Washington Laboratories, Ltd.

FCC Certification Test Report
For the
Proxim Corporation
AP4900MR-LR
(2.4GHz Radio, 802.11b Mode)
FCC ID: HZB-4900LR

WLL JOB# **9141**
July 19, 2006

Revised October 17, 2006

Prepared for:

Proxim Corporation
2115 O'Nel Drive
San Jose, CA 95131

Prepared By:

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7560 Lindbergh Drive
Gaithersburg, Maryland 20879

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Documentation Specialist

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Chief EMC Engineer

Abstract

This report has been prepared on behalf of Proxim Corporation 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 Proxim Corporation AP4900MR-LR 2.4GHz card operating in the 802.11b mode. A separate test report covers the 802.11a 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 Proxim Corporation AP4900MR-LR complies 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 Proxim Corporation AP4900MR-LR complies with the limits for a Digital Transmission System Transmitter device under FCC Part 15.247.

1.2 Test Scope

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.

1.3 Contract Information

Customer:	Proxim Corporation 2115 O'Nel Drive San Jose, CA 95131
Purchase Order Number:	P06040012
Quotation Number:	62929

1.4 Test Dates

Testing performed on the following date(s): July 13 to July 14, 2006

1.5 Test and Support Personnel

Washington Laboratories, LTD	James Ritter
Client Representative	Michael F. Young

2 Equipment Under Test

2.1 EUT Identification & Description

The Proxim Corporation AP4900MR-LR is one configuration of dual band access point product line.

- 2.4GHz + 4.9 GHz public safety radio

The **2.4 GHz 802.11b** portion of the radio is reported here.

The other sections are reported separately. Both have separate amplifier boards that are mounted in the metal case with the access point device.

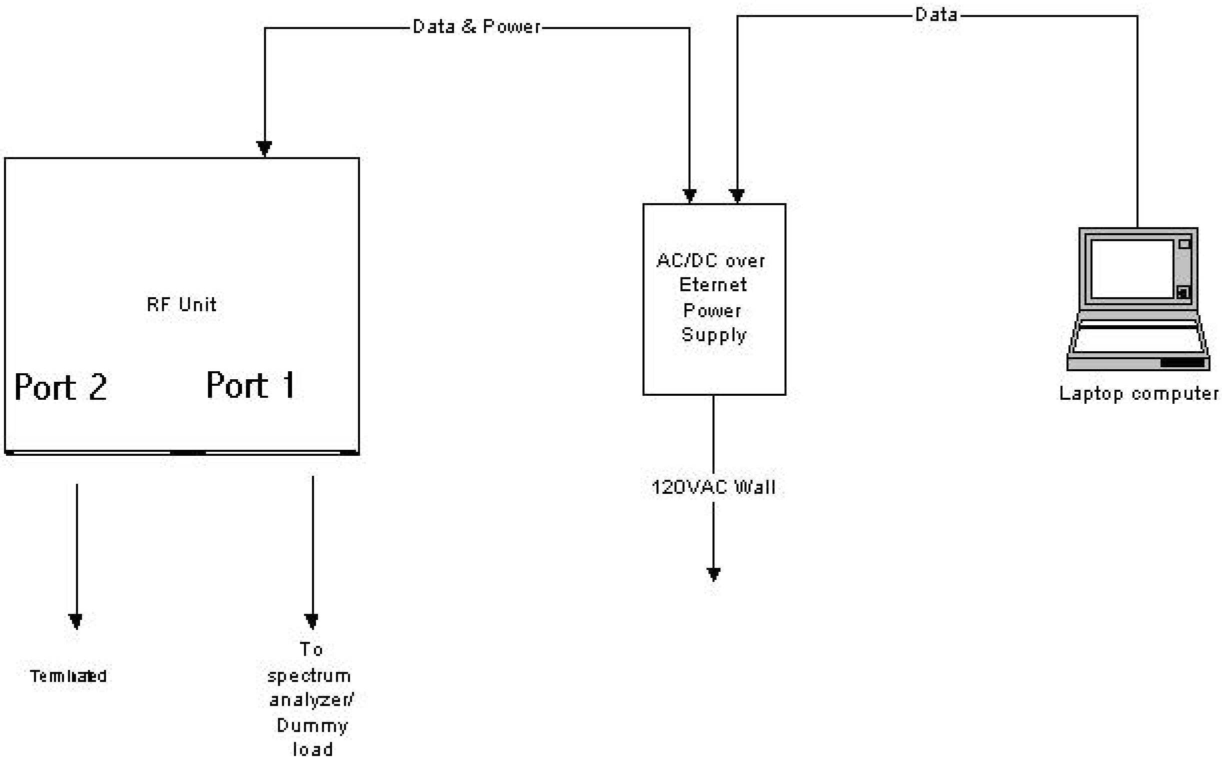
The product is offered with an external connector. External antennas must be professionally installed.

Table 1. Device Summary

ITEM	DESCRIPTION
Manufacturer:	Proxim Corporation
FCC ID:	HZB-4900LR
Model:	AP4900MR-LR
FCC Rule Parts:	§15.247
Frequency Range:	2412 – 2462MHz
Maximum Output Power:	230mW (23.6dBm)
Modulation:	QPSK
Occupied Bandwidth:	12.73MkHz
Keying:	Automatic
Type of Information:	Data
Number of Channels:	11
Power Output Level	Stepped
Antenna Connector	N-type
Antenna Type	Three types intended: Linear Omni Array Sector Panel
Interface Cables:	Ethernet Network Connector
Power Source & Voltage:	48Vdc

2.2 Test Configuration

The AP4900MR-LR was provided 48 VDC power mixed with data over a CAT5 RJ-45 (data & power port) from the PW130 Power supply. This power supply accepted AC 100-250 VAC wall power and data from the support laptop (via CAT5 RJ-45) and outputted the above power and data. A support laptop used an ART program and local server to provide power and tuning command to the unit. The EUT was set to 15 and 24 dBm output (9 and 18 dBm on ART program) at hi, mid, & low channels). The following diagram shows the test setup. Port 1 is the RF port under test.



2.3 Testing Algorithm

The EUT was provided with 48 VDC power mixed with data over a CAT5 RJ-45 (data & power port) from the PW130 Power supply. This power supply accepted AC 100-250 VAC wall power and data from the support laptop (via cat5 RJ-45) and outputted the above power and data. A support laptop used an ART program and local server to provide power and tuning command to the unit. The EUT was set to 15 and 24 dBm output (9 and 18 dBm on ART program) at high, mid, & low channels).

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:

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

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
0073	HP 8568B	SPECTRUM ANALYZER	6/26/2007
0069	HP 85650A	QUASI-PEAK ADAPTER	6/26/2007
0007	ARA LPB-2520	BICONILOG ANTENNA	12/20/2006
0074	HEWLETT-PACKARD 8593A	SPECTRUM ANALYZER	10/04/2006
0522	HEWLETT-PACKARD 8449B	MICROWAVE PREAMP	5/4/2007
0425	ARA DRG118/A	MICROWAVE HORN ANTENNA	1/17/2007
0557	Schaffner, CBL6141A	BICONILOG ANTENNA	12/1/2006
0071	HP 85685A	RF PRESELECTOR	6/26/2007

4 Test Results

4.1 RF Power Output: (FCC Part §2.1046)

The output from the transmitter was connected to a diode detector and oscilloscope. The peak deflection was measured on the oscilloscope and recorded. A signal generator was then substituted in place of EUT and set to the same frequency as the transmitter. The CW output of the signal generator was increased until the same deflection was noted on the oscilloscope. A power meter was then connected to the output of the signal generator to determine the output power of the signal generator. This level is then recorded as the output power of the EUT at the specified frequency.

Table 3. RF Power Output

Channel and/or Frequency	Measured Level (dBm)	Measured Level (Watts)	Rated (dBm)	Limit (dBm)	Limit w 18dbi ant (dBm)
2412 MHz (highest power)	23.3	0.212	24	30	26
2442 MHz (highest power)	24.0	0.250	24	30	26
2462 MHz (highest power)	23.8	0.240	24	30	26
2412 MHz (Lowest power)	13.4	0.022	24	30	26
2442 MHz (Lowest power)	15.5	0.035	24	30	26
2462 MHz (lowest power)	15.6	0.036	24	30	26

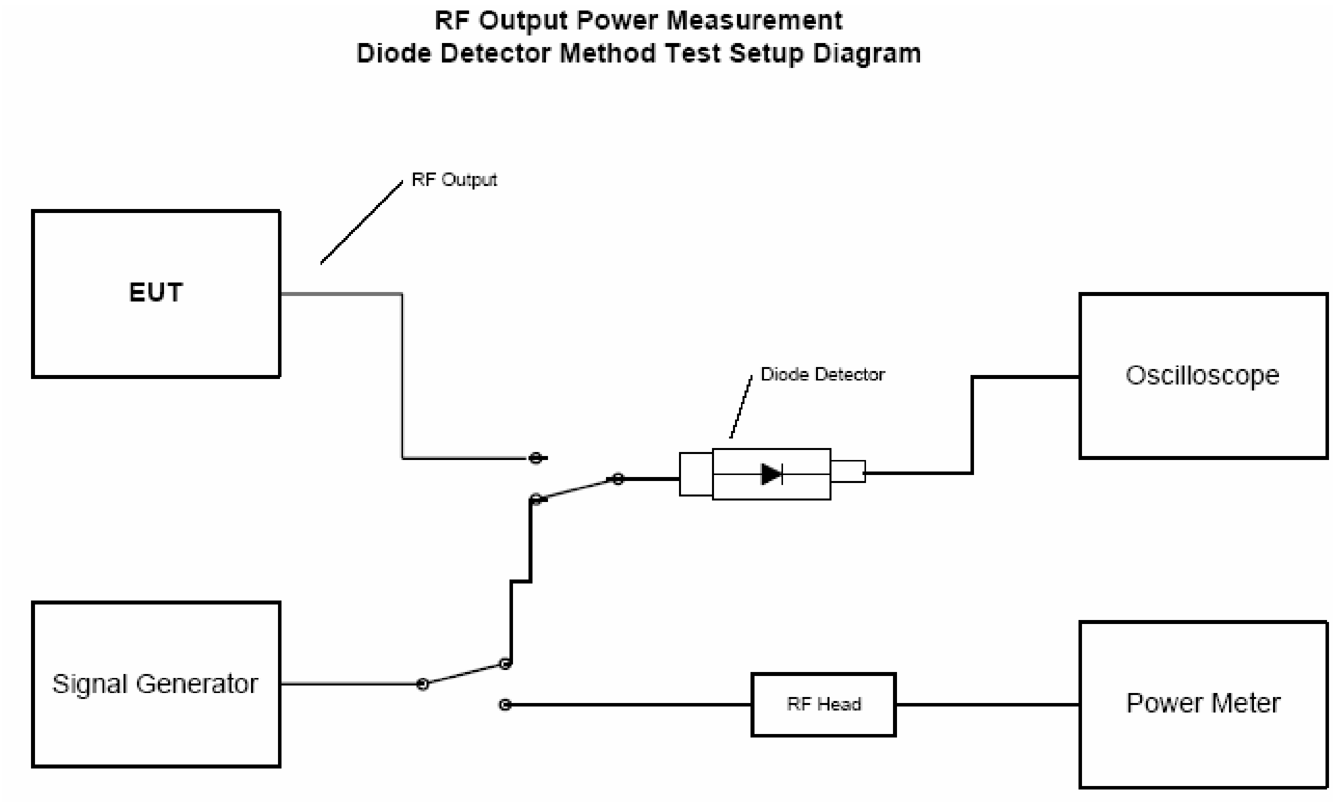


Figure 1. Power Measurement Setup

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 DTS systems, FCC Part 15.247 requires that the 20 dB bandwidth exceed 0.5MHz.

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

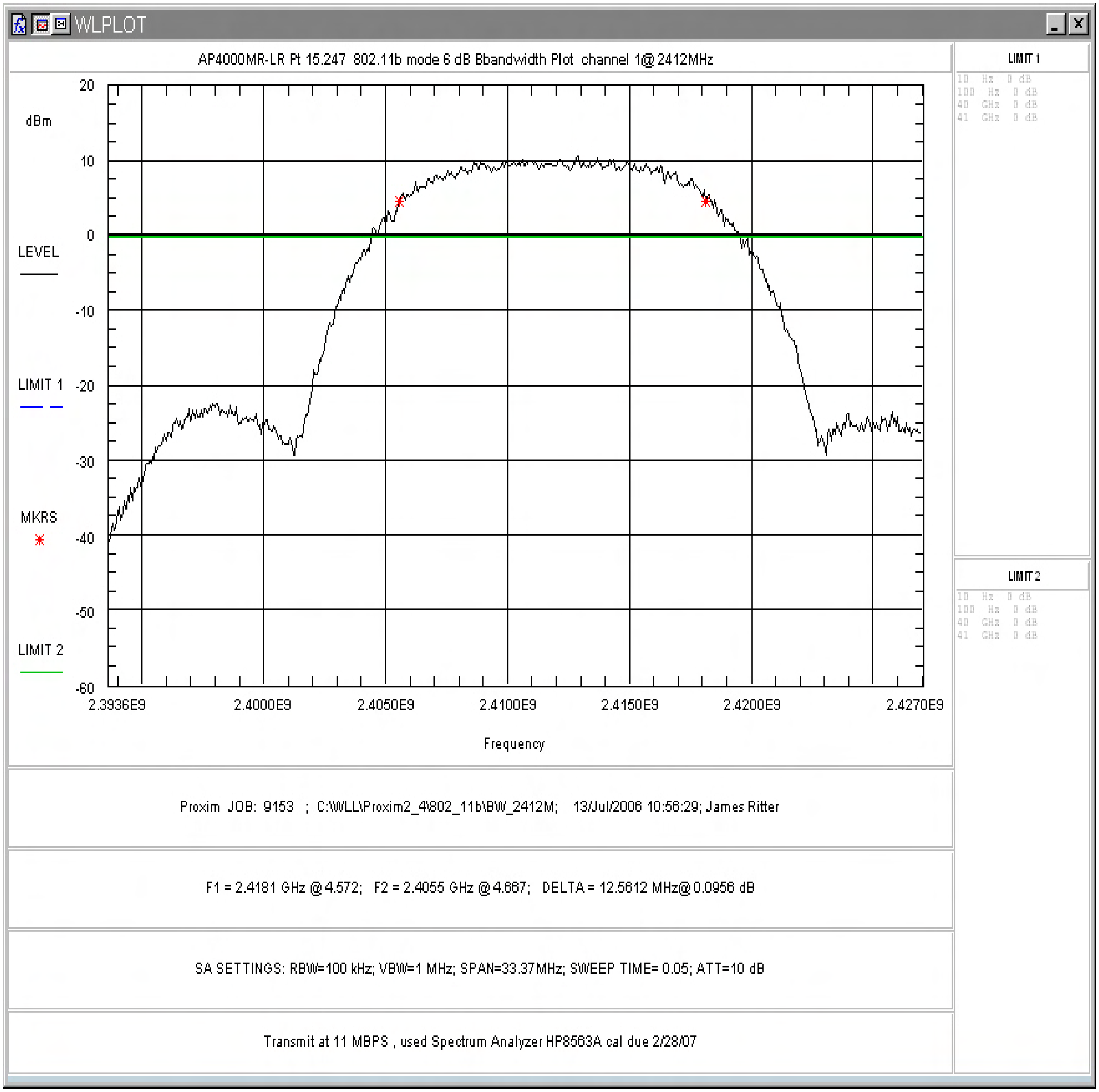


Figure 4-2. Occupied Bandwidth, Low Channel

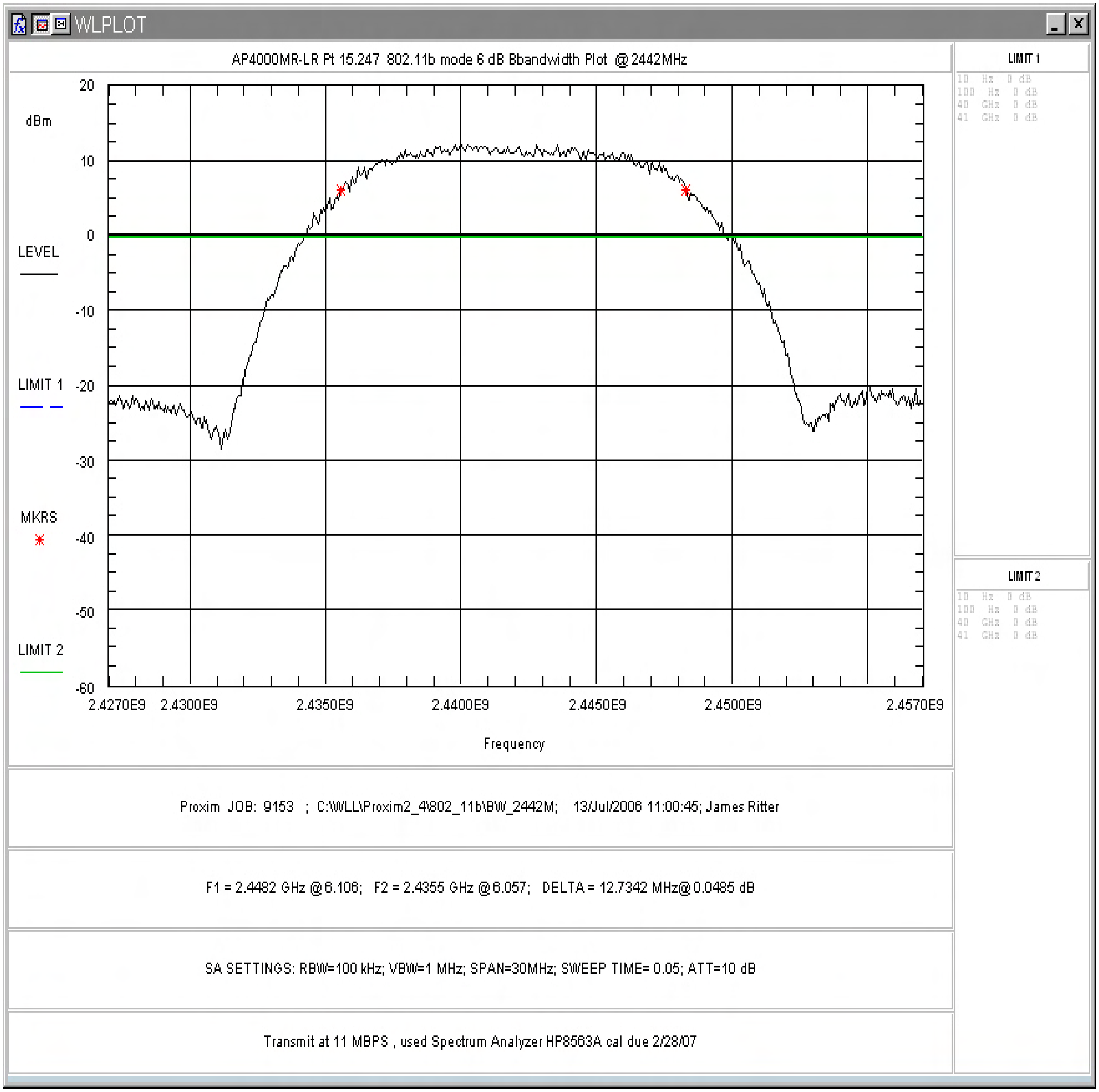


Figure 4-3. Occupied Bandwidth, Mid Channel

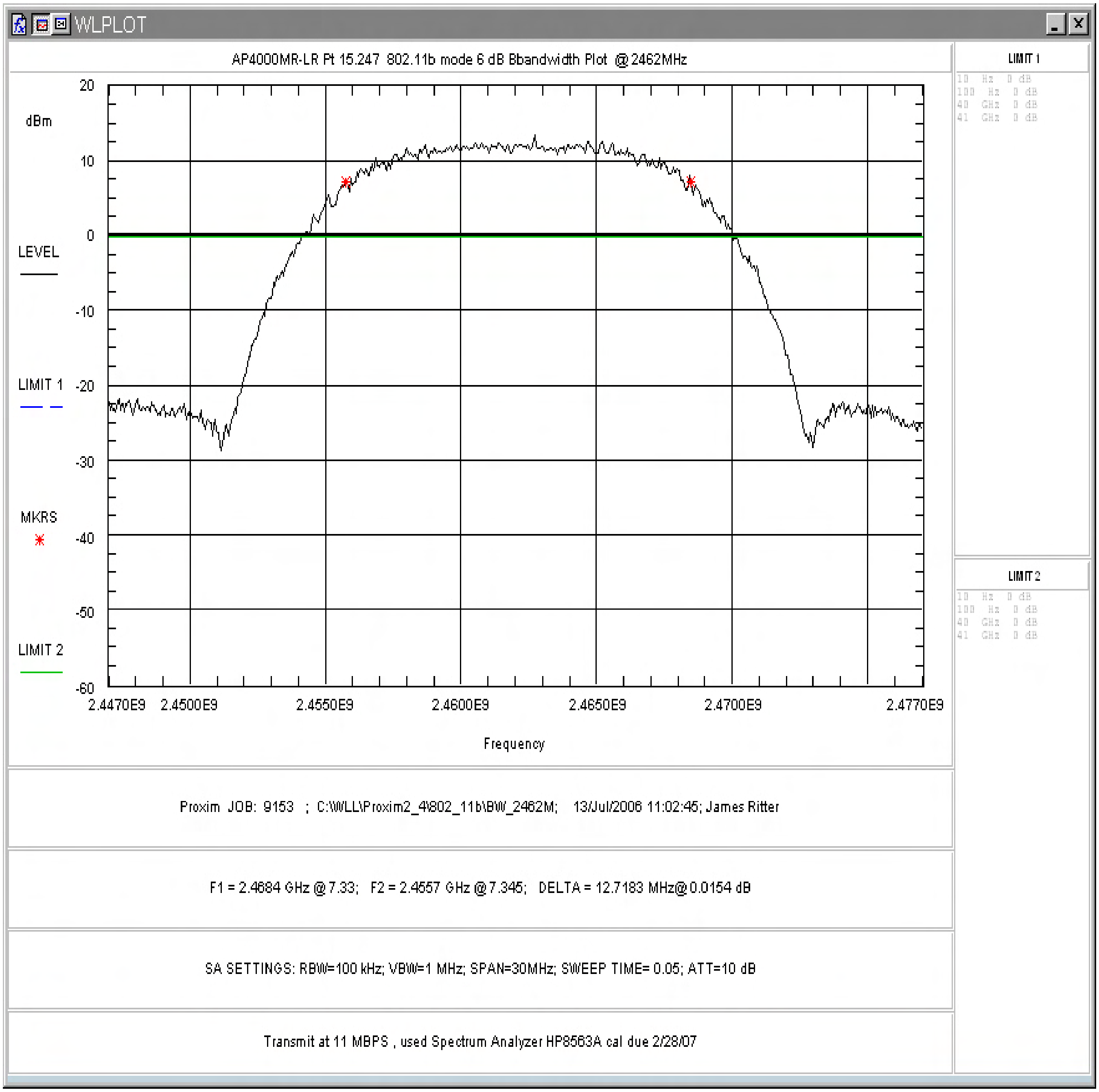


Figure 4-4. Occupied Bandwidth, High Channel

Table 4 provides a summary of the Occupied Bandwidth Results.

Table 4. Occupied Bandwidth Results

Frequency	Bandwidth	Limit	Pass/Fail
Low Channel 2412MHz	12.56MHz	>0.5 MHz	Pass
Mid Channel 2442MHz	12.734MHz	>0.5 MHz	Pass
High Channel 2462MHz	12.718MHz	>0.5 MHz	Pass

4.3 RF Peak Power Spectral Density (§15.247(e))

For digitally modulated systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

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.

The highest peak within the transmission was located and measured for the high, middle and low channels of operation. Plots of the PSD were taken as shown in Figure 6 through Figure 9 below. Table 5 provides a summary of the data.

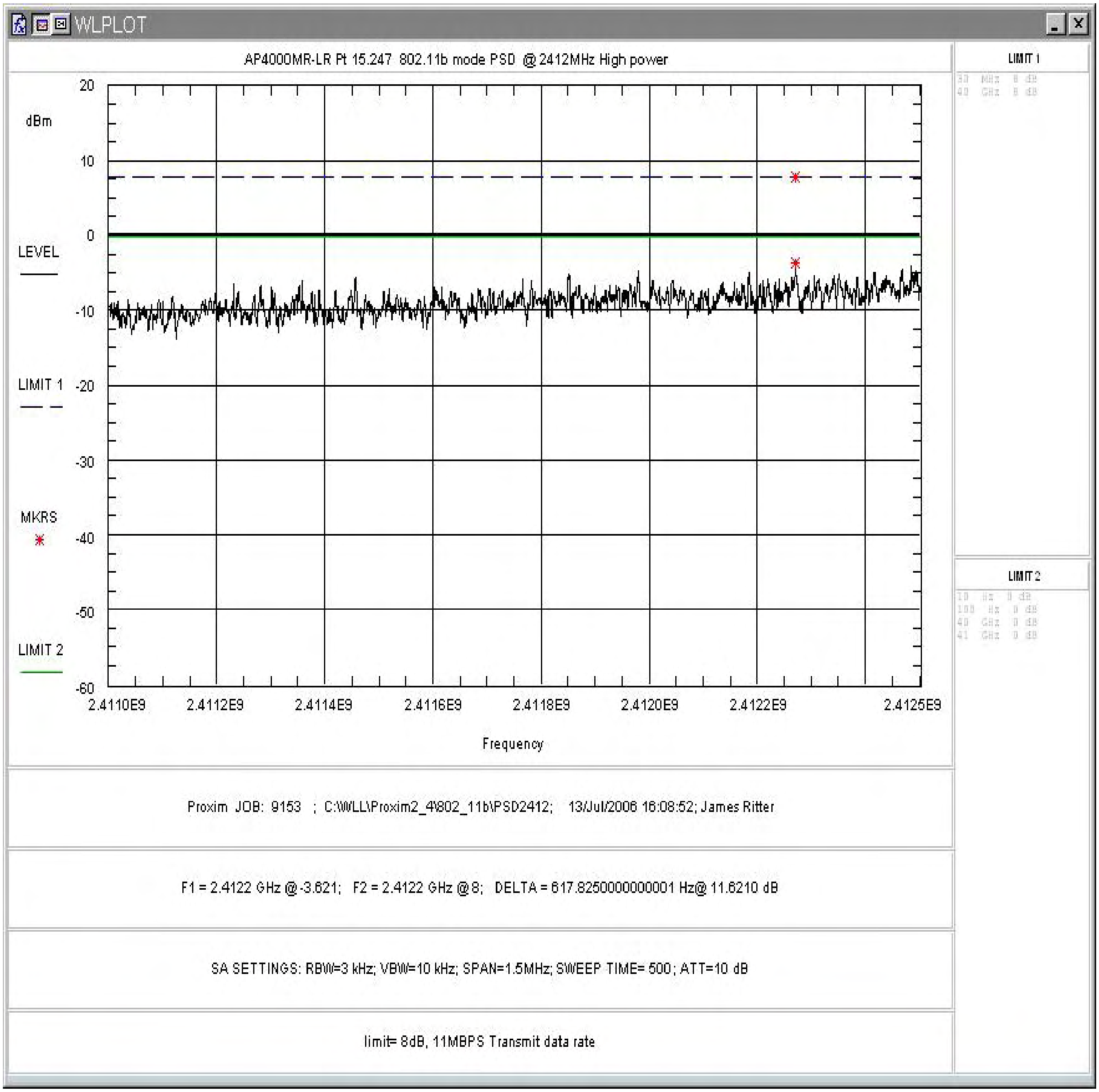


Figure 4-5: Power Spectral Density, Low Channel

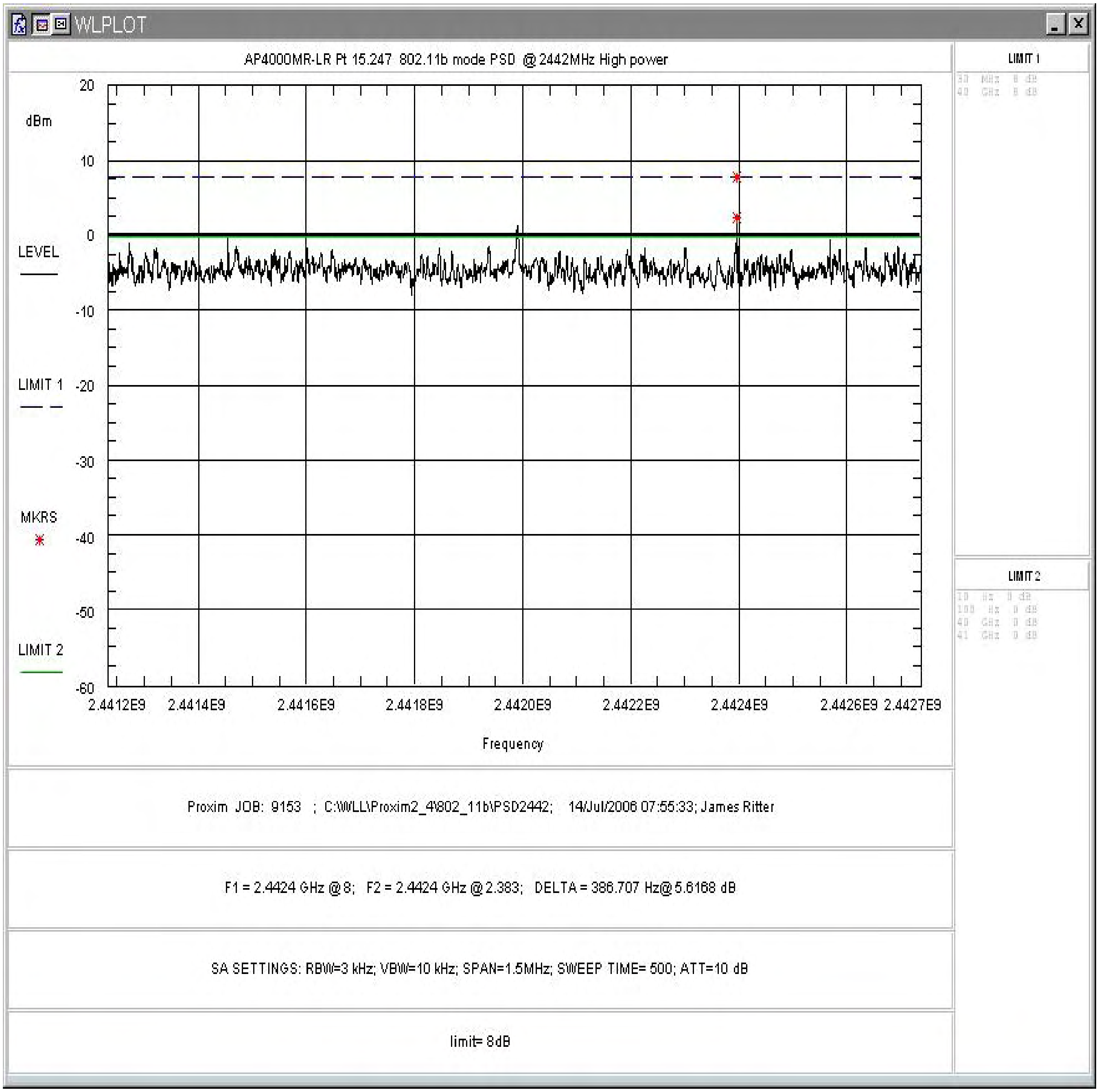


Figure 4-6: Power Spectral Density, Mid Channel

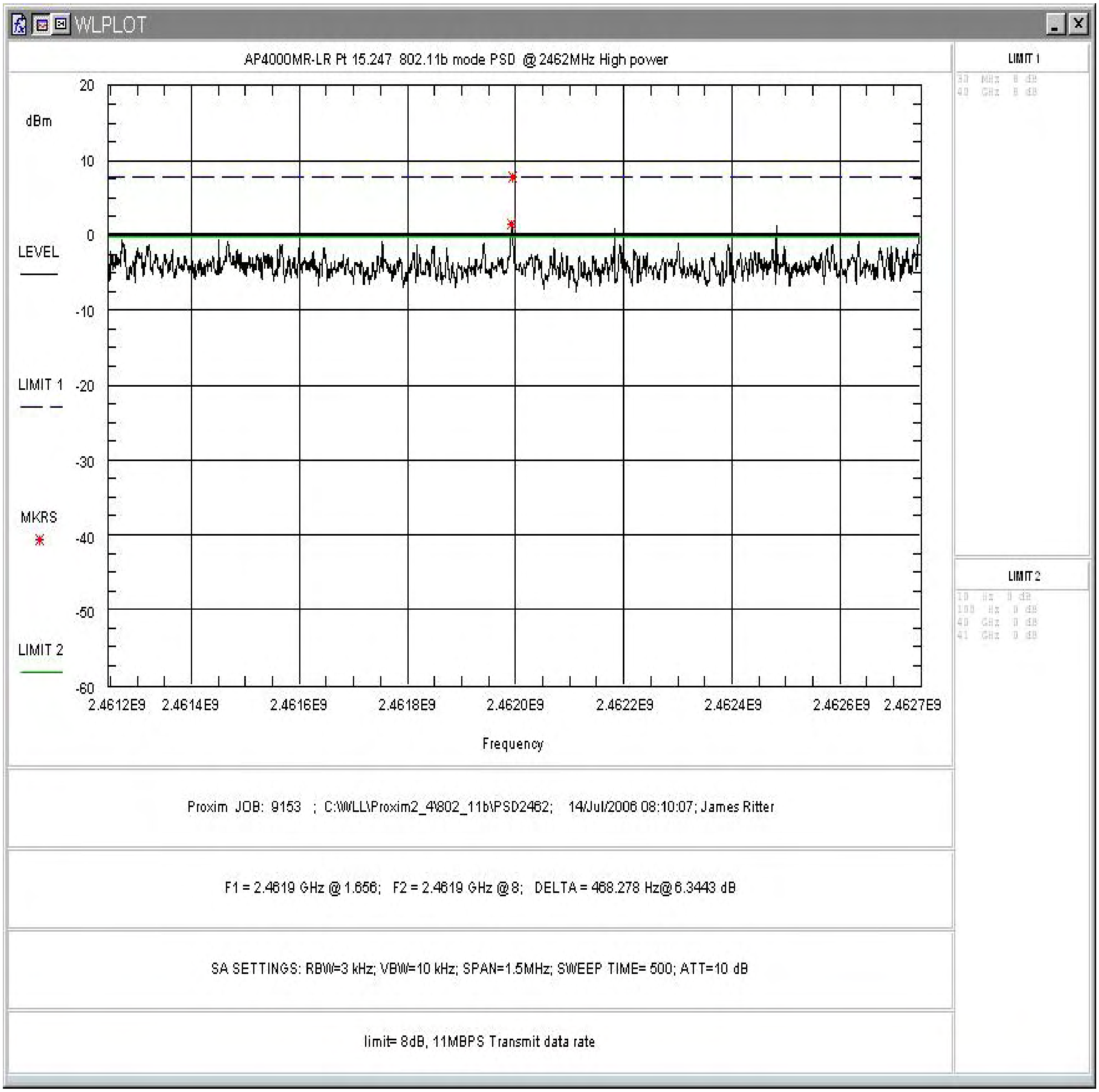


Figure 4-7: Power Spectral Density, High Channel

4.4 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.

Conducted Spurious data was taken at Low Power and at High Power. The following are plots of the conducted spurious emissions data.

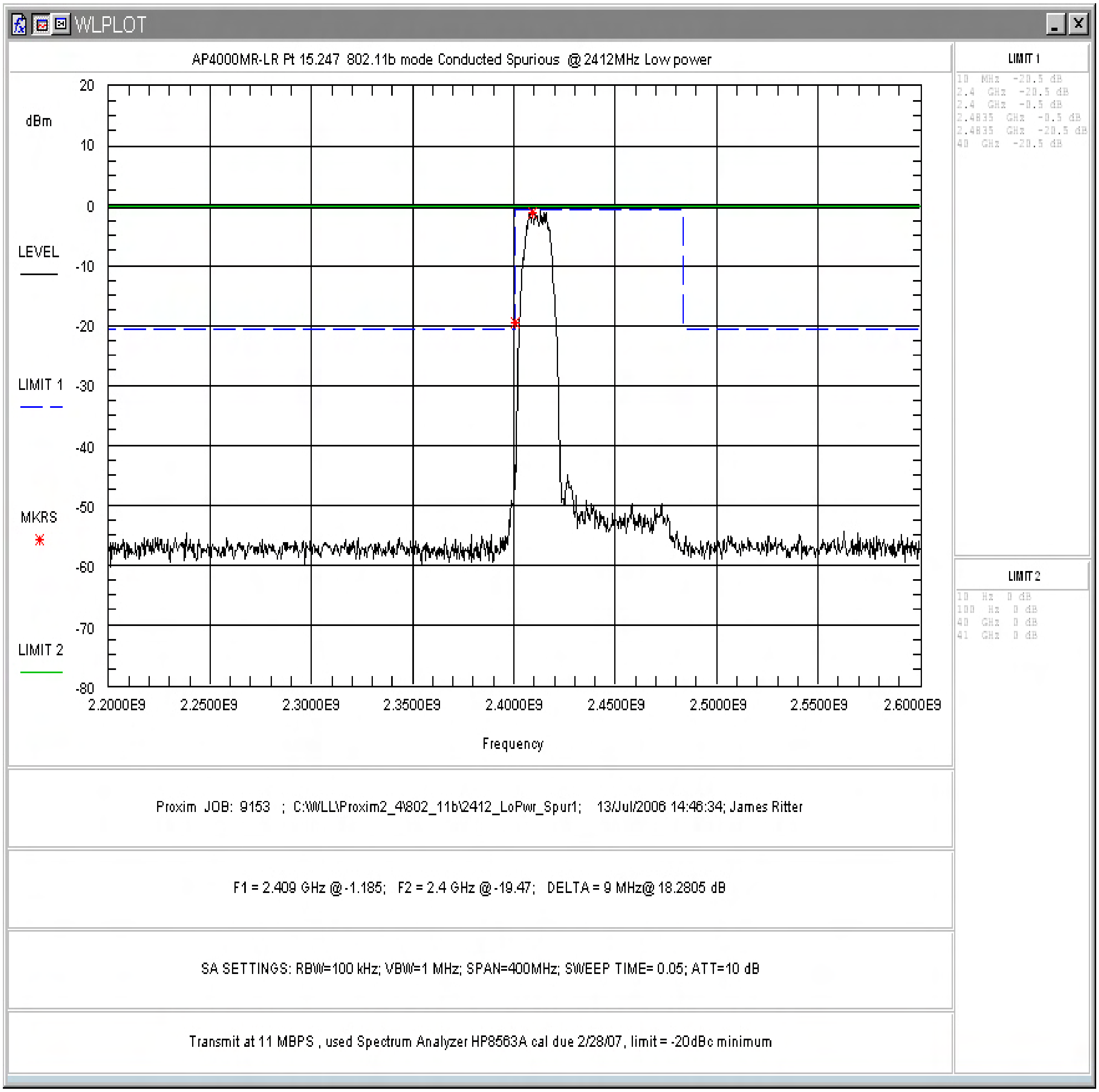


Figure 4-8. Conducted Spurious Emissions, Low Power: Low Channel In-Band (2.2 – 2.6GHz)

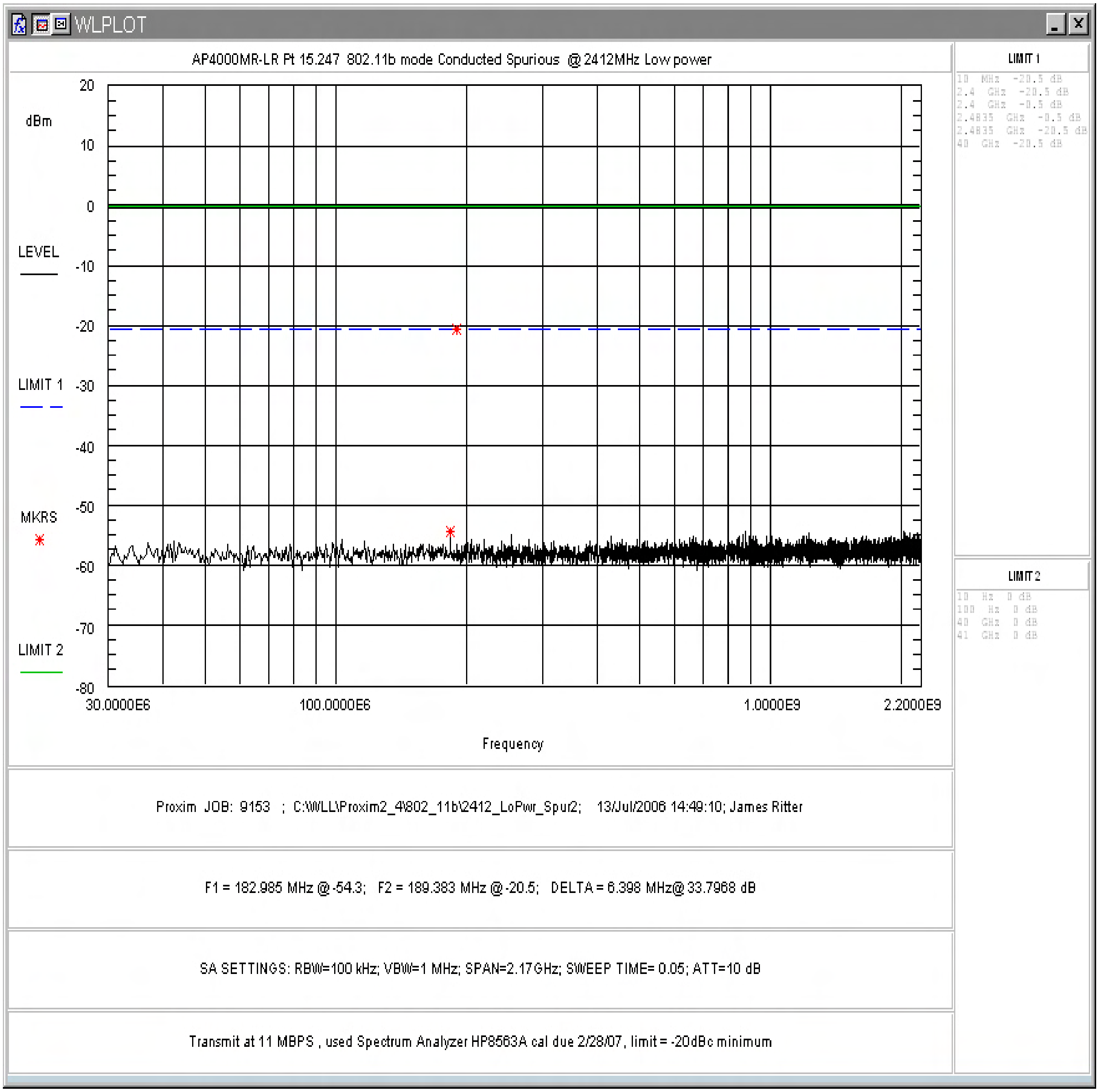


Figure 4-9. Conducted Spurious Emissions, Low Power: Low Channel 30 - 2200MHz

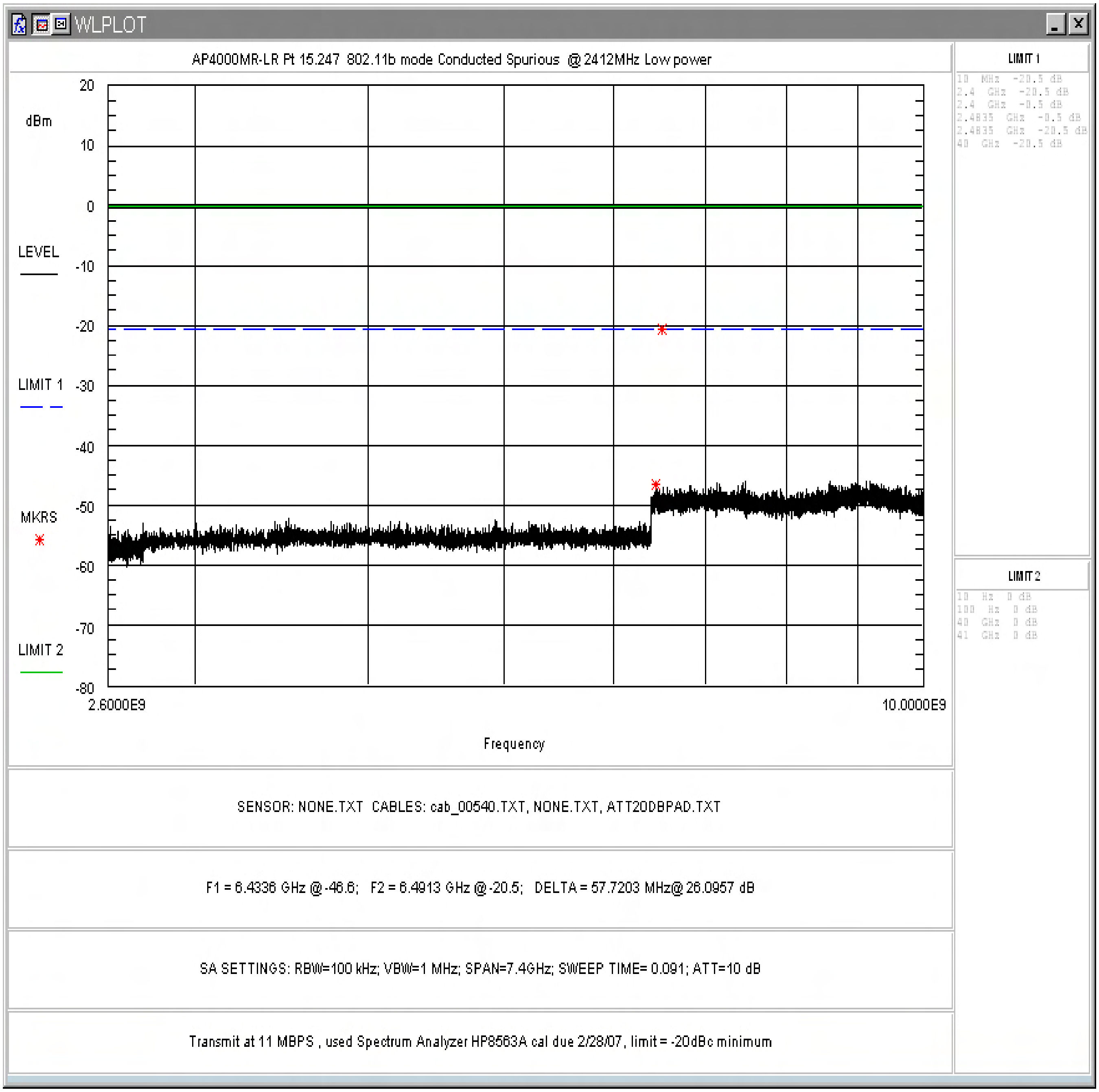


Figure 4-10. Conducted Spurious Emissions, Low Power: Low Channel 2.6– 10GHz

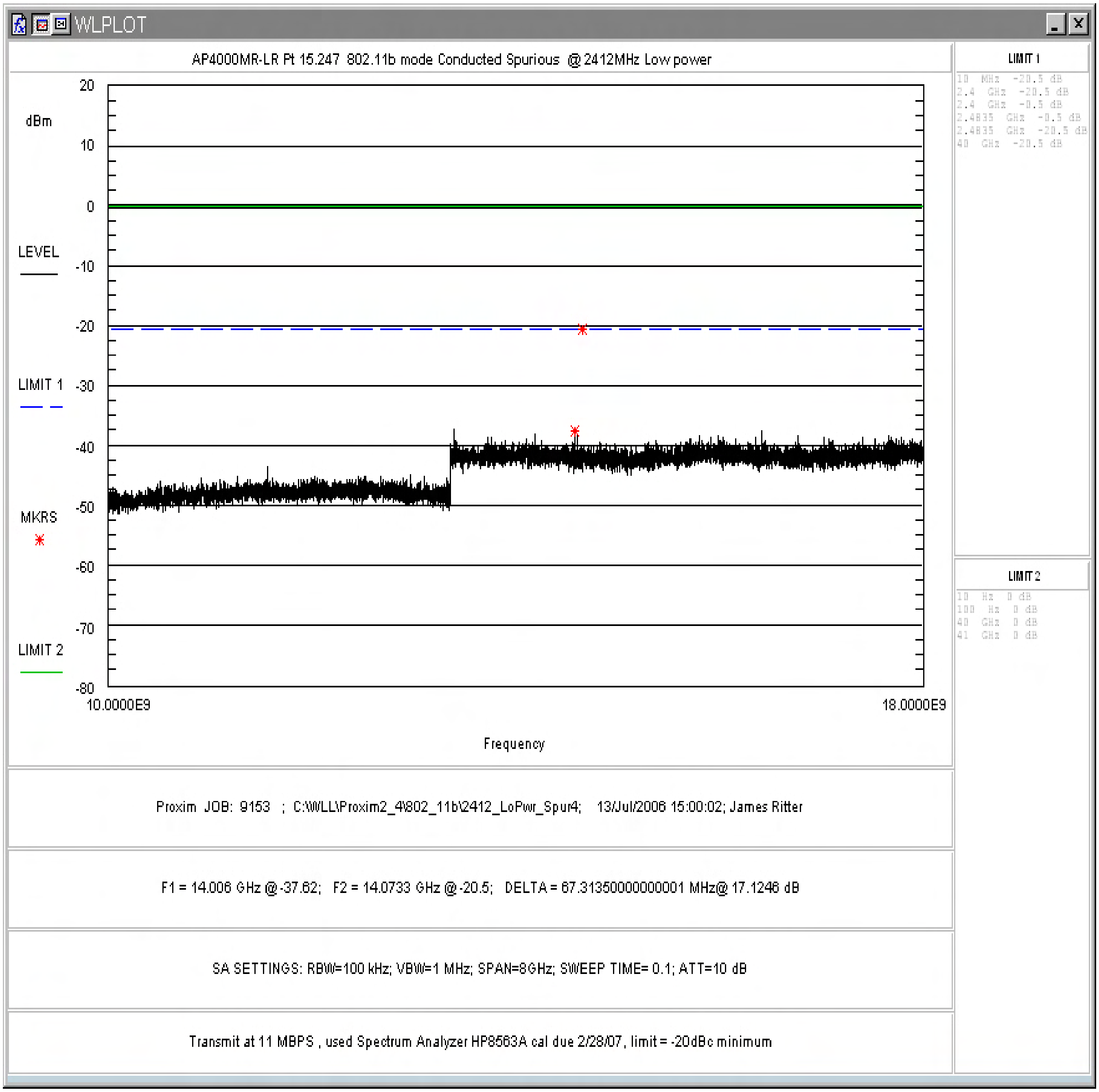


Figure 4-11. Conducted Spurious Emissions, Low Power: Low Channel 10 -18GHz

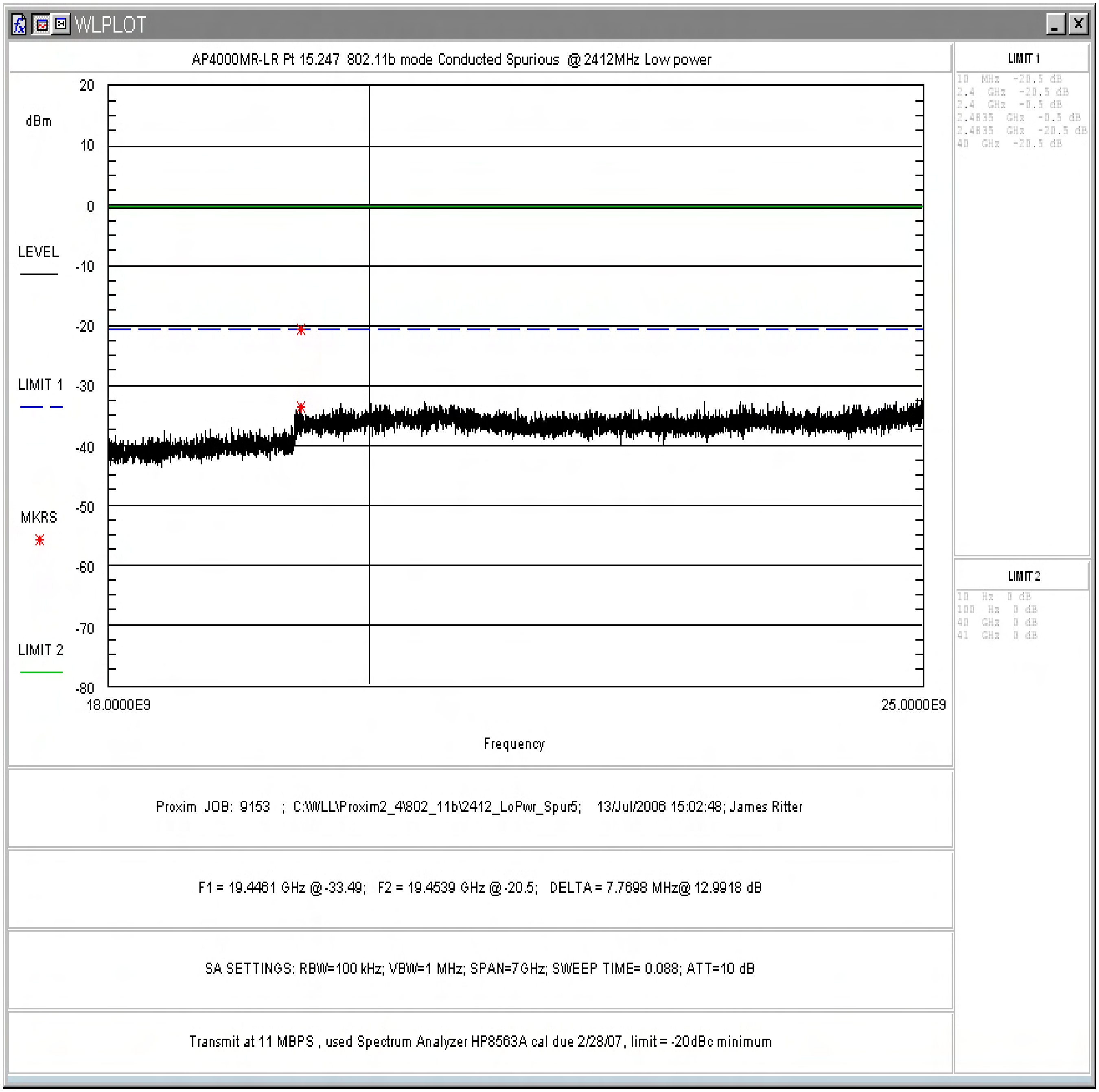


Figure 4-12. Conducted Spurious Emissions, Low Power: Low Channel 18– 25GHz

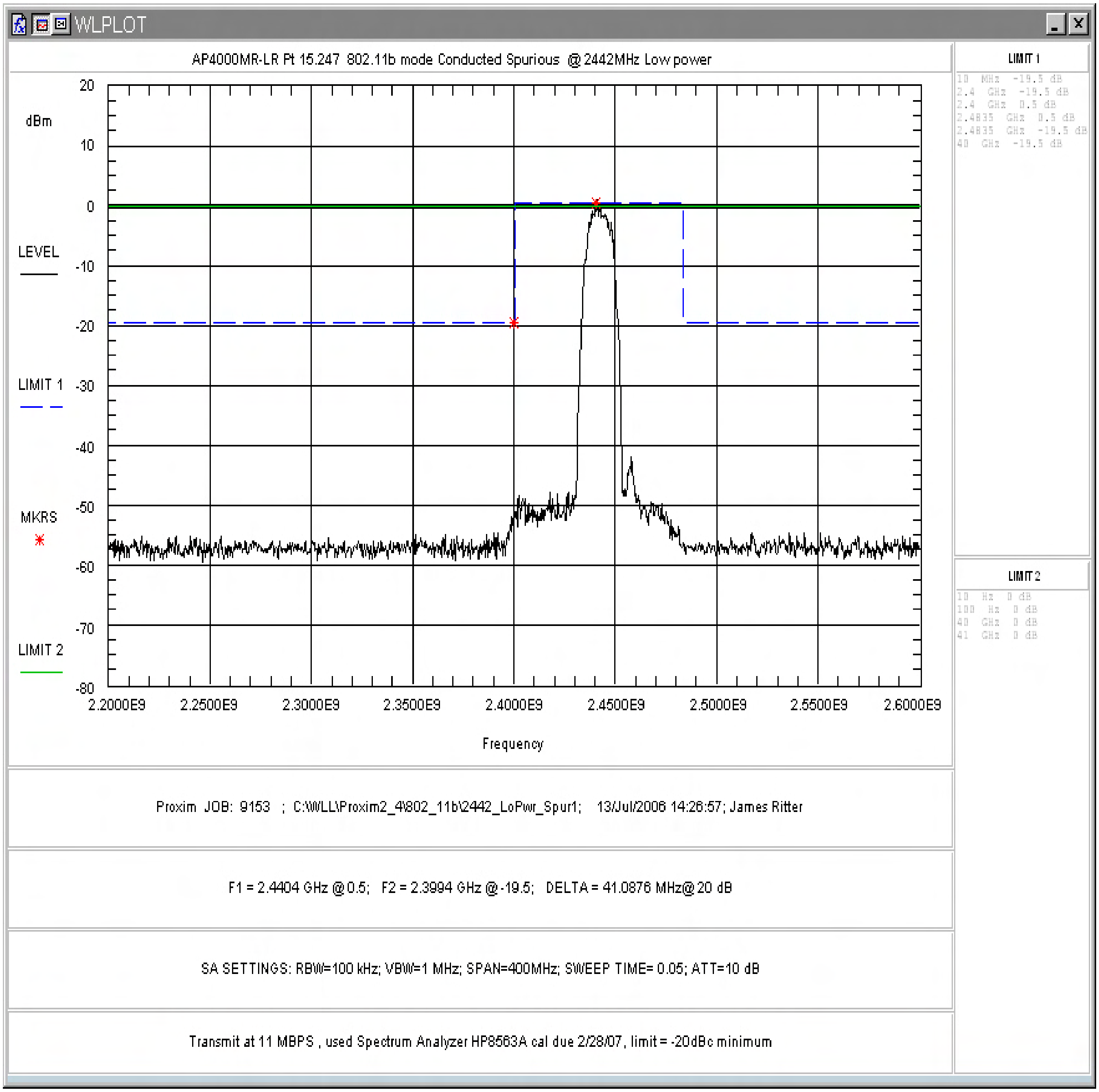


Figure 4-13. Conducted Spurious Emissions, Low Power: Mid Channel In-Band (2.2 – 2.6GHz)

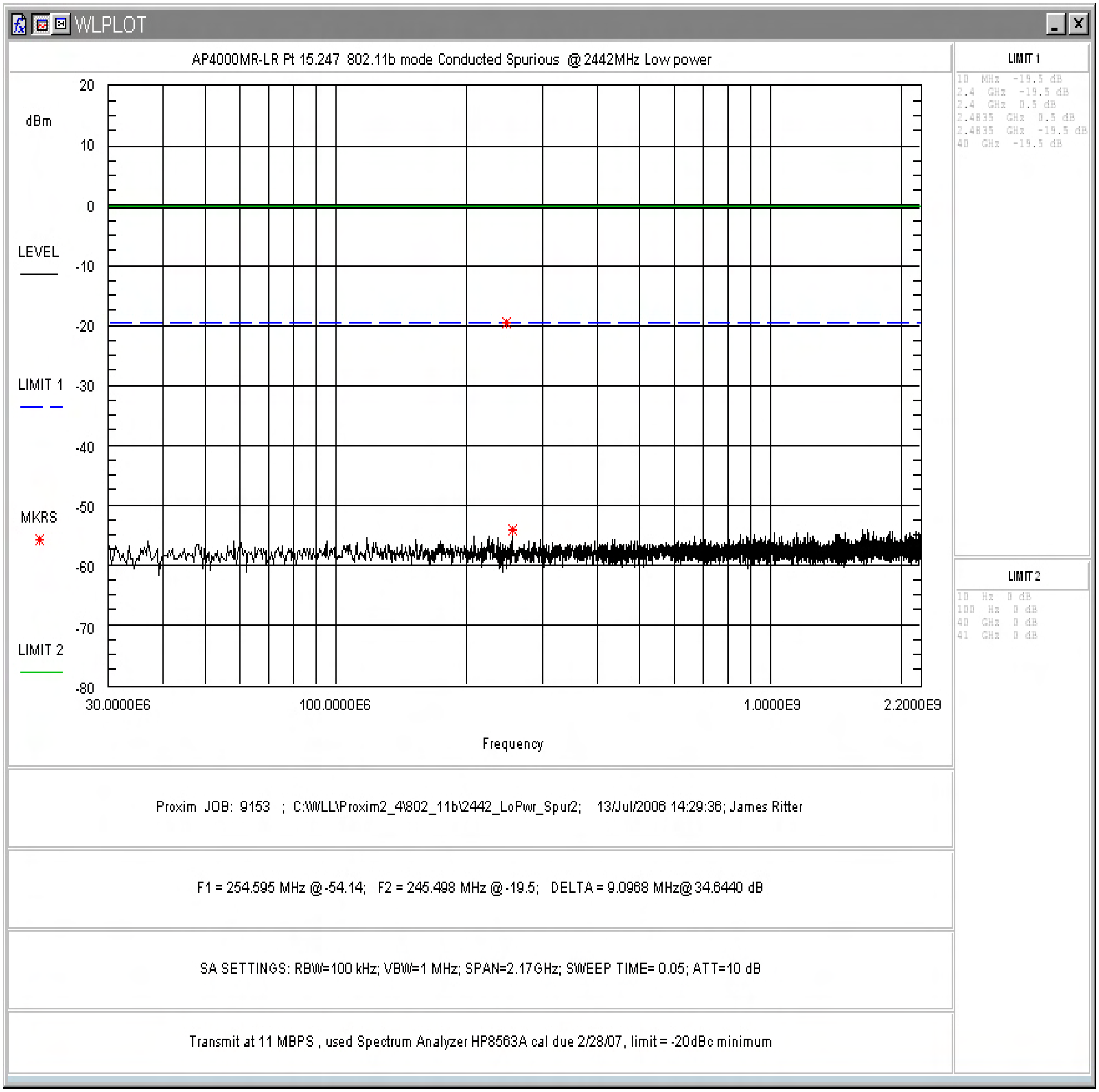


Figure 4-14. Conducted Spurious Emissions, Low Power: Mid Channel 30 – 2200MHz

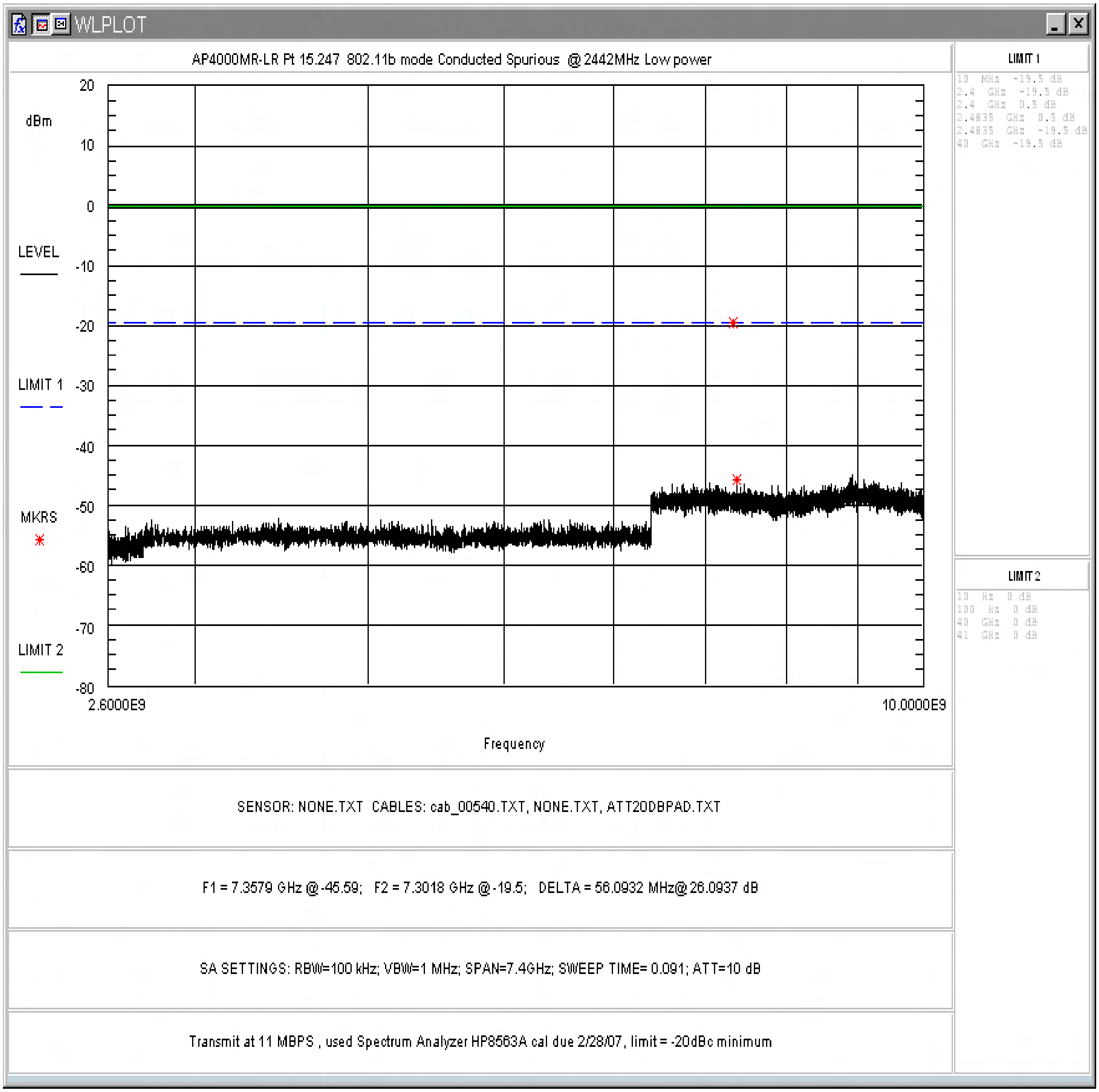


Figure 4-15. Conducted Spurious Emissions, Low Power: Mid Channel 2.6 - 10GHz

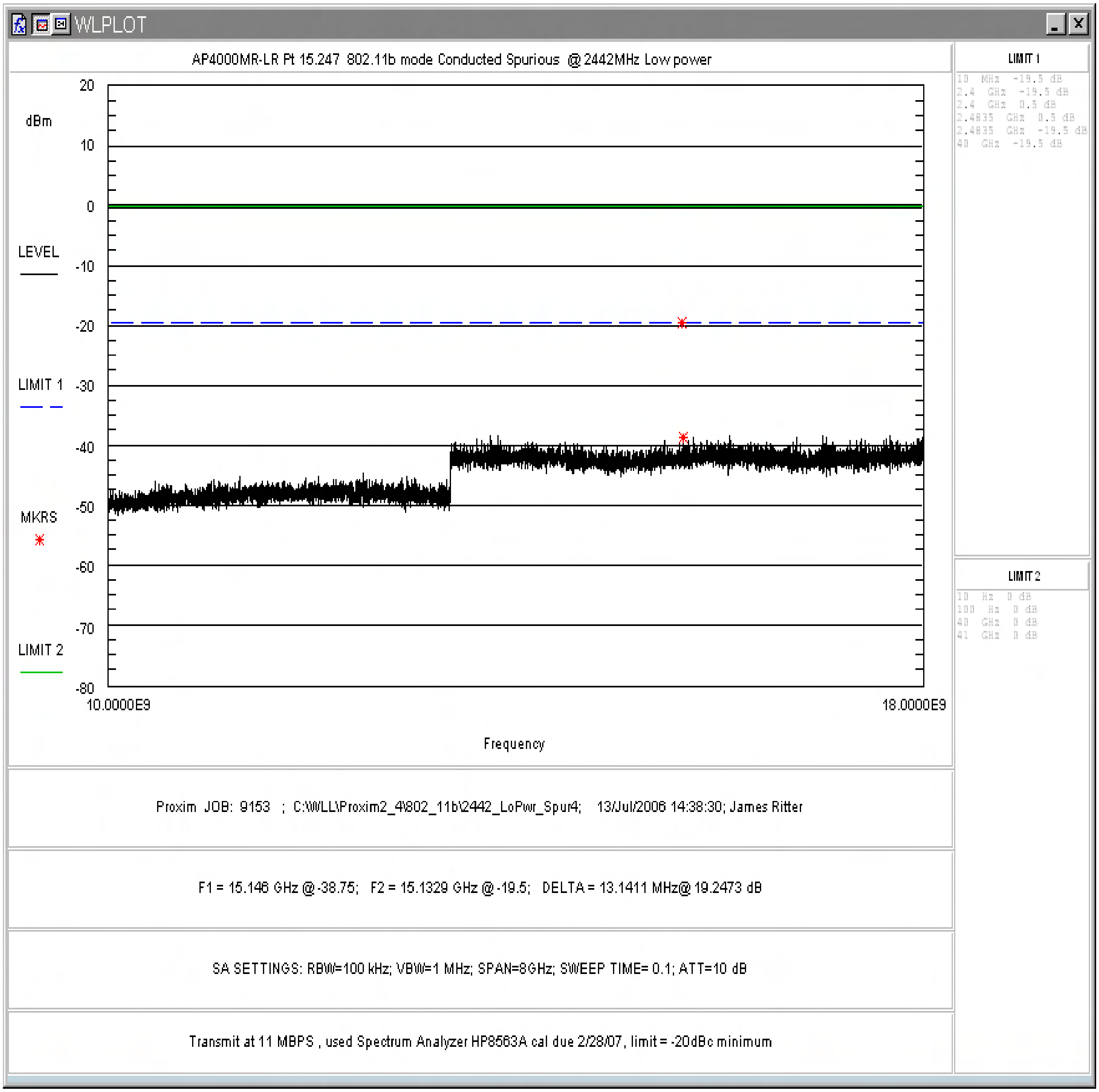


Figure 4-16. Conducted Spurious Emissions, Low Power: Mid Channel 10 - 18GHz

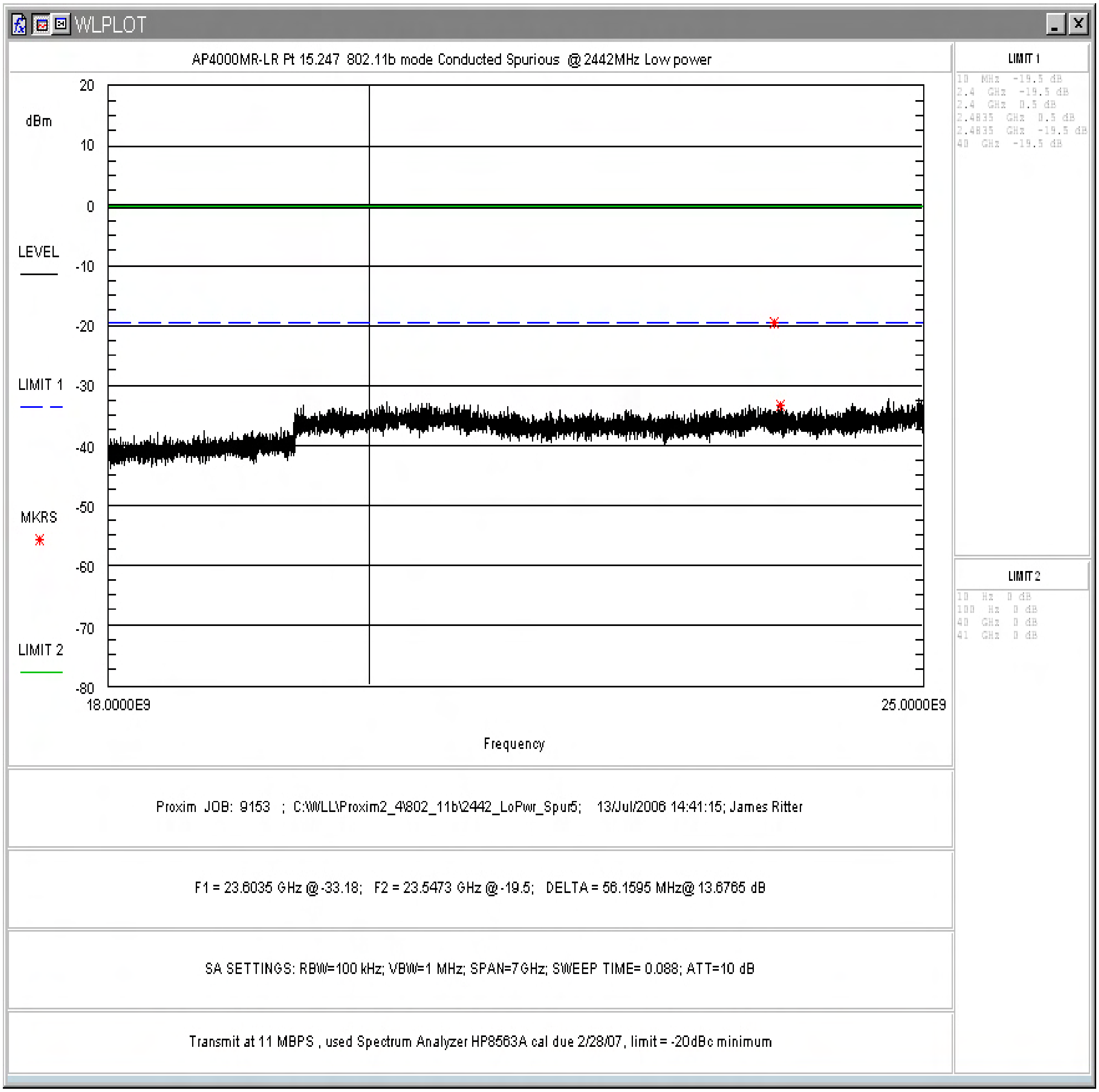


Figure 4-17. Conducted Spurious Emissions, Low Power: Mid Channel 18 - 25GHz

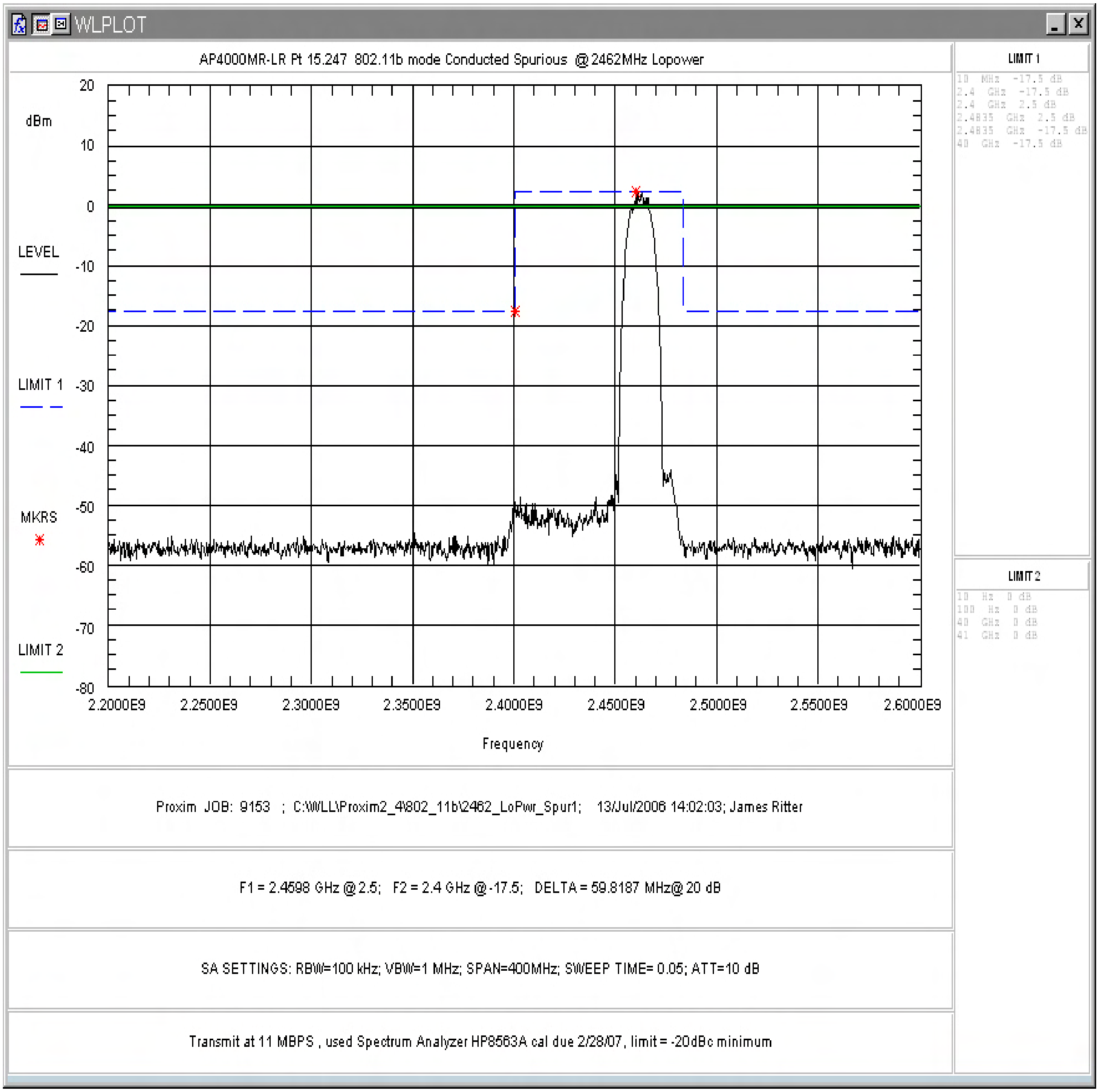


Figure 4-18. Conducted Spurious Emissions, Low Power: High Channel In-Band (2.2 – 2.6GHz)

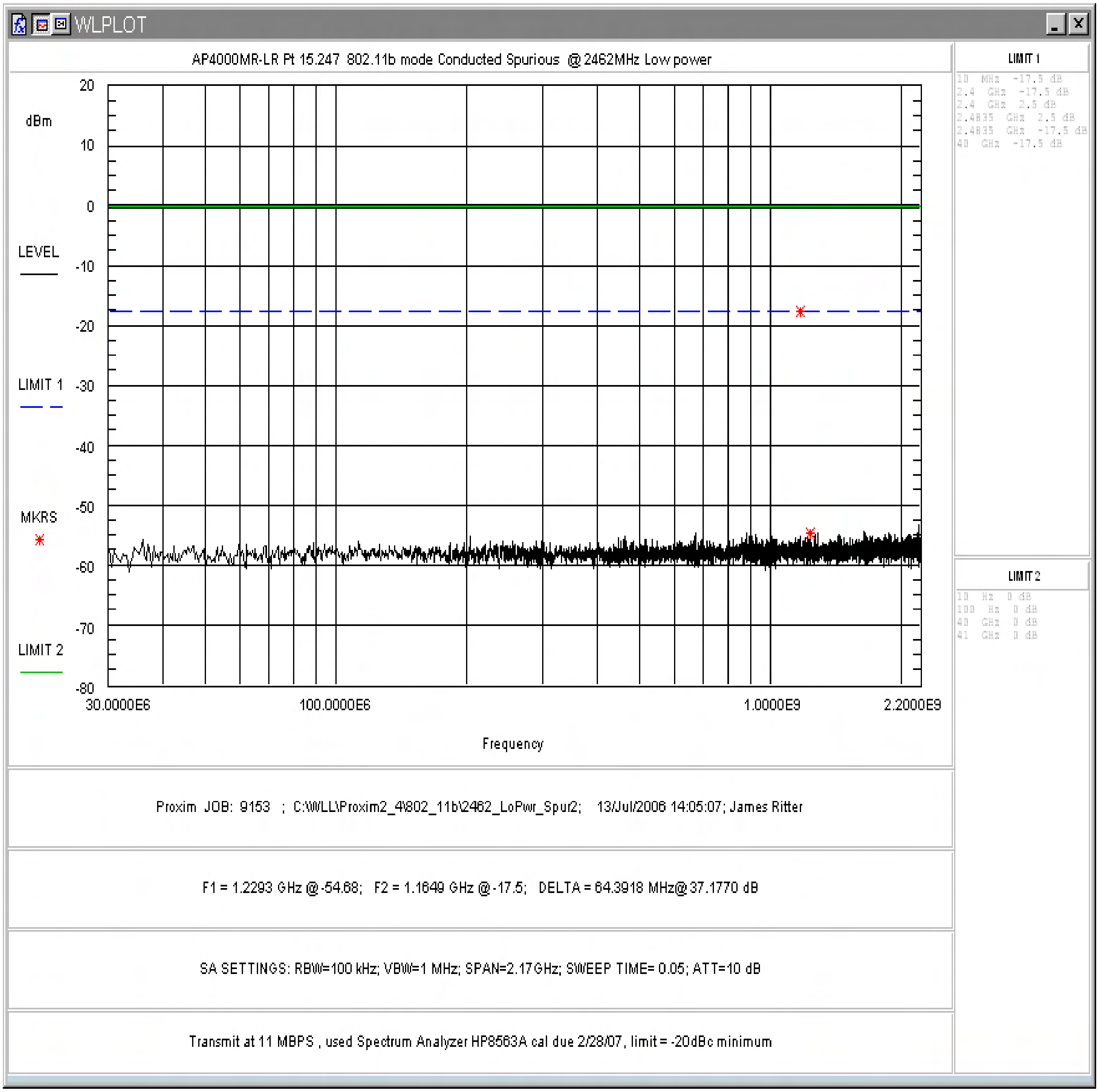


Figure 4-19. Conducted Spurious Emissions, Low Power: High Channel 30 – 2200MHz

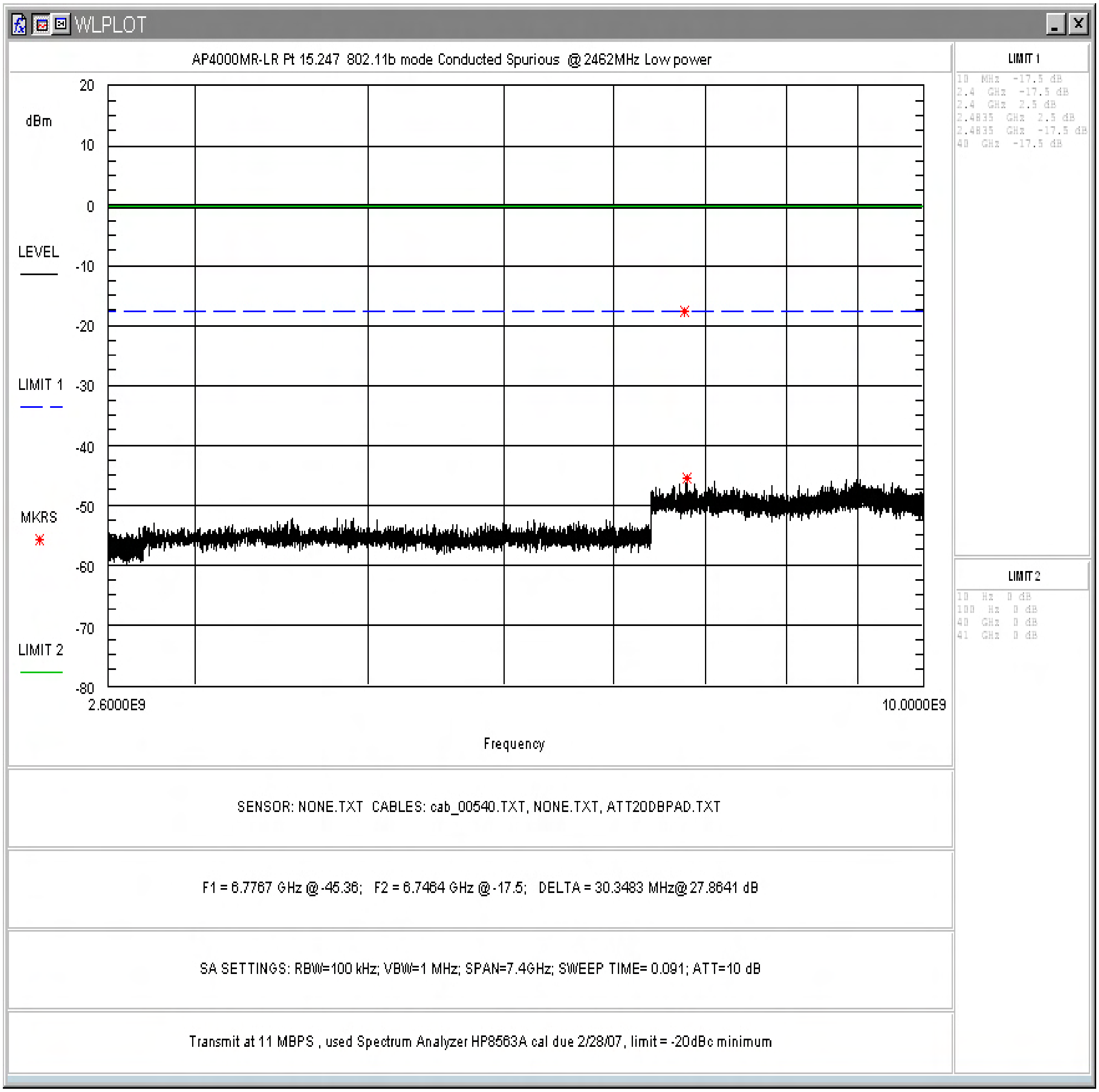


Figure 4-20. Conducted Spurious Emissions, Low Power: High Channel 2.6 - 10GHz

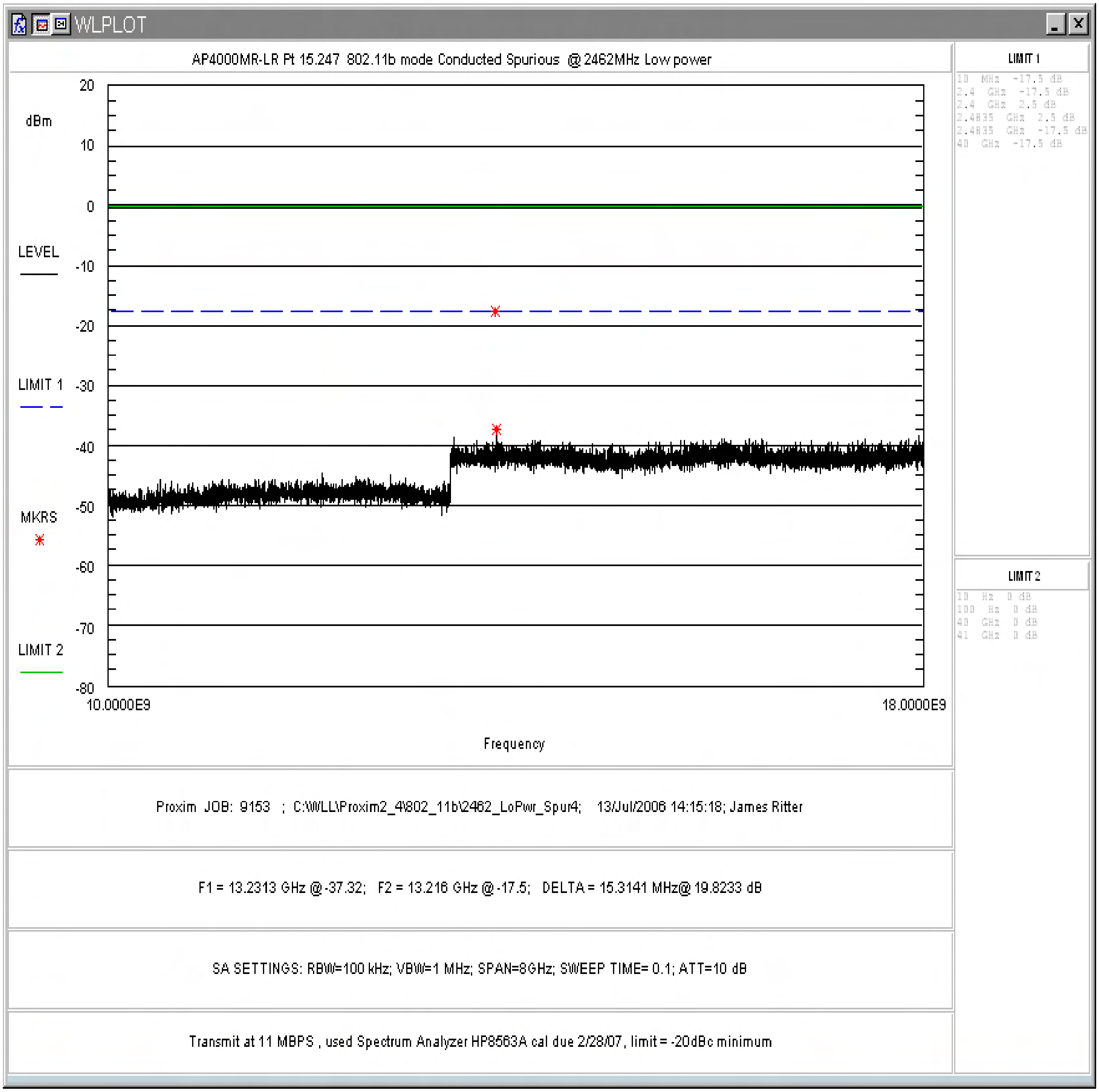


Figure 4-21. Conducted Spurious Emissions, Low Power: High Channel 10 - 18GHz

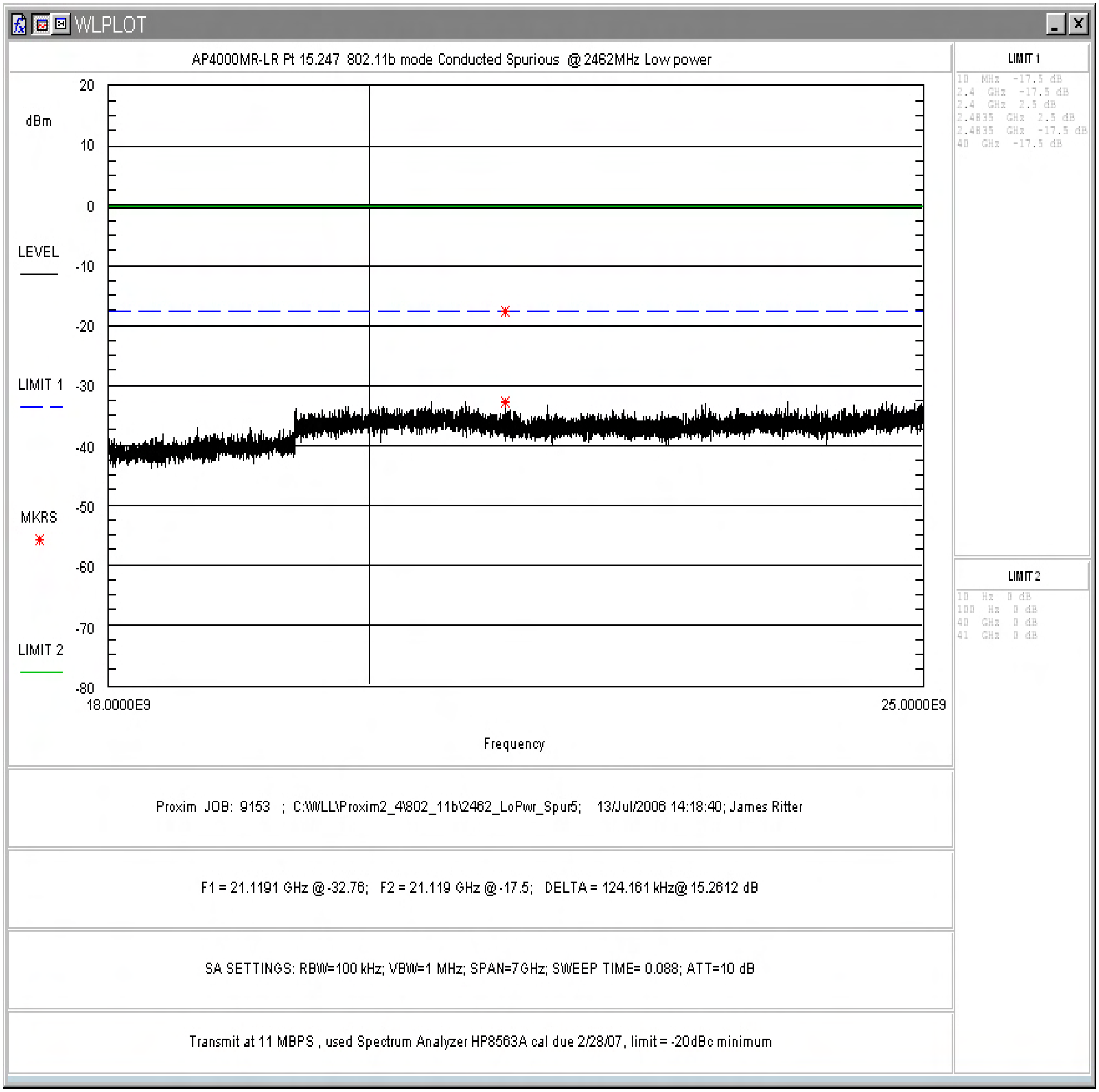


Figure 4-22. Conducted Spurious Emissions, Low Power: High Channel 18 - 25GHz

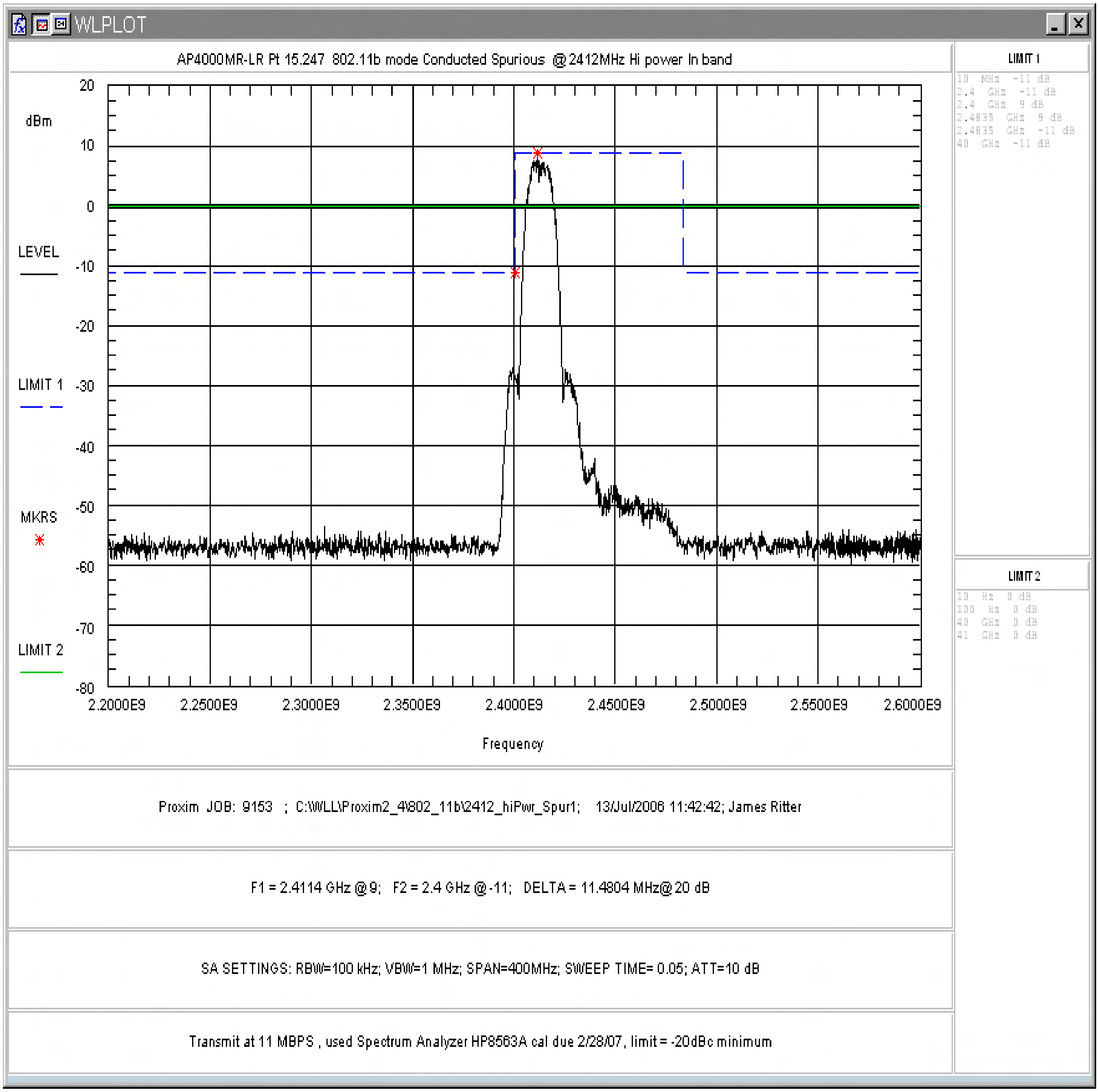


Figure 4-23. Conducted Spurious Emissions, High Power: Low Channel In-Band (2.2 – 2.6GHz)

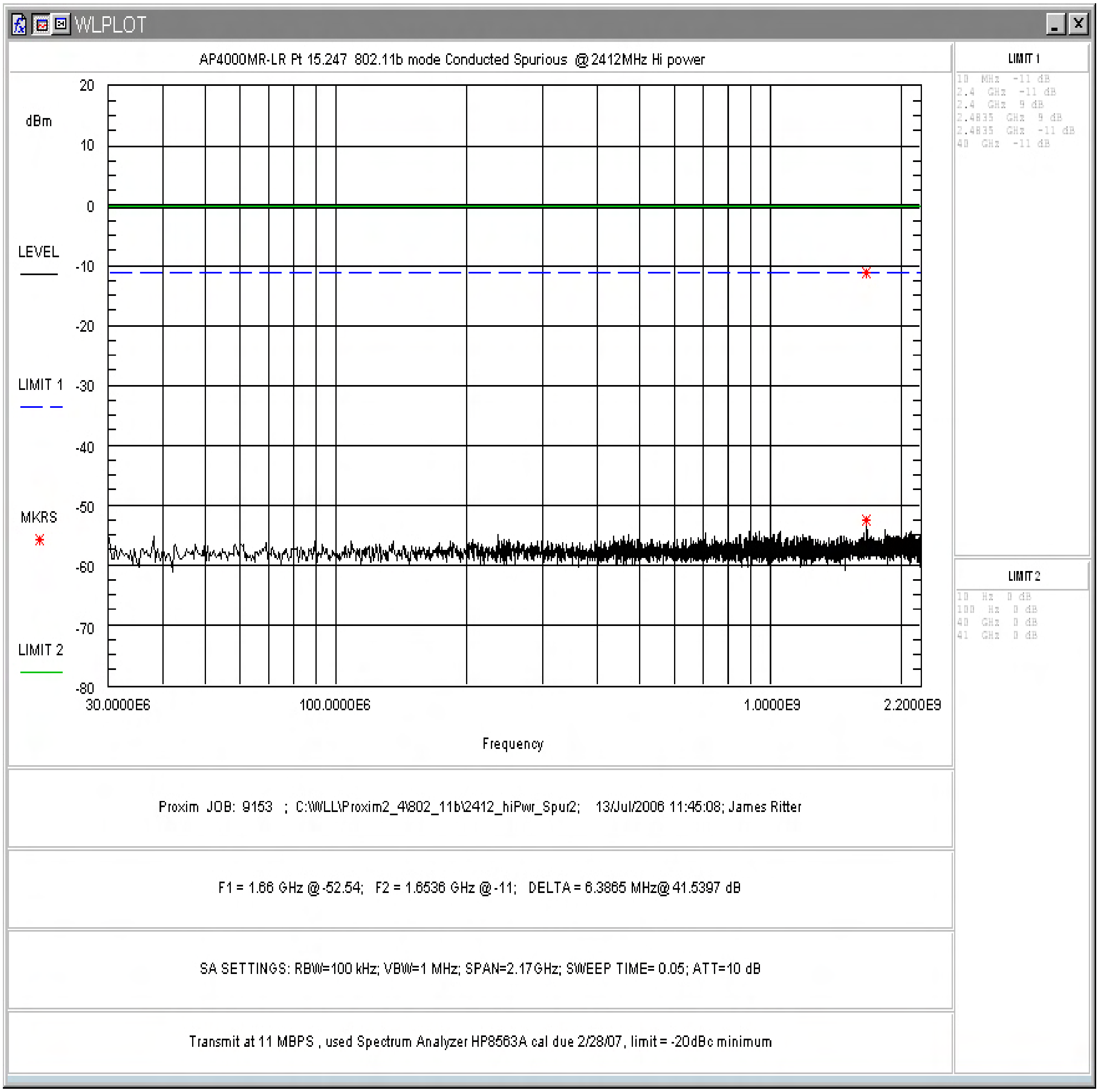


Figure 4-24. Conducted Spurious Emissions, High Power: Low Channel 30 - 2200MHz

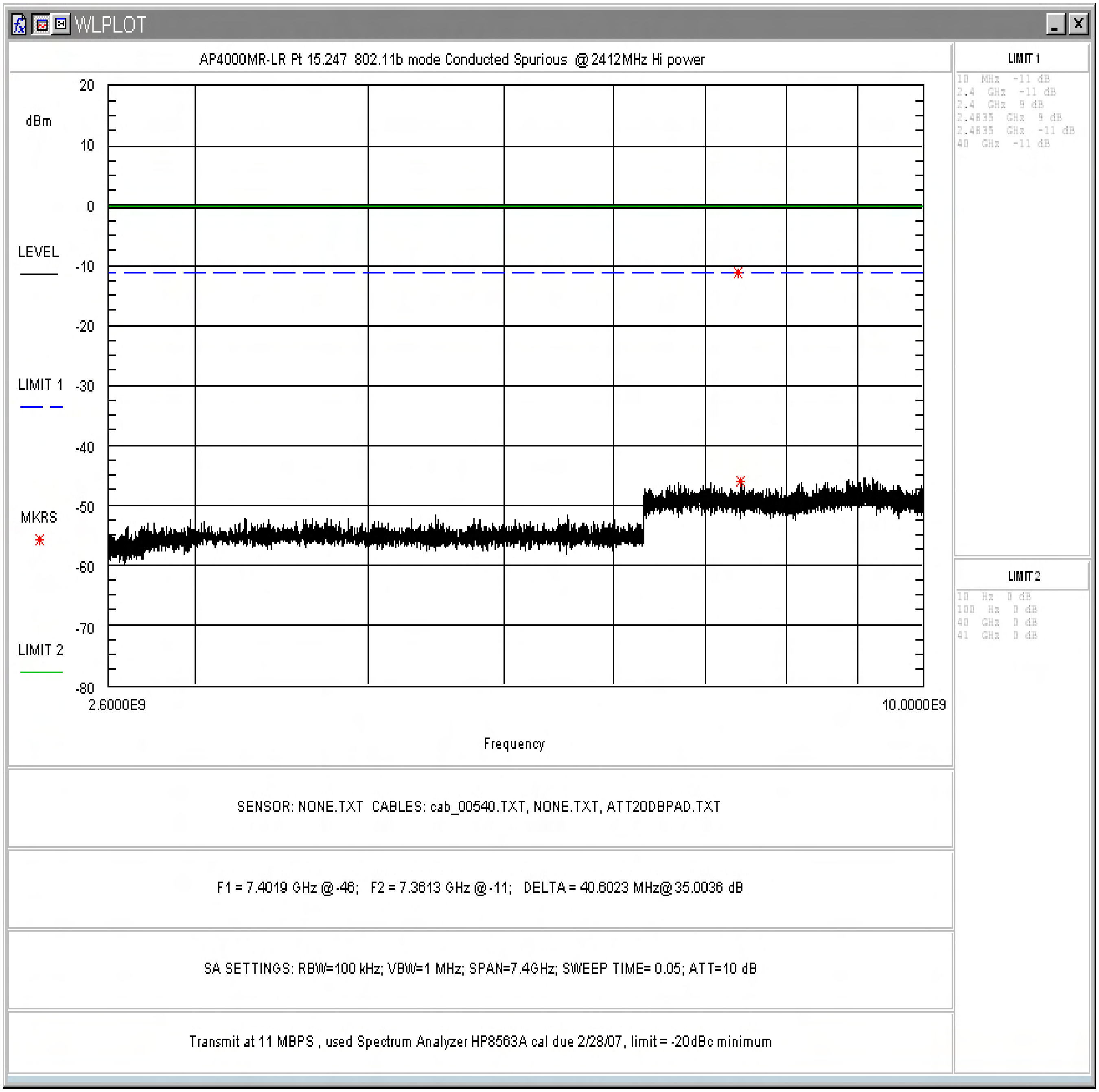


Figure 4-25. Conducted Spurious Emissions, High Power: Low Channel 2.6– 10GHz

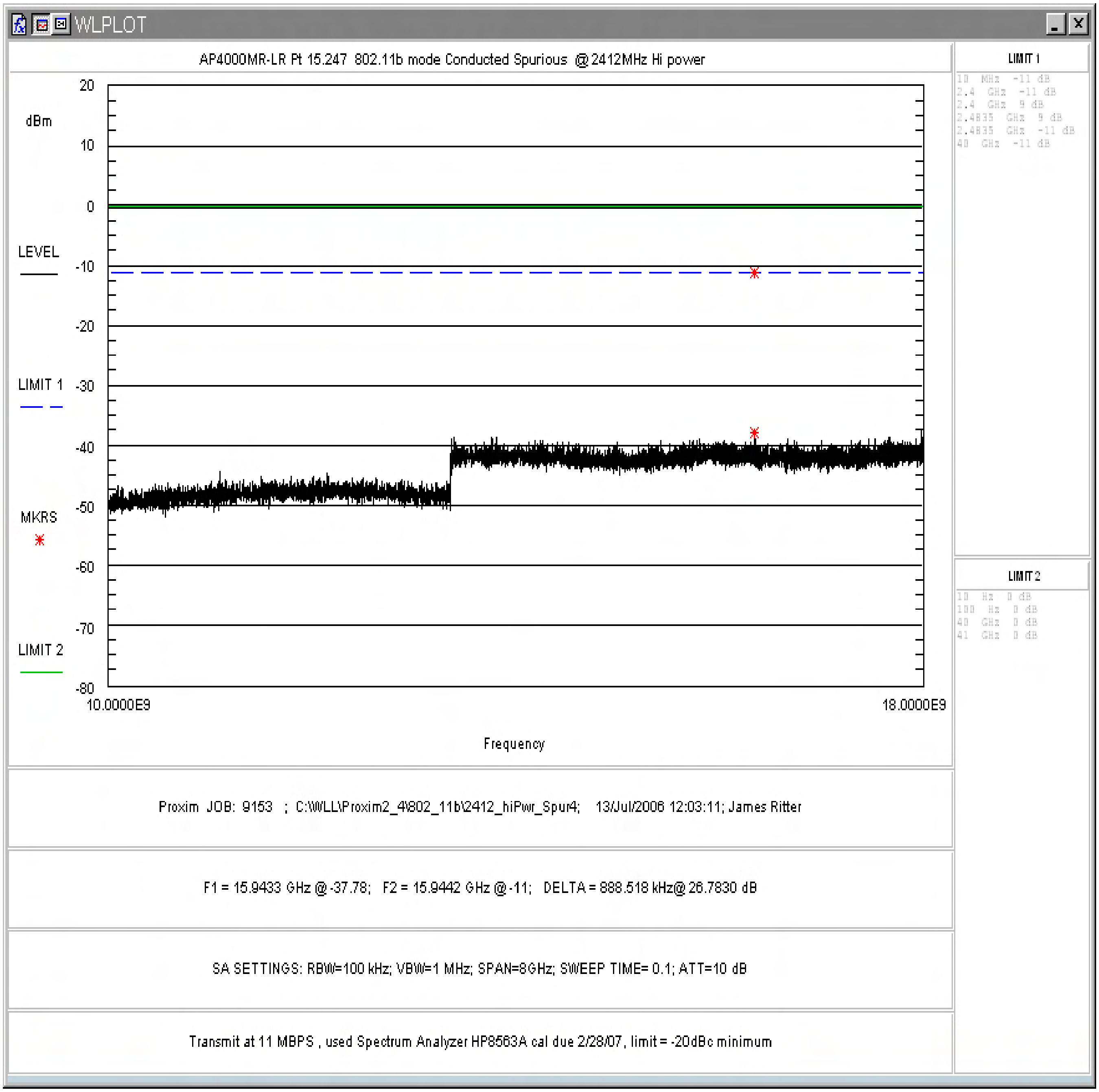


Figure 4-26. Conducted Spurious Emissions, High Power: Low Channel 10 -18GHz

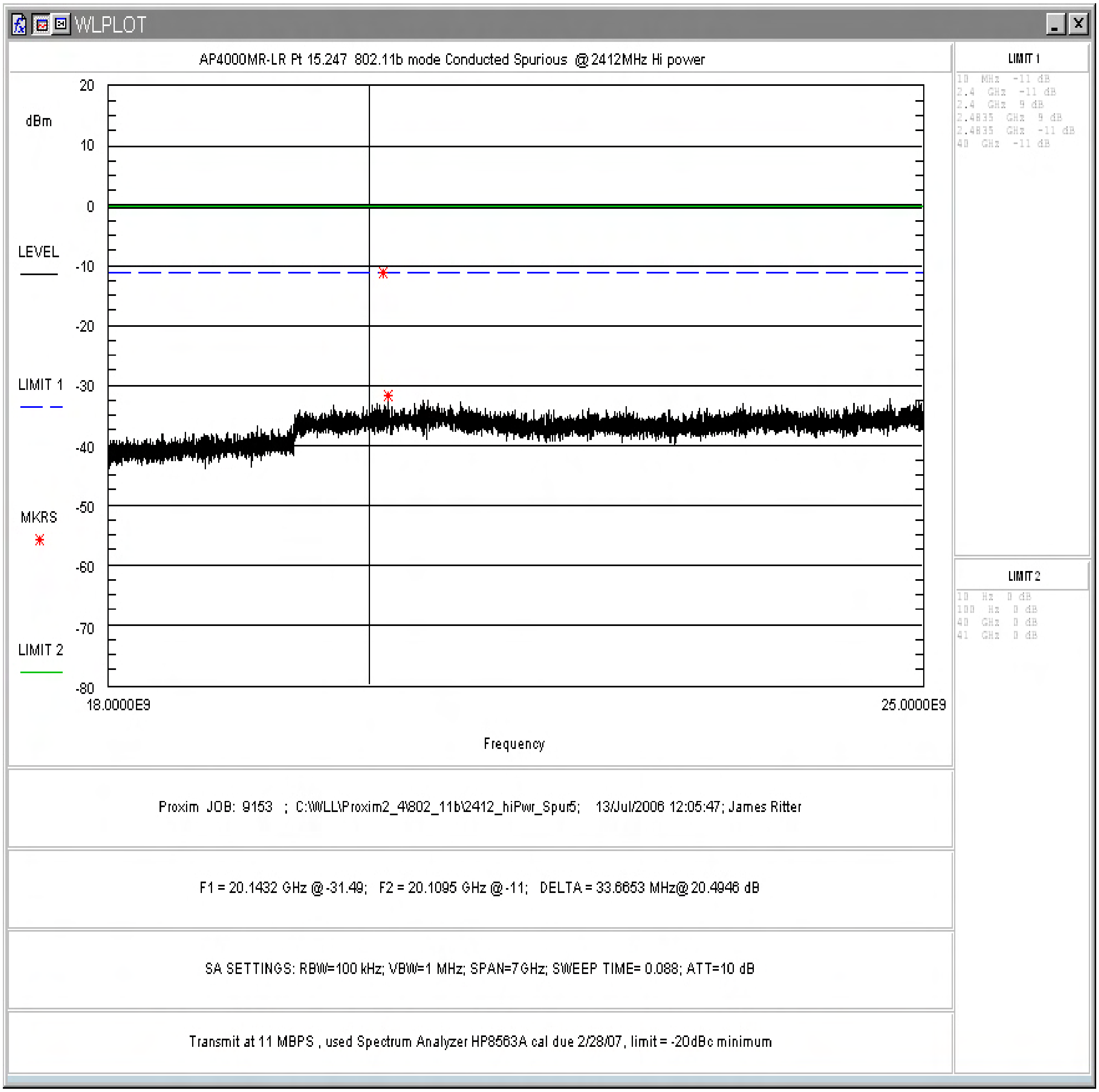


Figure 4-27. Conducted Spurious Emissions, High Power: Low Channel 18– 25GHz