# CERTIFICATE OF COMPLIANCE
# FCC PART 22 MEASUREMENTS

**Test Lab:**

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**Applicant Information:**

**ITRONIX CORPORATION**
801 South Stevens Street
Spokane, WA 99024
Attn: Fred Phillips, Certification Engineer
Phone: 509-742-1506
Fax: 509-626-4204

| | |
|---|---|
| **FCC Classification:** | **Licensed Non-Broadcast Station Transmitter (TNB)** |
| **FCC Rule Part(s):** | **§22.901(d), §2** |
| **FCC ID:** | **KBCIX550AC300** |
| **Model(s):** | **IX550** |
| **Equipment Type:** | **Rugged Laptop PC with Sierra Wireless PCMCIA CDPD Modem Card Model: AirCard 300/350** |
| **Tx Frequency Range:** | **824-849 MHz** |
| **Rx Frequency Range:** | **869-894 MHz** |
| **Max. RF Output Power:** | **0.591 Watts (ERP)** |
| **Frequency Tolerance:** | **2.5 PPM** |
| **Emission Designator:** | **31K5FXW** |
| **Antenna Type:** | **Itronix Dipole Antenna** |

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in §2.947.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

Celltech Research Inc. certifies that no party to this application has been denied FCC benefits pursuant to Section 5301 of the Anti-Drug Abuse Act of 1988, 21 U.S.C. 853(a).

**Shawn McMillen**
**General Manager**
**Celltech Research Inc.**

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# MEASUREMENT REPORT - FCC PART 22

## *1.1 SCOPE*

Measurement and determination of electromagnetic emissions (EME) from radio frequency devices for compliance with the technical rules and regulations of the Federal Communications Commission.

### *§2.1033(a) General Information*

**APPLICANT:**

**ITRONIX CORPORATION**
**801 South Stevens Street**
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**Attn: Fred Phillips, Certification Engineer**

| | |
|---|---|
| **FCC ID** | **KBCIX550AC300** |
| **Model(s)** | **IX550** |
| **EUT Type** | **Rugged Laptop PC with Sierra Wireless PCMCIA CDPD Modem Card Model: AirCard 300/350** |
| **Classification** | **Licensed Non-Broadcast Station Transmitter (TNB)** |
| **Rule Part(s)** | **§22.901(d), §2** |
| **Max. RF Output Power** | **0.591 Watts (ERP)** |
| **Tx Freq. Range** | **824-849 MHz** |
| **Rx Freq. Range** | **869-894 MHz** |
| **Emission Designator** | **31K5FXW** |
| **Signal Modulation** | **GMSK** |
| **Mode(s) Tested** | **Unmodulated Carrier** |
| **Antenna Type** | **Itronix Dipole Antenna** |

## *2.1 MEASUREMENT PROCEDURES*

## *2.2 SPURIOUS EMISSIONS AT ANTENNA TERMINAL - §2.1051*

The level of the carrier and the various conducted spurious and harmonic frequencies were measured by means of a calibrated spectrum analyzer. The spectrum was scanned from 10MHz to 20GHz. The antenna output terminal of the EUT was connected to the input of a 50Ω spectrum analyzer through a matched 30dB attenuator and coaxial cable. The transmitter was operating at maximum power with internal data modulation.

## *2.3 RADIATED SPURIOUS AND HARMONIC EMISSIONS - §2.1053*

Radiated and harmonic emissions above 1 GHz were measured at our 3-meter outdoor site. The EUT was placed on the turntable with the transmitter transmitting into a non-radiating load. A receiving antenna located 3 meters from the turntable received any signal radiated from the transmitter and its operating accessories. The receiving antenna was varied from 1 to 4 meters and the polarization was varied (horizontal and vertical) to determine the worst-case emission level.

## *2.4 FREQUENCY STABILITY/TEMPERATURE VARIATION - §2.1055*

The frequency stability of the transmitter is measured by:
a) Temperature: The temperature is varied from -30°C to +60°C using an environmental chamber.
b) Primary Supply Voltage: The primary supply voltage is varied from 85% to 115% of the voltage normally at the input to the device or at the power supply terminals if cables are not normally supplied. The EUT is tested down to the battery endpoint.

*Specification – The minimum frequency stability shall be +/- 0.00025% at any time during normal operation.*

Time Period and Procedure:

1. The carrier frequency of the transmitter and the individual oscillators is measured at room temperature (25°C to 27°C to provide a reference).
2. The equipment is subjected to an overnight “soak” at -30°C without any power applied.
3. After the overnight “soak” at -30°C (usually 14-16 hours), the equipment is turned on in a “standby” condition for one minute before applying power to the transmitter. Measurement of the carrier frequency of the transmitter and the individual oscillators is made within a three-minute interval after applying power to the transmitter.
4. Frequency measurements were made at 10°C intervals up to +60°C then back to room temperature. A minimum period of one and one half-hour is provided to allow stabilization of the equipment at each temperature level.

## *3.1 TEST DATA*

## *3.2 EFFECTIVE RADIATED POWER OUTPUT - §2.1046*

| Freq. Tuned | EUT Conducted Power | Max. Field Strength of EUT (dBm) | Dipole Gain | Dipole Forward Conducted Power | ERP of EUT Dipole Gain + Dipole Forward Conducted Power | |
|---|---|---|---|---|---|---|
| (MHz) | (dBm) | Vertical Pol. | (dBd) | (dBm) | (dBm) | (Watts) |
| 824.04 | 26.71 | - 15.14 | - 1.44 | 29.16 | 27.72 | 0.591 |
| 836.49 | 26.71 | - 13.25 | - 1.34 | 28.83 | 27.49 | 0.561 |
| 848.97 | 26.50 | - 15.84 | - 1.24 | 26.79 | 25.55 | 0.359 |

Notes:

ERP Measurements by Substitution Method:

The EUT was placed on a turntable 3-meters from the receive antenna. The field of maximum intensity was found by rotating the EUT approximately 360 degrees and changing the height of the receive antenna from 1 to 4 meters. The field strength was recorded from a calibrated spectrum analyzer for each channel being tested. A half-wave dipole was substituted in place of the EUT. The dipole was fed through a directional coupler and the power at the coupler port was monitored. A signal generator and power amplifier controlled the dipole, and the input level of the dipole was adjusted to the same field strength level as the EUT. The feed point for the dipole was then connected to a calibrated power meter and the power adjusted to read the same as the coupler port previously recorded, this is to account for any mismatch in impedance, which may occur at the dipole antenna. The conducted power at the antenna feed point was recorded. The forward power for the dipole was then determined and the ERP level was determined by adding the forward dipole power and the dipole gain in dB. For readings above 1GHz the above method is repeated using standard gain horn antennas.

### *3.3 FIELD STRENGTH OF SPURIOUS RADIATION - 2.1053*

| | |
|---|---|
| Operating Frequency (MHz): | 824.04 |
| Channel: | 991 (Low) |
| Measured Cond. Pwr. (dBm): | 26.71 |
| Measured ERP (dBm): | 27.72 |
| Modulation: | Unmodulated Carrier |
| Distance: | 3 Meters |
| Limit: | 43 + 10 log (W) = 40.31 dBc |

| **Frequency** (MHz) | **Field Strength of Spurious Radiation** (dBm) | **Horn Forward Cond. Pwr.** (dBm) | **Standard Gain Horn Antenna Gain** (dBi) | **POL** (H/V) | **EIRP** (dBm) | **ERP** (dBm) | **dBc** |
|---|---|---|---|---|---|---|---|
| 1648.08 | -55.04 | -29.86 | 6.6 | V | -23.26 | -25.40 | 53.12 |
| 2472.12 | -80.06 | -52.86 | 7.8 | V | -45.06 | -47.20 | 74.92 |
| 3296.16 | -85.32 | -50.66 | 7.75 | V | -42.91 | -45.05 | 72.77 |
| 4120.20 | -89.01 | -59.99 | 7.6 | V | -52.39 | -54.53 | 82.25 |
| 4944.24 | < -104 | | | | | | |
| 5768.28 | < -104 | | | | | | |
| 6592.32 | < -104 | | | | | | |
| 7416.36 | < -104 | | | | | | |
| 8240.40 | < -104 | | | | | | |

Notes:
Radiated Measurements by Substitution Method:

The EUT was placed on a turntable 3-meters from the receive antenna. The field of maximum intensity was found by rotating the EUT approximately 360 degrees and changing the height of the receive antenna from 1 to 4 meters. The field strength was recorded from a calibrated spectrum analyzer for each channel being tested. A standard gain horn antenna was substituted in place of the EUT. The antenna was fed through a directional coupler and the power at the coupler port was monitored. A signal generator and power amplifier controlled the antenna, and the input level of the antenna was adjusted to the same field strength level as the EUT. The feed point for the antenna was then connected to a calibrated power meter and the power adjusted to read the same as the coupler port previously recorded, this is to account for any mismatch in impedance, which may occur at the horn antenna. The conducted power at the antenna feed point was recorded. The forward power for the antenna was then determined and the EIRP level was determined by adding the forward power and the antenna gain in dB.

***FIELD STRENGTH OF SPURIOUS RADIATION - 2.1053***

| | |
|---|---|
| Operating Frequency (MHz): | 836.49 |
| Channel: | 383 (Mid) |
| Measured Cond. Pwr. (dBm): | 26.71 |
| Measured ERP (dBm): | 27.49 |
| Modulation: | Unmodulated Carrier |
| Distance: | 3 Meters |
| Limit: | 43 + 10 log (W) = 40.31 dBc |

| **Frequency** (MHz) | **Field Strength of Spurious Radiation** (dBm) | **Horn Forward Cond. Pwr.** (dBm) | **Standard Gain Horn Antenna Gain** (dBi) | **POL** (H/V) | **EIRP** (dBm) | **ERP** (dBm) | **dBc** |
|---|---|---|---|---|---|---|---|
| 1672.98 | -64.04 | -41.15 | 6.6 | V | -34.55 | -36.69 | 64.18 |
| 2509.47 | -85.29 | -55.49 | 7.8 | V | -47.69 | -49.83 | 77.32 |
| 3345.96 | -76.02 | -49.44 | 7.75 | V | -41.69 | -43.83 | 71.32 |
| 4182.45 | < -104 | | | | | | |
| 5018.94 | < -104 | | | | | | |
| 5855.43 | < -104 | | | | | | |
| 6691.92 | < -104 | | | | | | |
| 7528.41 | < -104 | | | | | | |
| 8364.90 | < -104 | | | | | | |

Notes:

Radiated Measurements by Substitution Method:

The EUT was placed on a turntable 3-meters from the receive antenna. The field of maximum intensity was found by rotating the EUT approximately 360 degrees and changing the height of the receive antenna from 1 to 4 meters. The field strength was recorded from a calibrated spectrum analyzer for each channel being tested. A standard gain horn antenna was substituted in place of the EUT. The antenna was fed through a directional coupler and the power at the coupler port was monitored. A signal generator and power amplifier controlled the antenna, and the input level of the antenna was adjusted to the same field strength level as the EUT. The feed point for the antenna was then connected to a calibrated power meter and the power adjusted to read the same as the coupler port previously recorded, this is to account for any mismatch in impedance, which may occur at the horn antenna. The conducted power at the antenna feed point was recorded. The forward power for the antenna was then determined and the EIRP level was determined by adding the forward power and the antenna gain in dB.

***FIELD STRENGTH OF SPURIOUS RADIATION - 2.1053***

| | |
|---|---|
| Operating Frequency (MHz): | 848.97 |
| Channel: | 799 (High) |
| Measured Cond. Pwr. (dBm): | 26.5 |
| Measured ERP (dBm): | 25.55 |
| Modulation: | Unmodulated Carrier |
| Distance: | 3 Meters |
| Limit: | 43 + 10 log (W) = 40.31 dBc |

| **Frequency** (MHz) | **Field Strength of Spurious Radiation** (dBm) | **Horn Forward Cond. Pwr.** (dBm) | **Standard Gain Horn Antenna Gain** (dBi) | **POL** (H/V) | **EIRP** (dBm) | **ERP** (dBm) | **dBc** |
|---|---|---|---|---|---|---|---|
| 1697.94 | -64.65 | -39.07 | 6.6 | V | -32.47 | -34.61 | 60.16 |
| 2546.91 | -80.02 | -52.42 | 7.8 | V | -44.62 | -46.76 | 72.31 |
| 3395.88 | -82.96 | -45.07 | 7.75 | V | -37.32 | -39.46 | 65.01 |
| 4244.85 | < -104 | | | | | | |
| 5093.82 | < -104 | | | | | | |
| 5942.79 | < -104 | | | | | | |
| 6791.76 | < -104 | | | | | | |
| 7640.73 | < -104 | | | | | | |
| 8489.70 | < -104 | | | | | | |

Notes:
Radiated Measurements by Substitution Method:

The EUT was placed on a turntable 3-meters from the receive antenna. The field of maximum intensity was found by rotating the EUT approximately 360 degrees and changing the height of the receive antenna from 1 to 4 meters. The field strength was recorded from a calibrated spectrum analyzer for each channel being tested. A standard gain horn antenna was substituted in place of the EUT. The antenna was fed through a directional coupler and the power at the coupler port was monitored. A signal generator and power amplifier controlled the antenna, and the input level of the antenna was adjusted to the same field strength level as the EUT. The feed point for the antenna was then connected to a calibrated power meter and the power adjusted to read the same as the coupler port previously recorded, this is to account for any mismatch in impedance, which may occur at the horn antenna. The conducted power at the antenna feed point was recorded. The forward power for the antenna was then determined and the EIRP level was determined by adding the forward power and the antenna gain in dB.

### *3.4 FREQUENCY STABILITY - § 2.1055*

Operating Frequency: 836,490,000 Hz

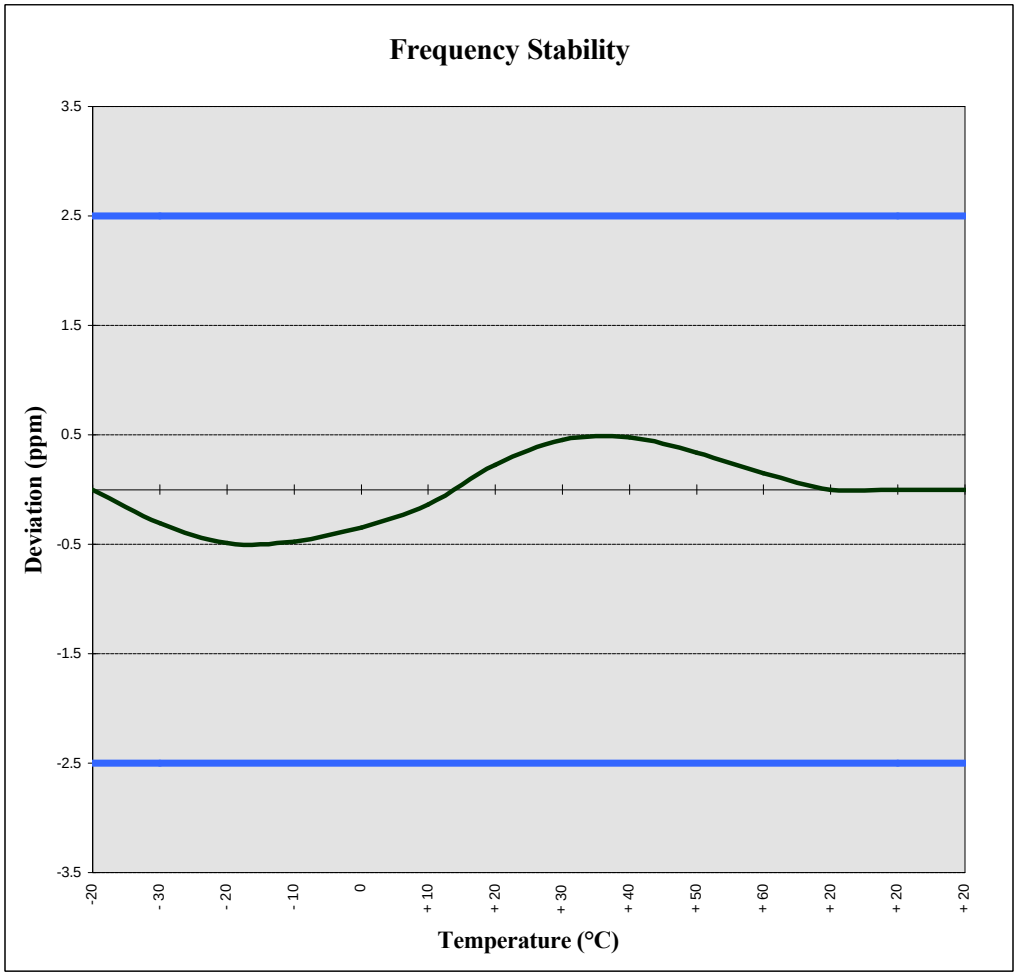
Channel: 383

Reference Voltage: 5.0 VDC

Deviation Limit: ± 0.00025 % or 2.5 ppm

| VOLTAGE (%) | POWER (VDC) | TEMP (ºC) | FREQ. (Hz) | Deviation (%) |
|---|---|---|---|---|
| 100 % | 5.00 | + 20 (Ref) | 836490000 | 0.00000000 |
| 100 % | | - 30 | 836490258 | -0.00000031 |
| 100 % | | - 20 | 836490409 | -0.00000049 |
| 100 % | | - 10 | 836490397 | -0.00000047 |
| 100 % | | 0 | 836490288 | -0.00000034 |
| 100 % | | + 10 | 836490115 | -0.00000014 |
| 100 % | | + 20 | 836489810 | 0.00000023 |
| 100 % | | + 30 | 836489620 | 0.00000045 |
| 100 % | | + 40 | 836489602 | 0.00000048 |
| 100 % | | + 50 | 836489718 | 0.00000034 |
| 100 % | | + 60 | 836489874 | 0.00000015 |
| 85 % | N/A | + 20 | 836490000 | 0.00000000 |
| 115 % | N/A | + 20 | 836490000 | 0.00000000 |
| BATT. ENDPOINT | N/A | + 20 | 836490000 | 0.00000000 |

***FREQUENCY STABILITY - § 2.1055***



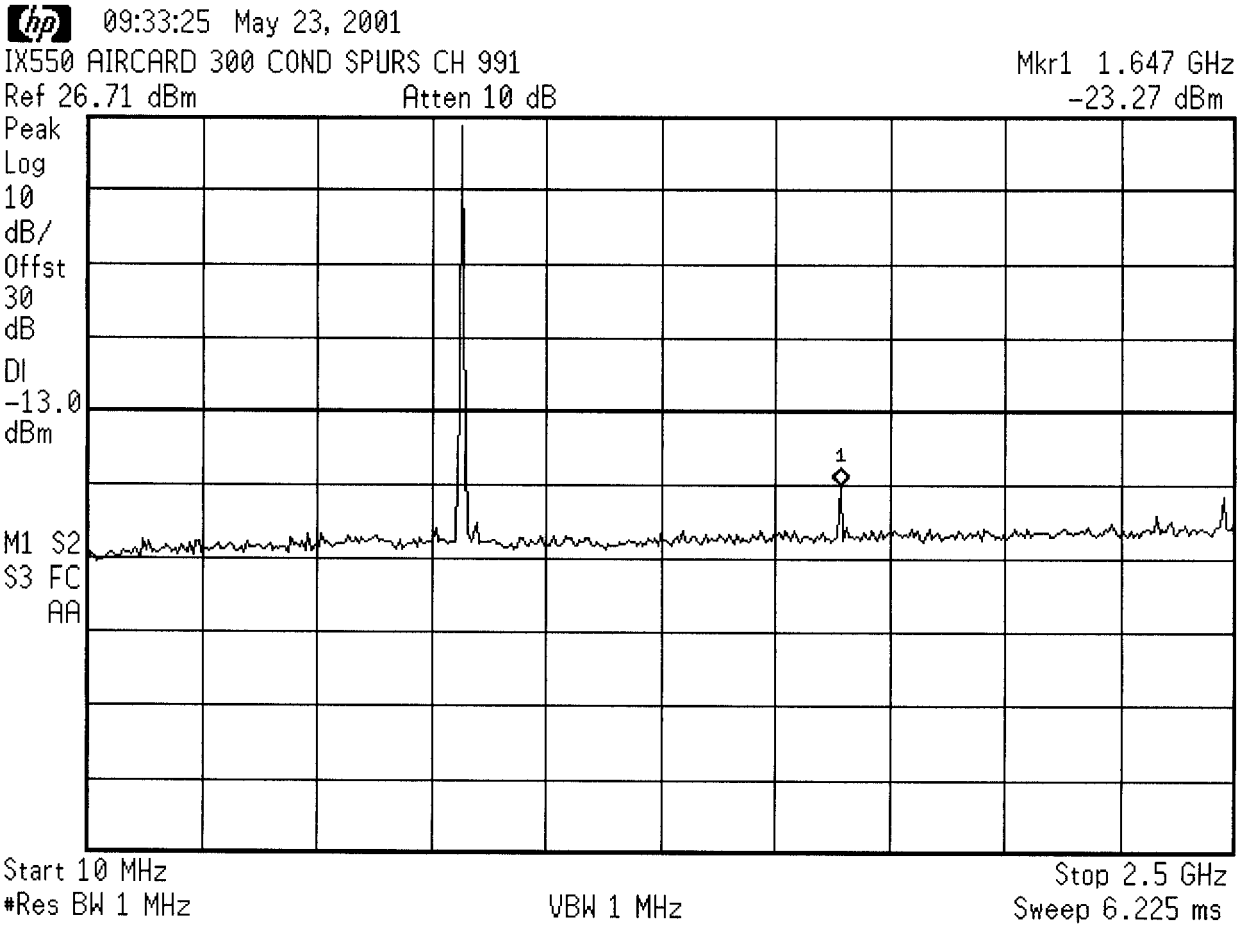
## *4.1 TEST EQUIPMENT*

| Type | Model | Calib. Date | Serial No. |
|---|---|---|---|
| Signal Generator | HP 8648D (9kHz-4.0GHz) | Nov 1999 | 3847A00611 |
| Gigatronics Power Meter | 8652A | Oct 1999 | 1835272 |
| Gigatronics Power Sensor (2) | 80701A (0.05-18GHz) | Oct 1999 | 1833535, 1833542 |
| Amplifier Research Power Amp. | 5S1G4 (5W, 800MHz-4.2GHz) | N/A | 26235 |
| Microwave System Amplifier | HP 83017A (0.5-26.5GHz) | N/A | 3123A00587 |
| Network Analyzer | HP 8753E (30kHz-3GHz) | Nov 1999 | US38433013 |
| Audio Analyzer | HP 8903B | March 1999 | 3729A18691 |
| Modulation Analyzer | HP 8901A | March 1999 | 3749A07154 |
| Frequency Counter | HP 53181A (3GHz) | May 1999 | 3736A05175 |
| CDMA Base Station Test Set | Agilent E8285A | N/A | US40332926 |
| DC Power Supply | HP E3611A | N/A | KR83015294 |
| Multi-Device Controller | EMCO 2090 | N/A | 9912-1484 |
| Mini Mast | EMCO 2075 | N/A | 0001-2277 |
| Turntable | EMCO 2080-1.2/1.5 | N/A | 0002-1002 |
| Double Ridged Horn Antenna | ETS 3115 (1-18GHz) | Oct. 2000 | 6267 |
| Double Ridged Horn Antenna | ETS 3115 (1-18GHz) | Oct. 2000 | 6276 |
| Horn Antenna | Chase BBHA 9120-A (0.7-4.8GHz) | Sept 1998 | 9120A-239 |
| Horn Antenna | Chase BBHA 9120-A (0.7-4.8GHz) | Sept 1998 | 9120A-240 |
| Roberts Dipoles | Compliance Design (2 sets) 3121C | June 2000 | |
| Spectrum Analyzer | HP 8594E | March 2000 | 3543A02721 |
| Spectrum Analyzer | HP E4408B | Nov 1999 | US39240170 |
| Shielded Screen Room | Lindgren R.F. 18W-2/2-0 | N/A | 16297 |
| Environmental Chamber | ESPEC ECT-2 (Temperature/Humidity) | Feb 2000 | 0510154-B |

## *5.1 CONCLUSION*

The data collected shows that the ITRONIX CORPORATION IX550 Rugged Laptop PC FCC ID: KBCIX550AC300 with SIERRA WIRELESS AirCard 300/350 PCMCIA CDPD Modem Card complies with all the requirements of Parts 2 and 22.901(d) of the FCC rules.

# TEST PLOTS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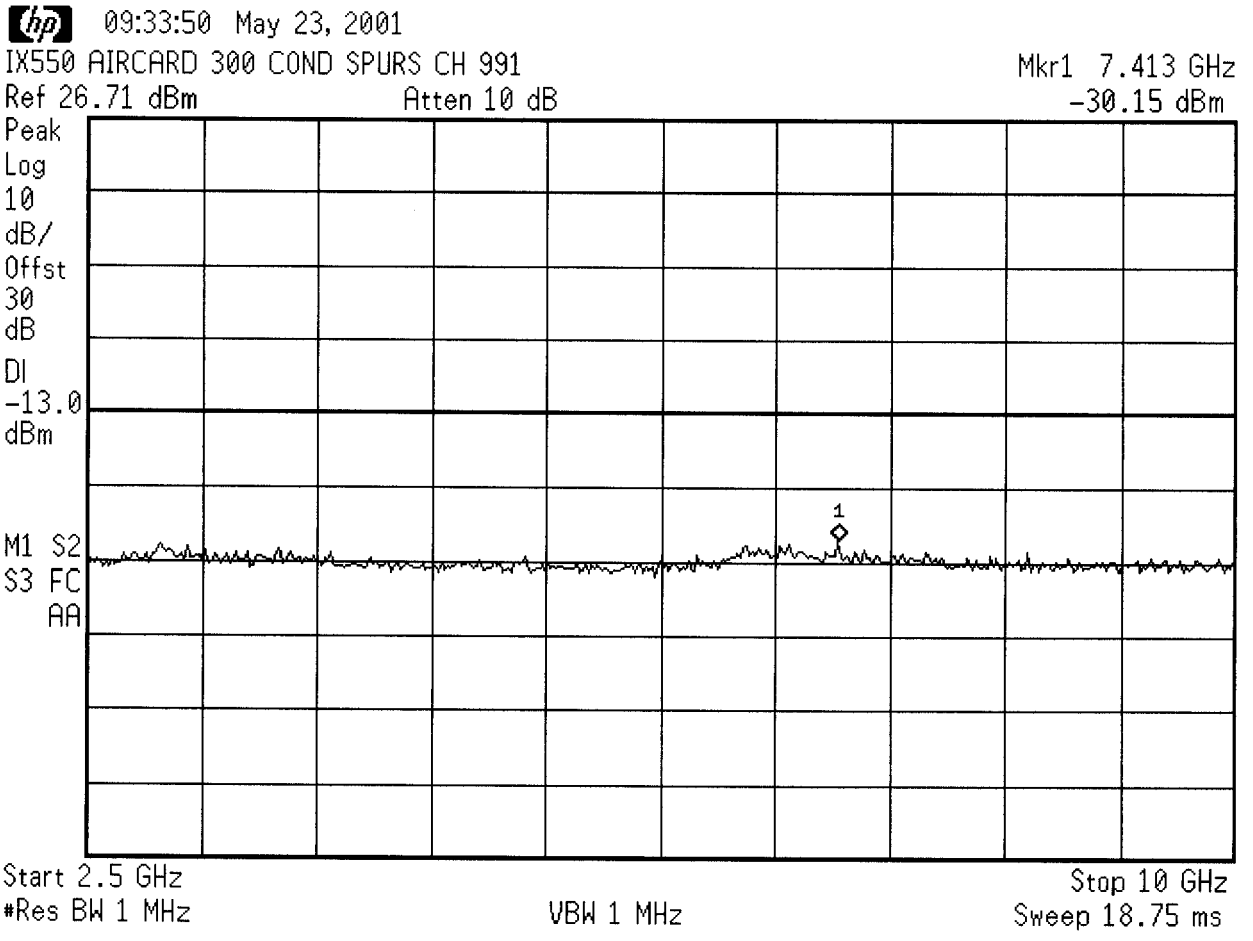
IX550 AIRCARD 300 COND SPURS CH 991
Mkr1 1.647 GHz
Ref 26.71 dBm
Atten 10 dB
-23.27 dBm
Peak
Log
10
dB/
Offst
30
dB
Dl
-13.0
dBm
1
M1 S2
S3 FC
AA
Start 10 MHz
Stop 2.5 GHz
#Res BW 1 MHz
VBW 1 MHz
Sweep 6.225 ms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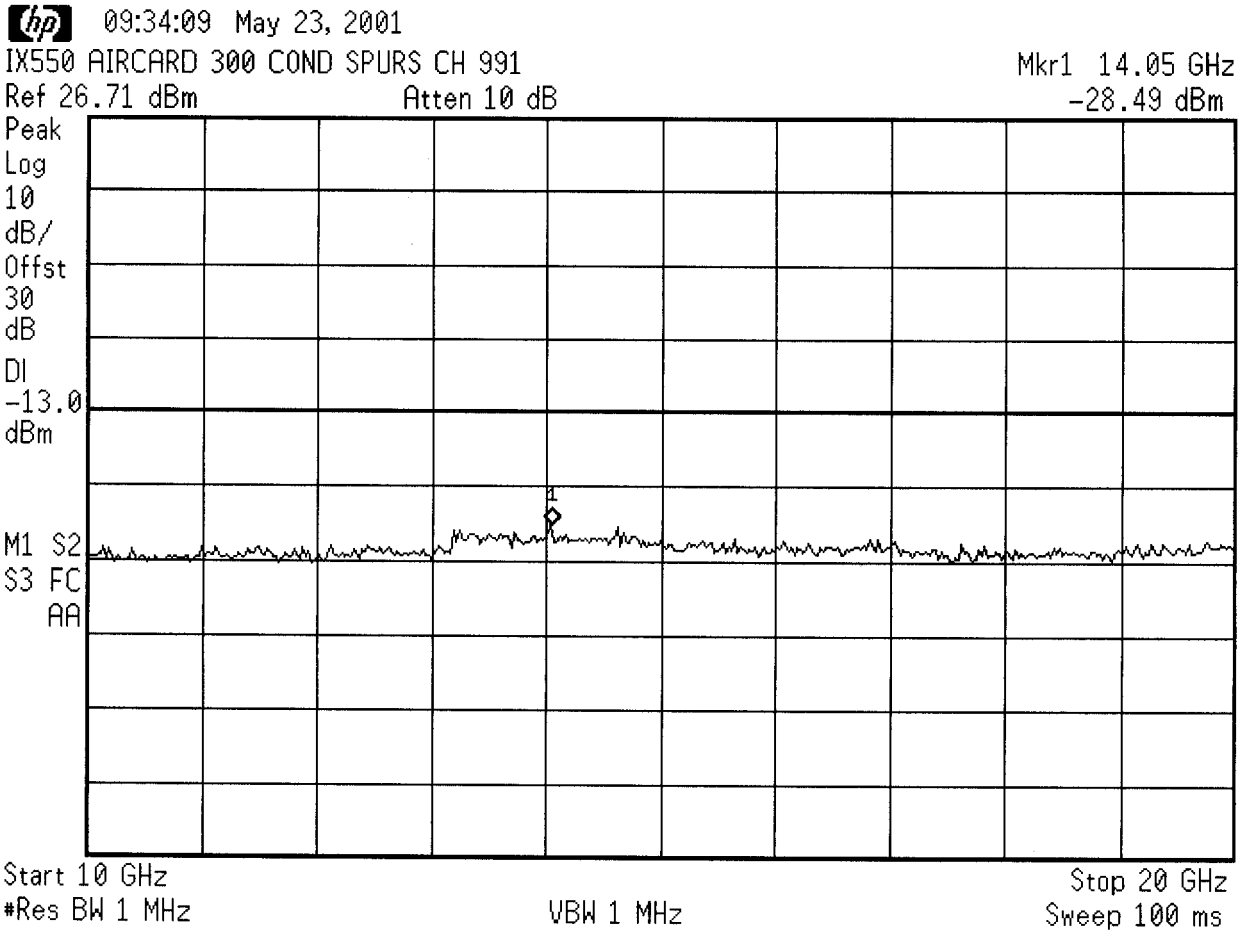
Log
10
dB/
Offst
30
dB
Dl
-13.0
dBm
M1 S2
S3 FC
AA
1
Start 2.5 GHz
Stop 10 GHz
#Res BW 1 MHz
VBW 1 MHz
Sweep 18.75 ms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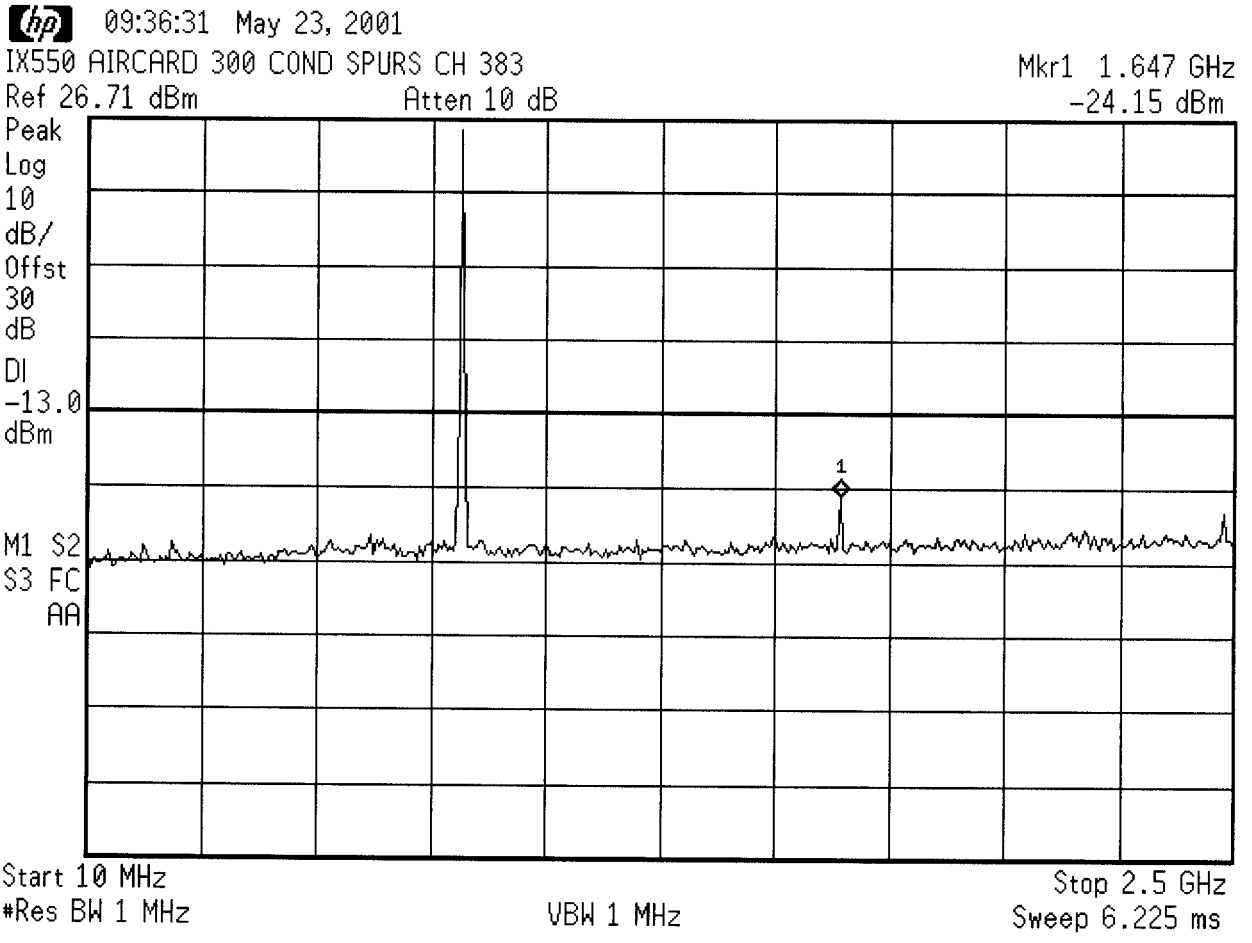
IX550 AIRCARD 300 COND SPURS CH 991
Mkr1 14.05 GHz
Ref 26.71 dBm
Atten 10 dB
-28.49 dBm
Peak
Log
10
dB/
Offst
30
dB
Dl
-13.0
dBm
M1 S2
S3 FC
AA
1
Start 10 GHz
Stop 20 GHz
#Res BW 1 MHz
VBW 1 MHz
Sweep 100 ms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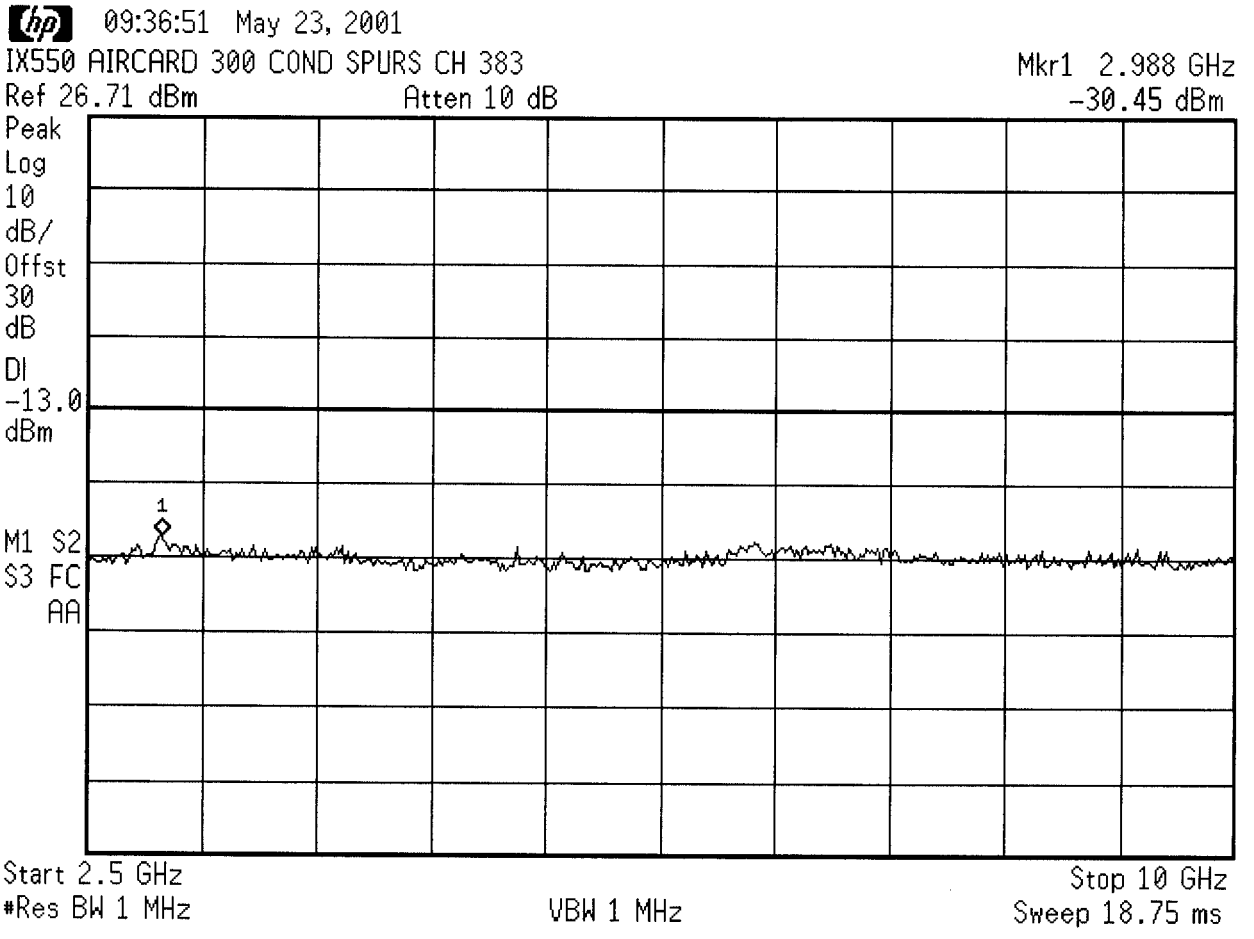
IX550 AIRCARD 300 COND SPURS CH 383
Mkr1 1.647 GHz
Ref 26.71 dBm
Atten 10 dB
-24.15 dBm
Peak
Log
10
dB/
Offst
30
dB
Dl
-13.0
dBm
1
M1 S2
S3 FC
AA
Start 10 MHz
Stop 2.5 GHz
#Res BW 1 MHz
VBW 1 MHz
Sweep 6.225 ms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IX550 AIRCARD 300 COND SPURS CH 383
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Peak
Log
10
dB/
Offst
30
dB
Dl
-13.0
dBm
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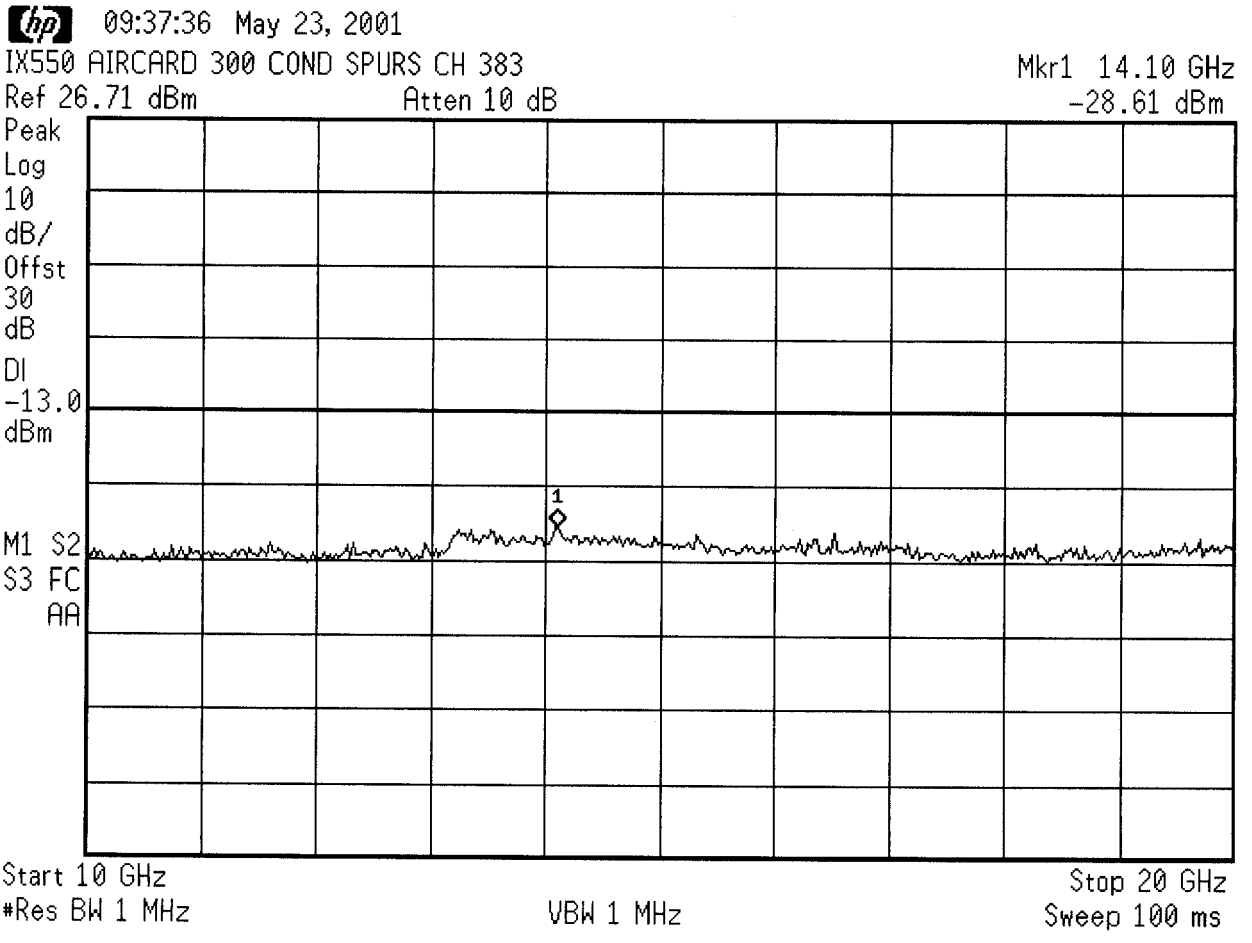
M1 S2
S3 FC
AA
Start 2.5 GHz
Stop 10 GHz
#Res BW 1 MHz
VBW 1 MHz
Sweep 18.75 ms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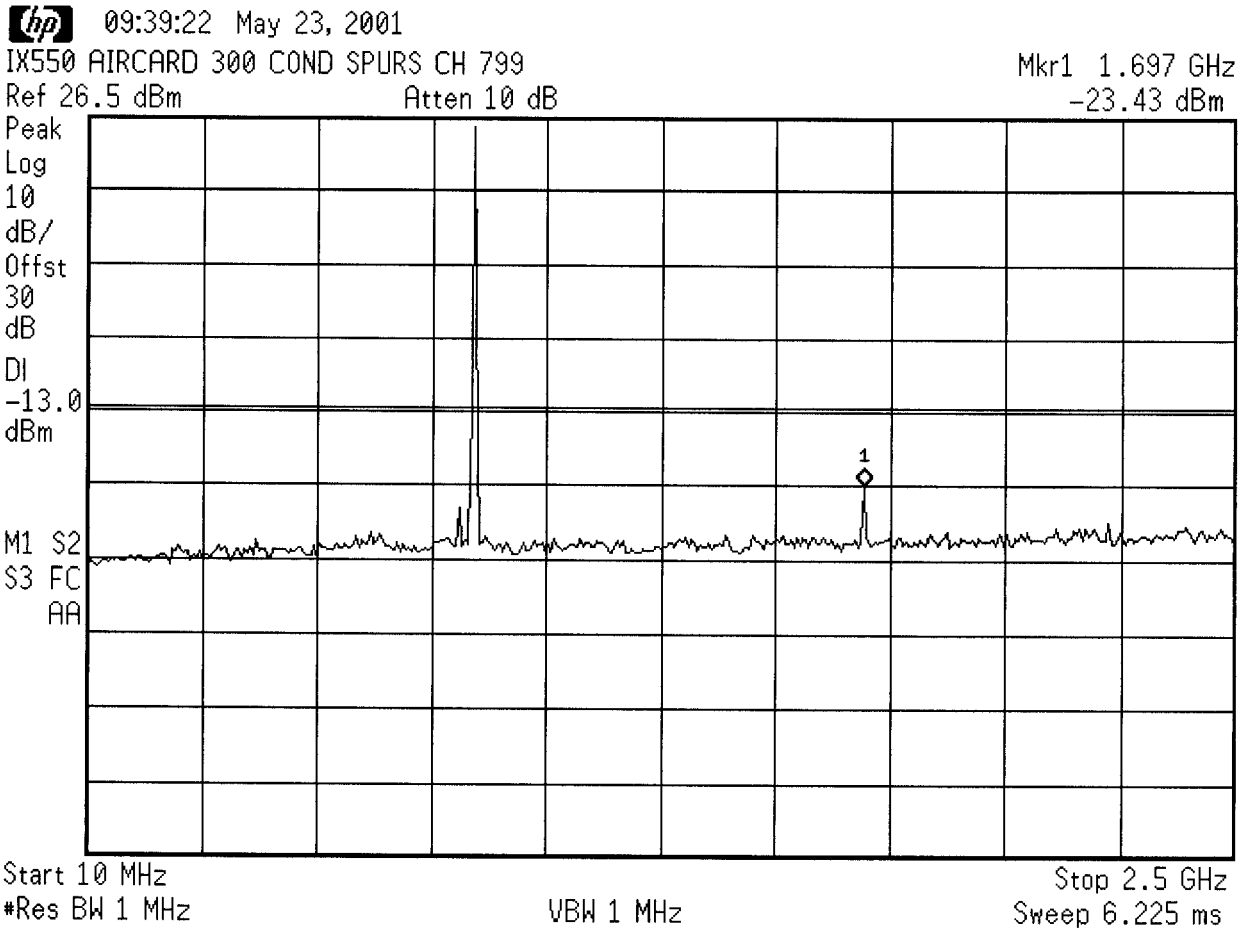
IX550 AIRCARD 300 COND SPURS CH 383
Mkr1 14.10 GHz
Ref 26.71 dBm
Atten 10 dB
-28.61 dBm
Peak
Log
10
dB/
Offst
30
dB
Dl
-13.0
dBm
1
M1 S2
S3 FC
AA
Start 10 GHz
Stop 20 GHz
#Res BW 1 MHz
VBW 1 MHz
Sweep 100 ms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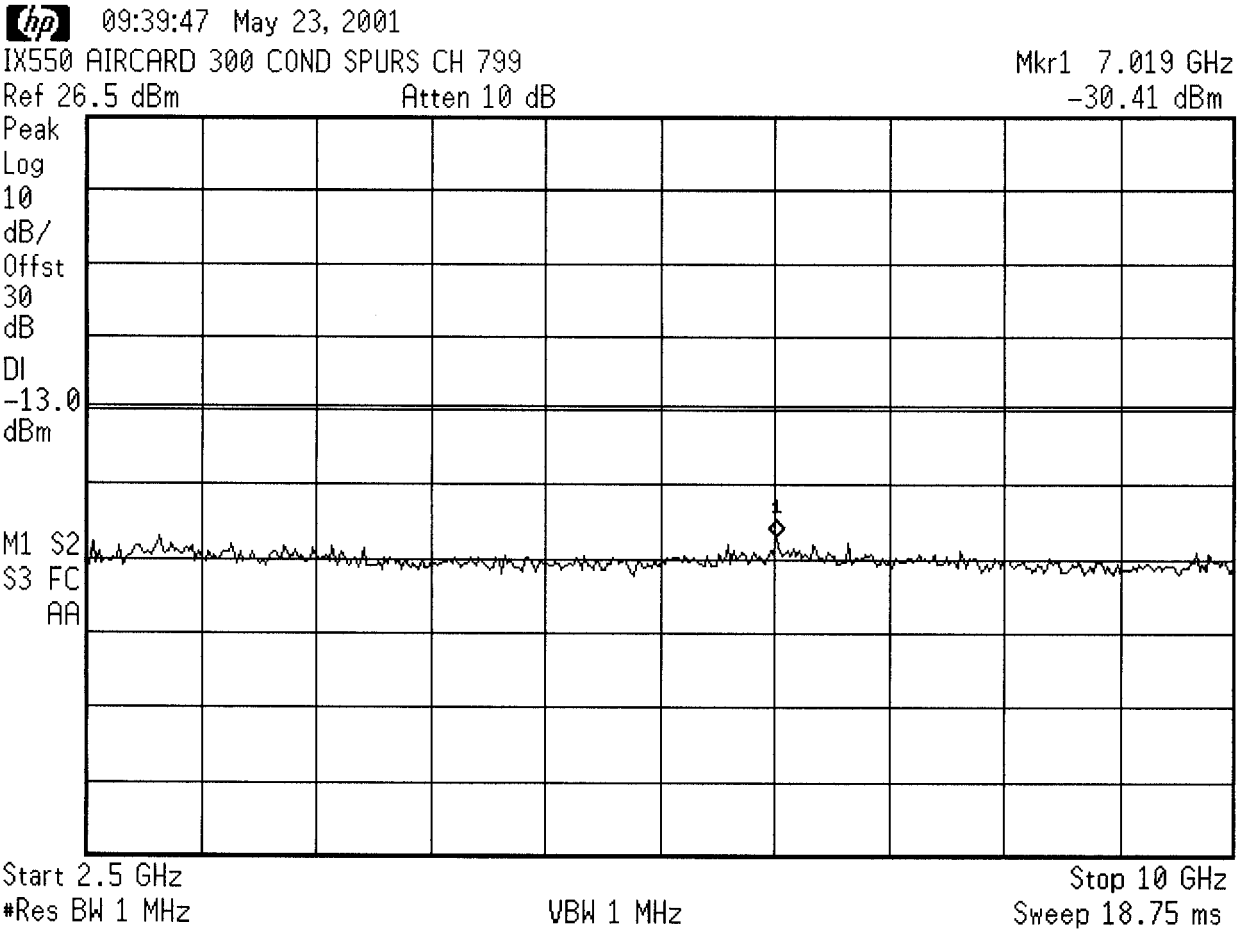
IX550 AIRCARD 300 COND SPURS CH 799
Mkr1 1.697 GHz
Ref 26.5 dBm
Atten 10 dB
-23.43 dBm
Peak
Log
10
dB/
Offst
30
dB
Dl
-13.0
dBm
1
M1 S2
S3 FC
AA
Start 10 MHz
Stop 2.5 GHz
#Res BW 1 MHz
VBW 1 MHz
Sweep 6.225 ms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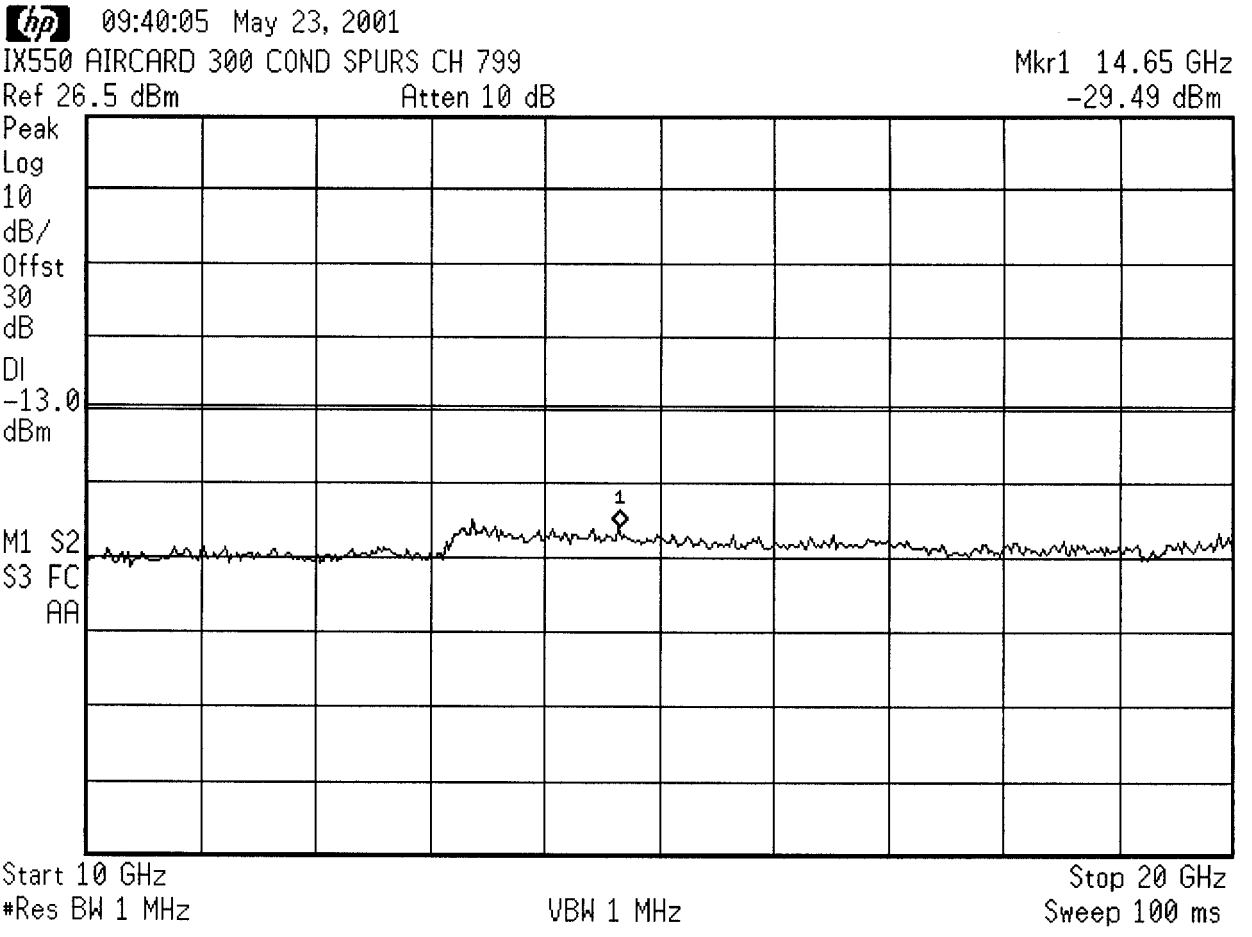
IX550 AIRCARD 300 COND SPURS CH 799
Mkr1 7.019 GHz
Ref 26.5 dBm
Atten 10 dB
-30.41 dBm
Peak
Log
10
dB/
Offst
30
dB
Dl
-13.0
dBm
M1 S2
S3 FC
AA
1
Start 2.5 GHz
Stop 10 GHz
#Res BW 1 MHz
VBW 1 MHz
Sweep 18.75 ms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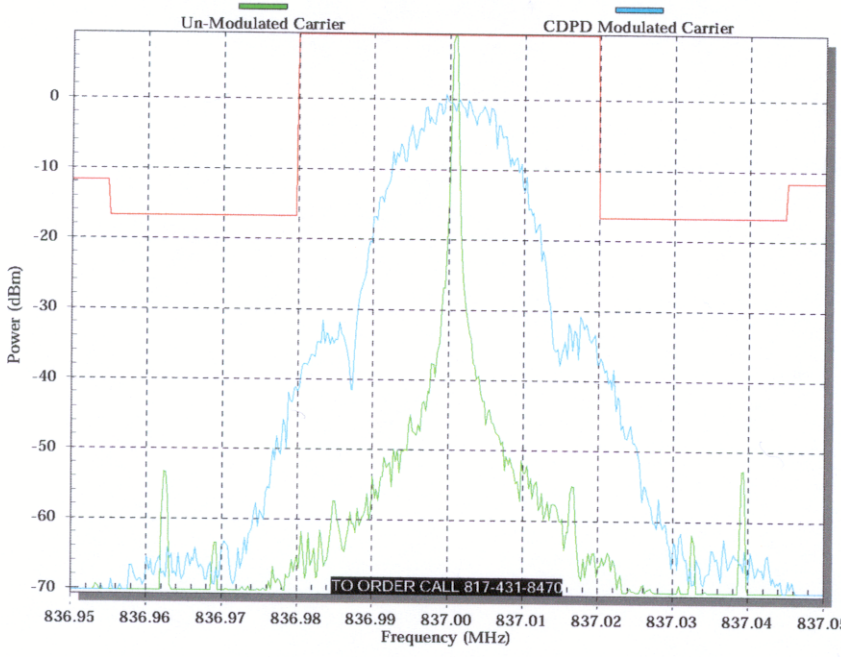
IX550 AIRCARD 300 COND SPURS CH 799
Mkr1 14.65 GHz
Ref 26.5 dBm
Atten 10 dB
-29.49 dBm
Peak
Log
10
dB/
Offst
30
dB
Dl
-13.0
dBm
M1 S2
S3 FC
AA
1
Start 10 GHz
Stop 20 GHz
#Res BW 1 MHz
VBW 1 MHz
Sweep 100 ms

## CDPD (FXW) Occupied Spectrum - 2.989

*09/29/98 CE000221 19.2kbps, 4.8kHz Deviation, 8dBm Output Power*




## CDPD (FXW) Occupied Spectrum - 2.989

*09/29/98 CE000221 19.2kbps, 4.8kHz Deviation, 28dBm Output Power*