Washington Laboratories, Ltd.

FCC & Industry Canada Certification Test Report
For the
Datamatic, Ltd
D4100 WMIU
(Water Meter Interface Unit)

FCC ID: ODYD4100
IC ID: TBD

WLL JOB# **9841**
September 14, 2007

Prepared for:

Datamatic, Ltd
3600 K Avenue
Plano, Texas, 75074

Prepared By:

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

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Prepared by: James Ritter
Compliance Engineer

Reviewed by: Michael Violette
President

Abstract

This report has been prepared on behalf of Datamatic, Ltd, 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 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 the Datamatic, Ltd D4100 WMIU (Water Meter Interface Unit).

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 NIST NVLAP (NVLAP Lab Code: 200066-0) as an independent FCC test laboratory.

The Datamatic, Ltd D4100 WMIU (Water Meter Interface Unit) 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

List of Tables

List of Figures

1 Introduction

1.1 Compliance Statement

The Datamatic, Ltd D4100 WMIU (Water Meter Interface Unit) complies with the limits for a Frequency Hopping Spread Spectrum Transmitter device under FCC Part 15.247 and Industry Canada RSS-210.

A separate FCC declaration of Conformity Test contains data for the EUT's receiver spurious radiated emissions (no power line emissions were conducted as the EUT was battery powered).

1.2 Test Scope

Tests for radiated and conducted (at antenna terminal) emissions were performed. All measurements were performed in accordance with FCC Public Notice DA 00-705 and 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:	Datamatic, Ltd 3600 K Avenue Plano, TX, 75074
Quotation Number:	63677

1.4 Test Dates

Testing was performed on the following date(s):	June 11-18, 2007

1.5 Test and Support Personnel

Washington Laboratories, LTD	James Ritter
Client Representative	Frank Moody (Axiometric)

1.6 Abbreviations

A	**A**mpere
ac	**a**lternating **c**urrent
AM	Amplitude Modulation
Amps	**Amp**eres
b/s	**b**its per **s**econd
BW	**B**and**W**idth
CE	**C**onducted **E**mission
cm	**c**enti**m**eter
CW	**C**ontinuous **W**ave
dB	**d**eci**B**el
dc	**d**irect **c**urrent
EMI	**E**lectro**m**agnetic **I**nterference
EUT	**E**quipment **U**nder **T**est
FM	**F**requency **M**odulation
G	**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 Datamatic, Ltd D4100 WMIU is a water meter interface unit which is normally connected via integral cable to a residential water meter. The D4100 WMIU communicates to the mesh nodes via a frequency hopping spread spectrum RF link in the 902 MHz to 928 MHz ISM band. The D4100 includes:

- AX_RFM_250 transceiver module
- ARM7 micro-controller
- lithium primary battery (maximum 3.3VDC during transmission)
- helical 902-928MHz antenna
- Water meter (sensor) interface circuitry

The D4100 is typically potted and permanently sealed and mounted beneath ground level in a water meter pit with the tip of the helical antenna at or near ground level. In addition to running the wireless mesh protocols, the ARM7 micro-controller gathers water usage data from the residential water meter.

Table 1. Device Summary

ITEM	DESCRIPTION
Manufacturer:	Datamatic, Ltd
FCC ID Number	ODYD4100
IC ID Number	TBD
EUT Name:	Water Meter Interface Unit
Model:	D4100 WMIU
FCC Rule Parts:	15.247
IC Rule Parts	RSS-210
Frequency Range:	902.5 - 927MHz
Maximum Output Power:	159mW (22 dBm)
Modulation:	FHSS FSK
20dB Bandwidth:	180 kHz
Keying:	Automatic
Type of Information:	Data
Number of Channels:	50
Power Output Level	Fixed
Antenna Type	1dBi Integral helical antenna
Interface Cables:	Unshielded sensor cable with 9 conductors
Power Source & Voltage:	Powered from a 3.3VDC Lithium battery

2.2 Test Configuration

The D4100 WMIU (Water Meter Interface Unit) was configured with an integral antenna. A test port located inside the enclosure was connected to a support laptop to run the test configurations. The sensor cables were left unterminated for this test.

2.3 Testing Algorithm

The D4100 WMIU (Water Meter Interface Unit) was programmed via support laptop to continuously transmit on 902.5, 915, and 927MHz. The unit was also programmed to hop it its normal operating mode

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

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

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. All testing was completed June 18, 2007.

Table 2: Test Equipment List

Conducted Emissions

Asset #	Manufacturer/Model	Description	Cal. Due
00069	HP, 85650A	ADAPTER, QP	6/26/2007
00071	HP, 85685A	PRESELECTOR, RF	6/26/2007
00073	HP, 8568B	ANALYZER, SPECTRUM	6/26/2007
00053	HP, 11947A	LIMITER, TRANSIENT	4/9/2008
00125	SOLAR, 8028-50-TS-24-BNC	LISN	2/1/2008
00126	SOLAR, 8028-50-TS-24-BNC	LISN	2/1/2008

Radiated Emissions

Asset #	Manufacturer/Model	Description	Cal. Due
00618	HP 8563A	ANALYZER, SPECTRUM	2/9/2008
00066	HP, 8449B	PRE-AMPLIFIER, RF. 1-26.5GHZ	6/22/2007
00004	ARA, DRG-118/A	ANTENNA, DRG, 1-18GHZ	2/2/2009
00069	HP, 85650A	ADAPTER, QP	6/26/2007
00073	HP, 8568B	ANALYZER, SPECTRUM	6/26/2007
00071	HP, 85685A	PRESELECTOR, RF	6/26/2007
00007	ARA, LPB-2520	ANTENNA, BICONILOG ANTENNA	6/7/2008

Bench Conducted Emissions

Asset #	Manufacturer/Model	Description	Cal. Due
00618	HP, 8563A	ANALYZER, SPECTRUM	2/9/2008
00541	MEGAPHASE, LLC TM40-K1K1-36	CABLE, 36" BENCH TEST CABLE	9/11/2007
00528	AGILENT, E4446A	ANALYZER, SPECTRUM	2/15/2008

4 Test Results

4.1 Duty Cycle Correction and Time of Occupancy

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 108ms.

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.

Figure 4-2 shows compliance with this paragraph.

Axiometric LLC, D4100 WMIU Part 15.247 Time of Occupancy On time for a single Hop
Frequency 902.5MHz used. On time for a single Hop= 108ms
Note (No additional Radiated duty cycle correction allowed for On times greater than 100ms)

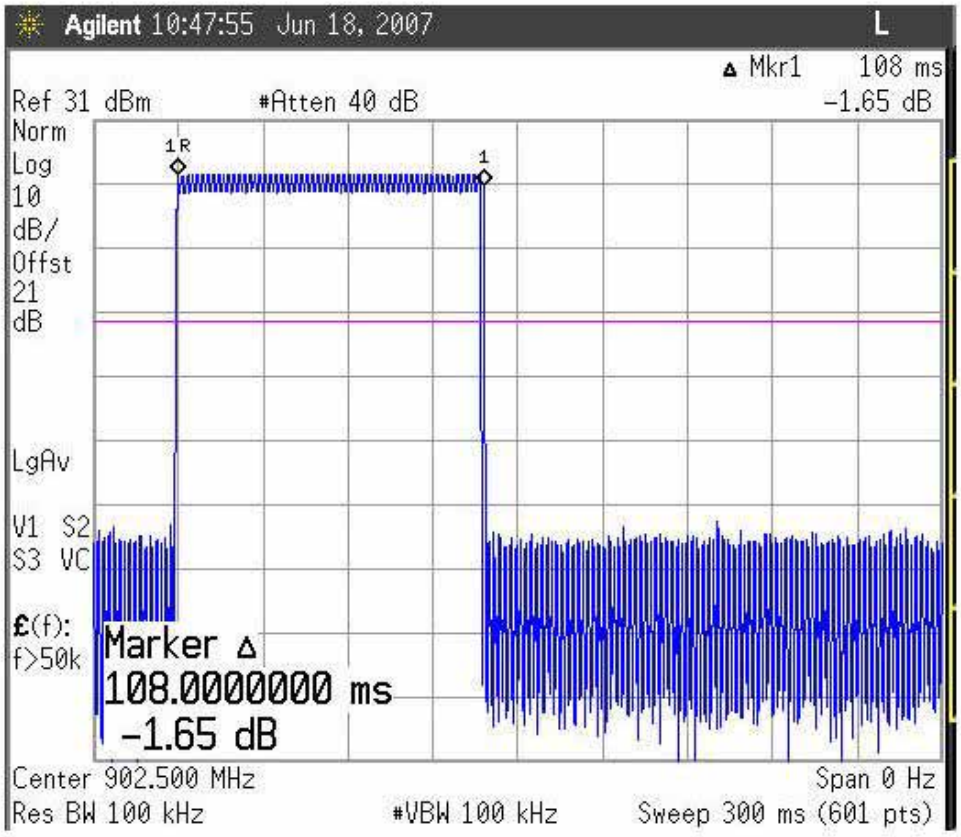

Figure 4-1: Duty Cycle Plot

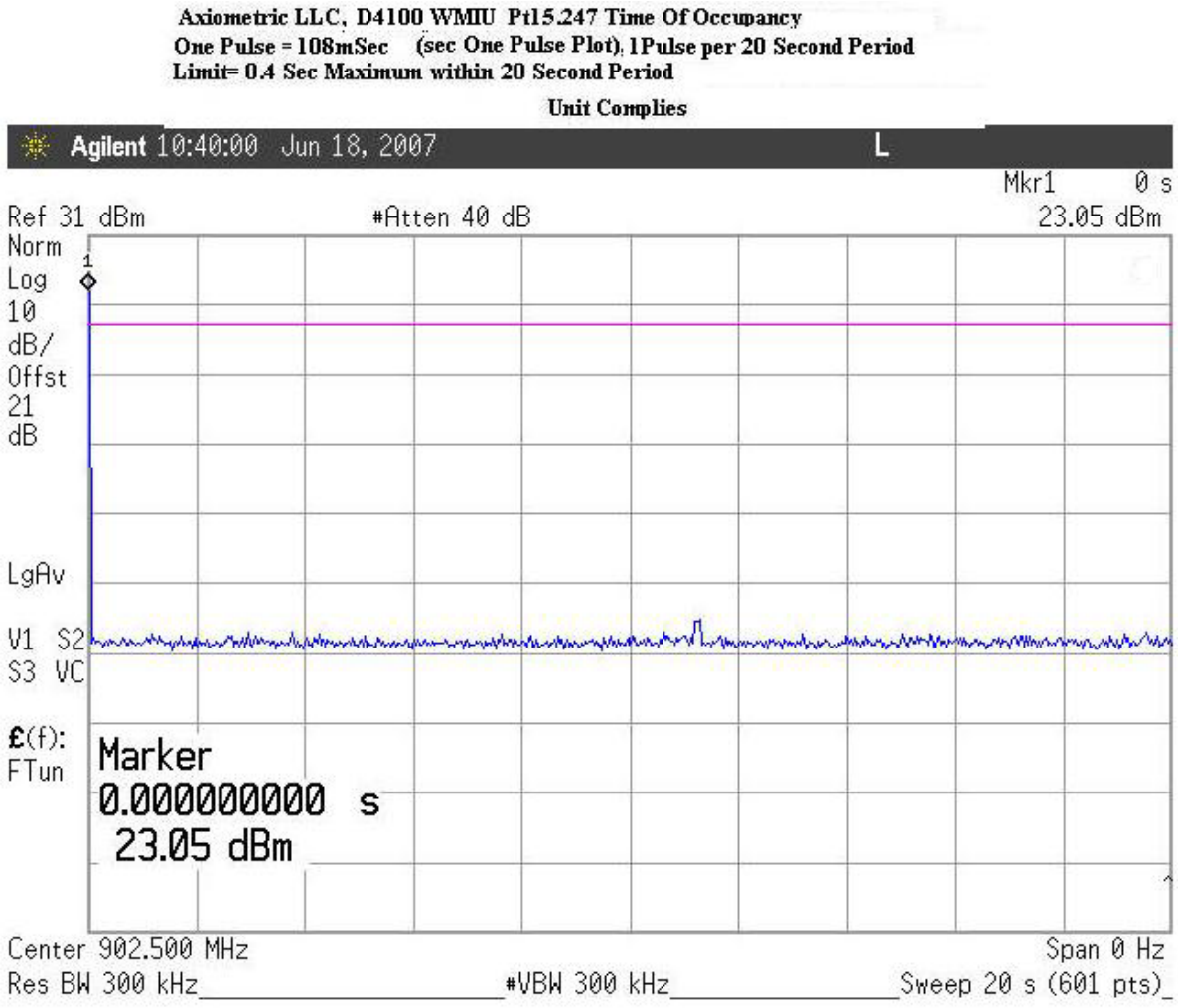

Figure 4-2: Time of Occupancy

4.2 RF Power Output: (FCC Part §2.1046)

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 3. RF Power Output

Frequency	Level	Limit	Pass/Fail
Low Channel: 902.5MHz	22.0 dBm	30 dBm	Pass
Mid Channel: 915.0MHz	21.8 dBm	30 dBm	Pass
High Channel: 927.0MHz	21.8 dBm	30 dBm	Pass

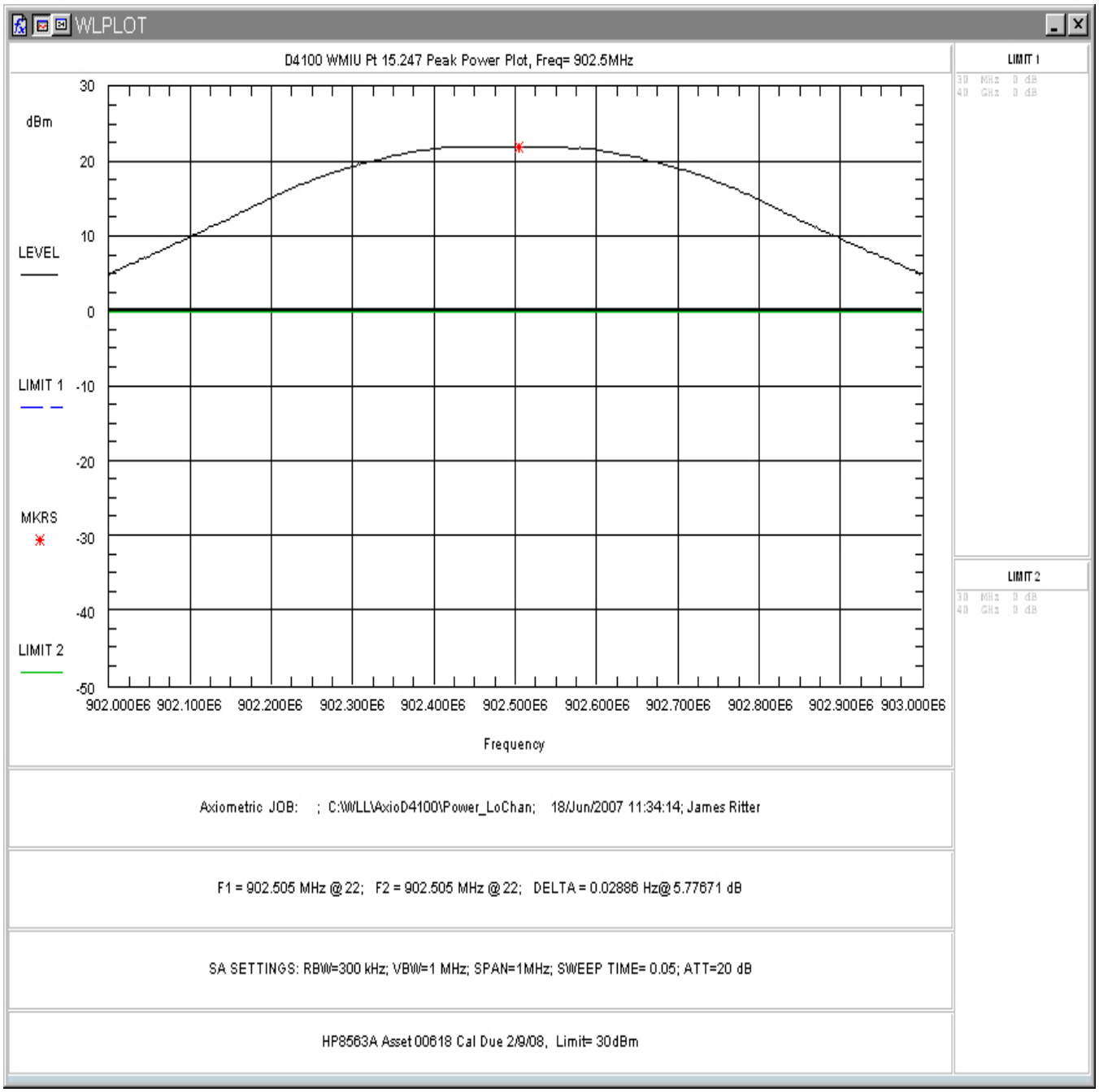

Figure 4-3: RF Peak Power, Low Channel

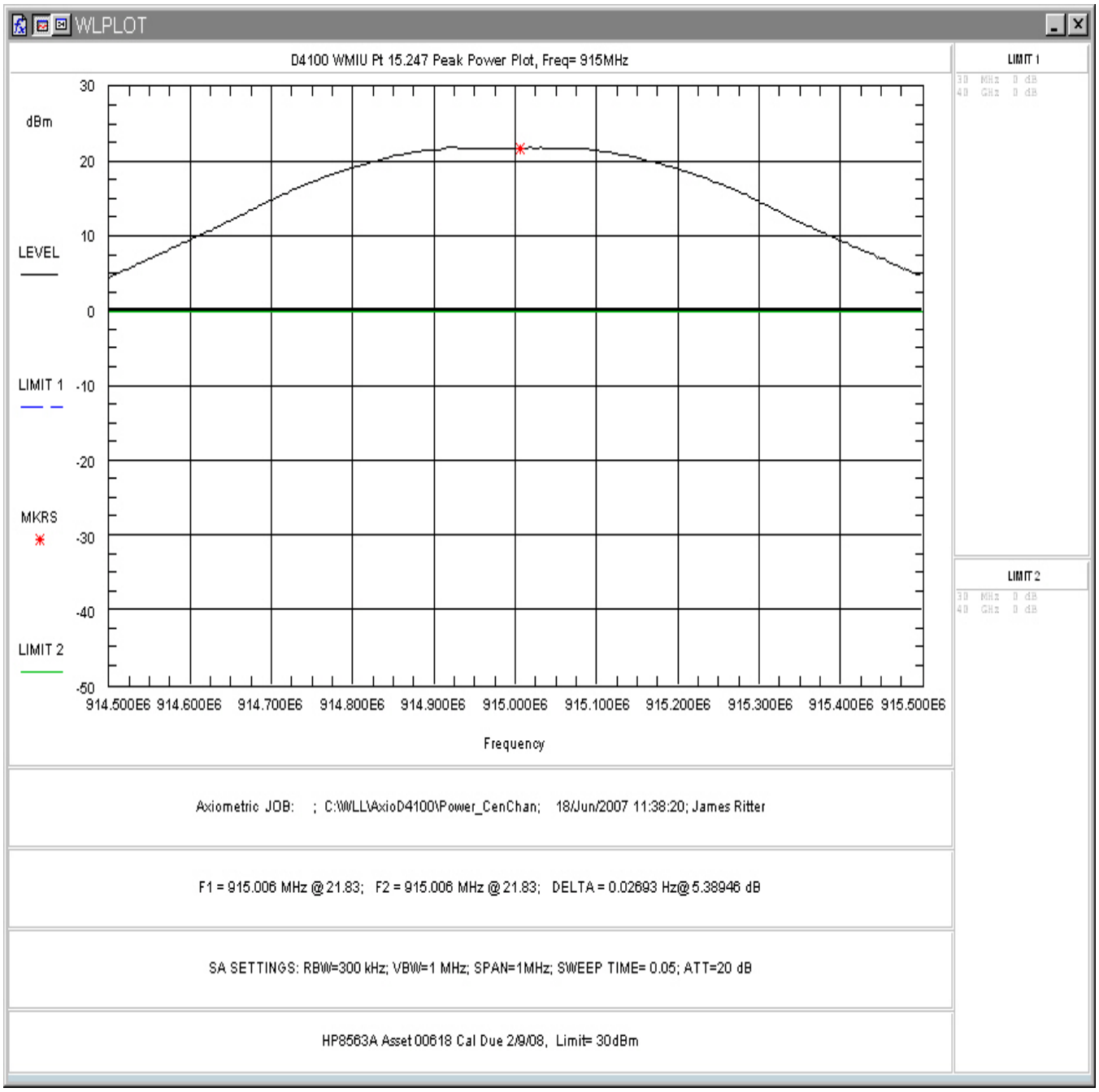

Figure 4-4: RF Peak Power, Mid Channel

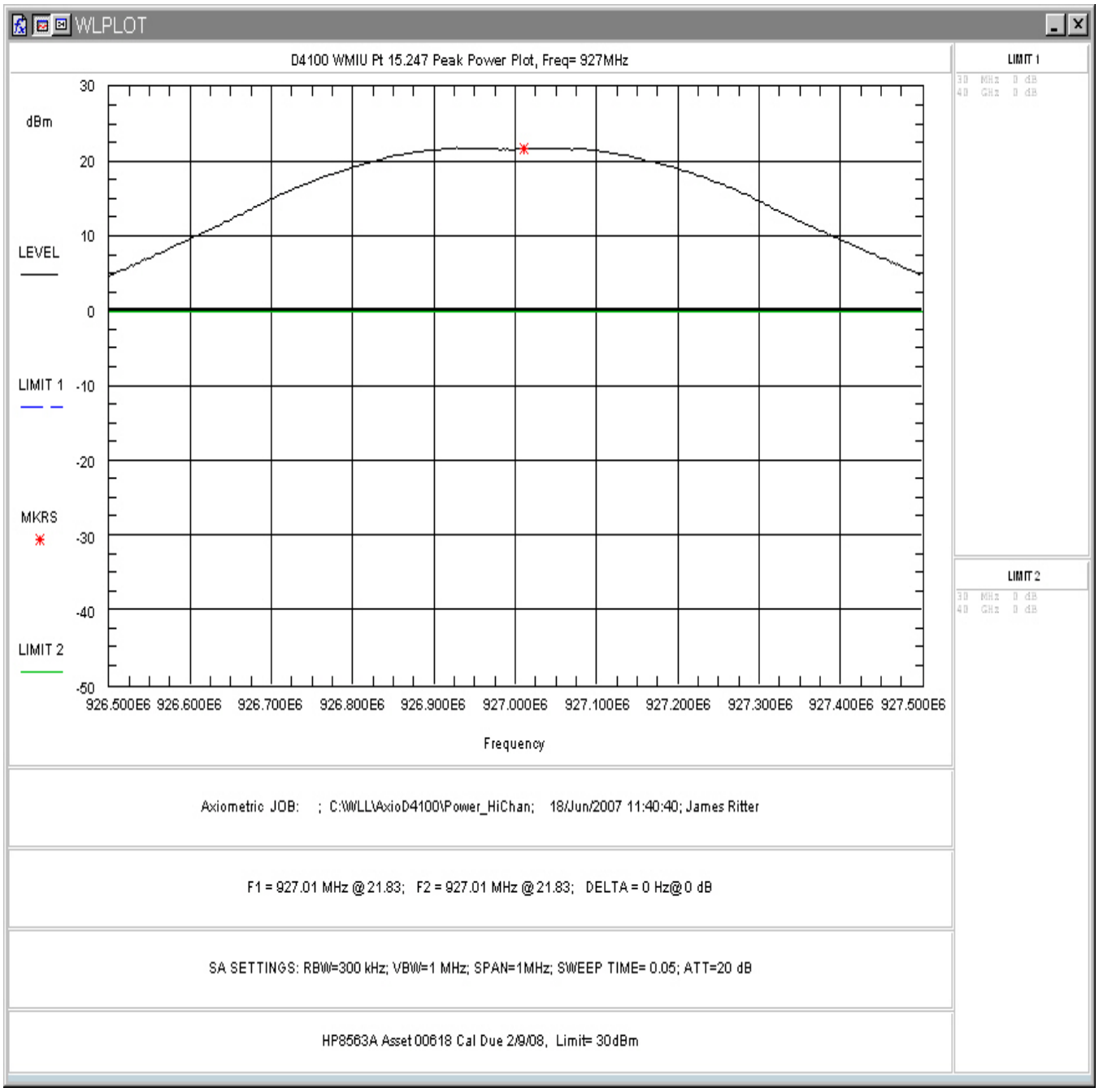

Figure 4-5: RF Peak Power, High Channel

4.3 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 Frequency Hopping Spread Spectrum Systems, FCC Part 15.247 requires the maximum 20 dB bandwidth not exceed 250kHz.

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

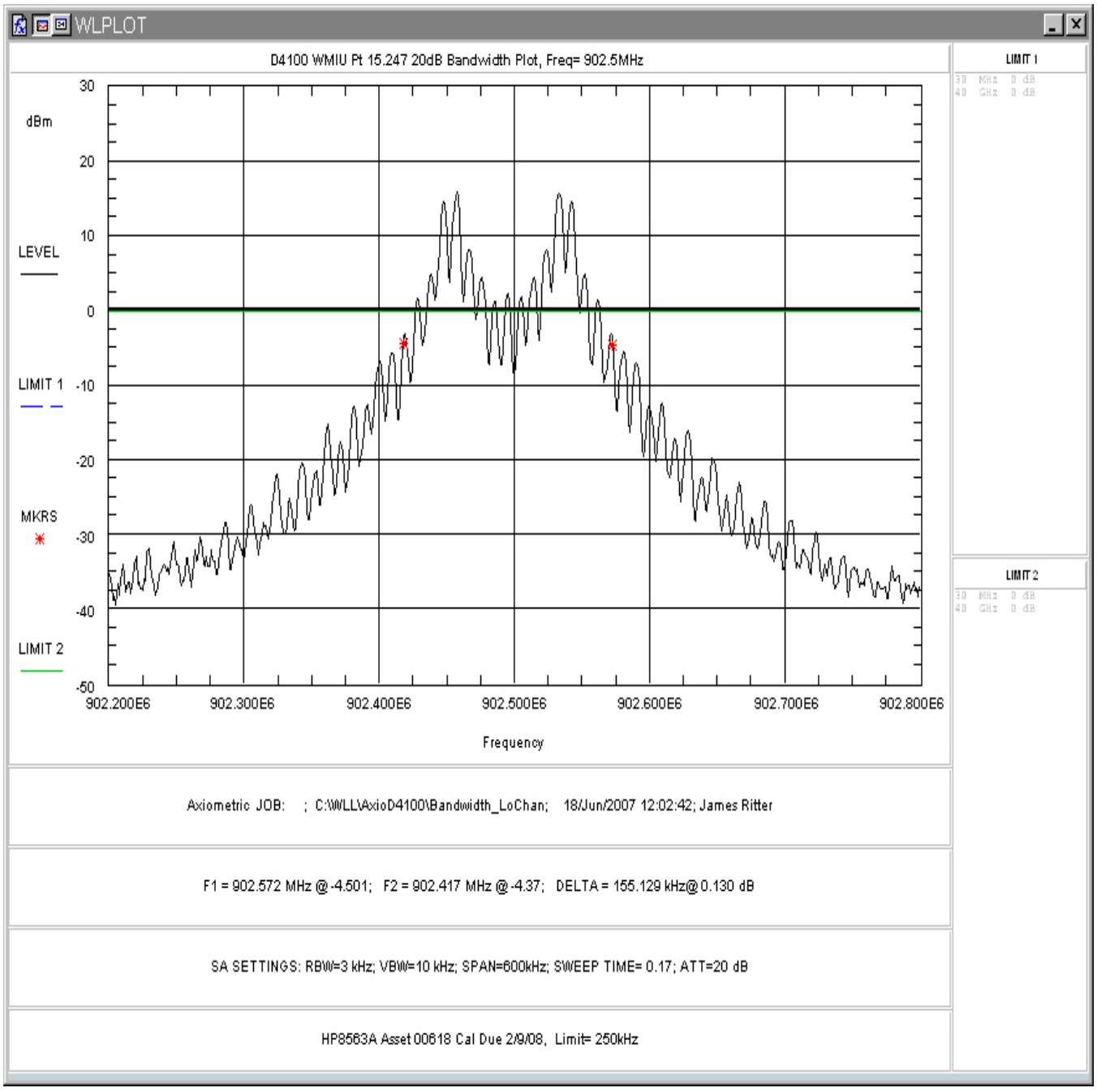

Figure 4-6: Occupied Bandwidth, Low Channel

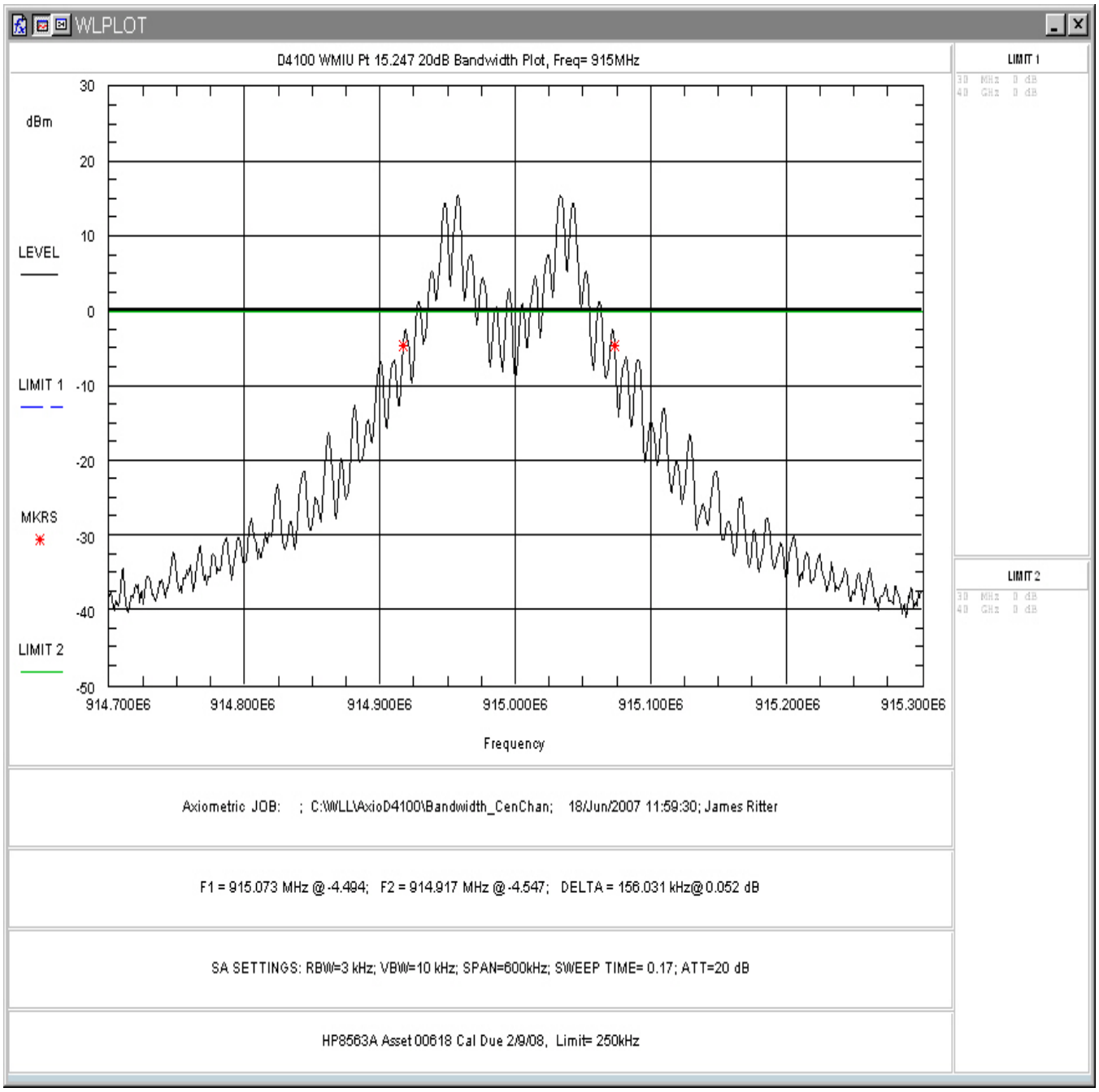

Figure 4-7: Occupied Bandwidth, Mid Channel

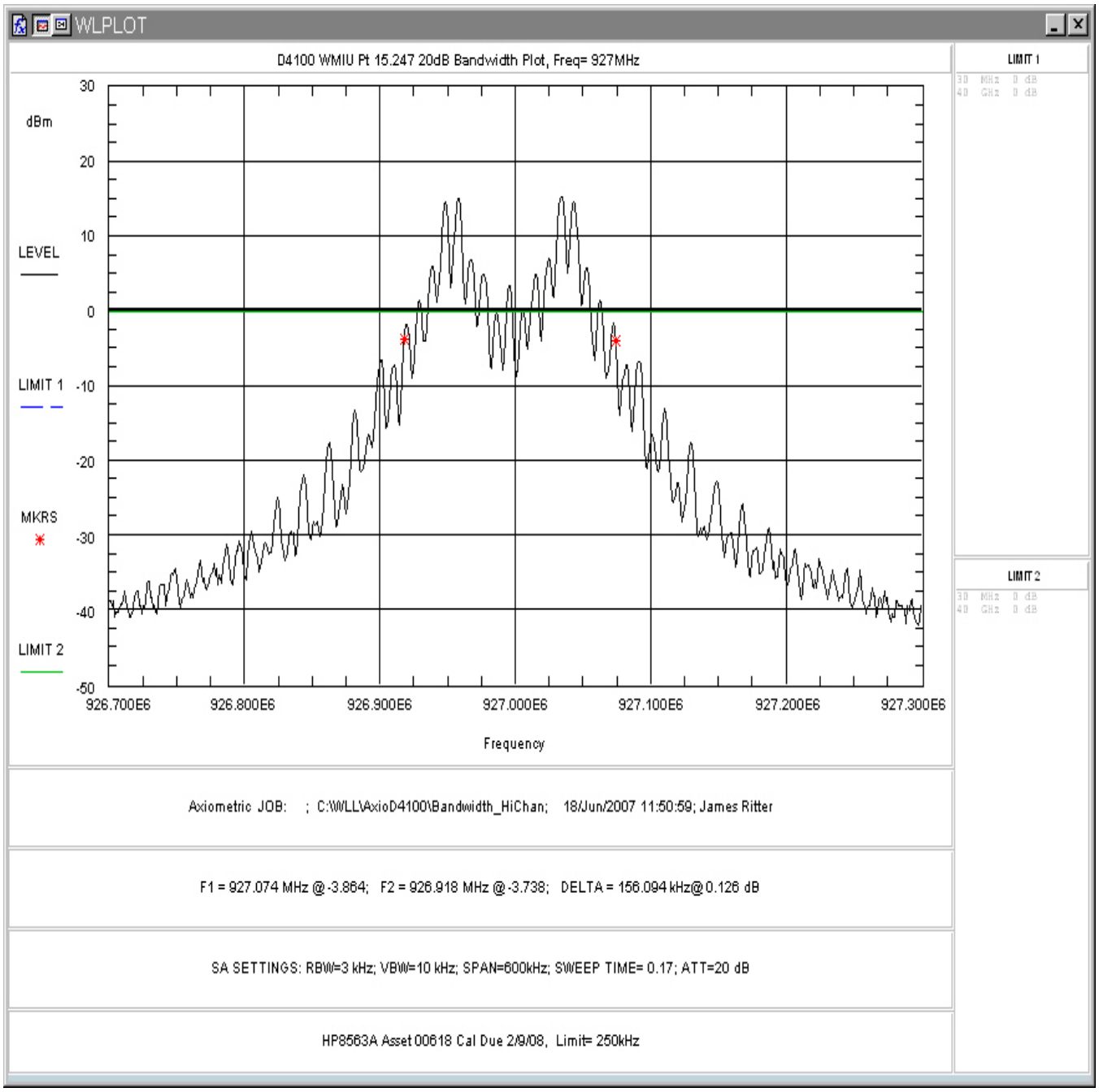

Figure 4-8: Occupied Bandwidth, High Channel

Table 4 provides a summary of the Occupied Bandwidth Results.

Table 4. Occupied Bandwidth Results

Frequency	Bandwidth	Limit	Pass/Fail
Low Channel: 902.5MHz	155.1 kHz	250 kHz	Pass
Mid Channel: 915.0MHz	156.0 kHz	250 kHz	Pass
High Channel: 927.0MHz	156.1 kHz	250 kHz	Pass

4.4 Channel Spacing and Number of Hop Channels (FCC Part §15247(a)(1)

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 156kHz so the channel spacing must be more than 156kHz. In addition, for a 900-928MHz with a 20dB Bandwidth less than 250 kHz the number of hopping channels shall at least 50 channels.

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 30 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.

The following are plots of the channel spacing and number of hopping channels data. The channel spacing was measured to be 500 kHz and the number of channels used is 50.

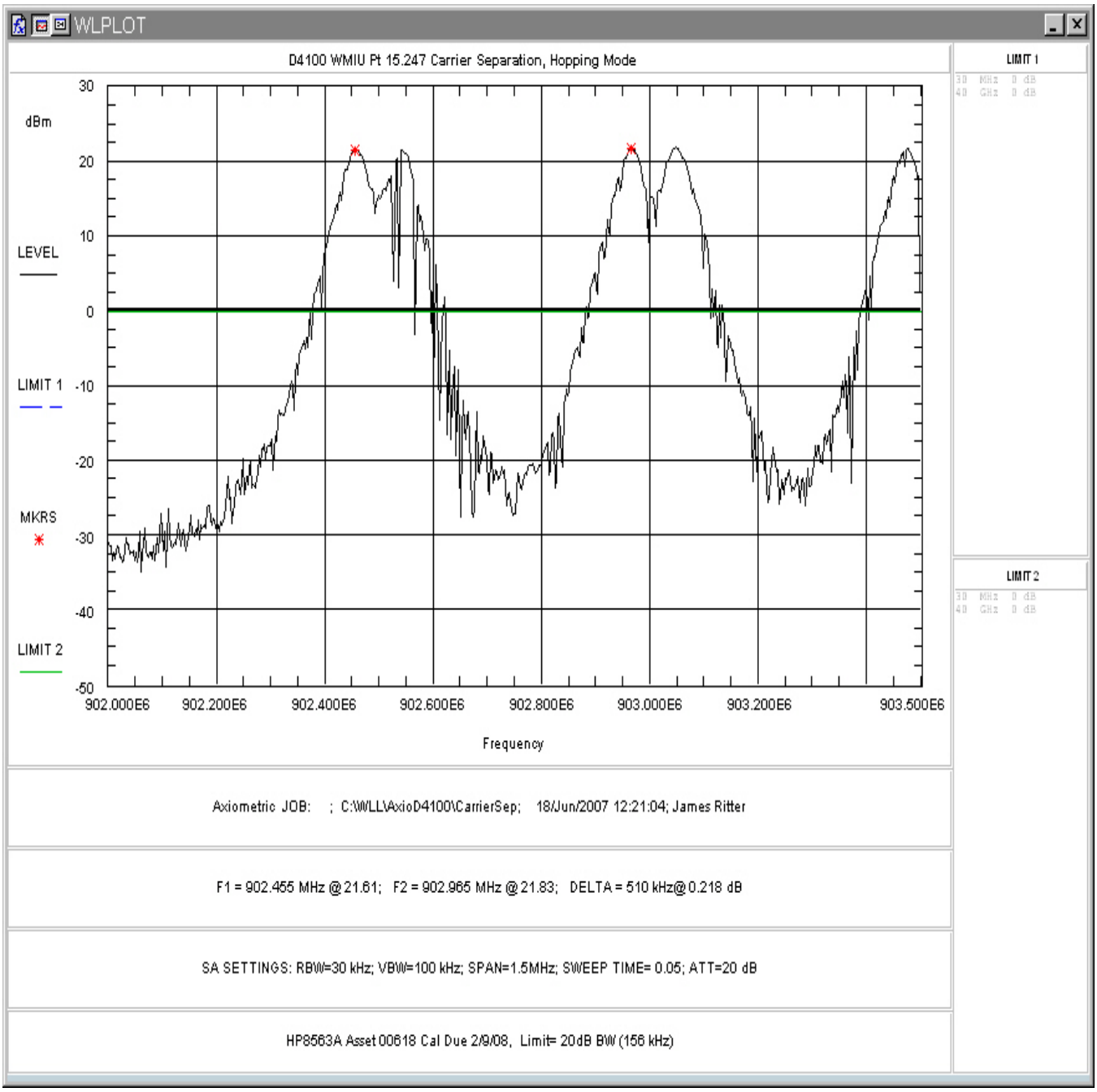

Figure 4-9: Channel Spacing, 500 kHz

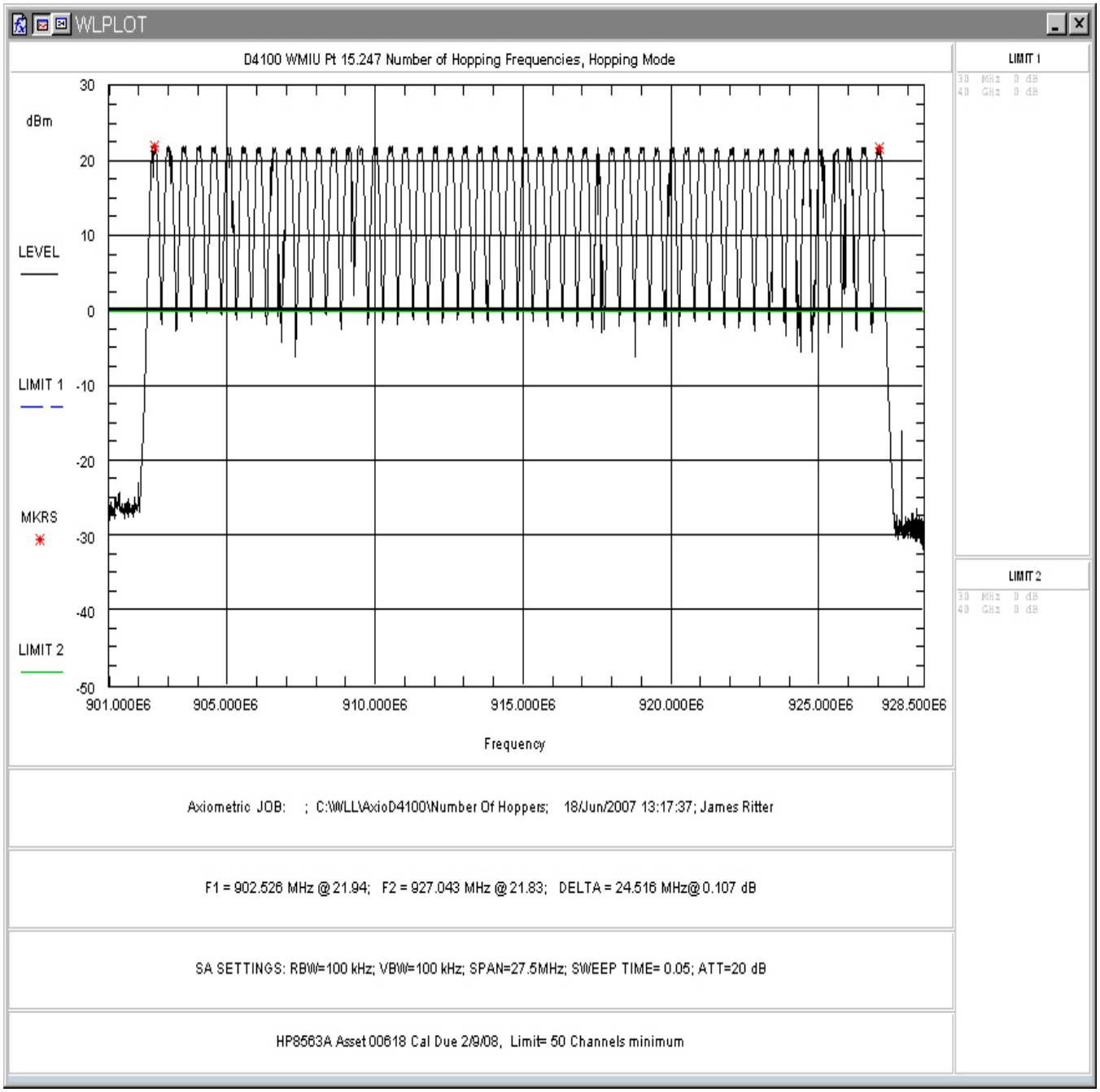

Figure 4-10: Number of Channels

4.5 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, presented by channel and including band-edge data.

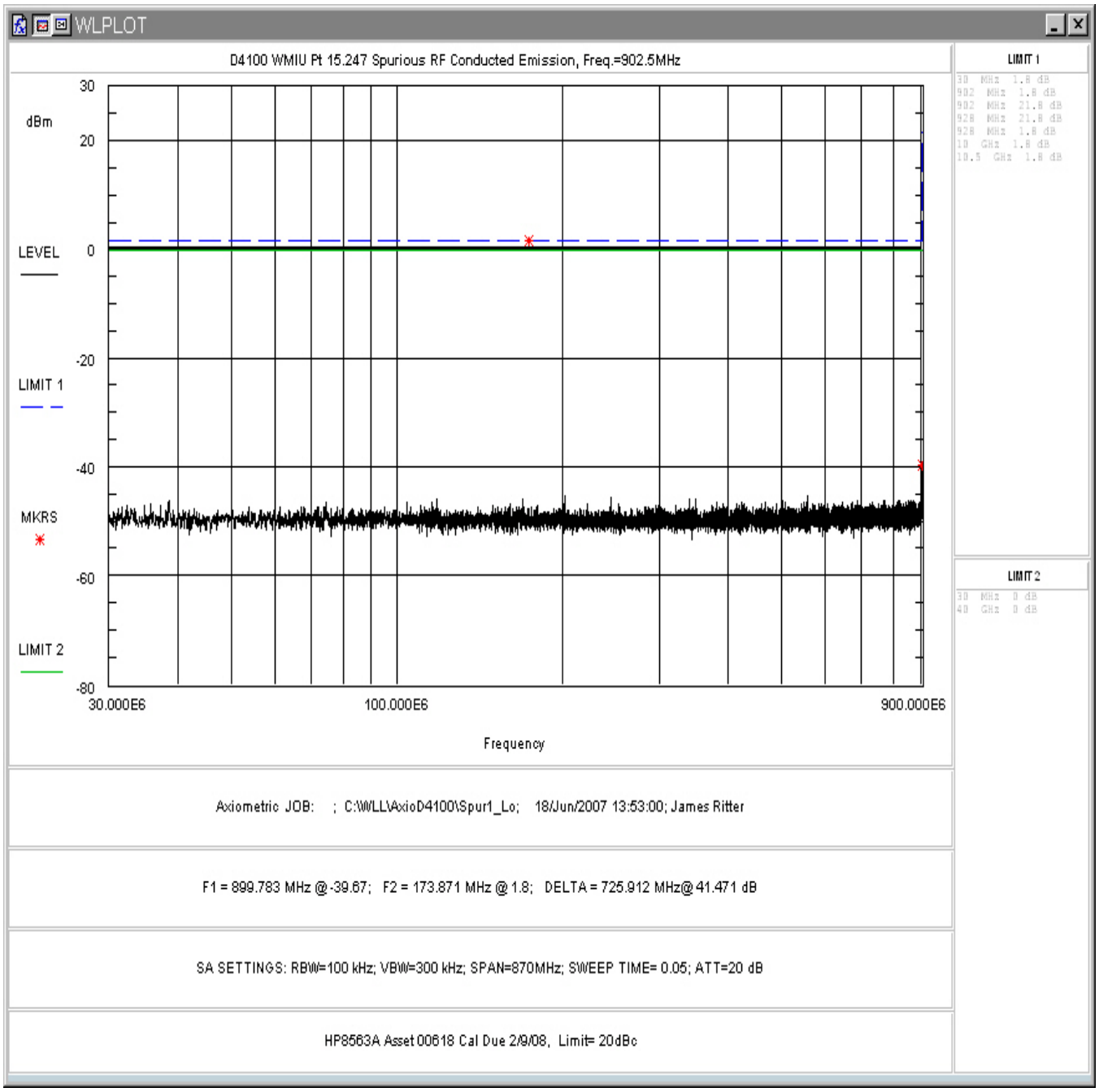

Figure 4-11: Conducted Spurious Emissions, Low Channel 30 - 900MHz

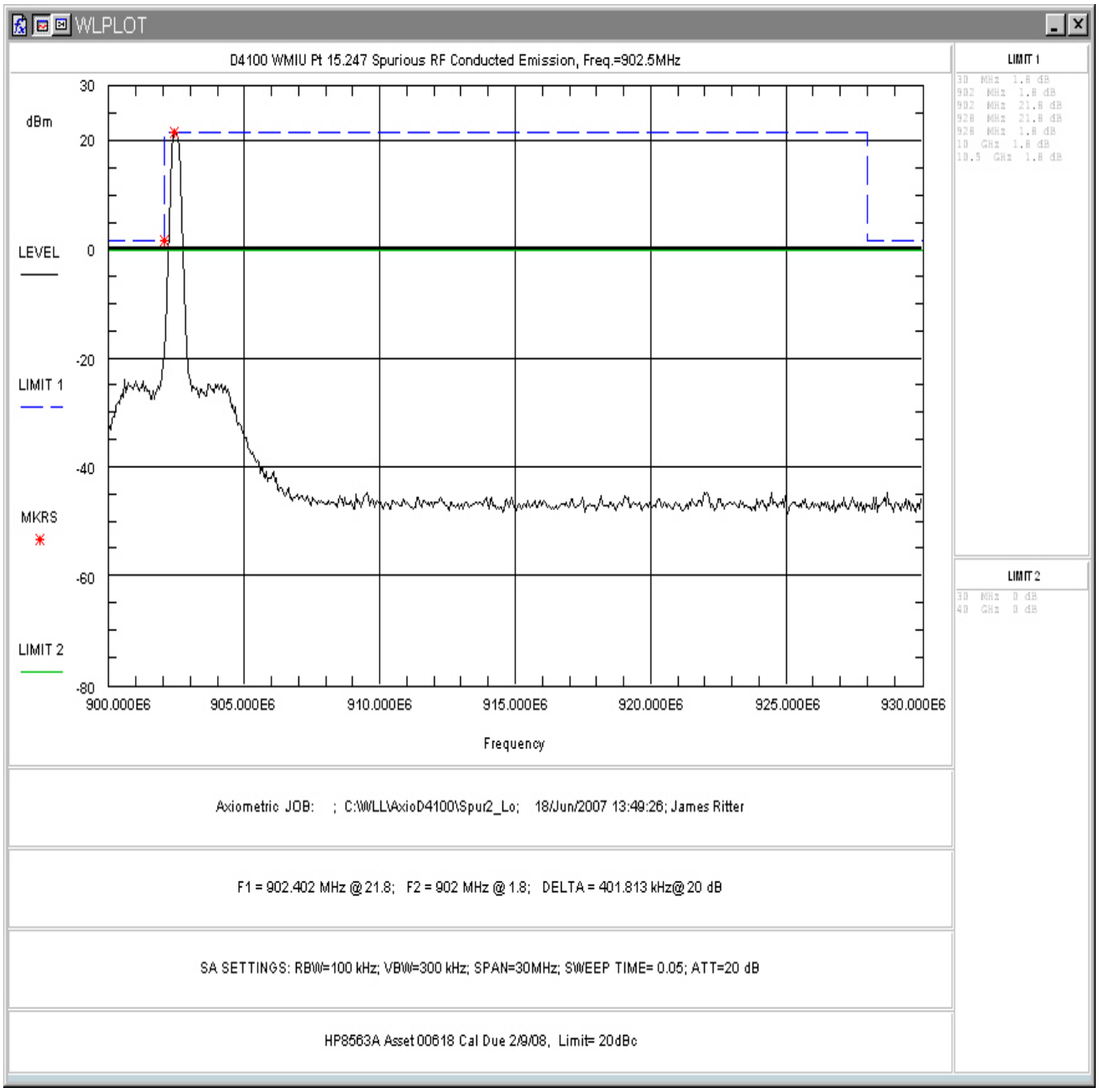

Figure 4-12: Conducted Spurious Emissions, Low Channel 900MHz-930MHz

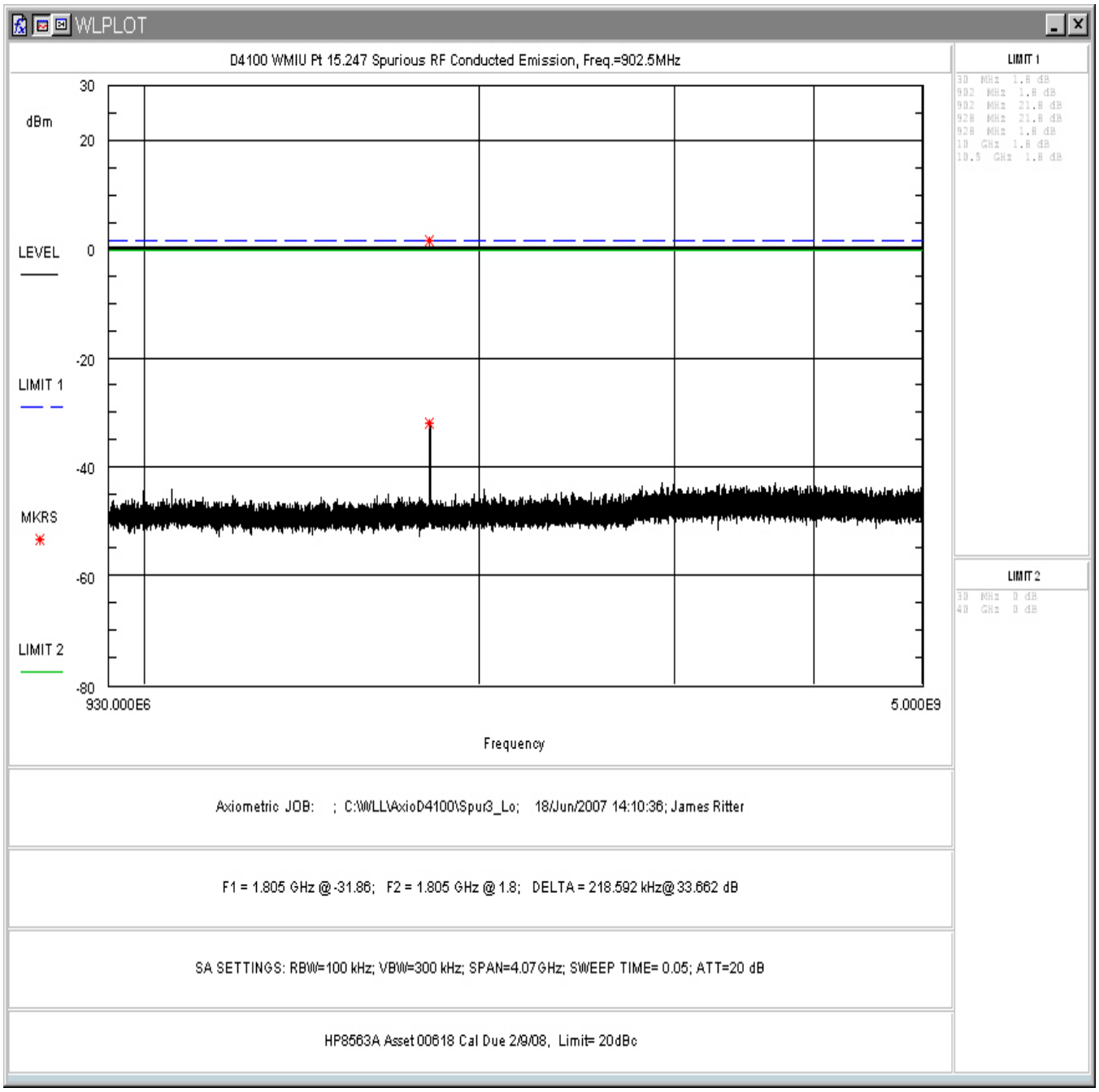

Figure 4-13: Conducted Spurious Emissions, Low Channel 930MHz – 5GHz

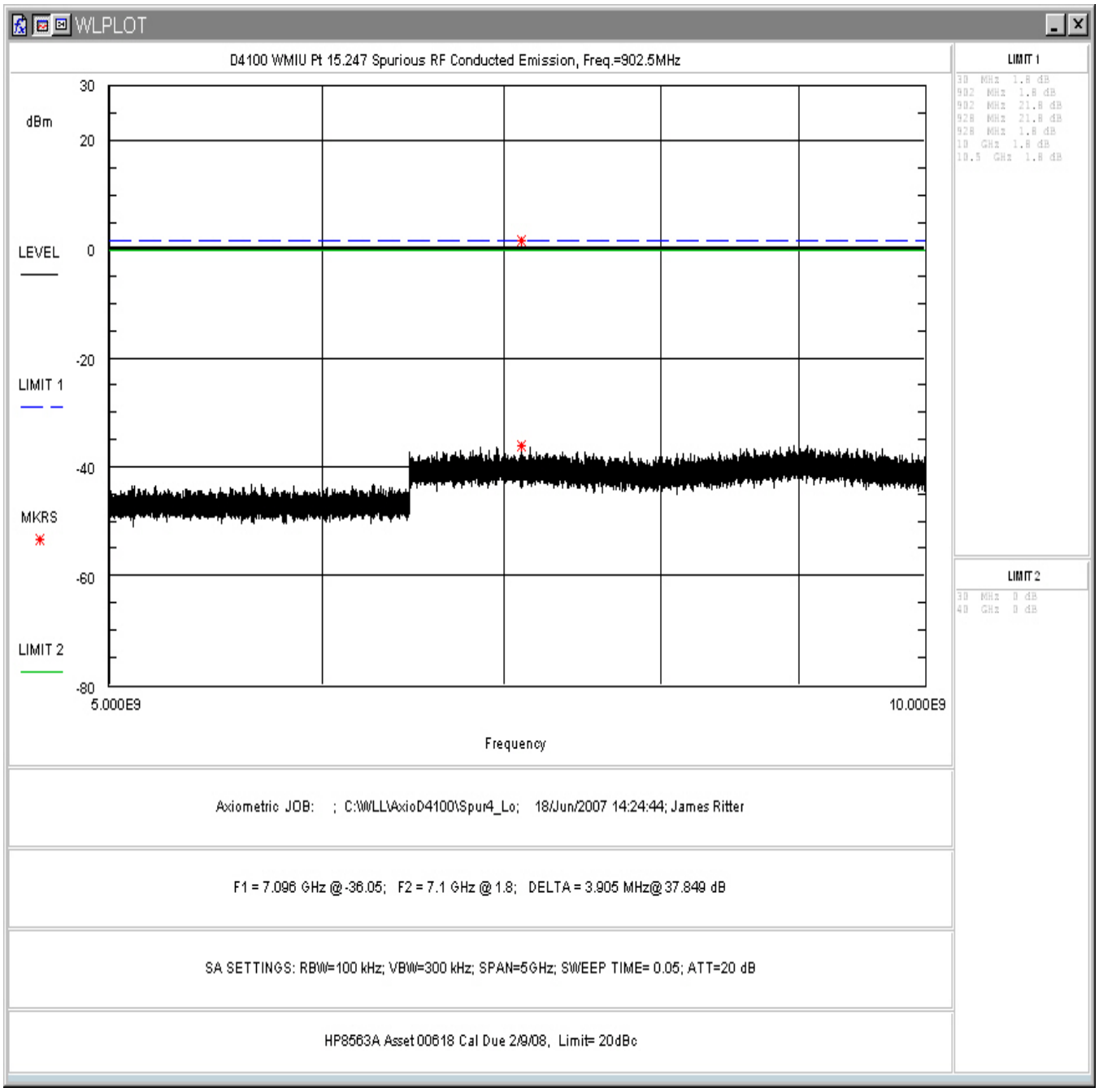

Figure 4-14: Conducted Spurious Emissions, Low Channel 5 - 10GHz

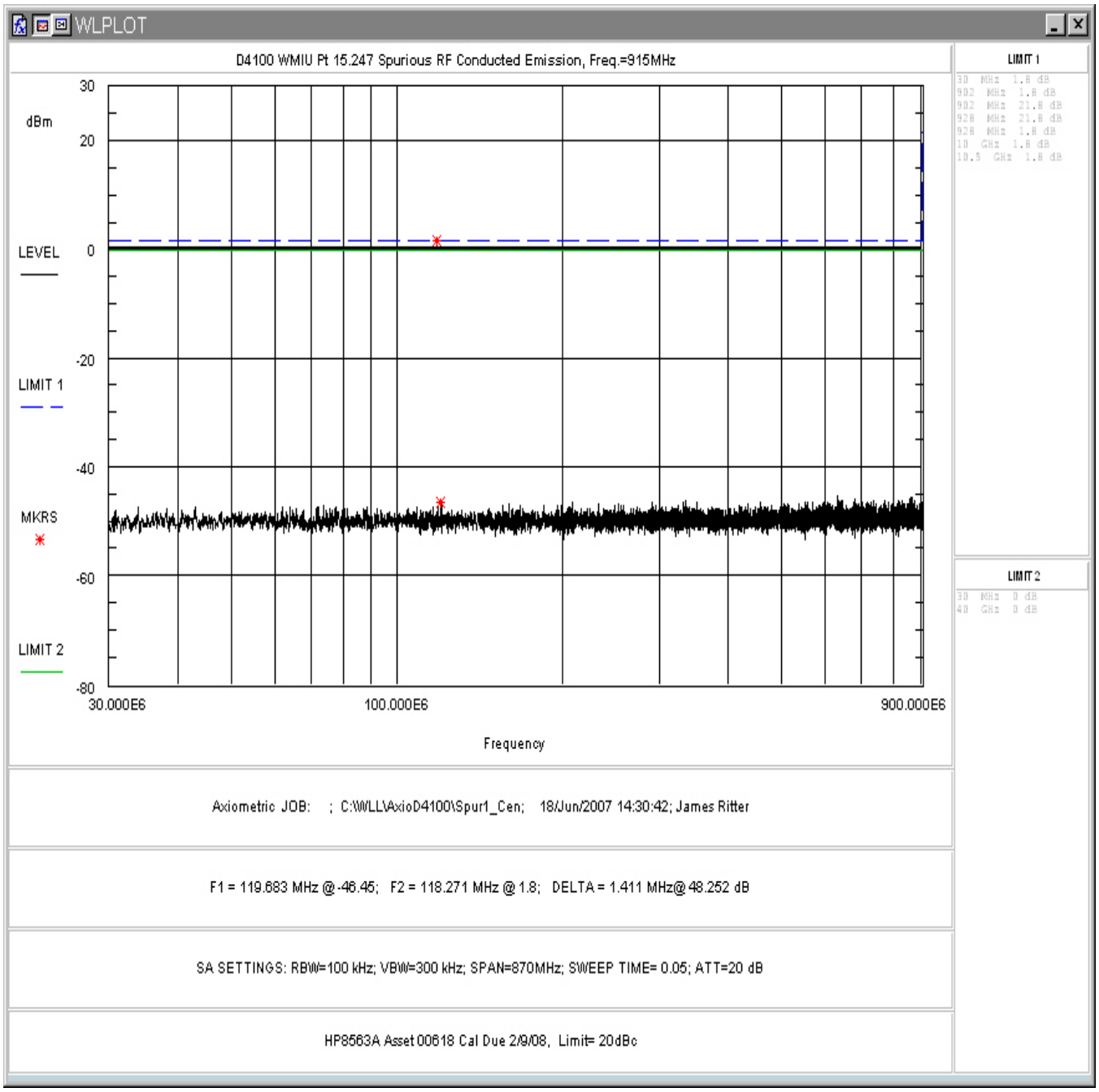

Figure 4-15: Conducted Spurious Emissions, Mid Channel 30 - 900MHz

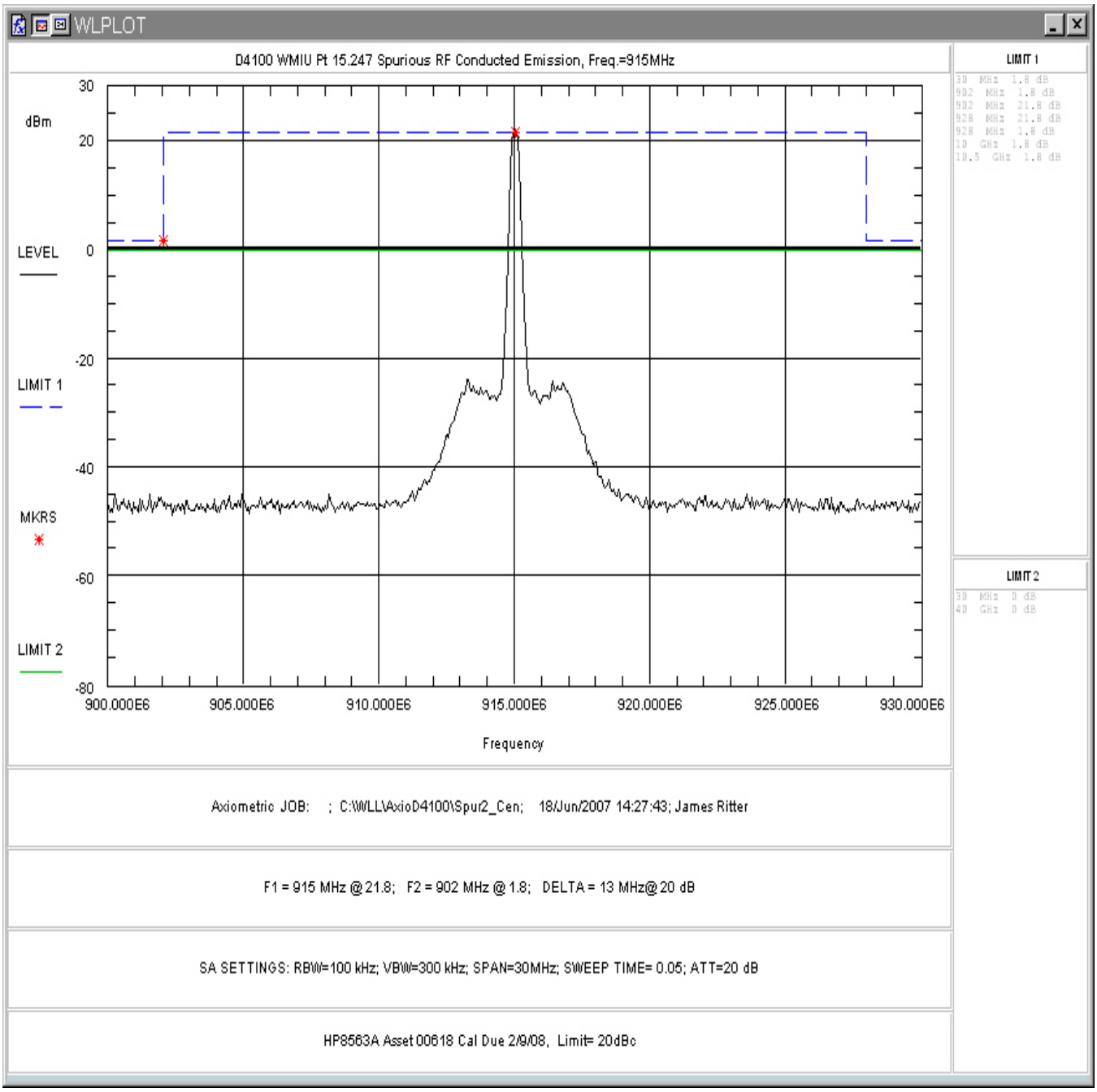

Figure 4-16: Conducted Spurious Emissions, Mid Channel 900 - 930MHz

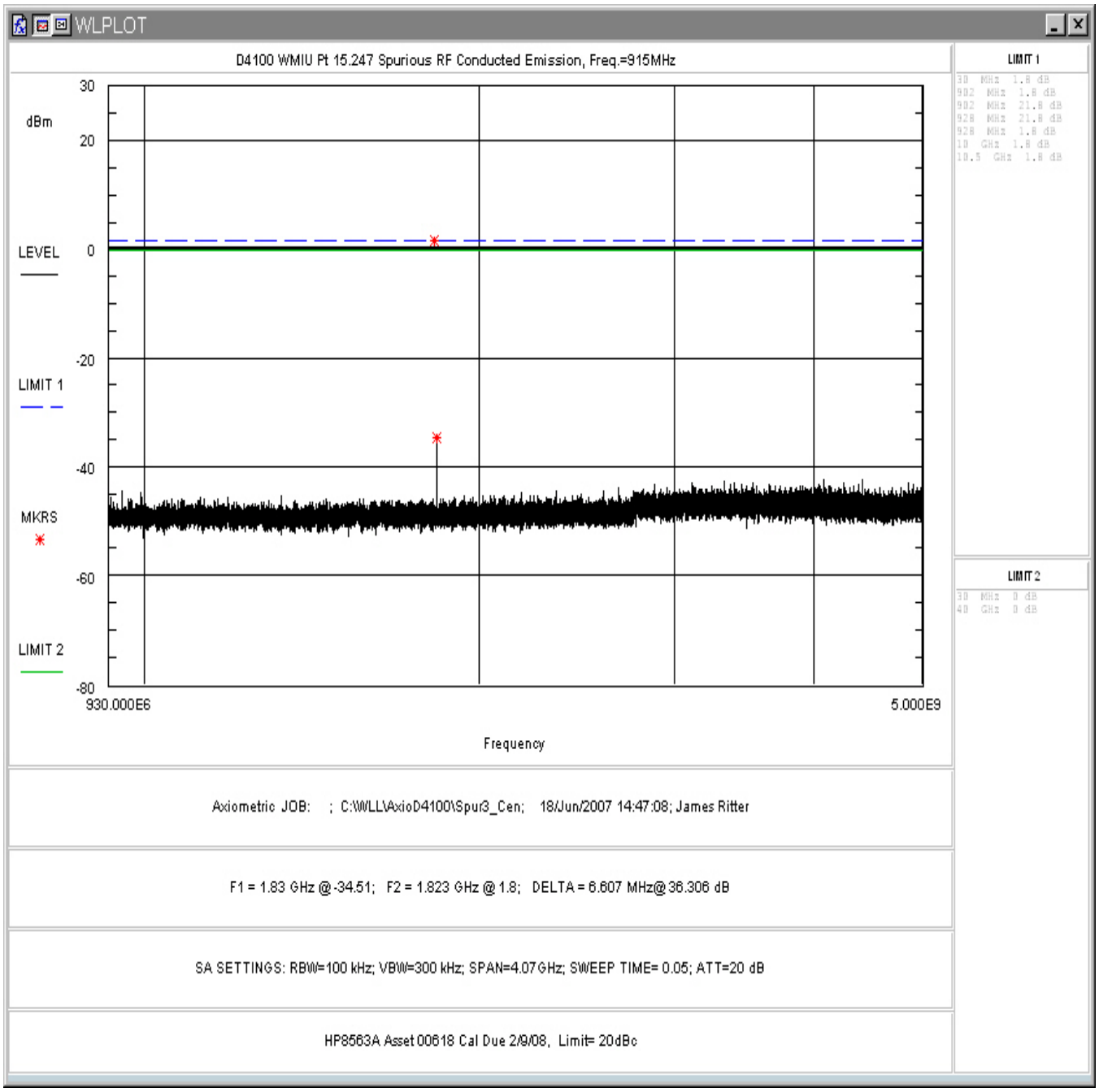

Figure 4-17: Conducted Spurious Emissions, Mid Channel 930MHz – 5GHz

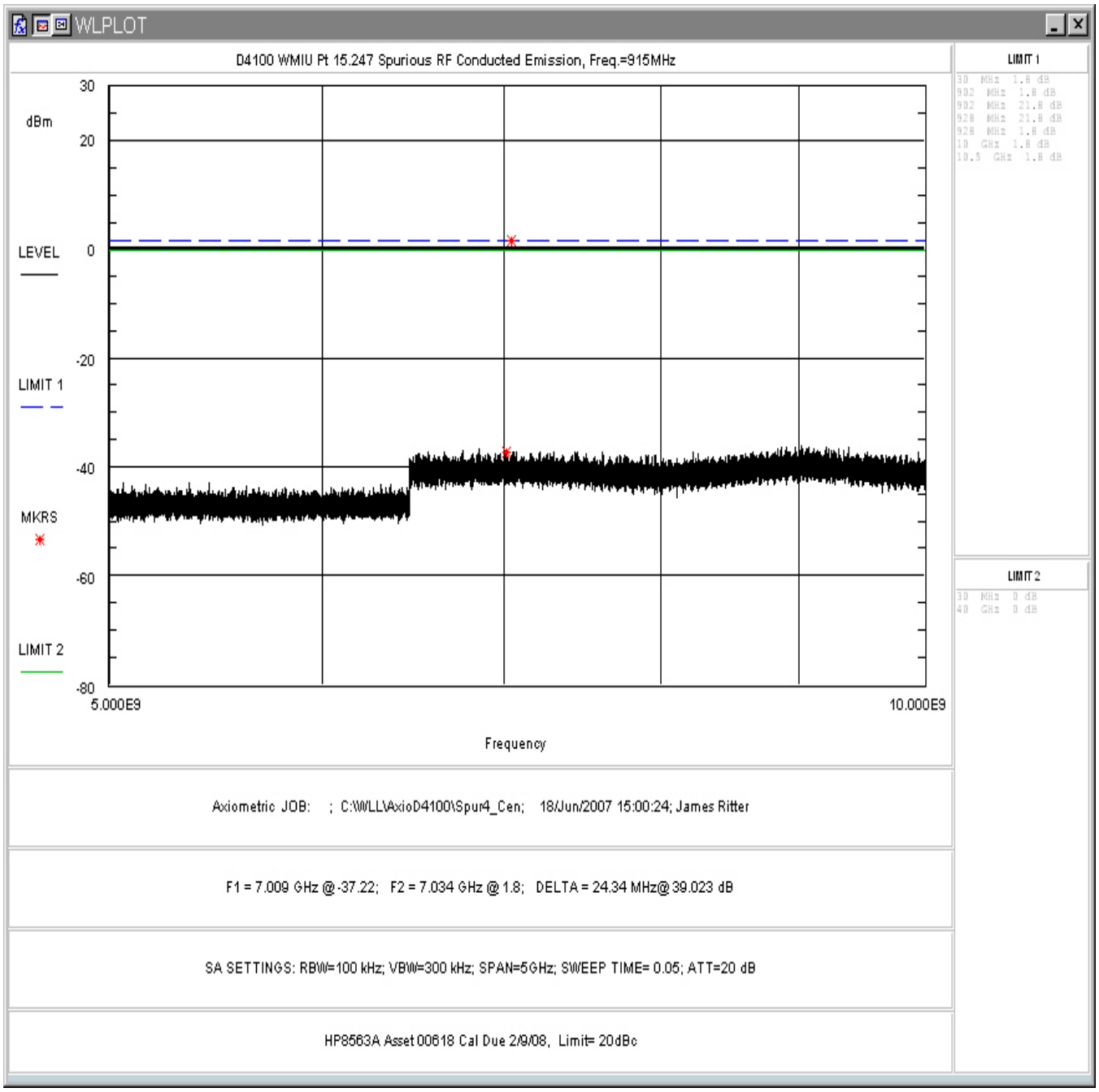

Figure 4-18: Conducted Spurious Emissions, Mid Channel 5 – 10GHz

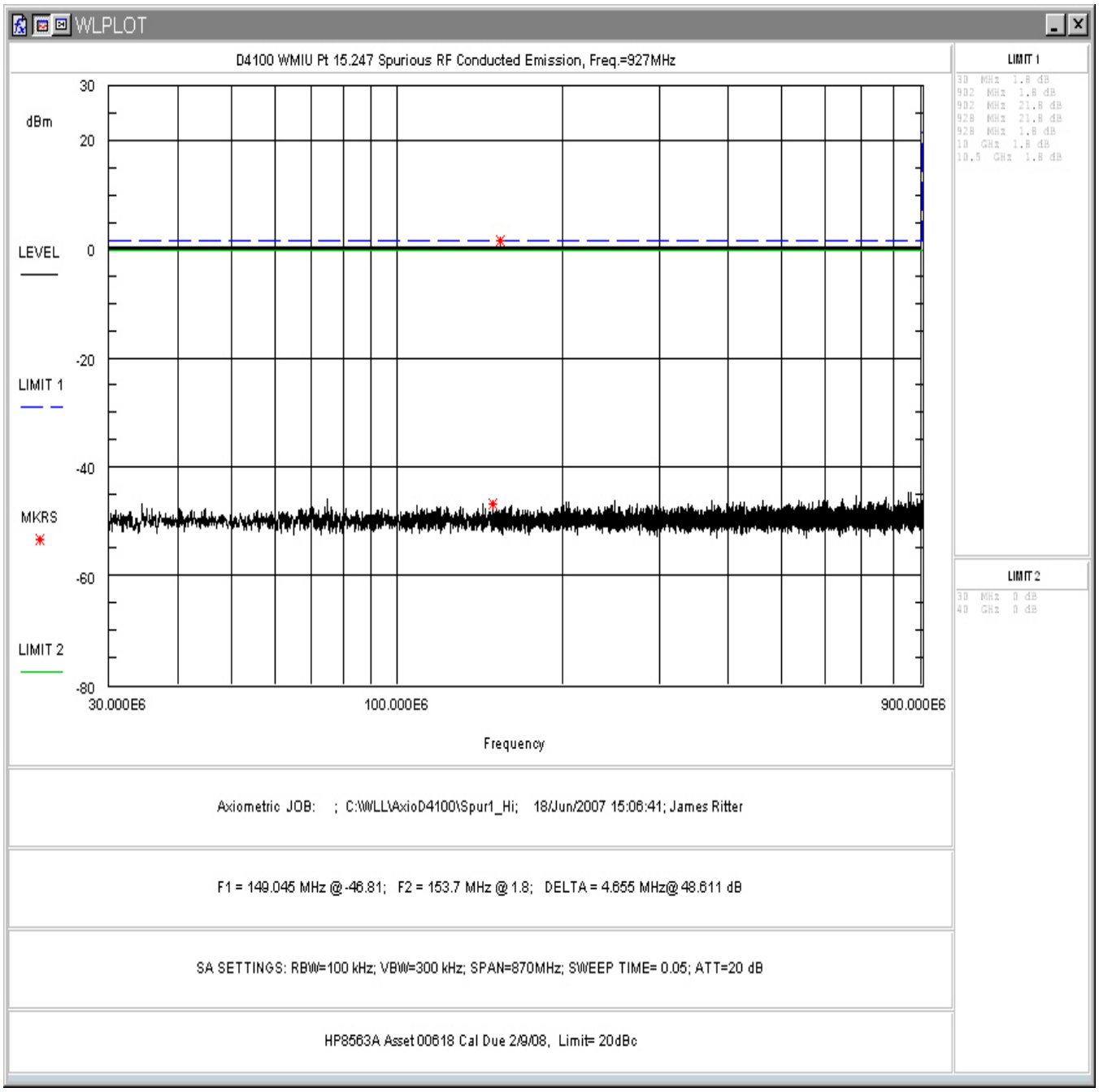

Figure 4-19: Conducted Spurious Emissions, High Channel 30 - 900MHz

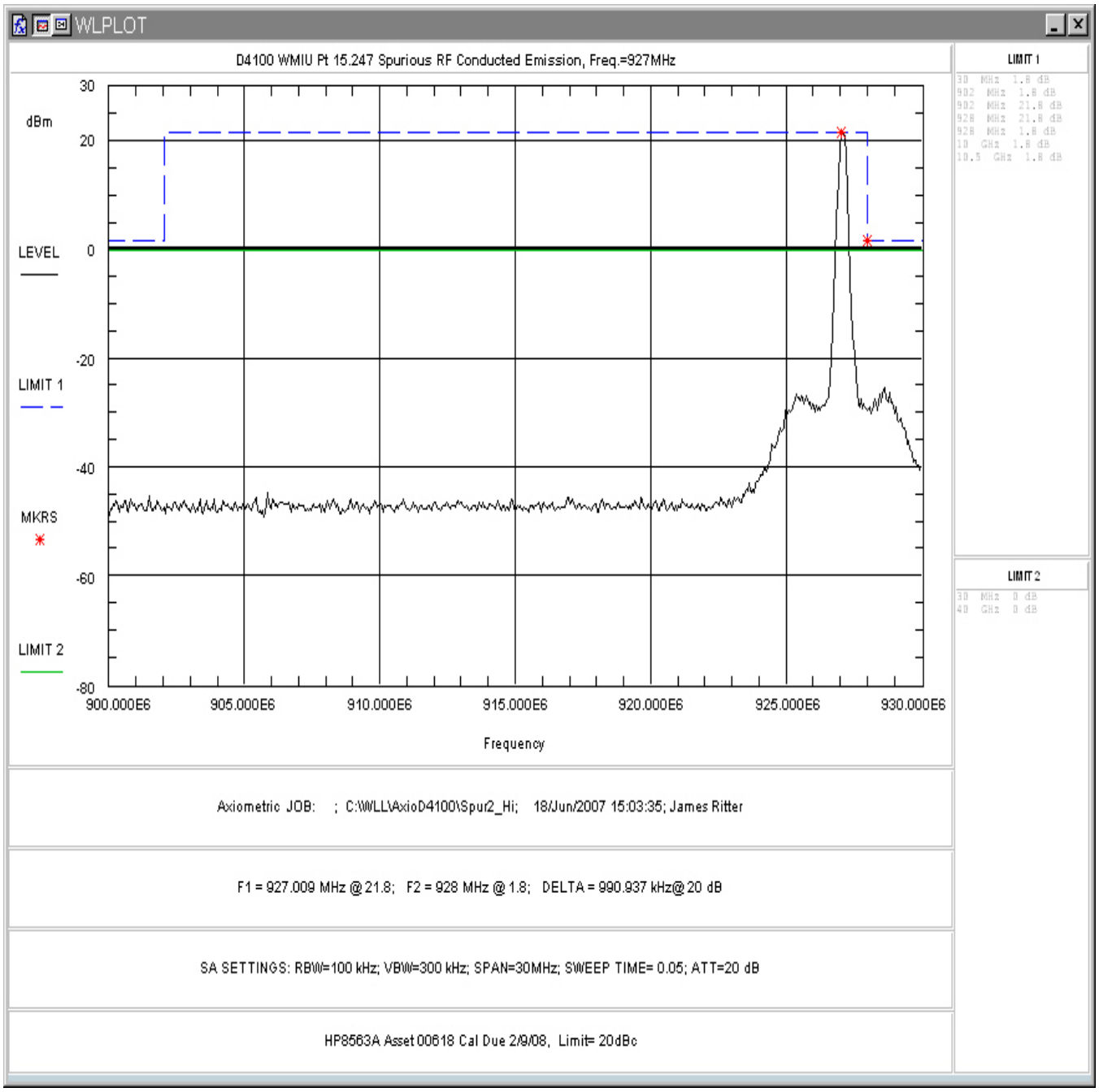

Figure 4-20: Conducted Spurious Emissions, High Channel 900 – 930MHz

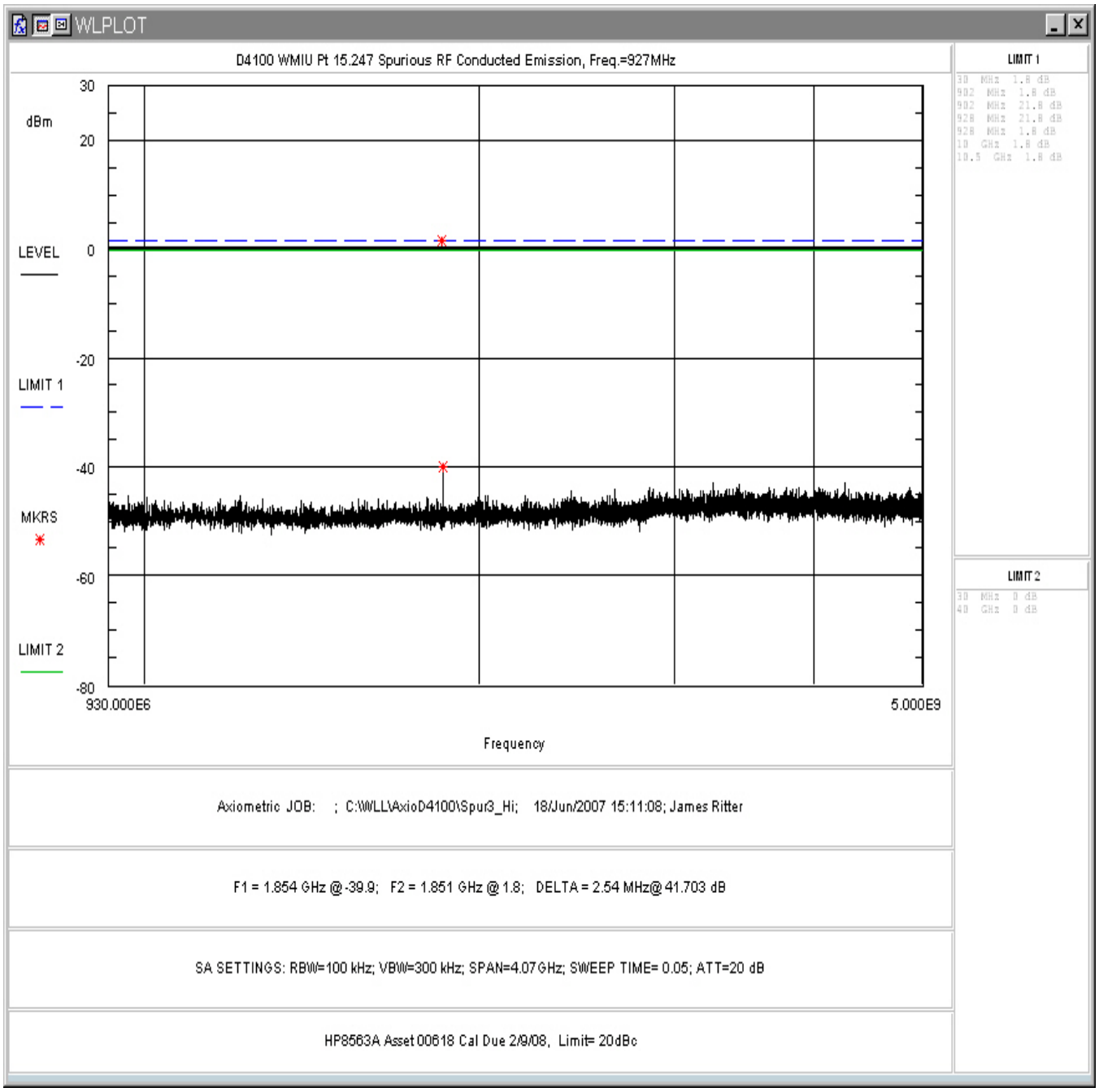

Figure 4-21: Conducted Spurious Emissions, High Channel 930MHz - 5GHz

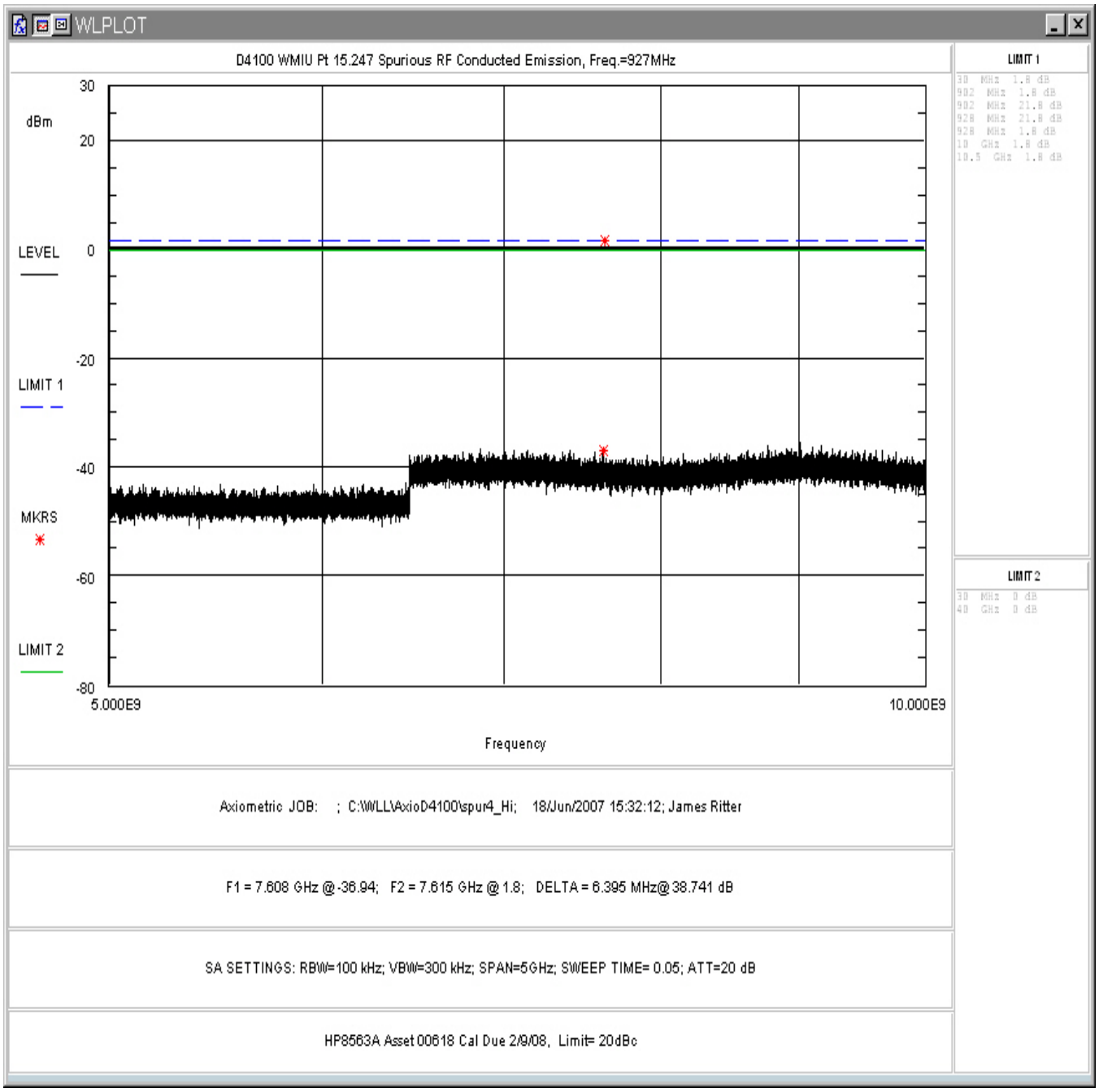

Figure 4-22: Conducted Spurious Emissions, High Channel 5 - 10GHz

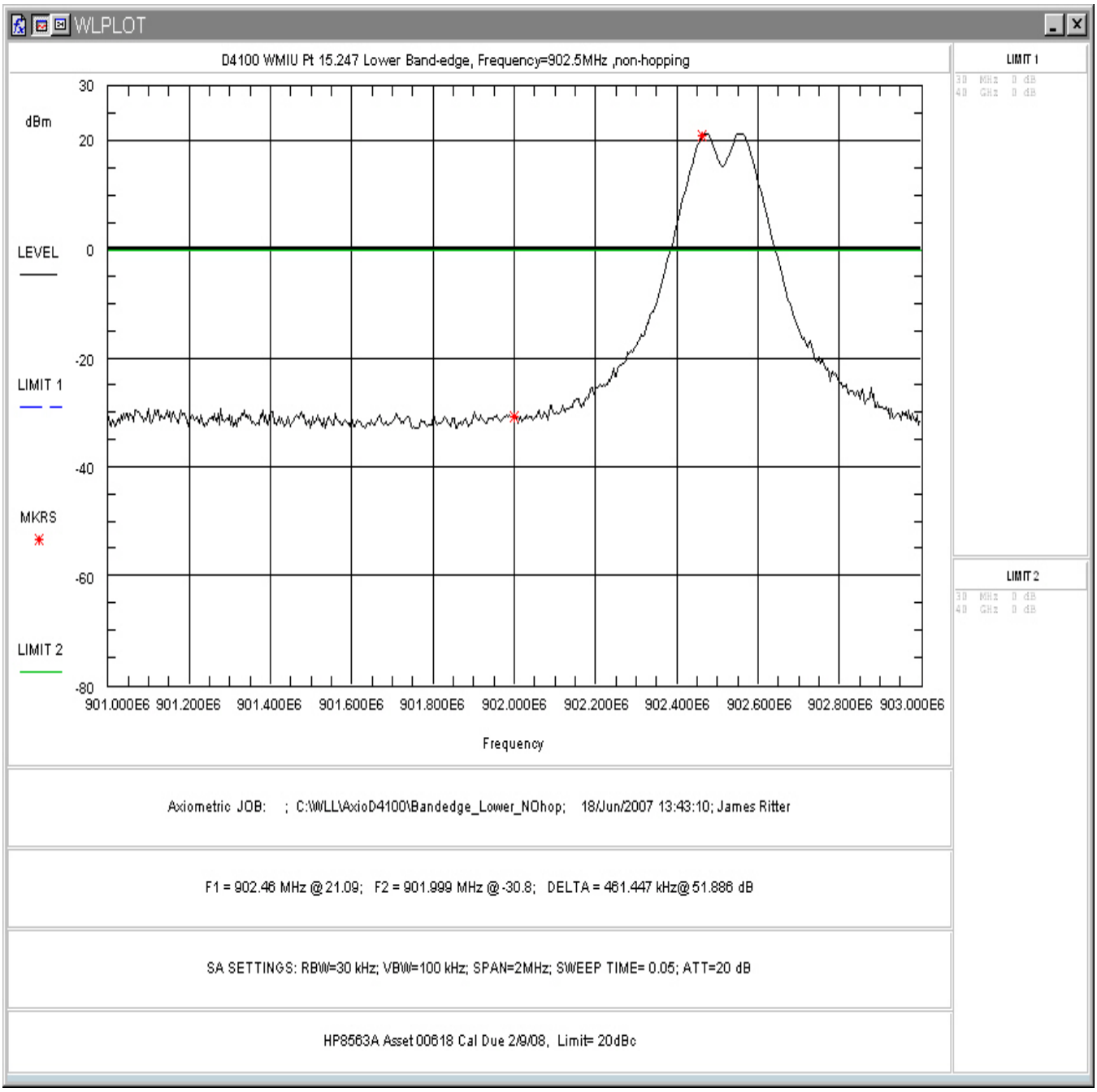

Figure 4-23: Lower Band Edge –Low Channel

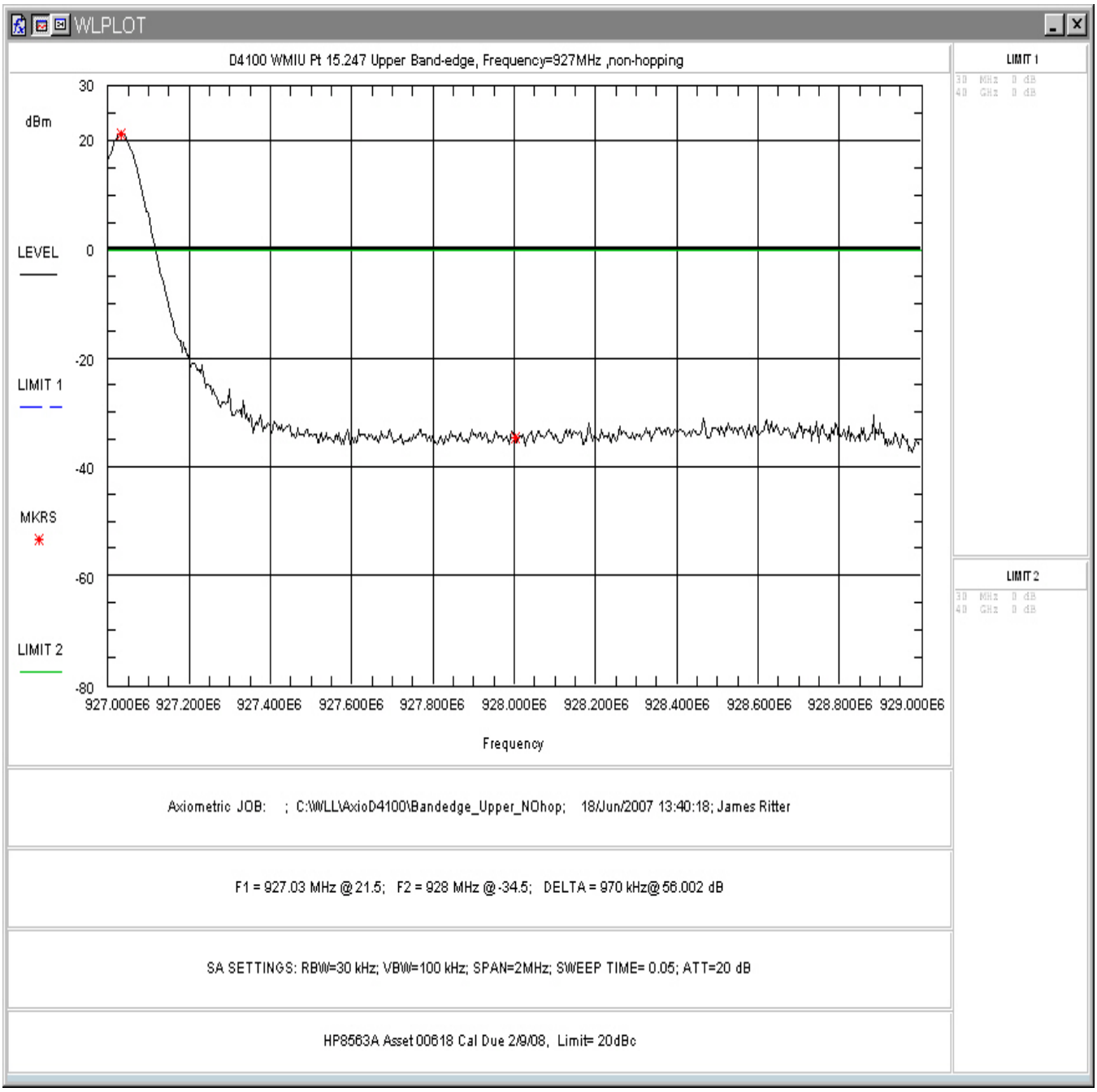

Figure 4-24: Upper Band Edge –Hi Channel

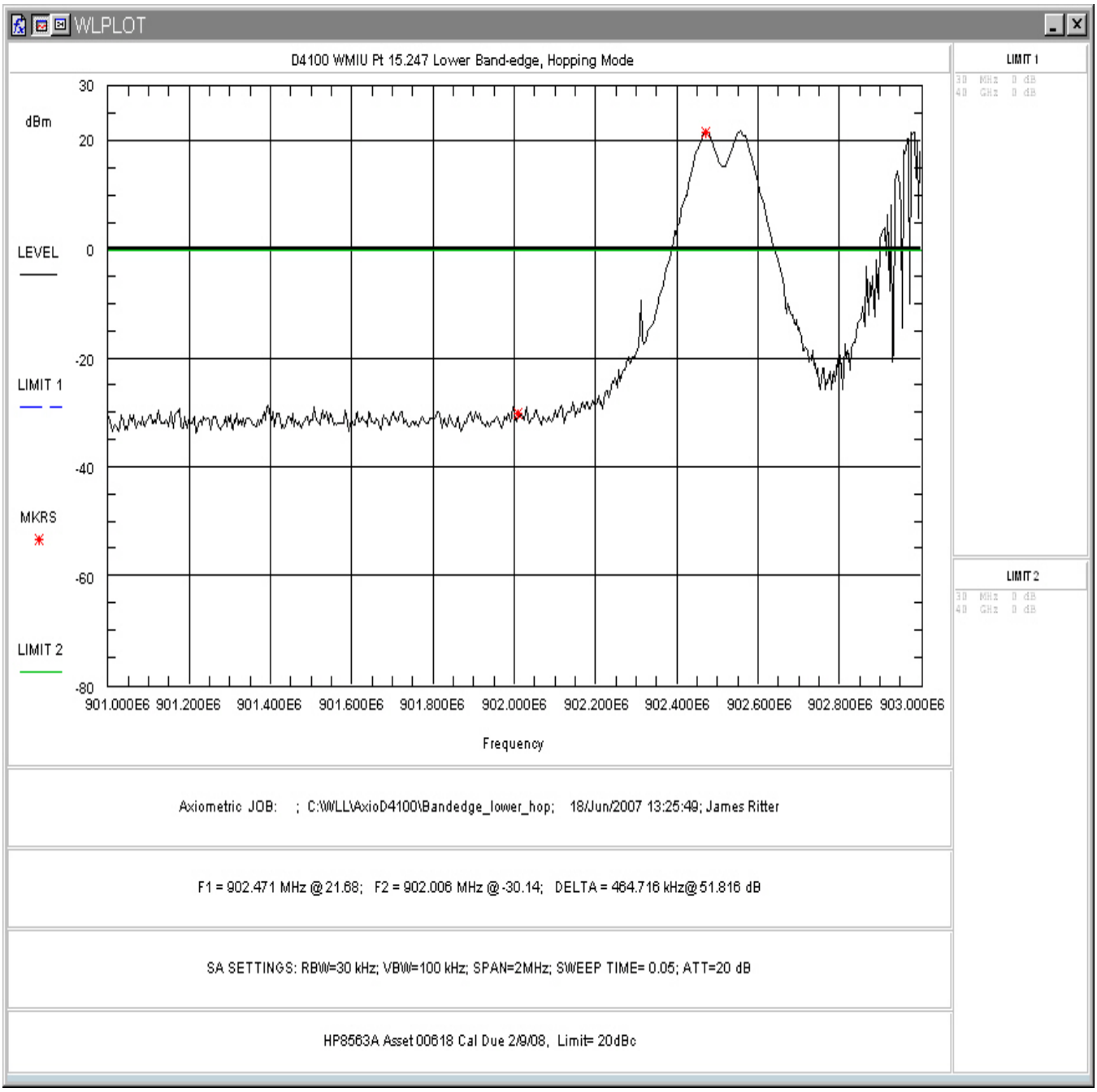

Figure 4-25: Lower Band Edge- Hopping Mode

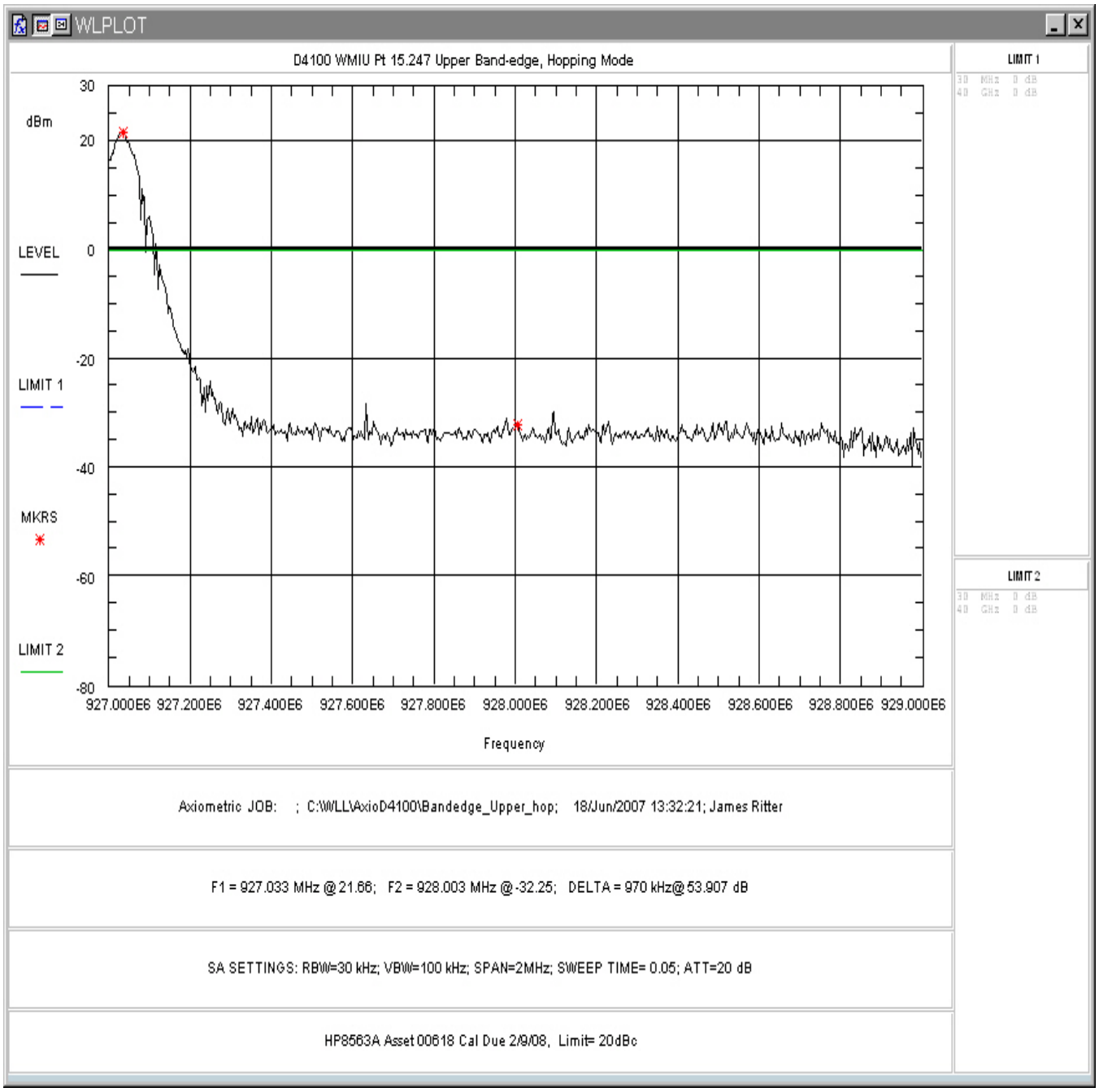

Figure 4-26: Upper Band Edge- Hopping Mode

4.6 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.

4.6.1 Test Procedure

The EUT was placed on motorized turntable for radiated testing on a 3-meter open field test site. The emissions from the EUT were measured continuously at every azimuth by rotating the turntable. Receiving antennas were mounted on an antenna mast to determine the height of maximum emissions. The height of the antenna was varied between 1 and 4 meters. The peripherals were placed on the table in accordance with ANSI C63.4-2003. Cables were varied in position to produce maximum emissions. Both the horizontal and vertical field components were measured.

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 Channel @ 902.5MHz

(Restricted Bands)

<1000MHz Unit mounted Vertically

Frequency (MHz)	Pol. H/V	Azimuth Degree	Ant. Hght (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)
32.750	V	90.0	1.0	9.7	18.1	0.7	0.0	28.5	26.8	100.0	-11.5
37.887	V	90.0	1.0	9.0	17.9	0.8	0.0	27.7	24.3	100.0	-12.3
47.990	V	0.0	1.0	5.2	15.2	1.0	0.0	21.4	11.7	100.0	-18.6
110.874	V	90.0	1.2	4.3	11.2	1.7	0.0	17.2	7.2	150.0	-26.4
193.252	V	0.0	1.5	6.6	10.2	2.5	0.0	19.3	9.2	150.0	-24.2
206.437	V	0.0	1.5	3.9	11.1	2.1	0.0	17.1	7.2	150.0	-26.4
671.987	V	270.0	2.0	4.5	19.3	5.0	0.0	28.8	27.7	200.0	-17.2
960.950	V	170.0	1.3	14.4	22.2	6.8	0.0	43.4	148.7	500.0	-10.5
32.750	H	180.0	2.6	3.6	10.9	0.7	0.0	15.2	5.8	100.0	-24.8
37.887	H	180.0	3.0	4.8	11.6	0.8	0.0	17.2	7.2	100.0	-22.8
47.990	H	180.0	3.3	3.8	10.6	1.0	0.0	15.4	5.9	100.0	-24.6
110.874	H	200.0	2.6	3.0	10.1	1.7	0.0	14.8	5.5	150.0	-28.7

193.252	H	90.0	3.0	5.9	13.1	2.5	0.0	21.5	11.9	150.0	-22.0
206.437	H	270.0	3.0	5.4	11.1	2.1	0.0	18.6	8.5	150.0	-24.9
671.987	H	90.0	1.5	3.6	19.3	5.0	0.0	27.9	24.9	200.0	-18.1
960.950	H	180.0	2.4	5.6	22.2	6.8	0.0	34.6	54.0	500.0	-19.3

>1000MHz

Frequency (MHz)	Pol. H/V	Azimuth Degree	Ant. Hght (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)
Peak											
2707.500	H	180.0	1.0	58.2	29.5	1.5	36.0	53.2	455.5	5000.0	-20.8
3610.000	H	180.0	1.0	50.3	30.7	2.5	35.6	47.9	249.5	5000.0	-26.0
4512.500	H	190.0	1.0	49.5	32.0	3.3	35.5	49.4	293.5	5000.0	-24.6
5415.000	H	90.0	1.0	49.3	33.5	3.8	35.6	51.0	355.8	5000.0	-23.0
8122.500	H	0.0	1.0	51.5	37.4	6.1	35.8	59.2	907.4	5000.0	-14.8
9025.000	H	0.0	1.0	48.8	38.0	4.8	36.1	55.5	597.9	5000.0	-18.4
2707.500	V	90.0	1.0	55.3	29.5	1.5	36.0	50.3	328.5	5000.0	-23.6
3610.000	V	0.0	1.0	48.7	30.7	2.5	35.6	46.3	206.1	5000.0	-27.7
4512.500	V	0.0	1.0	47.7	32.0	3.3	35.5	47.5	237.8	5000.0	-26.5
5415.000	V	270.0	1.0	48.8	33.5	3.8	35.6	50.5	335.9	5000.0	-23.5
8122.500	V	0.0	1.0	51.8	37.4	6.1	35.8	59.5	942.5	5000.0	-14.5
9025.000	V	0.0	1.0	47.7	38.0	4.8	36.1	54.4	523.1	5000.0	-19.6
Average											
2707.500	H	180.0	1.0	56.0	29.5	1.5	36.0	51.0	354.8	500.0	-3.0
3610.000	H	180.0	1.0	43.8	30.7	2.5	35.6	41.4	118.0	500.0	-12.5
4512.500	H	190.0	1.0	44.8	32.0	3.3	35.5	44.7	171.5	500.0	-9.3
5415.000	H	90.0	1.0	44.7	33.5	3.8	35.6	46.4	208.1	500.0	-7.6
8122.500	H	0.0	1.0	43.7	37.4	6.1	35.8	51.4	369.7	500.0	-2.6
9025.000	H	0.0	1.0	39.8	38.0	4.8	36.1	46.5	212.1	500.0	-7.4
2707.500	V	90.0	1.0	53.2	29.5	1.5	36.0	48.2	256.2	500.0	-5.8
3610.000	V	0.0	1.0	44.3	30.7	2.5	35.6	41.9	125.0	500.0	-12.0
4512.500	V	0.0	1.0	44.7	32.0	3.3	35.5	44.5	168.3	500.0	-9.5
5415.000	V	270.0	1.0	43.7	33.5	3.8	35.6	45.4	185.4	500.0	-8.6
8122.500	V	0.0	1.0	44.2	37.4	6.1	35.8	51.8	390.2	500.0	-2.2
9025.000	V	0.0	1.0	36.8	38.0	4.8	36.1	43.5	150.4	500.0	-10.4

Table 6: Radiated Emission Test Data- Center Channel @ 915MHz

<1000MHz Unit mounted Vertically

Frequency (MHz)	Pol. H/V	Azimuth Degree	Ant. Hght (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)
32.750	V	90.0	1.0	9.7	18.1	0.7	0.0	28.5	26.8	100.0	-11.5
37.887	V	90.0	1.0	9.0	17.9	0.8	0.0	27.7	24.3	100.0	-12.3
47.990	V	0.0	1.0	5.2	15.2	1.0	0.0	21.4	11.7	100.0	-18.6
110.874	V	90.0	1.2	4.3	11.2	1.7	0.0	17.2	7.2	150.0	-26.4
193.252	V	0.0	1.5	6.6	10.2	2.5	0.0	19.3	9.2	150.0	-24.2
206.437	V	0.0	1.5	3.9	11.1	2.1	0.0	17.1	7.2	150.0	-26.4
671.987	V	270.0	2.0	4.5	19.3	5.0	0.0	28.8	27.7	200.0	-17.2
992.950	V	270.0	1.6	19.1	22.5	6.8	0.0	48.4	263.5	500.0	-5.6
32.750	H	180.0	2.6	3.6	10.9	0.7	0.0	15.2	5.8	100.0	-24.8
37.887	H	180.0	3.0	4.8	11.6	0.8	0.0	17.2	7.2	100.0	-22.8
47.990	H	180.0	3.3	3.8	10.6	1.0	0.0	15.4	5.9	100.0	-24.6
110.874	H	200.0	2.6	3.0	10.1	1.7	0.0	14.8	5.5	150.0	-28.7
193.252	H	90.0	3.0	5.9	13.1	2.5	0.0	21.5	11.9	150.0	-22.0
206.437	H	270.0	3.0	5.4	11.1	2.1	0.0	18.6	8.5	150.0	-24.9
671.987	H	90.0	1.5	3.6	19.3	5.0	0.0	27.9	24.9	200.0	-18.1
992.950	H	180.0	2.4	7.4	22.5	6.8	0.0	36.7	68.5	500.0	-17.3

>1000MHz

Frequency (MHz)	Pol. H/V	Azimuth Degree	Ant. Hght (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)
Peak											
2745.000	H	270.0	1.0	56.0	29.6	1.5	36.0	51.1	358.4	5000.0	-22.9
3660.000	H	270.0	1.0	50.7	30.8	2.5	35.5	48.4	263.8	5000.0	-25.6
4575.000	H	270.0	1.0	48.0	32.1	3.4	35.5	48.0	250.8	5000.0	-26.0
7320.000	H	345.0	1.0	48.3	37.1	4.5	35.8	54.2	510.8	5000.0	-19.8
8235.000	H	10.0	1.0	49.3	37.5	5.9	35.9	56.9	696.3	5000.0	-17.1
9150.000	H	0.0	1.0	49.7	38.1	4.8	36.2	56.5	665.7	5000.0	-17.5
2745.000	V	0.0	1.0	55.3	29.6	1.5	36.0	50.4	331.8	5000.0	-23.6
3660.000	V	180.0	1.0	51.2	30.8	2.5	35.5	48.9	279.5	5000.0	-25.1
4575.000	V	270.0	1.0	46.5	32.1	3.4	35.5	46.5	211.0	5000.0	-27.5

7320.000	V	180.0	1.0	47.8	37.1	4.5	35.8	53.7	482.2	5000.0	-20.3
8235.000	V	170.0	1.0	48.0	37.5	5.9	35.9	55.5	597.4	5000.0	-18.5
9150.000	V	150.0	1.0	47.7	38.1	4.8	36.2	54.5	528.8	5000.0	-19.5
Average											
2745.000	H	270.0	1.0	53.2	29.6	1.5	36.0	48.3	259.6	500.0	-5.7
3660.000	H	270.0	1.0	46.8	30.8	2.5	35.5	44.6	169.6	500.0	-9.4
4575.000	H	270.0	1.0	43.7	32.1	3.4	35.5	43.7	152.3	500.0	-10.3
7320.000	H	345.0	1.0	41.2	37.1	4.5	35.8	47.0	224.0	500.0	-7.0
8235.000	H	10.0	1.0	41.3	37.5	5.9	35.9	48.8	276.2	500.0	-5.2
9150.000	H	0.0	1.0	41.0	38.1	4.8	36.2	47.8	245.4	500.0	-6.2
2745.000	V	0.0	1.0	52.8	29.6	1.5	36.0	47.9	248.8	500.0	-6.1
3660.000	V	180.0	1.0	47.8	30.8	2.5	35.5	45.6	190.2	500.0	-8.4
4575.000	V	270.0	1.0	41.8	32.1	3.4	35.5	41.8	123.2	500.0	-12.2
7320.000	V	180.0	1.0	39.2	37.1	4.5	35.8	45.0	177.9	500.0	-9.0
8235.000	V	170.0	1.0	40.2	37.5	5.9	35.9	47.7	242.5	500.0	-6.3
9150.000	V	150.0	1.0	36.7	38.1	4.8	36.2	43.5	149.6	500.0	-10.5

Table 7: Radiated Emission Test Data- High Channel @ 927.5MHz

<1000MHz Unit mounted Vertically

Frequency (MHz)	Pol. H/V	Azimuth Degree	Ant. Hght (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)
32.750	V	90.0	1.0	9.7	18.1	0.7	0.0	28.5	26.8	100.0	-11.5
37.887	V	90.0	1.0	9.0	17.9	0.8	0.0	27.7	24.3	100.0	-12.3
47.990	V	0.0	1.0	5.2	15.2	1.0	0.0	21.4	11.7	100.0	-18.6
110.874	V	90.0	1.2	4.3	11.2	1.7	0.0	17.2	7.2	150.0	-26.4
193.252	V	0.0	1.5	6.6	10.2	2.5	0.0	19.3	9.2	150.0	-24.2
206.437	V	0.0	1.5	3.9	11.1	2.1	0.0	17.1	7.2	150.0	-26.4
671.987	V	270.0	2.0	4.5	19.3	5.0	0.0	28.8	27.7	200.0	-17.2
965.947	V	270.0	1.3	18.7	22.3	6.8	0.0	47.8	244.5	500.0	-6.2
32.750	H	180.0	2.6	3.6	10.9	0.7	0.0	15.2	5.8	100.0	-24.8
37.887	H	180.0	3.0	4.8	11.6	0.8	0.0	17.2	7.2	100.0	-22.8
47.990	H	180.0	3.3	3.8	10.6	1.0	0.0	15.4	5.9	100.0	-24.6
110.874	H	200.0	2.6	3.0	10.1	1.7	0.0	14.8	5.5	150.0	-28.7
193.252	H	90.0	3.0	5.9	13.1	2.5	0.0	21.5	11.9	150.0	-22.0
206.437	H	270.0	3.0	5.4	11.1	2.1	0.0	18.6	8.5	150.0	-24.9
671.987	H	90.0	1.5	3.6	19.3	5.0	0.0	27.9	24.9	200.0	-18.1
965.947	H	0.0	1.4	6.5	22.3	6.8	0.0	35.6	60.0	500.0	-18.4

>1000MHz

Frequency (MHz)	Pol. H/V	Azimuth Degree	Ant. Hght (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)
Peak											
2781.000	V	100.0	1.0	55.8	29.6	1.5	36.0	51.0	354.7	5000.0	-23.0
3708.000	V	90.0	1.0	53.3	30.8	2.6	35.5	51.2	364.1	5000.0	-22.8
4635.000	V	90.0	1.0	50.2	32.2	3.4	35.5	50.3	326.6	5000.0	-23.7
7416.000	V	190.0	1.0	48.2	37.1	4.8	35.8	54.3	518.4	5000.0	-19.7
8343.000	V	180.0	1.0	48.2	37.5	5.8	35.9	55.6	600.6	5000.0	-18.4
2781.000	H	270.0	1.0	58.8	29.6	1.5	36.0	54.0	501.1	5000.0	-20.0
3708.000	H	270.0	1.0	53.5	30.8	2.6	35.5	51.4	371.3	5000.0	-22.6

4635.000	H	180.0	1.0	49.5	32.2	3.4	35.5	49.6	302.3	5000.0	-24.4
7416.000	H	0.0	1.0	48.7	37.1	4.8	35.8	54.8	549.1	5000.0	-19.2
8343.000	H	180.0	1.0	49.7	37.5	5.8	35.9	57.1	713.8	5000.0	-16.9
Average											
2781.000	V	100.0	1.0	54.3	29.6	1.5	36.0	49.5	298.5	500.0	-4.5
3708.000	V	90.0	1.0	50.5	30.8	2.6	35.5	48.4	262.9	500.0	-5.6
4635.000	V	90.0	1.0	46.7	32.2	3.4	35.5	46.8	218.3	500.0	-7.2
7416.000	V	190.0	1.0	40.2	37.1	4.8	35.8	46.3	207.1	500.0	-7.7
8343.000	V	180.0	1.0	39.2	37.5	5.8	35.9	46.6	213.1	500.0	-7.4
2781.000	H	270.0	1.0	57.2	29.6	1.5	36.0	52.3	413.9	500.0	-1.6
3708.000	H	270.0	1.0	50.2	30.8	2.6	35.5	48.1	253.1	500.0	-5.9
4635.000	H	180.0	1.0	46.3	32.2	3.4	35.5	46.4	209.9	500.0	-7.5
7416.000	H	0.0	1.0	41.5	37.1	4.8	35.8	47.6	240.5	500.0	-6.4
8343.000	H	180.0	1.0	41.0	37.5	5.8	35.9	48.4	263.1	500.0	-5.6

4.7 Conducted Emissions

4.7.1 Test Data

As this Unit is powered only from an internal 3.3VDC Lithium battery no conducted emissions testing was performed.