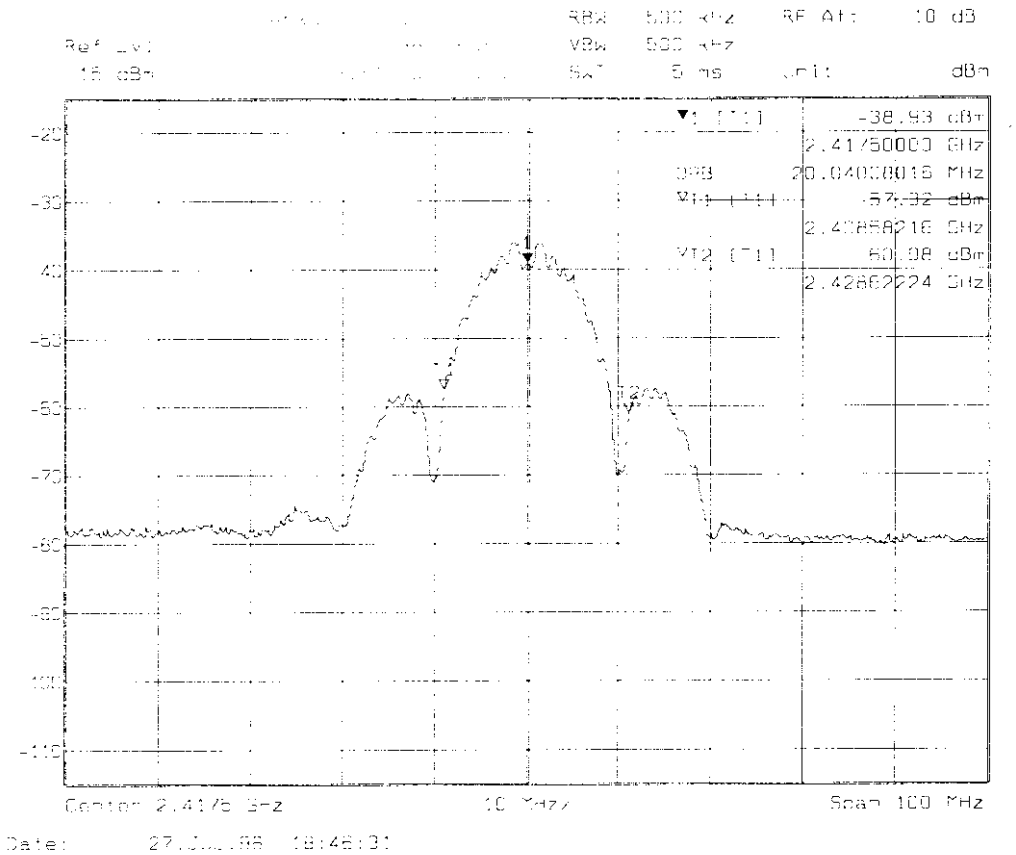


**Determination of Processing Gain for CSI Models 4200 and 4210  
July 27, 1998**

Measurements were made to show the compliance of CSI Models 4200 and 4210 with 47 CFR 15.247(e) which requires a direct sequence spread spectrum transmitter to have a processing gain of at least 10dB.

The model 4200/4210 uses a baseband processor integrated circuit manufactured by Harris Semiconductor Corp., model HFA3824A. In the 4200/4210 the baseband processor is programmed to use a spreading code (PN code) with a length of 15 chips. The code used is a modified Barker code, 1F35. A spectrogram of the transmitter output signal using this PN code is shown in Figure 1. Note: The CSI Models 4200 and 4210 are identical except that the Model 4200 is line powered and the 4210 is battery powered.



**Figure 1 - Spectrum with Spreading Enabled**

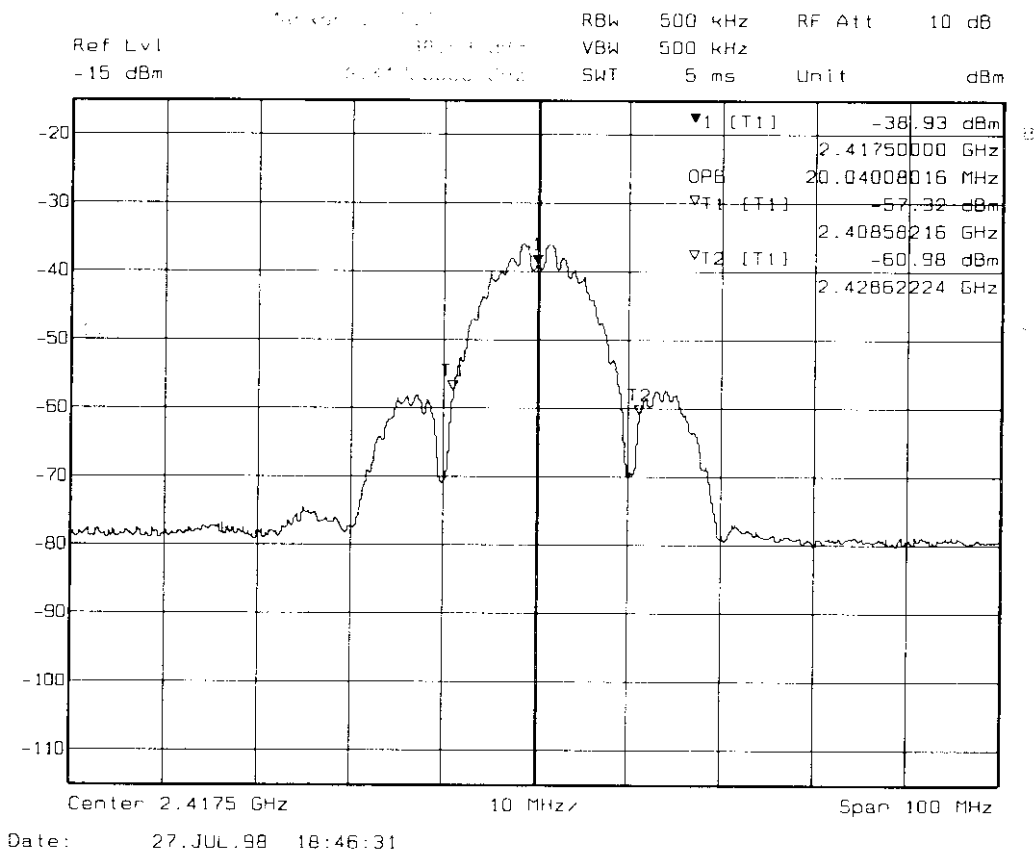
**PROPRIETARY**

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**Figure 1 - Spectrum with Spreading Enabled**

**PROPRIETARY**

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The processing gain was measured by comparing two bit-error rate (BER) versus signal strength curves; one with signal spreading enabled and the other with spreading disabled. The HFA3824A allows non-spread spectrum communication by setting the register that contains the spreading code to an all-ones value (7FFF for a 15-chip code).. A spectrogram of the transmitter output signal using this PN code is shown in Figure 2.

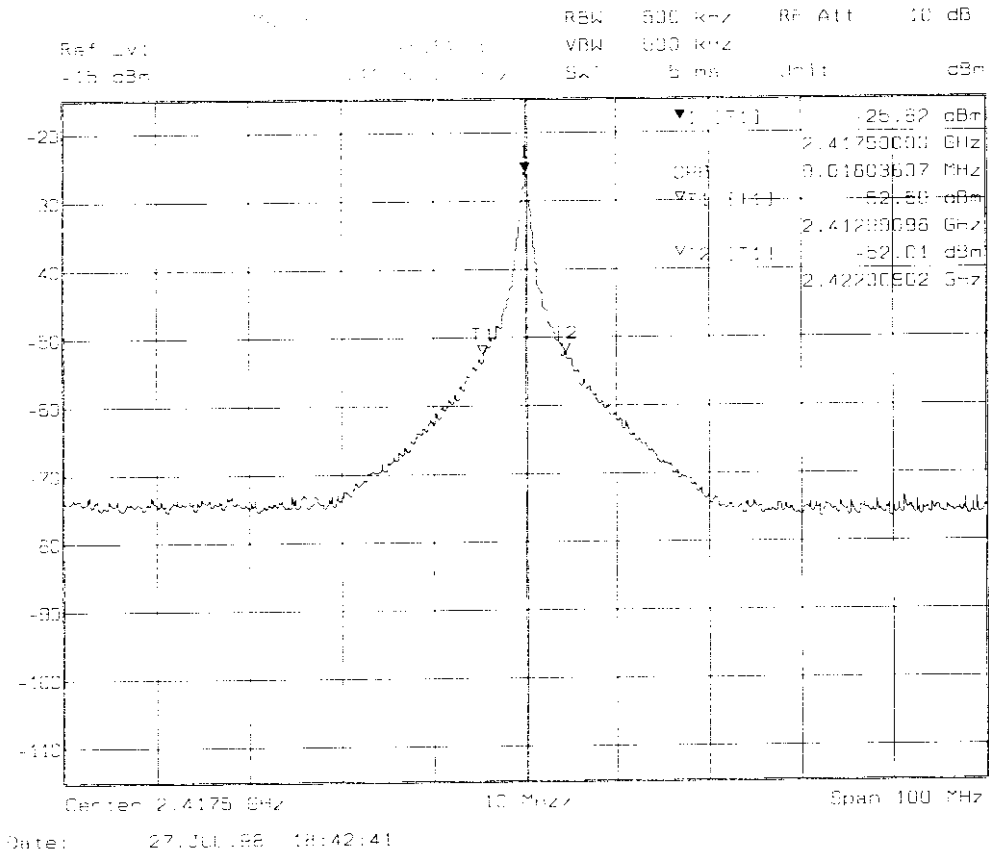
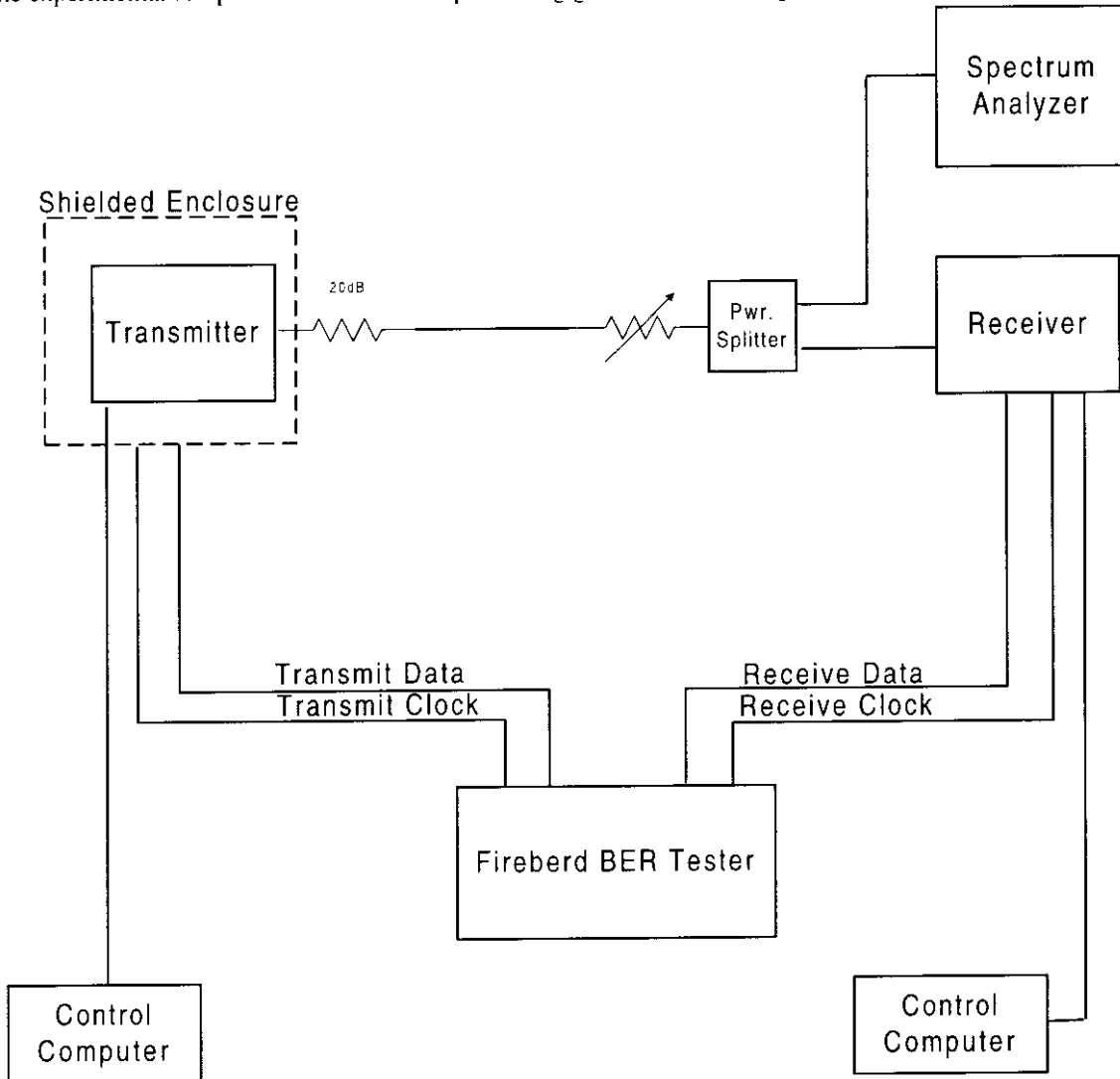


Figure 2 - Spectrum with Spreading Disabled

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The experimental setup used to measure the processing gain is shown in Figure 3.



**Figure 3 - Experimental Setup**

The procedure used to determine the processing gain was as follows:

1. Set the transmitter and receiver to use the normal (1F35) PN code.
2. Set the variable attenuator to 0dB and measure the power delivered to the receiver. This is the reference power level.
3. Set the variable attenuator to the highest attenuation that still allows measurement of BER.
4. Record the BER and attenuator setting for this power level and successively lower attenuation levels until the BER becomes too low to be measured in a reasonable length of time.
5. Set the PN code to 7FFF.
6. Repeat steps 2 through 4 for this code.

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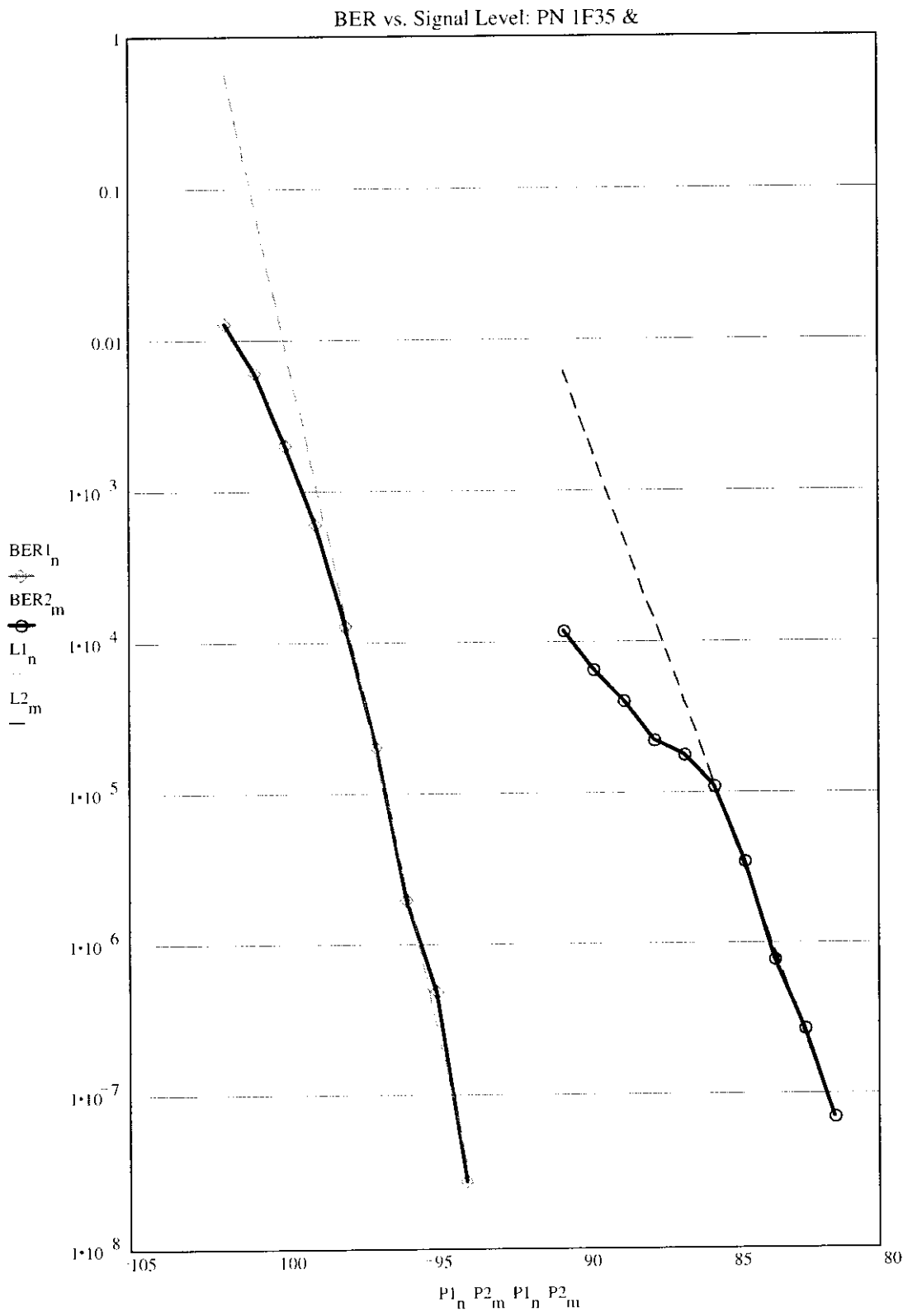


Figure 4 - Plot of Experimental Data

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The results of this are plotted in Figure 3. It is seen that at lower BER values the two curves have approximately the same slope but are separated by more than 10 dB of signal strength.

In order to arrive at a more precise determination of the processing gain a least squares fit of the data represented by the 5 lowest BER points was determined. Using the linear equation thus derived, the signal power necessary for the reference BER ( $1 \times 10^{-6}$ ) was determined. The results of this yield the following:

Power for reference BER with spreading = -95.394 dBm  
Power for reference BER w/o spreading = -83.587 dBm

The processing gain is the difference in these two power levels:

Processing Gain = 11.807 dB

The theoretical processing gain for a 15 chip direct sequence spread spectrum system is given by:

Processing Gain =  $10 \times \text{Log}(15) = 11.761$  dB

The agreement between the theoretical and measured processing gain is excellent and clearly shows that the Model 4200 complies with 47 CFR 15.247(e).

## **PROPRIETARY**

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**EUT and Peripherals**

| Description                                     | Model No.  | Serial No. | FCC ID               | Cable Description   |
|---|------------|------------|----------------------|---------------------|
| EUT<br>Computational<br>Systems<br>Incorporated | 4200       | None       | NL54200<br>(Pending) | 6' U<br>To AC Power |
| EUT<br>Computational<br>Systems<br>Incorporated | 4210       | None       | NL54200<br>(Pending) | None                |
| Antenna<br>Cushcraft<br>Corporation             | RTN2400SXR | None       | None                 | 7"                  |

**Table 1A. Peak Radiated Spurious Emissions (Model 4200)  
Channel 2- Low**

| Freq. (GHz) | Test Data* (dBm) | Amp. Gain (dB) | Antenna Factor (dB) | Cable Loss (dB) | Results (uV/m) 3m | Peak FCC Limits (uV/m) |
|-------------|------------------|----------------|---------------------|-----------------|-------------------|------------------------|
| 4.845       | -59.5            | 34.2           | 34.7                | 4.2             | 404.8             | 5000.0                 |
| 7.267       | -58.3            | 34.5           | 37.1                | 6.8             | 801.2             | 5000.0                 |

**Table 1B. Peak Radiated Spurious Emissions (Model 4200)  
Channel 3-Mid**

| Freq. (GHz) | Test Data* (dBm) | Amp. Gain (dB) | Antenna Factor (dB) | Cable Loss (dB) | Results (uV/m) 3m | Peak FCC Limits (uV/m) |
|-------------|------------------|----------------|---------------------|-----------------|-------------------|------------------------|
| 4.865       | -60.1            | 34.2           | 34.7                | 4.2             | 378.7             | 5000.0                 |
| 7.297       | -57.5            | 34.5           | 37.2                | 6.8             | 887.3             | 5000.0                 |

**Table 1C. Peak Radiated Spurious Emissions (Model 4200)  
Channel 5-High**

| Freq. (GHz) | Test Data* (dBm) | Amp. Gain (dB) | Antenna Factor (dB) | Cable Loss (dB) | Results (uV/m) 3m | Peak FCC Limits (uV/m) |
|-------------|------------------|----------------|---------------------|-----------------|-------------------|------------------------|
| 4.905       | -56.3            | 34.2           | 34.8                | 4.2             | 589.2             | 5000.0                 |
| 7.358       | -56.9            | 34.5           | 37.3                | 6.8             | 970.3             | 5000.0                 |

\* Data has been corrected by 1dB for high pass filter loss.

SAMPLE CALCULATION:

RESULTS (uV/m @ 3m) = Antilog ((-59.5 - 34.2 + 34.7 + 4.2 + 107)/20) = 404.8  
CONVERSION FROM dBm TO dBuV = 107 dB



**Table 1D. Peak Radiated Spurious Emissions (Model 4210)  
Channel 2- Low**

| Freq. (GHz) | Test Data* (dBm) | Amp. Gain (dB) | Antenna Factor (dB) | Cable Loss (dB) | Results (uV/m) 3m | Peak FCC Limits (uV/m) |
|-------------|------------------|----------------|---------------------|-----------------|-------------------|------------------------|
| 4.845       | -54.6            | 34.2           | 34.7                | 4.2             | 711.6             | 5000.0                 |
| 7.268       | -58.8            | 34.5           | 37.1                | 6.8             | 756.6             | 5000.0                 |

**Table 1E. Peak Radiated Spurious Emissions (Model 4210)  
Channel 3-Mid**

| Freq. (GHz) | Test Data* (dBm) | Amp. Gain (dB) | Antenna Factor (dB) | Cable Loss (dB) | Results (uV/m) 3m | Peak FCC Limits (uV/m) |
|-------------|------------------|----------------|---------------------|-----------------|-------------------|------------------------|
| 4.865       | -60.9            | 34.2           | 34.7                | 4.2             | 345.3             | 5000.0                 |
| 7.298       | -57.8            | 34.5           | 37.2                | 6.8             | 857.5             | 5000.0                 |

**Table 1F. Peak Radiated Spurious Emissions (Model 4210)  
Channel 5-High**

| Freq. (GHz) | Test Data* (dBm) | Amp. Gain (dB) | Antenna Factor (dB) | Cable Loss (dB) | Results (uV/m) 3m | Peak FCC Limits (uV/m) |
|-------------|------------------|----------------|---------------------|-----------------|-------------------|------------------------|
| 4.905       | -58.1            | 34.2           | 34.8                | 4.2             | 478.9             | 5000.0                 |
| 7.357       | -55.7            | 34.5           | 37.3                | 6.8             | 1113.7            | 5000.0                 |

\* Data has been corrected by 1dB for high pass filter loss.

SAMPLE CALCULATION:

RESULTS (uV/m @ 3m) = Antilog ((-54.6 - 34.2 + 34.7 + 4.2 + 107)/20) = 711.6  
 CONVERSION FROM dBm TO dBuV = 107 dB

**Table 2A. Average Radiated Spurious Emissions (Model 4200)  
Channel 2 -Low**

| Freq. (GHz) | Test Data* (dBm) | Amp. Gain (dB) | Antenna Factor (dB) | Cable Loss (dB) | Results (uV/m) 3m | Average FCC Limits (uV/m) |
|-------------|------------------|----------------|---------------------|-----------------|-------------------|---------------------------|
| 4.845       | -68.0            | 34.2           | 34.7                | 4.2             | 152.1             | 500.0                     |
| 7.267       | -69.4            | 34.5           | 37.1                | 6.8             | 283.2             | 500.0                     |

**Table 2B. Average Radiated Spurious Emissions (Model 4200)  
Channel 3-Mid**

| Freq. (GHz) | Test Data* (dBm) | Amp. Gain (dB) | Antenna Factor (dB) | Cable Loss (dB) | Results (uV/m) 3m | Average FCC Limits (uV/m) |
|-------------|------------------|----------------|---------------------|-----------------|-------------------|---------------------------|
| 4.865       | -69.5            | 34.2           | 34.7                | 4.2             | 128.3             | 500.0                     |
| 7.297       | -69.4            | 34.5           | 37.1                | 6.8             | 225.5             | 500.0                     |

**Table 2C. Average Radiated Spurious Emissions (Model 4200)  
Channel 5-High**

| Freq. (GHz) | Test Data* (dBm) | Amp. Gain (dB) | Antenna Factor (dB) | Cable Loss (dB) | Results (uV/m) 3m | Average FCC Limits (uV/m) |
|-------------|------------------|----------------|---------------------|-----------------|-------------------|---------------------------|
| 4.905       | -61.6            | 34.2           | 34.8                | 4.2             | 320.1             | 500.0                     |
| 7.358       | -68.2            | 34.5           | 37.3                | 6.8             | 264.2             | 500.0                     |

\*Data has been corrected by 1dB for high pass filter loss

SAMPLE CALCULATION:

RESULTS (uV/m @ 3m) = Antilog  $((-68.0 - 34.2 + 34.7 + 4.2 + 107)/20) = 152.1$

CONVERSION FROM dBm TO dBuV = 107 dB

**Table 2D. Average Radiated Spurious Emissions (Model 4210)  
Channel 2 -Low**

| Freq. (GHz) | Test Data* (dBm) | Amp. Gain (dB) | Antenna Factor (dB) | Cable Loss (dB) | Results (uV/m) 3m | Average FCC Limits (uV/m) |
|-------------|------------------|----------------|---------------------|-----------------|-------------------|---------------------------|
| 4.845       | -59.1            | 34.2           | 34.7                | 4.2             | 423.9             | 500.0                     |
| 7.268       | -69.7            | 34.5           | 37.1                | 6.8             | 215.7             | 500.0                     |

**Table 2E. Average Radiated Spurious Emissions (Model 4210)  
Channel 3-Mid**

| Freq. (GHz) | Test Data* (dBm) | Amp. Gain (dB) | Antenna Factor (dB) | Cable Loss (dB) | Results (uV/m) 3m | Average FCC Limits (uV/m) |
|-------------|------------------|----------------|---------------------|-----------------|-------------------|---------------------------|
| 4.865       | -71.8            | 34.2           | 34.7                | 4.2             | 98.5              | 500.0                     |
| 7.298       | -68.9            | 34.5           | 37.1                | 6.8             | 238.9             | 500.0                     |

**Table 2F. Average Radiated Spurious Emissions (Model 4210)  
Channel 5-High**

| Freq. (GHz) | Test Data* (dBm) | Amp. Gain (dB) | Antenna Factor (dB) | Cable Loss (dB) | Results (uV/m) 3m | Average FCC Limits (uV/m) |
|-------------|------------------|----------------|---------------------|-----------------|-------------------|---------------------------|
| 4.905       | -67.2            | 34.2           | 34.8                | 4.2             | 168.0             | 500.0                     |
| 7.357       | -68.1            | 34.5           | 37.3                | 6.8             | 267.2             | 500.0                     |

\*Data has been corrected by 1dB for high pass filter loss

SAMPLE CALCULATION:

RESULTS (uV/m @ 3m) = Antilog  $((-59.1 - 34.2 + 34.7 + 4.2 + 107)/20)$  = 423.4

CONVERSION FROM dBm TO dBuV = 107 dB

**TABLE 3A. CONDUCTED EMISSIONS DATA****CLASS A**

**Test Date:** August 11, 1998  
**UST Project:** 98-360  
**Customer:** Computational Systems Incorporated  
**Product:** Model 4200

**Worse Case Mode = Receive**

| Frequency<br>(MHz) | Test Data<br>(dBm) |         | RESULTS (uV) |         | FCC<br>Limits<br>(uV) |
|--------------------|--------------------|---------|--------------|---------|-----------------------|
|                    | Phase              | Neutral | Phase        | Neutral |                       |
| 0.7                | -61.0              | -62.0   | 199.5        | 177.8   | 1000                  |
| 1.0                | -63.0              | -64.0   | 158.5        | 141.3   | 1000                  |
| 2.3                | -61.0              | -63.0   | 199.5        | 158.5   | 3000                  |
| 3.9                | -61.0              | -62.0   | 199.5        | 177.8   | 3000                  |
| 5.4                | -63.0              | -64.0   | 158.5        | 141.3   | 3000                  |
| 30.0               | -63.0              | -62.0   | 158.5        | 177.8   | 3000                  |

**SAMPLE CALCULATIONS:**

RESULTS uV = ANTILOG  $((-61.0 + 107)/20) = 199.5$   
 CONVERSION FROM dBm TO dBuV = 107 dB

**Tested By:** 

**Name:** Erik Collins

**TABLE 3B. CONDUCTED EMISSIONS DATA**

**CLASS A**

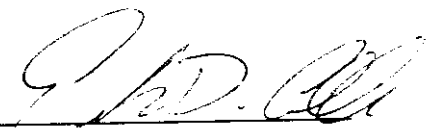
**Test Date:** August 11, 1998  
**UST Project:** 98-360  
**Customer:** Computational Systems Incorporated  
**Product:** Model 4210

**Worse Case Mode = Receive**

| Frequency<br>(MHz)                            | Test Data<br>(dBm)<br>Phase Neutral | RESULTS (uV)<br>Phase Neutral | FCC<br>Limits<br>(uV) |
|---|-------------------------------------|-------------------------------|-----------------------|
| <b>NOT APPLICABLE UNIT IS BATTERY POWERED</b> |                                     |                               |                       |

SAMPLE CALCULATIONS:

RESULTS uV = ANTILOG  
 CONVERSION FROM dBm TO dBuV = 107 dB

**Tested By:** 
**Name:** Erik Collins

**TABLE 4. RADIATED EMISSIONS DATA****CLASS A**

**Test Date:** July 26, 1998  
**UST Project:** 98-360  
**Customer:** Computational Systems Incorporated  
**Product:** Model 4200 and 4210

| Frequency (MHz) | Test Data @10m | Antenna Factor + Cable Attenuation | Results (uV/m) @10m | FCC Limits (uV/m) @ 10m |
|-----------------|----------------|------------------------------------|---------------------|-------------------------|
| 240.0           | -88.0          | 14.7                               | 48.2                | 210.0                   |
| 260.0           | -93.0          | 15.7                               | 30.4                | 210.0                   |
| 280.0           | -95.0          | 16.7                               | 27.4                | 210.0                   |
| 300.0           | -94.0          | 17.7                               | 34.3                | 210.0                   |
| 320.0           | -96.0          | 18.0                               | 28.2                | 210.0                   |
| 340.0           | -95.0          | 18.4                               | 33.1                | 210.0                   |

NOTE: Since there was no significant difference between the radiated emissions for Model 4200 and 4210 , only 1 table has been included.

## SAMPLE CALCULATIONS:

RESULTS uV/m @ 10m = Antilog ((-88.0 + 14.7 + 107)/20) = 48.2  
 CONVERSION FROM dBm TO dBuV = 107 dB

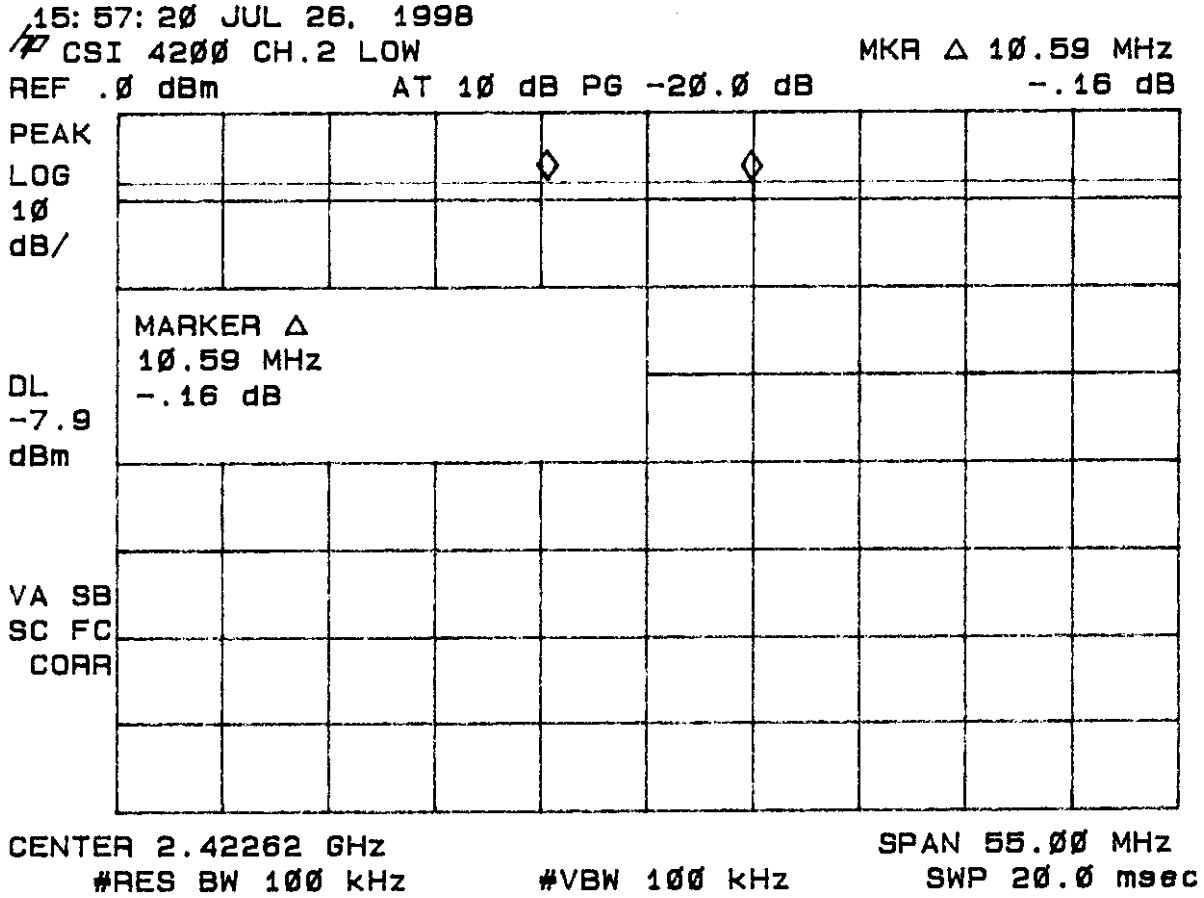
Tested By:



Name:

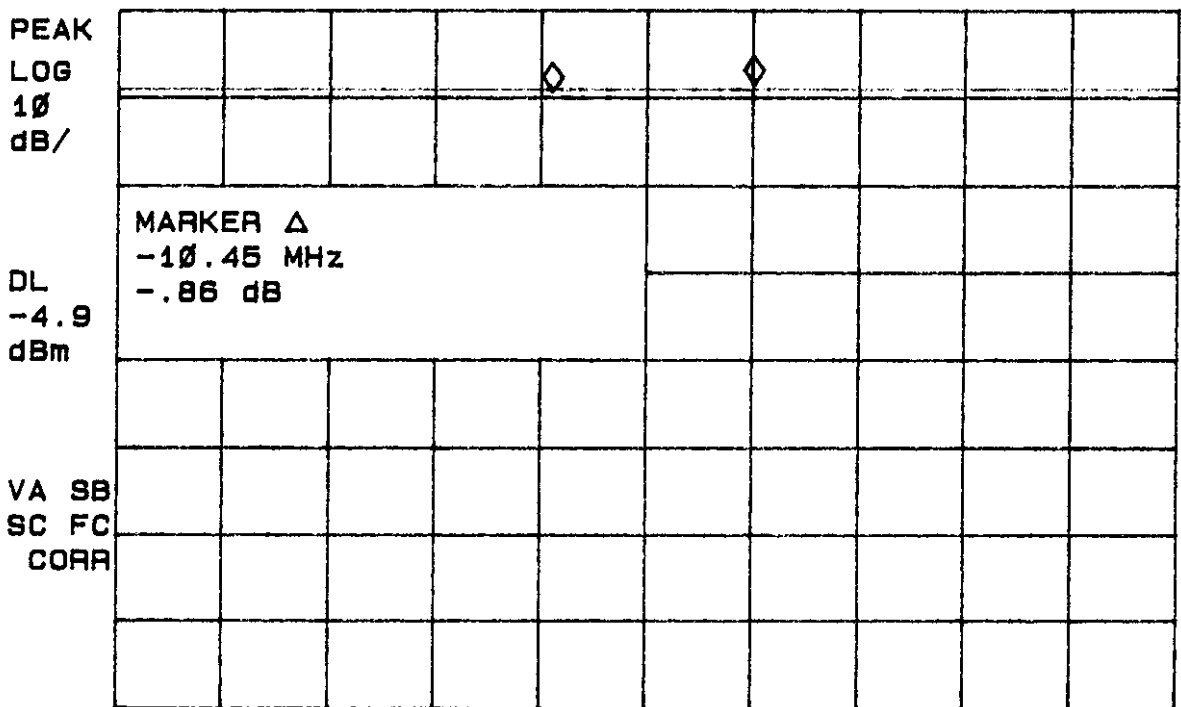
Erik Collins

Model 4200  
Figure 1A. 6 dB Bandwidth 15.247(a)(2) (Low)



**Model 4210**  
**Figure 1B. 6 dB Bandwidth 15.247(a)(2) (Low)**

11:37:23 JUL 31, 1998  
 CSI 4210 CH.2 LOW MKR Δ -10.45 MHz  
 REF 4.0 dBm AT 10 dB PG -20.0 dB -.86 dB



CENTER 2.42238 GHz SPAN 55.00 MHz  
 #RES BW 100 kHz #VBW 100 kHz #SWP 20.0 msec



**Model 4200**  
**Figure 1C. 6 dB Bandwidth 15.247(a)(2) (Mid)**

15:40:02 JUL 26, 1998

CSI 4200 CH.3 MID

REF .0 dBm

AT 10 dB PG -20.0 dB

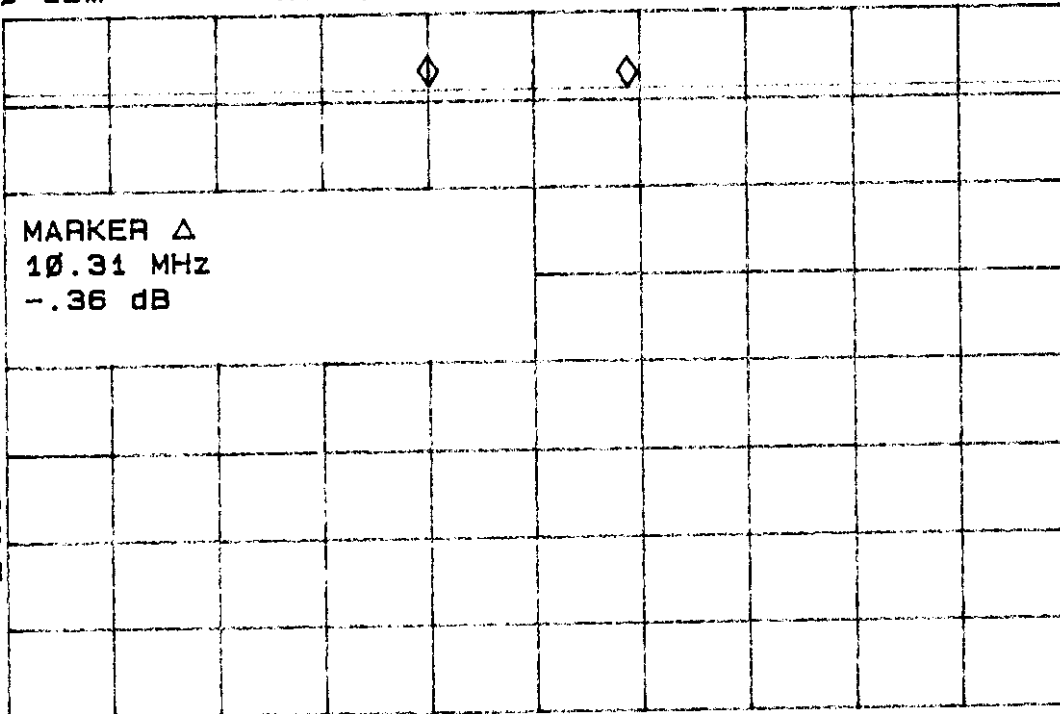
MKR Δ 10.31 MHz

-.36 dB

PEAK  
 LOG  
 10  
 dB/

DL  
 -8.6  
 dBm

VA SB  
 SC FC  
 CORR



CENTER 2.43295 GHz  
 #RES BW 100 KHz

#VBW 100 KHz

SPAN 55.00 MHz  
 SWP 20.0 msec

Model 4210  
 Figure 1D. 6 dB Bandwidth 15.247(a)(2) (Mid)

14:54:42 AUG 01, 1998

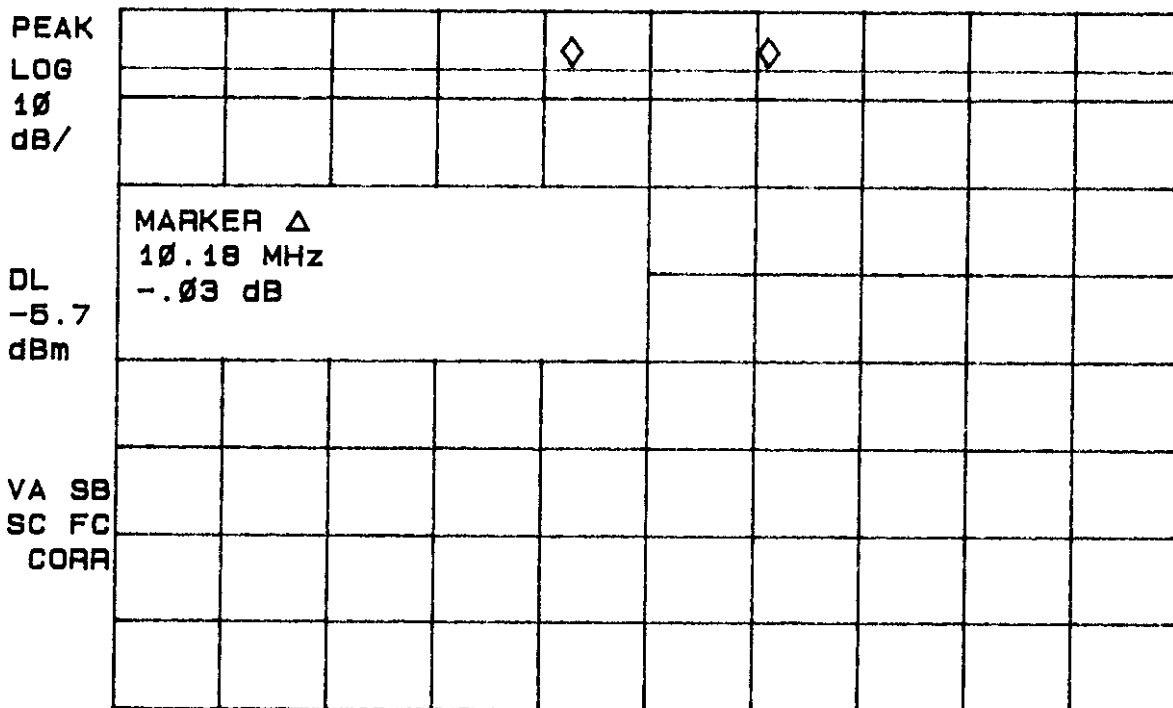
CSI 4210 CH.3 MID

MKR Δ 10.18 MHz

REF 1.0 dBm

AT 10 dB PG -20.0 dB

-.03 dB



CENTER 2.43163 GHz

#RES BW 100 kHz

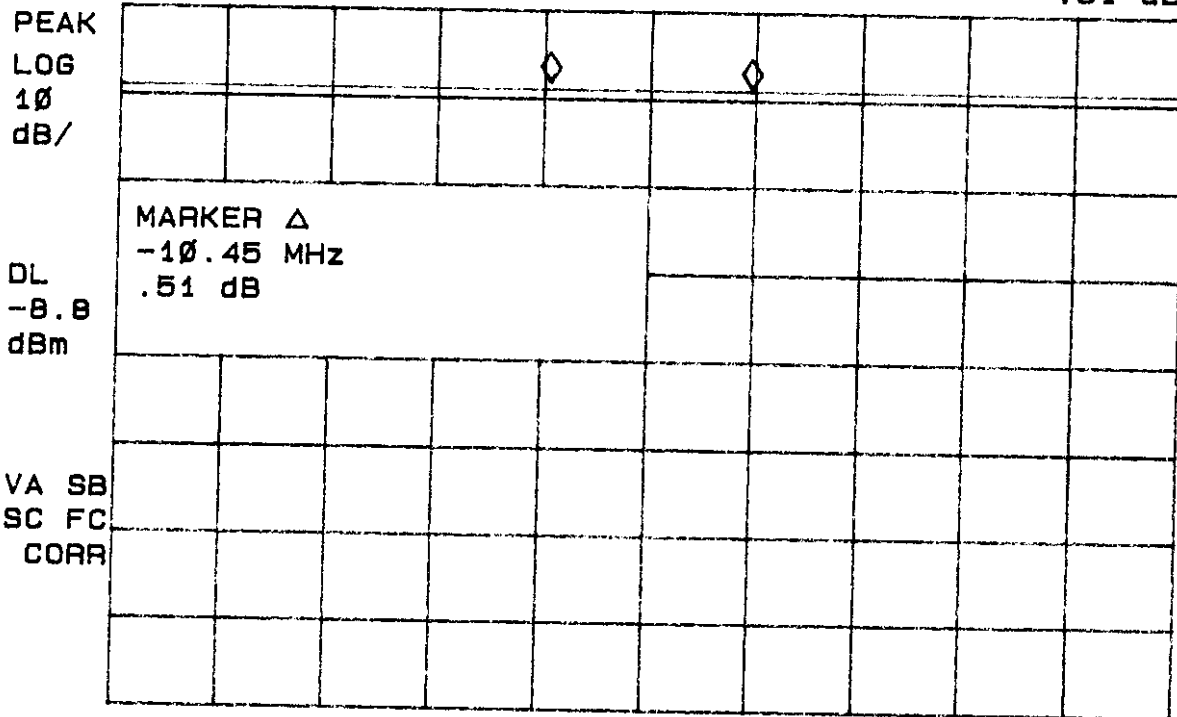
#VBW 100 kHz

SPAN 55.00 MHz

SWP 20.0 msec

Model 4200  
 Figure 1E. 6 dB Bandwidth 15.247(a)(2) (High)

16:56:26 JUL 26, 1998  
 CSI 4200 CH.5 HIGH  
 REF .0 dBm AT 10 dB PG -20.0 dB MKR Δ -10.45 MHz  
 .51 dB



CENTER 2.45275 GHz SPAN 55.00 MHz  
 #RES BW 100 kHz #VBW 100 kHz SWP 20.0 msec

**Model 4210**  
**Figure 1F. 6 dB Bandwidth 15.247(a)(2) (High)**

12:34:18 JUL 31, 1998

CSI 4210 CH.5 HIGH

MKR Δ 10.18 MHz

REF 4.0 dBm

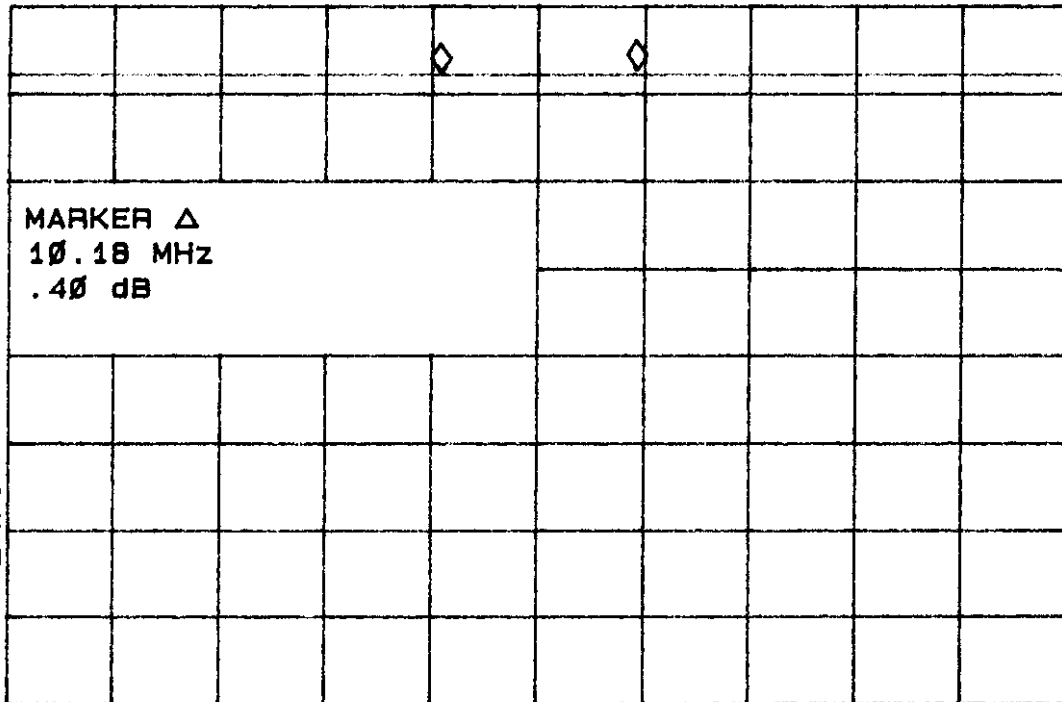
AT 10 dB PG -20.0 dB

.40 dB

PEAK  
 LOG  
 10  
 dB/

DL  
 -3.6  
 dBm

VA SB  
 SC FC  
 CORR



CENTER 2.45257 GHz  
 #RES BW 100 KHz

#VBW 100 KHz

SPAN 55.00 MHz  
 SWP 20.0 msec

**Model 4200**  
**Figure 2A. Peak Power 15.247(b) (Low)**

16:00:28 JUL 26, 1998

CSI 4200 CH.2 LOW

MKR 2.42128 GHz

REF .0 dBm

AT 10 dB PG -20.0 dB

-1.08 dBm

|       |               |               |  |  |  |     |       |     |  |
|-------|---------------|---------------|--|--|--|-----|-------|-----|--|
| SMPL  | CHANNEL POWER |               |  |  |  |     |       |     |  |
| LOG   | Pwr:          | 9.25 dBm      |  |  |  |     |       |     |  |
| 10    |               | -64.24 dBm/Hz |  |  |  |     |       |     |  |
| dB/   |               |               |  |  |  | CSP | 10.00 | MHz |  |
|       |               |               |  |  |  | CBW | 22.31 | MHz |  |
|       | MARKER        |               |  |  |  |     |       |     |  |
|       | 2.42128 GHz   |               |  |  |  |     |       |     |  |
|       | -1.08 dBm     |               |  |  |  |     |       |     |  |
|       |               |               |  |  |  |     |       |     |  |
| VA SB |               |               |  |  |  |     |       |     |  |
| SC FC |               |               |  |  |  |     |       |     |  |
| CORR  |               |               |  |  |  |     |       |     |  |
|       |               |               |  |  |  |     |       |     |  |

CENTER 2.42262 GHz

#RES BW 300 kHz

#VBW 3 MHz

SPAN 44.63 MHz

SWP 20.0 msec

**Model 4210**  
**Figure 2B. Peak Power 15.247(b) (Low)**

11:41:19 JUL 31, 1998  
 CSI 4210 CH.2 LOW MKR 2.42093 GHz  
 REF 4.0 dBm AT 10 dB PG -20.0 dB 3.55 dBm

|       |             |               |  |  |  |  |     |       |     |  |
|-------|-------------|---------------|--|--|--|--|-----|-------|-----|--|
| SMPL  | CHANNEL     | POWER         |  |  |  |  |     |       |     |  |
| LOG   | Pwr:        | 12.66 dBm     |  |  |  |  |     |       |     |  |
| 10    |             | -60.83 dBm/Hz |  |  |  |  |     |       |     |  |
| dB/   |             |               |  |  |  |  | CSP | 10.00 | MHz |  |
|       |             |               |  |  |  |  | CBW | 22.31 | MHz |  |
|       | MARKER      |               |  |  |  |  |     |       |     |  |
|       | 2.42093 GHz |               |  |  |  |  |     |       |     |  |
|       | 3.55 dBm    |               |  |  |  |  |     |       |     |  |
|       |             |               |  |  |  |  |     |       |     |  |
| VA SB |             |               |  |  |  |  |     |       |     |  |
| SC FC |             |               |  |  |  |  |     |       |     |  |
| CORR  |             |               |  |  |  |  |     |       |     |  |
|       |             |               |  |  |  |  |     |       |     |  |

CENTER 2.42238 GHz SPAN 44.63 MHz  
 #RES BW 300 kHz #VBW 3 MHz SWP 20.0 msec

**Model 4200**  
**Figure 3A. Peak Power 15.247(b) (Mid)**

15:09:47 JUL 26, 1998

CSI 4200 CH.3 MID

MKR 2.43083 GHz

REF .0 dBm

AT 10 dB PG -20.0 dB

-.82 dBm

SMPL  
 LOG  
 10  
 dB/

|                |        |        |  |  |  |     |       |     |  |
|----------------|--------|--------|--|--|--|-----|-------|-----|--|
| CHANNEL POWER  |        |        |  |  |  |     |       |     |  |
| Pwr:           | 7.71   | dBm    |  |  |  |     |       |     |  |
|                | -65.78 | dBm/Hz |  |  |  |     |       |     |  |
|                |        |        |  |  |  | CSP | 10.00 | MHz |  |
|                |        |        |  |  |  | CBW | 22.31 | MHz |  |
| CENTER         |        |        |  |  |  |     |       |     |  |
| 2.43250 GHz    |        |        |  |  |  |     |       |     |  |
| STEP 10.00 MHz |        |        |  |  |  |     |       |     |  |
|                |        |        |  |  |  |     |       |     |  |
|                |        |        |  |  |  |     |       |     |  |
|                |        |        |  |  |  |     |       |     |  |
|                |        |        |  |  |  |     |       |     |  |
|                |        |        |  |  |  |     |       |     |  |
|                |        |        |  |  |  |     |       |     |  |

VA SB  
 SC FC  
 CORR

CENTER 2.43250 GHz  
 #RES BW 300 kHz

#VBW 3 MHz

SPAN 44.63 MHz  
 SWP 20.0 msec

Model 4210  
 Figure 3B. Peak Power 15.247(b) (Mid)

14:58:11 AUG 01, 1998

CSI 4210 CH.3 MID

MKR 2.43419 GHz

REF 1.0 dBm

AT 10 dB PG -20.0 dB

1.14 dBm

|       |                |               |  |  |  |     |           |  |  |
|-------|----------------|---------------|--|--|--|-----|-----------|--|--|
| SMPL  | CHANNEL POWER  |               |  |  |  |     |           |  |  |
| LOG   | Pwr:           | 10.08 dBm     |  |  |  |     |           |  |  |
| 10    |                | -63.41 dBm/Hz |  |  |  |     |           |  |  |
| dB/   |                |               |  |  |  | CSP | 10.00 MHz |  |  |
|       |                |               |  |  |  | CBW | 22.31 MHz |  |  |
|       | CENTER         |               |  |  |  |     |           |  |  |
|       | 2.43252 GHz    |               |  |  |  |     |           |  |  |
|       | STEP 10.00 MHz |               |  |  |  |     |           |  |  |
|       |                |               |  |  |  |     |           |  |  |
|       |                |               |  |  |  |     |           |  |  |
| VA SB |                |               |  |  |  |     |           |  |  |
| SC FC |                |               |  |  |  |     |           |  |  |
| CORR  |                |               |  |  |  |     |           |  |  |
|       |                |               |  |  |  |     |           |  |  |

CENTER 2.43252 GHz

#RES BW 300 kHz

#VBW 3 MHz

SPAN 44.63 MHz

SWP 20.0 msec



**Model 4200**  
**Figure 4A. Peak Power 15.247(b) (High)**

16:46:15 JUL 26, 1998  
 CSI 4200 CH.5 HIGH MKR 2.45085 GHz  
 REF .0 dBm AT 10 dB PG -20.0 dB -1.48 dBm

|       |               |  |  |  |  |               |  |  |  |
|-------|---------------|--|--|--|--|---------------|--|--|--|
| SMPL  | CHANNEL POWER |  |  |  |  |               |  |  |  |
| LOG   | Pwr: 7.67 dBm |  |  |  |  |               |  |  |  |
| 10    | -65.82 dBm/Hz |  |  |  |  |               |  |  |  |
| dB/   |               |  |  |  |  | CSP 10.00 MHz |  |  |  |
|       |               |  |  |  |  | CBW 22.31 MHz |  |  |  |
|       | MARKER        |  |  |  |  |               |  |  |  |
|       | 2.45085 GHz   |  |  |  |  |               |  |  |  |
|       | -1.48 dBm     |  |  |  |  |               |  |  |  |
|       |               |  |  |  |  |               |  |  |  |
|       |               |  |  |  |  |               |  |  |  |
| VA SB |               |  |  |  |  |               |  |  |  |
| SC FC |               |  |  |  |  |               |  |  |  |
| CORR  |               |  |  |  |  |               |  |  |  |
|       |               |  |  |  |  |               |  |  |  |

CENTER 2.45275 GHz SPAN 44.63 MHz  
 #RES BW 300 kHz #VBW 3 MHz SWP 20.0 msec

Model 4210  
 Figure 4B. Peak Power 15.247(b) (High)

12:37:05 JUL 31, 1998  
 CSI 4210 CH.5 HIGH MKR 2.45089 GHz  
 REF 4.0 dBm AT 10 dB PG -20.0 dB 3.07 dBm

|       |               |               |  |  |  |     |           |  |  |
|-------|---------------|---------------|--|--|--|-----|-----------|--|--|
| SMPL  | CHANNEL POWER |               |  |  |  |     |           |  |  |
| LOG   | Pwr:          | 12.28 dBm     |  |  |  |     |           |  |  |
| 10    |               | -61.21 dBm/Hz |  |  |  |     |           |  |  |
| dB/   |               |               |  |  |  | CSP | 10.00 MHz |  |  |
|       |               |               |  |  |  | CBW | 22.31 MHz |  |  |
|       | MARKER        |               |  |  |  |     |           |  |  |
|       | 2.45089 GHz   |               |  |  |  |     |           |  |  |
|       | 3.07 dBm      |               |  |  |  |     |           |  |  |
|       |               |               |  |  |  |     |           |  |  |
|       |               |               |  |  |  |     |           |  |  |
| VA SB |               |               |  |  |  |     |           |  |  |
| SC FC |               |               |  |  |  |     |           |  |  |
| CORR  |               |               |  |  |  |     |           |  |  |
|       |               |               |  |  |  |     |           |  |  |

CENTER 2.45257 GHz SPAN 44.63 MHz  
 #RES BW 300 kHz #VBW 3 MHz SWP 20.0 msec

**Model 4200**  
**Figure 5A. Conducted Spurious Emission 15.247(c) (Low)**

16:05:13 JUL 26, 1998

CSI 4200 CH.2 LOW

MKR 462.9 MHz

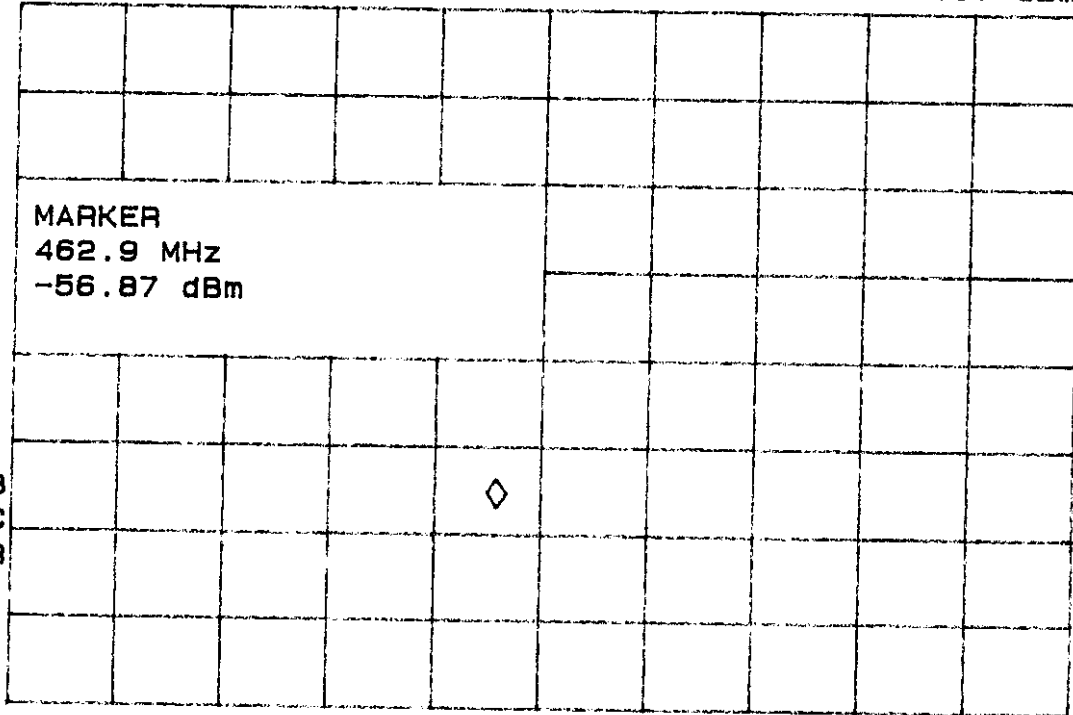
REF .0 dBm

AT 10 dB PG -20.0 dB

-56.87 dBm

PEAK  
LOG  
10  
dB/

VA SB  
SC FC  
CORR



START 10.0 MHz

#RES BW 100 kHz

#VBW 30 kHz

STOP 1.0000 GHz

SWP 990 msec

**Model 4210**  
**Figure 5B. Conducted Spurious Emission 15.247(c) (Low)**

11:58:36 JUL 31, 1998

CSI 4210 CH.2 LOW

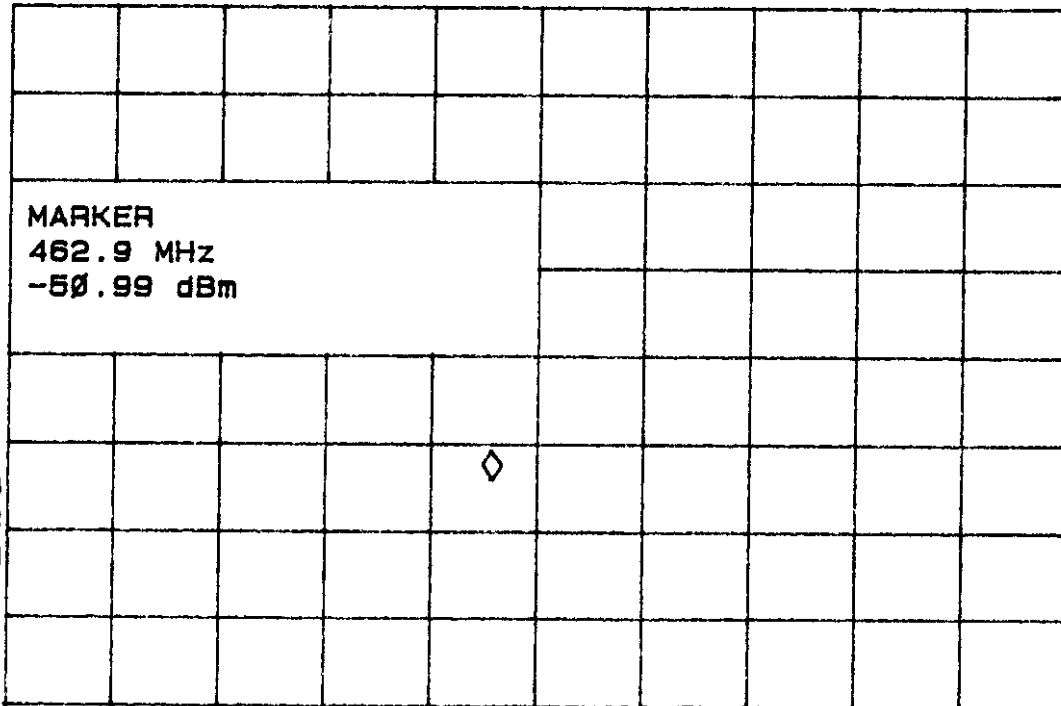
MKR 462.9 MHz

REF 3.0 dBm

AT 10 dB PG -20.0 dB

-50.99 dBm

PEAK  
 LOG  
 10  
 dB/



START 10.0 MHz

#RES BW 100 kHz

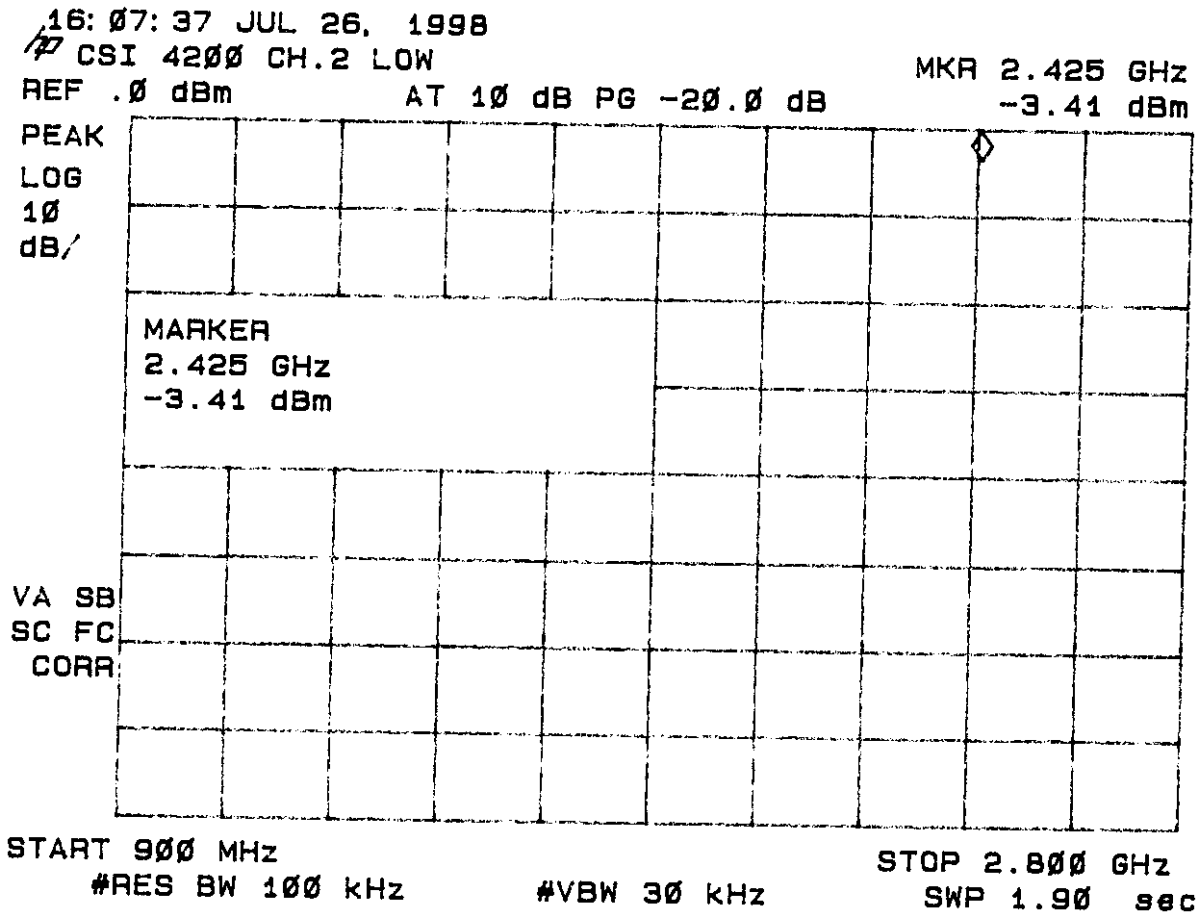
#VBW 30 kHz

STOP 1.0000 GHz

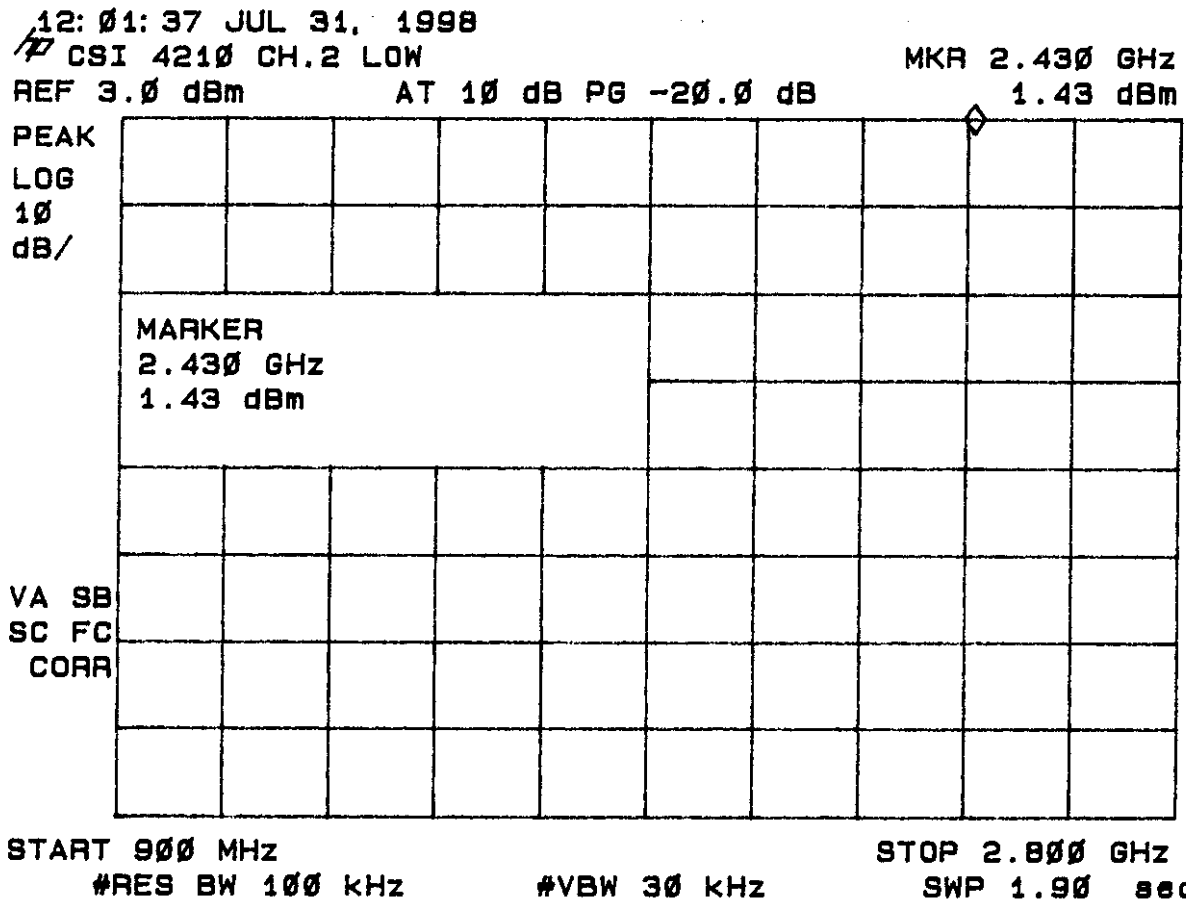
SWP 990 msec

VA SB  
 SC FC  
 CORR

**Model 4200**  
**Figure 6A. Conducted Spurious Emission 15.247(c) (Low)**

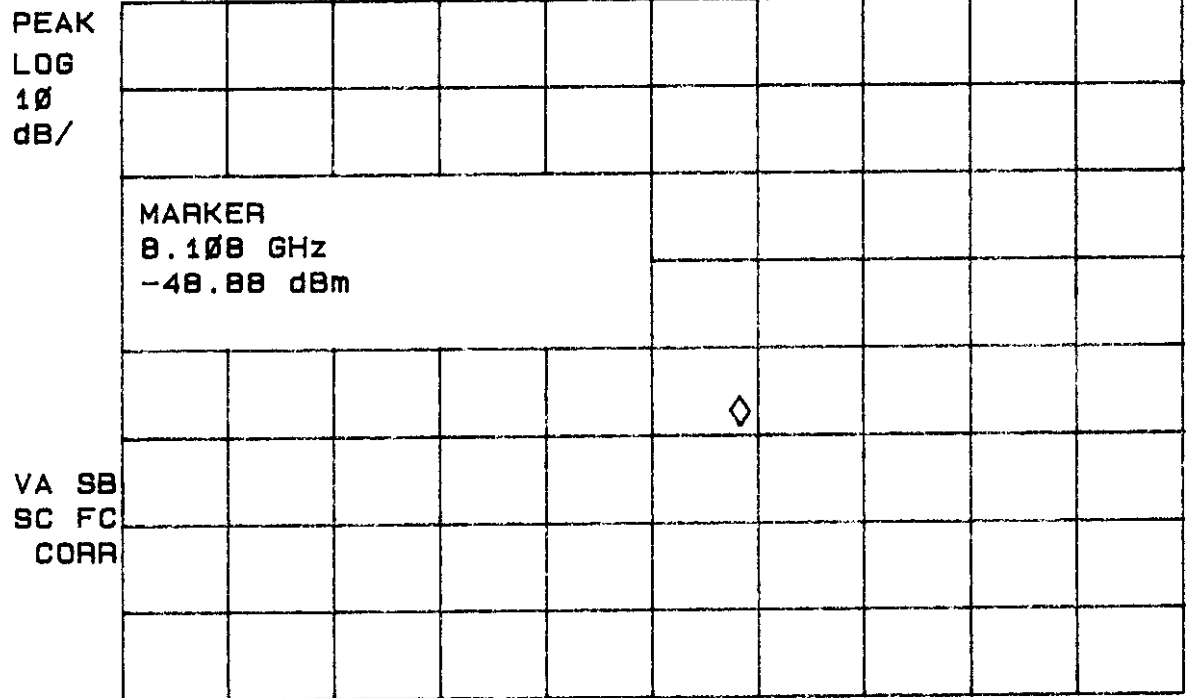


Model 4210  
Figure 6B. Conducted Spurious Emission 15.247(c) (Low)



**Model 4200**  
**Figure 7A. Conducted Spurious Emission 15.247(c) (Low)**

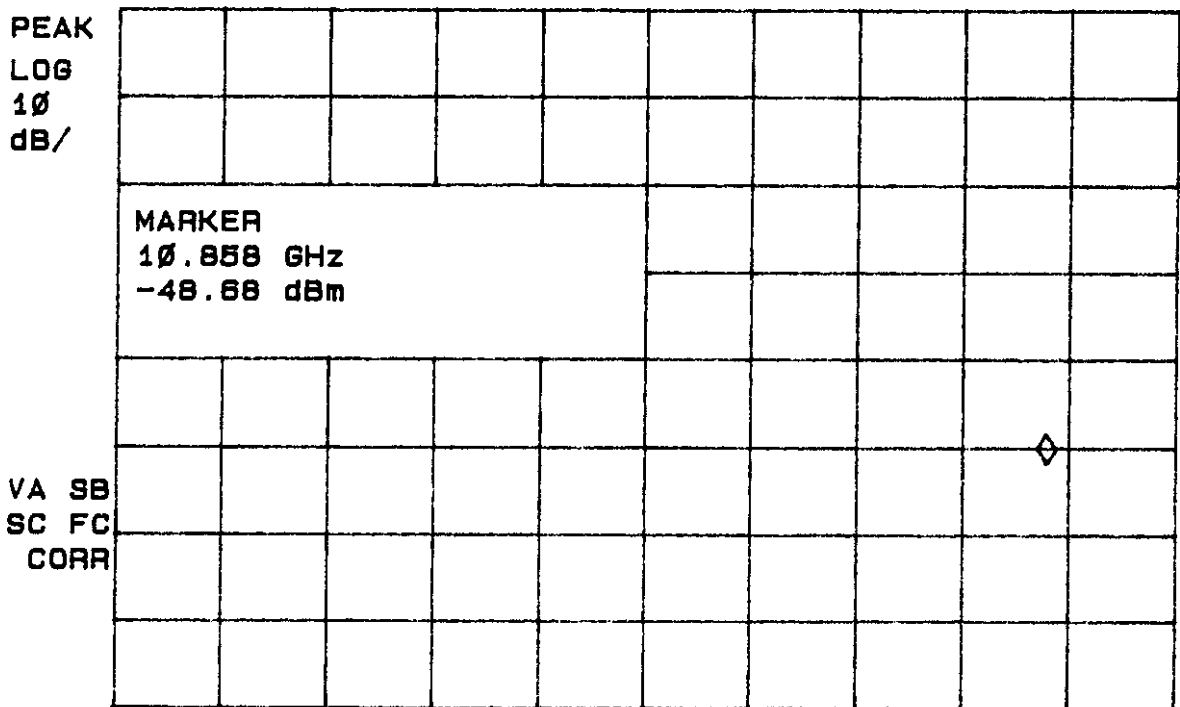
16:10:26 JUL 26, 1998  
CSI 4200 CH.2 LOW MKR 8.108 GHz  
REF .0 dBm AT 10 dB PG -20.0 dB -48.88 dBm



START 2.679 GHz STOP 12.000 GHz  
#RES BW 100 kHz #VBW 30 kHz SWP 9.32 sec

**Model 4210**  
**Figure 7B. Conducted Spurious Emission 15.247(c) (Low)**

12:04:02 JUL 31, 1998  
~~10~~ CSI 4210 CH.2 LOW MKR 10.858 GHz  
 REF 3.0 dBm AT 10 dB PG -20.0 dB -48.68 dBm



START 2.679 GHz STOP 12.000 GHz  
 #RES BW 100 kHz #VBW 30 kHz SWP 9.32 sec



**Model 4200**  
**Figure 8A. Conducted Spurious Emission 15.247(c) (Low)**

16:16:49 JUL 26, 1998

CSI 4200 CH.2 LOW

MKR 21.71 GHz

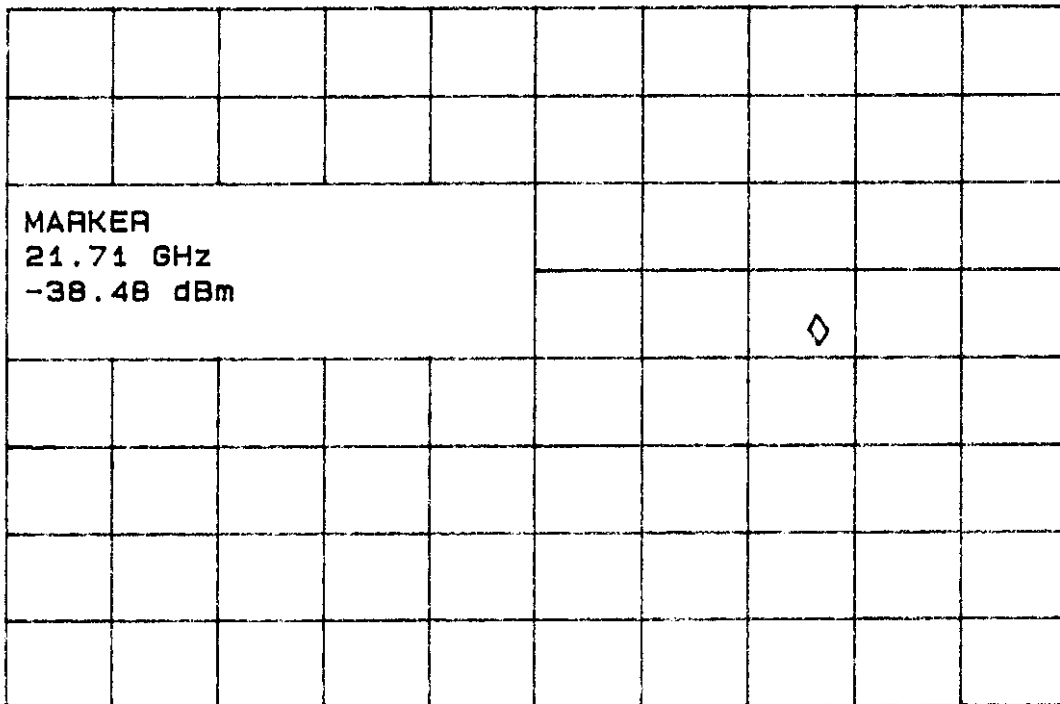
REF .0 dBm

AT 10 dB PG -20.0 dB

-38.48 dBm

PEAK  
LOG  
10  
dB/

VA SB  
SC FC  
CORR



START 11.00 GHz

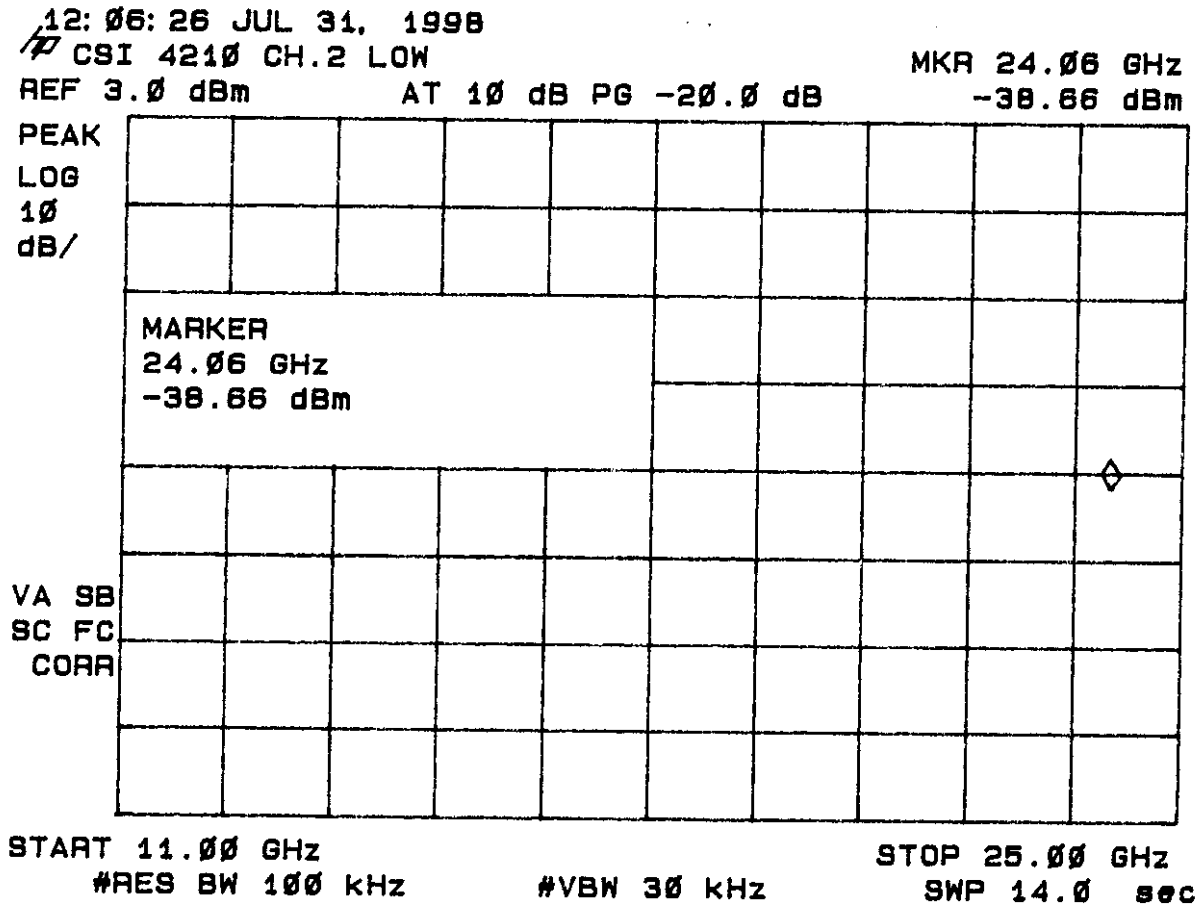
#RES BW 100 kHz

#VBW 30 kHz

STOP 25.00 GHz

SWP 14.0 sec

Model 4210  
Figure 8B. Conducted Spurious Emission 15.247(c) (Low)



Model 4200

Figure 9A. Conducted Spurious Emission 15.247(c) (Mid)

15:24:06 JUL 26, 1998

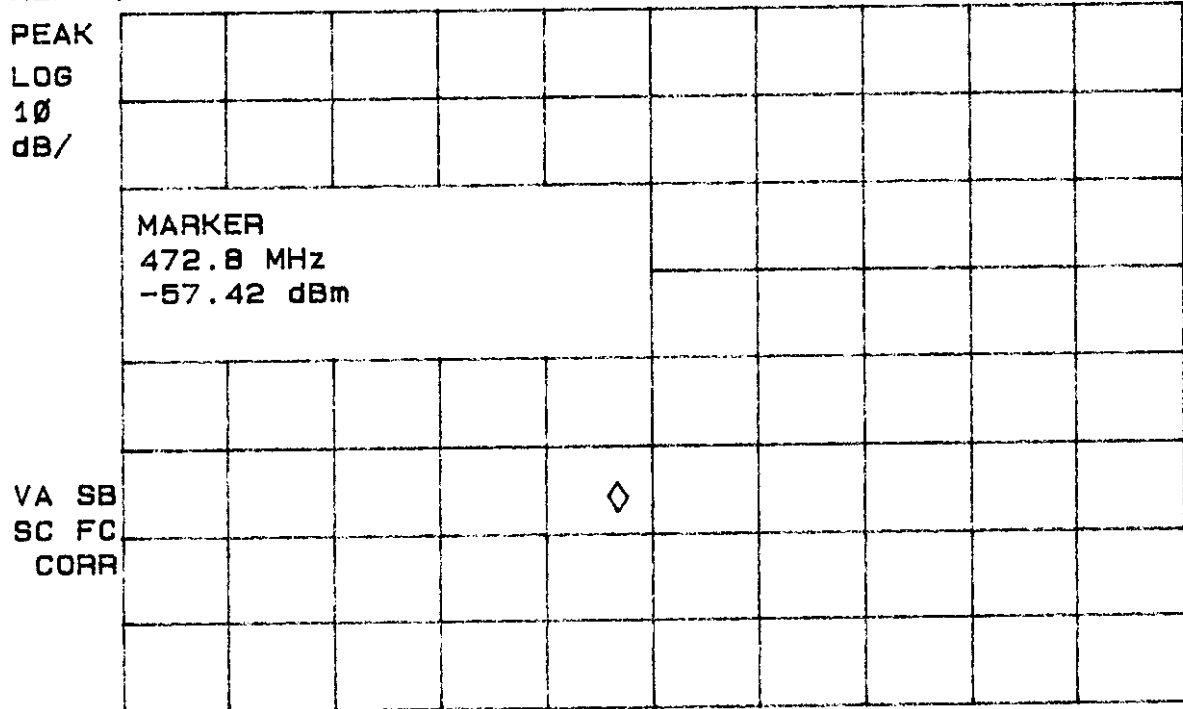
CSI 4200 CH.3 MID

MKR 472.8 MHz

REF .0 dBm

AT 10 dB PG -20.0 dB

-57.42 dBm



START 10.0 MHz

#RES BW 100 kHz

#VBW 30 kHz

STOP 1.0000 GHz

SWP 990 msec

**Model 4210**  
**Figure 9B. Conducted Spurious Emission 15.247(c) (Mid)**

15:05:20 AUG 01, 1998

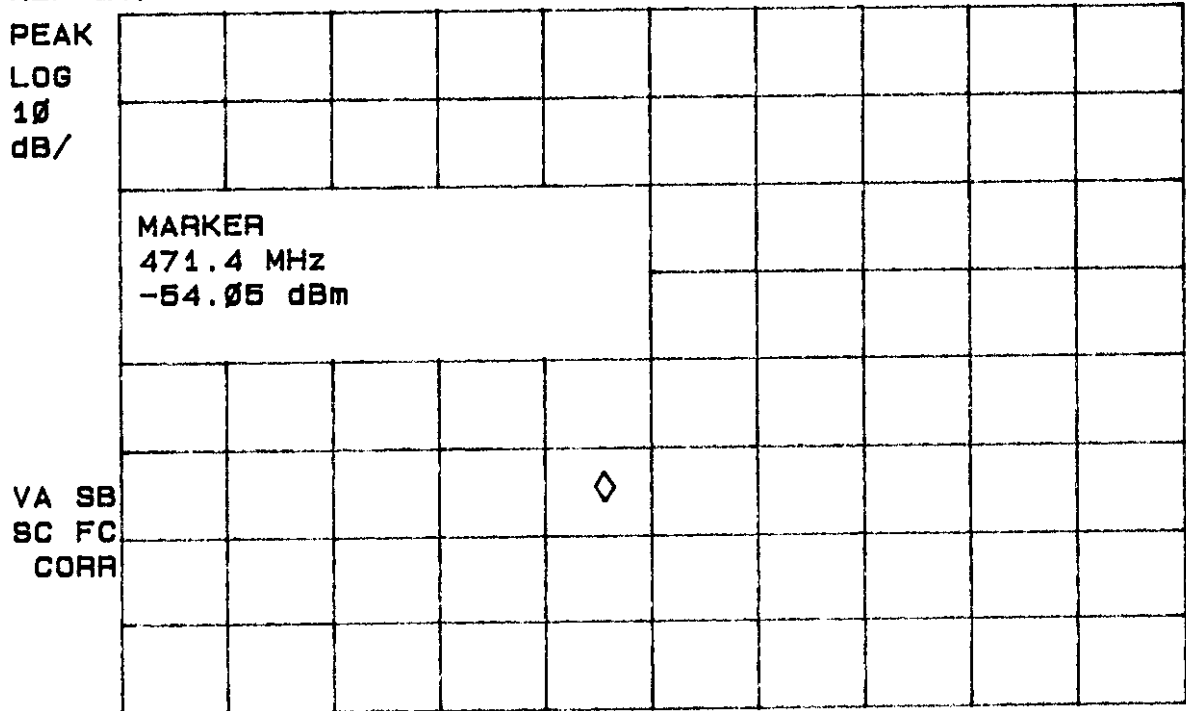
CSI 4210 CH.3 MID

MKR 471.4 MHz

REF 2.0 dBm

AT 10 dB PG -20.0 dB

-54.05 dBm



START 30.0 MHz

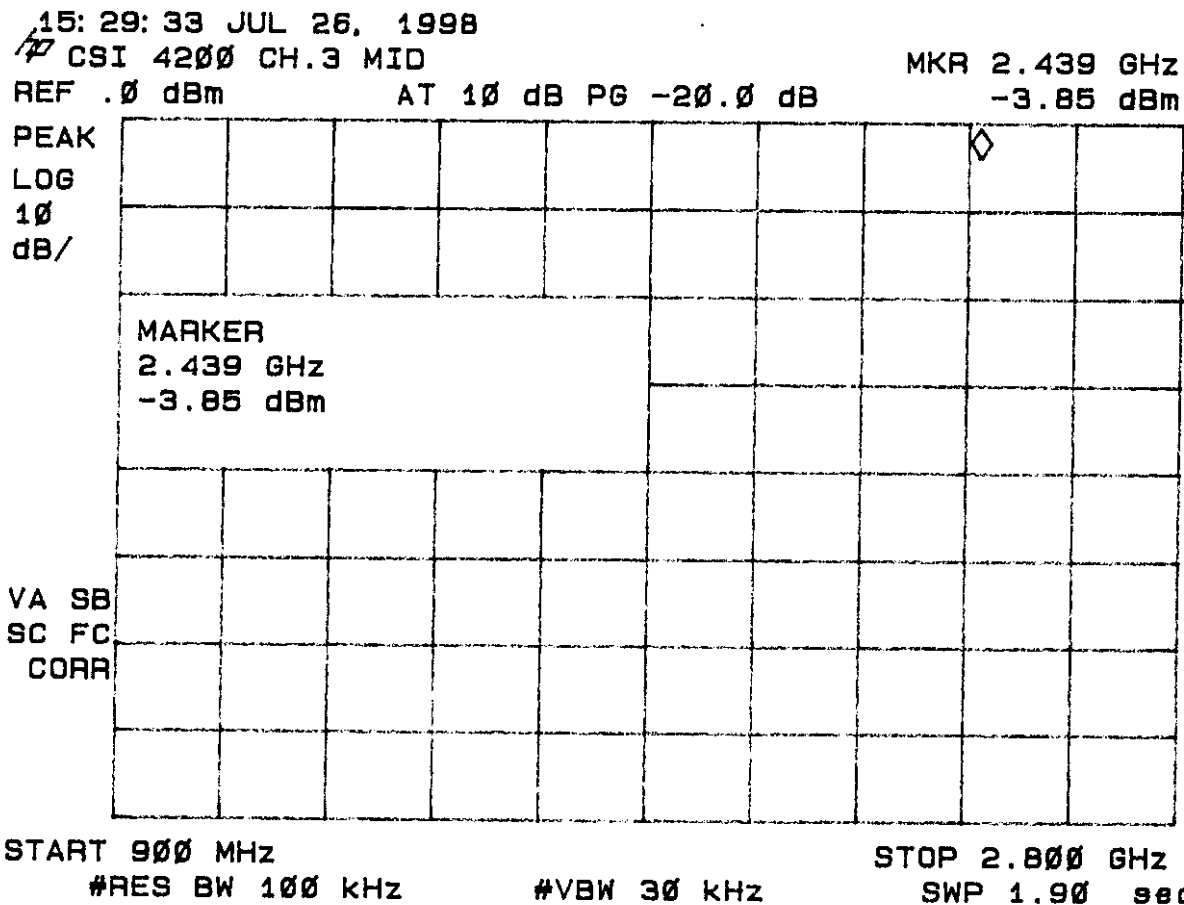
#RES BW 100 kHz

#VBW 30 kHz

STOP 1.0000 GHz

SWP 970 msec

**Model 4200**  
**Figure 10A. Conducted Spurious Emission 15.247(c) (Mid)**



**Model 4210**  
**Figure 10B. Conducted Spurious Emission 15.247(c) (Mid)**

15:07:45 AUG 01, 1998

CSI 4210 CH.3 MID

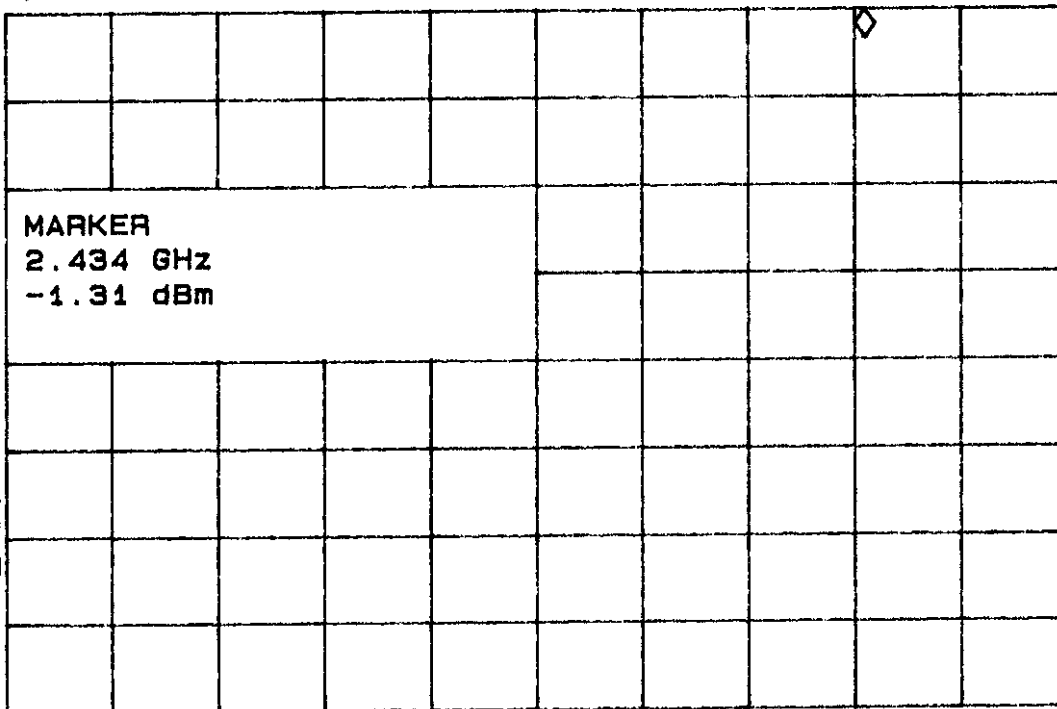
MKR 2.434 GHz

REF 2.0 dBm

AT 10 dB PG -20.0 dB

-1.31 dBm

PEAK  
LOG  
10  
dB/



START 900 MHz

#RES BW 100 kHz

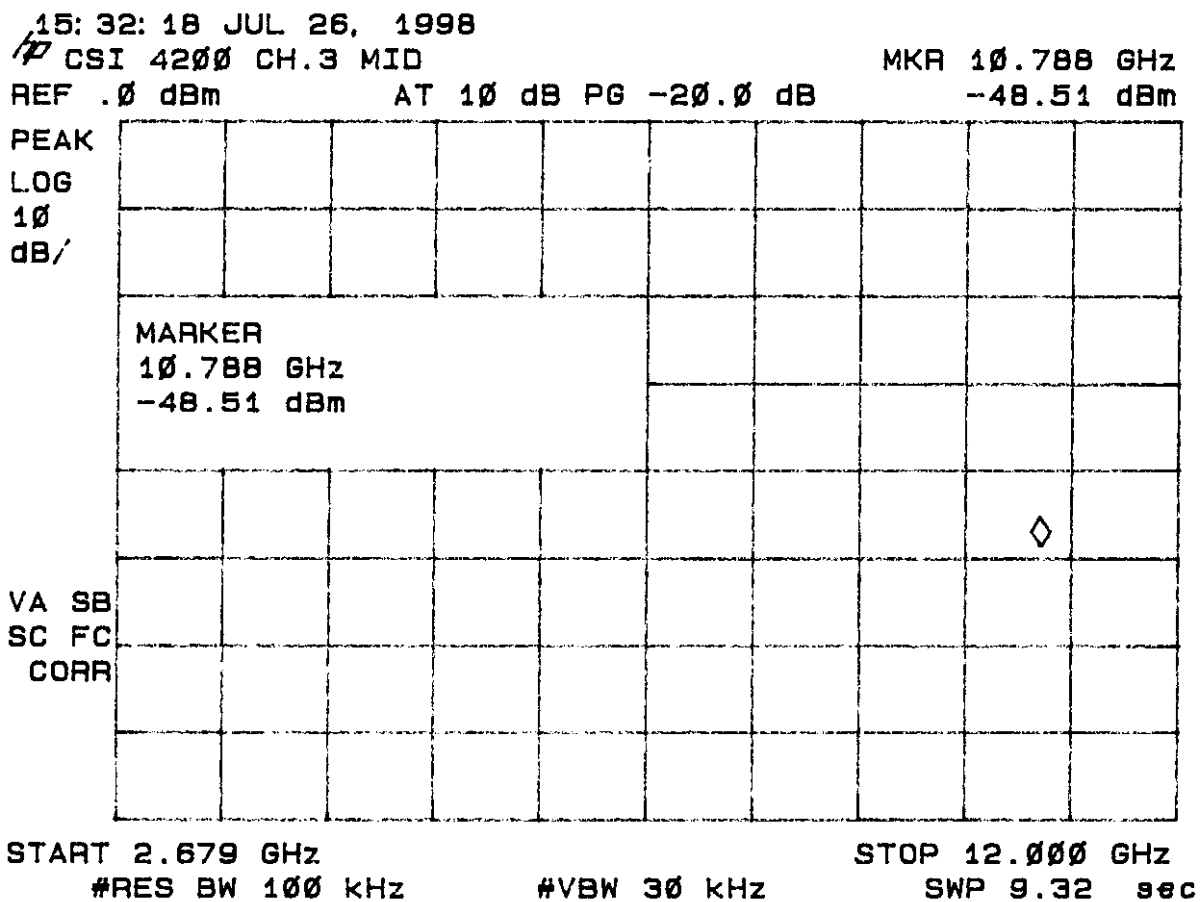
#VBW 30 kHz

STOP 2.800 GHz

SWP 1.90 sec

### Model 4200

#### Figure 11A. Conducted Spurious Emission 15.247(c) (Mid)



**Model 4210**  
**Figure 11B. Conducted Spurious Emission 15.247(c) (Mid)**

15:10:41 AUG 01, 1998

CSI 4210 CH.3 MID

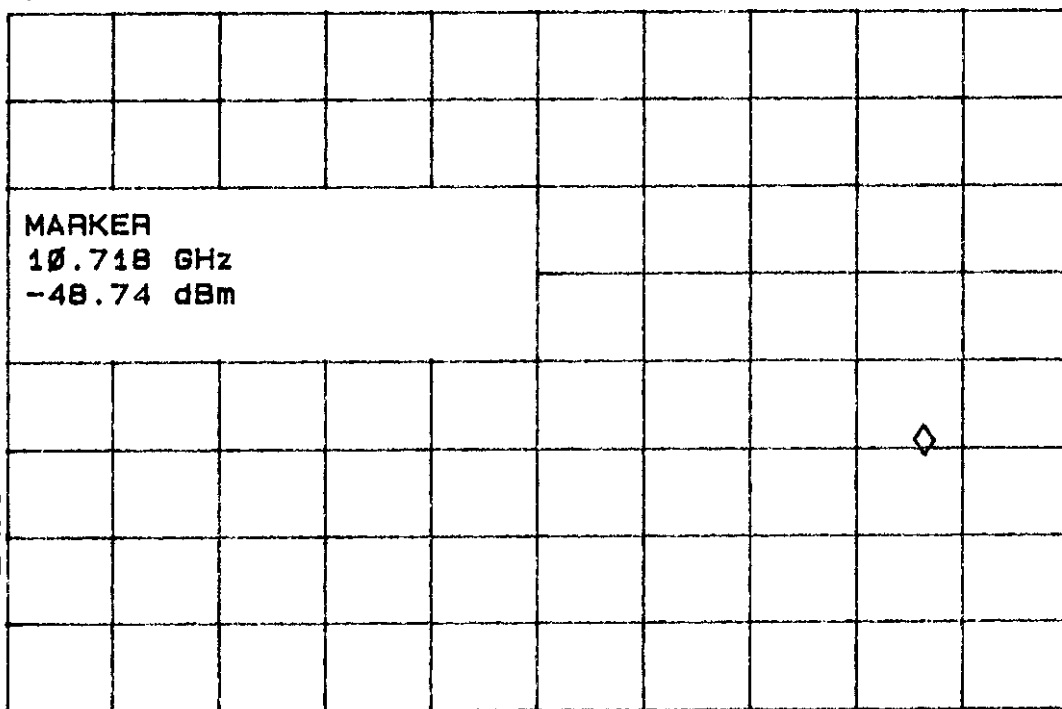
MKR 10.718 GHz

REF 2.0 dBm

AT 10 dB PG -20.0 dB

-48.74 dBm

PEAK  
LOG  
10  
dB/



VA SB  
SC FC  
CORR

START 2.679 GHz

#RES BW 100 kHz

#VBW 30 kHz

STOP 12.000 GHz

SWP 9.32 sec



### Model 4200

## Figure 12A. Conducted Spurious Emission 15.247(c) (Mid)

15:34:57 JUL 26, 1998

CSI 4200 CH.3 MID

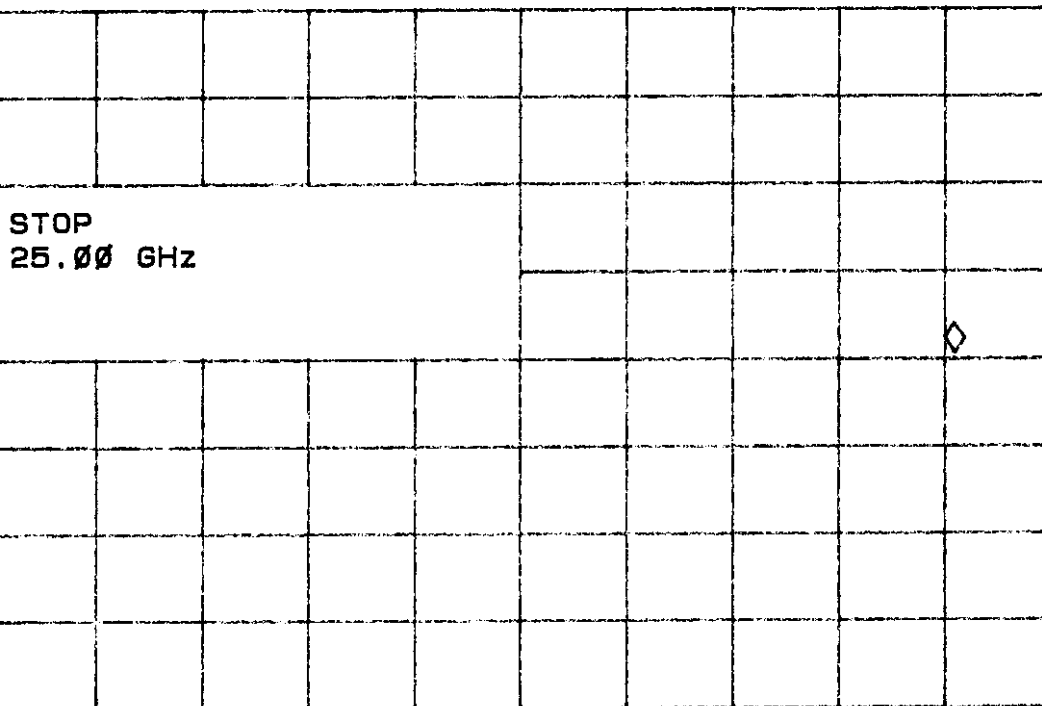
MKR 23.71 GHz

REF .0 dBm

AT 10 dB PG -20.0 dB

-39.28 dBm

PEAK  
LOG  
10  
dB/



VA SB  
SC FC  
CORR

START 11.00 GHz

#RES BW 100 kHz

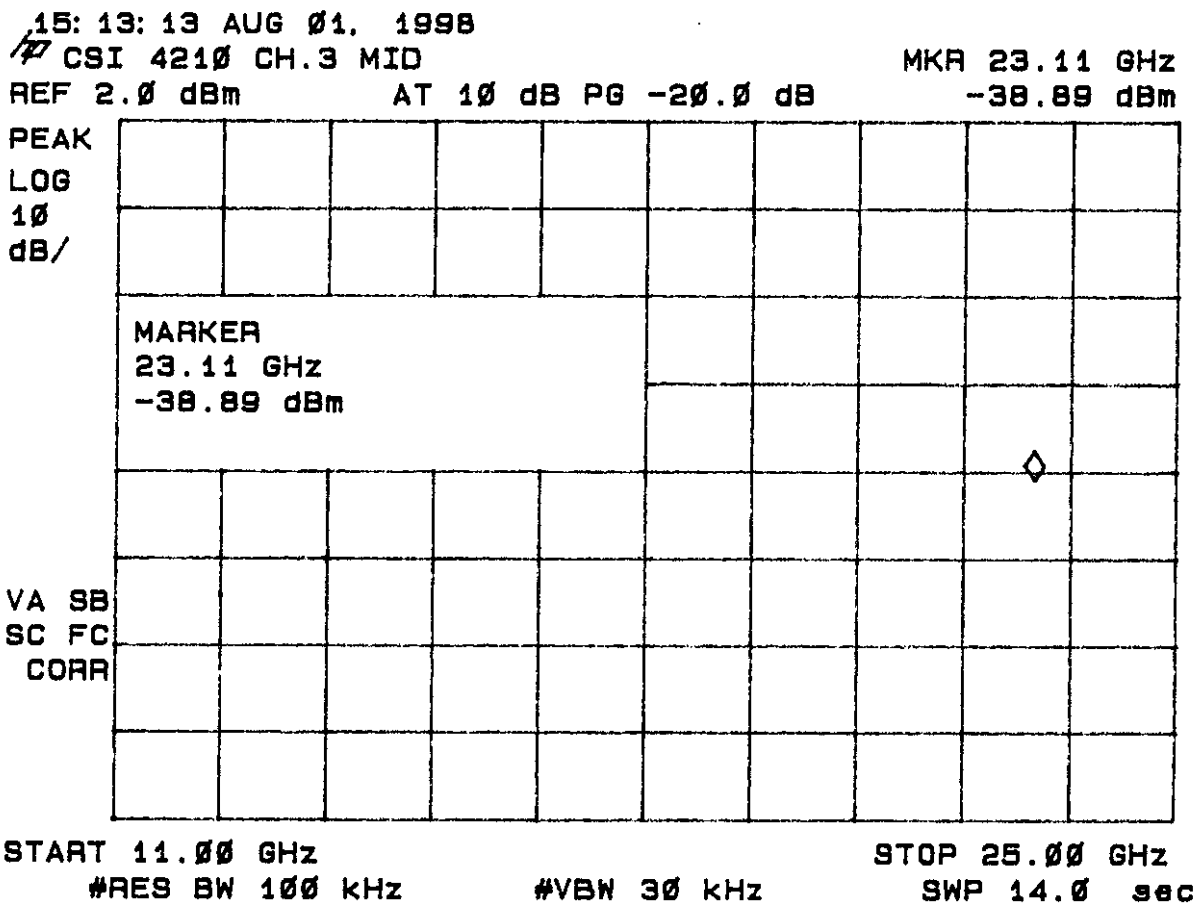
#VBW 30 kHz

STOP 25.00 GHz

SWP 14.0 sec

### Model 4210

#### Figure 12B. Conducted Spurious Emission 15.247(c) (Mid)



Model 4200

Figure 13A. Conducted Spurious Emission 15.247(c) (High)

16: 29: 02 JUL 26, 1998

CSI 4200 CH.5 HIGH

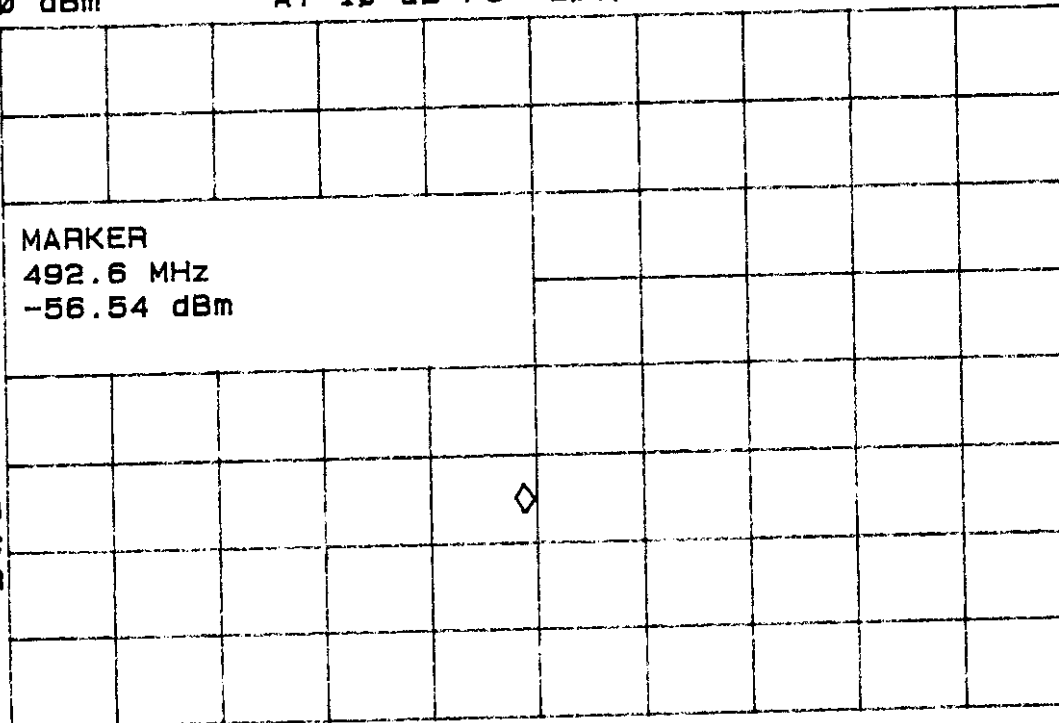
MKR 492.6 MHz

REF .0 dBm

AT 10 dB PG -20.0 dB

-56.54 dBm

PEAK  
LOG  
10  
dB/



VA SB  
SC FC  
CORR

START 10.0 MHz

#RES BW 100 KHz

#VBW 30 KHz

STOP 1.0000 GHz

SWP 990 msec

Model 4210

Figure 13B. Conducted Spurious Emission 15.247(c) (High)

12:50:45 JUL 31, 1998

CSI 4210 CH.5 HIGH

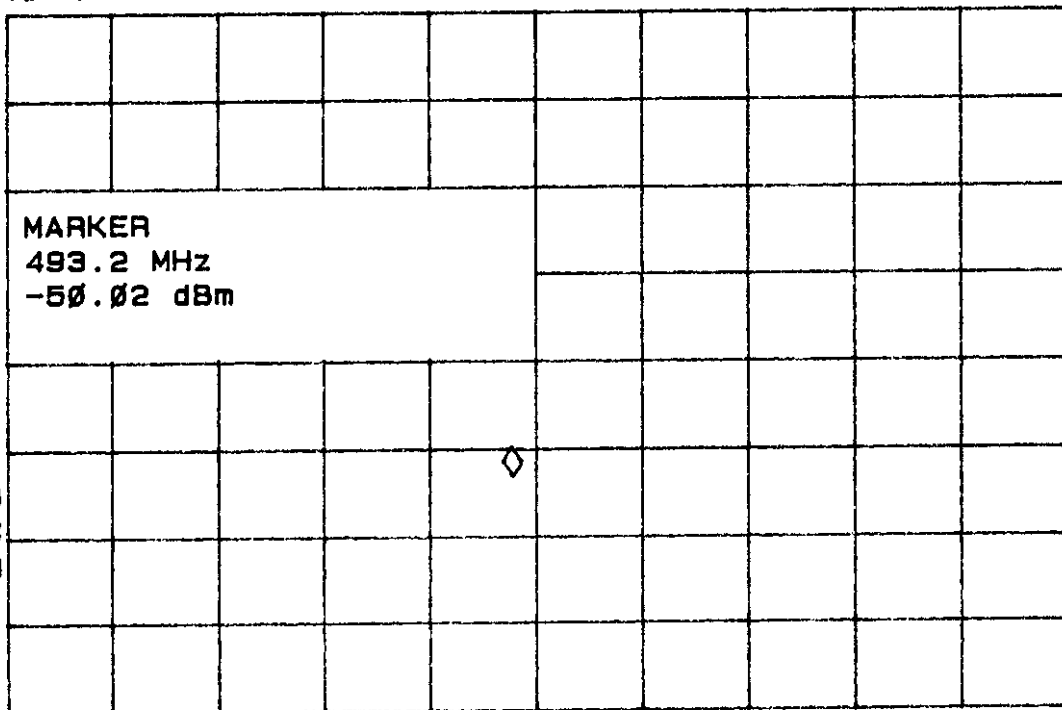
MKR 493.2 MHz

REF 3.0 dBm

AT 10 dB PG -20.0 dB

-50.02 dBm

PEAK  
LOG  
10  
dB/



VA SB  
SC FC  
CORR

START 30.0 MHz

#RES BW 100 KHz

#VBW 30 KHz

STOP 1.0000 GHz

SWP 970 msec

**Model 4200**  
**Figure 14A. Conducted Spurious Emission 15.247(c) (High)**

16:26:48 JUL 26, 1998

CSI 4200 CH.5 HIGH

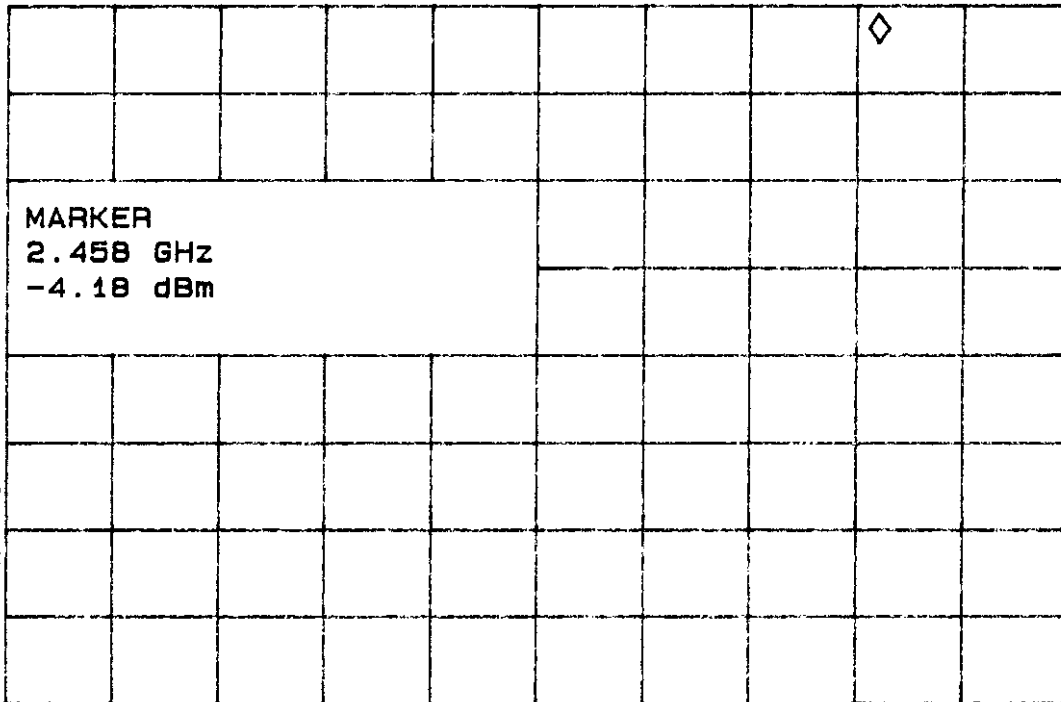
MKR 2.458 GHz

REF .0 dBm

AT 10 dB PG -20.0 dB

-4.18 dBm

PEAK  
 LOG  
 10  
 dB/



VA SB  
 SC FC  
 CORR

START 900 MHz

#RES BW 100 kHz

#VBW 30 kHz

STOP 2.800 GHz

SWP 1.90 sec

Model 4210  
Figure 14B. Conducted Spurious Emission 15.247(c) (High)

12:53:18 JUL 31, 1998

CSI 4210 CH.5 HIGH

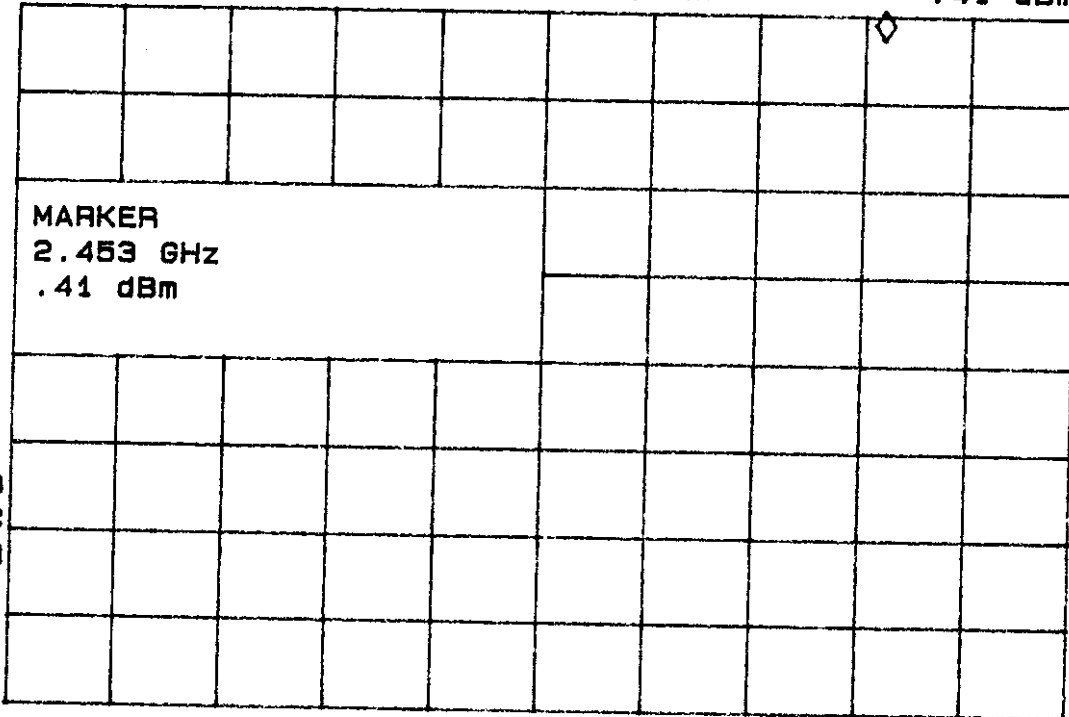
MKR 2.453 GHz

REF 3.0 dBm

AT 10 dB PG -20.0 dB

.41 dBm

PEAK  
LOG  
10  
dB/



VA SB  
SC FC  
CORR

START 900 MHz

#RES BW 100 kHz

#VBW 30 kHz

STOP 2.800 GHz

SWP 1.90 sec

### Model 4200

### Figure 15A. Conducted Spurious Emission 15.247(c) (High)

16:32:09 JUL 26, 1998

~~15~~ CSI 4200 CH.5 HIGH

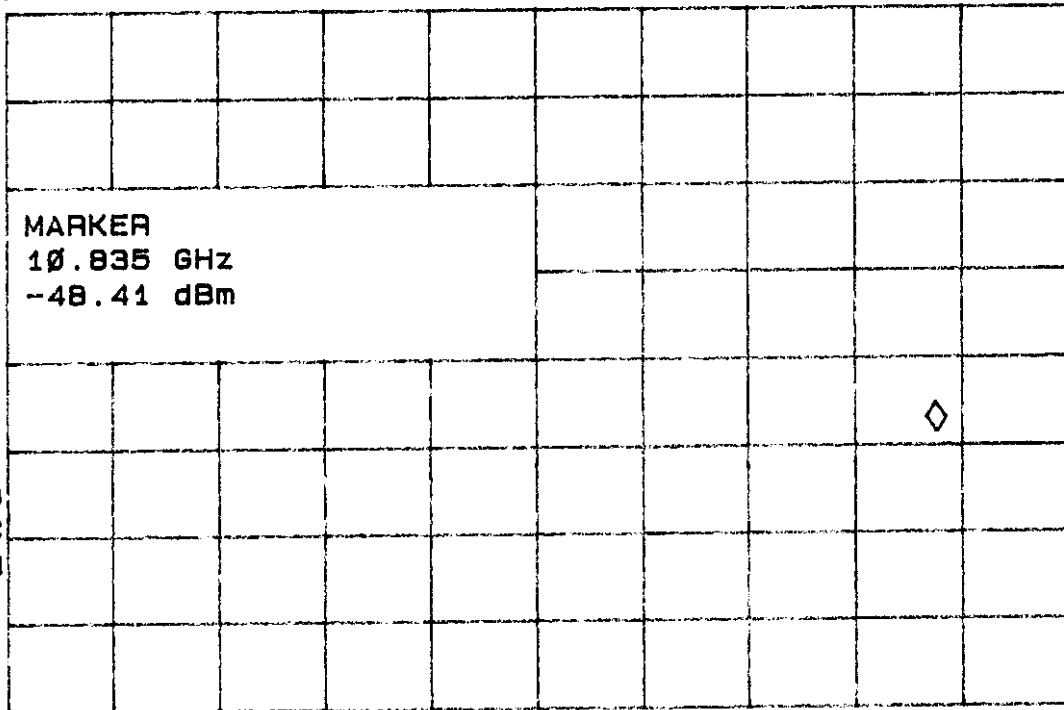
MKR 10.835 GHz

REF .0 dBm

AT 10 dB PG -20.0 dB

-48.41 dBm

PEAK  
LOG  
10  
dB/



VA SB  
SC FC  
CORR

START 2.679 GHz

#RES BW 100 kHz

#VBN 30 kHz

STOP 12.000 GHz

SWP 9.32 sec

**Model 4210**  
**Figure 15B. Conducted Spurious Emission 15.247(c) (High)**

12:55:27 JUL 31, 1998

CSI 4210 CH.5 HIGH

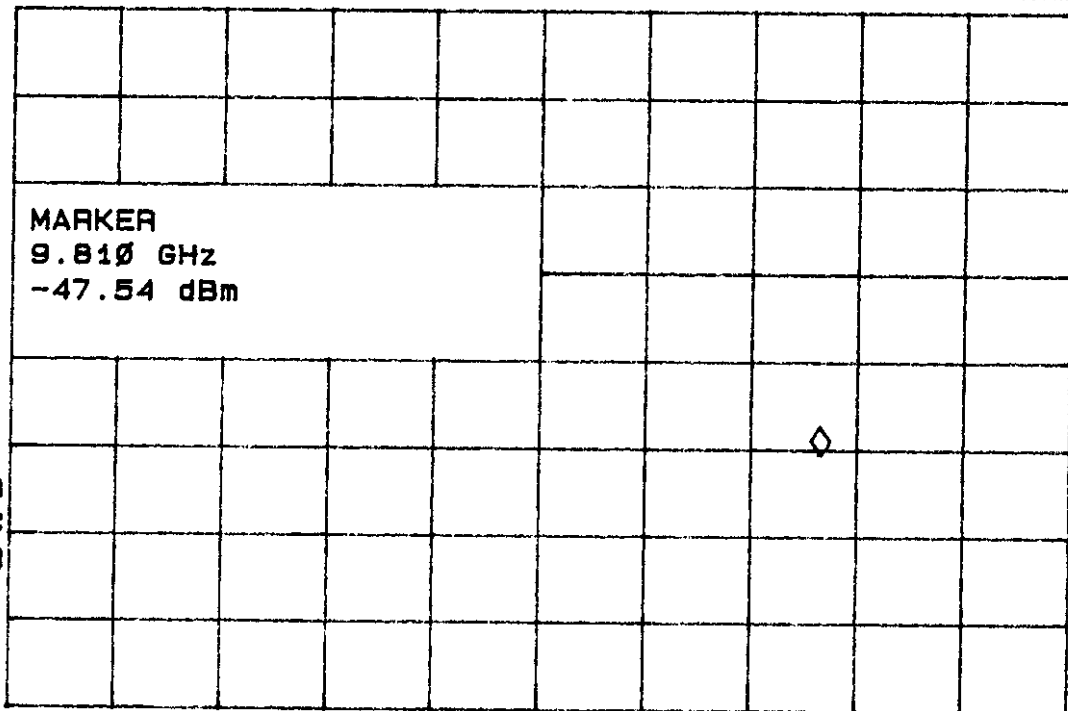
MKR 9.810 GHz

REF 3.0 dBm

AT 10 dB PG -20.0 dB

-47.54 dBm

PEAK  
 LOG  
 10  
 dB/



VA SB  
 SC FC  
 CORR

START 2.679 GHz

#RES BW 100 kHz

#VBW 30 kHz

STOP 12.000 GHz

SWP 9.32 sec



Model 4200

Figure 16A. Conducted Spurious Emission 15.247(c) (High)

16:34:55 JUL 26, 1998

CSI 4200 CH.5 HIGH

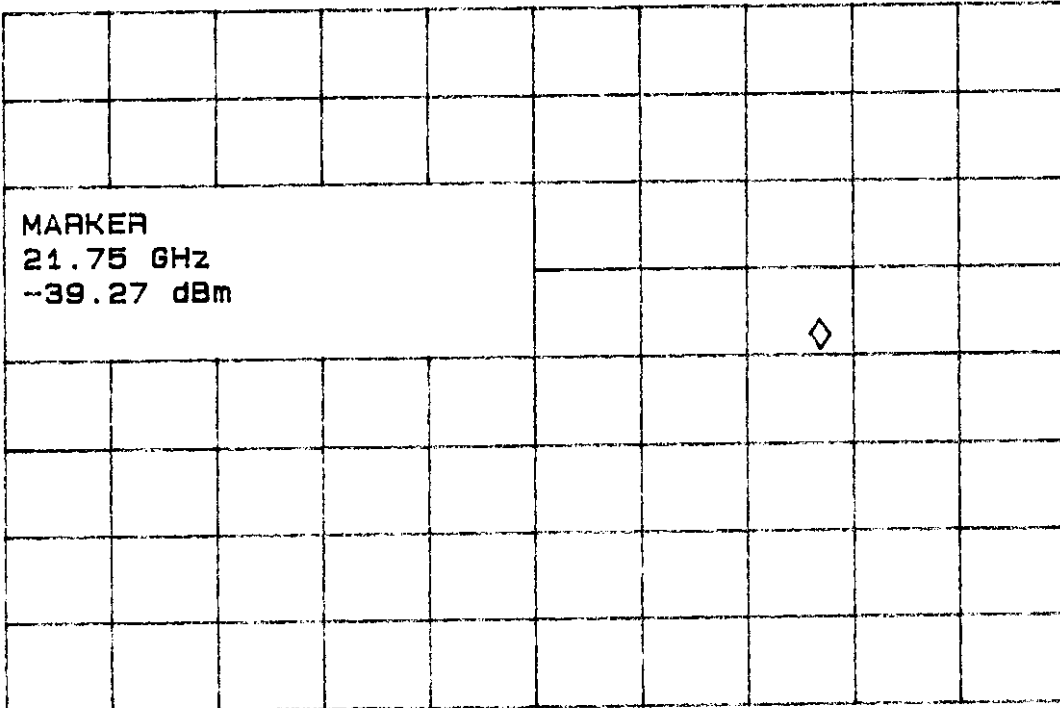
MKR 21.75 GHz

REF .0 dBm

AT 10 dB PG -20.0 dB

-39.27 dBm

PEAK  
LOG  
10  
dB/



START 11.00 GHz

#RES BW 100 kHz

#VBW 30 kHz

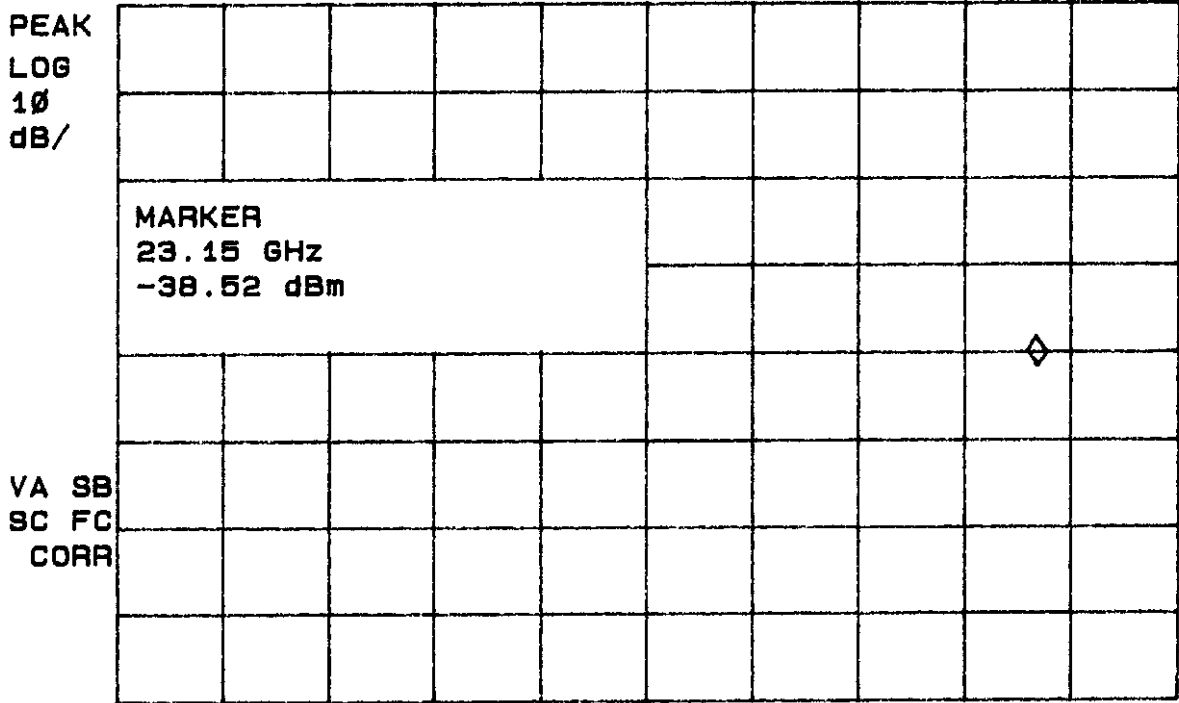
STOP 25.00 GHz

SWP 14.0 sec

VA SB  
SC FC  
CORR

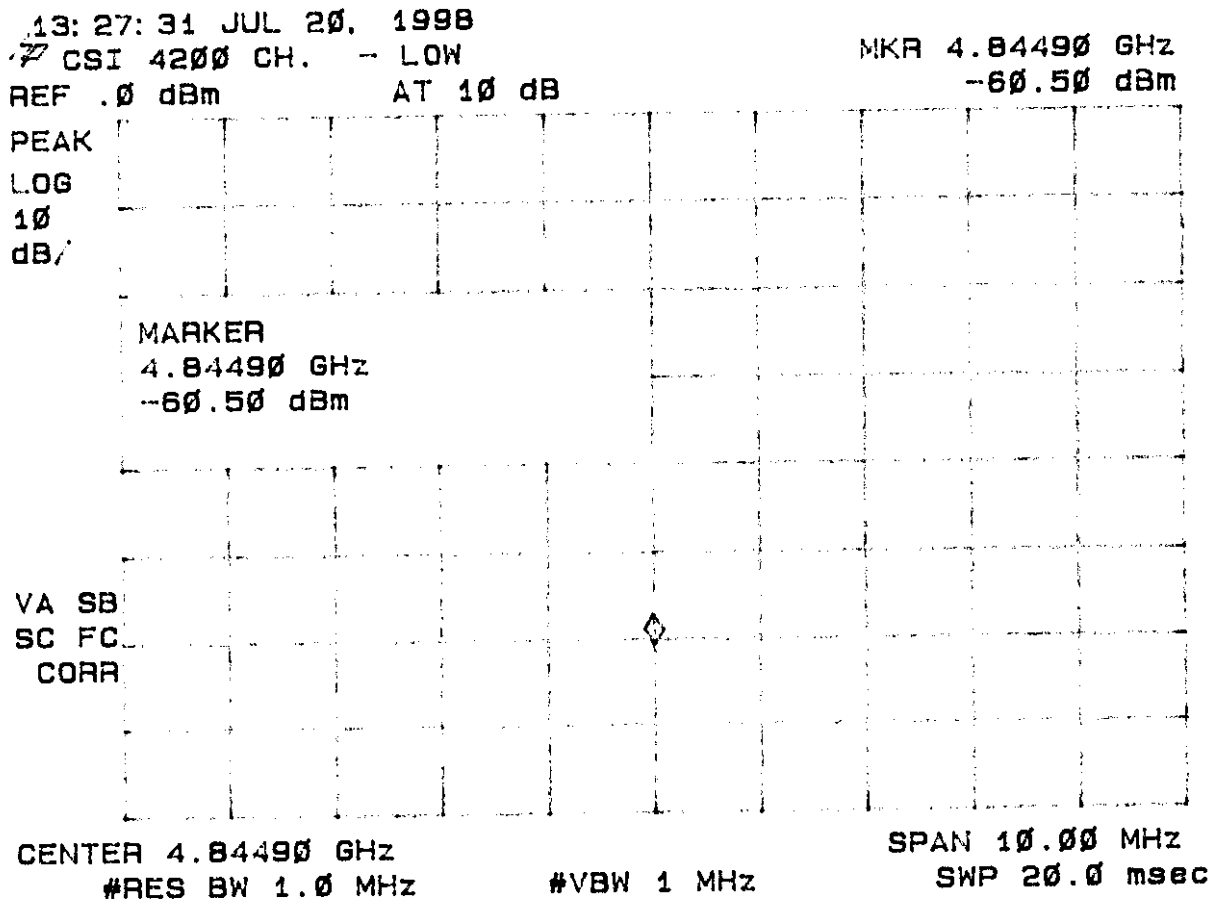
**Model 4210**  
**Figure 16B. Conducted Spurious Emission 15.247(c) (High)**

12:57:52 JUL 31, 1998  
CSI 4210 CH.5 HIGH MKR 23.15 GHz  
REF 3.0 dBm AT 10 dB PG -20.0 dB -38.52 dBm



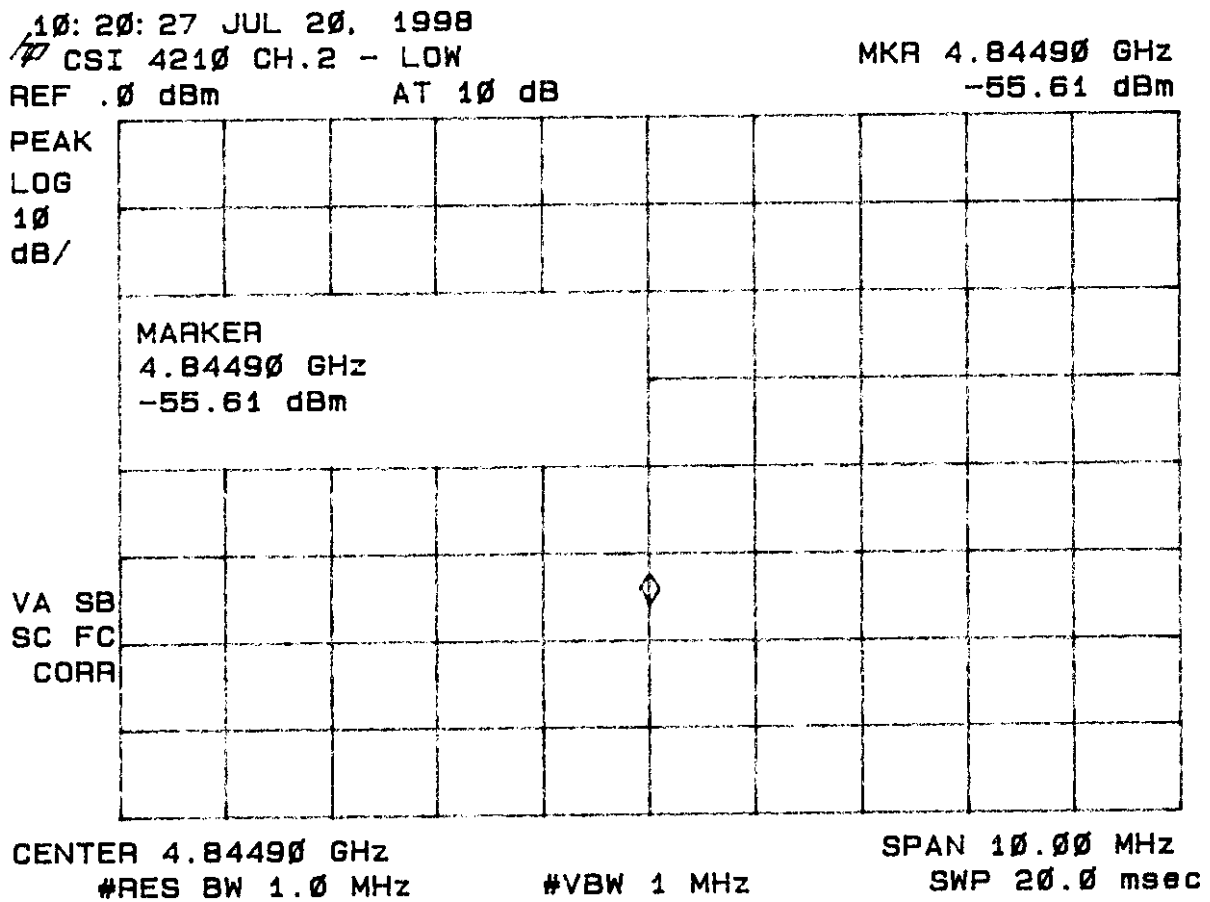
START 11.00 GHz STOP 25.00 GHz  
#RES BW 100 kHz #VBW 30 kHz SWP 14.0 sec

Model 4200  
Figure 17A. Peak Radiated Spurious Emission 15.247(c) (Low)



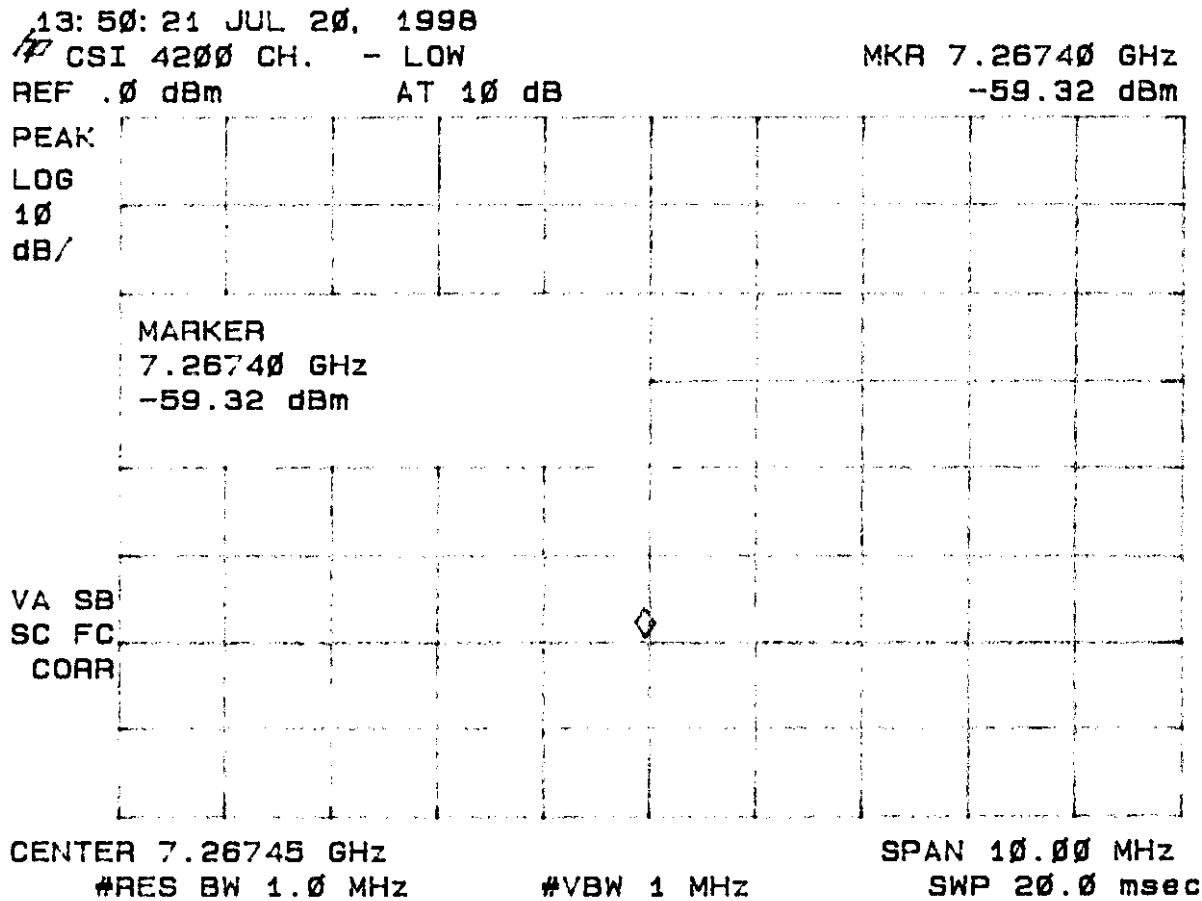
Model 4210

Figure 17B. Peak Radiated Spurious Emission 15.247(c) (Low)



Model 4200

Figure 18A. Peak Radiated Spurious Emission 15.247(c) (Low)



**Model 4210**  
**Figure 18B. Peak Radiated Spurious Emission 15.247(c) (Low)**

10:31:04 JUL 20, 1998

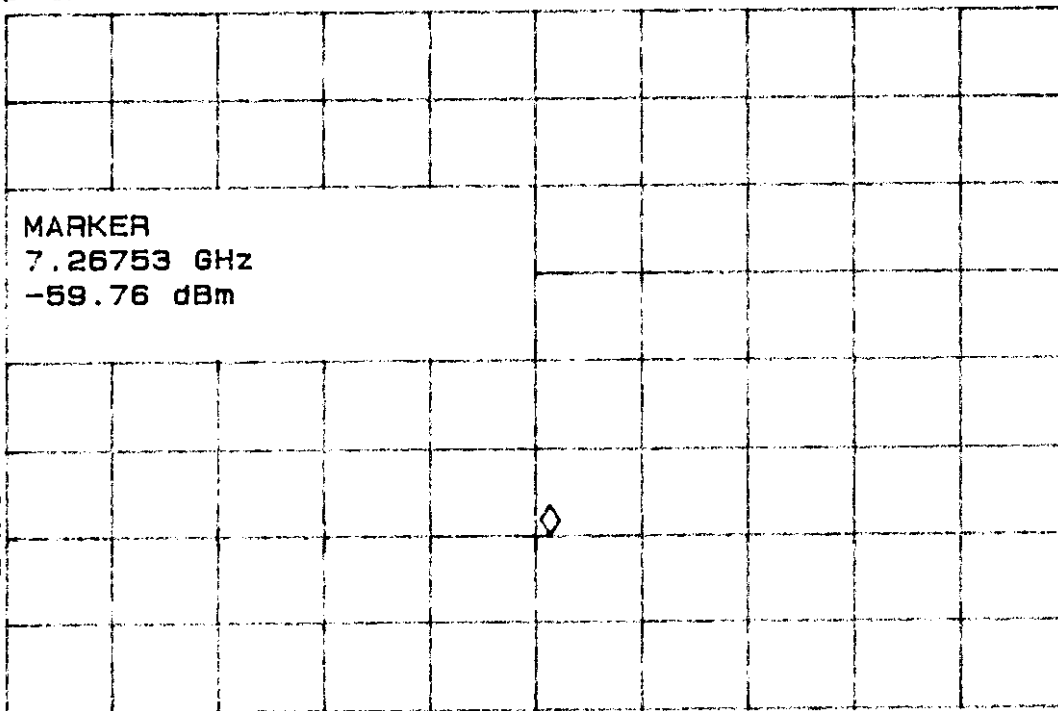
CSI 4210 CH.2 - LOW

MKR 7.26753 GHz

REF .0 dBm AT 10 dB

-59.76 dBm

PEAK  
LOG  
10  
dB/



VA SB  
SC FC  
CORR

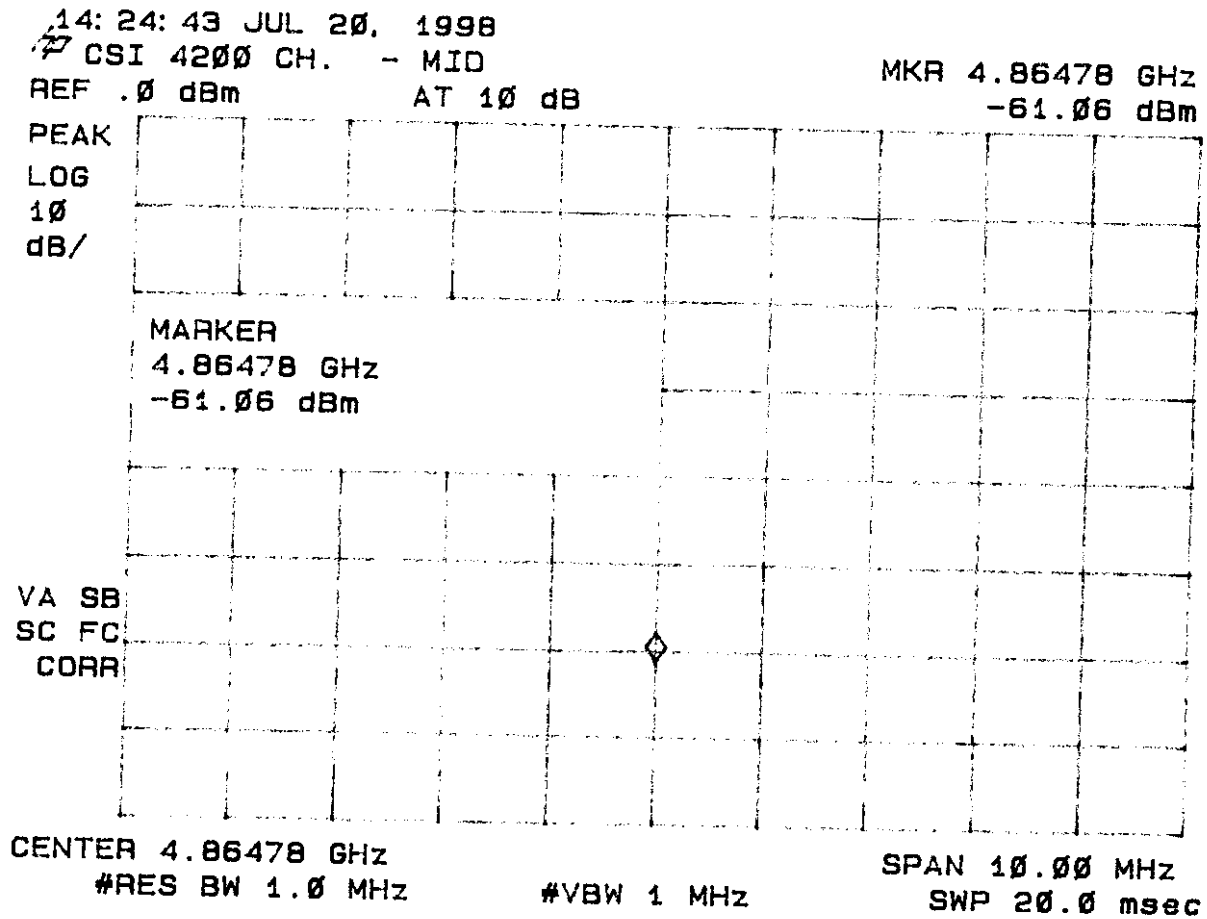
CENTER 7.26740 GHz  
#RES BW 1.0 MHz

#VBW 1 MHz

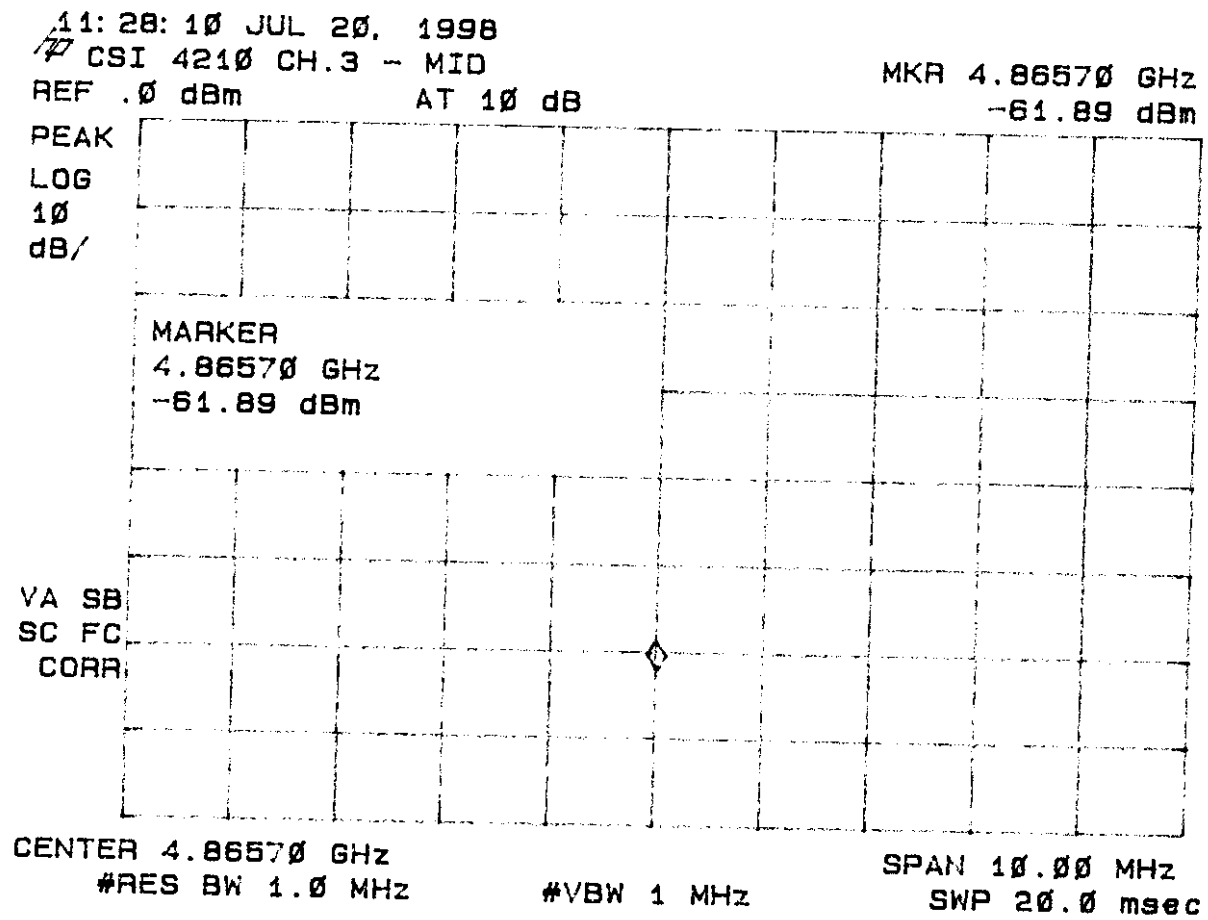
SPAN 10.00 MHz  
SWP 20.0 msec

Model 4200

Figure 19A. Peak Radiated Spurious Emission 15.247(c) (Mid)



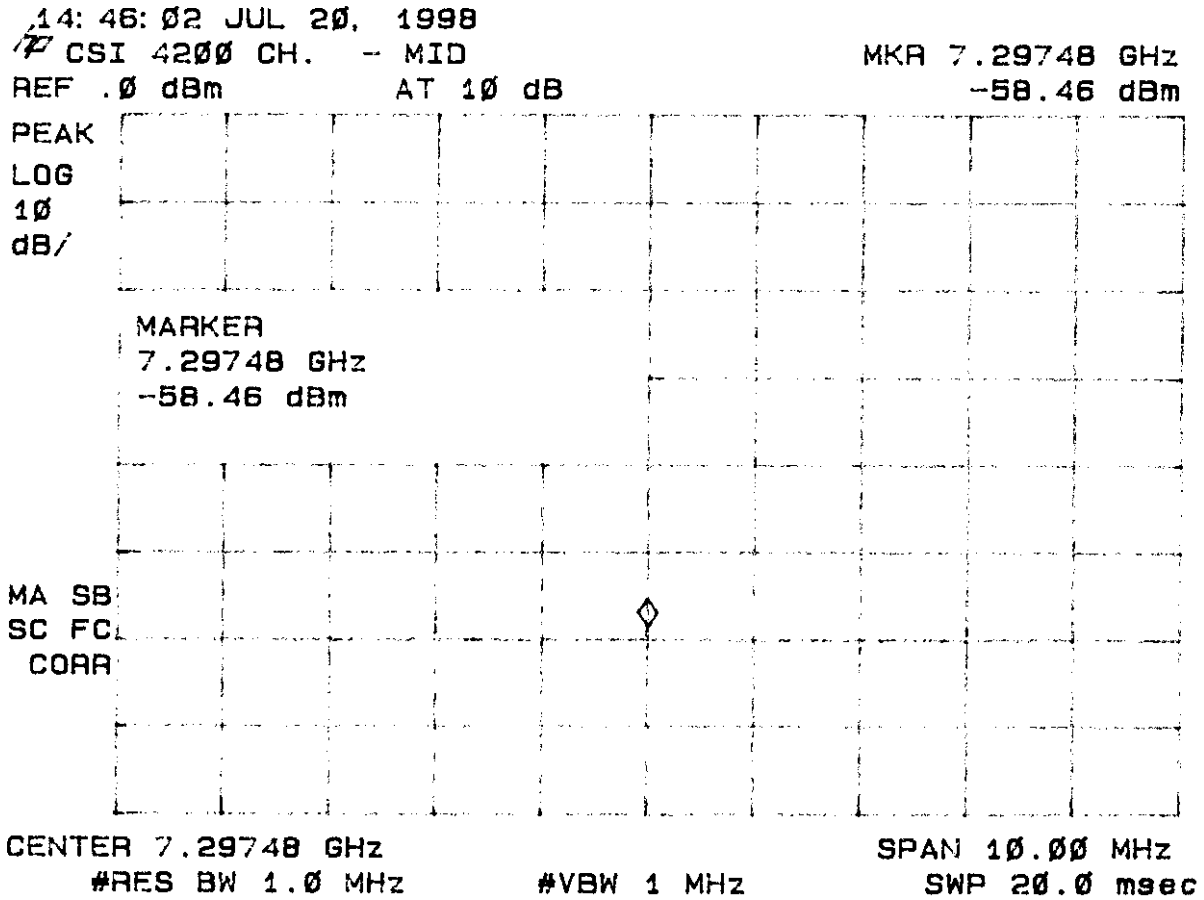
**Model 4210**  
**Figure 19B. Peak Radiated Spurious Emission 15.247(c) (Mid)**





Model 4200

Figure 20A. Peak Radiated Spurious Emission 15.247(c) (Mid)



Model 4210

Figure 20B. Peak Radiated Spurious Emission 15.247(c) (Mid)

11:42:52 JUL 20, 1998

CSI 4210 CH.3 - MID

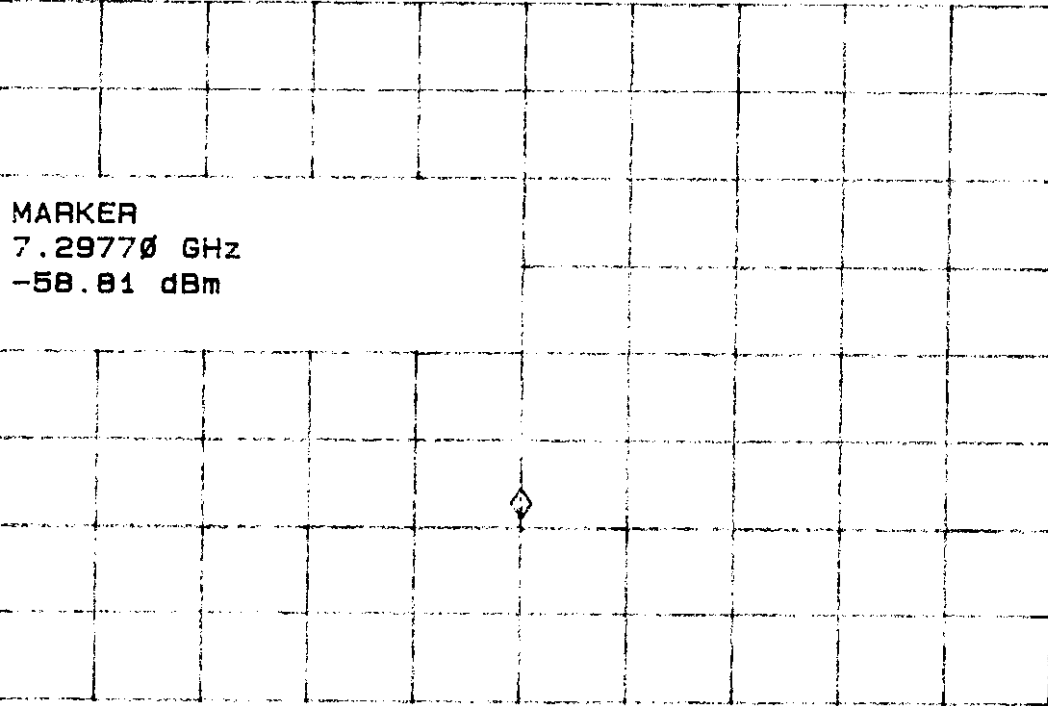
MKR 7.29770 GHz

REF .0 dBm

AT 10 dB

-58.81 dBm

PEAK  
LOG  
10  
dB/



VA SB  
SC FC  
CORR

CENTER 7.29770 GHz

#RES BW 1.0 MHz

#VBW 1 MHz

SPAN 10.00 MHz

SWP 20.0 msec

Model 4200

Figure 21A. Peak Radiated Spurious Emission 15.247(c) (High)

15: 22: 47 JUL 25, 1998

CSI 4200 CH.5 HIGH

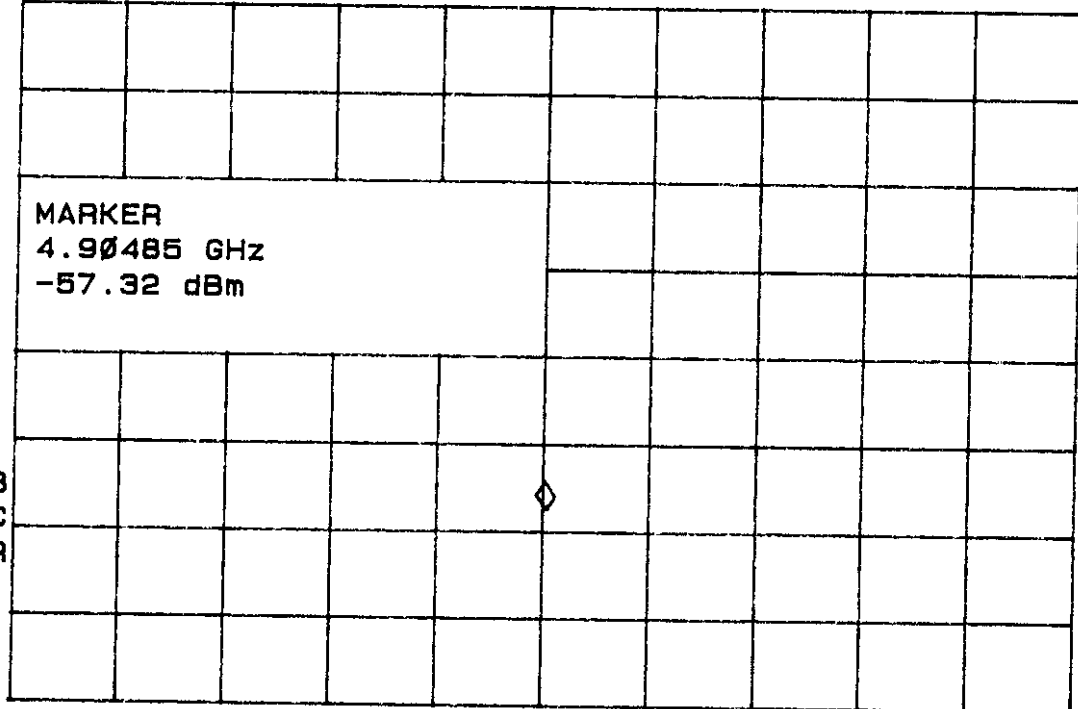
MKR 4.90485 GHz

REF .0 dBm

AT 10 dB

-57.32 dBm

PEAK  
LOG  
10  
dB/



VA SB  
SC FC  
CORR

CENTER 4.90483 GHz

#RES BW 1.0 MHz

#VBW 1 MHz

SPAN 10.00 MHz

SWP 20.0 msec

Model 4210

Figure 21B. Peak Radiated Spurious Emission 15.247(c) (High)

10:53:08 JUL 20, 1998

CSI 4210 CH.5 - HIGH

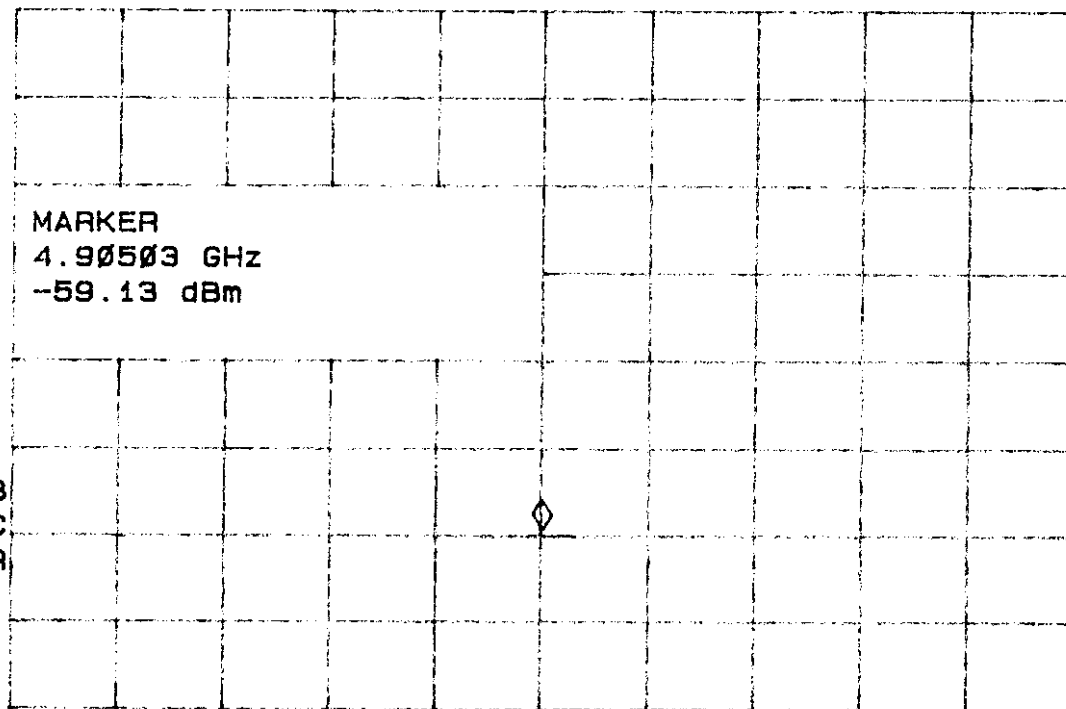
MKR 4.90503 GHz

REF .0 dBm

AT 10 dB

-59.13 dBm

PEAK  
LOG  
10  
dB/



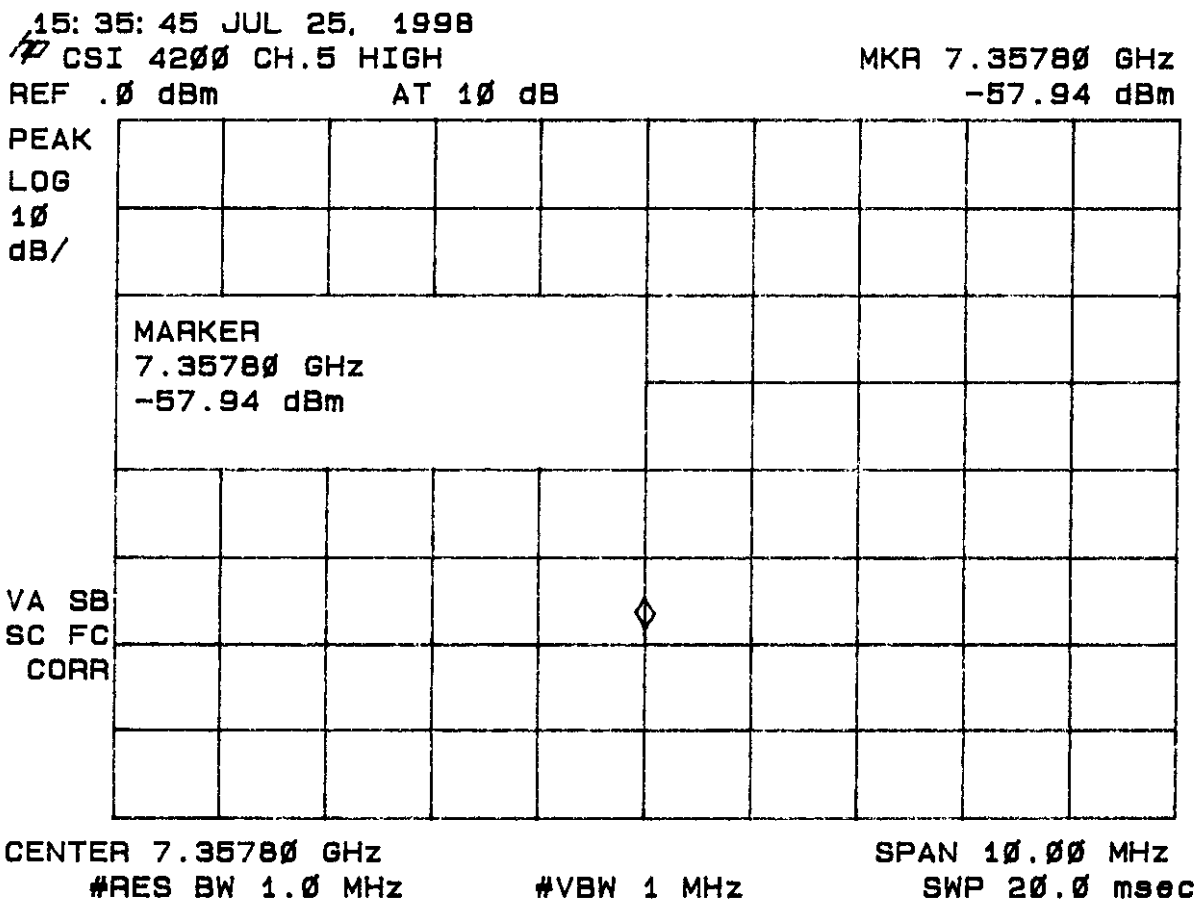
CENTER 4.90503 GHz  
#RES BW 1.0 MHz

#VBW 1 MHz

SPAN 10.00 MHz  
SWP 20.0 msec

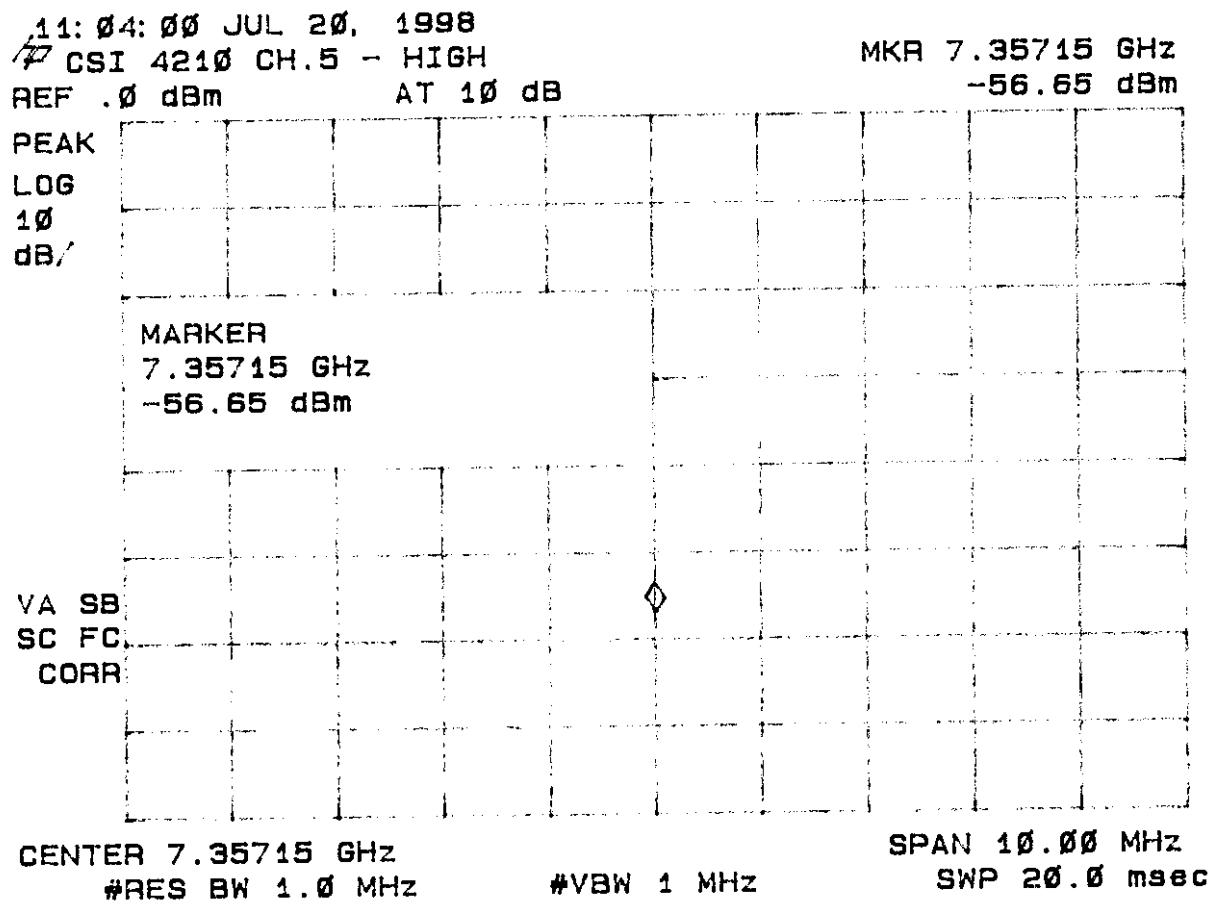
Model 4200

Figure 22A. Peak Radiated Spurious Emission 15.247(c) (High)



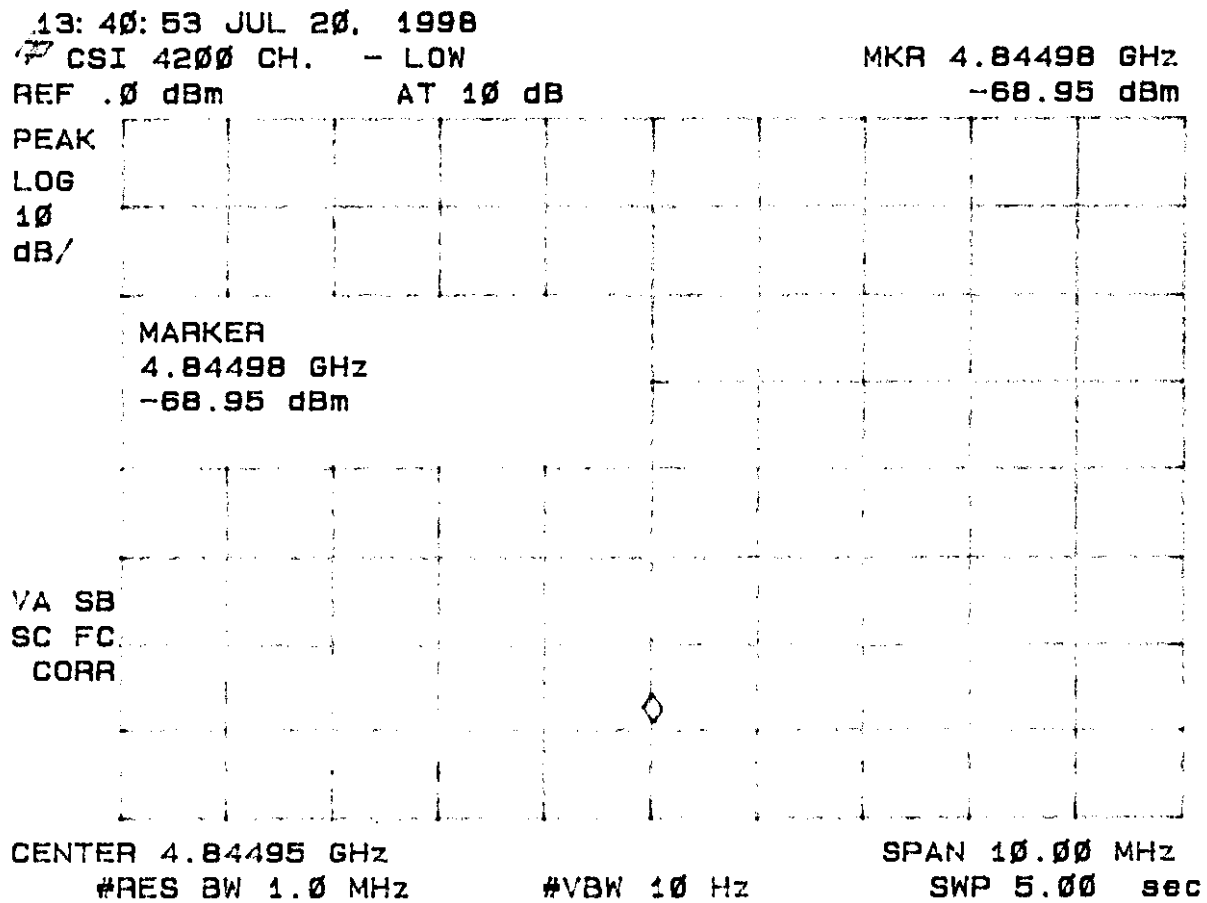
Model 4210

Figure 22B. Peak Radiated Spurious Emission 15.247(c) (High)



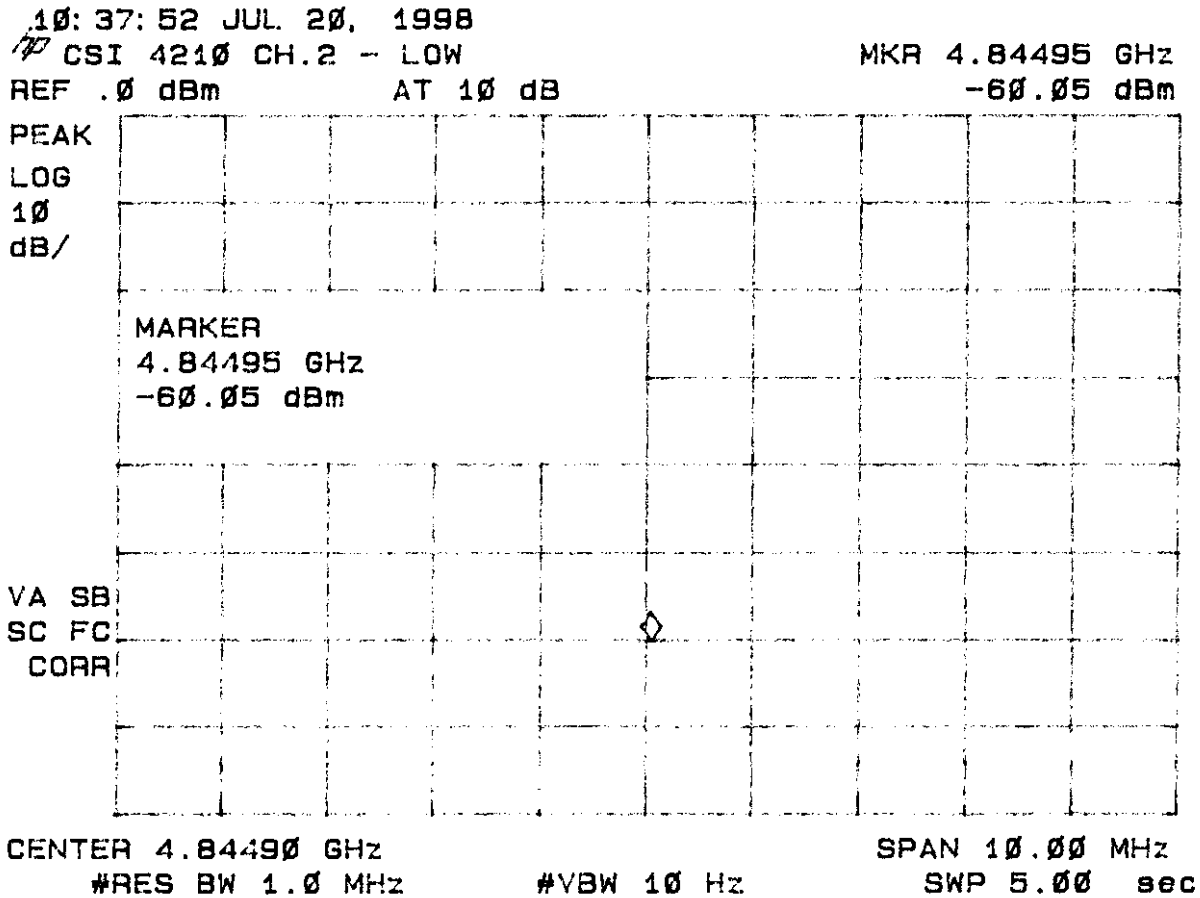
Model 4200

Figure 23A. Average Radiated Spurious Emission 15.247(c) (Low)



Model 4210

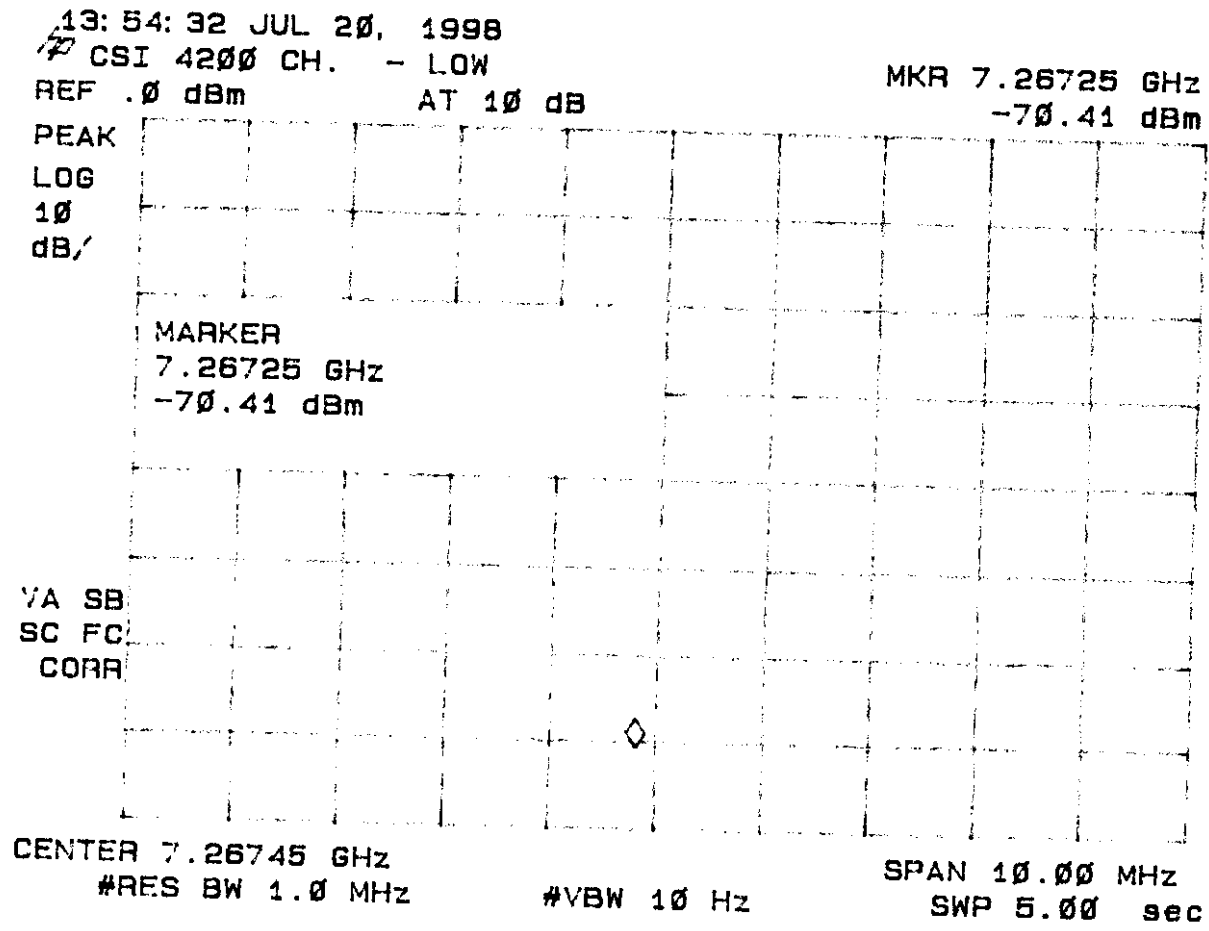
Figure 23B. Average Radiated Spurious Emission 15.247(c) (Low)





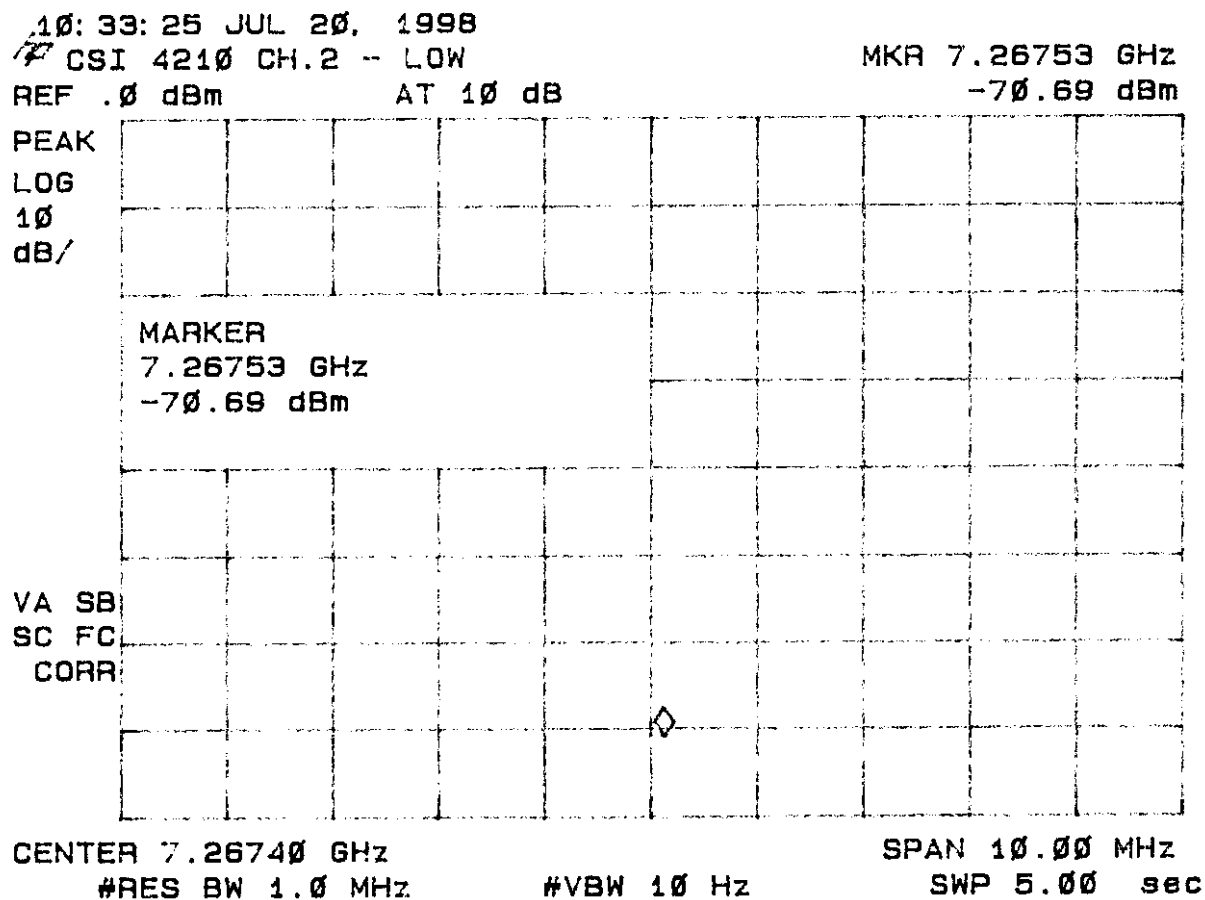
Model 4200

Figure 24A. Average Radiated Spurious Emission 15.247(c) (Low)



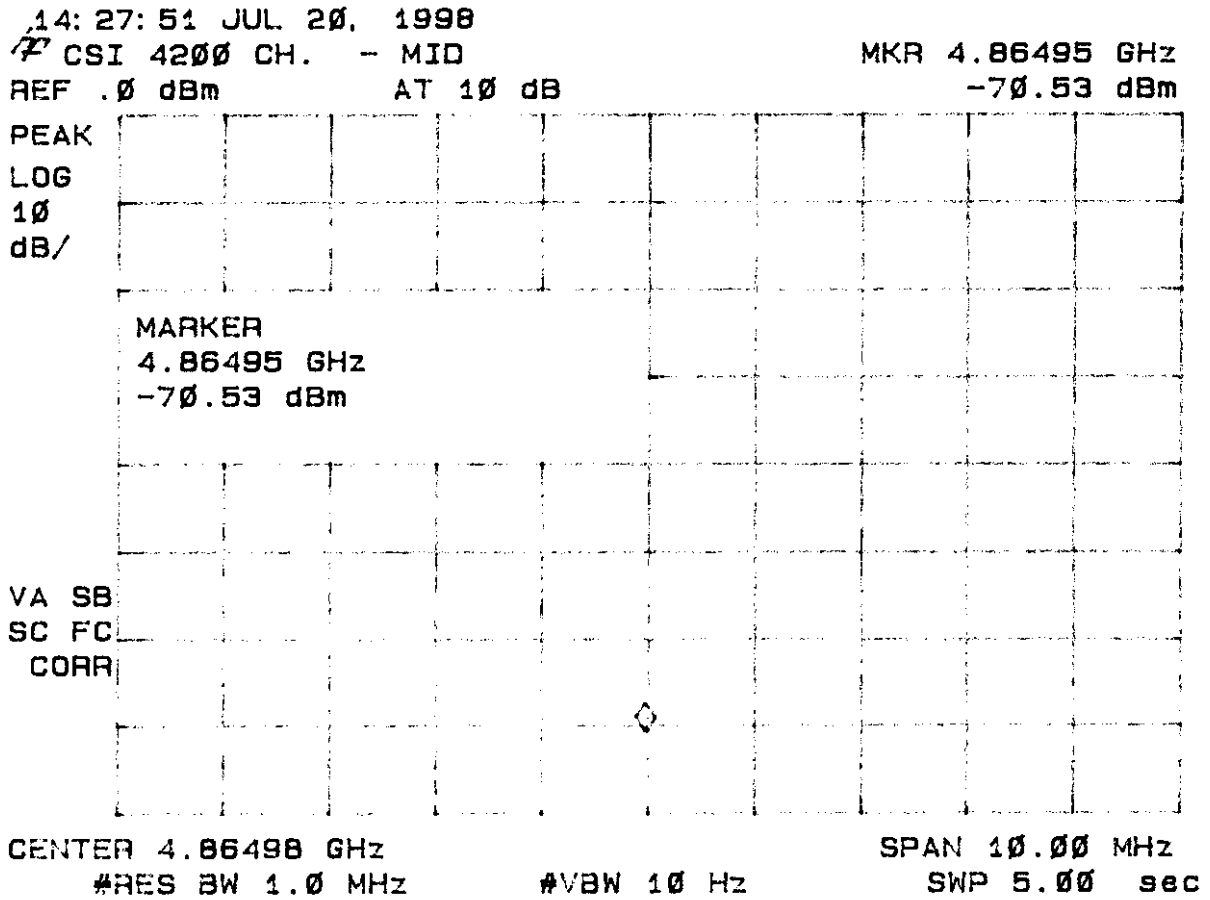
### Model 4210

#### Figure 24B. Average Radiated Spurious Emission 15.247(c) (Low)



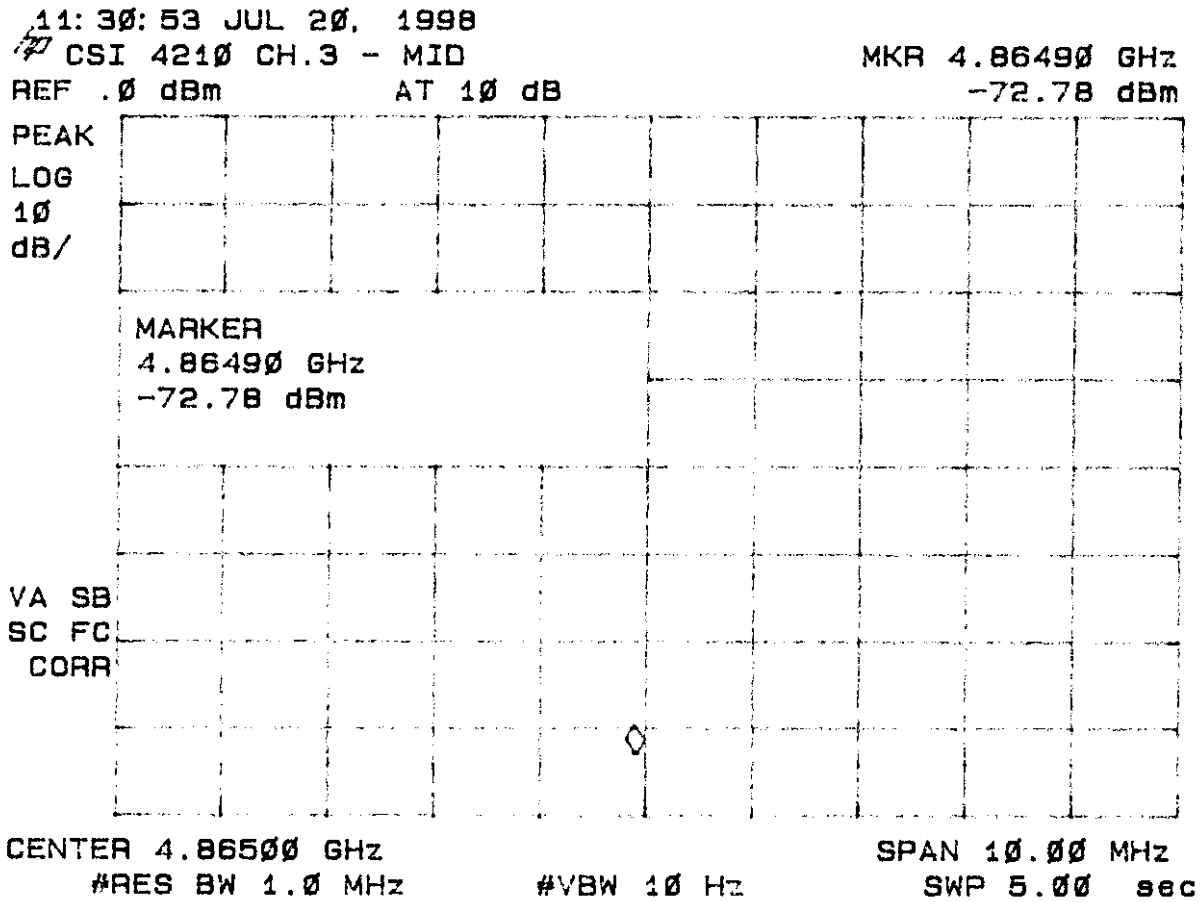
Model 4200

Figure 25A. Average Radiated Spurious Emission 15.247(c) (Mid)



Model 4210

Figure 25B. Average Radiated Spurious Emission 15.247(c) (Mid)



Model 4200

Figure 26A. Average Radiated Spurious Emission 15.247(c) (Mid)

15:43:51 JUL 25, 1998

CSI 4200 CH.2 MID

MKR 7.29748 GHz

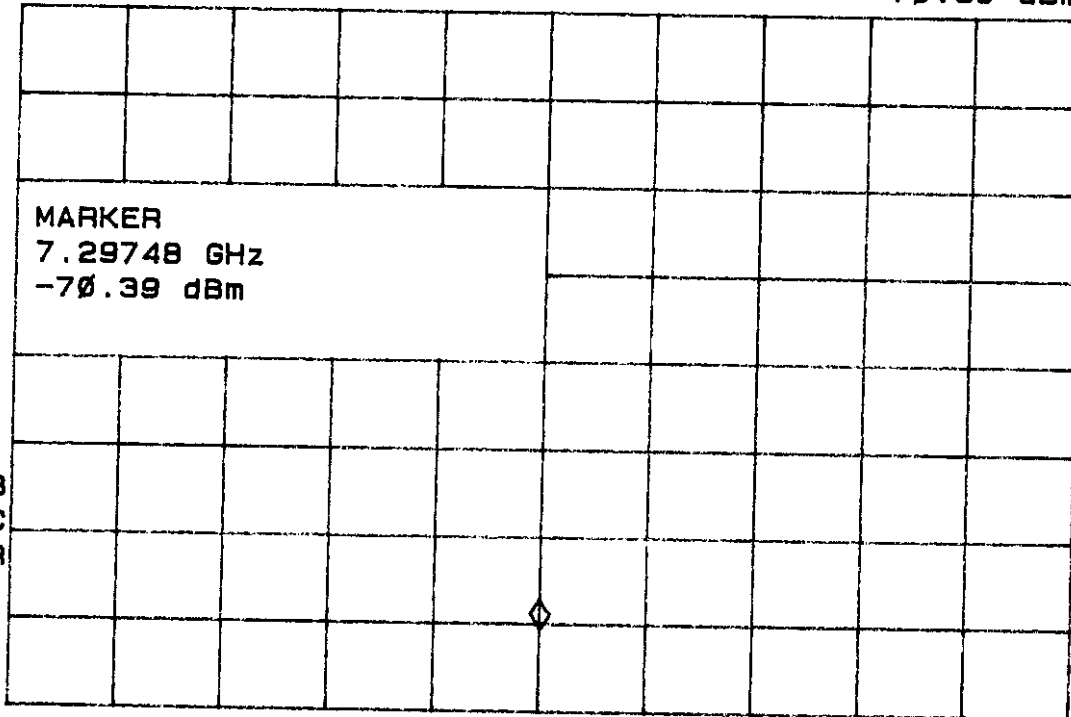
REF .0 dBm

AT 10 dB

-70.39 dBm

PEAK  
LOG  
10  
dB/

VA SB  
SC FC  
CORR



CENTER 7.29748 GHz

#RES BW 1.0 MHz

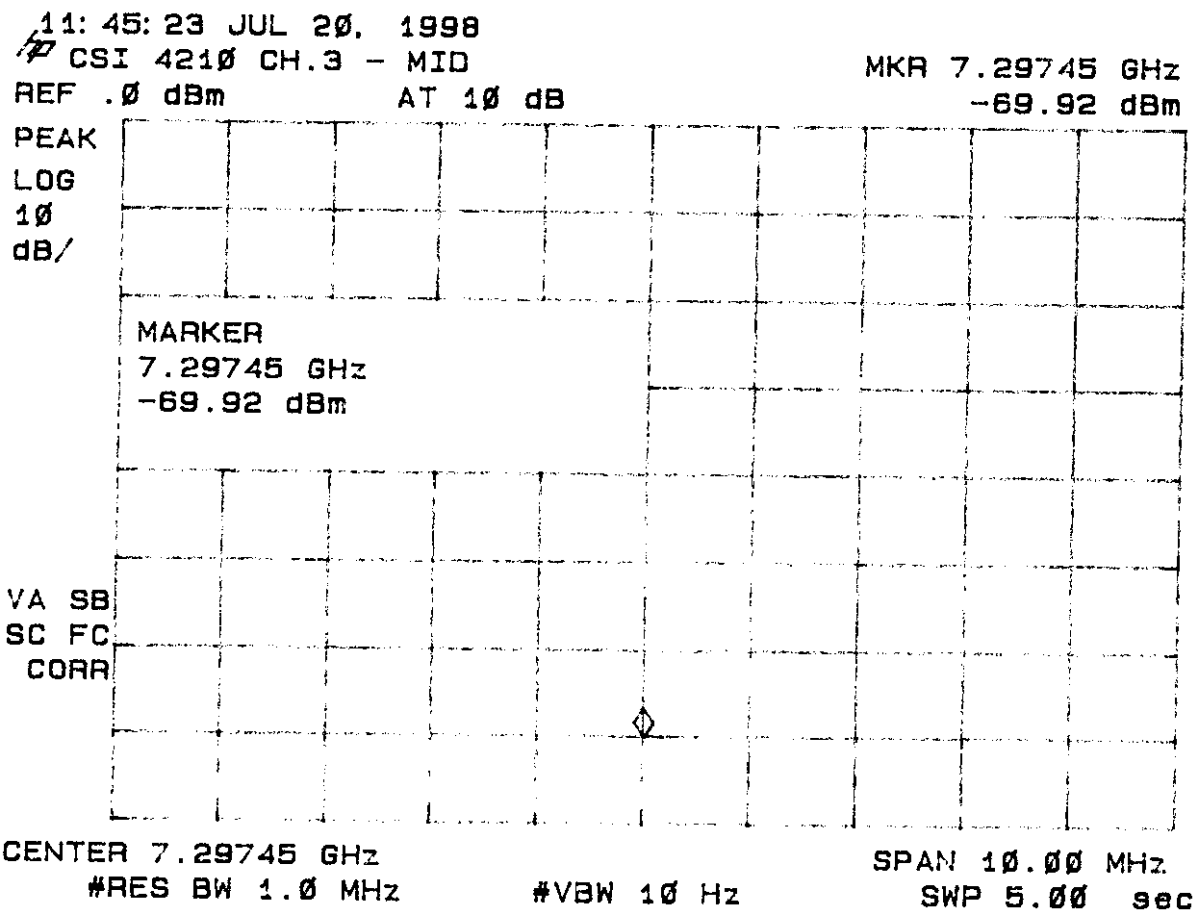
#VBW 10 Hz

SPAN 10.00 MHz

SWP 5.00 sec

Model 4210

Figure 26B. Average Radiated Spurious Emission 15.247(c) (Mid)



Model 4200

Figure 27A. Average Radiated Spurious Emission 15.247(c) (High)

15: 25: 03 JUL 25, 1998

CSI 4200 CH.5 HIGH

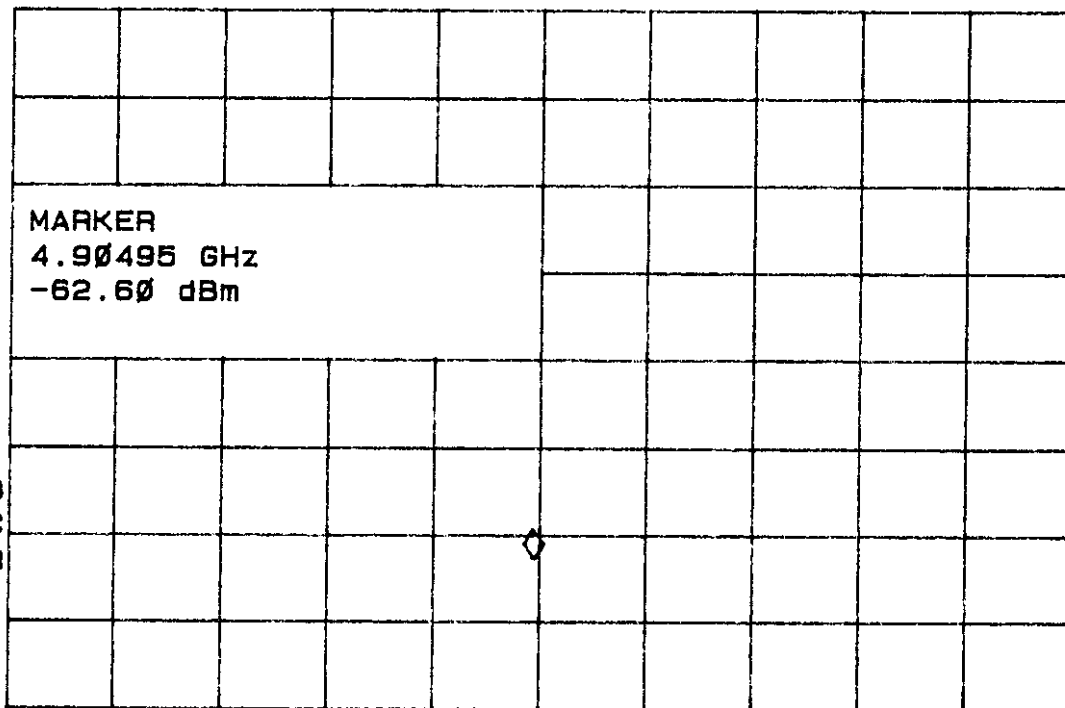
MKR 4.90495 GHz

REF .0 dBm

AT 10 dB

-62.60 dBm

PEAK  
LOG  
10  
dB/



CENTER 4.90500 GHz  
#RES BW 1.0 MHz

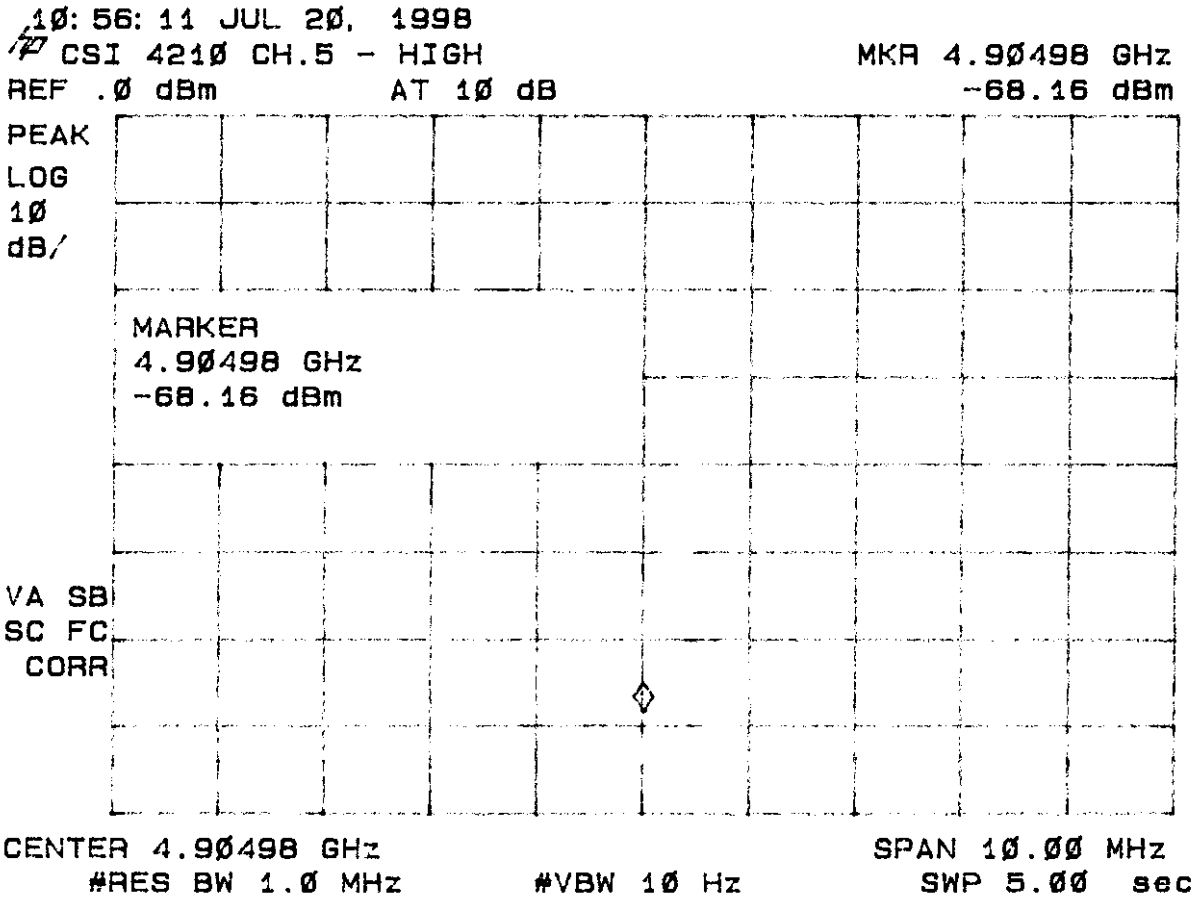
#VBW 10 Hz

SPAN 10.00 MHz  
SWP 5.00 sec

VA SB  
SC FC  
CORR

Model 4210

Figure 27B. Average Radiated Spurious Emission 15.247(c) (High)





Model 4200

Figure 28A. Average Radiated Spurious Emission 15.247(c) (High)

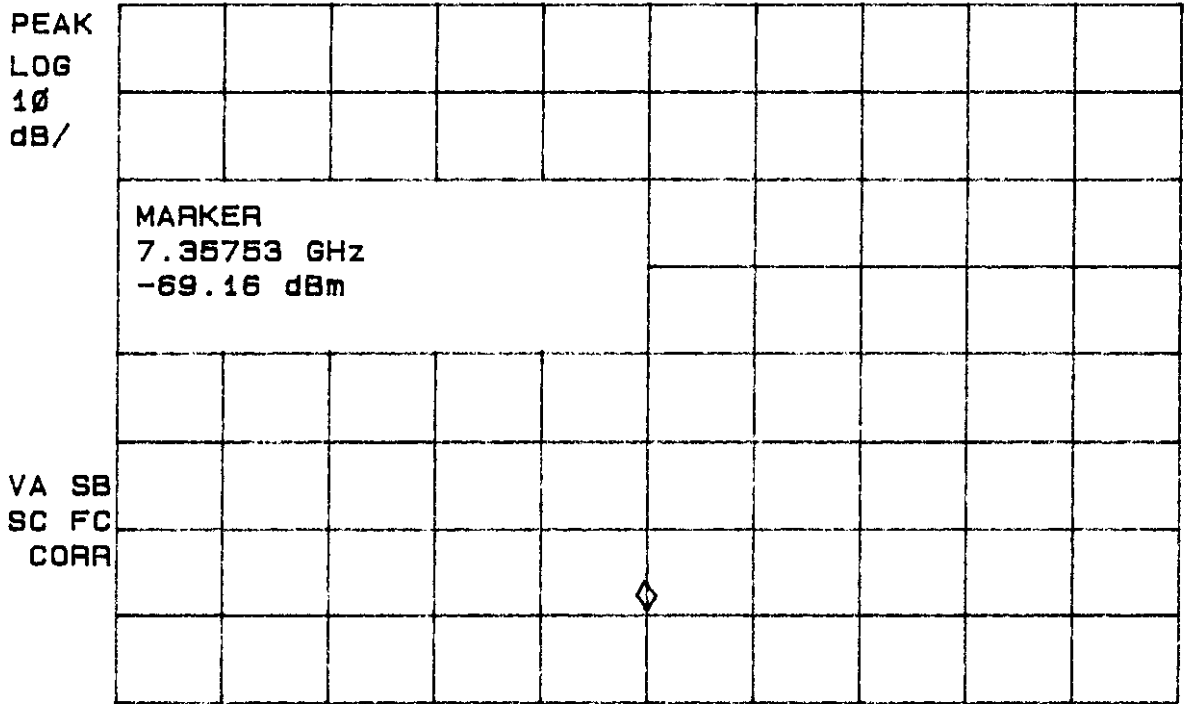
15: 40: 04 JUL 25, 1998

CSI 4200 CH.5 HIGH

MKR 7.35753 GHz

REF .0 dBm AT 10 dB

-69.16 dBm



CENTER 7.35753 GHz

SPAN 10.00 MHz

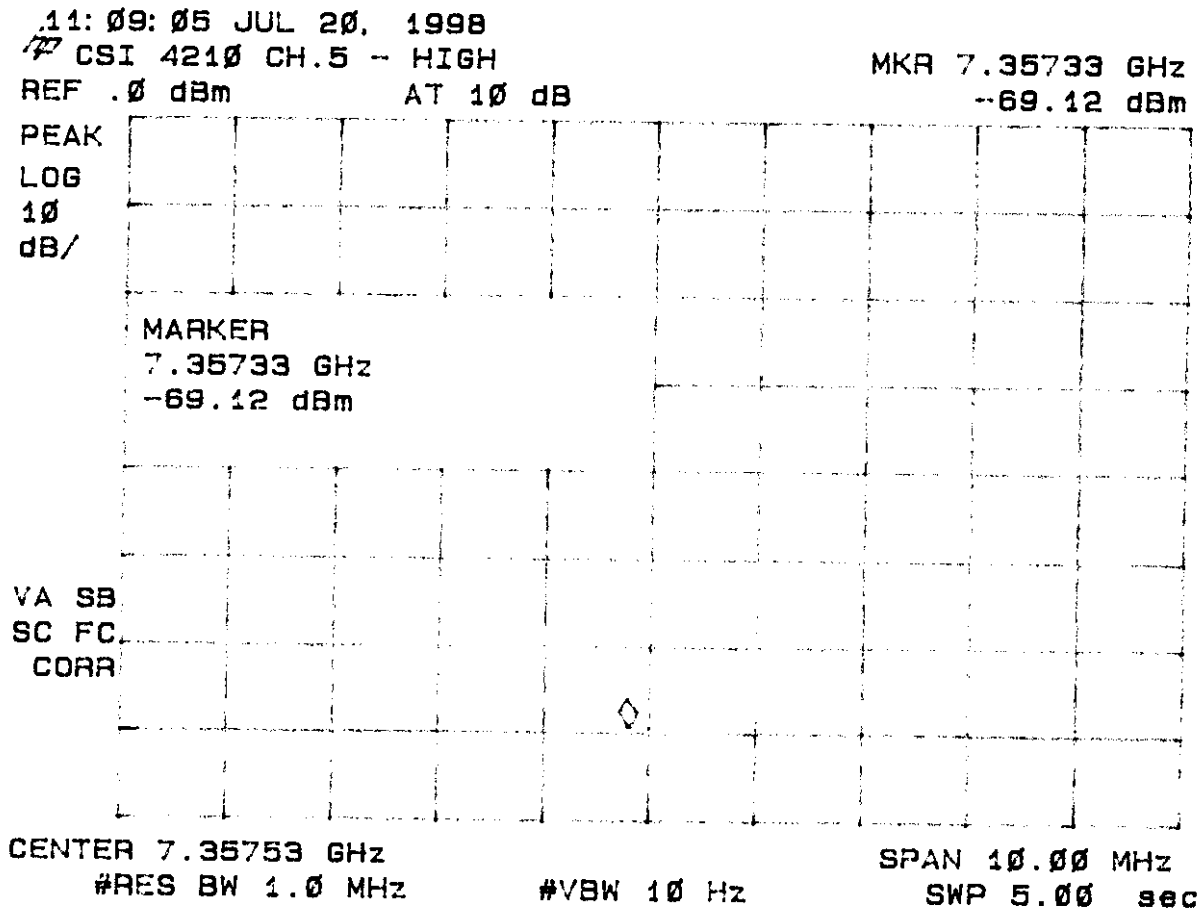
#RES BW 1.0 MHz

#VBW 10 Hz

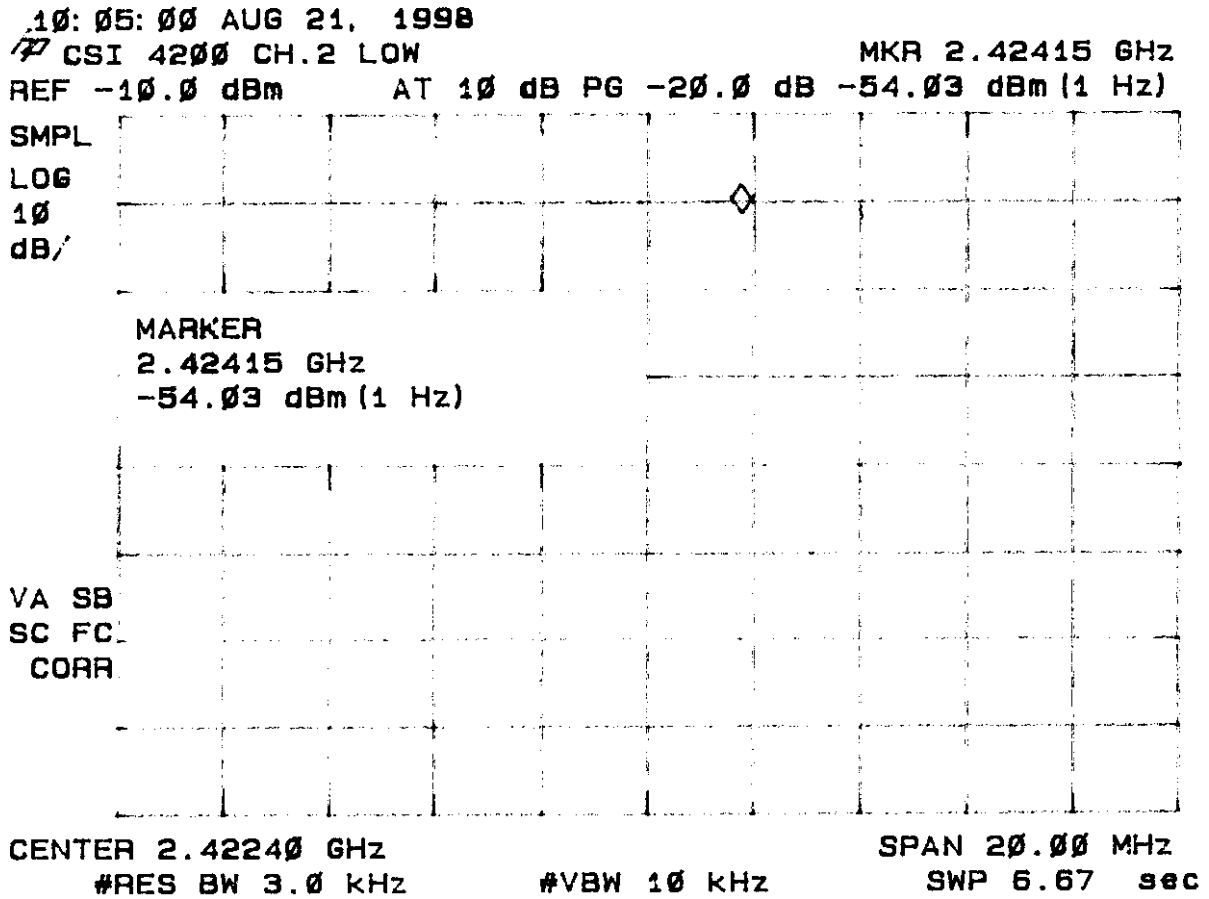
SWP 5.00 sec

Model 4210

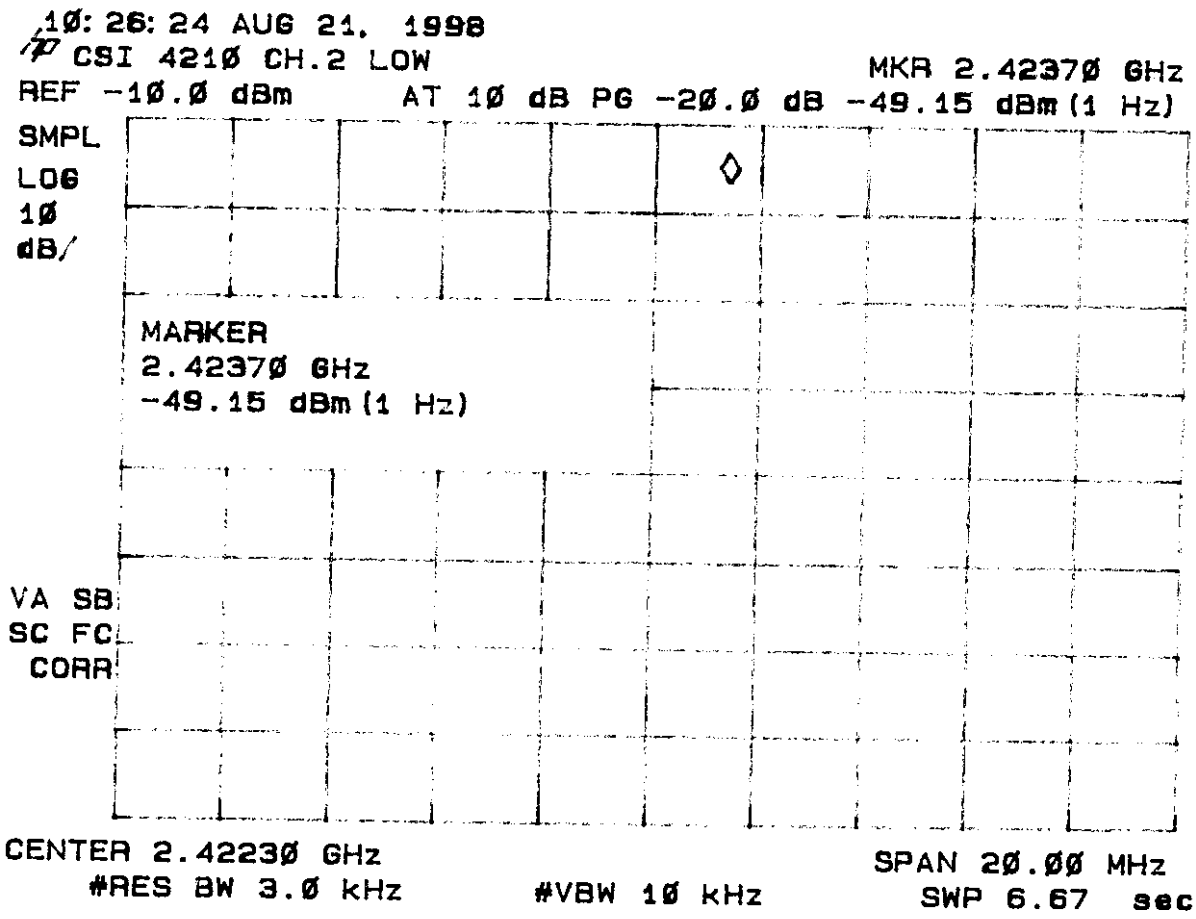
Figure 28B. Average Radiated Spurious Emission 15.247(c) (High)



Model 4200  
Figure 29A. Power Density 15.247(c) (Low)



### Model 4210 Figure 29B. Power Density 15.247(c) (Low)



### Model 4200 Figure 30A. Power Density 15.247(c) (Mid)

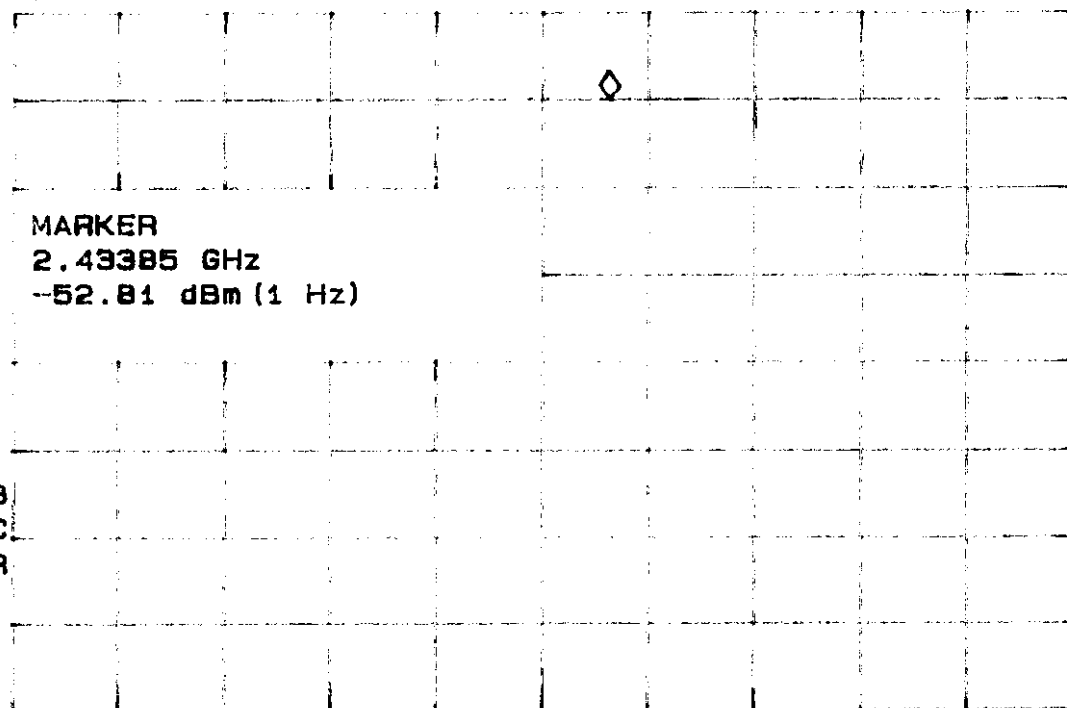
10:02:05 AUG 21, 1998

CSI 4200 CH.3 MID

MKR 2.43385 GHz

REF -10.0 dBm AT 10 dB PG -20.0 dB -52.81 dBm (1 Hz)

SMPL  
LOG  
10  
dB/



MARKER  
2.43385 GHz  
-52.81 dBm (1 Hz)

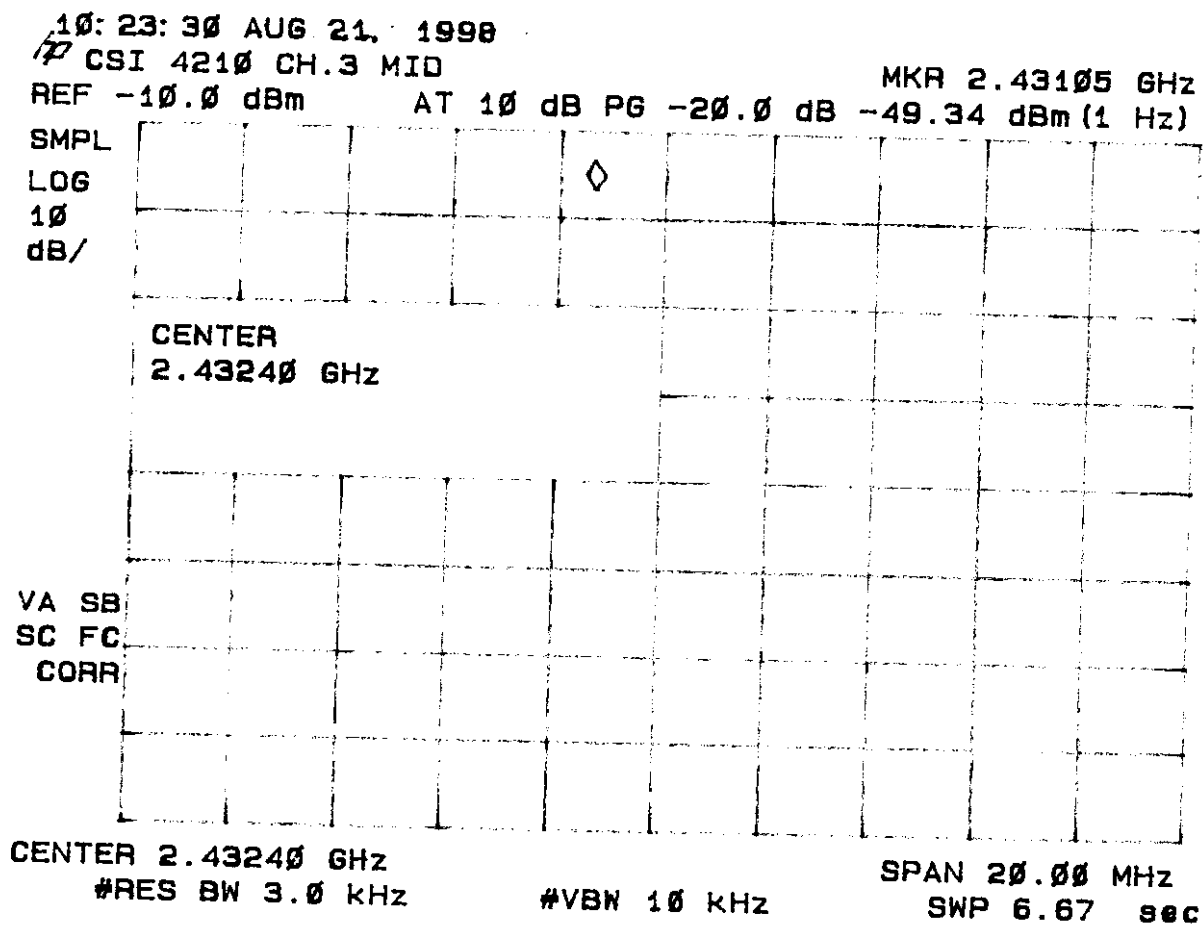
VA SB  
SC FC  
CORR

CENTER 2.43260 GHz  
#RES BW 3.0 kHz

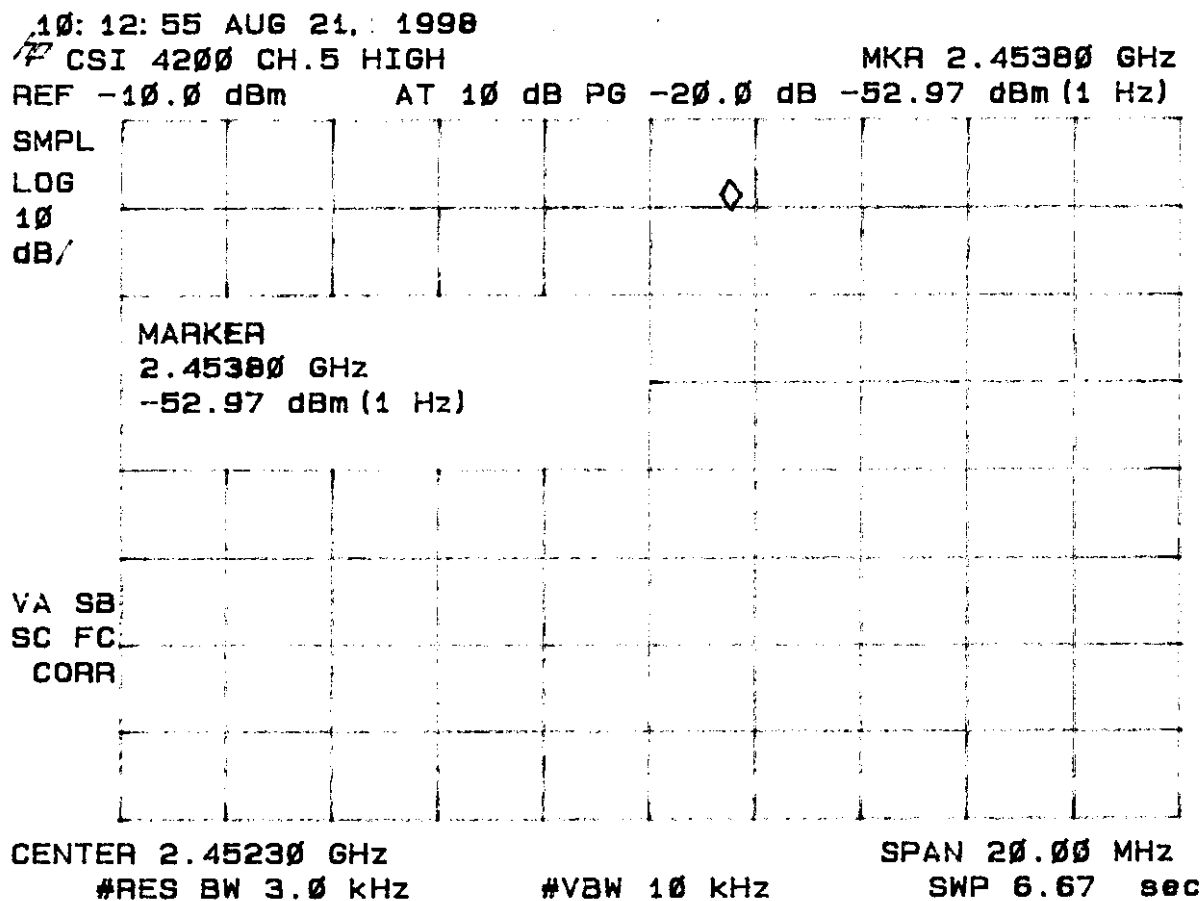
#VBW 10 kHz

SPAN 20.00 MHz  
SWP 6.67 sec

**Model 4210**  
**Figure 30B. Power Density 15.247(c) (Mid)**



Model 4200  
Figure 31A. Power Density 15.247(c) (High)



**Model 4210**  
**Figure 31B. Power Density 15.247(c) (High)**

10:19:51 AUG 21, 1998

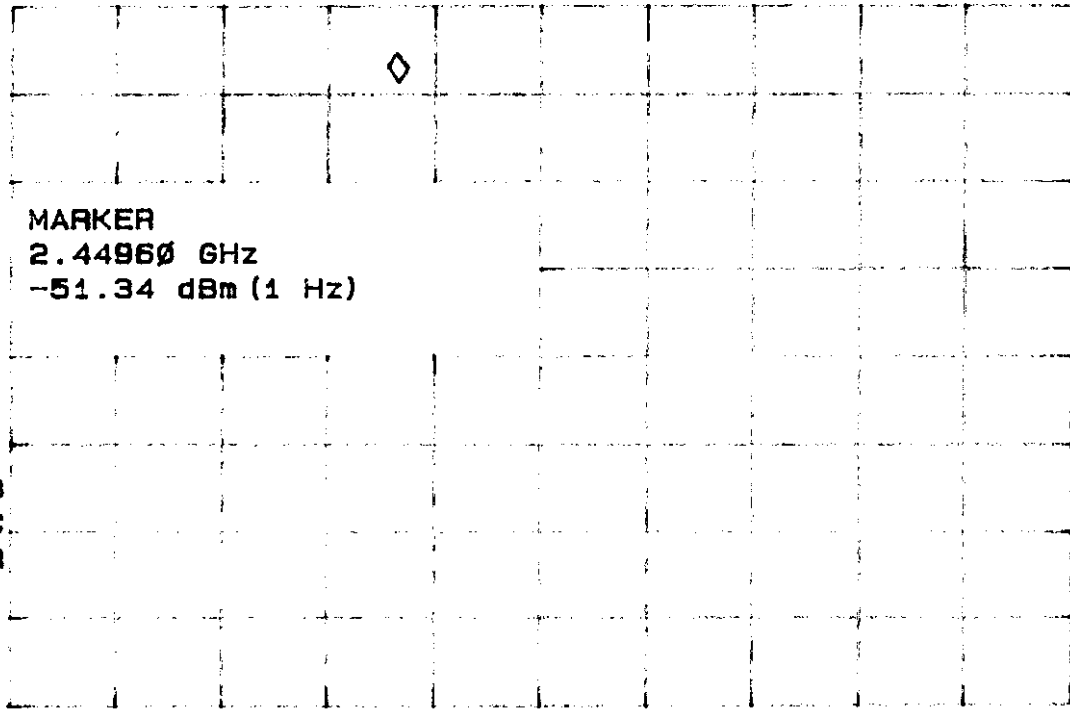
CSI 4210 CH.5 HIGH

MKR 2.44960 GHz

REF -10.0 dBm

AT 10 dB PG -20.0 dB -51.34 dBm (1 Hz)

SMPL  
 LOG  
 10  
 dB/



VA SB  
 SC FC  
 CORR

CENTER 2.45230 GHz

#RES BW 3.0 kHz

#VBW 10 kHz

SPAN 20.00 MHz

SWP 6.67 sec



### Model 4200

#### Figure 32A. Band Edge Emissions 15.247(c)

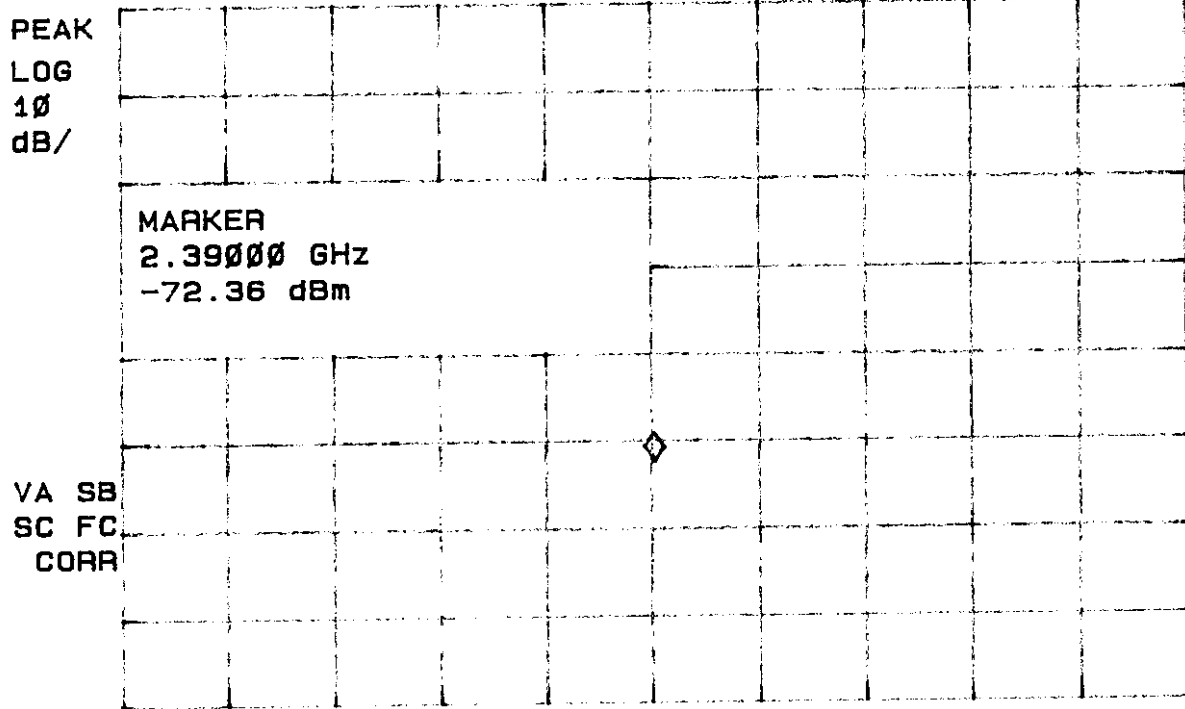
16:16:22 AUG 31, 1998

CSI 4200 CH.2 LOW

MKR 2.39000 GHz

REF -20.0 dBm AT 10 dB

-72.36 dBm



CENTER 2.39000 GHz  
#RES BW 1.0 MHz

#VBW 1 MHz

SPAN 75.00 MHz  
SWP 20.0 msec

### Model 4210 Figure 32B. Band Edge Emissions 15.247(c)

16:06:45 AUG 31, 1998

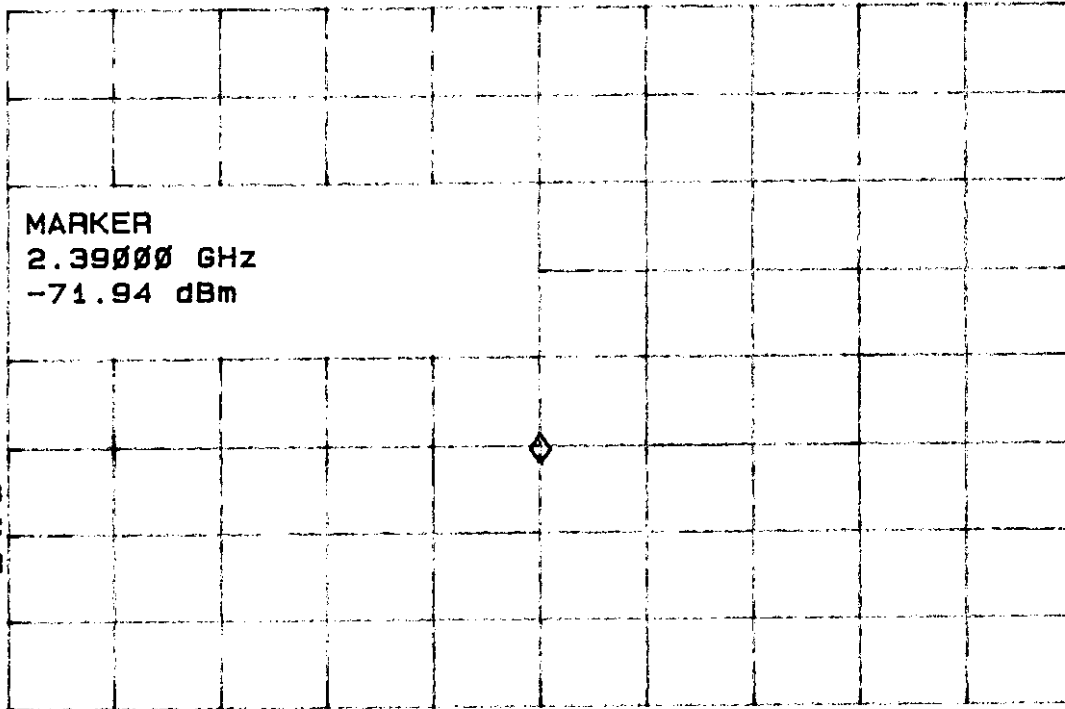
CSI 4210 CH.2 LOW

MKR 2.39000 GHz

REF -20.0 dBm AT 10 dB

-71.94 dBm

PEAK  
LOG  
10  
dB/



VA SB  
SC FC  
CORR

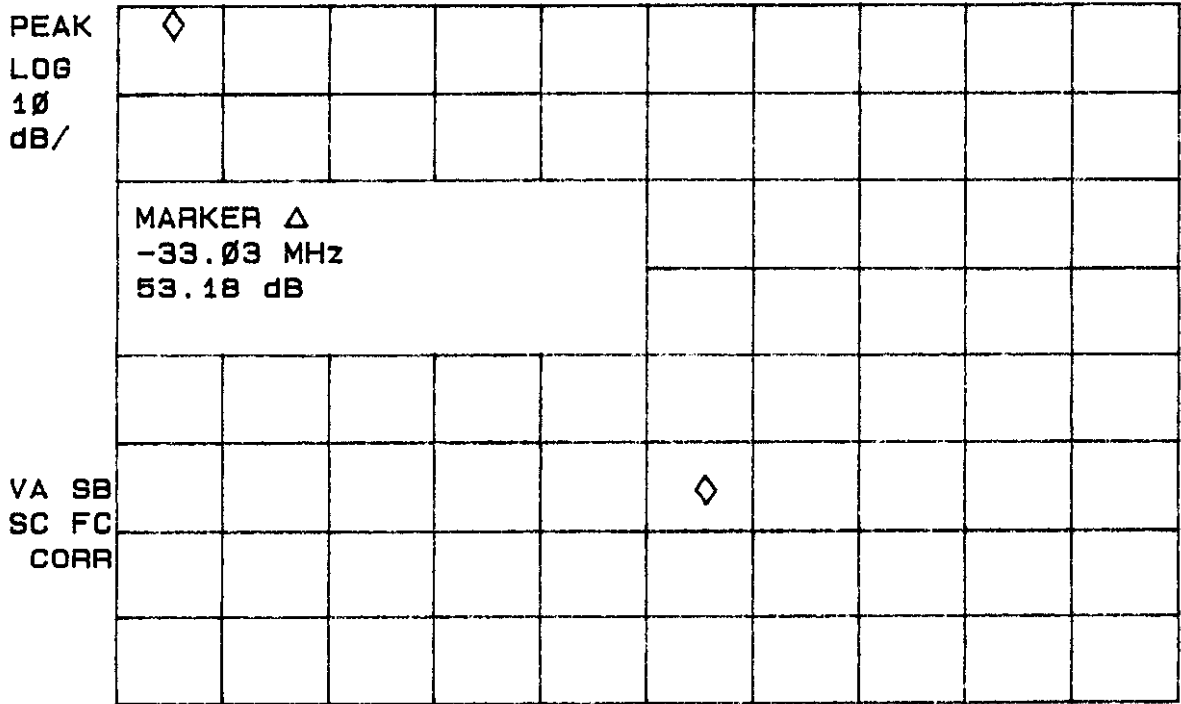
CENTER 2.39000 GHz  
#RES BW 1.0 MHz

#VBW 1 MHz

SPAN 75.00 MHz  
SWP 20.0 msec

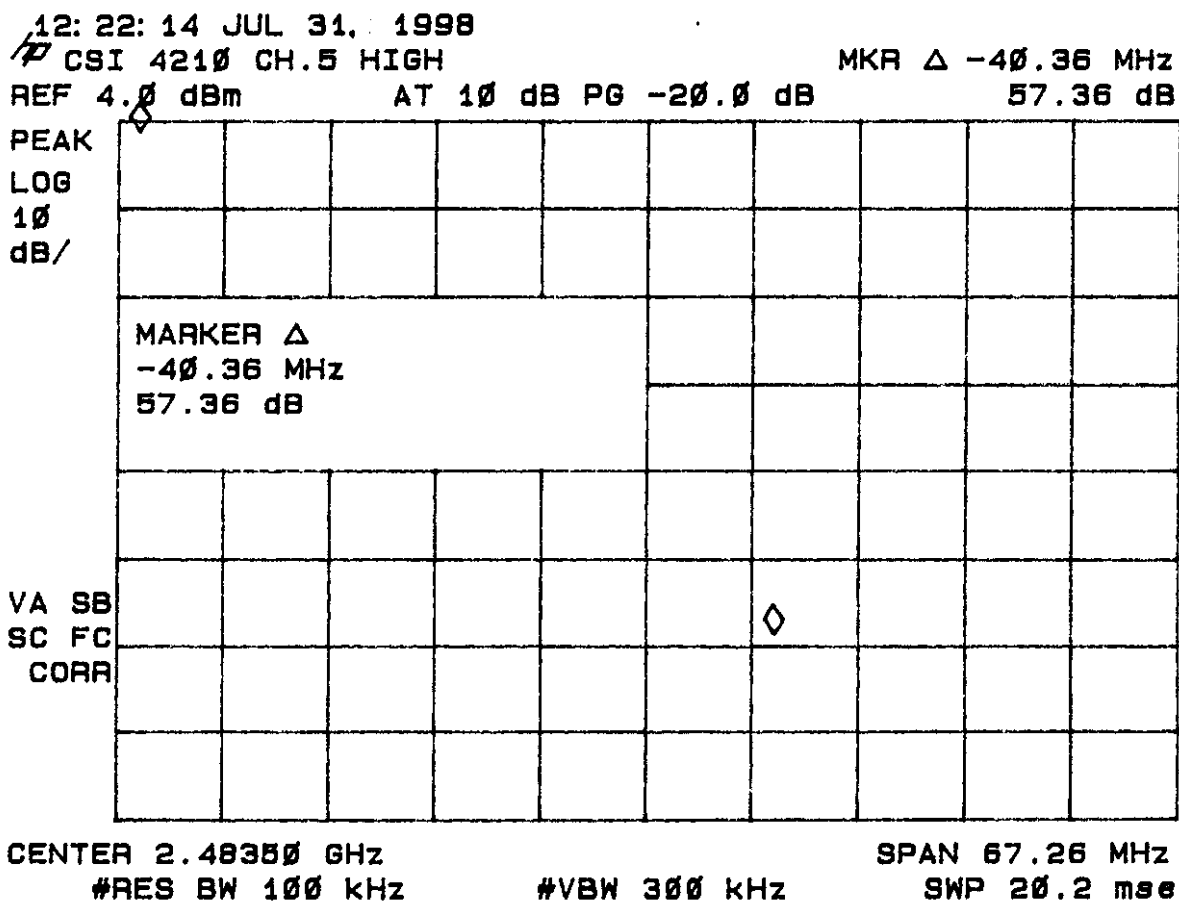
**Model 4200**  
**Figure 33A. band Edge Emissions 15.247(c)**

14: 47: 34 JUL 26, 1998  
CSI 4200 CH.5 HIGH MKR  $\Delta$  -33.03 MHz  
REF .0 dBm AT 10 dB PG -20.0 dB 53.18 dB

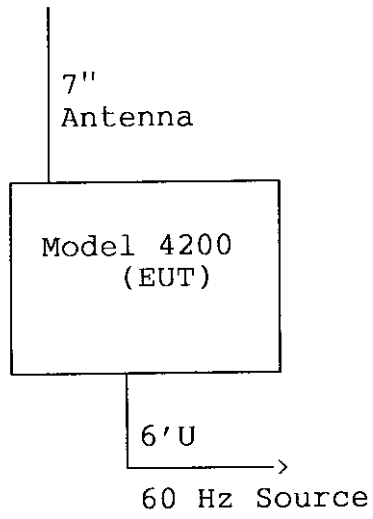


CENTER 2.48350 GHz SPAN 65.73 MHz  
#RES BW 100 kHz #VBW 300 kHz SWP 20.0 msec

**Model 4210**  
**Figure 33B. band Edge Emissions 15.247(c)**



**FIGURE 34A. Test Set-up  
Model 4200**



**FIGURE 34B. Test Set-up  
Model 4210**

