Washington Laboratories, Ltd.

FCC & Industry Canada Certification Test Report
for the
Honeywell International, Inc.

50016517 Module:
FCC ID: S5750016517
IC ID: 573I-50016517

WLL JOB# **9455-01 Rev 1**
May 28, 2007

Revised July 30, 2007

Prepared for:
Honeywell International, Inc.
1100 Virginia Drive
Fort Washington, PA, 19034

Prepared By:
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7560 Lindbergh Drive
Gaithersburg, Maryland 20879

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Prepared by: Brian J. Dettling
Documentation Specialist

Reviewed by: Michael Violette, P.E.
President

Abstract

This report has been prepared on behalf of Honeywell International, Inc. 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 a Honeywell International, Inc. 50016517 Module.

Testing was performed on an Open Area Test Site (OATS) of Washington Laboratories, Ltd, 7560 Lindbergh Drive, Gaithersburg, MD 20879. Site description and site attenuation data have been placed on file with the FCC's Sampling and Measurements Branch at the FCC laboratory in Columbia, MD. 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 Honeywell International, Inc. 50016517 Module comply with the limits for a Frequency Hopping Spread Spectrum Transmitter device under FCC Part 15.247 and Industry Canada RSS-210.

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1 Introduction

1.1 Compliance Statement

The Honeywell International, Inc. 50016517 Module comply with the limits for a Frequency Hopping Spread Spectrum 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:	Honeywell International, Inc. 1100 Virginia Drive Fort Washington, PA, 19034
Purchase Order Number:	258233
Quotation Number:	63252

1.4 Test Dates

Testing was performed on the following date(s):	October, 2006 - February 6, 2007

1.5 Test and Support Personnel

Washington Laboratories, LTD	James Ritter, Steve Dovell
Client Representative	Tony DiGiulian, Fred Kent

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 Honeywell International, Inc. 50016517 Module were tested within a XYR 6000. The 50016517 Module will only be integrated into products manufactured by Honeywell. They are Frequency hopping RF Transceiver modules for the 2.402-2.480 GHz ISM band to be used in industrial control and monitoring applications.

Table 1. Device Summary

ITEM	DESCRIPTION
Manufacturer:	Honeywell International, Inc.
FCC ID:	S5750016517
IC:	573I-50016517
Model:	50016517 Module
FCC Rule Parts:	§15.247
Industry Canada:	RSS210
Frequency Range:	2.402GHz - 2.480GHz
Maximum Output Power:	69mW (18.39dBm)
Modulation:	GFSK
Emissions Designator:	2G40X2D
Occupied Bandwidth:	867.62 kHz
Keying:	Automatic
Type of Information:	Data
Number of Channels:	80
Power Output Level	Adjustable
Antenna Connector	Internal; not accessible
Antenna Type	Integral Omni-directional 2dBi Hyperlink External Omni-directional 8dBi Hyperlink External Directional 14dBi
Interface Cables:	N/A
Power Source & Voltage:	From Host

2.2 Test Configuration

The XYR 6000/50016517 Module were configured with three antennas:

Integral Omni-directional 2dBi

Hyperlink External Omni-directional 8dBi

Hyperlink External Directional 14dBi

2.3 Testing Algorithm

The XYR 6000/50016517 Module was programmed for FHSS operation via a laptop computer program running test scripts.

Worst case emission levels are provided in the test results.

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.

Table 2: Test Equipment List

WLL Asset #	Manufacturer Model/Type	Function	Cal. Due
00528	AGILENT, E4446A	ANALYZER, SPECTRUM	6/20/2007
00522	HP, 8449B	PRE-AMPLIFIER, 1-26.5GHZ	5/4/2007
00004	ARA, DRG-118/A	ANTENNA, DRG, 1-18GHZ	2/2/2009
00280	ITC, 21C-3A1	WAVEGUIDE 3.45-11.0GHZ	6/12/2008
00281	ITC, 21A-3A1	WAVEGUIDE 4.51-10.0GHZ	2/7/2008
00284	ITC, 22K-3A1	WAVEGUIDE 14.5-35.5GHZ	6/12/2008
00069	HP, 85650A	ADAPTER, QP	6/26/2007
00073	HP, 8568B	ANALYZER, SPECTRUM	6/26/2007
00071	HP, 85685A	PRESELECTOR, RF	6/26/2007
00562	EMCO, 3110B	ANTENNA, BICONICAL	12/12/2008
00029	EMCO, 3146A	ANTENNA, LOG PERIODIC	7/19/2008

4 Test Results

4.1 Duty Cycle Correction

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 figures show the plot of the dwell time for the transmitter. Based on this plot, the dwell time per hop is 2.33 mSec. Figure 4-1 shows the total dwell time per 100ms is 2.33ms. This corresponds to a duty cycle correction of -32.65dB, however, the maximum allowed duty cycle correction is 20dB.

Figure 4-1: Duty Cycle Plot; Time of Occupancy for 1 Pulse

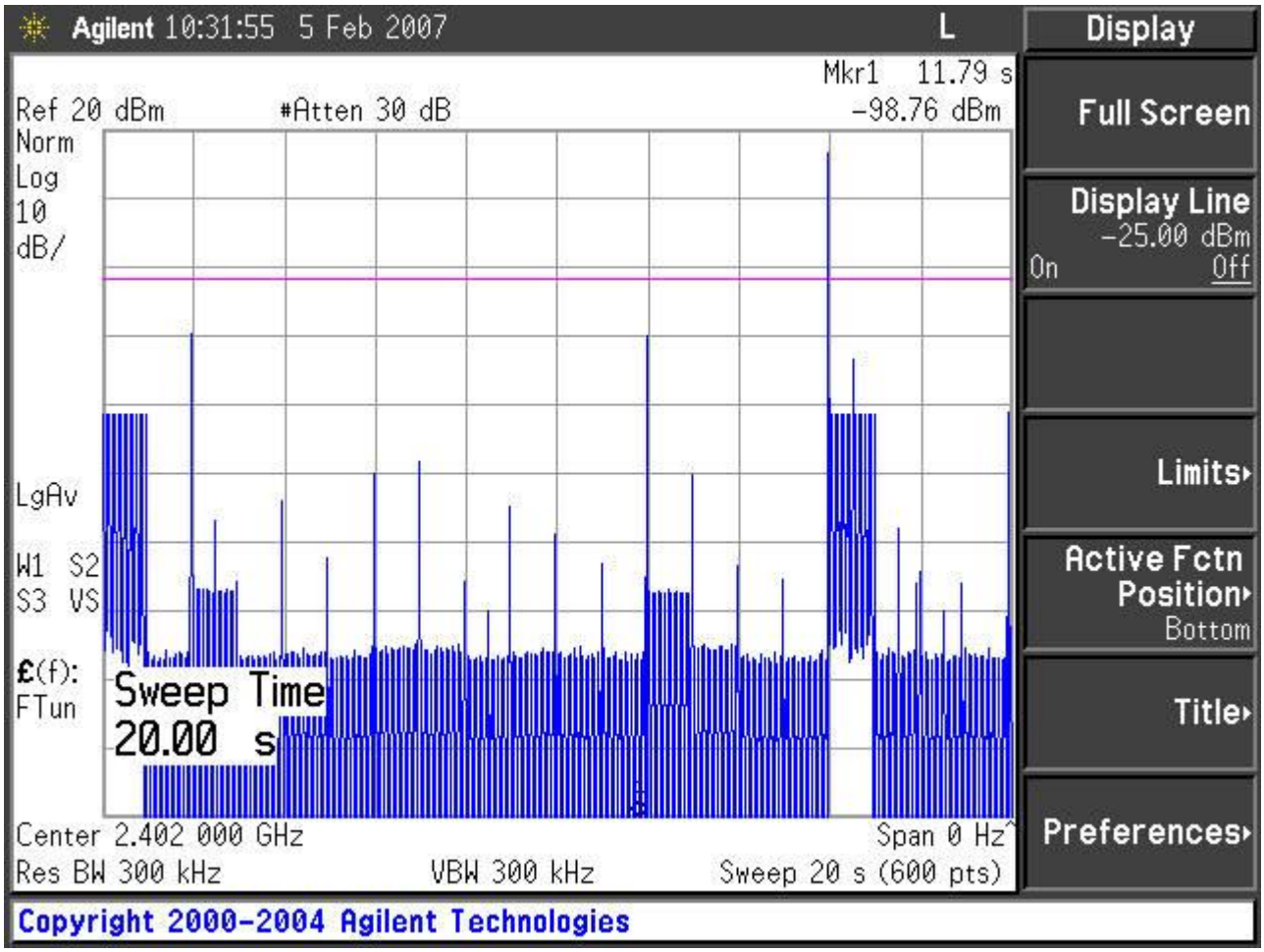

Figure 4-2: Duty Cycle Plot; Time of Occupancy for 20 seconds

Honeywell International Module 50016517 Job 9454 Pt 15.247 Time of Occupancy
Limit= .4 sec per (.4sec Times the Number of Hoppers), 15 Hoppers present= .4sec * 15= .4 seconds per 6 seconds Max
Each Pulse= 2.3ms (see single pulse plot); 1pulse per 6 sec = 2.3ms per 6 sec- Unit complies
1 pulse at Trigger Time(Beginning of sweep

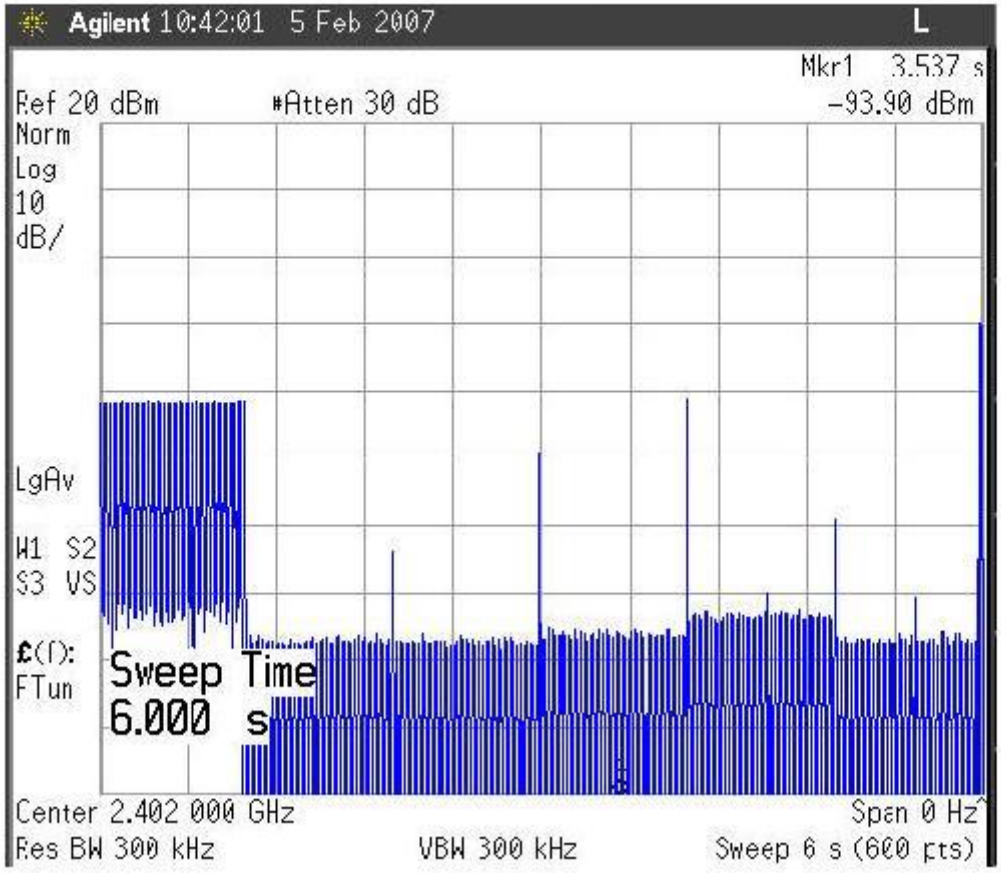

Figure 4-3: Duty Cycle Plot; Single Pulse, Six-second Sweep

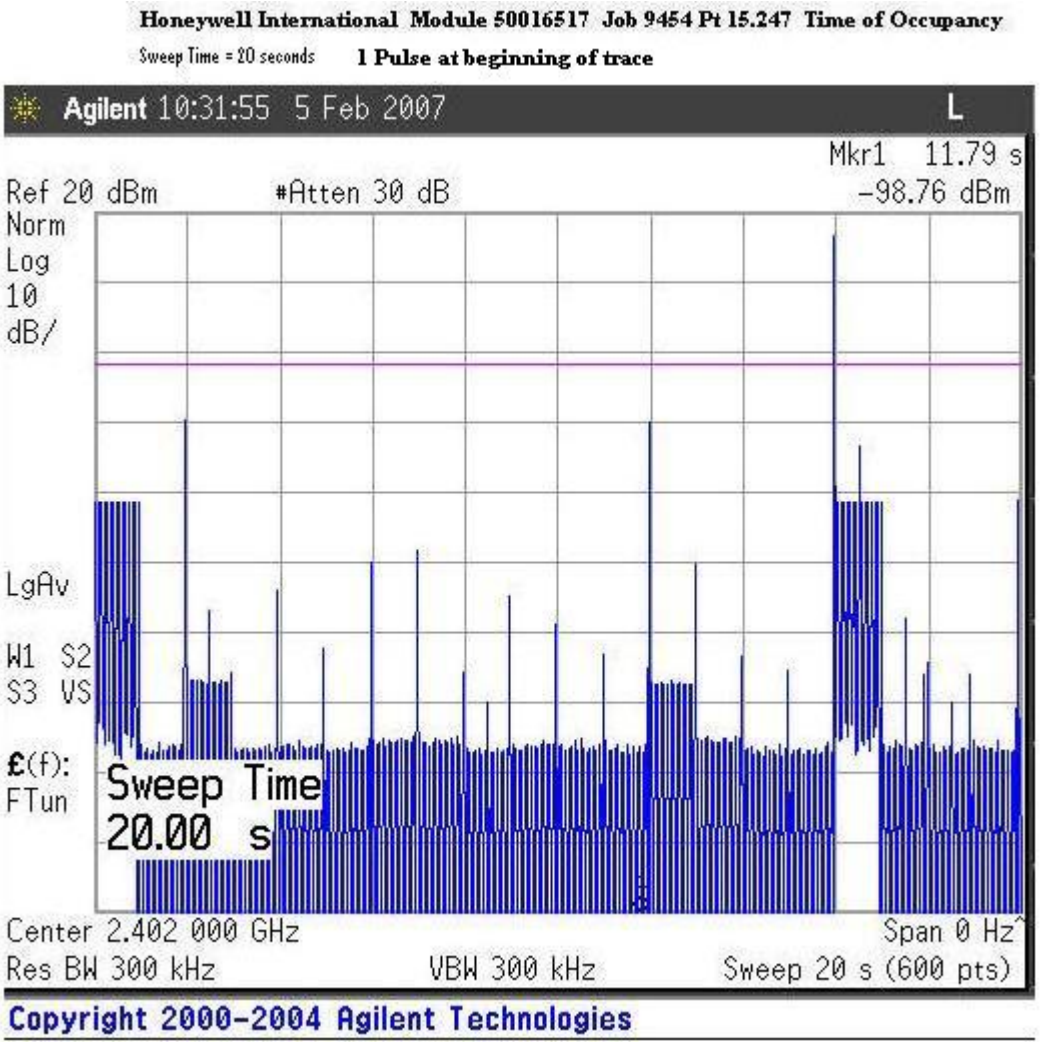

Figure 4-4: Duty Cycle Plot; Single Pulse, Twenty Sec Sweep

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: 2402MHz	17.66 dBm	30 dBm	Pass
Mid Channel: 2442MHz	18.39 dBm	30 dBm	Pass
High Channel: 2481MHz	16.65 dBm	30 dBm	Pass

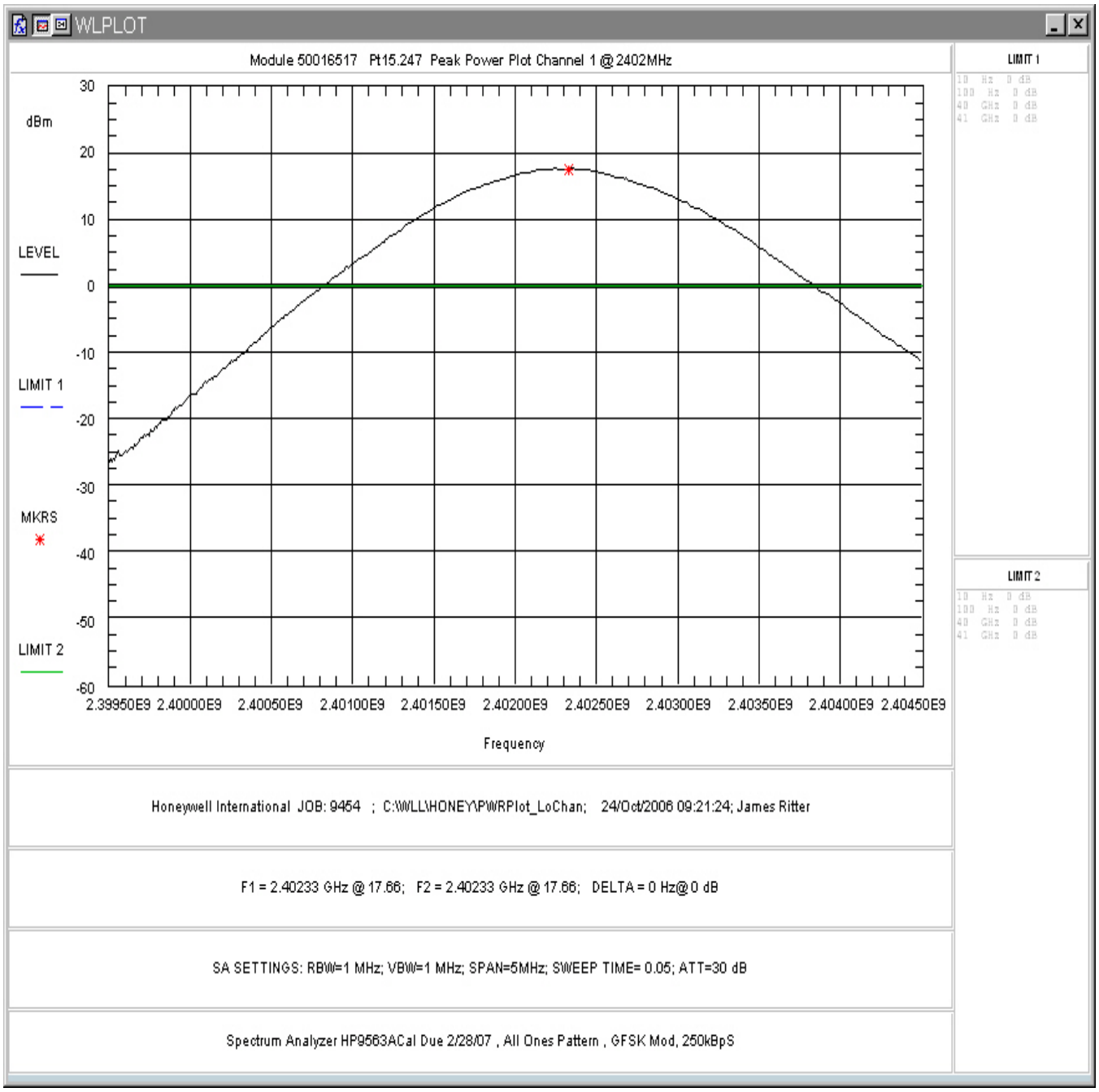

Figure 4-5: RF Peak Power, Low Channel

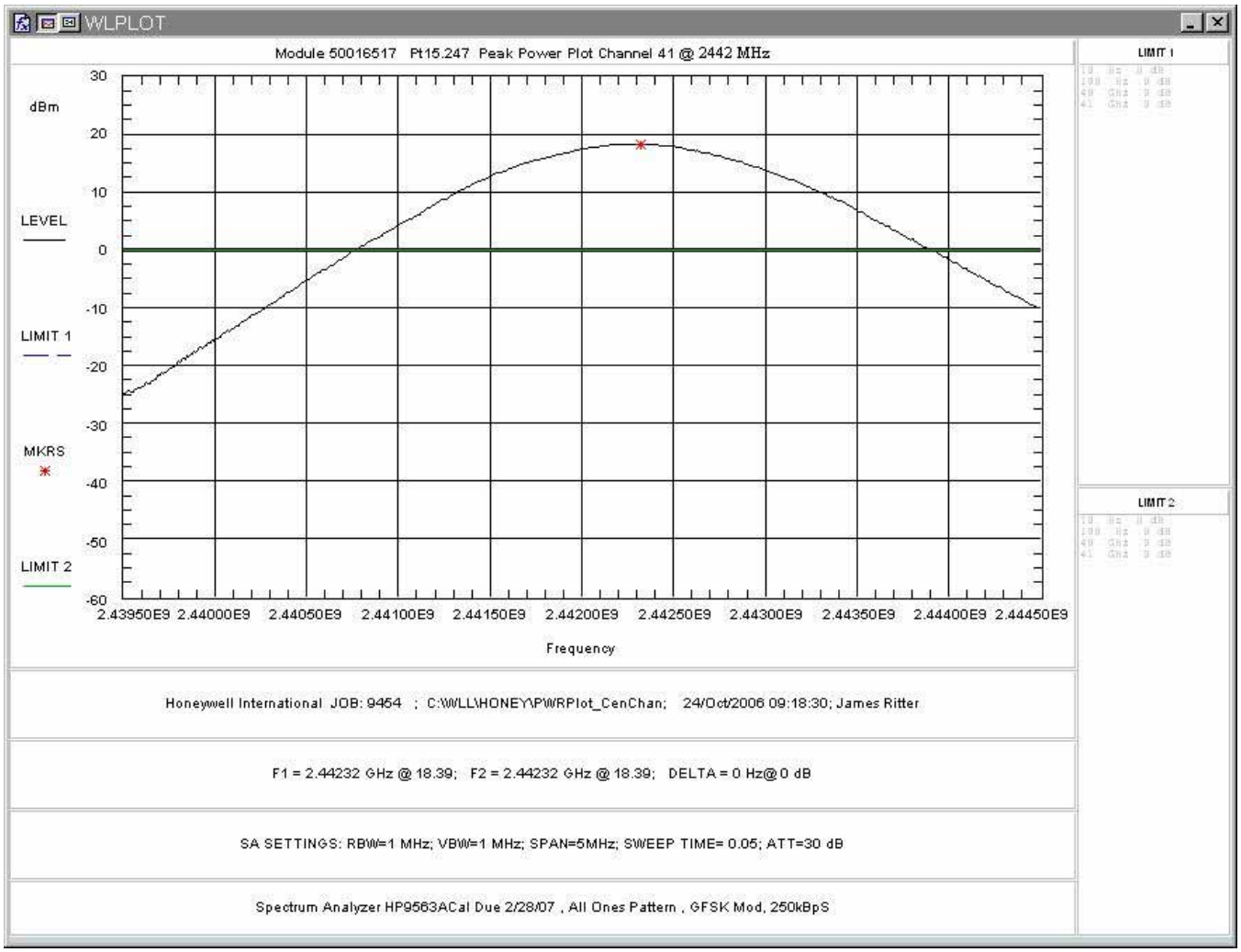

Figure 4-6: RF Peak Power, Mid Channel

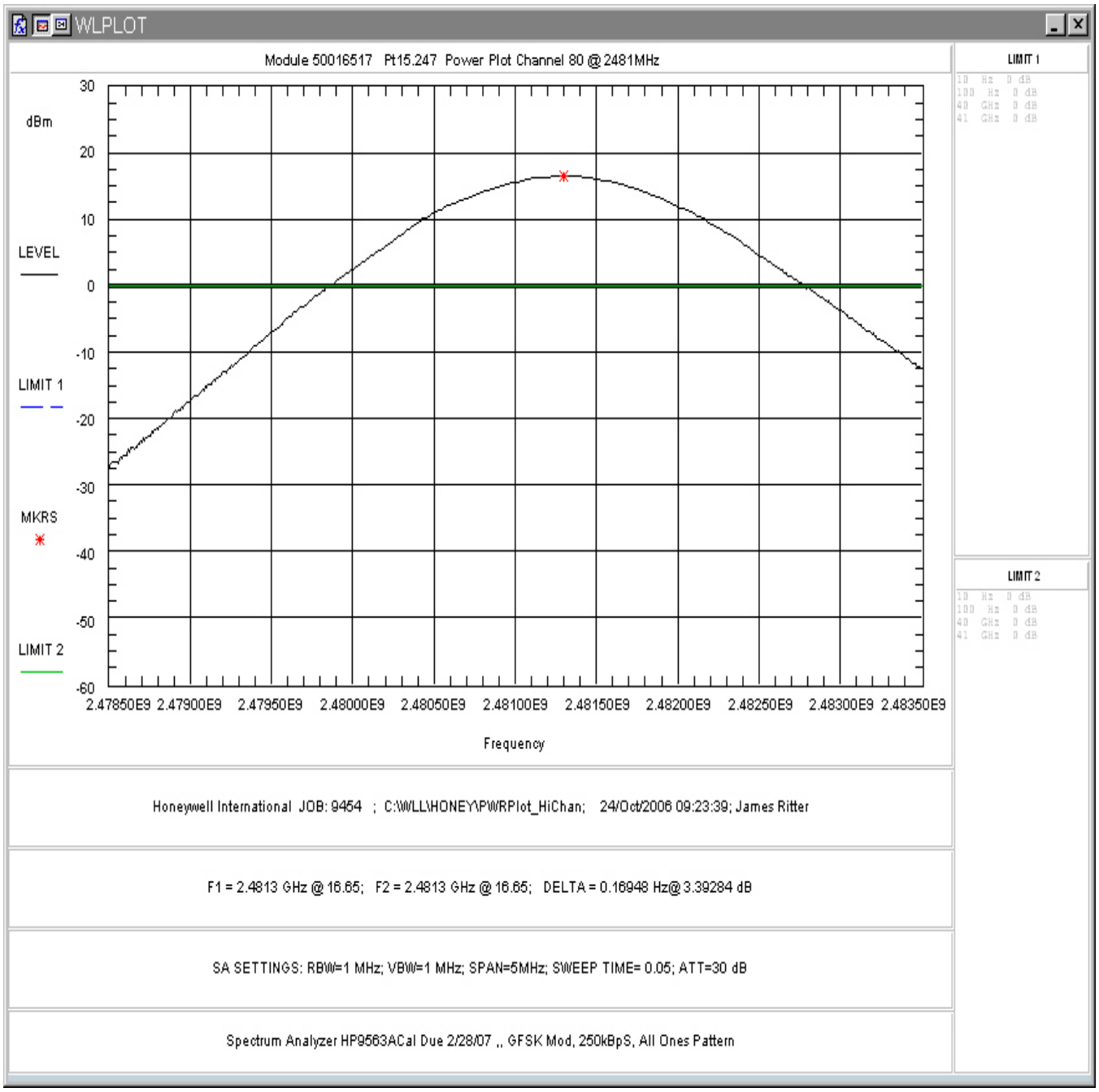

Figure 4-7: RF Peak Power, High Channel

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 1MHz.

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

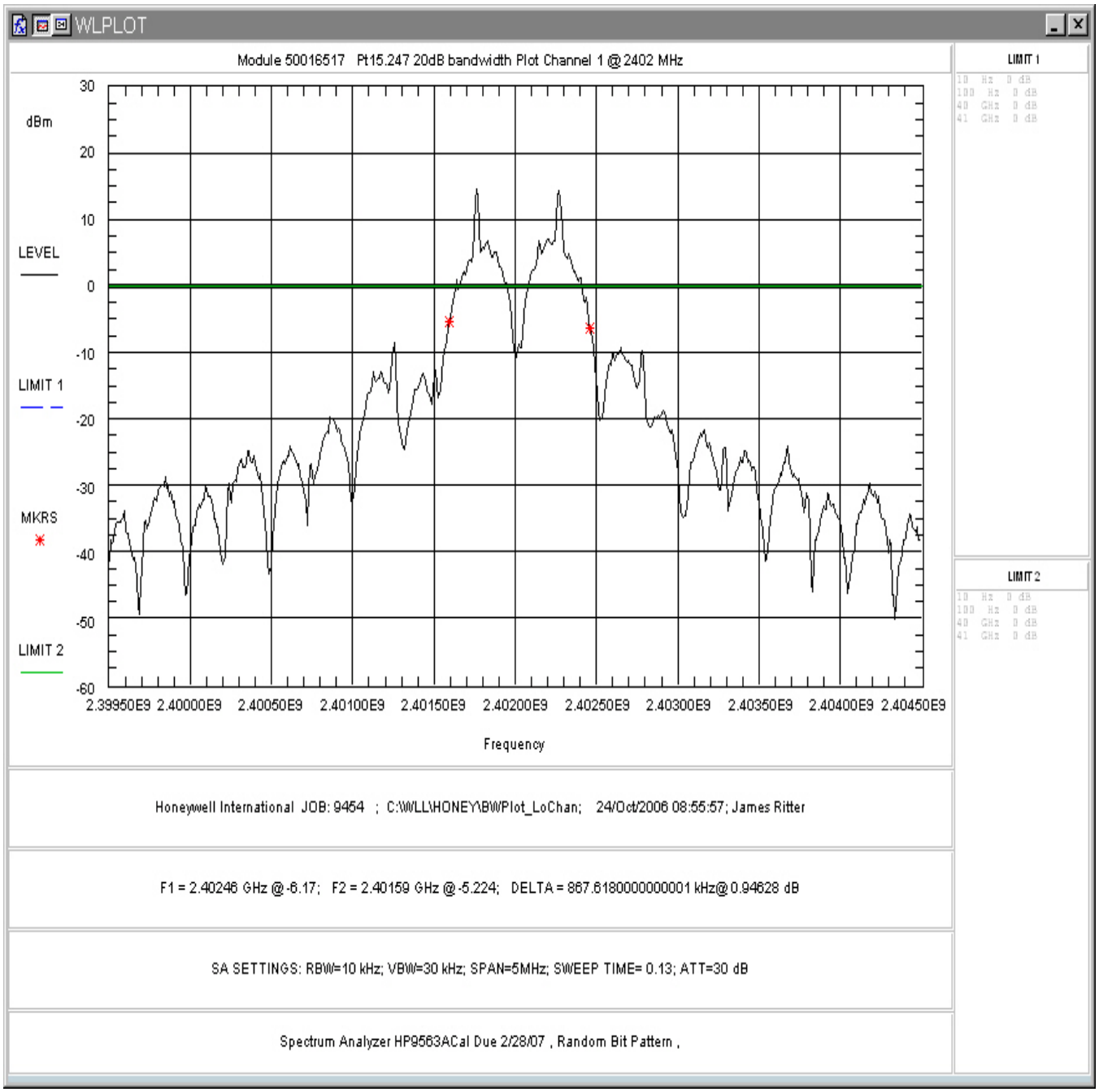

Figure 4-8: Occupied Bandwidth, Low Channel

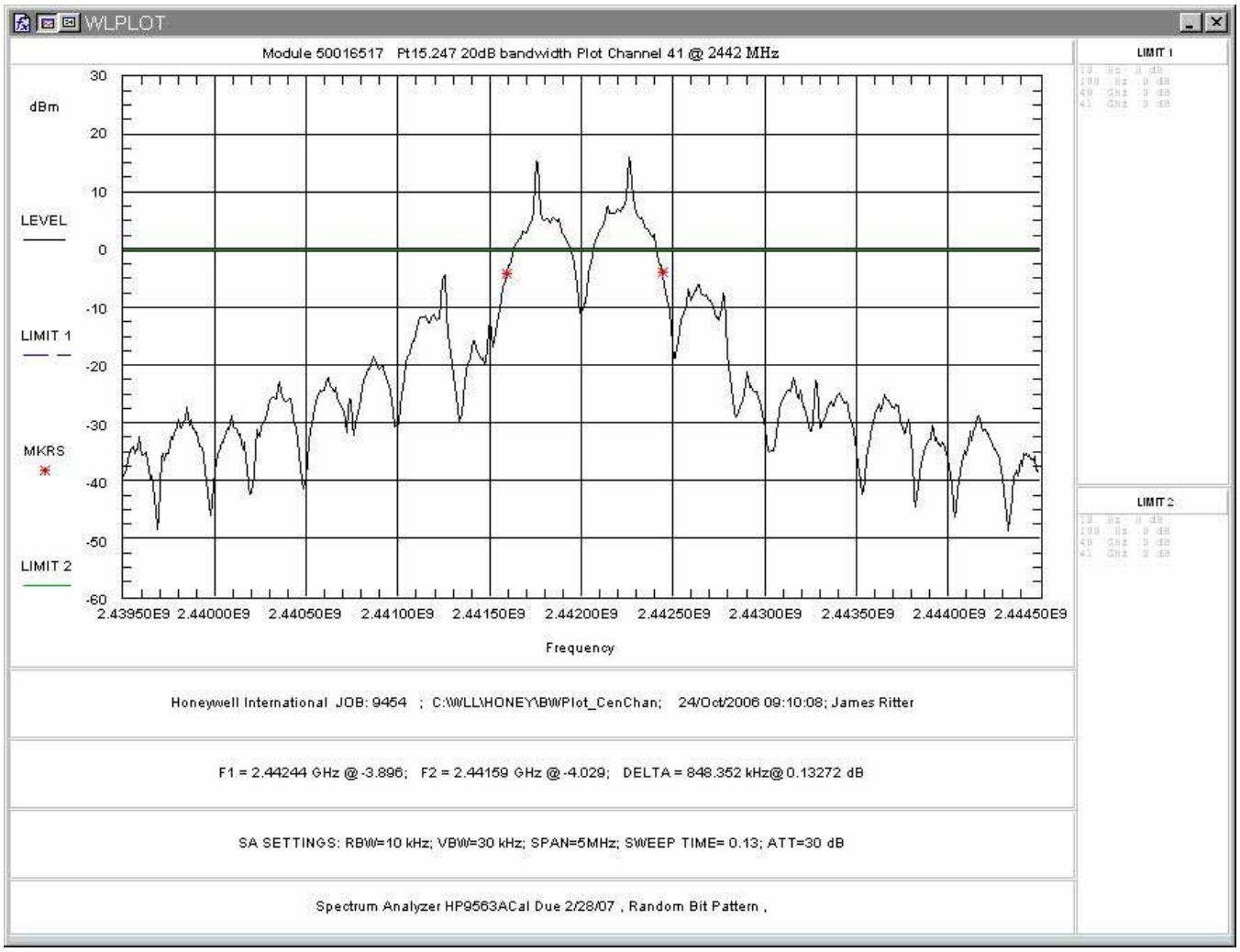

Figure 4-9: Occupied Bandwidth, Mid Channel

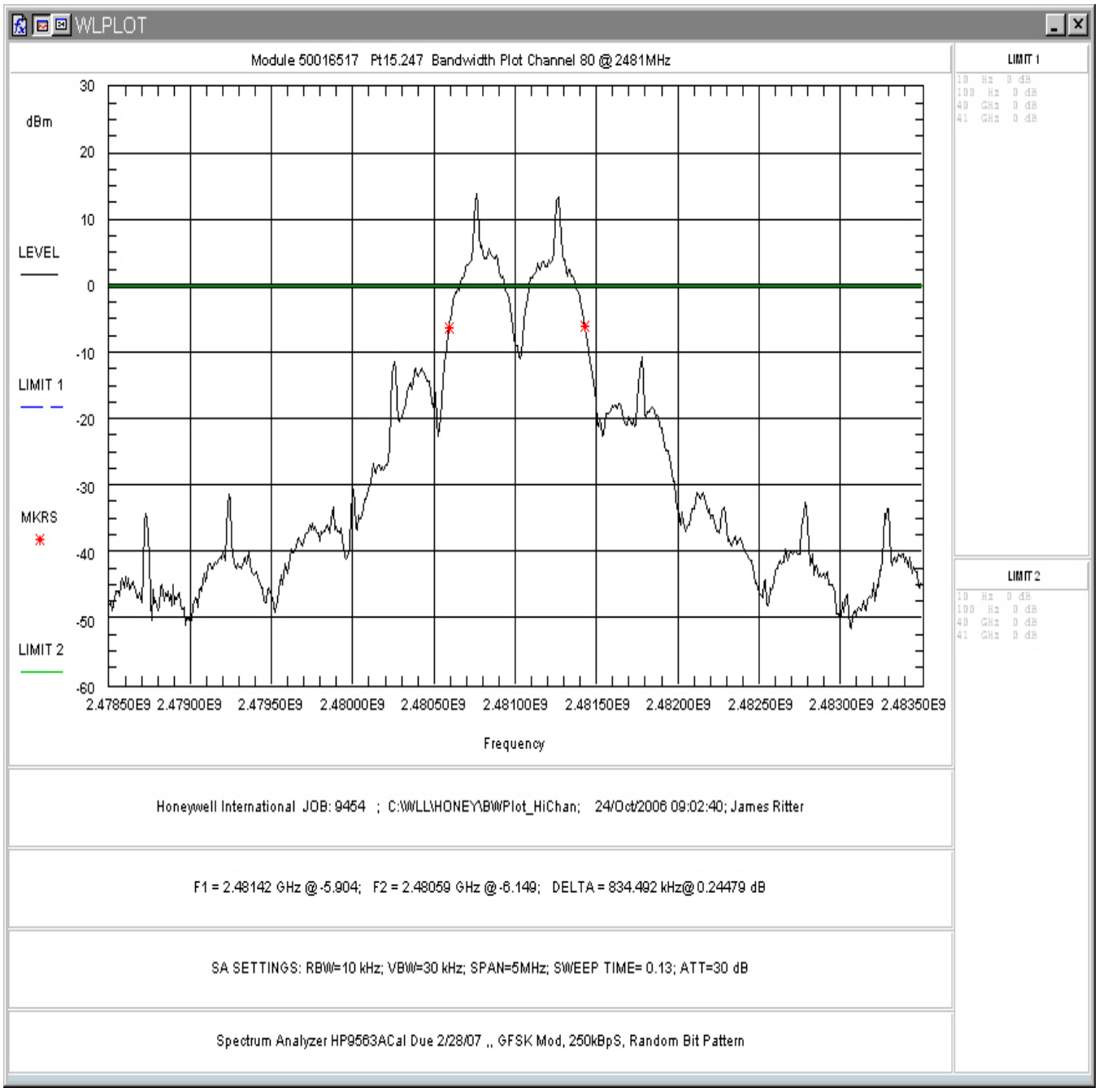

Figure 4-10. Occupied Bandwidth, High Channel

Table 4 provides a summary of the Occupied Bandwidth Results.

Table 4. Occupied Bandwidth Results

Frequency	Bandwidth	Limit	Pass/Fail
Low Channel: 2402MHz	867kHz	1 MHz	Pass
Mid Channel: 2442MHz	848kHz	1 MHz	Pass
High Channel: 2481MHz	834kHz	1 MHz	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 867kHz so the channel spacing must be more than 867kHz. In addition, for a 2.4GHz the number of hopping channels shall be stated.

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 channel spacing of 2 adjacent channels was measured using a spectrum analyzer span setting of 2.3MHz. Also, the number of hopping channels was measured from 2.4GHz to 2.5GHz.

The following plots, Figure 4-11 through Figure 4-14 show the number of hopping channels data, and Figure 4-15 shows the channel seperation. The channel spacing was measured to be 1.025 MHz and the number of channels used is 15 per band, 4 different bands.

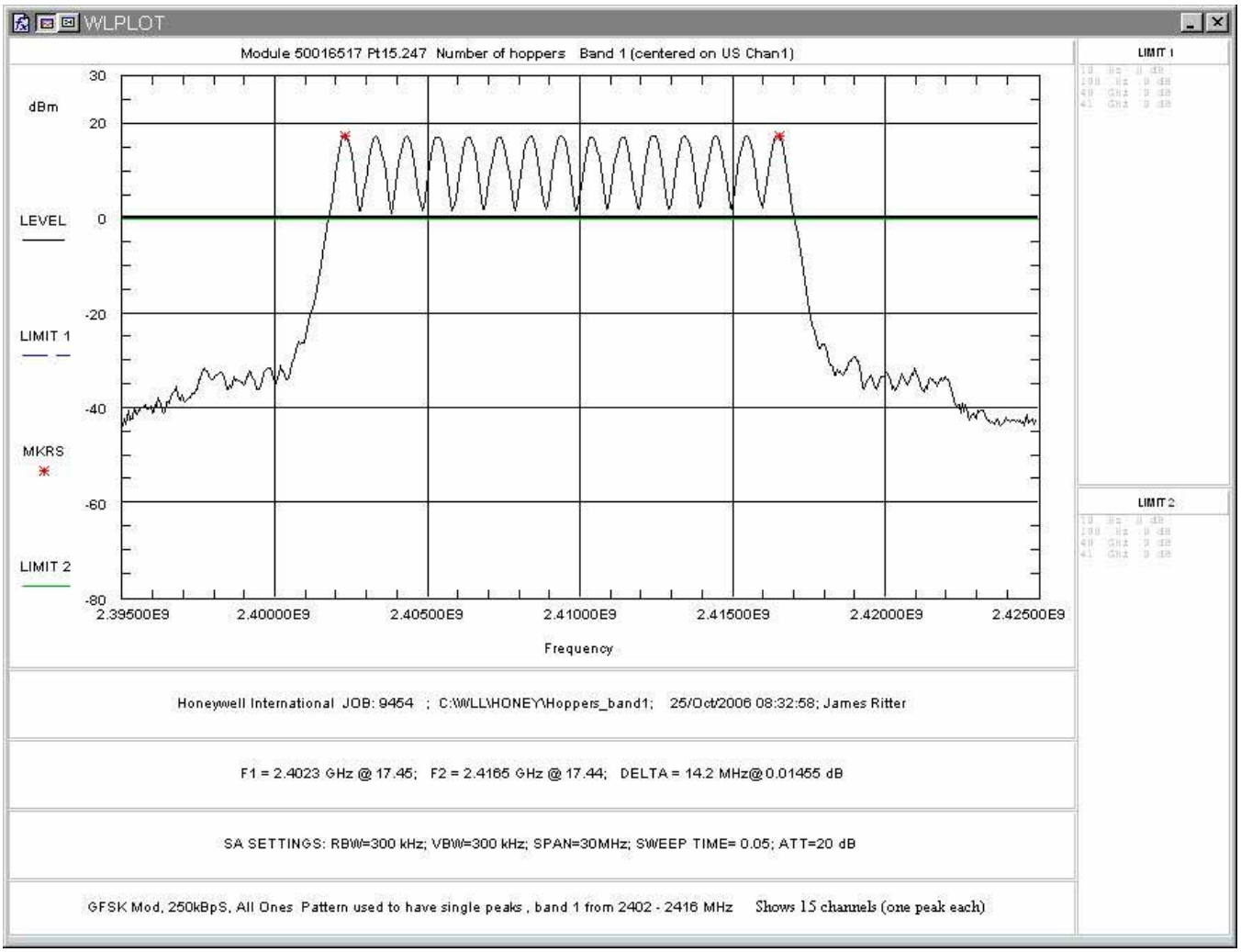

Figure 4-11: Channel Hopping, Band 1 Centered on Channel 1

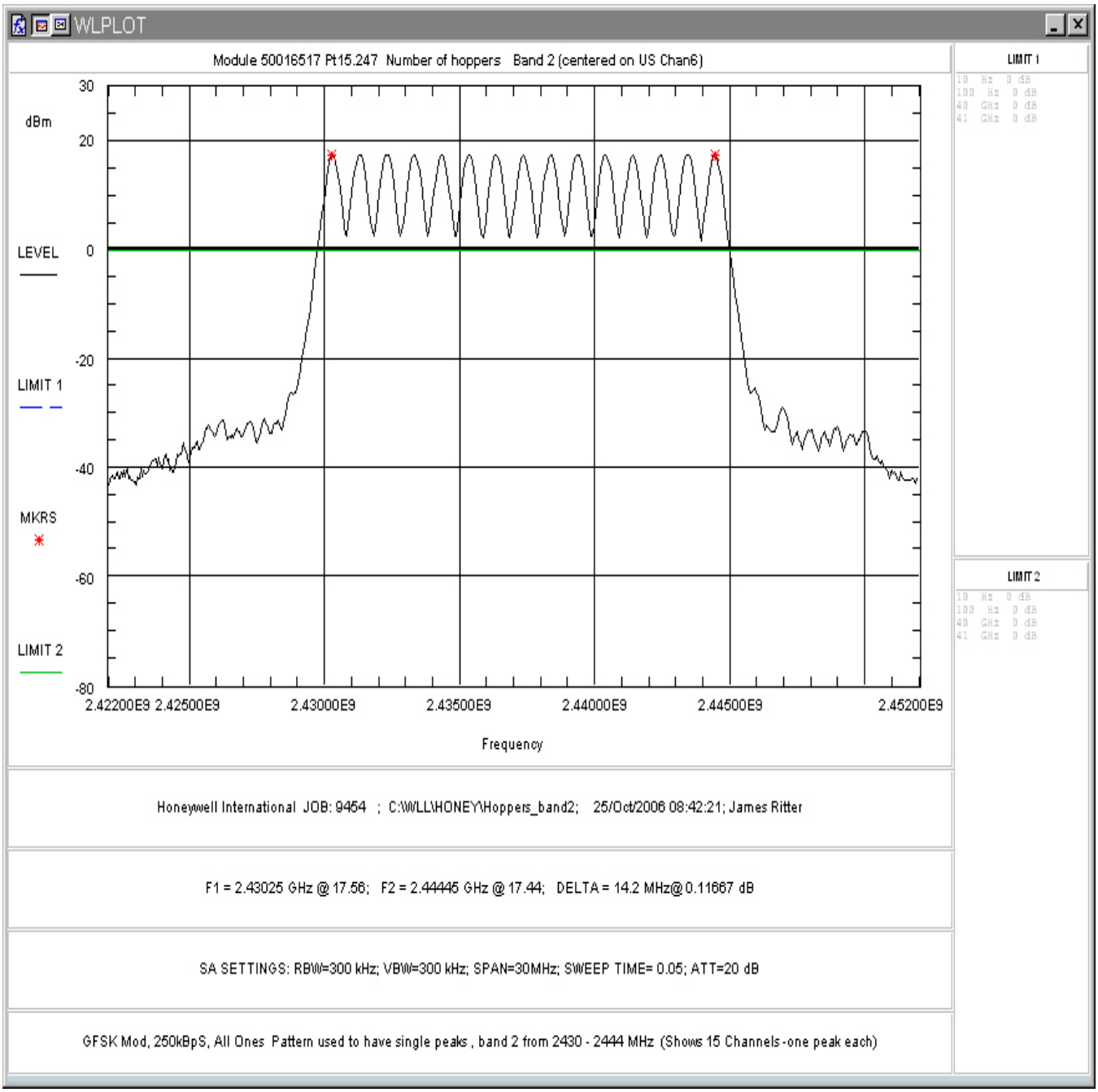

Figure 4-12: Channel Hopping, Band 2 Centered on Channel 6

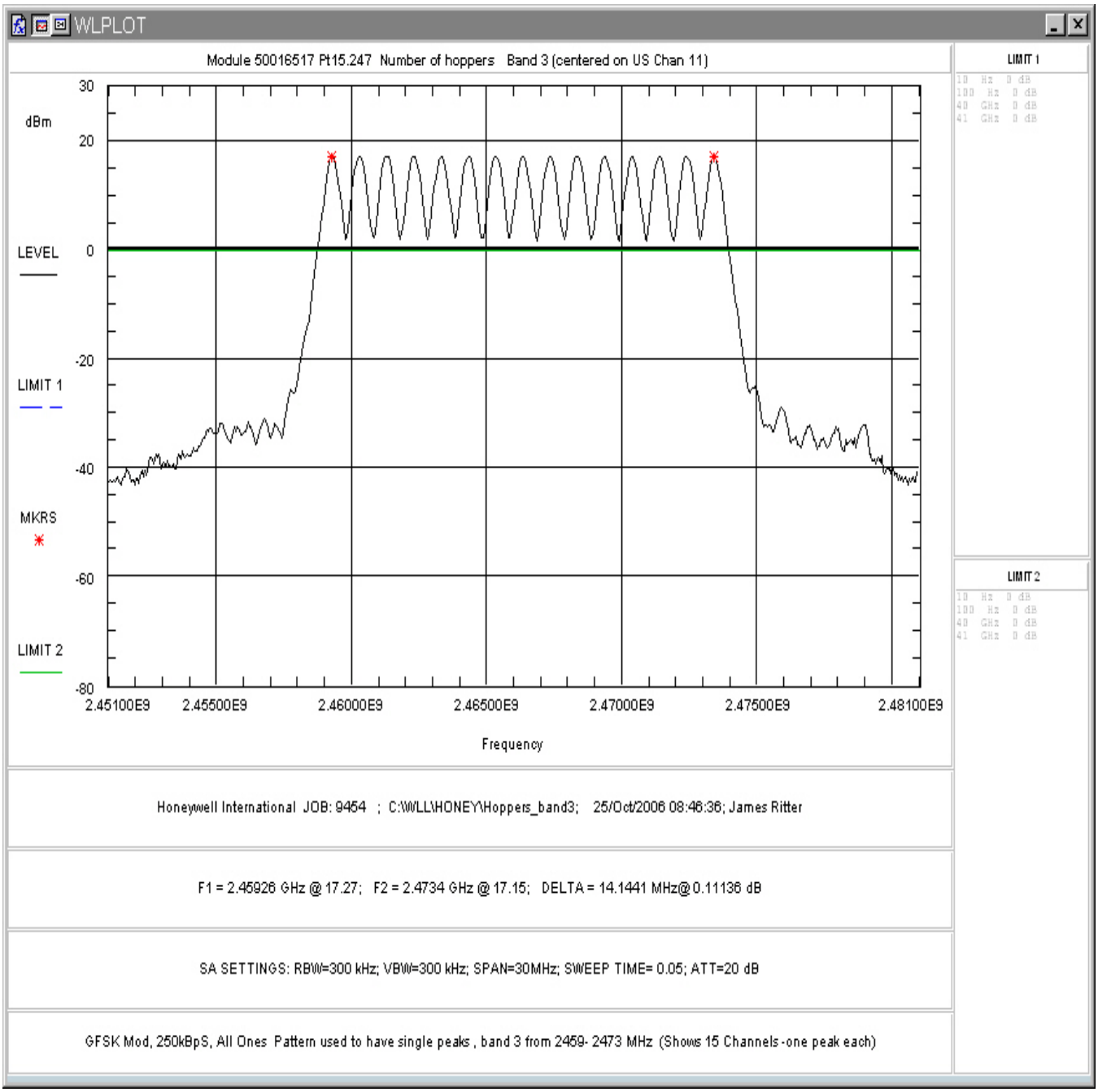

Figure 4-13: Channel Hopping, Band 3 Centered on Channel 1

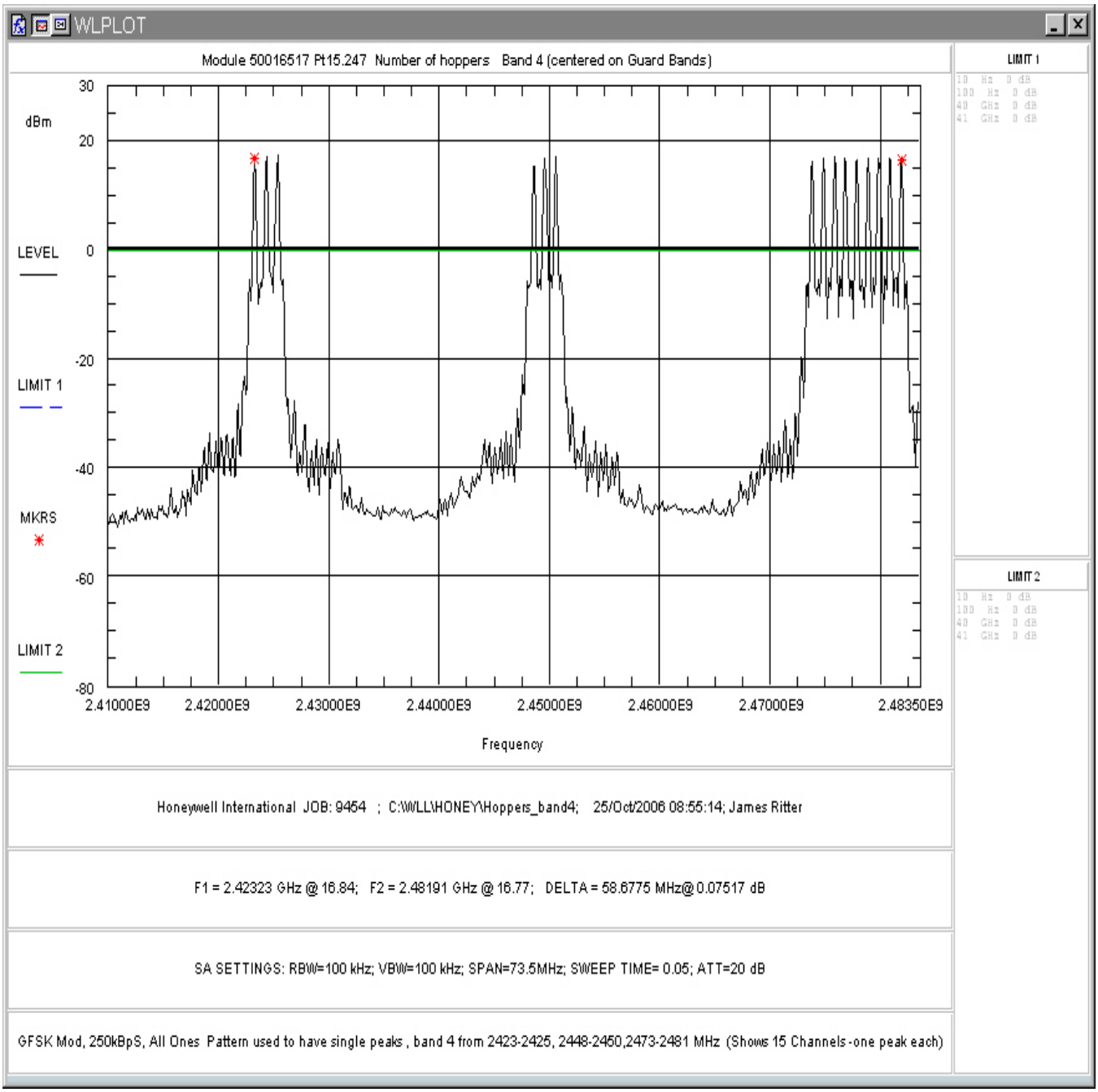

Figure 4-14: Channel Hopping, Band 4 Centered on Guard Bands

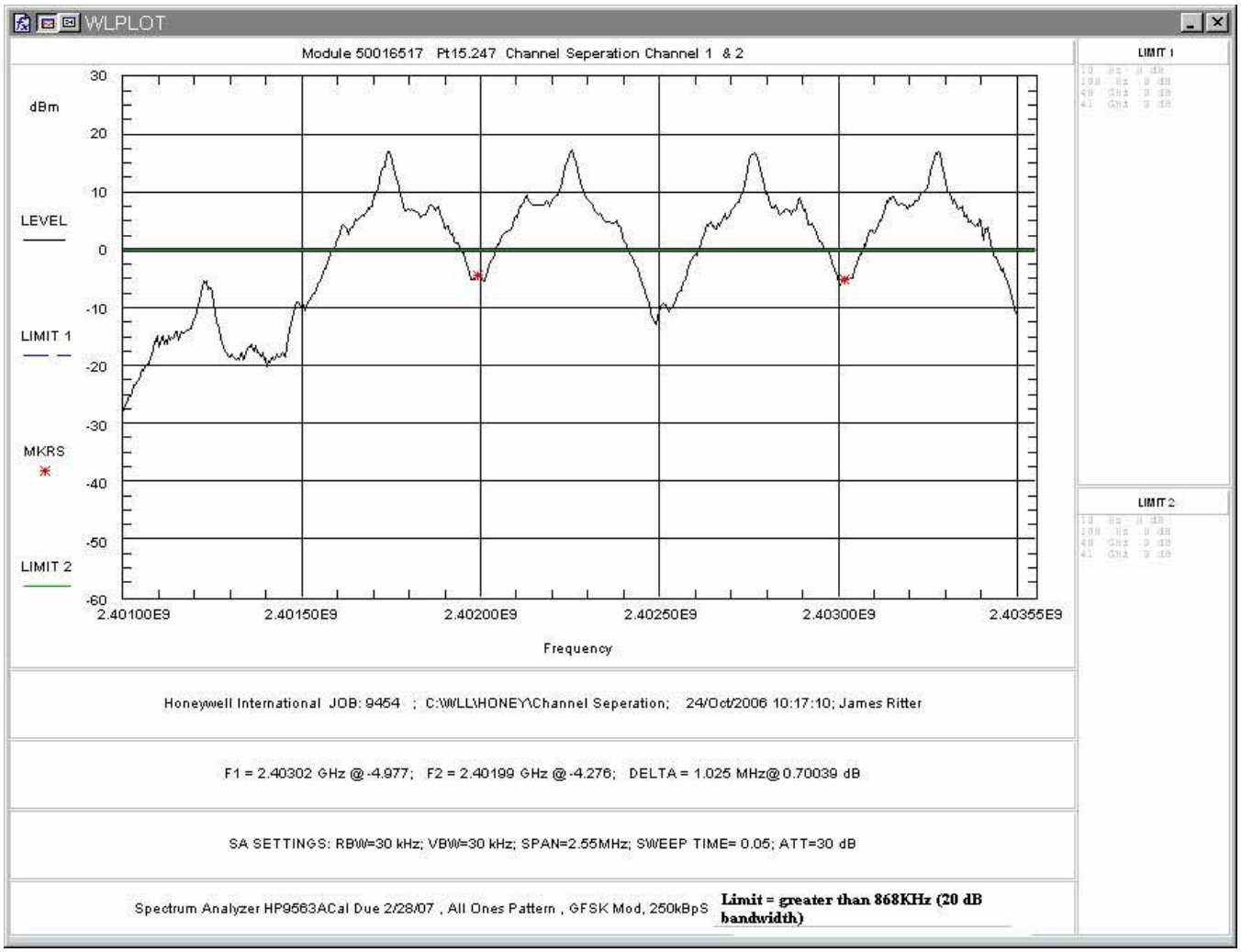

Figure 4-15: Channel Separation, Channel 1 & 2

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.

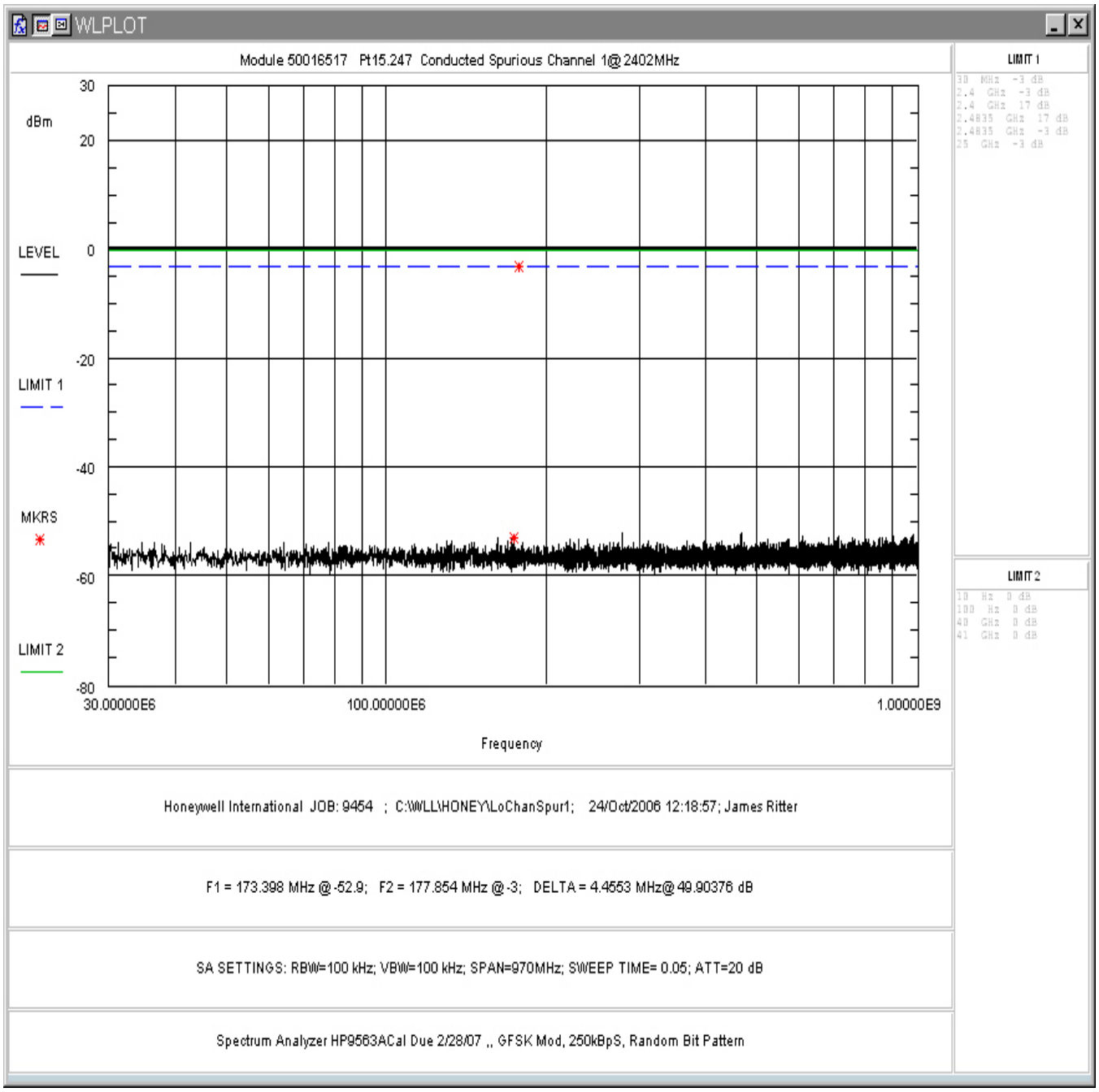

Figure 4-16: Conducted Spurious Emissions, Low Channel, 30 - 1000MHz

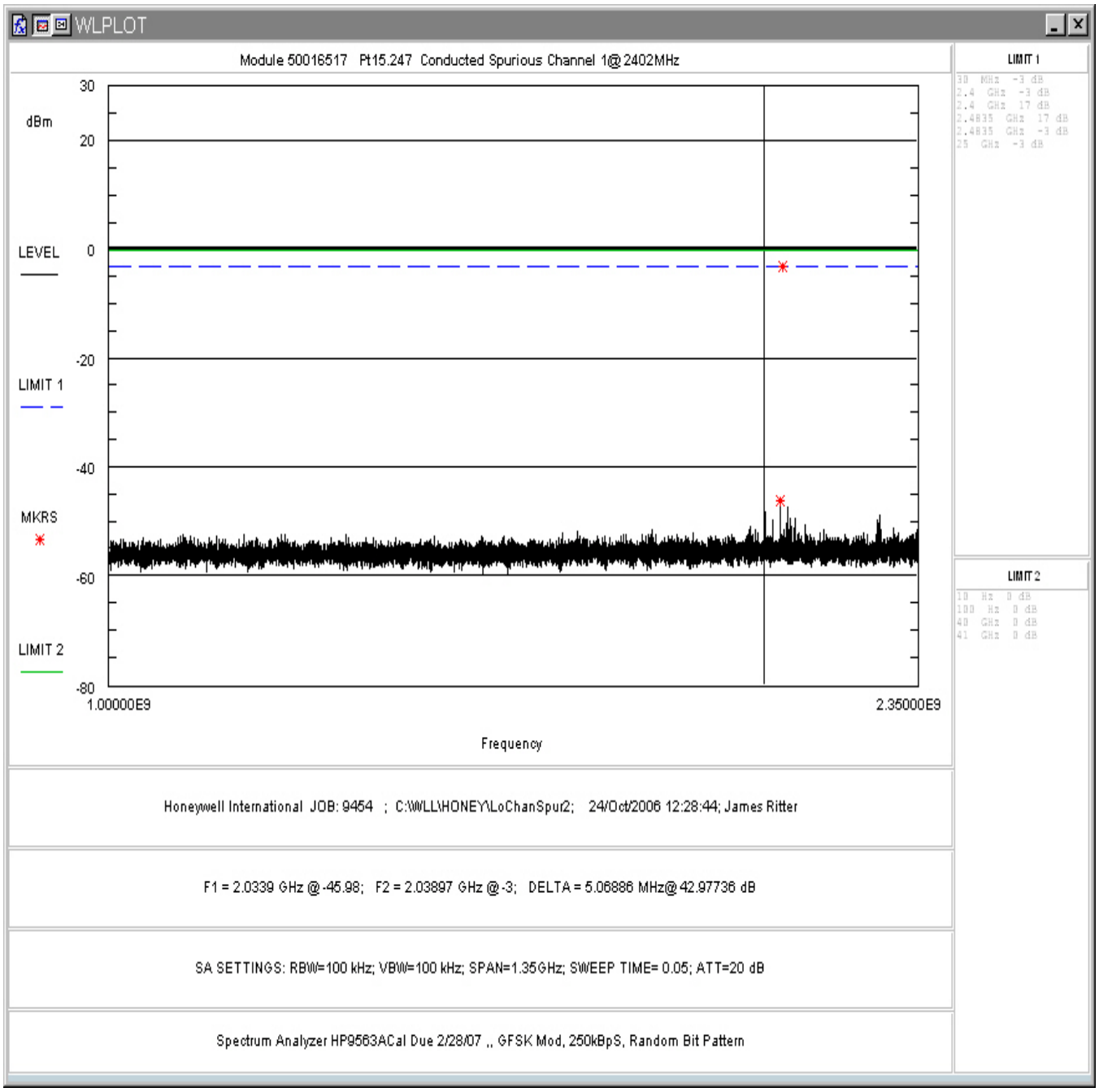

Figure 4-17: Conducted Spurious Emissions, Low Channel, 1 – 2.35GHz

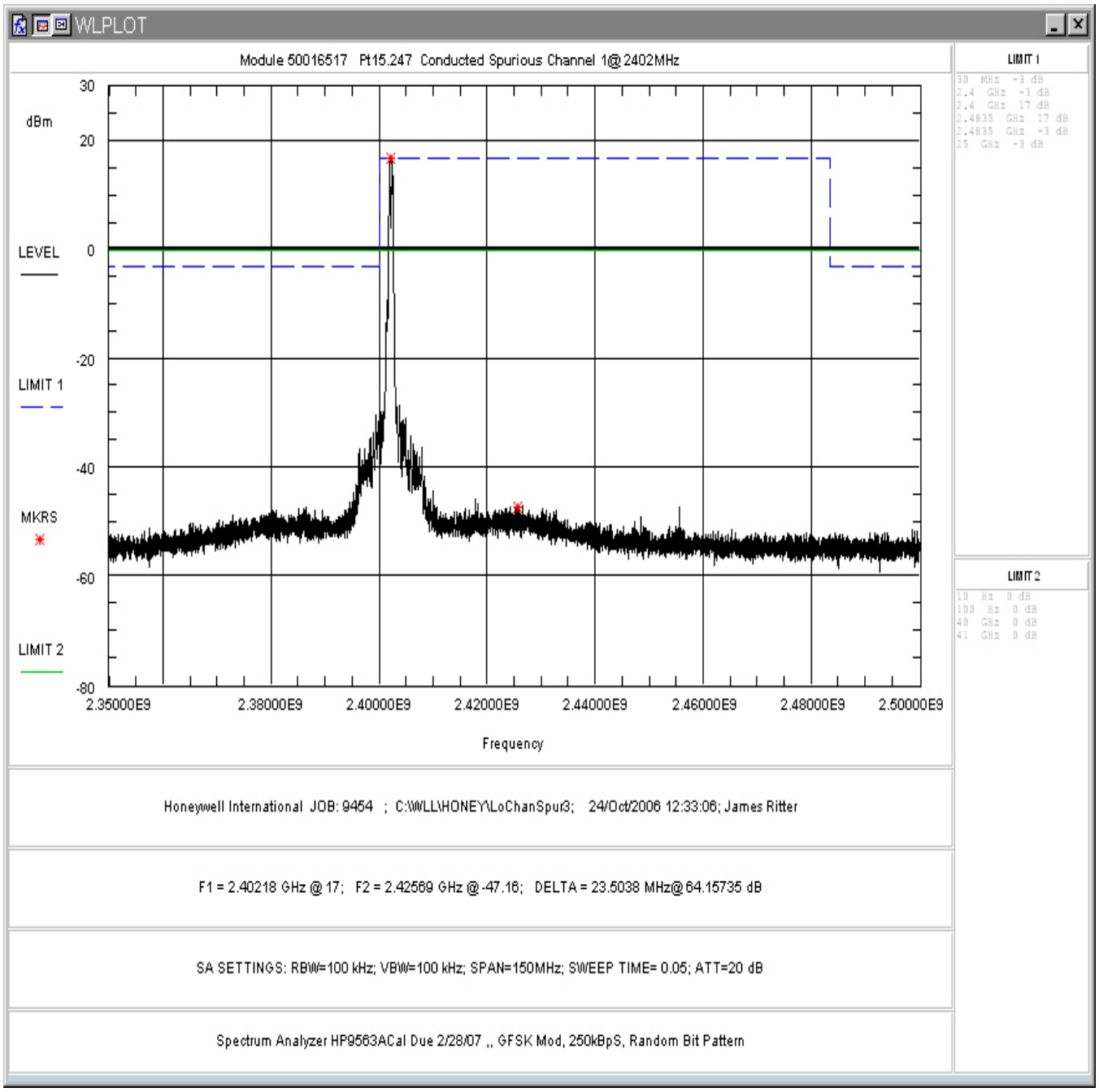

Figure 4-18: Conducted Spurious Emissions, Low Channel, 2.35 – 2.5GHz

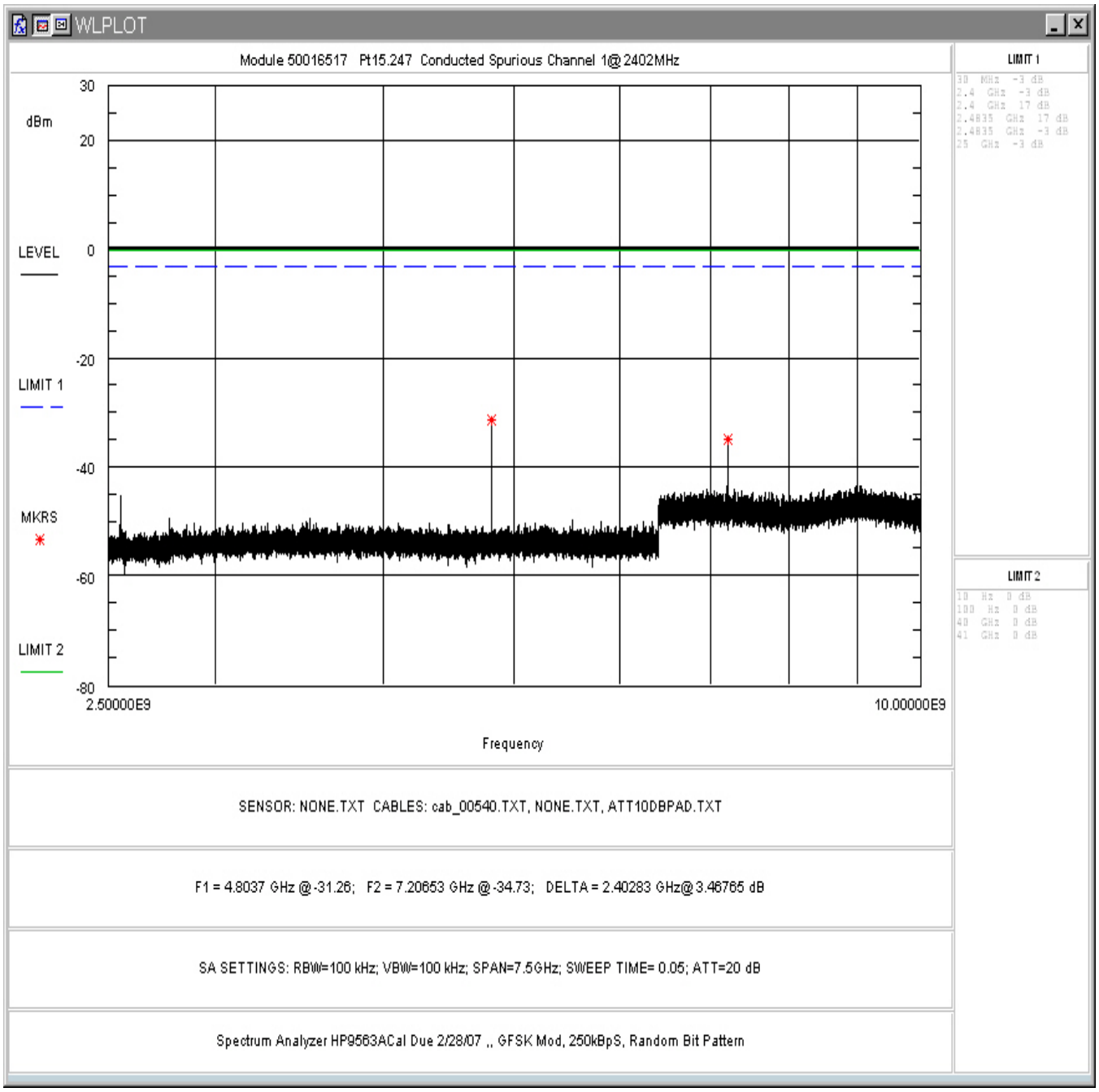

Figure 4-19: Conducted Spurious Emissions, Low Channel, 2.5 - 10GHz

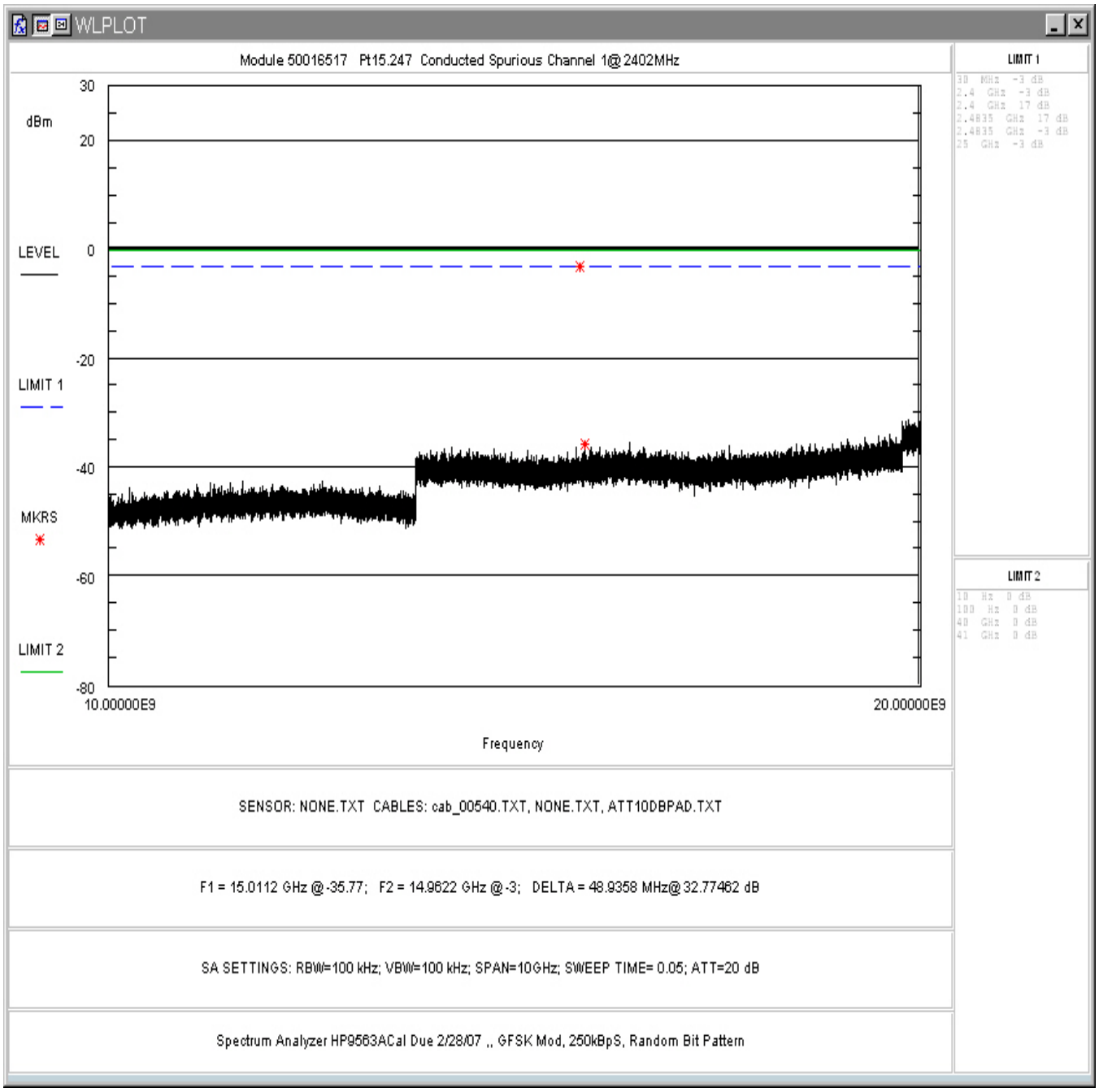

Figure 4-20: Conducted Spurious Emissions, Low Channel, 10 - 20GHz

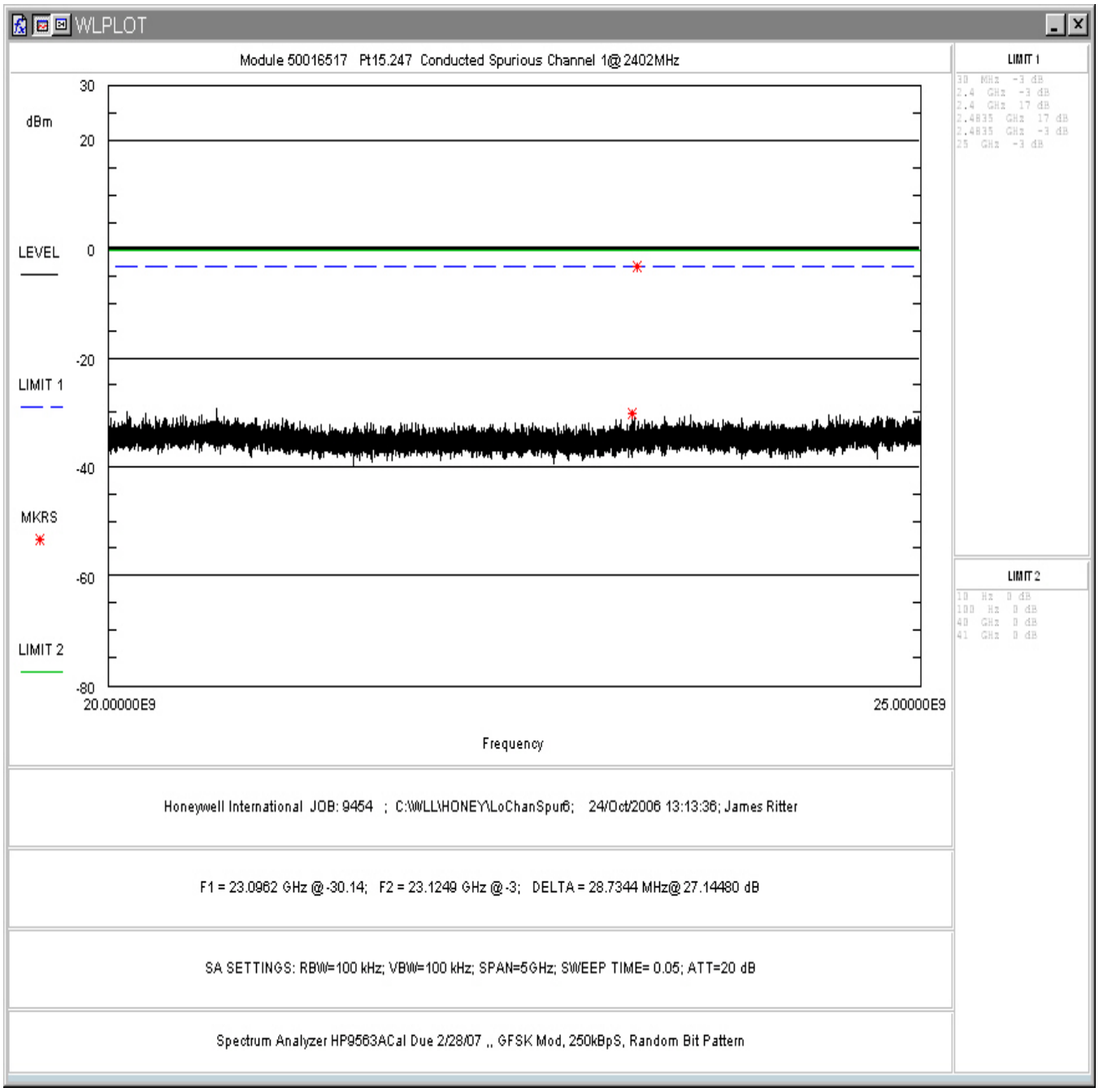

Figure 4-21: Conducted Spurious Emissions, Low Channel, 20 - 25GHz

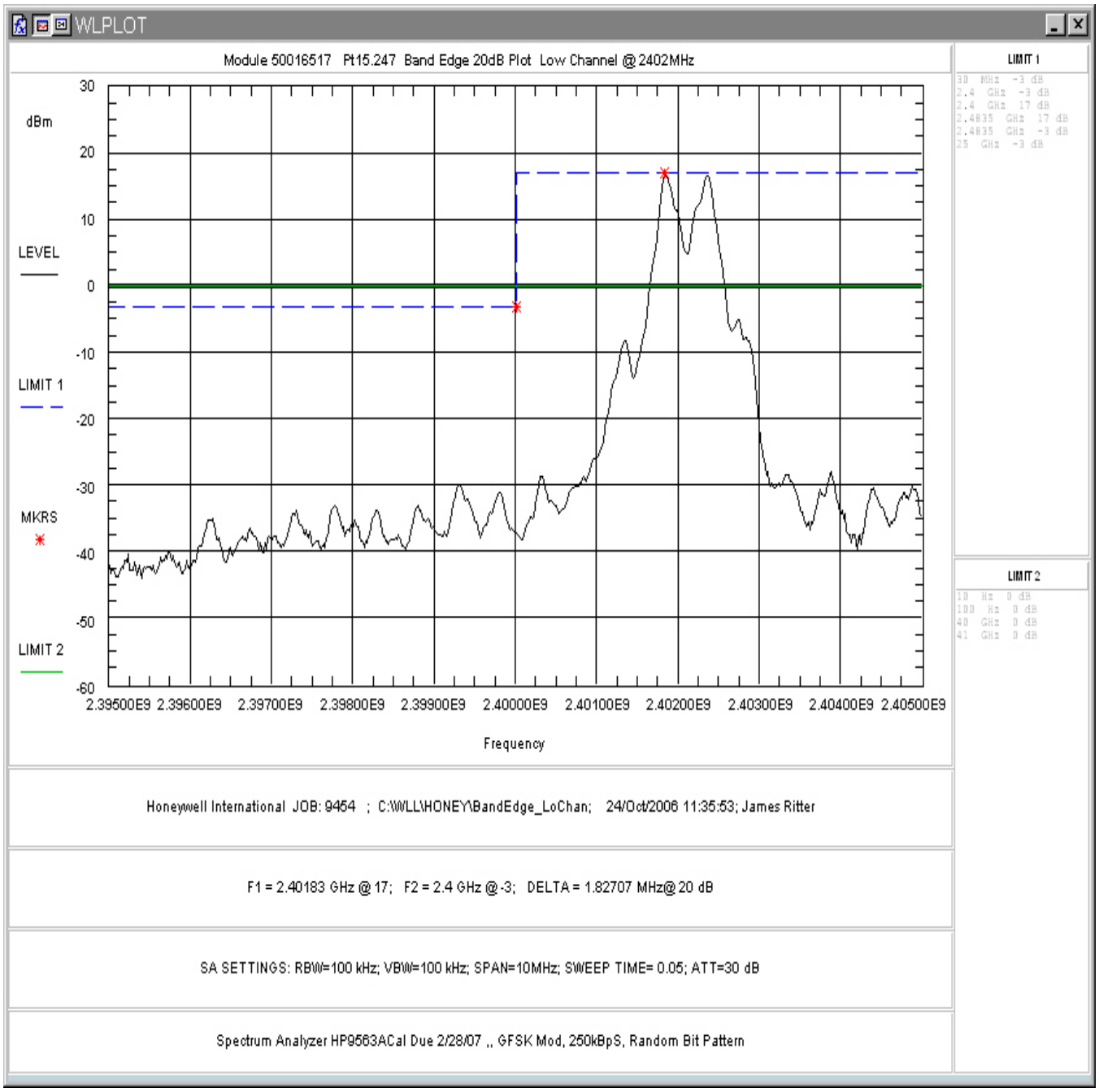

Figure 4-22: Band Edge, Low Channel

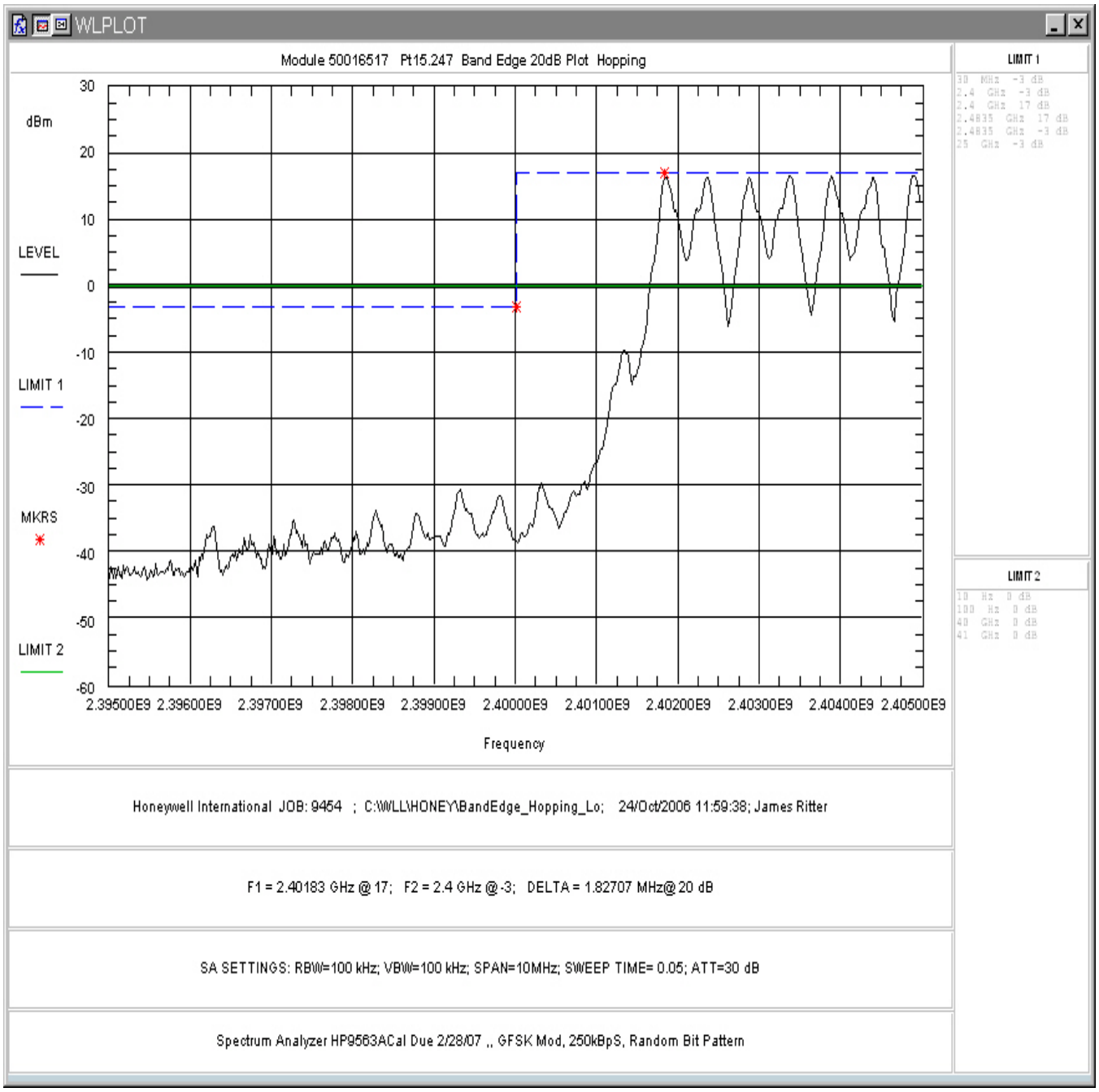

Figure 4-23: Band Edge, Low Channel Hopping Mode

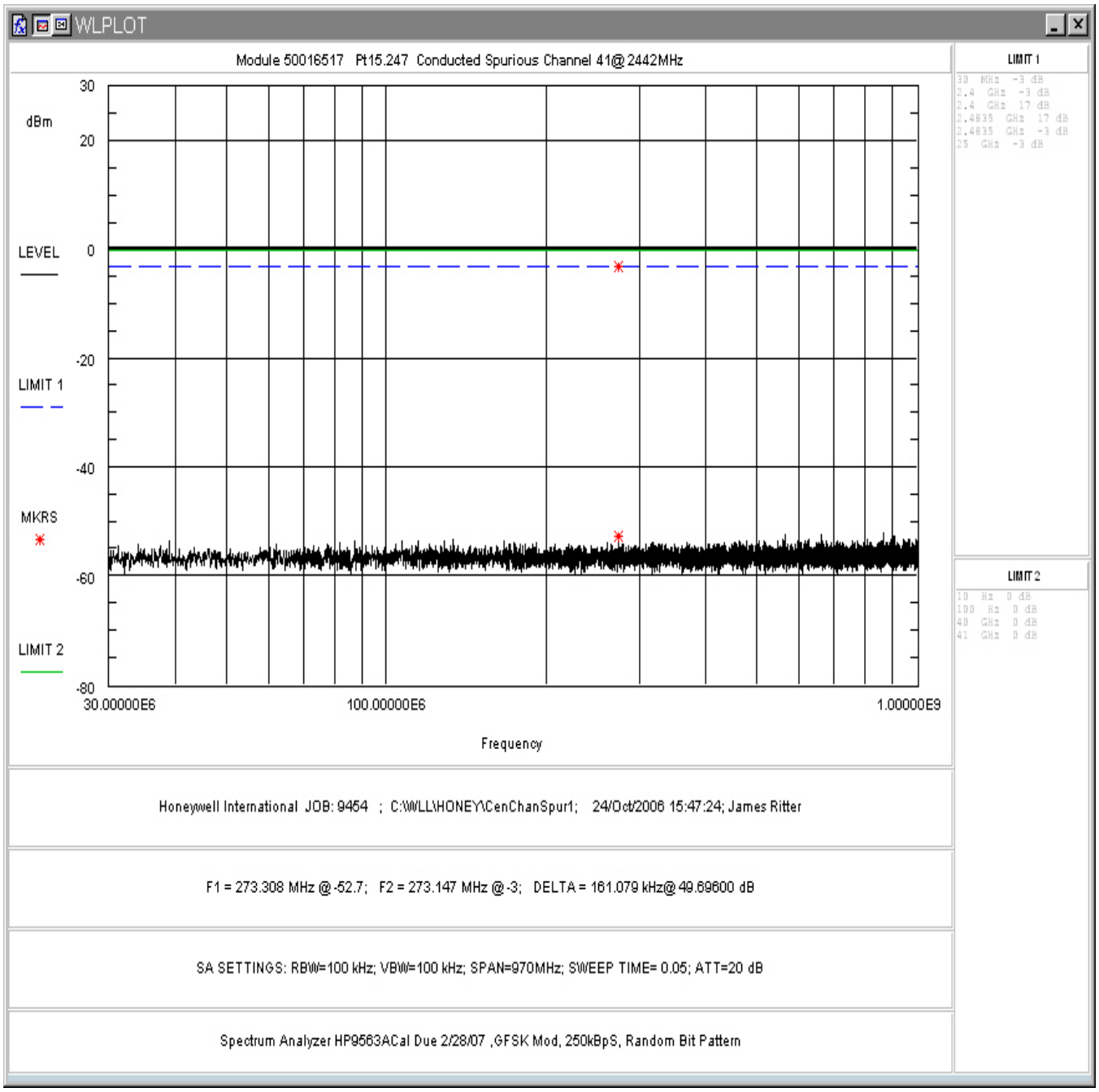

Figure 4-24: Conducted Spurious Emissions, Mid Channel, 30 - 1000MHz

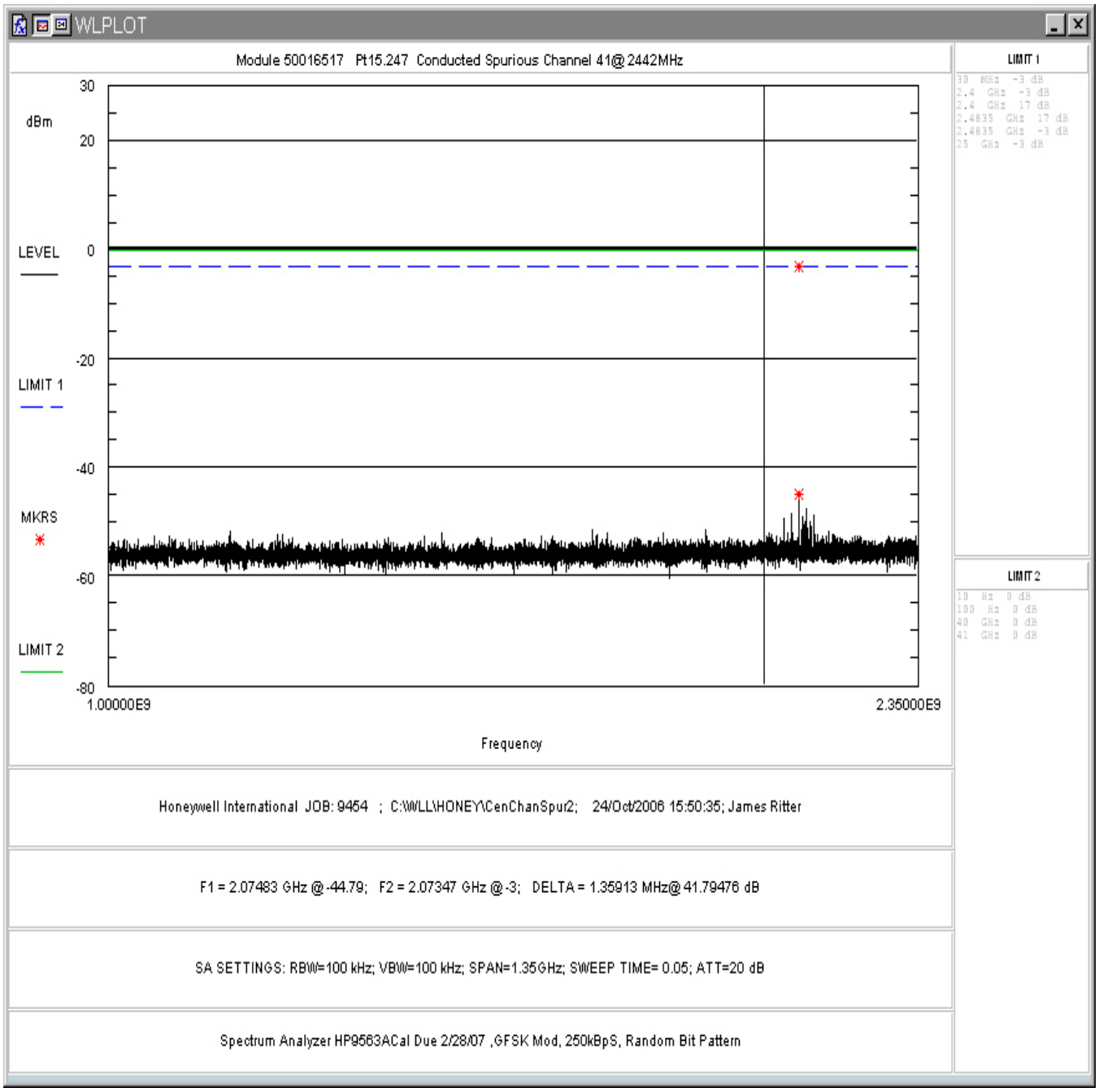

Figure 4-25: Conducted Spurious Emissions, Mid Channel, 1 – 2.35GHz

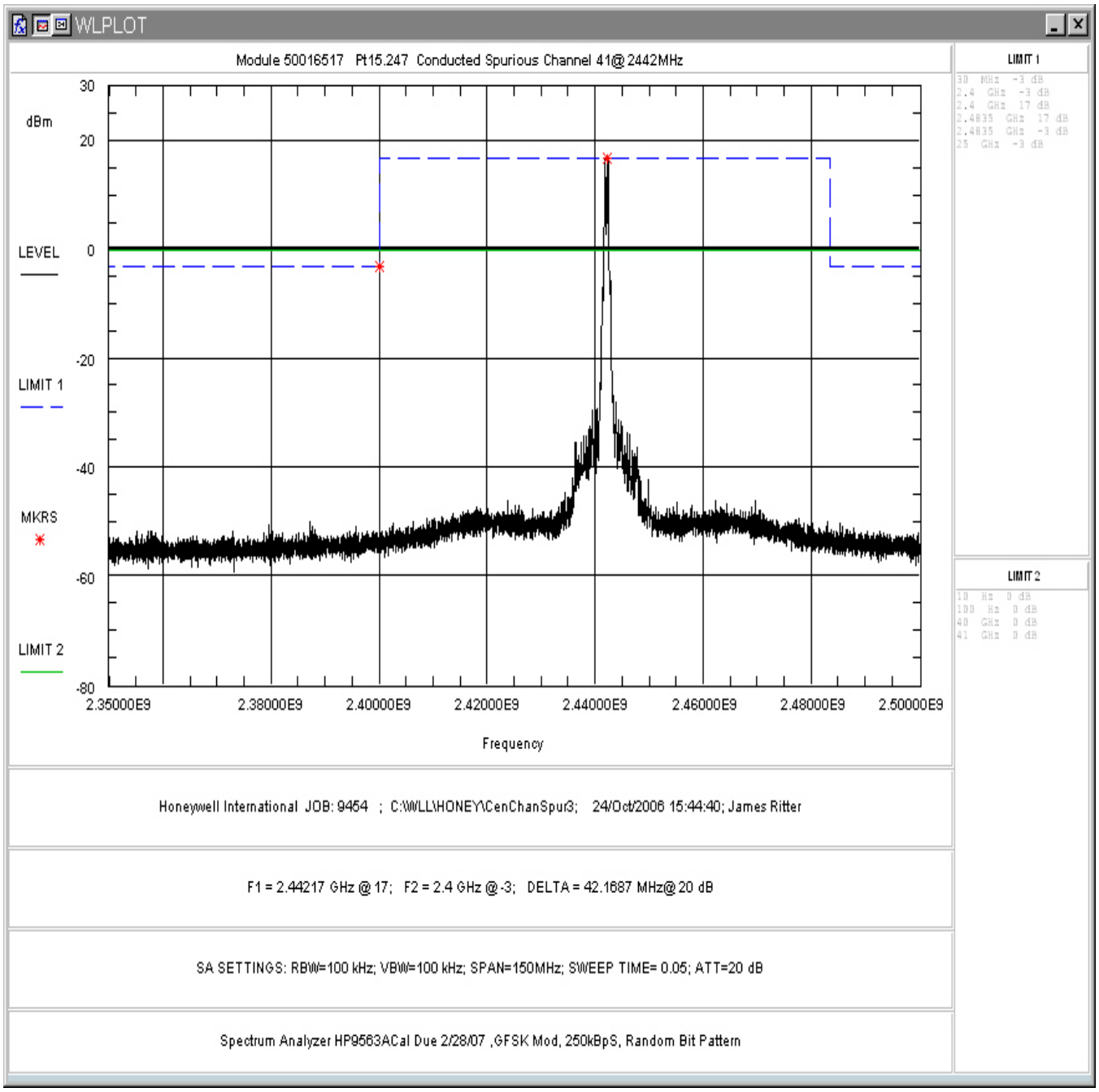

Figure 4-26: Conducted Spurious Emissions, Mid Channel, 2.35 – 2.5GHz

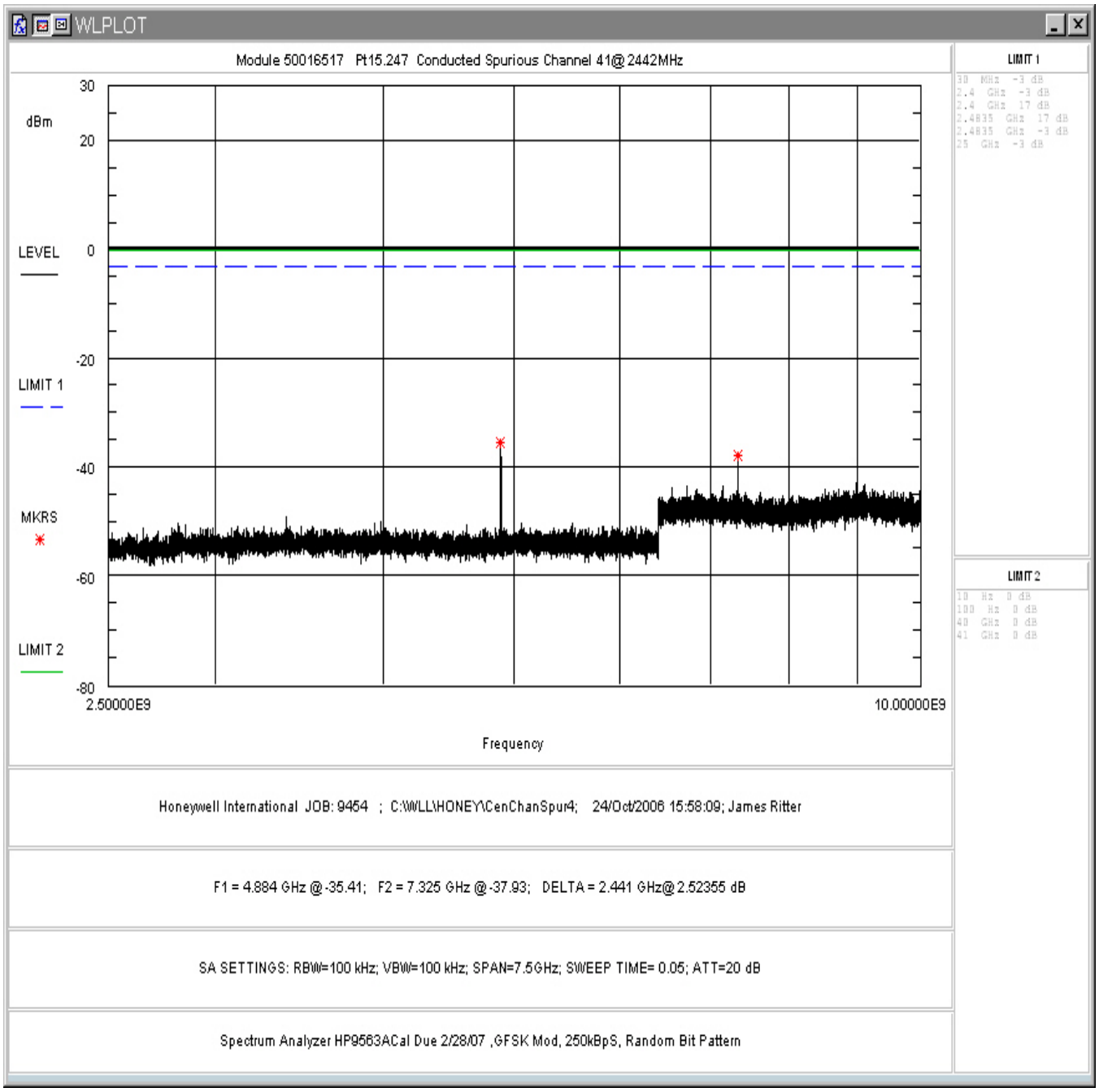

Figure 4-27: Conducted Spurious Emissions, Mid Channel, 2.5 - 10GHz

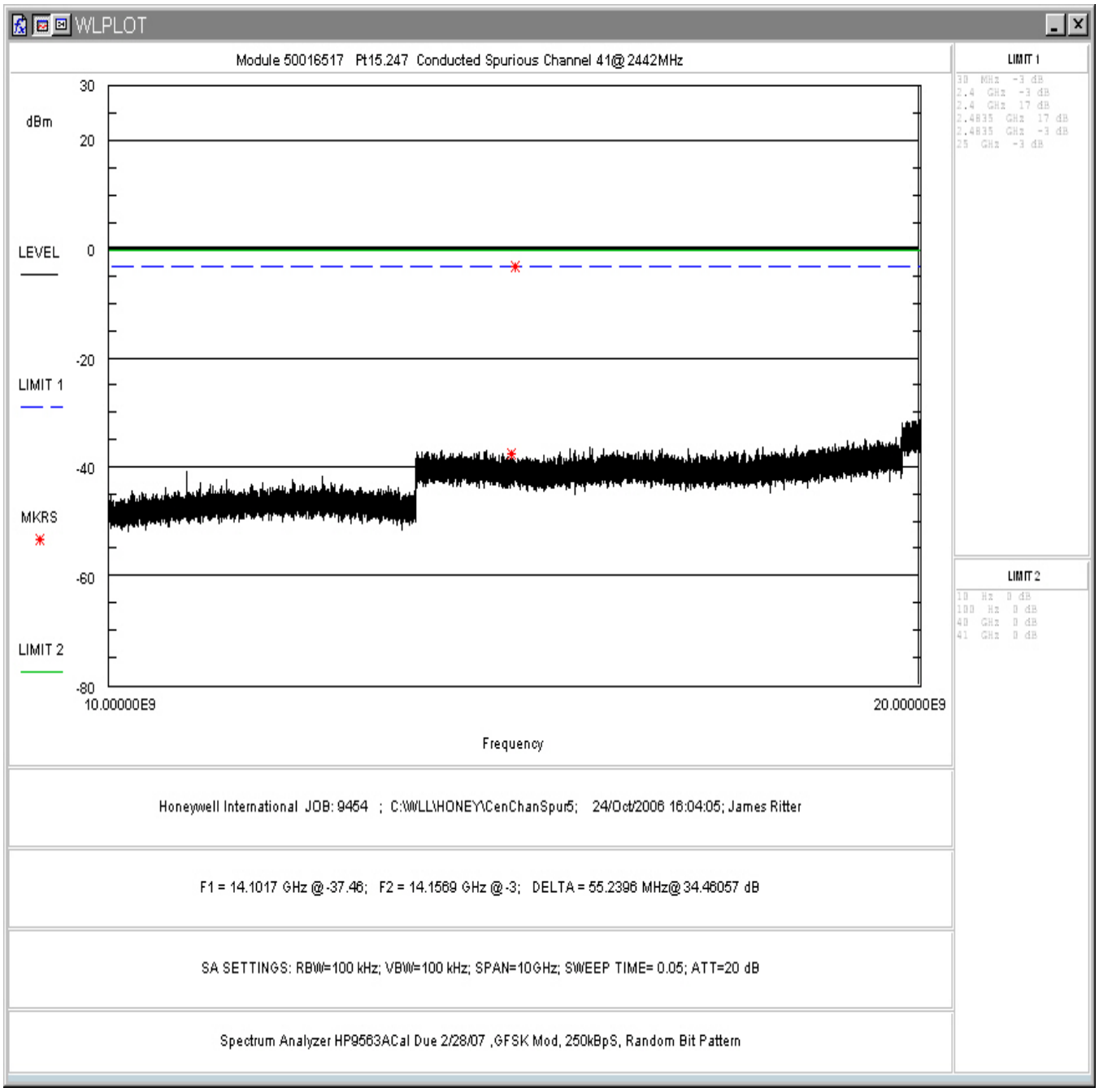

Figure 4-28: Conducted Spurious Emissions, Mid Channel, 10 - 20GHz

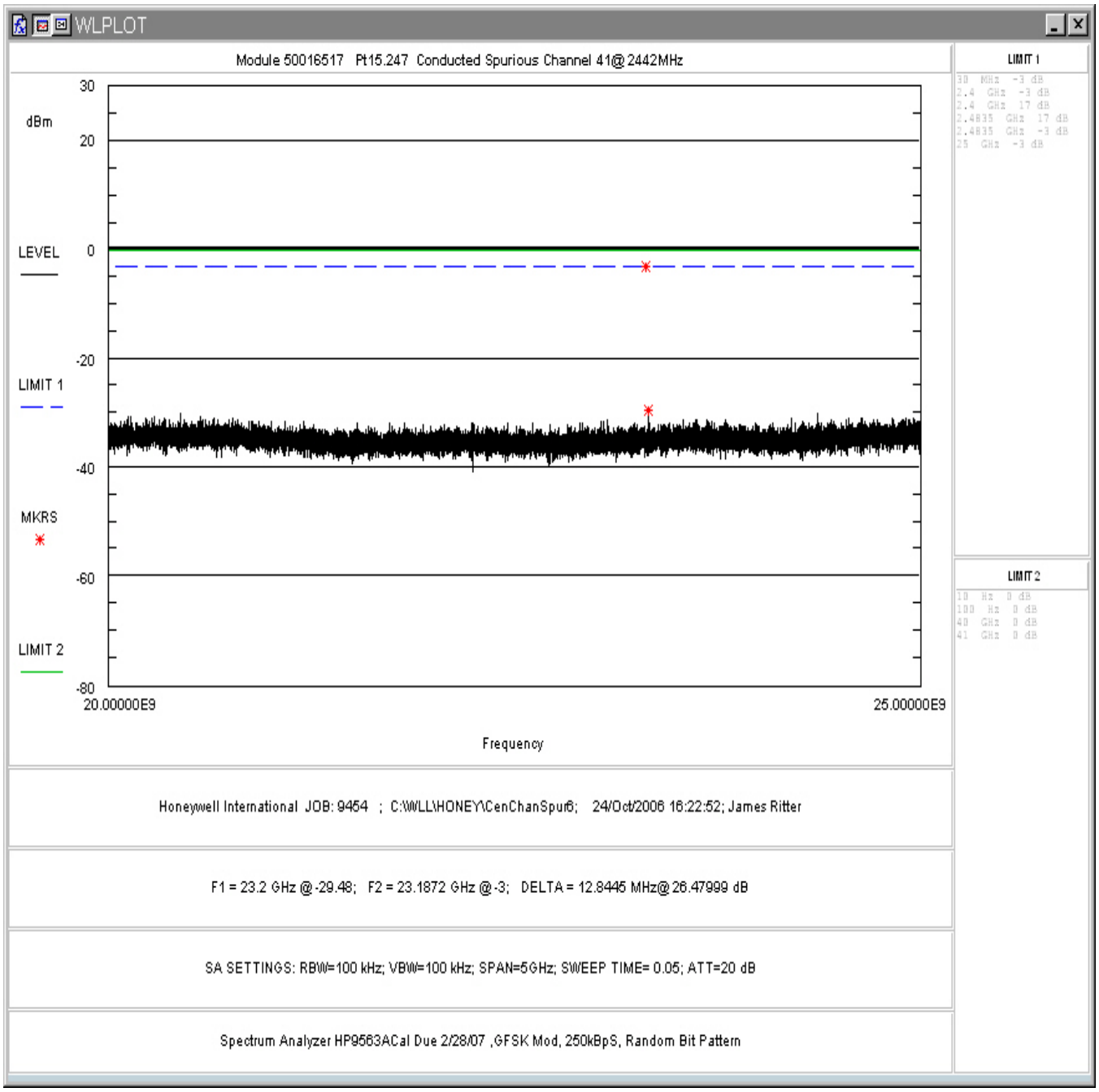

Figure 4-29: Conducted Spurious Emissions, Mid Channel, 20 - 25GHz

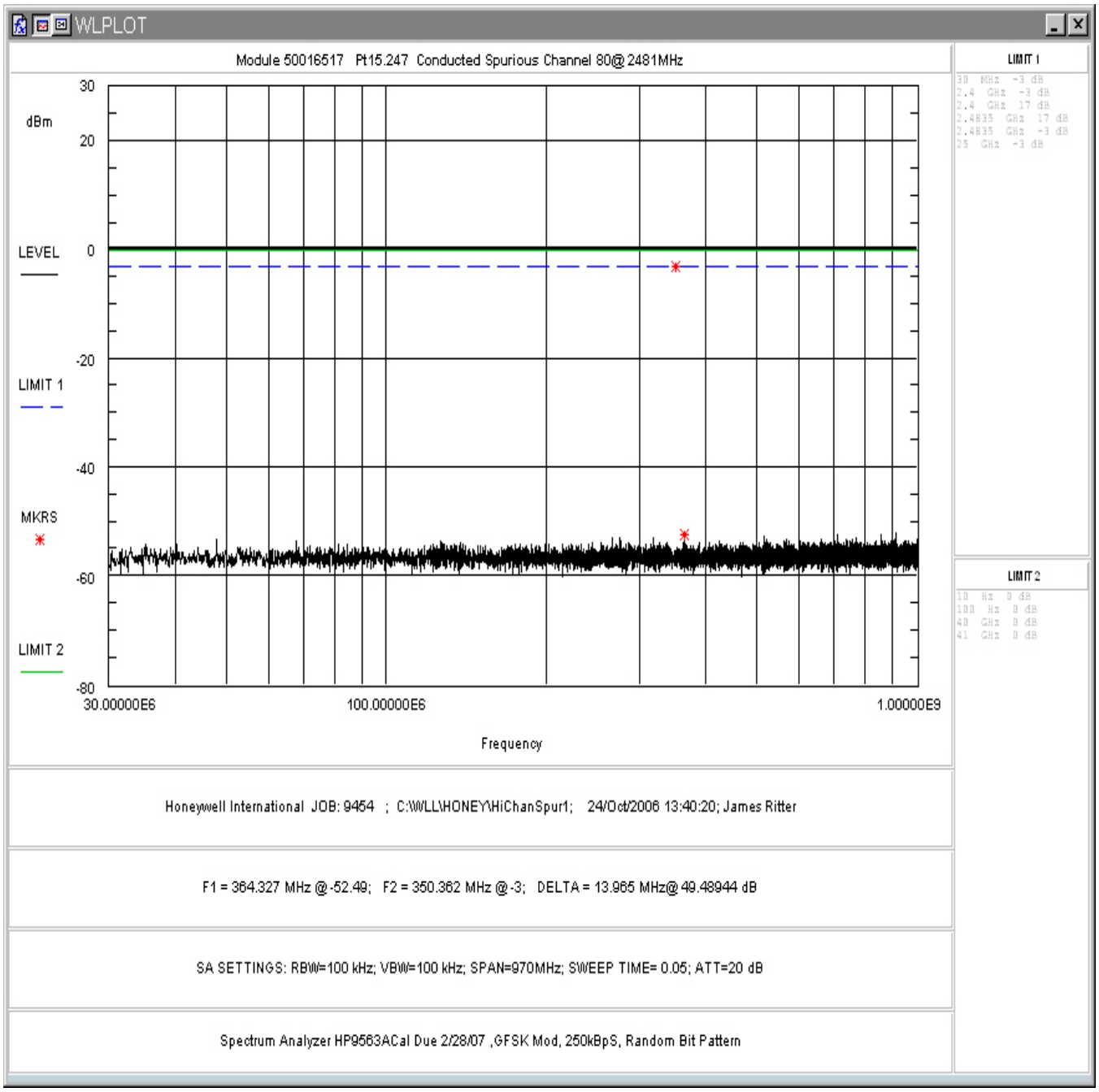

Figure 4-30: Conducted Spurious Emissions, High Channel, 30 - 1000MHz

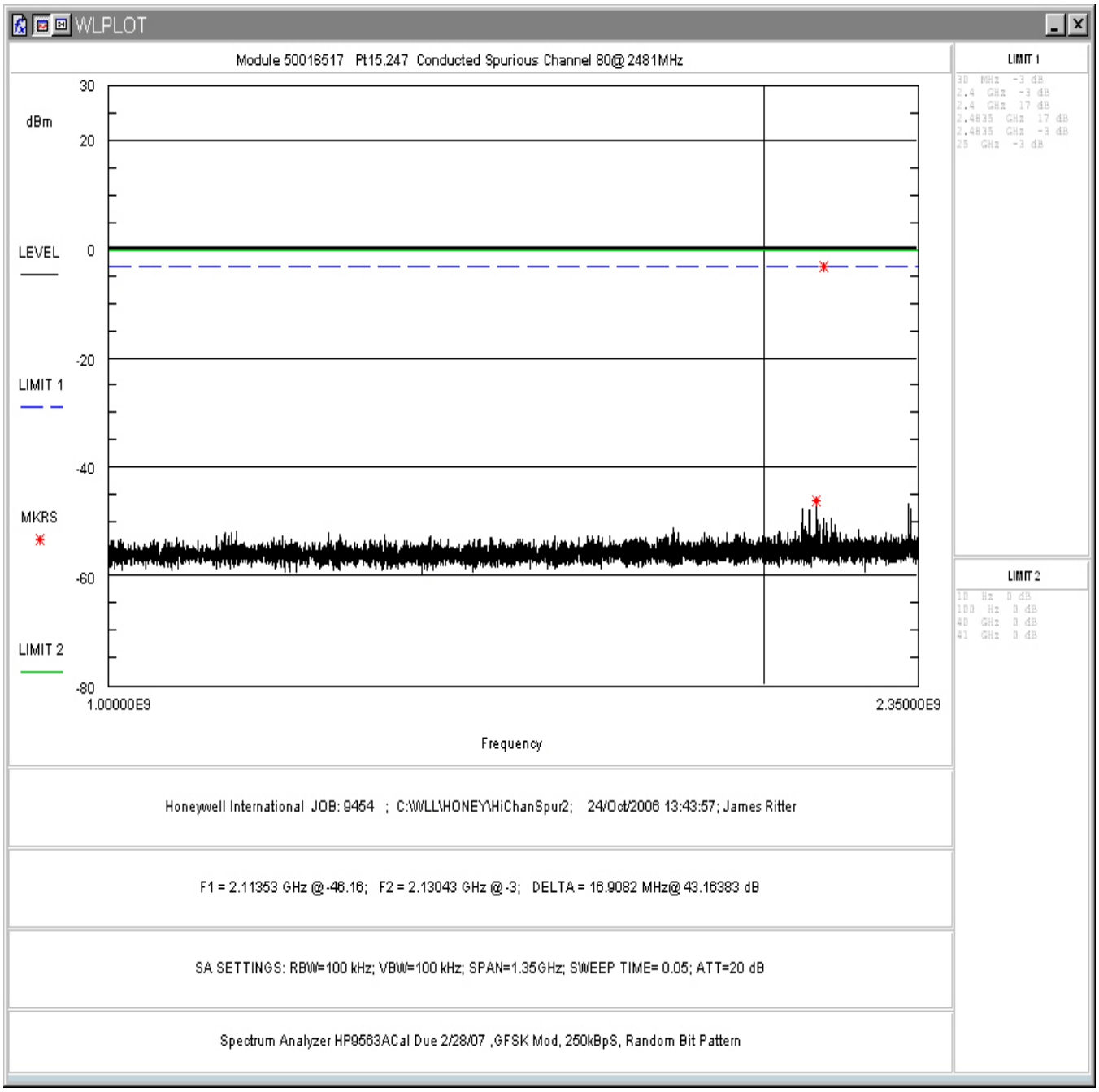

Figure 4-31: Conducted Spurious Emissions, High Channel, 1 – 2.35GHz

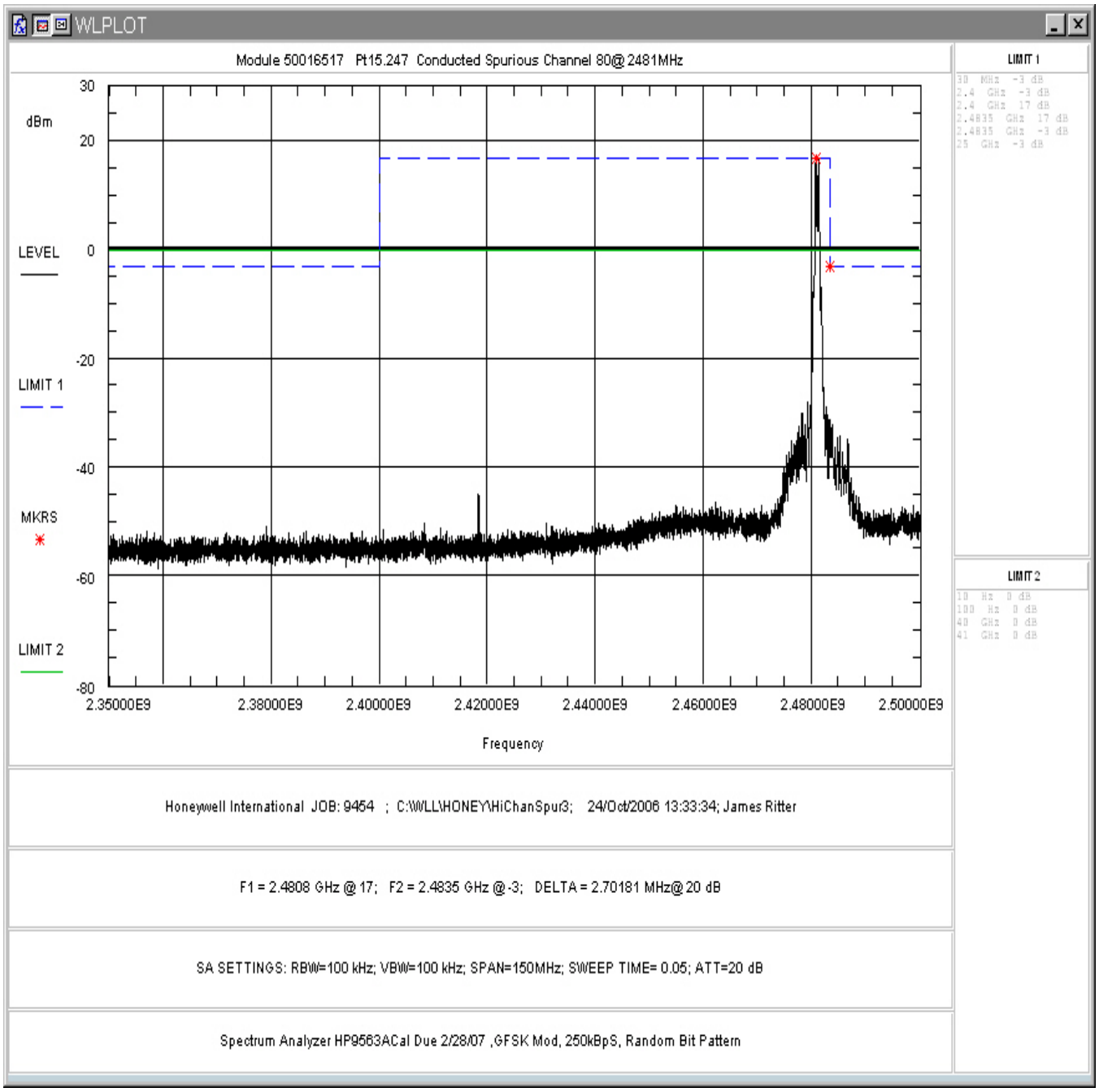

Figure 4-32: Conducted Spurious Emissions, High Channel, 2.35 – 2.5GHz

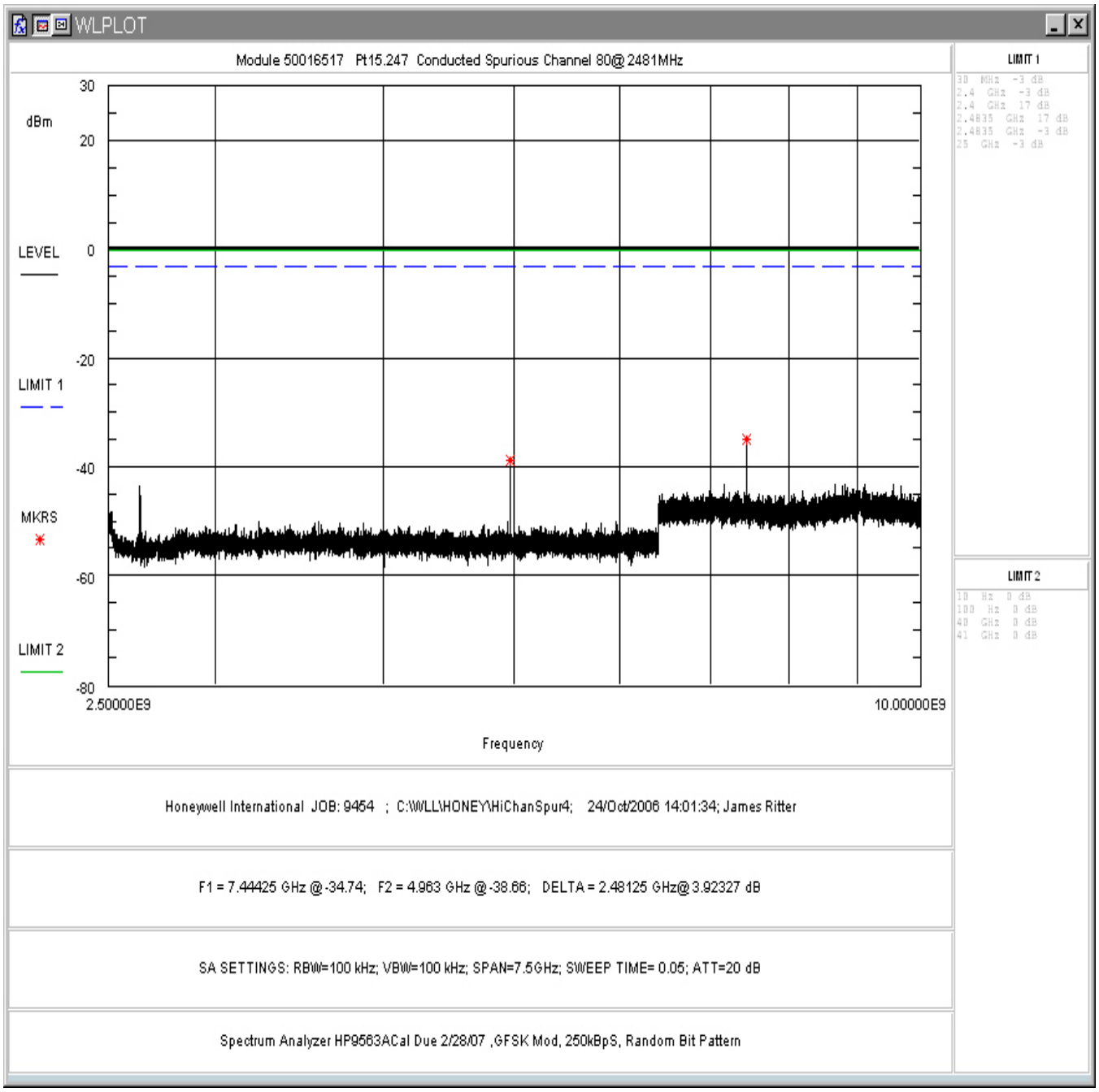

Figure 4-33: Conducted Spurious Emissions, High Channel, 2.5 - 10GHz

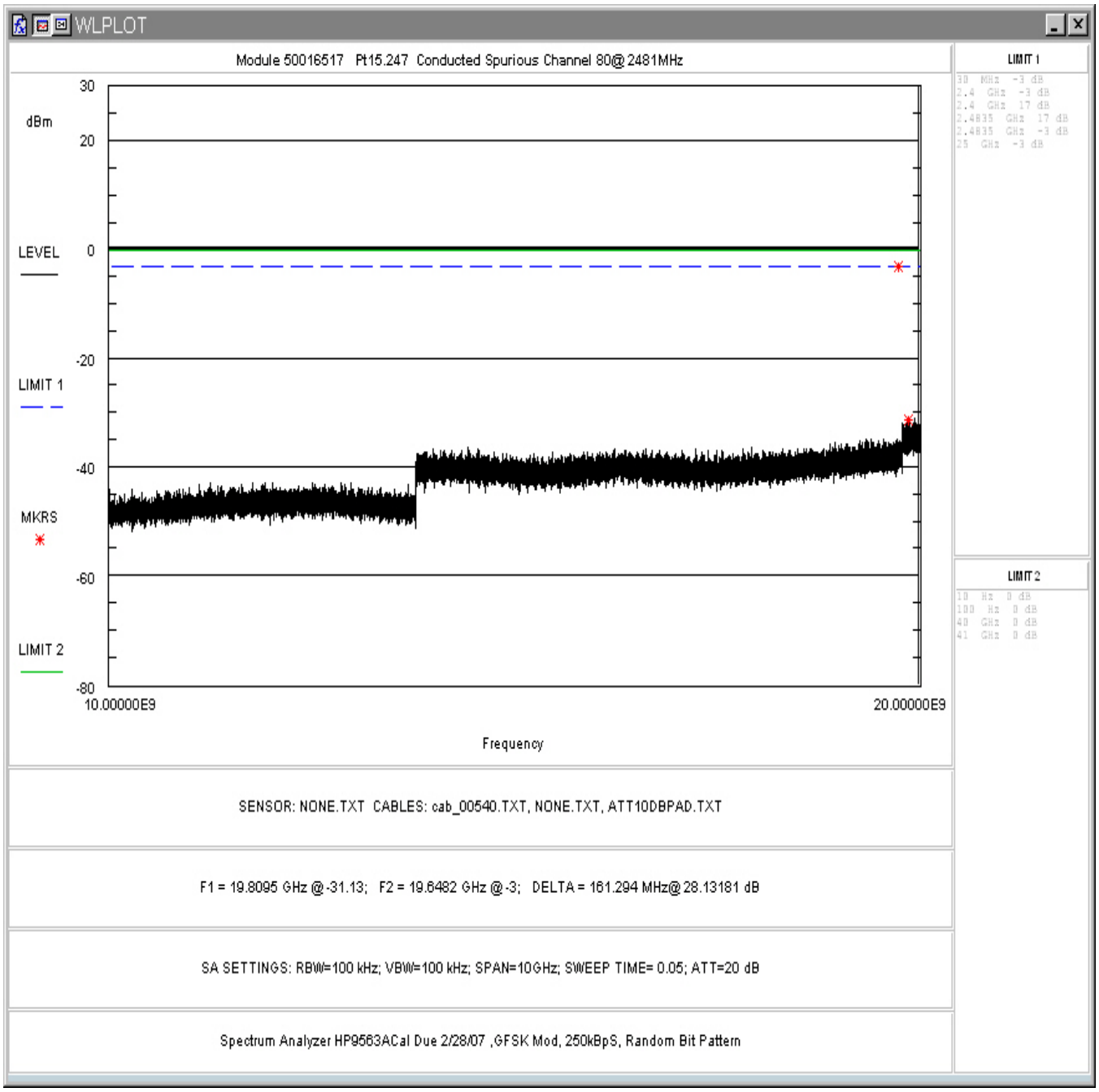

Figure 4-34: Conducted Spurious Emissions, High Channel, 10 - 20GHz

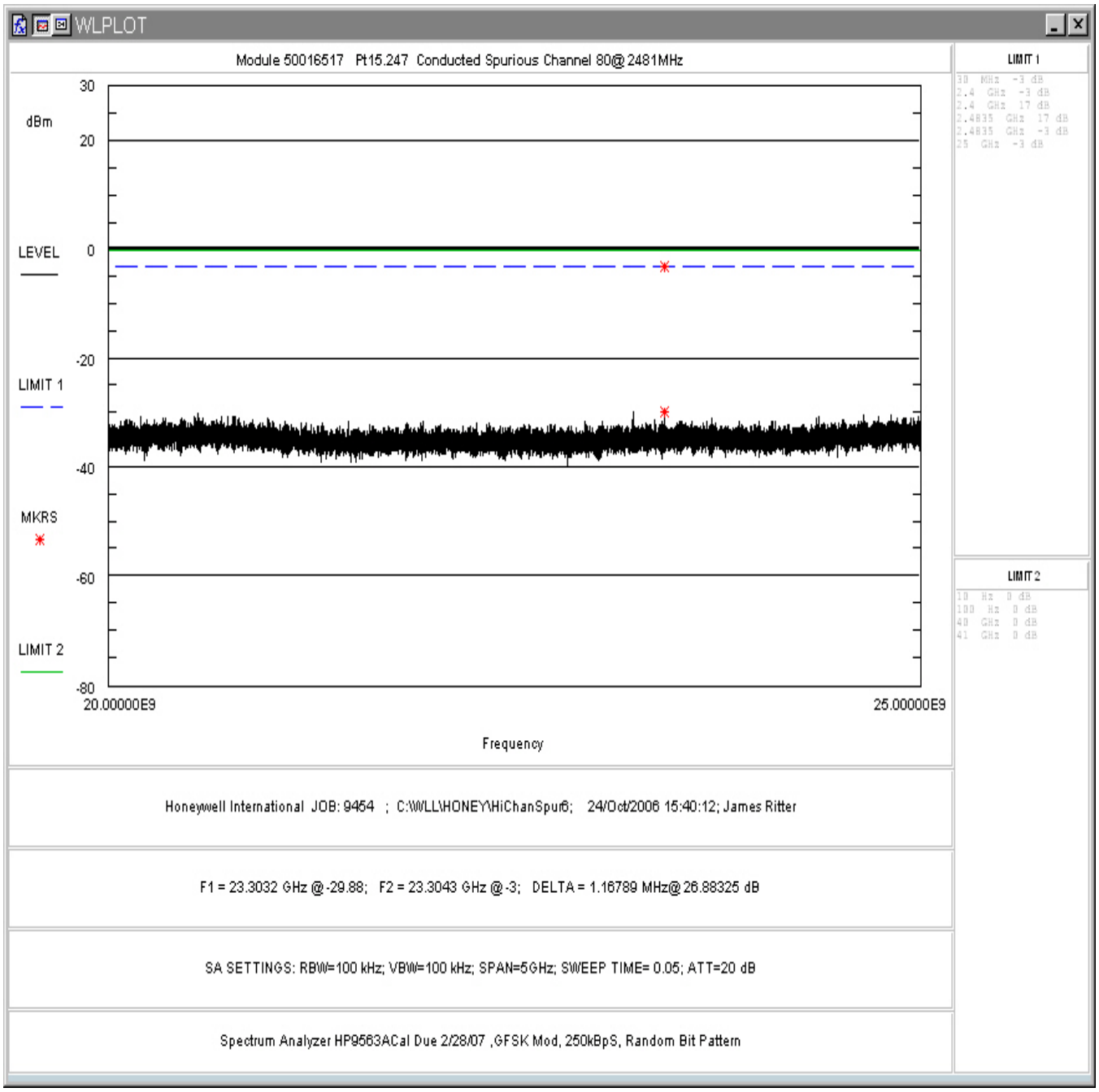

Figure 4-35: Conducted Spurious Emissions, High Channel, 20 - 25GHz

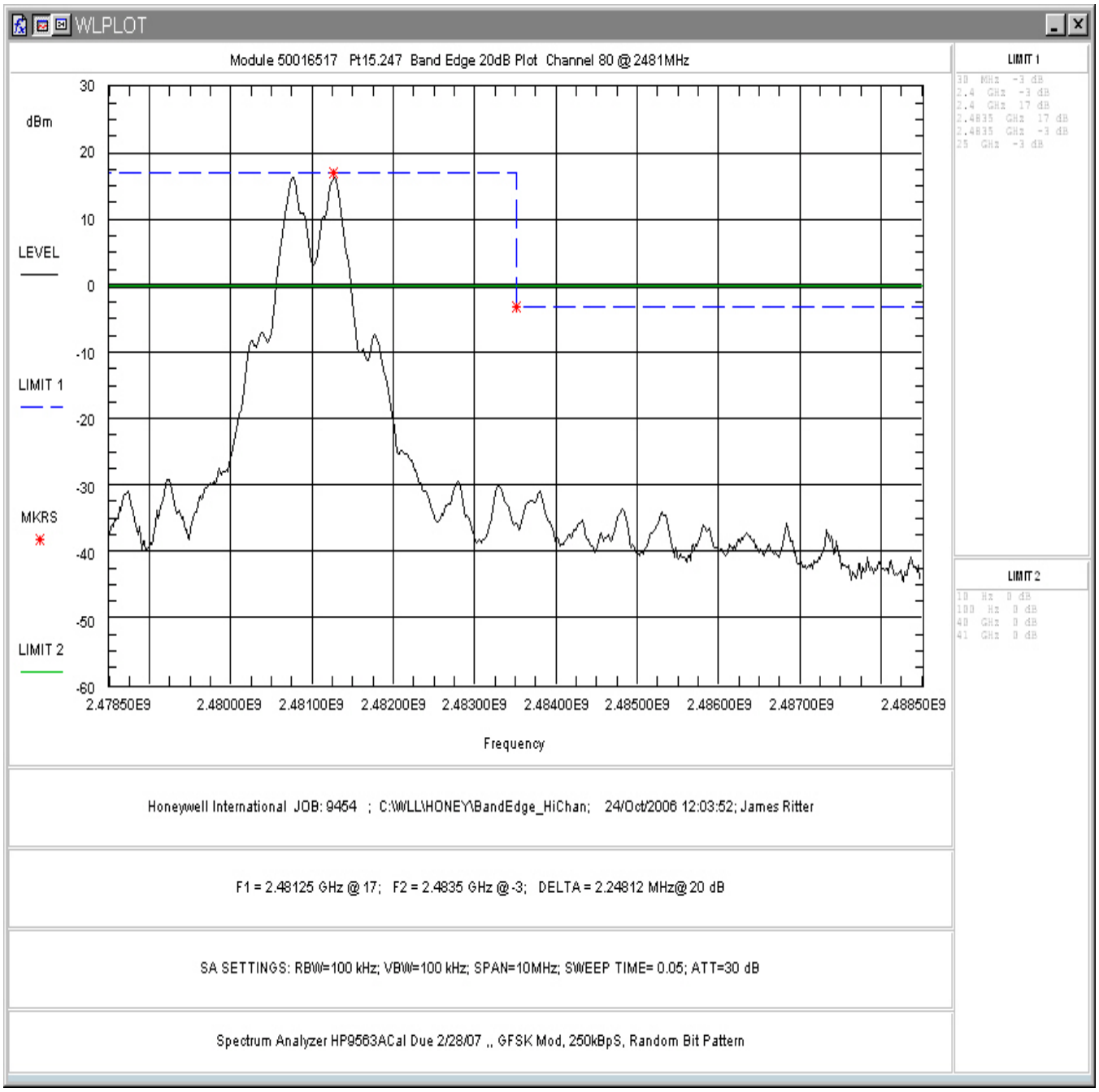

Figure 4-36: Band Edge, High Channel

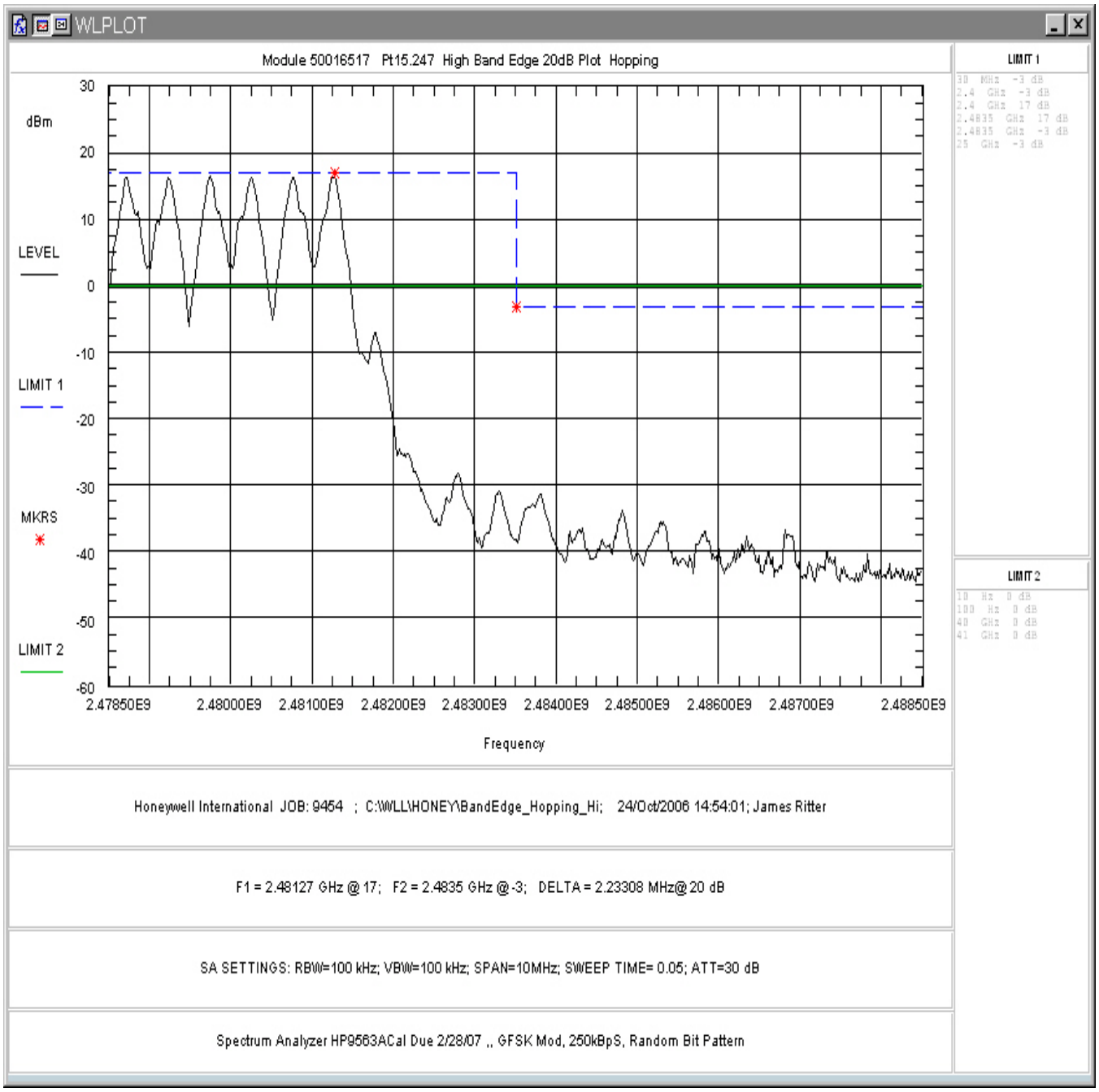

Figure 4-37: Band Edge, High Channel Hopping Mode

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 Frequency Data (<1GHz)

Notes: Transmit on noted Channel with external 14dBi directional antenna (worst case)

Power set to 255 (CC2400) set 0.0dB (255 is max) 12dBm conducted

All measurements recorded are ambient

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)
114.405	V	180.0	1.0	18.2	11.4	1.7	31.3	36.9	150.0	-12.2
123.964	V	90.0	1.0	15.8	11.9	2.1	29.8	30.9	150.0	-13.7
200.000	V	0.0	1.0	14.7	14.7	2.1	31.5	37.6	150.0	-12.0
795.000	V	45.0	1.0	3.0	21.3	5.4	29.7	30.6	200.0	-16.3
898.265	V	180.0	1.0	9.9	23.1	6.0	39.0	88.8	200.0	-7.1
162.394	H	40.0	1.8	6.8	12.9	2.3	22.0	12.6	150.0	-21.5
257.435	H	140.0	1.8	6.9	19.1	2.9	28.9	27.9	200.0	-17.1
266.950	H	190.0	1.8	9.0	19.4	3.0	31.4	37.2	200.0	-14.6
295.570	H	270.0	1.8	8.9	14.1	3.1	26.1	20.2	200.0	-19.9

Table 6: Radiated Emission Test Data (>1GHz): 2dBi Integral Antenna

Fundamental Frequency: 2402MHz

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)	Notes
Harmonics												
4804.000	H	180.0	1.0	47.0	32.5	3.5	31.8	51.2	361.8	5000.0	-22.8	peak
12010.000	H	190.0	1.0	48.7	40.0	5.0	30.6	63.1	1426.0	5000.0	-10.9	peak
4804.000	H	180.0	1.0	37.7	32.5	3.5	31.8	41.8	123.6	500.0	-12.1	Avg
12010.000	H	190.0	1.0	36.5	40.0	5.0	30.6	50.9	351.3	500.0	-3.1	Avg
4804.000	V	180.0	1.0	48.1	32.5	3.5	31.8	52.3	410.7	5000.0	-21.7	peak
12010.000	V	190.0	1.0	46.0	40.0	5.0	30.6	60.4	1048.6	5000.0	-13.6	peak
4804.000	V	180.0	1.0	38.0	32.5	3.5	31.8	42.2	128.4	500.0	-11.8	Avg
12010.000	V	190.0	1.0	34.5	40.0	5.0	30.6	48.9	279.0	500.0	-5.1	Avg

Band Edge

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)	Notes
2390.000	V	190.0	1.0	50.2	28.9	1.6	32.0	48.6	270.2	5000.0	-25.3	Peak
2390.000	V	190.0	1.0	35.3	28.9	1.6	32.0	33.8	48.8	500.0	-20.2	Avg
2390.000	H	190.0	1.0	47.2	28.9	1.6	32.0	45.6	190.7	5000.0	-28.4	Peak
2390.000	H	35.0	1.0	0.0	28.9	1.6	32.0	-1.6	0.8	500.0	-55.5	Avg
2483.500	V	180.0	1.0	45.8	29.1	1.5	32.0	44.4	166.8	5000.0	-29.5	Peak
2483.500	V	180.0	1.0	34.7	29.1	1.5	32.0	33.3	46.2	500.0	-20.7	Avg
2483.500	H	180.0	1.0	45.0	29.1	1.5	32.0	43.6	151.6	5000.0	-20.4	Peak
2483.500	H	180.0	1.0	34.0	29.1	1.5	32.0	32.6	42.7	500.0	-21.4	Avg

Table 7: Radiated Emission Test Data (>1GHz): 8dBi External Antenna

Frequency (MHz)	Polarity H/V	Az Deg	Ant. Hght (m)	SA Level (QP) (dBµV)	Ant. Corr. (dB/m)	Cable Corr. (dB)	Amp Gain (dB)	Dwell Time Corr (db)	Corr. Level (dBµV/m)	Corr. Level (µV/m)	Limit (µV/m)	Margin (dB)	Notes
2402.000													
4804.000	V	300.0	1.0	51.4	32.5	3.5	37.2	0.0	50.2	323.1	5000.0	-23.8	peak
4804.000	V	300.0	1.0	44.3	32.5	3.5	37.2	-20.0	23.1	14.3	500.0	-30.9	AVG
7206.000	V	300.0	1.0	57.6	37.1	4.2	37.5	0.0	61.3	1162.5	5000.0	-12.7	peak
7206.000	V	300.0	1.0	48.8	37.1	4.2	37.5	-20.0	32.5	42.2	500.0	-21.5	AVG
12010.000	V	300.0	1.0	41.8	40.0	5.0	37.9	0.0	48.9	279.5	5000.0	-25.1	peak
12010.000	V	300.0	1.0	31.8	40.0	5.0	37.9	-20.0	18.9	8.8	500.0	-35.1	AVG
4804.000	H	300.0	1.0	52.6	32.5	3.5	37.2	0.0	51.4	369.7	5000.0	-22.6	peak
4804.000	H	300.0	1.0	44.2	32.5	3.5	37.2	-20.0	23.0	14.1	500.0	-31.0	AVG
7206.000	H	300.0	1.0	58.0	37.1	4.2	37.5	0.0	61.7	1217.3	5000.0	-12.3	peak
7206.000	H	300.0	1.0	48.4	37.1	4.2	37.5	-20.0	32.1	40.3	500.0	-21.9	AVG
12010.000	H	300.0	1.0	39.7	40.0	5.0	37.9	0.0	46.8	219.5	5000.0	-27.2	peak
12010.000	H	300.0	1.0	31.1	40.0	5.0	37.9	-20.0	18.2	8.2	500.0	-35.8	AVG
2445.000													
4890.000	V	340.0	1.0	53.2	32.6	3.5	37.2	0.0	52.2	406.0	5000.0	-21.8	Peak
4890.000	V	340.0	1.0	47.1	32.6	3.5	37.2	-20.0	26.1	20.1	500.0	-27.9	AVG
7335.000	V	320.0	1.0	53.4	37.1	4.5	37.6	0.0	57.5	748.2	5000.0	-16.5	peak
7335.000	V	320.0	1.0	42.6	37.1	4.5	37.6	-20.0	26.7	21.6	500.0	-27.3	AVG
12225.000	V	300.0	1.0	43.4	40.0	5.2	37.4	0.0	51.1	361.0	5000.0	-22.8	peak
12225.000	V	300.0	1.0	33.9	40.0	5.2	37.4	-20.0	21.6	12.1	500.0	-32.3	AVG
4890.000	H	300.0	1.0	49.9	32.6	3.5	37.2	0.0	48.9	278.0	5000.0	-25.1	Peak
4890.000	H	300.0	1.0	38.3	32.6	3.5	37.2	-20.0	17.3	7.3	500.0	-36.7	AVG
7335.000	H	300.0	1.0	51.5	37.1	4.5	37.6	0.0	55.5	597.7	5000.0	-18.4	Peak
7335.000	H	300.0	1.0	40.8	37.1	4.5	37.6	-20.0	24.9	17.5	500.0	-29.1	AVG
12225.000	H	300.0	1.0	41.9	40.0	5.2	37.4	0.0	49.6	303.7	5000.0	-24.3	peak
12225.000	H	300.0	1.0	33.6	40.0	5.2	37.4	-20.0	21.3	11.7	500.0	-32.6	AVG
2481.000													
4962.000	V	10.0	1.0	56.4	32.7	3.6	37.2	0.0	55.5	597.1	5000.0	-18.5	Peak
4962.000	V	10.0	1.0	49.3	32.7	3.6	37.2	-20.0	28.4	26.4	500.0	-25.6	AVG
7443.000	V	0.0	1.0	56.5	37.1	4.8	37.6	0.0	60.9	1107.5	5000.0	-13.1	Peak
7443.000	V	0.0	1.0	47.8	37.1	4.8	37.6	-20.0	32.2	40.7	500.0	-21.8	AVG
12405.000	V	0.0	1.0	44.3	40.0	5.3	37.1	0.0	52.6	424.7	5000.0	-21.4	peak
12405.000	V	0.0	1.0	33.5	40.0	5.3	37.1	-20.0	21.8	12.2	500.0	-32.2	AVG
4962.000	H	300.0	1.0	50.5	32.7	3.6	37.2	0.0	49.6	302.7	5000.0	-24.4	Peak
4962.000	H	300.0	1.0	40.8	32.7	3.6	37.2	-20.0	19.9	9.9	500.0	-34.1	AVG
7443.000	H	10.0	1.0	54.8	37.1	4.8	37.6	0.0	59.2	910.6	5000.0	-14.8	Peak
7443.000	H	10.0	1.0	44.4	37.1	4.8	37.6	-20.0	28.8	27.5	500.0	-25.2	AVG
12405.000	H	0.0	1.0	43.3	40.0	5.3	37.1	0.0	51.6	378.5	5000.0	-22.4	peak
12405.000	H	0.0	1.0	33.6	40.0	5.3	37.1	-20.0	21.9	12.4	500.0	-32.1	AVG

Frequency (MHz)	Polarity H/V	Az Deg	Ant. Hght (m)	SA Level (QP) (dBµV)	Ant. Corr. (dB/m)	Cable Corr. (dB)	Amp Gain (dB)	Dwell Time Corr (db)	Corr. Level (dBµV/m)	Corr. Level (µV/m)	Limit (µV/m)	Margin (dB)	Notes
BAND EDGE													
2483.500	V	270.0	1.0	31.7	29.1	1.5	0.0	0.0	62.3	1305.4	5000.0	-11.7	peak (a)
2483.500	V	270.0	1.0	31.2	29.1	1.5	0.0	-20.0	41.8	123.2	500.0	-12.2	AVG (a)
2483.500	H	260.0	1.0	22.2	29.1	1.5	0.0	0.0	52.8	437.3	5000.0	-21.2	peak (a)
2483.500	H	260.0	1.0	19.0	29.1	1.5	0.0	-20.0	29.6	30.3	500.0	-24.4	AVG (a)
2390.000	V	300.0	1.0	63.0	28.9	1.6	38.1	0.0	55.3	583.6	5000.0	-18.7	peak
2390.000	V	300.0	1.0	51.6	28.9	1.6	38.1	-20.0	23.9	15.7	500.0	-30.1	AVG
2390.000	H	300.0	1.0	60.5	28.9	1.6	38.1	0.0	52.8	435.1	5000.0	-21.2	Peak
2390.000	H	300.0	1.0	39.8	28.9	1.6	38.1	-20.0	12.1	4.0	500.0	-41.9	AVG

(a) = Delta Method

Table 8: Radiated Emission Test Data (>1GHz): 14dBi External Antenna

Frequency (MHz)	Polarity H/V	Az Deg	Ant. Hght (m)	SA Level (QP) (dBµV)	Ant. Corr. (dB/m)	Cable Corr. (dB)	Amp Gain (dB)	Dwell Time Corr (db)	Corr. Level (dBµV/m)	Corr. Level (µV/m)	Limit (µV/m)	Margin (dB)	Notes
2402.000													
4804.000	V	310.0	1.0	52.6	32.5	3.5	37.2	0.0	51.4	371.0	5000.0	-22.6	peak
4804.000	V	310.0	1.0	45.6	32.5	3.5	37.2	-20.0	24.4	16.6	500.0	-29.6	AVG
7206.000	V	300.0	1.0	57.5	37.1	4.2	37.5	0.0	61.2	1149.2	5000.0	-12.8	peak
7206.000	V	300.0	1.0	49.1	37.1	4.2	37.5	-20.0	32.8	43.7	500.0	-21.2	AVG
12010.000	V	300.0	1.0	44.1	40.0	5.0	37.9	0.0	51.2	364.3	5000.0	-22.8	peak
12010.000	V	300.0	1.0	32.7	40.0	5.0	37.9	-20.0	19.8	9.8	500.0	-34.2	AVG
4804.000	H	300.0	1.0	51.5	32.5	3.5	37.2	0.0	50.3	326.9	5000.0	-23.7	peak
4804.000	H	300.0	1.0	45.0	32.5	3.5	37.2	-20.0	23.8	15.5	500.0	-30.2	AVG
7206.000	H	280.0	1.0	58.0	37.1	4.2	37.5	0.0	61.7	1217.3	5000.0	-12.3	peak
7206.000	H	280.0	1.0	49.8	37.1	4.2	37.5	-20.0	33.5	47.4	500.0	-20.5	AVG
12010.000	H	300.0	1.0	42.5	40.0	5.0	37.9	0.0	49.6	303.0	5000.0	-24.4	peak
12010.000	H	300.0	1.0	32.6	40.0	5.0	37.9	-20.0	19.7	9.7	500.0	-34.3	AVG
2445.000													
4890.000	V	340.0	1.0	60.8	32.6	3.5	37.2	0.0	59.8	973.9	5000.0	-14.2	Peak
4890.000	V	340.0	1.0	55.3	32.6	3.5	37.2	-20.0	34.3	51.7	500.0	-19.7	AVG
7335.000	V	40.0	1.0	54.6	37.1	4.5	37.6	0.0	58.7	859.0	5000.0	-15.3	peak
7335.000	V	40.0	1.0	43.9	37.1	4.5	37.6	-20.0	28.0	25.1	500.0	-26.0	AVG

Frequency (MHz)	Polarity H/V	Az Deg	Ant. Hght (m)	SA Level (QP) (dBµV)	Ant. Corr. (dB/m)	Cable Corr. (dB)	Amp Gain (dB)	Dwell Time Corr (db)	Corr. Level (dBµV/m)	Corr. Level (µV/m)	Limit (µV/m)	Margin (dB)	Notes
12225.000	V	0.0	1.0	44.2	40.0	5.2	37.4	0.0	51.9	395.8	5000.0	-22.0	peak
12225.000	V	0.0	1.0	32.7	40.0	5.2	37.4	-20.0	20.4	10.5	500.0	-33.5	AVG
4890.000	H	290.0	1.0	52.6	32.6	3.5	37.2	0.0	51.6	378.9	5000.0	-22.4	Peak
4890.000	H	290.0	1.0	45.0	32.6	3.5	37.2	-20.0	24.0	15.8	500.0	-30.0	AVG
7335.000	H	350.0	1.0	54.9	37.1	4.5	37.6	0.0	59.0	889.2	5000.0	-15.0	Peak
7335.000	H	350.0	1.0	43.5	37.1	4.5	37.6	-20.0	27.6	23.9	500.0	-26.4	AVG
12225.000	H	0.0	1.0	42.7	40.0	5.2	37.4	0.0	50.4	333.0	5000.0	-23.5	peak
12225.000	H	0.0	1.0	32.9	40.0	5.2	37.4	-20.0	20.6	10.8	500.0	-33.3	AVG
2481.000													
4962.000	V	0.0	1.0	57.0	32.7	3.6	37.2	0.0	56.1	639.8	5000.0	-17.9	Peak
4962.000	V	0.0	1.0	51.2	32.7	3.6	37.2	-20.0	30.3	32.8	500.0	-23.7	AVG
7443.000	V	10.0	1.0	57.2	37.1	4.8	37.6	0.0	61.6	1200.4	5000.0	-12.4	Peak
7443.000	V	10.0	1.0	48.0	37.1	4.8	37.6	-20.0	32.4	41.6	500.0	-21.6	AVG
12405.000	V	0.0	1.0	43.0	40.0	5.3	37.1	0.0	51.3	365.6	5000.0	-22.7	peak
12405.000	V	0.0	1.0	32.9	40.0	5.3	37.1	-20.0	21.2	11.4	500.0	-32.8	AVG
			1.0										
4962.000	H	350.0	1.0	54.9	32.7	3.6	37.2	0.0	54.0	502.4	5000.0	-20.0	Peak
4962.000	H	350.0	1.0	48.9	32.7	3.6	37.2	-20.0	28.0	25.2	500.0	-26.0	AVG
7443.000	H	320.0	1.0	58.9	37.1	4.8	37.6	0.0	63.3	1459.9	5000.0	-10.7	Peak
7443.000	H	320.0	1.0	49.1	37.1	4.8	37.6	-20.0	33.5	47.2	500.0	-20.5	AVG
12405.000	H	0.0	1.0	43.9	40.0	5.3	37.1	0.0	52.2	405.6	5000.0	-21.8	peak
12405.000	H	0.0	1.0	32.9	40.0	5.3	37.1	-20.0	21.2	11.4	500.0	-32.8	AVG
BAND EDGE													
2483.500	V	0.0	1.0	36.8	29.1	1.5	0.0	0.0	67.4	2348.2	5000.0	-6.6	peak (a)
2483.500	V	0.0	1.0	35.5	29.1	1.5	0.0	-20.0	46.1	202.2	500.0	-7.9	AVG (a)
2483.500	H	0.0	1.0	31.0	29.1	1.5	0.0	0.0	61.6	1204.3	5000.0	-12.4	peak (a)
2483.500	H	0.0	1.0	30.0	29.1	1.5	0.0	-20.0	40.6	107.3	500.0	-13.4	AVG (a)
2390.000	V	310.0	1.0	27.4	28.9	1.6	0.0	0.0	57.8	779.4	5000.0	-16.1	peak
2390.000	V	310.0	1.0	17.2	28.9	1.6	0.0	-20.0	27.6	24.1	500.0	-26.3	AVG
2390.000	H	300.0	1.0	27.4	28.9	1.6	0.0	0.0	57.8	779.4	5000.0	-16.1	Peak
2390.000	H	300.0	1.0	17.3	28.9	1.6	0.0	-20.0	27.7	24.4	500.0	-26.2	AVG

(a) = Delta Method