FCC and IC Certification Test Report

FCC and Industry Canada Certification Test Report

for

SkyBitz, Inc.

FCC ID: SAE-000MTXC

IC ID: 5375A-000MTXC

June 23, 2005

Prepared for:

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

Prepared By:

Washington Laboratories, Ltd.
7560 Lindbergh Drive
Gaithersburg, Maryland 20879

FCC and Industry Canada Certification Test Report
for the
SkyBitz, Inc.
MTXC L-Band Mobile Terminal
FCC ID: SAE-000MTXC
IC ID: 5375A-000MTXC

WLL JOB# 8708/8709

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Documentation Specialist

Reviewed by: Gregory M. Snyder
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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 and under the Regulations and Spectrum Management and Telecommunications Policy RSS-170 of Industry Canada. This Certification Test Report documents the test configuration and test results for a SkyBitz, Inc. MTXC 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. The Industry Canada OATS numbers are 3035A-1 and 3035A-2 for Washington Laboratories, Ltd. Site 1 and Site 2, respectively. 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. MTXC L-Band Mobile Terminal complies with the technical requirements under FCC Part 25 and Industry Canada RSS-170.

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1 Introduction

1.1 Compliance Statement

The SkyBitz, Inc. MTXC L-Band Mobile Satellite Terminal complies with the limits for a Mobile Earth Station under FCC Part 25 and Industry Canada RSS-170.

1.2 Test Scope

Tests for radiated and conducted emissions were performed. All measurements were performed according to the 2003 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:	62316

1.4 Test Dates

Testing was performed from May 2, 2005, and from May 23 to 26, 2005.

1.5 Test and Support Personnel

Washington Laboratories, LTD	James Ritter
Customer	Dana Johnson

2 Equipment Under Test

2.1 EUT Identification & Description

The SkyBitz, Inc. MTXC 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-000MTXC
IC ID Number	5375A-000MTXC
EUT Name:	Mobile Terminal
Model:	MTXC
FCC Rule Parts:	§25
IC Rule Parts	RSS-170 Annex B
Frequency Range:	1630 – 1659 MHz (1626.5 – 1660.5 MHz authorized)
Maximum Output Power:	1.3 watts EIRP
Modulation:	MSK
Occupied Bandwidth (26dB):	kHz
Keying:	Automatic
Type of Information:	Data
Number of Channels:	Variable- determined by satellite provider
Antenna Type	Integral
Frequency Tolerance:	0.001% (FCC), +/-320 Hz (IC)
Emission Type(s):	G1D
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.

EUT Components:

Description	Manufacturer	Model	S/N
L Band Mobile Terminal	Skybitz	MTXC	MTXC0NC0150857051

Cable/Port Listings:

Port ID	Connector Type	Cable Length (m)	Shielded (Y/N)	Connected To/From
Custom Circular 18 pin	N/A (for Maintenance & programming only)			Laptop to EUT (not connected during testing)

Test Configuration:

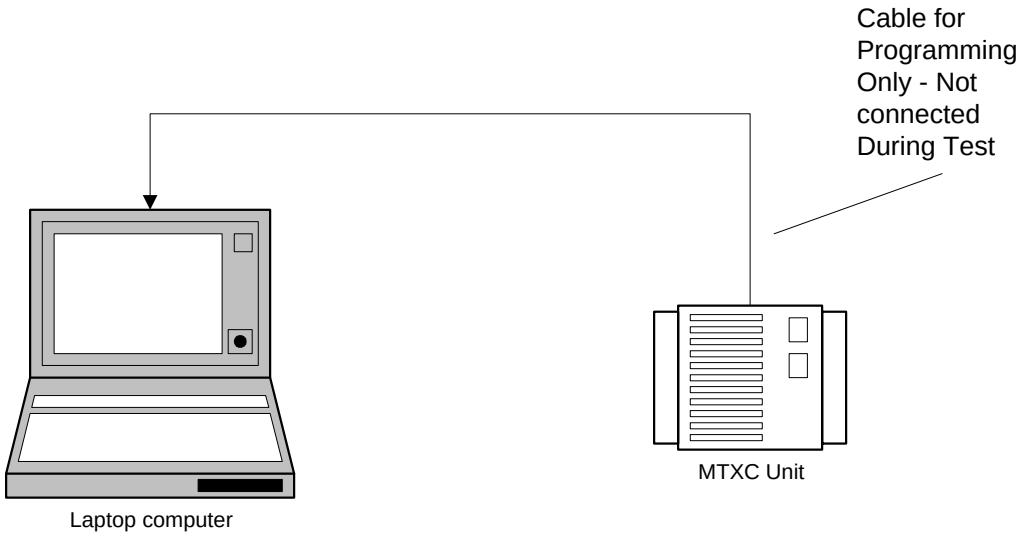


Figure 1. Test Configuration

EUT Peripherals:

Description	Manufacturer	Model	S/N	FCC ID
Laptop PC	Hewlett Packard	Pavillion ZE5500	None Listed	None Listed

2.3 Testing Algorithm

The MTXC 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. The Industry Canada OATS numbers are 3035A-1 and 3035A-2 for Washington Laboratories, Ltd. Site 1 and Site 2, respectively. 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

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

Error! Reference source not found. shows a list of the test equipment used for measurements along with the calibration information.

Table 2: Test Equipment List

Equipment	WLL Asset #	Calibration Due
Signal Generator Rhode & Schwarz SMT06	00478	11/23/2005
Synth Signal Generator HP 8672A	00257	3/4/2006
RF Preselector(site2) HP 85685A	00071	7/8/2005
Spectrum Analyzer(site2) HP 8568B	00073	7/9/2005
Quasi-Peak Adaptor HP 85650A	00069	7/9/2005
Spectrum Analyzer HP 8593A	00074	8/17/2005
Amplifier HP8449B	00522	4/11/2006
Antenna Electrometrics BIA30	00034	6/10/2005
Antenna Electrometrics 3146A	00029	6/24/2005
Antenna ARA SAS-200/518	00001	3/11/2006
Antenna ARA DRG-118A	00004	2/17/2006
Antenna ARA	00007	9/14/2005
Spectrum Analyzer, Rhode & Schwarz FSP	RENTAL	12/6/2005

4 Test Results

4.1 RF Power Output (FCC 25.204, RSS-170 Section 6.2)

FCC 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.

IC RSS-170 Section 6.2 and Annex B specifies the following requirements:

The output power shall be measured when the transmitter is operating at the manufacturer's rated power and modulated with signals representative (i.e. typical) of those encountered in a real system operation. This measurement shall be carried out before the other tests.

If the power is in bursts, the power shall be averaged over any 100 millisecond interval, or over the burst interval if the burst is shorter than 100 milliseconds, during which its value is at its maximum.

Record the output power.

4.1.1 Power measurement test procedure – Signal Substitution Method

No direct connection to the antenna is available for making the power measurement as the antenna is integrated with the unit.

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)	Spurious Level dBµV	Sub. Sig. Gen. Level	Sub. Power Level	Sub. Ant. Gain	EIRP Level Pout dBW/4kHz	Limit dBW/4kHz	Margin dB
1643.00	H	10.0	1.0	109.8	13.2	15.7	5.9	-8.4	40.0	-48.4
1643.00	V	0.0	1.0	115.0	22.7	25.3	5.9	1.2	40.0	-38.8

4.2 Occupied Bandwidth

The occupied bandwidth of the MTXC 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.

As no signal without modulation was available, the 26dB occupied bandwidth was measured for the Low, High and Middle channels from the reference of maximum measured power and the test results are listed in the following table. The following is a plot of the occupied bandwidth.

Table 4: Occupied Bandwidths

Frequency (MHz)	Occupied Bandwidth (kHz)	Standard Reference
1626.5	4133.33	RSS-170
1643	4700	FCC Part 25
1660.5	4633.33	RSS-170

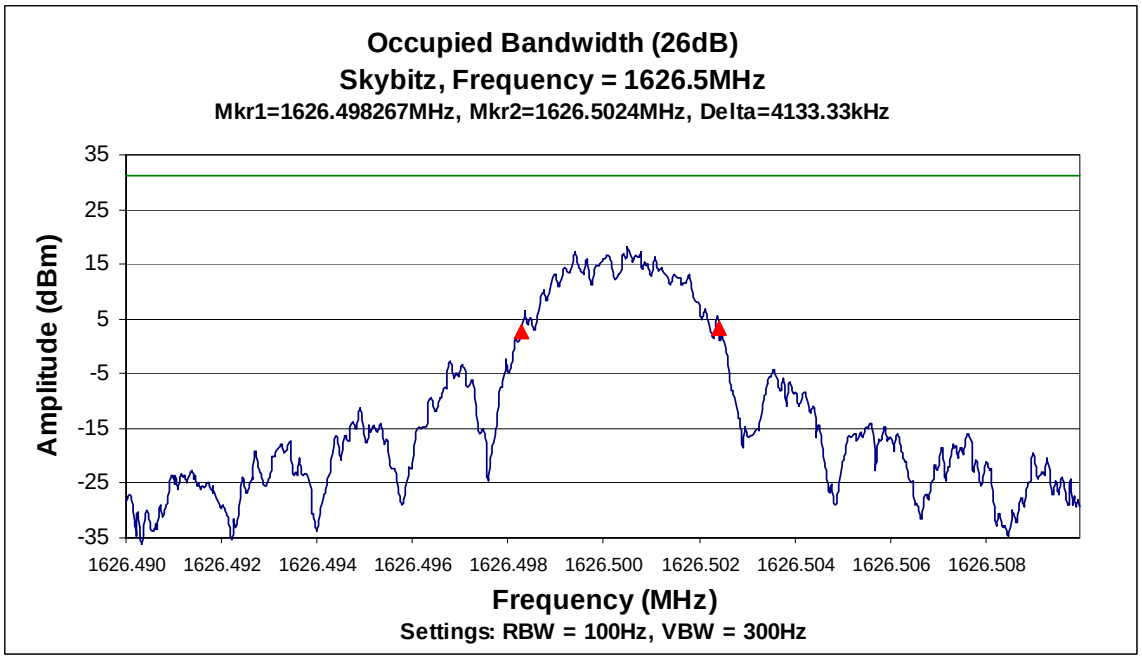


Figure 2. Occupied Bandwidth (26dB), Low Channel, RSS-170

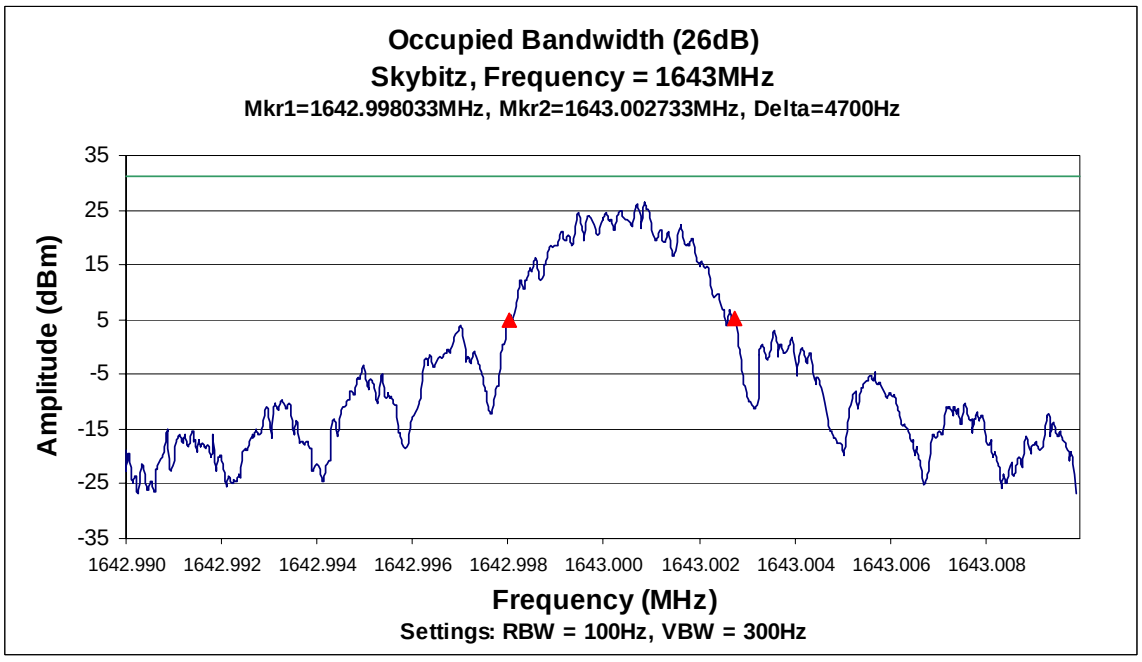


Figure 3: Occupied Bandwidth (26dBc), Mid Channel, FCC Part 25

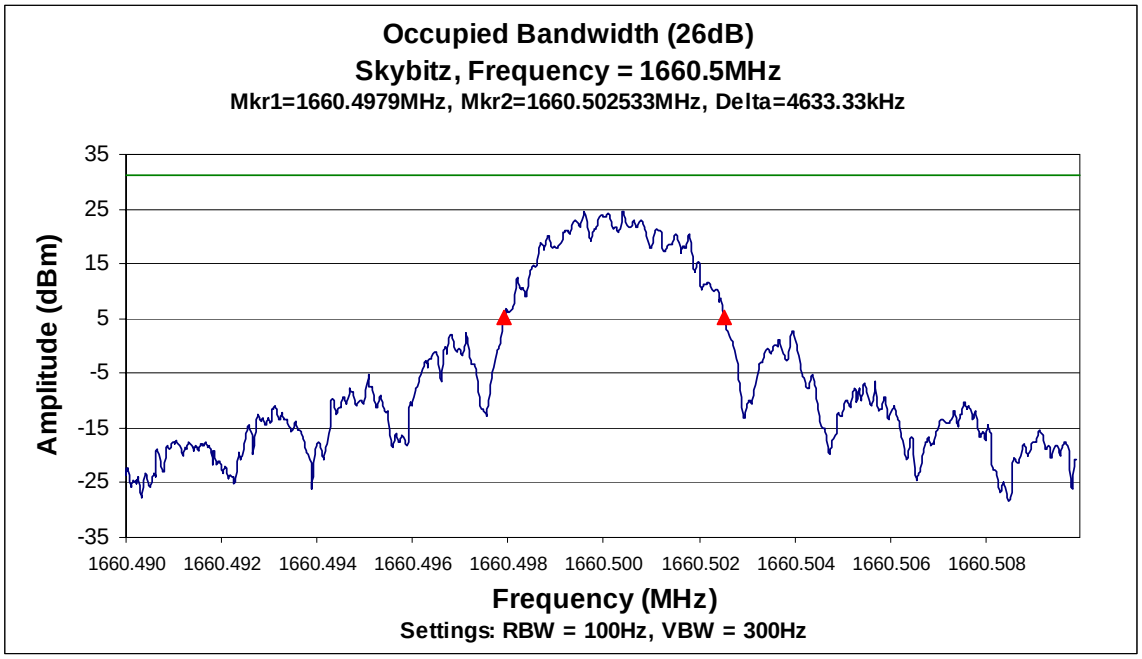


Figure 4: Occupied Bandwidth (26dB), High Channel, RSS-170

4.3 Emission Limitations per FCC Part 25.202(f) and RSS-170 Section 6.3 (Emission Masks)

Radiated spurious emissions must comply with the requirements of Table B1 column (a) of RSS-170 and §25.202 (f) of FCC. The limits for the spurious emissions for RSS-170 and FCC Part 25 are as follows:

RSS-170(B2):

The attenuation of the spectrum shall be in accordance with the schedule of column (a), or alternatively of column (b) of Table B1, whichever is less stringent.

Table 5: Table B1 of RSS-170

Frequency Offset Normalized to SR (symbol rate)	(a) Minimum attenuation relative to in-band spectral density, (dB)	(b) Minimum attenuation relative to transmitter output power (dB), in any 4 kHz
+0.75 SR	0	0
+1.40 SR	20	30
+2.80 SR	40	50
+4.00 SR	55 or (37 + 10 Log_{10}TP) whichever is less stringent	65 or (47 + 10 Log_{10}TP) whichever is less stringent

FCC Part 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;

4.3.1 Test Procedure

For complying with the RSS-170 emission mask, the unit was first set to transmit at the lowest authorized frequency of 1626.5MHz. The emission mask of Table B1 column "a" was then entered into the spreadsheet based on a baud rate of 3600. Discrete measurements of the channel power in a 4kHz bandwidth were then measured and plotted against the limit curve.

The unit was then set to the highest authorized frequency of 1660.5MHz and the test was repeated.

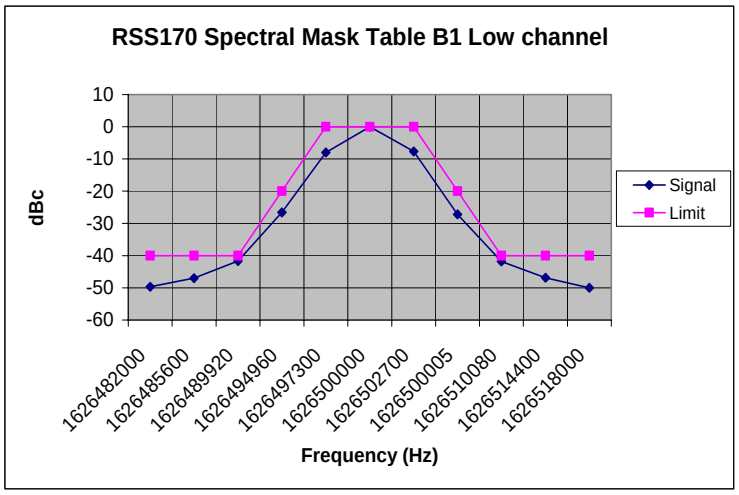
Spectrum plots of the emissions as measured with a 100Hz RBW were also obtained at the low and high channel settings and are shown in Figure 6 and Figure 7.

For the FCC Part 25 requirements the unit was set to transmit at 1643MHz and the emissions were scanned to +/-250% of the authorized bandwidth and compared to the emission mask specified in FCC Part 25.202(f). The authorized bandwidth used in the calculations for the limit was 10kHz.

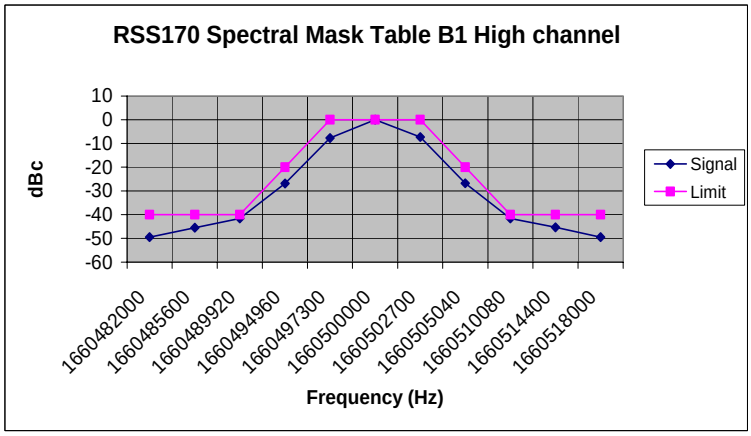
4.3.2 Test Results

The EUT complies with the emissions mask requirements of RSS-170 Annex B and FCC Part 25.202(f). Figure 5 contains the plots of the emissions mask per RSS-170. Figure 8 and Figure 9 are the plots of the emissions mask for FCC Part 25.202(f).

	Freq	Power	dBc	limit	Baud:	3600
Low Chan						
	1626482000	-54	-49.7	-40		
	1626485600	-51.3	-47	-40		
	1626489920	-46	-41.7	-40		
	1626494960	-30.9	-26.6	-20		
	1626497300	-12.3	-8	0		
	1626500000	-4.3	0	0		
	1626502700	-12	-7.7	0		
	1626500005	-31.5	-27.2	-20		
	1626510080	-46.1	-41.8	-40		
	1626514400	-51.2	-46.9	-40		
	1626518000	-54.3	-50	-40		



	Freq	Power	dBc	limit
Hi Chan				
	1660482000	-46.9	-49.5	-40
	1660485600	-42.9	-45.5	-40
	1660489920	-39	-41.6	-40
	1660494960	-24.3	-26.9	-20
	1660497300	-5.1	-7.7	0
	1660500000	2.6	0	0
	1660502700	-4.7	-7.3	0
	1660505040	-24.2	-26.8	-20
	1660510080	-39	-41.6	-40
	1660514400	-42.7	-45.3	-40
	1660518000	-46.9	-49.5	-40



Method: Using SAS200/518 Antenna. a spectrum analyzer was utilized to measure Channel power in a 4 kHz Bandwidth a Resolution and Video BW of 300 Hz was used with video averaging . A signal reading was taken at each point specified in RSS170 table B1 Column 1

Test equipment
SAS200/518 HF Antenna
HP8564E Spectrum Analyzer, Asset 67,Cal due 7/7/05

Figure 5: Out-of-Band Emissions to Table B1

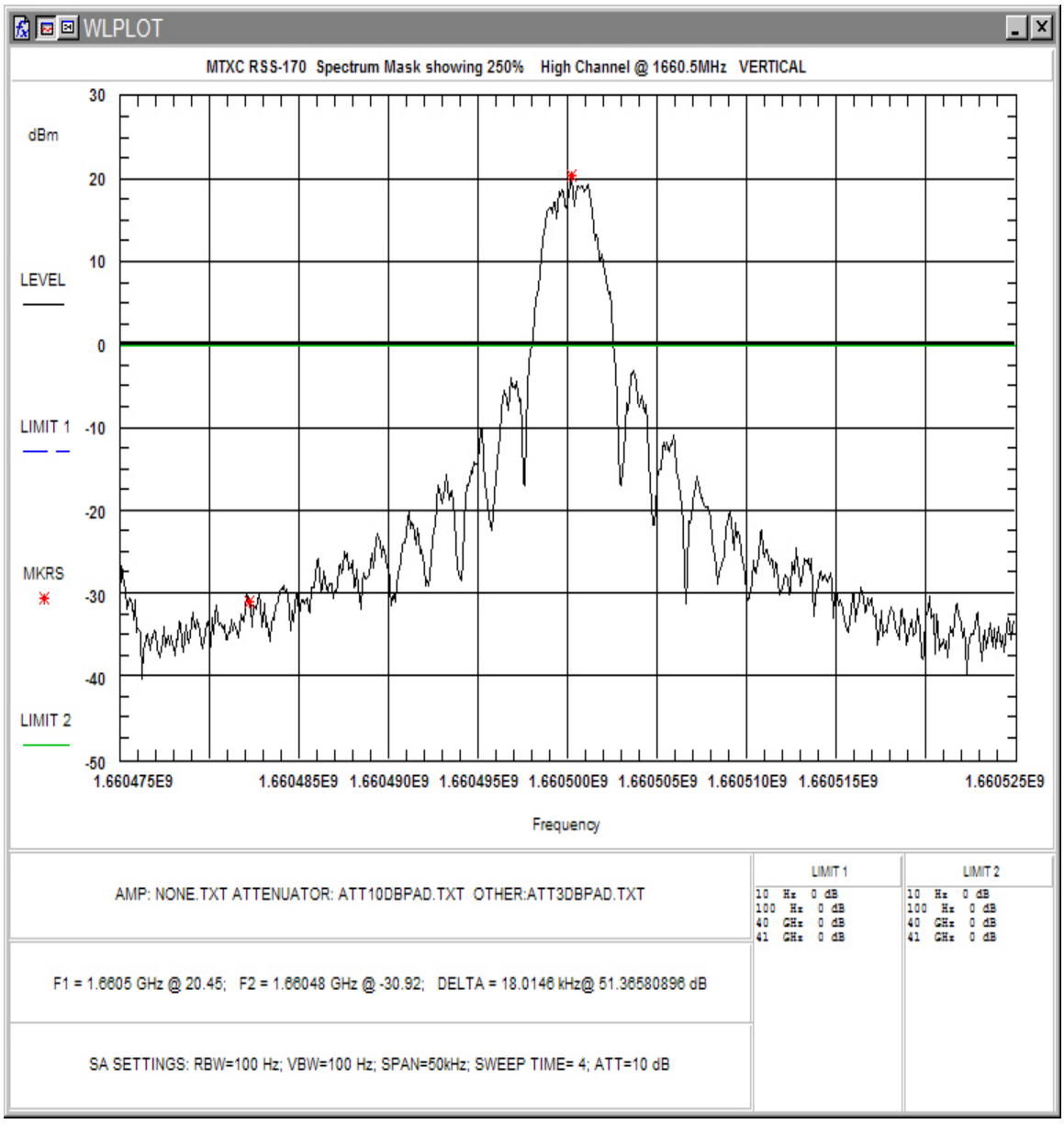


Figure 6: Spectrum Plot, High Channel @ +/-250% of BW

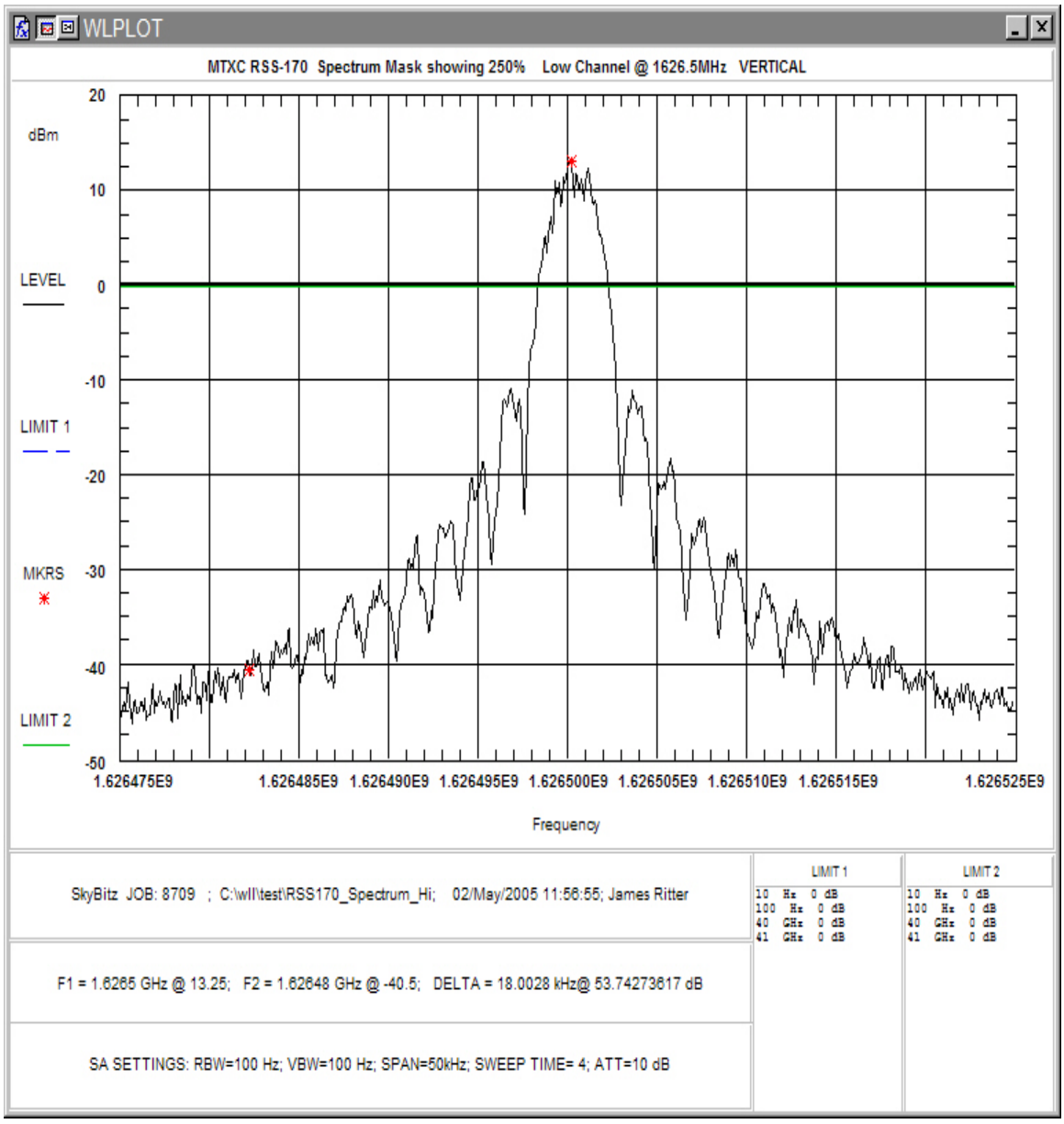


Figure 7: Spectrum Plot, Low Channel @ +/-250% of BW

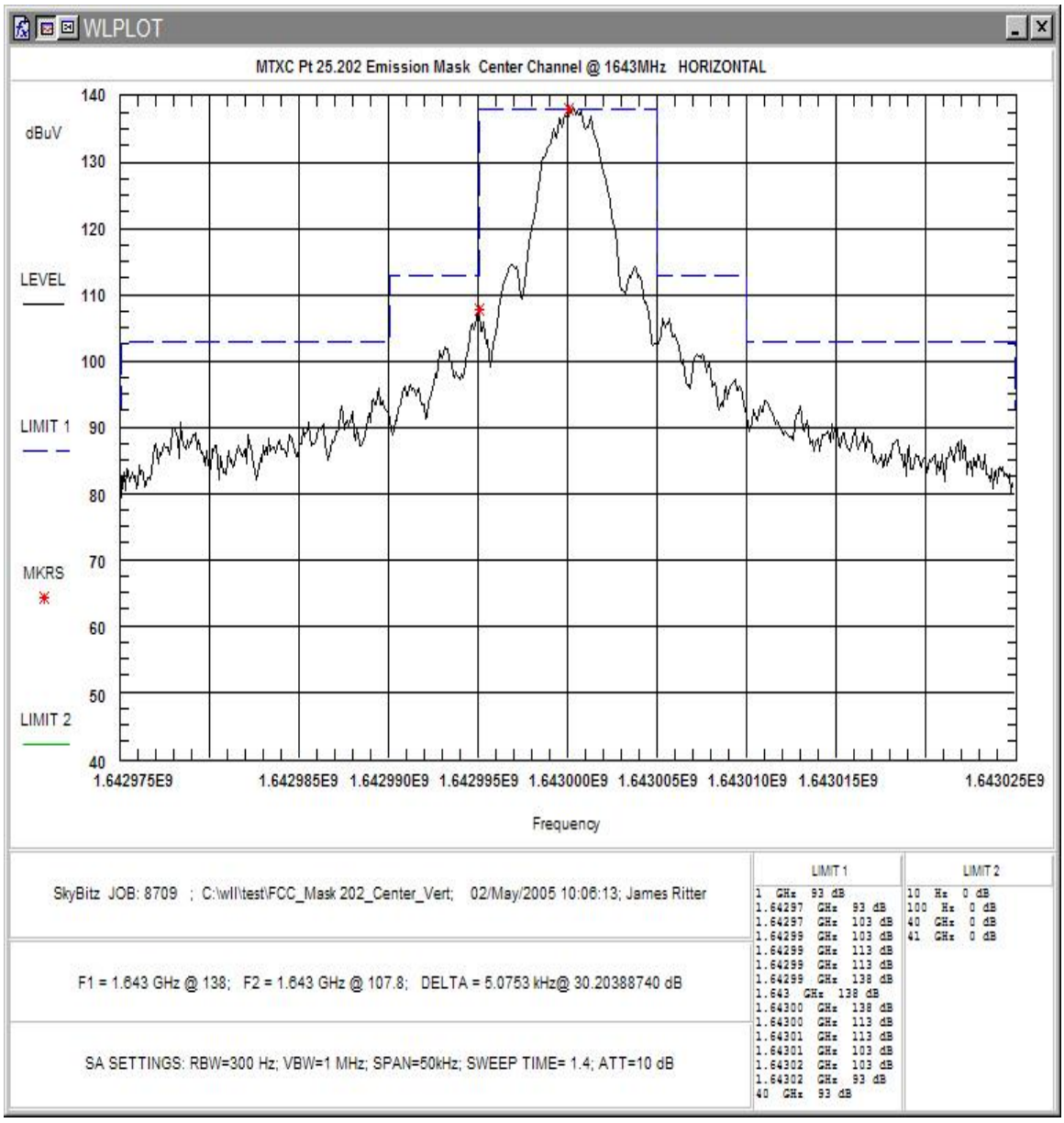


Figure 8: FCC Part 25.202(f) Emissions Mask, Vertical Polarity

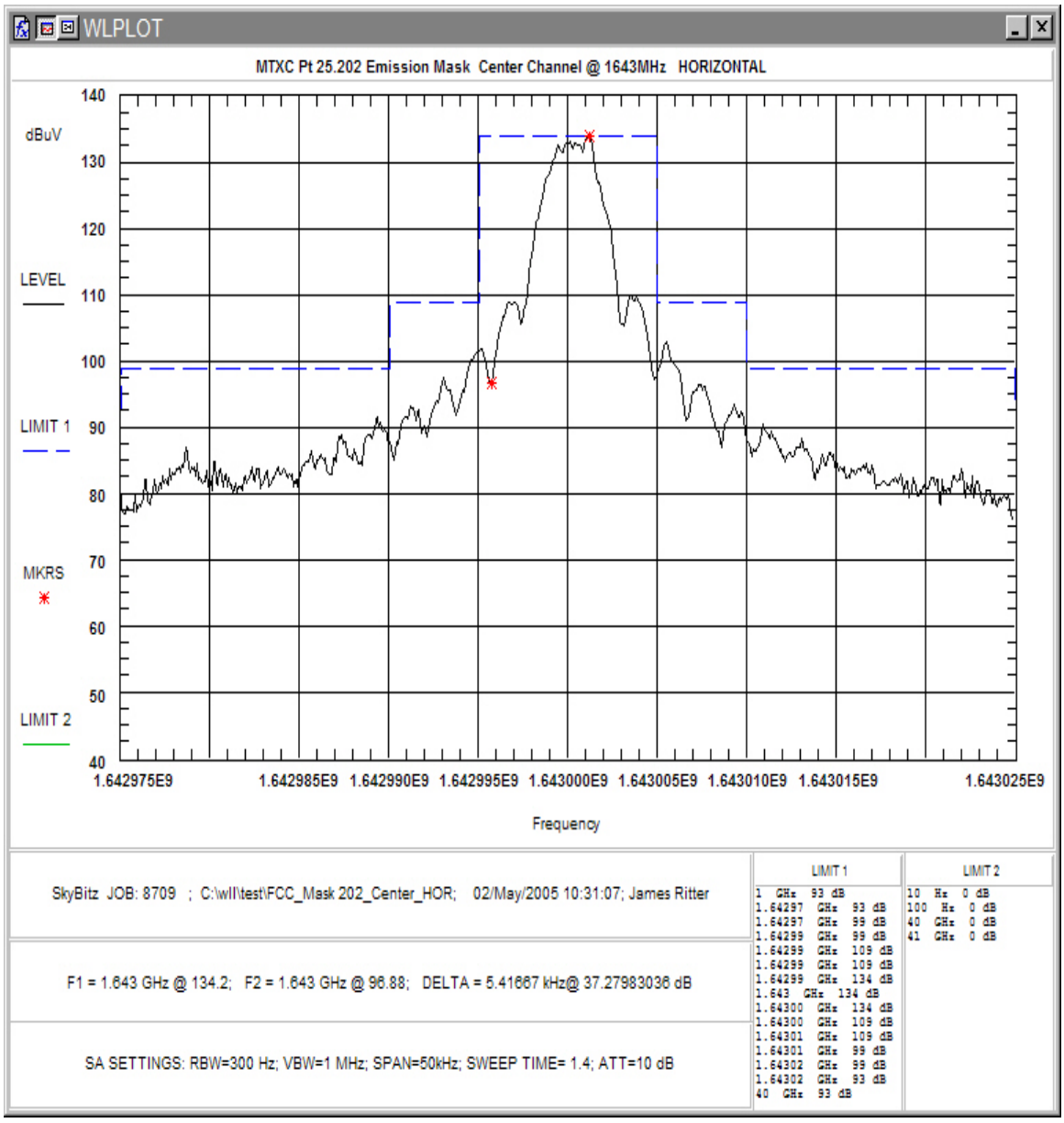


Figure 9: FCC Part 25.202(f) Emissions Mask, Horizontal Polarity

4.4 Radiated Spurious Emissions: EIRP Data (RSS-170, Annex B3 and FCC §25.202(f))

Radiated spurious emissions must comply with the requirements of Annex B3 of RSS-170 and §25.202 (f) of FCC. The limits for the spurious emissions are as follows:

RSS-170:

Spurious and harmonic emissions, excluding the frequency band of ±4 SR about the carrier frequency (see Section 4.3) shall be attenuated below the transmitter output power

TP in accordance with the following Table from RSS-170 Annex B, when measured with a spectrum analyzer of 4 kHz resolution bandwidth.

Frequency (MHz)	Minimum Attenuation Relative to Tx Power in any 4 kHz
30-1559	83 dB or (65 + 10 Log_{10}TP) dB whichever is less stringent
above 1559	55 dB or (37 + 10 Log_{10}TP) dB whichever is less stringent

The limit for RSS-170 is therefore calculated as:

For 30-1559 MHz: 33dBm – (65+10Log(2W)) = -35dBm

Above 1559MHz: 33dBm – (37+10Log(2W)) = -7dBm

FCC Part 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:

Limit(dBm) = 33(dBm) – (43 + 10Log(2)) = -13dBm

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 C63.4-2003. 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 bandwidth correction was calculated as follows:

BWcorr(dB) = 10 x Log (BWref/BWmeas) = 10 x Log(4k/3k) = 1.25dB

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 6 and Table 7. The tables use the most restrictive limit between the RSS-170 and FCC Part 25 specifications. Thus for emissions below 1559MHz the limit used is -35dBm and above 1559MHz the limit is -13dBm. No above limit emissions were detected.

Table 6: Radiated Emission Test Data, Low Frequency

FCC Part 25 and IC RSS-170

CLIENT:	Skybitz	DATE:	5/24/05
TESTER:	James Ritter	JOB #:	8709
EUT Information:		**Test Requirements:**	
EUT:	MTXC	TEST STANDARD:	25 & RSS170
Configuration:	Transmitting	DISTANCE:	3m
Tx Frequency:	1643MHz		
Power (Watts)	2.0		

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

Test Equipment/Limit:
Substitution Ant <1GHz: A_00034 & 00029 LIMIT: RSS-170
FCC Limit = -13dBm

Frequency (MHz)	Polarity H/V	Azimuth Degree	Ant. Height (m)	Spurious Level dBµV	Sub. Sig. Gen. Level dBm	Sub. Power Level dBm	Sub. Ant. Factor dB/m	Sub. Ant. Gain dBi	EIRP Level dBm	Limit dBm	Margin dB
165.877	H	180.0	2.4	2.7	-80.3	-80.3	15.4	-0.8	-81.1	-35.0	-46.1
184.320	H	180.0	1.3	3.9	-78.3	-78.3	17.0	-1.5	-79.8	-35.0	-44.8
239.617	H	190.0	1.5	6.0	-71.2	-71.2	14.8	3.0	-68.2	-35.0	-33.2
258.040	H	190.0	1.3	4.2	-72.3	-72.3	17.1	1.3	-71.0	-35.0	-36.0
276.477	H	180.0	1.6	5.6	-69.3	-69.3	19.7	-0.7	-70.0	-35.0	-35.0
294.908	H	180.0	1.4	1.7	-71.3	-71.3	20.2	-0.6	-71.9	-35.0	-36.9
331.773	H	190.0	3.5	5.0	-70.3	-70.3	13.8	6.8	-63.5	-35.0	-28.5
350.197	H	180.0	3.0	5.2	-72.3	-72.3	14.5	6.6	-65.7	-35.0	-30.7
516.089	H	180.0	1.4	2.4	-72.4	-72.4	17.3	7.2	-65.2	-35.0	-30.2
165.877	V	90.0	1.5	1.6	-71.3	-71.3	15.4	-0.8	-72.1	-35.0	-37.1
184.320	V	0.0	1.0	1.4	-71.4	-71.4	17.0	-1.5	-72.9	-35.0	-37.9
239.617	V	90.0	1.6	4.5	-69.3	-69.3	14.8	3.0	-66.3	-35.0	-31.3
258.040	V	190.0	2.4	1.5	-65.3	-65.3	17.1	1.3	-64.0	-35.0	-29.0
276.477	V	90.0	2.5	9.7	-66.5	-66.5	19.7	-0.7	-67.2	-35.0	-32.2
331.773	V	45.0	1.5	2.9	-72.0	-72.0	13.8	6.8	-65.2	-35.0	-30.2
516.089	V	190.0	1.8	1.7	-73.5	-73.5	17.3	7.2	-66.3	-35.0	-31.3

Table 7: Radiated Emission Test Data, High Frequency

FCC Part 25 and RSS-170

CLIENT:	SkyBitz	DATE:	5/23/2005
TESTER:	James Ritter	JOB #:	8709
EUT Information:		**Test Requirements:**	
EUT:	MTXC Mobile	TEST STANDARD:	RSS-170 and Part 25
CONFIGURATION:	Set to 1643 MHz	DISTANCE:	1m

Measured at 3KHz RBW – 1.25 dB added to dBuV reading for 4KHz correction
Based on 10kHz authorized BW (provided from client satellite provider)
Power limit based on 40dBW from pt 25.204(a)

Test Equipment/Limit:

Substitution Ant <1GHz:	#N/A	LIMIT:	EIRP
Substitution Ant >1GHz:	A_00001	AMPLIFIER (dB)	A_00066

Frequency (MHz)	Pol. H/V	Az Deg	Ant. Hght (m)	Spurious Level dBµV	Sub. Sig. Gen. Level dBm	Sub. Power Level dBm	Sub. Ant. Factor dB/m	Sub. Ant. Gain dBi	EIRP Level dBm	Limit dBm	Margin dB
1357.037	V	0.0	1.0	21.7	-64.5	-64.5	26.9	6.0	-58.5	-35.0	-23.5
1621.522	V	0.0	1.0	47.7	-34.5	-34.5	28.5	5.9	-28.6	-13.0	-15.6
1623.278	V	0.0	1.0	41.6	-40.6	-40.6	28.5	5.9	-34.7	-13.0	-21.7
1627.628	V	0.0	1.0	51.0	-30.8	-30.8	28.6	5.9	-24.9	-13.0	-11.9
1630.469	V	0.0	1.0	57.4	-24.2	-24.2	28.6	5.9	-18.3	-13.0	-5.3
1635.808	V	0.0	1.0	51.2	-31.4	-31.4	28.6	5.9	-25.5	-13.0	-12.5
1641.602	V	0.0	1.0	43.2	-41.0	-41.0	28.6	5.9	-35.1	-13.0	-22.1
1643.510	V	0.0	1.0	45.6	-38.4	-38.4	28.7	5.9	-32.5	-13.0	-19.5
1644.405	V	0.0	1.0	44.6	-40.6	-40.6	28.7	5.9	-34.7	-13.0	-21.7
1645.552	V	0.0	1.0	44.6	-40.1	-40.1	28.7	5.9	-34.2	-13.0	-21.2
1647.103	V	0.0	1.0	47.9	-36.9	-36.9	28.7	5.9	-31.0	-13.0	-18.0
1649.414	V	0.0	1.0	42.9	-41.8	-41.8	28.7	5.9	-35.9	-13.0	-22.9
1650.189	V	0.0	1.0	52.9	-31.6	-31.6	28.7	5.9	-25.7	-13.0	-12.7
1655.530	V	0.0	1.0	60.4	-24.7	-24.7	28.7	5.9	-18.8	-13.0	-5.8
1658.371	V	0.0	1.0	55.5	-29.0	-29.0	28.7	5.9	-23.1	-13.0	-10.1
1664.491	V	0.0	1.0	49.8	-34.8	-34.8	28.8	5.9	-28.9	-13.0	-15.9
1928.509	V	10.0	1.0	41.5	-41.8	-41.8	30.2	5.8	-36.0	-13.0	-23.0
1928.951	V	0.0	1.0	42.0	-41.3	-41.3	30.2	5.8	-35.5	-13.0	-22.5
3286.007	V	10.0	1.0	56.8	-21.5	-21.5	35.1	5.4	-16.1	-13.0	-3.1
3857.901	V	0.0	1.0	45.3	-55.5	-56.3	35.9	6.1	-50.2	-13.0	-37.2
4143.853	V	0.0	1.0	34.7	-69.0	-70.5	36.3	6.3	-64.2	-13.0	-51.2
4928.998	V	10.0	1.0	68.2	-34.0	-36.3	36.4	7.6	-28.7	-13.0	-15.7
6072.804	V	20.0	1.0	42.6	-54.5	-56.7	38.6	7.3	-49.4	-13.0	-36.4
6571.997	V	45.0	1.0	61.8	-32.5	-35.3	39.1	7.5	-27.8	-13.0	-14.8
8215.005	V	0.0	1.0	59.4	-33.0	-36.0	42.4	6.1	-29.9	-13.0	-16.9
11500.996	V	350.0	1.0	44.8	-40.5	-44.5	47.0	4.4	-40.1	-13.0	-27.1

Frequency (MHz)	Pol. H/V	Az Deg	Ant. Hght (m)	Spurious Level dBµV	Sub. Sig. Gen. Level dBm	Sub. Power Level dBm	Sub. Ant. Factor dB/m	Sub. Ant. Gain dBi	EIRP Level dBm	Limit dBm	Margin dB
1357.037	H	0.0	1.0	27.5	-57.5	-57.5	26.9	6.0	-51.5	-13.0	-38.5
1621.522	H	10.0	1.0	46.6	-35.2	-35.2	28.5	5.9	-29.3	-13.0	-16.3
1623.278	H	10.0	1.0	42.4	-38.9	-38.9	28.5	5.9	-33.0	-13.0	-20.0
1627.628	H	0.0	1.0	51.6	-29.3	-29.3	28.6	5.9	-23.4	-13.0	-10.4
1630.469	H	10.0	1.0	56.6	-24.5	-24.5	28.6	5.9	-18.6	-13.0	-5.6
1635.808	H	0.0	1.0	48.9	-33.4	-33.4	28.6	5.9	-27.5	-13.0	-14.5
1641.602	H	0.0	1.0	40.2	-43.3	-43.3	28.6	5.9	-37.4	-13.0	-24.4
1643.510	H	10.0	1.0	42.2	-42.0	-42.0	28.7	5.9	-36.1	-13.0	-23.1
1644.405	H	0.0	1.0	40.8	-43.0	-43.0	28.7	5.9	-37.1	-13.0	-24.1
1645.552	H	0.0	1.0	39.5	-44.3	-44.3	28.7	5.9	-38.4	-13.0	-25.4
1647.103	H	0.0	1.0	40.2	-43.1	-43.1	28.7	5.9	-37.2	-13.0	-24.2
1649.414	H	0.0	1.0	37.5	-46.8	-46.8	28.7	5.9	-40.9	-13.0	-27.9
1650.189	H	0.0	1.0	45.6	-38.9	-38.9	28.7	5.9	-33.0	-13.0	-20.0
1655.530	H	0.0	1.0	49.3	-35.2	-35.2	28.7	5.9	-29.3	-13.0	-16.3
1658.371	H	0.0	1.0	43.8	-40.6	-40.6	28.7	5.9	-34.7	-13.0	-21.7
1664.491	H	0.0	1.0	37.6	-47.1	-47.1	28.8	5.9	-41.2	-13.0	-28.2
1928.951	H	10.0	1.0	45.7	-37.2	-37.2	30.2	5.8	-31.4	-13.0	-18.4
3286.007	H	355.0	1.0	52.2	-24.9	-24.9	35.1	5.4	-19.5	-13.0	-6.5
3857.901	H	10.0	1.0	51.8	-39.0	-40.1	35.9	6.1	-34.0	-13.0	-21.0
4143.853	H	0.0	1.0	26.2	-74.5	-75.1	36.3	6.3	-68.8	-13.0	-55.8
4928.998	H	350.0	1.0	66.8	-34.5	-36.9	36.4	7.6	-29.3	-13.0	-16.3
6072.804	H	10.0	1.0	40.9	-57.5	-60.3	38.6	7.3	-53.0	-13.0	-40.0
6571.997	H	350.0	1.0	66.6	-29.0	-31.9	39.1	7.5	-24.4	-13.0	-11.4
8215.005	H	0.0	1.0	60.2	-31.5	-34.3	42.4	6.1	-28.2	-13.0	-15.2
9857.997	H	320.0	1.0	27.8	-63.0	-66.3	45.4	4.7	-61.6	-13.0	-48.6
11500.996	H	0.0	1.0	38.0	-45.0	-49.3	47.0	4.4	-44.9	-13.0	-31.9
13144.002	H	0.0	1.0	45.9	-28.0	-32.9	48.6	4.0	-28.9	-13.0	-15.9
14787.012	H	10.0	1.0	30.1	-41.5	-46.0	52.5	1.1	-44.9	-13.0	-31.9
16430.014	H	350.0	1.0	26.7	-45.0	-54.6	52.0	2.5	-52.1	-13.0	-39.1

4.5 Receiver Spurious Emissions, RSS-170 Section 9.0

Spurious emissions related to the receiver were measured in accordance with RSS-170 Section 9.0. Testing was performed at 3m test distance on an OATS. The emission scan was performed from 30MHz up to 5577MHz (3 times the highest LO).

Test results for the receiver spurious emissions are located in Table 8.

Table 8: Receiver Spurious Emissions, RSS-170, Section 9.0

CLIENT:	Skybitz	DATE:	5/24/2005
TESTER:	James Ritter	JOB #:	8709
EUT Information:		**Test Requirements:**	
EUT:	MTXC	TEST STANDARD:	RSS170
CONFIGURATION:	Receive only	DISTANCE:	3m
CLOCKS:	1859 MHz (LO)	CLASS:	B
Test Equipment/Limit:			
ANTENNA:	A_00007 (A_00004>1GHz)	LIMIT:	IC_3m_Class_B
CABLE:	CSITE2_3m	AMPLIFIER (dB)	0522 for above 1 GHz

Frequency (MHz)	Pol. H/V	Az Deg	Ant. Hght (m)	SA Level dBµV	Ant. Corr. dB/m	Cable Corr. dB	Amp Gain dB	Corr. Level dBµV/m	Corr. Level µV/m	Limit µV/m	Margin dB
73.724	V	270.0	1.0	3.5	6.3	1.9	0.0	11.7	3.8	100.0	-28.3
239.617	V	270.0	1.6	0.0	11.7	3.0	0.0	14.7	5.4	200.0	-31.3
258.450	V	290.0	1.5	2.9	12.0	3.1	0.0	18.0	7.9	200.0	-28.0
276.483	V	120.0	2.5	10.6	12.9	3.2	0.0	26.7	21.7	200.0	-19.3
294.915	V	10.0	1.6	2.1	12.5	3.3	0.0	17.9	7.9	200.0	-28.1
589.828	V	270.0	1.3	2.2	17.1	5.5	0.0	24.8	17.3	200.0	-21.2
254.098	V	190.0	2.0	5.1	11.7	3.1	0.0	19.9	9.9	200.0	-26.1
1859.000	V	0.0	1.0	25.4	27.6	1.6	35.6	19.0	8.9	500.0	-35.0a
5577.000	V	0.0	1.0	21.6	33.8	3.9	35.7	23.6	15.1	500.0	-30.4a
147.450	H	90.0	2.6	1.9	8.0	2.4	0.0	12.4	4.2	150.0	-31.1
165.877	H	180.0	2.6	5.0	9.6	2.5	0.0	17.1	7.2	150.0	-26.4
184.320	H	190.0	2.0	2.9	9.4	2.7	0.0	14.9	5.6	150.0	-28.6
239.617	H	0.0	1.4	5.4	11.7	3.0	0.0	20.1	10.1	200.0	-25.9
258.040	H	0.0	1.3	4.5	11.9	3.1	0.0	19.6	9.5	200.0	-26.5
276.477	H	10.0	1.5	6.5	12.9	3.2	0.0	22.6	13.6	200.0	-23.4
294.908	H	180.0	1.4	2.9	12.5	3.3	0.0	18.7	8.6	200.0	-27.3
331.773	H	180.0	3.5	4.9	13.5	3.5	0.0	21.9	12.5	200.0	-24.1
350.197	H	180.0	2.4	3.5	13.9	3.6	0.0	21.0	11.3	200.0	-25.0
516.089	H	180.0	1.4	2.6	16.4	4.6	0.0	23.7	15.2	200.0	-22.4
681.982	H	270.0	1.5	1.8	19.0	5.8	0.0	26.6	21.4	200.0	-19.4
228.820	H	10.0	3.5	10.9	11.6	2.9	0.0	25.5	18.8	200.0	-20.5
1568.580	H	270.0	1.0	44.1	26.8	1.5	35.8	36.5	67.2	500.0	-17.4
1763.000	H	0.0	1.0	40.6	27.4	1.5	35.7	33.9	49.5	500.0	-20.1
1859.000	H	0.0	1.0	34.6	27.6	1.6	35.6	28.2	25.8	500.0	-25.8a
5577.000	H	0.0	1.0	26.5	33.8	3.9	35.7	28.5	26.5	500.0	-25.5a

a = ambient reading

4.6 Radiated Spurious Emissions per FCC §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.

In accordance with §25.216(i) the peak e.i.r.p density of carrier-off state emissions from mobile earth stations manufactured more than six months after **Federal Register** publication of the rule changes adopted in FCC 03–283 with assigned uplink frequencies between 1 and 3 GHz shall not exceed -80 dBW/MHz in the 1559– 1610 MHz band averaged over any 2 millisecond active transmission interval.

4.6.1 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 10 and Figure 11.

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.

4.6.2 Test Results

The following plots are the emissions detected with the band of 1559M – 1610MHz. Emissions were also measured in the standby mode from 1559M – 1610MHz.

Figure 12 through Figure 15 are plots of the emissions appearing in the band of 1605M – 1610MHz.

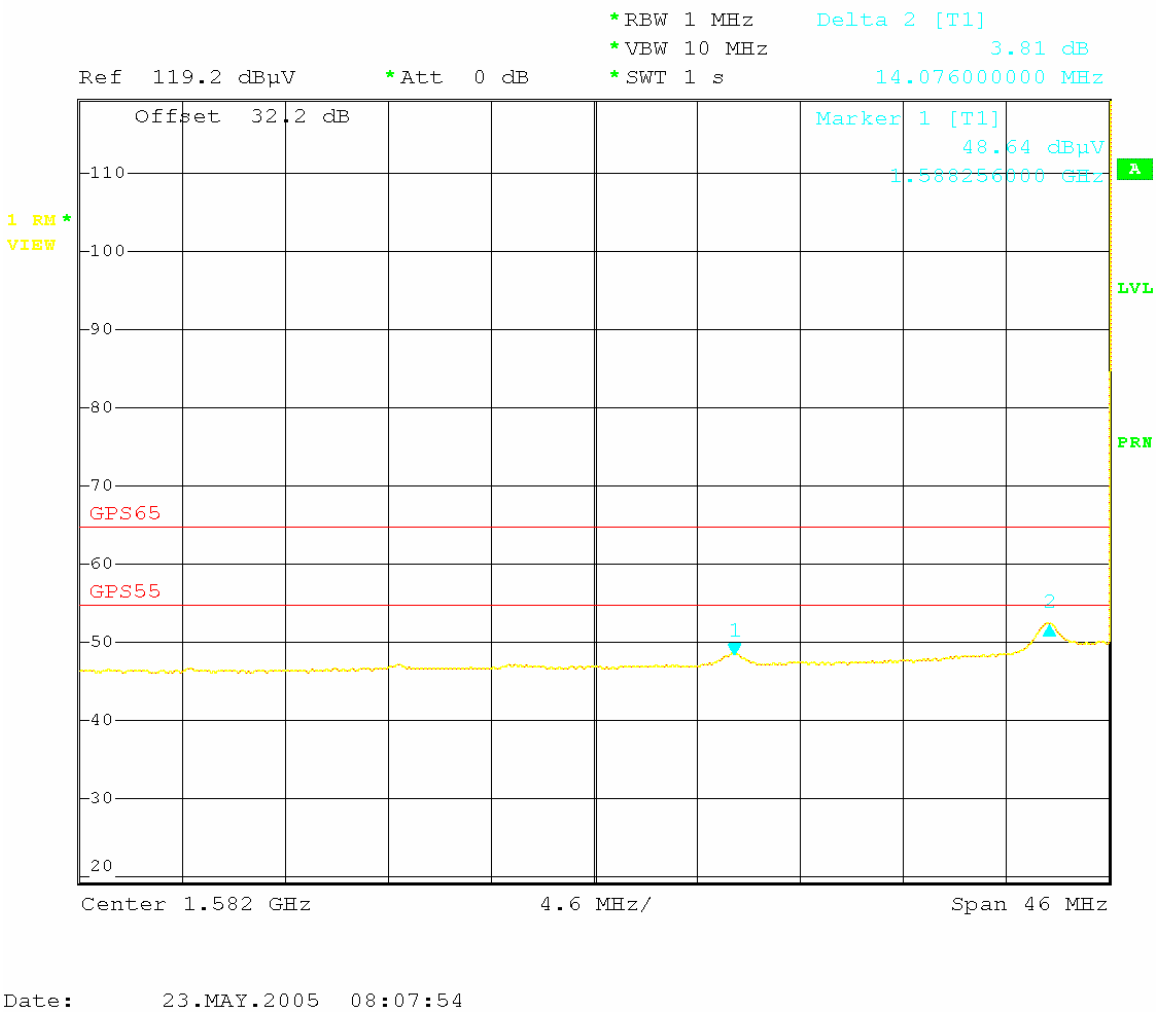


Figure 10: Spurious Emissions 1559M – 1605MHz, Vertical Polarity

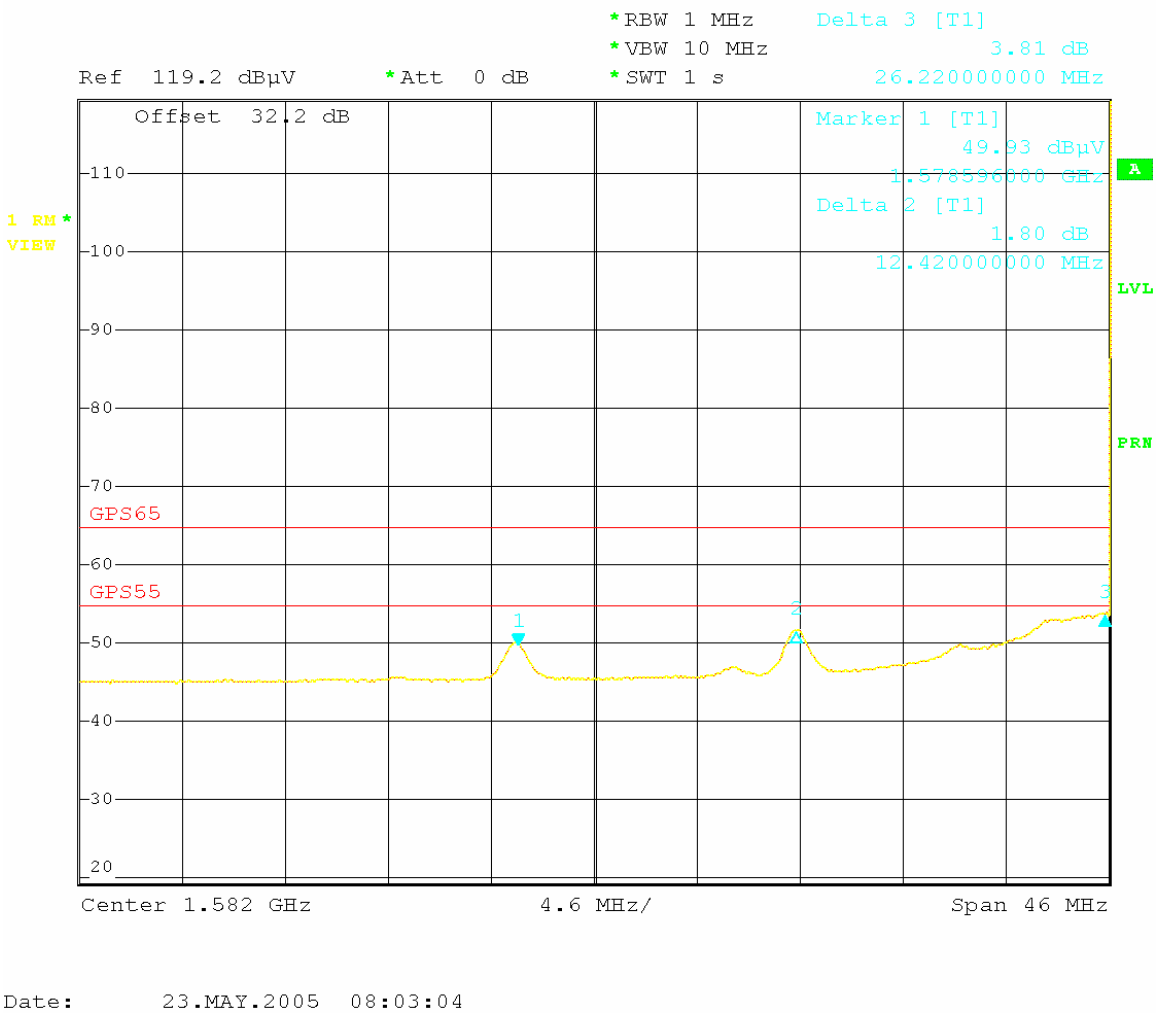


Figure 11: Spurious Emissions 1559M – 1605MHz, Horizontal Polarity

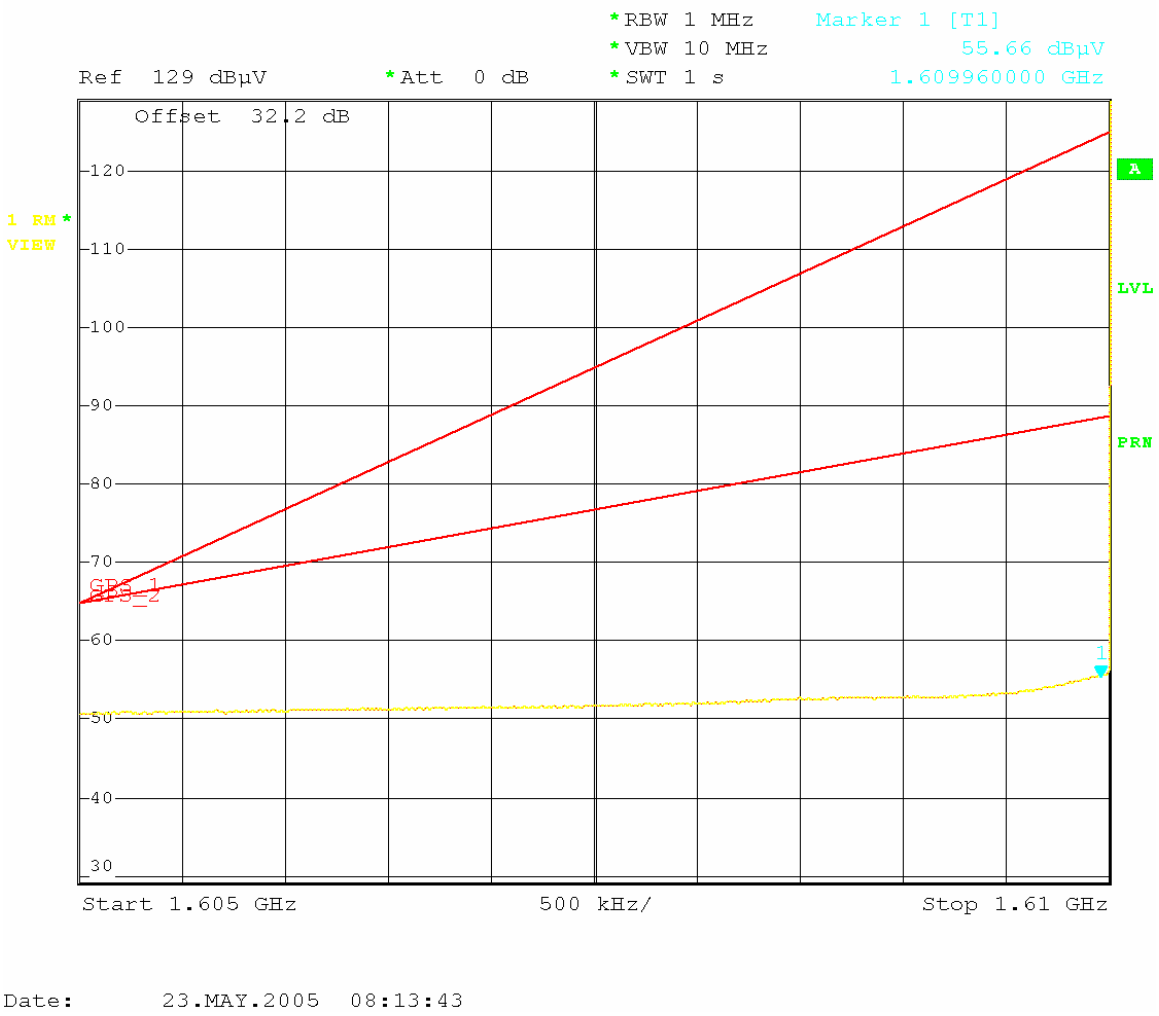


Figure 12: Spurious Emissions 1605M – 1610MHz, Vertical Polarity

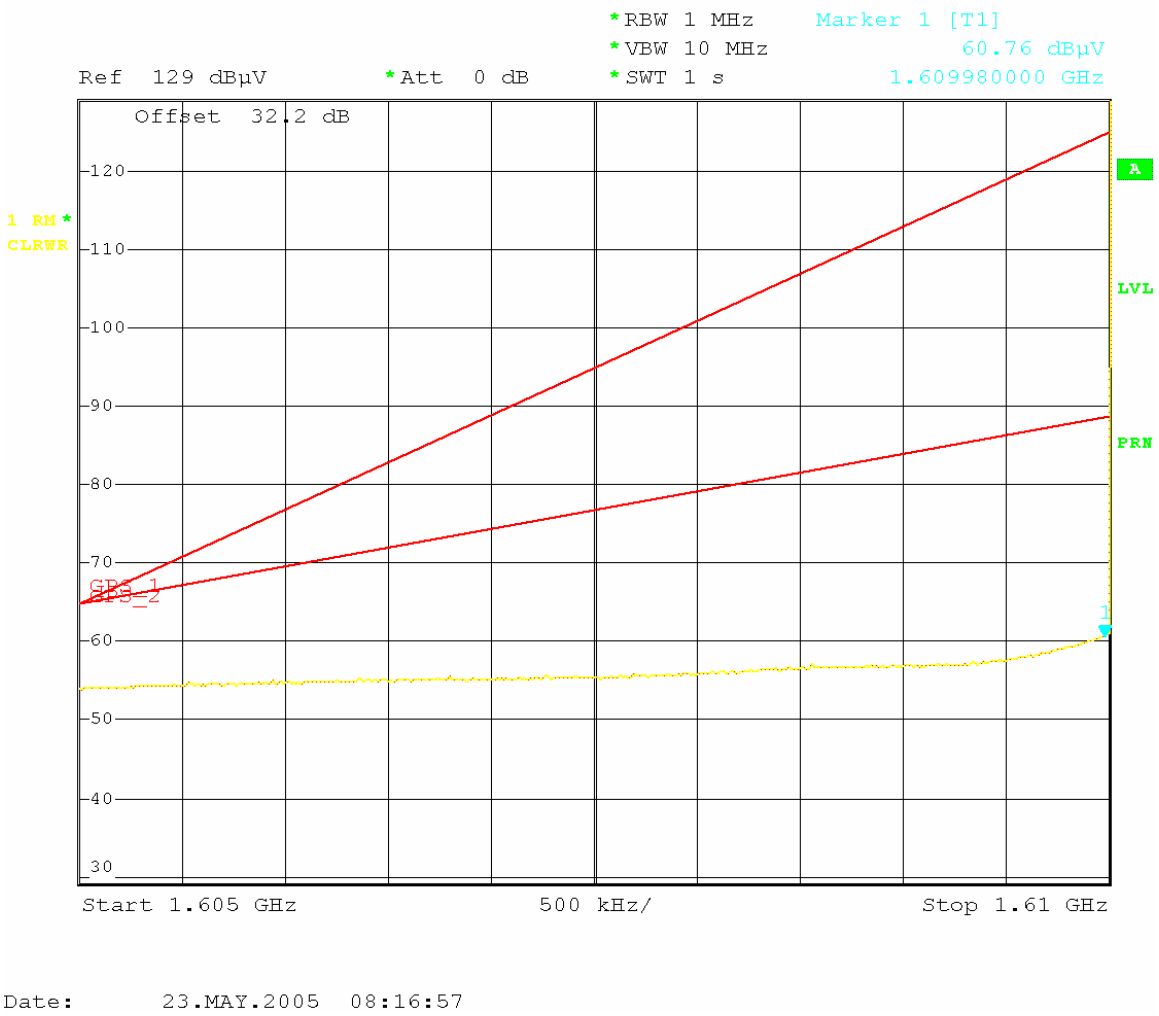


Figure 13: Spurious Emissions 1605M – 1610MHz, Horizontal Polarity

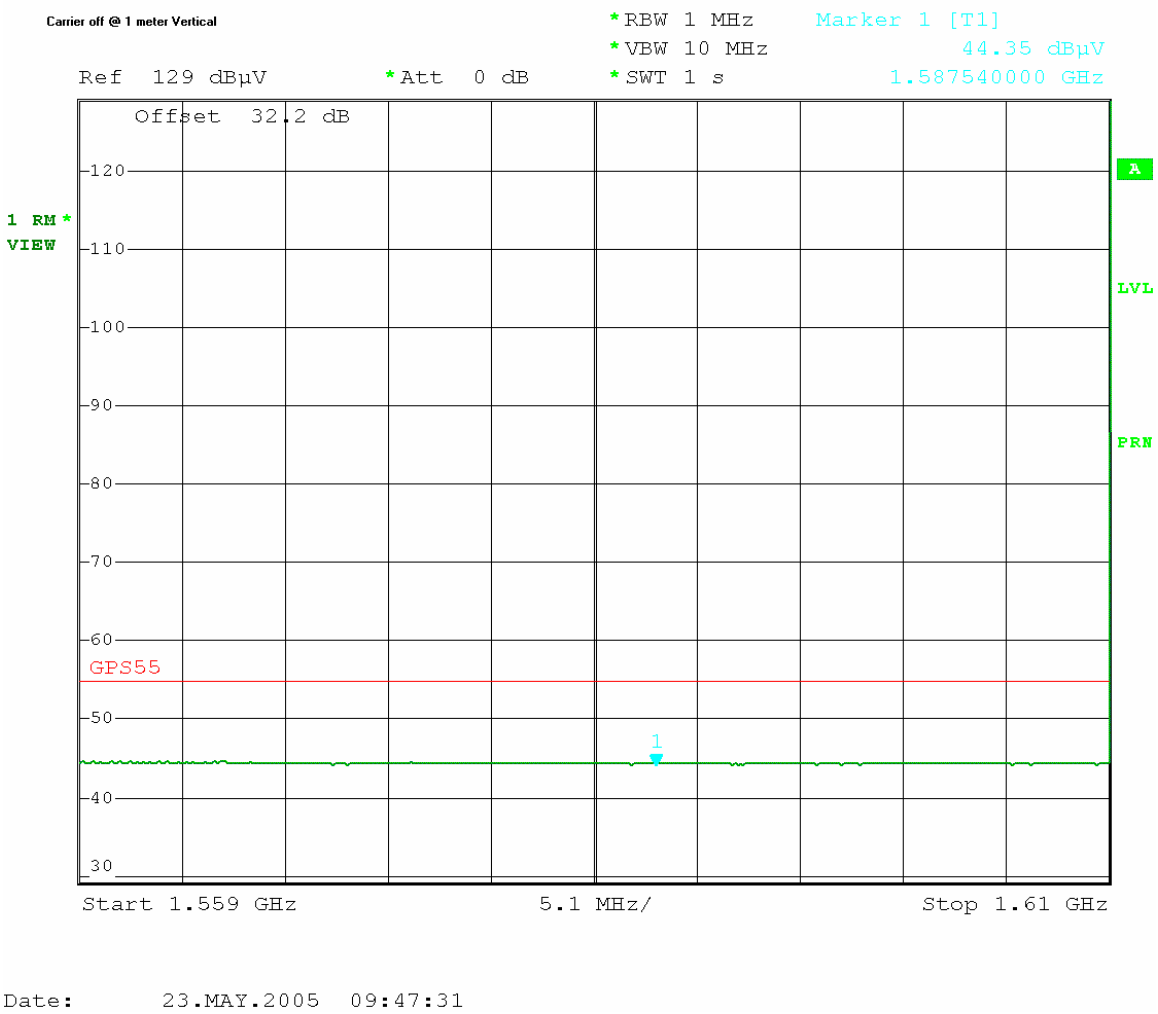


Figure 14: Emissions in Standby Mode, Vertical

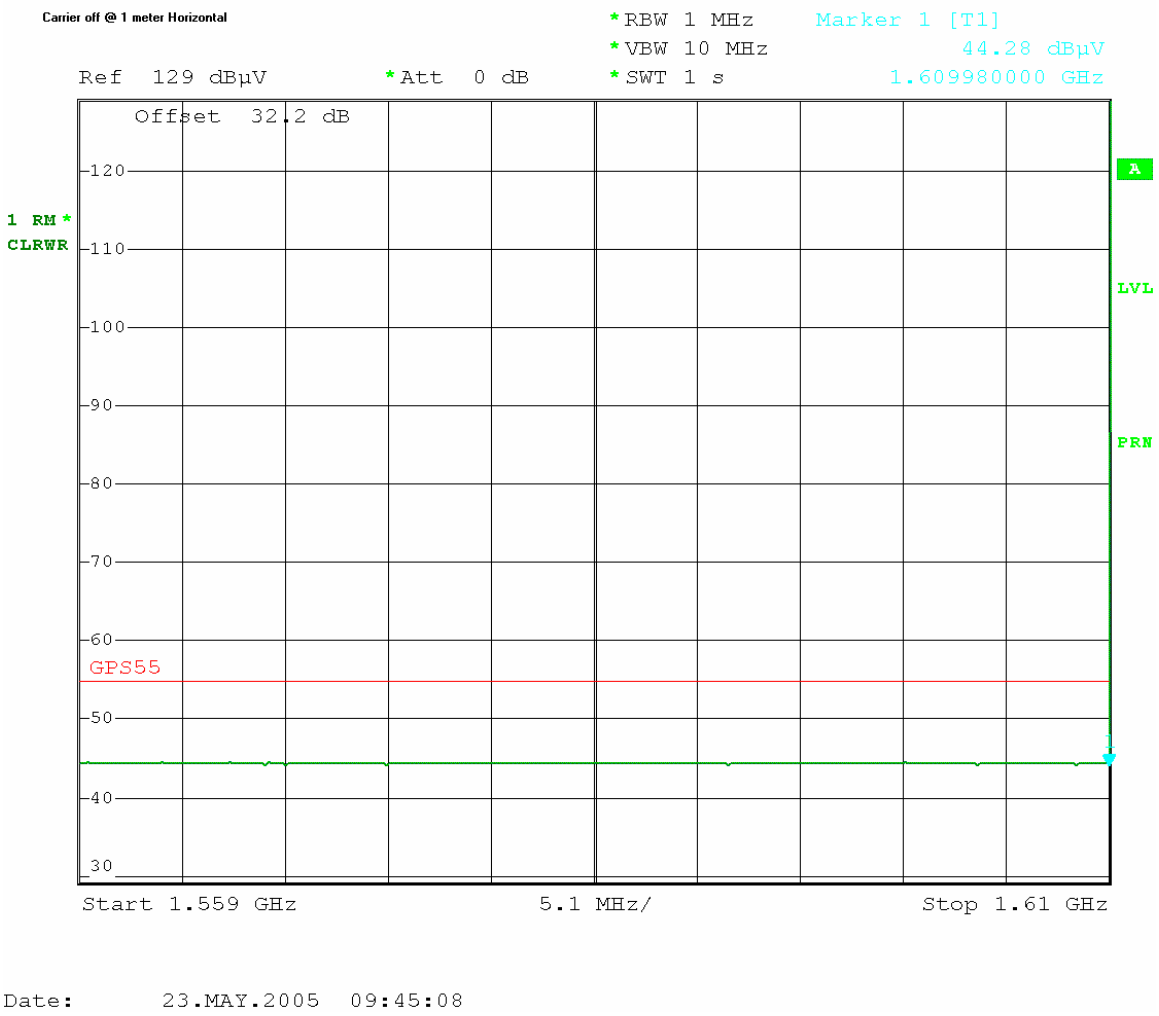


Figure 15: Emissions in Standby Mode, Horizontal

4.7 Frequency Stability: (FCC Part §2.1055, IC RSS-170 Section 7))

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. The RSS-170 specifies a frequency tolerance limit of +/-320Hz.

4.7.1 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.

RSS-170 also includes the temperature test as above and adds the following.

Test at +20ºC temperature and +/-15% supply voltage variations.

The frequency stabilities can be maintained to a lesser temperature range provided that the transmitter is automatically inhibited from operating outside the lesser temperature range.

The RF carrier frequency shall not depart from the reference frequency (reference frequency is the frequency at 20ºC and rated supply voltage) in excess of +/-320 Hz.

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

4.7.2 Test Results

The EUT complies with the temperature stability requirements of FCC §25.202 and RSS-170. Test results are given in Table 9.

Table 9: Frequency Stability Test Data

CLIENT: Skybitz Inc

MODEL NO: Mobile Terminal MTXC

DATE: 5/26/2005

JOB #: 8708/8709

BY: James Ritter

Limit: 0.001% (FCC Part 25), +/-320Hz (RSS-170)

Temperature Degrees C	Frequency MHz	Difference (RSS-170 Limit = +/-320Hz) Hz	Deviation (FCC Limit = 0.001%) (%)
Ambient	1644.815310	0.0	0
-30	1644.815124	-186.0	0.000011
-20	1644.815100	-210.0	0.000013
-10	1644.815152	-158.0	0.000010
0	1644.815188	-122.0	0.000007
10	1644.815248	-62.0	0.000004
20	1644.815316	6.0	0.000000
30	1644.815351	41.0	0.000002
40	1644.815362	52.0	0.000003
50	1644.815395	85.0	0.000005

Voltage Volts	Frequency MHz	Difference Hz	Deviation (%)	Voltage Volts
At rated	1644.815442	0	0.0	6 VDC
At 85%	1644.815488	-46	0.000003	5.3VDC
At 115%	1644.815482	-40	0.000002	6.9VDC

Note: EUT powers off below 5.3Vdc.