

FCC Test report Test report no.: EMC_624FCC-25_2004_SAT

FCC Part 25 / RSS 170 Model: MBS1000-2 FCC ID: P5IMBS2A IC ID: 1478A-MBS2A







FCC listed # 101450

IC recognized # 3925

CETECOM Inc.

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CETECOM

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1	General information

1.1 Notes

The test results of this test report relate exclusively to the test item specified in 1.5. The CETECOM Inc. does not assume responsibility for any conclusions and generalisations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of the CETECOM Inc.

TEST REPORT PREPARED BY: EMC Engineer: Harpreet Sidhu

1.2 **Testing laboratory**

CETECOM Inc. 411 Dixon Landing Road, Milpitas, CA-95035, USA Phone: +1 408 586 6200 Fax: +1 408 586 6299 E-mail: lothar.schmidt@cetecomusa.com Internet: www.cetecom.com

1.3

1.4

1.5

Number of channels

Extreme temp. Tolerance :

Test standards:

Antenna

1.6

Power supply

Output power

:

:

:

5666

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1.3 Details of app	olicant	
Name	:	Wireless Matrix Corporation
Street	:	12369-B Sunrise Valley Drive
City / Zip Code	:	Reston, VA 20164
Country	:	USA
Contact	:	Darryl Strucko
Telephone	:	703 262 4021
Tele-fax	:	703 262 3085
e-mail	:	darryl.strucko@wrx-us.com
1.4 Application detai	ls	
Date of receipt test item	:	2004-03-01
Date of test	:	2004-03-01/02/03
1.5 Test item		
Manufacturer	:	Applicant
Marketing Name	:	Mobile Base Station 2
Model No.	:	MBS1000-2
Description	:	Mobile base station with GSM 850/1900, WLAN 802.11
		Satellite Transmitters.
FCC-ID	:	P5IMBS2A
IC-ID	:	1478A-MBS2A
Additional information		
Frequency	:	Tx 1626.5MHz – 1660.5MHz
		Rx 1525MHz – 1559MHz
Type of modulation	:	QPSK

Note: All radiated measurements were made in all three orthogonal planes. The values reported are the maximum values.

Cross Dipole for Satellite

13.6VDC Nominal voltage

Lower: -20°C Upper: +60°C

34.47dBm (2.8W) max. EIRP measured

FCC Part 25 / CANADA RSS-170



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2 Technical test

2.1 Summary of test results

No deviations from the technical specification(s) were Performed	e ascertained in the course of the tests
Final Verdict: (only "passed" if all single measurements are "passed")	Passed

Technical responsibility for area of testing:

2004-03-12	EMC & Radio	Lothar Schmidt (Technical Manager)	ldunich
Date	Section	Name	Signature

Responsible for test report and project leader:

2004-03-12 EMC & Radio Harpreet Sidhu (EMC Engineer)

Date

Section

Name

Signature



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2.2 Test report

TEST REPORT

Test report no.: EMC_624FCC-25_2004_SAT (Model: MBS1000-2)



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TEST REPORT REFERENCE

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ANNEX-2: GLONASS BAND NOISE AND SPURIOUS TESTS

ANNEX-3: MODULATION CHARACTERISTIC

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POWER OUTPUT

Summary:

During the process of testing, the EUT was controlled via HyperTerminal.

This paragraph contains peak conducted output power and EIRP measurements for the EUT. In all cases, output power is within the specified limits.

Method of Measurements:

The EUT was set up for the max. Output power with pseudo-random data modulation. The power was measured with R&S Spectrum Analyzer ESIB 40 (peak) These measurements were done at 3 frequencies, 1626.5 MHz, 1643.5 MHz and 1660.5 MHz (bottom, middle and top of operational frequency range) **Power measurements were done as per RSS170, 6.2**

Limit:

40dBW EIRP as per FCC 25.204

Conducted:

Frequency (MHz)	Conducted Peak Power (dBm)
1626.5	34.12
1643.5	34.32
1660.5	34.33

Radiated:

EIRP Measurements

Frequency	EIRP
(MHz)	(dBm)
1626.5	34.47
1643.5	34.17
1660.5	34.43

ANALYZER SETTINGS: RBW = VBW = 3MHz



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§ 25.204



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Conducted Peak Power Lowest Channel: 1626.5MHz







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Conducted Peak Power Mid Channel: 1643.5MHz







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Conducted Peak Power Highest Channel: 1660.5MHz







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EIRP

Lowest Channel: 1626.5MHz

SWEEP TABLE: "EIRP SAT CH-LOW"

Start	Stop	Detector	Meas.	RBW/VBW
Frequency	Frequency		Time	
1.6215 GHz	1.6315 GHz	Max Peak	Coupled	3 MHz





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EIRP Mid Channel: 1643.5MHz

SWEEP TABLE: "EIRP SAT CH-MID"

Start	Stop	Detector	Meas.	RBW/VBW
Frequency	Frequency		Time	
1.6385 GHz	1.6485 GHz	Max Peak	Coupled	3 MHz





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EIRP Highest Channel: 1660.5MHz

SWEEP TABLE: "EIRP SAT CH-HIGH"

Start	Stop	Detector	Meas.	RBW/VBW
Frequency	Frequency		Time	
1.6555 GHz	1.6655 GHz	Max Peak	Coupled	3 MHz





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FREQUENCY STABILITY

§ 25.202 (e)

Frequency Stability measurements were performed by Wireless Matrix. See under Appendix-1 to this test report.



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OCCUPIED BANDWIDTH

§2.1049

Occupied Bandwidth Results

Table below lists the measured -20dBc BW (99%). Spectrum analyzer plots are included on the following pages.

Frequency	Occupied Bandwidth (-20dBc BW)
	kHz
1626.5	5.09
1643.5	5.15
1660.5	5.25



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Lowest Channel: 1626.5MHz Occupied Bandwidth (-20dBc BW)





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Mid Channel: 1643.5MHz Occupied Bandwidth (-20dBc BW)





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Highest Channel: 1660.5MHz Occupied Bandwidth (-20dBc BW)



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EMISSIONS LIMITS

§25.202(f)

Measurement Procedure:

The following steps outline the procedure used to measure the radiated emissions from the EUT. The site is constructed in accordance with ANSI C63.4 – 1992 requirements and is recognised by the FCC. The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment, which is the transmitted carrier that can be as high as 1660.5 MHz. The resolution bandwidth is set as outlined in Part 25. The spectrum was scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels.

The final Radiated emission test procedure is as follows:

a) The test item was placed on a 0.8 meter high non-conductive stand at a 3 meter test distance from the receive antenna.

b) A double-ridged wave-guide antenna was placed on an adjustable height antenna mast 3 meters from the test item for emission measurements.

c) Detected emissions were maximized at each frequency by rotating the test item and adjusting the receive antenna height and polarization. The maximum meter reading was recorded. The radiated emission measurements of all non-harmonic and harmonics of the transmit frequency through the 10th harmonic were measured with peak detector and 1MHz bandwidth. If the harmonic could not be detected above the noise floor, the ambient level was recorded.

Channel Frequency

Low	1626.5 MHz
Mid	1643.5 MHz
High	1660.5 MHz

Measurement Limit:

Sec. 25.202(f) Emission Limits.



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Measurement Results:

NOTE: The spurious emissions were done with different settings, using the relevant pre-amplifiers for the relevant frequency ranges. This is the reason that the graphs show different noise levels. In the range between 3GHz and 18 GHz very short cable connections to the antenna was used to minimize the noise level.

RESULTS OF RADIATED TESTS FOR FCC-25:

Harmonic	Tx Freq.: 1626.5(MHz)	Level (dBm)	Tx Freq.: 1643.5(MHz)	Level (dBm)	Tx Freq.: 1660.5(MHz)	Level (dBm)
2	3253	-33.18	3287	-35.59	3321	-38.56
3	4879.5	-43.86	4930.5	-48.55	4981.5	nf
4	6506	-31.46	6574	-41.37	6642	nf
5	8132.5	nf	8217.5	-46.63	8302.5	-47.08
6	9759	nf	9861	nf	9963	nf
7	11385.5	nf	11504.5	nf	11623.5	nf
8	13012	nf	13148	nf	13284	nf
9	14638.5	nf	14791.5	nf	13944.5	nf
10	16265	nf	16435	nf	16605	nf

nf: noise floor



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RADIATED SPURIOUS EMISSIONS

Lowest Channel (1626.5MHz):30MHz - 1GHz

Spurious emission limit –13dBm

Antenna: vertical

Note: This plot is valid for low, mid & high channels (worst-case plot).

SWEEP TABLE: "FCC 25 Spur 30M-1G"

Start	Stop	Detector	Meas.	RBW/VBW
Frequency	Frequency		Time	
30MHz	1GHz	Max Peak	Coupled	1 MHz





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RADIATED SPURIOUS EMISSIONS

Lowest Channel (1626.5MHz):30MHz - 1GHz

Spurious emission limit –13dBm

Antenna: horizontal

Note: This plot is valid for low, mid & high channels (worst-case plot).

SWEEP TABLE: "FCC 25 Spur 30M-1G"

Start	Stop	Detector	Meas.	RBW/VBW
Frequency	Frequency		Time	
30MHz	1GHz	Max Peak	Coupled	1 MHz





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RADIATED SPURIOUS EMISSIONS Lowest Channel (1626.5MHz):1GHz - 3GHz

Spurious emission limit -13dBm

NOTE: peak above the limit line is the Carrier frequency @ low channel

SWEEP TABLE: "FCC Spuri 1-3G"

Start	Stop	Detector	Meas.	RBW/VBW
Frequency	Frequency		Time	
1GHz	3GHz	Max Peak	Coupled	1 MHz





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RADIATED SPURIOUS EMISSIONS Lowest Channel (1626.5MHz):3GHz - 18GHz

Spurious emission limit -13dBm

SWEEP TABLE: "FCC Spuri 3-18G"

Start	Stop	Detector	Meas.	RBW/VBW
Frequency	Frequency		Time	
3GHz	18GHz	Max Peak	Coupled	1 MHz





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RADIATED SPURIOUS EMISSIONS Mid Channel (1643.5MHz):1GHz - 3GHz

Spurious emission limit –13dBm

NOTE: peak above the limit line is the Carrier frequency @ mid channel

SWEEP TABLE: "FCC Spuri 1-3G"

Start	Stop	Detector	Meas.	RBW/VBW
Frequency	Frequency		Time	
1GHz	3GHz	Max Peak	Coupled	1 MHz





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RADIATED SPURIOUS EMISSIONS Mid Channel (1643.5MHz):3GHz - 18GHz

Spurious emission limit –13dBm

SWEEP TABLE: "FCC Spuri 3-18G"

Start	Stop	Detector	Meas.	RBW/VBW
Frequency	Frequency		Time	
3GHz	18GHz	Max Peak	Coupled	1 MHz





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RADIATED SPURIOUS EMISSIONS Highest Channel (1660.5MHz):1GHz - 3GHz

Spurious emission limit –13dBm

NOTE: marked peak above the limit line is the Carrier frequency @ high channel

SWEEP TABLE: "FCC Spuri 1-3G"

Start	Stop	Detector	Meas.	RBW/VBW
Frequency	Frequency		Time	
1GHz	3GHz	Max Peak	Coupled	1 MHz





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RADIATED SPURIOUS EMISSIONS Highest Channel (1660.5MHz):3GHz - 18GHz

Spurious emission limit –13dBm

SWEEP TABLE: "FCC Spuri 3-18G"

Start	Stop	Detector	Meas.	RBW/VBW
Frequency	Frequency		Time	
3GHz	18GHz	Max Peak	Coupled	1 MHz





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RADIA' EUT in Spurious of Antenna SWEEP T Start Frequency 30MHz	TED SI Idle Me emission a: verti <i>TABLE:</i> <i>Stop</i> <i>Freq</i> 1GH	PURIC ode: 3 1 limit - cal "FCC 2 uency z	OUS 0MH -13dB 25 Spu Dete Max	EMI r 30M <i>r 30M</i> <i>ctor</i> Peak	SSI(GH2 -1G' M T C	DNS Z Jeas Jime Joup	S led	<i>RBW/</i> 1 MH	VBW z									_
Leve	l [dBm]																	
10																	_	
0 -																	_	_
-10 –																		
_																		
-20															he e la strade	. Maskel	white	/h.h.h.
								m	~~~				1. Martin	mount	in Merela an	1997 - 1997 		
-30 -					\sim	/				- A - A - Mark	MM	mm	wWN ^C				-	_
				\nearrow														
-40																		
-50																		
3	0M	50N	Л	70M		100	M		200	M	300	М	500	M	700	М	1	G

Frequency [Hz]

30M

50M

70M

100M

Frequency [Hz]



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200M

300M

500M

700M

1G



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RADIATED SPURIOUS EMISSIONS EUT in Idle Mode: 1GHz – 3GHz

Spurious emission limit –13dBm

SWEEP TABLE: "FCC Spuri 1-3G"

Start	Stop	Detector	Meas.	RBW/VBW
Frequency	Frequency		Time	
1GHz	3GHz	Max Peak	Coupled	1 MHz





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RADIATED SPURIOUS EMISSIONS EUT in Idle Mode: 3GHz – 18GHz

Spurious emission limit –13dBm

SWEEP TABLE: "FCC spuri 3-18G"

Start	Stop	Detector	Meas.	RBW/VBW
Frequency	Frequency		Time	
3GHz	18GHz	Max Peak	Coupled	1 MHz





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EMISSION MASK (Conducted)

§25.202 (f)

Emission mask table based on 25.202(f)

Frequency offset from centre freq (kHz)	Mean power of emissions below the mean output		
	power of transmitter		
0 to 3kHz	0 dBc		
3kHz to 9kHz	-25 dBc in any 4kHz		
9kHz to 15kHz	-35 dBc in any 4kHz		
> 15kHz	-43 dBW in any 4kHz		

Analyzer settings: RBW = VBW = 4 kHz



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EMISSION MASK Lowest Channel (1626.5MHz) (Conducted)





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EMISSION MASK Mid Channel (1643.5MHz) (Conducted)





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EMISSION MASK Highest Channel (1660.5MHz) (Conducted)





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RECEIVER RADIATED EMISSIONS

§ 15.209

NOTE: The radiated emissions were done with different settings, using the relevant pre-amplifiers for the relevant frequency ranges. This is the reason that the graphs show different noise levels. In the range between 3GHz and 18GHz very short cable connections to the antenna was used to minimize the noise level.

Limits		SUBCLAUSE § 15.209
Frequency (MHz)	Field strength (µV/m)	Measurement distance (m)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3



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RECEIVER RADIATED EMISSIONS						
EUT in R	EUT in Rx Mode: 30MHz – 1GHz					
Antenna: vertical						
Note: This plot is valid for both polarities (worst-case plot)						
SWEEP TABLE: "FCC 15 Spur 30M-1G"						
Start	Stop	Detector	Meas.	RBW/VBW		
Frequency	Frequency		Time			
30MHz	1GHz	Max Peak	Coupled	100KHz		
Sweep IA Start Frequency 30MHz	Stop Frequency 1GHz	Detector Max Peak	Meas. Time Coupled	<i>RBW/VBW</i> 100KHz		





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RECEIVER RADIATED EMISSIONS EUT in Rx Mode: 1GHz – 3GHz

SWEEP TABLE: "FCC 15 Spuri 1-3G"

Start	Stop	Detector	Meas.	RBW/VBW
Frequency	Frequency		Time	
1GHz	3GHz	Max Peak	Coupled	1 MHz





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RECEIVER RADIATED EMISSIONS EUT in Rx Mode: 3GHz – 18GHz

SWEEP TABLE: "FCC 15 spuri 3-18G"

Start	Stop	Detector	Meas.	RBW/VBW
Frequency	Frequency		Time	
3GHz	18GHz	Max Peak	Coupled	1 MHz





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CONDUCTED SPURIOUS EMISSIONS

Measurement Procedure:

The following steps outline the procedure used to measure the conducted emissions from the EUT.

1. Determine frequency range for measurements: From CFR 2.1057 the spectrum should be investigated from the lowest radio frequency generated in the equipment up to at least the 10th harmonic of the carrier frequency.

For the equipment under test, this equates to a frequency range of 30 MHz to 16.065 GHz, data taken from 30 MHz to 18 GHz.

2. Determine EUT transmit frequencies: below outlines the band edge frequencies pertinent to conducted emissions testing.

Channel	Frequency
Low	1626.5 MHz
Mid	1643.5 MHz
High	1660.5 MHz

Measurement Limit:

Sec. 25.202(f) Emission Limits.

Test data

See plots on next pages



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CONDUCTED SPURIOUS EMISSIONS Lowest Channel (1626.5MHz):30MHz - 18GHz

Spurious emission limit -13dBm

NOTE: peak above the limit line is the carrier frequency.





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CONDUCTED SPURIOUS EMISSIONS Mid Channel (1643.5MHz):30MHz - 18GHz

Spurious emission limit –13dBm

NOTE: peak above the limit line is the carrier frequency.





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CONDUCTED SPURIOUS EMISSIONS Highest Channel (1660.5MHz):30MHz - 18GHz

Spurious emission limit –13dBm

NOTE: peak above the limit line is the carrier frequency.





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CONDUCTED EMISSIONS This measurement is not applicable for EUT § 15.107/207



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TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS

No	Instrument/Ancillary	Туре	Manufacturer	Serial No.
01	Spectrum Analyzer	ESIB 40	Rohde & Schwarz	100107
02	Spectrum Analyzer	FSEM 30	Rohde & Schwarz	826880/010
03	Signal Generator	SMY02	Rohde & Schwarz	836878/011
04	Power-Meter	NRVD	Rohde & Schwarz	0857.8008.02
05	Biconilog Antenna	3141	EMCO	0005-1186
06	Horn Antenna (1-18GHz)	SAS-200/571	AH Systems	325
07	Horn Antenna (18-26.5GHz)	3160-09	EMCO	1240
08	Power Splitter	11667B	Hewlett Packard	645348
09	Climatic Chamber	VT4004	Voltsch	G1115
10	High Pass Filter	5HC2700	Trilithic Inc.	9926013
11	High Pass Filter	4HC1600	Trilithic Inc.	9922307
12	Pre-Amplifier	JS4-00102600	Miteq	00616
13	Power Sensor	URV5-Z2	Rohde & Schwarz	DE30807
14	Digital Radio Comm. Tester	CMD-55	Rohde & Schwarz	847958/008
15	Universal Radio Comm. Tester	CMU 200	Rohde & Schwarz	832221/06



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BLOCK DIAGRAMS Conducted Testing





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Radiated Testing



ANECHOIC CHAMBER

Spectrum Analyzer