

# Assessment of Compliance

with

Respect to FCC Part 15, Subpart B,  
Class B, Unintentional Radiator

**BlackBerry Wireless Handheld  
Model: RAL10IN**

**Research in Motion**



August 2003

APREL Project No.:RIMB-7510-4043

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# Engineering Report

**Subject:** Assessment of Compliance with  
Respect to FCC Part 15, Subpart B,  
Class B, Unintentional Radiator

**FCC ID:** L6ARAL10IN

**Product:** BlackBerry Wireless Handheld

**Model.:** RAL10IN

**Client:** Research in Motion (RIM)  
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Waterloo, Ontario

**Project #:** RIMB-7510-4043

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



FCC Part 15, Subpart B, Class B

## ***SUMMARY***

This report describes the Electromagnetic Interference evaluation performed on a **RIM BlackBerry Wireless Handheld Model RAL10IN**, referred to as DUI (Device Under Investigation).

The evaluation was performed for the purpose of verification of compliance with the requirements of FCC Part 15, Subpart B, Class B Digital Devices.

The DUI was evaluated for both conducted and radiated emissions. The ANSI C63.4-1992 document “Method of Measurement of Radio Noise Emissions from Low-Voltage Electrical and Electronic Equipment” was used as a guideline for evaluation. The methodology is described in **Section 1, Conducted Signal Analysis** and **Section 2, Radiated Signal Analysis**.

### **The Equipment conforms to Class B limits by margins of:**

- Conducted emission: 18.3 dB (Lowest)
- Radiated emission: 7.2 dB (Lowest)

### Summary of Test Results

Specification	Test Type	Results
FCC CFR 47, Part 15, Subpart B & ICES 003	Class B	Pass

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

## ***INTRODUCTION***

### **General**

This report describes the results of the Electromagnetic Interference Analysis performed on a ***Research in Motion (RIM) BlackBerry Wireless Handheld, Model RAL10IN.***

APREL Laboratories performed the tests for RIM at APREL's EMI facility located in Nepean, Ontario, Canada. The laboratory operates a 3 and 10 meter Open Area Test Site (OATS) measurement facility. The test site is calibrated to ANSI C63.4-1992 document.

A description of the measurement facility in accordance with the radiated and AC line conducted test site criteria in 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's Open Area Test Site (OATS) is approved by Industry Canada (IC) under the certification number **IC 2068**.

APREL is accredited by Standard Council of Canada. All equipment used is calibrated or verified. APREL is also accredited by Industry Canada and recognized by the Federal Communications Commission (FCC). ***Under the terms of the MRA between NVLAP and SCC, APREL is acceptable by FCC to perform Declaration of Conformity (DoC) testing under the FCC rules.***

### **Standard**

The evaluation and analysis were conducted in accordance with FCC Part 15, Subpart B requirements for Class B Digital Devices.

### **Sample for Evaluation**

The sample of the evaluation consisted of the following:

<b>Description</b>	<b>Model No</b>	<b>S/N</b>
BlackBerry Wireless Handheld (FCC ID:L6ARAL10IN)	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. The Laptop and Charger cannot be connected to the BlackBerry at the same time.

### **Test Equipment:**

The test equipment used during the evaluation is listed in Appendix A.

### **Environmental Conditions:**

Measurements were conducted in shielded room and open area test site.

	Shielded Room	OATS
Temperature	23 ± 2 °C	19 ± 3 °C
Relative humidity	30-60 %	30-60 %
Air pressure	101 ± 3 kPa	101 ± 3 kPa

### **Measurement Repeatability Information:**

The test data presented in this report was acquired using the guidelines set forth in ANSI C63.4-1992 and are valid only for the equipment identified herein under the test conditions described. Repeatability of these test results will only be achieved with identical measurement conditions. These conditions include the same test distance, DUI height, measurement site characteristics, and the same DUI and system components. The system must have the same interconnecting cables arranged in identical placement, with the system and/or DUI functioning in the identical mode of operation (i.e. software and so on) as on the date of the test. Any deviation from the test conditions and environment on the date of the test may result in measurement uncertainty which may be difficult to track.

Uncertainty: - for Radiated Emissions Measurement: ±4dB  
 - for Conducted Emissions Measurement: ±2dB

**SECTION ONE**

**CONDUCTED SIGNAL ANALYSIS**

**Procedure**

Measurement of conducted emission was carried out following the test procedure ANSI C63.4-1992 paragraph 7.2.

Conducted power-line measurements were made over the frequency range from 150 kHz to 30 MHz, to determine the line-to-ground radio noise voltage that is conducted from the DUI (Device Under Investigation) power-line input terminals that are directly (or indirectly via separate transformers or power supplies) connected to a public power network.

The power-input leads of the wall mount power supply were connected to the Line Impedance Stabilization Network (LISN) using the 50 Ω/50μH CISPR network. The LISN and the DUI were connected and positioned as shown in Figure 1.

Measurements were performed using the spectrum analyzer with quasi-peak function and 9 kHz resolution bandwidth. Specific peaks were measured from the continuous plots.

The rear of the DUI and peripherals were all aligned and flush with the rear of the table top. The rear of the table top was 40 cm removed from the vertical conducting (shielded room) wall.

**Limit:**

Frequency (MHz)	Conducted Limits for Class B	
	Quasi-peak (dBμV)	Average (dBμV)
0.15 – 0.5	66 – 56	56 – 46
0.5 – 5.0	56	46
5.0 – 30	60	50

Decreases with the logarithm of the frequency

**Test Results:**

Test Data is tabulated in Tables 1 to 4.

**Conclusion:**

The DUI complies with *Class B* limit for conducted emissions. Only the highest or measurable readings are shown.

The strongest emission was observed at 177.2 kHz (36.4 dBμV – average detection).

## ***SECTION TWO***

### **RADIATED SIGNAL ANALYSIS**

#### **Procedure**

Measurement of radiated emissions was carried out following the test procedure ANSI C63.4-1992 Paragraph 8.1. The Open Site arrangement is shown in Figure 2.

Radiated emission measurements were made over the frequency range 30 MHz to above 960 MHz following the radiated emission limits of Subpart B, Section 15.109, Paragraph A.

Preliminary radiated emissions from 30 MHz were scanned in a shielded enclosure using a broadband Biconical and Log-periodic Antenna in order to determine the characteristic frequencies of radiation. If it is found necessary, the scan for radiated emissions is performed above 1000 MHz, using broadband Double Ridged Guide Horn.

Based on this information, measurements were performed in the open area test site at these characteristic frequencies. APREL Open Area Test Site is calibrated to ANSI C63.4-1992 and is filed with FCC. The test site is characteristically flat, free of reflecting structures. All reflecting objects, including test personnel, lie outside the perimeter of the ellipse (defined in ANSI C63.4-1992) or below the ground plane level. The horizontal and vertical site attenuation measurements are within  $\pm 4$  dB of the theoretical site attenuation of an ideal site. The DUI was placed on a turntable positioned 3 meters away from the receiving antenna, which in turn was connected to the spectrum analyzer. The DUI was operated in a manner that produced the highest emissions.

For each identified characteristic frequency, the received signal was maximized by appropriate positioning of the turntable and the height of the receiving antenna. The height of the antenna was adjusted between 1 m and 4 m in height above the ground plane. The turntable was rotated 360° from a remote control to maximize the emissions. The process was repeated for both horizontal and vertical polarization. All cables were arranged for maximum emission.

Radiated RF emission levels measured were identified as having been emitted by the DUI. Measurements were performed using the spectrum analyzer employing a CISPR quasi-peak detector function and 120 kHz bandwidth on frequencies from 30 MHz to 960 MHz, and for frequencies above 960 MHz employing an average detector function and 1 MHz resolution bandwidth. All measurements were performed at discrete frequencies.



**Limit:**

According to FCC Part 15, Subpart B, Section 15.109, Paragraph B, radiated emission measurement, maximum allowable field strength for Class B Digital Devices at a distance of 3 meters is  $100\mu\text{V/m}$  ( $40.0\text{ dB}\mu\text{V/m}$ ) for the frequency range of 30 to 88 MHz,  $150\mu\text{V/m}$  ( $43.5\text{ dB}\mu\text{V/m}$ ) for 88 to 216 MHz,  $200\mu\text{V/m}$  ( $46.0\text{ dB}\mu\text{V/m}$ ) for 216 to 960 MHz, and  $500\mu\text{V/m}$  ( $54.0\text{ dB}\mu\text{V/m}$ ) for frequencies above 960 MHz.

All measurements were performed using Quasi-peak function of the spectrum analyzer with 120 kHz bandwidth up to 960 MHz and above 960 MHz averaging detector function and 1 MHz resolution bandwidth were used.

**Test Results:**

Test data is tabulated in Tables 5 to 8.

**Conclusion:**

Only the highest or measurable readings are shown. Signals from the local oscillators and their harmonics were more than 20 dB below the limit.

The strongest emission was observed at 970.152 MHz ( $35.3\text{ dB}\mu\text{V/m}$  – QP detection).

The DUI complies with **Class B** limit for radiated emissions.



**TABLE 1**  
**CONDUCTED R.F. EMISSION LEVELS**  
**QUASI-PEAK DETECTION (RB: 9kHz)**

**Line: LIVE**

Frequency (MHz)	Measured Level		Criteria Class B		Margin to Class B (dB) "A3"
	(dBµV) "A1"	(µV)	(dBµV) "A2"	(µV)	
0.1789	43.9	156.0	64.5	1686	20.7
0.2792	33.8	48.8	60.8	1101	27.1
0.3761	28.9	27.8	58.4	828	29.5
0.4747	29.3	29.2	56.4	663	27.1
0.5801	25.3	18.5	56.0	631	30.7
0.6770	20.7	10.8	56.0	631	35.3
0.7603	23.7	15.3	56.0	631	32.3
0.8725	22.5	13.4	56.0	631	33.5
0.9728	21.9	12.4	56.0	631	34.1
7.9480	19.6	9.6	60.0	1000	40.4
8.0410	19.6	9.5	60.0	1000	40.4
8.3200	19.8	9.7	60.0	1000	40.2

Margin to class B is: A3 = A2-A1 (in dB)

**TABLE 2**  
**CONDUCTED R.F. EMISSION LEVELS**  
**QUASI-PEAK DETECTION (RB: 9kHz)**

**Line: NEUTRAL**

Frequency (MHz)	Measured Level		Criteria Class B		Margin to Class B (dB) "A3"
	(dBµV) "A1"	(µV)	(dBµV) "A2"	(µV)	
0.1772	45.6	191.2	64.6	1701	19.0
0.2741	34.9	55.3	61.0	1121	26.1
0.3591	31.7	38.5	58.7	866	27.0
0.4543	31.8	39.0	56.8	692	25.0
0.5682	27.9	24.7	56.0	631	28.2
0.6413	26.0	20.0	56.0	631	30.0
0.7365	27.6	24.0	56.0	631	28.4
0.8300	25.7	19.2	56.0	631	30.3
0.9225	25.7	19.4	56.0	631	30.3
7.7610	20.0	10.0	60.0	1000	40.0
7.8550	20.5	10.5	60.0	1000	39.6
7.9470	20.2	10.3	60.0	1000	39.8

Margin to class B is: A3 = A2-A1 (in dB)

**Test configuration: BlackBerry RAL10IN connected to charger**

**TABLE 3**  
**CONDUCTED R.F. EMISSION LEVELS**  
**Average Detection**  
**Line: LIVE**

Frequency (MHz)	Measured Level		Criteria Class B		Margin to Class B (dB) "A3"
	(dBµV) "A1"	(µV)	(dBµV) "A2"	(µV)	
0.1772	36.4	65.8	54.6	538	18.3
0.2639	24.8	17.3	51.3	368	26.5
0.3591	25.4	18.6	48.7	274	23.4
0.4526	24.7	17.2	46.8	219	22.1
0.5478	23.1	14.3	46.0	200	22.9
0.6430	20.7	10.8	46.0	200	25.3
0.7365	19.5	9.5	46.0	200	26.5
0.8317	19.2	9.2	46.0	200	26.8
0.9235	20.4	10.5	46.0	200	25.6
7.9470	16.8	6.9	50.0	316	33.2
8.0390	17.1	7.2	50.0	316	32.9
8.1310	16.9	7.0	50.0	316	33.1

Margin to class B is: A3 = A2-A1 (in dB)

**TABLE 4**  
**CONDUCTED R.F. EMISSION LEVELS**  
**Average Detection**  
**Line: NEUTRAL**

Frequency (MHz)	Measured Level		Criteria Class B		Margin to Class B (dB) "A3"
	(dBµV) "A1"	(µV)	(dBµV) "A2"	(µV)	
0.1755	34.6	53.4	54.7	543	20.1
0.2656	24.9	17.5	51.3	365	26.4
0.3591	26.0	20.0	48.7	274	22.7
0.4543	24.9	17.6	46.8	219	21.9
0.5478	22.5	13.4	46.0	200	23.5
0.6431	20.8	11.0	46.0	200	25.2
0.7365	20.9	11.1	46.0	200	25.1
0.8300	20.4	10.4	46.0	200	25.7
0.9235	21.3	11.6	46.0	200	24.7
7.7600	16.8	6.9	50.0	316	33.2
7.8530	17.0	7.1	50.0	316	33.0
7.9470	16.6	6.7	50.0	316	33.4

Margin to class B is: A3 = A2-A1 (in dB)

**Test configuration: BlackBerry RAL10IN connected to charger**

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## RADIATED R.F. EMISSION LEVELS

**TABLE 5**  
**FCC PART 15 CLASS B**  
**QUASI-PEAK DETECTION, RB: 120 kHz**  
**ANTENNA POLARIZATION: VERTICAL**

Frequency  (MHz)	Measured Level at 3m  (dBμV) "B1"	Correction Factor  (dB/m) "B2"	Field Strength at 3m		Criteria Class B at 3m		Margin to Class B  (dB) "B7"
			(dBμV/m) "B3"	(μV/m)	(dBμV/m) "B5"	(μV/m)	
50.806	42.5	-13.8	28.7	27.2	40.0	100	11.3
114.243	44.0	-15.7	28.3	26.0	43.5	150	15.2
326.120	36.2	-8.5	27.8	24.4	46.0	200	18.3
599.456	26.1	0.4	26.5	21.2	46.0	200	19.5
722.868	24.5	1.8	26.3	20.5	46.0	200	19.8
732.680	25.3	1.6	26.9	22.1	46.0	200	19.1

B3 = B1 + B2;

Margin to class B (in dB) is: B7 = B5 - B3;

Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Loss (dB) - Amp.Gain (dB)

**Test configuration: BlackBerry RAL10IN connected to Laptop PC**

**TABLE 6**  
**FCC PART 15 CLASS B**  
**QUASI-PEAK DETECTION, RB: 120 kHz**  
**ANTENNA POLARIZATION: HORIZONTAL**

Frequency (MHz)	Measured Level at 3m (dBµV) "B1"	Correction Factor (dB/m) "B2"	Field Strength at 3m		Criteria Class B at 3m		Margin to Class B (dB) "B7"
			(dBµV/m) "B3"	(µV/m)	(dBµV/m) "B5"	(µV/m)	
110.876	42.9	-15.9	27.0	22.3	43.5	150	16.5
114.242	47.6	-15.7	31.9	39.3	43.5	150	11.6
151.200	37.3	-10.1	27.2	23.0	43.5	150	16.3
310.808	34.6	-8.7	25.9	19.7	46.0	200	20.1
854.116	26.5	3.1	29.6	30.1	46.0	200	16.4
970.152	28.4	6.9	35.3	58.4	54.0	500	18.7

B3 = B1 + B2;

Margin to class B (in dB) is: B7 = B5 - B3;

Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Loss (dB) - Amp.Gain (dB)

**Test configuration: BlackBerry RAL10IN connected to Laptop PC**

**TABLE 7**  
**FCC PART 15 CLASS B**  
**QUASI-PEAK DETECTION, RB: 120 kHz**  
**ANTENNA POLARIZATION: VERTICAL**

Frequency (MHz)	Measured Level at 3m (dB $\mu$ V) "B1"	Correction Factor (dB/m) "B2"	Field Strength at 3m		Criteria Class B at 3m		Margin to Class B (dB) "B7"
			(dB $\mu$ V/m) "B3"	( $\mu$ V/m)	(dB $\mu$ V/m) "B5"	( $\mu$ V/m)	
50.398	41.1	-13.6	27.5	23.7	40.0	100	12.5
52.208	47.3	-14.5	32.8	43.6	40.0	100	7.2
61.694	43.2	-16.6	26.6	21.4	40.0	100	13.4
85.378	43.7	-17.4	26.3	20.7	40.0	100	13.7
90.126	42.3	-17.3	25.0	17.8	43.5	150	18.5
970.154	26.3	6.9	33.2	45.9	54.0	500	20.8

B3 = B1 + B2;

Margin to class B (in dB) is: B7 = B5 - B3;

Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Loss (dB) - Amp.Gain (dB)

**Test configuration: BlackBerry RAL10IN connected to charger and earphone**

**TABLE 8**  
**FCC PART 15 CLASS B**  
**QUASI-PEAK DETECTION, RB: 120 kHz**  
**ANTENNA POLARIZATION: HORIZONTAL**

Frequency (MHz)	Measured Level at 3m (dBµV) "B1"	Correction Factor (dB/m) "B2"	Field Strength at 3m		Criteria Class B at 3m		Margin to Class B (dB) "CB"
			(dBµV/m) "B3"	(µV/m)	(dBµV/m) "B5"	(µV/m)	
47.398	41.9	-13.0	28.9	27.8	40.0	100	11.1
52.128	41.5	-14.5	27.0	22.4	40.0	100	13.0
56.874	34.1	-16.0	18.2	8.1	40.0	100	21.9
61.610	32.9	-16.6	16.3	6.5	40.0	100	23.7
127.944	31.1	-14.0	17.1	7.2	43.5	150	26.4
303.292	23.3	-8.9	14.4	5.3	46.0	200	31.6

B3 = B1 + B2;

Margin to class B (in dB) is: B7 = B5 - B3;

Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Loss (dB) - Amp.Gain (dB)

**Test configuration: BlackBerry 7510 connected to charger and earphone**

Tested by *Ku Chen Power* Date *August 2003*

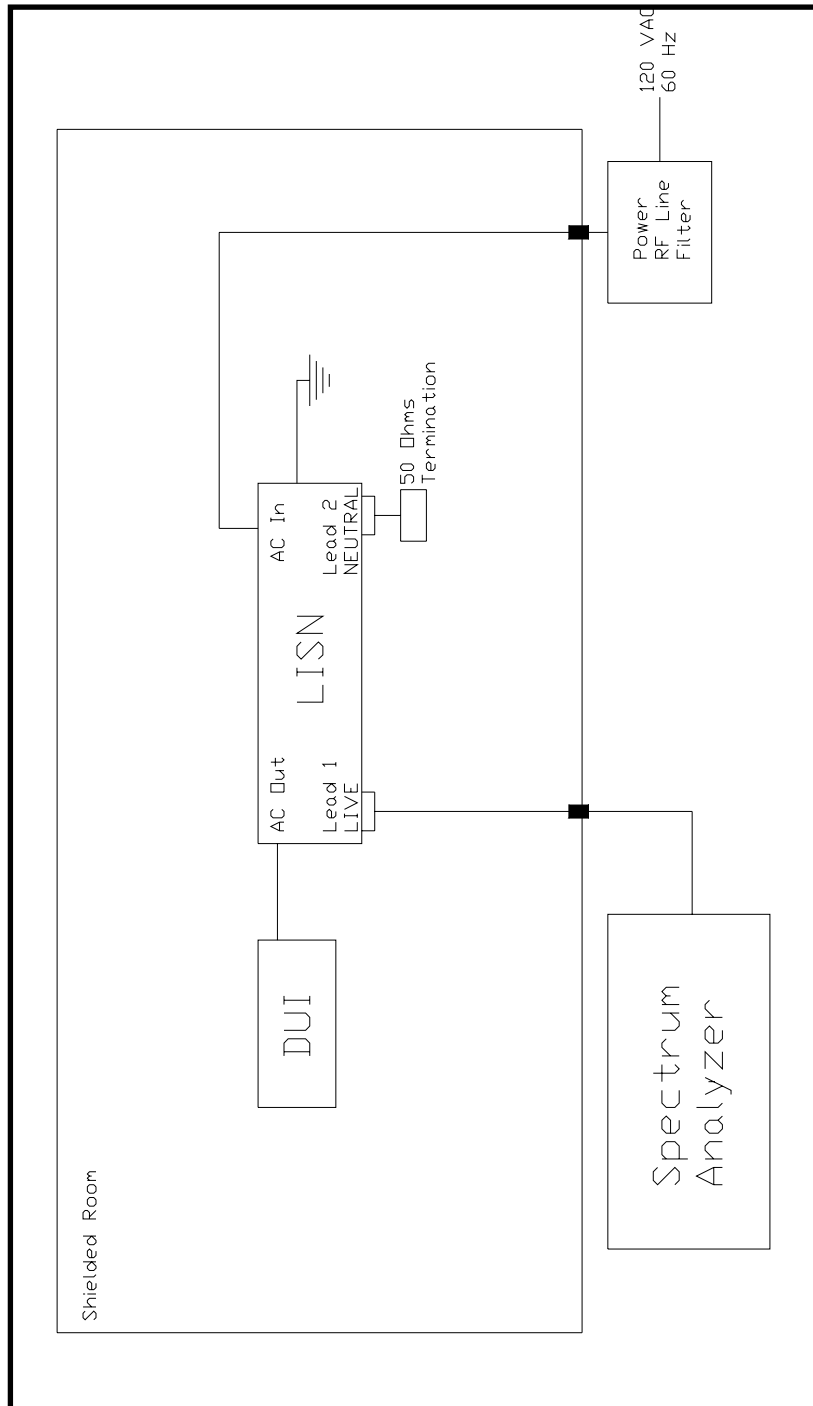
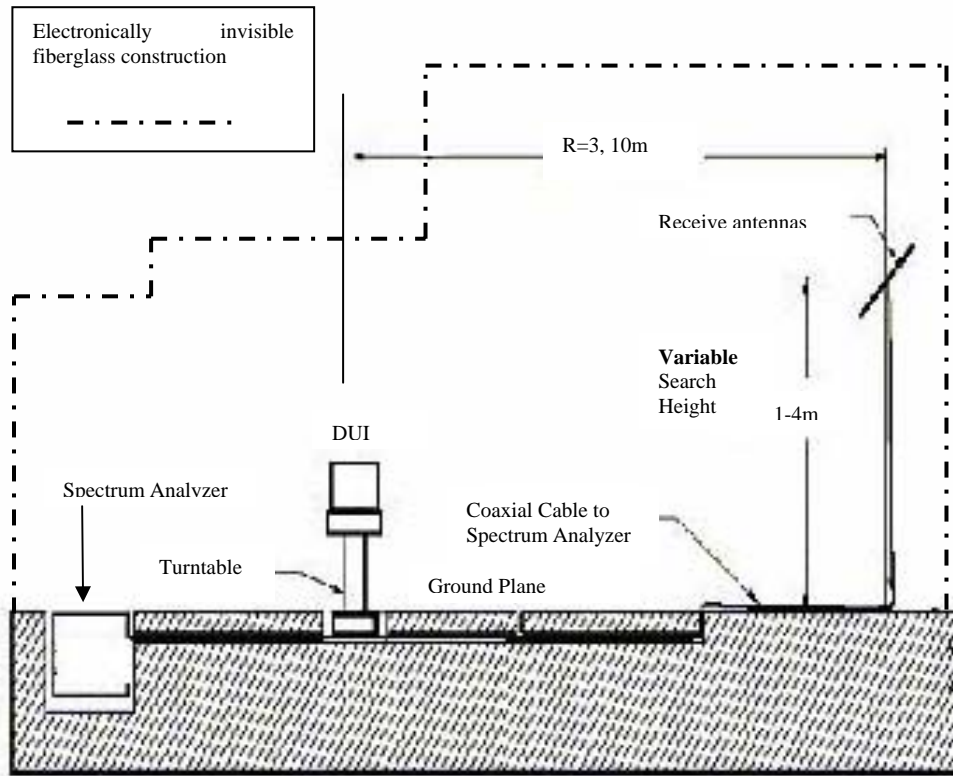


Fig. 1: Test set up for the power line conducted emission measurement.





**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)**

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## APPENDIX A

### List of Equipment used for Evaluation of the DUI

Description	Range	Manufacturer	Model #	APREL Asset #	Cal. Due Date
Spectrum Analyzer	9 kHz-3 GHz	Anritsu	MS2661C	301330	September 11, 2003
Spectrum Analyzer	9 kHz – 30GHz	Anritsu	MS2667C	301386	September 5, 2003
Line Impedance Stabilization Network (LISN)	10 kHz-1.0 GHz	APREL Inc.	—	301310	August 4, 2004
Bi-conical 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 GHz – 18 GHz	APREL Inc.	AA-118	100553	June 17, 2004
Mast with Controller	1 m - 4 m	EMCO	1051-12	100507	N/A
OATS	3m & 10 m	APREL Inc.	3 m & 10 m	N/A	N/A
Anechoic/Shielded Room	10 kHz - 10 GHz	APREL Inc.	—	301329	N/A
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

## APPENDIX B

### Photographs of DUI and Test-Setup



**Picture of DUI  
BlackBerry RAL10IN**



**Radiated Emissions Measurement in Open Area Test Site  
Testing setup: BlackBerry RAL10IN connected to charger and earphone**





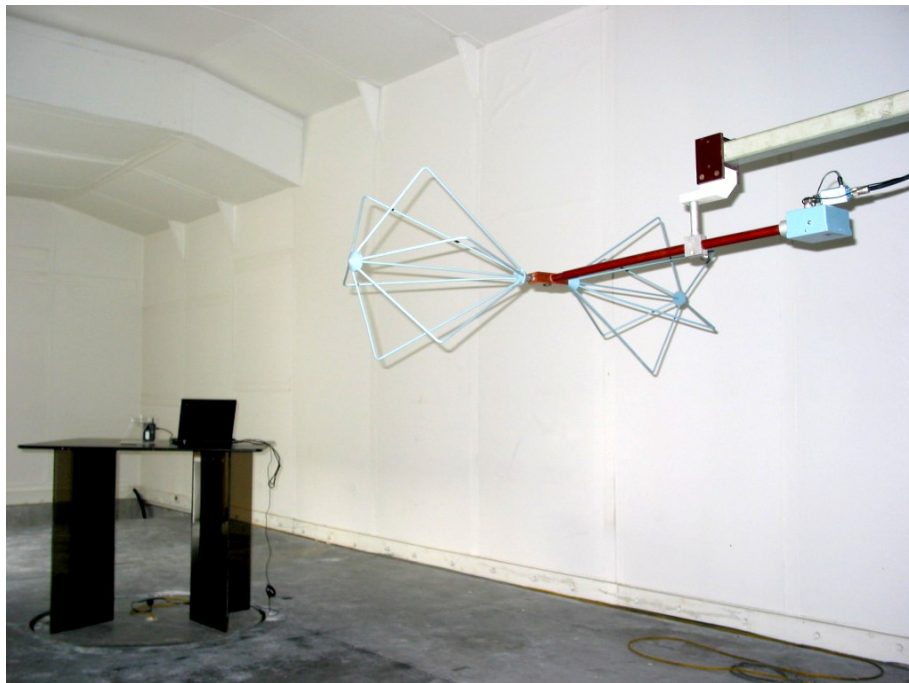
**Radiated Emissions Measurement in Open Area Test Site  
Testing setup: BlackBerry RAL10IN connected to laptop PC**



**Radiated Emissions Measurement in Open Area Test Site  
(Frequency range: 30 MHz – 200 MHz)  
Configuration: BlackBerry RAL10IN connected to charger and earphone**

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**Radiated Emissions Measurement in Open Area Test Site  
(Frequency range: 30 MHz – 200 MHz)  
Configuration: BlackBerry RAL10IN connected to laptop PC**

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**Radiated Emissions Measurement in Open Area Test Site  
(Frequency range: 200 MHz – 960 MHz)  
Configuration: BlackBerry RAL10IN connected to charger and earphone**



**Radiated Emission Measurement in Open Area Test Site  
(Frequency range: 200 MHz – 960 MHz)  
Configuration: BlackBerry RAL10IN connected to laptop PC**

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