



**FCC Certification Test Report
for
Mine Safety Appliances
FireHawk® M7 Control & Power Module
FCC ID: P9R-10075346**

September 21, 2007

Prepared for:

**Mine Safety Appliances, Instrument Division
1000 Cranberry Woods Drive
Pittsburgh, PA 16066**

Prepared By:

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WLL JOB# 9851

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Compliance Engineer

Reviewed by: Steven D. Koster
EMC Operations Manager

Abstract

This report has been prepared on behalf of Mine Safety Appliances, Instrument Division to support the attached Application for Equipment Authorization. The test report and application are submitted for an Intentional Radiator under Part 15.209 of the FCC Rules and Regulations. This Federal Communication Commission (FCC) Certification Test Report documents the test configuration and test results for a Mine Safety Appliances FireHawk® M7 Control Module.

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 Appliances FireHawk® M7 Control Module complies with the limits for an Intentional Radiator device under Part 15.209 of the FCC Rules and Regulations.

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1 Introduction

1.1 Compliance Statement

The Mine Safety Appliances FireHawk® M7 Control Module complies with the limits for a Intentional Radiator device under Part 15.209 of the FCC Rules and Regulations.

1.2 Test Scope

Tests for radiated 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: Mine Safety Appliances, Instrument Division
1000 Cranberry Woods Drive
Pittsburgh, PA 16066

Quotation Number: 63621A

1.4 Test Dates

Testing was performed on August 16, 2007.

1.5 Test and Support Personnel

Washington Laboratories, LTD	Steven Dovell
Customer	Greg Imblum

1.6 Abbreviations

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

2 Equipment Under Test

2.1 EUT Identification & Description

The Mine Safety Appliances FireHawk® M7 Control Module is a component of the FireHawk® M7 Firemen Safety system. The control module / transmitter is mounted in the same location as the pneumatic pressure gage on a Self Contained Breathing Apparatus (SCBA). It contains a numeric display an integral electronic pressure transducer that measures the pressure in the gage line. The receiver (also known as the Heads Up Display (HUD)) is mounted to the face piece in the user's lower right hand corner of the lens. The HUD incorporates numerous LEDs to indicate various functions, primarily remaining tank capacity. This product uses magnetic induction to couple the transmitter to the receiver over a distance of up to eighteen (18) inches.

The RF ID Tag uses the same magnetic induction coupling to transmit user ID to the control module. The ID Tag is activated by swiping it by a magnet housed in the control unit. The ID Tag is powered by a single coin cell battery.

Table 1. Device Summary

ITEM	DESCRIPTION
Manufacturer:	Mine Safety Appliances
FCC ID:	P9R-10075346
EUT Name:	FireHawk® M7
Model:	Control Module
FCC Rule Parts:	§15.209
Frequency Range:	27kHz
Occupied Bandwidth:	3.56 kHz
Keying:	Automatic
Type of Information:	Data
Number of Channels:	1
Power Output Level	Fixed
Antenna Type	Integral
Interface Cables:	None
Power Source & Voltage:	Battery

2.2 Test Configuration

The Control Module was tested in a stand-alone configuration.

2.3 Testing Algorithm

The Control Module was operated continuously by being placed into a continuous transmit mode.

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. 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:

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

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

Test Name:	Radiated Emissions	Test Date: 8/16/2007	
Asset #	Manufacturer/Model	Description	Cal. Due
00031	EMCO, 6502	ANTENNA, ACTIVE LOOP	2/12/2008
00618	HP 8563A	ANALYZER, SPECTRUM	2/9/2008
00069	HP, 85650A	ADAPTER, QP	7/6/2008
00007	ARA, LPB-2520	ANTENNA, BICONILOG ANTENNA	6/7/2008
00073	HP, 8568B	ANALYZER, SPECTRUM	7/6/2008
00071	HP, 85685A	PRESELECTOR, RF	7/6/2008

4 Test Results

4.1 Occupied Bandwidth: (FCC Part §2.1049)

Occupied bandwidth was performed by setting the EUT near the loop antenna to allow for sufficient pickup of the signal.

At full modulation, the occupied bandwidth (10dB) was measured at 3.56 kHz as shown in the following plot:

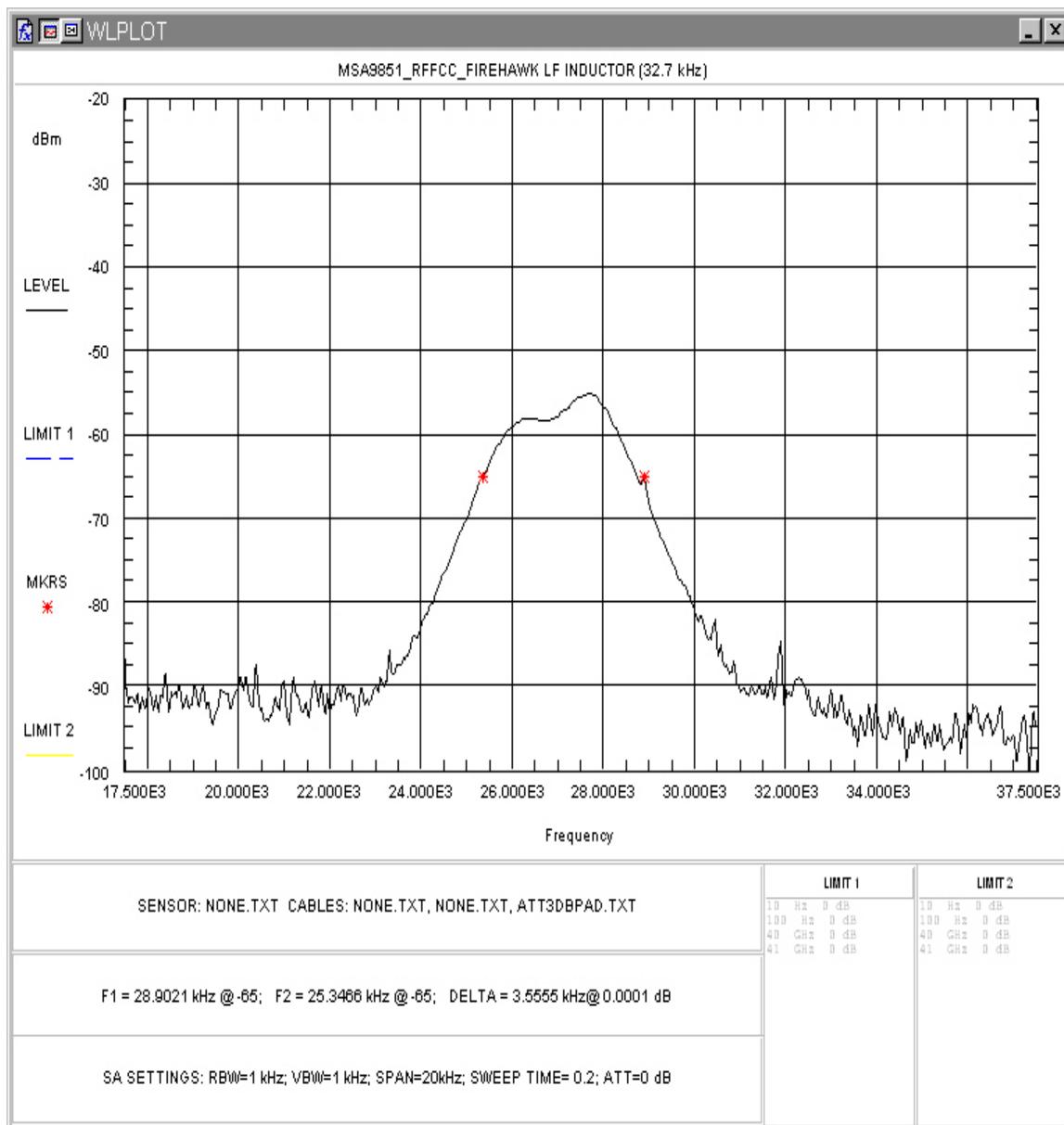


Figure 1. Occupied Bandwidth

4.2 Radiated Spurious Emissions: (FCC Part §15.209)

Transmitters operating under §15.209 must comply with the radiated emissions listed in the following table:

Table 3. Radiated Emissions Limits

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

4.2.1 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. Both the horizontal and vertical field components were measured.

The EUT was scanned to 30MHz. No emissions were detectable at 3 meters test distance. Emission plots to 400kHz showing the ambient and with the unit on are included in Figure 2 and Figure 3. A 0 meter scan was then performed to 400kHz to verify the fundamental and other spurious emissions. Ambient measurements at 0 meters are shown in Figure 4. A plot showing the 0 meter scan emissions is shown in Figure 5. The limit has been interpolated to 3m using the 40dB per decade roll-off.

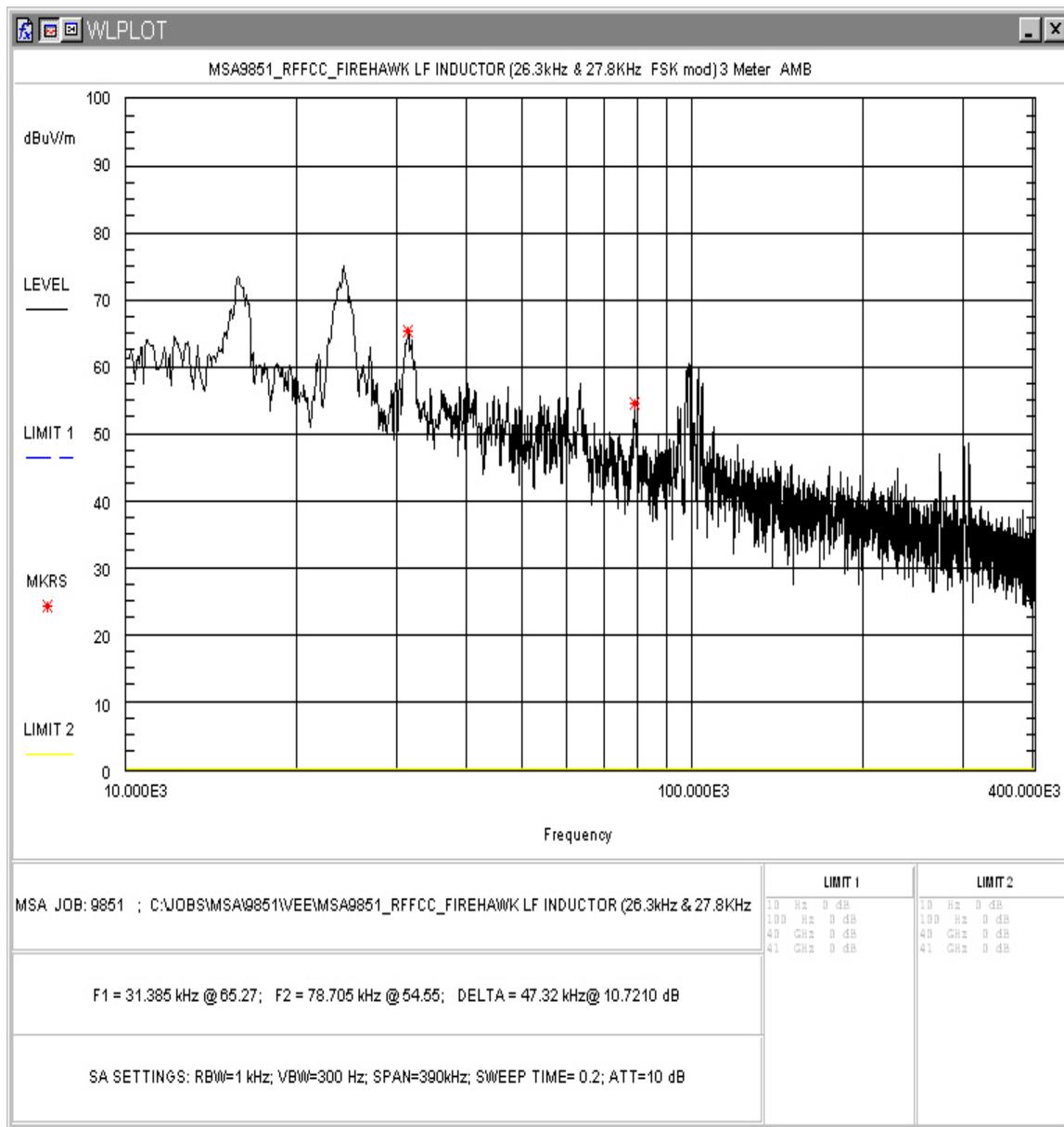


Figure 2. Radiated Emissions Test Data, Ambient, 3 meters

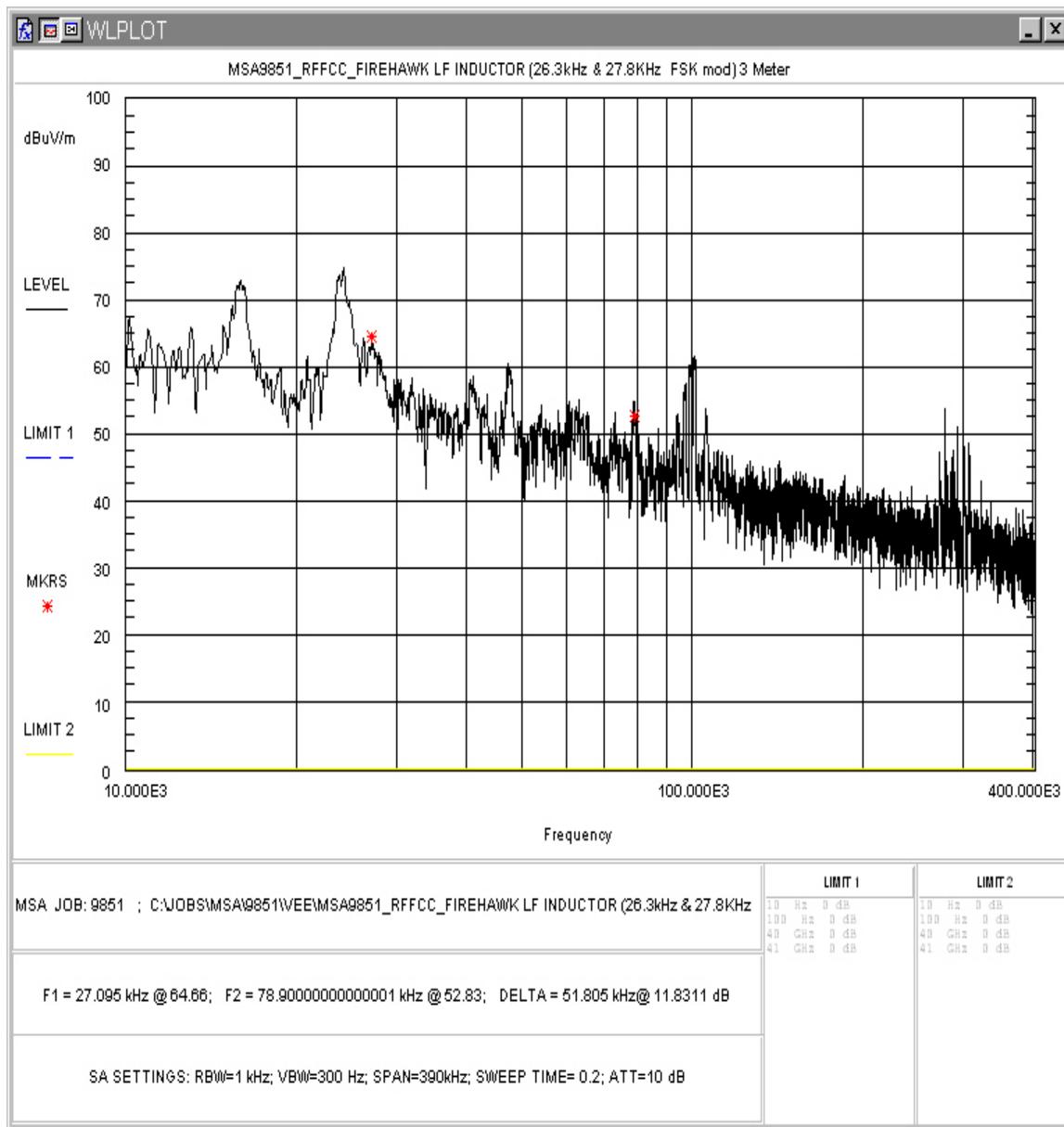


Figure 3. Radiated Emissions Test Data, 3 meters

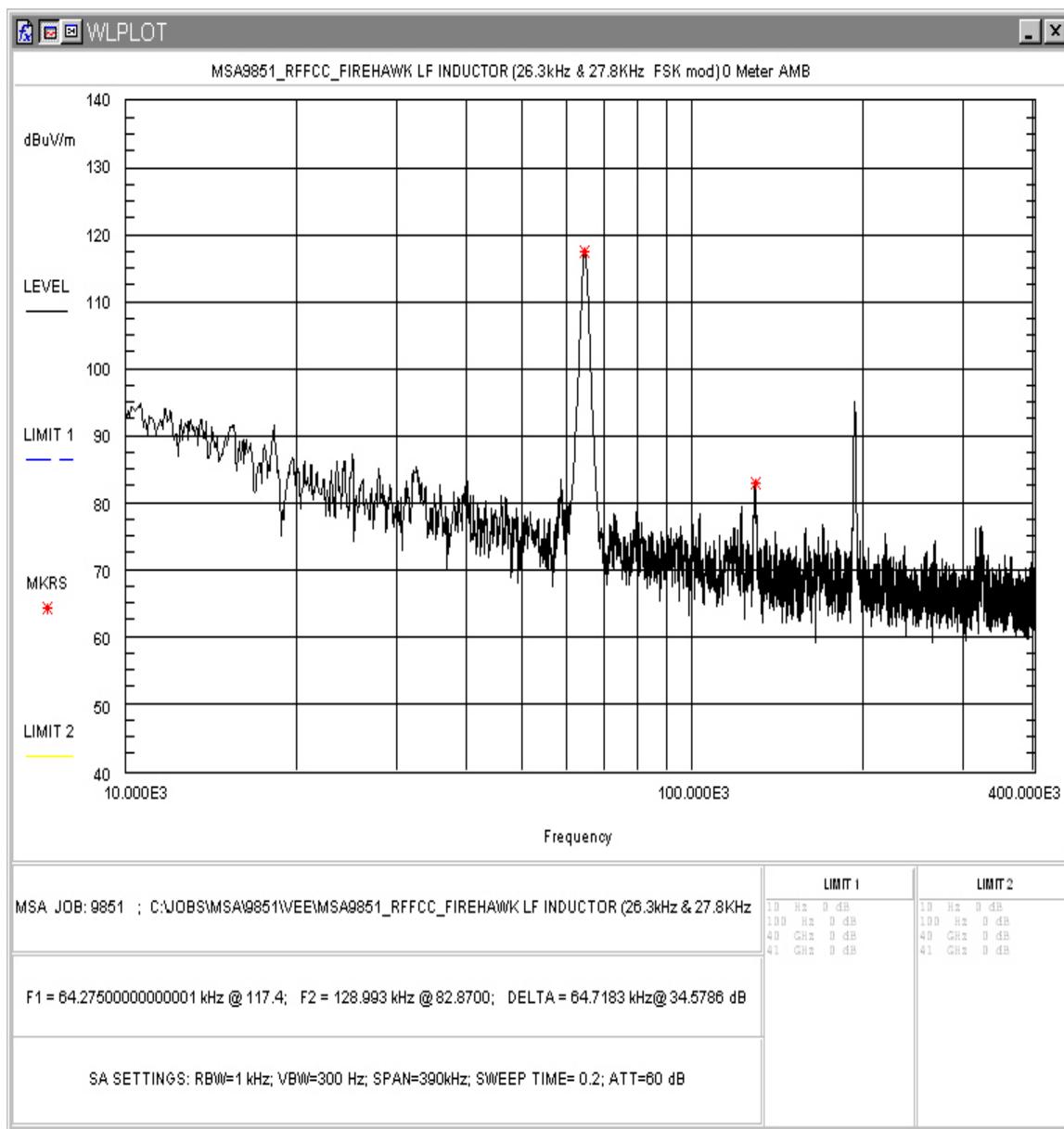


Figure 4. Radiated Emissions Test Data, Ambient, 0 meters

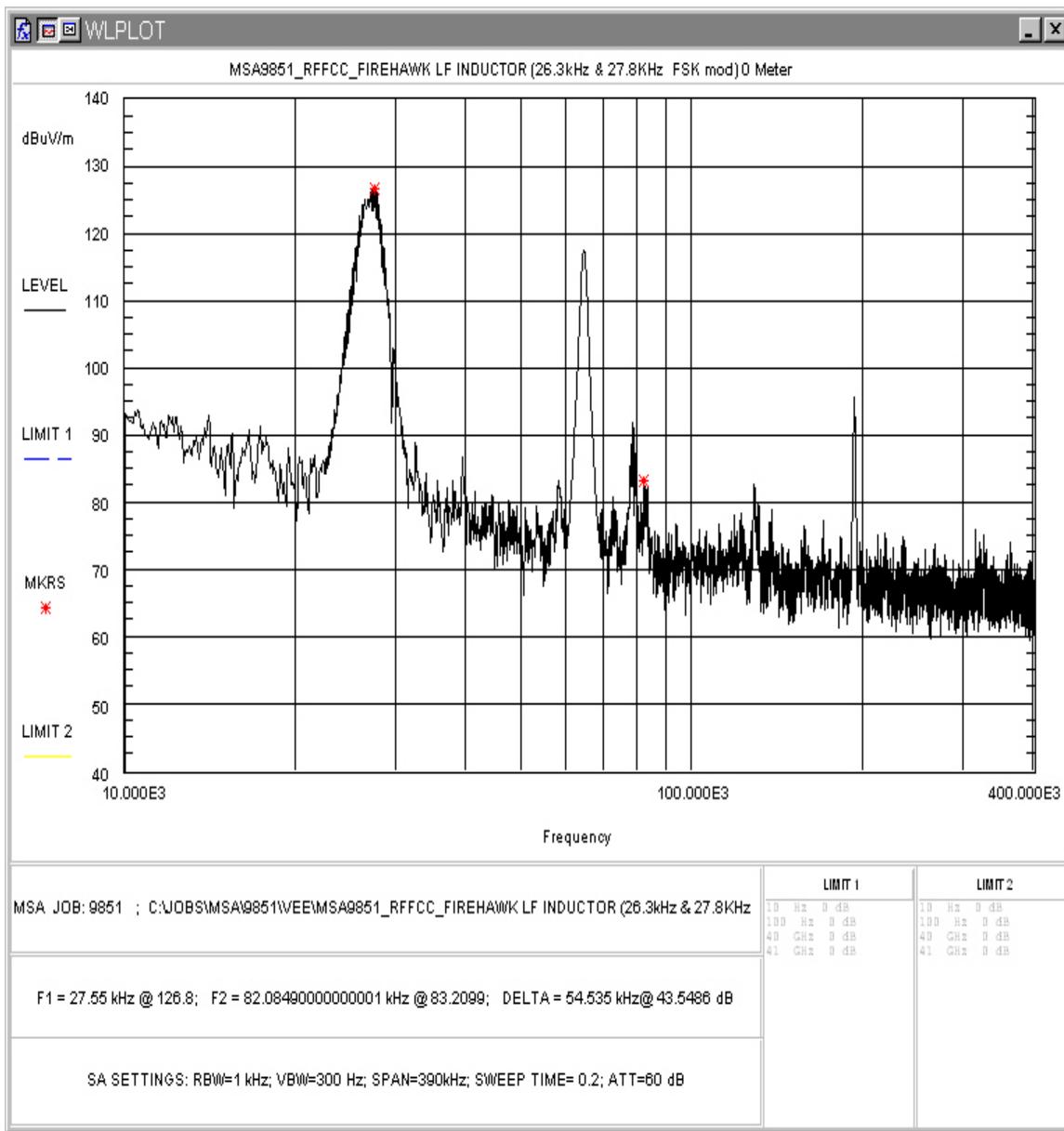


Figure 5. Radiated Emissions Test Data, 0 meters

Table 4. Radiated Emissions Test Data

Frequency (MHz)	Polarity H/V	Azimuth Degree	Ant. Height (m)	SA Level (QP) (dB μ V)	Ant. Corr. (dB/m)	Cable Corr. (dB)	Corr. Level (dB μ V/m)	Corr. Level (μ V/m)	Limit (μ V/m)	Margin (dB)
0.028	V	180.0	1.0	45.3	13.1	0.0	58.4	827.3	872727.3	-60.5
0.055	V	279.0	1.0	37.6	10.8	0.0	48.4	263.2	436363.6	-64.4
0.083	V	180.0	1.0	32.0	10.4	0.0	42.4	132.3	290909.1	-66.8
0.272	V	0.0	1.0	37.7	10.2	0.0	47.9	248.3	88154.3	-51.0
0.301	V	0.0	1.0	34.5	10.2	0.0	44.7	171.8	79760.7	-53.3
0.454	V	0.0	1.0	32.0	10.2	0.0	42.2	128.8	52886.7	-52.3

$$\text{Limit} = 10^{((40 * \text{LOG}(300/3)) + (20 * \log(2400/f))) / 20}$$

872727.3 μ V/m