

## **EMISSIONS TEST REPORT FOR A LOW POWER TRANSMITTER**

### **I. GENERAL INFORMATION**

Requirement: Federal Communications Commissions  
Test Requirements: 15.205, 15.207, 15.209, 15.247  
Applicant: Afar Communications Inc.

Product ID: **FCC ID: Q7N-24027**

Antennas used with this product must be professionally installed. The user manual for this product instructs users of this fact, along with providing instructions on allowable power and frequency settings.

### **II. DESCRIPTION OF EQUIPMENT UNDER TEST (EUT)**

#### **RF Specifications**

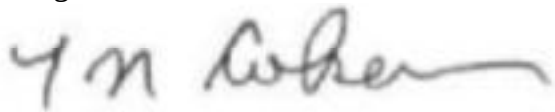
|                          |                                                                        |
|--------------------------|------------------------------------------------------------------------|
| RF Frequency Band        | 2.406 to 2.474 GHz                                                     |
| RF Channels              | 34 channels programmable in 2 MHz steps<br>12 non-overlapping channels |
| RF Signal Bandwidth      | 4.6 MHz                                                                |
| Modulation Type          | BPSK, QPSK and CCK                                                     |
| Data rate                | 250, 500, 1375, 2750 Kbps                                              |
| Transmitter Output Power | 23 dBm (average), variable                                             |
| Antennas                 | 24 dBi grid antenna<br>18 dBi flat panel antenna<br>9 dBi omni antenna |

The product employs the Prism chipset from Intersil used in most of the 802.11b devices used in a non-standard mode. The modification consists of slowing down the clock to 1/4 of the standard rate. All the RF circuitry stayed the same but the occupied RF bandwidth is now 1/4 of the previous design.

### **III. TEST LOCATION**

All tests were performed at:

Compliance Certification Services  
571F Monterey Road  
Morgan Hill, CA 95037



T.N. Cokenias  
EMC Consultant/Agent for Afar Communications Inc.

16 September 2003

## TEST PROCEDURES

### Measurement Equipment Used:

| TEST EQUIPMENTS LIST    |                         |                      |
|-------------------------|-------------------------|----------------------|
| Name of Equipment       | Manufacturer            | Model No.            |
| Line Filter             | Lindgren 10k - 10GHz    | LMF-3489             |
| LISN                    | Fischer 9k - 100MHz     | FCC-LISN-50/250-25-2 |
| EMI Test Receiver       | Rohde & Schwarz         | ESHS 20              |
| Spectrum Analyzer       | Agilent                 | E4446A               |
| Receiver                | HP                      | 84320A               |
| Antenna, Bilog          | Schaffner-Chase30M-2GHz | CBL6112B             |
| Pre-Amplifier           | MITEQ1-26GHz            | NSP2600-44           |
| Horn Antenna(1 - 18GHz) | EMCO                    | 3115                 |
| Filter 3.2 GHz          | FSY Microwave           | FM-3200-9SS          |

### Radiated Emissions

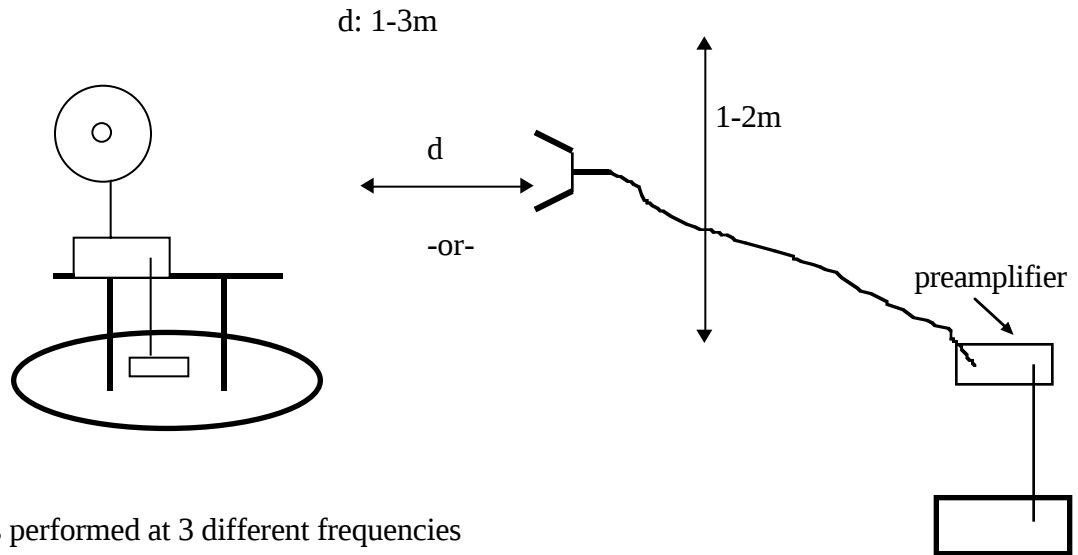
**Test Requirement:** 15.109, 15.205, 15.209, 15.247

### Test Procedures, 1- 26 GHz:

1. The EUT was placed on a wooden table resting on a turntable on the open air test site. The search antenna was placed 3m from the EUT. The EUT antenna was mounted vertically as per normal installation.
2. The turntable was slowly rotated to locate the direction of maximum emission at each emission falling in the restricted bands of 15.205.
3. Radiated emissions were investigated for a LOW channel, a MID channel, and HIGH channel. Emissions were investigated to the 10<sup>th</sup> harmonic.
4. Once maximum direction was determined, the search antenna was raised and lowered in both vertical and horizontal polarizations. The maximum readings so obtained are recorded in the data listed below.

**NOTE:** Spurious and harmonic emissions appeared to be independent of modulation type. CCK appeared to be worst case for bandedge and was chosen as the modulation type for radiated emissions. CCK was also chosen for antenna conducted output emissions, as tests indicated no significant difference test data differences among the three modulation types.

## Radiated Test Set-up, 1-40 GHz



**Figure 2**

Testing was performed at 3 different frequencies

### Channel Frequency, MHz

|      |      |
|------|------|
| Low  | 2406 |
| Mid  | 2440 |
| High | 2474 |

Radiated emissions were performed at each frequency for 2 different transmitter antennas.

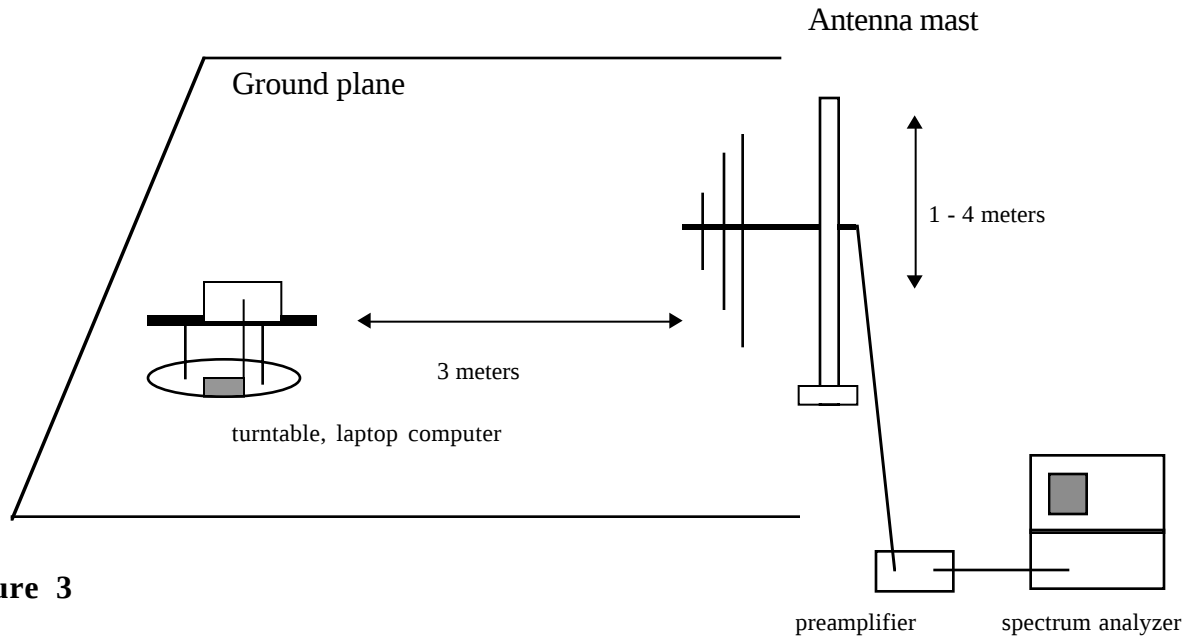
Antennas tested:

| Antenna Type | Gain   | Antenna Manufacturer | Model Number  |
|--------------|--------|----------------------|---------------|
| omni         | 9 dBi  | Mobilemark           | OD9-2400-24   |
| grid         | 24 dBi | Andrew               | AND26T-2400-1 |
| flat panel   | 18 dBi | Superpass            | SPFPG18       |

**Test Results:** Worst case results are presented. Refer to separate Excel spread sheet files.

NOTE: Normal EUT operation is TDD (TX on 50%, RX on 50%). Duty cycle is -6dB and is entered on radiated emissions spread sheets.

### Radiated Test Set-up, 30 - 1000 MHz



**Figure 3**

### Test Procedures, 30 -1000 MHz

The EUT was set to RECEIVE/TRANSMIT mode. Radiation emissions from the digital portion of the EUT were measured according to the dictates of ANSI C63.4.

### Test Results

Refer to separate attachment.

09/15/03     **High Frequency Measurement**  
**Compliance Certification Services, Morgan Hill Open Field Site**

Test Engr: William Zhuang  
Project #: 03U2168-1  
Company Name: Afar Communication  
EUT Descrip.: Afar Communication  
EUT M/N: AR24027 with 9 dBi omni  
Test Target: FCC15.247  
Mode Oper: Transmit

**Test Equipment:**

|                    |                       |                         |              |
|--------------------|-----------------------|-------------------------|--------------|
| EMCO Horn 1-18GHz  | Pre-amplifier 1-26GHz | Spectrum Analyzer       | Horn > 18GHz |
| T60; S/N: 2238 @1m | T86 Miteq 924341      | Agilent E4446A Analyzer |              |

Hi Frequency Cables

|          |              |              |           |
|----------|--------------|--------------|-----------|
| b (2 ft) | e (2 ~ 3 ft) | e (4 ~ 6 ft) | b (12 ft) |
|----------|--------------|--------------|-----------|

**Peak Measurements:**  
1 MHz Resolution Bandwidth  
1MHz Video Bandwidth

**Average Measurements:**  
1 MHz Resolution Bandwidth  
10Hz Video Bandwidth

| f<br>GHz | Dist<br>feet | Read Pk<br>dBuV | Read Avg.<br>dBuV | AF<br>dB/m | CL<br>dB | Amp<br>dB | D Corr<br>dB | HPF | Peak<br>dBuV/m | Duty<br>Cycle dB | Avg<br>dBuV/m | Pk Lim<br>dBuV/m | Avg Lim<br>dBuV/m | Pk Mar<br>dB | Avg Mar<br>dB | Notes                |
|----------|--------------|-----------------|-------------------|------------|----------|-----------|--------------|-----|----------------|------------------|---------------|------------------|-------------------|--------------|---------------|----------------------|
| 4.880    | 9.8          | 71.0            | 63.0              | 33.8       | 3.9      | -45.6     | 0.0          | 1.0 | 63.9           | -6.0             | 50.0          | 74.0             | 54.0              | -10.1        | -4.0          | Mid Ch 20, V, PL 21  |
| 4.880    | 9.8          | 72.5            | 65.7              | 33.8       | 3.9      | -45.6     | 0.0          | 1.0 | 65.5           | -6.0             | 52.7          | 74.0             | 54.0              | -8.5         | -1.3          | Mid Ch 20, H, PL 21  |
| 7.320    | 9.8          | 55.3            | 43.9              | 37.3       | 4.9      | -46.6     | 0.0          | 1.0 | 51.9           | -6.0             | 34.5          | 74.0             | 54.0              | -22.1        | -19.5         | Mid Ch 20, V, PL 21  |
| 7.320    | 9.8          | 55.7            | 44.9              | 37.3       | 4.9      | -46.6     | 0.0          | 1.0 | 52.3           | -6.0             | 35.5          | 74.0             | 54.0              | -21.7        | -18.5         | Mid Ch 20, H, PL 21  |
| 4.812    | 9.8          | 71.8            | 64.4              | 33.7       | 3.8      | -45.6     | 0.0          | 1.0 | 64.8           | -6.0             | 51.4          | 74.0             | 54.0              | -9.2         | -2.6          | Low Ch 3, V, PL 23   |
| 4.812    | 9.8          | 69.4            | 60.7              | 33.7       | 3.8      | -45.6     | 0.0          | 1.0 | 62.4           | -6.0             | 47.7          | 74.0             | 54.0              | -11.6        | -6.3          | Low Ch 3, H, PL 23   |
| 7.218    | 9.8          | 58.5            | 48.6              | 37.2       | 4.9      | -46.6     | 0.0          | 1.0 | 54.9           | -6.0             | 39.0          | 74.0             | 54.0              | -19.1        | -15.0         | Low Ch 3, V, PL 23   |
| 7.218    | 9.8          | 57.2            | 46.9              | 37.2       | 4.9      | -46.6     | 0.0          | 1.0 | 53.6           | -6.0             | 37.4          | 74.0             | 54.0              | -20.4        | -16.6         | Low Ch 3, H, PL 23   |
| 4.948    | 9.8          | 67.1            | 59.1              | 33.8       | 3.9      | -45.7     | 0.0          | 1.0 | 60.1           | -6.0             | 46.1          | 74.0             | 54.0              | -13.9        | -7.9          | High Ch 37, V, PL 23 |
| 4.948    | 9.8          | 74.1            | 66.9              | 33.8       | 3.9      | -45.7     | 0.0          | 1.0 | 67.1           | -6.0             | 53.9          | 74.0             | 54.0              | -6.9         | -0.1          | High Ch 37, H, PL 23 |
| 7.422    | 9.8          | 66.1            | 51.5              | 37.4       | 5.0      | -46.5     | 0.0          | 1.0 | 62.9           | -6.0             | 42.3          | 74.0             | 54.0              | -11.1        | -11.7         | High Ch 37, V, PL 23 |
| 7.422    | 9.8          | 64.1            | 50.0              | 37.4       | 5.0      | -46.5     | 0.0          | 1.0 | 60.9           | -6.0             | 40.8          | 74.0             | 54.0              | -13.1        | -13.2         | High Ch 37, H, PL 23 |

09/04/03     **High Frequency Measurement**  
**Compliance Certification Services, Morgan Hill Open Field Site**

Test Engr: William Zhuang  
Project #: 03U2168-1  
Company Name: Afar Communication  
EUT Descrip.: Afar Communication  
EUT M/N: AR24027 with 18 dBi panel antenna  
Test Target: FCC15.247  
Mode Oper: Transmit

**Test Equipment:**

|                    |                       |                         |              |
|--------------------|-----------------------|-------------------------|--------------|
| EMCO Horn 1-18GHz  | Pre-amplifier 1-26GHz | Spectrum Analyzer       | Horn > 18GHz |
| T73; S/N: 6717 @1m | T87 Miteq 924342      | Agilent E4446A Analyzer |              |

Hi Frequency Cables

|          |              |              |           |
|----------|--------------|--------------|-----------|
| b (2 ft) | e (2 ~ 3 ft) | e (4 ~ 6 ft) | b (12 ft) |
|----------|--------------|--------------|-----------|

**Peak Measurements:**  
1 MHz Resolution Bandwidth  
1MHz Video Bandwidth

**Average Measurements:**  
1 MHz Resolution Bandwidth  
10Hz Video Bandwidth

| f<br>GHz | Dist<br>feet | Read Pk<br>dBuV | Read Avg.<br>dBuV | AF<br>dB/m | CL<br>dB | Amp<br>dB | D Corr<br>dB | HPF | Peak<br>dBuV/m | Duty<br>Cycle dB | Avg<br>dBuV/m | Pk Lim<br>dBuV/m | Avg Lim<br>dBuV/m | Pk Mar<br>dB | Avg Mar<br>dB | Notes                |
|----------|--------------|-----------------|-------------------|------------|----------|-----------|--------------|-----|----------------|------------------|---------------|------------------|-------------------|--------------|---------------|----------------------|
| 4.880    | 9.8          | 67.9            | 61.2              | 34.0       | 3.9      | -44.7     | 0.0          | 1.0 | 61.9           | -6.0             | 49.2          | 74.0             | 54.0              | -12.1        | -4.8          | Mid Ch 20, V, PL 23  |
| 4.880    | 9.8          | 68.0            | 61.4              | 34.0       | 3.9      | -44.7     | 0.0          | 1.0 | 62.1           | -6.0             | 49.4          | 74.0             | 54.0              | -11.9        | -4.6          | Mid Ch 20, H, PL 23  |
| 7.320    | 9.8          | 65.8            | 52.2              | 36.8       | 4.9      | -44.5     | 0.0          | 1.0 | 64.0           | -6.0             | 44.4          | 74.0             | 54.0              | -10.0        | -9.6          | Mid Ch 20, V, PL 23  |
| 7.320    | 9.8          | 66.7            | 54.7              | 36.8       | 4.9      | -44.5     | 0.0          | 1.0 | 64.9           | -6.0             | 46.9          | 74.0             | 54.0              | -9.1         | -7.1          | Mid Ch 20, H, PL 23  |
| 4.812    | 9.8          | 66.3            | 60.9              | 33.9       | 3.8      | -44.7     | 0.0          | 1.0 | 60.3           | -6.0             | 49.0          | 74.0             | 54.0              | -13.7        | -5.0          | Low Ch 3, V, PL 23   |
| 4.812    | 9.8          | 67.9            | 61.2              | 33.9       | 3.8      | -44.7     | 0.0          | 1.0 | 61.9           | -6.0             | 49.2          | 74.0             | 54.0              | -12.1        | -4.8          | Low Ch 3, H, PL 23   |
| 7.218    | 9.8          | 55.5            | 42.8              | 36.7       | 4.9      | -44.6     | 0.0          | 1.0 | 53.5           | -6.0             | 34.7          | 74.0             | 54.0              | -20.5        | -19.3         | Low Ch 3, V, PL 23   |
| 7.218    | 9.8          | 58.4            | 43.2              | 36.7       | 4.9      | -44.6     | 0.0          | 1.0 | 56.3           | -6.0             | 35.2          | 74.0             | 54.0              | -17.7        | -18.8         | Low Ch 3, H, PL 23   |
| 4.948    | 9.8          | 68.9            | 61.9              | 34.0       | 3.9      | -44.8     | 0.0          | 1.0 | 63.0           | -6.0             | 50.0          | 74.0             | 54.0              | -11.0        | -4.0          | High Ch 37, V, PL 23 |
| 4.948    | 9.8          | 68.4            | 60.7              | 34.0       | 3.9      | -44.8     | 0.0          | 1.0 | 62.5           | -6.0             | 48.8          | 74.0             | 54.0              | -11.5        | -5.2          | High Ch 37, H, PL 23 |
| 7.422    | 9.8          | 65.2            | 53.3              | 37.0       | 5.0      | -44.4     | 0.0          | 1.0 | 63.7           | -6.0             | 45.8          | 74.0             | 54.0              | -10.3        | -8.2          | High Ch 37, V, PL 23 |
| 7.422    | 9.8          | 65.8            | 53.1              | 37.0       | 5.0      | -44.4     | 0.0          | 1.0 | 64.3           | -6.0             | 45.6          | 74.0             | 54.0              | -9.7         | -8.4          | High Ch 37, H, PL 23 |

09/15/03     **High Frequency Measurement**  
**Compliance Certification Services, Morgan Hill Open Field Site**

Test Engr: William Zhuang  
Project #: 03U2168-1  
Company Name: Afar Communication  
EUT Descrip.: Afar Communication  
EUT M/N: AR24027 with 24 dBi grid antenna  
Test Target: FCC15.247  
Mode Oper: Transmit

**Test Equipment:**

|                    |                       |                         |              |
|--------------------|-----------------------|-------------------------|--------------|
| EMCO Horn 1-18GHz  | Pre-amplifier 1-26GHz | Spectrum Analyzer       | Horn > 18GHz |
| T60; S/N: 2238 @1m | T86 Miteq 924341      | Agilent E4446A Analyzer |              |

Hi Frequency Cables

|          |              |              |           |
|----------|--------------|--------------|-----------|
| b (2 ft) | e (2 ~ 3 ft) | e (4 ~ 6 ft) | b (12 ft) |
|----------|--------------|--------------|-----------|

**Peak Measurements:**

1 MHz Resolution Bandwidth  
1MHz Video Bandwidth

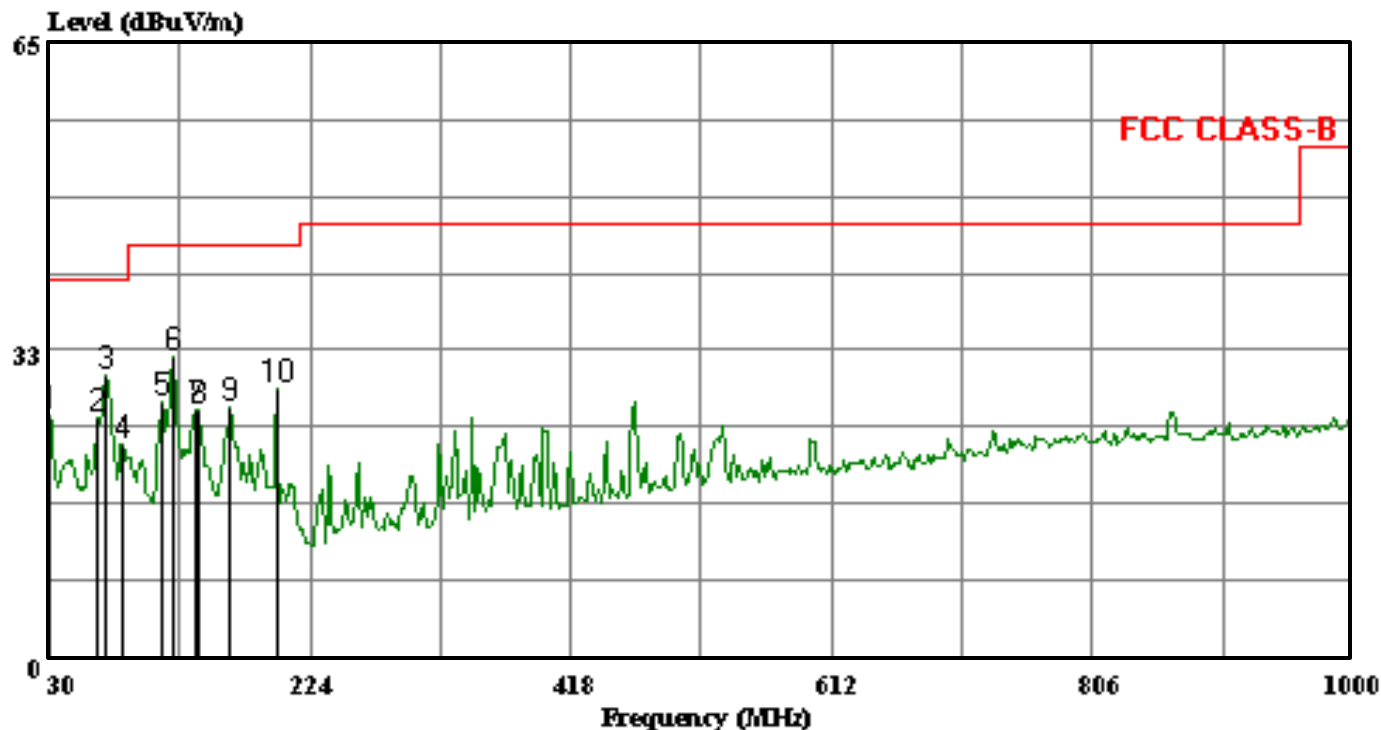
**Average Measurements:**

1 MHz Resolution Bandwidth  
10Hz Video Bandwidth

| f<br>GHz | Dist<br>feet | Read Pk<br>dBuV | Read Avg.<br>dBuV | AF<br>dB/m | CL<br>dB | Amp<br>dB | D Corr<br>dB | HPF | Peak<br>dBuV/m | Duty<br>Cycle dB | Avg<br>dBuV/m | Pk Lim<br>dBuV/m | Avg Lim<br>dBuV/m | Pk Mar<br>dB | Avg Mar<br>dB | Notes                |
|----------|--------------|-----------------|-------------------|------------|----------|-----------|--------------|-----|----------------|------------------|---------------|------------------|-------------------|--------------|---------------|----------------------|
| 4.880    | 9.8          | 71.0            | 63.0              | 33.8       | 3.9      | -45.6     | 0.0          | 1.0 | 63.9           | -6.0             | 50.0          | 74.0             | 54.0              | -10.1        | -4.0          | Mid Ch 20, V, PL 21  |
| 4.880    | 9.8          | 72.5            | 65.7              | 33.8       | 3.9      | -45.6     | 0.0          | 1.0 | 65.5           | -6.0             | 52.7          | 74.0             | 54.0              | -8.5         | -1.3          | Mid Ch 20, H, PL 21  |
| 7.320    | 9.8          | 55.3            | 43.9              | 37.3       | 4.9      | -46.6     | 0.0          | 1.0 | 51.9           | -6.0             | 34.5          | 74.0             | 54.0              | -22.1        | -19.5         | Mid Ch 20, V, PL 21  |
| 7.320    | 9.8          | 55.7            | 44.9              | 37.3       | 4.9      | -46.6     | 0.0          | 1.0 | 52.3           | -6.0             | 35.5          | 74.0             | 54.0              | -21.7        | -18.5         | Mid Ch 20, H, PL 21  |
| 4.812    | 9.8          | 71.8            | 64.4              | 33.7       | 3.8      | -45.6     | 0.0          | 1.0 | 64.8           | -6.0             | 51.4          | 74.0             | 54.0              | -9.2         | -2.6          | Low Ch 3, V, PL 23   |
| 4.812    | 9.8          | 69.4            | 60.7              | 33.7       | 3.8      | -45.6     | 0.0          | 1.0 | 62.4           | -6.0             | 47.7          | 74.0             | 54.0              | -11.6        | -6.3          | Low Ch 3, H, PL 23   |
| 7.218    | 9.8          | 58.5            | 48.6              | 37.2       | 4.9      | -46.6     | 0.0          | 1.0 | 54.9           | -6.0             | 39.0          | 74.0             | 54.0              | -19.1        | -15.0         | Low Ch 3, V, PL 23   |
| 7.218    | 9.8          | 57.2            | 46.9              | 37.2       | 4.9      | -46.6     | 0.0          | 1.0 | 53.6           | -6.0             | 37.4          | 74.0             | 54.0              | -20.4        | -16.6         | Low Ch 3, H, PL 23   |
| 4.948    | 9.8          | 67.1            | 59.1              | 33.8       | 3.9      | -45.7     | 0.0          | 1.0 | 60.1           | -6.0             | 46.1          | 74.0             | 54.0              | -13.9        | -7.9          | High Ch 37, V, PL 23 |
| 4.948    | 9.8          | 74.1            | 66.9              | 33.8       | 3.9      | -45.7     | 0.0          | 1.0 | 67.1           | -6.0             | 53.9          | 74.0             | 54.0              | -6.9         | -0.1          | High Ch 37, H, PL 23 |
| 7.422    | 9.8          | 66.1            | 51.5              | 37.4       | 5.0      | -46.5     | 0.0          | 1.0 | 62.9           | -6.0             | 42.3          | 74.0             | 54.0              | -11.1        | -11.7         | High Ch 37, V, PL 23 |
| 7.422    | 9.8          | 64.1            | 50.0              | 37.4       | 5.0      | -46.5     | 0.0          | 1.0 | 60.9           | -6.0             | 40.8          | 74.0             | 54.0              | -13.1        | -13.2         | High Ch 37, H, PL 23 |

Data#: 4 File#: EMI.EMI

Date: 09-03-2003 Time: 11:16:31



(Auxiliary ATC)

Trace: 3

Ref Trace:

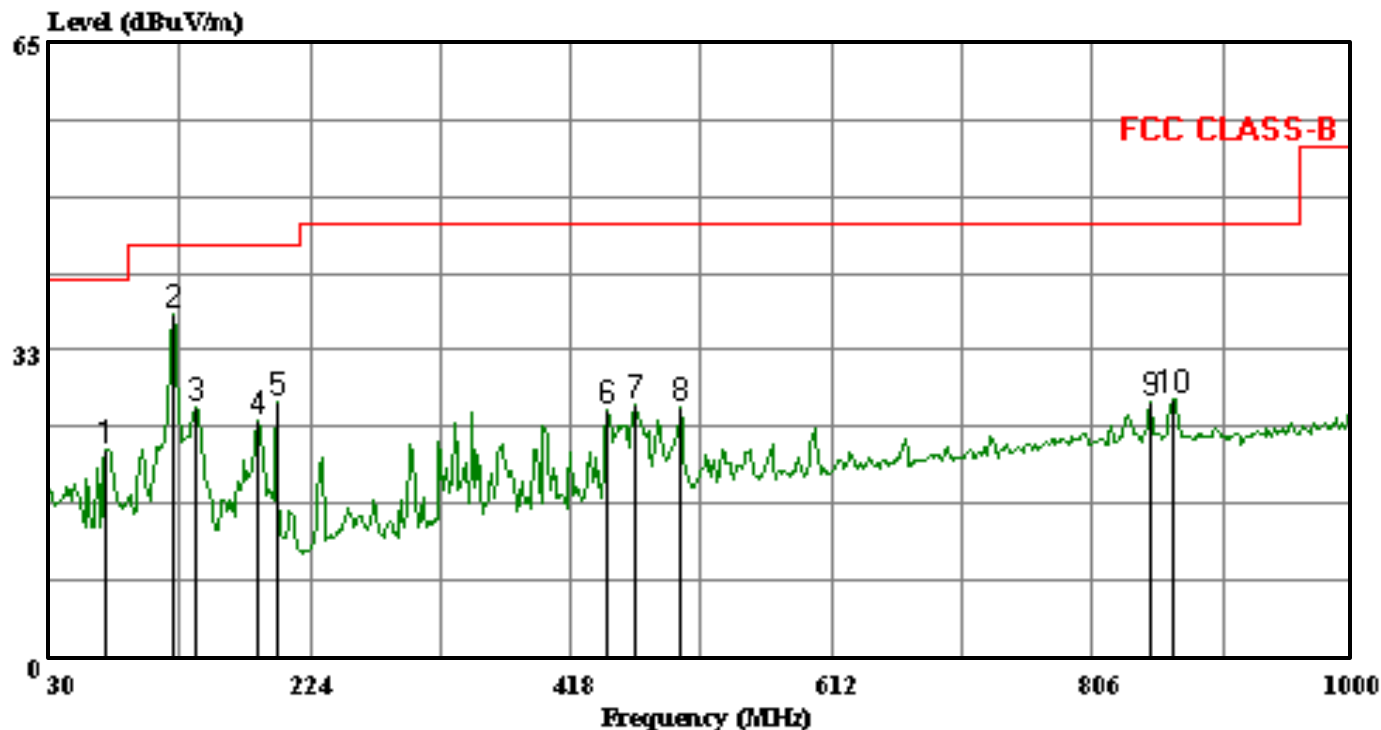
Condition: FCC CLASS-B  
Company : Aar Communication  
EUT Description : Wireless Ethernet Bridge  
Model Number : AR24027  
Test Configuration: EUT/Power Inserter Unit/Antenna  
Tester : William Zhuang  
Test Target : FCC CLASS B  
Mode of Operation: Transmit Mode  
Project No : 03U2168-1  
              : Vertical

Page: 1

|    | Read Freq | Probe Level | Probe Factor | Cable Loss | Preamplifier Factor | Level  | Limit Line | Over Limit | Remark |
|----|-----------|-------------|--------------|------------|---------------------|--------|------------|------------|--------|
|    | MHz       | dBuV        | dB           | dB         | dB                  | dBuV/m | dBuV/m     | dB         |        |
| 1  | 30.000    | 7.97        | 16.99        | 0.55       | 0.00                | 25.51  | 40.00      | -14.49     | Peak   |
| 2  | 65.890    | 15.25       | 9.38         | 0.77       | 0.00                | 25.40  | 40.00      | -14.60     | Peak   |
| 3  | 72.680    | 21.57       | 7.47         | 0.79       | 0.00                | 29.83  | 40.00      | -10.17     | Peak   |
| 4  | 85.290    | 14.40       | 7.30         | 0.86       | 0.00                | 22.56  | 40.00      | -17.44     | Peak   |
| 5  | 114.390   | 15.72       | 10.15        | 1.03       | 0.00                | 26.90  | 43.50      | -16.61     | Peak   |
| 6  | 121.180   | 20.27       | 10.50        | 1.03       | 0.00                | 31.80  | 43.50      | -11.70     | Peak   |
| 7  | 138.640   | 15.92       | 9.06         | 1.11       | 0.00                | 26.09  | 43.50      | -17.41     | Peak   |
| 8  | 140.580   | 16.13       | 8.83         | 1.13       | 0.00                | 26.09  | 43.50      | -17.41     | Peak   |
| 9  | 164.830   | 16.57       | 8.71         | 1.26       | 0.00                | 26.54  | 43.50      | -16.96     | Peak   |
| 10 | 198.780   | 18.12       | 9.04         | 1.38       | 0.00                | 28.54  | 43.50      | -14.96     | Peak   |

Data#: 2 File#: EMI.EMI

Date: 09-03-2003 Time: 11:06:43



(Auxiliary ATC)

Trace: 1

Ref Trace:

Condition: FCC CLASS-B  
Company : Aar Communication  
EUT Description : Wireless Ethernet Bridge  
Model Number : AR24027  
Test Configuration: EUT/Power Inserter Unit/Antenna  
Tester : William Zhuang  
Test Target : FCC CLASS B  
Mode of Operation: Transmit Mode  
Project No : 03U2168-1  
Horizontal

Page: 1

|    | Read Freq | Probe Level | Probe Factor | Cable Loss | Preamp Factor | Level  | Limit Line | Over Limit | Remark |
|----|-----------|-------------|--------------|------------|---------------|--------|------------|------------|--------|
|    | MHz       | dBuV        | dB           | dB         | dB            | dBuV/m | dBuV/m     | dB         |        |
| 1  | 72.680    | 13.70       | 7.47         | 0.79       | 0.00          | 21.96  | 40.00      | -18.04     | Peak   |
| 2  | 121.180   | 24.88       | 10.50        | 1.03       | 0.00          | 36.41  | 43.50      | -7.09      | Peak   |
| 3  | 138.640   | 16.39       | 9.06         | 1.11       | 0.00          | 26.56  | 43.50      | -16.94     | Peak   |
| 4  | 184.230   | 14.76       | 8.92         | 1.34       | 0.00          | 25.02  | 43.50      | -18.48     | Peak   |
| 5  | 198.780   | 16.68       | 9.04         | 1.38       | 0.00          | 27.10  | 43.50      | -16.40     | Peak   |
| 6  | 444.190   | 8.55        | 15.44        | 2.15       | 0.00          | 26.14  | 46.00      | -19.86     | Peak   |
| 7  | 465.530   | 8.55        | 15.87        | 2.25       | 0.00          | 26.67  | 46.00      | -19.33     | Peak   |
| 8  | 499.480   | 7.62        | 16.53        | 2.29       | 0.00          | 26.44  | 46.00      | -19.56     | Peak   |
| 9  | 848.680   | 3.61        | 20.20        | 3.15       | 0.00          | 26.96  | 46.00      | -19.04     | Peak   |
| 10 | 866.140   | 3.93        | 20.33        | 3.13       | 0.00          | 27.39  | 46.00      | -18.61     | Peak   |

## **Radiated Emissions, Band Edge**

Investigations were performed in the 2310 - 2390 MHz and 2483.5 – 2500 MHz restricted bands at the edges of the operating band.

The EUT was set up with transmit antenna as shown in Figure 2 above, except that the high pass filter and pre-amplifier were not used. The search antenna was raised and lowered, and the turntable was rotated, to maximize received emissions, which were compared against the limits for radiated emissions in the restricted bands.

Transmitter was set to 2406 MHz for 2310-2390 MHz investigation. Transmitter was set to 2475 MHz for 2483.5 – 2500 MHz investigation. To meet restricted band emissions levels at the high band edge, the power to the omni, panel antenna and the grid antenna were reduced according to the following schedule:

9 dBi omni

| Channel    | Pout max dbm |
|------------|--------------|
| 37         | 22           |
| all others | 23           |

Low Bandedge: Channel 3, 23 dBm  
18 dBi Panel Antenna

| Channel    | Pout max dbm |
|------------|--------------|
| 37         | 19           |
| 36         | 21           |
| 35         | 22           |
| 34         | 23           |
| all others | 23           |

Low Bandedge: Channel 3, 23 dBm

24 dBi Grid Antenna

| Channel    | Pout max dbm |
|------------|--------------|
| 37         | 10           |
| 36         | 20           |
| 35         | 21           |
| 34         | 22           |
| 33         | 23           |
| all others | 23           |

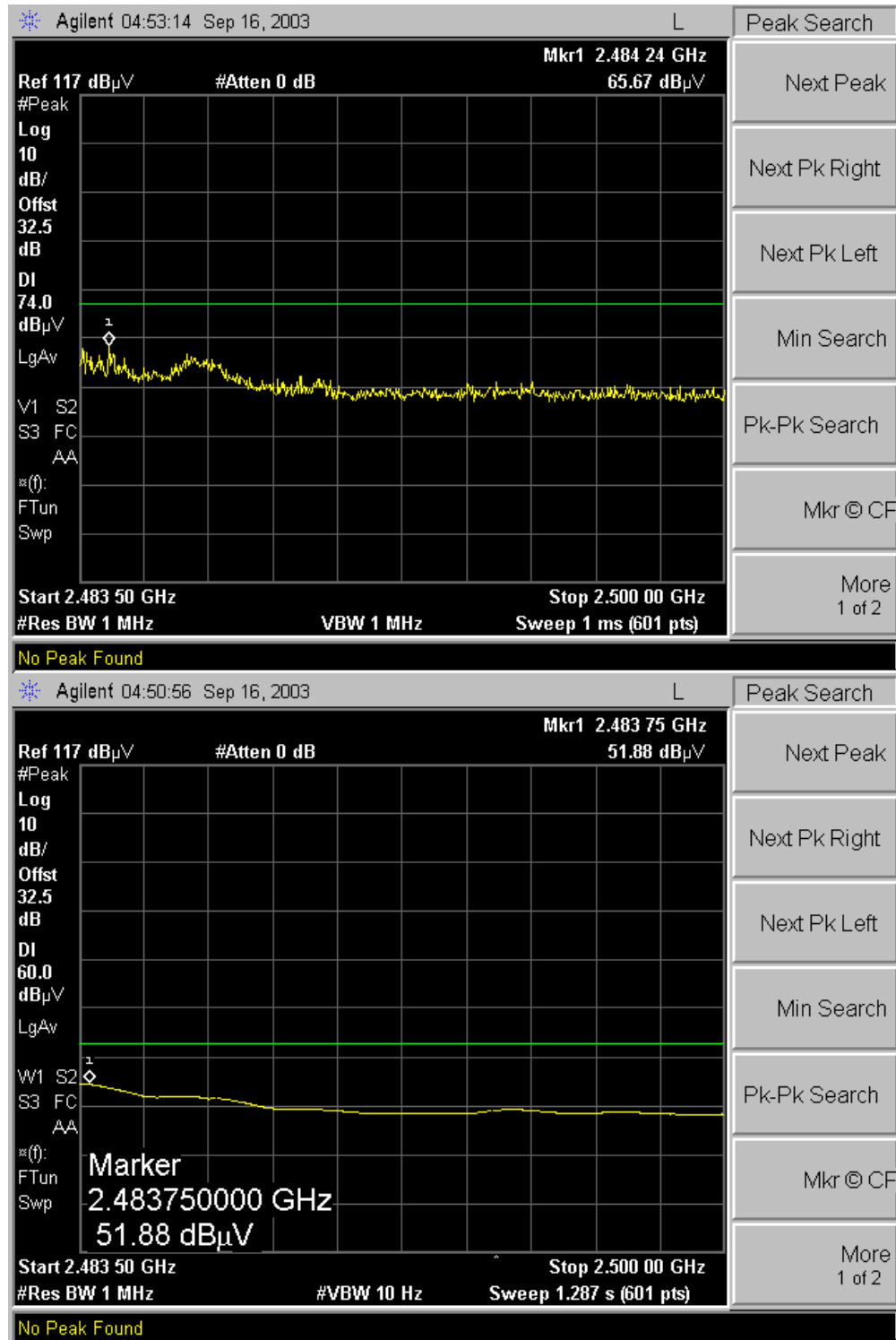
Low Bandedge: Channel 3, 23 dBm

Worst case band edge spectrum analyzer plots shown below. The user manual will include a table showing maximum output power for each channel.

NOTE: Normal transmission is TDD (-6 dB duty cycle). Correction included in display line level for average readings.

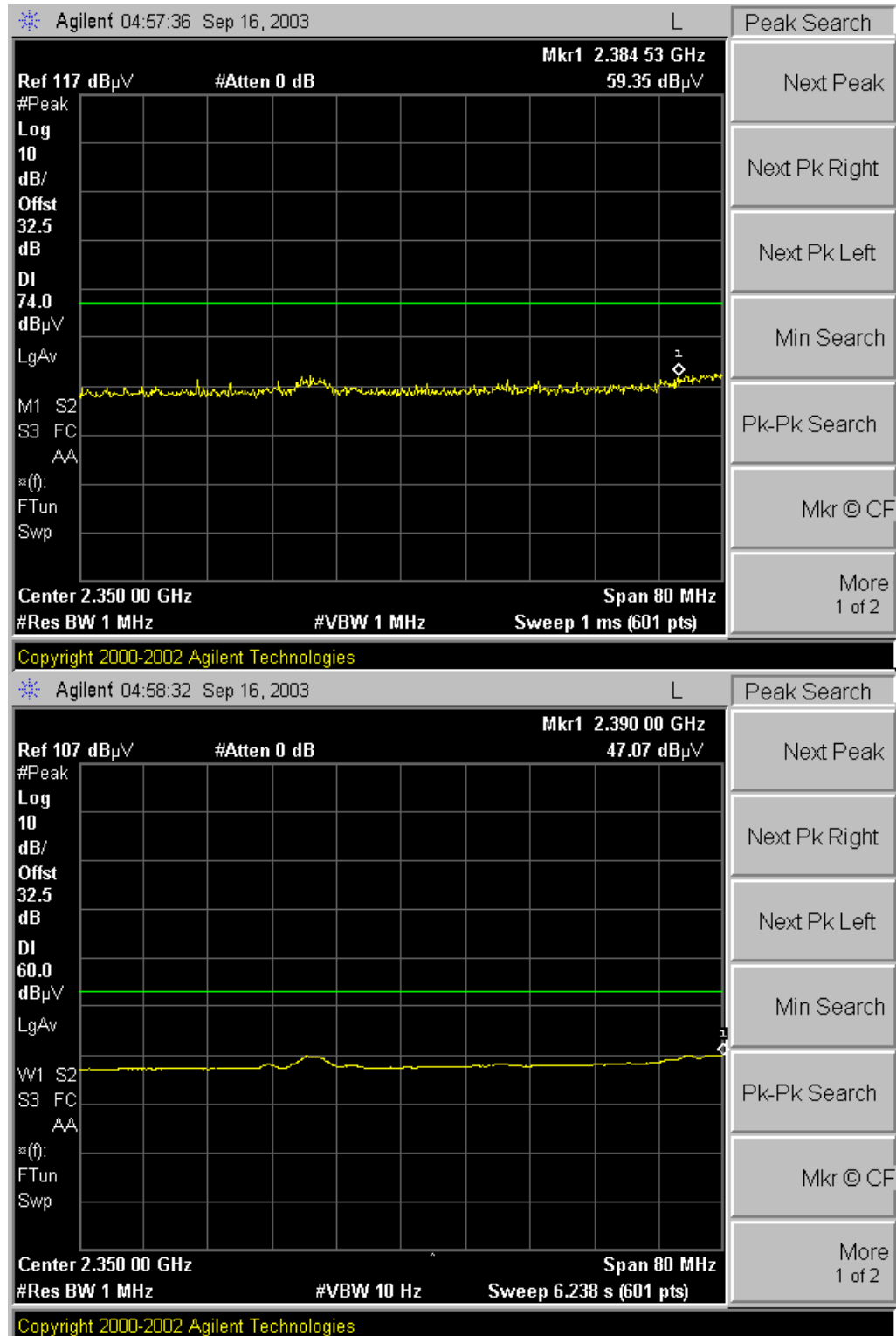
## Omni ANTENNA, 2483.5-2500 MHz, Peak and Average Field Strength

### Channel 36



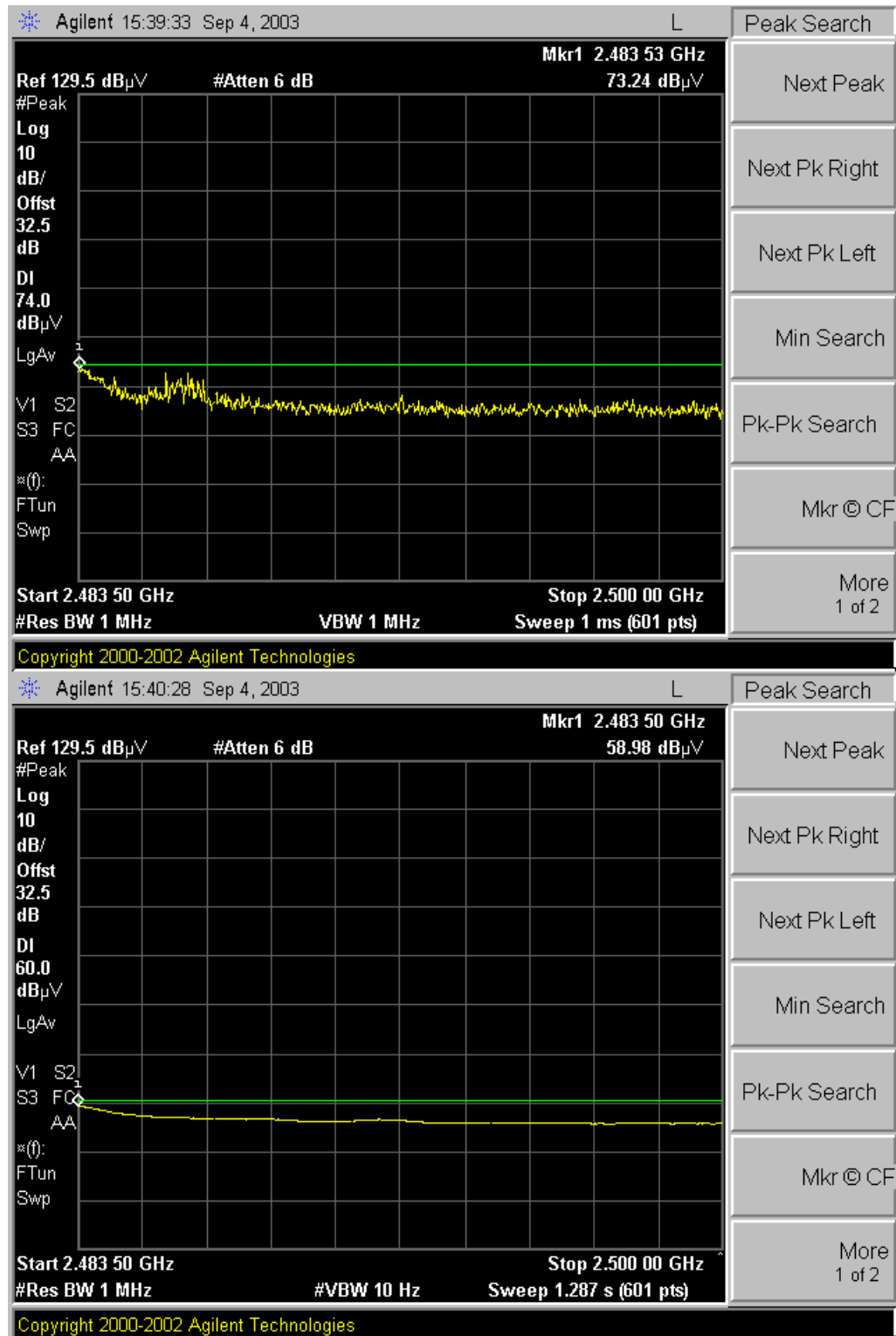
## Omni ANTENNA, 2310-2390 MHz, Peak and Average Field Strength

### Channel 3



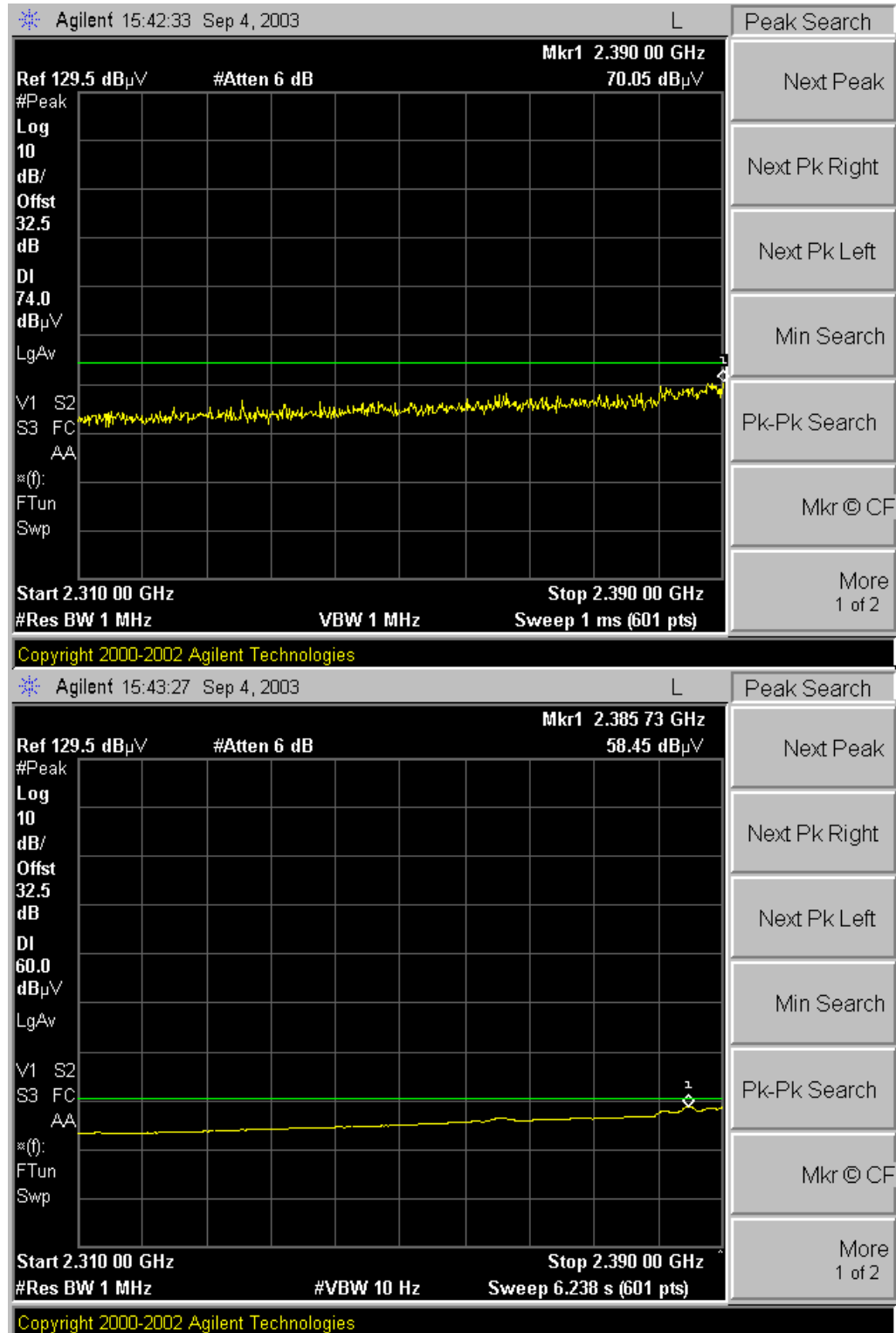
## FLAT PANEL ANTENNA, 2483.5-2500 MHz, Peak and Average Field Strength

### Channel 34



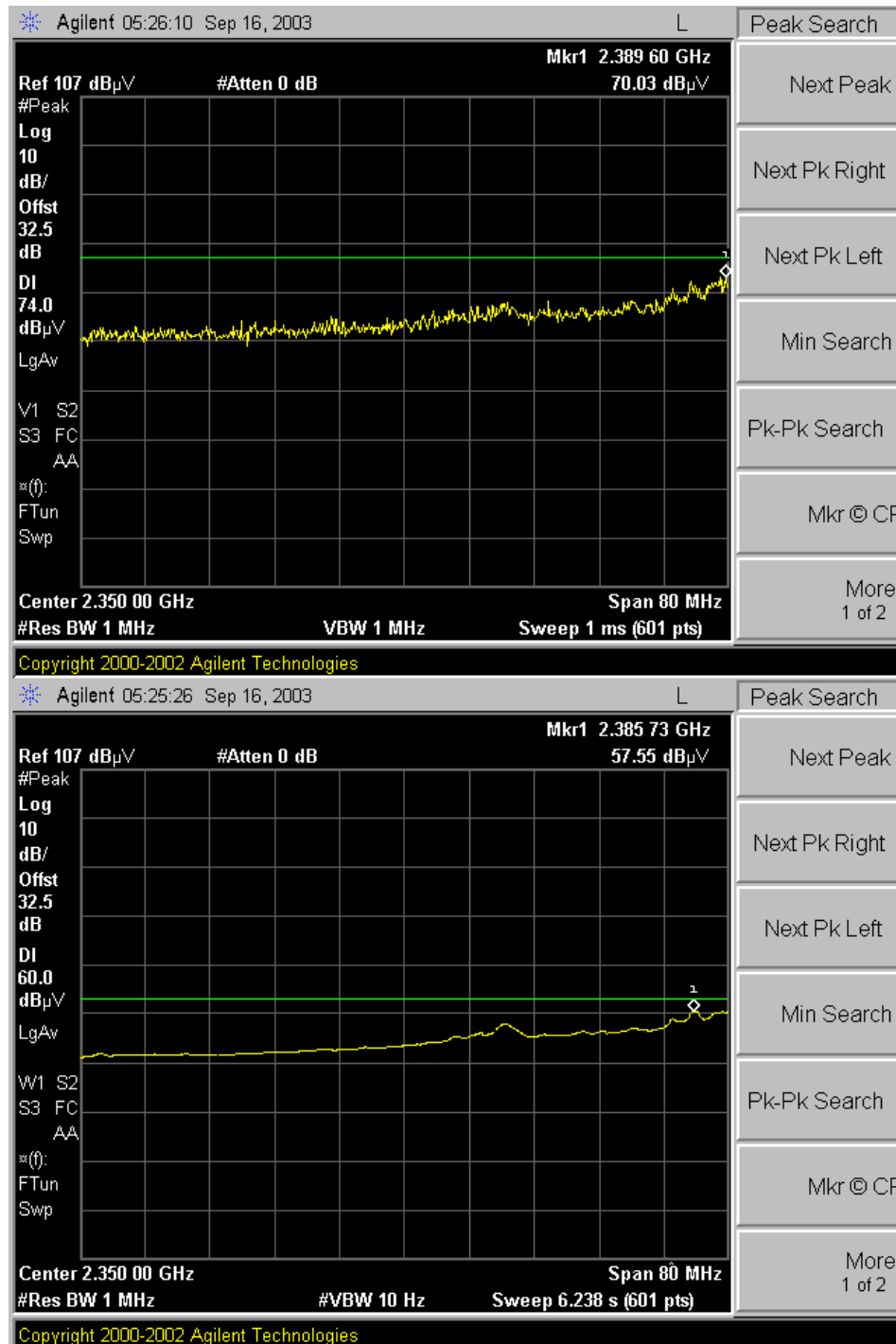
# **FLAT PANEL ANTENNA, 2310 - 2390 MHz, Peak and Average Field Strength**

## **Channel 3**

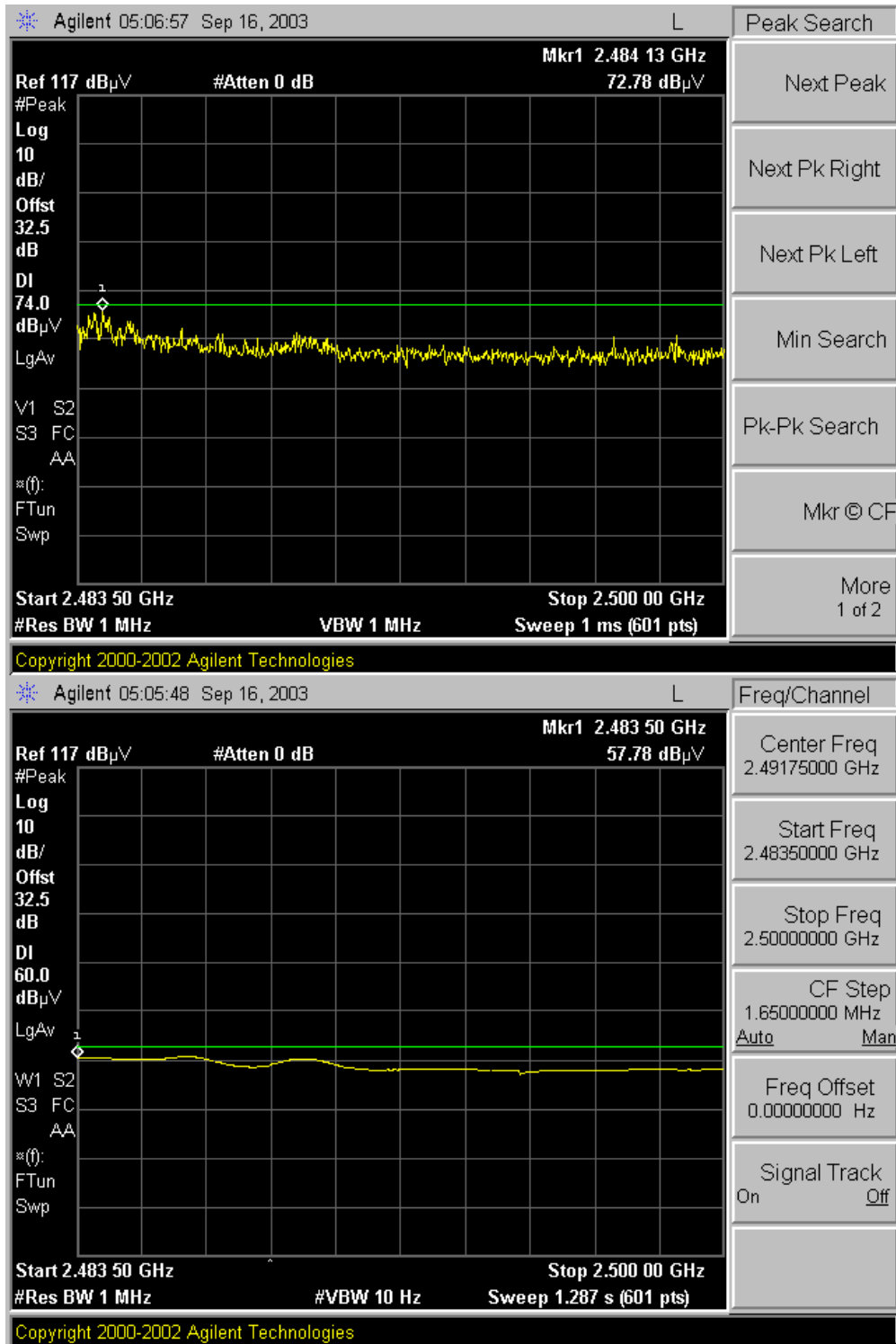


# DISH ANTENNA, 2310-2390 MHz, Peak and Average Field Strength

## Ch 3



**DISH ANTENNA, 2483.5-2500 MHz, Peak and Average Field Strength  
Ch 33 at 23 dBm**



**AC Line Conducted Emissions**

**Test Requirement:** 15.107, 15.207

**Measurement Equipment Used:**

Rohde & Schwarz EMI Receiver ESHS-20  
Fischer Custom Communication LISN, FCC-LISN-50/250-25-2

**Test Procedure**

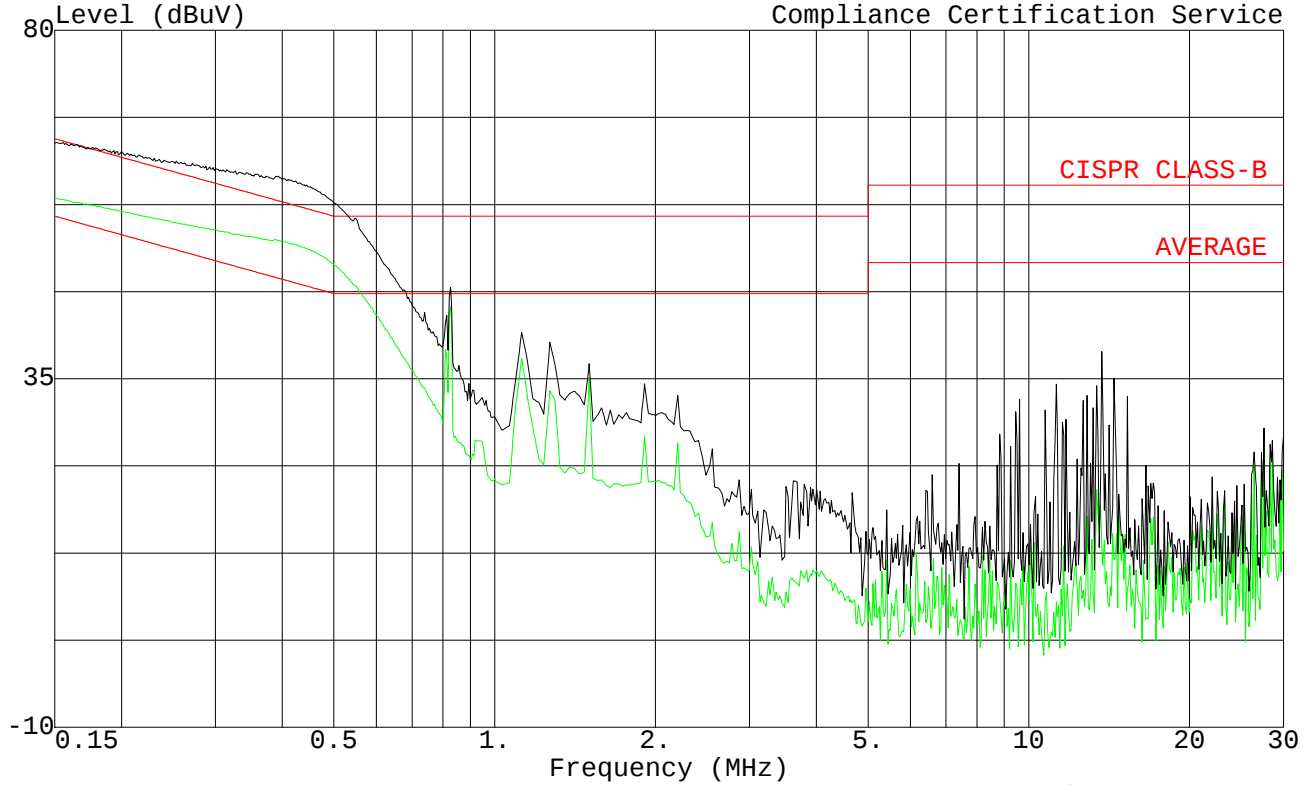
1. The EUT was placed on a wooden table 40 cm from a vertical ground plane and approximately 80 cm above the horizontal ground plane on the floor. The EUT was set to transmit in normally.
2. Line conducted data was recorded for both NEUTRAL and HOT lines.

**Test Results**

PASS. Refer to separate data sheets.

Data#: 21 File#: 03U2168.EMI

Date: 07-31-2003 Time: 12:20:15  
Compliance Certification Service



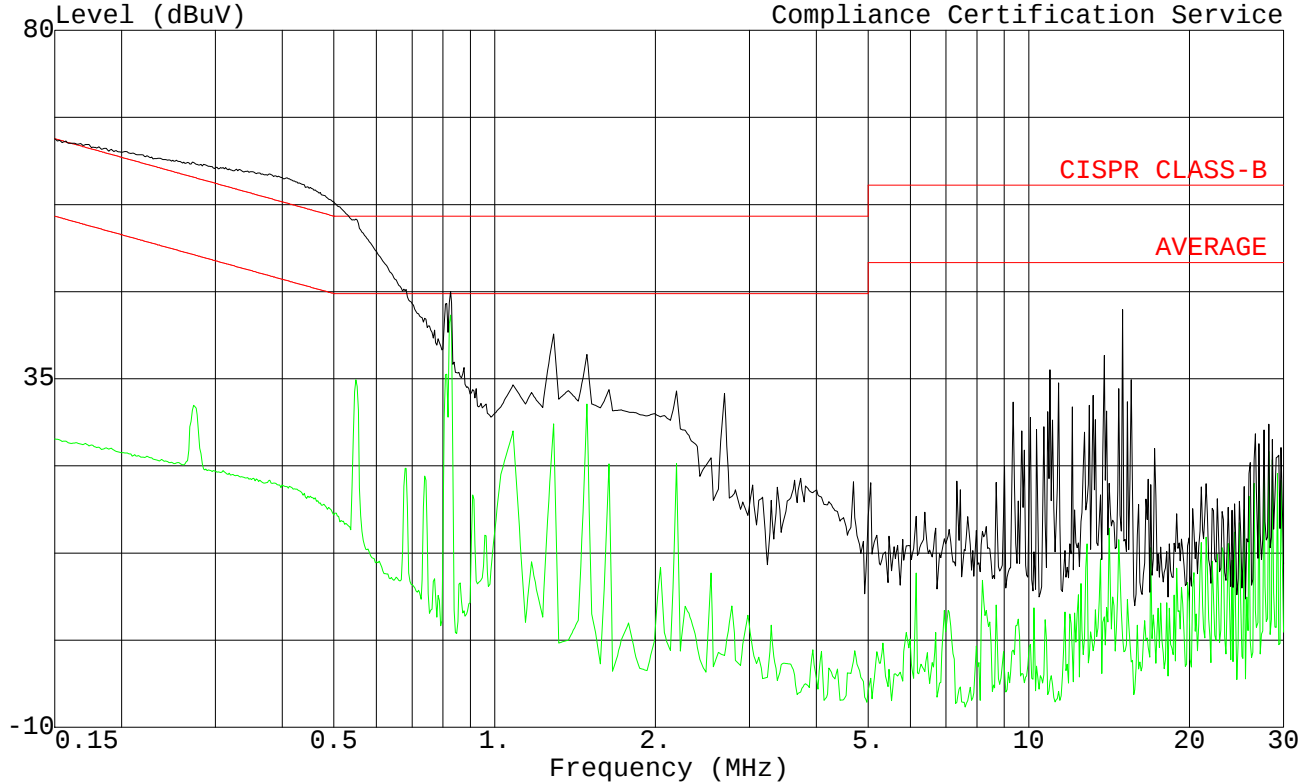
Trace: 19

Ref Trace:

Project # : 03U2168  
Test Engineer : William Zhuang  
Company : Afar Communication  
EUT : Wireless Ethernet Bridge  
Model : AR24027  
Configuration : EUT with Power Inserter and Antenna  
Mode of Operation: Normal  
Target of Test : FCC CLASS B  
: Line 1: Pk (Black), QP (Green)  
: 115VAC/60Hz

Data#: 7 File#: 03U2168.EMI

Date: 07-31-2003 Time: 11:50:36  
Compliance Certification Service

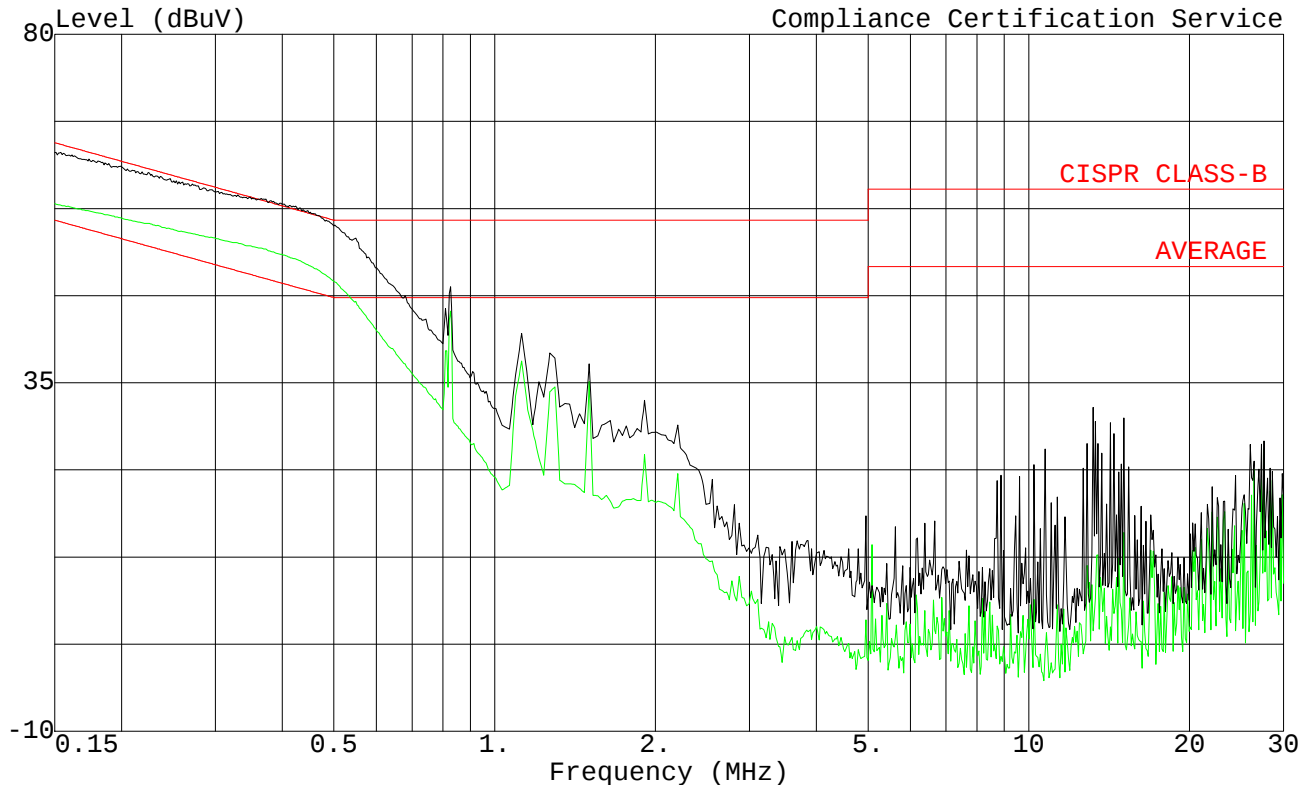


Trace: 5  
Project # : 03U2168  
Test Engineer : William Zhuang  
Company : Afar Communication  
EUT : Wireless Ethernet Bridge  
Model : AR24027  
Configuration : EUT with Power Inserter and Antenna  
Mode of Operation: Normal  
Target of Test : FCC CLASS B  
: Line 1: Pk (Black), Avg (Green)  
: 115VAC/60Hz

Ref Trace:

Data#: 28 File#: 03U2168.EMI

Date: 07-31-2003 Time: 12:51:13  
Compliance Certification Service

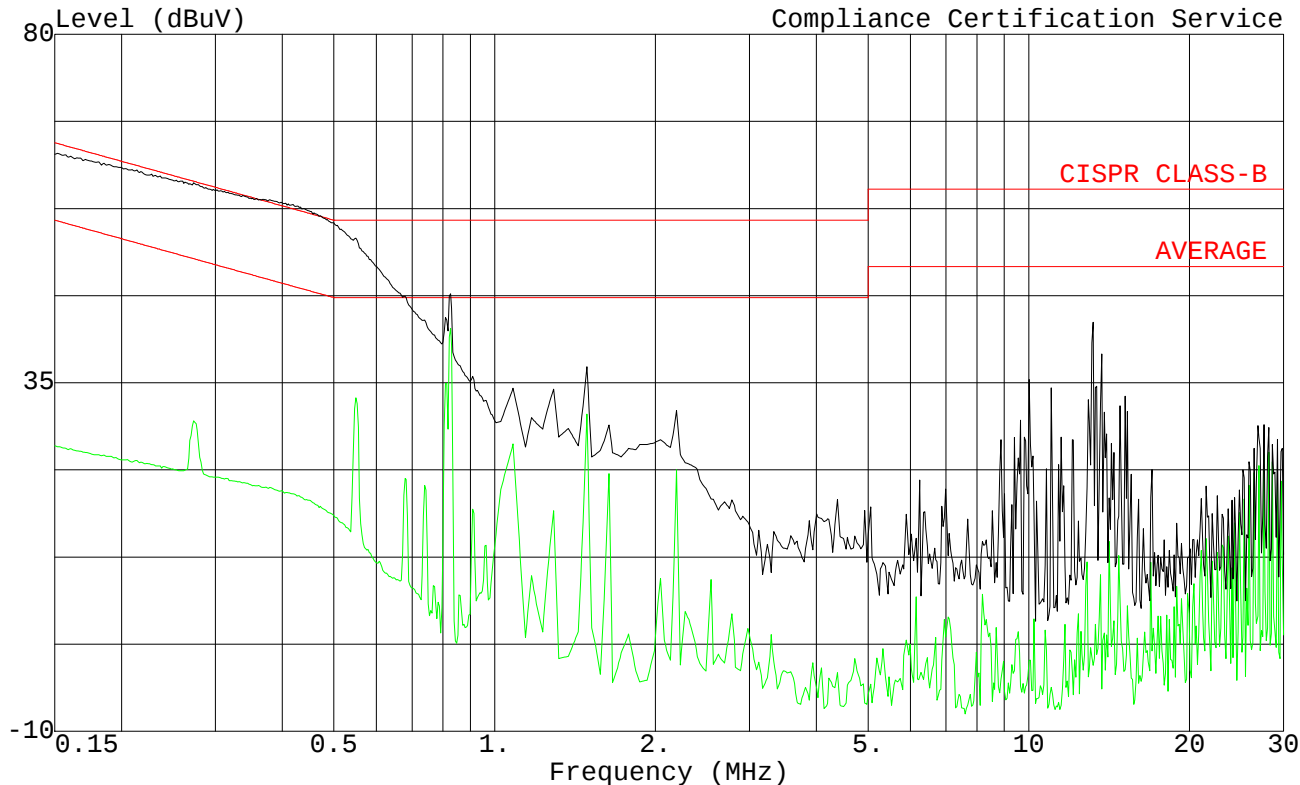


Trace: 26  
Project # : 03U2168  
Test Engineer : William Zhuang  
Company : Afar Communication  
EUT : Wireless Ethernet Bridge  
Model : AR24027  
Configuration : EUT with Power Inserter and Antenna  
Mode of Operation: Normal  
Target of Test : FCC CLASS B  
: Line 2: Pk (Black), QP (Green)  
: 115VAC/60Hz

Ref Trace:

Data#: 14 File#: 03U2168.EMI

Date: 07-31-2003 Time: 11:58:11  
Compliance Certification Service



Trace: 12

Ref Trace:

Project # : 03U2168  
Test Engineer : William Zhuang  
Company : Afar Communication  
EUT : Wireless Ethernet Bridge  
Model : AR24027  
Configuration : EUT with Power Inserter and Antenna  
Mode of Operation: Normal  
Target of Test : FCC CLASS B  
: Line 2: Pk (Black), Avg (Green)  
: 115VAC/60Hz

**Minimum 6 dB Bandwidth**  
**Test Requirement: 15.247(a)2**

**Measurement Equipment Used:**

Agilent E4446A spectrum analyzer  
10 dB attenuator  
2ft length coaxial cable ( .3 dB loss)

**Test Procedures**

The EUT was configured on a test bench. The EUT was set for continuous operation . Frequency was set to LOW channel. While the transmitter broadcast a steady stream of digital data, the analyzer MAX HOLD function was used to capture the envelope of the transmission occupied bandwidth.

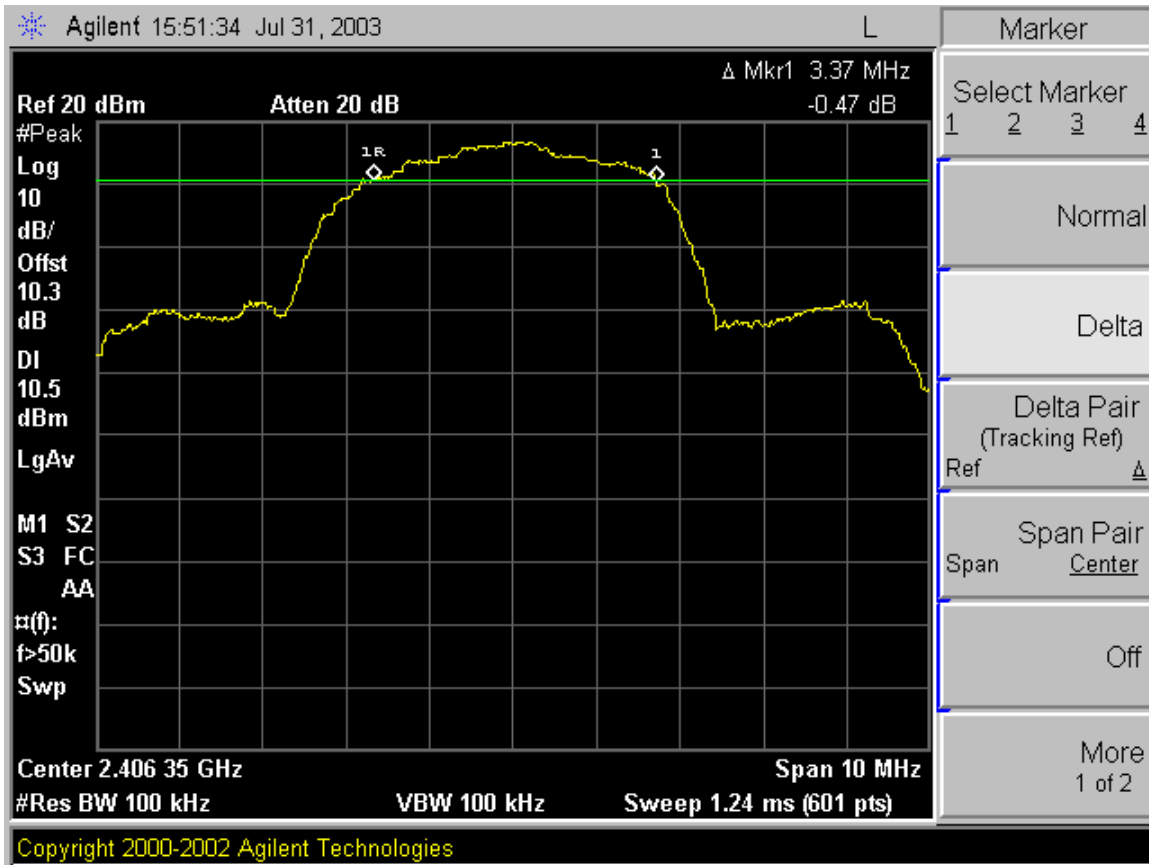
The test was repeated at MID channel and at HIGH channel.

**Test Results:** Refer to attached spectrum analyzer charts. Data taken with RES BW of 100 kHz shows minimum 6 dB BW of 3.2 MHz. Minimum requirement: no less than 500 kHz

| <b>Channel</b> | <b>Frequency, MHz</b> |
|----------------|-----------------------|
| 3 Low          | 2406                  |
| 20 Mid         | 2440                  |
| 37 High        | 2474                  |

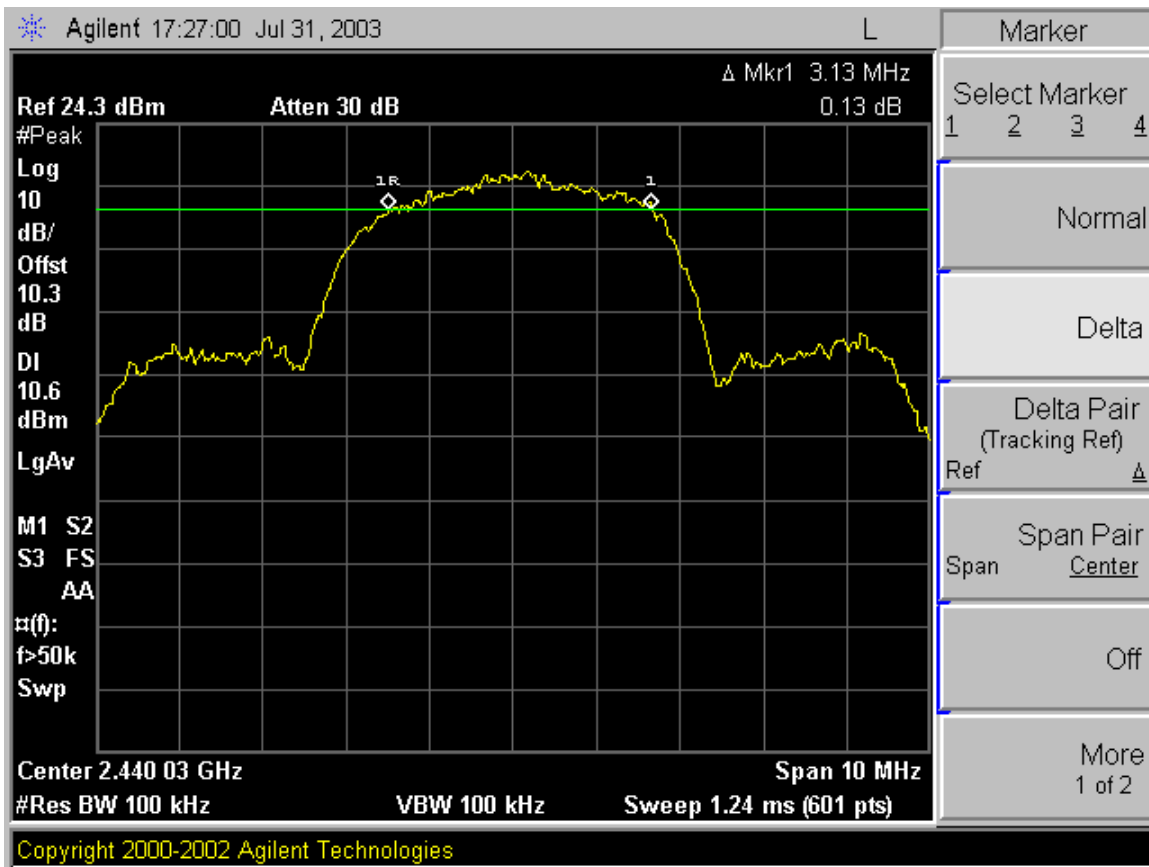
## 15.247(a)2: Minimum 6 dB Bandwidth

### LOW Channel



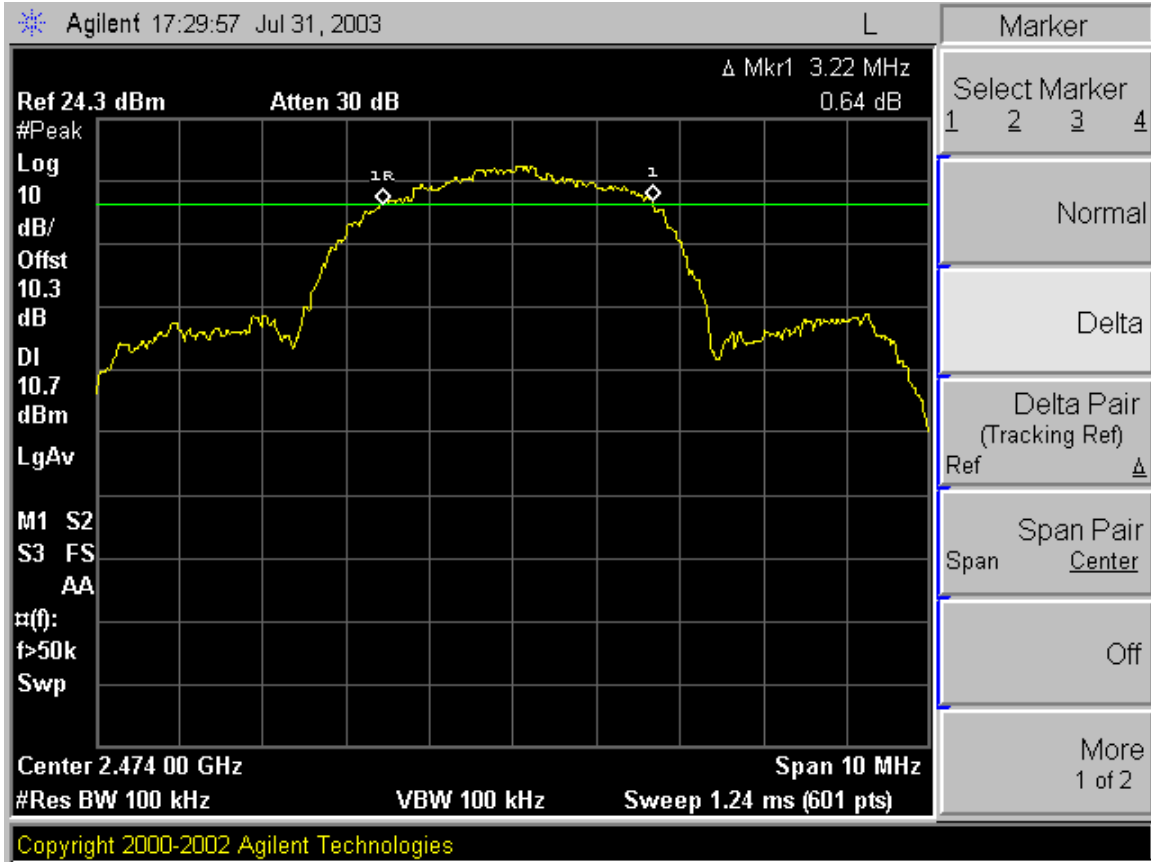
## Minimum 6 dB BW

### MID Channel

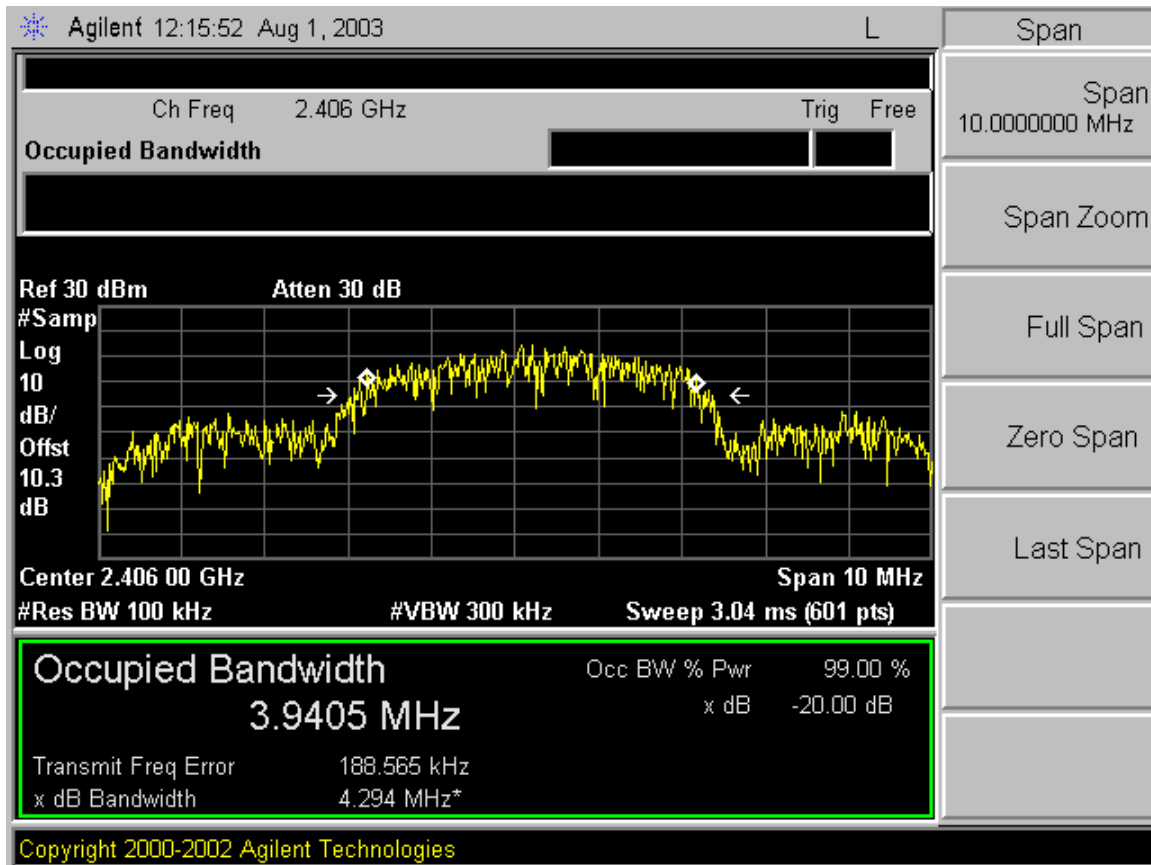


Minimum 6 dB BW

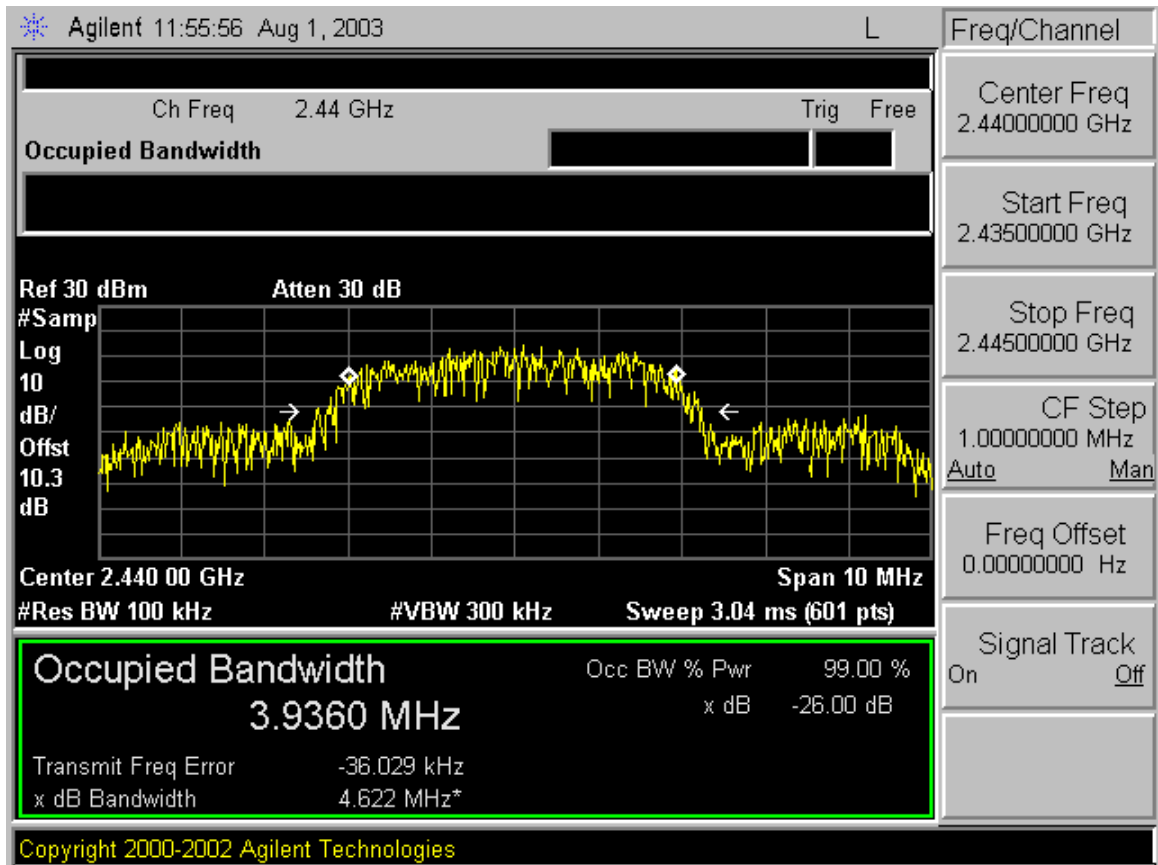
HIGH Channel



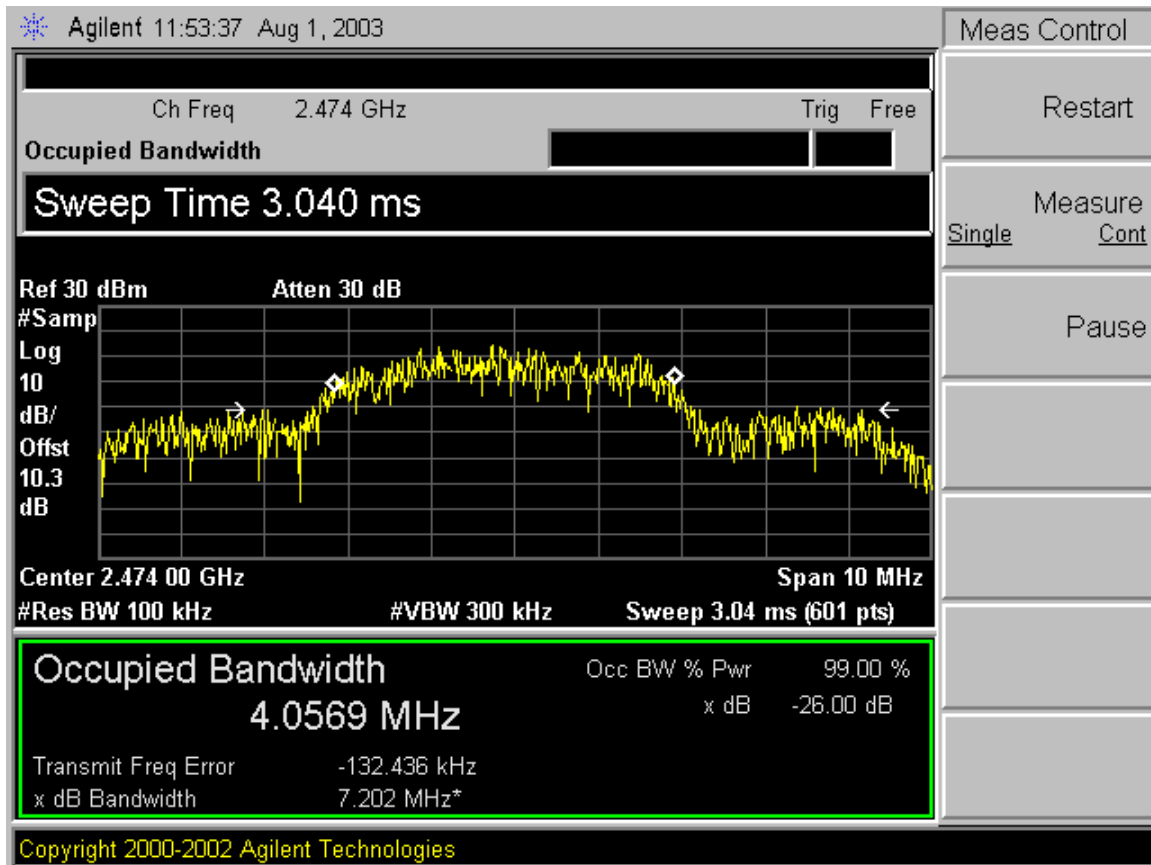
**LOW channel 99% bandwidth (Industry Canada Only)**  
**RSS-210**



**MID channel 99% bandwidth (Industry Canada Only)**  
**RSS-210**



**HIGH channel 99% bandwidth (Industry Canada Only)**  
**RSS-210**



## **RF Power Output**

### **Test Requirement: 15.247(b)**

### **Measurement Equipment Used:**

Agilent E4446A spectrum analyzer  
10 dB attenuator  
12ft length coaxial cable ( 2.4 dB loss)

### **Test Procedures**

1. The EUT was configured on a test bench and set to the LOW channel
2. The analyzer CHANNEL POWER function was activated with PEAK detector and power read directly from the screen.
3. The process in (1) and (2) was repeated for MID channel and HIGH channel.

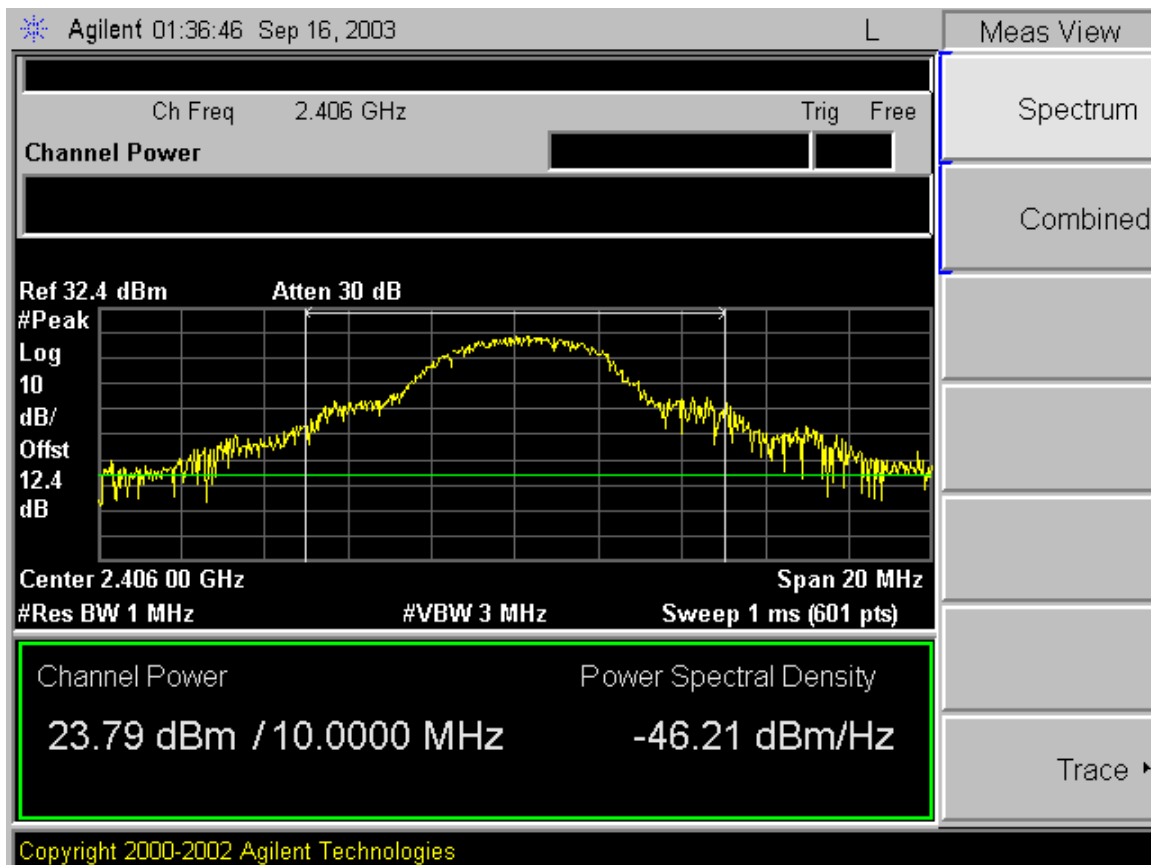
### **Test Results**

Peak power level readings are shown below. Refer also to spectrum analyzer graphs. Reference level offset corrects for external attenuation and cable loss.

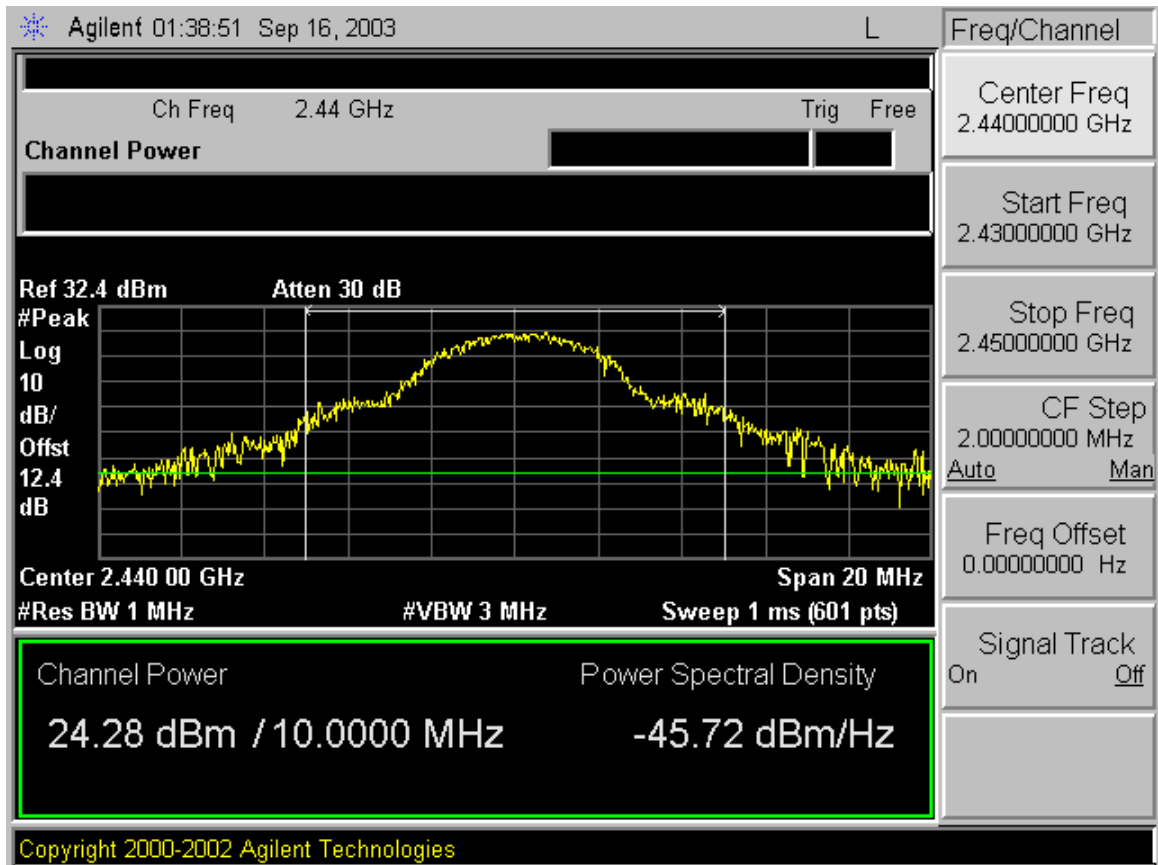
| <b>Channel</b> | <b>Frequency, MHz</b> | <b>Output Power, dBm</b> |
|----------------|-----------------------|--------------------------|
| 3 LOW          | 2406                  | 23.79                    |
| 20 MID         | 2440                  | 24.28                    |
| 37 HIGH        | 2474                  | 24.67                    |

The EUT power setting was at 23 dBm for all three measurements. The power settings correspond to readings that would be obtained by an average power meter. Peak to average ratio for CCK is approximately 2 dB, theoretical maximum 2.5 dB.

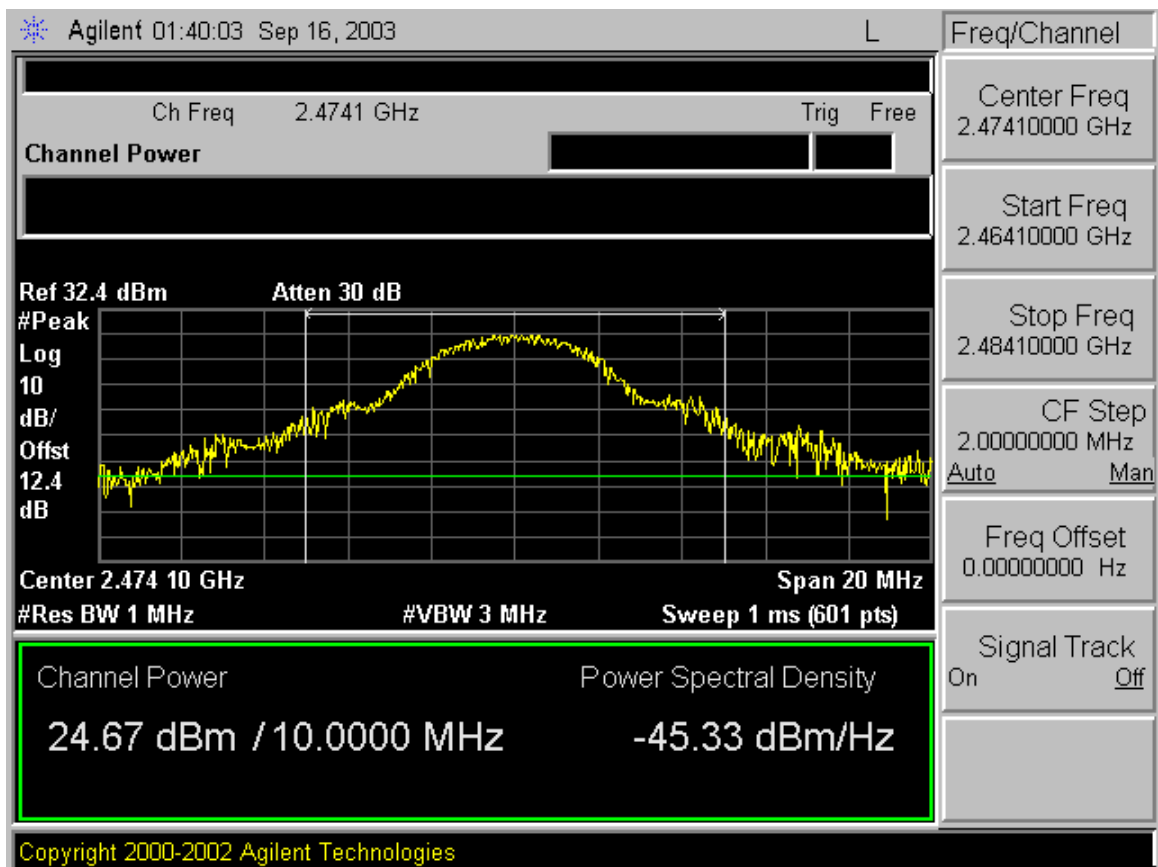
LOW channel 3 peak output power



MID channel 20 peak output power



HIGH channel 37 peak output power



**Spurious Emissions, Conducted**  
**Test Requirement: 15.247(c)**

**Measurement Equipment Used:**

Agilent E4446A Spectrum Analyzer  
10 dB attenuator  
12ft length coaxial cable (2.4 dB loss)

**Test Procedure**

1. The EUT was configured on a test bench. The cable was connected between the EUT antenna port and the spectrum analyzer input port.

Spectrum analyzer RES BW was set to 100 kHz. While the transmitter broadcast a steady stream of digital data, the analyzer MAX HOLD function was used to capture the envelope of the transmission.

Readings were taken out to 10fo.

2. The process in (1) was repeated for MID channel and HIGH channel.

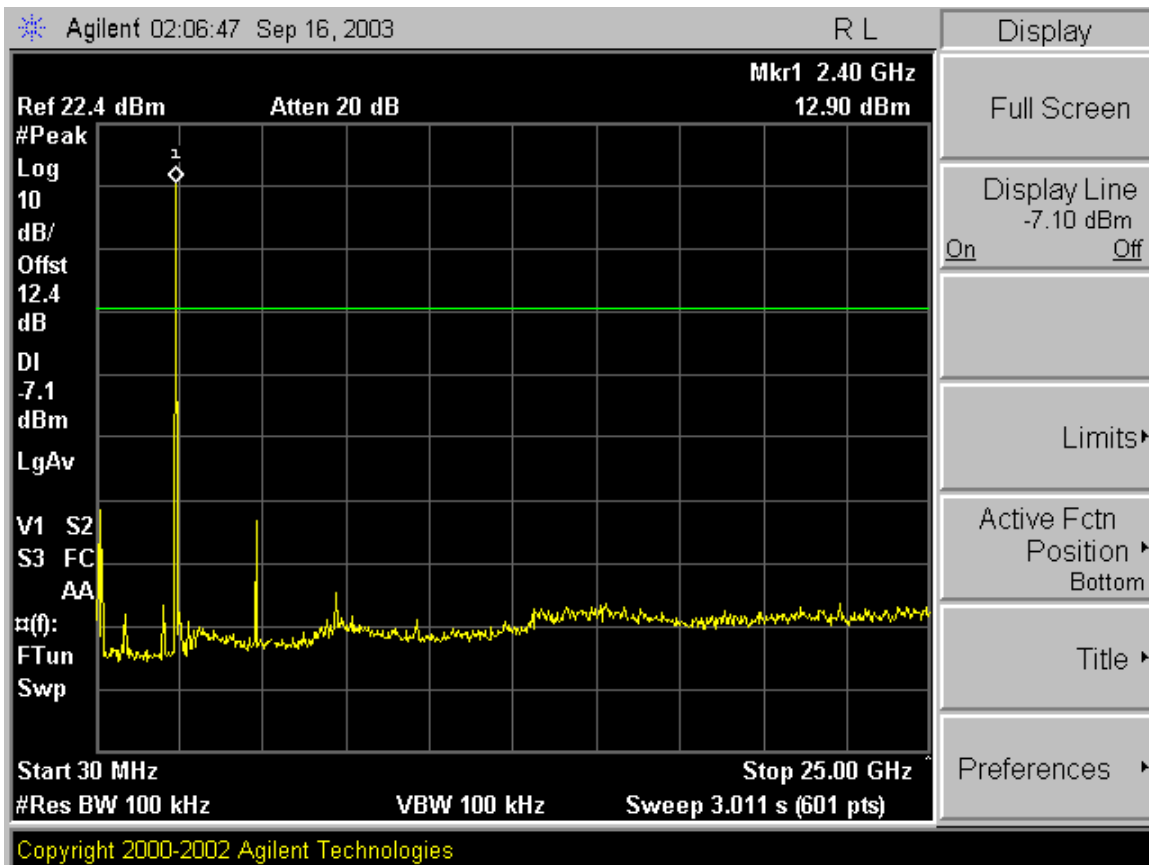
**Test Results**

Refer to attached data sheets. Data shows out of band emissions are suppressed well below the -20 dBc minimum required by the Rules.

| <b>Channel</b> | <b>Frequency, MHz</b> |
|----------------|-----------------------|
| 3 Low          | 2406                  |
| 20 Mid         | 2440                  |
| 37 High        | 2474                  |

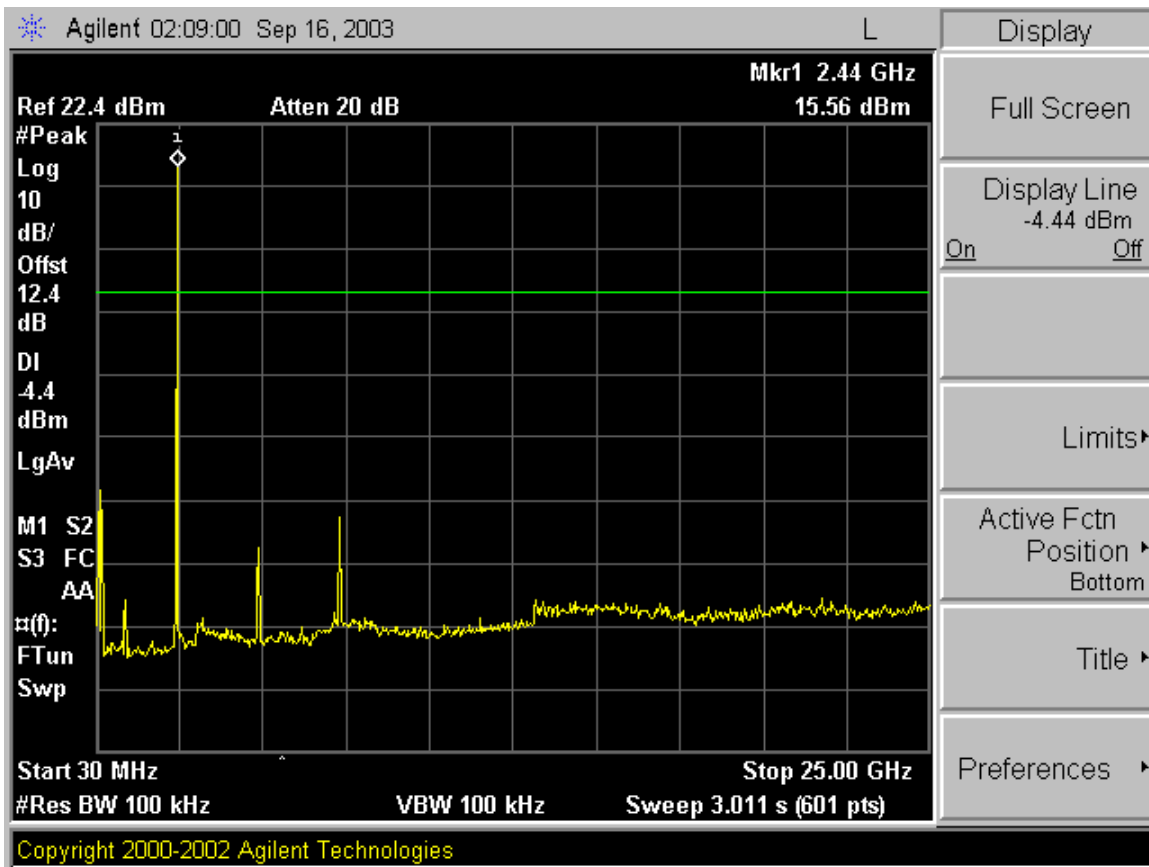
# 15.247(c): Spurious Emissions, Conducted, -20 dBc

## LOW Channel 3, 23 dBm power output setting



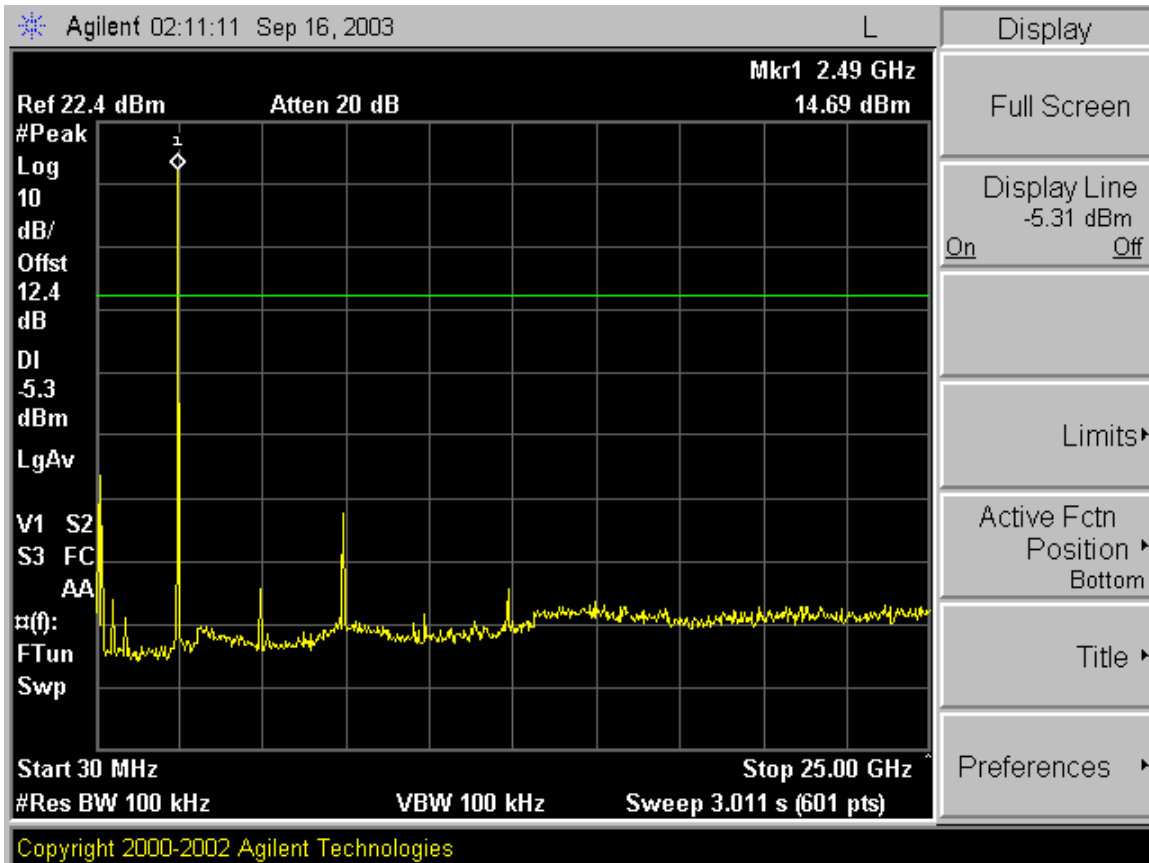
**15.247(c): Spurious Emissions, Conducted, -20 dBc**

**MID Channel 20, 23 dBm power output setting**



**15.247(c): Spurious Emissions, Conducted, -20 dBc**

**High Channel 37 , 23 dBm power output setting**



### **Power Spectral Density**

**Test Requirement:** 15.247(d)

### **Measurement Equipment Used:**

Agilent E4446A spectrum analyzer  
10 dB attenuator  
12ft length coaxial cable ( 2.4 dB loss)

### **Test Procedure**

For the LOW channel, the emission peak was set to the center of the display. The SPAN was set to 300 kHz, the RES BW and VID BW were set to 3 kHz, and SWEEP TIME was set to 100 seconds. The maximum trace was recorded and compared to the 8 dBm limit.

The test was repeated for MID and HIGH channel.

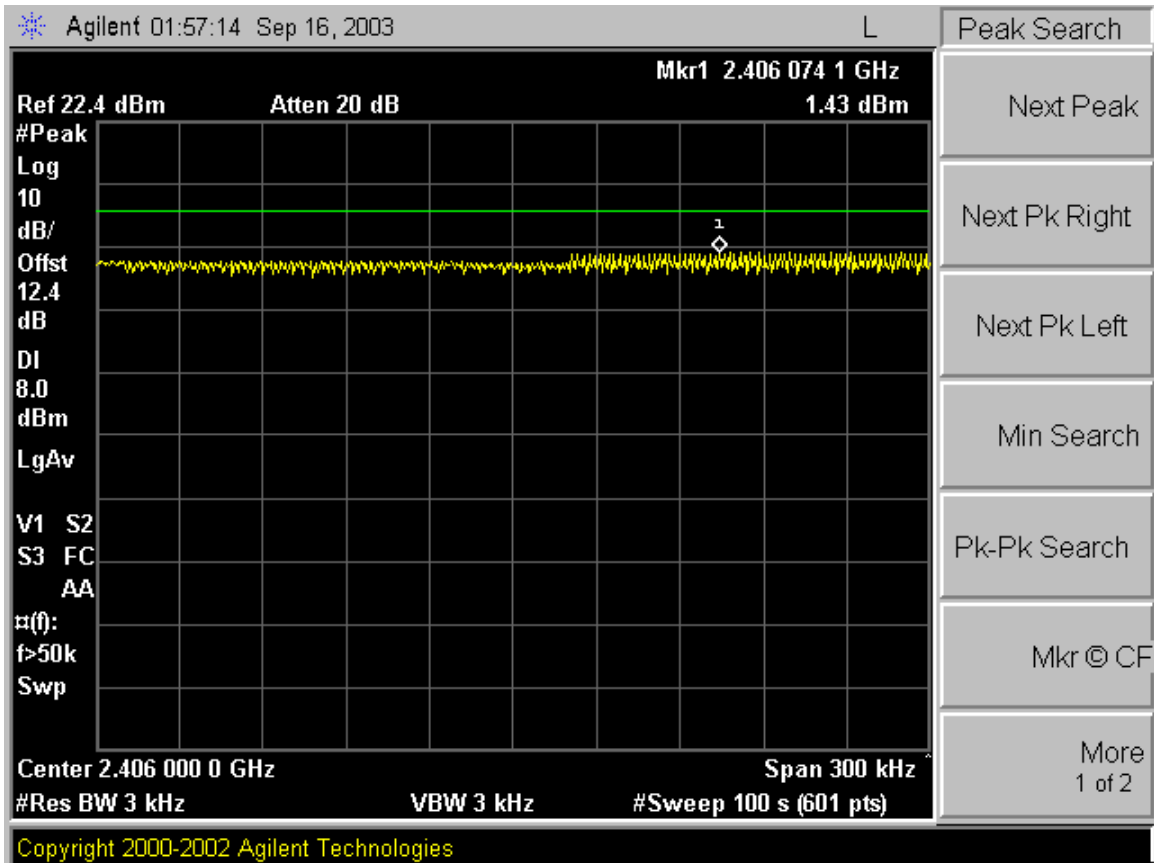
### **Test Results**

Maximum measured PSD was approximately 2 dBm. Maximum allowed psd is 8 dBm. Refer to attached spectrum analyzer charts.

| <b>Channel</b> | <b>Frequency, MHz</b> |
|----------------|-----------------------|
| 3 Low          | 2406                  |
| 20 Mid         | 2440                  |
| 37 High        | 2474                  |

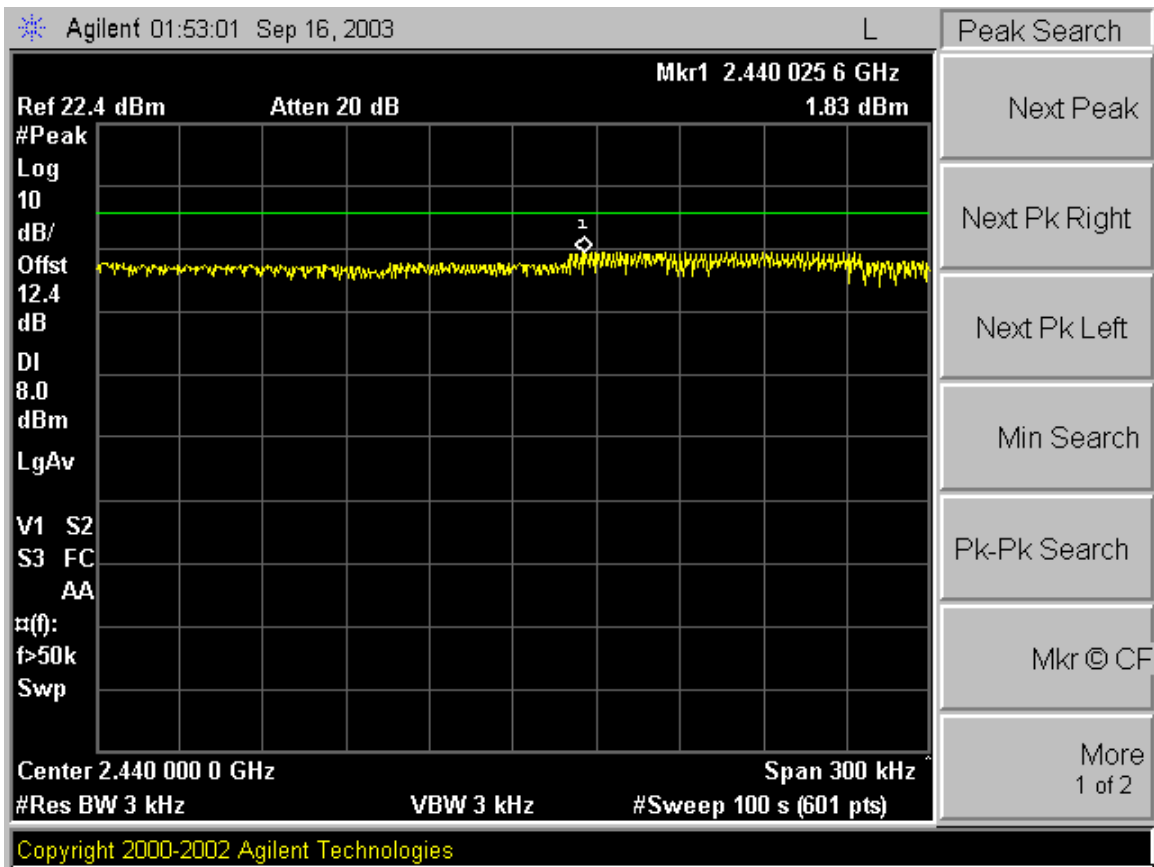
# 15.247(d): Power Spectral Density

## LOW Channel 3, 23 dBm power output setting



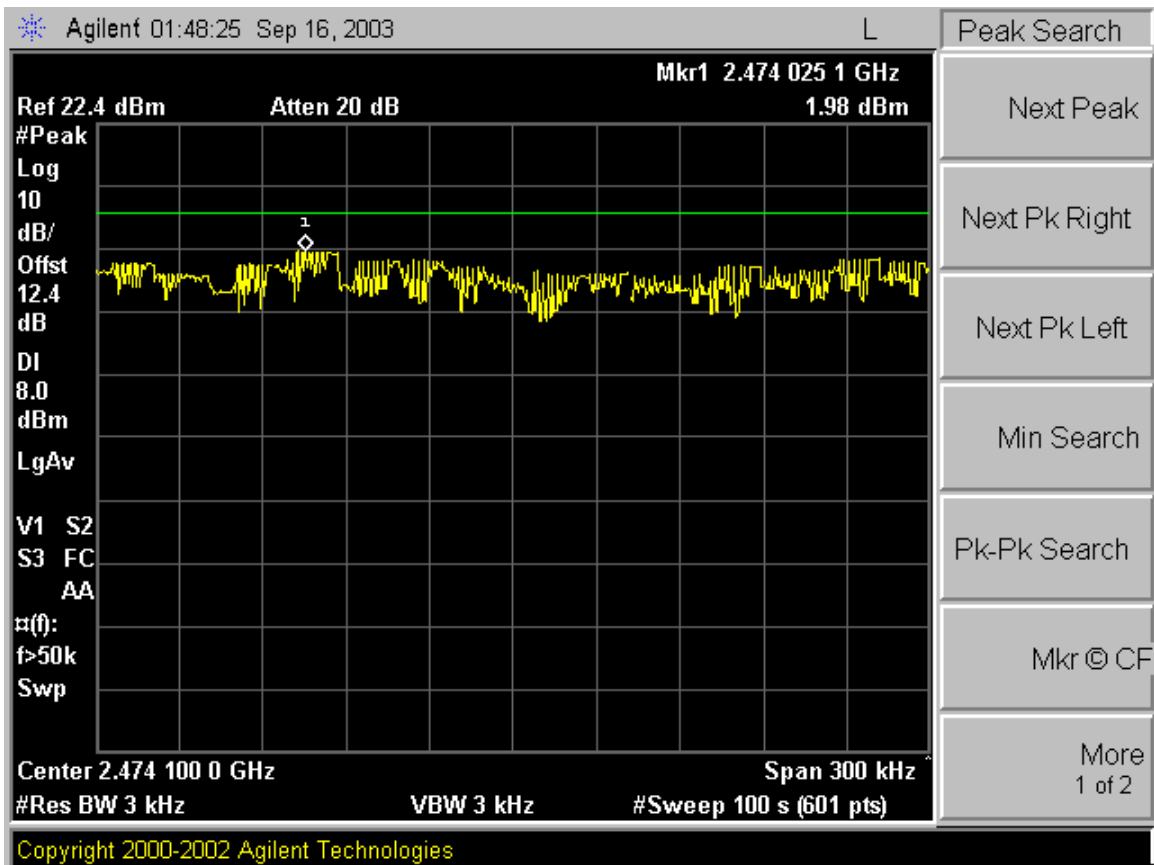
# 15.247(d): Power Spectral Density

MID Channel 20 , 23 dBm power output setting



# 15.247(d): Power Spectral Density

## HIGH Channel 37, 23 dBm power output setting



## MPE Calculations

Afar Communications Inc.  
FCC ID:

## RF Hazard Distance Calculation

mW/cm2 from Table1: 1.00

| Max RF Power<br>P, dBm | TX Antenna<br>G, dBi | MPE<br>Safe Distance, cm |
|------------------------|----------------------|--------------------------|
| 24.0                   | 9.0                  | 12.6                     |
| 24.0                   | 18.0                 | 35.5                     |
| 24.0                   | 24.0                 | 70.9                     |

## Basis of Calculations:

$$E^2/3770 = S, \text{ mW/cm}^2$$

$$E, \text{ V/m} = (P_{\text{watts}} * G_{\text{gain}} * 30)^{.5} / d, \text{ meters}$$

$$d = ((P_{\text{watts}} * G * 30) / (3770 * S))^{0.5} \quad P_{\text{watts}} * G_{\text{gain}} = 10^{(P_{\text{dBm}} - 30 + G_{\text{dBi}}) / 10}$$

**NOTE: For fixed location transmitters, minimum separation distance is 2m, even if calculations indicate MPE distance is less**