# TEST REPORT

**Report Number: 3131792LEX-001**
**Project Number: 3131792**

**Evaluation of Model Number: TG-4**

**FCC ID: MTFTG5112597A**

**FCC Part 15 Subpart B**
**FCC Part 22 Subpart H**
**FCC Part 24 Subpart E**

**For**

**Telular Corporation**

| Test Performed by: | Test Authorized by: |
|---|---|
| Intertek<br>731 Enterprise Drive<br>Lexington, KY 40510 | Telular Corporation<br>580 Old Willets Path<br>Hauppage, NY 11788 |

**Prepared By:** _____ **Date:** 10/4/2007

Vinay Kutty, Senior Project Engineer

**Approved By:** _____ **Date:** 10/4/2007

Bryan C. Taylor, Team Leader

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# 1 JOB DESCRIPTION

## 1.1 Company Information

| Company Information | |
|---|---|
| **Manufacturer:** | Telular Corporation |
| **Address:** | 580 Old Willets Path<br>Hauppage NY 11788 |
| **Contact Name:** | Matt McKiernan |
| **Telephone Number:** | (631) 232-6070 x 223 |

## 1.2 Test Sample Information

The Telular Corporation TG-4 is a residential primary and small business cellular alarm communicator.

| Test sample | | |
|---|---|---|
| **Model Number:** | TG-4 | |
| **Serial Number:** | 3157288471 | |
| **FCC ID:** | MTFTG5112597A | |
| **Device Category:** | Mobile | |
| **RF Exposure Category:** | General Population/Uncontrolled Environment | |
| **Transmission Modes:** | **GSM 850** | **GSM 1900** |
| **Frequency Range, MHz:** | 824 MHz-849 MHz | 1850 – 1910 MHz |
| **Maximum Conducted RF Output Power:** | 32.4 dBm | 29.6 dBm |

### 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 |
|---|---|---|---|
| 120 V AC – 12 VAC Adapter | GlobTek, Inc. | GT-348A-12-800 | - |

### 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 |
| AC Power Cord | 2 ft | No | No | 120 V AC – 12 VAC Adapter | AC Power Source |
| RJ31X cable | 5 ft | No | No | J7 connector | Unterminated |
| STC1/STC2 cable | 8 ft | No | No | JP4 connector | Unterminated |

## 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

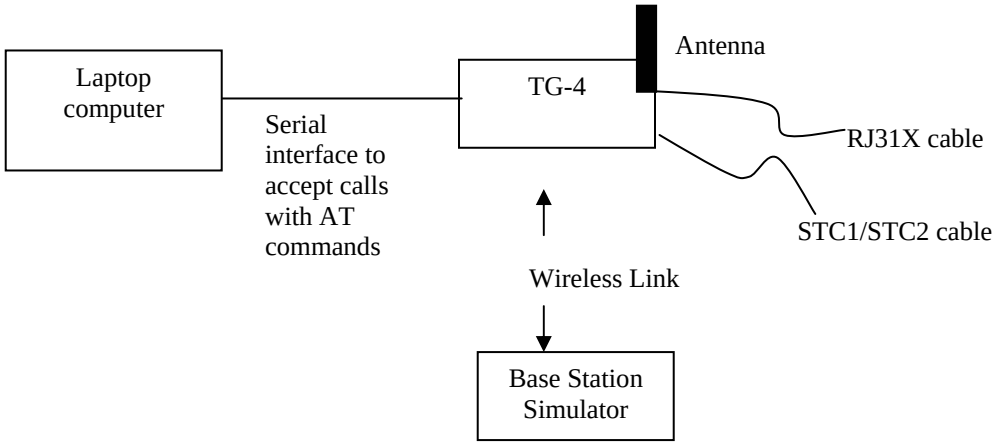
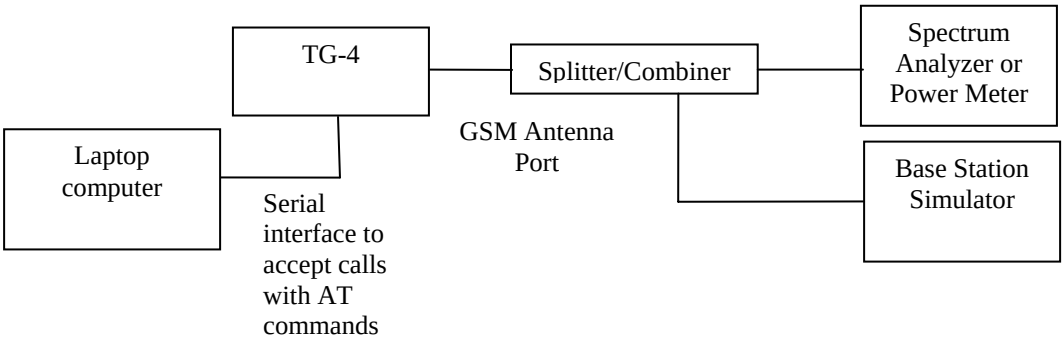



Figure 1-2: Conducted Test Configuration




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

The TG-4 was powered by a supplied AC adapter which was powered by 120 VAC. For radiated testing, the GSM antenna was connected to the TG-4. For conducted measurements, the antenna was removed and a calibrated coaxial cable inserted between the GSM port and the measuring equipment (spectrum analyzer or power meter). A base station simulator was used to force the TG-4 to transmit at maximum output power.

## 2 EXECUTIVE SUMMARY

Testing performed for: Telular Corporation

Equipment Under Test: TG-4

Receipt of Test Sample: 9/3/2007

Test Start Date: 9/3/2007

Test End Date: 9/11/2007

| FCC RULE | IC RULE | DESCRIPTION OF TEST | RESULT | PAGE |
|---|---|---|---|---|
| §2.1046 | RSS-129 (9.2.2) | RF Power Output | **Compliant** | 9 |
| §22.913, §24.232 | RSS-129 (9.1) RSS-133 (6.4) | ERP, EIRP | **Compliant** | 10 |
| §2.1049 §22.917(b)(d) §24.238(a) | NA | Occupied Bandwidth, Emissions Limitations | **Compliant** | 12 |
| §2.1051 §22.917(a) §24.238(a) | RSS-129 (8.1.1) RSS-133 (6.5.1) | Out of Band Emissions at Antenna Terminals | **Compliant** | 17 |
| §2.1053 §22.917(a) §24.238(a) | RSS-129 (8.1.1) RSS-133 (6.5.1) | Radiated Spurious Emissions | **Compliant** | 24 |
| §15.107 | RSS-Gen [7.2.2] | Power Line Conducted Emissions | **Compliant** | - |
| §15.109 | RSS-129 (10) RSS-133 (6.7) | Receiver Spurious Emission | **Compliant** | 29 |
| §2.1055, §22.355, §24.235 | RSS-129 (9.2.1) RSS-133 (6.3) | Frequency Stability vs. Temperature | **Compliant** | 31 |
| §2.1055, §22.355, §24.235 | RSS-129 (9.2.1) RSS-133 (6.3) | Frequency Stability vs. Voltage | **Compliant** | 32 |

### 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 2055A-1. The FCC registration number is 485103.

### 3.1 Test Equipment

| Description | Manufacturer | Model Number | Serial Number | Calibration due date |
|---|---|---|---|---|
| Environmental Chamber | Envirotronics | SSH32C | 05994674-S-11007 | 4/26/2008 |
| Signal Generator | HP | 83620B | 3614A00199 | 8/20/2008 |
| Horn Antenna | EMCO | 3115 | 6556 | 8/2/2008 |
| EMI Receiver | Rohde & Schwarz | ESI B40 | 100229 | 5/9/2008 |
| EMI Receiver | HP | E7405A | 2142 | 8/16/2008 |
| LISN | Fischer Custom Communication | FCC-LISN-50-50-2M | 1026 | 5/11/2008 |
| Bilog Antenna | EMCO | 3142C | 00051864 | 11/14/2007 |
| Preamplifier | Miteq | AFS44-00102000-30-10P-44 | 987410 | 6/19/2008 |
| Digital Multimeter | Fluke | 87 | 1280 | 3/18/2008 |
| Base Station Simulator | Rhode & Schwarz | CMU200 | 1100.0008.02 | 3/29/2008 |
| Function Generator | HP | 3325B | 2801A0216 | 2/21/2008 |
| Modulator Analyzer | HP | 8901B | 2142A01663 | 3/22/2008 |

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

Table 4-1 RF Power Variation (dBm) with Temperature

| | **GSM 850 Band (Limit is 7W or 38.45 dBm)** | | | **GSM 1900 Band (Limit is 2W or 33 dBm)** | | |
|---|---|---|---|---|---|---|
| **Temp (°C)** | **Channel 128** | **Channel 190** | **Channel 251** | **Channel 512** | **Channel 661** | **Channel 810** |
| -30 | 32.4 | 32.2 | 31.8 | 30.0 | 29.7 | 29.2 |
| -20 | 32.4 | 32.2 | 31.8 | 29.9 | 29.6 | 29.1 |
| -10 | 32.5 | 32.2 | 31.8 | 29.9 | 29.5 | 29.0 |
| 0 | 32.4 | 32.1 | 31.7 | 29.8 | 29.4 | 28.9 |
| 10 | 32.4 | 32.1 | 31.6 | 29.7 | 29.4 | 28.8 |
| 20 | 32.4 | 32.1 | 31.7 | 29.6 | 29.2 | 28.7 |
| 30 | 32.4 | 32.1 | 31.7 | 29.6 | 29.2 | 28.6 |
| 40 | 32.4 | 32.1 | 31.7 | 29.5 | 29.0 | 28.5 |
| 50 | 32.3 | 32.1 | 31.6 | 29.4 | 28.9 | 28.3 |
| 60 | 32.4 | 32.1 | 31.7 | 29.3 | 28.8 | 28.2 |

# 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 power was measured in a fully anechoic chamber designed to measure antenna performance. ERP in the GSM 850 band and EIRP in the GSM 1900 band were measured using a substitution method as described in TIA-603-B Section 2.2.17 (Radiated Power Output). EIRP was calculated as follows:

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

where,

**$E_1$** is the receiver reading in dBm when measuring the field strength of the EUT

**$E_2$** is the receiver reading in dBm when measured field strength from the generator

**$V_{sub}$** 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 TG-4 met the radiated power requirements of FCC §22.913 and §24.232. The test results are located in Table 5-1 and Table 5-2. The maximum ERP for the GSM 850 band was 3.06 W. The maximum EIRP for the GSM 1900 band was 1.98 W.

Table 5-1 Radiated RF Power – ERP in GSM 850 Band

| Technology | Band | Phone Configuration | Channel | Peak ERP (dBm) | Peak ERP (Watts) |
|---|---|---|---|---|---|
| GSM | 850 | Free Space | 128 | **34.89** | **3.06** |
| | | Free Space | 190 | 31.73 | 1.49 |
| | | Free Space | 251 | 30.14 | 1.032 |

Table 5-2 Radiated RF Power – EIRP in GSM 1900 Band

| Technology | Band | Phone Configuration | Channel | Peak EIRP (dBm) | Peak EIRP (Watts) |
|---|---|---|---|---|---|
| GSM | 1900 | Free Space | 512 | **32.96** | **1.98** |
| | | Free Space | 661 | 31.3 | 1.35 |
| | | Free Space | 810 | 30.27 | 1.06 |

# 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.

RSS-129 (6.3.2)

## 6.1 Test Procedure

In both GSM 850 and GSM 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 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 Results

The following is the occupied bandwidth data for the TG-4 .

Table 6-1: Occupied bandwidth measurements for GSM modes

| Mode | Channel | Resolution Bandwidth | Video Bandwidth | Sweep time | Measured Bandwidth (kHz) |
|---|---|---|---|---|---|
| GSM850 | 128 | 3 kHz | 3 kHz | 190 ms | 277.5 |
| | 190 | 3 kHz | 3 kHz | 190 ms | 277.5 |
| | 251 | 3 kHz | 3 kHz | 190 ms | 257.5 |
| GSM1900 | 512 | 3 kHz | 3 kHz | 190 ms | 247.5 |
| | 661 | 3 kHz | 3 kHz | 190 ms | 277.5 |
| | 810 | 3 kHz | 3 kHz | 190 ms | 280.0 |

Figure 6-1: Occupied Bandwidth – GSM850 Channel 128

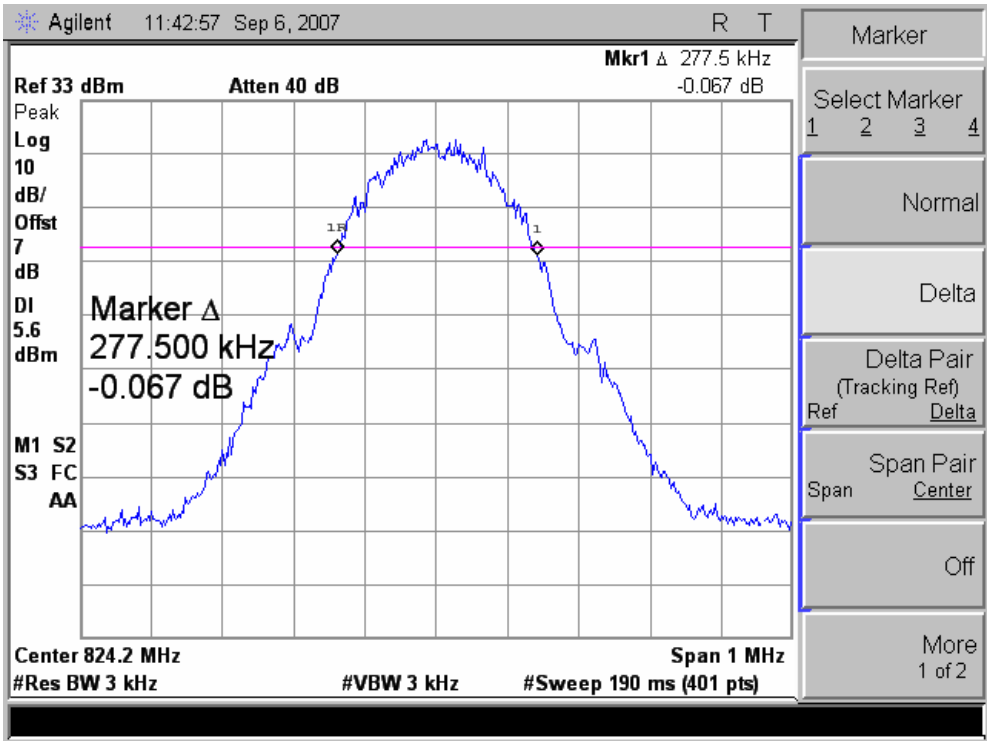



Figure 6-2: Occupied Bandwidth – GSM850 Channel 190

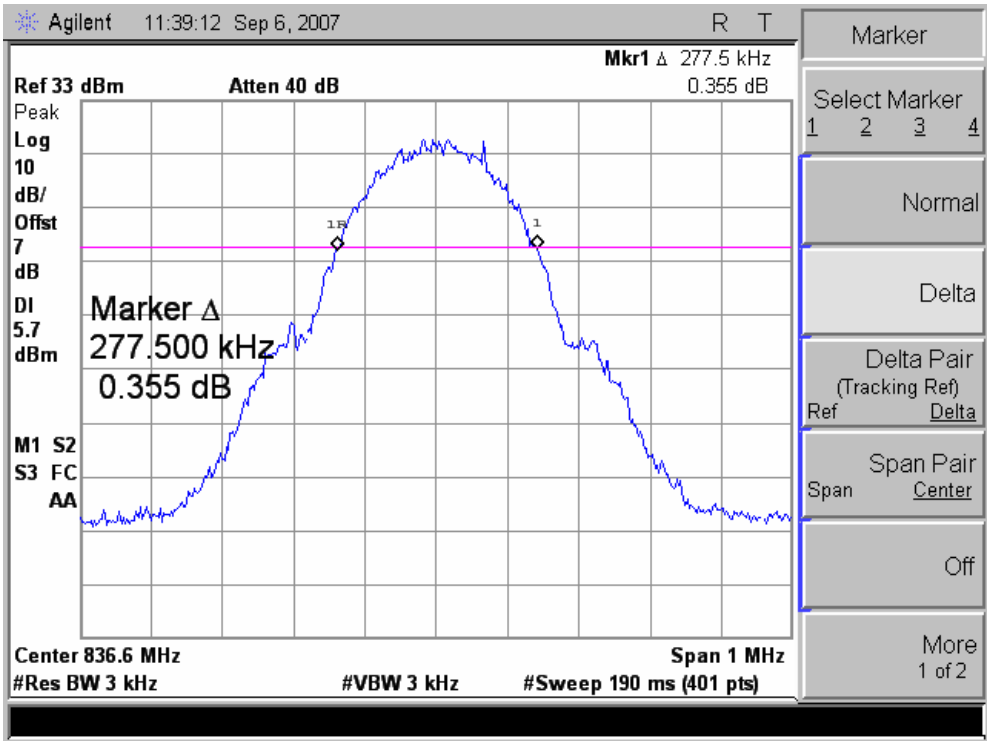


Figure 6-3: Occupied Bandwidth – GSM850 Channel 251

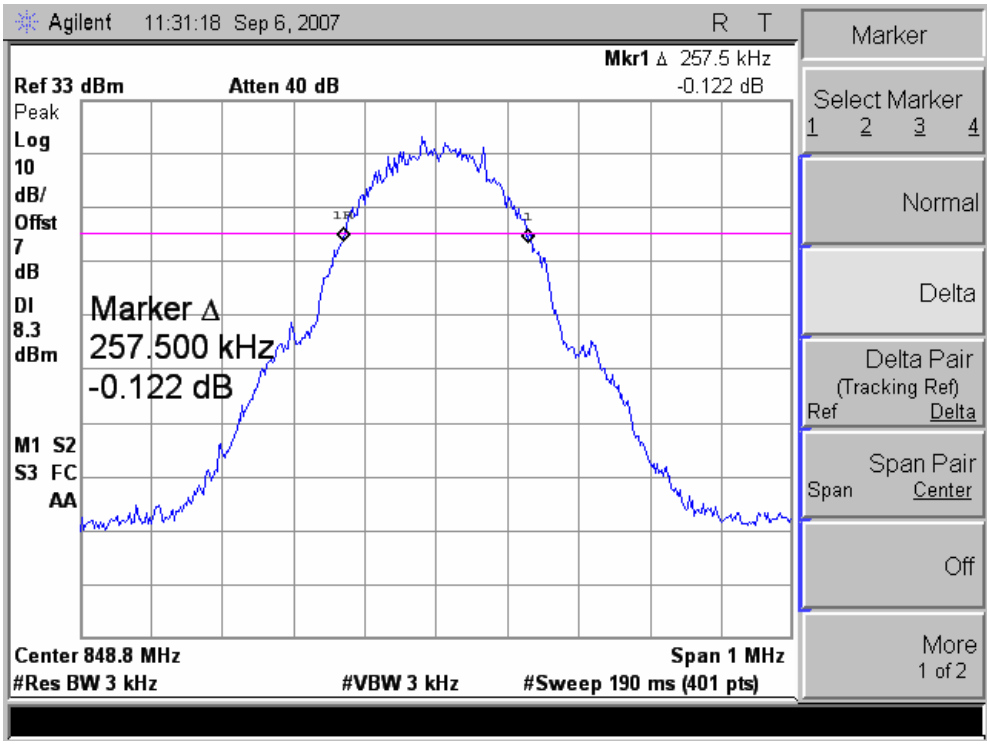



Figure 6-4: Occupied Bandwidth – GSM1900 Channel 512

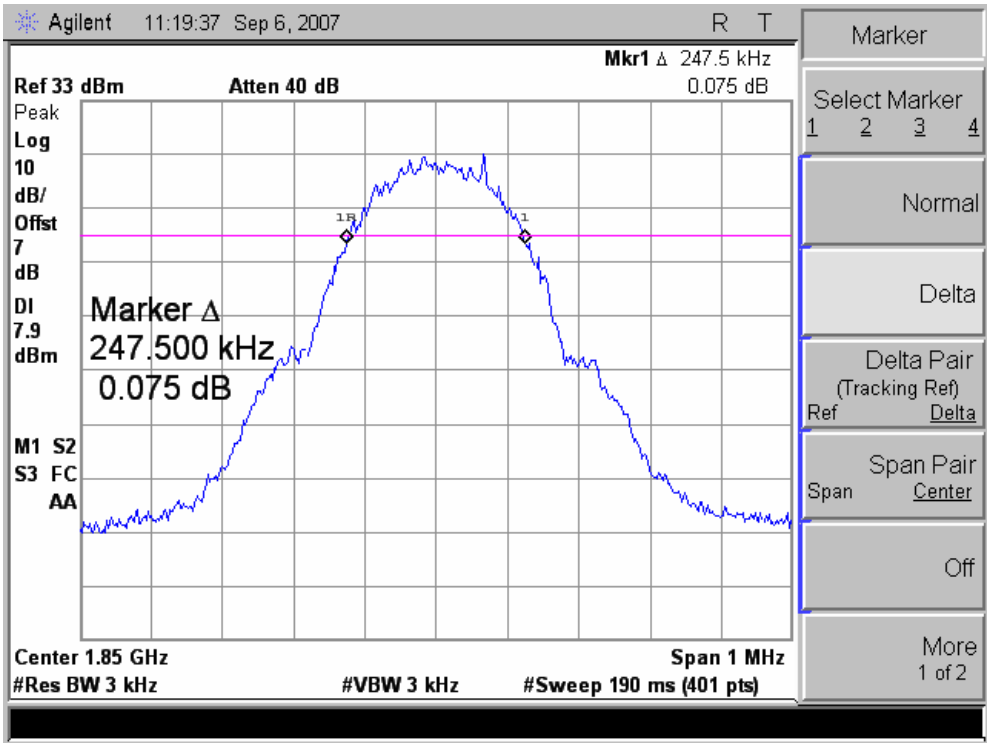


Figure 6-5: Occupied Bandwidth – GSM1900 Channel 661

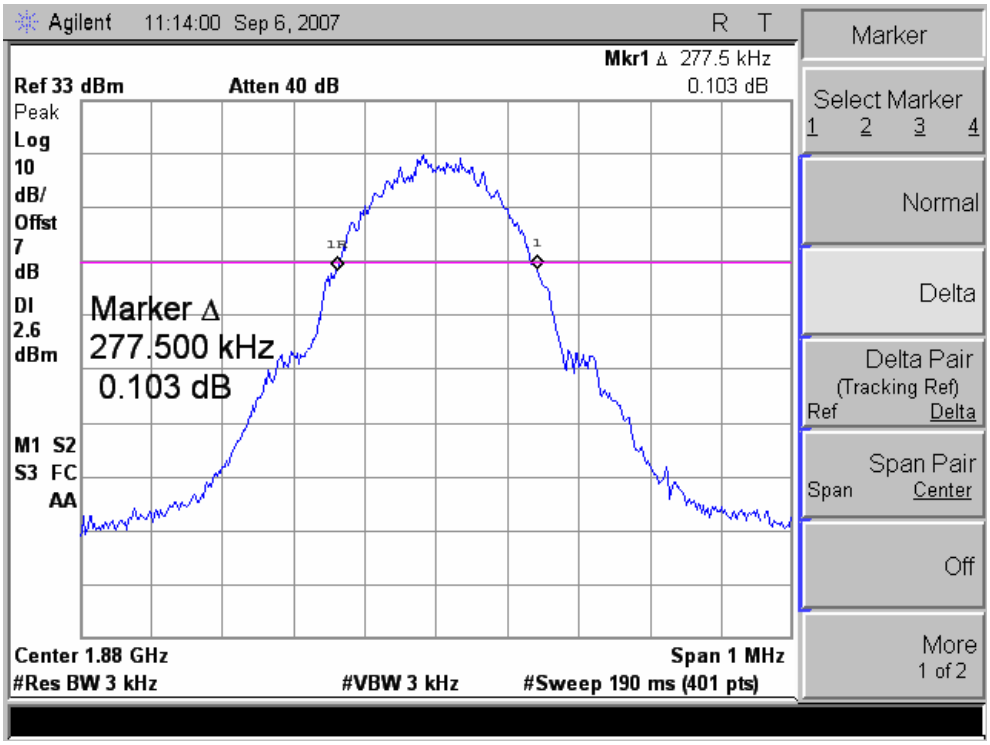
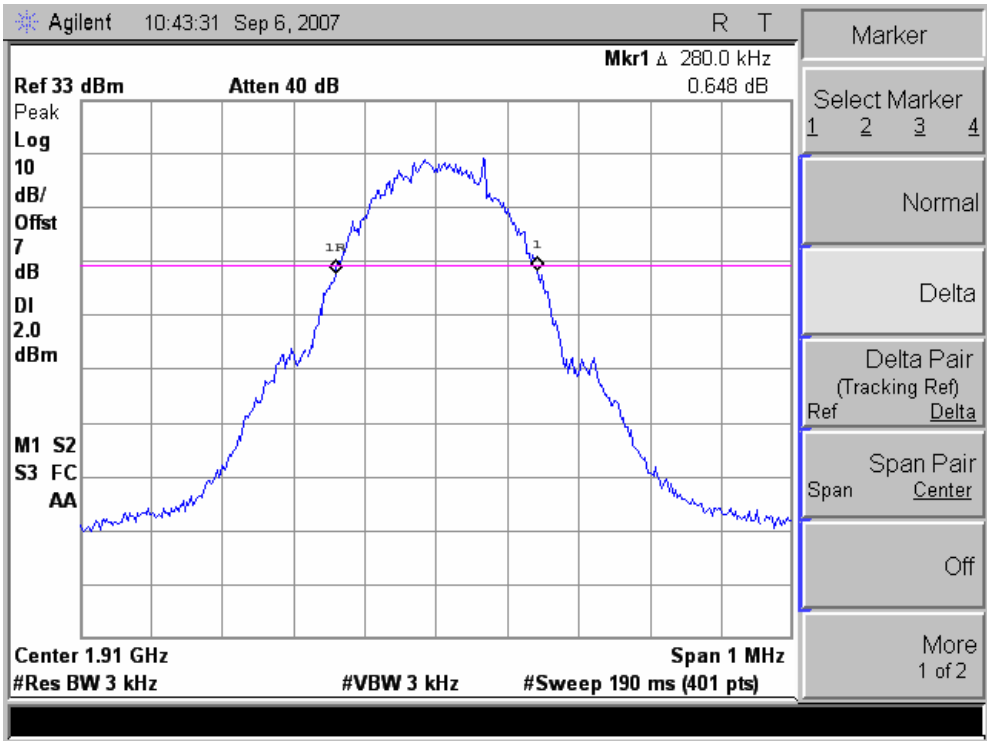



Figure 6-6: Occupied Bandwidth – GSM1900 Channel 810



# 7 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.

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

## 7.2 Test Results

The TG-4 met the out of band emissions at antenna terminal requirements of §22.917(a), FCC §24.238(a). There were no peaks within 20dB of the limit, therefore, a list of such frequencies was not provided. Graphical results are shown in Figure 7-1 through *Figure 7-4*.

Table 7-1: Summary of test result locations

| Location | Mode (Band) | Channel | Description |
|---|---|---|---|
| Figure 7-1 | GSM 850 | 128,190,251 | Conducted spurious emissions, 30MHz to 20 GHz |
| Figure *7-2* | | 128,190,251 | Zoom Graph of the Carrier Frequencies |
| Figure 7-3 | GSM 1900 | 512,661,810 | Conducted spurious emissions, 30MHz to 20 GHz |
| Figure *7-4* | | 512,661,810 | Zoom Graph of the Carrier Frequencies |
| Figure 7-5 | GSM 850 | 128 | Emissions within 1 MHz of band edge |
| Figure 7-6 | | 251 | Emissions within 1 MHz of band edge |
| Figure 7-7 | GSM 1900 | 512 | Emissions within 1 MHz of band edge |
| Figure 7-8 | | 810 | Emissions within 1 MHz of band edge |

Figure 7-1: Out of band emissions at antenna terminals – GSM 850 Channels 128, 190 and 251

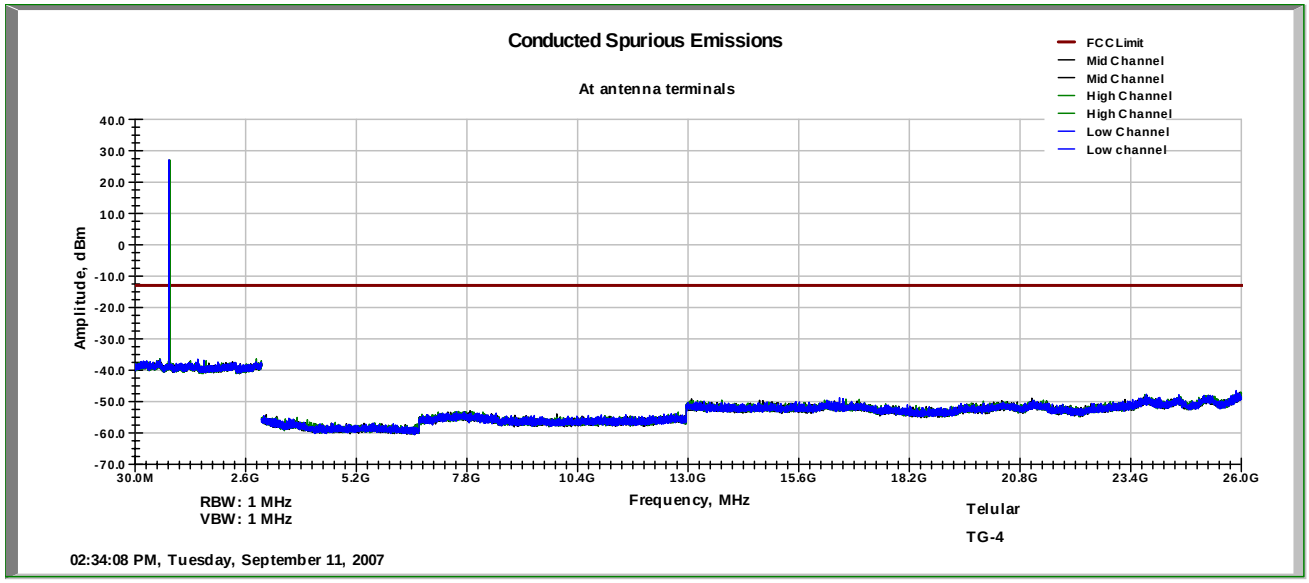



Figure 7-2: Out of band emissions at antenna terminals – GSM 850 Channels 128, 190 and 251 (Zoomed Around Carrier Frequencies)

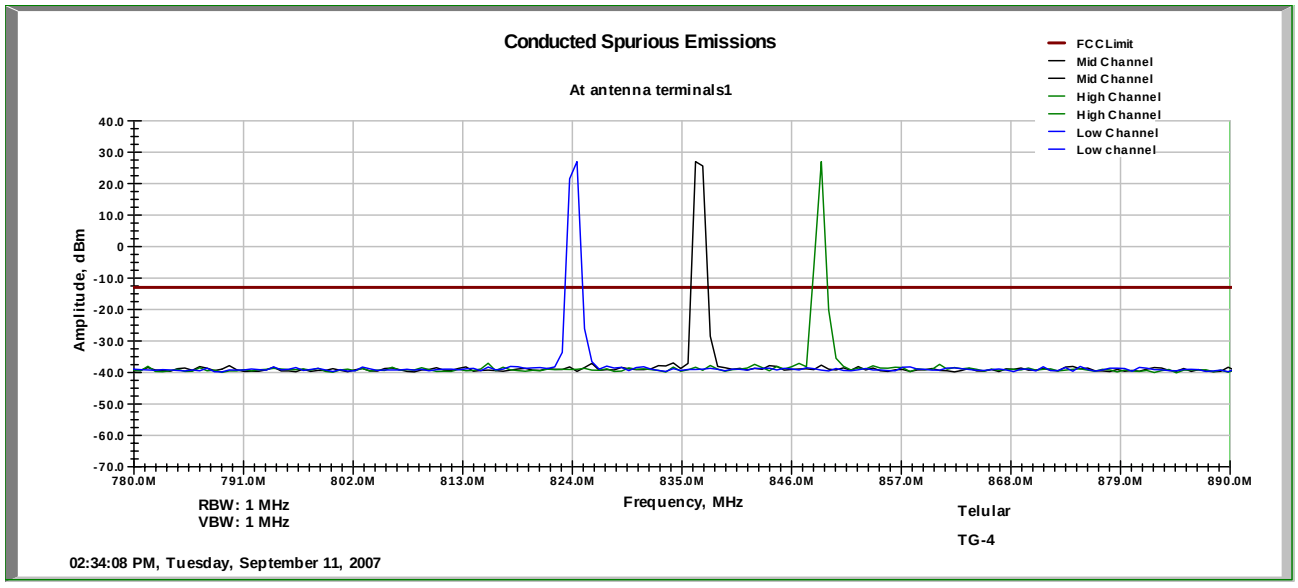


Figure 7-3: Out of band emissions at antenna terminals – GSM 1900 Channels 512, 661 and 810

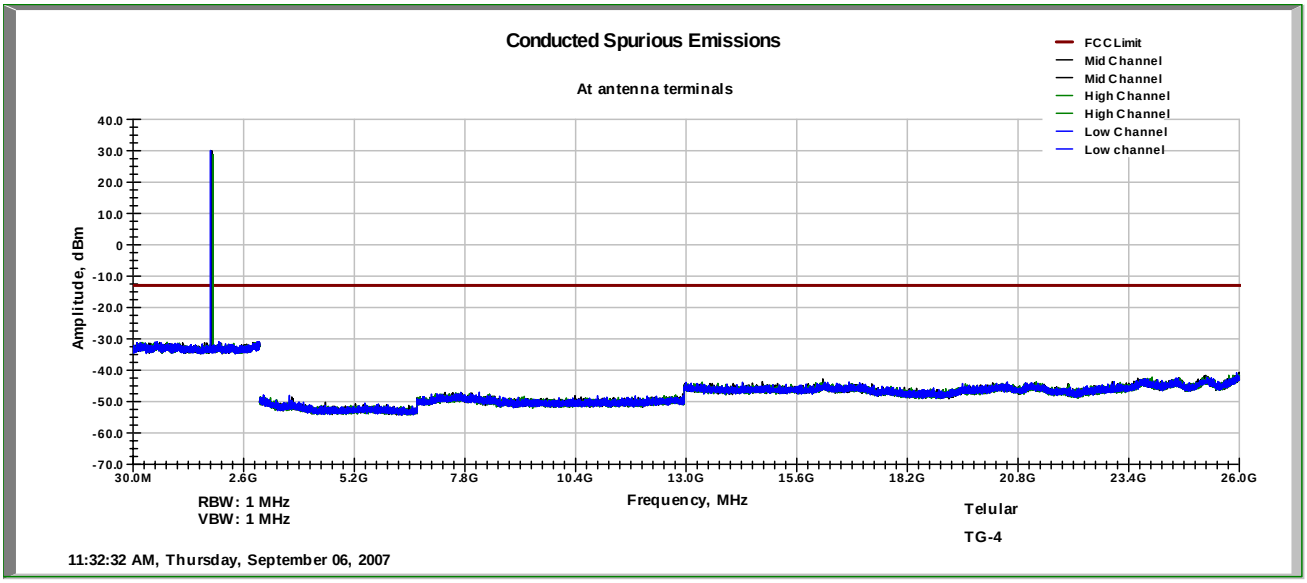



Figure 7-4: Out of band emissions at antenna terminals – GSM 1900 Channels 512, 661 and 810 (Zoomed In on Carrier Frequencies)

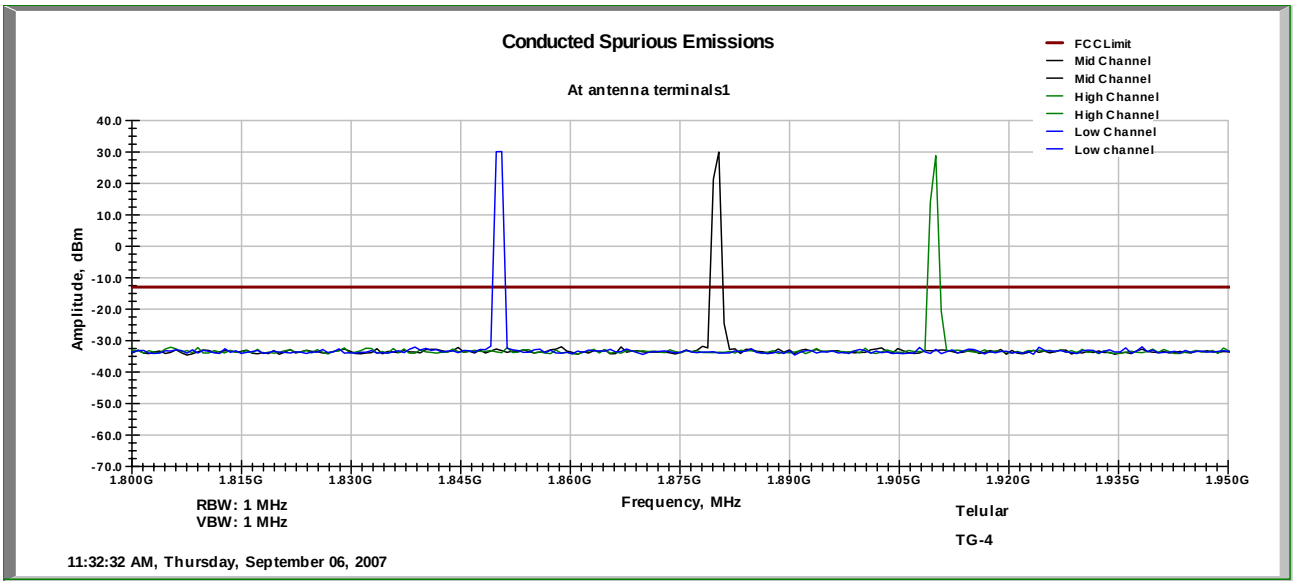


Figure 7-5: Emissions within 1 MHz of band edge, GSM 850 Channel 128

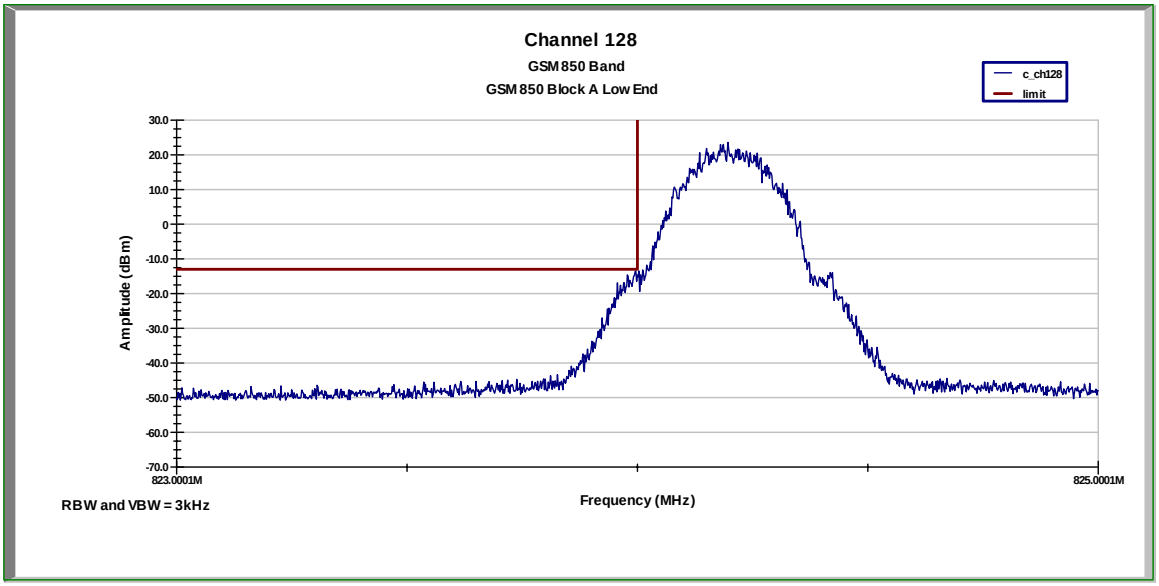



Figure 7-6: Emissions within 1 MHz of band edge, GSM 850 Channel 251

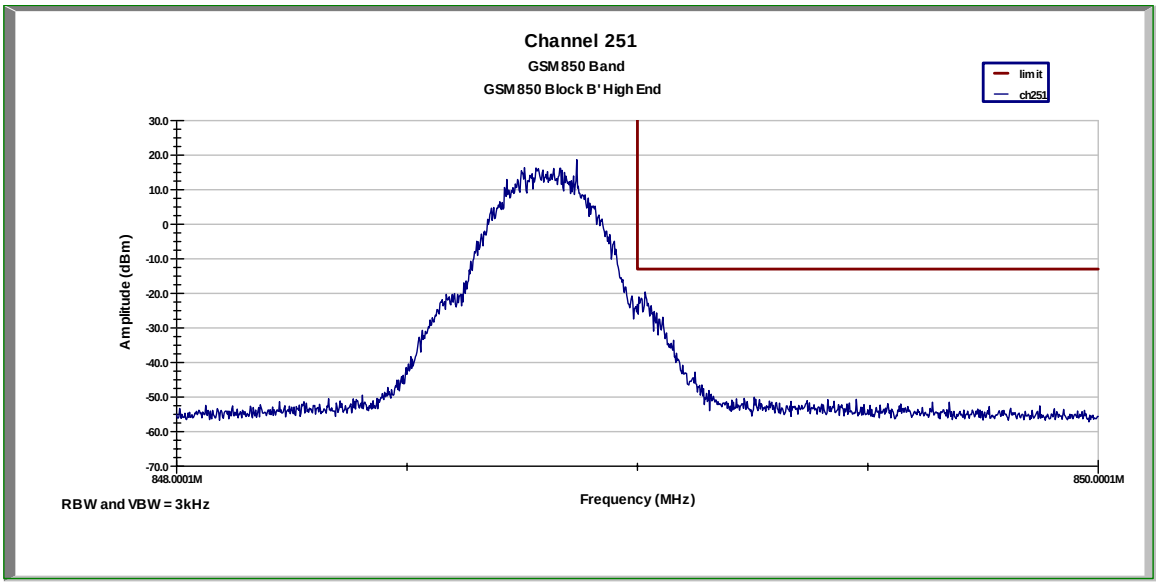


Figure 7-7: Emissions within 1 MHz of band edge, GSM 1900 Channel 512

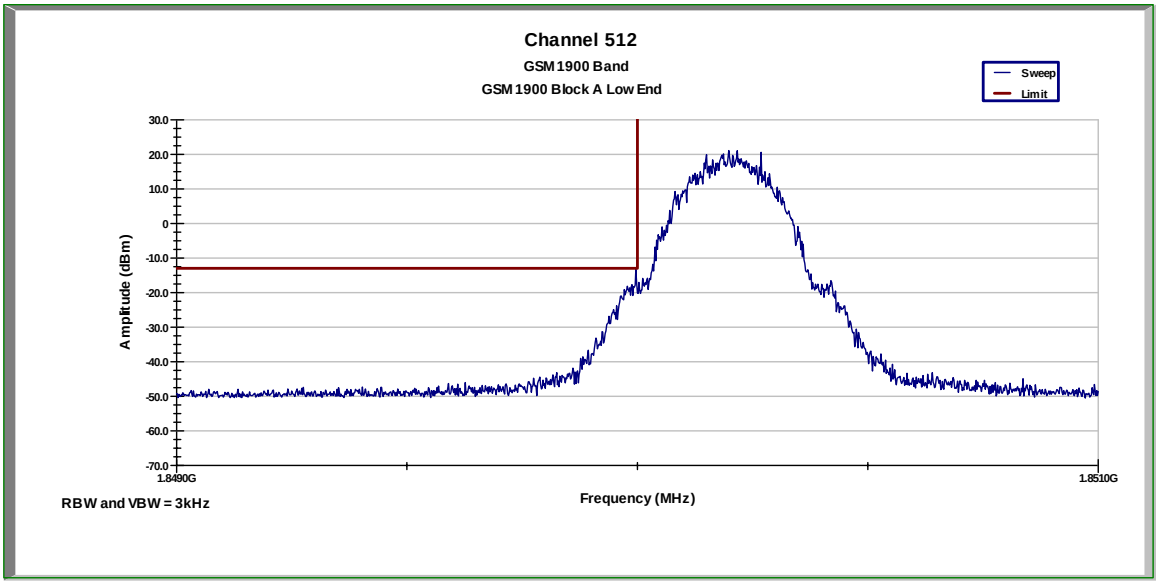
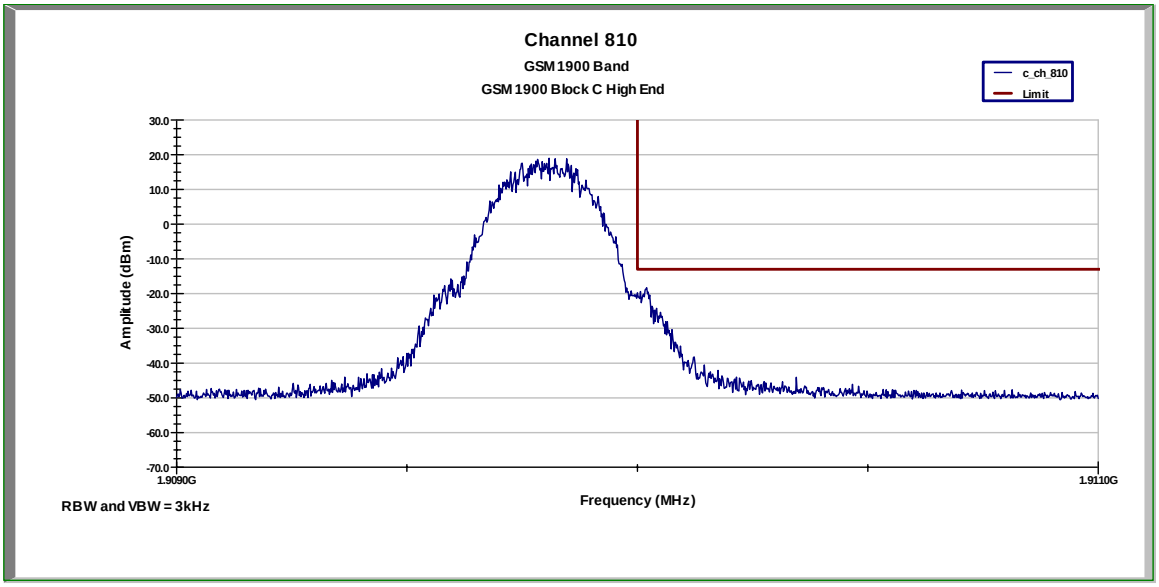



Figure 7-8: Emissions within 1 MHz of band edge, GSM 1900 Channel 810



# 8 CONDUCTED VOLTAGE EMISSIONS

FCC §15.107 Class B limits

RSS-Gen §7.2.2

## 8.1 Test Procedure

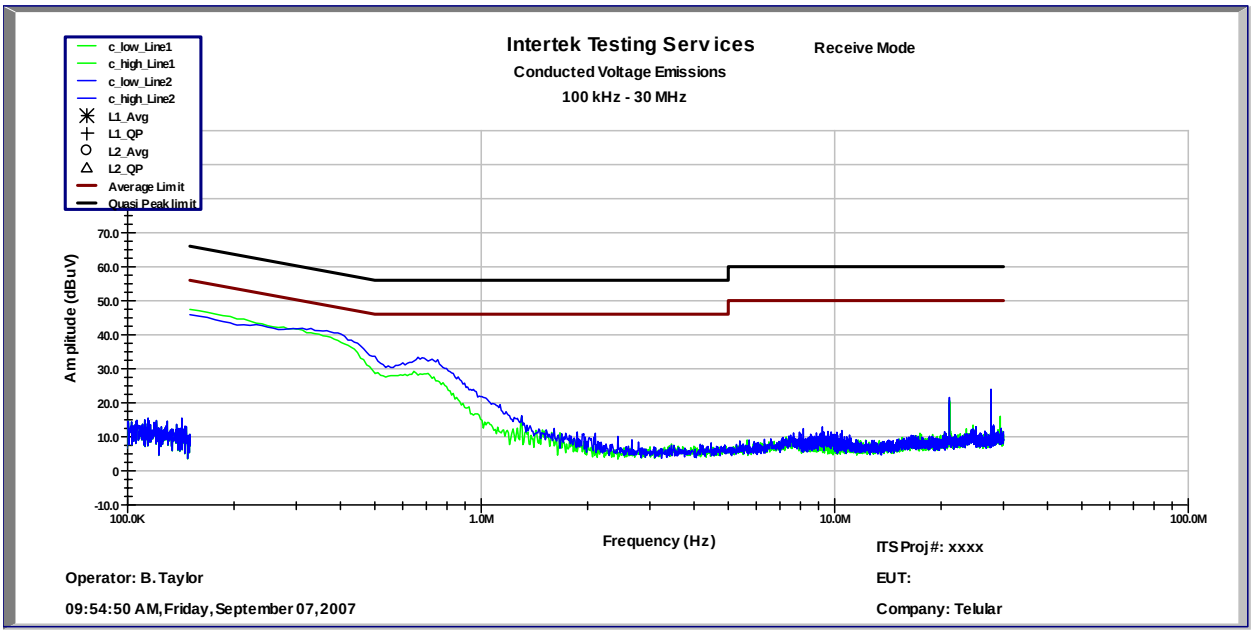
Conducted voltage emission measurements were performed as follows:

- The TG-4 was connected to the power source using a Line Impedance Stabilization Network (LISN) in line with each current carrying conductor.
- A spectrum analyzer was connected to the RF port of the LISN installed on the line under test.
- The LISNs installed on all lines not under test were terminated into 50 Ω.
- The TG-4 was powered and left in a "receive" mode, without placing a call.
- The orientation of each connecting cable was varied to find the configuration that maximized the conducted emission.
- The insertion loss of the measurement cable, the LISN insertion loss, and the output of the spectrum analyzer were added together to give a corrected reading in dBuV.
- The corrected reading was compared to the limit above to determine compliance.
- A quasi-peak and/or average detector was used for measurements close to or exceeding the limit with a peak detector.

## 8.2 Test Results

The TG-4 was **compliant** with conducted the voltage emissions requirements of Part 15.107 (Class B limits). No conducted voltage emissions on the AC power interface exceeded the quasi-peak or average limits. See Figure 8-1 for graphical test results. An optimization of the peak-detected frequencies was not performed because they were well below the limit.

Figure 8-1: Conducted Voltage Emissions Graphical Data – Receive Mode



# 9 RADIATED SPURIOUS EMISSIONS

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.

EIRP was calculated as follows:

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

where,

**$E_1$** is the receiver reading in dBm when measuring the field strength of the EUT

**$E_2$** is the receiver reading in dBm when measured field strength from the generator

**$V_{sub}$** 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.

## 9.2 Test Results

The TG-4 met the field strength of spurious radiation requirements of FCC §2.1053. See Table 9-1 for spurious emissions data and Figure 9-1 through Figure 9-6 for the graphical test data. Note: Table 9-1 shows an optimization of the GSM850 peaks only. The peak-detected GSM1900 frequencies were well below the limit. All emissions not reported are at least 10dB below the limit.

Table 9-1: Spurious Emissions

| EUT Mode | Polarity | Spurious Emission Frequency (MHz) | Device Reading (dBµV) | Sub. Reading (dBµV) | Cable Loss (dB) | Tx Antenna Gain (dBi) | Signal Generator Output (dBm) | EIRP (dBm) |
|---|---|---|---|---|---|---|---|---|
| 850 High | V | 1.698 | 39.44 | 68.6 | 3.6 | 8.3 | 0 | -24.46 |
| | H | | 32.5 | 69.1 | 3.6 | 8.3 | 0 | -31.9 |
| | V | 2.545 | 28.39 | 59.2 | 4.6 | 9.1 | 0 | -26.31 |
| | H | | 29.76 | 61.6 | 4.6 | 9.3 | 0 | -27.14 |
| 850 Mid | V | 1.672 | 33.77 | 68.6 | 3.6 | 8.3 | 0 | -30.13 |
| | H | | 26.52 | 69.1 | 3.6 | 8.3 | 0 | -37.88 |
| | V | 2.51 | 28.4 | 59.33 | 4.6 | 9.1 | 0 | -26.43 |
| | H | | 27.59 | 61.6 | 4.6 | 9.3 | 0 | -29.31 |
| 850 Low | V | 1.648 | 41.01 | 68.6 | 3.6 | 8.3 | 0 | -22.89 |
| | H | | 30.06 | 69.1 | 3.6 | 8.3 | 0 | -34.34 |
| | V | 2.472 | 28.36 | 59.2 | 4.6 | 9.1 | 0 | -26.34 |
| | H | | 26.94 | 61.6 | 4.6 | 9.3 | 0 | -29.96 |

Figure 9-1: Field Strength of Spurious Radiation (30 MHz – 20 GHz), GSM 850 Channel 128

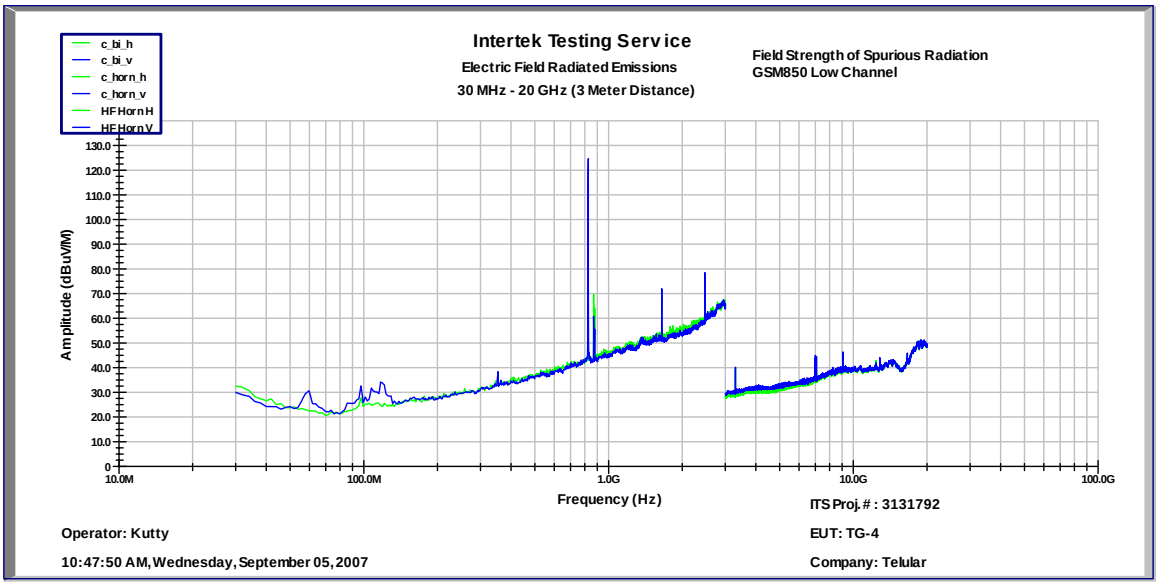



Figure 9-2: Field Strength of Spurious Radiation (30 MHz – 20 GHz), GSM 850 Channel 190

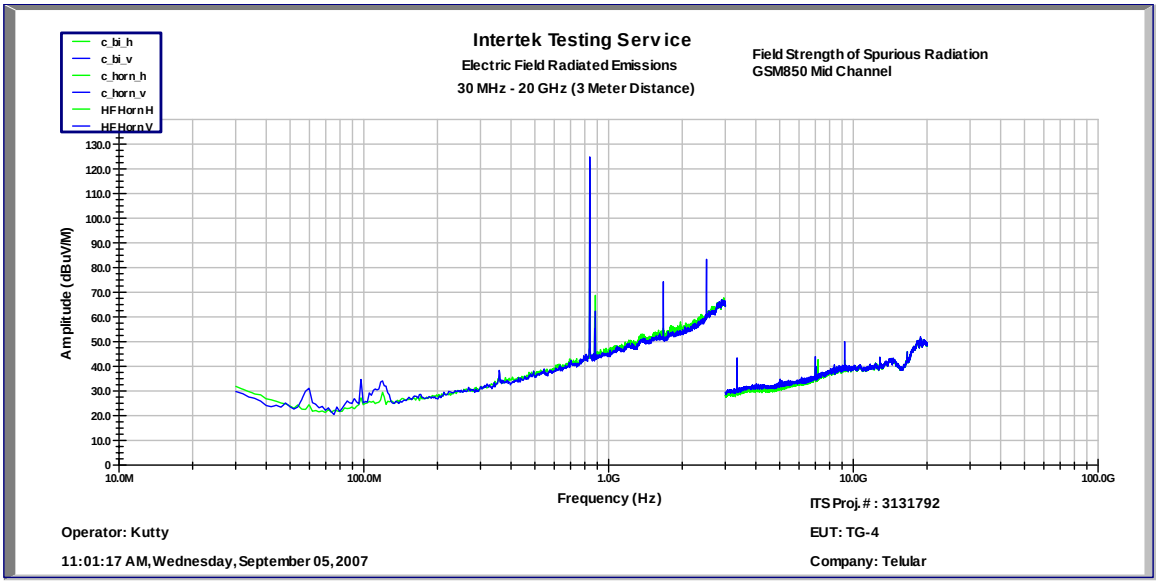


Figure 9-3: Field Strength of Spurious Radiation (30 MHz – 20 GHz), GSM 850 Channel 251

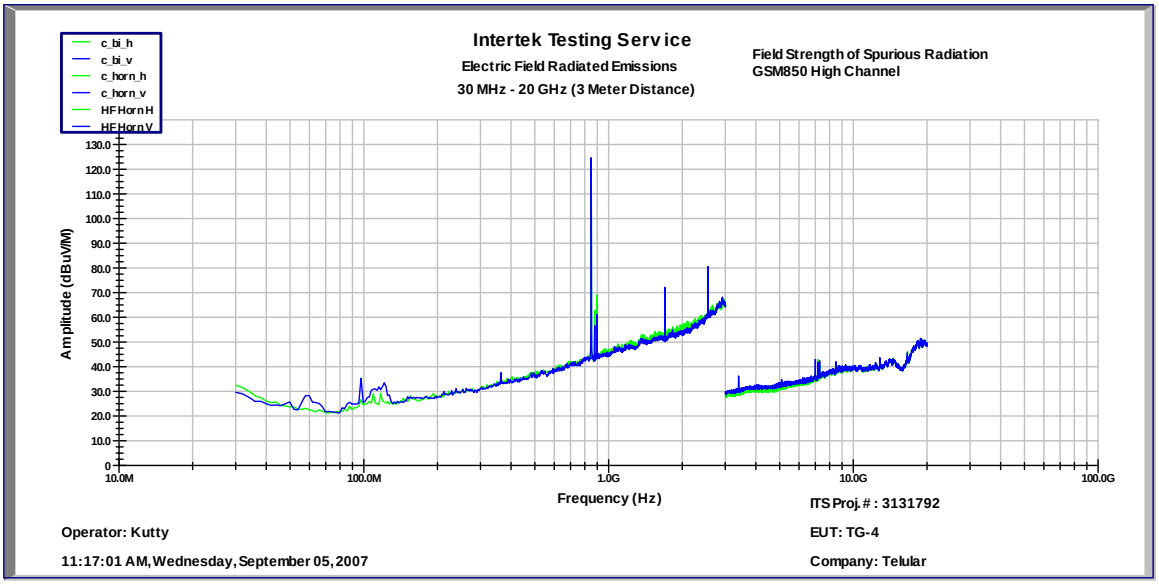



Figure 9-4: Field Strength of Spurious Radiation (30 MHz – 20 GHz), GSM 1900 Channel 512

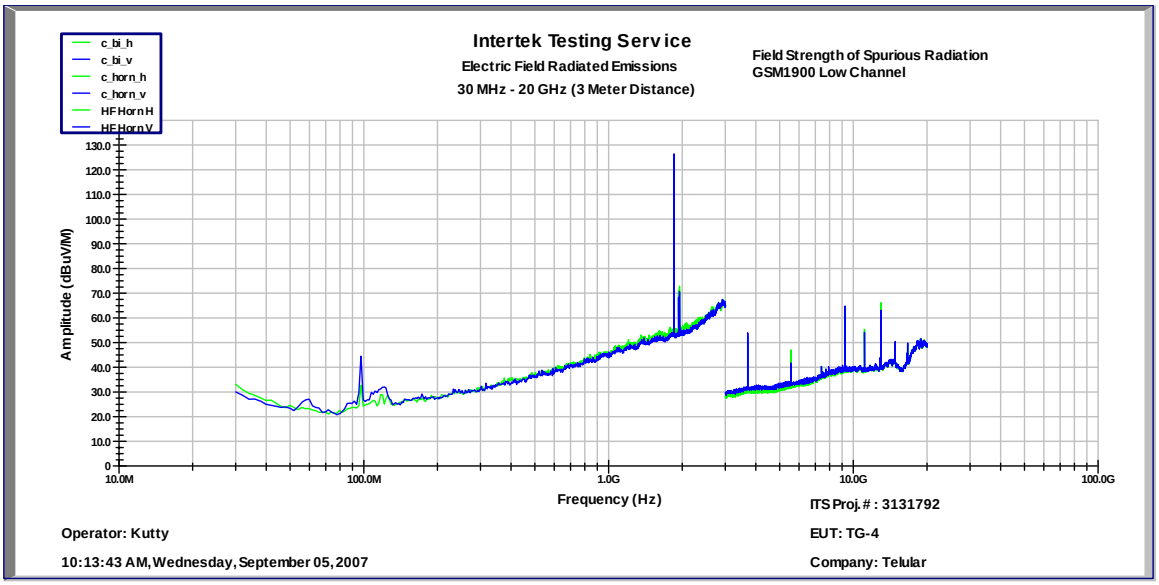


Figure 9-5: Field Strength of Spurious Radiation (30 MHz – 20 GHz), GSM 1900 Channel 661

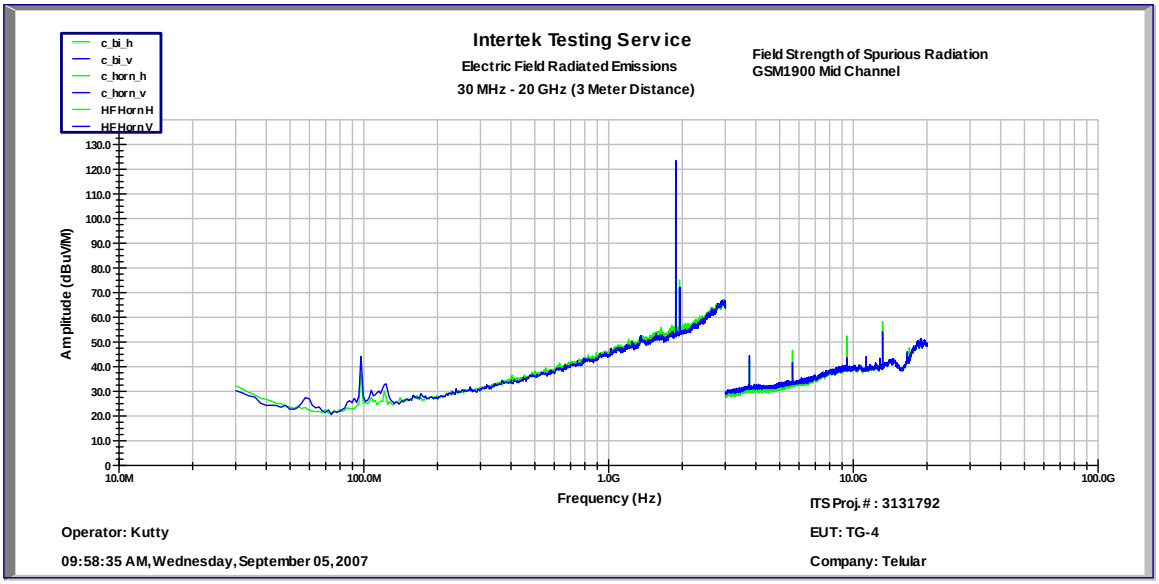
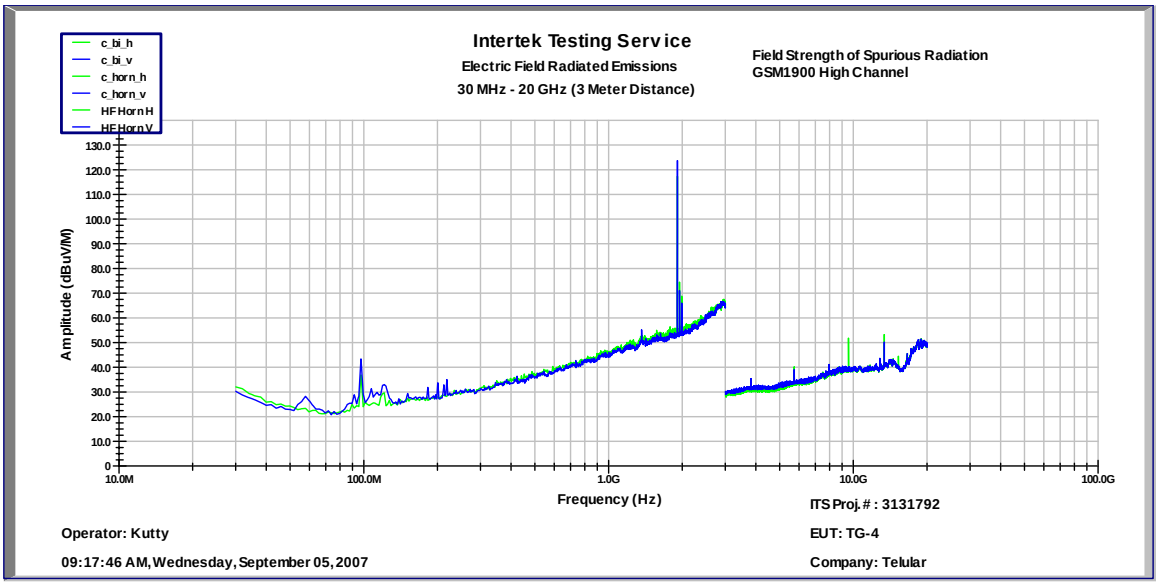



Figure 9-6: Field Strength of Spurious Radiation (30 MHz – 20 GHz), GSM 1900 Channel 810



## 10 RECEIVER SPURIOUS EMISSIONS

FCC §15.109

ICES-003, RSS-129 §10, RSS-133 §9

### 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 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.

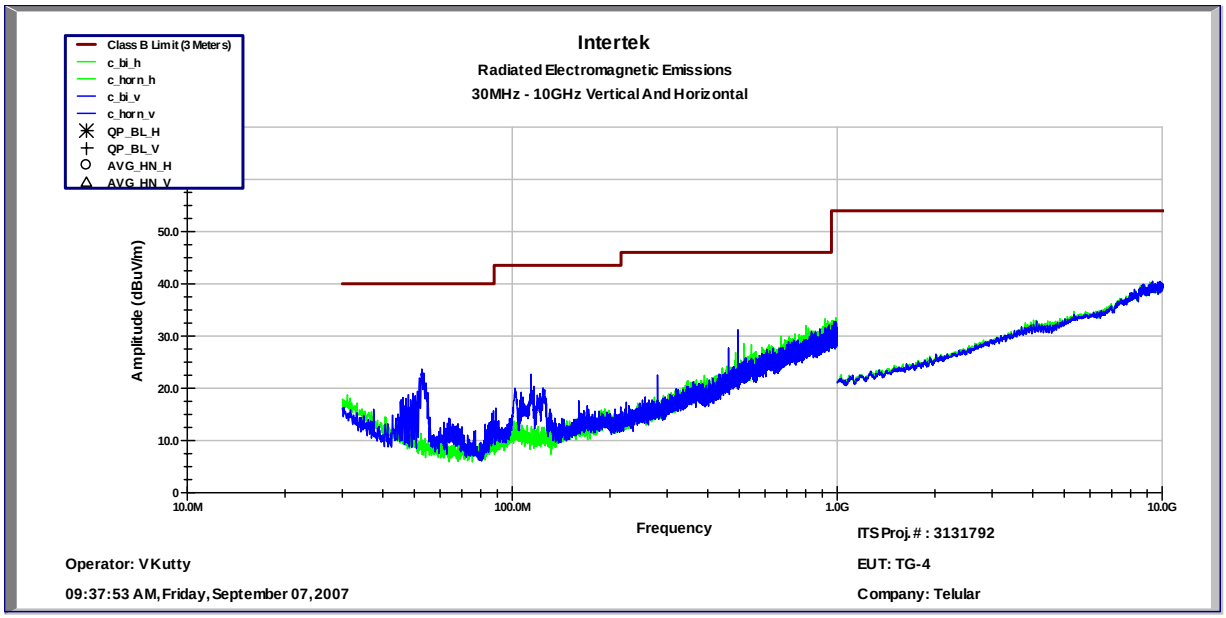
The EUT, where intended for tabletop use, is placed on a table whose top is 0.8m above the ground plane. The table is constructed of non-conductive materials. Its dimensions are 1m by 1.5m, but may be extended for larger EUT.

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

## 10.3 Test Results

The TG-4 was **compliant** with the radiated disturbance requirements of FCC §15.109 for a class B device. Maximized quasi peak data was not taken because the peak-detected frequencies were well below the limit.

Figure 10-1 FCC §15.109 Receiver Spurious Emissions Graphical Data (3 Meter Test Distance)



## 11 FREQUENCY STABILITY VS TEMPERATURE

FCC §2.1055, FCC §22.355, FCC §24.235

RSS-133 §7

Frequency tolerance: 2.5ppm

### 11.1 Test Procedure

The equipment under test was powered by its supplied AC adapter 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 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.

### 11.2 Test Results

The TG-4 met the frequency stability requirements of FCC §2.1055, FCC §22.355 and FCC §24.235. The test results are shown in Table 11-1.

Table 11-1: Frequency Error (ppm) vs. Temperature

| | GSM 850 Band | | | GSM 1900 Band | | |
|---|---|---|---|---|---|---|
| **Temp** | **Channel 128** | **Channel 190** | **Channel 128** | **Channel 190** | **Channel 128** | **Channel 190** |
| -30 | 0.0255 | 0.0263 | 0.0212 | 0.0238 | 0.0191 | 0.0141 |
| -20 | 0.0085 | 0.0155 | 0.0153 | 0.0092 | 0.0207 | 0.0194 |
| -10 | 0.0231 | 0.0203 | 0.0236 | 0.0059 | 0.0043 | 0.0042 |
| 0 | 0.0182 | 0.0263 | 0.0106 | 0.0070 | 0.0096 | 0.0141 |
| 10 | 0.0328 | 0.0287 | 0.0283 | 0.0043 | 0.0128 | 0.0173 |
| 20 | 0.0279 | 0.0143 | 0.0330 | 0.0141 | 0.0090 | 0.0063 |
| 30 | 0.0158 | 0.0227 | 0.0271 | 0.0070 | 0.0064 | 0.0052 |
| 40 | 0.0158 | 0.0287 | 0.0212 | 0.0076 | 0.0096 | 0.0157 |
| 50 | 0.0170 | 0.0239 | 0.0165 | 0.0130 | 0.0186 | 0.0220 |
| 60 | 0.0255 | 0.0215 | 0.0271 | 0.0276 | 0.0250 | 0.0236 |

## 12 FREQUENCY STABILITY VS VOLTAGE

FCC §2.1055, FCC §22.355

Frequency tolerance: 2.5ppm

### 12.1 Test Procedure

The EUT's AC adapter was connected to a variable AC power supply. The input voltage to the AC adapter was set to its normal operating voltage (120VAC), which was then varied by +/- 15%. The Base Station Simulator was set to force the EUT to its maximum power setting. The output frequency error was recorded for each voltage.

### 12.2 Test Results

The TG-4 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: Frequency Error (ppm) vs. Input Voltage

| | GSM 850 Band | | | GSM 1900 Band | | |
|---|---|---|---|---|---|---|
| **Input Voltage** | **Channel 128** | **Channel 190** | **Channel 251** | **Channel 512** | **Channel 661** | **Channel 810** |
| -15% (102VAC) | 0.0437 | 0.0287 | 0.0401 | 0.0162 | 0.0154 | 0.0063 |
| Normal (120VAC) | 0.0328 | 0.0251 | 0.0271 | 0.0119 | 0.0122 | 0.0141 |
| +15% (138VAC) | 0.0279 | 0.0311 | 0.0330 | 0.0124 | 0.0117 | 0.0136 |