ELECTROMAGNETIC EMISSIONS TEST REPORT

BY

COM-SERVE CORPORATION

KITCHENER, ONTARIO

CANADA

RADIATED and CONDUCTED EMI TEST REPORT

June 14, 1999

CLIENT:

Research In Motion
295 Phillip Street
Waterloo, Ontario
N2L 3W8

TESTED MODEL:

Model Number:	**R800D-2-PW**
Serial Number:	BSN: 1000387631
Description:	Interactive Pager
Date tested:	May 28 & 31, 1999
Tested with:	Host computer, IBM ThinkPad 760ED Type 9546-U9A, Serial # 78-ACPW2 97/02, FCC ID ANOGCF2704AT; ThinkPad AC power adapter IBM P/N: 85G6704; Printer, Hewlett Packard DeskJet 710C, Model C5894A, Serial # MX91D1WOXH, FCC ID B94C4557X; Computer interface cable 850125; Printer AC power adapter # C4557-60004 Associated cables and cords.

IN ACCORDANCE WITH:

- **FCC Part 2 and FCC Part 90 Transmitters; Type Acceptance.**
- **Industry Canada OATS reference number IC 2963 RSP 100 Issue 7.**
- Test procedure(s) MP-4 and ANSI C63.4

TESTED BY:

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Jim Sims
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TECHNICIAN:

Jim Sims
With: Mr. Adam Stevenson and Mr. Jonathan Doll (Research in Motion)

FILE NUMBER: RIM 023

RESULTS R800D-2-PW RIM 023

		COMPLIANCE (yes)	(no)
RF POWER OUTPUT			
Transmitter:	2.985	(X)	( )
OCCUPIED BANDWIDTH			
Transmitter:	2.989	(N/T)	( )
SPURIOUS EMISSIONS AT THE ANTENNA TERMINALS			
Transmitter:	2.991	(N/A)	( )
FIELD STRENGTH OF SPURIOUS RADIATION			
Transmitter:	2.993	(X)	( )
FREQUENCY STABILITY			
Transmitter:	2.995	(N/T)	( )
BANDWIDTH LIMITATIONS			
Transmitter:	90.210 g	(N/T)	( )

SYSTEM DESCRIPTION RIM 023

The R800D-2-PW Inter@ctive Pager

The Research In Motion R800D-2-PW Inter@ctive pager is a stand alone, wireless, two-way data communications device operating on the DataTAC packet-switched wireless data network. The intended users are business people and executives who travel or work away from the office. Also targeted are mobile computer users, cell phone users and alpha-numeric pager users. The device is a high end consumer communications product.

The Inter@ctive Pager has a standard EIA/TIA 232 level serial asynchronous interface, allowing it to backup and transfer information between the pager and a host computer and/or other terminal device. The serial connection to an external device requires the use of a serial interface cable or an optional "cradle assembly". The recommended cable is a Molex, part number 92601-0028. It can also be acquired directly from Research In Motion under part number WIR-01985-001. This is a 2.0 metre cable which has standard connections for RS-232 at one end, and a connector that mates with the R800D-2-PW Inter@ctive pager at the EUT end. As an alternative to the cable, the pager can be inserted into a charging-enabled cradle. This charging cradle is in turn connected to the host computer. The cradle can be obtained from Research In Motion under part number ASY-02215-001. The cradle I/O cable is 2.0 metres long and has standard connections for RS-232 at one end and a connector that mates with the pager on the other end. A UL/CSA listed, class II, direct plug-in power transformer is used to supply power to the charging cradle. The wireless service providers and their resellers will make the cable and the charging cradle available as approved accessories to the Inter@ctive Pager.

The Inter@ctive pager is a self-contained, battery powered device. It contains an embedded 4.15 V Lithium Ion battery pack that provides system power. The pager also contains a compartment for one removable standard AA cell, which is used as a charging source for the internal Lithium Ion battery.

The antenna for the Inter@ctive pager is internal to the device. It is located inside the case around the device's liquid crystal display. There is no facility for connecting an external antenna to this device.

Normal pager operation for live use is called burst packet activity. The pager is normally in receive mode listening to all network activity. When a data packet is received that is explicitly addressed to the pager, it then transmits a short acknowledgment packet. When data is to be transmitted from the pager, the pager radio first receives system information from the network to determine when to transmit. There is no deterministic pattern to the network traffic or transmit packet timing.

SYSTEM DESCRIPTION; CONTINUED

During testing, the pager was running the RIM proprietary test software loaded internal to the pager. The test software, the "RIM Type Test", can place the device in different test modes, allowing it to receive continuously or transmit for several seconds on a fixed frequency. Transmit modes include unmodulated carrier and/or a repetitive or a scrambled data modulation. To facilitate compliance testing to CFR47 standards, the RIM Type Test can also allow the operator to select several different modes which keep the serial connection between the host computer and the Inter@ctive pager continuously active. Tests were

performed while the RIM pager was transmitting carrier for several seconds without modulation and/or with scrambler sequence modulation or fixed sequence data modulation.

FUNCTIONAL DESCRIPTION:

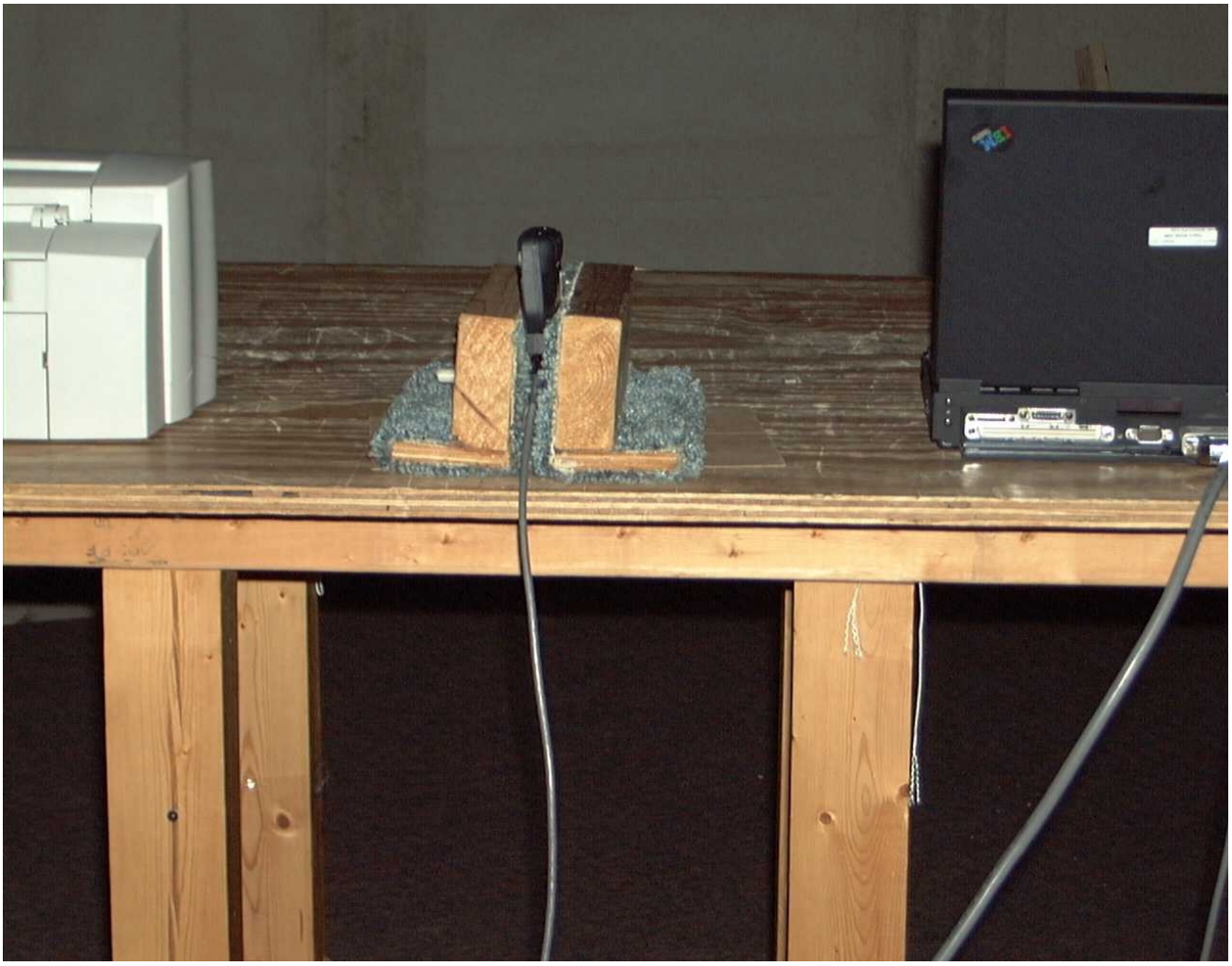
The R800D-2-PW is an 800 MHz band, half duplex (two frequency simplex), 2.0 Watt transceiver system for wireless data modem communications on the DataTAC wireless system.

The transmitter is capable of transmitting at carrier frequencies from 806 MHz to 825 MHz, with channels at discrete 12.5 KHz steps having channel bandwidths of 25 KHz each.

The active transmit frequencies are determined by the radio firmware for nationally allocated DataTAC system channels and by the DataTAC system for operational local channels. The user is not capable of modifying the frequency of operation of the device.

The transmitter will only generate RF power at a single level of 2000 milliwatts (+33 dBm). The output power level of the device cannot be modified by the user.

SYSTEM DESCRIPTION Photos



TEST PROCEDURE: RADIATED EMISSIONS RIM 023

All tests were performed in accordance with FCC/MP-4, & ANSI C63.4.

The Research In Motion Limited R800D-2-PW Inter@ctive pager, was connected together with a host laptop computer and printer as described on the "Title and System Description" pages. The system was arranged in a typical configuration of use and placed on top of a one metre non-conducting turntable as per ANSI C63.4. All of the system parts were connected together with cables that are sold with each piece or generic cables purchased for the specific connection involved. Several different equipment placements were tried so as to establish the worst normal case of equipment positioning. In this case the IBM laptop computer with the Inter@ctive pager and printer were placed on top of the turntable, while the power supply for the IBM ThinkPad computer was placed at the bottom centre of the test table. All of the cables and cords were moved about so as to create the highest level of EMI. The complete system was operating as it would be in normal use. Special software was employed in order that the Research in Motion Inter@ctive pager was processing data to and from the IBM PC. To evaluate radiated power or ERP, the transmitter was tested while connected to the laptop computer and was retested while standing alone on the test table. The turntable was rotated through 360 degrees.

A preliminary radio frequency scan was performed on the system to determine the worst case cable and equipment configuration. The attached results represent the system configuration maximized for worst case emissions in each frequency band.

The tests were conducted at a distance of three (3) metres with the receiving antennas in both the horizontal and vertical planes at each emission frequency. It should be noted that a preamplifier (LNA) in conjunction with a notch filter, was used above 1.0 GHz. The test results table entry referred to as "ANT. FAC." include cable loss, antenna correction factor, LNA gain and notch filter insertion loss.

EQUIPMENT: Advantest R3261A Spectrum Analyzer and
H.P. 8563E Spectrum Analyzer 9.0 KHz - 26.5 GHz
Setting: BW: 300 Hz, 100 KHz or 120 KHz (Q.P), as required.
LNA, HP 8449B Preamplifier (30 dB) 1.0 to 26.5 GHz
MA-COM 20 dB att. # 2082-6502-20 0 Hz - 18.0 GHz
A.H. Systems biconical antenna; 20 MHz - 330 MHz
A.H. Systems log periodic antenna; 300 MHz - 1.8 GHz
A.H. Systems log periodic antenna; 1.0 GHz - 12.4 GHz
EATON dipole antennas; T1, T2, T3 25 MHz - 1.0 GHz
CDI ROBERTS dipole antennas T1 T2 T3 T4 25 MHz - 1.0 GHz

NOTE: The three metre test range has been carefully evaluated to the ANSI C63.4, and will be remeasured for reflections and losses every three years. (ANSI C63.4/FCC OET-55)

RADIATED EMISSION RESULTS RIM 023

BW: 100/120 KHz
Span: 05 to 50 MHz

PART 2/90 TRANSMITTER RADIATED TESTS

TEST #	FREQ. G Hz	LEVEL µV	ANT. TYPE (PZ)	ANT. FAC.	F.S. µV/M	LIMIT µV/M	DIFF. TO LIMIT; dB
01 TX	815.00	39100.0	RT.4 V	41.5	1618740	3300000	-6.19
02 TX	1630.00	1063.00	L/P H	3.0	3189.0	16564	-14.31
03 TX	2445.00	181.00	L/P V	5.5	995.5	16564	-24.42

NOTES:

A) The EUT integral antenna is not, and does not perform like a ½ wave dipole antenna, therefore the ERP based upon a measurement of the actual carrier level, is **0.479W**. It also should be noted that a preamplifier (LNA) in conjunction with a notch filter was used above 1.0 GHz. The test results table entry referred to as "ANT. FAC." include cable loss, antenna correction factor, LNA gain and notch filter insertion loss.

B) The LIMIT as specified in the above table, is 39.80 dBc below the relative radiated power (ERP) output of the transmitter, assuming all emissions are radiated from halfwave dipole antennas.

C) Limit Calculations:

Attenuation = 43 + 10 × Log of ERP (0.479w)
= 43 + (-3.20)
= 39.80 **dBc**

Limit (FS) = 1.61874 V/m less 39.80dB
= 0.016564 V/m or 16564 µV/m

ERP = $(|E|^2 \times D^2) \div (30 \times 1.64)$ where $|E|$ is the measured field strength at the receiving antenna, and 1.64 is antenna factor relative to a dipole reference. The distance (= 3 metres) is the distance between the transmitting antenna of the EUT/device and the receiving antenna.

- For $|E|$ = 1.61874 V/m and D = 3 metres, the ERP is 0.479W.
- Due to the RIM calibration test tool tolerance, add +0.5 dB adjusted = **0.537 W.**