# EMI Test Report

Tested in accordance with
Federal Communications Commission (FCC)
Personal Communications Services
CFR 47, Parts 15, Subpart B
And
Industry Canada (IC), ICES-003

## Research In Motion Limited

**REPORT NO.:** RIM-0048-0306-07

**PRODUCT MODEL NO.**: RAM10MN
**TYPE NAME**: BlackBerry Wireless Handheld
**FCC ID**: L6ARAM10MN
**IC**: 2503A-RAM10MN

**Date**: 03 July 2003

Report No. RIM-0048-0306-07 Test Date: June 26, 2003

**Statement of Performance:**

The Moditex BlackBerry Wireless Handheld, model RAM10MN ASY-06245-002 tested with the following accessories: Travel Charger model number SPS-015, part number ASY-02488-001, AC Power Adapter part number PWR-02232-002 and Docking/Charging Cradle model number ASY-02556-001 when configured and operated per RIM's operation instructions, performs within the requirements of the test standards.

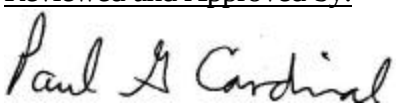
**Declaration:**

We hereby certify that:
The test data reported herein is an accurate record of the performance of the sample(s) tested.
The test 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:

Masud S. Attayi, P.Eng.
Senior Compliance Engineer Date: 24 July 2003

Reviewed and Approved by:



Paul G. Cardinal, Ph.D.
Manager, Compliance and Certification Date: 07 August 2003

# Table of Contents

## A) Scope

This report details the results of compliance tests which were performed in accordance with the requirements of:
FCC CFR 47 Part 15, Subpart B, Oct. 1, 2000, Class B Digital Devices, Unintentional Radiators
IC ICES-003, Nov. 22, 1997, Class B Digital Devices, Unintentional Radiators

## 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.net

The testing began on June 26, 2003 and completed on June 26, 2003. The sample equipment under test (EUT) included:

1) BlackBerry Wireless Handheld, model number RAM10MN, ASY-06245-002, RF PCB version 002, PIN 10331652, S/N 031/17/156161, FCC ID L6ARAM10MN, IC: 2503A-RAM10MN.
2) Travel Charger, model number SPS-015, part number ASY-02488-001 with an output voltage of 4.2 volts dc.
3) AC Power Adapter part number PWR-02232-002 with an output voltage of 12.0 volts dc.
4) Docking/Charging Cradle, model number ASY-02556-001

The transmit frequency band for the Handheld is 896 to 901 MHz.

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

1. PC System, Dell, model number MMP, serial number 6SPS20B
2. Monitor, ViewSonic, model number VCDTS23103-2M, serial number 24B022952648 with Moditex Config
3. Printer, H/P, model number C5884A, serial number US8251W0VQ
4) Signal Generator, model number 8646A, serial number 3838A02755

## D) Test Voltage

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

## E) Test Results Chart

| SPECIFICATION | Test Type | MEETS REQUIREMENTS | Performed By |
|---|---|---|---|
| FCC CFR 47 Part 15, Subpart B<br>IC ICES-003 | Class B | Yes | Masud Attayi |

## F) Modifications to EUT

No modifications were required on the EUT.

## G) Summary of Results

a) CONDUCTED EMISSIONS

The conducted emissions were measured while using the test procedure outlined in CISPR Recommendation 22 through a 50 Ohm Line Impedance Stabilization Network (LISN), which was inserted in the power line to the equipment to provide the specified impedance for measurements. The EUT was placed on a nonconductive wooden table, 80 cm high that was positioned 40 cm from a vertical ground plane. The RF output of the network was connected to an EMI receiver system with characteristics that duplicate those of the receiver specified in CISPR Publication 16.
The following test configurations were measured:

- The Travel Charger was connected to the Handheld. The ac input to the Travel Charger was 120 volts, 60 Hz.
- The Handheld was connected to the Docking/Charging Cradle in battery charge mode. The Docking/Charging Cradle data cable was connected to the support PC and to the AC Adapter. The ac input to the AC Adapter was 120 volts, 60 Hz.

The EUT was configured and operated in idle mode.

The sample EUT's conducted emissions were compared with respect to the FCC CFR 47 Part 15, Subpart B and IC ICES-003, Class B limit. The sample EUT had a worse case test margin of 7.49 dB at 1.900 MHz.

**Measurement Uncertainty ±2.0 dB**

To view the test data/plots, see APPENDIX 1.

b) RADIATED EMISSIONS

The radiated emissions from the EUT were measured using the methods outlined in CISPR Recommendation 22. The EUT was placed on a nonconductive wooden table, 80 cm high that was positioned on a remotely rotatable turntable. The test distance used between the EUT and the receiving antenna was three metres. The turntable was rotated to determine the azimuth of the peak emissions. At this point the emissions were maximized by elevating the antenna in the range of 1 to 4 metres. The maximum emission level was recorded. The frequency range measured was from 30 MHz to 1.0 GHz. Both the horizontal and vertical polarisations of the emissions were measured.
The measurements were done 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 configured and operated to produce the maximum radiated emissions while still keeping within RIM's specifications.
The following test configurations were measured:

- The Handheld was connected to the Travel Charger.
- The Handheld was connected to the support PC via the Docking/Charging Cradle.

The system's radiated emission levels in idle mode were compared with respect to the FCC CFR 47 Part 15, Subpart B and IC ICES-003, Class B limit.
The system **passed** with a worse case emission test margin of 6.23 dB at 40.895 MHz.

The EUT's receive RF local oscillator emissions were measured on the low and high channels (480 and 880) in the horizontial position connected to the Travel Charger. Both the horizontal and vertical polarizations were measured up to the $5^{th}$ harmonic.
The system **passed** with a worse case emission test margin of 7.20 dB at 895.00 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 2.

## H) **Compliance Test Equipment Used**

| UNIT | MANUFACTURER | MODEL / SERIAL NUMBER | CAL DUE DATE (YY MO DD) | USE |
|---|---|---|---|---|
| Preamplifier | Sonoma | 310N/11909A 185831 | 03-10-02 | Radiated Emissions |
| Preamplifier system | TDK | PA-02 080010 | 03-10-02 | Radiated Emissions |
| EMC Analyzer | Agilent | E7405A US40240226 | 03-09-21 | Radiated Emissions |
| Hybrid Log Antenna | TDK | HLP-3003C 017301 | 03-12-11 | Radiated Emissions |
| Horn Antenna | TDK | HRN-0118 130092 | 03-08-14 | Radiated Emissions |
| Horn Antenna | TDK | HRN-0118 030201 | 03-12-11 | Radiated Emissions |
| Signal Generator | HP | 8646A 3838A02755 | 03-08-07 | Radiated Emissions |
| L.I.S.N. | Emco | 3816/2 1120 | 03-08-29 | Conducted Emissions |
| L.I.S.N. | Emco | 3816/2 1118 | 03-08-29 | Conducted Emissions |
| Impulse Limiter | Rohde & Schwarz | ESHS-Z2 836248/052 | 03-10-04 | Conducted Emissions |
| EMI Receiver | Agilent | 85462A 3942A00517 | 03-10-04 | Conducted Emissions |
| RF Filter Section | Agilent | 85460A 3704A00481 | 03-10-04 | Conducted Emissions |
| | | | | |

# APPENDIX 1

# CONDUCTED EMISSIONS TEST DATA/PLOTS

## Conducted Emissions Test Results

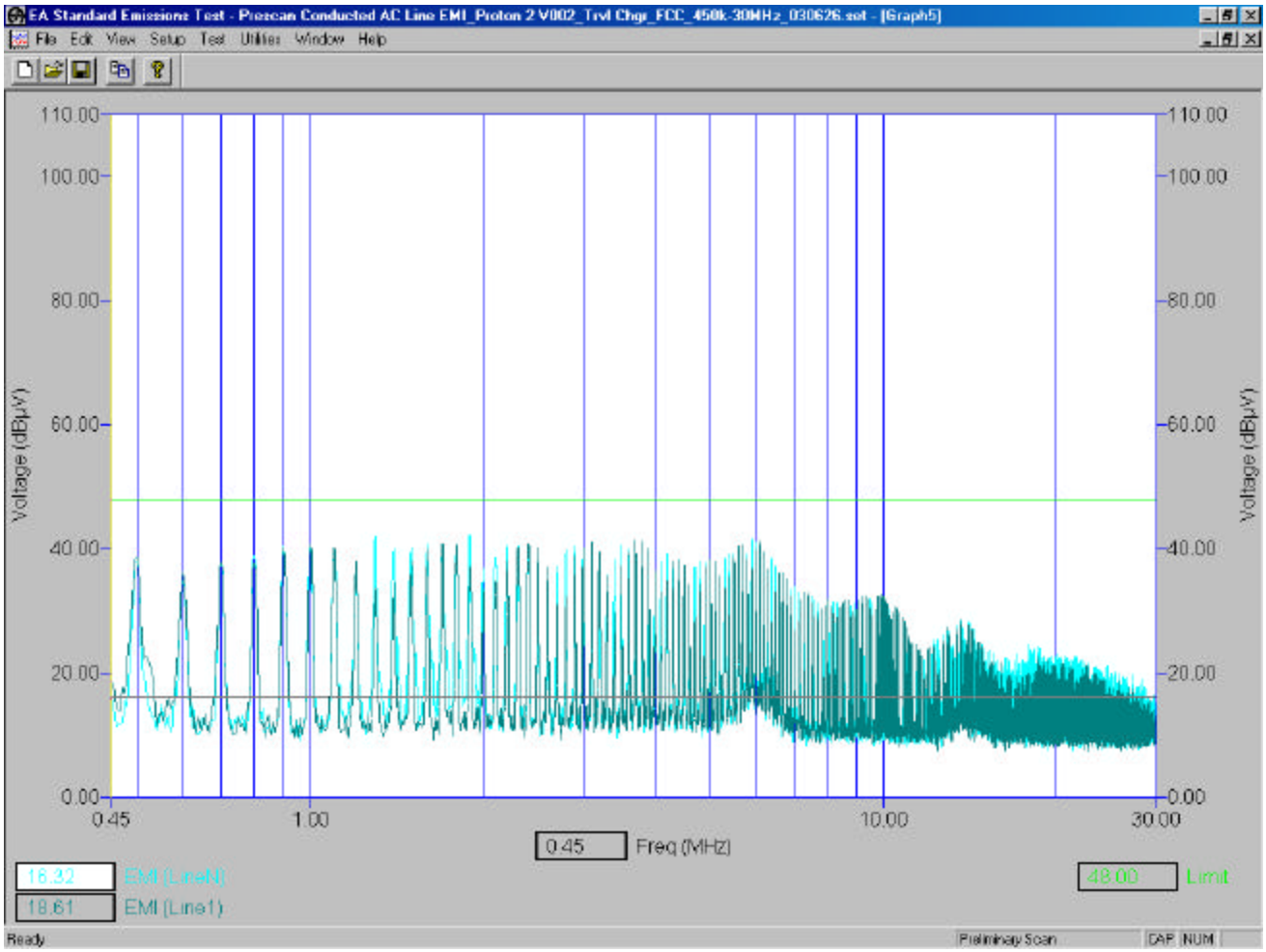
FCC CFR 47 Part 15, Subpart B, Class B June 26, 2003

Operating Mode: The Travel Charger was connected to the Handheld in battery charge mode. The ac input to the Travel Charger was 120 volts, 60 Hz.

| Frequency (MHz) | Line | READING Quasi-Peak (dBµV) | Correction Factors for Impulse Limiter, LISN, Cable (dB) | QP Level (reading + Corr.Factor) (dB) | Limit (dBµV) | Margin (dB) |
|---|---|---|---|---|---|---|
| 1.299 | N | 28.79 | 9.83 | 38.62 | 48.0 | -9.38 |
| 1.599 | N | 23.45 | 9.83 | 33.28 | 48.0 | -14.72 |
| 1.701 | L1 | 27.53 | 9.83 | 37.36 | 48.0 | -10.64 |
| 1.900 | N | 30.67 | 9.84 | 40.51 | 48.0 | -7.49 |
| 2.399 | L1 | 23.90 | 9.88 | 33.78 | 48.0 | -14.22 |
| 3.101 | L1 | 15.83 | 9.91 | 25.74 | 48.0 | -22.26 |
| 3.501 | N | 30.12 | 9.92 | 40.04 | 48.0 | -7.96 |
| 3.698 | L1 | 28.30 | 9.92 | 38.22 | 48.0 | -9.78 |
| 3.789 | L1 | 27.73 | 9.93 | 37.66 | 48.0 | -10.34 |
| 5.890 | N | 16.78 | 9.96 | 26.74 | 48.0 | -21.26 |
| 5.992 | N | 23.17 | 9.96 | 33.13 | 48.0 | -14.87 |
| 6.094 | L1 | 26.42 | 9.96 | 36.38 | 48.0 | -11.62 |
| | | | | | | |
| | | | | | | |

All other emission levels had a test margin of greater than 25 dB.

## Conducted Emissions Test Graph




The Travel Charger was connected to the Handheld in battery charge mode. The ac input to the Travel Charger was 120 volts, 60 Hz.

Conducted Emissions Test Results con't

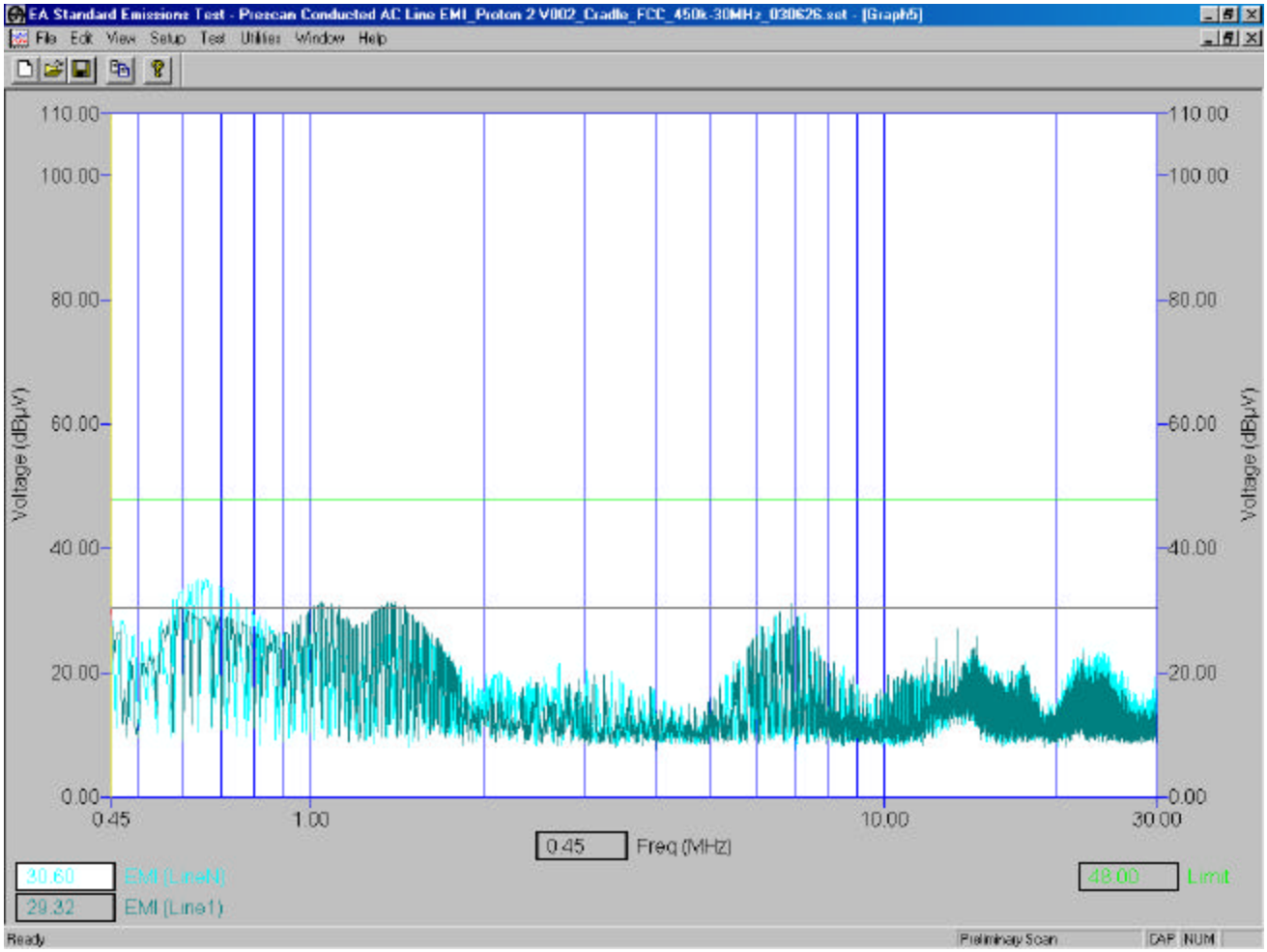
FCC CFR 47 Part 15, Subpart B, Class B June 26, 2003

Operating Mode: The Handheld was connected to the Docking/Charging Cradle in battery charge mode. The Docking/Charging Cradle data cable was connected to the support PC and to the AC Adapter.
The ac input to the AC Adapter was 120 volts, 60 Hz.

| Frequency (MHz) | Line | READING Quasi-Peak (dBµV) | Correction Factors for Impulse Limiter, LISN, Cable (dB) | QP Level (reading + Corr.Factor) (dB) | Limit (dBµV) | Margin (dB) |
|---|---|---|---|---|---|---|
| 0.618 | N | 26.42 | 9.78 | 36.20 | 48.0 | -11.80 |
| 0.632 | N | 26.91 | 9.78 | 36.69 | 48.0 | -11.31 |
| 0.641 | N | 27.02 | 9.79 | 36.81 | 48.0 | -11.19 |
| 0.656 | N | 27.18 | 9.79 | 36.97 | 48.0 | -11.03 |
| 0.666 | N | 27.23 | 9.80 | 37.03 | 48.0 | -10.97 |
| 0.678 | N | 27.18 | 9.80 | 36.98 | 48.0 | -11.02 |
| 1.041 | L1 | 22.67 | 9.81 | 32.48 | 48.0 | -15.52 |
| 1.047 | L1 | 22.80 | 9.81 | 32.61 | 48.0 | -15.39 |
| 1.370 | L1 | 22.78 | 9.83 | 32.61 | 48.0 | -15.39 |
| 1.392 | L1 | 22.96 | 9.83 | 32.79 | 48.0 | -15.21 |
| 1.400 | L1 | 23.01 | 9.83 | 32.84 | 48.0 | -15.16 |
| 6.918 | L1 | 21.10 | 9.94 | 31.04 | 48.0 | -16.96 |
| | | | | | | |
| | | | | | | |

All other emission levels had a test margin of greater than 25 dB.

## Conducted Emissions Test Graph




The Handheld was connected to the Docking/Charging Cradle in battery charge mode. The Docking/Charging Cradle data cable was connected to the support PC and to the AC Adapter.
The ac input to the AC Adapter was 120 volts, 60 Hz

## Conducted Emission Test-Setup Photos

FCC CFR 47 Part 15, Subpart B, Class B

# APPENDIX 2

# RADIATED EMISSIONS TEST DATA

Report No. RIM-0048-0306-07 Test Date: June 26, 2003

## Radiated Emissions Test Results

FCC CFR 47 Part 15, Subpart B, Class B June 26, 2003

Operating Mode: The Handheld was connected to the Travel Charger. The Handheld was operating in battery charging mode. The ac input to the Travel Charger was 120 volts, 60 Hz.
Test Distance was 3.0 metres.

| Frequency (MHz) | Antenna Pol. (V/H) | Antenna Height (metres) | Test Angle (Deg.) | Detector (Q.P. or Peak) | Measured Level (dBµV) | Correction Factors for preamp/antenna/cables/ filter (dB/m) | Field Strength Level (reading+corr.) (dBµV/m) | Limit @ 3.0 m (dBµV/m) | Test Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| 40.578 | H | 3.02 | 287 | Q.P. | 44.87 | -20.68 | 24.19 | 40.0 | -15.81 |
| 40.895 | V | 1.39 | 147 | Q.P. | 54.52 | -20.75 | 33.77 | 40.0 | -6.23 |
| 51.216 | H | 3.50 | 273 | Q.P. | 43.99 | -21.92 | 22.07 | 40.0 | -17.93 |
| 51.705 | V | 1.72 | 158 | Q.P. | 55.39 | -21.94 | 33.45 | 40.0 | -6.55 |
| 60.877 | V | 1.00 | 76 | Q.P. | 38.12 | -21.78 | 16.34 | 40.0 | -23.66 |
| 95.247 | H | 2.17 | 277 | Q.P. | 39.55 | -19.37 | 20.18 | 43.5 | -23.32 |
| 95.712 | H | 3.26 | 187 | Q.P. | 38.15 | -19.41 | 18.74 | 43.5 | -24.76 |
| | | | | | | | | | |

All other emission levels had a test margin of greater than 25 dB.

## Radiated Emissions Test Results con't

FCC CFR 47 Part 15, Subpart B, Class B June 26, 2003

Operating Mode: The Handheld was connected to the support PC via the docking/Charging Cradle for charging and data link. The ac input to the AC Adapter was 120 volts, 60 Hz.
Test Distance was 3.0 metres.

| Frequency (MHz) | Antenna Pol. (V/H) | Antenna Height (metres) | Test Angle (Deg.) | Detector (Q.P. or Peak) | Measured Level (dBµV) | Correction Factors for preamp/antenna/cables/ filter (dB/m) | Field Strength Level (reading+corr.) (dBµV/m) | Limit @ 3.0 m (dBµV/m) | Test Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| 100.099 | H | 2.79 | 90 | Q.P. | 53.29 | -19.60 | 33.69 | 43.5 | -9.81 |
| 100.627 | V | 2.82 | 192 | Q.P. | 54.91 | -19.57 | 35.34 | 43.5 | -8.16 |
| 500.391 | V | 1.62 | 181 | Q.P. | 42.90 | -8.31 | 34.59 | 46.0 | -11.41 |
| 503.375 | V | 1.54 | 181 | Q.P. | 41.89 | -8.26 | 33.63 | 46.0 | -12.37 |
| 600.991 | H | 2.02 | 190 | Q.P. | 44.23 | -5.68 | 38.55 | 46.0 | -7.45 |
| 604.116 | H | 2.01 | 191 | Q.P. | 45.10 | -5.68 | 39.41 | 46.0 | -6.59 |
| 900.526 | H | 1.92 | 4 | Q.P. | 31.10 | -1.40 | 29.61 | 46.0 | -16.39 |
| 900.725 | V | 1.44 | 3 | Q.P. | 33.77 | -1.40 | 32.37 | 46.0 | -13.63 |
| 901.215 | V | 1.73 | 176 | Q.P. | 34.86 | -1.40 | 33.46 | 46.0 | -12.54 |
| 901.522 | H | 2.01 | 336 | Q.P. | 32.54 | -1.39 | 31.15 | 46.0 | -14.85 |
| 905.609 | V | 1.78 | 175 | Q.P. | 35.95 | -1.40 | 34.55 | 46.0 | -11.45 |
| 906.403 | H | 1.84 | 340 | Q.P. | 33.27 | -1.39 | 31.88 | 46.0 | -14.12 |
| | | | | | | | | | |

## Radiated Emissions Test Results con't

The measurements were performed with the handheld in a horizontal position connected to the Travel Charger.

Test Distance was 3.0 metres. June 26, 2003

| Type | Channel | Frequency | Antenna | | Reading | Corrected Reading | Limit | Diff. To Limit |
|---|---|---|---|---|---|---|---|---|
| | | (MHz) | Type | Pol | (dBuV) | (dBuV) | (dBuv/m) | (dB) |
| (Local Oscillator)<br>Receive RF Local Oscillator (LO) Tx/Rx mode<br>**Low Channel** | | | | | | | | |
| F0 | 480 | 890.000 | HLP | V | 39.1 | 37.6 | 46.0 | -8.4 |
| F0 | 480 | 890.000 | HLP | H | 40.0 | 38.5 | 46.0 | -7.5 |
| 2nd | 480 | 1780.000 | Horn | V | 36.5 | 38.9 | 54.0 | -15.1 |
| 2nd | 480 | 1780.000 | Horn | H | NF | | | |
| The LO was measured up to the 5th harmonic.<br>Emissions above the 2nd harmonic where in the NF.<br>**High Channel** | | | | | | | | |
| F0 | 880 | 895.000 | HLP | V | 39.0 | 37.5 | 46.0 | -8.5 |
| F0 | 880 | 895.000 | HLP | H | 40.3 | 38.8 | 46.0 | -7.2 |
| 2nd | 880 | 1790.000 | Horn | V | 35.6 | 38.0 | 54.0 | -16.0 |
| 2nd | 880 | 1790.000 | Horn | H | NF | | | |
| The LO was measured up to the 5th harmonic.<br>Emissions above the 2nd harmonic where in the NF. | | | | | | | | |

## Radiated Emissions Test Photo