Washington Laboratories, Ltd.

FCC & Industry Canada Certification Test Report

For

MB Martin & Company
FCC ID: TDOAVIACOM1-PA
IC ID: 6186A-AVIACOM1PA

May 6, 2009

Re-issued May 29, 2009

Prepared for:

MB Martin & Company
965 Leigh Mill Road
Great Falls, VA 22066

Prepared By:

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

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WLL JOB# **10520**
May 6, 2009

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Prepared by:

Steven Dovell
Compliance Engineer

Reviewed by:

Steven D. Koster
EMC Operations Manager

Abstract

This report has been prepared on behalf of MB Martin & Company to support the attached Application for Equipment Authorization. The test report and application are submitted for an Amplifier under Part 87 part of the FCC Rules and Regulations and under RSS-141 part of the IC Rules and Regulations. This Federal Communication Commission (FCC) and Industry Canada (IC) Certification Test Report documents the test configuration and test results for a MB Martin & Company AVIACOM1-PA VHF Amplifier.

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 the American Association for Laboratory Accreditation (A2LA) under Certificate 2675.01 as an independent FCC test laboratory.

The MB Martin & Company AVIACOM1-PA VHF Amplifier complies with the limits for an Amplifying device under Part 87 part of the FCC Rules and Regulations and RSS-141 part of the IC Rules and Regulations.

Revision History	Reason	Date
Rev 0	Initial Release	May 6, 2009
Rev 1	Add input data and other corrections per the TCB	May 29, 2009

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1 Introduction

1.1 Compliance Statement

The MB Martin & Company AVIACOM1-PA VHF Amplifier complies with the limits for a transmitter device under Part 87 part of the FCC Rules and Regulations.

1.2 Test Scope

Tests for radiated and conducted emissions were performed. All measurements were performed according to ANSI/TIA-603C. The measurement equipment conforms to ANSI C63.2 Specifications for Electromagnetic Noise and Field Strength Instrumentation.

1.3 Contract Information

Customer:	MB Martin & Company 965 Leigh Mill Road Great Falls, VA 22066
Purchase Order Number:	N/A
Quotation Number:	64295A

1.4 Test Dates

Testing was performed on the following date(s):	07/29/2008 to 08/1/2008

1.5 Test and Support Personnel

Washington Laboratories, Ltd.	Steven Dovell
Client Representative	Jim Mastropole

1.6 Abbreviations

A	**A**mpere
ac	**a**lternating **c**urrent
AM	**A**mplitude **M**odulation
Amps	**Amp**eres
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	giga - prefix for 10^9 multiplier
Hz	**H**ertz
IF	**I**ntermediate **F**requency
k	kilo - prefix for 10^3 multiplier
M	Mega - prefix for 10^6 multiplier
m	**m**eter
μ	micro - prefix for 10^{-6} multiplier
NB	**N**arrow**b**and
LISN	**L**ine **I**mpedance **S**tabilization **N**etwork
RE	**R**adiated **E**missions
RF	**R**adio **F**requency
rms	**r**oot-**m**ean-**s**quare
SN	**S**erial Number
S/A	**S**pectrum **A**nalyzer
V	**V**olt

2 Equipment Under Test

2.1 EUT Identification & Description

The MB Martin & Company AVIACOM1-PA VHF Amplifier is an aviation VHF Amplifier designed to attach directly to the AVIACOM1 VHF transmitter and is intended for ground-based applications. The frequency range of operation is from 118-137 MHz.

Table 1. Device Summary

ITEM	DESCRIPTION
Manufacturer:	MB Martin & Company
FCC ID Number	TDOAVIACOM1-PA
IC ID Number	6186A-AVIACOM1PA
EUT Name:	Aviation VHF Amplifier
Model:	AVIACOM1-PA
FCC Rule Parts:	Part 2 and Part 87
Frequency Range:	118 MHz – 136.975 MHz
Maximum Output Power:	2.15 W
Modulation:	AM
Necessary Bandwidth:	6kHz
Keying:	Manual
Type of Information:	Voice
Power Output Level	Fixed
Antenna Type	Connector
Frequency Tolerance:	<20 ppm
Emission Type(s):	A3E
Interface Cables:	RS-232 Comm Port, SMA Antenna Port Custom connector for Audio I/O
Power Source & Voltage:	+12Vdc

2.2 Test Configuration

The AVIACOM1-PA VHF Amplifier was powered from an external AC to DC regulated supply into a custom connector. The custom connector also has 2 RCA type connections for transmit audio input and for receive. The amplifier simply provides a path for the Analog signals (voice), which are passed through the control connector of the amplifier and routed directly to the analog input of the AVIACOM1 radio. Transmit levels, saturation limitations, and analog filtering is provided by the AVIACOM1radio. The transmit audio port was attached to a function generator providing 2500Hz 1 Vp-p input to the Transmitter. The receive port was terminated in 50 Ohms. A support Laptop with HyperTerminal was connected to the EUT's RS232 port (DB9 connector) for controlling the radio during testing.

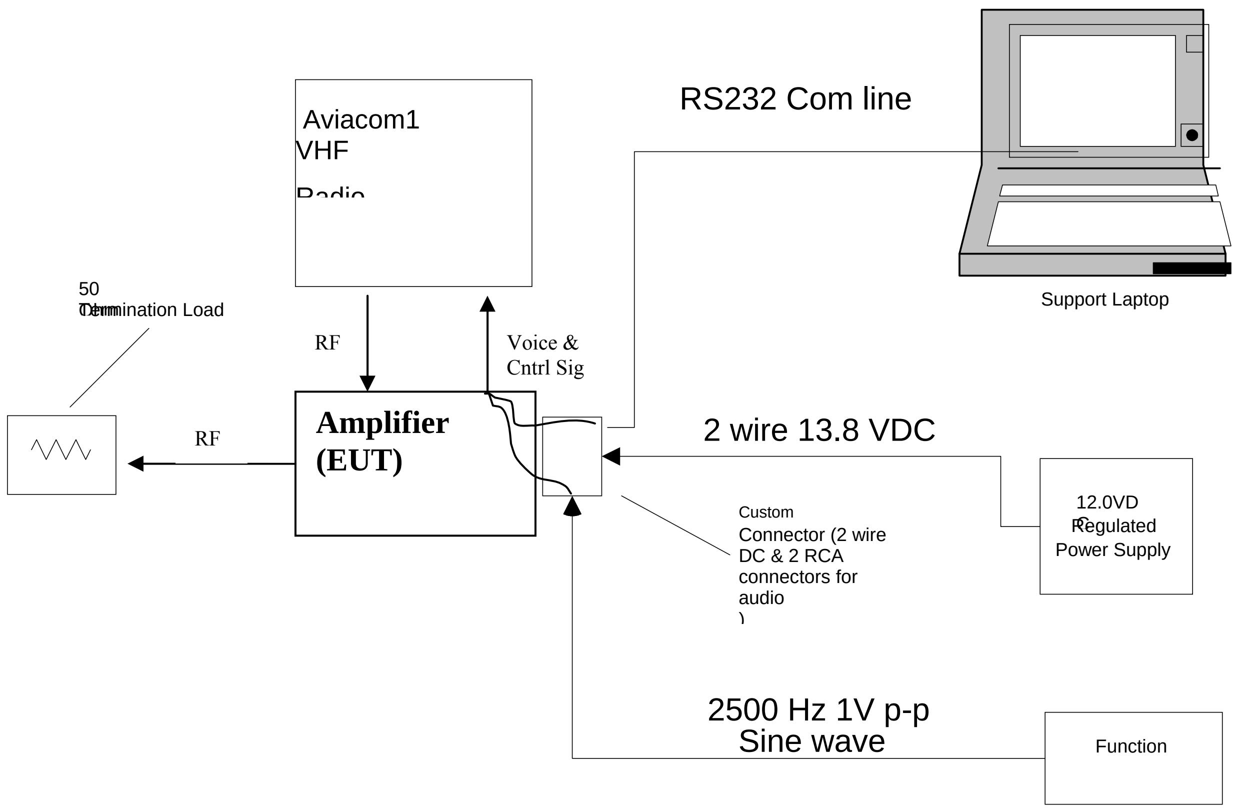

Figure 1. Test Configuration

2.3 Testing Algorithm

The AVIACOM1-PA VHF Amplifier was operated for continuous transmission as follows:

The Unit was set to transmit @ 127.5MHz via a RS232 link to HyperTerminal on the support laptop. The command: *$F127.5000* set the transmit frequency to 127.5 MHz, and *$T* started the transmit pulses. A function generator supplied 2500 Hz sine wave 1Vpp level, which is the maximum allowable level as specified by the manufacture, at the audio input port to modulate the transmission. Additional frequencies were similarly programmed.

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

2.4 Test Location

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 the American Association for Laboratory Accreditation (A2LA) under Certificate 2675.01 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 basis for uncertainty calculation uses ANSI/NCSL Z540-2-1997 with a type B evaluation of the standard uncertainty. Elements contributing to the standard uncertainty are combined using the method described in Equation 1 to arrive at the total standard uncertainty. The standard uncertainty is multiplied by the coverage factor to determine the expanded uncertainty which is generally accepted for use in commercial, industrial, and regulatory applications and when health and safety are concerned (see Equation 2). A coverage factor was selected to yield a 95% confidence in the uncertainty estimation.

Equation 1: Standard Uncertainty

$$\boxed{u_c = \pm\sqrt{\frac{a^2}{{div_a}^2} + \frac{b^2}{{div_b}^2} + \frac{c^2}{{div_c}^2} + \ldots\ldots}}$$

where u_c = standard uncertainty

a, b, c,.. = individual uncertainty elements

$div_{a,\ b,\ c}$ = the individual uncertainty element divisor based on the probability distribution

divisor = 1.732 for rectangular distribution

divisor = 2 for normal distribution

divisor = 1.414 for trapezoid distribution

Equation 2: Expanded Uncertainty

$$\boxed{U = ku_c}$$

where U = expanded uncertainty

k = coverage factor

$k \leq 2$ for 95% coverage (ANSI/NCSL Z540-2 Annex G)

u_c = standard uncertainty

The measurement uncertainty complies with the maximum allowed uncertainty from CISPR 16-4-2. Measurement uncertainty is not used to adjust the measurements to determine compliance. The expanded uncertainty values for the various scopes in the WLL accreditation are provided in Table 2 below.

Table 2: Expanded Uncertainty List

Scope	Standard(s)	Expanded Uncertainty
Conducted Emissions	FCC Part 15	2.63 dB
Radiated Emissions	FCC Part 15	4.55 dB

2.7 Equipment Used

Table 3: Conducted RF Test Equipment

Test Name:	Conducted RF test		07/29/2008
Asset #	**Manufacturer/Model**	**Description**	**Cal. Due**
00618	HP 8563A	Analyzer, Spectrum	03/07/2009
00406	B&K Precision, 4040A	Generator, Function/Sweep	CAL-IN-TEST
	MCL Attenuator 3dB	None	Cal-in-use
	Mini Circuits Attenuator 6dB	None	Cal-in-use
00642	HQ Power	0-50V 5AMP DC Supply	CNR
00333	Tektronix, TDS 220	Oscilloscope	09/17/2008

Table 4: Radiated Emissions Test Equipment

Test Name:	**Radiated Emissions**	Test Date:	**07/30/2008**
Asset #	**Manufacturer/Model**	**Description**	**Cal. Due**
00382	Sunol, JB1	Antenna, Biconlog	01/30/2009
00068	HP, 85650A	Adapter, QP	07/07/2009
00072	HP, 8568B	Analyzer, Spectrum	07/03/2009
00070	HP, 85685A	Preselector, RF w/opt 8ZE	07/07/2009
00478	Rhode & Schwarz, SMT 06	Signal Generator	02/12/2009
00004	ARA, DRG-118/A	Antenna, DRG, 1-18GHz	02/02/2009
00618	HP 8563A	Analyzer, Spectrum	03/07/2009
00007	ARA, LPB-2520	Antenna, Biconilog Antenna	06/07/2009
000626	ARA DRG-118/A	Antenna, Horn	05/22/2009

3 Test Results

3.1 RF Power Output: (§2.1046(a)/§87.131)

The test setup was in accordance with TIA/EIA 603. The unmodulated output from the transmitter/amplifier was connected to an attenuator and then to the input of the RF Spectrum Analyzer. The analyzer offset was adjusted to compensate for the attenuator and other losses in the system. The spectrum analyzer bandwidth settings were: RBW = 1MHz, VBW = 1MHz.

Table 5. RF Power Output

Channel and/or Frequency	Measured Level (dBm)	Measured Level (Watts)	Rated (Watts)	Limit (Watts)
118	33.33	2.15	2.5	55
127.5	33.33	2.15	2.5	55
136.975	33.17	2.07	2.5	55

3.2 Modulation Characteristics: (FCC Part 87 §2.1047(a)/§87.141); Audio Filter Response and Modulation Limiting

Modulation Limiting and Audio Filter Response are defined by the transmitter and were not tested as part of the Amplifier.

3.3 Emission Mask and Occupied Bandwidth: (FCC Part §2.1049/§87.139(a))

The EUT was setup in accordance with the method described in EIA/TIA 603 for sideband spectrum measurements. A 2500Hz audio signal was provided to the audio input of the EUT. The spurious emissions were then measured for the low, middle, and high channels and compared to the appropriate emission mask.

The following figures are plots of the emissions within the emission mask.

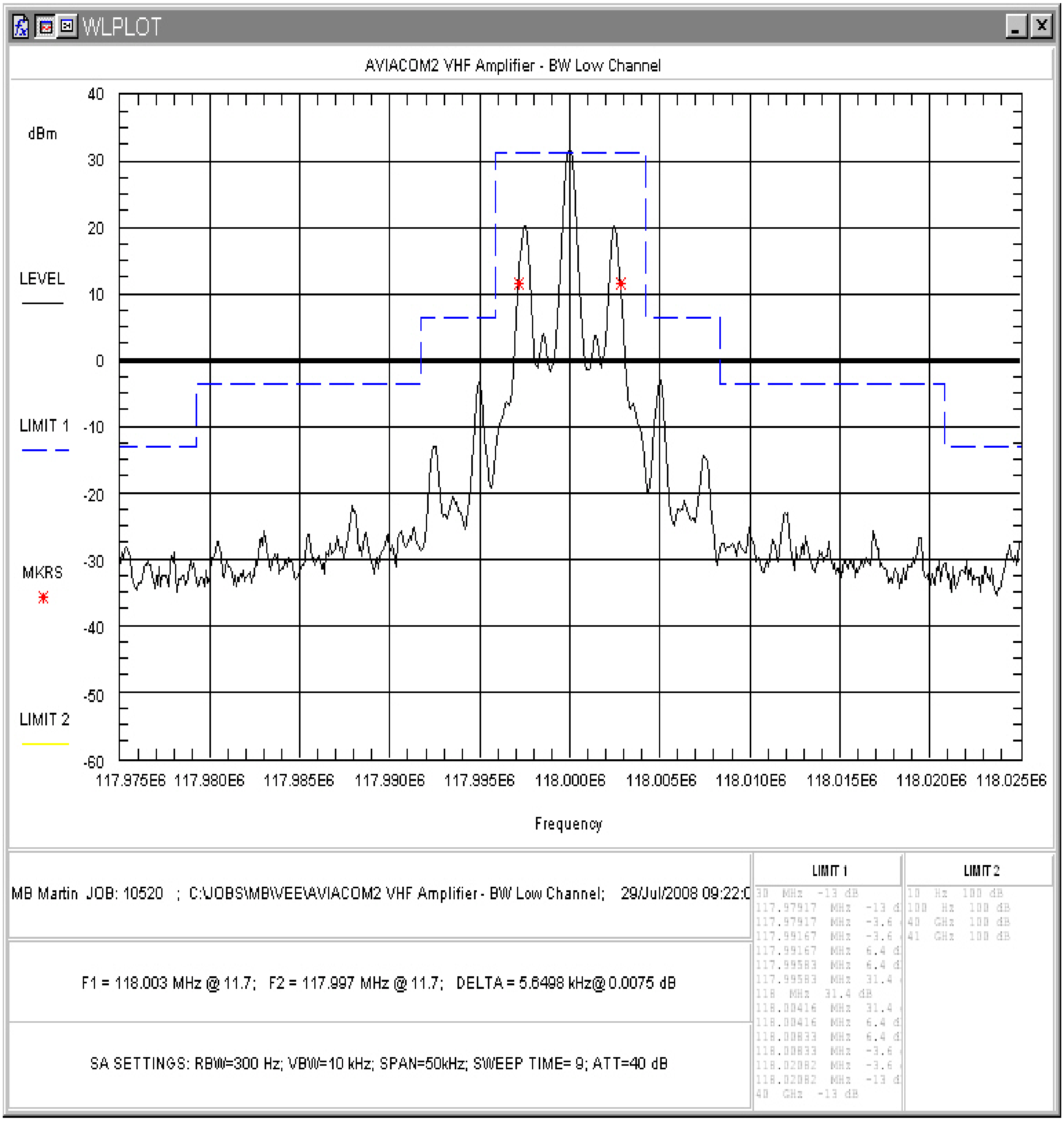

Figure 2. Occupied Bandwidth, Low Channel Emission Mask

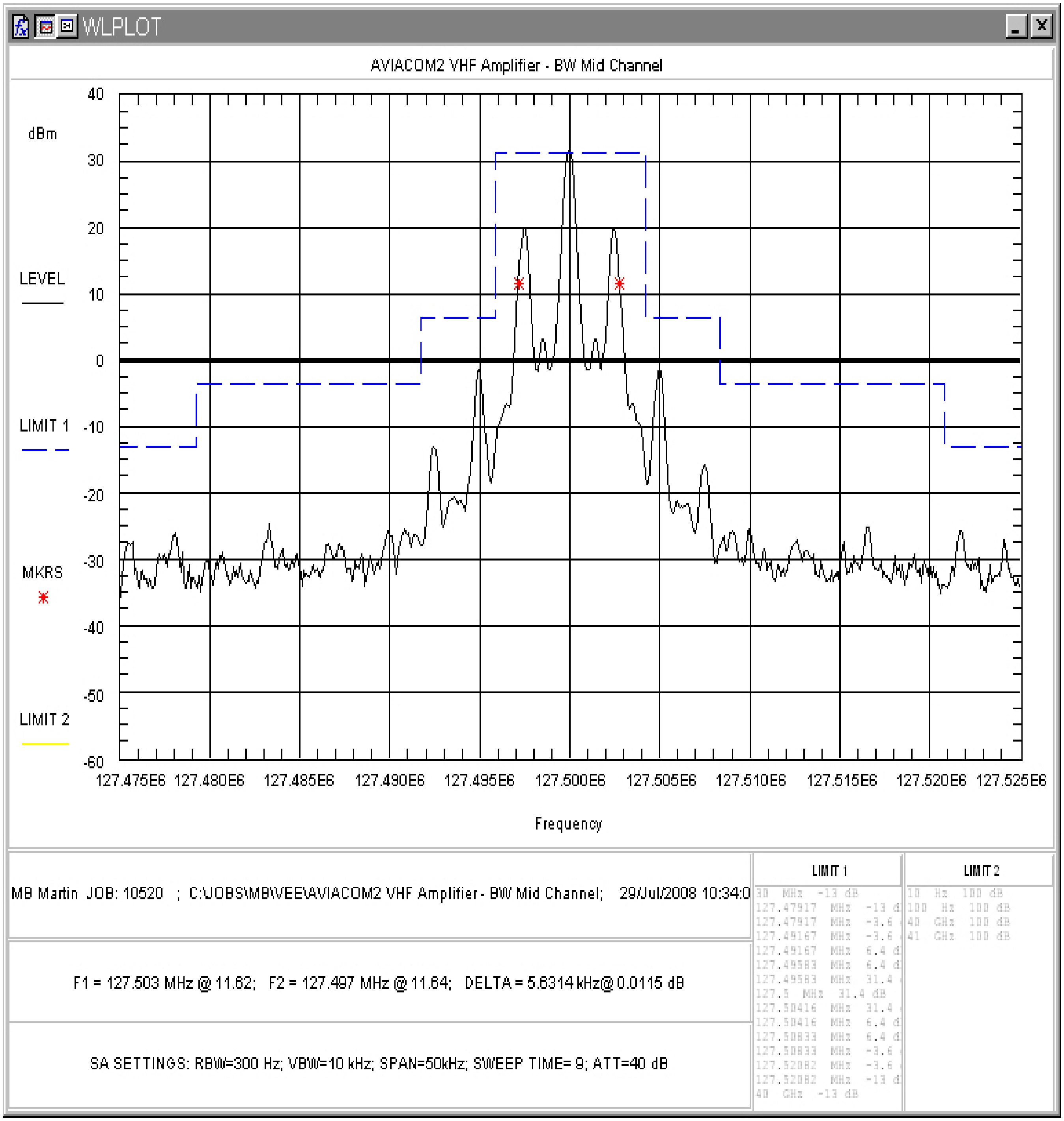

Figure 3. Occupied Bandwidth, Mid Channel Emission Mask

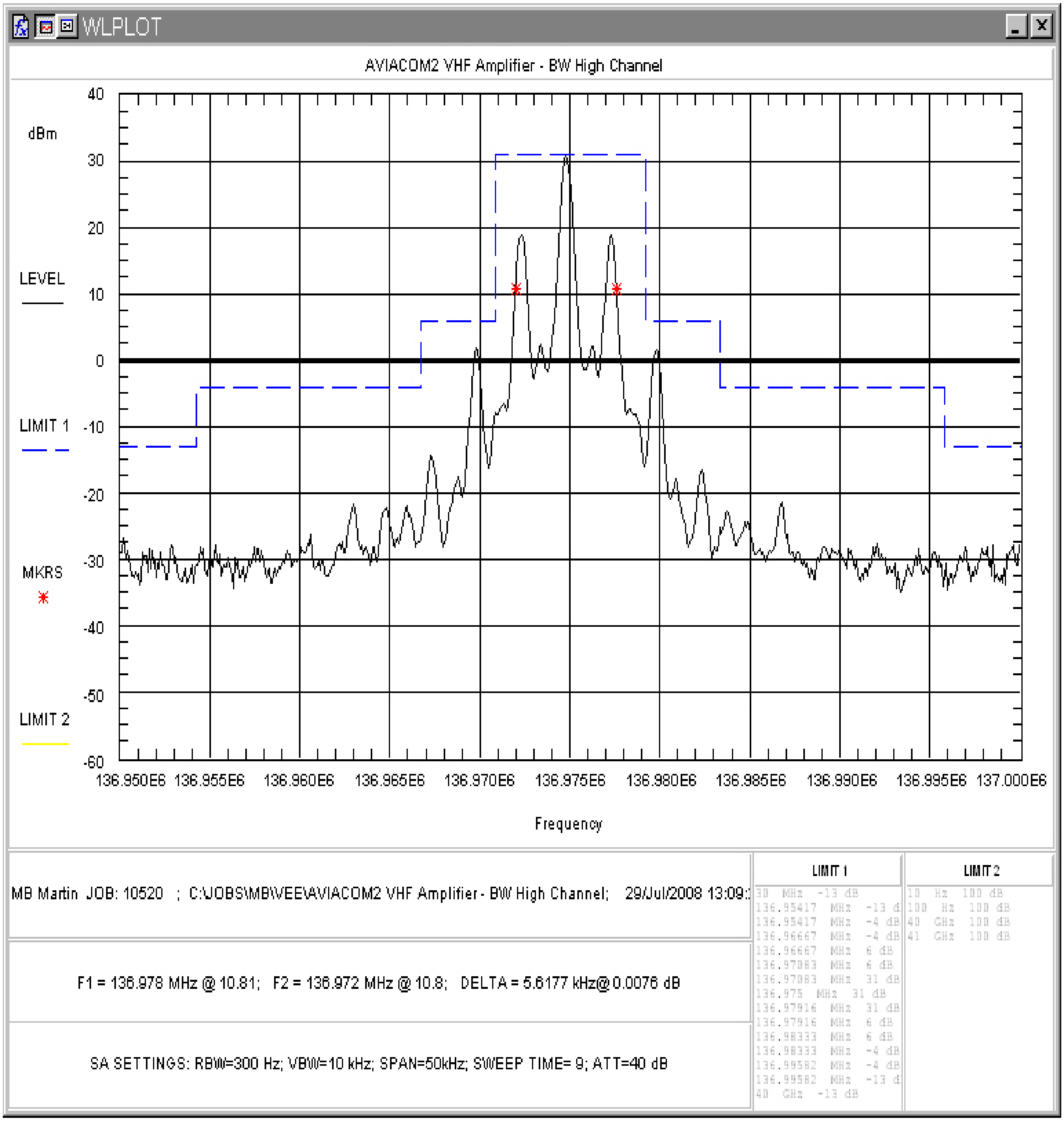

Figure 4. Occupied Bandwidth, High Channel Emission Mask

Table 6 provides a summary of the Occupied Bandwidth Results.

Table 6. Occupied Bandwidth Results

Frequency	Bandwidth	Pass/Fail
Low Channel: 118 MHz	5.6498kHz	Pass
Mid Channel: 127.5 MHz	5.6314kHz	Pass
High Channel: 136.975 MHz	5.6177kHz	Pass

Emissions Designator:

Per FCC §87.137 for a transmitter with an emission class of A3E the emission designator will be:

5K6A3E

Per RSS 141 for a transmitter with an emission class of A3E the emission designator will be:

6K00A3E

3.4 Faithful Reproduction

To demonstrate that the amplifier provides faithful reproduction of the output of the radio, Figure 5 through Figure 10 are included.

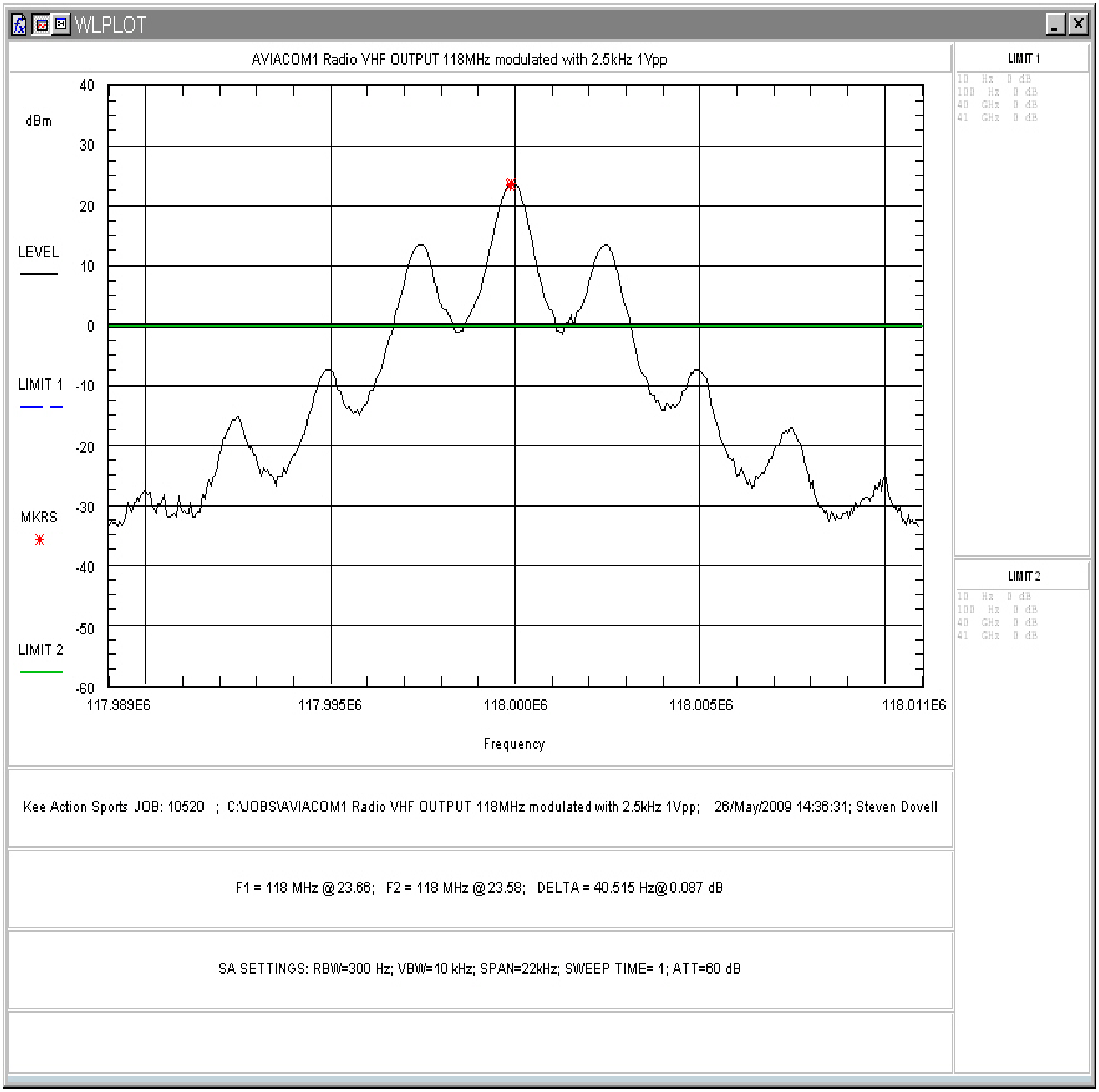

Figure 5: Radio Output - Low Channel

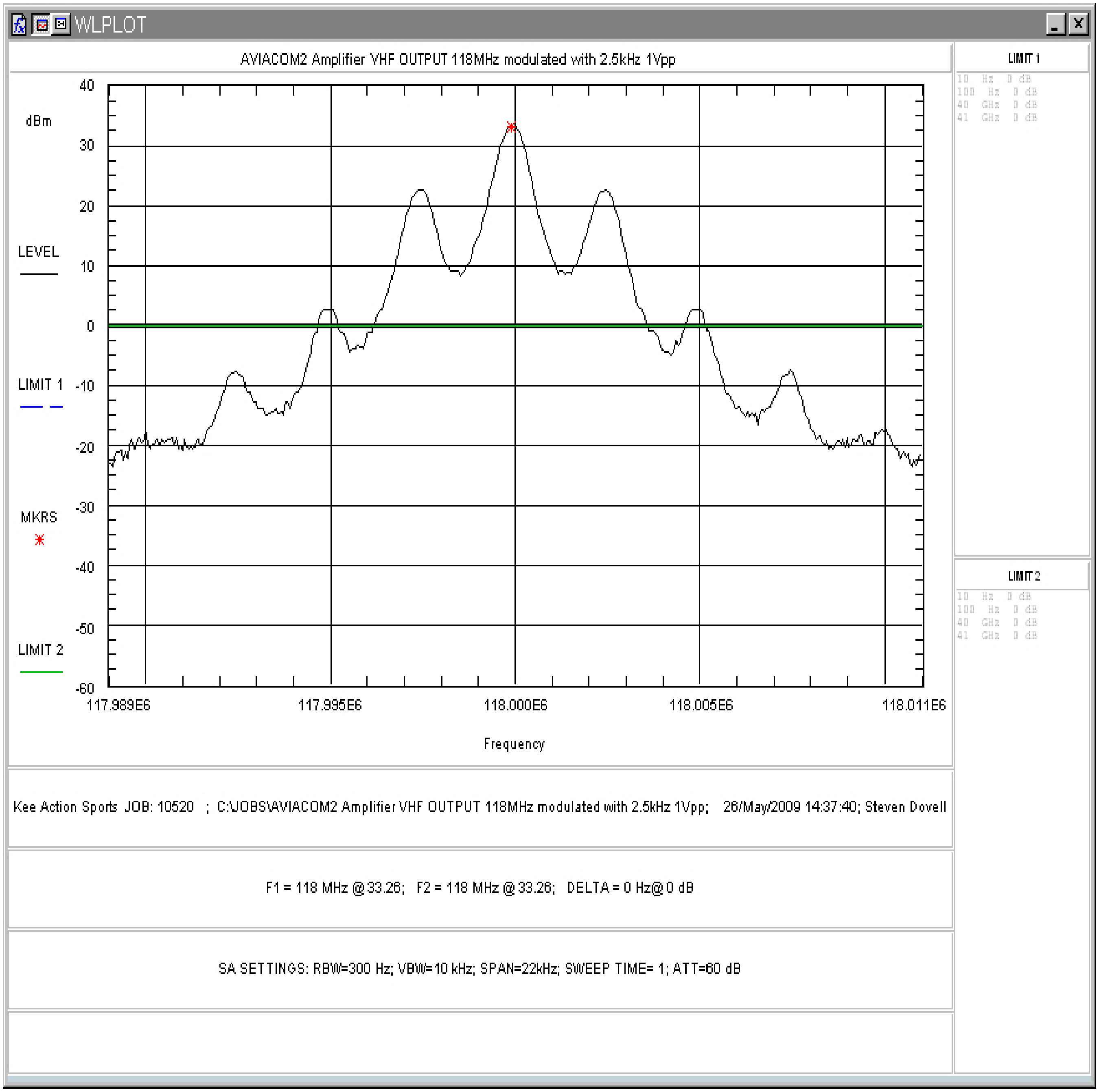

Figure 6: Amplifier Output - Low Channel

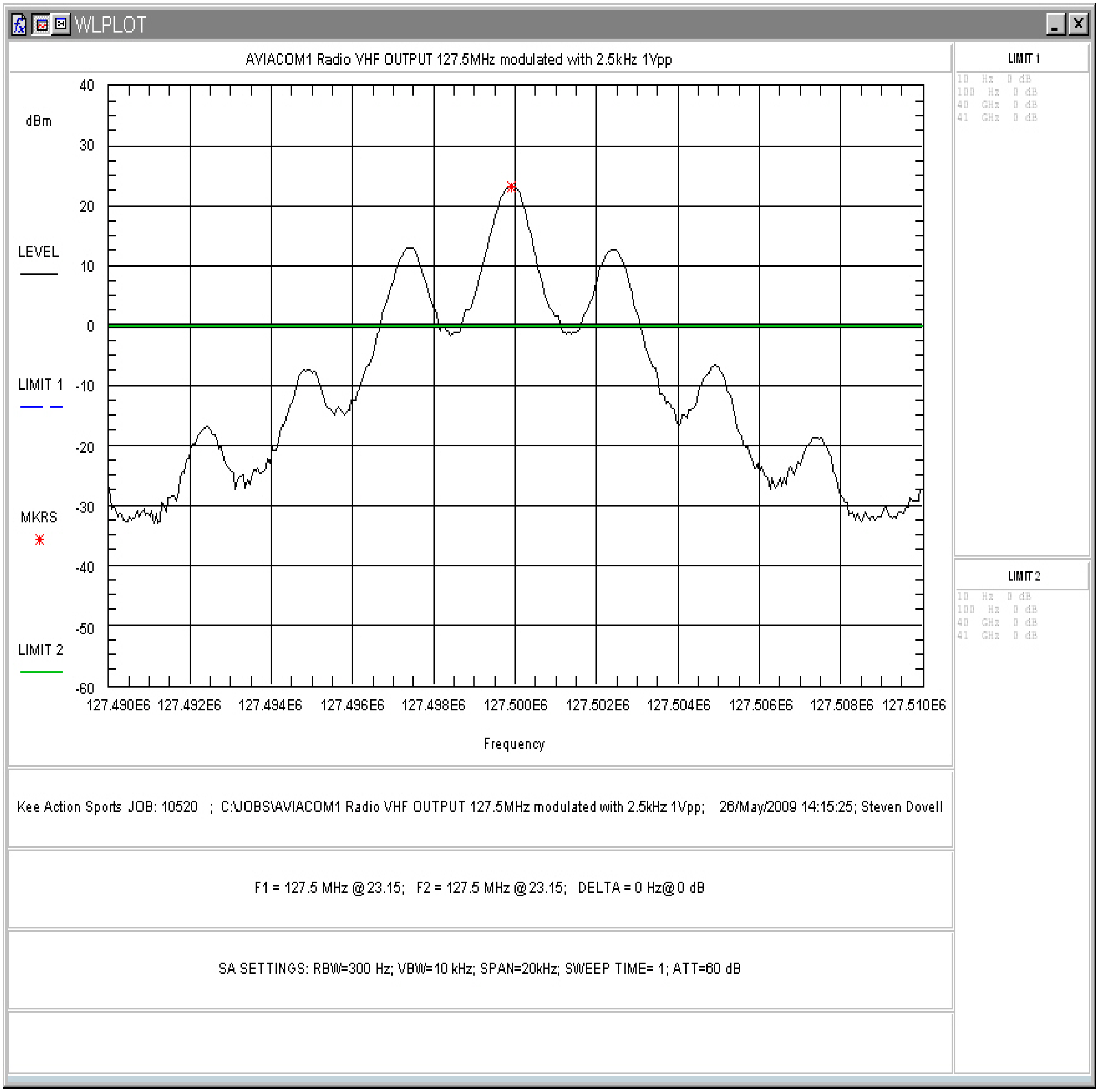

Figure 7: Radio Output - Mid Channel

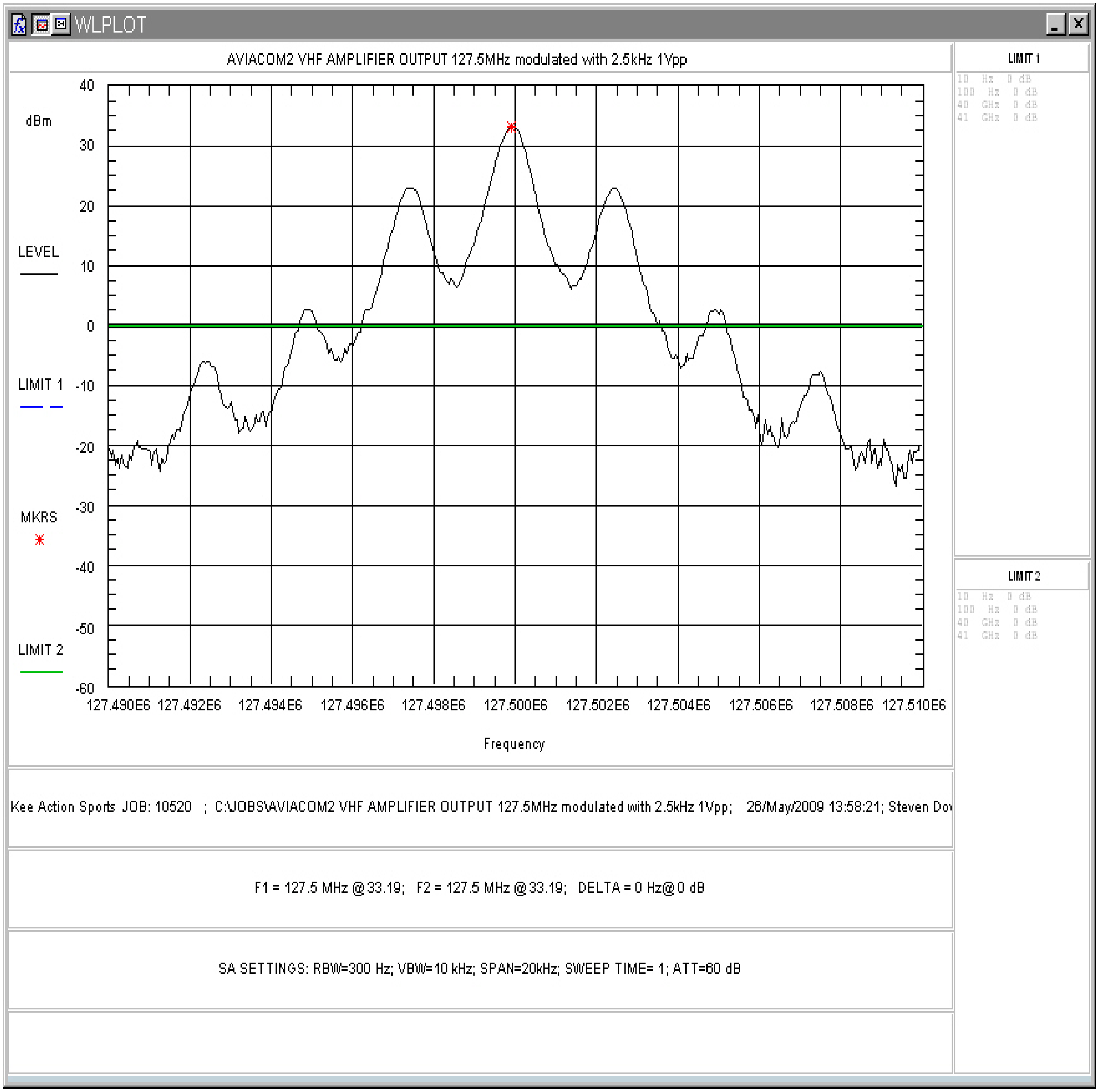

Figure 8: Amplifier Output - Mid Channel

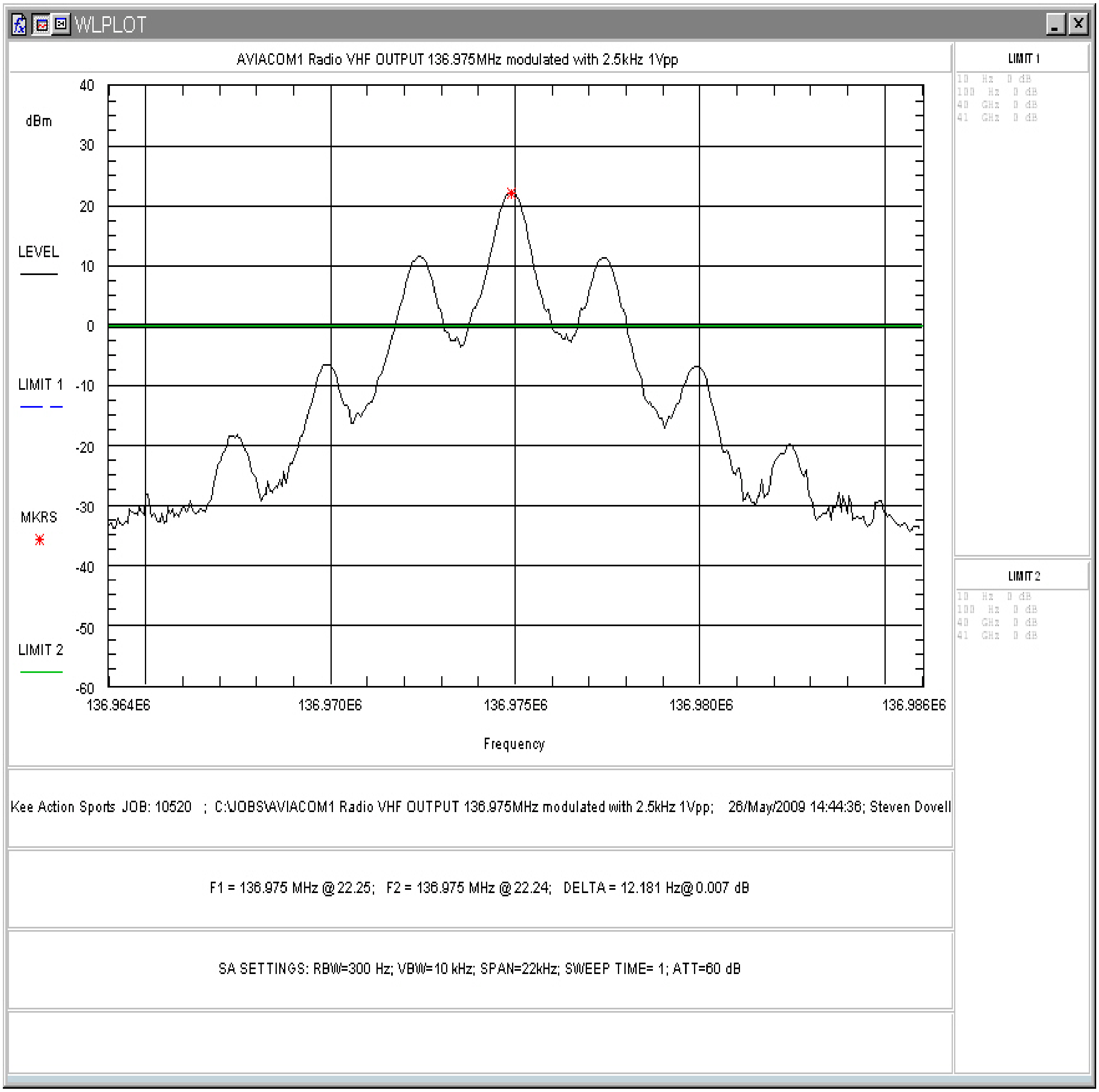

Figure 9: Radio Output - High Channel

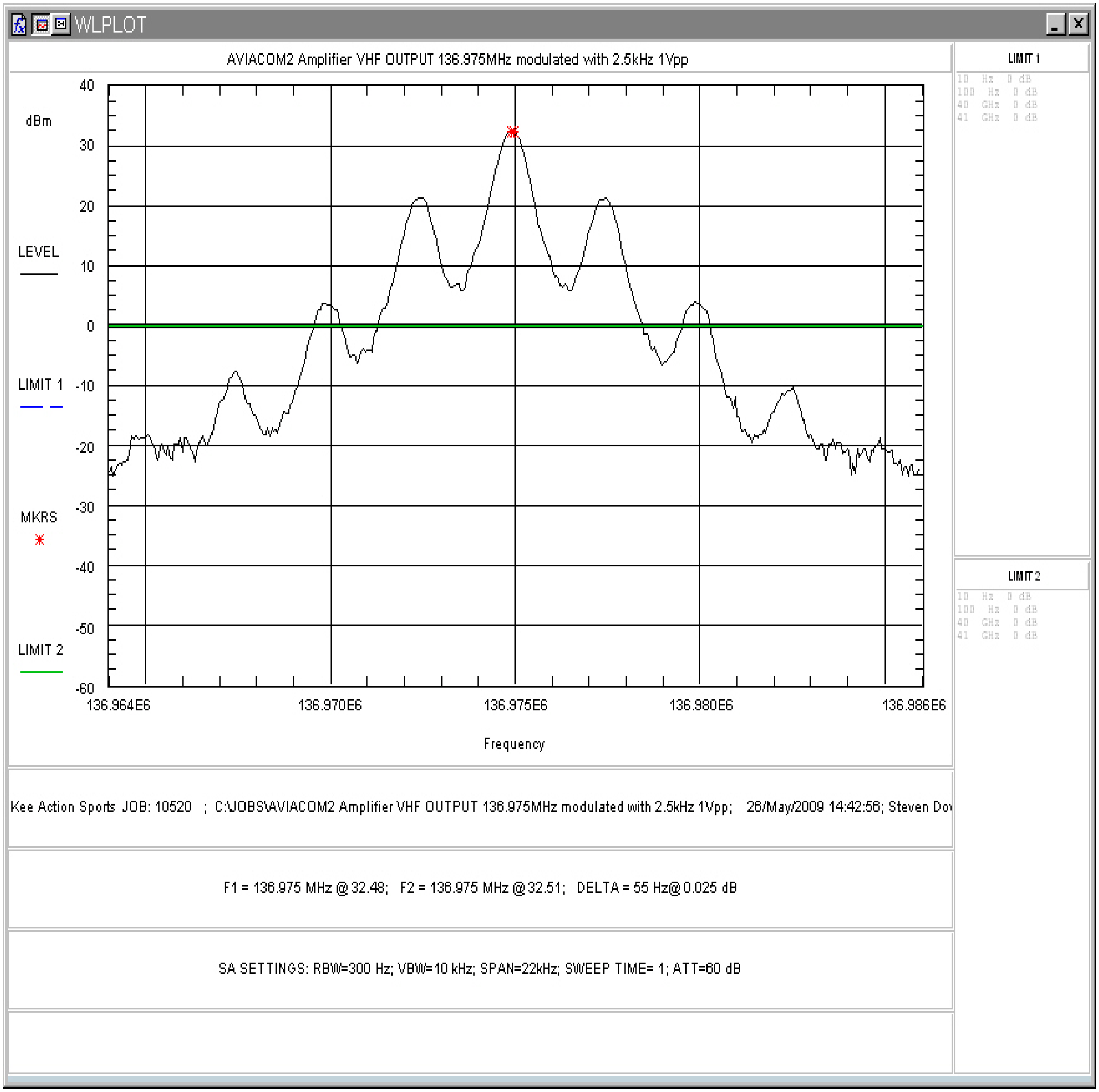

Figure 10: Amplifier Output - High Channel

3.5 Spurious Emissions at Antenna Terminals (FCC §87.139(a) and §2.1051)

The EUT must comply with requirements for spurious emissions at antenna terminals. The limits, from §87.139(a), are as follows:

(1) When the frequency is removed from the assigned frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth the attenuation must be at least 25 dB;

(2) When the frequency is removed from the assigned frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth the attenuation must be at least 35 dB.

(3) When the frequency is removed from the assigned frequency by more than 250 percent of the authorized bandwidth the attenuation for aircraft station transmitters must be at least 40 dB; and the attenuation for aeronautical station transmitters must be at least 43 + 10 $\log_{10}$ pY dB.

Results of the conducted spurious emissions are shown in the following plots.

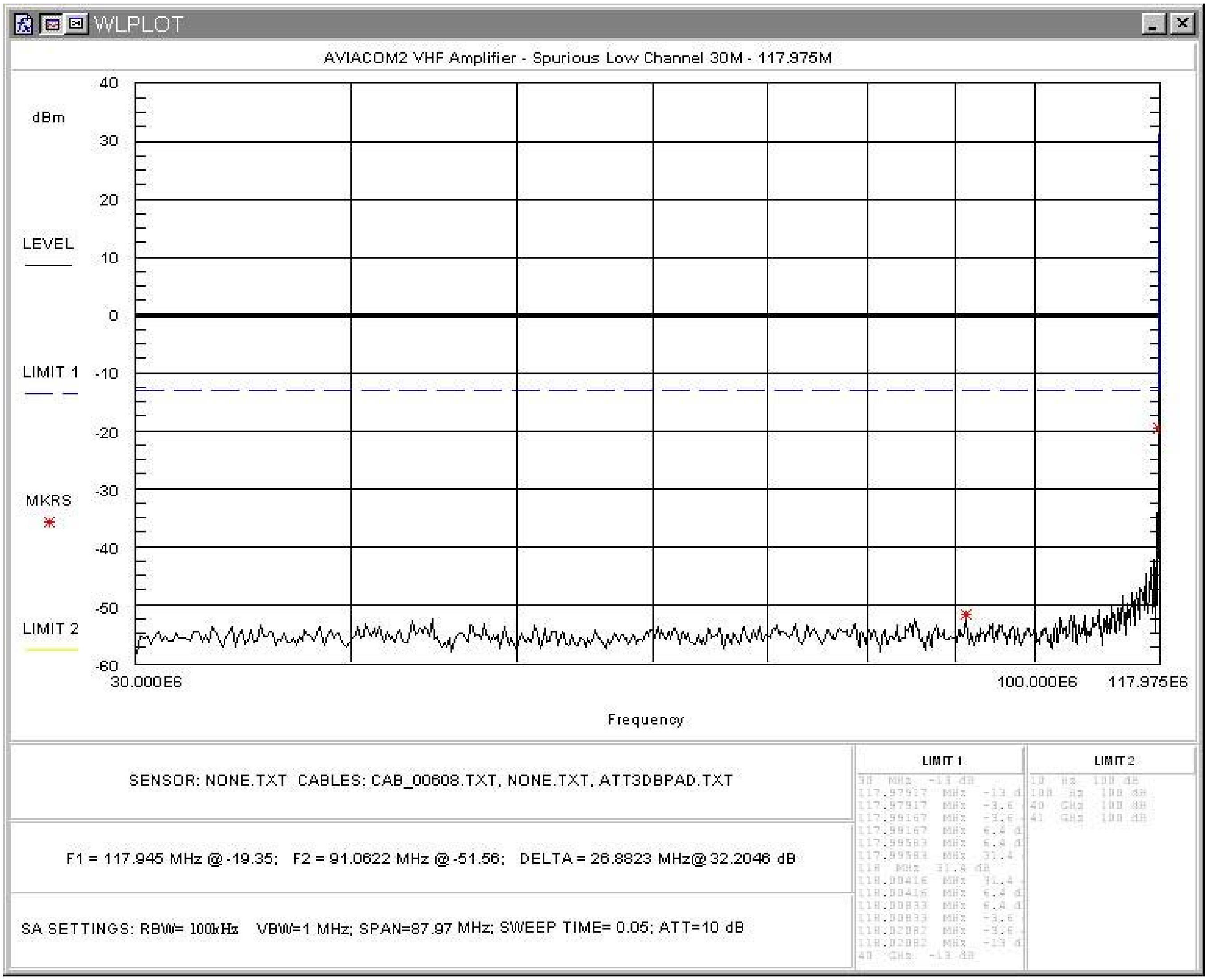

Figure 11. Conducted Spurious Emissions, Low Channel Plot 1

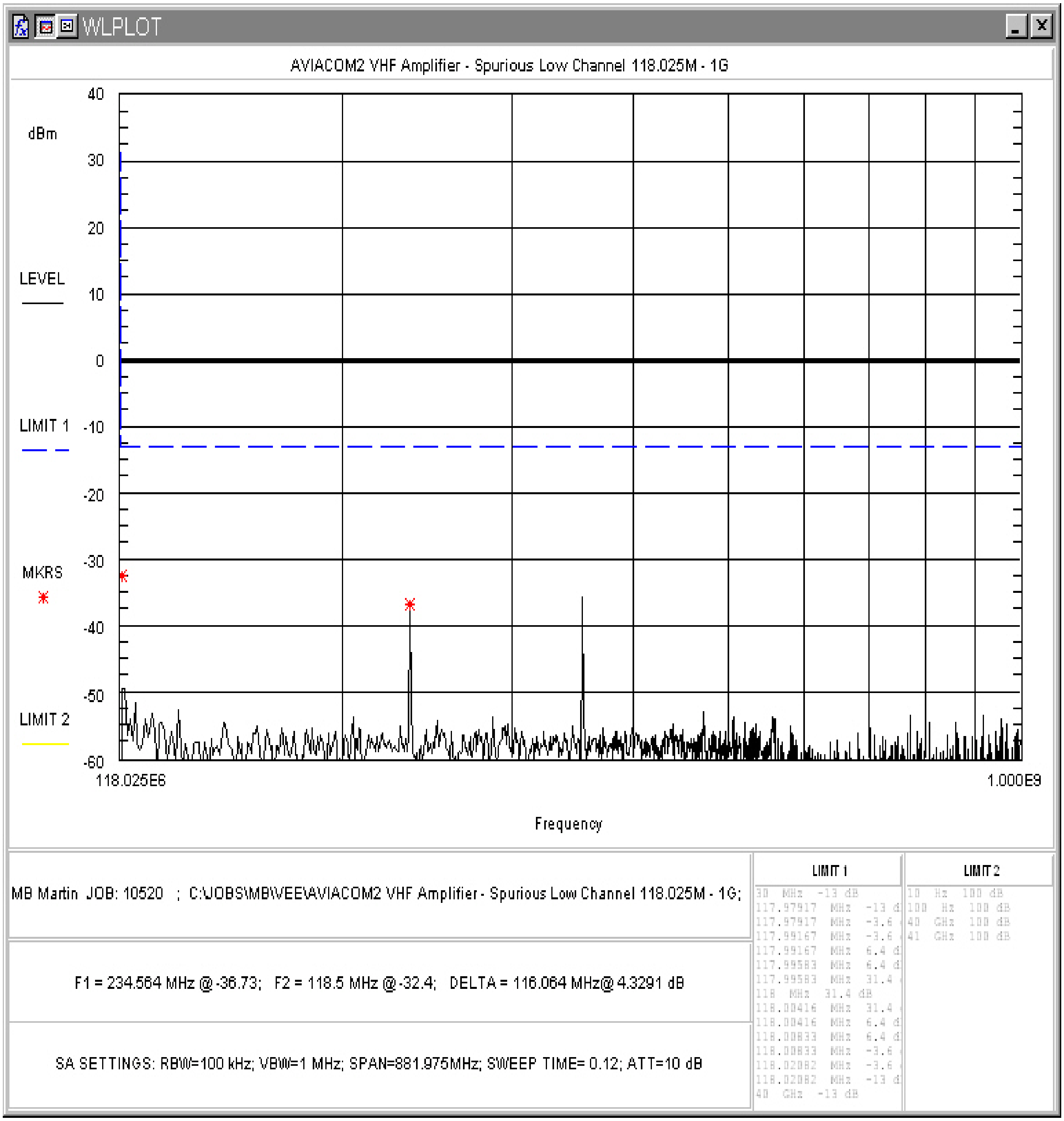

Figure 12. Conducted Spurious Emissions, Low Channel Plot 2

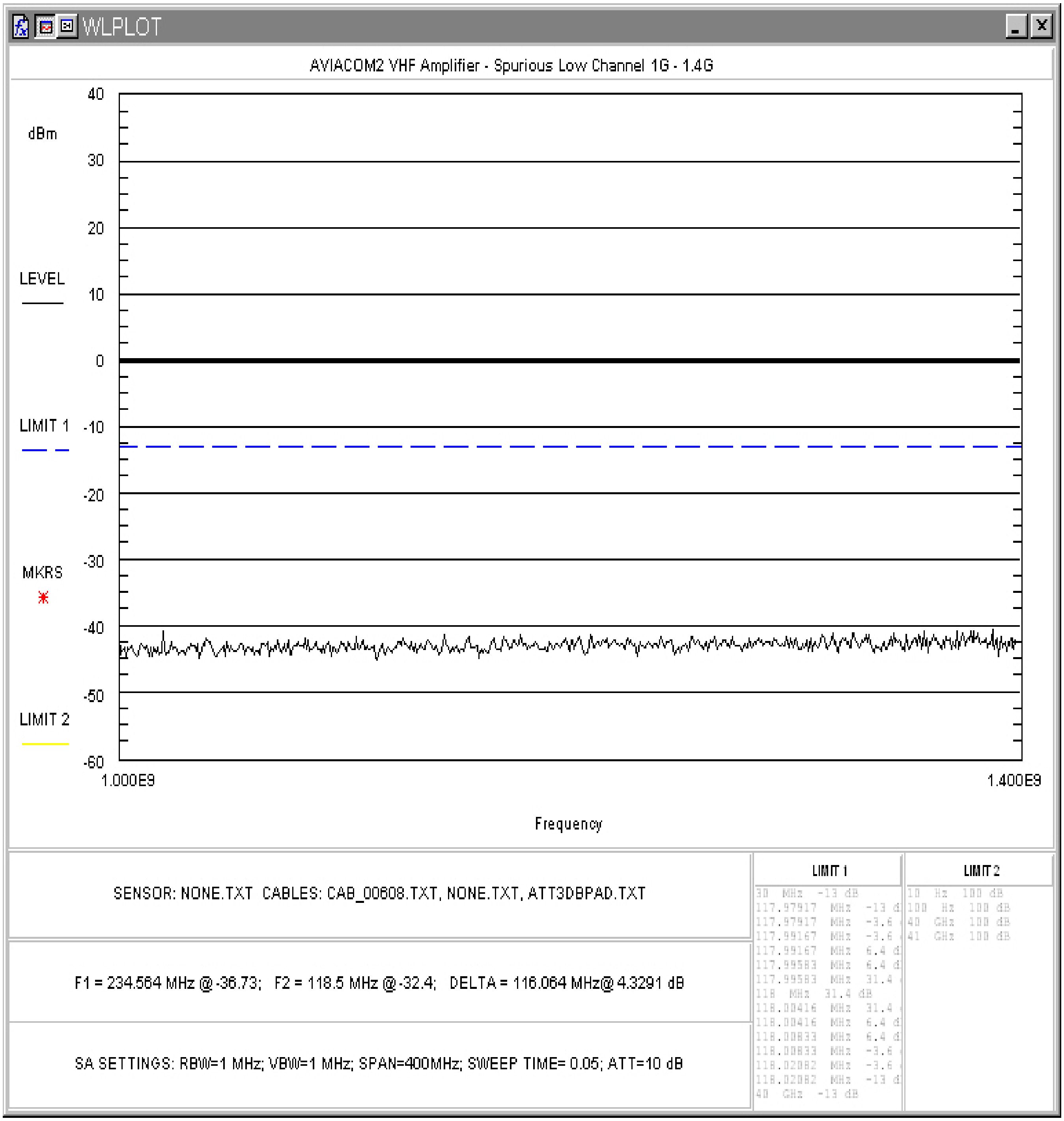

Figure 13. Conducted Spurious Emissions, Low Channel Plot 3

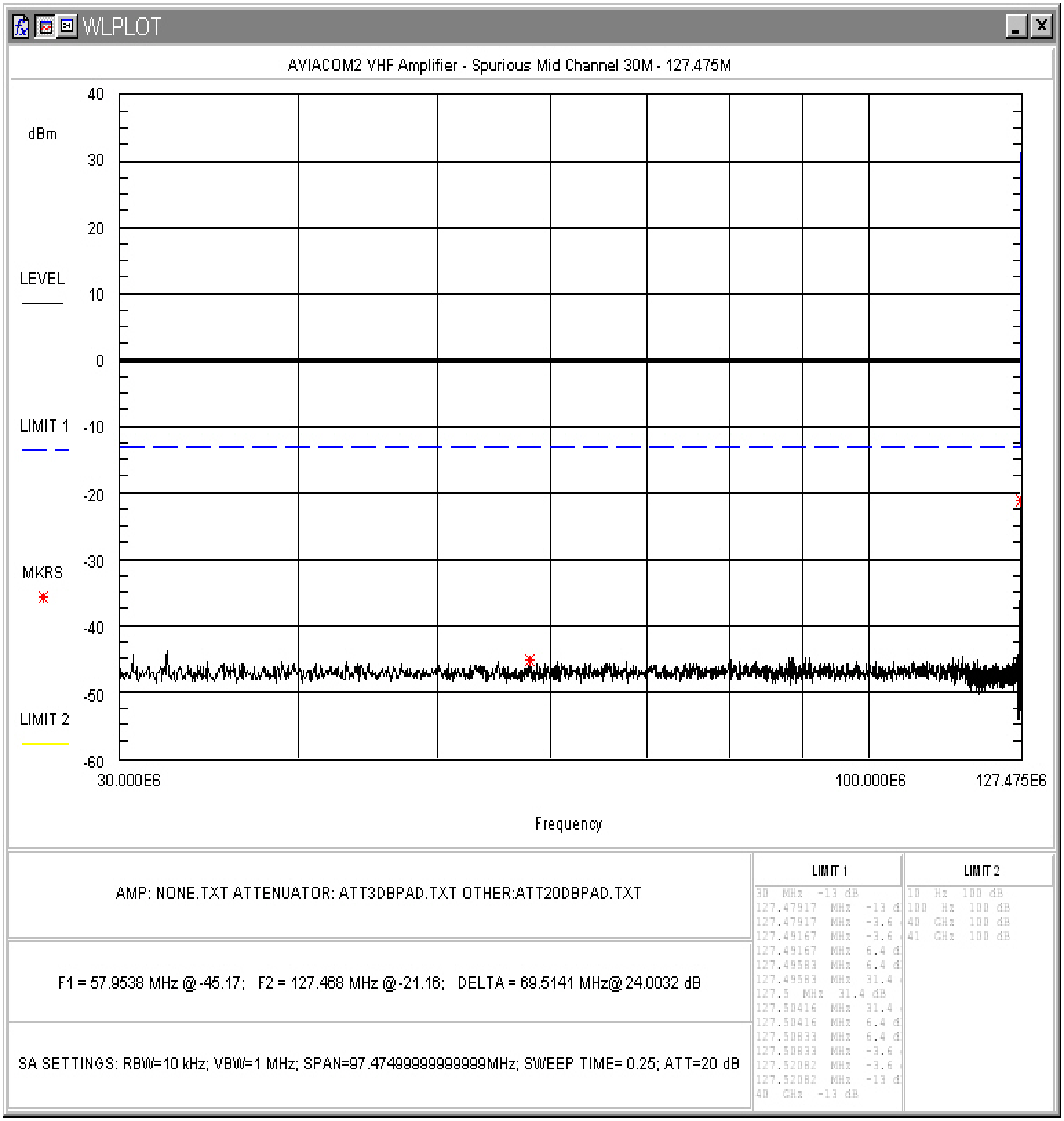

Figure 14. Conducted Spurious Emissions, Mid Channel Plot 1

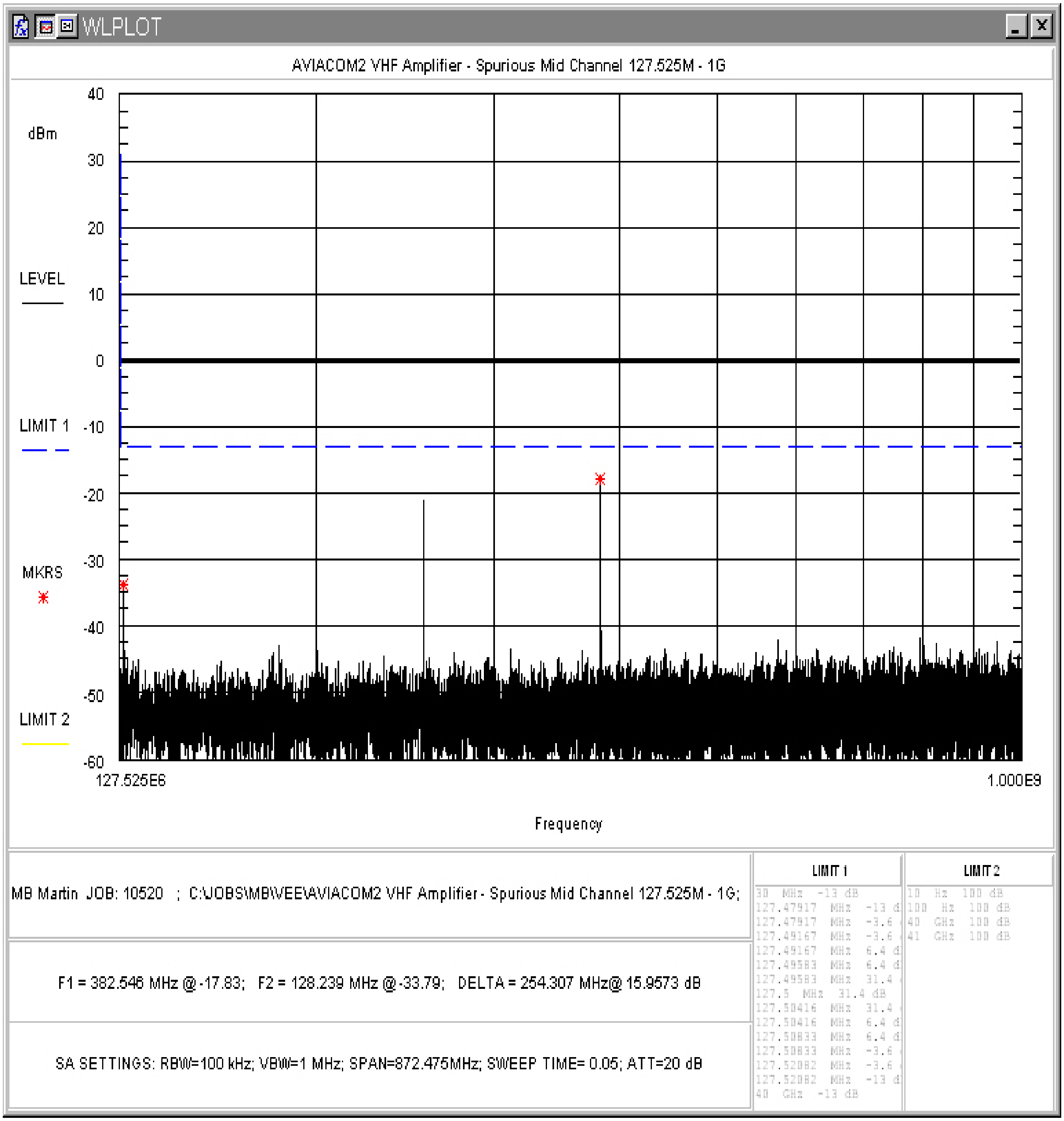

Figure 15. Conducted Spurious Emissions, Mid Channel Plot 2

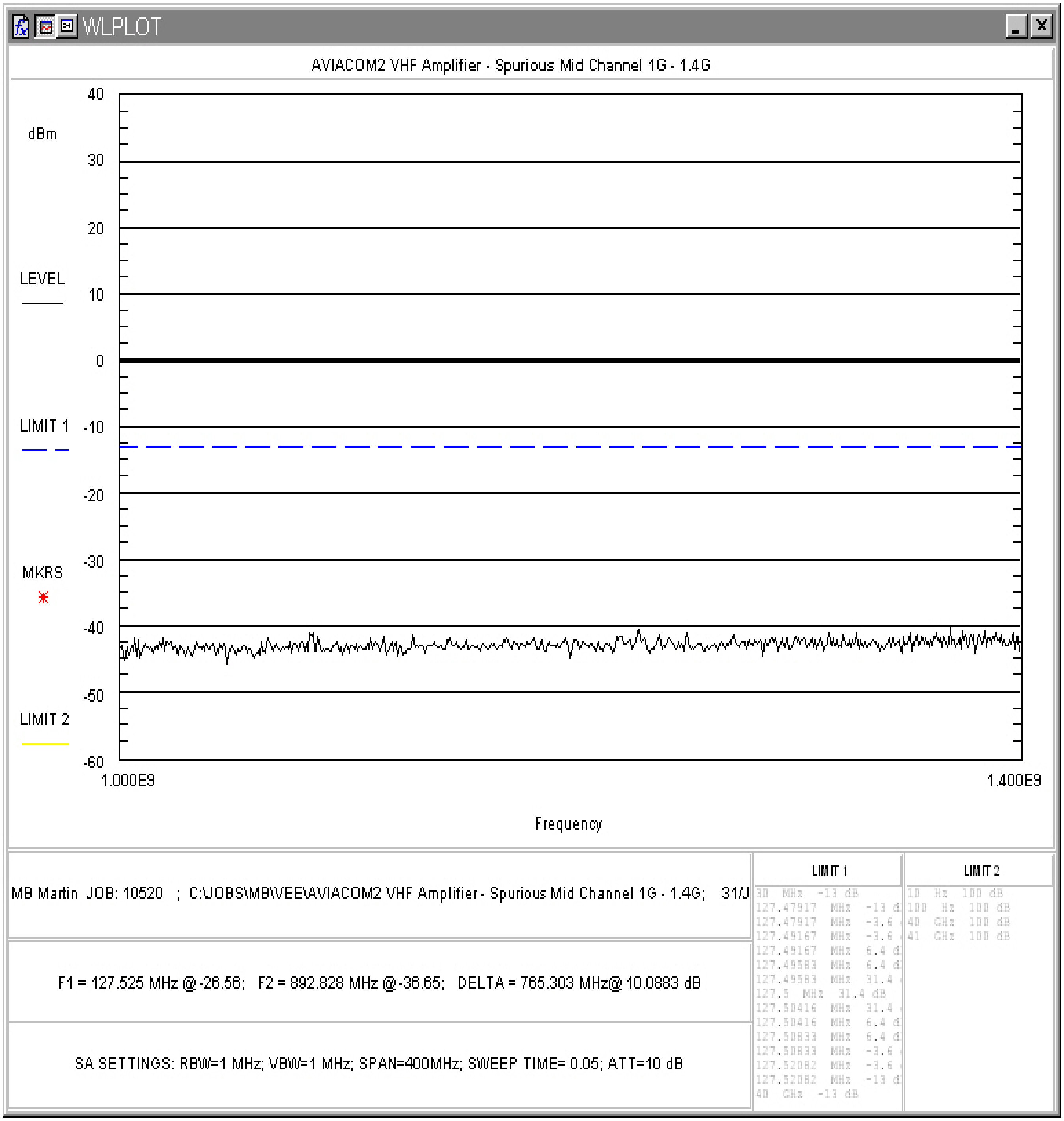

Figure 16. Conducted Spurious Emissions, Mid Channel Plot 3

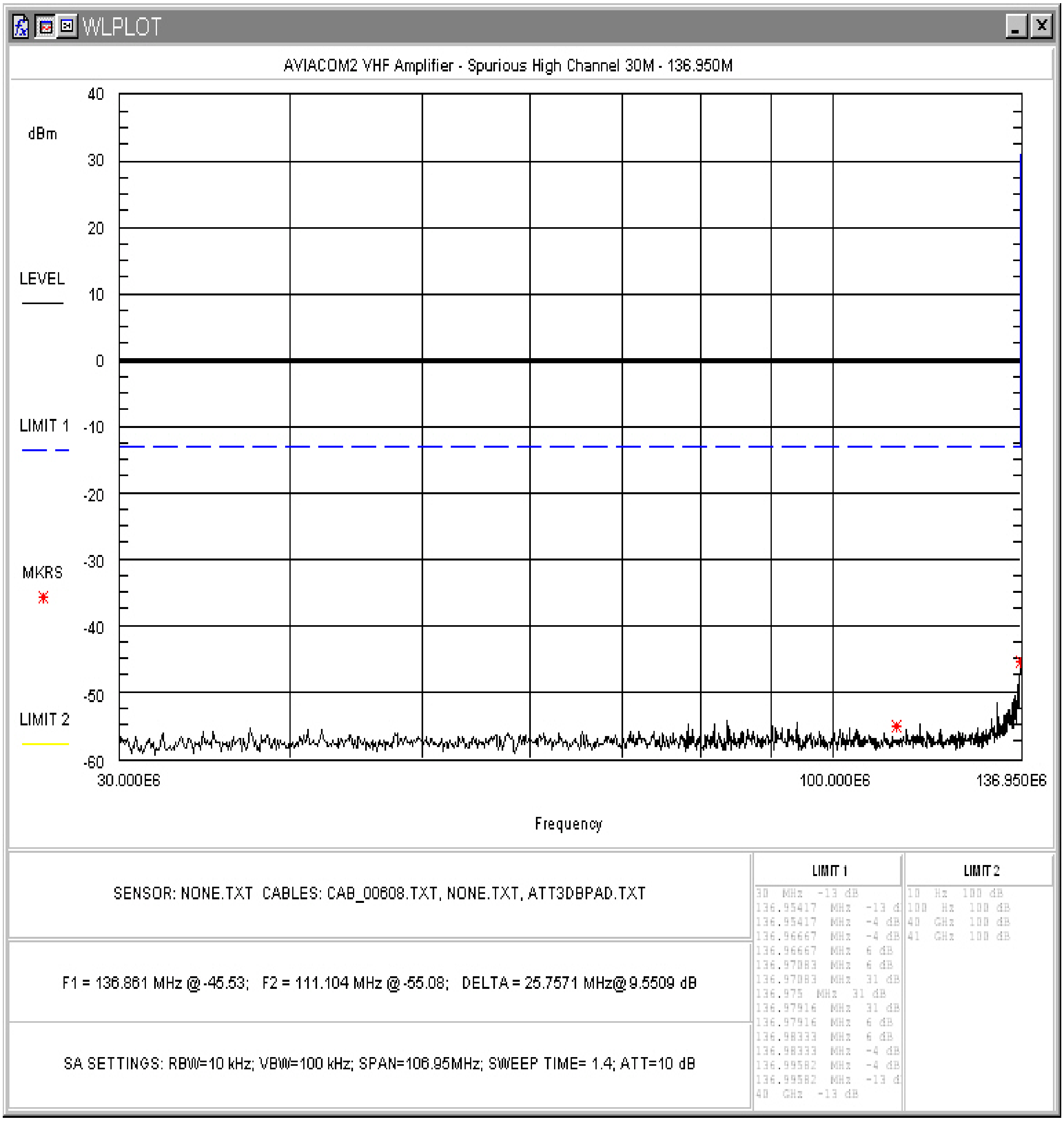

Figure 17. Conducted Spurious Emissions, High Channel Plot 1

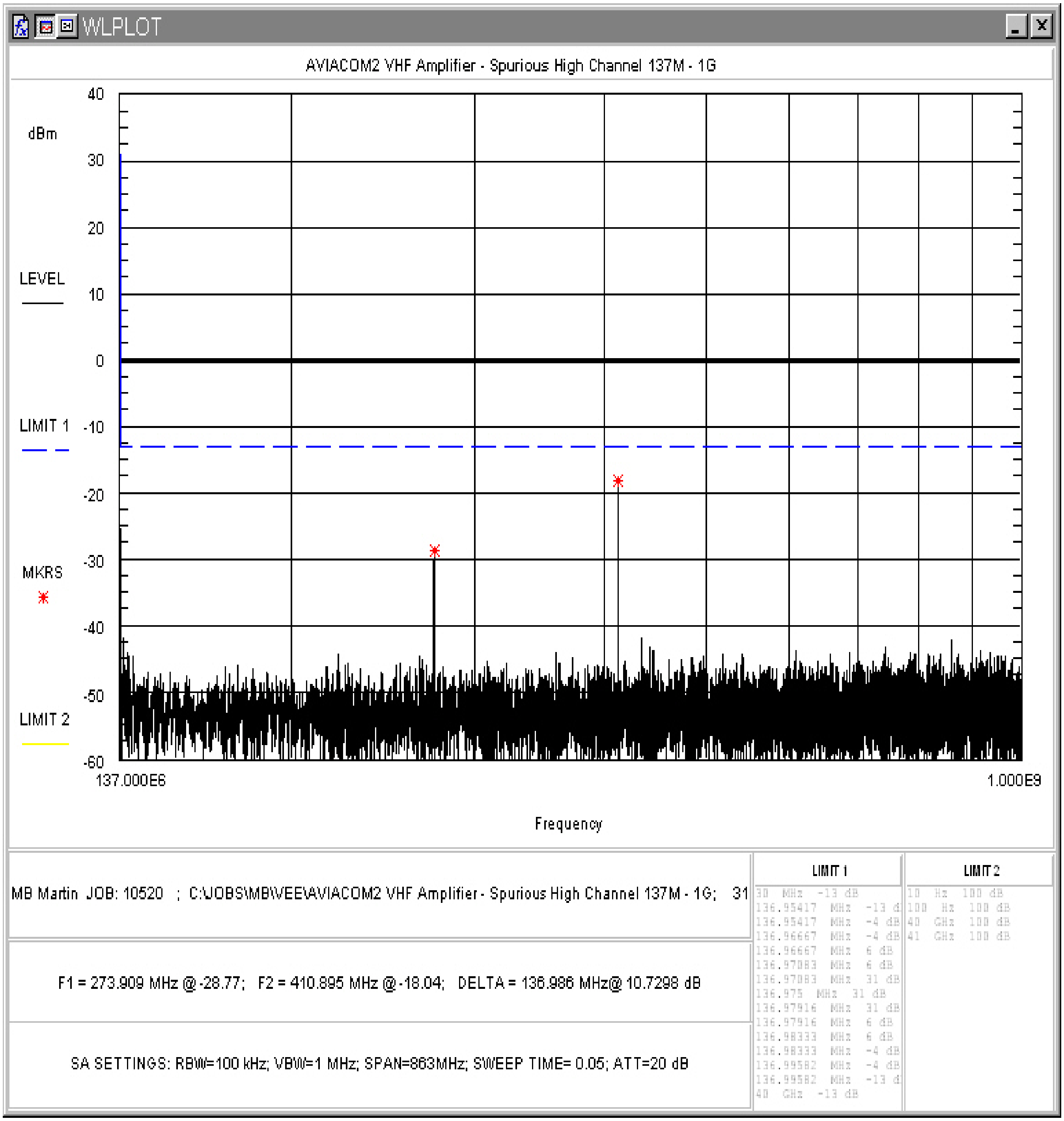

Figure 18. Conducted Spurious Emissions, High Channel Plot 2

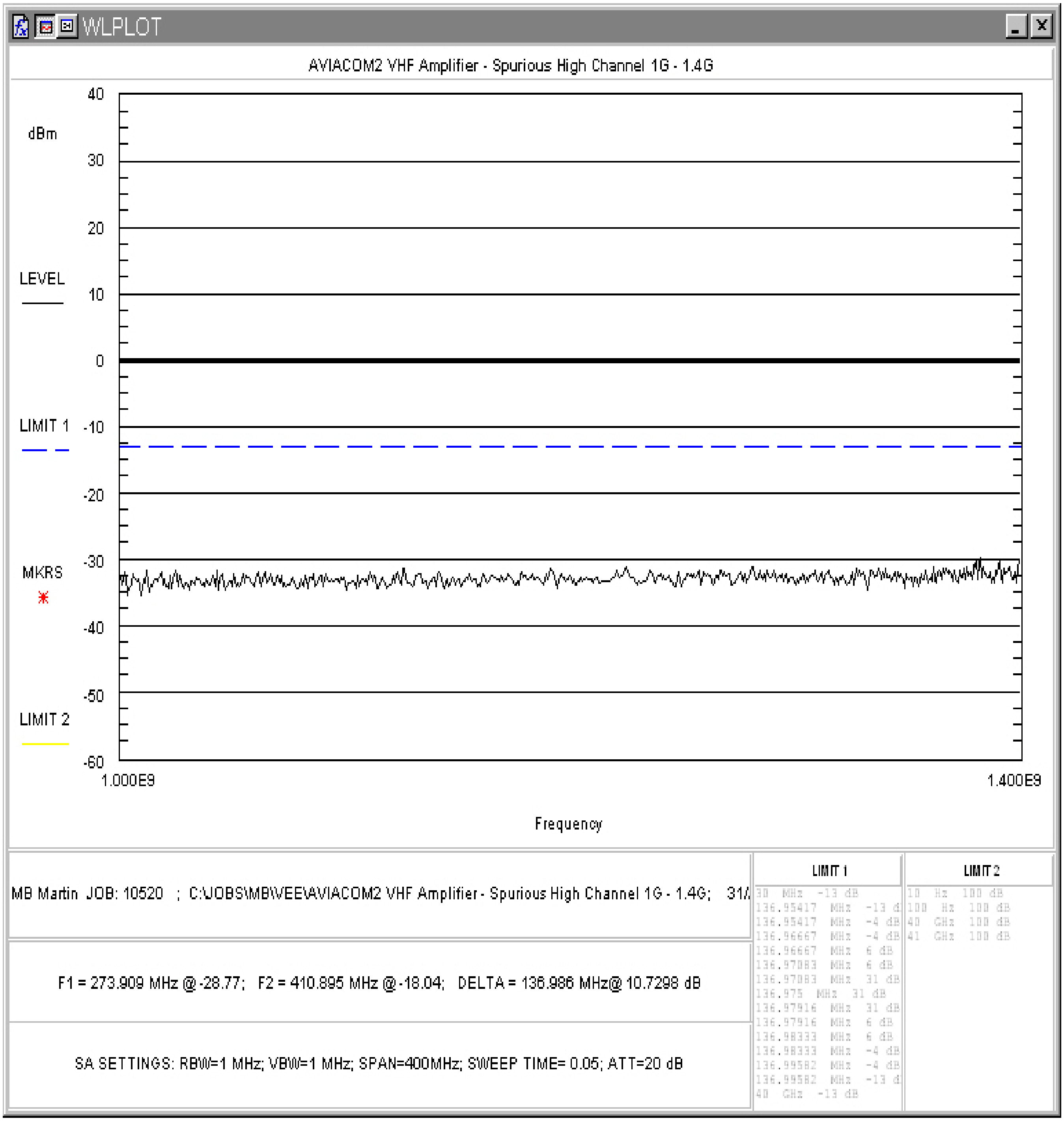

Figure 19. Conducted Spurious Emissions, High Channel Plot 3

3.6 Radiated Spurious Emissions: (FCC Part 87 and §2.1053)

The EUT must comply with requirements for radiated spurious emissions. The limit for the spurious radiated emissions is calculated from §87.139(a) as all spurious emissions must be attenuated below the carrier by 43 + 10 $\log_{10}$ pY.

3.6.1 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 Effective Isotropic Radiated Power (EIRP) levels were measured and compared with the limit of §87.139(a). The limit of -13dBm is derived from the formula of 43 + 10 $\log_{10}$ pY dB per §87.139(a)(3).

Emissions were scanned up to the 10th harmonic of the fundamental. Worst case measurements are reported. The signal substitution method procedure as given in TIA-603 was used to obtain EIRP levels.

Sample Calculation:

EIRP Level (dBm) = Sub. Power Level (dBm) + Sub. Ant. Gain (dBi)

Table 7: Radiated Emission Test Data

Frequency	Polarity	Azimuth	Ant. Height	Spurious Level	Sub. Sig. Gen. Level	Sub. Power Level	Sub. Ant. Factor	Sub. Ant. Gain	EIRP Level	Limit	Margin
(MHz)	H/V	Degree	(m)	dBµV	dBm	dBm	dB/m	dBi	dBm	dBm	dB
Unit Flat											
44.210	V	59.0	1.0	12.2	-70.0	-71.0	16.4	-13.2	-84.2	-13.0	-71.2
61.640	V	186.0	1.0	14.1	-71.2	-72.2	10.1	-4.1	-76.3	-13.0	-63.3
115.760	V	82.0	1.0	8.8	-73.1	-74.1	11.5	0.0	-74.1	-13.0	-61.1
205.250	V	23.0	1.0	9.6	-74.7	-75.7	11.0	5.4	-70.3	-13.0	-57.3
286.064	V	258.0	1.0	12.9	-64.1	-65.1	14.6	4.7	-60.4	-13.0	-47.4
456.619	V	167.0	1.0	12.4	-66.9	-67.9	16.6	6.8	-61.1	-13.0	-48.1
127.50	V	249.0	1.0	68.8	-8.1	-12.3	11.2	1.1	-11.2	33.1	-44.3
255.00	V	230.0	1.0	17.5	-61.5	-65.5	13.7	4.7	-60.8	-13.0	-47.8
382.50	V	150.0	1.0	24.7	-53.1	-59.2	15.6	6.3	-52.9	-13.0	-39.9
510.00	V	180.0	2.0	-0.4	No Signal Detected						-90.0
637.50	V	180.0	2.0	-0.4	No Signal Detected						-90.0
765.00	V	180.0	2.0	-2.0	No Signal Detected						-90.0
892.50	V	180.0	1.2	5.9	No Signal Detected						-90.0
1020.00	V	180.0	2.0	0.6	No Signal Detected						-90.0
1147.50	V	180.0	2.0	-0.2	No Signal Detected						-90.0
1275.00	V	180.0	2.0	-1.1	No Signal Detected						-90.0

Frequency	Polarity	Azimuth	Ant. Height	Spurious Level	Sub. Sig. Gen. Level	Sub. Power Level	Sub. Ant. Factor	Sub. Ant. Gain	EIRP Level	Limit	Margin
(MHz)	H/V	Degree	(m)	dBµV	dBm	dBm	dB/m	dBi	dBm	dBm	dB
44.210	H	2.0	4.0	3.9	-65.0	-66.0	16.4	-13.2	-79.2	-13.0	-66.2
61.640	H	220.0	4.0	8.5	-63.6	-64.6	10.1	-4.1	-68.7	-13.0	-55.7
111.100	H	84.0	4.0	16.5	-65.6	-66.6	11.2	-0.1	-66.7	-13.0	-53.7
455.079	H	278.0	2.1	9.4	-75.1	-76.1	16.6	6.8	-69.3	-13.0	-56.3
127.50	H	174.0	4.0	68.4	-8.2	-12.2	11.2	1.1	-11.1	33.1	-44.2
255.00	H	56.0	1.8	26.3	-53.3	-57.3	13.7	4.7	-52.6	-13.0	-39.6
382.50	H	130.0	1.1	25.4	-47.3	-53.3	15.6	6.3	-47.0	-13.0	-34.0
510.00	H	180.0	1.5	-0.4			No Signal Detected				-90.0
637.50	H	180.0	1.5	-0.4			No Signal Detected				-90.0
765.00	H	180.0	2.0	-0.7			No Signal Detected				-90.0
892.50	H	180.0	2.0	0.5			No Signal Detected				-90.0
1020.00	H	180.0	1.0	0.3			No Signal Detected				-90.0
1147.50	H	180.0	1.0	-1.0			No Signal Detected				-90.0
1275.00	H	180.0	1.0	-0.3			No Signal Detected				-90.0
Unit On side											
44.210	V	302.0	1.0	5.9	-67.3	-68.3	16.4	-13.2	-81.5	-13.0	-68.5
61.640	V	231.0	1.0	11.1	-71.2	-72.2	10.1	-4.1	-76.3	-13.0	-63.3
115.760	V	123.0	1.0	9.0	-74.0	-75.0	11.5	0.0	-75.0	-13.0	-62.0
205.250	V	54.0	1.0	8.8	-60.7	-61.7	11.0	5.4	-56.3	-13.0	-43.3
286.064	V	176.0	1.0	1.0	-62.7	-63.7	14.6	4.7	-59.0	-13.0	-46.0
456.619	V	156.0	1.0	12.0	-72.5	-73.5	16.6	6.8	-66.7	-13.0	-53.7
127.50	V	52.0	1.0	68.2	-8.6	-12.6	11.2	1.1	-11.5	33.1	-44.6
255.00	V	90.0	1.0	21.1	-57.6	-61.7	13.7	4.7	-57.0	-13.0	-44.0
382.50	V	180.0	1.0	17.5	-60.5	-66.7	15.6	6.3	-60.4	-13.0	-47.4
510.00	V	174.0	1.0	9.1	-70.3	-77.6	17.7	6.6	-71.0	-13.0	-58.0
637.50	V	180.0	2.0	-1.1			No Signal Detected				-90.0
765.00	V	180.0	2.0	-1.1			No Signal Detected				-90.0
892.50	V	180.0	2.0	-1.6			No Signal Detected				-90.0
1020.00	V	180.0	2.0	0.5			No Signal Detected				-90.0
1147.50	V	180.0	2.0	0.1			No Signal Detected				-90.0
1275.00	V	180.0	1.3	-0.2			No Signal Detected				-90.0
44.210	H	302.0	4.0	5.6	-63.8	-64.8	16.4	-13.2	-78.0	-13.0	-65.0
61.640	H	357.0	4.0	6.3	-64.6	-65.6	10.1	-4.1	-69.7	-13.0	-56.7
111.100	H	70.0	4.0	20.2	-75.6	-76.6	11.2	-0.1	-76.7	-13.0	-63.7
455.079	H	126.0	2.0	10.2	-65.7	-66.7	16.6	6.8	-59.9	-13.0	-46.9
127.50	H	157.0	4.0	67.8	-8.8	-12.8	11.2	1.1	-11.7	33.1	-44.8

Frequency	Polarity	Azimuth	Ant. Height	Spurious Level	Sub. Sig. Gen. Level	Sub. Power Level	Sub. Ant. Factor	Sub. Ant. Gain	EIRP Level	Limit	Margin
(MHz)	H/V	Degree	(m)	dBμV	dBm	dBm	dB/m	dBi	dBm	dBm	dB
255.00	H	128.0	1.8	29.9	-49.8	-53.7	13.7	4.7	-49.0	-13.0	-36.0
382.50	H	25.0	1.1	18.2	-54.6	-60.8	15.6	6.3	-54.5	-13.0	-41.5
510.00	H	180.0	2.0	-0.2			No Signal Detected				-90.0
637.50	H	180.0	2.0	-0.2			No Signal Detected				-90.0
765.00	H	190.0	1.6	-2.0			No Signal Detected				-90.0
892.50	H	190.0	2.0	-0.5			No Signal Detected				-90.0
1020.00	H	180.0	1.0	0.2			No Signal Detected				-90.0
1147.50	H	180.0	1.0	-0.4			No Signal Detected				-90.0
1275.00	H	180.0	1.0	-1.3			No Signal Detected				-90.0
Unit upright											
44.210	V	30.0	1.0	6.6	-72.1	-73.1	16.4	-13.2	-86.3	-13.0	-73.3
61.640	V	181.0	1.0	18.9	-72.7	-73.7	10.1	-4.1	-77.8	-13.0	-64.8
115.760	V	23.0	1.0	14.8	-76.8	-77.8	11.5	0.0	-77.8	-13.0	-64.8
205.250	V	296.0	1.0	6.9	-67.5	-68.5	11.0	5.4	-63.1	-13.0	-50.1
286.064	V	180.0	1.0	1.0	-66.3	-67.3	14.6	4.7	-62.6	-13.0	-49.6
456.619	V	181.0	1.0	8.8	-74.9	-75.9	16.6	6.8	-69.1	-13.0	-56.1
127.50	V	43.0	1.0	70.0	-7.1	-11.5	11.2	1.1	-10.4	33.1	-43.5
255.00	V	285.0	1.0	21.2	-57.3	-61.4	13.7	4.7	-56.7	-13.0	-43.7
382.50	V	188.0	1.0	43.6	-34.3	-40.3	15.6	6.3	-34.0	-13.0	-21.0
510.00	V	305.0	1.0	10.2	-60.9	-68.0	17.7	6.6	-61.4	-13.0	-48.4
637.50	V	180.0	1.7	0.2			No Signal Detected				-90.0
765.00	V	180.0	1.7	0.2			No Signal Detected				-90.0
892.50	V	180.0	1.0	0.4			No Signal Detected				-90.0
1020.00	V	180.0	2.0	0.4			No Signal Detected				-90.0
1147.50	V	180.0	2.0	0.2			No Signal Detected				-90.0
1275.00	V	180.0	2.0	-1.1			No Signal Detected				-90.0
44.210	H	47.0	4.0	2.6	-72.1	-73.1	16.4	-13.2	-86.3	-13.0	-73.3
61.640	H	328.0	4.0	5.3	-72.7	-73.7	10.1	-4.1	-77.8	-13.0	-64.8
111.100	H	79.0	4.0	21.0	-76.8	-77.8	11.2	-0.1	-77.9	-13.0	-64.9
455.079	H	52.0	2.0	6.2	-67.5	-68.5	16.6	6.8	-61.7	-13.0	-48.7
127.50	H	121.0	4.0	63.2	-13.4	-16.8	11.2	1.1	-15.7	33.1	-48.8
255.00	H	276.0	2.2	24.4	-55.4	-59.4	13.7	4.7	-54.7	-13.0	-41.7
382.50	H	144.0	2.5	38.5	-34.3	-40.3	15.6	6.3	-34.0	-13.0	-21.0
510.00	H	180.0	1.0	1.6			No Signal Detected				-90.0
637.50	H	180.0	1.0	1.6			No Signal Detected				-90.0
765.00	H	180.0	1.0	1.6			No Signal Detected				-90.0
892.50	H	180.0	1.0	1.6			No Signal Detected				-90.0
1020.00	H	180.0	1.0	36.0			No Signal Detected				-90.0
1147.50	H	180.0	1.0	34.2			No Signal Detected				-90.0
1275.00	H	180.0	1.0	33.2			No Signal Detected				-90.0

3.7 Radiated Spurious Emissions: (RSS 141e Section 6.3)

The EUT must comply with requirements for radiated spurious emissions.
If a radiated emission measurement is made, all spurious emissions shall comply with the limits of Table 8, below. The resolution bandwidth of the spectrum analyzer shall be 100 kHz for measuring spurious missions below 1.0 GHz, and 1.0 MHz for above 1.0 GHz.

Table 8: Radiated Emission Limits - Receivers

Spurious Frequency (MHz)	Field Strength (microvolts/m) @ 3 meters
30-88	100
88-216	150
216-960	200
960-1610	500
Above 1610	1000

3.7.1 Test Procedure

The EUT was placed on an 80 cm high 1 X 1.5 meters non-conductive motorized turntable for radiated testing on a 10-meter open field test site. The emissions from the EUT were measured continuously at every azimuth by rotating the turntable. Biconical and log periodic broadband 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 output of the antenna was connected to the input of the spectrum analyzer and the emissions in the frequency range of 30 MHz to 1.4GHz were measured. 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. Measurements were performed in three axis to ensure highest emissions were taken.

The output from the antenna was connected, via a preamplifier, to the input of the spectrum analyzer. The detector function was set to quasi-peak or peak, as appropriate. The measurement bandwidth of the spectrum analyzer system was set to at least 100 kHz, with all post-detector filtering no less than 10 times the measurement bandwidth.

Frequency (MHz)	Polarity H/V	Azimuth Degree	Ant. Height (m)	SA Level (QP) (dBμV)	Ant. Corr. (dB/m)	Cable Corr. (dB)	Amplifier Gain (dB)	Corr. Level (dBμV/m)	Corr. Level (μV/m)	Limit (μV/m)	Margin (dB)
Unit Flat											
44.210	V	59.0	1.0	12.2	10.9	1.1	0.0	24.2	16.2	100.0	-15.8
61.640	V	186.0	1.0	14.1	7.7	1.2	0.0	23.0	14.1	100.0	-17.0
115.760	V	82.0	1.0	8.8	13.3	1.4	0.0	23.5	15.0	150.0	-20.0
205.250	V	23.0	1.0	9.6	10.9	2.1	0.0	22.6	13.4	150.0	-20.9
286.064	V	258.0	1.0	12.9	13.3	2.5	0.0	28.7	27.2	200.0	-17.3
456.619	V	167.0	1.0	12.4	16.7	3.2	0.0	32.3	41.0	200.0	-13.8
44.210	H	2.0	4.0	3.9	10.9	1.1	0.0	15.9	6.2	100.0	-24.1
61.640	H	220.0	4.0	8.5	7.7	1.2	0.0	17.4	7.4	100.0	-22.6
111.100	H	84.0	4.0	16.5	12.9	1.4	0.0	30.8	34.7	150.0	-12.7
455.079	H	278.0	2.1	9.4	16.6	3.2	0.0	29.2	28.8	200.0	-16.8
Unit on Side											
44.210	V	302.0	1.0	5.9	10.9	1.1	0.0	17.9	7.9	100.0	-22.1
61.640	V	231.0	1.0	11.1	7.7	1.2	0.0	20.0	10.0	100.0	-20.0
115.760	V	123.0	1.0	9.0	13.3	1.4	0.0	23.7	15.4	150.0	-19.8
205.250	V	54.0	1.0	8.8	10.9	2.1	0.0	21.8	12.3	150.0	-21.7
286.064	V	176.0	1.0	1.0	13.3	2.5	0.0	16.8	6.9	200.0	-29.2
456.619	V	156.0	1.0	12.0	16.7	3.2	0.0	31.9	39.2	200.0	-14.2
44.210	H	302.0	4.0	5.6	10.9	1.1	0.0	17.6	7.6	100.0	-22.4
61.640	H	357.0	4.0	6.3	7.7	1.2	0.0	15.2	5.7	100.0	-24.8
111.100	H	70.0	4.0	20.2	12.9	1.4	0.0	34.5	53.2	150.0	-9.0
455.079	H	126.0	2.0	10.2	16.6	3.2	0.0	30.0	31.6	200.0	-16.0
Unit Upright											
44.210	V	30.0	1.0	6.6	10.9	1.1	0.0	18.6	8.5	100.0	-21.4
61.640	V	181.0	1.0	18.9	7.7	1.2	0.0	27.8	24.5	100.0	-12.2
115.760	V	23.0	1.0	14.8	13.3	1.4	0.0	29.5	30.0	150.0	-14.0
205.250	V	296.0	1.0	6.9	10.9	2.1	0.0	19.9	9.9	150.0	-23.6
286.064	V	180.0	1.0	1.0	13.3	2.5	0.0	16.8	6.9	200.0	-29.2
456.619	V	181.0	1.0	8.8	16.7	3.2	0.0	28.7	27.1	200.0	-17.4
44.210	H	47.0	4.0	2.6	10.9	1.1	0.0	14.6	5.4	100.0	-25.4
61.640	H	328.0	4.0	5.3	7.7	1.2	0.0	14.2	5.1	100.0	-25.8
111.100	H	79.0	4.0	21.0	12.9	1.4	0.0	35.3	58.3	150.0	-8.2
455.079	H	52.0	2.0	6.2	16.6	3.2	0.0	26.0	19.9	200.0	-20.0

Table 9: Spurious Radiated Emissions (Receiver)

Frequency Stability: (FCC Part §2.1055/§87.133)

Frequency as a function of temperature and voltage variation shall be maintained within the FCC-prescribed tolerances. The frequency stability requirement for this radio is 20 ppm.

Since the EUT is a simple booster with no frequency translating circuitry, temperature and voltage variation testing was not required.

