Washington Laboratories, Ltd.

FCC Certification Test Report
For the
Comtech Mobile Datacom Corporation

UQR-CTMDCMTM203

WLL REPORT# **9330-01 Rev 0**

September 13, 2006

Prepared for:

Comtech Mobile Datacom Corporation
20430 Century Blvd.
Germantown, MD 20874

Prepared By:

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

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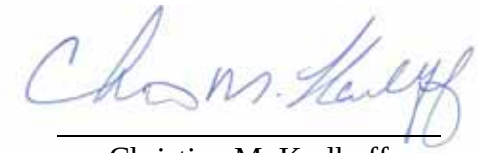

Christina M. Karlhoff
Technical Liaison

Reviewed by:

Gregory M. Snyder
Chief EMC Engineer

Abstract

This report has been prepared on behalf of Comtech Mobile Datacom Corporation MTM-203 Transceiver to support the attached Application for Equipment Authorization. The test report and application are submitted for an L-Band Satellite Earth Station under Part 25 of the FCC Rules. This Certification Test Report documents the test configuration and test results for a Comtech Mobile Datacom Corporation MTM-203 Transceiver.

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 Comtech Mobile Datacom Corporation MTM-203 Transceiver complies with the limits for an L-Band Satellite Earth Station device under FCC Part 25.

Table of Contents

List of Tables

List of Figures

1 Introduction

1.1 Compliance Statement

The Comtech Mobile Datacom Corporation MTM-203 Transceiver complies with the limits for an L-Band Satellite Earth Station device under FCC Part 25.

1.2 Test Scope

Tests for radiated and conducted (at antenna terminal) emissions were performed. The measurement equipment conforms to ANSI C63.2 Specifications for Electromagnetic Noise and Field Strength Instrumentation.

1.3 Contract Information

Customer:	Comtech Mobile Datacom Corporation 20430 Century Blvd Germantown, MD 20874
Purchase Order Number:	0007031
Quotation Number:	63056

1.4 Test Dates

Testing was performed on the following date(s):	7/26/2006-8/3/2006

1.5 Test and Support Personnel

Washington Laboratories, LTD	James Ritter
Client Representative	Doug Macauley

1.6 Abbreviations

A	**A**mpere
ac	**a**lternating **c**urrent
AM	Amplitude Modulation
Amps	**Amp**ere**s**
b/s	**b**its per **s**econd
BW	**B**and**W**idth
CE	**C**onducted **E**mission
cm	**c**enti**m**eter
CW	**C**ontinuous **W**ave
dB	**d**eci**B**el
dc	**d**irect **c**urrent
EMI	**E**lectro**m**agnetic **I**nterference
EUT	**E**quipment **U**nder **T**est
FM	**F**requency **M**odulation
G	**g**iga - prefix for 10^9 multiplier
Hz	**H**ertz
IF	**I**ntermediate **F**requency
k	**k**ilo - prefix for 10^3 multiplier
LISN	**L**ine **I**mpedance **S**tabilization **N**etwork
M	**M**ega - prefix for 10^6 multiplier
m	**M**eter
µ	**m**icro - prefix for 10^{-6} multiplier
NB	**N**arrow**b**and
QP	**Q**uasi-**P**eak
RE	**R**adiated **E**missions
RF	**R**adio **F**requency
rms	**r**oot-**m**ean-**s**quare
SN	**S**erial **N**umber
S/A	**S**pectrum **A**nalyzer
V	**V**olt

2 Equipment Under Test

2.1 EUT Identification & Description

The MTM-203 Transceiver is a compact module that can easily be integrated into a device. The transceiver's primary function is to allow users and applications the ability to send and receive messages via satellite. Using the GPS receiver, a transceiver can "piggyback" location information on each message. A transceiver can also transmit its location automatically.

The MTM-203 Transceiver module provides the following features:

- Small, two-sided board to easily integrate into a device
- Includes a single serial interface, at TTL levels
- Supports API commands using the serial interface
- Contains internal GPS device with capability to connect to an external GPS device
- Low power operation to minimize battery consumption and can connect to an external power supply
- Provides GPS pass-through model to provide RF signal to an external GPS for both L1 and L2 frequencies
- Ensures GPS receiver can receive RHCP signal, regardless of communication channel polarization
- Allows for dual polarization antenna use
- Provides overload protection on the receive channel to prevent LNA burn-out for large signals
- Allows for FPGA code loading via an external serial port at rates higher than normal API rates
- Ensures a short power on to operational period, including less than 1 sec FPGA load times
- Able to provide a range of data rates depending on satellite links and antenna characteristics

Table 1. Device Summary

ITEM	DESCRIPTION
Manufacturer:	Comtech Mobile Datacom Corporation
FCC ID:	UQR-CTMDCMTM203
Model:	MTM-203 Transceiver
FCC Rule Parts:	§25
Frequency Range:	1626.5-1660.5 MHz
Maximum Output Power:	2506mW (33.99dBm)
Modulation:	Digital
Occupied Bandwidth:	144.346kHz
Keying:	Automatic
Type of Information:	Data
Power Output Level	Fixed
Antenna Connector	MMCX
Antenna Type	Detachable
Interface Cables:	CAT-5 Data Cable
Power Source & Voltage:	10VDC

2.2 Test Configuration

The MTM-203 transceiver was configured with a laptop computer connected through the data port via shielded cable. An external power supply provides DC power to the unit.

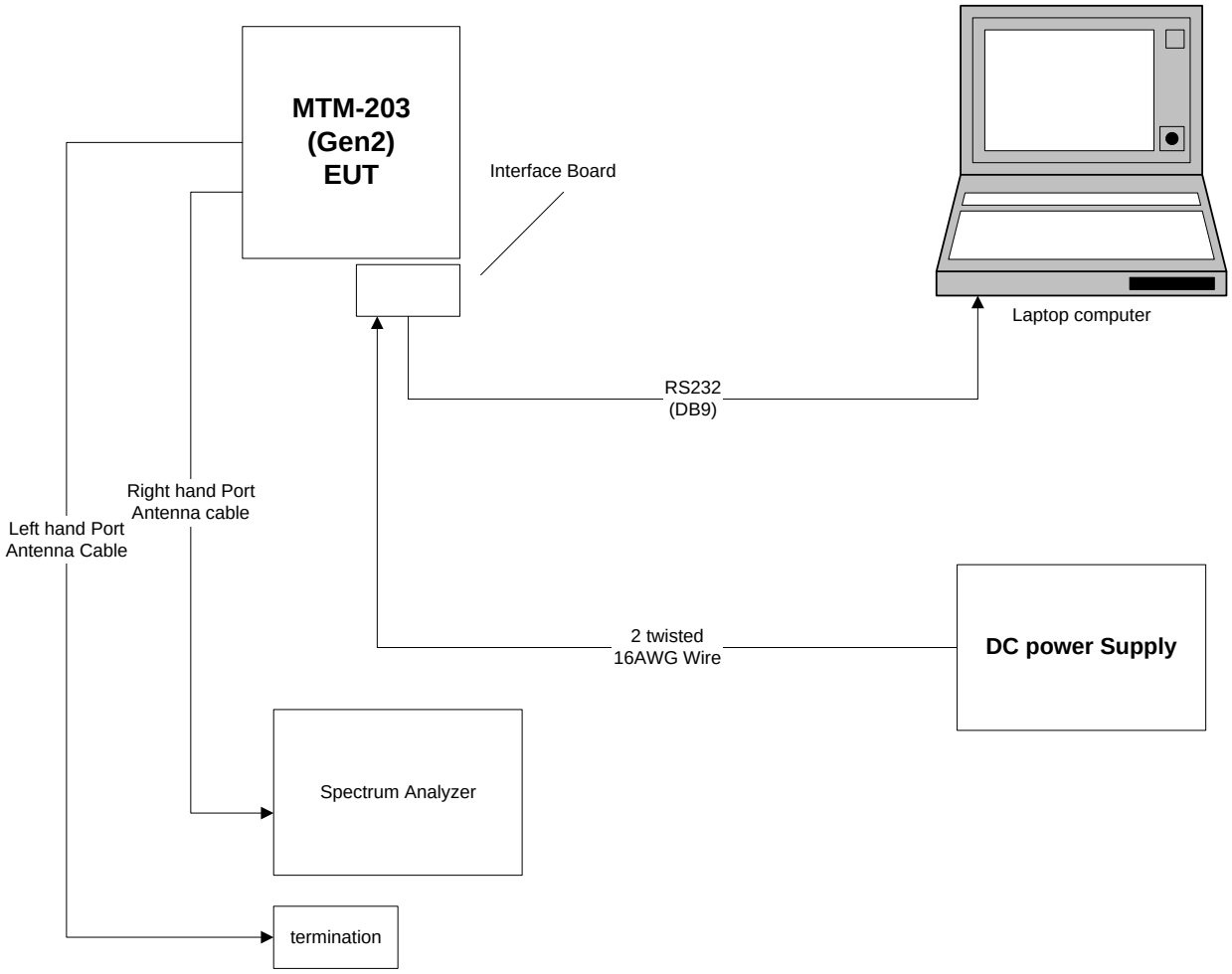

Figure 1. Test Setup Diagram

2.3 Testing Algorithm

The Support laptop used a Wterm Version1.3.10 to program the transmit channel at 5 second transmit intervals.

Worst case emission levels are provided in the test results data.

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

TIA-603-B Land Mobile FM or PM Communications Equipment Measurement and Performance Standard

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. 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:

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

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

WLL Asset #	Manufacturer Model/Type	Function	Cal. Due
00029	EMCO, 3146A	ANTENNA, LOG PERIODIC	07/19/2008
00034	EMCO, BIA-30	ANTENNA, BICONICAL	01/23/2007
00382	SUNOL, JB1	BICONLOG	01/25/2007
00068	HP, 85650A	ADAPTER, QP	07/03/2007
00070	HP, 85685A	PRESELECTOR, RF W/OPT 8ZE	07/03/2007
00072	HP, 8568B	ANALYZER, SPECTRUM	07/03/2007
00528	AGILENT, E4446A	ANALYZER, SPECTRUM	6/27/2007
00361	GLOBAL SPECIALTIES 1337	POWER SUPPLY	N/A
00001	A.H., SYSTEMS, SAS-200/518	ANTENNA, LP, 1-18GHZ	03/11/2007
00425	ARA, DRG-118/A	ANTENNA, DRG, 1-18GHZ	01/17/2007
00282	ITC, 21X-3A1	WAVEGUIDE 6.8-15GHZ	02/07/2007
00075	HP, 8648C	GENERATOR, RF SIGNAL	05/15/2008
00080	HP, 8672A	GENERATOR, RF SIGNAL	03/22/2007
00257	HP, 8672A-K22	FREQUENCY EXTENTION UNIT	03/22/2007
00066	HP, 8449B	PRE-AMPLIFIER, RF. 1-26.5GHZ	06/22/2007
00453	A.H., SYSTEMS, PAM1840	PRE-AMPLIFIER, 18GHZ-40 GHZ	03/03/2007
00209	NARDA	HORN, STANDARD, GAIN	12/25/2008
00210	NARDA, V638	HORN, STANDARD, GAIN	12/25/2008
00283	ITC, 21KU-3A1	WAVEGUIDE; 9.8-20.5GHZ	06/12/2008
00280	ITC, 21C-3A1	WAVEGUIDE 3.45-11.0GHZ	06/12/2008

4 Test Results

4.1 RF Power Output (FCC 25.204)

FCC 25.204 specifies the limits for Satellite Earth Stations.

4.1.1 Power measurement

The power was measured conducted into a spectrum analyzer. The RBW and VBW were set to 1MHz. The results are in the following table and figure.

Table 3: RF Power Output

Channel	Frequency	Power Output (dBm)	Power Output (W)
Center	1.642 MHz	33.99	2.51

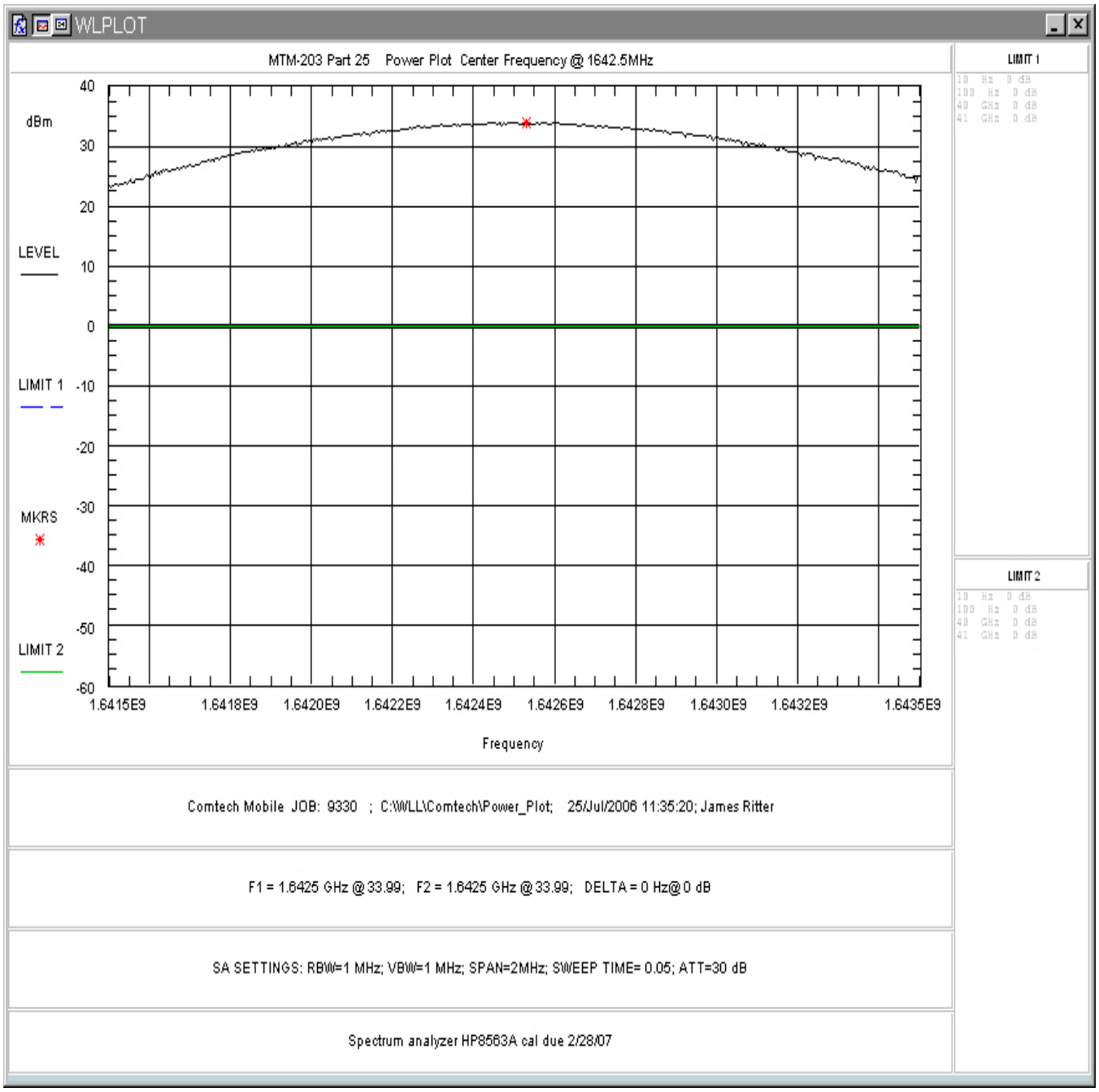

Figure 2. RF Peak Power, Center Channel 1642.5 MHz

4.2 Occupied Bandwidth

Occupied bandwidth (20dB) was performed by coupling the output of the EUT via an antenna to the input of a spectrum analyzer.

Table 4: Occupied Bandwidth Results

Frequency	Bandwidth
Mid Channel 1.642 MHz	144.346kHz

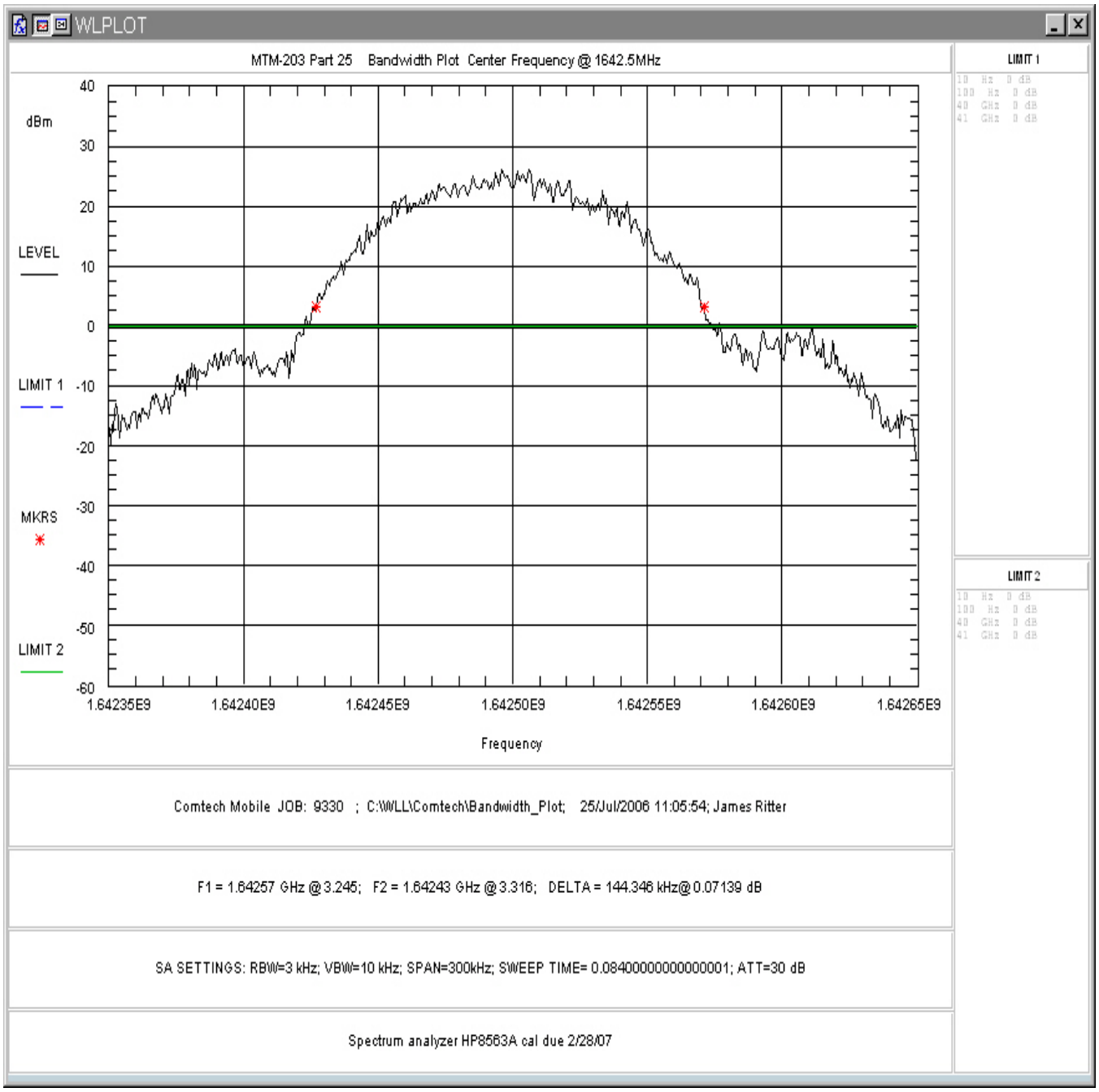

Figure 3. Occupied Bandwidth, Mid Channel

4.3 Emission Limitations per FCC Part 25.202(f)

Radiated spurious emissions must comply with the requirements of §25.202 (f) of FCC. The limits for the spurious emissions for FCC Part 25 are as follows:

FCC Part 25.202(f):

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 the FCC Part 25 requirements the unit was set to transmit at 1643MHz and the emissions were measured 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 FCC Part 25.202(f). Figure 4 and Figure 5 show the plots of the emissions mask for FCC Part 25.202(f).

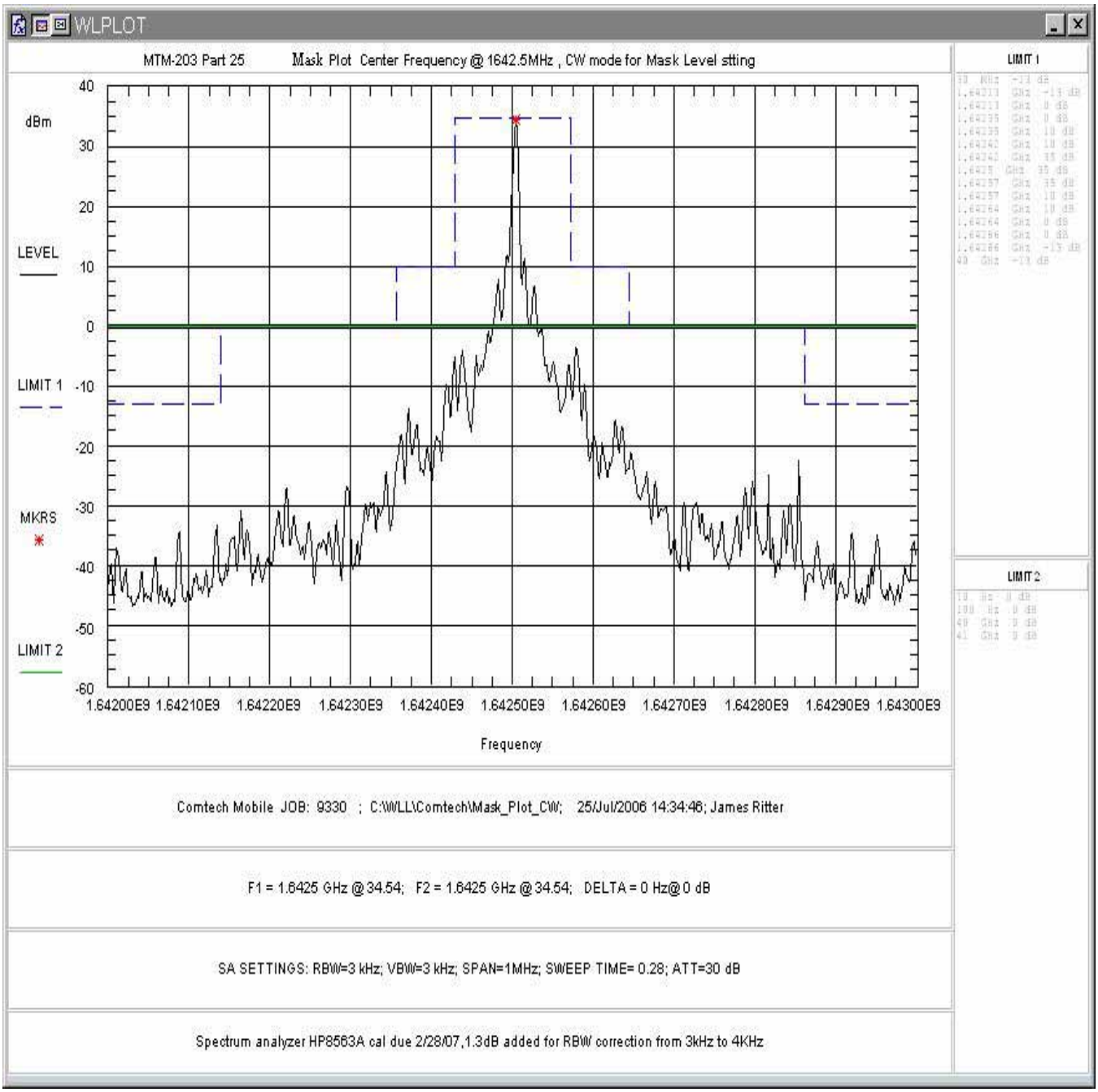

Figure 4: FCC Part 25.202(f) Emissions Mask, Peak Power Plot for Limit Setting

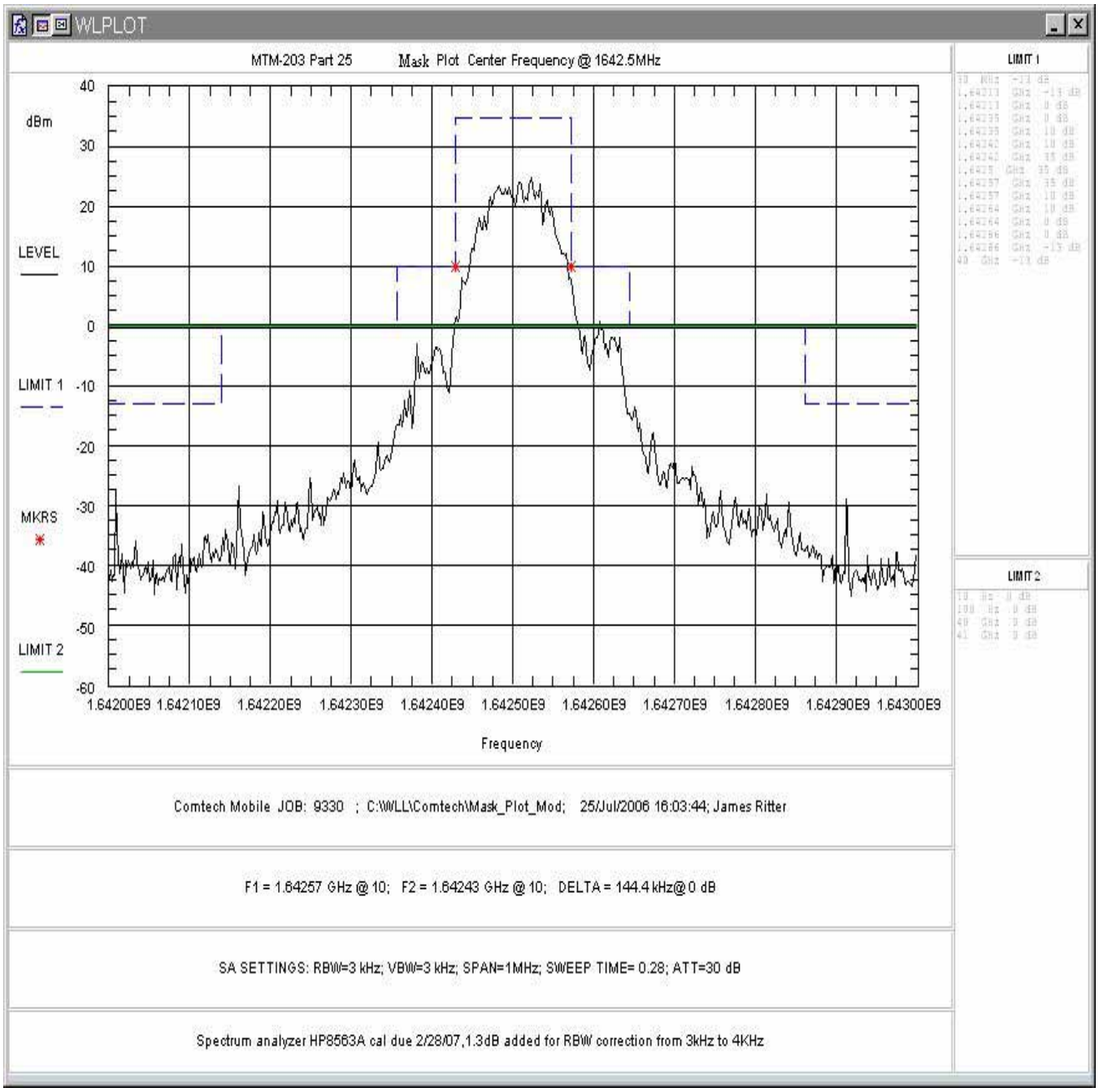

Figure 5: FCC Part 25 Emission Mask

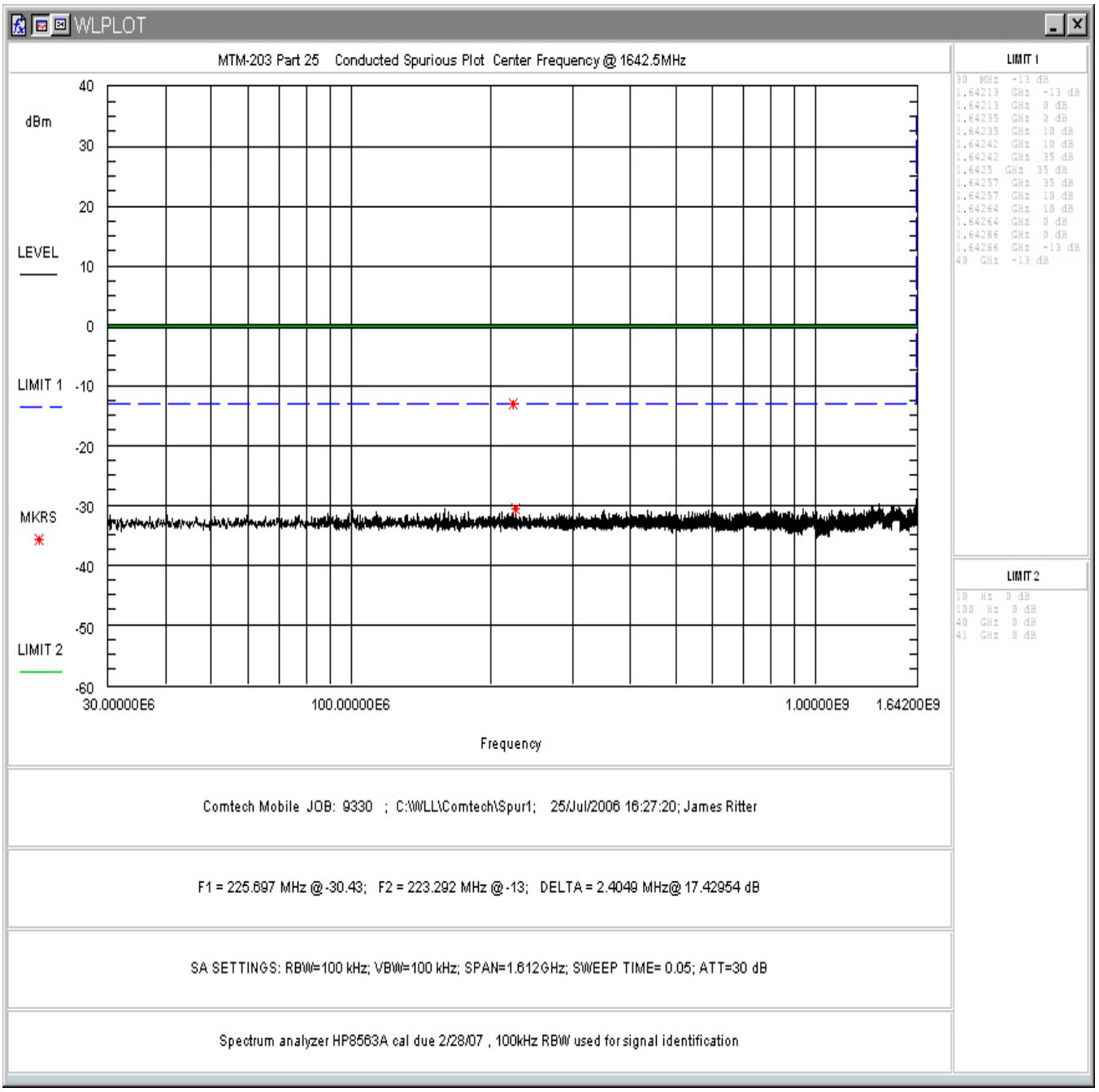

Figure 6: FCC Part 25 Conducted Spurious Emissions Data, 30 1642 MHz

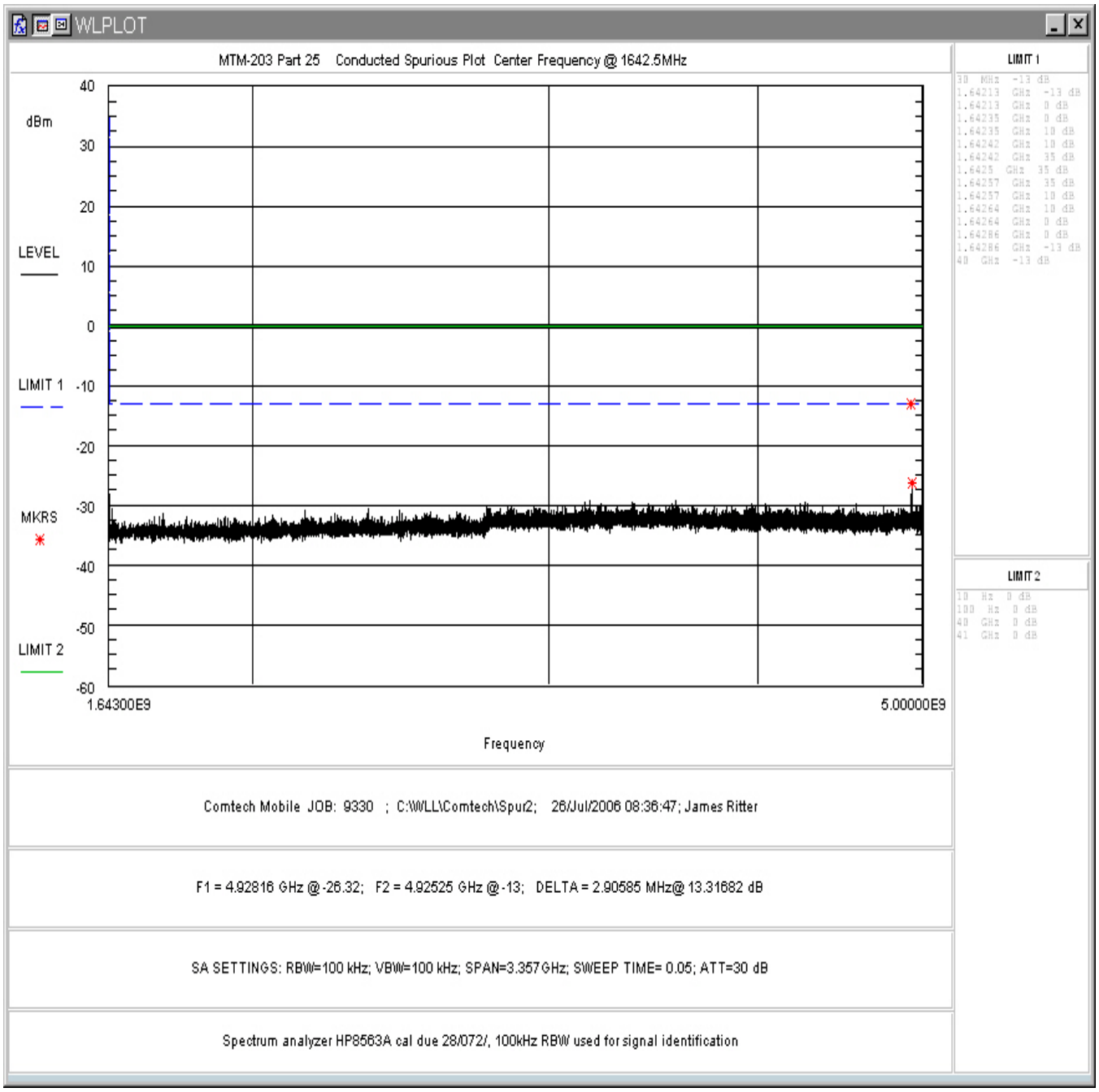

Figure 7: FCC Part 25 Conducted Spurious Emissions Data, 1.643 – 5 GHz

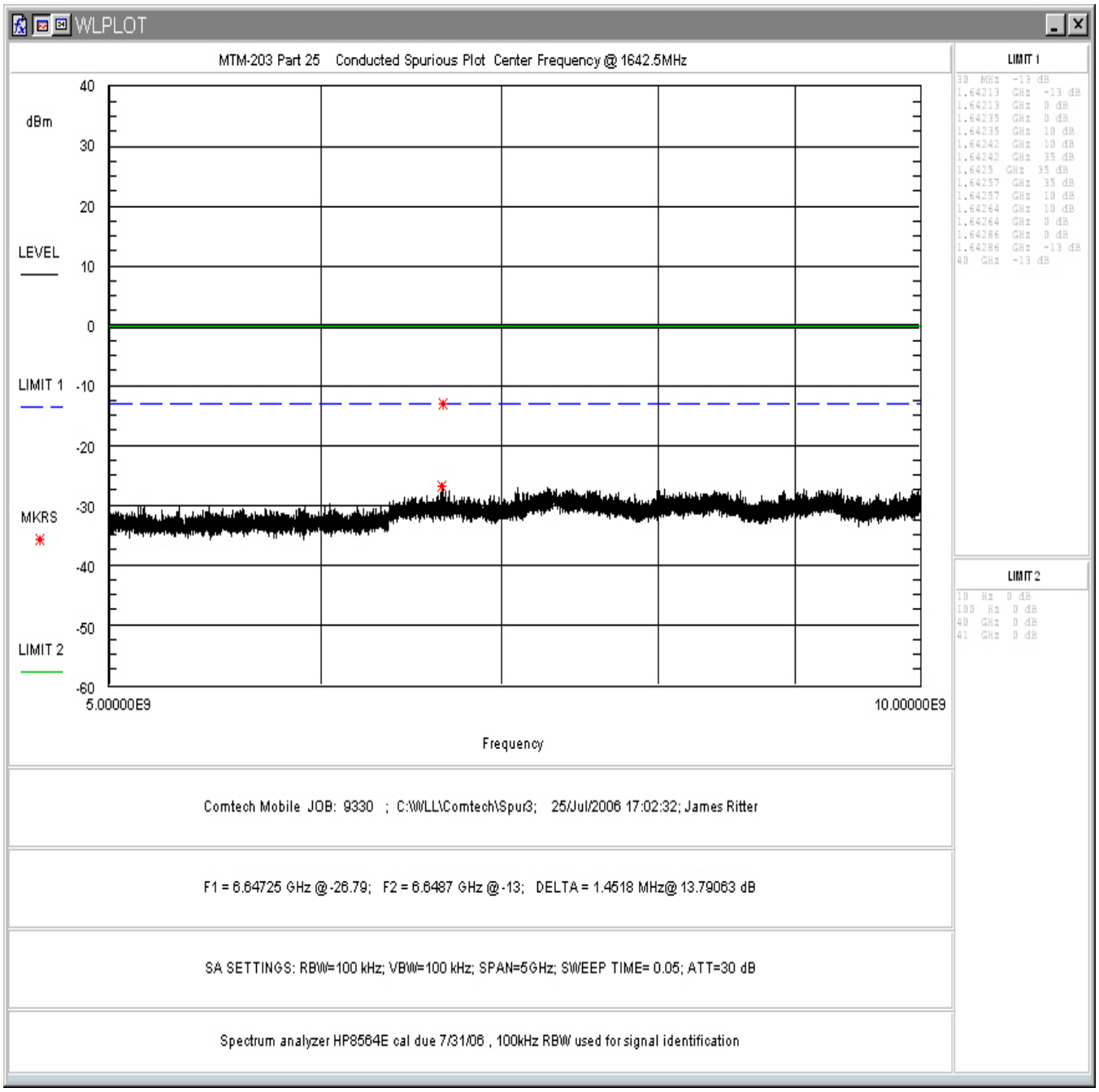

Figure 8: FCC Part 25 Conducted Spurious Emissions Data, 5 – 10GHz

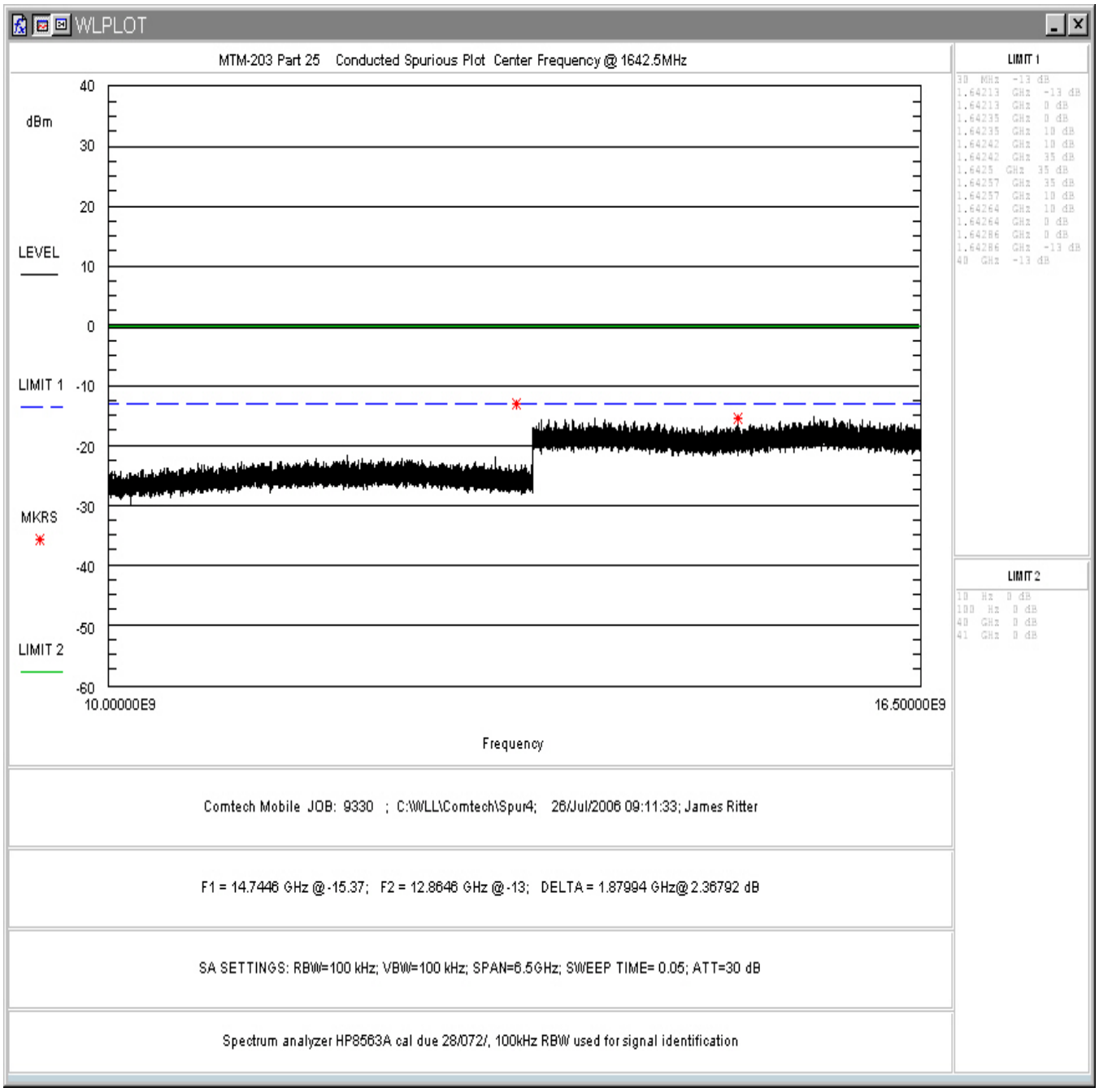

Figure 9: FCC Part 25 Conducted Spurious Emissions Data, 10 – 16.5GHz

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

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

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, the limit for emissions removed from the center frequency by more than 250% of the authorized bandwidth will be:

$$\text{Limit(dBm)} = 34\text{(dBm)} - (43 + 10\text{Log}(2.51)) = -13\text{dBm}$$

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 C63.4-2003. 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 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 16.5 GHz was measured and the data presented below.

Table 5. Radiated Emissions <1000MHz Test Data Sheet

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
@ 1642.5											
31.11800	V	0.0	1.0	8.5	-59.1	-60.1	11.8	-11.7	-71.8	-13.0	-58.8
54.02500	V	10.0	1.0	12.0	-66.0	-67.0	10.8	-5.9	-72.9	-13.0	-59.9
87.16200	V	242.0	1.0	7.3	-76.5	-77.5	7.5	1.5	-76.0	-13.0	-63.0
109.64000	V	0.0	1.0	4.5	-69.3	-70.8	15.5	-4.5	-75.3	-13.0	-62.3
156.18600	V	113.0	1.2	12.9	-59.3	-60.8	14.7	-0.6	-61.4	-13.0	-48.4
164.50000	V	342.0	1.0	11.8	-57.1	-58.6	14.7	-0.1	-58.7	-13.0	-45.7
200.01500	V	75.0	1.4	12.2	-61.0	-62.5	17.3	-1.1	-63.6	-13.0	-50.6
228.87100	V	293.0	1.0	4.9	-72.2	-73.7	14.9	2.5	-71.2	-13.0	-58.2
237.61000	V	310.0	1.7	6.2	-73.7	-75.2	14.7	3.1	-72.1	-13.0	-59.1
259.22100	V	207.0	1.6	5.4	-72.3	-73.8	17.4	1.1	-72.7	-13.0	-59.7
266.67200	V	242.0	1.7	11.7	-66.1	-67.6	18.4	0.4	-67.2	-13.0	-54.2
280.83200	V	300.0	1.1	6.9	-63.9	-65.4	20.6	-1.4	-66.8	-13.0	-53.8
311.0620	V	167.0	1.6	6.1	-74.0	-75.5	13.9	6.2	-69.3	-13.0	-56.3
400.0210	V	248.0	1.2	15.2	-61.9	-63.4	16.5	5.8	-57.6	-13.0	-44.6
600.02000	V	318.0	1.4	8.6	-64.2	-66.2	18.6	7.2	-59.0	-13.0	-46.0
54.02500	H	353.0	3.4	7.5	-71.1	-72.1	10.8	-5.9	-78.0	-13.0	-65.0
110.00000	H	359.0	2.9	4.8	-74.3	-75.8	15.8	-4.8	-80.6	-13.0	-67.6
156.18600	H	218.0	2.9	7.3	-69.1	-70.6	14.7	-0.6	-71.2	-13.0	-58.2
200.01500	H	110.0	1.7	19.8	-58.2	-59.7	17.3	-1.1	-60.8	-13.0	-47.8
228.87100	H	359.0	3.4	6.5	-72.0	-73.5	14.9	2.5	-71.0	-13.0	-58.0
237.61000	H	366.0	1.4	9.0	-72.6	-74.1	14.7	3.1	-71.0	-13.0	-58.0
259.22100	H	240.0	1.7	8.9	-62.6	-64.1	17.4	1.1	-63.0	-13.0	-50.0
266.67200	H	186.0	3.4	11.6	-66.5	-68.0	18.4	0.4	-67.6	-13.0	-54.6
280.83200	H	343.0	2.4	5.6	-70.9	-72.4	20.6	-1.4	-73.8	-13.0	-60.8
311.06200	H	107.0	2.7	4.2	-55.0	-56.5	13.9	6.2	-50.3	-13.0	-37.3
400.02100	H	169.0	2.1	13.9	-58.6	-60.6	16.5	5.8	-54.8	-13.0	-41.8

Table 6. Radiated Emissions >1000Mhz Test Data Sheet

Frequency (MHz)	Polarity H/V	Ant. Hght (m)	Spur Level dBm	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
@ 1642.5MHz										
1642.50000	V	1.0	-27.33	-27.20	-28.70	28.7	5.9	-22.8	35.0	-57.8
1598.50000	V	1.0	-68.83	-68.80	-70.30	28.4	5.9	-64.4	-13.0	-51.4
1646.00000	V	1.0	-69.00	-71.10	-72.60	28.7	5.9	-66.7	-13.0	-53.7
1650.30000	V	1.0	-68.50	-70.30	-71.80	28.7	5.9	-65.9	-13.0	-52.9
3285.00000	V	1.0	-58.67	-55.80	-57.30	35.1	5.4	-51.9	-12.0	-39.9
4927.50000	V	1.0	-68.80	-59.70	-61.80	36.4	7.6	-54.2	-13.0	-41.2
6570.00000	V	1.0	-72.50	-60.80	-63.30	39.1	7.5	-55.8	-13.0	-42.8
8212.50000	V	1.0	-78.00	-63.10	-64.60	42.4	6.1	-58.5	-13.0	-45.5
9855.00000	V	1.0	-75.80	-58.40	-61.10	45.4	4.7	-56.4	-13.0	-43.4
11497.50000	V	1.0	-74.00	-56.90	-59.80	47.0	4.4	-55.4	-13.0	-42.4
13140.00000	V	1.0	-75.00	-50.20	-53.40	48.6	4.0	-49.4	-13.0	-36.4
14782.50000	V	1.0	-75.50	-47.90	-51.20	52.5	1.1	-50.1	-13.0	-37.1
16425.0000	V	1.0	-75.10	-50.10	-53.70	52.0	2.5	-51.2	-13.0	-38.2
1642.50000	H	1.0	-32.67	-29.70	-31.20	28.7	5.9	-25.3	35.0	-60.3
1646.00000	H	1.0	-69.20	-67.50	-69.00	28.7	5.9	-63.1	-13.0	-50.1
1650.30000	H	1.0	-70.00	-67.90	-69.40	28.7	5.9	-63.5	-13.0	-50.5
3285.00000	H	1.0	-69.00	-64.20	-65.70	35.1	5.4	-60.3	-13.0	-47.3
4927.50000	H	1.0	-67.67	-57.20	-59.30	36.4	7.6	-51.7	-13.0	-38.7
6570.00000	H	1.0	-76.00	-61.50	-64.00	39.1	7.5	-56.5	-13.0	-43.5
8212.50000	H	1.0	-75.00	-59.50	-61.00	42.4	6.1	-54.9	-13.0	-41.9
9855.00000	H	1.0	-75.15	-56.60	-59.30	45.4	4.7	-54.6	-13.0	-41.6
11497.50000	H	1.0	-74.3	-53.90	-56.80	47.0	4.4	-52.4	-13.0	-39.4
13140.00000	H	1.0	-74.14	-49.20	-52.40	48.6	4.0	-48.4	-13.0	-35.4
14782.50000	H	1.0	-75.83	-46.80	-50.10	52.5	1.1	-49.0	-13.0	-36.0
16425.0000	H	1.0	-73.67	-48.6	-52.20	52.0	2.5	-49.7	-13.0	-36.7

4.5 Radiated Spurious Emissions per FCC §25.216

FCC Part 25 limits the emissions from mobile earth stations for the protection of aeronautical radio navigation-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.

4.5.1 Test Procedure

The output of the EUT was connected to the input of measurement receiver with a RMS detector and the capability of performing the measurements as specified in §25.216. The following was used to calculate the limit and the corrected emissions levels for obtaining the plots shown in Figure 10 through Figure 13.

For emissions from 1559M – 1605MHz:
Limit = -70dBW/MHz = -40dBm/MHz

For discrete emissions with bandwidths less than 700Hz from 1559M – 1605MHz
Limit = -80dBW = -50dBm

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

Emission Level = RXL + ATT
Where: RXL = Raw received level
ATT = Attenuator = 20dB

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 plot shows the maximum emissions detected with the band of 1559M – 1610MHz in both a standby and operating mode.

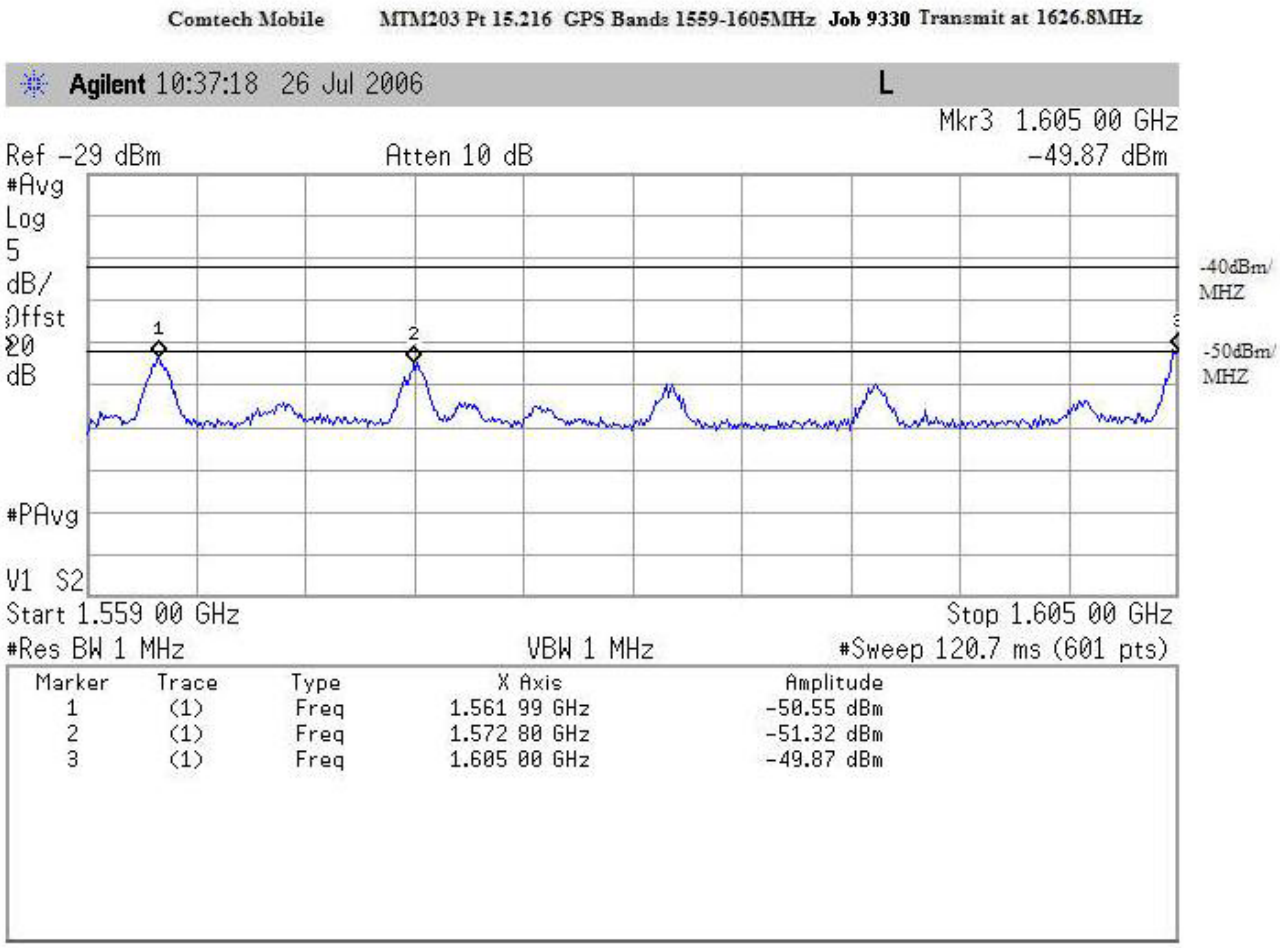

Figure 10: GPS Band Emissions Low Channel, 1559 – 1605MHz

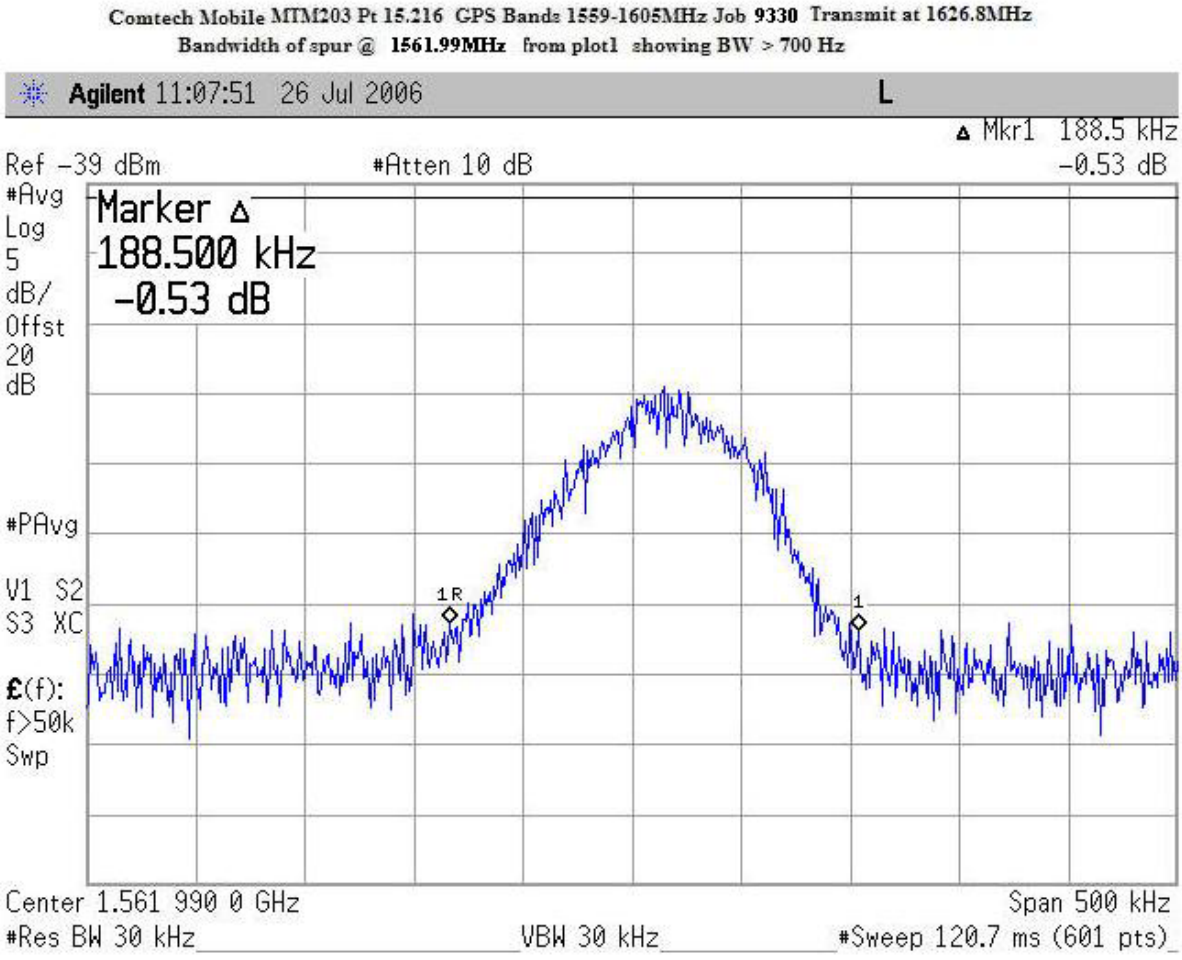

Figure 11: GPS Band Emission, 1562MHz BW >700Hz

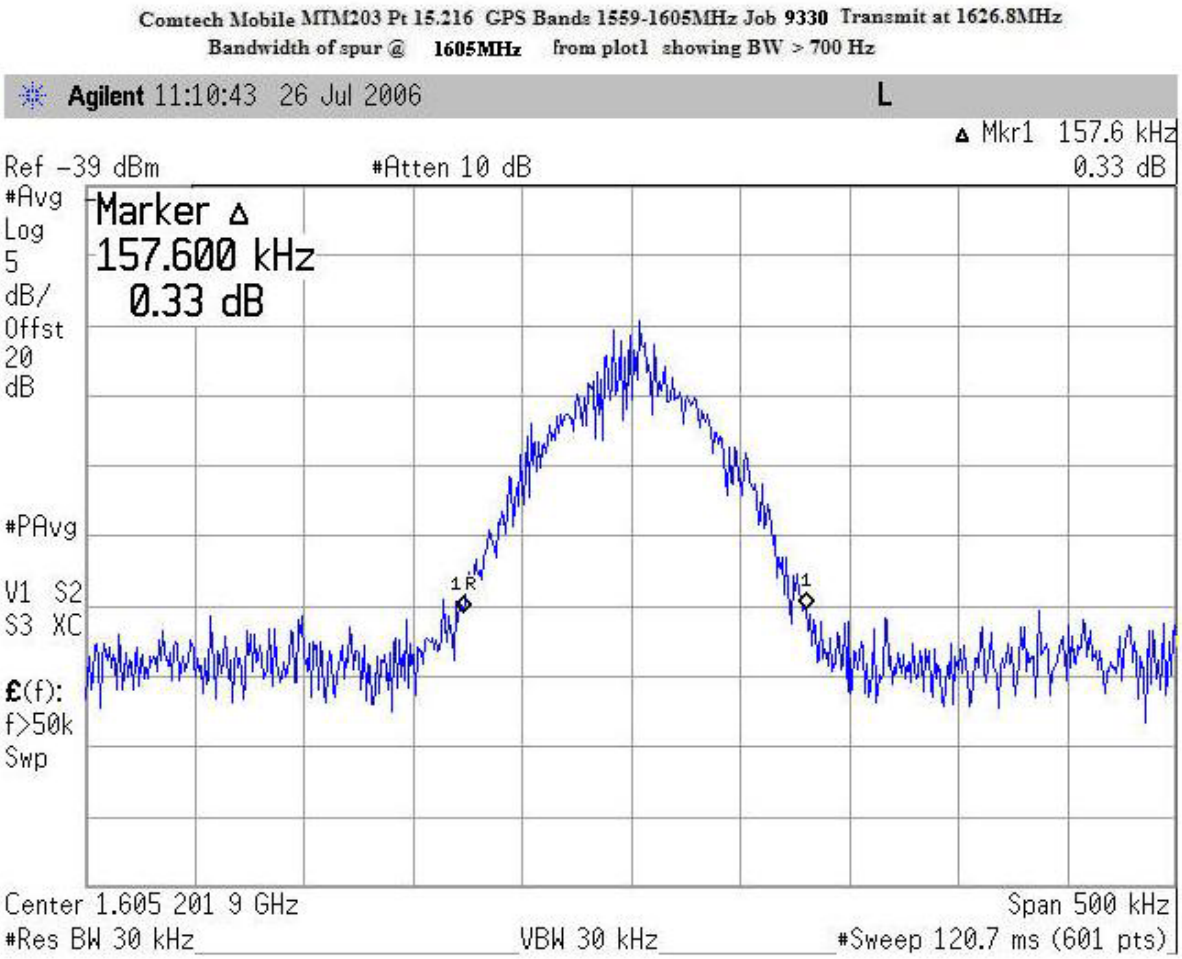

Figure 12: GPS Band Emission, 1605.2MHz BW >700Hz

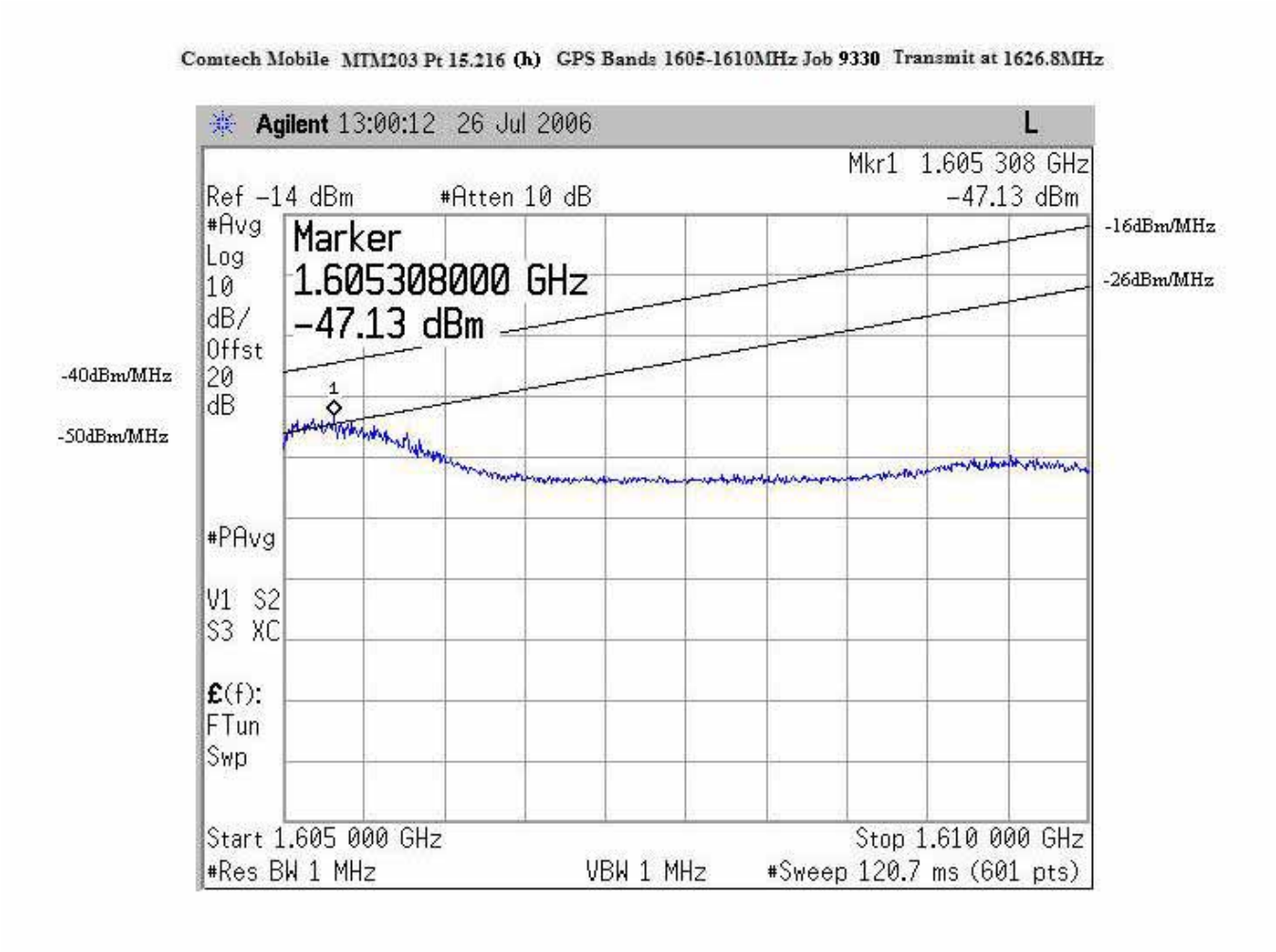

Figure 13: GPS Band Emissions, 25.216(f) and 25.216(h), Low Channel, 1605 – 1610MHz

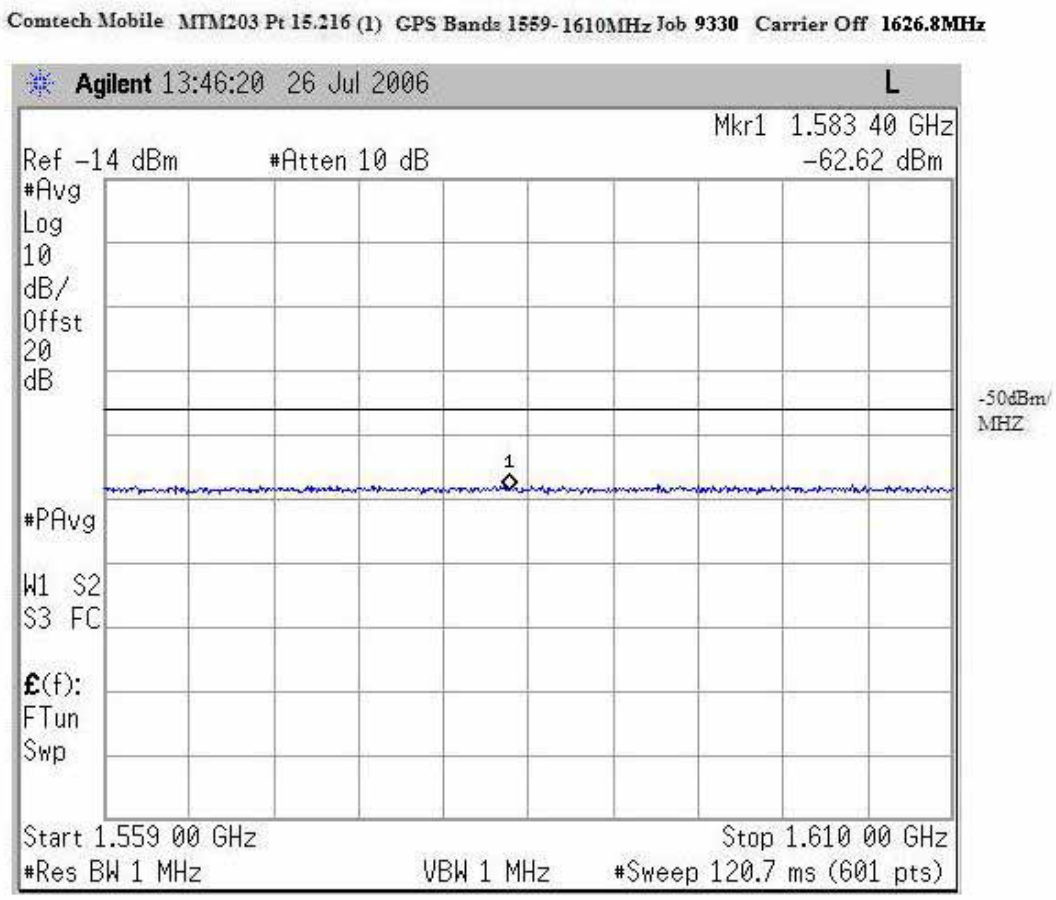

Figure 14. GPS Band Emission, Carrier Off, Low Channel, 1559 – 1610MHz

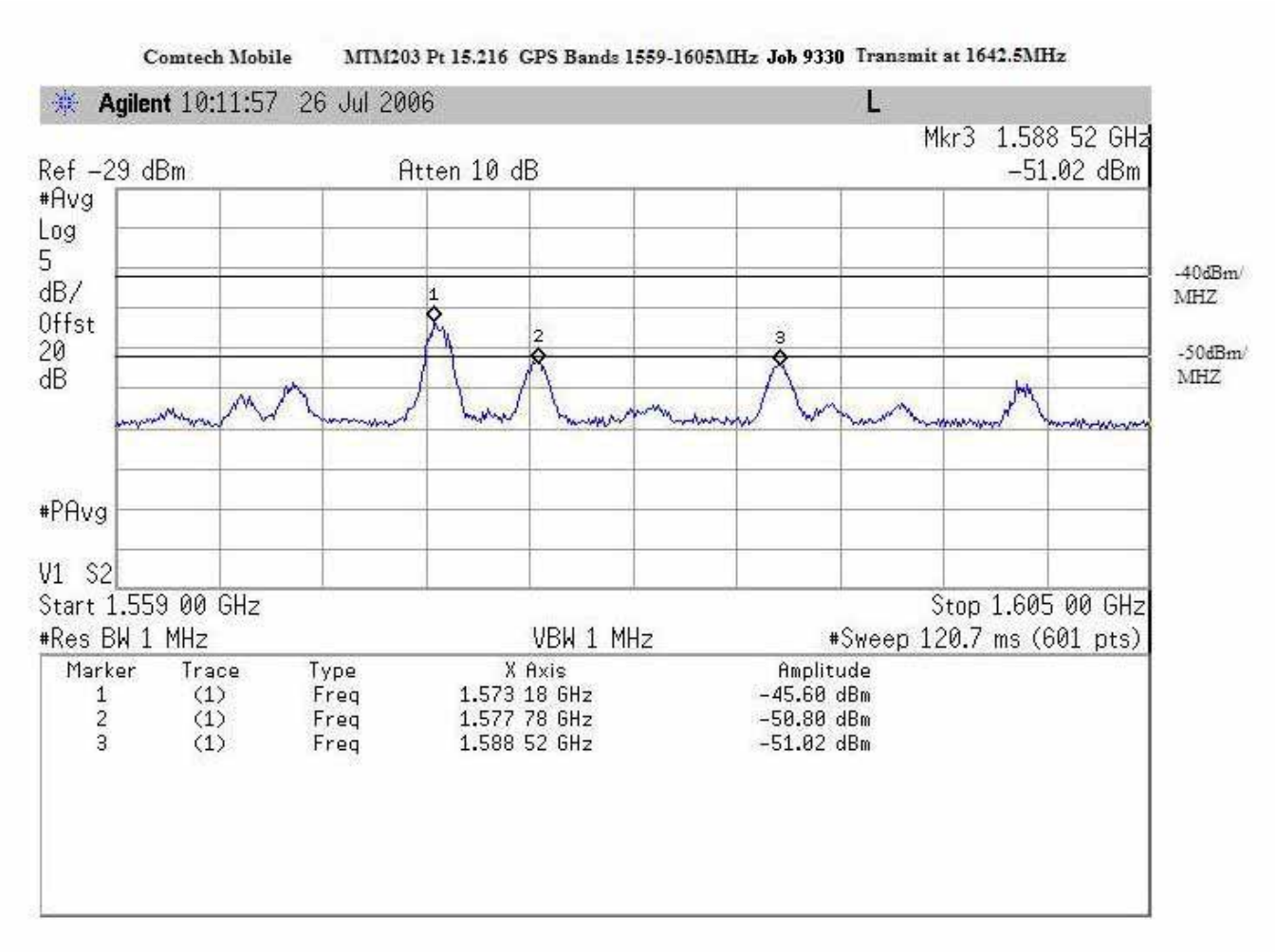

Figure 15. GPS Band Emissions Middle Channel, 1559 – 1605MHz

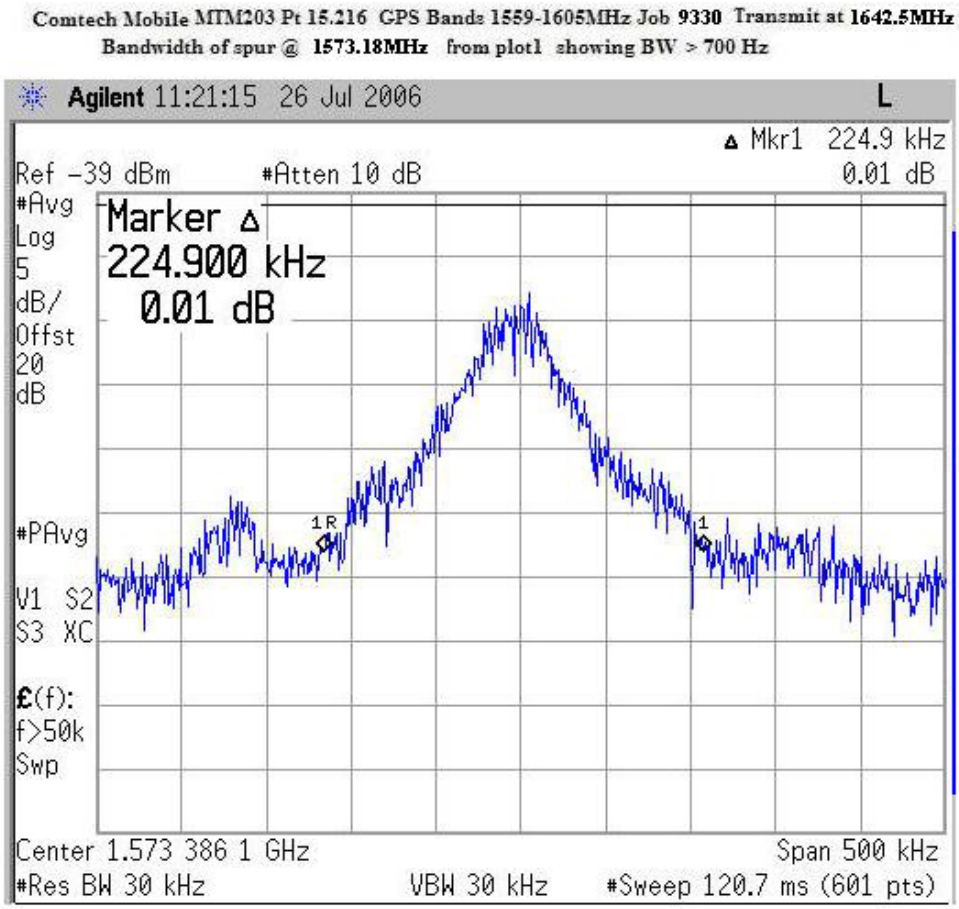

Figure 16. GPS Band Emission, 1573.4MHz BW >700Hz

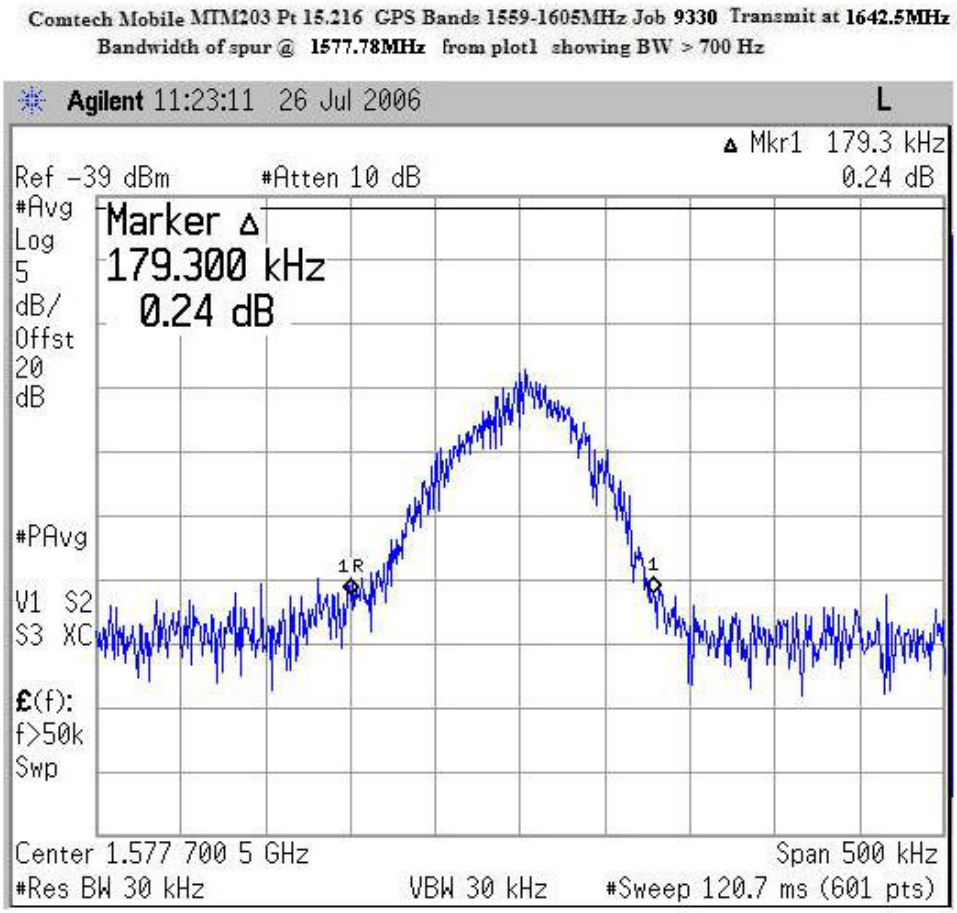

Figure 17. GPS Band Emission, 1577.7MHz BW >700Hz

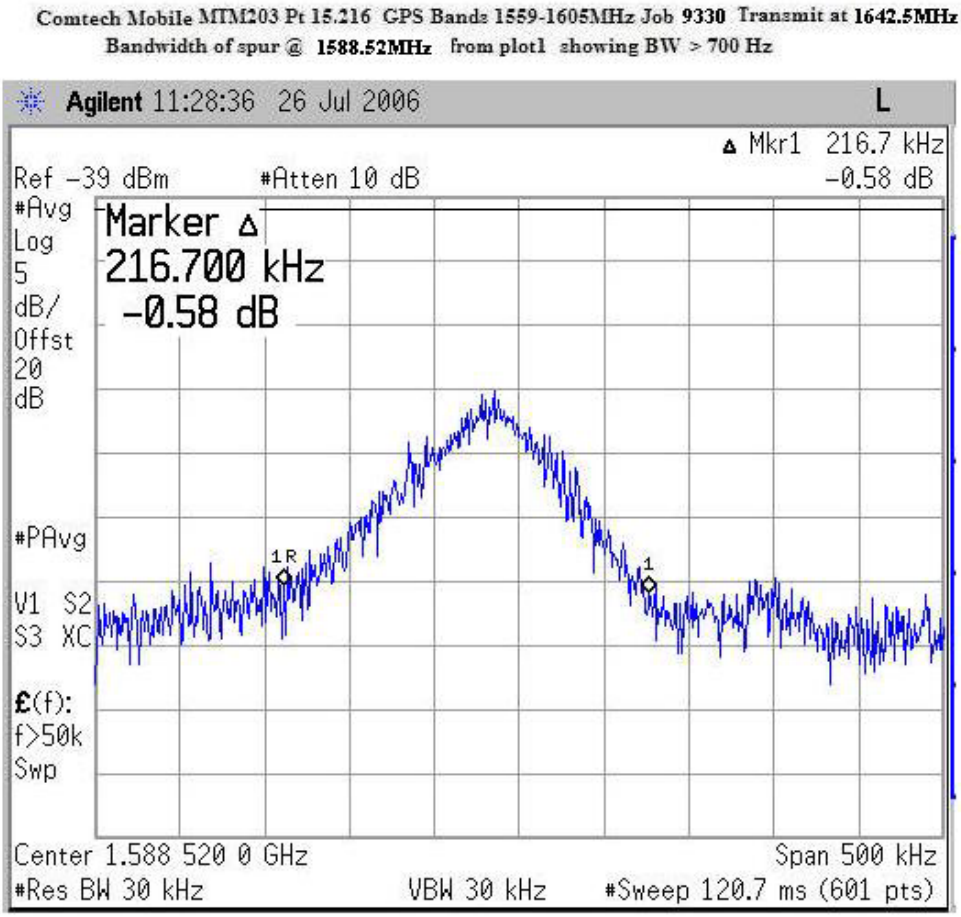

Figure 18. GPS Band Emission, 1588.52MHz BW >700Hz

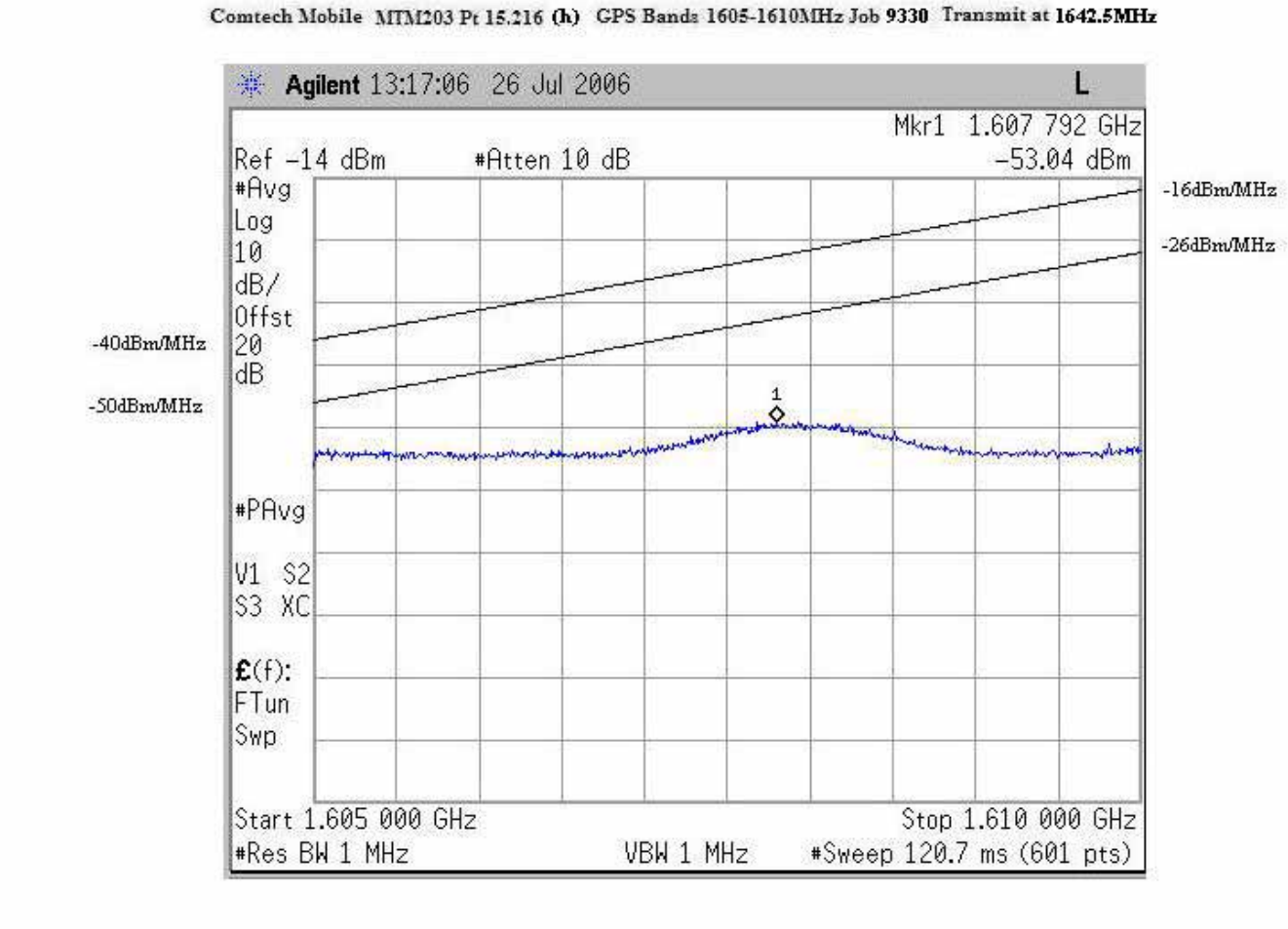

Figure 19. GPS Band Emissions, 25.216(f) and (h), Middle Channel, 1605 – 1610MHz

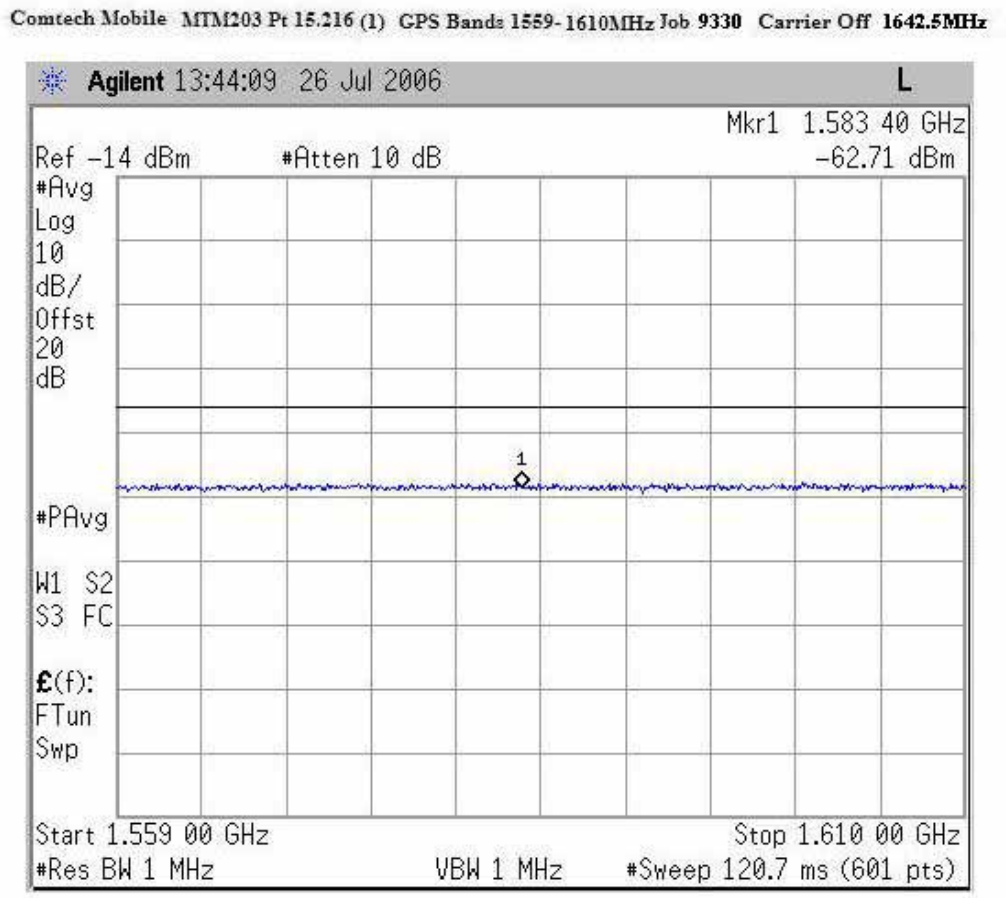

Figure 20. GPS Band Emission, Carrier Off, Mid Channel, 1559 – 1610MHz

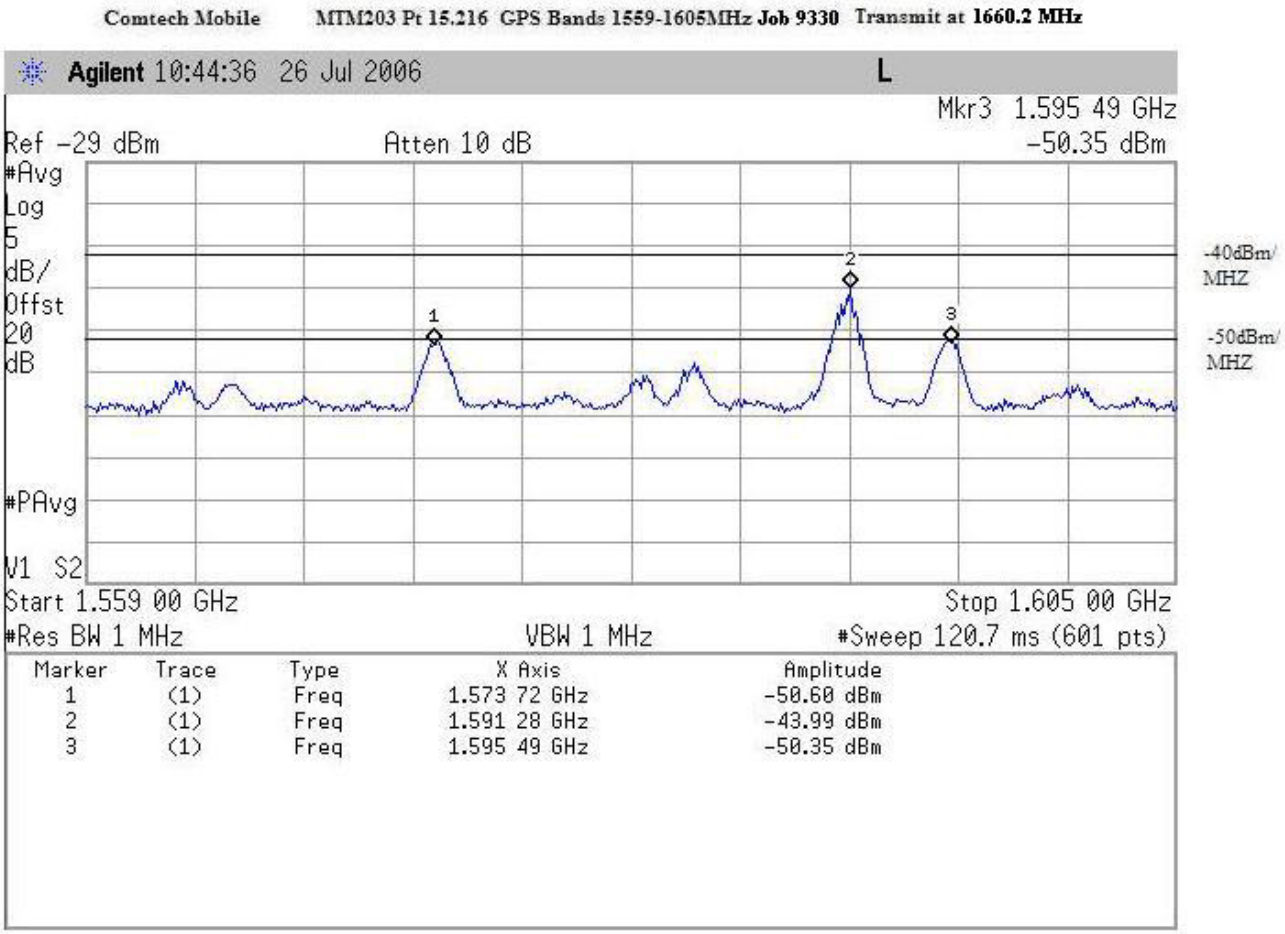

Figure 21. GPS Band Emissions High Channel, 1559 – 1605MHz

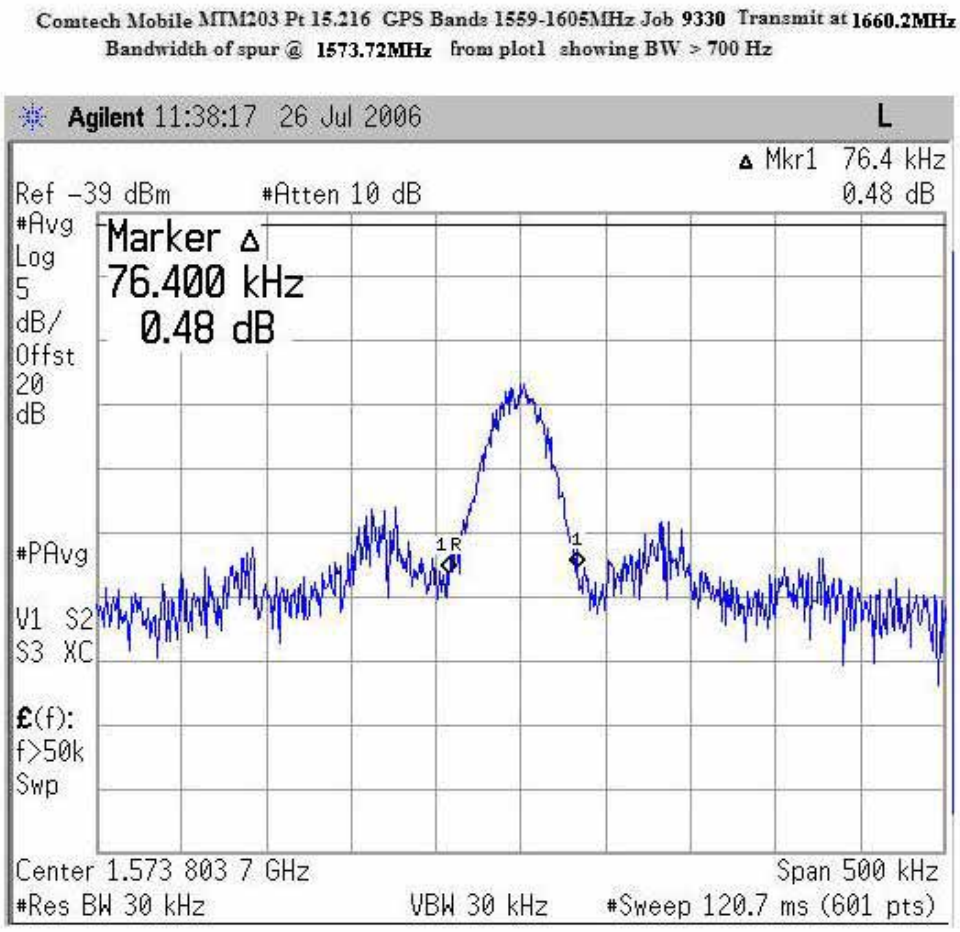

Figure 22. GPS Band Emission, 1573.8MHz BW >700Hz

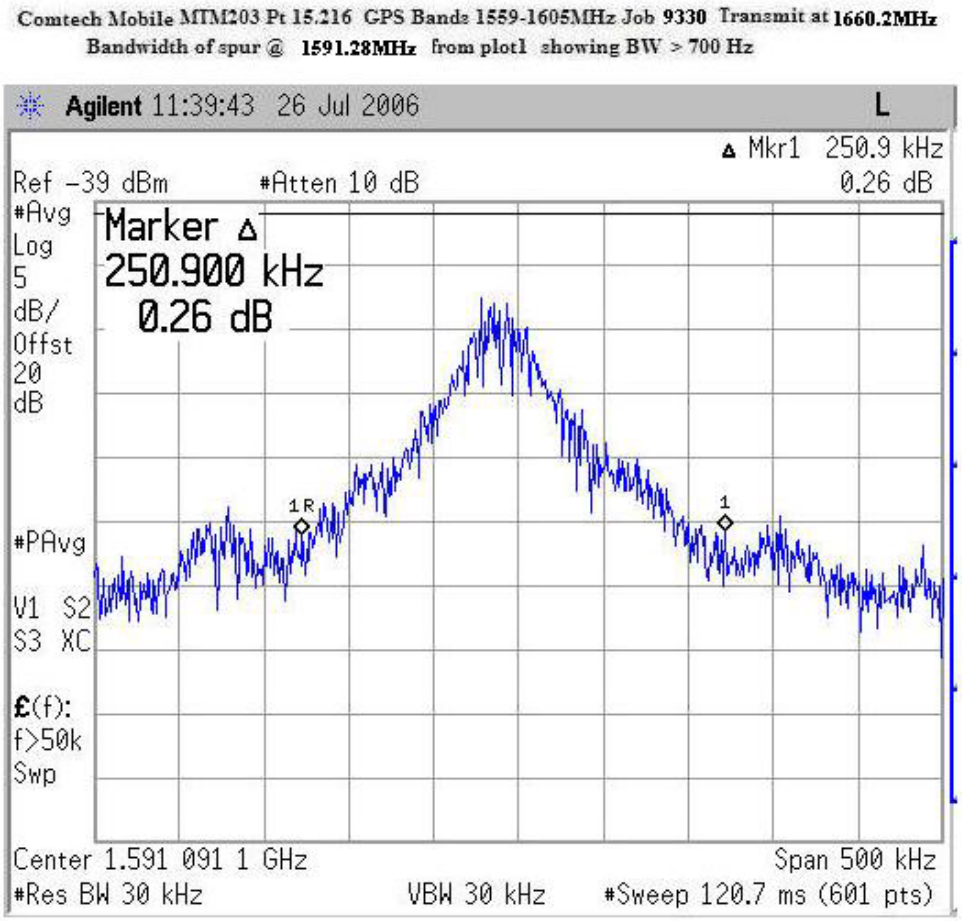

Figure 23. GPS Band Emission, 1591.09MHz BW >700Hz

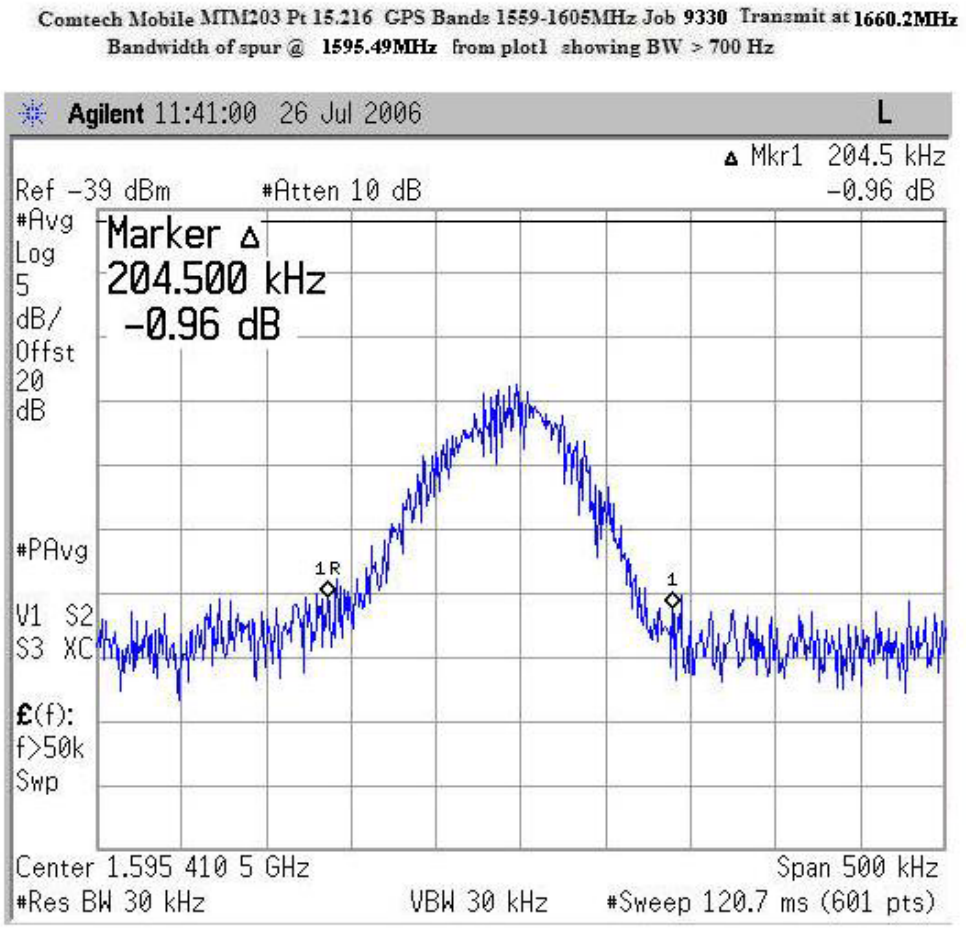

Figure 24. GPS Band Emission, 1595.4MHz BW >700Hz

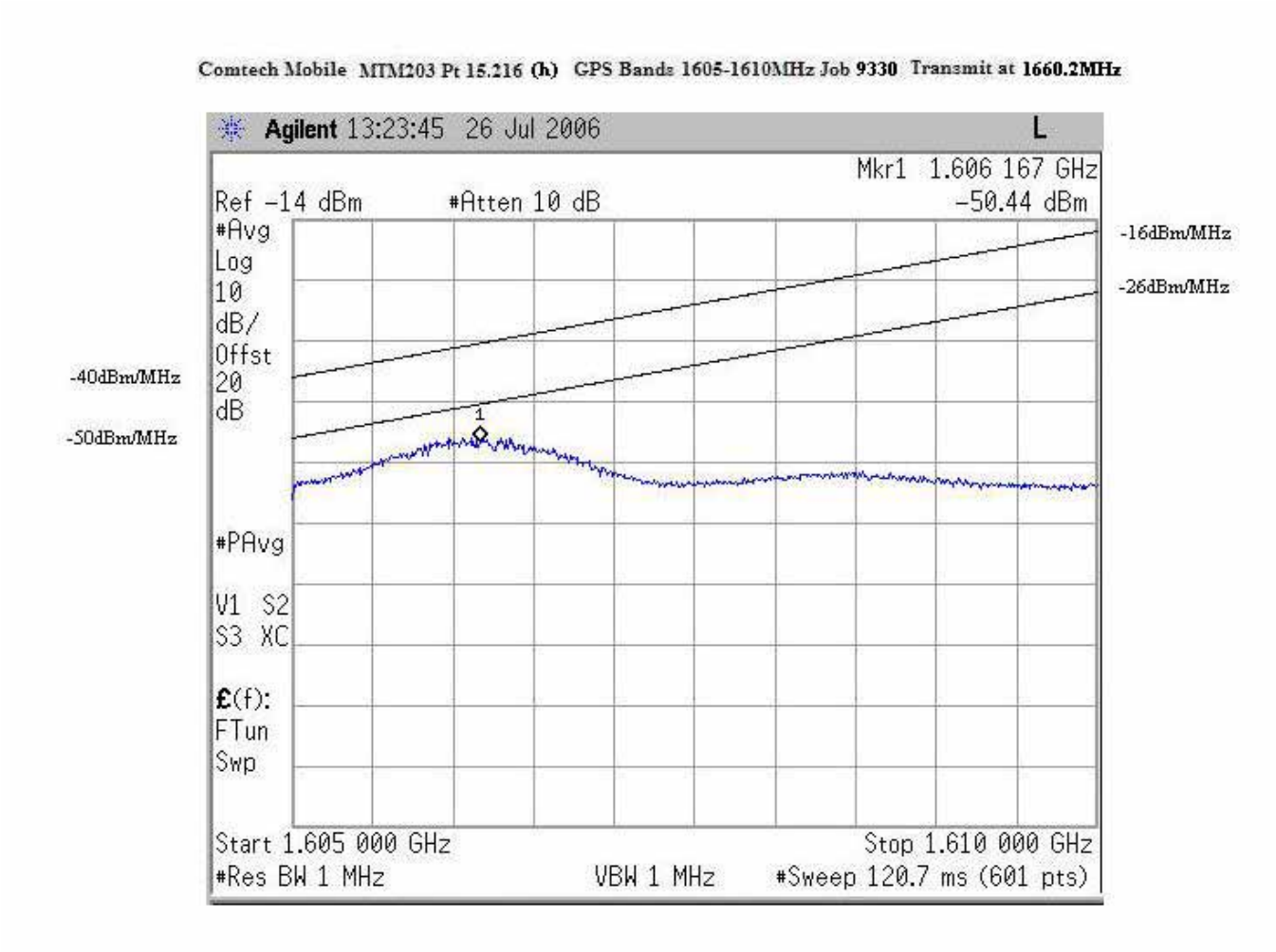

Figure 25. GPS Band Emissions, 25.216(f) and (h), High Channel, 1605 – 1610MHz

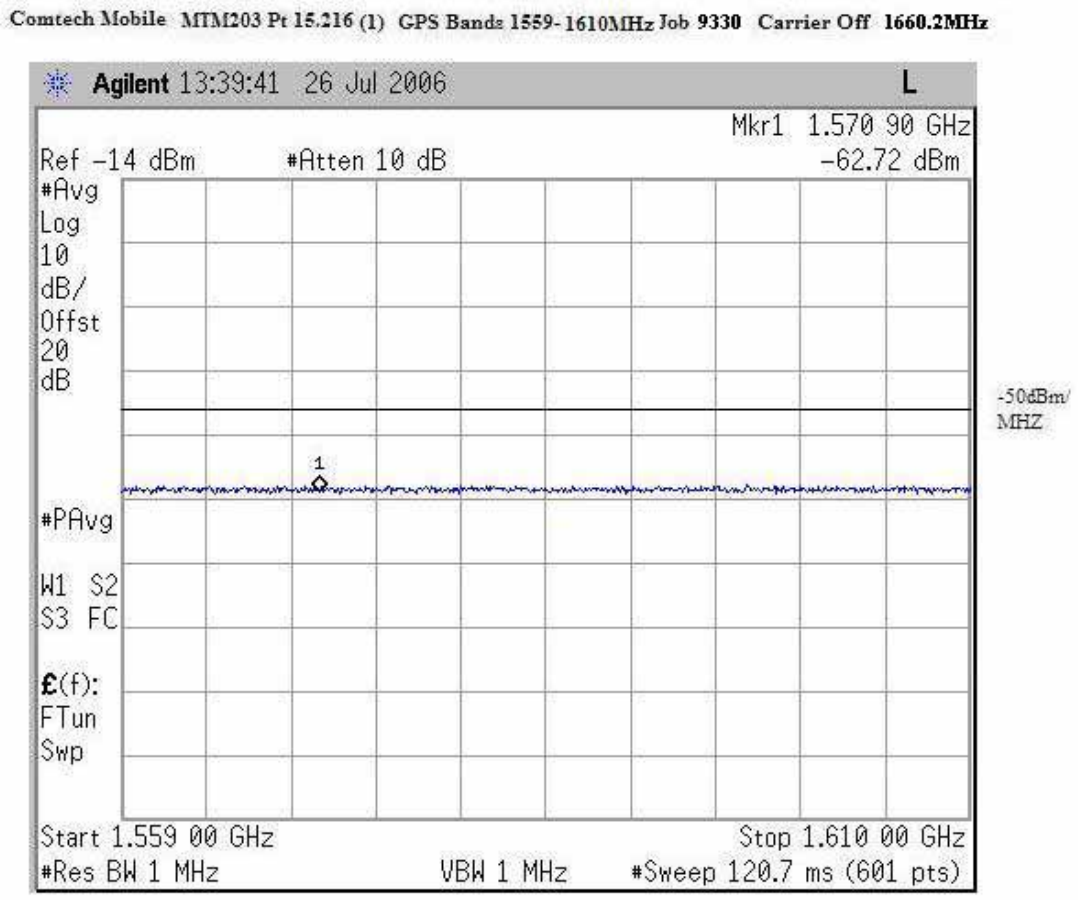

Figure 26. GPS Band Emission, Carrier Off, High Channel, 1559 – 1610MHz

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 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 10Vdc voltage supplied via an external DC power supply.

4.6.2 Test Results

The EUT complies with the temperature stability requirements of FCC §25.202. Test results are given in Table 7.

Table 7: Frequency Stability Test Data

Temperature Degrees Celcius	Frequency GHz	Difference Hz	Limit (0.001% of Baseline)
Ambient	1.642501900	0.00	16425.0190
-30	1.642498400	3500.00	16425.0190
-20	1.642499900	2000.00	16425.0190
-10	1.642499930	1970.00	16425.0190
0	1.642498940	2960.00	16425.0190
10	1.642500530	1370.00	16425.0190
20	1.642500310	1590.00	16425.0190
30	1.642500200	1700.00	16425.0190
40	1.642500000	1900.00	16425.0190
50	1.642499700	2200.00	16425.0190
Voltage			
Nominal (10V)	1.642501900	0.00	16425.0190
Low (6.5V)	1.642499800	2100.00	16425.0190
High (15V)	1.642501000	900.00	16425.0190