FCC Certification Test Report

FCC Certification Test Report
for
SkyBitz, Inc.
FCC ID: SAE-000MTXB

July 30, 2004

Prepared for:

SkyBitz, Inc.
45365 Vintage Park Plaza Suite 210
Dulles, Virginia 20166

Prepared By:

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FCC Certification Test Report
for the
SkyBitz, Inc.
MTXBA L-Band Mobile Terminal
FCC ID: SAE-000MTXB

WLL JOB# 8183

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Abstract

This report has been prepared on behalf of SkyBitz, Inc. to support the attached Application for Equipment Authorization. The test report and application are submitted for a Satellite Terminal under Part 25 of the FCC Rules and Regulations. This Federal Communication Commission (FCC) Certification Test Report documents the test configuration and test results for a SkyBitz, Inc. MTXBA L-Band Mobile Terminal.

Testing was performed on an Open Area Test Site (OATS) of Washington Laboratories, Ltd, 7560 Lindbergh Drive, Gaithersburg, MD 20879. Site description and site attenuation data have been placed on file with the FCC's Sampling and Measurements Branch at the FCC laboratory in Columbia, MD. Washington Laboratories, Ltd. has been accepted by the FCC and approved by NIST NVLAP (NVLAP Lab Code: 200066-0) as an independent FCC test laboratory.

The SkyBitz, Inc. MTXBA L-Band Mobile Terminal complies with the technical requirements under Part 25 of the FCC Rules and Regulations.

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1 Introduction

1.1 Compliance Statement

The SkyBitz, Inc. MTXBA L-Band Mobile Satellite Terminal complies with the limits for a Mobile Earth Station under Part 25 of the FCC Rules and Regulations.

1.2 Test Scope

Tests for radiated and conducted emissions were performed. All measurements were performed according to the 1992 version of ANSI C63.4. The measurement equipment conforms to ANSI C63.2 Specifications for Electromagnetic Noise and Field Strength Instrumentation.

1.3 Contract Information

Customer:	SkyBitz, Inc. 45365 Vintage Park Plaza Suite 210 Dulles, Virginia 20166
Quotation Number:	61555-A

1.4 Test Dates

Testing was performed from June 9 to June 16, 2004.

1.5 Test and Support Personnel

Washington Laboratories, LTD	James Ritter
Customer	Dana Johnson

1.6 Abbreviations

A	Ampere
Ac	alternating current
AM	Amplitude Modulation
Amps	Amperes
b/s	bits per second
BW	Bandwidth
CE	Conducted Emission
Cm	centimeter
CW	Continuous Wave
dB	decibel
Dc	direct current
EMI	Electromagnetic Interference
EUT	Equipment Under Test
FM	Frequency Modulation
G	giga - prefix for 10^9 multiplier
Hz	Hertz
IF	Intermediate Frequency
K	kilo - prefix for 10^3 multiplier
M	Mega - prefix for 10^6 multiplier
M	Meter
μ	micro - prefix for 10^{-6} multiplier
NB	Narrowband
LISN	Line Impedance Stabilization Network
RE	Radiated Emissions
RF	Radio Frequency
Rms	root-mean-square
SN	Serial Number
S/A	Spectrum Analyzer
V	Volt

2 Equipment Under Test

2.1 EUT Identification & Description

The SkyBitz, Inc. MTXBA L-Band Mobile Terminal transmits and receives messages through the SkyBitz network. Its integrated design includes a software-based radio, antennas, and lithium battery pack in one package.

Table 1: Device Summary

ITEM	DESCRIPTION
Manufacturer:	SkyBitz, Inc.
FCC ID Number	SAE-000MTXB
EUT Name:	Mobile Terminal
Model:	MTXBA
FCC Rule Parts:	§25
Frequency Range:	1630 – 1659 MHz (1636.22 – 1645 MHz authorized)
Maximum Output Power:	2 watts EIRP
Modulation:	MSK
Occupied Bandwidth:	7.2kHz
Keying:	Automatic
Type of Information:	Data
Number of Channels:	Variable- determined by satellite provider
Antenna Type	Integral
Frequency Tolerance:	0.001%
Emission Type(s):	F1D
Interface Cables:	RS485 Interface
Power Source & Voltage:	6Vdc from batteries

2.2 Test Configuration

The EUT was configured with a support laptop and an RS485 adapter. The laptop used SkyBitz software, SkyPort, to configure the system for continuous transmit. A separate DC power supply was used to provide a constant 6Vdc to the EUT so as not to drain the batteries.

The EUT firmware/software was set up to simulate normal transmission to a satellite

2.3 Testing Algorithm

The MTXBA L-Band Mobile Terminal was configured by SkyBitz software on the support laptop to continually transmit at 1643 MHz.

2.4 Test Location

All measurements herein were performed at Washington Laboratories, Ltd. test center in Gaithersburg, MD. Site description and site attenuation data have been placed on file with the FCC's Sampling and Measurements Branch at the FCC laboratory in Columbia,

MD. Washington Laboratories, Ltd. has been accepted by the FCC and approved by NIST NVLAP (NVLAP Lab Code: 200066-0) as an independent FCC test laboratory.

2.5 Measurements

2.5.1 References

ANSI C63.2 Specifications for Electromagnetic Noise and Field Strength Instrumentation

ANSI C63.4 American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

Land Mobile FM or PM Communications Equipment Measurement and Performance Standards (ANSI/TIA/EIA-603-93)

2.6 Measurement Uncertainty

All results reported herein relate only to the equipment tested. The measurement uncertainty of the data contained herein is ±2.3 dB.

For the purposes of the measurements performed by Washington Laboratories, the measurement uncertainty is ±2.3 dB. This has been calculated for a *worst-case situation* (radiated emissions measurements performed on an open area test site).

The following measurement uncertainty calculation is provided:

Total Uncertainty = $(A^2 + B^2 + C^2)^{1/2}/(n-1)$

where:

A = Antenna calibration uncertainty, in dB = 2 dB

B = Spectrum Analyzer uncertainty, in dB = 1 dB

C = Site uncertainty, in dB = 4 dB

n = number of factors in uncertainty calculation = 3

Thus, total uncertainty = $0.5\ (2^2 + 1^2 + 4^2)^{1/2} = \pm 2.3$ dB.

3 Test Equipment

Table 2 shows a list of the test equipment used for measurements along with the calibration information.

Table 2: Test Equipment List

Manufacturer	Model/Type	Function	Identification	Cal. Due
HP	8568B	Spectrum Analyzer	2634A02888	7/07/04
HP	85650A	Quasi-Peak Adapter	3303A01786	7/08/04
HP	HP 8593A	Spectrum Analyzer	3009A00739	6/25/04
HP	8563E	Spectrum Analyzer		
HP	8449B	Microwave Preamp	3008A00385	9/29/05
Rhode & Schwarz	1093.4495.03	Vector Analyzer	1093.4495.03	12/23/04
Solar	8012-50-R-24BNC	LISN	8379493	6/30/04
ARA	LPB-2520	BiconiLog Antenna	1044	6/20/04
ARA	DRG118/A	Microwave Horn Antenna	1236	4/17/05
HP	85685A	RF Preselector	3221A01395	7/07/04
EMCO	3110B	Biconical Antenna	9808-1078	6/20/04
EMCO	3146A	Log Periodic Antenna	8912-1129	6/20/04

4 Test Results

4.1 RF Power Output

Section 25.204 specifies the limits for Satellite Earth Stations.

In bands shared coequally with terrestrial radio communication services, the equivalent isotropically radiated power transmitted in any direction towards the horizon by an earth station operating in frequency bands between 1 and 15 GHz, shall not exceed the following limits:

+40 dBW in any 4 KHz band for θ: 0°
+40+3 θ dBW in any 4 KHz band for θ <0°≤05°

where θ is the angle of elevation of the horizon viewed from the center of radiation of the antenna of the earth station and measured in degrees as positive above the horizontal plane and negative below it.

4.1.1 Power measurement test procedure – Signal Substitution Method

To measure the EIRP the EUT was placed on motorized turntable for radiated testing on a 3-meter open field test site. The emissions from the EUT were measured continuously at every azimuth by rotating the turntable. Receiving antennas were mounted on an antenna mast to determine the height of maximum emissions. The height of the antenna was varied between 1 and 4 meters. Cables were varied in position to produce maximum emissions. Both the horizontal and vertical field components of the EUT were measured.

The received level of the detected emission was recorded in the data sheet. The EUT is then replaced with a transmit antenna and signal generator. Output power of the signal generator was increased until the same received level was indicated on the spectrum analyzer for the emission under investigation. Radiated power of the emission was then determined by adding the forward power supplied to the substitution antenna with the gain of the substitution antenna and comparing the result to the limit.

As specified above, the limit is +40 dBW in any 4 kHz band. The analyzer used for testing was limited to a 3 kHz measurement bandwidth. To adjust to the 4 kHz specification a BW correction of +1.25 dB was added to the final reading. The following calculations were used for determining the EIRP level:

Pout(dBW) = SL(dBm) + G(dBi) + -30(dB)

Where: SL is the substitution level in dBm

G is the substitution antenna gain in dBi

-30dB is the conversion factor for dBm to dBW

Table 3: RF Power Output

Freq. (MHz)	Pol H/V	Az Deg	Ant. Hght (m)	SA Level dBµV	BW Corr dBuV	Ant. Gain (G) dBi	Sig. Gen. (SL) dBm	EIRP Level Pout dBW/4kHz	Limit dBW/4kHz	Margin dB
1643.00	H	0.0	1.0	100.5	101.75	4.4	16.05	-9.55	40.0	-49.6
1643.00	V	0.0	1.0	115.2	116.45	4.4	27.72	2.12	40.0	-37.9

4.2 Occupied Bandwidth

The occupied bandwidth of the MTXBA Mobile Terminal was measured. This measurement was performed by coupling the output of the EUT via an antenna to the input of a spectrum analyzer.

The 26dB occupied bandwidth was measured at 7.2 kHz. The following is a plot of the occupied bandwidth.

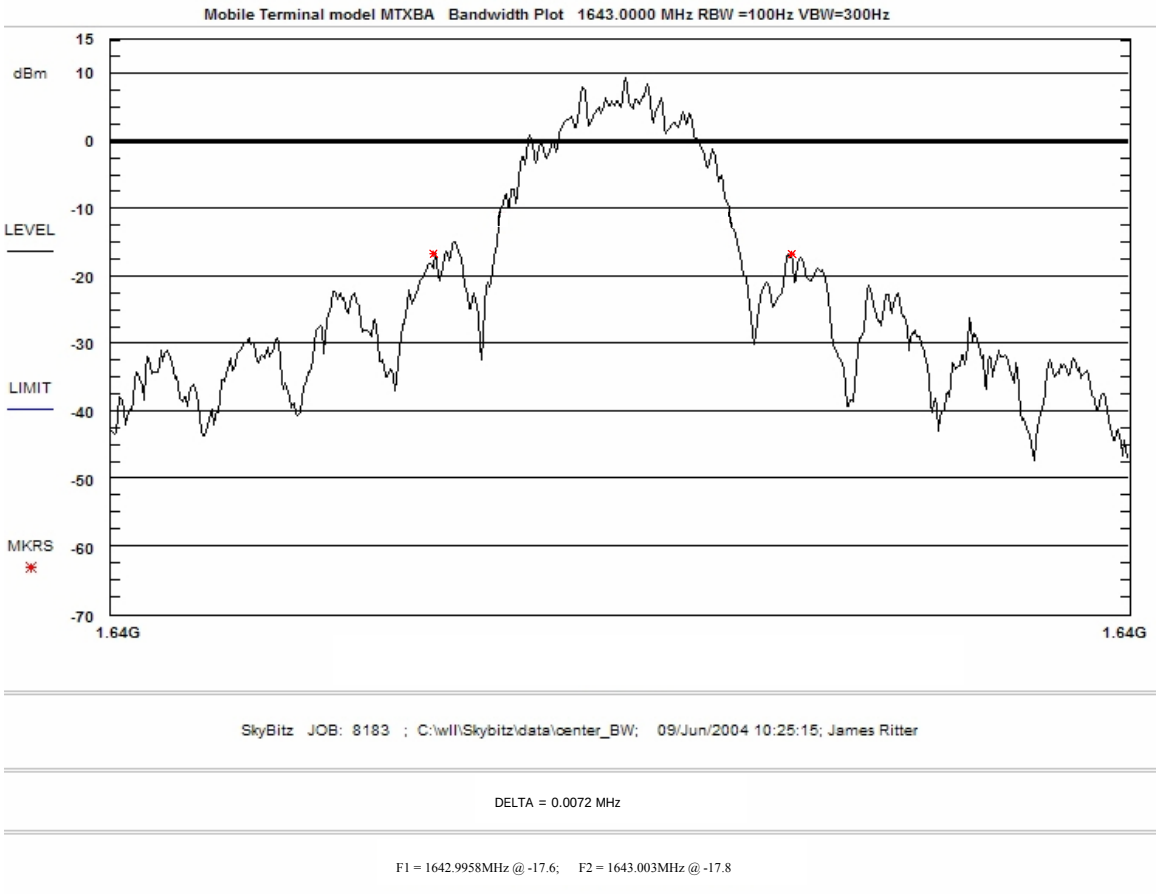

Figure 1. Occupied Bandwidth

4.3 Emission Limitations per §25.202(f)

Testing on the EUT was performed to show compliance with the specified emissions mask.

The mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the following schedule:

(1) In any 4 kHz band, the center frequency of which is removed from the assigned frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: 25 dB;

(2) In any 4 kHz band, the center frequency of which is removed from the assigned frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth: 35 dB;

(3) In any 4 kHz band, the center frequency of which is removed from the assigned frequency by more than 250 percent of the authorized bandwidth: An amount equal to 43 dB plus 10 times the logarithm (to the base 10) of the transmitter power in watts;

4.3.1 Test Procedure

To measure the emissions within the mask the EUT was placed on motorized turntable for radiated testing on a 3-meter open field test site. The emissions from the EUT were measured continuously at every azimuth by rotating the turntable. Receiving antennas were mounted on an antenna mast to determine the height of maximum emissions. The height of the antenna was varied between 1 and 4 meters. Cables were varied in position to produce maximum emissions. Both the horizontal and vertical field components of the EUT were measured.

At the point of highest reading the emission mask limit was applied to the received signal.

4.3.2 Test Results

The EUT complies with the emissions mask requirements of §25.202(f). The authorized bandwidth used in the calculations for the limit was 10kHz. The following figures are plots of the emissions for both horizontal and vertical polarities.

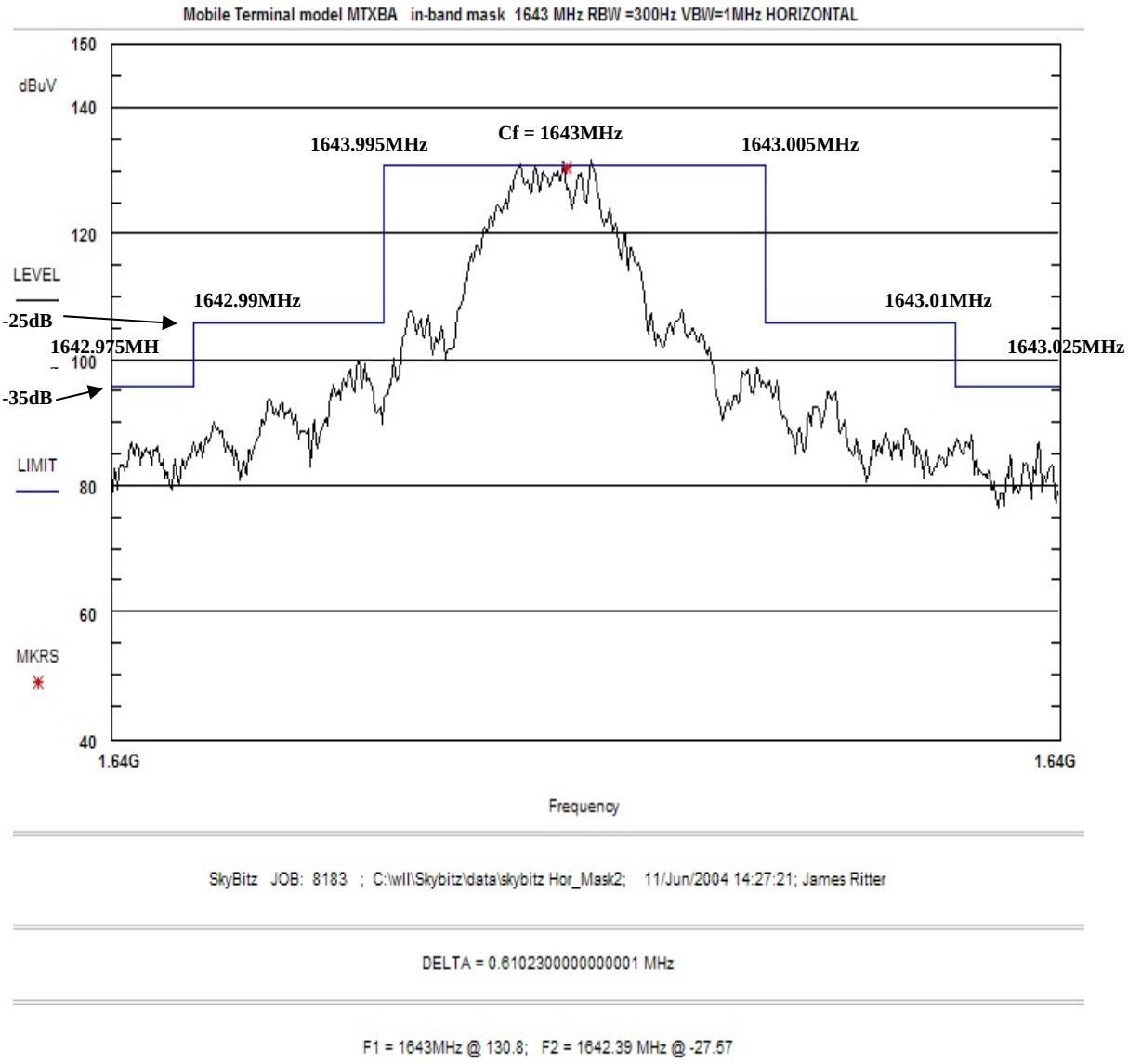

Figure 2: Emissions Mask, Horizontal

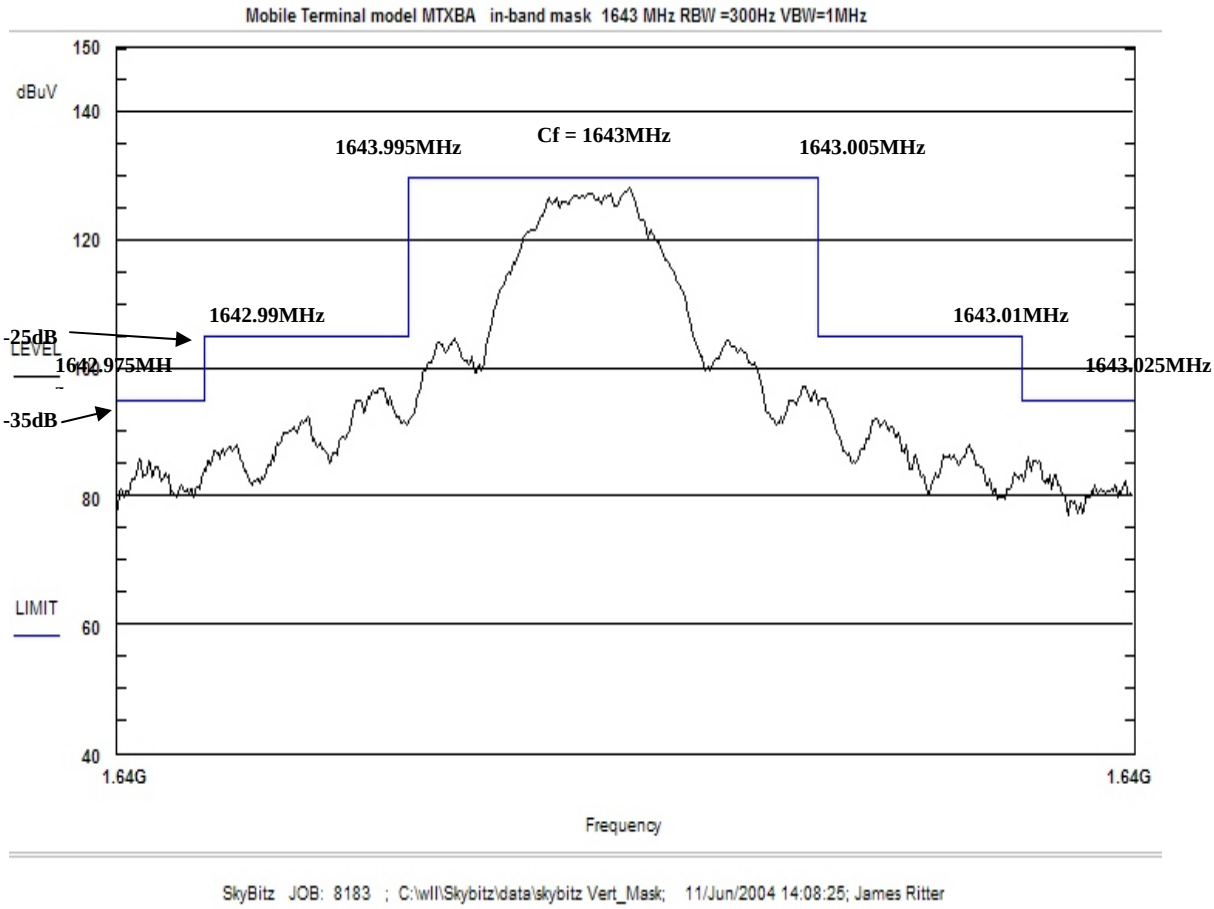

Figure 3: Emission Mask, Vertical

4.4 Radiated Spurious Emissions: EIRP Data (§25.202(f))

Radiated spurious emissions must comply with the requirements of §25.202(f). The limits for the spurious emissions are as follows:

The mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the following schedule:

(1) In any 4 kHz band, the center frequency of which is removed from the assigned frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: 25 dB;

(2) In any 4 kHz band, the center frequency of which is removed from the assigned frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth: 35 dB;

(3) In any 4 kHz band, the center frequency of which is removed from the assigned frequency by more than 250 percent of the authorized bandwidth: An amount equal to 43 dB plus 10 times the logarithm (to the base 10) of the transmitter power in watts;

Based on the power measured of 2 watts the limit for emissions removed from the center frequency by more than 250% of the authorized bandwidth will be:

$$\text{Limit(dBm)} = 33\text{(dBm)} - (43 + 10\text{Log}(2)) = -13\text{dBm}$$

This section covers emissions detected at more than 250% removed from the authorized bandwidth.

4.4.1 Test Procedure

The EUT was placed on motorized turntable for radiated testing on a 3-meter open field test site. The emissions from the EUT were measured continuously at every azimuth by rotating the turntable. Receiving antennas were mounted on an antenna mast to determine the height of maximum emissions. The height of the antenna was varied between 1 and 4 meters. The peripherals were placed on the table in accordance with ANSI C63.4-2001. Cables were varied in position to produce maximum emissions. Both the horizontal and vertical field components were measured.

Where emissions were detected, the EIRP levels were determined using the method of signal substitution. The measurement bandwidth used was set to 3kHz. A 1.25dB correction was added to the spectrum analyzer signal level for referencing to the specification bandwidth of 4kHz. The actual EIRP level was calculated as follows.

EIRP(dBm) = Signal generator substitution level(dBm) + Antenna Gain(dBi)

4.4.2 Test Results

The frequency range of 30 MHz to 17 GHz was measured. All emissions detected are recorded in Table 4 and Table 5. No above limit emissions were detected.

Table 4: Radiated Emission Test Data, Low Frequency

CLIENT:	SkyBitz	DATE:	6/10/2004
TESTER:	James Ritter	JOB #:	8183
EUT Information:		**Test Requirements:**	
EUT:	Mobile Terminal MTXB	TEST STANDARD:	FCC Part 25
CONFIGURATION:	Set to 1643 MHz	DISTANCE:	3m

Based on 10kHz authorized BW (provided from client satellite provider)

Test Equipment/Limit:			
ANTENNA:	A_00007	LIMIT:	EIRP
CABLE:	CSITE2_3m		

Frequency (MHz)	Polarity H/V	Az Deg	Ant. Hght (m)	SA Level (dBµV)	Sig. Gen. Level dBm	Ant. Gain dBi	EIRP Level dBm	Limit (dBm)	Margin dB
147.467	V	270.0	1.3	28.4	-49.3	0.8	-47.3	-13.0	-34.3
165.900	V	180.0	1.0	35.5	-38.1	-0.8	-37.7	-13.0	-24.7
184.313	V	90.0	2.0	29.9	-42.1	-1.4	-42.3	-13.0	-29.3
202.760	V	10.0	1.2	32.4	-39.8	-1.1	-39.7	-13.0	-26.7
239.617	V	125.0	1.4	32.6	-40.5	3.0	-36.3	-13.0	-23.3
258.050	V	90.0	2.0	33.2	-43.2	1.3	-40.7	-13.0	-27.7
276.483	V	125.0	1.4	29.8	-40.7	-0.7	-40.2	-13.0	-27.2
294.900	V	90.0	1.2	34.4	-31.2	-0.8	-30.8	-13.0	-17.8
331.790	V	180.0	2.0	24.1	-54.1	7.0	-45.9	-13.0	-32.9
350.223	V	180.0	2.0	18.6	-51.7	6.5	-44.0	-13.0	-31.0
368.660	V	180.0	2.4	17.4	-53.8	6.5	-46.1	-13.0	-33.1
387.090	V	190.0	1.7	20.2	-52.7	6.1	-45.4	-13.0	-32.4
552.965	V	0.0	1.7	19.5	-56.0	7.3	-47.5	-13.0	-34.5
589.798	V	350.0	1.7	17.3	-52.7	7.2	-44.3	-13.0	-31.3
147.467	H	180.0	2.3	37.2	-46.5	0.8	-44.5	-13.0	-31.5
165.900	H	0.0	2.0	38.7	-38.8	-0.8	-38.4	-13.0	-25.4
184.313	H	0.0	2.2	35.5	-39.9	-1.4	-40.1	-13.0	-27.1
202.760	H	0.0	1.5	35.6	-42.2	-1.1	-42.1	-13.0	-29.1
221.178	H	25.0	2.0	27.5	-44.3	1.3	-41.8	-13.0	-28.8
239.617	H	0.0	1.5	41.5	-32.8	3.0	-28.6	-13.0	-15.6
258.050	H	350.0	1.4	40.6	-31.6	1.3	-29.1	-13.0	-16.1
276.483	H	0.0	1.5	40.7	-24.2	-0.7	-23.7	-13.0	-10.7
294.900	H	0.0	1.3	42.3	-18.8	-0.8	-18.4	-13.0	-5.4
313.337	H	0.0	1.2	28.8	-51.4	5.9	-44.3	-13.0	-31.3
331.790	H	0.0	1.2	37.7	-43.7	7.0	-35.5	-13.0	-22.5
350.223	H	10.0	1.2	19.8	-52.9	6.5	-45.2	-13.0	-32.2
368.660	H	0.0	1.0	28.0	-50.8	6.5	-43.1	-13.0	-30.1
387.090	H	0.0	1.0	23.2	-50.3	6.1	-43.0	-13.0	-30.0
423.960	H	0.0	1.0	21.3	-50.0	5.6	-43.2	-13.0	-30.2
442.377	H	350.0	1.0	22.0	-46.1	6.3	-38.6	-13.0	-25.6
479.231	H	0.0	1.0	21.0	-44.3	6.9	-36.2	-13.0	-23.2
497.678	H	0.0	1.0	17.0	-48.8	6.9	-40.7	-13.0	-27.7

Frequency (MHz)	Polarity H/V	Az Deg	Ant. Hght (m)	SA Level (dBµV)	Sig. Gen. Level dBm	Ant. Gain dBi	EIRP Level dBm	Limit (dBm)	Margin dB
516.098	H	21.7	1.2	21.7	-49.8	7.3	-41.3	-13.0	-28.3
534.542	H	0.0	1.0	15.7	-54.7	7.0	-46.5	-13.0	-33.5
589.798	H	0.0	1.4	20.5	-55.1	7.2	-46.7	-13.0	-33.7
681.982	H	125.0	1.5	13.3	-50.8	6.7	-42.9	-13.0	-29.9

Table 5: Radiated Emission Test Data, High Frequency

CLIENT:	SkyBitz	DATE:	6/10/2004
TESTER:	James Ritter	JOB #:	8183
EUT Information:		**Test Requirements:**	
EUT:	Mobile	TEST STANDARD:	FCC Part 25
CONFIGURATION:	Tx at 1643 MHz	DISTANCE:	1m

Measured at 3KHz RBW – 1.25 dB added for 4Khz correction
Based on 10kHz authorized BW (provided from client satellite provider)

Test Equipment/Limit: Power limit at fundamental based on 40dBW from pt 25.204(a)

ANTENNA:	A_00425	LIMIT:	EIRP
CABLE:	Cable 407 and 466	AMPLIFIER (dB)	A_00066

Frequency (MHz)	Polarity H/V	Az Deg	Ant. Hght (m)	SA Level (dBuV)	Ant. Gain dBi	Sig. Gen. Level dBm	EIRP Level dBm	Limit (dBm)	Margin dB
1643.000	H	0.0	1.0	104.3	4.4	18.6	23.0	70.0	-47.1
1013.763	H	45.0	1.0	48.0	5.2	-71.4	-66.2	-13.0	-53.2
1071.068	H	45.0	1.0	65.9	5.1	-51.7	-46.6	-13.0	-33.6
1071.074	H	90.0	1.0	66.3	5.1	-50.9	-45.8	-13.0	-32.8
1143.854	H	90.0	1.0	59.0	5.0	-58.7	-53.7	-13.0	-40.7
1143.860	H	90.0	1.0	59.3	5.0	-57.1	-52.1	-13.0	-39.1
1357.037	H	90.0	1.0	52.1	4.7	-59.8	-55.1	-13.0	-42.1
1623.367	H	0.0	1.0	50.6	4.4	-39.0	-34.6	-13.0	-21.6
1662.630	H	0.0	1.0	50.5	4.4	-45.6	-41.2	-13.0	-28.2
1928.963	H	45.0	1.0	60.3	4.2	-52.3	-48.1	-13.0	-35.1
2214.928	H	0.0	1.0	66.3	4.0	-49.0	-45.0	-13.0	-32.0
2500.880	H	0.0	1.0	45.3	3.8	-71.5	-67.7	-13.0	-54.7
2786.859	H	315.0	1.0	52.8	3.7	-63.5	-59.8	-13.0	-46.8
3072.824	H	320.0	1.0	42.6	3.6	-70.8	-67.2	-13.0	-54.2
3286.007	H	315.0	1.0	42.8	3.9	-36.3	-32.4	-13.0	-19.4
3358.789	H	290.0	1.0	49.0	4.0	-65.3	-61.3	-13.0	-48.3
3571.961	H	0.0	1.0	50.0	4.4	-64.3	-59.9	-13.0	-46.9
3785.140	H	0.0	1.0	40.3	4.5	-76.3	-71.8	-13.0	-58.8
3857.926	H	0.0	1.0	72.5	4.6	-41.1	-36.5	-13.0	-23.5
4143.890	H	0.0	1.0	42.0	5.0	-73.3	-68.3	-13.0	-55.3
4429.856	H	350.0	1.0	59.6	5.5	-49.8	-44.3	-13.0	-31.3
4928.995	H	0.0	1.0	58.1	6.1	-50.8	-44.7	-13.0	-31.7
5500.926	H	0.0	1.0	45.6	5.3	-61.3	-56.0	-13.0	-43.0
5786.889	H	320.0	1.0	48.5	5.2	-56.3	-51.1	-13.0	-38.1
6000.073	H	0.0	1.0	39.3	5.2	-66.3	-61.1	-13.0	-48.1
6072.853	H	0.0	1.0	50.5	5.3	-53.3	-48.0	-13.0	-35.0
6358.817	H	0.0	1.0	50.5	5.5	-55.8	-50.3	-13.0	-37.3
6571.991	H	20.0	1.0	47.6	5.6	-56.8	-51.2	-13.0	-38.2
8214.999	H	345.0	1.0	41.8	6.0	-65.3	-59.3	-13.0	-46.3
9358.853	H	45.0	1.0	42.6	3.3	-47.3	-44.0	-13.0	-31.0

Frequency (MHz)	Polarity H/V	Az Deg	Ant. Hght (m)	SA Level (dBuV)	Ant. Gain dBi	Sig. Gen. Level dBm	EIRP Level dBm	Limit (dBm)	Margin dB
9644.815	H	30.0	1.0	40.0	3.9	-58.2	-54.3	-13.0	-41.3
9857.988	H	350.0	1.0	54.1	4.0	-45.0	-41.0	-13.0	-28.0
11573.779	H	10.0	1.0	45.8	3.5	-50.3	-46.8	-13.0	-33.8
1643.000	V	0.0	1.0	119.0	4.4	30.3	34.7	70.0	-35.4
1013.763	V	90.0	1.0	43.8	5.2	-73.7	-68.5	-13.0	-55.5
1071.068	V	90.0	1.0	67.3	5.1	-49.8	-44.7	-13.0	-31.7
1071.074	V	90.0	1.0	67.3	5.1	-49.8	-44.7	-13.0	-31.7
1143.854	V	90.0	1.0	60.3	5.0	-56.8	-51.8	-13.0	-38.8
1143.860	V	90.0	1.0	60.0	5.0	-57.4	-52.4	-13.0	-39.4
1357.037	V	90.0	1.0	54.3	4.7	-61.8	-57.1	-13.0	-44.1
1623.367	V	0.0	1.0	52.3	4.4	-38.8	-34.4	-13.0	-21.4
1662.630	V	0.0	1.0	47.8	4.4	-47.6	-43.2	-13.0	-30.2
1928.963	V	0.0	1.0	71.1	4.2	-42.3	-38.1	-13.0	-25.1
2214.928	V	90.0	1.0	64.1	4.0	-49.8	-45.8	-13.0	-32.8
2500.880	V	0.0	1.0	46.3	3.8	-66.6	-62.8	-13.0	-49.8
2786.859	V	340.0	1.0	46.0	3.7	-69.3	-65.6	-13.0	-52.6
3072.824	V	340.0	1.0	37.6	3.6	-73.3	-69.7	-13.0	-56.7
3286.007	V	25.0	1.0	39.3	3.9	-38.8	-34.9	-13.0	-21.9
3358.789	V	90.0	1.0	40.1	4.0	-71.3	-67.3	-13.0	-54.3
3571.961	V	15.0	1.0	43.8	4.4	-71.3	-66.9	-13.0	-53.9
3785.140	V	0.0	1.0	29.8	4.5	-86.1	-81.6	-13.0	-68.6
3857.926	V	315.0	1.0	64.5	4.6	-47.5	-42.9	-13.0	-29.9
4143.890	V	15.0	1.0	42.3	5.0	-72.8	-67.8	-13.0	-54.8
4429.856	V	0.0	1.0	48.5	5.5	-61.3	-55.8	-13.0	-42.8
4928.995	V	350.0	1.0	56.5	6.1	-52.8	-46.7	-13.0	-33.7
5500.926	V	0.0	1.0	45.6	5.3	-61.8	-56.5	-13.0	-43.5
5786.889	V	0.0	1.0	53.5	5.2	-54.8	-49.6	-13.0	-36.6
6000.073	V	0.0	1.0	37.6	5.2	-73.8	-68.6	-13.0	-55.6
6072.853	V	0.0	1.0	45.6	5.3	-59.8	-54.5	-13.0	-41.5
6358.817	V	0.0	1.0	46.1	5.5	-60.3	-54.8	-13.0	-41.8
6571.991	V	10.0	1.0	50.5	5.6	-55.8	-50.2	-13.0	-37.2
8214.999	V	0.0	1.0	48.0	6.0	-54.8	-48.8	-13.0	-35.8
9358.853	V	0.0	1.0	48.5	3.3	-48.8	-45.5	-13.0	-32.5
9644.815	V	20.0	1.0	44.6	3.9	-47.8	-43.9	-13.0	-30.9
9857.988	V	20.0	1.0	53.5	4.0	-45.5	-41.5	-13.0	-28.5
11573.779	V	0.0	1.0	48.6	3.5	-46.5	-43.0	-13.0	-30.0

4.5 Radiated Spurious Emissions per §25.216

FCC Part 25 limits the emissions from mobile earth stations for the protection of aeronautical radionavigation-satellite service. The EIRP density of spurious emissions which fall within the frequency range of 1559M to 1610MHz were measured in accordance with §25.216.

In accordance with §25.216(c) the EIRP density of emissions from mobile earth stations operating between 1610MHz and 1660.5MHz shall not exceed -70dBW/MHz, averaged over any 2ms active transmission interval, in the band 1559M – 1605MHz. The EIRP of discrete emissions of less than 700 Hz bandwidth from such stations shall not exceed -80 dBW, averaged over any 2ms active transmission interval, in the 1559M – 1605MHz band.

4.5.1 Test Procedure

The FCC was consulted on the measurement procedure of these emissions. Also, a measurement receiver with a RMS detector and the capability of performing the measurements as specified in §25.216 was obtained.

The EUT was setup at a test distance of 1 meter. The receiver was initially setup to scan the frequency range of 1559M – 1605MHz with a measurement bandwidth of 1MHz. Per the FCC guidance the EIRP limits were converted to field strength levels using the correction of 95.3. The following was used to calculate the limit and the corrected emissions levels for obtaining the plots shown in Figure 4 and Figure 5.

For emissions from 1559M – 1605MHz:

Limit = -70dBW/MHz = -40dBm/MHz

-40dBm + 95.3 = 55.3dBuV/m @ 3m

To correct for the test distance of 1m:

55.3dBuV/m + 9.54 = 64.84dBuV/m @ 1m

For discrete emissions with bandwidths less than 700Hz from 1559M – 1605MHz

Limit = -80dBW = -50dBm

-50dBm + 95.3 = 45.3dBuV/m @ 3m

To correct for the test distance of 1m:

45.3dBuV/m + 9.54 = 54.84dBuV/m @ 1m

The receiver emissions levels were adjusted for correction factors as follows:

Emission Level = RXL + ANTCORR + CABL + ATT

Where: RXL = Raw received level

ANTCORR = Antenna correction factor = 27.8dB

CABL = Cable loss = 1.1dB

ATT = Attenuator = 3dB

These correction factors were entered into the receiver as an offset so the obtained plots would display corrected data for comparison to the limit.

The receiver was then setup to scan the emissions in the frequency range of 1605M – 1610MHz as per §25.216(f). The same procedure used for the 1559M -1605MHz scan, as described above, was used. The limit for emissions appearing in the 1605M – 1610MHz is determined by the linear interpolation from -70dBW/MHz at 1605M to -10dBW/MHz at 1610MHz. Additionally, the emission levels were compared to the specification limit of §25.216(h). Under this section the limit is determined by linear interpolation from -70dBW/MHz at 1605MHz to -46dBW/MHz at 1610MHz.

4.5.2 Test Results

The following plots are the emissions detected with the band of 1559M – 1605MHz. The peak emissions shown in Figure 4 for the vertical polarity were further evaluated to determine the bandwidth of the emissions. Figure 6 and Figure 7 are the bandwidth measurements of the discrete emissions showing a bandwidth in excess of 700 Hz.

Figure 8 and Figure 9 are plots of the emissions appearing in the band of 1605M – 1610MHz.

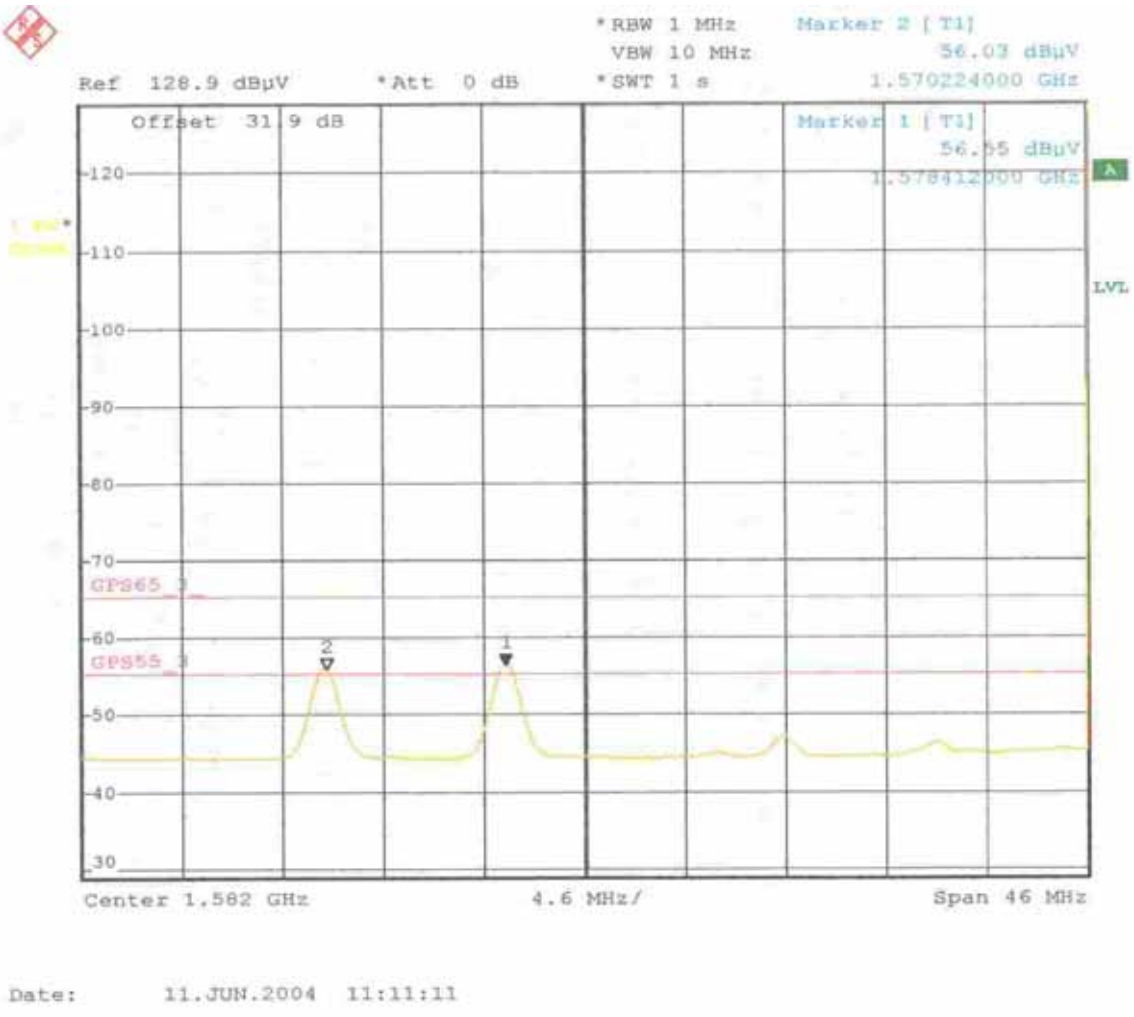

Figure 4: Spurious Emissions 1559M – 1605MHz, Vertical Polarity

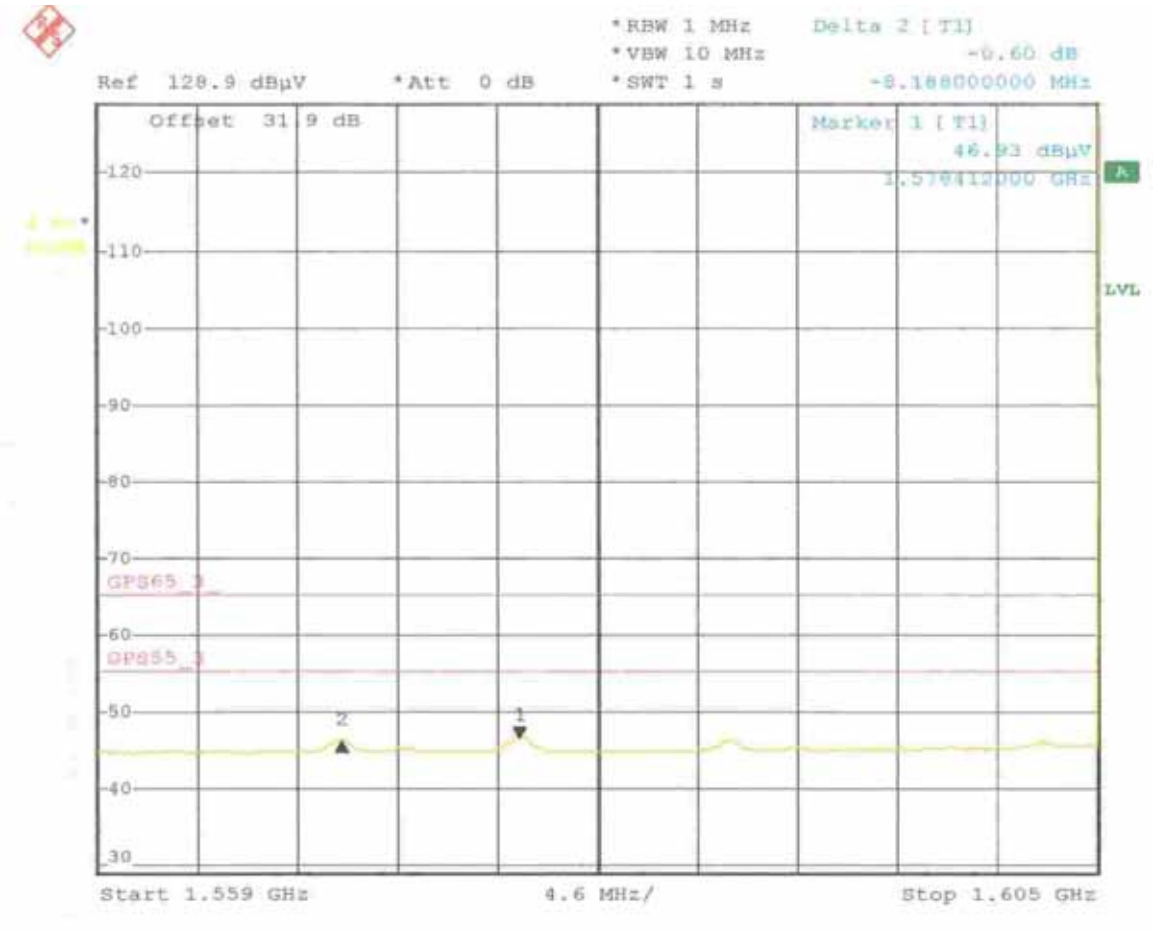

Figure 5: Spurious Emissions 1559M – 1605MHz, Horizontal Polarity

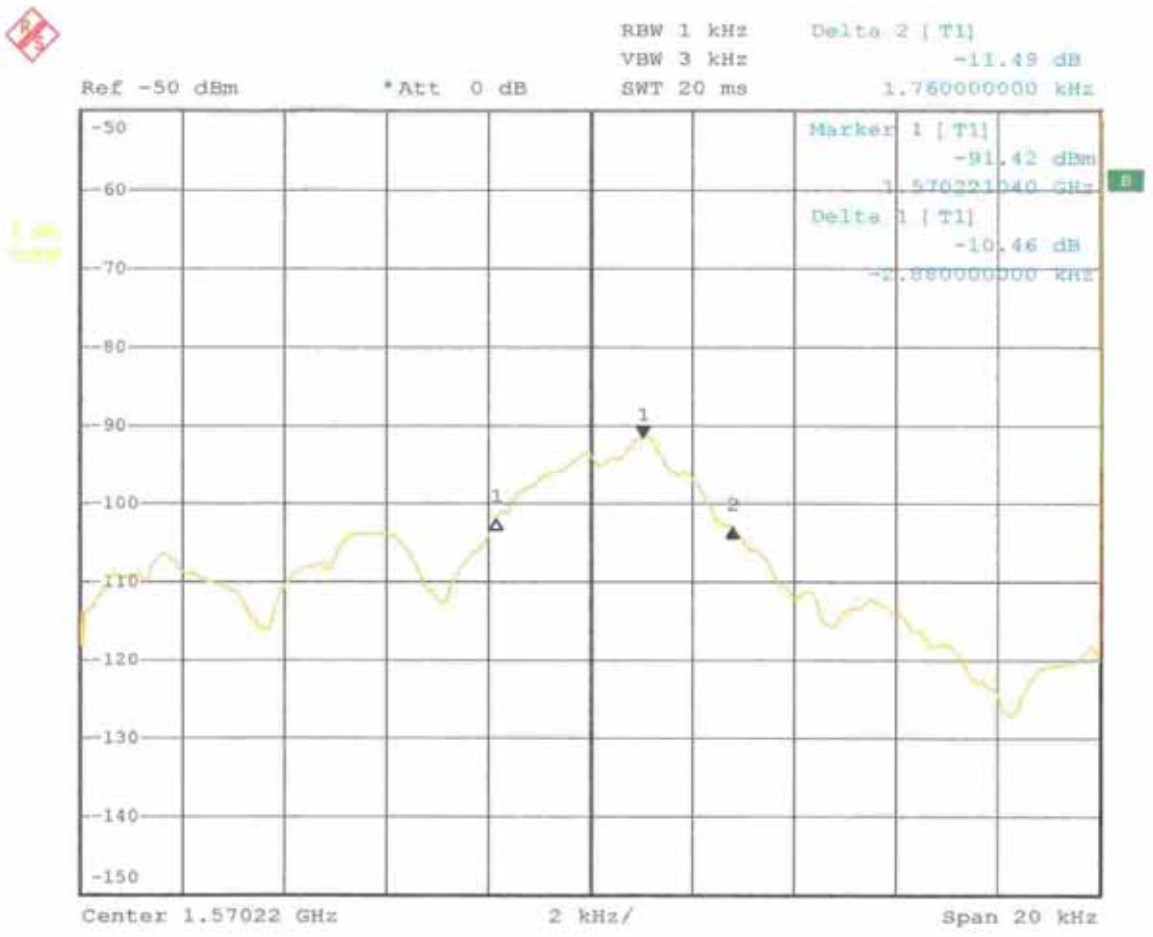

Figure 6: Bandwidth measurement of discrete emission at 1570.2MHz

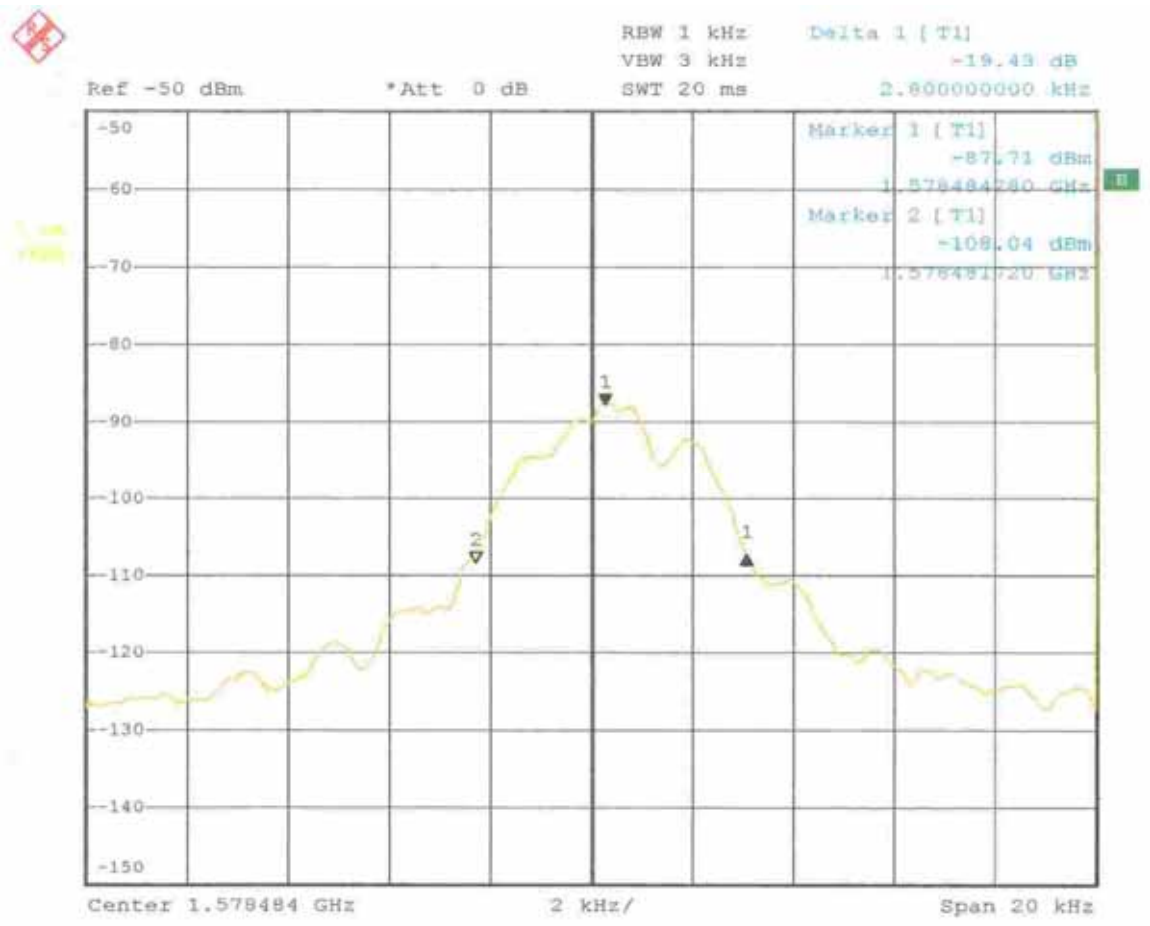

Figure 7: Bandwidth measurement of discrete emission at 1578.4MHz

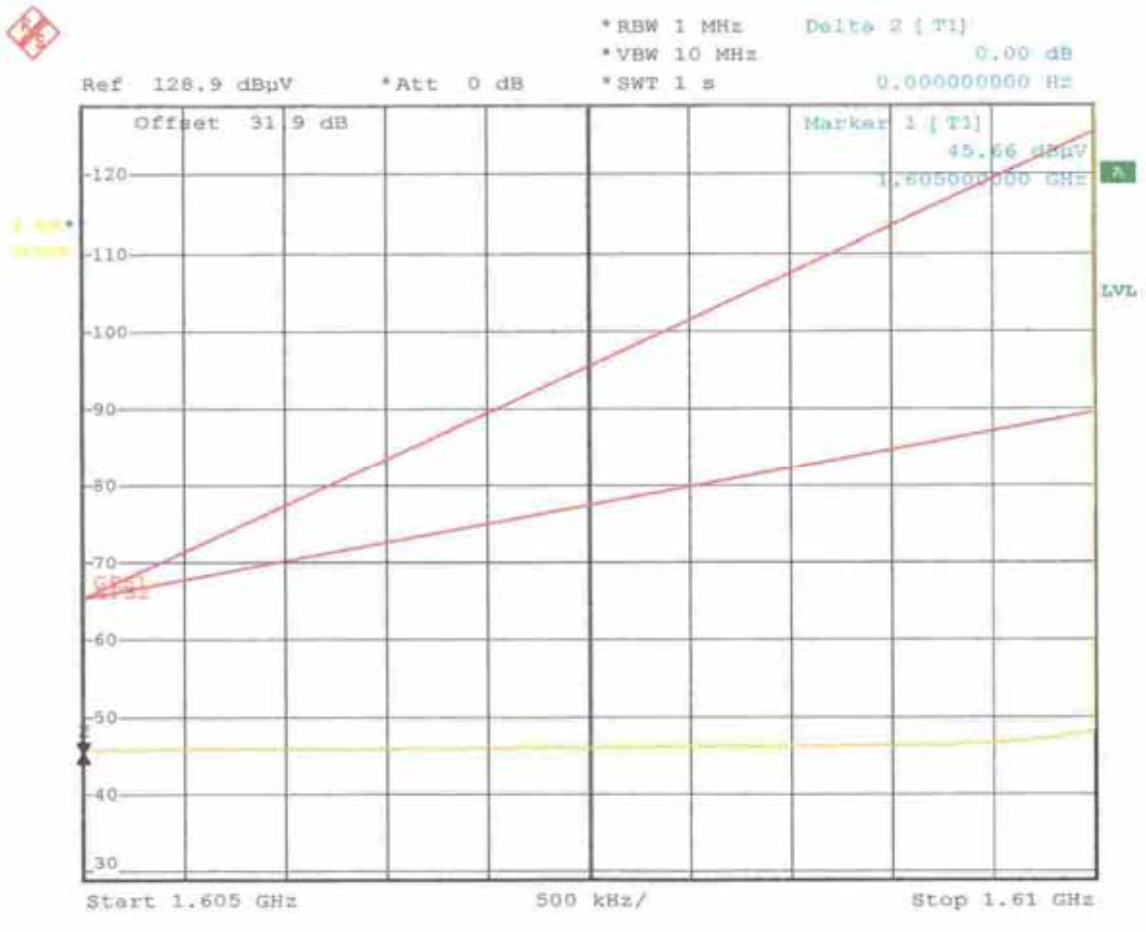

Figure 8: Spurious Emissions 1605M – 1610MHz, Vertical Polarity

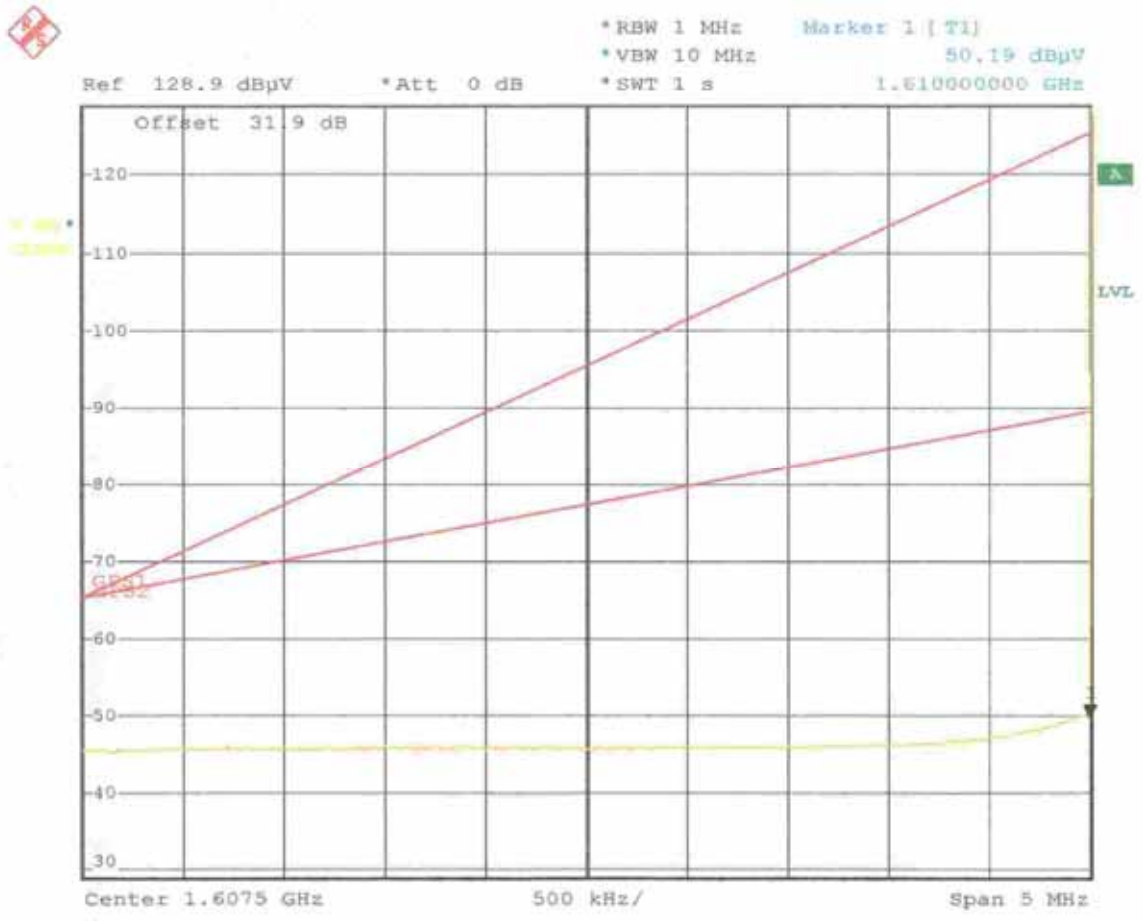

Figure 9: Spurious Emissions 1605M – 1610MHz, Horizontal Polarity

4.6 Frequency Stability: (FCC Part §2.1055)

Frequency as a function of temperature and voltage variation shall be maintained within the FCC-prescribed tolerances. Per §25.202(d) the frequency tolerance shall be maintained within 0.001% of the reference frequency.

4.6.1 Test Procedure

The temperature stability was measured with the unit in an environmental chamber used to vary the temperature of the sample. The sample was held at each temperature step to allow the temperature of the sample to stabilize.

The frequency stability of the transmitter was examined at the voltage extremes and for the temperature range of -30°C to +50°C. The carrier frequency was measured while the EUT was in the temperature chamber. The reference frequency of the EUT was measured at the ambient room temperature with the frequency counter.

The EUT is powered by 6Vdc voltage supplied via an external DC power supply.

4.6.2 Test Results

The EUT complies with the temperature stability requirements of §25.202. Test results are given in Table 6.

Table 6: Frequency Stability Test Data

Client: Skybitz Inc
Model: Mobile Terminal MTXB
Date: 6/16/2004
Job #: 8183
Tester: James Ritter
Limit: 0.001%

Temperature Degrees C	Frequency MHz	Difference Hz	Deviation (%)
Ambient	1643.000300	0.0	0
-30	1643.003000	2700.0	0.000164
-20	1643.003170	2870.0	0.000175
-10	1643.002870	2570.0	0.000156
0	1643.002500	2200.0	0.000134
10	1643.002300	2000.0	0.000122
20	1643.000970	670.0	0.000041
30	1643.000030	-270.0	0.000016
40	1642.999400	-900.0	0.000055
50	1642.998630	-1670.0	0.000102

Voltage Volts	Frequency MHz	Difference Hz	Deviation (%)	Voltage Volts
At rated	1642.999900	0	0.0	6VDC
At 85%	1643.000030	-130	0.000008	5.1VDC
At 115%	1643.000070	-170	0.000010	6.9VDC