Engineering and Testing for EMC and Safety Compliance

# CLASS II PERMISSIVE CHANGE REPORT

**E. F. Johnson Company**
**299 Johnson Avenue**
**Waseca, MN 65093**
**John Oblak (507) 835-6276**

**MODEL: 242-5180**

**FCC ID: ATH2425180**

***November 6, 2003***

| STANDARDS REFERENCED FOR THIS REPORT | |
|---|---|
| PART 2: 1999 | FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS |
| PART 15: 1999 | §15.109: RADIATED EMISSIONS LIMITS |
| PART 90: 1998 | PRIVATE LAND MOBILE RADIO SERVICES |
| PART 22: 1998 | PUBLIC MOBILE SERVICES |
| ANSI C63.4-1992 | STANDARD FORMAT MEASUREMENT/TECHNICAL REPORT PERSONAL COMPUTER AND PERIPHERALS |
| ANSI/TIA/EIA603- 1992 | LAND MOBILE FM OR PM COMMUNICATIONS EQUIPMENT MEASUREMENT AND PERFORMANCE STANDARDS |
| ANSI/TIA/EIA 603-1-1998 | ADDENDUM TO ANSI/TIA/EIA 603-1992 |
| ANSI/TIA/EIA –102.CAAA; 1999 | DIGITAL C4FM/CQPSK TRANSCEIVER MEASUREMENT METHODS |
| RSS-119; Issue 6; 2000 | LAND MOBILE AND FIXED RADIO TRANSMITTERS AND RECEIVERS 27.41 TO 960.0 MHZ |

| Frequency Range | Output Power (W) Conducted | Frequency Tolerance (ppm) | Emission Designator |
|---|---|---|---|
| 806.0125-823.9875 MHz | 3.45 | 2.5 | 16K0F3E |
| 806.0125-823.9875 MHz | 3.42 | 2.5 | 14K0F3E |
| 806.0125-823.9875 MHz | 3.43 | 2.5 | 8K10F1E |
| 851.0125-868.9875 MHz | 3.47 | 2.5 | 16K0F3E |
| 851.0125-868.9875 MHz | 3.45 | 2.5 | 14K0F3E |
| 851.0125-868.9875 MHz | 3.43 | 2.5 | 8K10F1E |

**REPORT PREPARED BY:**

**TEST ENGINEER: DANIEL BALTZELL**

*Document Number: 2003180 / QRTL03-115*



360 Herndon Parkway, Suite 1400
Herndon, VA 20170
Telephone: 703-689-0368 Fax: 703-689-2056 Metro: 703-471-6441

## TABLE OF CONTENTS



## INDEX OF TABLES



## INDEX OF FIGURES

## INDEX OF APPENDIXES



## INDEX OF PHOTOGRAPHS

# 1 GENERAL INFORMATION

The following Report of a Class II Permissive Change is prepared on behalf of **E. F. Johnson Company** in accordance with the Federal Communications Commission and Industry Canada Rules and Regulations. The Equipment Under Test (EUT) was Model **242-5180; FCC ID: ATH2425180**. The test results reported in this document relate only to the item that was tested.

All measurements contained in this application were conducted in accordance with FCC Rules and Regulations CFR 47, Industry Canada RSS-119, and ANSI C63.4 Methods of Measurement of Radio Noise Emissions, 1992. The instrumentation utilized for the measurements conforms to the ANSI C63.4 standard for EMI and Field Strength Instrumentation. Calibration checks are performed regularly on the instruments, and all accessories including high pass filter, coaxial attenuator, preamplifier and cables.

## 1.1 TEST FACILITY

The open area test site and conducted measurement facility used to collect the radiated data is located on the parking lot of Rhein Tech Laboratories, Inc. 360 Herndon Parkway, Suite 1400, Herndon, Virginia 20170. This site has been fully described in a report dated March 3, 1994, submitted to and approved by the Federal Communications Commission to perform AC line conducted and radiated emissions testing (ANSI C63.4 1992).

## 1.2 RELATED SUBMITTAL(S)/GRANT(S)

The original application for Certification was FCC ID: ATH2425180; this is a Class II Permissive Change per FCC 2.1043(b)(2).

## 1.3 DESCRIPTION OF CHANGE IN DEVICE

A new stubby antenna is being added which can be used connected directly to the radio body or connected to the external speaker/microphone. A new Alkaline battery pack is also being added. No changes have been made to the radio itself.

## 1.4 TESTED SYSTEM DETAILS

Listed below are the identifiers and descriptions of all equipment, cables, and internal devices used with the EUT for this test, as applicable.

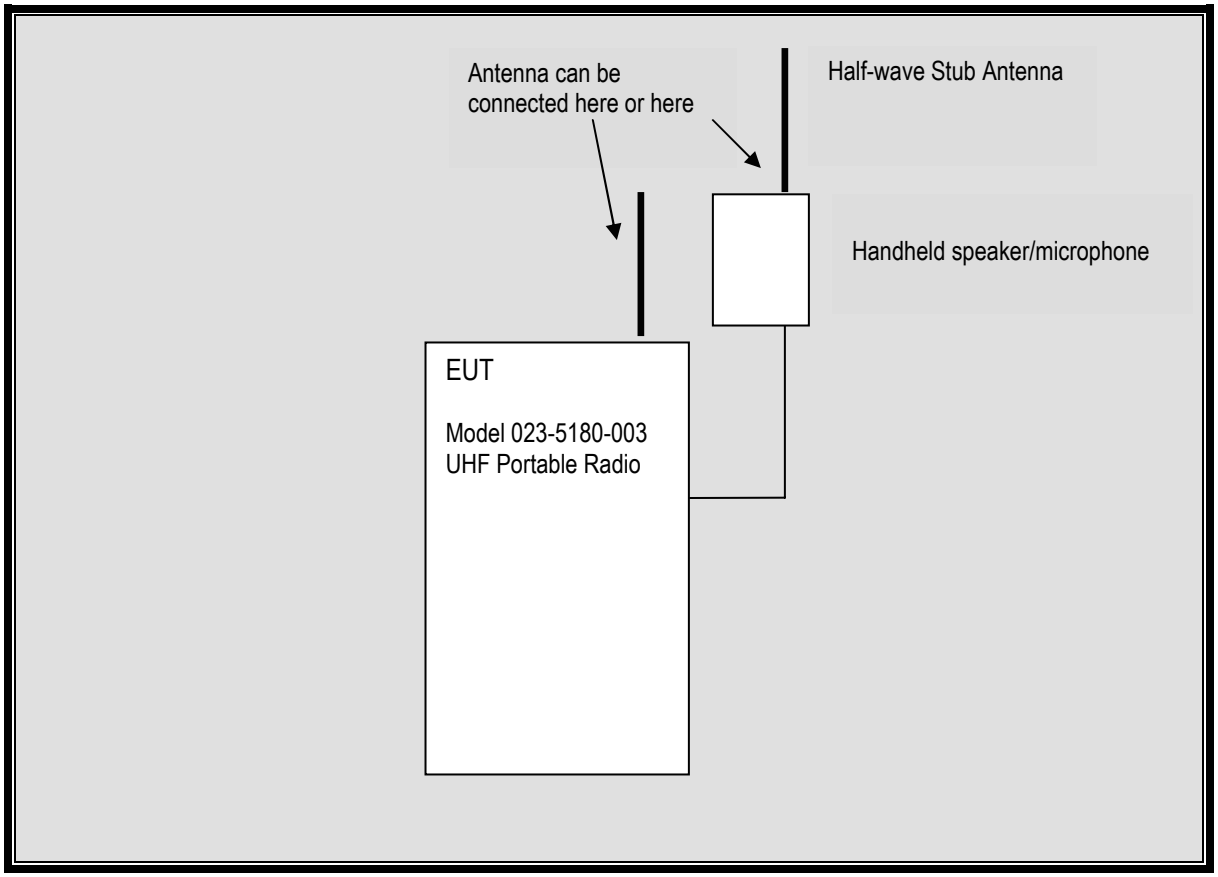
**TABLE 1-1: EQUIPMENT UNDER TEST (EUT)**

| Part | Manufacturer | Model | Serial Number | FCC ID | RTL Bar Code |
|---|---|---|---|---|---|
| UHF Portable Radio | EF JOHNSON | 023-5180-003 | 51830A103A 16525 | ATH2425180 | 15066 |

**TABLE 1-2: EXTERNAL COMPONENTS USED IN TEST CONFIGURATION**

| Part | Manufacturer | Model | Serial Number | FCC ID | RTL Bar Code |
|---|---|---|---|---|---|
| Speaker/Microphone | Speaker/Microphone | 242-5180 | CLI-433-005 | N/A | 14857 |
| Speaker/Microphone | Speaker/Microphone | 242-5180 | CLI-433-012 | N/A | 15068 |
| Stub Antenna | EF JOHNSON | Half-wave | CLI-433-009 | N/A | 15529 |
| 9V AA Alkaline Cell Pack | EF JOHNSON | 242-5180 | CLI-433-002 | N/A | 15065 |

**FIGURE 1-1: CONFIGURATION OF TESTED SYSTEM**



## 2 FIELD STRENGTH CALCULATION

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FI(dBuV/m) = SAR(dBuV) + SCF(dB/m)
FI = Field Intensity
SAR = Spectrum Analyzer Reading
SCF = Site Correction Factor

The Site Correction Factor (SCF) used in the above equation is determined empirically, and is expressed in the following equation:

SCF(dB/m) = - PG(dB) + AF(dB/m) + CL(dB)

SCF = Site Correction Factor
PG = Pre-amplifier Gain
AF = Antenna Factor
CL = Cable Loss

The field intensity in microvolts per meter can then be determined according to the following equation:

$$FI(uV/m) = 10^{FI(dBuV/m)/20}$$

For example, assume a signal at a frequency of 125 MHz has a received level measured as 49.3 dBuV. The total Site Correction Factor (antenna factor plus cable loss minus preamplifier gain) for 125 MHz is -11.5 dB/m. The actual radiated field strength is calculated as follows:

49.3 dBuV - 11.5 dB/m = 37.8 dBuV/m

$$10^{37.8/20} = 10^{1.89} = 77.6 \text{ uV/m}$$

# 3 RADIATED EMISSIONS

## 3.1 RADIATED MEASUREMENT

Before final measurements of radiated emissions were made on the open-field three meter range, the EUT was scanned indoors at a three meter distance in order to determine its emissions spectrum signature. The physical arrangement of the test system and associated cabling was varied in order to determine the effect on the EUT's emissions in amplitude, direction and frequency. This process was repeated during final radiated emissions measurements on the open-field range, at each frequency, in order to insure that maximum emission amplitudes were attained.

Final radiated emissions measurements were made on the three-meter, open-field test site. The EUT was placed on a nonconductive turntable at specified level.

At each frequency, the EUT was rotated 360 degrees, and the antenna was raised and lowered from one to four meters in order to determine the maximum emission levels. Measurements were taken using both horizontal and vertical antenna polarizations.

*Note: Rhein Tech Laboratories, Inc. has implemented procedures to minimize errors that occur from test instruments, calibration, procedures, and test setups. Test instrument and calibration errors are documented from the manufacturer or calibration lab. Other errors have been defined and calculated within the Rhein Tech Quality Manual, section 6.1. Rhein Tech implements the following procedures to minimize errors that may occur: yearly, as well as daily calibration methods, technician training, and emphasis to employees on avoiding error.*

# 4 FCC RULES AND REGULATIONS PART 2 §2.1046 (A): RF POWER OUTPUT: CONDUCTED

## 4.1 TEST PROCEDURE

ANSI/TIA/EIA-603-1992, section 2.2.1

The EUT was connected to a coaxial attenuator having a 50 Ω load impedance.

## 4.2 TEST DATA

**TABLE 4-1: RF POWER OUTPUT (HIGH POWER): CARRIER OUTPUT POWER (UNMODULATED)**

| Channel | Frequency (MHz) | RF Power measured (Watt)* | Modulation Type |
|---|---|---|---|
| 1 | 806.0125 | 3.42 | 25 KHz Analog |
| 2 | 815.5000 | 3.45 | 25 KHz Analog |
| 3 | 823.9875 | 3.44 | 25 KHz Analog |
| 4 | 806.0125 | 3.40 | NPSPC Analog |
| 5 | 815.5000 | 3.42 | NPSPC Analog |
| 6 | 823.9875 | 3.42 | NPSPC Analog |
| 7 | 806.0125 | 3.37 | P25 Digital |
| 8 | 815.5000 | 3.42 | P25 Digital |
| 9 | 823.9875 | 3.43 | P25 Digital |
| 10 | 851.0125 | 3.43 | 25 KHz Analog |
| 11 | 860.5000 | 3.45 | 25 KHz Analog |
| 12 | 868.9875 | 3.47 | 25 KHz Analog |
| 13 | 851.0125 | 3.43 | NPSPC Analog |
| 14 | 860.5000 | 3.45 | NPSPC Analog |
| 15 | 868.9875 | 3.45 | NPSPC Analog |
| 16 | 815.0125 | 3.43 | P25 Digital |

* Measurement accuracy: +/- .02 dB (logarithmic mode)
* Measurement was taken from antenna port on radio

**TABLE 4-2: RF POWER OUTPUT (RATED POWER)**

| Rated Power (W) |
|---|
| 3.4 W |

**TABLE 4-3: TEST EQUIPMENT USED FOR TESTING (RF POWER OUTPUT - CONDUCTED)**

| RTL Asset # | Manufacturer | Model | Part Type | Serial Number | Calibration Due Date |
|---|---|---|---|---|---|
| 901184 | Agilent Technologies | E4416A | EPM-P Power Meter, single channel | GB41050573 | 7/30/04 |
| 901186 | Agilent Technologies | E9323A (50 MHz – 6 GHz) | Peak & Average Power Sensor | US40410380 | 7/30/04 |
| 901139 | Weinschel Corp. | 48-20-34 DC-18GHz | Attenuator, 100W 20dB | BK5859 | 5/13/04 |

TEST PERSONNEL:

| RICHARD B. MCMURRAY | Richard B. McMurray | OCTOBER 6, 2003 |
|---|---|---|
| TEST ENGINEER | SIGNATURE | DATE OF TEST |

# 5 FCC PART 2 §2.1046 (A): RF POWER OUTPUT: RADIATED

## 5.1 RF POWER OUTPUT: RADIATED TEST PROCEDURE

**Substitution Method:**

The EUT was setup at an antenna to EUT distance of 3 meters on an open area test site. The EUT was placed on a nonconductive turntable 1.0 meter above the ground plane. The physical arrangement of the EUT was varied through three orthogonal planes in order to determine the effect on the EUT's emissions in amplitude, direction and frequency. At each frequency, the EUT was rotated 360 degrees, and the antenna was raised and lowered from one to four meters in order to determine the maximum emission levels. Measurements were taken using both horizontal and vertical antenna polarizations. The worst-case, maximum radiated emission was recorded and used as reference for the measurement. The EUT was then replaced by a ½ wave dipole antenna and polarized in accordance with the EUT's antenna polarization. The ½ wave dipole antenna was connected to a RF signal generator with a coaxial cable. The search antenna height, and search antenna polarity was set to levels that produced the maximum reading obtained. The signal generator was adjusted to a level that produced that maximum radiated emission level. The signal generator level was recorded and corrected by the power loss in the cable between the generator and the antenna and further corrected for the gain of the substitution antenna used relative to an ideal ½ wave dipole antenna. The signal generator corrected level is the ERP level.

## 5.2 RF POWER OUTPUT: §2.1046 RADIATED TEST DATA

The following channels (in MHz) were tested: 806.0125; 815.0125; 823.9875; 851.0125; 860.0125; and 868.9875 MHz. The worst-case Output Power (highest) levels are shown.

**TABLE 5-1: RADIATED CARRIER OUTPUT POWER (STUB ANTENNA ON RADIO)**

| Frequency (MHz) | Spectrum Analyzer Level (dBuV) | Signal Generator Level (dBm) | Cable Loss (dB)* | Antenna Factor (dBd) | ERP (dBm) | ERP (W) |
|---|---|---|---|---|---|---|
| 806.0125 | 116.5 | 34.7 | 0.2 | -1.3 | 33.2 | 2.1 |
| 815.0125 | 116.0 | 34.5 | 0.2 | -1.3 | 33.0 | 2.0 |
| 823.9875 | 115.3 | 35.0 | 0.2 | -1.3 | 33.5 | 2.2 |
| 851.0125 | 115.2 | 35.0 | 0.3 | -1.2 | 33.6 | 2.2 |
| 860.0125 | 115.5 | 36.0 | 0.3 | -1.2 | 34.6 | 2.8 |
| 868.9875 | 115.5 | 35.8 | 0.3 | -1.2 | 34.4 | 2.7 |

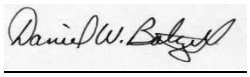
*Cable loss from transmitting antenna to signal generator
*Measurement accuracy is +/- .5 dB

**TABLE 5-2: RADIATED CARRIER OUTPUT POWER (STUB ANTENNA ON HANDSET)**

| Frequency (MHz) | Spectrum Analyzer Level (dBuV) | Signal Generator Level (dBm) | Cable Loss (dB)* | Antenna Factor (dBd) | ERP (dBm) | ERP (W) |
|---|---|---|---|---|---|---|
| 806.0125 | 113.2 | 31.4 | 0.4 | -1.3 | 29.7 | 0.9 |
| 815.0125 | 113.3 | 31.8 | 0.4 | -1.3 | 30.1 | 1.0 |
| 823.9875 | 112.3 | 32.0 | 0.4 | -1.3 | 30.3 | 1.1 |
| 851.0125 | 112.2 | 32.0 | 0.4 | -1.2 | 30.5 | 1.1 |
| 860.0125 | 112.5 | 33.0 | 0.4 | -1.2 | 31.5 | 1.4 |
| 868.9875 | 112.4 | 32.7 | 0.4 | -1.2 | 31.2 | 1.3 |

*Cable loss from transmitting antenna to signal generator

TEST PERSONNEL:

| DANIEL BALTZELL |  | NOVEMBER 4, 2003 |
|---|---|---|
| TEST ENGINEER | SIGNATURE | DATE OF TEST |

## 5.3 TEST EQUIPMENT

**TABLE 5-3: TEST EQUIPMENT**

| RTL Asset # | Manufacturer | Model | Part Type | Serial Number | Calibration Due Date |
|---|---|---|---|---|---|
| 900878 | Rhein Tech Labs | AM3-1197-0005 | 3 meter antenna mast, polarizing | Outdoor Range 1 | not req'd |
| 900928 | Hewlett Packard | 83752A | Synthesized Sweeper (0.01 - 20 GHz) | 3610A00866 | 8/5/04 |
| 901020 | Hewlett Packard | 8564E | Portable Spectrum Analyzer (9 kHz - 40 GHz) | 3943A01719 | 7/15/04 |
| 901053 | Schaffner Chase | CBL6112B | Bi-Log Antenna, (20 MHz - 2 GHz) | 2648 | 7/03/04 |
| 901235 | IW Microwave Products | KPS-1503-360-KPS | High frequency RF cable, 36" | N/A | 1/30/04 |
| 901231 | IW Microwave Products | KPW-1503-2400-KPS | High Frequency RF Cables | 240" | 1/30/04 |
| 901242 | Rhein Tech Labs | WRT-000-0003 | Wood rotating table | w/o top for wireless testing | not req'd |
| 900154 | Compliance Design Inc, | Roberts Dipole | Adjustable Elements Dipole Antenna (3 0 - 1000 MHz) | 900154 | 10/6/04 |

# 6 FCC RULES AND REGULATIONS PART 2 §2.1053 (A): FIELD STRENGTH OF SPURIOUS RADIATION

## 6.1 TEST PROCEDURE

ANSI/TIA/EIA-603-1992, section 2.2.12

The spurious emissions levels were measured and the device under test was replaced by a substitution antenna connected to a signal generator. This signal generator level was then corrected by subtracting the cable loss from the substitution antenna to the signal generator and the gain of the antenna was further corrected to a half wave dipole.

## 6.2 TEST DATA

### 6.2.1 CFR 47 PART 90.210 REQUIREMENTS

The worst-case emissions test data are shown. The magnitude of emissions attenuated more than 20 dB below the FCC limit need not be recorded.

**TABLE 6-1: FIELD STRENGTH OF SPURIOUS RADIATION CHANNEL 2 – 815.0125 MHZ; WIDE BAND (ANTENNA MOUNTED ON RADIO)**

Radiated Spurious Emissions
Mid Band Channel 2 (815.0125 MHz, Wideband)
Limit = 43 + 10 Log P = 48.38 dBc
Conducted Power = 35.38 dBm = 3.45 W

| Frequency (MHz) | Spectrum Analyzer Level (dBuV) | Signal Generator Level (dBm) | Cable Loss (dB)* | Antenna Gain (dBd) | Corrected Signal Generator Level (dBc) | Margin (dB) |
|---|---|---|---|---|---|---|
| 1630.0250 | 55.8 | -21.5 | 0.5 | 4.7 | 52.7 | -4.3 |
| 2445.0375 | 72.0 | -16.7 | 8.5 | 5.1 | 55.5 | -7.1 |
| 3260.0500 | 60.5 | -24.7 | 11.2 | 6.1 | 65.2 | -16.8 |
| 4075.0625 | 53.0 | -34.2 | 0.9 | 6.0 | 64.5 | -16.1 |
| 4890.0750 | 48.7 | -38.3 | 1.0 | 7.0 | 67.7 | -19.3 |
| 5705.0875 | 46.2 | -39.5 | 1.2 | 6.5 | 69.6 | -21.2 |
| 6520.1000 | 39.7 | -38.4 | 1.5 | 7.8 | 67.5 | -19.2 |
| 7335.1125 | 38.0 | -32.6 | 1.4 | 7.6 | 61.8 | -13.4 |
| 8150.1250 | 35.2 | -46.0 | 1.4 | 8.4 | 74.4 | -26.0 |

*This insertion loss corresponds to the cable connecting the RF Signal Generator to the ½ wave dipole antenna.

**TABLE 6-2: FIELD STRENGTH OF SPURIOUS RADIATION CHANNEL 11 – 860.0125 MHZ; WIDE BAND (ANTENNA MOUNTED ON RADIO)**

Radiated Spurious Emissions
Mid Band Channel 11 (860.0125 MHz, Wideband)
Limit = 43 + 10 Log P = 48.38 dBc
Conducted Power = 35.38 dBm = 3.45 W

| Frequency (MHz) | Spectrum Analyzer Level (dBuV) | Signal Generator Level (dBm) | Cable Loss (dB)* | Antenna Gain (dBd) | Corrected Signal Generator Level (dBc) | Margin (dB) |
|---|---|---|---|---|---|---|
| 1720.0250 | 57.8 | -19.4 | 0.5 | 4.7 | 50.5 | -2.2 |
| 2580.0375 | 61.8 | -25.7 | 8.0 | 5.3 | 63.8 | -15.4 |
| 3440.0500 | 62.8 | -21.5 | 11.8 | 6.0 | 62.7 | -14.3 |
| 4300.0625 | 44.7 | -41.2 | 0.9 | 6.6 | 70.9 | -22.5 |
| 5160.0750 | 46.0 | -40.8 | 1.1 | 6.8 | 70.5 | -22.1 |
| 6020.0875 | 40.3 | -42.5 | 1.4 | 6.7 | 72.6 | -24.2 |
| 6880.1000 | 37.5 | -37.3 | 1.5 | 7.7 | 66.5 | -18.1 |
| 7740.1125 | 34.7 | -37.7 | 1.3 | 8.0 | 66.4 | -18.0 |
| 8600.1250 | 39.5 | -40.7 | 1.4 | 8.1 | 69.4 | -21.0 |

*This insertion loss corresponds to the cable connecting the RF Signal Generator to the ½ wave dipole antenna.

**TABLE 6-3: FIELD STRENGTH OF SPURIOUS RADIATION CHANNEL 2 – 815.0125 MHZ; WIDE BAND (ANTENNA MOUNTED ON HANDSET)**

Radiated Spurious Emissions
Mid Band Channel 2 (815.0125 MHz, Wideband)
Limit = 43 + 10 Log P = 48.38 dBc
Conducted Power = 35.38 dBm = 3.45 W

| Frequency (MHz) | Spectrum Analyzer Level (dBuV) | Signal Generator Level (dBm) | Cable Loss (dB)* | Antenna Gain (dBd) | Corrected Signal Generator Level (dBc) | Margin (dB) |
|---|---|---|---|---|---|---|
| 1630.0250 | 46.3 | -31.0 | 0.5 | 4.7 | 62.2 | -13.8 |
| 2445.0375 | 53.3 | -35.4 | 8.5 | 5.1 | 74.2 | -25.8 |
| 3260.0500 | 37.0 | -48.2 | 11.2 | 6.1 | 88.7 | -40.3 |
| 4075.0625 | 28.8 | -58.4 | 0.9 | 6.0 | 88.7 | -40.3 |
| 4890.0750 | 27.0 | -60.0 | 1.0 | 7.0 | 89.4 | -41.0 |
| 5705.0875 | 28.2 | -57.5 | 1.2 | 6.5 | 87.6 | -39.2 |
| 6520.1000 | 23.2 | -54.9 | 1.5 | 7.8 | 84.0 | -35.7 |
| 7335.1125 | 26.7 | -43.9 | 1.4 | 7.6 | 73.1 | -24.7 |
| 8150.1250 | 20.8 | -60.4 | 1.4 | 8.4 | 88.8 | -40.4 |

*This insertion loss corresponds to the cable connecting the RF Signal Generator to the ½ wave dipole antenna.

**TABLE 6-4: FIELD STRENGTH OF SPURIOUS RADIATION CHANNEL 11 – 860.0125 MHZ; WIDE BAND (ANTENNA MOUNTED ON HANDSET)**

Radiated Spurious Emissions
Mid Band Channel 11 (860.0125 MHz, Wideband)
Limit = 43 + 10 Log P = 48.38 dBc
Conducted Power = 35.38 dBm = 3.45 W

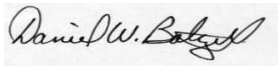
| Frequency (MHz) | Spectrum Analyzer Level (dBuV) | Signal Generator Level (dBm) | Cable Loss (dB)* | Antenna Gain (dBd) | Corrected Signal Generator Level (dBc) | Margin (dB) |
|---|---|---|---|---|---|---|
| 1720.0250 | 45.2 | -32.0 | 0.5 | 4.7 | 63.1 | -14.8 |
| 2580.0375 | 51.7 | -35.8 | 8.0 | 5.3 | 73.9 | -25.5 |
| 3440.0500 | 47.5 | -36.8 | 11.8 | 6.0 | 78.0 | -29.6 |
| 4300.0625 | 30.0 | -55.9 | 0.9 | 6.6 | 85.6 | -37.2 |
| 5160.0750 | 30.0 | -56.8 | 1.1 | 6.8 | 86.5 | -38.1 |
| 6020.0875 | 30.5 | -52.3 | 1.4 | 6.7 | 82.4 | -34.0 |
| 6880.1000 | 29.0 | -45.8 | 1.5 | 7.7 | 75.0 | -26.6 |
| 7740.1125 | 28.7 | -43.7 | 1.3 | 8.0 | 72.4 | -24.0 |
| 8600.1250 | 30.8 | -49.4 | 1.4 | 8.1 | 78.1 | -29.7 |

*This insertion loss corresponds to the cable connecting the RF Signal Generator to the ½ wave dipole antenna.

**TABLE 6-5: TEST EQUIPMENT USED FOR TESTING (FIELD STRENGTH OF SPURIOUS RADIATION)**

| RTL Asset # | Manufacturer | Model | Part Type | Serial Number | Calibration Due Date |
|---|---|---|---|---|---|
| 900814 | Electrometrics | EM6961 (RGA-60) | Double Ridge Guide Antenna (1 - 18 GHz) | 2310 | 2/17/04 |
| 900932 | Hewlett Packard | 8449B OPT H02 | Preamplifier (1 - 26.5 GHz) | 3008A00505 | 4/22/04 |
| 901020 | Hewlett Packard | 8564E | Portable Spectrum Analyzer (9 kHz - 40 GHz) | 3943A01719 | 7/15/04 |
| 901053 | Schaffner Chase | CBL6112B | Bi-Log Antenna, (20 MHz - 2 GHz) | 2648 | 7/03/04 |
| 901235 | IW Microwave Products | KPS-1503-360-KPS | High frequency RF cable, 36” | N/A | 1/30/04 |
| 901231 | IW Microwave Products | KPW-1503-2400-KPS | High Frequency RF Cables | 240" | 1/30/04 |
| 901242 | Rhein Tech Labs | WRT-000-0003 | Wood rotating table | w/o top for wireless testing | not req’d |
| 900154 | Compliance Design Inc, | Roberts Dipole | Adjustable Elements Dipole Antenna (3 0 - 1000 MHz) | 900154 | 10/6/04 |
| 900772 | EMCO | 3161-02 | Horn Antenna (2 - 4 GHz) | 9804-1044 | 3/15/04 |
| 900321 | EMCO | 3161-03 | Horn Antenna (4.0 - 8.2 GHz) | 9508-1020 | 4/10/04 |
| 900323 | EMCO | 3160-07 | Horn Antenna (8.2 - 12.4 GHz) | 9605-1054 | 6/10/04 |

TEST PERSONNEL:

| DANIEL BALTZELL |  | NOVEMBER 4, 2003 |
|---|---|---|
| TEST ENGINEER | SIGNATURE | DATE OF TEST |

## 7 FCC RULES AND REGULATIONS PART 15 §15.109: RADIATED EMISSIONS LIMITS

**TABLE 7-1: RADIATION EMISSIONS TEST RESULTS – RX/DIGITAL**

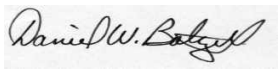
| Emission Frequency (MHz) | Test Detector | Antenna Polarity (H/V) | Turntable Azimuth (deg) | Antenna Height (m) | Analyzer Reading (dBuV) | Site Correction Factor (dB/m) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| 188.457 | Qp | V | 270 | 1.0 | 48.4 | -11.5 | 36.9 | 43.5 | -6.6 |
| 196.590 | Qp | V | 300 | 2.0 | 44.1 | -11.1 | 33.0 | 43.5 | -10.5 |
| 220.100 | Qp | V | 0 | 1.0 | 39.5 | -9.9 | 29.6 | 46.0 | -16.4 |
| 364.500 | Qp | V | 30 | 1.8 | 43.3 | -4.4 | 38.9 | 46.0 | -7.1 |
| 729.000 | Qp | V | 270 | 1.8 | 35.8 | 5.3 | 41.1 | 46.0 | -4.9 |
| 777.670 | Qp | V | 0 | 1.0 | 34.9 | 6.6 | 41.5 | 46.0 | -4.5 |
| 786.660 | Qp | V | 0 | 1.0 | 34.1 | 6.8 | 40.9 | 46.0 | -5.1 |
| 795.645 | Qp | V | 0 | 1.0 | 33.5 | 7.1 | 40.6 | 46.0 | -5.4 |
| 822.670 | Qp | V | 0 | 1.0 | 33.5 | 7.7 | 41.2 | 46.0 | -4.8 |
| 831.670 | Qp | V | 0 | 1.0 | 33.3 | 7.8 | 41.1 | 46.0 | -4.9 |
| 840.645 | Qp | V | 0 | 1.0 | 33.5 | 7.9 | 41.4 | 46.0 | -4.6 |

Limit/Distance: FCC B/3M

**TABLE 7-2: TEST EQUIPMENT USED FOR TESTING (FCC CLASS B RADIATED EMISSIONS)**

| RTL Asset # | Manufacturer | Model | Part Type | Serial Number | Calibration Due Date |
|---|---|---|---|---|---|
| 900724 | Antenna Research Associates, Inc. | LPB-2520 | LOG Periodic/Biconical Antenna (25 – 1000 MHz) | 1037 | 3/27/04 |
| 900811 | Rhein Tech Labs | PR-1040 | Amplifier | 1003 | 2/13/04 |
| 900896 | Hewlett Packard | 85662A | Display Section | 900896 | 2/07/04 |
| 900897 | Hewlett Packard | 8567A | HP Spectrum Analyzer (10 KHz - 1.5GHz) | 900897 | 2/07/04 |
| 900901 | Hewlett Packard | 85650A | Quasi-Peak Adapter (30 Hz - 40 GHz) | 900901 | 2/07/04 |

TEST PERSONNEL:

| DANIEL BALTZELL |  | NOVEMBER 4, 2003 |
|---|---|---|
| TEST ENGINEER | SIGNATURE | DATE OF TEST |