ENGINEERING TEST REPORT

BlackBerry Wireless Handheld
Model No.: R1900G-1-4
FCC ID: L6AR1900G-1-4

Applicant: **Research In Motion Limited**
295 Phillip Street
Waterloo, Ontario
Canada, N2L 3W8

Tested in Accordance With

Federal Communications Commission (FCC)
PERSONAL COMMUNICATIONS SERVICES
CFR 47, PARTS 2 and 24 (Subpart E)

UltraTech's File No.: RIM3-FTX

This Test report is Issued under the Authority of
Tri M. Luu, Professional Engineer,
Vice President of Engineering
UltraTech Group of Labs

Date: April 2, 2001

Report Prepared by: Dan Huynh	Tested by: Mr. Hung Trinh, RFI/EMI Technician
Issued Date: March 27, 2001	Test Dates: March 22 - 25, 2001

The results in this Test Report apply only to the sample(s) tested, and the sample tested is randomly selected.

UltraTech

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EXHIBIT 1. INTRODUCTION

1.1. SCOPE

Reference:	FCC Parts 2 and 24 (Subpart E): 1998
Title	Telecommunication - Code of Federal Regulations, CFR 47, Parts 2 & 24
Purpose of Test:	To gain FCC Certification Authorization for Radio operating in the frequency band 1850 - 1910 MHz (Broadband PCS).
Test Procedures	Both conducted and radiated emissions measurements were conducted in accordance with American National Standards Institute ANSI C63.4 - American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.

1.2. NORMATIVE REFERENCES

Publication	Year	Title
FCC CFR Parts 2 and 24	1998	Code of Federal Regulations – Telecommunication
ANSI C63.4	1992	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
CISPR 22 & EN 55022	1997 1998	Limits and Methods of Measurements of Radio Disturbance Characteristics of Information Technology Equipment
CISPR 16-1		Specification for Radio Disturbance and Immunity measuring apparatus and methods

EXHIBIT 2. PERFORMANCE ASSESSMENT

2.1. CLIENT INFORMATION

APPLICANT	
Name:	Research In Motion Limited
Address:	295 Phillip Street Waterloo, Ontario Canada, N2L 3W8
Contact Person:	Mr. Masud Attayi Phone #: (519) 888-7465 x2442 Fax #: (519) 888-6906 Email Address: mattayi@rim.net

MANUFACTURER	
Name:	Research In Motion Limited
Address:	295 Phillip Street Waterloo, Ontario Canada, N2L 3W8
Contact Person:	Mr. Masud Attayi Phone #: (519) 888-7465 x2442 Fax #: (519) 888-6906 Email Address: mattayi@rim.net

2.2. EQUIPMENT UNDER TEST (EUT) INFORMATION

The following information (with the exception of the Date of Receipt) has been supplied by the applicant.

Brand Name:	BlackBerry
Product Name:	BlackBerry Wireless Handheld
Model Name or Number:	R1900G-1-4
Serial Number:	Pre-production sample
Type of Equipment:	Personal Communications Services
External Power Supply:	AC charging adaptor and synchronization cradle supplied
Transmitting/Receiving Antenna Type:	Integral
Primary User Functions of EUT:	e-mail, personal digital assistant (PDA)

2.3. EUT'S TECHNICAL SPECIFICATIONS

TRANSMITTER	
Equipment Type:	Portable
Intended Operating Environment:	• Residential • Commercial, light industry & heavy industry
Power Supply Requirement:	Internal rechargeable battery – required accessories supplied for charging
RF Output Power Rating:	1.38 Watts EIRP
Duty Cycle:	PCS network – 1 slot in 8 slot frame – 12.5%
Operating Frequency Range:	1850 - 1910 MHz (Broadband PCS)
RF Output Impedance:	Not applicable – antenna is not removable
Channel Spacing:	200 kHz
Occupied Bandwidth (99%):	250 kHz
Emission Designation*:	307KGXW
Digital Oscillator Frequencies:	13 MHz
Radio Oscillator Frequencies:	1048 MHz IF LO, 1719-1779 MHz variable oscillators
Antenna Connector Type:	Integral
Antenna Description:	Manufacturer: RIM Type: Internal modified center fed folded dipole Model: PCB-03092-003 Frequency Range: 1850 - 1990 MHz In/Out Impedance: Not applicable – antenna in not removable Gain: -3 to +2 dBi

2.4. LIST OF EUT'S PORTS

Port Number	EUT's Port Description	Number of Identical Ports	Connector Type	Cable Type (Shielded/Non-shielded)
1	Serial I/O & DC	1	JAE PCB-to-cable connector	None
2	Audio	1	2.5mm audio plug	None

NOTES:

(1) ***Ports of the EUT which in normal operation*** *were connected to ancillary equipment through interconnecting cables via a representative interconnecting cable to simulate t he input/output characteristics.*

(2) ***Ports which are not connected to cables during normal intended operation*** *(for factory/technical services uses only)*

None.

2.5. MODIFICATIONS INCORPORATED IN THE EUT FOR COMPLIANCE PURPOSES

None

2.6. ANCILLARY EQUIPMENT

The EUT was tested while connected to the following representative configuration of ancillary equipment necessary to exercise the ports during tests:

Ancillary Equipment # 1	
Description:	Cradle
Brand name:	BlackBerry
Model Name or Number:	ASY-03209-003
Serial Number:	Pre-production sample
Cable Length & Type:	2m shielded with RS232 termination to plug into computer and DC receptacle
Connected to EUT's Port:	Serial I/O & DC

Ancillary Equipment # 2	
Description:	AC charging adapter
Brand name:	BlackBerry
Model Name or Number:	PWR-02908-003
Serial Number:	Pre-production sample
Cable Length & Type:	2m unshielded with barrel jack
Connected to EUT's Port:	None – it is plugs into receptacle by RS232 connector on cradle cable

Ancillary Equipment # 3	
Description:	Headset1
Model Name or Number:	HDW-03458-001
Serial Number:	N/A
Cable Length & Type:	1.2m
Connected to EUT's Port:	Audio

Ancillary Equipment # 4	
Description:	Headset2
Model Name or Number:	HDW-03458-002
Serial Number:	N/A
Cable Length & Type:	1.2m
Connected to EUT's Port:	Audio

Ancillary Equipment # 5	
Description:	Headset3
Model Name or Number:	HDW-03458-003
Serial Number:	N/A
Cable Length & Type:	1.2m
Connected to EUT's Port:	Audio

Ancillary Equipment # 6	
Description:	International Travel Charger
Brand name:	BlackBerry
Manufacturer:	Shun Shing
Model Name or Number:	SPS-027-0B
Serial Number:	Pre-production sample
Part Number:	ASY-02790-001
Cable Length & Type:	2m unshielded with barrel jack
Connected to EUT's Port:	DC charging voltage

EXHIBIT 3. EUT OPERATING CONDITIONS AND CONFIGURATIONS DURING TESTS

3.1. CLIMATE TEST CONDITIONS

The climate conditions of the test environment are as follows:

Temperature:	21°C
Humidity:	51%
Pressure:	102 kPa
Power input source:	Internal rechargeable battery

3.2. OPERATIONAL TEST CONDITIONS & ARRANGEMENT FOR TEST SIGNALS

Operating Modes:	The transmitter was operated in a continuous transmission mode with the carrier modulated as specified in the Test Data.
Special Test Software:	N/A
Special Hardware Used:	R&S CMU 200

Transmitter Test Signals	
Frequency Band(s): ▪ 1850 – 1910 MHz	Near lowest, near middle & near highest frequencies each frequency bands that the transmitter covers: ▪ 1850.2 MHz, 1880.0 MHz and 1909.8 MHz
Transmitter Wanted Output Test Signals: ▪ RF Power Output (measured maximum output power): ▪ Normal Test Modulation ▪ Modulating signal source:	 ▪ 1.38 Watts (e.i.r.p.) ▪ GXW ▪ Internal

EXHIBIT 4. SUMMARY OF TEST RESULTS

4.1. LOCATION OF TESTS

All of the measurements described in this report were performed at Ultratech Group of Labs located in the city of Oakville, Province of Ontario, Canada.

- Radiated Emissions were performed at the Ultratech's 3 Meter Open Field Test Site (OFTS) situated in the Town of Oakville, province of Ontario.

The above site have been calibrated in accordance with ANSI C63.4, and found to be in compliance with the requirements of Sec. 2.948 of the FCC Rules. The descriptions and site measurement data of the Oakville Open Field Test Site has been filed with FCC office (FCC File No.: 31040/SIT 1300B3) and Industry Canada office (Industry Canada File No.: IC2049). Last Date of Site Calibration: Sep. 20, 1999.

4.2. APPLICABILITY & SUMMARY OF EMC EMISSION TEST RESULTS

FCC PARAGRAPH.	TEST REQUIREMENTS	APPLICABILITY (YES/NO)
24.229	Frequencies	Yes
24.232 & 2.1046	Equivalent Isotropically Radiated Power (e.i.r.p.) Limits	Yes
24.235 & 2.1055	Frequency Stability	Note
24.238 & 2.1051	Emission Limits (Conducted)	Yes
24.236 & 24.238, 2.1057 & 2.1053	Emission Limits (Radiated)	Yes

BlackBerry Wireless Handheld, **Model No.: R1900G-1-4**, by **Research In Motion Limited** has also been tested and found to comply with **FCC Part 15, Subpart B - Radio Receivers and Class B Digital Devices**. The engineering test report has been documented and kept in file and it is available anytime upon FCC request.

Note: Test to be performed by the manufacturer (Research In Motion Limited) and will be attached along with this report.

EXHIBIT 5. MEASUREMENTS, EXAMINATIONS & TEST DATA FOR EMC EMISSIONS

5.1. TEST PROCEDURES

This section contains test results only. Details of test methods and procedures can be found in Exhibit 7 of this report

5.2. MEASUREMENT UNCERTAINTIES

The measurement uncertainties stated were calculated in accordance with requirements of UKAS Document NIS 81 with a confidence level of 95%. Please refer to Exhibit 6 for Measurement Uncertainties.

5.3. MEASUREMENT EQUIPMENT USED:

The measurement equipment used complied with the requirements of the Standards referenced in the Methods & Procedures ANSI C63.4:1992 and CISPR 16-1.

5.4. ESSENTIAL/PRIMARY FUNCTIONS AS DECLARED BY THE MANUACTURER:

The essential function of the EUT is to correctly communicate data to and from radios over RF link.

5.5. FREQUENCIES @ FCC 24.229

5.5.1. Limits

The frequencies available in the Broadband PCS Service are listed as follows:

(a) The following frequency blocks are available for assignment on an MTA (Major Trading Areas) basis
- Block A: 1850-1865 MHz (Mobile) paired with 1930-1945 MHz (Base)
- Block B: 1870-1885 MHz (Mobile) paired with 1950-1965 MHz (Base)

(b) The following frequency blocks are available for assignment on an BTA (Basic Trading Areas) basis
- Block C: 1895-1910 MHz (Mobile) paired with 1975-1990 MHz (Base)
- Block D: 1865-1870 MHz (Mobile) paired with 1945-1950 MHz (Base)
- Block E: 1885-1890 MHz (Mobile) paired with 1965-1970 MHz (Base)
- Block F: 1890-1895 MHz (Mobile) paired with 1970-1975 MHz (Base)

5.5.2. Analysis

The EUT conforms with all frequency Blocks A, B, C, D, E and F for Portable/Mobile uses

5.6. RF POWER OUTPUT AND EIRP @ FCC 2.1046 & 24.232

5.6.1. Limits

Mobile/portable stations are limited to 2 watts e.i.r.p. peak power and the equipment must employ means to limit the power to the minimum necessary for successful communications

5.6.2. Method of Measurements

Please refer to Exhibit 7, Section 7.1 for test procedures and test setup.

5.6.3. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range	Calibration Date
Spectrum Analyzer/ EMI Receiver	Advantest	R3271	15050203	100 Hz – 26.5 GHz	November 3, 2000
Microwave Amplifier	Hewlett Packard	HP 83017A	3116A00661	1 GHz to 26.5 GHz	July 18, 2000
Biconilog Antenna	EMCO	3143	1029	20 MHz to 2 GHz	July 5, 2000
Horn Antenna	EMCO	3155	9911-5955	1 GHz – 18 GHz	June 1, 2000
Horn Antenna with Mixer	EMCO	3160-09	1007	18 GHz – 26.5 GHz	September 21, 2000
Horn Antenna with Mixer	EMCO	3160-09	5061	18 GHz – 26.5 GHz	March 29, 2000

5.6.4. Test Data

RF Power Output Measurements

- Nominal peak output power is 30 dBm

Frequency (MHz)	[(1)]Peak Conducted Output Power (dBm)		[(2)]Maximum EIRP Measured (dBm)
	Test Configuration 1 (EUT with PWR-02908-003)	Test Configuration 2 (EUT with SPS-027-0B)	
1850.2	29.5	29.5	31.4
1880.0	29.5	29.5	29.4
1909.8	29.4	29.4	26.6

(1) Conducted power was measured with 2 different AC charging adapters, BlackBerry model PWR-02908-003 and SPS-027-0B AC charging adapter. The conducted powers measured from both test configurations results indicate that the powers are exactly identical. Herein, tests results presented are performed with the PWR-02908-003 AC charging adapter where applicable.

(2) Please refer to the following detailed measurements data for maximum EIRP.

EIRP MEASUREMENTS – SUBSTITUTION METHOD

- **Test Configuration # 1: EUT in Cradle with Headset**

Frequency (MHz)	Peak E-Field @ 3m (dBµV/m)	Antenna Polarization (V/H)	Peak Power From Signal Generator (dBm)	Substitution Antenna Gain (dBi)	Measured Peak EIRP (dBm)	Peak EIRP LIMIT (dBm)
1850.2	127.3	V	20.6	7.01	27.6	33.0
	123.5	H	16.9	7.01	23.9	33.0
1880.0	126.5	V	21.0	7.03	28.0	33.0
	120.3	H	14.0	7.03	21.0	33.0
1909.8	123.3	V	18.5	7.05	25.6	33.0
	119.4	H	13.8	7.05	20.9	33.0

- **Test Configuration # 2: EUT Standalone (Side Up)**

Frequency (MHz)	Peak E-Field @ 3m (dBµV/m)	Antenna Polarization (V/H)	Peak Power From Signal Generator (dBm)	Substitution Antenna Gain (dBi)	Measured Peak EIRP (dBm)	Peak EIRP LIMIT (dBm)
1850.2	120.7	V	13.9	7.01	20.9	33.0
	121.3	H	14.7	7.01	21.7	33.0
1880.0	121.1	V	15.7	7.03	22.7	33.0
	122.4	H	16.3	7.03	23.3	33.0
1909.8	117.1	V	12.3	7.05	19.4	33.0
	120.7	H	14.9	7.05	22.0	33.0

- **Test Configuration # 3: EUT Standalone (Laid Flat)**

Frequency (MHz)	Peak E-Field @ 3m (dBµV/m)	Antenna Polarization (V/H)	Peak Power From Signal Generator (dBm)	Substitution Antenna Gain (dBi)	Measured Peak EIRP (dBm)	Peak EIRP LIMIT (dBm)
1850.2	120.1	V	13.4	7.01	20.4	33.0
	125.2	H	18.6	7.01	25.6	33.0
1880.0	120.5	V	15.1	7.03	22.1	33.0
	126.8	H	20.4	7.03	27.4	33.0
1909.8	120.3	V	15.4	7.05	22.5	33.0
	124.3	H	18.5	7.05	25.6	33.0

- **Test Configuration # 4: EUT Standalone (Upright Position)**

Frequency (MHz)	Peak E-Field @ 3m (dBµV/m)	Antenna Polarization (V/H)	Peak Power From Signal Generator (dBm)	Substitution Antenna Gain (dBi)	Measured Peak EIRP (dBm)	Peak EIRP LIMIT (dBm)
1850.2	127.6	V	20.9	7.01	27.9	33.0
	123.2	H	16.6	7.01	23.6	33.0
1880.0	125.8	V	20.3	7.03	27.3	33.0
	123.3	H	17.0	7.03	24.0	33.0
1909.8	122.2	V	17.4	7.05	24.5	33.0
	118.9	H	13.3	7.05	20.4	33.0

- **Test Configuration # 5: EUT In Cradle**

Frequency (MHz)	Peak E-Field @ 3m (dBµV/m)	Antenna Polarization (V/H)	Peak Power From Signal Generator (dBm)	Substitution Antenna Gain (dBi)	Measured Peak EIRP (dBm)	Peak EIRP LIMIT (dBm)
1850.2	131.1	V	24.4	7.01	31.4	33.0
	117.7	H	10.9	7.01	17.9	33.0
1880.0	127.9	V	22.4	7.03	29.4	33.0
	119.8	H	13.6	7.03	20.6	33.0
1909.8	124.4	V	19.5	7.05	26.6	33.0
	116.2	H	10.5	7.05	17.6	33.0

5.7. EMISSION LIMITS (CONDUCTED) & OCCUPIED BANDWIDTH @ FCC §24.238 & §2.1049

5.7.1. Limits

On any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least 43+10log(P) dB.

5.7.2. Method of Measurements

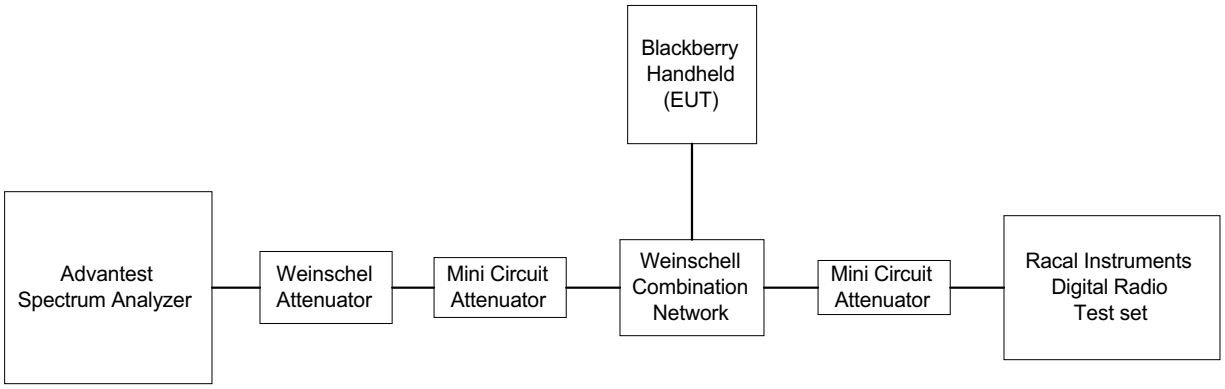
Please refer to FCC 24.238(b) - (d) and Exhibit 7, Section 7.2 of this test report for detailed test procedures.

Measuring Bandwidths:

- Outside the permitted band block: RBW = 1 MHz, VBW $\geq$ RBW
- Inside or on the permitted band block: RBW = 1% of -26dBc Bandwidth, VBW $\geq$ RBW

5.7.3. Test Arrangement

This test arrangement is for 26dB Bandwidth and 99% Occupied Bandwidth measurements.



5.7.4. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range	Calibration Date
Spectrum Analyzer/ EMI Receiver	Advantest	R3271	15050203	100 Hz – 26.5 GHz	November 3, 2000
Combination Network	Weinschel	1515	--	DC – 18 GHz	*
Attenuator	Weinschel	24-10-34	--	DC – 8.5 GHz 10W	*
Attenuator	Mini Circuit	MCLBW56W2	--	--	*
Attenuator	Mini Circuit	MCLBW56W2	--	--	*
Digital Radio Test Set	Racal Instruments	6103E	2573	--	Rim's Equipment

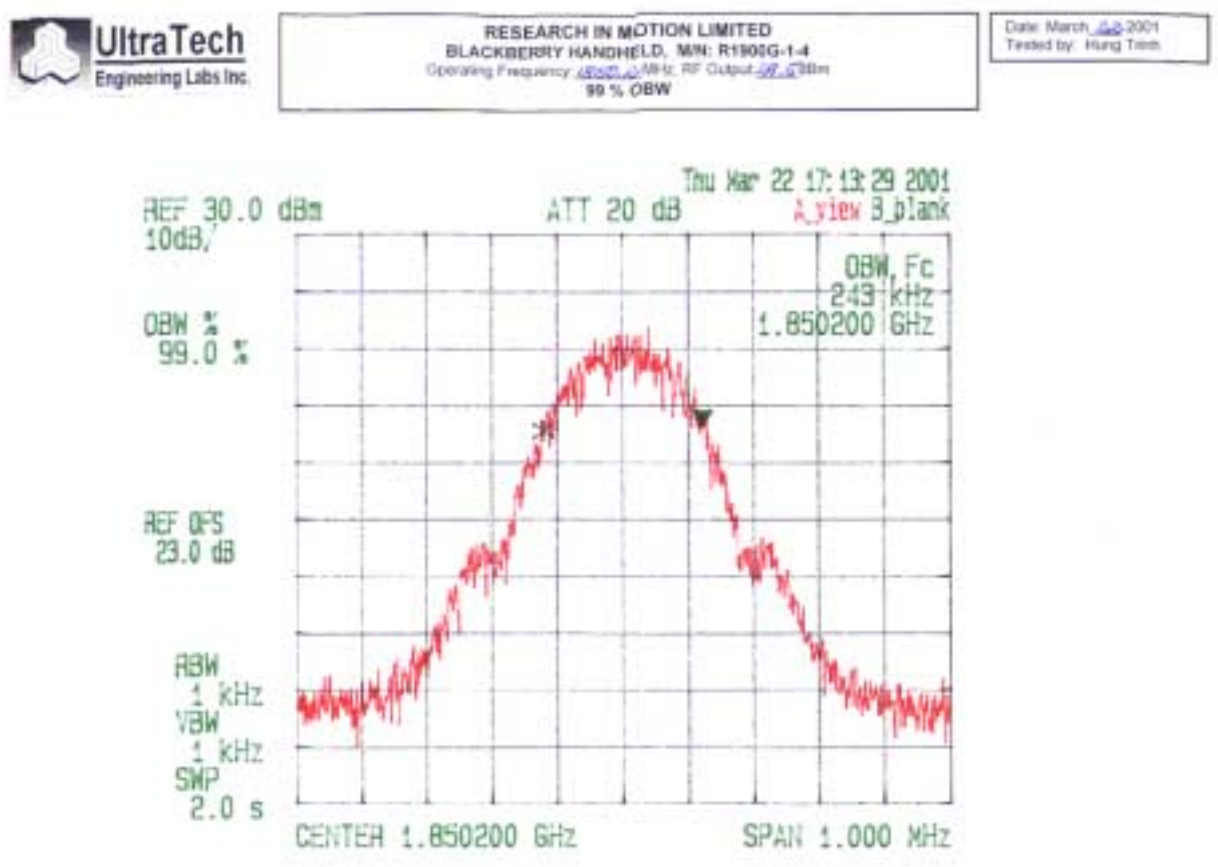
* In house calibration performed before every test.

5.7.5. Test Data

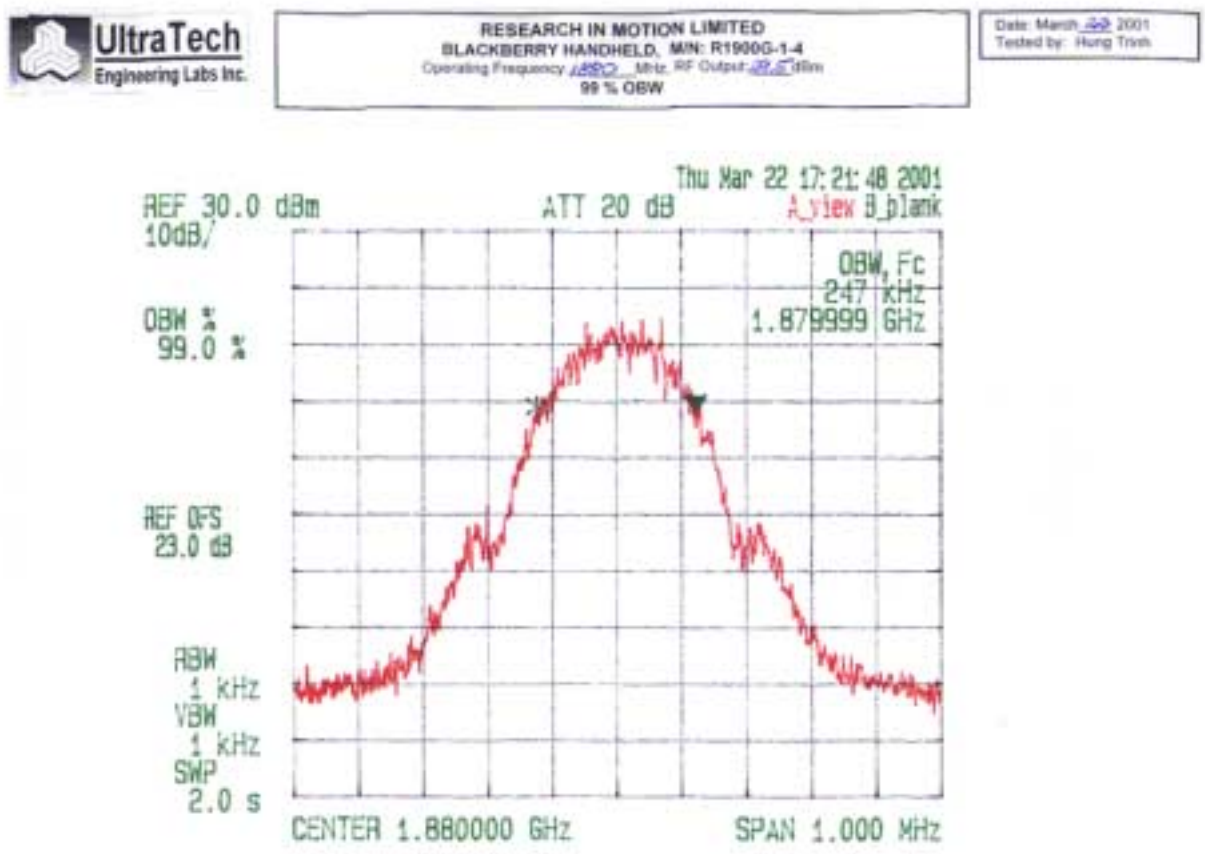
5.7.5.1. 99% Occupied Bandwidths And -26dBc Bandwidth

Frequency (MHz)	99% Occupied Bandwidth (kHz)	-26dBc Bandwidth (kHz)
1850.2	243	306
1880.0	247	307
1909.8	250	304
Refer to the following test data plots for detailed measurements (plots 1 - 6).		

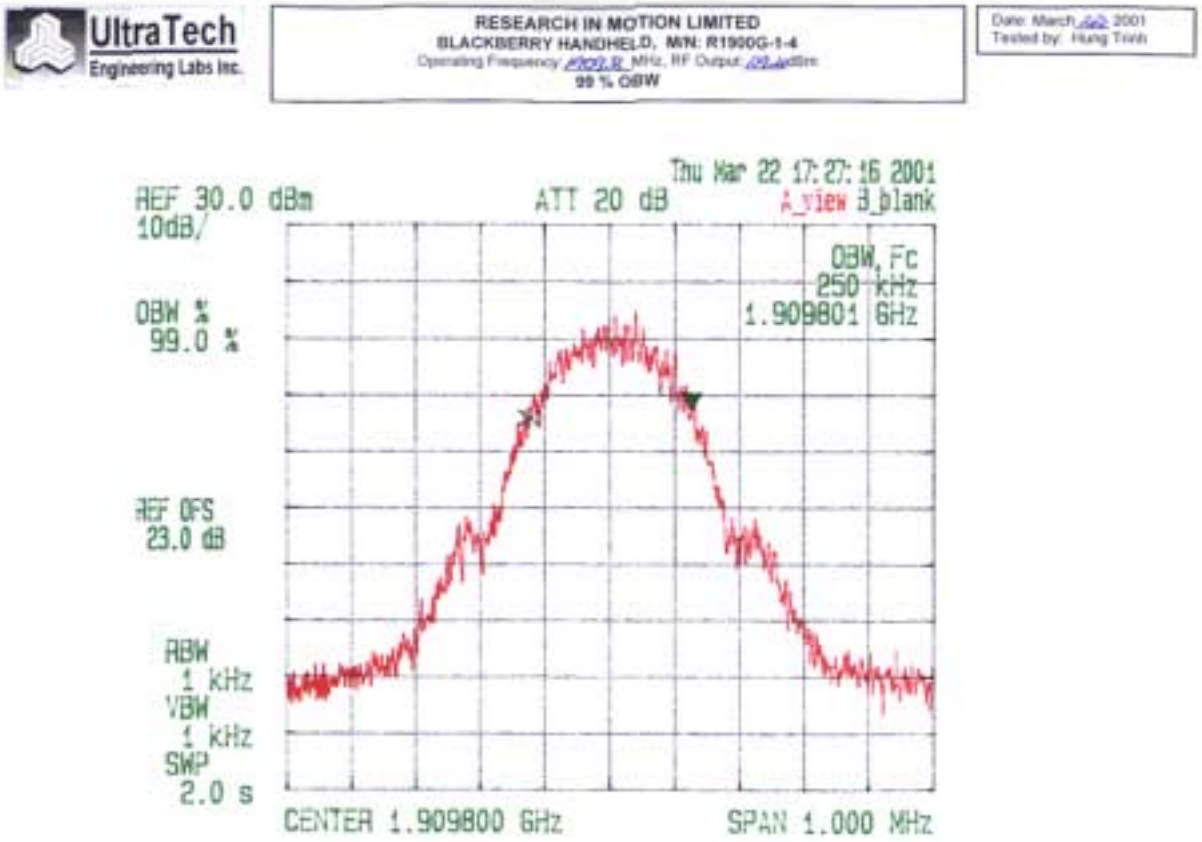
Plot 1: 99% Occupied Bandwidth
Transmitter Frequency: 1850.2 MHz



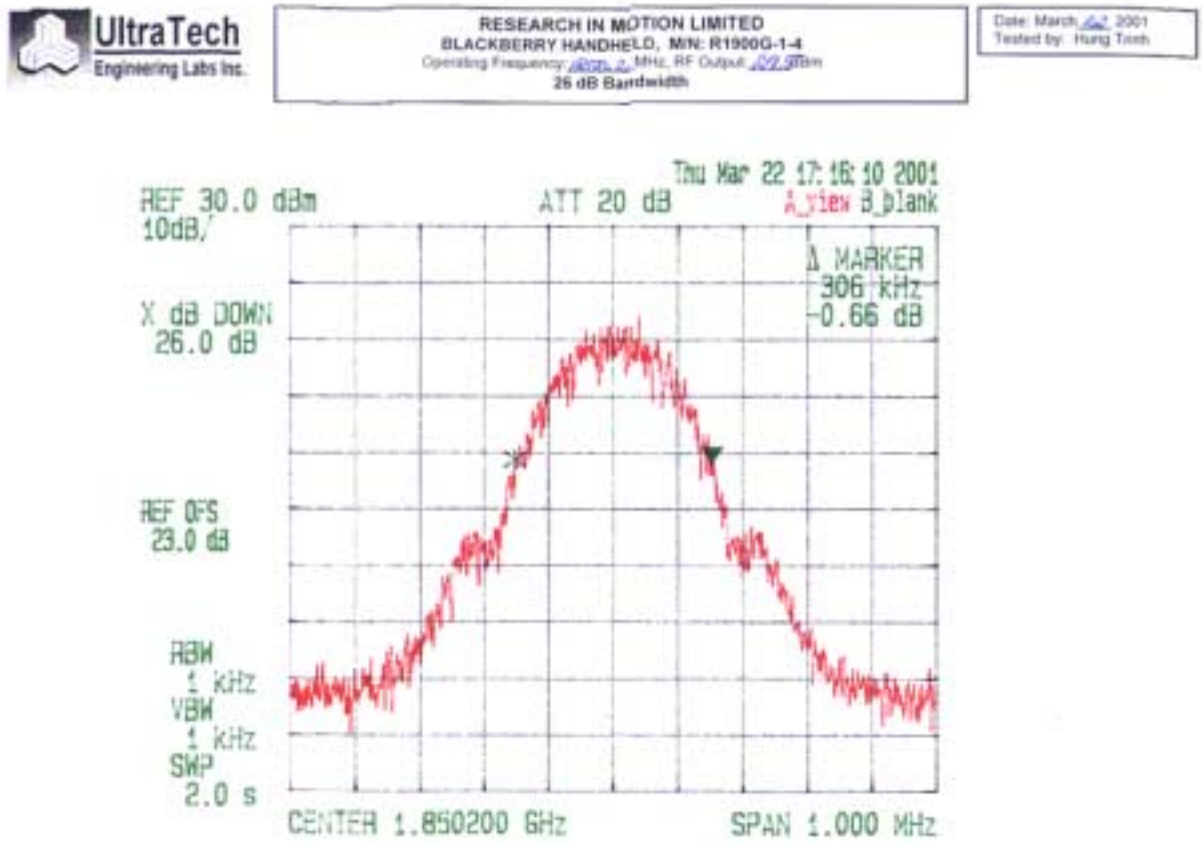
Plot 2: 99% Occupied Bandwidth
Transmitter Frequency: 1880.0 MHz



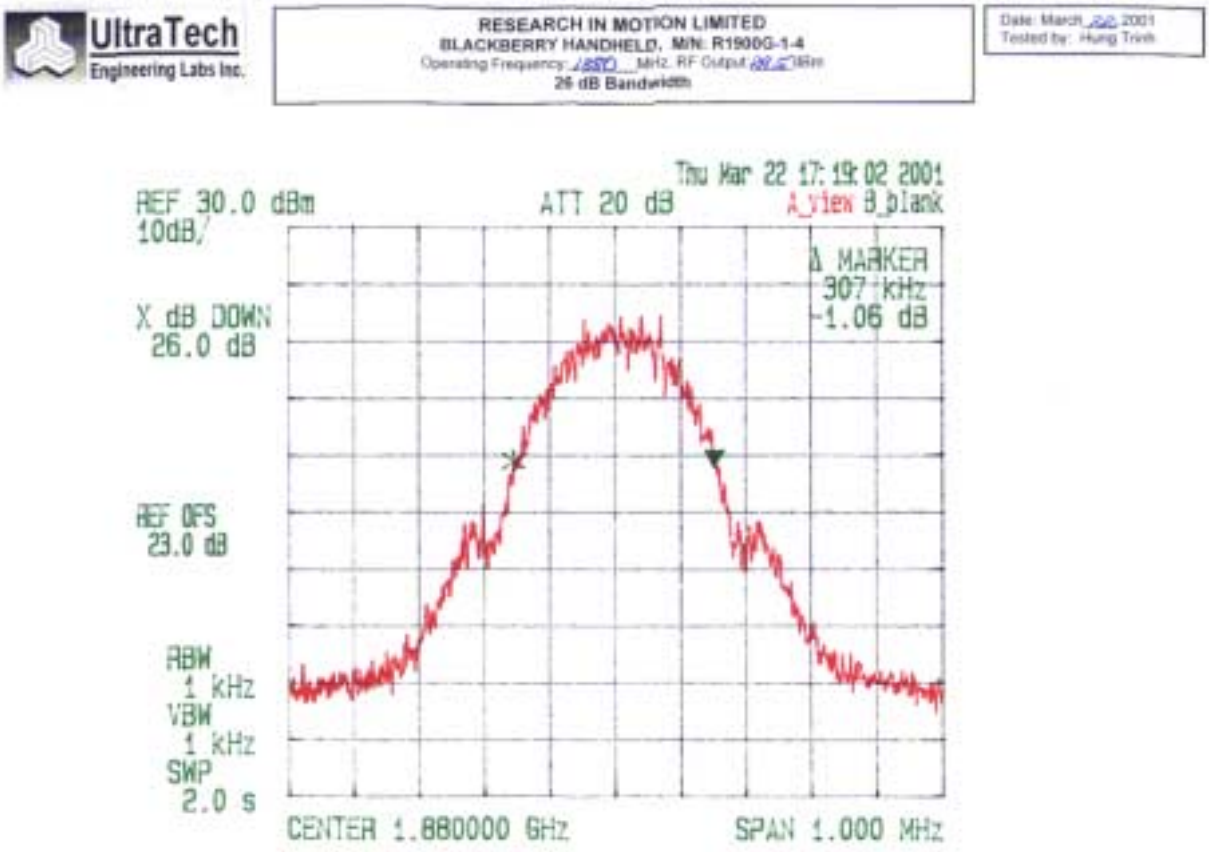
Plot 3: 99% Occupied Bandwidth
Transmitter Frequency: 1909.8 MHz



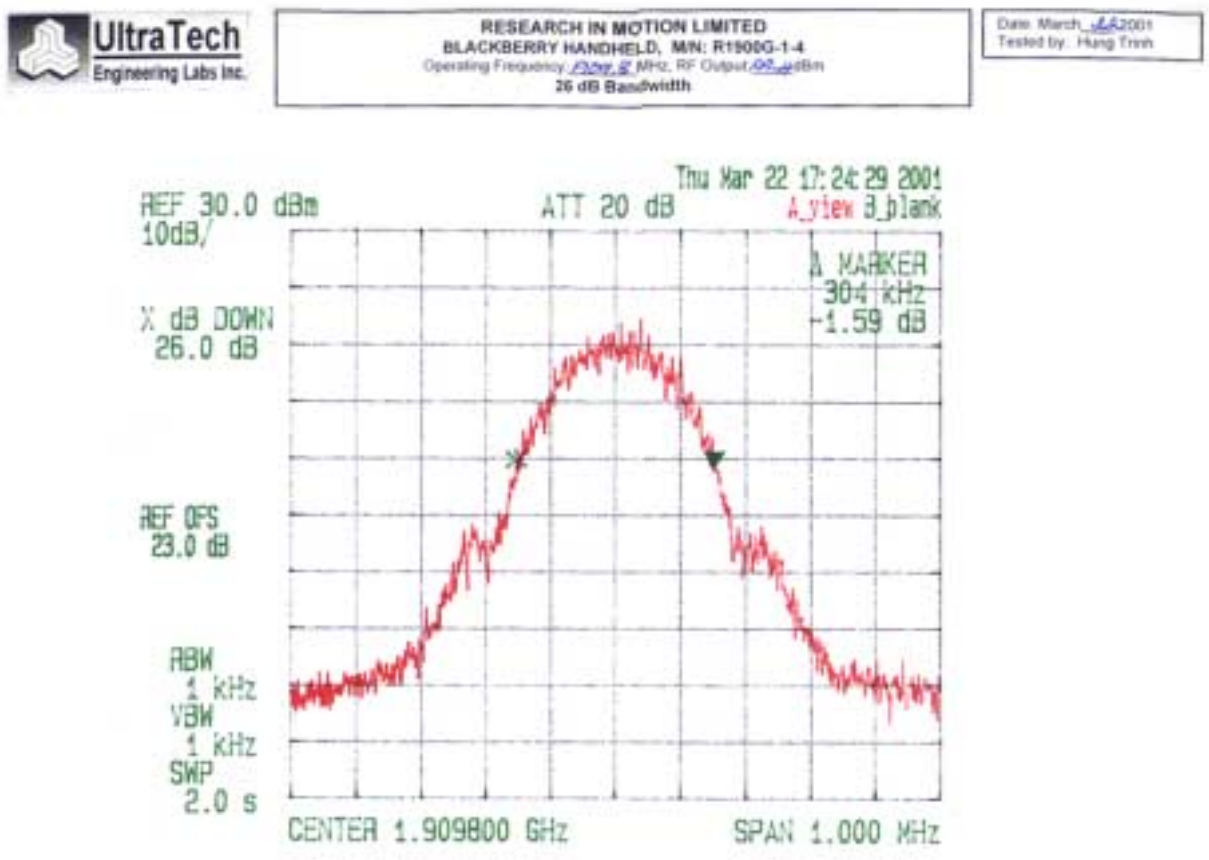
Plot 4: -26dBc Bandwidth
Transmitter Frequency: 1850.2 MHz



Plot 5: -26dBc Bandwidth
Transmitter Frequency: 1880.0 MHz



Plot 6: -26dBc Bandwidth
Transmitter Frequency: 1909.8 MHz

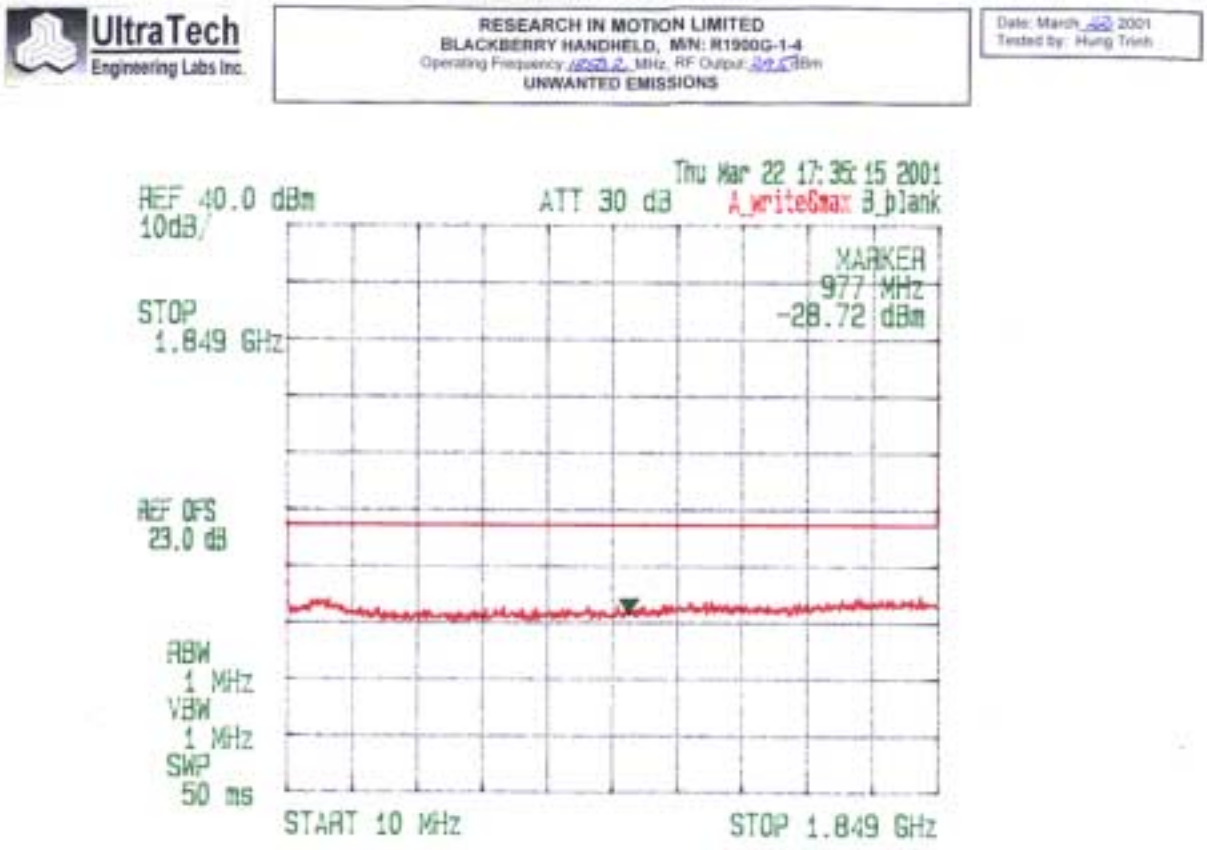


5.7.5.2. Conducted Spurious Emissions

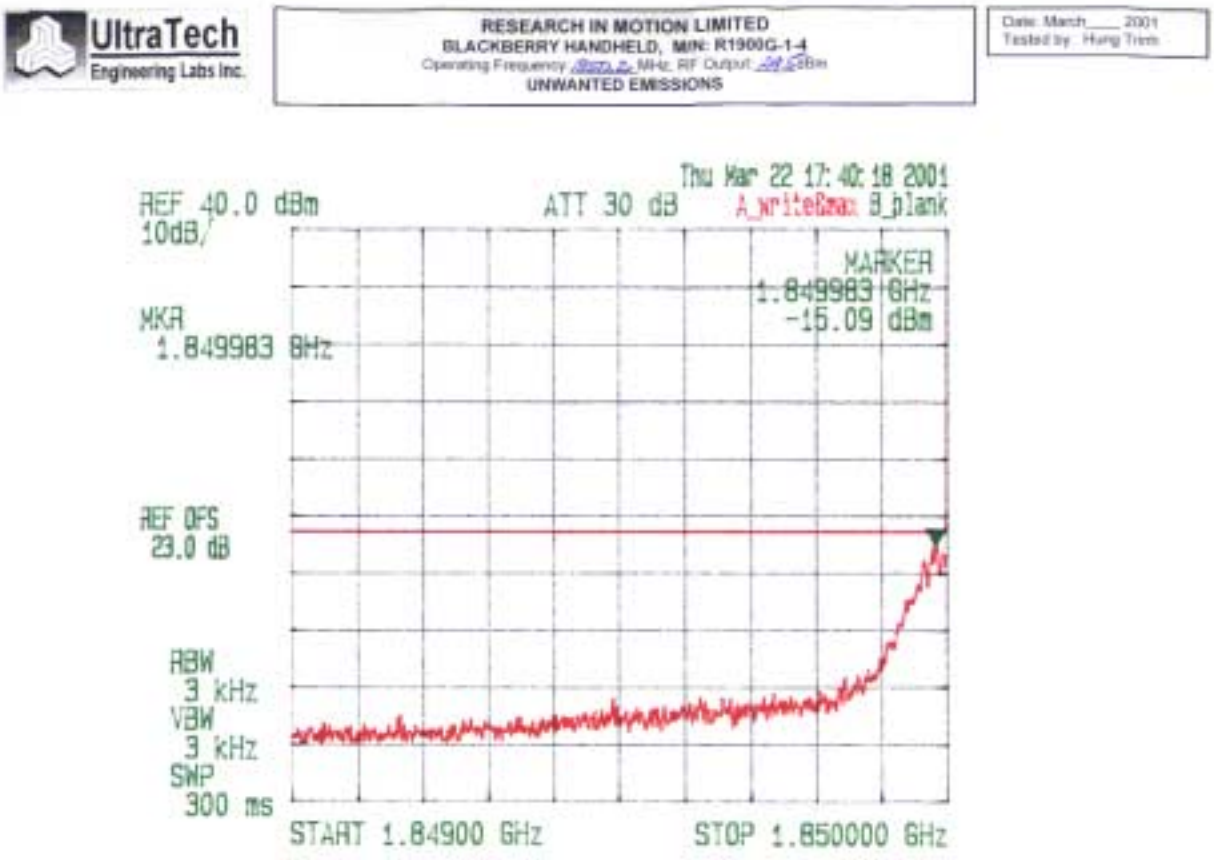
- **Lowest Frequency (1850.2 MHz)**

The emissions were scanned from 10 MHz to 20 GHz and no significant signals were found. Refer to the following test data plots for detailed measurements (plots 7 – 11):

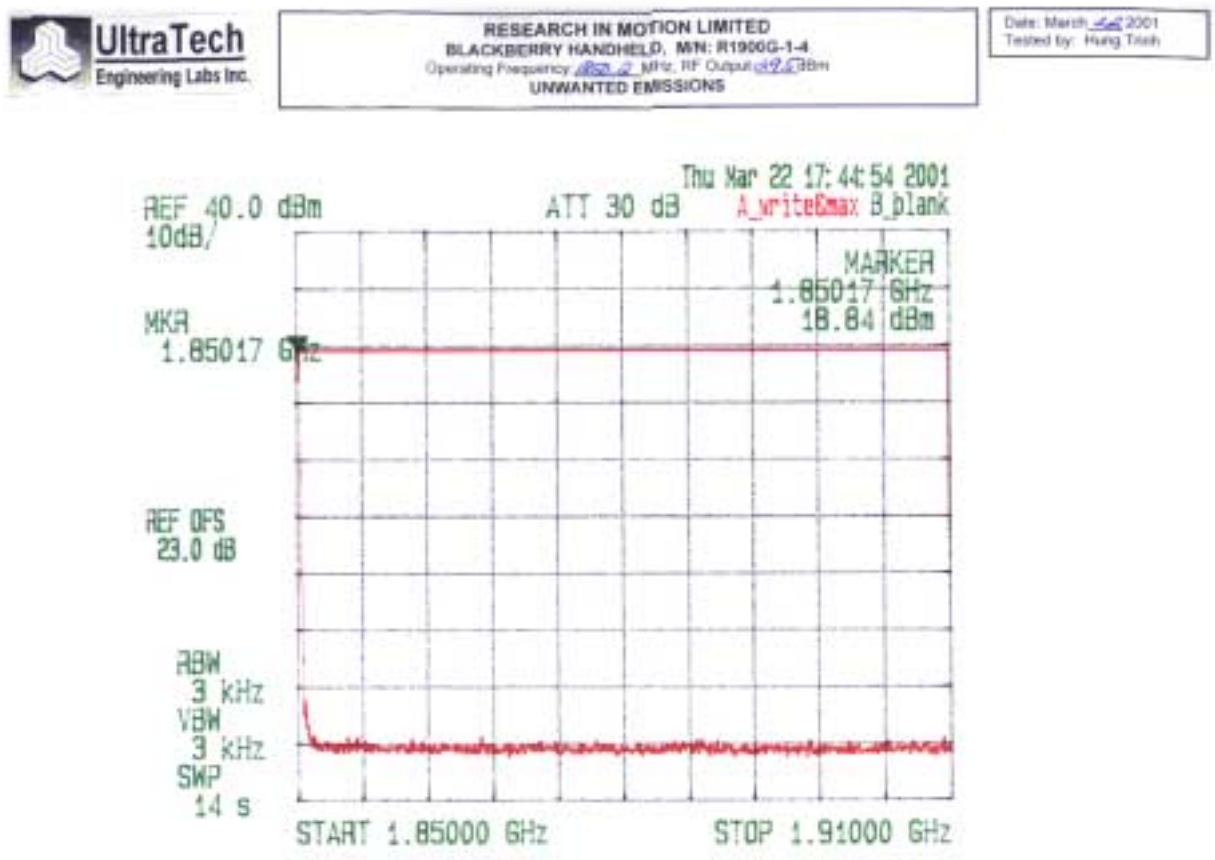
Plot 7: Conducted Spurious Emissions
Transmitter Frequency: 1850.2 MHz



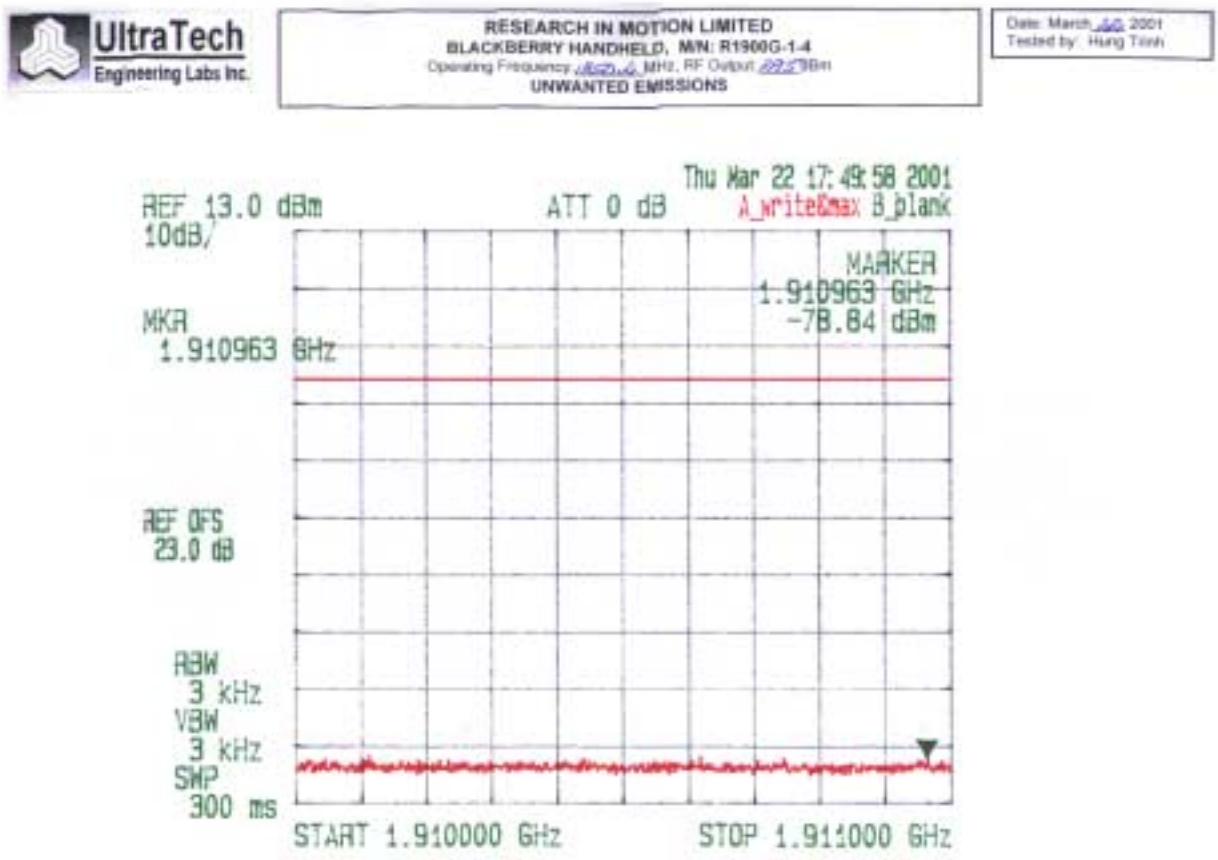
Plot 8: Conducted Spurious Emissions
Transmitter Frequency: 1850.2 MHz



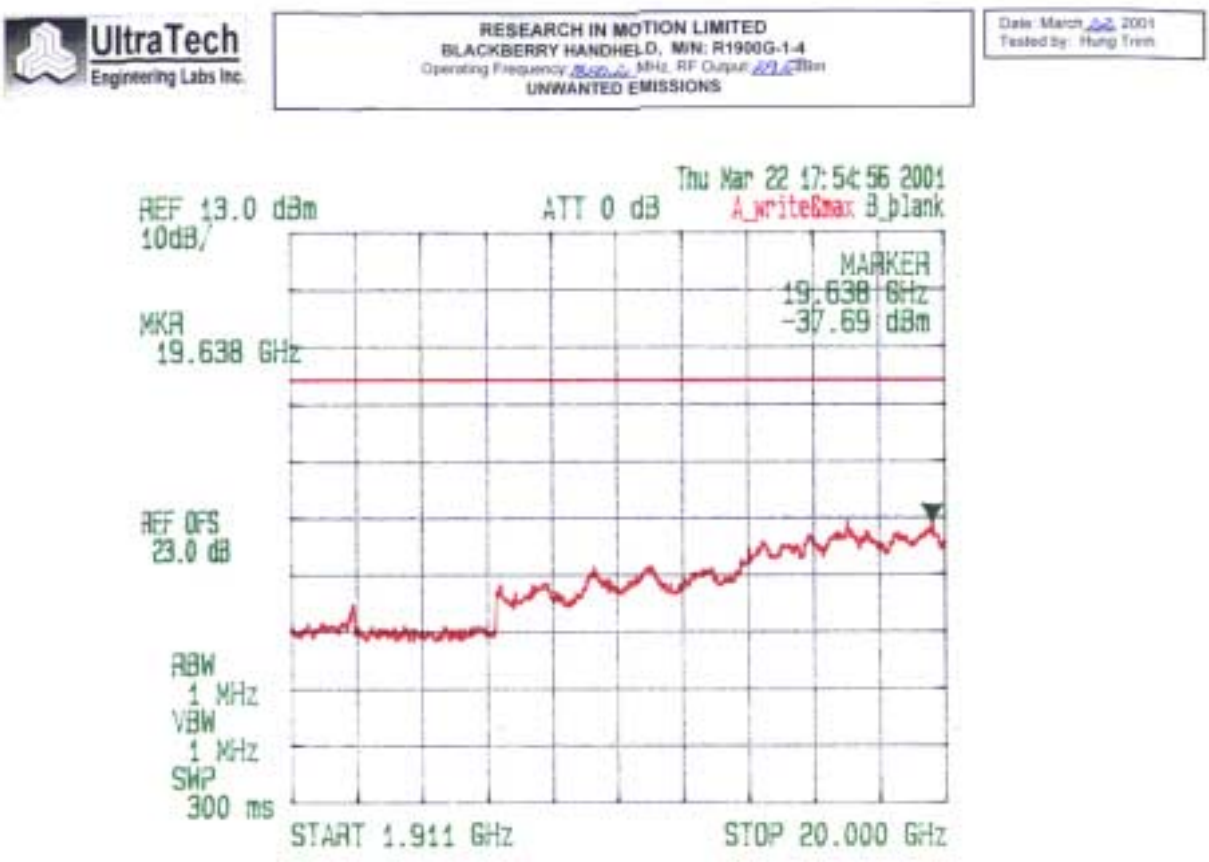
Plot 9: Conducted Spurious Emissions
Transmitter Frequency: 1850.2 MHz



Plot 10: Conducted Spurious Emissions
Transmitter Frequency: 1850.2 MHz



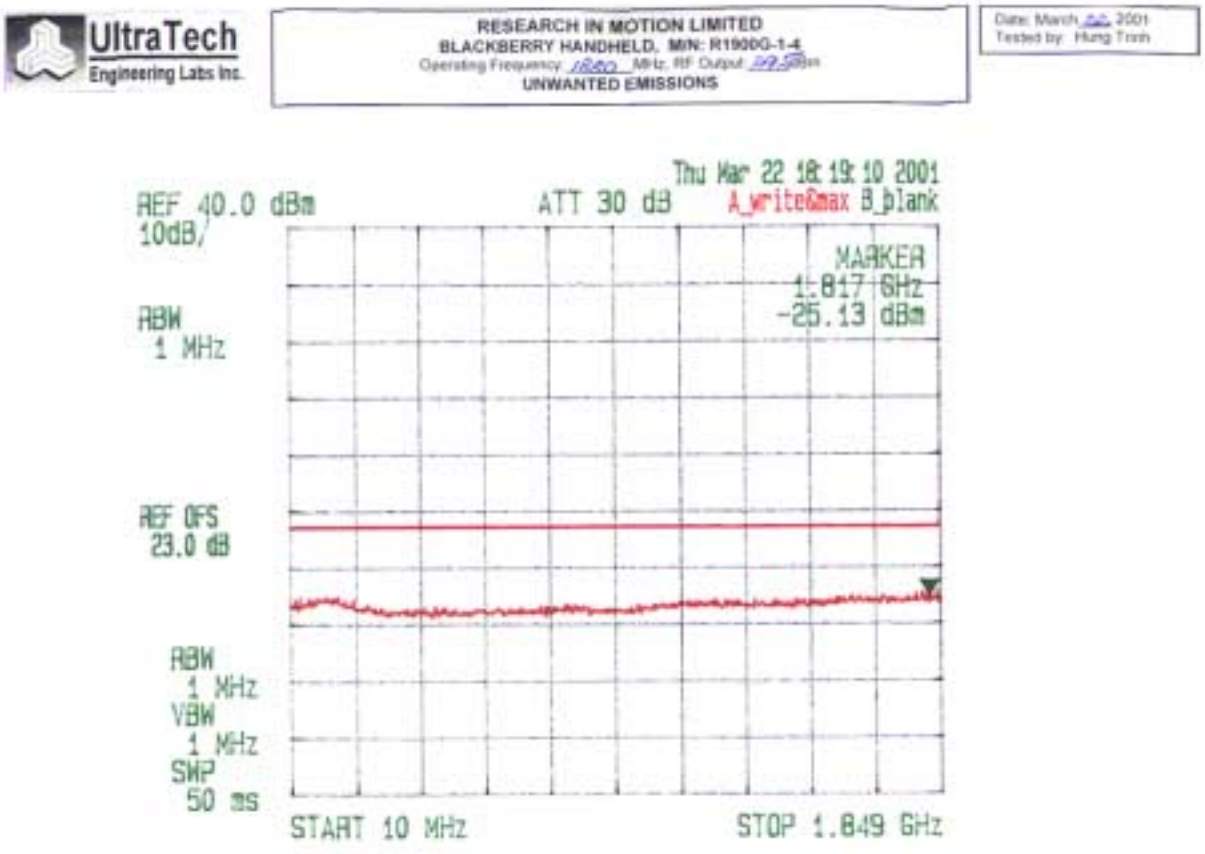
Plot 11: Conducted Spurious Emissions
Transmitter Frequency: 1850.2 MHz



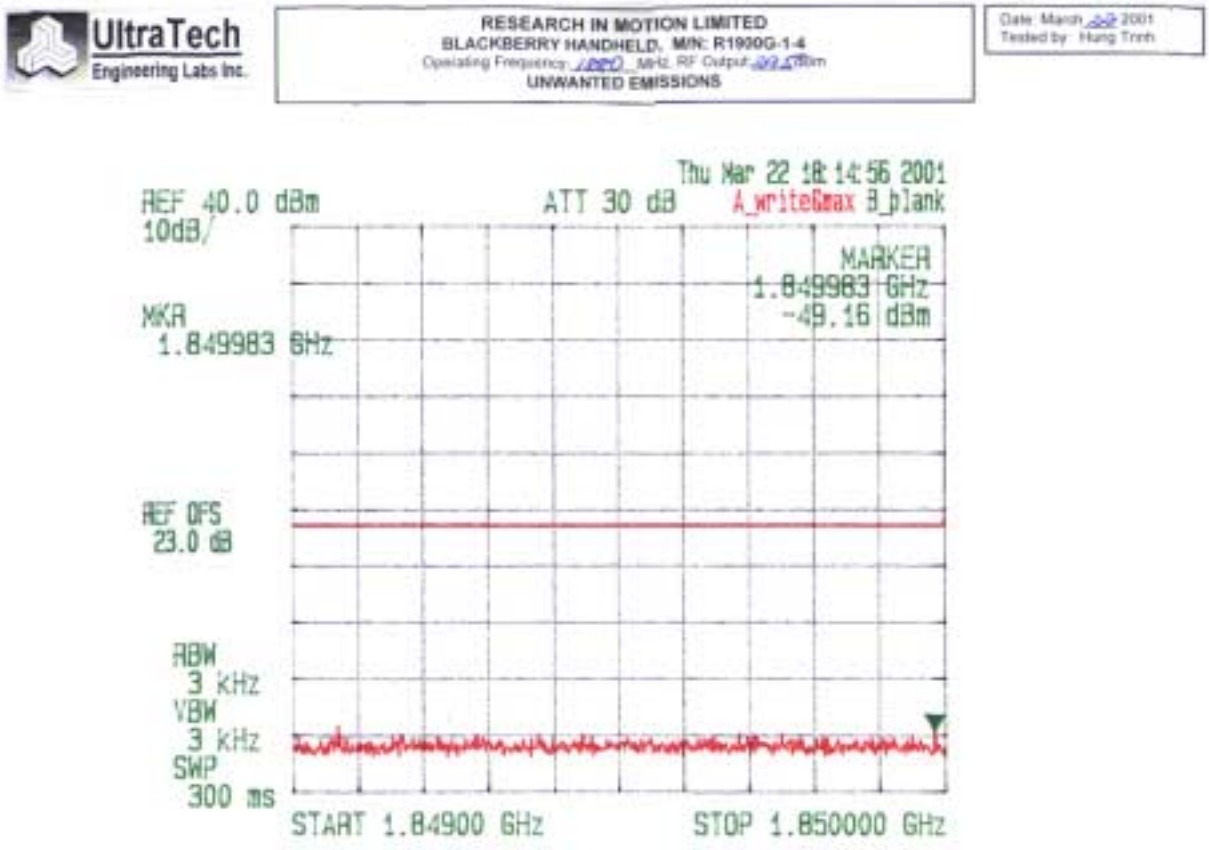
- **Middle Frequency in Frequency Block (1880.0 MHz)**

The emissions were scanned from 10 MHz to 20 GHz and no significant signals were found. Refer to the following test data plots for detailed measurements (plots 12 - 16):

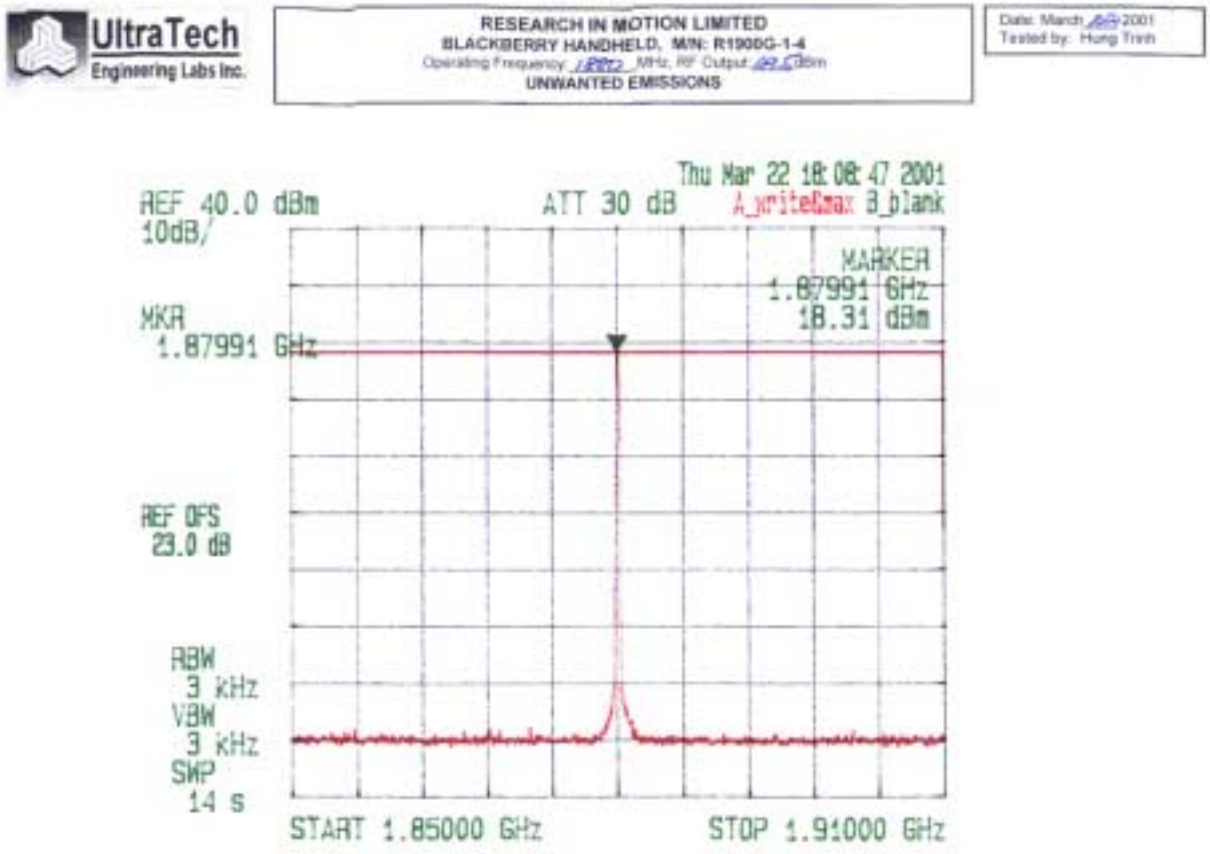
Plot 12: Conducted Spurious Emissions
Transmitter Frequency: 1880.0 MHz



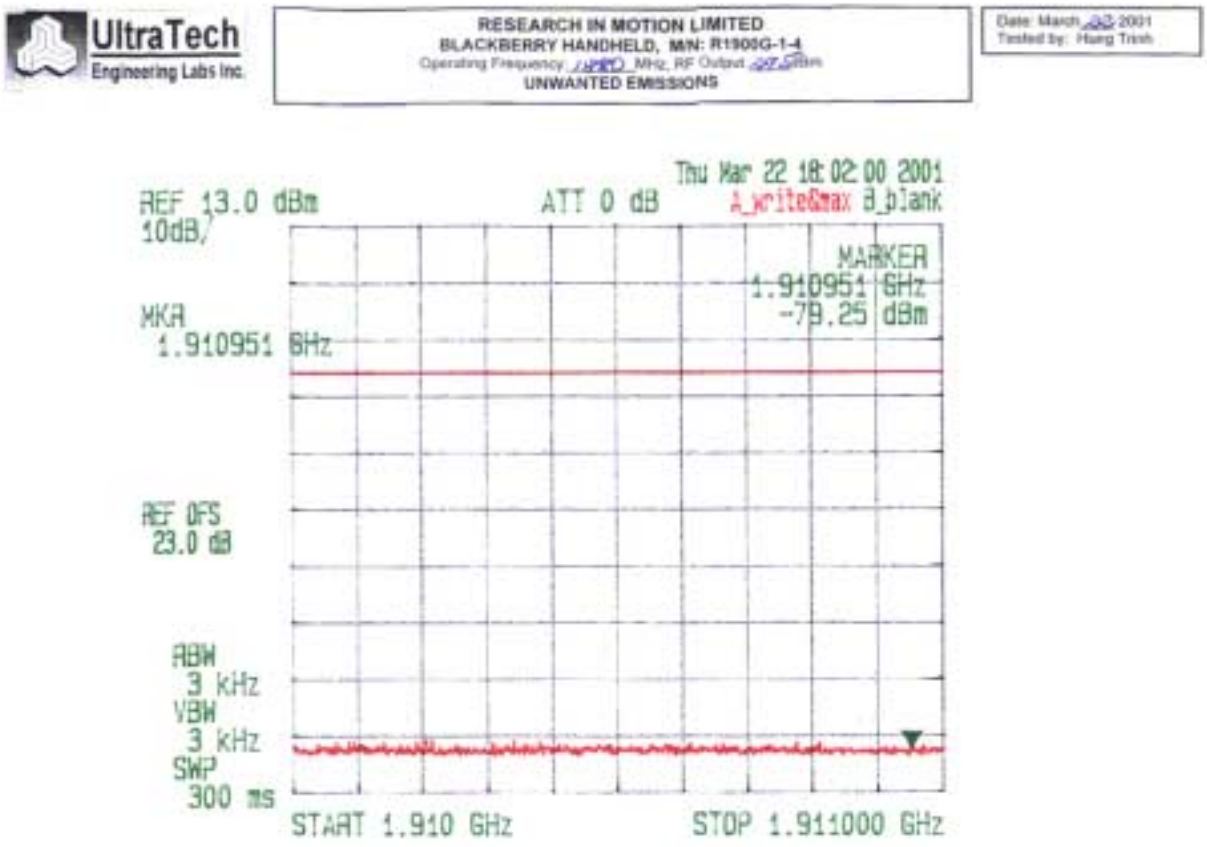
Plot 13: Conducted Spurious Emissions
Transmitter Frequency: 1880.0 MHz



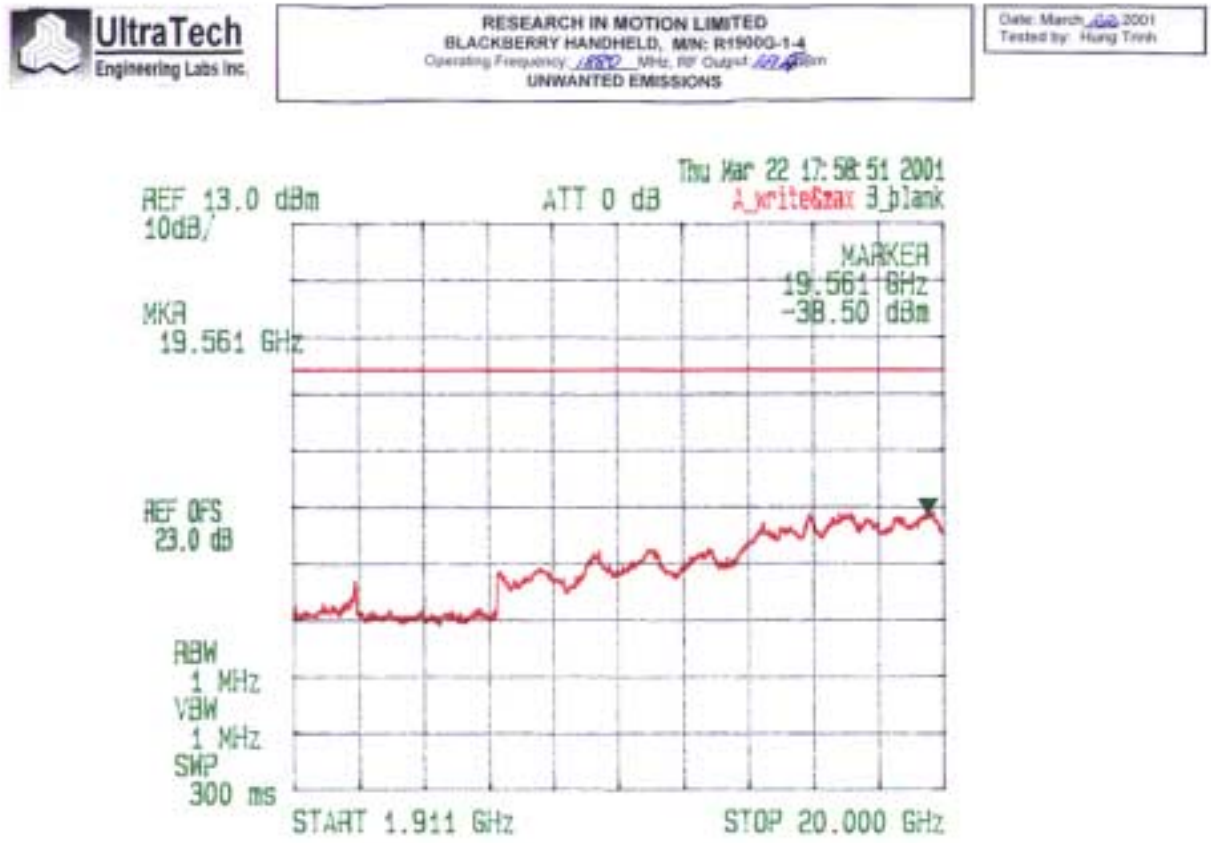
Plot 14: Conducted Spurious Emissions
Transmitter Frequency: 1880.0 MHz



Plot 15: Conducted Spurious Emissions
Transmitter Frequency: 1880.0 MHz



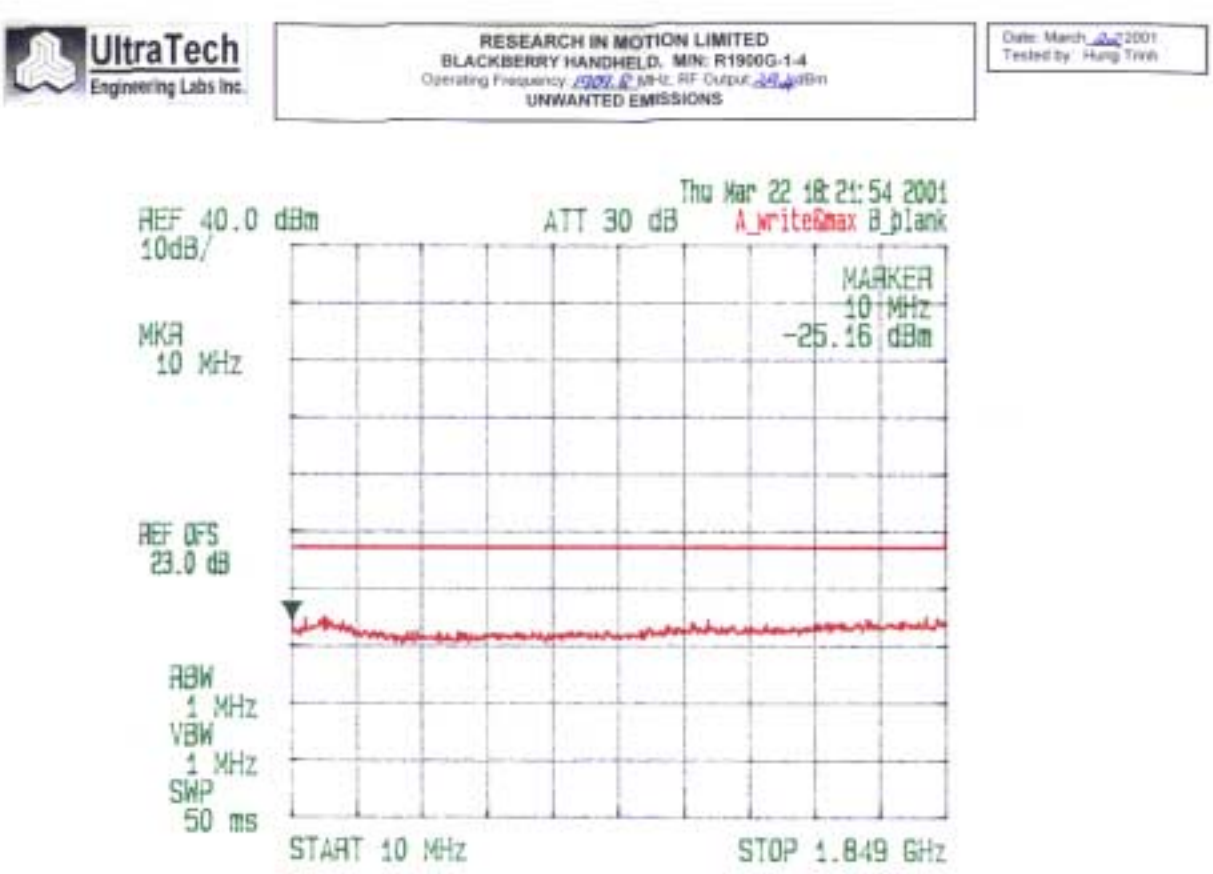
Plot 16: Conducted Spurious Emissions
Transmitter Frequency: 1880.0 MHz



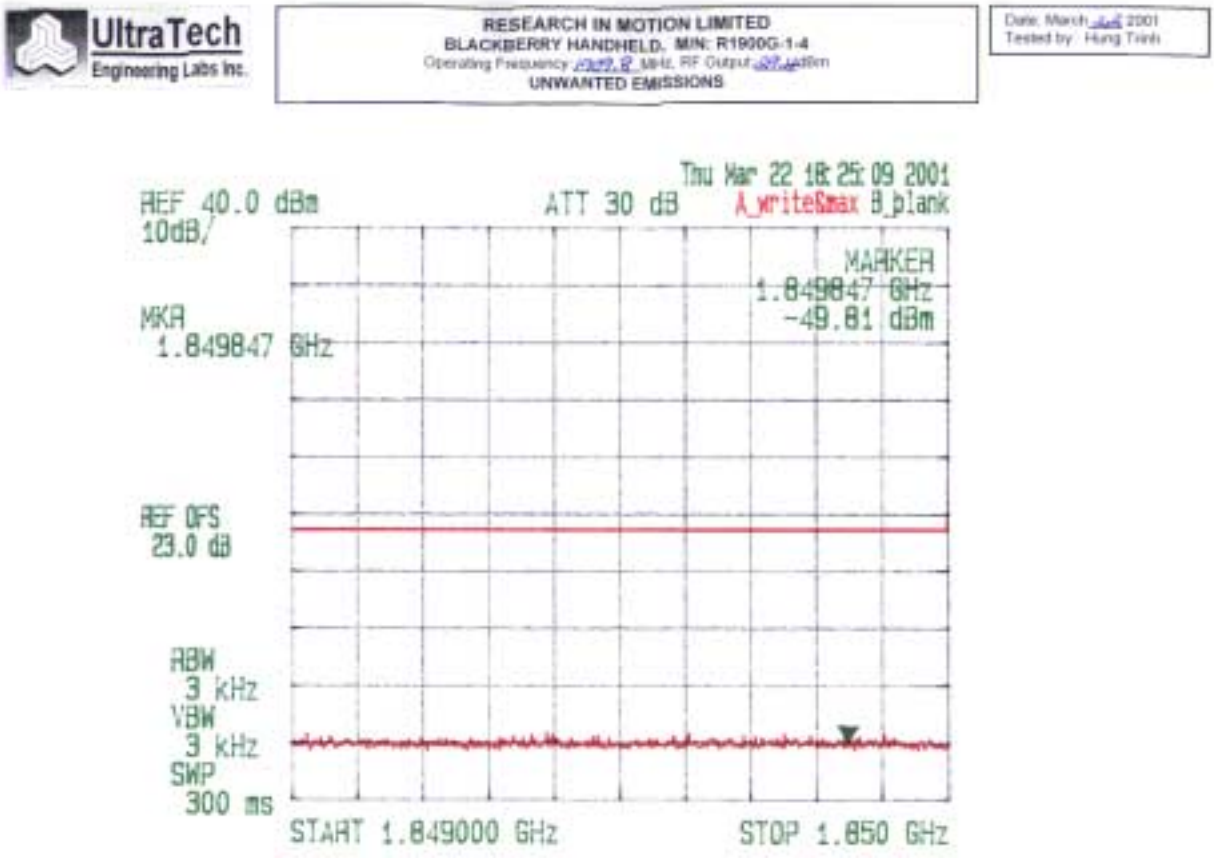
- **Highest Frequency (1909.8 MHz)**

The emissions were scanned from 10 MHz to 20 GHz and no significant signals were found. Refer to the following test data plots for detailed measurements (plots 17 - 21):

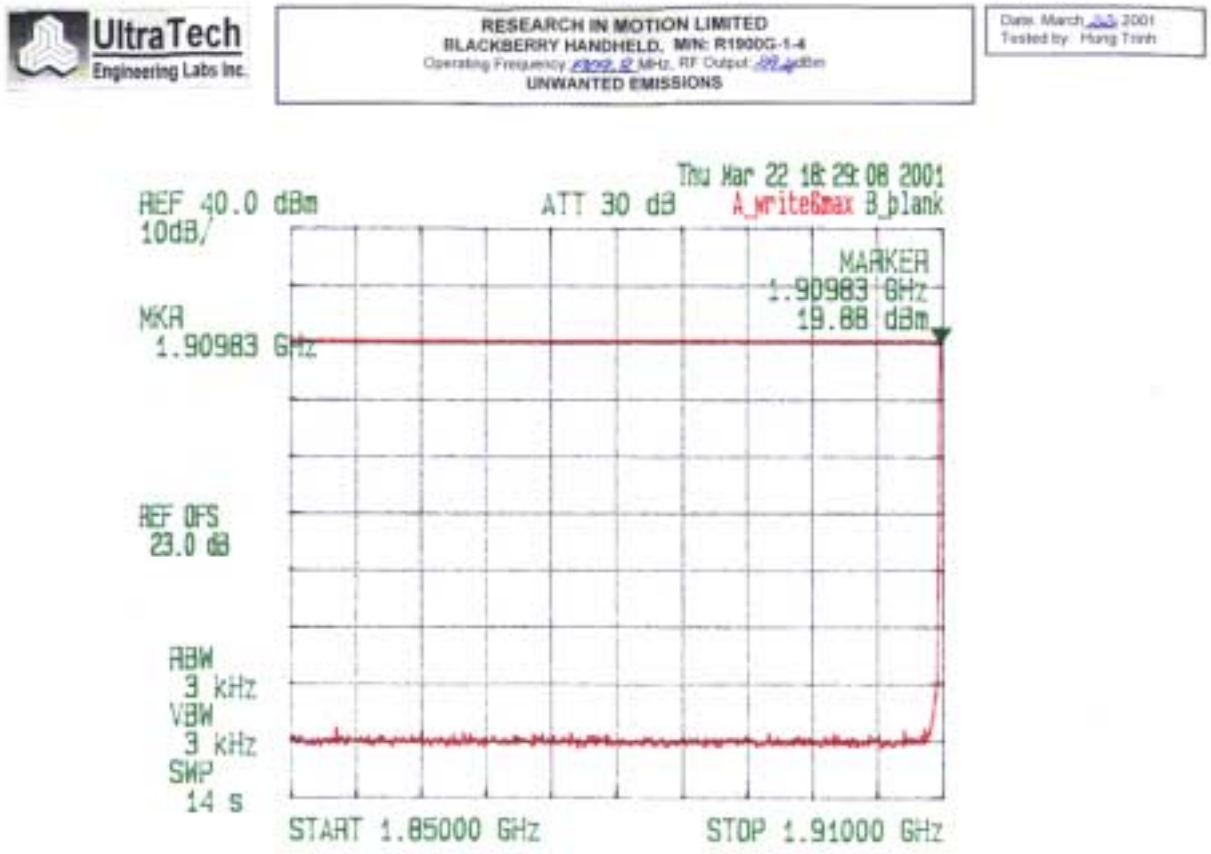
Plot 17: Conducted Spurious Emissions
Transmitter Frequency: 1909.8 MHz



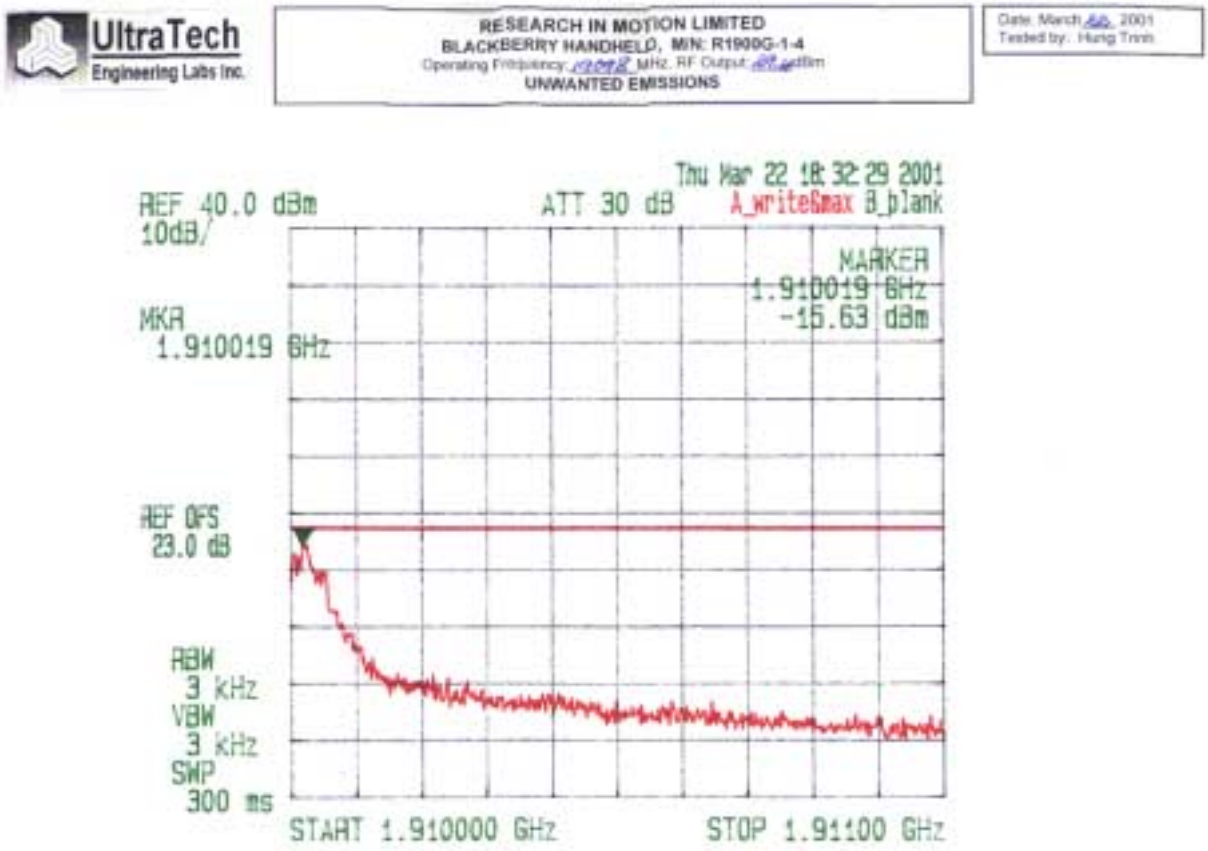
Plot 18: Conducted Spurious Emissions
Transmitter Frequency: 1909.8 MHz



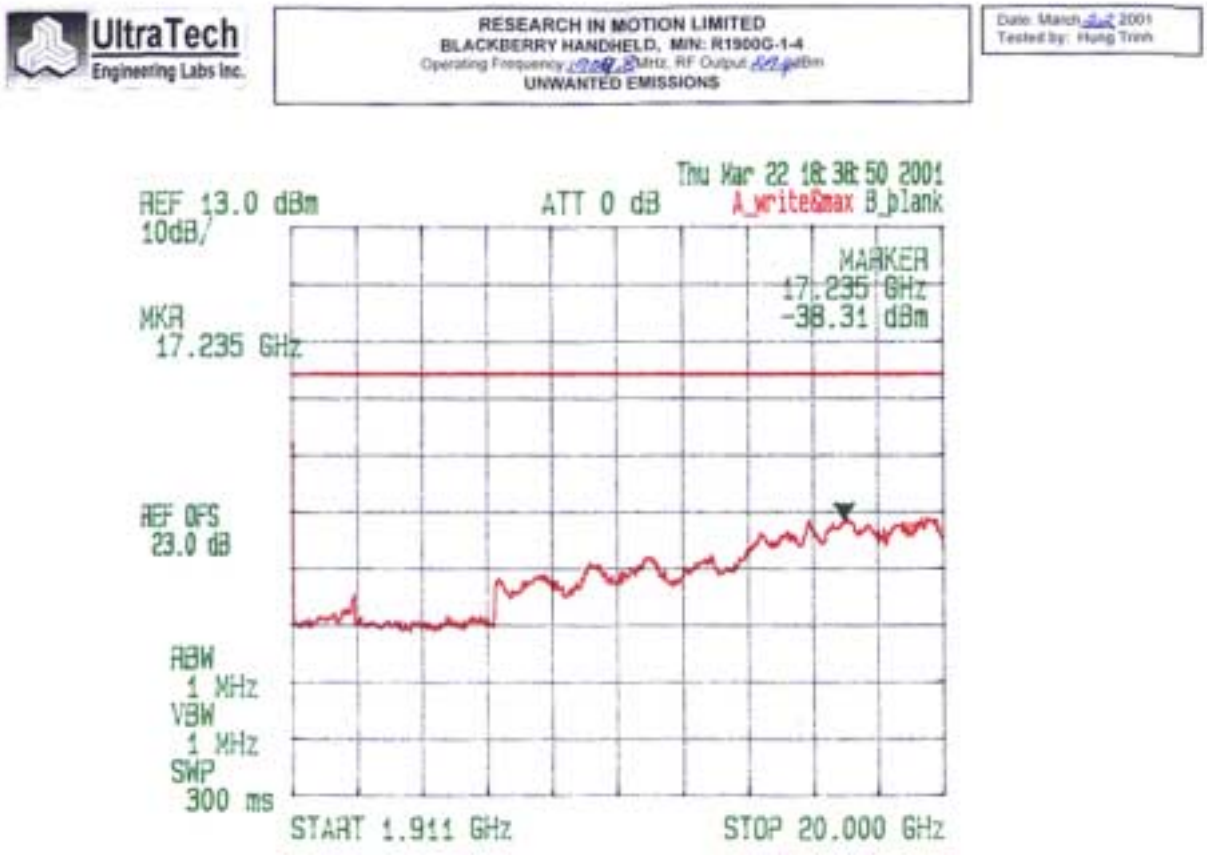
Plot 19: Conducted Spurious Emissions
Transmitter Frequency: 1909.8 MHz



Plot 20: Conducted Spurious Emissions
Transmitter Frequency: 1909.8 MHz



Plot 21: Conducted Spurious Emissions
Transmitter Frequency: 1909.8 MHz



5.8. EMISSION LIMITS (RADIATED) @ FCC 24.236 & 24.238

5.8.1. Limits

- The predicted or measured field strength at any location on the border of the PCS Service area shall not exceed 47 dBμV/m unless the parties agree to a higher field strength.
- On any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least 43+10log(P) dB.

5.8.2. Method of Measurements

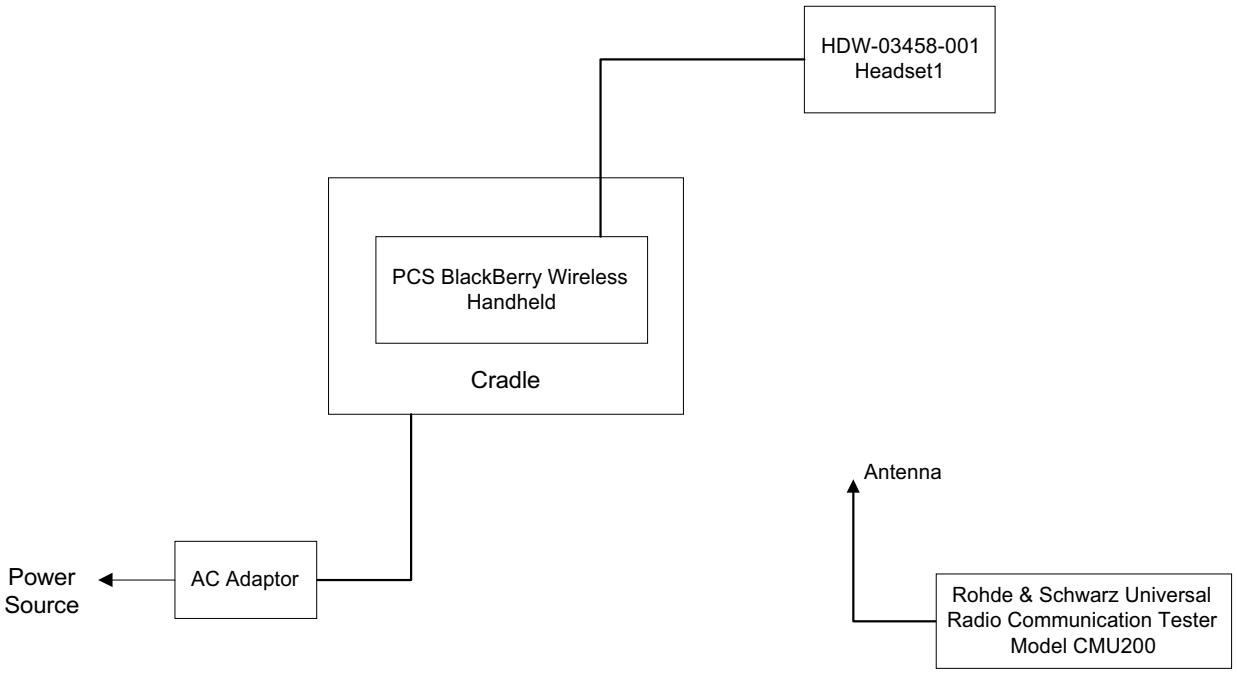
Please refer to the Exhibit 7, Section 7. 3 of this test report and ANSI C63-4:1992 for radiated emissions test method.

Measuring Bandwidths:

- Outside the permitted band block: RBW = 1 MHz, VBW ≥ RBW
- Inside or on the permitted band block: RBW = 1% of -26dBc Bandwidth, VBW ≥ RBW

5.8.3. Test Arrangement

Block Diagram For Radiated Emissions Measurements



5.8.4. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range	Calibration Date
Spectrum Analyzer/ EMI Receiver	Advantest	R3271	15050203	100 Hz – 26.5 GHz	November 3, 2000
Microwave Amplifier	Hewlett Packard	HP 83017A	3116A00661	1 GHz to 26.5 GHz	July 18, 2000
Biconilog Antenna	EMCO	3143	1029	20 MHz to 2 GHz	July 5, 2000
Horn Antenna	EMCO	3155	9911-5955	1 GHz – 18 GHz	June 1, 2000
Horn Antenna with Mixer	EMCO	3160-09	1007	18 GHz – 26.5 GHz	September 21, 2000
Horn Antenna with Mixer	EMCO	3160-09	5061	18 GHz – 26.5 GHz	March 29, 2000

5.8.5. Test Data

Remark: The EUT operates with 3 different headsets accessories (HDW-03458-001, -002 and -003**).** To determine the worst-case test configuration, pre-scanned of the EUT with 3 different headsets was performed. From this pre-scanned, the EUT with HDW-03458-001 emits the highest RF field level. The following test results were performed with this worst-case test configuration.

5.8.5.1. Lowest Frequency (1850.2 MHz)

Frequency (MHz)	RF Field Level @ 3 Meters (dBµV/m)	RF Power Level (dBm)	Detector Used (Peak/QP)	Antenna Plane (H/V)	Limit (dBm)	Margin (dB)	Pass / Fail
3700.4	53.25	-44.3	Peak	V	-13	-31.3	Pass
3700.4	55.16	-42.3	Peak	H	-13	-29.3	Pass
5550.6	66.03	-31.5	Peak	V	-13	-18.5	Pass
5550.6	66.84	-30.7	Peak	H	-13	-17.7	Pass
The emissions were scanned from 10 MHz to 20 GHz and all emissions within 40 dB below the limits were recorded.							

5.8.5.2. Middle Frequency (1880.0 MHz)

Frequency (MHz)	RF Field Level @ 3 Meters (dBµV/m)	RF Power Level (dBm)	Detector Used (Peak/QP)	Antenna Plane (H/V)	Limit (dBm)	Margin (dB)	Pass / Fail
3760.0	54.81	-42.7	Peak	V	-13	-29.7	Pass
3760.0	55.41	-42.1	Peak	H	-13	-29.1	Pass
5640.0	65.50	-32.0	Peak	V	-13	-19.0	Pass
5640.0	67.75	-29.8	Peak	H	-13	-16.8	Pass
The emissions were scanned from 10 MHz to 20 GHz and all emissions within 40 dB below the limits were recorded.							

5.8.5.3. Highest Frequency (1909.8 MHz)

Frequency (MHz)	RF Field Level @ 3 Meters (dBµV/m)	RF Power Level (dBm)	Detector Used (Peak/QP)	Antenna Plane (H/V)	Limit (dBm)	Margin (dB)	Pass / Fail
3819.6	53.66	-43.8	Peak	V	-13	-30.8	Pass
3819.6	54.81	-42.7	Peak	H	-13	-29.7	Pass
5729.4	62.94	-34.6	Peak	V	-13	-21.6	Pass
5729.4	64.59	-32.9	Peak	H	-13	-19.9	Pass
The emissions were scanned from 10 MHz to 20 GHz and all emissions within 40 dB below the limits were recorded.							

EXHIBIT 6. MEASUREMENT UNCERTAINTY

The measurement uncertainties stated were calculated in accordance with the requirements of NIST Technical Note 1297 and NIS 81 (1994)

6.1. RADIATED EMISSION MEASUREMENT UNCERTAINTY

CONTRIBUTION (Radiated Emissions)	PROBABILITY DISTRIBUTION	UNCERTAINTY (± dB)	
		3 m	10 m
Antenna Factor Calibration	Normal (k=2)	±1.0	±1.0
Cable Loss Calibration	Normal (k=2)	±0.3	±0.5
EMI Receiver specification	Rectangular	±1.5	±1.5
Antenna Directivity	Rectangular	+0.5	+0.5
Antenna factor variation with height	Rectangular	±2.0	±0.5
Antenna phase center variation	Rectangular	0.0	±0.2
Antenna factor frequency interpolation	Rectangular	±0.25	±0.25
Measurement distance variation	Rectangular	±0.6	±0.4
Site imperfections	Rectangular	±2.0	±2.0
Mismatch: Receiver VRC Γ_1 = 0.2 Antenna VRC Γ_R = 0.67(Bi) 0.3 (Lp) Uncertainty limits 20Log(1±$\Gamma_1\Gamma_R$)	U-Shaped	+1.1 -1.25	±0.5
System repeatability	Std. Deviation	±0.5	±0.5
Repeatability of EUT		-	-
Combined standard uncertainty	Normal	+2.19 / -2.21	+1.74 / -1.72
Expanded uncertainty U	Normal (k=2)	+4.38 / -4.42	+3.48 / -3.44

Calculation for maximum uncertainty when 3m biconical antenna including a factor of k=2 is used:

$U = 2u_c(y) = 2x(+2.19) = +4.38$ dB And $U = 2u_c(y) = 2x(-2.21) = -4.42$ dB

EXHIBIT 7. MEASUREMENT METHODS

7.1. EQUIVALENT ISOTROPIC RADIATED POWER (EIRP) MEASUREMENTS

- The following shall be applied to the combination(s) of the radio device and its intended antenna(e).
- I f the RF level is user adjustable, all measurements shall be made with the highest power level available to the user for that combination.
- The following method of measurement shall apply to both conducted and radiated measurements.
- The radiated measurements are performed at the Ultratech Calibrated Open Field Test Site.
- The measurement shall be performed using normal operation of the equipment with modulation.

Test procedure shall be as follows:

Step 1: Duty Cycle measurements

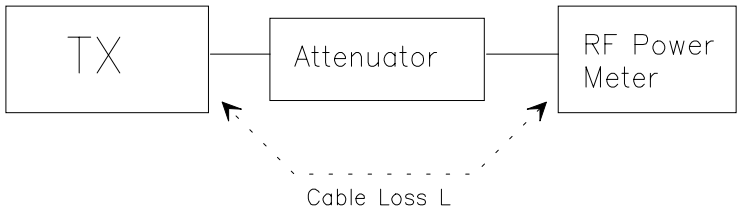
- Using a spectrum analyzer with the frequency span set to 0 Hz and the sweep time set at a suitable value to capture the envelope peaks and the duty cycle of the transmitter output signal;
- The duty cycle of the transmitter, x = Tx on / (Tx on + Tx off) with 0<x<1, is measure and recorded in the test report. For the purpose of testing, the equipment shall be operated with a duty cycle that is equal or more than 0.1.

Step 2: Calculation of Average EIRP. See Figure 1

- The average output power of the transmitter shall be determined using a wideband, calibrated RF power meter with the power sensor with an integration period that exceeds the repetition period of the transmitter by a factor 5 or more. The observed value shall be recorded as “A” (in dBm);
- The e.i.r.p. shall be calculated from the above measured power output “A”, the observed duty cycle x, and the applicable antenna assembly gain “G” in dBi, according to the formula:

EIRP = A + G + 10log(1/x)

Figure 1.



Step 3: Substitution Method. See Figure 2

(a) The measurements was performed in the absence of modulation (un-modulated)
(b) Test was performed at listed 3m open area test site (listed with FCC, IC, ITI, NVLAP, ACA & VCCI).
(c) The transmitter under test was placed at the specified height on a non-conducting turntable (80 cm height)
(d) The horn test antenna was used and tuned to the transmitter carrier frequency.
(e) The spectrum analyzer was tuned to transmitter carrier frequency. The test antenna was lowered or raised from 1 to 4 meters until the maximum signal level was detected.
(f) The transmitter was rotated through 360^{o} about a vertical axis until a higher maximum signal was received.
(g) The test antenna was lowered or raised again from 1 to 4 meters until a maximum was obtained. This level was recorded.

(h) The substitution horn antenna and the signal generator replaced the transmitter and antenna under test in the same position, and the substitution horn antenna was placed in vertical polarization. The test horn antenna was lowered or raised as necessary to ensure that the maximum signal is still received.
(i) The input signal to the substitution antenna was adjusted in level until an equal or a known related level to that detected from the transmitter was obtained in the test receiver. The maximum carrier radiated power is equal to the power supply by the generator.
(j) The substitution antenna gain and cable loss were added to the signal generator level for the corrected ERP level.
(k) Repeat steps (c) to (j) with the substitution antenna oriented in horizontal polarization.
(l) Actual gain of the EUT's antenna is the difference of the measured ERP and measured RF power at the RF port. Correct the antenna gain if necessary.
(m) EIRP = ERP + 2.15

Figure 2

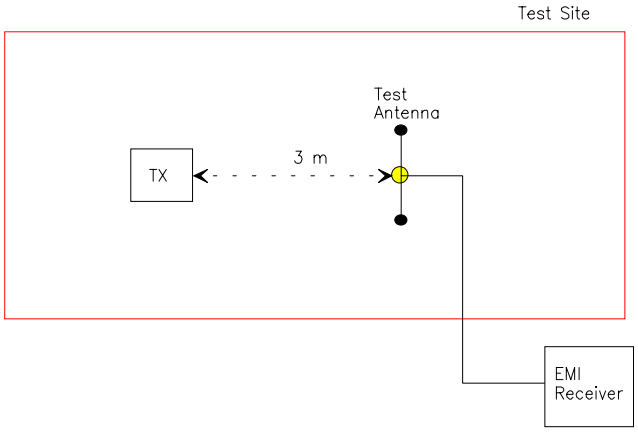
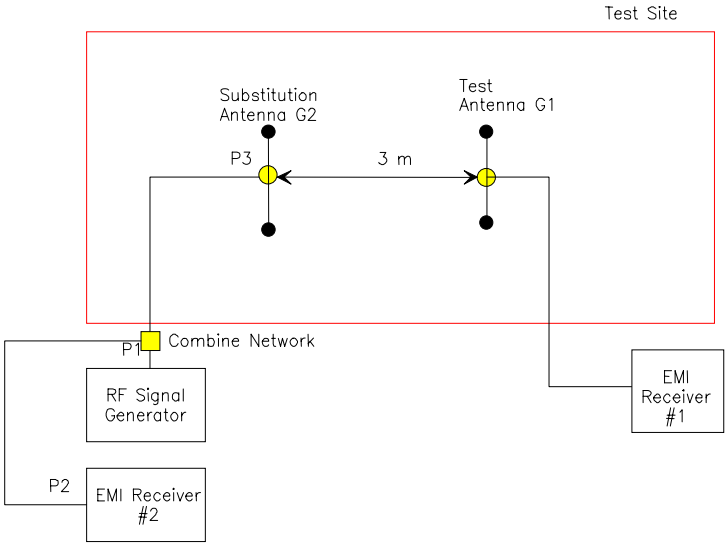


Figure 3



P3 = P2 + Insertion Loss (P1–P3
EIRP = P3 + G2

7.2. SPURIOUS EMISSIONS (CONDUCTED)

With transmitter modulation characteristics described in Out-of-Band Emissions measurements @ 2.1049, the transmitter spurious and harmonic emissions were scanned. The spurious and harmonic emissions were measured with the Spectrum Analyzer controls set as RBW = 1 MHz, VBW ≥ RBW and SWEEP TIME = AUTO). The transmitter was operated at a full rated power output, and modulated as follows:

FCC CFR 47, Para. 2.1057 - Frequency spectrum to be investigated:- The spectrum was investigated from the lowest radio generated in the equipment up to at least the 10th harmonic of the carrier frequency or to the highest frequency practicable in the present state of the art of measuring techniques, whichever is lower. Particular attention should be paid to harmonics and subharmonics of the carrier frequency. Radiation at the frequencies of multiplier stages should be checked. The amplitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be reported.

FCC CFR 47, Para. 2.1051 - Spurious Emissions at Antenna Terminal:- The radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of the harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in 2.1049 as appropriate. The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified.

7.3. SPURIOUS EMISSIONS (RADIATED)

With transmitter modulation characteristics described in Out-of-Band Emissions measurements @ 2.1049, the transmitter spurious and harmonic emissions were scanned. The spurious and harmonic emissions were measured with the Spectrum Analyzer controls set as RBW = 1 MHz, VBW ≥ RBW and SWEEP TIME = AUTO). The transmitter was operated at a full rated power output, and modulated as follows:

FCC CFR 47, Para. 2.1057 - Frequency spectrum to be investigated:- The spectrum was investigated from the lowest radio generated in the equipment up to at least the 10th harmonic of the carrier frequency or to the highest frequency practicable in the present state of the art of measuring techniques, whichever is lower. Particular attention should be paid to harmonics and subharmonics of the carrier frequency. Radiation at the frequencies of multiplier stages should be checked. The amplitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be reported.

FCC CFR 47, Para. 2.1053 - Field Strength Spurious Emissions

(a) Measurements were made to detect spurious emissions radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal conditions of installation and operation. Curves or equivalent data were supplied showing the magnitude of each harmonic and other spurious emission. For this test, single sideband, independent sideband, and controlled carrier transmitters shall be modulated under the conditions specified in paragraph 2.1049(c) as appropriate. For equipment operating on frequencies below 1 GHz, an Open Field Test is normally required with the measuring instrument antenna located in the far field at all test frequencies. In event it is either impractical or impossible to make open field measurements (e.g. a broadcast transmitter installed in a building) measurement will be accepted of the equipment as installed. Such measurements must be accompanied by a description of the site where the measurements were made showing the location of any possible

source of reflections, which might distort the field strength measurements. Information submitted shall include the relative radiated power of each spurious emission with the reference to the rated power output of the transmitter, assuming all emissions are radiated from horn antennas.

(b) Measurements specified in paragraph (a) of this section shall be made for the following equipment:

(1) Those in which the spurious emission are required to be 60 dB or more below the mean power of the transmitter.
(2) All equipment operating on frequencies higher than 25 MHz
(3) All equipment where the antenna is an integral part of, and attached directly to the transmitter.
(4) Other types of equipment as required, when deemed necessary by the Commission.

Maximizing RF Emission Level:

(a) The measurements was performed with standard modulation
(b) Test was performed at listed 3m open area test site (listed with FCC, IC, ITI, NVLAP, ACA & VCCI).
(c) The transmitter under test was placed at the specified height on a non-conducting turntable (80 cm height)
(d) The biconilog Antenna (20 MHz to 1 GHz) or Horn Antenna (1 GHz to 18 GHz) was used for measuring.
(e) The spectrum analyzer was tuned to transmitter carrier frequency. The test antenna was lowered or raised from 1 to 4 meters until the maximum signal level was detected.
(f) The transmitter was rotated through 360^{o} about a vertical axis until a higher maximum signal was received.
(g) The test antenna was lowered or raised again from 1 to 4 meters until a maximum was obtained. This level was recorded.
(h) The recorded reading was corrected to the true field strength level by adding the antenna factor, cable loss and subtracting the pre-amplifier gain.
(i) The field strength level measured at 3m is converted to the power in dBm by subtracting a constant factor of 97.5 dB

METHOD OF CALCULATION FOR TRANSMITTED POWER (P) FROM THE MEASURED FIELD STRENGTH LEVEL (E):

According to IEC 801-3, the power density can be calculated as follows:

$S = P / (4xPIxD^2)$ Where: S: Power density in watts per square feet
P: Transmitted power in watts
PI: 3.1415
D: Distance in meters

The power density S (W/m^2) and electric field E (V/m) is related by:

$S = E^2/(120xPI)$

Accordingly, the field intensity of isotropic radiator in free space can be expressed as follows:

$E = (30xP)^{1/2}/D = 5.5x(P)^{1/2}/D$

$S = (1.64xP)/(4xPIxD^2)$
$E = (49.2xP)^{1/2}xD = 7.01x(P)^{1/2}/D$

$$P = (ExD/7.01)^2$$

Calculation of transmitted power P (dBm) given a measured field intensity E (dBµV/m):

$P(W) = [E(V/m)xD/7.01]^2$
$P(mW) = P(W)x1000$
=> $P(dBm) = 10logP(mW)$
$= 20logE(V/m) + 20log(D) - 20log(7.01) + 10log1000$
$= E(dBV/m) + 20logD + 13$
$= E(dBµV/m) - 120 + 20log(D) + 13$
$= E(dBµV/m) + 20log(D) - 107$

The Transmitted Power @ D = 3 Meters

P(dBm) = E(dBµV/m) - 97.5

CFR 47 - Federal Communication Commission Rules

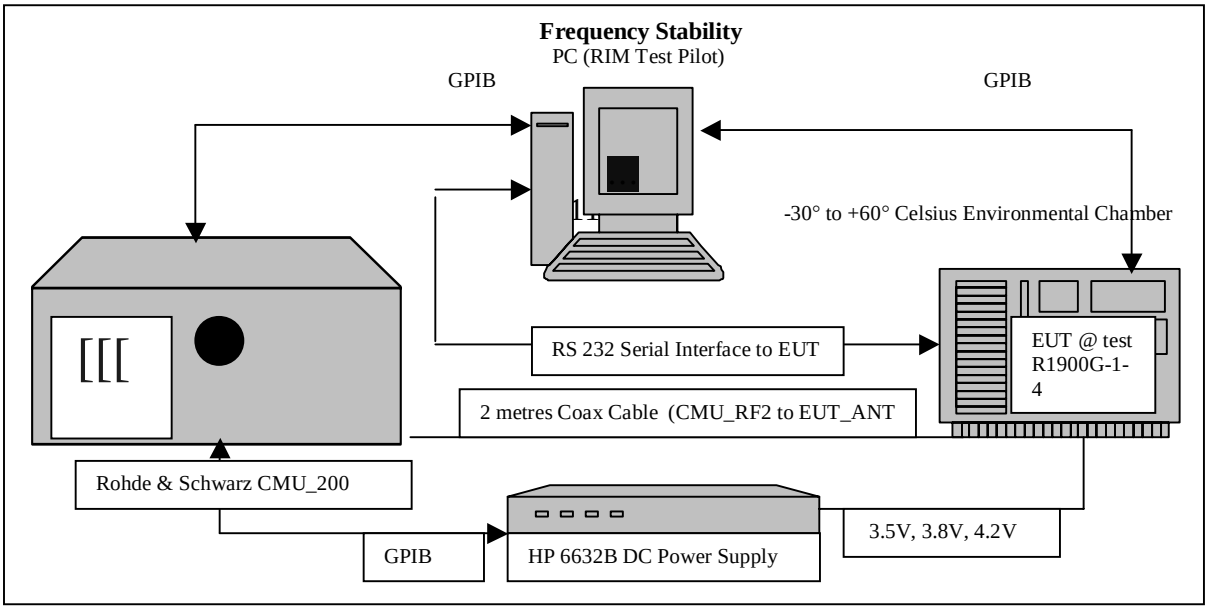
Part 2 Required Measurements
2.995 Frequency Stability - Procedures
(a,b) Frequency Stability - Temperature Variation
(d) Frequency Stability - Voltage Variation

24.235 Frequency Stability.
The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.
The frequency stability for R1900G-1-4 BlackBerry Handheld of the transmitter is less than 0.1 ppm of the received frequency from the Rhode & Schwarz CMU 200 Universal Radio Communication Test Set. Frequency and power measurements were tested and recorded across temperature, voltage and channel with the same test set up. The set up used is a PC with a GPIB interface linked to the Environmental Chamber, a DC power supply and the Rhode & Schwarz CMU 200 Communications Test Set. A 2 meter coax cable was connected between the RF input/output of the CMU 200 and the EUT antenna port.
The radio is located inside the environmental chamber, and controlled by a PC terminal and associated software via an RS232 serial interface. The coax cable was calibrated to allow compensation of the insertion loss between the transmitter and the CMU 200.

Equipment list:

Type	Manufacturer	Model	Serial Number	Calibration Date
Universal Radio Communication Test Set	R&S	CMU200	837261/049	01-Sept-2000
System DC Power Supply	HP	HP 6632B	US37472258	02-Aug-2000
Network Analyzer	HP	HP 8753D	20A80143792	09-Aug-2000
Calibration Kit	HP	HP85033D	20A80143914	09-Aug-2000

Environmental Chamber used:
Manufacturer: Espec
Model: SH240
Serial No: 91005607



Calibration for the Cable Loss:
Procedure: Full Two port Calibration of 85033D using the 8753D was done. The two-meter coax cable was set up to complete the RF power measurement.

The cable assembly from the RF input to the RF output was measured at the following Frequencies:
1850.2 MHz = 3.0 dB
1880.0 MHz = 3.05 dB
1909.8 MHz = 3.15 dB

Place: RF Lab in RIM
Date: April 16th, 2001

Procedure:

The BlackBerry Handheld was placed in the temperature chamber and connected to CMU 200 outside the temperature chamber as shown in the figure above. Dry air was pumped inside the temperature chamber to maintain back-pressure during the test. The Radio was kept in the off condition at all times except when the measurements were to be made.

The chamber was switched on and the temperature was set to -30°C. After the chamber stabilized at -30 °C there was a soak period of one hour to alleviate moisture in the chamber. The Radio was switched on and frequency and power measurements were made as follows:

A computer controlled RIM automated software "Test Pilot" was ran to test and log the results. Test Pilot controlled the CMU 200, temperature chamber, and power supply via the GPIB Bus. The radio was put in repetitive transmit modes at 100 bursts for each set of temperature and voltage settings for the 3 selected frequencies of 1850.2, 1880.0 and 1909.8 MHz. The power supply was cycled through the voltage steps of 3.5, 3.8, 4.2 Volts and the Frequency Error was measured at a maximum output power of 30 dBm and recorded by Test Pilot. The Handheld is not rated to operate at extreme voltages of 85% and 115% of nominal supply voltage. However, the 3.5 V and 4.2 V are the extreme operating voltages for the Handheld.

The frequency generated by the radio has been recorded in Hz and also as deviation from nominal in Parts Per Million.

After the initial one-hour soak the temperature was incremented by 10 degrees Celsius with a half-hour soak between each subsequent temperature steps.

PROCEDURE

RIM Test Pilot for commencing the Frequency Stability Tests carried through the following cycle.

1. Switch on the HP 6632B power supply; CMU 200 Communications test Set, and Environmental Chamber.
2. Start Test Pilot Program
3. Set the Temperature to –30 degrees Celsius and hold for initial 1 hour soak
4. Set power supply to 3.5 Volts
5. Set up CMU 200 Radio Communication Tester
6. Command the CMU 200 to switch to 1850.2 MHz
7. Turn on EUT and connect to CMU 200
8. EUT commanded to Transmit 100 Bursts
9. The test tool logs the following data from the CMU 200, power supply and temperature chamber: Traffic Channel Number, Traffic Channel Frequency, Power Level, Chamber Temperature, Supply Voltage, Power, Frequency Error.
10. The CMU 200 commands the EUT to change frequency to 1880 and 1909.8 MHz and repeat steps 8 to 9.

11. Repeat steps 5 to 10 for supply voltage of 3.8 and 4.2.
12. Increase temperature by 10°C and soak for 1/2 hour.
13. Repeat steps 4 - 12 for temperatures –30 to +60 degrees Celsius.

Procedure 5 to 10 was then repeated at room temperature with the power supply voltage set to 3.5, 3.8, and 4.2

Channel 512 (1850.2 MHz), nominal voltage (3.8 V)

Temperature (Degrees Celsius)	Frequency Error (Hertz)	ppm
-30	-8.27	-0.00447
-20	7.23	0.003908
-10	28.86	0.015598
0	35.39	0.019128
10	22.66	0.012247
20	8.98	0.004854
30	-21.11	-0.01141
40	17.89	0.009669
50	41	0.02216
60	2.78	0.001503

Channel 661 (1880.0 MHz), nominal voltage

Temperature (Degrees Celsius)	Frequency Error (Hertz)	ppm
-30	42.49	0.022601
-20	-18.6	-0.00989
-10	-51.21	-0.02724
0	-1.49	-0.00079
10	8.27	0.004399
20	30.03	0.015973
30	39.07	0.020782
40	45.01	0.023941
50	11.24	0.005979
60	13.37	0.007112

Channel 810 (1909.8 MHz), nominal voltage

Temperature (Degrees Celsius)	Frequency Error (Hertz)	ppm
-30	47.72	0.024987
-20	18.08	0.009467
-10	42.68	0.022348
0	-0.19	-9.9E-05
10	23.37	0.012237
20	23.83	0.012478
30	21.83	0.011431
40	51.4	0.026914
50	42.68	0.022348
60	61.47	0.032187

Channel 512 (1850.2 MHz), room temperature (20 deg C)

Device Supply [Volts]	Frequency Error (Hertz)	ppm
3.5	28.86	0.016
3.8	17.89	0.009
4.2	32.67	0.018

Channel 661 (1880.0 MHz), room temperature

Device Supply [Volts]	Frequency Error (Hertz)	ppm
3.5	51.46	0.044
3.8	30.03	0.025
4.2	50.82	0.027

Channel 810 (1909.8 MHz), room temperature

Device Supply [Volts]	Frequency Error (Hertz)	ppm
3.5	65.54	0.034
3.8	23.83	0.012
4.2	58.82	0.031