



## Certification Test Report

**Test Report:** 2005 060392-FCC  
**FCC ID:** APVGX820

**Equipment Under Test:** GSM/GPRS Modem Module  
**Model:** GX820  
**Antenna Model:** Tuf Duck EXE-821-SM

**Applicant:** CalAmp Corporation  
2236 Rutherford Road, Suite 103  
Carlsbad, CA 92008-8836  
760.268.5876

**In Accordance With:** FCC Part 22, Subpart H  
Industry Canada RSS-129, Issue 2  
Industry Canada RSS-132, Issue 2  
  
AND

**In Accordance With:** FCC Part 24, Subpart E  
Industry Canada RSS-133.Issue 3

**Tested By:** Nemko USA Inc.  
11696 Sorrento Valley Road  
San Diego, CA 92121-1024

**Date:** June 7, 2005

**Total Number of Pages:** 69



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## **Section 1.        Summary of Test Results**

### **General:**

**All measurements are traceable to national standards.**

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with FCC Part 22, Subpart H and FCC Part 24, Subpart E.

### **DOCUMENT HISTORY**

| <b>REVISION</b> | <b>DATE</b>  | <b>COMMENTS</b>              |
|-----------------|--------------|------------------------------|
| -               | June 7, 2005 | Prepared By: A. Laudani      |
| -               | June 7, 2005 | Initial Release: Chip Fleury |

NOTE: Nemko USA, Inc. hereby makes the following statements so as to conform to Chapter 10 (Test Reports) Requirements of ANSI C63.4 (2003) "Methods and Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz":

- o The unit described in this report was received at Nemko USA, Inc.'s facilities on June 1, 2005 . Testing was performed on the unit described in this report on June 1, 2005 to June 5, 2005 .
- o The Test Results reported herein apply only to the Unit actually tested, and to substantially identical Units.
- o This report does not imply the endorsement of the Federal Communications Commission (FCC), NVLAP or any other government agency.

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## **CERTIFICATION**

Nemko USA, Inc., an independent Electromagnetic Compatibility (EMC) Test Laboratory, produced this Test Report and performed the Radio Frequency Interference (RFI) testing and data evaluation contained herein.

Nemko USA, Inc.'s measurement facility is currently registered with the United States Federal Communications Commission (FCC) in accordance with the provisions of 47 United States Code (CFR) Part 2, Subpart I, Section 2.948(a). A current description of Nemko USA, Inc.'s measurement facility is on file with the FCC. Nemko USA Inc. has additionally satisfied the FCC that it complies with the requirements set forth in 47 CFR Part 2, Subpart I, Section 2.948(d) regarding the accreditation of EMC laboratories. As a result, the FCC has placed Nemko USA Inc. on its list of EMC laboratories approved to perform Declaration of Conformity (DOC) procedure testing.

The RFI testing, test data collection and test data evaluation were accomplished in accordance with the ANSI C63.4-2003 Standard, and in accordance with the applicable sections of the FCC rules (47 CFR Parts 2 and 18)." digital devices. The testing was also accomplished in accordance with Industry Canada's ICES-003 standard for unintentional radiating device per EMCAB-3, Issue 3 (May 1998). The administrative summary of this test report provides a description of the test sample

I hereby certify that the test data, test data evaluation, and equipment configurations used to compile this test report are a true and accurate representation of the test sample's radio frequency interference characteristics as of the test date(s), and, for the design of the test sample.

**Test Supervisor:** Chip Fleury

Chip Fleury

Manager Nemko USA, Inc.



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**Summary Of Test Data**

| <b>Name Of Test</b>                     | <b>Para. No.</b> | <b>Result</b>   |
|-----------------------------------------|------------------|-----------------|
| RF Power Output                         | 2.1046           | Complies        |
| Audio Frequency Response                | 2.1047           | NA <sup>1</sup> |
| Audio Low Pass Filter Response          | 2.1047           | NA <sup>1</sup> |
| Modulation Limiting                     | 2.1047           | NA <sup>1</sup> |
| Occupied Bandwidth (WB Data )           | 2.1049           | Complies        |
| Spurious Emissions at Antenna Terminals | 2.1051           | Complies        |
| Field Strength of Spurious Emissions    | 2.1053           | Complies        |
| Frequency Stability                     | 2.1055           | Complies        |

**Footnotes For N/A's:**     <sup>1</sup> Digital Modulation



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## **Section 2.        General Equipment Specification**

|                              |                                                                    |
|------------------------------|--------------------------------------------------------------------|
| Manufacturer:                | CalAmp                                                             |
| Model No.:                   | GX820<br>GSM/GPRS Modem Module                                     |
| Serial No.:                  | 63                                                                 |
| Antenna Model:               | Tuf Duck EXE-821-SM   3 dBi Gain                                   |
| Date Received In Laboratory: | June 1, 2005                                                       |
| Nemko Identification No.:    | 25-392-SKYR1                                                       |
| Frequency Ranges:            | 824.04 – 849.97 MHz<br>824.20 – 849.80 MHz<br>1850.2 to 1909.8 MHz |
| RF Output (Limit):           | Part 22: 7 W        Part 24: 2 W                                   |
| RF Output (Measured):        | Part 22: 1.64 W        Part 24: 1.34W                              |
| Emission Designators:        | 40K01F1D, 40K0F8W, 1M25F9W                                         |
| FCC Identifier:              | APVGX820                                                           |



## 2.1 SYSTEM CONFIGURATION

### System Components and Power Cables

The **GX820** is a **GSM/GPRS Modem Module**. Its function is to transmit data using GSM and AMPS cellular telephone frequencies 824.04 to 849.97 MHz and 1850.2 to 1909.8 MHz. The EUT was exercised by putting it into a call with a Wireless Communications Test Set.

### Device Interconnection and I/O Cables

| DEVICE                           | MANUFACTURER<br>MODEL #<br>SERIAL #                      | POWER CABLE                          |
|----------------------------------|----------------------------------------------------------|--------------------------------------|
| EUT - GSM/GPRS Modem Module      | MFG: CalAmp<br>GSM/GPRS Modem Module<br>Serial #: 63     | 4.0 Volt DC wires from Power supply  |
| EUT Test Fixture                 | CalAmp<br>Model #:<br>Serial #                           | 12.0 Volt DC wires from Power supply |
| Wireless Communications Test Set | Agilent<br>Model #: 8960<br>Serial #: US40300218         | 120 Vac 60 Hz                        |
| Power Supply                     | Electro Precision<br>Model#: XP580<br>SN Serial #: NA    | 120 Vac 60 Hz                        |
| Computer                         | Gateway<br>Model #:E4200<br>Serial #: 0018239842         | 120 Vac 60 Hz                        |
| Monitor                          | ADC<br>Model #:LM-700<br>Serial #: T7AF21AA06613         | 120 Vac 60 Hz                        |
| Keyboard                         | Propellor Plot<br>Model #: K280W<br>Serial #: FKD46AK280 |                                      |
| Mouse                            | Logitek<br>Model #: M-S48<br>Serial #: LZ93550747        |                                      |

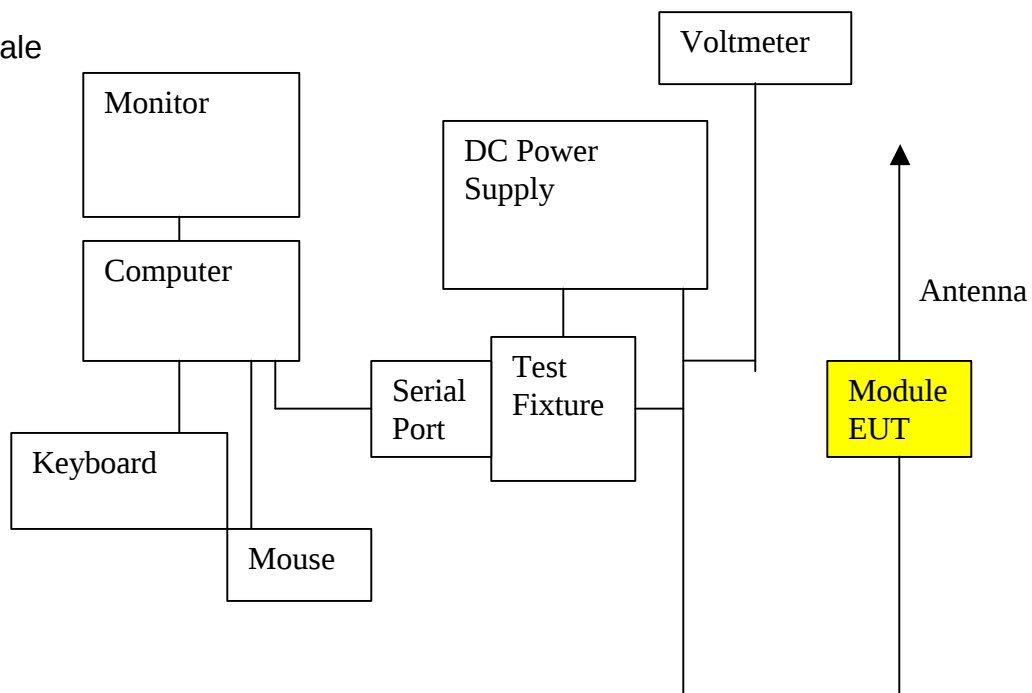
| CONNECTION   | I/O CABLE                                           |
|--------------|-----------------------------------------------------|
| RF cable     | From Test Fixture to Wireless Comm. Test Set – Coax |
| Serial Cable | From Computer to Test Fixture                       |



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General Test Setup:

--not to scale





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## **Design Modifications for Compliance**

*Device:* GSM/GPRS Modem Module

*Model:* GX820

The following design modifications were made to the EUT during testing.

No design modifications were made to the EUT during testing.



### Section 3. RF Power Output

Para. No.: 2.1046

|                                        |                             |
|----------------------------------------|-----------------------------|
| <b>Test Performed By:</b> Alan Laudani | <b>Date of Test:</b> 6-3-05 |
|----------------------------------------|-----------------------------|

**Minimum Standard:** 22.913(a). The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts. & Para.24.232, the EIRP must not exceed 2 Watts.

**Test Results:** Complies, see tables below.

#### Measurement Data:

##### Conductive Measurement

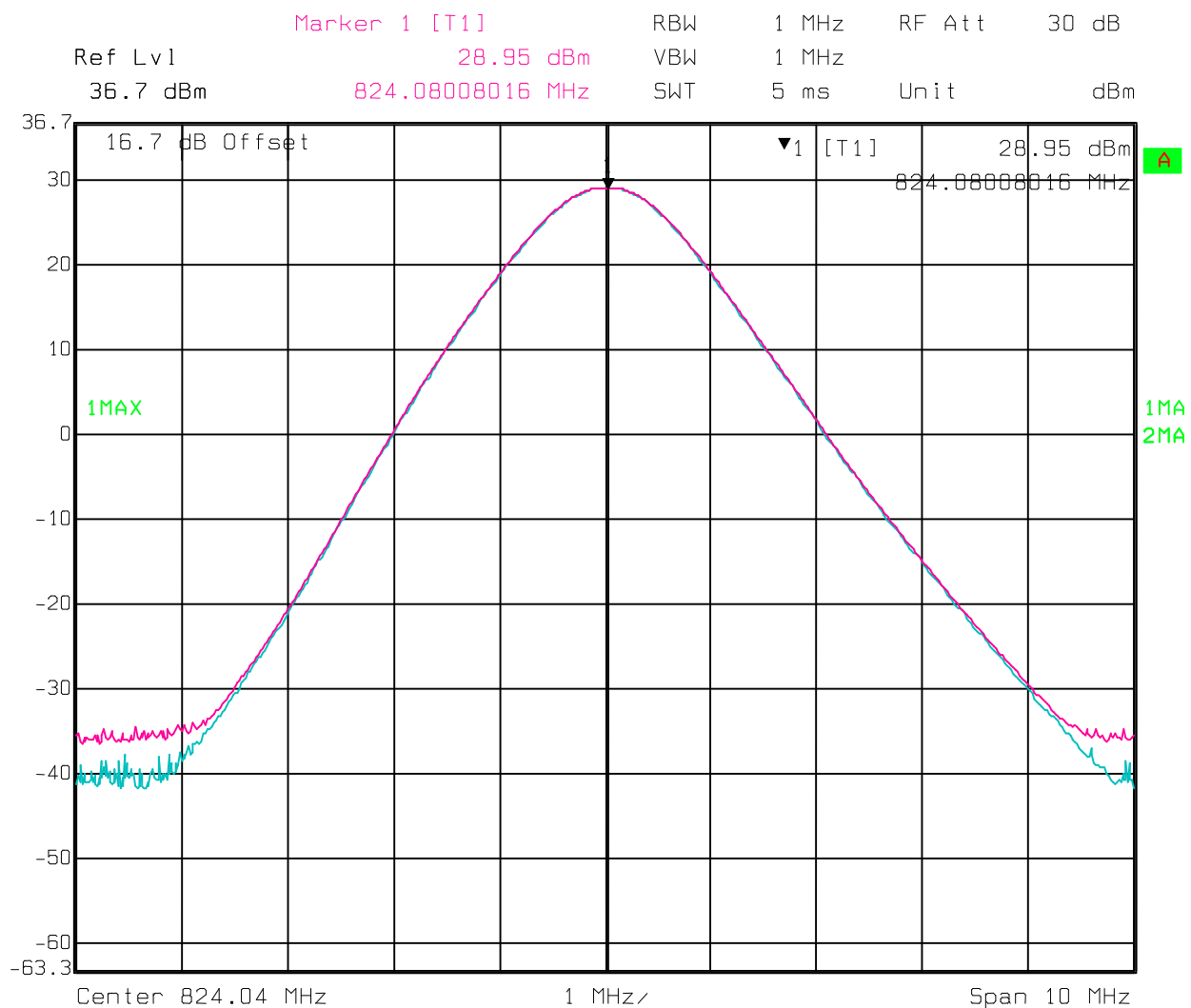
| Modulation | Frequency (MHz) | Measured (dBm) | Antenna Gain (dBi) | ERP/EIRP (dBm) | ERP/EIRP Watts |
|------------|-----------------|----------------|--------------------|----------------|----------------|
| AMPS       | 824.04          | 28.95          | 3                  | 31.95          | 1.57           |
|            | 836.49          | 29.17          | 3                  | <b>32.14</b>   | <b>1.64</b>    |
|            | 848.97          | 26.04          | 3                  | 29.04          | 0.80           |
| GSM        | 824.20          | 28.07          | 3                  | 31.07          | 1.28           |
|            | 836.40          | 27.79          | 3                  | 30.79          | 1.20           |
|            | 848.80          | 28.76          | 3                  | <b>31.76</b>   | <b>1.50</b>    |
| PCS GSM    | 1850.02         | 28.28          | 3                  | <b>31.28</b>   | <b>1.34</b>    |
|            | 1880.00         | 27.34          | 3                  | 30.34          | 1.08           |
|            | 1909.80         | 26.60          | 3                  | 29.60          | 0.91           |

##### Radiated Measurement

| Modulation | Frequency (MHz) | Measured (dBm) | Substituted Result (dBm) | Substituted Result Watts |
|------------|-----------------|----------------|--------------------------|--------------------------|
| AMPS       | 824.04          | 30.4           | 22.8                     | 0.19                     |
|            | 836.49          | 31.0           | 23.4                     | 0.22                     |
|            | 848.97          | 32.0           | 24.2                     | 0.26                     |
| GSM        | 824.20          | 30.4           | 22.8                     | 0.19                     |
|            | 836.40          | 32.1           | 24.5                     | 0.28                     |
|            | 848.80          | 32.8           | 25.0                     | 0.32                     |
| PCS GSM    | 1850.02         | 33.2           | 26.8                     | 0.48                     |
|            | 1880.00         | 31.6           | 25.0                     | 0.32                     |
|            | 1909.80         | 31.5           | 25.0                     | 0.32                     |



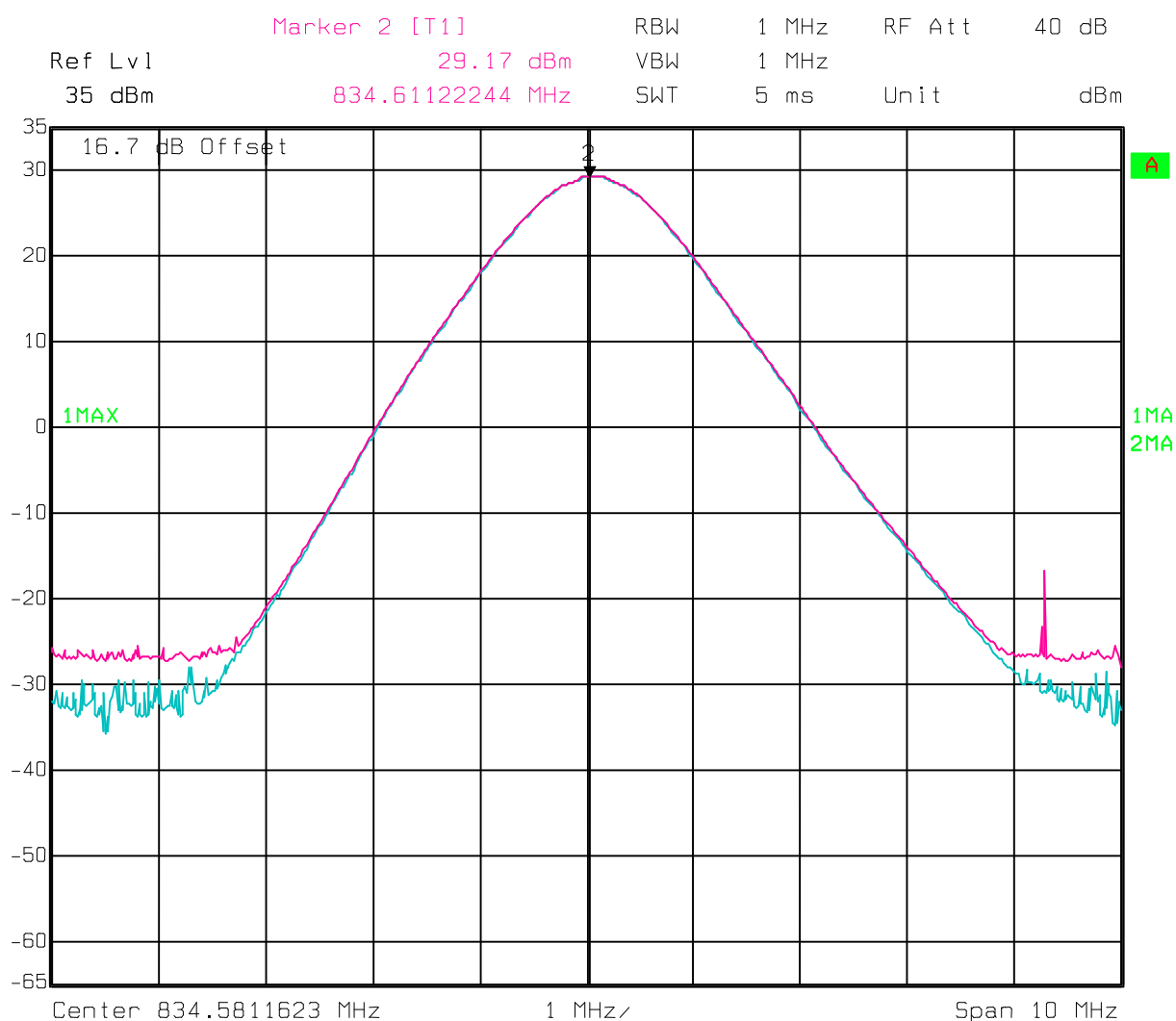
AMPS LOWEST CHANNEL



Date: 01.JUN.2005 16:20:28



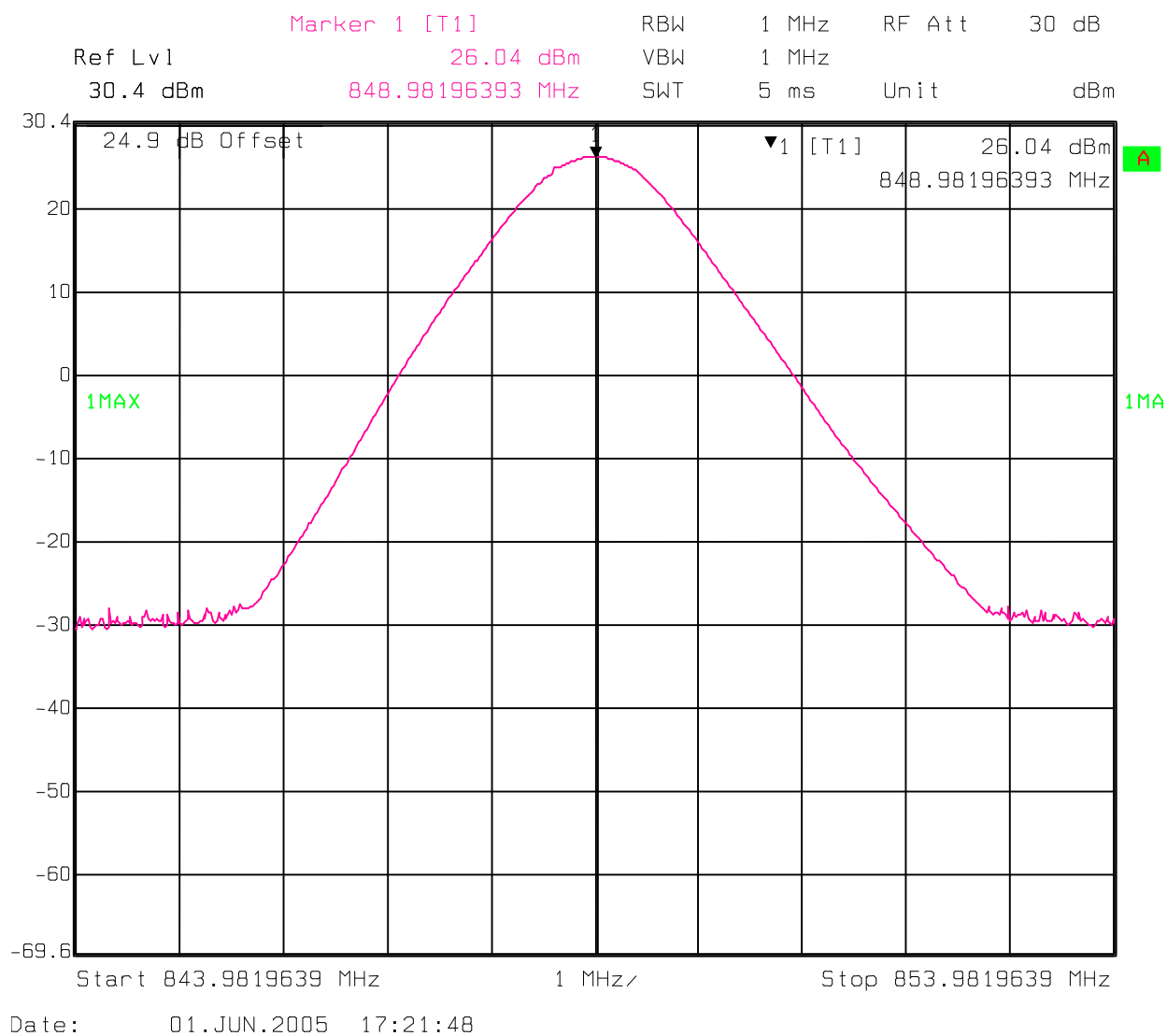
MID CHANNEL



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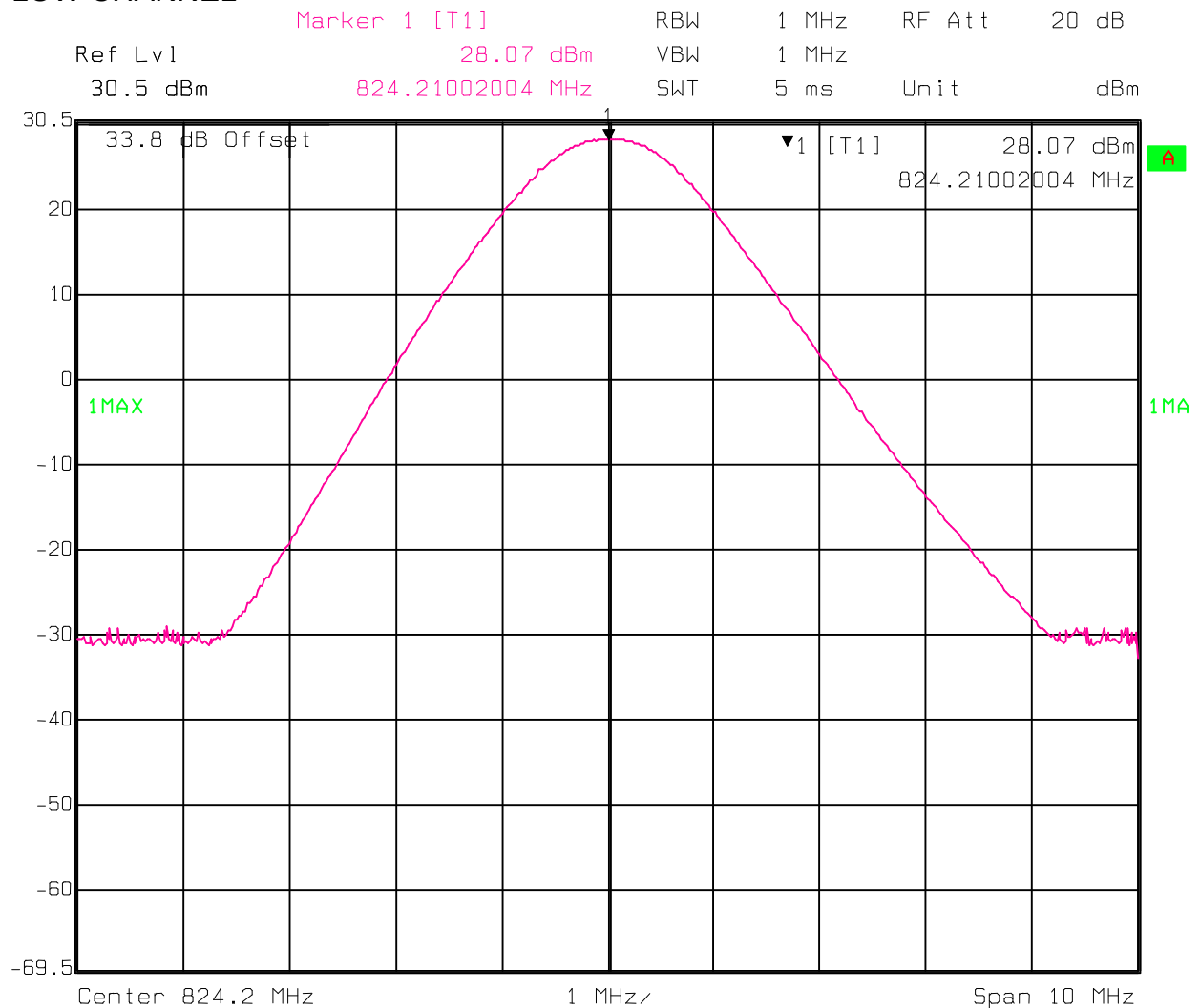


## HIGHEST CHANNEL





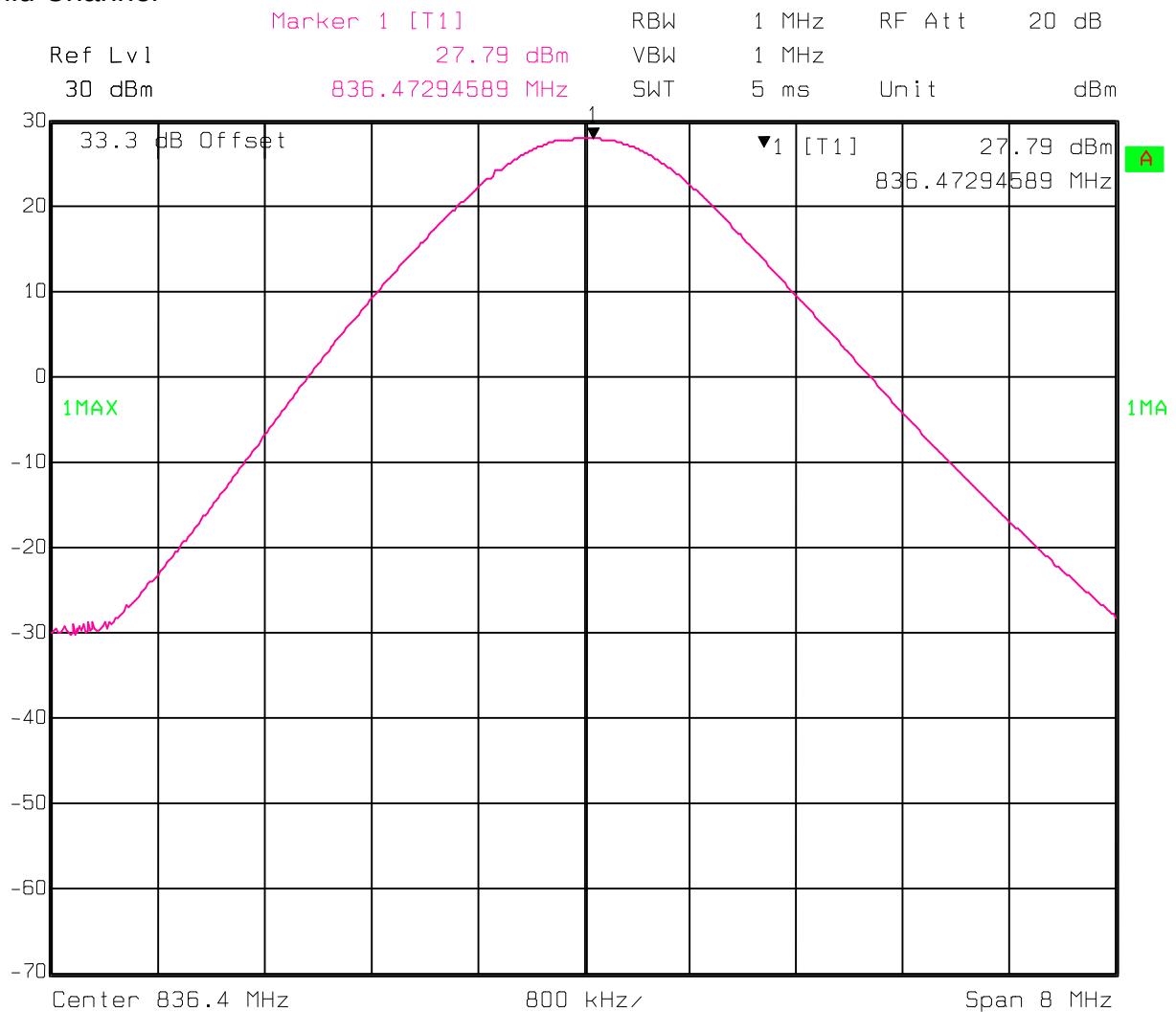
GSM Part 22  
LOW CHANNEL



Date: 02.JUN.2005 15:10:45



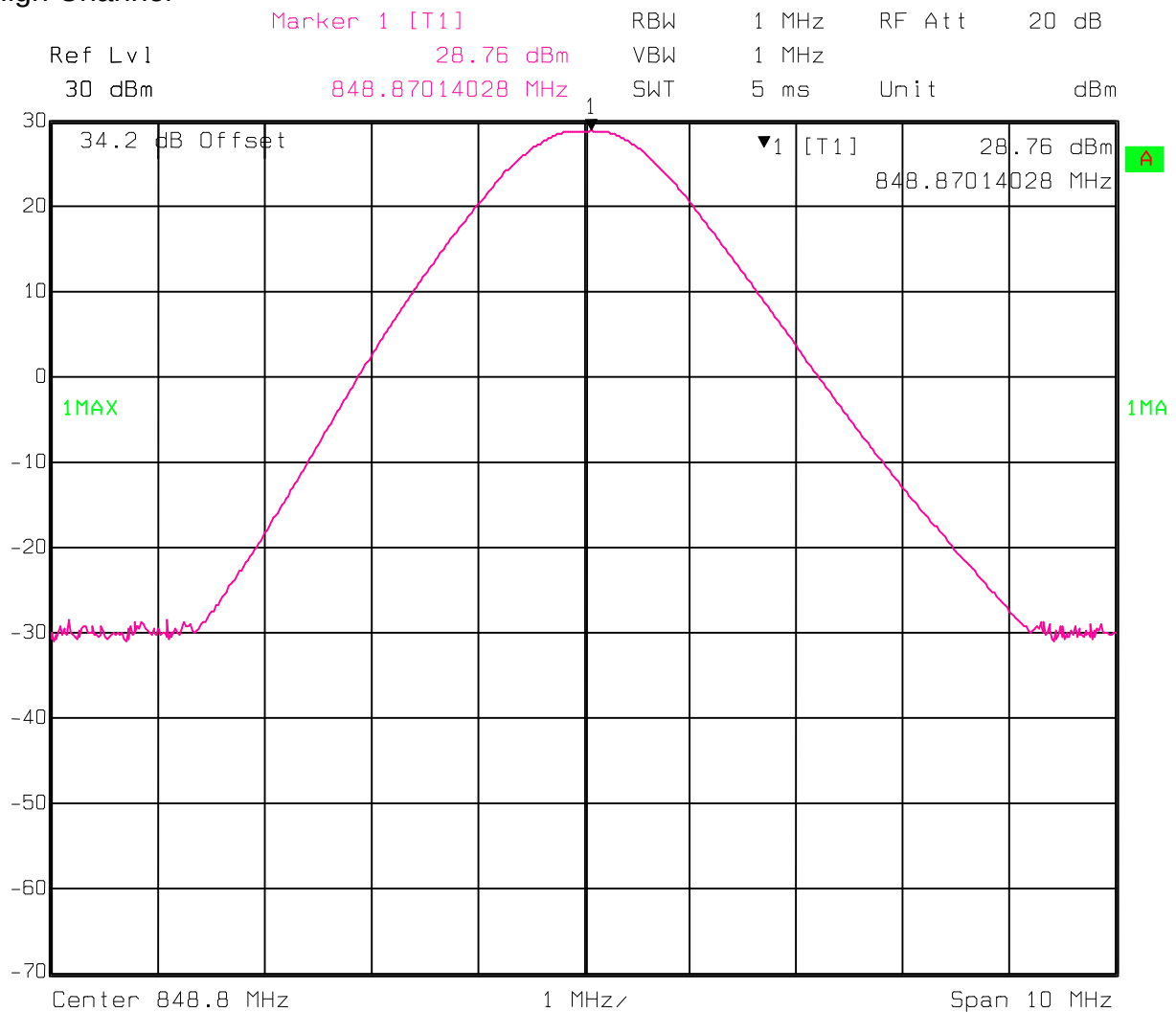
Mid Channel



Date: 02.JUN.2005 15:02:59



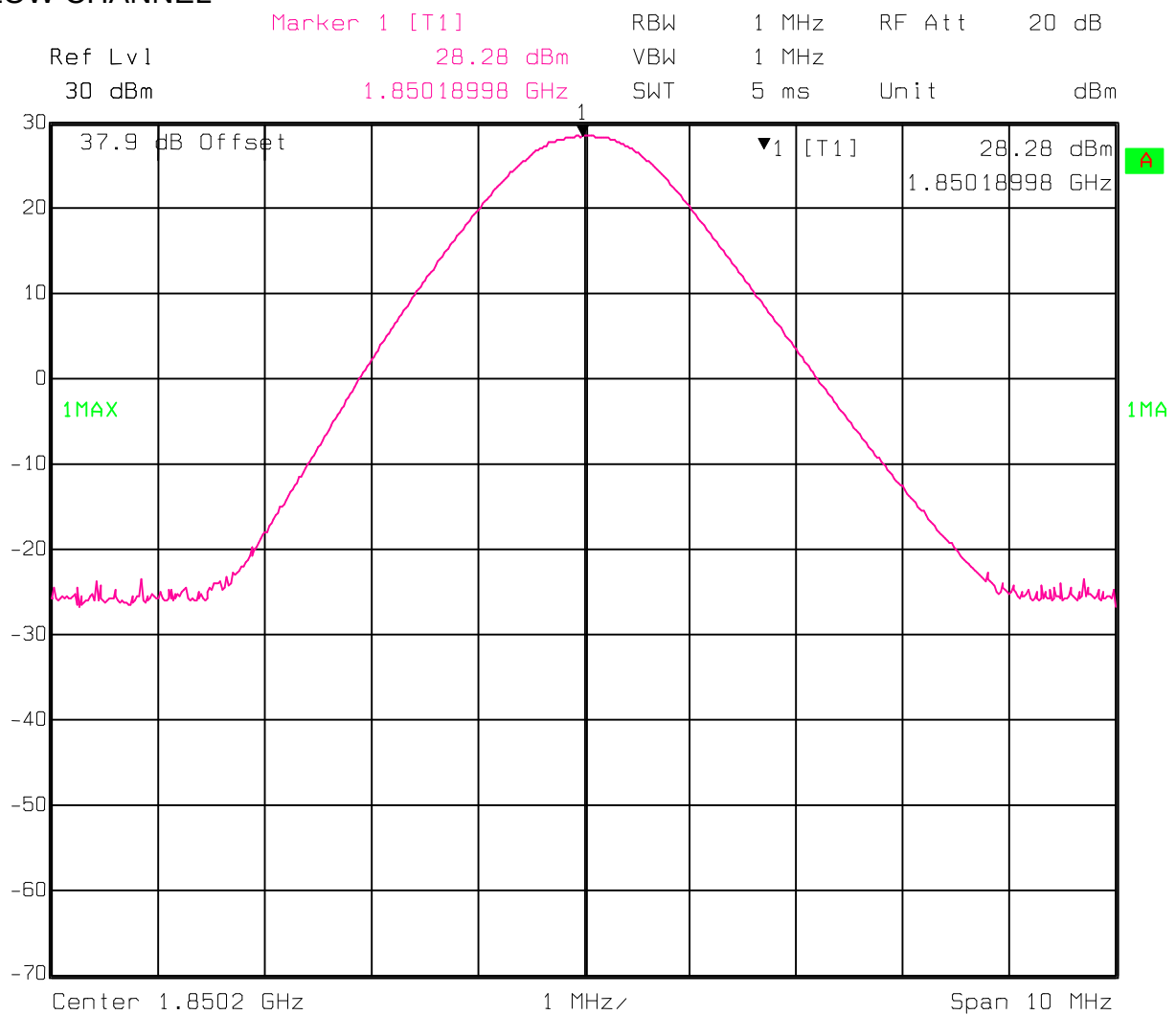
High Channel



Date: 02.JUN.2005 15:25:46



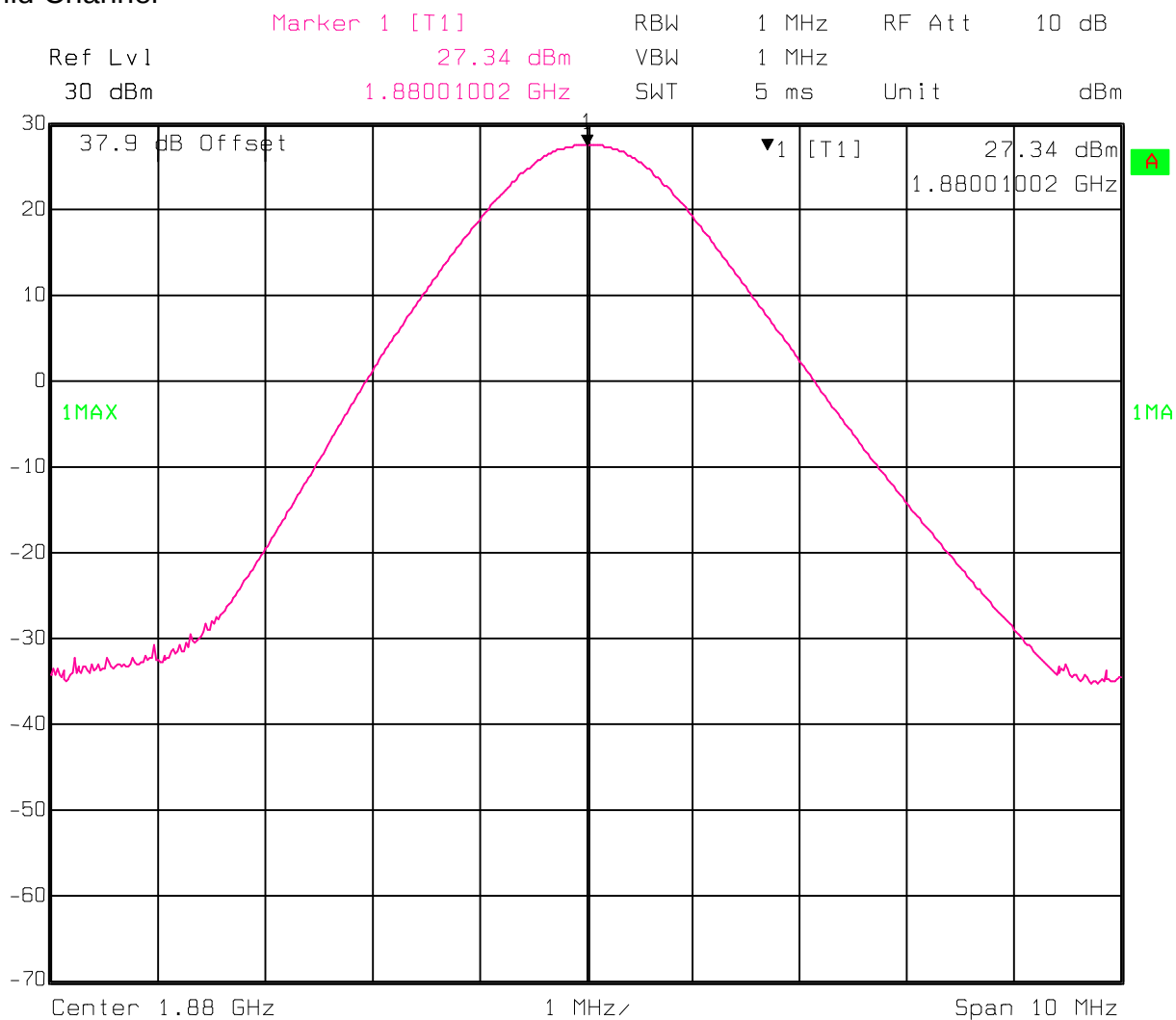
GSM Part 24  
LOW CHANNEL



Date: 02.JUN.2005 15:37:10



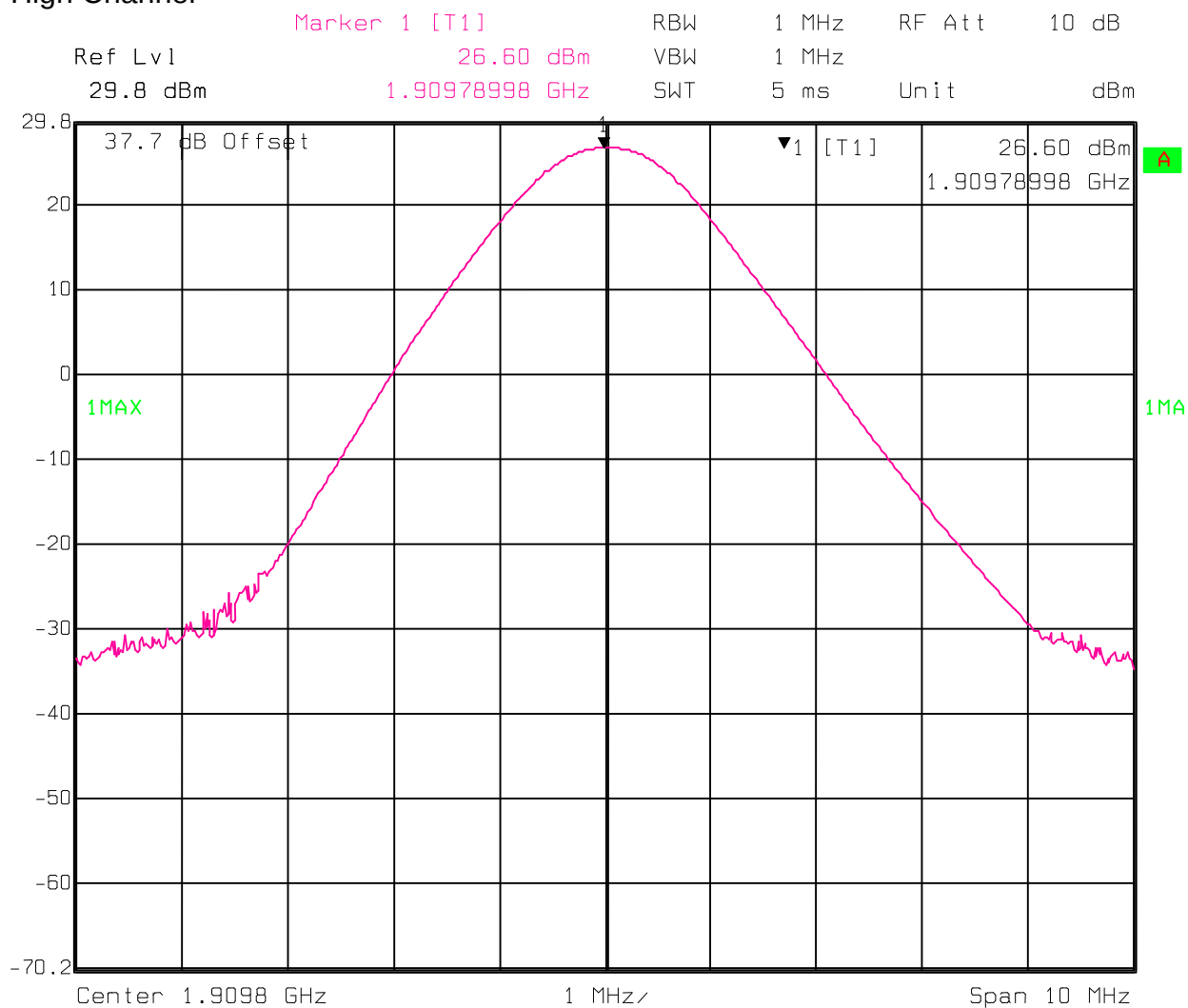
Mid Channel



Date: 02.JUN.2005 15:51:25



High Channel



Date: 02.JUN.2005 16:02:16



## Radiated Measurements

## Radiated Emissions Data

Job # : 25-392-SKYR1 Test # : 1  
Page 1 of 1

Client Name : Calamp Corporation  
EUT Name : GSM/GPRS Modem Module  
EUT Model # : GX820  
EUT Part # :  
EUT Serial # : 63  
EUT Config. : AMPS Tx Harmonics

Specification : FCC Part 22  
Rod. Ant. # : NA Temp. (°C) : 16  
Bicon Ant. # : NA Humidity (%) : 77  
Log Ant. # : 112 EUT Voltage : 4 Vdc  
DRG Ant. # : 529 EUT Frequency : NA  
Dipole Ant. # : NA Phase : NA  
Cable# : soats Location : RN# 90579  
Preamp# : 317 Distance : 3m  
Spec An. # : 835 ERP conversion factor : 7  
QP # : NA  
PreSelect# : NA

Reference :  
Date : 06/06/05  
Time :  
Staff : A. Laudani  
Peak Bandwidth: 1 MHz  
Video Bandwidth 1 MHz

| Meas. Freq. (MHz) | Vertical (dBuV) pk | Horizontal (dBuV) pk | CF (db) | Max Level (dBm) pk | Spec. Limit (ERP) (dBm) pk | Margin dB pk | EUT Rotation | Ant. Height | Pass Fail Unc. | Comment                |
|-------------------|--------------------|----------------------|---------|--------------------|----------------------------|--------------|--------------|-------------|----------------|------------------------|
| 824.02            | 97.0               | 89.0                 | 30.7    | 30.4               | 33.0                       | -2.6         | 60.0         | 1.5         | Pass           |                        |
| 1648.04           | 58.9               | 55.0                 | 7.7     | -30.7              | -13.0                      | -17.7        | 60.0         | 1.2         | Pass           |                        |
| 2472.06           | 59.2               | 50.4                 | 10.2    | -27.9              | -13.0                      | -14.9        | 60.0         | 1.0         | Pass           |                        |
| 3296.08           | 48.1               | 49.5                 | 13.6    | -34.2              | -13.0                      | -21.2        | 60.0         | 1.0         | Pass           |                        |
| 4120.10           |                    |                      | 16.1    |                    | -13.0                      |              |              |             |                | no signal, noise floor |
| 4944.12           |                    |                      | 15.7    |                    | -13.0                      |              |              |             |                | no signal, noise floor |
| 5768.14           |                    |                      | 17.6    |                    | -13.0                      |              |              |             |                | no signal, noise floor |
| 6592.16           |                    |                      | 19.2    |                    | -13.0                      |              |              |             |                | no signal, noise floor |
| 7416.18           |                    |                      | 21.2    |                    | -13.0                      |              |              |             |                | no signal, noise floor |
| 8240.20           |                    |                      | 23.9    |                    | -13.0                      |              |              |             |                | no signal, noise floor |
| 834.60            | 97.5               | 89.6                 | 30.8    | 31.0               | 33.0                       | -2.0         | 60.0         | 1.5         | Pass           |                        |
| 1669.20           | 59.8               | 58.3                 | 7.7     | -29.8              | -13.0                      | -16.8        | 60.0         | 1.2         | Pass           |                        |
| 2503.80           | 60.2               | 50.6                 | 11.1    | -26.0              | -13.0                      | -13.0        | 60.0         | 1.1         | Pass           |                        |
| 3338.40           | 52.6               | 49.6                 | 13.6    | -31.1              | -13.0                      | -18.1        | 60.0         | 1.0         | Pass           |                        |
| 4173.00           |                    |                      | 16.1    |                    | -13.0                      |              |              |             |                | no signal, noise floor |
| 5007.60           |                    |                      | 16.8    |                    | -13.0                      |              |              |             |                | no signal, noise floor |
| 5842.20           |                    |                      | 17.6    |                    | -13.0                      |              |              |             |                | no signal, noise floor |
| 6676.80           |                    |                      | 19.2    |                    | -13.0                      |              |              |             |                | no signal, noise floor |
| 7511.40           |                    |                      | 22.4    |                    | -13.0                      |              |              |             |                | no signal, noise floor |
| 8346.00           |                    |                      | 23.9    |                    | -13.0                      |              |              |             |                | no signal, noise floor |
| 848.97            | 98.4               | 89.8                 | 30.9    | 32.0               | 33.0                       | -1.0         | 60.0         | 1.6         | Pass           |                        |
| 1697.94           | 55.1               | 55.9                 | 7.7     | -33.7              | -13.0                      | -20.7        | 60.0         | 1.2         | Pass           |                        |
| 2546.91           | 54.4               | 49.7                 | 11.1    | -31.8              | -13.0                      | -18.8        | 60.0         | 1.0         | Pass           |                        |
| 3395.88           | 49.0               | 47.6                 | 13.6    | -34.7              | -13.0                      | -21.7        | 60.0         | 1.0         | Pass           |                        |
| 4244.85           |                    |                      | 16.1    |                    | -13.0                      |              |              |             |                | no signal, noise floor |
| 5093.82           |                    |                      | 16.8    |                    | -13.0                      |              |              |             |                | no signal, noise floor |
| 5942.79           |                    |                      | 17.6    |                    | -13.0                      |              |              |             |                | no signal, noise floor |
| 6791.76           |                    |                      | 19.2    |                    | -13.0                      |              |              |             |                | no signal, noise floor |
| 7640.73           |                    |                      | 22.4    |                    | -13.0                      |              |              |             |                | no signal, noise floor |
| 8489.70           |                    |                      | 23.9    |                    | -13.0                      |              |              |             |                | no signal, noise floor |

## Radiated Emissions Data

Job #: 25-392-SKYR1      Test #: 3  
Page 1      of 1

|                |                       |
|----------------|-----------------------|
| Client Name :  | Calamp Corporation    |
| EUT Name :     | GSM/GPRS Modem Module |
| EUT Model # :  | GX820                 |
| EUT Part # :   |                       |
| EUT Serial # : | 63                    |
| EUT Config. :  | PCS GSM Tx            |

|                 |             |                        |             |                  |            |
|-----------------|-------------|------------------------|-------------|------------------|------------|
| Specification : | FCC Part 24 |                        | Reference : |                  |            |
| Log Ant.#:      | 112         | Temp. (°C) :           | 19          | Date :           | 6/6/05     |
| Dipole Ant.#:   | 759         | Humidity (%) :         | 62          | Time :           |            |
| DRG Ant. #      | 529         | EUT Voltage :          | 4 Vdc       | Staff :          | A. Laudani |
| Cable#:         | rx          | EUT Frequency :        | NA          | Photo ID:        |            |
| Cable#:         | tx          | Phase:                 | NA          | Peak Bandwidth:  | 1 MHz      |
| Preamp#:        | 317         | Location:              | RN# 90579   | Video Bandwidth: | 1 MHz      |
| Spec An.#:      | 835         | Distance:              | 3m          |                  |            |
| QP #:           | NA          | EIRP conversion factor | 5.5         |                  |            |
| PreSelect#:     | NA          |                        |             |                  |            |

[illegible]



## Radiated Emissions Data

Job #: 25-392-SKYR1 Test #: 2  
Page 1 of 1

Client Name : Calamp Corporation  
EUT Name : GSM/GPRS Modem Module  
EUT Model # : GX820  
EUT Part # :  
EUT Serial # : 63  
EUT Config. : CDMA Tx Harmonics

Specification : FCC Part 22  
Temp. (°C) : 17  
Humidity (%) : 72  
EUT Voltage : 4 Vdc  
EUT Frequency : NA  
Phase : NA  
Location : RN# 90579  
Distance : 3m  
ERP conversion factor : 7

Reference :  
Date : 06/06/05  
Time :  
Staff : A. Laudani  
Peak Bandwidth: 1 MHz  
Video Bandwidth 1 MHz

Log Ant.#: 112  
DRG Ant. # 529  
Dipole Ant.#: NA  
Cable#: soats  
Preamp#: 317  
Spec An.#: 835  
QP #: NA  
PreSelect#: NA

| Meas. Freq. (MHz) | Vertical (dBuV) pk | Horizontal (dBuV) pk | CF (db) | Max Level (dBm) pk | Spec. Limit (ERP) (dBm) pk | Margin dB pk | EUT Rotation | Ant. Height | Pass Fail Unc. | Comment                |
|-------------------|--------------------|----------------------|---------|--------------------|----------------------------|--------------|--------------|-------------|----------------|------------------------|
| 824.20            | 97.0               | 87.0                 | 30.7    | 30.4               | 33.0                       | -2.6         | 60.0         | 1.5         | Pass           |                        |
| 1648.40           | 56.7               | 52.1                 | 7.7     | -32.9              | -13.0                      | -19.9        | 60.0         | 1.2         | Pass           |                        |
| 2472.60           | 51.8               | 54.1                 | 10.2    | -33.0              | -13.0                      | -20.0        | 60.0         | 1.1         | Pass           |                        |
| 3296.80           | 48.2               | 50.2                 | 13.6    | -33.5              | -13.0                      | -20.5        | 60.0         | 1.0         | Pass           |                        |
| 4121.00           |                    |                      | 16.1    |                    | -13.0                      |              |              |             |                | no signal, noise floor |
| 4945.20           |                    |                      | 15.7    |                    | -13.0                      |              |              |             |                | no signal, noise floor |
| 5769.40           |                    |                      | 17.6    |                    | -13.0                      |              |              |             |                | no signal, noise floor |
| 6593.60           |                    |                      | 19.2    |                    | -13.0                      |              |              |             |                | no signal, noise floor |
| 7417.80           |                    |                      | 21.2    |                    | -13.0                      |              |              |             |                | no signal, noise floor |
| 8242.00           |                    |                      | 23.9    |                    | -13.0                      |              |              |             |                | no signal, noise floor |
| 834.40            | 98.6               | 89.1                 | 30.8    | 32.1               | 33.0                       | -0.9         | 60.0         | 1.5         | Pass           |                        |
| 1668.80           | 56.9               | 51.2                 | 7.7     | -32.7              | -13.0                      | -19.7        | 60.0         | 1.2         | Pass           |                        |
| 2503.20           | 51.1               | 51.3                 | 11.1    | -34.9              | -13.0                      | -21.9        | 60.0         | 1.1         | Pass           |                        |
| 3337.60           | 46.6               | 50.5                 | 13.6    | -33.2              | -13.0                      | -20.2        | 60.0         | 1.0         | Pass           |                        |
| 4172.00           | 48.2               | 48.6                 | 16.1    | -32.6              | -13.0                      | -19.6        | 60.0         | 1.0         | Pass           |                        |
| 5006.40           |                    |                      | 16.8    |                    | -13.0                      |              |              |             |                | no signal, noise floor |
| 5840.80           |                    |                      | 17.6    |                    | -13.0                      |              |              |             |                | no signal, noise floor |
| 6675.20           |                    |                      | 19.2    |                    | -13.0                      |              |              |             |                | no signal, noise floor |
| 7509.60           |                    |                      | 22.4    |                    | -13.0                      |              |              |             |                | no signal, noise floor |
| 8344.00           |                    |                      | 23.9    |                    | -13.0                      |              |              |             |                | no signal, noise floor |
| 848.80            | 99.2               | 90.5                 | 30.9    | 32.8               | 33.0                       | -0.2         | 60.0         | 1.6         | Pass           |                        |
| 1697.60           | 54.3               | 50.6                 | 7.7     | -35.3              | -13.0                      | -22.3        | 60.0         | 1.2         | Pass           |                        |
| 2546.40           | 51.0               | 51.1                 | 11.1    | -35.1              | -13.0                      | -22.1        | 60.0         | 1.1         | Pass           |                        |
| 3395.20           | 48.6               | 54.6                 | 13.6    | -29.1              | -13.0                      | -16.1        | 60.0         | 1.0         | Pass           |                        |
| 4244.00           | 49.3               | 45.6                 | 16.1    | -31.9              | -13.0                      | -18.9        | 60.0         | 1.0         | Pass           |                        |
| 5092.80           |                    |                      | 16.8    |                    | -13.0                      |              |              |             |                | no signal, noise floor |
| 5941.60           |                    |                      | 17.6    |                    | -13.0                      |              |              |             |                | no signal, noise floor |
| 6790.40           |                    |                      | 19.2    |                    | -13.0                      |              |              |             |                | no signal, noise floor |
| 7639.20           |                    |                      | 22.4    |                    | -13.0                      |              |              |             |                | no signal, noise floor |
| 8488.00           |                    |                      | 23.9    |                    | -13.0                      |              |              |             |                | no signal, noise floor |



## Substitution Method For Radiated Emissions

|                      |                       |                      |                                    |
|----------------------|-----------------------|----------------------|------------------------------------|
| Complete Preliminary | Yes                   | Job # : 25-392-SKYR1 | Test # : 4                         |
|                      |                       | Page 1               | of 1                               |
| Client Name :        | Calamp Corporation    |                      |                                    |
| EUT Name :           | GSM/GPRS Modem Module |                      |                                    |
| EUT Model # :        | GX820                 |                      |                                    |
| EUT Serial # :       | 63                    |                      |                                    |
| Specification :      | Part 22, Part 24 FCC  |                      | Reference :                        |
| Rod. Ant. #:         | NA                    | Temp. (deg. C) :     | Date : 6/6/2005                    |
| Bicon Ant. #:        | NA                    | Humidity (%) :       | Time :                             |
| Log Ant. #:          | 112                   | EUT Voltage :        | Staff : A. Laudani                 |
| DRG Ant. #           | 513                   | EUT Frequency :      | Photo ID:                          |
| Dipole Ant. #:       | NA                    | Phase:               | Peak Bandwidth: RBW-1MHz, VBW-1MHz |
| Cable#:              | 20ft                  | Location:            |                                    |
| Preamp#:             | 40db                  | Distance:            |                                    |
| Spec An. #:          | 835                   |                      |                                    |

| target<br>Frequency<br>mHz | level<br>dBuV/m | dipole<br>Gain<br>dBi | cable<br>loss<br>dB | Signal<br>Generator<br>dBm | Total<br>(EIRP)<br>dBm | Spec<br>dBm | Margin<br>dBm |
|----------------------------|-----------------|-----------------------|---------------------|----------------------------|------------------------|-------------|---------------|
| AMPS                       |                 |                       |                     |                            |                        |             |               |
| 824.02                     | 97.0            | 0                     | 2.79                | 25.6                       | 22.8                   | 33.0        | -10.2         |
| 836.60                     | 97.5            | 0                     | 2.82                | 26.3                       | 23.4                   | 33.0        | -9.6          |
| 848.97                     | 98.4            | 0                     | 2.88                | 27.1                       | 24.2                   | 33.0        | -8.8          |
| target<br>Frequency<br>mHz | level<br>dBuV/m | Horn<br>Gain<br>dBi   | cable<br>loss<br>dB | Signal<br>Generator<br>dBm | Total<br>(EIRP)<br>dBm | Spec<br>dBm | Margin<br>dBm |
| 1648.04                    | 58.9            | 5.37                  | 4.17                | -38.7                      | -37.5                  | -13.0       | -24.5         |
| 1669.20                    | 59.80           | 5.45                  | 4.12                | -37.6                      | -36.3                  | -13.0       | -23.3         |
| 2472.06                    | 59.20           | 6.84                  | 4.17                | -33.2                      | -30.5                  | -13.0       | -17.5         |
| 2503.80                    | 50.20           | 6.91                  | 4.17                | -32.0                      | -29.3                  | -13.0       | -16.3         |
| 2546.91                    | 54.40           | 6.98                  | 4.17                | -37.3                      | -34.5                  | -13.0       | -21.5         |
| 3338.40                    | 52.60           | 7.87                  | 4.17                | -36.2                      | -32.5                  | -13.0       | -19.5         |
| GSM                        |                 |                       |                     |                            |                        |             |               |
| target<br>Frequency<br>mHz | level<br>dBuV/m | dipole<br>Gain<br>dBi | cable<br>loss<br>dB | Signal<br>Generator<br>dBm | Total<br>(EIRP)<br>dBm | Spec<br>dBm | Margin<br>dBm |
| 824.2                      | 97.0            | 0                     | 2.79                | 25.6                       | 22.8                   | 33.0        | -10.2         |
| 834.4                      | 98.6            | 0                     | 2.82                | 27.4                       | 24.5                   | 33.0        | -8.5          |
| 848.9                      | 99.2            | 0                     | 2.88                | 27.9                       | 25.0                   | 33.0        | -8.0          |
| target<br>Frequency<br>mHz | level<br>dBuV/m | Horn<br>Gain<br>dBi   | cable<br>loss<br>dB | Signal<br>Generator<br>dBm | Total<br>(EIRP)<br>dBm | Spec<br>dBm | Margin<br>dBm |
| 1648.4                     | 56.7            | 5.37                  | 4.17                | -40.9                      | -39.7                  | -13.0       | -26.7         |
| 1668.8                     | 56.9            | 5.44                  | 4.12                | -40.5                      | -39.2                  | -13.0       | -26.2         |
| 3395.2                     | 54.6            | 7.88                  | 6.26                | -35.0                      | -33.4                  | -13.0       | -20.4         |
| 4172.0                     | 48.2            | 8.19                  | 7.07                | -39.3                      | -38.2                  | -13.0       | -25.2         |
| 4244.0                     | 49.3            | 8.27                  | 7.10                | -37.5                      | -36.3                  | -13.0       | -23.3         |
| target<br>Frequency<br>mHz | level<br>dBuV/m | Horn<br>Gain<br>dBi   | cable<br>loss<br>dB | Signal<br>Generator<br>dBm | Total<br>(EIRP)<br>dBm | Spec<br>dBm | Margin<br>dBm |
| 1850.0                     | 94.8            | 5.73                  | 4.27                | 25.3                       | 26.8                   | 33.0        | -6.2          |
| 1880.0                     | 93.2            | 5.78                  | 4.36                | 23.6                       | 25.0                   | 33.0        | -8.0          |
| 1909.8                     | 93.1            | 5.84                  | 4.39                | 23.5                       | 25.0                   | 33.0        | -8.1          |
| 3700.4                     | 60.1            | 7.94                  | 6.50                | -35.8                      | -34.3                  | -13.0       | -21.3         |
| 3760.0                     | 59.5            | 7.95                  | 6.77                | -36.1                      | -34.9                  | -13.0       | -21.9         |
| 3819.6                     | 63.0            | 7.96                  | 6.66                | -33.2                      | -31.9                  | -13.0       | -18.9         |
| 5550.6                     | 50.3            | 9.27                  | 8.08                | -40.1                      | -38.9                  | -13.0       | -25.9         |
| 5640.0                     | 48.6            | 9.29                  | 8.20                | -41.0                      | -39.9                  | -13.0       | -26.9         |
| 5729.4                     | 49.2            | 9.32                  | 8.63                | -39.6                      | -38.9                  | -13.0       | -25.9         |



---

## **Section 4.        Audio Frequency Response**

Para. No.: 2.1047

|                           |                      |
|---------------------------|----------------------|
| <b>Test Performed By:</b> | <b>Date of Test:</b> |
|---------------------------|----------------------|

**Minimum Standard:**                      Para. No. 15-19-B.

**Test Results:**                              Not Applicable, digital modulation

Measurement Data:



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## Section 5. Audio Low-Pass Filter Response

Para. No.: 2.1047

|                           |                      |
|---------------------------|----------------------|
| <b>Test Performed By:</b> | <b>Date of Test:</b> |
|---------------------------|----------------------|

**Minimum Standard:** 22.915 (d).

**Test Results:** Not Applicable, digital modulation

### Measurement Data:

- d) Audio filter characteristics. Except as provided in Sec. 22.917, radiotelephony signals applied to the modulator from the modulation limiter must be attenuated as a function of frequency as specified in this paragraph.
- (1) For mobile stations, these signals must be attenuated, relative to the level at 1 kHz, as follows:
- (i) In the frequency ranges of 3.0 to 5.9 kHz and 6.1 to 15.0 kHz, signals must be attenuated by at least  $40 \log (f/3)$  dB, where  $f$  is the frequency of the signal in kHz.
  - (ii) In the frequency range of 5.9 to 6.1 kHz, signals must be attenuated at least 35 dB.
  - (iii) In the frequency range above 15 kHz, signals must be attenuated at least 28 dB.



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## **Section 6. Modulation Limiting**

**Para. No.: 2.1047**

|                           |                      |
|---------------------------|----------------------|
| <b>Test Performed By:</b> | <b>Date of Test:</b> |
|---------------------------|----------------------|

**Minimum Standard:** 22.915(b)

**Test Results:** Not Applicable, digital modulation

**Measurement Data:**

SAT Deviation:  
WB Data Deviation:  
ST Deviation:



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## **Section 7.        Occupied Bandwidth**

**Para. No.: 2.1049**

|                                      |
|--------------------------------------|
| <b>Test Performed By: A. Laudani</b> |
|--------------------------------------|

|                             |
|-----------------------------|
| <b>Date of Test: 6-3-05</b> |
|-----------------------------|

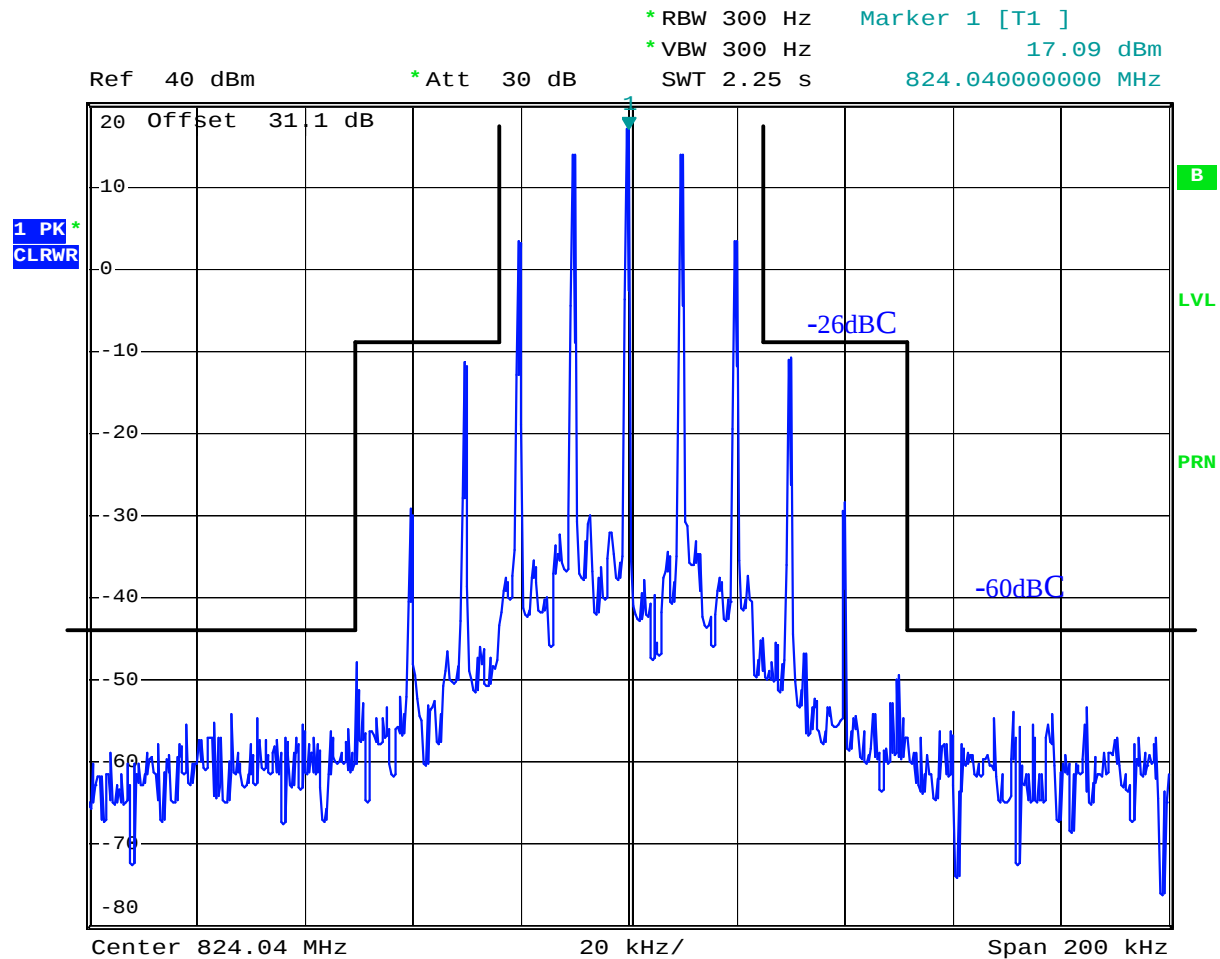
**Minimum Standard:**        22.917(d); Para. No.: 24.238.

**Test Results:**                Modes: ST, SAT, Digital Data and ST with SAT

**Test Data:**                    **See Plots below**



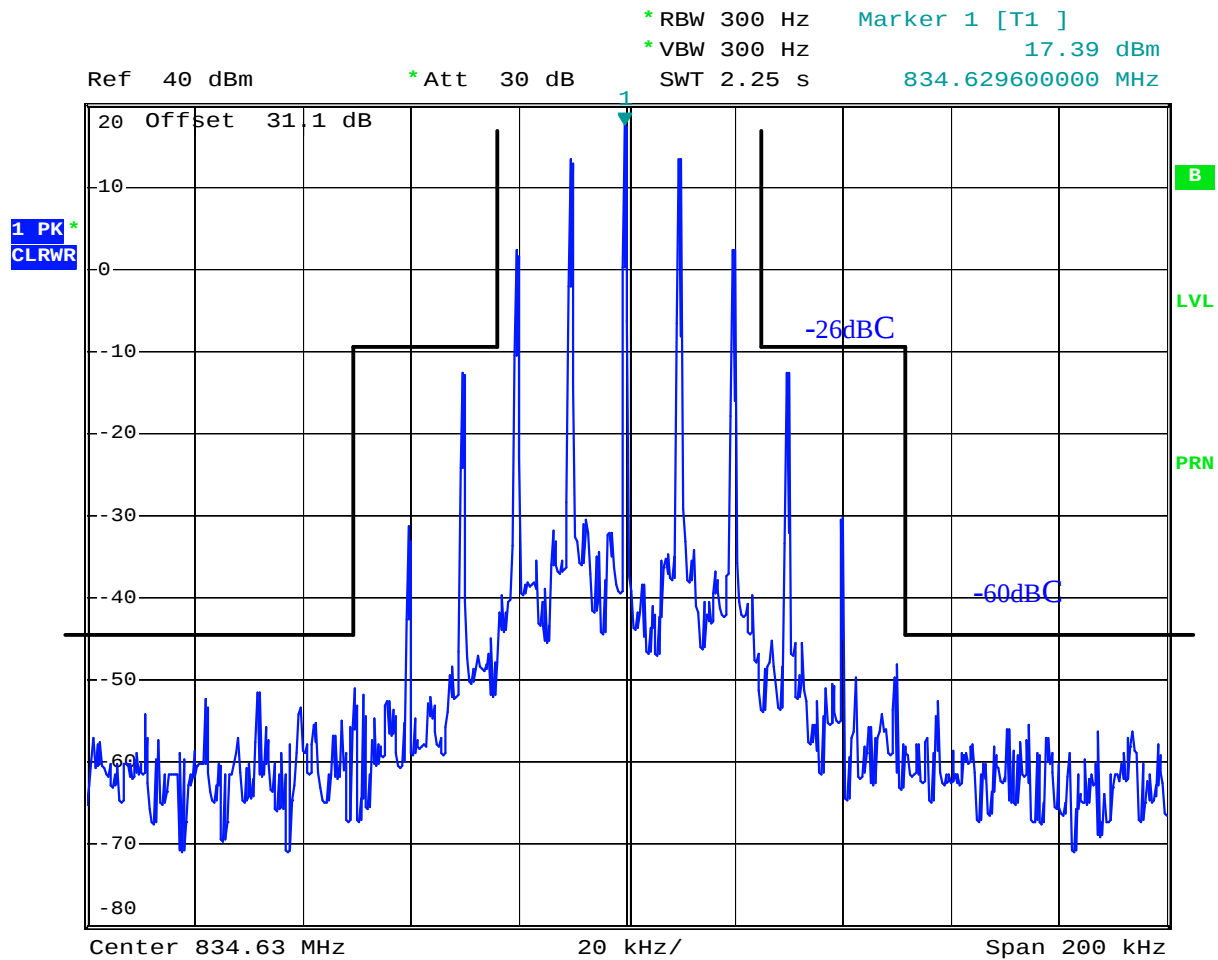
Amps Lowest Channel, ST



Date: 8.JUN.2005 14:53:58



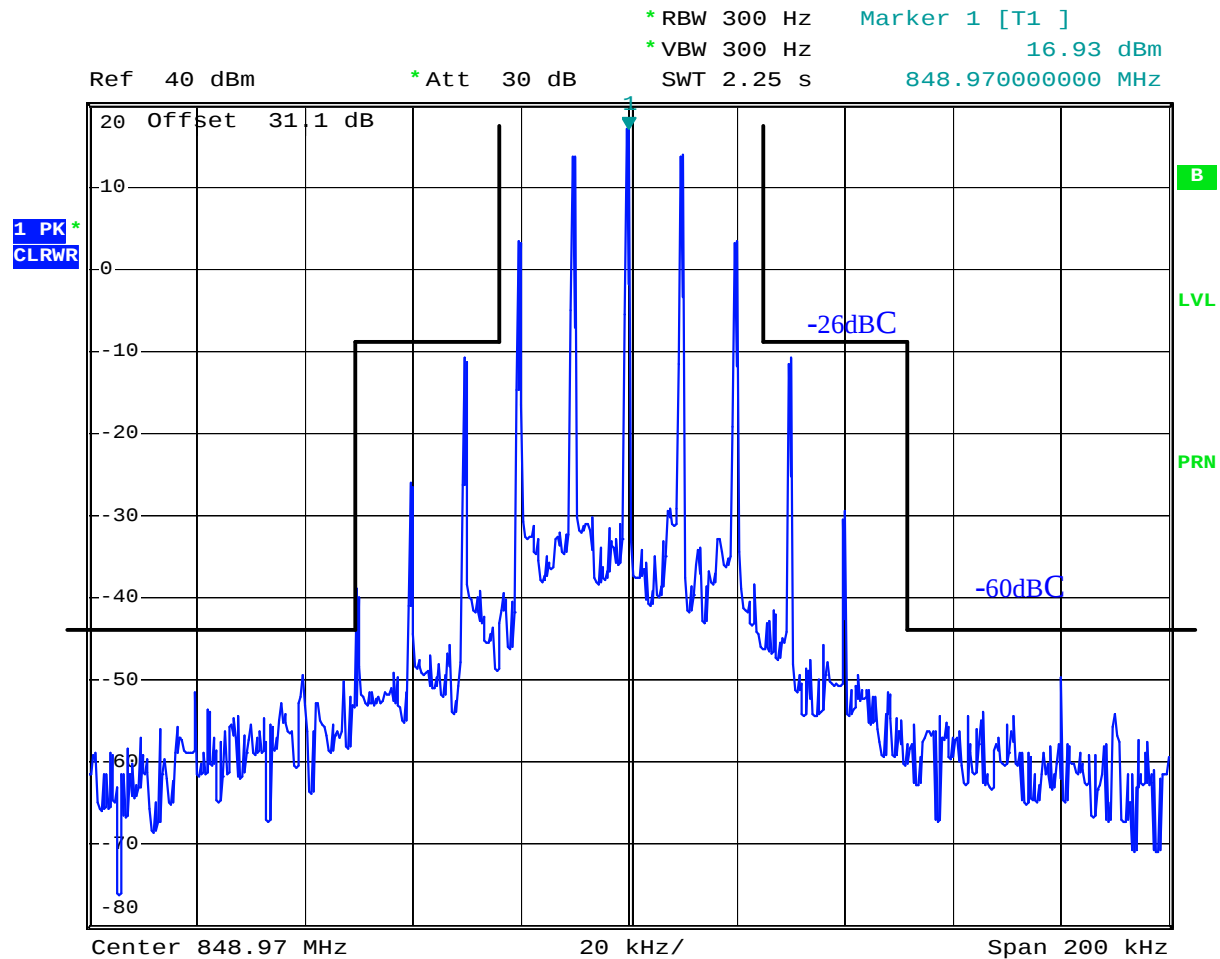
Amps Mid Channel ST



Date: 8.JUN.2005 14:45:33



Amps High Channel ST



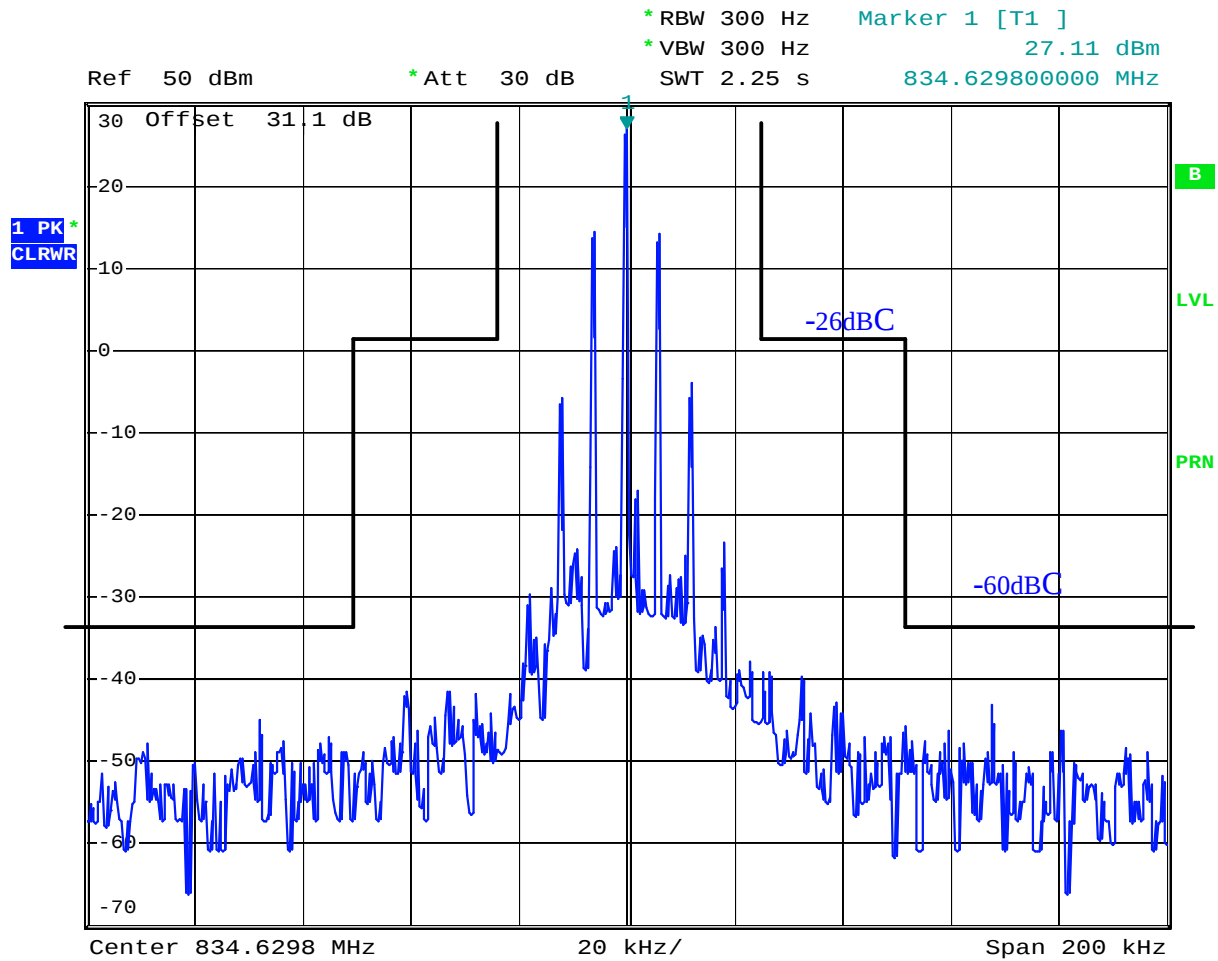
Date: 8.JUN.2005 14:56:49



FCC Part 22, Part 24  
25-352-SKYR1  
FCC ID#: APVGX820



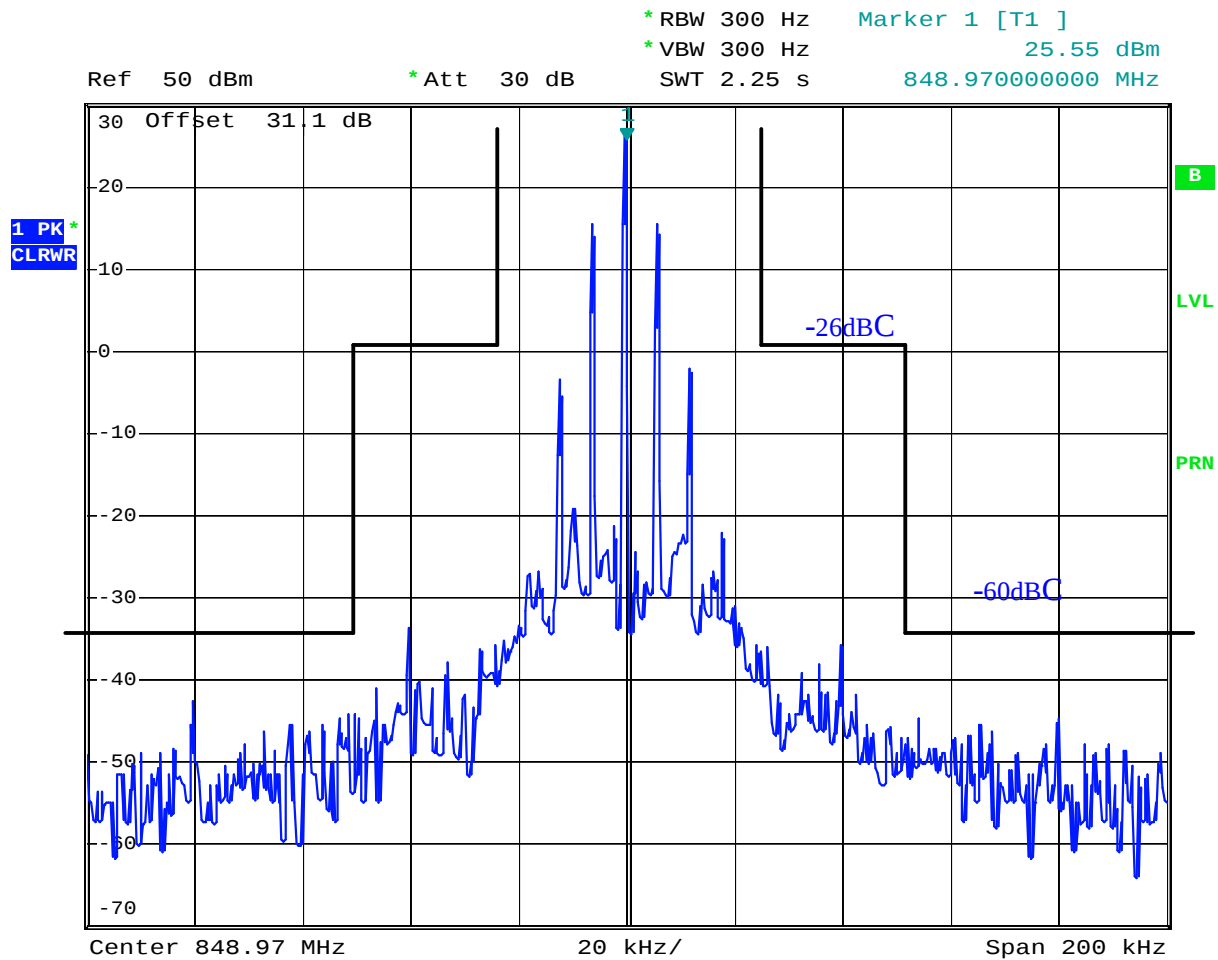
Amps Mid Channel SAT



Date: 8.JUN.2005 15:01:44



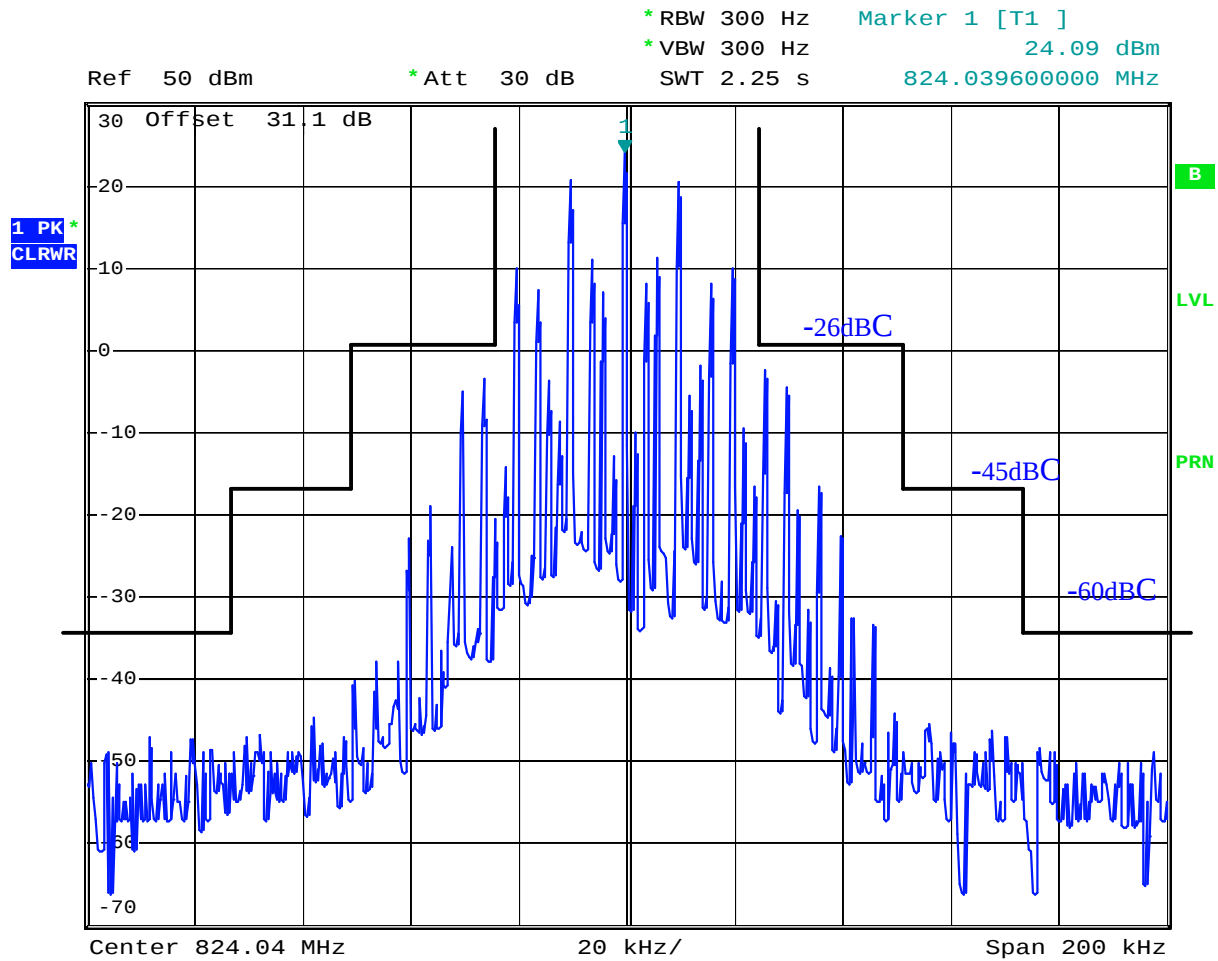
Amps High Channel SAT



Date: 8.JUN.2005 15:00:26



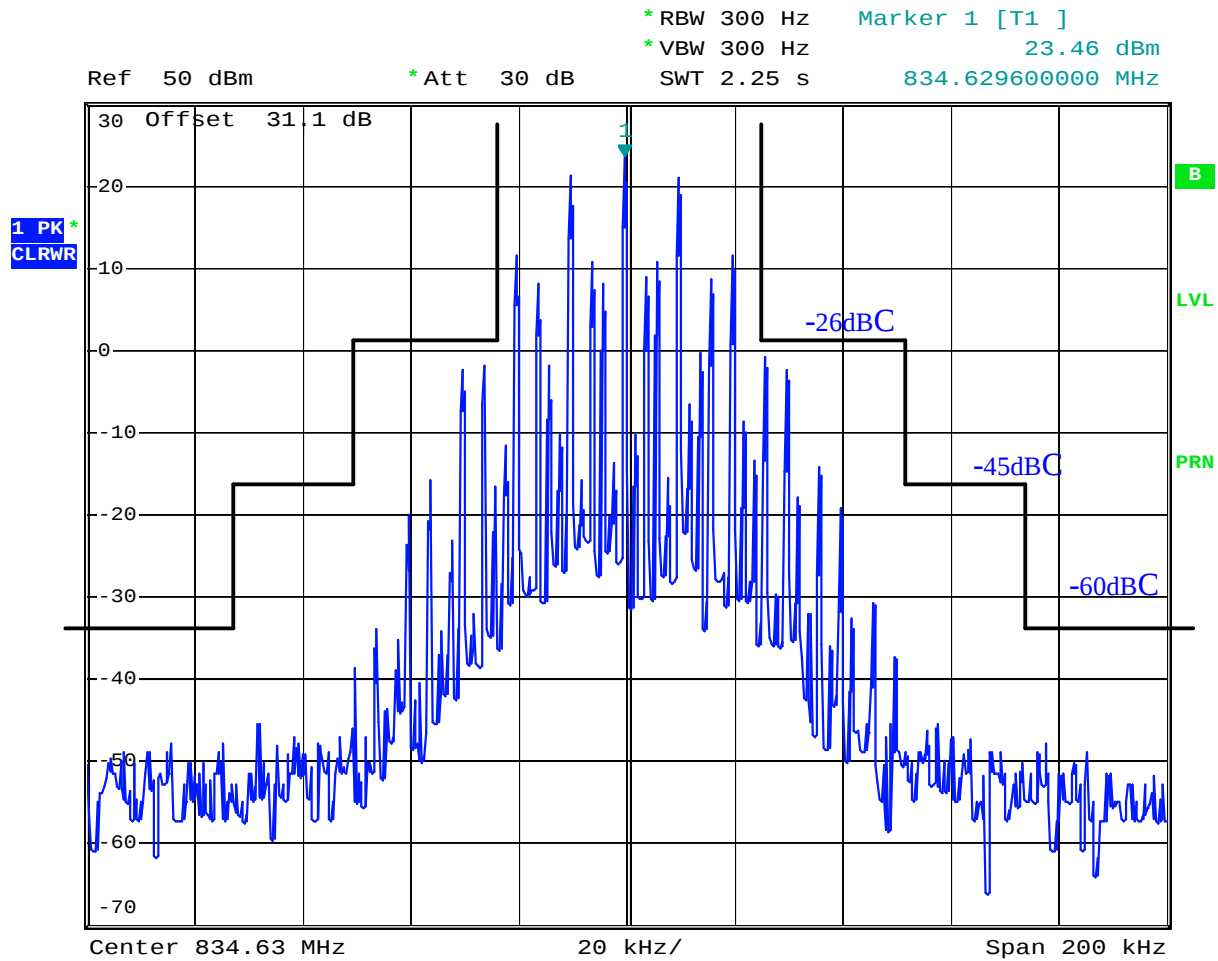
Amps Low Channel SAT & ST



Date: 8.JUN.2005 15:08:23



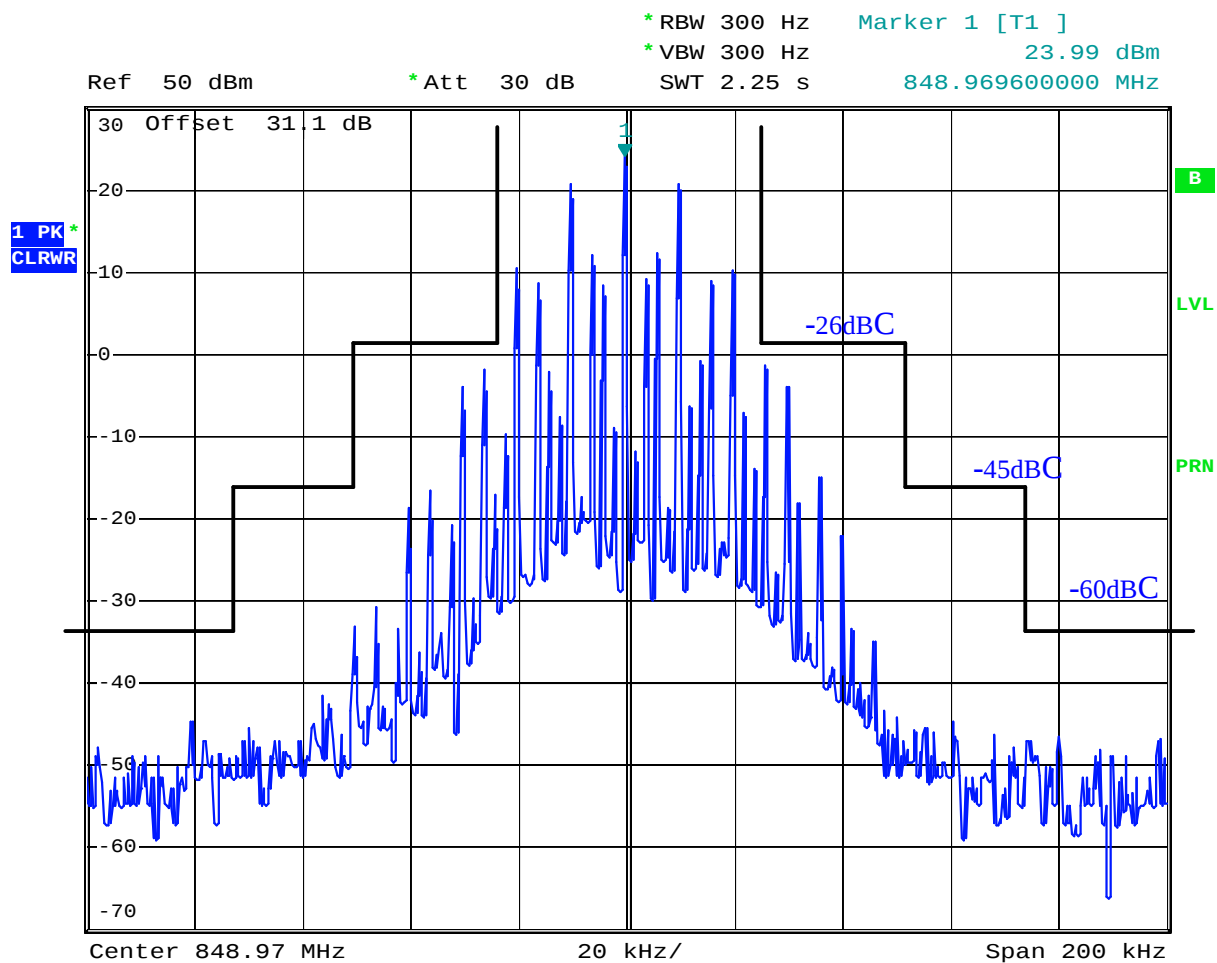
Amps Mid Channel SAT & ST



Date: 8.JUN.2005 15:09:37



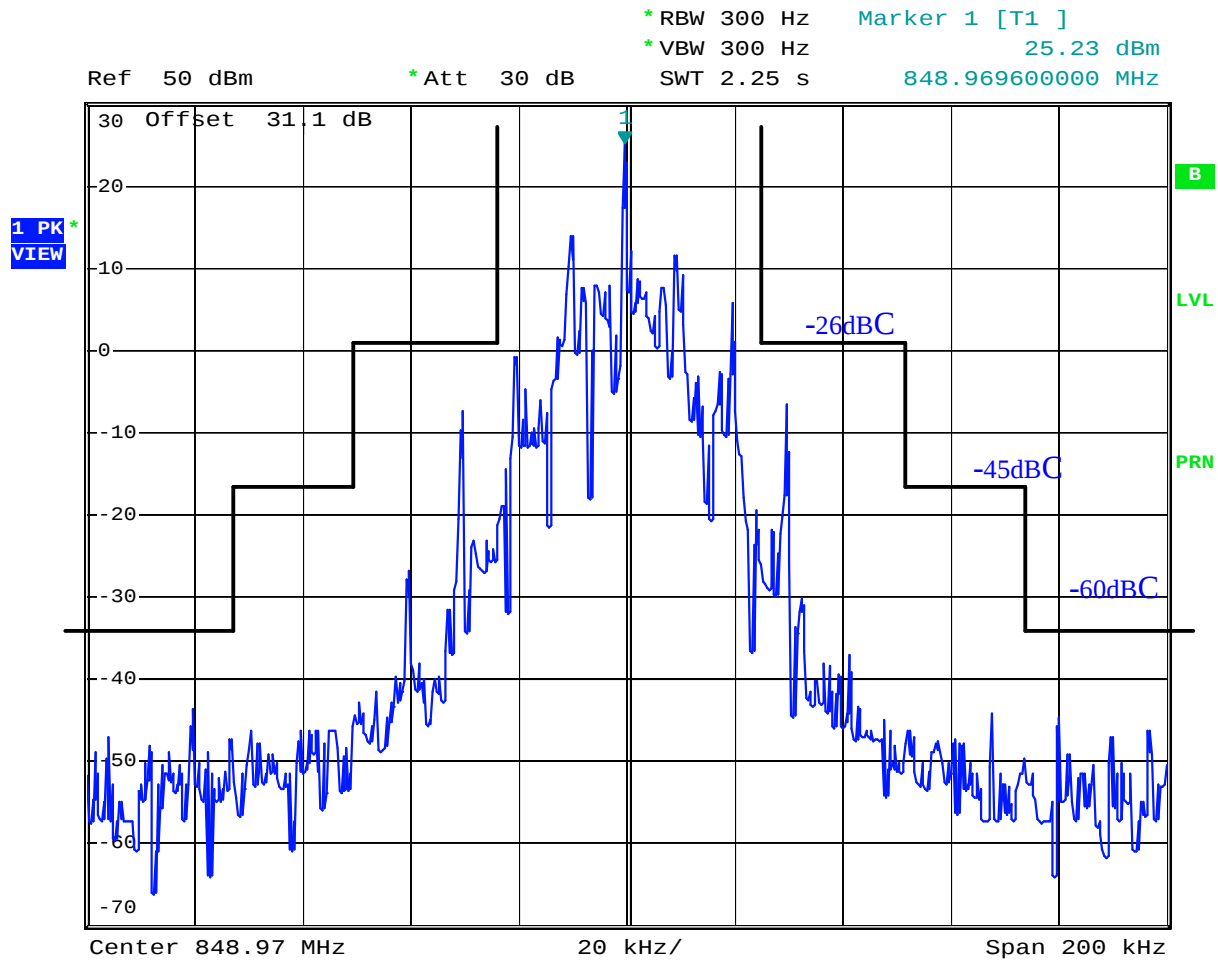
Amps High Channel SAT & ST



Date: 8.JUN.2005 15:17:31



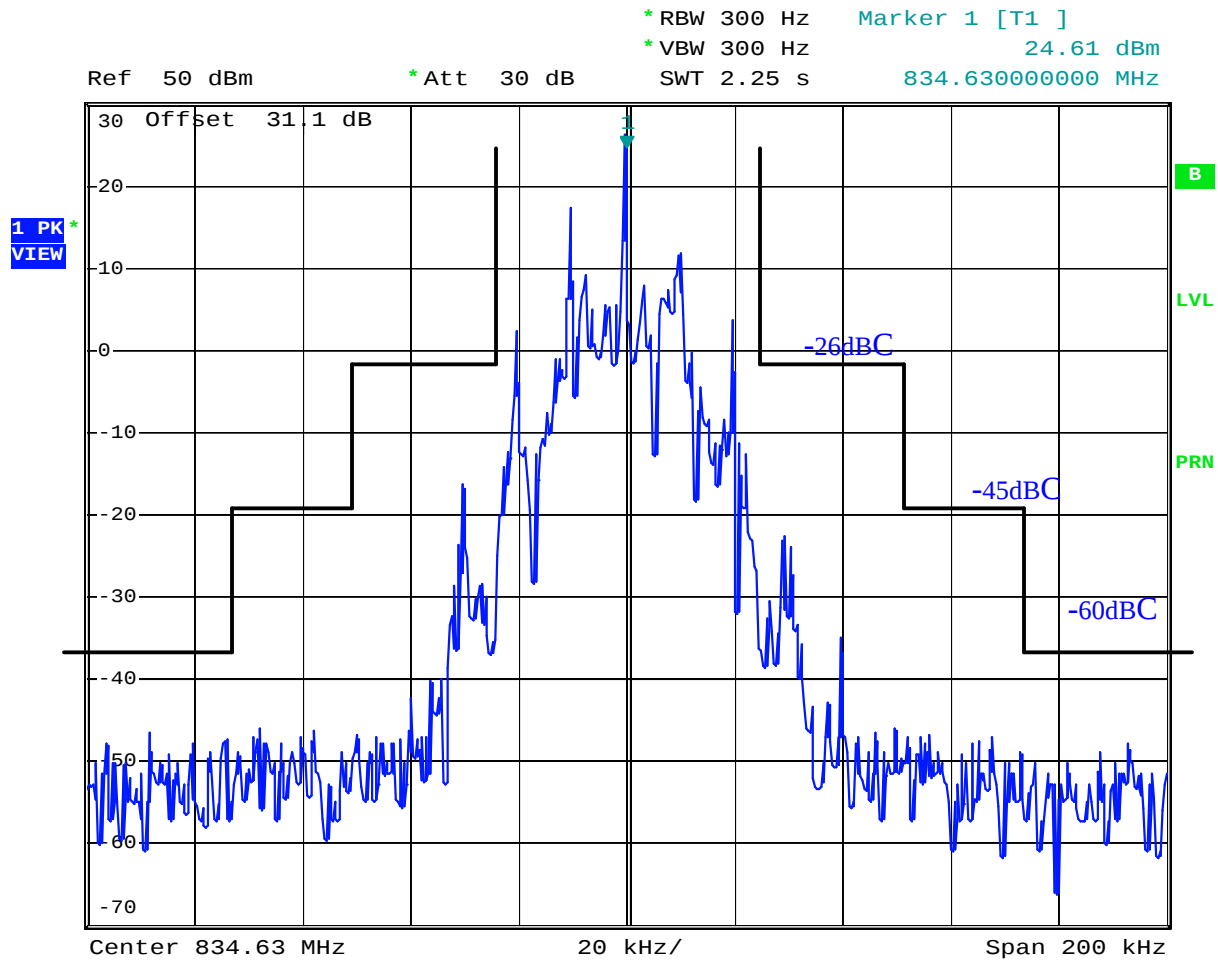
AMPS Low Channel –Data



Date: 8.JUN.2005 15:20:25



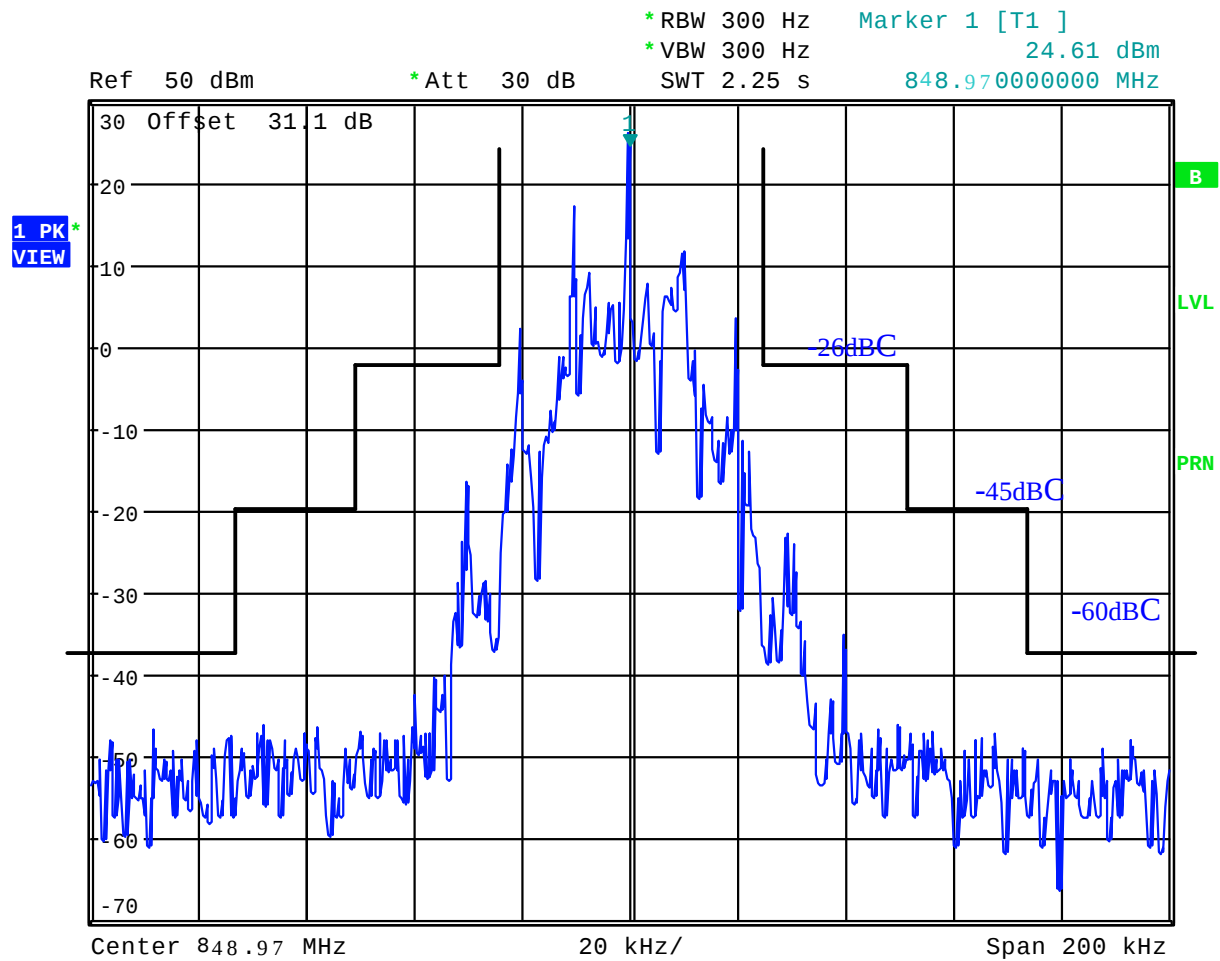
AMPS Mid Channel -Data



Date: 8.JUN.2005 15:22:18



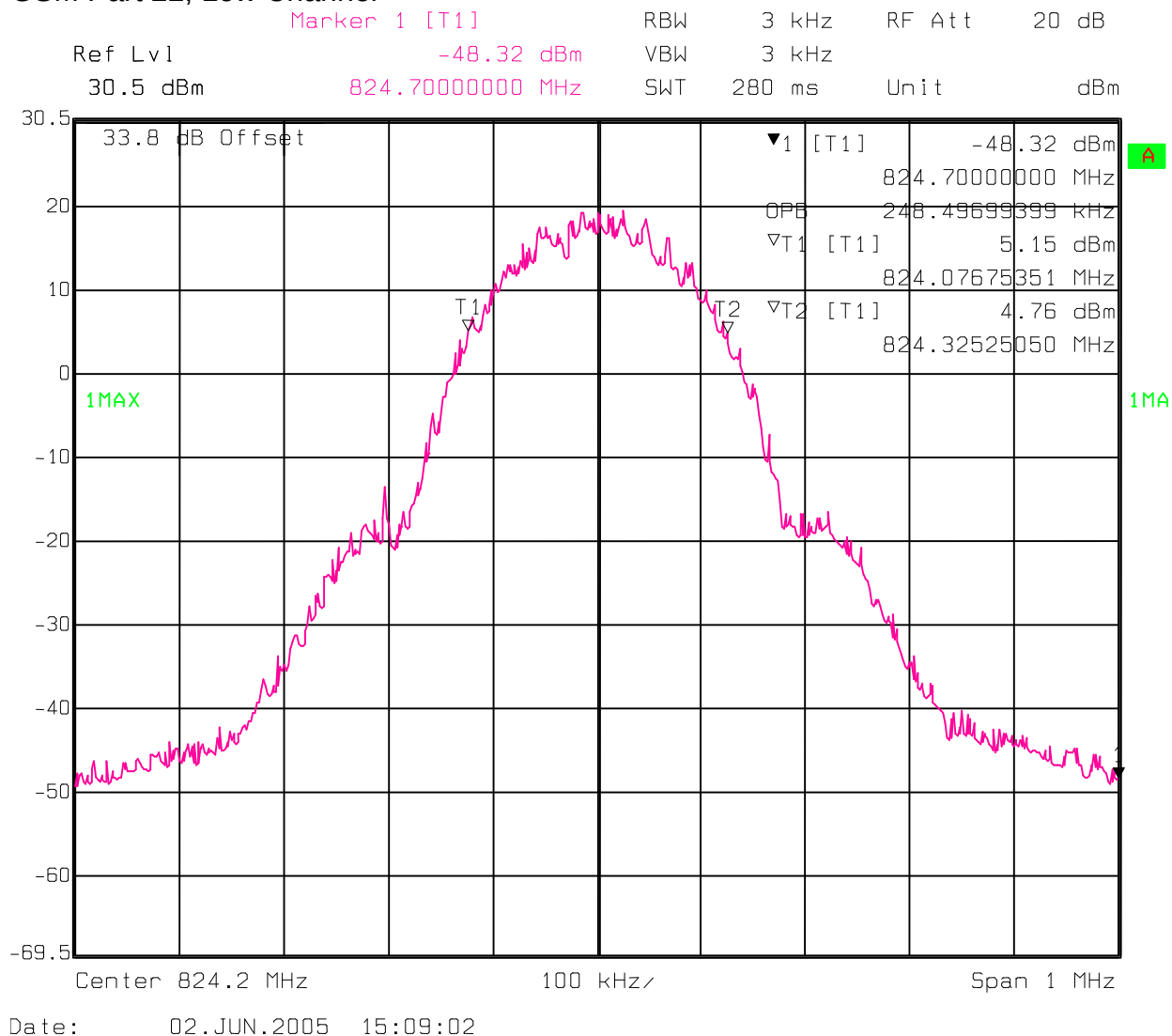
AMPS High Channel—Data



Date: 8.JUN.2005 15:22:18

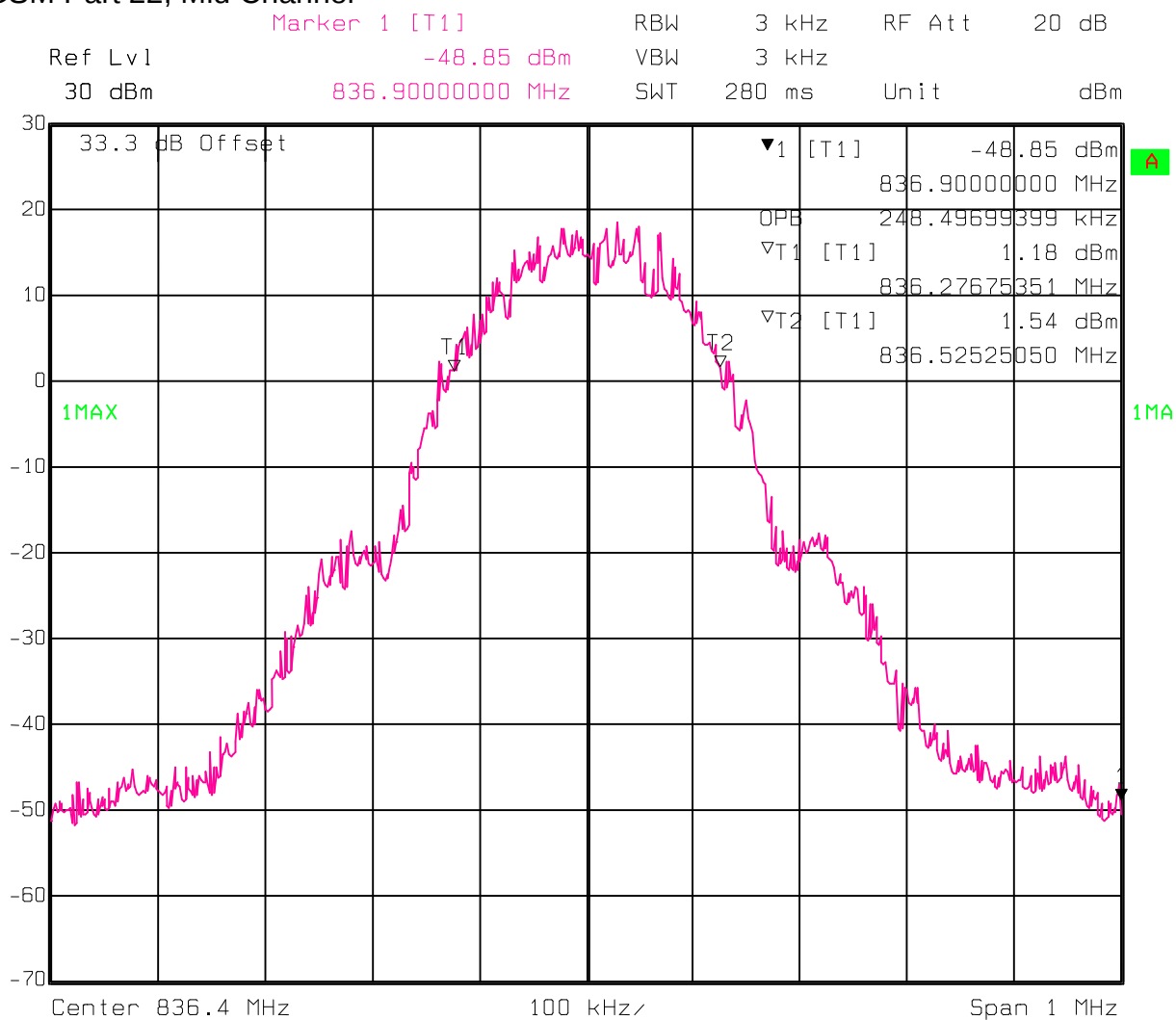


GSM Part 22, Low Channel





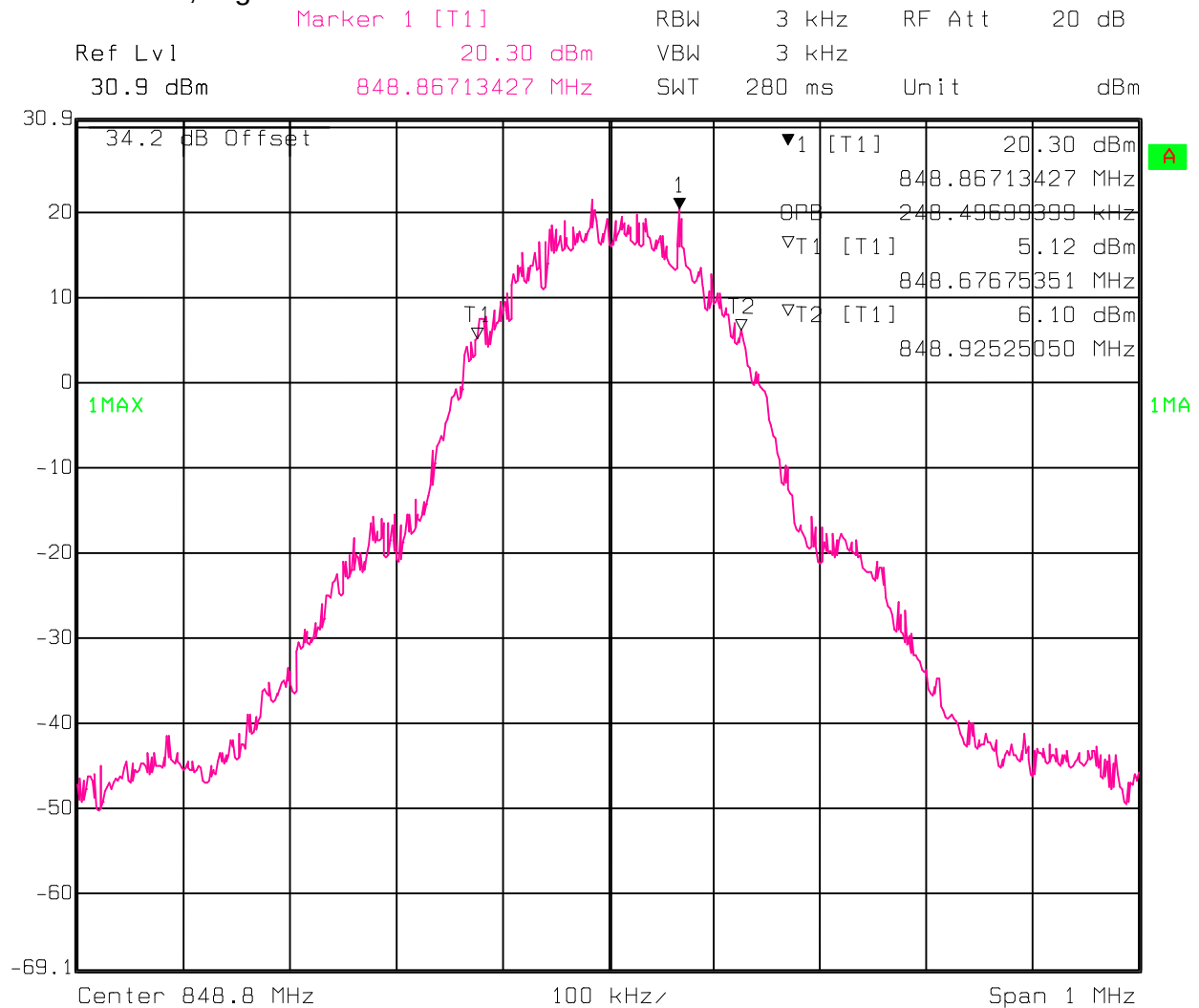
GSM Part 22, Mid Channel



Date: 02.JUN.2005 15:07:23



GSM Part 22, High Channel

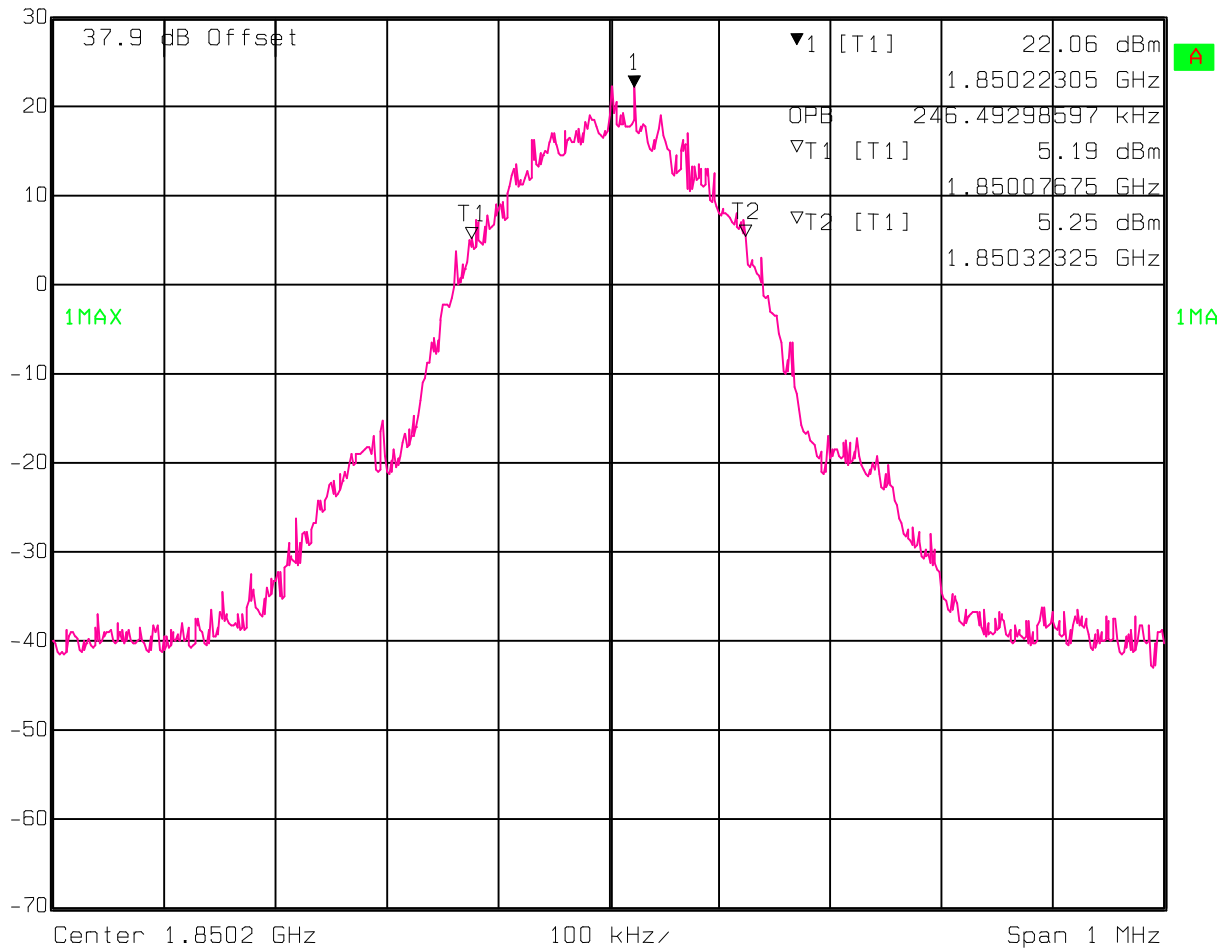


Date: 02.JUN.2005 15:24:41



GSM Part 24, Low Channel

Marker 1 [T1] RBW 3 kHz RF Att 10 dB  
Ref Lvl 22.06 dBm VBW 3 kHz  
30 dBm 1.85022305 GHz SWT 280 ms Unit dBm

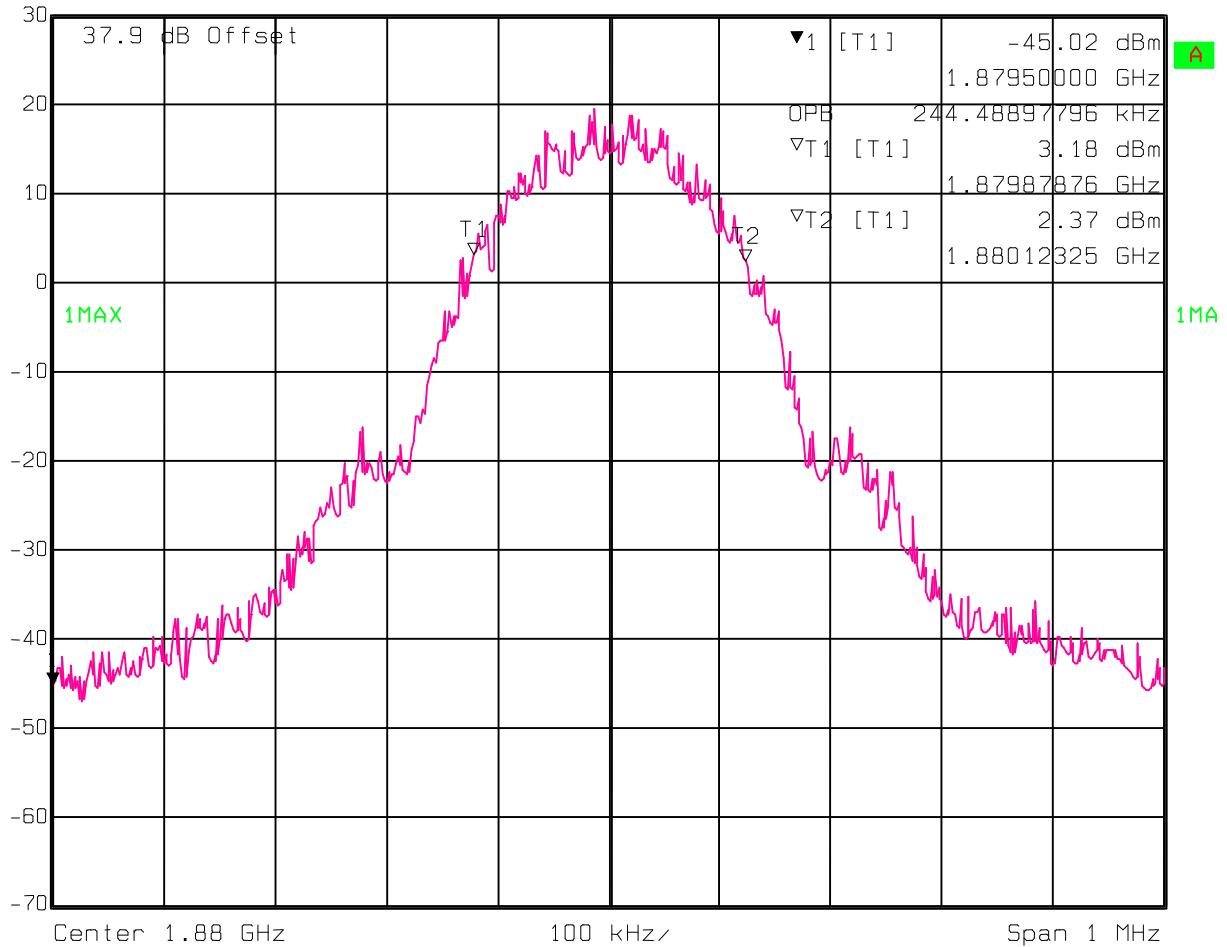


Date: 02.JUN.2005 15:47:30



GSM Part 24, Mid Channel

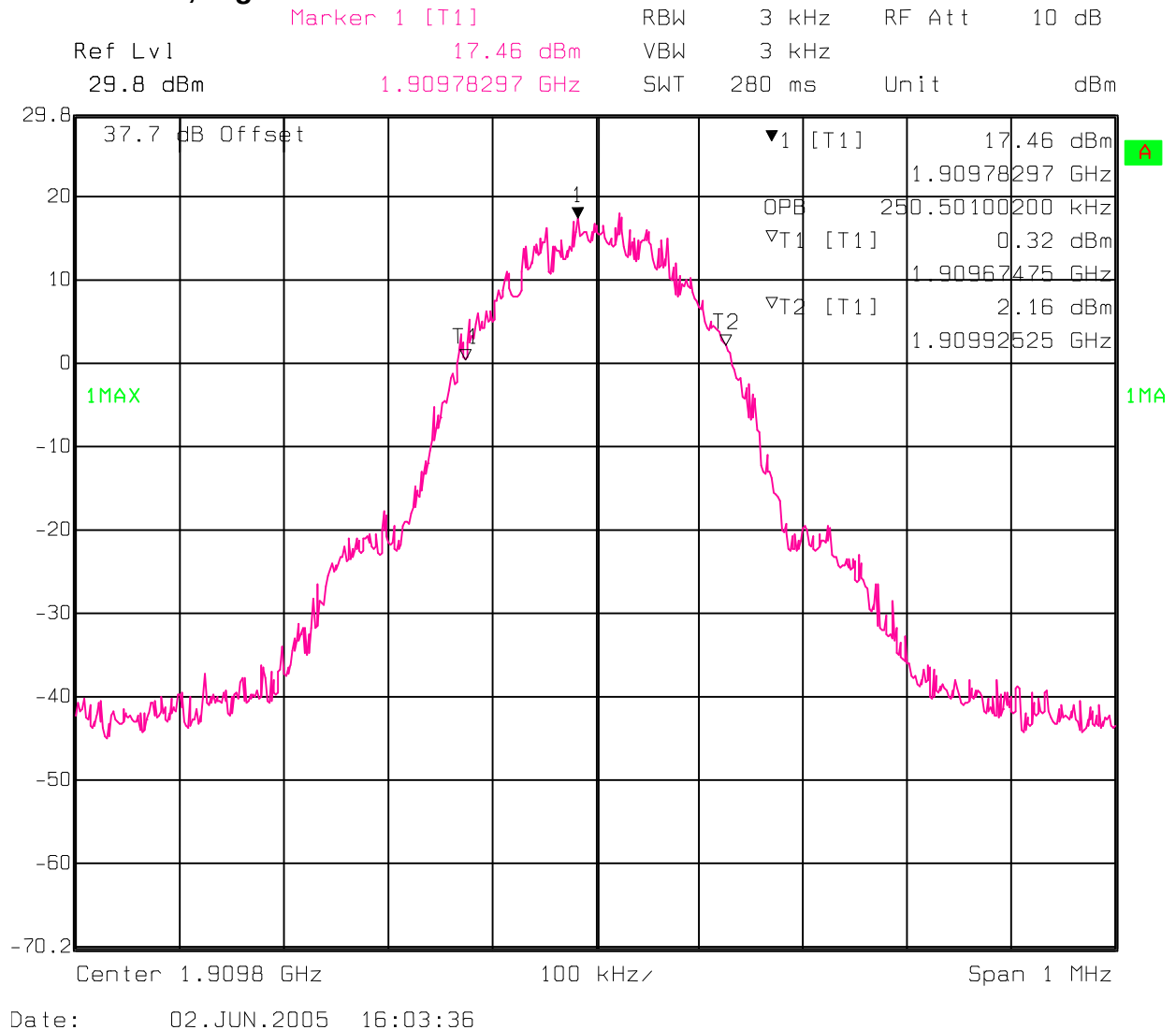
Marker 1 [T1] RBW 3 kHz RF Att 10 dB  
Ref Lvl -45.02 dBm VBW 3 kHz  
30 dBm 1.87950000 GHz SWT 280 ms Unit dBm



Date: 02.JUN.2005 15:48:22



**GSM Part 24, High Channel**





## **Section 8. Spurious Emissions At Antenna Terminals**

**Para. No.: 2.1051**

|                                      |                             |
|--------------------------------------|-----------------------------|
| <b>Test Performed By: A. Laudani</b> | <b>Date of Test: 6-3-05</b> |
|--------------------------------------|-----------------------------|

**Minimum Standard:** 22.917(b), 24.238.

### **Test Results:**

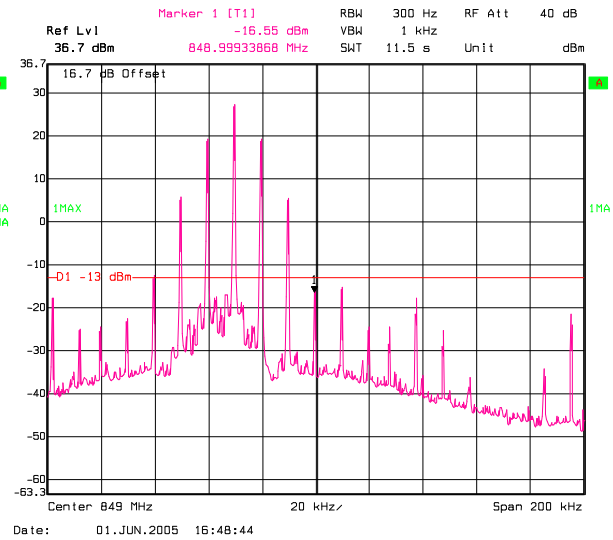
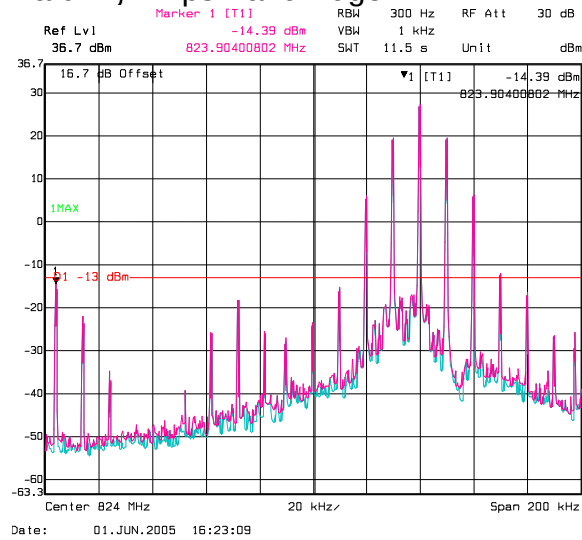
Summary of plots below, worst case.

| Mode                 | Frequency | Level      | Limit   | Comment  |
|----------------------|-----------|------------|---------|----------|
| AMPS low Channel     | 1006 MHz  | -14.10 dBm | -13 dBm | Complies |
| AMPS Mid Channel     | 1017 MHz  | -14.74 dBm | -13 dBm | Complies |
| AMPS High Channel    | 1035 MHz  | -14.92 dBm | -13 dBm | Complies |
| GSM Low Channel      | 643.7 MHz | -14.87 dBm | -13 dBm | Complies |
| GSM Mid Channel      | 655.7 MHz | -16.03 dBm | -13 dBm | Complies |
| GSM High Channel     | 664.4 MHz | -16.89 dBm | -13 dBm | Complies |
| PCS/GSM Low Channel  | 1.669 GHz | -17.32 dBm | -13 dBm | Complies |
| PCS/GSM Mid Channel  | 1.697 GHz | -14.80 dBm | -13 dBm | Complies |
| PCS/GSM High Channel | 1.720 GHz | -15.01 dBm | -13 dBm | Complies |

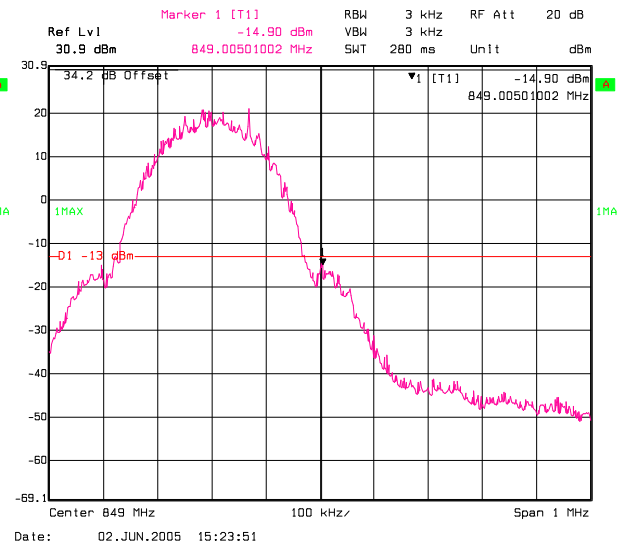
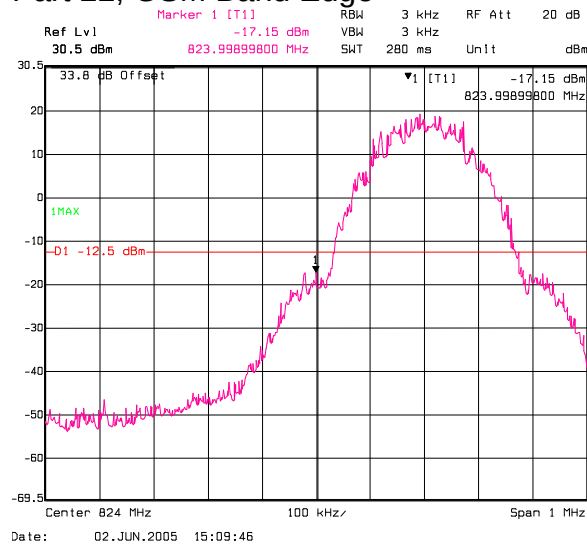
**Test Data:** See plots below



## Part 22, Amps Band Edge

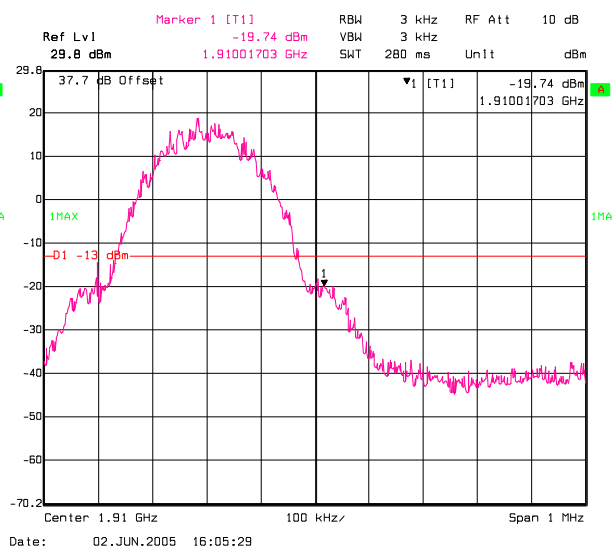
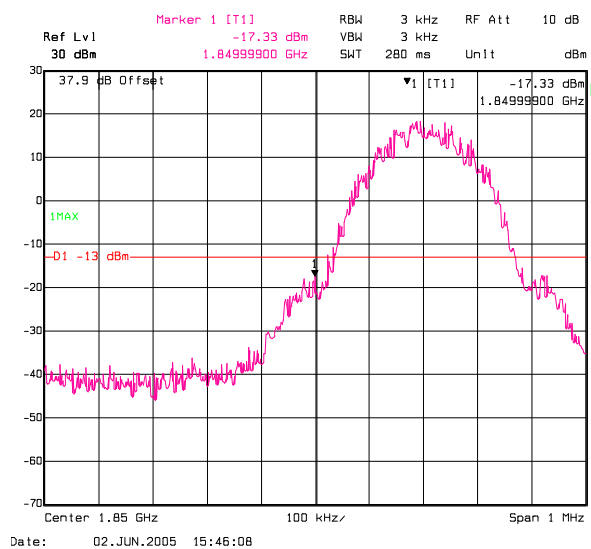


## Part 22, GSM Band Edge



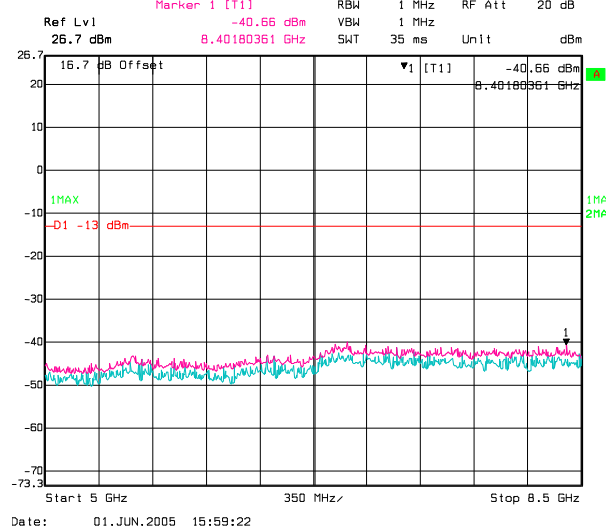
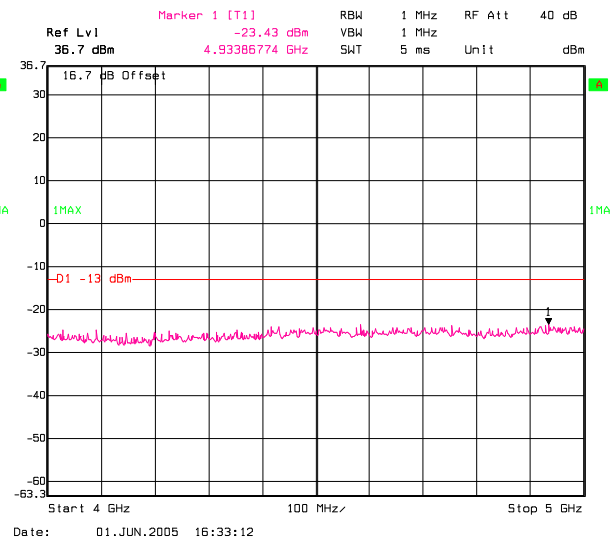
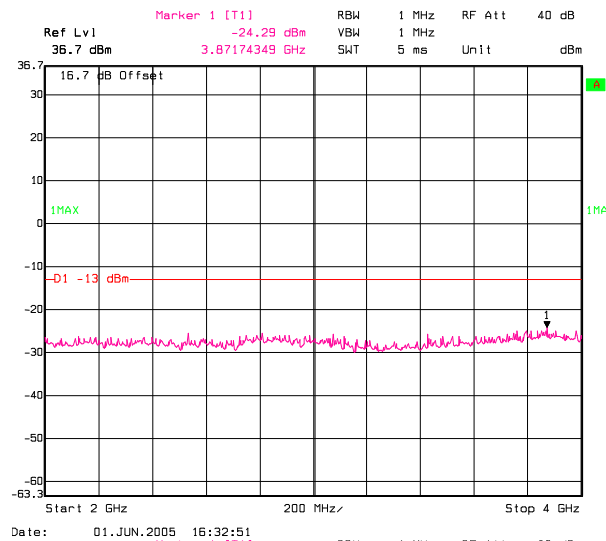
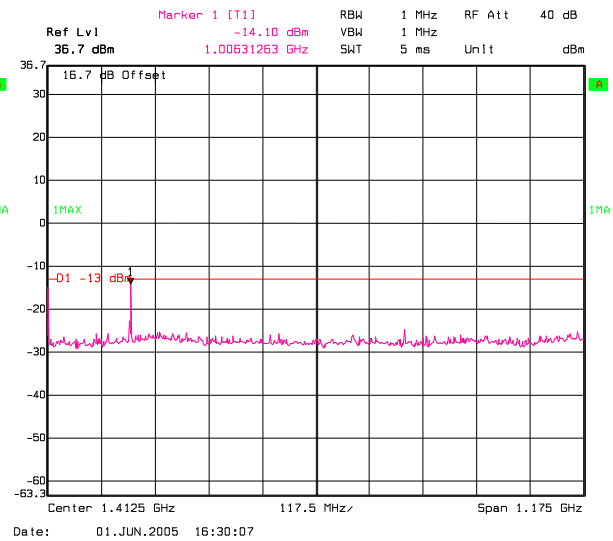
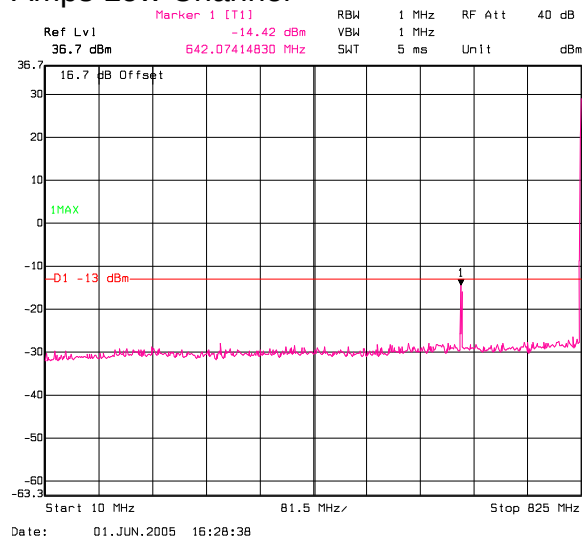


## Part 24, GSM Band Edge



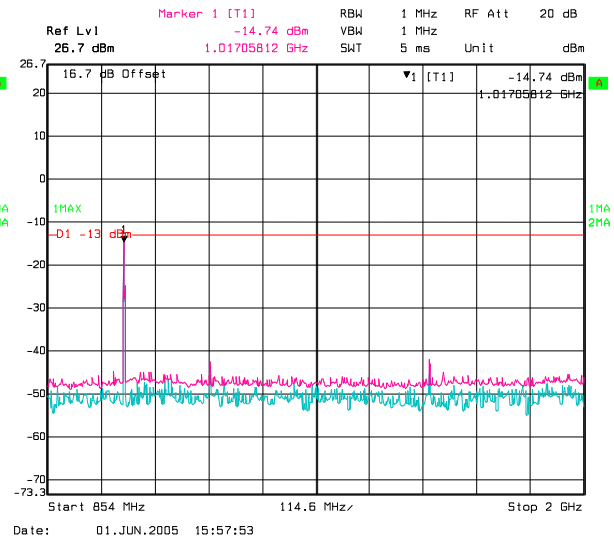
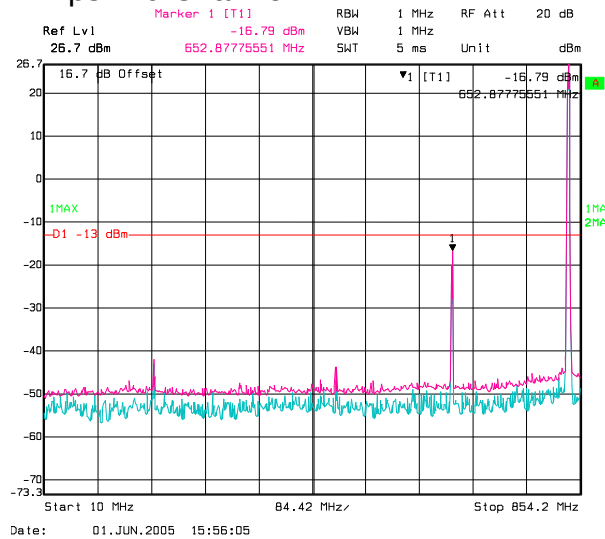


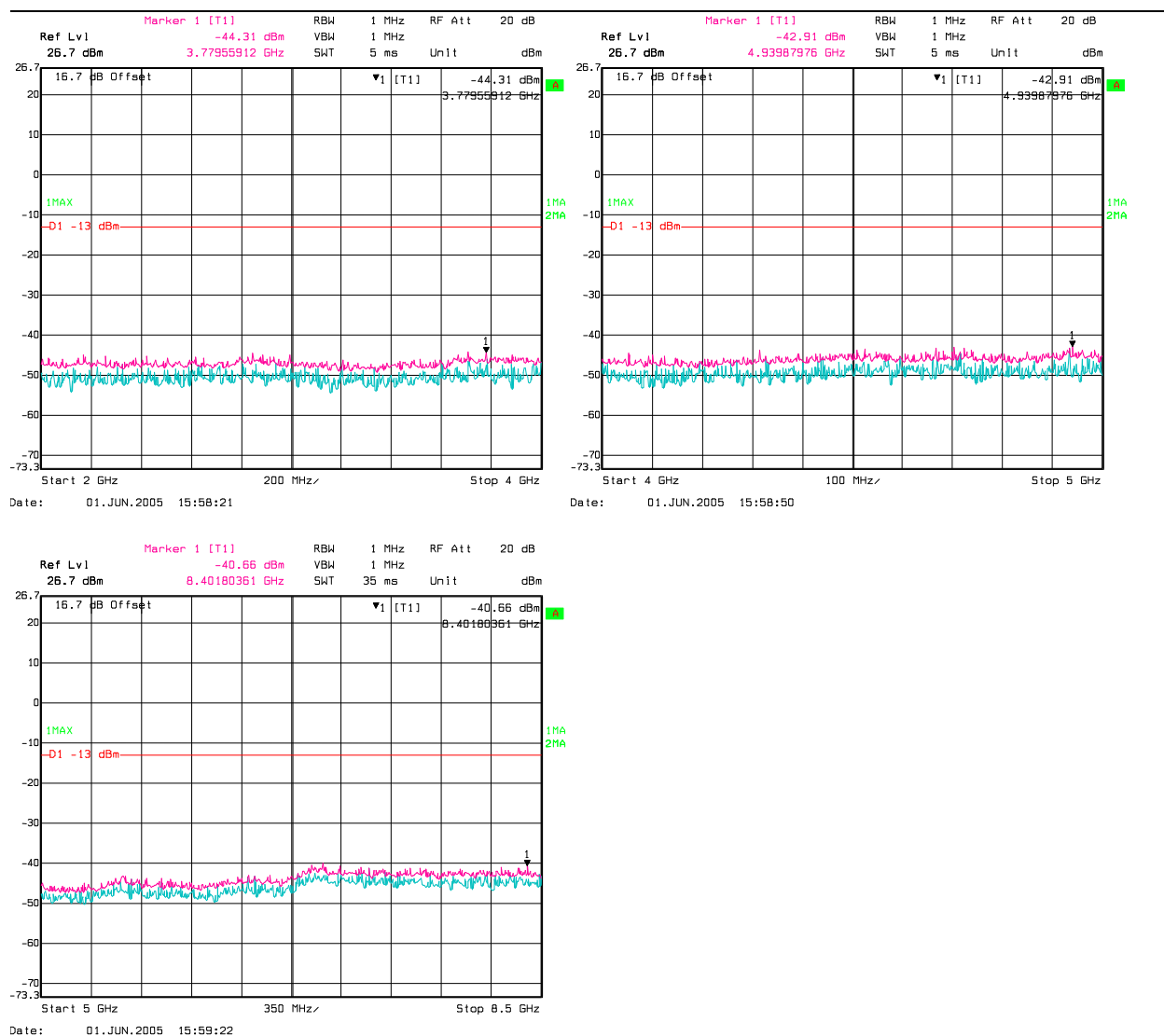
## Amps Low Channel

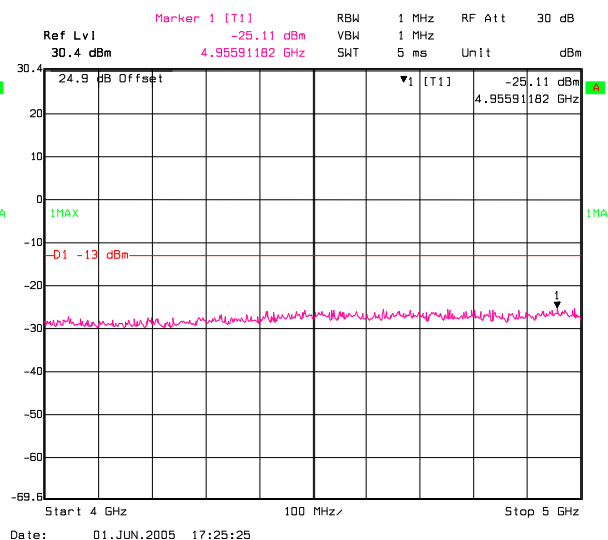
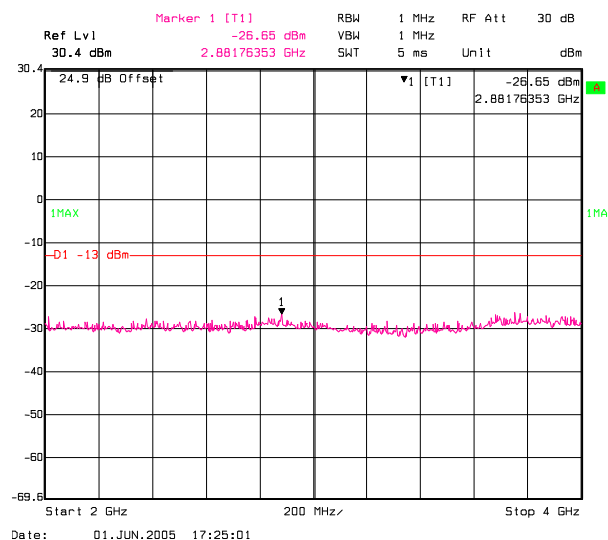
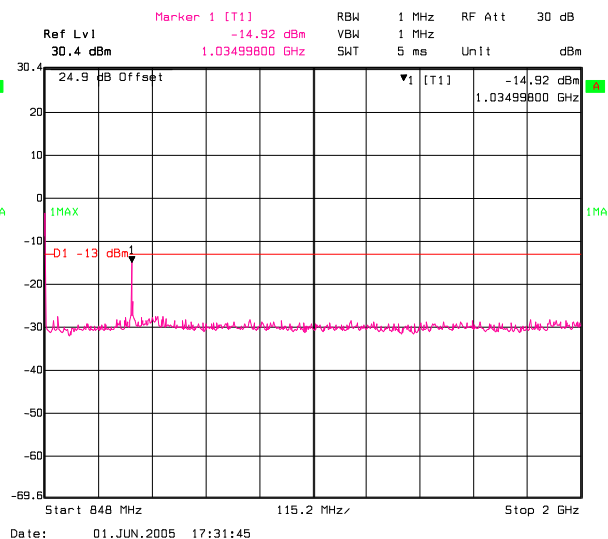
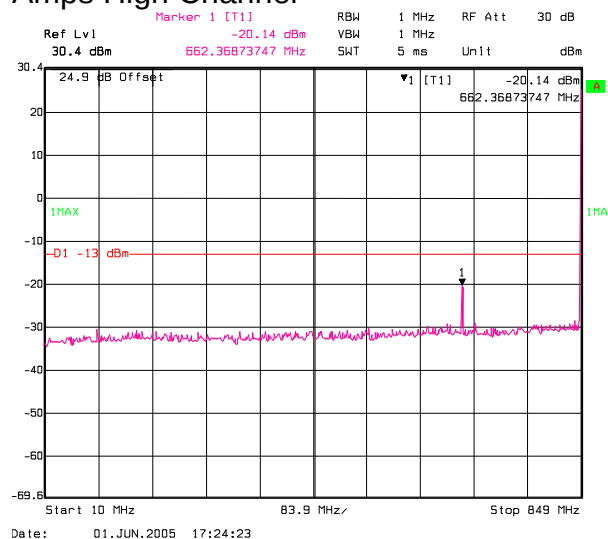


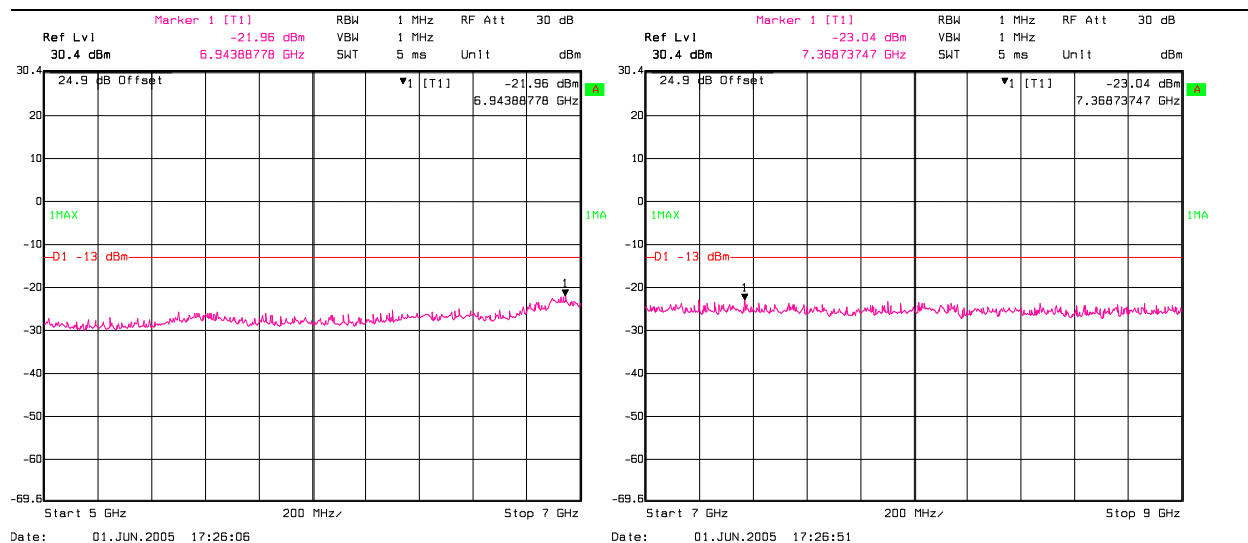


## Amps Mid Channel



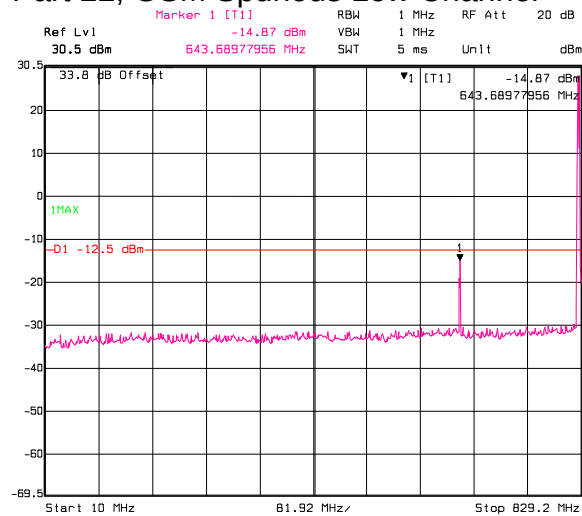


**Amps High Channel**


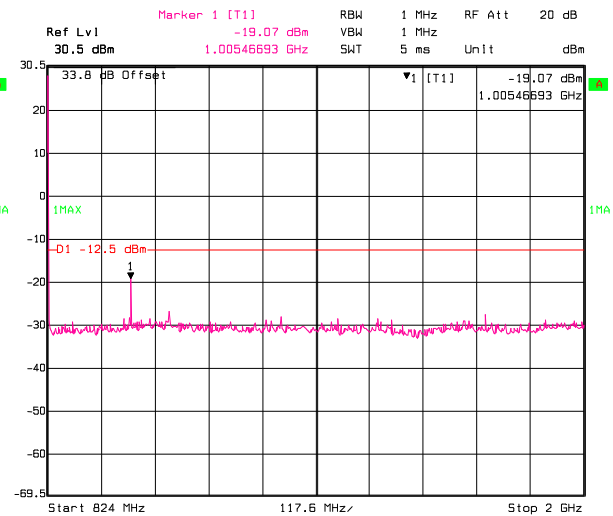




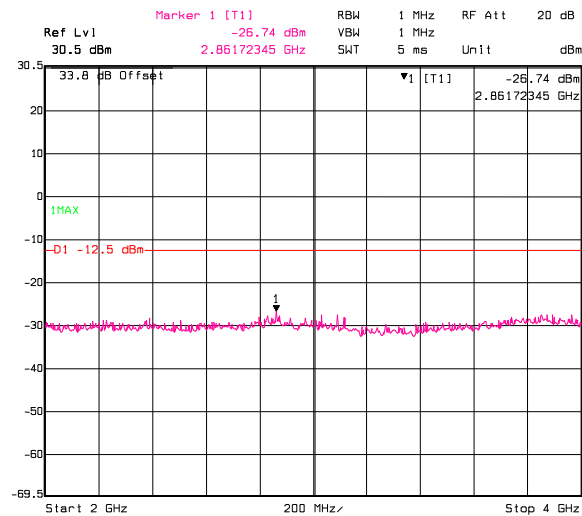
## Part 22, GSM Spurious Low Channel



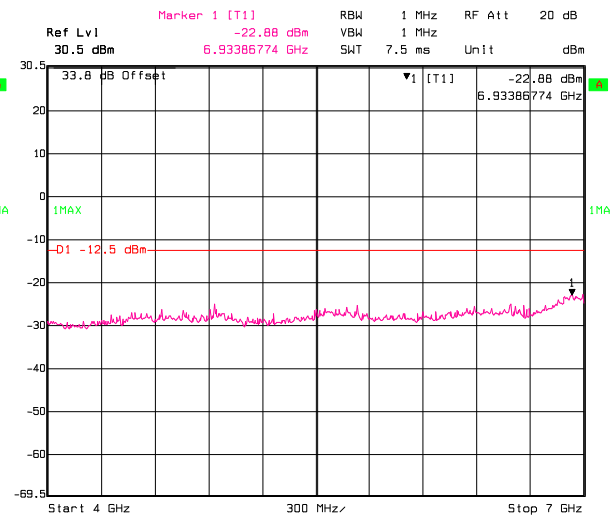
Date: 02.JUN.2005 15:11:21



Date: 02.JUN.2005 15:15:34



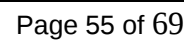
Date: 02.JUN.2005 15:16:19



Date: 02.JUN.2005 15:16:59

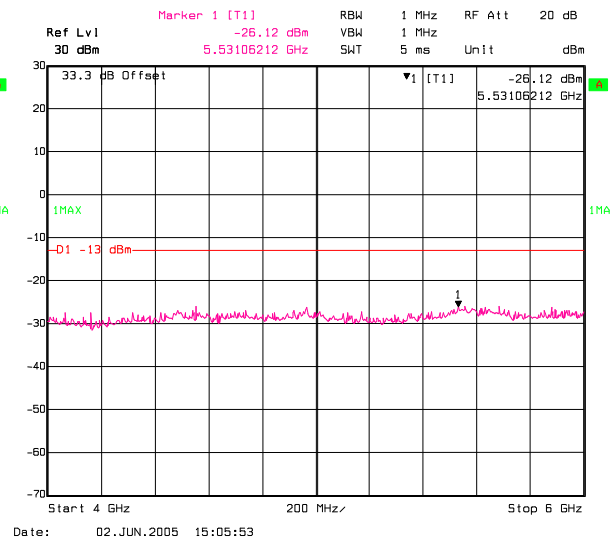
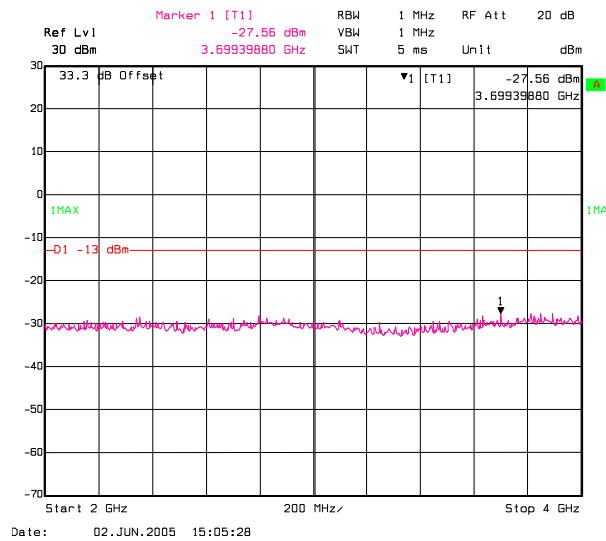
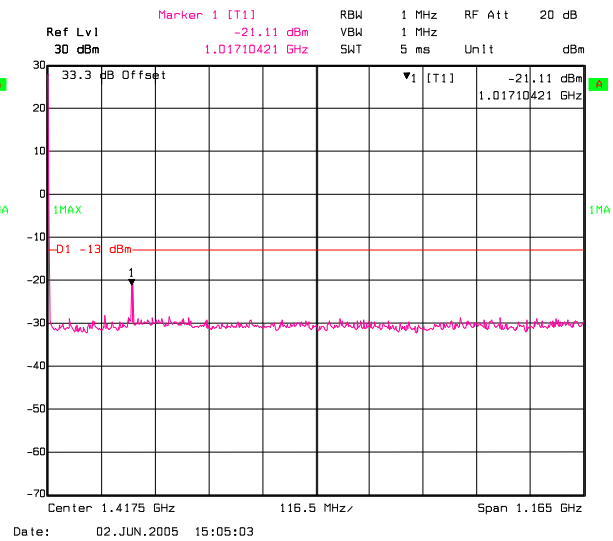
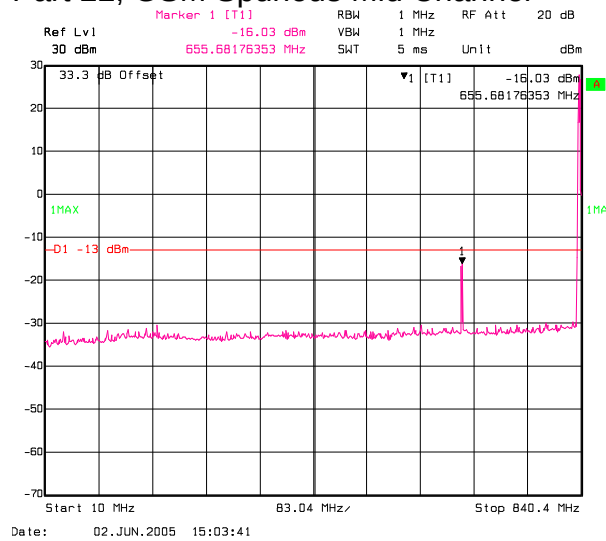


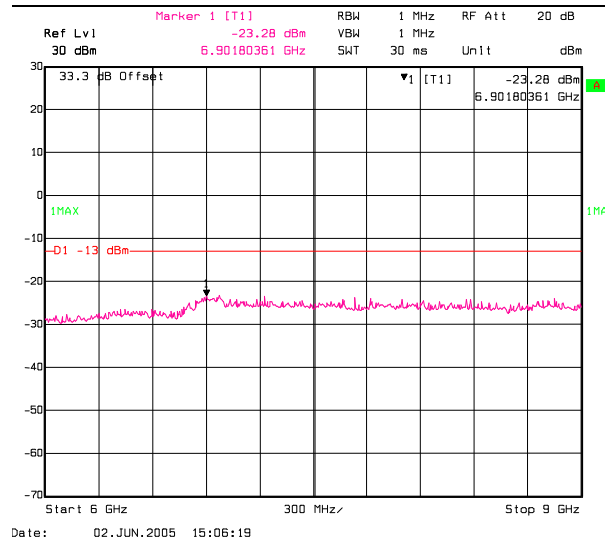
FCC Part 22, Part 24  
25-352-SKYR1  
FCC ID#: APVGX820



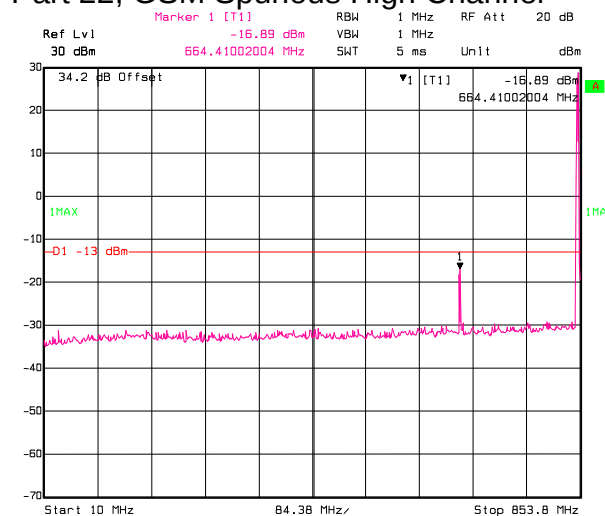


## Part 22, GSM Spurious Mid Channel

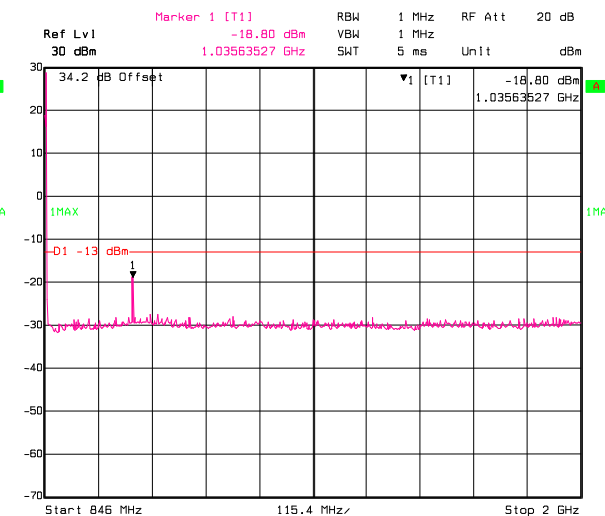




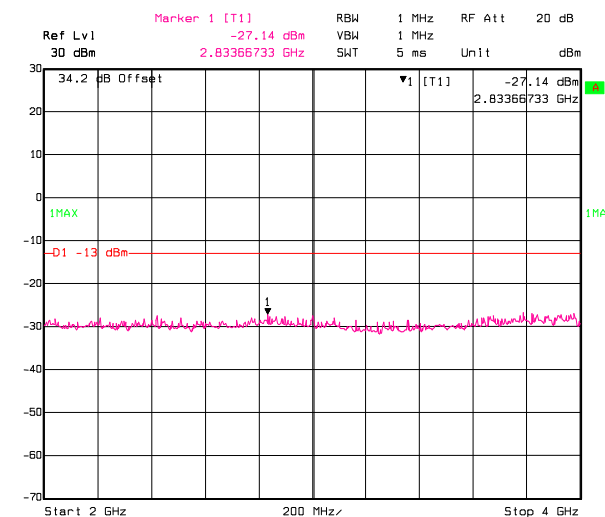
## Part 22, GSM Spurious High Channel



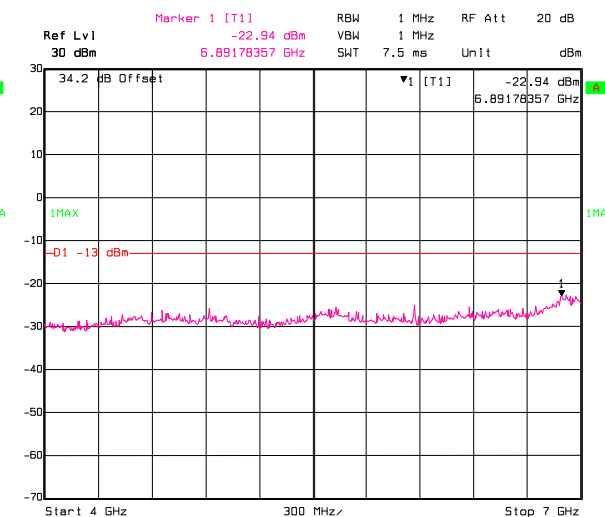
Date: 02.JUN.2005 15:26:16



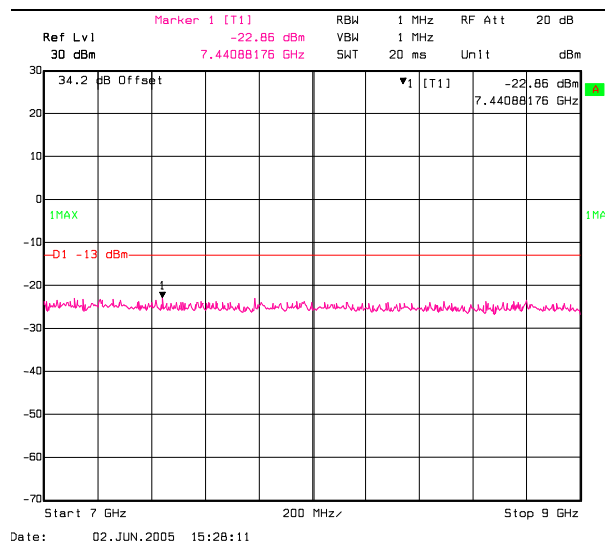
Date: 02.JUN.2005 15:26:45



Date: 02.JUN.2005 15:27:15

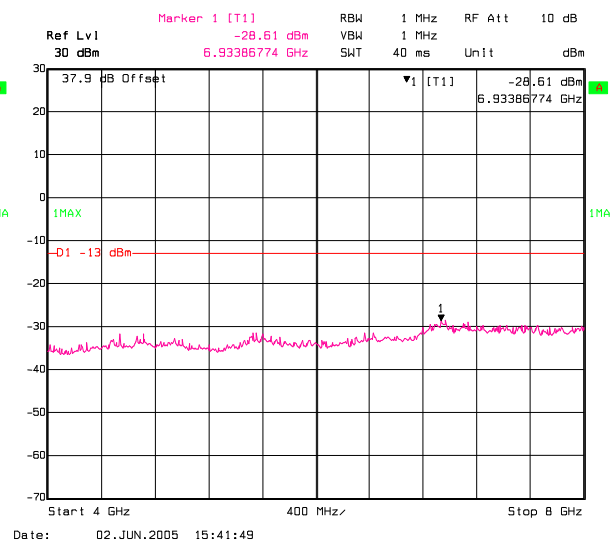
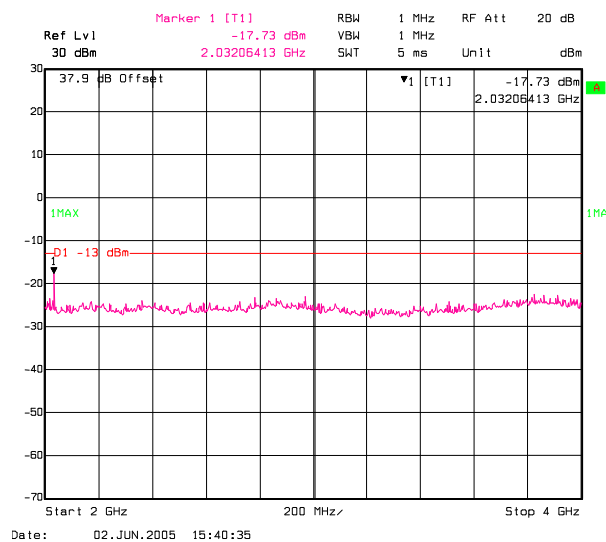
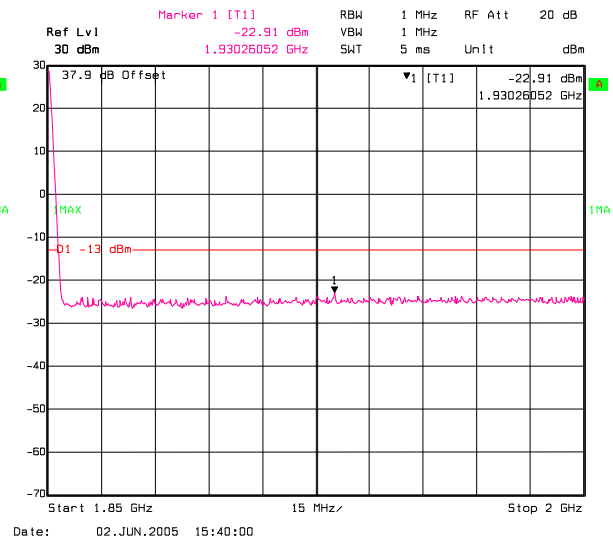
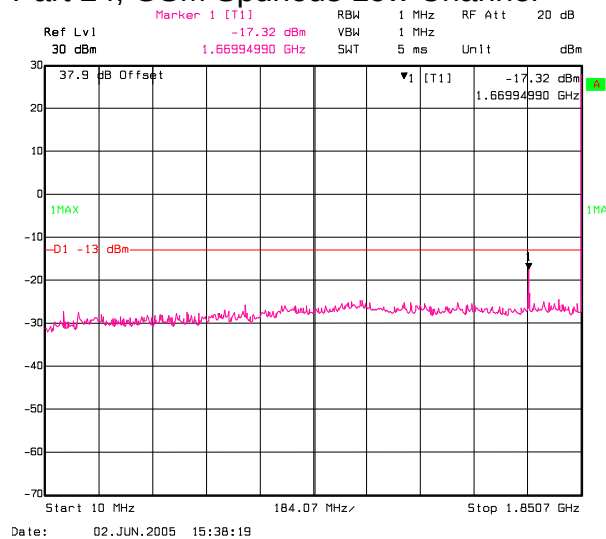


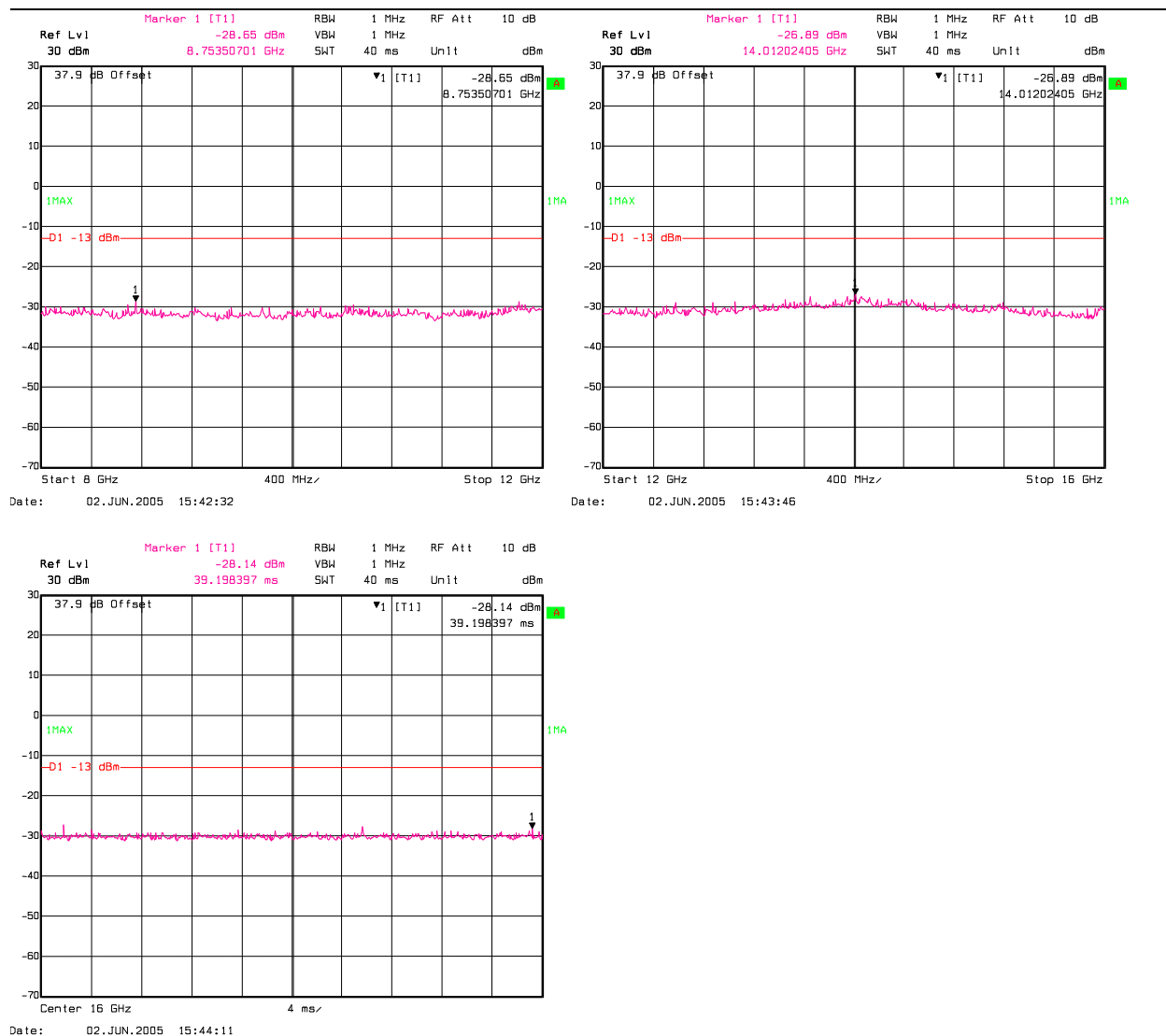
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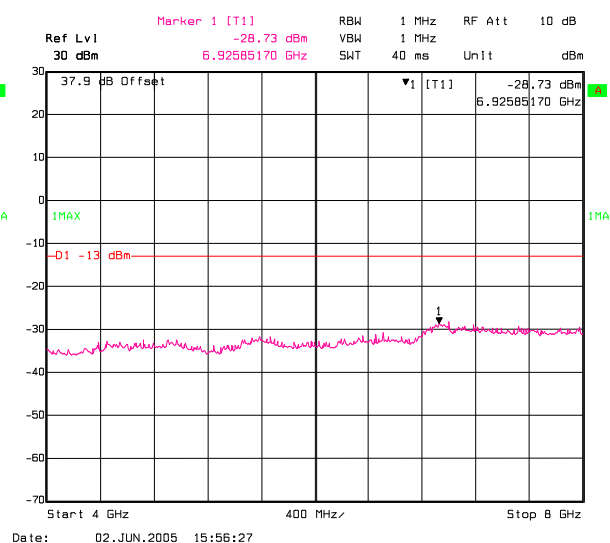
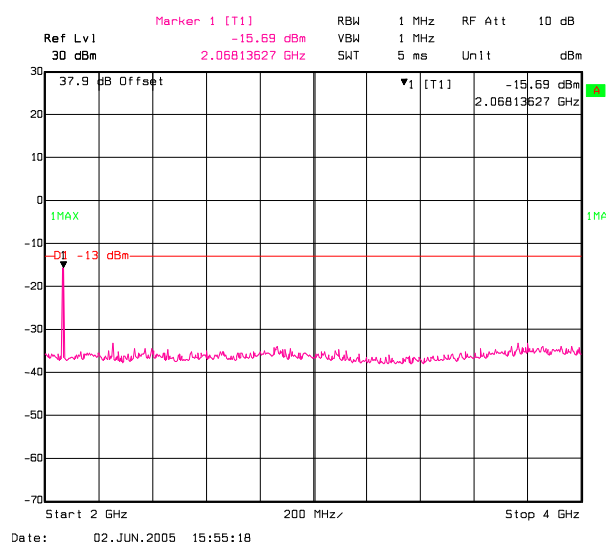
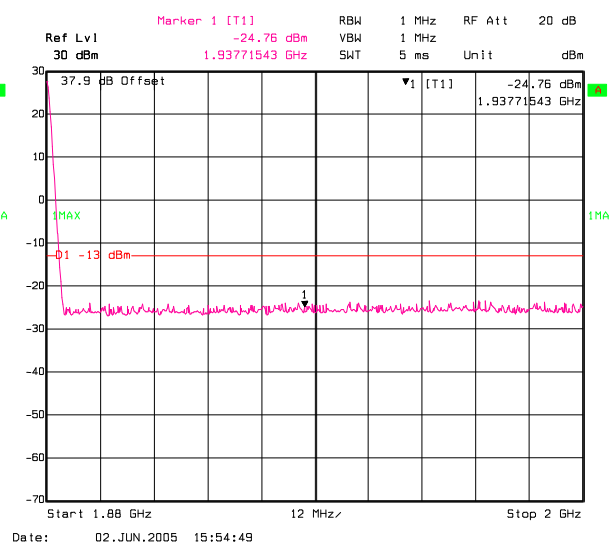
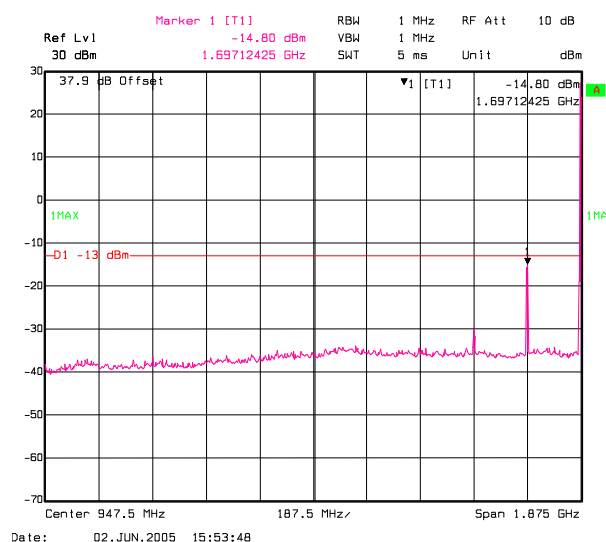


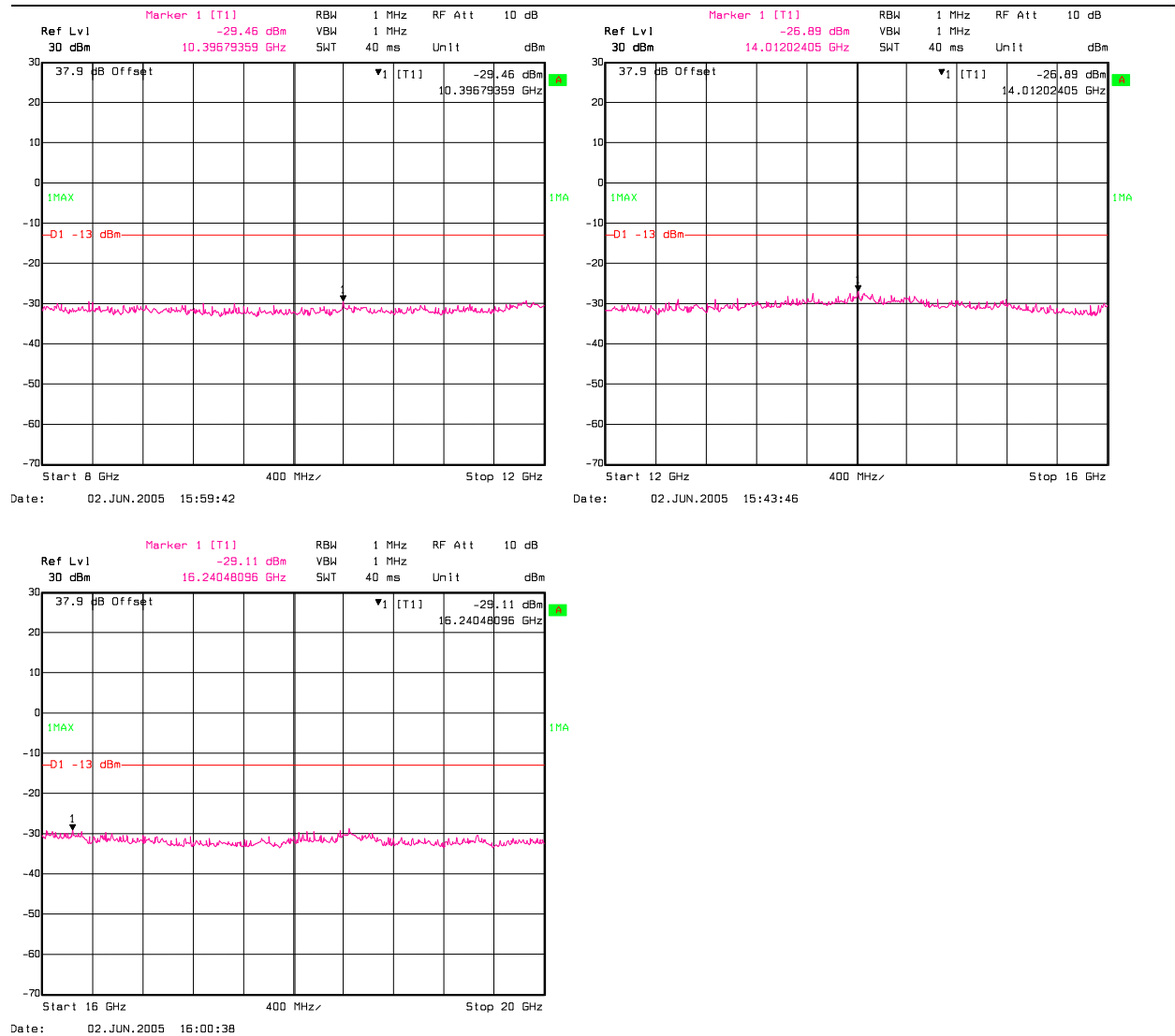


## Part 24, GSM Spurious Low Channel



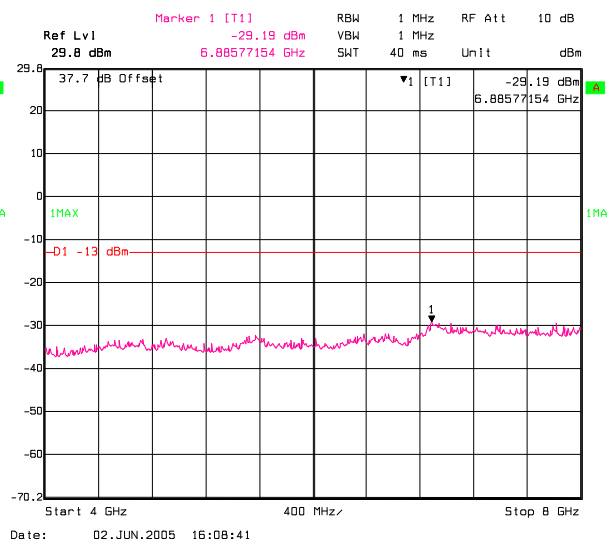
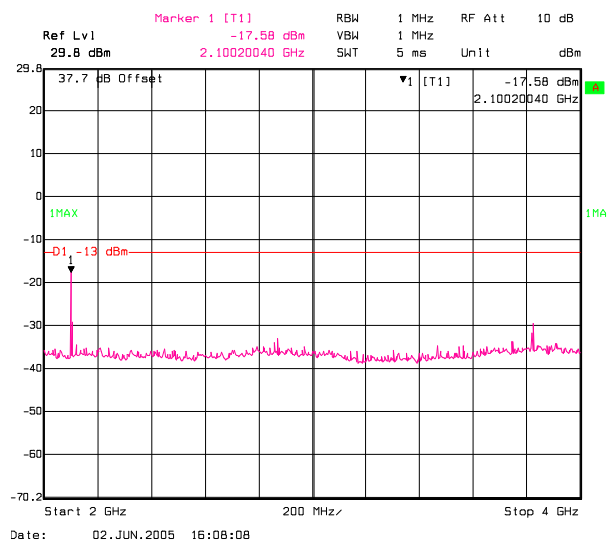
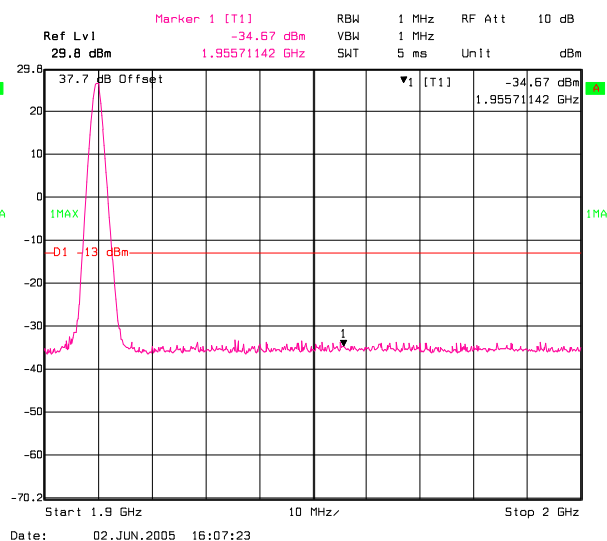
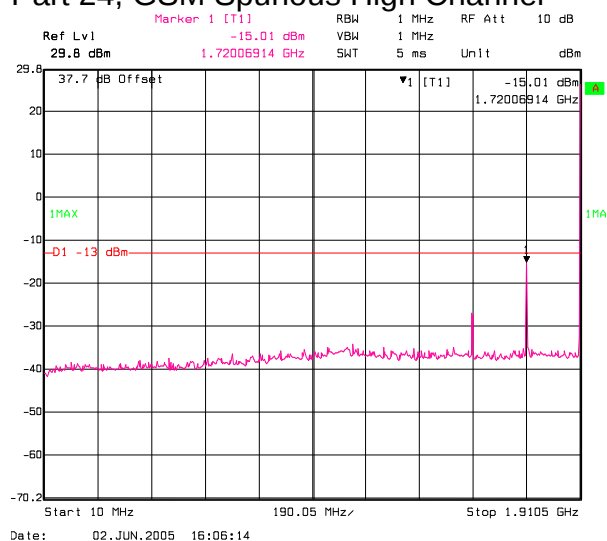


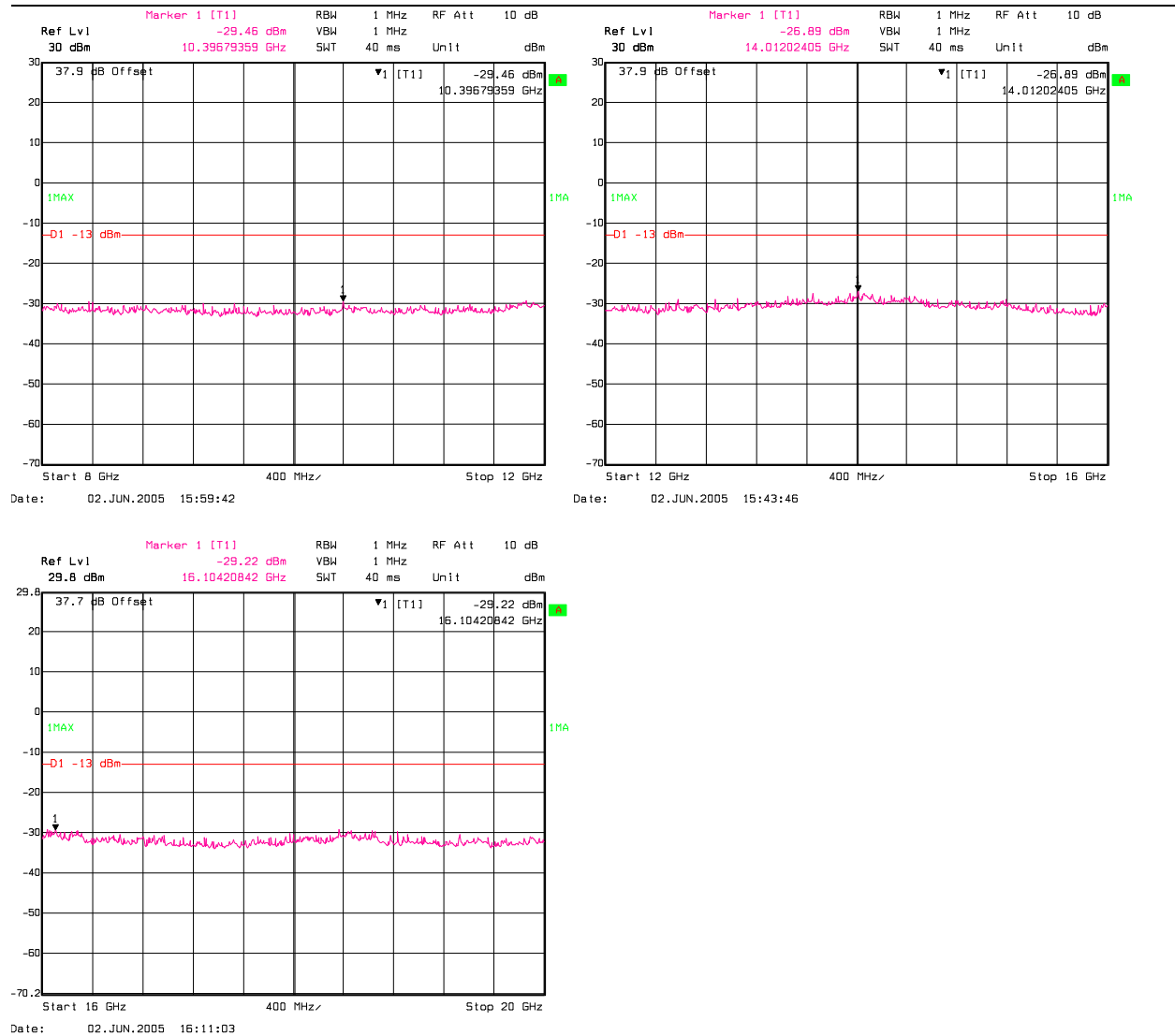
**Part 24, GSM Spurious Mid Channel**






## Part 24, GSM Spurious High Channel







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## Section 9. Field Strength of Spurious

Para. No.: 2.1053

|                               |                      |
|-------------------------------|----------------------|
| Test Performed By: A. Laudani | Date of Test: 6-3-05 |
|-------------------------------|----------------------|

Minimum Standard: 22.917(b); 24.238.

### Test Results:

Radiated spurious was investigated from 1000 MHz to 10x the Transmit Frequency or 1000 MHz to 19100 MHz. Emissions within 20 dB of the limit were substituted by a signal generator and matching antenna and were shown to comply.

The maximum spurious field strength in AMPS mode is 13.0 dB below the limit @ 2503.8 MHz.

The maximum spurious field strength in GSM mode is 16.1 dB below the limit @ 3395.2 MHz.

The maximum spurious field strength in PCS GSM mode is 4.3 dB below the limit @ 3819.6 MHz.

Test Data: See tables pages 20 to 23.



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**Section 10. Frequency Variation****Para. No.: 2.1055**

|                                      |                             |
|--------------------------------------|-----------------------------|
| <b>Test Performed By: A. Laudani</b> | <b>Date of Test: 6-3-05</b> |
|--------------------------------------|-----------------------------|

**Minimum Standard:** Para. No. 22.355, 24.235.**Test Results:** Limit = 2.5 ppm of Frequency 1850.02 MHz

Worst Case 0.039 ppm variation -- Complies, see tables below.  
Ambient Temperature 22°C, Relative Humidity 40%

**Equipment List:**

Agilent Wireless communication Test Set Model 8960 Series 10 E5515C sn GB44051091  
Cal. Date due 5-19-07  
N149 Cincinnati SubZero Environmental Chamber Model Z+32 sn ZP0552665  
Cal. Date due 5/13/06

**Measurement Data:****Frequency Stability over Voltage Range**

| Voltage | Output Power | Frequency Error | Frequency Error |
|---------|--------------|-----------------|-----------------|
| Volt    | dBm          | HZ              | (PPM)           |
| 4.6     | 28.12        | -51             | -0.028          |
| 4.0     | 28.08        | -60             | -0.032          |
| 3.6     | 27.75        | -73             | <b>-0.039</b>   |
| 3.5     | 27.64        | -62             | -0.034          |
| 3.4     | 27.58        | -33             | -0.018          |
| 3.3     | 27.58        | -47             | -0.025          |
| 3.25    | RF turns off |                 |                 |

4.0 Volts is power supply level as specified by Calamp Corp.

3.6 Volts is power supply minimum level as specified by Calamp Corp.

4.6 Volts is specified power supply level x 1.15%.

Ambient 21°C RH 55%



## Frequency Stability vs. Temperature

Frequency stability measurements were made over the temperature range of -30°C to +50°C. The frequency error was measured with the Agilent 8960 Test Set. Climate control was accomplished using a temperature chamber. The unit remained in the chamber during temperature transitions while turned off and during the measurement process, it was turned on and the error was scanned after one minute and recorded the maximum error over the next minute.

|             | Power Supply    |                 |                 |                 |                 |                 |
|-------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
|             | 3.6 Volts       |                 | 4.0 Volts       |                 | 4.6 Volts       |                 |
| Temperature | Frequency Error | Frequency Error | Frequency Error | Frequency Error | Frequency Error | Frequency Error |
| °C          | HZ              | (PPM)           | HZ              | (PPM)           | HZ              | (PPM)           |
| 19.9        | -54             | -0.029          | -52             | -0.028          | -47             | -0.025          |
| 30.0        | -56             | -0.030          | -51             | -0.028          | 54              | 0.029           |
| 40.0        | -73             | <b>-0.039</b>   | -55             | -0.030          | -62             | -0.034          |
| 50.1        | -61             | -0.033          | -60             | -0.032          | -62             | -0.034          |
| -30.7       | -37             | -0.020          | -22             | -0.012          | -33             | -0.018          |
| -20.0       | -29             | -0.016          | 19              | 0.010           | 15              | 0.008           |
| -10.0       | -67             | -0.036          | -59             | -0.032          | -63             | -0.034          |
| 0.2         | -14             | -0.008          | 16              | 0.009           | -19             | -0.010          |
| 10.1        | -16             | -0.009          | 12              | 0.006           | -11             | -0.006          |

4.0 Volts is power supply level as specified by Calamp Corp.

3.6 Volts is power supply minimum level as specified by Calamp Corp.

4.6 Volts is specified power supply level x 1.15%.

**Section 11. Test Equipment List**

| <b>Asset Number</b> | <b>Description</b>                  | <b>Model Number</b> | <b>Serial Number</b> | <b>Last Cal</b> | <b>Cal Due</b> |
|---------------------|-------------------------------------|---------------------|----------------------|-----------------|----------------|
| 836                 | Signal Generator, Agilent           | E8254A              | US41140229           | 12/30/04        | 12/30/05       |
| 835                 | Spectrum Analyzer, Rhode & Schwartz | RHDFSEK             | 829058/005           | 12/30/04        | 12/30/05       |
| 317                 | Preamplifier, HP                    | 8449A               | 2749A00167           | 1/6/05          | 1/6/06         |
| 752                 | Antenna, DRWG, EMCO                 | 3115                | 4943                 | 12/29/04        | 12/29/05       |
| 529                 | Antenna, DRWG, EMCO                 | 3115                | 2505                 | 4/13/05         | 4/13/06        |
| 112                 | Antenna, LPA, EMCO                  | 3146                | 9101-2988            | 10/28/04        | 10/28/05       |
| 759                 | Antenna Set, Dipole, EMCO           | 3121C               | 1214                 | 1/28/05         | 1/28/06        |
| 810                 | Multimeter, Fluke                   | 111                 | 77820242             | 1/6/05          | 1/6/06         |
| 223                 | DC Power Supply                     | XP-580              | None                 | NCR             | NCR            |
|                     |                                     |                     |                      |                 |                |
|                     |                                     |                     |                      |                 |                |
|                     |                                     |                     |                      |                 |                |
|                     |                                     |                     |                      |                 |                |