
Project Number: 09121-10

Prepared for:

Wonderware Mobile Solutions
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Houston, TX 77042

By
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March 2009

CERTIFICATION
Electromagnetic Interference Test Report
Wonderware Mobile Solutions
SRM-1

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THIS REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL, WITHOUT THE WRITTEN APPROVAL OF PROFESSIONAL TESTING (EMI), INC.



Certificate Of Compliance

Applicant: Wonderware Mobile Solutions

Applicant's Address: 10111 Richmond Ave., Suite 650
Houston, TX 77042

FCC ID: OFZSRM1

IC: 6984A -SRM1

Project Number: March 10, 2009

I, Jason Anderson, Director of Testing Services for Professional Testing (EMI), Inc., being familiar with the FCC and IC rules and test procedures have reviewed the test setup, measured data and this report. I believe them to be true and accurate.

The **Wonderware Mobile Solutions, SRM-1** was tested to and found to be in compliance with FCC 15.209 and RSS-210 2.6.

The highest emissions generated by the above equipment are listed below:

	<u>Frequency (MHz)</u>	<u>Level (dBμV/m)</u>	<u>Limit (dBμV/m)</u>	<u>Margin (dB)</u>
Fundamental	0.134	77.4	105.0	-27.6
Spurious	913.56	36.0	37.0	-1.0
Emission Designator	14K8F1D			

A handwritten signature in black ink, appearing to be "JA" followed by a stylized flourish.

Jason Anderson
Director of Testing Services

This report has been reviewed and accepted by Wonderware Mobile Solutions. The undersigned is responsible for ensuring that **Wonderware Mobile Solutions, SRM-1** will continue to comply with the FCC and IC rules.

1.0 EUT Description

The Wonderware Mobile Solutions SRM-1 is short range RFID transmitter/interrogator that queries RFID transponders used as asset tags in industrial applications. The EUT transmits at 134.2 kHz. Every read or write operation starts with a 50 ms burst to charge the transponder. Charge-only read operations send only the charge burst. Selective read operations follow the charge burst with 16 ms of On/Off modulation. Write operations follow the charge burst with 100 ms of On/Off modulation. The transponders are passive, with no internal battery. An internal capacitor gathers enough energy from the charge burst to allow a reply lasting about 20 milliseconds. The transponders reply using FSK modulation.

This EUT can only operate utilizing a USB connection by the host computer.

The system tested consisted of the following:

Manufacturer & Model	FCC ID	IC Number	Description
Wonderware Mobile Solutions, SRM-1	OFZSRM1	6984A -SRM1	SRM-1

1.1 Applicable Documents

Document	Title	Release
ANSI C63.4	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low Voltage Electrical and Electronic Equipment.	2003
47 CFR	Part 15 – Radio Frequency Devices Subpart C -Intentional Radiators	

1.2 Applicable Rules

Guidelines	FCC Rules, Part 15	IC Rules	
		RSS-GEN Issue 1	RSS-210 Issue 7
Transmitter Characteristics	15.209	4.1, 4.2, 4.4, 4.9	2.6
Spurious Radiated Power*	15.205, 15.209	4.2, 4.7	2.6, 2.7 Table 2
Powerline Conducted Limit	15.207	4.2, 4.7, 7.2.2	
Antenna Requirement	15.203	7.1, 7.1.4	

1.2 EUT Operation

The EUT was operated in continuous transmit mode at max power continuous wave with a worst case bit pattern to measure fundamental, harmonics, and spurious radiation.

2.0 Electromagnetic Emissions Testing

Measurements were made at the PTI semi-anechoic facility designated Site 45 (FCC 459644, IC 3036B-1) in Austin, Texas. This site is registered with the FCC under Section 2.948 and Industry Canada per RS-212 and is subsequently confirmed by laboratory accreditation (NVLAP). Professional Testing (EMI), Inc. (PTI), follows the guidelines of NIST for all uncertainty calculations, estimates and expressions thereof for EMC testing. The procedure of ANSI C63.4:2003 were utilized for making all emissions measurements.

2.1 Conducted Emissions Measurements

2.1.1 Test Procedure

The EUT was configured and operated in a manner consistent with typical applications. The EUT power cord in excess of one meter was folded back and forth forming a bundle 30 to 40 cm long in the approximate center of the cable. Power supply cords for the peripheral equipment were powered from an auxiliary LISN. Excess interface cable lengths were separately bundled in a non-inductive arrangement at the approximate center of the cable with the bundle 30 to 40 centimeters in length.

The tests were performed in a 12' x 8' RayProof modular shielded room. The EUT was placed on a non-metallic table 0.4 meters from a vertical metal reference plane and 0.8 meters from a horizontal metal reference plane. A drawing showing the test setup is given as Figure 1.

2.1.2 Test Criteria

The FCC Part 15 Class B conduction limits are given below.

Frequency (MHz)	Conducted Limits (dBuV)	
	Average	Quasi-Peak
0.15 – .50	66-56*	56 – 46*
.50 - 5	56	46
5 – 30	60	50

The tighter limit shall apply at the edge between two frequency bands.

*Decreases with the logarithm of the frequency.

2.1.3 Test Results

The conducted emissions data is included as Appendix A. The conducted emissions generated by the EUT as measured on the mains terminals are below the FCC and IC limits

2.2 Radiated Emissions Measurements

Radiated emission measurements were made of the Fundamental and Spurious Emission levels for the EUT. Measurements of the occupied bandwidth were also made for the EUT.

Tests of the fundamental for the device were performed to determine the worst case polarization of the devices. The fundamental emissions of the device were measured with the antenna of the device in three orthogonal axes.

2.2.1 Test Procedure

The EUT was placed at the center of a non-conductive remotely-rotated table 0.8 meters above the ground plane. From 30 MHz to 1 GHz the measurement antenna was placed at a distance of 10 meters as measured from the closest point of the EUT. Below 30 MHz a loop antenna is placed at 3 meters distance on a 0.8 m high manually operated non-conductive turntable. The radiated emissions were maximized by rotating the EUT. A drawing showing the test setup is given as Figure 1.

The EUT was oriented with the internal loop antenna facing the loop measurement antenna.

2.2.2 Test Criteria

Relevant FCC/IC & CISPR emission limits are listed below. Transmitter harmonics are measured up to the 10th harmonic. The lower limit shall apply at the transition frequency.

FCC/IC		
Frequency (MHz)	Test Distance (Meters)	Field Strength Limit (dB μ V/m)
0.009 to 0.490	300	
0.490 to 1.705	30	
1.705 to 30	30	
30 to 88	3	40.0
88 to 216	3	43.5
216 to 960	3	46.0
960 and above	3	54.0

CISPR		
Frequency (MHz)	Test Distance (Meters)	Field Strength Limit (dB μ V/m)
30 to 230	10	30.0
230 to 1000	10	37.0

2.2.3 Test Results

The radiated test data for the fundamental is included in Appendix A. Peak detection was used during the test for the fundamental and harmonics. Quasi-Peak detection was used for spurious emissions below 1 GHz. The radiated emission test data is included in Appendix A. The radiated emissions generated by the SRM-1 are below the FCC and IC limits.

3.0 Occupied Bandwidth Measurement

3.1 Test Procedure

The EUT was placed on a non-conductive table 0.8 meters above the floor. The occupied bandwidth was based on a 26 dB criteria (26 dB down either side of the emission from the peak emission). A drawing showing the test setup is given as Figure 1.

3.2 Test Criteria

The bandwidth must be measured in order to calculate the emission designator per Industry Canada rules.

3.3 Test Results

The occupied bandwidth test data is included in Appendix A. The maximum occupied bandwidth for the fundamental frequency 134 kHz is 14.76 kHz (26 dB).

4.0 Antenna Requirement

An analysis of the SRM-1 was performed to determine compliance with FCC Section 15.203. This section requires specific handling and control of antennas used for devices subject to regulations.

4.1 Evaluation Procedure

The structure and application of the SRM-1 was analyzed with respect to the rules. The antenna is an internal antenna, and is not accessible to the user. An auxiliary antenna port is not present.

4.2 Evaluation Criteria

Section 15.203 of the rules states that the subject device must meet at least one of the following criteria:

- (a) Antenna must be permanently attached to the unit.
- (b) Antenna must use a unique type of connector to attach to the EUT.
- (c) Unit must be professionally installed. Installer shall be responsible for verifying that the correct antenna is employed with the unit.

4.3 Evaluation Results

The SRM-1 meets the criteria of this rule by virtue of having an internal antenna inaccessible to the user. The EUT is therefore compliant.

5.0 Modifications to Equipment

Decoupling capacitors were added to the USB data lines and a pre fabricated USB cable with a ferrite was used to pass the radiated emissions testing at 913 MHz.

6.0 List of Test Equipment

A list of the test equipment utilized to perform the testing is given below. The date of calibration is given for each.

Conducted Test Equipment

Asset #	Manufacturer	Model #	Description	Calibration Due
1281	HP	85650A	Quasi-peak Adapter	January 05, 2010
0045	HP	85662A	Spectrum Analyzer Display	NCR
1284	HP	8568B	Spectrum Analyzer	January 05, 2010
1086	PTI	PTI-ALF2	Attenuator, Limiter, Filter	March 26, 2009
1185	Emco	3825/2	Line Impedance Stabilization Network	September 13, 2009
0081	ELGAR	1751SL	AC Power Supply	NCR
1173	PTI	100KHz HPF	High Pass Filter	March 26, 2009

Radiated Test Equipment

Asset #	Manufacturer	Model #	Description	Calibration Due
0006	EMCO	6502	Active Loop Antenna	December 22, 2009
0275	HP	85650A	Quasi-peak Adapter (high band)	July 03, 2009
1273	HP	85662A	Spectrum Analyzer Display (high band)	NCR
84	HP	8566B	Spectrum Analyzer (high band)	March 14, 2009
0990	HP	85685A	RF Preselector (high band)	March 18, 2009
0085	HP	85650A	Quasi-peak Adapter (low band)	July 7, 2009
1629	HP	85662A	Spectrum Analyzer Display (low band)	NCR
1145	HP	8568B	Spectrum Analyzer (low band)	July 7, 2009
0238	HP	85685A	RF Preselector (low band)	July 30, 2009
1454	HP	8447D	RF Preamplifier	June 17, 2009
1497	Emco	3108	Biconical Antenna	April 16, 2009
1486	Emco	3147	Log Periodic Dipole Array Antenna	April 16, 2009
C026	none	none	Coaxial Cable (low band)	July 02, 2009
C027	none	none	Coaxial Cable (high band)	July 02, 2009

FIGURE 1: Conducted Emissions Mains Terminal Measurements

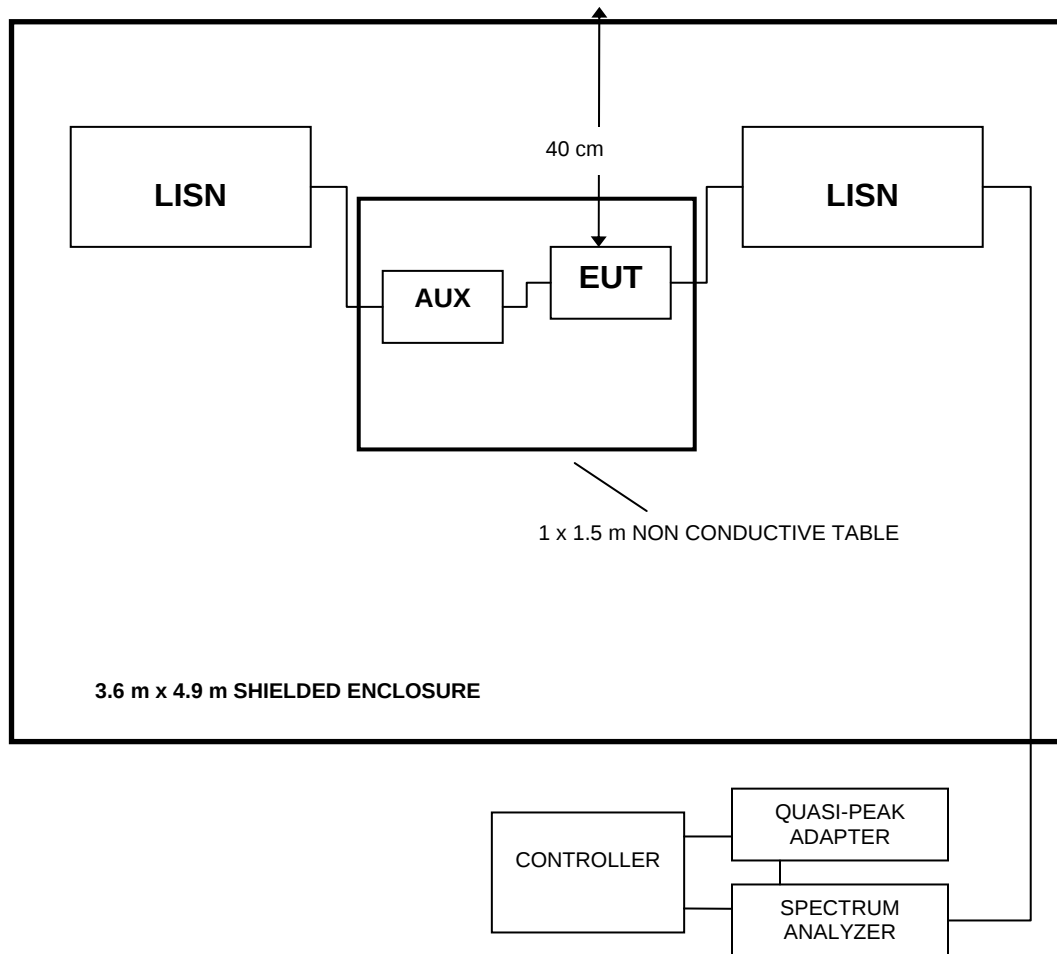
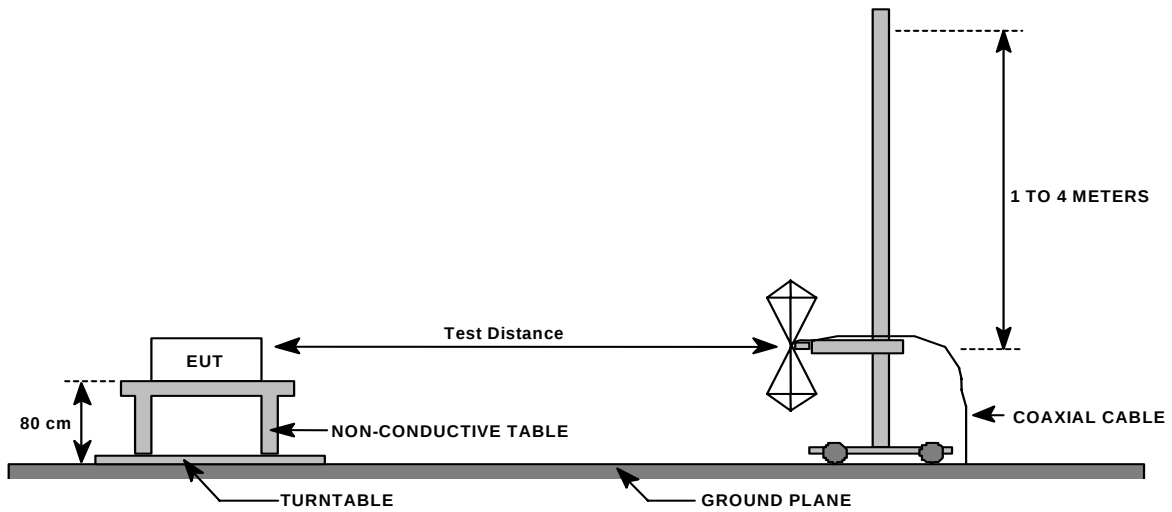


FIGURE 2: Radiated Emissions Test Setup



APPENDIX A EMISSIONS DATA SHEET

Conducted Data Sheet

Wonderware Mobile Solutions

SRM-1

LINE MEASURED: Phase

DETECTOR FUNCTION: Quasi-Peak and Avg

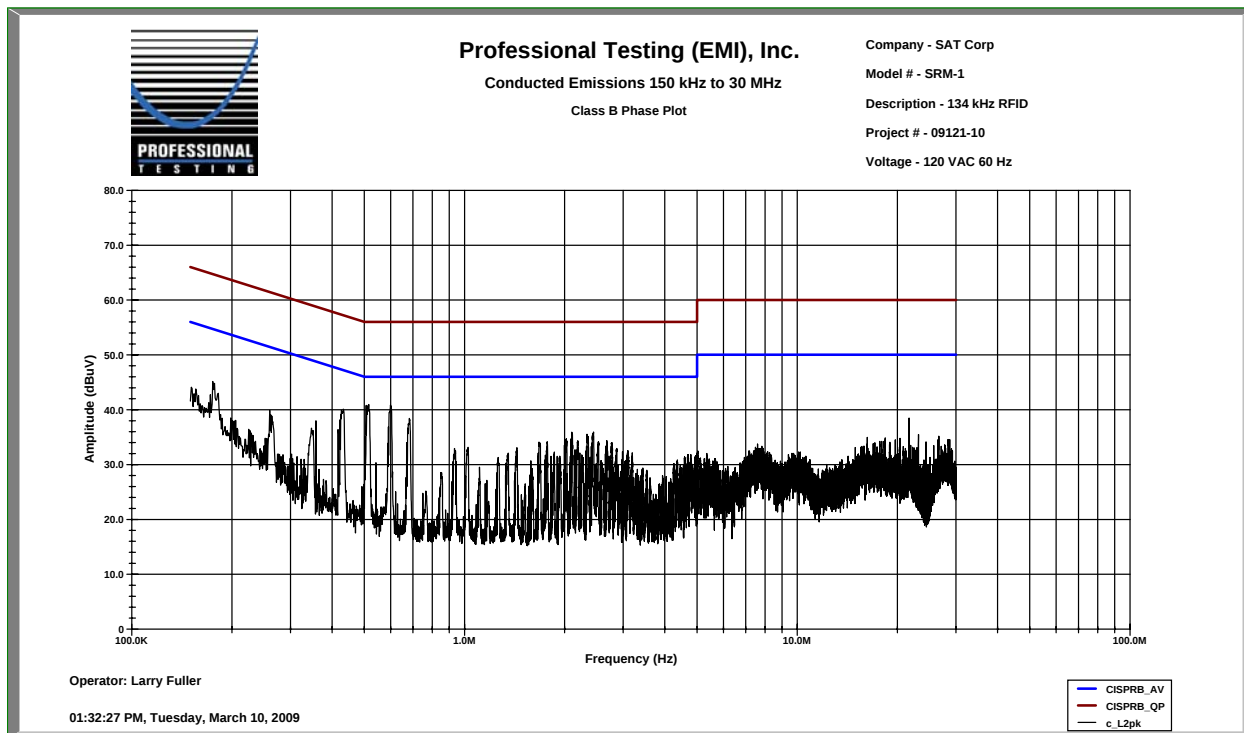
RBW: CISPR 9 kHz

VBW: 100 kHz, 10 Hz Avg

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Frequency Reading (MHz)	Quasi-peak Reading (dBuV)	Average Reading (dBuV)	Quasi-peak Limit (dBuV)	Quasi-peak Margin (dB)	Average Limit (dBuV)	Average Margin (dB)
0.17472	40.9	37.7	65.3	-24.4	55.3	-17.6
0.26411	35	33.3	62.7	-27.8	52.7	-19.4
0.42647	39.3	38.3	58.1	-18.8	48.1	-9.8
0.49964	39.3	38.5	56	-16.7	46	-7.6
0.59536	39.6	38.9	56	-16.4	46	-7.1
16.2373	30.8	25.7	60	-29.2	50	-24.3
18.3747	30.4	25	60	-29.6	50	-25
21.6707	33.2	29.2	60	-26.8	50	-20.8
21.6759	33.4	29.1	60	-26.6	50	-20.9
23.1365	34.1	29.6	60	-25.9	50	-20.4



Conducted Data Sheet **Wonderware Mobile Solutions** **SRM-1**

LINE MEASURED: Neutral

DETECTOR FUNCTION: Quasi-Peak and Avg

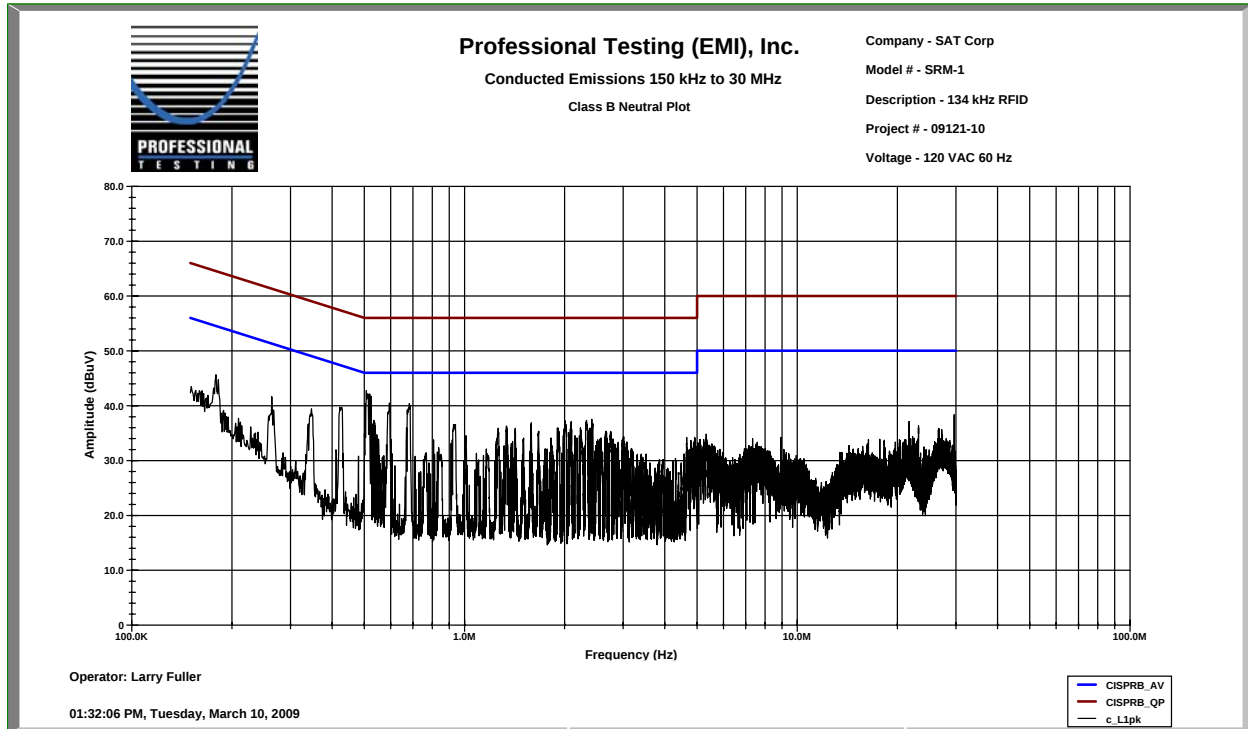
RBW: CISPR 9 kHz

VBW: 100 kHz, 10 Hz Avg

DATE: March 10, 2009

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Frequency Reading (MHz)	Quasi-peak Reading (dBuV)	Average Reading (dBuV)	Quasi-peak Limit (dBuV)	Quasi-peak Margin (dB)	Average Limit (dBuV)	Average Margin (dB)
0.17609	41.9	38.7	65.3	-23.4	55.3	-16.5
0.50055	40.6	39.9	56	-15.4	46	-6.1
0.5008	40.7	40.4	56	-15.3	46	-5.6
0.50381	40.8	40.1	56	-15.2	46	-5.9
0.67223	39	37.9	56	-17	46	-8.1
5.3581	31.3	22.3	60	-28.7	50	-27.7
21.6727	33.6	29.4	60	-26.4	50	-20.6
21.6738	33.4	29.5	60	-26.6	50	-20.5
23.1405	34.5	29.9	60	-25.5	50	-20.1
29.6167	30.1	26.5	60	-29.9	50	-23.5



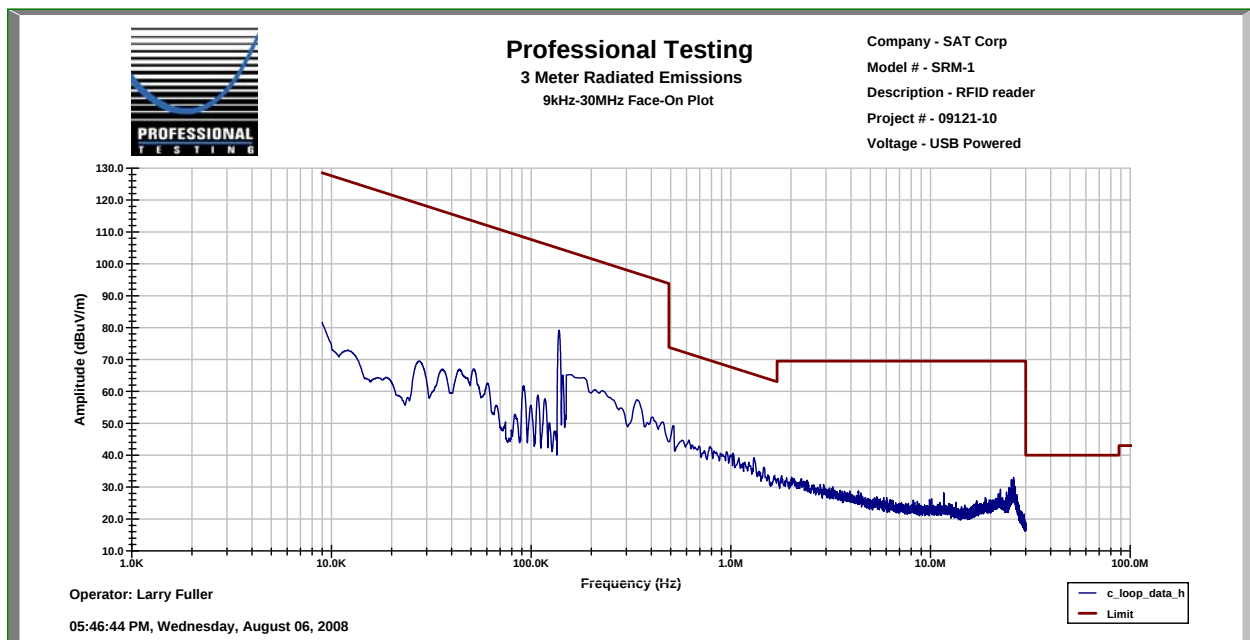
Radiated Data Sheet
9kHz – 30 MHz
Wonderware Mobile Solutions
SRM-1

MEASUREMENT DISTANCE (m): 3
DETECTOR FUNCTION: Peak
RBW: CISPR 9 kHz
VBW: 100 kHz

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Face On

Frequency (MHz)	EUT Direction (degrees)	Antenna Elevation (Meters)	Recorded Level (dBuV)	Amplifier Gain (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
0.134	200	1	66.9	0.0	10.4	0.1	77.4	105	-27.6



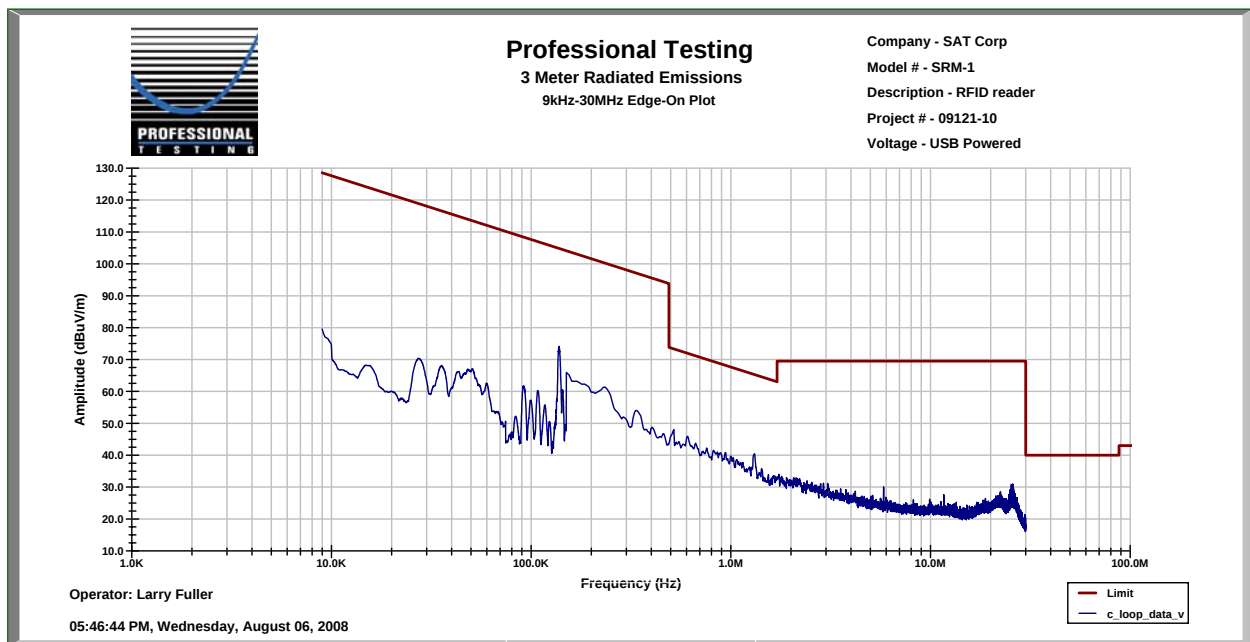
Radiated Data Sheet
9kHz – 30 MHz
Wonderware Mobile Solutions
SRM-1

MEASUREMENT DISTANCE (m): 3
DETECTOR FUNCTION: Peak
RBW: CISPR 9 kHz
VBW: 100 kHz

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Edge On

Frequency (MHz)	EUT Direction (degrees)	Antenna Elevation (Meters)	Recorded Level (dBuV)	Amplifier Gain (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
0.134	75	1	59.4	0.0	10.4	0.1	69.9	105	-35.1



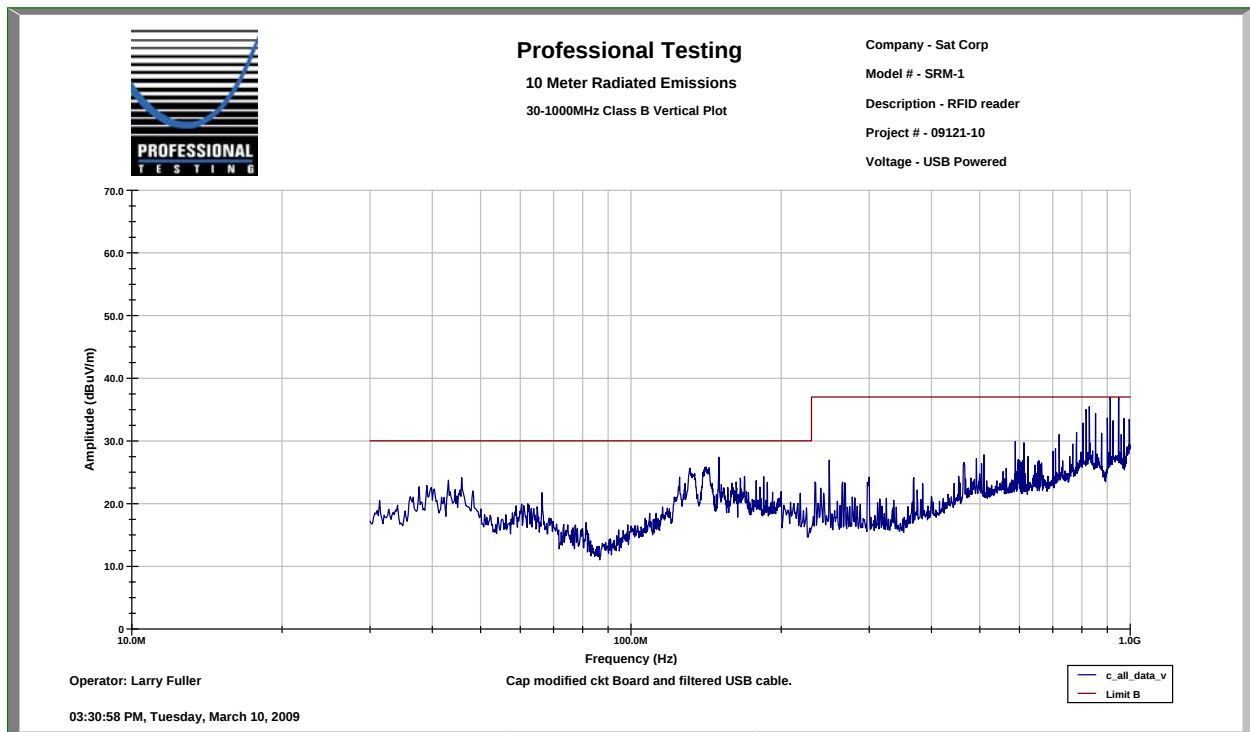
Radiated Data Sheet
Spurious 30 MHz - 1 Ghz
Wonderware Mobile Solutions
SRM-1

MEASUREMENT DISTANCE (m): 10
DETECTOR FUNCTION: Peak
RBW: CISPR 120 kHz
VBW: 1 MHz

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Vertical

Frequency (MHz)	EUT Direction (degrees)	Antenna Elevation (Meters)	Recorded Level (dBuV)	Amplifier Gain (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
64.779	308	1	32.4	26.0	10.1	0.7	17.2	30	-12.8
137.45	135	1.2	33.2	25.8	12.1	1.4	20.9	30	-9.1
149.995	149	1	35.9	25.7	12.3	1.4	23.8	30	-6.2
829.388	85	4	37.6	36.6	23.0	4.7	28.6	37	-8.4
913.56	266	1.9	43.8	36.4	23.4	5.3	36.0	37	-1.0
949.64	39	1.8	39.2	36.5	24.3	5.4	32.4	37	-4.6



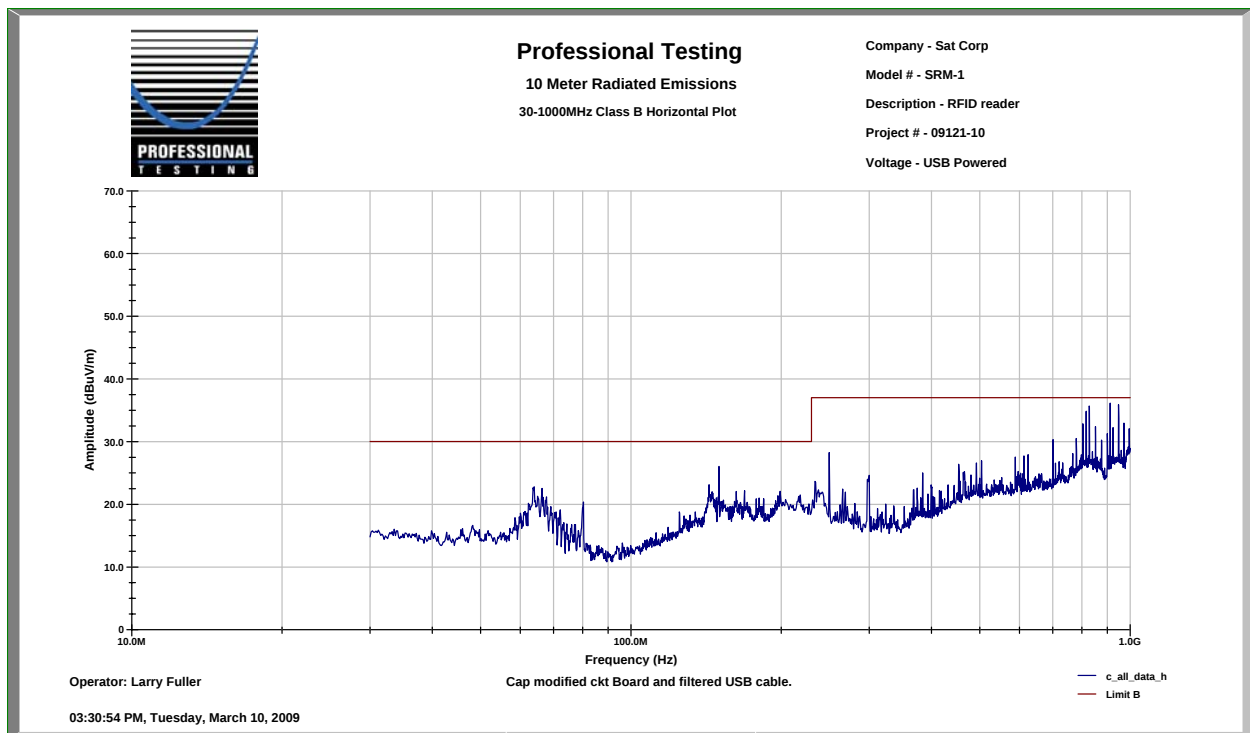
Radiated Data Sheet
Spurious 30 MHz - 1 Ghz
Wonderware Mobile Solutions
SRM-1

MEASUREMENT DISTANCE (m): 10
DETECTOR FUNCTION: Peak
RBW: CISPR 120 kHz
VBW: 1 MHz

DATE: March 10, 2009
PROJECT #: 09121-10

Horizontal

Frequency (MHz)	EUT Direction (degrees)	Antenna Elevation (Meters)	Recorded Level (dBuV)	Amplifier Gain (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
64.779	197	3	29.3	26.0	10.1	0.7	14.1	30	-15.9
137.45	95	3.5	27.6	25.8	12.1	1.4	15.3	30	-14.7
149.995	76	4	34.6	25.7	12.3	1.4	22.5	30	-7.5
829.388	114	3.4	43.2	36.6	23.0	4.7	34.2	37	-2.8
913.56	109	1	42.3	36.4	23.4	5.3	34.5	37	-2.5
949.64	102	1	40.5	36.5	24.3	5.4	33.7	37	-3.3



Occupied Bandwidth Data Sheet
Wonderware Mobile Solutions
SRM-1

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