PCTEST ENGINEERING LABORATORY, INC.
6660-B Dobbin Road, Columbia, MD 21045 USA
Tel. 410.290.6652 / Fax 410.290.6554
http://www.pctestlab.com

# CERTIFICATE OF COMPLIANCE
## FCC Part 22 & 24 Certification

**Applicant Name:**
Hughes Network Systems
11717 Exploration Lane, Bldg. 366
Germantown, MD 20876

**Date of Testing:**
April 01, 2008
**Test Site/Location:**
PCTEST Lab, Columbia, MD, USA
**Test Report Serial No.:**
0804040419.K3Y

| | |
|---|---|
| **FCC ID:** | **K3Y-PASS-TCU** |
| **APPLICANT:** | **HUGHES NETWORK SYSTEMS** |

| | |
|---|---|
| **Application Type:** | Certification |
| **FCC Classification:** | PCS Licensed Transmitter (PCB) |
| **FCC Rule Part(s):** | §2; §22(H), §24(E) |
| **EUT Type:** | 850/1900 GSM/GPRS Module |
| **Model(s):** | PASS-TCU |
| **Tx Frequency Range:** | 824.20 - 848.80MHz (Cell. GSM) / 1850.20 - 1909.80MHz (PCS GSM) |
| **Max. RF Output Power:** | 32.30 dBm Cellular GSM / 28.7 dBm PCS GSM |
| **Emission Designator(s):** | 250KGXW (Cellular GSM), 242KGXW (PCS GSM) |
| **Test Device Serial No.:** | *identical prototype* [S/N: 89810080290010] |

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in §2.947.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

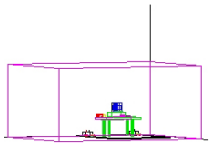
**Grant Conditions:** Power output listed is conducted.

*PCTEST certifies that no party to this application has been denied the FCC benefits pursuant to Section 5301 of the Anti-Drug Abuse Act of 1988, 21 U.S.C. 862.*

Randy Ortanez
President

ACCREDITED
TESTING LABORATORY
CERTIFICATE #2041.01

# TABLE OF CONTENTS



# MEASUREMENT REPORT
## FCC Part 22 & 24

## §2.1033 General Information

| | |
|---|---|
| **APPLICANT:** | Hughes Network Systems |
| **APPLICANT ADDRESS:** | 11717 Exploration Lane, Bldg. 366<br>Germantown, MD 20876 |
| **TEST SITE:** | PCTEST ENGINEERING LABORATORY, INC. |
| **TEST SITE ADDRESS:** | 6660-B Dobbin Road, Columbia, MD 21045 USA |
| **FCC RULE PART(S):** | §2; §22(H), §24(E) |
| **BASE MODEL:** | PASS-TCU |
| **FCC ID:** | K3Y-PASS-TCU |
| **FCC CLASSIFICATION:** | PCS Licensed Transmitter (PCB) |
| **EMISSION DESIGNATOR(S):** | 250KGXW (Cellular GSM), 242KGXW (PCS GSM) |
| **MODE:** | GSM |
| **FREQUENCY TOLERANCE:** | ±0.00025 % (2.5 ppm) |
| **Test Device Serial No.:** | 89810080290010 ☐ Production ☒ Pre-Production ☐ Engineering |
| **DATE(S) OF TEST:** | April 01, 2008 |
| **TEST REPORT S/N:** | 0804040419.K3Y |

## Test Facility / Accreditations

**Measurements were performed at PCTEST Engineering Lab located in Columbia, MD 21045, U.S.A.**


- PCTEST facility is an FCC registered (PCTEST Reg. No. 90864) test facility with the site description report on file and has met all the requirements specified in Section 2.948 of the FCC Rules and Industry Canada (IC-2451).
- PCTEST Lab is accredited to ISO 17025 by U.S. National Institute of Standards and Technology (NIST) under the National Voluntary Laboratory Accreditation Program (NVLAP Lab code: 100431-0) in EMC, FCC and Telecommunications.
- PCTEST Lab is accredited to ISO 17025-2005 by the American Association for Laboratory Accreditation (A2LA) in Specific Absorption Rate (SAR) testing, Hearing Aid Compatibility (HAC) testing, CTIA Test Plans, and wireless testing for FCC and Industry Canada Rules.
- PCTEST Lab is a recognized U.S. Conformity Assessment Body (CAB) in EMC and R&TTE (n.b. 0982) under the U.S.-EU Mutual Recognition Agreement (MRA).
- PCTEST TCB is a Telecommunication Certification Body (TCB) accredited to ISO/IEC Guide 65 by the American National Standards Institute (ANSI) in all scopes of FCC Rules and Industry Canada Standards (RSS).
- PCTEST facility is an IC registered (IC-2451) test laboratory with the site description on file at Industry Canada.
- PCTEST is a CTIA Authorized Test Laboratory (CATL) for AMPS, CDMA, and EvDO wireless devices and for Over-the-Air (OTA) Antenna Performance testing for AMPS, CDMA, GSM, GPRS, EGPRS, UMTS (W-CDMA), CDMA 1xEVDO, and CDMA 1xRTT.

# 1.0 INTRODUCTION

## 1.1 Scope

Measurement and determination of electromagnetic emissions (EME) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission.

## 1.2 Testing Facility

The map below shows the location of the PCTEST LABORATORY, its proximity to the FCC Laboratory, the Columbia vicinity are, the Baltimore-Washington Internt'l (BWI) airport, the city of Baltimore and the Washington, DC area. (*see Figure 1-1*).

These measurement tests were conducted at the PCTEST Engineering Laboratory, Inc. facility in New Concept Business Park, Guilford Industrial Park, Columbia, Maryland. The site address is 6660-B Dobbin Road, Columbia, MD 21045. The test site is one of the highest points in the Columbia area with an elevation of 390 feet above mean sea level. The site coordinates are 39° 11'15" N latitude and 76° 49'38" W longitude. The facility is 1.5 miles North of the FCC laboratory, and the ambient signal and ambient signal strength are approximately equal to those of the FCC laboratory. There are no FM or TV transmitters within 15 miles of the site. The detailed description of the measurement facility was found to be in compliance with the requirements of § 2.948 according to ANSI C63.4-2003 on January 27, 2006 and Industry Canada.

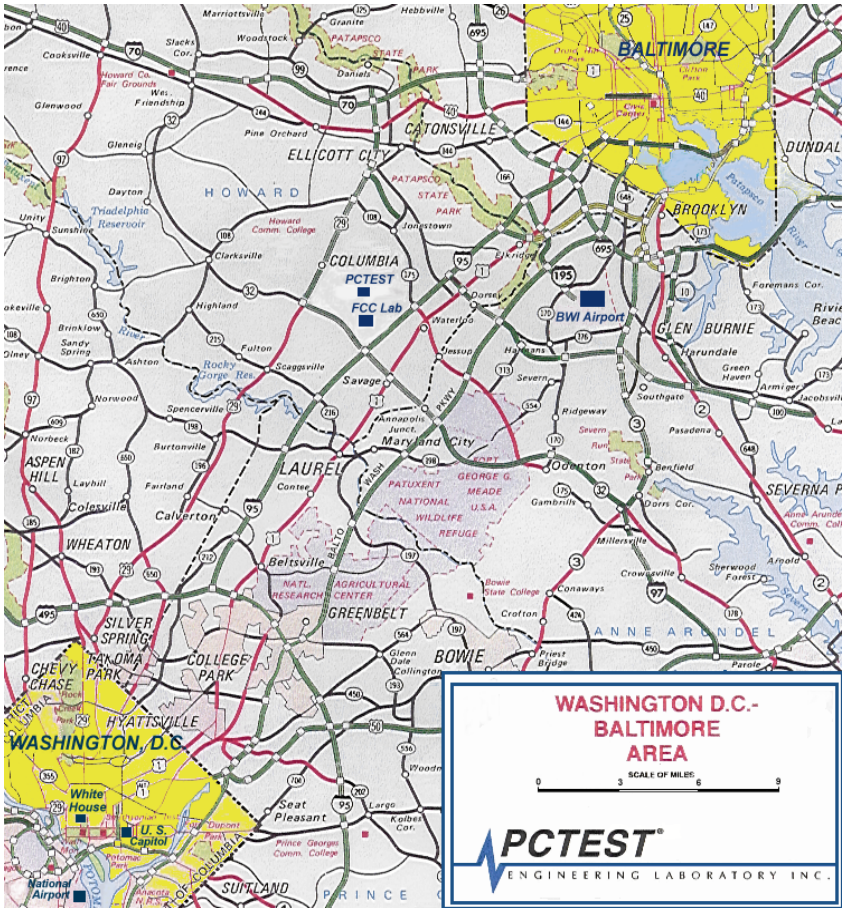



**Figure 1-1. Map of the Greater Baltimore and Metropolitan Washington, D.C. area**

# 2.0 PRODUCT INFORMATION

## 2.1 Equipment Description

The Equipment Under Test (EUT) is the **Hughes 850/1900 GSM/GPRS Module FCC ID: K3Y-PASS-TCU**. The EUT consisted of the following component(s):

| Trade Name / Base Model | FCC ID | Description |
|---|---|---|
| Hughes / Model: PASS-TCU | K3Y-PASS-TCU | 850/1900 GSM/GPRS Module |

**Table 2-1. EUT Equipment Description**

## 2.2 EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and no modifications were made during testing.

## 2.3 Labeling Requirements

Per 2.925

The FCC identifier shall be permanently affixed to the equipment and shall be readily visible to the purchaser at the time of purchase.

Per 15.19; Docket 95-19

In addition to this requirement, a device subject to certification shall be labeled as follows:

*This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.*

The label shall be permanently affixed at a conspicuous location on the device; instruction manual or pamphlet supplied to the user and be readily visible to the purchaser at the time of purchase. However, when the device is so small wherein placement of the label with specified statement is not practical, only the trade name and FCC ID must be displayed on the device per Section 15.19(b)(2).

Please see attachment for FCC ID label and label location.

# 3.0 DESCRIPTION OF TESTS

## 3.1 Measurement Procedure

The radiated spurious measurements were made outdoors at a 3-meter test range (see Figure 3-1). The equipment under test is placed on a wooden turntable 3-meters from the receive antenna. The receive antenna height and turntable rotations were adjusted for the highest reading on the receive spectrum analyzer. A half-wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same receive spectrum analyzer reading. This level is recorded. For readings above 1GHz, the above procedure is repeated using horn antennas and the difference between the gain of the horn and an isotropic antenna are taken into consideration.

**Deviation from Measurement Procedure……..None**

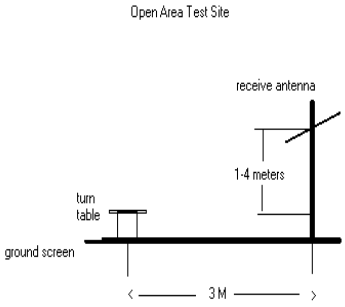



**Figure 3-1. Diagram of 3-meter outdoor test range**

## 3.2 Occupied Bandwidth Emission Limits

**§2.1049, 22.917(a), 24.238(a)**

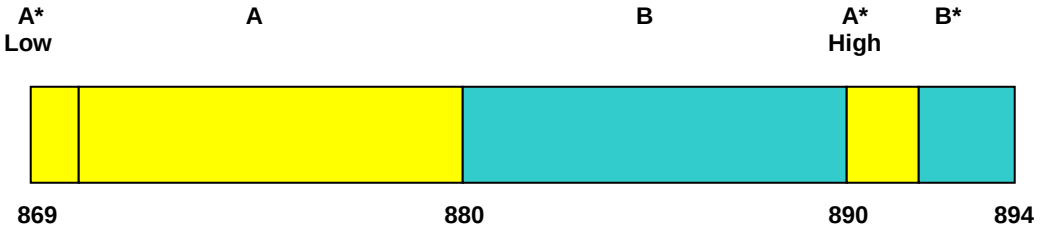
a. On any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least 43 + 10 log(P) dB.

b. Compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, 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. 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 emission are attenuated at least 26 dB below the transmitter power.

c. When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the licensee's frequency block edges, both upper and lower, as the design permits.

d. The measurement of emission power can be expressed in peak or average values, provided they are expressed in the same parameters as the transmitter power.

## 3.3 Cellular - Base Frequency Blocks



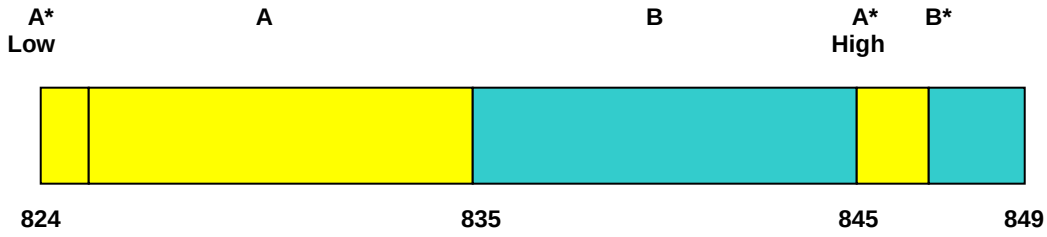

**BLOCK 1: 869 – 880 MHz (A* Low + A)**

**BLOCK 2: 880 – 890 MHz (B)**

**BLOCK 3: 890 – 891.5 MHz (A* High)**

**BLOCK 4: 891.5 – 894 MHz (B*)**

## 3.4 Cellular - Mobile Frequency Blocks



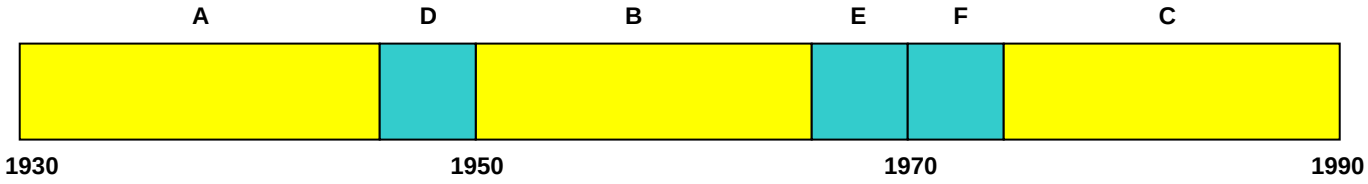

**BLOCK 1: 824 – 835 MHz (A* Low + A)**

**BLOCK 2: 835 – 845 MHz (B)**

**BLOCK 3: 845 – 846.5 MHz (A* High)**

**BLOCK 4: 846.5 – 849 MHz (B*)**

## 3.5 PCS - Base Frequency Blocks




**BLOCK 1: 1930 – 1945 MHz (A)**

**BLOCK 2: 1945 – 1950 MHz (D)**

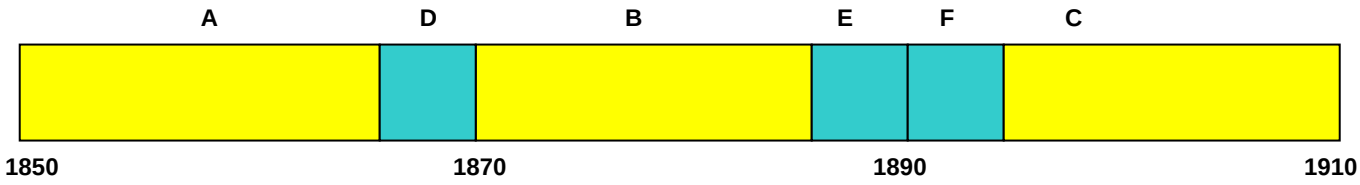
**BLOCK 3: 1950 – 1965 MHz (B)**

**BLOCK 4: 1965 – 1970 MHz (E)**

**BLOCK 5: 1970 – 1975 MHz (F)**

**BLOCK 6: 1975 – 1990 MHz (C)**

## 3.6 PCS - Mobile Frequency Blocks




**BLOCK 1: 1850 – 1865 MHz (A)**

**BLOCK 2: 1865 – 1870 MHz (D)**

**BLOCK 3: 1870 – 1885 MHz (B)**

**BLOCK 4: 1885 – 1890 MHz (E)**

**BLOCK 5: 1890 – 1895 MHz (F)**

**BLOCK 6: 1895 – 1910 MHz (C)**

## 3.7 Spurious and Harmonic Emissions at Antenna Terminal

**§2.1051, 22.917(a), 24.238(a)**

The level of the carrier and the various conducted spurious and harmonic frequencies is measured by means of a calibrated spectrum analyzer. The spectrum is scanned from the lowest frequency generated in the equipment up to a frequency including its 10th harmonic.

## 3.8 Radiated Spurious and Harmonic Emissions

**§2.1053, 22.917(a), 24.238(a)**

Spurious and harmonic radiated emissions are measured outdoors at our 3-meter test range. The equipment under test is placed on a wooden turntable 3-meters from the receive antenna. The receive antenna height and turntable rotations were adjusted for the highest reading on the receive spectrum analyzer. The spectrum is scanned from the lowest frequency generated in the equipment up to a frequency including its $10^{th}$ harmonic. A half-wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator with the level of the signal generator being adjusted to obtain the same receive spectrum analyzer reading. This level is recorded. For readings above 1 GHz, the above procedure is repeated using horn antennas and the difference between the gain of the horn and an isotropic or dipole antenna are taken into consideration. This device was tested in all configurations and the highest power is reported in GSM voice mode while using a Power Control Level of "5" in the Cellular band and "0" in the PCS band.

## 3.9 Frequency Stability / Temperature Variation

**§2.1055, 22.355, 24.235**

The frequency stability of the transmitter is measured by:

a.) **Temperature:** The temperature is varied from -30°C to +50°C in 10°C increments using an environmental chamber.

b.) **Primary Supply Voltage:** The primary supply voltage is varied from 85% to 115% of the nominal value for non hand-carried battery equipment. For hand-carried, battery-powered equipment, primary supply voltage is reduced to the battery operating end point which shall be specified by the manufacturer.

*Specification – The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. The frequency stability of the transmitter shall be maintained within ±0.00025% (±2.5 ppm) of the center frequency.*

**Time Period and Procedure:**

1. The carrier frequency of the transmitter is measured at room temperature (20°C to provide a reference).

2. The equipment is turned on in a “standby” condition for one minute before applying power to the transmitter. Measurement of the carrier frequency of the transmitter is made within one minute after applying power to the transmitter.

3. Frequency measurements are made at 10°C intervals ranging from -30°C to +50°C. A period of at least one half-hour is provided to allow stabilization of the equipment at each temperature level.

# 4.0 TEST EQUIPMENT CALIBRATION DATA

Test Equipment Calibration is traceable to the National Institute of Standards and Technology (NIST).

| Manufacturer | Model / Equipment | Calibration Date | Cal Interval | Calibration Due | Serial No. |
|---|---|---|---|---|---|
| - | 263-10dB (DC-18GHz) 10 dB Attenuator | N/A | | N/A | N/A |
| - | No.165 (30MHz - 1000MHz) RG58 Coax Cable | N/A | | N/A | N/A |
| - | No.166 (1000-26500MHz) Microwave RF Cable | N/A | | N/A | N/A |
| - | No.167 (100kHz - 100MHz) RG58 Coax Cable | N/A | | N/A | N/A |
| Agilent | 8648D (9kHz-4GHz) Signal Generator | 10/11/07 | Biennial | 10/10/09 | 3613A00315 |
| Agilent | E4407B ESA Spectrum Analyzer | 04/29/07 | Annual | 04/28/08 | US39210313 |
| Agilent | E4448A (3Hz-50GHz) Spectrum Analyzer | 10/01/07 | Annual | 10/01/08 | US42510244 |
| Agilent | E5515C Wireless Communications Test Set | 10/06/06 | Biennial | 10/05/08 | GB43193972 |
| Agilent | E5515C Wireless Communications Test Set | 06/08/07 | Biennial | 06/08/09 | GB46310798 |
| Agilent | E5515C Wireless Communications Test Set | 08/31/07 | Biennial | 08/30/09 | GB41450275 |
| Agilent | E6651A Mobile WiMAX Tester | 08/23/07 | Biennial | 08/22/09 | MY47310109 |
| Agilent | E8257D (250kHz-20GHz) Signal Generator | 03/08/07 | Biennial | 03/08/09 | MY45470194 |
| Agilent | HP 11713A Attenuation/Switch Driver | 12/13/07 | Annual | 12/13/08 | 3439A02645 |
| Agilent | HP 8449B (1-26.5GHz) Pre-Amplifier | 12/13/07 | Annual | 12/12/08 | 3008A00985 |
| Agilent | HP 8495A (0-70dB) DC-4GHz Attenuator | N/A | | N/A | N/A |
| Agilent | HP 8566B (100Hz–22GHz) Spectrum Analyzer | 12/13/07 | Annual | 12/13/08 | 3638A08713 |
| Agilent | HP 8591A (9kHz-1.8GHz) Spectrum Analyzer | 09/18/07 | Annual | 09/18/08 | 3144A02458 |
| Agilent | HP 8901A Modulation Analyzer | 06/18/07 | Annual | 06/18/08 | 2432A03467 |
| Agilent | HP 8903 B Audio Analyzer | 06/01/07 | Annual | 06/01/08 | 3011A09025 |
| Compliance Design | Roberts Dipole Set | 11/09/07 | Biennial | 11/08/09 | 146 |
| Compliance Design | Roberts Dipole Set | 11/09/07 | Biennial | 11/08/09 | 147 |
| EMCO | 3116 Horn Antenna (18 - 40GHz) | 08/25/05 | Triennial | 08/24/08 | 9203-2178 |
| EMCO | 3816/2 LISN | 08/09/06 | Biennial | 08/08/08 | 9707-1077 |
| EMCO | 3816/2 LISN | 08/09/06 | Biennial | 08/08/08 | 9707-1079 |
| EMCO | Dipole Pair | 09/20/06 | Biennial | 09/19/08 | 23951 |
| EMCO | Model 3115 (1-18GHz) Horn Antenna | 09/24/07 | Biennial | 09/23/09 | 9704-5182 |
| EMCO | Model 3115 (1-18GHz) Horn Antenna | 10/04/07 | Biennial | 10/03/09 | 9205-3874 |
| Gigatronics | 80701A (0.05-18GHz) Power Sensor | 04/20/07 | Annual | 04/19/08 | 1835299 |
| Gigatronics | 80701A (0.05-18GHz) Power Sensor | 06/22/07 | Annual | 06/21/08 | 1833460 |
| Gigatronics | 8651A (50MHz-18GHz) | 04/20/07 | Annual | 04/19/08 | 1834052 |
| Gigatronics | 8651A Universal Power Meter | 06/22/07 | Annual | 06/21/08 | 8650319 |
| K & L | 11SH10 Band Pass Filter | N/A | Annual | N/A | 1300/4000 |
| K & L | 11SH10 Band Pass Filter | N/A | Annual | N/A | 4000/12000 |
| MiniCircuits | VHF-1300+ High Pass Filter | N/A | | N/A | 30716 |
| MiniCircuits | VHF-3100+ High Pass Filter | N/A | | N/A | 30721 |
| Pasternack | PE2208-6 Bidirectional Coupler | N/A | | N/A | N/A |
| Rohde & Schwarz | CMU200 Base Station Simulator | 05/24/07 | Annual | 05/23/08 | 836371/079 |
| Rohde & Schwarz | CMU200 Base Station Simulator | 09/07/07 | Annual | 09/06/08 | 833855/010 |
| Rohde & Schwarz | CMU200 Base Station Simulator | 12/06/07 | Annual | 12/05/08 | 107826 |
| Rohde & Schwarz | NRVD Dual Channel Power Meter | 12/11/06 | Biennial | 12/10/08 | 101695 |
| Rohde & Schwarz | NRVS Power Meter | 07/03/07 | Biennial | 07/02/09 | 835360/079 |
| Rohde & Schwarz | NRV-Z32 Peak Power Sensor (100uW-2W) | 12/21/06 | Biennial | 12/20/08 | 100155 |
| Rohde & Schwarz | NRV-Z33 Peak Power Sensor (1mW-20W) | 11/28/06 | Biennial | 11/27/08 | 100004 |
| Rohde & Schwarz | NRV-Z53 Power Sensor | 07/03/07 | Biennial | 07/02/09 | 846076/007 |
| Schwarzbeck | UHA9105 Dipole Antenna (400 - 1GHz) Rx | 06/19/07 | Biennial | 06/18/09 | 91052404 |
| Schwarzbeck | UHA9105 Dipole Antenna (400 - 1GHz) Tx | 06/19/07 | Biennial | 06/18/09 | 91052403 |
| SOLAR | 8012-50 LISN (2) | 11/08/07 | Biennial | 11/07/09 | 0310233, 0310234 |

**Table 4-1. Test Equipment**

# 5.0 SAMPLE CALCULATIONS

## Emission Designator

**Emission Designator = 250KGXW**

GSM BW = 250 kHz
G = Phase Modulation
X = Cases not otherwise covered
W = Combination (Audio/Data)

## Spurious Radiated Emission - PCS Band

**Example: Channel 512 PCS Mode 2nd Harmonic (3700.40 MHz)**

The receive analyzer reading at 3 meters with the EUT on the turntable was –81.0 dBm. The gain of the substituted antenna is 8.1 dBi. The signal generator connected to the substituted antenna terminals is adjusted to produce a reading of –81.0 dBm on the receive analyzer. The loss of the cable between the signal generator and the terminals of the substituted antenna is 2.0 dB at 3700.40 MHz. So 6.1 dB is added to the signal generator reading of –30.9 dBm yielding –24.80 dBm. The fundamental EIRP was 25.501 dBm so this harmonic was 25.501 dBm – (-24.80) = 50.3 dBc.

# 6.0 TEST RESULTS

## 6.1 Summary

Company Name: Hughes Network Systems

FCC ID: K3Y-PASS-TCU

FCC Classification: PCS Licensed Transmitter (PCB)

Mode(s): GSM

| FCC Part Section(s) | Test Description | Test Limit | Test Condition | Test Result | Reference |
|---|---|---|---|---|---|
| **TRANSMITTER MODE (TX)** | | | | | |
| 2.1049, 22.917(a), 24.238(a) | Occupied Bandwidth | N/A | CONDUCTED | PASS | Section 7.0 |
| 2.1051, 22.917(a), 24.238(a) | Band Edge / Conducted Spurious Emissions | < 43 + $\log_{10}$ (P[Watts]) at Band Edge and for all out-of-band emissions | | PASS | Section 7.0 |
| 2.1046 | Transmitter Conducted Output Power | N/A | | PASS | Section 6.2 |
| 22.913(a)(2) | Effective Radiated Power | < 7 Watts max. ERP (<6.3 Watts max. ERP (IC)) | RADIATED | PASS | Section 6.3 |
| 24.232(c) | Equivalent Isotropic Radiated Power | < 2 Watts max. EIRP | | PASS | Section 6.4 |
| 2.1053, 22.917(a), 24.238(a) | Undesirable Emissions | < 43 + $\log_{10}$ (P[Watts]) for all out-of-band emissions | | PASS | Sections 6.5, 6.6 |
| 2.1055, 22.355, 24.235 | Frequency Stability | < 2.5 ppm | CONDUCTED | PASS | Sections 6.7, 6.8 |
| **RECEIVER MODE (RX) / DIGITAL EMISSIONS** | | | | | |
| 15.107 | AC Conducted Emissions 150kHz – 30MHz | < FCC 15.207 limits or < RSS-Gen table 2 limits | LINE CONDUCTED | PASS | Pt. 15B Test Report |
| 15.109 | General Field Strength Limits (Restricted Bands and Radiated Emissions Limits) | < FCC 15.209 limits or < RSS-210 table 3 limits | RADIATED (30MHz-1GHz) (1-25 GHz) | PASS | Pt. 15B Test Report |
| **RF EXPOSURE** | | | | | |
| 2.1091 / 2.1093 | MPE Test | 1.6 W/kg (SAR Limit) (Cell)<br>1.6 W/kg (SAR Limit) (PCS) | MPE | PASS | MPE Report |

**Table 6-1. Summary of Test Results**

## 6.2 Conducted Output Power

**§2.1046**

A base station simulator (Rhode and Schwartz Model: CMU200) was used to establish communication with the **Hughes 850/1900 GSM/GPRS Module FCC ID: K3Y-PASS-TCU**. The base station simulator parameters were set to produce the maximum power from the EUT. This device was tested in all configurations and the highest power is reported in GSM voice mode while using a Power Control Level of "5" in the Cellular band and "0" in the PCS band. The powers are reported below.

| Band | Channel | GSM | | GPRS | |
|---|---|---|---|---|---|
| | | Power Control Level | Conducted Power | Uplink / Downlink Slots Used | Conducted Power |
| | | | [dBm] | | [dBm] |
| Cellular | 128 | 5 | 32.00 | 1/1 | 31.90 |
| | 190 | 5 | 32.20 | 1/1 | 31.90 |
| | 251 | 5 | 32.30 | 1/1 | 32.00 |
| PCS | 512 | 0 | 28.70 | 1/1 | 28.50 |
| | 661 | 0 | 28.50 | 1/1 | 28.50 |
| | 810 | 0 | 28.70 | 1/1 | 28.60 |

**Table 6-2. GSM Conducted Output Powers**

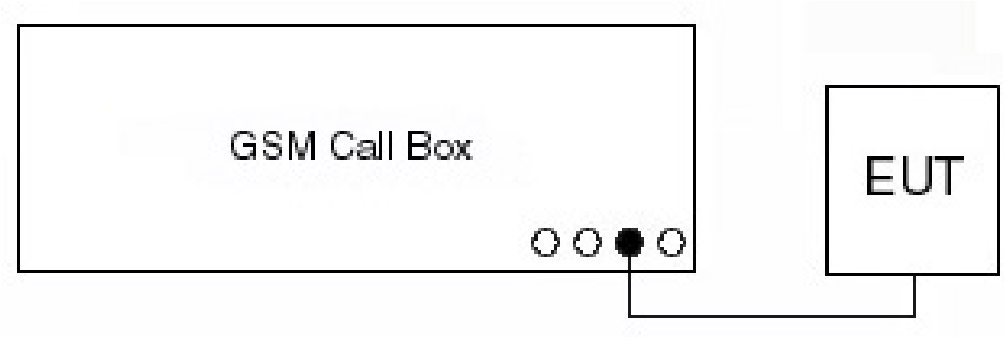



**Figure 6-1. GSM Conducted Power Test Setup Diagram**

## 6.3 Effective Radiated Power Output Data

**§22.913(a)(2)**

**POWER: PCL "5" (Cellular GSM Mode)**

| Frequency [MHz] | Measured Level [dBm] | Substitute Level [dBm] | Antenna Gain [dBd] | Pol [H/V] | ERP [dBm] | ERP [Watts] |
|---|---|---|---|---|---|---|
| 824.20 | -7.900 | 29.91 | 0.00 | H | 29.91 | 0.979 |
| 836.60 | -8.700 | 29.11 | 0.00 | H | 29.11 | 0.815 |
| 848.80 | -9.200 | 28.61 | 0.00 | H | 28.61 | 0.726 |

**Table 6-3. Effective Radiated Power Output Data**

**NOTES:**

Effective Radiated Power Output Measurements by Substitution Method according to ANSI/TIA/EIA-603-C-2004, Aug. 17, 2004:

The EUT was placed on a wooden turn table 3-meters from the receive antenna. The receive antenna height and turntable rotation was adjusted for the highest reading on the receive spectrum analyzer. For CDMA signals, a peak detector is used, with RBW = VBW = 3 MHz. For WCDMA signals, a peak detector is used, with RBW = VBW = 5 MHz. For AMPS, GSM, and NADC TDMA signals, a peak detector is used, with RBW = VBW = 1 MHz. A half-wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same receive spectrum analyzer reading. The conducted power at the terminals of the dipole is measured. The ERP is recorded.

This device was tested in all configurations and the highest power is reported in GSM voice mode while using a Power Control Level of "5" in the Cellular band and "0" in the PCS band. This unit was tested with its standard battery.

## 6.4 Equivalent Isotropic Radiated Power Output Data

**§24.232(c)**

**POWER: PCL "0" (PCS GSM Mode)**

| Frequency [MHz] | Measured Level [dBm] | Substitute Level [dBm] | Antenna Gain [dBi] | Pol [H/V] | EIRP [dBm] | EIRP [Watts] |
|---|---|---|---|---|---|---|
| 1850.20 | -11.400 | 24.91 | 8.00 | V | 32.91 | 1.954 |
| 1880.00 | -12.800 | 23.51 | 8.00 | V | 31.51 | 1.416 |
| 1909.80 | -11.900 | 24.41 | 8.00 | V | 32.41 | 1.742 |

**Table 6-4. Equivalent Isotropic Radiated Power Output Data**

**NOTES:**

Equivalent Isotropic Radiated Power Measurements by Substitution Method according to ANSI/TIA/EIA-603-C-2004, Aug. 17, 2004:

The EUT was placed on a wooden turn table 3-meters from the receive antenna. The receive antenna height and turntable rotation was adjusted for the highest reading on the receive spectrum analyzer. For CDMA signals, a peak detector is used, with RBW = VBW = 3 MHz. For WCDMA signals, a peak detector is used, with RBW = VBW = 5 MHz. For AMPS, GSM, and NADC TDMA signals, a peak detector is used, with RBW = VBW = 1 MHz. A Horn antenna was substituted in place of the EUT. This Horn antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same receive spectrum analyzer reading. The conducted power at the terminals of the Horn antenna is measured. The difference between the gain of the horn and an isotropic antenna is taken into consideration and the EIRP is recorded.

This device was tested in all configurations and the highest power is reported in GSM voice mode while using a Power Control Level of "5" in the Cellular band and "0" in the PCS band. This unit was tested with its standard battery.

## 6.5 Cellular GSM Radiated Measurements

**§2.1053, 22.917(a); RSS-132 (4.5.1)**

### Field Strength of SPURIOUS Radiation

| | | | | |
|---|---|---|---|---|
| OPERATING FREQUENCY: | 824.20 | MHz | | |
| CHANNEL: | 128 | | | |
| MEASURED OUTPUT POWER: | 29.910 | dBm | = | 0.979 W |
| MODULATION SIGNAL: | GSM (Internal) | | | |
| DISTANCE: | 3 | meters | | |
| LIMIT: | 43 + 10 log10 (W) = | 42.91 | dBc | |

| FREQUENCY (MHz) | LEVEL @ ANTENNA TERMINALS (dBm) | SUBSTITUTE ANTENNA GAIN (dBd) | CORRECT GENERATOR LEVEL (dBm) | POL (H/V) | (dBc) |
|---|---|---|---|---|---|
| 1648.40 | -43.78 | 6.32 | -37.46 | H | 67.4 |
| 2472.60 | -54.62 | 7.69 | -46.94 | H | 76.8 |
| 3296.80 | -53.56 | 7.83 | -45.73 | H | 75.6 |
| 4121.00 | -51.78 | 7.83 | -43.95 | H | 73.9 |
| 4945.20 | -91.60 | 8.62 | -82.98 | H | 112.9 |

**Table 6-5. Radiated Spurious Data (Cellular GSM Mode – Ch. 128)**

**NOTES:**

Radiated Spurious Emission Measurements by Substitution Method according to ANSI/TIA/EIA-603-C-2004, Aug. 17, 2004:

The EUT was placed on a wooden turn table 3-meters from the receive antenna. The receive antenna height and turntable rotation was adjusted for the highest reading on the receive spectrum analyzer. For CDMA signals, a peak detector is used, with RBW = VBW = 3 MHz. For WCDMA signals, a peak detector is used, with RBW = VBW = 5 MHz. For AMPS, GSM, and NADC TDMA signals, a peak detector is used, with RBW = VBW = 1 MHz. A half-wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same receive spectrum analyzer reading. This spurious level is recorded. For readings above 1GHz, the above procedure is repeated using horn antennas and the difference between the gain of the horn and an isotropic or dipole antenna are taken into consideration.

This device was tested in all configurations and the highest power is reported in GSM voice mode while using a Power Control Level of "5" in the Cellular band and "0" in the PCS band. This unit was tested with its standard battery.

## Cellular GSM Radiated Measurements (Cont'd)

**§2.1053, 22.917(a); RSS-132 (4.5.1)**

### Field Strength of SPURIOUS Radiation

| | | | | |
|---|---|---|---|---|
| OPERATING FREQUENCY: | 836.60 | MHz | | |
| CHANNEL: | 190 | | | |
| MEASURED OUTPUT POWER: | 29.910 | dBm | = | 0.979 W |
| MODULATION SIGNAL: | GSM (Internal) | | | |
| DISTANCE: | 3 | meters | | |
| LIMIT: | 43 + 10 log10 (W) = | 42.91 | dBc | |

| FREQUENCY (MHz) | LEVEL @ ANTENNA TERMINALS (dBm) | SUBSTITUTE ANTENNA GAIN (dBd) | CORRECT GENERATOR LEVEL (dBm) | POL (H/V) | (dBc) |
|---|---|---|---|---|---|
| 1673.20 | -46.40 | 6.33 | -40.08 | H | 70.0 |
| 2509.80 | -55.59 | 7.75 | -47.85 | H | 77.8 |
| 3346.40 | -53.82 | 7.86 | -45.96 | H | 75.9 |
| 4183.00 | -49.32 | 8.07 | -41.25 | H | 71.2 |
| 5019.60 | -91.32 | 8.55 | -82.77 | H | 112.7 |

**Table 6-6. Radiated Spurious Data (Cellular GSM Mode – Ch. 190)**

**NOTES:**

Radiated Spurious Emission Measurements by Substitution Method according to ANSI/TIA/EIA-603-C-2004, Aug. 17, 2004:

The EUT was placed on a wooden turn table 3-meters from the receive antenna. The receive antenna height and turntable rotation was adjusted for the highest reading on the receive spectrum analyzer. For CDMA signals, a peak detector is used, with RBW = VBW = 3 MHz. For WCDMA signals, a peak detector is used, with RBW = VBW = 5 MHz. For AMPS, GSM, and NADC TDMA signals, a peak detector is used, with RBW = VBW = 1 MHz. A half-wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same receive spectrum analyzer reading. This spurious level is recorded. For readings above 1GHz, the above procedure is repeated using horn antennas and the difference between the gain of the horn and an isotropic or dipole antenna are taken into consideration.

This device was tested in all configurations and the highest power is reported in GSM voice mode while using a Power Control Level of "5" in the Cellular band and "0" in the PCS band. This unit was tested with its standard battery.

## Cellular GSM Radiated Measurements (Cont'd)

**§2.1053, 22.917(a); RSS-132 (4.5.1)**

### Field Strength of SPURIOUS Radiation

| | | | | |
|---|---|---|---|---|
| OPERATING FREQUENCY: | 848.80 | MHz | | |
| CHANNEL: | 251 | | | |
| MEASURED OUTPUT POWER: | 29.910 | dBm | = | 0.979 W |
| MODULATION SIGNAL: | CDMA (Internal) | | | |
| DISTANCE: | 3 | meters | | |
| LIMIT: | 43 + 10 log10 (W) = | 42.91 | dBc | |

| FREQUENCY (MHz) | LEVEL @ ANTENNA TERMINALS (dBm) | SUBSTITUTE ANTENNA GAIN (dBd) | CORRECT GENERATOR LEVEL (dBm) | POL (H/V) | (dBc) |
|---|---|---|---|---|---|
| 1697.60 | -45.22 | 6.34 | -38.89 | H | 68.8 |
| 2546.40 | -55.23 | 7.74 | -47.49 | H | 77.4 |
| 3395.20 | -52.48 | 7.89 | -44.59 | H | 74.5 |
| 4244.00 | -46.46 | 8.31 | -38.15 | H | 68.1 |
| 5092.80 | -91.04 | 8.53 | -82.51 | H | 112.4 |

**Table 6-7. Radiated Spurious Data (Cellular GSM Mode – Ch. 251)**

**NOTES:**

Radiated Spurious Emission Measurements by Substitution Method according to ANSI/TIA/EIA-603-C-2004, Aug. 17, 2004:

The EUT was placed on a wooden turn table 3-meters from the receive antenna. The receive antenna height and turntable rotation was adjusted for the highest reading on the receive spectrum analyzer. For CDMA signals, a peak detector is used, with RBW = VBW = 3 MHz. For WCDMA signals, a peak detector is used, with RBW = VBW = 5 MHz. For AMPS, GSM, and NADC TDMA signals, a peak detector is used, with RBW = VBW = 1 MHz. A half-wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same receive spectrum analyzer reading. This spurious level is recorded. For readings above 1GHz, the above procedure is repeated using horn antennas and the difference between the gain of the horn and an isotropic or dipole antenna are taken into consideration.

This device was tested in all configurations and the highest power is reported in GSM voice mode while using a Power Control Level of "5" in the Cellular band and "0" in the PCS band. This unit was tested with its standard battery.

## 6.6 PCS GSM Radiated Measurements

**§2.1053, 24.238(a); RSS-133 (6.5.1)**

### Field Strength of SPURIOUS Radiation

| | | | | |
|---|---|---|---|---|
| OPERATING FREQUENCY: | 1850.20 | MHz | | |
| CHANNEL: | 512 | | | |
| MEASURED OUTPUT POWER: | 32.910 | dBm | = | 1.954 W |
| MODULATION SIGNAL: | GSM (Internal) | | | |
| DISTANCE: | 3 | meters | | |
| LIMIT: | 43 + 10 $\log_{10}$ (W) | 45.91 | dBc | |

| FREQUENCY (MHz) | LEVEL @ ANTENNA TERMINALS (dBm) | SUBSTITUTE ANTENNA GAIN (dBd) | CORRECT GENERATOR LEVEL (dBm) | POL (H/V) | (dBc) |
|---|---|---|---|---|---|
| 3700.40 | -25.46 | 9.85 | -15.61 | V | 48.5 |
| 5550.60 | -32.04 | 10.72 | -21.33 | V | 54.2 |
| 7400.80 | -30.48 | 11.60 | -18.88 | V | 51.8 |
| 9251.00 | -74.26 | 11.36 | -62.91 | V | 95.8 |
| 11101.20 | -75.16 | 12.74 | -62.42 | V | 95.3 |

**Table 6-8. Radiated Spurious Data (PCS GSM Mode – Ch. 512)**

**NOTES:**

Radiated Spurious Emission Measurements by Substitution Method according to ANSI/TIA/EIA-603-C-2004, Aug. 17, 2004:

The EUT was placed on a wooden turn table 3-meters from the receive antenna. The receive antenna height and turntable rotation was adjusted for the highest reading on the receive spectrum analyzer. For CDMA signals, a peak detector is used, with RBW = VBW = 3 MHz. For WCDMA signals, a peak detector is used, with RBW = VBW = 5 MHz. For AMPS, GSM, and NADC TDMA signals, a peak detector is used, with RBW = VBW = 1 MHz. A half-wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same receive spectrum analyzer reading. This spurious level is recorded. For readings above 1GHz, the above procedure is repeated using horn antennas and the difference between the gain of the horn and an isotropic or dipole antenna are taken into consideration.

This device was tested in all configurations and the highest power is reported in GSM voice mode while using a Power Control Level of "5" in the Cellular band and "0" in the PCS band.This unit was tested with its standard battery.

## PCS GSM Radiated Measurements (Cont'd)

**§2.1053, 24.238(a); RSS-133 (6.5.1)**

### Field Strength of SPURIOUS Radiation

| | | | | |
|---|---|---|---|---|
| OPERATING FREQUENCY: | 1880.00 | MHz | | |
| CHANNEL: | 661 | | | |
| MEASURED OUTPUT POWER: | 32.910 | dBm | = | 1.954 W |
| MODULATION SIGNAL: | GSM (Internal) | | | |
| DISTANCE: | 3 | meters | | |
| LIMIT: | 43 + 10 log10 (W) = | 45.91 | dBc | |

| FREQUENCY (MHz) | LEVEL @ ANTENNA TERMINALS (dBm) | SUBSTITUTE ANTENNA GAIN (dBd) | CORRECT GENERATOR LEVEL (dBm) | POL (H/V) | (dBc) |
|---|---|---|---|---|---|
| 3760.00 | -26.14 | 9.78 | -16.36 | V | 49.3 |
| 5640.00 | -33.51 | 10.92 | -22.59 | V | 55.5 |
| 7520.00 | -33.73 | 11.66 | -22.07 | V | 55.0 |
| 9400.00 | -72.09 | 11.56 | -60.52 | V | 93.4 |
| 11280.00 | -75.24 | 12.63 | -62.61 | V | 95.5 |

**Table 6-9. Radiated Spurious Data (PCS GSM Mode – Ch. 661)**

**NOTES:**

Radiated Spurious Emission Measurements by Substitution Method according to ANSI/TIA/EIA-603-C-2004, Aug. 17, 2004:

The EUT was placed on a wooden turn table 3-meters from the receive antenna. The receive antenna height and turntable rotation was adjusted for the highest reading on the receive spectrum analyzer. For CDMA signals, a peak detector is used, with RBW = VBW = 3 MHz. For WCDMA signals, a peak detector is used, with RBW = VBW = 5 MHz. For AMPS, GSM, and NADC TDMA signals, a peak detector is used, with RBW = VBW = 1 MHz. A half-wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same receive spectrum analyzer reading. This spurious level is recorded. For readings above 1GHz, the above procedure is repeated using horn antennas and the difference between the gain of the horn and an isotropic or dipole antenna are taken into consideration.

This device was tested in all configurations and the highest power is reported in GSM voice mode while using a Power Control Level of "5" in the Cellular band and "0" in the PCS band. This unit was tested with its standard battery.

## PCS GSM Radiated Measurements (Cont'd)

**§2.1053, 24.238(a); RSS-133 (6.5.1)**

### Field Strength of SPURIOUS Radiation

| | | | | |
|---|---|---|---|---|
| OPERATING FREQUENCY: | 1909.80 | MHz | | |
| CHANNEL: | 810 | | | |
| MEASURED OUTPUT POWER: | 32.910 | dBm | = | 1.954 W |
| MODULATION SIGNAL: | GSM (Internal) | | | |
| DISTANCE: | 3 | meters | | |
| LIMIT: | 43 + 10 log10 (W) = | 45.91 | dBc | |

| FREQUENCY (MHz) | LEVEL @ ANTENNA TERMINALS (dBm) | SUBSTITUTE ANTENNA GAIN (dBd) | CORRECT GENERATOR LEVEL (dBm) | POL (H/V) | (dBc) |
|---|---|---|---|---|---|
| 3819.60 | -25.33 | 9.71 | -15.62 | V | 48.5 |
| 5729.40 | -28.67 | 11.12 | -17.56 | V | 50.5 |
| 7639.20 | -28.94 | 11.44 | -17.50 | V | 50.4 |
| 9549.00 | -70.79 | 11.73 | -59.06 | V | 92.0 |
| 11458.80 | -75.32 | 12.52 | -62.80 | V | 95.7 |

**Table 6-10. Radiated Spurious Data (PCS GSM Mode – Ch. 810)**

**NOTES:**

Radiated Spurious Emission Measurements by Substitution Method according to ANSI/TIA/EIA-603-C-2004, Aug. 17, 2004:

The EUT was placed on a wooden turn table 3-meters from the receive antenna. The receive antenna height and turntable rotation was adjusted for the highest reading on the receive spectrum analyzer. For CDMA signals, a peak detector is used, with RBW = VBW = 3 MHz. For WCDMA signals, a peak detector is used, with RBW = VBW = 5 MHz. For AMPS, GSM, and NADC TDMA signals, a peak detector is used, with RBW = VBW = 1 MHz. A half-wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same receive spectrum analyzer reading. This spurious level is recorded. For readings above 1GHz, the above procedure is repeated using horn antennas and the difference between the gain of the horn and an isotropic or dipole antenna are taken into consideration.

This device was tested in all configurations and the highest power is reported in GSM voice mode while using a Power Control Level of "5" in the Cellular band and "0" in the PCS band. This unit was tested with its standard battery.

## 6.7 Cellular GSM Frequency Stability Measurements

**§2.1055, 22.355; RSS-132 (4.3)**

OPERATING FREQUENCY: 836,600,000 Hz

CHANNEL: 190

REFERENCE VOLTAGE: 12 VDC

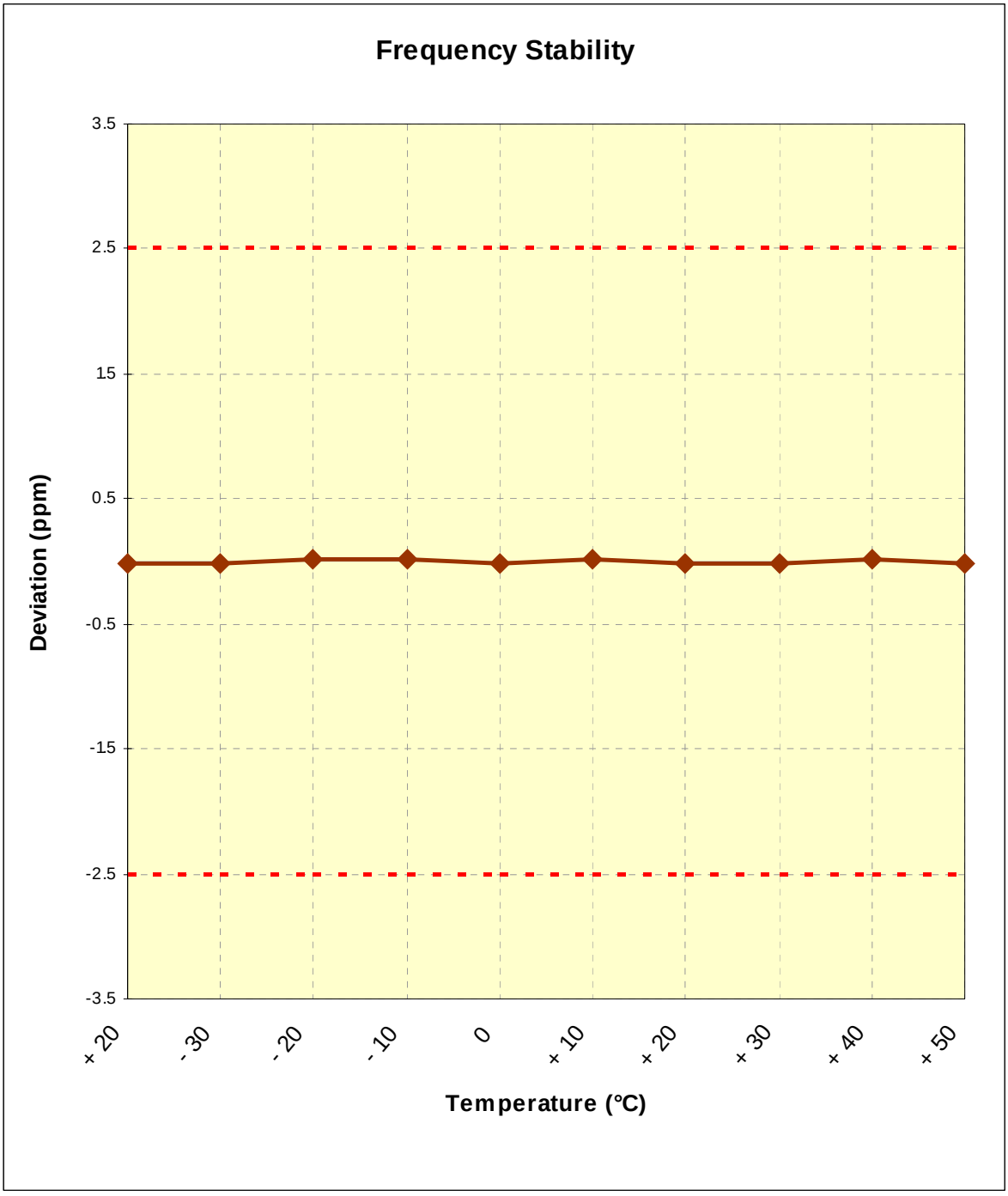
DEVIATION LIMIT: ± 0.00025 % or 2.5 ppm

| VOLTAGE (%) | POWER (VDC) | TEMP (°C) | FREQUENCY (Hz) | Freq. Dev. (Hz) | Deviation (%) |
|---|---|---|---|---|---|
| 100 % | 12.00 | + 20 (Ref) | 836,599,983 | -17 | -0.000002 |
| 100 % | | - 30 | 836,599,987 | -13 | -0.000002 |
| 100 % | | - 20 | 836,600,009 | 9 | 0.000001 |
| 100 % | | - 10 | 836,600,012 | 12 | 0.000001 |
| 100 % | | 0 | 836,599,984 | -16 | -0.000002 |
| 100 % | | + 10 | 836,600,014 | 14 | 0.000002 |
| 100 % | | + 20 | 836,599,983 | -17 | -0.000002 |
| 100 % | | + 30 | 836,599,986 | -14 | -0.000002 |
| 100 % | | + 40 | 836,600,008 | 8 | 0.000001 |
| 100 % | | + 50 | 836,599,982 | -18 | -0.000002 |
| 115 % | 13.80 | + 20 | 836,599,978 | -22 | -0.000003 |

**Table 6-11. Frequency Stability Data (Cellular GSM Mode – Ch. 190)**

## Cellular GSM Frequency Stability Measurements (Cont'd)

**§2.1055, 22.355; RSS-132 (4.3)**




**Plot 6-1. Frequency Stability Graph (Cellular GSM Mode – Ch. 190)**

## 6.8 PCS GSM Frequency Stability Measurements

**§2.1055, 24.235; RSS-133 (6.3)**

OPERATING FREQUENCY: 1,880,000,000 Hz

CHANNEL: 661

REFERENCE VOLTAGE: 12 VDC

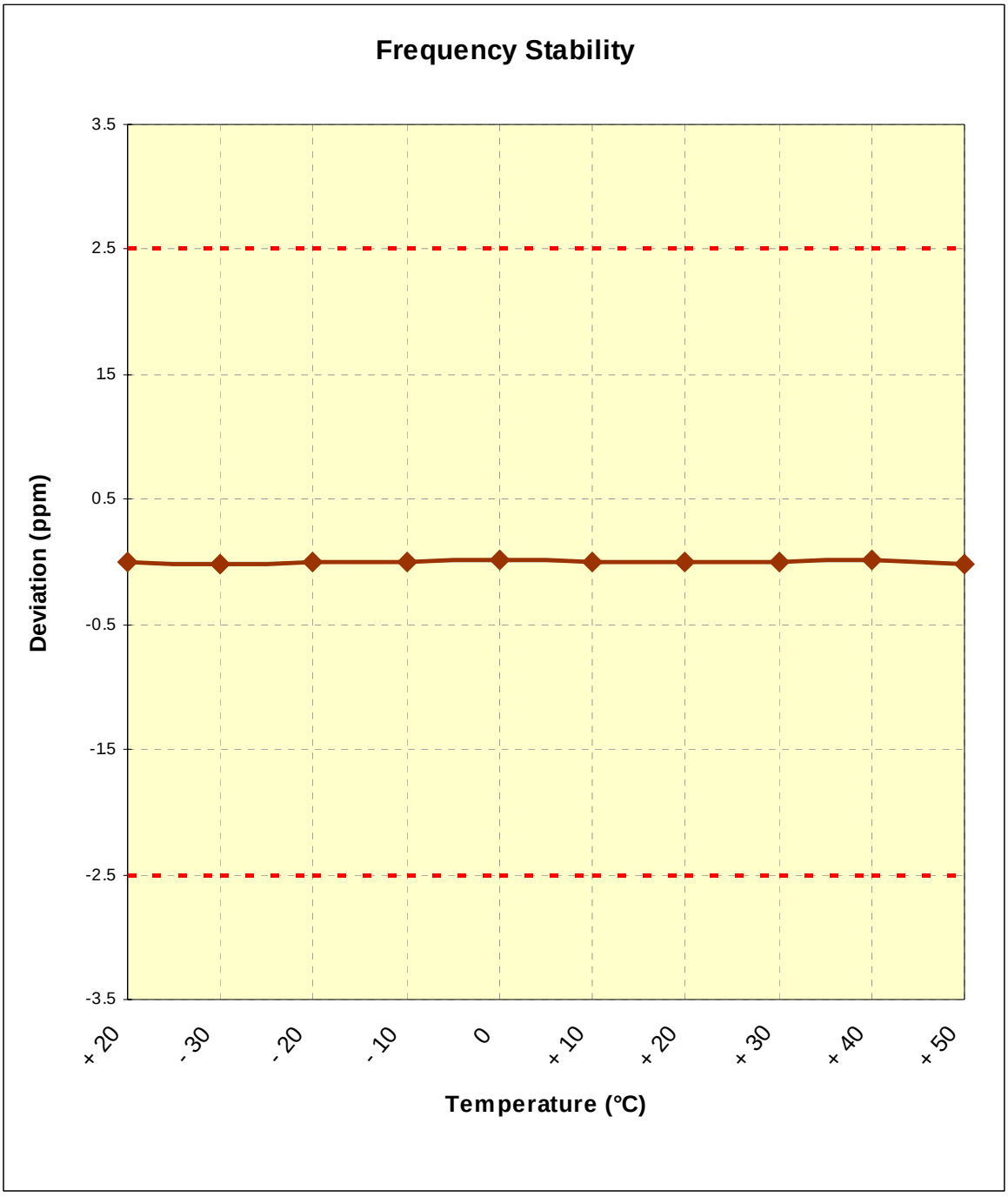
DEVIATION LIMIT: ± 0.00025 % or 2.5 ppm

| VOLTAGE (%) | POWER (VDC) | TEMP (°C) | FREQUENCY (Hz) | Freq. Dev. (Hz) | Deviation (%) |
|---|---|---|---|---|---|
| 100 % | 12.00 | + 20 (Ref) | 1,879,999,985 | -15 | -0.000001 |
| 100 % | | - 30 | 1,879,999,983 | -17 | -0.000001 |
| 100 % | | - 20 | 1,879,999,988 | -12 | -0.000001 |
| 100 % | | - 10 | 1,880,000,010 | 10 | 0.000001 |
| 100 % | | 0 | 1,880,000,017 | 17 | 0.000001 |
| 100 % | | + 10 | 1,880,000,008 | 8 | 0.000000 |
| 100 % | | + 20 | 1,879,999,985 | -15 | -0.000001 |
| 100 % | | + 30 | 1,880,000,012 | 12 | 0.000001 |
| 100 % | | + 40 | 1,880,000,021 | 21 | 0.000001 |
| 100 % | | + 50 | 1,879,999,982 | -18 | -0.000001 |
| 115 % | 13.80 | + 20 | 1,879,999,983 | -17 | -0.000001 |

**Table 6-12. Frequency Stability Data (PCS GSM Mode – Ch. 661)**

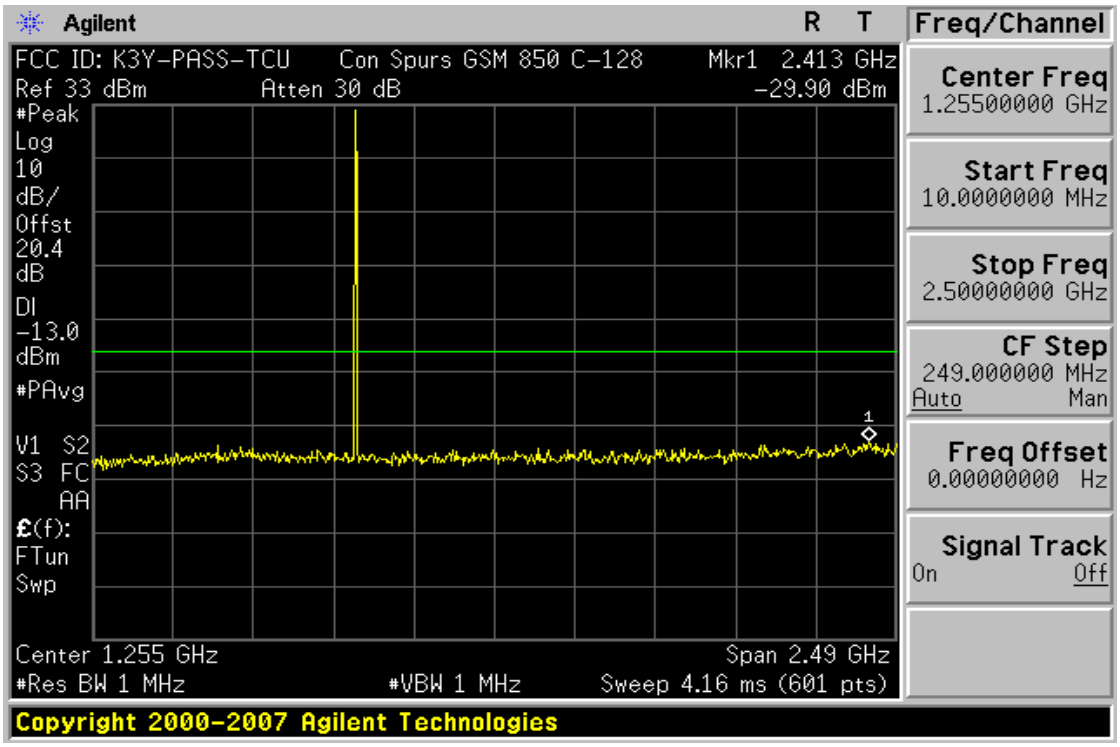
## PCS GSM Frequency Stability Measurements (Cont'd)

**§2.1055, 24.235; RSS-133 (6.3)**

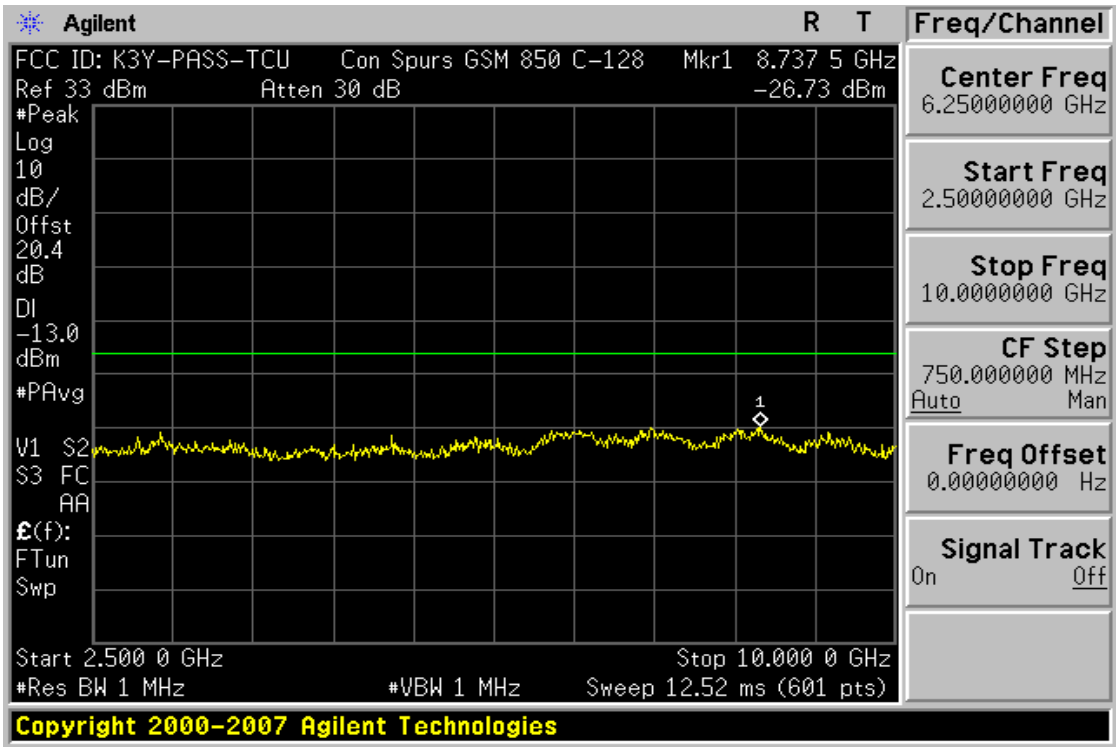



**Plot 6-2. Frequency Stability Graph (PCS GSM Mode – Ch. 661)**

# 7.0 PLOTS OF EMISSIONS

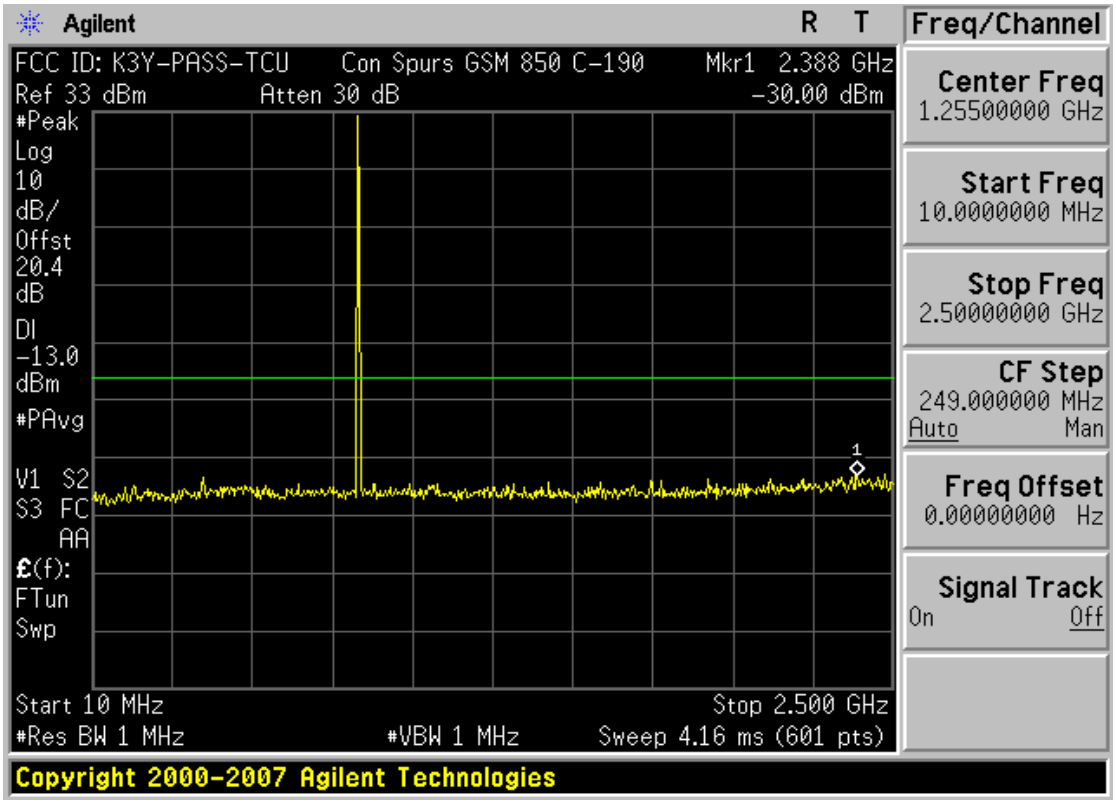



**Plot 7-1. Conducted Spurious Plot (Cellular GSM Mode – Ch. 128)**

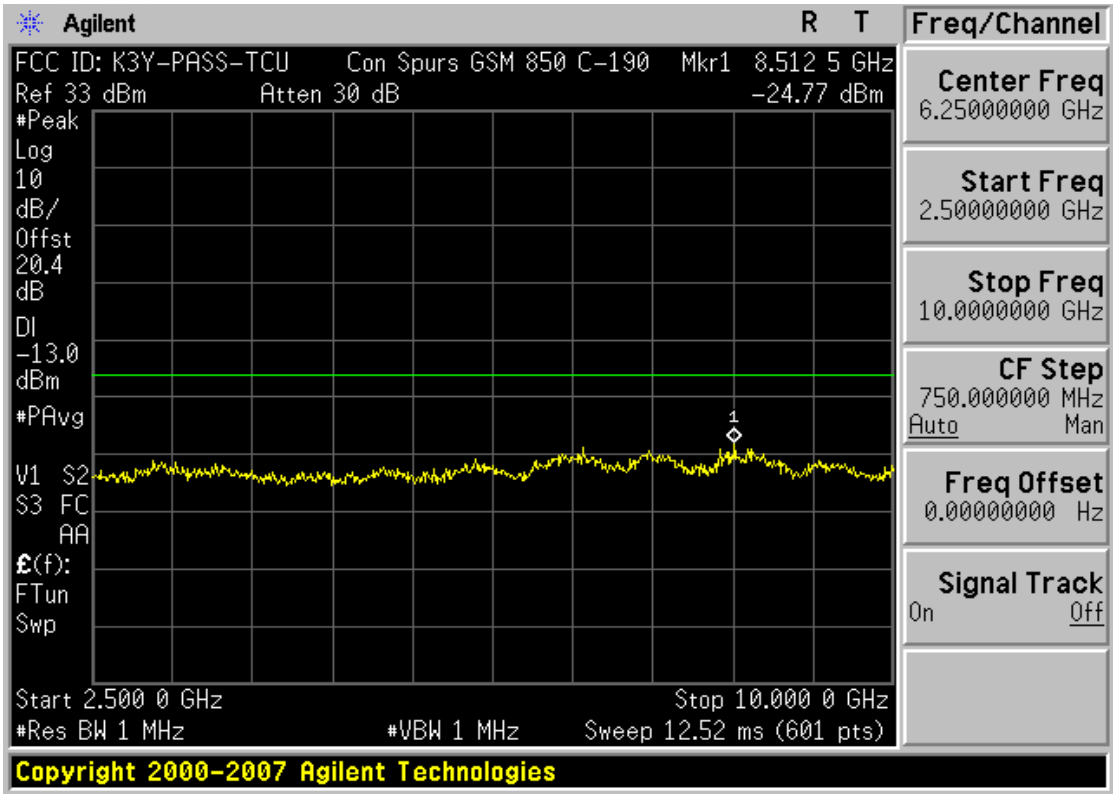



**Plot 7-2. Conducted Spurious Plot (Cellular GSM Mode – Ch. 128)**

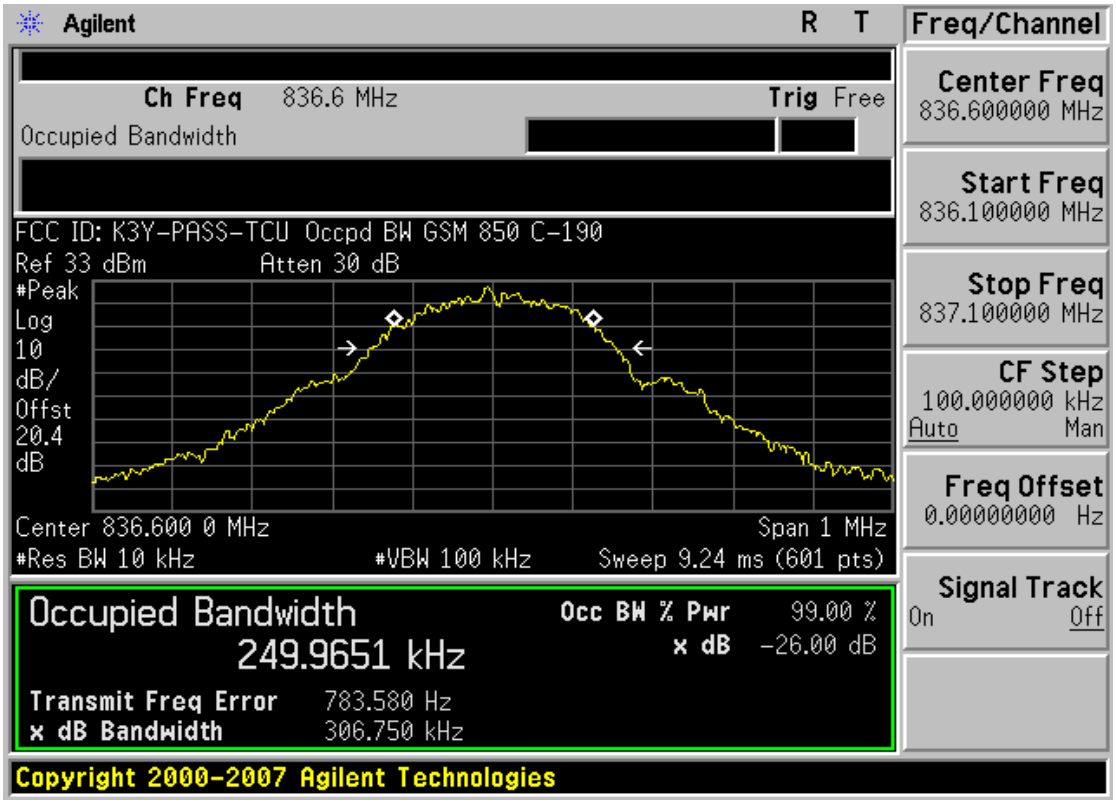

**Plot 7-3. Band Edge Plot (Cellular GSM Mode – Ch. 128)**



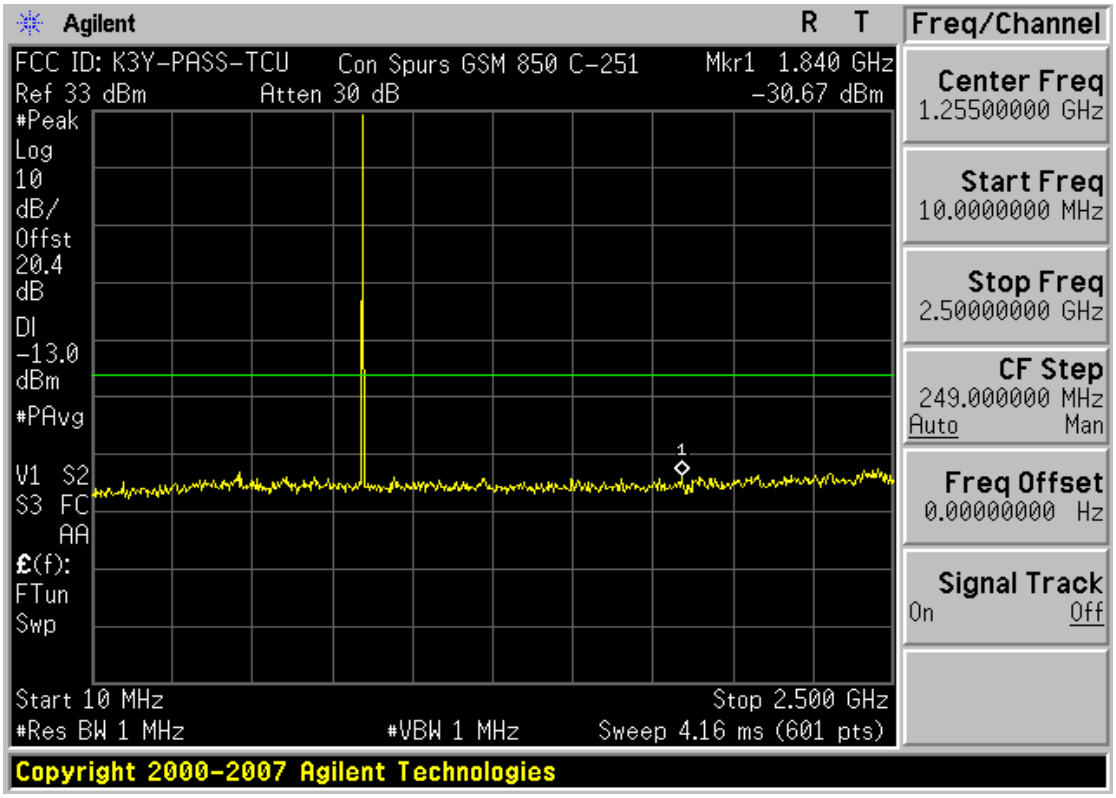

**Plot 7-4. Conducted Spurious (Cellular GSM Mode – Ch. 190)**



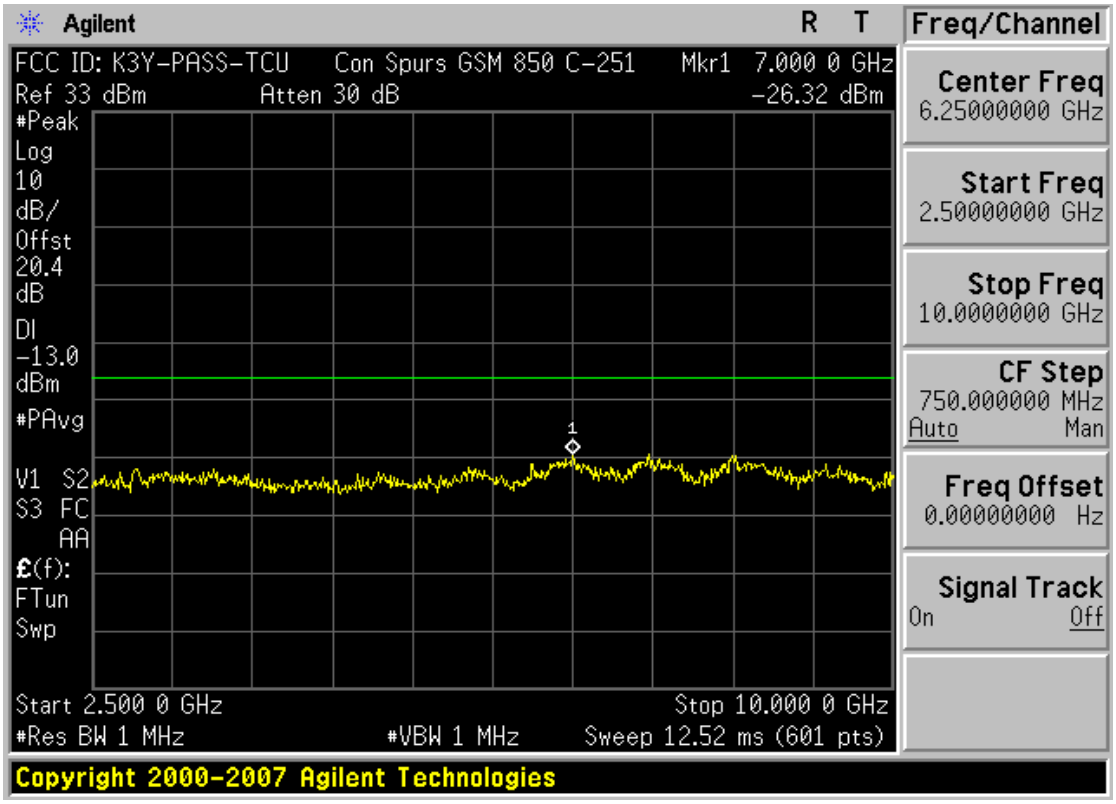

**Plot 7-5. Conducted Spurious Plot (Cellular GSM Mode – Ch. 190)**



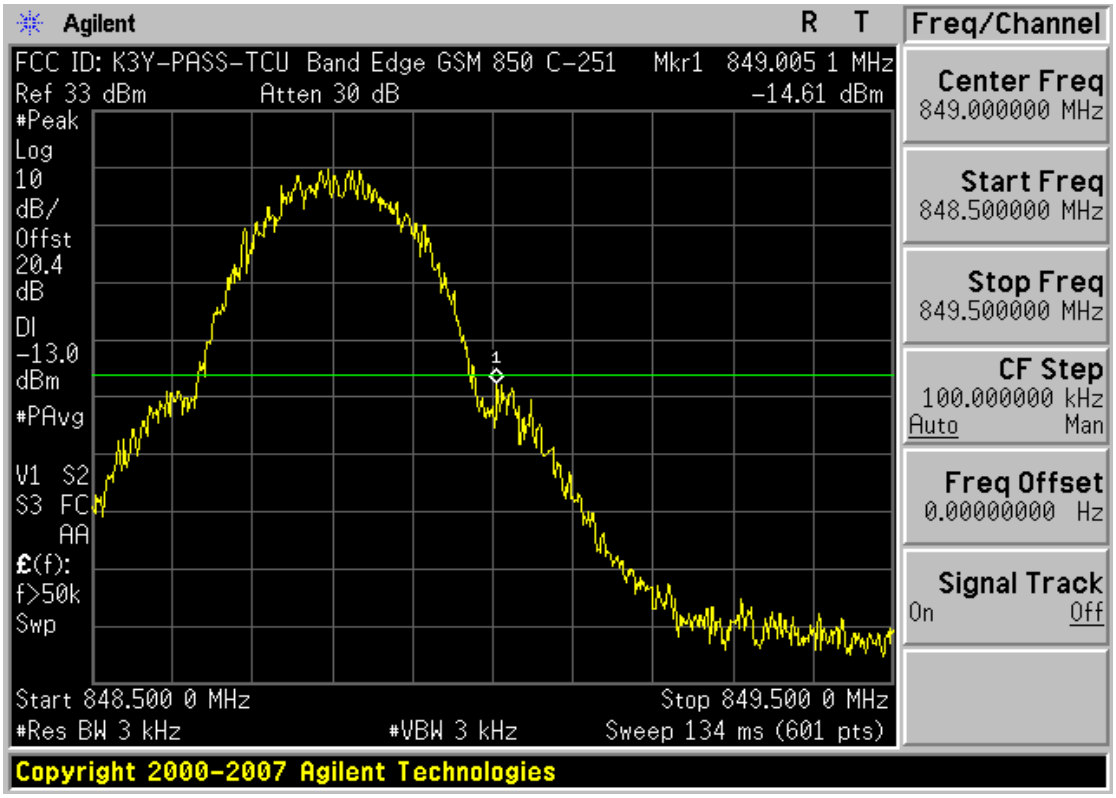

**Plot 7-6. Occupied Bandwidth Plot (Cellular GSM Mode – Ch. 190)**



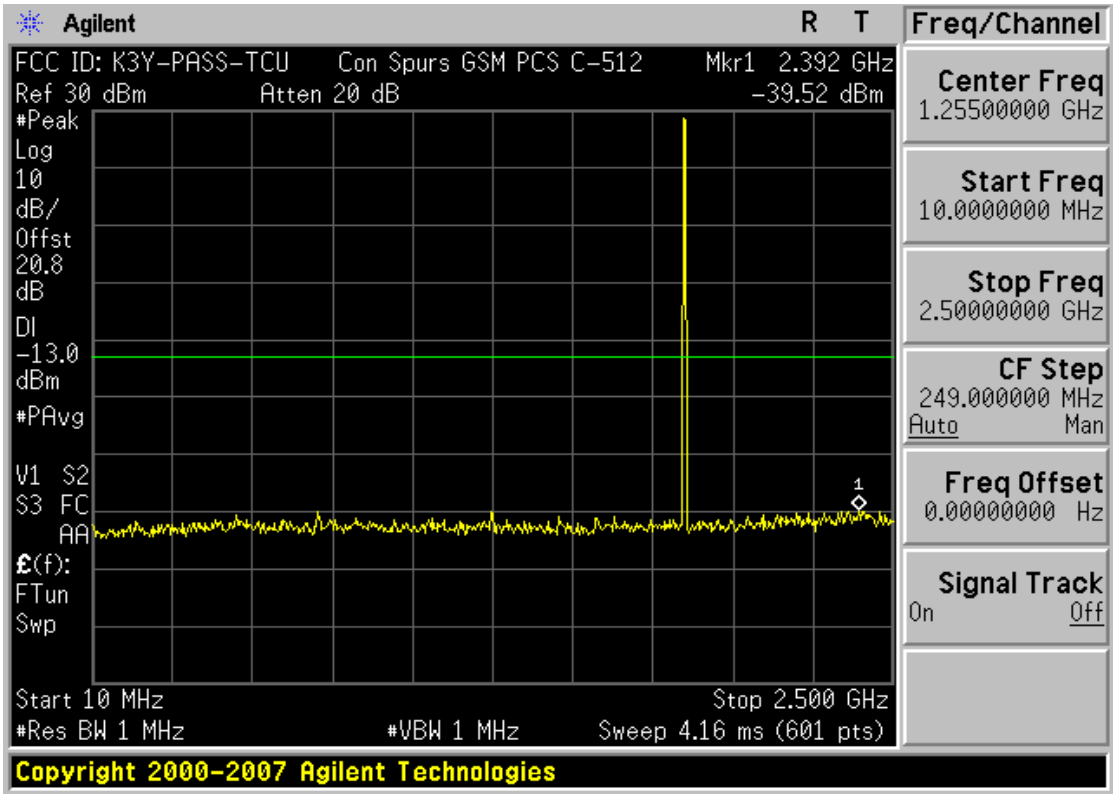

**Plot 7-7. Conducted Spurious Plot (Cellular GSM Mode – Ch. 251)**



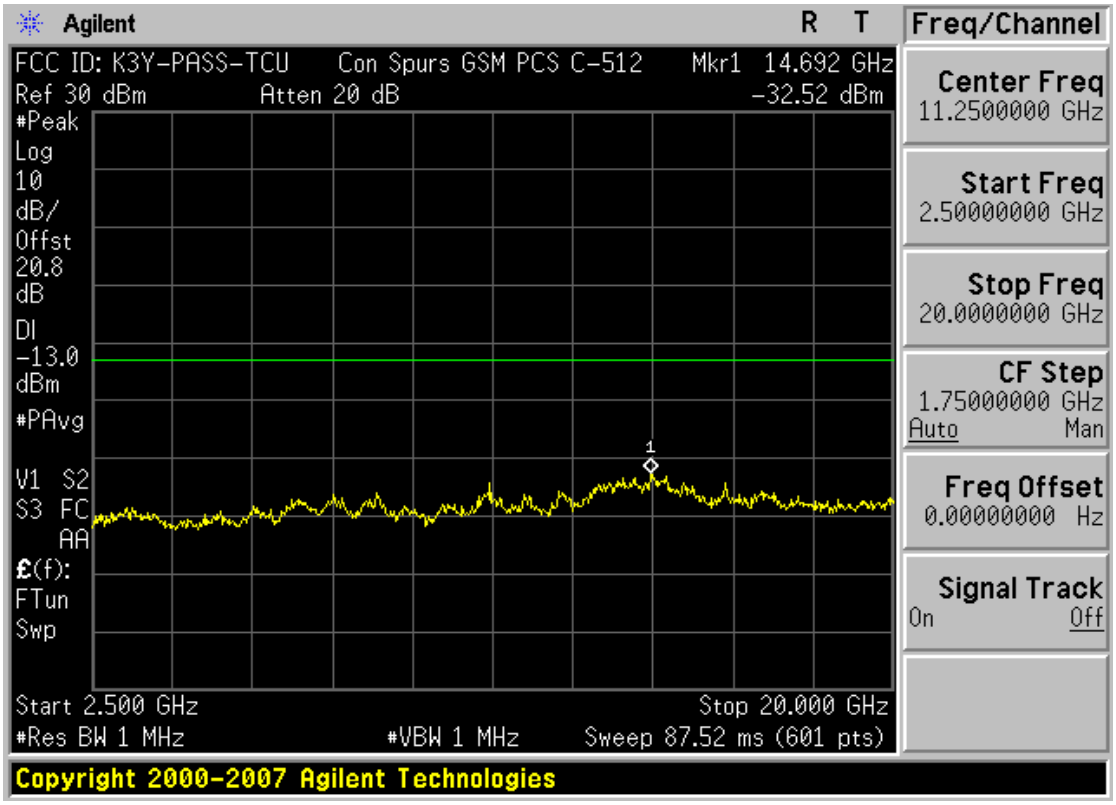

**Plot 7-8. Conducted Spurious Plot (Cellular GSM Mode – Ch. 251)**



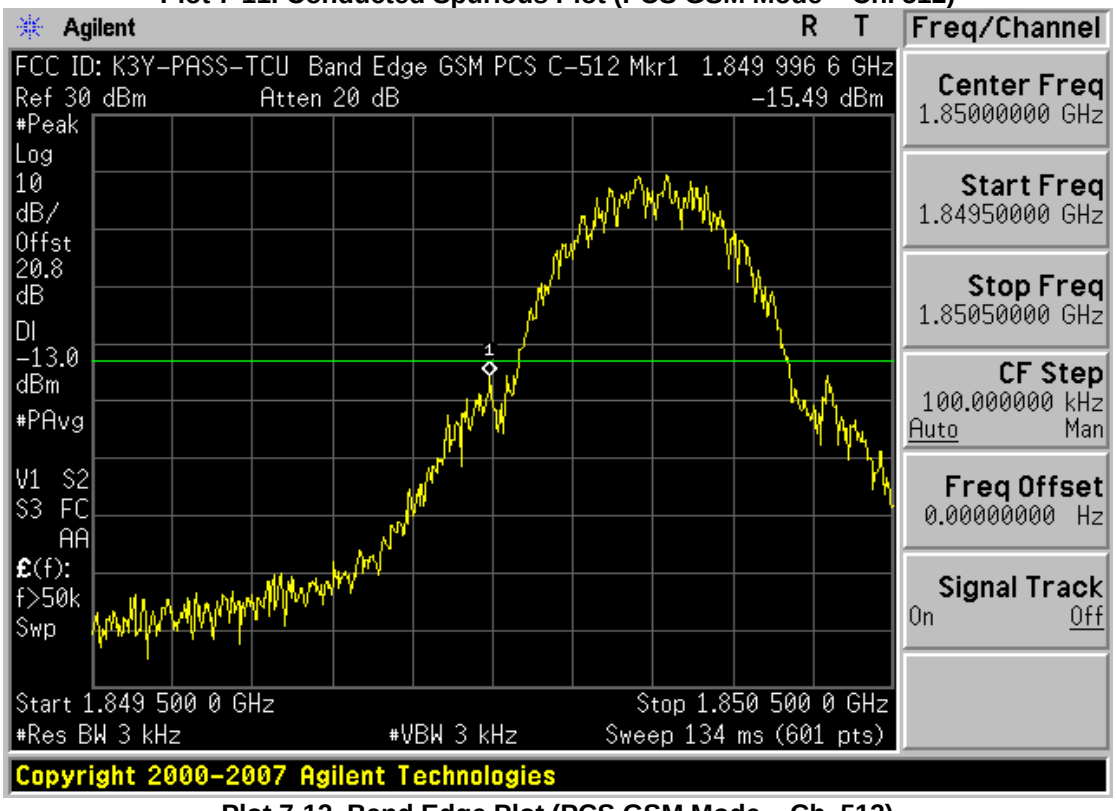

**Plot 7-9. Band Edge Plot (Cellular GSM Mode – Ch. 251)**



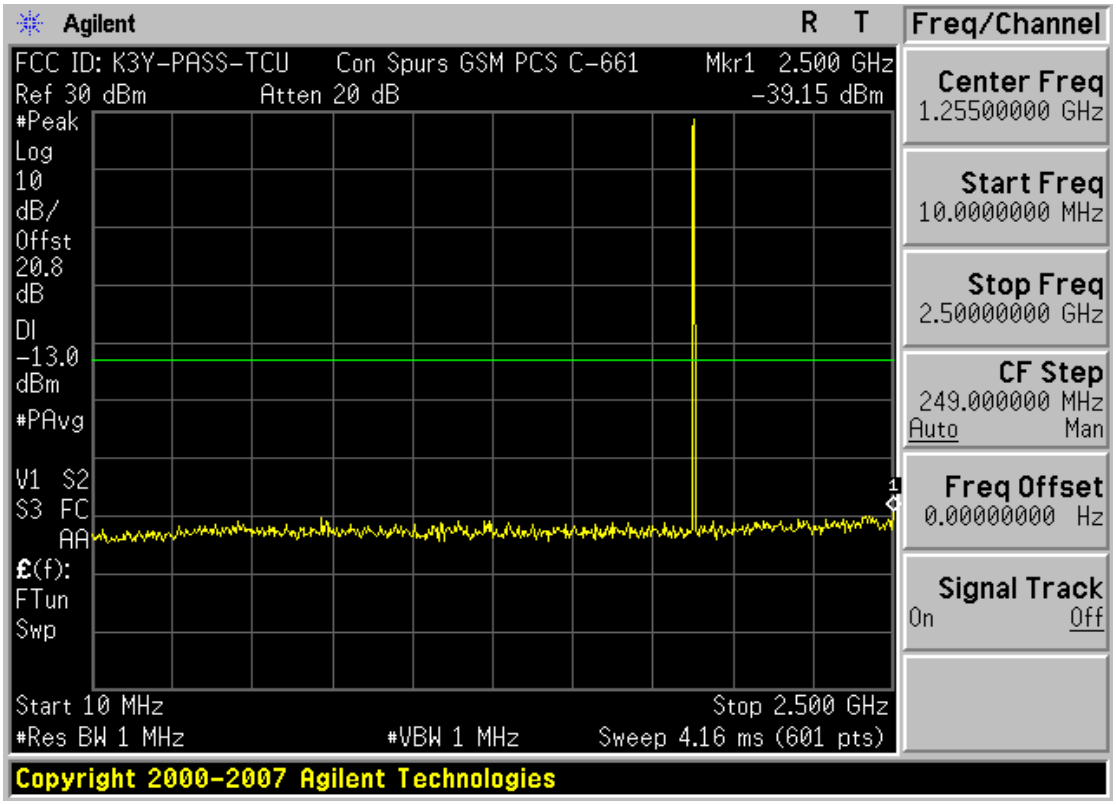

**Plot 7-10. Conducted Spurious Plot (PCS GSM Mode – Ch. 512)**



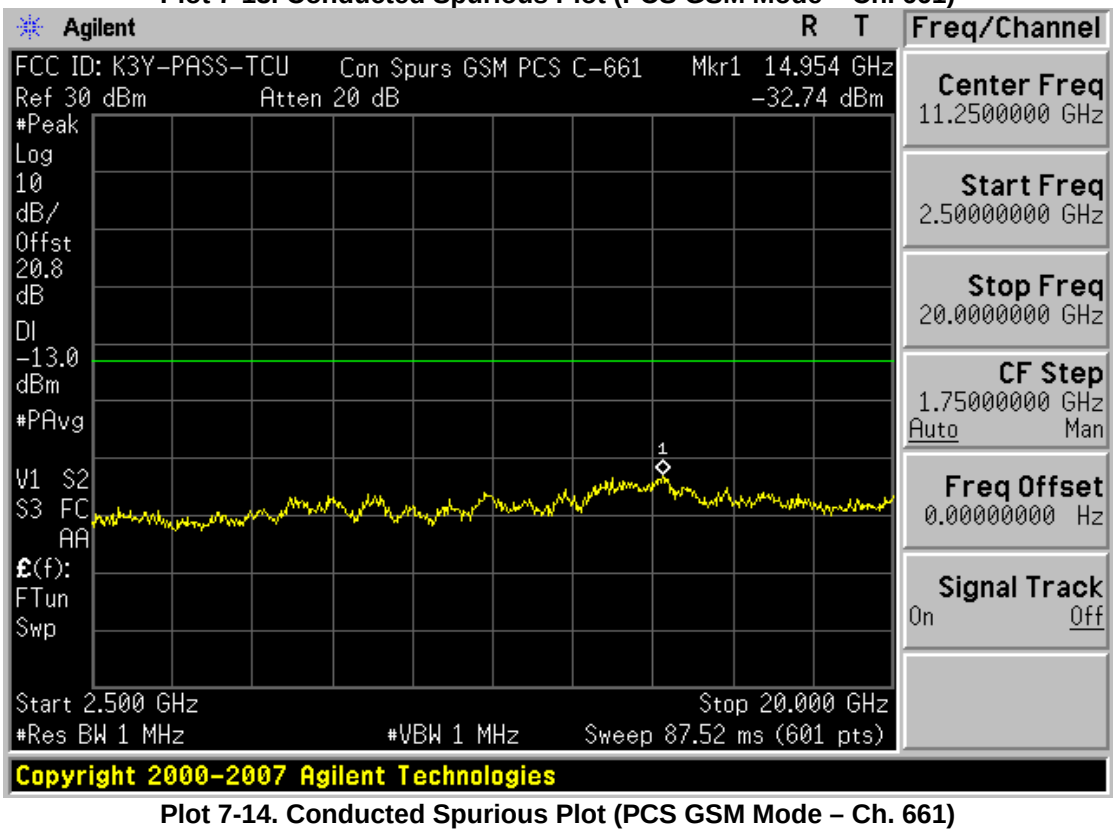

**Plot 7-11. Conducted Spurious Plot (PCS GSM Mode – Ch. 512)**



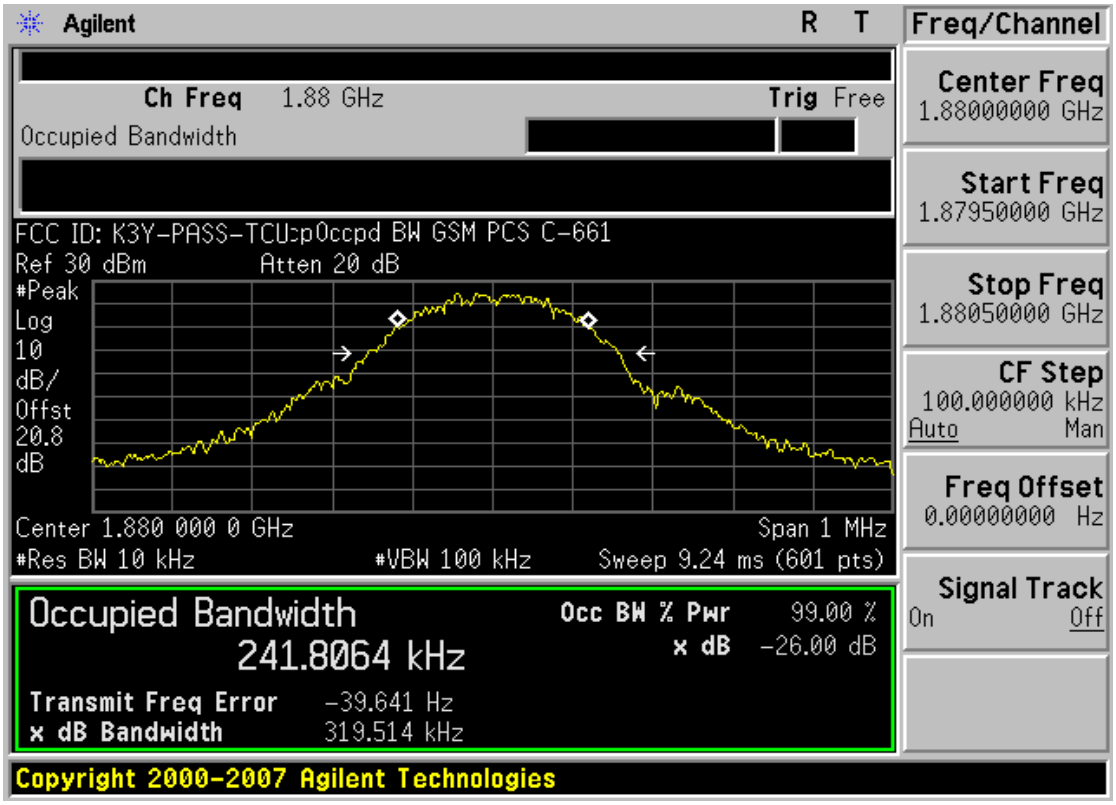

**Plot 7-12. Band Edge Plot (PCS GSM Mode – Ch. 512)**



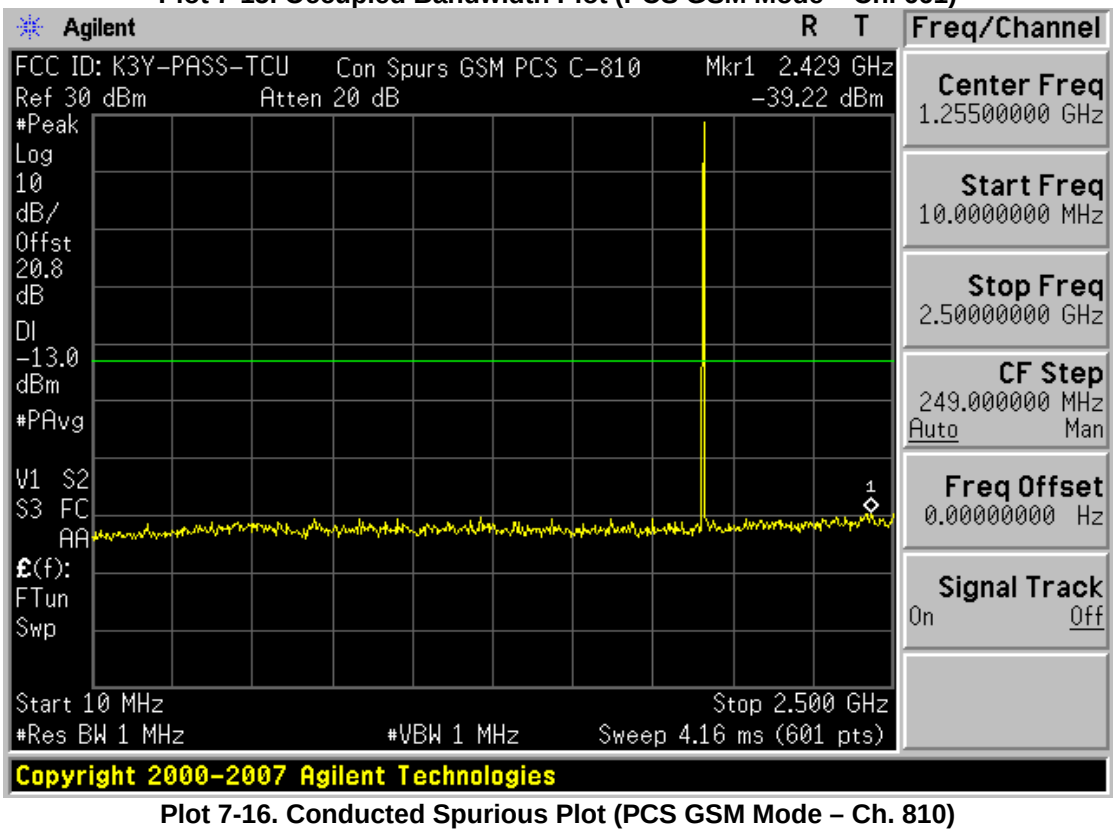

**Plot 7-13. Conducted Spurious Plot (PCS GSM Mode – Ch. 661)**



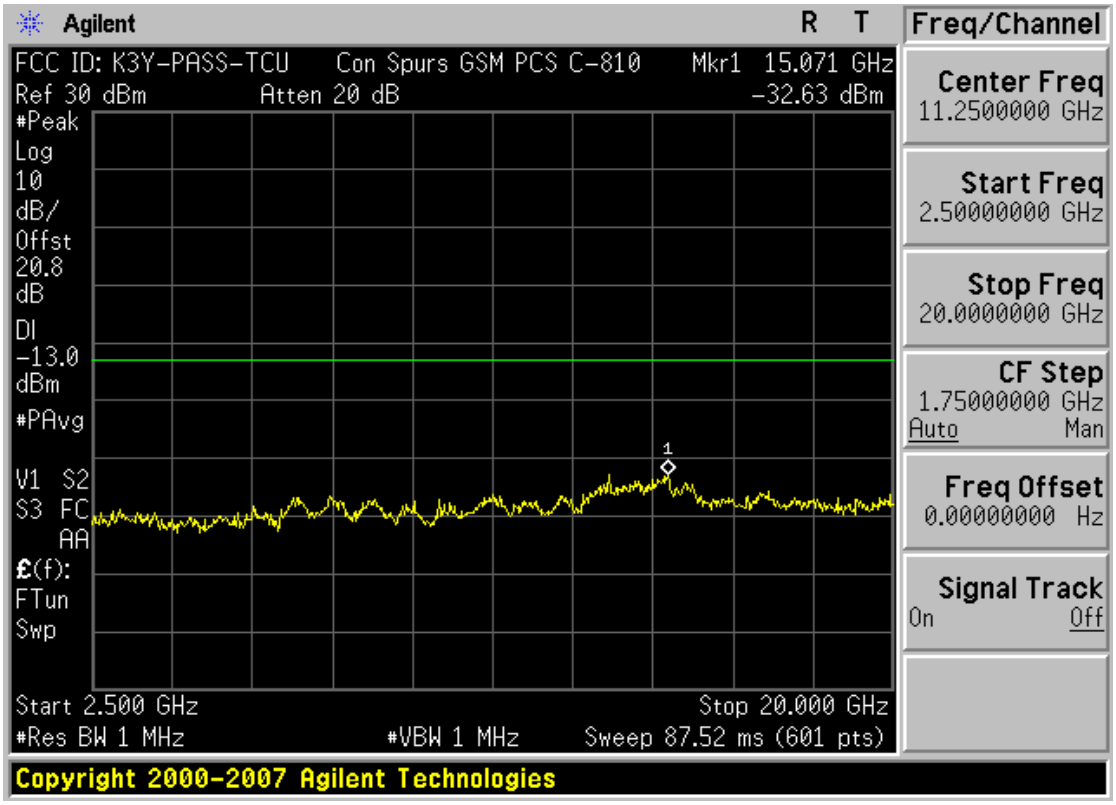

**Plot 7-14. Conducted Spurious Plot (PCS GSM Mode – Ch. 661)**



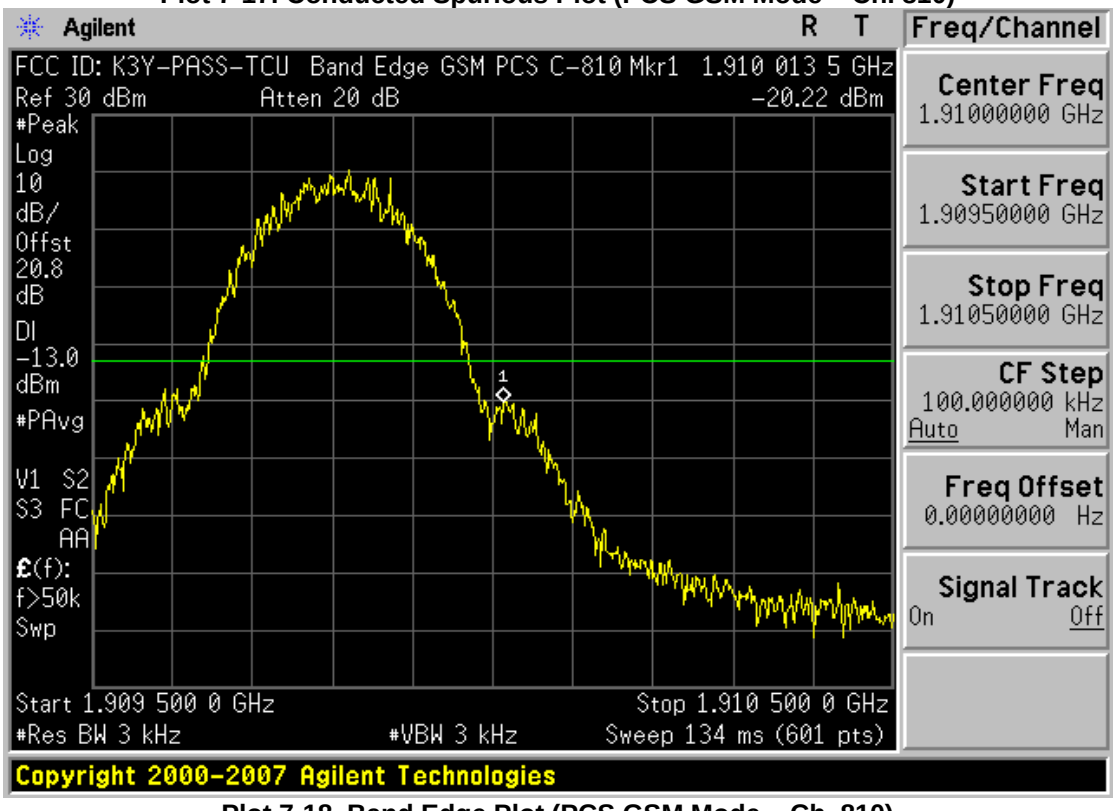

**Plot 7-15. Occupied Bandwidth Plot (PCS GSM Mode – Ch. 661)**




**Plot 7-16. Conducted Spurious Plot (PCS GSM Mode – Ch. 810)**




**Plot 7-17. Conducted Spurious Plot (PCS GSM Mode – Ch. 810)**




**Plot 7-18. Band Edge Plot (PCS GSM Mode – Ch. 810)**

# 8.0 CONCLUSION

The data collected show that the **Hughes 850/1900 GSM/GPRS Module FCC ID: K3Y-PASS-TCU** complies with all the requirements of Parts 2, 22, and 24 of the FCC rules.