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Electromagnetic Emissions Test Report In Accordance With Industry Canada Radio Standards Specification 133 issue 2, FCC Part 24 Subpart E on the Handspring Model: Treo 600 (CDMA Version)

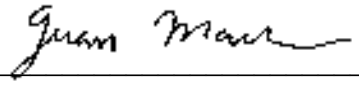
FCC ID NUMBER:	O8FBW
UPN:	3959ABW
APPLICANT:	Handspring 189 Bernardo Avenue Mountain View, CA 94043
TEST SITE:	Elliott Laboratories, Inc. 684 W. Maude Ave Sunnyvale, CA 94086
TEST SITE:	Elliott Laboratories, Inc. 41039 Boyce Road Fremont, CA 94538
REPORT DATE:	July 03, 2003
FINAL TEST DATE:	June 24, June 25, and June 27, 2003
AUTHORIZED SIGNATORY:	 Sr. EMC Engineer

TABLE OF CONTENTS

COVER PAGE **1**

TABLE OF CONTENTS **2**

FCC CERTIFICATION INFORMATION **3**

DECLARATIONS OF COMPLIANCE **5**

SCOPE **6**

OBJECTIVE **6**

SUMMARY OF TEST RESULTS **7**

PART 24E AND RSS-133 TEST SUMMARY 7

MEASUREMENT UNCERTAINTIES **8**

EQUIPMENT UNDER TEST (EUT) DETAILS **9**

GENERAL 9
OTHER EUT DETAILS 9
ENCLOSURE 9
MODIFICATIONS 9
SUPPORT EQUIPMENT 9
EUT INTERFACE PORTS 9
EUT OPERATION DURING TESTING 9

TEST SITE **10**

GENERAL INFORMATION 10
CONDUCTED EMISSIONS CONSIDERATIONS 10
RADIATED EMISSIONS CONSIDERATIONS 10

MEASUREMENT INSTRUMENTATION **11**

RECEIVER SYSTEM 11
PEAK POWER METER 11
FILTERS/ATTENUATORS 11
ANTENNAS 12
ANTENNA MAST AND EQUIPMENT TURNTABLE 12
INSTRUMENT CALIBRATION 12

TEST PROCEDURES **13**

SPECIFICATION LIMITS AND SAMPLE CALCULATIONS **17**

RADIATED EMISSIONS SPECIFICATION LIMITS 17
CALCULATIONS – EFFECTIVE RADIATED POWER 17

EXHIBIT 1: Test Equipment Calibration Data *1*
EXHIBIT 2: Test Measurement Data *2*
EXHIBIT 3: Test Configuration Photos *3*
EXHIBIT 4: FCC ID Label and Label Location *4*
EXHIBIT 5: Detailed Photographs *5*
EXHIBIT 6: Schematics *6*
EXHIBIT 7: Theory of Operation *7*
EXHIBIT 8: User Manual *8*

FCC CERTIFICATION INFORMATION

The following information is in accordance with FCC Rules, 47CFR Part 2, Subpart J, Section 2.1033(C) & to Industry Canada RSP-100.

2.1033(c)(1) Applicant: Handspring
189 Bernardo Avenue
Mountain View, CA 94043

2.1033(c)(2) & RSP-100 (4) FCC ID: **O8FBW**
UPN: **3959ABW**

2.1033(c)(3) & RSP-100 (7.2(a)) Instructions/Installation Manual

Please refer to Exhibit 7: User Manual, Theory of Operation, and Tune-up Procedure

2.1033(c)(4) & RSP-100 (7.2(b)(iii)) Type of emissions

FCC 24E & RSS-133**: 1M3F9W**

2.1033(c)(5) & RSP-100 (7.2(a)) Frequency Range

FCC 24E & RSS-133**:** 1851.25 - 1908.75 MHz (1900)

2.1033(c)(6) & RSP-100 (7.2(a)) Range of Operation Power

FCC 24E & RSS-133**: 24dBm (0.251 Watts EIRP)**

2.1033(c)(7) & RSP-100 (7.2(a)) Maximum FCC & IC Allowed Power Level

24.235(b) & RSS-133 (6.2): 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.

2.1033(c)(8) & RSP-100 (7.2(a)) Applied voltage and currents into the final transistor elements

Refer to Exhibit 6. The schematic diagram

2.1033(c)(9) & RSP-100 (7.2(a)) Tune-up Procedure

Please refer to Exhibit 7: User Manual, Theory of Operation, and Tune-up Procedure

2.1033(c)(10) & RSP 100 (7.2(a)) Schematic Diagram of the Transmitter

Refer to Exhibit 6. The schematic diagram

2.1033(c)(10) & RSP-100 (7.2(a)) Means for Frequency Stabilization

Refer to Exhibit 6. The schematic diagram

2.1033(c)(10) & RSP-100 (7.2(a)) Means for Suppression of Spurious radiation

Refer to Exhibit 6. The schematic diagram

2.1033(c)(10) & RSP-100 (7.2(a)) Means for Limiting Modulation

For more information please refer to Exhibit 7: Theory of Operation

2.1033(c)(10) & RSP-100 (7.2(a)) Means for Limiting Power

Refer to Exhibit 6. The schematic diagram

2.1033(c)(11) & RSP-100 (7.2(g)) Photographs or Drawing of the Equipment Identification Plate or Label

Refer to Exhibit 4

2.1033(c)(12) & RSP-100 (7.2(c)) Photographs of equipment

Refer to Exhibit 5

2.1033(c)(13) & RSP-100 (7.2(a)) Equipment Employing Digital Modulation

Manufacturer to provide detailed information.

2.1033(c)(14) & RSP-100 (7.2(b)(ii)) Data taken per Section 2.1046 to 2.1057 and RSS-133 issue 2, Rev. 1.

Refer to Exhibit 2

DECLARATIONS OF COMPLIANCE

Equipment Name and Model:
Treo 600 (CDMA Version)

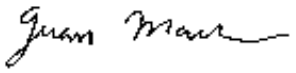
Manufacturer:
Handspring
189 Bernardo Avenue
Mountain View, CA 94043

Tested to applicable standards:
RSS-133 Issue 2, Rev. 1 November 6, 1999 (2GHz Personal Communications Services)
FCC Part 24 Subpart E

Measurement Facility Description Filed With Department of Industry:

Departmental Acknowledgement Number: IC2845 **SV4** Dated July 30, 2001
Departmental Acknowledgement Number: IC4549_**3** Dated March 5, 2003
Departmental Acknowledgement Number: IC2549_**4** Dated March 5, 2003

I declare that the testing was performed or supervised by me; that the test measurements were made in accordance with the above mentioned departmental standards (through the use of TIA/EIA-603 and the specific RSS standards applicable to this device); and that the equipment performed in accordance with the data submitted in this report.



Signature	_____
Name	Juan Martinez
Title	Sr. EMC Engineer
Company	Elliott Laboratories Inc.
Address	684 W. Maude Ave Sunnyvale, CA 94086 USA
Date:	July 3, 2003

Maintenance of compliance with the above standards is the responsibility of the manufacturer. Any modification of the product which may result in increased emissions should be checked to ensure compliance has been maintained (i.e., printed circuit board layout changes, different line filter, different power supply, harnessing or I/O cable changes, etc.).

SCOPE

FCC Part 24 Subpart E & IC RSS-133 testing was performed for the equipment mentioned in this report. The equipment was tested in accordance with the procedures specified in Sections 2.1046 to 2.1057 of the FCC Rules & IC RSS-133. TIA-603 was also used as a test procedure guideline to perform some of the required tests.

The intentional radiator above was tested in a simulated typical installation to demonstrate compliance with the relevant FCC & RSS performance and procedural standards.

Final system data was gathered in a mode that tended to maximize emissions by varying orientation of EUT, orientation of power and I/O cabling, antenna search height, and antenna polarization.

Every practical effort was made to perform an impartial test using appropriate test equipment of known calibration. All pertinent factors have been applied to reach the determination of compliance.

OBJECTIVE

The primary objective of the manufacturer is compliance with the FCC 24 Subpart E & IC RSS-133. Certification of these devices is required as a prerequisite to marketing as defined in Section 2.1033 & RSP-100.

Certification is a procedure where the manufacturer or a contracted laboratory makes measurements and submits the test data and technical information to FCC & Industry Canada. FCC & Industry Canada issues a grant of equipment authorization and a certification number upon successful completion of their review of the submitted documents. Once the equipment authorization has been obtained, the label indicating compliance must be attached to all identical units subsequently manufactured.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product that may result in increased emissions should be checked to ensure compliance has been maintained (i.e., printed circuit board layout changes, different line filter, different power supply, harnessing or I/O cable changes, etc.).

SUMMARY OF TEST RESULTS

Part 24E and RSS-133 Test Summary

Part 2 Measurements Required Section	FCC Part 24 Subpart E Section	RSS-133 Section	Test Performed	Measured Value	Test Procedure Used	Result
Modulation Tested	CDMA	CDMA	-	-	-	-
2.1047: Modulation characteristics	24.238 (b)	5.6	99% Bandwidth	1300 MHz	D	Complies
2.1046: RF power output	24.232 (b)	6.2	Substitution Output Power Test	24dBm (0.251 Watts EIRP)	A	Complies
2.1046: RF power output	24.232 (b)	6.2	Conducted Output Power Test (**Antenna Conducted**)	23.92dBm (0.247 Watts)	B	Complies
2.1051: Spurious emissions at antenna Port	24.238 (a) & (b)	6.3	Emission Limits and/or Unwanted Emission 30MHz – 25GHz (**Antenna Conducted**)	All spurious emissions < -13dBm	J	Complies
2.1049: Occupied Bandwidth	24.238 (a) & (b)	6.3	Out of Block Emissions (**Antenna Conducted**)	All spurious emissions < -13dBm	I	Complies
2.1053 Field strength of spurious radiation	24.238 (a) & (b)	6.3	Radiated Spurious Emissions 30MHz – 25GHz	-23.5 dBm @ 9404 MHz (-10.5 dB)	N	Complies
2.1055: Frequency stability	24.235	7(a)	Frequency Stability (Frequency Vs. Temperature)	-102 Hz	K	Complies
2.1055: Frequency stability	24.235	7(b)	Frequency Stability (Frequency Vs. Voltage)	23 Hz	L & M	Complies
2.1093: Exposure to portable devices	24.52	8	Exposure of Humans to RF Fields	SAR Report provided	N/A	-
-	-	9 (ii)	Receiver Spurious Emissions (**Antenna Conducted**)	All spurious emission below 1 GHz < 2 nanowatts and above 1 GHz < 5 nanowatts	P	Complies

MEASUREMENT UNCERTAINTIES

ISO Guide 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level and were calculated in accordance with NAMAS document NIS 81.

Measurement Type	Frequency Range (MHz)	Calculated Uncertainty (dB)
Conducted Emissions	0.15 to 30	± 2.4
Radiated Emissions	30 to 1000	± 3.6

EQUIPMENT UNDER TEST (EUT) DETAILS

GENERAL

The EUT is a personal digital assistant with a built-in cellular phone. Normally, the EUT would be placed on a tabletop during operation. The EUT was, therefore, treated as tabletop equipment during testing to simulate the end-user environment. The electrical rating of the EUT is 120/240 V, 50/60 Hz, 1 Amps.

The sample was received on June 23, 2003 and tested on June 24, June 25, and June 27, 2003. The EUT consisted of the following component(s):

Manufacturer/Model/Description	Serial Number	Proposed FCC ID #
Handspring/Treo 600 (CDMA Version)/PDA phone	N/A	**O8FBW**

OTHER EUT DETAILS

None

ENCLOSURE

The EUT enclosure is primarily constructed of plastic. It measures approximately 6.5 cm wide by 1.5 cm deep by 13 cm high.

MODIFICATIONS

The EUT did not require modifications during testing in order to comply with the emission specifications.

SUPPORT EQUIPMENT

No remote support equipment was used during testing.

EUT INTERFACE PORTS

The I/O cabling configuration during emissions testing was as follows:

Port	Connected to	Description	Shielded or Unshielded	Length (m)
Docking Port (EUT)	Serial (Computer) and AC Mains	Multiconductor (Y-cable)	Shielded	1.9

EUT OPERATION DURING TESTING

EUT was set to operate on the low, middle, and high channel at full power.

TEST SITE

GENERAL INFORMATION

Final test measurements were taken on June 24 at the Elliott Laboratories Chamber # 3 and 4 located Fremont, 41039 Boyce Road, Fremont CA 94538. Final test measurements were taken on June 25 &, 27, 2003 at the Elliott Laboratories Open Area Test Site # 4 located at 684 West Maude Avenue, Sunnyvale, California. Pursuant to Section 2.948 of the FCC Rules, construction, calibration, and equipment data has been filed with the Commission.

CONDUCTED EMISSIONS CONSIDERATIONS

Conducted emissions testing are performed in conformance with Section 2 of FCC Rules. Measurements are made with the EUT connected to a spectrum analyzer through an attenuator to prevent overloading the analyzer.

RADIATED EMISSIONS CONSIDERATIONS

Radiated measurements are performed in an open field environment or Anechoic Chamber. The test site is maintained free of conductive objects within the CISPR 16-1 defined elliptical area.

MEASUREMENT INSTRUMENTATION

RECEIVER SYSTEM

An EMI receiver as specified in CISPR 16-1 is used for emissions measurements. The receivers are capable of measuring over the frequency range of 9 kHz up to 2000 MHz. These receivers allow both ease of measurement and high accuracy to be achieved. The receivers have Peak, Average, and CISPR (Quasi-peak) detectors built into their design so no external adapters are necessary. The receiver automatically sets the required bandwidth for the particular detector used during measurements.

For measurements above the frequency range of the receivers, a spectrum analyzer is utilized because it provides visibility of the entire spectrum along with the precision and versatility required to support engineering analysis. If average measurements above 1000MHz are performed, the linear-average method with a resolution bandwidth of 1 MHz and a video bandwidth of 10 Hz is used.

INSTRUMENT CONTROL COMPUTER

A personal computer is utilized to record the receiver measurements of the field strength at the antenna, which is then compared directly with the appropriate specification limit. The receiver is programmed with appropriate factors to convert the received voltage into filed strength at the antenna. Results are printed in a graphic and/or tabular format, as appropriate.

The test receiver also provides a visual display of the signal being measured.

PEAK POWER METER

A peak power meter and thermister mount may be used for output power measurements from transmitters as they provide a broadband indication of the power output.

FILTERS/ATTENUATORS

External filters and precision attenuators are often connected between the receiving antenna or EUT and the receiver. This eliminates saturation effects and non-linear operation due to high amplitude transmitters and transient events.

ANTENNAS

A biconical antenna is used to cover the range from 30 MHz to 300 MHz and a log periodic antenna is utilized from 300 MHz to 1000 MHz. Narrowband tuned dipole antennas are used over the 30 to 1000 MHz range for precision measurements of field strength. Above 1000 MHz, a horn antenna is used. The antenna calibration factors are included in site factors programmed into the test receivers

ANTENNA MAST AND EQUIPMENT TURNTABLE

The antennas used to measure the radiated electric field strength are mounted on a non-conductive antenna mast equipped with a motor drive to vary the antenna height.

The requirements of ANSI C63.4 were used for configuration of the equipment turntable. It specifies that the test height above ground for table-mounted devices shall be 80 centimeters. Floor mounted equipment shall be placed on the ground plane if the device is normally used on a conductive floor or separated from the ground plane by insulating material from 3 to 12 mm if the device is normally used on a non-conductive floor. During radiated measurements, the EUT is positioned on a motorized turntable in conformance with this requirement.

INSTRUMENT CALIBRATION

All test equipment is regularly checked to ensure that performance is maintained in accordance with the manufacturer's specifications. All antennas are calibrated at regular intervals with respect to tuned half-wave dipoles. An appendix of this report contains the list of test equipment used and calibration information.

TEST PROCEDURES

General: For Transmitters with detachable antenna, direct measurements for output power, modulation characterization, occupied bandwidth, and frequency stability are performed with the antenna port of the EUT connected to either the power meter, modulation analyzer, or spectrum analyzer via a suitable attenuator and/or filter. The attenuators and/or filters are used to ensure that the transmitter fundamental will not overload the front end of the measurement instrument.

Procedure A – Power Measurement (Radiated Method): The following procedure was used for transmitters that do not use external antennas or with devices with test port were the output power can be measured directly, but Power must still be made with antenna attached.

1) Set the EUT to maximum power and to the lowest channel.
2) A spectrum analyzer was use to measure the power output. The search antenna was located 3 meter from the EUT.
3) The spectrum analyzer resolution and video bandwidth was set to 2 MHz to measure the power output. No amplifier was used since the fundamental will cause the amplifier to saturate.
4) The EUT was then rotated for a complete 360 degrees and the search antenna was raised and lowered to maximize the fundamental. Both vertical and horizontal polarization's were performed. All correction factors are applied to the fundamental.
5) Substitution is then performed. Substitution method is performed by replacing the EUT with a horn antenna and signal generator. The horn antenna factors can be reference to a half-wave dipole in dBi. The signal generator power level is adjusted until a similar level, which was measured, in step 4, is achieved on the spectrum analyzer. The level on the signal generator is than added to the antenna factor, in dBi, which will give the corrected value.
6) Steps 1 to 5 are repeated for the middle and the highest channel.

Procedure B – Power Measurement (Conducted Method): The following procedure was used for transmitters that do use external antennas.

1) Set the EUT to maximum power and to the lowest channel.
2) Either a power meter or a spectrum analyzer was used to measure the power output.
3) If a spectrum analyzer was used a resolution and video bandwidth 1MHz was used to measure the power output. Corrected for any external attenuation used for the protection of the input of analyzer. In addition, For CDMA or TDMA modulations set spectrum analyzer resolution to 1MHz and video to 30 kHz. Use video averaging with a 100-sample rate.
4) If a power meter was used, corrected for any external attenuation used for the protection of the input of the sensor head. Also set the power sensor correction by setting up the frequency range that will be measured.
5) Repeat this for the high channel and all modulations that will be used and all output ports used for transmission

Procedure D - Occupied Bandwidth (Conducted Method): Either for analog, digital, or data modulations, occupied bandwidth was performed. The EUT was set to transmit the appropriate modulation at maximum power. The bandwidth was measured using following methods:

1) The built-in 99% function of the spectrum analyzer was used.
2) If the built-in 99% is not available then the following method is used:

   26-dB was subtracted to the maximum peak of the emission. Then the display line function was used, in conjunction with the marker delta function, to measure the emissions bandwidth.

3) For the above two methods a resolution and video bandwidth of 10 or 30 kHz was used to measure the emission's bandwidth.

Procedure H - Other Types of Equipment: Either digital or data modulated signals were simulated, by software or external sources, to performed the required tests. The EUT was set to transmit the appropriate digital modulation.

Procedure I – Bandedge: Where Bandedge measurements are specified the following procedure was performed:

1) Set the transmitting signal as close as possible to the edge of the frequency band/block as specified in the standard. Power is set to maximum
2) Set the spectrum analyzer display line function to –13 dBm.
3) Set the spectrum analyzer bandwidth to the minimum 1% of the emission bandwidth. The emission bandwidth is determined by using **procedure D**. For CDMA or TDMA modulations used trace averaging set to 100 sweeps.
4) Set the marker function to the FCC or IC specified frequency band/block.
5) Set the spectrum analyzer span to show any emission within 2 MHz above or below the frequency band/block. All spurious or intermodulation emission must not exceed the –13 dBm limit.
6) Steps 1 to 5 were repeated for all modulations and output ports that will be used for transmission. Also, bandedge is determined for blocks A (high edge), D, B, E, F, C (low edge).

Procedure J – Antenna Conducted Emissions: For spurious emission measurements at the antenna terminal the following procedure was performed:

1) Set the transmitting signal as close as possible to the edge of the frequency band/block as specified in the standard. Power is set to maximum
2) Set the spectrum analyzer display line function to –13-dBm.
3) Set the spectrum analyzer bandwidth to 1 MHz.
4) For the spectrum analyzer, the start frequency was set to 30 MHz and the stop frequency set to the 10th harmonic of the fundamental. All spurious or intermodulation emission must not exceed the –13dBm limit.
5) Steps 1 to 4 were repeated for all modulations and output ports that will be used for transmission.

Procedure K - Frequency Stability: The EUT is placed inside a temperature chamber with all support and test equipment located outside of the chamber. The spectrum analyzer is configured to give a 6-digit display for the marker-frequency function. The spectrum analyzer's built-in frequency counter is used to measure the maximum deviation of the fundamental frequency at each temperature. The Temperature chamber was varied from –30 to +50° C (or +60° C for some IC RSS standards) in 10 degrees increment. The EUT was allowed enough time to stabilize for each temperature variation.

Procedure L - Frequency Stability: For AC or DC operated devices the nominal voltage is varied to 85% and to 115% at either room temperature or at a controlled +20°C temperature.

Procedure M - Frequency Stability: For battery-powered devices the voltage battery end-point is determined by reducing the dc voltage until the unit ceases to function. This is performed at either room temperature or at a controlled +20°C temperature.

Procedure N - Field Strength Measurement: The EUT was set on the turntable and the search antenna position 3 meters away. The output antenna terminal was terminated with a 50-ohm terminator. The EUT was set at the middle of the frequency band and set at maximum output power.

For the first scan, a pre-liminary measurement is performed. A preliminary scan of emissions is conducted in which all significant EUT frequencies are identified with the system in a nominal configuration. One or more of these is with the antenna polarized vertically while the one or more of these are with the antenna polarized horizontally. During the preliminary scans, the EUT is rotated through 360°, the antenna height is varied and cable positions are varied to determine the highest emission relative to the limit.

For the final measurement, Substitution method is performed on spurious emissions not being 20-dB below the calculated radiated limit. Substitution method is performed by replacing the EUT with a horn antenna and signal generator. The horn antenna factors can be reference to a half-wave dipole in dBi. The signal generator power level was adjusted until a similar level, which was measured on the first scan, is achieved on the spectrum analyzer. The level on the signal generator is than added to the antenna factor, in dBi, which will give the corrected value.

Procedure P – Receiver Antenna Conducted Emissions: Receiver spurious emission was measured at the antenna terminal, as a port was available.

1) Set the receiver was set to the midpoint of the operating band as specified in the standard.
2) Set the spectrum analyzer display line function to 2 nanowatts for measurements below 1 GHz and 5 nanowatts for measurements above 1 GHz.
3) Set the spectrum analyzer bandwidth to 1 MHz.
4) For the spectrum analyzer, the start frequency was set to 30 MHz and the stop frequency set to the 5^{th} harmonic of the receiver LO. All spurious or intermodulation emission must not exceed the specified limit.

SPECIFICATION LIMITS AND SAMPLE CALCULATIONS

RADIATED EMISSIONS SPECIFICATION LIMITS

The limits for radiated emissions are based on the power of the transmitter at the operating frequency. Data is measured in the logarithmic form of decibels relative to one milliwatt (dBm) or one microvolt/meter (dBuV/m,). The field strength of the emissions from the EUT is measured on a test site with a receiver.

Below is a formula example used to calculate the attenuation requirement, relative to the transmitters power output, in dBuV/m. For this example an operating power range of 3 watts is used. The radiated emissions limit for spurious signals outside of the assigned frequency block is $43+10\text{Log}_{10}$ (mean output power in watts) dB below the measured amplitude at the operating power.

CALCULATIONS – EFFECTIVE RADIATED POWER

$$E(V/m) = \frac{\sqrt{30 * P * G}}{d}$$

E= Field Strength in V/m
P= Power in Watts (for this example we use 3 watts)
G= Gain of antenna in numeric gain (Assume 1.64 for ERP)
d= distance in meters

$$E(V/m) = \frac{\sqrt{30 * 3 \text{ watts} * 1.64 \text{ dB}}}{3 \text{ meters}}$$

20 * log (4.049 V/m * 1,000,000) = 132.14 dBuV/m @ 3 meters

FCC Rules request an attenuation of 43 + 10 log (3) or 47.8 dB for all emissions outside the assigned block, the limit for spurious and harmonic emissions is:

132.1 dBuV/m – 47.8 dB = 84.3 dBuV/m @ 3 meter.

Note: Substitution Method is performed for spurious emission not being 20-dB below the calculated field strength.

EXHIBIT 1: Test Equipment Calibration Data

Antenna Conducted Emissions, 02-Jul-03
Engineer: jmartinez

Manufacturer	Description	Model #	Assett #	Cal interval	Last Calibrated	Cal Due
Hewlett Packard	Microwave EMI test system (SA40, 9kHz - 40GHz)	84125C	1149	12	3/12/2003	3/12/2004

Power Output Measurement, 02-Jul-03
Engineer: jmartinez

Manufacturer	Description	Model #	Assett #	Cal interval	Last Calibrated	Cal Due
Rohde & Schwarz	Power Meter, Single Channel	NRVS	1290	12	4/8/2003	4/8/2004
Rohde & Schwarz	Power Sensor 100uW - 10 Watts	NRV-Z53	1236	12	8/15/2002	8/15/2003
Rohde & Schwarz	Peak Power Sensor 100uW - 2 Watts	NRV-Z32	1536	12	3/20/2003	3/20/2004

Radiated Emissions, 1000 - 20,000 MHz, 07-Jul-03
Engineer: jmartinez

Manufacturer	Description	Model #	Assett #	Cal interval	Last Calibrated	Cal Due
EMCO	Log Periodic Antenna, 0.2-2 GHz	3148	1404	12	11/11/2002	11/11/2003
Hewlett Packard	Spectrum Analyzer 9kHz - 40 GHz	8564E (84125C)	1393	12	3/12/2003	3/12/2004
Miteq	Preamplifier, 1-18GHz	AFS44	1540	12	6/16/2003	6/16/2004

Radiated Emissions, 1 - 20,000 GHz, 07-Jul-03
Engineer: jmartinez

Manufacturer	Description	Model #	Assett #	Cal interval	Last Calibrated	Cal Due
EMCO	Horn Antenna, D. Ridge 1-18GHz	3115	487	12	4/24/2003	4/24/2004
Elliott Laboratories	Log Periodic Antenna 300-1000 MHz	EL300.1000	297	12	1/21/2003	1/21/2004
Hewlett Packard	Signal Generator (sweep) 0.01 - 26.5 GHz	8340A	1244	N/A		

EXHIBIT 2: Test Measurement Data

The following data includes conducted and radiated emission measurements of the Handspring, Model No: Treo 600 (CDMA Version).

T51640_24E	25 Pages

Elliott

EMC Test Data

Client:	Handspring	Job Number:	J49635
Model:	Robin	T-Log Number:	T51640
		Account Manager:	Christine Vu
Contact:	David Waitt		
Emissions Spec:	FCC 22H & 24E	Class:	Radio
Immunity Spec:		Environment:	

EMC Test Data

For The

Handspring

Model

Robin

Date of Last Test: 6/27/2003

Client:	Handspring	Job Number:	J49635
Model:	Robin	T-Log Number:	T51640
		Account Manager:	Christine Vu
Contact:	David Waitt		
Emissions Spec:	FCC 22H & 24E	Class:	Radio
Immunity Spec:	Enter immunity spec on cover	Environment:	

EUT INFORMATION

General Description

The EUT is a personal digital assistant with a built-in cellular phone.. Normally, the EUT would be placed on a table top during operation. The EUT was, therefore, treated as table-top equipment during testing to simulate the end-user environment. The electrical rating of the EUT is 120/240 V, 50/60 Hz, 1 Amps.

Equipment Under Test

Manufacturer	Model	Description	Serial Number	FCC ID
Handspring	Trio 600	Robin	N/A	TBD
Motorola	MU12-1052100-A1	Power Supply	N/A	N/A

EUT Enclosure

The EUT enclosure is primarily constructed of plastic. It measures approximately 6.5 cm wide by 1.5 cm deep by 13 cm high.

Modification History

Mod. #	Test	Date	Modification
1			

Modifications applied are assumed to be used on subsequent tests unless otherwise stated as a further modification.

Client:	Handspring	Job Number:	J49635
Model:	Robin	T-Log Number:	T51640
		Account Manager:	Christine Vu
Contact:	David Waitt		
Emissions Spec:	FCC 22H & 24E	Class:	Radio
Immunity Spec:	Enter immunity spec on cover	Environment:	

Test Configuration #1

Local Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
IBM	2635	Laptop	78-Gy734	AMO9611TBOON
IBM	02K6663	Power Supply	N/A	N/A

Remote Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
None				

Interface Cabling and Ports

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
Docking Port(EUT)	Serial (Computer) and AC Mains	Multiconductor (Y-cabe)	Shielded	1.9

Note: The paralled port was not connected as would not normally be connected for the radio to function properly.

EUT Operation During Emissions Radio

EUT was set to operated on the low, middle, and high channel at full power.

Client:	Handspring	Job Number:	J49635
Model:	Robin	T-Log Number:	T51640
		Account Manager:	Christine Vu
Contact:	David Waitt		
Spec:	FCC 22H & 24E	Class:	Radio

Radiated Emissions

Test Specifics

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 6/24/2003
Test Engineer: jmartinez
Test Location: FTChamber #4
Config. Used: 1
Config Change: None
EUT Voltage: 120V/60Hz

General Test Configuration

The EUT was located on the turntable for radiated field strength measurements and the local support equipment was located underneath the table.
For radiated measurements were taken with receive antenna located 3 meters from the EUT.

Ambient Conditions:

Temperature: 15 °C
Rel. Humidity: 55 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	RE, Fudnamental Power Output	FCC 24E	Pass	24 dBm (EIRP)
1	Conducted Output Power	FCC 24E	Pass	23.92 dBm
2	RE, Fudnamental Power Output	FCC 22H	Pass	21.8 dBm (ERP)
2	Conducted Output Power	FCC 22H	Pass	24 dBm
3	Standby Power Output	RSS-129 (9.3 & 9.4)	Pass	-67.8 dBm
3	Control Power Output	RSS-129 (9.3 & 9.4)	Pass	-57.8 dBm

Modifications Made During Testing:

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

Elliott

EMC Test Data

Client:	Handspring	Job Number:	J49635
Model:	Robin	T-Log Number:	T51640
		Account Manager:	Christine Vu
Contact:	David Waitt		
Spec:	FCC 22H & 24E	Class:	Radio

Run #1: Fundamental 1900 MHHz
Fundamental Field strenght level

Frequency	Level	Pol	FCC 24E		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
Low Channel								
1851.229	118.5	V	-	-	Avg	0	1.0	Vertical produced highest field level
Middle Channel								
1867.223	117.5	V	-	-	Avg	0	1.0	Vertical produced highest field level
High Channel								
1907.957	121.1	V	-	-	Avg	360	1.0	Vertical produced highest field level

Output Power (Substitution Method)

Frequency	EUT Measured Level	Max field produced by Sig. Gen & horn	Pol	Delta	Sig Gen. Actual Pin	Corrected Pin	Comment
MHz	dBµV/m	dBµV/m	v/h	(dB)	(dBm)	(dBm)	
1851.229	118.5	117.0	V	1.5	15.0	16.5	Note 1
1867.223	117.5	116.1	V	1.4	15.0	16.4	Note 1
1907.957	121.1	117.0	V	4.1	12.0	16.1	Note 1

Output Power Substitution [Note 2]					
Frequency	Pin	Gain	EIRP	ERP	Comment
MHz	dBm	dBi	dBm	dBm	
1851.229	16.5	7.5	24.0	21.8	Note 2
1867.223	16.4	7.5	23.9	21.7	Note 2
1907.957	16.1	7.8	23.9	21.7	Note 2

Note 1:	Delta (dB) = EUT measured level - Maximum field level produced by signal generator & substitution antenna. The resulting Delta (dB) was then added to the actual signal generators Pin going into the substitution antenna, which will yield the values located under the column label "Corrected Pin".
Note 2:	Pin is the power input (dBm) to the substitution antenna to obtain the field strength recorded from the EUT (refer to note 1). G is the gain (dBi) for the substitution antenna.ERP is the effective radiated power (Pin + GdBi - 2.2) from the substitution antenna. EIRP is calculated as follows (Pin+GdBi)

Antenna Conducted Output Power (Power Meter)

Frequency	Power Output
MHz	(dBm)
1867.000	23.92

Client:	Handspring	Job Number:	J49635
Model:	Robin	T-Log Number:	T51640
		Account Manager:	Christine Vu
Contact:	David Waitt		
Spec:	FCC 22H & 24E	Class:	Radio

Run #2: Fundamental 850 MHz
Fundamental Field strenght level

Frequency	Level	Pol	FCC 22H		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
Low Channel								
825.283	121.2	V	-	-	Avg	55	1.0	Vertical produced highest field level
Middle Channel								
835.392	120.2	V	-	-	Avg	46	1.0	Vertical produced highest field level
High Channel								
835.392	122.1	V	-	-	Avg	57	1.0	Vertical produced highest field level

Output Power (Substitution Method)

Frequency	EUT Measured Level	Max field produced by Sig. Gen & horn	Pol	Delta	Sig Gen. Actual Pin	Corrected Pin	Comment
MHz	dBµV/m	dBµV/m	v/h	(dB)	(dBm)	(dBm)	
825.283	121.2	119.8	V	1.5	15.0	16.5	Note 1
835.392	120.2	117.8	V	2.4	14.0	16.4	Note 1
845.525	122.1	118.0	V	4.1	12.0	16.1	Note 1

Output Power Substitution [Note 2]					
Frequency	Pin	Gain	EIRP	ERP	Comment
MHz	dBm	dBi	dBm	dBm	
825.283	16.5	7.5	24.0	21.8	Note 2
835.392	16.4	7.5	23.9	21.7	Note 2
845.525	16.1	7.8	23.9	21.7	Note 2

Note 1:	Delta (dB) = EUT measured level - Maximum field level produced by signal generator & substitution antenna. The resulting Delta (dB) was then added to the actual signal generators Pin going into the substitution antenna, which will yield the values located under the column label "Corrected Pin".
Note 2:	Pin is the power input (dBm) to the substitution antenna to obtain the field strength recorded from the EUT (refer to note 1). G is the gain (dBi) for the substitution antenna.ERP is the effective radiated power (Pin + GdBi - 2.2) from the substitution antenna. EIRP is calculated as follows (Pin+GdBi)

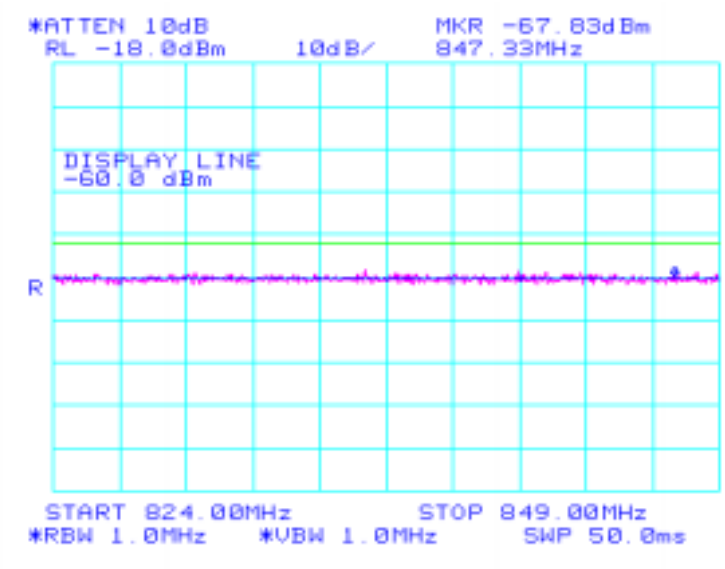
Antenna Conducted Output Power (Power Meter)

Frequency	Power Output
MHz	(dBm)
835.000	24.00

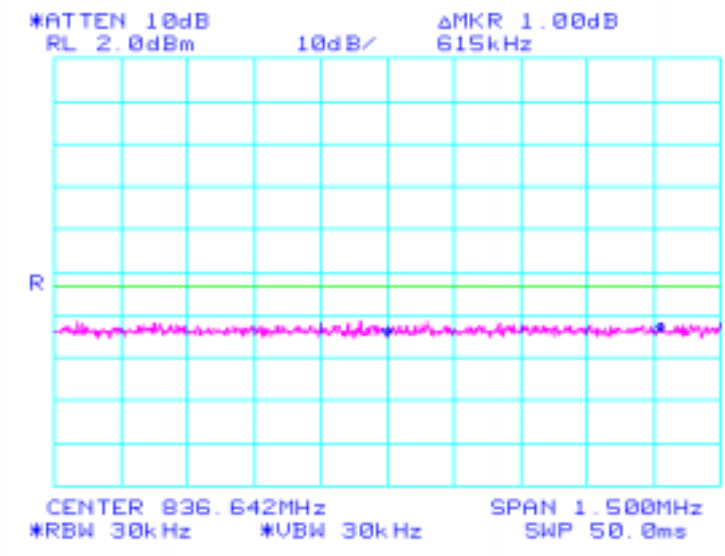
Client:	Handspring	Job Number:	J49635
Model:	Robin	T-Log Number:	T51640
		Account Manager:	Christine Vu
Contact:	David Waitt		
Spec:	FCC 22H & 24E	Class:	Radio

Run #3: Minimum Standby and Control Output Power

RSS-129 (9.3)

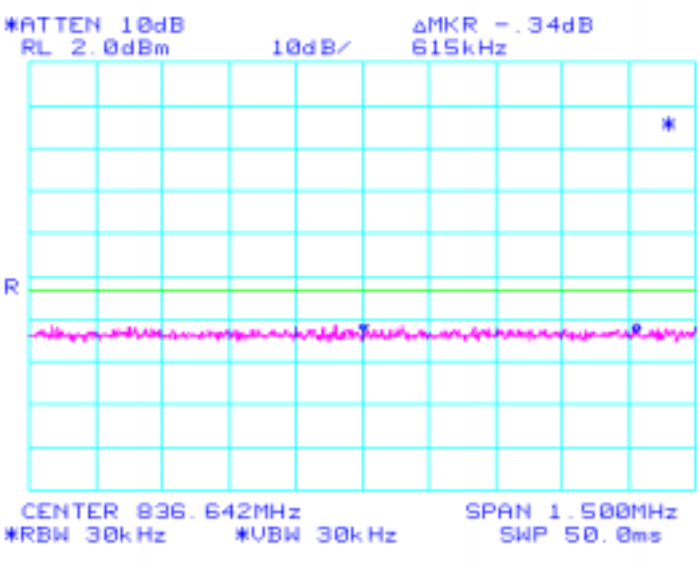


RSS-129 (9.4) Minimum Power Open Loop



Client:	Handspring	Job Number:	J49635
Model:	Robin	T-Log Number:	T51640
		Account Manager:	Christine Vu
Contact:	David Waitt		
Spec:	FCC 22H & 24E	Class:	Radio

RSS-129 (9.4) Minimum Power Close Loop



Client:	Handspring	Job Number:	J49635
Model:	Robin	T-Log Number:	T51640
		Account Manager:	Christine Vu
Contact:	David Waitt		
Spec:	FCC 22H & 24E	Class:	Radio

Radiated Emissions

Test Specifics

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 6/27/2003
Test Engineer: jmartinez
Test Location: SVOATS #4

Config. Used: 1
Config Change: None
EUT Voltage: 120V/60Hz

General Test Configuration

When measuring the conducted emissions from the EUT's antenna port, the antenna port of the EUT was connected to the spectrum analyzer or power meter via a suitable attenuator to prevent overloading the measurement system. All measurements are corrected to allow for the external attenuators used.

Ambient Conditions:

Temperature: 16 °C
Rel. Humidity: 45 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	Bandedges	24.238(a)	Pass	-19dBm @ 1865 MHz
2	Out of Band	24.238(a)	Pass	All emission < -13 dBm
2	99% Bandwidth	24.238(a)	Pass	1300 MHz

Modifications Made During Testing:

No modifications were made to the EUT during testing

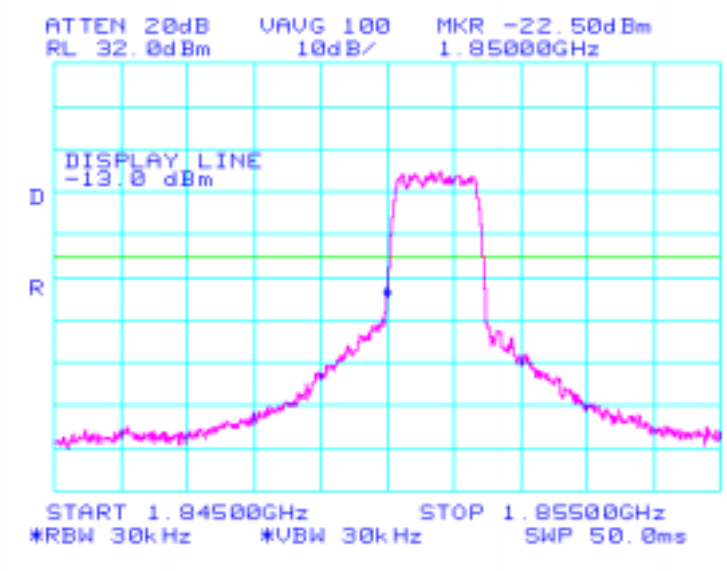
Deviations From The Standard

No deviations were made from the requirements of the standard.

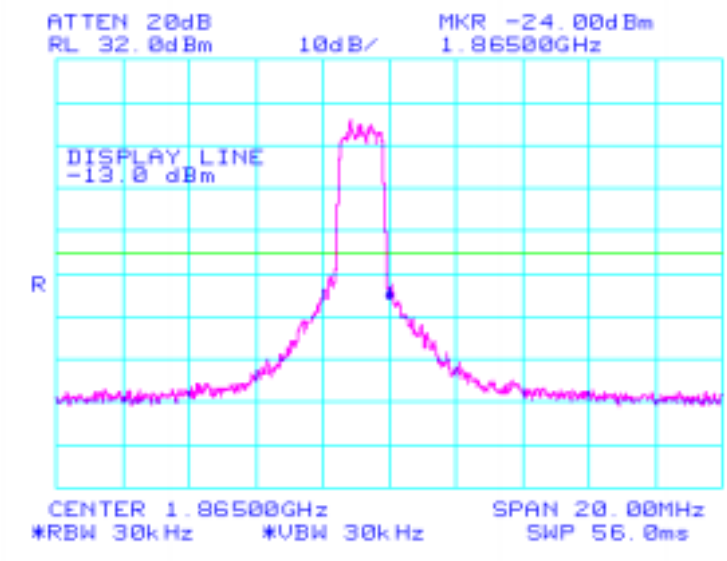
Client:	Handspring	Job Number:	J49635
Model:	Robin	T-Log Number:	T51640
		Account Manager:	Christine Vu
Contact:	David Waitt		
Spec:	FCC 22H & 24E	Class:	Radio

Run# 1: Bandedge

Low channel Block A 13

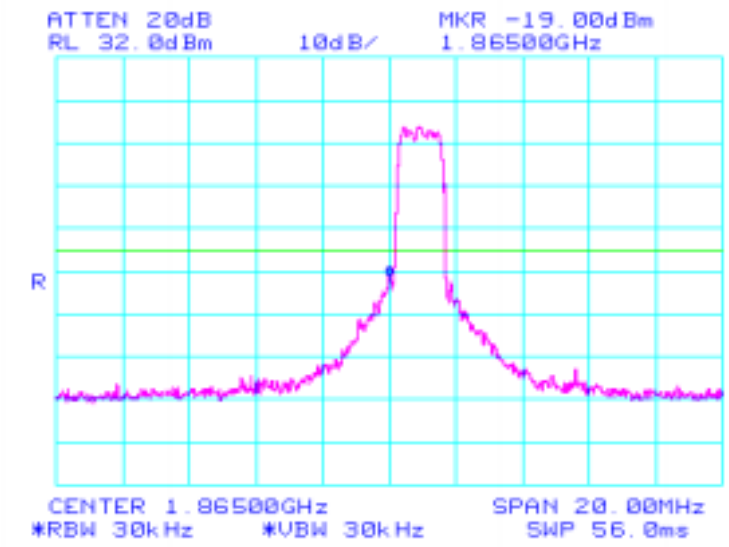


Block A High channel 280

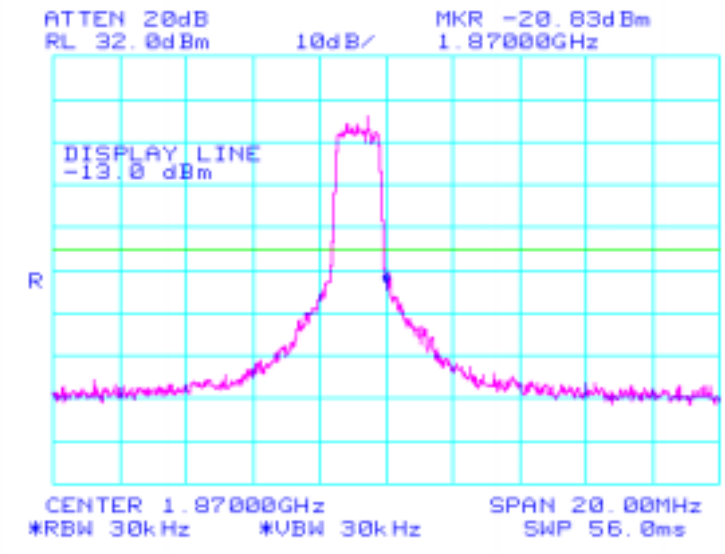


Client:	Handspring	Job Number:	J49635
Model:	Robin	T-Log Number:	T51640
		Account Manager:	Christine Vu
Contact:	David Waitt		
Spec:	FCC 22H & 24E	Class:	Radio

Block D Low channel 315

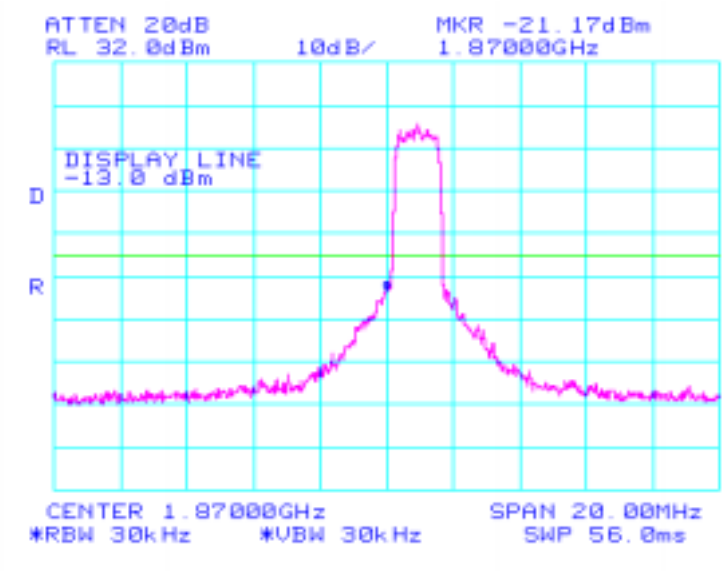


Block D High channel 380

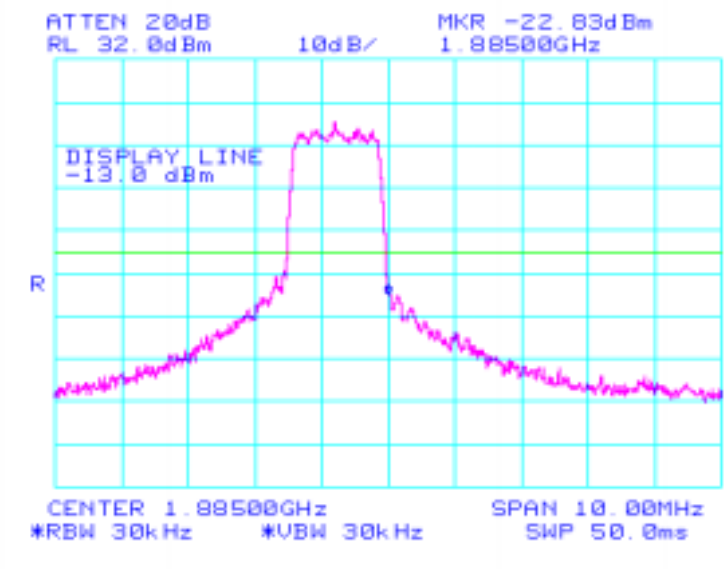


Client:	Handspring	Job Number:	J49635
Model:	Robin	T-Log Number:	T51640
		Account Manager:	Christine Vu
Contact:	David Waitt		
Spec:	FCC 22H & 24E	Class:	Radio

Block B Low channel 415

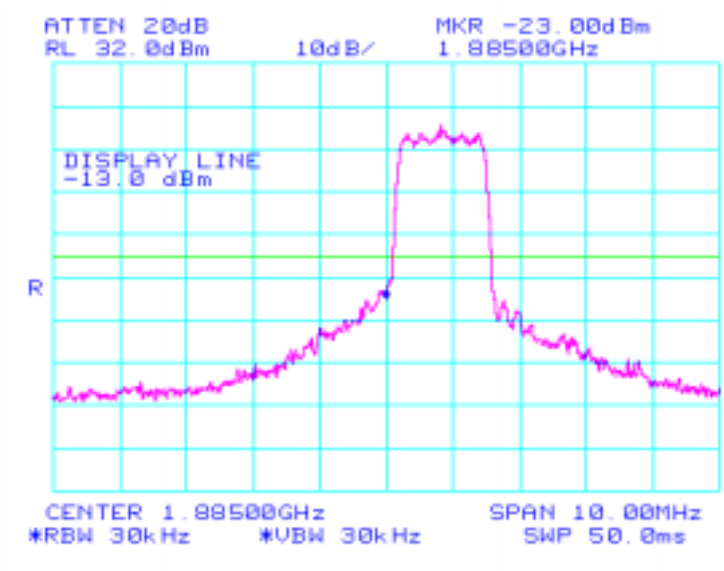


Block B High channel 683

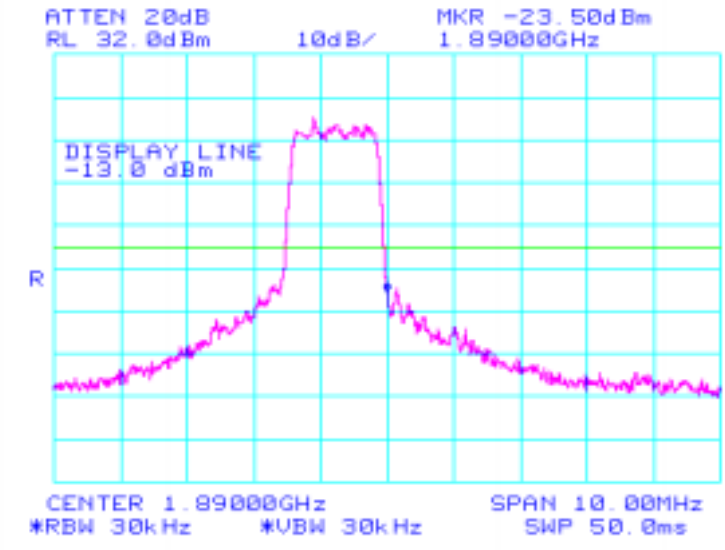


Client:	Handspring	Job Number:	J49635
Model:	Robin	T-Log Number:	T51640
		Account Manager:	Christine Vu
Contact:	David Waitt		
Spec:	FCC 22H & 24E	Class:	Radio

Block E Low channel 715

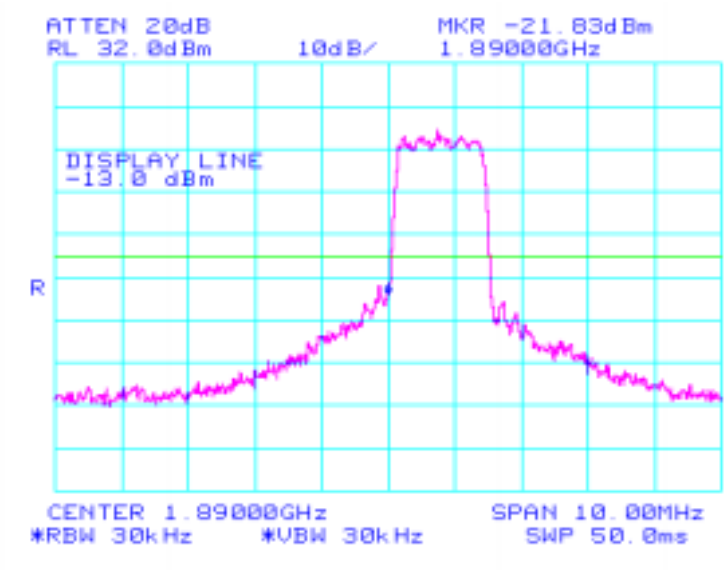


Block E High channel 783

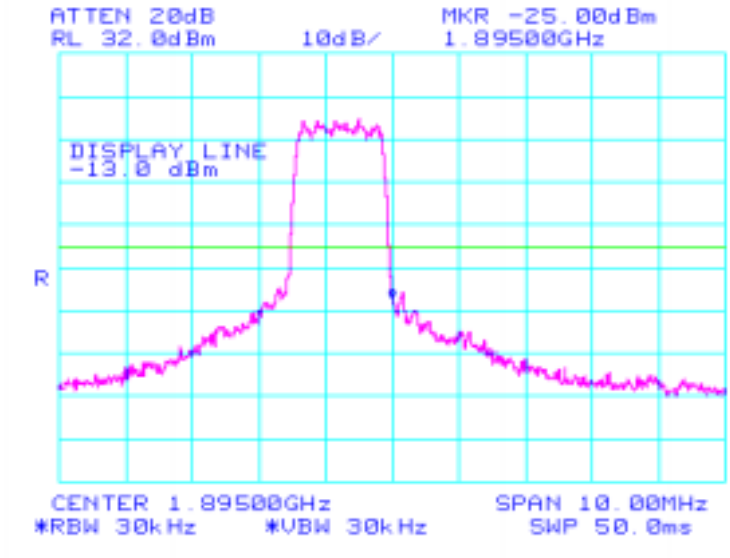


Client:	Handspring	Job Number:	J49635
Model:	Robin	T-Log Number:	T51640
		Account Manager:	Christine Vu
Contact:	David Waitt		
Spec:	FCC 22H & 24E	Class:	Radio

Block FLow channel 814

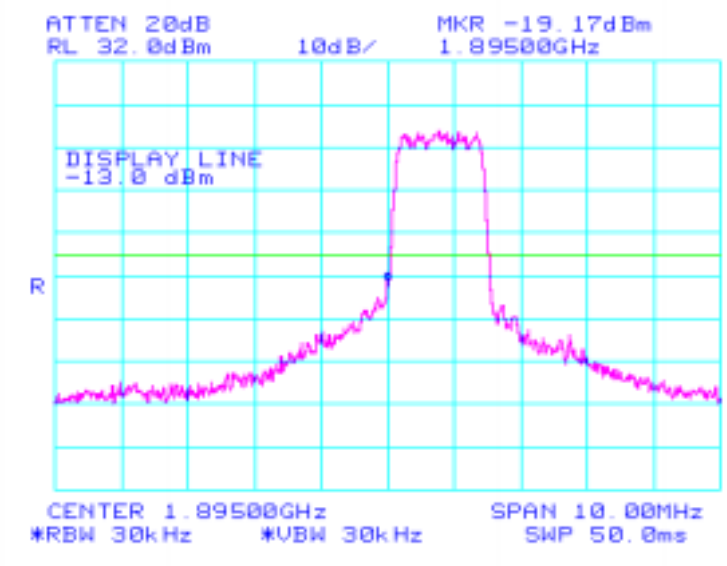


Block FHigh channel 883

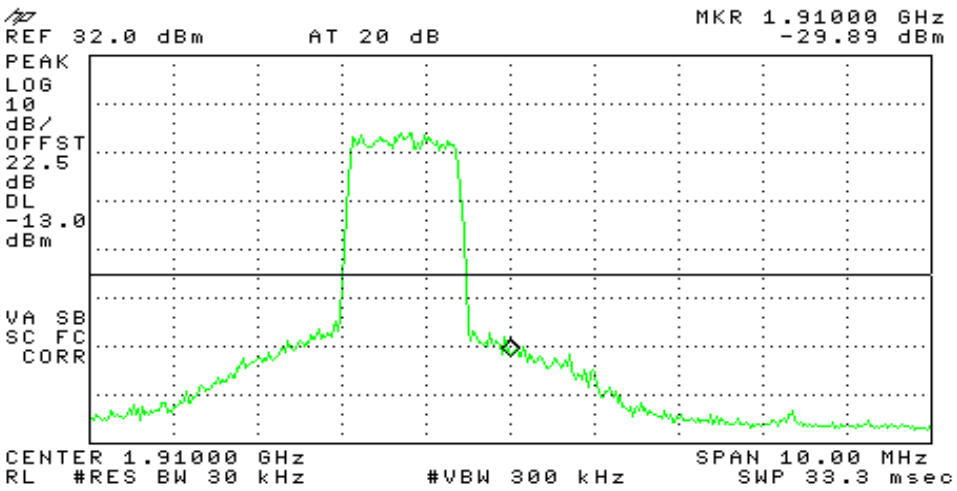


Client:	Handspring	Job Number:	J49635
Model:	Robin	T-Log Number:	T51640
		Account Manager:	Christine Vu
Contact:	David Waitt		
Spec:	FCC 22H & 24E	Class:	Radio

Block C Low channel 914



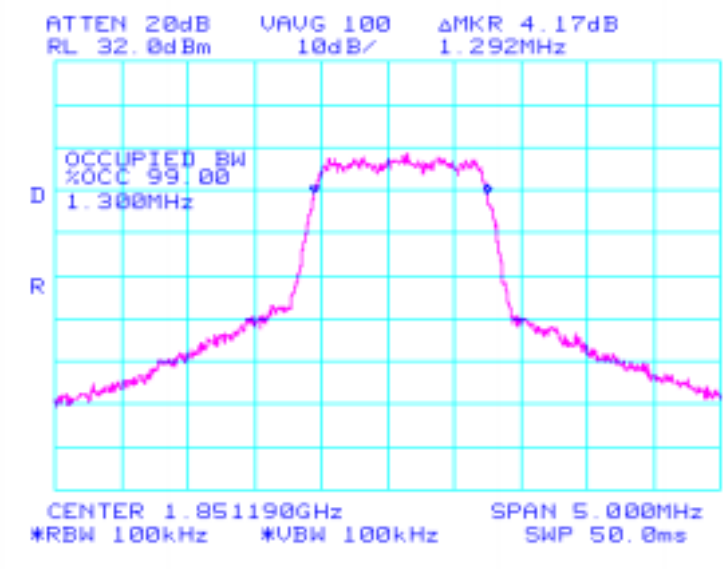
High channel Block C 1175



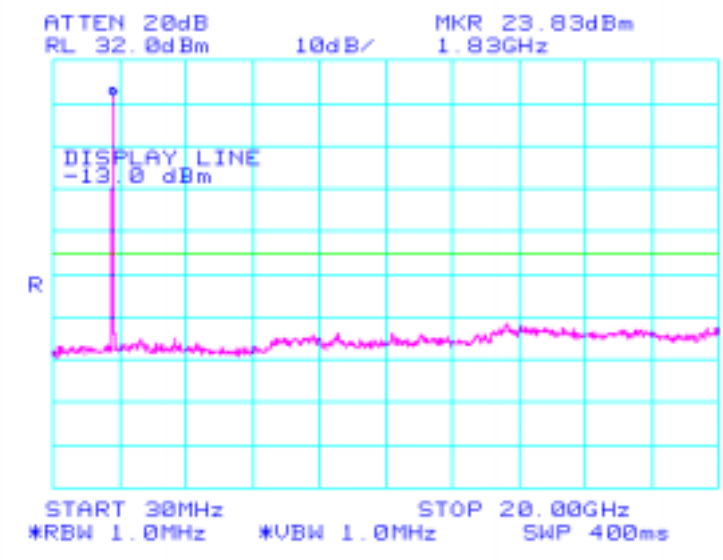
Client:	Handspring	Job Number:	J49635
Model:	Robin	T-Log Number:	T51640
		Account Manager:	Christine Vu
Contact:	David Waitt		
Spec:	FCC 22H & 24E	Class:	Radio

Run# 2: Out of Band Emission and 99% BW.

Low channel Block A 99% BW

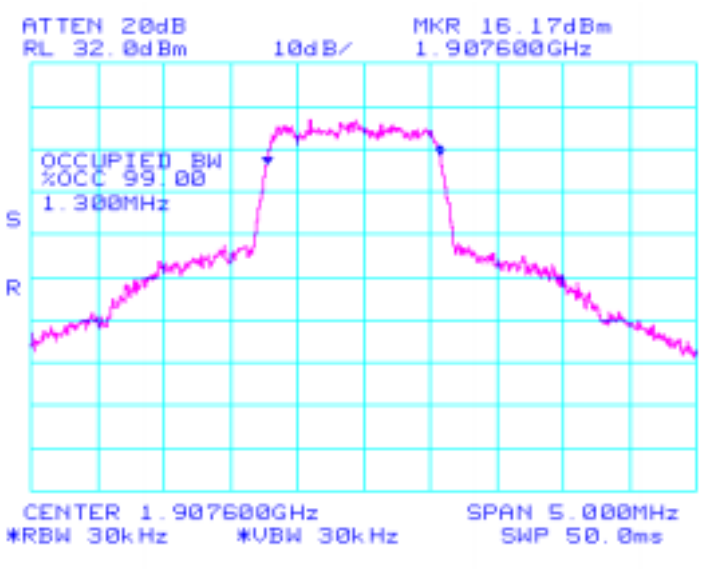


Low Channel Block A Out of Band

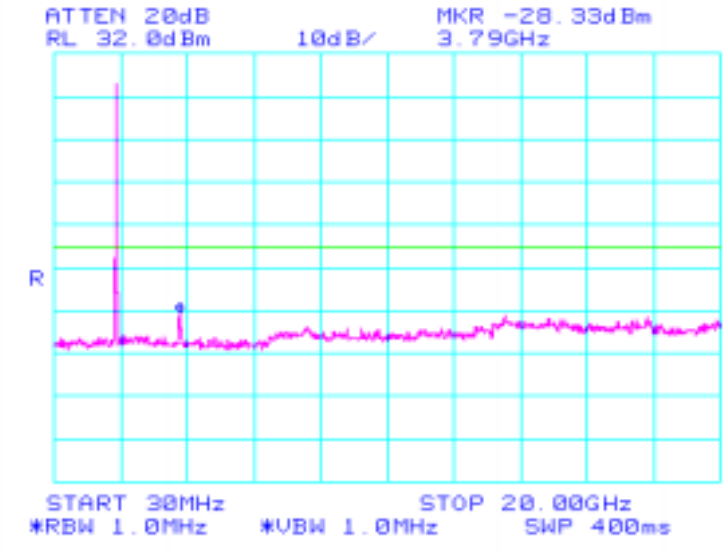


Client:	Handspring	Job Number:	J49635
Model:	Robin	T-Log Number:	T51640
		Account Manager:	Christine Vu
Contact:	David Waitt		
Spec:	FCC 22H & 24E	Class:	Radio

High Channel Block C 99% BW



High Channel Block C Out of Band



Client:	Handspring	Job Number:	J49635
Model:	Robin	T-Log Number:	T51640
		Account Manager:	Christine Vu
Contact:	David Waitt		
Spec:	FCC 22H & 24E	Class:	Radio

Radiated Emissions

Test Specifics

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 6/24/2003
Test Engineer: jmartinez
Test Location: FTChamber #4
Config. Used: 1
Config Change: None
EUT Voltage: 120V/60Hz

General Test Configuration

The EUT and all local support equipment were located on the turntable for radiated emissions testing.

On the OATS, the measurement antenna was located 3m from the EUT for the frequency range 1 - 10 GHz.

Ambient Conditions:

Temperature: 15 °C
Rel. Humidity: 55 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1-3	RE, 1000 - 19000 MHz Maximized Emissions	24.238(a)	Pass	-10.5 dB @ 9404.16 MHz

Modifications Made During Testing:

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

EMC Test Data

Client:	Handspring	Job Number:	J49635
Model:	Robin	T-Log Number:	T51640
		Account Manager:	Christine Vu
Contact:	David Waitt		
Spec:	FCC 22H & 24E	Class:	Radio

Run #1: Preliminary Radiated Emissions, Low Channel

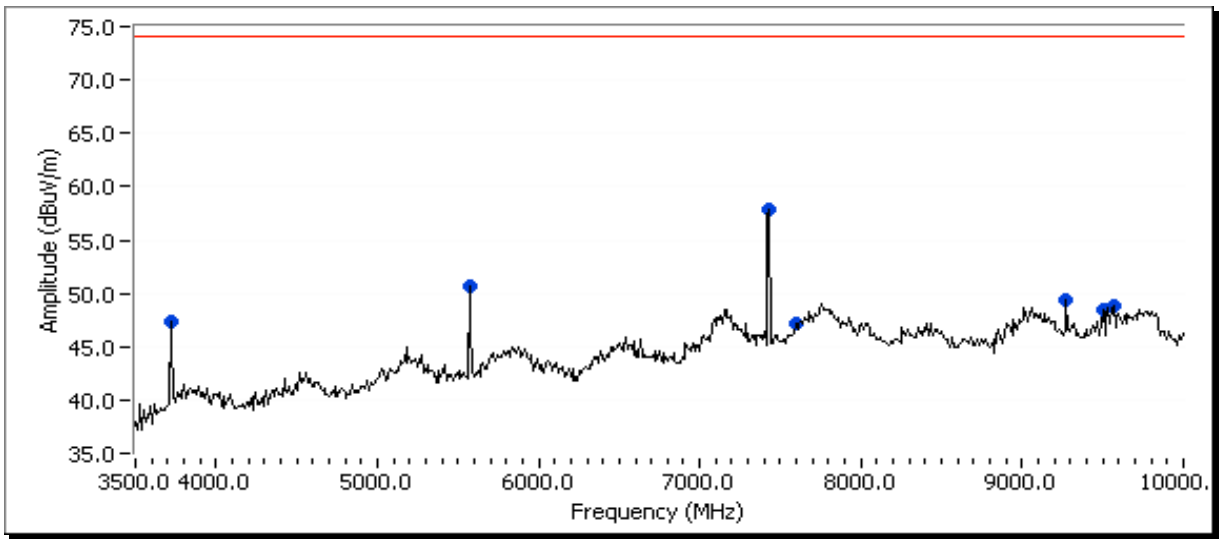
Frequency	Level	Pol	FCC 24E		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
3716.667	47.4	H	74.0	-26.6	Peak	156	1.6	
5569.167	50.8	V	74.0	-23.3	Peak	225	1.0	
7432.500	57.8	H	74.0	-16.2	Peak	138	1.6	

Note 1:	Add note here
Note 2:	

Harmonics Emissions (Substitution Method)

			Substitution Note 1						
Frequency	Level	Pol	Pin	Gain	EIRP	ERP	Limit	Margin	Comment
MHz	dBµV/m	v/h	dBm	dBi	dBm	dBm	(dBm)	(dB)	
3716.667	47.4	H	-53.2	9.8	-43.4	-45.6	-13.0	-30.4	Note 1
5569.167	50.8	V	-50.4	10.1	-40.3	-42.5	-13.0	-27.3	Note 1
7432.500	57.8	H	-41.1	11.0	-30.1	-32.3	-13.0	-17.1	Note 1

Note 1:	Pin is the power input (dBm) to the substitution antenna to obtain the field strength recorded from the EUT. G is the gain (dBi) for the substitution antenna.ERP is the effective radiated power (Pin + GdBi - 2.2) from the substitution antenna. EIRP is calculated as follows (Pin+GdBi)



EMC Test Data

Client:	Handspring	Job Number:	J49635
Model:	Robin	T-Log Number:	T51640
		Account Manager:	Christine Vu
Contact:	David Waitt		
Spec:	FCC 22H & 24E	Class:	Radio

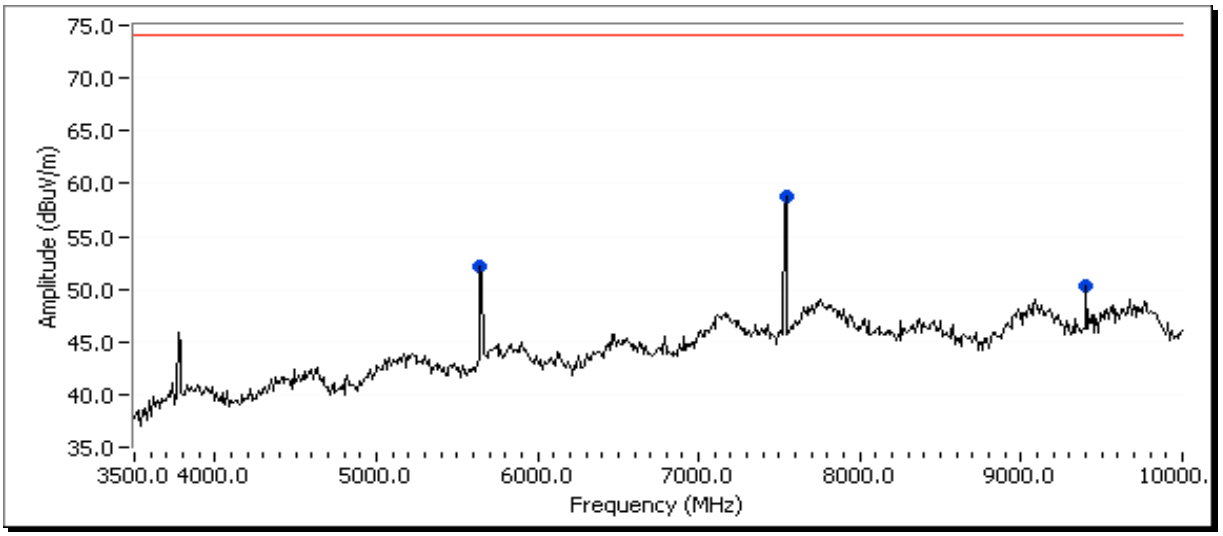
Run #2: Preliminary Radiated Emissions, Middle Channel

Frequency	Level	Pol	FCC 24E		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5645.000	52.1	V	74.0	-21.9	Peak	112	1.0	
7540.834	58.8	H	74.0	-15.2	Peak	130	1.6	
9404.167	50.3	H	74.0	-23.7	Peak	151	1.3	

Harmonics Emissions (Substitution Method)

			Substitution Note 1						
Frequency	Level	Pol	Pin	Gain	EIRP	ERP	Limit	Margin	Comment
MHz	dBµV/m	v/h	dBm	dBi	dBm	dBm	(dBm)	(dB)	
5645.000	47.4	V	-48.2	9.8	-38.4	-40.6	-13.0	-25.4	Note 1
7540.834	50.8	H	-42.5	10.1	-32.4	-34.6	-13.0	-19.4	Note 1
9404.167	57.8	H	-34.5	11.0	-23.5	-25.7	-13.0	-10.5	Note 1

Note 1:	Pin is the power input (dBm) to the substitution antenna to obtain the field strength recorded from the EUT. G is the gain (dBi) for the substitution antenna.ERP is the effective radiated power (Pin + GdBi - 2.2) from the substitution antenna. EIRP is calculated as follows (Pin+GdBi)



EMC Test Data

Client:	Handspring	Job Number:	J49635
Model:	Robin	T-Log Number:	T51640
		Account Manager:	Christine Vu
Contact:	David Waitt		
Spec:	FCC 22H & 24E	Class:	Radio

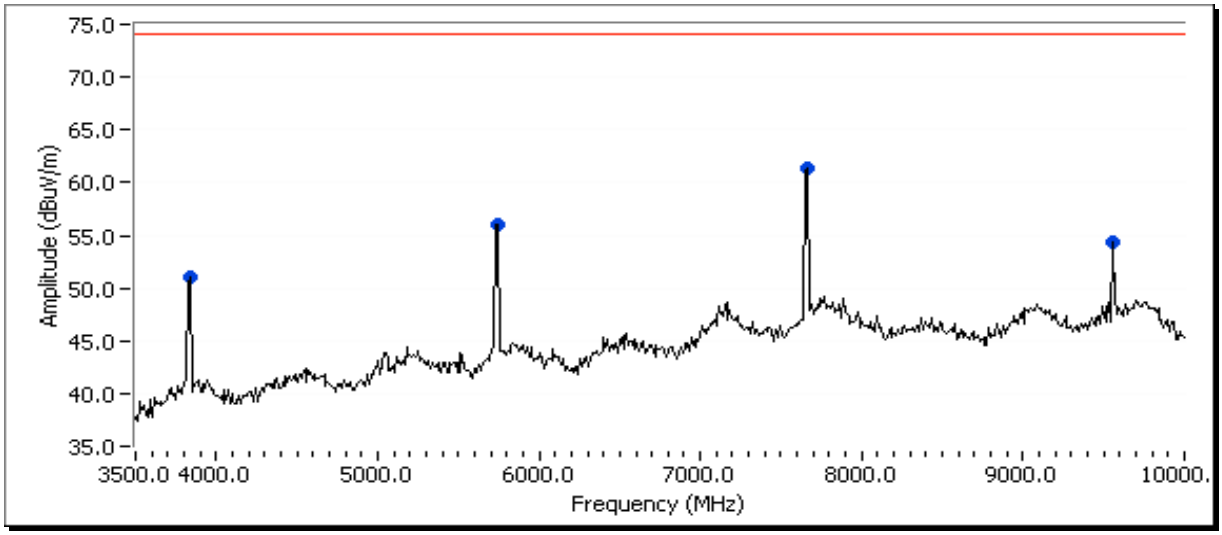
Run #3: Preliminary Radiated Emissions, High Channel

Frequency	Level	Pol	FCC 24E		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
3835.833	51.1	V	74.0	-22.9	Peak	195	1.0	
5742.500	56.1	V	74.0	-17.9	Peak	121	1.0	
7660.000	61.3	H	74.0	-12.7	Peak	129	1.6	
9555.833	54.4	H	74.0	-19.6	Peak	142	1.3	

Harmonics Emissions (Substitution Method)

			Substitution Note 1						
Frequency	Level	Pol	Pin	Gain	EIRP	ERP	Limit	Margin	Comment
MHz	dBµV/m	v/h	dBm	dBi	dBm	dBm	(dBm)	(dB)	
3835.833	51.1	H	-47.2	9.8	-37.4	-39.6	-13.0	-24.4	Note 1
5742.500	56.1	V	-44.5	9.8	-34.7	-36.9	-13.0	-21.7	Note 1
7660.000	61.3	H	-37.5	10.1	-27.4	-29.6	-13.0	-14.4	Note 1
9555.833	54.4	H	-36.5	11.0	-25.5	-27.7	-13.0	-12.5	Note 1

Note 1:	Pin is the power input (dBm) to the substitution antenna to obtain the field strength recorded from the EUT. G is the gain (dBi) for the substitution antenna.ERP is the effective radiated power (Pin + GdBi - 2.2) from the substitution antenna. EIRP is calculated as follows (Pin+GdBi)



Client:	Handspring	Job Number:	J49635
Model:	Robin	T-Log Number:	T51640
		Account Manager:	Christine Vu
Contact:	David Waitt		
Spec:	FCC 22H & 24E	Class:	Radio

Frequency Stability

Test Specifics

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 6/25/2003
Test Engineer: Juan Martinez
Test Location: Environmental Chamber
Config. Used: 1
Config Change: None
EUT Voltage: 120V/60Hz

General Test Configuration

EUT was place inside the Temperature Chamber and all local support equipment were located outside on a table for testing. The Eut was connected directly to Spectrum Analyzer. An attenuator was used between the EUT and Spectrum Analzyer.
Chamber was set to -30 to 50 degrees Celsius (60 degrees Celsius for Canada). Incremented 10 degress per temperature and let unit stabilized for every temperature.
Voltage stability was done at 20 degress Celsius. For battery operated units decrease DC voltage until battery end-point was found.
Voltage stability was done at 20 degress Celsius. For AC operated units varied voltage at 85% and 115% of the nomial AC voltage.

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	Temperature Vs. Frequency	24.235 & RSS-133 (7)	Pass	-102 Hz
2-3	Voltage Vs. Frequency	24.235 & RSS-133 (7)	Pass	23 Hz

Modifications Made During Testing:

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

Client:	Handspring	Job Number:	J49635
Model:	Robin	T-Log Number:	T51640
		Account Manager:	Christine Vu
Contact:	David Waitt		
Spec:	FCC 22H & 24E	Class:	Radio

Run# 1: Temperature Vs. Frequency

Drift	Freq.	Limit
(ppm)	(MHz)	(Hz)
2.5	1851.25	4628.1

Temperature	Drift	Limit
(Celsius)	(Hz)	(Hz)
-30	2.0	4628.1
-20	8.0	4628.1
-10	8.0	4628.1
0	4.0	4628.1
10	46.0	4628.1
20	45.0	4628.1
30	-34.0	4628.1
40	-85.0	4628.1
50	-102.0	4628.1

Run# 2: Voltage Vs. Frequency

Battery end point is ??**Vdc**. This will be stated by the manufacturer. No frequency drift occurred, only power decreased as voltage decreased.

Run# 3: Voltage Vs. Frequency

Nominal Voltage is 120Vac.

Voltage	Voltage	Drift	Limit
(Dc)	(AC)	(Hz)	(Hz)
85%	102.00	23.0	4628.1
115%	138.00	11.0	4628.1

Client:	Handspring	Job Number:	J49635
Model:	Robin	T-Log Number:	T51640
		Proj Eng:	Christine Vu
Contact:	David Waitt		
Spec:	FCC 22H & 24E	Class:	Radio

1900 MHz Receiver Emissions

Test Specifics

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 6/27/2003
Test Engineer: jmartinez
Test Location: SVOATS #4
Config. Used: 1
Config Change: None
EUT Voltage: 120V/60Hz

General Test Configuration

The Eut was connected directly to Spectrum Analyzer. A 20-dB attenuator was used between the EUT and Spectrum Analyzer. A external output connector was available to performed antenna receive conducted emissions. The device was set to received at midpoint of the operating range.

Ambient Conditions:

Temperature: 16 °C
Rel. Humidity: 45 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	RE, 30 - 25,000 MHz, Antenna Conducted Emissions	RSS-133 (9)	Pass	794.3 pW @ 13,4800 MHz

Modifications Made During Testing:

No modifications were made to the EUT during testing

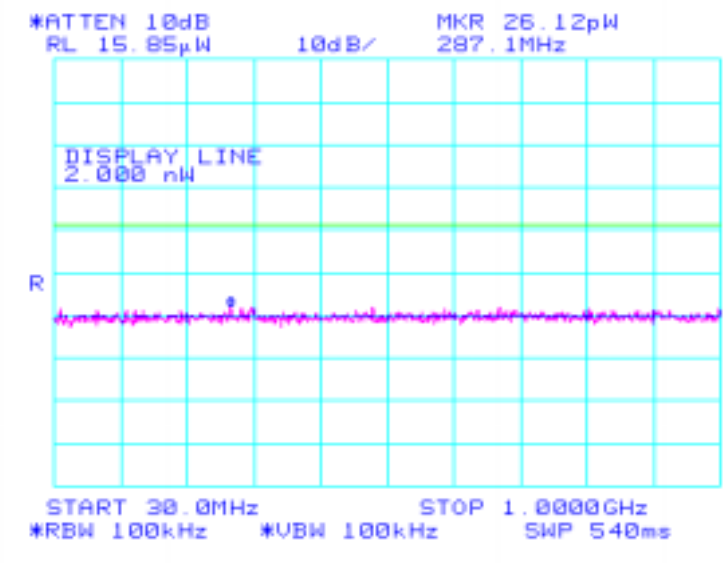
Deviations From The Standard

No deviations were made from the requirements of the standard.

Client:	Handspring	Job Number:	J49635
Model:	Robin	T-Log Number:	T51640
		Proj Eng:	Christine Vu
Contact:	David Waitt		
Spec:	FCC 22H & 24E	Class:	Radio

Run #1: Antenna Conducted Emissions, 30-25,000 MHz

RSS-133 (9)(ii) Rx



RSS-133 (9)(ii) Rx

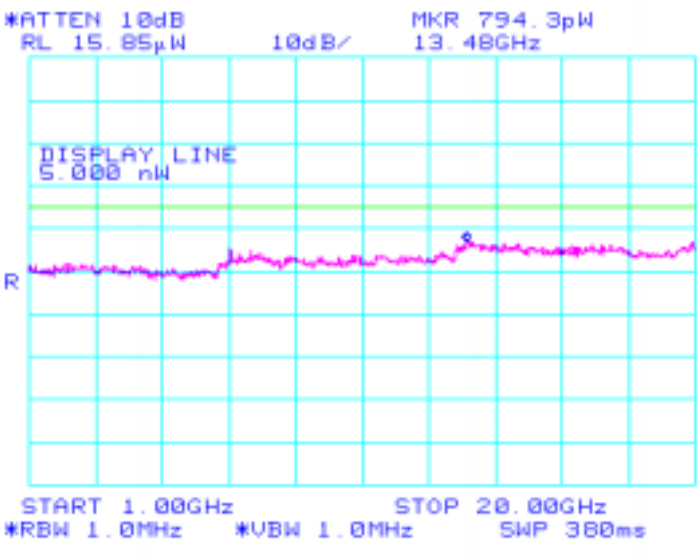


EXHIBIT 3: Test Configuration Photos

EXHIBIT 4: FCC ID Label and Label Location

EXHIBIT 5: Detailed Photographs

EXHIBIT 6: Schematics

EXHIBIT 7: Theory of Operation

EXHIBIT 8: User Manual