Washington Laboratories, Ltd.

FCC Certification Test Report
For the
Mine Safety Appliance
Firehawk M7 2.4 GHz Transceiver Control Module
FCC ID: P9R-10075346

WLL REPORT# **9849-01 Rev 0**
9/17/2007

Prepared for:

Mine Safety Appliance
1000 Cranberry Woods Drive
Cranberry Township, PA 16066

Prepared By:

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

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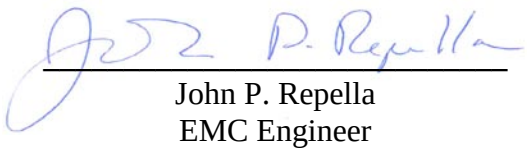

John P. Repella
EMC Engineer

Reviewed by:

Steven D. Koster
EMC Operations Manager

Abstract

This report has been prepared on behalf of Mine Safety Appliance to support the attached Application for Equipment Authorization. The test report and application are submitted for a Digital Transmission System Transmitter under Part 15.247 of the FCC Rules and Regulations.

This Certification Test Report documents the test configuration and test results for a Mine Safety Appliance Firehawk M7 2.4 GHz Transceiver Control Module operating in the 802.11b mode.

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

The Mine Safety Appliance Firehawk M7 2.4 GHz Transceiver Control Module complied with the limits for a Digital Transmission System Transmitter device under FCC Part 15.247.

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1 Introduction

1.1 Compliance Statement

The Mine Safety Appliance Firehawk M7 2.4 GHz Transceiver Control Module complied with the limits for a Digital Transmission System Transmitter device under FCC Part 15.247.

1.2 Test Scope Summary

Tests for radiated and conducted (at antenna terminal) emissions were performed. All measurements were performed in accordance with the 2003 version of ANSI C63.4. The measurement equipment conforms to ANSI C63.2 Specifications for Electromagnetic Noise and Field Strength Instrumentation.

Test Specification	Specific Description	Date Completed	Result	Modifications? (Y/N)
CFR47 Part 2.1046	RF Power Output	8/17/07	Complied	No
CFR47 Part 2.1049	Occupied Bandwidth	8/17/07	Complied	No
CFR47 Part 2.1051	Conducted Spurious Emissions at Antenna Terminals	8/17/07	Complied	No
CFR47 Part 2.1053	Radiated Spurious Emissions	8/16/07	Complied	No
CFR47 Part 15.247	Power Spectral Density	8/17/07	Complied	No

1.3 Contract Information

Customer: Mine Safety Appliance
1000 Cranberry Woods Drive
Cranberry Township, PA 16066

Quotation Number: 63621

1.4 Test Dates

Testing performed on the following date(s): August 15-17, 2007

1.5 Test and Support Personnel

Washington Laboratories, LTD John P. Repella

Client Representative Greg Imblum

2 Equipment Under Test

2.1 EUT Identification & Description

The Mine Safety Appliance Firehawk M7 2.4 GHz Transceiver Control Module, Equipment Under Test (EUT), The Firehawk M7 Control Module is a safety component designed to be connected to a fire fighter's self contained breathing apparatus (SCBA). During operation, the unit is monitoring air pressure, motion of the user and if enabled the temperature. The device has a built in LCD to show specific information to the user. The CM has a cable which is connected to a second electronic component, the Firehawk M7 Power Module (PM). The PM contains the batteries to power both units and is providing the supply power to the CM via the cable. The PM is operating with 4 C-cell batteries.

Wireless: The CM has build in 2 different wireless links. During normal operation mode they are used for communication with a Head-Up Display (HUD). The HUD is a device that is mounted on the users face piece mask and shows the pressure information via LED indicators. The CM is storing some data log information in an internal memory. This information can be read out by putting the unit in a special data mode, while the unit is in standby (switched off) and using the FireHawk M7 Reader / ID Tag Writer connected to a PC and the . When the unit is in the normal operation mode, the user will not be able to put the unit into the data mode.

Table 1. Device Summary

ITEM	DESCRIPTION
Manufacturer:	Mine Safety Appliance
FCC ID:	P9R-10075346
Model:	Firehawk M7 2.4 GHz Transceiver Control Module
FCC Rule Parts:	§15.247
Frequency Range:	2400-2485.3MHz
Maximum Output Power:	0.420mW
Modulation:	DSSS
Occupied Bandwidth:	1.6372MHz (6dB BW)
Keying:	Automatic
Type of Information:	Data 802.11b
Number of Channels:	16
Power Output Level	Fixed
Antenna Type	Internal (Chip)
Interface Cables:	None
Power Source & Voltage:	Battery

2.2 Test Configuration

The following diagram shows the test configuration:

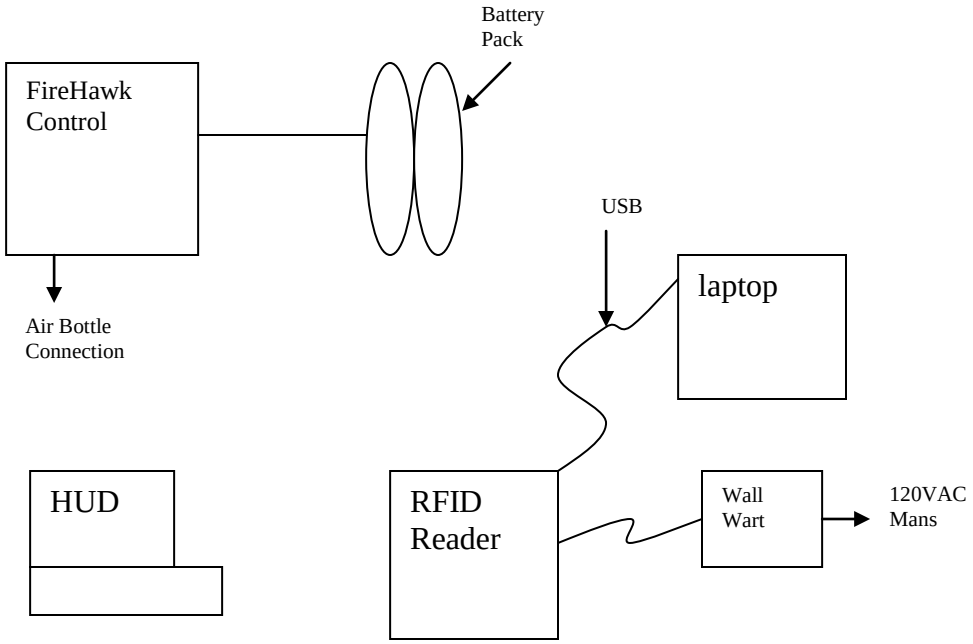

Figure 1: EUT Test Configuration

2.3 Testing Algorithm

The EUT was configured to constantly transmit channel 1, channel 8 or channel 16, modulated.

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. 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 = $0.5\ (2^2 + 1^2 + 4^2)^{1/2}$ = ±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

Test Name:	**Emissions**	Test Date:	**08/16/2007**
Asset #	**Manufacturer/Model**	**Description**	**Cal. Due**
00068	HP, 85650A	ADAPTER, QP	07/06/2008
00072	HP, 8568B	ANALYZER, SPECTRUM	07/06/2008
00070	HP, 85685A	PRESELECTOR, RF W/OPT 8ZE	07/06/2008
00382	SUNOL, JB1	ANTENNA, BICONLOG	02/02/2008
00474	HP, 8563E	ANALYZER, SPECTRUM	09/05/2007
00627	AGILENT 8449B	AMPLIFIER 1-26GHZ	01/07/2008
00004	ARA, DRG-118/A	ANTENNA, DRG, 1-18GHZ	02/02/2009
00519	MEGAPHASE, LLC TM40-K1K1-72-T	CABLE, COAXIAL - 72"LONG - 40 GHZ	08/01/2008

4 Test Results

4.1 RF Power Output: (FCC Part §2.1046)

To measure the output power the unit was set to dwell on a low, high and middle channel. The output from the transmitter 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.

Table 3. RF Power Output

Channel	Frequency	(dBm)	Limit	mWatts	Pass/Fail
Channel 1	2405MHz	-7.020	+30dBm	0.191	Pass
Channel 8	2440MHz	-3.764	+30dBm	0.420	Pass
Channel 16	2480MHz	-3.794	+30dBm	0.417	Pass

Notes:

Test Engineer(s): John P. Repella

Test Date(s): August 16-17, 2007

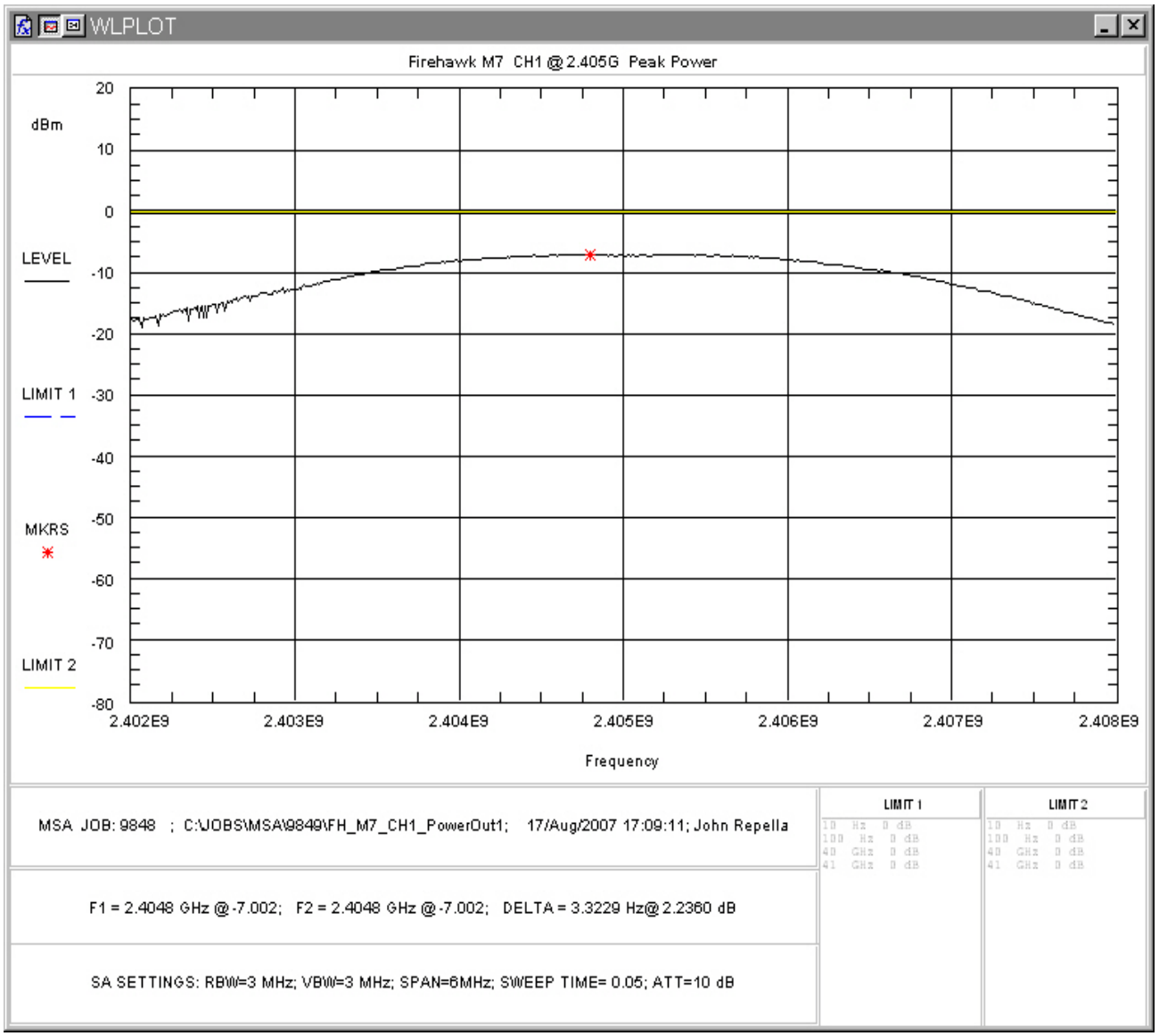

Figure 2. RF Peak Power, Low Channel

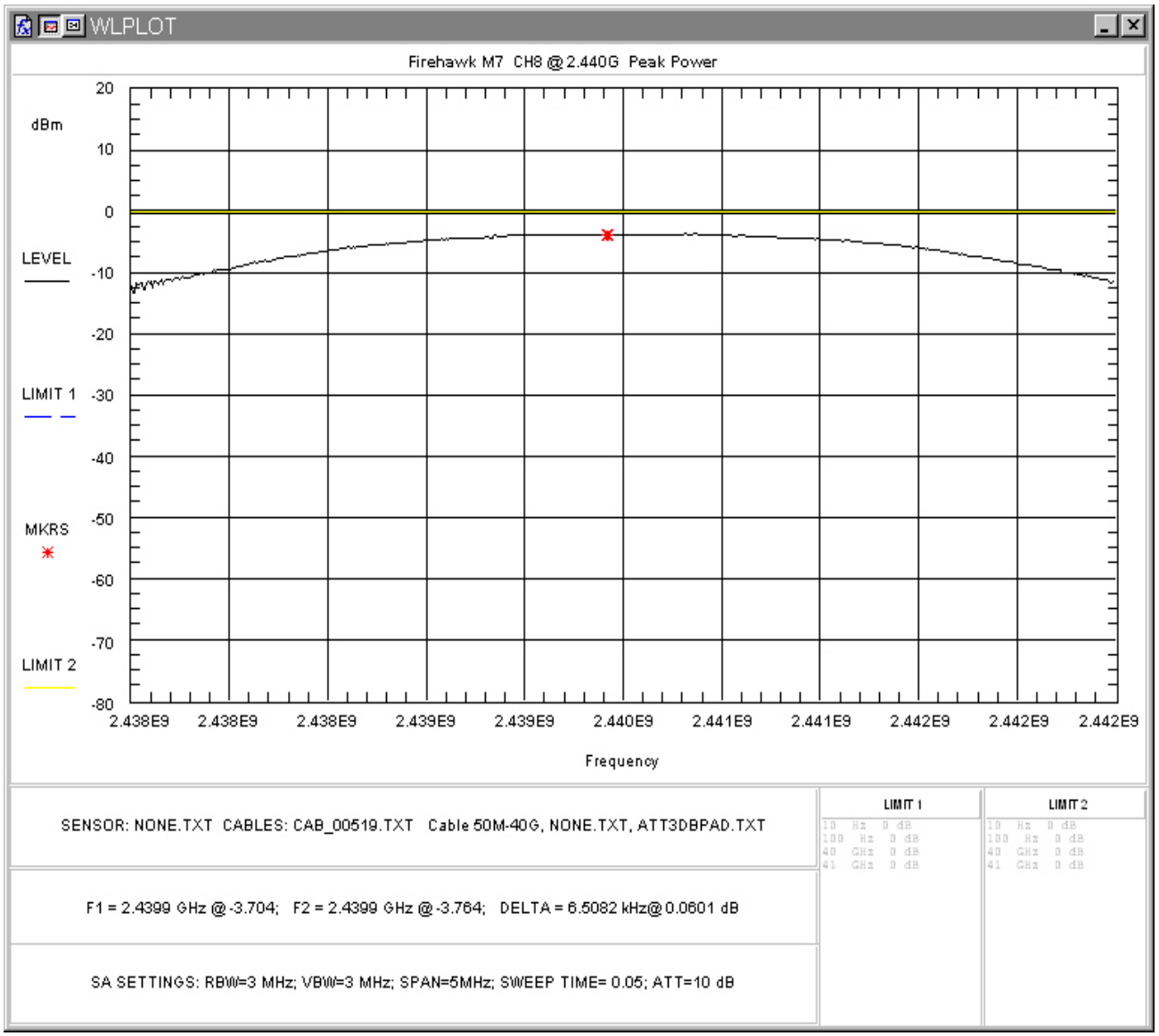

Figure 3. RF Peak Power, Mid Channel

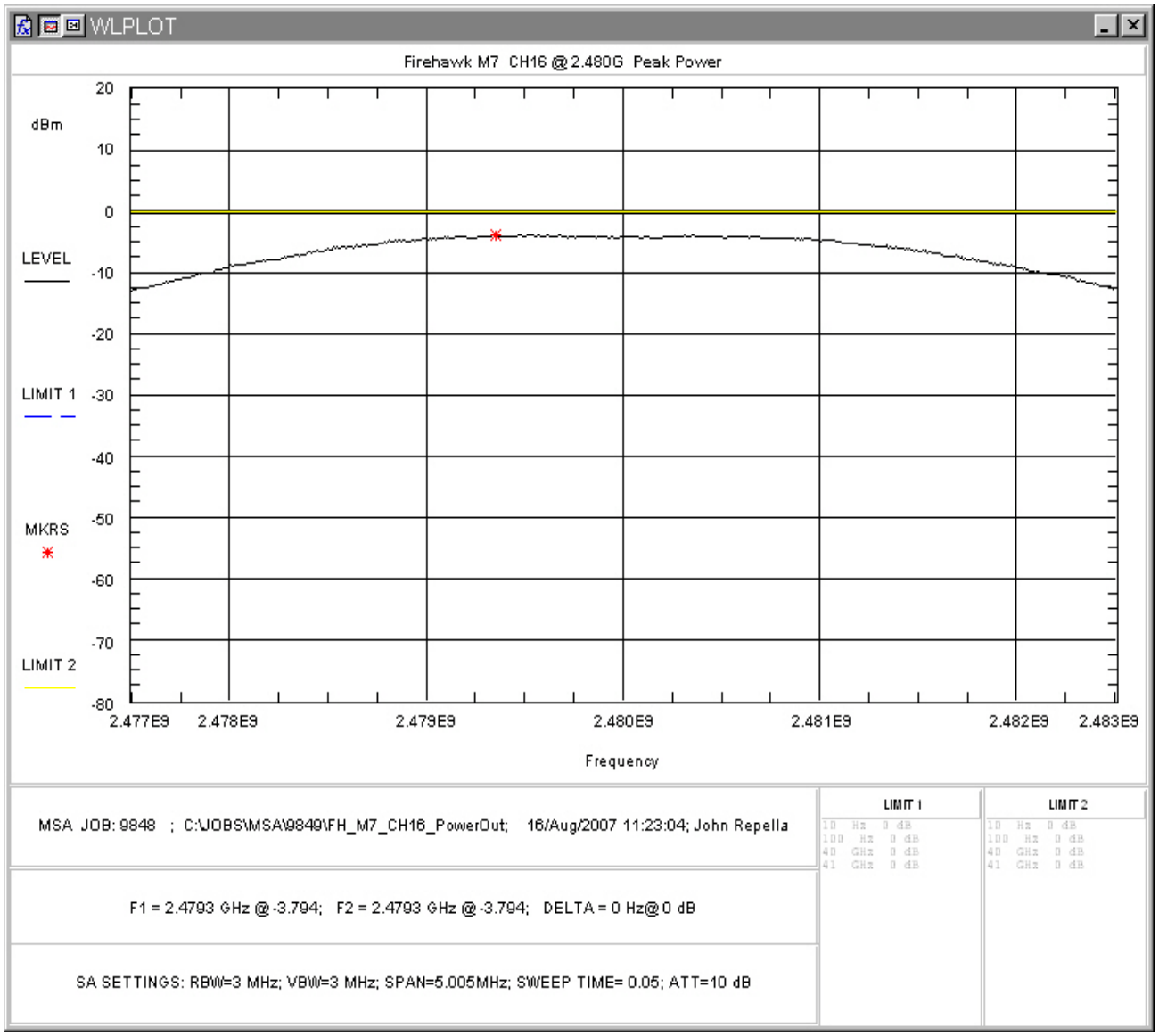

Figure 4. RF Peak Power, High Channel

4.2 Occupied Bandwidth: (FCC Part §2.1049)

Occupied bandwidth was performed by coupling the output of the EUT to the input of a spectrum analyzer.

For Direct Sequence Spread Spectrum Systems, FCC Part 15.247 requires the maximum 20 dB bandwidth be greater than 500kHz.

At full modulation, the occupied bandwidth was measured as shown:

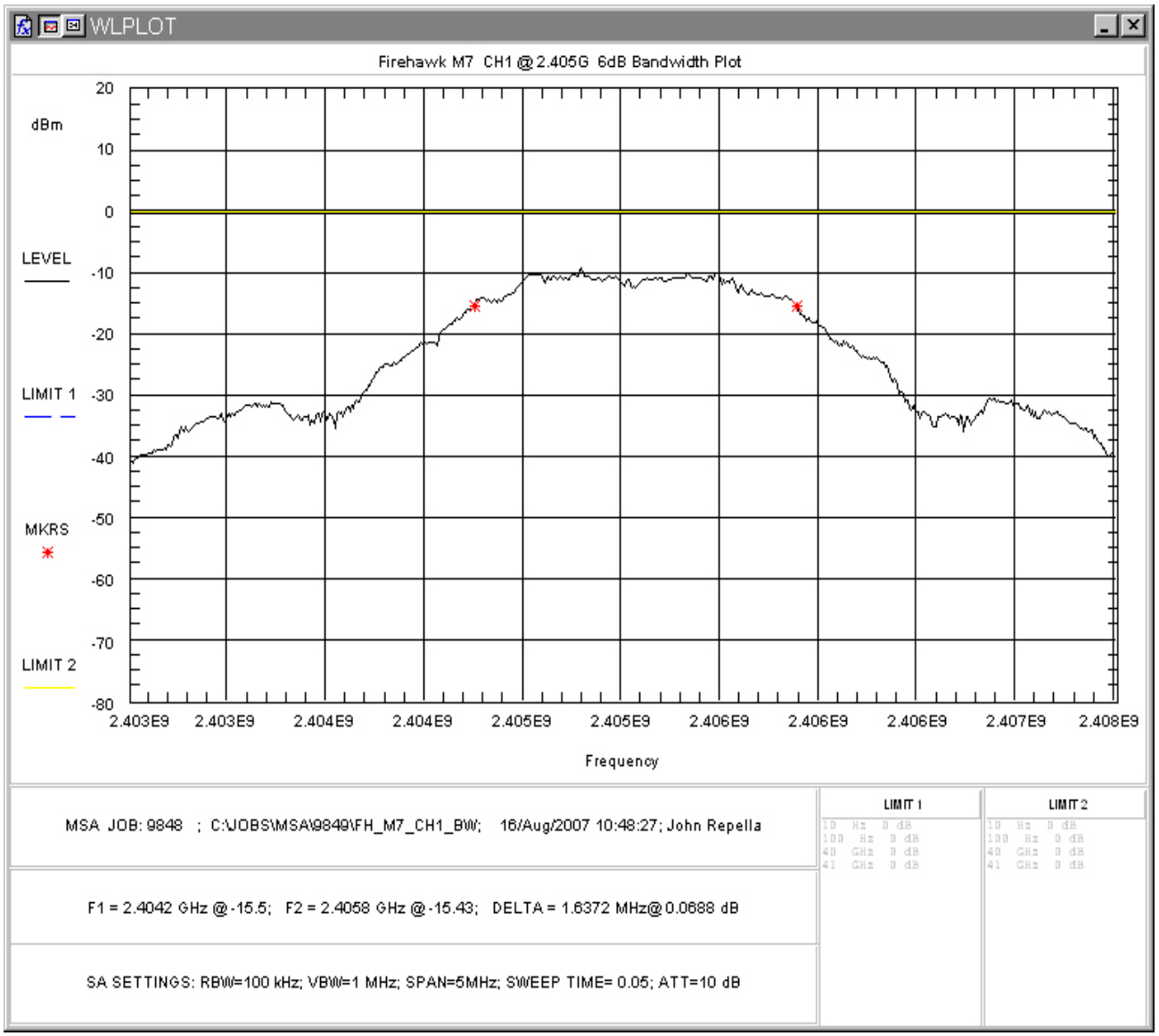

Figure 5. Occupied Bandwidth, Low Channel

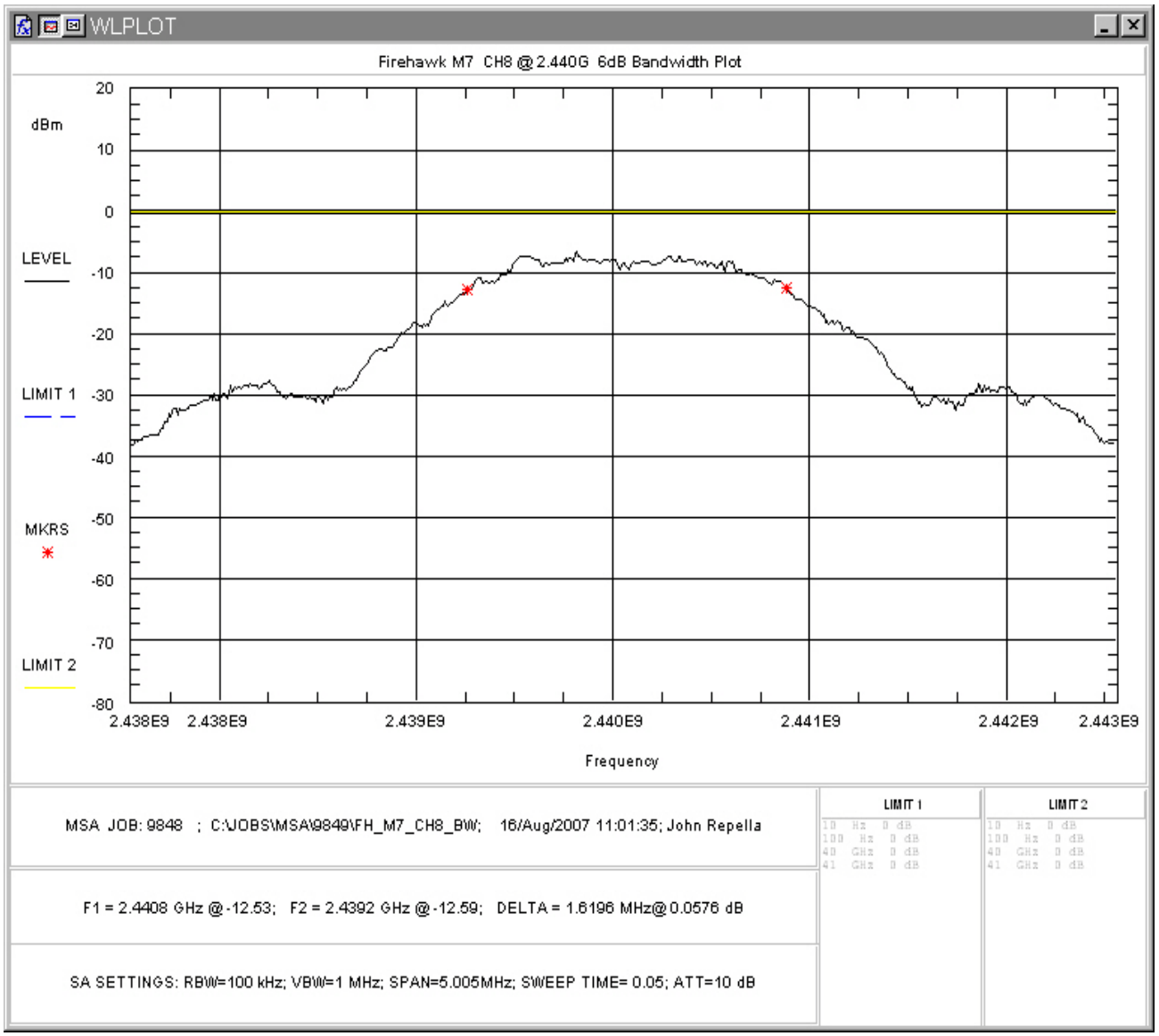

Figure 6. Occupied Bandwidth, Mid Channel

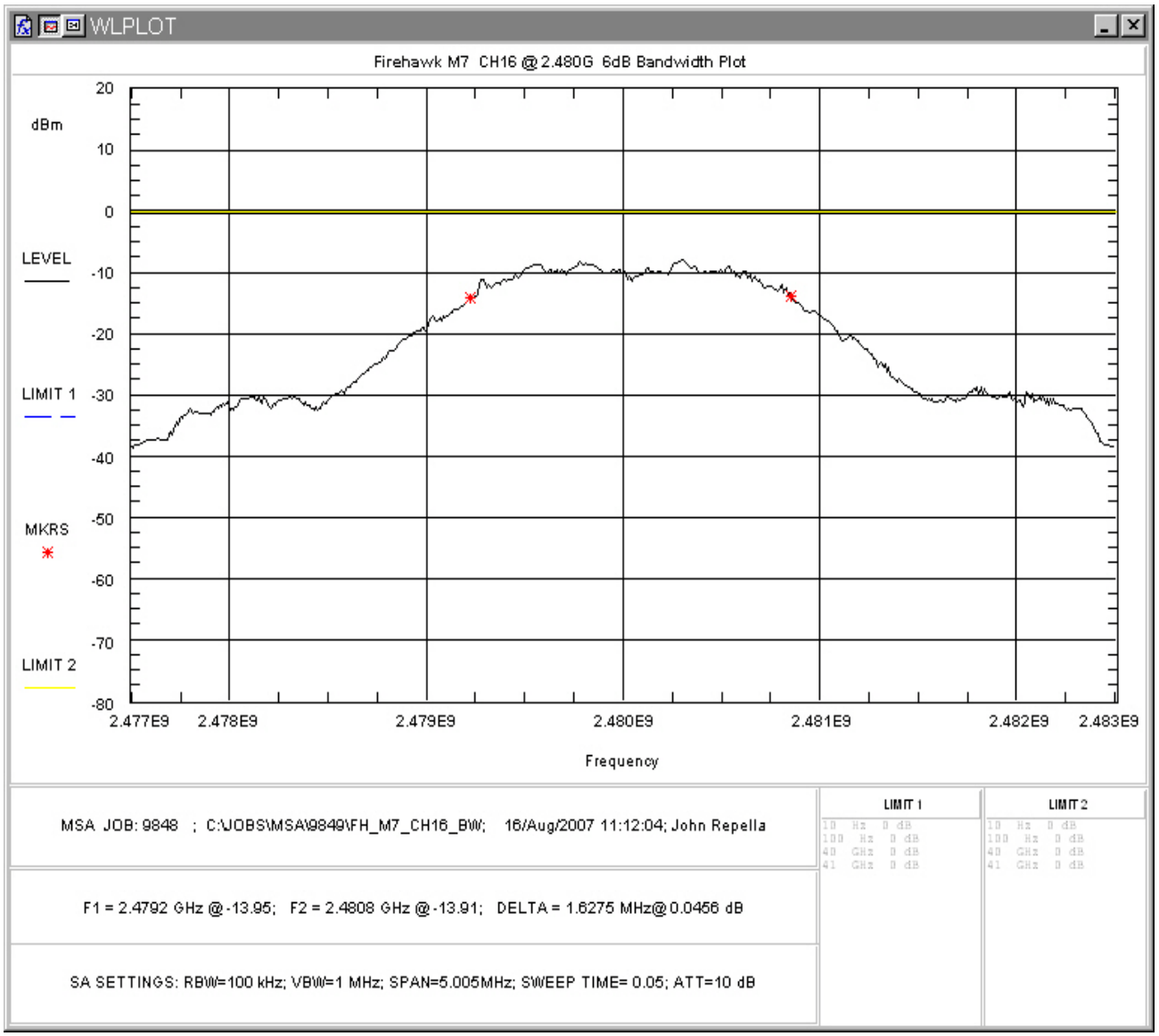

Figure 7. Occupied Bandwidth, High Channel

Table 4 provides a summary of the Occupied Bandwidth Results.

Table 4. Occupied Bandwidth Results

Channel/Frequency (MHz)	Channel Bandwidth (MHz)	Pass/Fail
Channel1 @2405MHz	1.6372	Pass
Channel8 @2440MHz	1.6196	Pass
Channel16 @2480MHz	1.6275	Pass

Notes: Bandwidth limit > 500kHz as per Part15.247(a) (2)

Test Engineer(s): John P. Repella

Test Date(s): August 16-17, 2007

4.3 Conducted Spurious Emissions at Antenna Terminals (FCC Part §2.1051)

The EUT must comply with requirements for spurious emissions at antenna terminals. Per §15.247(c) all spurious emissions in any 100 kHz bandwidth outside the frequency band in which the spread spectrum device is operating shall be attenuated 20 dB below the highest power level in a 100 kHz bandwidth within the band containing the highest level of the desired power.

The EUT antenna was removed and the cable was connected directly into a spectrum analyzer through a 10 dB attenuator. An offset was programmed into the spectrum analyzer to compensate for the loss of the external attenuator. The spectrum analyzer resolution bandwidth was set to 100 kHz and the video bandwidth was set to 100 kHz. The amplitude of the EUT carrier frequency was measured to determine the emissions limit (20 dB below the carrier frequency amplitude). The emissions outside of the allocated frequency band were then scanned from 30 MHz up to the tenth harmonic of the carrier.

The following are plots of the conducted spurious emissions data.

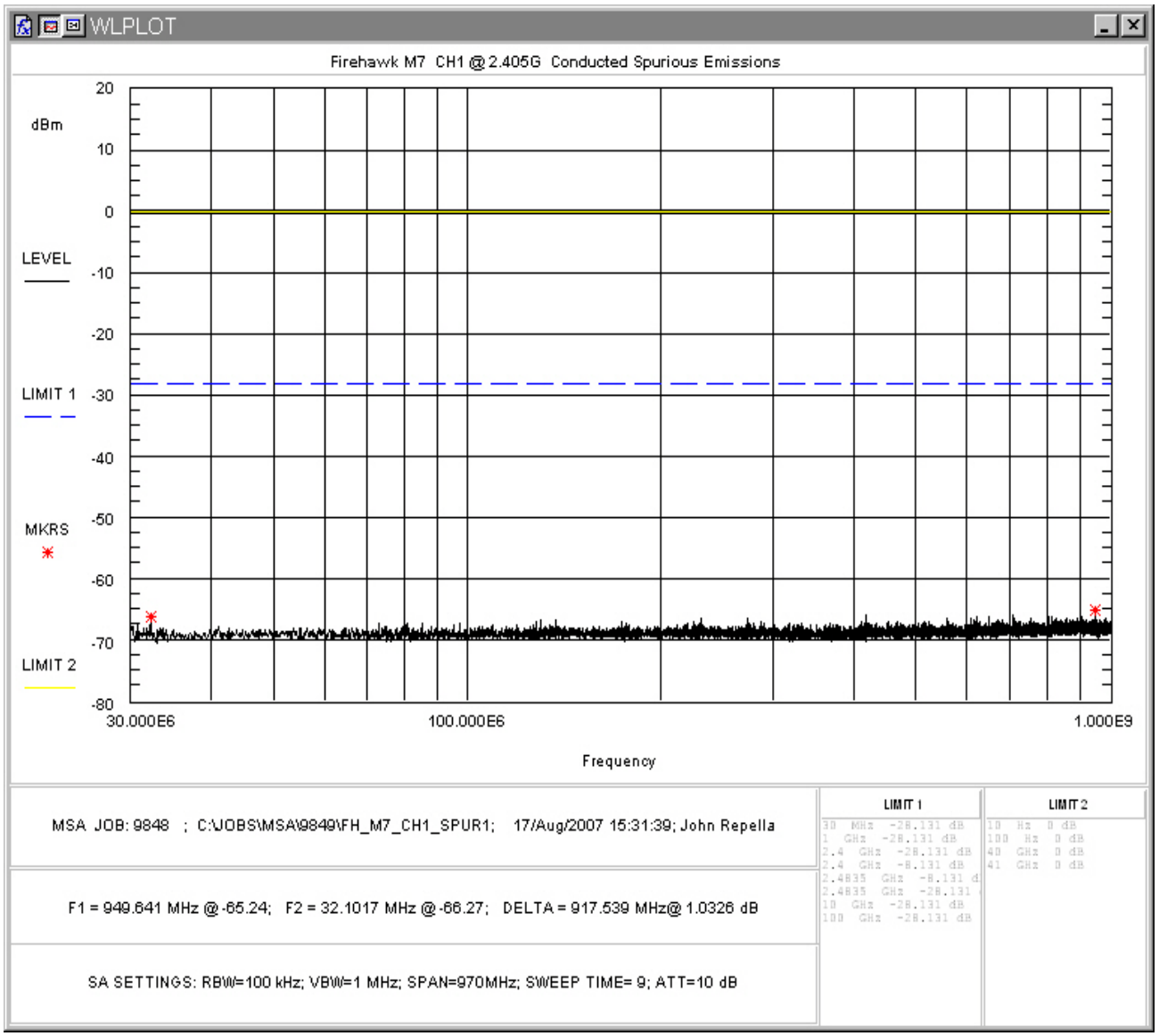

Figure 8. Conducted Spurious Emissions, Low Channel, 30 - 1000MHz

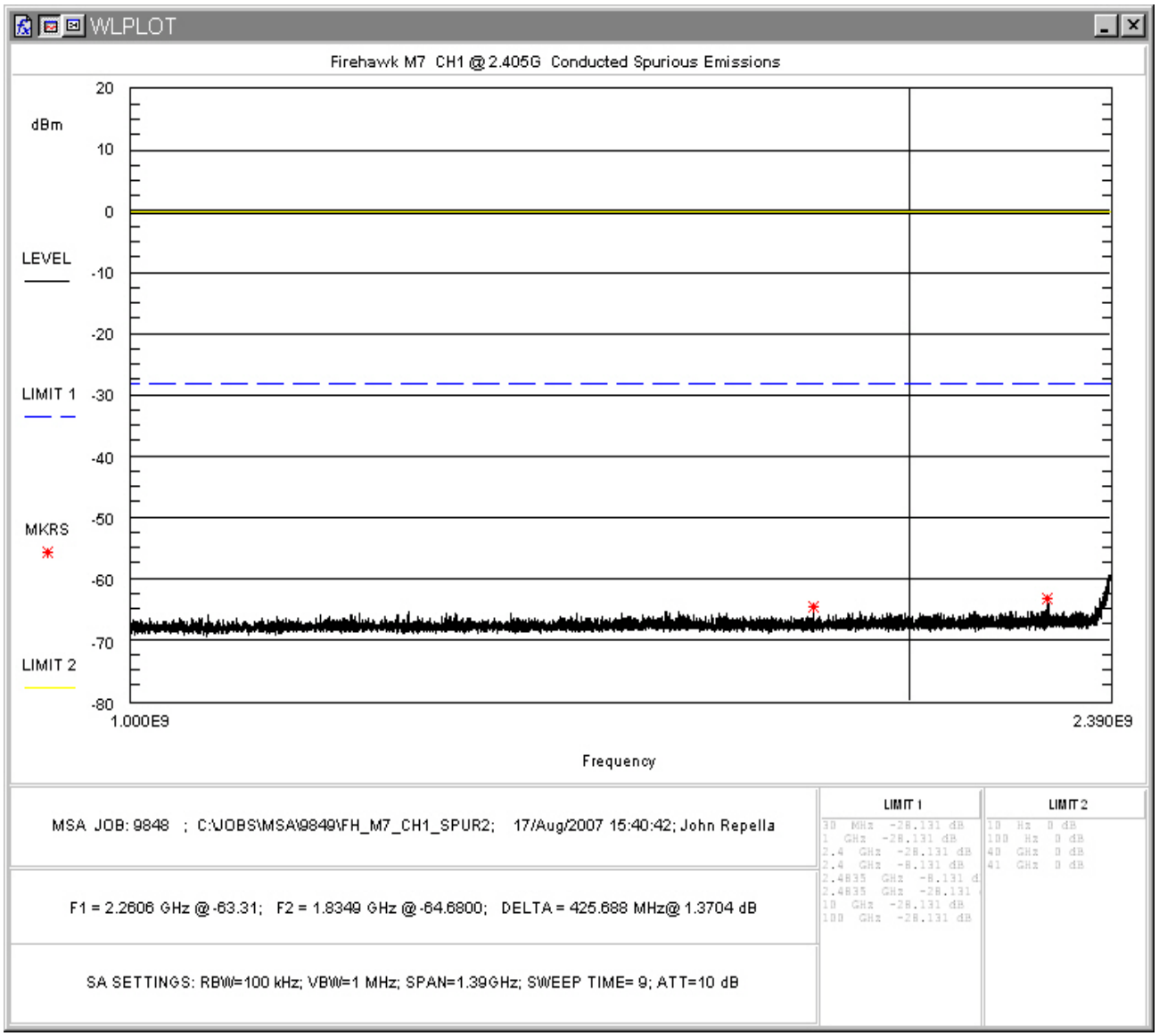

Figure 9. Conducted Spurious Emissions, Low Channel, 1 – 2.39GHz

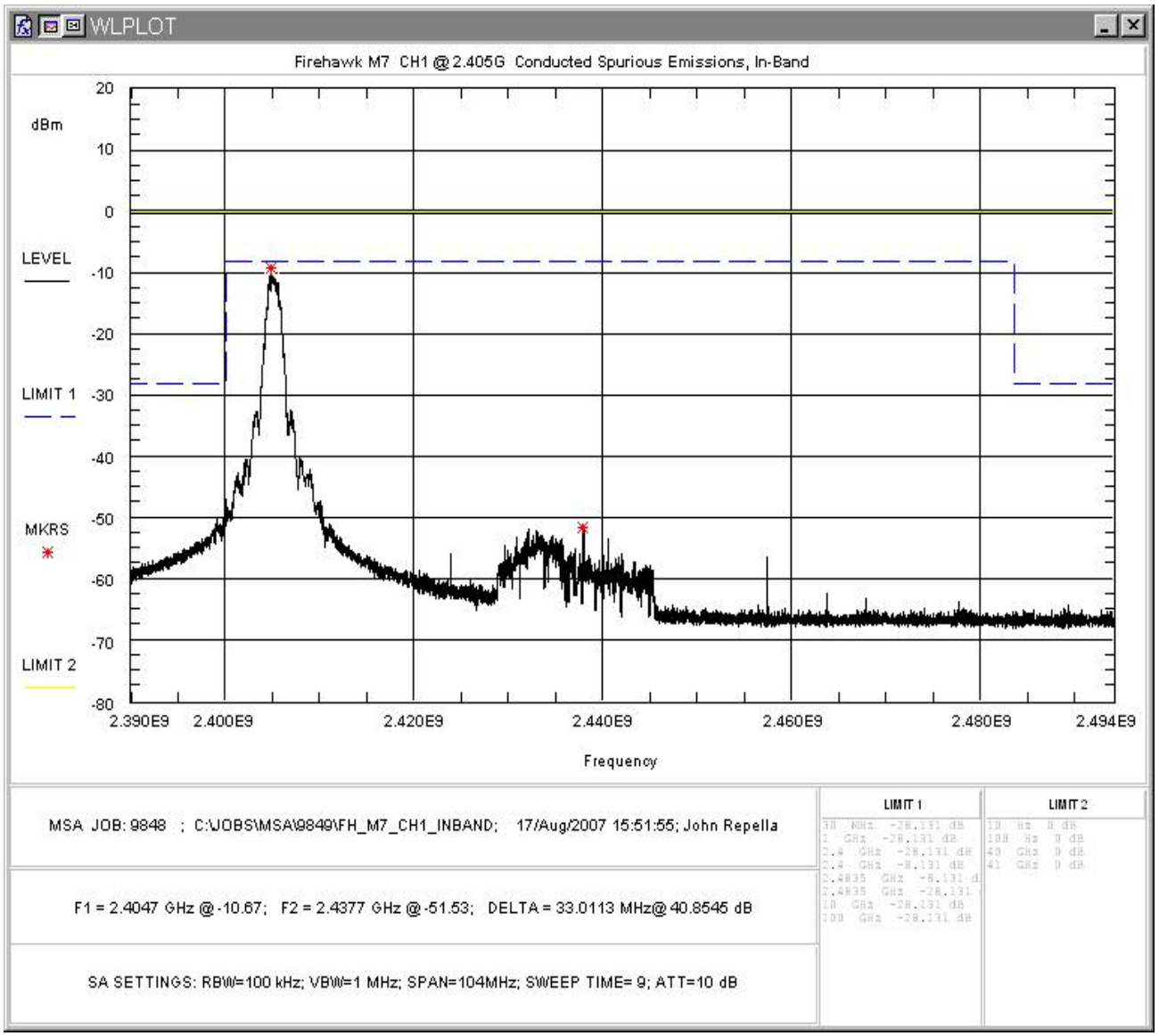

Figure 10. Conducted Spurious Emissions In-Band, Low Channel, 2.39 – 2.494GHz

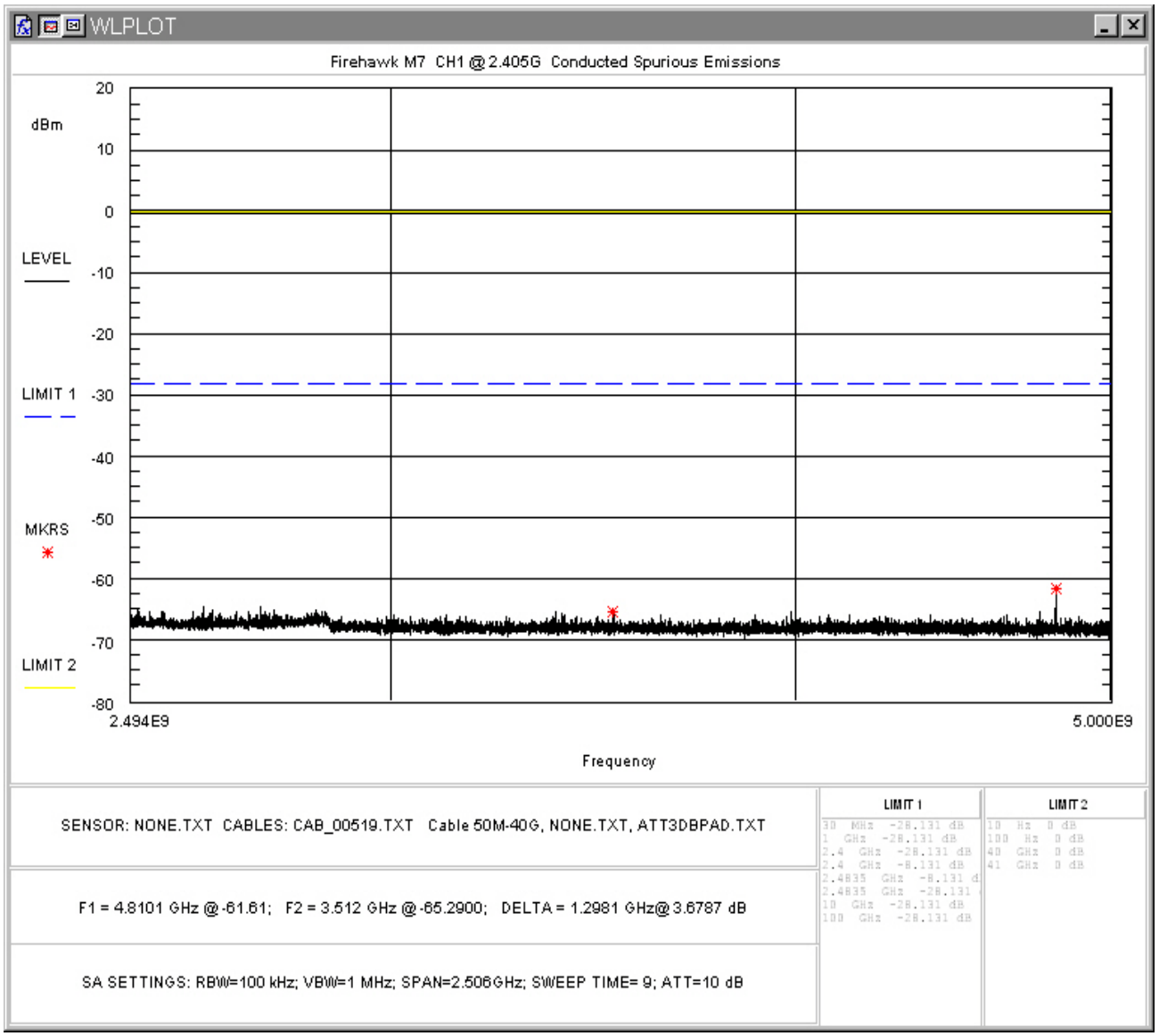

Figure 11. Conducted Spurious Emissions, Low Channel, 2.494 - 5GHz

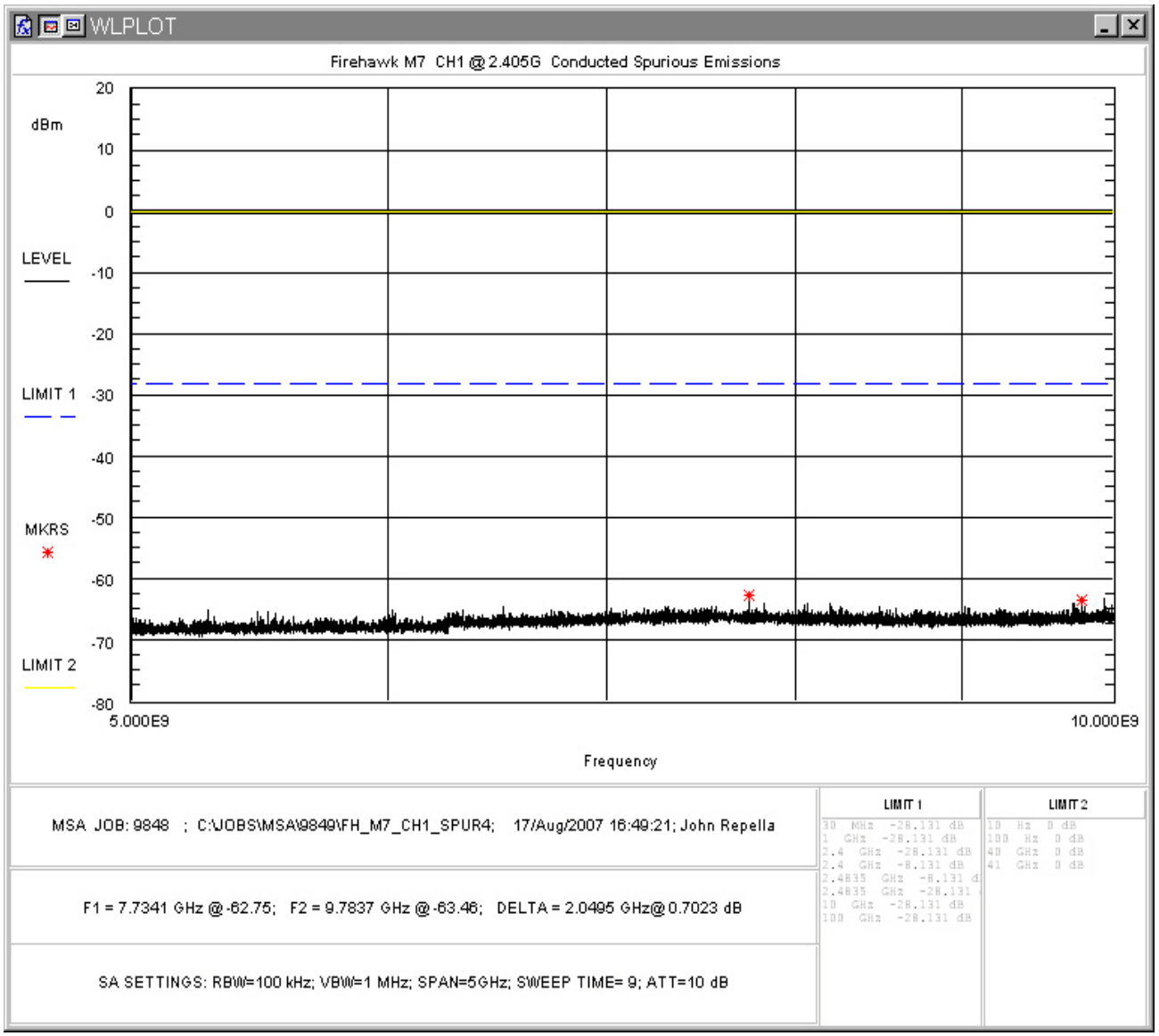

Figure 12. Conducted Spurious Emissions, Low Channel, 5 - 10GHz

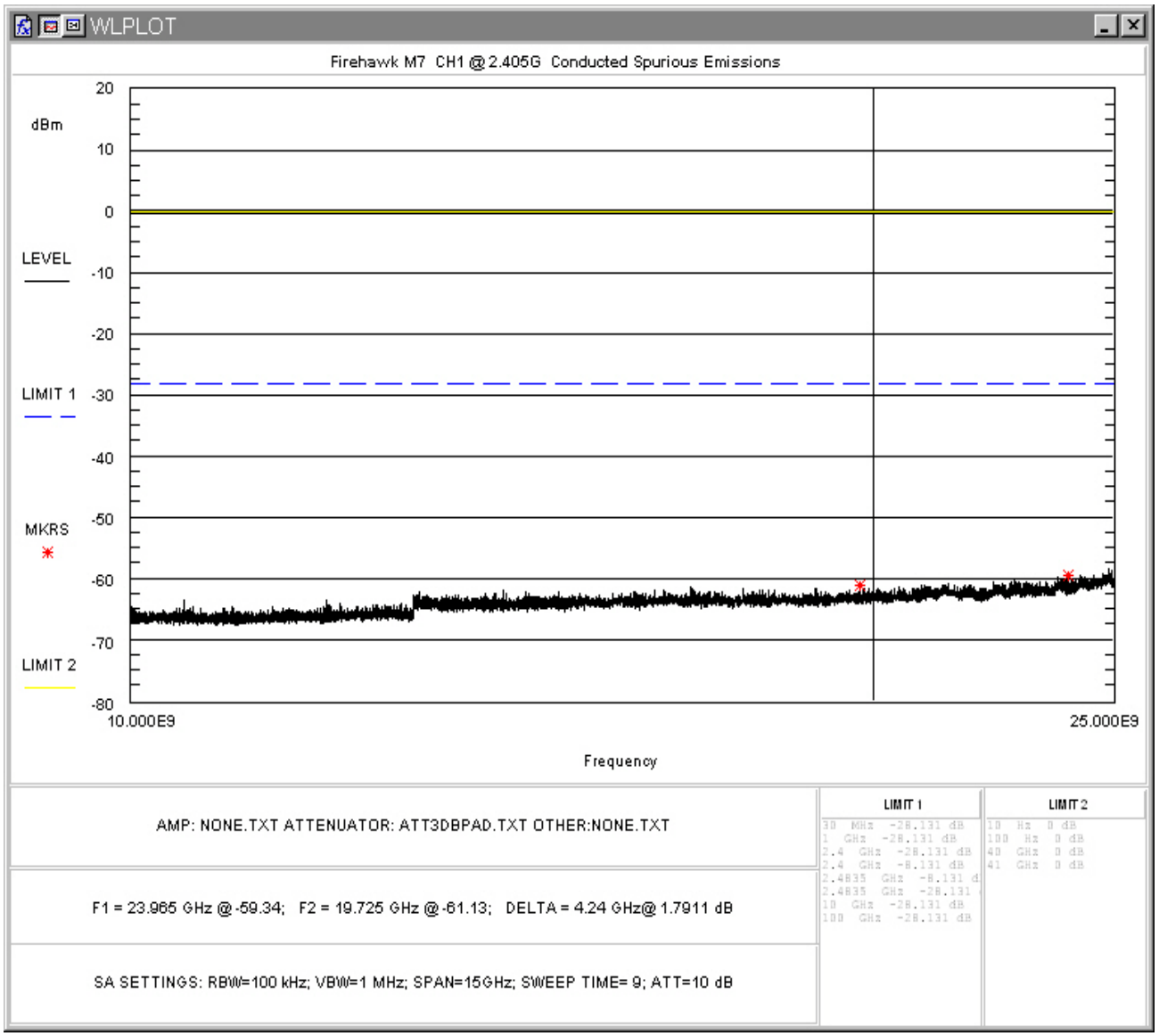

Figure 13. Conducted Spurious Emissions, Low Channel, 10 - 25GHz

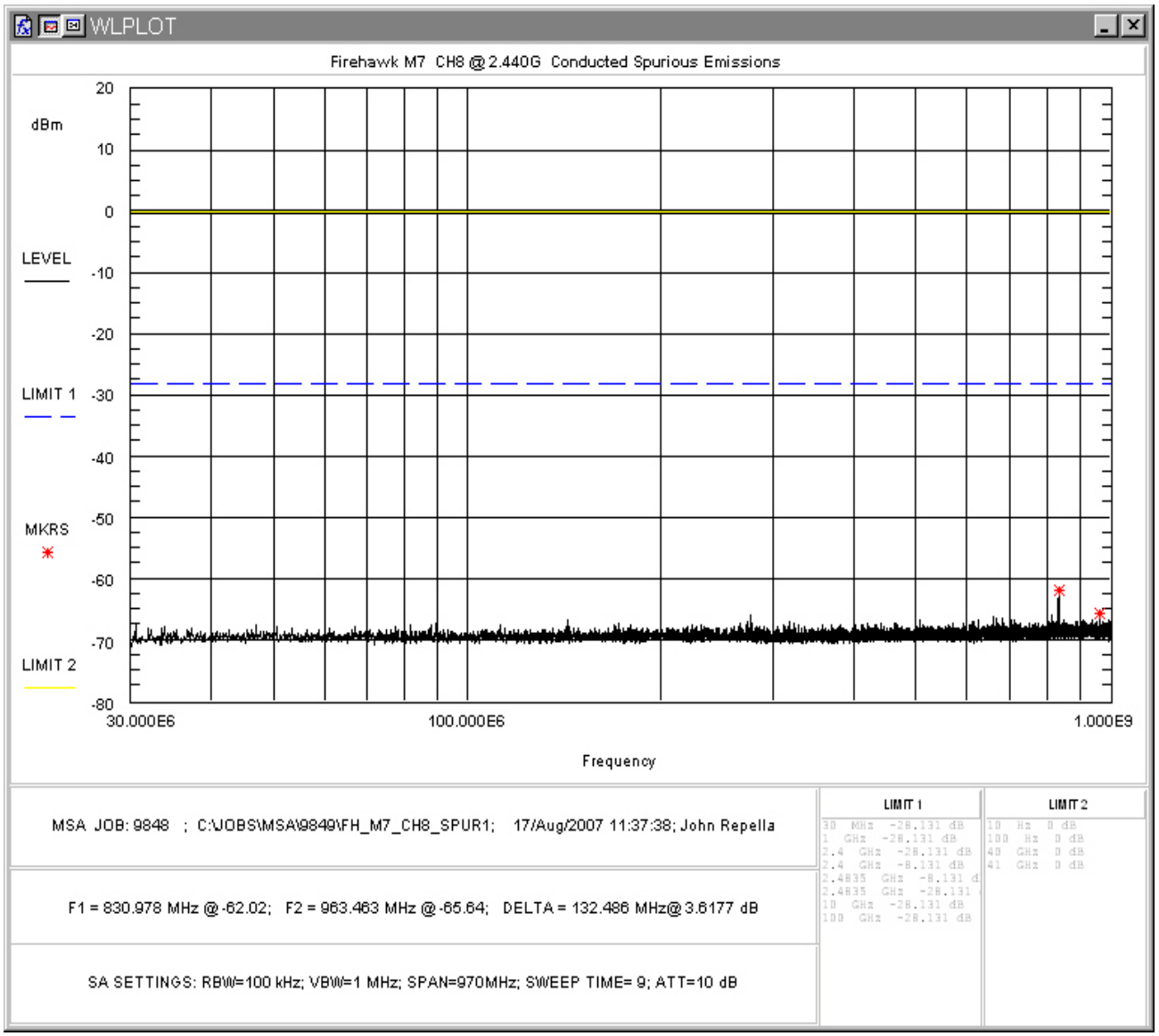

Figure 14. Conducted Spurious Emissions, Mid Channel, 30 - 1000MHz

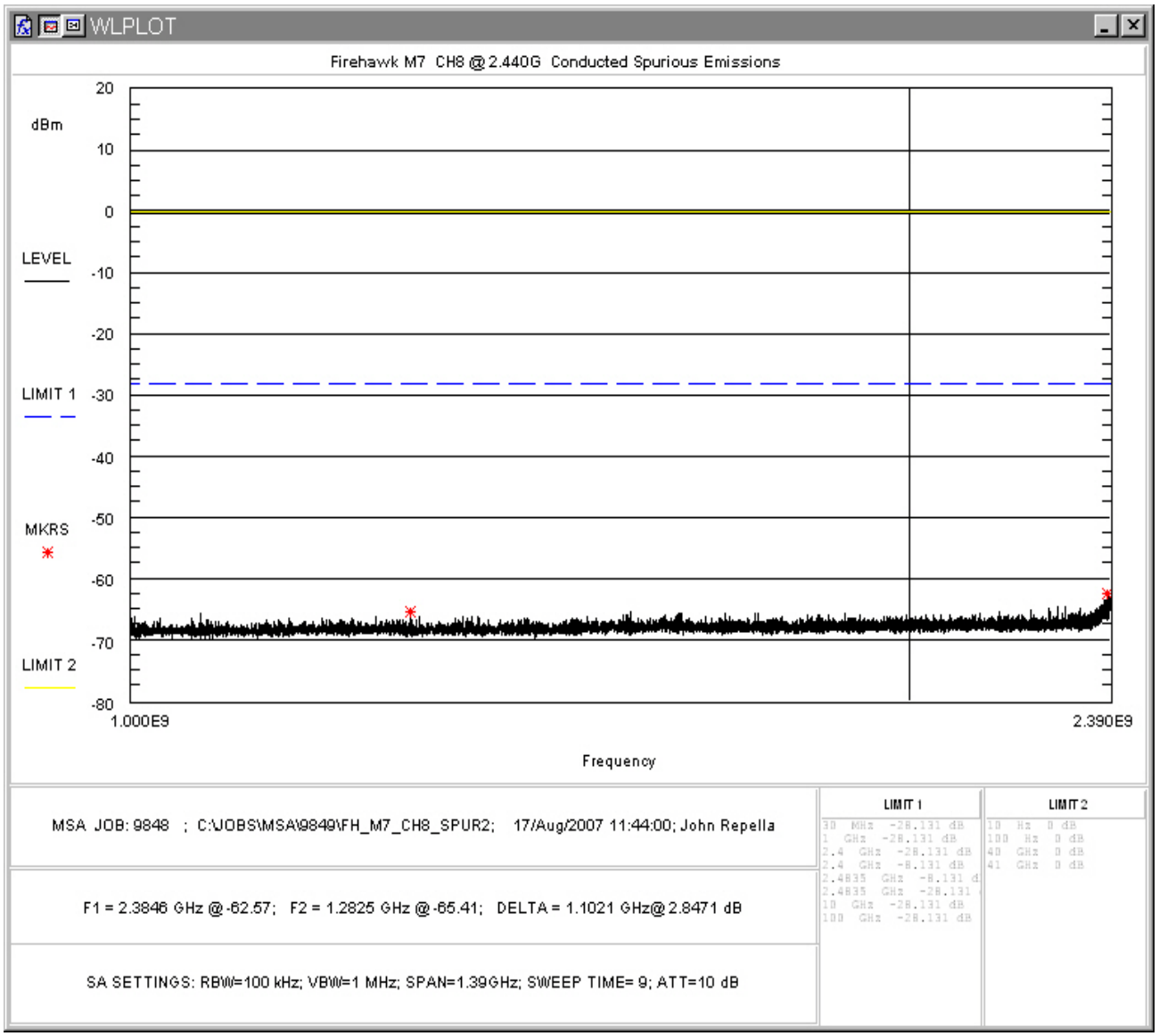

Figure 15. Conducted Spurious Emissions, Mid Channel, 1 – 2.39GHz

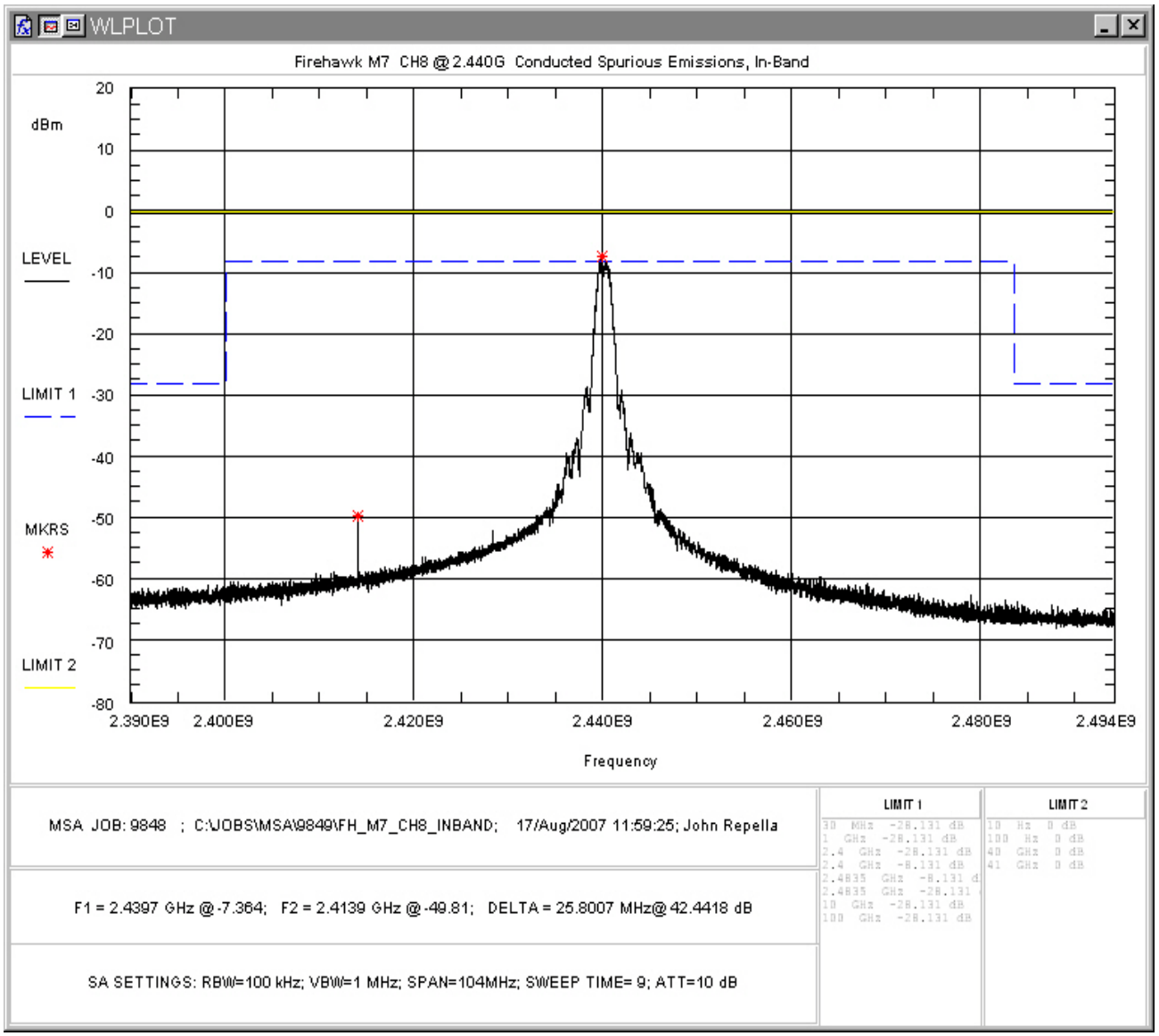

Figure 16. Conducted Spurious Emissions In-Band, Mid Channel, 2.39 – 2.494GHz

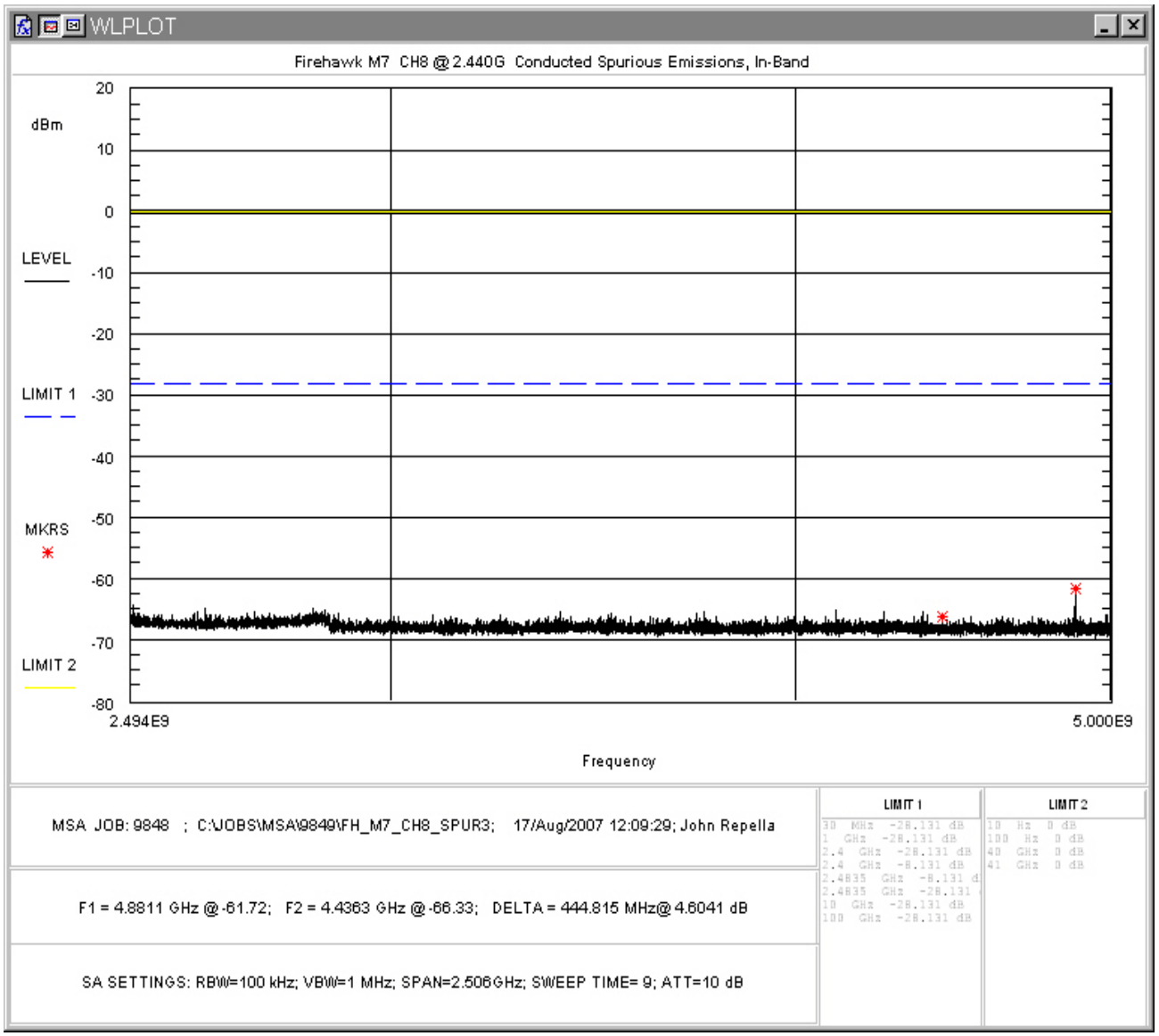

Figure 17. Conducted Spurious Emissions, Mid Channel, 2.494 - 5GHz

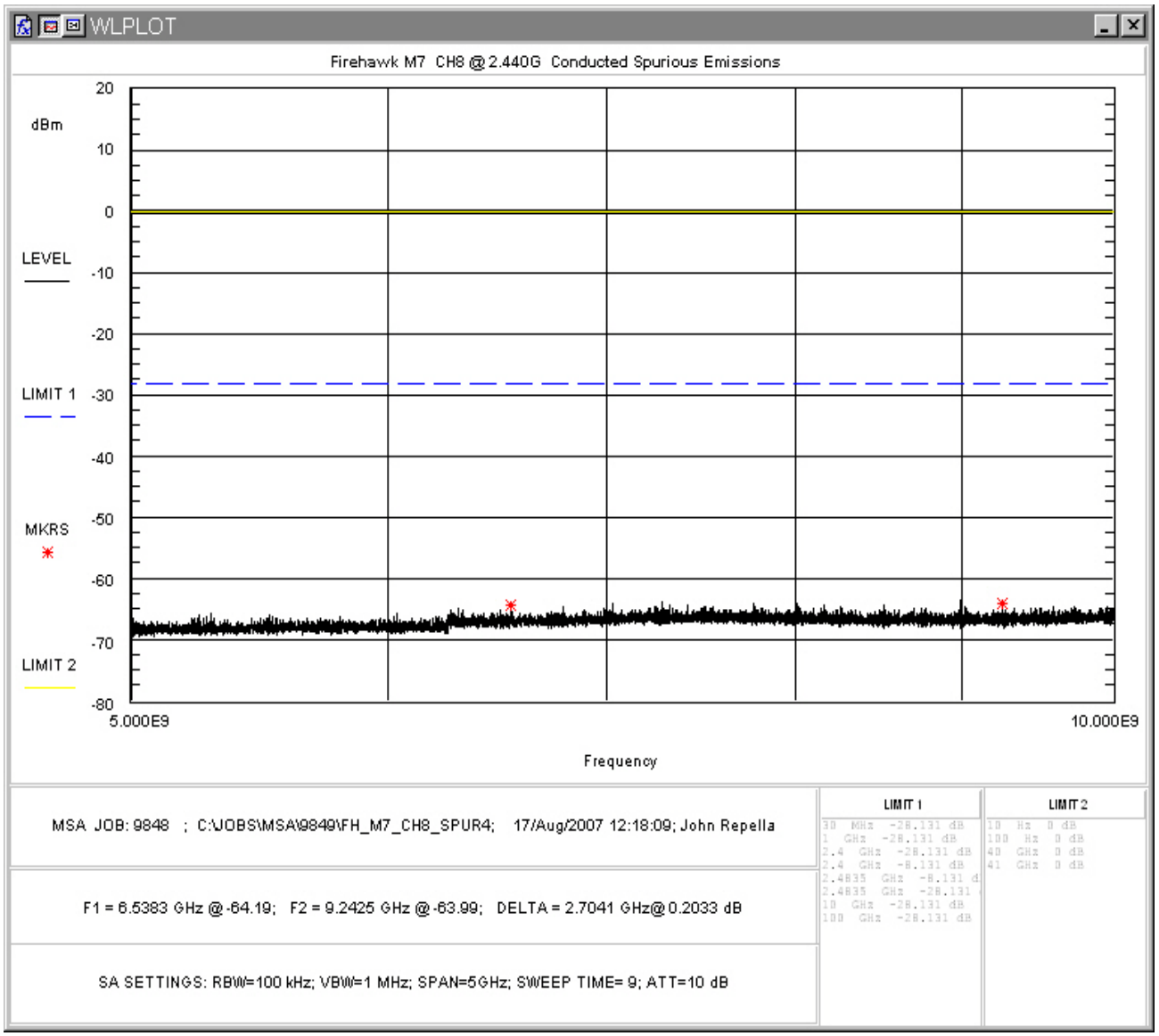

Figure 18. Conducted Spurious Emissions, Mid Channel, 5 - 10GHz

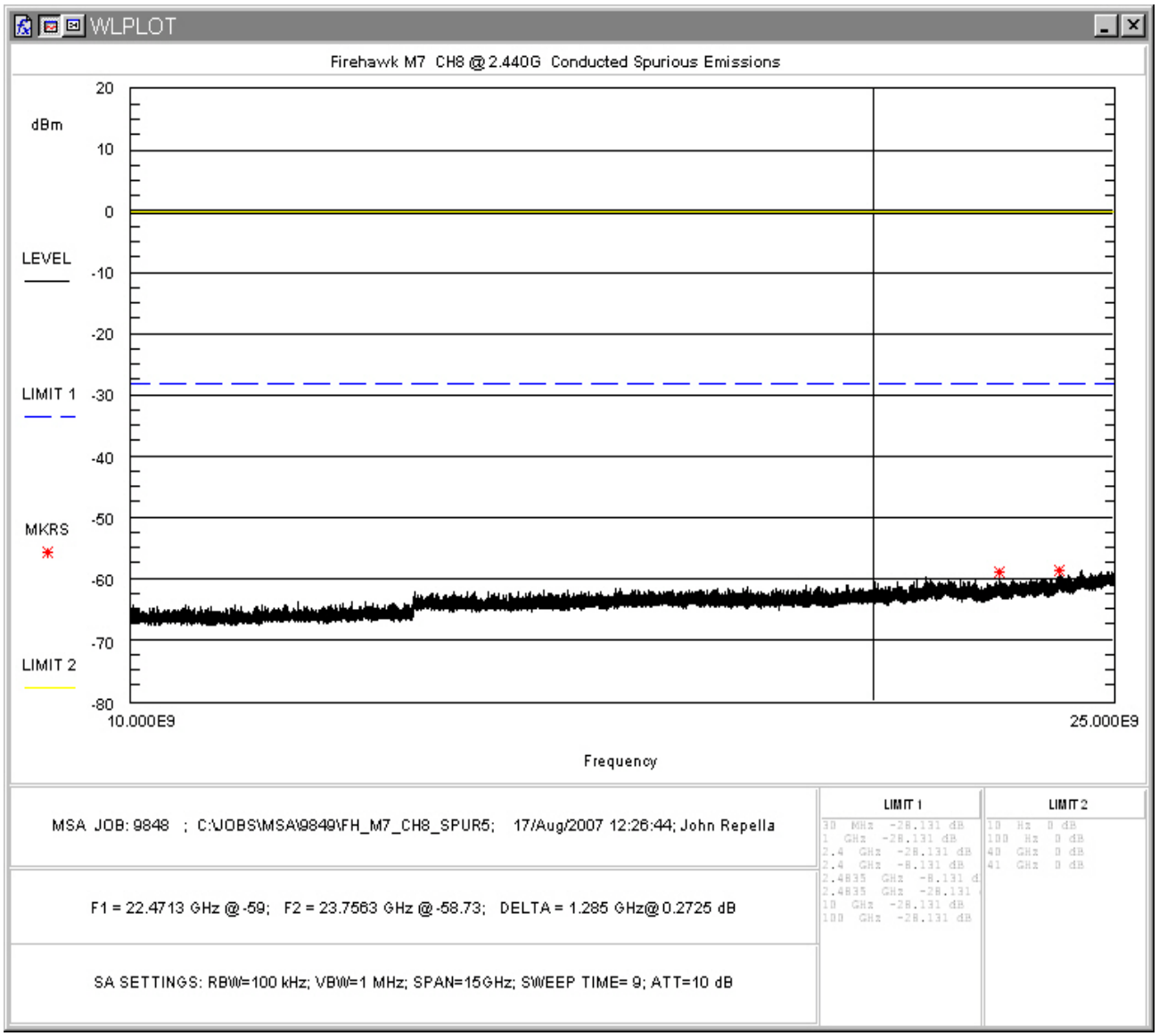

Figure 19. Conducted Spurious Emissions, Mid Channel, 10 - 25GHz

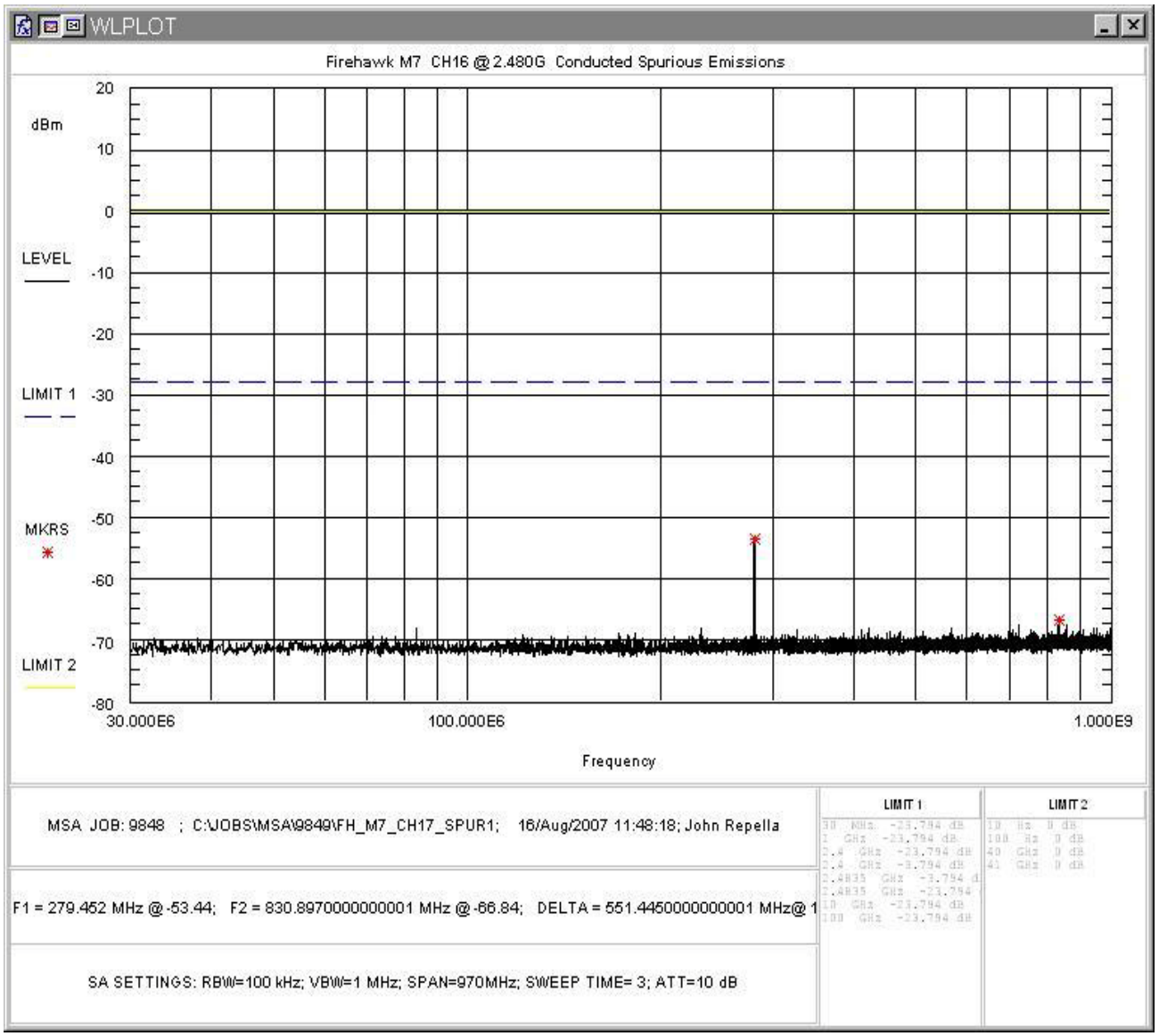

Figure 20. Conducted Spurious Emissions, High Channel, 30 - 1000MHz

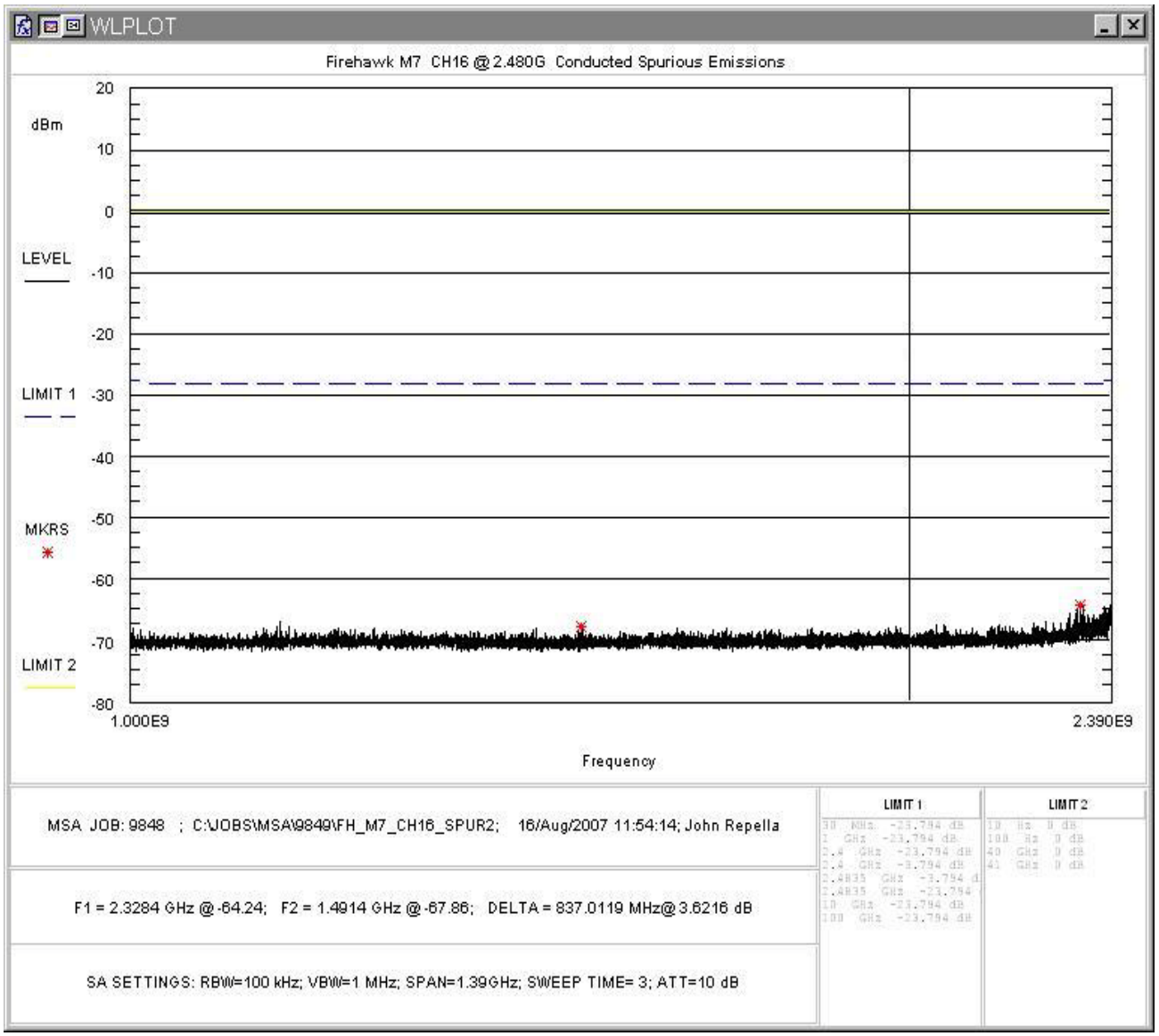

Figure 21. Conducted Spurious Emissions, High Channel, 1 – 2.39GHz

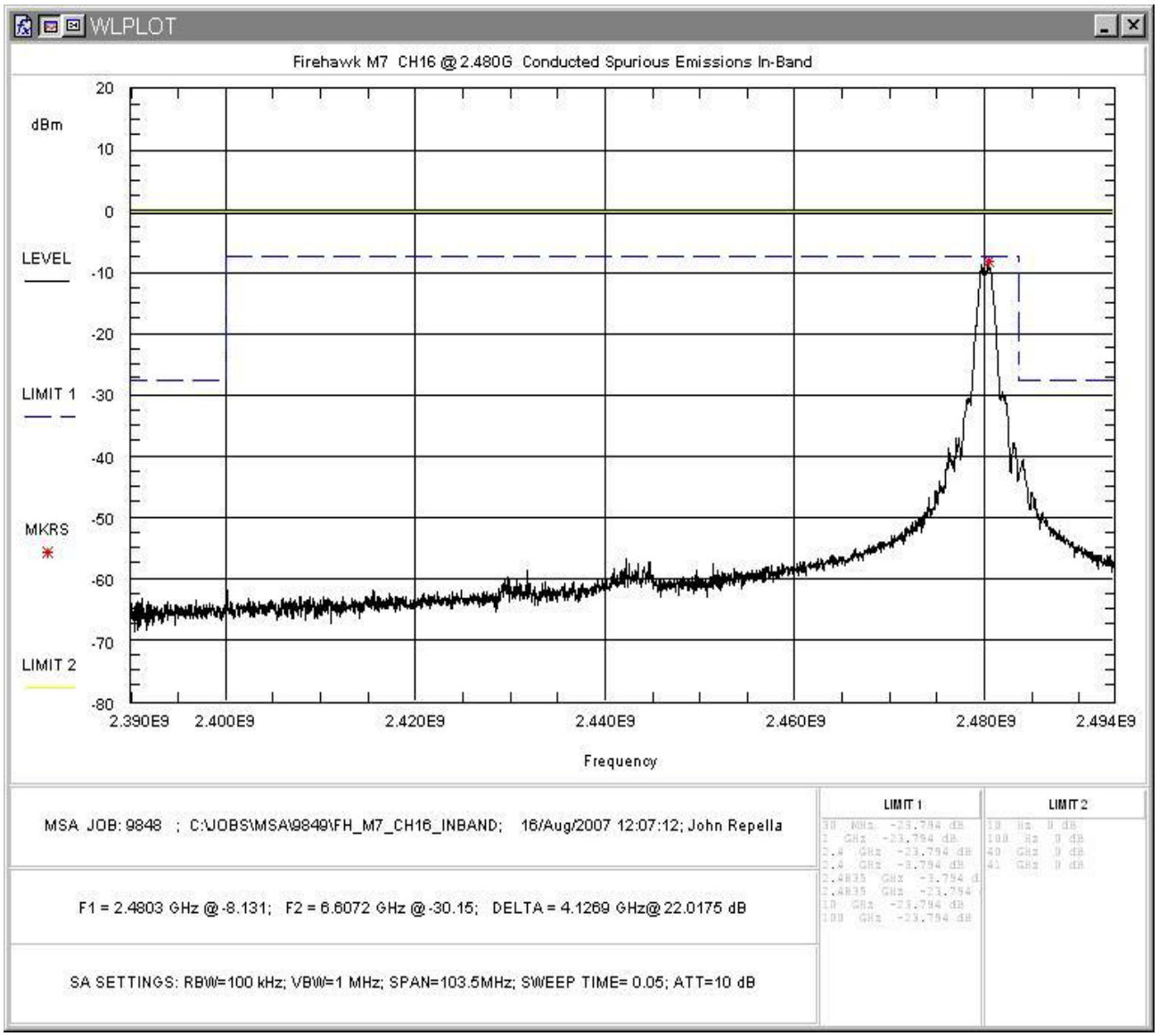

Figure 22. Conducted Spurious Emissions In-Band, High Channel, 2.39 – 2.494GHz

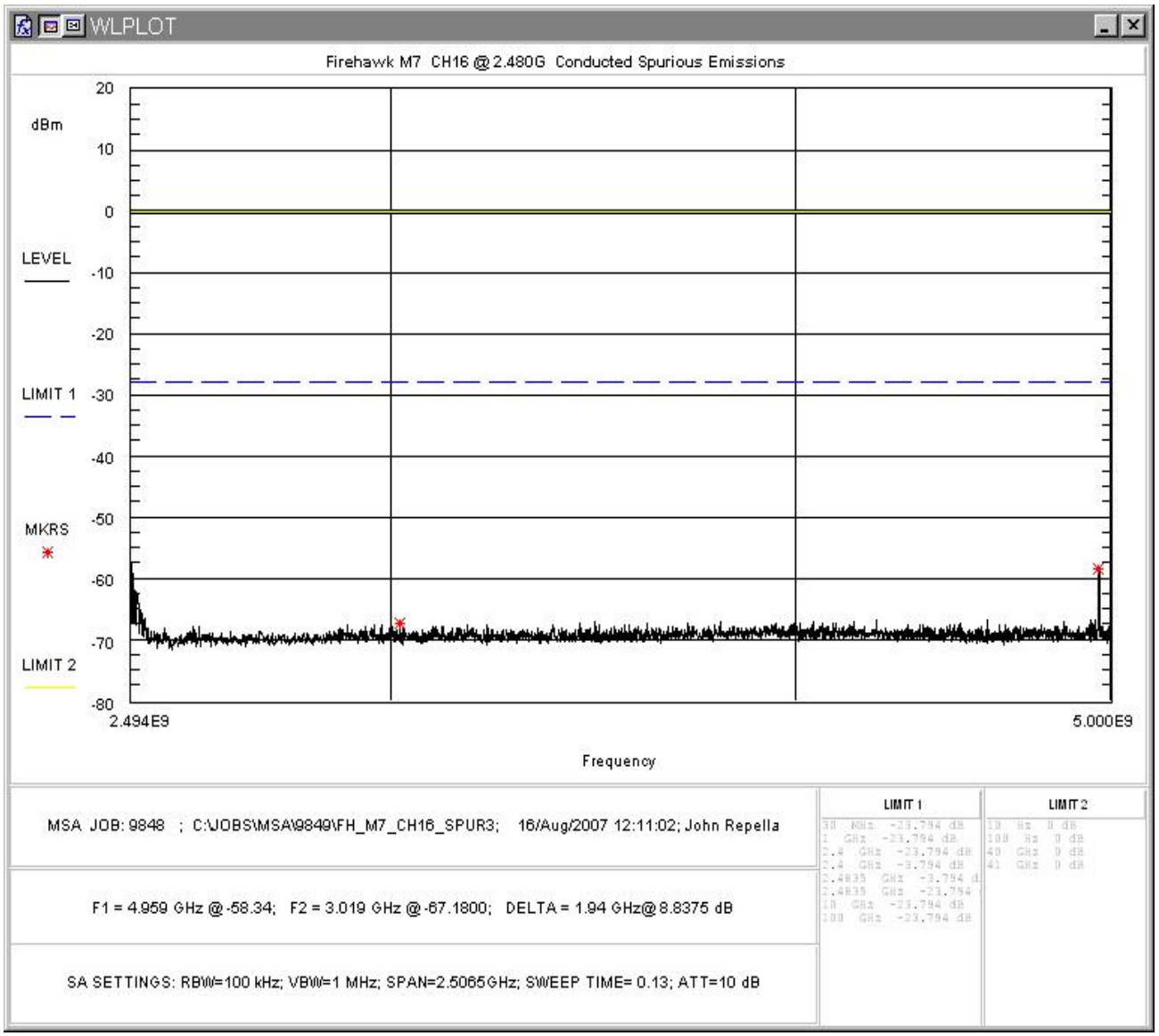

Figure 23. Conducted Spurious Emissions, High Channel, 2.494 - 5GHz

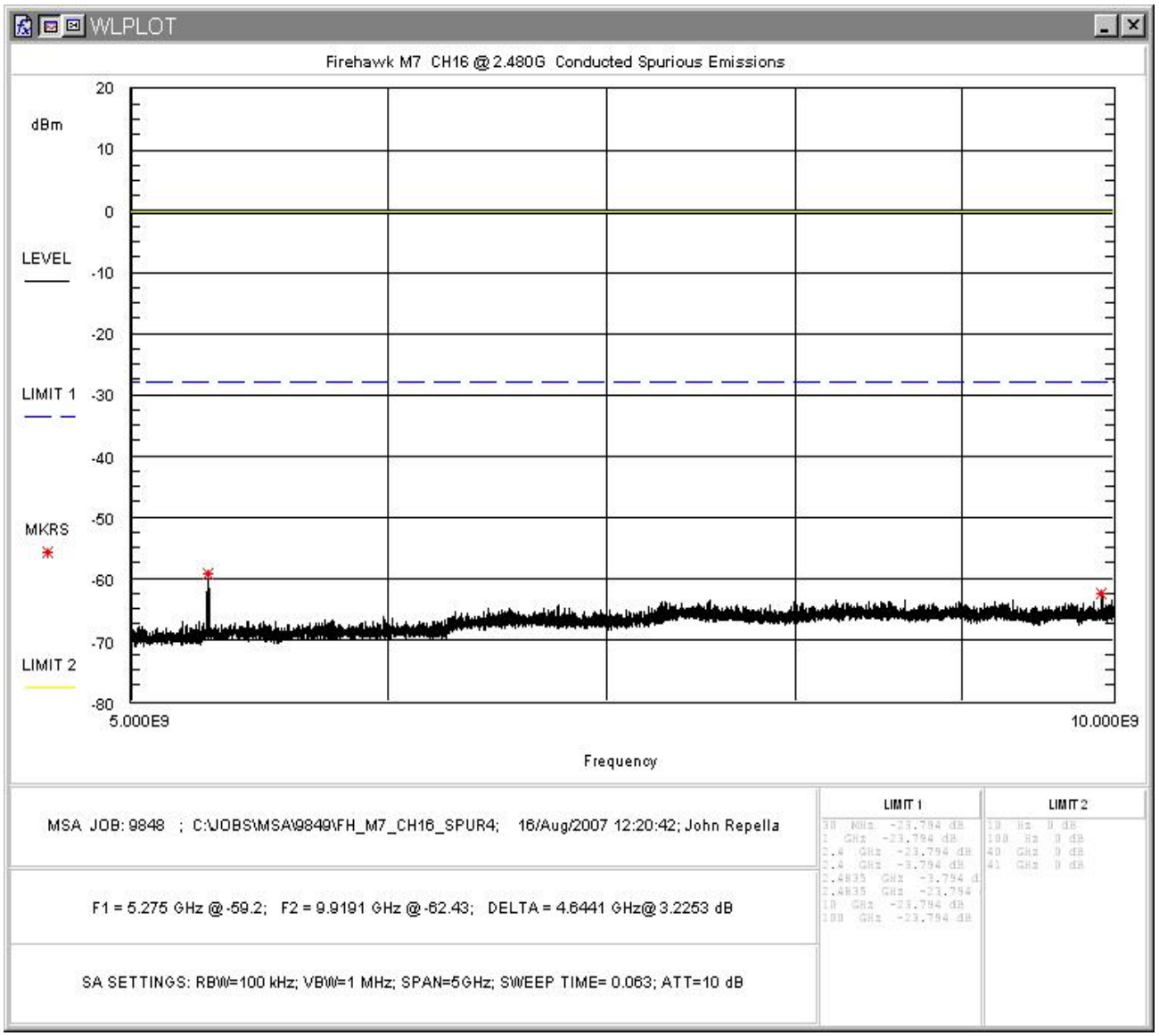

Figure 24. Conducted Spurious Emissions, High Channel, 5 - 10GHz

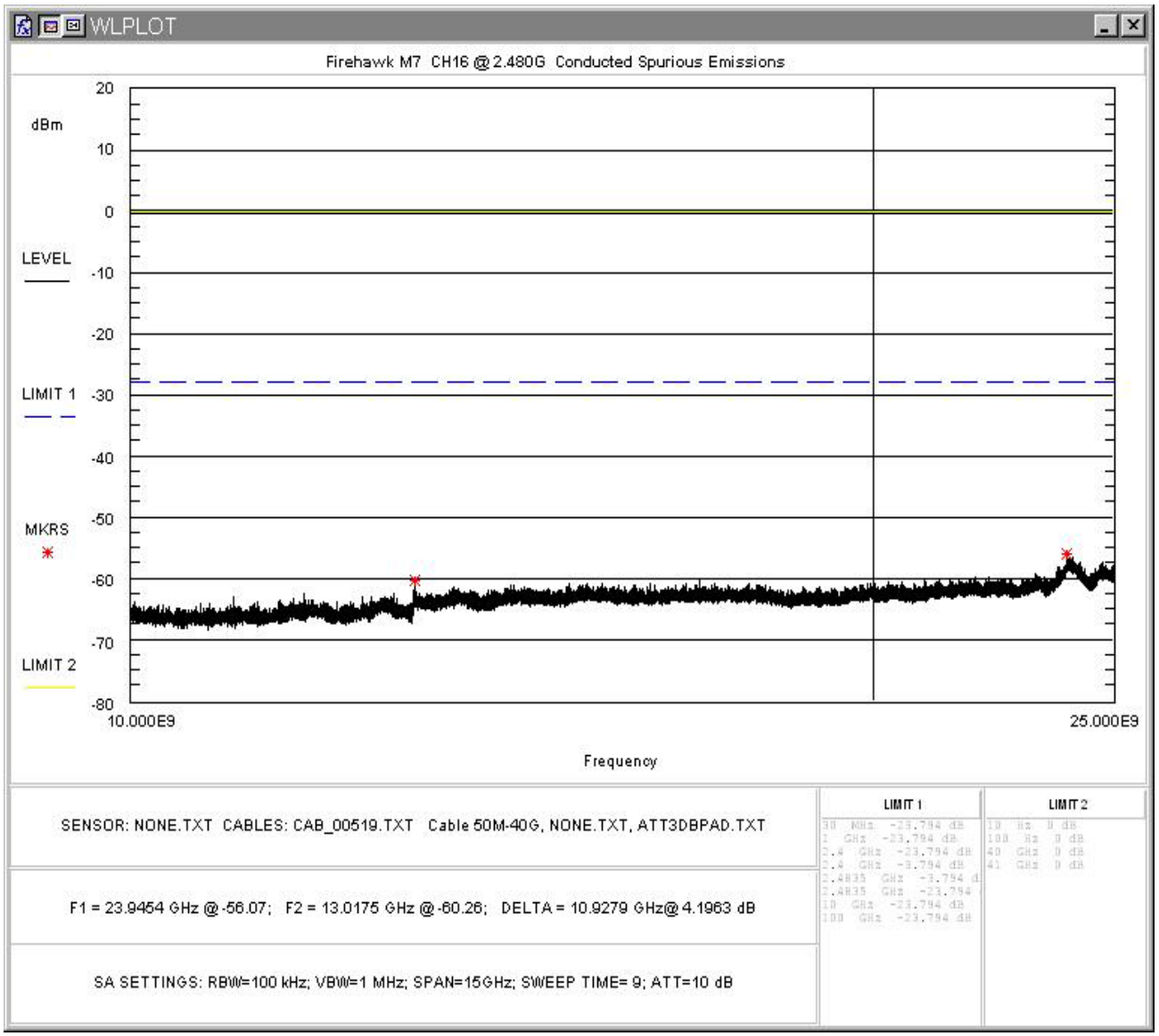

Figure 25. Conducted Spurious Emissions, High Channel, 10 - 25GHz

4.4 Power Spectral Density

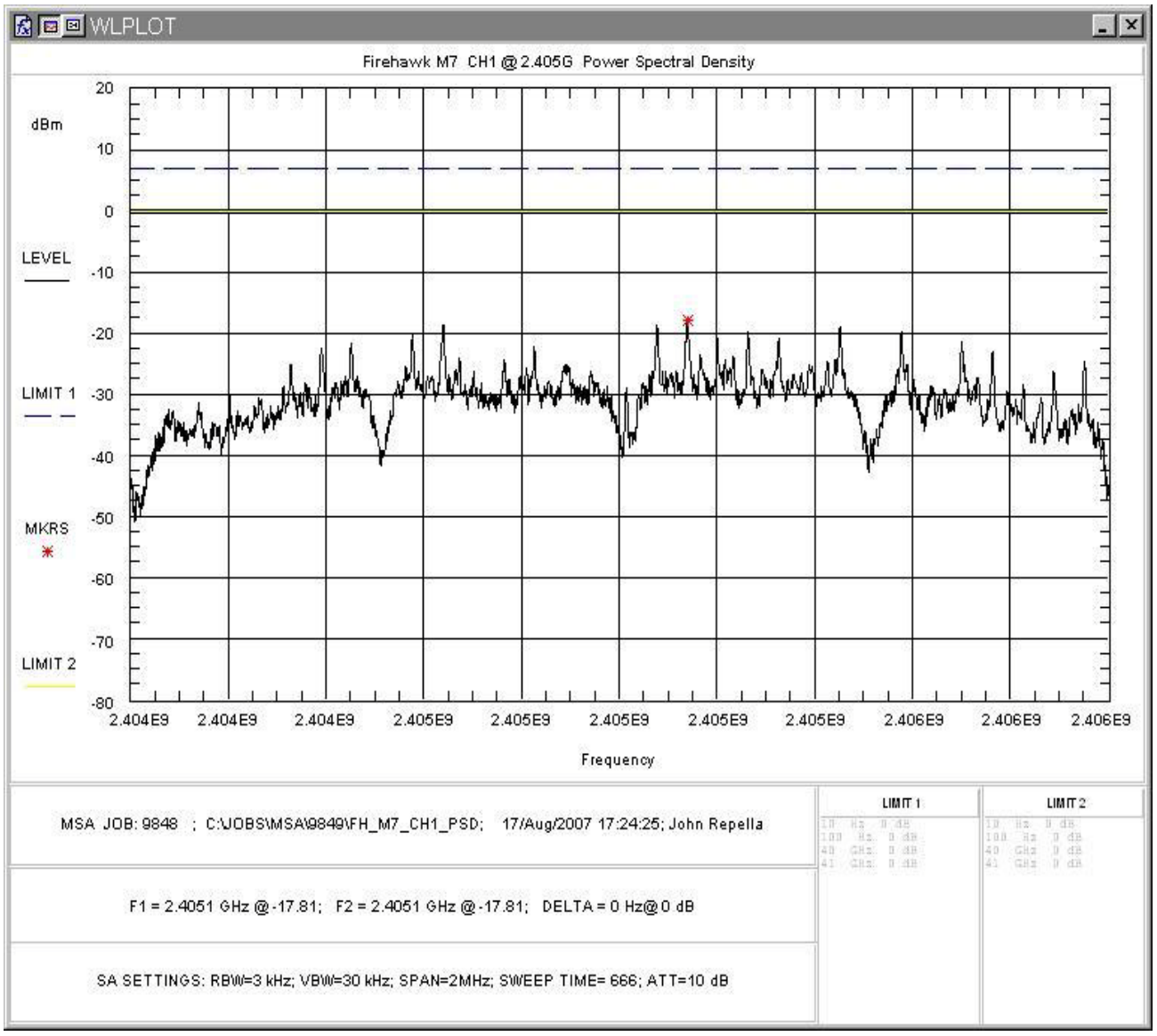

Figure 30. Power Spectral Density, Low Channel

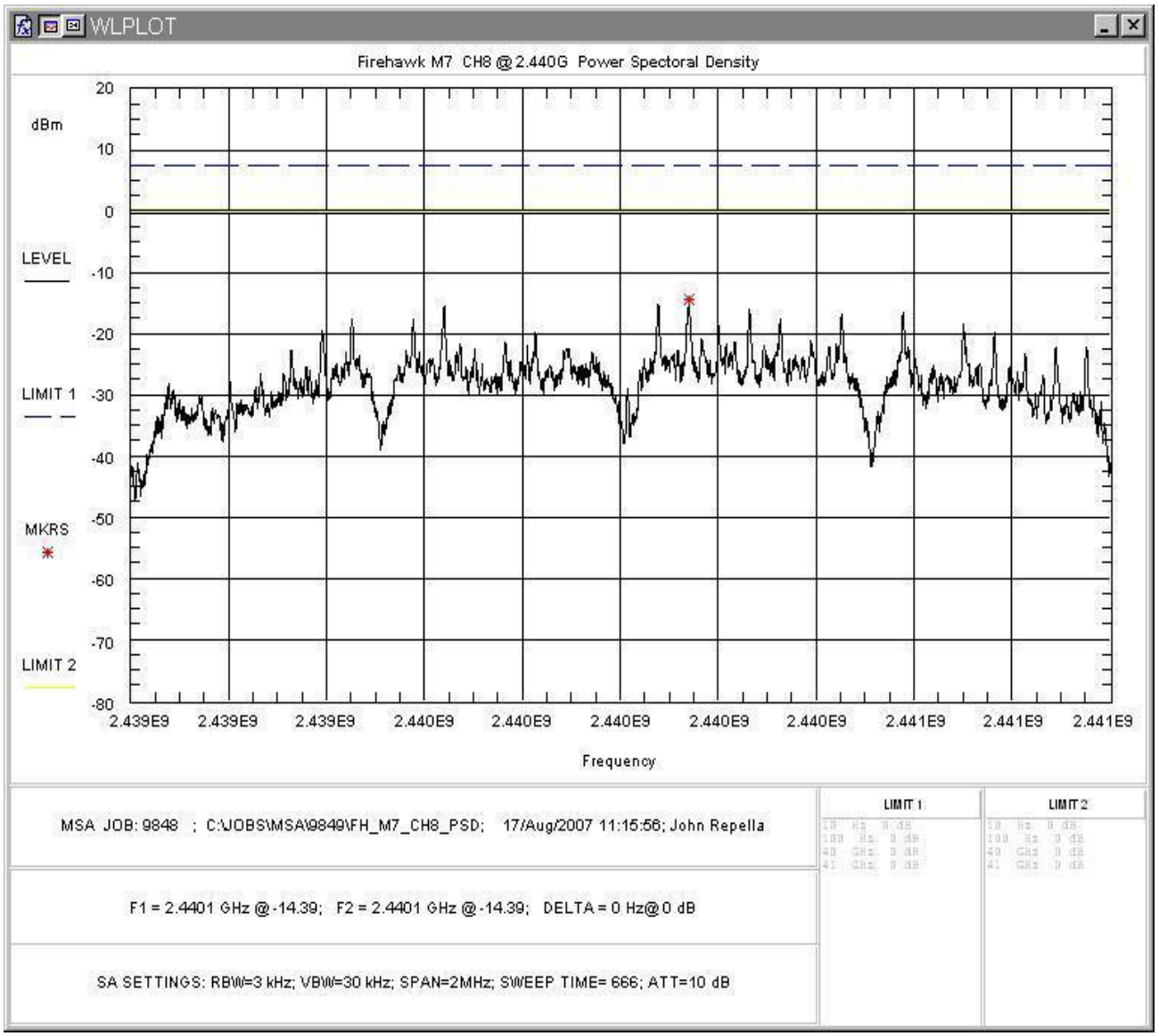

Figure 31. Power Spectral Density, Mid Channel

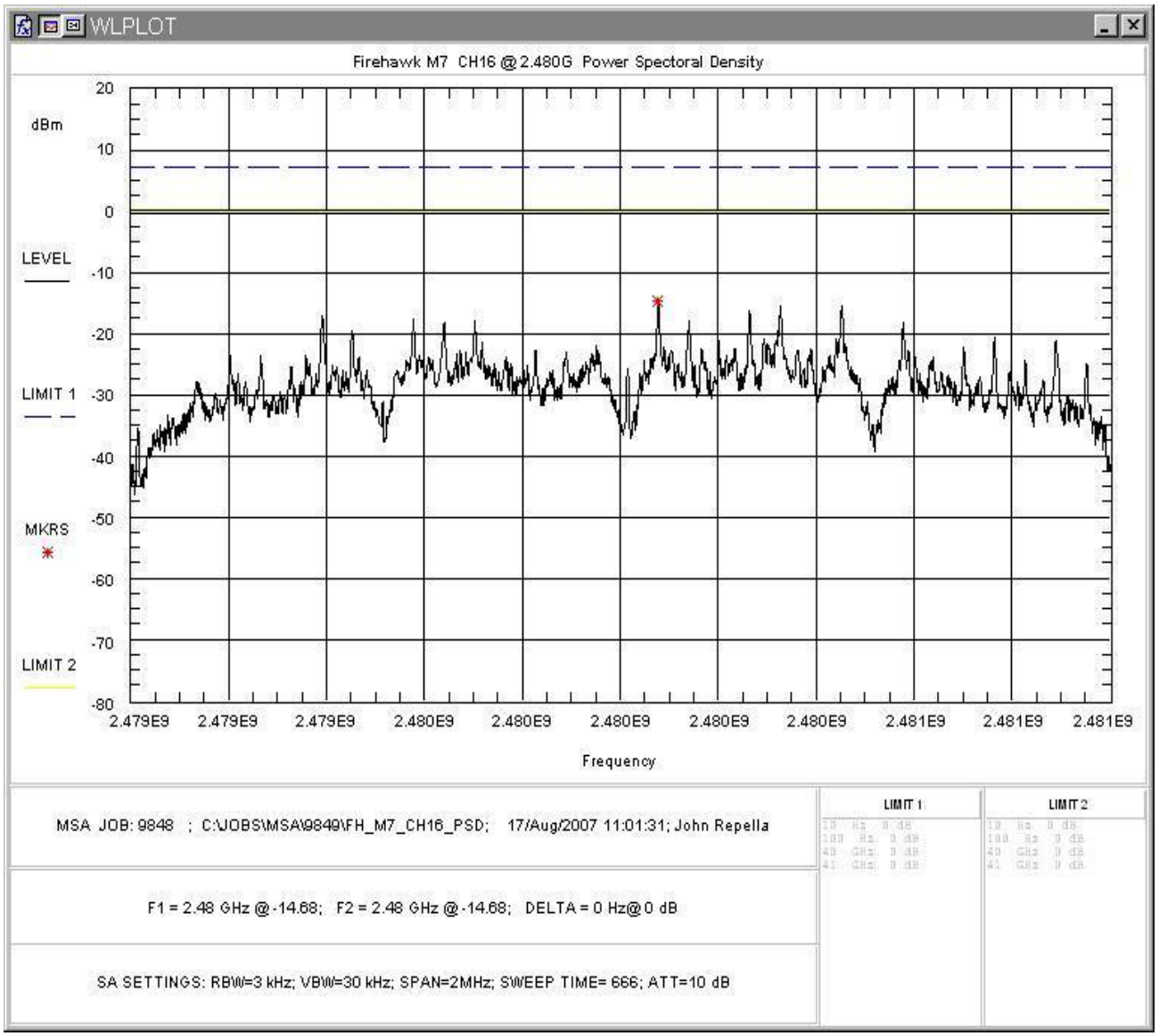

Figure 32. Power Spectral Density, High Channel

4.5 Radiated Spurious Emissions: (FCC Part §2.1053)

The EUT must comply with the requirements for radiated spurious emissions that fall within the restricted bands. These emissions must meet the limits specified in §15.209 and §15.35(b) for peak measurements.

4.5.1 Test Procedure

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

The emissions were measured using the following resolution bandwidths:

Frequency Range	Resolution Bandwidth	Video Bandwidth
30MHz-1000 MHz	120kHz	>100 kHz
>1000 MHz	1 MHz	<30 Hz (Avg.) 1MHz (Peak)

Table 5: Radiated Emission Test Data, Low Frequency Data (<1GHz)

Freq (MHz)	Polarity H/V	Azimuth Degree	Ant. Height (m)	SA Level (QP) (dBµV)	Ant. Corr. (dB/m)	Cable Corr. (dB)	Corr. Level (dBµV/m)	Corr. Level (µV/m)	Limit (µV/m)	Margin (dB)
51.900	H	348.0	1.0	7.3	8.0	1.3	16.6	6.7	100.0	-23.4
62.170	H	198.0	2.0	3.3	7.6	1.5	12.3	4.1	100.0	-27.7
117.900	H	304.0	218.0	5.7	13.7	2.0	21.4	11.8	150.0	-22.1
136.380	H	65.0	4.0	12.0	13.2	2.2	27.4	23.5	150.0	-16.1
240.000	H	223.0	1.3	8.4	11.3	2.9	22.6	13.6	200.0	-23.4
268.920	H	333.0	3.5	7.3	12.9	3.2	23.3	14.7	200.0	-22.7
300.000	H	298.0	1.0	3.4	13.3	3.4	20.1	10.1	200.0	-26.0
332.440	H	234.0	1.0	4.8	14.0	3.6	22.4	13.1	200.0	-23.6
365.560	H	248.0	1.0	6.5	14.7	3.7	24.9	17.6	200.0	-21.1
44.980	V	325.0	1.0	12.0	10.7	1.3	24.0	15.8	100.0	-16.0
51.982	V	83.0	1.0	17.5	8.0	1.3	26.8	21.8	100.0	-13.2
62.170	V	193.0	1.0	10.0	7.6	1.5	19.0	8.9	100.0	-21.0
136.380	V	221.0	1.0	9.6	13.2	2.2	25.0	17.8	150.0	-18.5
240.000	V	298.0	1.0	4.7	11.3	2.9	18.9	8.9	200.0	-27.1
268.920	V	126.0	4.0	14.0	12.9	3.2	30.0	31.7	200.0	-16.0
300.000	V	223.0	1.7	3.2	14.7	3.4	21.2	11.5	200.0	-24.8
332.440	V	177.0	186.0	5.7	14.0	3.6	23.3	14.6	200.0	-22.7
365.560	V	200.0	2.0	9.5	14.7	3.7	27.9	24.9	200.0	-18.1

Table 6: Radiated Emission Test Data, High Frequency Data (>1GHz)

(Restricted Bands)

Test Engineer(s): John P. Repella, Steve Dovell

Test Date(s): 8/21/07

Low Channel TX @ 2405MHz

Frequency (MHz)	Pol H/V	Az Deg	Ant. Ht (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)	Notes
2405 (X)												
4810.000	V	0.0	1.0	38.8	32.5	6.1	34.3	43.1	143.5	5000.0	-30.8	Peak AMB
4810.000	V	0.0	1.0	31.7	32.5	6.1	34.3	36.0	63.4	500.0	-17.9	Avg AMB
12025.000	V	180.0	1.0	47.0	40.0	12.3	34.8	64.5	1674.5	5000.0	-9.5	Peak AMB
12025.000	V	180.0	1.0	31.7	40.0	12.3	34.8	49.2	287.7	500.0	-4.8	Avg AMB
4810.000	H	0.0	1.0	38.8	32.5	6.1	34.3	43.1	143.5	5000.0	-30.8	Peak AMB
4810.000	H	0.0	1.0	31.7	32.5	6.1	34.3	36.0	63.4	500.0	-17.9	Avg AMB
12025.000	H	180.0	1.0	47.0	40.0	12.3	34.8	64.5	1674.5	5000.0	-9.5	Peak AMB
12025.000	H	180.0	1.0	31.7	40.0	12.3	34.8	49.2	287.7	500.0	-4.8	Avg AMB
2405 (Y)												
4810.000	V	0.0	1.0	38.8	32.5	6.1	34.3	43.1	143.5	5000.0	-30.8	Peak AMB
4810.000	V	0.0	1.0	31.7	32.5	6.1	34.3	36.0	63.4	500.0	-17.9	Avg AMB
12025.000	V	180.0	1.0	47.0	40.0	12.3	34.8	64.5	1674.5	5000.0	-9.5	Peak AMB
12025.000	V	180.0	1.0	31.7	40.0	12.3	34.8	49.2	287.7	500.0	-4.8	Avg AMB
4810.000	H	0.0	1.0	38.8	32.5	6.1	34.3	43.1	143.5	5000.0	-30.8	Peak AMB
4810.000	H	0.0	1.0	31.7	32.5	6.1	34.3	36.0	63.4	500.0	-17.9	Avg AMB
12025.000	H	180.0	1.0	47.0	40.0	12.3	34.8	64.5	1674.5	5000.0	-9.5	Peak AMB
12025.000	H	180.0	1.0	31.7	40.0	12.3	34.8	49.2	287.7	500.0	-4.8	Avg AMB
2405 (Z)												
4810.000	V	0.0	1.0	38.8	32.5	6.1	34.3	43.1	143.5	5000.0	-30.8	Peak AMB
4810.000	V	0.0	1.0	31.7	32.5	6.1	34.3	36.0	63.4	500.0	-17.9	Avg AMB
12025.000	V	180.0	1.0	47.0	40.0	12.3	34.8	64.5	1674.5	5000.0	-9.5	Peak AMB
12025.000	V	180.0	1.0	31.7	40.0	12.3	34.8	49.2	287.7	500.0	-4.8	Avg AMB
4810.000	H	0.0	1.0	38.8	32.5	6.1	34.3	43.1	143.5	5000.0	-30.8	Peak AMB
4810.000	H	0.0	1.0	31.7	32.5	6.1	34.3	36.0	63.4	500.0	-17.9	Avg AMB
12025.000	H	180.0	1.0	47.0	40.0	12.3	34.8	64.5	1674.5	5000.0	-9.5	Peak AMB
12025.000	H	180.0	1.0	31.7	40.0	12.3	34.8	49.2	287.7	500.0	-4.8	Avg AMB

Middle Channel TX @2440MHz

Frequency (MHz)	Pol H/V	Az Deg	Ant. Ht (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)	Notes
2440 (X)												
4880.000	V	0.0	1.0	44.2	32.6	6.2	34.3	48.7	271.4	5000.0	-25.3	Peak AMB
4880.000	V	0.0	1.0	32.0	32.6	6.2	34.3	36.5	66.6	500.0	-17.5	Avg AMB
7320.000	V	0.0	1.0	39.1	37.1	8.0	34.7	49.5	297.6	5000.0	-24.5	Peak AMB
7320.000	V	0.0	1.0	33.0	37.1	8.0	34.7	43.4	147.4	500.0	-10.6	Avg AMB
12200.000	V	0.0	1.0	45.3	40.0	12.7	34.6	63.3	1464.9	5000.0	-10.7	Peak AMB
12200.000	V	0.0	1.0	32.5	40.0	12.7	34.6	50.5	335.6	500.0	-3.5	Avg AMB
4880.000	H	0.0	1.0	32.0	32.6	6.2	34.3	36.5	66.6	5000.0	-37.5	Peak AMB
4880.000	H	0.0	1.0	38.8	32.6	6.2	34.3	43.3	145.7	500.0	-10.7	Avg AMB
7320.000	H	0.0	1.0	39.1	37.1	8.0	34.7	49.5	297.6	5000.0	-24.5	Peak AMB
7320.000	H	0.0	1.0	33.0	37.1	8.0	34.7	43.4	147.4	500.0	-10.6	Avg AMB
12200.000	H	0.0	1.0	45.3	40.0	12.7	34.6	63.3	1464.9	5000.0	-10.7	Peak AMB
12200.000	H	0.0	1.0	32.5	40.0	12.7	34.6	50.5	335.6	500.0	-3.5	Avg AMB
2440 (Y)												
4880.000	V	0.0	1.0	44.2	32.6	6.2	34.3	48.7	271.4	5000.0	-25.3	Peak AMB
4880.000	V	0.0	1.0	32.0	32.6	6.2	34.3	36.5	66.6	500.0	-17.5	Avg AMB
7320.000	V	0.0	1.0	39.1	37.1	8.0	34.7	49.5	297.6	5000.0	-24.5	Peak AMB
7320.000	V	0.0	1.0	33.0	37.1	8.0	34.7	43.4	147.4	500.0	-10.6	Avg AMB
12200.000	V	0.0	1.0	45.3	40.0	12.7	34.6	63.3	1464.9	5000.0	-10.7	Peak AMB
12200.000	V	0.0	1.0	32.5	40.0	12.7	34.6	50.5	335.6	500.0	-3.5	Avg AMB
4880.000	H	0.0	1.0	32.0	32.6	6.2	34.3	36.5	66.6	5000.0	-37.5	Peak AMB
4880.000	H	0.0	1.0	38.8	32.6	6.2	34.3	43.3	145.7	500.0	-10.7	Avg AMB
7320.000	H	0.0	1.0	39.1	37.1	8.0	34.7	49.5	297.6	5000.0	-24.5	Peak AMB
7320.000	H	0.0	1.0	33.0	37.1	8.0	34.7	43.4	147.4	500.0	-10.6	Avg AMB
12200.000	H	0.0	1.0	45.3	40.0	12.7	34.6	63.3	1464.9	5000.0	-10.7	Peak AMB
12200.000	H	0.0	1.0	32.5	40.0	12.7	34.6	50.5	335.6	500.0	-3.5	Avg AMB
2440 (Z)												
4880.000	V	0.0	1.0	44.2	32.6	6.2	34.3	48.7	271.4	5000.0	-25.3	Peak AMB
4880.000	V	0.0	1.0	32.0	32.6	6.2	34.3	36.5	66.6	500.0	-17.5	Avg AMB
7320.000	V	0.0	1.0	39.1	37.1	8.0	34.7	49.5	297.6	5000.0	-24.5	Peak AMB
7320.000	V	0.0	1.0	33.0	37.1	8.0	34.7	43.4	147.4	500.0	-10.6	Avg AMB
12200.000	V	0.0	1.0	45.3	40.0	12.7	34.6	63.3	1464.9	5000.0	-10.7	Peak AMB
12200.000	V	0.0	1.0	32.5	40.0	12.7	34.6	50.5	335.6	500.0	-3.5	Avg AMB
4880.000	H	0.0	1.0	32.0	32.6	6.2	34.3	36.5	66.6	5000.0	-37.5	Peak AMB
4880.000	H	0.0	1.0	38.8	32.6	6.2	34.3	43.3	145.7	500.0	-10.7	Avg AMB
7320.000	H	0.0	1.0	39.1	37.1	8.0	34.7	49.5	297.6	5000.0	-24.5	Peak AMB
7320.000	H	0.0	1.0	33.0	37.1	8.0	34.7	43.4	147.4	500.0	-10.6	Avg AMB
12200.000	H	0.0	1.0	45.3	40.0	12.7	34.6	63.3	1464.9	5000.0	-10.7	Peak AMB
12200.000	H	0.0	1.0	32.5	40.0	12.7	34.6	50.5	335.6	500.0	-3.5	Avg AMB

High Channel TX @ 2480MHz

Frequency (MHz)	Pol H/V	Az Deg	Ant. Ht (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)	Notes
2480 (X)												
4960.000	V	0.0	1.0	44.2	32.7	6.2	34.3	48.8	276.2	5000.0	-25.2	Peak AMB
4960.000	V	0.0	1.0	32.0	32.7	6.2	34.3	36.6	67.8	500.0	-17.4	Avg AMB
7440.000	V	0.0	1.0	39.1	37.1	8.1	34.8	49.5	299.7	5000.0	-24.4	Peak AMB
7440.000	V	0.0	1.0	33.0	37.1	8.1	34.8	43.4	148.5	500.0	-10.5	Avg AMB
12400.000	V	0.0	1.0	45.3	40.0	13.1	34.5	63.9	1570.8	5000.0	-10.1	Peak AMB
12400.000	V	0.0	1.0	32.5	40.0	13.1	34.5	51.1	359.9	500.0	-2.9	Avg AMB
4960.000	H	0.0	1.0	32.0	32.7	6.2	34.3	36.6	67.8	5000.0	-37.4	Peak AMB
4960.000	H	0.0	1.0	38.8	32.7	6.2	34.3	43.4	148.3	500.0	-10.6	Avg AMB
7440.000	H	0.0	1.0	39.1	37.1	8.1	34.8	49.5	299.7	5000.0	-24.4	Peak AMB
7440.000	H	0.0	1.0	33.0	37.1	8.1	34.8	43.4	148.5	500.0	-10.5	Avg AMB
12400.000	H	0.0	1.0	45.3	40.0	13.1	34.5	63.9	1570.8	5000.0	-10.1	Peak AMB
12400.000	H	0.0	1.0	32.5	40.0	13.1	34.5	51.1	359.9	500.0	-2.9	Avg AMB
2480 (Y)												
4960.000	V	0.0	1.0	44.2	32.7	6.2	34.3	48.8	276.2	5000.0	-25.2	Peak AMB
4960.000	V	0.0	1.0	32.0	32.7	6.2	34.3	36.6	67.8	500.0	-17.4	Avg AMB
7440.000	V	0.0	1.0	39.1	37.1	8.1	34.8	49.5	299.7	5000.0	-24.4	Peak AMB
7440.000	V	0.0	1.0	33.0	37.1	8.1	34.8	43.4	148.5	500.0	-10.5	Avg AMB
12400.000	V	0.0	1.0	45.3	40.0	13.1	34.5	63.9	1570.8	5000.0	-10.1	Peak AMB
12400.000	V	0.0	1.0	32.5	40.0	13.1	34.5	51.1	359.9	500.0	-2.9	Avg AMB
4960.000	H	0.0	1.0	32.0	32.7	6.2	34.3	36.6	67.8	5000.0	-37.4	Peak AMB
4960.000	H	0.0	1.0	38.8	32.7	6.2	34.3	43.4	148.3	500.0	-10.6	Avg AMB
7440.000	H	0.0	1.0	39.1	37.1	8.1	34.8	49.5	299.7	5000.0	-24.4	Peak AMB
7440.000	H	0.0	1.0	33.0	37.1	8.1	34.8	43.4	148.5	500.0	-10.5	Avg AMB
12400.000	H	0.0	1.0	45.3	40.0	13.1	34.5	63.9	1570.8	5000.0	-10.1	Peak AMB
12400.000	H	0.0	1.0	32.5	40.0	13.1	34.5	51.1	359.9	500.0	-2.9	Avg AMB
2480 (Z)												
4960.000	V	0.0	1.0	44.2	32.7	6.2	34.3	48.8	276.2	5000.0	-25.2	Peak AMB
4960.000	V	0.0	1.0	32.0	32.7	6.2	34.3	36.6	67.8	500.0	-17.4	Avg AMB
7440.000	V	0.0	1.0	39.1	37.1	8.1	34.8	49.5	299.7	5000.0	-24.4	Peak AMB
7440.000	V	0.0	1.0	33.0	37.1	8.1	34.8	43.4	148.5	500.0	-10.5	Avg AMB
12400.000	V	0.0	1.0	45.3	40.0	13.1	34.5	63.9	1570.8	5000.0	-10.1	Peak AMB
12400.000	V	0.0	1.0	32.5	40.0	13.1	34.5	51.1	359.9	500.0	-2.9	Avg AMB
4960.000	H	0.0	1.0	32.0	32.7	6.2	34.3	36.6	67.8	5000.0	-37.4	Peak AMB
4960.000	H	0.0	1.0	38.8	32.7	6.2	34.3	43.4	148.3	500.0	-10.6	Avg AMB
7440.000	H	0.0	1.0	39.1	37.1	8.1	34.8	49.5	299.7	5000.0	-24.4	Peak AMB
7440.000	H	0.0	1.0	33.0	37.1	8.1	34.8	43.4	148.5	500.0	-10.5	Avg AMB
12400.000	H	0.0	1.0	45.3	40.0	13.1	34.5	63.9	1570.8	5000.0	-10.1	Peak AMB
12400.000	H	0.0	1.0	32.5	40.0	13.1	34.5	51.1	359.9	500.0	-2.9	Avg AMB