EMI Test Report

For RAW20IN

Tested in accordance with
Federal Communications Commission (FCC)
Personal Communications Services
CFR 47, Parts 2 and 90
And
Industry Canada, RSS-119

RIM Testing Services (RTS)

REPORT NO RTS-0184-0507-05

PRODUCT MODEL NO.: RAW20IN
TYPE NAME: BlackBerry Wireless Handheld
FCC ID: L6ARAW20IN
IC: 2503A-RAW20IN

Date: _____29 July, 2005_____

Declaration

Statement of Performance:

The BlackBerry Wireless Handheld, model RAW20IN ASY-08961-001 and accessories when configured and operated per RIM's operating 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

Maurice Battler
Compliance Specialist Date: 29 July 2005

M. Attay

Masud S. Attayi, P.Eng.
Senior Compliance Engineer Date: 03 August 2005

Reviewed and Approved by:

Paul G Cardinal

Paul G. Cardinal, Ph.D.
Manager Date: 04 August 2005

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A) Scope

This report details the results of compliance tests which were performed in accordance with the requirements of:

FCC CFR 47 Part 2, Oct. 1, 2000, Subpart L, Marketing of Radio Frequency Devices
FCC CFR 47 Part 90, Oct. 1, 2000, Subpart I, General Technical Standards
Industry Canada, RSS-119 Issue 6, March 25, 2000, Land Mobile and Fixed Radio Transmitters and Receivers, 27.41 to 960 MHz.

B) Product Identification

The equipment under test (EUT) was tested at the EMI test facilities, located at:

RIM Testing Services (RTS)	and	Research In Motion (RIM)
305 Phillip Street		50 Northside Road
Waterloo, Ontario		Ottawa, Ontario
Canada, N2L 3W8		Canada, K2H 5Z6
Phone: 519 888 7465		Phone: 613 829 7465
Fax: 519 888 6906		Fax: 613 829 0800

The testing began on July 12, 2005 and was completed on July 19, 2005. The Ottawa facility performed the frequency stability measurements. The sample equipment under test (EUT) included:

1a. BlackBerry Wireless Handheld model number RAW20IN, ASY-08961-001, POP-00823-003, PIN 400B1FFB, FCC ID L6ARAW20IN, IC: 2503A-RAW20IN.
1b. BlackBerry Wireless Handheld model number RAW20IN, ASY-08961-001, POP-00823-003, PIN 400B20002, FCC ID L6ARAW20IN, IC: 2503A-RAW20IN.
1c. BlackBerry Wireless Handheld model number RAW20IN, ASY-08961-001, POP-00823-003, PIN 40082007, FCC ID L6ARAW20IN, IC: 2503A-RAW20IN.

The BlackBerry Wireless Handheld is an 800 and 900 MHz portable unit that uses two digital technologies: Quad 16QAM and Time Division Multiple Access (TDMA). This device also has Bluetooth functionality operating in the frequency range of 2402 to 2480 MHz.

C) Support Equipment Used for the Testing of the EUT

1). DC power supply, HP, model number 6632B, serial number US37472178
2). DC power supply, HP, model number 66321D, serial number GB40180110

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 2, Subpart L IC RSS-119	Radiated Spurious/harmonic Emissions, ERP	Yes	Masud Attayi
FCC CFR 47 Part 2, Subpart L, Part 90, Subpart I IC RSS-119	Conducted Emissions, Occupied Bandwidth	Yes	Maurice Battler
FCC CFR 47, Part 2.947, 2.1055 and 90.213 IC RSS-119	Frequency Stability	Yes	Johanna Dwyer

F) Modifications to EUT

No modifications were required to the EUT.

G) **Summary of Results**

1) The EUT met the requirements of the Conducted Spurious Emissions in the 800 and 900 bands as per 47 CFR 2.1051. The EUT was measured in 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 Occupied Bandwidth and emission mask as per 47 CFR 2.1049, 2.1053, 90.210 and 90.691. The channels measured were low, middle and high in the 800 and 900 MHz bands.
See APPENDIX 1 for the test data.

3) The EUT met the requirements of the Conducted RF Output Power as per 47 CFR 2.1046 and 2.1033. The channels measured were low, middle and high in the 800 and 900 MHz bands.
See APPENDIX 2 for the test data.

4) The EUT met the requirements of the Frequency Stability vs. Temperature and Voltage as per CFR 47 2.1055, 90.213 and RSS-119. The maximum frequency error measured was less than 0.1 PPM.
The temperature range was from -30°C to +55°C in 10 degree temperature steps. The EUT was measured on low, middle and high channels in the 800 and 900 MHz bands at each temperature step. The EUT was measured at low (3.6 volts), nominal (3.8 volts) and high (4.2 volts) dc input voltage at each temperature step and channel at maximum output power. The Handheld's frequency was locked to the base station simulator.
See APPENDIX 3 for the test data.

5) The radiated spurious emissions/harmonics and ERP were measured in the 800 and 900 MHz 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 rotatable turntable. The test distance used between the EUT and the receiving antenna was three metres. At this point the emissions were maximized by elevating the antenna in the range of 1 to 4 metres. The EUT was measured on the low, middle and high channels. The turntable was rotated to determine the azimuth of the peak emissions. The maximum emissions level was recorded. The measurements were performed in a semi-anechoic chamber. The semi-anechoic chamber's FCC registration number is **778487** and the Industry Canada file number is **IC4240**.
The highest ERP measured in the 800 MHz band was 33.3 dBm at 806.0125 MHz.
The highest ERP measured in the 900 MHz band was 32.9 dBm at 896.01875 MHz.

To view the test data see APPENDIX 4.

6) The radiated spurious emissions/harmonics were investigated up to the 10th harmonic for iDEN and Bluetooth transmitting simultaneously. The worst test margin for radiated spurious emissions measured was 15.6 dB below the limit at 1801.9625 MHz.
To view the test data see APPENDIX 4.

7) The EUT's RF local oscillator emissions were measured on the high channel in the vertical position. Both the horizontal and vertical polarizations were measured.
The measurements were in the noise floor (NF) of the Spectrum Analyzer.

To view the test data see APPENDIX 4.

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

H) Compliance Test Equipment Used

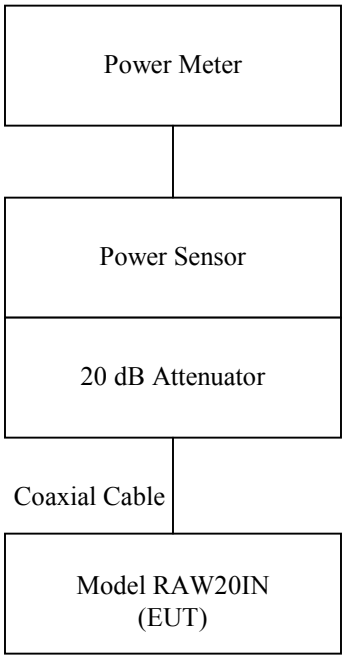
UNIT	MANUFACTURER	MODEL	SERIAL NUMBER	CAL DUE DATE (YY MM DD)	USE
Environmental Chamber	ESPEC Corp.	SH-241	92000152	N/R	Frequency Stability
Signal Generator	HP	ESG4433BR	US38440638	05-08-25	Frequency Stability
DC Power Supply	HP	66321D	GB40180110	05-08-18	Frequency Stability
Vector Signal Analyzer	Agilent	89441	US39313988	05-08-25	Frequency Stability
Temperature Probe	Hart Scientific	61161-302	21352860	05-09-10	Frequency Stability
Power Meter	HP	E4419B	MY40511065	05-08-20	Frequency Stability
Power Sensor	HP	8482H	MY41090594	05-08-20	Frequency Stability
Preamplifier system	TDK RF Solutions	PA-02	080010	06-01-13	Radiated Emissions
Preamplifier	Sonoma	310N/11909A	185831	05-11-26	Radiated Emissions
EMC Analyzer	Agilent	E7405A	US40240226	05-07-29	Radiated Emissions
Environment Monitor	Control Company	1870	230355190	06-01-11	Radiated Emissions
Hybrid Log Antenna	TDK	HLP-3003C	17401	05-07-21	Radiated Emissions
Horn Antenna	TDK	HRN-0118	130092	05-09-24	Radiated Emissions
Horn Antenna	TDK	HRN-0118	030101	05-07-21	Radiated Emissions
Horn Antenna	Emco	3116	2538	05-09-27	Radiated Emissions
Pre-Amplifier	TDK	18-26	30002	06-01-13	Radiated Emissions
Signal Generator	HP	83630B	3844A00927	06-08-04	Radiated Emissions
Dipole Antenna	Schwarzbeck	UHAP	974	05-09-21	Radiated Emissions
Dipole Antenna	Schwarzbeck	UHAP	973	05-12-13	Radiated Emissions
Power Meter	Giga-Tronics	8541C	1837762	05-12-03	Conducted Emissions
Power Sensor	Giga-Tronics	80401A	1835838	05-12-03	Conducted Emissions
Spectrum Analyzer	HP	8563E	3745A08112	06-07-13	Conducted Emissions
DC Power Supply	HP	6632B	US37472178	07-07-12	Conducted Emissions

APPENDIX 2

CONDUCTED RF OUTPUT POWER TEST DATA

Conducted RF Output Power Test Data

Test Setup Diagram



The environmental test conditions were: Temperature 24ºC
Pressure 1010 mb
Relative Humidity 32%

Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Power Meter	Giga-Tronics	8541C	1837762	.01 – 18.0 GHz
Power Sensor	Giga-Tronics	80401A	1835838	.01 – 18.0 GHz
Attenuator, 20 dB, 25 W	Weinschel	33-20-33	BL8170	DC – 18 GHz
Attenuator, 20 dB, 25 W	Weinschel	33-20-34	BM0697	DC – 18 GHz

RF Power Output at Maximum

At three transmit frequencies the maximum radio output power level with a duty cycle of 33% was measured using the power meter. The calibrated insertion loss measured for the attenuator and cable assembly was added to the power measurements that produced the following results.

Test Data

Frequency (MHz)	Measured Pulse Average Conducted Power (dBm)	Total Correction Factor (dB)	Corrected Pulse Average Conducted Power (dBm)
806.0125	7.57	20.65	28.22
815.500	7.55	20.65	28.20
824.9875	7.49	20.65	28.14
896.01875	7.35	20.65	28.00
898.49375	7.25	20.65	27.90
901.98125	7.27	20.65	27.92

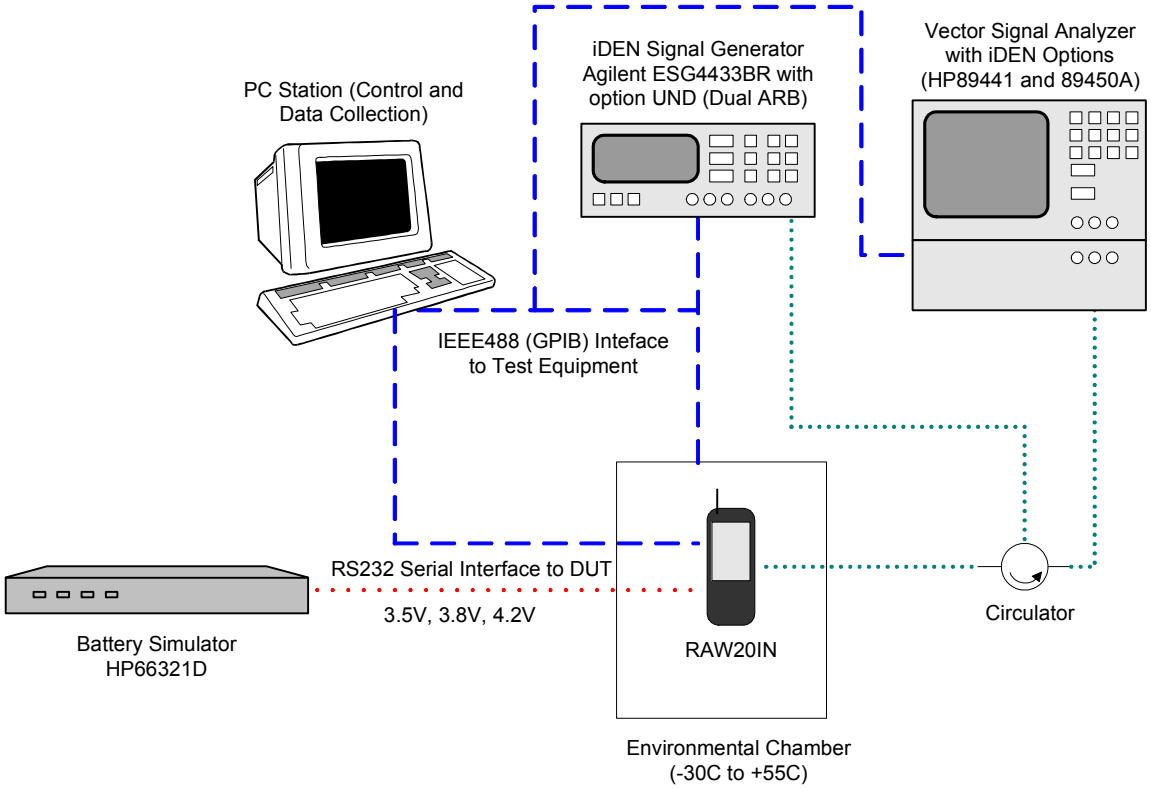
Conducted RF Output Power Test Data Photo

APPENDIX 3

FREQUENCY STABILITY TEST DATA

Frequency Stability Test Data

The following document contains measurement data pertaining to Frequency Stability.



SYSTEM	*Model*	*Serial Number*
Agilent Vector Signal Analyzer	HP89441A with HP89450A	US39313988 and US39312360
HP DC Power Supply	HP66321D	GB40180110
Signal Generator	HP ESG4433BR	US38440638
Network Analyzer (Calibration)	HP8753E	US384432364
Espec Environmental Chamber	SH241	92000152
Temperature Probe	61161-302	21352860

Test sample measured was model number RAW20IN, PIN 40082007.

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 BlackBerry iDEN Handheld's (referred to as EUT from hereinafter) transmitted frequency stability is less than 0.1 ppm of the ideal transmit frequency. The frequency accuracy is measured by the HP89441 Vector Signal Analyzer.

The BlackBerry iDEN Handheld meets the requirements as stated in CFR 47 chapter 1, Section 2.947, 2.105, 24.235 and 90.213, Frequency Stability.

Frequency Stability measurement devices were configured as presented in the block diagram recording frequency, temperatures, and stepped voltages which were controlled via GPIB interfaces linked to the Environmental chamber, a Battery Simulator, a Signal Generator and the Vector Signal Analyzer. The test set was calibrated to characterize the insertion loss for the transmitted frequencies between the RF input of the Vector Signal Analyzer and the EUT antenna port. The EUT is located inside the environmental chamber.
Calibration for the cable loss was performed in the Ottawa RF Laboratory on July 14, 2005.

Test Procedure:

The EUT was placed in the temperature chamber and connected to the test set. The EUT was kept in idle mode at all times except when the measurements were to be made.

The chamber was switched on, and the temperature was set to -30ºC

After the chamber stabilized at -30ºC there was a soak period of 30 minutes. A period of thirty minutes soak was maintained between each ascending temperature step prior to the start of the next measurement test cycle.

A computer system controlled the automated software. All the test equipment intrinsic to the temperature and voltage tests was controlled via the GPIB Bus. The EUT communication was passed through a RS232 serial connection.

The EUT was set to 1/6 duty cycle. The frequency accuracy was averaged over 16 transmit bursts for each combination temperature, voltage and frequency. Three test frequencies were selected for each band. For 800 MHz band operation the test frequencies are: 806.0125, 815.5000, and 824.9875 MHz. For 900 MHz band operation the test frequencies are: 896.01875, 898.51875, and 900.98125 MHz.

The power supply was cycled from minimum voltage of 3.6 volts to 3.8 volts nominal and 4.2V maximum operating voltage under load. The frequency error and maximum output power are recorded by the automated system test software. The frequency error is recorded in Hz and deviation from nominal, in Parts Per Million.

Procedure:

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

1. Switch on the HP66321D battery simulator, The ESG4433BR signal generator, and the HP89441 Vector Signal Analyzer.
2. Start system test program
3. Set the Temperature to –30 degrees Celsius and maintain a period of thirty minutes soak time, with the EUT supply voltage disabled.
4. Set power supply voltage to 3.6 volts
5. Set up HP89441 Vector Signal Analyzer.
6. Set the VSA to 806.0125 MHz.
7. Enable the voltage to the EUT, and connect a link to the VSA.
8. Set the transmit frequency of the EUT to 806.0125MHz and put the EUT in RTR (receive/transmit) mode.
9. Capture 16 bursts with the VSA and record the average frequency error over the 16 bursts.
10. Put the EUT back into IDLE mode, change the frequency on the VSA and the EUT to the next test frequency (as detailed above) and repeat steps 7, to 9. Repeat again for the four remaining test frequencies.
11. Repeat steps 5, to 10 changing the supply voltage to 3.8 volts. Then repeat with the supply voltage at 4.2 volts.
12. Increase temperature by 10ºC and maintain a period of thirty minutes soak time, with the EUT supply voltage disabled.
13. Repeat steps 4 - 12 for temperatures –30ºC to 55ºC in 10ºC steps.

The maximum frequency error measured was 0.0496 PPM.

Channel results @ 20ºC and maximum transmitted power

Frequency (MHz)	*Voltage (Volts)*	*Temperature (Celsius)*	*Frequency Error (Hz)*	*PPM*
806.0125	3.6	20	-25	-0.0310
815.5000	3.6	20	-5	-0.0061
824.9875	3.6	20	-21	-0.0255
896.01875	3.6	20	-28	-0.0312
898.51875	3.6	20	-35	-0.0390
900.98125	3.6	20	-5	-0.0055

Frequency (MHz)	*Voltage (Volts)*	*Temperature (Celsius)*	*Frequency Error (Hz)*	*PPM*
806.0125	3.8	20	-25	-0.0310
815.5000	3.8	20	-21	-0.0258
824.9875	3.8	20	-10	-0.0121
896.01875	3.8	20	-7	-0.0078
898.51875	3.8	20	-24	-0.0267
900.98125	3.8	20	-7	-0.0078

Frequency (MHz)	*Voltage (Volts)*	*Temperature (Celsius)*	*Frequency Error (Hz)*	*PPM*
806.0125	4.2	20	-24	-0.0298
815.5000	4.2	20	-6	-0.0074
824.9875	4.2	20	-14	-0.0170
896.01875	4.2	20	-1	-0.0011
898.51875	4.2	20	-7	-0.0078
900.98125	4.2	20	-7	-0.0078

Channel Results: 806.0125 @ maximum transmitted power

Frequency (MHz)	*Voltage (Volts)*	*Temperature (Celsius)*	*Frequency Error (Hz)*	*PPM*
806.0125	3.6	-30	-26	-0.0323
806.0125	3.6	-20	0	0.0000
806.0125	3.6	-10	-32	-0.0397
806.0125	3.6	0	-28	-0.0347
806.0125	3.6	10	7	0.0087
806.0125	3.6	20	-25	-0.0310
806.0125	3.6	30	-16	-0.0199
806.0125	3.6	40	6	0.0074
806.0125	3.6	50	5	0.0062
806.0125	3.6	55	6	0.0074

Frequency (MHz)	*Voltage (Volts)*	*Temperature (Celsius)*	*Frequency Error (Hz)*	*PPM*
806.0125	3.8	-30	-23	-0.0285
806.0125	3.8	-20	3	0.0037
806.0125	3.8	-10	-28	-0.0347
806.0125	3.8	0	-4	-0.0050
806.0125	3.8	10	-26	-0.0323
806.0125	3.8	20	-25	-0.0310
806.0125	3.8	30	4	0.0050
806.0125	3.8	40	-24	-0.0298
806.0125	3.8	50	0	0.000
806.0125	3.8	55	4	0.0050

Frequency (MHz)	*Voltage (Volts)*	*Temperature (Celsius)*	*Frequency Error (Hz)*	*PPM*
806.0125	4.2	-30	8	0.0099
806.0125	4.2	-20	-13	-0.0161
806.0125	4.2	-10	-4	-0.0050
806.0125	4.2	0	-40	-0.0496
806.0125	4.2	10	-20	-0.0248
806.0125	4.2	20	-24	-0.0298
806.0125	4.2	30	-16	-0.0199
806.0125	4.2	40	0	0.000
806.0125	4.2	50	-1	-0.0012
806.0125	4.2	55	-8	-0.0099

Channel Results: 815.5000 @ maximum transmitted power

Frequency (MHz)	*Voltage (Volts)*	*Temperature (Celsius)*	*Frequency Error (Hz)*	*PPM*
815.5000	3.6	-30	15	0.0184
815.5000	3.6	-20	-2	-0.0025
815.5000	3.6	-10	-10	-0.0123
815.5000	3.6	0	-32	-0.0392
815.5000	3.6	10	-1	-0.0012
815.5000	3.6	20	-5	-0.0061
815.5000	3.6	30	-26	-0.0319
815.5000	3.6	40	-12	-0.0147
815.5000	3.6	50	1	0.0012
815.5000	3.6	55	-3	-0.0037

Frequency (MHz)	*Voltage (Volts)*	*Temperature (Celsius)*	*Frequency Error (Hz)*	*PPM*
815.5000	3.8	-30	-10	-0.0122
815.5000	3.8	-20	-22	-0.0270
815.5000	3.8	-10	-26	-0.0319
815.5000	3.8	0	-5	-0.0061
815.5000	3.8	10	-8	-0.0098
815.5000	3.8	20	-21	-0.0258
815.5000	3.8	30	-3	-0.0037
815.5000	3.8	40	-3	-0.0037
815.5000	3.8	50	-13	-0.0159
815.5000	3.8	55	-11	-0.0135

Frequency (MHz)	*Voltage (Volts)*	*Temperature (Celsius)*	*Frequency Error (Hz)*	*PPM*
815.5000	4.2	-30	-16	-0.0196
815.5000	4.2	-20	-28	-0.0343
815.5000	4.2	-10	-8	-0.0098
815.5000	4.2	0	-22	-0.0270
815.5000	4.2	10	-3	-0.0037
815.5000	4.2	20	-6	-0.0074
815.5000	4.2	30	-7	-0.0086
815.5000	4.2	40	-14	-0.0172
815.5000	4.2	50	-1	-0.0012
815.5000	4.2	55	-18	-0.0221

Channel Results: 824.9875 @ maximum transmitted power

Frequency (MHz)	*Voltage (Volts)*	*Temperature (Celsius)*	*Frequency Error (Hz)*	*PPM*
824.9875	3.6	-30	-2	-0.0024
824.9875	3.6	-20	-12	-0.0145
824.9875	3.6	-10	-16	-0.0194
824.9875	3.6	0	-33	-0.0400
824.9875	3.6	10	-21	-0.0255
824.9875	3.6	20	-21	-0.0255
824.9875	3.6	30	-33	-0.0400
824.9875	3.6	40	-6	-0.0073
824.9875	3.6	50	-12	-0.0145
824.9875	3.6	55	-23	-0.0279

Frequency (MHz)	*Voltage (Volts)*	*Temperature (Celsius)*	*Frequency Error (Hz)*	*PPM*
824.9875	3.8	-30	-26	-0.0315
824.9875	3.8	-20	-15	-0.0182
824.9875	3.8	-10	-7	-0.0085
824.9875	3.8	0	-13	-0.0158
824.9875	3.8	10	-9	-0.0109
824.9875	3.8	20	-10	-0.0121
824.9875	3.8	30	-21	-0.0255
824.9875	3.8	40	-5	-0.0061
824.9875	3.8	50	-1	-0.0012
824.9875	3.8	55	-19	-0.0230

Frequency (MHz)	*Voltage (Volts)*	*Temperature (Celsius)*	*Frequency Error (Hz)*	*PPM*
824.9875	4.2	-30	-16	-0.0194
824.9875	4.2	-20	-16	-0.0194
824.9875	4.2	-10	-24	-0.0291
824.9875	4.2	0	-8	-0.0097
824.9875	4.2	10	-7	-0.0085
824.9875	4.2	20	-14	-0.0170
824.9875	4.2	30	-23	-0.0279
824.9875	4.2	40	-8	-0.0097
824.9875	4.2	50	-21	-0.0255
824.9875	4.2	55	-11	-0.0133

Channel Results: 896.01875 @ maximum transmitted power

Frequency (MHz)	*Voltage (Volts)*	*Temperature (Celsius)*	*Frequency Error (Hz)*	*PPM*
896.01875	3.6	-30	-23	-0.0257
896.01875	3.6	-20	-7	-0.0078
896.01875	3.6	-10	-36	-0.0402
896.01875	3.6	0	-9	-0.0100
896.01875	3.6	10	-6	-0.0067
896.01875	3.6	20	-28	-0.0312
896.01875	3.6	30	-11	-0.0123
896.01875	3.6	40	-32	-0.0357
896.01875	3.6	50	-16	-0.0179
896.01875	3.6	55	-2	-0.0022

Frequency (MHz)	*Voltage (Volts)*	*Temperature (Celsius)*	*Frequency Error (Hz)*	*PPM*
896.01875	3.8	-30	1	0.0011
896.01875	3.8	-20	-30	-0.0335
896.01875	3.8	-10	-6	-0.0067
896.01875	3.8	0	-2	-0.0022
896.01875	3.8	10	-9	-0.0100
896.01875	3.8	20	-7	-0.0078
896.01875	3.8	30	-19	-0.0212
896.01875	3.8	40	-29	-0.0323
896.01875	3.8	50	1	0.0011
896.01875	3.8	55	-6	-0.0067

Frequency (MHz)	*Voltage (Volts)*	*Temperature (Celsius)*	*Frequency Error (Hz)*	*PPM*
896.01875	4.2	-30	-27	-0.0301
896.01875	4.2	-20	-2	-0.0022
896.01875	4.2	-10	-5	-0.0056
896.01875	4.2	0	-8	-0.0089
896.01875	4.2	10	-11	-0.0123
896.01875	4.2	20	-1	-0.0011
896.01875	4.2	30	-25	-0.0279
896.01875	4.2	40	-6	-0.0067
896.01875	4.2	50	-2	-0.0022
896.01875	4.2	55	-12	-0.0134

Channel Results: 898.51875 @ maximum transmitted power

Frequency (MHz)	*Voltage (Volts)*	*Temperature (Celsius)*	*Frequency Error (Hz)*	*PPM*
898.51875	3.6	-30	-7	-0.0078
898.51875	3.6	-20	-33	-0.0367
898.51875	3.6	-10	-1	-0.0011
898.51875	3.6	0	-5	-0.0056
898.51875	3.6	10	-6	-0.0067
898.51875	3.6	20	-35	-0.0390
898.51875	3.6	30	-26	-0.0289
898.51875	3.6	40	-33	-0.0367
898.51875	3.6	50	-24	-0.0267
898.51875	3.6	55	-34	-0.0378

Frequency (MHz)	*Voltage (Volts)*	*Temperature (Celsius)*	*Frequency Error (Hz)*	*PPM*
898.51875	3.8	-30	-2	-0.0022
898.51875	3.8	-20	-8	-0.0089
898.51875	3.8	-10	-9	-0.0100
898.51875	3.8	0	-6	-0.0067
898.51875	3.8	10	-18	-0.0200
898.51875	3.8	20	-24	-0.0267
898.51875	3.8	30	-4	-0.0044
898.51875	3.8	40	-2	-0.0022
898.51875	3.8	50	-10	-0.0111
898.51875	3.8	55	2	0.0022

Frequency (MHz)	*Voltage (Volts)*	*Temperature (Celsius)*	*Frequency Error (Hz)*	*PPM*
898.51875	4.2	-30	-2	-0.0022
898.51875	4.2	-20	-3	-0.0033
898.51875	4.2	-10	-28	-0.0312
898.51875	4.2	0	-17	-0.0190
898.51875	4.2	10	0	0.0000
898.51875	4.2	20	-7	-0.0078
898.51875	4.2	30	-24	-0.0267
898.51875	4.2	40	-9	-0.0100
898.51875	4.2	50	-3	-0.0033
898.51875	4.2	55	1	0.0011

Channel Results: 900.98125 @ maximum transmitted power

Frequency (MHz)	*Voltage (Volts)*	*Temperature (Celsius)*	*Frequency Error (Hz)*	*PPM*
900.98125	3.6	-30	21	0.0233
900.98125	3.6	-20	-30	-0.0333
900.98125	3.6	-10	-4	-0.0044
900.98125	3.6	0	-6	-0.0067
900.98125	3.6	10	-2	-0.0022
900.98125	3.6	20	-5	-0.0055
900.98125	3.6	30	-2	-0.0022
900.98125	3.6	40	-33	-0.0366
900.98125	3.6	50	-8	-0.0089
900.98125	3.6	55	-11	-0.0122

Frequency (MHz)	*Voltage (Volts)*	*Temperature (Celsius)*	*Frequency Error (Hz)*	*PPM*
900.98125	3.8	-30	-2	-0.0022
900.98125	3.8	-20	-9	-0.0100
900.98125	3.8	-10	-23	-0.0255
900.98125	3.8	0	-27	-0.0300
900.98125	3.8	10	-7	-0.0078
900.98125	3.8	20	-7	-0.0078
900.98125	3.8	30	-10	-0.0111
900.98125	3.8	40	-7	-0.0078
900.98125	3.8	50	-11	-0.0122
900.98125	3.8	55	-20	-0.0222

Frequency (MHz)	*Voltage (Volts)*	*Temperature (Celsius)*	*Frequency Error (Hz)*	*PPM*
900.98125	4.2	-30	-6	-0.0067
900.98125	4.2	-20	-24	-0.0266
900.98125	4.2	-10	-5	-0.0056
900.98125	4.2	0	-6	-0.0067
900.98125	4.2	10	-4	-0.0044
900.98125	4.2	20	-7	-0.0078
900.98125	4.2	30	-13	-0.0144
900.98125	4.2	40	-9	-0.0100
900.98125	4.2	50	-22	-0.0244
900.98125	4.2	55	-3	-0.0033

APPENDIX 4

RADIATED SPURIOUS/HARMONIC EMISSIONS AND ERP TEST DATA

Radiated Emissions Test Data Results

Test distance is 3.0 metres. EUT at 1.0 metre height. July 19, 2005

Test sample measured was model number RAW20IN, PIN 400B2002.

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)
ERP 800 MHz Band Antenna Extended – (Handheld standalone, horizontal position) QAM (Quad QPSK), Slot Multiplex Factor 2/6										
F0	Low	806.0125	800	Dipole	V	79.7	91.8	V V	16.7	33.3
F0	Low	806.0125	800	Dipole	H	91.8		H H	15.1	
F0	Mid.	815.5000	800	Dipole	V	80.2	89.9	V V	15.5	32.1
F0	Mid.	815.5000	800	Dipole	H	89.9		H H	13.9	
F0	High	824.9875	800	Dipole	V	80.6	90.9	V V	16.6	33.2
F0	High	824.9875	800	Dipole	V	90.9		H H	15.6	

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

Example: 806.0125 MHz = 16.7 (Tracking Generator Level) – 7.8 (Antenna Loss) – 2.15 (Dipole Factor) – 3.7 (Cable Loss) + 30.2 (Preamp Gain) = 33.3 dBm (Reading Relative to Dipole)

The environmental test conditions were: Temperature 23ºC
Pressure 1010 mb
Relative Humidity 42%

Radiated Emissions Test Data Results

Test distance is 3.0 metres. EUT at 1.0 metre height. July 19, 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)
ERP 900 MHz Band Antenna Extended – (Handheld standalone, edge position) QAM (Quad QPSK), Slot Multiplex Factor 2/6										
F0	Low	896.01875	900	Dipole	V	82.9	91.2	V V	16.9	32.9
F0	Low	896.01875	900	Dipole	H	91.2		H H	16.8	
F0	Mid.	899.0000	900	Dipole	V	82.3	91.0	V V	16.7	32.7
F0	Mid.	899.0000	900	Dipole	H	91.0		H H	16.5	
F0	High	900.98125	900	Dipole	V	82.5	91.2	V V	16.9	32.9
F0	High	900.98125	900	Dipole	V	91.2		H H	16.5	

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

Example: 896.01875 MHz = 16.9 (Tracking Generator Level) – 7.7 (Antenna Loss) – 2.15 (Dipole Factor) – 3.9 (Cable Loss) + 29.7 (Preamp Gain) = 32.9 dBm (Reading Relative to Dipole)

Radiated Emissions Test Data Results cont'd

Test distance is 3.0 metres. EUT at 1.0 metre height. July 19, 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)
Harmonics 800 MHz band with Bluetooth transmitting simultaneously with iDEN												
Antenna Extended - (Handheld standalone, vertical position) QAM16 (Quad QPSK), Slot Multiplex Factor 2/6												
Low Channel – 806.0125 MHz												
2nd	Low	1612.0250	800	Horn	V	53.8	62.4	V V	-39.9	-35.9	-13	-22.9
2nd	Low	1612.0250	800	Horn	H	62.4		H H	-39.6			
3rd	Low	2418.0375	800	Horn	V	47.5	52.0	V V	-41.8	-38.6	-13	-25.6
3rd	Low	2418.0375	800	Horn	H	52.0		H H	-43.2			
The harmonics were investigated up to the 10th harmonic. Emissions above the 3rd harmonic were in the noise floor (NF)												
Middle Channel – 815.5000 MHz												
2nd	Mid.	1631.000	800	Horn	V	57.8	63.7	V V	-38.4	-34.5	-13	-21.5
2nd	Mid.	1631.000	800	Horn	H	63.7		H H	-38.2			
3rd	Mid.	2446.500	800	Horn	V	48.7	51.4	V V	-43.6	-40.4	-13	-27.4
3rd	Mid.	2446.500	800	Horn	H	51.4		H H	-44.5			
The harmonics were investigated up to the 10th harmonic. Emissions above the 3rd harmonic were in the noise floor (NF)												
High Channel – 824.9875 MHz												
2nd	High	1649.9875	800	Horn	V	59.4	63.7	V V	-37.3	-33.6	-13	-20.6
2nd	High	1649.9875	800	Horn	H	63.7		H H	-37.4			
3rd	High	2474.9625	800	Horn	V	N.F.	51.1	V V	-43.9	-40.7	-13	-27.7
3rd	High	2474.9625	800	Horn	H	51.1		H H	-44.9			
The harmonics were investigated up to the 10th harmonic. Emissions above the 3rd harmonic were in the noise floor (NF)												

Radiated Emissions Test Data Results cont'd

Test distance is 3.0 metres. EUT at 1.0 metre height. July 19, 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)
Harmonics 900 MHz band with Bluetooth transmitting simultaneously with iDEN												
Antenna Extended - (Handheld standalone, vertical position) QAM16 (Quad QPSK), Slot Multiplex Factor 2/6												
Low Channel – 896.01875MHz												
2nd	Low	1792.0375	900	Horn	V	58.4	66.1	V V	-32.5	-29.1	-13	-16.1
2nd	Low	1792.0375	900	Horn	H	66.1		H H	-32.0			
3rd	Low	2688.0563	900	Horn	V	45.8	47.7	V V	-45.9	-42.3	-13	-29.3
3rd	Low	2688.0563	900	Horn	H	47.7		H H	-46.9			
4th	Low	3584.0750	900	Horn	V	48.3	48.3	V V	-42.2	-38.5	-13	-25.5
4th	Low	3584.0750	900	Horn	H	45.6		H H	-42.8			
The harmonics were investigated up to the 10th harmonic. Emissions above the 4th harmonic were in the noise floor (NF)												
Middle Channel – 899.0000 MHz												
2nd	Mid.	1798.0000	900	Horn	V	57.8	66.8	V V	-32.3	-28.7	-13	-15.7
2nd	Mid.	1798.0000	900	Horn	H	66.8		H H	-31.6			
3rd	Mid.	2697.0000	900	Horn	V	45.4	45.4	V V	-50.4	-46.8	-13	-33.8
3rd	Mid.	2697.0000	900	Horn	H	45.4		H H	-51.3			
4th	Mid.	3596.0000	900	Horn	V	47.7	47.7	V V	-43.9	-40.2		-27.2
4th	Mid.	3596.0000	900	Horn	H	47.7		H H	-44.1			
5th	Mid.	4495.0000	900	Horn	V	46.6	46.6	V V	-41.8	-38.1		-25.1
5th	Mid.	4495.0000	900	Horn	H	46.5		H H	-40.5			
The harmonics were investigated up to the 10th harmonic. Emissions above the 5th harmonic were in the noise floor (NF)												

Radiated Emissions Test Data Results cont'd

Test distance is 3.0 metres. EUT at 1.0 metre height. July 19, 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)
Harmonics 900 MHz band with Bluetooth transmitting simultaneously with iDEN cont'd Antenna Extended - (Handheld standalone, vertical position) QAM16 (Quad QPSK), Slot Multiplex Factor 2/6 **High Channel –** 896.01875MHz												
2nd	Low	1801.9625	900	Horn	V	57.4	66.5	V V	-32.1	-28.6	-13	-15.6
2nd	Low	1801.9625	900	Horn	H	66.5		H H	-31.5			
3rd	Low	2702.94375	900	Horn	V	52.7	52.7	V V	-40.0	-36.4	-13	-23.4
3rd	Low	2702.94375	900	Horn	H	50.7		H H	-41.1			
4th	Low	3603.9250	900	Horn	V	49.9	49.9	V V	-40.9	-37.0	-13	-24.0
4th	Low	3603.9250	900	Horn	H	47.6		H H	-40.7			
5th	Low	4504.90625	900	Horn	V	46.8	46.9	V V	-41.8	-38.0	-13	-25.0
5th	Low	4504.90625	900	Horn	H	46.9		H H	-40.4			
The harmonics were investigated up to the 10th harmonic. Emissions above the 5th harmonic were in the noise floor (NF)												

Radiated Emissions Test Data Results cont'd

Test distance is 3.0 metres. EUT at 1.0 metre height. July 19, 2005

The measurements were performed with the handheld in an upright position.
IDEN and Bluetooth were transmitting simultaneously.
QAM16 (Quad QPSK), Slot Multiplex Factor 2/6

800 MHz band

EUT			Rx Antenna		Spectrum Analyzer		Substitution Method / Tracking Generator				
Type	Ch	Frequency (MHz)	Type	Pol.	Reading (dBuV)	Max (V,H) (dBuV)	Pol. Tx-Rx	Reading (dBm)	Corrected Reading (relative to dipole)	Limit (dBm)	Diff to Limit (dB)
Tx LO pre-scaler / RF-Lo (Tx)	High	573.9043	HLP	V	N.F.	-	V V	-	-	-13	-
RF-Lo (Tx)	High	573.9043	HLP	H	N.F.		H H	-			
Tx Lo											
RF-Lo (Tx)	High	1721.7130	Horn	V	N.F.	-	V V	-	-	-13	-
RF-Lo (Tx)	High	1721.7130	Horn	H	N.F.		H H	-			
Emissions were in the noise floor.											

900 MHz band

Tx LO pre-scaler / RF-Lo (Tx)	High	656.7696	HLP	V	NF	-	-	-	-	-13	-
RF-Lo (Tx)	High	626.7696	HLP	H	NF		-	-			
Tx Lo											
RF-Lo (Tx)	High	1880.3087	Horn	V	NF	-	-	-	-	-13	-
RF-Lo (Tx)	High	1880.3087	Horn	H	NF		-	-			
Emissions were in the noise floor.											

Radiated Emissions Test Data Results cont'd

Radiated Emissions Test Photo

Radiated Emissions at 3.0 metres