

*FCC PART 15, SUBPART C*  
*TEST REPORT*  
*for*  
**FLEET MANAGEMENT SYSTEM**  
**Model: FMS2000**

Prepared for

AXIOM NAVIGATION, INC.  
3545 HOWARD WAY  
COSTA MESA, CALIFORNIA 92626

Prepared by:\_\_\_\_\_

KYLE FUJIMOTO

Approved by:\_\_\_\_\_

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DATE: MARCH 21, 2002

REPORT BODY	APPENDICES	TOTAL				
		A	B	C	D	E
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C	Diagrams, Charts and Photos <ul style="list-style-type: none"><li>• Test Setup Diagrams</li><li>• Radiated Emissions Photos</li><li>• Antenna and Effective Gain Factors</li></ul>
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## GENERAL REPORT SUMMARY

This electromagnetic emission test report is generated by Compatible Electronics Inc., which is an independent testing and consulting firm. The test report is based on testing performed by Compatible Electronics personnel according to the measurement procedures described in the test specifications given below and in the "Test Procedures" section of this report.

The measurement data and conclusions appearing herein relate only to the sample tested and this report may not be reproduced without the written permission of Compatible Electronics, unless done so in full.

This report must not be used to claim product endorsement by NVLAP or any other agency of the U.S. Government.

Device Tested:                   Fleet Management System  
    Model: FMS2000  
    S/N: N/A

Product Description:           See Expository Statement.

Modifications:                   The EUT was not modified during the testing.

Manufacturer:                   Axiom Navigation, Inc.  
    3545 Howard Way  
    Costa Mesa, California 92626

Test Date:                       March 13, 2002

File # For Canada:           IC2154-D

Test Specifications:           EMI requirements  
    CFR Title 47, Part 15 Subpart C, Sections 15.205, 15.209,  
    and 15.249

Test Procedure:               ANSI C63.4: 1992

Test Deviations:               The test procedure was not deviated from during the testing.

## SUMMARY OF TEST RESULTS

TEST	DESCRIPTION	RESULTS
1	Conducted RF Emissions, 450 kHz - 30 MHz	This test was not performed because the EUT operates on 12 Vdc only and will not be plugged into the AC public mains.
2	Radiated RF Emissions, 10 kHz - 9300 MHz	Complies with the limits of CFR Title 47, Part 15 Subpart C, sections 15.205, 15.209, and 15.249



## 1. PURPOSE

This document is a qualification test report based on the Electromagnetic Interference (EMI) tests performed on the Fleet Management System Model: FMS2000. The EMI measurements were performed according to the measurement procedure described in ANSI C63.4: 1992. The tests were performed in order to determine whether the electromagnetic emissions from the equipment under test, referred to as EUT hereafter, are within the specification limits defined by CFR Title 47, Part 15, Subpart C, sections 15.205, 15.209, and 15.249.



## 2. ADMINISTRATIVE DATA

### 2.1 Location of Testing

The EMI tests described herein were performed at the test facility of Compatible Electronics, 114 Olinda Drive, Brea, California 92823.

### 2.2 Traceability Statement

The calibration certificates of all test equipment used during the test are on file at the location of the test. The calibration is traceable to the National Institute of Standards and Technology (NIST).

### 2.3 Cognizant Personnel

Axiom Navigation, Inc.

W.A. Duke, Jr. "Buc" Field and Test Support Manager  
Chris Foja Engineer

Compatible Electronics Inc.

Kyle Fujimoto Test Engineer  
Michael Christensen Test Engineer

### 2.4 Date Test Sample was Received

The test sample was received on March 13, 2002.

### 2.5 Disposition of the Test Sample

The test sample has not been returned to Axiom Navigation, Inc. as of March 14, 2002.

### 2.6 Abbreviations and Acronyms

The following abbreviations and acronyms may be used in this document.

RF	Radio Frequency
EMI	Electromagnetic Interference
EUT	Equipment Under Test
P/N	Part Number
S/N	Serial Number
HP	Hewlett Packard
ITE	Information Technology Equipment
CML	Corrected Meter Limit
LISN	Line Impedance Stabilization Network
Tx	Transmitter
Rx	Receiver



### 3. APPLICABLE DOCUMENTS

The following documents are referenced or used in the preparation of this EMI Test Report.

SPEC	TITLE
CFR Title 47, Part 15	FCC Rules – Radio frequency devices (including digital devices)
ANSI C63.4 1992	Methods of measurement of radio-noise emissions from low-voltage electrical and electronic equipment in the range of 9 kHz to 40 GHz



## 4. DESCRIPTION OF TEST CONFIGURATION

### 4.1 Description of Test Configuration - EMI

#### Specifics of the EUT and Peripherals Tested

The Fleet Management System Model: FMS2000 (EUT) was connected to a DC Power Supply (through an event box) and an antenna via its Power and I/O; and 900 MHz and GPS ports, respectively. The EUT was continuously transmitting and receiving. The low, middle, and high channels were checked.

The antenna connector is a regular SMA connector. The EUT will be professionally installed by qualified personnel only.

The final radiated as data was taken in the configuration described above. Please see Appendix D for the data sheets.



#### 4.1.1 **Cable Construction and Termination**

##### **Cable 1**

This is a 6 foot unshielded cable connecting the DC Power Supply to the event box. It has a cigarette lighter connector at the DC Power Supply end and is hard wired into the event box. It has a 20 pin Molex connector at the EUT end and two banana plug connectors at the DC Power Supply end. The cable was bundled to a length of 1 meter.

##### **Cable 2**

This is a 1 meter unshielded cable connecting the event box to the EUT. It has a 20 pin Molex connector at the EUT end and is hard wired into the event box.

##### **Cable 3**

This is a 5 meter braid shielded cable connecting the EUT to the antenna. It has two metallic SMA connectors at the EUT end is hard wired into the antenna. The cable was bundled to a length of 1 meter. The shield of the cable was grounded to the chassis via the connectors on the EUT end only.



## 5. LISTS OF EUT, ACCESSORIES AND TEST EQUIPMENT

### 5.1 EUT and Accessory List

EQUIPMENT	MANUFACTURER	MODEL NUMBER	SERIAL NUMBER	FCC ID
FLEET MANAGEMENT SYSTEM (EUT)	AXIOM NAVIGATION, INC.	FMS2000	N/A	PMHFMS2000
DC POWER SUPPLY	IPC	RPS-712	N/A	N/A
ANTENNA (EUT)	AXIOM NAVIGATION, INC.	N/A	P/N: FMA02A-3A15	N/A
EVENT BOX	AXIOM NAVIGATION, INC.	N/A	N/A	N/A



## 5.2 EMI Test Equipment

EQUIPMENT TYPE	MANUFACTURER	MODEL NUMBER	SERIAL NUMBER	CAL. DATE	CAL. DUE DATE
Radiated Emissions Manual Test – Radiated	Compatible Electronics	N/A	N/A	N/A	N/A
Spectrum Analyzer – Main Section	Hewlett Packard	8566B	3638A08768	June 15, 2001	June 15, 2002
Spectrum Analyzer – Display Section	Hewlett Packard	85662A	3701A22262	June 15, 2001	June 15, 2002
Spectrum Analyzer – Quasi-Peak Adapter	Hewlett Packard	85662A	2811A01363	June 15, 2001	June 15, 2002
Preamplifier	Com Power	PA-102	1017	Dec. 31, 2001	Dec. 31, 2002
Biconical Antenna	Com Power	AB-100	1548	Oct. 11, 2001	Oct. 11, 2002
Log Periodic Antenna	Com Power	AL-100	16089	Oct. 11, 2001	Oct. 11, 2002
Computer	Hewlett Packard	D5251A 888	US74458128	N/A	N/A
Printer	Hewlett Packard	C5886A	SG7CM1P090	N/A	N/A
Monitor	Hewlett Packard	D5258A	DK74889705	N/A	N/A
Loop Antenna	Com-Power	AL-130	17070	May 21, 2001	May 21, 2002
Horn Antenna	Antenna Research	DRG-118/A	1053	Jan. 13, 2002	Jan. 13, 2003
Microwave Preamplifier	Com-Power	PA-122	25195	Jan. 7, 2002	Jan. 7, 2003



## 6. TEST SITE DESCRIPTION

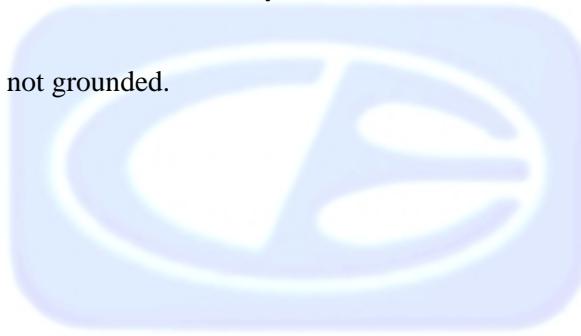
### 6.1 Test Facility Description

Please refer to section 2.1 and 7.1 of this report for EMI test location.

### 6.2 EUT Mounting, Bonding and Grounding

The EUT was mounted on a 1.0 by 1.5 meter non-conductive table 0.8 meters above the ground plane.

The EUT was not grounded.



## 7. TEST PROCEDURES

The following sections describe the test methods and the specifications for the tests. Test results are also included in this section.

### 7.1

#### Radiated Emissions (Spurious and Harmonics) Test

The spectrum analyzer was used as a measuring meter along with the quasi-peak adapter. Amplifiers were used to increase the sensitivity of the instrument. The Com Power Preamplifier Model: PA-102 was used for frequencies from 30 MHz to 1 GHz, and the Com Power Microwave Preamplifier Model: PA-122 was used for frequencies above 1 GHz. The spectrum analyzer was used in the peak detect mode with the "Max Hold" feature activated. In this mode, the spectrum analyzer records the highest measured reading over all the sweeps.

For the peak readings below 1000 MHz that were over the spec limit or within 3 dB of the spec limit, the quasi-peak adapter was used.

For the peak readings above 1000 MHz that were over the spec limit or within 3 dB of the spec limit, the readings were averaged manually by narrowing the video filter down to 10 Hz and slowing the sweep time to keep the amplitude reading calibrated.

The measurement bandwidths and transducers used for the radiated emissions test were:

FREQUENCY RANGE	EFFECTIVE MEASUREMENT BANDWIDTH	TRANSDUCER
9 kHz to 150 kHz	200 Hz	Active Loop Antenna
150 kHz to 30 MHz	9 kHz	Active Loop Antenna
30 MHz to 300 MHz	120 kHz	Biconical Antenna
300 MHz to 1 GHz	120 kHz	Log Periodic Antenna
1 GHz to 9.3 GHz	1 MHz	Horn Antenna

The open field test site of Compatible Electronics, Inc. was used for radiated emission testing. This test site is set up according to ANSI C63.4: 1992. Please see section 6.2 of this report for mounting, bonding and grounding of the EUT. The turntable supporting the EUT is remote controlled using a motor. The turntable permits EUT rotation of 360 degrees in order to maximize emissions. Also, the antenna mast allows height variation of the antenna from 1 meter to 4 meters. Data was collected in the worst case (highest emission) configuration of the EUT. At each reading, the EUT was rotated 360 degrees and the antenna height was varied from 1 to 4 meters (for E field radiated field strength). The gunsight method was used when measuring with the horn antenna in order to ensure accurate results.



**Radiated Emissions (Spurious and Harmonics) Test (con't)**

The presence of ambient signals was verified by turning the EUT off. In case an ambient signal was detected, the measurement bandwidth was reduced temporarily and verification was made that an additional adjacent peak did not exist. This ensures that the ambient signal does not hide any emissions from the EUT. The EUT was tested at a 3 meter test distance to obtain final test data. The final qualification data sheets are located in Appendix D.



## 7.2

### Band Edge Plots of the Low and High Channels

Spectral plots of both the low and high channels were taken of the EUT to show that the emissions at the band edges (902 and 928 MHz) were attenuated by at least 50 dB below the level of the fundamental or to the general radiated emissions limits in FCC Title 47, Subpart C, section 15.209, whichever is the lesser attenuation. A preamplifier was used to boost the signal level at the band edges for easier comparison to the spec limit. The spectral plots are located in Appendix D.



## 8. CONCLUSIONS

The Fleet Management System Model: FMS2000 meets all of the specification limits defined in CFR Title 47, Part 15, Subpart C, sections 15.205, 15.209, and 15.249.



## APPENDIX A

### ***MODIFICATIONS TO THE EUT***



## MODIFICATIONS TO THE EUT

The modifications listed below were made to the EUT to pass FCC 15.249 specifications.

All the rework described below was implemented during the test in a method that could be reproduced in all the units by the manufacturer.

No modifications were made to the EUT during the testing.



## APPENDIX B

***ADDITIONAL MODELS COVERED  
UNDER THIS REPORT***



## **ADDITIONAL MODELS COVERED UNDER THIS REPORT**

USED FOR THE PRIMARY TEST

Fleet Management System  
Model: FMS2000  
S/N: N/A

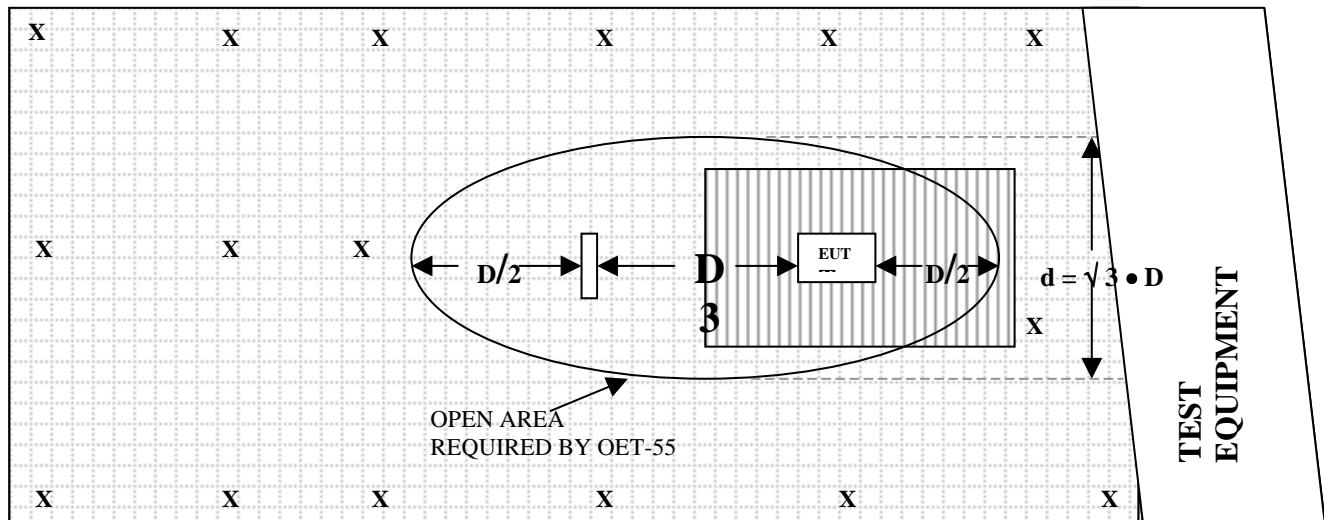
No additional models were covered under this report.



## APPENDIX C

### *DIAGRAMS, CHARTS AND PHOTOS*



**FIGURE 1: PLOT MAP AND LAYOUT OF RADIATED SITE****OPEN LAND > 15 METERS****OPEN LAND > 15 METERS****OPEN LAND > 15 METERS**

	= GROUND RODS		= GROUND SCREEN
	= TEST DISTANCE (meters)		= WOOD COVER



**FRONT VIEW**

AXIOM NAVIGATION, INC.  
FLEET MANAGEMENT SYSTEM  
MODEL: FMS2000  
FCC SUBPART C - RADIATED EMISSIONS – 3-13-02

**PHOTOGRAPH SHOWING THE EUT CONFIGURATION  
FOR MAXIMUM EMISSIONS**



**REAR VIEW**

AXIOM NAVIGATION, INC.  
FLEET MANAGEMENT SYSTEM  
MODEL: FMS2000  
FCC SUBPART C - RADIATED EMISSIONS – 3-13-02

**PHOTOGRAPH SHOWING THE EUT CONFIGURATION  
FOR MAXIMUM EMISSIONS**



COM-POWER AB-100

BICONICAL ANTENNA

S/N: 01548

CALIBRATION DATE: OCTOBER 11, 2001

FREQUENCY (MHz)	FACTOR (dB)	FREQUENCY (MHz)	FACTOR (dB)
30	13.70	120	11.00
35	13.70	125	11.20
40	11.80	140	12.50
45	12.30	150	13.20
50	11.00	160	13.50
60	10.40	175	14.60
70	8.60	180	14.40
80	8.30	200	15.90
90	8.30	250	17.60
100	8.80	300	19.90



COM-POWER AL-100

LOG PERIODIC ANTENNA

S/N: 16089

CALIBRATION DATE: OCTOBER 11, 2001

FREQUENCY (MHz)	FACTOR (dB)	FREQUENCY (MHz)	FACTOR (dB)
300	14.10	700	20.60
400	15.10	800	22.40
500	16.60	900	22.70
600	19.90	1000	26.50



COM-POWER PA-102

PREAMPLIFIER

S/N: 1017

CALIBRATION DATE: DECEMBER 31, 2001

FREQUENCY (MHz)	FACTOR (dB)	FREQUENCY (MHz)	FACTOR (dB)
30	38.5	300	38.5
40	38.5	350	38.4
50	38.5	400	38.2
60	38.5	450	37.8
70	38.5	500	38.0
80	38.5	550	38.2
90	38.3	600	38.2
100	38.3	650	38.0
125	38.6	700	38.1
150	38.5	750	37.7
175	38.4	800	37.4
200	38.5	850	37.9
225	38.5	900	37.2
250	38.4	950	36.8
275	38.4	1000	37.3



COM-POWER PA-122

MICROWAVE PREAMPLIFIER

S/N: 25195

CALIBRATION DATE: JANUARY 7, 2002

FREQUENCY (GHz)	FACTOR (dB)	FREQUENCY (GHz)	FACTOR (dB)
1.0	33.7	9.5	31.8
1.1	33.4	10.0	32.2
1.2	33.1	11.0	31.4
1.3	33.1	12.0	30.2
1.4	33.2	13.0	32.9
1.5	32.5	14.0	33.9
1.6	32.7	15.0	32.4
1.7	32.3	16.0	32.2
1.8	32.3	17.0	31.5
1.9	31.4	18.0	32.2
2.0	32.8	19.0	31.2
2.5	33.3	20.0	31.3
3.0	31.7	21.0	31.7
3.5	31.6	22.0	29.7
4.0	31.2		
4.5	31.2		
5.0	31.0		
5.5	31.3		
6.0	32.1		
6.5	32.1		
7.0	31.8		
7.5	32.0		
8.0	33.1		
8.5	32.0		
9.0	30.8		



## ANTENNA RESEARCH DRG-118/A

## HORN ANTENNA

S/N: 1053

CALIBRATION DATE: JANUARY 13, 2002

FREQUENCY (GHz)	FACTOR (dB)	FREQUENCY (GHz)	FACTOR (dB)
1.0	25.5	9.5	39.1
1.5	26.6	10.0	39.7
2.0	29.4	10.5	40.9
2.5	30.4	11.0	40.7
3.0	31.2	11.5	42.4
3.5	32.3	12.0	42.6
4.0	32.9	12.5	42.4
4.5	33.0	13.0	41.5
5.0	34.8	13.5	41.0
5.5	35.2	14.0	40.5
6.0	36.4	14.5	43.6
6.5	36.6	15.0	43.7
7.0	38.8	15.5	43.3
7.5	38.8	16.0	42.8
8.0	38.0	16.5	43.0
8.5	38.1	17.0	42.7
9.0	39.9	17.5	44.0
		18.0	41.8



## Com-Power Corporation

(949) 587-9800

## Antenna Calibration

Frequency MHz	Magnetic (dB/m)	Electric (dB/m)
0.009	-40.5	11.0
0.01	-40.4	11.1
0.02	-41.4	10.1
0.03	-40.0	11.5
0.04	-40.4	11.1
0.05	-41.7	9.8
0.06	-41.2	10.3
0.07	-41.5	10.0
0.08	-41.8	9.7
0.09	-41.8	9.7
0.1	-41.8	9.7
0.2	-44.0	7.5
0.3	-41.6	9.9
0.4	-41.6	9.9
0.5	-41.6	9.9
0.6	-41.5	10.0
0.7	-41.4	10.1
0.8	-41.3	10.2
0.9	-41.3	10.2
1	-40.9	10.6
2	-40.3	11.2
3	-40.5	11.0
4	-40.8	10.7
5	-40.2	11.3
6	-40.0	11.5
7	-40.4	11.1
8	-40.5	11.0
9	-40.0	11.5
10	-40.7	10.8
12	-41.2	10.3
14	-41.3	10.2
15	-41.3	10.2
16	-41.4	10.1
18	-41.4	10.1
20	-41.4	10.1
25	-41.7	9.8
30	-43.1	8.4

### Separation Distance

1700

**APPENDIX D**

***DATA SHEETS***

***RADIATED EMISSIONS***

***DATA SHEETS***

## RADIATED EMISSIONS (FCC SECTION 15.205 AND 15.247)

COMPANY	AXIOM NAVIGATION, INC.											DATE	3/13/02
EUT	MOBILE UNIT											DUTY CYCLE	N/A
MODEL	FMS2000											PEAK TO AVG	N/A
S/N	N/A											TEST DIST.	3 METERS
TEST ENGINEER	KYLE FUJIMOTO											LAB	D

Frequency MHz	Peak Reading (dBuV)	Average (A) or Quasi- Peak (QP)	Antenna Polar. (V or H)	Antenna Height (meters)	EUT Azimuth (degrees)	EUT Axis (X,Y,Z)	EUT Tx Channel	Antenna Factor (dB)	Cable Loss (dB)	Amplifier Gain (dB)	*Corrected Reading (dBuV/m)	Delta ** (dB)	Spec Limit (dBuV/m)	Comments	
903.3000	63.1	A	H	1.0	180	X	LOW	22.8	5.1	0.0	91.0	-3.0	94.0		
903.3000	62.2	A	V	1.0	180	X	LOW	22.8	5.1	0.0	90.1	-3.9	94.0		
912.3000	60.3	A	H	2.0	270	X	MID	23.2	5.2	0.0	88.7	-5.3	94.0		
912.3000	62.8	A	V	1.0	90	X	MID	23.2	5.2	0.0	91.2	-2.8	94.0		
921.3000	58.2	A	H	1.0	270	X	HIGH	23.5	5.4	0.0	87.1	-6.9	94.0		
921.3000	64.8	64.7	A	V	1.0	180	X	HIGH	23.5	5.4	0.0	93.6	-0.4	94.0	

\* CORRECTED READING = METER READING + ANTENNA FACTOR + CABLE LOSS - AMPLIFIER GAIN

\*\* DELTA = SPEC LIMIT - CORRECTED READING

PAGE 1

## RADIATED EMISSIONS (FCC SECTION 15.205 AND 15.247)

COMPANY	AXIOM NAVIGATION, INC.											DATE	3/13/02
EUT	MOBILE UNIT											DUTY CYCLE	N/A
MODEL	FMS2000											PEAK TO AVG	N/A
S/N	N/A											TEST DIST.	3 METERS
TEST ENGINEER	KYLE FUJIMOTO											LAB	D

Frequency MHz	Peak Reading (dBuV)	Average (A) or Quasi- Peak (QP)	Antenna Polar. (V or H)	Antenna Height (meters)	EUT Azimuth (degrees)	EUT Axis (X,Y,Z)	EUT Tx Channel	Antenna Factor (dB)	Cable Loss (dB)	Amplifier Gain (dB)	*Corrected Reading (dBuV/m)	Delta ** (dB)	Spec Limit (dBuV/m)	Comments
1806.6000	45.9	A	H	1.0	90	X	LOW	28.3	3.4	32.2	45.4	-8.6	54.0	
1806.6000	50.9	A	V	1.0	180	X	LOW	28.3	3.4	32.2	50.4	-3.6	54.0	
1824.6000	46.4	A	H	1.0	180	X	MID	28.4	3.4	32.1	46.2	-7.8	54.0	
1824.6000	49.9	A	V	1.0	0	X	MID	28.4	3.4	32.1	49.7	-4.3	54.0	
1842.6000	46.3	A	H	1.0	180	X	HIGH	28.5	3.4	31.9	46.3	-7.7	54.0	
1842.6000	48.3	A	V	1.0	180	X	HIGH	28.5	3.4	31.9	48.3	-5.7	54.0	

\* CORRECTED READING = METER READING + ANTENNA FACTOR + CABLE LOSS - AMPLIFIER GAIN

\*\* DELTA = SPEC LIMIT - CORRECTED READING

PAGE 2

## RADIATED EMISSIONS (FCC SECTION 15.205 AND 15.247)

COMPANY	AXIOM NAVIGATION, INC.											DATE	3/13/02
EUT	MOBILE UNIT											DUTY CYCLE	N/A
MODEL	FMS2000											PEAK TO AVG	N/A
S/N	N/A											TEST DIST.	3 METERS
TEST ENGINEER	KYLE FUJIMOTO											LAB	D

Frequency MHz	Peak Reading (dBuV)	Average (A) or Quasi- Peak (QP)	Antenna Polar. (V or H)	Antenna Height (meters)	EUT Azimuth (degrees)	EUT Axis (X,Y,Z)	EUT Tx Channel	Antenna Factor (dB)	Cable Loss (dB)	Amplifier Gain (dB)	*Corrected Reading (dBuV/m)	Delta ** (dB)	Spec Limit (dBuV/m)	Comments
2709.9000	46.0	A	H	1.0	180	X	LOW	30.7	3.6	32.6	47.7	-6.3	54.0	
2709.9000	45.2	A	V	1.0	90	X	LOW	30.7	3.6	32.6	46.9	-7.1	54.0	
2736.9000	48.1	A	H	1.0	180	X	MID	30.8	3.6	32.5	49.9	-4.1	54.0	
2736.9000	47.7	A	V	1.0	0	X	MID	30.8	3.6	32.5	49.5	-4.5	54.0	
2763.9000	42.4	A	H	1.0	0	X	HIGH	30.8	3.6	32.5	44.4	-9.6	54.0	
2763.9000	44.0	A	V	1.0	270	X	HIGH	30.8	3.6	32.5	46.0	-8.0	54.0	

\* CORRECTED READING = METER READING + ANTENNA FACTOR + CABLE LOSS - AMPLIFIER GAIN

\*\* DELTA = SPEC LIMIT - CORRECTED READING

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## RADIATED EMISSIONS (FCC SECTION 15.205 AND 15.247)

COMPANY	AXIOM NAVIGATION, INC.											DATE	3/13/02
EUT	MOBILE UNIT											DUTY CYCLE	N/A
MODEL	FMS2000											PEAK TO AVG	N/A
S/N	N/A											TEST DIST.	3 METERS
TEST ENGINEER	KYLE FUJIMOTO											LAB	D

Frequency MHz	Peak Reading (dBuV)	Average (A) or Quasi- Peak (QP)	Antenna Polar. (V or H)	Antenna Height (meters)	EUT Azimuth (degrees)	EUT Axis (X,Y,Z)	EUT Tx Channel	Antenna Factor (dB)	Cable Loss (dB)	Amplifier Gain (dB)	*Corrected Reading (dBuV/m)	Delta ** (dB)	Spec Limit (dBuV/m)	Comments
3613.2000	34.6	A	H	1.0	180	X	LOW	32.4	5.0	31.5	40.6	-13.4	54.0	
3613.2000	37.5	A	V	1.0	180	X	LOW	32.4	5.0	31.5	43.5	-10.5	54.0	
3649.2000	38.1	A	H	1.0	270	X	MID	32.5	5.1	31.5	44.2	-9.8	54.0	
3649.2000	36.5	A	V	1.0	270	X	MID	32.5	5.1	31.5	42.6	-11.4	54.0	
3685.2000	37.3	A	H	1.0	270	X	HIGH	32.5	5.1	31.5	43.4	-10.6	54.0	
3685.2000	34.5	A	V	1.0	180	X	HIGH	32.5	5.1	31.5	40.6	-13.4	54.0	

\* CORRECTED READING = METER READING + ANTENNA FACTOR + CABLE LOSS - AMPLIFIER GAIN

\*\* DELTA = SPEC LIMIT - CORRECTED READING

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## RADIATED EMISSIONS (FCC SECTION 15.205 AND 15.247)

COMPANY	AXIOM NAVIGATION, INC.											DATE	3/13/02
EUT	MOBILE UNIT											DUTY CYCLE	N/A
MODEL	FMS2000											PEAK TO AVG	N/A
S/N	N/A											TEST DIST.	3 METERS
TEST ENGINEER	KYLE FUJIMOTO											LAB	D

Frequency MHz	Peak Reading (dBuV)	Average (A) or Quasi- Peak (QP)	Antenna Polar. (V or H)	Antenna Height (meters)	EUT Azimuth (degrees)	EUT Axis (X,Y,Z)	EUT Tx Channel	Antenna Factor (dB)	Cable Loss (dB)	Amplifier Gain (dB)	*Corrected Reading (dBuV/m)	Delta ** (dB)	Spec Limit (dBuV/m)	Comments
4516.5000	44.5	38.5	A	H	1.0	180	X	LOW	34.1	5.6	31.2	47.0	-7.0	54.0
4516.5000	46.5	43.9	A	V	1.0	180	X	LOW	34.1	5.6	31.2	52.4	-1.6	54.0
4561.5000	37.2		A	H	1.0	270	X	MID	34.2	5.6	31.2	45.8	-8.2	54.0
4561.5000	41.9		A	V	1.0	180	X	MID	34.2	5.6	31.2	50.5	-3.5	54.0
4606.5000	44.0	31.6	A	H	1.0	180	X	HIGH	34.4	5.6	31.2	40.4	-13.6	54.0
4606.5000	44.5	40.0	A	V	1.0	180	X	HIGH	34.4	5.6	31.2	48.8	-5.2	54.0

\* CORRECTED READING = METER READING + ANTENNA FACTOR + CABLE LOSS - AMPLIFIER GAIN

\*\* DELTA = SPEC LIMIT - CORRECTED READING

No Harmonics nor Emissions found after the 5th  
Harmonic for the EUT

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Test location: Compatible Electronics  
 Customer : AXIOM NAVIGATION, INC. Date : 3/13/2002  
 Manufacturer : AXIOM NAVIGATION, INC. Time : 15.13  
 EUT name : MOBILE UNIT Model: FMS2000  
 Specification: Fcc\_B Test distance: 3.0 mtrs Lab: D  
 Distance correction factor(20\*log(test/spec)) : 0.00  
 Test Mode :  
 SPURIOUS EMISSIONS 30 MHz TO 9300 MHz  
 TEMPERATURE 70 DEGREES F., RELATIVE HUMIDITY 15%  
 TESTED BY: KYLE FUJIMOTO

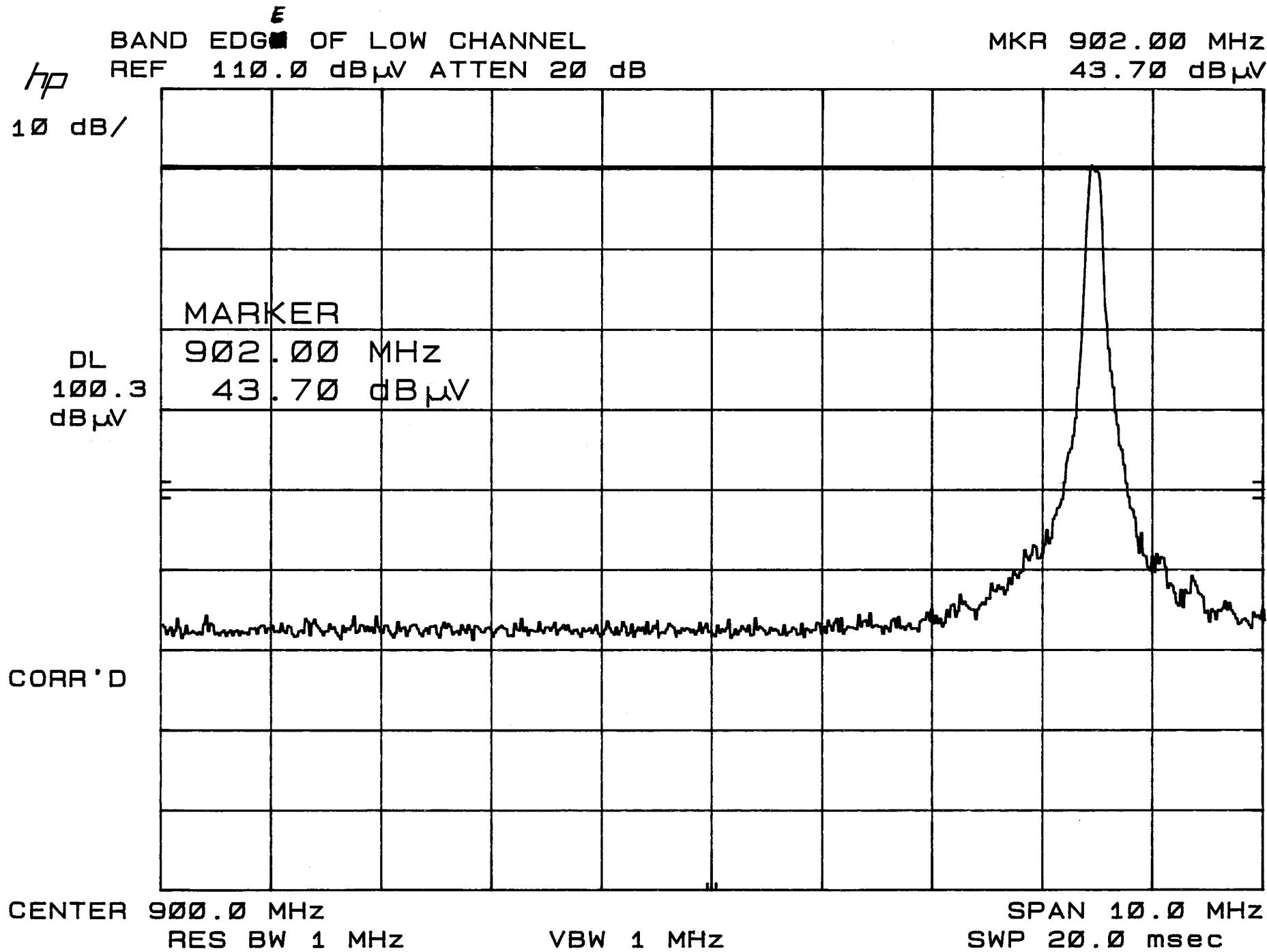
Pol	Freq	Rdng	Cable	Ant	Amp	Cor'd	limit	Delta
			loss	factor	gain	rdg = R	= L	R-L
	MHz	dBuV	dB	dB	dB	dBuV	dBuV/m	dB
<b>HORIZONTAL POLARIZATION</b>								
1H	36.91	51.70	0.84	12.97	38.50	27.01	40.00	-12.99
2H	135.63	46.30	1.89	12.12	38.56	21.75	43.50	-21.75
3H	153.09	49.60	2.04	13.29	38.49	26.44	43.50	-17.06
4H	343.81	43.40	3.38	14.54	38.41	22.90	46.00	-23.10
5H	343.85	45.50	3.38	14.54	38.41	25.00	46.00	-21.00
6H	392.91	51.80	3.66	15.03	38.23	32.26	46.00	-13.74
7H	442.03	53.00	3.87	15.73	37.86	34.73	46.00	-11.27
8H	491.13	55.00	4.06	16.47	37.96	37.57	46.00	-8.43
<b>VERTICAL POLARIZATION</b>								
9V	114.59	56.20	1.72	10.41	38.48	29.85	43.50	-13.65
10V	336.13	44.80	3.34	14.46	38.43	24.18	46.00	-21.82
11V	400.14	42.50	3.70	15.10	38.20	23.10	46.00	-22.90
12V	495.78	41.30	4.08	16.54	37.98	23.94	46.00	-22.06

Test location: Compatible Electronics  
Customer : AXIOM NAVIGATION, INC. Date : 3/13/2002  
Manufacturer : AXIOM NAVIGATION, INC. Time : 16.21  
EUT name : MOBILE UNIT Model: FMS2000  
Specification: Fcc\_B Test distance: 3.0 mtrs Lab: D  
Distance correction factor( $20 \log(\text{test/spec})$ ) : 0.00  
Test Mode :  
SPURIOUS EMISSIONS 10 kHz to 30 MHz  
TEMPERATURE 67 DEGREES F., RELATIVE HUMIDITY 27%  
TESTED BY: KYLE FUJIMOTO

NO SPURIOUS EMISSIONS FOUND FOR THE EUT IN EITHER THE VERTICAL OR  
HORIZONTAL POLARIZATION

***BAND EDGE***

***DATA SHEETS***



BAND EDGE OF HIGH CHANNEL  
REF 110.0 dB $\mu$ V ATTEN 20 dB

MKR 929.02 MHz  
42.00 dB $\mu$ V

hp

10 dB/

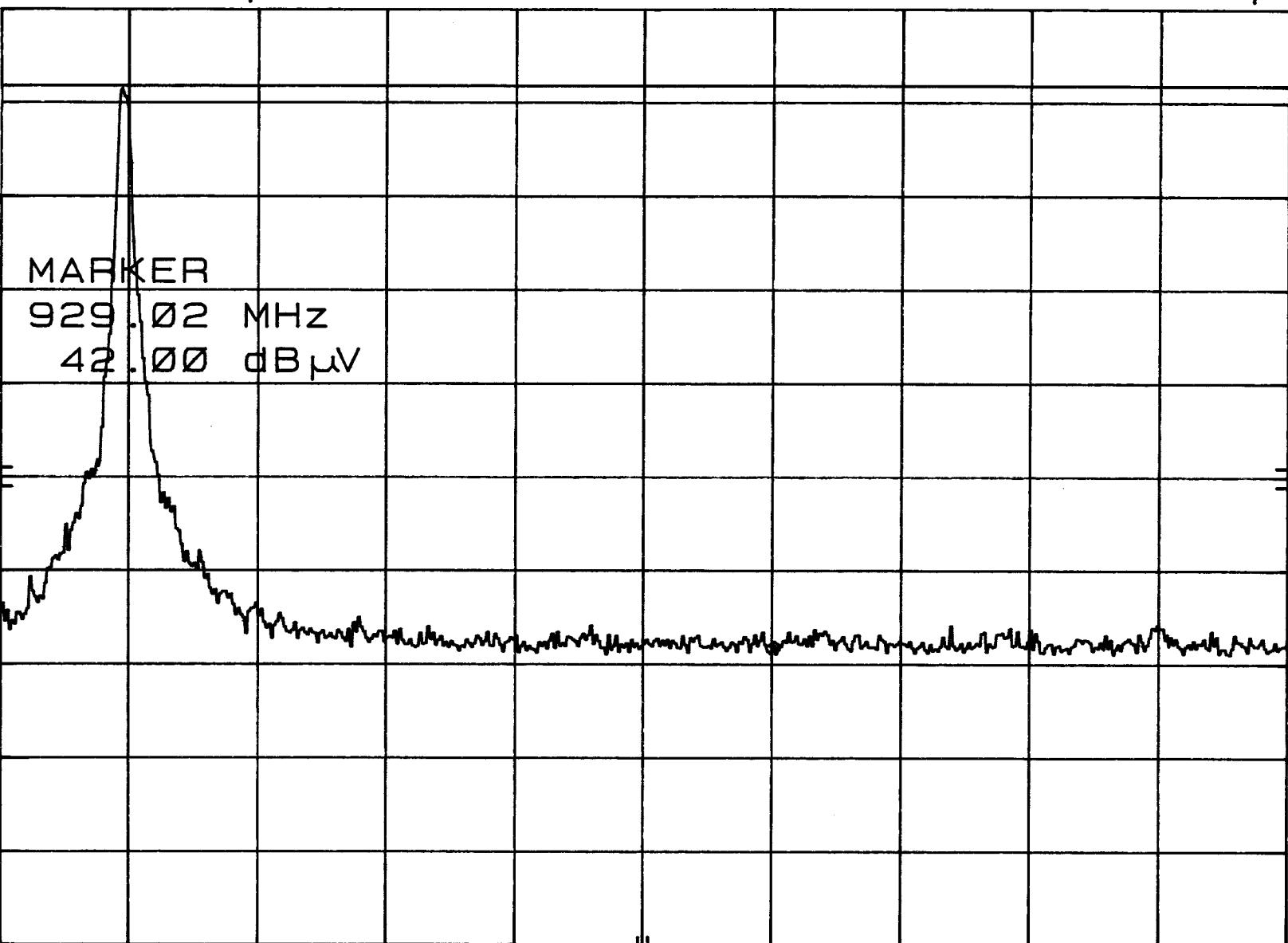
DL  
101.8  
dB $\mu$ V

CORR'D

START 920.0 MHz  
RES BW 1 MHz

VBW 1 MHz

STOP 935.0 MHz  
SWP 20.0 msec



**APPENDIX E**

***LABORATORY RECOGNITIONS***

## ***LABORATORY RECOGNITIONS***

**Compatible Electronics has the following agency accreditations:**

National Voluntary Laboratory Accreditation Program - Lab Code: 200063-0

Voluntary Control Council for Interference - Registration Numbers: R-983, C-1026, R-984 and C-1027

Bureau of Standards and Metrology Inspection - Reference Number: SL2-IN-E-1031

**Compatible Electronics is recognized or on file with the following agencies:**

Federal Communications Commission

Industry Canada

Radio-Frequency Technologies (Competent Body)

Technology International (Europe) Ltd.