# TEST REPORT

**Report Number: 3088284-003**
**Project Number: 3088284**

**Evaluation of theResidential Gateway**
**Model Number: NC800**
**FCC ID: Q3O-NC800-GW223R1**

**FCC Part 22 Subpart H**
**FCC Part 24 Subpart E**

**For**

**Flextronics Design: South Africa**

| Test Performed by: | Test Authorized by: |
|---|---|
| Intertek<br>731 Enterprise Drive<br>Lexington, KY 40510 | Flextronics Design: South Africa<br>260 Surrey Avenue, Ferndale<br>Randburg, South Africa 2194 |

**Prepared By:**_____ **Date:**____1/21/2006_____

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# 1 JOB DESCRIPTION

## 1.1 Company Information

| Company Information | |
|---|---|
| **Manufacturer:** | Flextronics Design: South Africa |
| **Address:** | 260 Surrey Avenue, Ferndale<br>Randburg South Africa 2194 |
| **Contact Name:** | Warren Tromp |
| **Telephone Number:** | 011 27 126439260 |
| **Fax Number:** | 011 27 2930555 |
| **Email Address:** | warren.tromp@za.flextronics.com |

## 1.2 Test Sample Information

The model NC800 Residential Gateway enables networking between two 10/100BaseT ports, wireless 802.11b/g ports, and the internet over a CDMA connection. It is powered by 12VDC and comes with an AC to DC power adapter. There are two hinged monopole antennas mounted on the back side of the NC800 for 802.11b/g communication. The CDMA antenna is externally mounted (via suction cups) and comes equipped with a 6 foot long coaxial cable to connect to the WAN port on the NC800.

| Test sample | | | | |
|---|---|---|---|---|
| **Model Number:** | NC800 | | | |
| **Serial Number:** | WG395W530X | | | |
| **FCC ID:** | Q3O-NC800-GW223R1 | | | |
| **Device Category:** | Mobile | | | |
| **RF Exposure Category:** | General Population/Uncontrolled Environment | | | |
| **Transmission Modes:** | **802.11b** | **802.11g** | **CDMA Cell** | **CDMA PCS** |
| **Frequency Range, MHz:** | 2412MHz – 2462MHz | 2412MHz – 2462MHz | 824.7 – 848.31MHz | 1850 – 1910 MHz |
| **Maximum Conducted RF Output Power:** | 18.12dBm | 17.81dBm | 24.3dBm | 24.1dBm |
| **Antenna Type:** | Hinged Monopole | Hinged Monopole | Monopole with Suction Cup Mounts | Monopole with Suction Cup Mounts |
| **Antenna Location:** | Back Left and Right Sides | Back Left and Right Sides | Externally Mounted | Externally Mounted |
| **Antenna Gain:** | -2.4dB | -2.4dB | -1dB | -2dB |
| **Power Supply** | **Manufacturer** | **Model Number** | **Serial Number** | |
| | ITE | FW SM/30.1215.0-2170SE | Not Labeled | |

### 1.3 System Support Equipment

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

*Table 1-1: System Support Equipment*

| Description | Manufacturer | Model Number | Serial Number |
|---|---|---|---|
| 802.11 Wireless Laptop | Compaq | Nc6000 | CNU512035T |
| 10/100BaseT Computer | IBM | NetVista | Not Labeled |

### 1.4 Cables Used During Testing

Table 1-2 contains the details of the cables used during the testing.

*Table 1-2: Interconnecting Cables Used During Testing*

| Cables | | | | | |
|---|---|---|---|---|---|
| Description | Length | Shielding | Ferrites | Connection | |
| | | | | From | To |
| Serial Cable | 6 ft | Yes | None | Comm. Port | Comm. on Laptop |
| AC Power Cable | 5 ft | None | None | AC Power Source | AC Input of AC/DC Converter |
| DC Power Cable | 5 ft | None | None | DC Output of AC/DC Converter | 12VDC Input of the NC800 |
| CDMA Antenna Cable | 6 ft | Yes | None | WAN Port on the NC800 | CDMA Antenna |

## 1.5 System Block Diagram(s)

The diagrams below detail the interconnection of the EUT and its accessories during the testing.

*Figure 1-1: Radiated Test Configuration*

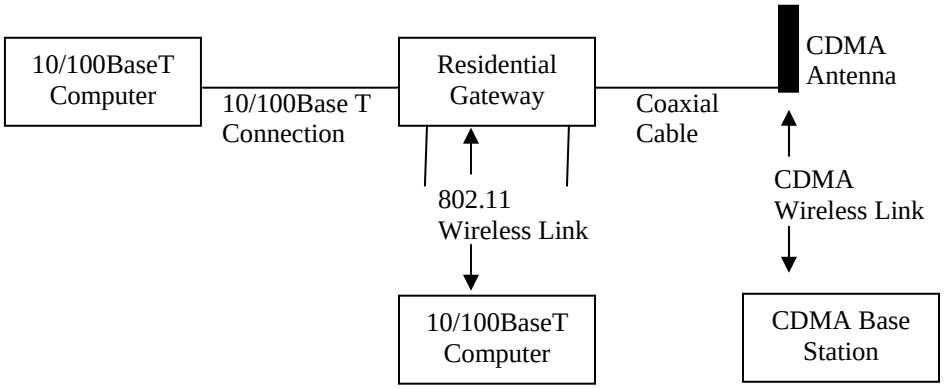
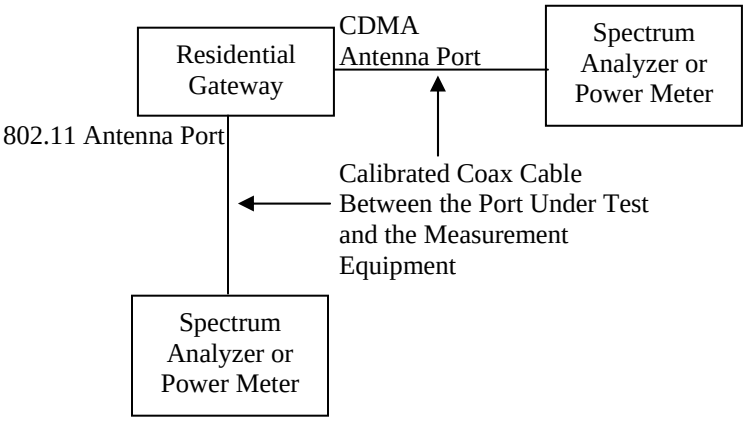



*Figure 1-2: Conducted Test Configuration*



## 1.6 Mode(s) of operation / Engineering Judgments

The Residential Gateway was powered by the AC to DC power supply provided with the sample.

For 802.11b mode, the test commands from the Broadcom "WL" package were used to force 802.11b transmissions at maximum output power.

Test commands were not provided for 802.11g mode. In order to force transmission at the "g" data rates, the online configuration utility provided with the Residential Gateway was used to select channels, and a large (~4Gigabyte) file was transferred from the wired Ethernet computer to the wireless 802.11b/g laptop.

The Residential Gateway comes equipped with two 802.11 antennas and, in normal operation, automatically chooses the one with the best reception. Initial conducted output power measurements indicated that the "main" antenna port had higher output powers. Therefore all testing was done on that port.

The Residential Gateway comes equipped with a CDMA antenna port (SMA connector) and a removable CDMA antenna. For radiated testing, the CDMA antenna was connected to the Residential Gateway. For conducted measurements the antenna was removed and a calibrated coaxial cable inserted between the CDMA port and the measuring equipment (spectrum analyzer or power meter). For the CDMA transmissions, a base station simulator was used to force the Residential Gateway to transmit at maximum output power.

The CDMA conducted output power of the Residential Gateway was measured at the low, mid, and high channels in PCS and Cell bands using 1xRTT and EV-DO modulations. Since the output power in 1xRTT was slightly higher than in EV-DO, the remaining tests were performed using 1xRTT modulation.

## 2 EXECUTIVE SUMMARY

Testing performed for: Flextronics Design: South Africa

Equipment Under Test: NC800

Receipt of Test Sample: 11/22/2005

Test Start Date: 11/22/2005

Test End Date: 12/22/2005

| FCC RULE | DESCRIPTION OF TEST | RESULT | PAGE |
|---|---|---|---|
| §2.1046 | RF Power Output | **Compliant** | 10 |
| §22.913, §24.232 | ERP, EIRP | **Compliant** | 12 |
| § 1.1310 | Maximum Permissable Exposure (MPE) Calculations | **Compliant** | 13 |
| §2.1049 §22.917(b)(d) | Emission Limitation, Occupied Bandwidth | **Compliant** | 14 |
| §2.1051 §22.917(e) §22.917(f) §24.238(a) | Out of Band Emissions at Antenna Terminals | **Compliant** | 22 |
| §2.1053 | Field Strength of Spurious Radiation | **Compliant** | 29 |
| §15.107, §15.207 | Power Line Conducted Emissions | **Compliant** | 37 |
| §15.109 | Receiver Spurious Emission | **Compliant** | 38 |
| §2.1055, §22.355, §24.235 | Frequency Stability vs. Temperature | **Compliant** | 40 |
| §2.1055, §22.355, §24.235 | Frequency Stability vs. Voltage | **Compliant** | 41 |

### 2.1 Modifications required for compliance

No modifications were implemented by Intertek. All results in this report pertain to the un-modified sample provided to Intertek.

# 3 TEST FACILITY

All testing was completed at the INTERTEK-Lexington location 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.

For radiated immunity testing, removable ferrite tiles are positioned between the transmitting antenna and the area occupied by the equipment under test. The remaining tests typically are performed outside the chamber on the conducting ground reference plane.

The Industry Canada filing number for this site is 2055. The FCC registration number is 485103. The VCCI registration numbers are R-2056, C-2214, and T-195.

## 3.1 Test Equipment

| Description | Manufacturer | Model Number | Serial Number | Calibration due date |
|---|---|---|---|---|
| Environmental Chamber | Thermotron | SM-8C | 32692 | 1/17/2006 |
| Signal Generator | HP | 83620B | 3614A00199 | 8/17/2006 |
| Horn Antenna | EMCO | 3115 | 6556 | 7/27/2006 |
| Horn Antenna | Antenna Research | DRG-118/A | 1086 | 7/6/2006 |
| Dipole Antenna | CDI | Roberts | 1 | 1/31/2006 |
| EMI Receiver | Rohde & Schwarz | ESI 26 | 1088.7490 | 8/16/2006 |
| EMI Receiver | Agilent | E7405A | 2142 | 10/12/2006 |
| LISN | Solar Electronics | 6338-57-PJ-50-N | 1583 | 5/12/2006 |
| LISN | Solar Electronics | 6338-57-PJ-50-N | 1584 | 5/12/2006 |
| Bilog Antenna | EMCO | 3142B | 1674 | 10/12/2006 |
| Preamplifier | Miteq | AFS44-00102000-30-10P-44 | 987410 | 6/7/2006 |
| Digital Multimeter | Fluke | 87 | 2021 | 2/3/2006 |
| Base Station Simulator | Agilent | 8960 | GB43046102 | 10/10/2006 |
| High Pass Filter | Filtek | HP12/3000-5AB | 15857-01 | 10/21/2006 |

# 4 CONDUCTED RF POWER

FCC Rule: §2.1046

IC Rule: RSS-129 §7.1, §9.1 and RSS-133 §6.2

## 4.1 Test Procedure

The transmitter output was connected to a calibrated coaxial cable, the other end of which was connected to a 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 base station simulator in dBm. The power output at the transmitter antenna port was determined by adding the value of the cable insertion loss to the base station simulator 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 Results

The Residential Gateway 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*

| Power Stability Vs. Temperature (dBm) | | | | | | |
|---|---|---|---|---|---|---|
| Temp. (Celsius) | Cell Band | | | PCS Band | | |
| | 384 | 777 | 1013 | 25 | 600 | 1175 |
| 60 | 23.2 | 23.2 | 23.4 | 23.1 | 23.2 | 23 |
| 50 | 23.2 | 23.3 | 23.5 | 23.2 | 23.2 | 23 |
| 40 | 23.3 | 23.4 | 23.8 | 23.3 | 23.3 | 23.1 |
| 30 | 23.3 | 23.5 | 23.8 | 23.3 | 23.3 | 23 |
| 20 | 23.3 | 23.6 | 23.8 | 23.1 | 23.2 | 22.9 |
| 10 | 23.4 | 23.5 | 23.6 | 23.4 | 23.5 | 23.4 |
| 0 | 23.7 | 23.8 | 24 | 23.7 | 23.8 | 23.7 |
| -10 | 23.7 | 23.7 | 24.2 | 23.9 | 23.9 | 23.8 |
| -20 | 23.7 | 23.8 | 24.3 | 23.9 | 24 | 24 |
| -30 | 23.9 | 24 | 24.2 | 24.1 | 23.9 | 24.1 |

# 5 RADIATED RF POWER

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

FCC Rule §24.232; RSS-133 §6.2: The equivalent Isotropic Radiated Power (EIRP) must not exceed 2 Watts.

RSS-129 §7.1, §9.1

## 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 1 MHz and the video bandwidth was set to 3 MHz. 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 (E in dBm).

ERP in the CDMA 800 band and EIRP in the CDMA 1900 band were measured using a substitution method as described in TIA-603-B Section 2.2.17 (Radiated Power Output). The EUT was replaced with a substitution antenna (tuned dipole below 1 GHz; Horn antenna above 1 GHz) and was fed with an input power of 15 dBm. The receiver reading was recorded and EIRP was calculated as follows:

$$EIRP = E_1 - E_2 + Vsub + G$$

where,

$\mathbf{E_1}$ is the receiver reading in dBμV/m when measuring the field strength of the EUT

$\mathbf{E_2}$ is the receiver reading in dBμV/m when measured field strength from the generator

$\mathbf{V_{sub}}$ is the power delivered to the substitution antenna (generator output in dBm – cable loss between the generator and the substitution antenna)

**G** is the gain of the transmitting antenna in dBi.

## 5.2 Test Results

The Residential Gateway met the radiated power requirements of FCC §24.232. The test results are located in Table 5-1. The maximum ERP for the CDMA Cell band was 26.94 dBm. The maximum EIRP for the PCS band was 25.08 dBm.

*Table 5-1 Radiated RF Power*

| EUT Mode | TX Channel | Polarity | TX Frequency | Device Reading (dBuV) | Sub. Reading (dBuV) | Cable Loss (dB) | Tx Antenna Gain (dBi) | Signal Generator Output (dBm) | ERP {Cell} EIRP {PCS} (dBm) |
|---|---|---|---|---|---|---|---|---|---|
| CDMA Cell | 384 | H | 836.52 | 92.7 | 88.57 | 2.2 | 0 | 15 | 16.93 |
| CDMA Cell | 777 | H | 848.31 | 90.5 | 88.01 | 2.2 | 0 | 15 | 15.29 |
| CDMA Cell | 1013 | H | 824.7 | 91.7 | 88.24 | 2.2 | 0 | 15 | 16.26 |
| CDMA Cell | 384 | V | 836.52 | 100.11 | 85.97 | 2.2 | 0 | 15 | **26.94** |
| CDMA Cell | 777 | V | 848.31 | 99.91 | 86.94 | 2.2 | 0 | 15 | 25.77 |
| CDMA Cell | 1013 | V | 824.7 | 100.68 | 86.67 | 2.2 | 0 | 15 | 26.81 |
| CDMA PCS | 25 | H | 1851.25 | 81.4 | 84.64 | 3.4 | 7.2 | 15 | 15.56 |
| CDMA PCS | 600 | H | 1880 | 84.06 | 85.23 | 3.4 | 7.2 | 15 | 17.63 |
| CDMA PCS | 1175 | H | 1908.75 | 86.36 | 84.56 | 3.6 | 7.2 | 15 | 20.4 |
| CDMA PCS | 25 | V | 1851.25 | 88.47 | 85.63 | 3.4 | 7.2 | 15 | 21.64 |
| CDMA PCS | 600 | V | 1880 | 91.59 | 85.31 | 3.4 | 7.2 | 15 | **25.08** |
| CDMA PCS | 1175 | V | 1908.75 | 88.63 | 84.56 | 3.6 | 7.2 | 15 | 22.67 |

# 6 MAXIMUM PERMISSIBLE EXPOSURE (MPE) CALCULATIONS

The § 1.1310 Radiofrequency radiation exposure limits are listed in the table below.

| | Frequency Range (MHz) | Power Density Limit ($mW/cm^2$) |
|---|---|---|
| **Limits for Occupational/Controlled Exposures** | 0.3-3.0 | 100 |
| | 3.0-30 | 900/ Frequency2 |
| | 30-300 | 1.0 |
| | 300-1500 | Frequency/300 |
| | 1500-100,000 | 5.0 |
| **Limits for General Population/Uncontrolled Exposure** | 0.3-1.34 | 100 |
| | 1.34-30 | 180/Frequency2 |
| | 30-300 | 0.2 |
| | 300-1500 | Frequency/1500 |
| | 1500-100,000 | 1.0 |

## 6.1 Calculations

The radiated RF power (calculated using the stated antenna gain and the measured conducted output power) was used to calculate the maximum RF exposure at a 20 cm distance using the formula:

$$\text{Maximum RF Exposure at 20cm} = (\text{EIRP in mW})/(4\text{Pi}(20\text{cm})^2)$$

**Cell Band:**

The maximum measured radiated power for the cell band was 26.94dBm.

In order to convert to EIRP a 2.15dB factor is added to the ERP to get 29.09dBm or 810.96mW (Isotropic).

Substituting this into the equation above, we get a Maximum RF Exposure (MPE) at 20cm of:

$$\text{MPE at 20cm} = 810.96\text{mW} / (4\text{Pi}(20\text{cm})^2)$$

$$\text{MPE at 20cm} = 0.161\text{mW/cm}^2$$

**PCS Band:**

The maximum measured radiated power for the PCS band was 25.08dBm or 322.1mW. For the PCS band, there is no need to apply the 2.15dB factor to convert to EIRP since the measured radiated power is already in reference to an isotropic radiator.

Substituting 322.1mW into the equation above, we get a Maximum RF Exposure (MPE) at 20cm of:

$$\text{MPE at 20cm} = 322.1\text{mW} / (4\text{Pi}(20\text{cm})^2)$$

$$\text{MPE at 20cm} = 0.064\text{mW/cm}^2$$

## 6.2 Test Results

The worst case MPE at 20cm of $0.161\text{mW/cm}^2$ is much less than the $0.557\ \text{mW/cm}^2$ limit for general population/uncontrolled exposure shown in the table above for the cell band. For the PCS band, the worst case MPE at 20cm of $0.064\text{mW/cm}^2$ is much less than the $1\ \text{mW/cm}^2$ limit.

# 7 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.

RSS-129 §6.3; RSS-129 §8.1

## 7.1 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 power divider. The EUT was placed into a call using a Agilent 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.

## 7.2 Test Results

The following is the occupied bandwidth data for the Residential Gateway .

*Table 7-1: Occupied bandwidth measurements for CDMA modes*

| Mode | Channel | Resolution Bandwidth | Video Bandwidth | Sweep time | Measured Bandwidth (MHz) |
|---|---|---|---|---|---|
| CDMA800 | 384 | 30 kHz | 300 kHz | 2s | 1.269 |
| CDMA800 | 1013 | 30 kHz | 300 kHz | 2s | 1.269 |
| CDMA800 | 777 | 30 kHz | 300 kHz | 2s | 1.275 |
| CDMA1900 | 25 | 30 kHz | 300 kHz | 2s | 1.269 |
| CDMA1900 | 600 | 30 kHz | 300 kHz | 2s | 1.269 |
| CDMA1900 | 1175 | 30 kHz | 300 kHz | 2s | 1.281 |

*Figure 7-1: Occupied Bandwidth – Cell Channel 384*

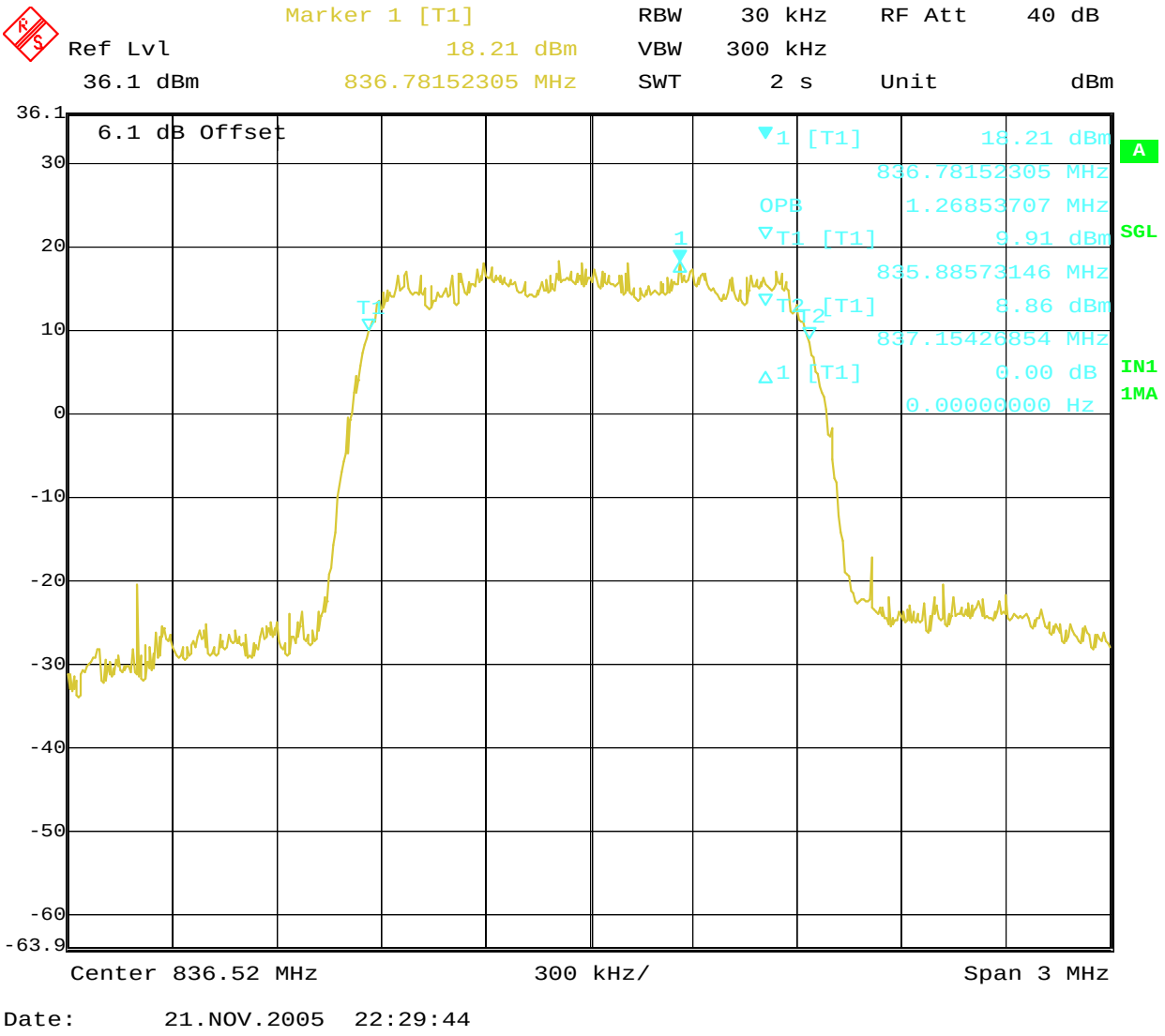


*Figure 7-2: Occupied Bandwidth – Cell Channel 777*

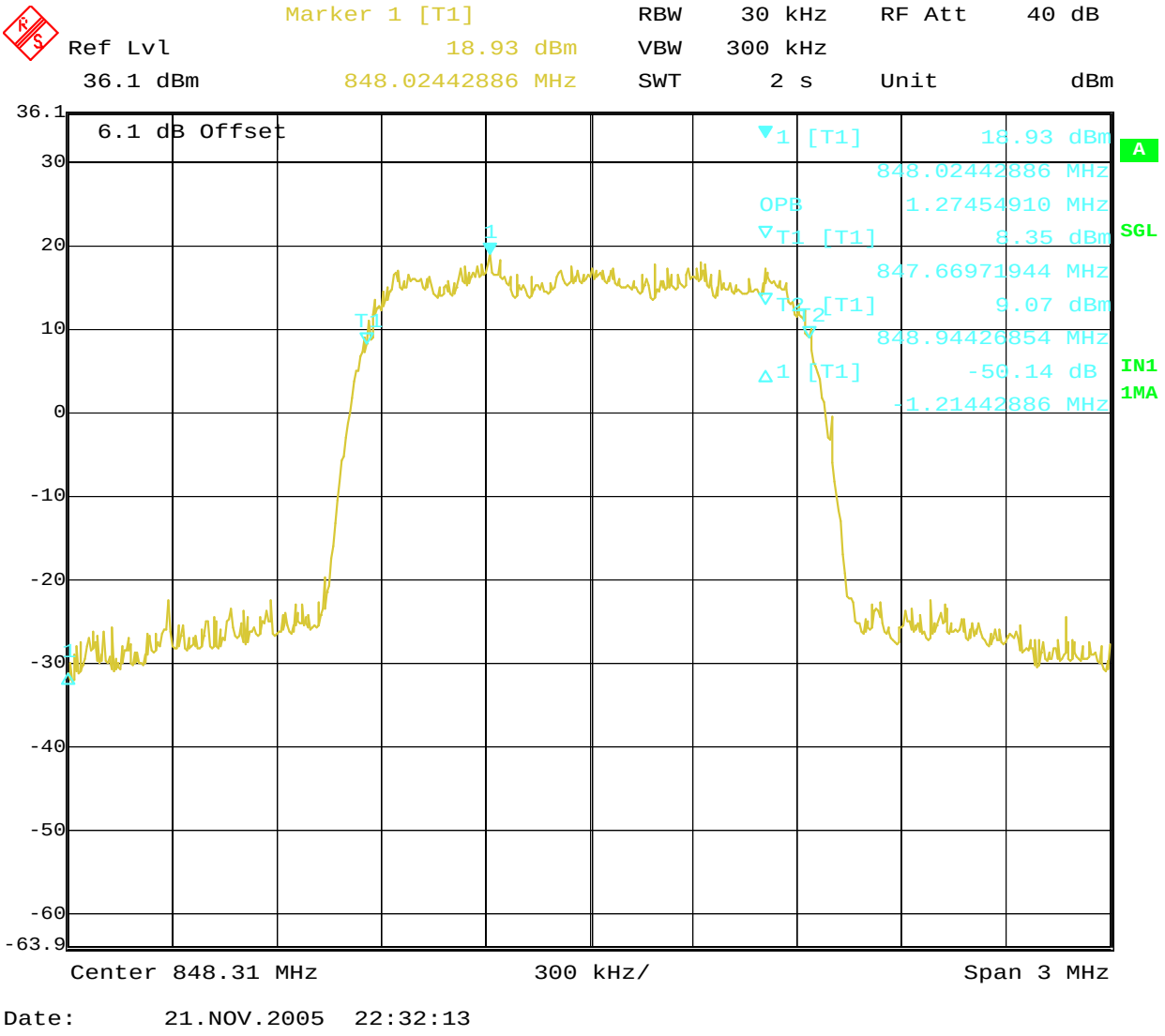


*Figure 7-3: Occupied Bandwidth – Cell Channel 1013*

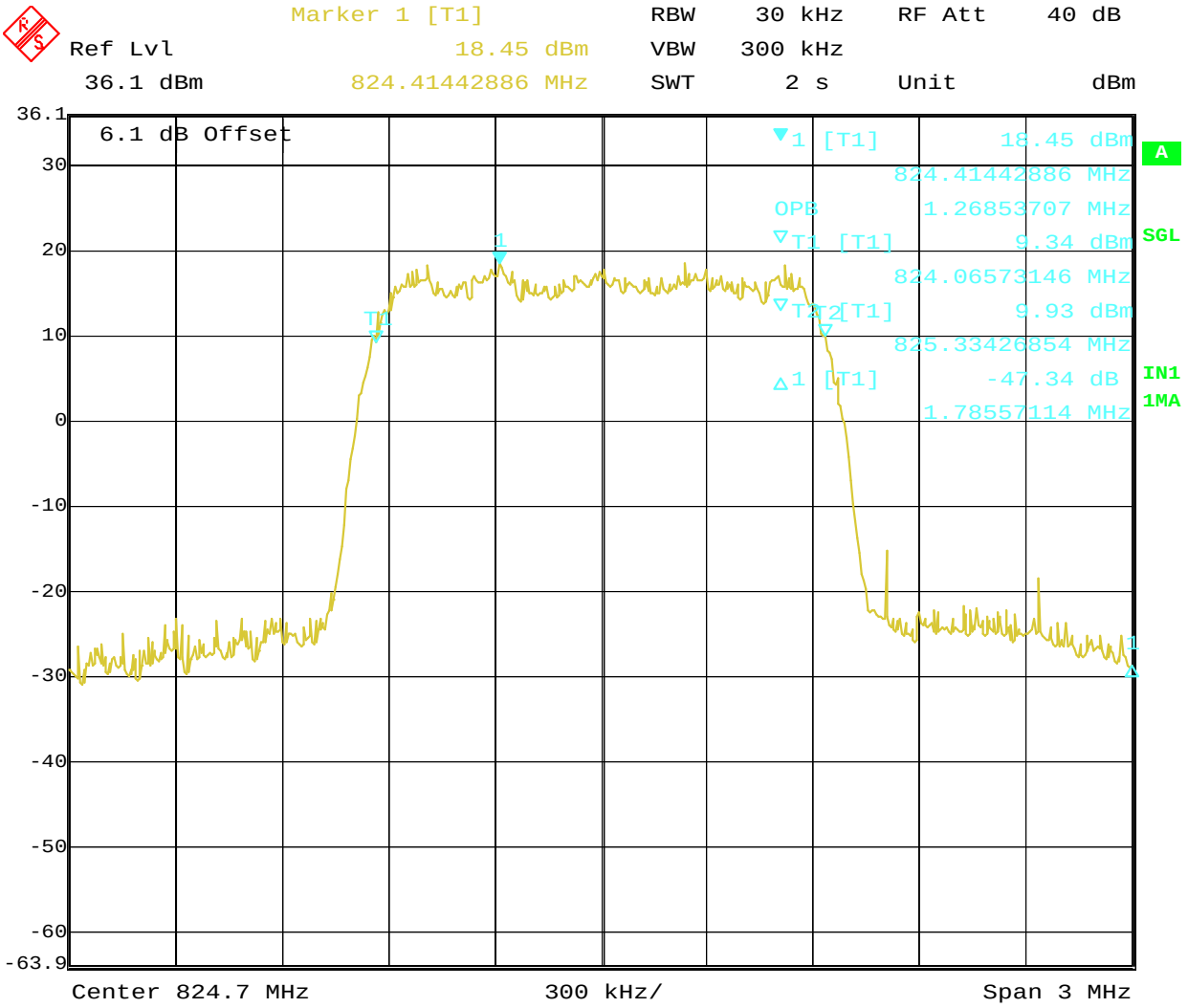


*Figure 7-4: Occupied Bandwidth – PCS Channel 25*

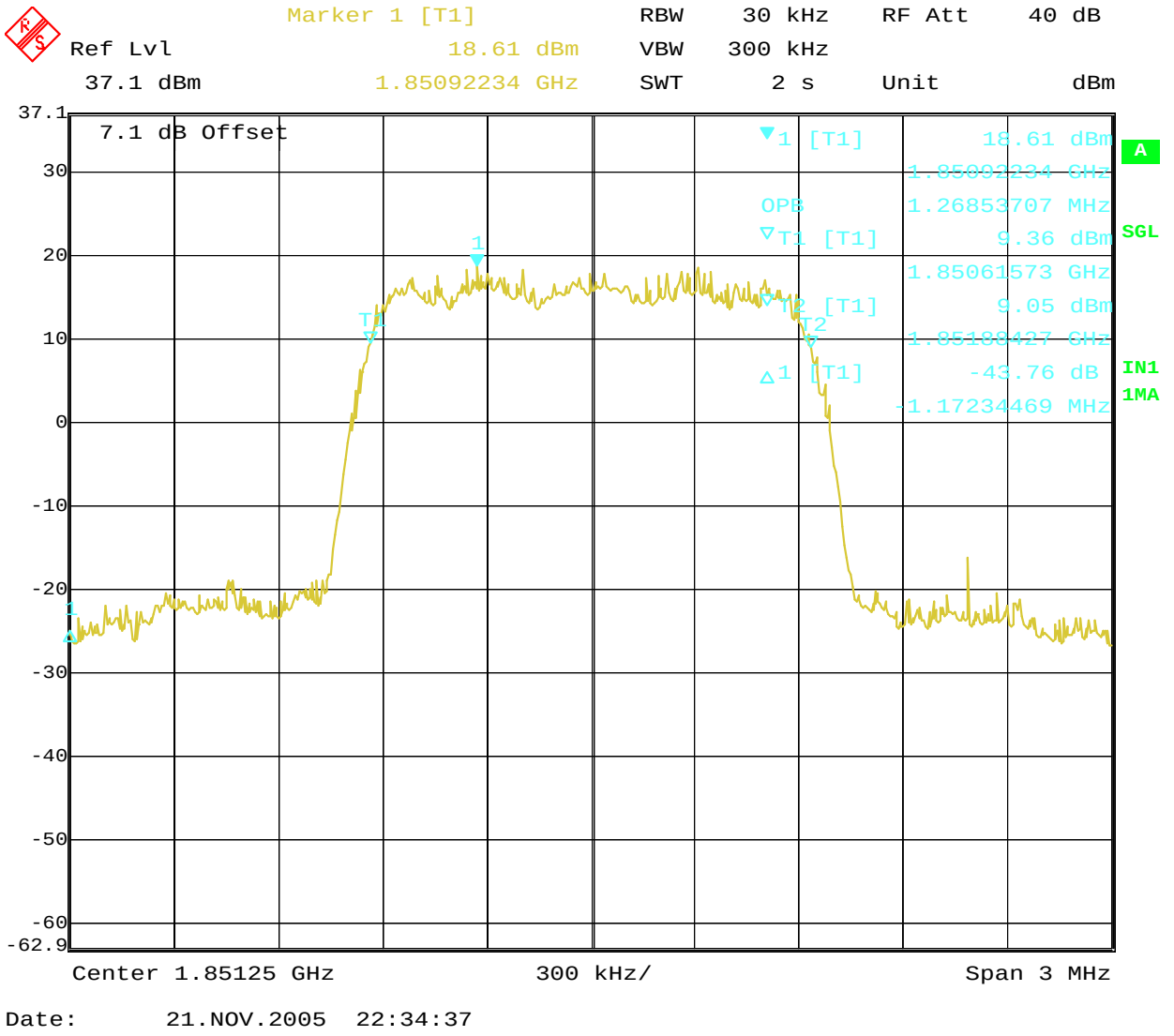


*Figure 7-5: Occupied Bandwidth – PCS Channel 600*

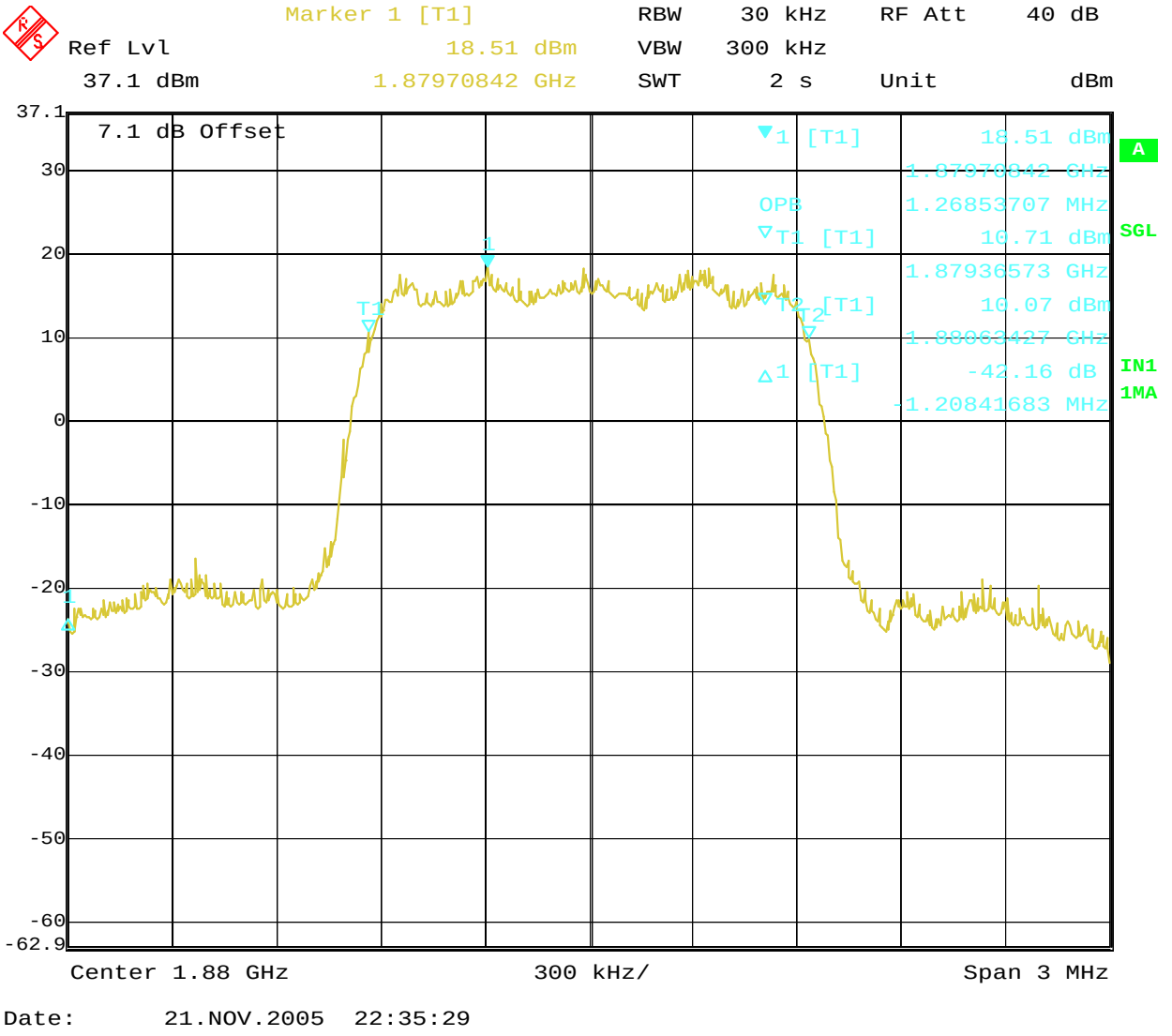
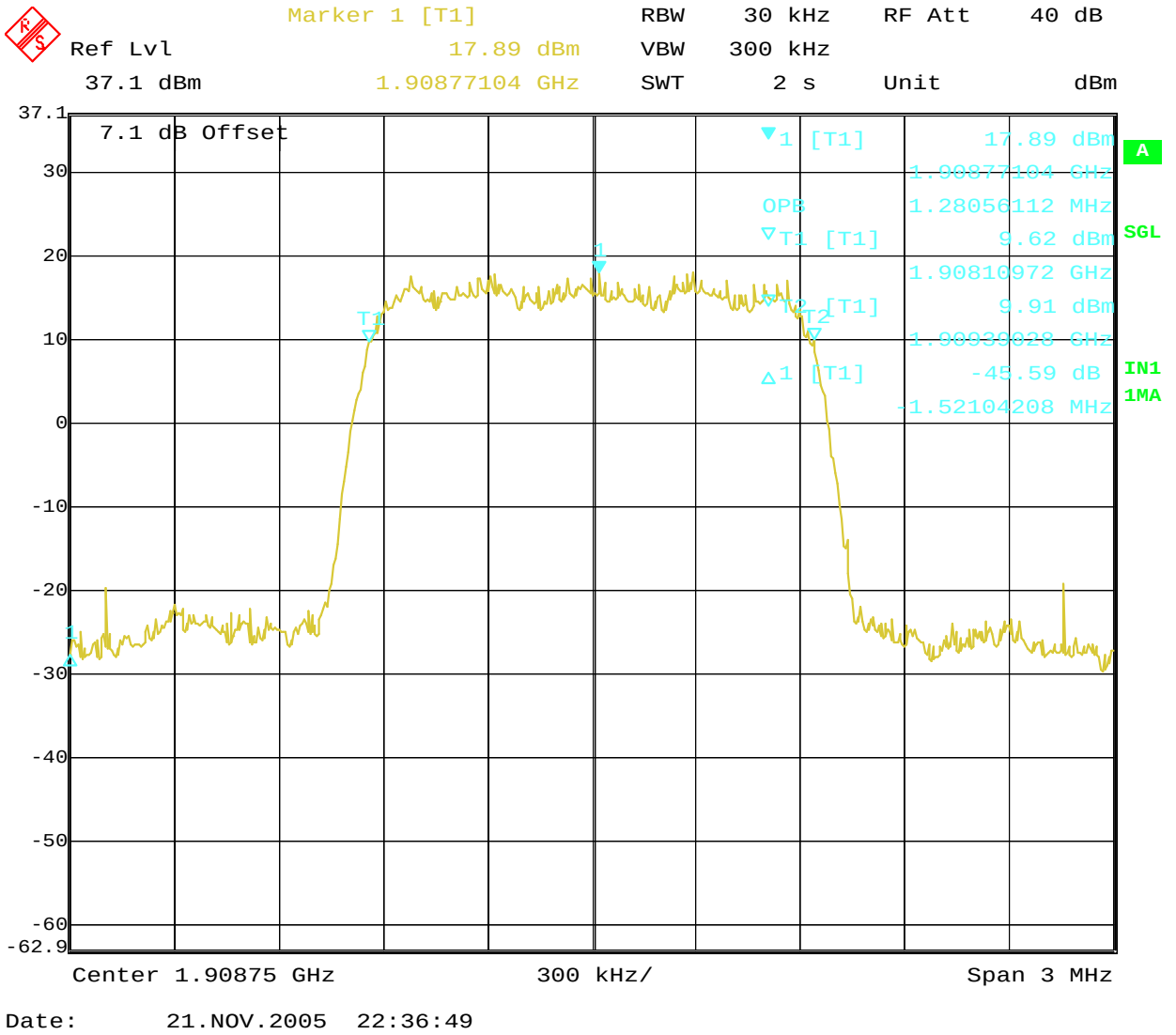


*Figure 7-6: Occupied Bandwidth – PCS Channel 1175*



# 8 OUT OF BAND EMISSION AT ANTENNA TERMINALS

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

RSS-129 §6.3, §7.2.2, §8.1.1, §10

RSS-133 §6.3

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.

## 8.1 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. Sufficient scans were taken to show the out of band Emissions if any up to 10th harmonic.

## 8.2 Test Results

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

*Table 8-1: Summary of test result locations*

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

*Figure 8-1: Out of band emissions at antenna terminals – CDMA 800 Channel 384, 777, and 1013*

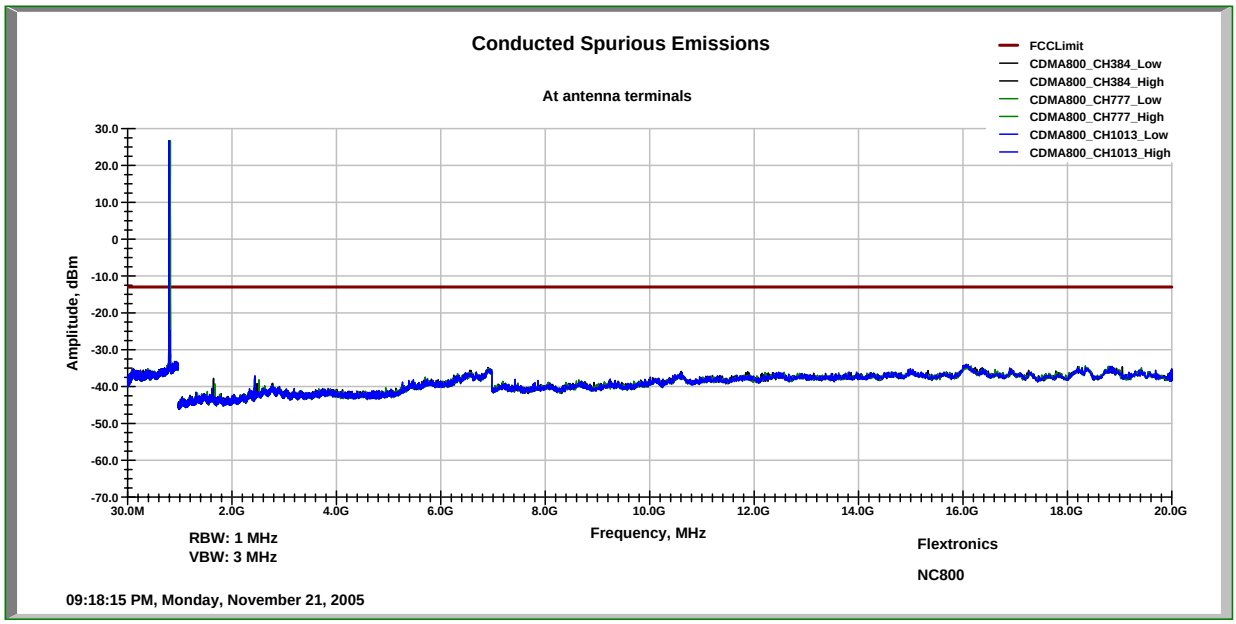



*Figure 8-2: Out of band emissions at antenna terminals – CDMA 800 Channel 384, 777, and 1013 (Zoomed Around Carrier Frequencies)*

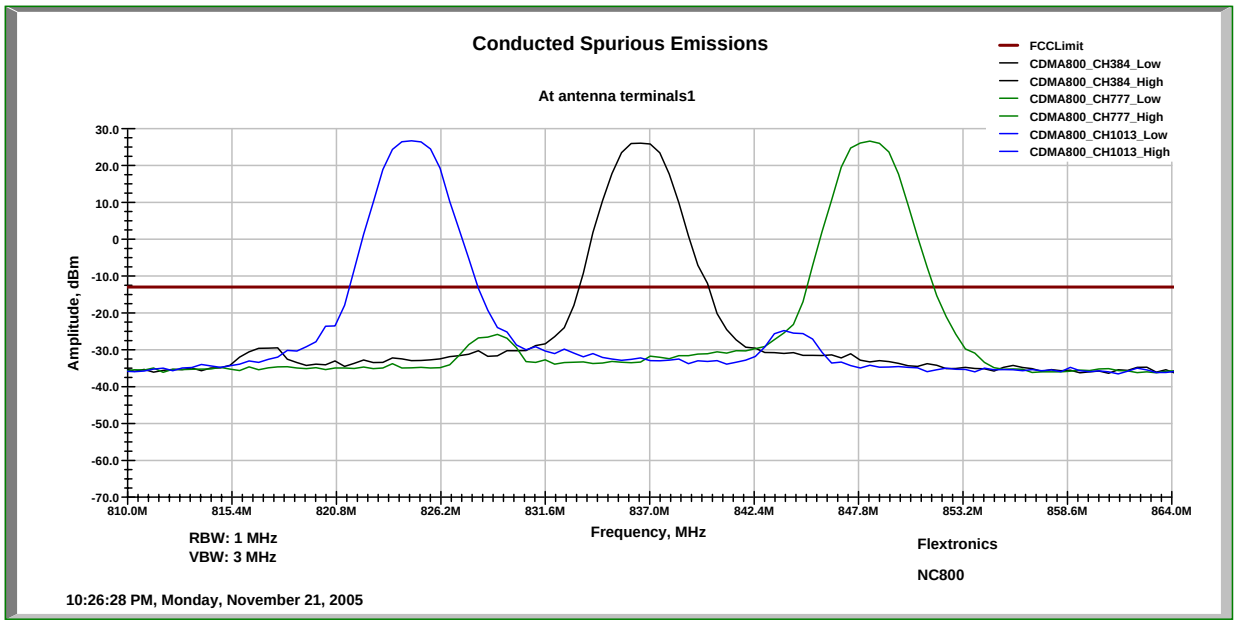


*Figure 8-3: Out of band emissions at antenna terminals – CDMA1900 Channel 25, 600, 1175*

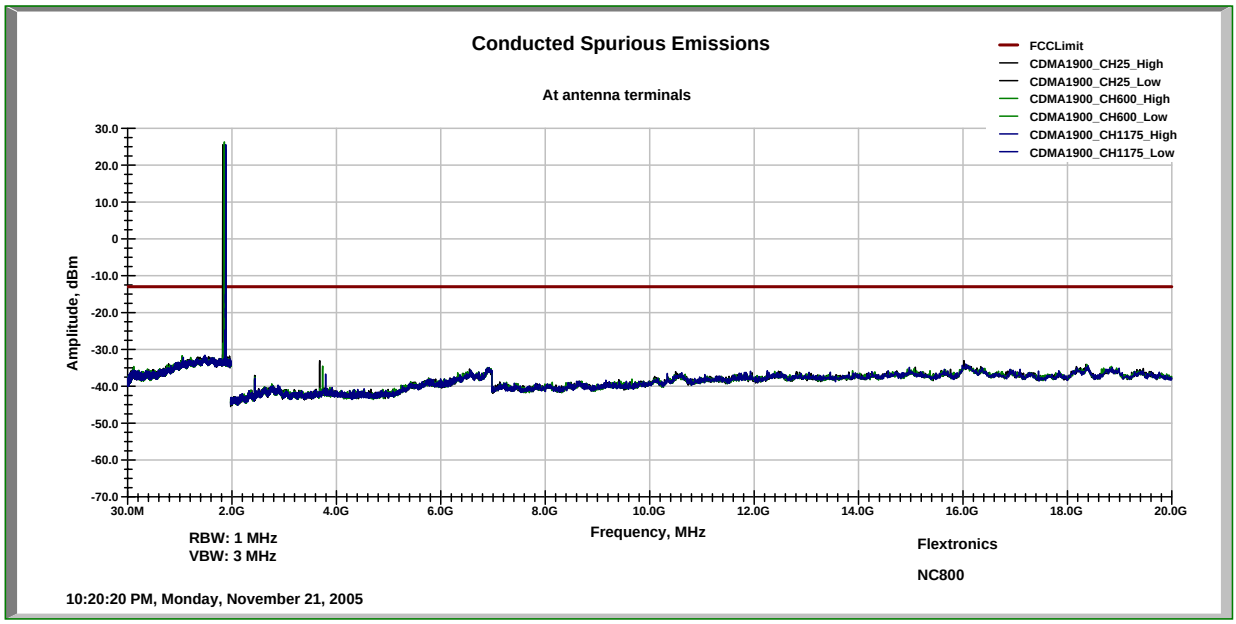



*Figure 8-4: Out of band emissions at antenna terminals – CDMA1900 Channel 25, 600, 1175 (Zoomed In on Carrier Frequencies)*

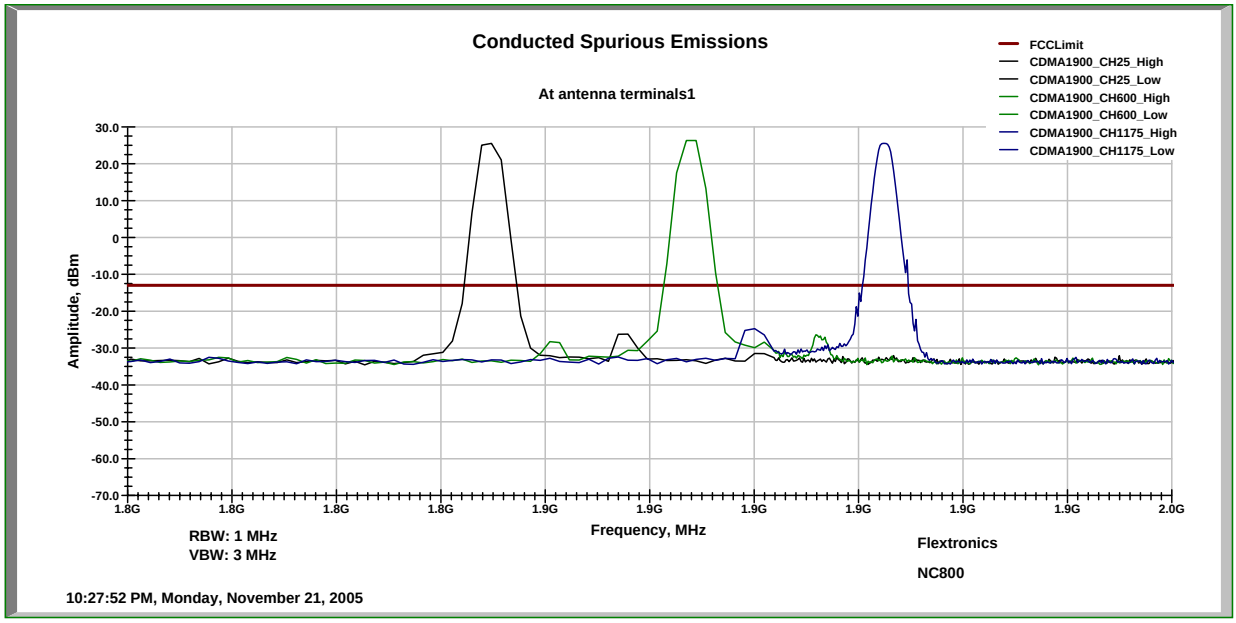


*Figure 8-5: Emissions within 1 MHz of band edge, CDMA 800 Channel 1013*

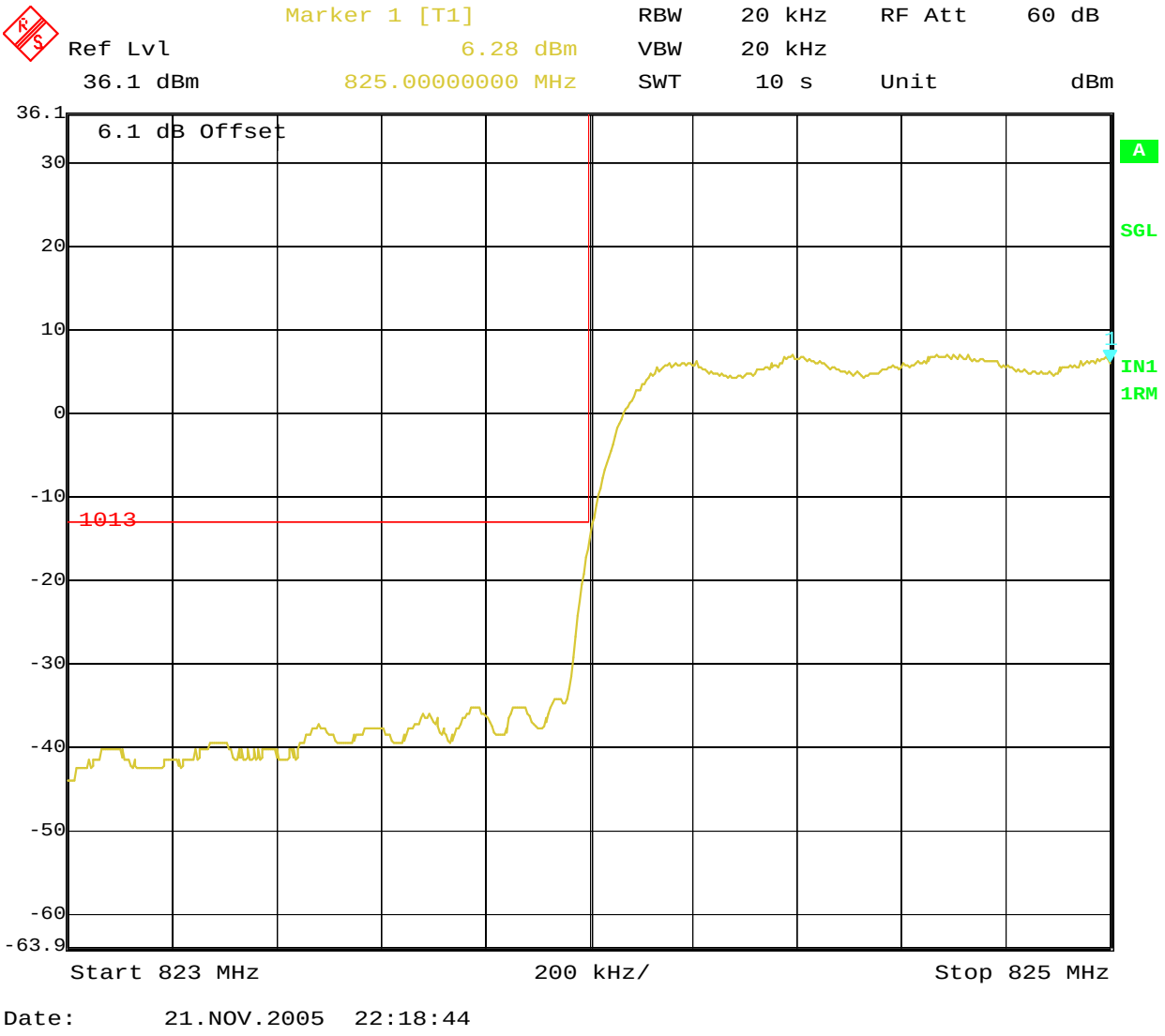


*Figure 8-6: Emissions within 1 MHz of band edge, CDMA 800 Channel 777*

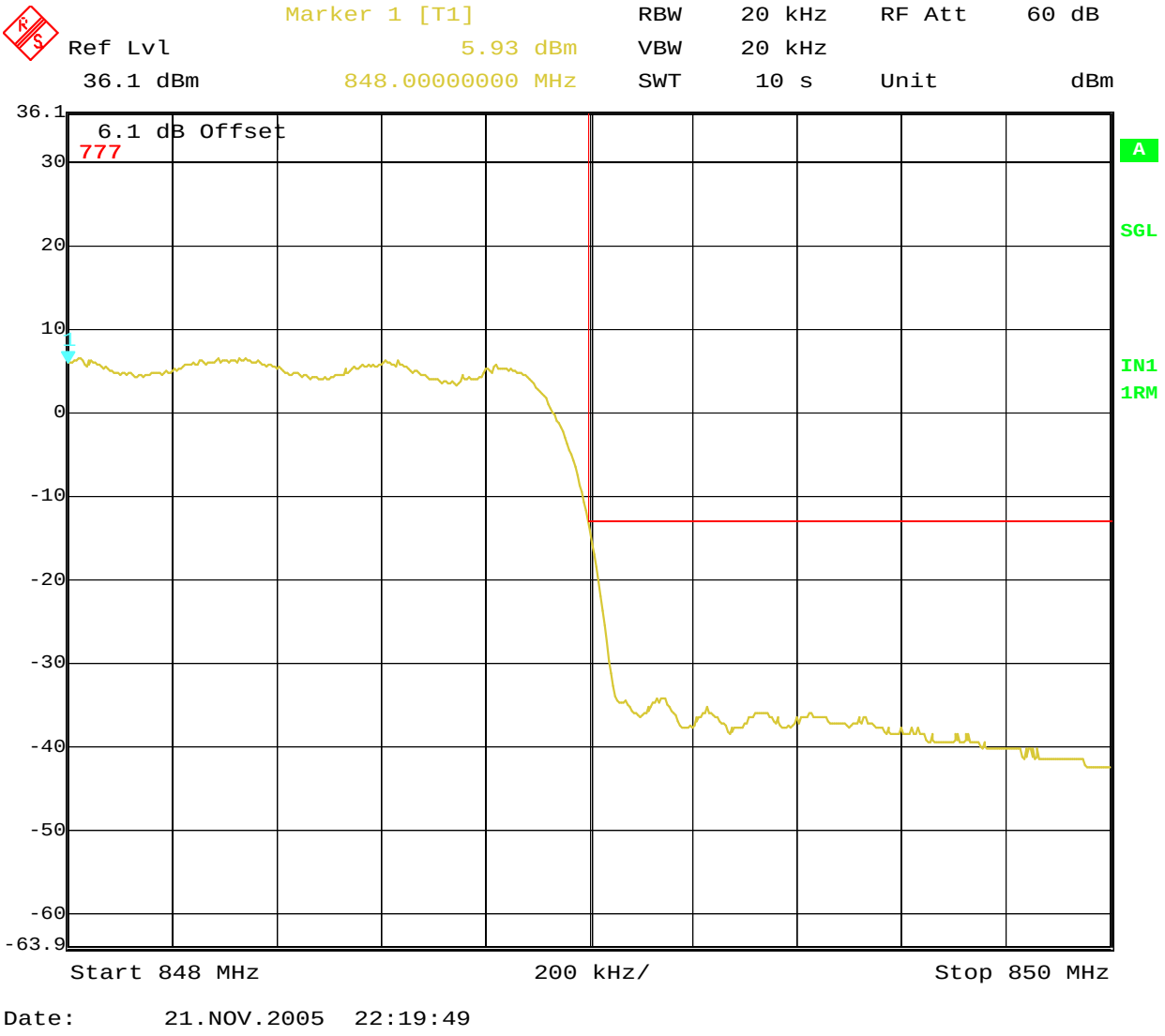


*Figure 8-7: Emissions within 1 MHz of band edge, CDMA 1900 Channel 25*

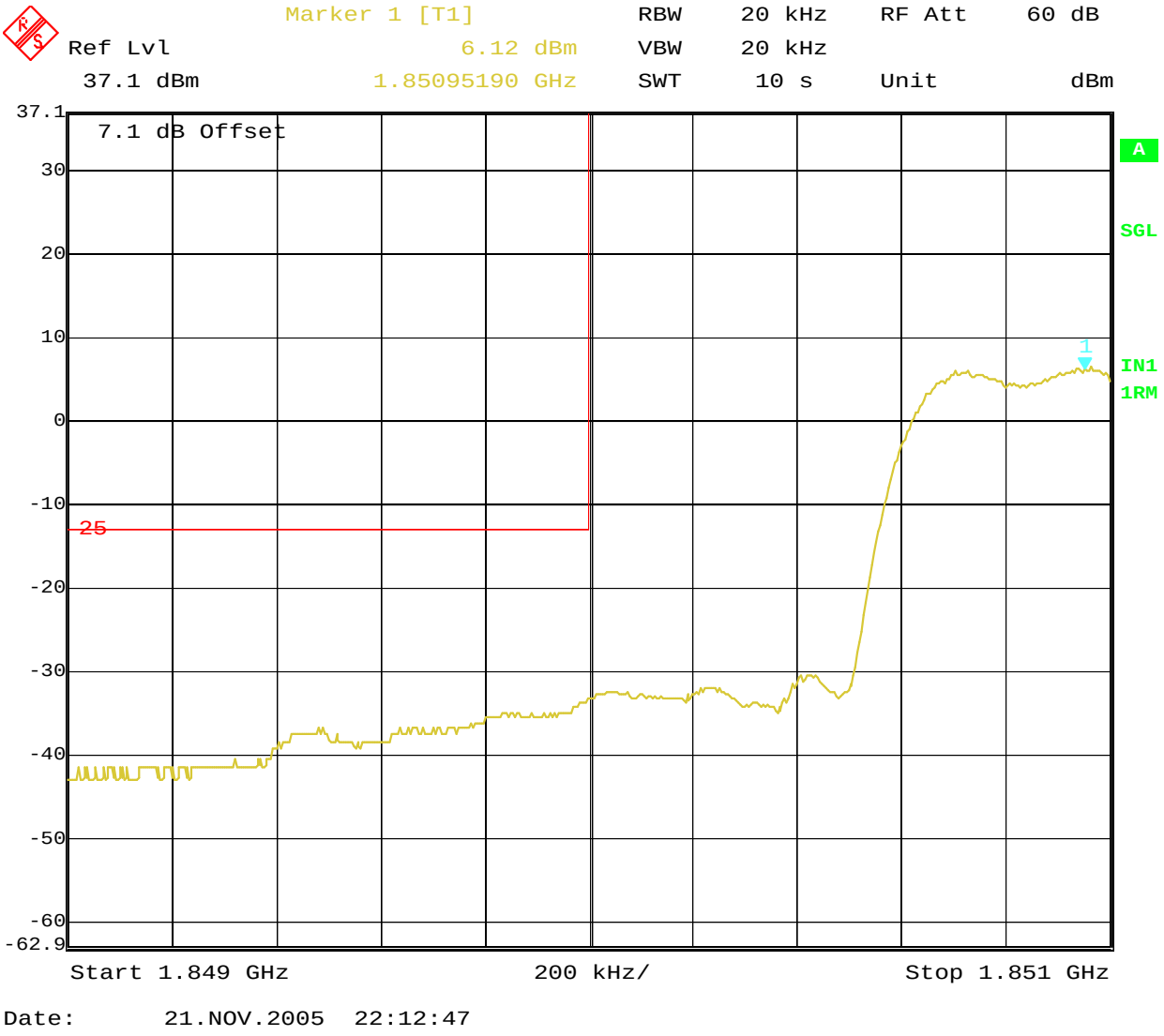
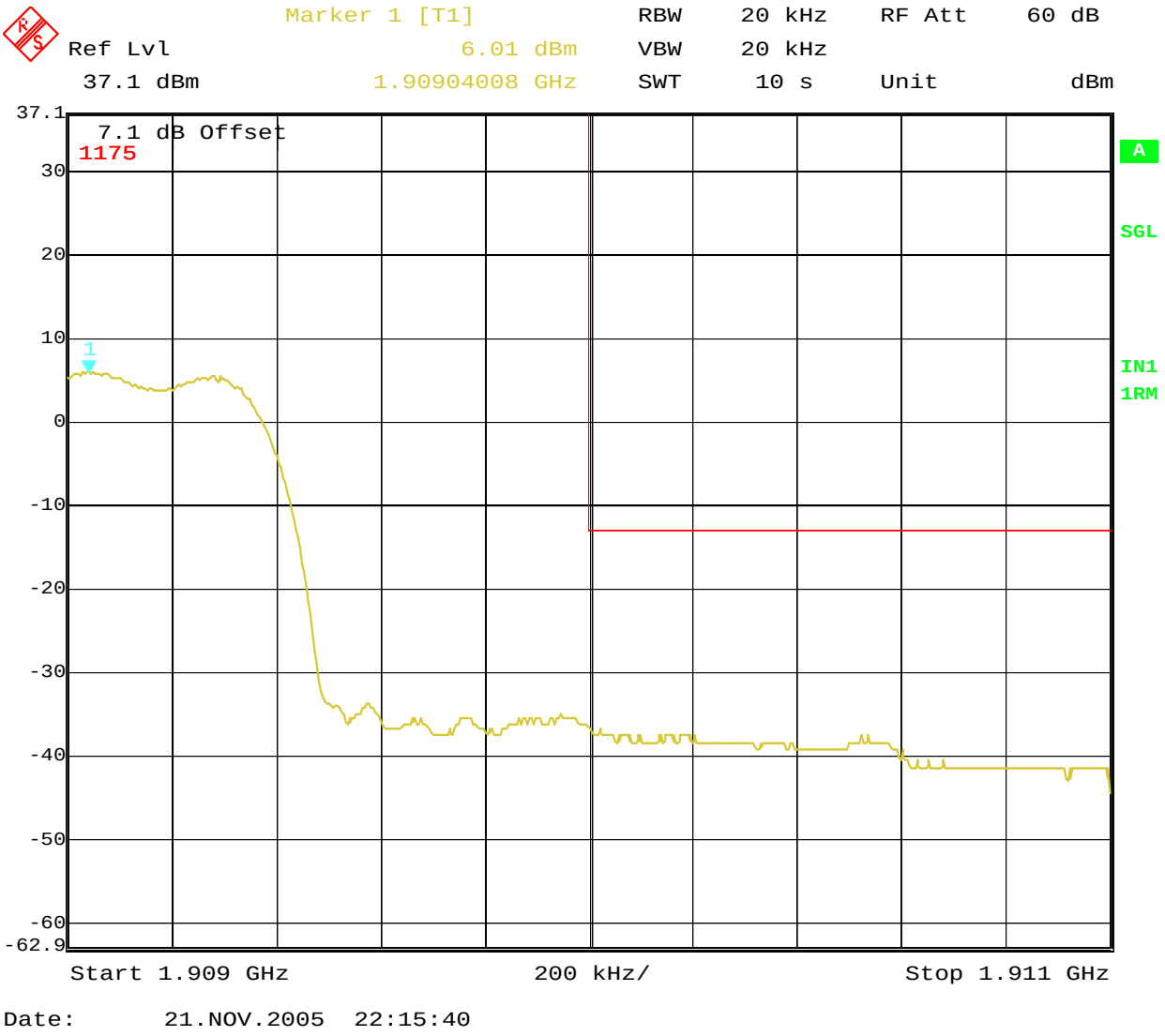


*Figure 8-8: Emissions within 1 MHz of band edge, CDMA 1900 Channel 1175*



# 9 FIELD STRENGTH OF SPURIOUS RADIATION

FCC §2.1053

RSS-129 §8.1

## 9.1 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.

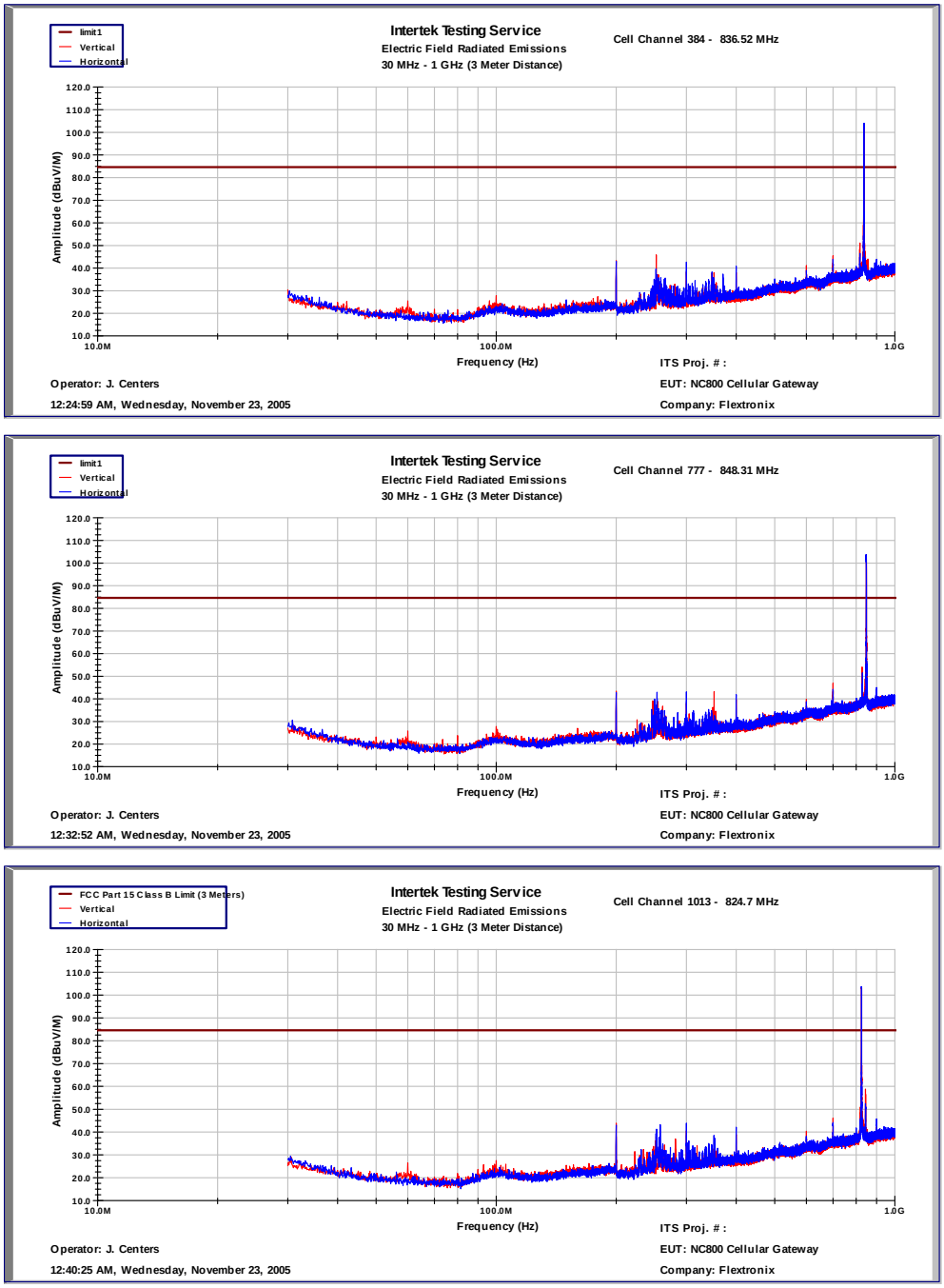
The frequency range up to tenth harmonic was investigated for each of three fundamental frequencies (low, middle, and high channels) in each operating band. Once spurious emissions were identified, the power of the emission was determined using the substitution method described in TIA-603-B section 2.2.12 (Radiated Spurious Emissions).

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

## 9.2 Test Results

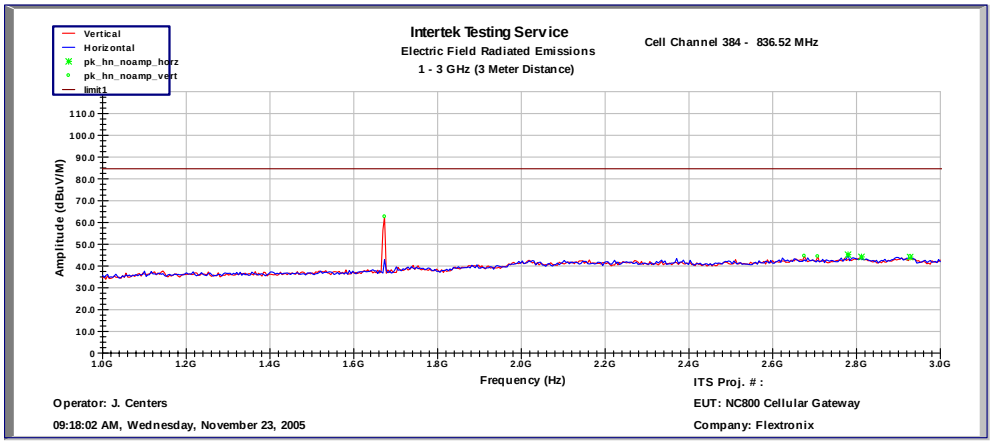
The Residential Gateway met the field strength of spurious radiation requirements of FCC §2.1053. See The Figure 9-1 through Figure 9-6 for the graphical test data.

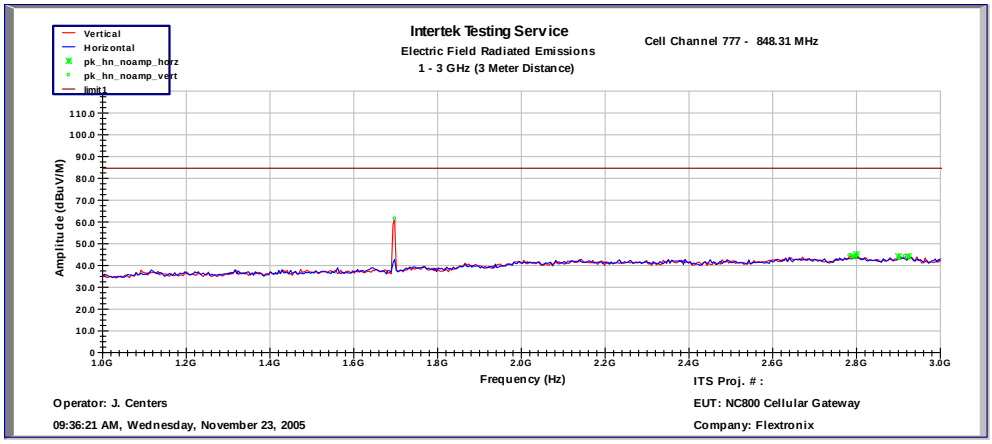
*The Figure 9-1: Field Strength of Spurious Radiation (30 MHz – 1 GHz), CDMA 800 Channel 384, 777, and 1013*[1]




[1] The emission shown exceeding the limit in these three plots is the fundamental for channels 384, 777, and 1013.

*Figure 9-2: Field Strength of Spurious Radiation (1 GHz – 3 GHz), CDMA 800 Channel 384,777, 1013*



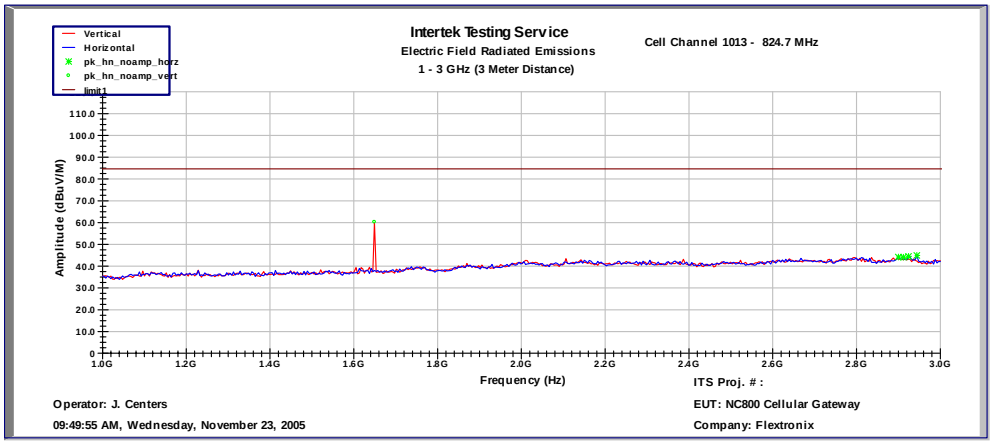
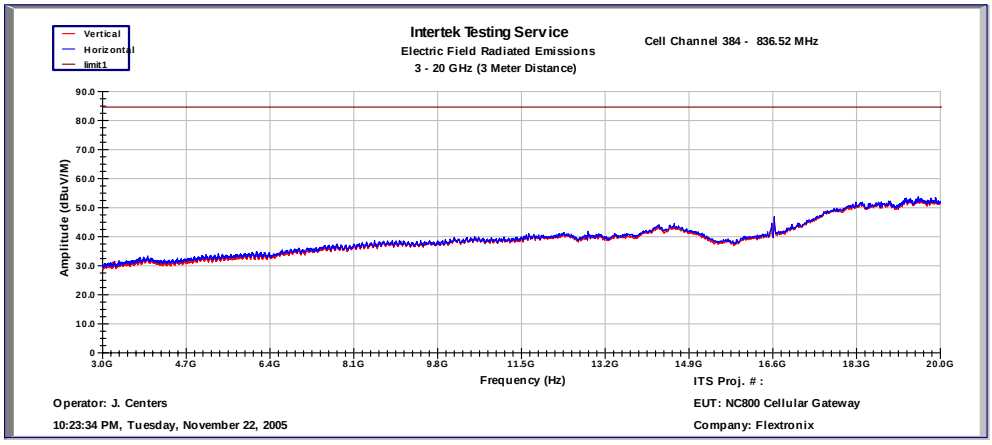
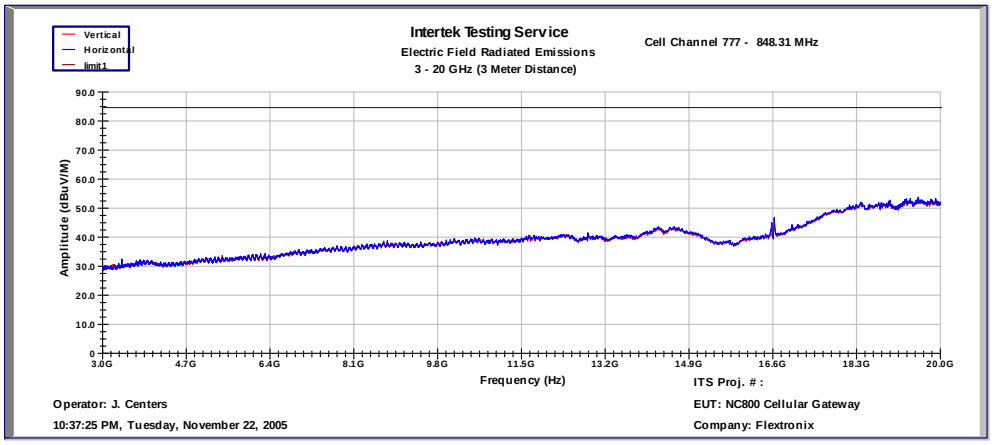



*Figure 9-3: Field Strength of Spurious Radiation (3GHz – 20GHz), CDMA 800 Channel 384, 777, and 1013*



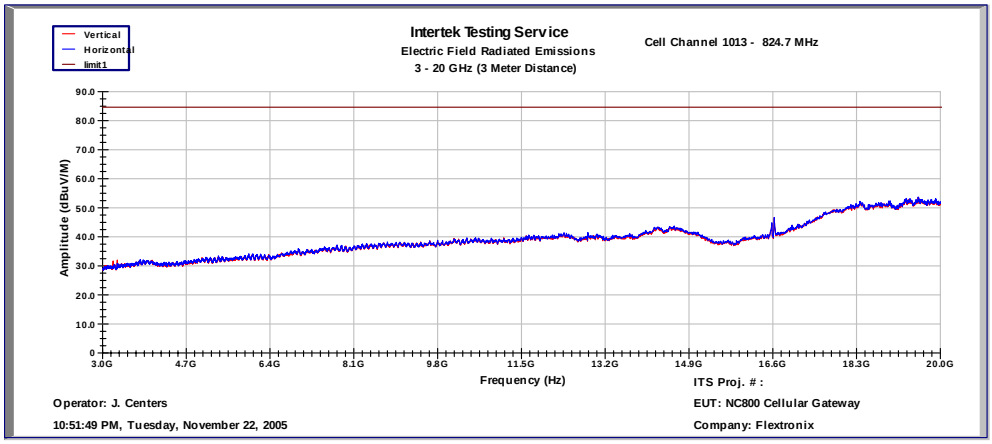
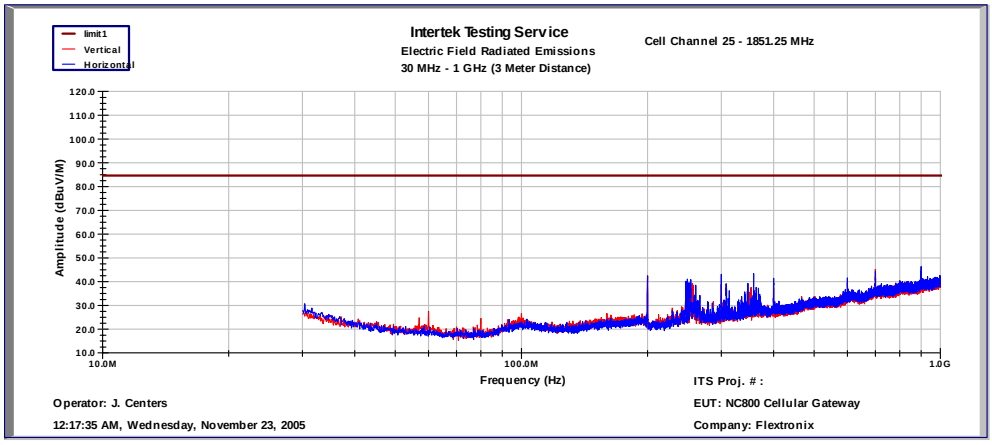
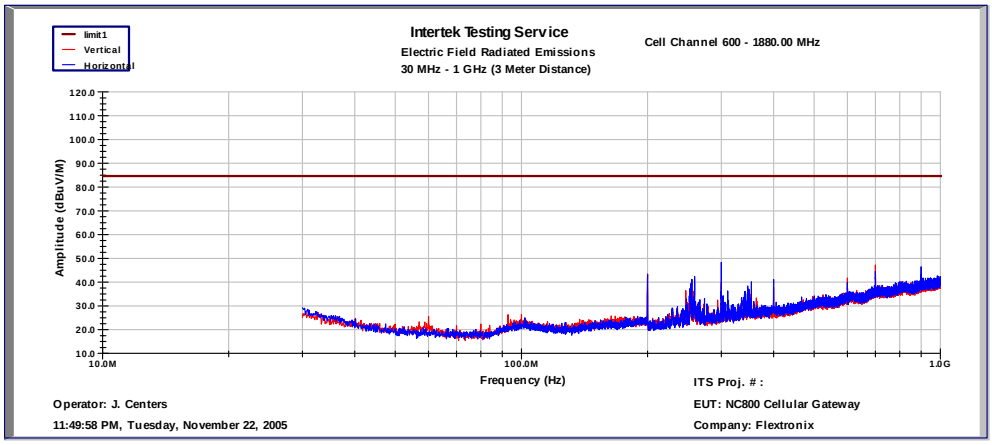



*Figure 9-4: Field Strength of Spurious Radiation (30 MHz – 1 GHz), CDMA 1900 Channel 25, 600, and 1175*



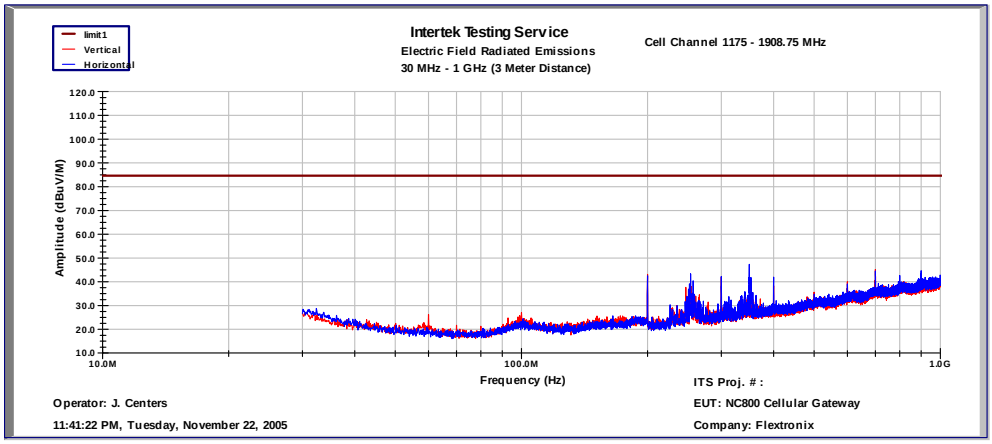
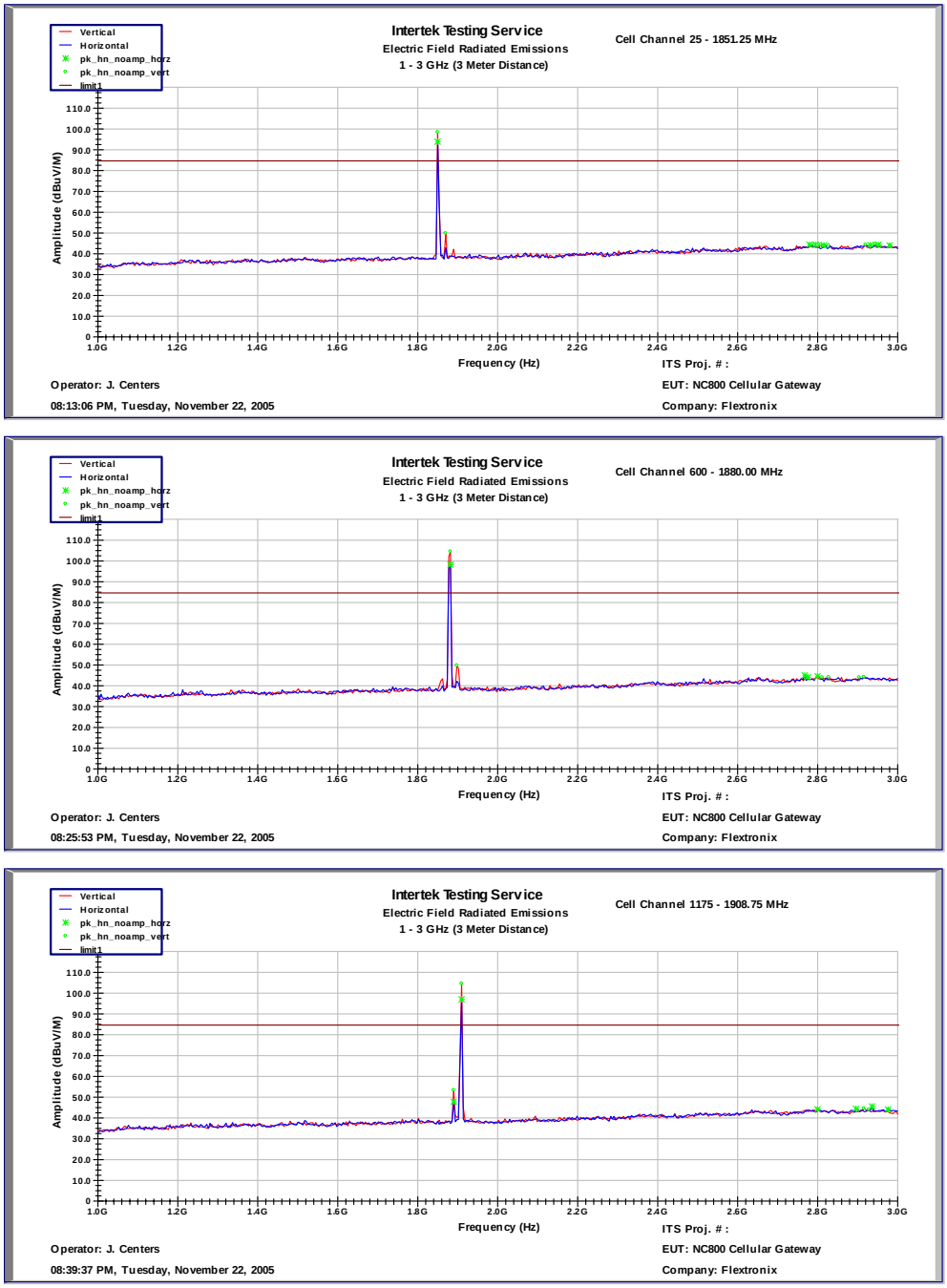
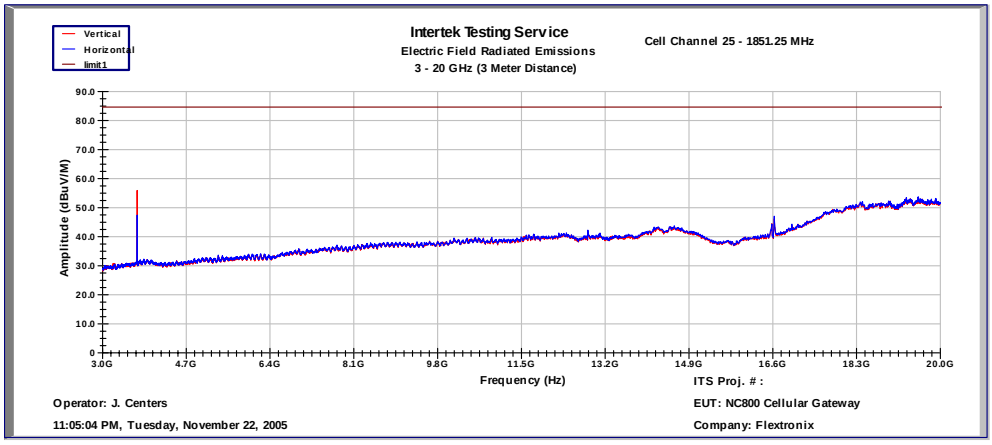



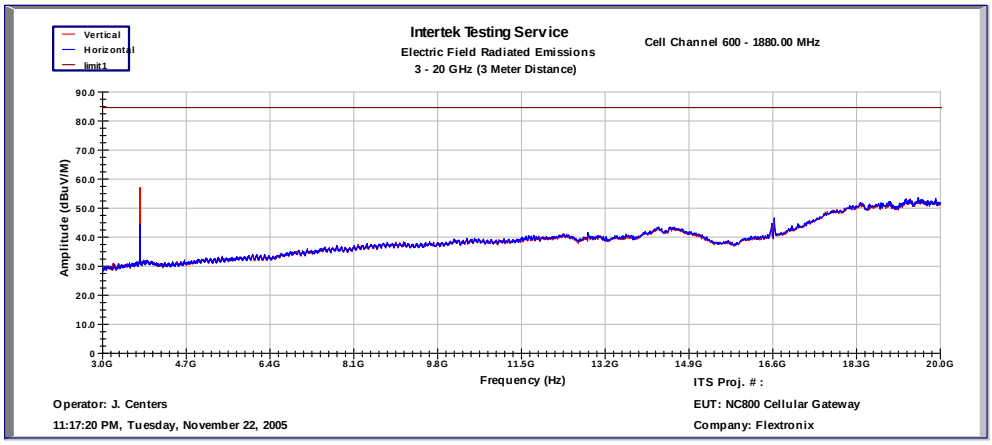
*Figure 9-5: Field Strength of Spurious Radiation (1 GHz – 3 GHz), CDMA 1900 Channel 25, 600, and 1175* [2]

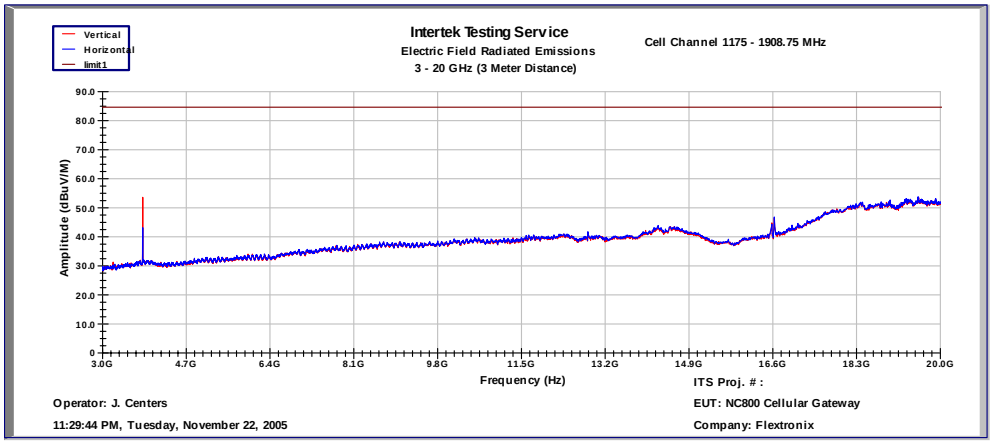



[2] The emission shown in these three plots is the fundamental for channels 25, 600, and 1175.

*Figure 9-6: Field Strength of Spurious Radiation (3GHz – 20GHz), CDMA 1900 Channel 25, 600, and 1175*



# 10 POWER LINE CONDUCTED EMISSIONS

FCC §15.107, FCC §15.207

IC ES-003

## 10.1 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.

## 10.2 Test Results

The Residential Gateway met the power line conducted emission requirements of FCC §15.107 and §15.207. The test results are located in Figure 10-1. The graphical data, measured with peak detection, was all below the class B quasi-peak and average limits.

*Figure 10-1: FCC §15.107 and §15.207 power line conducted emissions (Lines 1 and 2 )*

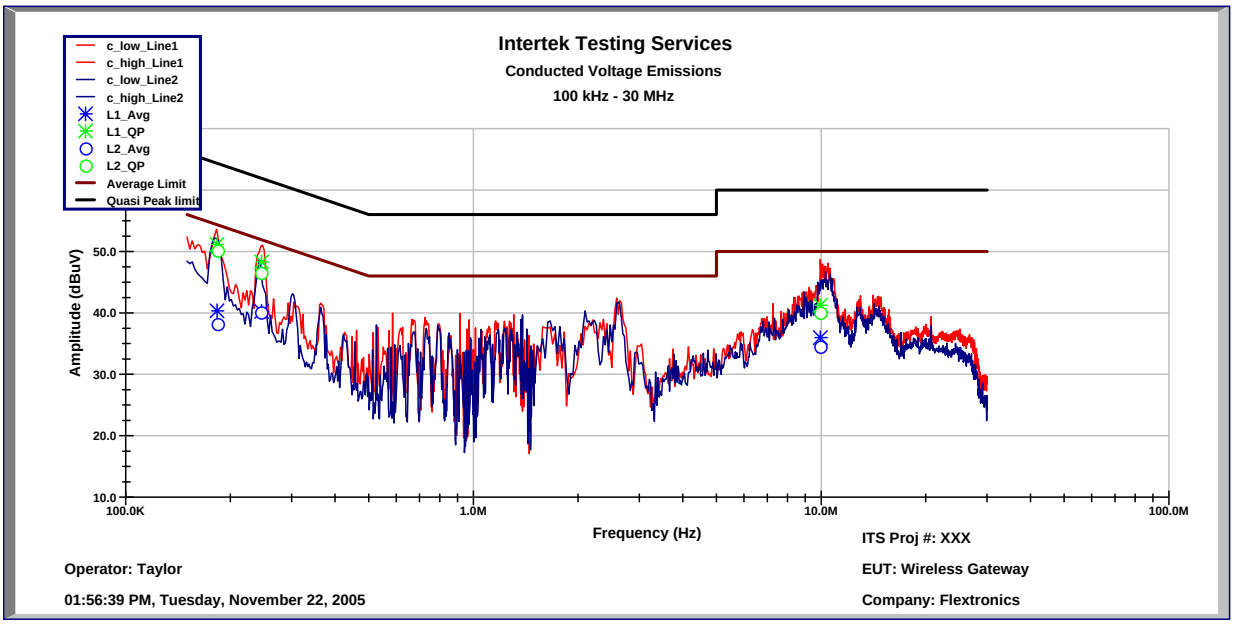



*Figure 10-2:Quasi-peak and average detector readings for FCC §15.107 and §15.207 power line conducted emissions (Lines 1 and 2 )*

| Line | Frequency (MHz) | Quasi-Peak(dBuV) | Quasi-Peak Limit (dBuV) | Quasi-Peak Delta (dB) | Average (dBuV) | Average Limit (dBuV) | Average Delta (dB) | Results |
|---|---|---|---|---|---|---|---|---|
| Line 1 | 183.1 KHz | 51.13 | 64.34 | -13.21 | 40.33 | 55.05 | -14.73 | **Compliant** |
| Line 1 | 245.9 KHz | 48.31 | 61.89 | -13.59 | 40.25 | 53.26 | -13.01 | **Compliant** |
| Line 1 | 9.94 MHz | 41.23 | 60 | -18.77 | 35.97 | 50 | -14.03 | **Compliant** |
| Line 2 | 183.8 KHz | 50.15 | 64.31 | -14.16 | 38.19 | 55.03 | -16.84 | **Compliant** |
| Line 2 | 245.1 KHz | 46.51 | 61.92 | -15.41 | 40.08 | 53.28 | -13.2 | **Compliant** |
| Line 2 | 9.94 MHz | 40.03 | 60 | -19.97 | 34.5 | 50 | -15.5 | **Compliant** |

# 11 RECEIVER SPURIOUS EMISSIONS

FCC §15.109

IC ES-003, RSS-129 §10, RSS-133 §9

## 11.1 Test Limits

*Table 11-1 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 |

## 11.2 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.

## 11.3 Test Results

The Residential Gateway is **compliant** with the radiated disturbance requirements of FCC §15.109 for a class B device. The maximized quasi peak data can be found in Figure 11-2.

*Figure 11-1 FCC §15.109 Receiver Spurious Emissions Graphical Data*

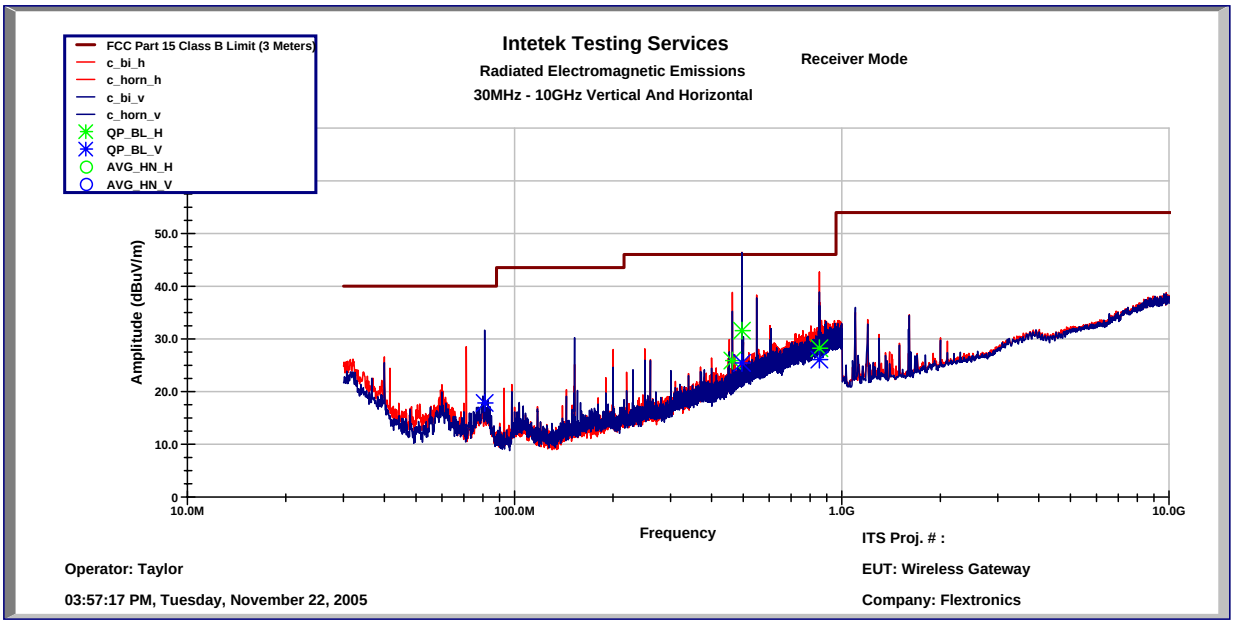



*Figure 11-2 FCC §15.109 Maximized Quasi Peak and Average Emissions*

| Frequency (MHz) | Polarity (H/V) | Cab. (dB) | Ant. (dB) | Corr. Reading. (dBuV/m) | Limit (dBuV/m) | Delta (dB) | Azimuth (deg) | Tower (cm) | Results |
|---|---|---|---|---|---|---|---|---|---|
| 462.88 MHz | V | 1.77 | 18.4 | 25.87 | 46.02 | -20.15 | 179 | 112 | **Compliant** |
| 495.28 MHz | V | 1.86 | 19.03 | 31.56 | 46.02 | -14.46 | 185 | 186 | **Compliant** |
| 853.7 MHz | V | 2.44 | 24 | 28.22 | 46.02 | -17.8 | 154 | 325 | **Compliant** |
| 81.0 MHz | V | 0.73 | 8.18 | 17.83 | 40 | -22.17 | 332 | 113 | **Compliant** |
| 495.3 MHz | V | 1.86 | 18.32 | 25.42 | 46.02 | -20.6 | 129 | 100 | **Compliant** |
| 853.7 MHz | V | 2.44 | 22.5 | 26.06 | 46.02 | -19.96 | 238 | 173 | **Compliant** |

## 12 FREQUENCY STABILITY VS TEMPERATURE

FCC §2.1055, FCC §22.355, FCC §24.235

RSS-133 §7

Frequency tolerance: 2.5ppm

### 12.1 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 BASE STATION SIMULATOR.

### 12.2 Test Results

The Residential Gateway met the frequency stability requirements of FCC §2.1055, FCC §22.355and FCC §24.235. The test results are located in Table 12-1.

*Table 12-1: Frequency stability vs. Temperature*

| Frequency Stability Vs. Temperature (Hz) | | | | | | |
|---|---|---|---|---|---|---|
| Temp. | Cell Band | | | PCS Band | | |
| (Celsius) | 384 | 777 | 1013 | 25 | 600 | 1175 |
| 60 | 4.5 | 5.5 | 4.7 | 8.2 | 10.2 | 12.1 |
| 50 | 3.2 | 5.8 | 3.7 | 6.8 | 9.4 | 11.3 |
| 40 | 6 | 4.7 | 5.2 | 12.2 | 11 | 12.2 |
| 30 | 5.7 | 6.8 | 5.1 | 11 | 10.4 | 10.4 |
| 20 | 7.1 | 4.5 | 6.7 | 6.9 | 9.6 | 11.5 |
| 10 | 6.8 | 4.2 | 4.9 | 7.5 | 6.4 | 7.7 |
| 0 | 1 | 2.1 | 3.4 | 5.2 | 2.2 | 1.2 |
| -10 | 3.4 | 3.5 | 3.9 | 7.4 | 4.7 | 6.2 |
| -20 | 2.7 | 6.9 | 2.5 | 3.3 | 3.8 | 7.9 |
| -30 | 4.8 | 5.4 | 5 | 2.6 | 3.4 | 2.7 |

# 13 FREQUENCY STABILITY VS VOLTAGE

FCC §2.1055, FCC §22.355

Frequency tolerance: 2.5ppm

## 13.1 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.

## 13.2 Test Results

The Residential Gateway met the frequency stability requirements of FCC §2.1055 and FCC §22.355. The test results are located in Table 13-1.

*Table 13-1: CDMA Frequency stability vs. input voltage*

| Frequency Stability Vs. Voltage | | | | | | |
|---|---|---|---|---|---|---|
| **Voltage** | **Cell Band** | | | **PCS Band** | | |
| **(V)** | **384** | **777** | **1013** | **25** | **600** | **1175** |
| 135.25 | 6.3 | 4.4 | 7.9 | 3.8 | 8.2 | 6.3 |
| 120 | 3.2 | 7.1 | 9.8 | 6.7 | 3.5 | 6.6 |
| 97.75 | 3.8 | 6.5 | 5.5 | 7.2 | 6.7 | 2.7 |