Engineering and Testing for EMC and Safety Compliance

Type II Permissive Change Report
FCC Part 15 & 90 and Industry Canada RSS-119

Test Lab:	Applicant:
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FCC ID:	OWDTR-0024-E	**GRANTEE FRN:**	0004945812
PLAT FORM:	N/A	**RTL WORK ORDER #:**	2003167
MODEL(S):	SMRMCX, SXRJTX	**RTL QUOTE #:**	QRTL03-101
DATE OF TEST REPORT:	September 15, 2003		

American National Standard Institute:	ANSI/TIA/EIA 603 and ANSI/TIA/EIA 603-1
FCC Classification:	TNB – Land Mobile Base Station
FCC Rule Part(s):	Part 90: Private Land Mobile Radio Services Part 15: Radio Frequency Devices §15.109: Radiated Emissions Limits
Industry Canada Standard:	RSS-119: Land Mobile and Fixed Radio Transmitters and Receivers, 27.41 to 960 MHz
Digital Interface Information	Digital Interface was found to be compliant
Receiver Information	Receiver was found to be compliant

Frequency Range (MHz)	Output Power (W) Conducted	Frequency Tolerance	Emission Designator
403 - 425	90.57	1.5	16K0F3E (Voice)
403 - 425	90.57	1.5	11K0F3E (Voice)
403 - 425	90.57	1.5	7K8F1D (2 level NB 4800)
403 - 425	90.57	1.5	7K8F1E (2 level NB 4800)
403 - 425	90.57	1.5	7K1F1D (2 level NB XNB 9600) measured
403 - 425	90.57	1.5	7K1F1E (2 level NB XNB 9600) measured
403 - 425	90.57	1.5	10K0F1D (2 level NB 9600) measured
403 - 425	90.57	1.5	10K0F1E (2 level NB 9600) measured
403 - 425	90.57	1.5	12K0F1D (2 level WB 9600) measured
403 - 425	90.57	1.5	12K0F1E (2 level WB 9600) measured
403 - 425	90.57	1.5	10K13F1D (4 Level) measured
403 - 425	90.57	1.5	10K13F1E (4 Level) measured

We, the undersigned, hereby declare that the equipment tested and referenced in this report conforms to the identified standard(s) as described in this test report. No modifications were made to the equipment during testing in order to achieve compliance with these standards.

Furthermore, there was no deviation from, additions to, or exclusions from, the FCC Part 2, FCC Part 15, FCC Part 90, Industry Canada RSS-119, ANSI C63.4, ANSI/TIA/EIA603 and ANSI/TIA/EIA 603-1.

Signature:  October 16, 2003

Typed/Printed Name: Desmond A. Fraser Position: President

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Table of Contents

Table Index

Appendix Index

Photograph Index

1 General Information

The following report of a Class II Permissive Change application is prepared on behalf of **M/A Com, Inc.**, in accordance with Part 2, and Part 15, Subparts A and B of the Federal Communications Commission rules and regulations and Industry Canada RSS-215. The Equipment Under Test (EUT) was Model: MASTRIII Sitepro Trunking Base Station UHF Radio, 403 - 425 MHz, (Model # SMRMCX, SXRJTX), FCC ID: OWDTR-0024-E. The test results reported in this document relate only to this model.

All measurements contained in this application were conducted in accordance with ANSI C63.4 Methods of Measurement of Radio Noise Emissions, 1992. The instrumentation utilized for the measurements conforms to the ANSI C63.4 standard for EMI and Field Strength Instrumentation. Some accessories are used to increase sensitivity and prevent overloading of the measuring instrument. These are explained in the appendix of this report. Calibration checks are performed regularly on the instruments, and all accessories including the high pass filter, preamplifier and cables.

All radiated and conducted emissions measurements were performed manually at Rhein Tech Laboratories, Inc. The radiated emissions measurements required by the rules were performed on the (three/ten) meter open field test range. Complete description and site attenuation measurement data has been placed on file with the Federal Communications Commission. The power line conducted emission measurements were performed in a shielded enclosure. Rhein Tech Laboratories is accepted by the FCC as a facility available to do measurement work for others on a contract basis.

Note: Rhein Tech Laboratories, Inc. has implemented procedures to minimize errors that occur from test instruments, calibration, procedures, and test setups. Test instrument and calibration errors are documented from the manufacturer or calibration lab. Other errors have been defined and calculated in the Rhein Tech Quality Manual, Section 6.1. Rhein Tech implements the following procedures to minimize errors that may occur: yearly as well as daily calibration methods, technician training, and emphasis to employees on avoiding errors.

1.1 Modifications

No modifications were made to the EUT during testing in order to achieve compliance.

1.2 Related Submittal(s)/Grant(s)

This is a Class II Permissive Change report for the original application for FCC ID: OWDTR-0024-E.

1.3 Description of Change in Device

A hardware modification was made to meet modulation mask requirements (CFR 47 Part 90.210D mask) when operating in 2-Level XNB Narrowband 9600 baud mode. The modification comprises a frequency change of crystal Y1, located on the Analog Filter Board (CB101070V1) within the SitePro Shelf, from 400 kHz to 384 kHz, plus adjustment of the peak FM deviation of the transmitter. The crystal change has the effect of reducing the (programmable) modulation filter bandwidth by 4% allowing equipment to meet the mask with the required deviation setting.

1.4 Test Methodology

Radiated testing was performed according to the procedures in ANSI C63.4 2000. Radiated testing was performed at an antenna-to-EUT distance of 3 meters.

2 System Test Configuration

2.1 Justification

To complete the test configuration required by the FCC, the receiver was connected to an external antenna, which receives a signal from a signal generator output. With the antenna installed, the receiver indicator was used to determine optimal reception. The EUT's Intermediate Frequencies (IF), Local Oscillators (LO), 2nd Local Oscillators (LO), crystal oscillators and harmonics of each were investigated. Conducted emission was measured from the AC port of the power supply. All modes were investigated and tested including standby mode. The final radiated data was taken with the EUT locked to a set frequency.

2.2 Exercising the EUT

The MASTRIII is a transceiver designed to function at the following frequency range: 403 MHz – 425 MHz. The following channel frequency was tested: 413.525 MHz. This frequency was measured independently. In order to activate the receiver circuitry; a signal was transmitted from a signal generator. This allowed the EUT to function in its typical state throughout the course of all testing.

3 Test System Details

3.1 Tested Configuration

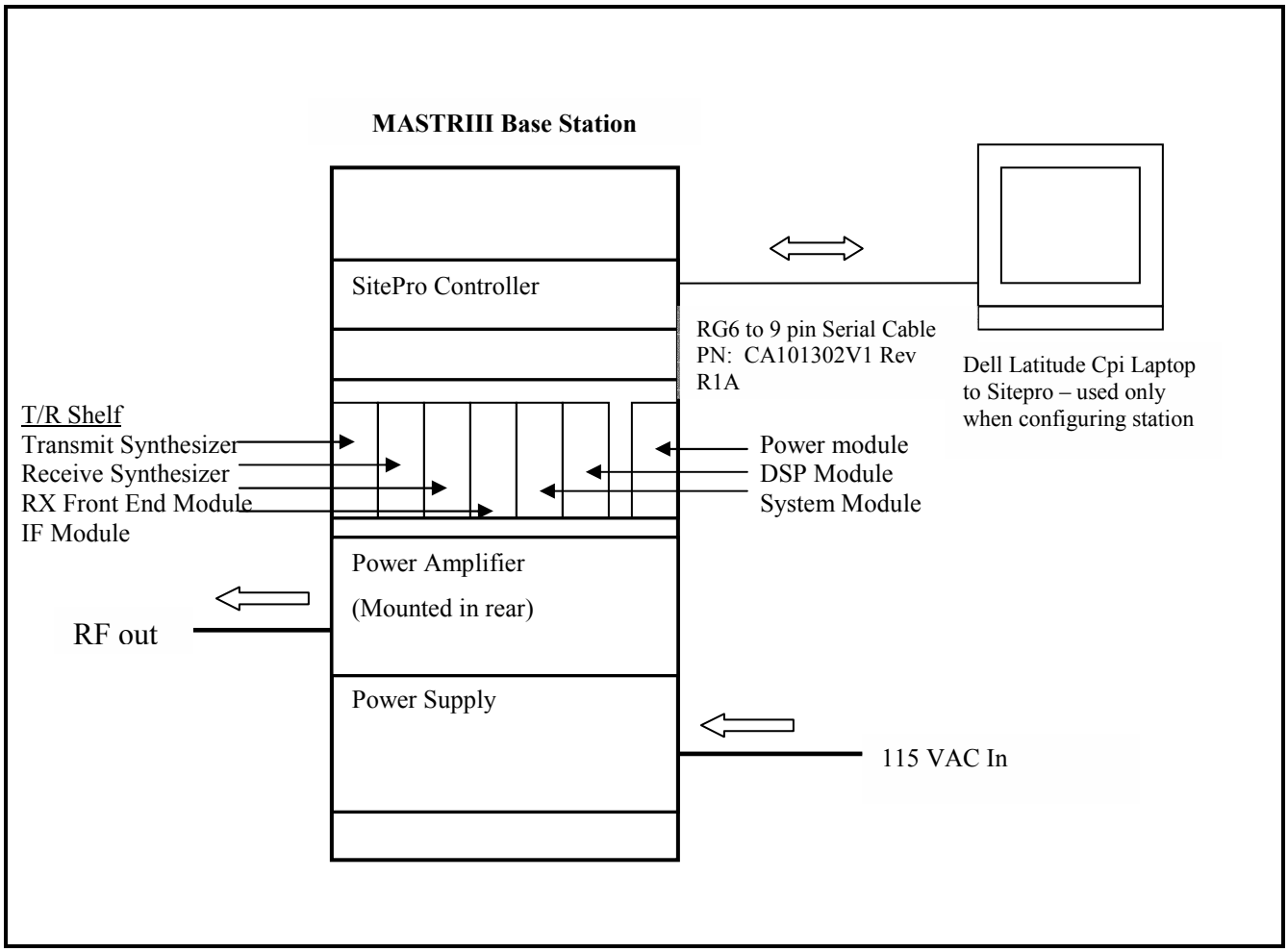
TABLE 3-1: EQUIPMENT UNDER TEST

PART	MANUFACTURER	MODEL	SERIAL NUMBER	FCC ID	CABLE DESCRIPTION	RTL BAR CODE
UHF Basestation Radio	M/A-COM, INC.	SMRMCX, SXRJTX	N/A	OWDTR-0024-E	N/A	
T/R Shelf Transmit Synthesizer Receive Synthesizer RX Front End Module IF Module DSP module Power module	M/A-COM, INC.	403-425 MHz	19D902839G2 19D902780G6 19D902781G3 19D902782G11 EA101401V1 EA101800V1 19D902589G2	N/A		15247
T/R Shelf Transmit Synthesizer Receive Synthesizer RX Front End Module IF Module DSP module Power module	M/A-COM, INC.	403-425 MHz	19D902839G2 19D902780G6 19D902781G3 19D902782G11 EA101401V1 EA101800V1 19D902589G2	N/A		15255
Power amplifier	M/A-COM, INC.	403-425 MHz	19D902797G11	N/A		15354
SitePro Controller	M/A-COM, INC.		EA101209V1	N/A		15253
Power Supply	M/A-COM, INC.		19A149978P1/ 03109467	N/A		N/A

TABLE 3-2: SUPPORT EQUIPMENT

PART	MANUFACTURER	MODEL	SERIAL NUMBER	FCC ID	CABLE DESCRIPTION	RTL BAR CODE
Laptop Computer	Dell	Latitude Cpi	N/A	N/A	N/A	900917
RG6 to 9 pin Serial Cable			CA101302V1 Rev R1A	N/A	shielded serial cable	14886

3.1.1 Tested Configuration Diagram



4 Test Results

4.1 Amendments to Emissions Test Methodology

4.1.1 Deviations from Test Methodology

There was no deviation from, additions to, or exclusions from, ANSI C63.4: 1992.

4.2 Radiated Emissions Measurements

4.2.1 Site and Test Description

Before final radiated emissions measurements were made on the OATS, the EUT was scanned indoors at both one and three meter distances. This was done in order to determine its emission spectrum signal. The physical arrangement of the test system and associated cabling was varied in order to determine the effect on the EUT's emissions in amplitude, direction and frequency. This process was repeated during final radiated emission measurements on the OATS, at each frequency, in order to ensure that maximum emission amplitudes were measured.

Final radiated emissions measurements were made on the OATS at a distance of 3 meters. The floor-standing EUT was placed on a nonconductive turntable at a height of 1m.

At each frequency, the EUT was rotated 360°, and the antenna was raised and lowered from 1 to 4 meters in order to determine the emissions maximum levels. Measurements were taken using both horizontal and vertical antenna polarization. The spectrum analyzer's 6 dB bandwidth was set to 120 kHz, and the analyzer was operated in the quasi-peak detection mode. No video filter less than 10 times the resolution bandwidth was used. The highest emission amplitudes relative to the appropriate limit were measured and recorded in this report.

4.2.2 Field Strength Calculations

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FI(dB\mu V/m) = SAR(dB\mu V) + SCF(dB/m)$$

FI=Field Intensity
SAR=Spectrum Analyzer Reading
SCF=Site Correction Factor

The Site Correction Factor (SCF) used in the above equation is determined empirically, and is expressed in the following equation:

$$SCF(dB/m) = -PG(dB) + AF(dB/m) + CL(dB)$$

SCF=Site Correction Factor
PG=Pre-Amplifier Gain
AF=Antenna Factor
CL=Cable Loss

The field intensity in microvolts per meter can then be determined according to the following equation:

$$FI(\mu V/m) = 10^{FI(dB\mu V/m)/20}$$

For example, assume a signal frequency of 125 MHz has a received level measured as 49.3 dBuV. The total

Site Correction Factor (antenna factor plus cable loss minus preamplifier gain) for 125 MHz is –11.5 dB/m.

The actual radiated field strength is calculated as follows:

$$49.3dB\mu V - 11.5dB/m = 37.8dB\mu V/m$$
$$10^{37.8/20} = 10^{1.89} = 77.6\mu V/m$$

4.2.3 Measurement Uncertainty

Rhein Tech Laboratories, Inc. has implemented procedures to minimize errors that occur from test instruments, calibration, procedures, and test setups. Test instrument and calibration errors are documented from the manufacturer or calibration lab. Other errors have been defined and calculated within the Rhein Tech Quality Manual, Section 6.1. Rhein Tech implements the following procedures to minimize errors that may occur: yearly as well as daily calibration methods, technician training, and emphasis to employees on avoiding error.

4.2.4 Test Limits

TABLE 4-1: TEST LIMITS

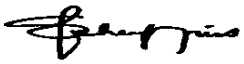
FCC Class B Radiated Emissions	
Frequency (MHz)	**At 3m (dBµV/m)**
30-88	40.0
88-216	43.5
216-960	46.0
> 1000	54

4.2.5 Radiated Emissions Data

TABLE 4-2: RADIATED EMISSIONS – MODE RX

Emission Frequency (MHz)	Test Detector	Antenna Polarity (H/V)	Turntable Azimuth (deg)	Antenna Height (m)	Analyzer Reading (dBuV)	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
110.638	Qp	V	145	1.0	39.6	-15.7	23.9	43.5	-19.6
147.488	Qp	V	185	1.0	49.2	-17.0	32.2	43.5	-11.3
177.008	Qp	V	145	1.0	42.6	-18.2	24.4	43.5	-19.1
206.508	Qp	H	45	2.3	47.6	-18.0	29.6	43.5	-13.9
213.878	Qp	V	180	1.0	45.7	-17.6	28.1	43.5	-15.4
221.248	Qp	H	45	2.3	42.5	-18.2	24.3	46.0	-21.7
235.988	Qp	H	145	2.3	43.4	-16.8	26.6	46.0	-19.4
250.756	Qp	V	180	1.0	47.3	-15.8	31.5	46.0	-14.5
265.419	Qp	V	180	1.0	44.6	-15.1	29.5	46.0	-16.5
402.080	Qp	V	145	1.0	38.7	-11.5	27.2	46.0	-18.8
413.016	Qp	V	180	1.0	37.6	-10.8	26.8	46.0	-19.2

TEST PERSONNEL:

Signature:  Date: September 15, 2003 Typed Name: Franck Schuppius

4.3 AC Conducted Measurement

4.3.1 Conducted Emissions Data (TX mode)

TABLE 4-3: NEUTRAL SIDE (LINE 1); TX MODE; LIMIT CISPR B

Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	FCC B Limit (dBuV)	FCC B Margin (dBuV)
0.174	Pk	34.8	1.8	36.6	54.8	-18.2
0.208	Pk	26.0	1.5	27.5	53.3	-25.8
0.283	Pk	23.1	1.0	24.1	50.7	-26.6
0.548	Pk	19.0	0.7	19.7	46.0	-26.3
2.452	Pk	26.9	1.3	28.2	46.0	-17.8
10.240	Pk	27.1	2.1	29.2	50.0	-20.8
29.500	Pk	28.1	3.6	31.7	50.0	-18.3

TABLE 4-4: HOT SIDE (LINE 2); TX MODE; LIMIT CISPR B

Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	FCC B Limit (dBuV)	FCC B Margin (dBuV)
0.169	Pk	33.9	1.9	35.8	55.0	-19.2
2.452	Pk	28.1	1.3	29.4	46.0	-16.6
9.835	Pk	24.7	1.4	26.1	50.0	-23.9
10.220	Pk	34.4	1.5	35.9	50.0	-14.1
12.280	Pk	38.9	2.5	41.4	50.0	-8.6
22.510	Pk	24.5	3.3	27.8	50.0	-22.2
26.620	Pk	25.7	3.5	29.2	50.0	-20.8

(1)Pk = Peak; QP = Quasi-Peak; Av = Average

4.3.2 Conducted Emissions Data (RX mode)

TABLE 4-5: NEUTRAL SIDE (LINE 1); RX MODE; LIMIT CISPR B

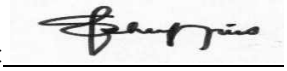
Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	FCC B Limit (dBuV)	FCC B Margin (dBuV)	Pass/ Fail
0.169	Pk	35.5	1.9	37.4	55.0	-17.6	Pass
0.517	Pk	18.9	0.7	19.6	46.0	-26.4	Pass
2.452	Pk	27.2	1.3	28.5	46.0	-17.5	Pass
8.185	Pk	22.6	2.0	24.6	50.0	-25.4	Pass
10.220	Pk	25.0	2.1	27.1	50.0	-22.9	Pass
12.280	Pk	28.0	2.5	30.5	50.0	-19.5	Pass
26.620	Pk	24.2	3.4	27.6	50.0	-22.4	Pass
0.169	Pk	35.5	1.9	37.4	55.0	-17.6	Pass

TABLE 4-6: HOT SIDE (LINE 2); RX MODE; LIMIT CISPR B

Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	FCC B Limit (dBuV)	FCC B Margin (dBuV)	Pass/ Fail
0.170	Pk	35.5	1.8	37.3	55.0	-17.7	Pass
0.520	Pk	18.7	0.7	19.4	46.0	-26.6	Pass
2.452	Pk	28.1	1.3	29.4	46.0	-16.6	Pass
8.185	Pk	23.0	2.0	25.0	50.0	-25.0	Pass
9.940	Pk	25.7	1.4	27.1	50.0	-22.9	Pass
10.220	Pk	34.6	1.5	36.1	50.0	-13.9	Pass
12.280	Pk	39.2	2.5	41.7	50.0	-8.3	Pass
22.520	Pk	24.8	3.3	28.1	50.0	-21.9	Pass
26.620	Pk	26.1	3.5	29.6	50.0	-20.4	Pass

(1)Pk = Peak; QP = Quasi-Peak; Av = Average

TEST PERSONNEL:

Signature:  Date: September 15, 2003 Typed Name: Franck Schuppius

4.4 FCC Rules and Regulations Part 2 §2.1049 (c) (1): Occupied Bandwidth

Occupied Bandwidth - Compliance with the emission masks

4.4.1 Test Procedure

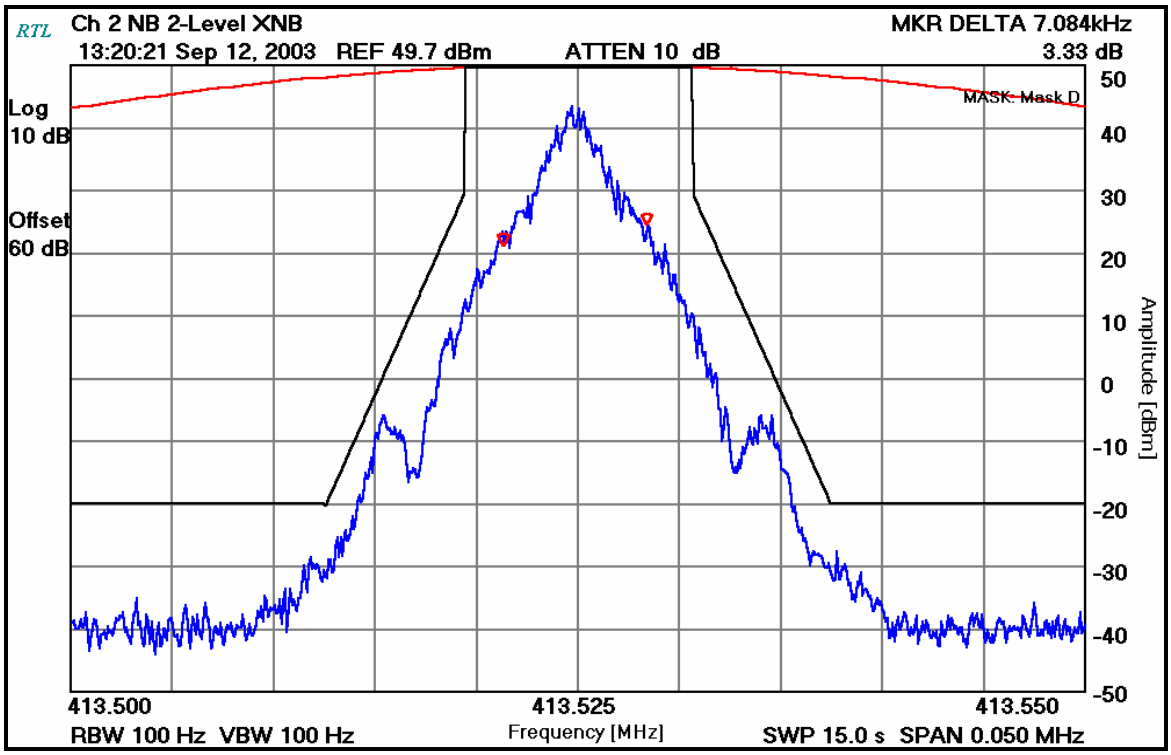
ANSI/TIA/EIA-603-1992, section 2.2.11 and TIA/EIA-102.CAAA-1999 section 2.2.5

Device with audio modulation: Transmitter was modulated with a 2,500 Hz sine wave at an input level of 16 dB greater than that required to produce 50% of rated system deviation at 1,000 Hz.

Device with digital modulation: Modulated to its maximum extent using a pseudo random data sequence – 9600-bps.

4.4.2 Test Data

PLOT 4-1: 99% OCCUPIED BANDWIDTH - 2 LEVEL DIGITAL; NARROW BAND; 9600 BAUD; XNB MODE



TEST PERSONNEL:

Signature: Daniel Biggs Date: September 12, 2003 Typed Name: Daniel Biggs

4.5 FCC Rules and Regulations Part 2 §2.202: Necessary Bandwidth and Emission Bandwidth

Type of Emission: F1D, F1E

Necessary Bandwidth and Emission Bandwidth:

Digital voice and data – 12.5 kHz separation; 9600 Baud; XNB Mode

Measurement: 99.0% Occupied Bandwidth

Bn = 7.084 kHz
Emission designator: 7K1F1D, 7K1F1E

5 Test Equipment Used

TABLE 5-1: TEST EQUIPMENT USED

RTL Asset Number	Manufacturer	Model	Part Type	Serial Number	Calibration due date
900969	Hewlett Packard	85650A	Quasi-Peak Adapter (30 Hz – 40 GHz)	2412A00414	05/12/04
900931	Hewlett Packard	8566B	Spectrum Analyzer (100 Hz – 22 GHz)	3138A07771	05/12/04
901053	Schaffner-Chase	CBL6112	Antenna (25 MHz – 2 GHz)	2648	07/03/04
900930	Hewlett Packard	85662A	Spectrum Analyzer Display	3144A20839	05/12/04
901084	AFJ	LS16	16A LISN	16010020082	11/04/03
900268	Taylor	5565	Hygrometer / Thermometer	N/A	02/05/04
900339	Hewlett Packard	85650A	Quasi peak adapter	2521A00743	04/17/04
900970	Hewlett Packard	85662A	Spectrum Analyzer Display	2542A11239	04/17/04
900968	Hewlett Packard	8567A	Spectrum Analyzer	2602A00160	04/17/04
900889	Hewlett Packard	85685A	RF Preselector (20 Hz – 2 GHz)	3146A01309	03/05/04
901020	Hewlett Packard	8564E	Portable Spectrum Analyzer (9 kHz - 40 GHz)	3943A01719	07/15/04
901118	Hewlett Packard	8901A Opt. 002-003	Modulation Analyzer	2406A00178	06/18/04

6 Conclusion

The data in this measurement report shows that the M/A Com, Inc., Model: MASTRIII Sitepro Trunking Base Station UHF Radio, 403 - 425 MHz, (Model # SMRMCX, SXRJTX), FCC ID: OWDTR-0024-E, complies with all the requirements of Parts 90 and 15 of the FCC Rules, and Industry Canada RSS-119, Issue 1.