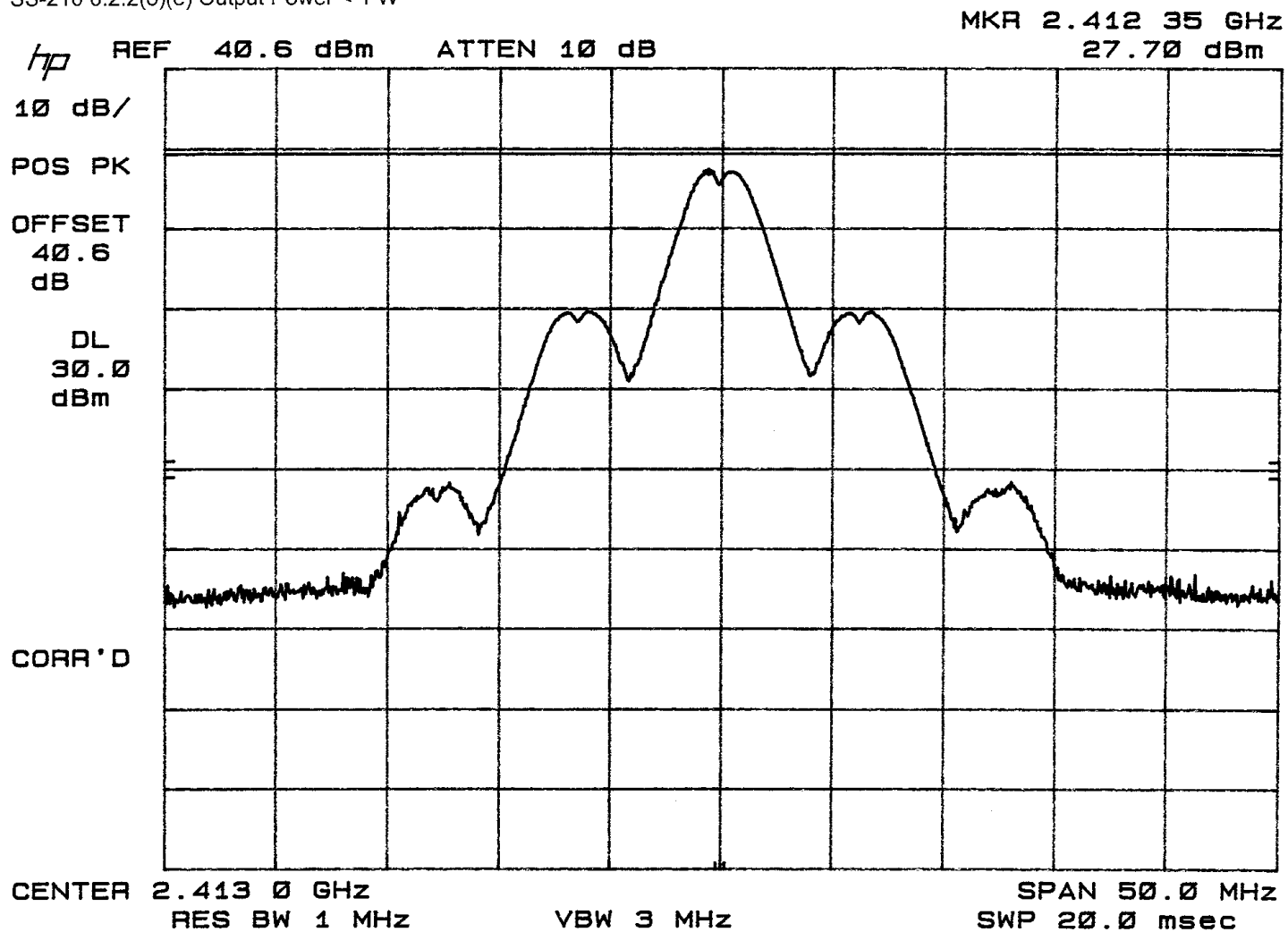
SC3001679      Avalon RF      Model TX630 (High Power)      May 22, 2003      LOCATION:SR2      TECH/ENGR: AAL  
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 CFR 47 FCC 90.205 (I) Output Power < 5 W  
 FSS-210 6.2.2(o)(e) Output Power < 1 W



SC3001679      Avalon RF      Model TX630 (High Power)      May 22, 2003    LOCATION:SR2    TECH/ENGR: AAL  
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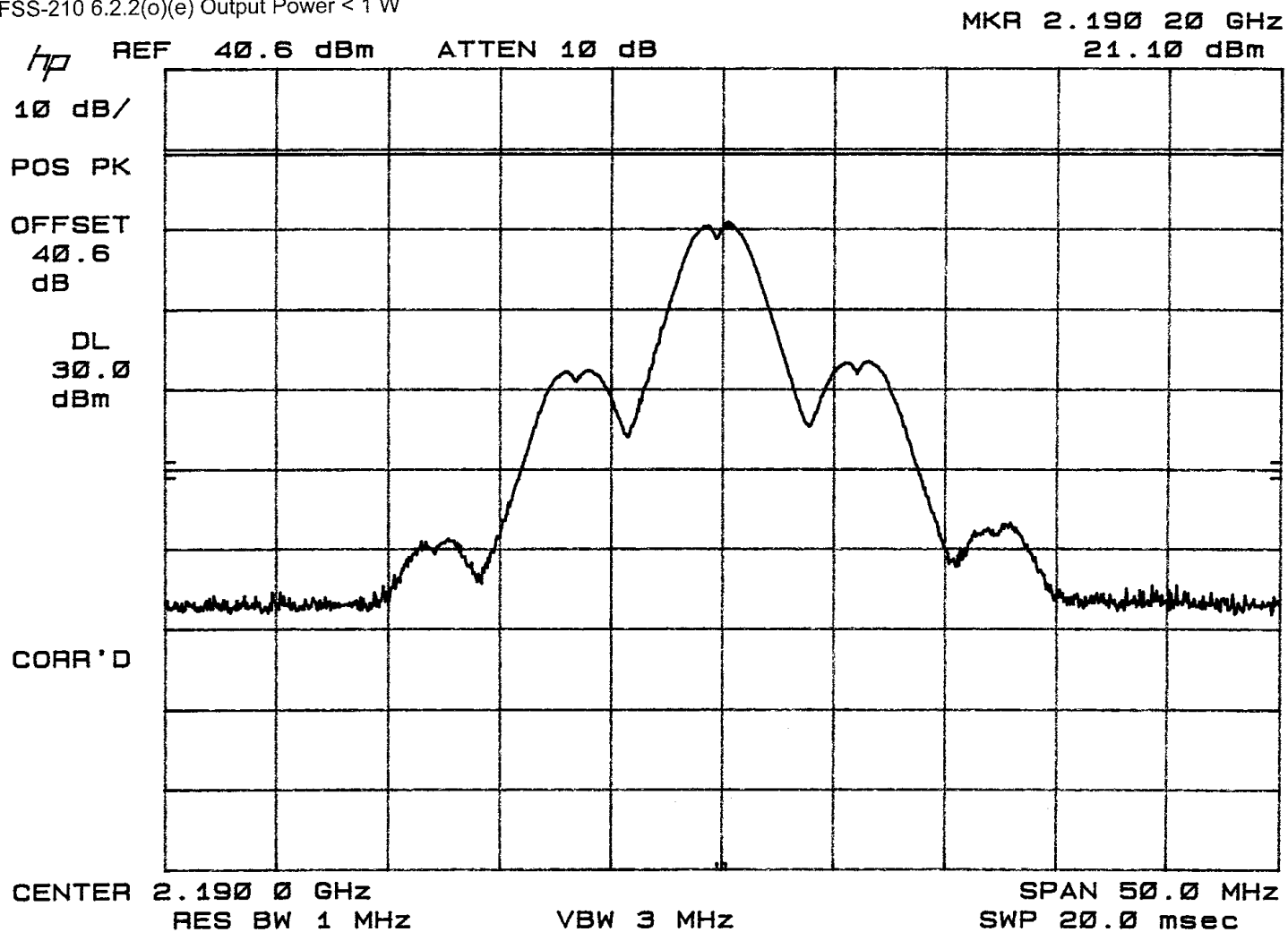


SC3001679      Avalon RF      Model TX630 (High Power)      May 22, 2003      LOCATION:SR2      TECH/ENGR: AAL  
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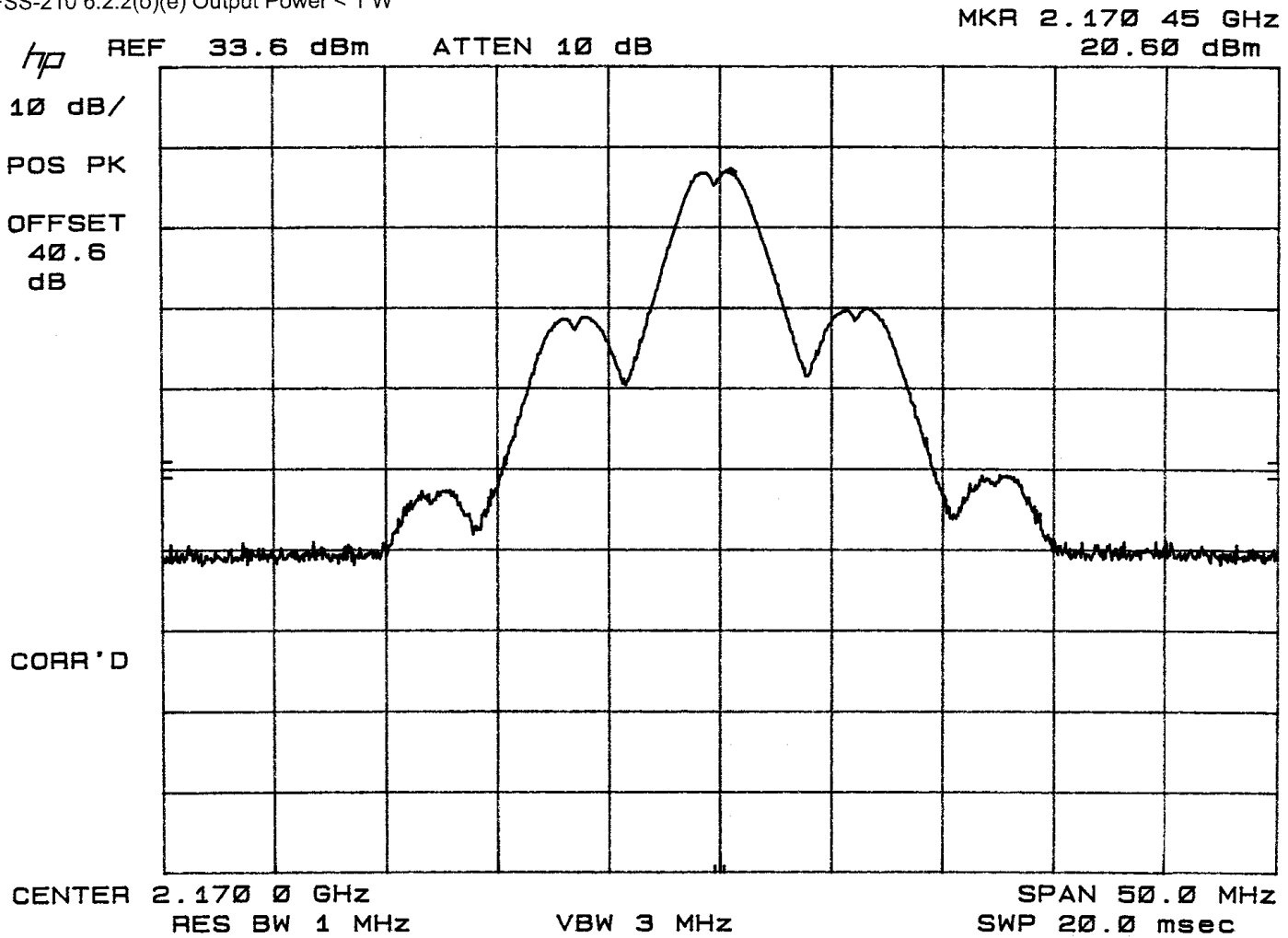


SC3001679      Avalon RF      Model TX630 (High Power)  
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 FSS-210 6.2.2(o)(e) Output Power < 1 W

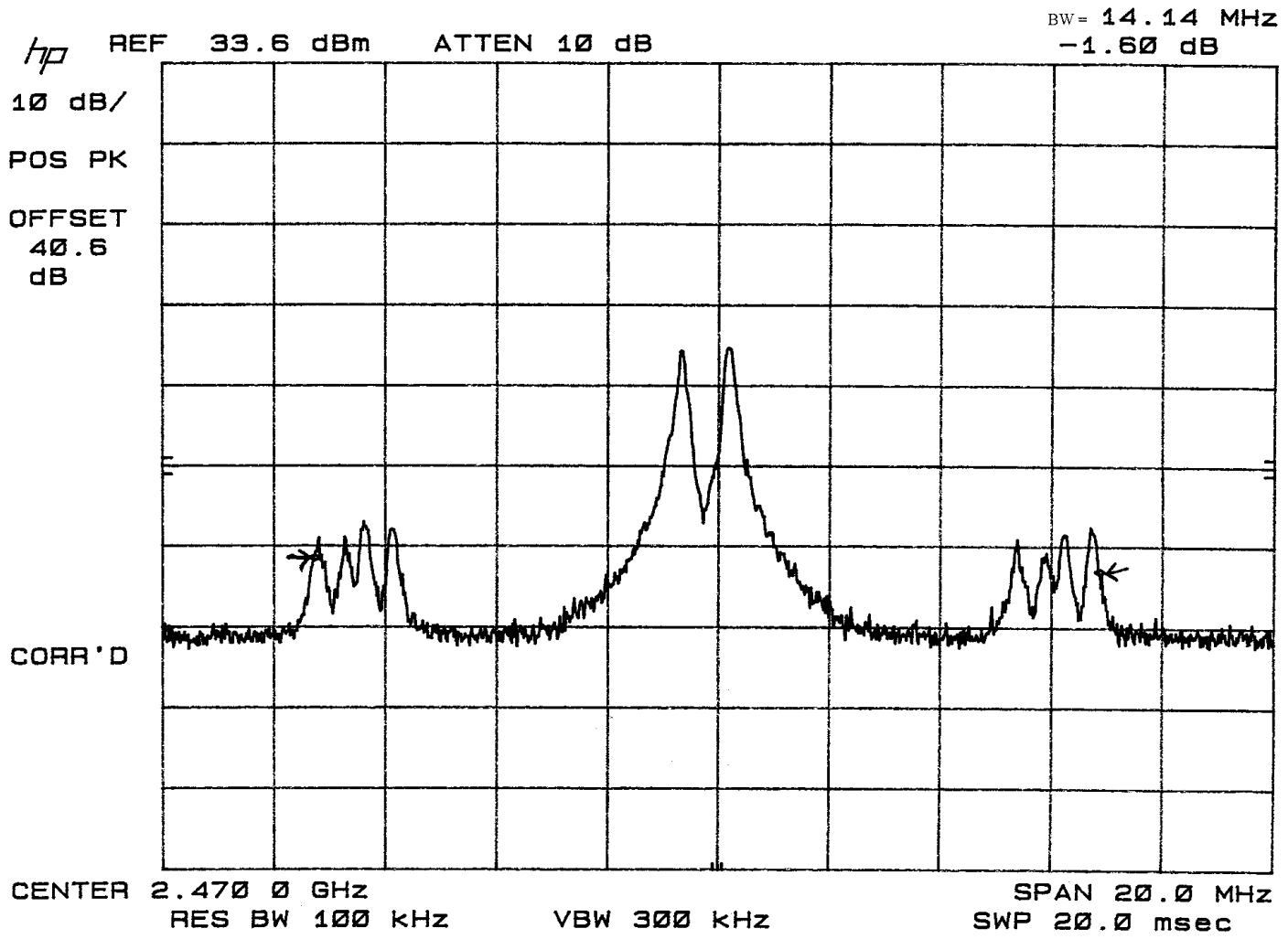
May 22, 2003 LOCATION:SR2 TECH/ENGR: AAL



SC3001679      Avalon RF      Model TX630 (High Power)      May 22, 2003      LOCATION:SR2      TECH/ENGR: AAL  
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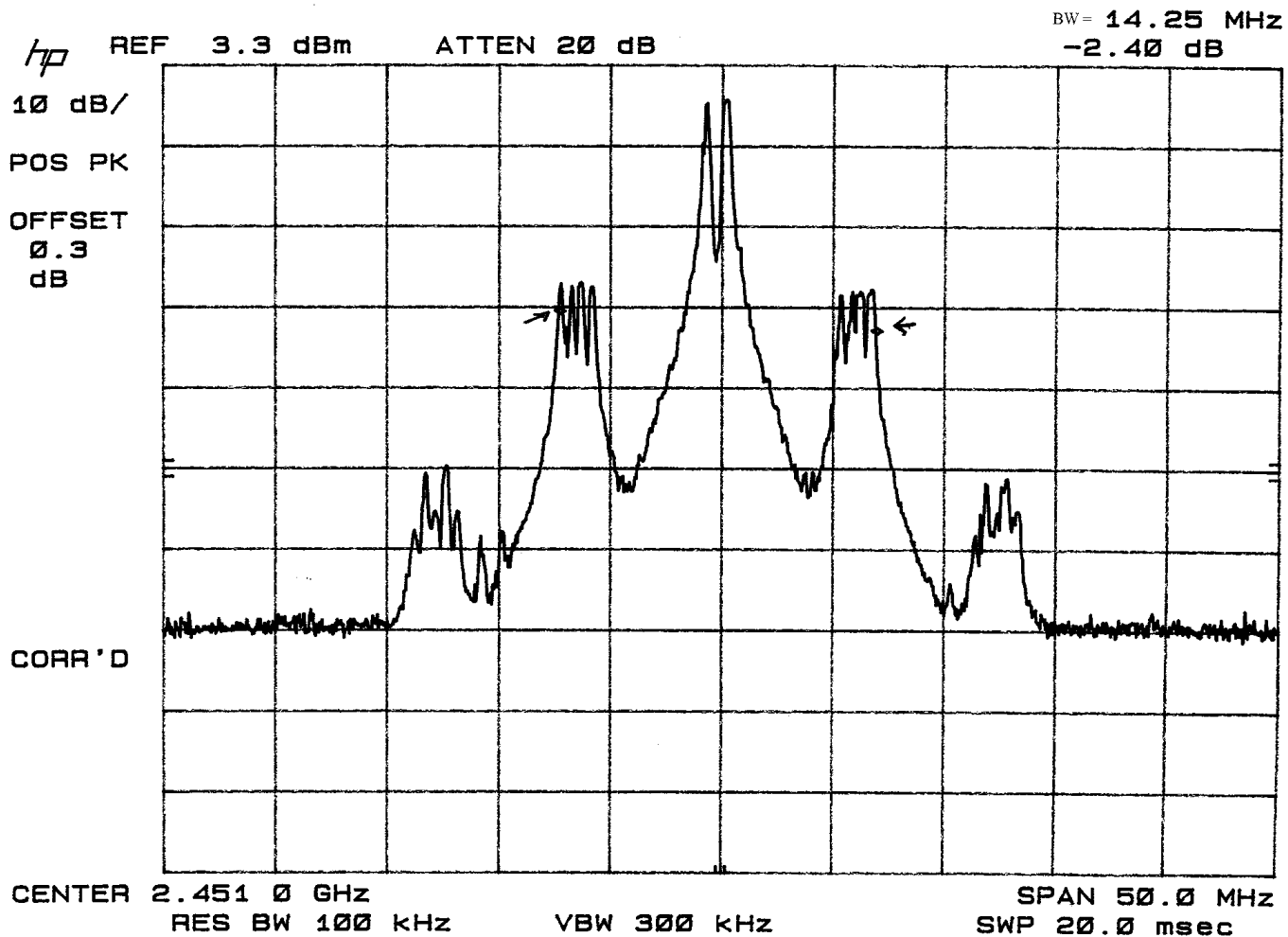


SC3001679      Avalon RF      Model TX600 (Low Power)      May 22, 2003      LOCATION:SR2      TECH/ENGR: AAL  
 CFR 47 FCC 90.209 (b)(5) Bandwidth      (-20 dB BW) < 16 MHz  
 FSS-210 6.2.2(o)(e1) Bandwidth Table 5, Note 2 BW to be wideband

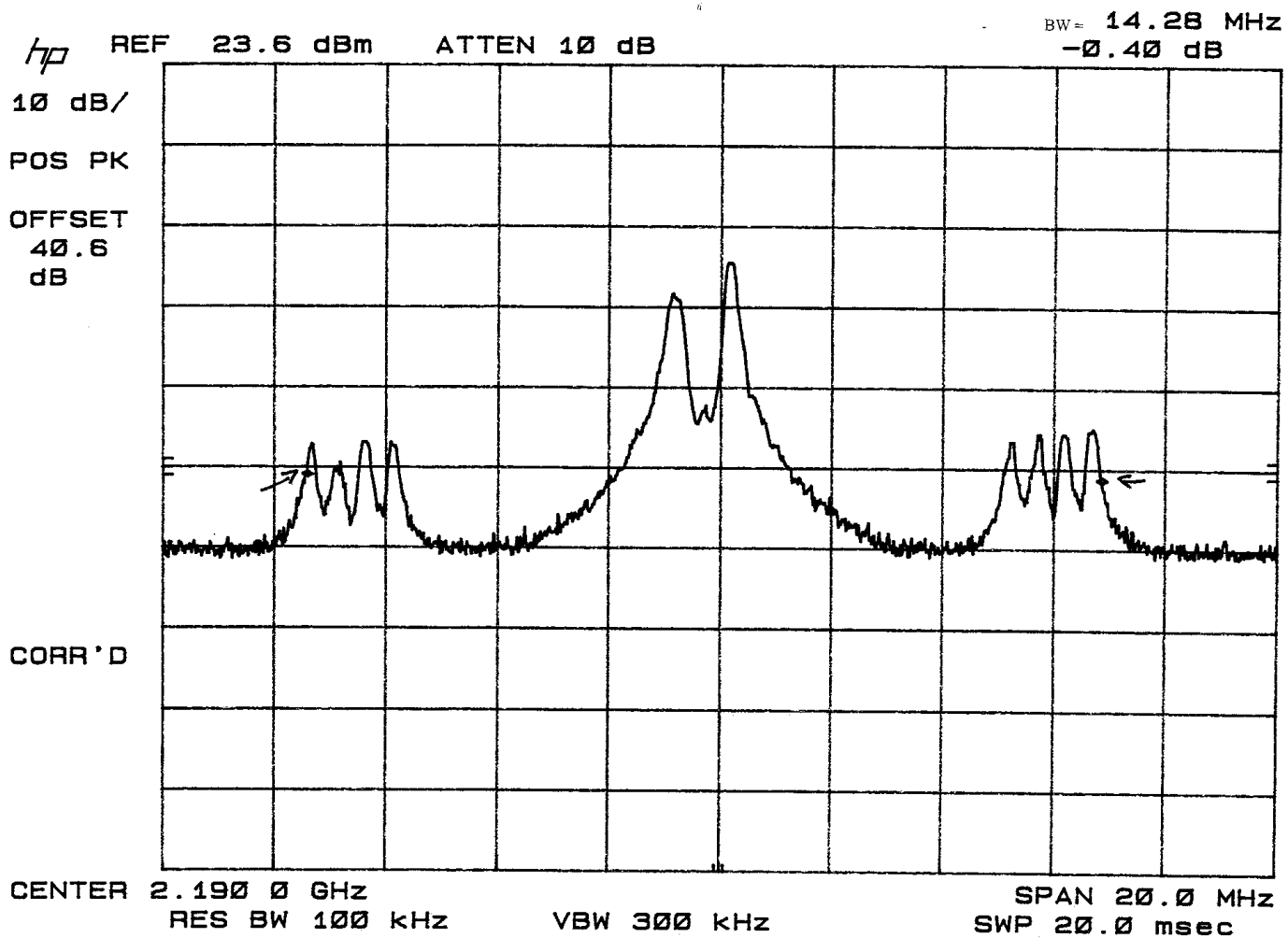


SC3001679      Avalon RF      Model TX600 (Low Power)  
 CFR 47 FCC 90.209 (b)(5) Bandwidth (-20 dB BW) < 16 MHz  
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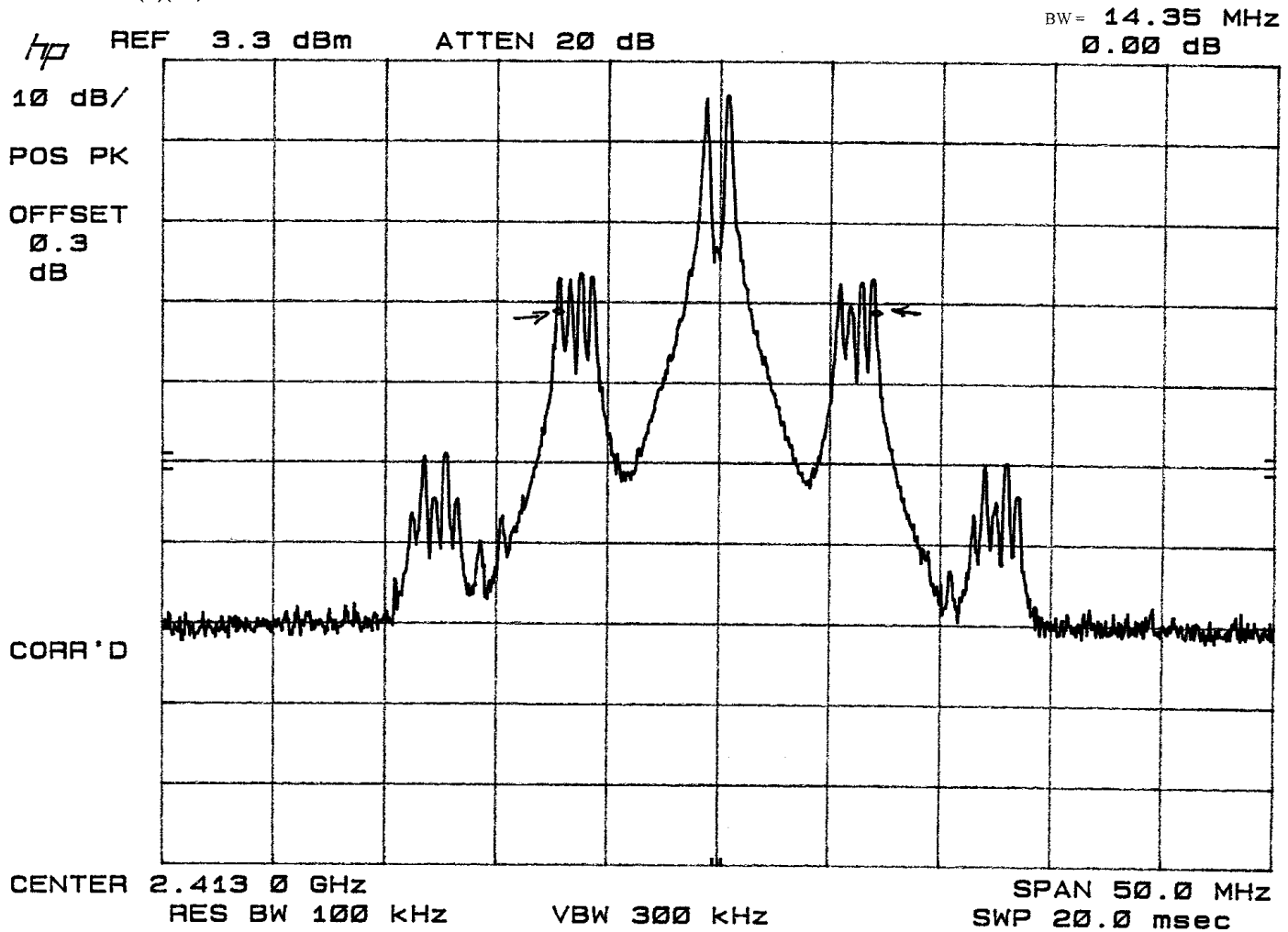
May 22, 2003 LOCATION:SR2 TECH/ENGR: AAL



SC3001679      Avalon RF      Model TX600 (Low Power)      May 22, 2003      LOCATION:SR2      TECH/ENGR: AAL  
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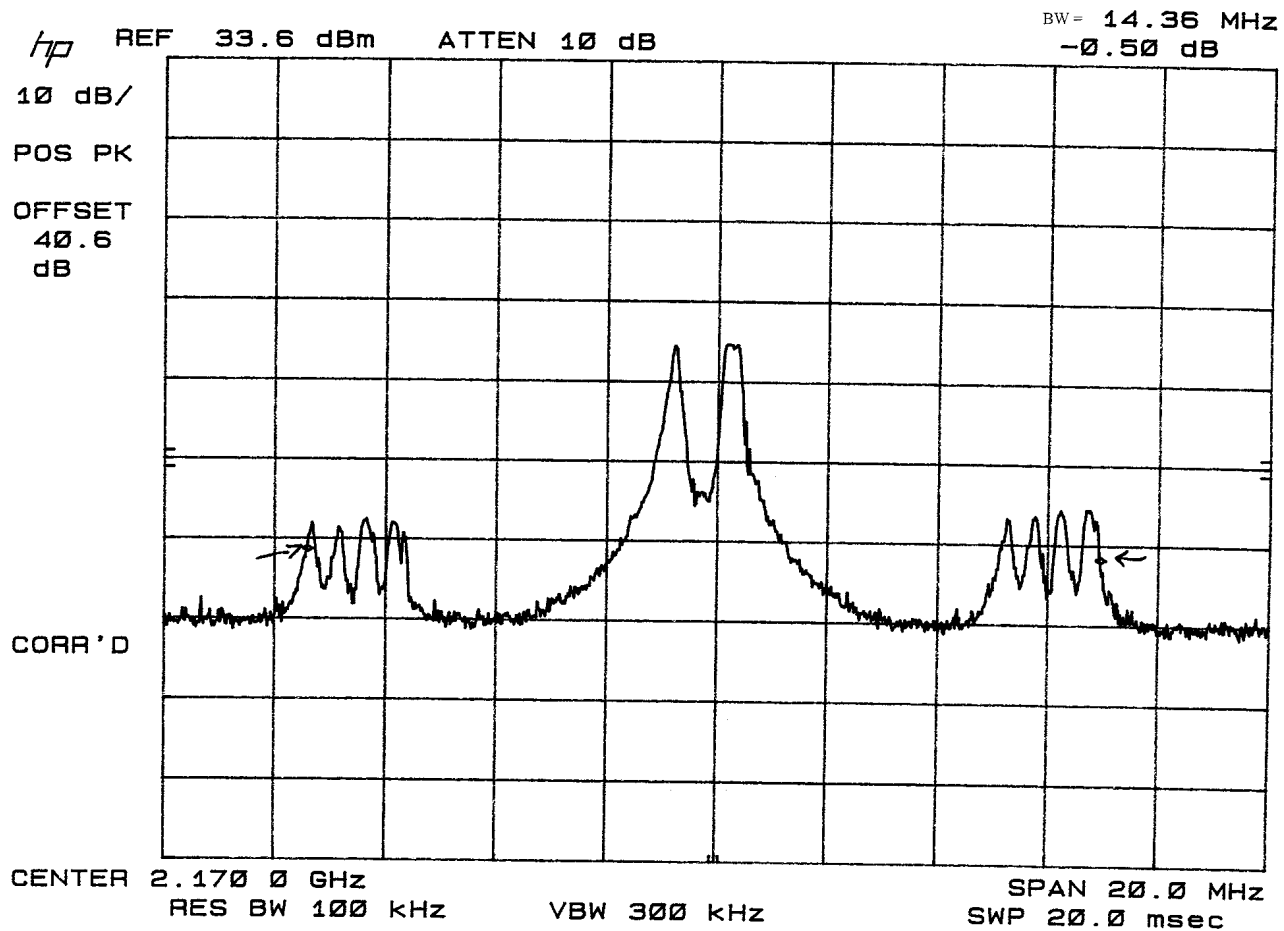


SC3001679      Avalon RF      Model TX600 (Low Power)      May 22, 2003      LOCATION:SR2      TECH/ENGR: AAL  
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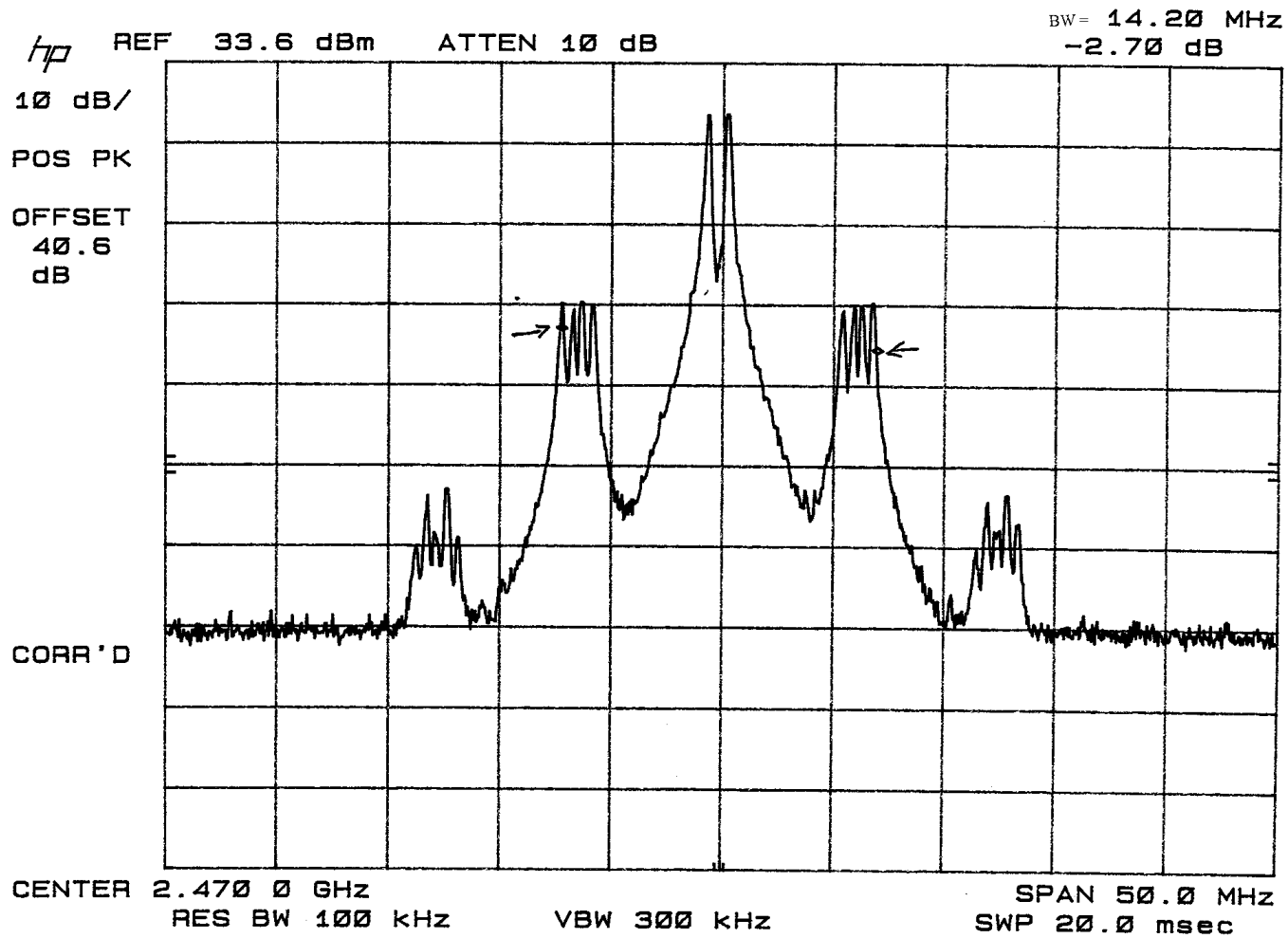


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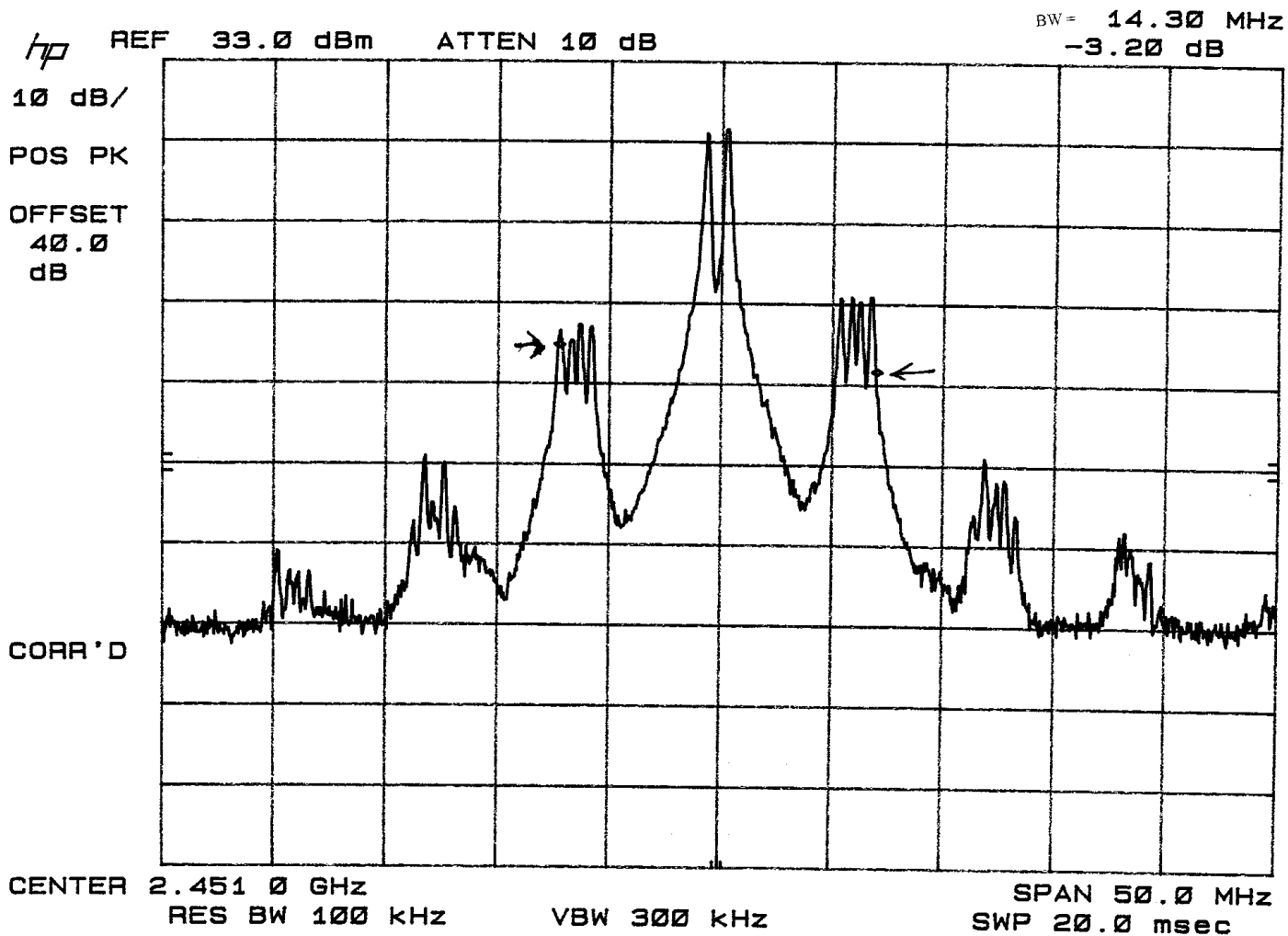


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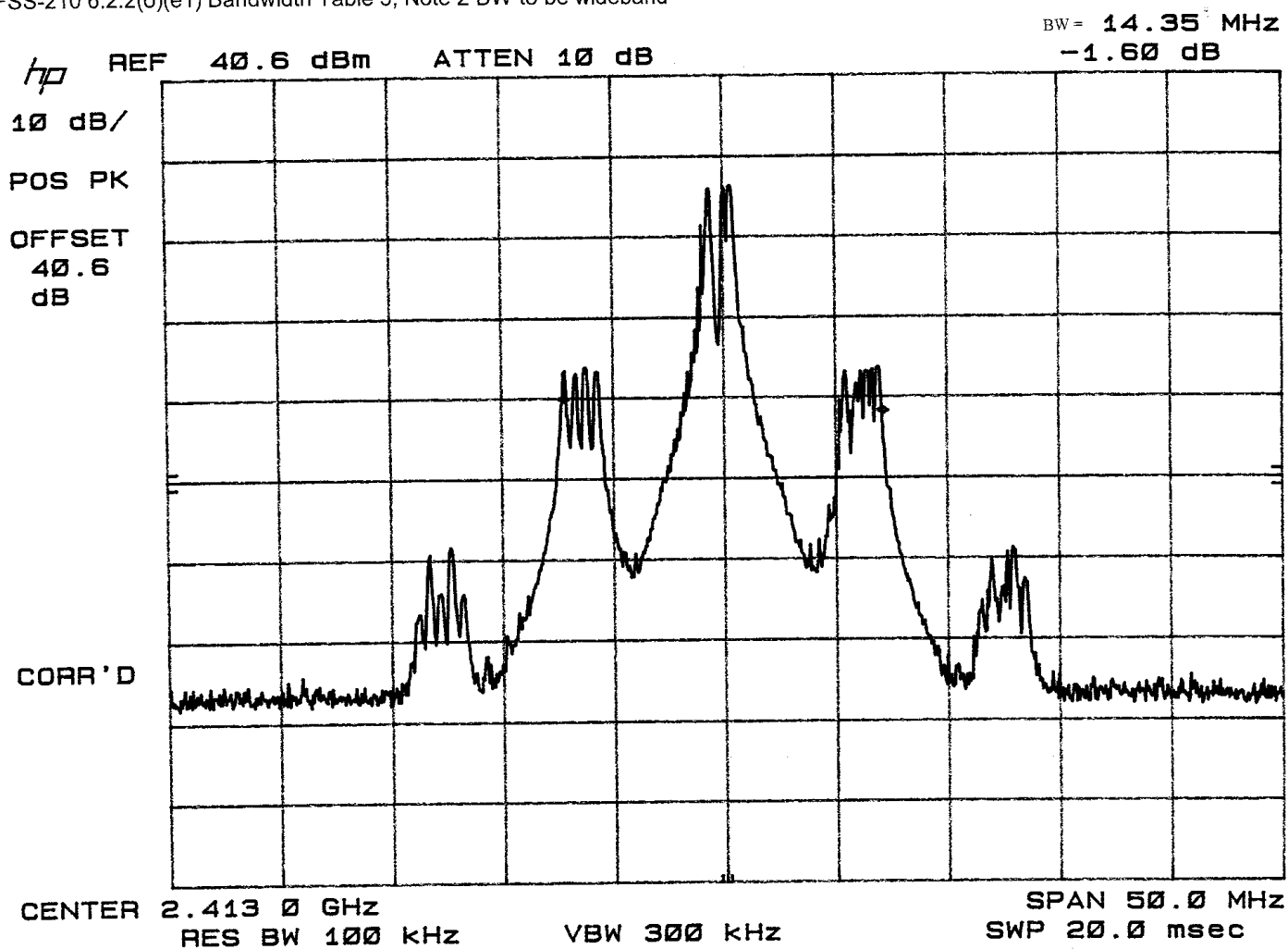
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May 22, 2003    LOCATION:SR2    TECH/ENGR: AAL



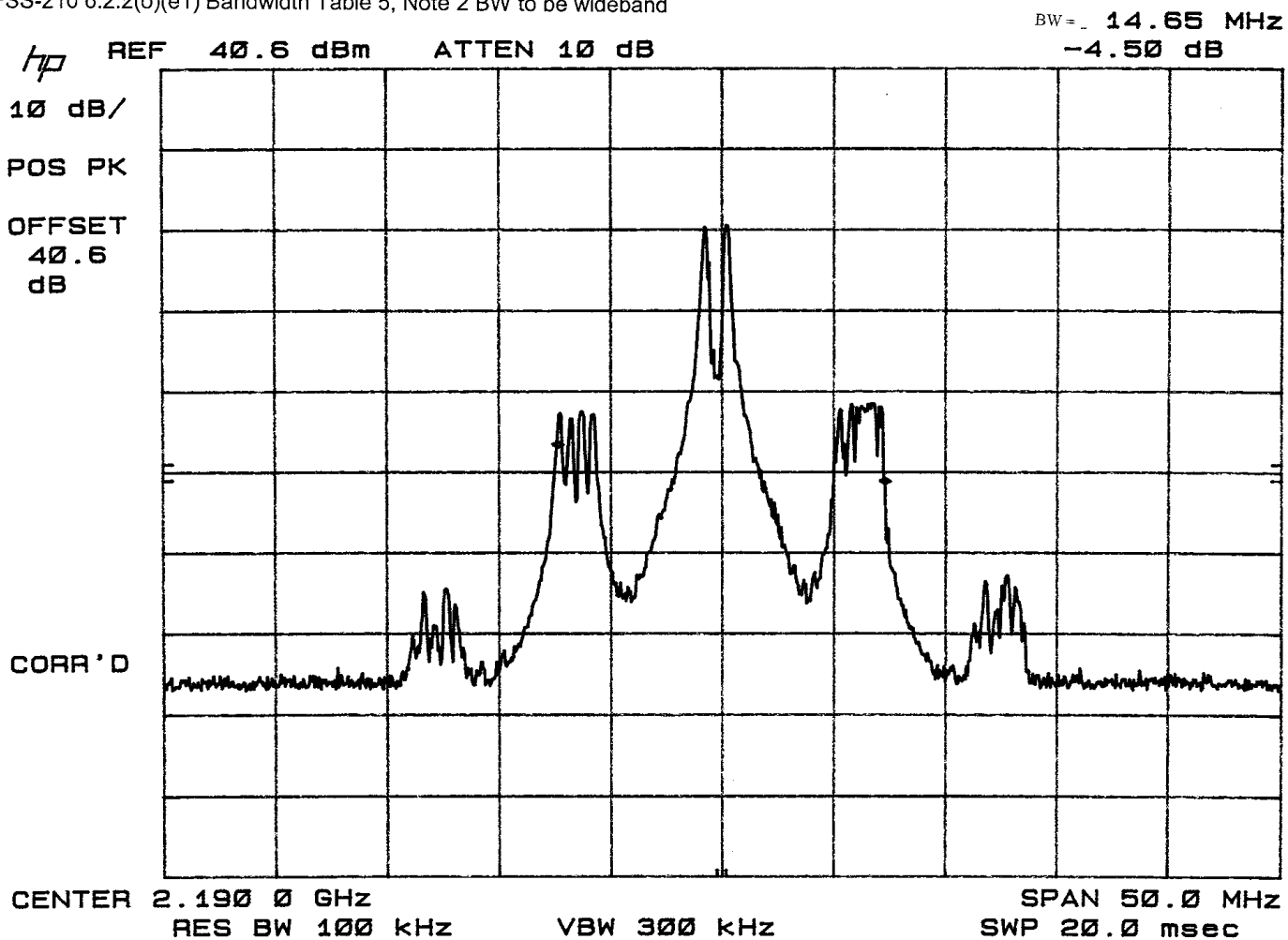
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 CFR 47 FCC 90.209 (b)(5) Bandwidth (-20 dB BW) < 16 MHz  
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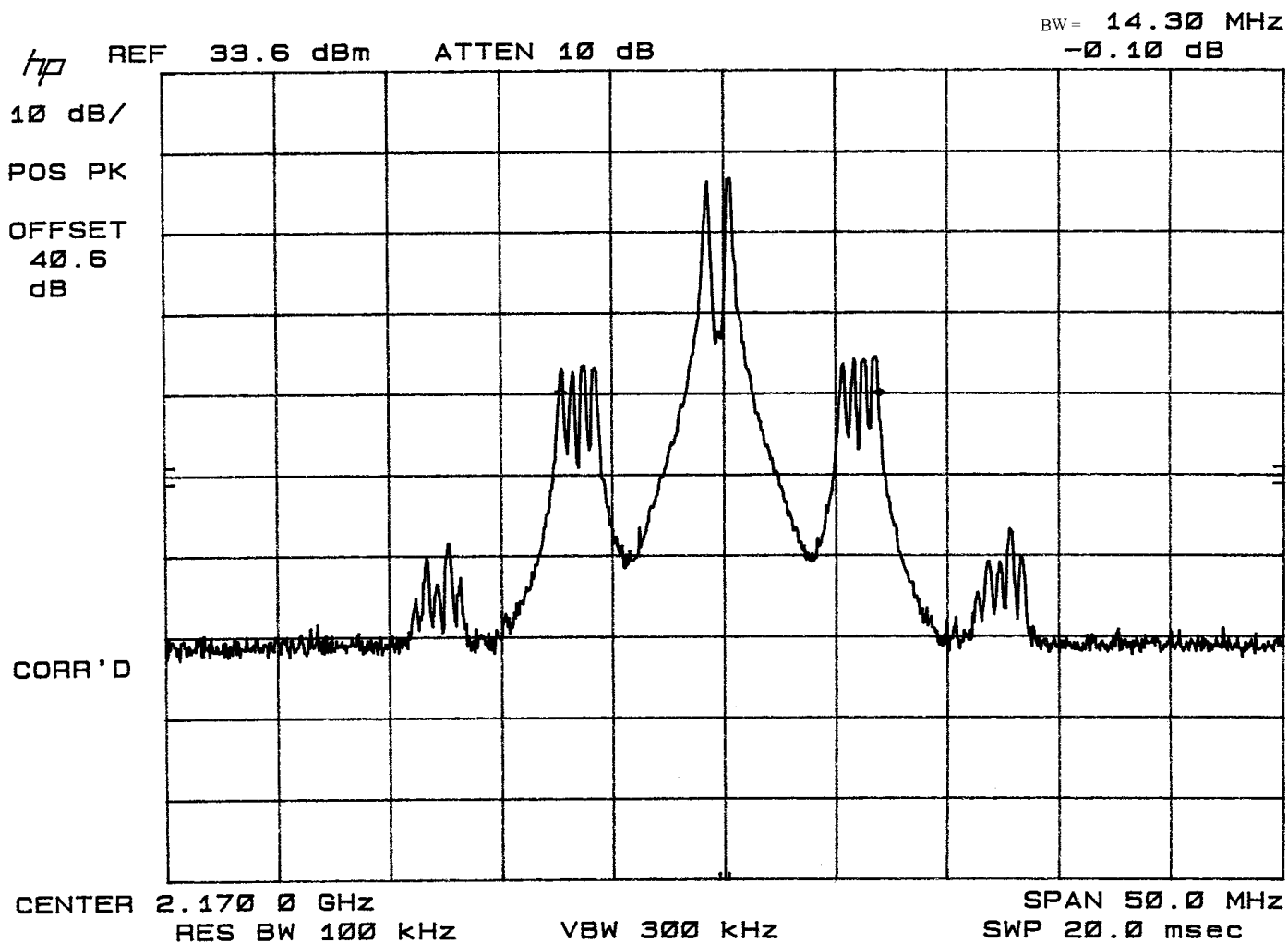
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May 22, 2003 LOCATION:SR2 TECH/ENGR: AAL

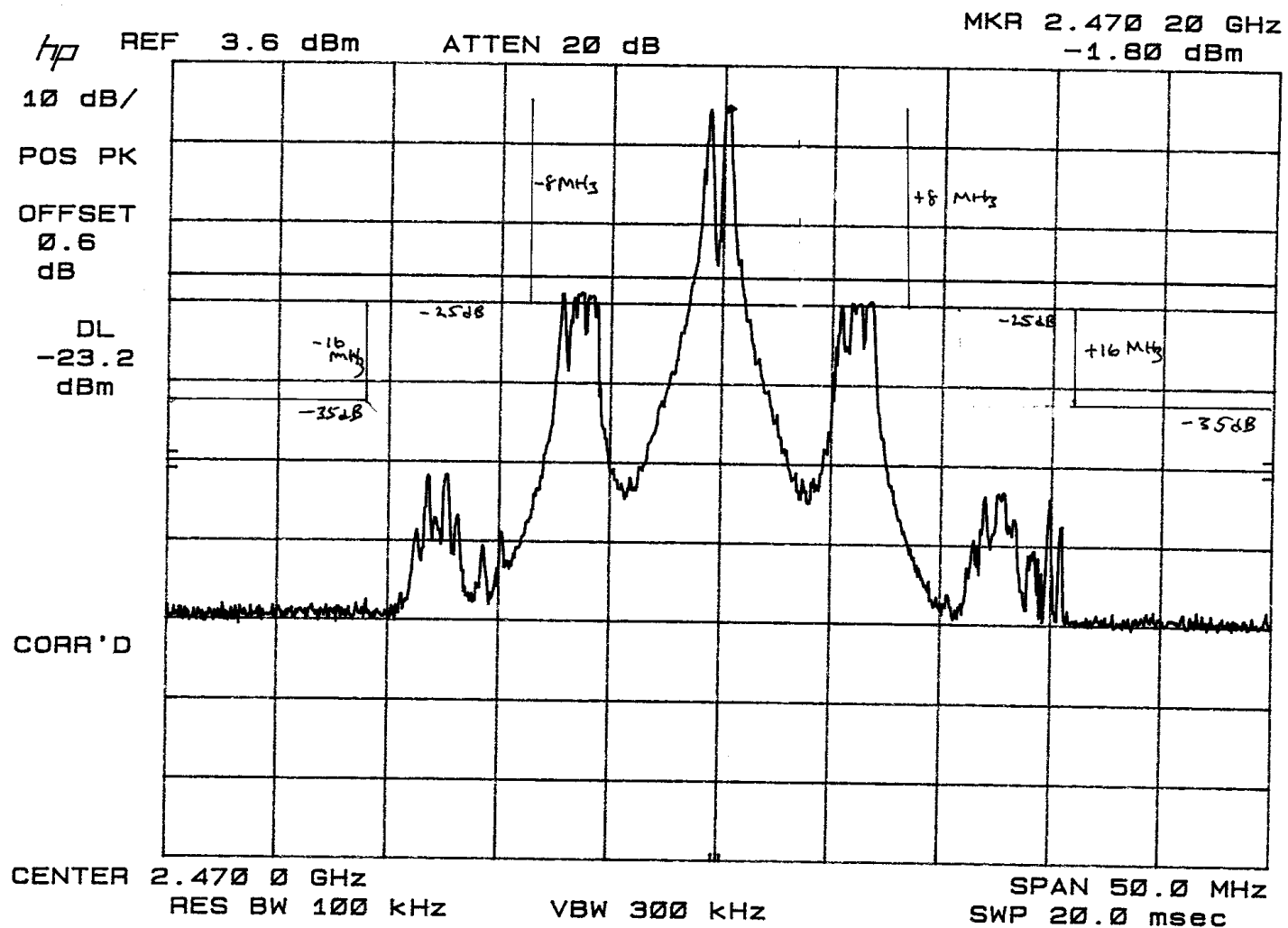


SC3001679 Avalon RF Model TX630 (High Power)  
 CFR 47 FCC 90.209 (b)(5) Bandwidth (-20 dB BW) < 16 MHz  
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May 22, 2003 LOCATION:SR2 TECH/ENGR: AAL

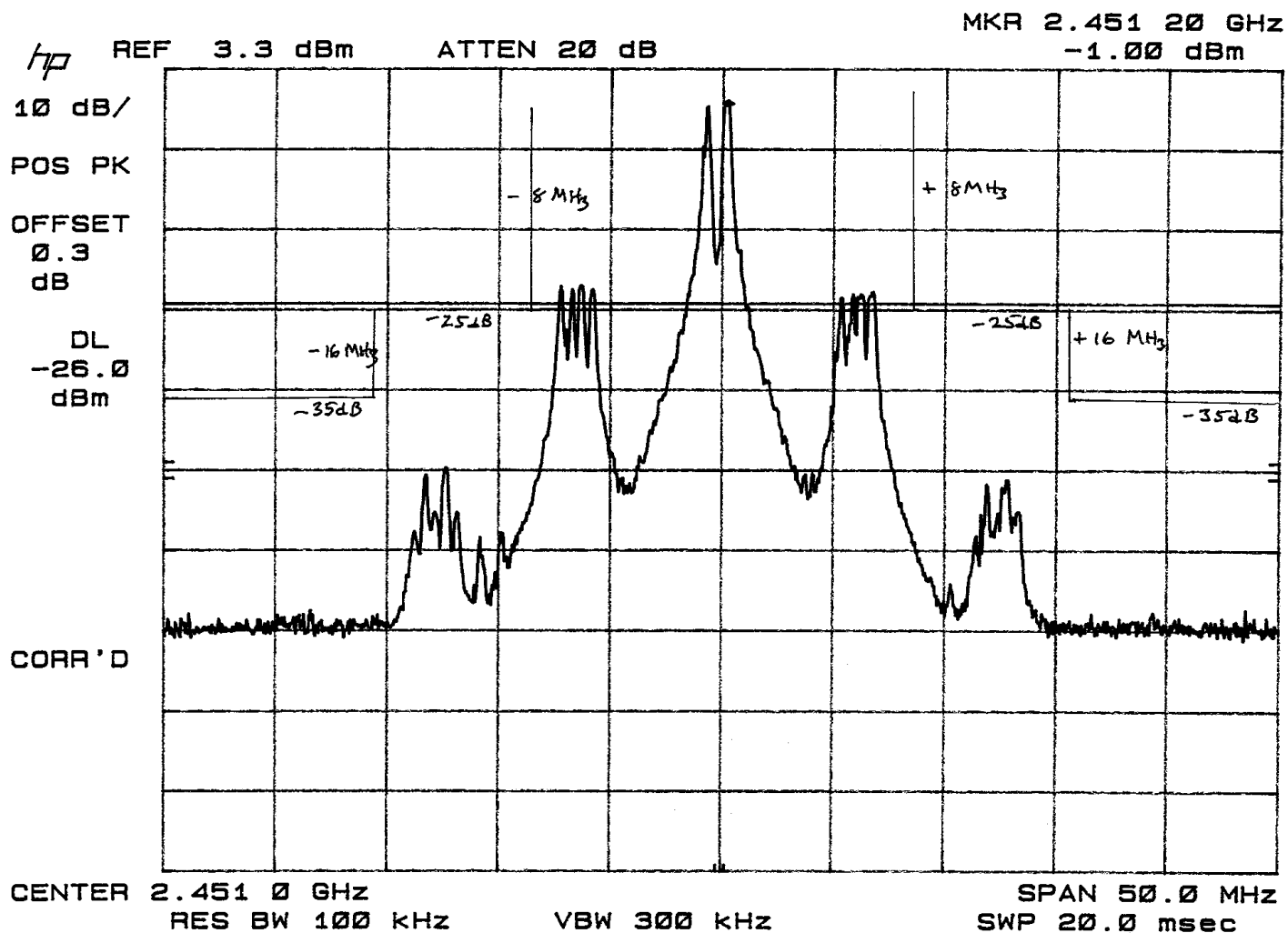


SC3001679 Avalon RF Model TX600 (Low Power) May 22, 2003 LOCATION:SR2 TECH/ENGR: AAL  
 CFR 47 FCC 90.210 (b) Emission Mask  
 FSS-210 6.2.2(o)(e1) Out of Band Emissions



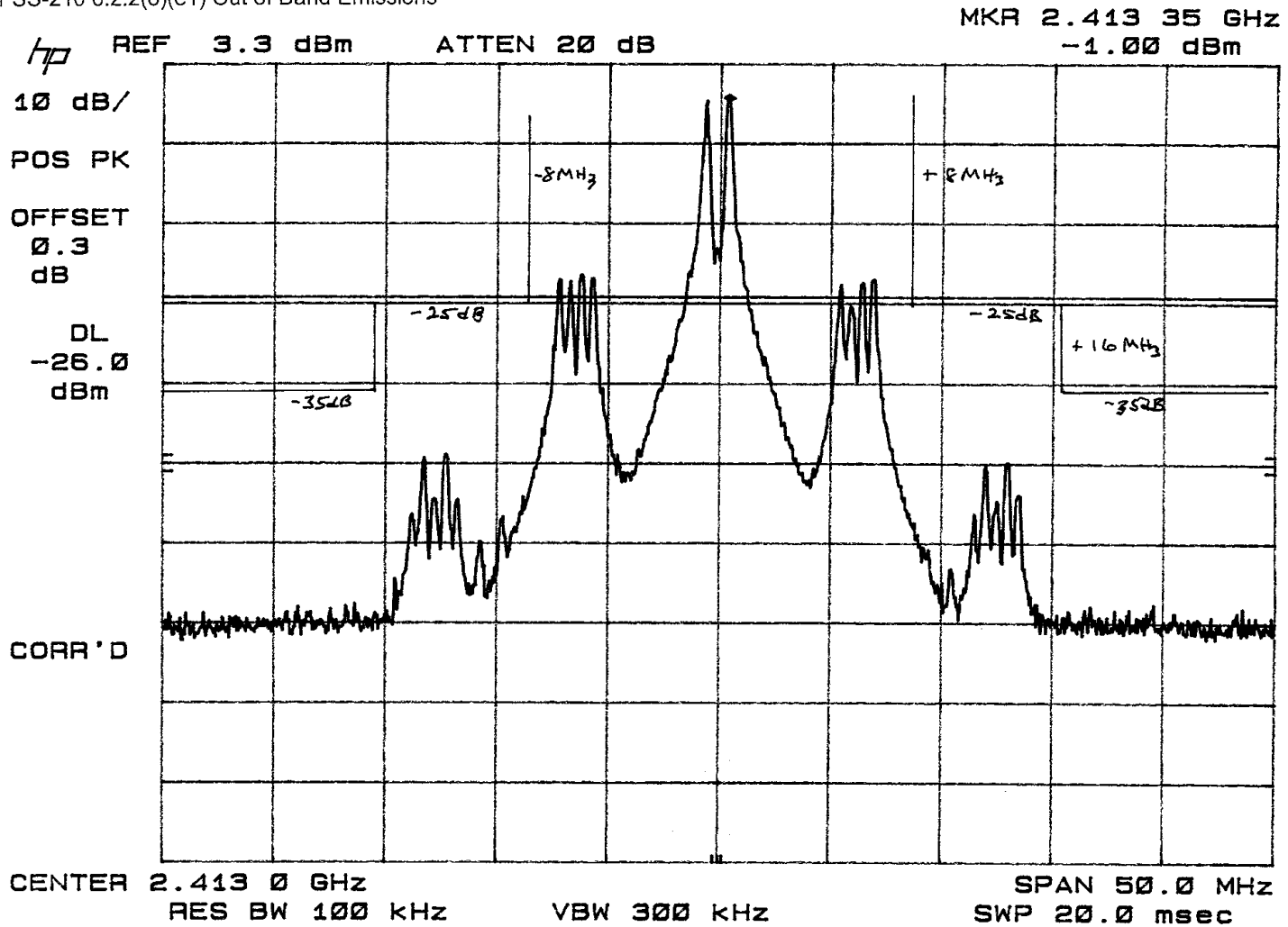
SC3001679 Avalon RF Model TX600 (Low Power)  
 CFR 47 FCC 90.210 (b) Emission Mask  
 FSS-210 6.2.2(o)(e1) Out of Band Emissions

May 22, 2003 LOCATION:SR2 TECH/ENGR: AAL



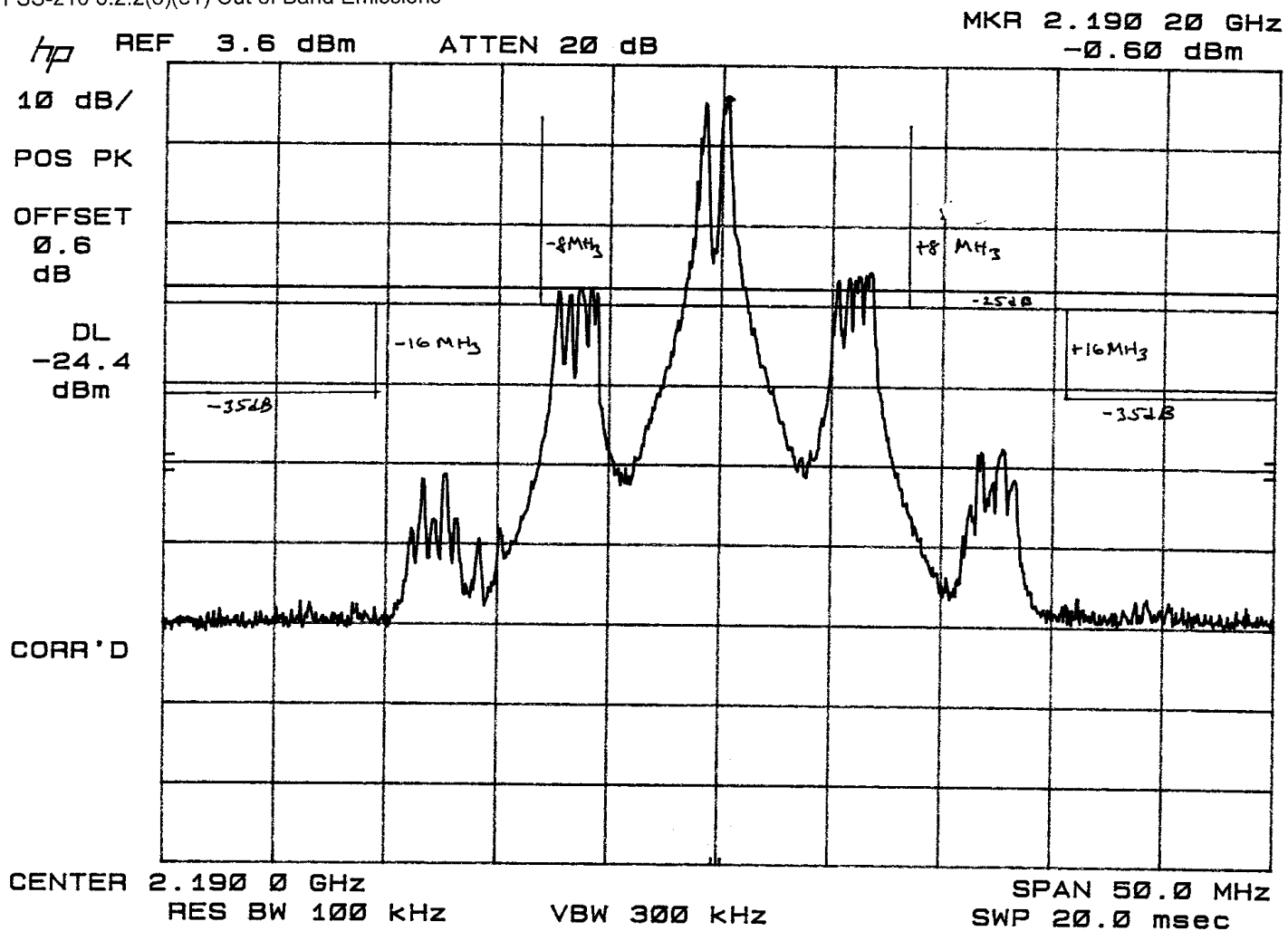
SC3001679 Avalon RF Model TX600 (Low Power)  
CFR 47 FCC 90.210 (b) Emission Mask  
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May 22, 2003 LOCATION:SR2 TECH/ENGR: AAL

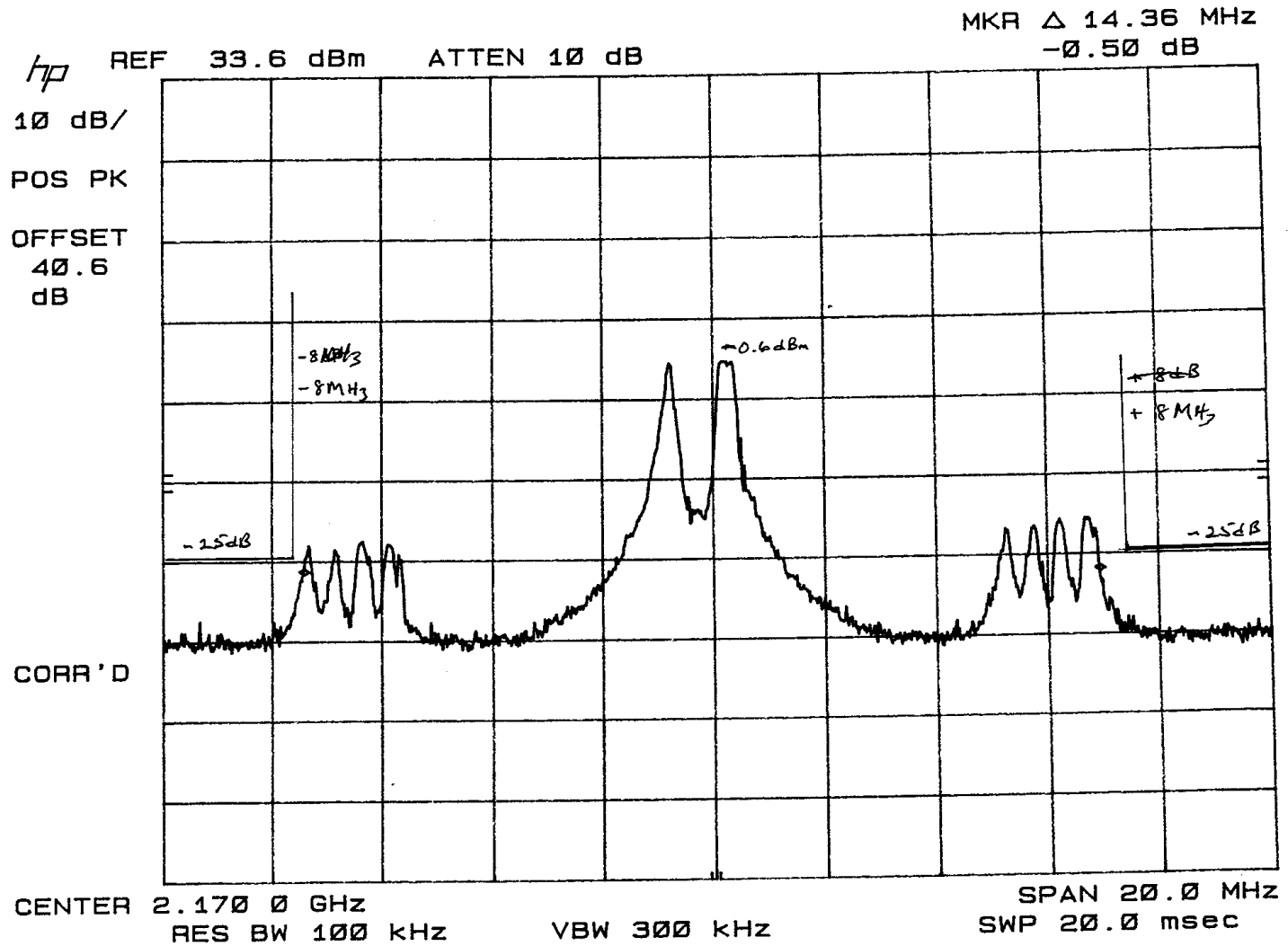


SC3001679 Avalon RF Model TX600 (Low Power)  
 CFR 47 FCC 90.210 (b) Emission Mask  
 FSS-210 6.2.2(o)(e1) Out of Band Emissions

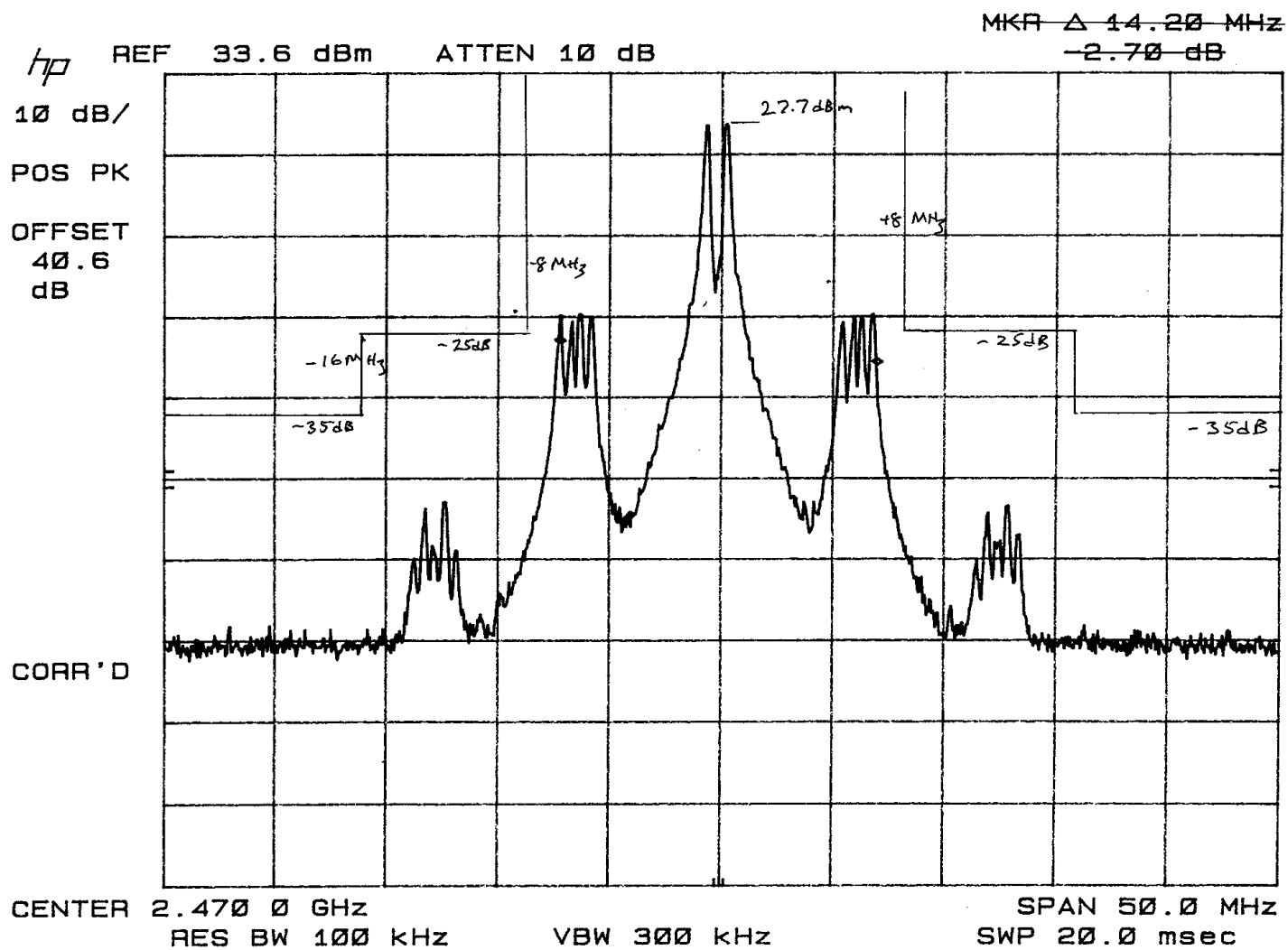
May 22, 2003 LOCATION:SR2 TECH/ENGR: AAL



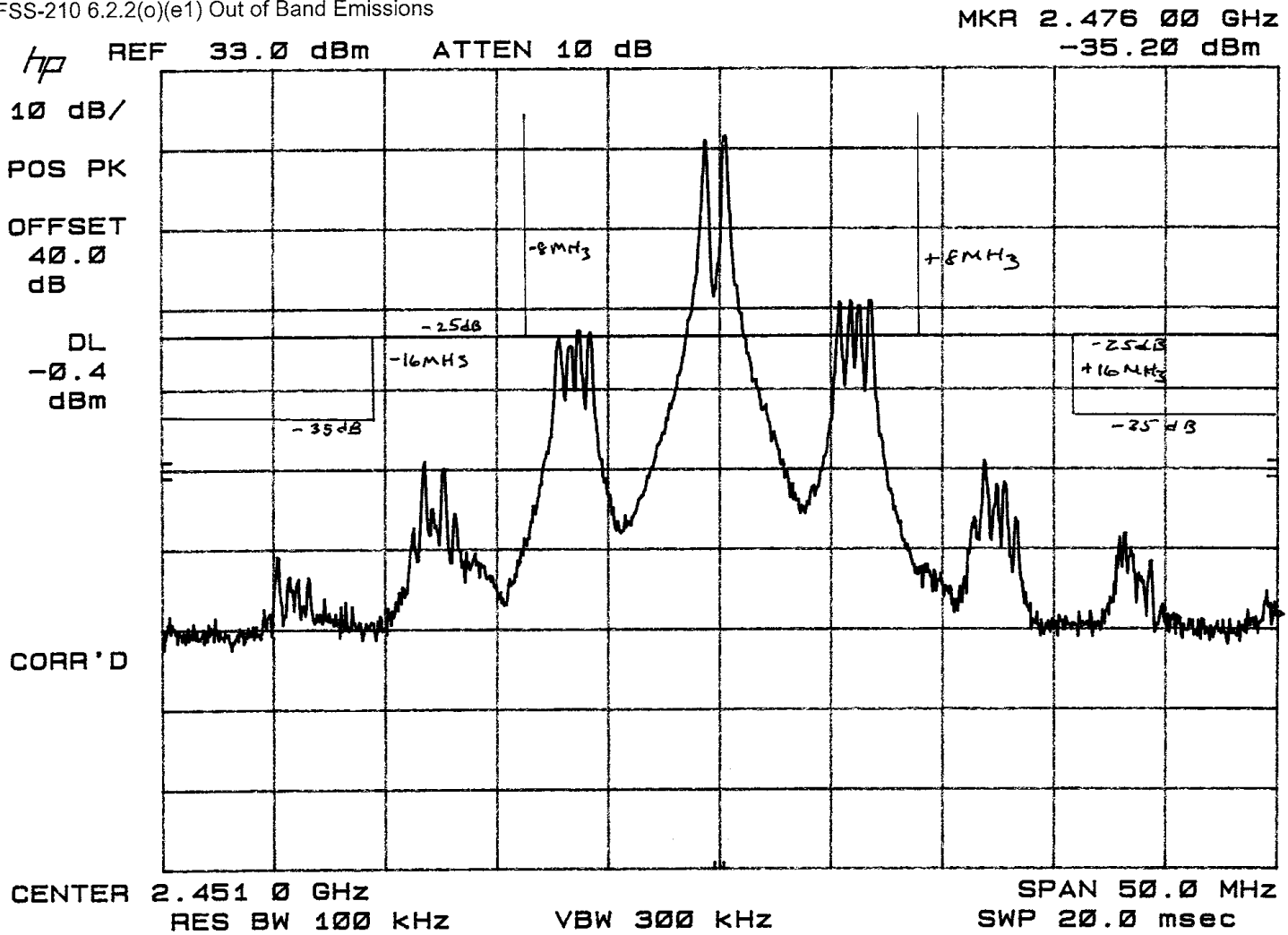
SC3001679 Avalon RF Model TX600 (Low Power) May 22, 2003 LOCATION:SR2 TECH/ENGR: AAL  
 CFR 47 FCC 90.210 (b) Emission Mask  
 FSS-210 6.2.2(o)(e1) Out of Band Emissions



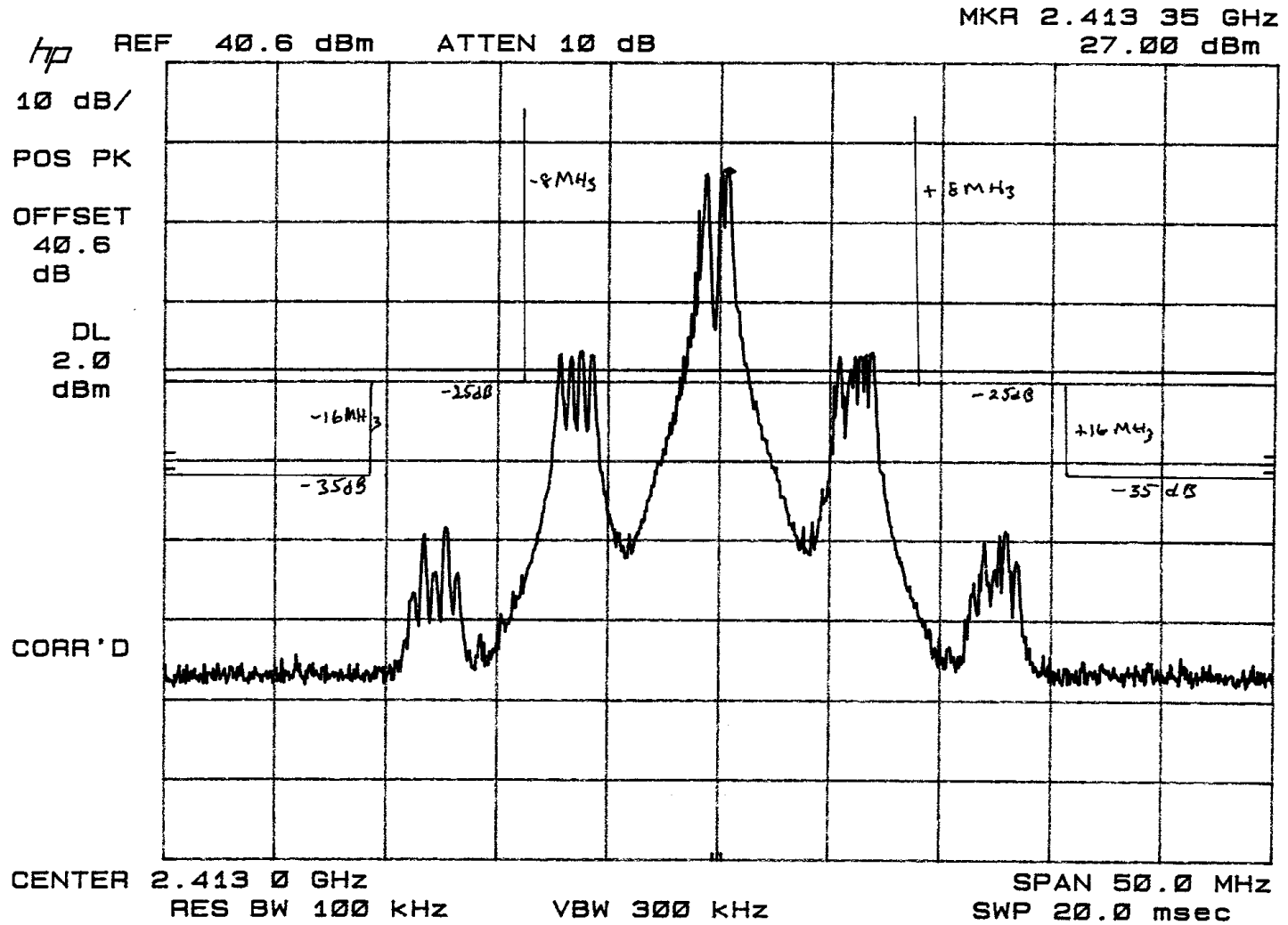
SC3001679 Avalon RF Model TX630 (High Power) May 22, 2003 LOCATION:SR2 TECH/ENGR: AAL  
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 FSS-210 6.2.2(o)(e1) Out of Band Emissions



SC3001679 Avalon RF Model TX630 (High Power) May 22, 2003 LOCATION:SR2 TECH/ENGR: AAL  
 CFR 47 FCC 90.210 (b) Emission Mask  
 FSS-210 6.2.2(o)(e1) Out of Band Emissions

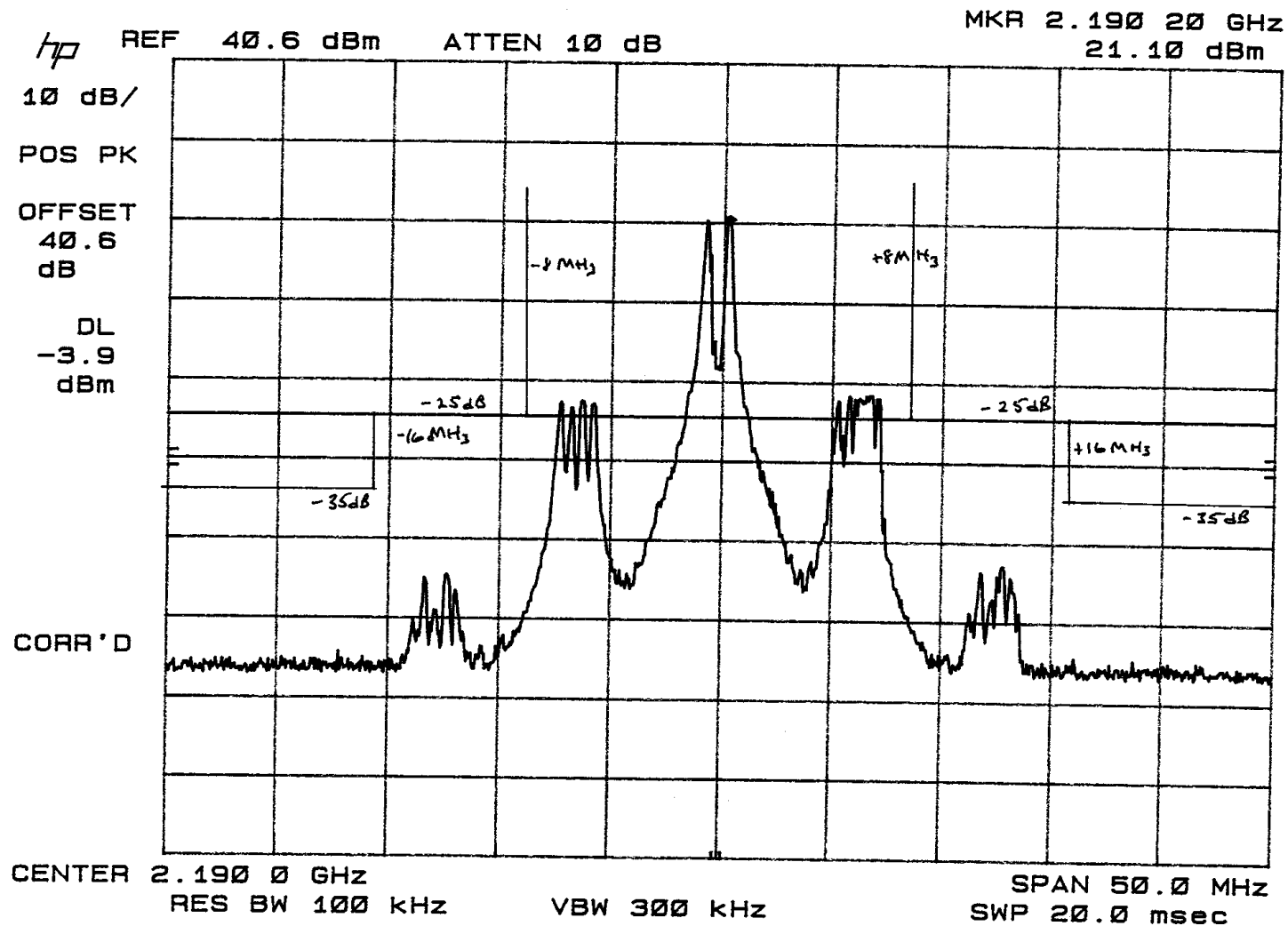


SC3001679 Avalon RF Model TX630 (High Power) May 22, 2003 LOCATION:SR2 TECH/ENGR: AAL  
 CFR 47 FCC 90.210 (b) Emission Mask  
 FSS-210 6.2.2(o)(e1) Out of Band Emissions

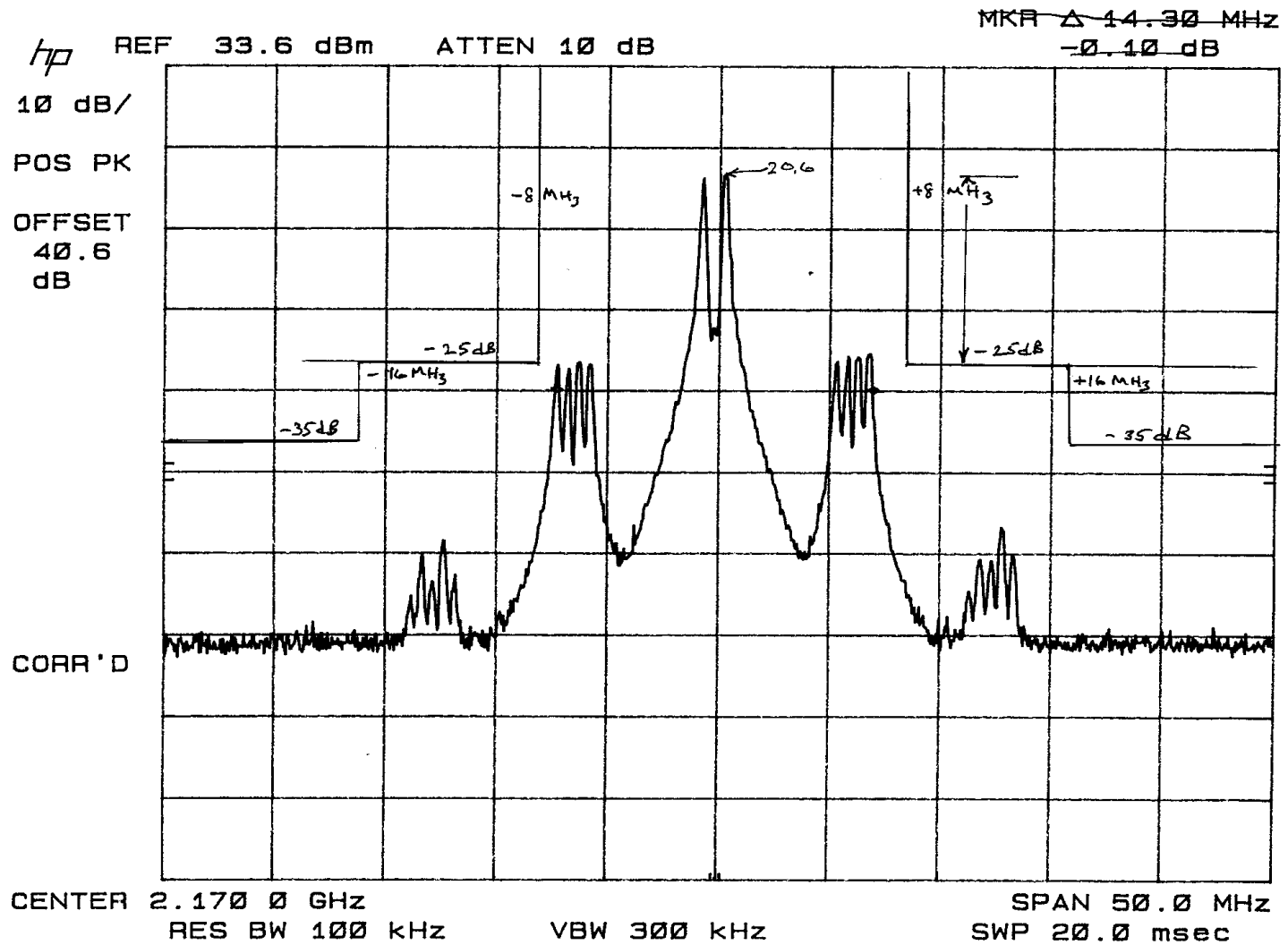


SC3001679 Avalon RF Model TX630 (High Power)  
 CFR 47 FCC 90.210 (b) Emission Mask  
 FSS-210 6.2.2(o)(e1) Out of Band Emissions

May 22, 2003 LOCATION:SR2 TECH/ENGR: AAL



SC3001679      Avalon RF      Model TX630 (High Power)      May 22, 2003      LOCATION:SR2      TECH/ENGR: AAL  
 CFR 47 FCC 90.210 (b) Emission Mask  
 FSS-210 6.2.2(o)(e1) Out of Band Emissions



Report No. SC301679-03

# FREQUENCY STABILITY

SHEET 1 OF 3



TEST REPORT # SC301679

TEST AREA TestRoom 2

DATE May 27, 2003

EUT MODEL # TX630

TEMPERATURE 23 °C

SPECIFICATION (S):

EUT SERIAL # 4002

HUMIDITY 49 %

FCC 74.661

EUT DESCRIPTION Video Transmitter

AIR PRESSURE 99.9 kPa

FCC 90.213

| TEMP 20 C | Frequency  |  |  | REMARKS                       |
|-----------|------------|--|--|-------------------------------|
| Baseline  | 2470.08903 |  |  | Limit is 0.002 % of frequency |

| TEMP -20 C<br>minute | Frequency  | DELTA %  | COMPLIES | REMARKS |
|----------------------|------------|----------|----------|---------|
| 1                    | 2470.09006 | 0.00004% | YES      |         |
| 2                    | 2470.09041 | 0.00006% | YES      |         |
| 3                    | 2470.09131 | 0.00009% | YES      |         |
| 4                    | 2470.09202 | 0.00012% | YES      |         |
| 5                    | 2470.09202 | 0.00012% | YES      |         |
| 6                    | 2470.09202 | 0.00012% | YES      |         |
| 7                    | 2470.09081 | 0.00007% | YES      |         |
| 8                    | 2470.09177 | 0.00011% | YES      |         |
| 9                    | 2470.09207 | 0.00012% | YES      |         |
| 10                   | 2470.09156 | 0.00010% | YES      |         |

| TEMP -10 C<br>minute | Frequency  | DELTA %  | COMPLIES | REMARKS |
|----------------------|------------|----------|----------|---------|
| 1                    | 2470.09041 | 0.00006% | YES      |         |
| 2                    | 2470.09141 | 0.00010% | YES      |         |
| 3                    | 2470.09237 | 0.00014% | YES      |         |
| 4                    | 2470.09232 | 0.00013% | YES      |         |
| 5                    | 2470.09070 | 0.00007% | YES      |         |
| 6                    | 2470.09232 | 0.00013% | YES      |         |
| 7                    | 2470.09187 | 0.00011% | YES      |         |
| 8                    | 2470.09207 | 0.00012% | YES      |         |
| 9                    | 2470.09187 | 0.00011% | YES      |         |
| 10                   | 2470.09262 | 0.00015% | YES      |         |

NOTES: Nominal Voltage = 12.0 Vdc

CW measured. Without modulation, EUT rf power output is automatically limited to -30.9 dBm.

TEST EQUIP. : 2,8,9,15

TESTED BY: A. Laudani

A. Laudani

FREQ STAB.doc  
5/23/02

# FREQUENCY STABILITY

SHEET 2 OF 3

TEST REPORT # SC301679

TEST AREA TestRoom 2



| TEMP 0 C<br>minute | Frequency  | DELTA %   | COMPLIES | REMARKS |
|--------------------|------------|-----------|----------|---------|
| 1                  | 2470.09287 | 0.00016%  | YES      |         |
| 2                  | 2470.09297 | 0.00016%  | YES      |         |
| 3                  | 2470.09212 | 0.00013%  | YES      |         |
| 4                  | 2470.09026 | 0.00005%  | YES      |         |
| 5                  | 2470.09056 | 0.00006%  | YES      |         |
| 6                  | 2470.09071 | 0.00007%  | YES      |         |
| 7                  | 2470.08021 | -0.00036% | YES      |         |
| 8                  | 2470.08826 | -0.00003% | YES      |         |
| 9                  | 2470.08821 | -0.00003% | YES      |         |
| 10                 | 2470.08751 | -0.00006% | YES      |         |

| TEMP +10 C<br>minute | Frequency  | DELTA %   | COMPLIES | REMARKS       |
|----------------------|------------|-----------|----------|---------------|
| 1                    | 2470.08561 | -0.00014% | YES      |               |
| 2                    | 2470.10562 | 0.00067%  | YES      | Largest delta |
| 3                    | 2470.10222 | 0.00053%  | YES      |               |
| 4                    | 2470.10202 | 0.00053%  | YES      |               |
| 5                    | 2470.09922 | 0.00041%  | YES      |               |
| 6                    | 2470.09772 | 0.00035%  | YES      |               |
| 7                    | 2470.09747 | 0.00034%  | YES      |               |
| 8                    | 2470.09687 | 0.00032%  | YES      |               |
| 9                    | 2470.09957 | 0.00043%  | YES      |               |
| 10                   | 2470.09667 | 0.00031%  | YES      |               |

| TEMP +20 C<br>minute | Frequency  | DELTA %  | COMPLIES | REMARKS |
|----------------------|------------|----------|----------|---------|
| 1                    | 2470.09732 | 0.00034% | YES      |         |
| 2                    | 2470.09752 | 0.00034% | YES      |         |
| 3                    | 2470.09462 | 0.00023% | YES      |         |
| 4                    | 2470.09432 | 0.00021% | YES      |         |
| 5                    | 2470.09347 | 0.00018% | YES      |         |
| 6                    | 2470.09252 | 0.00014% | YES      |         |
| 7                    | 2470.09392 | 0.00020% | YES      |         |
| 8                    | 2470.09302 | 0.00016% | YES      |         |
| 9                    | 2470.09302 | 0.00016% | YES      |         |
| 10                   | 2470.09347 | 0.00018% | YES      |         |

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# FREQUENCY STABILITY

SHEET 3 OF 3



TEST REPORT # SC301679

TEST AREA TestRoom 2

| TEMP +30 C<br>Minute | Frequency  | DELTA %  | COMPLIES |  | REMARKS |
|----------------------|------------|----------|----------|--|---------|
| 1                    | 2470.09321 | 0.00017% | YES      |  |         |
| 2                    | 2470.09031 | 0.00005% | YES      |  |         |
| 3                    | 2470.09041 | 0.00006% | YES      |  |         |
| 4                    | 2470.08966 | 0.00003% | YES      |  |         |
| 5                    | 2470.09001 | 0.00004% | YES      |  |         |
| 6                    | 2470.09081 | 0.00007% | YES      |  |         |
| 7                    | 2470.08965 | 0.00003% | YES      |  |         |
| 8                    | 2470.08950 | 0.00002% | YES      |  |         |
| 9                    | 2470.08995 | 0.00004% | YES      |  |         |
| 10                   | 2470.09025 | 0.00005% | YES      |  |         |

| TEMP +40 C<br>Minute | Frequency  | DELTA %   | COMPLIES |  | REMARKS |
|----------------------|------------|-----------|----------|--|---------|
| 1                    | 2470.09900 | 0.00040%  | YES      |  |         |
| 2                    | 2470.08855 | -0.00002% | YES      |  |         |
| 3                    | 2470.08875 | -0.00001% | YES      |  |         |
| 4                    | 2470.08810 | -0.00004% | YES      |  |         |
| 5                    | 2470.08850 | -0.00002% | YES      |  |         |
| 6                    | 2470.08920 | 0.00001%  | YES      |  |         |
| 7                    | 2470.08965 | 0.00003%  | YES      |  |         |
| 8                    | 2470.08950 | 0.00002%  | YES      |  |         |
| 9                    | 2470.08995 | 0.00004%  | YES      |  |         |
| 10                   | 2470.09025 | 0.00005%  | YES      |  |         |

| TEMP +50 C<br>Minute | Frequency  | DELTA %  | COMPLIES |  | REMARKS |
|----------------------|------------|----------|----------|--|---------|
| 1                    | 2470.08905 | 0.00000% | YES      |  |         |
| 2                    | 2470.08975 | 0.00003% | YES      |  |         |
| 3                    | 2470.08995 | 0.00004% | YES      |  |         |
| 4                    | 2470.08980 | 0.00003% | YES      |  |         |
| 5                    | 2470.09205 | 0.00012% | YES      |  |         |
| 6                    | 2470.09205 | 0.00012% | YES      |  |         |
| 7                    | 2470.09190 | 0.00012% | YES      |  |         |
| 8                    | 2470.09190 | 0.00012% | YES      |  |         |
| 9                    | 2470.09195 | 0.00012% | YES      |  |         |
| 10                   | 2470.09230 | 0.00013% | YES      |  |         |

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# FREQUENCY STABILITY

SHEET 1 OF 1



TEST REPORT # SC301679

TEST AREA TestRoom 2

DATE May 27, 2003

EUT MODEL # TX630

TEMPERATURE 23 °C

SPECIFICATION (S):

EUT SERIAL # 4002

HUMIDITY 49 %

RSS210 clause 6.2.2(o)  
clause 6.4

EUT DESCRIPTION Video Transmitter

AIR PRESSURE 99.9 kPa

| Frequency   | Temperature     | DELTA %    | COMPLIES |  | REMARKS                      |
|-------------|-----------------|------------|----------|--|------------------------------|
| 2470.089036 | 20 C            |            |          |  | Limit is 0.02 % of frequency |
| 2470.089560 | +50 C           | +0.00002   | YES      |  |                              |
| 2470.090060 | -20 C           | +0.00004   | YES      |  |                              |
|             | Voltage at 20 C |            |          |  |                              |
| 2470.089036 | 100 %           |            |          |  |                              |
| 2470.089026 | 115 %           | -0.0000004 | YES      |  |                              |
| 2470.089046 | 85 %            | +0.0000004 | YES      |  |                              |

NOTES: Nominal Voltage = 12.0 Vdc

CW measured. Without modulation, EUT rf power output is automatically limited to -30.9 dBm.

TEST EQUIP. : 2,8,9,15

TESTED BY: A. Laudani

A. Laudani

|              |    |                |     |
|--------------|----|----------------|-----|
| Temperature: | 24 | Rel. Humidity: | 45% |
|--------------|----|----------------|-----|

ver 1.8a

| Transmit Mode | FREQUENCY (MHz) | VERTICAL measured (dBuV) | HORIZONTAL measured (dBuV) | Cable loss (dB) | Coupler AF (dB) | Signal Generator (dBm) | Total (ERP) | SPECIFIED LIMIT (dBm) | EUT MARGIN (dB) |
|---------------|-----------------|--------------------------|----------------------------|-----------------|-----------------|------------------------|-------------|-----------------------|-----------------|
| L2470         | 60.00           | 22.1                     |                            | 10.2            | -9.9            | -51                    | -71.1       | -55.2                 | -15.9           |
| H2451         | 132.00          | 17.4                     |                            | 10.5            | -9.93           | -56.7                  | -77.13      | -51.7                 | -25.4           |
| H2470         | 186.00          |                          | 10.3                       | 10.7            | -9.95           | -67.4                  | -88.05      | -51.7                 | -36.4           |
| L2190         | 189.00          | 26.9                     |                            | 10.7            | -9.95           | -41.5                  | -62.15      | -51.7                 | -10.5           |
| L2170         | 216.00          | 24.3                     |                            | 12.4            | -10             | -40.9                  | -63.3       | -49.2                 | -14.1           |
| L2190         | 220.12          | 7.9                      |                            | 12.4            | -10             | -60                    | -82.4       | -49.2                 | -33.2           |

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#### 4.0 ATTESTATION STATEMENT

##### GENERAL REMARKS:

##### SUMMARY:

All tests were performed per CFR 47, Part(s) 2.1051, 15.209(a), 74.636, 74.661, 90.205(l), 90.209(b), 90.210(b), 90.213

■ - Performed

The Equipment Under Test

■ - **Fulfills** the requirements of CFR 47, Part(s) 2.1051, 15.209(a), 74.636, 74.661, 90.205(l), 90.209(b), 90.210(b), 90.213

Testing Start Date: 22 May 2003

Testing End Date: 27 May 2003

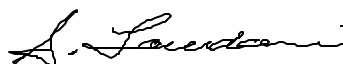
##### - TÜV AMERICA, INC. -

Responsible Engineer:



Jim Owen  
(EMC Chief Engineer)

Responsible Engineer:



Alan Laudani  
(EMC Engineer)