Washington Laboratories, Ltd.

FCC & Industry Canada Certification Test Report

For the

Matric Limited

CAN Bridge 500

K5B-CB500

3926A-CB500

WLL JOB# **8862/3**
September 2005

Prepared for:

Matric Limited
2099 Hill City Road
Seneca, PA 16346

Prepared By:

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

FCC & Industry Canada Certification Test Report
for the
Matric Limited
CAN Bridge 500
FCC ID: K5B-CB500
IC ID: 3926A-CB500

September 2005

WLL JOB# 8862/3

Prepared by: Brian J. Dettling
Documentation Specialist

Reviewed by: Gregory M. Snyder
Chief EMC Engineer

Abstract

This report has been prepared on behalf of Matric Limited to support the attached Application for Equipment Authorization. The test report and application are submitted for a Digitally Modulated 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 a Matric Limited CAN Bridge 500.

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 Matric Limited CAN Bridge 500 complies with the limits for a Digitally Modulated Transmitter device under FCC Part 15.247 and Industry Canada RSS-210.

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1 Introduction

1.1 Compliance Statement

The Matric Limited CAN Bridge 500 complies with the limits for a Digitally Modulated Transmitter device under FCC Part 15.247 and Industry Canada RSS-210.

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:	Matric Limited 2099 Hill City Road Seneca, PA 16346
Purchase Order Number:	117694
Quotation Number:	62487

1.4 Test Dates

Testing was performed on the following date(s):	August 16 to August 18, 2005

1.5 Test and Support Personnel

Washington Laboratories, LTD	James Ritter, Thuan Ta
Client Representative	Rick Rogers

2 Equipment Under Test

2.1 EUT Identification & Description

The Matric Limited CAN Bridge 500 functions as a wireless link that transfers CAN messages. Using the Wireless CAN Bridge, nodes on either side of a wireless link can communicate at a typical separation of 500 feet. Since actual CAN messages are transferred, the Wireless CAN Bridge supports any type of CAN bus standard.

Table 1. Device Summary

ITEM	DESCRIPTION
Manufacturer:	Matric Limited
FCC ID:	K5B-CB500
IC:	3926A-CB500
Model:	CAN Bridge 500
FCC Rule Parts:	§15.247
Industry Canada:	RSS210
Frequency Range:	2405 – 2480 MHz
Maximum Output Power:	0.2mW (-7dBm)
Modulation:	FSK
Occupied Bandwidth:	766.7kHz
Keying:	Automatic, Manual
Type of Information:	CAN Bus Data
Number of Channels:	16
Power Output Level	Fixed
Antenna Connector	Reverse SMA
Antenna Type	¼ wave whip
Interface Cables:	5-pin DIN Com port, Power
Power Source & Voltage:	12-24 Vdc

2.2 Test Configuration

The CAN Bridge 500 was configured with a power supply and a laptop PC.

2.3 Testing Algorithm

The CAN Bridge 500 was connected to a support PC via the serial port and setup for continuous transmission. The channel under test was set by adjusting the internal dip switches.

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 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	6/30/2006
0069	HP 85650A	QUASI-PEAK ADAPTER	6/30/2006
0125	SOLAR 8028-50-TS-BNC	LISN	10/1/2005
0126	SOLAR 8028-50-TS-BNC	LISN	10/1/2005
0073	HP 8568B	SPECTRUM ANALYZER	6/30/2006
0007	ARA LPB-2520	BICONILOG ANTENNA	9/14/2005
0312	HEWLETT-PACKARD 8449B	MICROWAVE PREAMP	9/29/2005
0425	ARA DRG118/A	MICROWAVE HORN ANTENNA	10/31/2005
0026	EMCO 3110B	BICONICAL ANTENNA	12/10/2005
0029	EMCO 3146A	LOG PERIODIC ANTENNA	6/28/2006
0071	HP 85685A	RF PRESELECTOR	6/30/2006
0069	HP 85650A	QUASI-PEAK ADAPTER	6/30/2006

4 Test Results

4.1 RF Power Output: (FCC Part §2.1046/RSS-210)

To measure the output power the unit was set to the 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 2405MHz	-7 dBm	30 dBm	Pass
Mid Channel 2440MHz	-8.2 dBm	30 dBm	Pass
High Channel 2480MHz	-7.8 dBm	30 dBm	Pass

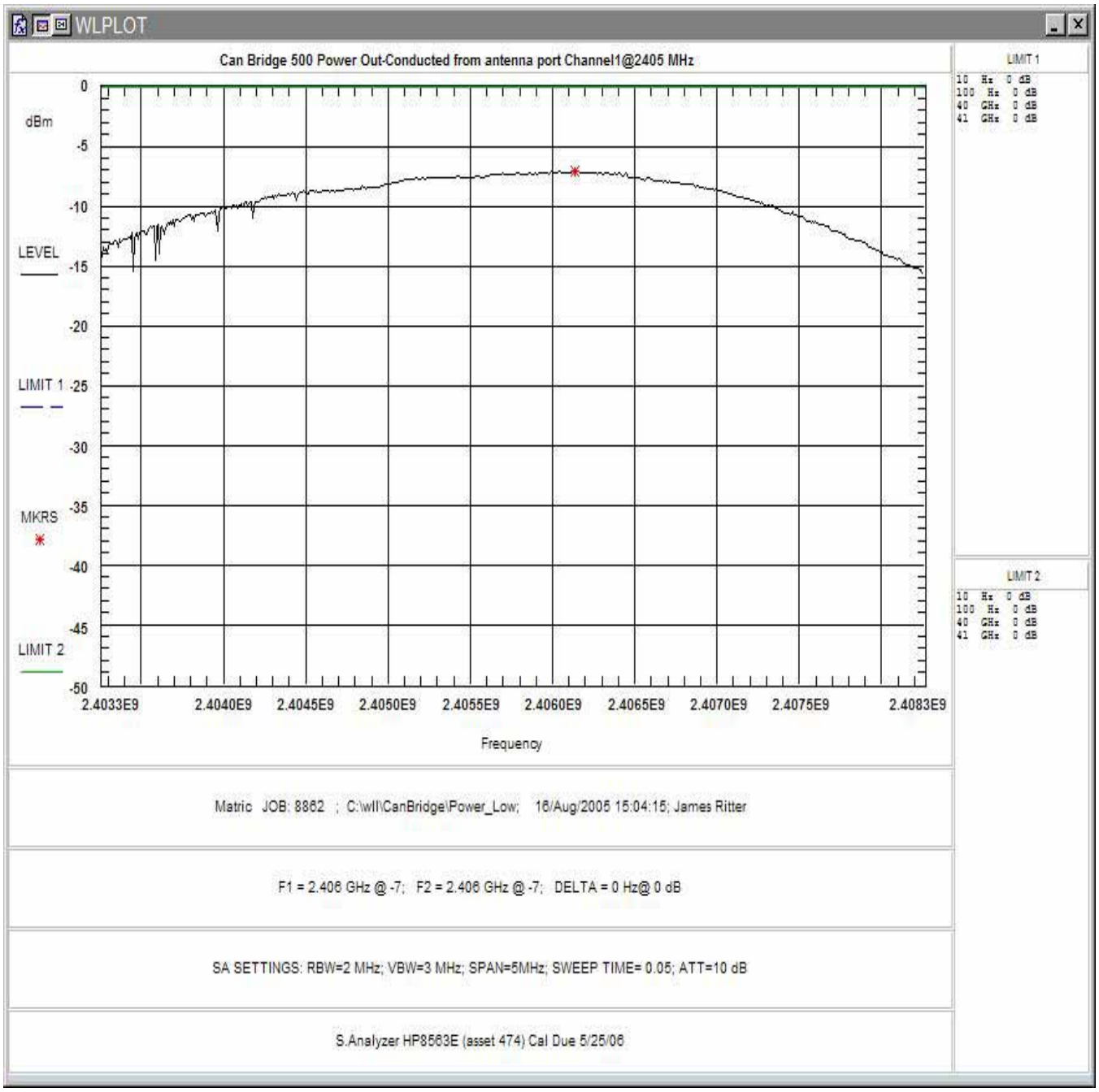

Figure 4-1. RF Peak Power, Low Channel

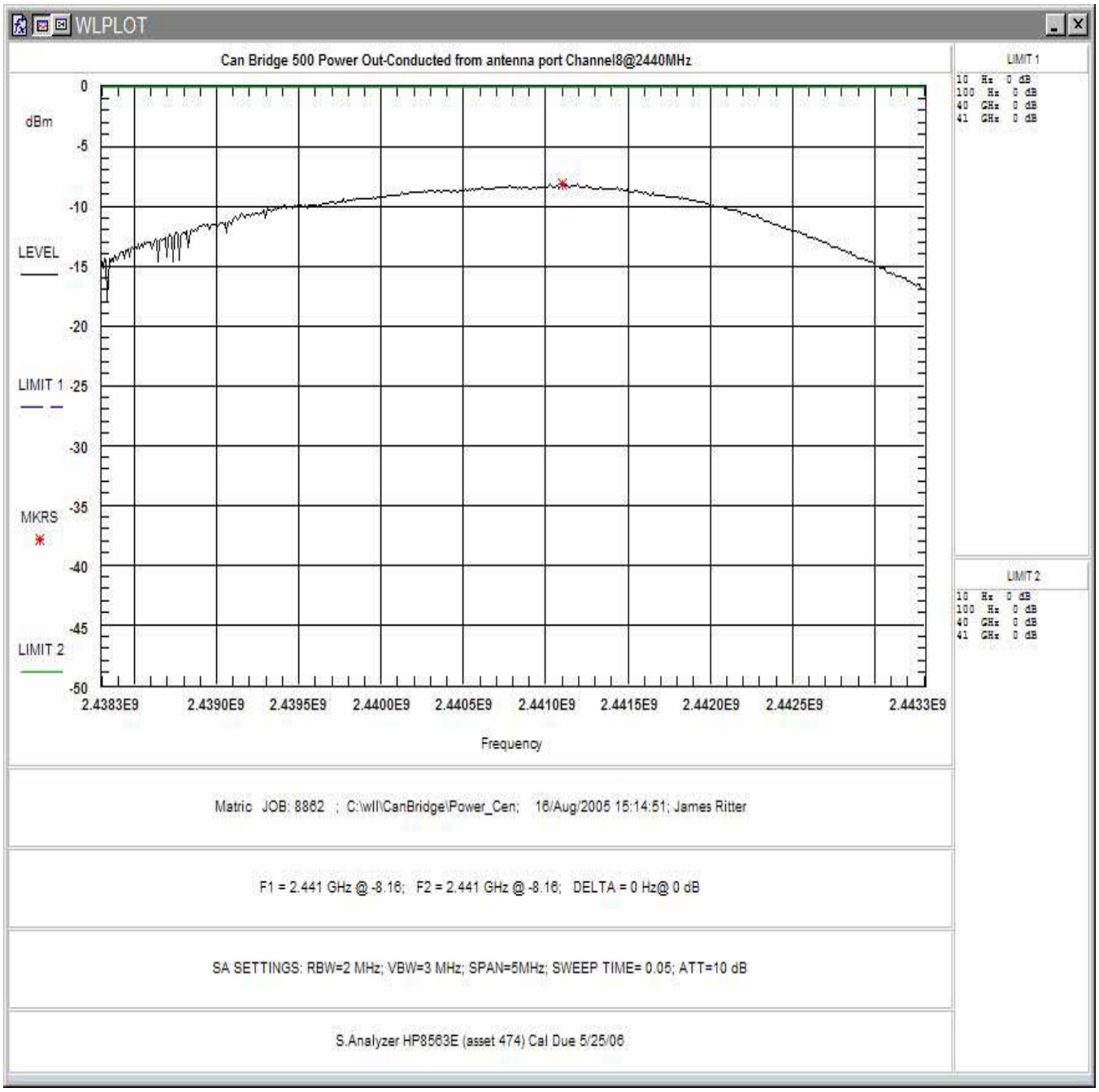

Figure 4-2. RF Peak Power, Mid Channel

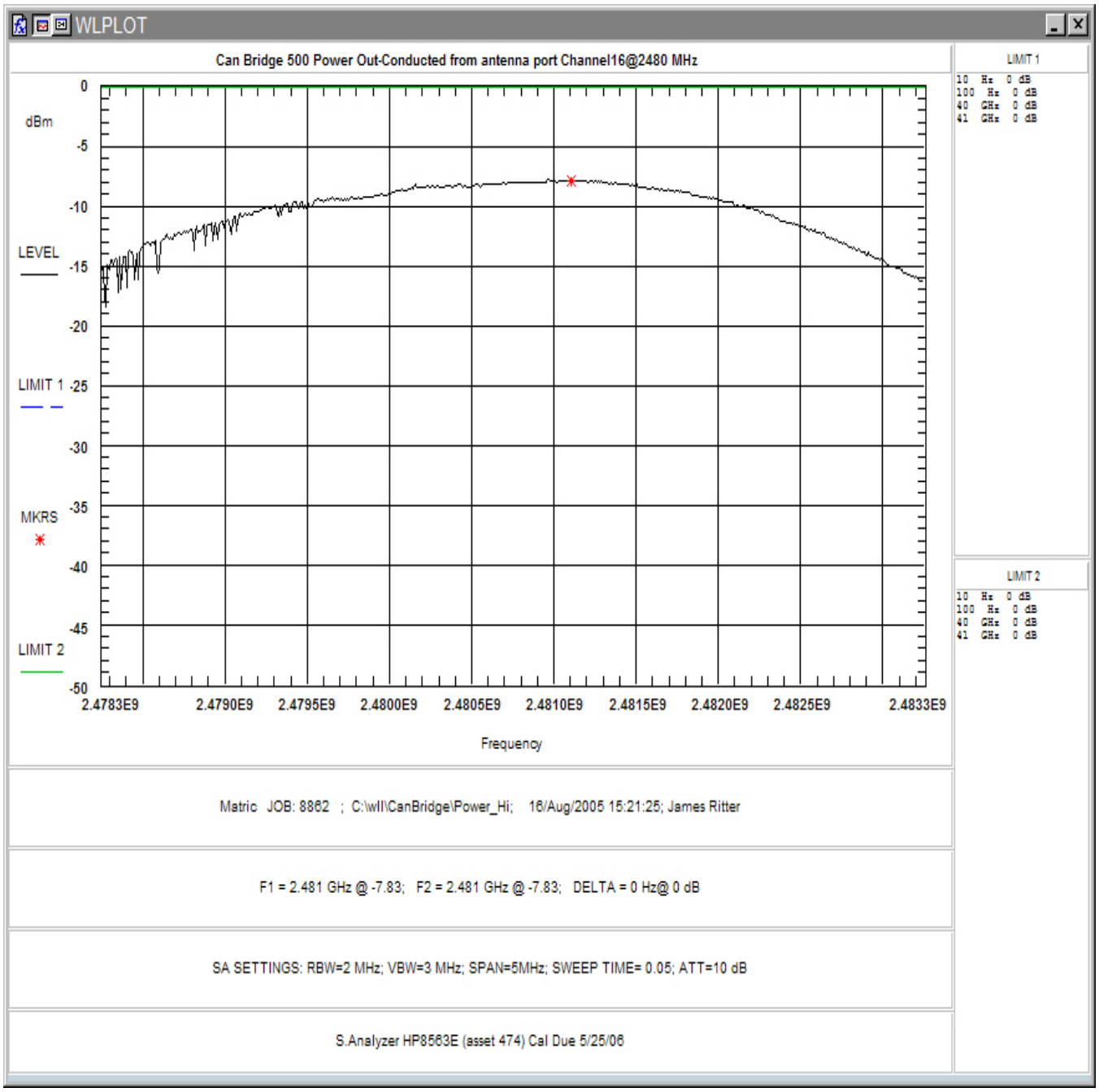

Figure 4-3. RF Peak Power, High Channel

4.2 Power Spectral Density (FCC Part 15.247/RSS-210)

For DSSS devices, 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.

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.

Following are plots of the Power Spectral Density emissions for the Low, Middle and High channels.

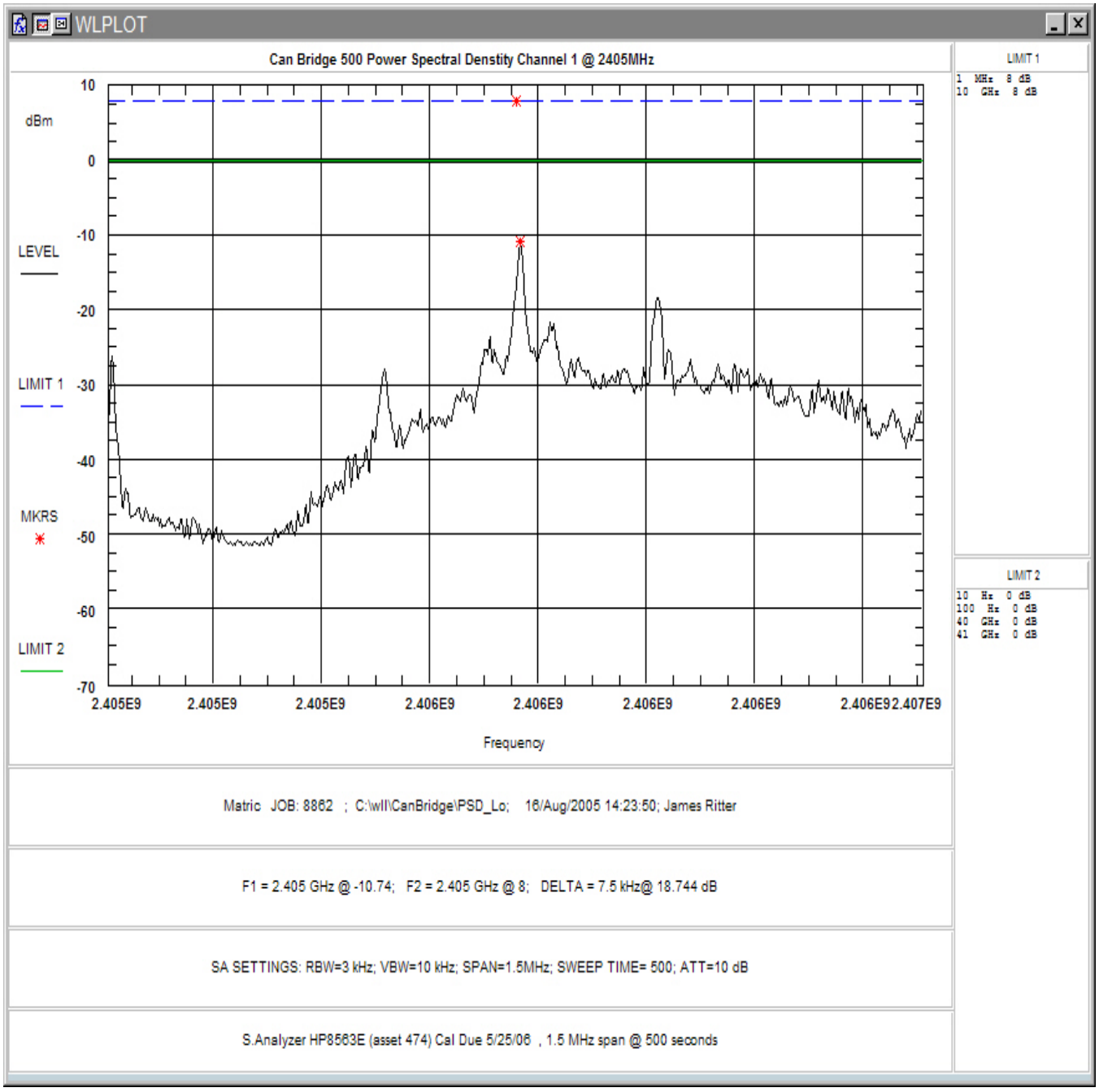

Figure 4-4: Power Spectral Density Plot, Channel 1

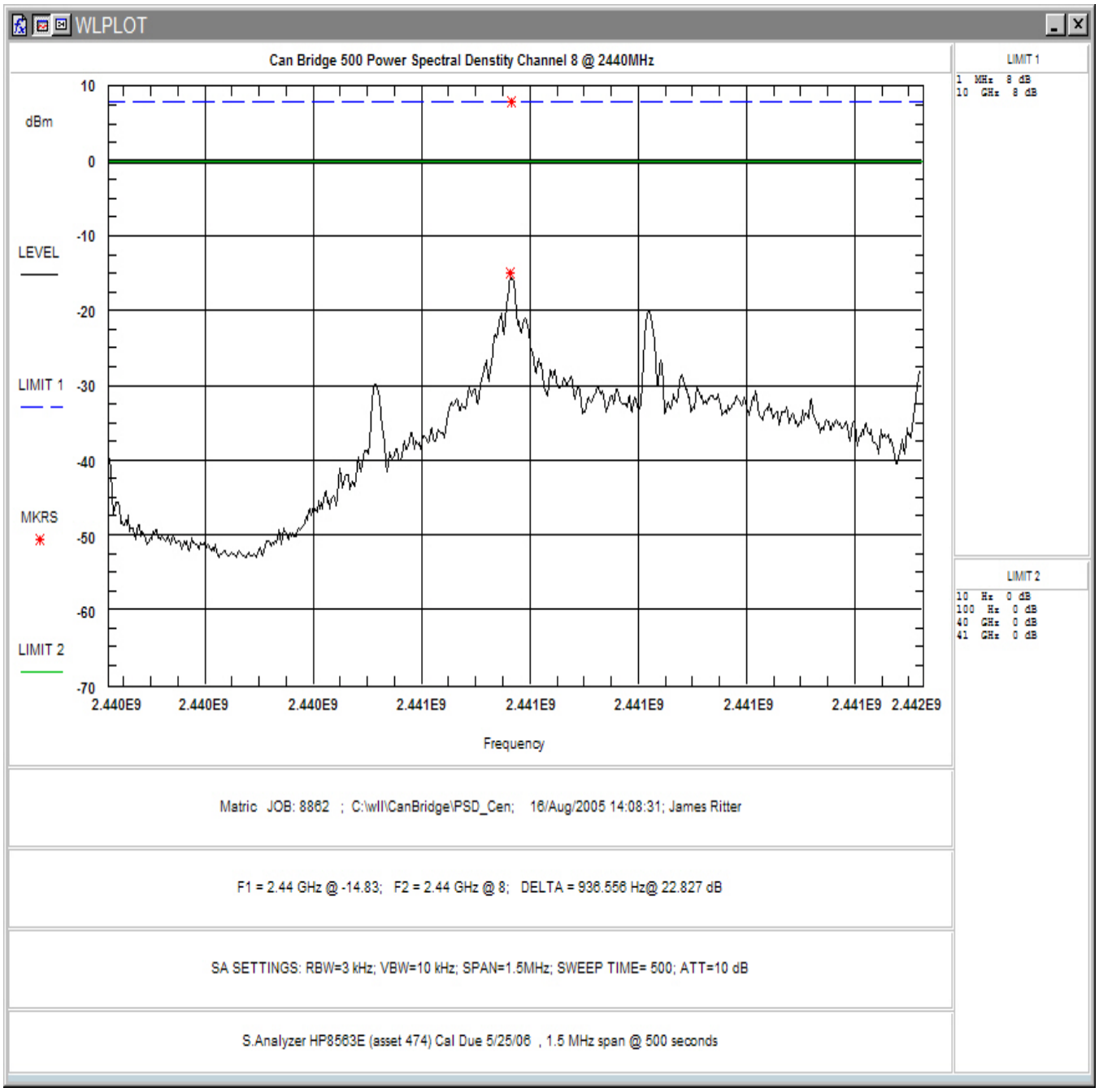

Figure 4-5: Power Spectral Density Plot, Channel 8

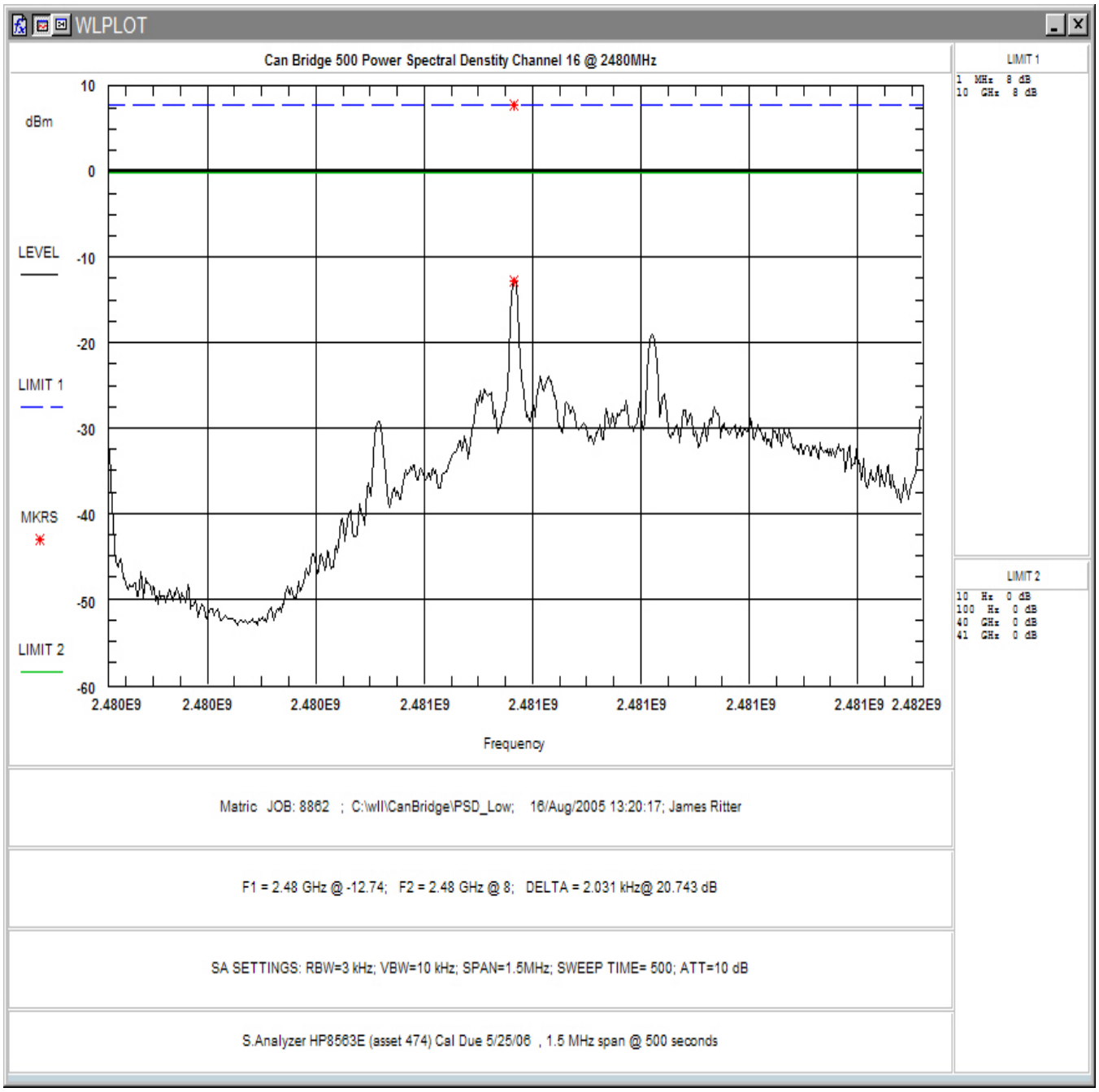

Figure 4-6: Power Spectral Density Plot, Channel 16

4.3 Occupied Bandwidth: (FCC Part §2.1049/IC RSS-210)

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

For Digitally Modulated Systems, FCC Part 15.247 requires the minimum 6 dB bandwidth be at least 500 kHz.

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

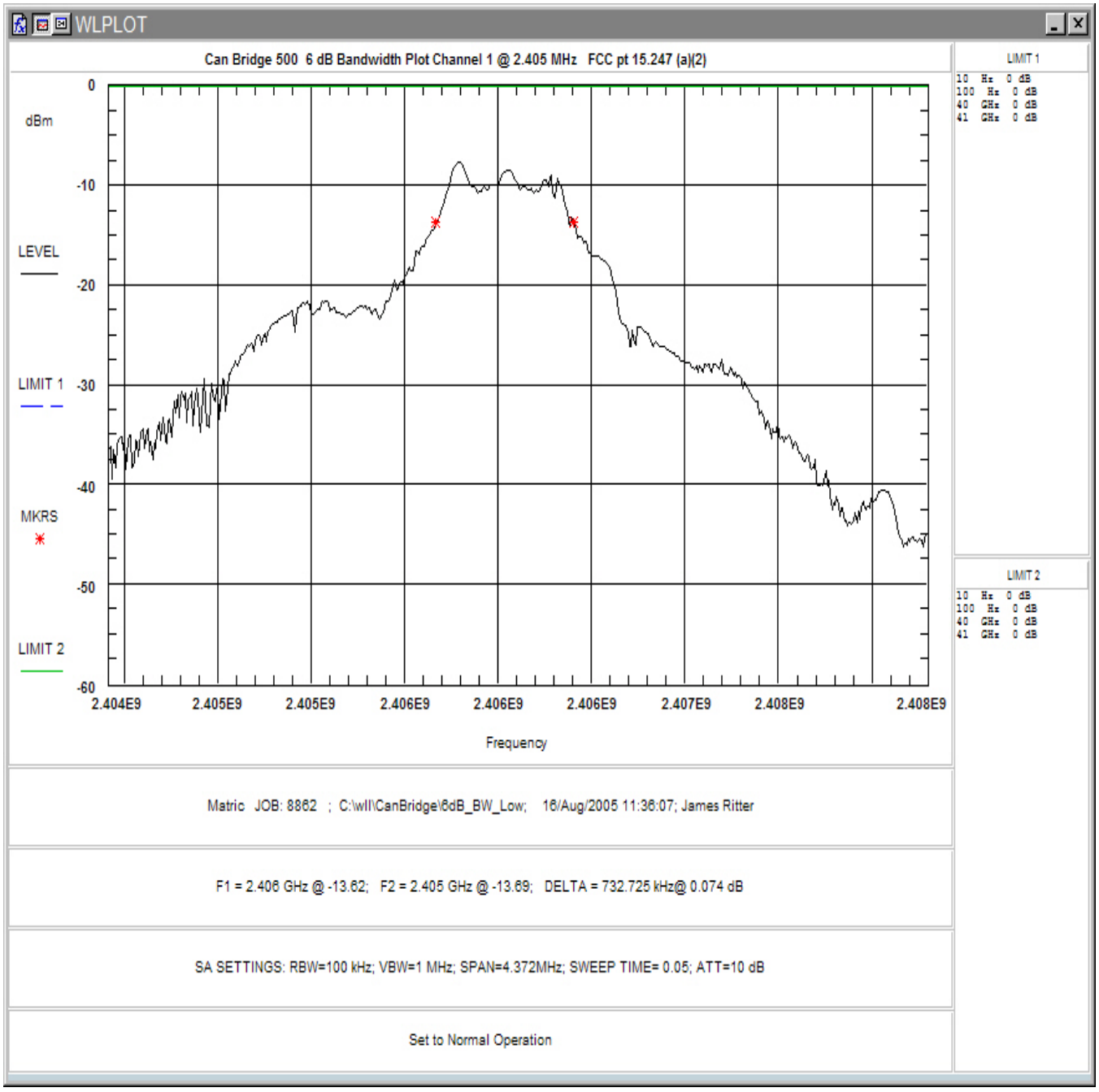

Figure 4-7. 6dB Occupied Bandwidth, Low Channel

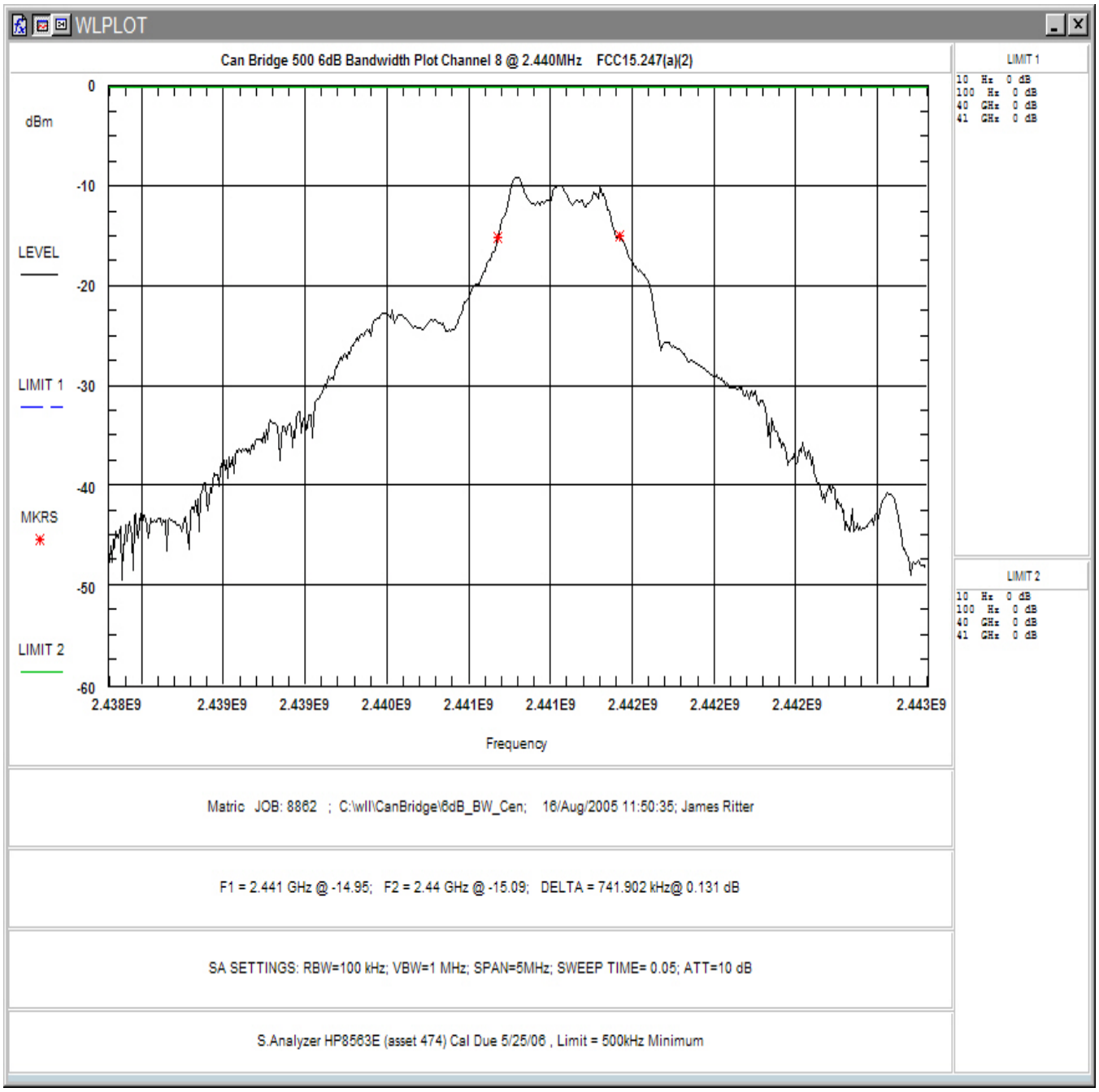

Figure 4-8. 6dB Occupied Bandwidth, Mid Channel

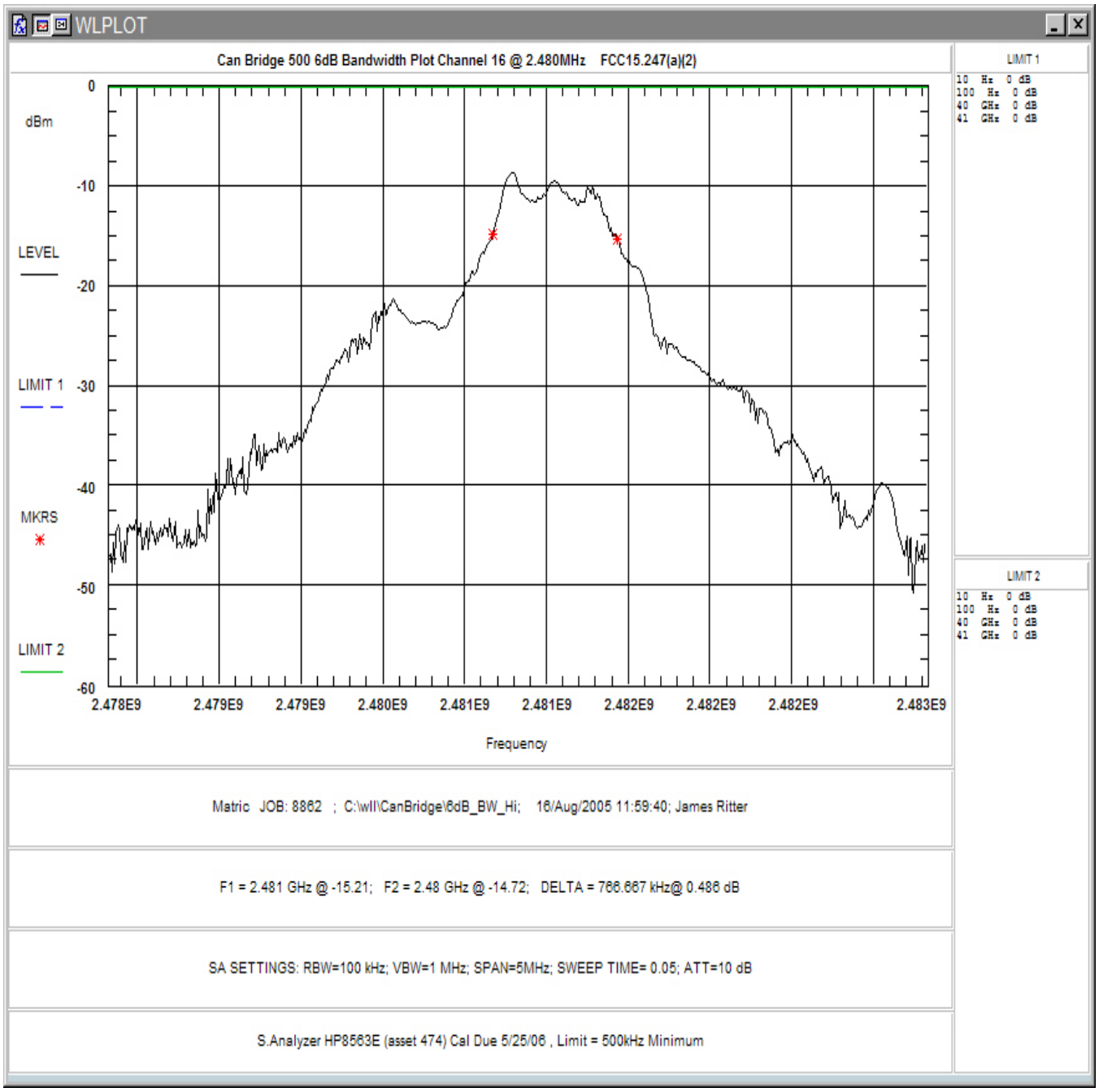

Figure 4-9. 6dB Occupied Bandwidth, High Channel

Table 4 provides a summary of the Occupied Bandwidth Results.

Table 4. Occupied Bandwidth Results

6dB

Frequency	Bandwidth	Limit (Minimum)	Pass/Fail
Low Channel 2405MHz	732.725kHz	500kHz	Pass
Mid Channel 2440MHz	741.902kHz	500kHz	Pass
High Channel 2480MHz	766.667kHz	500kHz	Pass

4.4 Conducted Spurious Emissions at Antenna Terminals (FCC Part §2.1051/IC RSS-210)

The EUT must comply with requirements for spurious emissions at antenna terminals. Per §15.247(c) and RSS-210 Section 6.2.2(o)(e1) all spurious emissions in any 100 kHz bandwidth outside the frequency band in which the spread spectrum device is operating shall be attenuated 20 dB below the highest power level in a 100 kHz bandwidth within the band containing the highest level of the desired power.

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

The following are plots of the conducted spurious emissions data.

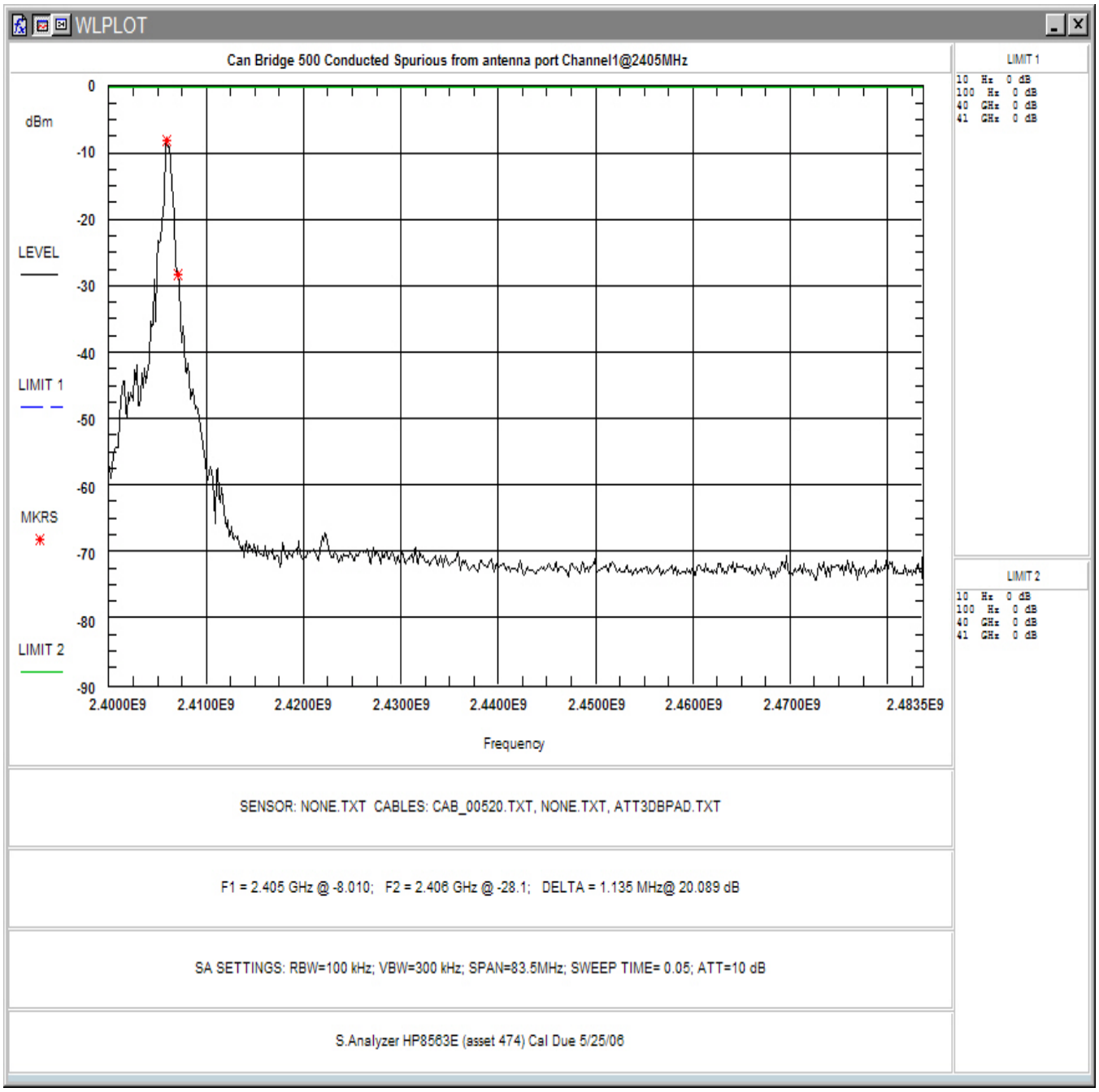

Figure 4-10. Conducted Spurious Emissions, Low Channel In-Band

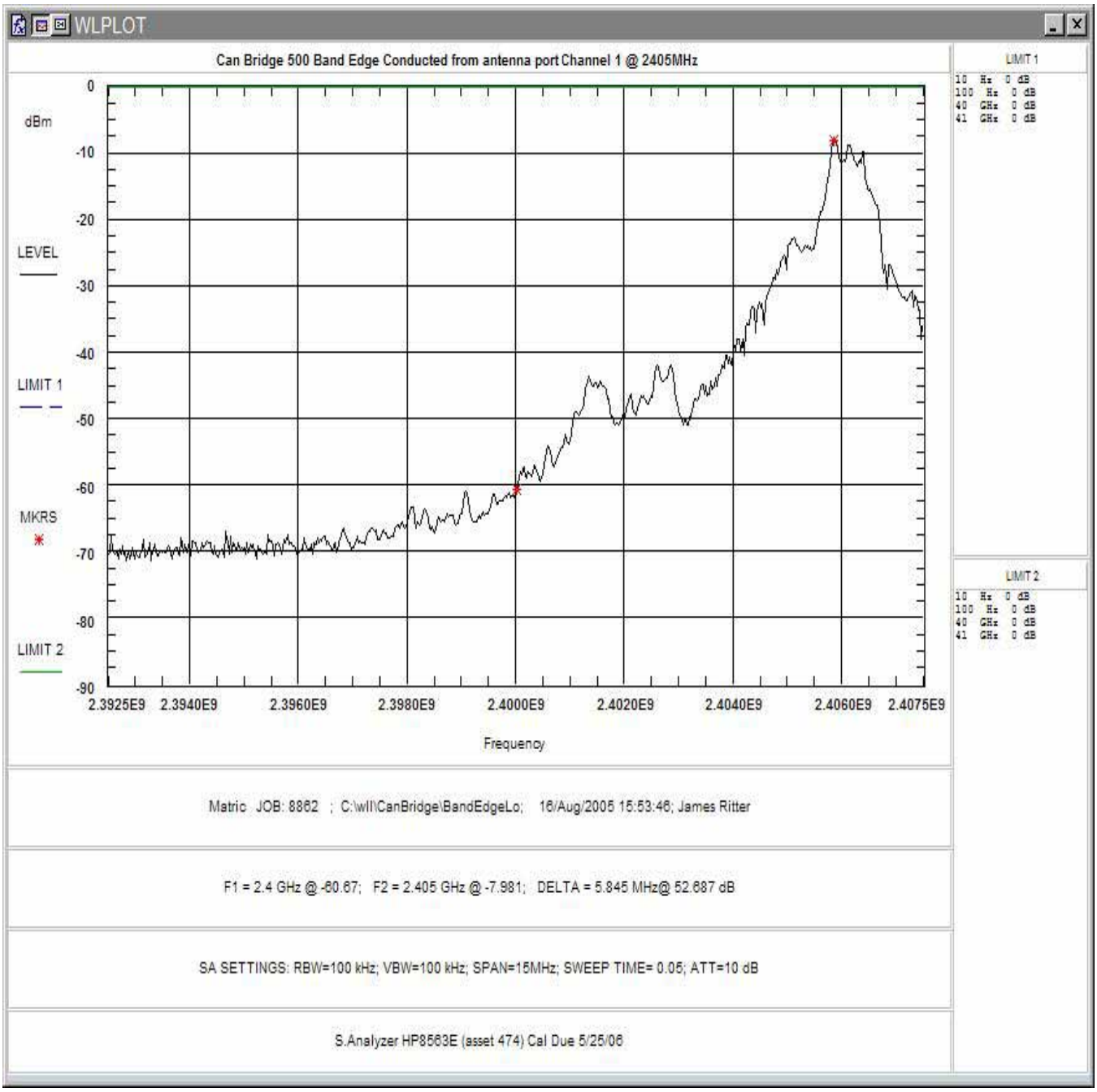

Figure 4-11. Conducted Spurious Emissions, Low Channel Band Edge

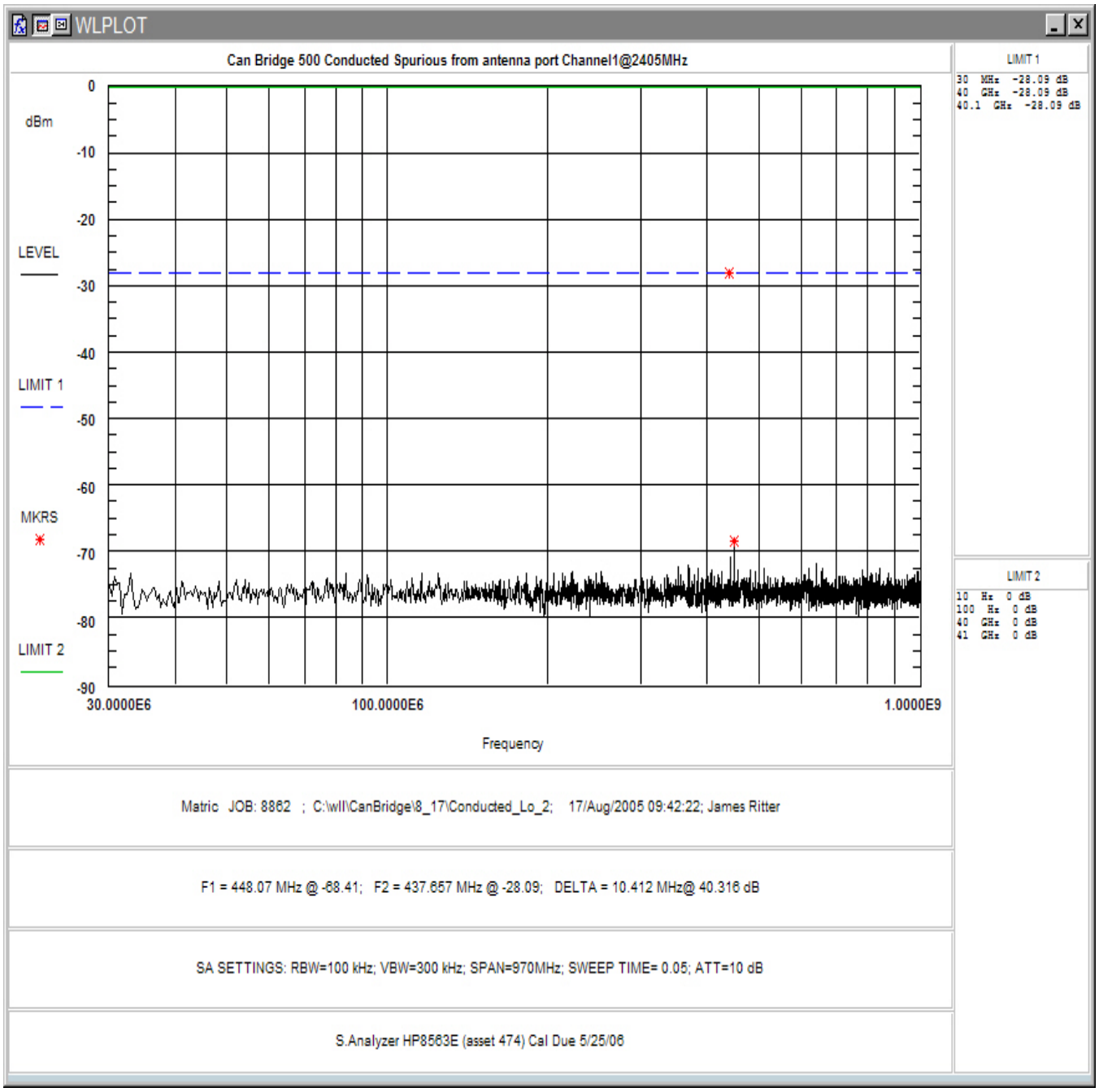

Figure 4-12. Conducted Spurious Emissions, Low Channel 30MHz – 1GHz

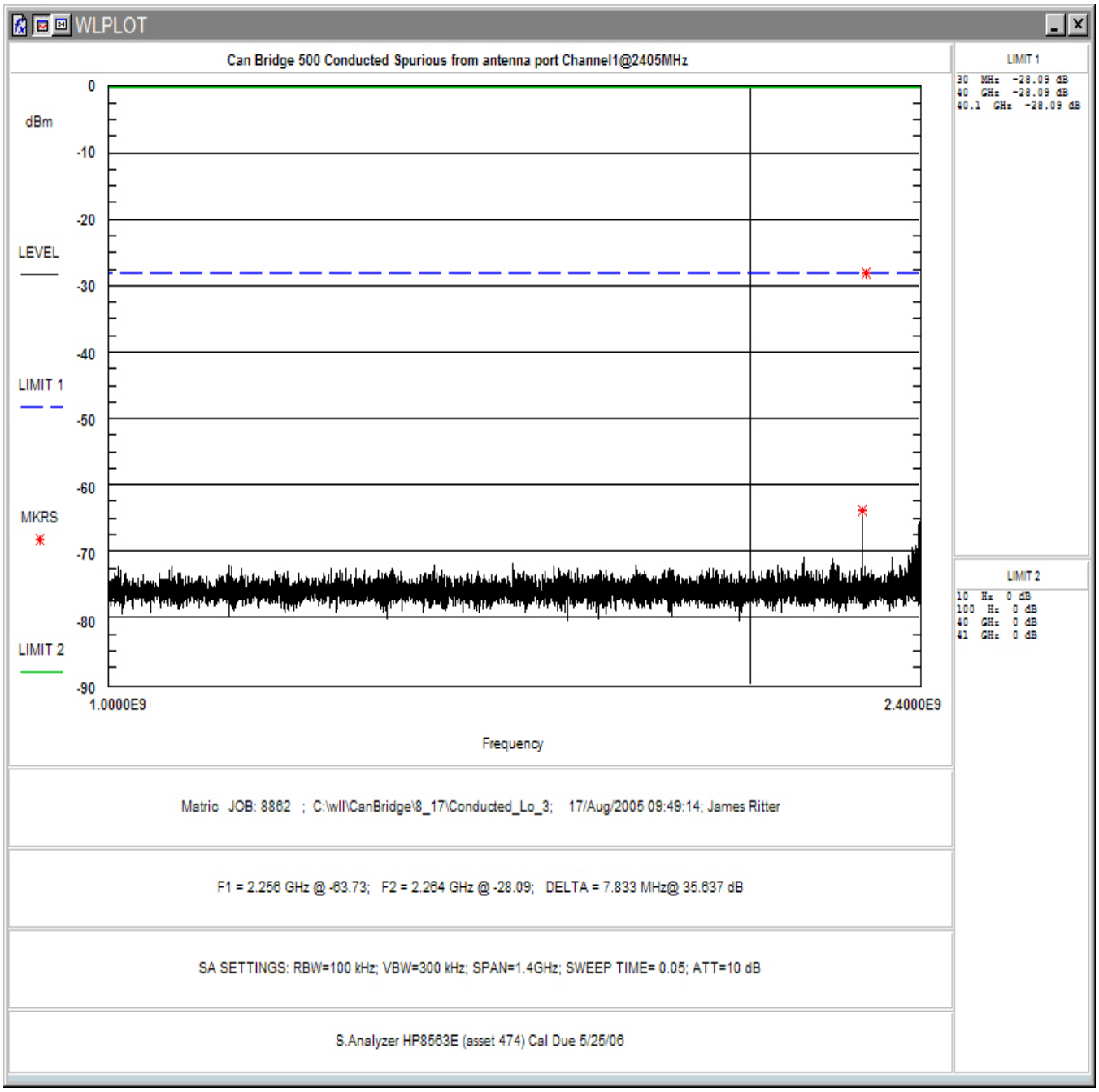

Figure 4-13. Conducted Spurious Emissions, Low Channel 1 – 2.4GHz

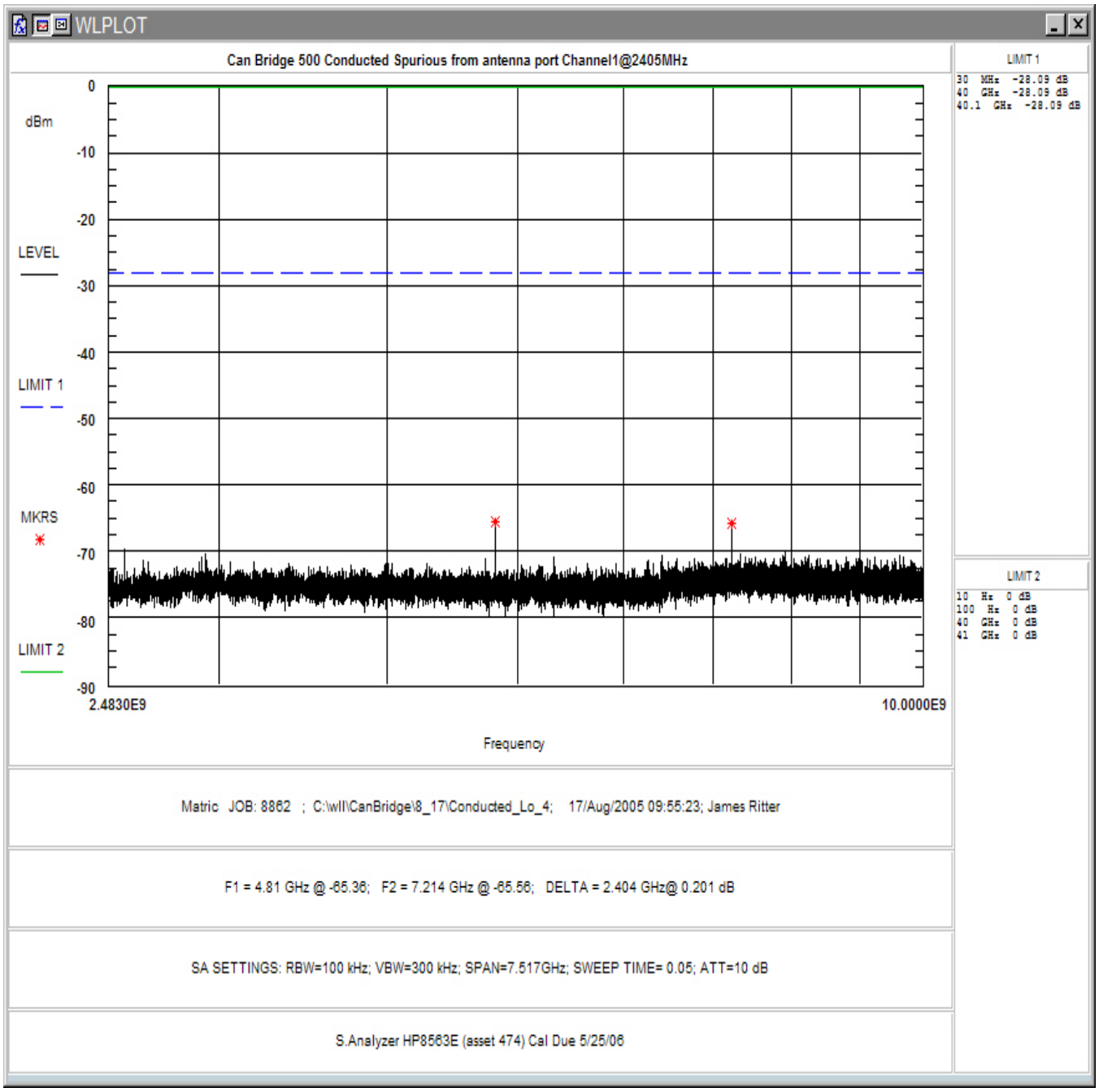

Figure 4-14. Conducted Spurious Emissions, Low Channel 2.483 - 10GHz

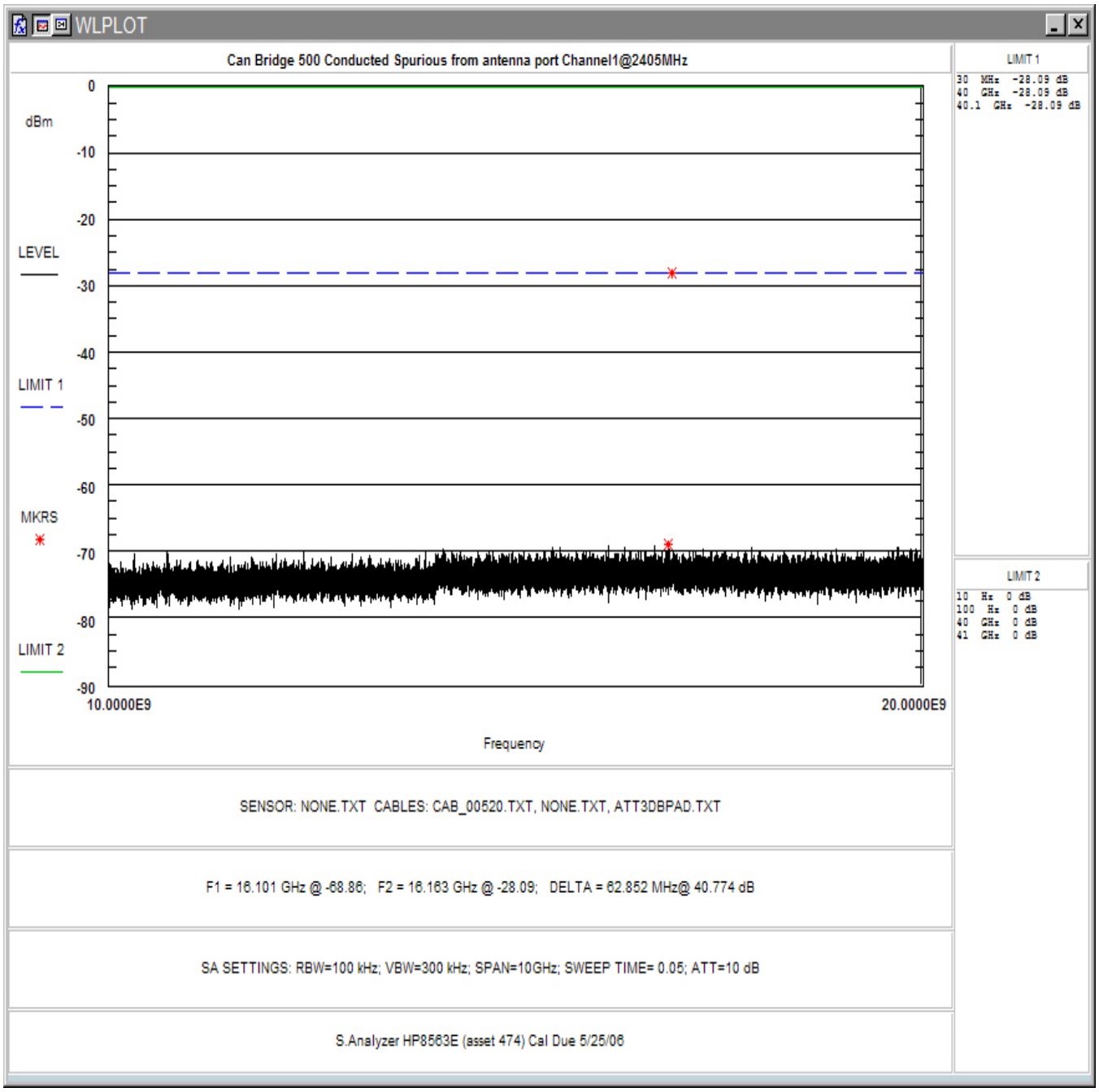

Figure 4-15. Conducted Spurious Emissions, Low Channel 10 - 20GHz

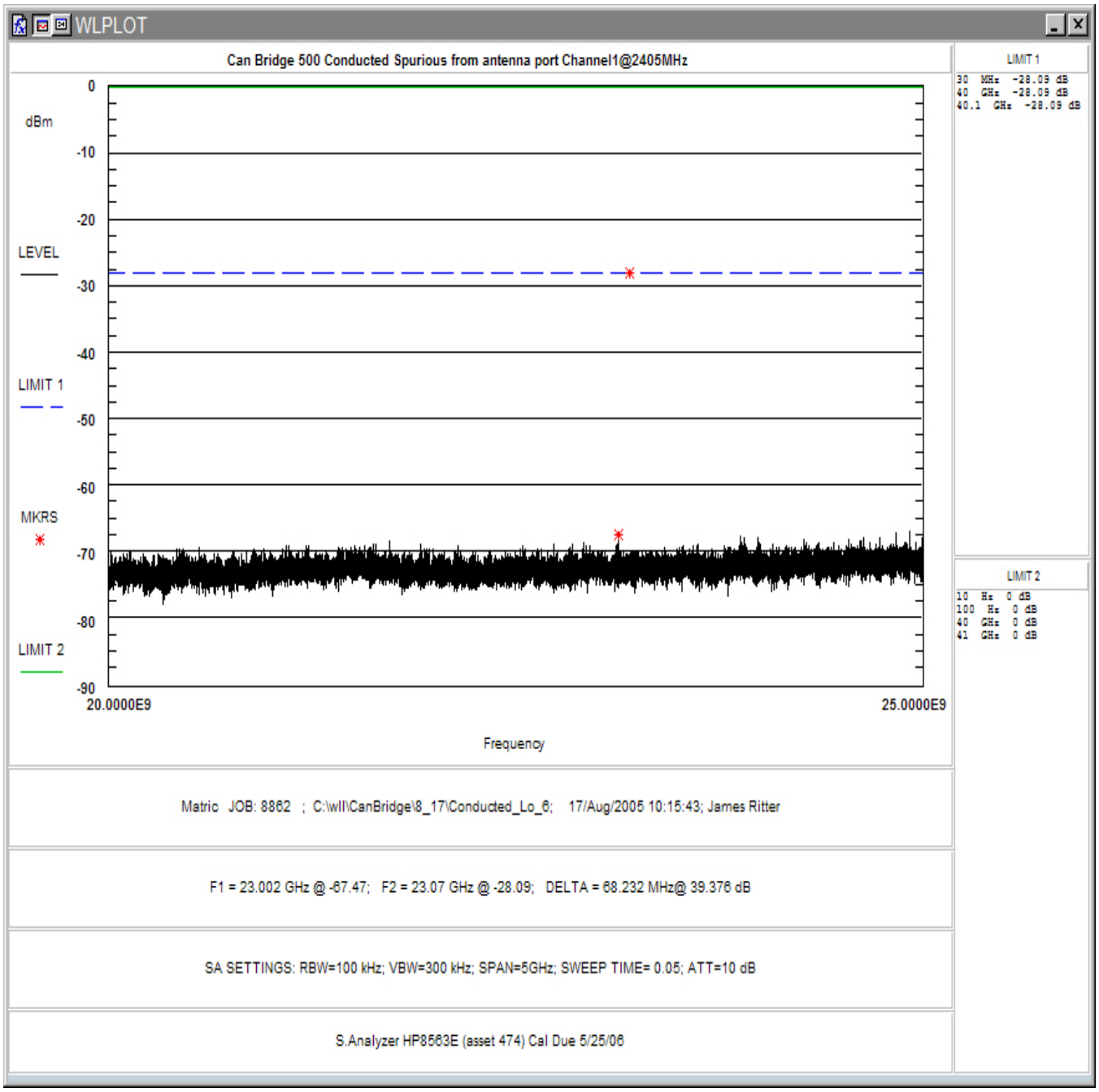

Figure 4-16. Conducted Spurious Emissions, Low Channel 20 - 25GHz

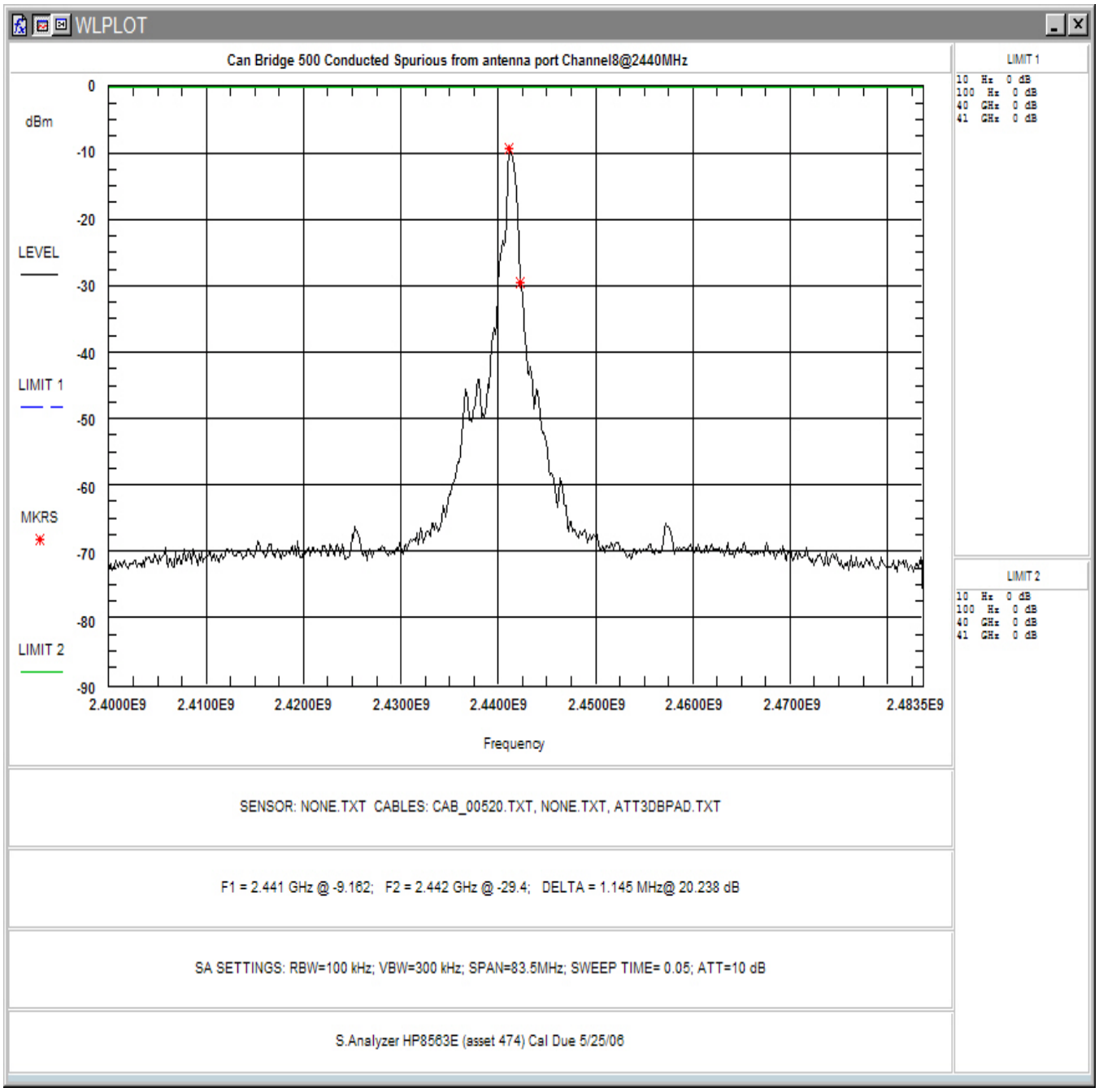

Figure 4-17. Conducted Spurious Emissions, Mid Channel In-Band

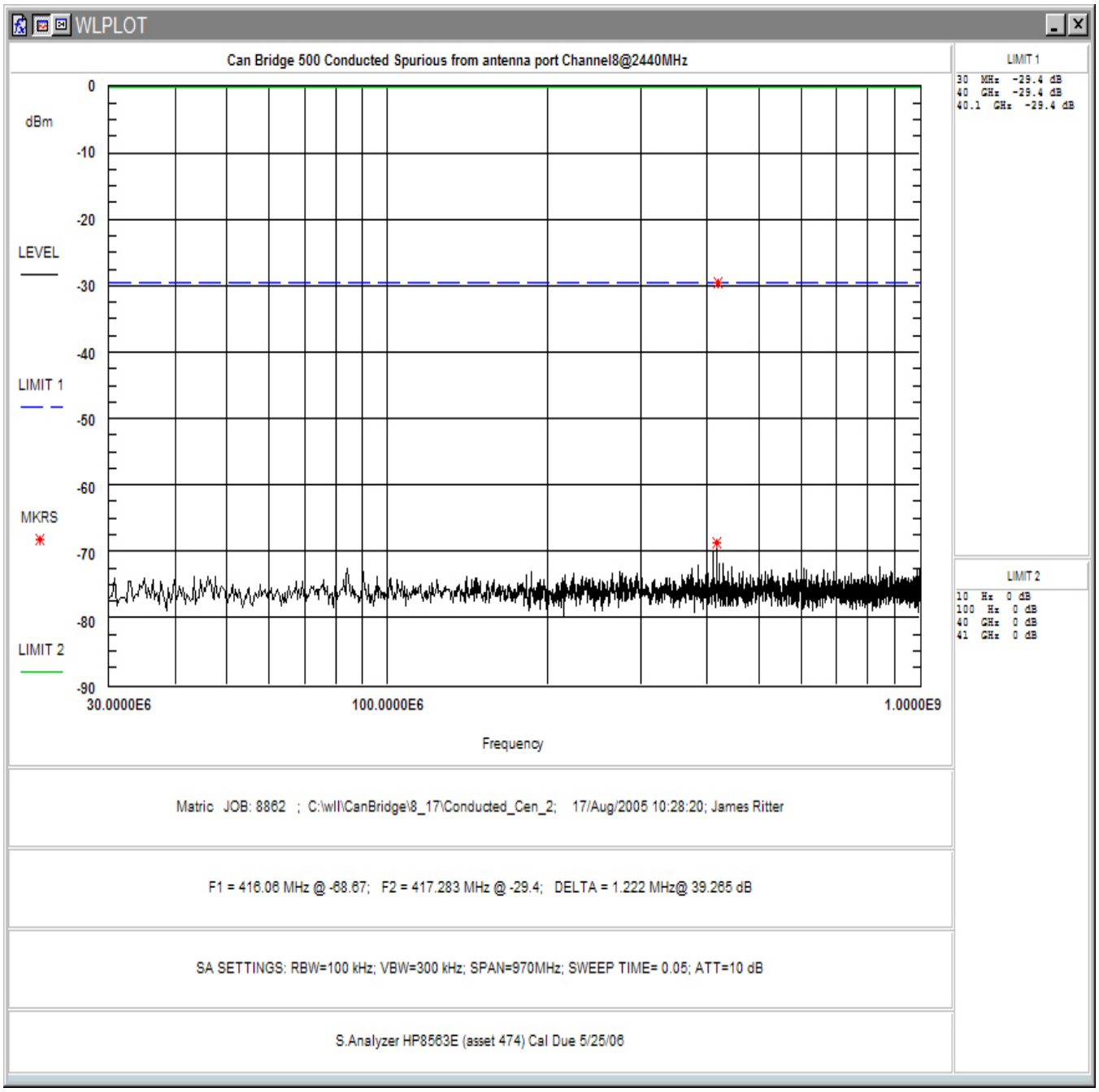

Figure 4-18. Conducted Spurious Emissions, Mid Channel 30MHz – 1GHz

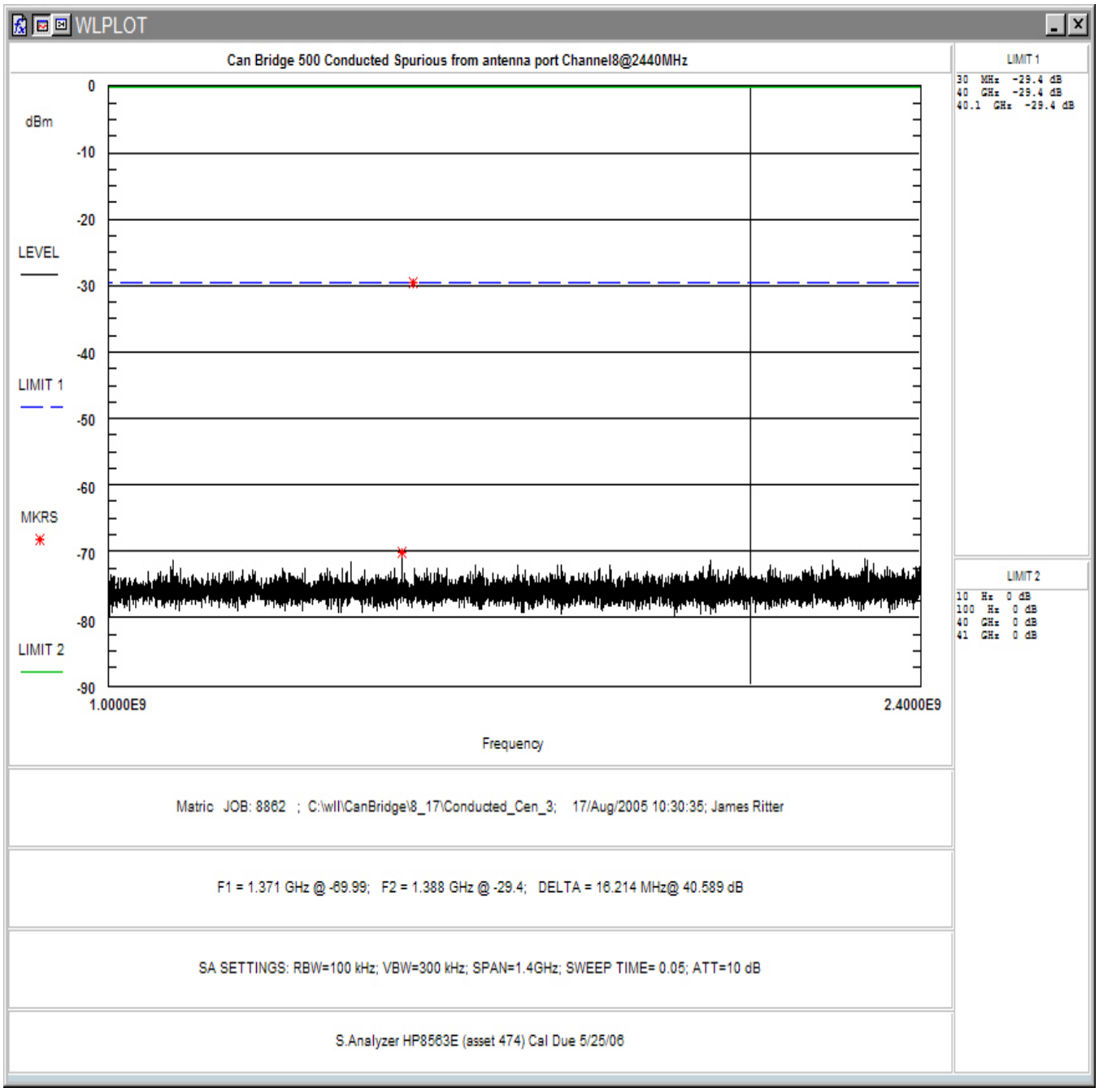

Figure 4-19. Conducted Spurious Emissions, Mid Channel 1 – 2.4GHz

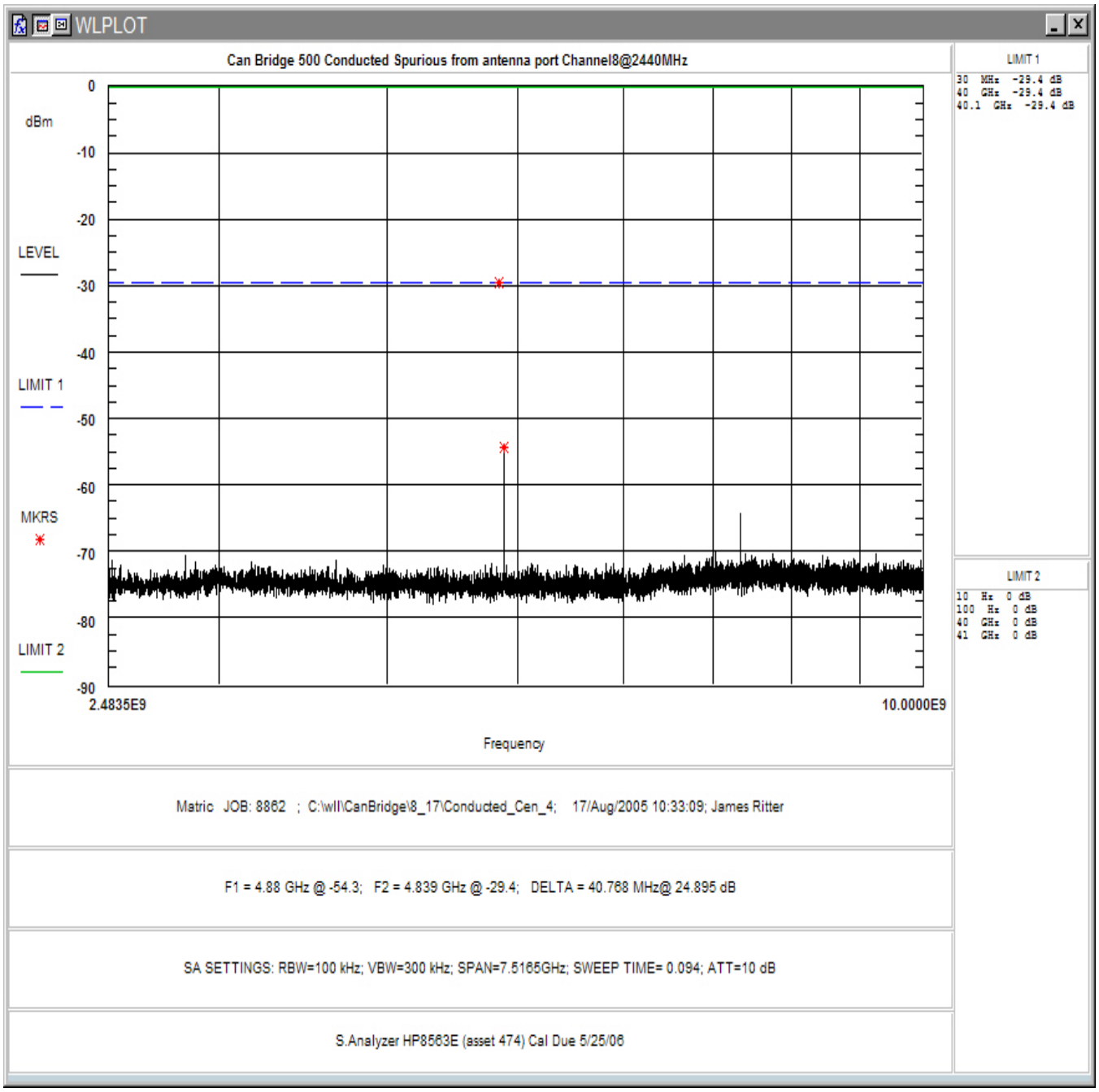

Figure 4-20. Conducted Spurious Emissions, Mid Channel 2.483 - 10GHz

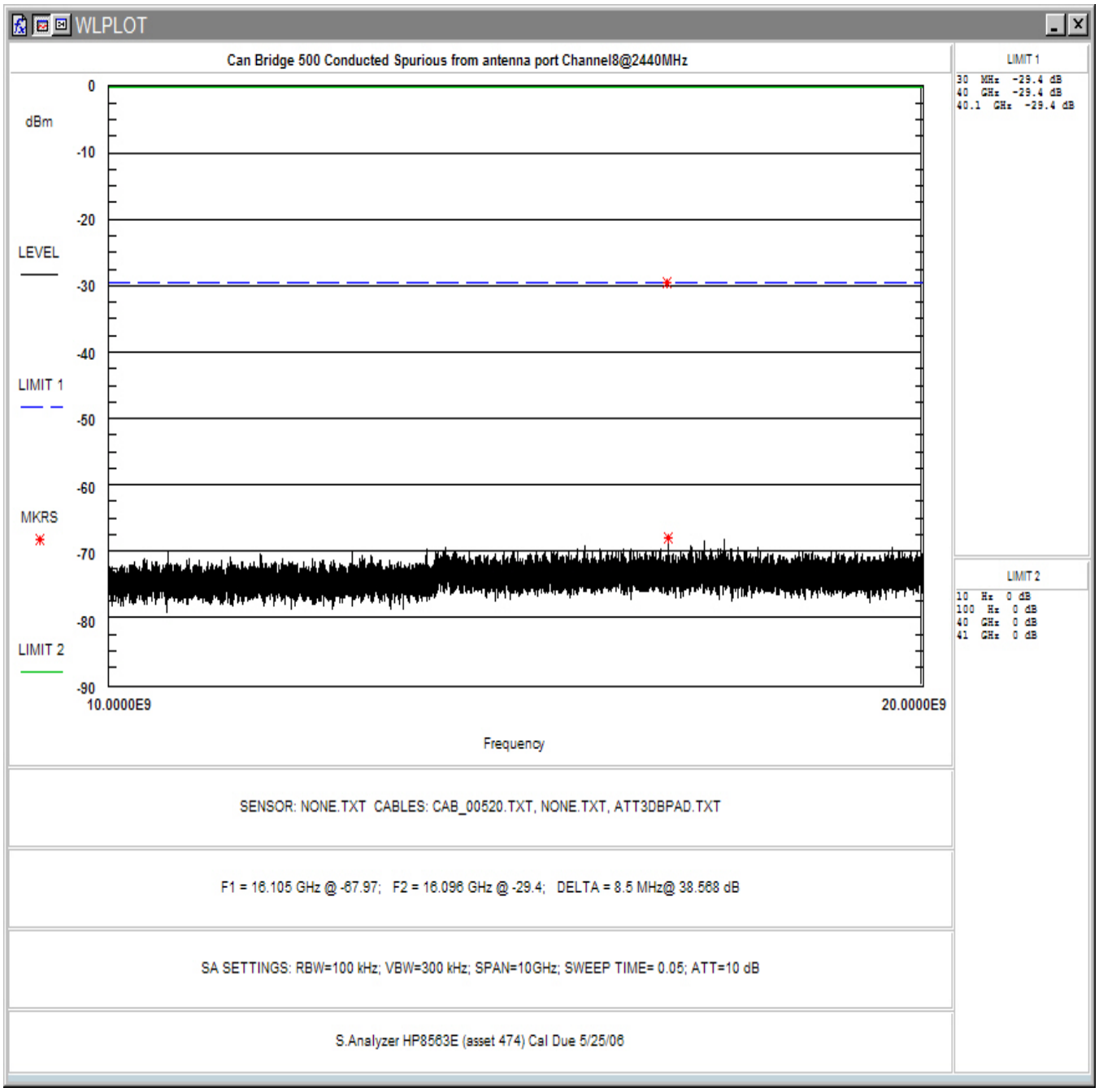

Figure 4-21. Conducted Spurious Emissions, Mid Channel 10 - 20GHz

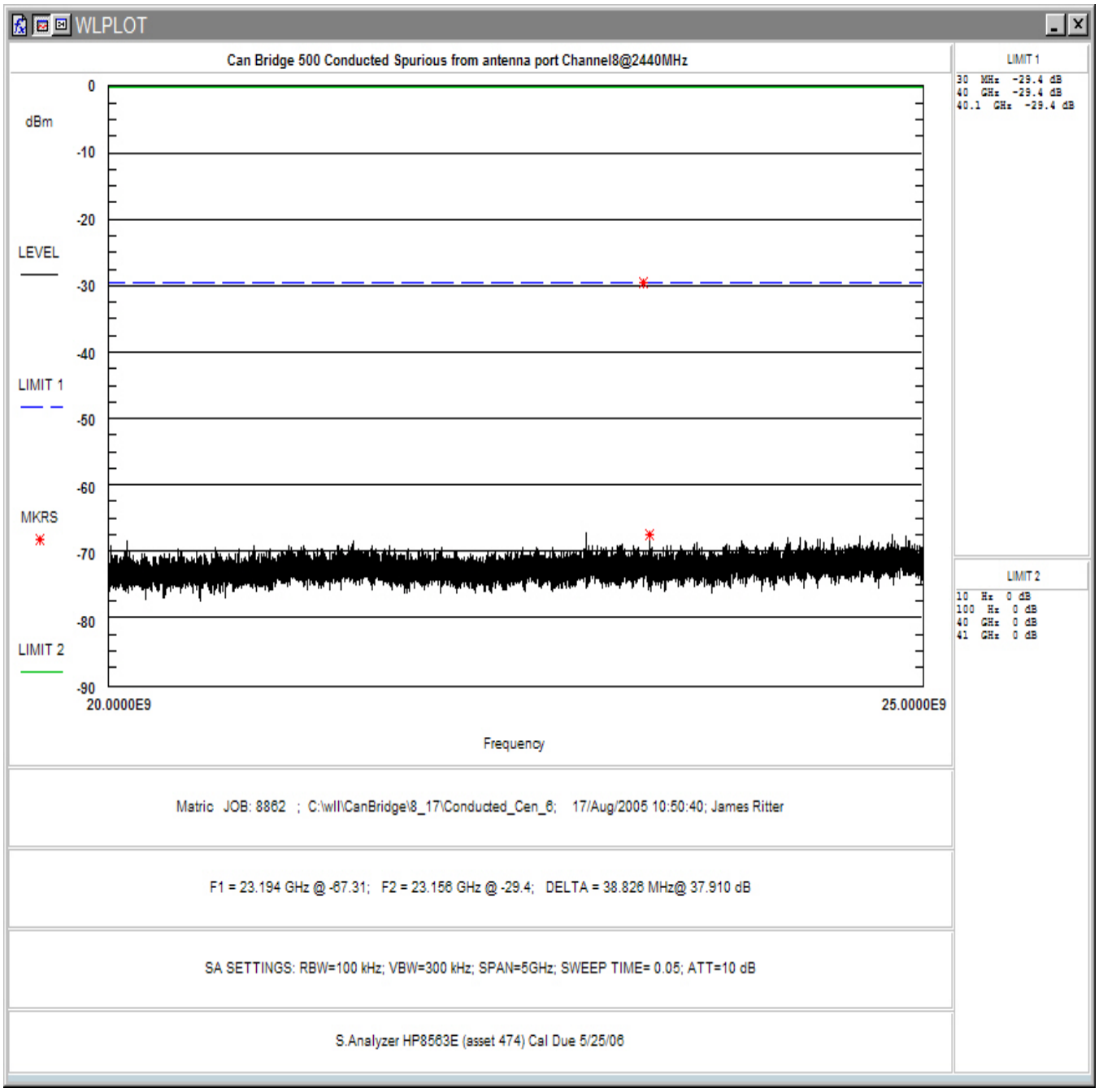

Figure 4-22. Conducted Spurious Emissions, Mid Channel 20 - 25GHz

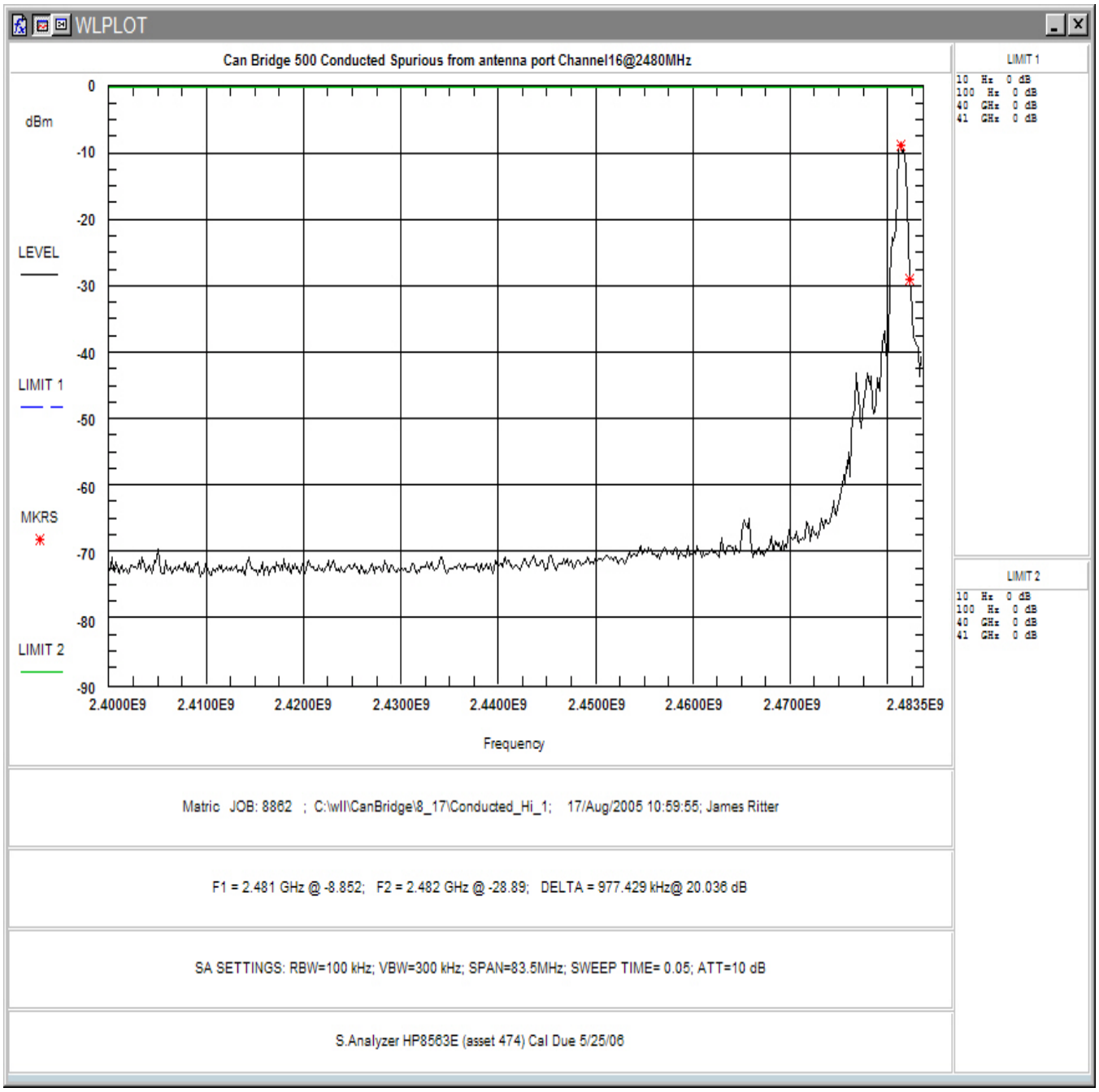

Figure 4-23. Conducted Spurious Emissions, High Channel In-Band

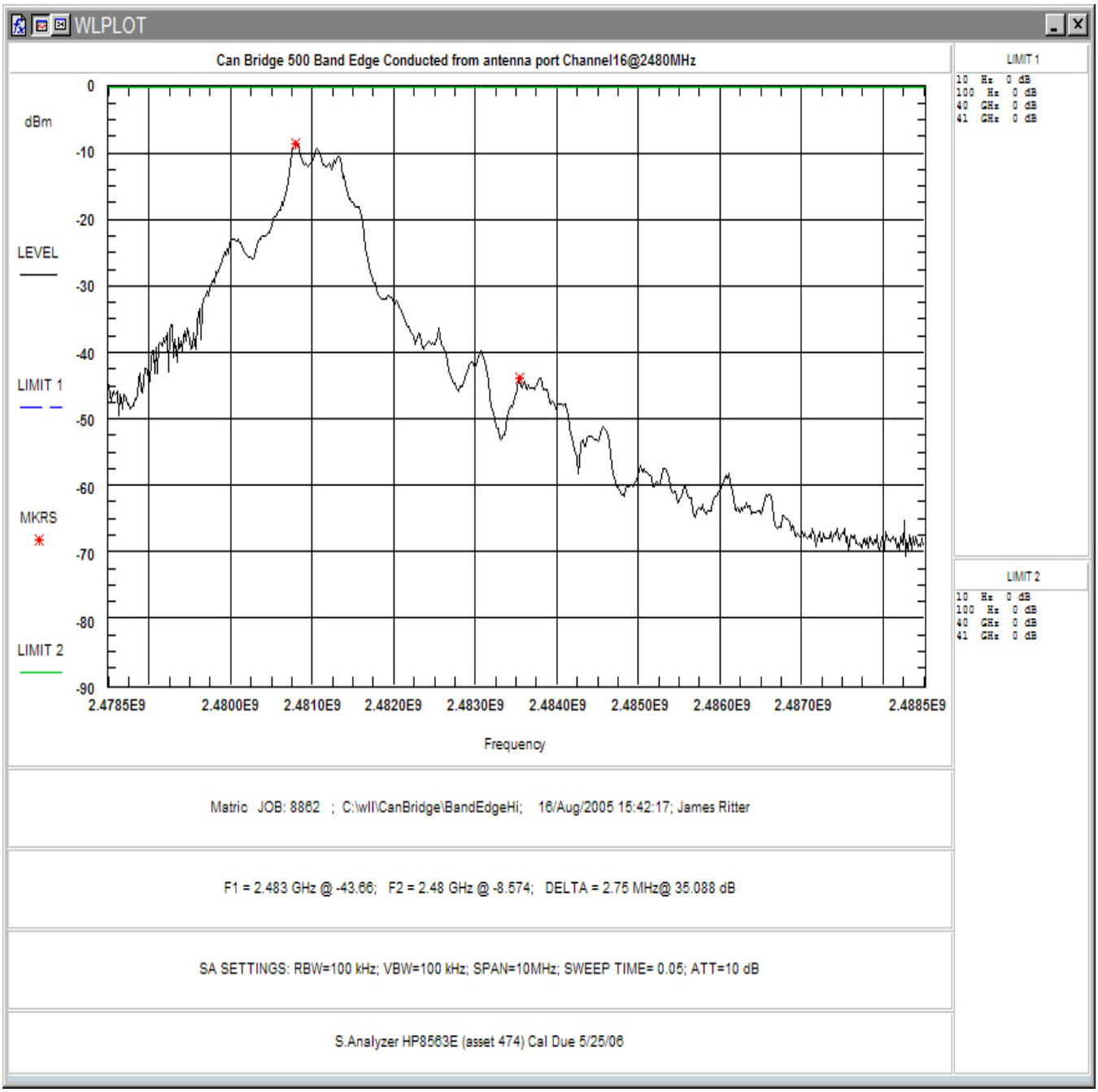

Figure 4-24. Conducted Spurious Emissions, High Channel Band Edge

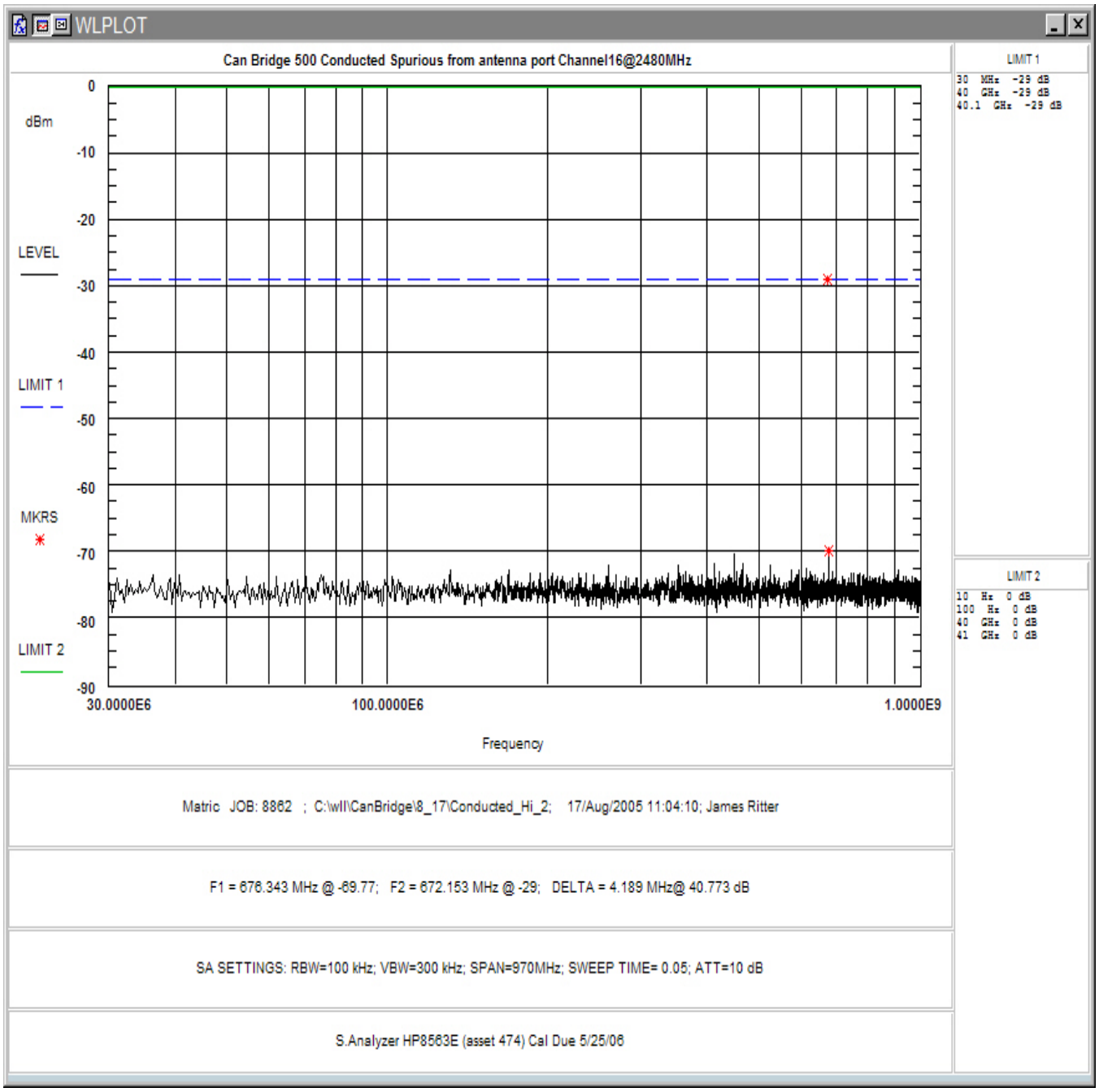

Figure 4-25. Conducted Spurious Emissions, High Channel 30MHz – 1GHz

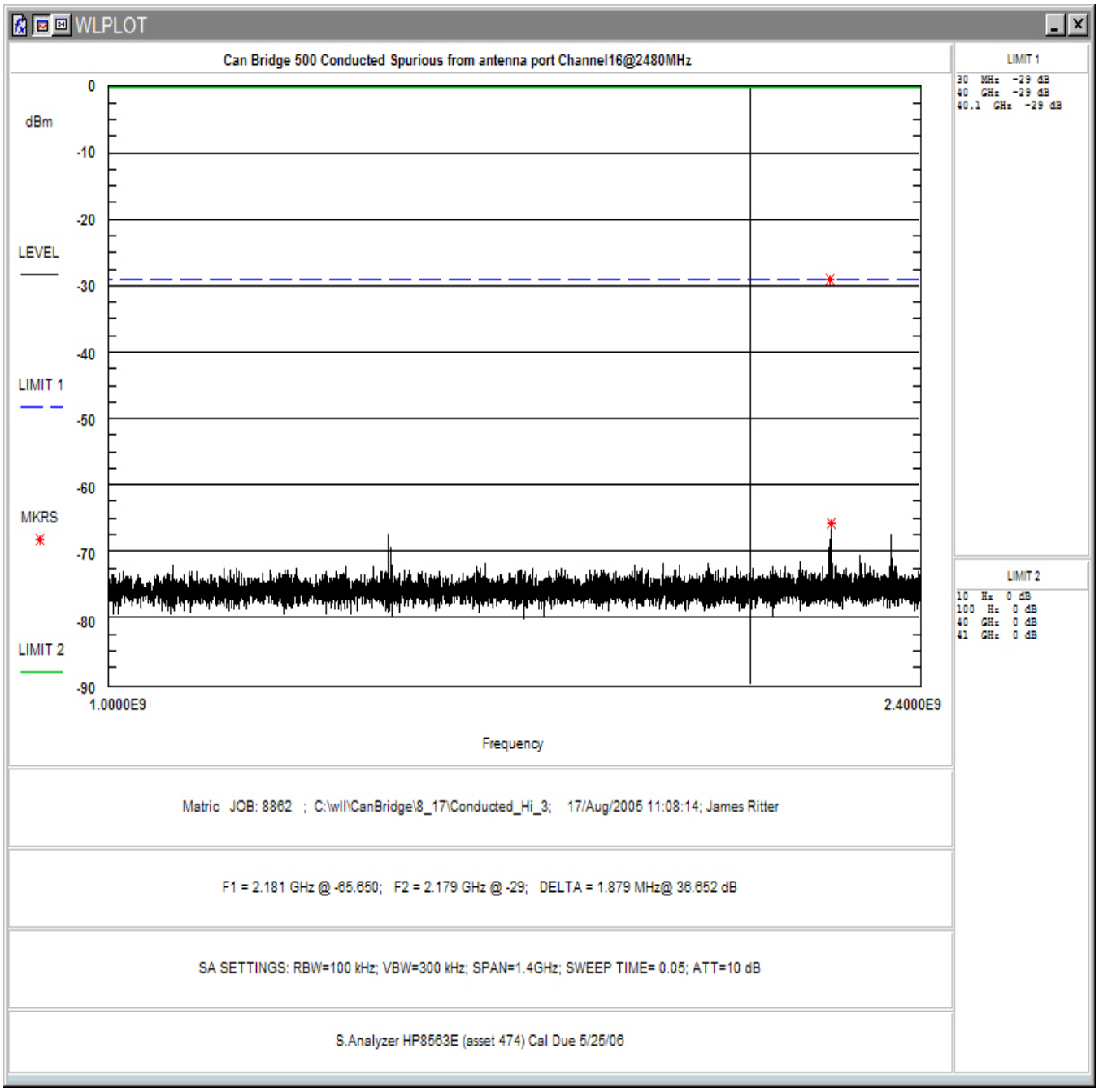

Figure 4-26. Conducted Spurious Emissions, High Channel 1 – 2.4GHz

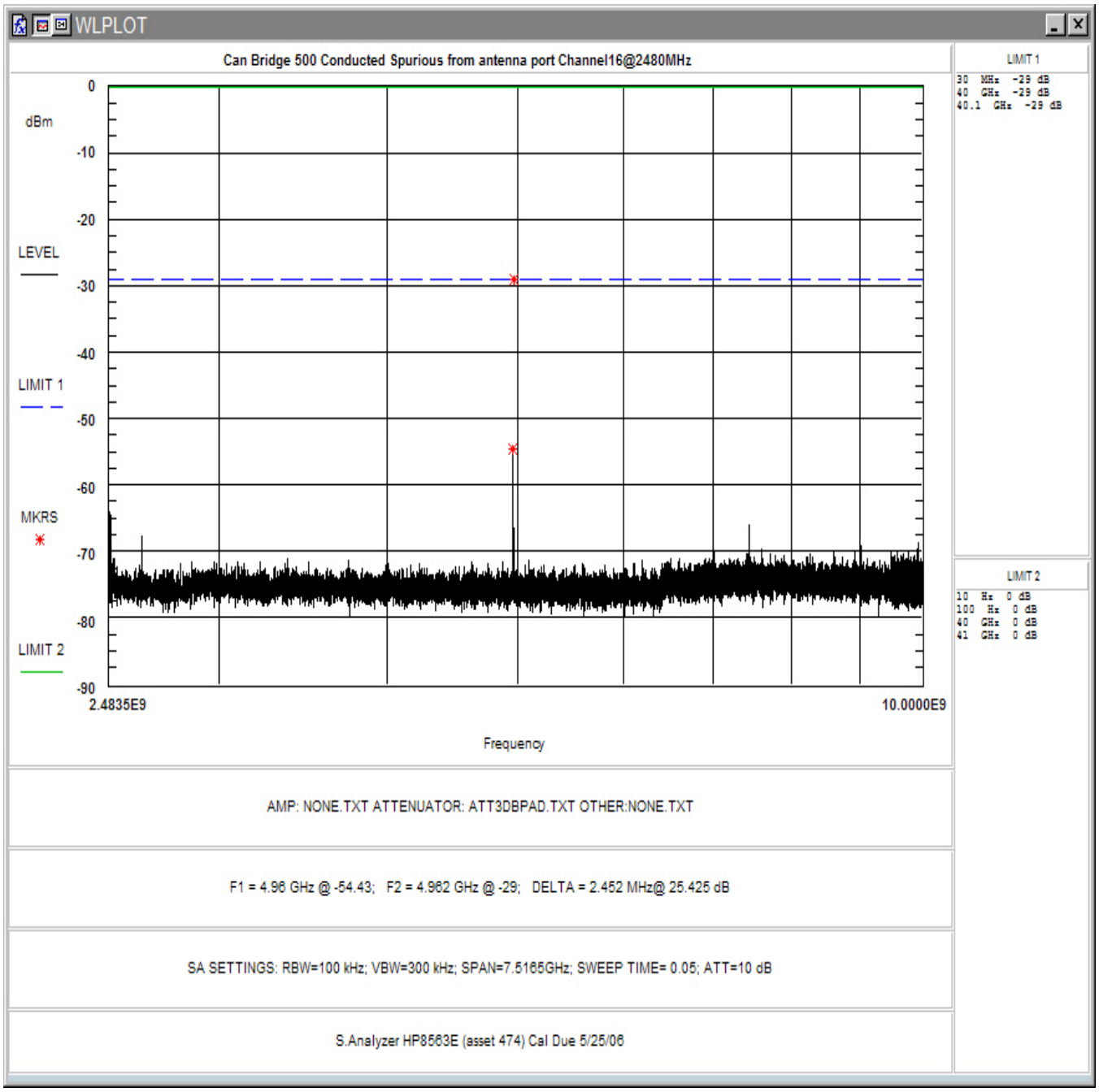

Figure 4-27. Conducted Spurious Emissions, High Channel 2.483 - 10GHz

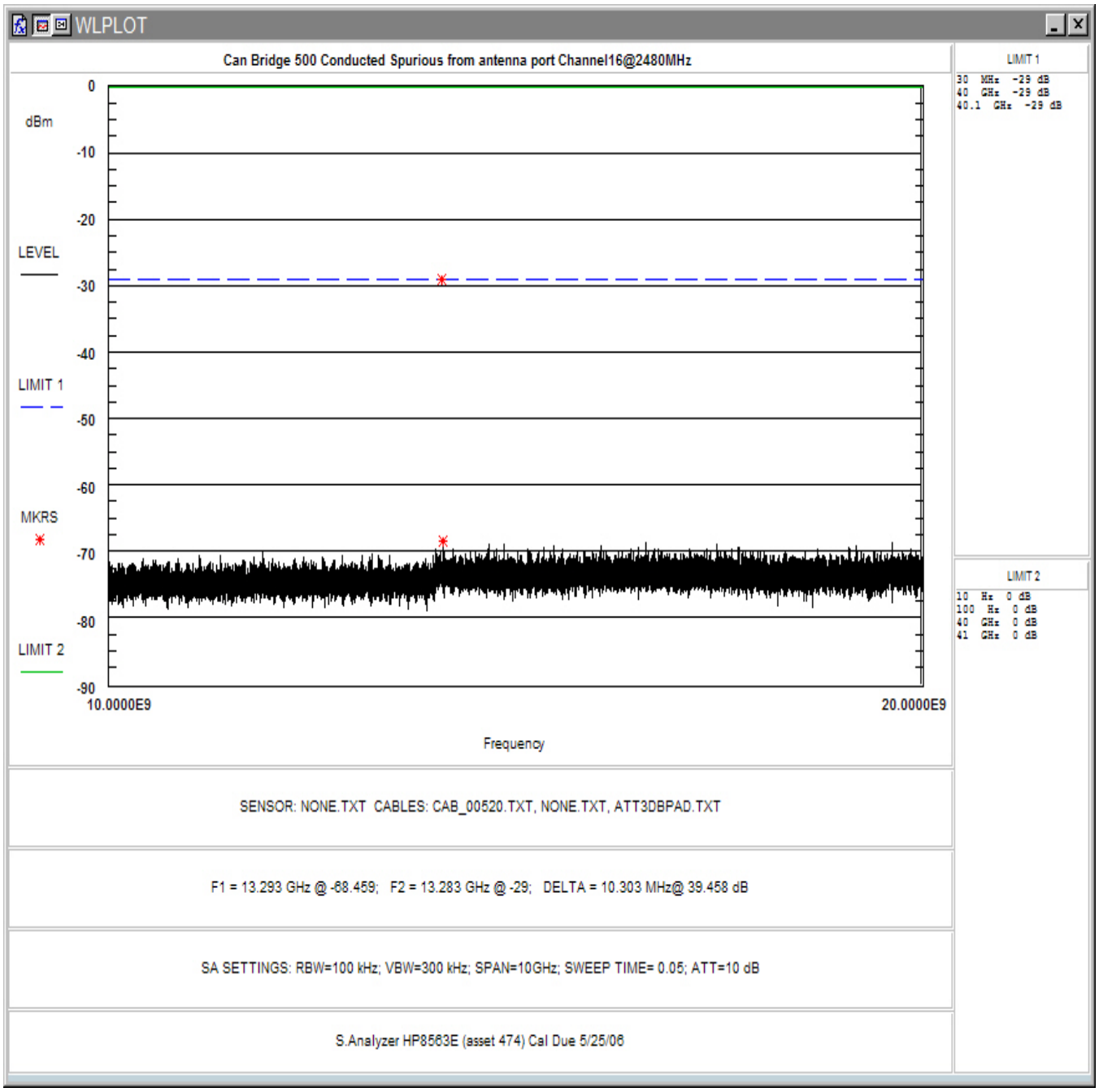

Figure 4-28. Conducted Spurious Emissions, High Channel 10 - 20GHz

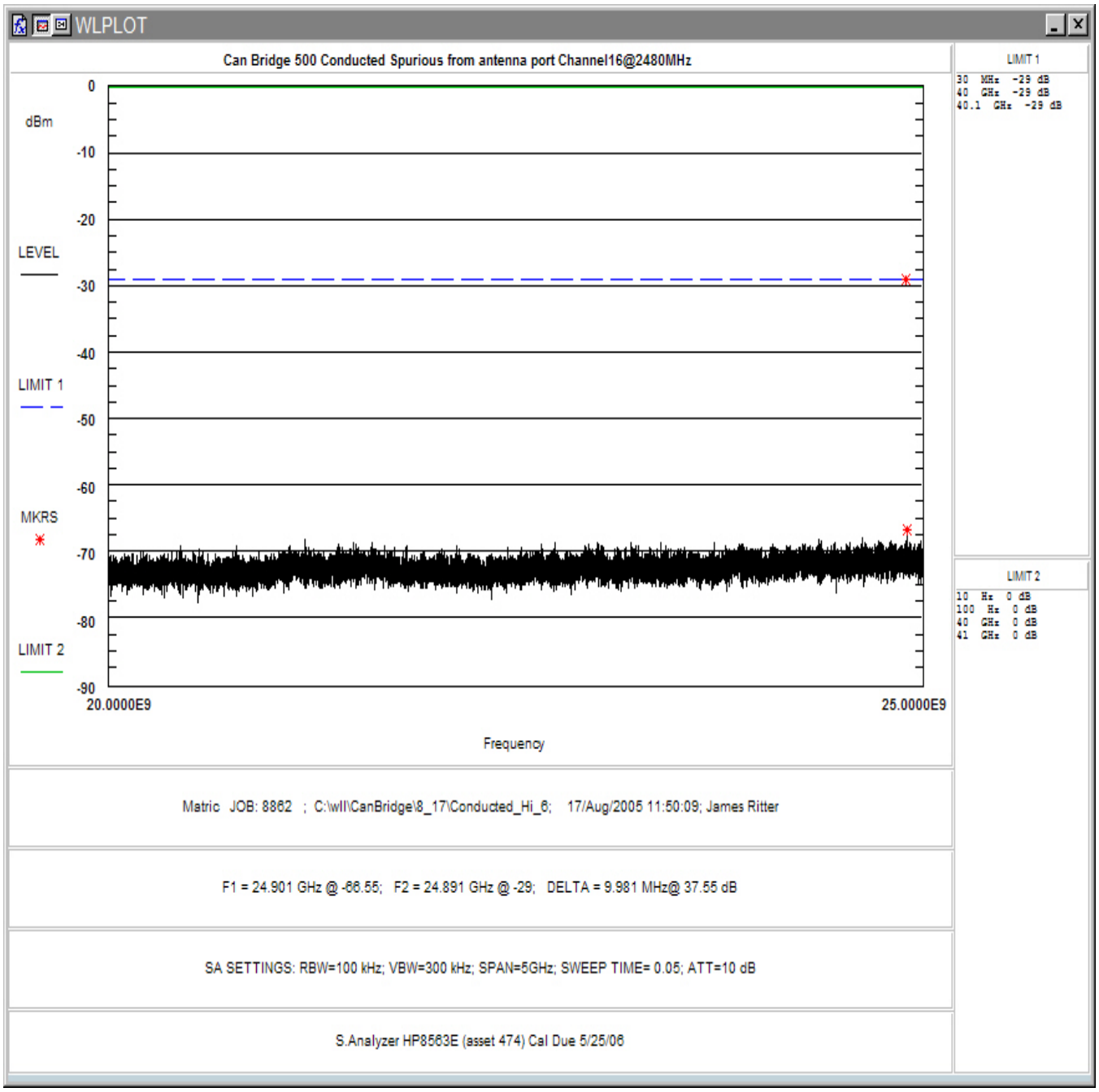

Figure 4-29. Conducted Spurious Emissions, High Channel 20 - 25GHz

4.5 Radiated Spurious Emissions: (FCC Part §2.1053/RSS-210)

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 FCC Part 15.209 and §15.35(b) for peak measurements. These requirements are also specified in RSS-210.

4.5.1 Test Procedure

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

The following is a sample calculation used in the data tables for calculating the final field strength of spurious emissions and comparing these levels to the specified limits.

Sample Calculation:

Spectrum Analyzer Voltage (SA Level): VdBµV
Antenna Factor (Ant Corr): AFdB/m
Cable Loss Correction (Cable Corr): CCdB
Amplifier Gain: GdB
Electric Field (Corr Level): EdBµV/m = VdBµV + AFdB/m + CCdB - GdB
To convert to linear units: EµV/m = antilog (EdBµV/m/20)

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

CLIENT:	Matric Limited	DATE:	8/18/05
TESTER:	Thuan Ta/James Ritter	JOB #:	8862
EUT Information:		**Test Requirements:**	
EUT:	Can Bridge 500	TEST STANDARD:	FCC Part 15
CONFIGURATION:	Transmitting at 2405 MHz	DISTANCE:	3m
CLASS:	B		
Test Equipment/Limit:			
ANTENNA:	A_00382	LIMIT:	LFCC_3m_Class_B
CABLE:	CSITE1_3m	AMPLIFIER (dB)	None

Frequency (MHz)	Polarity H/V	Az Deg	Ant. Hght (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
unit flat										
37.779	V	202.0	1.0	6.1	15.4	1.0	22.5	13.4	100.0	-17.5
53.350	V	335.0	1.3	25.0	7.4	1.1	33.5	47.6	100.0	-6.5
64.016	V	260.0	1.3	16.5	7.8	1.3	25.6	19.1	100.0	-14.4
120.000	V	270.0	1.0	15.7	14.0	1.7	31.5	37.5	150.0	-12.0
133.337	V	335.0	1.0	16.7	13.8	1.8	32.3	41.3	150.0	-11.2
166.648	V	0.0	1.5	19.0	12.0	2.0	33.0	44.5	150.0	-10.6
167.102	V	335.0	1.0	17.6	12.0	2.0	31.5	37.8	150.0	-12.0
213.452	V	260.0	1.4	14.5	10.7	2.2	27.4	23.6	150.0	-16.1
431.660	V	10.0	1.7	4.5	16.9	3.3	24.7	17.1	200.0	-21.3
37.778	H	202.0	4.0	1.3	15.4	1.0	17.7	7.7	100.0	-22.3
53.330	H	270.0	2.5	15.4	7.4	1.1	23.9	15.8	100.0	-16.1
64.016	H	135.0	2.5	9.7	7.8	1.3	18.8	8.7	100.0	-21.2
120.000	H	135.0	2.5	14.7	14.0	1.7	30.5	33.4	150.0	-13.0
133.333	H	225.0	2.2	13.1	13.8	1.8	28.7	27.3	150.0	-14.8
166.648	H	0.0	2.5	20.1	12.0	2.0	34.1	50.5	150.0	-9.5
167.102	H	0.0	2.2	19.2	12.0	2.0	33.1	45.4	150.0	-10.4
213.452	H	0.0	2.5	15.3	10.7	2.2	28.2	25.8	150.0	-15.3
431.660	H	180.0	2.5	-3.1	16.9	3.3	17.1	7.1	200.0	-28.9
Unit upright										
37.779	V	0.0	1.0	7.8	15.4	1.0	24.2	16.3	100.0	-15.8
53.350	V	200.0	1.2	22.6	7.4	1.1	31.1	36.1	100.0	-8.9
64.016	V	200.0	1.0	18.7	7.8	1.3	27.8	24.6	100.0	-12.2
120.000	V	345.0	1.3	19.1	14.0	1.7	34.9	55.4	150.0	-8.6
133.337	V	0.0	1.0	13.8	13.8	1.8	29.4	29.6	150.0	-14.1
166.648	V	350.0	1.2	20.5	12.0	2.0	34.5	52.9	150.0	-9.1
167.102	V	0.0	1.0	19.1	12.0	2.0	33.0	44.9	150.0	-10.5
213.452	V	270.0	1.5	16.0	10.7	2.2	28.9	28.0	150.0	-14.6
431.660	V	180.0	1.5	6.7	16.9	3.3	26.9	22.1	200.0	-19.1
37.778	H	270.0	2.0	4.2	15.4	1.0	20.6	10.8	100.0	-19.4

Frequency	Polarity	Az	Ant. Hght	SA Level (QP)	Ant. Corr.	Cable Corr.	Corr. Level	Corr. Level	Limit	Margin
(MHz)	H/V	Deg	(m)	(dBµV)	(dB/m)	(dB)	(dBµV/m)	(µV/m)	(µV/m)	dB
53.330	H	245.0	2.5	14.9	7.4	1.1	23.4	14.9	100.0	-16.6
64.016	H	180.0	2.5	8.2	7.8	1.3	17.3	7.3	100.0	-22.7
120.000	H	180.0	2.5	16.7	14.0	1.7	32.5	42.0	150.0	-11.0
133.333	H	245.0	2.2	11.2	13.8	1.8	26.8	21.9	150.0	-16.7
166.648	H	0.0	2.0	19.4	12.0	2.0	33.4	46.6	150.0	-10.2
167.102	H	180.0	2.0	19.4	12.0	2.0	33.3	46.5	150.0	-10.2
213.452	H	200.0	2.8	15.0	10.7	2.2	27.9	25.0	150.0	-15.6
431.660	H	180.0	2.0	10.6	16.9	3.3	30.8	34.6	200.0	-15.2
Unit on Side										
37.779	V	270.0	1.1	11.3	15.4	1.0	27.7	24.4	100.0	-12.3
53.350	V	270.0	1.3	23.4	7.4	1.1	31.9	39.6	100.0	-8.1
64.016	V	250.0	1.4	19.4	7.8	1.3	28.5	26.6	100.0	-11.5
120.000	V	0.0	1.3	17.2	14.0	1.7	33.0	44.5	150.0	-10.5
133.337	V	0.0	1.1	12.1	13.8	1.8	27.7	24.3	150.0	-15.8
166.648	V	90.0	1.2	19.6	12.0	2.0	33.6	47.7	150.0	-10.0
167.102	V	90.0	1.3	17.9	12.0	2.0	31.8	39.1	150.0	-11.7
213.452	V	270.0	1.2	15.4	10.7	2.2	28.3	26.1	150.0	-15.2
431.660	V	200.0	1.8	4.5	16.9	3.3	24.7	17.1	200.0	-21.3
37.778	H	180.0	2.0	5.5	15.4	1.0	21.9	12.5	100.0	-18.1
53.330	H	180.0	2.8	17.2	7.4	1.1	25.7	19.4	100.0	-14.3
64.016	H	75.0	3.2	15.6	7.8	1.3	24.7	17.2	100.0	-15.3
120.000	H	180.0	1.4	19.4	14.0	1.7	35.2	57.4	150.0	-8.3
133.333	H	180.0	2.8	11.3	13.8	1.8	26.9	22.2	150.0	-16.6
166.648	H	190.0	2.4	21.2	12.0	2.0	35.2	57.3	150.0	-8.4
167.102	H	180.0	3.0	18.3	12.0	2.0	32.2	41.0	150.0	-11.3
213.452	H	350.0	2.5	17.5	10.7	2.2	30.4	33.3	150.0	-13.1
431.660	H	180.0	1.3	3.3	16.9	3.3	23.5	14.9	200.0	-22.5

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

(Restricted Bands)

Low Channel

Frequency	Polarity	Az	Ant. Hght	SA Level	Ant. Corr.	Cable Corr.	Amp Gain	Corr. Level	Corr. Level	Limit	Margin
(MHz)	H/V	Deg	(m)	(dBµV)	(dB/m)	(dB)	(dB)	(dBµV/m)	(µV/m)	(µV/m)	dB
Unit Upright											
Peak											
4810.000	V	180.0	1.0	46.1	33.3	4.1	35.9	47.5	238.2	5000.0	-26.4
12025.000	V	0.0	1.0	47.6	41.5	6.6	35.7	60.0	997.1	5000.0	-14.0 **a**
AVG											
4810.000	V	180.0	1.0	38.2	33.3	4.1	35.9	39.6	95.9	500.0	-14.3
12025.000	V	0.0	1.0	35.5	41.5	6.6	35.7	47.9	247.6	500.0	-6.1 **a**
Peak											
4810.000	H	45.0	1.0	47.2	33.3	4.1	35.9	48.6	269.4	5000.0	-25.4
12025.000	H	180.0	1.0	46.8	41.5	6.6	35.7	59.2	909.3	5000.0	-14.8 **a**
AVG											
4810.000	H	45.0	1.0	35.9	33.3	4.1	35.9	37.3	73.6	500.0	-16.6
12025.000	H	180.0	1.0	35.2	41.5	6.6	35.7	47.6	239.2	500.0	-6.4 **a**
Unit On side											
Peak											
4810.000	V	170.0	1.0	46.9	33.3	4.1	35.9	48.3	261.2	5000.0	-25.6
12025.000	V	180.0	1.0	47.5	41.5	6.6	35.7	59.9	985.6	5000.0	-14.1 **a**
AVG											
4810.000	V	170.0	1.0	38.4	33.3	4.1	35.9	39.8	98.2	500.0	-14.1
12025.000	V	0.0	1.0	35.3	41.5	6.6	35.7	47.7	241.9	500.0	-6.3 **a**
Peak											
4810.000	H	190.0	1.0	47.0	33.3	4.1	35.9	48.4	264.2	5000.0	-25.5
12025.000	H	180.0	1.0	46.3	41.5	6.6	35.7	58.7	858.5	5000.0	-15.3
AVG											
4810.000	H	190.0	1.0	35.4	33.3	4.1	35.9	36.8	69.5	500.0	-17.1
12025.000	H	180.0	1.0	35.0	41.5	6.6	35.7	47.4	233.7	500.0	-6.6 **a**
Unit flat											
Peak											
4810.000	V	180.0	1.0	47.2	33.3	4.1	35.9	48.6	270.4	5000.0	-25.3
12025.000	V	90.0	1.0	46.5	41.5	6.6	35.7	58.9	878.5	5000.0	-15.1 **a**
AVG											

Frequency	Polarity	Az	Ant. Hght	SA Level	Ant. Corr.	Cable Corr.	Amp Gain	Corr. Level	Corr. Level	Limit	Margin
(MHz)	H/V	Deg	(m)	(dBµV)	(dB/m)	(dB)	(dB)	(dBµV/m)	(µV/m)	(µV/m)	dB
4810.000	V	180.0	1.0	39.0	33.3	4.1	35.9	40.4	105.2	500.0	-13.5
12025.000	V	90.0	1.0	35.4	41.5	6.6	35.7	47.8	244.7	500.0	-6.2 **a**
Peak											
4810.000	H	100.0	1.0	49.0	33.3	4.1	35.9	50.4	332.6	5000.0	-23.5
12025.000	H	180.0	1.0	46.0	41.5	6.6	35.7	58.4	829.3	5000.0	-15.6
AVG											
4810.000	H	100.0	1.0	37.7	33.3	4.1	35.9	39.1	90.6	500.0	-14.8
12025.000	H	180.0	1.0	34.6	41.5	6.6	35.7	47.0	223.2	500.0	-7.0 **a**

a = ambient No other EUT signals detected

Mid Channel

Frequency	Polarity	Az	Ant. Hght	SA Level (QP)	Ant. Corr.	Cable Corr.	Amp Gain	Corr. Level	Corr. Level	Limit	Margin
(MHz)	H/V	Deg	(m)	(dBµV)	(dB/m)	(dB)	(dB)	(dBµV/m)	(µV/m)	(µV/m)	dB
Unit flat											
Peak											
4880.000	V	180.0	1.0	48.7	33.4	4.1	35.9	50.3	326.4	5000.0	-23.7
7320.000	V	180.0	1.0	45.8	37.7	5.0	35.8	52.8	434.7	5000.0	-21.2 **a**
12200.000	V	0.0	1.0	46.8	41.3	6.6	35.5	59.2	912.4	5000.0	-14.8 **a**
AVG											
4880.000	V	180.0	1.0	38.0	33.4	4.1	35.9	39.6	95.2	500.0	-14.4
7320.000	V	180.0	1.0	34.9	37.7	5.0	35.8	41.9	123.9	500.0	-12.1 **a**
12200.000	V	0.0	1.0	35.2	41.3	6.6	35.5	47.6	240.0	500.0	-6.4 **a**
Peak											
4880.000	H	90.0	1.0	47.0	33.4	4.1	35.9	48.6	268.3	5000.0	-25.4
7320.000	H	0.0	1.0	46.5	37.7	5.0	35.8	53.5	471.2	5000.0	-20.5 **a**
12200.000	H	0.0	1.0	46.8	41.3	6.6	35.5	59.2	912.4	5000.0	-14.8 **a**
AVG											
4880.000	H	90.0	1.0	36.5	33.4	4.1	35.9	38.1	80.1	500.0	-15.9
7320.000	H	0.0	1.0	34.5	37.7	5.0	35.8	41.5	118.4	500.0	-12.5 **a**
12200.000	H	0.0	1.0	35.7	41.3	6.6	35.5	48.1	254.2	500.0	-5.9 **a**
Unit On Side											
Peak											
4880.000	V	180.0	1.0	47.5	33.4	4.1	35.9	49.1	284.2	5000.0	-24.9
7320.000	V	190.0	1.0	46.1	37.7	5.0	35.8	53.1	450.0	5000.0	-20.9 **a**
12200.000	V	0.0	1.0	46.5	41.3	6.6	35.5	58.9	881.5	5000.0	-15.1 **a**
AVG											
4880.000	V	180.0	1.0	38.2	33.4	4.1	35.9	39.8	97.4	500.0	-14.2
7320.000	V	190.0	1.0	34.6	37.7	5.0	35.8	41.6	119.7	500.0	-12.4 **a**
12200.000	V	0.0	1.0	35.0	41.3	6.6	35.5	47.4	234.5	500.0	-6.6 **a**
Peak											
4880.000	H	180.0	1.0	46.0	33.4	4.1	35.9	47.6	239.2	5000.0	-26.4
7320.000	H	190.0	1.0	46.5	37.7	5.0	35.8	53.5	471.2	5000.0	-20.5 **a**
12200.000	H	0.0	1.0	46.0	41.3	6.6	35.5	58.4	832.1	5000.0	-15.6 **a**
AVG											
4880.000	H	180.0	1.0	35.6	33.4	4.1	35.9	37.2	72.2	500.0	-16.8
7320.000	H	190.0	1.0	34.7	37.7	5.0	35.8	41.7	121.1	500.0	-12.3 **a**
12200.000	H	0.0	1.0	35.1	41.3	6.6	35.5	47.5	237.2	500.0	-6.5 **a**
Unit Upright											

Frequency (MHz)	Polarity H/V	Az Deg	Ant. Hght (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											
4880.000	V	190.0	1.0	47.9	33.4	4.1	35.9	49.5	297.6	5000.0	-24.5
7320.000	V	180.0	1.0	46.0	37.7	5.0	35.8	53.0	444.9	5000.0	-21.0 **a**
12200.000	V	0.0	1.0	46.0	41.3	6.6	35.5	58.4	832.1	5000.0	-15.6 **a**
AVG											
4880.000	V	190.0	1.0	39.0	33.4	4.1	35.9	40.6	106.8	500.0	-13.4
7320.000	V	180.0	1.0	34.4	37.7	5.0	35.8	41.4	117.0	500.0	-12.6 **a**
12200.000	V	0.0	1.0	34.8	41.3	6.6	35.5	47.2	229.2	500.0	-6.8 **a**
Peak											
4880.000	H	190.0	1.0	46.2	33.4	4.1	35.9	47.8	244.7	5000.0	-26.2
7320.000	H	190.0	1.0	46.1	37.7	5.0	35.8	53.1	450.0	5000.0	-20.9 **a**
12200.000	H	0.0	1.0	46.1	41.3	6.6	35.5	58.5	841.8	5000.0	-15.5 **a**
AVG											
4880.000	H	190.0	1.0	35.7	33.4	4.1	35.9	37.3	73.1	500.0	-16.7
7320.000	H	190.0	1.0	34.6	37.7	5.0	35.8	41.6	119.7	500.0	-12.4 **a**
12200.000	H	0.0	1.0	35.0	41.3	6.6	35.5	47.4	234.5	500.0	-6.6 **a**

a = ambient No other EUT signals detected

High Channel

Frequency	Polarity	Az	Ant. Hght	SA Level (QP)	Ant. Corr.	Cable Corr.	Amp Gain	Corr. Level	Corr. Level	Limit	Margin
(MHz)	H/V	Deg	(m)	(dBµV)	(dB/m)	(dB)	(dB)	(dBµV/m)	(µV/m)	(µV/m)	dB
Unit Upright											
Peak											
4960.000	V	180.0	1.0	46.1	33.6	4.1	36.0	47.8	246.2	5000.0	-26.2
7440.000	V	180.0	1.0	45.8	37.8	5.1	35.8	52.8	439.0	5000.0	-21.1 **a**
12400.000	V	0.0	1.0	47.1	41.0	6.7	35.3	59.5	948.1	5000.0	-14.4 **a**
AVG											
4960.000	V	180.0	1.0	38.3	33.6	4.1	36.0	40.0	100.3	500.0	-14.0
7440.000	V	180.0	1.0	35.0	37.8	5.1	35.8	42.0	126.6	500.0	-11.9 **a**
12400.000	V	0.0	1.0	36.0	41.0	6.7	35.3	48.4	264.2	500.0	-5.5 **a**
Peak											
4880.000	H	200.0	1.0	46.8	33.4	4.1	35.9	48.4	262.2	5000.0	-25.6
7320.000	H	200.0	1.0	45.8	37.7	5.0	35.8	52.8	434.7	5000.0	-21.2 **a**
12200.000	H	0.0	1.0	45.6	41.3	6.6	35.5	58.0	794.7	5000.0	-16.0 **a**
AVG											
4880.000	H	200.0	1.0	36.0	33.4	4.1	35.9	37.6	75.6	500.0	-16.4
7320.000	H	200.0	1.0	34.9	37.7	5.0	35.8	41.9	123.9	500.0	-12.1 **a**
12200.000	H	0.0	1.0	35.1	41.3	6.6	35.5	47.5	237.2	500.0	-6.5 **a**
Unit on side											
Peak											
4960.000	V	170.0	1.0	47.0	33.6	4.1	36.0	48.7	273.1	5000.0	-25.3
7440.000	V	180.0	1.0	45.2	37.8	5.1	35.8	52.2	409.7	5000.0	-21.7 **a**
12400.000	V	0.0	1.0	47.1	41.0	6.7	35.3	59.5	948.1	5000.0	-14.4 **a**
AVG											
4960.000	V	170.0	1.0	39.0	33.6	4.1	36.0	40.7	108.7	500.0	-13.3
7440.000	V	180.0	1.0	35.1	37.8	5.1	35.8	42.1	128.1	500.0	-11.8 **a**
12400.000	V	0.0	1.0	36.0	41.0	6.7	35.3	48.4	264.2	500.0	-5.5 **a**
Peak											
4880.000	H	170.0	1.0	46.3	33.4	4.1	35.9	47.9	247.6	5000.0	-26.1
7320.000	H	180.0	1.0	45.6	37.7	5.0	35.8	52.6	424.9	5000.0	-21.4 **a**
12200.000	H	0.0	1.0	45.6	41.3	6.6	35.5	58.0	794.7	5000.0	-16.0 **a**
AVG											
4880.000	H	170.0	1.0	36.2	33.4	4.1	35.9	37.8	77.4	500.0	-16.2
7320.000	H	180.0	1.0	34.9	37.7	5.0	35.8	41.9	123.9	500.0	-12.1 **a**
12200.000	H	0.0	1.0	35.1	41.3	6.6	35.5	47.5	237.2	500.0	-6.5 **a**
Unit Upright											

Frequency (MHz)	Polarity H/V	Az Deg	Ant. Hght (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											
4960.000	V	190.0	1.0	45.3	33.6	4.1	36.0	47.0	224.5	5000.0	-27.0
7440.000	V	190.0	1.0	44.9	37.8	5.1	35.8	51.9	395.8	5000.0	-22.0 **a**
12400.000	V	0.0	1.0	47.0	41.0	6.7	35.3	59.4	937.3	5000.0	-14.5 **a**
AVG											
4960.000	V	190.0	1.0	36.2	33.6	4.1	36.0	37.9	78.7	500.0	-16.1
7440.000	V	190.0	1.0	34.9	37.8	5.1	35.8	41.9	125.2	500.0	-12.0 **a**
12400.000	V	0.0	1.0	34.4	41.0	6.7	35.3	46.8	219.7	500.0	-7.1 **a**
Peak											
4880.000	H	165.0	1.0	46.0	33.4	4.1	35.9	47.6	239.2	5000.0	-26.4
7320.000	H	180.0	1.0	45.2	37.7	5.0	35.8	52.2	405.7	5000.0	-21.8 **a**
12200.000	H	0.0	1.0	45.1	41.3	6.6	35.5	57.5	750.2	5000.0	-16.5 **a**
AVG											
4880.000	H	165.0	1.0	36.1	33.4	4.1	35.9	37.7	76.5	500.0	-16.3
7320.000	H	180.0	1.0	34.1	37.7	5.0	35.8	41.1	113.0	500.0	-12.9 **a**
12200.000	H	0.0	1.0	34.2	41.3	6.6	35.5	46.6	213.9	500.0	-7.4 **a**

a = ambient No other EUT signals detected

4.6 AC Powerline Conducted Emissions: (FCC Part §15.207/RSS-210 Section 9)

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 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 or peak, 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.

Data is recorded in Table 7.

Table 7: AC Powerline Conducted Emissions

CLIENT:	Matric Limited	DATE:	8//18/05
TESTER:	James Ritter	JOB #:	8862
TEST STANDARD:	FCC_B	LISN 1:	A_00126
TEST SITE:	CSITE1_CE		
VOLTAGE:	120VAC	LISN 2:	A_00125

LINE 1 - NEUTRAL (LISN 1)

Freq. MHz	Level QP dBuV	Cable Loss dB	LISN Corr dB	Corr Level dBuV	Limit QP dBuV	Margin QP dB	Level AVG dBuV	Corr Level dBuV	Limit AVG dBuV	Margin AVG dB
0.158	49.1	10.3	1.4	60.8	65.6	-4.8	30.3	42.0	55.6	-13.6
0.322	33.3	10.1	0.8	44.2	59.7	-15.5	1.5	12.4	49.7	-37.3
0.538	40.1	10.2	0.6	50.9	56.0	-5.1	8.2	19.0	46.0	-27.0
1.295	29.8	10.4	0.3	40.5	56.0	-15.5	9.1	19.8	46.0	-26.2
15.273	17.8	11.5	0.8	30.1	60.0	-29.9	17.8	30.1	50.0	-19.9
21.331	19.0	11.8	1.3	32.1	60.0	-27.9	19.0	32.1	50.0	-17.9
26.663	20.6	12.0	2.3	34.9	60.0	-25.1	20.6	34.9	50.0	-15.1
29.090	24.1	12.1	2.8	38.9	60.0	-21.1	24.1	38.9	50.0	-11.1

LINE 2 - PHASE (LISN 2)

Freq. MHz	Level QP dBuV	Cable Loss dB	LISN Corr dB	Corr Level dBuV	Limit QP dBuV	Margin QP dB	Level AVG dBuV	Corr Level dBuV	Limit AVG dBuV	Margin AVG dB
0.158	48.3	10.3	1.8	60.4	65.6	-5.2	29.8	41.9	55.6	-13.7
0.322	36.1	10.1	1.0	47.2	59.7	-12.5	2.6	13.7	49.7	-36.0
0.538	39.8	10.2	0.7	50.7	56.0	-5.3	8.5	19.4	46.0	-26.6
1.295	26.0	10.4	0.3	36.7	56.0	-19.3	12.8	23.5	46.0	-22.5
15.273	17.3	11.5	0.9	29.7	60.0	-30.3	17.3	29.7	50.0	-20.3
21.331	24.7	11.8	1.4	37.9	60.0	-22.1	24.7	37.9	50.0	-12.1
26.663	21.8	12.0	2.3	36.1	60.0	-23.9	21.8	36.1	50.0	-13.9
29.090	25.9	12.1	2.7	40.6	60.0	-19.4	25.9	40.6	50.0	-9.4

