Washington Laboratories, Ltd.

FCC & Industry Canada Certification Test Report
For the
Axiometric, LLC
D4300 Electric Meter Interface Unit (EMIU)

FCC ID: ODYD4300
IC ID: TBD

WLL JOB# **9843-1**
April 30, 2008

Prepared for:

Axiometric, LLC
10718 Vista Road
Columbia, MD, 21044

Prepared By:

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

ACCREDITED

FCC & Industry Canada Certification Test Report
for the
Axiometric, LLC
D4300 Electric Meter Interface Unit (EMIU)
FCC ID: ODYD4300
IC ID: TBD

April 30, 2008

WLL JOB# 9843-1

Prepared by: James Ritter
Compliance Engineer

Reviewed by: Steven D. Koster
EMC Operations Manager

Abstract

This report has been prepared on behalf of Axiometric, LLC to support the attached Application for Equipment Authorization. The test report and application are submitted for a Frequency Hopping Spread Spectrum Transmitter under Part 15.247 (9/2007) of the FCC Rules and Regulations and Spectrum Management and Telecommunications Policy RSS-210 of Industry Canada. This Certification Test Report documents the test configuration and test results for an Axiometric, LLC D4300 Electric Meter Interface Unit (EMIU).

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 Axiometric, LLC D4300 Electric Meter Interface Unit (EMIU) complies with the limits for a Frequency Hopping Spread Spectrum Transmitter device under FCC Part 15.247 and Industry Canada RSS-210.

Table of Contents

Abstract ii
1 Introduction 1
1.1 Compliance Statement 1
1.2 Test Scope 1
1.3 Contract Information 1
1.4 Test Dates 1
1.5 Test and Support Personnel 1
1.6 Abbreviations 2
2 Equipment Under Test 3
2.1 EUT Identification & Description 3
2.2 Test Configuration 3
2.3 Testing Algorithm 3
2.4 Test Location 3
2.5 Measurements 4
2.5.1 References 4
2.6 Measurement Uncertainty 4
3 Test Equipment 5
4 Test Summary 6
5 Test Results 7
5.1 RF Power Output: (15.247 (b)(2),RSS-210 [A8.4 (1)]) 7
5.2 Occupied Bandwidth: (15.247 (a)(1)(i),RSS-210 [A8. 1(c)]) 10
5.3 Channel Spacing & Number of Hop Channels (15.247 (a)(1)(i), RSS-210 [A8. 1 (c)]) 14
5.4 Duty Cycle Correction & Time of Occupancy (15.247 (a)(1)(i), RSS-210 [A8. 1 (c)]) 16
5.5 Conducted Spurious Emissions at Antenna Terminals (15.247 (d), RSS-210 [A8. 5]) 18
5.6 Conducted Band Edge Emissions at Antenna Terminals (15.247 (d),RSS-210 [A8. 5] 31
5.7 Transmit Radiated Spurious Emissions: (FCC Part §15.205, §15.209, RSS210 (A.5)) 35
5.7.1 Test Procedure 35
5.7.2 Test Summary 35
5.8 Receiver Radiated Spurious Emissions: (FCC Part §15.209, RSS-Gen [7.2.3.2]) 39
5.8.1 Test Procedure 39
5.8.2 Test Summary 39
5.9 AC Conducted Emissions (FCC Pt.15.207, RSS-Gen [7.2.2]) 40
5.9.1 Requirements 40
5.9.2 Test Procedure 40
5.9.3 Test Data 40

List of Tables

Table 1. Device Summary 3
Table 2: Test Equipment List 5
Table 3: Test Summary Table 6
Table 4. RF Power Output 7
Table 5. Occupied Bandwidth Results 13
Table 6: Radiated Emission Test Data, Restricted Bands –Low Channel 36
Table 7: Radiated Emission Test Data, Restricted Bands –Center Channel 37
Table 8: Radiated Emission Test Data, Restricted Bands –High Channel 38
Table 9: Receiver Radiated Test Data 39
Table 10: Conducted Emission Test Data 41

List of Figures

Figure 5-1. RF Peak Power, Low Channel 8
Figure 5-2. RF Peak Power, Mid Channel 9
Figure 5-3. RF Peak Power, High Channel 10
Figure 5-4. Occupied Bandwidth, Low Channel 11
Figure 5-5. Occupied Bandwidth, Mid Channel 12
Figure 5-6. Occupied Bandwidth, High Channel 13
Figure 5-7. Channel Spacing, 989kHz 15
Figure 5-8. Number of Channels 16
Figure 5-9. Time of Occupancy, Single Pulse 17
Figure 5-10. Time off Occupancy, 20 second Dwell Time 18
Figure 5-11. Conducted Spurious Emissions, Low Channel 30 - 900MHz 19
Figure 5-12. Conducted Spurious Emissions, Low Channel 900 – 930MHz 20
Figure 5-13. Conducted Spurious Emissions, Low Channel 930 –5000 MHz 21
Figure 5-14. Conducted Spurious Emissions, Low Channel 5 - 10GHz 22
Figure 5-15. Conducted Spurious Emissions, Center Channel 30 - 900MHz 23
Figure 5-16. Conducted Spurious Emissions, Center Channel 900 – 930MHz 24
Figure 5-17. Conducted Spurious Emissions, Center Channel 930 - 5000MHz 25
Figure 5-18. Conducted Spurious Emissions, Center Channel 5 – 10GHz 26
Figure 5-19. Conducted Spurious Emissions, High Channel 30 - 900MHz 27
Figure 5-20. Conducted Spurious Emissions, High Channel 900 -930MHz 28
Figure 5-21. Conducted Spurious Emissions, High Channel 930 – 5000MHz 29
Figure 5-22. Conducted Spurious Emissions, High Channel 5 - 10GHz 30
Figure 5-23. Conducted Lower Band Edge, Non-hopping Low Channel 31
Figure 5-24. Conducted Upper Band Edge, Non-hopping High Channel 32
Figure 5-25. Conducted Lower Band Edge, Hopping Mode 33
Figure 5-26. Conducted Upper Band Edge, Hopping Mode 34

1 Introduction

1.1 Compliance Statement

The Axiometric, LLC D4300 Electric Meter Interface Unit (EMIU) complies with the limits for a Frequency Hopping Spread Spectrum Transmitter device under FCC Part 15.247 (9/2007) and Industry Canada RSS-210e issue 7.

1.2 Test Scope

Tests for radiated and conducted (at antenna terminal) emissions were performed. All measurements were performed in accordance with Public Notice DA 00-705 “Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems”. The measurement equipment conforms to ANSI C63.2 Specifications for Electromagnetic Noise and Field Strength Instrumentation.

1.3 Contract Information

Customer:	Axiometric, LLC 10718 Vista Road Columbia, MD, 21044
Purchase Order Number:	NA
Quotation Number:	63677

1.4 Test Dates

Testing was performed on the following date(s):	3/5/08-4/28/08

1.5 Test and Support Personnel

Washington Laboratories, LTD	James Ritter, John Repella
Client Representative	Frank Moody

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 Axiometric, LLC D4300 Electric Meter Interface Unit (EMIU) is a wireless electric metering system for monitoring of electrical usage.

Table 1. Device Summary

ITEM	DESCRIPTION
Manufacturer:	Axiometric, LLC
FCC ID:	ODYD4300
IC:	TBD
Model:	D4300 Electric Meter Interface Unit (EMIU)
FCC Rule Parts:	§15.247
Industry Canada:	RSS210
Frequency Range:	902.5 – 927MHz
Maximum Output Power:	207mW (23.16dBm)
Modulation:	FSK FHSS
Occupied Bandwidth:	157kHz
Keying:	Automatic, Manual
Type of Information:	Data
Number of Channels:	50
Power Output Level	Fixed
Antenna Connector	None
Antenna Type	integral
Interface Cables:	None
Power Source & Voltage:	200-230VAC

2.2 Test Configuration

The D4300 Electric Meter Interface Unit (EMIU) was configured with 230VAC provided to the Unit.

2.3 Testing Algorithm

The D4300 Electric Meter Interface Unit (EMIU) was programmed for FHSS operation via a support Laptop that connected to a maintenance port. A HyperTerminal connection allowed the unit to transmit /receive on one of 3 channels (Low: 902.5MHz, Center: 915MHz, & High: 927MHz). The unit was also programmed to hop on 50 channels with its normal pseudorandom rate.

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

2.5 Measurements

2.5.1 References

FCC Public Notice DA 00-705, Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems

ANSI C63.2 Specifications for Electromagnetic Noise and Field Strength Instrumentation

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
00069	HP, 85650A	ADAPTER, QP	7/6/2008
00071	HP, 85685A	PRESELECTOR, RF	7/6/2008
00073	HP, 8568B	ANALYZER, SPECTRUM	7/6/2008
00125	SOLAR, 8028-50-TS-24-BNC	LISN	1/30/2009
00126	SOLAR, 8028-50-TS-24-BNC	LISN	1/30/2009
00069	HP, 85650A	ADAPTER, QP	7/6/2008
00071	HP, 85685A	PRESELECTOR, RF	7/6/2008
00073	HP, 8568B	ANALYZER, SPECTRUM	7/6/2008
00618	HP 8563A	ANALYZER, SPECTRUM	3/7/2009
00522	HP, 8449B	PRE-AMPLIFIER, 1-26.5GHZ	7/27/2008
00425	ARA, DRG-118/A	ANTENNA, DRG, 1-18GHZ	8/8/2009
00382	SUNOL, JB1	ANTENNA, BICONLOG	1/30/2009
NA	Agilent E4466A	Spectrum Analyzer	4/22/09

4 Test Summary

The Table Below shows the results of testing for compliance with a Digital Transmission System in accordance with FCC Part 15.247:2007 and RSS210e issue 7. Full results are shown in section 5.

Table 3: Test Summary Table

TX Test Summary (Frequency Hopping Spread Spectrum)			
FCC Rule Part	**IC Rule Part**	**Description**	**Result**
15.247 (a)(1)(i)	RSS-210 [A8. 1(c)]	20dB Bandwidth	Pass
15.247 (b)(2)	RSS-210 [A8.4 (1)]	Transmit Output Power	Pass
15.247 (a)(1)	RSS-210 [A8.1 (b)]	Channel Separation	Pass
15.247 (a)(1)(i)	RSS-210 [A8. 1 (c)]	Number of Channels (50 min)	Pass
15.247 (a)(1)(i)	RSS-210 [A8. 1 (c)]	Time of Occupancy	Pass
15.247 (d)	RSS-210 [A8. 5]	Out-of-Band Emissions (Band Edge @ 20dB below)	Pass
15.205 15.209	RSS-210 [A8. 5]	General Field Strength Limits (Restricted Bands & RE Limits)	Pass
15.207	RSS-Gen [7.2.2]	AC Conducted Emissions	Pass
RX/Digital Test Summary (Frequency Hopping Spread Spectrum)			
FCC Rule Part	**IC Rule Part**	**Description**	**Result**
15.207	RSS-Gen [7.2.2]	AC Conducted Emissions	Pass
15.209	RSS-Gen [7.2.3.2]	General Field Strength Limits (Restricted Bands & RE Limits)	Pass

5 Test Results

5.1 RF Power Output: (15.247 (b)(2),RSS-210 [A8.4 (1)])

To measure the output power the hopping sequence was stopped while the frequency dwelled 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 4. RF Power Output

Frequency	Level	Limit	Pass/Fail
Low Channel: 902.5MHz	23.08 dBm	30 dBm	Pass
Mid Channel: 915MHz	23.16 dBm	30 dBm	Pass
High Channel: 927MHz	23.08 dBm	30 dBm	Pass

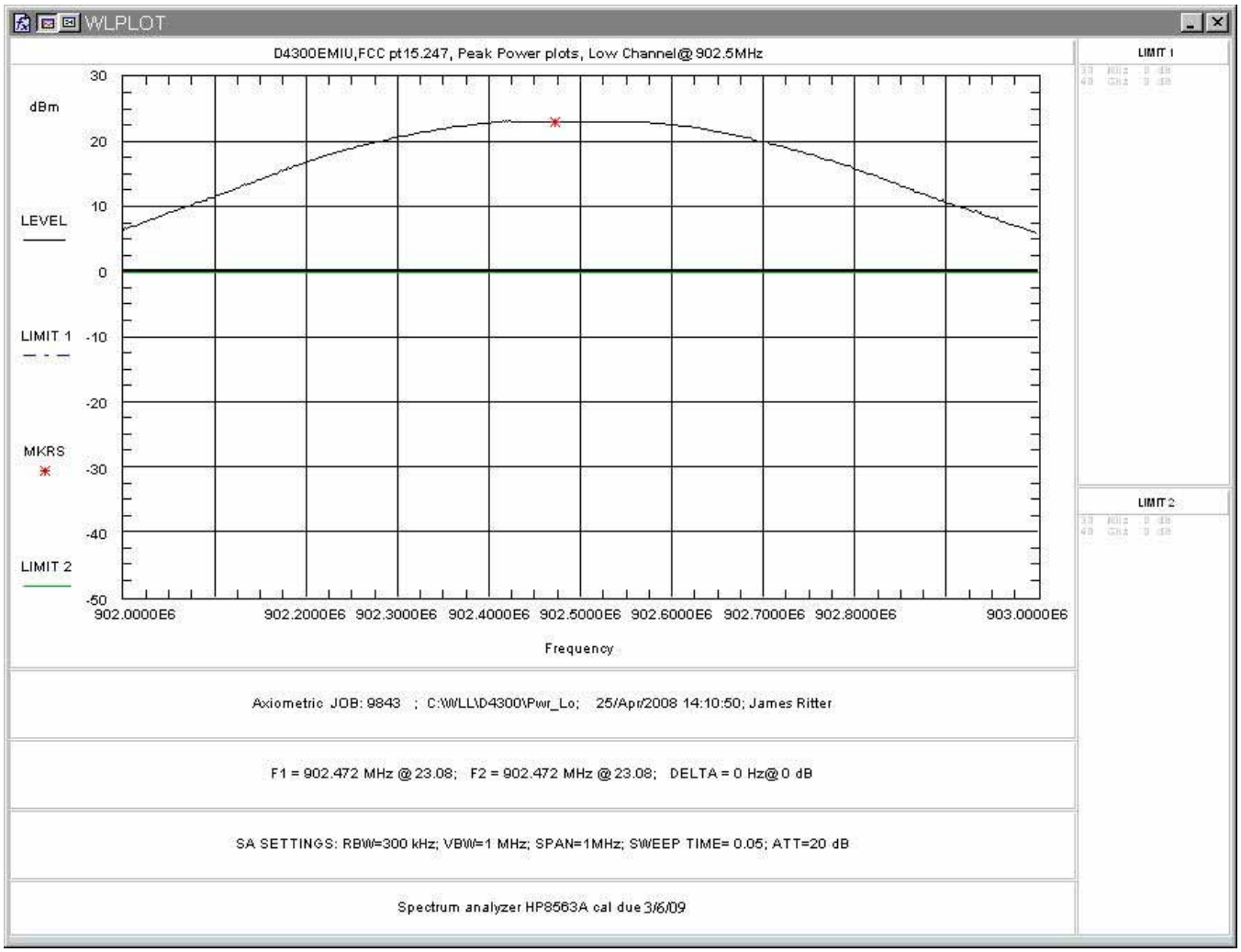

Figure 5-1. RF Peak Power, Low Channel

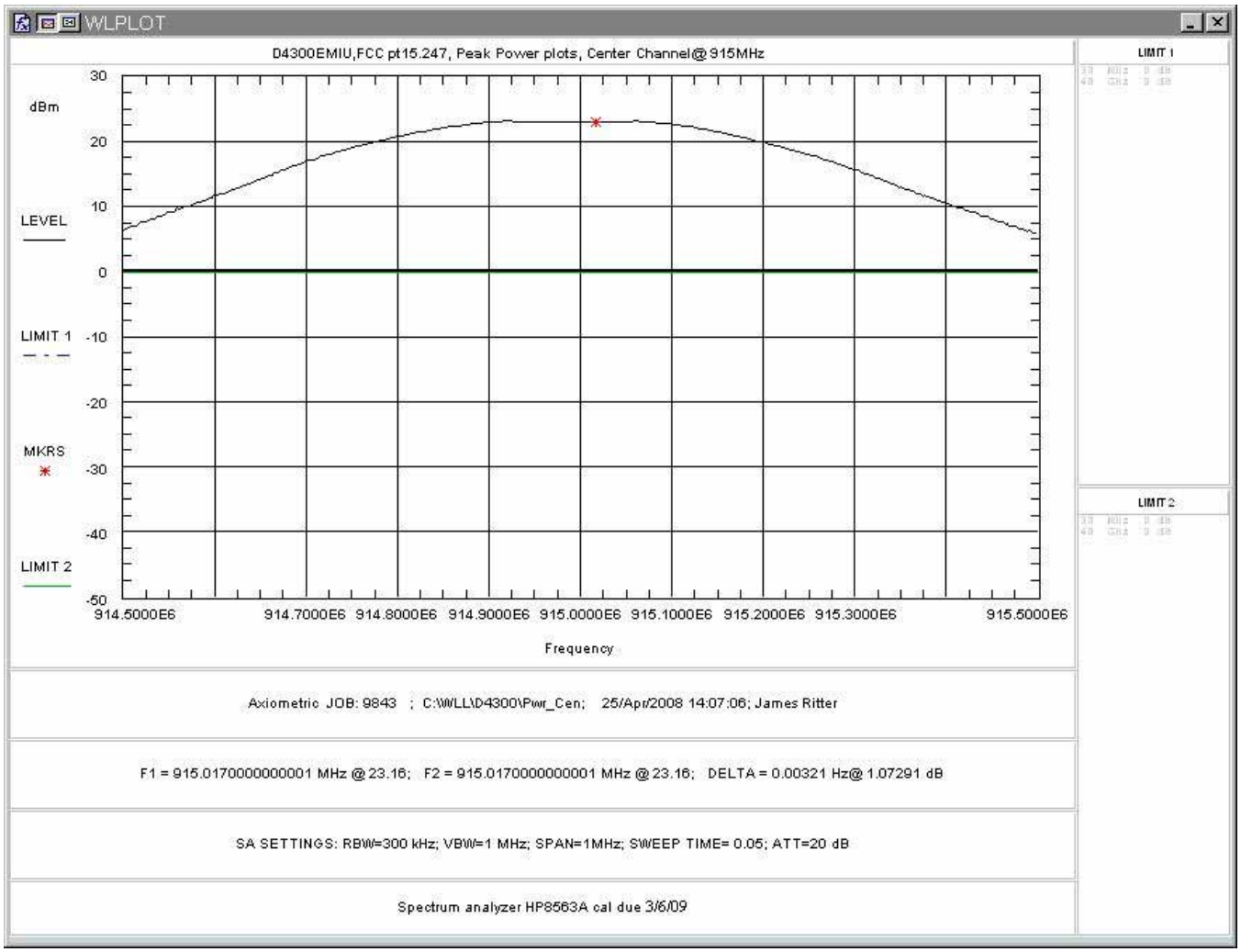

Figure 5-2. RF Peak Power, Mid Channel

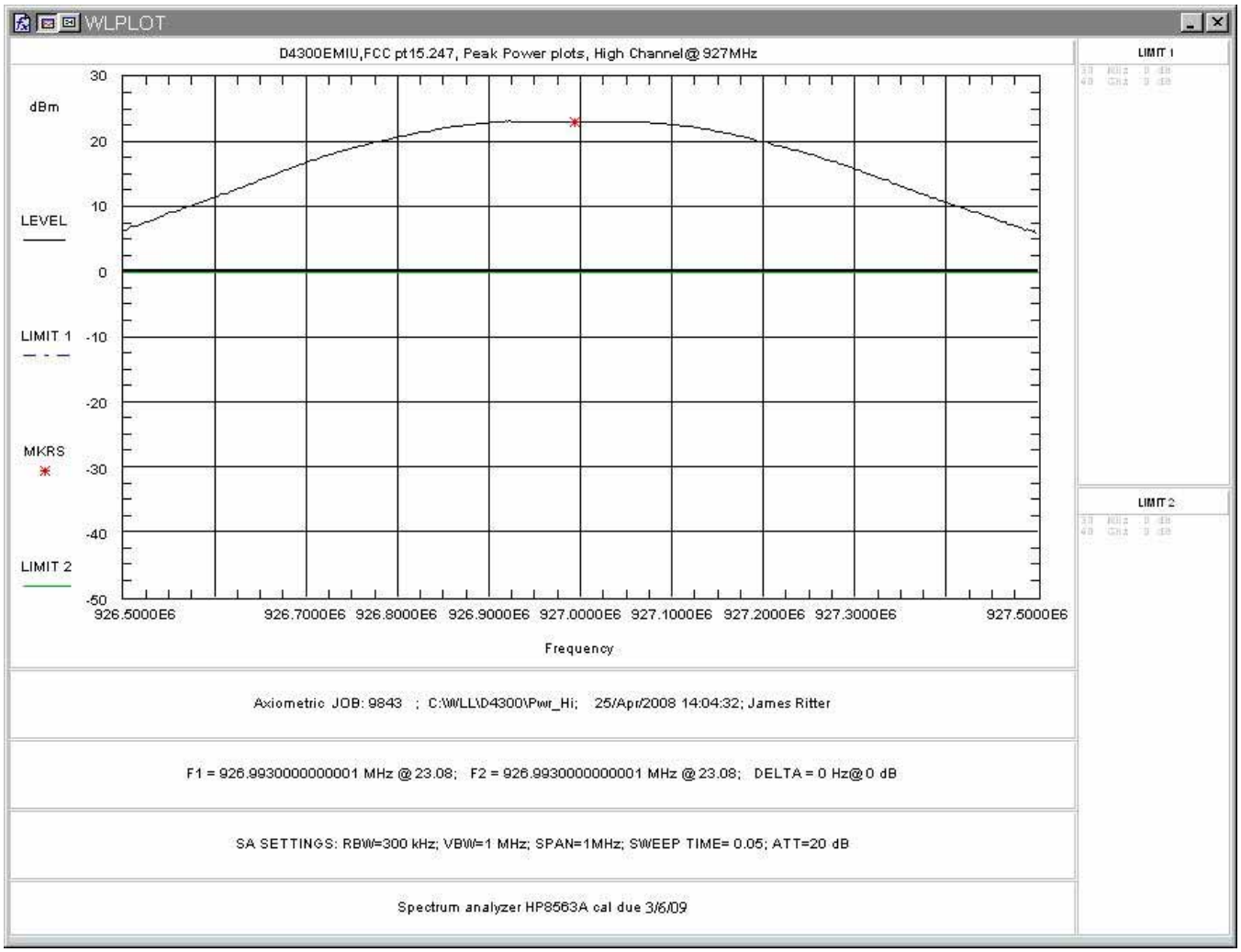

Figure 5-3. RF Peak Power, High Channel

5.2 Occupied Bandwidth: (15.247 (a)(1)(i),RSS-210 [A8. 1(c)])

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

For Frequency Hopping Spread Spectrum Systems, FCC Part 15.247 requires the maximum 20 dB bandwidth not exceed 500kHz.

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

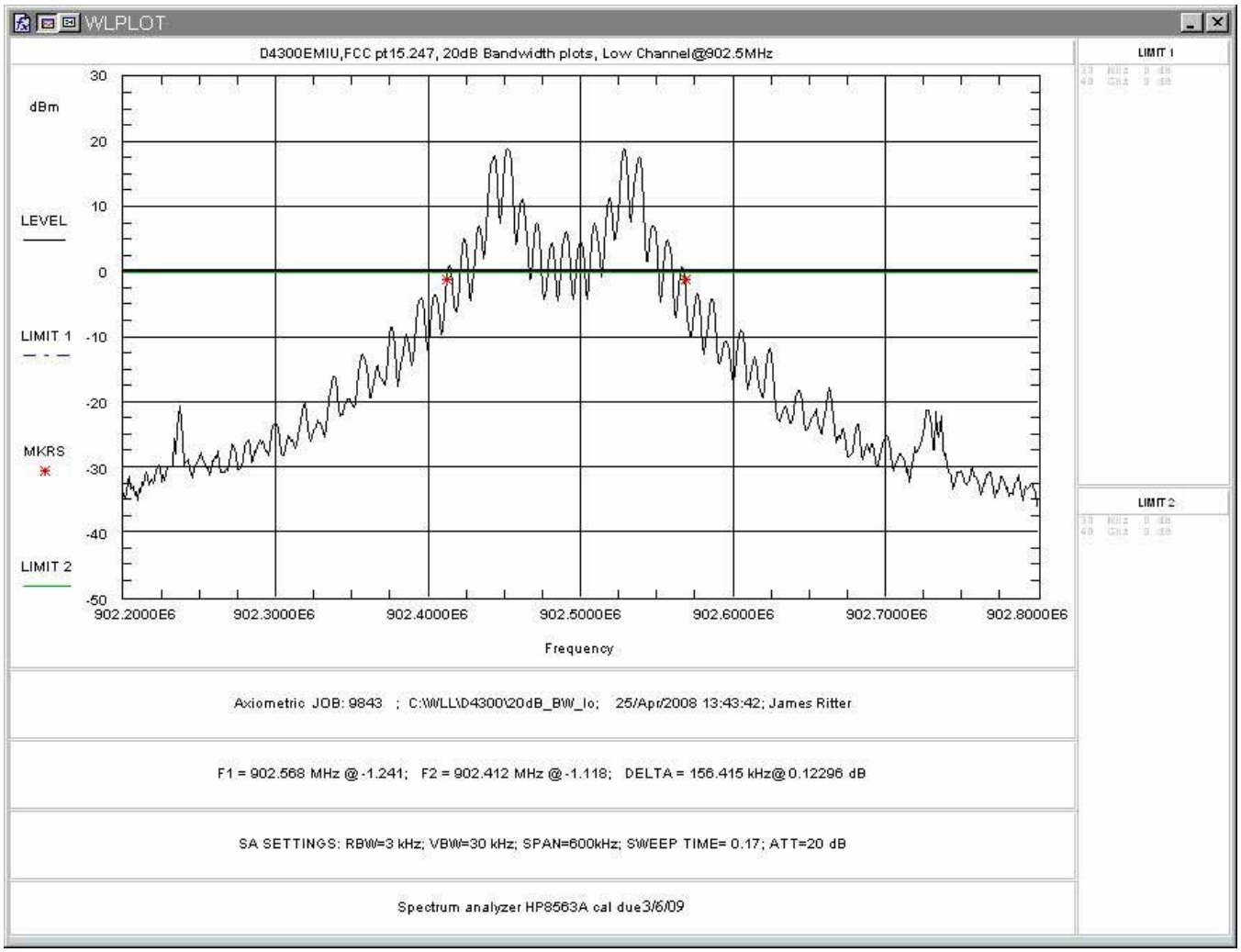

Figure 5-4. Occupied Bandwidth, Low Channel

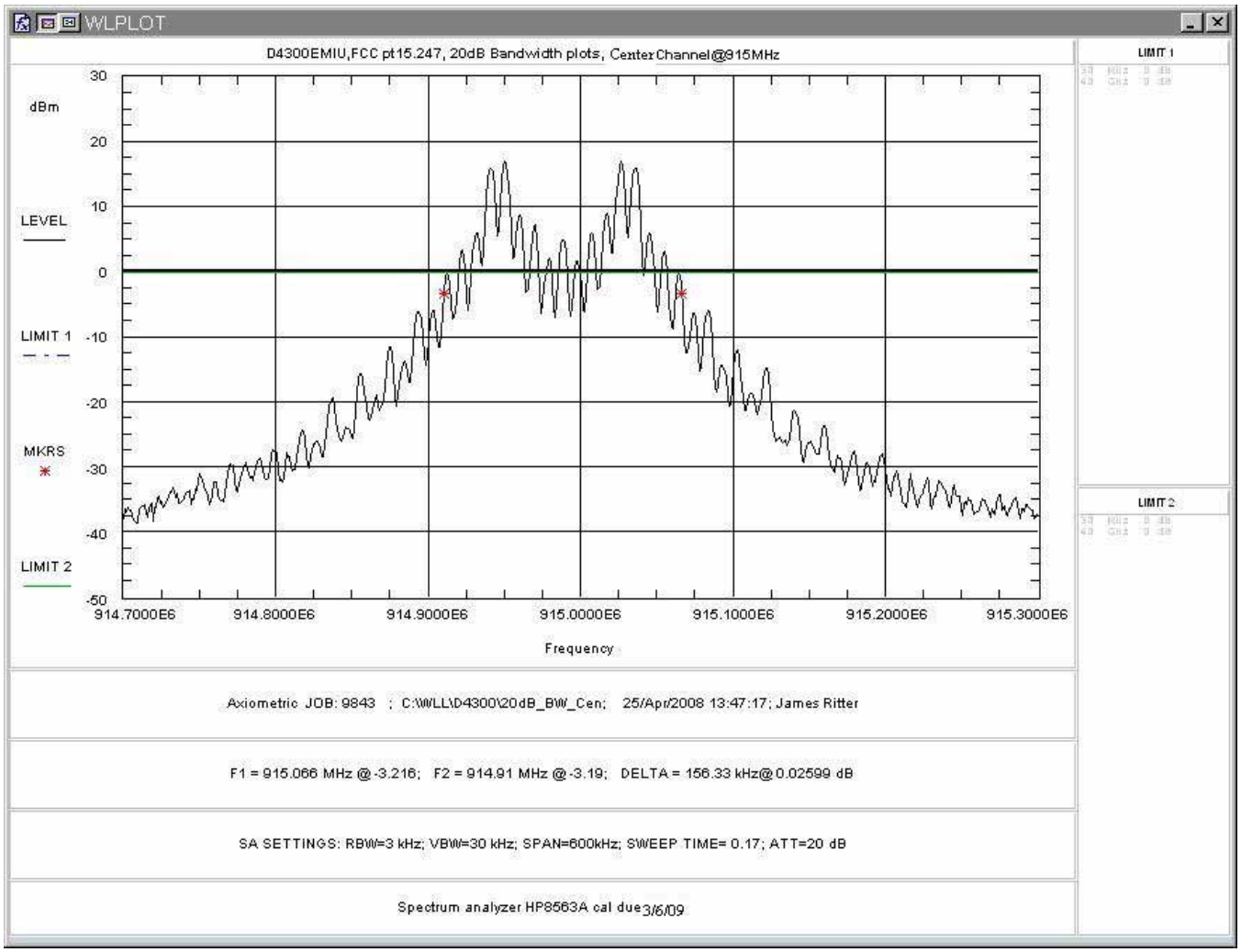

Figure 5-5. Occupied Bandwidth, Mid Channel

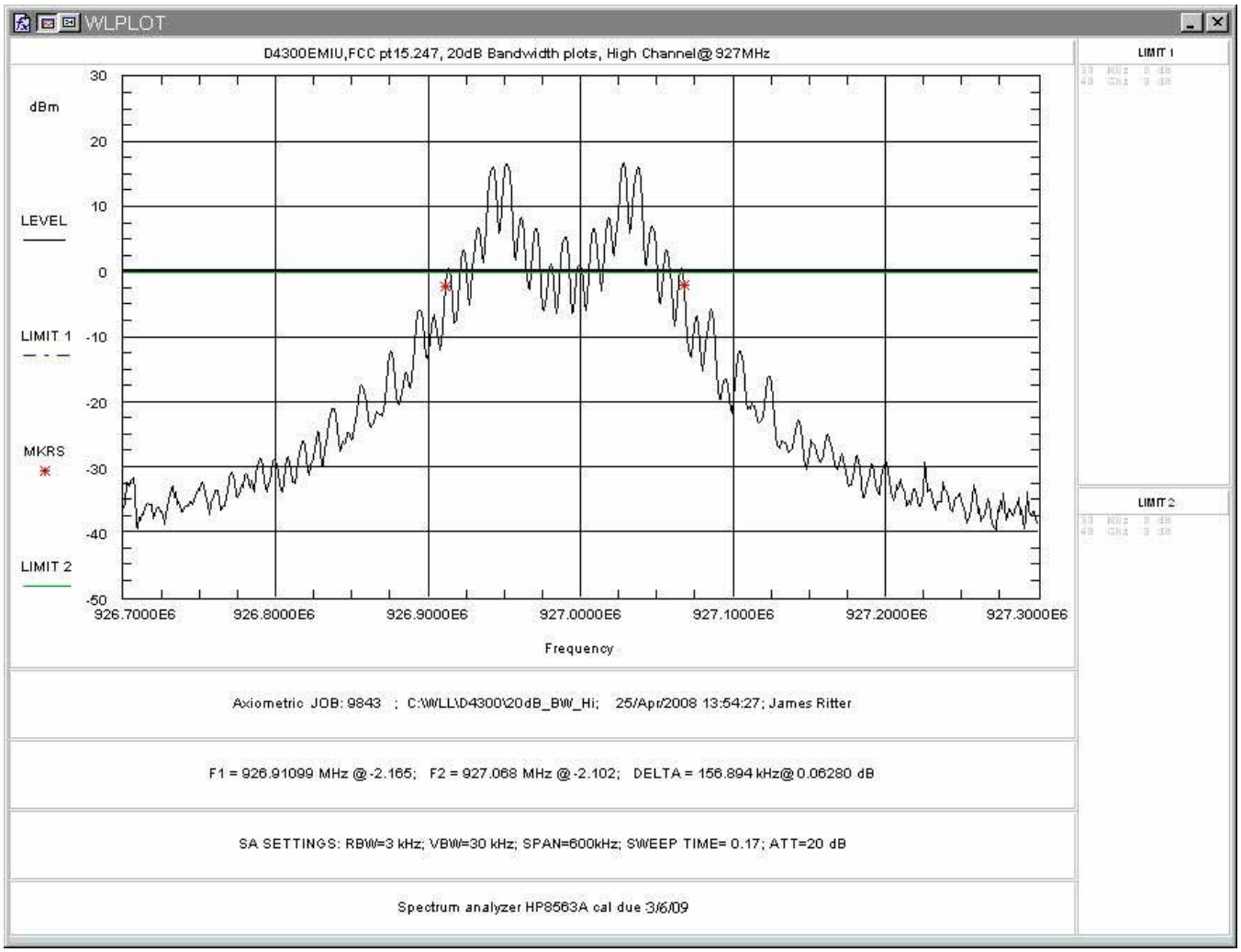

Figure 5-6. Occupied Bandwidth, High Channel

Table 5 provides a summary of the Occupied Bandwidth Results.

Table 5. Occupied Bandwidth Results

Frequency	Bandwidth	Max Limit	Pass/Fail
Low Channel: 902.5MHz	156.42kHz	500kHz	Pass
Mid Channel: 915MHz	156.33kHz	500kHz	Pass
High Channel: 927MHz	156.89kHz	500kHz	Pass

5.3 Channel Spacing & Number of Hop Channels (15.247 (a)(1)(i), RSS-210 [A8. 1 (c)])

Per the FCC requirements, frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25kHz or the 20 dB bandwidth, whichever is greater. The maximum 20dB bandwidth measured is 157kHz so the channel spacing must be more than 157kHz. In addition, for a 902-928MHz system the number of hopping channels shall be at least 50.

The EUT antenna was removed and the cable was connected directly into a spectrum analyzer through a 20 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 channel spacing of 2 adjacent channels was measured using a spectrum analyzer span setting of 1.5MHz. Also, the number of hopping channels was measured from 901 to 928MHz.

The following are plots of the channel spacing and number of hopping channels data. The channel spacing was measured to be 502.5kHz and the number of channels used is 50.

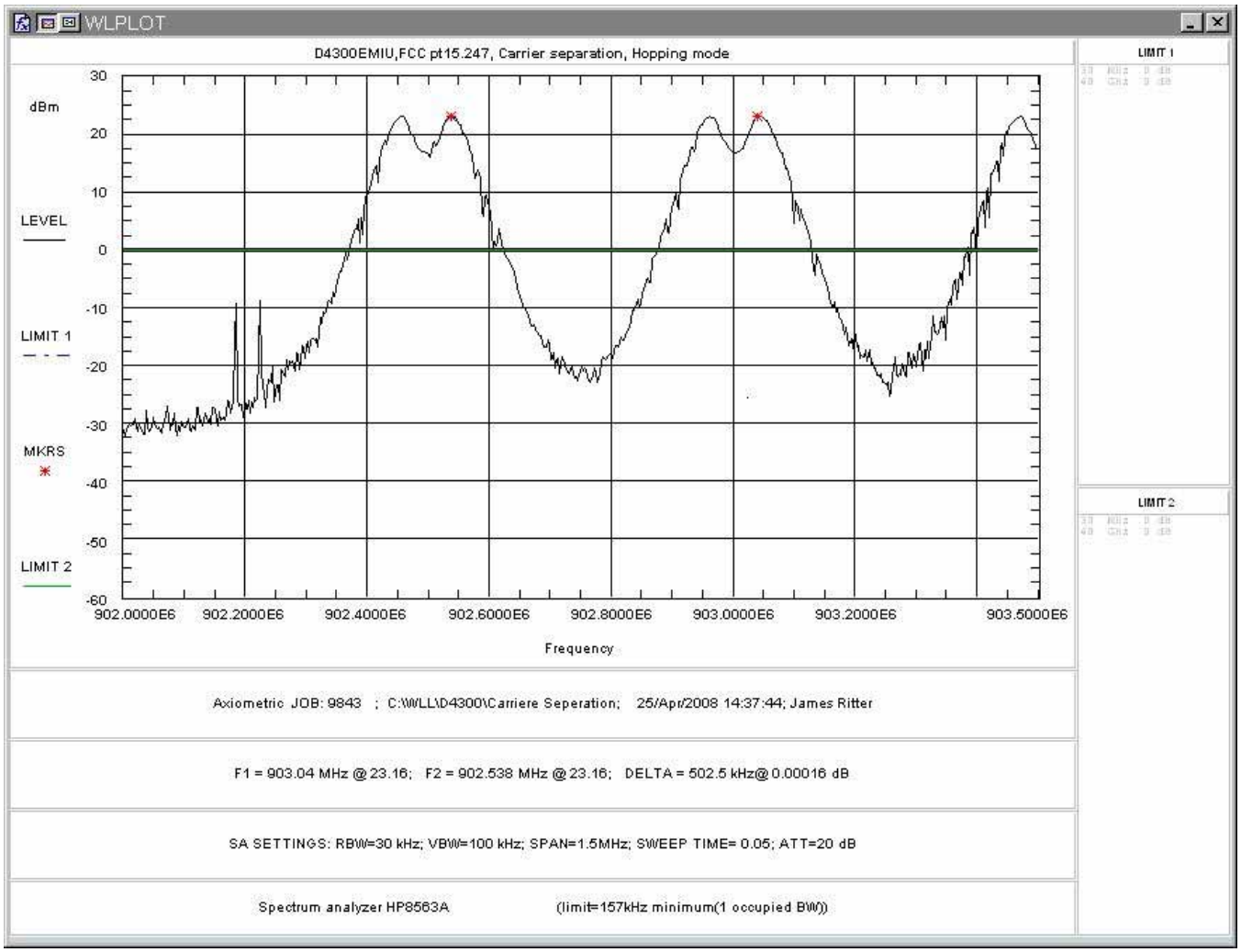

Figure 5-7. Channel Spacing, 502.5kHz

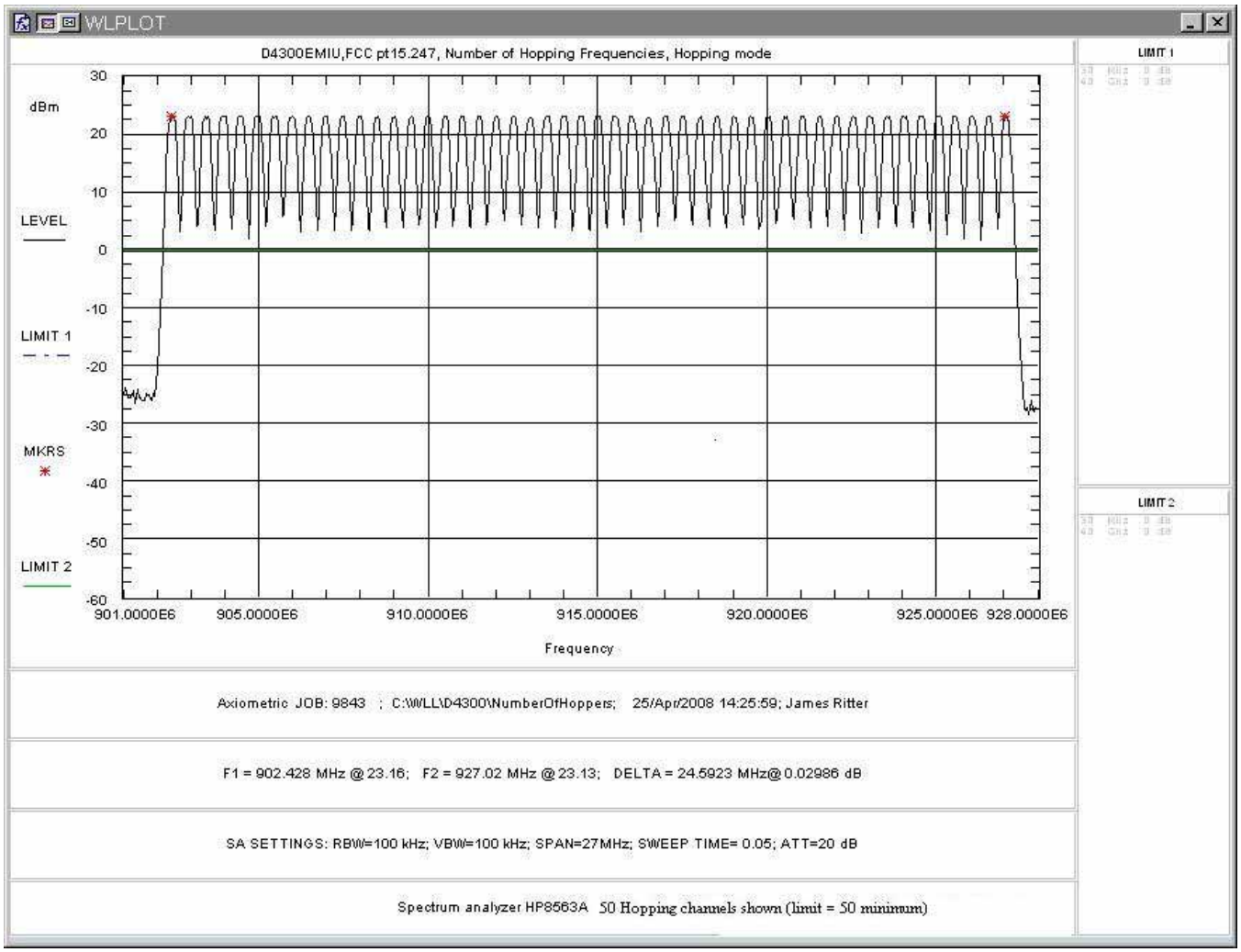

Figure 5-8. Number of Channels

5.4 Duty Cycle Correction & Time of Occupancy (15.247 (a)(1)(i), RSS-210 [A8. 1 (c)])

In accordance with the FCC Public Notice the spurious radiated emissions measurements may be adjusted if using a duty cycle correction factor if the dwell time per channel of the hopping signal is less than 100 ms.

The duty cycle correction factor is calculated by:

20 x LOG (dwell time/100 ms)

The following figure shows the plot of the dwell time for the transmitter. Based on this plot, the dwell time per hop is 108msec.

No Duty cycle correction is allowed.

In Accordance with FCC Part 15.247 (a)(i) systems operating in the 902-928 MHz band with a bandwidth of less than 250kHz and 50 hopping channels shall transmit no more than 0.4 seconds in any 20 second period.

The following plots shows compliance with this paragraph.

Axiometric Job 9843, D4300 EMIU, FCC Pt. 15.247 (1)(i) Time of Occupancy , Single Pulse
Single Pulse= 108ms.

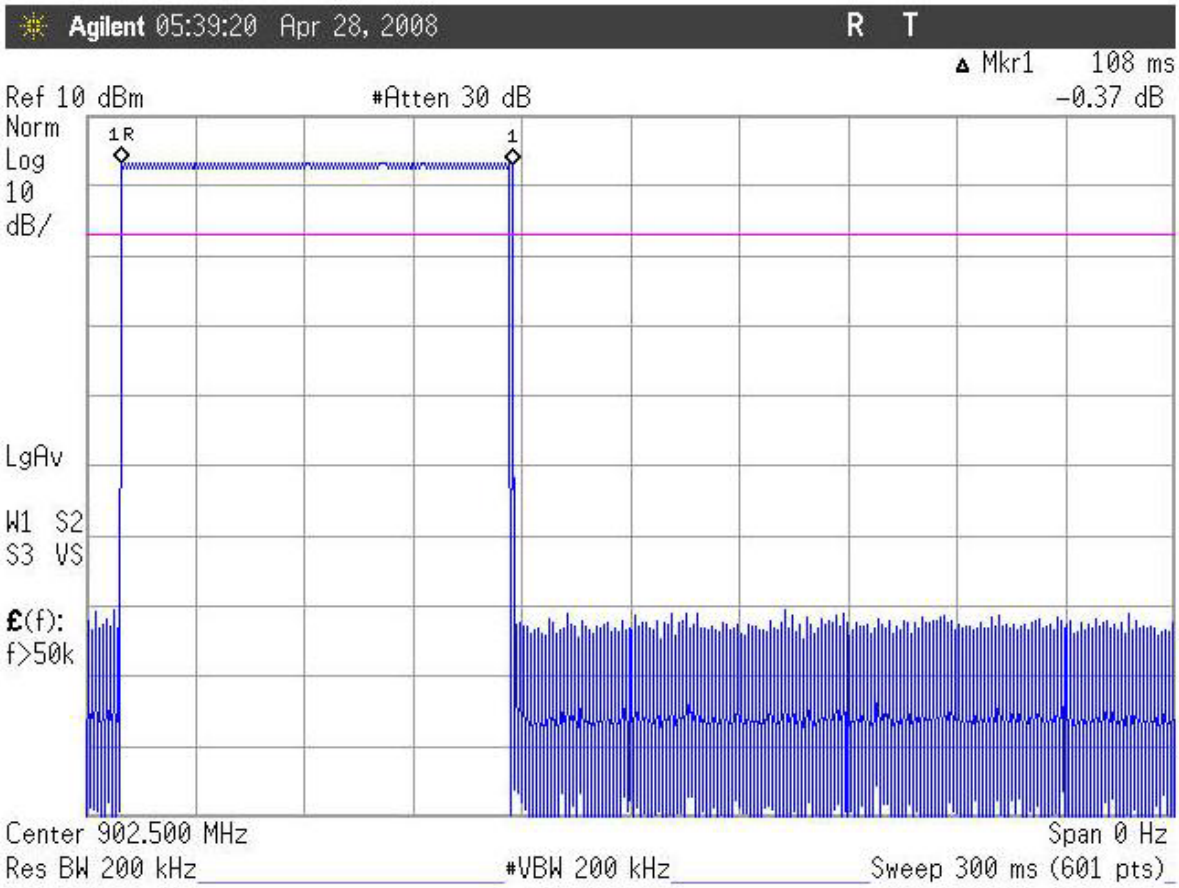

Figure 5-9. Time of Occupancy, Single Pulse

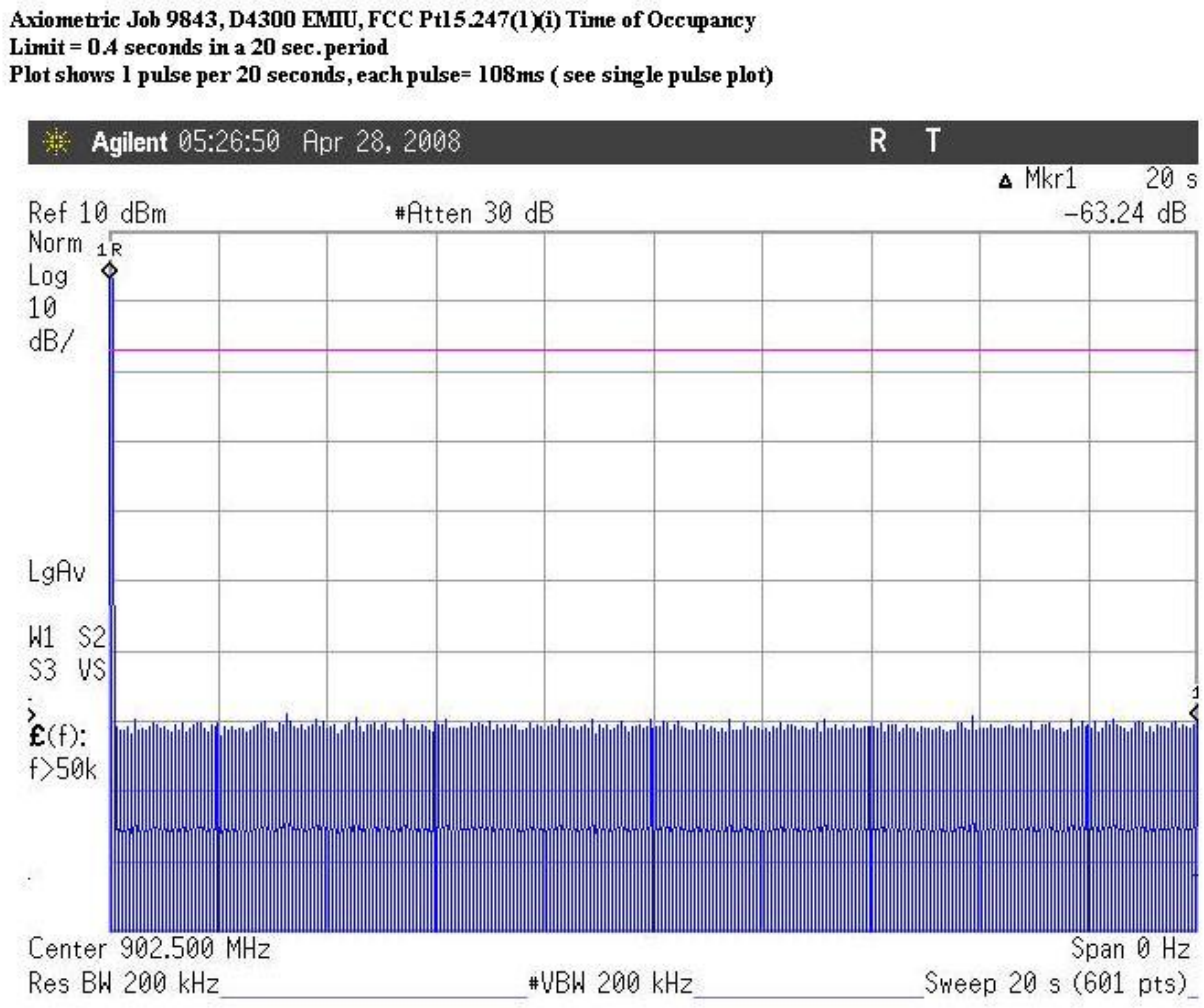

Figure 5-10. Time off Occupancy, 20 second Dwell Time

5.5 Conducted Spurious Emissions at Antenna Terminals (15.247 (d), RSS-210 [A8. 5])

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 20 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.

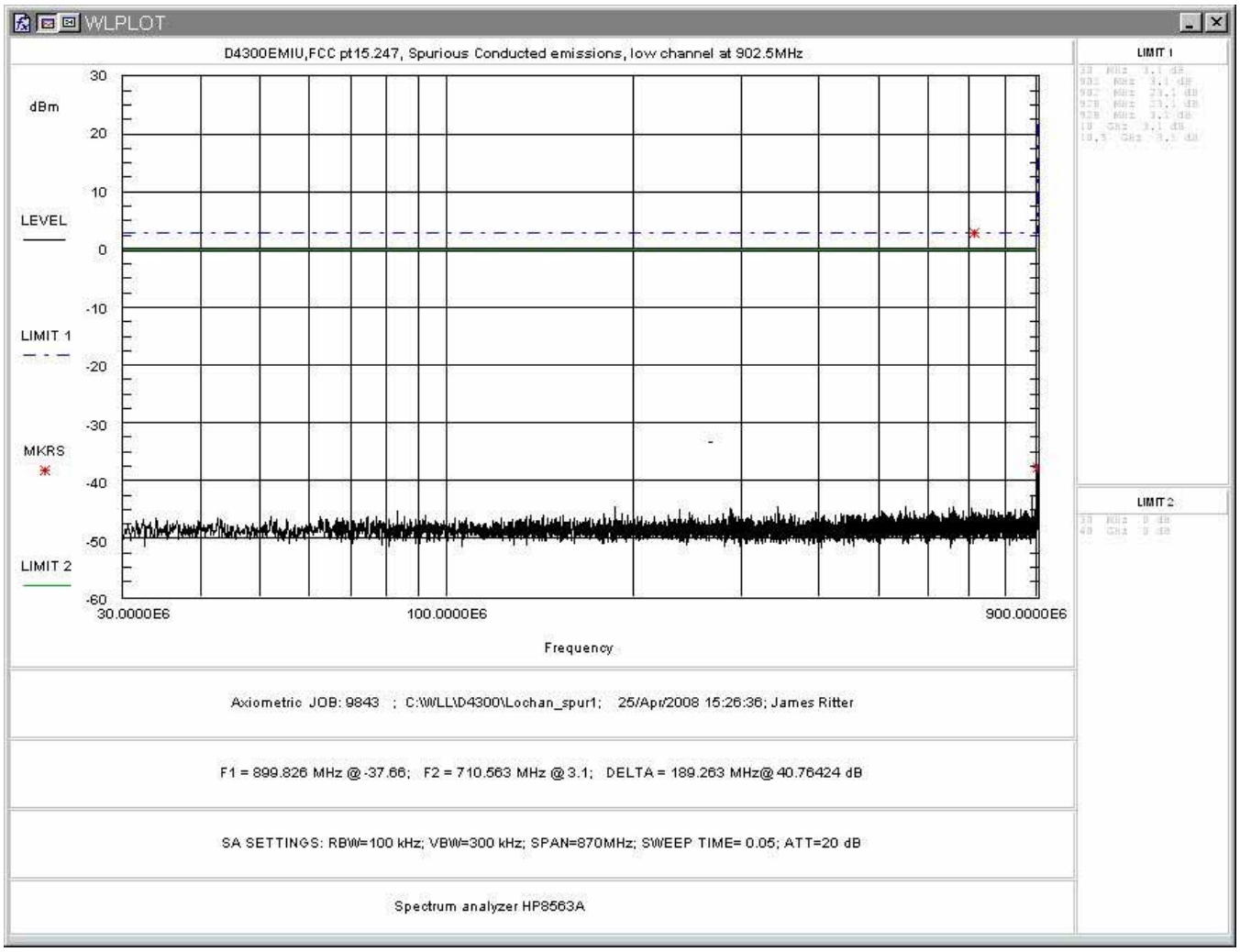

Figure 5-11. Conducted Spurious Emissions, Low Channel 30 - 900MHz

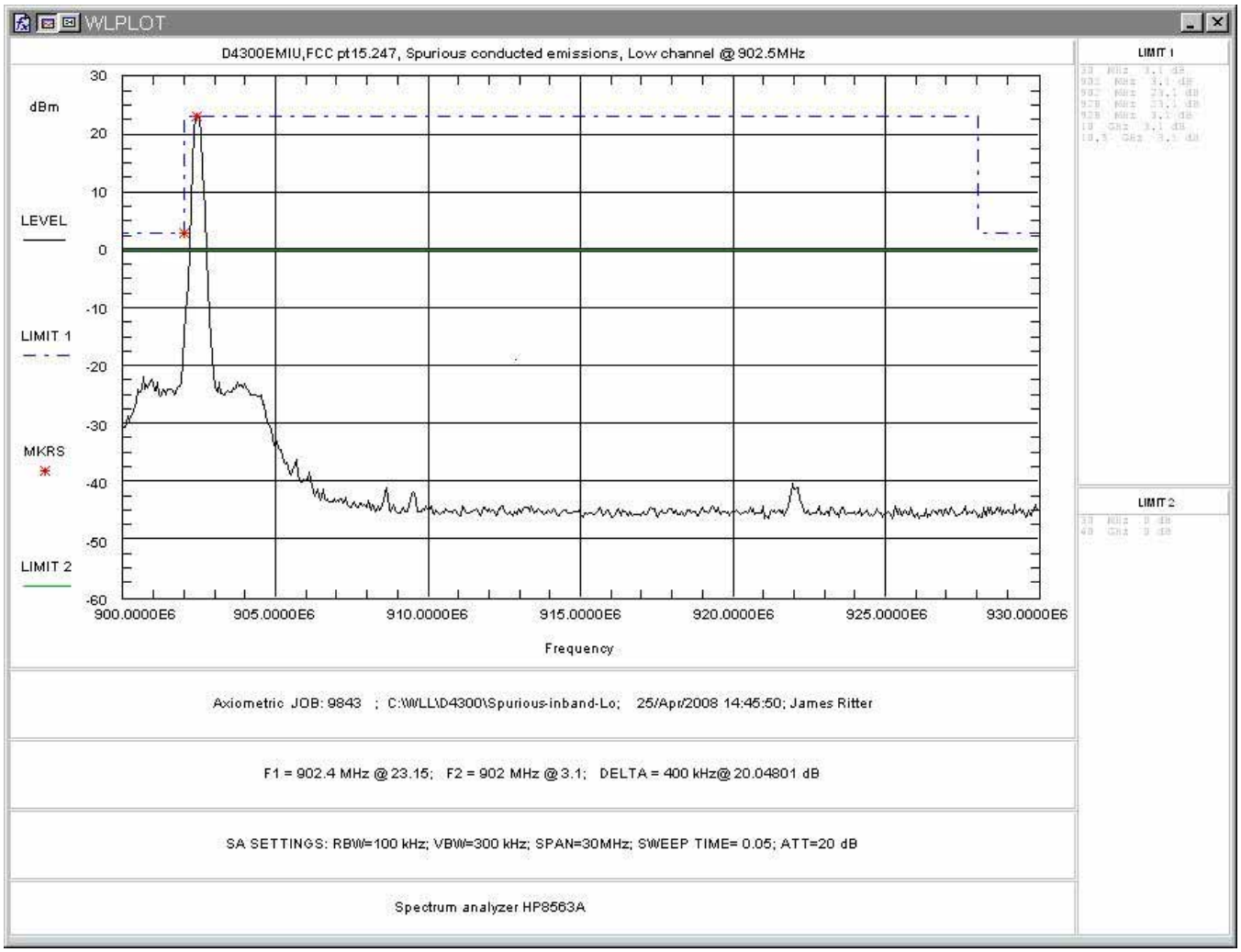

Figure 5-12. Conducted Spurious Emissions, Low Channel 900 – 930MHz

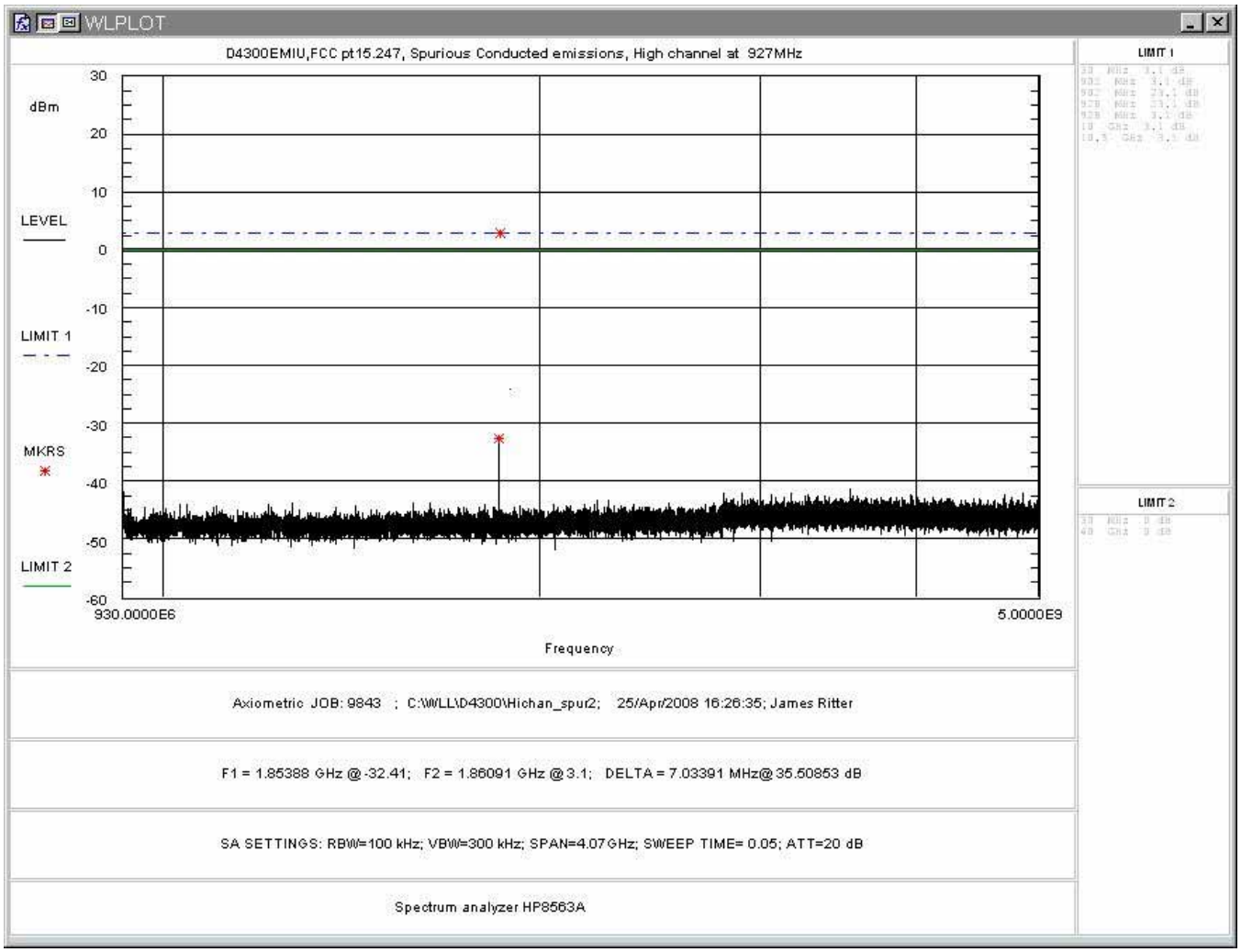

Figure 5-13. Conducted Spurious Emissions, Low Channel 930 –5000 MHz

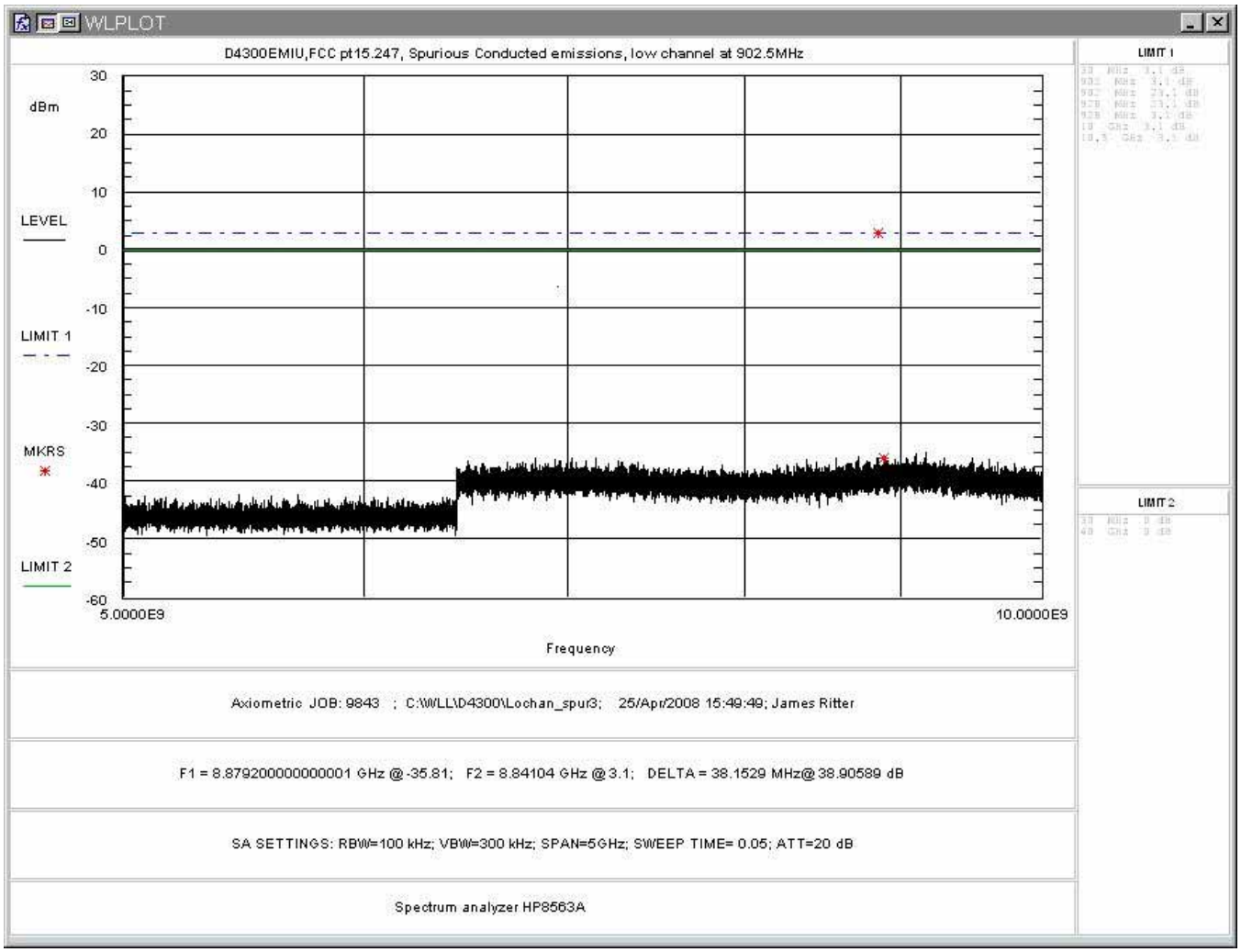

Figure 5-14. Conducted Spurious Emissions, Low Channel 5 - 10GHz

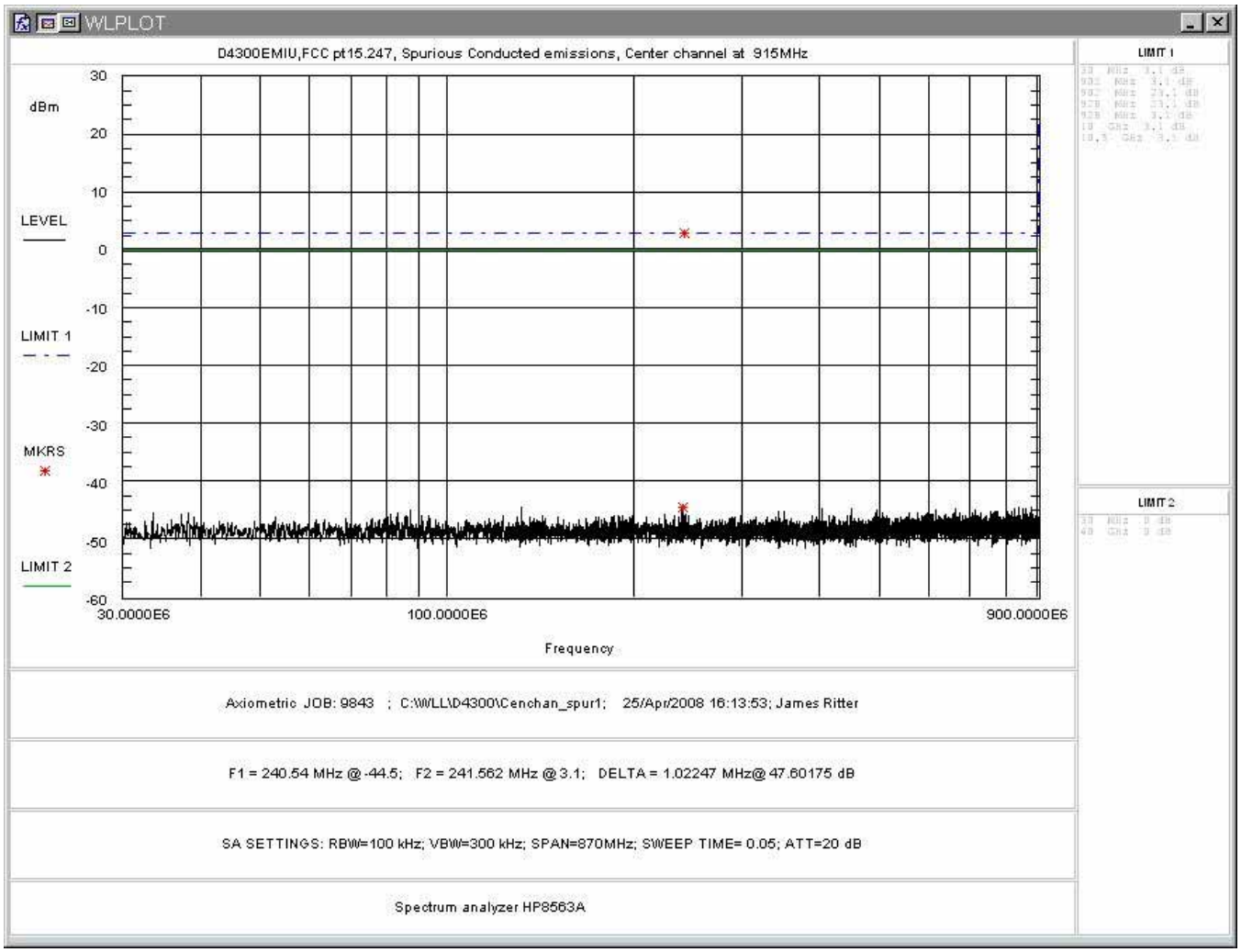

Figure 5-15. Conducted Spurious Emissions, Center Channel 30 - 900MHz

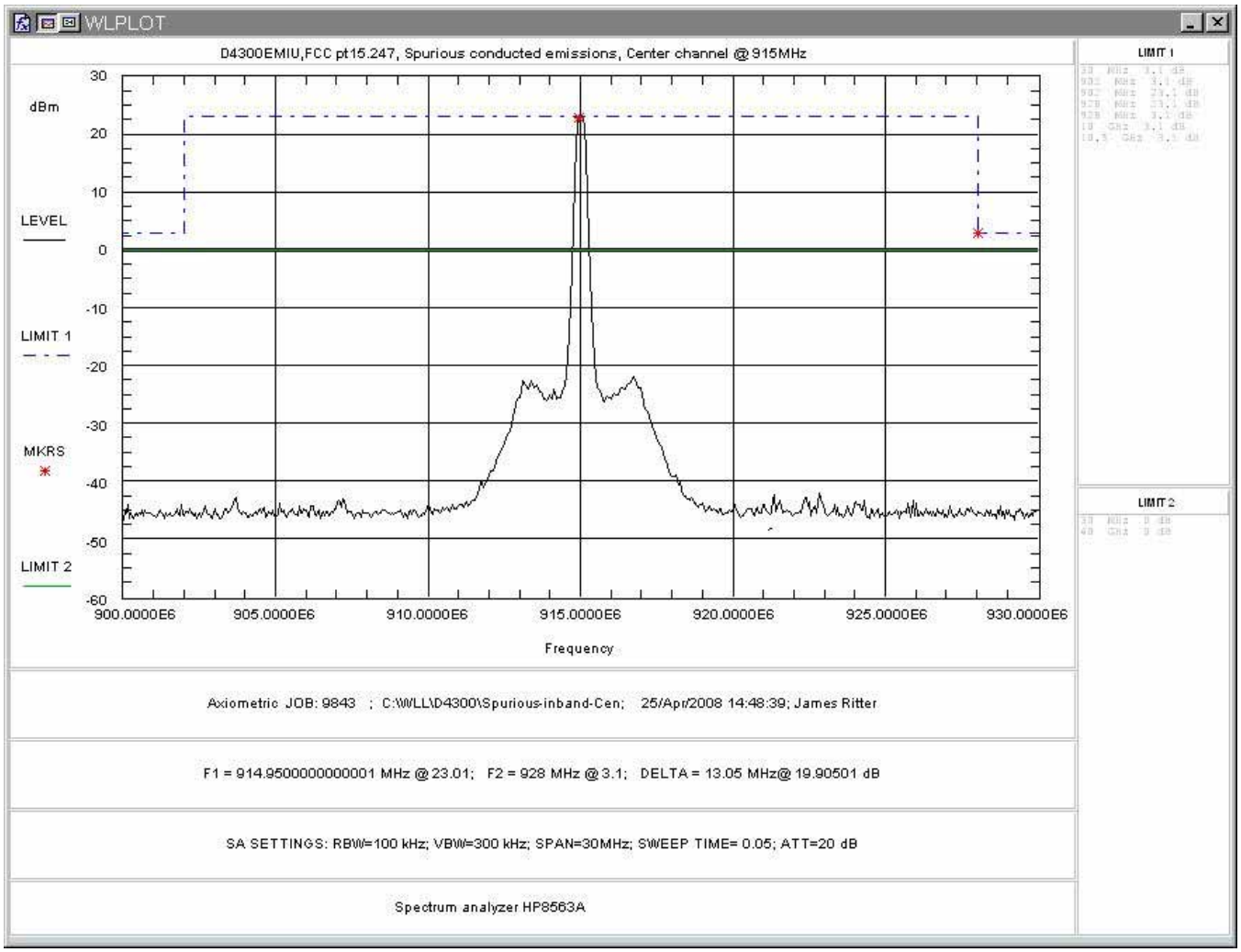

Figure 5-16. Conducted Spurious Emissions, Center Channel 900 – 930MHz

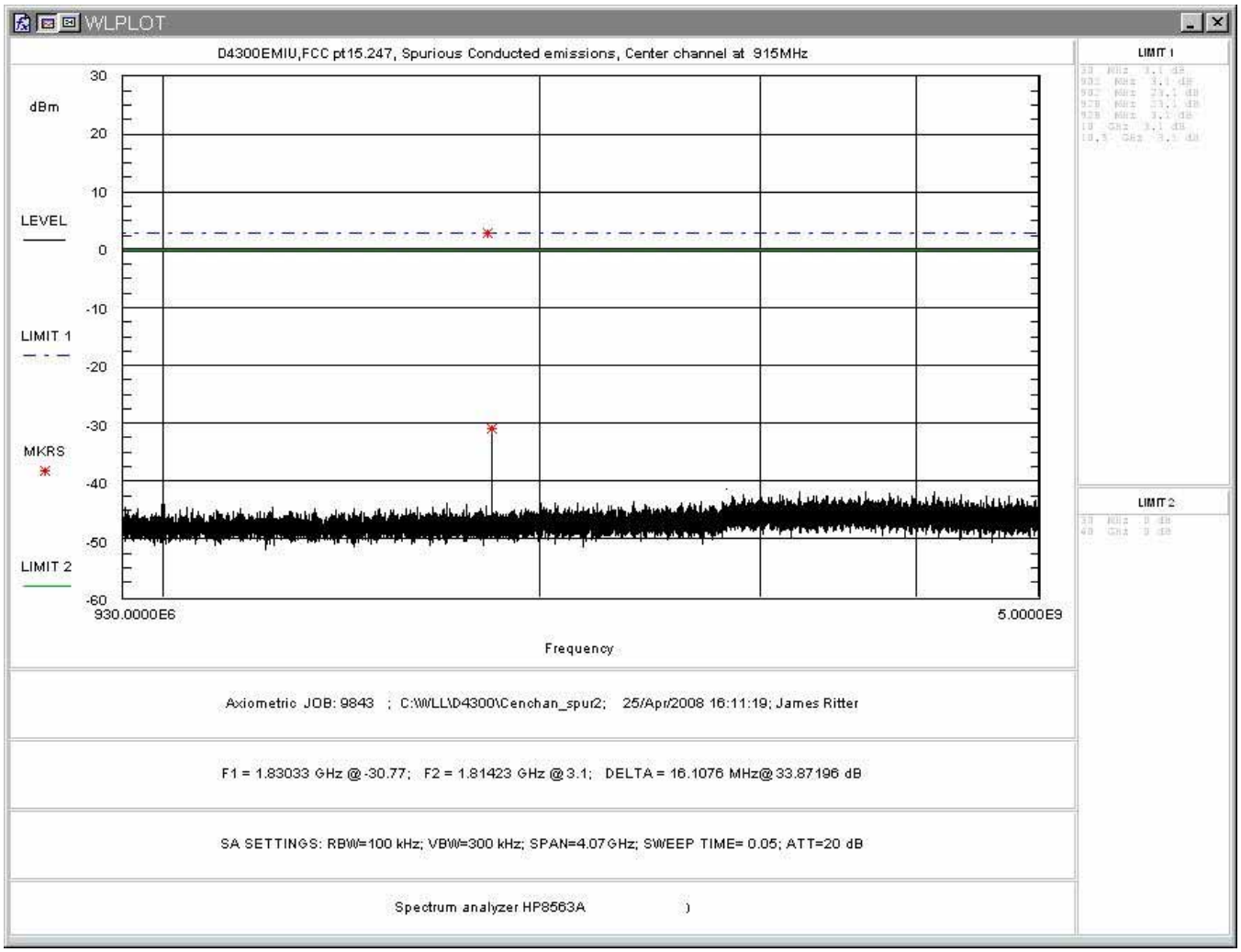

Figure 5-17. Conducted Spurious Emissions, Center Channel 930 - 5000MHz

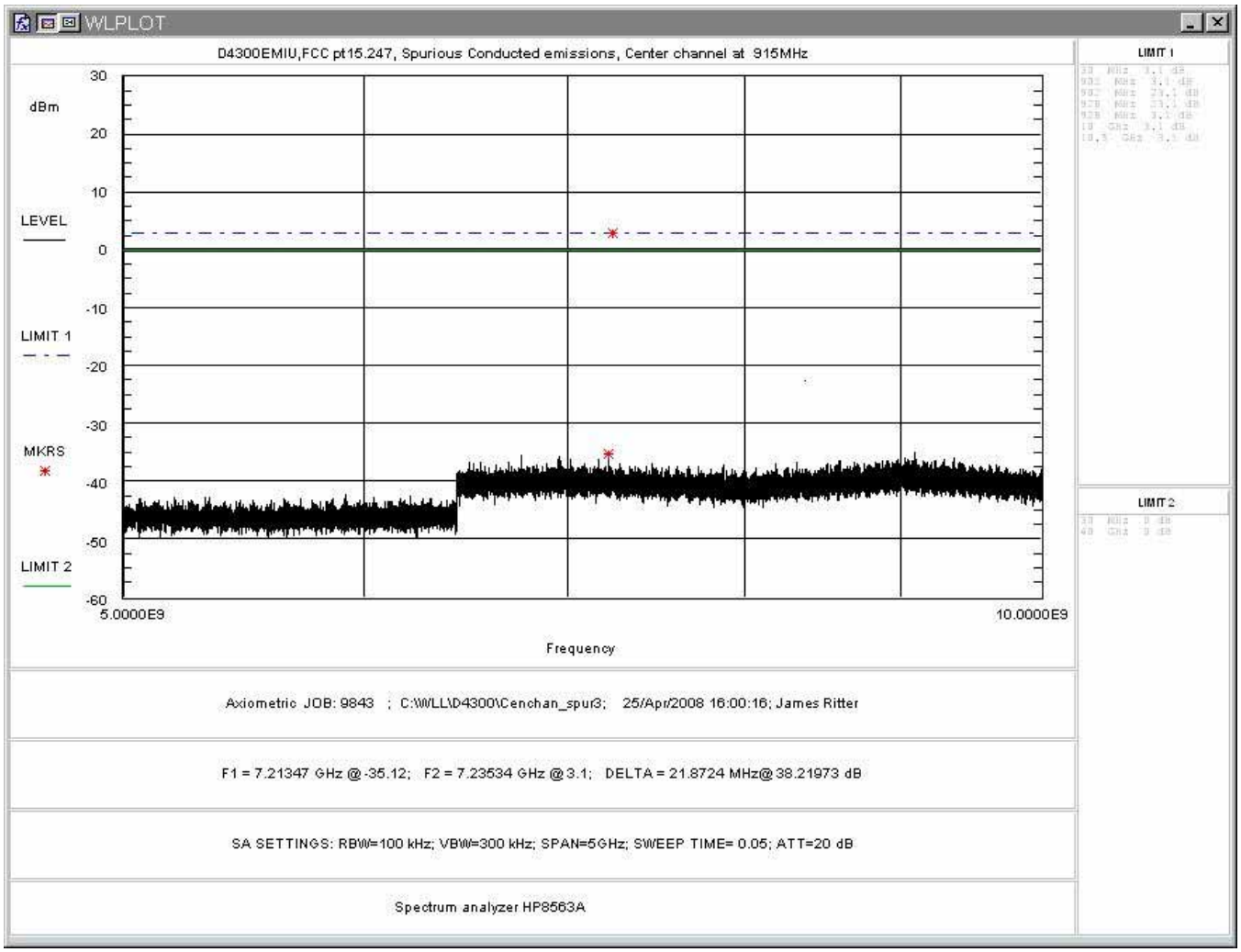

Figure 5-18. Conducted Spurious Emissions, Center Channel 5 – 10GHz

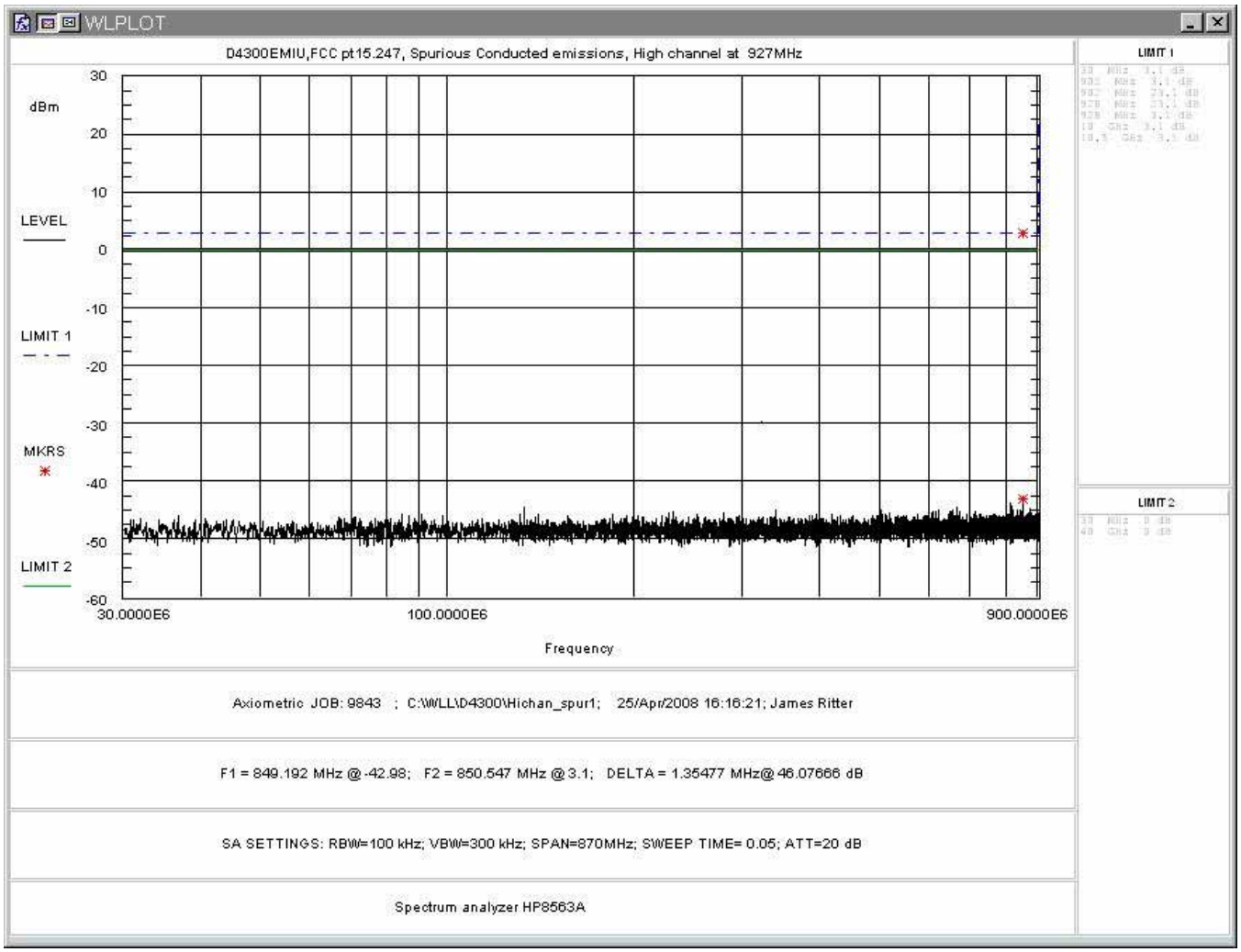

Figure 5-19. Conducted Spurious Emissions, High Channel 30 - 900MHz

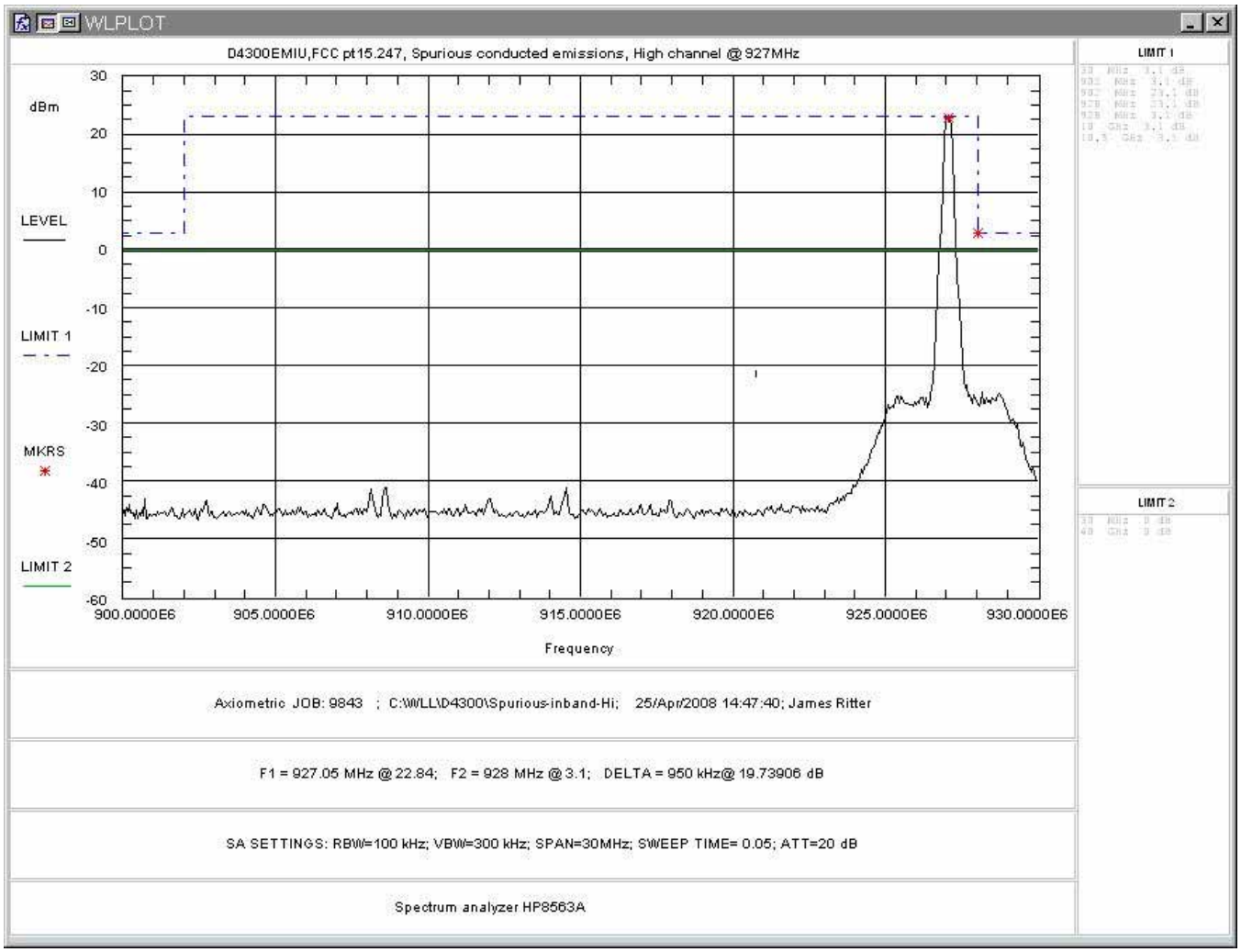

Figure 5-20. Conducted Spurious Emissions, High Channel 900 -930MHz

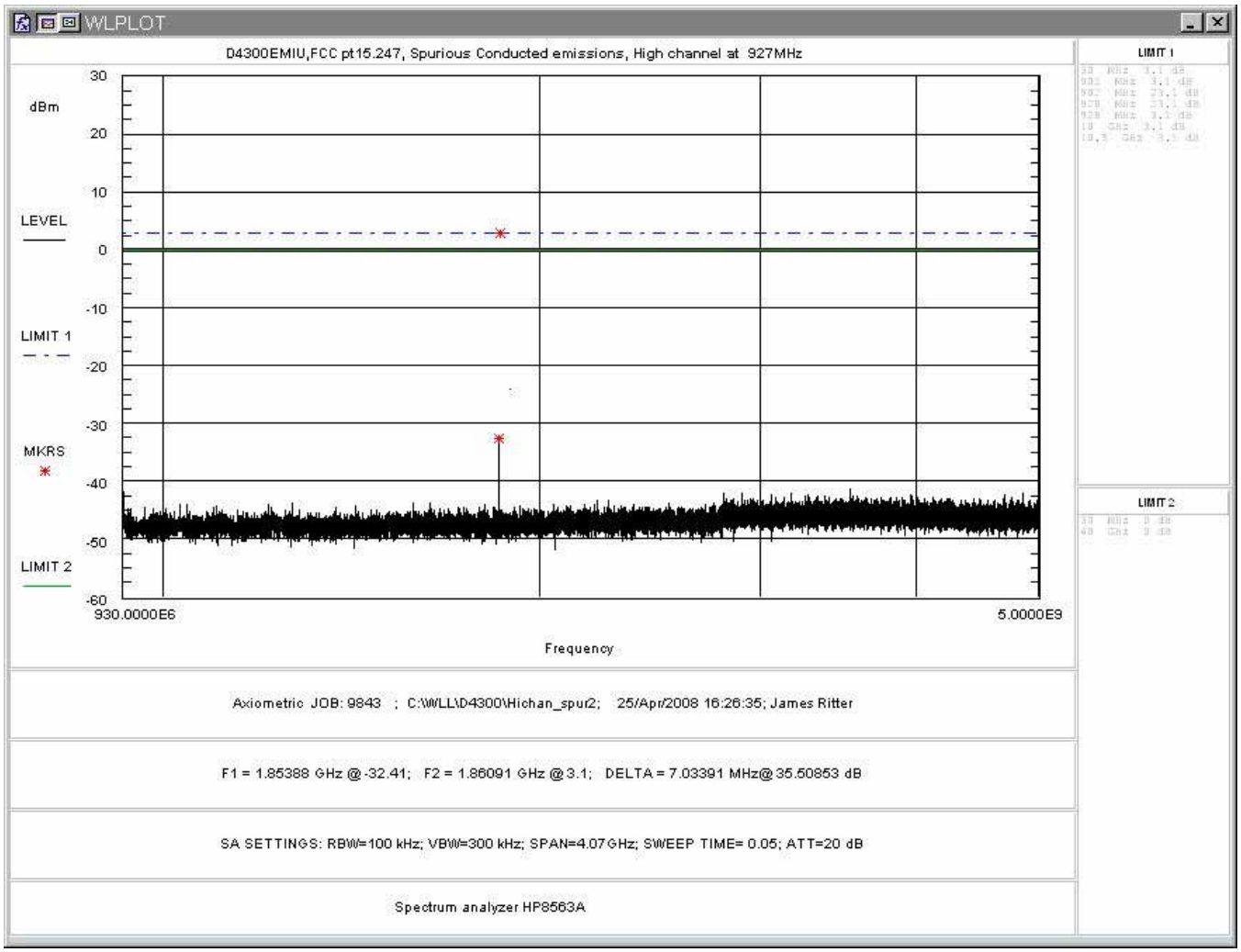

Figure 5-21. Conducted Spurious Emissions, High Channel 930 – 5000MHz

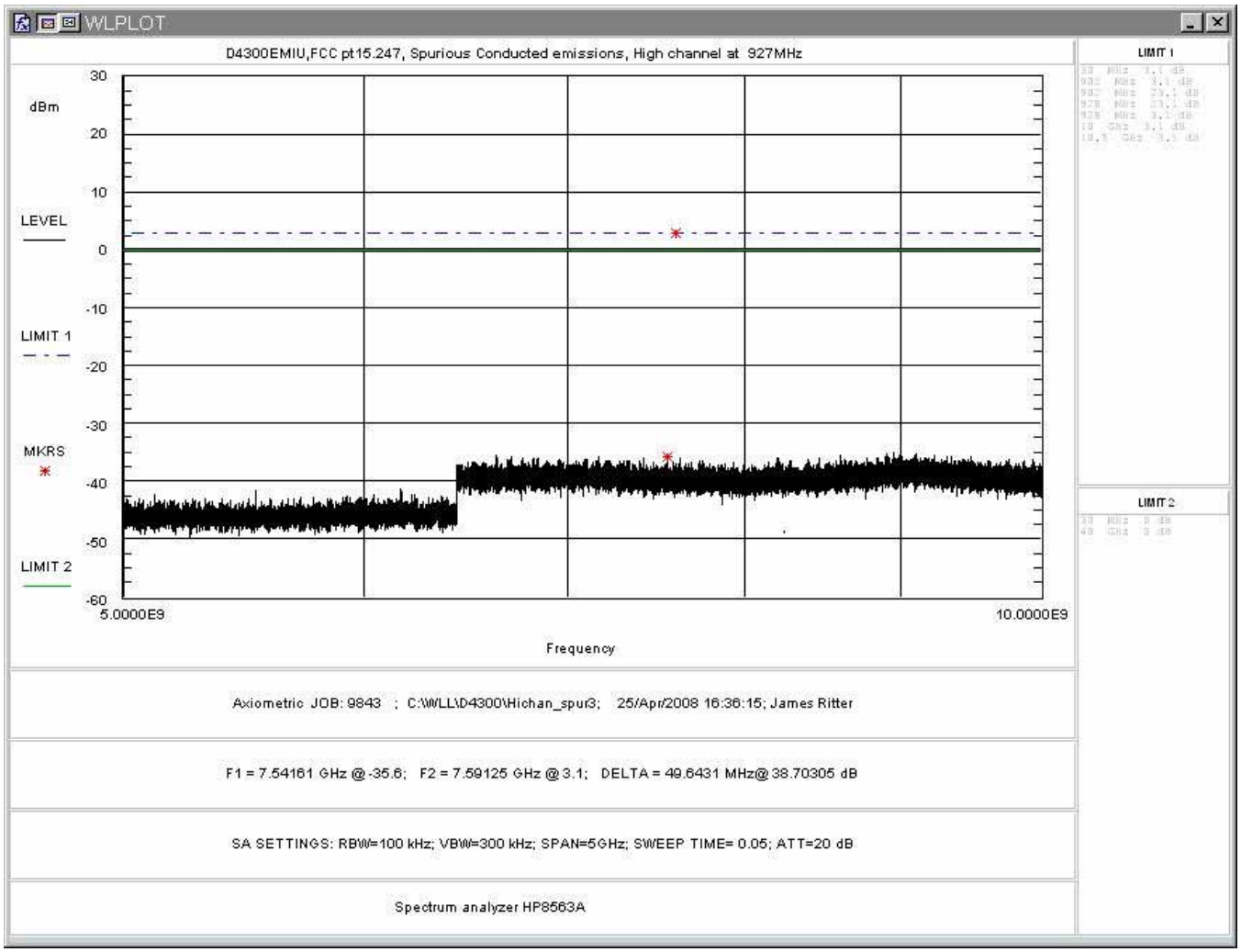

Figure 5-22. Conducted Spurious Emissions, High Channel 5 - 10GHz

5.6 Conducted Band Edge Emissions at Antenna Terminals: 15.247(d), RSS-210 [A8. 5]

The following plots show close-up plots of the allowable band edges with the EUT in both the stationary and hopping modes of operation. The EUT shall be 20dBc at the band edges in a 100kHz resolution bandwidth .

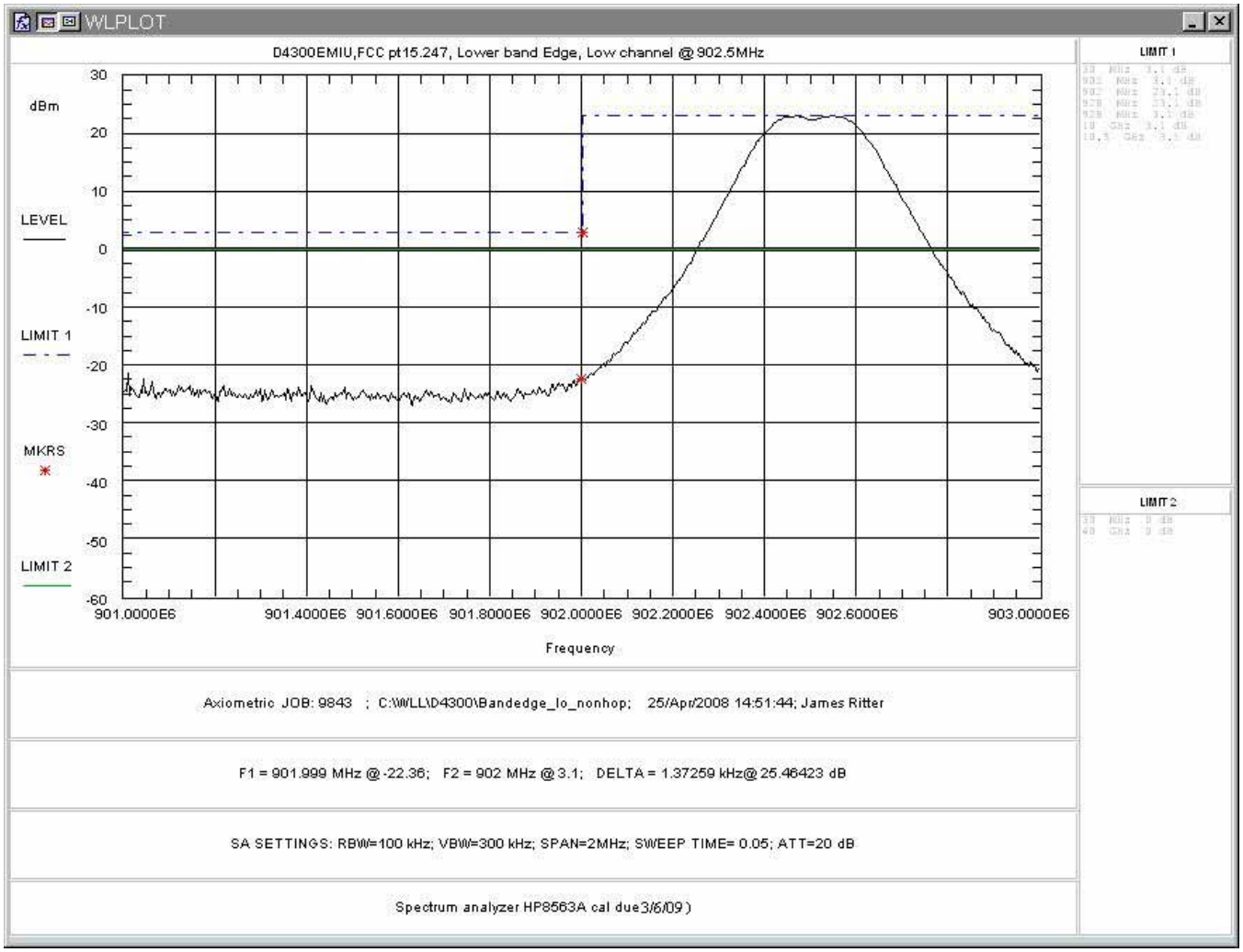

Figure 5-23. Conducted Lower Band Edge, Non-hopping Low Channel

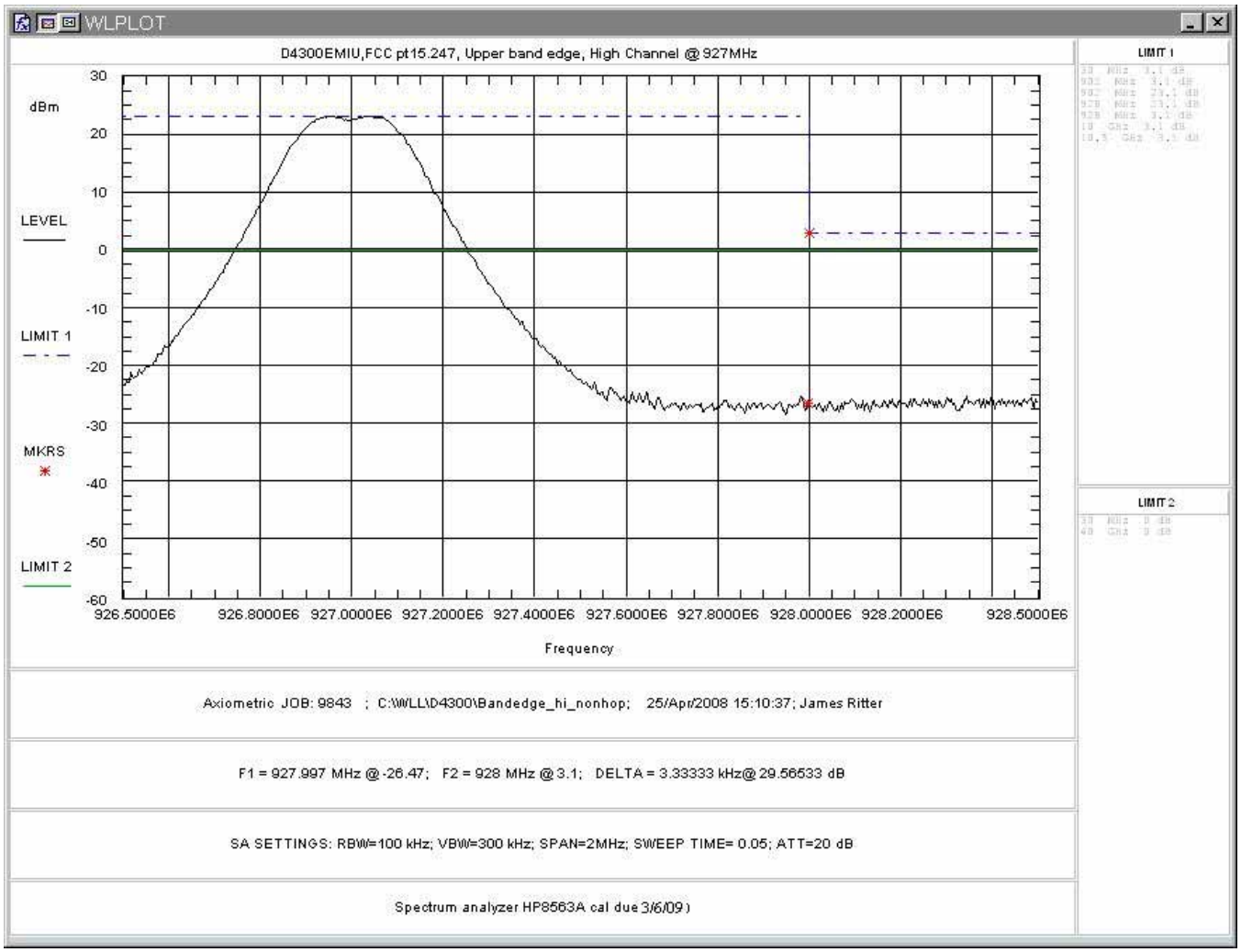

Figure 5-24. Conducted Upper Band Edge, Non-hopping High Channel

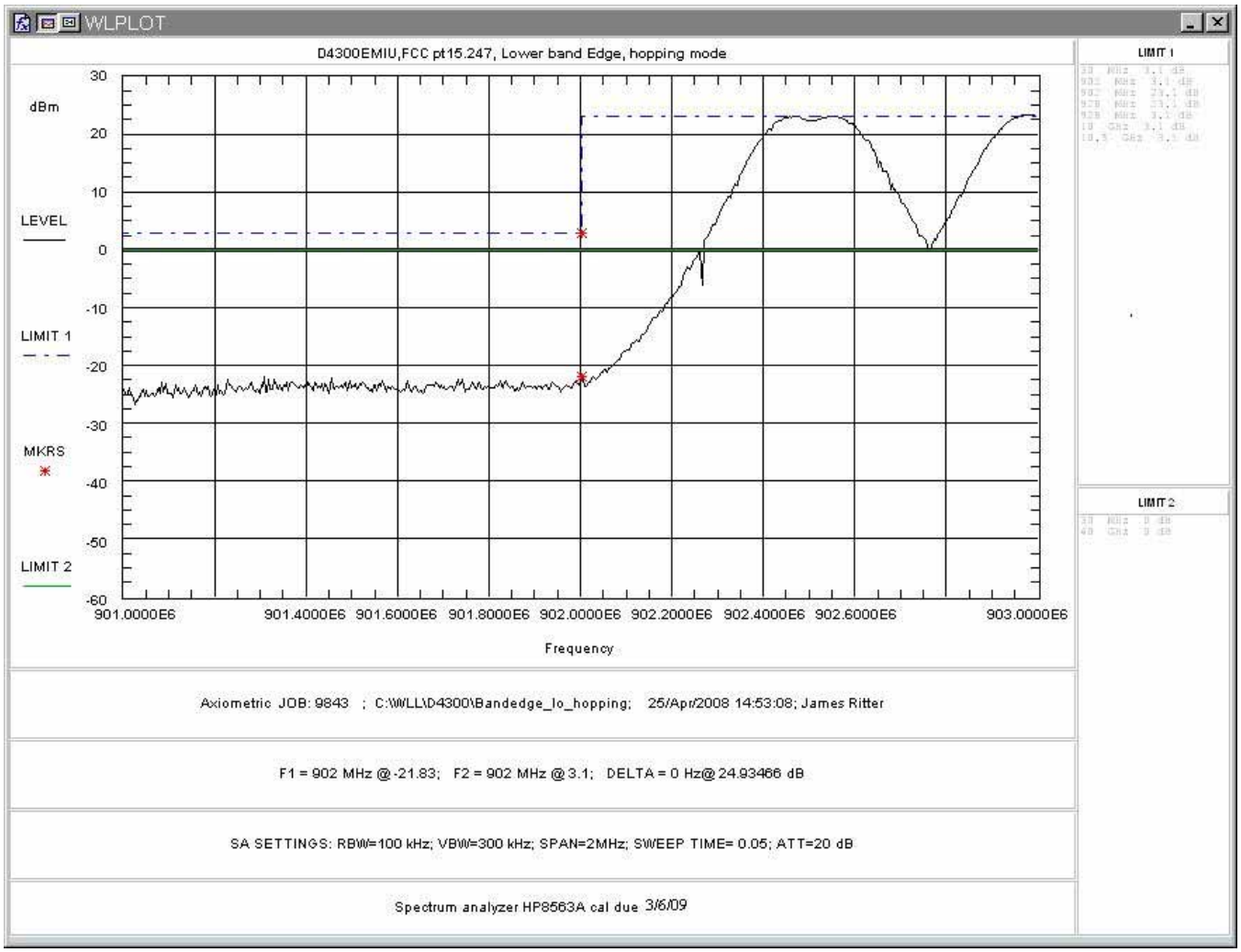

Figure 5-25. Conducted Lower Band Edge, Hopping Mode

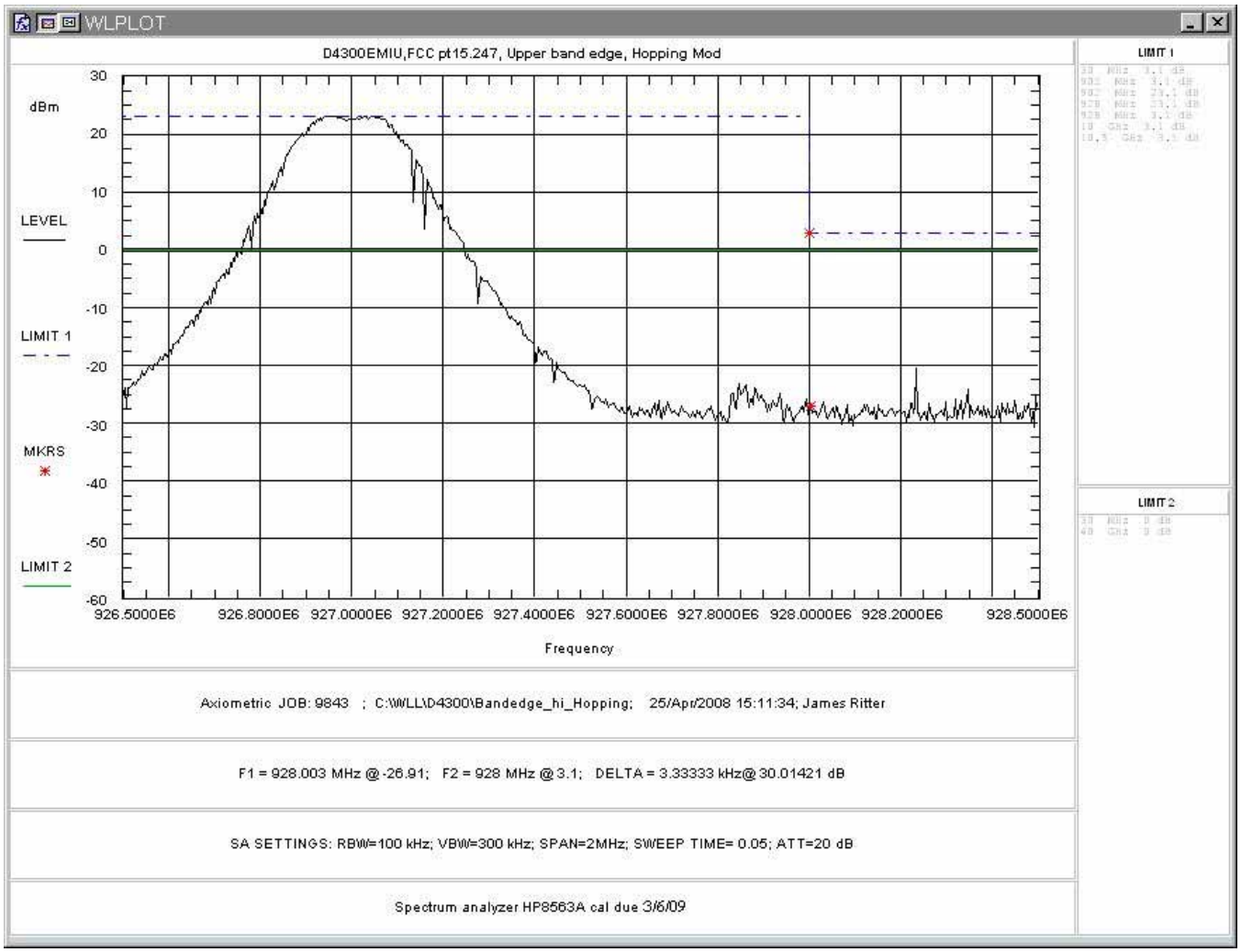

Figure 5-26. Conducted Upper Band Edge, Hopping Mode

5.7 Transmit Radiated Spurious Emissions: (FCC Part §15.205, §15.209, RSS210 (A.5))

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.

5.7.1 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 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)

5.7.2 Test Summary

The EUT complied with the requirements for radiated emissions FCC part 15.247 and IC RSS-210e issue 7.

Table 6: Radiated Emission Test Data, Restricted Bands –Low Channel

Frequency (MHz)	Polarity H/V	Azimuth Degree	Ant. Height (m)	SA Level (QP) (dBµV)	Ant. Corr. (dB/m)	Cable Corr. (dB)	Amp Gain (dB)	Corr. Level (dBµV/m)	Corr. Level (µV/m)	Limit (µV/m)	Margin (dB)
Peak											
2707.500	V	296.0	1.0	56.3	29.7	5.0	36.3	54.7	541.8	5000.0	-19.3
3610.000	V	264.0	1.0	52.7	30.5	5.8	35.7	53.2	458.8	5000.0	-20.7
4512.500	V	354.0	1.0	53.8	32.1	6.0	35.4	56.5	666.0	5000.0	-17.5
5415.000	V	357.0	1.0	50.7	33.8	6.5	35.3	55.7	607.3	5000.0	-18.3
8122.500	V	351.0	1.0	50.3	37.4	7.7	35.7	59.7	964.8	5000.0	-14.3
9025.000	V	356.0	1.0	50.6	38.0	7.5	35.7	60.4	1042.7	5000.0	-13.6
2707.500	H	29.0	1.0	53.4	29.7	5.0	36.3	51.8	390.7	5000.0	-22.1
3610.000	H	10.0	1.0	50.7	30.5	5.8	35.7	51.3	365.3	5000.0	-22.7
4512.500	H	291.0	1.0	55.1	32.1	6.0	35.4	57.8	773.5	5000.0	-16.2
5415.000	H	271.0	1.0	50.1	33.8	6.5	35.3	55.1	570.1	5000.0	-18.9
8122.500	H	0.0	1.0	48.8	37.4	7.7	35.7	58.2	817.4	5000.0	-15.7
9025.000	H	0.0	1.0	49.4	38.0	7.5	35.7	59.2	912.3	5000.0	-14.8
Average											
2707.500	V	296.0	1.0	50.9	29.7	5.0	36.3	49.3	290.6	500.0	-4.7
3610.000	V	264.0	1.0	41.3	30.5	5.8	35.7	41.8	123.2	500.0	-12.2
4512.500	V	354.0	1.0	48.5	32.1	6.0	35.4	51.1	360.2	500.0	-2.8
5415.000	V	357.0	1.0	41.9	33.8	6.5	35.3	47.0	222.9	500.0	-7.0
8122.500	V	351.0	1.0	40.3	37.4	7.7	35.7	49.7	306.9	500.0	-4.2
9025.000	V	356.0	1.0	39.8	38.0	7.5	35.7	49.6	302.5	500.0	-4.4
2707.500	H	29.0	1.0	46.7	29.7	5.0	36.3	45.1	179.9	500.0	-8.9
3610.000	H	10.0	1.0	41.7	30.5	5.8	35.7	42.2	129.3	500.0	-11.7
4512.500	H	291.0	1.0	49.9	32.1	6.0	35.4	52.5	421.3	500.0	-1.5
5415.000	H	271.0	1.0	40.5	33.8	6.5	35.3	45.5	189.2	500.0	-8.4
8122.500	H	0.0	1.0	39.8	37.4	7.7	35.7	49.2	290.0	500.0	-4.7
9025.000	H	0.0	1.0	39.2	38.0	7.5	35.7	49.0	281.6	500.0	-5.0

Table 7: Radiated Emission Test Data, Restricted Bands –Center Channel

Frequency (MHz)	Polarity H/V	Azimuth Degree	Ant. Height (m)	SA Level (QP) (dBµV)	Ant. Corr. (dB/m)	Cable Corr. (dB)	Amp Gain (dB)	Corr. Level (dBµV/m)	Corr. Level (µV/m)	Limit (µV/m)	Margin (dB)
Peak											
2745.000	V	291.0	1.0	53.4	29.7	5.1	36.2	52.0	397.1	5000.0	-22.0
3660.000	V	276.0	1.0	52.8	30.5	5.8	35.7	53.4	469.4	5000.0	-20.5
4575.000	V	348.0	1.0	52.9	32.3	6.0	35.4	55.7	608.6	5000.0	-18.3
7320.000	V	350.0	1.0	51.9	36.9	7.8	35.4	61.2	1147.8	5000.0	-12.8
8235.000	V	351.0	1.0	50.4	37.5	7.7	35.7	59.8	979.9	5000.0	-14.2
9150.000	V	356.0	1.0	50.9	38.2	8.0	35.8	61.3	1155.4	5000.0	-12.7
2745.000	H	29.0	1.0	54.4	29.7	5.1	36.2	53.0	446.5	5000.0	-21.0
3660.000	H	10.0	1.0	50.7	30.5	5.8	35.7	51.3	366.5	5000.0	-22.7
4575.000	H	291.0	1.0	53.6	32.3	6.0	35.4	56.4	663.4	5000.0	-17.5
7320.000	H	271.0	1.0	50.5	36.9	7.8	35.4	59.8	978.0	5000.0	-14.2
8235.000	H	0.0	1.0	51.2	37.5	7.7	35.7	60.7	1080.7	5000.0	-13.3
9150.000	H	0.0	1.0	50.8	38.2	8.0	35.8	61.2	1144.8	5000.0	-12.8
Average											
2745.000	V	291.0	1.0	46.6	29.7	5.1	36.2	45.2	183.0	500.0	-8.7
3660.000	V	276.0	1.0	41.7	30.5	5.8	35.7	42.3	130.8	500.0	-11.6
4575.000	V	348.0	1.0	40.9	32.3	6.0	35.4	43.8	154.4	500.0	-10.2
7320.000	V	350.0	1.0	40.0	36.9	7.8	35.4	49.3	291.8	500.0	-4.7
8235.000	V	351.0	1.0	40.1	37.5	7.7	35.7	49.5	300.0	500.0	-4.4
9150.000	V	356.0	1.0	39.8	38.2	8.0	35.8	50.2	321.9	500.0	-3.8
2745.000	H	29.0	1.0	47.7	29.7	5.1	36.2	46.3	205.7	500.0	-7.7
3660.000	H	10.0	1.0	40.5	30.5	5.8	35.7	41.1	113.5	500.0	-12.9
4575.000	H	291.0	1.0	45.8	32.3	6.0	35.4	48.6	268.7	500.0	-5.4
7320.000	H	271.0	1.0	40.6	36.9	7.8	35.4	49.8	310.7	500.0	-4.1
8235.000	H	0.0	1.0	40.6	37.5	7.7	35.7	50.0	317.5	500.0	-3.9
9150.000	H	0.0	1.0	40.1	38.2	8.0	35.8	50.5	334.3	500.0	-3.5

Table 8: Radiated Emission Test Data, Restricted Bands –High Channel

Frequency (MHz)	Polarity H/V	Azimuth Degree	Ant. Height (m)	SA Level (QP) (dBµV)	Ant. Corr. (dB/m)	Cable Corr. (dB)	Amp Gain (dB)	Corr. Level (dBµV/m)	Corr. Level (µV/m)	Limit (µV/m)	Margin (dB)
Peak											
2781.000	V	270.0	1.0	55.9	29.8	5.3	36.2	54.6	539.9	5000.0	-19.3
3708.000	V	286.0	1.0	52.4	30.5	5.8	35.7	53.0	446.5	5000.0	-21.0
4635.000	V	357.0	1.0	52.0	32.4	6.0	35.4	55.0	563.2	5000.0	-19.0
7416.000	V	352.0	1.0	50.9	37.0	7.8	35.5	60.2	1018.2	5000.0	-13.8
8343.000	V	356.0	1.0	51.3	37.5	7.7	35.7	60.8	1099.9	5000.0	-13.2
			1.0								
2781.000	H	29.0	1.0	57.1	29.8	5.3	36.2	55.9	622.1	5000.0	-18.1
3708.000	H	280.0	1.0	51.1	30.5	5.8	35.7	51.7	384.9	5000.0	-22.3
4635.000	H	332.0	1.0	52.3	32.4	6.0	35.4	55.3	583.0	5000.0	-18.7
7416.000	H	0.0	1.0	51.1	37.0	7.8	35.5	60.4	1044.3	5000.0	-13.6
8343.000	H	0.0	1.0	50.6	37.5	7.7	35.7	60.1	1011.2	5000.0	-13.9
Average											
2781.000	V	270.0	1.0	50.4	29.8	5.3	36.2	49.2	289.9	500.0	-4.7
3708.000	V	286.0	1.0	41.4	30.5	5.8	35.7	42.0	125.8	500.0	-12.0
4635.000	V	357.0	1.0	42.9	32.4	6.0	35.4	46.0	198.4	500.0	-8.0
7416.000	V	352.0	1.0	40.2	37.0	7.8	35.5	49.4	296.7	500.0	-4.5
8343.000	V	356.0	1.0	40.5	37.5	7.7	35.7	50.0	317.1	500.0	-4.0
2781.000	H	29.0	1.0	52.0	29.8	5.3	36.2	50.8	346.9	500.0	-3.2
3708.000	H	280.0	1.0	39.6	30.5	5.8	35.7	40.3	103.1	500.0	-13.7
4635.000	H	332.0	1.0	42.5	32.4	6.0	35.4	45.6	189.5	500.0	-8.4
7416.000	H	0.0	1.0	40.1	37.0	7.8	35.5	49.4	295.1	500.0	-4.6
8343.000	H	0.0	1.0	40.4	37.5	7.7	35.7	49.9	313.9	500.0	-4.0

5.8 Receiver Radiated Spurious Emissions: (FCC Part §15.209, RSS-Gen [7.2.3.2])

The EUT must comply with the requirements for radiated spurious emissions from the receiver. These emissions must meet the limits specified in §15.209 and RSS-Gen.

5.8.1 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 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.)

5.8.2 Test Summary

The EUT complied with the requirements for receiver radiated emissions FCC 15.209 IC RSS-Gen. Receiver Radiated Spurious Test Data

Table 9: Receiver Radiated Test Data

Frequency (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)
39.460	V	349.0	1.0	9.4	14.2	1.0	24.6	17.0	100.0	-15.4
32.440	V	4.0	1.0	12.3	19.2	1.0	32.5	42.3	100.0	-7.5
47.980	V	86.0	1.2	10.3	8.9	1.1	20.2	10.3	100.0	-19.8
51.400	V	6.0	1.0	14.2	7.7	1.1	23.0	14.1	100.0	-17.0
63.509	V	142.0	1.2	17.0	7.9	1.1	26.0	19.8	100.0	-14.0
193.270	V	74.0	1.6	6.9	11.5	1.2	19.6	9.6	150.0	-23.9
32.720	H	341.0	4.0	6.0	19.0	1.0	26.0	20.0	100.0	-14.0
40.520	H	280.0	3.8	6.8	13.4	1.0	21.3	11.6	100.0	-18.7
39.432	H	11.0	3.8	9.6	14.2	1.0	24.8	17.4	100.0	-15.2
47.970	H	214.0	3.8	6.8	8.9	1.1	16.7	6.9	100.0	-23.3
63.500	H	200.0	3.9	9.8	7.9	1.1	18.8	8.7	100.0	-21.2
85.836	H	220.0	3.8	8.0	7.7	1.1	16.8	6.9	100.0	-23.2
114.330	H	220.0	3.4	6.7	13.2	1.2	21.1	11.4	150.0	-22.4
193.270	H	190.0	3.6	5.4	11.5	1.2	18.1	8.0	150.0	-25.4
514.900	H	70.0	1.7	4.1	17.6	2.2	23.9	15.7	200.0	-22.1

5.9 AC Conducted Emissions (FCC Pt.15.207, RSS-Gen [7.2.2])

5.9.1 Requirements

Test Arrangement: Table Top

Compliance Standard: FCC Class B

FCC Compliance Limits		
Frequency	**Quasi-peak**	**Average**
0.15 - 0.5MHz	66 to 56dBµV	56 to 46dBµV
0.5 - 5MHz	56dBµV	46dBµV
5 - 30MHz	60dBµV	50dBµV

5.9.2 Test Procedure

The EUT was placed on an 80 cm high 1 X 1.5 m non-conductive table above a ground plane. Power to the EUT was provided through a Solar Corporation 50 Ω/50 µH Line Impedance Stabilization Network bonded to a 3 X 2 meter ground plane. The LISN has its AC input supplied from a filtered AC power source. Power was supplied to the peripherals through a second LISN. The peripherals were placed on the table in accordance with ANSI C63.4-2003. Power and data cables were moved about to obtain maximum emissions.

The 50 Ω output of the LISN was connected to the input of the spectrum analyzer and the emissions in the frequency range of 150 kHz to 30 MHz were measured. The detector function was set to quasi-peak, peak, or average as appropriate, and the resolution bandwidth during testing was at least 9 kHz, with all post-detector filtering no less than 10 times the resolution bandwidth. For average measurements the post-detector filter was set to 10 Hz.

At frequencies where quasi-peak or peak measurements comply with the average limit, no average measurements need be performed.

At frequencies where quasi-peak or peak measurements comply with the average limit, no average measurements need be performed. The Conducted emissions level to be compared to the FCC limit is calculated as shown in the following example.

Example:

Spectrum Analyzer Voltage: VdBµV

LISN Correction Factor: LISN dB

Cable Correction Factor: CF dB

Electric Field: EdBµV = V dBµV + LISN dB + CF dB

5.9.3 Test Data

The EUT complied with the Class B Conducted Emissions requirements. This system runs off of 230VAC. Table 2 provides the test results for phase and neutral line power line conducted emissions.

Table 10: Conducted Emission Test Data

LINE 1 - NEUTRAL

Frequency (MHz)	Level QP (dBµV)	Level AVG (dBµV)	Cable Loss (dB)	LISN Corr (dB)	Level QP Corr (dBµV)	Level Corr Avg (dBµV)	Limit QP (dBµV)	Limit AVG (dBµV)	Margin QP (dB)	Margin AVG (dB)
0.458	42.1	31.7	10.5	0.7	53.3	42.9	56.7	46.7	-3.5	-3.9
0.336	34.2	22.4	10.3	0.9	45.4	33.6	59.3	49.3	-13.9	-15.7
0.639	33.4	24.9	10.5	0.5	44.4	35.9	56.0	46.0	-11.6	-10.1
0.182	33.6	18.7	10.1	1.9	45.5	30.6	64.4	54.4	-18.9	-23.8
0.758	32.6	25.8	10.5	0.4	43.5	36.7	56.0	46.0	-12.5	-9.3
0.974	31.6	21.8	10.5	0.4	42.5	32.7	56.0	46.0	-13.5	-13.3

LINE 2 - Phase

Frequency (MHz)	Level QP (dBµV)	Level AVG (dBµV)	Cable Loss (dB)	LISN Corr (dB)	Level QP Corr (dBµV)	Level Corr Avg (dBµV)	Limit QP (dBµV)	Limit AVG (dBµV)	Margin QP (dB)	Margin AVG (dB)
0.460	38.4	28.9	10.5	0.7	49.5	40.1	56.7	46.7	-7.2	-6.6
0.210	35.9	16.6	10.1	1.4	47.5	28.2	63.2	53.2	-15.8	-25.1
0.554	35.9	20.8	10.5	0.7	47.1	32.0	56.0	46.0	-8.9	-14.0
0.167	38.2	26.2	10.0	2.2	50.4	38.4	65.1	55.1	-14.7	-16.7
0.758	35.2	21.9	10.5	0.4	46.1	32.8	56.0	46.0	-9.9	-13.2
2.706	34.2	16.3	10.8	0.4	45.4	27.5	56.0	46.0	-10.6	-18.5

Notes: Unit operates 200-230VAC

Test Engineer(s): James Ritter

Test Date(s): 4/28/08