EMC Test Report for iDEN BlackBerry

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Approvals

Function	Name	Job title	Signature
Document Release Approval	Guy Benjamin	Project Leader	[signature] July 30th/2002
Tester	Ryan Wallace	EMC Lab Technician	[signature] for Ryan Wallace July 31, 2002.
Author	Denis Lalonde	Radio Compliance Discipline Leader	[signature] July 30, 2002
Technical Reviewer	Jacques Rollin	EMC Advisor	[signature] July 30 2002

Accreditations

C-MAC Engineering EMC test facilities are accredited by the Standards Council of Canada (SCC) in accordance with the scope of accreditation outlined in SCC letter dated 2001-02-16 [1].

Through a Mutual Recognition Agreement (MRA) between the National Voluntary Laboratory Accreditation Program (NVLAP) and SCC, the accreditation status of this facility is valid for the U.S.

The Federal Communications Commission (FCC) in the United States also recognizes these facilities to be compliant with the requirements of Section 2.948 of the FCC Rules, as outlined in a letter dated May 25,1999 [2].

C-MAC Engineering is ISO 9001:2000 and ISO/IEC Guide 25 certified and its processes are documented in the C-MAC Engineering Quality Manual [3] and Lab Operations Manual [4].

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1. Executive Summary

RIM is developing a new BlackBerry Wireless Handheld that will operate on an iDEN network in the United States. The new handheld will feature the BlackBerry wireless email solution with digital cellular, digital two-way radio service, text and numeric paging and browser and will include an integrated speaker/microphone, removable/rechargeable battery and external antenna.

At the request of the Customer Development group, C-MAC Engineering Product Integrity has evaluated the radiated emissions of the iDEN BlackBerry. This report describes the test results of the FCC Part 15 Subpart B radiated emissions tests performed on the iDEN BlackBerry. All measurements were performed in the C-MAC Engineering laboratories in Kanata, Ontario, Canada.

A summary list of all the tests that were performed, including their results, is found in Sections 3. Complete details on each individual test are found in the body of the report.

On the basis of measurements performed in July 2002, the iDEN BlackBerry is verified to be compliant with Class B radiated emissions in accordance with FCC Part 15 Subpart B and ICES 003. The test data included in this report apply to the product titled above manufactured by Research In Motion Ltd.

2. Scope and Purpose

At the request of the Customer Development group, C-MAC Engineering Product Integrity has evaluated the radiated emissions of the iDEN BlackBerry. This report describes the test results of the FCC Part 15 Subpart B radiated emissions tests performed on the iDEN BlackBerry. All measurements were performed in the C-MAC Engineering laboratories in Kanata, Ontario, Canada.

3. Compliance Summary

This section summarizes all the measurements performed on iDEN BlackBerry and its compliance to FCC Part 15 Subpart B and ICES-003.

Table 3-1: Compliance Results Summary

Product Summary			
Product Name:	iDEN BlackBerry	Project Leader:	Guy Benjamin
Product Code:		EMC Engineer:	Denis Lalonde
Product Release:	Rev. 3	Tester:	Ryan Wallace
Product Status:		Date:	July 10, 2002

Test Cases[1]						
Completed	**Description**	**Specification**	**Test Results**			**Notes**
			Exceed	Meet	Fail	
■	Radiated Emissions (E-field)	FCC Part 15 / B	■	□	□	
		ICES-003	■	□	□	

1. All the emissions testing were performed at C-MAC Engineering Inc., Kanata, Ontario.

4. Equipment Under Test (EUT)

4.1 Product Functional Description

The product trade name of the unit to be tested is "iDEN BlackBerry".

RIM is developing a new BlackBerry Wireless Handheld that will operate on an iDEN network in the United States. The new handheld will feature the BlackBerry wireless email solution with digital cellular, digital two-way radio service, text and numeric paging and browser and will include an integrated speaker/microphone, removable/rechargeable battery and external antenna. Figure 4-1 is a picture of the system.

Figure 4-1: System picture

4.2 Manufacturer Information

Company Name	Research In Motion Ltd
Mailing Address	50 Northside Road, Ottawa, Ontario, Canada K2H 5Z6
Product Name	iDEN BlackBerry
Primary Technical Contact	Gerry Dwyer
Title	Project Leader
Phone	(613) 829-7465 ext. 4137
E-mail	gdwyer@rim.net

4.3 Power Requirements

For the purposes of EMC testing, there were no power requirements since the device was battery operated.

4.4 Clocks / Oscillators / Switching Power Supply Frequencies

Table 4-1 lists all the clock sources (e.g., discrete crystals and VCXOs) used in the configurations under test (and, where appropriate, the sub-multiples when clock division has been employed for distribution to other circuit packs).

Table 4-1: EUT Fundamental Frequencies

Circuit Pack	Fundamental Frequencies (MHz)
Digital board clocks	0.032768, 16.8
Test Freq. #1 Test Freq. #2	851.025 868.9875
RF L0 test #1 RF L0 test #2	960.6625 979.3675
Rx IF LO	219.3
Tx IF LO	309.3
Channel spacing	0.0125
Tx/Rx offset	45

4.5 System Components

The system tested consists of the following units, as shown in Table 4-2 and Figure 4-1.

Table 4-2: System Components

Component	Release	Quantity
BlackBerry unit	Rev. 3	1

4.6 EUT Interfaces and Cables

The system contained the following interfaces, as shown in Table 4-3:

Table 4-3: System Cables

Interface Type	EUT Connection	Description	Type	Length	Qty
USB	BlackBerry to ITB (Interface Test Board)	Mini-USB	shielded	3 feet	1
RS232	Test PC to ITB	DB9-DB9	unshielded	3 feet	1

4.7 Support Equipment

The support equipment required for the testing is described in Table 4-4

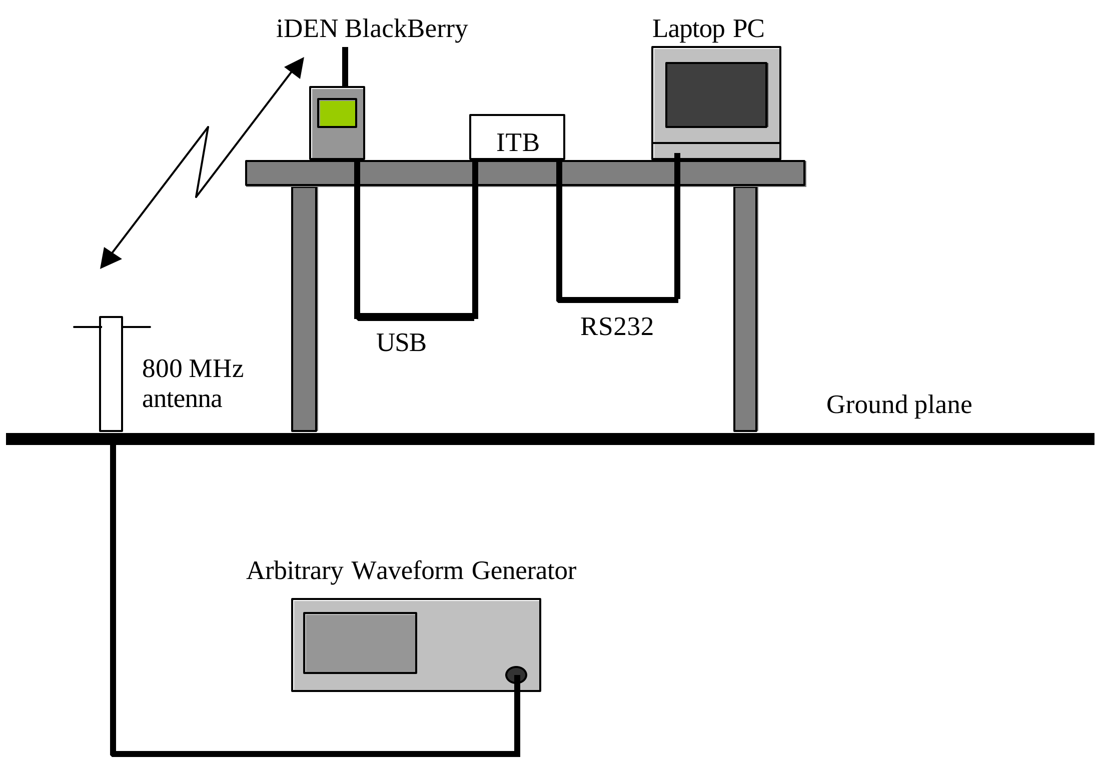
Table 4-4: Support equipment

Equipment	Manufacturer	Model number	Serial number
Laptop PC	IBM Thinkpad	2645-4BU	78WNV06-0899
Interface Test Board (ITB)	RIM		03265-006
Arbitrary Waveform Generator	Hewlett Packard	E4433B	US38440638

4.8 System Set-up and Test Configurations

The configuration used for radiated emissions is presented in Figure 4-2.

Figure 4-2: Hardware set-up for Emissions



4.9 EUT Operations and Software

The software used during tests to operate the system is described in Table 4-5.

Table 4-5 Software description

Component	Software	Release	Quantity
BlackBerry unit	Patriot processor: 751011/combs19.html Greewater processor: tunnel_flash_rev3.hex	Rev. 3	1

The Arbitrary Waveform Generator was configured to generate an iDEN signal at one of the two test frequencies (851.0125 and 868.9875 MHz) at an amplitude of -40 dBm. The Arbitrary Waveform Generator output was connected to an antenna port in the control room with an RF cable. The RF cable ran up to an antenna that was placed in the AFC. The EUT was configured to receive the iDEN signal at the test frequency.

In the AFC Chamber, the PC was connected to one port of the ITB Board through the RS232 cable. A USB cable connected the other port of the ITB board and to the EUT. The PC was running a VT100 terminal to control/configure the EUT. Once the EUT was configured, the USB Cable transferred data (logging information) from the EUT to the PC.

The tests were performed with the BlackBerry receiver turned ON, the charging circuit active (charging through the USB cable) and data transfer taking place from the EUT through the ITB board and to the PC.

4.10 System Modifications

No modifications to the EUT were necessary in order to comply with FCC Part 15.

4.11 System Inventory List

The EUT configuration is described in Table 4-6.

Table 4-6: Inventory List

Item	Component	Code	Release Number	Serial Number
1	IDEN BlackBerry		Rev. 3	R3DV-032

5. General Test Conditions

5.1 Test Facility

Radiated emissions testing were performed in a 10-meter Ambient Free Chamber (AFC). The AFC consists of a shielded room lined with ferrite tiles and anechoic material.

This test facility is accredited by the Standards Council of Canada (SCC) [1] and is listed with the Federal Communications Commission of the United States [2]. Through a Mutual Recognition Agreement (MRA) between the National Voluntary Laboratory Accreditation Program (NVLAP) and SCC, the accreditation status of this facility is valid for the U.S..

5.2 Measurement Instrumentation

The measurement instrumentation conforms to ANSI C63.2-1996 [6], CISPR 16 [7], GR-1089-CORE [12], and EN 300 386 [15]. Calibration of the measurement instrumentation is maintained in accordance with the supplier's recommendations, or as necessary to ensure its accuracy.

5.3 Test Margin

To account for the fact that a single unit is tested, C-MAC Engineering recommends margins to be added to the test specification level. C-MAC Engineering staff has assigned a margin that is a function of that particular test; the margin assignment has been based on extensive experience of C-MAC Engineering staff and on best engineering practices. A rating of **Exceed**, **Meet** and **Fail** is provided for each of the tests.

The following terms are used in the rating scheme:

Specification Level	The Equipment Under Test (EUT) must function as intended and meet the value in the given test specification.
Margin Level	The test specification value plus the margin required to account for single sample testing.

Based on the above, definitions for the ratings are as follows:

Fail	EUT does not function as intended at the specification level.
Meet	EUT functions as intended at the specification level. It does not function as intended at the margin level. The EUT fails to function at the point between the specification level and the margin level.
Exceed	EUT functions as intended at the margin level.

The margins for test cases are defined as follows:

1. Radiated Emission: 6 dB

6. Detailed Emissions Test Results

Emissions from telecommunication systems manifest themselves in two forms: conducted emissions on cables and radiated emissions from the entire system (i.e., electronic modules, hardware, and cables). Emissions standards restrict these different forms of radiation from the system.

For information on Emissions test facilities, measurement instrumentation and test margins, see Section 5: General Test Conditions.

6.1 E-field Radiated Emissions

E-field Radiated Emissions tests are performed to assure that that the product does not produce excess amounts of radiated emissions that could interfere with licensed radiators.

6.1.1 Test Specification

The system was tested to the Class B limits of the following requirements, listed in Table 6-1:

Table 6-1: E-field Radiated Emissions Requirements

Requirement	Section	Method / Limits	Country of Application
ICES 003	-	-	Canada
FCC Part 15, Subpart B	15.109	-	USA

6.1.1.1 Limits

The specification levels in Table 6-2 are worst-case limits taken from all test specifications.

Table 6-2: Regulatory E-field Radiated Emissions Limits at 10 meters, Class B / cover on

Frequency Range (MHz)	FCC Part 15 / ICES-003 (dBμV/m)
30 – 88	29.5
88 – 216	33.0
216 – 960	35.5
960 – 1000	43.5
1000 – 2000	43.5

6.1.2 Test Facility Information

Location:	C-MAC AFC
Date tested:	July 10 2002
Relative humidity:	57%
Temperature:	20ºC
Tested by:	Ryan Wallace

6.1.3 Test Configurations

For radiated emissions test cases, the EUT hardware configuration/software load used is described in Sections 4.8 and 4.9 (see Figure 4-2).

6.1.4 Test Procedure

Verifications of the test equipment and AFC were performed prior to the installation of the EUT in accordance with the quality assurance procedures in PI-01164-92 [8]. The test was performed as per the relevant Test procedures: ANSI C63.4-1992 [4], EN 55022 (CISPR 22 – 1997) [10].

A complete quality assurance test was performed prior to the measurements (according to the lab manual) and passed. The system was then tested in the following manner:

- The EUT was placed on a turntable inside the AFC and it was configured as in normal operation. The system and its cables were separated from the ground plane by an insulating support between 3 and 12 mm in height. The system was connected to the grounding system, in accordance with its installation specifications. No additional grounding connections are allowed.
- For tests between 30 MHz and 1 GHz a broadband bilog antenna was placed at a 10 m distance; a horn antenna, placed also at 10 m distance from the EUT, was used for high frequency measurements above 1 GHz.
- A pre-scan was performed to find emissions (frequencies) requiring detail measurement. The pre-scan was performed by rotating the system 360 degrees while recording all emissions (frequency and amplitude). This procedure was repeated for antenna heights of 1 to 4 meters, in steps of 1 meter, and for horizontal and vertical polarizations of the receiving antenna (for measurements above 30 MHz).
- Optimization was performed based on the pre-scan data. All frequencies, having emission levels within 10 dB of the specification(s) limits, were optimized. For each such frequency, the EUT was rotated in azimuth over 360 degrees and the direction of maximum emission was noted. Antenna height was then varied from 1 to 4 meters at this azimuth to obtain maximum emissions. The procedure was repeated for both horizontal and vertical polarizations of the search antenna. Then the maximum level measured was recorded.
- The frequency range investigated was 30 MHz to 2 GHz.

- Between 150 kHz and 30 MHz the bandwidth used on the spectrum analyzer was 9 kHz; above 30 MHz, up to 1 GHz, a resolution bandwidth of 120 kHz was used. For measurements at discrete frequencies the detector mode was always quasi-peak (QP) unless otherwise noted.
- Above 1 GHz, a 1 MHz resolution bandwidth and average (AVG) detection (video bandwidth of 100 Hz) were used.

6.1.5 Test Results: E-field Radiated Emissions

This section presents the E-field radiated emissions results for all the test cases considered. These measurements were taken using a peak detector and compared to the specification limit lines; all emissions within 10 dB from the limit lines were optimized using an average or a quasi-peak detector, as appropriate (AVG detector below 150 kHz and above 1 GHz and QP detector within 150 kHz – 1 GHz). All optimized emissions are presented in the tables below, while graphical representations of the measurements taken appear in Appendix B: Radiated Emissions Plots.

Note that a positive margin value in the "E-field Radiated Emissions Test Results" table below indicates a PASS and a negative margin value indicates a FAILURE.

Table 6-3 lists the highest emissions measured:

Table 6-3: E-field Radiated Emissions Test Results

Parameter		Unit	Emission No. 1
Frequency		(MHz)	960.5675
Antenna	Azimuth	(deg.)	328
	Height	(cm)	177
	Polarization		Vert.
Meter Reading		(dBμV)	37.2
Detector			QP
Gain / Loss Factor		(dB)	-24.7
Transducer Factor		(dB)	22.4
Level		(dBμV/m)	34.9
Margin to Class A	FCC Part 15	(dB)	8.6

Pre-scan plots of the radiated E-field emissions measured are included in Appendix B: Radiated Emissions Plots. All other emissions had more than 10 dB margin.

The data in Table 6-3 is based on the test case where the BlackBerry was receiving a signal at 851.0125 MHz. The worst-case margin with the EUT receiving a signal at 868.9875 MHz was 11.9 dB.

6.1.6 Measurement Uncertainties

The measurement uncertainty (with a 95% level of confidence) on E-field radiated emissions measurements is: ± 5.0 dB between 30 MHz and 1000 MHz, ± 5.6 dB between 1GHz and 10 GHz.

Uncertainty evaluation has been calculated according to the method described in NAMAS NIS 81 (May 1994), "The Treatment of Uncertainty in EMC Measurements" [27].

6.1.7 Calculation of the Compliance Margin

The following example illustrates the manner in which the compliance margin is calculated in the "E-field Radiated Emissions Test Results" table(s) from Section 6.1.5 above.

The rows in these tables are defined as follows:

Meter Reading (dBµV) =	Voltage measured using the spectrum analyzer with quasi-peak adapter
Gain/Loss Factor (dB) =	Cumulative gain or loss of pre-amplifier and cables used in the measurement path (a negative value indicates gain)
Transducer Factor (dB) =	Antenna factor
Level (dBµV/m) =	Corrected value or field strength, i.e., the parameter of interest that is compared to the limit
Margin (dB) =	Level with respect to the appropriate limit (a positive **Margin** indicates that the **Level** is below the limit and that the measurement is a PASS)

The values in the **Level** row are calculated as follows:

Level = Meter Reading + Gain/Loss Factor + Transducer Factor

For example, in the first column of Table 6-3 at 960.5675 MHz, **Level** is calculated as follows:

Level = 37.2 dBµV + (-24.7 dB) + 22.4 dB = 34.9 dB(µV/m)

The values in the **Margin** row are calculated as follows:

Margin = Limit – Level

For example, in the first column of Table 6-3 at 960.5675 MHz, **Margin** is calculated as follows:

Margin = 43.5 dB(µV/m) – 34.9 dB(µV/m) = 8.6 dB

Therefore, the radiated emission at 960.5675 MHz in Table 6-3 passes.

6.1.8 Test Conclusion

The worst-case margin is 8.6 dB at 960.5675 MHz to FCC Part 15, Class B limit line.

Since all measured emissions indicate positive margins, it can be declared that the EUT has passed the E-field radiated emission tests with respect to the class A limit of: ICES 003 and FCC Part 15 Subpart B.

Test result rating for E-field radiated emissions: EXCEED.

6.1.9 Test Equipment List

Table 6-4: Test Equipment used for E-field Radiated Emissions

Description	Make	Model Number	Serial Number	Cal. Due
Antenna Horn 1 GHz – 18 GHz	EMCO	3115	4690	July 20033999
Antenna Bilog - 30MHz-1000MHz	ANTENNA RESEARCH ASSOC.	2420/A	1113	July 2003
Cable-RF	HUBER & SUHNER	SUCOFLEX 104PEA	10242/4PEA	Feb/08/03
Cable-RF	SUCOFLEX	106/A	1059	Feb/08/03
Cable-RF	SUCOFLEX	106/A	1060	Feb/08/03
Cable-RF	SUCOFLEX	106/A	1061	Feb/08/03
Cable-RF	MICRO-COAX	FSCM	97G1449	Feb/08/03
Calibration Fixture	EMCO	3301-CB	1123	nc
Signal Generator	HP	8656A	2326A05179	Oct/23/02
Signal Generator	HP	83732A	3314A00190	Oct/23/02
EMI Software	Underwriters Laboratory	EMI Software	V 3.02	nc
Spectrum Analyzer SA	HP	8566B	2532A02287	Apr/25/03
Spectrum Analyzer QPA	HP	85650A	2043A00159	Apr/25/03
Spectrum Analyzer Display Unit	HP	8566B	3026A20026	Apr/25/03
Amplifier	HP	8447D	2944A10206	Oct/24/02

The measurement instrumentation conforms to ANSI C63.2-1996 [6], CISPR 16 [7], GR-1089-CORE [12], and EN 300 386 [15]. Calibration of the measurement instrumentation is maintained in accordance with the supplier's recommendations, or as necessary to ensure its accuracy.

7. References

7.1 Reference documents

1. Standards Council of Canada Scope of Accreditation Letter SCC 1003-15/163 dated 2001-02-16 (Scope of accreditation is effective until 2002-10-05 and includes FCC Part 15 and ICES-003).
2. Federal Communications Commission Letter dated May 25, 1999 (in response to submission EF-00049-99, Measurement facility located at Kanata Anechoic chamber (3 & 10 meters), FCC Registration Number 94326).
3. C-MAC Engineering Inc. Quality Manual, Document No. KG000347-QD-QM-01-04, Issue 04, December 2001.
4. C-MAC Engineering Inc. Lab Operations Manual, Document No. KG000347-QD-LAB-01-01, Issue 01, January 2002.
5. ANSI C63.4-1992, Methods of Measurement of Radio-Noise Emission from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz, 17 July 1992.
6. ANSI C63.2-1996, American National Standard for Electromagnetic Noise and Field Strength Instrumentation, 10 Hz to 40 GHz – Specifications.
7. CISPR 16-1, Specification for Radio Disturbance and Immunity Measuring Apparatus and Methods - Part 1: Radio Disturbance and Immunity Measuring Apparatus, Edition 2.0, 1999-10.
8. PI-01164-92, Product Integrity Electromagnetic Compatibility Quality Assurance Procedures, Issue 3, March 1997.
9. Code of Federal Regulations (Washington, DC: Federal Communications Commission), Title 47, Chapter 1, Part 15.
10. EN 55022, Limits and methods of measurement of radio disturbance characteristics of information technology equipment (CISPR22: 1997), September 1998, European Committee for Electro-technical Standardization.
11. EN 55024, Information technology equipment - Immunity characteristics - Limits and methods of measurement (CISPR24: 1997), 1998, European Committee for Electro-technical Standardization.
12. GR-1089-CORE, Issue 2 1997-12, "Electromagnetic Compatibility and Electrical Safety—Generic Criteria for Network Telecommunications Equipment", Revision 1, 1999-02

13. FCC Rules for Radio Frequency Devices, Title 47 of the Code of Federal Regulations Amended per FCC 89-103 (GEN Docket No. 87-389), Part 15, U.S. Federal Communications Commission, 1995.
14. ICES-003, Issue 3, "Spectrum Management: Interference-causing equipment standard (Digital Apparatus)," First edition, 1997-11.
15. EN 300 386, "Electromagnetic Compatibility and Radio Spectrum Matters (ERM); Telecommunication Network Equipment; Electromagnetic Compatibility (EMC) Requirements", V1.3.1, 2001-09.
16. EN 61000-3-2 (2000), "Electromagnetic compatibility (EMC) - Part 3-2: Limits - Limits for harmonic current emissions (equipment input current = 16 A per phase)".
17. EN 61000-3-3 (1995), "Electromagnetic compatibility (EMC) - Part 3: Limits - Section 3: Limitation of voltage fluctuations and flicker in low-voltage supply systems for equipment with rated current = 16 A".
18. EN 61000-4-2 1999-05, "Electromagnetic compatibility (EMC) - Part 4-2: Testing and measurement techniques - Electrostatic discharge immunity test", Amendment 2, 2000-11.
19. EN 61000-4-3 1996, "Electromagnetic compatibility (EMC) - Part 4-3: Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test", Edition 1, 1998.
20. EN 61000-4-4 1995-01, "Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques - Section 4: Electrical fast transient/burst immunity test", Amendment 1, 2000-11.
21. EN 61000-4-5 1995-02, "Electromagnetic compatibility (EMC) - Part 4-5: Testing and measurement techniques - Surge immunity test", Amendment 1, 2000-11.
22. EN 61000-4-6 1996-03, "Electromagnetic compatibility (EMC) - Part 4-6: Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields", Amendment 1, 2000-11.
23. EN 61000-4-11 1994-06, "Electromagnetic compatibility (EMC) - Part 4-11: Testing and measuring techniques - Voltage dips, short interruptions and voltage variations immunity tests", Amendment 1, 2000-11.
24. EN 50082-1, **"** Electromagnetic compatibility - Generic immunity standard - Part 1: Residential, commercial and light industry", First edition, 1997-08.
25. ITU-T Recommendation K.20 (1993): "Resistibility of telecommunication switching equipment to over-voltages and over-currents".
26. ITU-T Recommendation K.21 (1998): "Resistibility of subscribers' terminals to over-voltages and over-currents".
27. NAMAS Publication NIS 81: "The Treatment of Uncertainty in EMC Measurements", Edition 1, May 1994.

Appendices

Appendix A: Glossary

Included below are definitions and abbreviations of terms used in this document.

	Definition
A	6 dB Coaxial Attenuator (conducted immunity)
AC	Alternating Current
AD	Average Detector
AE	Auxiliary Equipment
AFC	Ambient Free Chamber
AM	Amplitude modulation
ANSI	American National Standards Institute
AVG	Average detector
Bellcore	Bell Communications Research
BF	Bandpass Filter, 0.27 – 6 MHz (analog voiceband leads conducted emissions)
BT	British Telecom Private Limited Company
CC	RF Current Clamp
CCC	Capacitive Coupling Clamp (EFT)
CDN	Coupling-decoupling Network
CE	Conducted Emissions
CENELEC	Comite Européen de Normalisation Electrotechnique
CI	Conducted Immunity
CID	Clamp Injection Device
CISPR	Comité International Spécial Perturbation Radioélectrique (International Special Committee on Radio Interference)
Class A	Class A Limits for typical commercial establishments

	Definition
Class B	Class B Limits for typical domestic and residential establishments
Conduction/ Conducted Emission	The emission of electromagnetic energy guided by conductors forming a transmission line.
CP	RF Current Probe
CPE	Customer Premises Equipment
CSA	Canadian Standards Association
dB	Decibel
DC	Direct Current
DN	Decoupling Network
DN/P	Decoupling / Protection Network
DP	High Voltage Differential Probe
EFT	Electrical Fast Transient
EFT/B	Electrical Fast Transient / Burst Generator
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
EN	European Normative
ESD	Electrostatic Discharge
ETSI	European Telecommunications Standards Institute
EUT	Equipment Under Test
FCC	Federal Communications Commission, USA
FM	Flicker Meter
FSM	Frequency Selective Meter (analog voiceband leads conducted emissions)
GND	Ground
GPIB	General Purpose Interface Bus
HCP	Horizontal Coupling Plane
HME	Harmonics Measurement Equipment

	Definition
HPS	High Priority of Service
HV	High Voltage
HVP	High Voltage Probe
IC	Industry Canada
IEC	International Electro technical Association
Immunity	The ability to maintain correct operation in the presence of unwanted electromagnetic energy.
LISN	Line Impedance Stabilization Network
MU	Measurement Uncertainty
NA	Not Applicable
NAMAS	National Measurement Accreditation Service
NBS/ NIST	National Bureau of Standards / National Institute of Standards and Technology
OSC	Digital Oscilloscope
PA	Broadband Power Amplifier
PK	Peak Detector
PPS	Programmable Power Supply
PS	Power Supply
QP	Quasi-peak Detector
QPA	Quasi-peak Adapter (for the Spectrum Analyzer)
R	100 Ω Injection Resistor (conducted immunity)
RBW	Resolution Bandwidth
RE	Radiated Emissions
RF	Radio-Frequency
RFI	Radio-Frequency Interference
RI	Radiated Immunity

	Definition
RMS	Root-mean-square
SA	Spectrum Analyzer, the ANSI C63.2 Compliant EMI meter
SCC	Standards Council of Canada
SG	RF Signal Generator
SGen	Surge Generator
Susceptibility	The tendency to respond undesirably to unwanted electromagnetic energy
T	50 Ω Coaxial Termination (conducted emissions / immunity)
TEM	Transverse Electromagnetic Mode
TL	Transient Limiter
TLISN	T-shaped Line Impedance Stabilization Network
TN	Termination Network (analog voiceband leads conducted emissions)
TTE	Telecommunication Terminal Equipment
UL	Underwriters Laboratories, Inc.
UUT	Unit Under Test
VBW	Video Bandwidth
VCP	Vertical Coupling Plane

Appendix B: Radiated Emissions Plots

This appendix presents all radiated emissions plots for the test cases measured.

Measurements were performed with:

1. the laptop PC only (it can be observed that most of the emissions are from the PC)
2. the EUT transmitting at 851.0125 MHz
3. the EUT transmitting at 868.9875 MHz.

Figure 0-1: E-field Radiated Emissions, 30 – 1000 MHz (PC only)

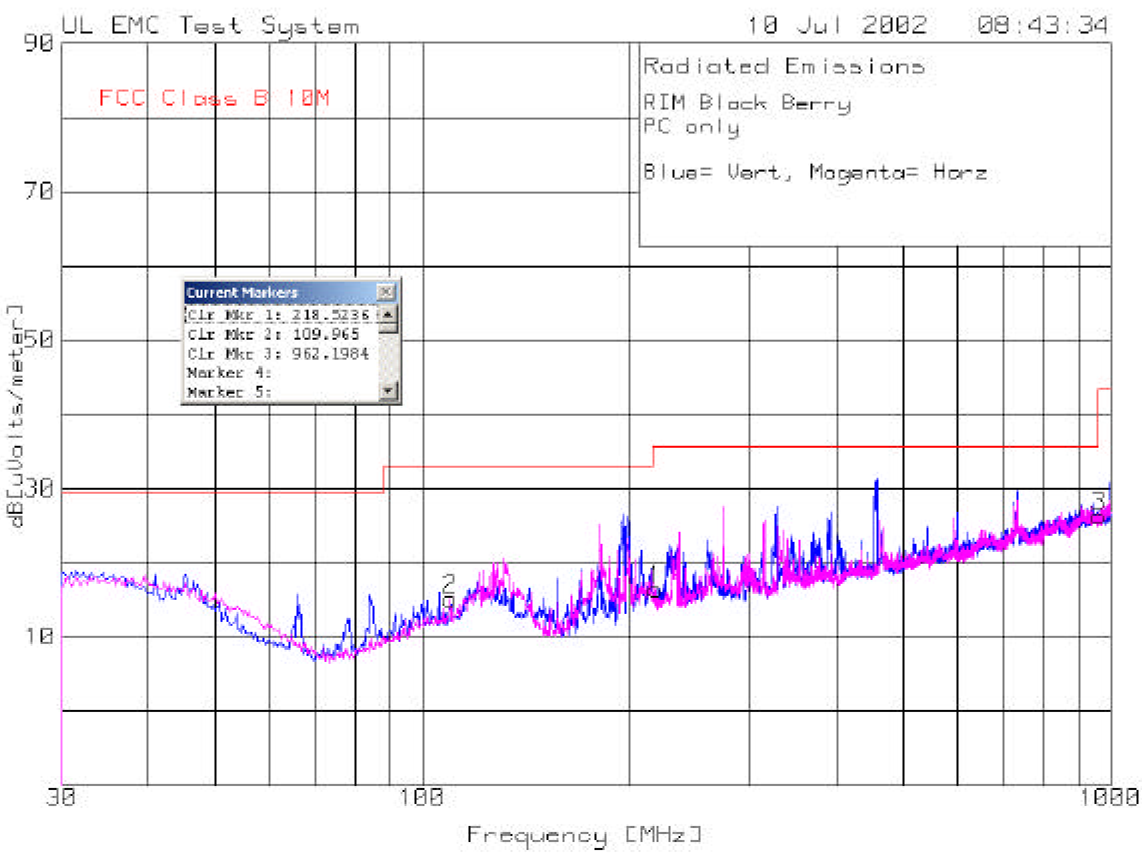


Figure 0-2: E-field Radiated Emissions, 1 GHz – 2 GHz (PC only)

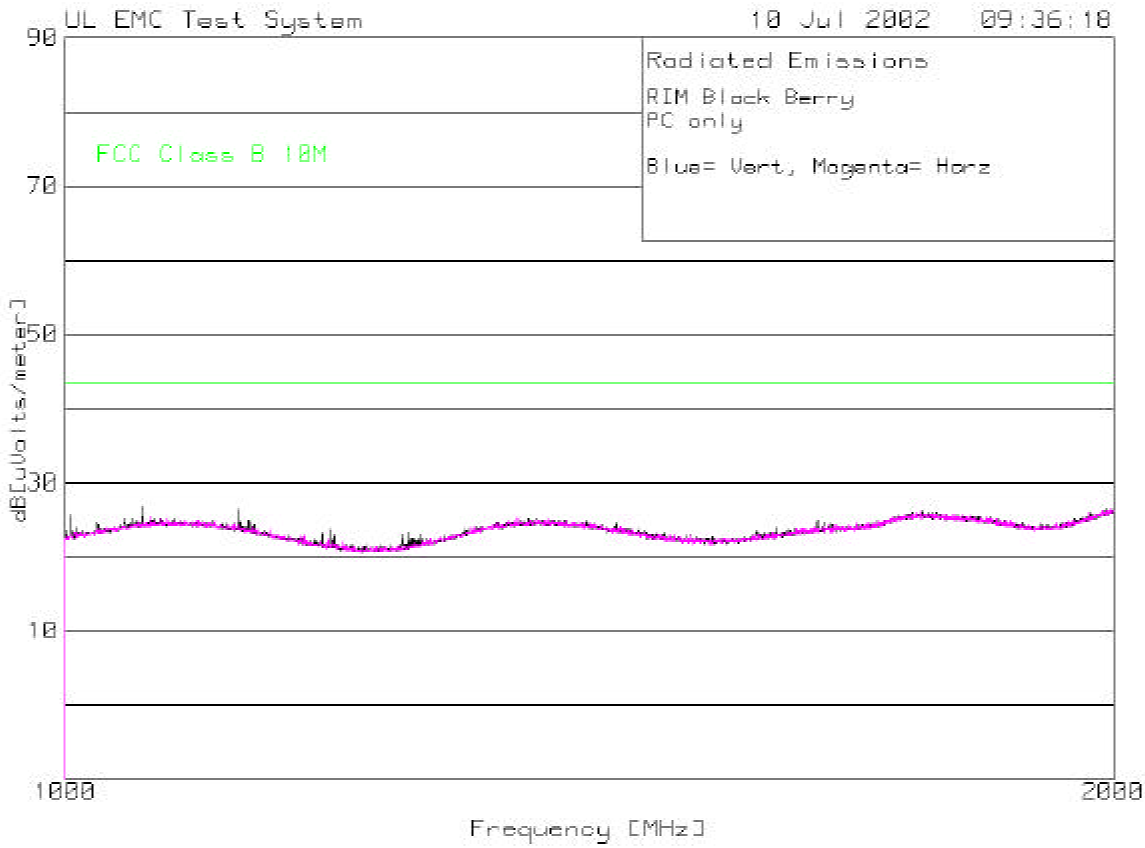
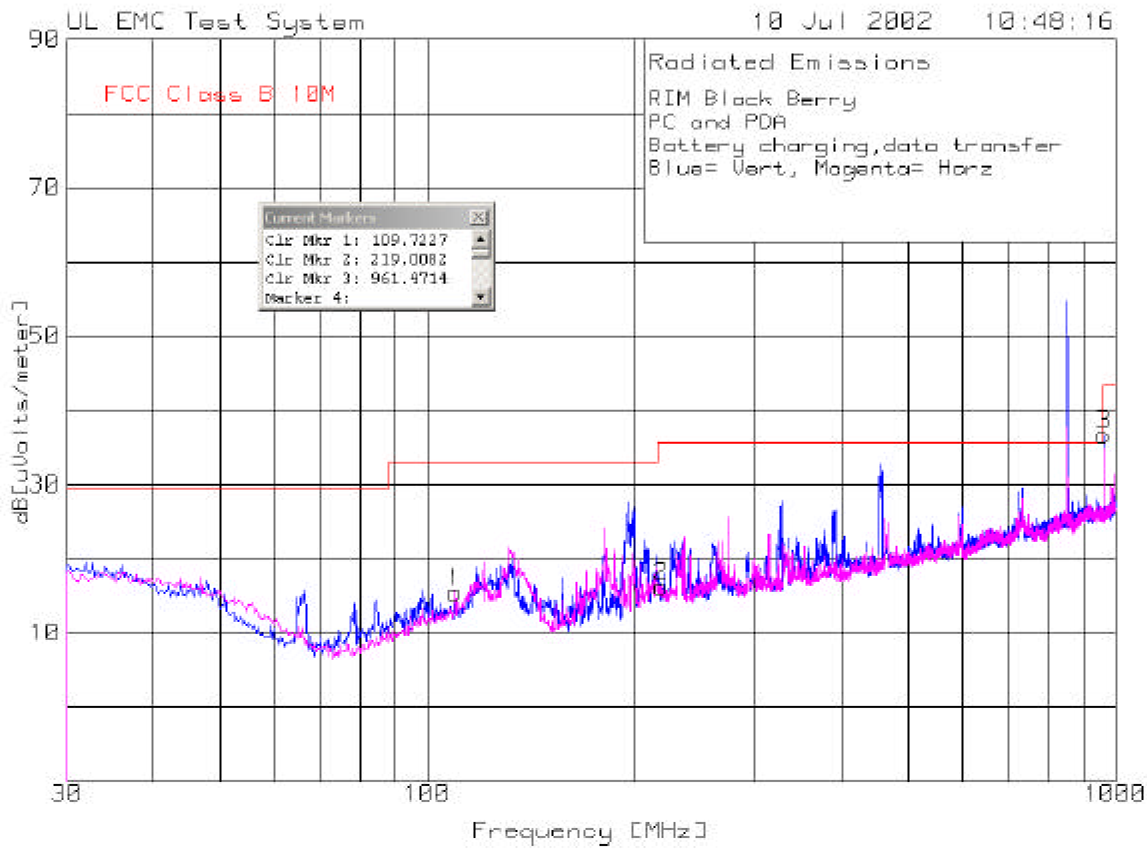


Figure 0-3: E-field Radiated Emissions, 30 – 1000 MHz (Tx = 851.0125 MHz)



Note: The emission at 850 MHz is the Arbitrary Waveform Generator's transmitted signal.

Figure 0-4: E-field Radiated Emissions, 1 GHz – 2 GHz (Tx = 851.0125 MHz)

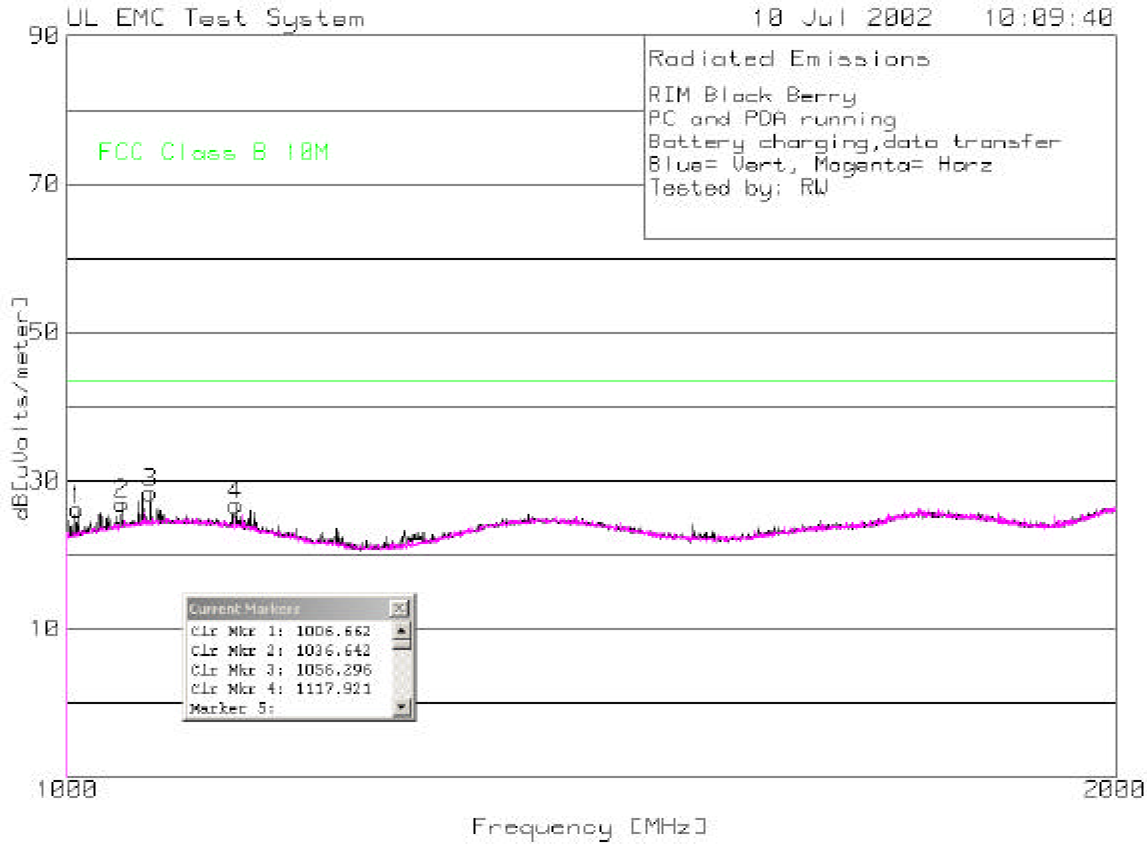
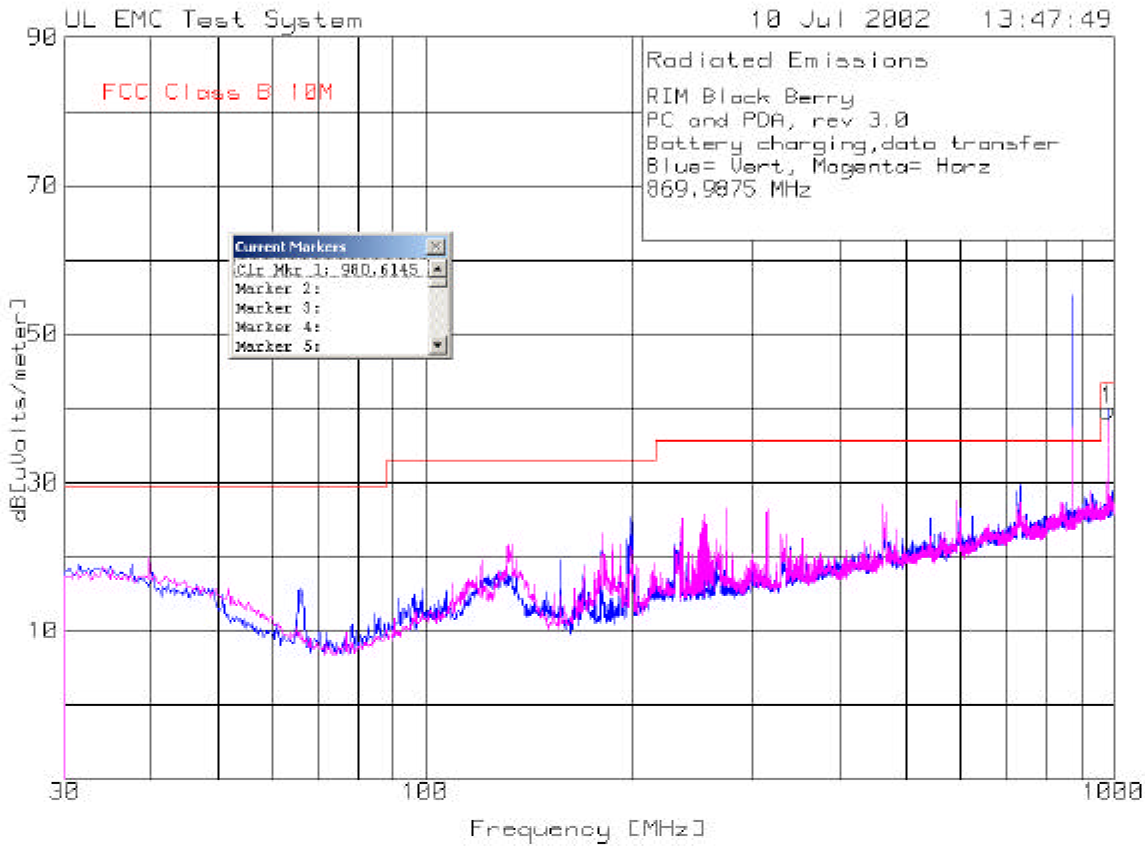
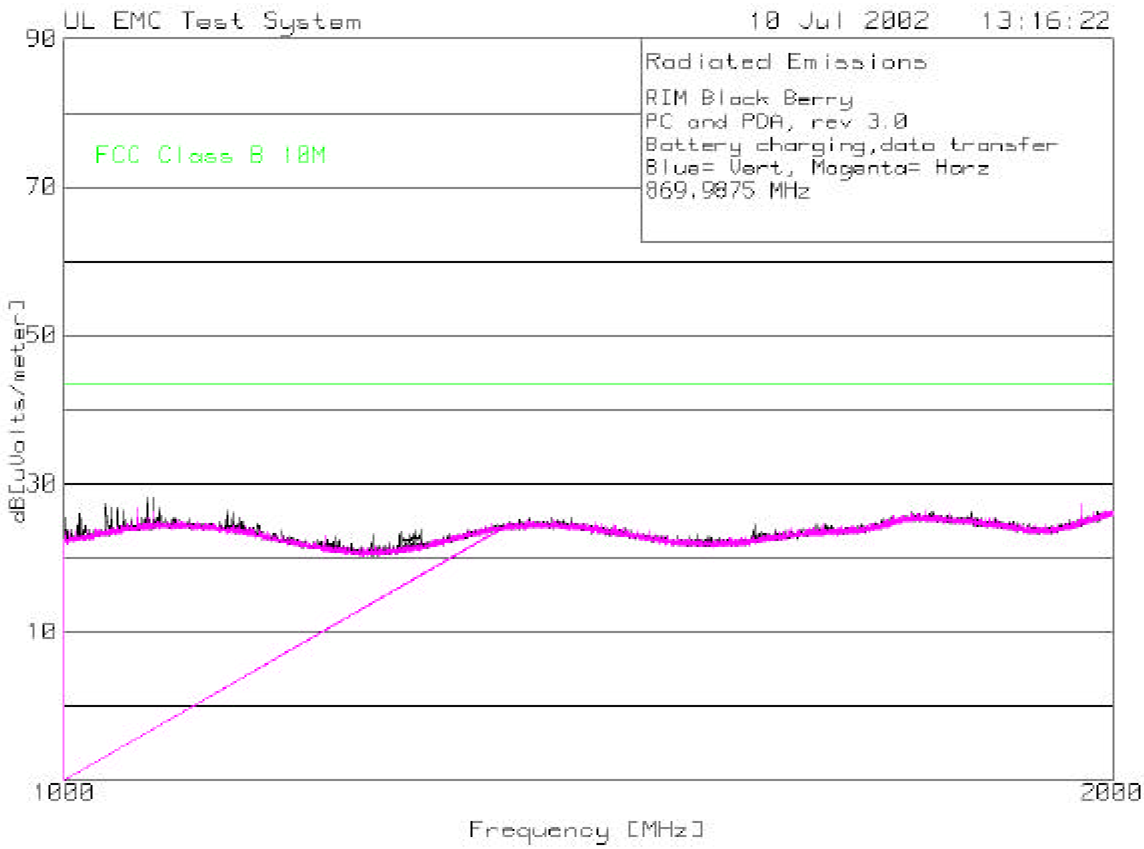


Figure 0-5: E-field Radiated Emissions, 30 – 1000 MHz (Tx = 868.9875 MHz)



Note: The emission at 870 MHz is the Arbitrary Waveform Generator's transmitted signal.

Figure 0-6: E-field Radiated Emissions, 1 GHz – 2 GHz (Tx = 868.9875 MHz)



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