Assessment of Compliance

for

Measurement of Field Strength of Spurious Radiation in accordance with the FCC Rules & Regulations Part 2.1053 and 90

BlackBerry Wireless Handheld
Model: RAL10IN

Research in Motion (RIM).

August 2003

APREL Project No.:RIMB-RAL10IN-4043

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APREL Laboratories

Engineering Report

Subject: **Measurement of Field Strength of Spurious Radiation in accordance with the FCC Rules & Regulations Part 2.1053 and 90**

FCC ID: **L6ARAL10IN**

Equipment: **BlackBerry Wireless Handheld**

Model: **RAL10IN**

Client: **Research in Motion (RIM)**
295 Phillip Street
Waterloo, Ontario
CANADA, N2L 3W8

Project #: RIMB-RAL10IN-4043

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Released by: _____ Date: Sept 3/03
Dr. Jack J. Wojcik, P.Eng.

LICENSED PROFESSIONAL ENGINEER J. J. WOJCIK PROVINCE OF ONTARIO

FCC ID: **L6ARAL10IN**
Applicant: Research in Motion
Equipment: BlackBerry Wireless Handheld
Model: RAL10IN
Standard: FCC Rules and Regulations Part 2.1053 and 90

ENGINEERING SUMMARY

This report contains the results of Field Strength of Spurious Radiation measurement performed on a RIM BlackBerry Wireless Handheld model RAL10IN, in accordance with the FCC Rules and Regulations Part 2.1053 and 90. The measurements were carried out using substitution method as radiated.

The product was evaluated for spurious radiation when it was set at the highest power.

Test configuration: BlackBerry RAL10IN with extended antenna connected to charger and earphone

This report presents test data for frequency band 806-825 MHz

The results presented in this report relate only to the sample tested.

Summary of the Results

Test Description	Page No.	Test Set-up Figure No.	Results Summary
Field Strength of Spurious Radiation Ref. Paragraph 2.1053 and 90	8	1	**Passed**

INTRODUCTION

General

This report describes the results of the Field Strength of Spurious Radiation measurement conducted on a RIM BlackBerry Wireless Handheld, model RAL10IN.

Test Facility

The tests were performed for Research in Motion by APREL Laboratories at APREL's EMI facility located in Nepean, Ontario, Canada. The laboratory operates an (3m and 10m) Open Area Test Site (OATS). The measurement facility is calibrated in accordance with ANSI C63.4-1992.

A description of the measurement facility in accordance with the radiated and AC line conducted test site criteria per ANSI C63.4-1992 is on file with the Federal Communications Commission and is in compliance with the requirements of Section 2.948 of the Commissions rules and regulations. ***APREL's registration number is 90416.***

APREL is accredited by Standard Council of Canada. APREL is also accredited by Industry Canada and recognised by the Federal Communications Commissions (FCC).

Standard

The evaluation and analysis were conducted in accordance with FCC Rules and Regulations Parts 2.1053 and 90.

Test Equipment

The test equipment used during the evaluation is listed in Appendix A with calibration due dates.

Sample for Evaluation

The sample of the evaluation consisted of the following:

Description	Model No	S/N
BlackBerry Wireless Handheld (FCC ID:L6ARAL1OIN)	**Model RAL10IN**	**IMEI No. 010001000083170**
Battery Charger	BCM6T10A	D0321
IBM Thinkpad Laptop PC (FCC ID: 4U6JPN-32476-D-T-M)	(Type No. 2645-4BU)	78-CLDMO

Product Description

The BlackBerry Wireless Handheld™ operates over iDEN® wireless networks allowing you to send and receive your email and place phone calls while on the go. It has integrated email, organizer and phone software, optimized keyboard, thumb-operated trackwheel, easy-to-read fullcolor backlit screen and intuitive menu-driven interface. It can exchange data with a PC. The PC and the charger cannot be connected to the BlackBerry RAL10IN at the same time.

Environmental Conditions

Measurements were conducted in open area test site. Temperature: 24°C ± 2, Relative Humidity: 30 - 50 % , Air Pressure: 101 kPa ± 3.

FCC SUBMISSION INFORMATION

FCC ID:	**L6ARAL10IN**
Equipment type:	**BlackBerry Wireless Handheld**
Model:	**RAL10IN**
For:	Certification
Applicant:	**Research in Motion** 295 Phillip Street Waterloo, Ontario CANADA, N2L 3W8
Manufacturer:	**Research in Motion** 295 Phillip Street Waterloo, Ontario CANADA, N2L 3W8
Evaluated by:	**APREL Laboratories** 51 Spectrum Way Nepean, Ontario Canada K2R 1E6

T*est:* **Field Strength of Spurious Radiation**

Ref: FCC Parts 2.1053 and 90.210

Frequency Band: 806-825 MHz

Criteria: The radiated spurious emissions shall be attenuated below the maximum level of Emissions of the carrier frequency in accordance with the following formula.

Spurious attenuation in dB=43+10log10(P); thus the effective limit is -13dBm for any transmitter power level

Set-up: See Figure 1.a

Conditions: Voltage Supply: Battery

Equipment: See Appendix A.

Methodology: Measurement by Substitution Method:

The final measurements were taken at APREL Laboratory's open area test site (OATS) measurement facility. This open area test site is calibrated to ANSI C63.4 document and a description of the measurement facility is on file with the Federal Communications Commission and is in compliance with the requirements of Section 2.948 of the Commissions rules and regulations.
(FCC Registration No.:90416).

The **DUI** was configured to operate at maximum power with appropriate modulation. Special software was employed in order that the transmitter was processing data in a normal manner.

Prior to final measurement in the OATS, preliminary radiated spurious emissions were scanned in a shielded enclosure at a distance of 1 m using biconical, log-periodic and horn antennas in order to determine the characteristic frequencies of the field strength of spurious emissions. Based on this information, measurements were performed in the OATS at these characteristic frequencies using substitution method.

The test was set-up as illustrated in Fig.1. The equipment under test was placed on a turntable positioned 3 m away from the calibrated receiving antenna, which in turn was connected to the spectrum analyzer.

For each transmitter frequency, the received signal was maximised by rotating the turntable and adjusting the height of the receiving antenna. To obtain the actual ERP, the DUI was replaced by a vertically polarised half-wave dipole antenna resonant to that frequency and fed by a RF power amplifier and signal generator. The center of the dipole antenna was placed precisely in the same location as the DUI. It was ensured that the orientation of the rotating table and the height of the receiving antenna were unmoved. The signal generator level was adjusted until the peak reading on the spectrum analyzer was identical to that obtained when the DUI was on the turntable. The two signals were matched by superimposing one signal to the other on the spectrum analyzer screen. The output of power amplifier was disconnected from the substitute dipole antenna and connected to a RF power meter. The signal strength was directly read from the power meter.

A set of three reference dipoles, a horn antenna and a signal generator to duplicate the signal were used. Signals radiated from the BlackBerry RAL10IN on the fundamental frequency as well as second and third harmonic were evaluated by comparing to the signals transmitted from the reference dipoles. For investigating the higher frequencies, fourth to 10^{th} harmonics, a calibrated horn antenna with known gain was used (instead of a reference dipole) as a replacement source of radiation thus substituting the BlackBerry RAL10IN. The duplicated reading (taken in dBm) was then referenced to the dipole.

The measurements were carried out at transmitting frequencies 806.0125 MHz, 815.500 MHz, 824.9875 MHz covering frequency band 806-825 MHz.

The equipment under test configurations: BlackBerry with extended antenna + travel charger + ear phone

The DUI was investigated for spurious emissions up to 10^{th} harmonic and the readings could be obtained only up to the third harmonic.

Criteria: The criteria level using substitution method was calculated to be –13.0 dBm in the frequency band 806-825 MHz.

This level was obtained by using the following expression:

$$\mathbf{Criteria_{Limit\ (dBm)} = ERP_{Carrier\ (dBm)} - [43 + 10 * \log_{10} ERP_{(W)}]}$$

Example: $\mathbf{Criteria}_{\text{Limit(dBm)}} = 28.1\ \text{dBm} - [43 + 10 * \log_{10}(0.646\ \text{W})]$

$\mathbf{Criteria}_{\text{Limit(dBm)}} = 28.1\ \text{dBm} - (43 - 1.9)\ \text{dB} = -13.0\ \text{dBm}$

Results: **Passed. See Tables 1 to 2 for substitution method**

Conclusion:

The DUI was investigated for spurious emissions up to 10th harmonic and the readings could be obtained only up to the third harmonic.
The DUI was also investigated for emission from the transmitters local oscillators. Signals from the local oscillators **(309.30 MHz, 154.65 MHz and 16.8 MHz)** and their harmonics were more than **20 dB below the limit**.
The DUI complies with limits specified in FCC Regulations Parts 2.1053 and 90.210.

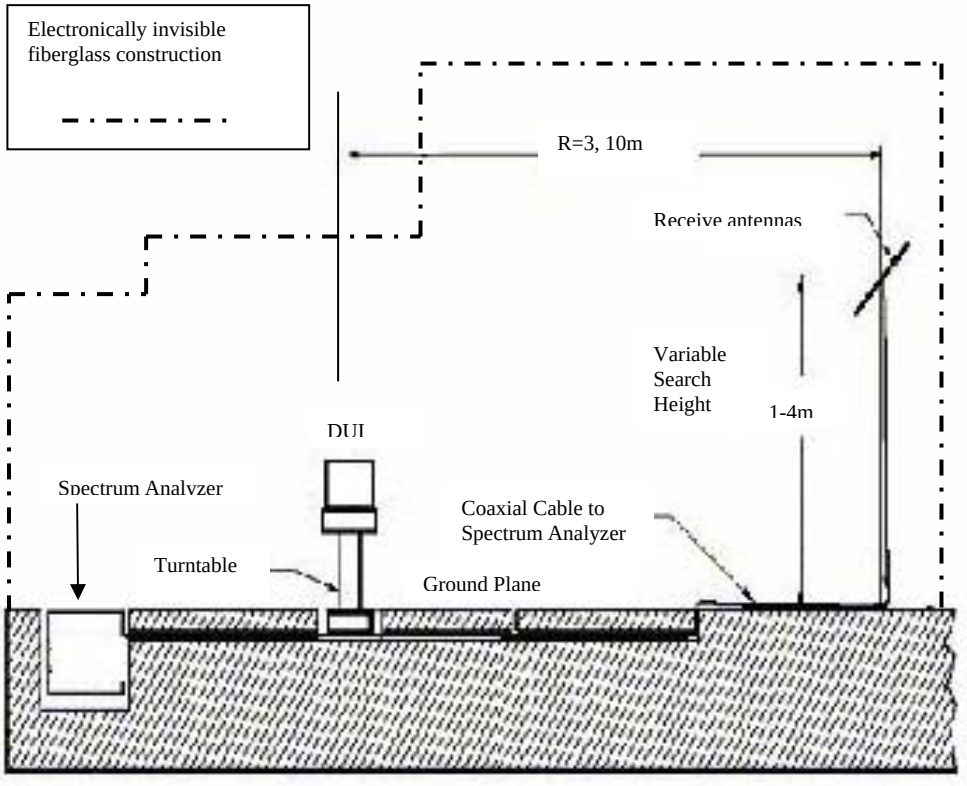


Figure 2.a: Test set up for the radiated emission measurement in OATS (not to scale)

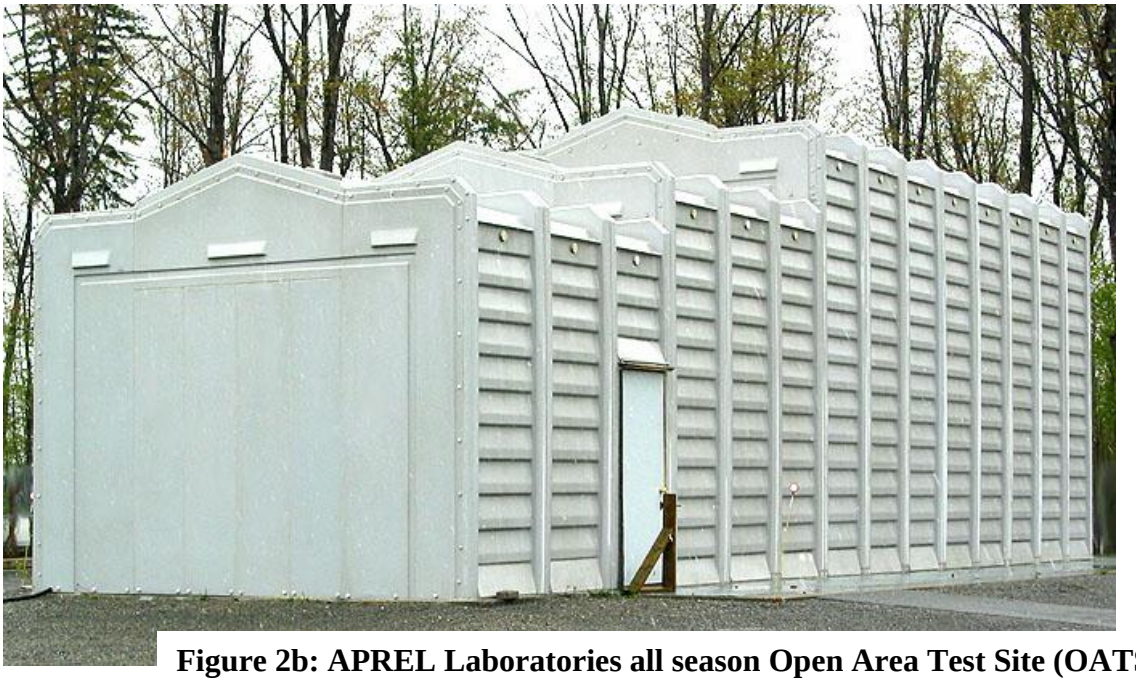


Figure 2b: APREL Laboratories all season Open Area Test Site (OATS)

Table 1
Field Strength of Spurious Radiation
Antenna Polarization: **Vertical**
Substitution Method as Radiated

Frequency	ERP_V	Limit	Margin
MHz	dBm	dBm	dB
Low Channel - Transmitting Frequency: 806.0125 MHz			
806.0125	-	-	-
1612.0250	-24.5	-13	11.5
2418.0375	-32.4	-13	19.4
3224.0500	noise floor	-13	-
4030.0625	noise floor	-13	-
Medium Channel - Transmitting Frequency: 815.5000 MHz			
815.5000	-	-	-
1631.0000	-23.8	-13	10.8
2446.5000	-31.3	-13	18.3
3262.0000	noise floor	-13	-
4077.5000	noise floor	-13	-
High Channel - Transmitting Frequency: 824.9875 MHz			
824.9875	-	-	-
1649.9750	-24.2	-13	11.2
2474.9625	-31.2	-13	18.2
3299.9500	noise floor	-13	-
4124.9375	noise floor	-13	-

Tested by Eric Rosen Date August 2003

Table 2
Field Strength of Spurious Radiation
Antenna Polarization: **Horizontal**
Substitution Method as Radiated

Frequency	ERP_H	Limit	Margin
MHz	dBm	dBm	dB
Low Channel - Transmitting Frequency: 806.0125 MHz			
806.0125	-	-	-
1612.0250	-35.9	-13	22.9
2418.0375	noise floor	-13	-
3224.0500	noise floor	-13	-
4030.0625	noise floor	-13	-
Medium Channel - Transmitting Frequency: 815.500 MHz			
815.5000	-	-	-
1631.0000	-34.4	-13	21.4
2446.5000	noise floor	-13	-
3262.0000	noise floor	-13	-
4077.5000	noise floor	-13	-
High Channel - Transmitting Frequency: 824.9875 MHz			
824.9875	-	-	-
1649.9750	-33.2	-13	20.2
2474.9625	noise floor	-13	-
3299.9500	noise floor	-13	-
4124.9375	noise floor	-13	-

Tested by Ku Chi Poon Date August 2003

APPENDIX A
List of Test Equipment

Radiated Spurious Emissions
List of Equipment

Description	Range	Manufacturer	Model #	APREL Asset #	Cal. Due Date
Spectrum Analyzer	9 kHz - 3 GHz	Anritsu	MS2661C	301330	Sept.11, 2003
Spectrum Analyzer	9 kHz - 30 GHz	Anritsu	MS2667C	301386	Sept. 5, 2003
RF Signal Generator	10 MHz – 26.5 GHz	Hewlett Packard	HP 8340 B	100955	Oct 5, 2003
Low Noise Antenna Pre-amplifier	30 MHz-1000MHz	APREL Inc.	LNA-1	301415	August 27, 2004
Microwave Pre-amplifier	1 GHz – 26.5 GHz	Hewlett-Packard	8449B	301462	June 16, 2004
Attenuator	3 dB	Bird	–	100889	CBT
Attenuator	6 dB	Pasternack	–	301565	CBT
Attenuator	6 dB	Pasternack	–	301566	CBT
Notch Filter	DC - 6 GHz	Microwavefilter Co.	6367	301055	CBT
RF Power Meter	10 MHz - 18 GHz	Rhodes & Schwarz	NRVS	100851	Oct. 10, 2003
Biconical Antenna	20 MHz - 200 MHz	Eaton	94455-1	100890	July 18, 2004
Log - Periodic Antenna	200 MHz -1.0 GHz	Eaton	ALP-1	100063	July 31, 2004
Horn Antenna	1 – 18 GHz	APREL Inc.	AA – 118	100400	June 17, 2004
Anechoic Shielded Room	10 kHz - 10 GHz	APREL Inc.	_	301329	N/A
Reference Half -wave Dipole Antenna	815.00 MHz	APREL Inc.	_	301482	N/A
Reference Half -wave Dipole Antenna	1630.00 MHz	APREL Inc.	_	301549	N/A
Reference Half -wave Dipole Antenna	2500.00 MHz	APREL Inc.	_	301550	N/A
OATS	30 MHz – 1 GHz	APREL Inc.	3 m & 10 m	N/A	April 4, 2004
Mast with the Controller	1 m – 4 m	EMCO	1051 – 12	100507	N/A
Turntable with the Controller	0° - 360°	EMCO	1060 – 1.241	100506	N/A

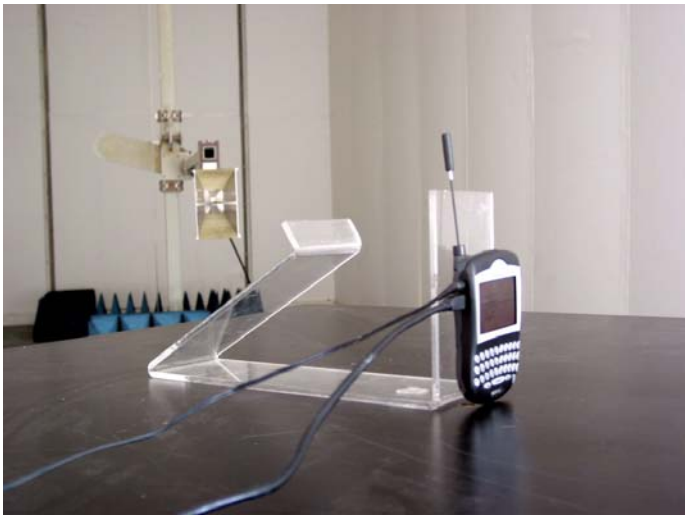
APPENDIX B
PHOTOGRAPHS

RIM RAL10IN BlackBerry Wireless Handheld

Measurement of Field Strength of Spurious Radiation in Open Area Test Site
Testing setup: BlackBerry RAL10IN with extended antenna connected to charger and earphone

RIM RAL10IN BlackBerry Wireless Handheld
Testing for Spurious Emissions from Transmitter
Frequency Range: 30 MHz – 200 MHz

RIM RAL10IN BlackBerry Wireless Handheld
Testing for Spurious Emissions from Transmitter
Frequency Range: 200 MHz – 1 GHz



RIM RAL10IN BlackBerry Wireless Handheld tested for Spurious Emissions from Transmitter Frequency Range: 1 GHz – 18 GHz