

# EMI Test Report

Tested in accordance with  
Federal Communications Commission (FCC)  
Personal Communications Services  
CFR 47, Parts 2, 22 and 24  
and  
Industry Canada, RSS-133 and RSS-128



## Research In Motion Limited

**REPORT NO.:** RIM-0086-0406-10

**PRODUCT MODEL NO:** RAP40GW  
**TYPE NAME:** BlackBerry Wireless Handheld  
**FCC ID:** L6ARAP40GW  
**IC:** 2503A-RAP40GW

**Date:** \_\_\_\_\_ 08 July 2004 \_\_\_\_\_

**Declaration****Statement of Performance:**

The BlackBerry Wireless Handheld, model RAP40GW ASY-07029-001, revision 1G 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 equipment used was suitable for the tests performed and within the manufacturers published specifications and operating parameters.

The test methods were consistent with the methods described in the relevant standards.

**Tested by**

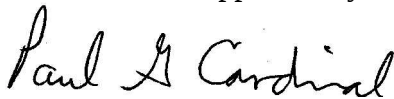
Maurice Battler  
Compliance Specialist

Date: 08 July 2004



Masud S. Attayi, P.Eng.  
Senior Compliance and Certification Engineer

Date: 09 July 2004

**Reviewed and Approved by:**

Paul G. Cardinal, Ph.D.  
Manager, Compliance and Certification

Date: 09 July 2004

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### Appendix 1 Frequency Stability Test Data

**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-128 Issue 2, Rev 1, Nov. 6/99, 800 MHz Dual-Mode TDMA Cellular Telephones
- Industry Canada, RSS-133 Issue 2, Rev. 1 Nov. 6/1999, 2.0 GHz Personal Communications Services

**B) Product Identification**

The equipment under test (EUT) was tested at the Research In Motion (RIM) EMI test facility, located at:

305 Phillip Street  
Waterloo, Ontario  
Canada, N2L 3W8  
Phone: 519 888 7465  
Fax: 519 888 6906  
Web Site: [www.rim.com](http://www.rim.com)

The testing began on April 30, 2004 and completed on May 03, 2004. The sample equipment under test (EUT) was a BlackBerry Wireless Handheld, model number RAP40GW, ASY-07029-001 revision 1G, RF PCB version 003, PIN 201052B1, FCC ID L6ARAP40GW, IC: 2503A-RAP40GW.

The transmit frequency ranges for the BlackBerry Wireless Handheld model number RAP40GW 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.

**C) Associated Document**

1. Test report number RIM-0086-0404-01

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

- 1) Communication Tester, Rohde & Schwarz, model CMU 200, serial number 100251
- 2) 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<br>REQUIREMENTS               | Performed By    |
|-------------------------------------------------------------------|-----------------------------------------------------------------------|-------------------------------------|-----------------|
| FCC CFR 47 Part 22, Subpart H<br>IC RSS-128                       | Radiated<br>Spurious/harmonic<br>Emissions, ERP, LO                   | See test report<br>RIM-0086-0404-01 | Masud Attayi    |
| FCC CFR 47 Part 2, Subpart J,<br>Part 22, Subpart H<br>IC RSS-128 | Conducted Output Power<br>Conducted Emissions,<br>Occupied Bandwidth, | See test report<br>RIM-0086-0404-01 | Maurice Battler |
| IC RSS-128                                                        | Frequency and Power<br>Stability                                      | Yes                                 | Maurice Battler |
| FCC CFR 47 Part 24, Subpart E<br>IC RSS-133                       | Radiated<br>Spurious/harmonic<br>Emissions, EIRP, LO                  | See test report<br>RIM-0086-0404-01 | Masud Attayi    |
| FCC CFR 47 Part 24, Subpart E<br>IC RSS-133                       | Conducted Emissions,<br>Occupied Bandwidth,<br>Frequency Stability    | See test report<br>RIM-0086-0404-01 | Maurice Battler |

**G) Modifications to EUT**

No modifications were required to the EUT.

## H) Summary of Results

- 1) The EUT passed the Frequency Stability and Power vs. Temperature and Voltage requirements for GSM850 band as per RSS-128.

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 1 for the test data.

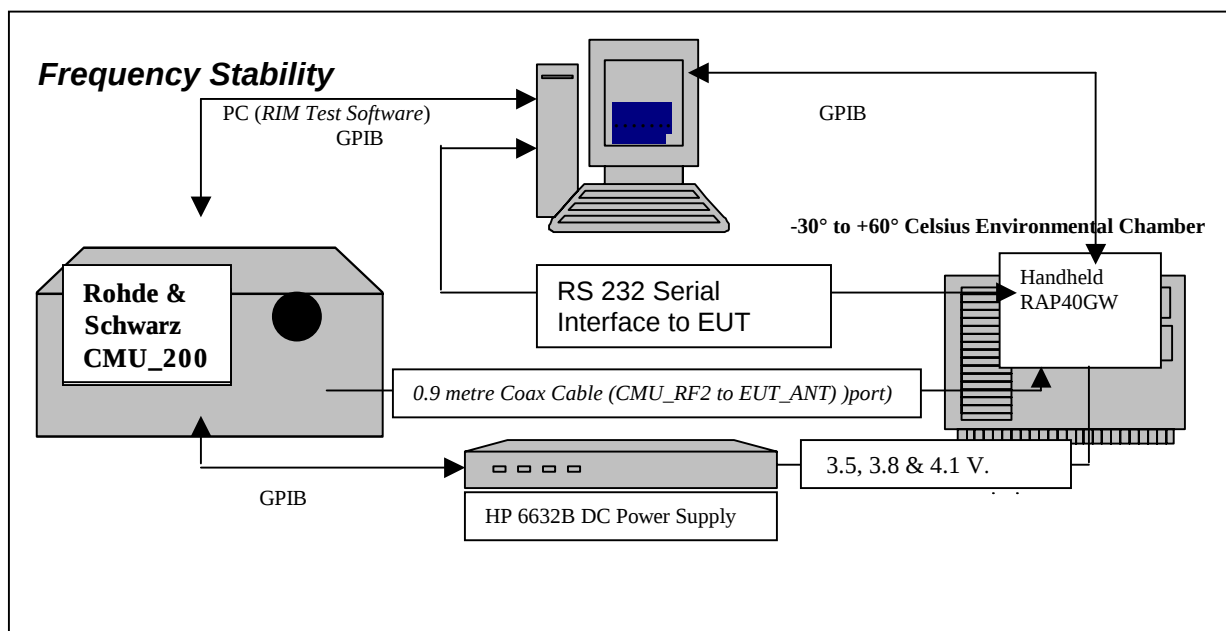
## I) Compliance Test Equipment Used

| <u>UNIT</u>                          | <u>MANUFACTURER</u> | <u>MODEL</u> | <u>SERIAL NUMBER</u> | <u>CAL DUE DATE</u><br>(YY MM DD) | <u>USE</u>          |
|--------------------------------------|---------------------|--------------|----------------------|-----------------------------------|---------------------|
| Universal Radio Communication Tester | Rohde & Schwarz     | CMU 200      | 100251               | 05-04-21                          | Frequency Stability |
| DC Power Supply                      | HP                  | 6632B        | US37472178           | 04-08-01                          | Frequency Stability |
| Temperature Probe                    | Hart Scientific     | 61161-302    | 21352860             | 04-09-15                          | Frequency Stability |
| Environmental Chamber                | ESPEC Corp.         | SH-240S1     | 91005607             | N/R                               | Frequency Stability |
|                                      |                     |              |                      |                                   |                     |

## APPENDIX 1

### FREQUENCY STABILITY TEST DATA

### Frequency Stability Test Data



| SYSTEM                                       | Model     | Serial Number | Calibration Due Date. |
|----------------------------------------------|-----------|---------------|-----------------------|
| R & S Universal Radio Communication Test Set | CMU200    | 100251        | 21-April-2005         |
| HP System DC Power Supply                    | 6632B     | US37472178    | 01-Aug-2004           |
| Network Analyzer                             | HP 8753D  | 3410A07083    | 31-July-2004          |
| Calibration Kit                              | HP85033C  | 2920A02997    | 20-Aug-2004           |
| Espec Environmental Chamber                  | SH240S1   | 91004919      | N/A                   |
| Hart Temperature Probe                       | 61161-302 | 21352860      | 15-Sept-2004          |

#### 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 RAP40GW 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 22.917 and RSS-128 Frequency Stability.*

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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 30 April 2004.

Procedure:

Full\_ Two port Calibration of 8720D using the 85033D was completed.

The cable assembly from the RF input to the RF output was measured at the following Frequencies:

| GSM 850<br>Frequency<br>(MHz) | Cable loss<br>(dB) |
|-------------------------------|--------------------|
| 824.2                         | 0.83               |
| 836.4                         | 0.83               |
| 848.6                         | 0.83               |

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.

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.

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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. 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 start of the measurement 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 degrees Celsius 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 degrees to 60 degrees Celsius.
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 0.0756 PPM.

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

| Traffic Channel Number | GSM850 Frequency (MHz) | Transmit Power (dBm) | Voltage (Volts) | Temperature (Celsius) | Frequency Error (Hz) | PPM    |
|------------------------|------------------------|----------------------|-----------------|-----------------------|----------------------|--------|
| 128                    | 824.2                  | 32.78                | 3.5             | 20                    | 30.740               | 0.0373 |
| 189                    | 836.4                  | 32.87                | 3.5             | 20                    | 35.640               | 0.0426 |
| 250                    | 848.6                  | 32.99                | 3.5             | 20                    | 53.340               | 0.0629 |

| Traffic Channel Number | GSM850 Frequency (MHz) | Transmit Power (dBm) | Voltage (Volts) | Temperature (Celsius) | Frequency Error (Hz) | PPM    |
|------------------------|------------------------|----------------------|-----------------|-----------------------|----------------------|--------|
| 128                    | 824.2                  | 32.80                | 3.8             | 20                    | 30.740               | 0.0373 |
| 189                    | 836.4                  | 32.90                | 3.8             | 20                    | 35.640               | 0.0426 |
| 250                    | 848.6                  | 33.02                | 3.8             | 20                    | 53.340               | 0.0629 |

| Traffic Channel Number | GSM850 Frequency (MHz) | Transmit Power (dBm) | Voltage (Volts) | Temperature (Celsius) | Frequency Error (Hz) | PPM    |
|------------------------|------------------------|----------------------|-----------------|-----------------------|----------------------|--------|
| 128                    | 824.2                  | 32.85                | 4.1             | 20                    | 30.930               | 0.0375 |
| 189                    | 836.4                  | 32.96                | 4.1             | 20                    | 31.960               | 0.0382 |
| 250                    | 848.6                  | 33.08                | 4.1             | 20                    | 56.440               | 0.0665 |

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## GSM850 Results: channel 128 @ maximum transmitted power

| Traffic Channel Number | Frequency (MHz) | Transmit Power (dBm) | Voltage (Volts) | Temperature (Celsius) | Frequency Error (Hz) | PPM    |
|------------------------|-----------------|----------------------|-----------------|-----------------------|----------------------|--------|
| 128                    | 824.2           | 33.18                | 3.5             | -30                   | 60.250               | 0.0731 |
| 128                    | 824.2           | 33.12                | 3.5             | -20                   | 46.490               | 0.0564 |
| 128                    | 824.2           | 33.02                | 3.5             | -10                   | 49.200               | 0.0597 |
| 128                    | 824.2           | 32.96                | 3.5             | 0                     | 19.050               | 0.0231 |
| 128                    | 824.2           | 32.87                | 3.5             | 10                    | 23.440               | 0.0284 |
| 128                    | 824.2           | 32.78                | 3.5             | 20                    | 30.740               | 0.0373 |
| 128                    | 824.2           | 32.71                | 3.5             | 30                    | 47.650               | 0.0578 |
| 128                    | 824.2           | 32.64                | 3.5             | 40                    | 48.690               | 0.0591 |
| 128                    | 824.2           | 32.54                | 3.5             | 50                    | 50.560               | 0.0613 |
| 128                    | 824.2           | 32.46                | 3.5             | 60                    | 62.180               | 0.0754 |

| Traffic Channel Number | Frequency (MHz) | Transmit Power (dBm) | Voltage (Volts) | Temperature (Celsius) | Frequency Error (Hz) | PPM     |
|------------------------|-----------------|----------------------|-----------------|-----------------------|----------------------|---------|
| 128                    | 824.2           | 33.16                | 3.8             | -30                   | 45.780               | 0.0555  |
| 128                    | 824.2           | 33.10                | 3.8             | -20                   | 39.450               | 0.0479  |
| 128                    | 824.2           | 33.03                | 3.8             | -10                   | 48.300               | 0.0586  |
| 128                    | 824.2           | 32.94                | 3.8             | 0                     | -27.830              | -0.0338 |
| 128                    | 824.2           | 32.87                | 3.8             | 10                    | -13.240              | -0.0161 |
| 128                    | 824.2           | 32.80                | 3.8             | 20                    | 30.740               | 0.0373  |
| 128                    | 824.2           | 32.72                | 3.8             | 30                    | 48.620               | 0.0590  |
| 128                    | 824.2           | 32.66                | 3.8             | 40                    | 48.950               | 0.0594  |
| 128                    | 824.2           | 32.58                | 3.8             | 50                    | 51.530               | 0.0625  |
| 128                    | 824.2           | 32.50                | 3.8             | 60                    | 53.210               | 0.0646  |

| Traffic Channel Number | Frequency (MHz) | Transmit Power (dBm) | Voltage (Volts) | Temperature (Celsius) | Frequency Error (Hz) | PPM     |
|------------------------|-----------------|----------------------|-----------------|-----------------------|----------------------|---------|
| 128                    | 824.2           | 33.23                | 4.1             | -30                   | 47.400               | 0.0575  |
| 128                    | 824.2           | 33.15                | 4.1             | -20                   | 39.650               | 0.0481  |
| 128                    | 824.2           | 33.07                | 4.1             | -10                   | 45.590               | 0.0553  |
| 128                    | 824.2           | 33.01                | 4.1             | 0                     | -21.570              | -0.0262 |
| 128                    | 824.2           | 32.94                | 4.1             | 10                    | 27.830               | 0.0338  |
| 128                    | 824.2           | 32.85                | 4.1             | 20                    | 30.930               | 0.0375  |
| 128                    | 824.2           | 32.79                | 4.1             | 30                    | 54.050               | 0.0656  |
| 128                    | 824.2           | 32.71                | 4.1             | 40                    | 45.780               | 0.0555  |
| 128                    | 824.2           | 32.62                | 4.1             | 50                    | 57.730               | 0.0700  |
| 128                    | 824.2           | 32.52                | 4.1             | 60                    | 61.020               | 0.0740  |

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## GSM850 Results: channel 189 @ maximum transmitted power

| Traffic Channel Number | Frequency (MHz) | Transmit Power (dBm) | Voltage (Volts) | Temperature (Celsius) | Frequency Error (Hz) | PPM    |
|------------------------|-----------------|----------------------|-----------------|-----------------------|----------------------|--------|
| 189                    | 836.4           | 33.32                | 3.5             | -30                   | 56.500               | 0.0676 |
| 189                    | 836.4           | 33.22                | 3.5             | -20                   | 51.140               | 0.0611 |
| 189                    | 836.4           | 33.14                | 3.5             | -10                   | 44.810               | 0.0536 |
| 189                    | 836.4           | 33.05                | 3.5             | 0                     | 49.530               | 0.0592 |
| 189                    | 836.4           | 32.97                | 3.5             | 10                    | 54.950               | 0.0657 |
| 189                    | 836.4           | 32.87                | 3.5             | 20                    | 35.640               | 0.0426 |
| 189                    | 836.4           | 32.78                | 3.5             | 30                    | 51.210               | 0.0612 |
| 189                    | 836.4           | 32.71                | 3.5             | 40                    | 50.040               | 0.0598 |
| 189                    | 836.4           | 32.62                | 3.5             | 50                    | 51.720               | 0.0618 |
| 189                    | 836.4           | 32.53                | 3.5             | 60                    | 54.890               | 0.0656 |

| Traffic Channel Number | Frequency (MHz) | Transmit Power (dBm) | Voltage (Volts) | Temperature (Celsius) | Frequency Error (Hz) | PPM    |
|------------------------|-----------------|----------------------|-----------------|-----------------------|----------------------|--------|
| 189                    | 836.4           | 33.31                | 3.8             | -30                   | 54.820               | 0.0655 |
| 189                    | 836.4           | 33.23                | 3.8             | -20                   | 49.980               | 0.0598 |
| 189                    | 836.4           | 33.15                | 3.8             | -10                   | 48.300               | 0.0577 |
| 189                    | 836.4           | 33.05                | 3.8             | 0                     | 49.590               | 0.0593 |
| 189                    | 836.4           | 32.99                | 3.8             | 10                    | 47.980               | 0.0574 |
| 189                    | 836.4           | 32.90                | 3.8             | 20                    | 35.640               | 0.0426 |
| 189                    | 836.4           | 32.83                | 3.8             | 30                    | 53.720               | 0.0642 |
| 189                    | 836.4           | 32.74                | 3.8             | 40                    | 51.920               | 0.0621 |
| 189                    | 836.4           | 32.67                | 3.8             | 50                    | 56.630               | 0.0677 |
| 189                    | 836.4           | 32.56                | 3.8             | 60                    | 53.010               | 0.0634 |

| Traffic Channel Number | Frequency (MHz) | Transmit Power (dBm) | Voltage (Volts) | Temperature (Celsius) | Frequency Error (Hz) | PPM    |
|------------------------|-----------------|----------------------|-----------------|-----------------------|----------------------|--------|
| 189                    | 836.4           | 33.35                | 4.1             | -30                   | 54.180               | 0.0648 |
| 189                    | 836.4           | 33.28                | 4.1             | -20                   | 52.170               | 0.0624 |
| 189                    | 836.4           | 33.20                | 4.1             | -10                   | 45.010               | 0.0538 |
| 189                    | 836.4           | 33.12                | 4.1             | 0                     | 46.490               | 0.0556 |
| 189                    | 836.4           | 33.04                | 4.1             | 10                    | 54.630               | 0.0653 |
| 189                    | 836.4           | 32.96                | 4.1             | 20                    | 31.960               | 0.0382 |
| 189                    | 836.4           | 32.87                | 4.1             | 30                    | 53.590               | 0.0641 |
| 189                    | 836.4           | 32.79                | 4.1             | 40                    | 49.590               | 0.0593 |
| 189                    | 836.4           | 32.71                | 4.1             | 50                    | 58.760               | 0.0703 |
| 189                    | 836.4           | 32.61                | 4.1             | 60                    | 57.660               | 0.0689 |

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## GSM850 Results: channel 250 @ maximum transmitted power

| Traffic Channel Number | Frequency (MHz) | Transmit Power (dBm) | Voltage (Volts) | Temperature (Celsius) | Frequency Error (Hz) | PPM    |
|------------------------|-----------------|----------------------|-----------------|-----------------------|----------------------|--------|
| 250                    | 848.6           | 33.45                | 3.5             | -30                   | 59.020               | 0.0695 |
| 250                    | 848.6           | 33.37                | 3.5             | -20                   | 56.630               | 0.0667 |
| 250                    | 848.6           | 33.27                | 3.5             | -10                   | 53.140               | 0.0626 |
| 250                    | 848.6           | 33.17                | 3.5             | 0                     | 48.040               | 0.0566 |
| 250                    | 848.6           | 33.08                | 3.5             | 10                    | 42.550               | 0.0501 |
| 250                    | 848.6           | 32.99                | 3.5             | 20                    | 53.340               | 0.0629 |
| 250                    | 848.6           | 32.91                | 3.5             | 30                    | 50.750               | 0.0598 |
| 250                    | 848.6           | 32.82                | 3.5             | 40                    | 46.620               | 0.0549 |
| 250                    | 848.6           | 32.72                | 3.5             | 50                    | 58.570               | 0.0690 |
| 250                    | 848.6           | 32.63                | 3.5             | 60                    | 58.500               | 0.0689 |

| Traffic Channel Number | Frequency (MHz) | Transmit Power (dBm) | Voltage (Volts) | Temperature (Celsius) | Frequency Error (Hz) | PPM    |
|------------------------|-----------------|----------------------|-----------------|-----------------------|----------------------|--------|
| 250                    | 848.6           | 33.44                | 3.8             | -30                   | 57.340               | 0.0676 |
| 250                    | 848.6           | 33.35                | 3.8             | -20                   | 61.540               | 0.0725 |
| 250                    | 848.6           | 33.28                | 3.8             | -10                   | 51.400               | 0.0606 |
| 250                    | 848.6           | 33.19                | 3.8             | 0                     | 40.550               | 0.0478 |
| 250                    | 848.6           | 33.12                | 3.8             | 10                    | 43.390               | 0.0511 |
| 250                    | 848.6           | 33.02                | 3.8             | 20                    | 53.340               | 0.0629 |
| 250                    | 848.6           | 32.94                | 3.8             | 30                    | 47.400               | 0.0559 |
| 250                    | 848.6           | 32.86                | 3.8             | 40                    | 44.490               | 0.0524 |
| 250                    | 848.6           | 32.78                | 3.8             | 50                    | 58.050               | 0.0684 |
| 250                    | 848.6           | 32.67                | 3.8             | 60                    | 64.180               | 0.0756 |

| Traffic Channel Number | Frequency (MHz) | Transmit Power (dBm) | Voltage (Volts) | Temperature (Celsius) | Frequency Error (Hz) | PPM    |
|------------------------|-----------------|----------------------|-----------------|-----------------------|----------------------|--------|
| 250                    | 848.6           | 33.50                | 4.1             | -30                   | 55.660               | 0.0656 |
| 250                    | 848.6           | 33.43                | 4.1             | -20                   | 57.600               | 0.0679 |
| 250                    | 848.6           | 33.35                | 4.1             | -10                   | 54.370               | 0.0641 |
| 250                    | 848.6           | 33.26                | 4.1             | 0                     | 40.680               | 0.0479 |
| 250                    | 848.6           | 33.17                | 4.1             | 10                    | 46.430               | 0.0547 |
| 250                    | 848.6           | 33.08                | 4.1             | 20                    | 56.440               | 0.0665 |
| 250                    | 848.6           | 33.01                | 4.1             | 30                    | 47.270               | 0.0557 |
| 250                    | 848.6           | 32.91                | 4.1             | 40                    | 46.430               | 0.0547 |
| 250                    | 848.6           | 32.82                | 4.1             | 50                    | 57.020               | 0.0672 |
| 250                    | 848.6           | 32.72                | 4.1             | 60                    | 61.800               | 0.0728 |