Cert. No. 1152.01
Electrical (EMC)

DATE: 27 January 2008

I.T.L. (PRODUCT TESTING) LTD.

FCC EMC/Radio Test Report

for

Mobile Access Networks

Equipment under test:

MobileAccess 1500 System

1. 1500-UHF-BU-2 2. 1500-UHF-RU

Written by: _____

D. Shidlowsky, Documentation

Approved by: _____

E. Pitt, Test Engineer

Approved by: _____

I. Raz, EMC Laboratory Manager

Cert. No. 1152.01
Electrical (EMC)

Measurement/Technical Report for

Mobile Access Networks

MobileAccess 1500 System

1. 1500-UHF-BU-2 2. 1500-UHF-RU

FCC ID:OJFMA1500UHF

27 January 2008

This report concerns: Original Grant X Class II change:

Class B verification ___ Class A verification_____Class I change

Equipment type: Licensed Non-Broadcast Station Transmitter

Request Issue of Grant:
__**x**__Immediately upon completion of review

Limits used:
CISPR 22 _____ Parts 2; 15, 90 __x__

Measurement procedure used is ANSI C63.4-2003.
Substitution Method used as in ANSI/TIA-603-B: 2002

Application for Certification prepared by:

Ishaishou Raz
ITL (Product Testing) Ltd.
Kfar Bin Nun
D.N. Shimshon 99780
Israel
e-mail Sraz@itl.co.il

Applicant for this device: (different from "prepared by")

Steve Blum
Mobile Access Networks
8391 Old Courthouse Rd., Suite #300
Vienna, VA. 22182
U.S.A.
Tel: +1-541-758-2880
Fax: +1-703-848-0260
e-mail: sblum@mobileaccess.com

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1. General Information

1.1 Administrative Information

Manufacturer:	Mobile Access Networks
Manufacturer's Address:	8391 Old Courthouse Rd. Suite #300 Vienna, VA 22182 U.S.A. Tel: +1-541-758-2880 Fax: +1-703-848-0260
Manufacturer's Representative:	Steve Blum
Equipment Under Test (E.U.T):	MobileAccess 1500 System
Equipment Model No.:	1. 1500-UHF-BU-2 2. 1500-UHF-RU
Equipment Serial No.:	1. 0701931 2. 0730158
Date of Receipt of E.U.T:	13.11.07
Start of Test:	13.11.07
End of Test:	15.11.07
Test Laboratory Location:	I.T.L (Product Testing) Ltd. Kfar Bin Nun, ISRAEL 99780
Test Specifications:	FCC Part 90 Sub-part I, S FCC Part 15 Sub-part B

UnWiring the Workplace

Date 01/28/2008

DECLARATION

I hereby declare that the MobileAccess 1500 System tested at the I.T.L. EMC laboratory between 13 – 11 November 2007 is comprised of two model units:

1500-UHF-BU-2
1500-UHF-RU

I HEREBY DECLARE THAT THE FOLLOWING PRODUCTS:

1. 1500-UHF-BU-2
2. 1500-UHF-RU

ARE IDENTICAL ELECTRONICALLY, PHYSICALLY, AND MECHANICALLY RESPECTIVELY TO:

1. 330-450MB-2
2. 330-450-RB-1

Please relate to them all (from an EMC point of view) as the same product.

Thank you,

Leonid Pakman
Director, Verification of Development, R&D
MobileAccess Networks

Ofek One Center Building No.2 Northern Industrial Zone LOD 71293
Tel 972-8-9183-833 Fax 972-8-9183-844

mobileaccess

UnWiring the Workplace

January 2, 2008

DECLARATION

I HEREBY DECLARE THAT

1500-UHF-BU-2
IS A FULL CONFIGURATION MODEL.

OTHER MODELS WHICH INCLUDE
1500-UHF-BU-1
DIFFER FROM THE 1500-UHF-BU-2 ONLY BY SOFTWARE AND/OR EXTRACTED COMPONENTS/ASSEMBLIES.

Please relate to them all (from an EMC point of view) as the same product.

Thank you,

Leonid Pakman
Director, Verification of Development, R&D
MobileAccess Networks

Wired: +972.8.918.3879
Unwired: +972.52.573.9814

Making Wireless an Indoor State of Mind

Ofek One Center Building No.2 Northern Industrial Zone LOD 71293
Tel 972-8-9183-833 Fax 972-8-9183-844

1.2 List of Accreditations

The EMC laboratory of I.T.L. is accredited by the following bodies:

1. The American Association for Laboratory Accreditation (A2LA) (U.S.A.), Certificate No. 1152.01.
2. The Federal Communications Commission (FCC) (U.S.A.), Registration No. 90715.
3. The Israel Ministry of the Environment (Israel), Registration No. 1104/01.
4. The Voluntary Control Council for Interference by Information Technology Equipment (VCCI) (Japan), Registration Numbers: C-1350, R-1285.
5. Industry Canada (Canada), File No. IC 4025.
6. TUV Product Services, England, ASLLAS No. 97201.
7. Nemko (Norway), Authorization No. ELA 207.

I.T.L. Product Testing Ltd. is accredited by the American Association for Laboratory Accreditation (A2LA) and the results shown in this test report have been determined in accordance with I.T.L.'s terms of accreditation unless stated otherwise in the report.

1.3 Product Description

MA 1500 provides a cost effective solution for extending 450 MHz signal from a single BTS location to remote locations, up to 20 Km away, over SM F/O connections.

Simplex RF inputs and outputs support a wide variety of channel assignments, while maintaining the service integrity via highly linear amplifiers. Intuitive GUI software enables end-to-end setup and adjustment of the coverage to minimize interaction with outdoor signals.

The system can support two independent links, where each link can support:

• A different service

• A sector – where two links are required for two sectors of the same service

The MA-1500 system is based on the following elements:

• 1500-UHF-BU – A 1500-UHF-BU unit is installed, adjacent to the BTS location. It performs the RF to optic signal conversion at the BTS side and transmits the services to the remote location(s) where 1500-UHF-RU units are installed.

• 1500-UHF-RU – A 1500-UHF-RU is installed at each remote location. This unit reconverts the signals received over the optic fiber to RF and distributes the services to the connected antennas.

• MA-1500 GUI Tool – Intuitive GUI used for setting up, adjusting and monitoring the MA 1500 system.

1.4 Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4: 2003. Radiated testing was performed at an antenna to EUT distance of 3 meters.

1.5 Test Facility

The radiated emissions tests were performed at I.T.L.'s testing facility at Kfar Bin-Nun, Israel. This site is a FCC listed test laboratory (FCC Registration No. 90715, date of listing August 22, 2006).
I.T.L.'s EMC Laboratory is also accredited by A2LA, certificate No. 1152.01.

1.6 Measurement Uncertainty

Radiated Emission

The Open Site complies with the ±4 dB Normalized Site Attenuation requirements of ANSI C63.4-2003. In accordance with Paragraph 5.4.6.1 of this standard, this tolerance includes instrumentation calibration errors, measurement technique errors, and errors due to site anomalies.

2. Product Labeling

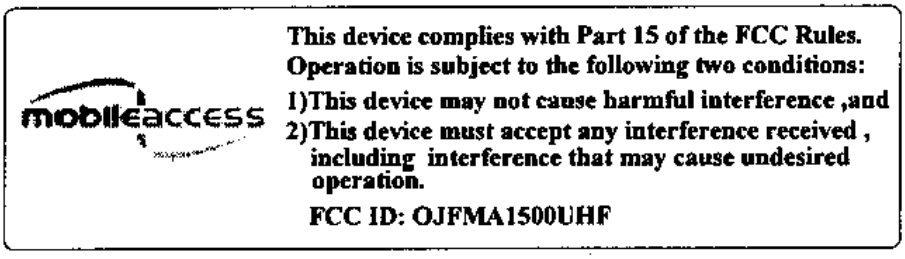


Figure 1. FCC Label

Figure 2. Label Location on the 1500-UHF-BU-2

Figure 3. Label Location on the 1500-UHF-RU

3. System Test Configuration

3.1 Justification

This RF-Optic fiber-RF based system was configured to its maximum output power, and the longest applicable fiber cable was used. All of these conclude to the worst case mode of the parameters under test.

3.2 EUT Exercise Software

MA330_Rel_1_1.cfg embedded software was used.

3.3 Special Accessories

No special accessories were needed in order to achieve compliance.

3.4 Equipment Modifications

No modifications were needed in order to achieve compliance.

3.5 Configuration of Tested System

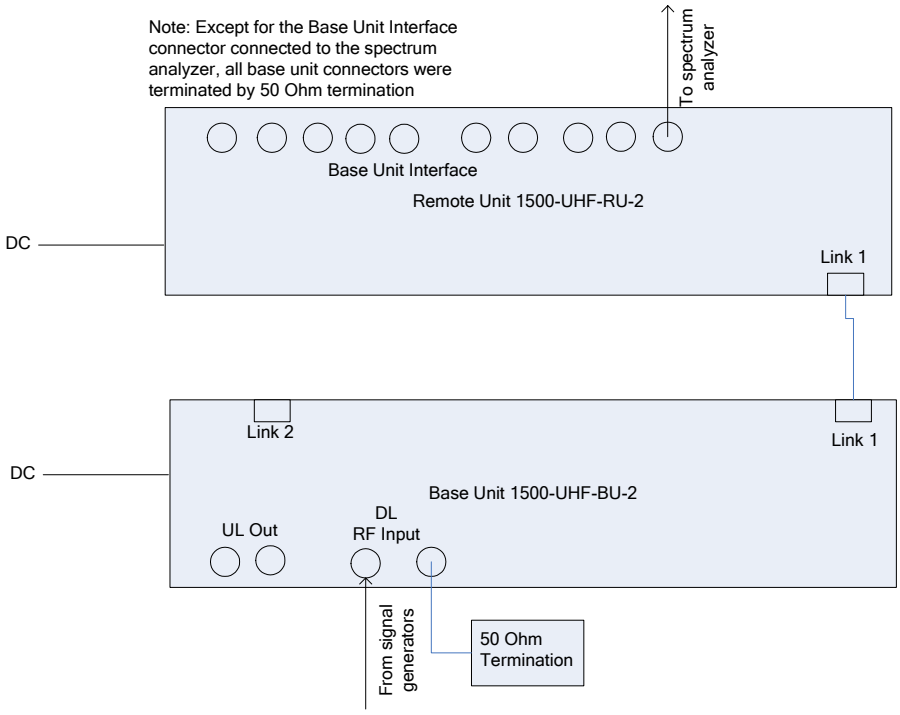


Figure 4. Tests Set-up

4. Block Diagram

4.1 Schematic Block/Connection Diagram

Withheld for reasons of confidentiality.

4.2 Theory of Operation

MA 1500 provides a cost effective solution for extending 450 MHz signal from a single BTS location to remote locations, up to 20 Km away, over SM F/O connections.

Simplex RF inputs and outputs support a wide variety of channel assignments, while maintaining the service integrity via highly linear amplifiers. Intuitive GUI software enables end-to-end setup and adjustment of the coverage to minimize interaction with outdoor signals.

The MA-1500 system is based on the following elements:

1500-UHF-BU – A 1500-UHF-BU unit is installed, adjacent to the BTS location. It performs the RF to optic signal conversion at the BTS side and transmits the services to the remote location(s) where 1500-UHF-RU units are installed.

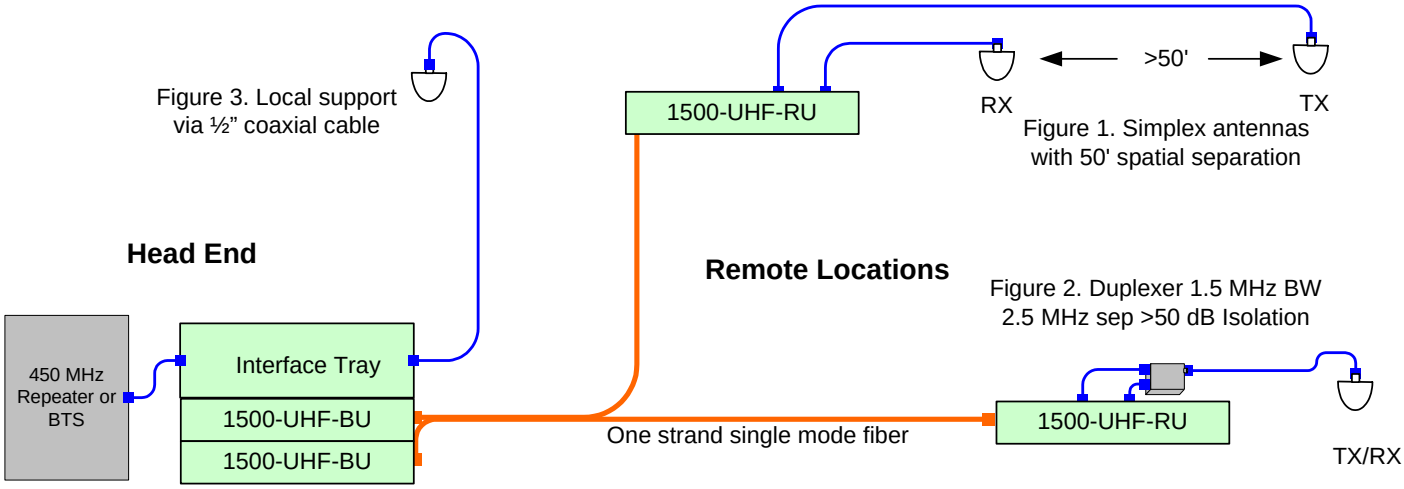
1500-UHF-RU – A 1500-UHF-RU is installed at each remote location. This unit reconverts the signals received over the optic fiber to RF and distributes the services to the connected antennas.

MA-1500 GUI Tool – Intuitive GUI used for setting up, adjusting and monitoring the MA 1500 system.

System Architecture

At the Main building, the 1500-UHF-BU interfaces to the BTS via passive interface. It converts the RF signal received from the BTS to an optic signal and transmits it over SM optic fiber to the MA 1500 Remote. At the Remote buildings, the 1500-UHF-RU reconverts the received RF signal to an optic signal and routes the RF signals to the antennas.

The MA-1500 system provides flexible solutions for two types of antennas – simplex and duplex. Both solutions are illustrated in the figure below.



5. Test Set-up Photos

Figure 5. Radiated Emission Test

Figure 6. Radiated Emission Test

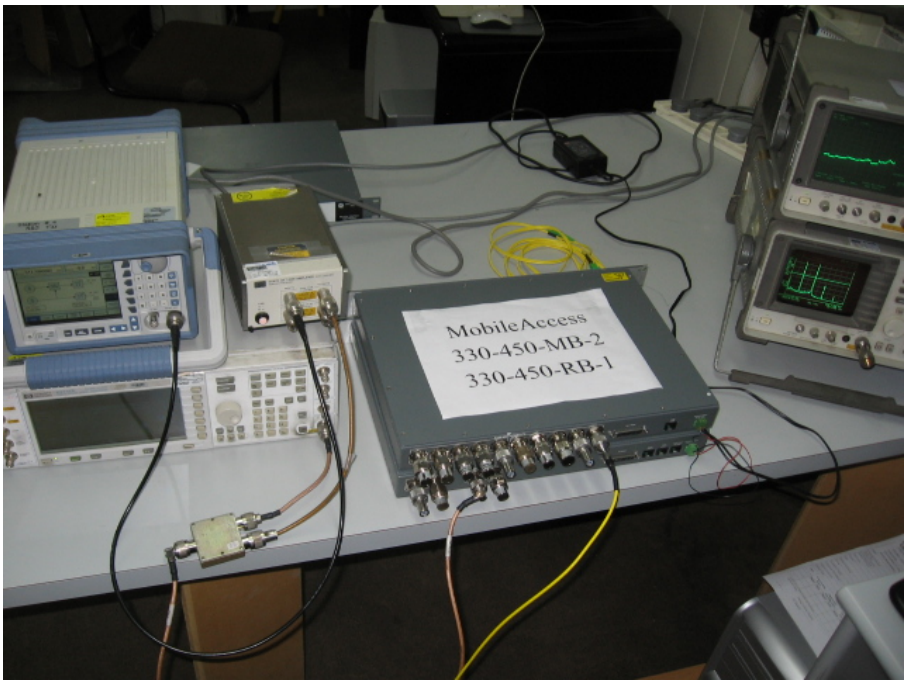


Figure 7. Conducted Emission From Antenna Ports Tests

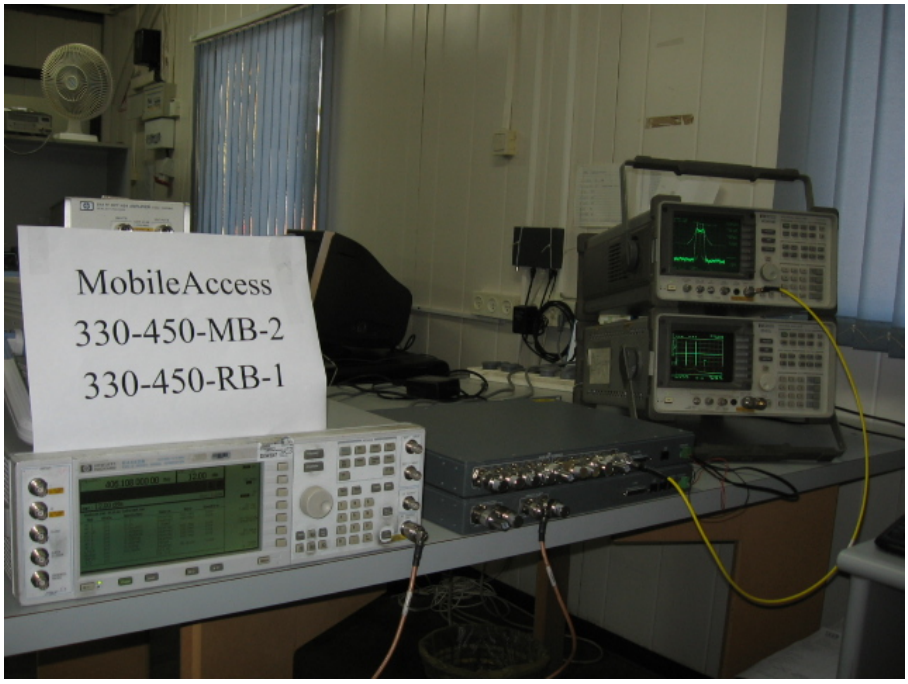


Figure 8. Conducted Emission From Antenna Ports Tests

6. Peak Output Power

6.1 Test procedure

Peak Output Power must not exceed 28 dBm
(EIRP – Antenna Gain = 33 – 5 = 28 dBm).

The E.U.T. antenna terminal was connected to the Spectrum Analyzer through a 20 dB external attenuator and an appropriate coaxial cable (Cable Loss = 1 dB). Special attention was taken to prevent Spectrum Analyzer RF input overload. The Spectrum Analyzer was set to 100 kHz resolution BW. The output power level was measured at 406.108, 511.908, and 464.00 MHz.

Type of modulation is FM, deviation 7 kHz, rate 400 Hz.

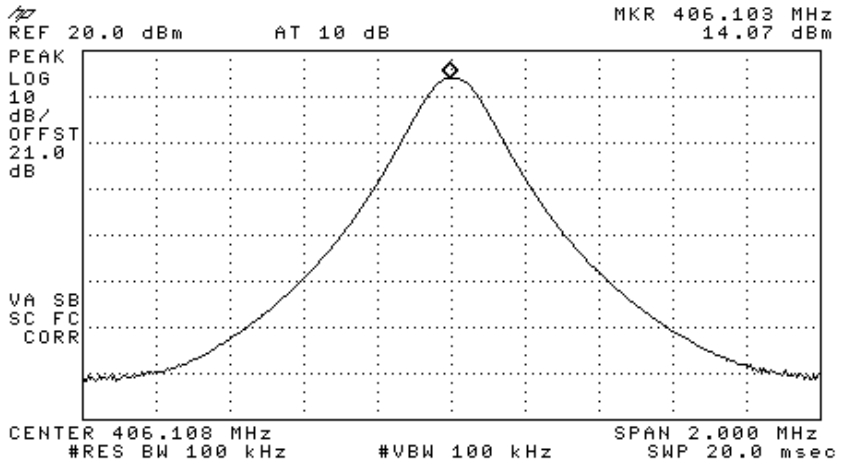


Figure 9.— 406.108 MHz

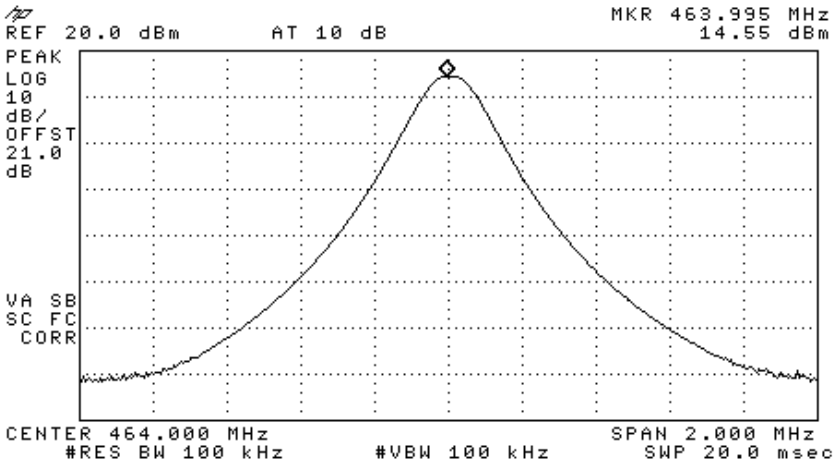


Figure 10.— 464.00 MHz

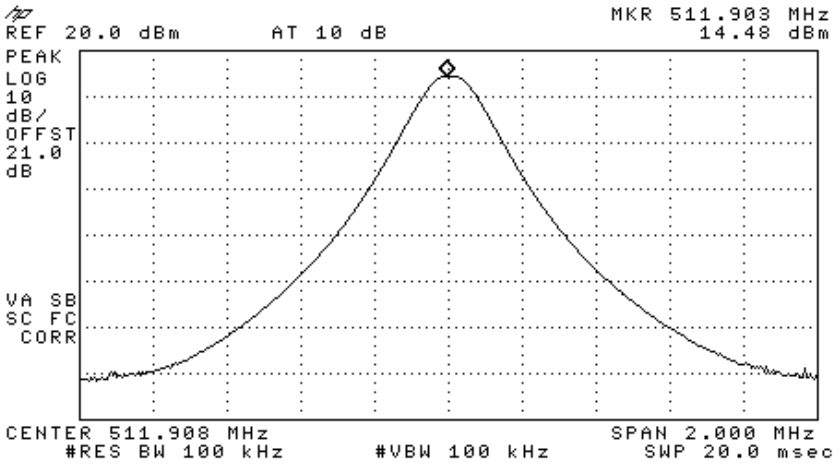


Figure 11.— 511.908 MHz

6.2 Results table

E.U.T. Description: MobileAccess 1500 System
Model No.: 1. 1500-UHF-BU-2 2. 1500-UHF-RU
Serial Number: 1. 0701931 2. 0730158
Specification: FCC Part 2, Section 2.1046; Part 90, Section 90.219

Operation Frequency (MHz)	Reading (dBm)	Specification (dBm)	Margin (dB)
406.108	14.07	28	-13.93
464.000	14.55	28	-13.45
511.908	14.48	28	-13.52

Figure 12 Peak Output Power

JUDGEMENT: Passed by 13.45 dB

TEST PERSONNEL:

Tester Signature: _____ Date: 28.01.08

Typed/Printed Name: E. Pitt

6.3 Test Equipment Used.

Peak Output Power

Instrument	Manufacturer	Model	Part/Serial Number	Calibration	
				Last Calibr.	Period
Spectrum Analyzer	HP	8592L	3926A01204	22 February, 2007	1 year
Cable	RHOPHASE	KPS-1501-1000	A1675	16 December 2006	1 year
Attenuator	Jyebao		P/N FAT-AM 5AF5G662W20	09 May 2007	1 year

Figure 13 Test Equipment Used

7. Occupied Bandwidth

7.1 Test Procedure

The E.U.T. was set to the applicable test frequency with frequency modulation. The E.U.T. antenna terminal was connected to the spectrum analyzer through a 20 dB external attenuator and appropriate coaxial cable (Cable Loss 1 dB). The spectrum analyzer was set to 1 kHz resolution B.W.
The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limit, the mean powers radiated are each equal to 0.5% of the total mean power radiated by a given emission.
The occupied bandwidth of the E.U.T. at the points of 20 dB below maximum peak power was measured and recorded.
Occupied bandwidth measured was repeated in the input terminal of the E.U.T.

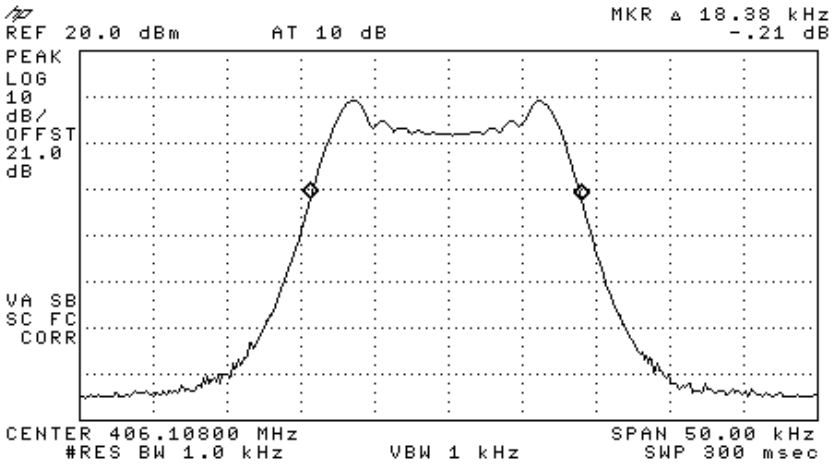


Figure 14.— 406.108 Input

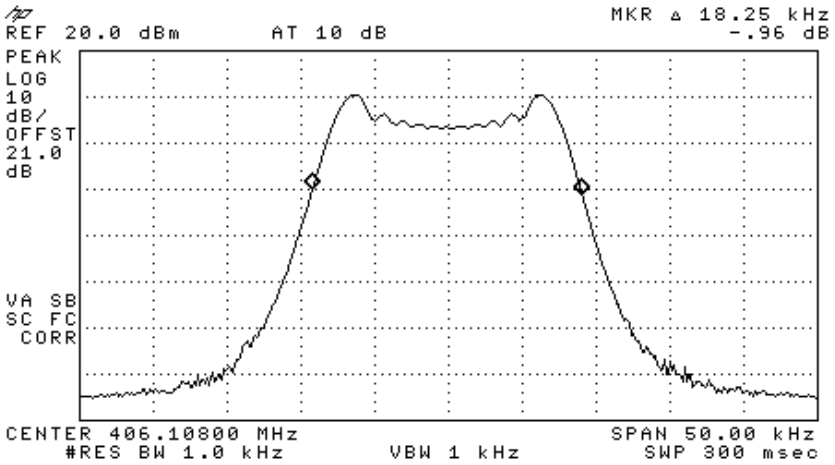


Figure 15.— 406.108 Output

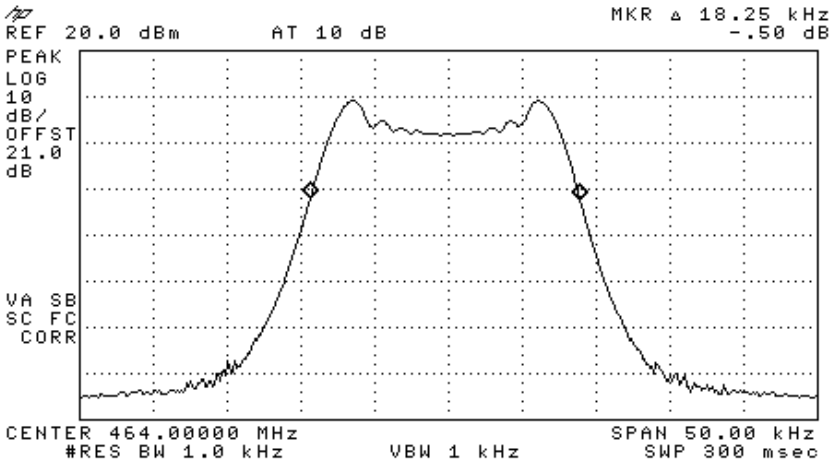


Figure 16.— 464.00 Input

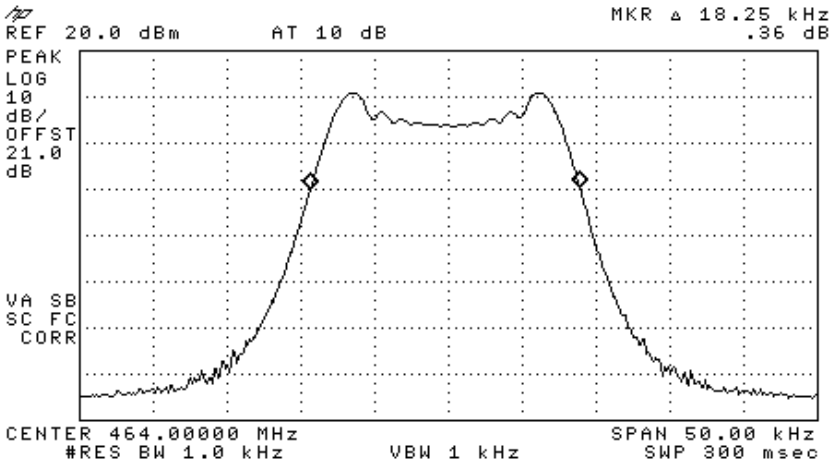


Figure 17.— 464.00 Output

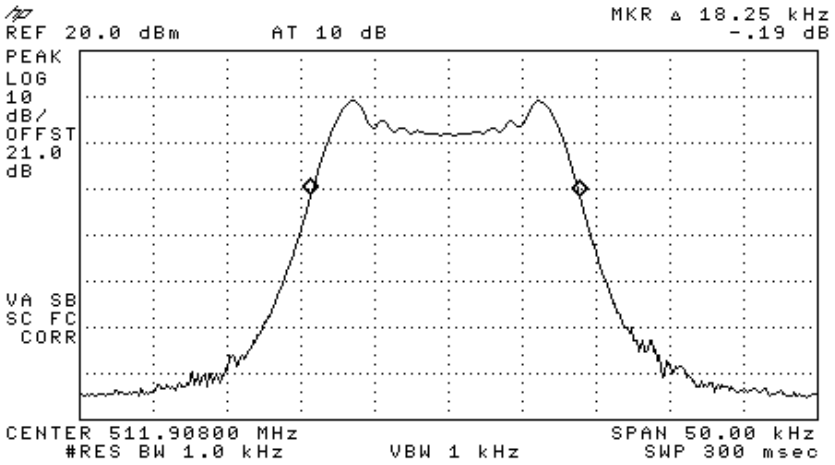


Figure 18.— 511.908 Input

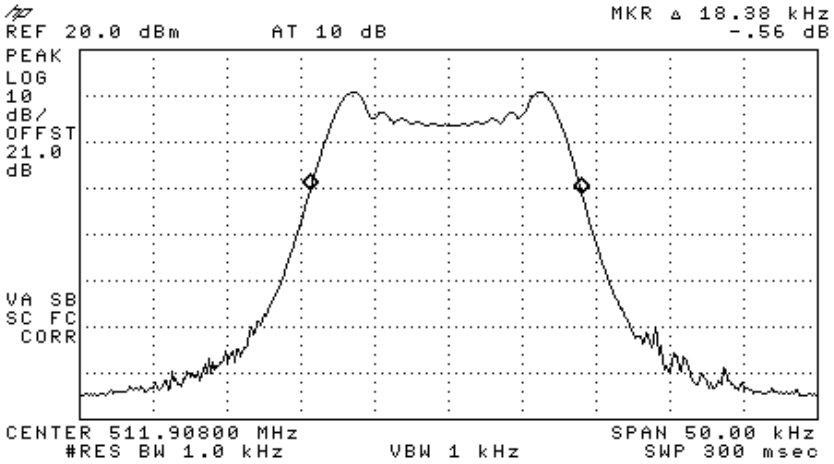


Figure 19.— 511.908 Output

7.2 Results Table

E.U.T. Description: MobileAccess 1500 System
Model No.: 1. 1500-UHF-BU-2 2. 1500-UHF-RU
Serial Number: 1. 0701931 2. 0730158
Specification: FCC Part 2, Section 2.1049; Part 90, Section 90.209

	Operating Frequency	Reading (kHz)
Input	406.108	18.38
Output	406.108	18.25
Input	464.00	18.25
Output	464.00	18.25
Input	511.908	18.25
Output	511.908	18.38

Figure 20 Occupied Bandwidth

TEST PERSONNEL:

Tester Signature: _____ Date: 28.01.08

Typed/Printed Name: E. Pitt

7.3 Test Equipment Used.

Occupied Bandwidth

Instrument	Manufacturer	Model	Part/Serial Number	Calibration	
				Last Calibr.	Period
Spectrum Analyzer	HP	8592L	3926A01204	22 February, 2007	1 year
Cable	RHOPHASE	KPS-1501-1000	A1675	16 December 2006	1 year
Attenuator	Jyebao		P/N FAT-AM 5AF5G662W20	09 May 2007	1 year

Figure 21 Test Equipment Used

8. Emission Mask

8.1 Test Specification

FCC Part 90 Sub-part I Section 90.210

According to the table in Section 90.210, the following mask shall be used:

For the operating frequencies 406.108, 464.00, and 511.908 MHz: Mask C

Also at all frequencies, the E.U.T. must comply with the emission mask in Section 90.691.

8.2 Test Procedure

The E.U.T. was set to the applicable test frequency with frequency modulation, deviation 7 kHz, rate 400 Hz.
The E.U.T. antenna terminal was connected to the spectrum analyzer through a 20 dB external attenuator and appropriate coaxial cable (1 dB cable loss). The spectrum analyzer was set to 300 Hz resolution B.W.

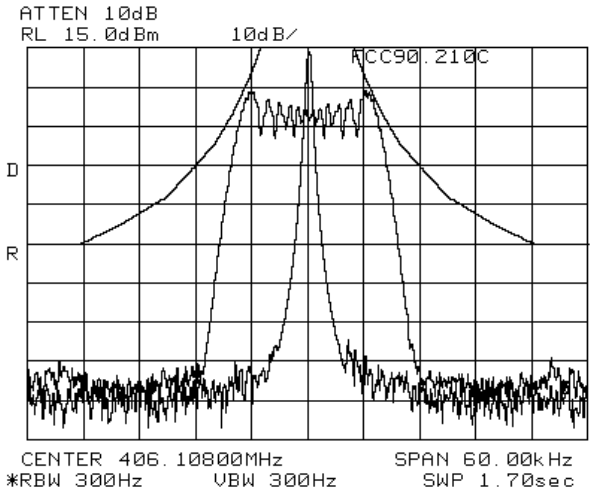


Figure 22.— 406.108

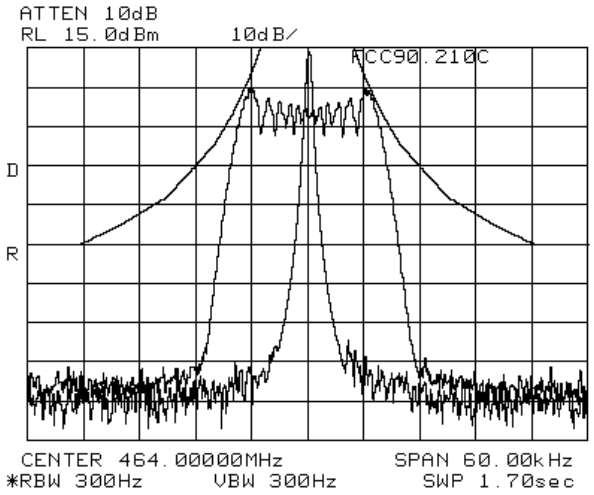


Figure 23.— 464.000

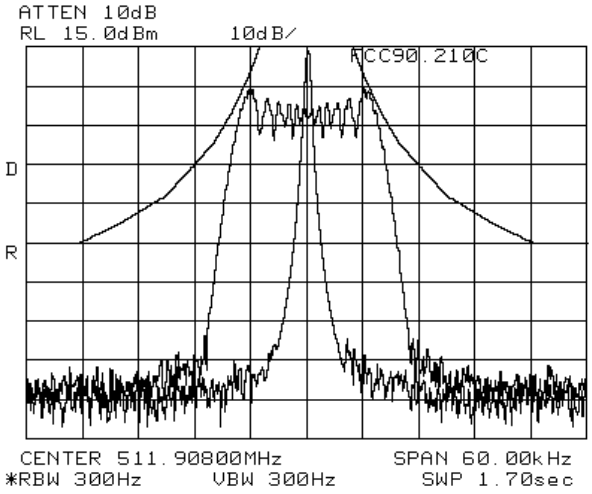


Figure 24.— 511.908

8.3 Results

E.U.T. Description: MobileAccess 1500 System
Model No.: 1. 1500-UHF-BU-2 2. 1500-UHF-RU
Serial Number: 1. 0701931 2. 0730158
Specification: FCC Part 90, Section 90.210

JUDGEMENT: Passed

TEST PERSONNEL:

Tester Signature: _____ Date: 28.01.08

Typed/Printed Name: E. Pitt

8.4 Test Equipment Used.

Occupied Bandwidth

Instrument	Manufacturer	Model	Part/Serial Number	Calibration	
				Last Calibr.	Period
Spectrum Analyzer	HP	8564E	3442A00275	14 November 2007	1 year
Cable	RHOPHASE	KPS-1501-1000	A1675	16 December 2006	1 year
Attenuator	Jyebao	-	P/N FAT-AM 5AF5G662W20	09 May 2007	1 year

Figure 25 Test Equipment Used

9. Out of Band Emissions at Antenna Terminals

9.1 Test Specification

FCC Part 90, Section 90.210

9.2 Test procedure

The power of any emission outside of the authorized bandwidth must be attenuated below the transmitting power (P) by a factor of at least 43 + log (P) dB, yielding –13dBm. The resolution bandwidth was set to 1.0 kHz for the frequency range 9 – 150 kHz, 30 kHz for the frequency range 150 kHz to 10 MHz, 100 kHz for the frequency range 10 MHz to 1.0 GHz,and 1 MHz in the frequency range 1 – 5 GHz. In the band edges, measurement was performed using resolution bandwidth of 10 kHz. Therefore the limit in these ranges = -13 - 10 log(10/100) = -23 dBm.
The E.U.T. antenna terminal was connected to the spectrum analyzer through a 20 dB external attenuator and an appropriate coaxial cable (Cable Loss= 1 dB).

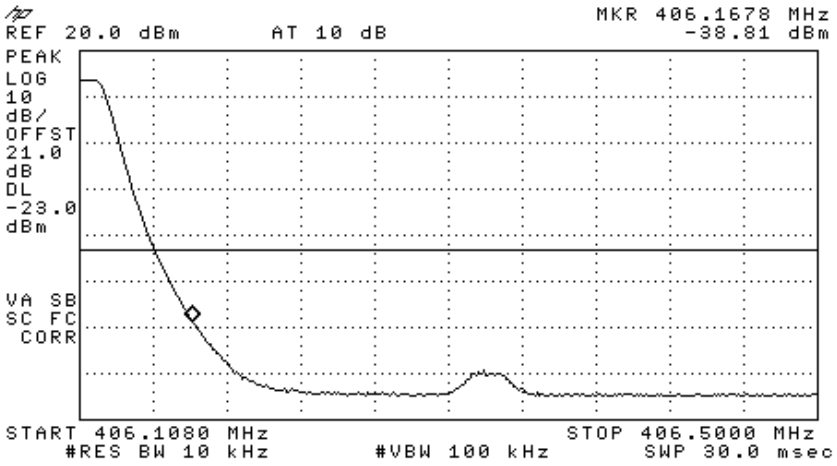


Figure 26.— 406.108 MHz

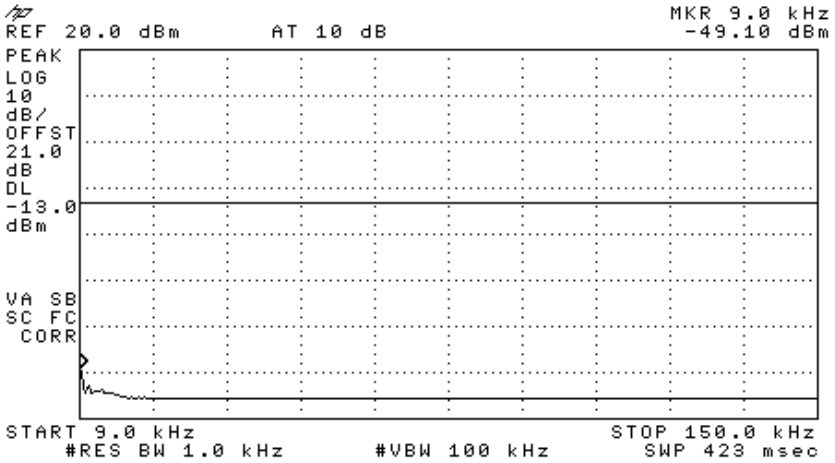


Figure 27.— 406.108 MHz

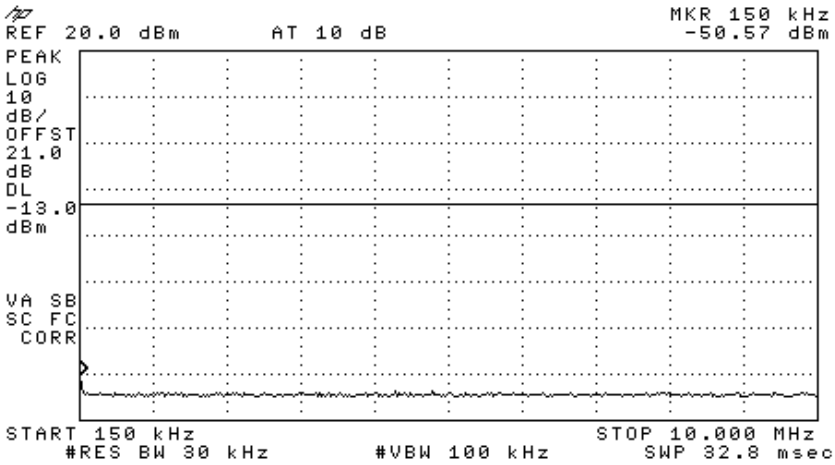


Figure 28.— 406.108 MHz

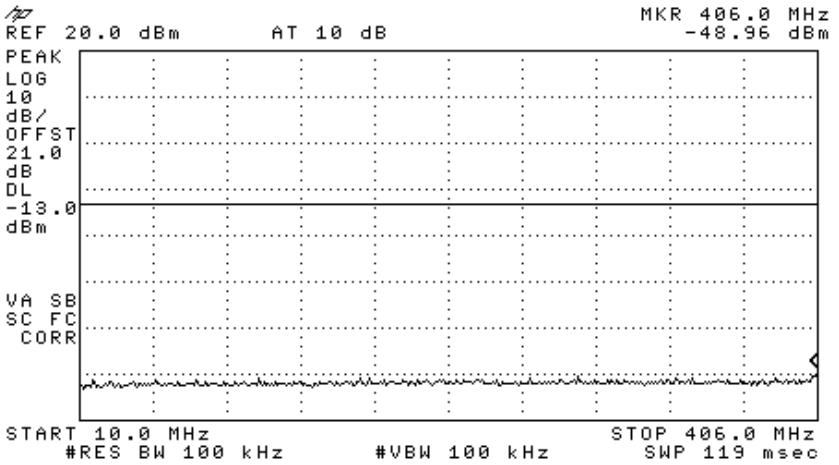


Figure 29.— 406.108 MHz

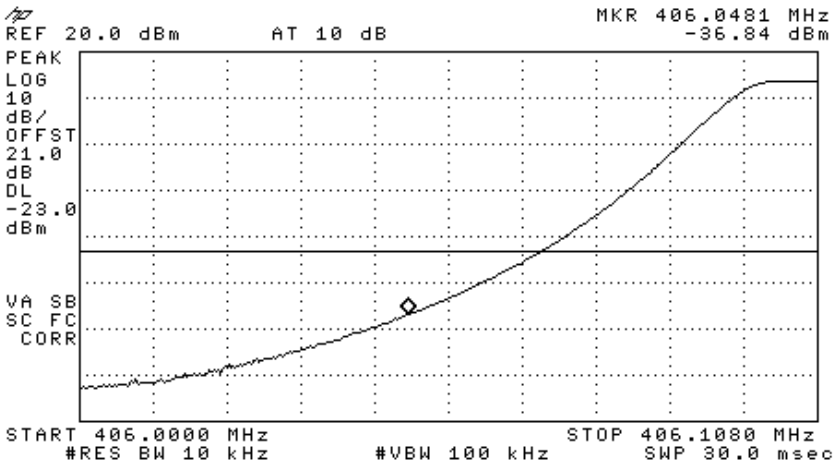


Figure 30.— 406.108 MHz

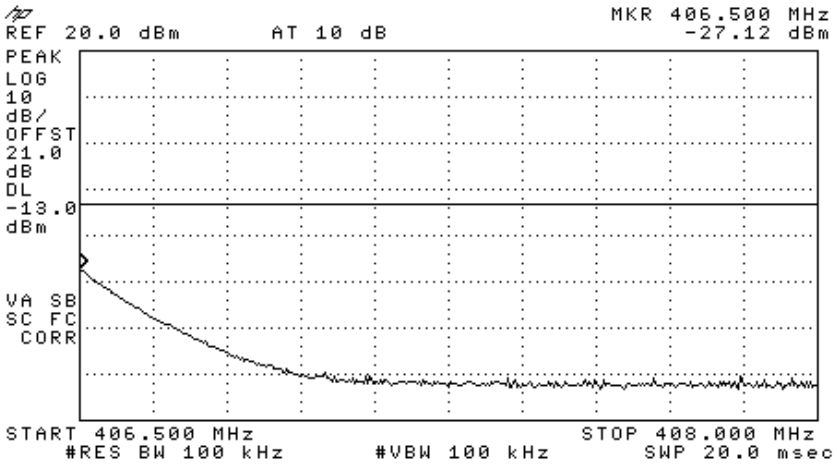


Figure 31.— 406.108 MHz

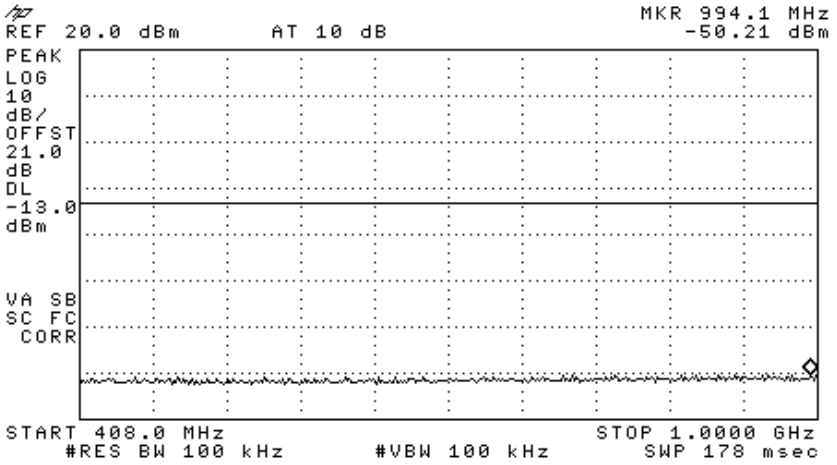


Figure 32.— 406.108 MHz

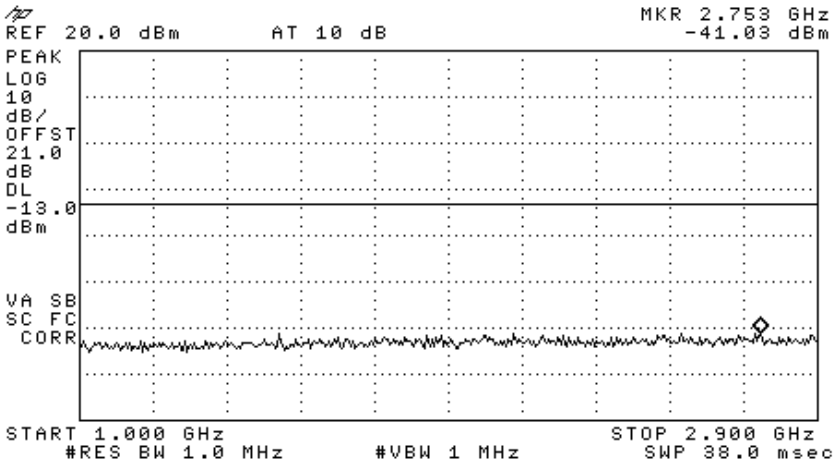


Figure 33.— 406.108 MHz

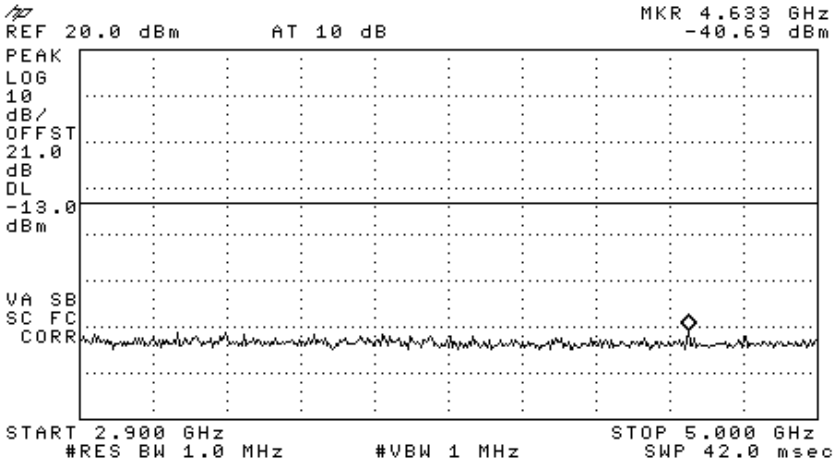


Figure 34.— 406.108 MHz

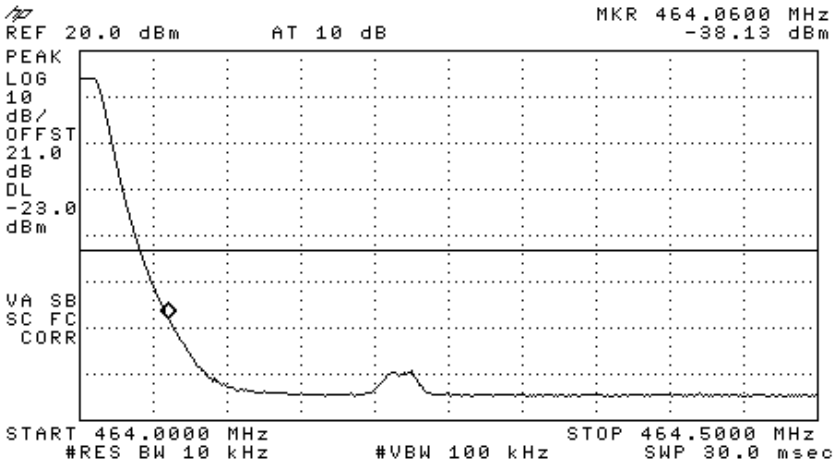


Figure 35.— 464.00 MHz

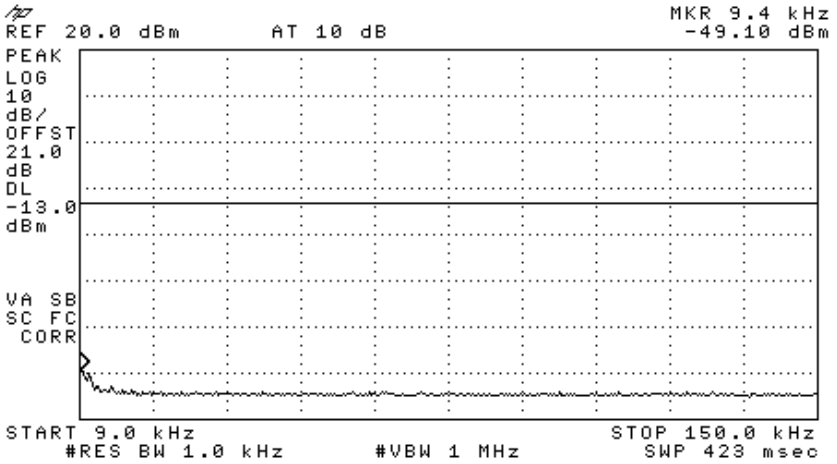


Figure 36.— 464.00 MHz

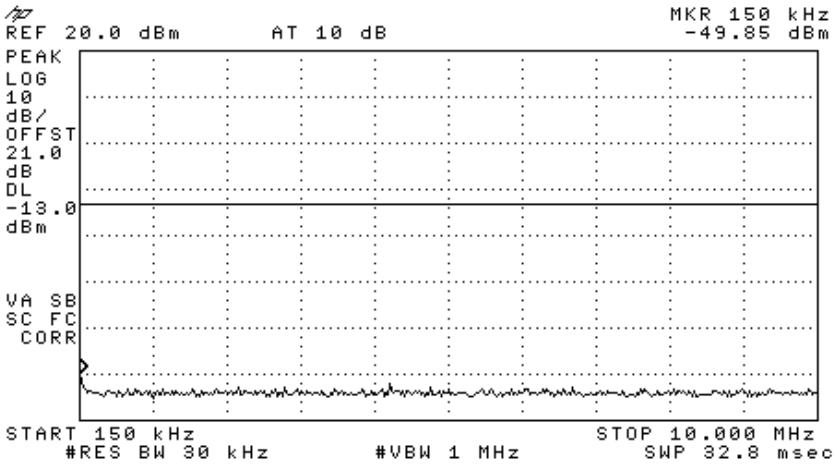


Figure 37.— 464.00 MHz

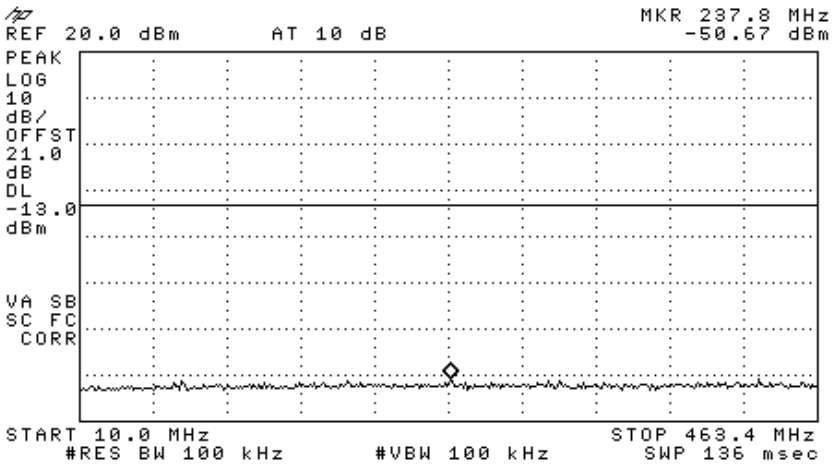


Figure 38.— 464.00 MHz

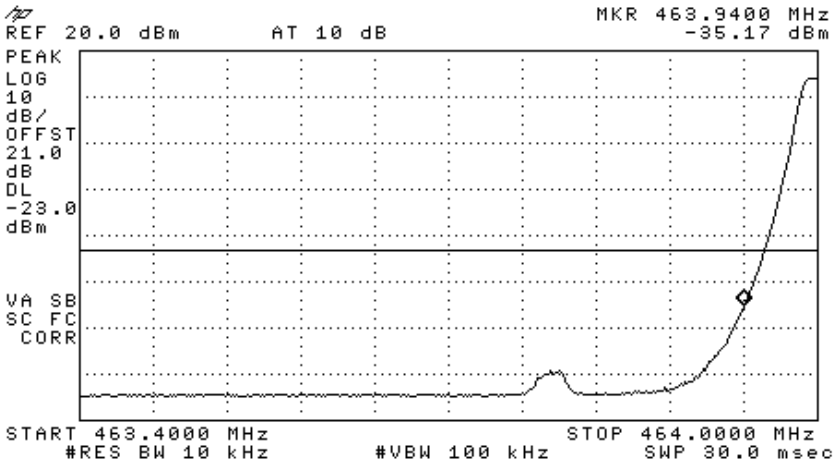


Figure 39.— 464.00 MHz

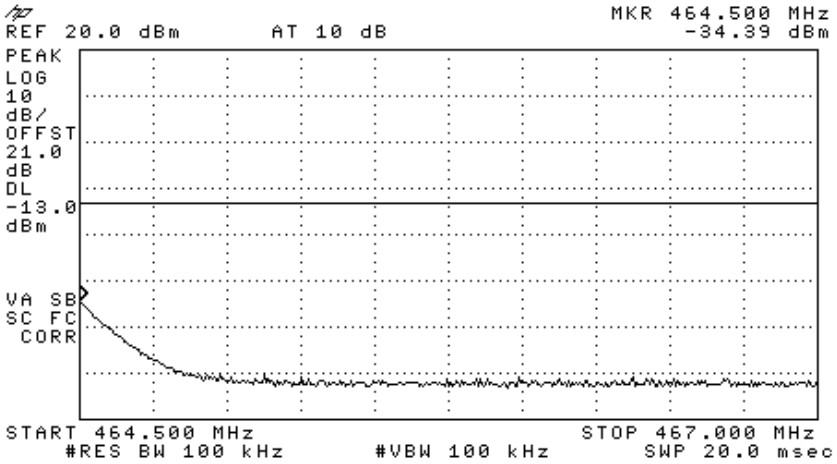


Figure 40.— 464.00 MHz

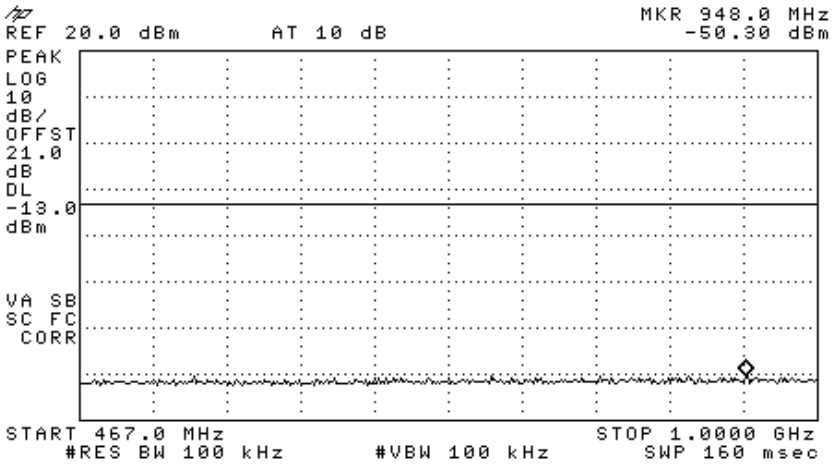


Figure 41.— 464.00 MHz

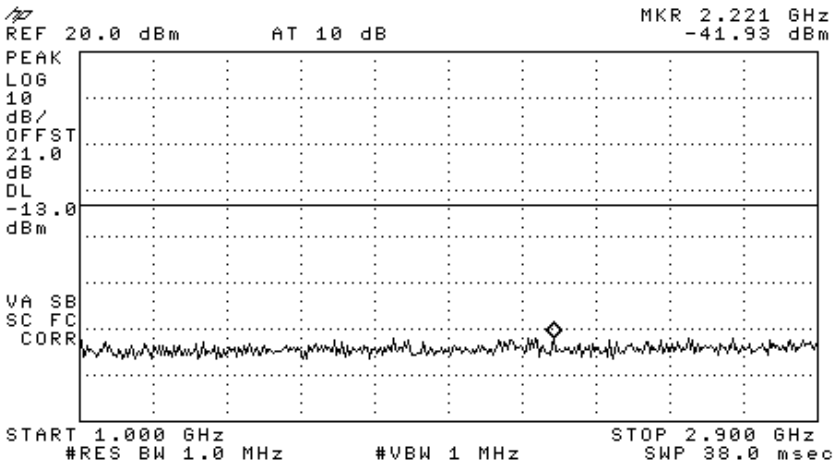


Figure 42.— 464.00 MHz

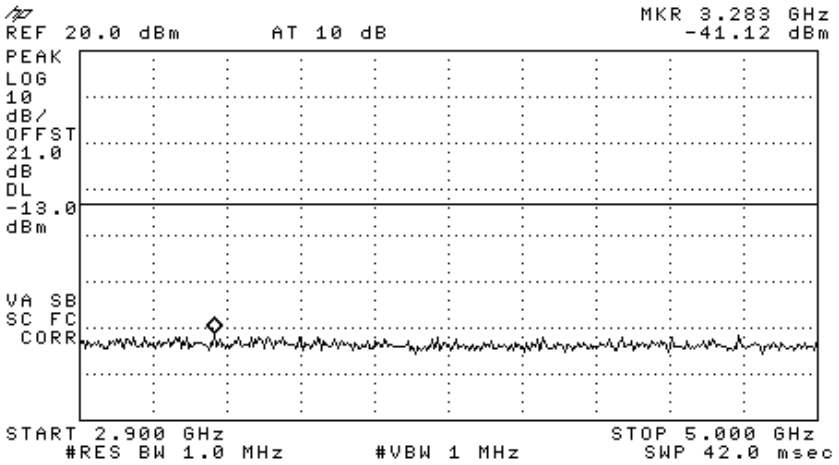


Figure 43.— 464.00 MHz

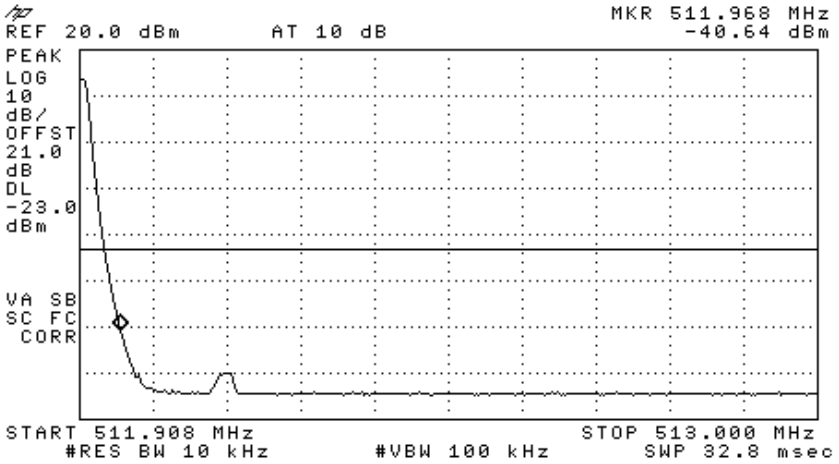


Figure 44.— 511.908 MHz

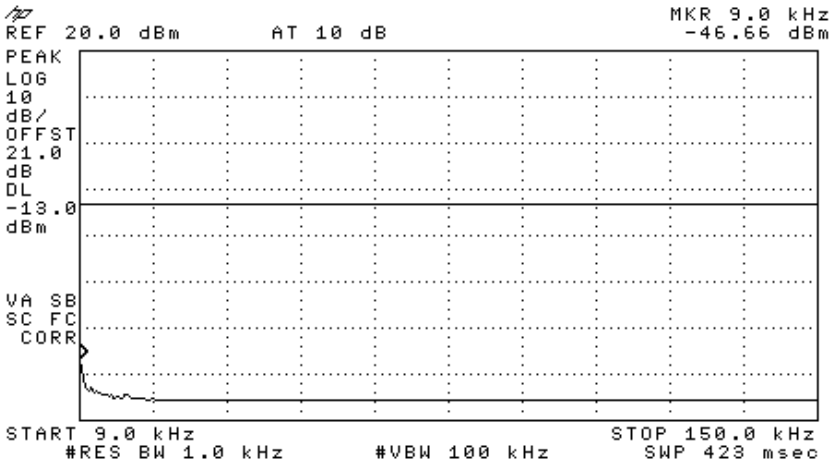


Figure 45.— 511.908 MHz

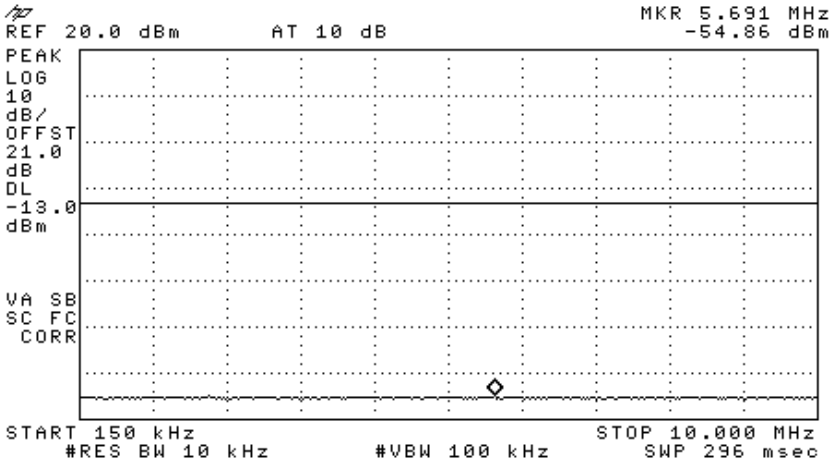


Figure 46.— 511.908 MHz

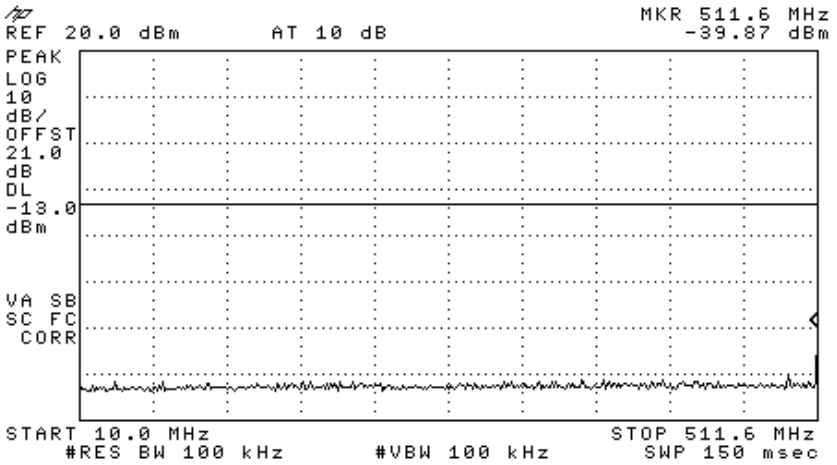


Figure 47.— 511.908 MHz

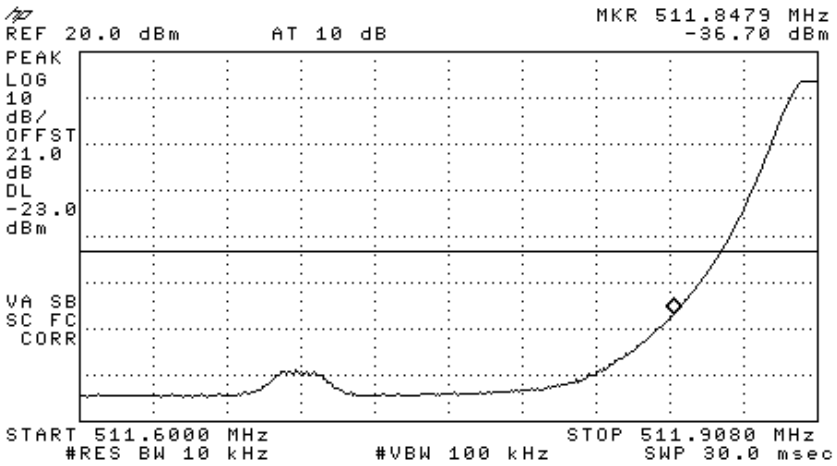


Figure 48.— 511.908 MHz

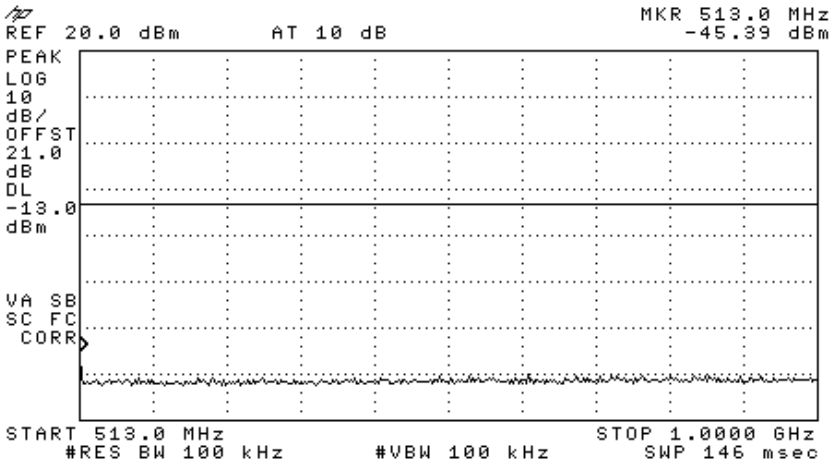


Figure 49.— 511.908 MHz

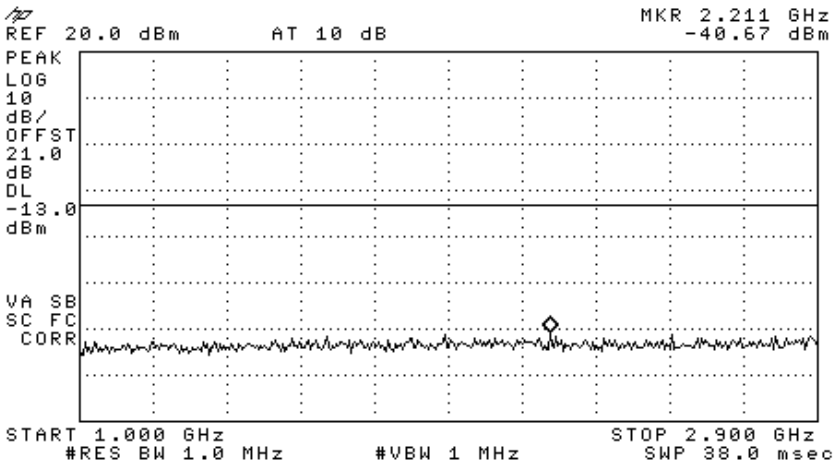


Figure 50.— 511.908 MHz

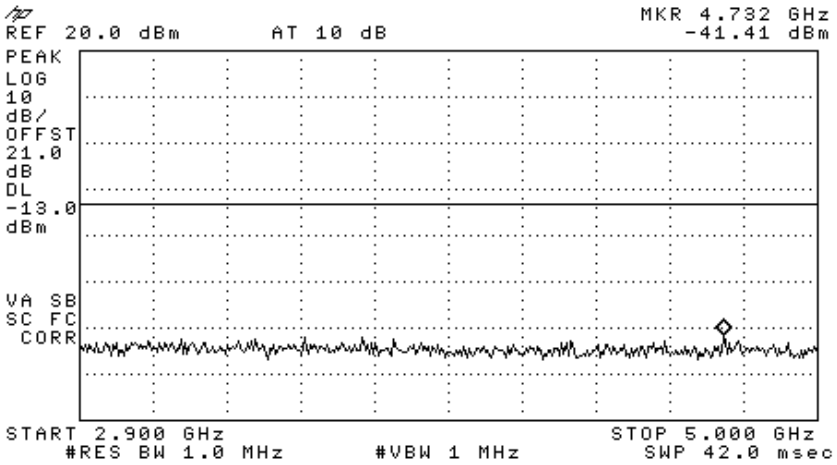


Figure 51.— 511.908 MHz

9.3 Results table

E.U.T. Description: MobileAccess 1500 System
Model No.: 1. 1500-UHF-BU-2 2. 1500-UHF-RU
Serial Number: 1. 0701931 2. 0730158
Specification: FCC Part 90, Section 90.210

Operation Frequency (MHz)	Reading (dBm)	Specification (dBm)	Margin (dB)
406.108	-36.2	-23.0	-13.2
464.00	-35.17	-23.0	-12.2
511.908	-36.7	-23.0	-13.7

Figure 52 Out of Band Emission Results

JUDGEMENT: Passed by 13.7 dB

TEST PERSONNEL:

Tester Signature: _____ Date: 28.01.08

Typed/Printed Name: E. Pitt

9.4 Test Equipment Used.

Out of Band Emission at Antenna Terminals

Instrument	Manufacturer	Model	Part/Serial Number	Calibration	
				Last Calibr.	Period
Spectrum Analyzer	HP	8592L	3926A01204	February 22 2007	1 year
Cable	RHOPHASE	KPS-1501-1000	A1675	16 December 2006	1 year
Attenuator	Jyebao	-	P/N FAT-AM 5AF5G662W20	09 May 2007	1 year

Figure 53 Test Equipment Used

10. Out of Band Emissions (Radiated)

10.1 Test Specification

FCC, Part 90, Section 90.210

10.2 Test Procedure

The power of any emission outside of the authorized bandwidth must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log (P) dB, yielding –13dBm.

(a) The E.U.T. operation mode and test set-up are as described in Section 3. A preliminary measurement to characterize the E.U.T was performed inside the shielded room at a distance of 3 meters, using peak detection mode and broadband antennas. The preliminary measurements produced a list of the highest emissions. The E.U.T was then transferred to the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 1.5 meters above the ground. The configuration tested is shown in Figure 3.5.
The frequency range 30 MHz-5.2 GHz was scanned, and the list of the highest emissions was verified and updated accordingly.
The readings were maximized by adjusting the antenna height between 1-4 meters, the turntable azimuth between 0-360°, and the antenna polarization.
The emissions were measured at a distance of 3 meters.

(b) The E.U.T. was replaced by a substitution antenna (dipole 30MHz-1GHz, Horn Antenna above 1GHz) driven by a signal generator. The height was readjusted for maximum reading. The signal generator level was adjusted to obtain the same reading on the EMI receiver as in step (a).
The signals observed in step (a) were converted to radiated power using:
P (dBm) = P_g(dBm) – Cable Loss (dB) + Substitution Antenna Gain (dBi)
P = Equivalent Isotropic Radiated Power.
P_g = Signal Generator Output Level.

10.3 Test Data

JUDGEMENT: Passed

The E.U.T met the requirements of the FCC, Part 90, Section 90.210 specifications.

The signals in the band 30 MHz –5.2 GHz were at least 20dB below the specification limit.

TEST PERSONNEL:

Tester Signature: _____ Date: 28.01.08

Typed/Printed Name: E. Pitt

10.4 Test Instrumentation Used, Radiated Measurements

Instrument	Manufacturer	Model	Serial No.	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	November 22, 2006	1Year
RF Filter Section	HP	85420E	3705A00248	November 22, 2006	1Year
Antenna Biconical	ARA	BCD 235/B	1041	March 22, 2007	1Year
Antenna Log Periodic	ARA	LPD-2010/A	1038	November 30, 2006	1 Year
Antenna Log Periodic	A.H. Systems	SAS-200/511	253	February 4, 2007	2 Years
Low Noise Amplifier	DBS MICROWAVE	LNA-DBS-0411N313	013	November 2, 2007	1 Year
Spectrum Analyzer	HP	8592L	3926A01204	February 22, 2007	1 Year
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A
Printer	HP	LaserJet 2200	JPKGC19982	N/A	N/A

11. Bandedge Intermodulation Tests

11.1 Test procedure

The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator (20 dB) and an appropriate coaxial cable
(cable loss = 1 dB). The spectrum analyzer was set to 1 kHz resolution BW.

Input signals were sent simultaneously to the E.U.T. at the operating frequencies of 406.108 and 511.908.

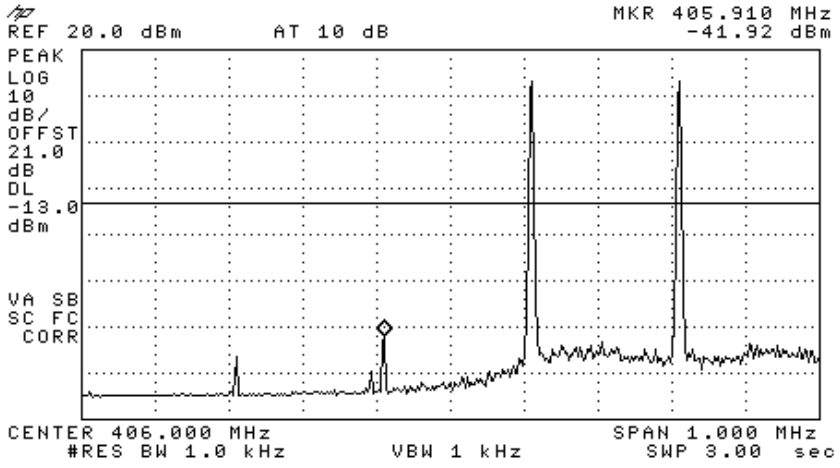


Figure 54 —406.108 MHz

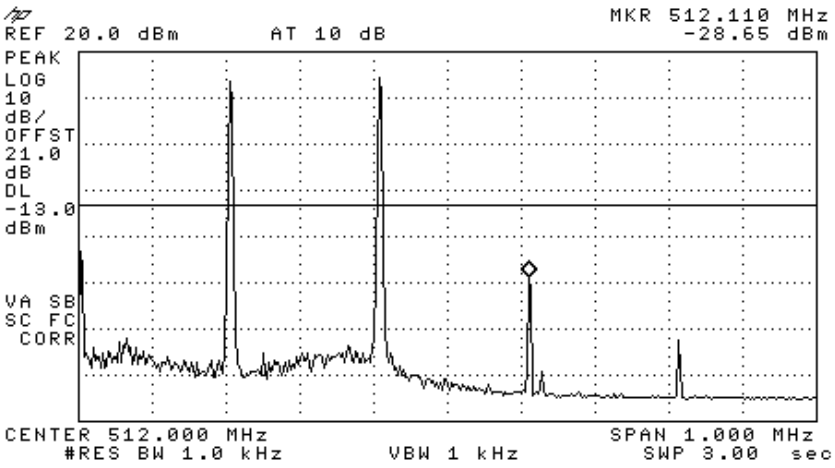


Figure 55 —511.908 MHz

JUDGEMENT: Passed

TEST PERSONNEL:

Tester Signature: _____ Date: 28.01.08

Typed/Printed Name: E. Pitt

11.2 Test Equipment Used.

Intermodulation

Instrument	Manufacturer	Model	Serial/Part Number	Calibration	
				Last Calibr.	Period
Spectrum Analyzer	HP	8592L	3926A01204	February 22, 2007	1 year
Attenuator	Jyebao	-	FAT-AM5AF5G6G2W20	May 9, 2007	1 year
Cable	Rhophase	KPS-1501-1000	A1675	December 16, 2006	1 year
Splitter	Mini-Circuits	15542	N/a	November 13, 2007	1 year
Amplifier	HP	8447F	3113A04961	November 21, 2006	1 year
Signal Generator	HP	E4432B	US39340672	April 26, 2007	1 year
Signal Generator	Rohde & Schwartz	SM300	902A000601	April 26, 2007	1 year

Figure 56 Test Equipment Used

12. R.F Exposure

Typical use of the E.U.T. is extending 450 MHz signals from a single BTS location to remote locations, up to 20 Km away, over SM F/O connections. The typical placement of the E.U.T. is on a wall near the ceiling. The typical distance between the E.U.T. and the user in the worst case application, is 20 cm.

Calculation of Maximum Permissible Exposure (MPE)

Based on Section 1.1307(b)(1) Requirements

(a) FCC limits at 406 MHz is: $0.27\frac{mW}{cm^2}$

Using table 1 of Section 1.1310 limit for general population/uncontrolled exposures, the above level is an average over 30 minutes.

(b) The power density produced by the E.U.T. is

$$S = \frac{P_t G_t}{4\pi R^2}$$

P_t- Transmitted Power (Peak) 28.51 mW= 14.55 dBm

G_T- Antenna Gain, 5 dBi = 3.16

R- Distance from Transmitter using 0.2 m worst case

(c) The peak power density is :

$$S_p = \frac{28.51 \times 3.16}{4\pi(20)^2} = 0.018\frac{mW}{cm^2}$$

(d) The duty cycle of transmission in actual worst case is 100%.

(e) The averaged power density of the E.U.T. is:

$$0.018\frac{mW}{cm^2}$$

(f) This is 1 order of magnitude below the FCC limit.

13. Radiated Emission Per FCC Part 15 Sub-Part B Test Data

13.1 Test Specification

30-2500 MHz, FCC Part 15, Subpart B, CLASS A

13.2 Test Procedure

The E.U.T. operation mode and test set-up are as described in Section 4.

A preliminary measurement to characterize the E.U.T was performed inside the shielded room at a distance of 3 meters, using peak detection mode and broadband antennas. The preliminary measurements produced a list of the highest emissions. The E.U.T was then transferred to the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 0.8 meters above the ground. The effect of varying the position of the cables was investigated to find the configuration that produces maximum emission. The configuration tested is shown in .

The E.U.T. highest frequency source or used frequency is 511.908 MHz.

The frequency range 30-2500 MHz was scanned, and the list of the highest emissions was verified and updated accordingly.

The emissions were measured using a computerized EMI receiver complying to CISPR 16 requirements. The specification limits and applicable correction factors are loaded to the receiver via a 3.5" floppy disk.

The readings were maximized by adjusting the antenna height between 1-4 meters, the turntable azimuth between 0-360°, and the antenna polarization.

Verification of the E.U.T emissions was based on the following methods:

Turning the E.U.T on and off.
Using a frequency span less than 10 MHz.
Observation of the signal level during turntable rotation. Background noise is not affected by the rotation of the E.U.T.

The emissions were measured at a distance of 3 meters.

13.3 Test Data

JUDGEMENT: Passed by dB

The EUT met the requirements of the F.C.C. Part 15, Subpart B, specification. The signals in the band 1.0 – 2.5 GHz were at least 20 dB below the specification limit.

The details of the highest emissions are given in *Figure 57* to *Figure 60*.

TEST PERSONNEL:

Tester Signature: _____ Date: 28.01.08

Typed/Printed Name: E. Pitt

Radiated Emission

E.U.T Description	MobileAccess 1500 System
Type	1. 1500-UHF-BU-2 2. 1500-UHF-RU
Serial Number:	1. 0701931 2. 0730158

Specification: FCC Part 15, Subpart B, Class A

Antenna Polarization: Horizontal
Antenna: 3 meters distance

Frequency range: 30 MHz to 1000 MHz
Detectors: Peak, Quasi-peak

Signal Number	Frequency (MHz)	Peak dBuV/m	QP dBuV/m	QP Delta L 1 (dB)	Avg dBuV/m	Av Delta L 2 (dB)	Corr (dB)
1	133.646450	29.7	25.0	-29.0			14.1
2	167.058250	32.6	26.7	-27.3			15.5
3	233.881850	35.8	30.8	-26.1			19.5
4	334.117250	38.2	33.5	-23.5			17.2
5	467.764450	40.9	37.1	-19.8			20.6
6	501.176250	37.6	33.0	-23.9			21.0

Figure 57. Radiated Emission. Antenna Polarization: HORIZONTAL. Detectors: Peak, Quasi-peak

Note: QP Delta refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

Radiated Emission

E.U.T Description	MobileAccess 1500 System
Type	1. 1500-UHF-BU-2 2. 1500-UHF-RU
Serial Number:	1. 0701931 2. 0730158

Specification: FCC Part 15, Subpart B, Class A

Antenna Polarization: Horizontal
Antenna: 3 meters distance

Frequency range: 30 MHz to 1000 MHz
Detectors: Peak, Quasi-peak

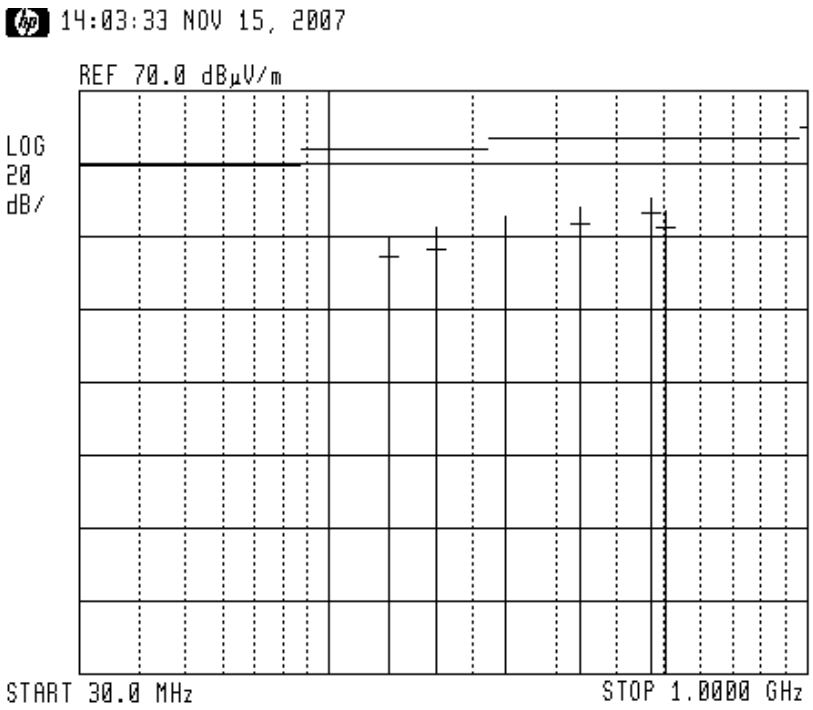


Figure 58. Radiated Emission. Antenna Polarization: HORIZONTAL Detectors: Peak, Quasi-peak

Note:

1. *Horizontal axis shows logarithmic frequency scale.*
2. *The vertical axis shows amplitude (in dB µV/m).*
3. *Peak detection is designated by the top of each vertical line.*
4. *Quasi-peak detection is designated by the first dash mark (from the top) of each vertical line.*

Radiated Emission

E.U.T Description	MobileAccess 1500 System
Type	1. 1500-UHF-BU-2 2. 1500-UHF-RU
Serial Number:	1. 0701931 2. 0730158

Specification: FCC Part 15, Subpart B, Class A

Antenna Polarization: Vertical
Antenna: 3 meters distance

Frequency range: 30 MHz to 1000 MHz
Detectors: Peak, Quasi-peak

Signal Number	Frequency (MHz)	Peak dBuV/m	QP dBuV/m	QP Delta L 1 (dB)	Avg dBuV/m	Av Delta L 2 (dB)	Corr (dB)
1	40.005000	31.2	26.5	-23.0			13.3
2	70.506200	32.9	30.2	-19.3			10.1
3	132.501250	38.1	33.7	-20.3			14.0
4	210.260000	38.2	35.0	-19.0			18.2
5	467.767500	43.2	40.4	-16.5			20.6
6	601.411825	40.3	34.8	-22.1			24.5

Figure 59. Radiated Emission. Antenna Polarization: VERTICAL. Detectors: Peak, Quasi-peak

Note: QP Delta refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

Radiated Emission

E.U.T Description	MobileAccess 1500 System
Type	1. 1500-UHF-BU-2 2. 1500-UHF-RU
Serial Number:	1. 0701931 2. 0730158

Specification: FCC Part 15, Subpart B, Class A

Antenna Polarization: Vertical
Antenna: 3 meters distance

Frequency range: 30 MHz to 1000 MHz
Detectors: Peak, Quasi-peak

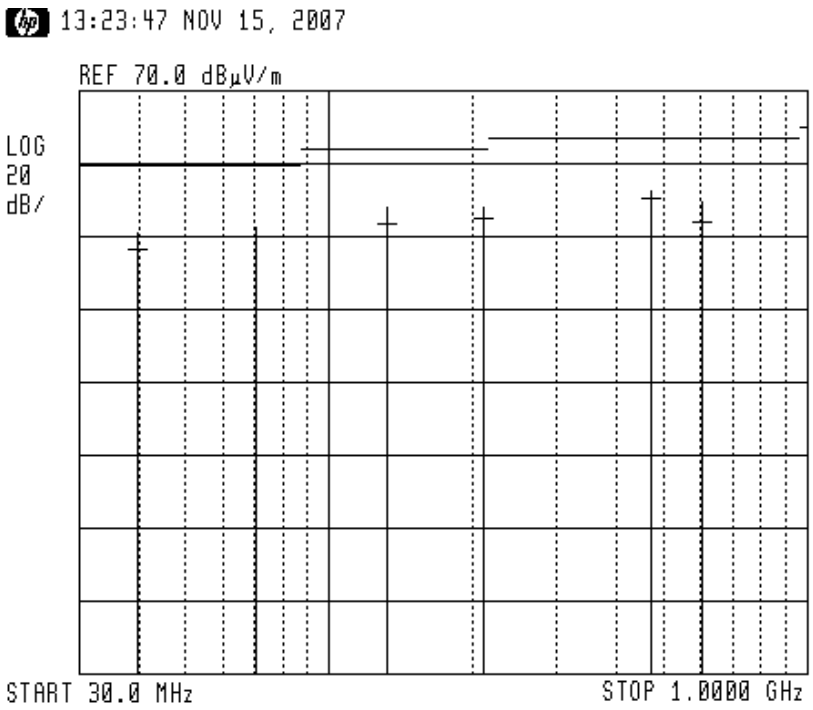


Figure 60. Radiated Emission. Antenna Polarization: VERTICAL Detectors: Peak, Quasi-peak

Note:

1. *Horizontal axis shows logarithmic frequency scale.*
2. *The vertical axis shows amplitude (in dB µV/m).*
3. *Peak detection is designated by the top of each vertical line.*
4. *Quasi-peak detection is designated by the first dash mark (from the top) of each vertical line.*

13.4 Test Instrumentation Used, Radiated Measurements

Instrument	Manufacturer	Model	Serial No.	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	November 22, 2006	1Year
RF Filter Section	HP	85420E	3705A00248	November 22, 2006	1Year
Antenna Biconical	ARA	BCD 235/B	1041	March 22, 2007	1Year
Antenna Log Periodic	ARA	LPD-2010/A	1038	November 30, 2006	1 Year
Antenna Log Periodic	A.H. Systems	SAS-200/511	253	February 4, 2007	2 Years
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A
Printer	HP	LaserJet 2200	JPKGC19982	N/A	N/A

13.5 Field Strength Calculation

The field strength is calculated directly by the EMI Receiver software, and a "Correction Factors" data disk, using the following equation:

$$FS = RA + AF + CF$$

FS:	Field Strength [dBμv/m]
RA:	Receiver Amplitude [dBμv]
AF:	Receiving Antenna Correction Factor [dB/m]
CF:	Cable Attenuation Factor [dB]

No external pre-amplifiers are used.

14. APPENDIX A - CORRECTION FACTORS

14.1 Correction factors for CABLE

from EMI receiver to test antenna at 3 meter range.

FREQUENCY (MHz)	CORRECTION FACTOR (dB)
10.0	0.3
20.0	0.6
30.0	0.8
40.0	0.9
50.0	1.1
60.0	1.2
70.0	1.3
80.0	1.4
90.0	1.6
100.0	1.7
150.0	2.0
200.0	2.3
250.0	2.7
300.0	3.1
350.0	3.4
400.0	3.7
450.0	4.0
500.0	4.3
600.0	4.7
700.0	5.3
800.0	5.9
900.0	6.3
1000.0	6.7

FREQUENCY (MHz)	CORRECTION FACTOR (dB)
1200.0	7.3
1400.0	7.8
1600.0	8.4
1800.0	9.1
2000.0	9.9
2300.0	11.2
2600.0	12.2
2900.0	13.0

NOTES:

1. The cable type is RG-214.

2. The overall length of the cable is 27 meters.

3. The above data is located in file 27MO3MO.CBL on the disk marked "Radiated Emission Tests EMI Receiver".

14.2 Correction factors for CABLE

from EMI receiver to test antenna at 3 meter range.

FREQUENCY (GHz)	CORRECTION FACTOR (dB)
1.0	1.2
2.0	1.6
3.0	2.0
4.0	2.4
5.0	3.0
6.0	3.4
7.0	3.8
8.0	4.2
9.0	4.6
10.0	5.0
12.0	5.8

NOTES:

1. The cable type is RG-8.

2. The overall length of the cable is 10 meters.

14.3 Correction factors for CABLE

from spectrum analyzer to test antenna above 2.9 GHz

FREQUENCY (GHz)	CORRECTION FACTOR (dB)	FREQUENCY (GHz)	CORRECTION FACTOR (dB)
1.0	1.9	14.0	9.1
2.0	2.7	15.0	9.5
3.0	3.5	16.0	9.9
4.0	4.2	17.0	10.2
5.0	4.9	18.0	10.4
6.0	5.5	19.0	10.7
7.0	6.0	20.0	10.9
8.0	6.5	21.0	11.2
9.0	7.0	22.0	11.6
10.0	7.5	23.0	11.9
11.0	7.9	24.0	12.3
12.0	8.3	25.0	12.6
13.0	8.7	26.0	13.0

NOTES:

1. The cable type is SUCOFLEX 104 E manufactured by SUHNER.

2. The cable is used for measurements above 2.9 GHz.

3. The overall length of the cable is 10 meters.

12.6 Correction factors for LOG PERIODIC ANTENNA

Type LPD 2010/A
at 3 and 10 meter ranges.

Distance of 3 meters

FREQUENCY (MHz)	AFE (dB/m)
200.0	9.1
250.0	10.2
300.0	12.5
400.0	15.4
500.0	16.1
600.0	19.2
700.0	19.4
800.0	19.9
900.0	21.2
1000.0	23.5

Distance of 10 meters

FREQUENCY (MHz)	AFE (dB/m)
200.0	9.0
250.0	10.1
300.0	11.8
400.0	15.3
500.0	15.6
600.0	18.7
700.0	19.1
800.0	20.2
900.0	21.1
1000.0	23.2

NOTES:

1. *Antenna serial number is 1038.*
2. *The above lists are located in file number 38M3O.ANT for a 3 meter range, and file number 38M100.ANT for a 10 meter range.*
3. *The files mentioned above are located on the disk marked "Radiated Emission Test EMI Receiver".*

14.4 Correction factors for LOG PERIODIC ANTENNA

Type SAS-200/511
at 3 meter range.

FREQUENCY (GHz)	ANTENNA FACTOR (dB)
1.0	24.9
1.5	27.8
2.0	29.9
2.5	31.2
3.0	32.8
3.5	33.6
4.0	34.3
4.5	35.2
5.0	36.2
5.5	36.7
6.0	37.2
6.5	38.1

FREQUENCY (GHz)	ANTENNA FACTOR (dB)
7.0	38.6
7.5	39.2
8.0	39.9
8.5	40.4
9.0	40.8
9.5	41.1
10.0	41.7
10.5	42.4
11.0	42.5
11.5	43.1
12.0	43.4
12.5	44.4
13.0	44.6

NOTES:

1. *Antenna serial number is 253.*
2. *The above lists are located in file number SAS3M0.ANT for a 3 meter range.*
3. *The files mentioned above are located on the disk marked "Antenna Factors".*

14.5 Correction factors for BICONICAL ANTENNA

Type BCD-235/B, at 3 meter range

FREQUENCY (MHz)	AFE (dB/m)
20.0	19.4
30.0	14.8
40.0	11.9
50.0	10.2
60.0	9.1
70.0	8.5
80.0	8.9
90.0	9.6
100.0	10.3
110.0	11.0
120.0	11.5
130.0	11.7
140.0	12.1
150.0	12.6
160.0	12.8
170.0	13.0
180.0	13.5
190.0	14.0
200.0	14.8
210.0	15.3
220.0	15.8
230.0	16.2
240.0	16.6
250.0	17.6
260.0	18.2
270.0	18.4
280.0	18.7
290.0	19.2
300.0	19.9
310	20.7
320	21.9
330	23.4
340	25.1
350	27.0

NOTES:

1. Antenna serial number is 1041.

2. The above list is located in file 19BC10M1.ANT on the disk marked "Radiated Emissions Tests EMI Receiver".