

## TEST REPORT

**Report Number: 3049826-001**

**Project Number: 3049826**

**11/1/2003**

**Evaluation of the  
ST810**

**Model Number: ST810**

**FCC ID:  
EFCST0001**

**FCC Part 2  
FCC Part 15  
FCC Part 24 Subpart E**

**For**

**Orion Electronics Ltd.**

Test Performed by:

Intertek  
731 Enterprise Drive  
Lexington, KY 40510

Test Authorized by:

Orion Electronics Ltd.  
90 Sanford Drive Box 2728  
Windsor, Nova Scotia B0N2T0

Prepared By: Bryan C. Taylor Date: 2/13/2004

**Bryan C. Taylor, Team Leader**

Approved By: David Schramm Date: 2/13/2004

**David Schramm, EMC Team Leader**

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**Intertek**

731 Enterprise Drive, Lexington, KY 40510

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Evaluation For: Orion Electronics Ltd.  
Model No: ST810

FCC ID: EFCST0001

## 1 EXECUTIVE SUMMARY

Testing performed for: Orion Electronics Ltd.

Equipment Under Test: ST810

| FCC RULE                                          | IC RULE                                                 | DESCRIPTION OF TEST                                                                    | RESULT | PAGE                  |
|---------------------------------------------------|---------------------------------------------------------|----------------------------------------------------------------------------------------|--------|-----------------------|
| §2.1046                                           | RSS-129<br>§7.1, §9.1<br>RSS-133 §6.2                   | RF Power Output                                                                        | Passed | 10                    |
| §22.913,<br>§24.232                               | RSS-129<br>§7.1, §9.1<br>RSS-133 §6.2                   | ERP, EIRP                                                                              | Passed | 12                    |
| §2.1049<br>§22.917(b)(d)                          | RSS-129 §6.3,<br>RSS-129 §8.1                           | Emission Limitation, Occupied Bandwidth                                                | Passed | 13                    |
| §2.1051<br>§22.917(e)<br>§22.917(f)<br>§24.238(a) | RSS-129<br>§6.3, §7.2.2,<br>§8.1.1, §10<br>RSS-133 §6.3 | Out of Band Emissions at Antenna Terminals<br>Mobile Emissions In Base Frequency Range | Passed | 18                    |
| §2.1053                                           | RSS-129 §8.1                                            | Field Strength of Spurious Radiation                                                   | Passed | 24                    |
| §2.1091, §2.1093                                  | RSS-129 §11,<br>RSS-133 §8                              | Specific Absorption Rate                                                               | N/S    | See Note <sup>1</sup> |
| §15.107, §15.207                                  | IC ES-003                                               | Power Line Conducted Emissions                                                         | Passed | 37                    |
| §15.109                                           | IC ES-003<br>RSS-129 §10,<br>RSS-133 §9                 | Receiver Spurious Emission                                                             | Passed | 40                    |
| §2.1055, §22.355,<br>§24.235                      | RSS-133 §7                                              | Frequency Stability vs. Temperature                                                    | Passed | 43                    |
| §2.1055, §22.355,<br>§24.235                      | --                                                      | Frequency Stability vs. Voltage                                                        | Passed | 44                    |

N/S: Not under scope of this evaluation

<sup>1</sup> Specific Absorption Rate testing was not under the scope of this evaluation.

## 2 JOB DESCRIPTION

### 2.1 Client information

The ST810 has been tested at the request of

**Company:** Orion Electronics Ltd.  
90 Sanford Drive Box 2728  
Windsor, Nova Scotia B0N2T0

**Name of contact:** David Roddis  
**Telephone:** (800)-665-4648  
**Fax:** (902)-798-8188

### 2.2 Test plan reference:

Tests were performed to the following standards:

- FCC Part 2
- FCC Part 15
- FCC Part 24 Subpart E rules for an intentional radiator
- FCC Part 22 Subpart H rules for an intentional radiator

The test procedures described in this test report and ANSI C63.4: 1992 were employed.

Evaluation For: Orion Electronics Ltd.  
Model No: ST810

FCC ID: EFCST0001

## 2.3 Equipment Under Test (EUT)

The Equipment Under Test (EUT) was an ST810 that operated in the CDMA800 and CDMA1900 modes.

|                                                       |                                                                                                         |
|-------------------------------------------------------|---------------------------------------------------------------------------------------------------------|
| <b>Product</b>                                        | ST810                                                                                                   |
| <b>EUT Model Number</b>                               | ST810                                                                                                   |
| <b>EUT Serial Number</b>                              | RD009/03                                                                                                |
| <b>Whether quantity (&gt;1) production is planned</b> | Quantity production is planned.                                                                         |
| <b>Cellular Phone standards</b>                       | CDMA 800 and 1900                                                                                       |
| <b>Type(s) of Emission</b>                            | 1M28F9W                                                                                                 |
| <b>RF Output Power</b>                                | 25.5 dBm – CDMA 800<br>24.7 dBm – CDMA1900                                                              |
| <b>Frequency Range</b>                                | 824.7 – 848.31 MHz      CDMA800<br>1850 – 1910 MHz      CDMA1900                                        |
| <b>Antenna &amp; Gain</b>                             | 1 Wi-Sys GPS antenna, part number ANT-SGM3<br>1 Klong EX202 dual-band antenna, part number ANT-DAG3-6FT |
| <b>Detachable Antenna ?</b>                           | Yes                                                                                                     |
| <b>External input</b>                                 | <input type="checkbox"/> Audio <input checked="" type="checkbox"/> Digital Data                         |

EUT receive date: 10/22/2003

EUT receive condition: The EUT was received in good condition with no apparent damage.

Test start date: 10/22/2003

Test completion date: 11/17/2003

The test results in this report pertain only to the item tested.

### 2.3.1 System Support Equipment

Table 2-1 contains the details of the support equipment associated with the Equipment Under Test during the FCC Part 15 testing.

*Table 2-1: System Support Equipment*

| Description       | Manufacturer     | Model Number | Serial Number | FCC ID number |
|-------------------|------------------|--------------|---------------|---------------|
| AC wall adapter   | Mode Electronics | DV-1280      | 68-128-1      | Not Labeled   |
| GPS antenna       | Wi-Sys           | ANT-SGM3     | HA5252        | Not Labeled   |
| Dual band antenna | Klong            | EX-202       | Not Labeled   | Not Labeled   |

### 2.3.2 Cables associated with EUT

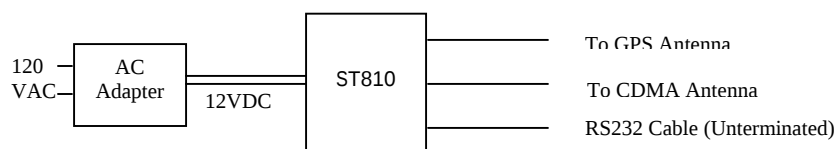
Table 2-2 contains the details of the cables associated with the EUT.

*Table 2-2: Interconnecting cables between modules of EUT*

| Cables                               |        |           |          |                         |                         |
|--------------------------------------|--------|-----------|----------|-------------------------|-------------------------|
| Description                          | Length | Shielding | Ferrites | Connection              |                         |
|                                      |        |           |          | From                    | To                      |
| Dual band antenna cable              | 6 ft   | Coax      | None     | CDMA antenna port       | Klong dual band antenna |
| GPS antenna cable                    | 7 ft   | Coax      | None     | GPS antenna port        | GPS antenna             |
| Power supply wire                    | 5 ft   | None      | None     | Wall mount power supply | Power input port        |
| RS232 programming cable <sup>2</sup> | 5 ft   | Foil      | None     | RS232 port              | Laptop                  |

### 2.3.3 System Block Diagram

The diagram shown below details the interconnection of the EUT and its accessories during FCC Part 15 testing. For specific layout, refer to the test configuration photograph in the relevant section of this report.



<sup>2</sup> This cable is not normally used when the ST810 is in service. During the testing, the cable was attached but was un-terminated.

Evaluation For: Orion Electronics Ltd.  
Model No: ST810

FCC ID: EFCST0001

#### **2.3.4 Justification**

The EUT was operated in the stand-alone configuration.

#### **2.3.5 Mode(s) of operation**

The ST810 was powered by the plug in wall mount power supply during all testing.

#### **2.4 Modifications required for compliance**

No modifications were implemented by Intertek.

#### **2.5 Related Submittal(s) Grants**

None

### 3 TEST FACILITY

The INTERTEK-Lexington is located at 731 Enterprise Drive, Lexington Kentucky, 40510. The radiated emission test site is a 10-meter semi-anechoic chamber. The chamber meets the characteristics of CISPR 16-1: 1993 and ANSI C63.4: 1992. For measurements, a remotely controlled flush-mount metal-top turntable is used to rotate the EUT a full 360 degrees. A remote controlled non-conductive antenna mast is used to scan the antenna height from one to four meters.

*Figure 3-1: 10-Meter EMC Site*



## 4 CONDUCTED RF POWER

FCC §2.1046

### 4.1 Test Procedure

The transmitter output was connected to a calibrated coaxial cable, the other end of which was connected to a CMU-200 Base Station Simulator. The Base Station Simulator was set to force the EUT to its maximum power setting. The EUT was placed into a call and the transmitter output was read off the CMU-200 in dBm. The power output at the transmitter antenna port was determined by adding the value of the cable insertion loss to the CMU-200 power reading.

Tests were performed at three frequencies (low, middle, and high channels) and on the highest power levels, which can be setup on the transmitters.

### 4.2 Test Equipment

| Description            | Manufacturer    | Model Number | Serial Number | Calibration due date |
|------------------------|-----------------|--------------|---------------|----------------------|
| Base Station Simulator | Rohde & Schwarz | CMU-200      | 1100.0008.02  | 8/2004               |

### 4.3 Test Results

The ST810 met the RF power output requirements of FCC Part 22 Subpart H and FCC Part FCC Part 24 Subpart E. The test results are located in Table 4-1.

Table 4-1 RF Power Variation with temperature

| EUT Mode | Frequency MHz | Channel | Measured Power dBm |       |       |
|----------|---------------|---------|--------------------|-------|-------|
|          |               |         | +60°C              | +20°C | -30°C |
| CDMA1900 | 1850.20       | 25      | 23.2               | 23.4  | 23.2  |
|          | 1880.00       | 600     | 23.9               | 24.5  | 24.7  |
|          | 1909.80       | 1175    | 23.08              | 24.3  | 24.7  |
| CDMA800  | 836.52        | 384     | 24.2               | 24.0  | 24.3  |
|          | 848.31        | 777     | 23.03              | 24.58 | 25.4  |
|          | 824.70        | 1013    | 25.5               | 25.09 | 24.5  |

## 5 RADIATED RF POWER

FCC §22.913: The Effective Radiated Power (ERP) of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.

FCC §24.232: The equivalent Isotropic Radiated Power (EIRP) must not exceed 2 Watts.

### 5.1 Test Procedure

The EUT was placed on a non-conductive turntable. The Base Station Simulator was set to force the EUT to its maximum power setting. The radiated emission at the fundamental frequency was measured at 3m with a test antenna and EMI receiver. This was performed with the antenna in both vertical and horizontal polarities.

During the measurement of the EUT, the receiver resolution bandwidth was set to 3 MHz and the video bandwidth was set to 10 kHz. These settings matched the power readings of a power meter with a thermocouple power sensor. The highest emission was recorded with the rotation of the turntable and the raising and lowering of the test antenna. The receiver reading was recorded and the field strength (E in dB $\mu$ V/m) was calculated.

EIRP in frequency band 1851.25-1910 MHz were measured using a substitution method. The EUT was replaced by a horn antenna (1851.25-1910 MHz) connected to a signal generator, which was set to -10 dBm. The receiver reading was recorded and EIRP was calculated as follows:

$$\text{EIRP} = E_1 - E_2 + V_g + G$$

where,

$E_1$  is the receiver reading in dB $\mu$ V/m when measuring the field strength of the EUT

$E_2$  is the receiver reading in dB $\mu$ V/m when measured field strength from the generator

$V_g$  is the generator output in dBm

G is the gain of the transmitting antenna in dBi.

### 5.2 Test Equipment

| Description      | Manufacturer     | Model Number | Serial Number | Calibration due date |
|------------------|------------------|--------------|---------------|----------------------|
| Signal Generator | HP               | 83620B       | 3614A00199    | 8/2004               |
| Horn Antenna     | Antenna Research | DRG-118/A    | 1086          | 3/7/2007             |
| Horn Antenna     | EMCO             | 3115         | 6556          | 7/11/2004            |
| EMI Receiver     | Rohde & Schwarz  | ESI 26       | 1088.7490     | 11/27/2003           |

### 5.3 Test Results

The ST810 met the radiated power requirements of FCC §24.232. The test results are located in Table 5-1.

Table 5-1 Radiated RF Power

| EUT Resting Vertical on an 80cm High Wooden Table |         |                 |                     |                               |                    |                             |                     |                       |                  |
|---------------------------------------------------|---------|-----------------|---------------------|-------------------------------|--------------------|-----------------------------|---------------------|-----------------------|------------------|
| EUT Mode                                          | Channel | Frequency (MHz) | Rx Antenna Polarity | Measurement Method (ERP/EIRP) | EUT Reading (dBuV) | Substitution Reading (dBuV) | Cable Reading (dBm) | Tx Antenna Gain (dBi) | ERP / EIRP (dBm) |
| CDMA PCS                                          | 25      | 1851.25         | V                   | EIRP                          | 79.16              | 62.31                       | -2.33               | 7.2                   | 21.72            |
| CDMA PCS                                          | 600     | 1880            | V                   | EIRP                          | 80.51              | 61.99                       | -2.32               | 7.2                   | 23.4             |
| CDMA PCS                                          | 1175    | 1908.75         | V                   | EIRP                          | 79.13              | 61.54                       | -2.44               | 7.2                   | 22.35            |
| CDMA PCS                                          | 25      | 1851.25         | H                   | EIRP                          | 78.2               | 62.24                       | -2.33               | 7.1                   | 20.73            |
| CDMA PCS                                          | 600     | 1880            | H                   | EIRP                          | 80.62              | 61.68                       | -2.32               | 7.1                   | 23.72            |
| CDMA PCS                                          | 1175    | 1908.75         | H                   | EIRP                          | 80.68              | 61.68                       | -2.44               | 7.1                   | 23.66            |
| CDMA Cell                                         | 384     | 836.52          | V                   | ERP                           | 92.8               | 70.98                       | 2.36                | 0                     | 24.18            |
| CDMA Cell                                         | 777     | 848.31          | V                   | ERP                           | 93.61              | 71.41                       | 2.34                | 0                     | 24.54            |
| CDMA Cell                                         | 1013    | 824.7           | V                   | ERP                           | 93.52              | 71.38                       | 2.38                | 0                     | 24.52            |
| CDMA Cell                                         | 384     | 836.52          | H                   | ERP                           | 91.03              | 72.15                       | 2.36                | 0                     | 21.24            |
| CDMA Cell                                         | 777     | 848.31          | H                   | ERP                           | 91.55              | 71.98                       | 2.34                | 0                     | 21.91            |
| CDMA Cell                                         | 1013    | 824.7           | H                   | ERP                           | 93.81              | 72.97                       | 2.38                | 0                     | 23.22            |

| EUT Resting Flat on an 80cm High Wooden Table |         |                 |                     |                               |                    |                             |                     |                       |                  |
|-----------------------------------------------|---------|-----------------|---------------------|-------------------------------|--------------------|-----------------------------|---------------------|-----------------------|------------------|
| EUT Mode                                      | Channel | Frequency (MHz) | Rx Antenna Polarity | Measurement Method (ERP/EIRP) | EUT Reading (dBuV) | Substitution Reading (dBuV) | Cable Reading (dBm) | Tx Antenna Gain (dBi) | ERP / EIRP (dBm) |
| CDMA PCS                                      | 25      | 1851.25         | V                   | EIRP                          | 78.3               | 62.31                       | -2.33               | 7.2                   | 20.86            |
| CDMA PCS                                      | 600     | 1880            | V                   | EIRP                          | 79.24              | 61.99                       | -2.32               | 7.2                   | 22.13            |
| CDMA PCS                                      | 1175    | 1908.75         | V                   | EIRP                          | 78.46              | 61.54                       | -2.44               | 7.2                   | 21.68            |
| CDMA PCS                                      | 25      | 1851.25         | H                   | EIRP                          | 79.2               | 62.24                       | -2.33               | 7.1                   | 21.73            |
| CDMA PCS                                      | 600     | 1880            | H                   | EIRP                          | 78.35              | 61.68                       | -2.32               | 7.1                   | 21.45            |
| CDMA PCS                                      | 1175    | 1908.75         | H                   | EIRP                          | 80.21              | 61.68                       | -2.44               | 7.1                   | 23.19            |
| CDMA Cell                                     | 384     | 836.52          | V                   | ERP                           | 91.46              | 70.98                       | 2.36                | 0                     | 22.84            |
| CDMA Cell                                     | 777     | 848.31          | V                   | ERP                           | 92.36              | 71.41                       | 2.34                | 0                     | 23.29            |
| CDMA Cell                                     | 1013    | 824.7           | V                   | ERP                           | 93.27              | 71.38                       | 2.38                | 0                     | 24.27            |
| CDMA Cell                                     | 384     | 836.52          | H                   | ERP                           | 91.05              | 72.15                       | 2.36                | 0                     | 21.26            |
| CDMA Cell                                     | 777     | 848.31          | H                   | ERP                           | 91.84              | 71.98                       | 2.34                | 0                     | 22.2             |
| CDMA Cell                                     | 1013    | 824.7           | H                   | ERP                           | 92.83              | 72.97                       | 2.38                | 0                     | 22.24            |

## 6 EMISSION LIMITATIONS, OCCUPIED BANDWIDTH

CFR 47 §2.1049

The occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission.

### 6.1 Test Procedure

In both CDMA 800 and 1900 modes the antenna port of the EUT was connected to a spectrum analyzer using a calibrated coaxial cable and directional coupler. The EUT was placed into a call using a CMU – 200 base station simulator. The Base Station Simulator was set to force the EUT to its maximum power setting. The occupied bandwidth function of the analyzer was used to automatically generate the occupied bandwidth plots below.

### 6.2 Test Equipment

| Description            | Manufacturer       | Model Number | Serial Number | Calibration due date |
|------------------------|--------------------|--------------|---------------|----------------------|
| Base Station Simulator | Rohde & Schwarz    | CMU-200      | 1100.0008.02  | 8/2004               |
| EMI Receiver           | Rohde & Schwarz    | ESI 26       | 1088.7490     | 11/27/2003           |
| Directional Coupler    | Amplifier Research | DC7144       | 22729         | 8/2004               |

### 6.3 Test Results

The following is the occupied bandwidth data for the ST810 .

*Table 6-1: Occupied bandwidth measurements for CDMA modes*

| Mode     | Channel | Resolution Bandwidth | Video Bandwidth | Sweep time | Measured Bandwidth MHz |
|----------|---------|----------------------|-----------------|------------|------------------------|
| CDMA800  | 384     | 30 kHz               | 300 kHz         | 2s         | 1.28                   |
| CDMA800  | 1013    | 30 kHz               | 300 kHz         | 2s         | 1.27                   |
| CDMA800  | 777     | 30 kHz               | 300 kHz         | 2s         | 1.28                   |
| CDMA1900 | 25      | 30 kHz               | 300 kHz         | 2s         | 1.28                   |
| CDMA1900 | 600     | 30 kHz               | 300 kHz         | 2s         | 1.28                   |
| CDMA1900 | 1175    | 30 kHz               | 300 kHz         | 2s         | 1.28                   |

Figure 6-1: Occupied Bandwidth – Cell Channel 384

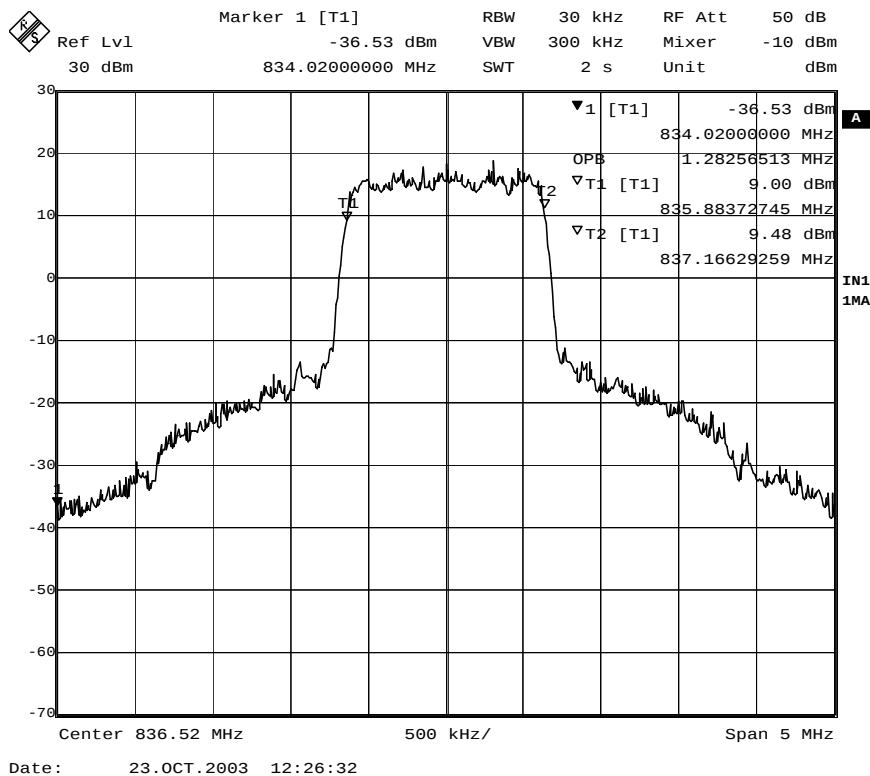


Figure 6-3: Occupied Bandwidth – Cell Channel 777

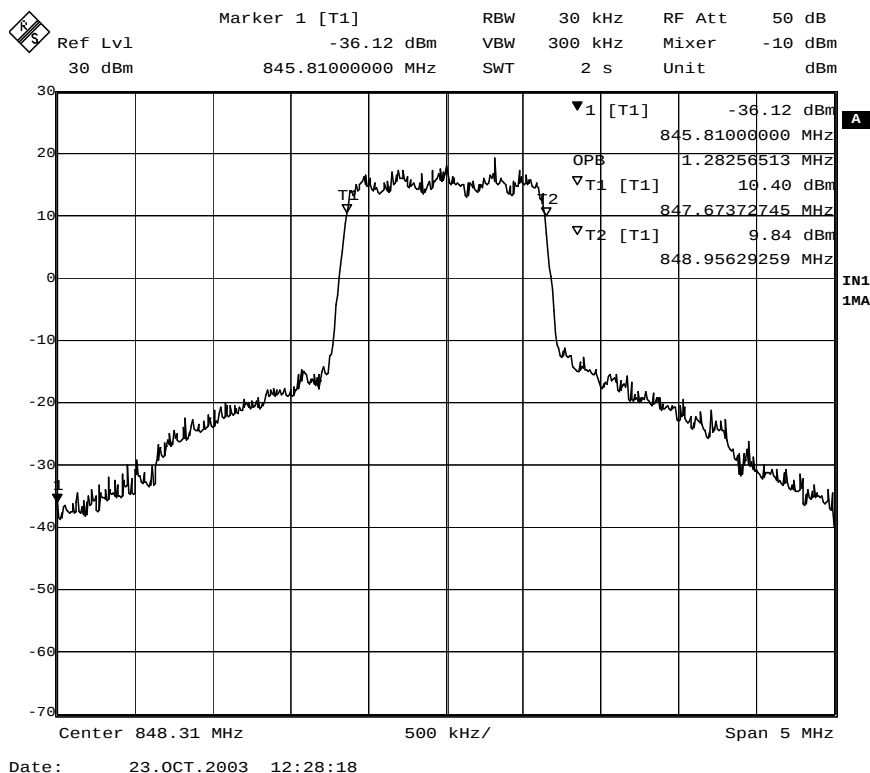


Figure 6-5: Occupied Bandwidth – Cell Channel 1013

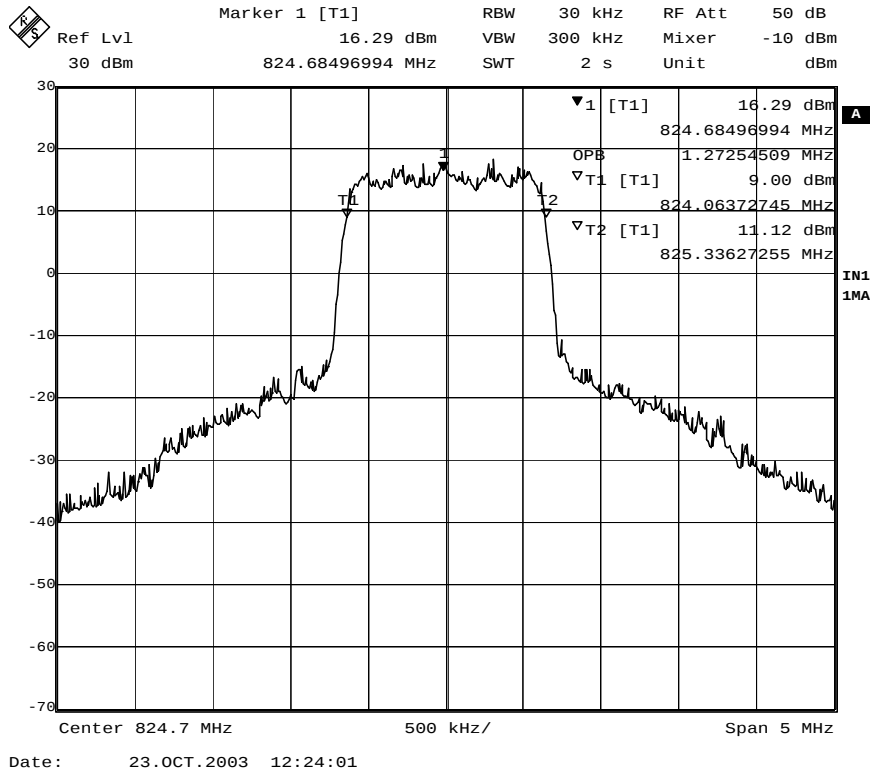


Figure 6-7: Occupied Bandwidth – PCS Channel 25

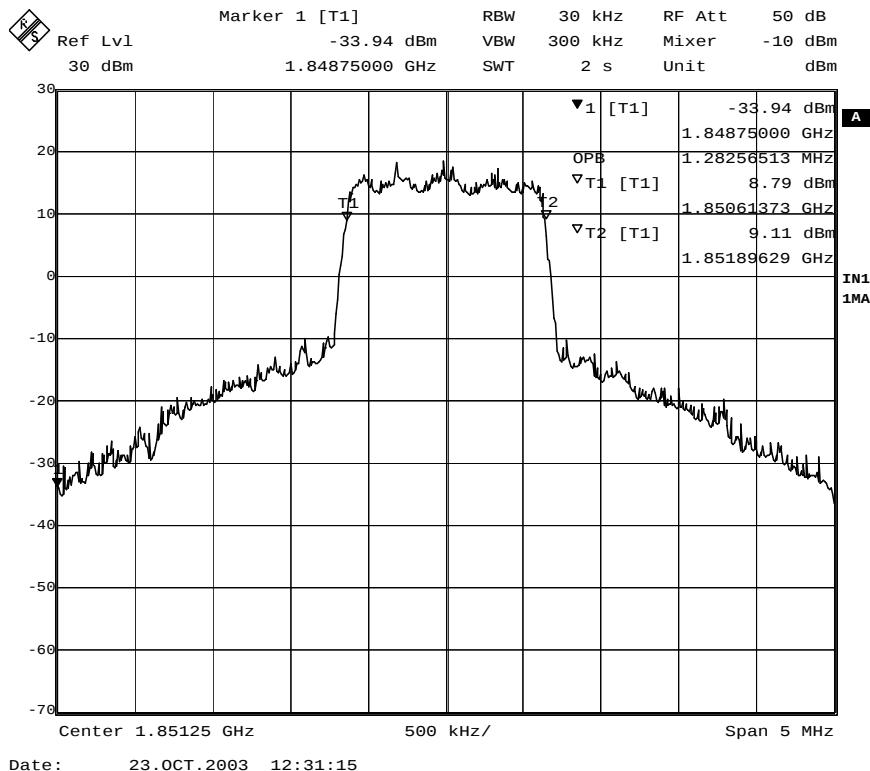


Figure 6-9: Occupied Bandwidth – PCS Channel 600

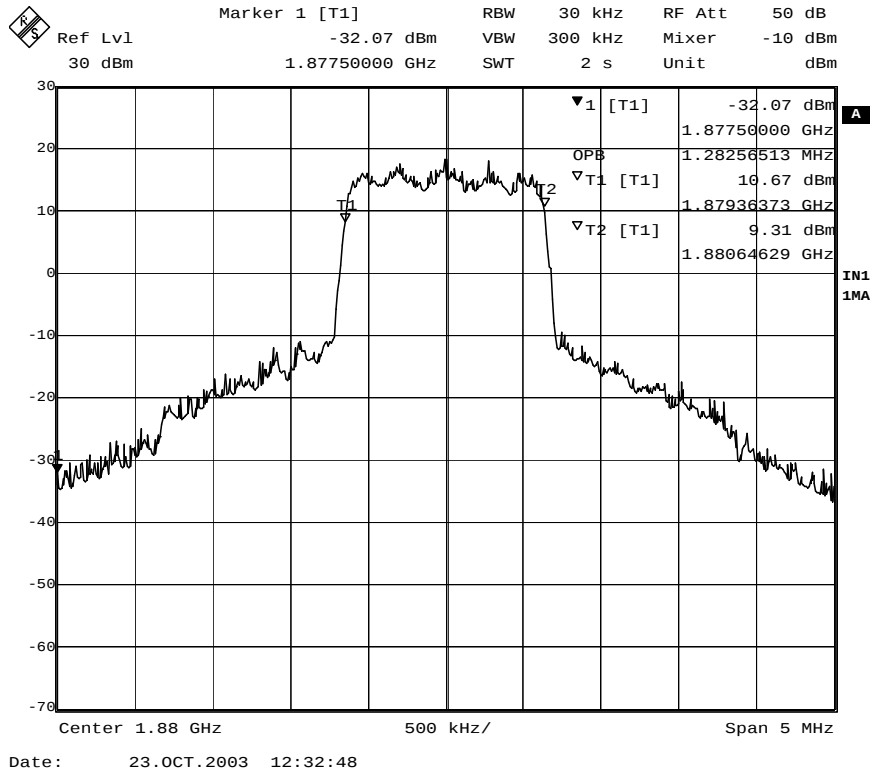
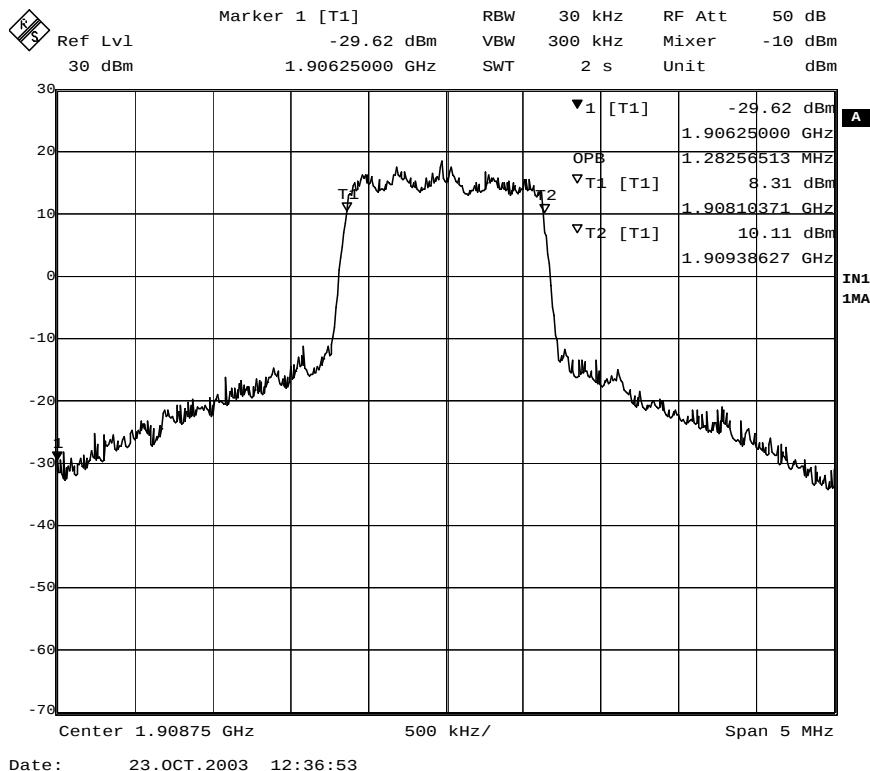


Figure 6-11: Occupied Bandwidth – PCS Channel 1175



## 7 OUT OF BAND EMISSION AT ANTENNA TERMINALS

FCC §2.1049, FCC §2.1051, §22.917(a), FCC §24.238(a)

Out of Band Emissions: The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log(P)$  dB.

### 7.1 Test Procedure

Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater for the Cellular band and 1 MHz or greater in the PCS band. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (*i.e.* 100 kHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

The RF output of the transceiver was connected to a spectrum analyzer through appropriate attenuation. The Base Station Simulator was set to force the EUT to its maximum power setting. The resolution bandwidth of the spectrum analyzer was set at 1 MHz. The audio modulating signal was adjusted like it is described in Section 6.1 of this report. Sufficient scans were taken to show the out of band Emissions if any up to 10th harmonic.

### 7.2 Test Equipment

| Description            | Manufacturer       | Model Number | Serial Number | Calibration due date |
|------------------------|--------------------|--------------|---------------|----------------------|
| Base Station Simulator | Rohde & Schwarz    | CMU-200      | 1100.0008.02  | 8/2004               |
| EMI Receiver           | Rohde & Schwarz    | ESI 26       | 1088.7490     | 11/27/2003           |
| Directional Coupler    | Amplifier Research | DC7144       | 22729         | 8/2004               |

### 7.3 Test Results

The ST810 met the out of band emission at antenna terminal requirements.

*Table 7-1: Summary of test result locations*

| Location   | Mode (Band) | Channel        | Description                                   |
|------------|-------------|----------------|-----------------------------------------------|
| Figure 7-1 | CDMA Cell   | 384, 777, 1013 | Conducted spurious emissions, 30MHz to 20 GHz |
| Figure 7-2 | CDMA Cell   | 384, 777, 1013 | Zoom Graph of the Carrier Frequencies         |
| Figure 7-3 | CDMA PCS    | 25, 600, 1175  | Conducted spurious emissions, 30MHz to 20 GHz |
| Figure 7-4 | CDMA PCS    | 25, 600, 1175  | Zoom Graph of the Carrier Frequencies         |
| Figure 7-5 | CDMA Cell   | 1013           | Emissions within 1 MHz of band edge           |
| Figure 7-6 | CDMA Cell   | 777            | Emissions within 1 MHz of band edge           |
| Figure 7-7 | CDMA PCS    | 25             | Emissions within 1 MHz of band edge           |
| Figure 7-8 | CDMA PCS    | 1175           | Emissions within 1 MHz of band edge           |

Figure 7-1: Out of band emissions at antenna terminals – CDMA 800 Channel 384, 777, and 1013

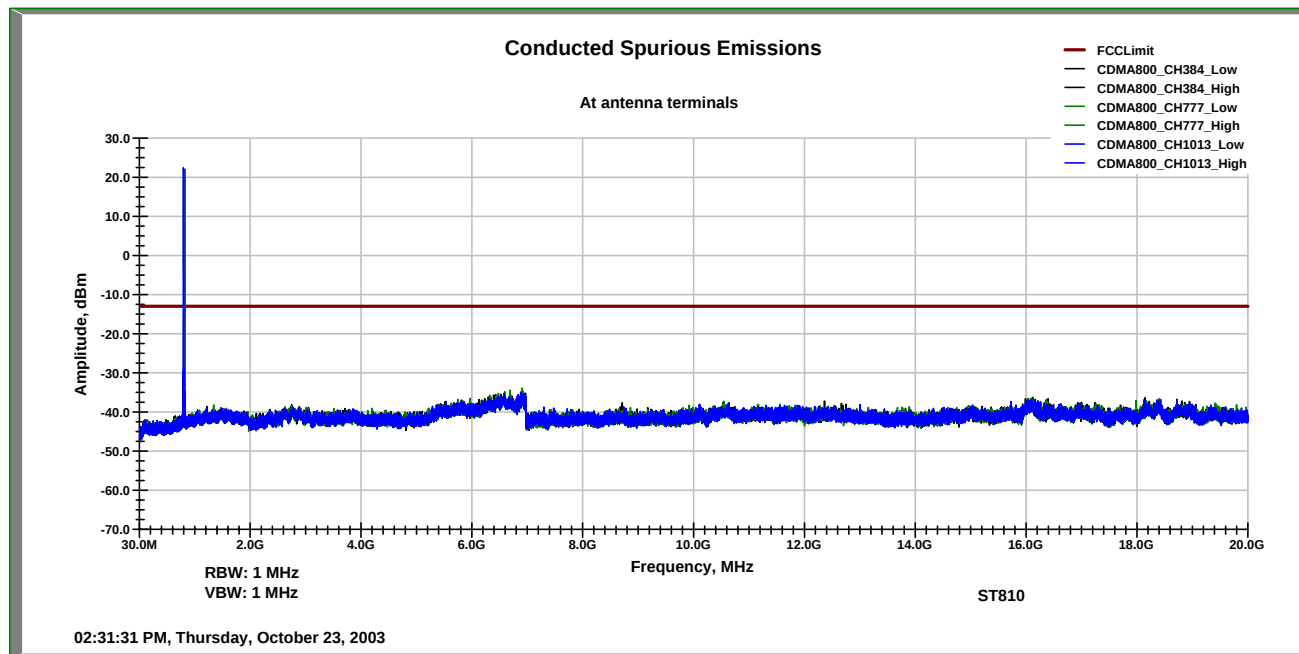


Figure 7-2: Out of band emissions at antenna terminals – CDMA 800 Channel 384, 777, and 1013  
(Zoomed Around Carrier Frequencies)

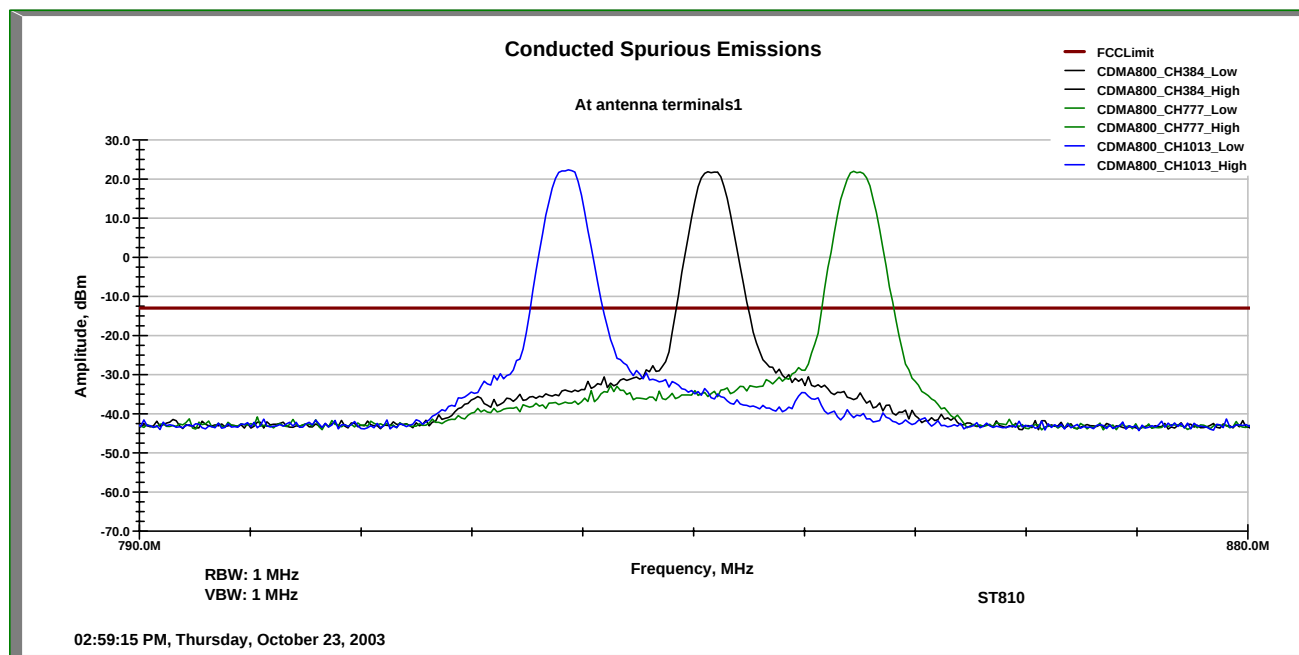


Figure 7-3: Out of band emissions at antenna terminals – CDMA1900 Channel 25, 600, 1175

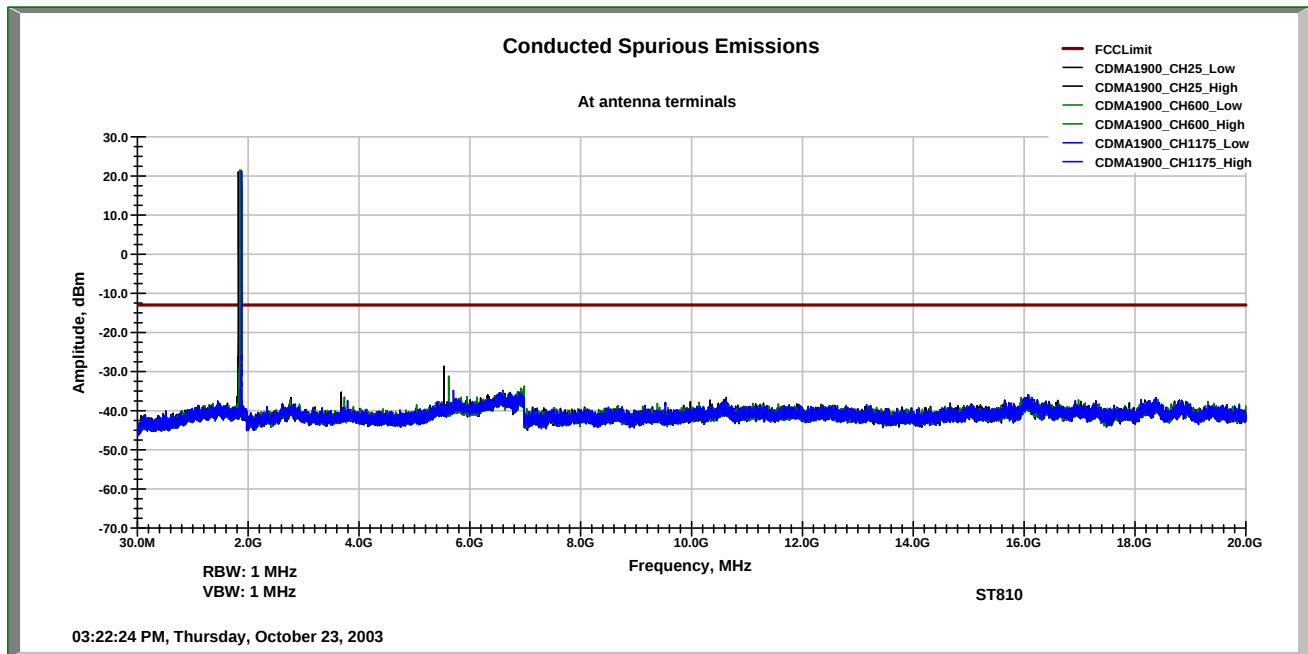


Figure 7-4: Out of band emissions at antenna terminals – CDMA1900 Channel 25, 600, 1175 (Zoomed In on Carrier Frequencies)

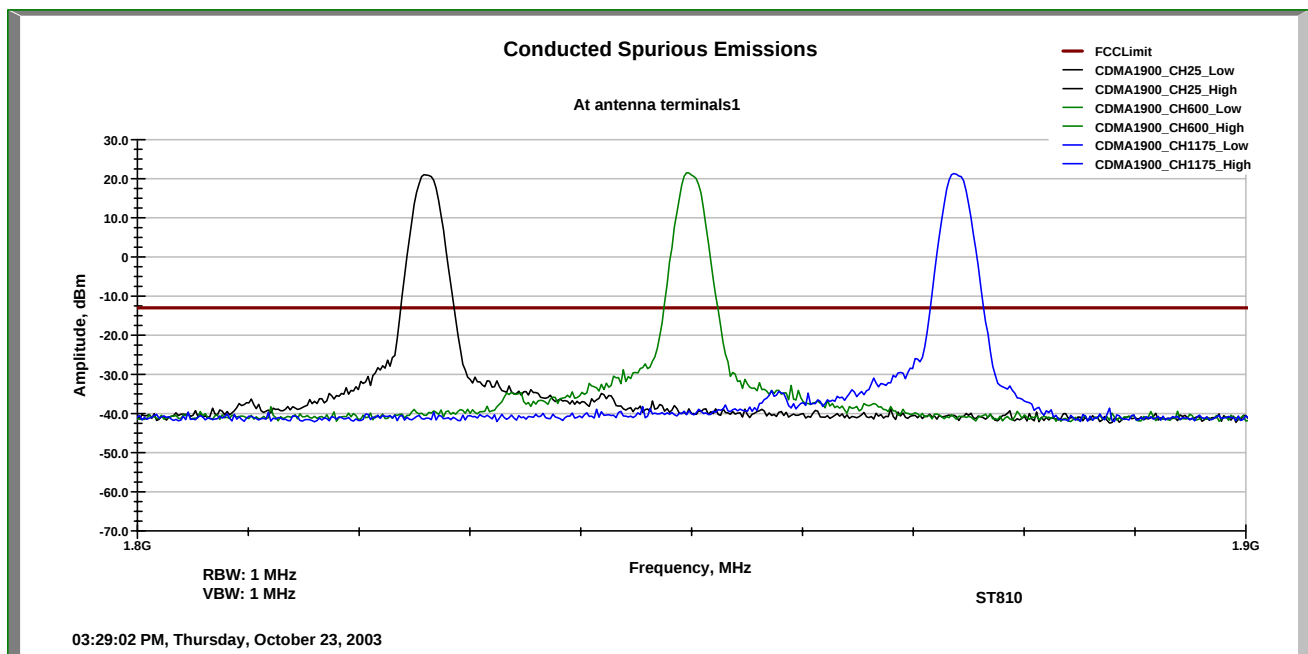


Figure 7-5: Emissions within 1 MHz of band edge, CDMA 800 Channel 1013

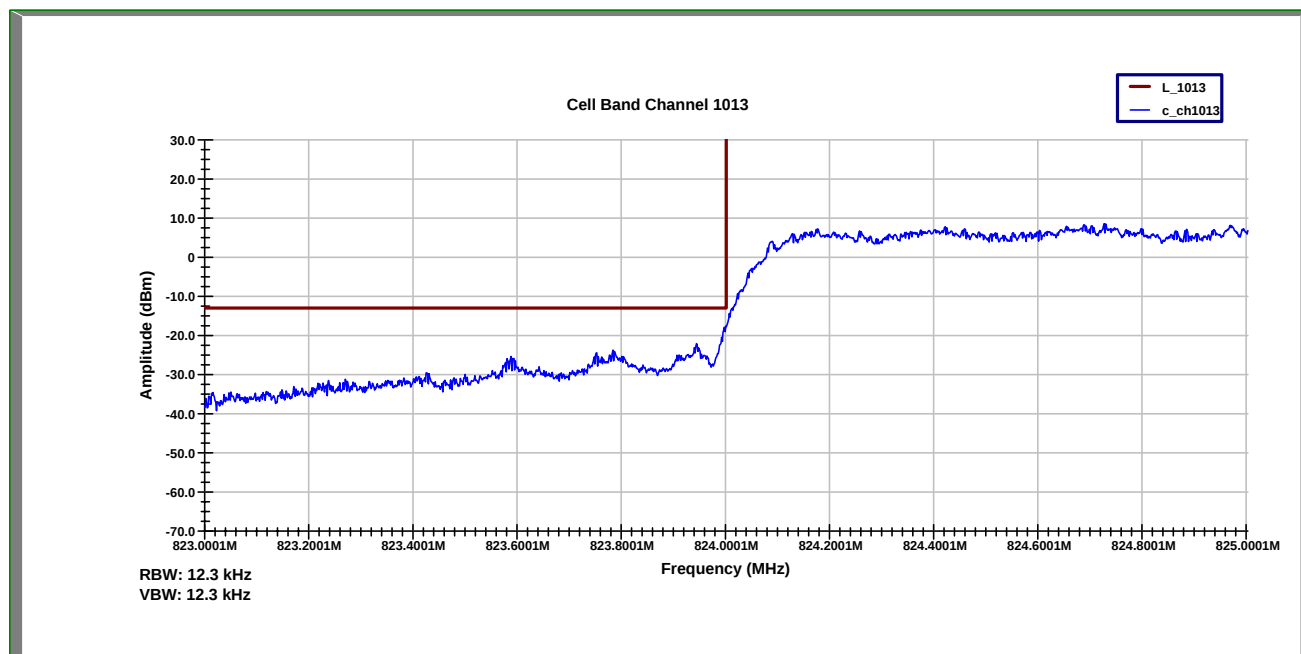


Figure 7-6: Emissions within 1 MHz of band edge, CDMA 800 Channel 777

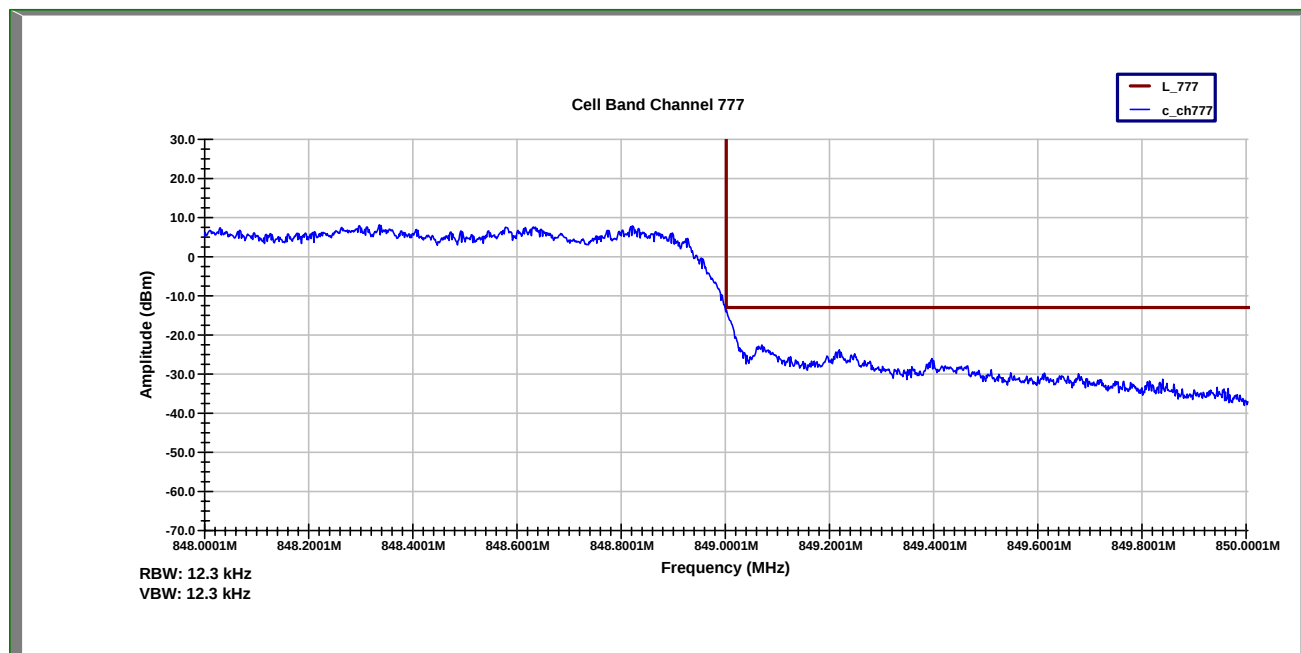


Figure 7-7: Emissions within 1 MHz of band edge, CDMA 1900 Channel 25

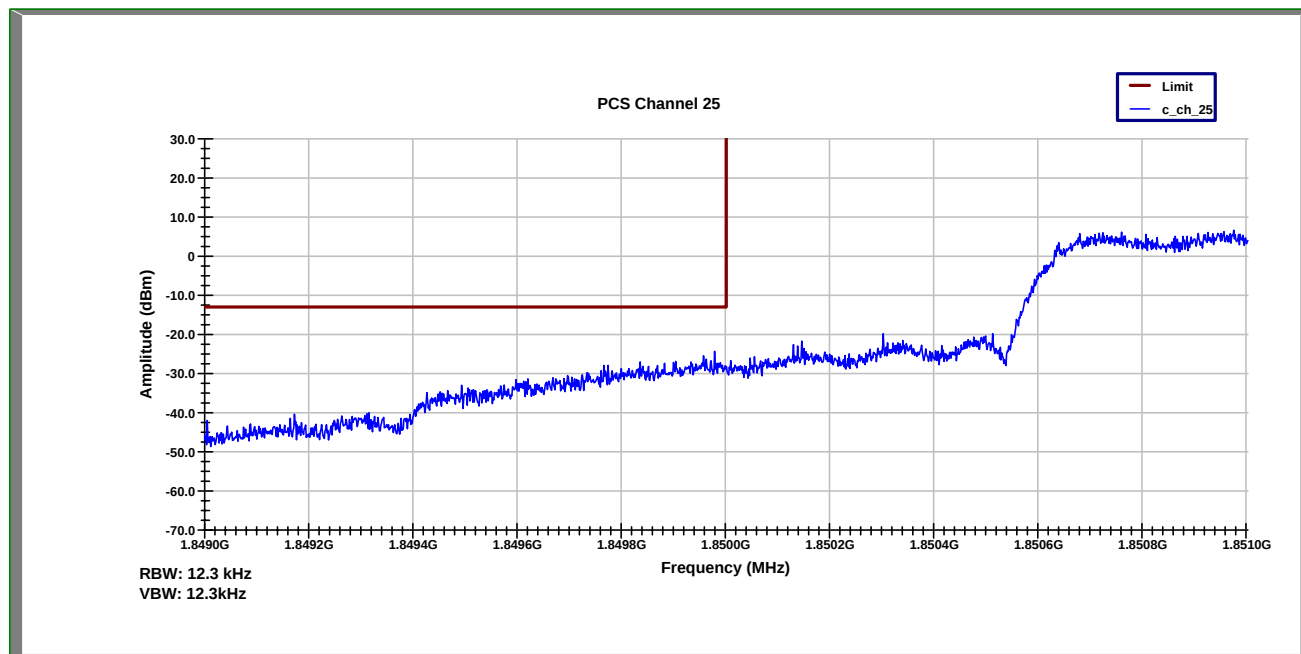
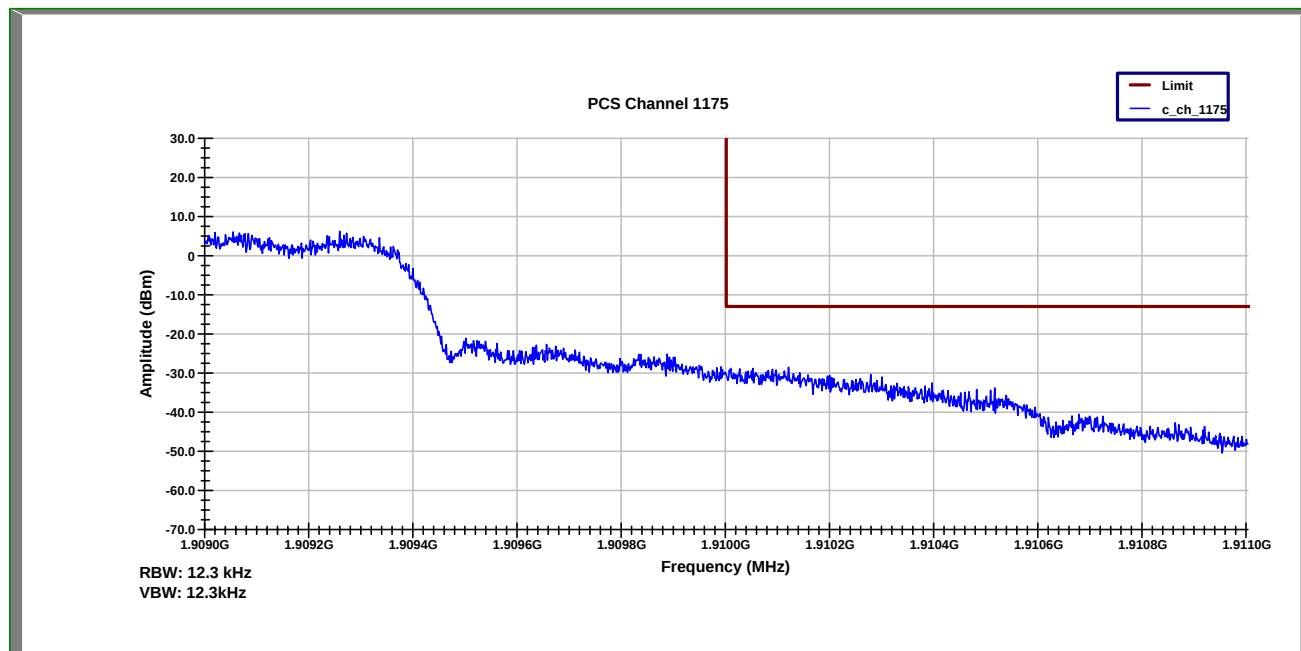


Figure 7-8: Emissions within 1 MHz of band edge, CDMA 1900 Channel 1175



## 8 FIELD STRENGTH OF SPURIOUS RADIATION

FCC §2.1053

### 8.1 Test Procedure

The EUT was placed on a non-conductive turntable. The measurement antenna was placed at a distance of 3 meters from the EUT. The Base Station Simulator was set to force the EUT to its maximum power setting. During the tests, the antenna height and EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. This maximization process was repeated with the EUT positioned in each of its three orthogonal orientations.

The frequency range up to tenth harmonic was investigated for each of three fundamental frequencies (low, middle, and high channels). Once spurious emissions were identified, the power of the emission was determined using the substitution method.

The spurious emissions attenuation was calculated as the difference between radiated power at the fundamental frequency and at the spurious emissions frequency.

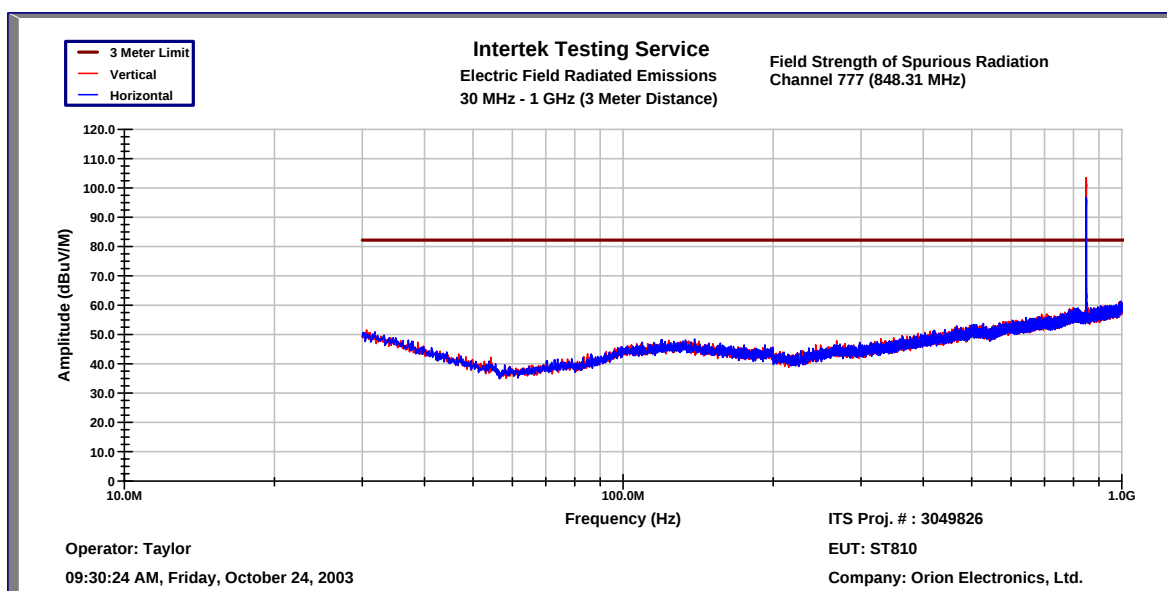
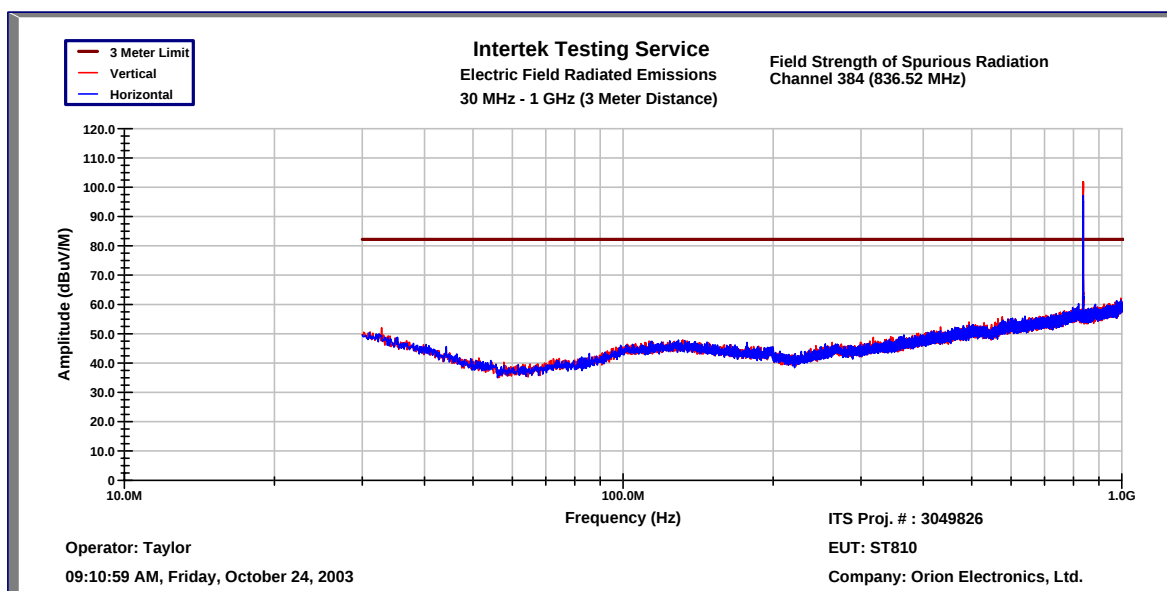
### 8.2 Test Equipment

| Description            | Manufacturer     | Model Number      | Serial Number | Calibration due date |
|------------------------|------------------|-------------------|---------------|----------------------|
| Base Station Simulator | Rohde & Schwarz  | CMU-200           | 1100.0008.02  | 8/2004               |
| Signal Generator       | HP               | 83620B            | 3614A00199    | 8/2004               |
| Horn Antenna           | Antenna Research | DRG-118/A         | 1086          | 3/7/2007             |
| Horn Antenna           | EMCO             | 3115              | 6556          | 7/11/2004            |
| EMI Receiver           | Rohde & Schwarz  | ESI 26            | 1088.7490     | 11/27/2003           |
| LISN                   | FCC              | FCC-LISN-50-50-2M | 1026          | 12/2003              |
| Bilog Antenna          | EMCO             | 3142B             | 1674          | 8/2004               |
| Preamplifier           | HP               | 8449B             | 3008A00775    | 12/2003              |
| High Pass Filter       | Filtek           | HP12/2000-5AB     | 15B61         | 8/2004               |

### 8.3 Test Results

The ST810 met the field strength of spurious radiation requirements of FCC §2.1053. There were no spurious emissions within 20 dB of the limit. See Figure 8-1 through Figure 8-6 for the graphical test data.

*Figure 8-1: Field Strength of Spurious Radiation (30 MHz – 1 GHz), CDMA 800 Channel 384, 777, and 1013*



Evaluation For: Orion Electronics Ltd.  
Model No: ST810

FCC ID: EFCST0001

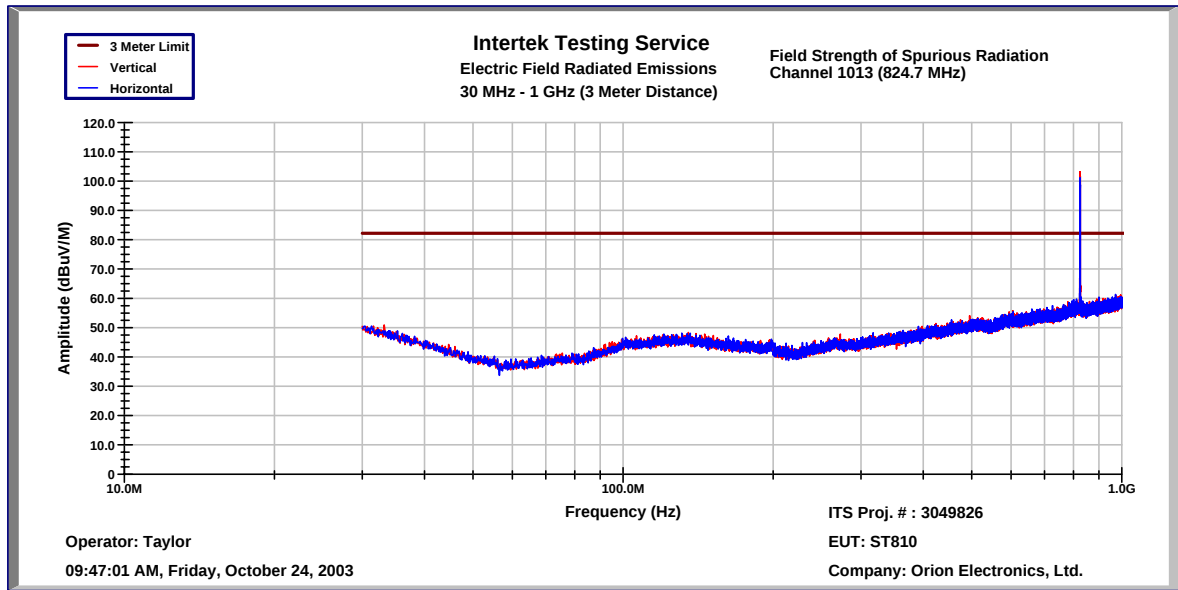
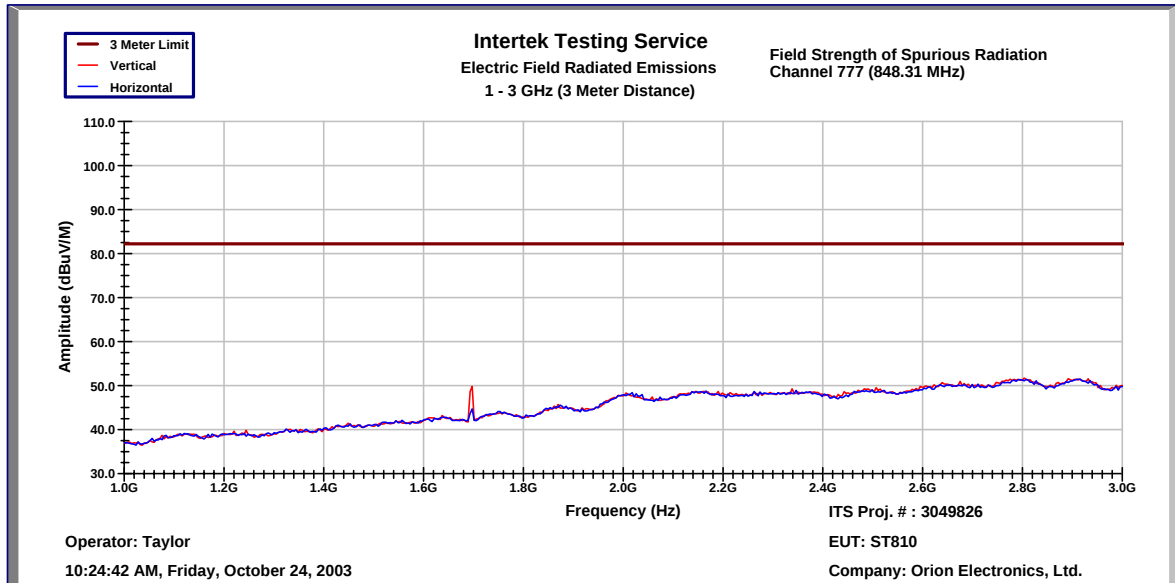
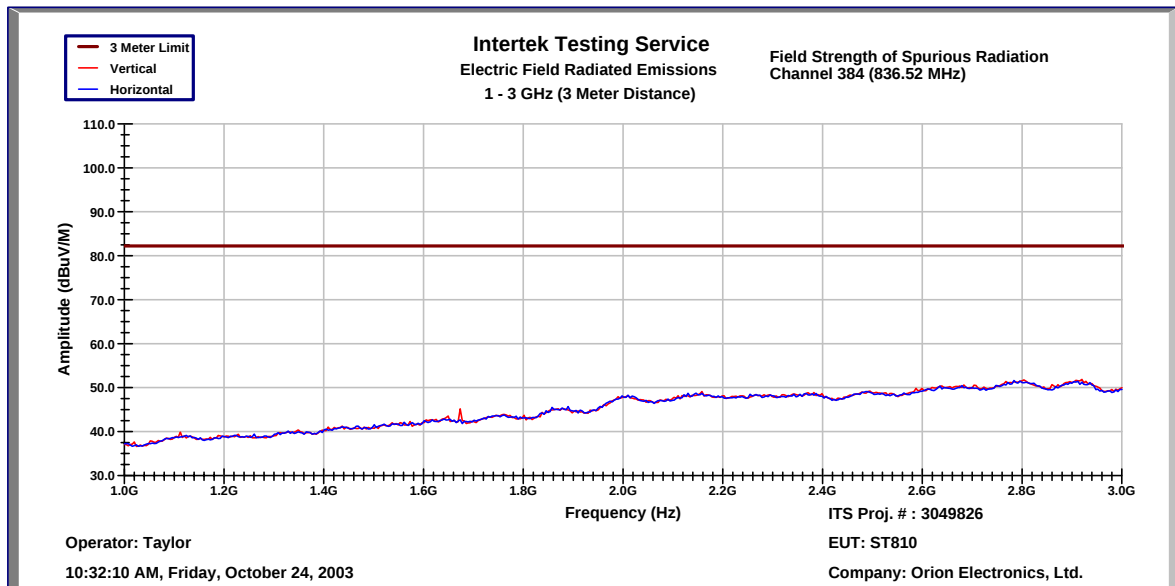


Figure 8-2: Field Strength of Spurious Radiation (1 GHz – 3 GHz), CDMA 800 Channel 384,777, 1013



Evaluation For: Orion Electronics Ltd.  
Model No: ST810

FCC ID: EFCST0001

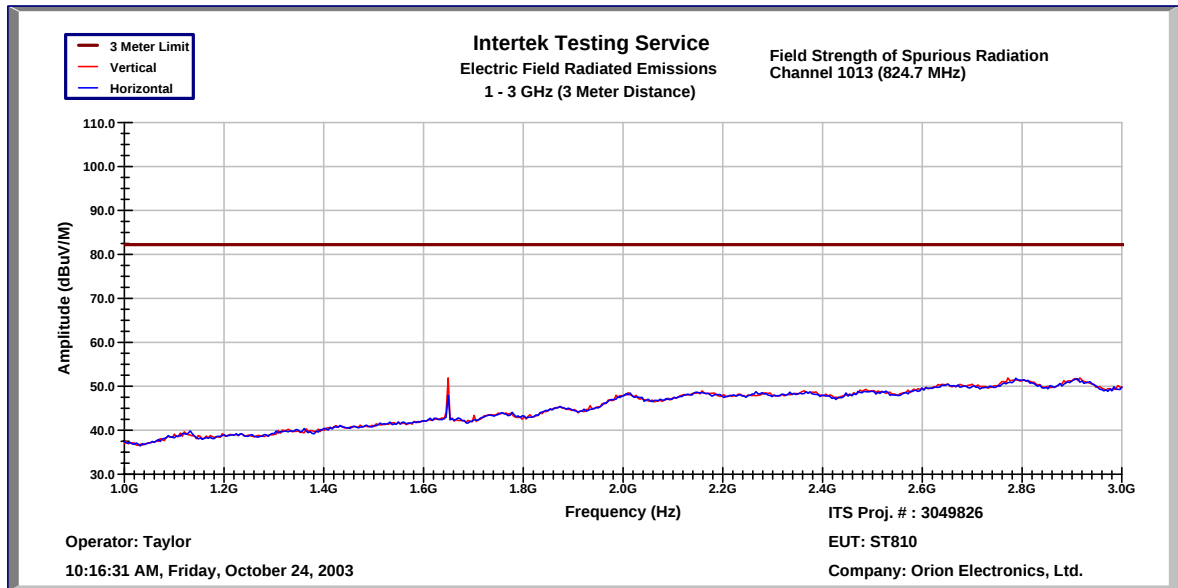
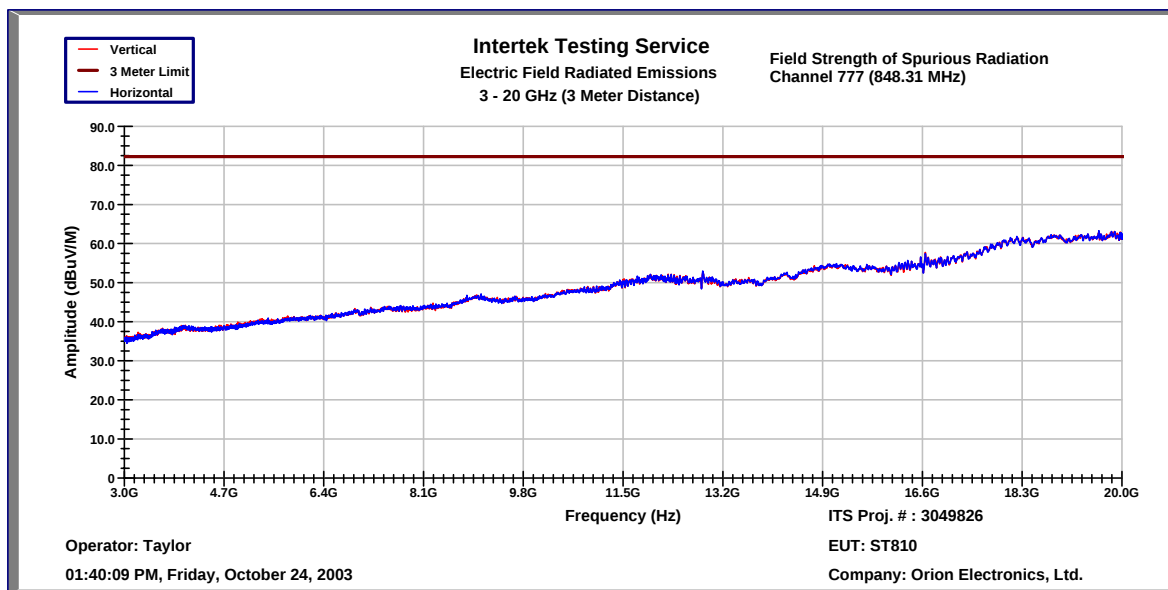
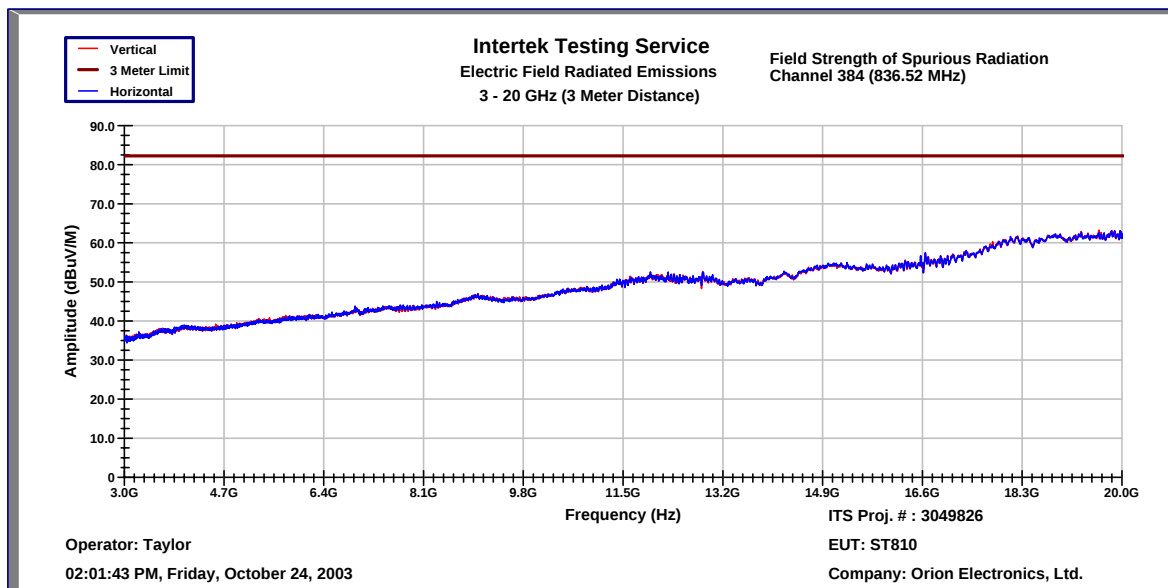


Figure 8-3: Field Strength of Spurious Radiation (3GHz – 20GHz), CDMA 800 Channel 384, 777, and 1013



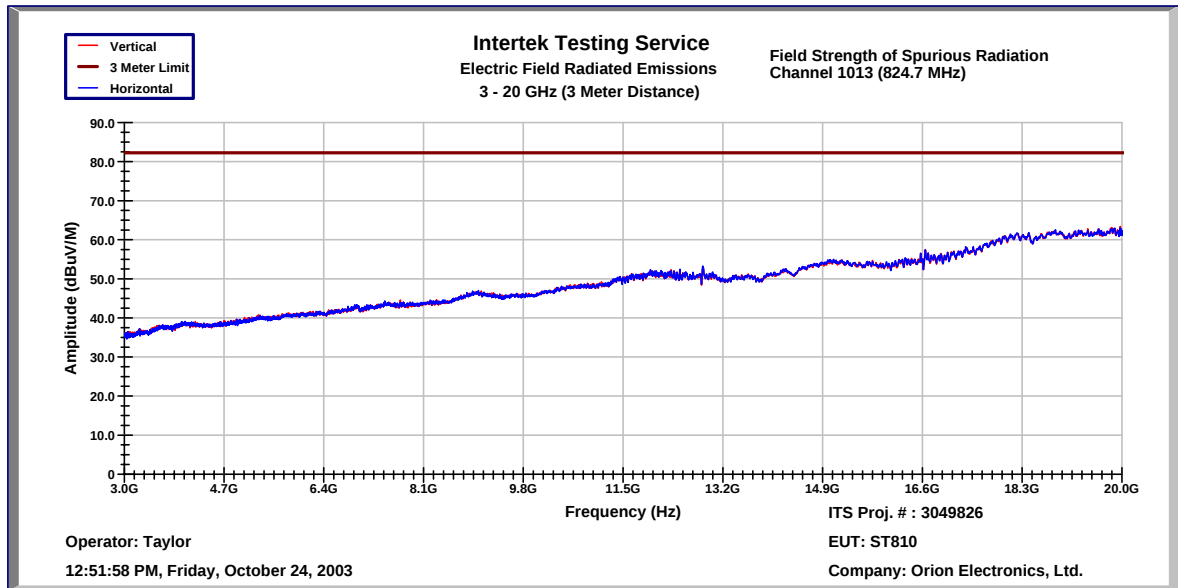
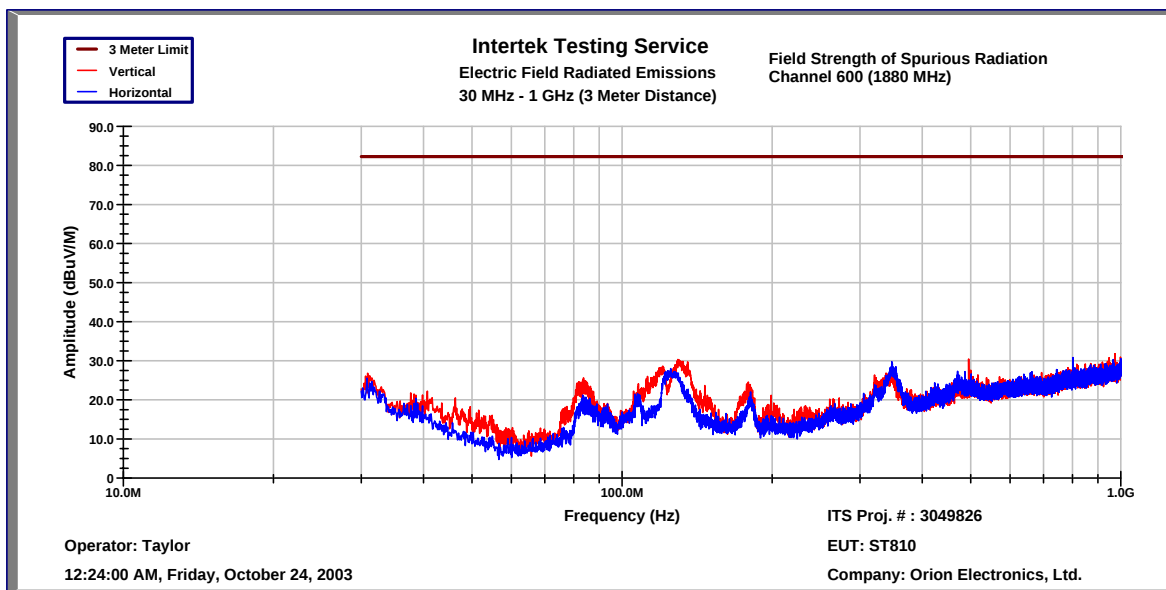
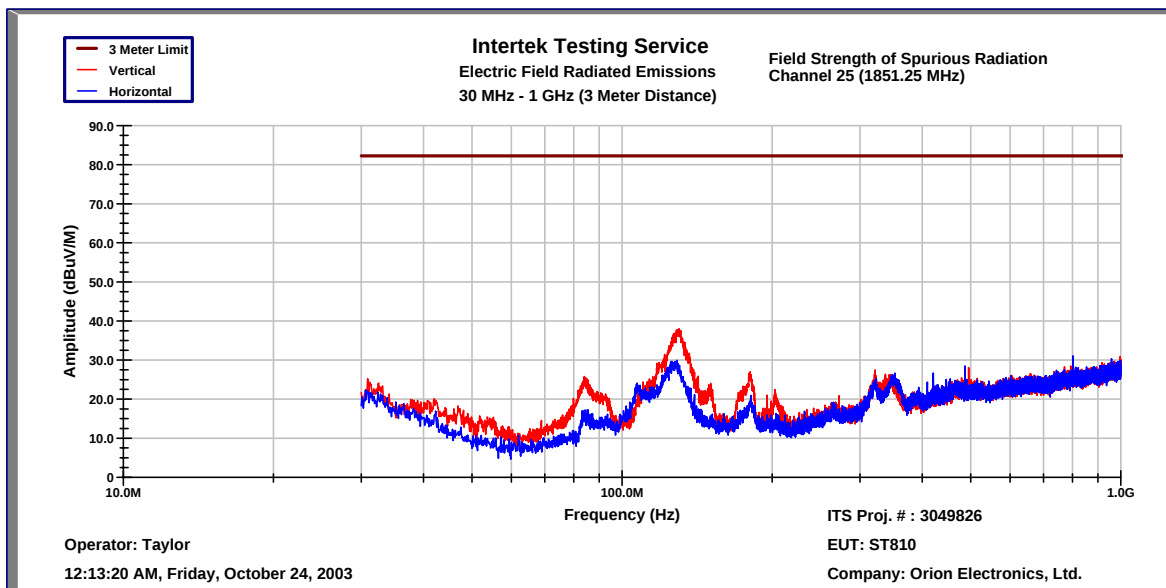


Figure 8-4: Field Strength of Spurious Radiation (30 MHz – 1 GHz), CDMA 1900 Channel 25, 600, and 1175



Evaluation For: Orion Electronics Ltd.  
Model No: ST810

FCC ID: EFCST0001

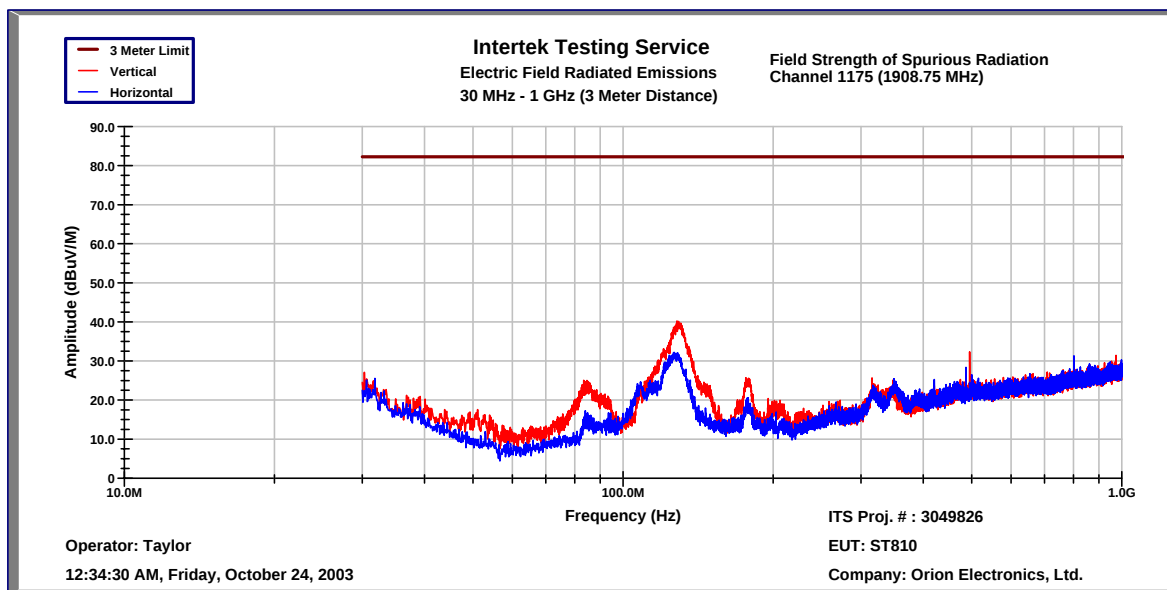
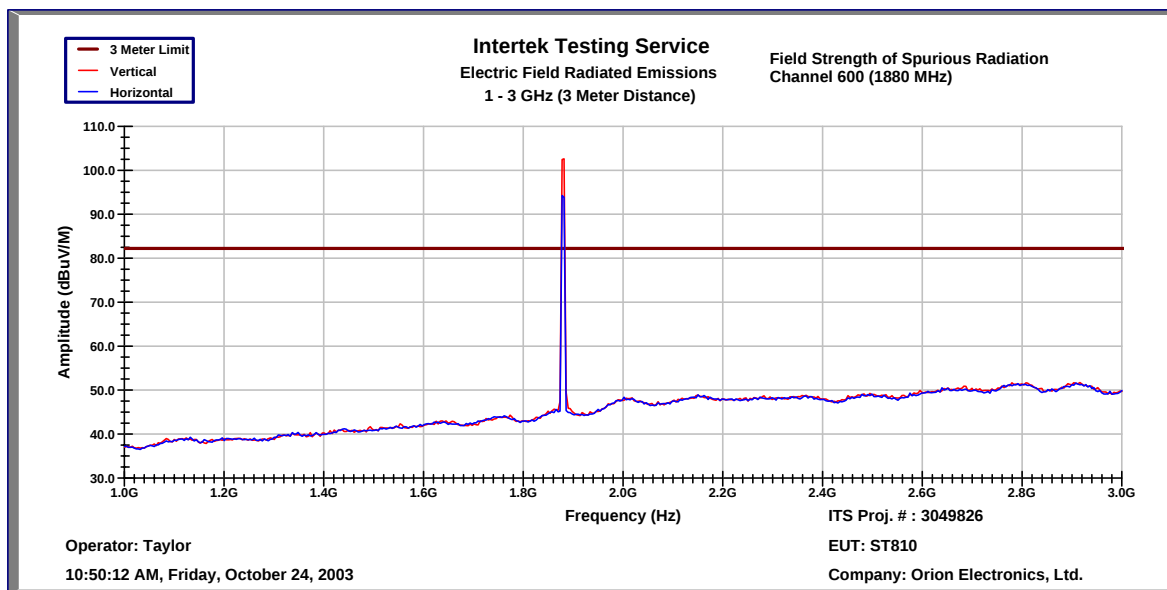
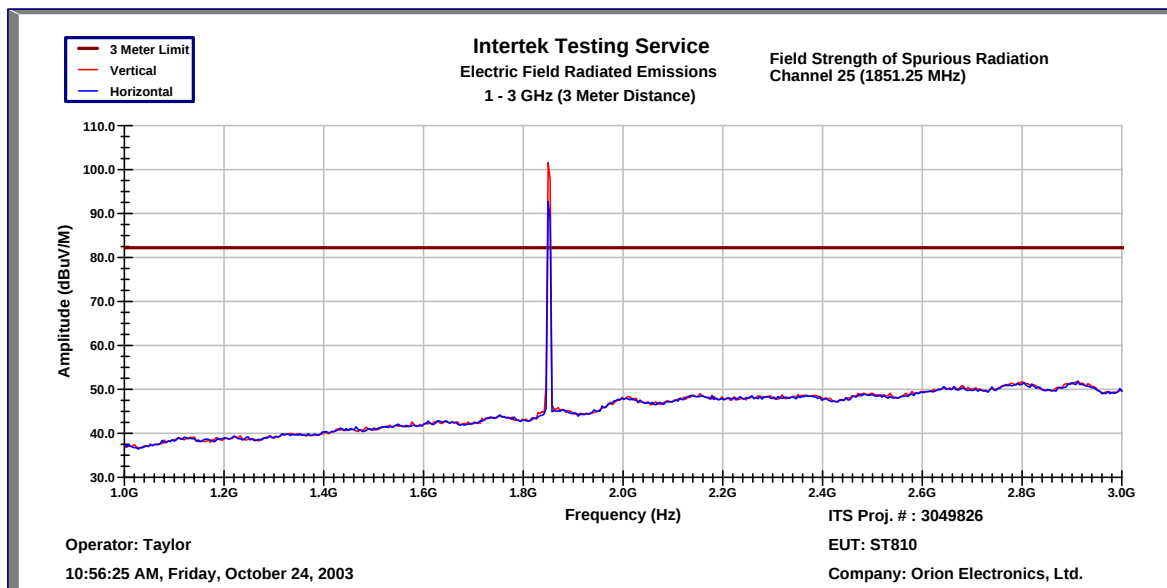


Figure 8-5: Field Strength of Spurious Radiation (1 GHz – 3 GHz), CDMA 1900 Channel 25, 600, and 1175



Evaluation For: Orion Electronics Ltd.  
Model No: ST810

FCC ID: EFCST0001

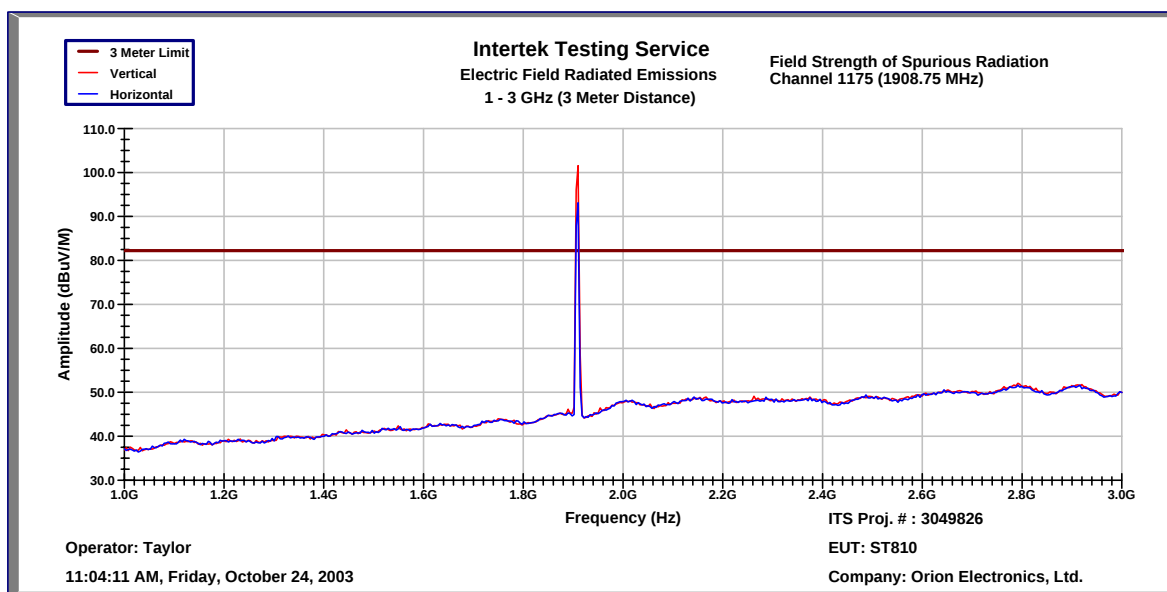
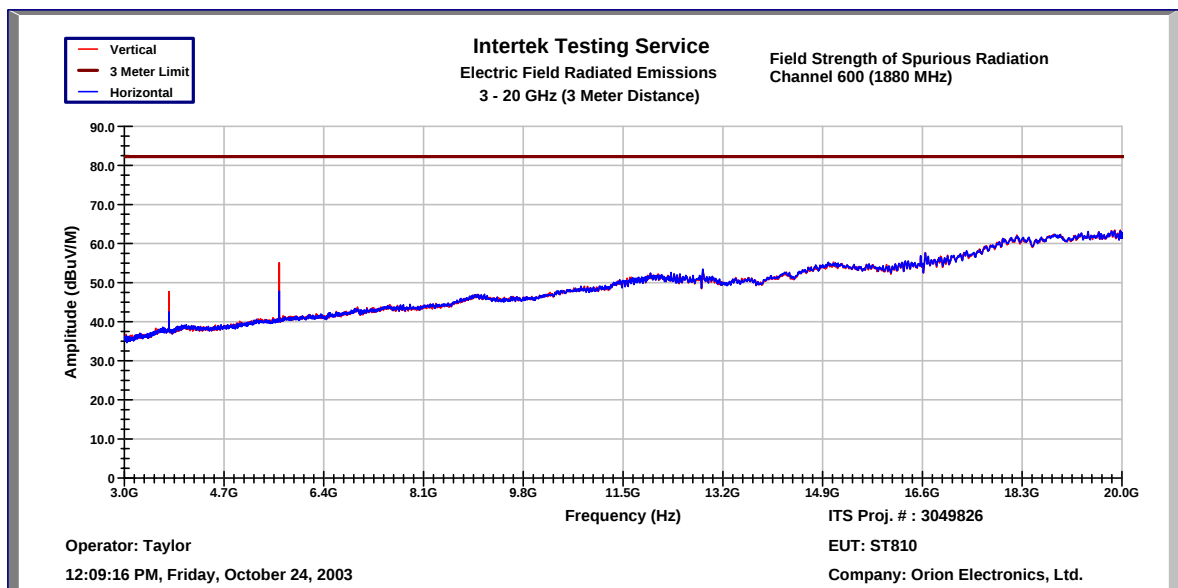
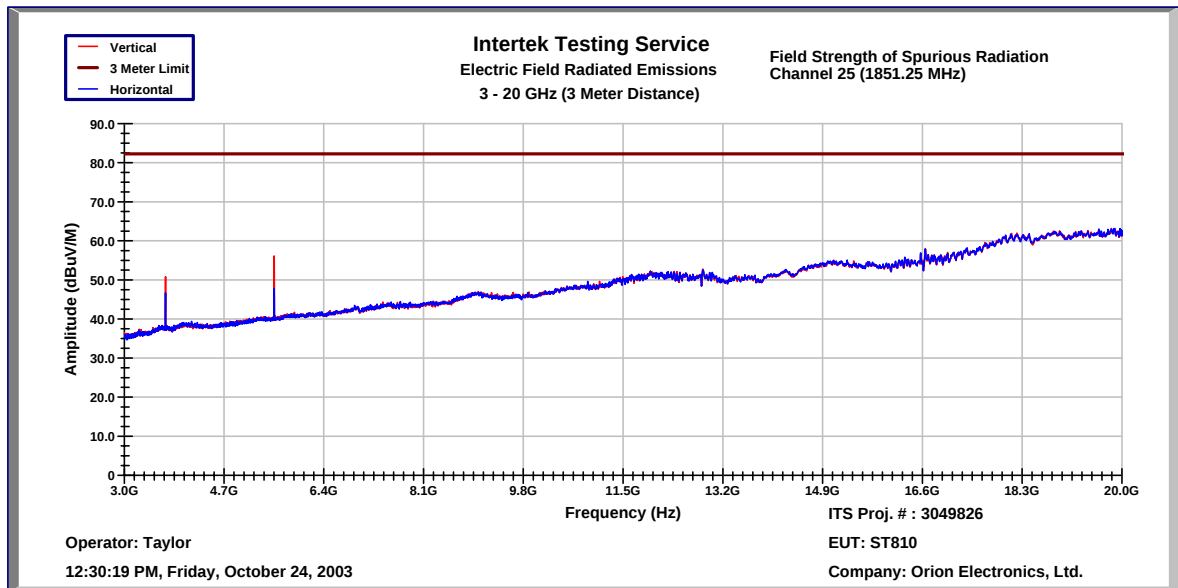
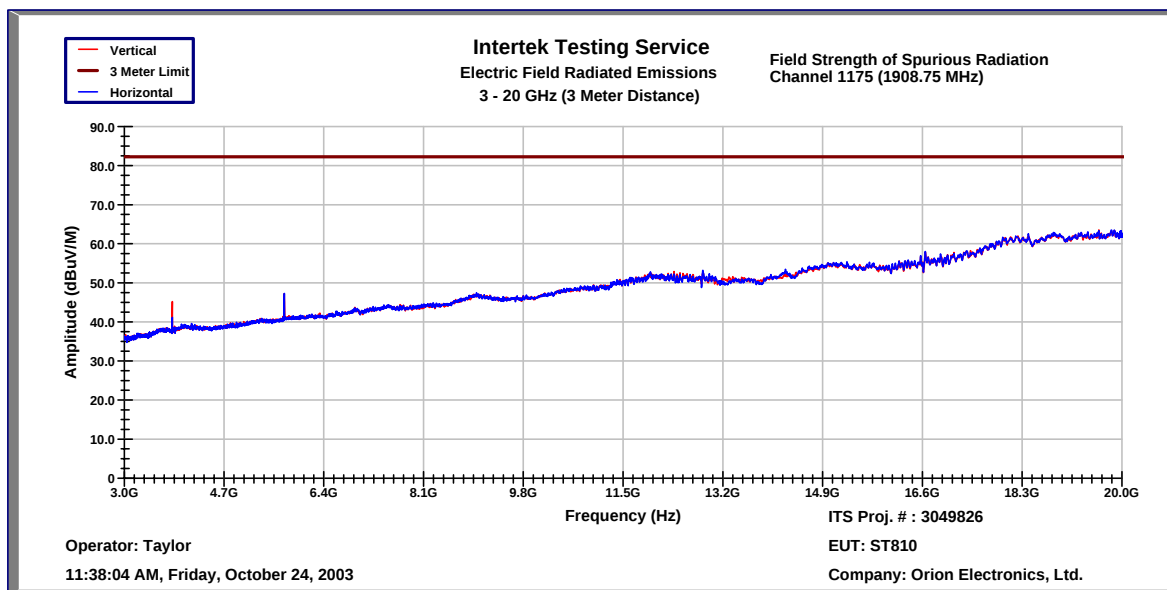


Figure 8-6: Field Strength of Spurious Radiation (3GHz – 20GHz), CDMA 1900 Channel 25, 600, and 1175





## 9 POWER LINE CONDUCTED EMISSIONS

FCC §15.107, FCC §15.207

### 9.1 Test Procedure

Measurements are carried out using quasi-peak and average detector receivers in accordance with CISPR 16. An AMN is required to provide a defined impedance at high frequencies across the power feed at the point of measurement of terminal voltage and also to provide isolation of the circuit under test from the ambient noise on the power lines. An AMN as defined in CISPR 16 shall be used.

The EUT is located so that the distance between the boundary of the EUT and the closest surface of the AMN is 0.8m.

Where a flexible mains cord is provided by the manufacturer, this shall be 1m long or if in excess of 1m, the excess cable is folded back and forth as far as possible so as to form a bundle not exceeding 0.4m in length.

The EUT is arranged and connected with cables terminated in accordance with the product specification.

Conducted disturbance is measured between the phase lead and the reference ground, and between the neutral lead and the reference ground. Both measured values are reported.

The EUT, where intended for tabletop use, is placed on a table whose top is 0.8m above the ground plane. A vertical, metal reference plane is placed 0.4m from the EUT. The vertical metal reference-plane is at least 2m by 2m. The EUT shall be kept at least 0.8m from any other metal surface or other ground plane not being part of the EUT. The table is constructed of non-conductive materials. Its dimensions are 1m by 1.5m, but may be extended for larger EUT.

Floor standing EUTs are placed on a horizontal metal ground plane and isolated from the ground plane by 3 to 12 mm of insulating material. The metal ground plane extends at least 0.5m beyond the boundaries of the EUT and has minimum dimensions of 2m by 2m.

Equipment setup for conducted disturbance tests followed the guidelines of ANSI C63.4: 1992.

### 9.2 Test Equipment

| Description            | Manufacturer    | Model Number      | Serial Number | Calibration due date |
|------------------------|-----------------|-------------------|---------------|----------------------|
| Base Station Simulator | Rohde & Schwarz | CMU-200           | 1100.0008.02  | 8/2004               |
| EMI Receiver           | Rohde & Schwarz | ESI 26            | 1088.7490     | 11/27/2003           |
| LISN                   | FCC             | FCC-LISN-50-50-2M | 1026          | 12/2003              |

### 9.3 Test Results

The ST810 met the power line conducted emission requirements of FCC §15.107 and §15.207. The test results are located in Figure 9-1 through . The graphical data, measured with peak detection, was all below the class B quasi-peak and average limits.

Figure 9-1: FCC §15.107 and §15.207 power line conducted emissions (Line 1 )

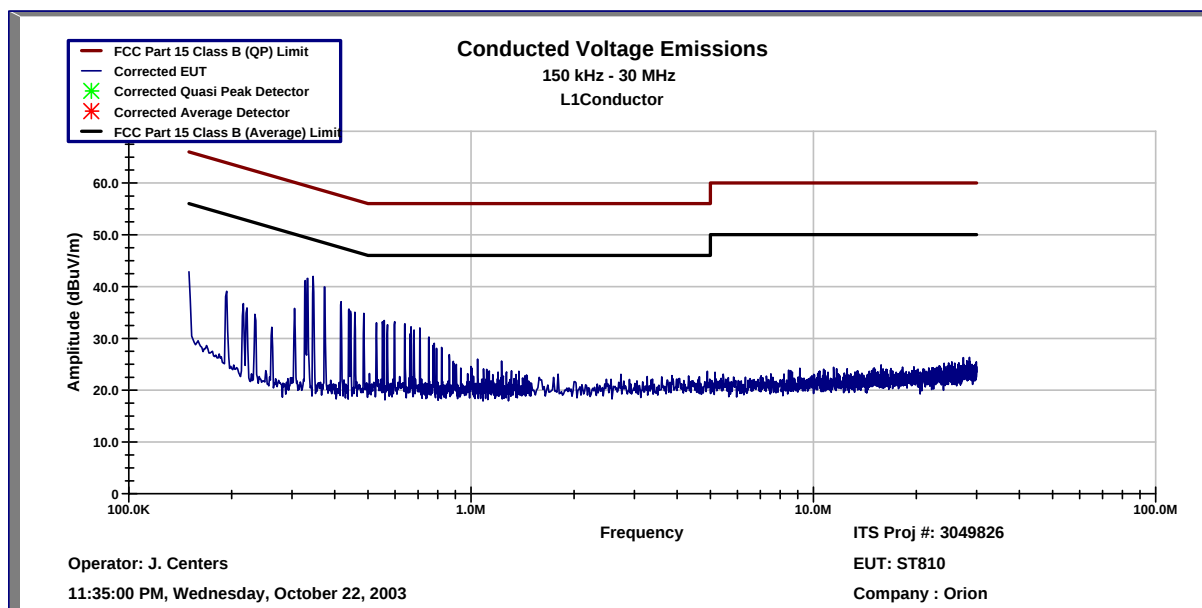
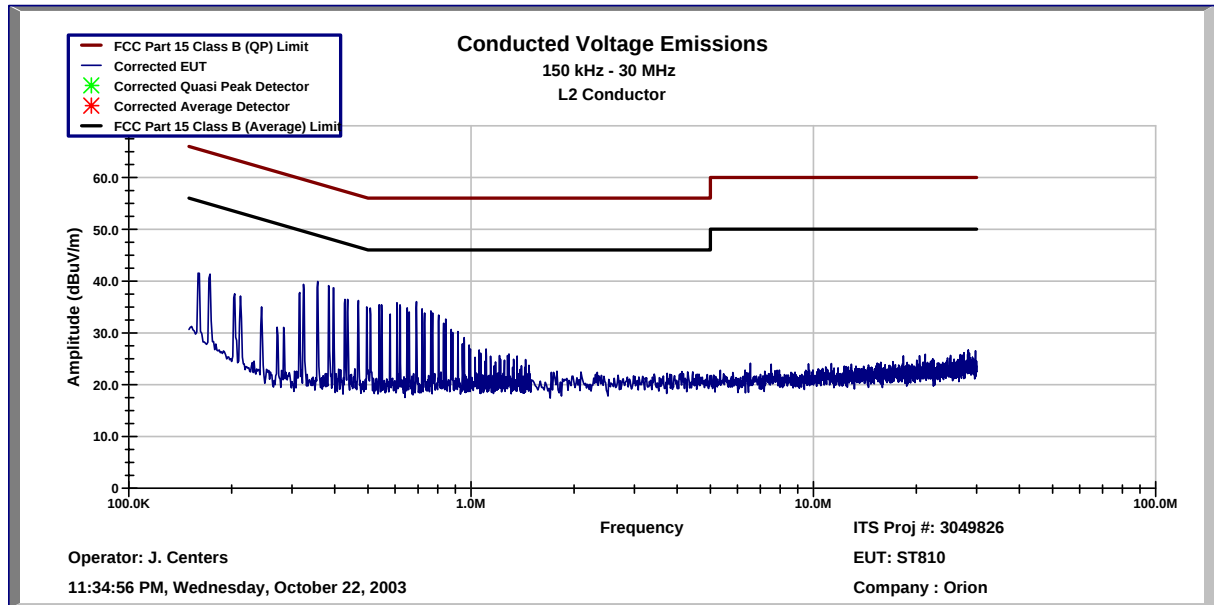


Figure 9-2: FCC §15.107 and §15.207 power line conducted emissions (Line 2)



## RECEIVER SPURIOUS EMISSIONS

### 10.1 Test Limits

Table 10-1 Radiated Emission Limit for FCC §15.109

| Radiated Emission Limits at 3 meters |                              |
|--------------------------------------|------------------------------|
| Frequency (MHz)                      | Quasi-Peak limits, dB (μV/m) |
| 30 to 88                             | 40.0                         |
| 88 to 216                            | 43.5                         |
| 216 to 960                           | 46.0                         |
| 960 and up                           | 54.0                         |

### 10.2 Test Equipment

| Description   | Manufacturer     | Model Number | Serial Number | Calibration due date |
|---------------|------------------|--------------|---------------|----------------------|
| Horn Antenna  | Antenna Research | DRG-118/A    | 1086          | 3/7/2007             |
| Horn Antenna  | EMCO             | 3115         | 6556          | 7/11/2004            |
| EMI Receiver  | Rohde & Schwarz  | ESI 26       | 1088.7490     | 11/27/2003           |
| Bilog Antenna | EMCO             | 3142B        | 1674          | 8/2004               |
| Preamplifier  | HP               | 8449B        | 3008A00775    | 12/2003              |

### 10.3 Test Procedure

Measurements are made over the frequency range of 30 MHz to five times the highest frequency operating within the device. The measuring receiver meets the requirements of Section One of CISPR 16 and the measuring antenna correlates to a balanced dipole. From 30 to 1000 MHz, a quasi-peak detector was used for measurement. Above 1000 MHz, average measurements were performed.

Measurements of the radiated field are made with the antenna located at a distance of 3 meters from the EUT. If the field-strength measurements at 3m cannot be made because of high ambient noise level or for other reasons, measurements may be made at a closer distance, for example 1m. An inverse proportionality factor of 20 dB per decade should be used to normalize the measured data to the specified distance for determining compliance.

The antenna is adjusted between 1m and 4m in height above the ground plane for maximum meter reading at each test frequency.

The antenna-to-EUT azimuth is varied during the measurement to find the maximum field-strength readings.

The antenna-to-EUT polarization (horizontal and vertical) is varied during the measurements to find the maximum field-strength readings.

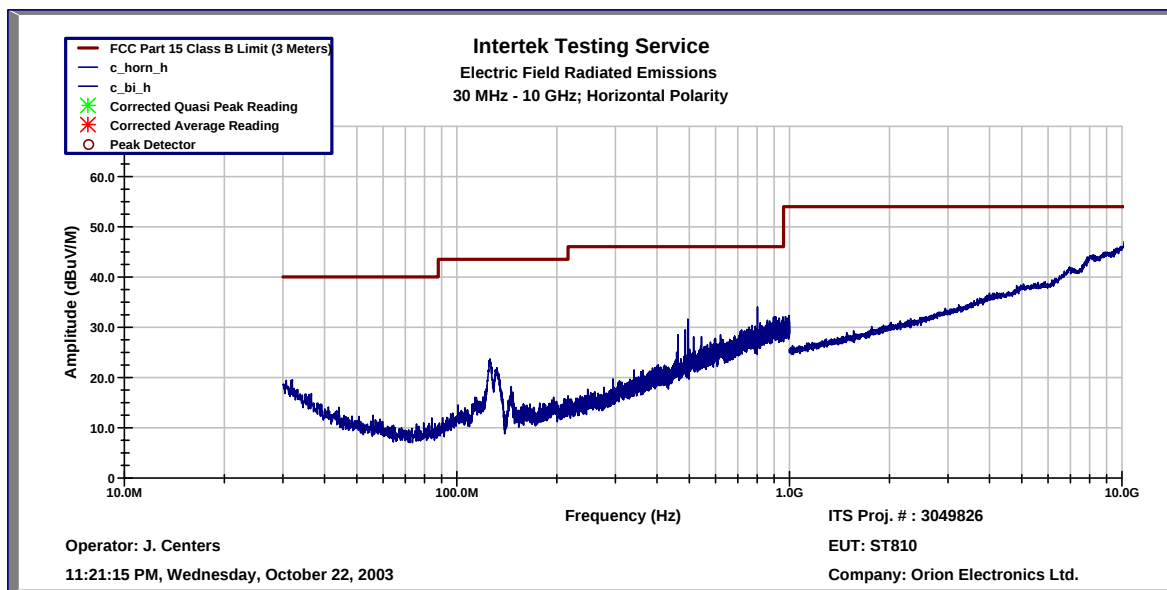
The EUT, where intended for tabletop use, is placed on a table whose top is 0.8m above the ground plane. The table is constructed of non-conductive materials. Its dimensions are 1m by 1.5m, but may be extended for larger EUT.

Equipment setup for radiated disturbance tests followed the guidelines of ANSI C63.4: 1992.

## 10.4 Test Results

The ST810 met the radiated disturbance requirements of FCC §15.109. The maximized quasi peak data can be found in Figure 10-3. There were no other emissions detected within 10 dB of the limit.

*Figure 10-1 FCC §15.109Worse Case Receiver Spurious Emission (Horizontal)*



*Figure 10-2 FCC §15.109Worse Case Receiver Spurious Emission (Vertical)*

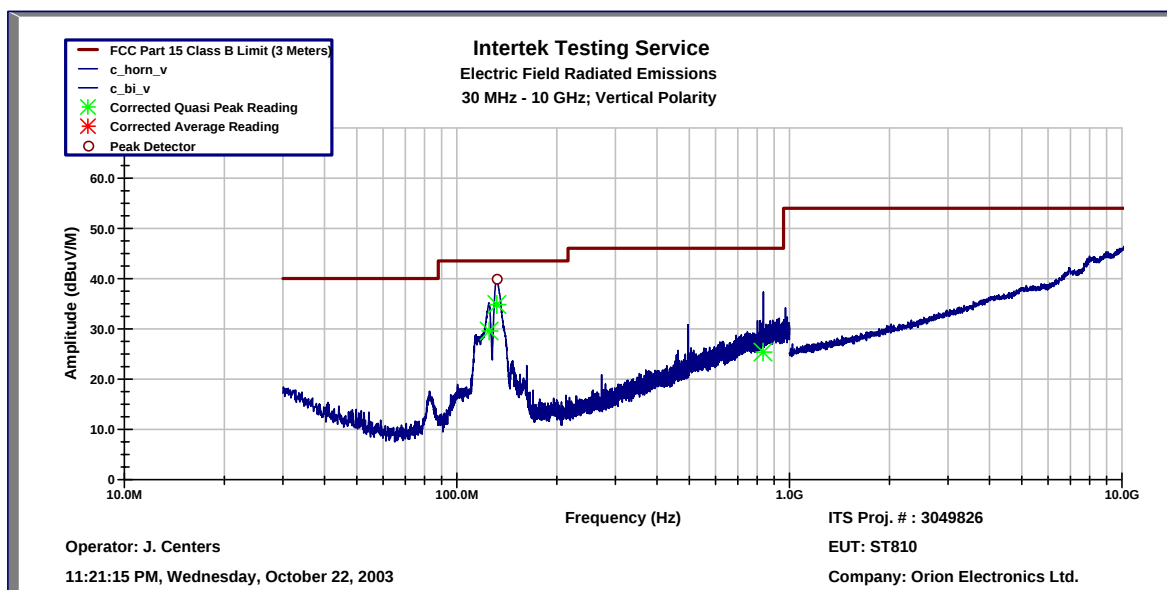


Figure 10-3 FCC §15.109 Maximized Quasi Peak and Average Emissions (Sorted by Delta)

| Frequency (MHz) | Polarity (H/V) | Cab. (dB) | Ant. (dB) | Corr. Reading. (dBuV/m) | Limit (dBuV/m) | Delta (dB) | Azimuth (deg) | Tower (cm) | Results   |
|-----------------|----------------|-----------|-----------|-------------------------|----------------|------------|---------------|------------|-----------|
| 132.02 MHz      | V              | 0.91      | 7.7       | 34.83                   | 43.52          | -8.69      | 28            | 99         | Compliant |
| 125.09 MHz      | V              | 0.88      | 7.93      | 29.56                   | 43.52          | -13.96     | 319           | 100        | Compliant |
| 833.57 MHz      | V              | 2.35      | 23.7      | 25.35                   | 46.02          | -20.67     | 45            | 352        | Compliant |

## 11 FREQUENCY STABILITY VS TEMPERATURE

FCC §2.1055, FCC §22.355, FCC §24.235

Frequency tolerance: 2.5ppm

### 11.1 Test Procedure

The equipment under test was connected to an external DC power supply and the RF output was connected to a CMU-200 Base Station Simulator. The Base Station Simulator was set to force the EUT to its maximum power setting. The EUT was placed inside the temperature chamber. The DC leads and RF output cable exited the chamber through an opening made for that purpose. After the temperature stabilized for approximately 30 minutes, the frequency error was read from the CMU-200.

### 11.2 Test Equipment

| Description            | Manufacturer    | Model Number | Serial Number | Calibration due date |
|------------------------|-----------------|--------------|---------------|----------------------|
| Base Station Simulator | Rohde & Schwarz | CMU-200      | 1100.0008.02  | 8/2004               |
| Environmental Chamber  | Thermotron      | SM-8C        | 32692         | 12/2003              |

### 11.3 Test Results

The ST810 met the frequency stability requirements of FCC §2.1055, FCC §22.355 and FCC §24.235. The test results are located in Table 11-1.

Table 11-1: Frequency stability vs. Temperature

| Frequency Stability (Hz) vs. Temp. |           |     |      |            |     |      |
|------------------------------------|-----------|-----|------|------------|-----|------|
|                                    | PCS Phone |     |      | Cell Phone |     |      |
| Temp (C)                           | 25        | 600 | 1175 | 384        | 777 | 1013 |
| 60                                 | -4        | -9  | -6   | -3         | -8  | -1   |
| 50                                 | -1        | -5  | -4   | -3         | -8  | 2    |
| 40                                 | -2        | -1  | 4    | -2         | -6  | 2    |
| 30                                 | -4        | -8  | -10  | -7         | -11 | -5   |
| 20                                 | -6        | -5  | -4   | -1         | -4  | -2   |
| 10                                 | 2         | -1  | -1   | -4         | -4  | -1   |
| 0                                  | 1         | -3  | -1   | -1         | 0   | 1    |
| -10                                | -6        | 1   | -7   | 1          | -2  | 2    |
| -20                                | -1        | 2   | 3    | -1         | -1  | 1    |
| -30                                | -1        | -3  | 3    | 2          | 0   | 2    |

## 12 FREQUENCY STABILITY VS VOLTAGE

FCC §2.1055, FCC §22.355

Frequency tolerance: 2.5ppm

### 12.1 Test Procedure

An external DC power supply was connected to the battery terminals of the equipment under test. The Base Station Simulator was set to force the EUT to its maximum power setting. The voltage was set to 115% of the nominal value and was then decreased to 85% of the nominal value. The output frequency was recorded for each battery voltage.

### 12.2 Test Equipment

| Description            | Manufacturer    | Model Number | Serial Number | Calibration due date |
|------------------------|-----------------|--------------|---------------|----------------------|
| DC Power Supply        | HP              | 6226         | 6M1203        | 5/20/2004            |
| Temperature Chamber    | Thermotron      | SM-8C        | 32692         | 12/2003              |
| Base Station Simulator | Rohde & Schwarz | CMU-200      | 1100.0008.02  | 8/2004               |

### 12.3 Test Results

The ST810 met the frequency stability requirements of FCC §2.1055 and FCC §22.355. The test results are located in Table 12-1.

Table 12-1: CDMA Frequency stability vs. input voltage

| Frequency Stability (Hz) vs. Voltage |           |     |      |            |     |      |
|--------------------------------------|-----------|-----|------|------------|-----|------|
|                                      | PCS Phone |     |      | Cell Phone |     |      |
| Vdc                                  | 25        | 600 | 1175 | 384        | 777 | 1013 |
| 13.8                                 | 1         | -1  | 1    | 3          | 3   | 4    |
| 12                                   | 1         | -2  | -1   | 5          | 5   | 4    |
| 10.2                                 | 1         | -1  | 3    | 3          | 4   | 4    |