

EMI Test Report



Research In Motion Limited

REPORT NO.: RIM-0206-01

PRODUCT Model No: R6510IN
Type Name: BlackBerry 6110 Wireless Handheld
FCC ID: L6AR6510IN
IC: 2503A-R6510IN

Approved by: _____

A handwritten signature in cursive script that reads "Paul G. Cardinal".

Paul G. Cardinal, Ph.D.
Manager, Compliance and Certification

Date: _____

17 June 2002



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A) Scope

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

FCC CFR 47 Part 15, Subpart B, Class B Digital Devices, Unintentional Radiators

IC ICES-003, Class B Digital Devices, Unintentional Radiators

B) Product Identification

The equipment under test (EUT) was tested at the Research In Motion (RIM) EMI test facility, located at:

305 Phillip Street
Waterloo, Ontario
Canada, N2L 3W8
Phone: 519 888 7465
Fax: 519 888 6906
Web Site: www.rim.net

The testing began on June 12, 2002 and was completed on June 13, 2002. The sample equipment under test (EUT) included:

1. BlackBerry 6110 Wireless Handheld, model number R6510IN, FCC ID L6AR6510IN, IC: 2503A-R6510IN
2. USB data cable, model number HDW-04162-001, 1.5 metres long.
3. Travel Charger, model number PSM05R-050Q, RIM part number ASY-04078-001 with an output voltage of 5.0 volts dc.
4. Headset, model number HDW-03458-001

The BlackBerry 6110 Wireless Handheld is an 800 MHz portable unit that uses two digital technologies: Quad 16QAM and Time Division Multiple Access (TDMA).

C) Support Equipment Used for the Testing of the EUT

1. PC, Dell, model number MMP, serial number 6SPS20B
2. Monitor, KDS, model number KD-1460, serial number 4530019652
3. Printer, H/P, model number C5884A, serial number US8251W0VQ

D) Test Voltage

The ac input voltage was 120 volts, 60 Hz. This configuration was per manufacturer's specifications.



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Test Date: June 12 to June 13, 2002

E) Test Results Chart

SPECIFICATION	Test Type	MEETS REQUIREMENTS	Performed By
FCC CFR 47 Part 15, Subpart B IC ICES-003	Class B	Yes	Masud Attayi

F) Modifications to EUT

No modifications were required on the EUT.

G) Summary of Results

1 CONDUCTED EMISSIONS

The conducted emissions were measured while using the test procedure outlined in CISPR Recommendation 22 through a 50 Ω Line Impedance Stabilization Network (LISN), which was inserted in the power line to the equipment to provide the specified impedance for measurements. The EUT was placed on a nonconductive wooden table, 80 cm high that was positioned 40 cm from a vertical ground plane. The RF output of the network was connected to a spectrum analyzer system with characteristics that duplicate those of the receiver specified in CISPR Publication 16. The following test configurations were measured:

- The Travel Charger was connected to the handheld. The ac input to the Travel Charger was 120 volts, 60 Hz.
- The handheld was connected to the support PC by the USB data cable. The ac input to the support PC was 120 volts, 60 Hz.

The sample EUT's conducted emissions were compared with respect to the FCC CFR 47 Part 15, Subpart B/IC ICES-003, Class B limit. The sample EUT had a worse case test margin of 9.72 dB at 16.684 MHz.

Measurement Uncertainty ± 2.0 dB

To view the test data/plots, see APPENDIX 1.

2 RADIATED EMISSIONS

The radiated emissions from the EUT were measured while using the methods outlined in CISPR Recommendation 22. The EUT was placed on a nonconductive wooden table, 80 cm high that was positioned on a remotely rotatable turntable. The test distance used between the EUT and the receiving antenna was three metres. The measurements were done in a semi-anechoic chamber. The semi-anechoic chamber FCC registration number is **778487** and the Industry Canada file number is **IC4240**. The turntable was rotated to determine the azimuth of the peak emissions. At this point the emissions were maximized by elevating the antenna in the range of 1 to 4 metres. The maximum emissions level was recorded. The frequency range measured was from 30 MHz to 5.0 GHz which is the 5th harmonic of the highest RF local oscillator (LO). Both the horizontal and vertical polarizations of the emissions were measured:

The EUT was configured and operated to produce the maximum radiated emissions while still keeping within RIM's specifications. The following test configuration was measured:

- The handheld was connected to Travel Charger. The system's radiated emission levels in charging mode were compared with respect to the FCC CFR 47 Part 15, Subpart B/IC ICES-003, Class B limit. The system **passed** with a worse case emission test margin of 15.25 dB at 33.5 MHz.
- The handheld was connected to the support PC via the USB data cable in charging mode and USB data flood running. The system's radiated emission levels were compared with respect to the FCC CFR 47 Part 15, Subpart B/IC ICES-003, Class B limit. The system **passed** with a worse case emission test margin of 2.14 dB at 64.0 MHz.
- The EUT's RF LO emissions were measured with the handheld standalone configuration in receive/transmit mode. The arbitrary waveform generator was set to 851.0, 860.5 and 870.0 MHz. Both the horizontal and vertical antenna polarizations of the emissions were measured up to the 5th harmonic.
The EUT **passed** with a worse case emission margin of 32.6 dB at 960.650 MHz.
- The EUT's RF LO emissions were measured with the handheld standalone configuration in receive mode. The arbitrary waveform generator was set to 860.5 MHz and the handheld at 860.5 MHz receive mode. Both the horizontal and vertical antenna polarizations of the emissions were measured up to the 5th harmonic. No emissions could be seen above the noise floor of the analyzer.



- o The EUT's RF IF LO emissions were measured with the handheld standalone configuration in transmit mode. The arbitrary waveform generator was set to 851.0 Mhz and the handheld at 815.5 MHz transmit mode. Both the horizontal and vertical antenna polarizations of the emissions were measured up to the 5th harmonic. The EUT **passed** with a worse case emission margin of 31.0 dB at 618.600 MHz.

Sample Calculation:

Field Strength (dB μ V/M) is calculated as follows:

$$FS = \text{Measured Level (dB}\mu\text{V)} + \text{A.F. (dB/m)} + \text{Cable Loss (dB)} - \text{Preamp (dB)} + \text{Filter loss (dB)}$$

Measurement Uncertainty ± 4.0 dB

To view the test data see APPENDIX 2.



H) Compliance Test Equipment Used

<u>UNIT</u>	<u>MANUFACTURER</u>	<u>MODEL / SERIAL NUMBER</u>		<u>CAL DUE DATE</u>	<u>USE</u>
Preamplifier system	TDK RF Solutions	PA-02	080010	02-06-21	Radiated Emissions
Preamplifier	Sonoma	310N/11909A	185831	02-06-21	Radiated Emissions
EMC Analyzer	Agilent	E7405A	US40240226	03-03-21	Radiated Emissions
L.I.S.N.	Emco	3816/2	1120	02-06-21	Conducted Emissions
L.I.S.N.	Emco	3816/2	1118	02-06-21	Conducted Emissions
Impulse Limiter	Rohde & Schwarz	ESHS-Z2	836248/052	02-06-21	Conducted Emissions
EMI Receiver	Agilent	85462A	3942A00517	03-04-04	Conducted Emissions
RF Filter Section	Agilent	85460A	3704A00481	03-04-04	Conducted Emissions
Hybrid Log Antenna	TDK	HLP-3003C	17301	02-10-03	Radiated Emissions
Horn Antenna	TDK	HRN-0118	090301	02-10-03	Radiated Emissions
Horn Antenna	TDK	HRN-0118	090601	02-10-03	Radiated Emissions
Signal Generator	HP	83630B	3844A00927	03-04-30	Radiated Emissions
Dipole Antenna	Schwarzbeck	VHAP	1006	03-03-05	Radiated Emissions
Dipole Antenna	Schwarzbeck	VHAP	1007	03-03-05	Radiated Emissions



K) Declaration

Statement of Performance:

The BlackBerry 6110 Wireless Handheld, model R6510IN, tested with the following accessories: Travel Charger, model number PSM05R-050Q, RIM part number ASY-04078-001, Headset, model number HDW-03458-001 and USB data cable, model number HDW-04162-001 when configured and operated per RIM’s operation instructions, performs within the requirements of the test standards.

Declaration:

We hereby certify that:

The test data reported herein is an accurate record of the performance of the sample(s) tested.

The test equipment used was suitable for the tests performed and within manufacturer’s published specifications.

The test equipment was used within its published operating parameters.

The test methods were consistent with the methods described in the relevant standards.

Tested by:

Masud S. Attayi, P.Eng.
Senior Engineer, Compliance and Certification

Date: 14 June, 2002

Reviewed and Approved by:

Date: 17 June, 2002

Paul G. Cardinal, Ph.D.
Manager, Compliance and Certification

APPENDIX 1

CONDUCTED EMISSIONS TEST DATA/PLOTS

Conducted Emissions Test Results

FCC CFR 47 Part 15, Subpart B, Class B

June 13, 2002

<u>FREQ.</u> (MHz)	<u>LINE</u>	<u>READING</u> Quasi-Peak (dBµV)	<u>Impulse</u> <u>Limiter loss</u> (dB)	<u>Cable +</u> <u>LISN</u> <u>Loss</u> (dB)	<u>Corrected</u> <u>Reading</u> (dBµV)	<u>LIMIT</u> (dBµV)	<u>MARGIN</u> (dB)
16.202	L1	25.82	10.0	0.21	36.03	48.0	-11.97
16.202	L2	25.93	10.0	0.21	36.14	48.0	-11.86
16.383	L1	26.56	10.0	0.21	36.77	48.0	-11.23
16.383	L2	25.76	10.0	0.21	35.97	48.0	-12.03
16.563	L1	26.40	10.0	0.21	36.61	48.0	-11.39
16.563	L2	25.90	10.0	0.21	36.11	48.0	-11.89
16.683	L1	28.08	10.0	0.20	38.28	48.0	-9.72
16.683	L2	27.44	10.0	0.20	37.64	48.0	-10.36
16.742	L1	27.50	10.0	0.21	37.71	48.0	-10.29
16.742	L2	25.22	10.0	0.21	35.43	48.0	-12.57
16.803	L1	27.48	10.0	0.22	37.70	48.0	-10.3
16.803	L2	26.31	10.0	0.22	36.53	48.0	-11.47

The handheld was connected to the support PC by the USB data cable. The ac input to the support PC was 120 volts, 60 Hz.

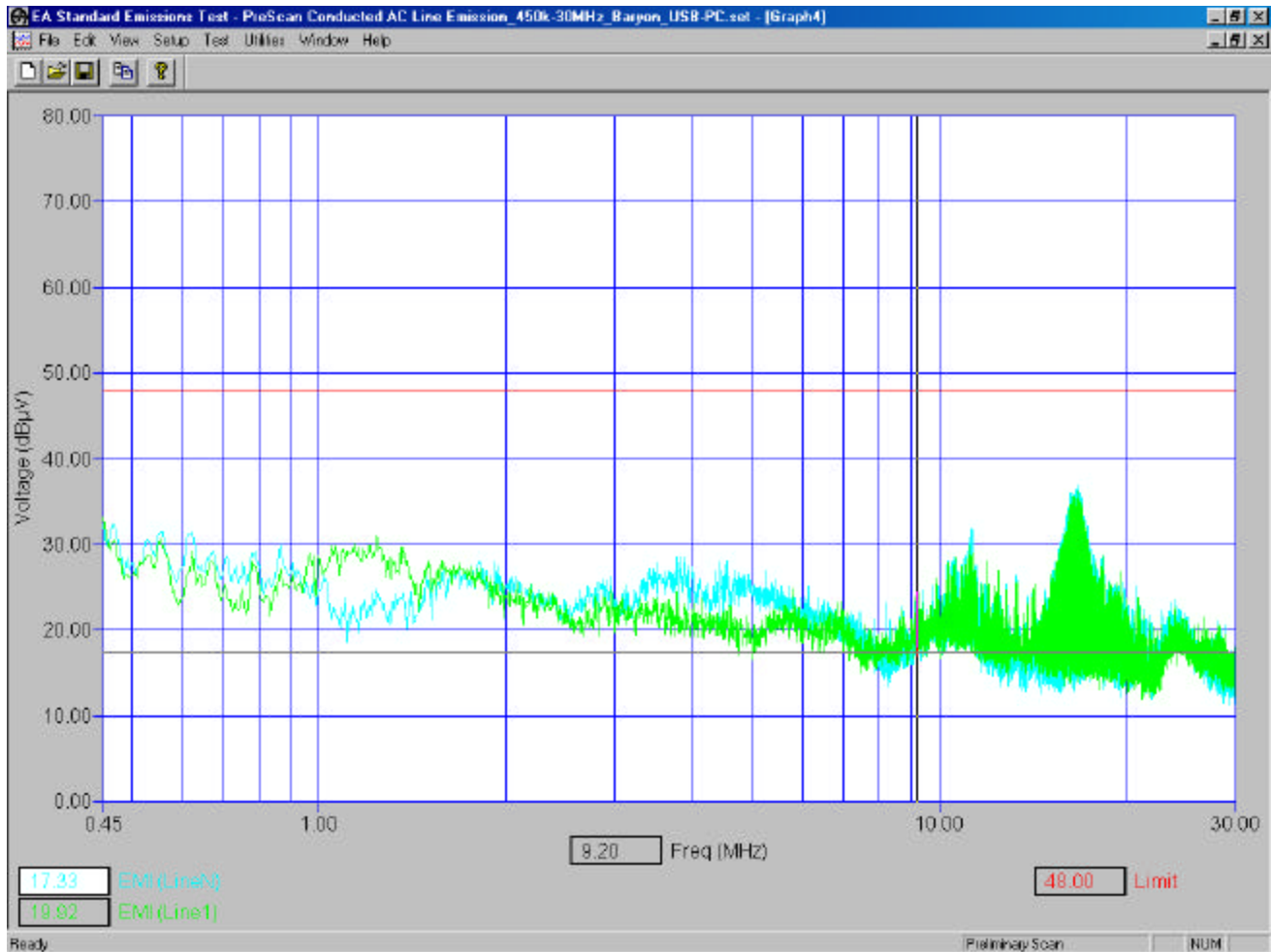
FCC CFR 47 Part 15, Subpart B, Class B

<u>FREQ.</u> (MHz)	<u>LINE</u>	<u>READING</u> Quasi-Peak (dBµV)	<u>Impulse</u> <u>Limiter loss</u> (dB)	<u>Cable +</u> <u>LISN</u> <u>Loss</u> (dB)	<u>Corrected</u> <u>Reading</u> (dBµV)	<u>LIMIT</u> (dBµV)	<u>MARGIN</u> (dB)
2.033	L1	6.14	10.0	0.12	16.26	48.0	-31.74
2.033	L2	6.00	10.0	0.12	16.12	48.0	-31.60

The Travel Charger was connected to the handheld. The ac input to the Travel Charger was 120 volts, 60 Hz.

Conducted Emission Graph

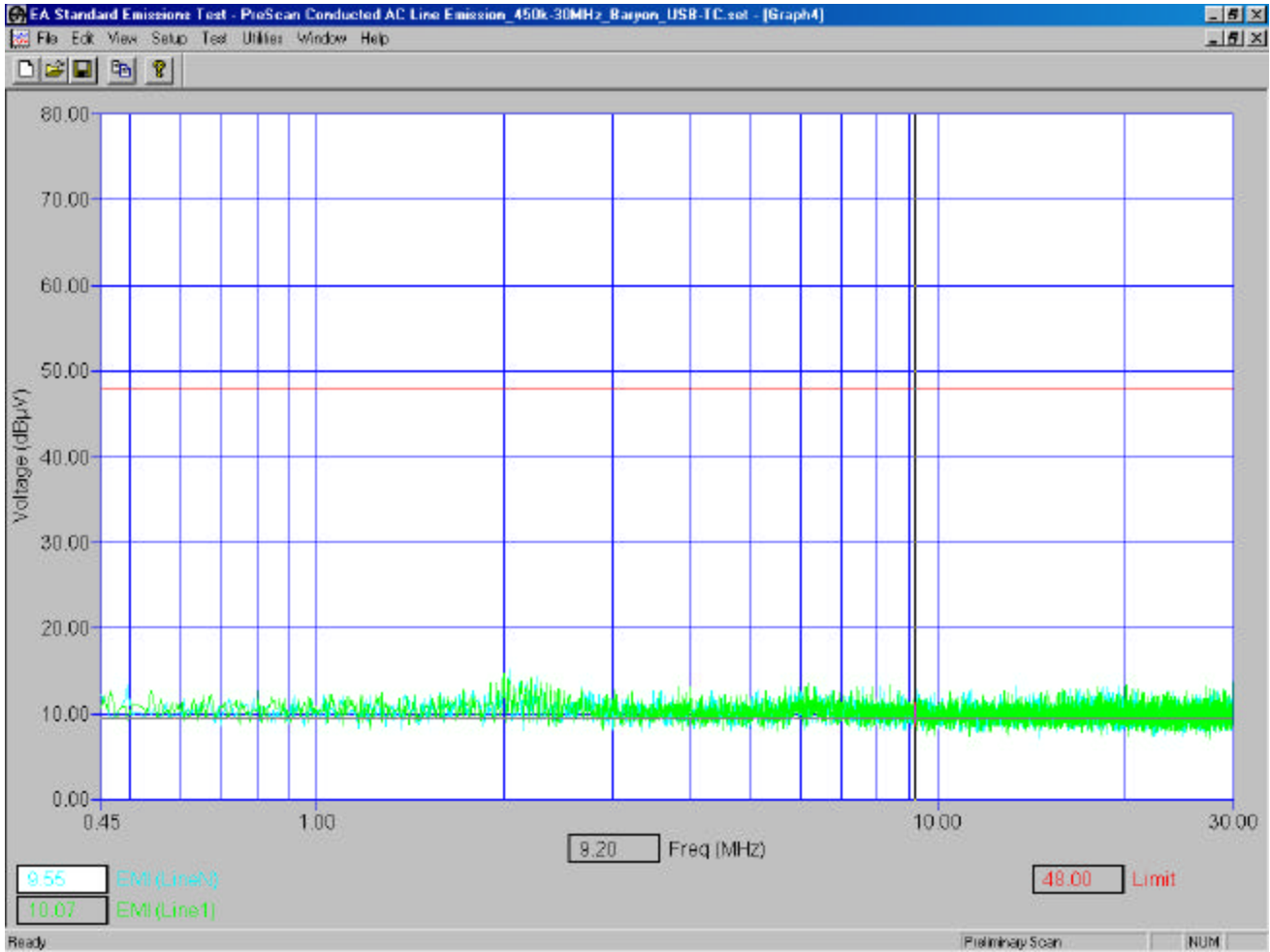
FCC CFR 47 Part 15, Subpart B, Class B



120 volt, 60 Hz ac input to the support PC which is connected to model number R6510IN via the USB data cable.

Conducted Emission Graph

FCC CFR 47 Part 15, Subpart B, Class B



120 volt, 60 Hz ac input to the Travel Charger, model number PSM05R-050Q connected to model number R6510IN.

Conducted Emission Test-Setup Photo

FCC CFR 47 Part 15, Subpart B, Class B



APPENDIX 2

RADIATED EMISSIONS TEST DATA/PLOTS



Radiated Emissions Test Results

FCC CFR 47 Part 15, Subpart B, Class B

June 13, 2002

Operating Mode: The handheld was connected to the Travel Charger. The ac input was 120 volts, 60 Hz.

Frequency (MHz)	Pol (V/H)	Detector (Q.P. or Peak)	Reading @ 3.0 M (dBµV)	Correction Factors for antennae/cables (dB/m)	Level (corr.+ meas.) (dBµV/m)	Limit @ 3.0 M (dBµV/m)	Test Margin (dB)
33.500	V	Q.P.	43.65	-18.9	24.75	40.0	-15.25
57.800	V	Q.P.	42.52	-21.48	21.04	40.0	-18.96

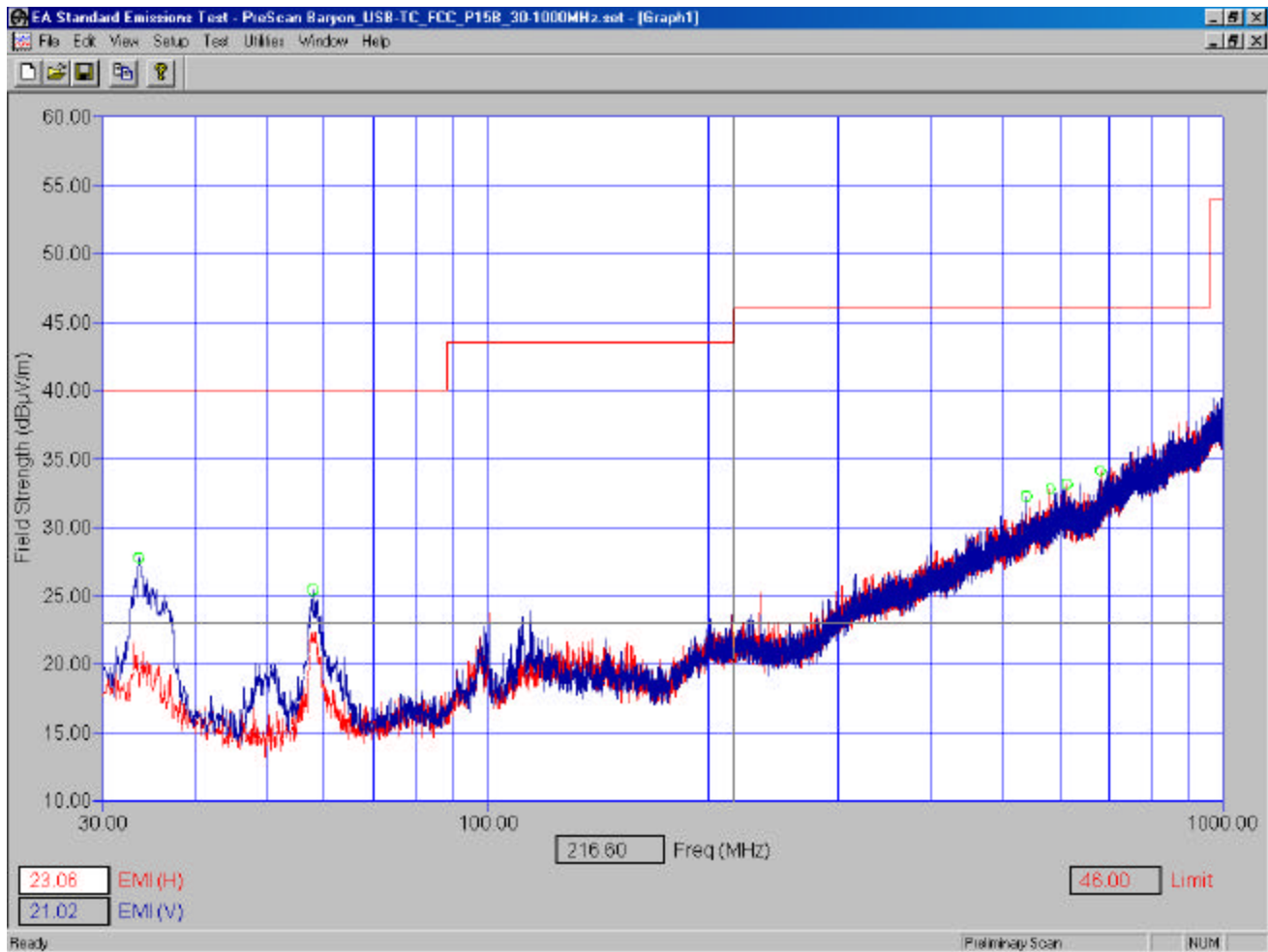
Note: All other emission levels were greater than 20 dB margin

Operating Mode: The handheld was connected to the support PC with the USB data cable. The ac input was 120 volts, 60 Hz. The Handheld was in charging mode and USB data flood running.

Frequency (MHz)	Pol (V/H)	Detector (Q.P. or Peak)	Reading @ 3.0 M (dBµV)	Correction Factors for antennae/cables (dB/m)	Level (corr.+ meas.) (dBµV/m)	Limit @ 3.0 M (dBµV/m)	Test Margin (dB)
64.000	V	Q.P.	59.1	-21.36	37.74	40.0	-2.14
360.100	V	Q.P.	51.0	-11.81	39.19	46.0	-6.81
596.900	H	Q.P.	40.7	-5.84	34.86	46.0	-11.14
894.300	V	Q.P.	41.15	-1.46	39.69	46.0	-6.31
894.800	H	Q.P.	36.20	-1.46	34.74	46.0	-11.26
899.400	V	Q.P.	40.60	-1.4	39.20	46.0	-6.80

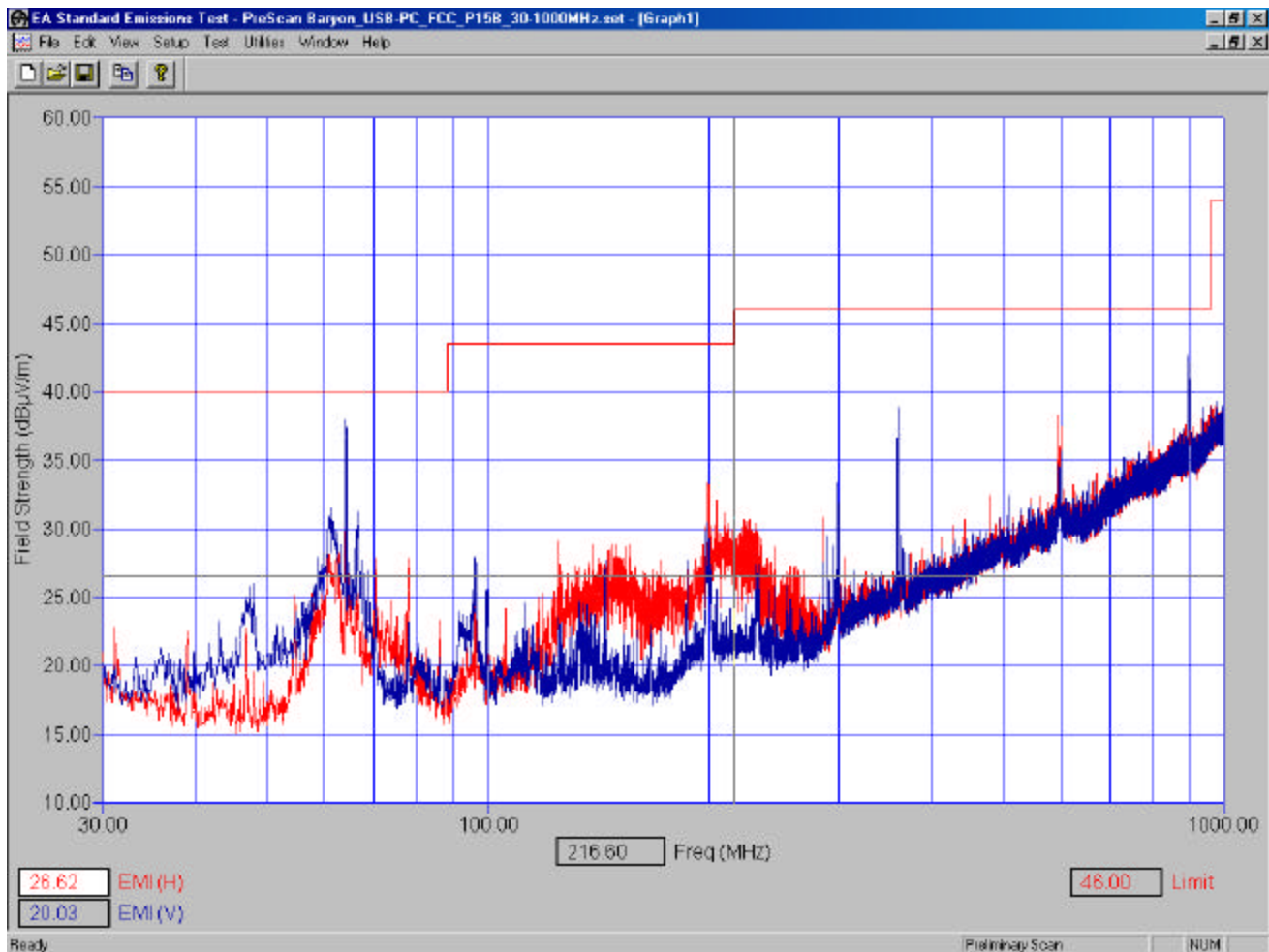
Note: All other emission levels were greater than 20 dB margin.

Radiated Emissions Prescan Graph



The handheld was connected to the ac Travel Charger, model number PSM05R-050Q. The ac input was 120 volts, 60 Hz.

Radiated Emissions Prescan Graph



The handheld was connected to the support PC with the USB data cable. The ac input was 120 volts, 60 Hz.

Radiated Emissions Test Data con't
IF LO - (Checked in Receive/ transmit Mode)

Antenna Extended - (handheld standalone, upright position) - QAM 16, 1/6 timeslot per frame, maximum output power.

LOW (Rx IF LO) - Require the Arbitrary waveform generator at 860.5 MHz and device at 860.5 MHz in Mode receive (middle channel is arbitrary)

Type	Frequency	Band	Antenna		Test Dist.	Reading		Limit	Diff. To Limit
	(MHz)		Type	Pol.		(m)	dBuV		
F0	219.30	800	HLP	V	3	NF	NF	46	-
F0	219.30	800	HLP	H	3	NF	NF		
2nd	438.60	800	HLP	V	3	NF	NF	46	-
2nd	438.60	800	HLP	H	3	NF	NF		
3rd	657.90	800	HLP	V	3	NF	NF	46	-
3rd	657.90	800	HLP	H	3	NF	NF		
4th	877.20	800	HLP	V	3	NF	NF	46	-
4th	877.20	800	HLP	H	3	NF	NF		
5th	1096.50	800	Horn	V	3	NF	NF	54	-
5th	1096.50	800	Horn	H	3	NF	NF		

High (TX IF LO) – Require the arbitrary waveform generator at 851 MHz and device at 815.5 MHz in mode transmit (middle channel is arbitrary)

F0	309.30	800	HLP	V	3	NF	NF	46	-
F0	309.30	800	HLP	H	3	NF	NF		
2nd	618.60	800	HLP	V	3	47.1	15	46	-31.0
2nd	618.60	800	HLP	H	3	36.7	4.6		
3rd	927.90	800	HLP	V	3	NF	NF	46	-
3rd	927.90	800	HLP	H	3	NF	NF		
4th	1237.20	800	Horn	V	3	NF	NF	54	-
4th	1237.20	800	Horn	H	3	NF	NF		
5th	1546.50	800	Horn	V	3	NF	NF	54	-
5th	1546.50	800	Horn	H	3	NF	NF		

Radiated Emissions Test Data con't

**Antenna Extended – Unmodulated (handheld standalone, upright position) - QAM 16, 1/6 timeslot per frame, maximum output power, Transmit/Receive_RF_LO (Transmit/Receive mode).
 LOW - Arbitrary waveform generator setting: frequency at 851 MHz, Amp -50 dBm
 device should display -90 to -100 dBm - Berbug> go <Enter>), Device setting: freq at 806 MHz, Mode RTR**

Type	Frequency	Band	Antenna		Test Dist.	Reading	Corrected Reading	Corrected Reading	Limit	Diff. To Limit
	(MHz)		Type	Pol.	(m)	dBuV	dBuV	dBuV	dBuV/m	dB
F0	960.65	Low	HLP	V	3	50.5	21.4	21.4	54	-32.6
F0	960.65	Low	HLP	H	3	46.7	17.6			
2nd - 5th	1921.3-4803.25	Low	Horn	V	3	NF			54	-
2nd - 5th	1921.3-4803.25	Low	Horn	H	3	NF				

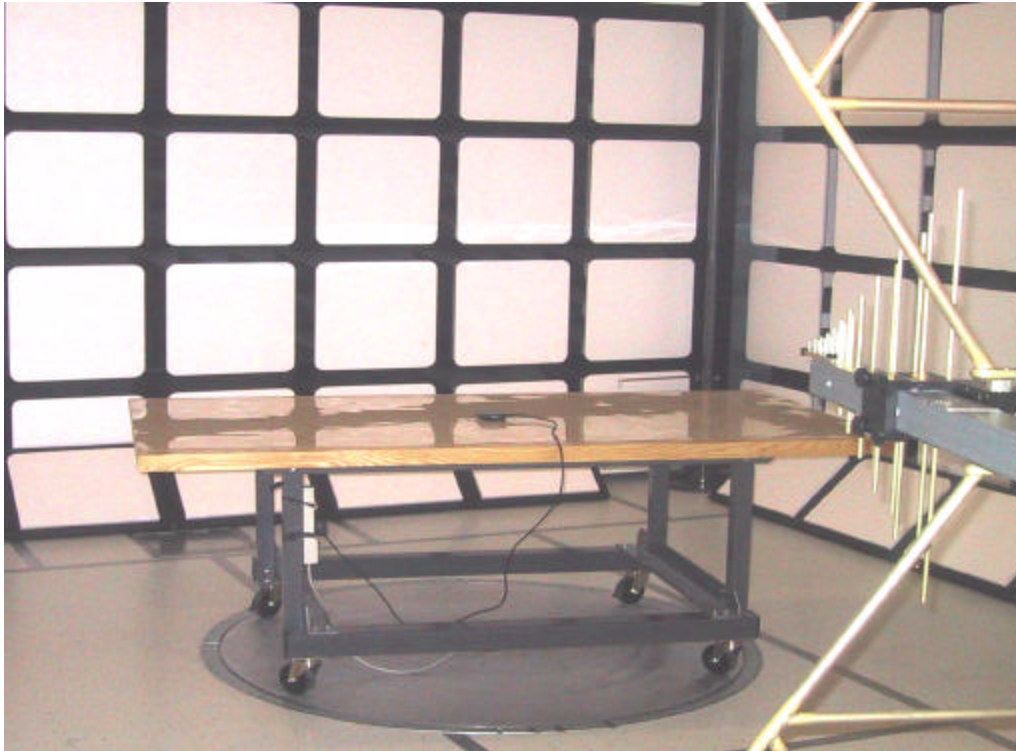
**MIDDLE – Arbitrary waveform generator setting: frequency at 860.5 MHz, Amp -50 dBm, Device setting
 frequency at 815.5 MHz, Mode Receive/Transmit**

F0	970.15	Mid	HLP	V	3	49	19.9	19.9	54	-34.1
F0	970.15	Mid	HLP	H	3	42.6	13.5			
2nd - 5th	1940.3-4853.25	Mid	Horn	V	3	NF			54	-
2nd - 5th	1940.3-1853.25	Mid	Horn	H	3	NF				

**HIGH - Arbitrary waveform generator setting: frequency at 870 MHz, Amp -50 dBm, Device setting:
 frequency at 825 MHz, Mode Receive/Transmit**

F0	979.65	High	HLP	V	3	42.4	13.3	13.3	54	-40.7
F0	979.65	High	HLP	H	3	40.7	11.6			
2nd - 5th	1959.3-4898.25	High	Horn	V	3	NF			54	-
2nd - 5th	1959.3-4898.25	High	Horn	H	3	NF				

Radiated emissions in semi- anechoic chamber. Test distance is three metres.



FCC CFR 47 Part 15, Subpart B



Radiated emissions in semi- anechoic chamber. Test distance is three metres.

