# EMI Test Report

Tested in accordance with
Federal Communications Commission (FCC)
Personal Communications Services
CFR 47, Parts 2, 22 and 24

# RIM Testing Services (RTS)

**REPORT NO.:** RTS-0101-0508-08

**REPORT NO.**: RAT40GW
**TYPE NAME**: BlackBerry Wireless Handheld
**FCC ID**: L6ARAT40GW
**IC**: 2503A-RAT40GW

**Date**: _____28 September 2005____

## Declaration

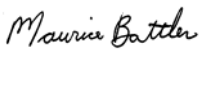
**Statement of Performance:**

The BlackBerry Wireless Handheld, model RAT40GW ASY-08757-001 when configured and operated per RIM's operation instructions, performs within the requirements of the test standards.

**Declaration:**

We hereby certify that:
The test data reported herein is an accurate record of the performance of the sample(s) tested.
The test results are valid for the tested unit (s) only.
The test equipment used was suitable for the tests performed and within manufacturer's published specifications and operating parameters.
The test methods were consistent with the methods described in the relevant standards.

Tested by:



Maurice Battler.
Certification Specialist

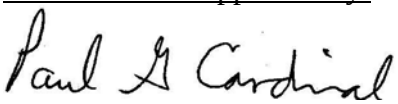
Date: September 28, 2005

Reviewed by:

Masud S Attayi, P.Eng.
Senior Compliance Engineer

Date: September 28, 2005

Reviewed and Approved by:



Paul G. Cardinal, Ph.D.
Manager

Date: September 30, 2005

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## A) Scope

This report details the results of compliance tests which were performed in accordance to the requirements of:
FCC CFR 47 Part 2, Oct. 1, 2000
FCC CFR 47 Part 22, Subpart H, Cellular Radiotelephone Services, Oct. 1, 2000
FCC CFR 47 Part 24 Subpart E, Broadband PCS, Oct 1. 2000
Industry Canada, RSS-132 Issue 1, August 2002, 800 MHz Cellular Telephones Employing New Technologies
Industry Canada, RSS-133 Issue 3, June 2005, 2 GHz Personal Communications Services

## B) Associated Document

1. Document number RTS-0101- RAT40GW -01

## C) Product Identification

The equipment under test (EUT) was tested at the RIM Testing Services (RTS) EMI test facility, located at:

305 Phillip Street
Waterloo, Ontario
Canada, N2L 3W8
Phone: 519 888 7465
Fax: 519 888 6906

The testing began on August 30, 2005 and completed on September 21, 2004. The sample equipment under test (EUT) included:

1a. BlackBerry Wireless Handheld, model number RAT40GW, ASY-08757-001 Rev. R, POP-10133-003 Rev. E, PIN 2035B59C, FCC ID L6ARAT40GW, IC: 2503A-RAT40GW.
1b. BlackBerry Wireless Handheld, model number RAT40GW, ASY-08757-001 Rev. Q, POP-10133-002 Rev. E, PIN 20331B98, FCC ID L6ARAT40GW, IC: 2503A-RAT40GW.
1c. BlackBerry Wireless Handheld, model number RAT40GW, ASY-08757-001 Rev. R, POP-10133-003 Rev. E, PIN 2035B4FE, FCC ID L6ARAT40GW, IC: 2503A-RAT40GW.

To view the differences between ASY-08757-001 Rev. R and ASY-08757-001 Rev. Q see document number RTS-0101- RAT40GW -01.
Only the measurements that maybe impacted by the changes from ASY-08757-001 Rev. Q to ASY-08757-001 Rev. R were remeasured.

The transmit frequency ranges for the BlackBerry Wireless Handheld model number RAT40GW are: GSM850 824 to 849 MHz, GSM 880 to 915 MHz, DCS 1710 to 1785 MHz, PCS 1850 to 1910 MHz, Bluetooth 2402 to 2480 MHz.

## D) Support Equipment Used for the Testing of the EUT

1) Communication Tester, Rohde & Schwarz, model CMU 200, serial number 100251
2) Communication Tester, Rohde & Schwarz, model CMU 200, serial number 837/493/073
3) DC Power Supply, H/P, model 6632B, serial number US37472178

## E) Test Voltage

The ac input voltage was 120 volts, 60 Hz where applicable. This configuration was per RIM's specifications.

## F) Test Results Chart

| SPECIFICATION | Test Type | MEETS REQUIREMENTS | Performed By |
|---|---|---|---|
| FCC CFR 47 Part 22, Subpart H<br>IC RSS-132 | Radiated Spurious/harmonic Emissions, ERP, LO | Yes | Masud Attayi |
| FCC CFR 47 Part 2, Subpart J, Part 22, Subpart H<br>IC RSS-132 | Conducted Output Power Conducted Emissions, Occupied Bandwidth, Frequency Stability | Yes | Maurice Battler |
| FCC CFR 47 Part 24, Subpart E<br>IC RSS-133 | Radiated Spurious/harmonic Emissions, EIRP, LO | Yes | Masud Attayi |
| FCC CFR 47 Part 24, Subpart E<br>IC RSS-133 | Conducted Emissions, Occupied Bandwidth, Frequency Stability | Yes | Maurice Battler |

## G) Modifications to EUT

No modifications were required to the EUT.

## H) **Summary of Results**

1) The EUT met the requirements of the Conducted Spurious Emissions requirements in the GSM850 band as per 47 CFR 2.1051, CFR 22.917, CFR 22.901(d) and RSS-132. The EUT was measured on the low, middle and high channels. The frequency range investigated was from 10 MHz to 10 GHz.
   See APPENDIX 1 for the test data.

2) The EUT met the requirements of the Conducted Spurious Emissions requirements in the PCS band as per 47 CFR 2.1051, CFR 24.238(a) and RSS-133. The EUT was measured on the low, middle and high channels. The frequency range investigated was from 10 MHz to 20 GHz.
   See APPENDIX 1 for the test data.

3) The EUT met the requirements of the Occupied Bandwidth and channel mask requirements in the GSM850 band as per 47 CFR 2.202, CFR 22.917 and RSS-132. The EUT was measured on the low, middle and high channels.
   See APPENDIX 1 for the test data.

4) The EUT met the requirements of the Occupied Bandwidth and channel mask requirements in the PCS band as per 47 CFR 2.202, CFR 24.238 and RSS-133. The EUT was measured on the low, middle and high channels.
   See APPENDIX 1 for the test data.

5) The EUT met the requirements of the Conducted RF Output Power requirements for both the GSM850 and PCS bands as per 47 CFR 2.1046(a). The EUT was measured on the low, middle and high channels.
   See APPENDIX 2 for the test data.

6) The EUT met the requirements of the Frequency Stability vs. Temperature and Voltage requirements for GSM850 band as per 47 CFR 2.1055(a), 2.1055(d), CFR 22.917 and RSS-132.
   The maximum frequency error measured was less than 0.1 ppm.
   The temperature range was from -30°C to +60°C in 10° temperature steps. The EUT was measured on low, middle and high channels at each temperature step. The EUT was measured at low (3.5 volts), nominal (3.8 volts) and high (4.1 volts) dc input voltage at each temperature step and channel at maximum output power.
   See APPENDIX 3 for the test data.

7) The EUT met the requirements of the Frequency Stability vs. Temperature and Voltage requirements for the PCS band as per 47 CFR 2.1055(a), 2.1055(d), 24.235 and RSS-133. The maximum frequency error measured was less than 0.1 ppm.
The temperature range was from -30°C to +60°C in 10 degree temperature steps. The EUT was measured on low, middle and high channels at each temperature step. The EUT was measured at low (3.5 volts), nominal (3.8 volts) and high (4.1 volts) dc input voltage at each temperature step and channel at maximum output power.
See APPENDIX 3 for the test data.

8) The radiated spurious emissions/harmonics and ERP/EIRP were measured for both GSM850 and PCS bands. The results are within the limits. The EUT was placed on a nonconductive styrofoam table, 100 cm high that was positioned on a remotely controlled turntable. The EUT height of one metre was set in order to align it with the lowest height of the receiving antenna. The test distance used between the EUT and the receiving antenna was three metres. Then the emissions were maximized by elevating the antenna in the range of 1 to 4 metres. The turntable was rotated to determine the azimuth of the peak emissions. The maximum emissions level was recorded. Both the horizontal and vertical polarisations of the emissions were measured.
The maximum emissions level was recorded. The EUT was then substituted with a substitution antenna placed in the same location as the EUT. A Dipole antenna was used for the ERP measurements and a Horn antenna was used for EIRP measurements. After the final maximum reading was obtained the Handheld was substituted with a dipole or horn antenna, which was placed in the same location as the Handheld. The substitution antenna was connected into a signal generator that was set to the test frequency. The emissions were maximized by elevating the antenna in the range of 1 to 4 metres. The signal generator output was then adjusted to match the Handheld output reading. The signal generator output was recorded. Both the horizontal and vertical polarisations of the emissions were measured.
The measurements were performed in a semi-anechoic chamber. The semi-anechoic chamber FCC registration number is **778487** and the Industry Canada file number is **IC4240**. The EUT was measured on the low, middle and high channels.

The highest ERP in the GSM850 band measured was 30.25 dBm at 837.6 MHz (channel 195).
The highest EIRP in the PCS band measured was 29.7 dBm at 1880 MHz (channel 661).

The radiated carrier harmonics were measured up to the $10^{th}$ harmonic for low, middle and high channels in the GSM850 band and PCS band.
The worst test margin for GSM850 band harmonic emissions measured was 22.2 dB below the limit at 3395.2 MHz.
The worst test margin for PCS band harmonic emissions measured was 15.4 dB below the limit at 5729.4 MHz.

The EUT's RF local oscillator (LO) emissions were measured in the GSM850 band and PCS band in the standalone configuration in the vertical position on the low and high channels. Both the horizontal and vertical polarizations were measured. The RF LO emissions were in the NF.

The radiated carrier harmonics were measured up to the 10th harmonic for low, middle and high channels for simultaneous transmission in GSM850 and Bluetooth and in PCS and Bluetooth. Both the horizontal and vertical polarizations were measured. The harmonics emissions above the 4th harmonics were in the NF for the GSM850 band and above the 3rd harmonics for the PCS band.
The worst test margin for GSM850 band measured was 20.9 dB below the limit at 3395.2 MHz.
The worst test margin for PCS band measured was 16.5 dB below the limit at 5729.4 MHz.

**Sample Calculation:**

Field Strength (dBµV/M) is calculated as follows:
FS = Measured Level (dBµV) + A.F. (dB/m) + Cable Loss (dB) - Preamp (dB) + Filter Loss (dB)

**Measurement Uncertainty ±4.0 dB**

To view the test data see APPENDIX 4.

## l) Compliance Test Equipment Used

| UNIT | MANUFACTURER | MODEL | SERIAL NUMBER | CAL DUE DATE (YY MM DD) | USE |
|---|---|---|---|---|---|
| Preamplifier | Sonoma | 310N/11909A | 185831 | 05-11-26 | Radiated Emissions |
| Preamplifier system | TDK RF Solutions | PA-02 | 080010 | 06-01-13 | Radiated Emissions |
| EMI Receiver | Rohde & Schwarz | ESIB-40 | 100255 | 06-06-20 | Radiated Emissions |
| Hybrid Log Antenna | TDK | HLP-3003C | 130092 | 06-09-24 | Radiated Emissions |
| Horn Antenna | TDK | HRN-0118 | 130092 | 06-09-24 | Radiated Emissions |
| Horn Antenna | TDK | HRN-0118 | 30201 | 07-01-07 | Radiated Emissions |
| Dipole Antenna | Schwarzbeck | UHAP | 1018 | 07-02-05 | Radiated Emissions |
| Dipole Antenna | Schwarzbeck | UHAP | 974 | 06-09-21 | Radiated Emissions |
| Universal Radio Communication Tester | Rohde & Schwarz | CMU 200 | 837/493/073 | 06-02-26 | Radiated Emissions |
| Universal Radio Communication Tester | Rohde & Schwarz | CMU 200 | 100251 | 06-05-19 | Conducted Emissions |
| Spectrum Analyzer | HP | 8563E | 3745A08112 | 06-09-10 | Conducted Emissions |
| DC Power Supply | HP | 6632B | US37472178 | 07-09-14 | Conducted Emissions |
| Power Sensor | Giga-tronics | 80401A | 1835838 | 05-12-03 | Frequency Stability |
| Power Meter | Giga-tronics | 8541C | 1837762 | 05-12-03 | Frequency Stability |
| Signal Generator | Agilent | 8648C | 4037U03155 | 07-09-13 | Frequency Stability |
| Temperature Probe | Control Company | 15-077-21 | 51129471 | 07-05-20 | Frequency Stability |
| Environmental Chamber | ESPEC Corp. | SH-240S1 | 91005607 | N/R | Frequency Stability |

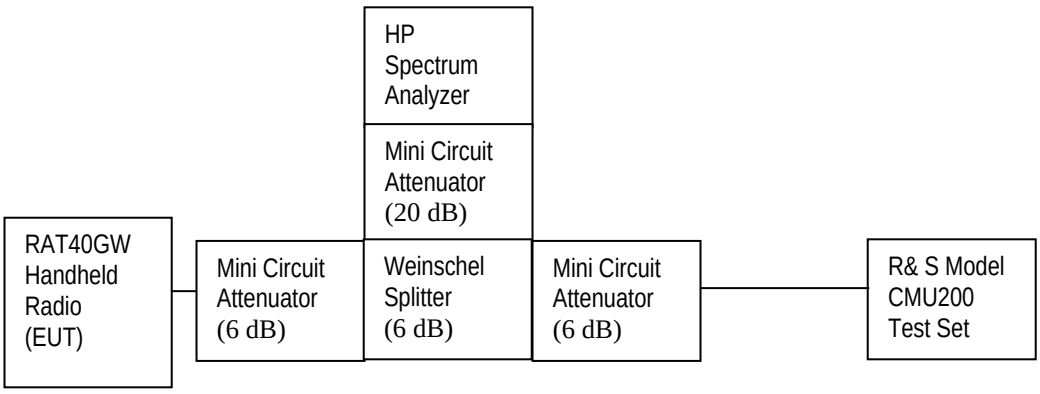
# APPENDIX 1

# RF CONDUCTED EMISSIONS TEST DATA/PLOTS

RF Conducted Emission Test Data cont'd

This appendix contains measurement data pertaining to conducted spurious emissions, –26 dBc bandwidth, 99% power bandwidth and the channel mask.

## Test Setup Diagram




## Test Equipment List

| Test Instruments | Manufacturer | Model No. | Serial No. | Frequency Range |
|---|---|---|---|---|
| Spectrum Analyzer | HP | 8563E | 3745A08112 | 30 Hz – 26.5 GHz |
| Splitter | Weinschel | 1515 | ME092 | DC – 18 GHz |
| Attenuator | Mini Circuit | MCL BW-S20W2 | -- | DC – 18 GHz |
| Attenuator | Mini Circuit | MCL BW-S6W2 | -- | DC – 18 GHz |
| Attenuator | Mini Circuit | MCL BW-S6W2 | -- | DC – 18 GHz |
| Universal Radio Communication Tester | Rohde & Schwarz | CMU200 | 100251 | -- |

RF Conducted Emission Test Data cont'd

**The conducted spurious emissions** – As per 47 CFR 2.1051, CFR 24.238(a), RSS-133, CFR 22 Subpart H and RSS-132 were measured from 10 MHz to 20 GHz. The EUT emissions were in the noise floor.
See figures 1 to 12 for the plots of the conducted spurious emissions.

–26 dBc Bandwidth and Occupied Bandwidth (99%)

For each carrier frequency of low, middle and high, the modulation spectrum was measured by both methods of 99% power bandwidth and –26 dBc bandwidth.
The resolution bandwidth required for out-of-band emissions in the 1 MHz bands immediately outside and adjacent to the frequency block, was determined to be at least 1% of the emission bandwidth.
The worst case –26dBc bandwidth for the three GSM850 channels was measured to be 277 kHz, and for the three PCS channels was measured to be 270 kHz as shown below. This results in a 3.0 kHz resolution bandwidth.
On any frequency outside the frequency block and outside the adjacent 1 MHz bands, a resolution bandwidth of at least 1 MHz was employed.

***Test Data for GSM850 and PCS selected Frequencies***

| GSM850 Frequency (MHz) | -26dBc Bandwidth (kHz) | -99% Occupied Bandwidth (kHz) |
|---|---|---|
| 824.2 | 277 | 245 |
| 837.6 | 270 | 245 |
| 848.8 | 273 | 245 |

| PCS Frequency (MHz) | -26dBc Bandwidth (kHz) | 99% Occupied Bandwidth (kHz) |
|---|---|---|
| 1850.2 | 270 | 243 |
| 1880.0 | 263 | 243 |
| 1909.8 | 270 | 245 |

***Measurement Plots for GSM850 and PCS***
Refer to the following measurement plots for more detail.

See Figures 13 to 24 for the plots of the –26dBc Bandwidth and 99% Occupied Bandwidth.
See Figures 25 to 28 for plots of the channel mask results.

The RF power output was at maximum for all the recorded measurements shown below.

RF Conducted Emission Test Data cont'd

**Figure 1: GSM 850, Spurious Conducted Emissions, Low channel**

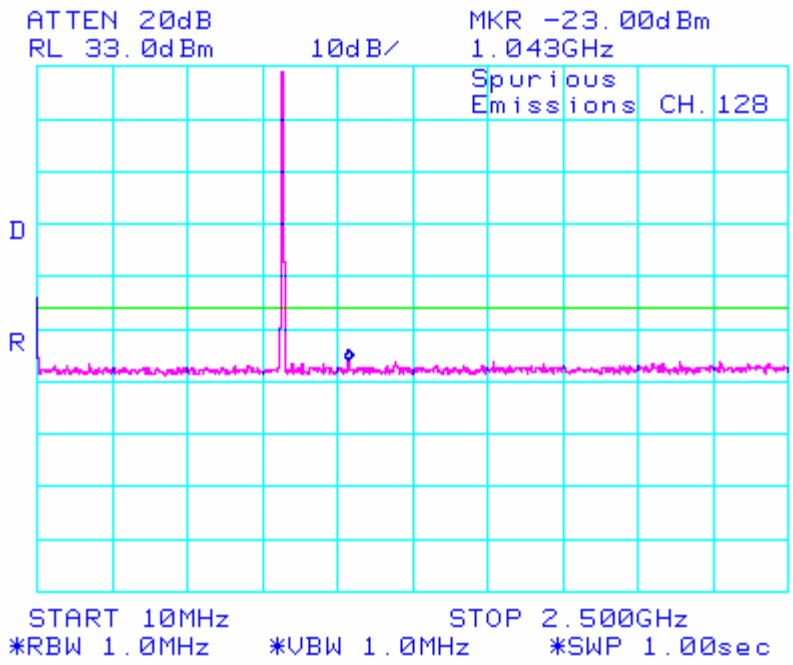
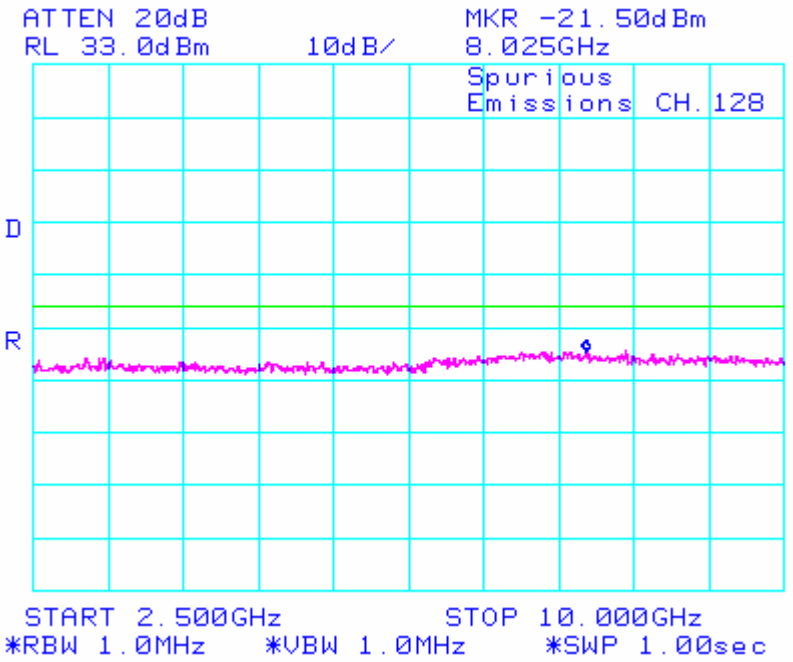



**Figure 2: GSM 850, Spurious Conducted Emissions, Low channel**



RF Conducted Emission Test Data cont'd

**Figure 3: GSM 850, Spurious Conducted Emissions, Middle Channel**

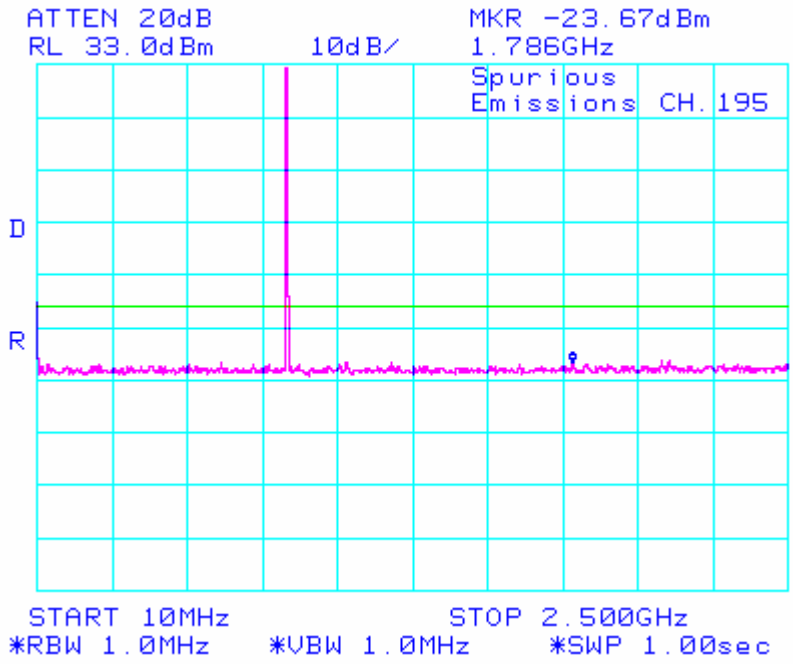
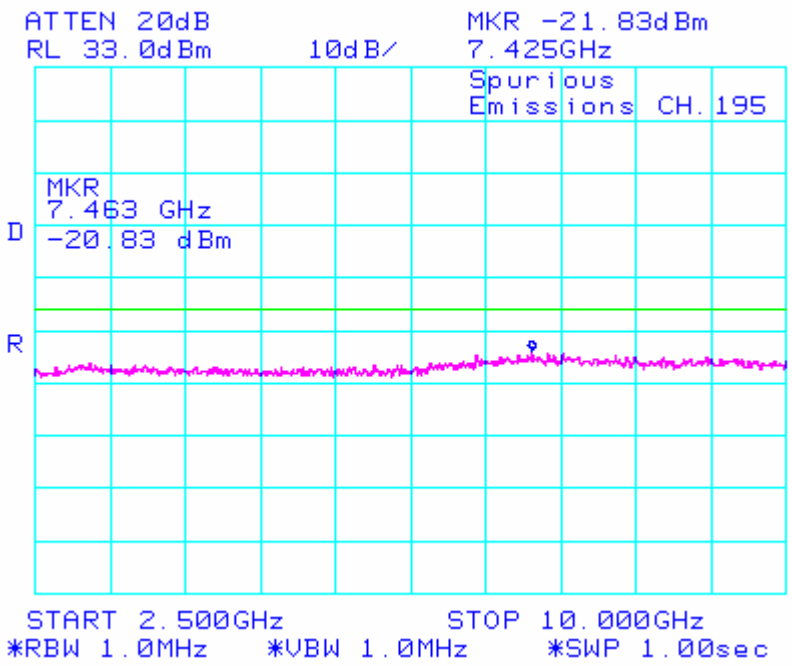



**Figure 4: GSM 850, Spurious Conducted Emissions, Middle Channel**



RF Conducted Emission Test Data cont'd

**Figure 5: GSM 850, Spurious Conducted Emissions, High Channel**

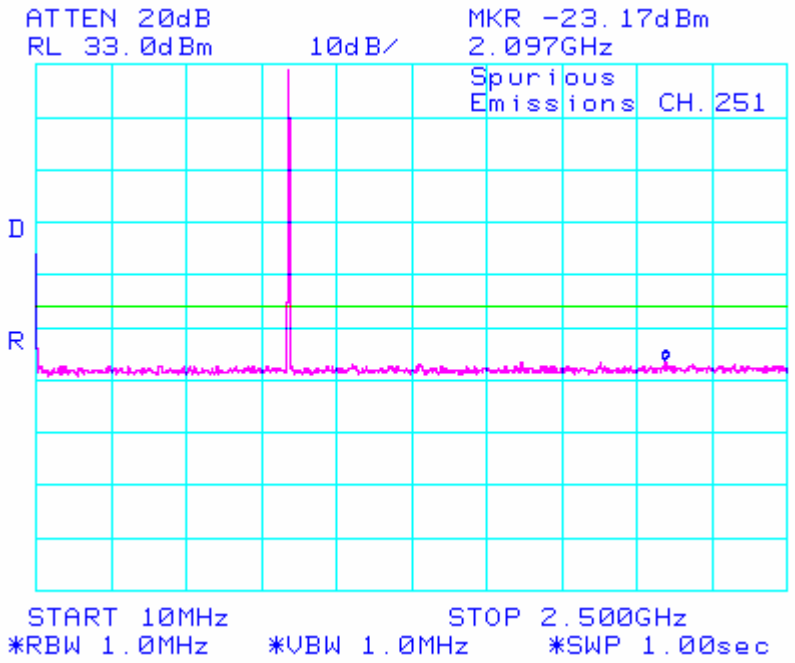
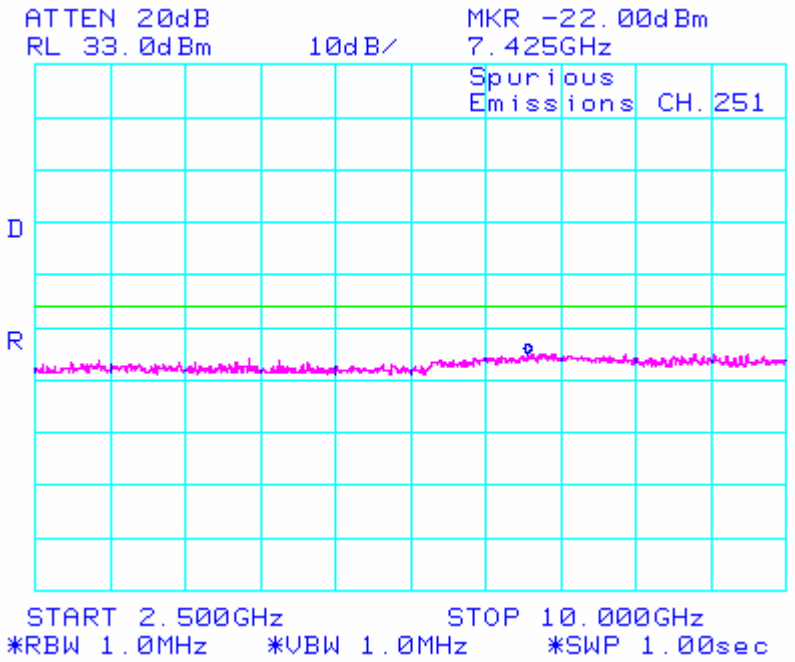



**Figure 6: GSM 850, Spurious Conducted Emissions, High Channel**



RF Conducted Emission Test Data cont'd

**Figure 7: PCS, Spurious Conducted Emissions, Low Channel**

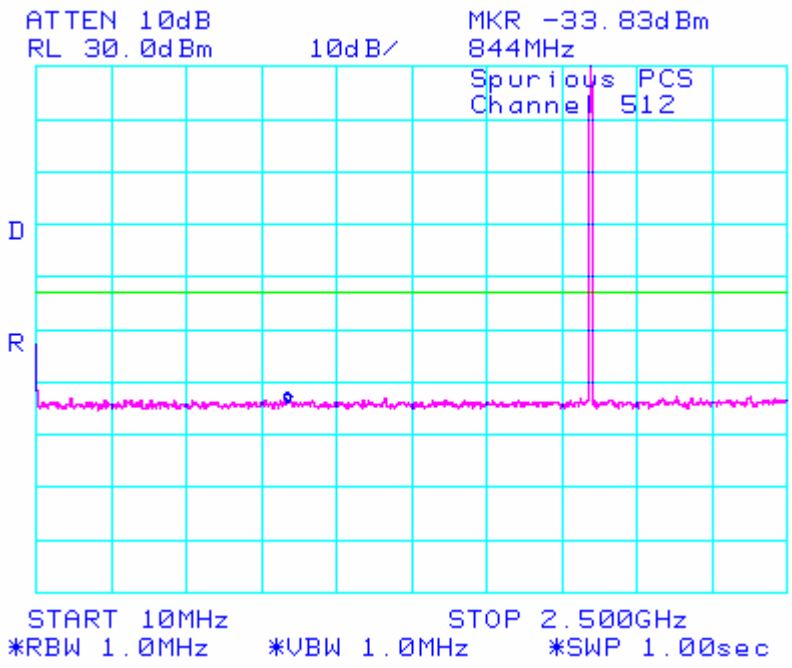
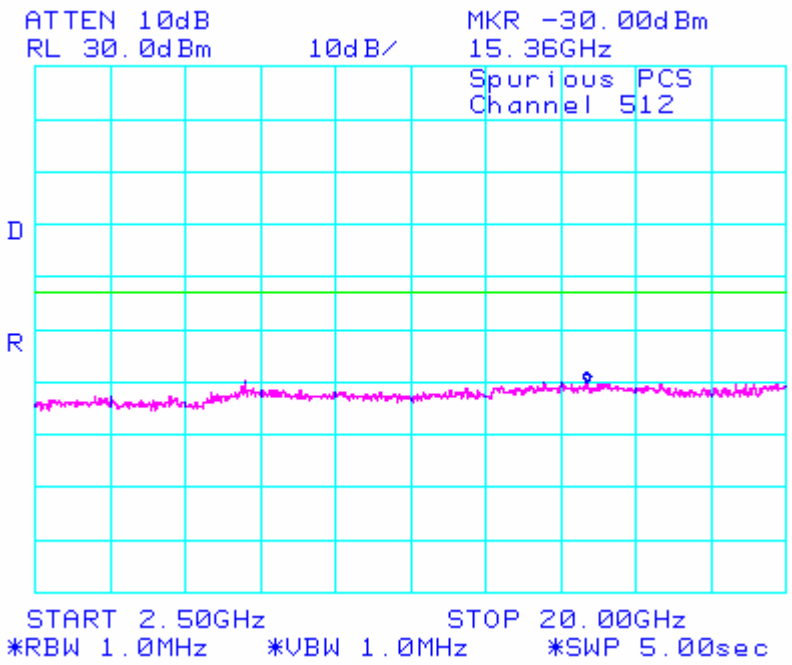



**Figure 8: PCS, Spurious Conducted Emissions, Low Channel**



RF Conducted Emission Test Data cont'd

**Figure 9: PCS, Spurious Conducted Emissions, Middle Channel**

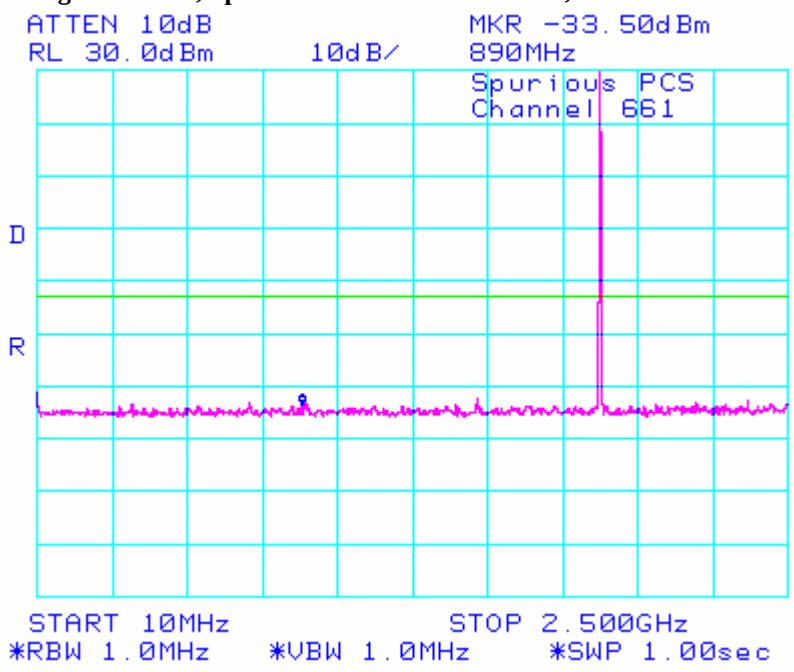
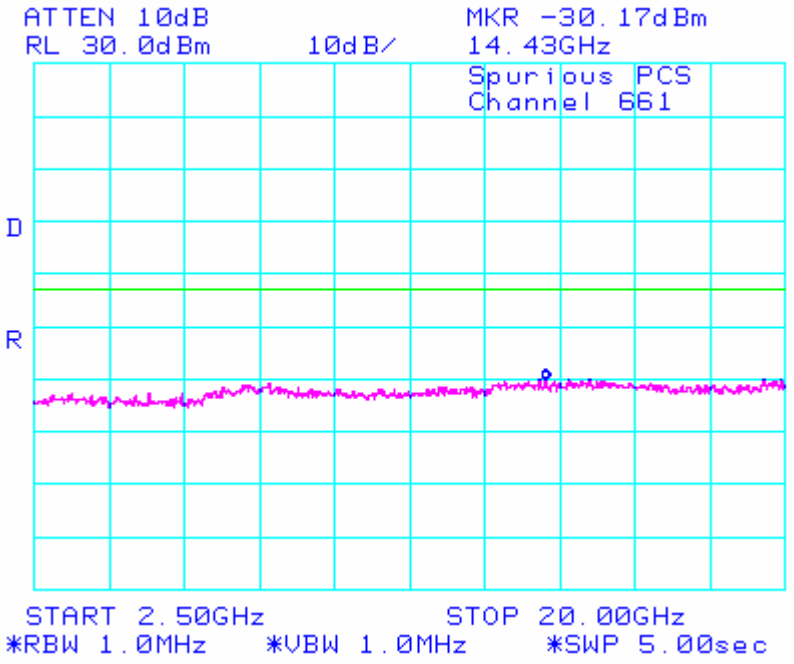



**Figure 10: PCS, Spurious Conducted Emissions, Middle Channel**



RF Conducted Emission Test Data cont'd

**Figure 11: PCS, Spurious Conducted Emissions, High Channel**

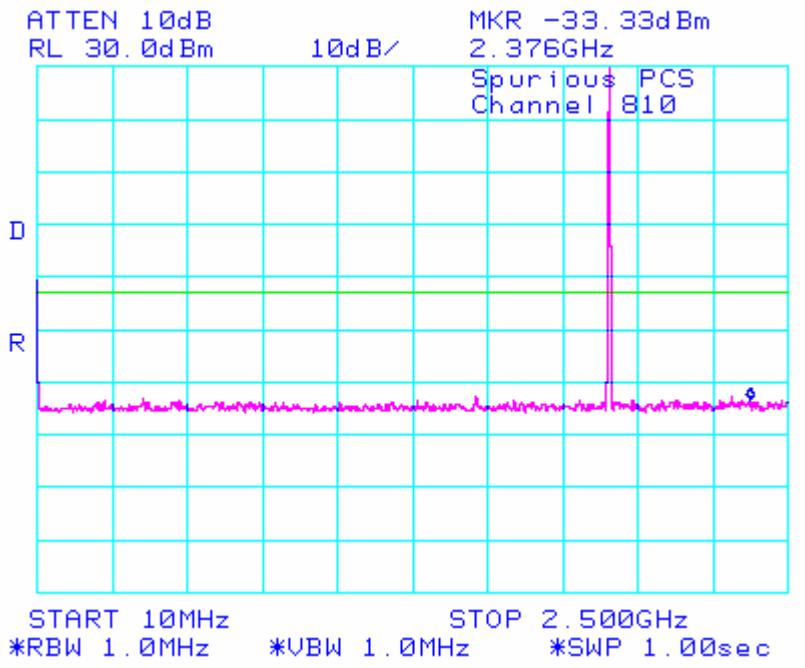
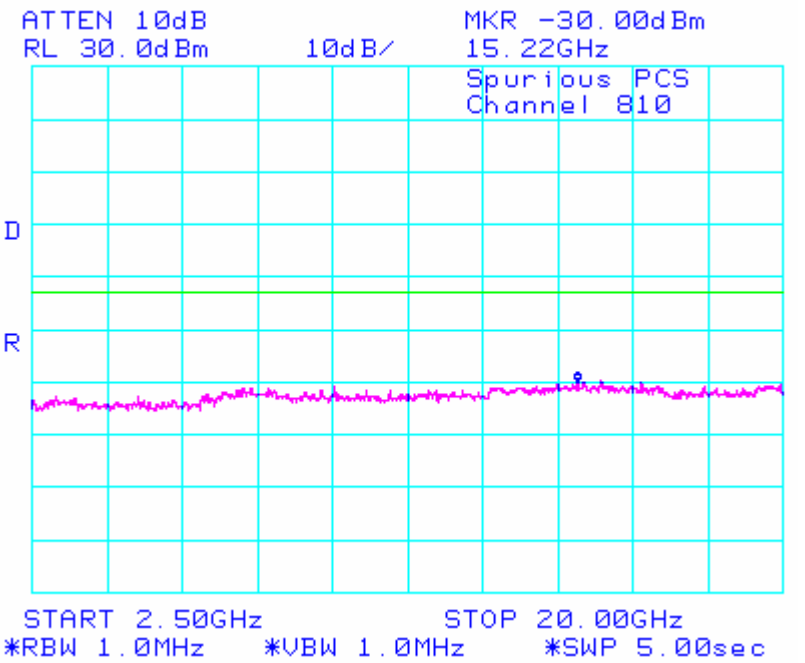



**Figure 12: PCS, Spurious Conducted Emissions, High Channel**



RF Conducted Emission Test Data cont'd

**Figure 13: -26dBc bandwidth, GSM 850 Low Channel**

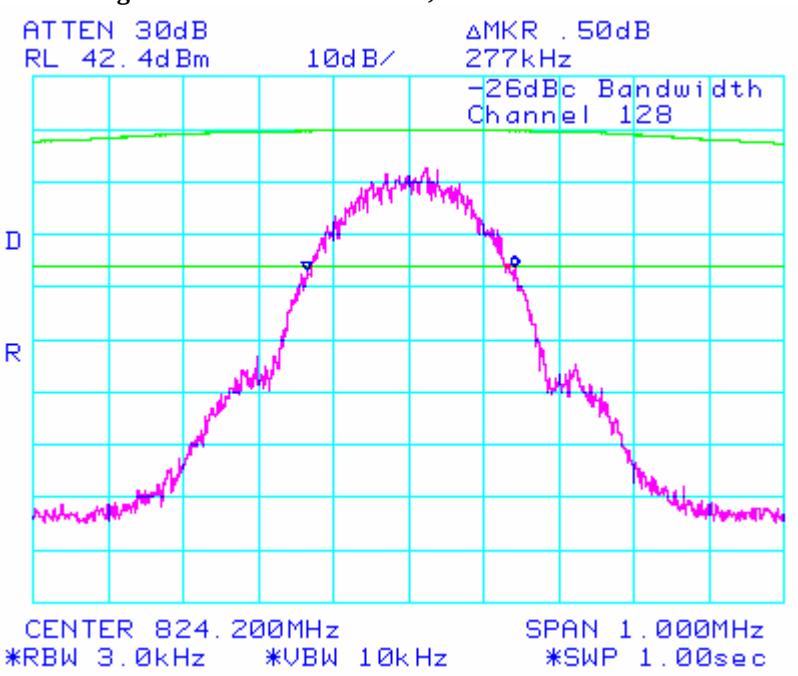
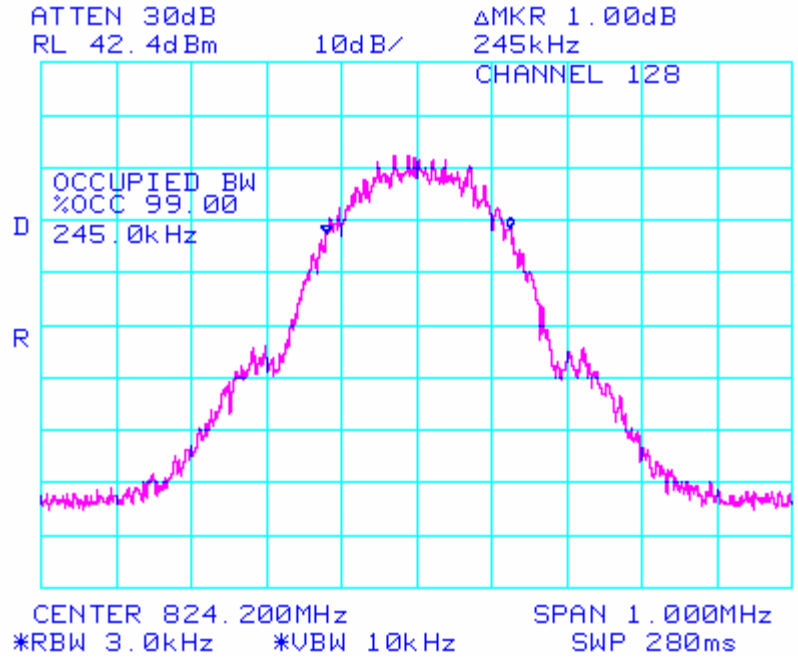



**Figure 14: Occupied Bandwidth, GSM 850 Low Channel**



RF Conducted Emission Test Data cont'd

**Figure 15: -26dBc bandwidth, GSM 850 Middle Channel**

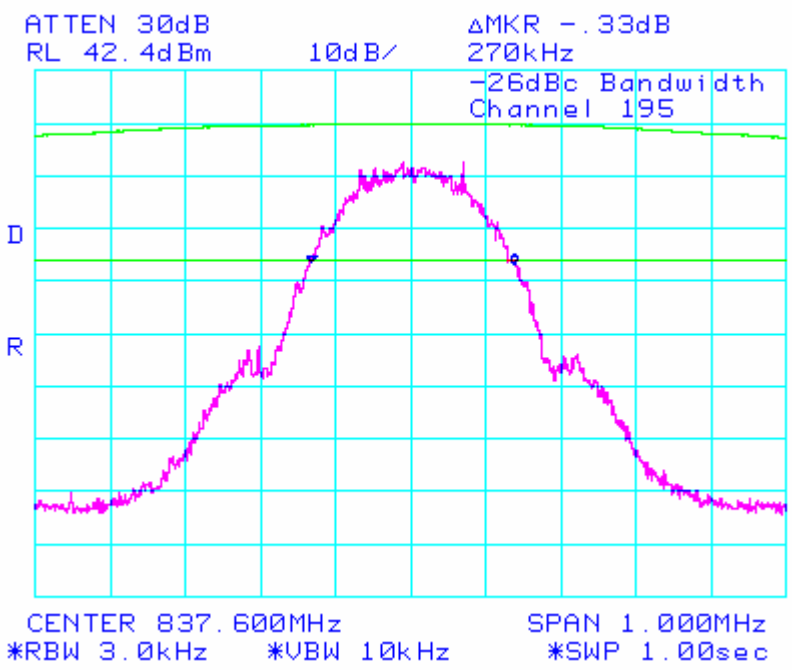
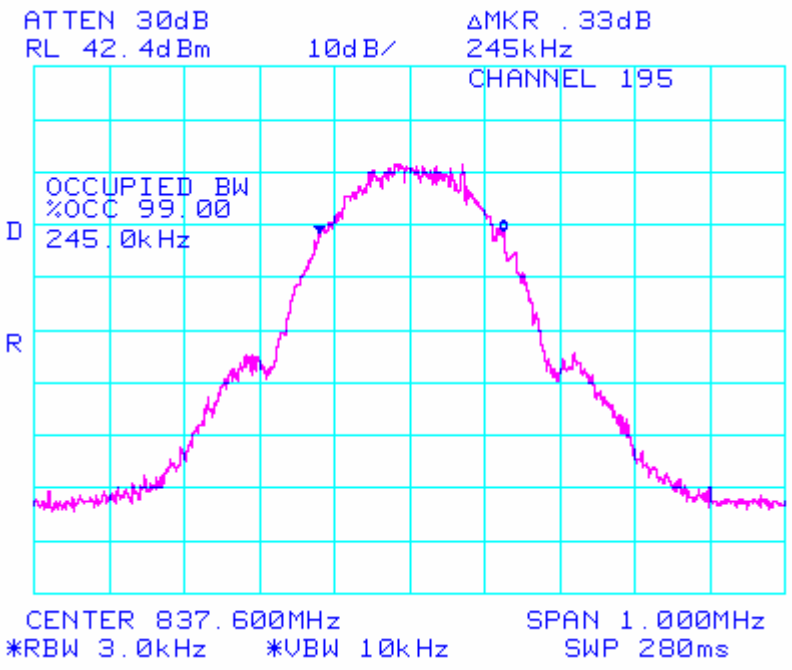



**Figure 16: Occupied Bandwidth, GSM 850 Middle Channel**



RF Conducted Emission Test Data cont'd

**Figure 17: -26dBc bandwidth, GSM 850 High Channel**

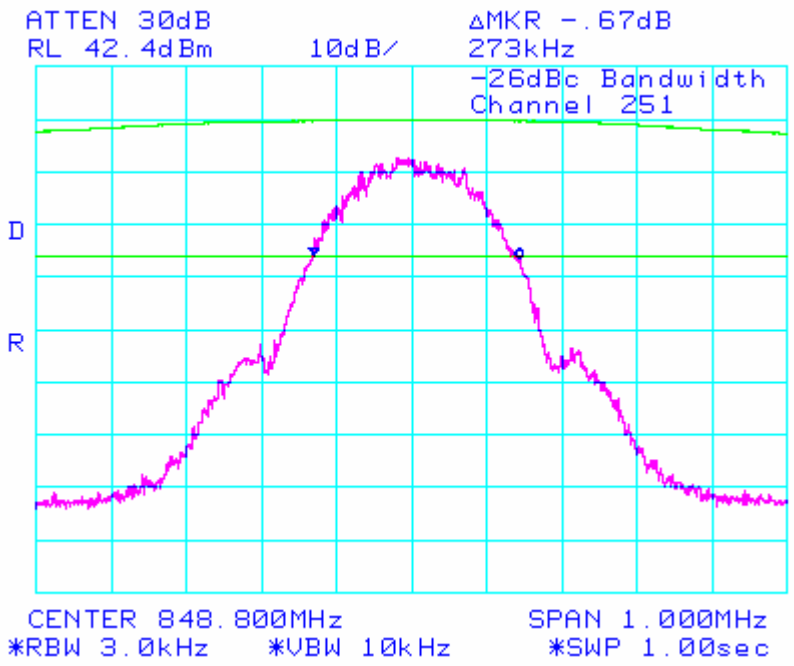
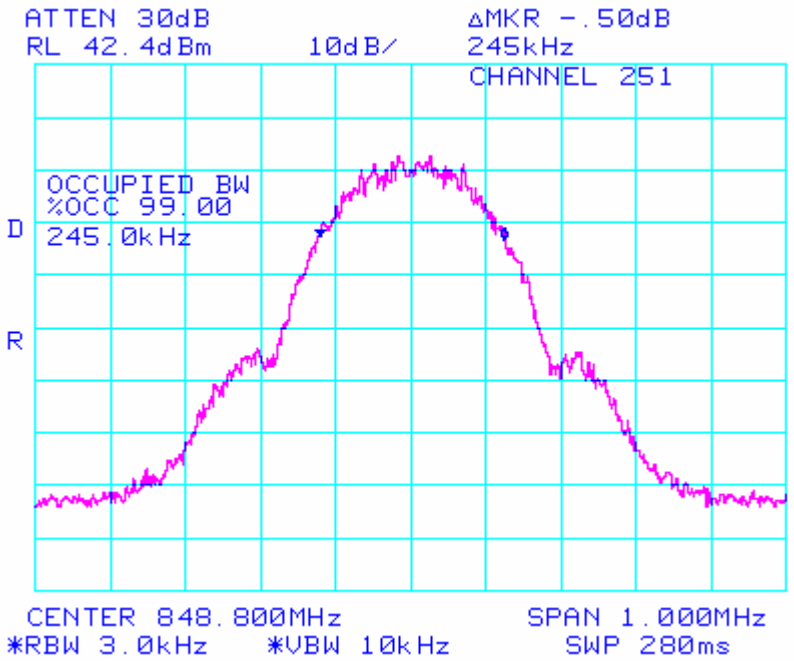



**Figure 18: Occupied Bandwidth, GSM 850 High Channel**



RF Conducted Emission Test Data cont'd

**Figure 19: -26dBc bandwidth, PCS Low Channel**

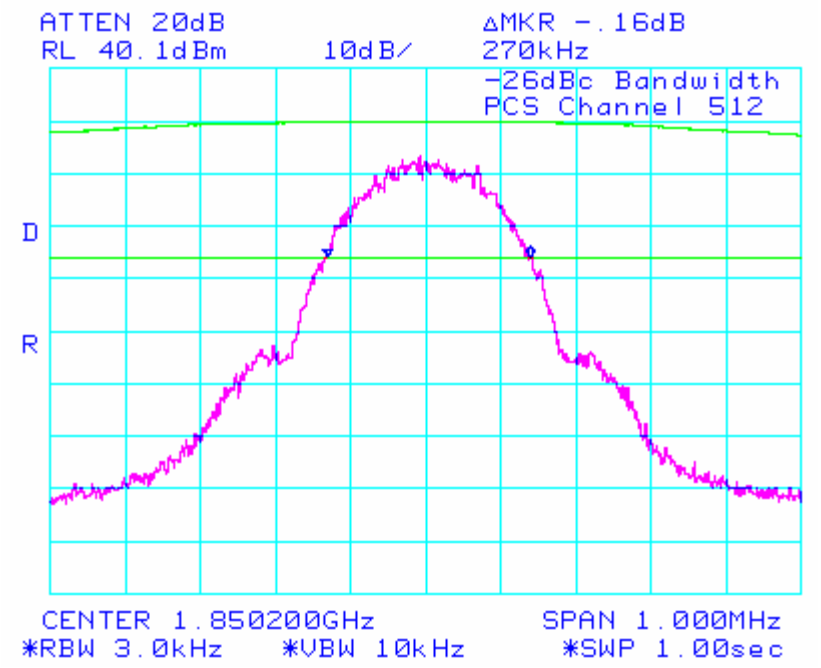
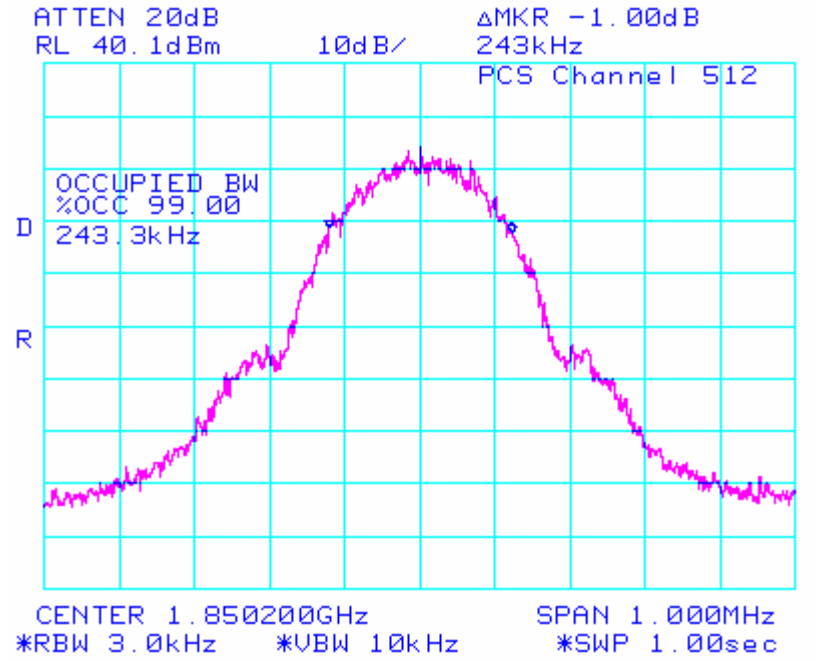



**Figure 20: Occupied Bandwidth, PCS Low Channel**



RF Conducted Emission Test Data cont'd

**Figure 21**: **-26dBc bandwidth, PCS Middle Channel**

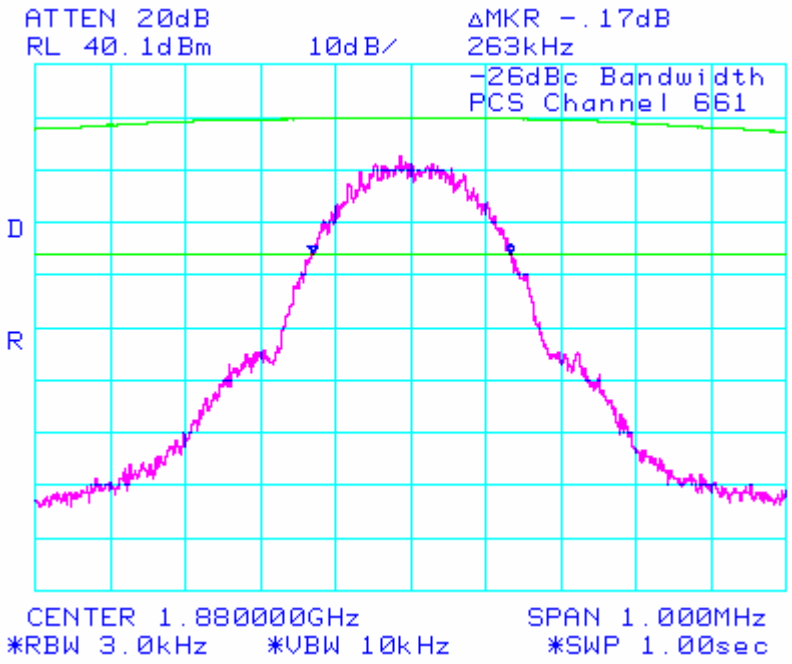
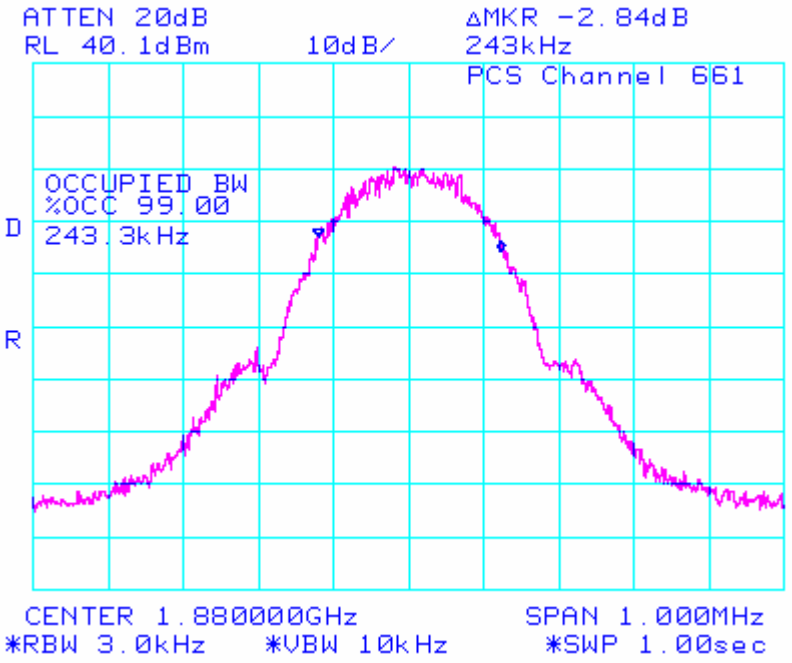



**Figure 22: Occupied Bandwidth, PCS Middle Channel**



RF Conducted Emission Test Data cont'd

**Figure 23: -26dBc bandwidth, PCS High Channel**

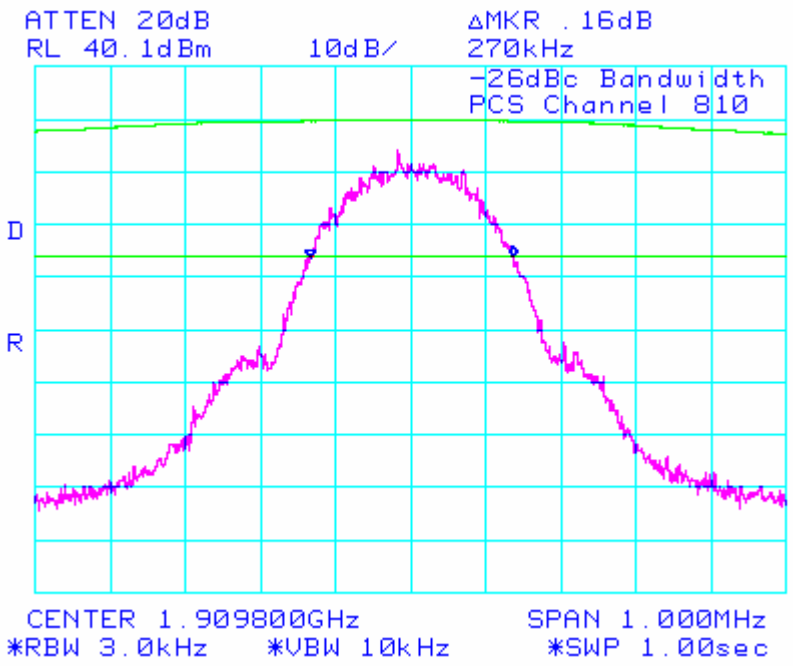
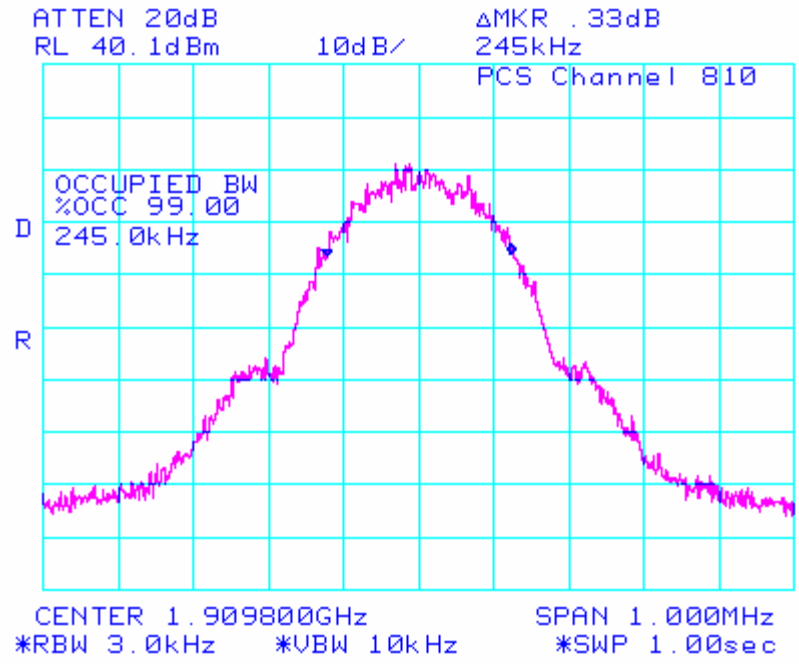



**Figure 24: Occupied Bandwidth, PCS High Channel**



RF Conducted Emission Test Data cont'd

**Figure 25: GSM 850, Low Channel Mask**

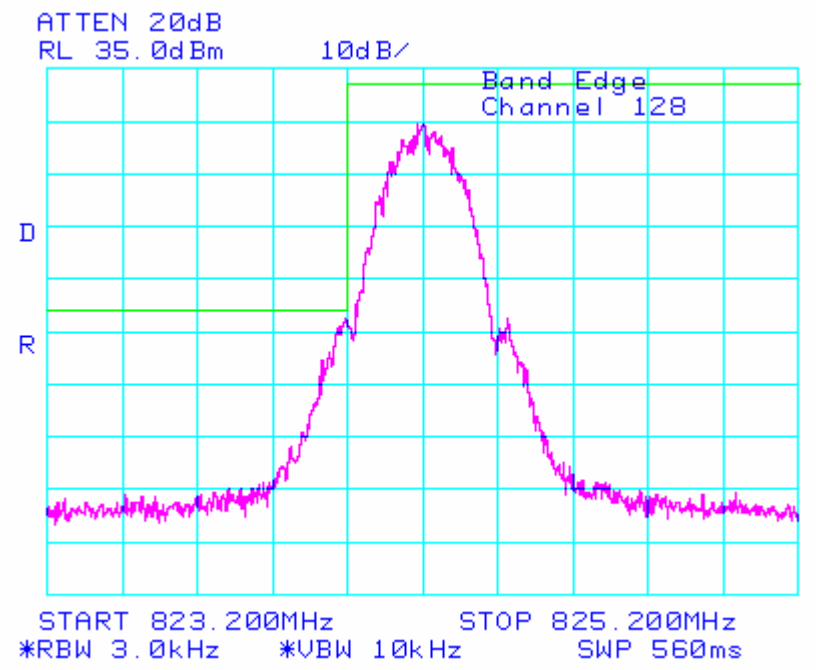
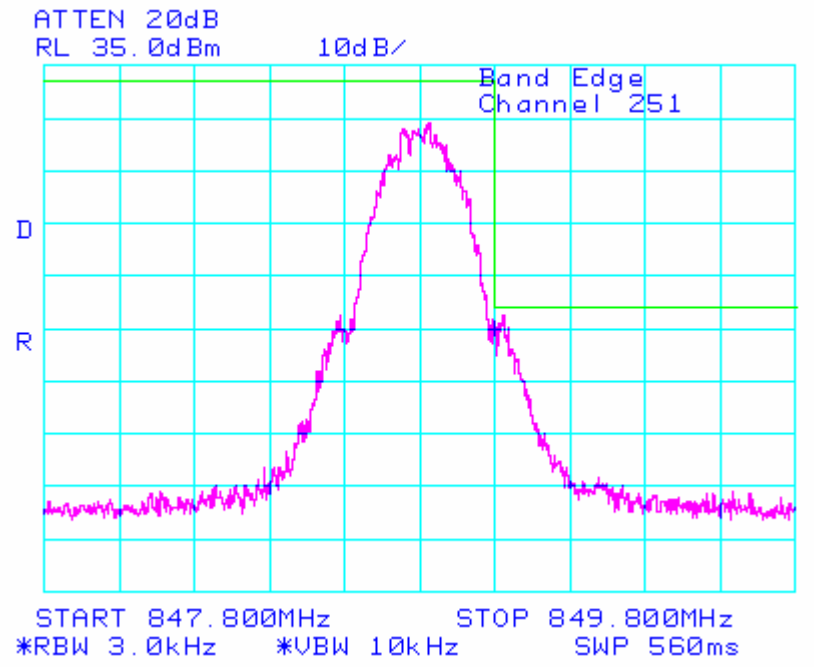



**Figure 26: GSM 850 High Channel Mask**



RF Conducted Emission Test Data cont'd

**Figure27: PCS, Low Channel Mask**

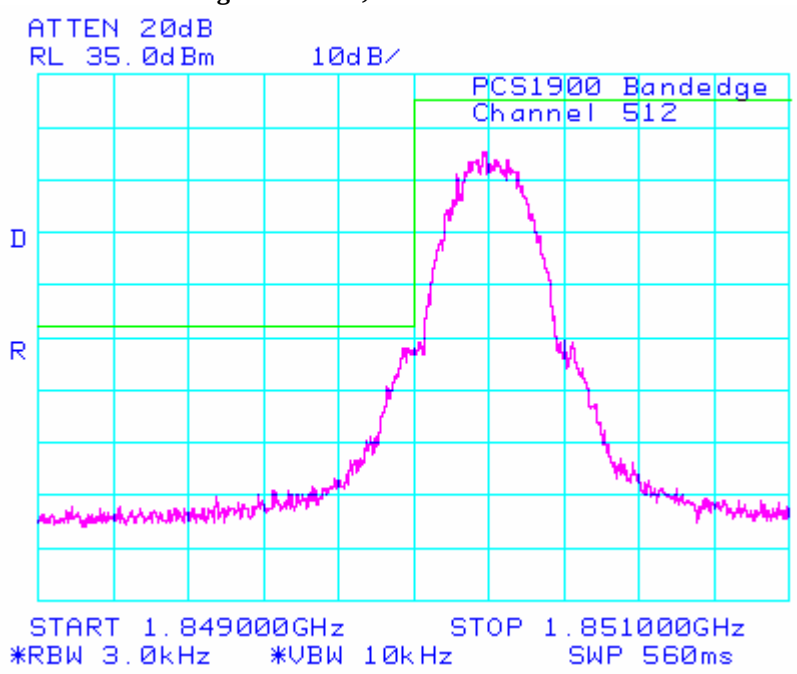
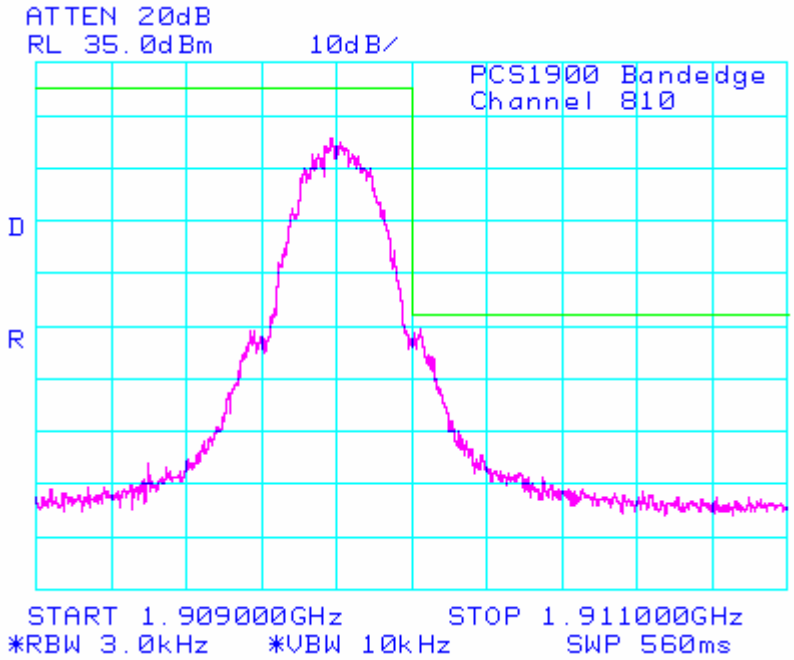



**Figure28: PCS, High Channel Mask**



# APPENDIX 2

# CONDUCTED RF OUTPUT POWER TEST DATA

## Conducted RF Output Power Test Data

The conducted RF output power was measured using the Communication Tester, Rohde & Schwarz, model CMU 200. The low, middle and high channels were measured at maximum radio output power. The insertion loss of the coaxial cable from the CMU 200 to the Handheld was compensated for in the measurements.
Peak nominal output power is 32.5 dBm ±0.3 dB for GSM850 and 29.3 dBm ±0.5 dB for PCS.

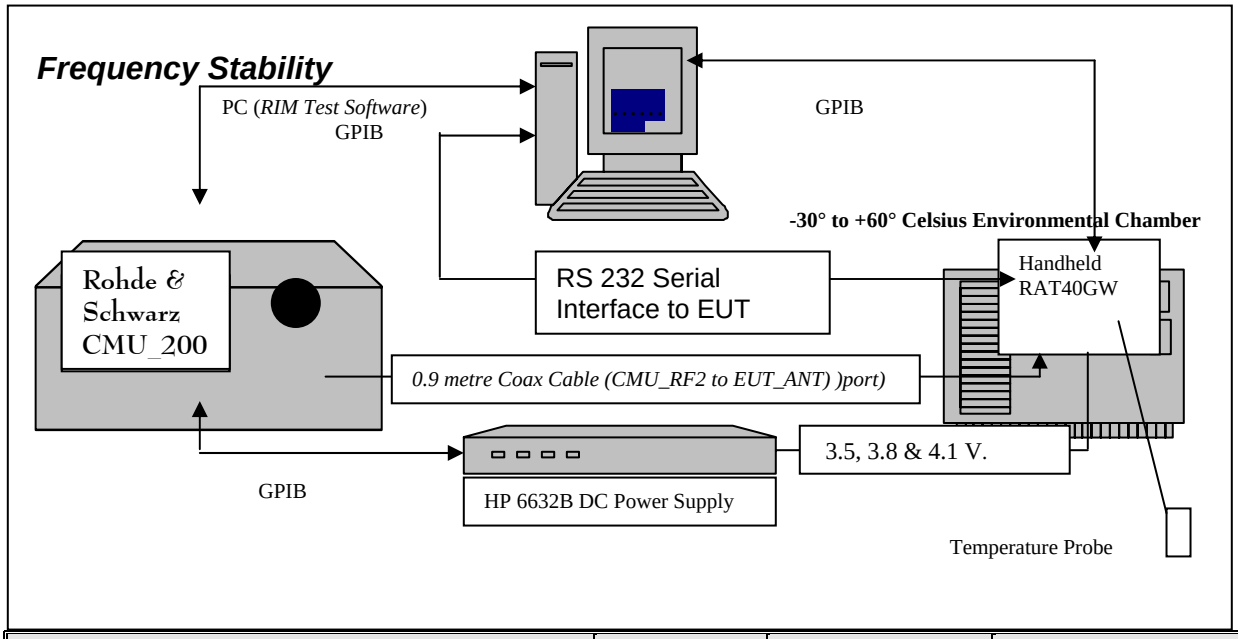
### Test Results

| Channel | Frequency (MHz) | Maximum Output Power (dBm) |
|---|---|---|
| GSM850 | | |
| 128 | 824.20 | 32.68 |
| 189 | 837.60 | 32.65 |
| 251 | 848.80 | 32.70 |
| PCS | | |
| 512 | 1850.2 | 29.59 |
| 661 | 1880.0 | 29.50 |
| 810 | 1909.8 | 29.56 |

# APPENDIX 3

# FREQUENCY STABILITY TEST DATA

Frequency Stability Test Data




| *SYSTEM* | *Model* | *Serial Number* | *Calibration Due Date.* |
|---|---|---|---|
| R & S Universal Radio Communication Test Set | CMU200 | 100251 | 19-May-06 |
| HP System DC Power Supply | 6632B | US37472178 | 12-July-2007 |
| Agilent Signal Generator | 8648C | 4037U03155 | 13-Sept.-2007 |
| Giga-tronics Power Meter | 8541C | 1837762 | 03 Dec.-2005 |
| Giga-tranics Power Sensor | 80401A | 1835838 | 03 Dec.-2005 |
| Espec Environmental Chamber | SH240S1 | 91004919 | N/A |
| Control Company Temperature Probe | 15-077-21 | 51129471 | 20-May-2007 |

CFR 47 Chapter 1 - Federal Communications Commission Rules

Part 2 Required Measurements
2.995 Frequency Stability - Procedures
(a,b) Frequency Stability - Temperature Variation
(d) Frequency Stability - Voltage Variation

**24.235** *Frequency Stability*.
*The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.*

The RAT40GW handheld, (referred as EUT herein and after) transmitted frequencies are less than 0.1 ppm of the received frequency from the Rhode & Schwarz CMU 200 Universal Radio Communication Test Set.

*The EUT meets the requirements as stated in CFR 47 chapter 1, Section 24.235, RSS-133, CFR 47 chapter 1, Section 22.917 and RSS-132 Frequency Stability.*

Frequency Stability measurement devices were configured as presented in the block diagram recording frequency, power, data, temperatures, and stepped voltages controlled via a GPIB interface linked to the Environmental chamber, a DC power supply, and the Communications Test Set. A 0.9-meter coax cable was calibrated to characterize the insertion loss for the transmitted frequencies between the RF input/output of the CMU 200 and the EUT antenna port; located inside the environmental chamber.

Calibration for the Cable Loss was performed in the RF Laboratory on 09 August 2005 using the Giga-tronics power meter and Agilent Signal Generator.
The cable assembly from the RF input to the RF output was measured at the following Frequencies:

| PCS Frequency (MHz) | Cable loss (dB) |
|---|---|
| 1850.2 | 1.10 |
| 1880.0 | 1.10 |
| 1909.8 | 1.10 |

| GSM 850 Frequency (MHz) | Cable loss (dB) |
|---|---|
| 824.2 | 0.71 |
| 836.4 | 0.71 |
| 848.6 | 0.71 |

Procedure:

The EUT was placed in the Temperature chamber and connected to CMU 200 outside as shown in the figure above. Dry air was pumped inside the temperature chamber to maintain a backpressure during the test. The EUT was kept in the off condition at all times except when the measurements were to be made.

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The chamber was switched on and the temperature was set to -30°C.
After the chamber stabilized at -30 °C there was a soak period of one hour to alleviate moisture in the chamber, the EUT voltage was enabled.
The system software recorded the frequency, power, and associated measurements.

A Computer system controlled the automated software. This application was given the command of activating all machines intrinsic to the temperature and voltage tests controlling the CMU 200 via the GPIB Bus. The Environmental Chamber was instructed through an RS-232 serial line. The EUT dialogue was passed through a serial connection.

The EUT repetitively transmitted 100 bursts for each set of programmed parameters recording temperature, voltage settings, and systematically selected frequencies. The power supply was cycled from minimum voltage 3.5 volts, to 3.8 volts to 4.1 volts nominal voltage.
The frequency error was measured at a maximum output power and recorded by the automated system test software.

The EUT output power and frequency was measured at 3.5 volts, 3.8 volts and 4.1 volts. The transmit frequency was varied in 3 steps consisting of 824.2, 836.4, and 848.6 MHz for the GSM850 band and 1850.2, 1880.0 and 1909.8 MHz for the PCS band. This frequency was recorded in MHz and deviation from nominal, in Parts Per Million.

After the initial one-hour soak at the beginning of the tests, a period of thirty minutes soak was initialized between each ascending temperature step, before proceeding to the next measurement test cycle.

PROCEDURE:

The test system software for commencing the Frequency Stability Tests carried through the following cycle.

1. Switch on the HP 6632B power supply; CMU 200 Communications test Set, and Environmental Chamber.
2. Start test program
3. Set the Temperature to –30°C and maintain a period of one- hour soak time, with the EUT supply voltage disabled.
4. Set power supply voltage to 3.5 Volts.
5. Set up CMU 200 Radio Communication Tester.
6. Command the CMU 200 to switch to the low channel.
7. Enable the voltage to the EUT, and connect a link to the CMU 200 test set.
8. EUT is commanded to Transmit 100 Bursts.
9. Software logs the following data from the CMU 200, power supply and temperature chamber: Traffic Channel Number, Traffic Channel Frequency, Power Level, Chamber Temperature, Supply Voltage, Power, Frequency Error.
10. The CMU 200 commands the EUT to change frequency to the middle channel and high channel and repeats steps 7 to 9.
11. Repeat steps 5 to 10 changing the supply voltage to 3.8 Volts
12. Increase temperature by 10°C and soak for 1/2 hour.
13. Repeat steps 4 - 12 for temperatures –30°C to 60°C.
14. Repeat steps 5 to 10 changing the supply voltage to 4.1 Volts

Procedure 5 to 10 was repeated at room temperature (20°C) with the power supply voltage set to 3.5, 3.8 and 4.1 Volts.

The maximum frequency error in the GSM850 band measured was -0.0464 PPM.

The maximum frequency error in the PCS band measured was -0.0377 PPM.

GSM850 Channel results: channels 128, 189 and 250 @ 20°C maximum transmitted power

| Traffic Channel Number | GSM850 Frequency (MHz) | Voltage (Volts) | Temperature (Celsius) | Frequency Error (Hz) | PPM |
|---|---|---|---|---|---|
| 128 | 824.2 | 3.5 | 20 | 17.89 | 0.0217 |
| 189 | 836.4 | 3.5 | 20 | 29.38 | 0.0351 |
| 250 | 848.6 | 3.5 | 20 | 27.31 | 0.0322 |

| Traffic Channel Number | GSM850 Frequency (MHz) | Voltage (Volts) | Temperature (Celsius) | Frequency Error (Hz) | PPM |
|---|---|---|---|---|---|
| 128 | 824.2 | 3.8 | 20 | 19.76 | 0.0240 |
| 189 | 836.4 | 3.8 | 20 | 25.63 | 0.0306 |
| 250 | 848.6 | 3.8 | 20 | 22.15 | 0.0261 |

| Traffic Channel Number | GSM850 Frequency (MHz) | Voltage (Volts) | Temperature (Celsius) | Frequency Error (Hz) | PPM |
|---|---|---|---|---|---|
| 128 | 824.2 | 4.1 | 20 | 15.30 | 0.0186 |
| 189 | 836.4 | 4.1 | 20 | -20.15 | -0.0241 |
| 250 | 848.6 | 4.1 | 20 | -27.06 | -0.0319 |

GSM850 Results: channel 128 @ maximum transmitted power

| Traffic Channel Number | Frequency (MHz) | Voltage (Volts) | Temperature (Celsius) | Frequency Error (Hz) | PPM |
|---|---|---|---|---|---|
| 128 | 824.2 | 3.5 | -30 | 20.08 | 0.0244 |
| 128 | 824.2 | 3.5 | -20 | 27.12 | 0.0329 |
| 128 | 824.2 | 3.5 | -10 | 26.60 | 0.0323 |
| 128 | 824.2 | 3.5 | 0 | 30.48 | 0.0370 |
| 128 | 824.2 | 3.5 | 10 | -30.41 | -0.0369 |
| 128 | 824.2 | 3.5 | 20 | 17.89 | 0.0217 |
| 128 | 824.2 | 3.5 | 30 | -17.18 | -0.0208 |
| 128 | 824.2 | 3.5 | 40 | -32.35 | -0.0393 |
| 128 | 824.2 | 3.5 | 50 | -21.24 | -0.0258 |
| 128 | 824.2 | 3.5 | 60 | 17.31 | 0.0210 |

| Traffic Channel Number | Frequency (MHz) | Voltage (Volts) | Temperature (Celsius) | Frequency Error (Hz) | PPM |
|---|---|---|---|---|---|
| 128 | 824.2 | 3.8 | -30 | -28.99 | -0.0352 |
| 128 | 824.2 | 3.8 | -20 | -25.57 | -0.0310 |
| 128 | 824.2 | 3.8 | -10 | 21.11 | 0.0256 |
| 128 | 824.2 | 3.8 | 0 | 25.96 | 0.0315 |
| 128 | 824.2 | 3.8 | 10 | 25.70 | 0.0312 |
| 128 | 824.2 | 3.8 | 20 | 19.76 | 0.0240 |
| 128 | 824.2 | 3.8 | 30 | -23.25 | -0.0282 |
| 128 | 824.2 | 3.8 | 40 | -33.38 | -0.0405 |
| 128 | 824.2 | 3.8 | 50 | -19.57 | -0.0237 |
| 128 | 824.2 | 3.8 | 60 | -20.40 | -0.0248 |

| Traffic Channel Number | Frequency (MHz) | Voltage (Volts) | Temperature (Celsius) | Frequency Error (Hz) | PPM |
|---|---|---|---|---|---|
| 128 | 824.2 | 4.1 | -30 | -38.16 | -0.0463 |
| 128 | 824.2 | 4.1 | -20 | -16.21 | -0.0197 |
| 128 | 824.2 | 4.1 | -10 | 17.50 | 0.0212 |
| 128 | 824.2 | 4.1 | 0 | 22.86 | 0.0277 |
| 128 | 824.2 | 4.1 | 10 | 25.31 | 0.0307 |
| 128 | 824.2 | 4.1 | 20 | 15.30 | 0.0186 |
| 128 | 824.2 | 4.1 | 30 | -23.83 | -0.0289 |
| 128 | 824.2 | 4.1 | 40 | 20.28 | 0.0246 |
| 128 | 824.2 | 4.1 | 50 | -30.03 | -0.0364 |
| 128 | 824.2 | 4.1 | 60 | -25.83 | -0.0313 |

GSM850 Results: channel 189 @ maximum transmitted power

| Traffic Channel Number | Frequency (MHz) | Voltage (Volts) | Temperature (Celsius) | Frequency Error (Hz) | PPM |
|---|---|---|---|---|---|
| 189 | 836.4 | 3.5 | -30 | -25.96 | -0.0310 |
| 189 | 836.4 | 3.5 | -20 | 16.14 | 0.0193 |
| 189 | 836.4 | 3.5 | -10 | 30.48 | 0.0364 |
| 189 | 836.4 | 3.5 | 0 | 31.90 | 0.0381 |
| 189 | 836.4 | 3.5 | 10 | 28.93 | 0.0346 |
| 189 | 836.4 | 3.5 | 20 | 29.38 | 0.0351 |
| 189 | 836.4 | 3.5 | 30 | -27.83 | -0.0333 |
| 189 | 836.4 | 3.5 | 40 | -32.80 | -0.0392 |
| 189 | 836.4 | 3.5 | 50 | -17.63 | -0.0211 |
| 189 | 836.4 | 3.5 | 60 | -21.05 | -0.0252 |

| Traffic Channel Number | Frequency (MHz) | Voltage (Volts) | Temperature (Celsius) | Frequency Error (Hz) | PPM |
|---|---|---|---|---|---|
| 189 | 836.4 | 3.8 | -30 | -38.36 | -0.0459 |
| 189 | 836.4 | 3.8 | -20 | 14.72 | 0.0176 |
| 189 | 836.4 | 3.8 | -10 | 21.44 | 0.0256 |
| 189 | 836.4 | 3.8 | 0 | 23.50 | 0.0281 |
| 189 | 836.4 | 3.8 | 10 | 28.99 | 0.0347 |
| 189 | 836.4 | 3.8 | 20 | 25.63 | 0.0306 |
| 189 | 836.4 | 3.8 | 30 | -29.83 | -0.0357 |
| 189 | 836.4 | 3.8 | 40 | -38.81 | **-0.0464** |
| 189 | 836.4 | 3.8 | 50 | -25.83 | -0.0309 |
| 189 | 836.4 | 3.8 | 60 | -20.28 | -0.0242 |

| Traffic Channel Number | Frequency (MHz) | Voltage (Volts) | Temperature (Celsius) | Frequency Error (Hz) | PPM |
|---|---|---|---|---|---|
| 189 | 836.4 | 4.1 | -30 | -34.68 | -0.0415 |
| 189 | 836.4 | 4.1 | -20 | 16.40 | 0.0196 |
| 189 | 836.4 | 4.1 | -10 | 19.37 | 0.0232 |
| 189 | 836.4 | 4.1 | 0 | 20.92 | 0.0250 |
| 189 | 836.4 | 4.1 | 10 | 29.83 | 0.0357 |
| 189 | 836.4 | 4.1 | 20 | -20.15 | -0.0241 |
| 189 | 836.4 | 4.1 | 30 | -26.15 | -0.0313 |
| 189 | 836.4 | 4.1 | 40 | 15.88 | 0.0190 |
| 189 | 836.4 | 4.1 | 50 | -29.25 | -0.0350 |
| 189 | 836.4 | 4.1 | 60 | 16.72 | 0.0200 |

GSM850 Results: channel 250 @ maximum transmitted power

| Traffic Channel Number | Frequency (MHz) | Voltage (Volts) | Temperature (Celsius) | Frequency Error (Hz) | PPM |
|---|---|---|---|---|---|
| 250 | 848.6 | 3.5 | -30 | -28.61 | -0.0337 |
| 250 | 848.6 | 3.5 | -20 | -18.21 | -0.0215 |
| 250 | 848.6 | 3.5 | -10 | 22.28 | 0.0263 |
| 250 | 848.6 | 3.5 | 0 | 25.76 | 0.0304 |
| 250 | 848.6 | 3.5 | 10 | 24.67 | 0.0291 |
| 250 | 848.6 | 3.5 | 20 | 27.31 | 0.0322 |
| 250 | 848.6 | 3.5 | 30 | -27.77 | -0.0327 |
| 250 | 848.6 | 3.5 | 40 | -36.22 | -0.0427 |
| 250 | 848.6 | 3.5 | 50 | 14.66 | 0.0173 |
| 250 | 848.6 | 3.5 | 60 | -28.15 | -0.0332 |

| Traffic Channel Number | Frequency (MHz) | Voltage (Volts) | Temperature (Celsius) | Frequency Error (Hz) | PPM |
|---|---|---|---|---|---|
| 250 | 848.6 | 3.8 | -30 | -34.74 | -0.0409 |
| 250 | 848.6 | 3.8 | -20 | -21.83 | -0.0257 |
| 250 | 848.6 | 3.8 | -10 | 16.66 | 0.0196 |
| 250 | 848.6 | 3.8 | 0 | 27.44 | 0.0323 |
| 250 | 848.6 | 3.8 | 10 | 29.32 | 0.0346 |
| 250 | 848.6 | 3.8 | 20 | 22.15 | 0.0261 |
| 250 | 848.6 | 3.8 | 30 | -18.92 | -0.0223 |
| 250 | 848.6 | 3.8 | 40 | -36.35 | -0.0428 |
| 250 | 848.6 | 3.8 | 50 | -26.67 | -0.0314 |
| 250 | 848.6 | 3.8 | 60 | -20.79 | -0.0245 |

| Traffic Channel Number | Frequency (MHz) | Voltage (Volts) | Temperature (Celsius) | Frequency Error (Hz) | PPM |
|---|---|---|---|---|---|
| 250 | 848.6 | 4.1 | -30 | -35.06 | -0.0413 |
| 250 | 848.6 | 4.1 | -20 | 21.50 | 0.0253 |
| 250 | 848.6 | 4.1 | -10 | 18.27 | 0.0215 |
| 250 | 848.6 | 4.1 | 0 | 18.34 | 0.0216 |
| 250 | 848.6 | 4.1 | 10 | 30.87 | 0.0364 |
| 250 | 848.6 | 4.1 | 20 | -27.06 | -0.0319 |
| 250 | 848.6 | 4.1 | 30 | -19.63 | -0.0231 |
| 250 | 848.6 | 4.1 | 40 | 22.86 | 0.0269 |
| 250 | 848.6 | 4.1 | 50 | -27.38 | -0.0323 |
| 250 | 848.6 | 4.1 | 60 | 19.24 | 0.0227 |

PCS Channel results: channels 512, 661, & 810 @ 20°C maximum transmitted power

| Traffic Channel Number | PCS Frequency (MHz | Voltage (Volts) | Temperature (Celsius) | Frequency Error (Hz) | *PPM* |
|---|---|---|---|---|---|
| 512 | 1850.2 | 3.5 | 20 | -30.15 | -0.0163 |
| 661 | 1880.0 | 3.5 | 20 | -22.28 | -0.0119 |
| 810 | 1909.8 | 3.5 | 20 | 32.80 | 0.0172 |

| Traffic Channel Number | PCS Frequency (MHz) | Voltage (Volts) | Temperature (Celsius) | Frequency Error (Hz) | PPM |
|---|---|---|---|---|---|
| 512 | 1850.2 | 3.8 | 20 | 24.86 | 0.0134 |
| 661 | 1880.0 | 3.8 | 20 | 31.83 | 0.0169 |
| 810 | 1909.8 | 3.8 | 20 | 35.06 | 0.0184 |

| Traffic Channel Number | PCS Frequency (MHz) | Voltage (Volts) | Temperature (Celsius) | Frequency Error (Hz) | PPM |
|---|---|---|---|---|---|
| 512 | 1850.2 | 4.1 | 20 | -23.83 | -0.0129 |
| 661 | 1880.0 | 4.1 | 20 | 31.90 | 0.0170 |
| 810 | 1909.8 | 4.1 | 20 | -22.08 | -0.0116 |

PCS 1900 Results: channel 512 @ maximum transmitted power

| *Traffic Channel Number* | *Frequency (MHz)* | *Voltage (Volts)* | *Temperature (Celsius)* | *Frequency Error (Hz)* | *PPM* |
|---|---|---|---|---|---|
| 512 | 1850.2 | 3.5 | -30 | -32.16 | -0.0174 |
| 512 | 1850.2 | 3.5 | -20 | 35.45 | 0.0192 |
| 512 | 1850.2 | 3.5 | -10 | -25.63 | -0.0139 |
| 512 | 1850.2 | 3.5 | 0 | 23.25 | 0.0126 |
| 512 | 1850.2 | 3.5 | 10 | 35.19 | 0.0190 |
| 512 | 1850.2 | 3.5 | 20 | -30.15 | -0.0163 |
| 512 | 1850.2 | 3.5 | 30 | 22.47 | 0.0121 |
| 512 | 1850.2 | 3.5 | 40 | -26.54 | -0.0143 |
| 512 | 1850.2 | 3.5 | 50 | -40.74 | -0.0220 |
| 512 | 1850.2 | 3.5 | 60 | -51.79 | -0.0280 |

| *Traffic Channel Number* | *Frequency (MHz)* | *Voltage (Volts)* | *Temperature (Celsius)* | *Frequency Error (Hz)* | *PPM* |
|---|---|---|---|---|---|
| 512 | 1850.2 | 3.8 | -30 | -36.48 | -0.0197 |
| 512 | 1850.2 | 3.8 | -20 | 28.41 | 0.0154 |
| 512 | 1850.2 | 3.8 | -10 | 40.23 | 0.0217 |
| 512 | 1850.2 | 3.8 | 0 | -34.29 | -0.0185 |
| 512 | 1850.2 | 3.8 | 10 | 25.18 | 0.0136 |
| 512 | 1850.2 | 3.8 | 20 | 24.86 | 0.0134 |
| 512 | 1850.2 | 3.8 | 30 | 20.79 | 0.0112 |
| 512 | 1850.2 | 3.8 | 40 | 29.25 | 0.0158 |
| 512 | 1850.2 | 3.8 | 50 | -63.86 | -0.0345 |
| 512 | 1850.2 | 3.8 | 60 | -47.85 | -0.0259 |

| *Traffic Channel Number* | *Frequency (MHz)* | *Voltage (Volts)* | *Temperature (Celsius)* | *Frequency Error (Hz)* | *PPM* |
|---|---|---|---|---|---|
| 512 | 1850.2 | 4.1 | -30 | -31.12 | -0.0168 |
| 512 | 1850.2 | 4.1 | -20 | 34.16 | 0.0185 |
| 512 | 1850.2 | 4.1 | -10 | 23.89 | 0.0129 |
| 512 | 1850.2 | 4.1 | 0 | 32.35 | 0.0175 |
| 512 | 1850.2 | 4.1 | 10 | 25.57 | 0.0138 |
| 512 | 1850.2 | 4.1 | 20 | -23.83 | -0.0129 |
| 512 | 1850.2 | 4.1 | 30 | -27.89 | -0.0151 |
| 512 | 1850.2 | 4.1 | 40 | -37.19 | -0.0201 |
| 512 | 1850.2 | 4.1 | 50 | -52.24 | -0.0282 |
| 512 | 1850.2 | 4.1 | 60 | -52.88 | -0.0286 |

PCS 1900 Results: channel 661 @ maximum transmitted power

| *Traffic Channel Number* | *Frequency (MHz)* | *Voltage (Volts)* | *Temperature (Celsius)* | *Frequency Error (Hz)* | *PPM* |
|---|---|---|---|---|---|
| 661 | 1880.0 | 3.5 | -30 | 23.57 | 0.0125 |
| 661 | 1880.0 | 3.5 | -20 | 47.85 | 0.0255 |
| 661 | 1880.0 | 3.5 | -10 | 28.15 | 0.0150 |
| 661 | 1880.0 | 3.5 | 0 | 21.05 | 0.0112 |
| 661 | 1880.0 | 3.5 | 10 | 37.97 | 0.0202 |
| 661 | 1880.0 | 3.5 | 20 | -22.28 | -0.0119 |
| 661 | 1880.0 | 3.5 | 30 | -32.67 | -0.0174 |
| 661 | 1880.0 | 3.5 | 40 | -46.30 | -0.0246 |
| 661 | 1880.0 | 3.5 | 50 | -43.46 | -0.0231 |
| 661 | 1880.0 | 3.5 | 60 | -53.08 | -0.0282 |

| *Traffic Channel Number* | *Frequency (MHz)* | *Voltage (Volts)* | *Temperature (Celsius)* | *Frequency Error (Hz)* | *PPM* |
|---|---|---|---|---|---|
| 661 | 1880.0 | 3.8 | -30 | 35.32 | 0.0188 |
| 661 | 1880.0 | 3.8 | -20 | 36.81 | 0.0196 |
| 661 | 1880.0 | 3.8 | -10 | 40.94 | 0.0218 |
| 661 | 1880.0 | 3.8 | 0 | -25.38 | -0.0135 |
| 661 | 1880.0 | 3.8 | 10 | 31.83 | 0.0169 |
| 661 | 1880.0 | 3.8 | 20 | 31.83 | 0.0169 |
| 661 | 1880.0 | 3.8 | 30 | -29.70 | -0.0158 |
| 661 | 1880.0 | 3.8 | 40 | -44.10 | -0.0235 |
| 661 | 1880.0 | 3.8 | 50 | -31.45 | -0.0167 |
| 661 | 1880.0 | 3.8 | 60 | -58.89 | -0.0313 |

| *Traffic Channel Number* | *Frequency (MHz)* | *Voltage (Volts)* | *Temperature (Celsius)* | *Frequency Error (Hz)* | *PPM* |
|---|---|---|---|---|---|
| 661 | 1880.0 | 4.1 | -30 | -21.31 | -0.0113 |
| 661 | 1880.0 | 4.1 | -20 | 43.39 | 0.0231 |
| 661 | 1880.0 | 4.1 | -10 | -27.83 | -0.0148 |
| 661 | 1880.0 | 4.1 | 0 | 26.28 | 0.0140 |
| 661 | 1880.0 | 4.1 | 10 | 29.96 | 0.0159 |
| 661 | 1880.0 | 4.1 | 20 | 31.90 | 0.0170 |
| 661 | 1880.0 | 4.1 | 30 | -29.70 | -0.0158 |
| 661 | 1880.0 | 4.1 | 40 | -45.85 | -0.0244 |
| 661 | 1880.0 | 4.1 | 50 | -62.76 | -0.0334 |
| 661 | 1880.0 | 4.1 | 60 | -64.51 | -0.0343 |

PCS 1900 Results: channel 810 @ maximum transmitted power

| *Traffic Channel Number* | *Frequency (MHz)* | *Voltage (Volts)* | *Temperature (Celsius)* | *Frequency Error (Hz)* | *PPM* |
|---|---|---|---|---|---|
| 810 | 1909.8 | 3.5 | -30 | 37.90 | 0.0198 |
| 810 | 1909.8 | 3.5 | -20 | 39.45 | 0.0207 |
| 810 | 1909.8 | 3.5 | -10 | 25.38 | 0.0133 |
| 810 | 1909.8 | 3.5 | 0 | 53.79 | 0.0282 |
| 810 | 1909.8 | 3.5 | 10 | 43.65 | 0.0229 |
| 810 | 1909.8 | 3.5 | 20 | 32.80 | 0.0172 |
| 810 | 1909.8 | 3.5 | 30 | -26.67 | -0.0140 |
| 810 | 1909.8 | 3.5 | 40 | -35.45 | -0.0186 |
| 810 | 1909.8 | 3.5 | 50 | -64.96 | -0.0340 |
| 810 | 1909.8 | 3.5 | 60 | -72.00 | **-0.0377** |

| *Traffic Channel Number* | *Frequency (MHz)* | *Voltage (Volts)* | *Temperature (Celsius)* | *Frequency Error (Hz)* | *PPM* |
|---|---|---|---|---|---|
| 810 | 1909.8 | 3.8 | -30 | -31.38 | -0.0164 |
| 810 | 1909.8 | 3.8 | -20 | 46.17 | 0.0242 |
| 810 | 1909.8 | 3.8 | -10 | 39.91 | 0.0209 |
| 810 | 1909.8 | 3.8 | 0 | 60.70 | 0.0318 |
| 810 | 1909.8 | 3.8 | 10 | 30.28 | 0.0159 |
| 810 | 1909.8 | 3.8 | 20 | 35.06 | 0.0184 |
| 810 | 1909.8 | 3.8 | 30 | -40.74 | -0.0213 |
| 810 | 1909.8 | 3.8 | 40 | -47.78 | -0.0250 |
| 810 | 1909.8 | 3.8 | 50 | -57.02 | -0.0299 |
| 810 | 1909.8 | 3.8 | 60 | -58.89 | -0.0308 |

| *Traffic Channel Number* | *Frequency (MHz)* | *Voltage (Volts)* | *Temperature (Celsius)* | *Frequency Error (Hz)* | *PPM* |
|---|---|---|---|---|---|
| 810 | 1909.8 | 4.1 | -30 | 70.45 | 0.0369 |
| 810 | 1909.8 | 4.1 | -20 | 48.88 | 0.0256 |
| 810 | 1909.8 | 4.1 | -10 | 50.62 | 0.0265 |
| 810 | 1909.8 | 4.1 | 0 | 52.30 | 0.0274 |
| 810 | 1909.8 | 4.1 | 10 | 45.85 | 0.0240 |
| 810 | 1909.8 | 4.1 | 20 | -22.08 | -0.0116 |
| 810 | 1909.8 | 4.1 | 30 | -39.84 | -0.0209 |
| 810 | 1909.8 | 4.1 | 40 | -69.74 | -0.0365 |
| 810 | 1909.8 | 4.1 | 50 | -55.66 | -0.0291 |
| 810 | 1909.8 | 4.1 | 60 | -57.15 | -0.0299 |

# APPENDIX 4

# RADIATED EMISSIONS TEST DATA

Radiated Emissions Test Data Results

Test distance is 3.0 metres August 30, 2005

| EUT | | | | Rx Antenna | | Spectrum Analyzer | | Substitution Method Tracking Generator | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Type | Ch | Frequency (MHz) | Band | Type | Pol. | Reading (dBuV) | Max (V,H) (dBuV) | Pol. Tx-Rx | Reading (dBm) | Corrected Reading (relative to Dipole) | Limit (dBm) | Diff. To Limit (dB) |
| **GSM850 Band (ERP)** Handheld Standalone, on its side | | | | | | | | | | | | |
| F0 | 128 | 824.20 | 850 | Dipole | V | 77.2 | 86.6 | V V | 13.6 | 29.85 | 38.50 | -8.65 |
| F0 | 128 | 824.20 | 850 | Dipole | H | 88.6 | | H H | 12.4 | | | |
| F0 | 195 | 837.60 | 850 | Dipole | V | 76.1 | 87.0 | V V | 14.0 | **30.25** | 38.50 | -8.25 |
| F0 | 195 | 837.60 | 850 | Dipole | H | 87.0 | | H H | 11.9 | | | |
| F0 | 251 | 848.80 | 850 | Dipole | V | 76.7 | 88.6 | V V | 13.6 | 29.85 | 38.50 | -8.65 |
| F0 | 251 | 848.80 | 850 | Dipole | H | 86.8 | | H H | 11.6 | | | |

ERP = Tracking Generator Level + Antenna Gain – Cable Loss + Preamp

Example: 824.20 MHz = 13.6 (Tracking Generator Level) – 7.8 (Antenna Loss) – 2.15 (Dipole Factor) – 3.8 (Cable Loss) + 30.0 (Preamp Gain) = 29.85 dBm (Reading Relative to Dipole)

Radiated Emissions Test Data Results cont'd

Test distance is 3.0 metres August 30, 2005

| EUT | | | | Rx Antenna | | Spectrum Analyzer | | Substitution Method Tracking Generator | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Type | Ch | Frequency (MHz) | Band | Type | Pol. | Reading (dBuV) | Max (V,H) (dBuV) | Pol. Tx-Rx | Reading (dBm) | Corrected Reading (relative to dipole) | Limit (dBm) | Diff to Limit (dB) |
| **GSM850 Band (Harmonics)** Handheld Standalone, vertical position **Low Channel –** 824.2 MHz | | | | | | | | | | | | |
| 2nd | 128 | 1648.40 | 850 | Horn | V | 55.0 | 55.0 | V-V | -48.3 | -44.4 | -13 | -31.4 |
| 2nd | 128 | 1648.40 | 850 | Horn | H | 49.9 | | H-H | -47.8 | | | |
| 3rd | 128 | 2472.60 | 850 | Horn | V | 42.0 | 51.2 | V-V | -43.1 | -39.6 | -13 | -26.6 |
| 3rd | 128 | 2472.60 | 850 | Horn | H | 51.2 | | H-H | -43.5 | | | |
| 4th | 128 | 3296.80 | 850 | Horn | V | 43.8 | 46.7 | V-V | -45.3 | -41.4 | -13 | -28.4 |
| 4th | 128 | 3296.80 | 850 | Horn | H | 46.7 | | H-H | -45.6 | | | |
| The harmonics were investigated up to the 10th harmonic. Emissions above the 4th harmonic were in the noise floor (NF) **Middle Channel** – 837.6 MHz | | | | | | | | | | | | |
| 2nd | 195 | 1675.20 | 850 | Horn | V | 53.9 | 53.9 | V-V | -49.5 | -45.7 | -13 | -32.7 |
| 2nd | 195 | 1675.20 | 850 | Horn | H | 50.7 | | H-H | -49.1 | | | |
| 3rd | 195 | 2512.80 | 850 | Horn | V | 42.3 | 49.9 | V-V | -44.7 | -41.2 | -13 | -28.2 |
| 3rd | 195 | 2512.80 | 850 | Horn | H | 49.9 | | H-H | -45.3 | | | |
| 4th | 195 | 3350.40 | 850 | Horn | V | 45.9 | 49.4 | V-V | -41.6 | -37.7 | -13 | -24.7 |
| 4th | 195 | 3350.40 | 850 | Horn | V | 49.4 | | H-H | -42.3 | | | |
| The harmonics were investigated up to the 10th harmonic. Emissions above the 4th harmonic were in the NF | | | | | | | | | | | | |

Radiated Emissions Test Data Results cont'd

Test distance is 3.0 metres August 30, 2005

| EUT | | | | Rx Antenna | | Spectrum Analyzer | | Substitution Method Tracking Generator | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Type | Ch | Frequency (MHz) | Band | Type | Pol. | Reading (dBuV) | Max (V,H) (dBuV) | Pol. Tx-Rx | Reading (dBm) | Corrected Reading (relative to dipole) | Limit (dBm) | Diff to Limit (dB) |
| **High Channel –** 848.8 MHz | | | | | | | | | | | | |
| 2nd | 251 | 1697.60 | 850 | Horn | V | 54.1 | 54.1 | V-V | -49.0 | -45.4 | -13 | -32.4 |
| 2nd | 251 | 1697.60 | 850 | Horn | H | 51.6 | | H-H | -48.8 | | | |
| 3rd | 251 | 2546.40 | 850 | Horn | V | 42.4 | 48.5 | V-V | -45.7 | -42.2 | -13 | -29.2 |
| 3rd | 251 | 2546.40 | 850 | Horn | H | 48.5 | | H-H | -45.9 | | | |
| 4th | 251 | 3395.20 | 850 | Horn | V | 47.6 | 50.4 | V-V | -39.1 | -35.2 | -13 | **-22.2** |
| 4th | 251 | 3395.20 | 850 | Horn | H | 50.4 | | H-H | -40.2 | | | |

The harmonics were investigated up to the 10th harmonic.
Emissions above the 4th harmonic were in the NF.

Radiated Emissions Test Data Results cont'd

Test distance is 3.0 metres August 30, 2005

| EUT | | | | Rx Antenna | | Spectrum Analyzer | | | Substitution Method Tracking Generator | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Type | Ch | Frequency (MHz) | Band | Type | Pol. | Reading (dBuV) | Corrected Reading (dBuV) | Max (V,H) (dBuV) | Pol. Tx-Rx | Reading (dBm)) | Corrected Reading (relative to dipole) (dBm)) | Limit (dBm) | Diff to Limit (dB) |
| **GSM BAND**<br>**RF Local Oscillator ($LO_1$)**<br>**Low Channel (824.2 MHz)** | | | | | | | | | | | | | |
| F0 | 128 | 1648.40 | 850 | Horn | V | NF | NF | | V-V | | | -13 | |
| F0 | 128 | 1648.40 | 850 | Horn | H | NF | | | H-H | | | | |
| Emissions were in the NF. | | | | | | | | | | | | | |
| **High Channel (848.8 MHz)** | | | | | | | | | | | | | |
| F0 | 251 | 1697.60 | 850 | Horn | V | NF | NF | | V-V | | | -13 | |
| F0 | 251 | 1697.60 | 850 | Horn | H | NF | | | H-H | | | | |
| Emissions were in the NF. | | | | | | | | | | | | | |
| **RF $LO_2$**<br>**Low Channel (824.2 MHz)** | | | | | | | | | | | | | |
| F0 | 128 | 3476.80 | 850 | Horn | V | NF | NF | | V-V | | | -13 | |
| F0 | 128 | 3476.80 | 850 | Horn | H | NF | | | H-H | | | | |
| Emissions were in the NF. | | | | | | | | | | | | | |
| **High Channel (848.8 MHz)** | | | | | | | | | | | | | |
| F0 | 251 | 3575.20 | 850 | Horn | V | NF | NF | | V-V | | | -13 | |
| F0 | 251 | 3575.20 | 850 | Horn | H | NF | | | H-H | | | | |
| Emissions were in the NF. | | | | | | | | | | | | | |

Radiated Emissions Test Data Results cont'd

Test distance is 3.0 metres September 12, 2005

| EUT | | | | Rx Antenna | | Spectrum Analyzer | | Substitution Method Tracking Generator | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Type | Ch | Frequency (MHz) | Band | Type | Pol. | Reading (dBuV) | Max (V,H) (dBuV) | Pol. Tx-Rx | Reading (dBm) | Corrected Reading (relative to dipole) | Limit (dBm) | Diff to Limit (dB) |
| **GSM850 and Bluetooth transmitting in frequency hopping mode** Handheld Standalone, vertical position **Low Channel –** 824.2 MHz | | | | | | | | | | | | |
| 2nd | 128 | 1648.40 | 850 | Horn | V | 55.0 | 55.0 | V-V | -48.3 | -44.4 | -13 | -31.4 |
| 2nd | 128 | 1648.40 | 850 | Horn | H | 50.4 | | H-H | -47.8 | | | |
| 3rd | 128 | 2472.60 | 850 | Horn | V | 41.7 | 51.1 | V-V | -43.1 | -39.6 | -13 | -26.6 |
| 3rd | 128 | 2472.60 | 850 | Horn | H | 51.1 | | H-H | -43.5 | | | |
| 4th | 128 | 3296.80 | 850 | Horn | V | 44.1 | 47.6 | V-V | -44.7 | -40.7 | -13 | -27.7 |
| 4th | 128 | 3296.80 | 850 | Horn | H | 47.6 | | H-H | -44.6 | | | |
| The harmonics were investigated up to the 10th harmonic. Emissions above the 4th harmonic were in the NF. **Middle Channel** – 837.6 MHz | | | | | | | | | | | | |
| 2nd | 195 | 1675.20 | 850 | Horn | V | 54.9 | 54.9 | V-V | -48.2 | -44.8 | -13 | -31.8 |
| 2nd | 195 | 1675.20 | 850 | Horn | H | 51.2 | | H-H | -49.1 | | | |
| 3rd | 195 | 2512.80 | 850 | Horn | V | 43.0 | 50.1 | V-V | -44.5 | -41.0 | -13 | -28.0 |
| 3rd | 195 | 2512.80 | 850 | Horn | H | 50.1 | | H-H | -45.3 | | | |
| 4th | 195 | 3350.40 | 850 | Horn | V | 46.6 | 49.6 | V-V | -41.6 | -37.7 | -13 | -24.7 |
| 4th | 195 | 3350.40 | 850 | Horn | V | 49.6 | | H-H | -42.3 | | | |
| The harmonics were investigated up to the 10th harmonic. Emissions above the 4th harmonic were in the NF | | | | | | | | | | | | |

Radiated Emissions Test Data Results cont'd

Test distance is 3.0 metres September 12, 2005

| EUT | | | | Rx Antenna | | Spectrum Analyzer | | Substitution Method Tracking Generator | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Type | Ch | Frequency (MHz) | Band | Type | Pol. | Reading (dBuV) | Max (V,H) (dBuV) | Pol. Tx-Rx | Reading (dBm) | Corrected Reading (relative to dipole) | Limit (dBm) | Diff to Limit (dB) |
| **High Channel –** 848.8 MHz | | | | | | | | | | | | |
| 2nd | 251 | 1697.60 | 850 | Horn | V | 54.5 | 54.5 | V-V | -48.5 | -45.0 | -13 | -32.0 |
| 2nd | 251 | 1697.60 | 850 | Horn | H | 51.4 | | H-H | -48.4 | | | |
| 3rd | 251 | 2546.40 | 850 | Horn | V | 43.9 | 49.4 | V-V | -44.8 | -41.3 | -13 | -28.3 |
| 3rd | 251 | 2546.40 | 850 | Horn | H | 49.4 | | H-H | -45.1 | | | |
| 4th | 251 | 3395.20 | 850 | Horn | V | 49.1 | 51.6 | V-V | -37.8 | -33.9 | -13 | **-20.9** |
| 4th | 251 | 3395.20 | 850 | Horn | H | 51.6 | | H-H | -38.8 | | | |

The harmonics were investigated up to the 10th harmonic.
Emissions above the 4th harmonic were in the NF.

Radiated Emissions Test Data Results cont'd

Test Distance was 3.0 metres. PCS Band August 30, 2005

| | | | | | | | | Substitution Method | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EUT | | | | Receive Antenna | | Spectrum Analyzer | | Tracking Generator | | | | |
| Type | Ch | Frequency (MHz) | Band | Type | Pol. | Reading (dBuV) | Max (V,H) dBuV | Pol. Tx-Rx | Reading (dBm) | Corrected Reading (relative to Isotropic Radiator) (dBm) | Limit (dBm) | Diff to Limit (dB) |
| **PCS BAND (EIRP)** Handheld Standalone | | | | | | | | | | | | |
| F0 | 512 | 1850.20 | 1900 | Horn | V | 85.5 | 91.9 | V-V | -8.5 | 28.1 | 33 | -4.9 |
| F0 | 512 | 1850.20 | 1900 | Horn | H | 91.9 | | H-H | -7.5 | | | |
| F0 | 661 | 1880.00 | 1900 | Horn | V | 80.3 | 92.5 | V-V | -7.3 | **29.7** | 33 | -3.3 |
| F0 | 661 | 1880.00 | 1900 | Horn | H | 92.5 | | H-H | -5.9 | | | |
| F0 | 810 | 1909.80 | 1900 | Horn | V | 80.0 | 91.6 | V-V | -7.5 | 29.0 | 33 | -4.0 |
| F0 | 810 | 1909.80 | 1900 | Horn | H | 91.6 | | H-H | -6.6 | | | |

EIRP = Tracking Generator Level + Antenna Factor – Cable Loss + Preamp Gain

Example: 1850.20 MHz = -7.5 (Tracking Generator Level) + 8.2 (Antenna Factor) – 5.6 (Cable Loss) + 33.0 (Preamp Gain) = 28.1 dBm (Reading Relative to Isotropic Radiator)

Radiated Emissions Test Data Results cont'd

Test Distance was 3.0 metres. PCS Band August 30, 2005

| | | | | | | | | Substitution Method | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EUT | | | | Receive Antenna | | Spectrum Analyzer | | Tracking Generator | | | | |
| Type | Ch | Frequency (MHz) | Band | Pol. Type | Pol. | Reading (dBuV) | Max (V,H) (dBuV) | Pol. Tx-Rx | Reading (dBm) | Corrected Reading (relative to Isotropic Radiator) (dBm) | Limit (dBm) | Diff to Limit (dB) |
| **PCS BAND (Harmonics)** Handheld Standalone, on it's side<br>**Low Channel** 1850.20 MHz | | | | | | | | | | | | |
| 2nd | 512 | 3700.40 | 1900 | Horn | V | 46.9 | 46.9 | V-V | -39.2 | -33.8 | -13 | -20.8 |
| 2nd | 512 | 3700.40 | 1900 | Horn | H | 43.2 | | H-H | -37.2 | | | |
| 3rd | 512 | 5550.60 | 1900 | Horn | V | 42.6 | 42.6 | V-V | -35.9 | -33.5 | -13 | -20.5 |
| 3rd | 512 | 5550.60 | 1900 | Horn | H | 42.4 | | H-H | -35.1 | | | |
| The harmonics were investigated up to the 10th harmonic.<br>Emissions above the 3rd harmonic were in the NF<br>**Middle Channel** 1880.00 MHz | | | | | | | | | | | | |
| 2nd | 661 | 3760.00 | 1900 | Horn | V | 45.1 | 45.1 | V-V | -40.4 | -36.8 | -13 | -23.8 |
| 2nd | 661 | 3760.00 | 1900 | Horn | H | 42.1 | | H-H | -40.2 | | | |
| 3rd | 661 | 5640.00 | 1900 | Horn | V | 45.1 | 45.1 | V-V | -33.4 | -30.8 | -13 | -17.8 |
| 3rd | 661 | 5640.00 | 1900 | Horn | H | 43.3 | | H-H | -32.4 | | | |
| The harmonics were investigated up to the 10th harmonic.<br>Emissions above the 3rd harmonic were in the NF<br>**High Channel** 1909.8 MHz | | | | | | | | | | | | |
| 2nd | 810 | 3819.60 | 1900 | Horn | V | 47.0 | 47.0 | V-V | -39.2 | -35.4 | -13 | -22.4 |
| 2nd | 810 | 3819.60 | 1900 | Horn | H | 42.3 | | H-H | -38.8 | | | |
| 3rd | 810 | 5729.40 | 1900 | Horn | V | 45.9 | 45.9 | V-V | -30.0 | -28.4 | -13 | **-15.4** |
| 3rd | 810 | 5729.40 | 1900 | Horn | H | 44.0 | | H-H | -32.0 | | | |
| The harmonics were investigated up to the 10th harmonic.<br>Emissions above the 3rd harmonic were in the NF | | | | | | | | | | | | |

## Radiated Emissions Test Results cont'd

Test Distance was 3.0 metres. PCS Band August 30, 2005
The measurements were performed in transmit mode with the handheld in standalone vertical position.

| EUT | | | | Rx Antenna | | Spectrum Analyzer | | | Substitution Method Tracking Generator | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Type | Ch | Frequency (MHz) | Band | Type | Pol. | Reading (dBuV) | Corrected Reading (dBuV) | Max (V,H) (dBuV) | Pol. Tx-Rx | Reading (dBm) | Corrected Reading (relative to Isotropic Radiator) (dBm) | Limit (dBm) | Diff to Limit (dB) |
| **RF $LO_1$** | | | | | | | | | | | | | |
| **Low Channel** | | | | | | | | | | | | | |
| F0 | 512 | 1423.20 | 1900 | Horn | V | NF | NF | | V-V | | | -13 | |
| F0 | 512 | 1423.20 | 1900 | Horn | H | NF | | | H-H | | | | |
| Emissions were in the NF. | | | | | | | | | | | | | |
| **High Channel** | | | | | | | | | | | | | |
| F0 | 810 | 1482.80 | 1900 | Horn | V | NF | NF | | V-V | | | -13 | |
| F0 | 810 | 1482.80 | 1900 | Horn | H | NF | | | H-H | | | | |
| Emissions were in the NF. | | | | | | | | | | | | | |
| **RF $LO_2$** | | | | | | | | | | | | | |
| **Low Channel** | | | | | | | | | | | | | |
| F0 | 512 | 1930.10 | 1900 | Horn | V | NF | NF | | V-V | | | -13 | |
| F0 | 512 | 1930.10 | 1900 | Horn | H | NF | | | H-H | | | | |
| Emissions were in the NF. | | | | | | | | | | | | | |
| **High Channel** | | | | | | | | | | | | | |
| F0 | 810 | 1989.70 | 1900 | Horn | V | NF | NF | | V-V | | | -13 | |
| F0 | 810 | 1989.70 | 1900 | Horn | H | NF | | | H-H | | | | |
| Emissions were in the NF. | | | | | | | | | | | | | |

## Radiated Emissions Test Results cont'd

Test Distance was 3.0 metres. August 30, 2005

| | | | | | | | | Substitution Method | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EUT | | | | Receive Antenna | | Spectrum Analyzer | | Tracking Generator | | | | |
| Type | Ch | Frequency (MHz) | Band | Pol. Type | Pol. | Reading (dBuV) | Max (V,H) (dBuV) | Pol. Tx-Rx | Reading (dBm) | Corrected Reading (relative to Isotropic Radiator) (dBm) | Limit (dBm) | Diff to Limit (dB) |
| **PCS and Bluetooth transmitting in frequency hopping mode** | | | | | | | | | | | | |
| Handheld Standalone, vertical position | | | | | | | | | | | | |
| **Low Channel** 1850.20 MHz | | | | | | | | | | | | |
| 2nd | 512 | 3700.40 | 1900 | Horn | V | 46.1 | 46.1 | V-V | -39.8 | -35.2 | -13 | -22.2 |
| 2nd | 512 | 3700.40 | 1900 | Horn | H | 42.5 | | H-H | -38.6 | | | |
| 3rd | 512 | 5550.6 | 1900 | Horn | V | 42.2 | 42.2 | V-V | -36.0 | -33.6 | -13 | -20.6 |
| 3rd | 512 | 5550.6 | 1900 | Horn | H | 41.0 | | H-H | -35.2 | | | |
| The harmonics were investigated up to the 10th harmonic. Emissions above the 3rd harmonic were in the NF | | | | | | | | | | | | |
| **Middle Channel** 1880.00 MHz | | | | | | | | | | | | |
| 2nd | 661 | 3760.00 | 1900 | Horn | V | 45.1 | 45.1 | V-V | -40.4 | 36.8 | -13 | -23.8 |
| 2nd | 661 | 3760.00 | 1900 | Horn | H | 41.8 | | H-H | -40.2 | | | |
| 3rd | 661 | 5640.00 | 1900 | Horn | V | 43.1 | 43.3 | V-V | -36.5 | -33.2 | -13 | -20.2 |
| 3rd | 661 | 5640.00 | 1900 | Horn | H | 43.3 | | H-H | -34.8 | | | |
| The harmonics were investigated up to the 10th harmonic. Emissions above the 3rd harmonic were in the NF | | | | | | | | | | | | |
| **High Channel** 1909.8 MHz | | | | | | | | | | | | |
| 2nd | 810 | 38.19.60 | 1900 | Horn | V | 46.6 | 46.6 | V-V | -39.4 | -35.9 | -13 | -22.9 |
| 2nd | 810 | 3819.60 | 1900 | Horn | H | 42.8 | | H-H | -39.3 | | | |
| 3rd | 810 | 5729.40 | 1900 | Horn | V | 45.2 | 45.2 | V-V | -32.7 | -29.5 | -13 | **-16.5** |
| 3rd | 810 | 5729.40 | 1900 | Horn | H | 43.8 | | H-H | -31.1 | | | |
| The harmonics were investigated up to the 10th harmonic. Emissions above the 3rd harmonic were in the NF | | | | | | | | | | | | |