



FCC Certification Test Report
For the
JLG Industries, Inc.
WANalyzer

FCC ID: 2ADCD1001147542

WLL JOB# 13579-01 Rev 1
March 4, 2015
Revised March 19, 2015

Prepared for:

JLG Industries, Inc.
13224 Fountainhead Plaza
Hagerstown, Maryland 21742

Prepared By:

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



Testing Certificate AT-1448

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Prepared by:



James Ritter
Compliance Engineer

Reviewed by:



Steven D. Koster
Vice President

Abstract

This report has been prepared on behalf of JLG Industries, Inc. to support the attached Application for Equipment Authorization. The test report and application are submitted for a Direct Sequence Spread Spectrum Transmitter under Part 15.247 (10/2013) of the FCC Rules and Regulations. This Certification Test Report documents the test configuration and test results for the JLG Industries, Inc. WANalyzer.

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 ACLASS under Certificate AT-1448 as an independent FCC test laboratory.

The JLG Industries, Inc. WANalyzer complies with the limits for a Direct Sequence Spread Spectrum Transmitter under FCC Part 15.247.

Revision History	Description of Change	Date
Rev 0	Initial Release	March 4, 2015
Rev 1	Corrected FCC ID	March 19, 2015

Table of Contents

Abstract	ii
1 Introduction	1
1.1 Compliance Statement	1
1.2 Test Scope	1
1.3 Contract Information	1
1.4 Test Dates	1
1.5 Test and Support Personnel	1
1.6 Abbreviations	2
2 Equipment Under Test	3
2.1 EUT Identification & Description	3
2.2 Test Configuration	4
2.3 Testing Algorithm	4
2.4 Test Location	4
2.5 Measurements	4
2.5.1 References	4
2.6 Measurement Uncertainty	4
3 Test Results	7
3.1 Test Summary	7
3.2 Occupied Bandwidth (DTS Bandwidth) : (FCC Part §15.247 (2))	8
3.3 RF Power Output: (FCC Part §15.247(b))	21
3.4 Power Spectral Density (Section §15.247(e))	22
3.5 Conducted Spurious Emissions at Antenna Terminals (FCC Part §15.247(c))	35
3.5.1 Band Edge Compliance	60
3.6 AC Conducted Emissions (FCC Part §15.207)	68
3.6.1 Requirements	68
3.6.2 Test Summary	68
3.7 Radiated Spurious Emissions: (FCC Part §15.205 & §15.209)	69
3.7.1 Test Procedure	69
3.8 Receiver Radiated Spurious Emissions	73

List of Tables

Table 1: Device Summary	3
Table 2: Expanded Uncertainty List	5
Table 3: Test Equipment List	6
Table 4: Test Summary	7
Table 5: Occupied Bandwidth Results	8
Table 6: RF Power Output	21
Table 7: Power Spectral Density	22
Table 8: Spectrum Analyzer Settings	69
Table 9: Radiated Emission Test Data, Low Channel (Restricted Bands)	70
Table 10: Radiated Emission Test Data, Center Channel (Restricted Bands)	71
Table 11: Radiated Emission Test Data, High Channel (Restricted Bands)	72

List of Figures

Figure 1: Occupied Bandwidth, 802.11b, 1Mbps, Channel 1	9
Figure 2: Occupied Bandwidth, 802.11b, 11Mbps, Channel 1	10
Figure 3: Occupied Bandwidth, 802.11g, 6Mbps, Channel 1	11
Figure 4: Occupied Bandwidth, 802.11g, 54Mbps, Channel 1	12
Figure 5: Occupied Bandwidth, 802.11b, 1Mbps, Channel 6	13
Figure 6: Occupied Bandwidth, 802.11b, 11Mbps, Channel 6	14
Figure 7: Occupied Bandwidth, 802.11g, 6Mbps, Channel 6	15
Figure 8: Occupied Bandwidth, 802.11g, 54Mbps, Channel 6	16
Figure 9: Occupied Bandwidth, 802.11b, 1Mbps, Channel 11	17
Figure 10: Occupied Bandwidth, 802.11b, 11Mbps, Channel 11	18
Figure 11: Occupied Bandwidth, 802.11g, 6Mbps, Channel 11	19
Figure 12: Occupied Bandwidth, 802.11g, 54Mbps, Channel 11	20
Figure 13: Power Spectral Density, 802.11b, 1Mbps, Channel 1	23
Figure 14: Power Spectral Density, 802.11b, 11Mbps, Channel 1	24
Figure 15: Power Spectral Density, 802.11g, 6Mbps, Channel 1	25
Figure 16: Power Spectral Density, 802.11g, 54Mbps, Channel 1	26
Figure 17: Power Spectral Density, 802.11b, 1Mbps, Channel 6	27
Figure 18: Power Spectral Density, 802.11b, 11Mbps, Channel 6	28
Figure 19: Power Spectral Density, 802.11g, 6Mbps, Channel 6	29
Figure 20: Power Spectral Density, 802.11g, 54Mbps, Channel 6	30
Figure 21: Power Spectral Density, 802.11b, 1Mbps, Channel 11	31
Figure 22: Power Spectral Density, 802.11b, 11Mbps, Channel 11	32
Figure 23: Power Spectral Density, 802.11g, 6Mbps, Channel 11	33
Figure 24: Power Spectral Density, 802.11g, 54Mbps, Channel 11	34
Figure 25: Conducted Spurious Emissions, Channel 1, 11Mbps, 30 - 1000MHz	36
Figure 26: Conducted Spurious Emissions, Channel 1, 11Mbps, 1 – 2.39GHz	37
Figure 27: Conducted Spurious Emissions, Channel 1, 11Mbps, 2.39 – 2.5GHz	38
Figure 28: Conducted Spurious Emissions, Channel 1, 11Mbps, 2.5 - 5GHz	39
Figure 29: Conducted Spurious Emissions, Channel 1, 11Mbps, 5 - 10GHz	40
Figure 30: Conducted Spurious Emissions, Channel 1, 11Mbps, 10-15GHz	41
Figure 31: Conducted Spurious Emissions, Channel 1, 11Mbps, 15-20GHz	42
Figure 32: Conducted Spurious Emissions, Channel 1, 11Mbps, 20-25 GHz	43
Figure 33: Conducted Spurious Emissions, Channel 6, 11Mbps, 30 - 1000MHz	44
Figure 34: Conducted Spurious Emissions, Channel 6, 11Mbps, 1 – 2.39GHz	45
Figure 35: Conducted Spurious Emissions, Channel 6, 11Mbps, 2.39 – 2.5GHz	46
Figure 36: Conducted Spurious Emissions, Channel 6, 11Mbps, 2.5 - 5GHz	47
Figure 37: Conducted Spurious Emissions, Channel 6, 11Mbps, 5 - 10GHz	48
Figure 38: Conducted Spurious Emissions, Channel 6, 11Mbps, 10-15GHz	49
Figure 39: Conducted Spurious Emissions, Channel 6, 11Mbps, 15-20GHz	50
Figure 40: Conducted Spurious Emissions, Channel 6, 11Mbps, 20-25 GHz	51
Figure 41: Conducted Spurious Emissions, Channel 11, 11Mbps, 30 - 1000MHz	52
Figure 42: Conducted Spurious Emissions, Channel 11, 11Mbps, 1 – 2.39GHz	53
Figure 43: Conducted Spurious Emissions, Channel 11, 11Mbps, 2.39 – 2.485GHz	54
Figure 44: Conducted Spurious Emissions, Channel 11, 11Mbps, 2.485 - 5GHz	55

Figure 45: Conducted Spurious Emissions, Channel 11, 11Mbps, 5 - 10GHz.....	56
Figure 46: Conducted Spurious Emissions, Channel 11, 11Mbps, 10-15GHz.....	57
Figure 47: Conducted Spurious Emissions, Channel 11, 11Mbps, 15-20GHz.....	58
Figure 48: Conducted Spurious Emissions, Channel 11, 11Mbps, 20-25 GHz.....	59
Figure 49: Lower Band-edge, Channel 1, 802.11b, 1Mbps	60
Figure 50: Lower Band-edge, Channel 1, 802.11b, 11Mbps	61
Figure 51: Lower Band-edge, Channel 1,802.11g, 6Mbps	62
Figure 52: Lower Band-edge, Channel 1,802.11g, 54 Mbps	63
Figure 53: Upper Band-edge, Channel 11, 802.11b, 1Mbps	64
Figure 54: Upper Band-edge, Channel 11, 802.11b, 11Mbps	65
Figure 55: Upper Band-edge, Channel 11,802.11g, 6Mbps	66
Figure 56: Upper Band-edge, Channel 11,802.11g, 54Mbps	67

1 Introduction

1.1 Compliance Statement

The JLG Industries, Inc. WANalyzer complies with the limits for a Direct Sequence Spread Spectrum Transmitter device under FCC Part 15.247 (10/2013).

1.2 Test Scope

Tests for radiated and conducted (at antenna terminal) emissions were performed. All measurements were performed in accordance with FCC 558074 D01 DTS Meas Guidance v03r02 dated June 2014, "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247"

The measurement equipment conforms to ANSI C63.2 Specifications for Electromagnetic Noise and Field Strength Instrumentation.

1.3 Contract Information

Customer:	JLG Industries, INC. 13224 Fountainhead Plaza Hagerstown, Maryland 21742
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Quotation Number:	68231A
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1.4 Test Dates

Testing was performed on the following date(s):	8/13/2014- 8/18/2014
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1.5 Test and Support Personnel

Washington Laboratories, LTD	James Ritter
Client Representative	Brian Mohlman

1.6 Abbreviations

A	A mpere
ac	a lternating current
AM	A mplitude Modulation
Amps	A mperes
b/s	b its per second
BW	B and W idth
CE	C onducted E mission
cm	c entimeter
CW	C ontinuous W ave
dB	d eci B el
dc	d irect current
EMI	E lectromagnetic 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-square
SN	S erial N umber
S/A	S pectrum A nalyzer
V	V olt

2 Equipment Under Test

2.1 EUT Identification & Description

The WANalyzer is a Vehicle system health analyzer with an 802.11b/g radio interface.

Table 1: Device Summary

ITEM	DESCRIPTION
Manufacturer:	JLG Industries, Inc.
FCC ID:	2ADCD1001147542
Model:	WANalyzer
FCC Rule Parts:	§15.247
Frequency Range:	2412 – 2462MHz
Maximum Output Power:	23.6 dBm (229mW) Peak
Modulation:	802.11b-DSSS, 802.11g- OFDM
Occupied Bandwidth:	802.11b-11.1MHz, 802.11g- 16.3MHz
Keying:	Automatic
Type of Information:	Data
Number of Channels:	11
Antenna Type	Rufa 2.4 GHz Internal PCB mounted chip antenna-2.1dBi Gain
Power Output Level	Fixed
Interface Connector:	Auto
Power Source & Voltage:	12VDC

2.2 Test Configuration

The WANalyzer was configured as a standalone unit. 12VDC power was applied to the EUT from the support 120VDC to 12VDC adaptor.

2.3 Testing Algorithm

The WANalyzer was programmed via a support switch device to transmit continuously at one of three channels, 2412MHz, 2437MHz, and 2462MHz. Worst case emission levels are provided in the test results data.

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 ACLASS under Certificate AT-1448 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 Methods of Measurement of Radio Noise from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.

FCC 558074 D01 DTS Meas Guidance v03r02 dated June 2014, "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247"

2.6 Measurement Uncertainty

All results reported herein relate only to the equipment tested. The basis for uncertainty calculation uses ANSI/NCSL Z540-2-1997 with a type B evaluation of the standard uncertainty. Elements contributing to the standard uncertainty are combined using the method described in Equation 1 to arrive at the total standard uncertainty. The standard uncertainty is multiplied by the coverage factor to determine the expanded uncertainty which is generally accepted for use in commercial, industrial, and regulatory applications and when health and safety are concerned (see Equation 2). A coverage factor was selected to yield a 95% confidence in the uncertainty estimation.

Equation 1: Standard Uncertainty

$$u_c = \pm \sqrt{\frac{a^2}{div_a^2} + \frac{b^2}{div_b^2} + \frac{c^2}{div_c^2} + \dots}$$

Where u_c = standard uncertainty

a, b, c, \dots = individual uncertainty elements

$Div_{a, b, c}$ = the individual uncertainty element divisor based on the probability distribution

Divisor = 1.732 for rectangular distribution

Divisor = 2 for normal distribution

Divisor = 1.414 for trapezoid distribution

Equation 2: Expanded Uncertainty

$$U = ku_c$$

Where U = expanded uncertainty

k = coverage factor

$k \leq 2$ for 95% coverage (ANSI/NCSL Z540-2 Annex G)

u_c = standard uncertainty

The measurement uncertainty complies with the maximum allowed uncertainty from CISPR 16-4-2. Measurement uncertainty is not used to adjust the measurements to determine compliance. The expanded uncertainty values for the various scopes in the WLL accreditation are provided in Table 2 below.

Table 2: Expanded Uncertainty List

Scope	Standard(s)	Expanded Uncertainty
Conducted Emissions	CISPR11, CISPR22, CISPR14, FCC Part 15	2.63 dB
Radiated Emissions	CISPR11, CISPR22, CISPR14, FCC Part 15	4.55 dB

Test Equipment Table 3 shows a list of the test equipment used for measurements along with the calibration information.

Table 3: Test Equipment List

Test Name: Bench Conducted RF Tests		: 8/15/2014	
Asset #	Manufacturer/Model	Description	Cal. Due
528	AGILENT E4446A	SPECTRUM ANALYZER	4/23/2016
728	HP8564E	SPECTRUM ANALYZER 30HZ - 40GHZ	8/30/2014

Test Name: Radiated Emissions		Test Date: 08/18/2014	
Asset #	Manufacturer/Model	Description	Cal. Due
69	HP - 85650A	ADAPTER QP	1/9/2015
802	HP - 8568B	SPECTRUM ANALYZER	1/9/2015
71	HP - 85685A	PRESELECTOR RF	1/9/2015
7	ARA - LPB-2520	ANTENNA BICONILOG ANTENNA	10/10/2014
4	ARA - DRG-118/A	ANTENNA DRG 1-18GHZ	2/20/2015
595	EAGLE TNF-200 - TNF-200	NOTCH FILTER	CNR
725	B-Z TECHNOLOGIES - BZP118UD1X2	1 - 18GHZ LOW NOISE AMP	1/6/2015
66	B&Z - BZ-01002650-401545-282525	PRE-AMPLIFIER RF. 1-26.5GHZ	10/2/2014
728	AGILENT - 8564EC	SPECTRUM ANALYZER 30HZ - 40GHZ	8/30/2014

3 Test Results

3.1 Test Summary

The Table Below shows the results of testing for compliance with a Direct Sequence Spread Spectrum System in accordance with FCC Part 15.247. Full results are shown in beginning in Section 4.2.

Table 4: Test Summary

FCC Rule Part	Description	Result
15.247 (2)	6dB Bandwidth	Pass
15.247 (2)(b)(3)	Transmit Output Power	Pass
15.247 (e)	Power Spectral Density	Pass
15.247 (d)	Out-of-Band Emissions (Band Edge @ 20dB below)	Pass
15.205 15.209	General Field Strength Limits (Restricted Bands & RE Limits)	Pass
15.207	AC Conducted Emissions	Not Applicable
FCC Rule Part	Description	Result
15.207	AC Conducted Emissions	Not Applicable
15.209	General Field Strength Limits	Pass

3.2 Occupied Bandwidth (DTS Bandwidth) : (FCC Part §15.247 (2))

Occupied bandwidth was performed by coupling the output of the EUT to the input of a spectrum analyzer. The lowest and highest data rates for each modulation type were evaluated.

For Direct Sequence Spread Spectrum Systems, FCC Part 15.247 requires the minimum 6 dB bandwidth using a 100 kHz Resolution bandwidth be greater than 500 kHz.

Per Option 2 of the FCC 558074 D01 DTS Meas Guidance v03r02 the automated function of the spectrum analyzer was used with the x dB function set to 6dB.

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

Table 5: Occupied Bandwidth Results

Channel and/or Frequency	Mode	Data Rate (Mbps)	6dB (DTS) Bandwidth (MHz)	99% Bandwidth (MHz)	Limit (kHz)	Pass/Fail
Chan 1 @ 2412MHz	802.11b	1	10.11	15.75	>500kHz	Pass
Chan 1 @ 2412MHz	802.11b	11	11.12	15.56	>500kHz	Pass
Chan 1 @ 2412MHz	802.11g	6	16.27	16.35	>500kHz	Pass
Chan 1 @ 2412MHz	802.11g	54	16.22	16.30	>500kHz	Pass
Chan 6 @ 2437MHz	802.11b	1	10.01	15.70	>500kHz	Pass
Chan 6 @ 2437MHz	802.11b	11	9.47	15.54	>500kHz	Pass
Chan 6 @ 2437MHz	802.11g	6	16.32	16.37	>500kHz	Pass
Chan 6 @ 2437MHz	802.11g	54	15.79	16.32	>500kHz	Pass
Chan 11 @ 2462MHz	802.11b	1	10.11	15.78	>500kHz	Pass
Chan 11 @ 2462MHz	802.11b	11	9.80	15.69	>500kHz	Pass
Chan 11 @ 2462MHz	802.11g	6	15.80	16.33	>500kHz	Pass
Chan 11 @ 2462MHz	802.11g	54	16.29	16.32	>500kHz	Pass

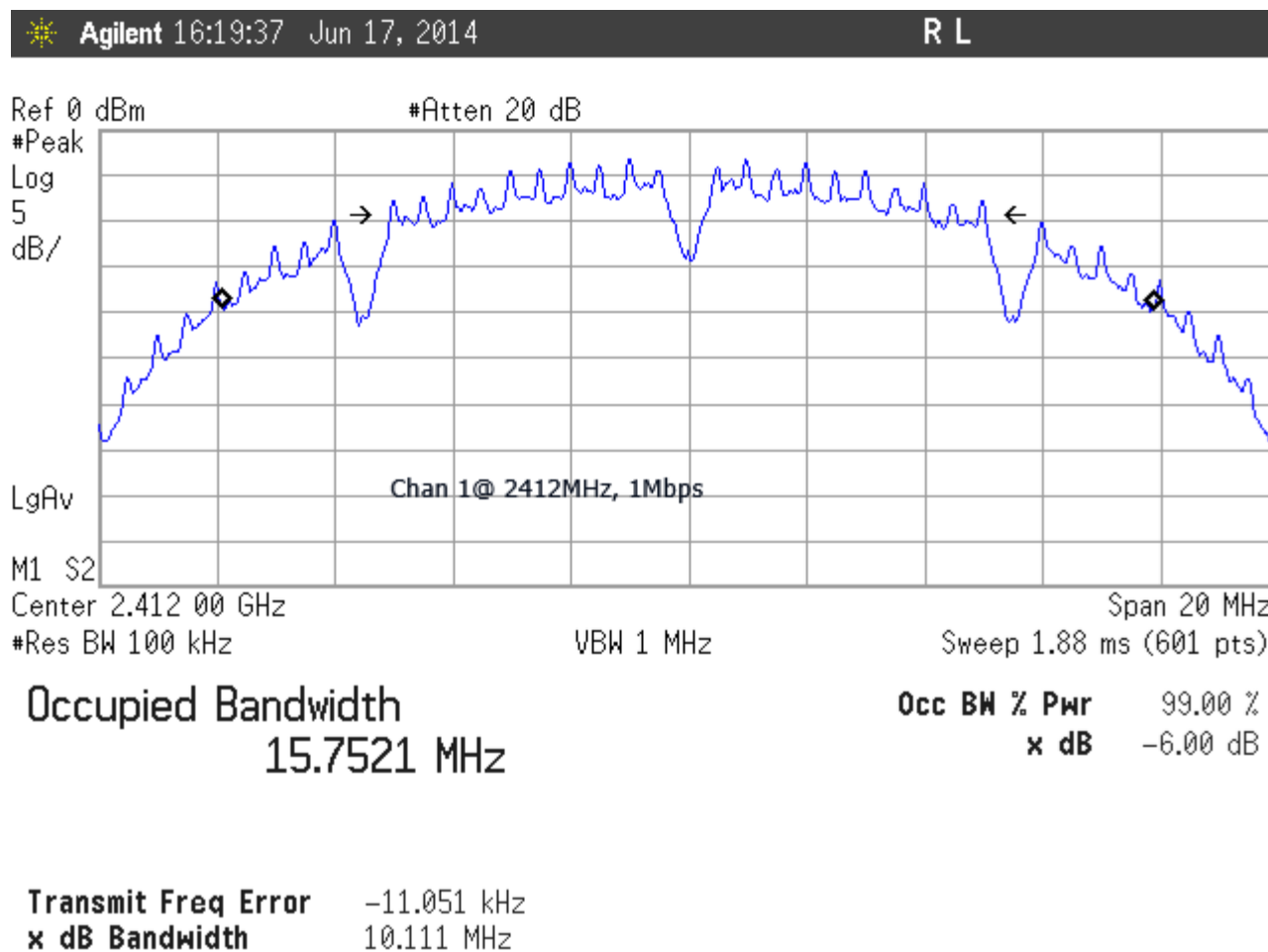


Figure 1: Occupied Bandwidth, 802.11b, 1Mbps, Channel 1

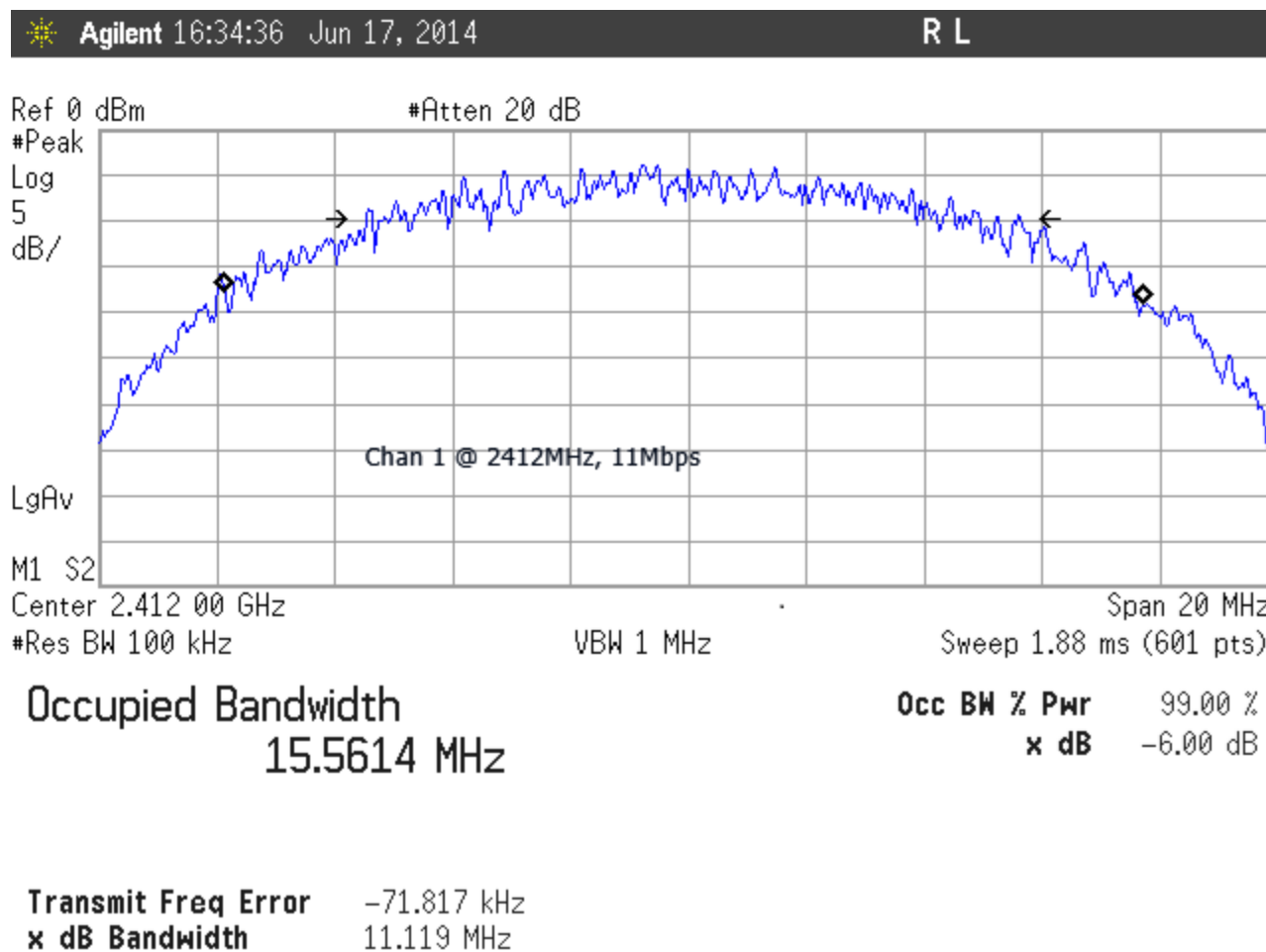


Figure 2: Occupied Bandwidth, 802.11b, 11Mbps, Channel 1

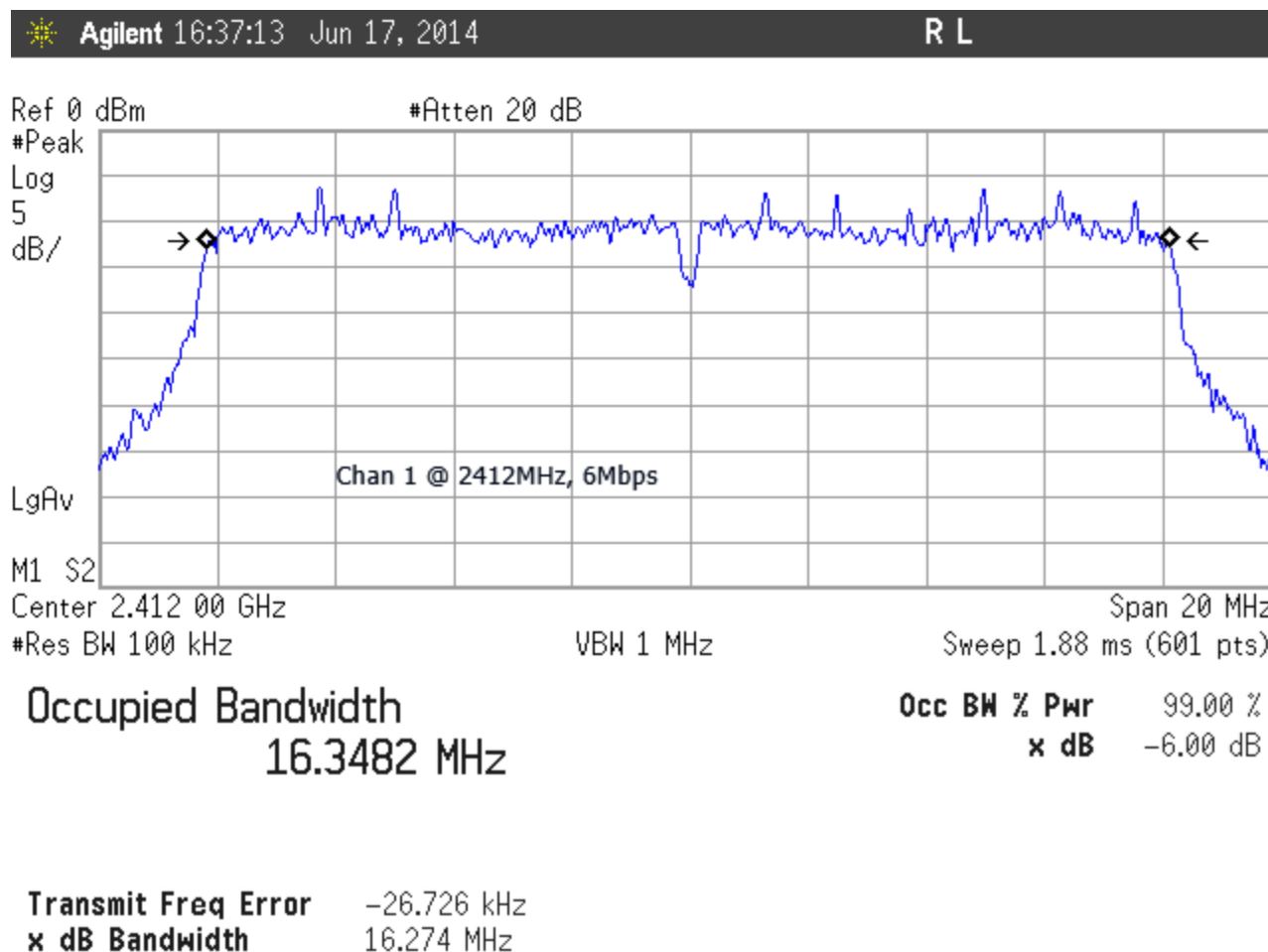


Figure 3: Occupied Bandwidth, 802.11g, 6Mbps, Channel 1

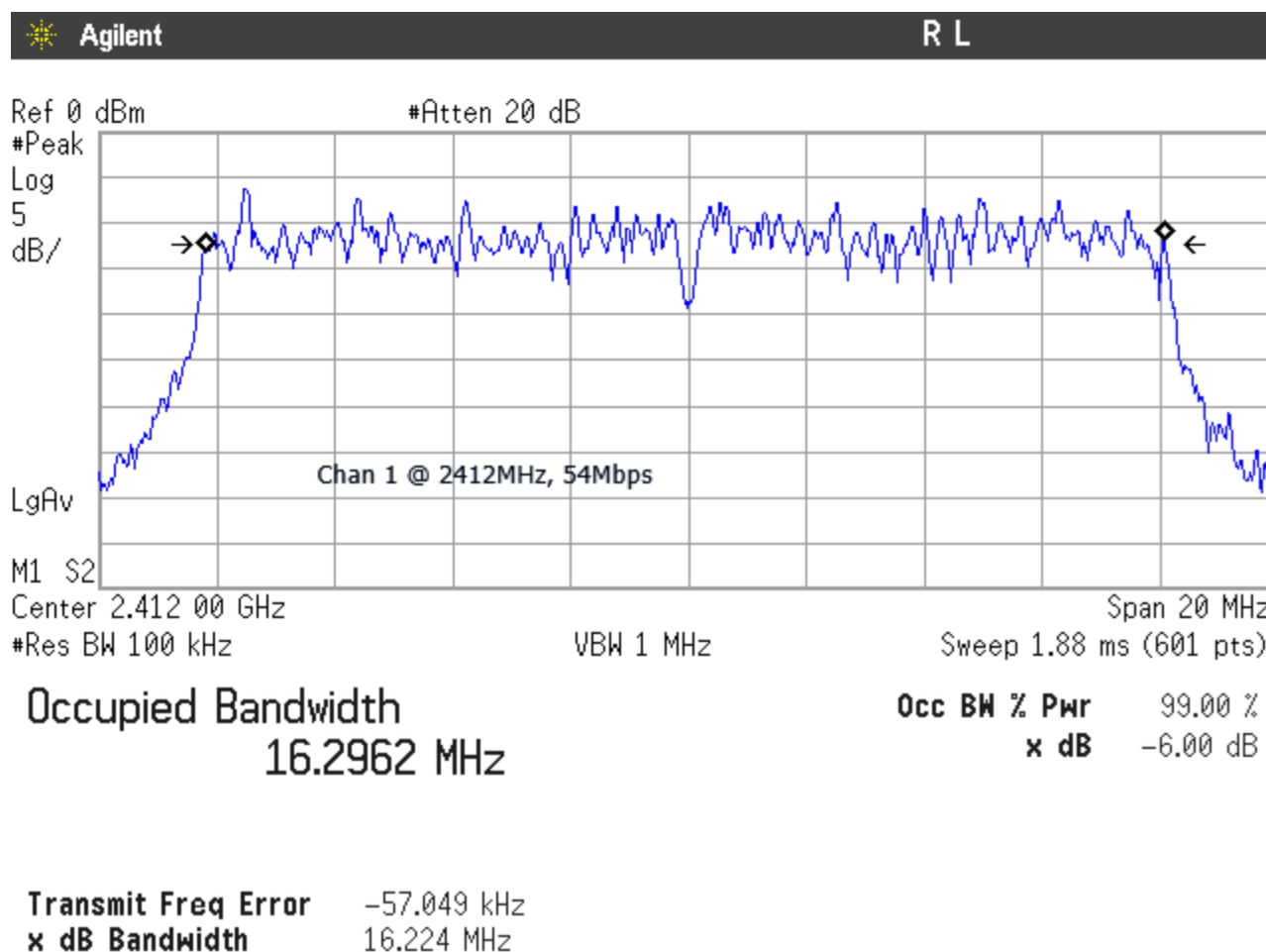


Figure 4: Occupied Bandwidth, 802.11g, 54Mbps, Channel 1

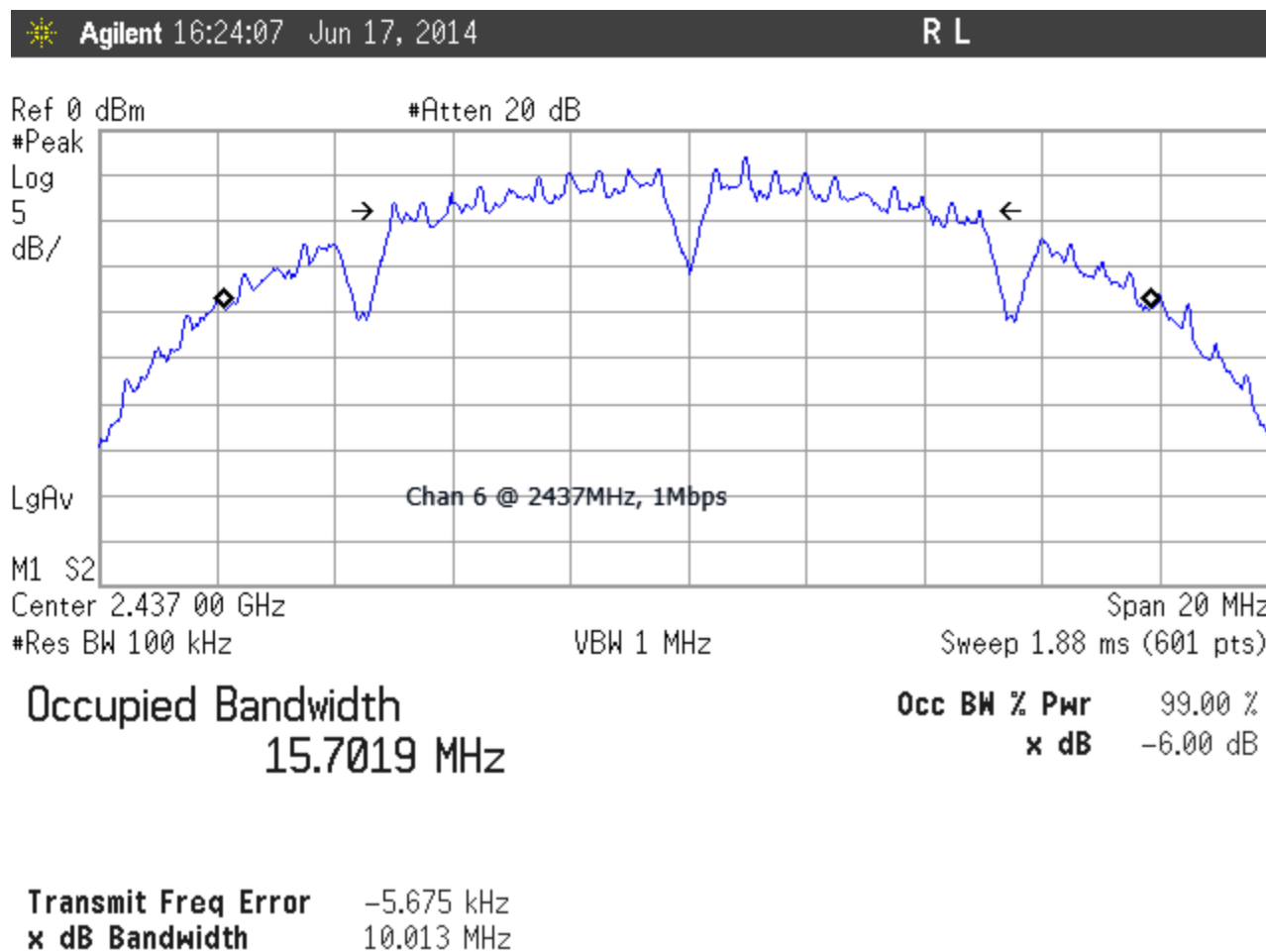


Figure 5: Occupied Bandwidth, 802.11b, 1Mbps, Channel 6

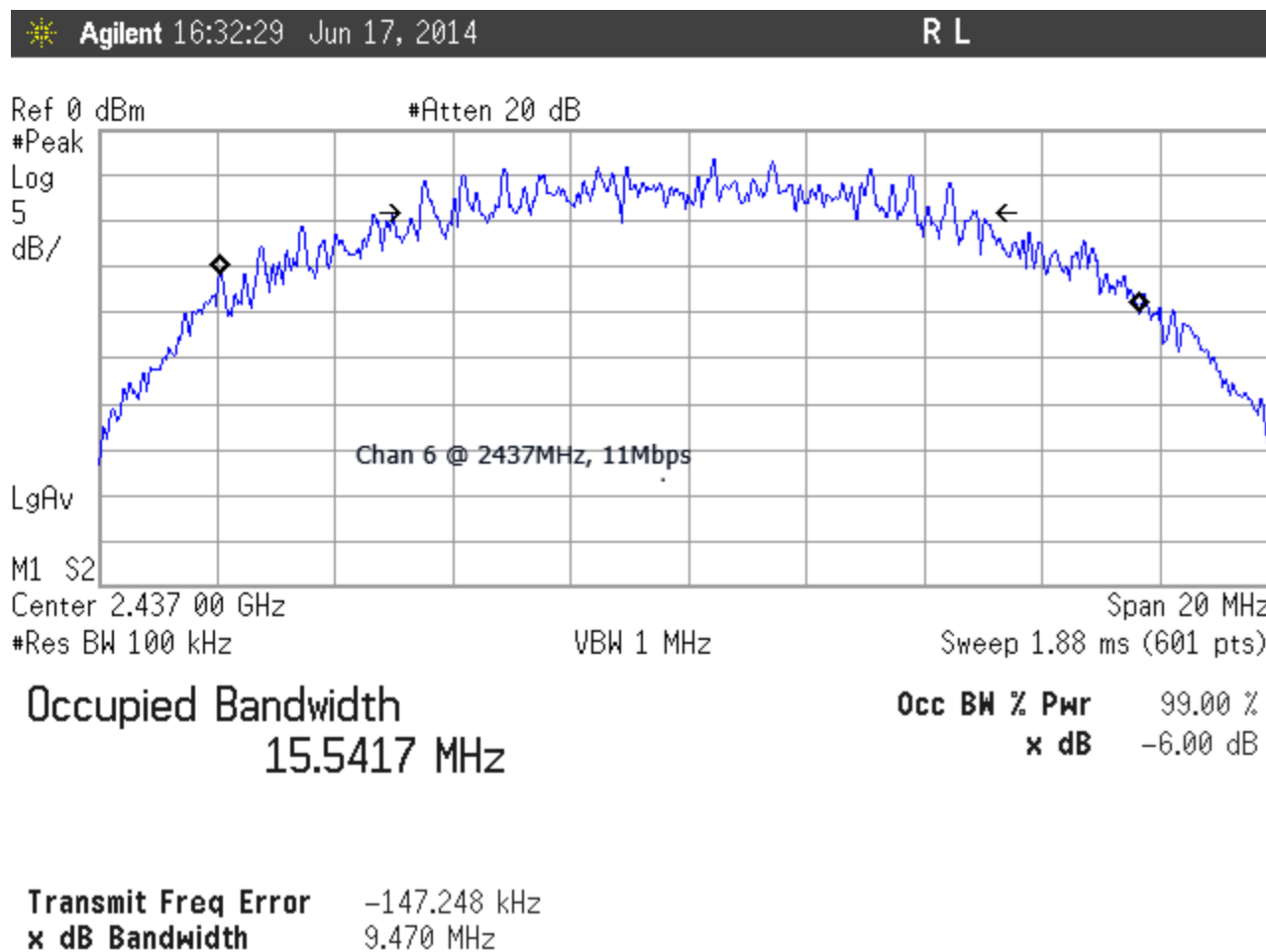


Figure 6: Occupied Bandwidth, 802.11b, 11Mbps, Channel 6

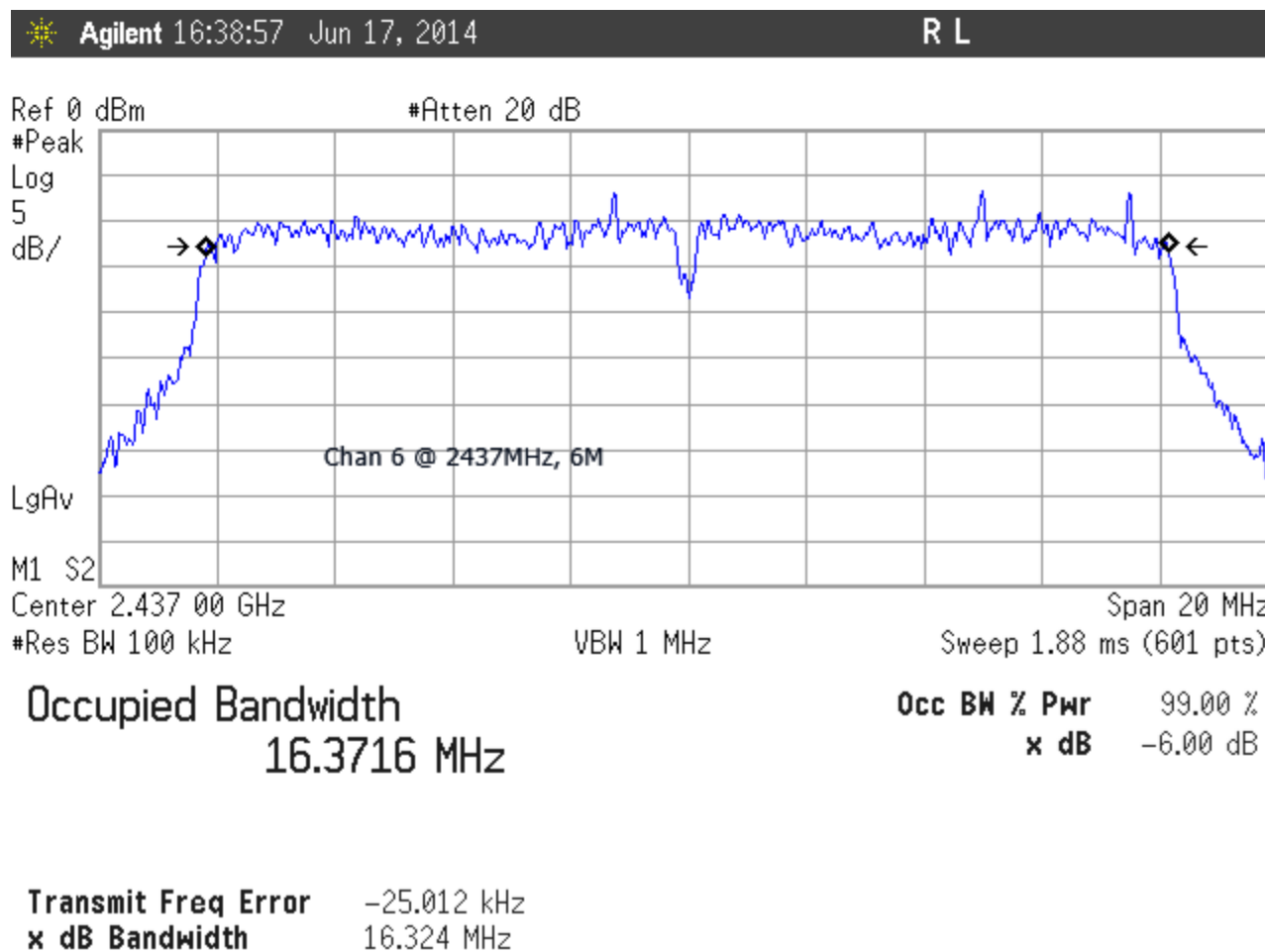


Figure 7: Occupied Bandwidth, 802.11g, 6Mbps, Channel 6

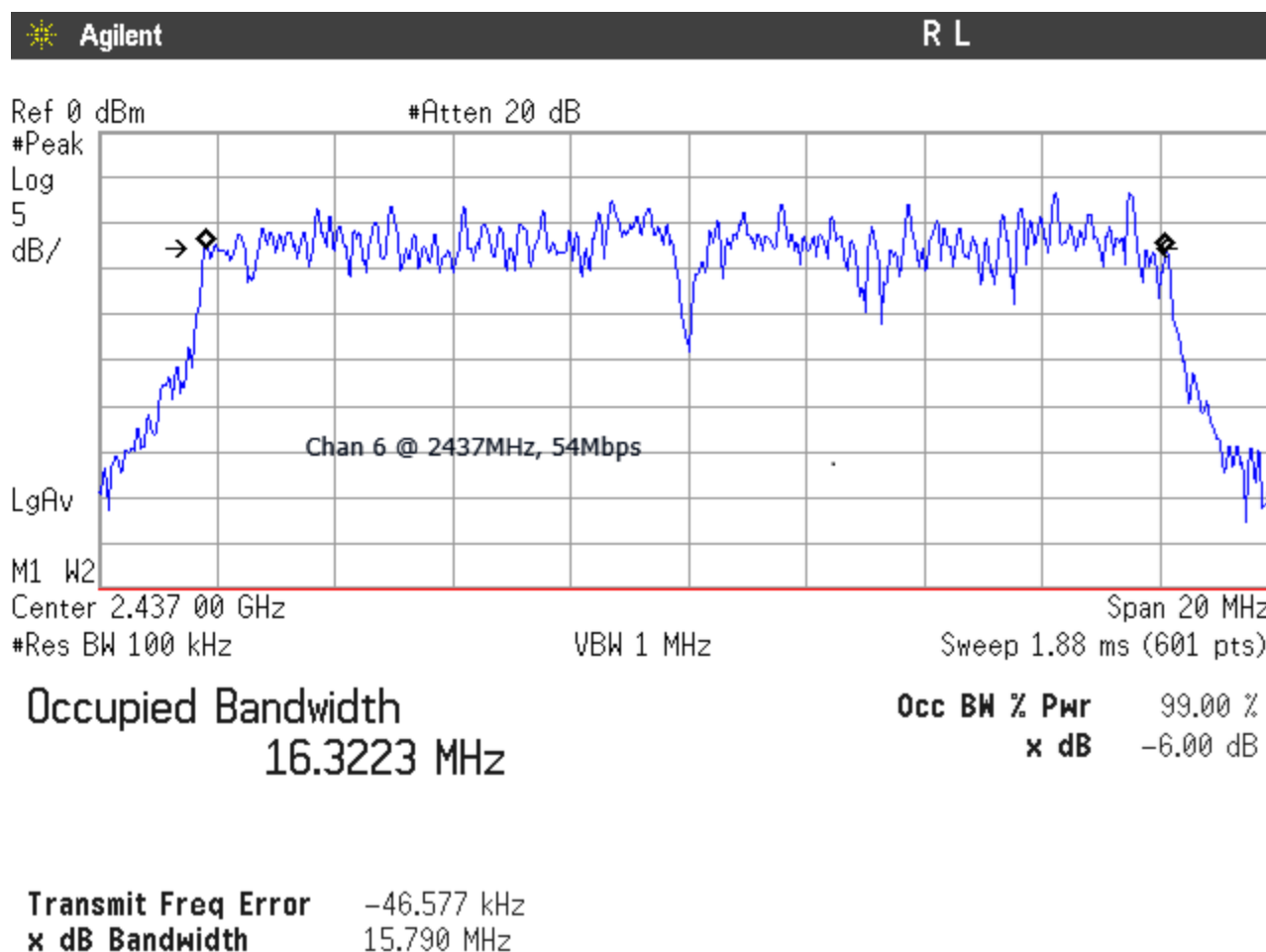


Figure 8: Occupied Bandwidth, 802.11g, 54Mbps, Channel 6

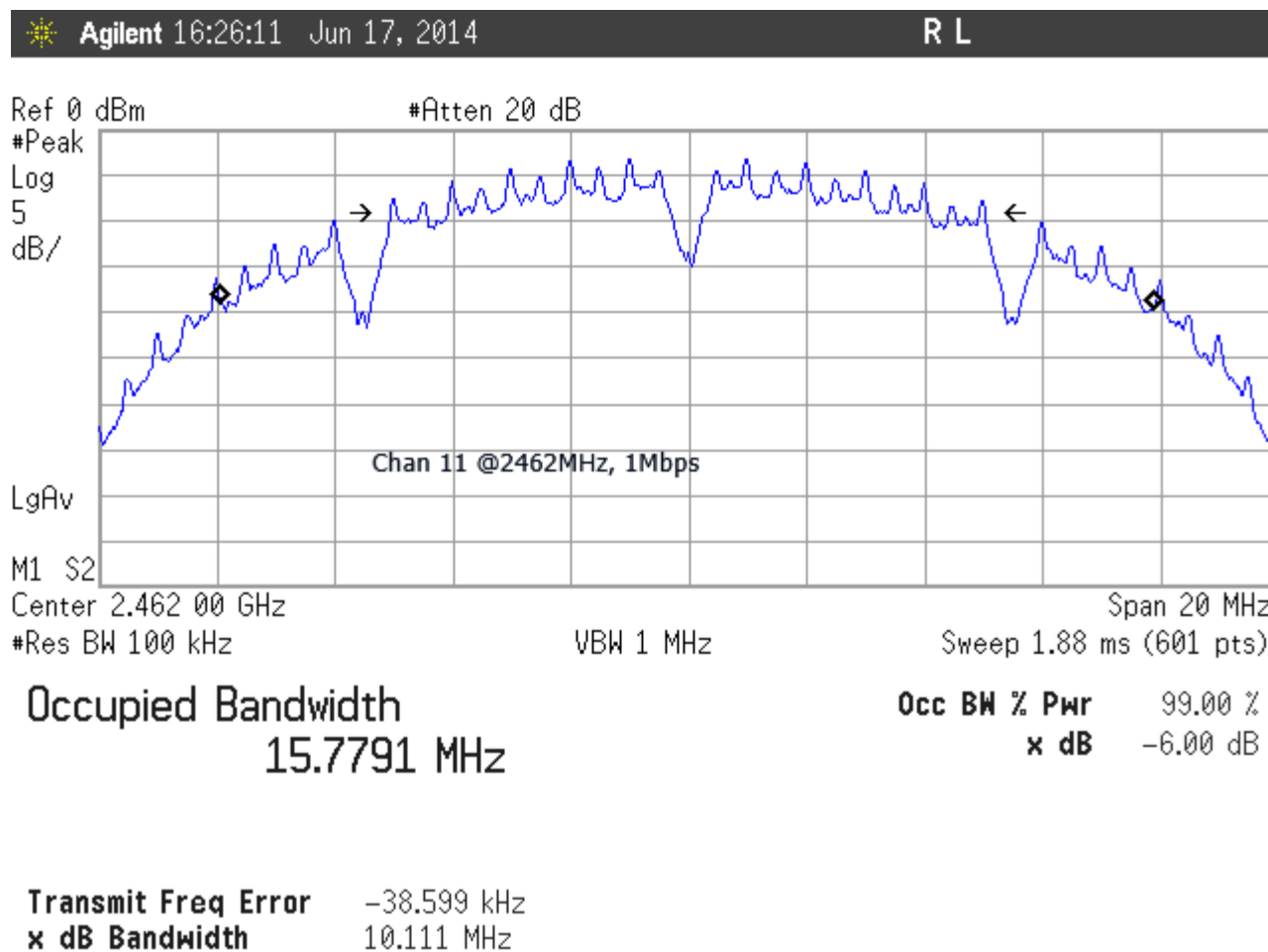


Figure 9: Occupied Bandwidth, 802.11b, 1Mbps, Channel 11

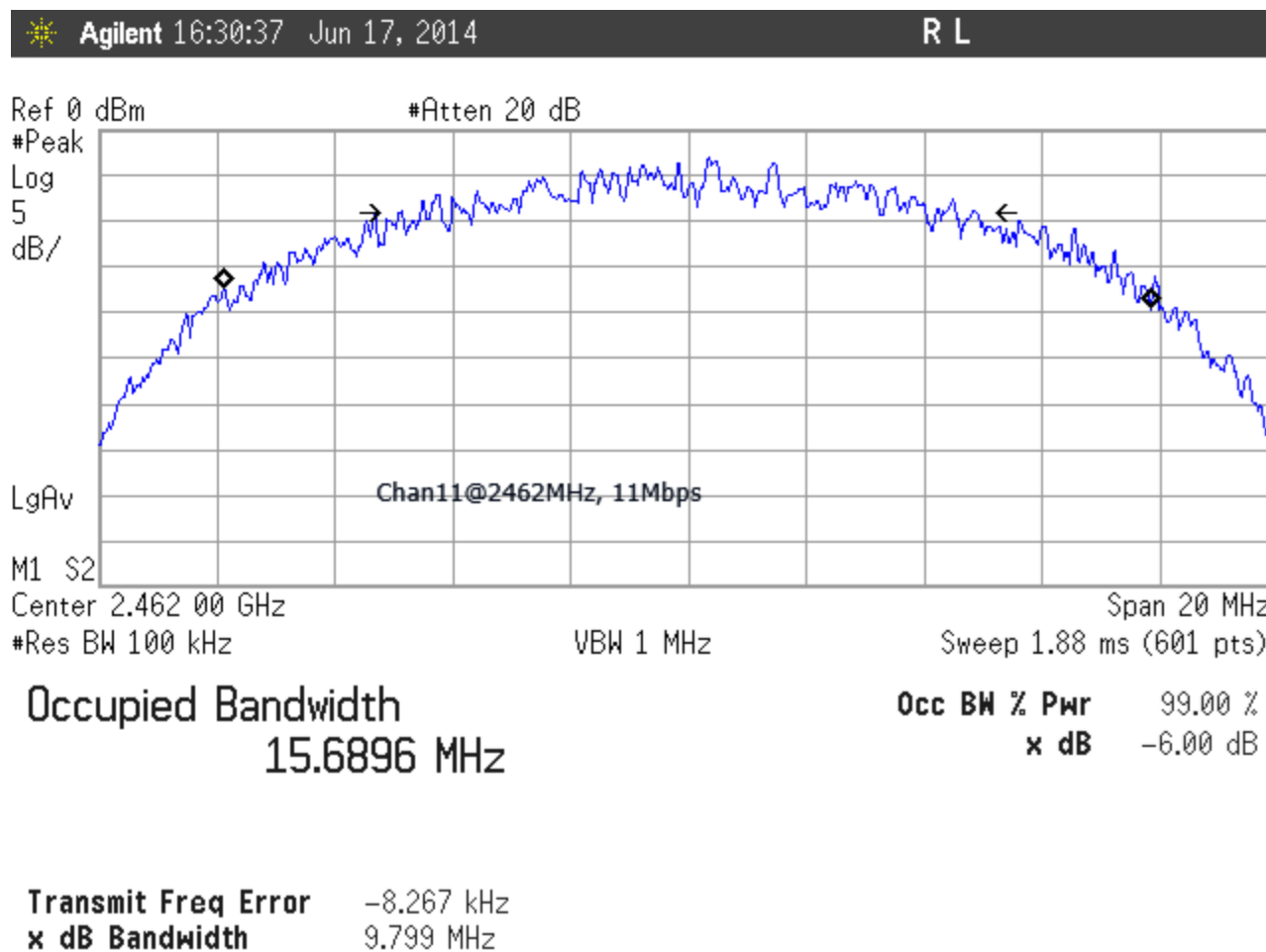


Figure 10: Occupied Bandwidth, 802.11b, 11Mbps, Channel 11

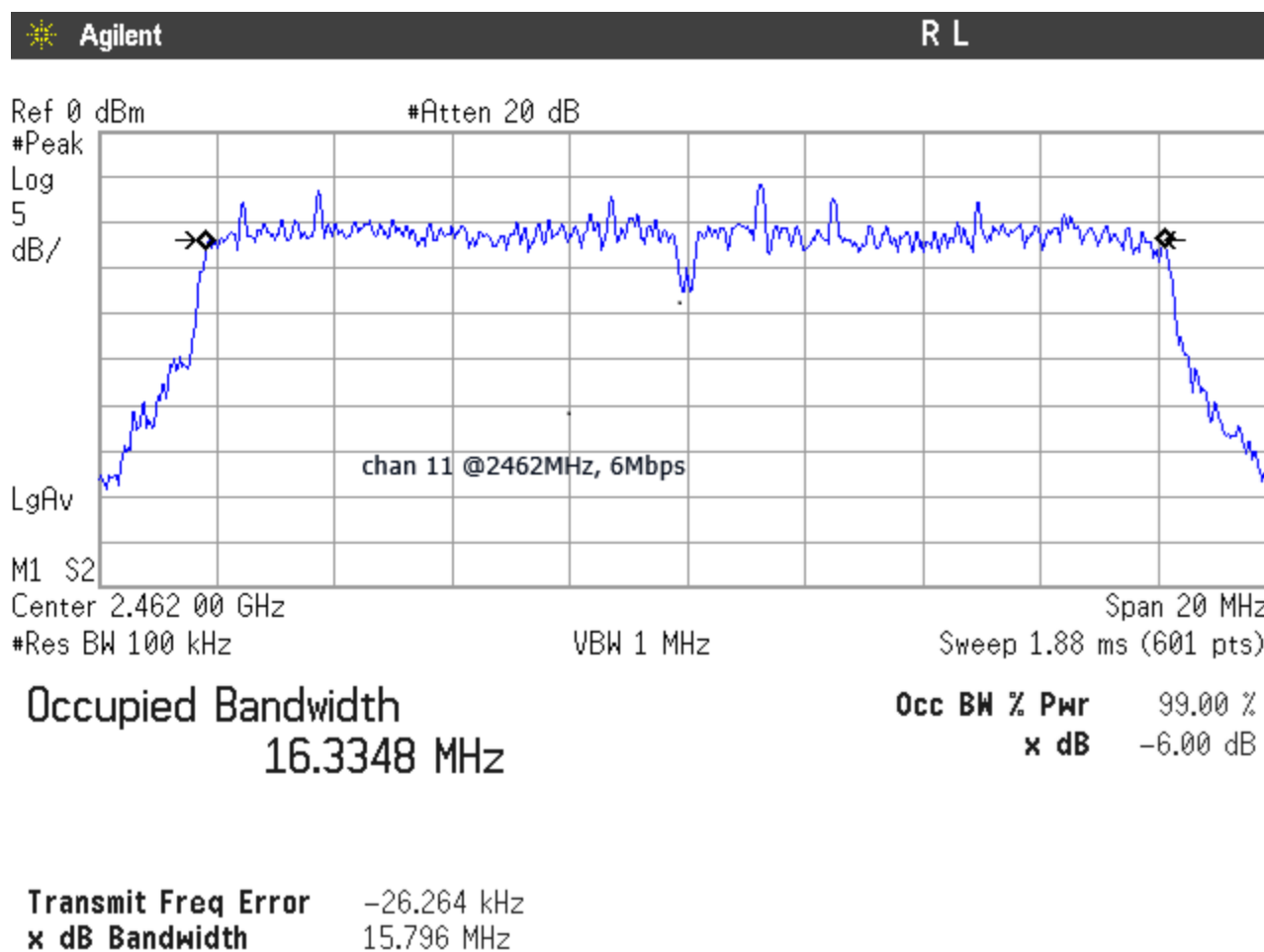


Figure 11: Occupied Bandwidth, 802.11g, 6Mbps, Channel 11

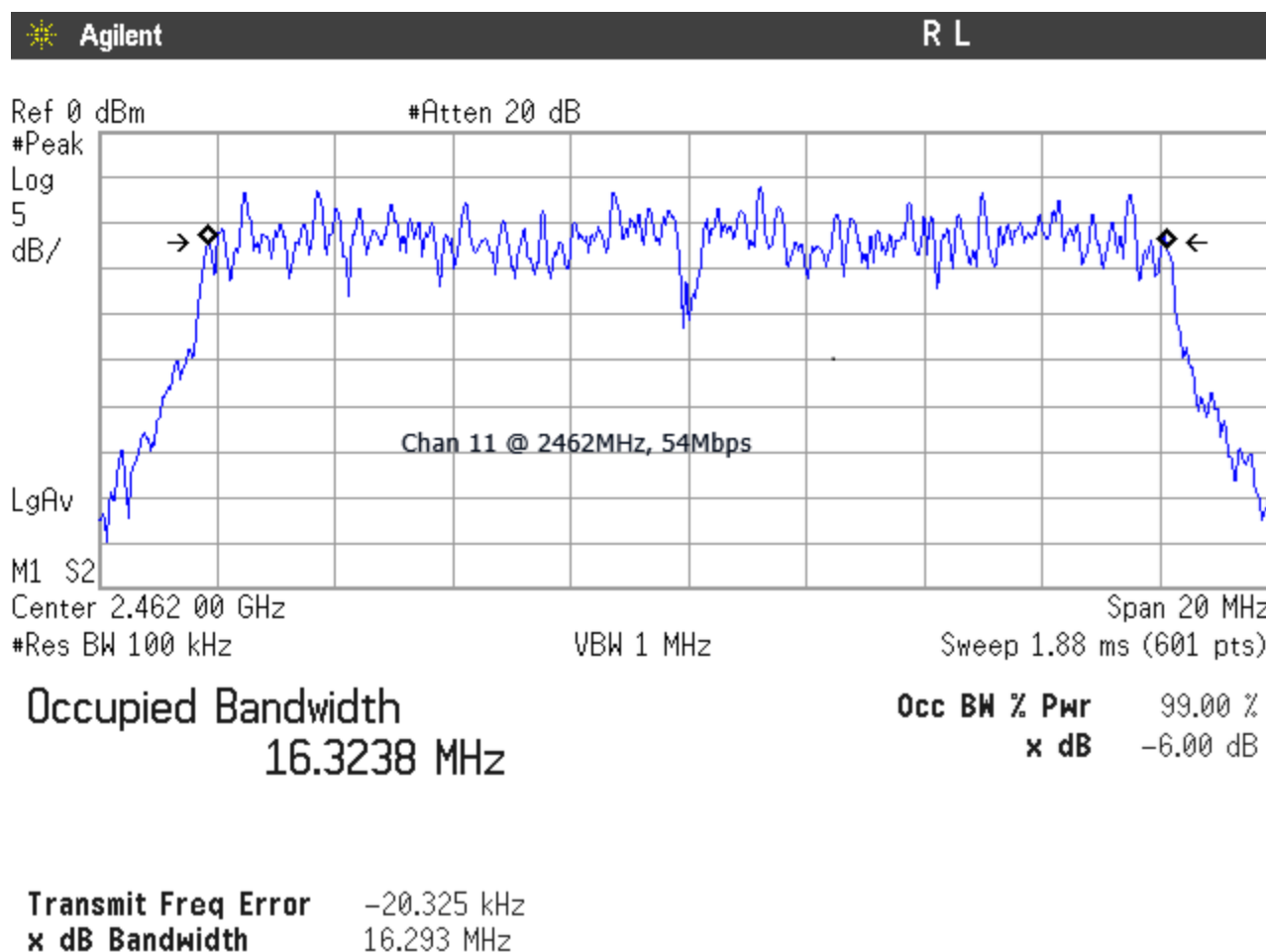


Figure 12: Occupied Bandwidth, 802.11g, 54Mbps, Channel 11

3.3 RF Power Output: (FCC Part §15.247(b))

To measure the output power the modulation was started while the frequency dwelled on a low, center and high channels. The output from the transmitter was connected to an attenuator and then to the input of a wide-band power meter. The power meter offset was adjusted to compensate for the attenuator and other losses in the system. Peak Power was measured.

Per 9.1.2 PKPM1 Peak power meter method of the FCC 558074 D01 DTS Meas Guidance v03r02

Table 6: RF Power Output

Channel and/or Frequency	Mode	Peak Measured Level (dBm)	Limit (dBm)
Chan 1 @ 2412MHz	1	20.10	30
Chan 1 @ 2412MHz	11	18.52	30
Chan 1 @ 2412MHz	6	23.36	30
Chan 1 @ 2412MHz	54	23.36	30
Chan 6 @ 2437MHz	1	19.84	30
Chan 6 @ 2437MHz	11	18.39	30
Chan 6 @ 2437MHz	6	23.53	30
Chan 6 @ 2437MHz	54	23.42	30
Chan 11 @ 2462MHz	1	19.67	30
Chan 11 @ 2462MHz	11	18.30	30
Chan 11 @ 2462MHz	6	23.59	30
Chan 11 @ 2462MHz	54	23.57	30

3.4 Power Spectral Density (Section §15.247(e))

Measurements for power spectral density were taken in accordance with 15.247(e). The measurements were performed per 10.2 Method PKPSD (peak PSD) method of the FCC 558074 D01 DTS Meas Guidance v03r02.

The spectrum analyzer was set to peak detect mode with a RBW of 10kHz and a VBW of 300kHz. The highest level detected across any 10kHz band for continuous transmission was then recorded and compared to the limit 8dBm. As the largest DTS bandwidth (6dB) was 16.32MHz a span of 24.5MHz was used (DTS BW *1.5). The below table and plots shoe the final result. The EUT complied with this requirement.

Table 7: Power Spectral Density

Channel and/or Frequency	Mode	Data Rate (Mbps)	Spectral Density (dBm)	Limit (dBm)	Pass/Fail
Chan 1 @ 2412MHz	802.11b	1	-2.72	8	Pass
Chan 1 @ 2412MHz	802.11b	11	-0.88	8	Pass
Chan 1 @ 2412MHz	802.11g	6	-4.74	8	Pass
Chan 1 @ 2412MHz	802.11g	54	-4.78	8	Pass
Chan 6 @ 2437MHz	802.11b	1	-2.51	8	Pass
Chan 6 @ 2437MHz	802.11b	11	2.42	8	Pass
Chan 6 @ 2437MHz	802.11g	6	-3.98	8	Pass
Chan 6 @ 2437MHz	802.11g	54	-4.83	8	Pass
Chan 11 @ 2462MHz	802.11b	1	-2.82	8	Pass
Chan 11 @ 2462MHz	802.11b	11	-2.32	8	Pass
Chan 11 @ 2462MHz	802.11g	6	-3.86	8	Pass
Chan 11 @ 2462MHz	802.11g	54	-3.40	8	Pass

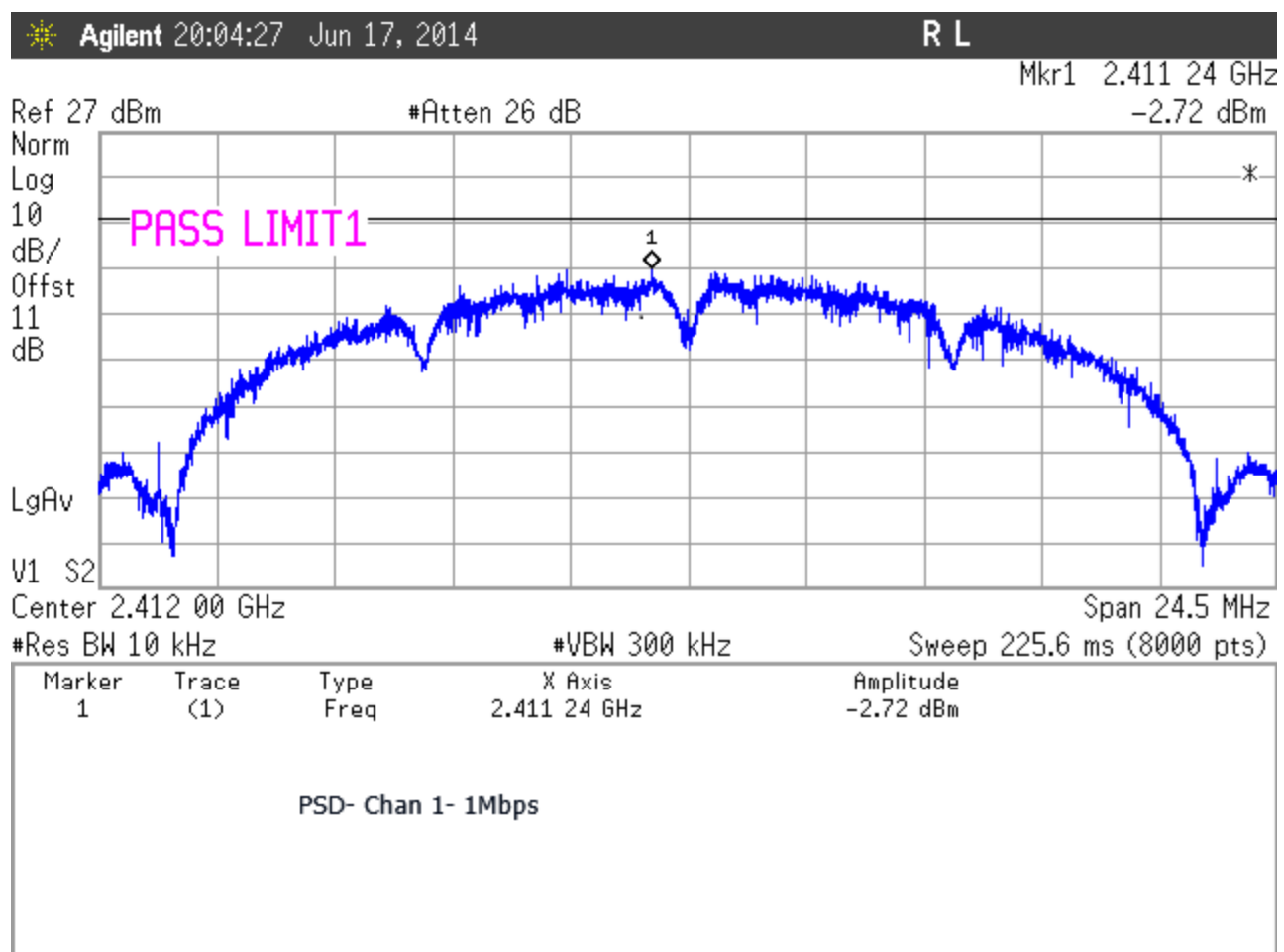


Figure 13: Power Spectral Density, 802.11b, 1Mbps, Channel 1

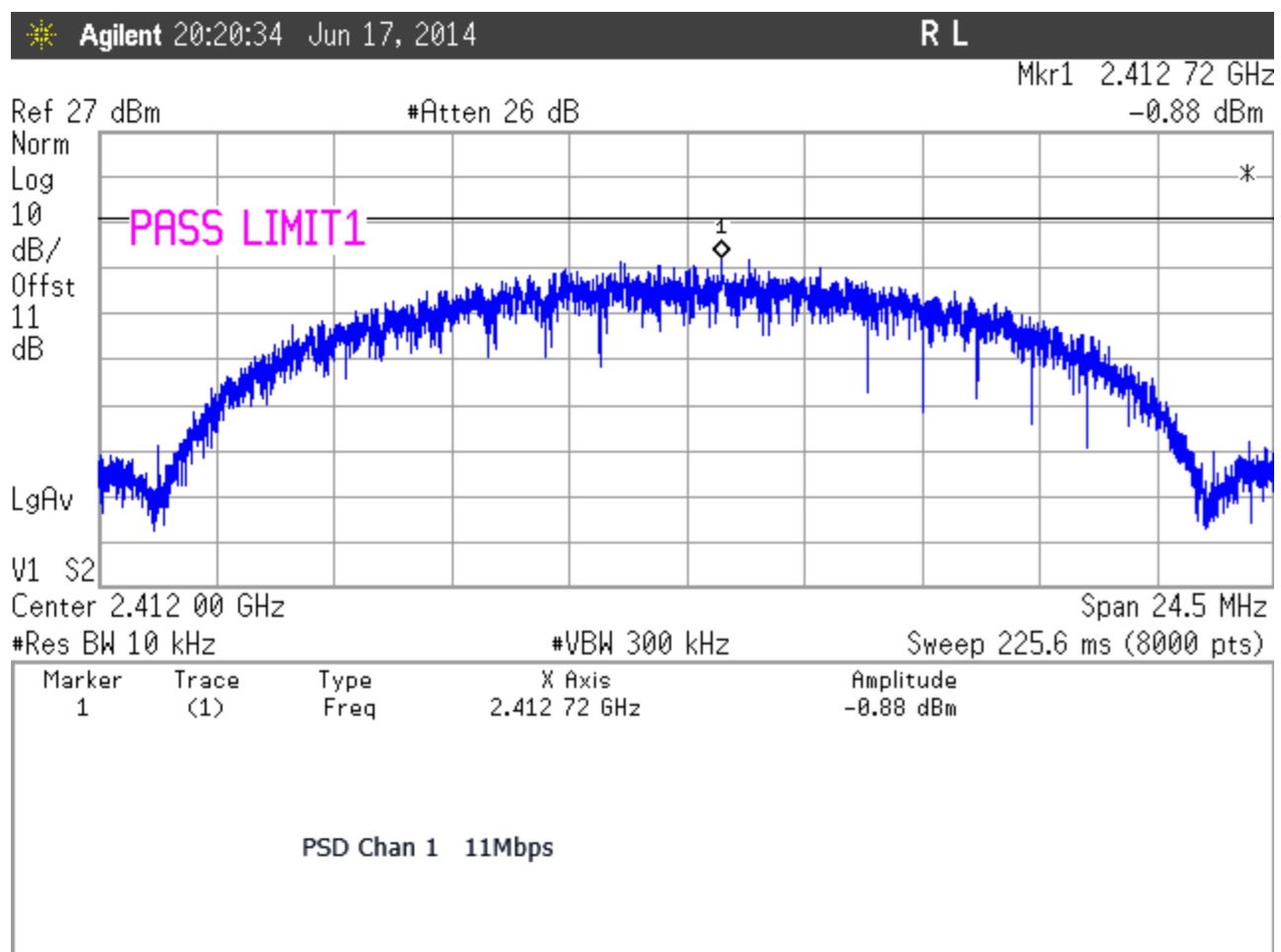


Figure 14: Power Spectral Density, 802.11b, 11Mbps, Channel 1

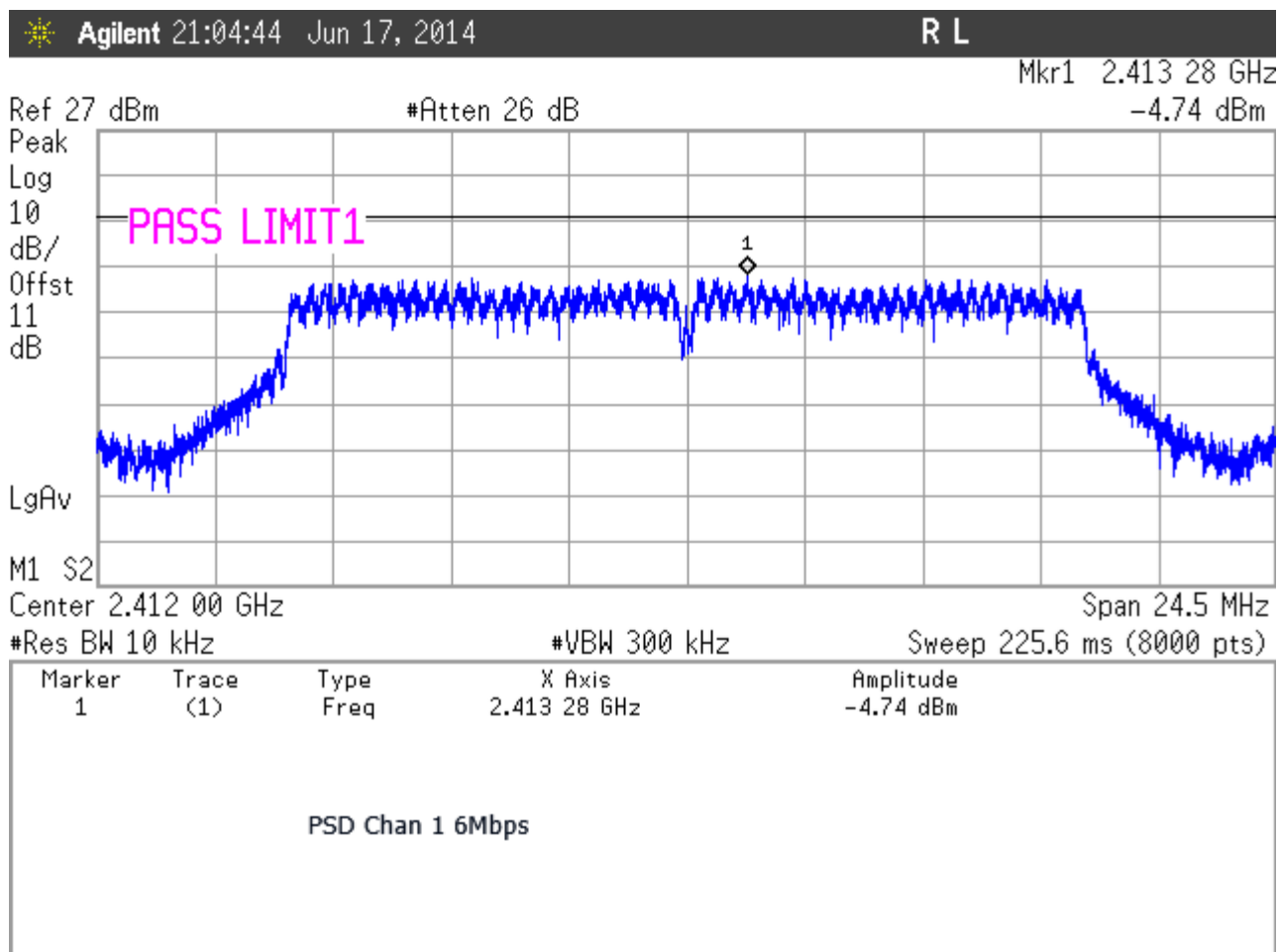


Figure 15: Power Spectral Density, 802.11g, 6Mbps, Channel 1

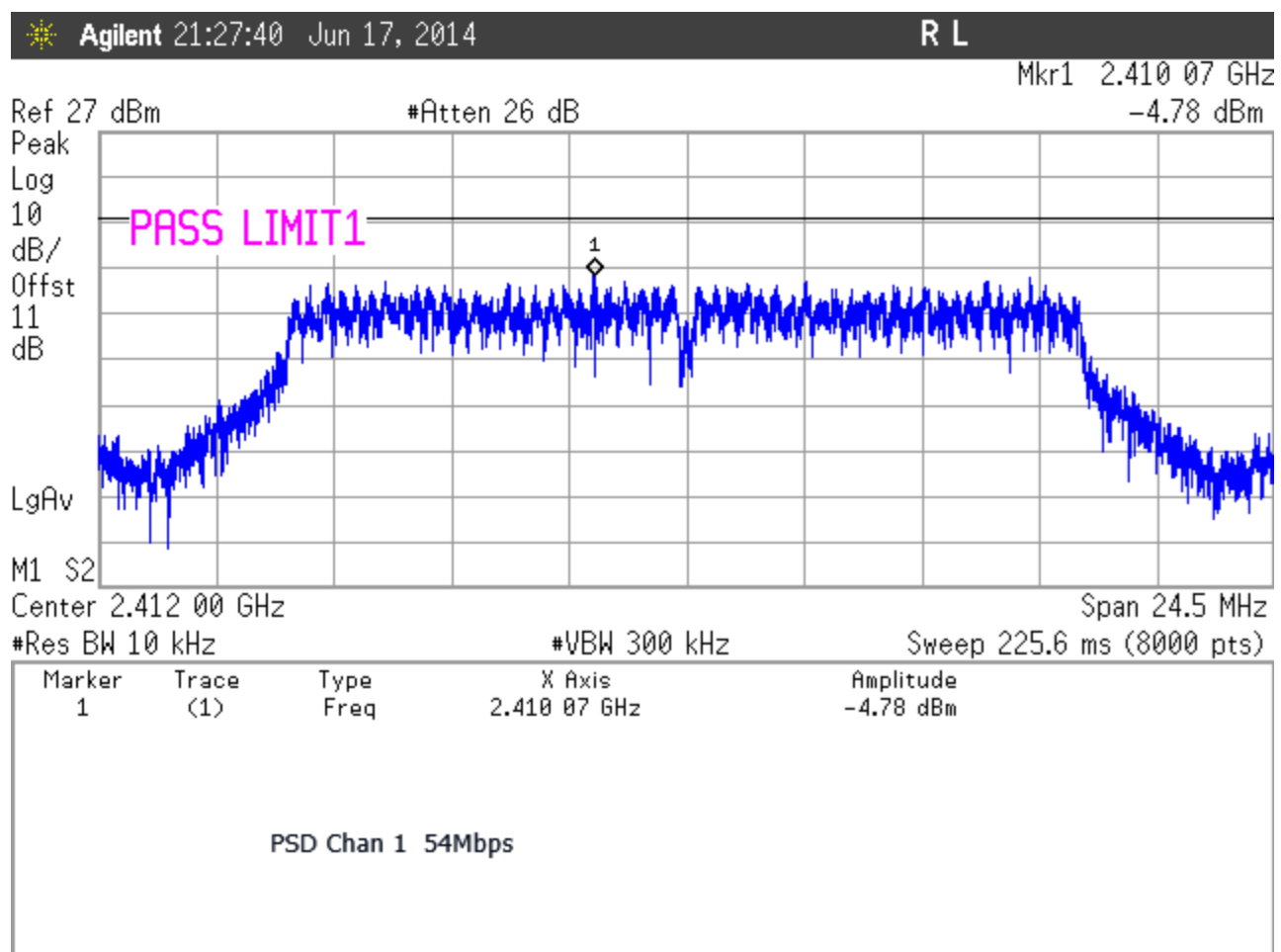


Figure 16: Power Spectral Density, 802.11g, 54Mbps, Channel 1

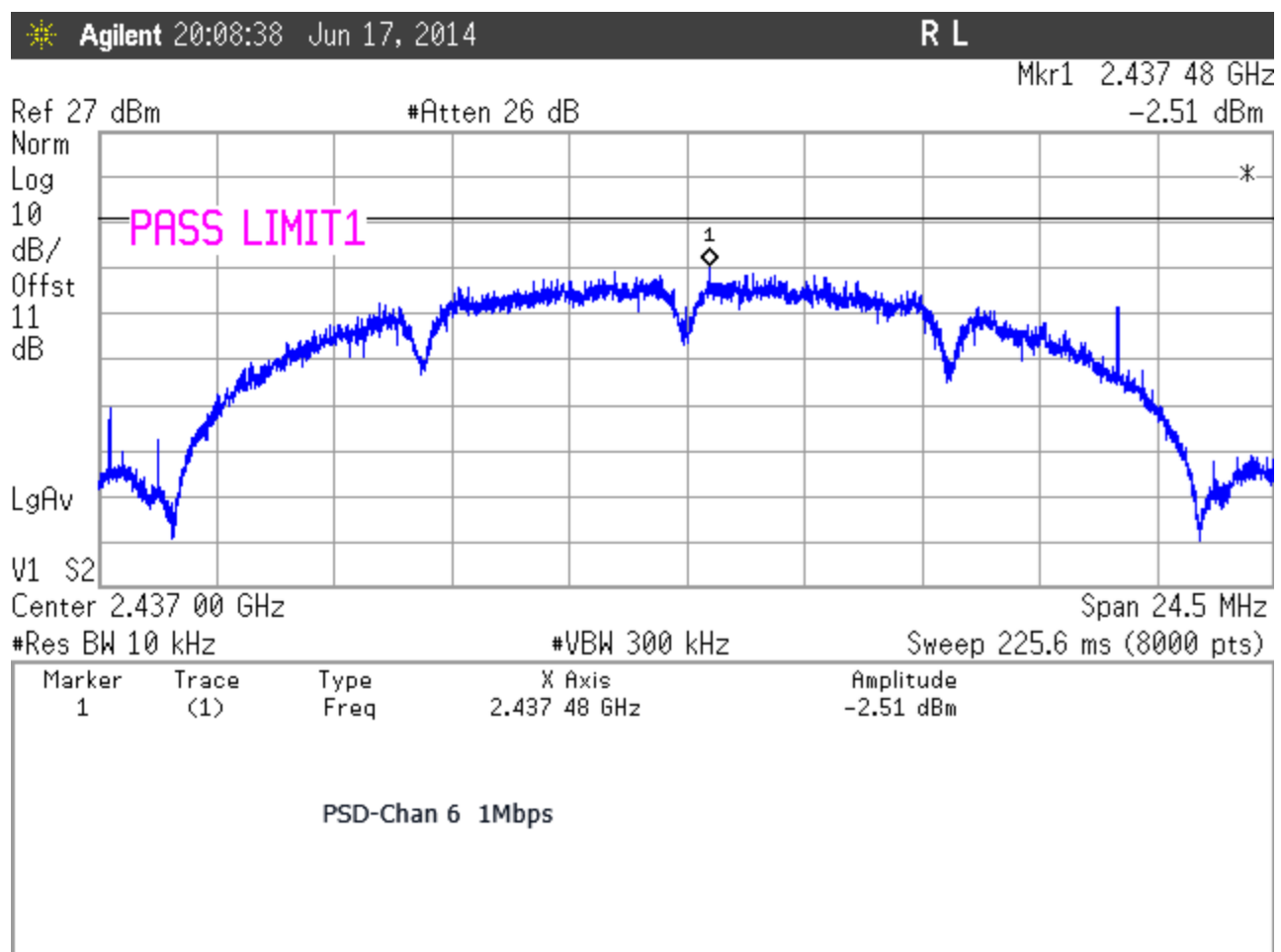


Figure 17: Power Spectral Density, 802.11b, 1Mbps, Channel 6

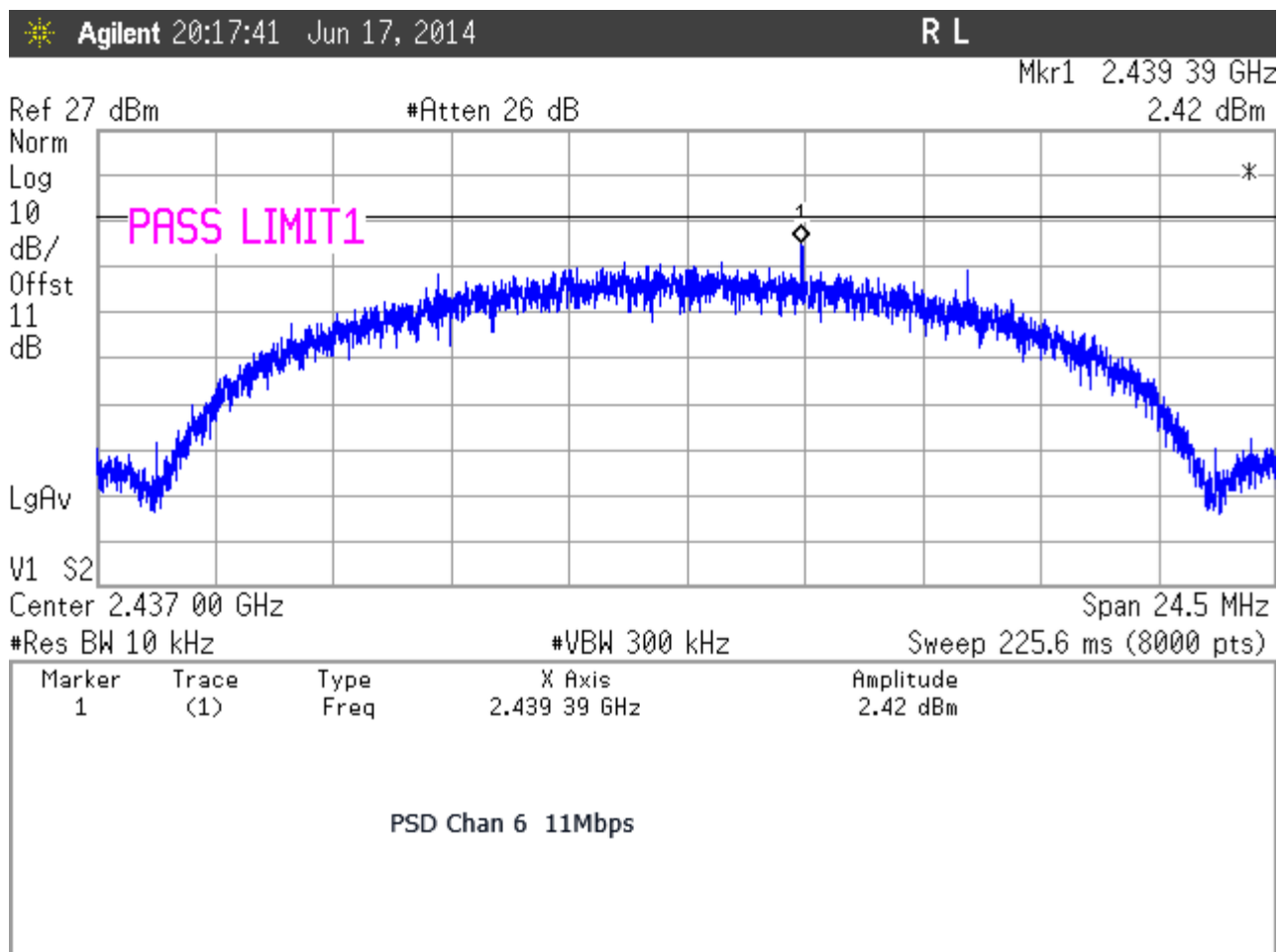


Figure 18: Power Spectral Density, 802.11b, 11Mbps, Channel 6

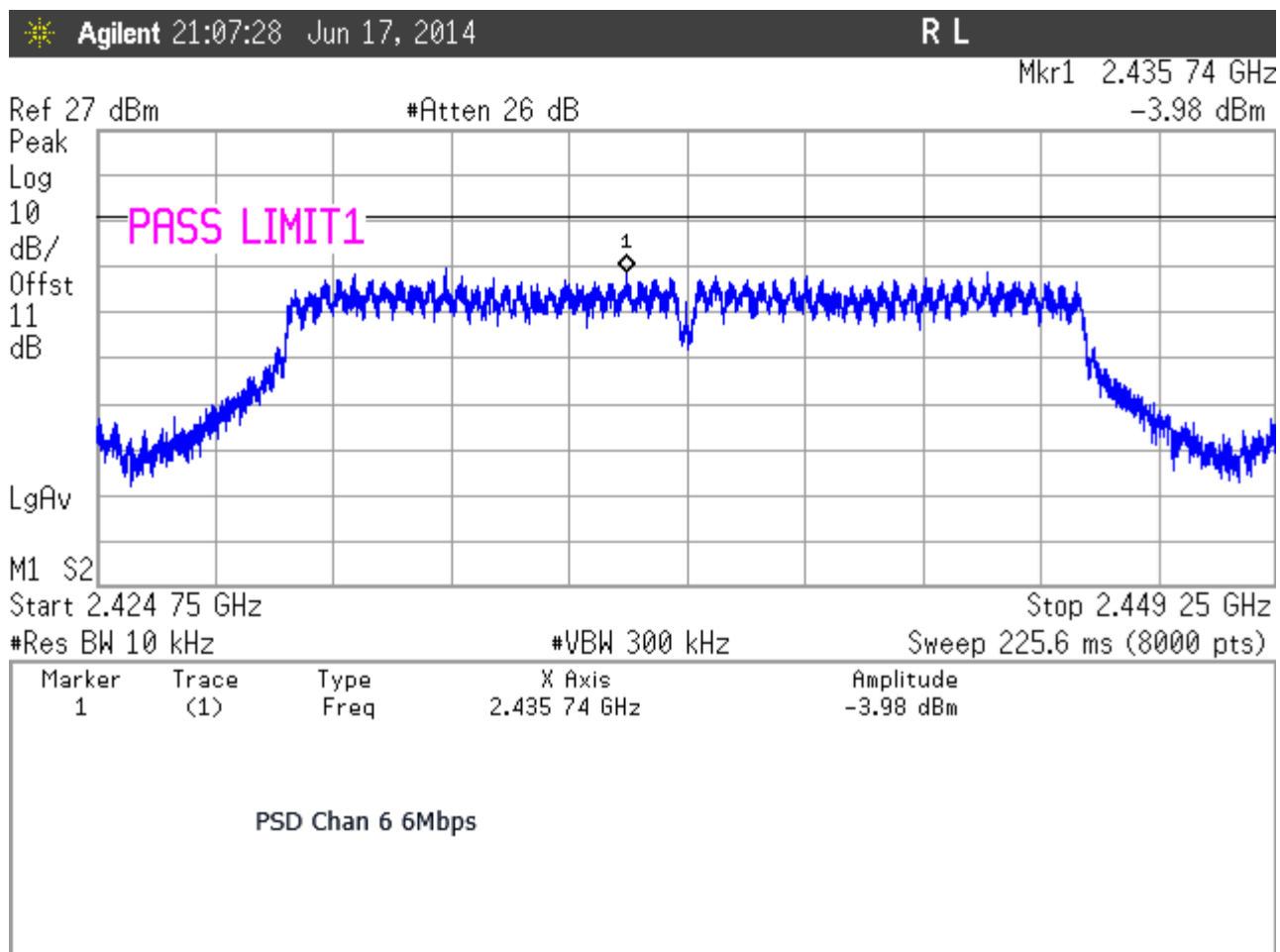


Figure 19: Power Spectral Density, 802.11g, 6Mbps, Channel 6

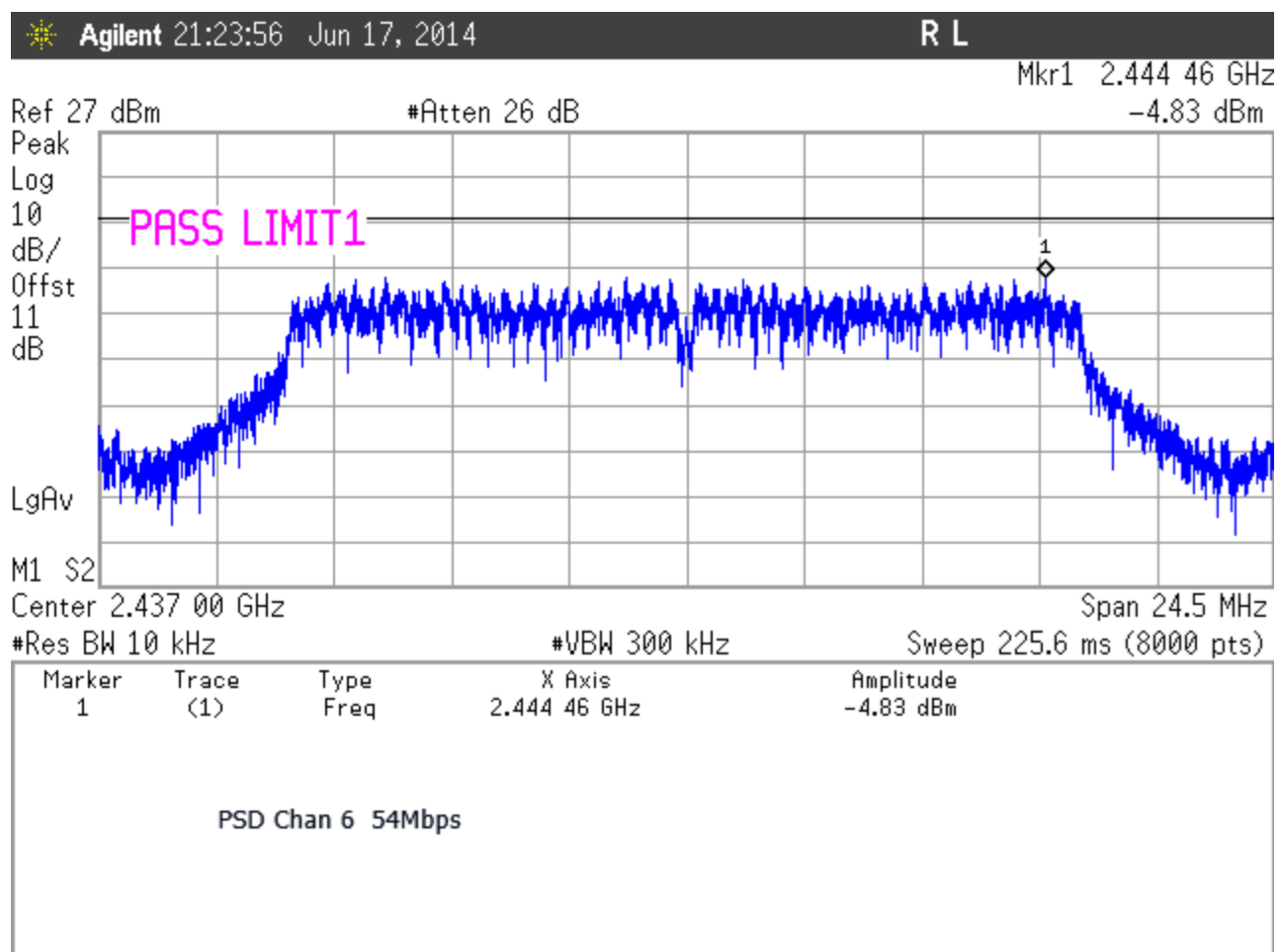


Figure 20: Power Spectral Density, 802.11g, 54Mbps, Channel 6

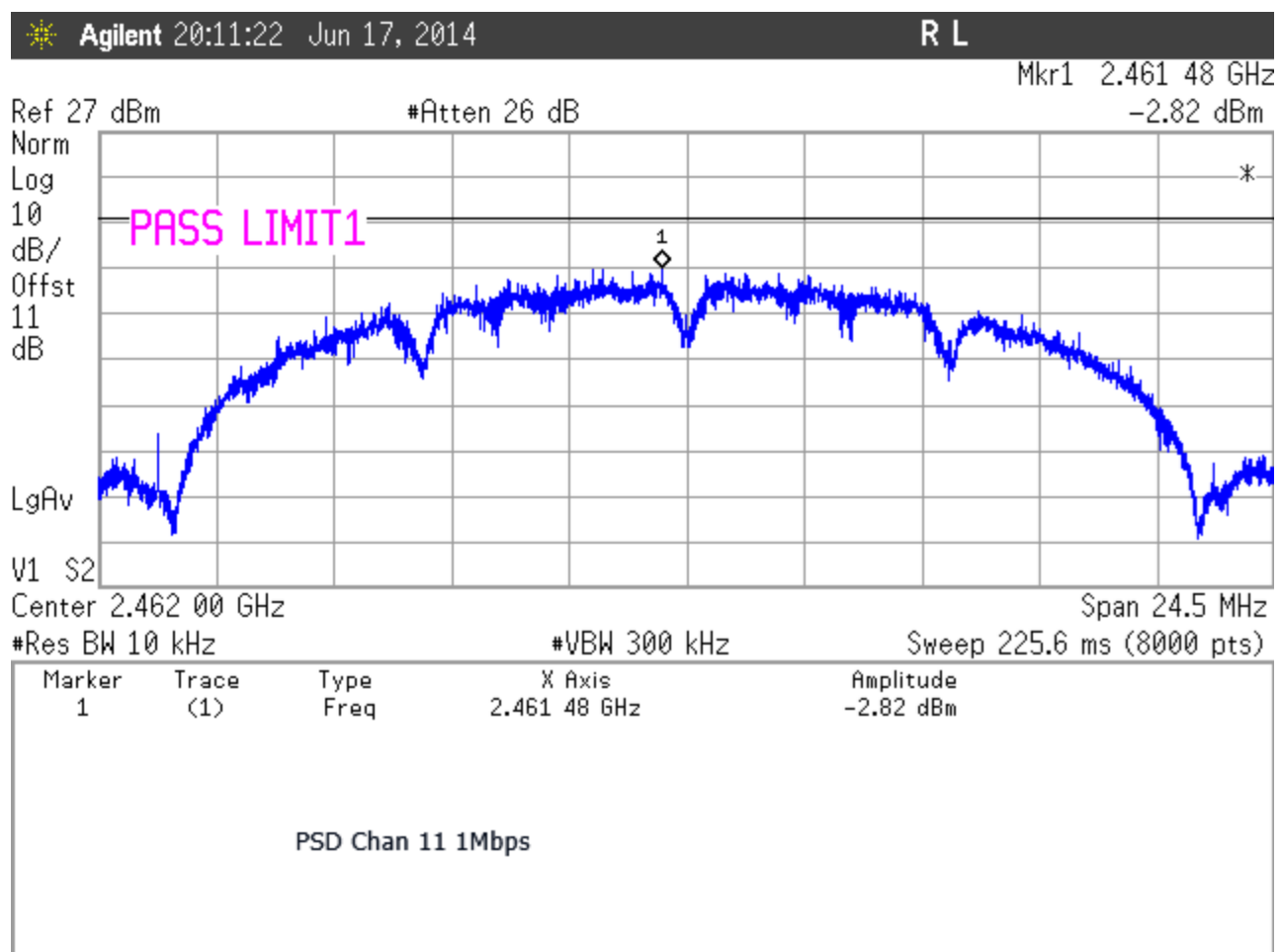


Figure 21: Power Spectral Density, 802.11b, 1Mbps, Channel 11

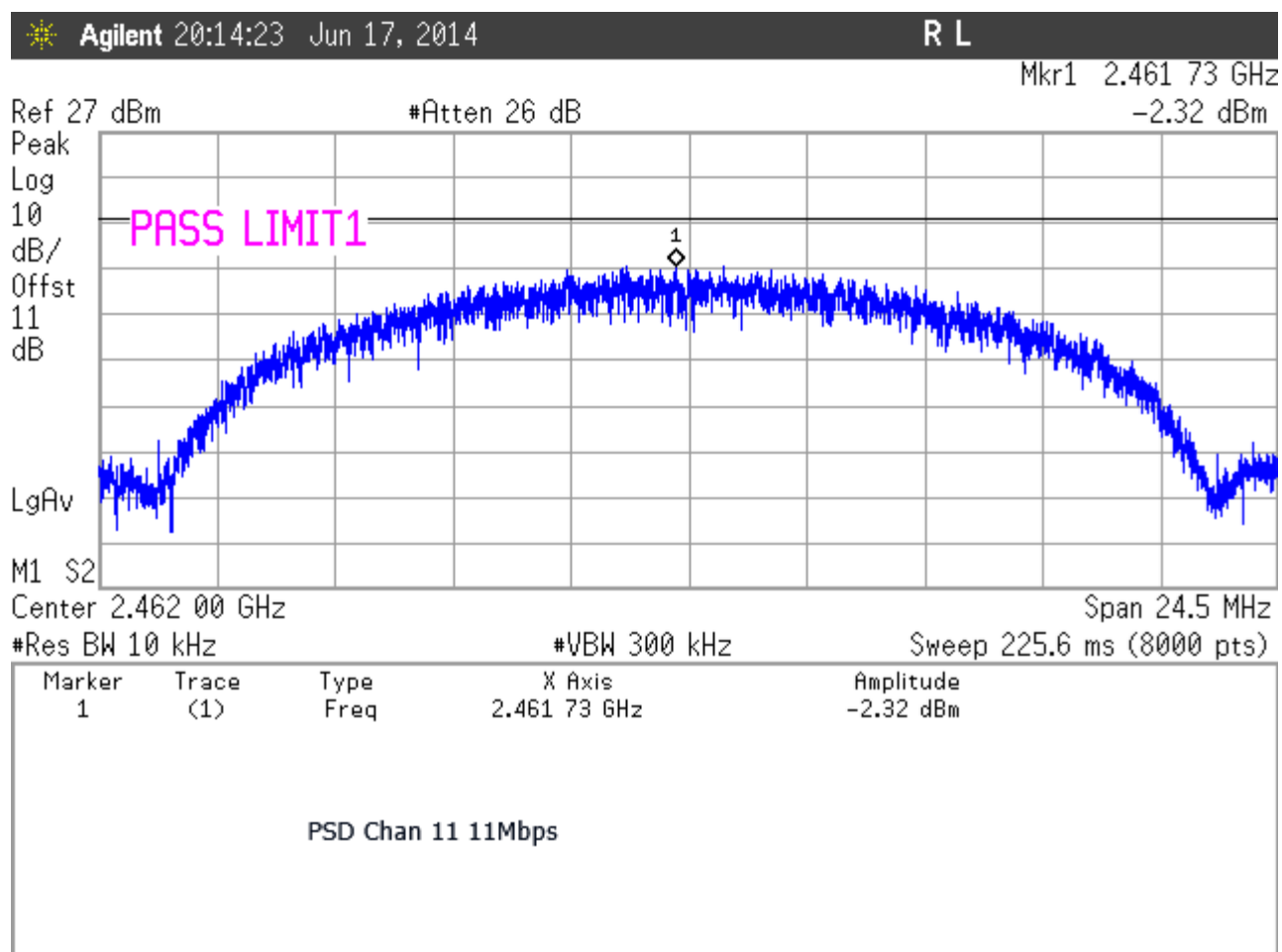


Figure 22: Power Spectral Density, 802.11b, 11Mbps, Channel 11

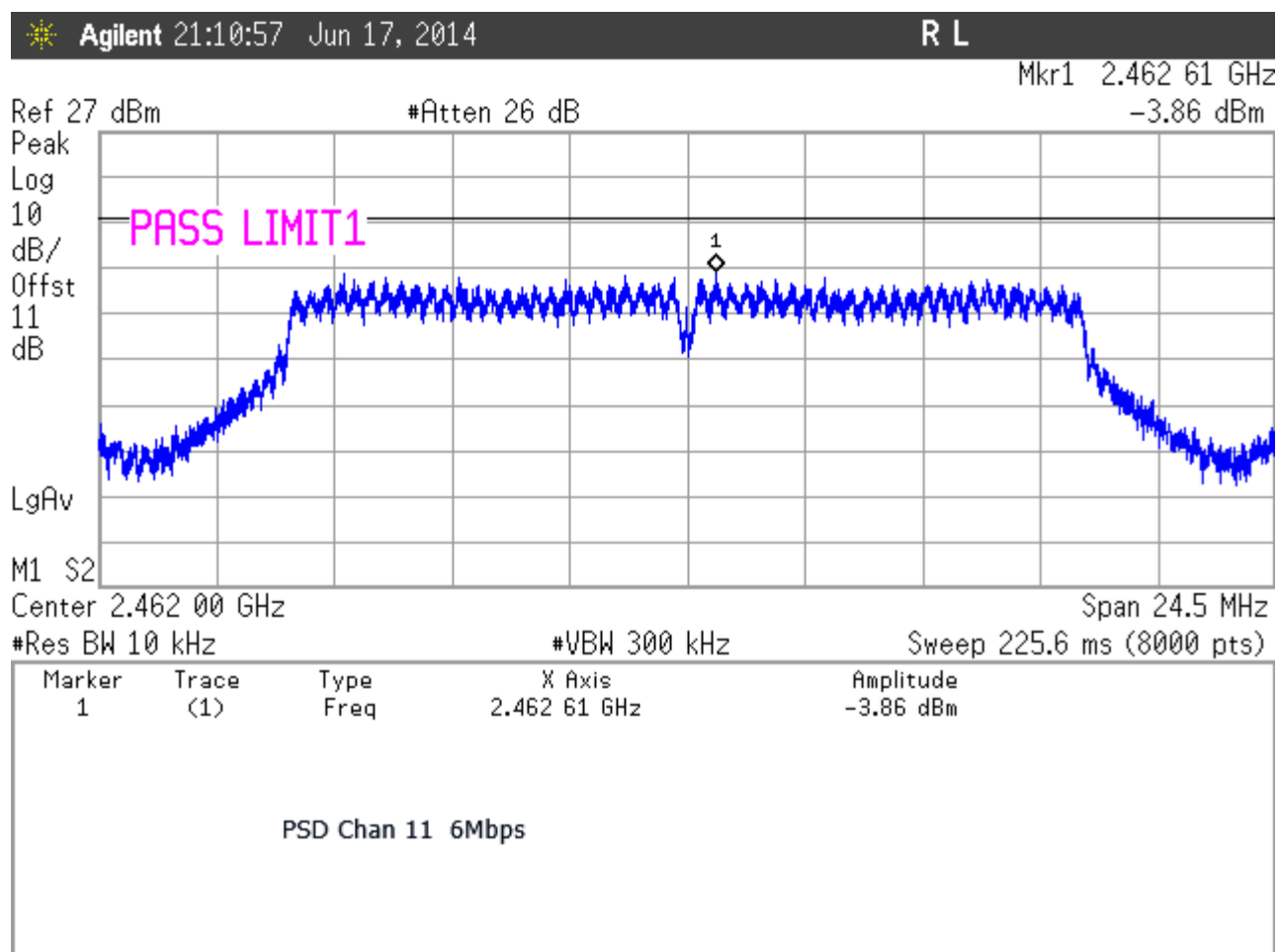


Figure 23: Power Spectral Density, 802.11g, 6Mbps, Channel 11

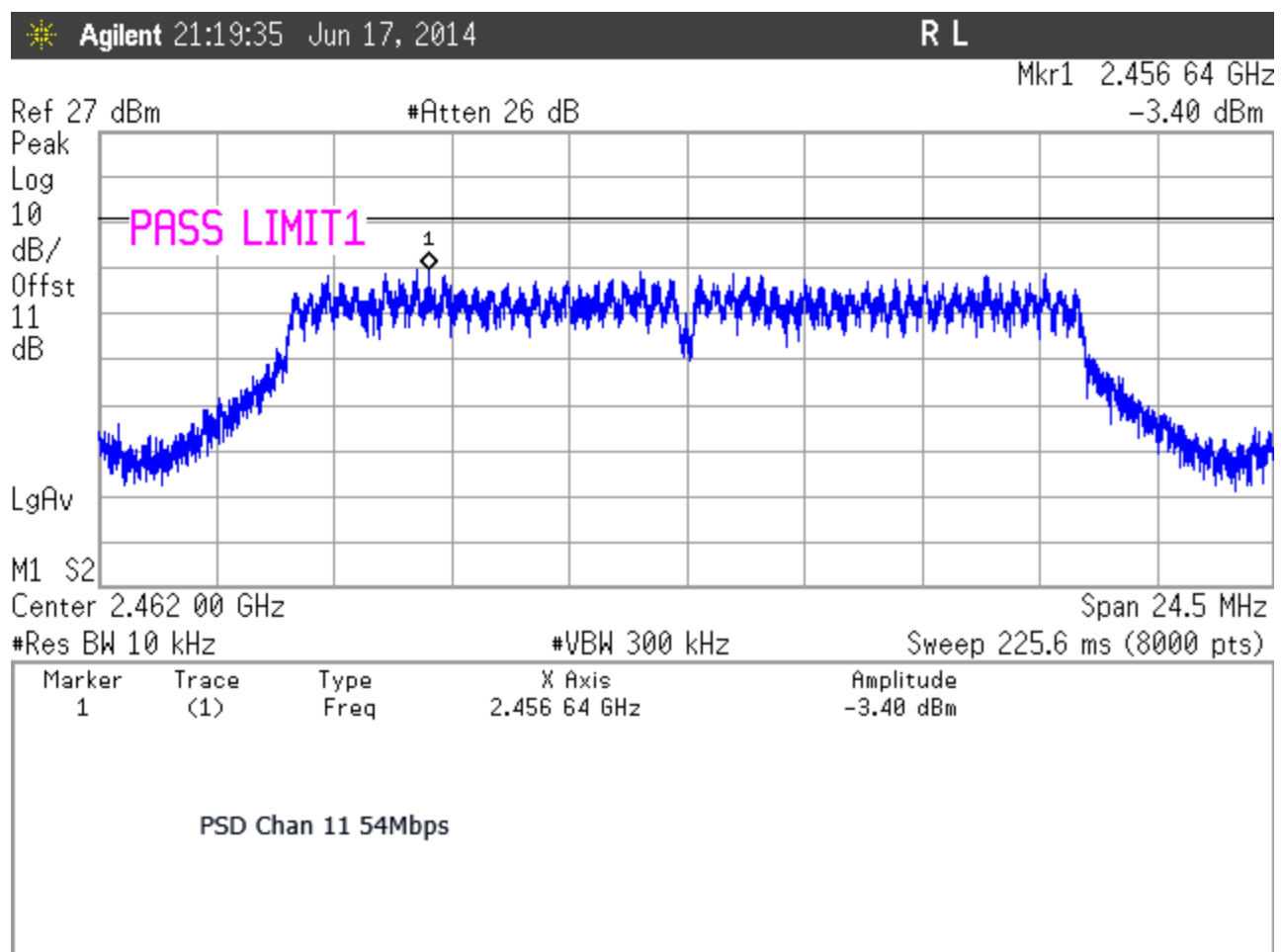


Figure 24: Power Spectral Density, 802.11g, 54Mbps, Channel 11

3.5 Conducted Spurious Emissions at Antenna Terminals (FCC Part §15.247(c))

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.

As per 11.2 of the FCC 558074 D01 DTS Meas Guidance v03r02 this test was performed with a data rate of 11Mbps (highest PSD) on the highest, center, and lowest channels up to 25GHz. In addition the 54Mbps mode was tested for band edge compliance.

The EUT complied with this requirement.

The following are plots of the conducted spurious emissions data.

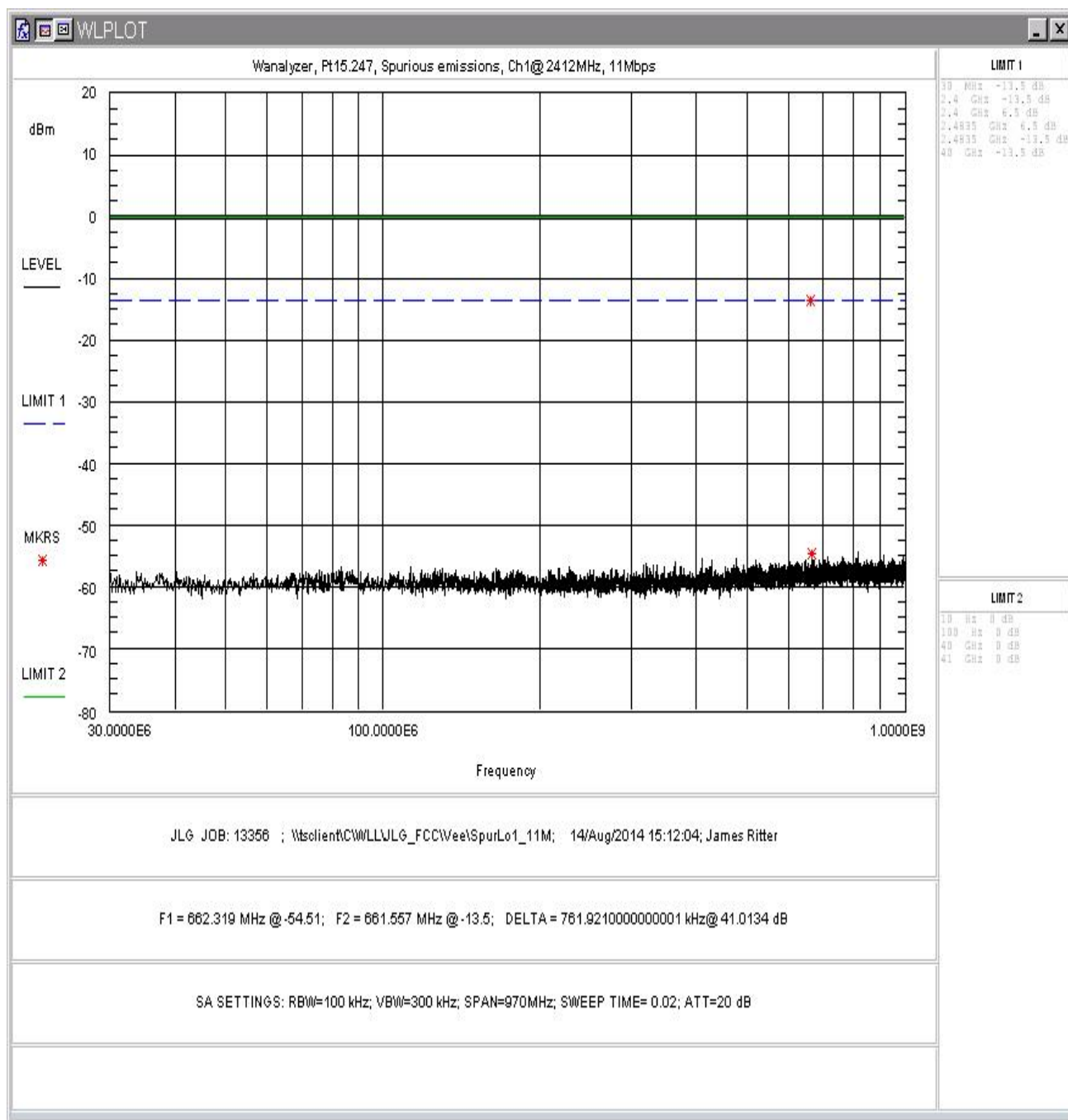


Figure 25: Conducted Spurious Emissions, Channel 1, 11Mbps, 30 - 1000MHz

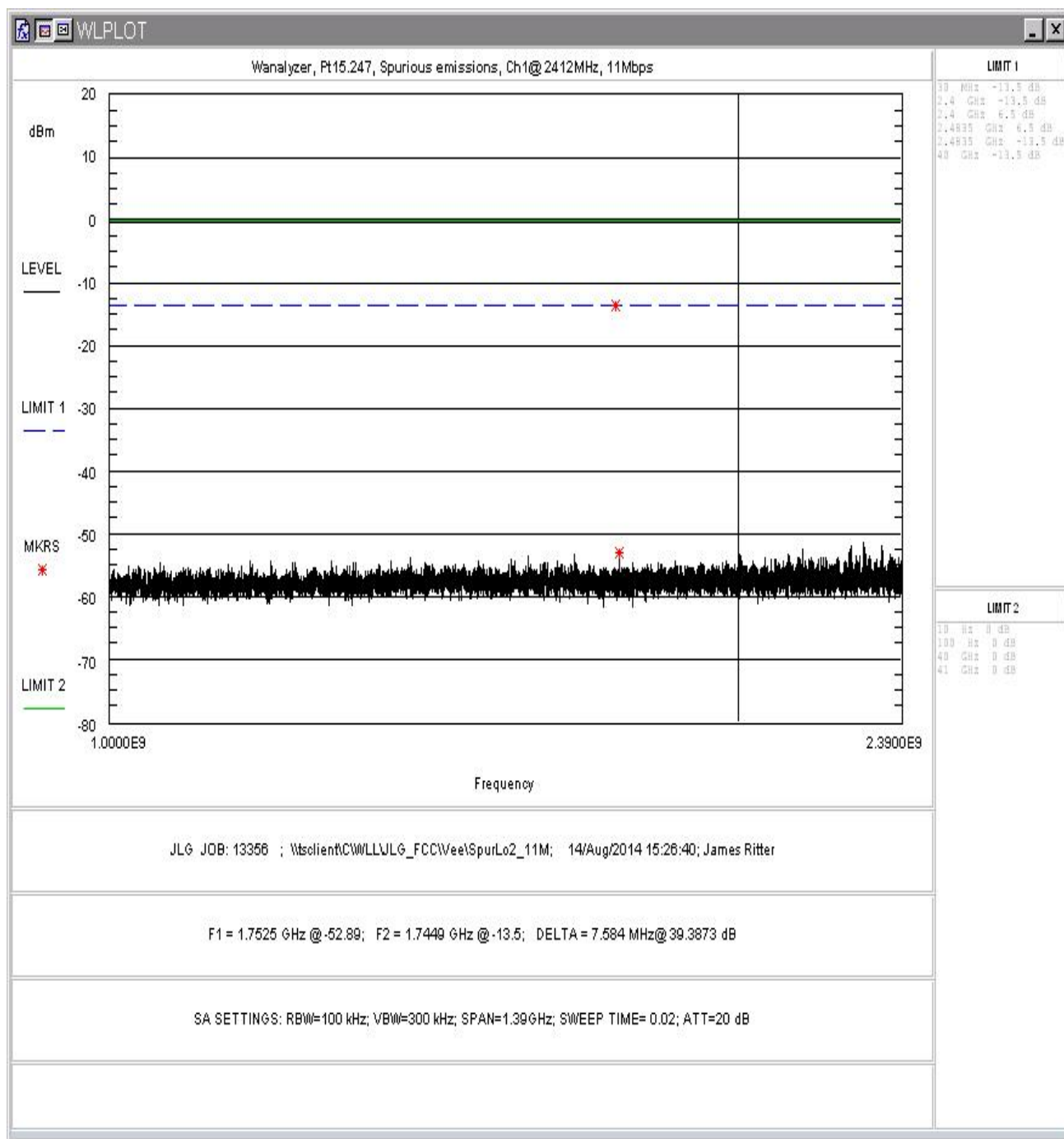


Figure 26: Conducted Spurious Emissions, Channel 1, 11Mbps, 1 – 2.39GHz

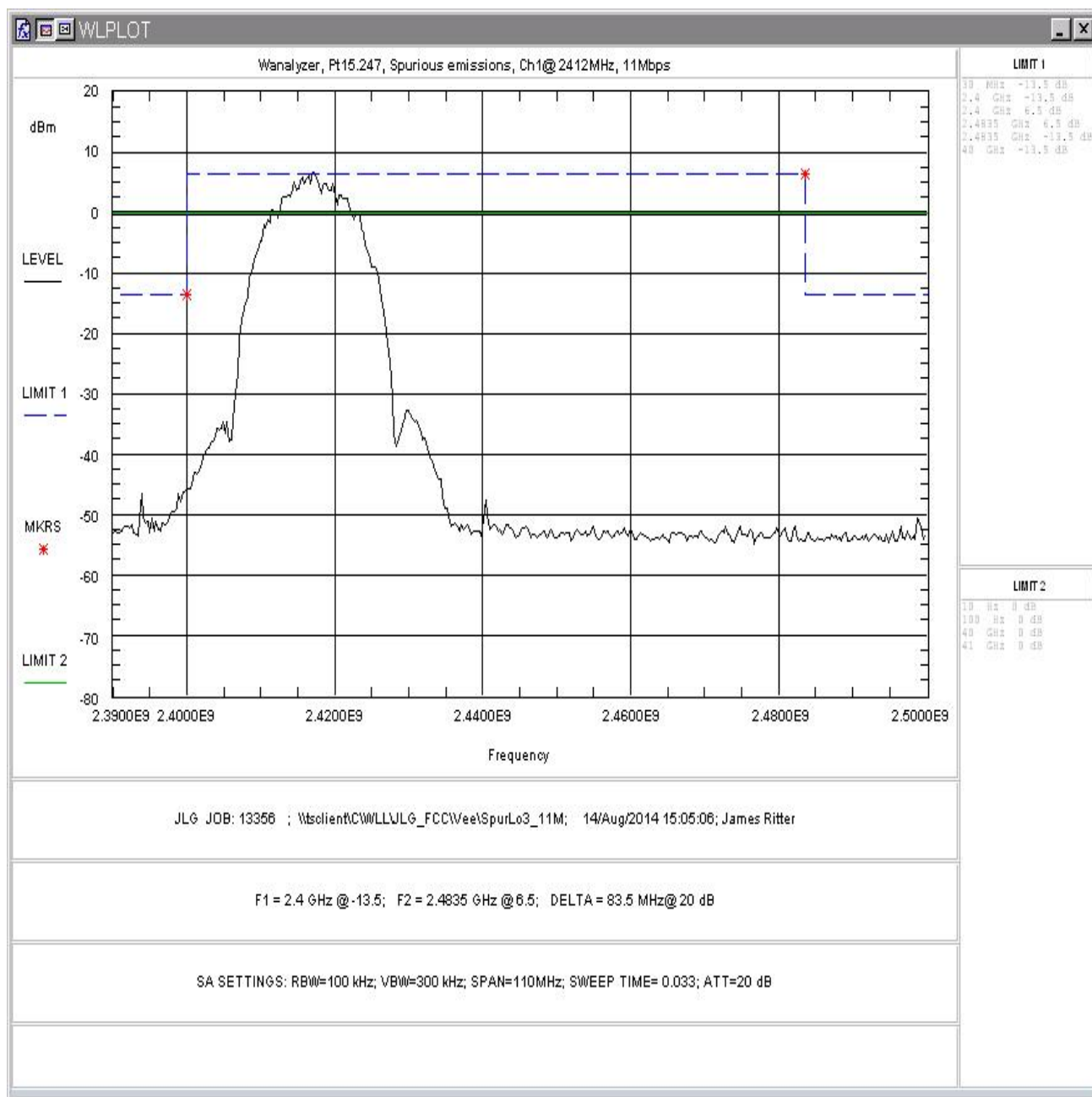


Figure 27: Conducted Spurious Emissions, Channel 1, 11Mbps, 2.39 – 2.5GHz

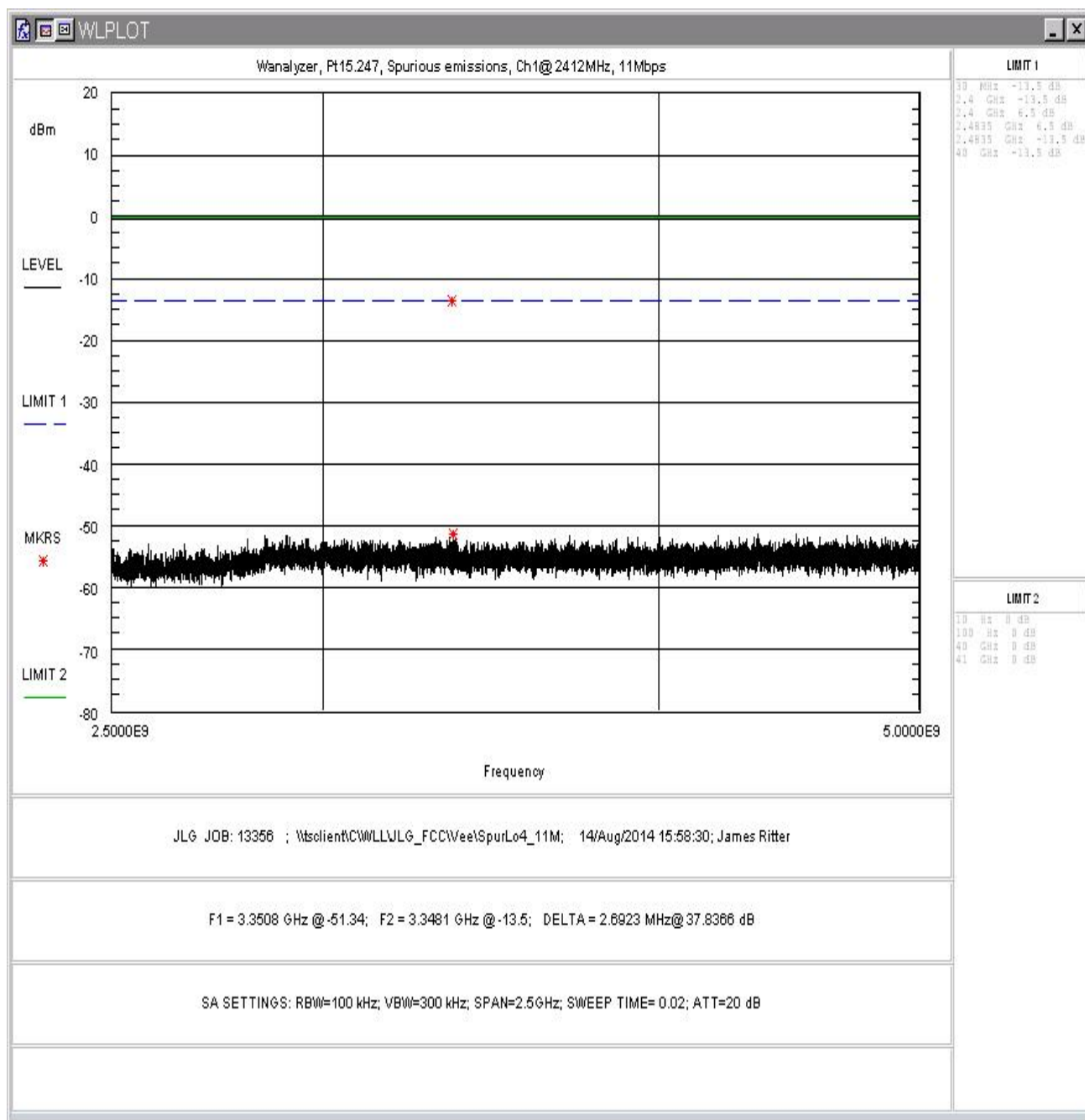


Figure 28: Conducted Spurious Emissions, Channel 1, 11Mbps, 2.5 - 5GHz

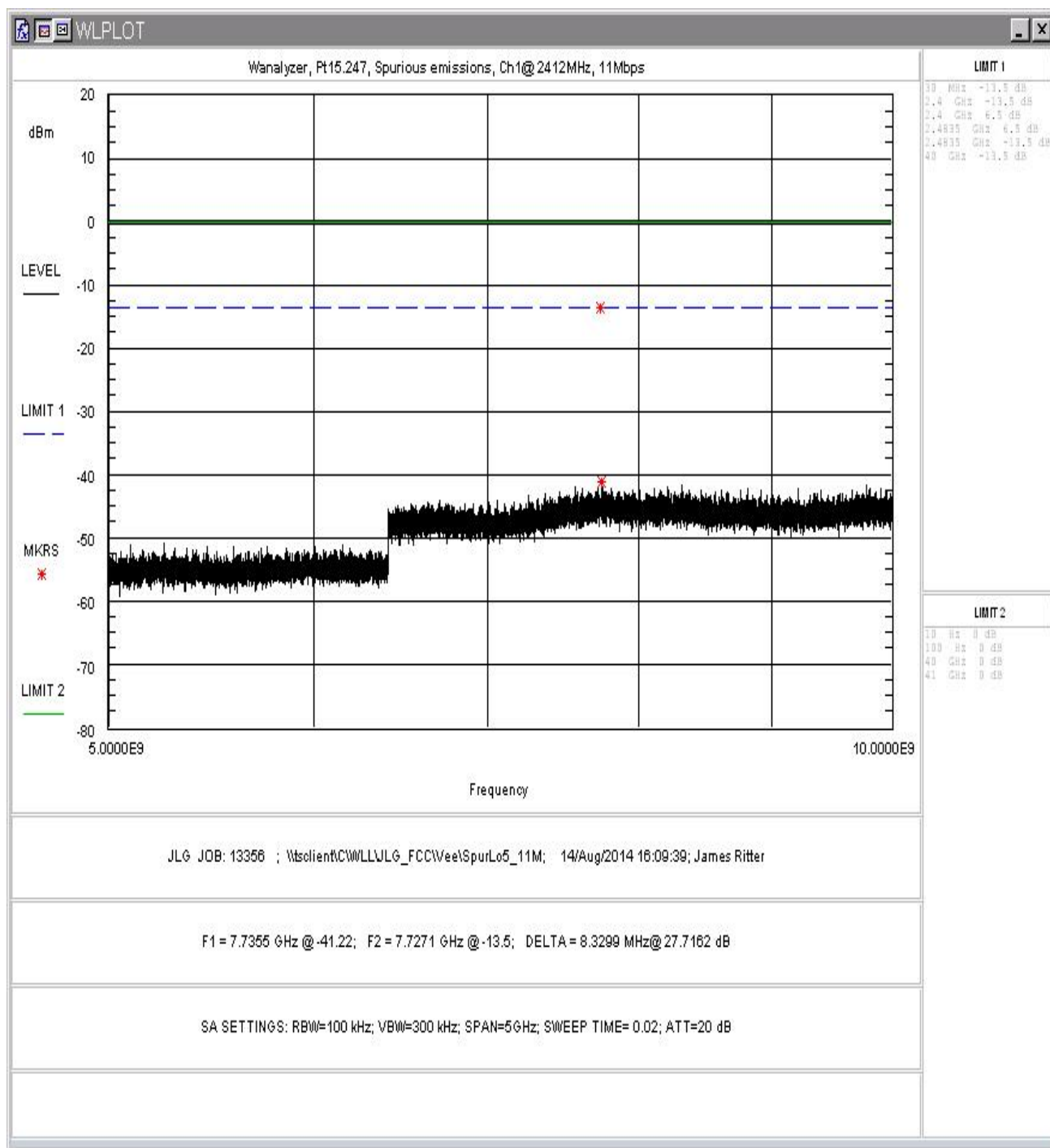


Figure 29: Conducted Spurious Emissions, Channel 1, 11Mbps, 5 - 10GHz

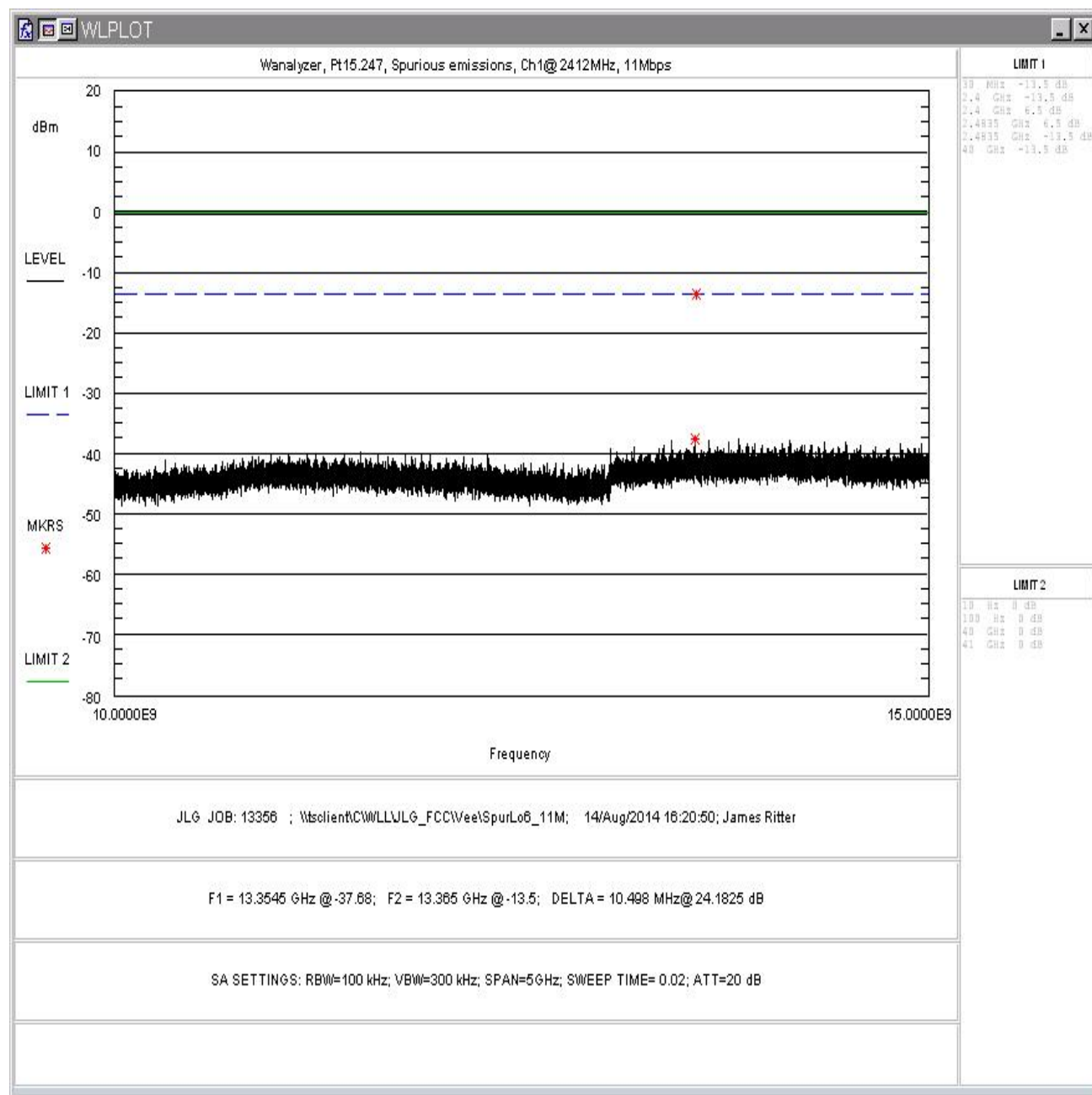


Figure 30: Conducted Spurious Emissions, Channel 1, 11Mbps, 10-15GHz

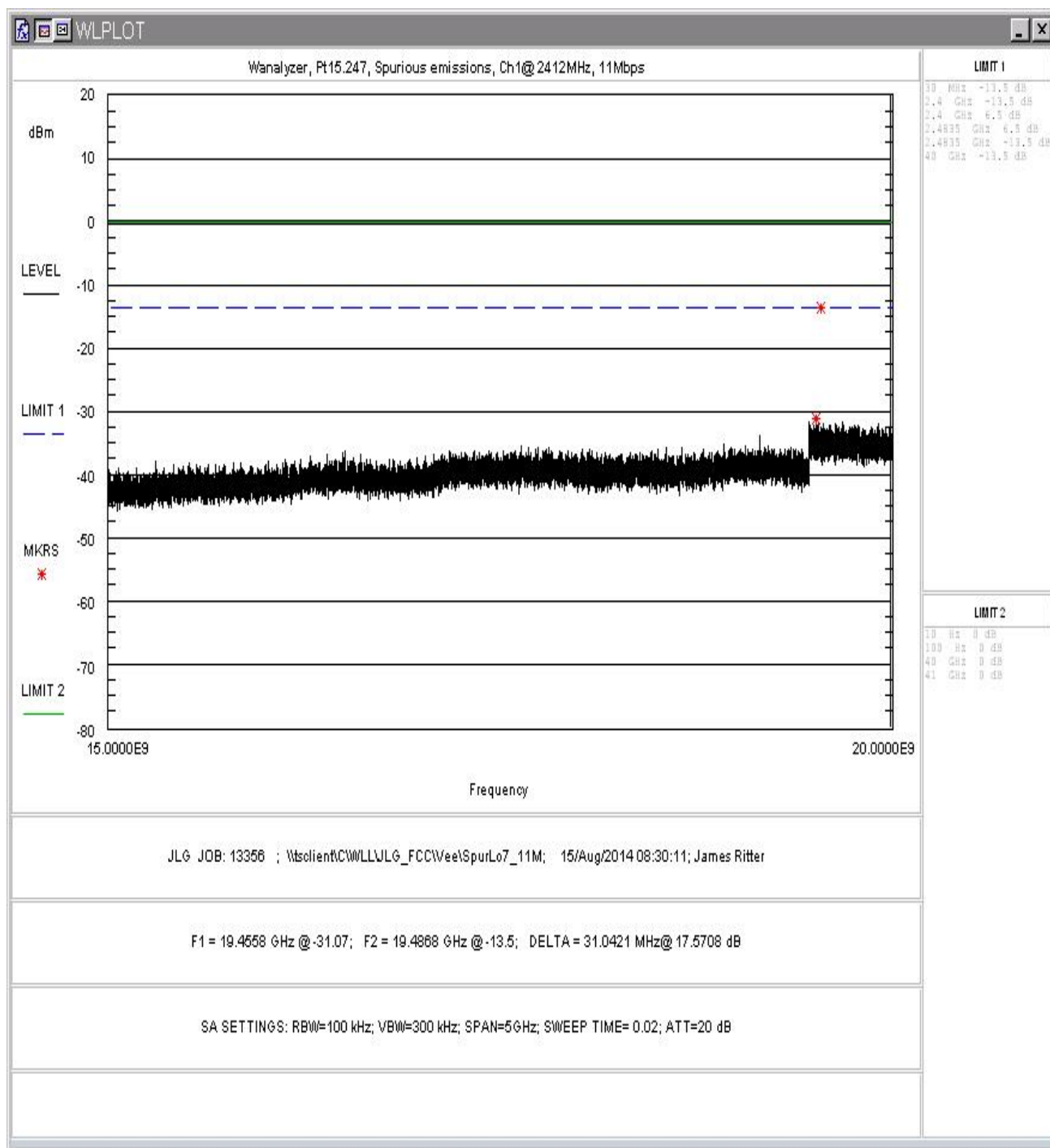


Figure 31: Conducted Spurious Emissions, Channel 1, 11Mbps, 15-20GHz

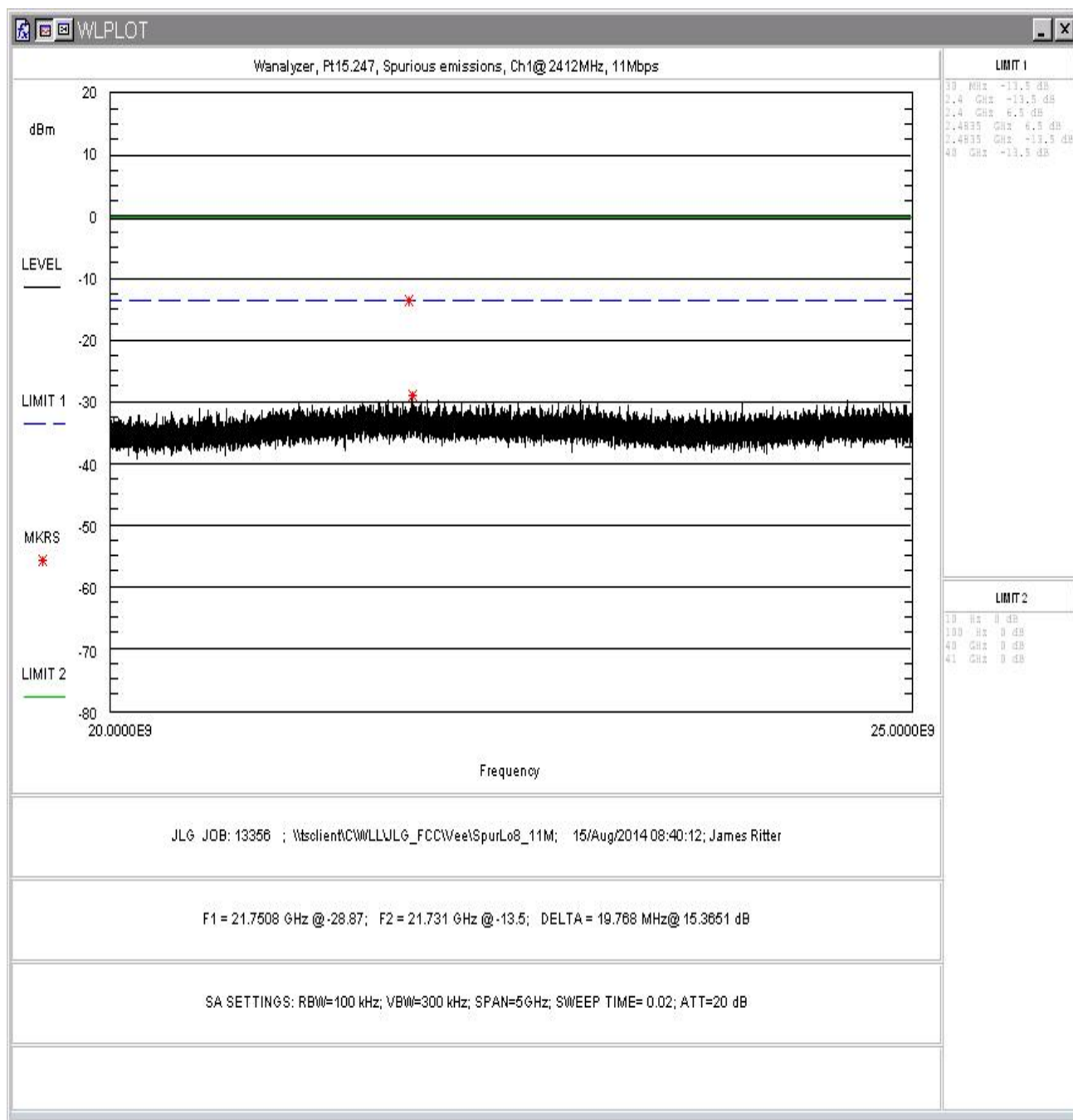


Figure 32: Conducted Spurious Emissions, Channel 1, 11Mbps, 20-25 GHz

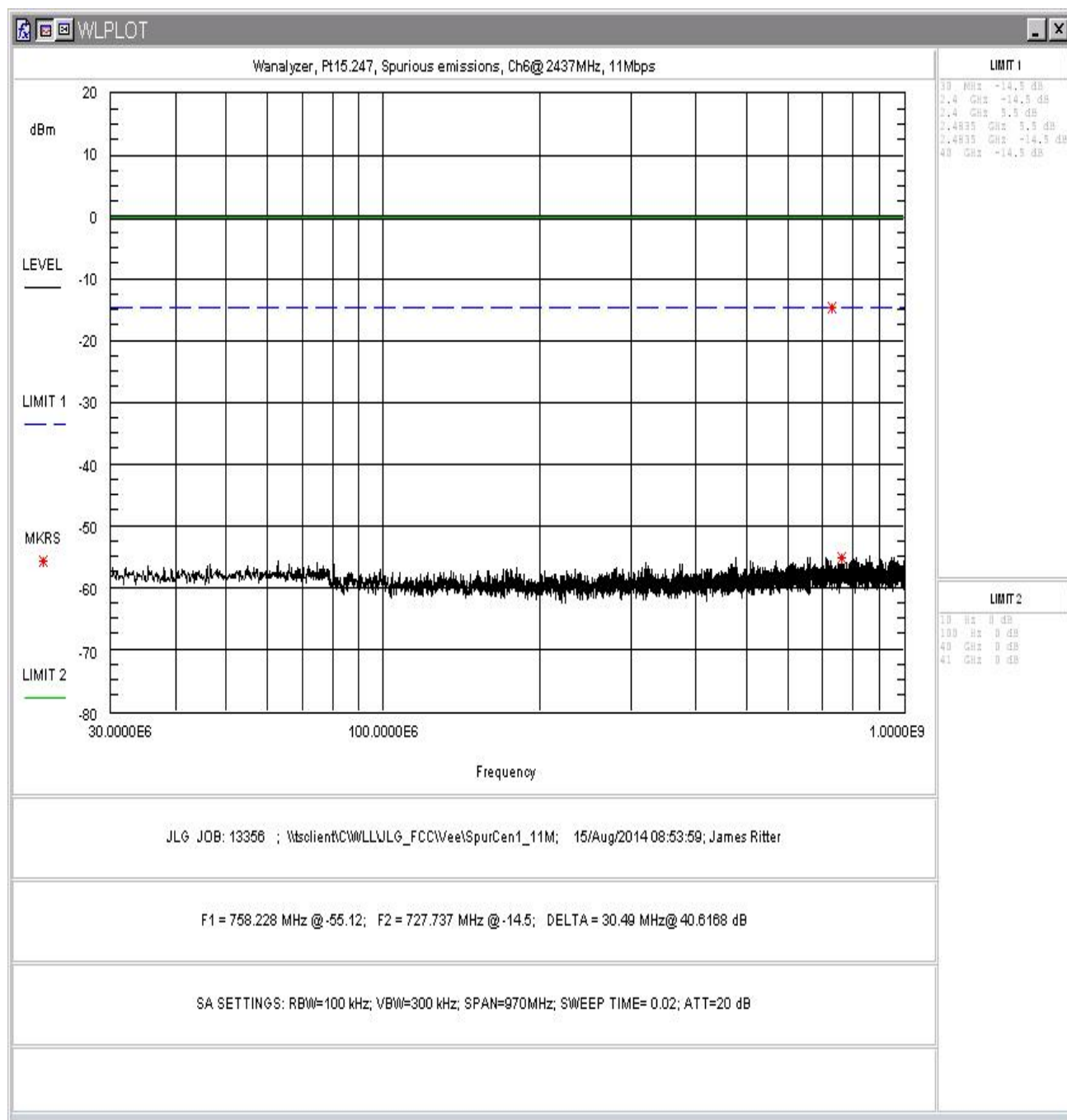


Figure 33: Conducted Spurious Emissions, Channel 6, 11Mbps, 30 - 1000MHz

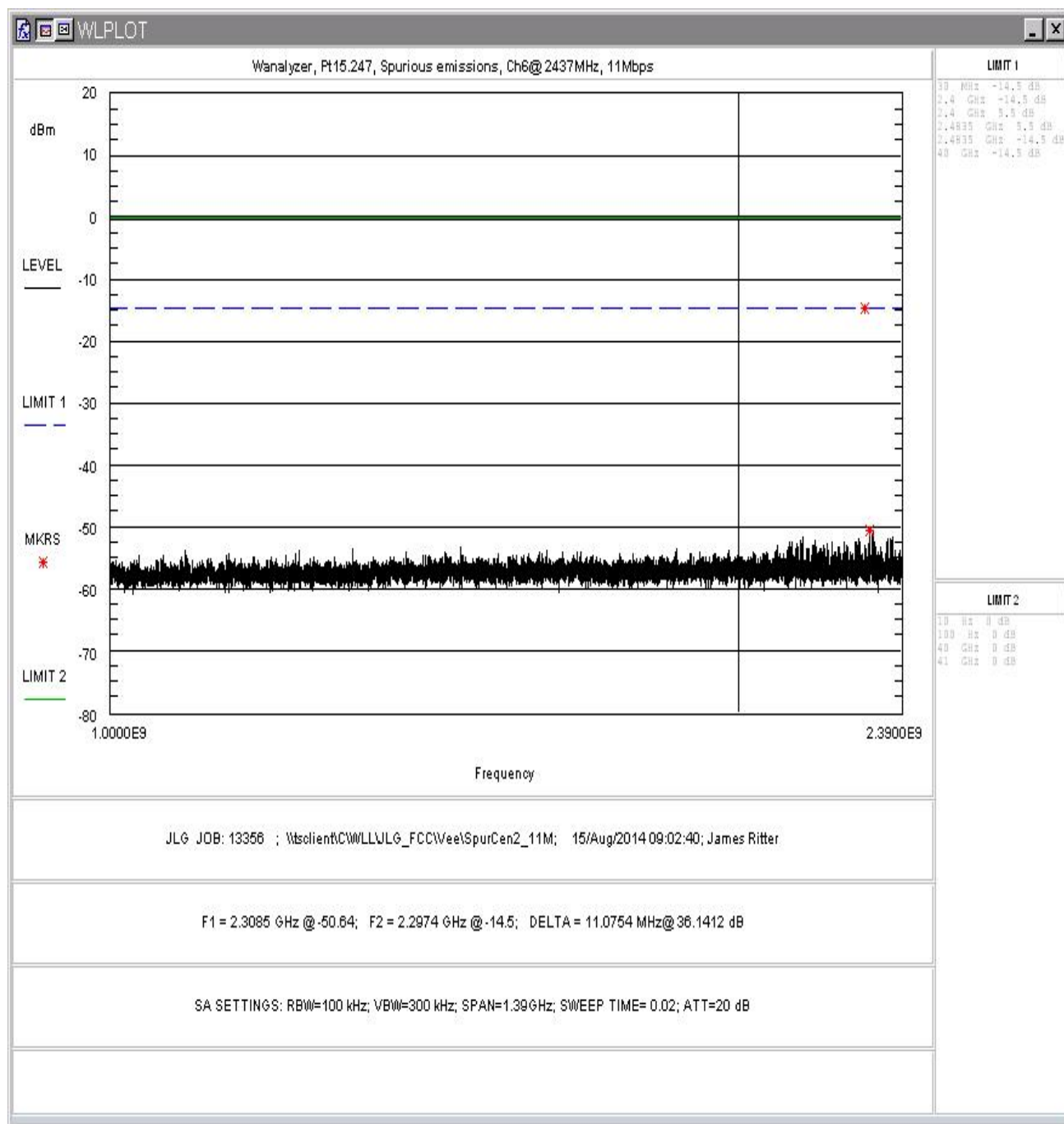


Figure 34: Conducted Spurious Emissions, Channel 6, 11Mbps, 1 – 2.39GHz

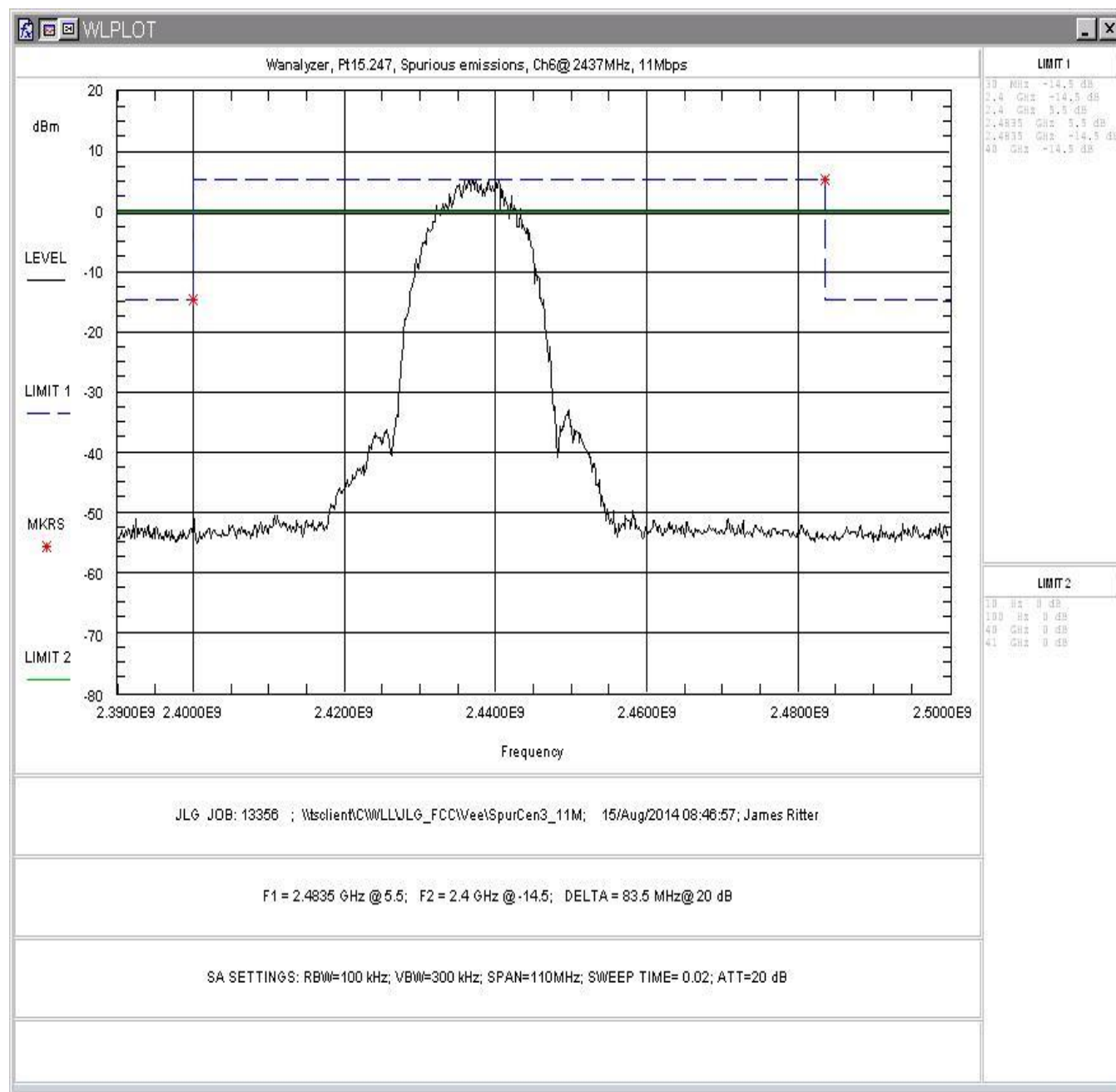


Figure 35: Conducted Spurious Emissions, Channel 6, 11Mbps, 2.39 – 2.5GHz

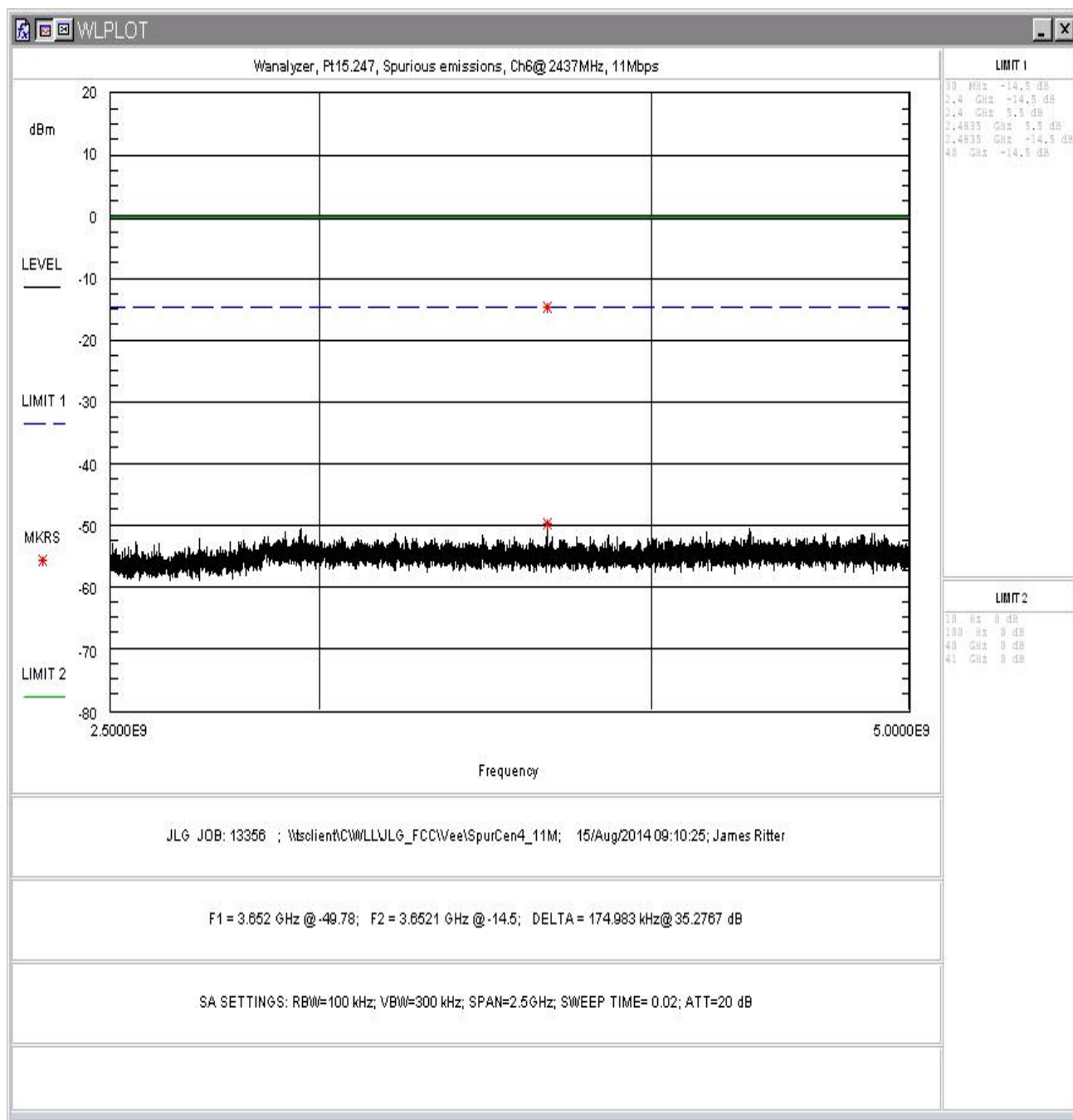


Figure 36: Conducted Spurious Emissions, Channel 6, 11Mbps, 2.5 - 5GHz

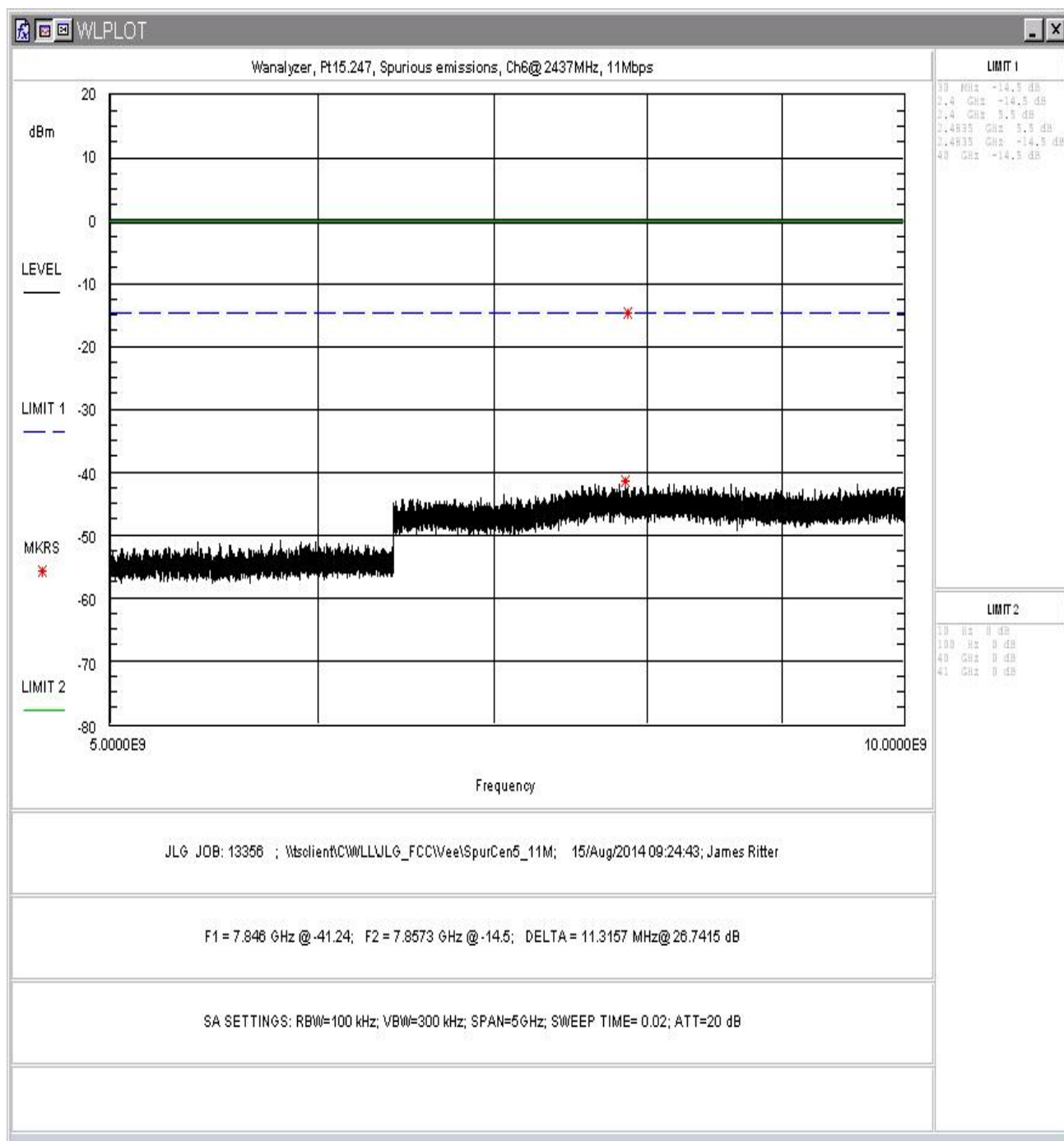


Figure 37: Conducted Spurious Emissions, Channel 6, 11Mbps, 5 - 10GHz

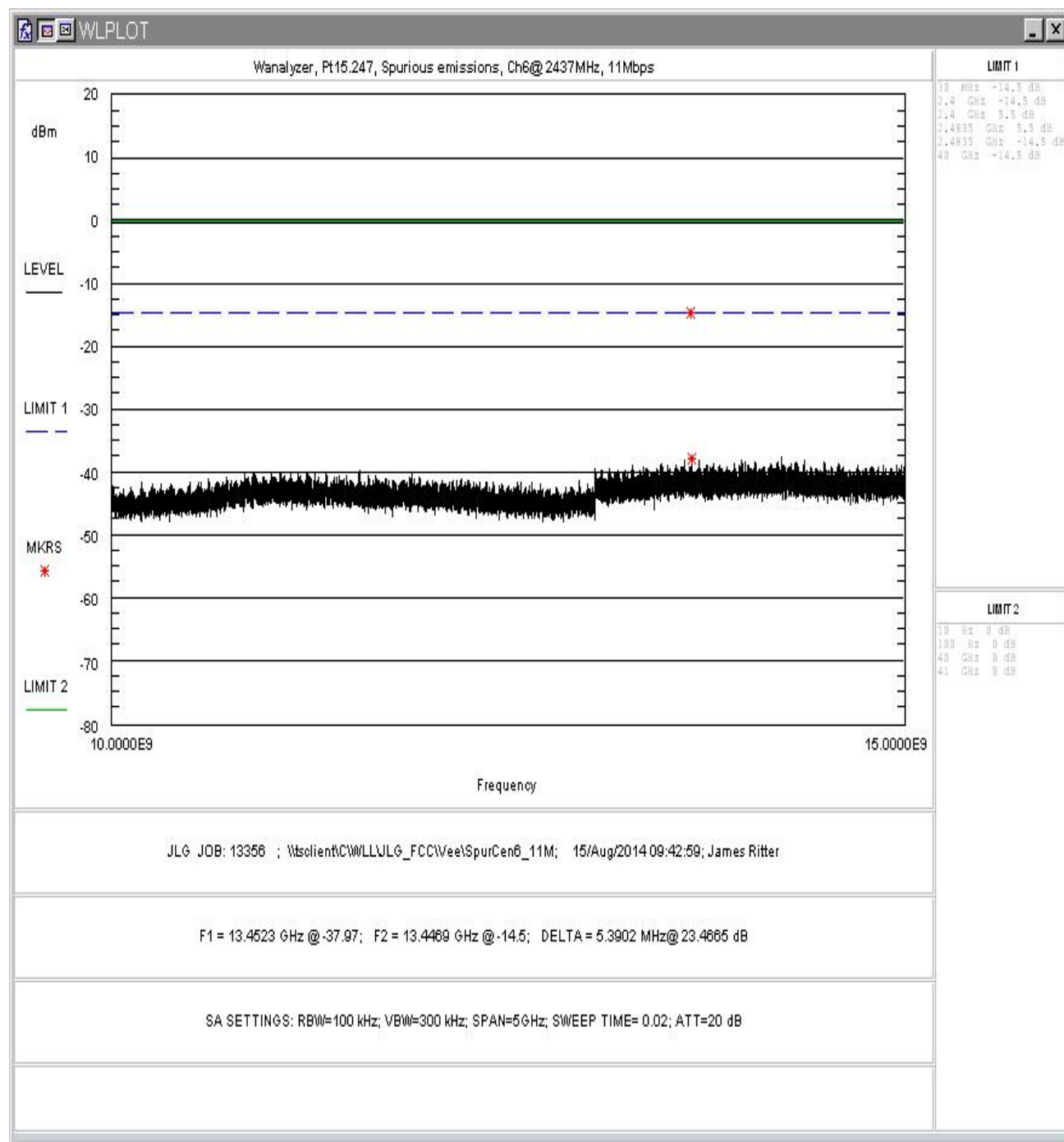


Figure 38: Conducted Spurious Emissions, Channel 6, 11Mbps, 10-15GHz

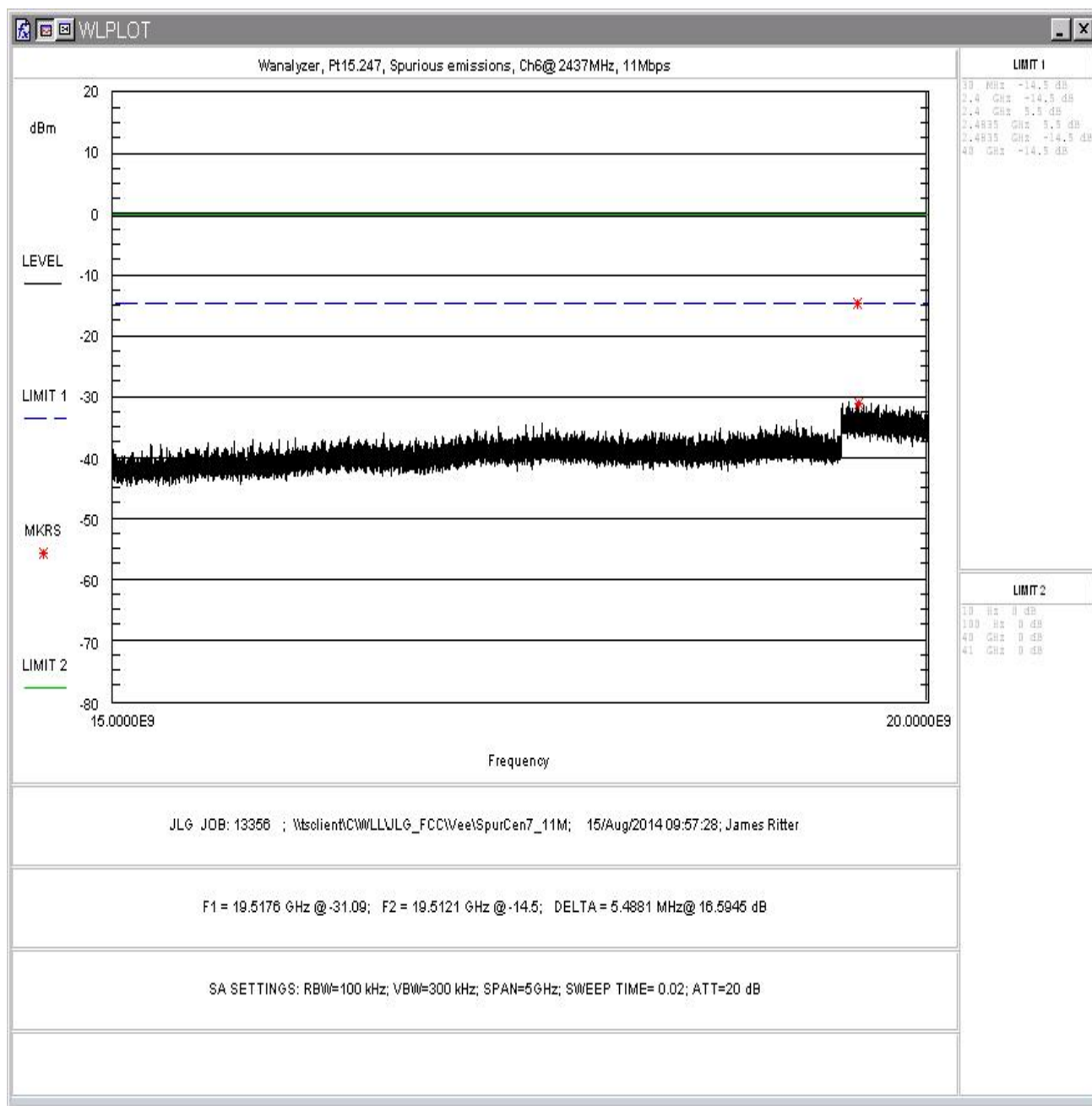


Figure 39: Conducted Spurious Emissions, Channel 6, 11Mbps, 15-20GHz

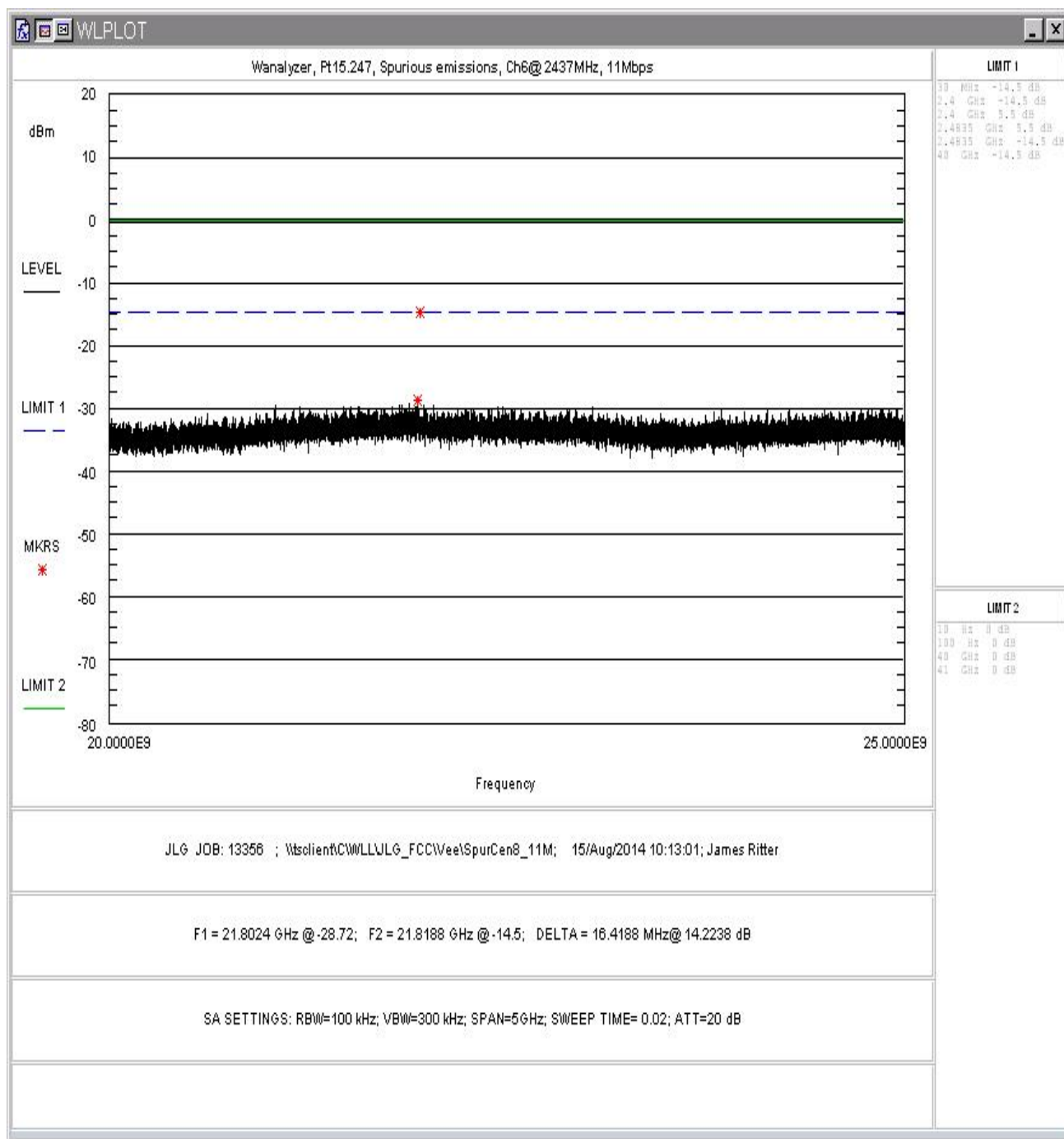


Figure 40: Conducted Spurious Emissions, Channel 6, 11Mbps, 20-25 GHz

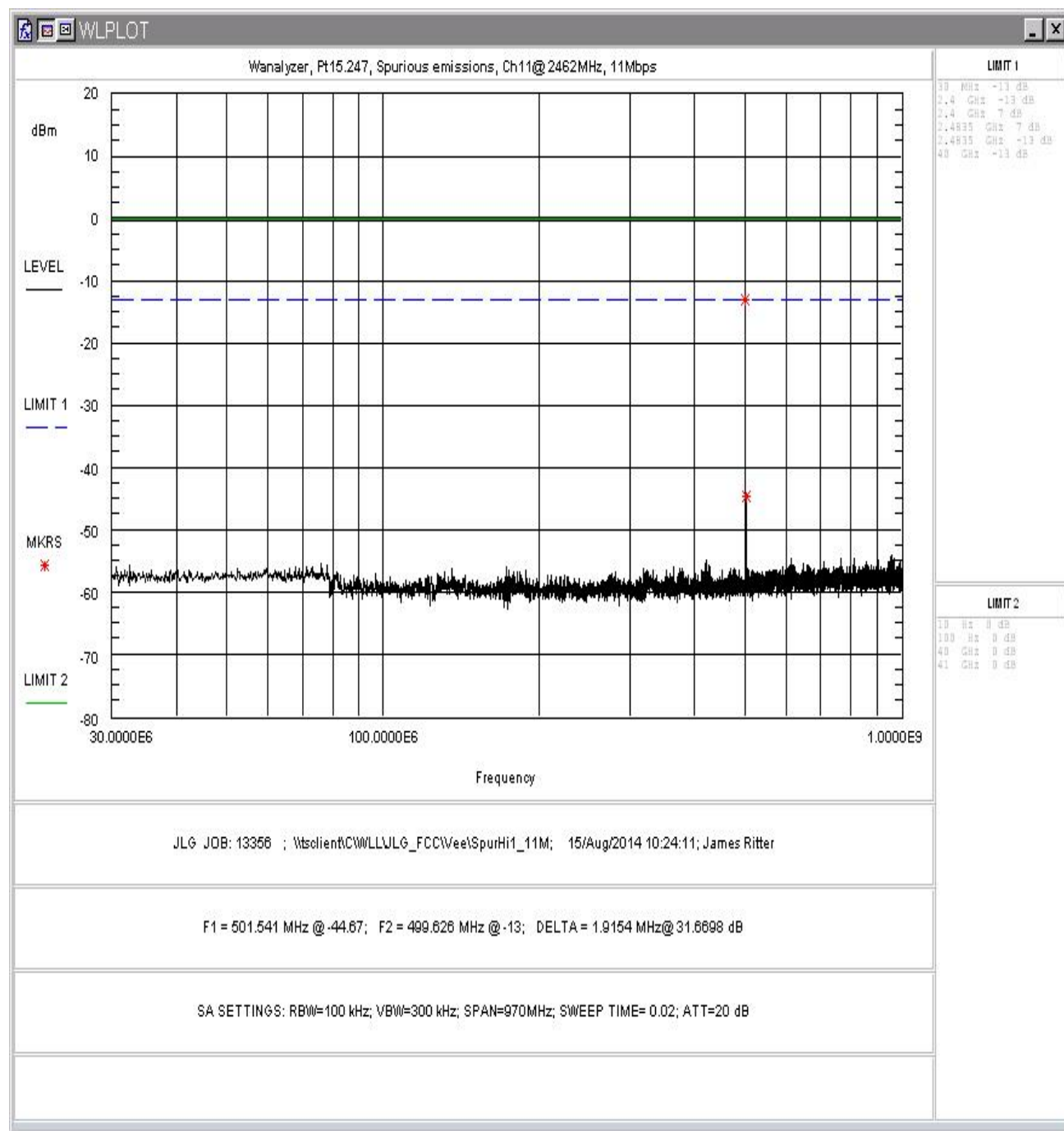


Figure 41: Conducted Spurious Emissions, Channel 11, 11Mbps, 30 - 1000MHz

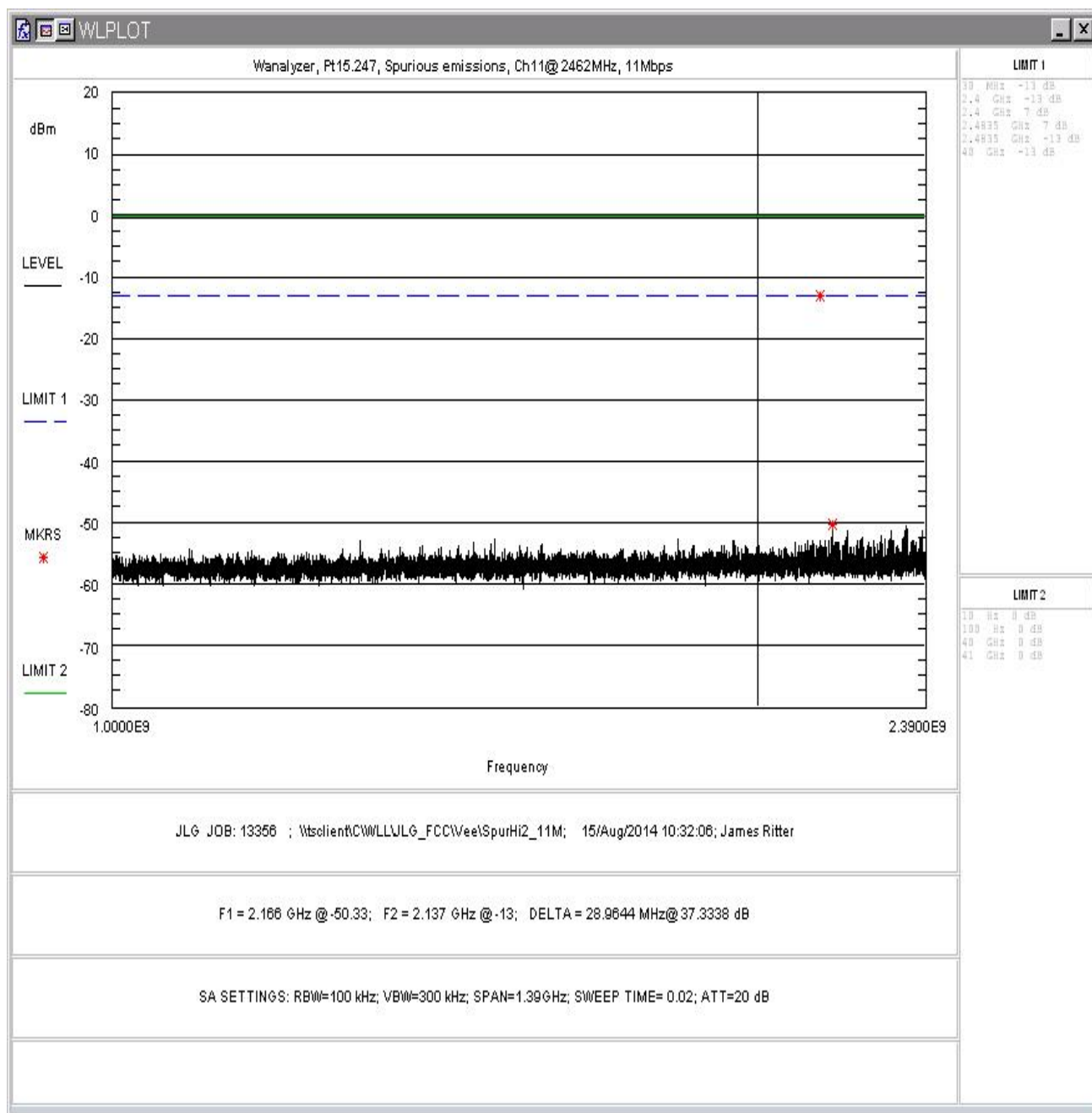


Figure 42: Conducted Spurious Emissions, Channel 11, 11Mbps, 1 – 2.39GHz

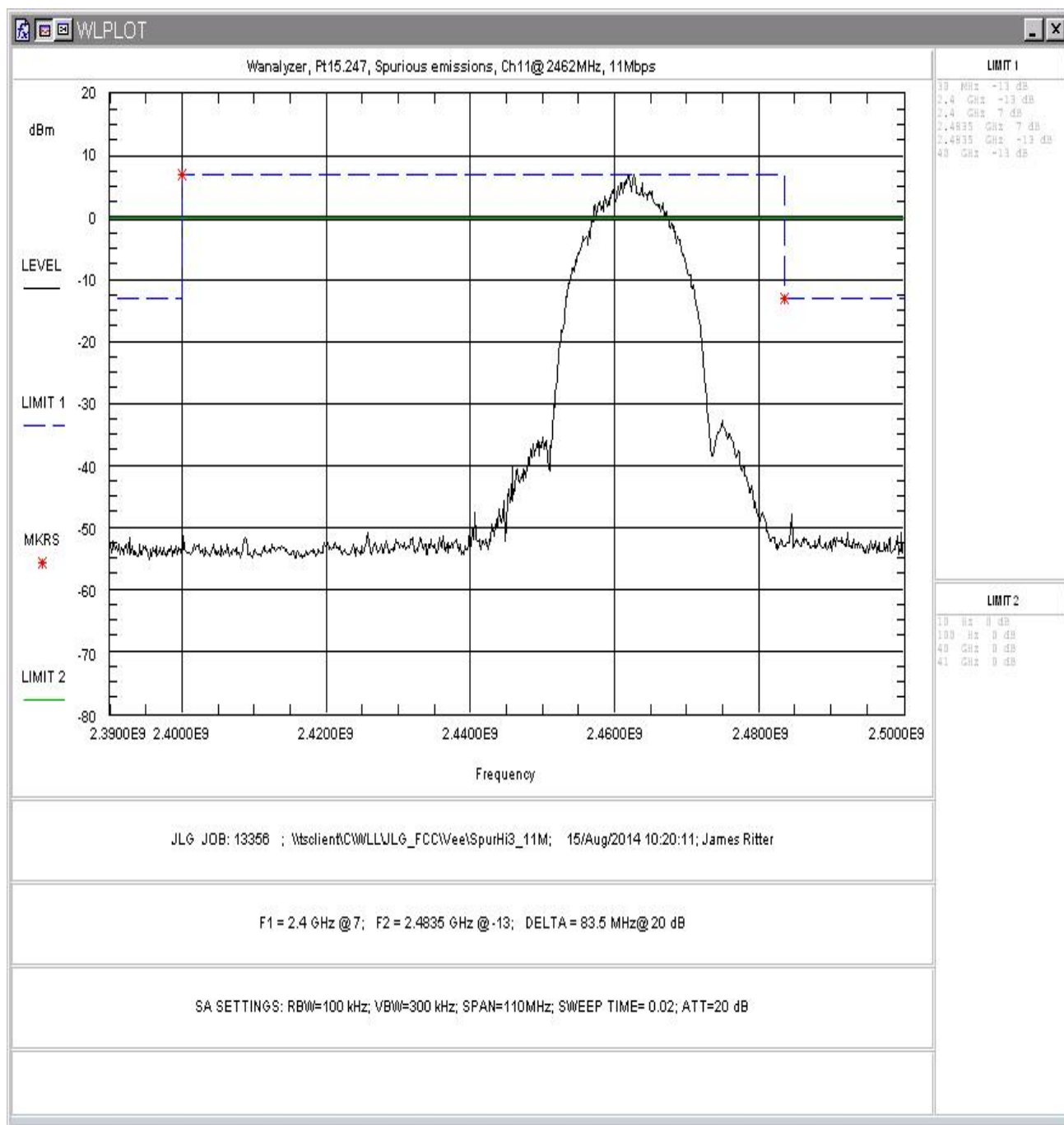


Figure 43: Conducted Spurious Emissions, Channel 11, 11Mbps, 2.39 – 2.485GHz

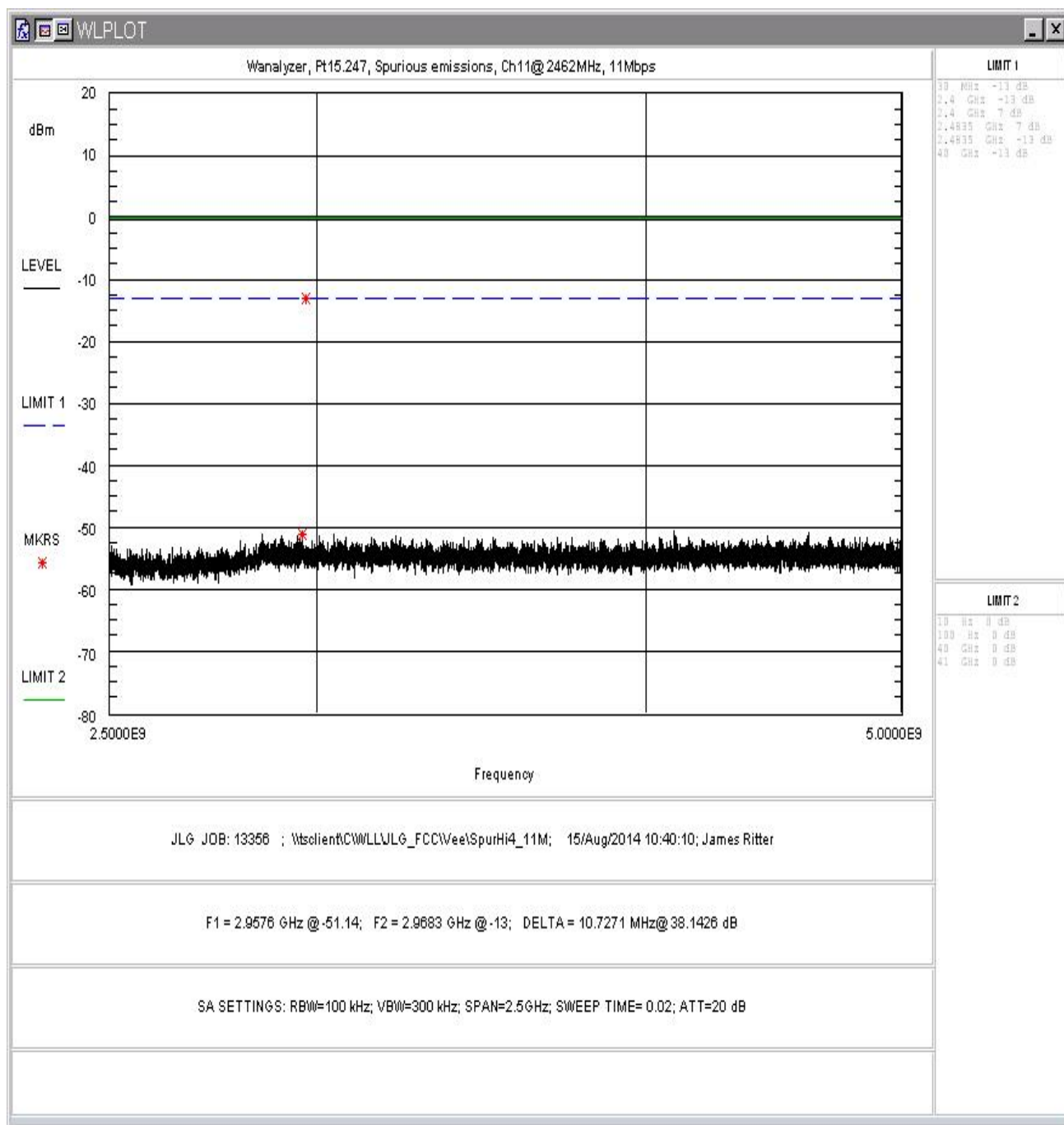


Figure 44: Conducted Spurious Emissions, Channel 11, 11Mbps, 2.485 - 5GHz

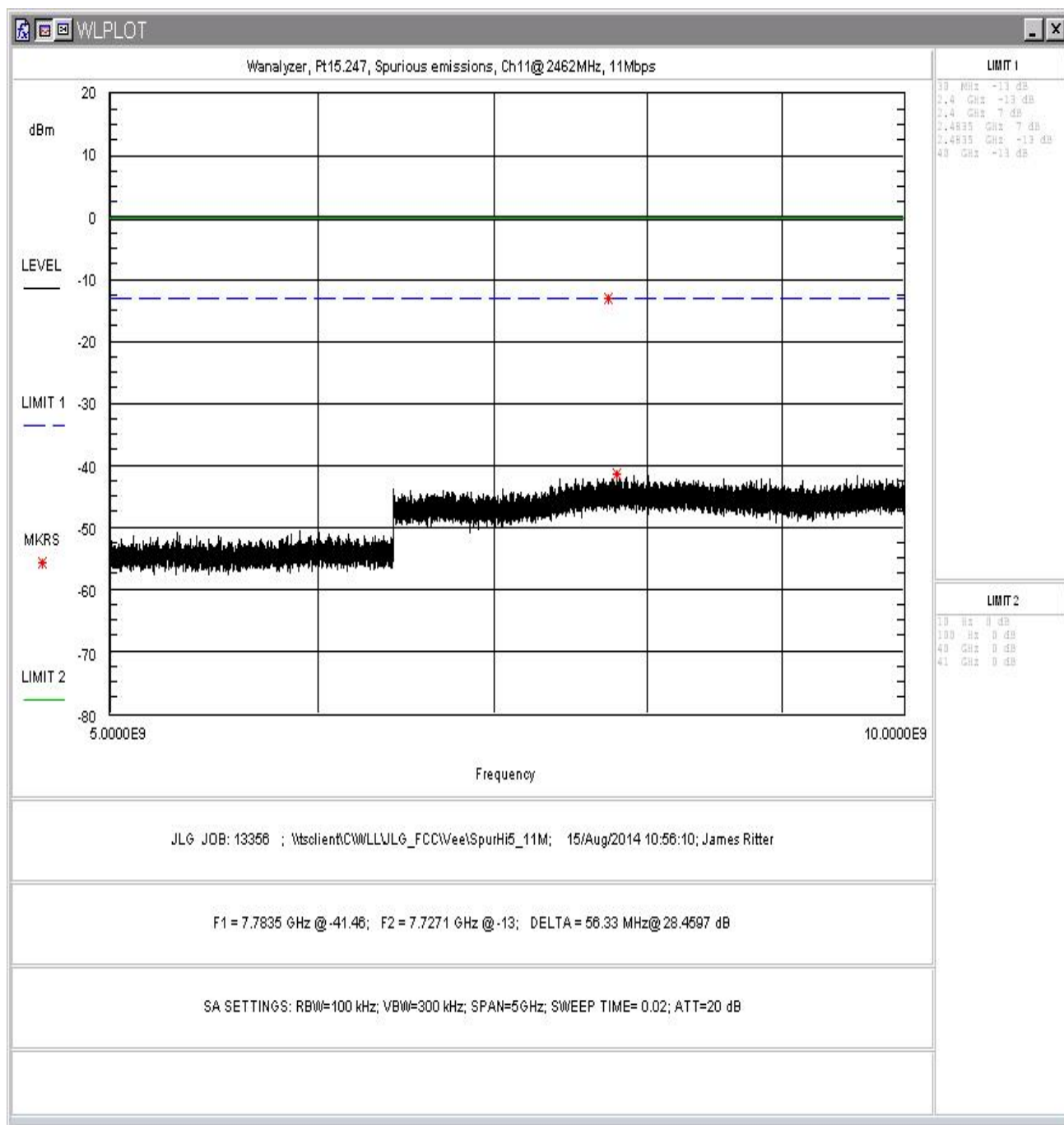


Figure 45: Conducted Spurious Emissions, Channel 11, 11Mbps, 5 - 10GHz

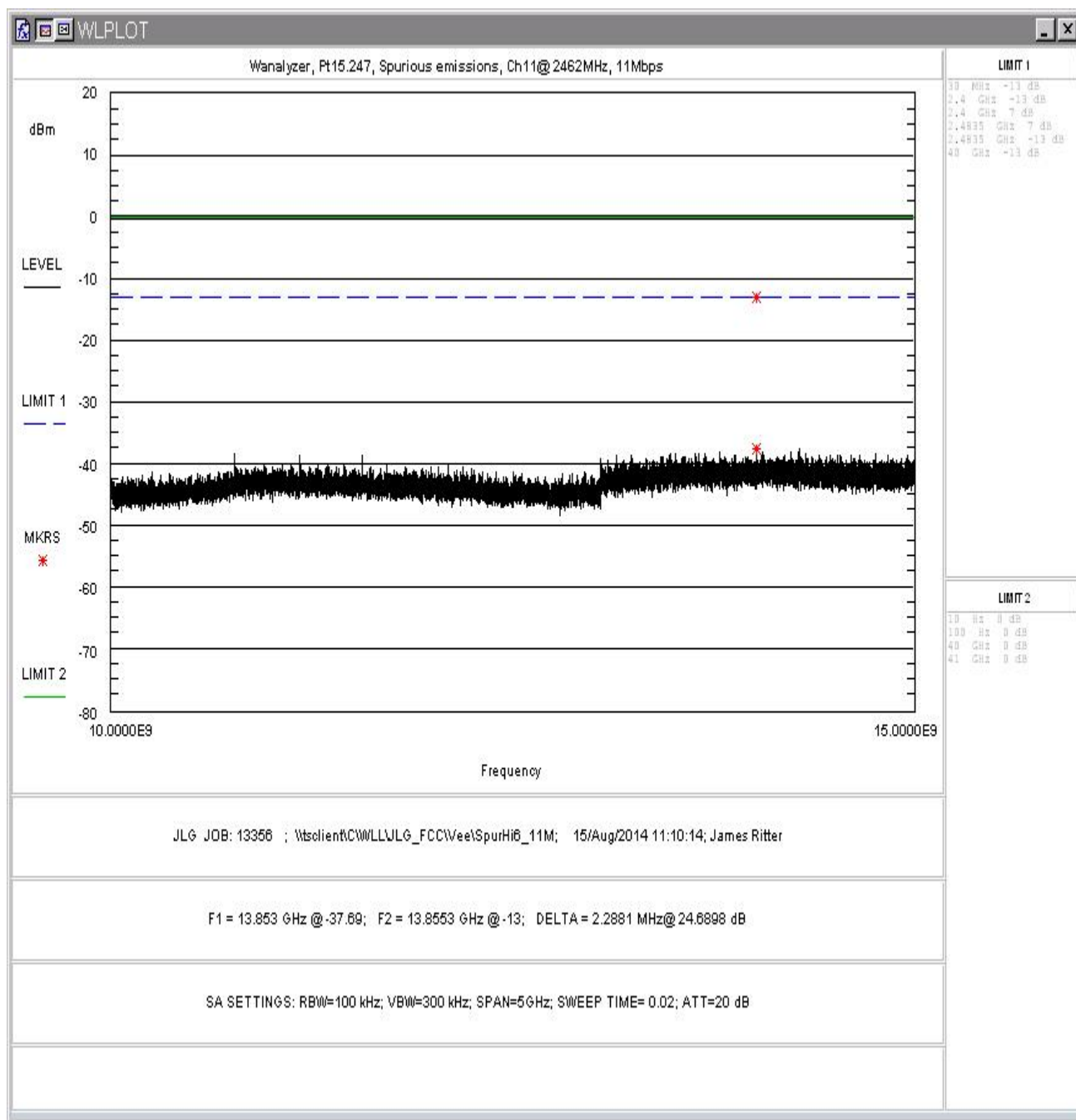


Figure 46: Conducted Spurious Emissions, Channel 11, 11Mbps, 10-15GHz

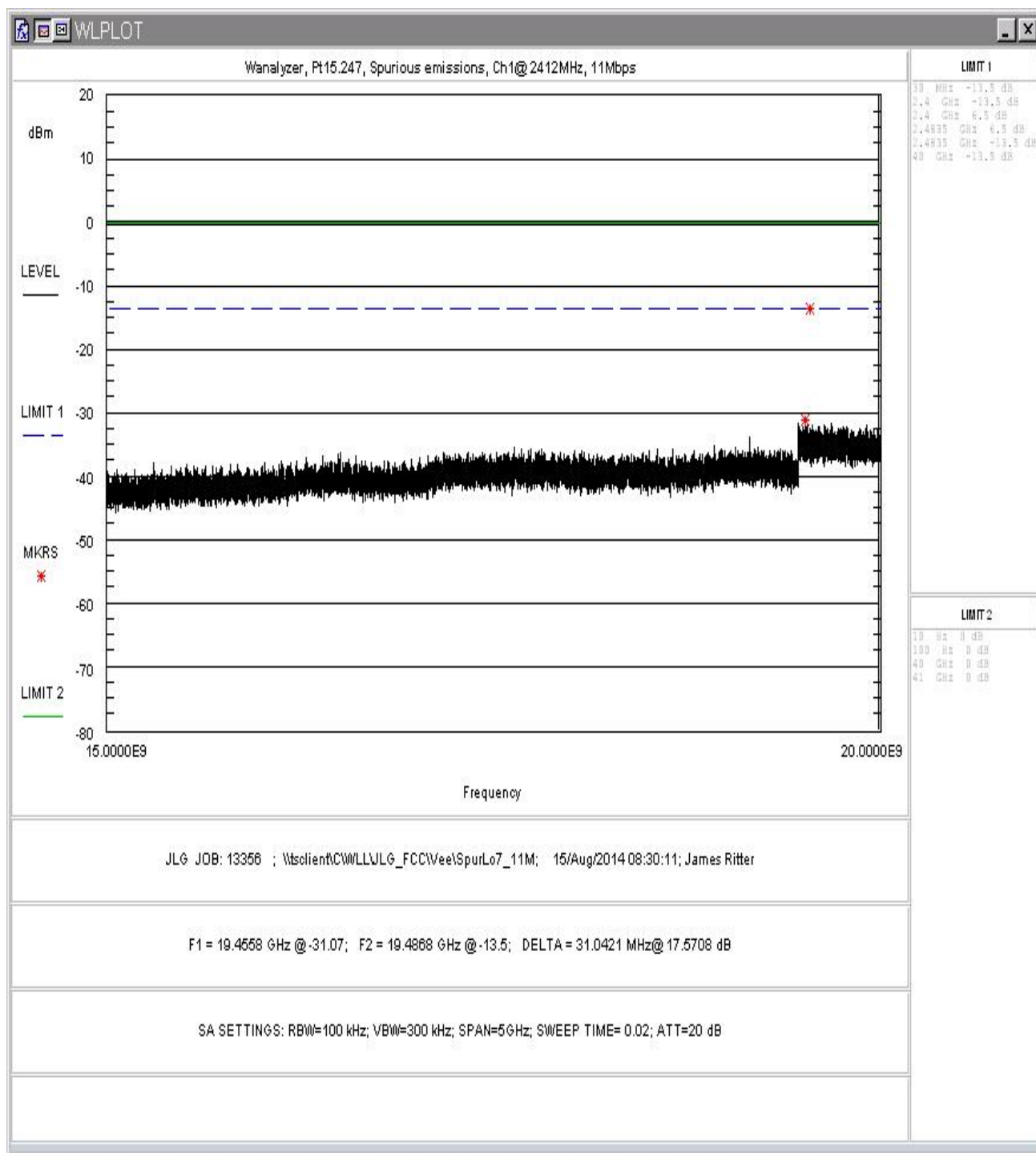


Figure 47: Conducted Spurious Emissions, Channel 11, 11Mbps, 15-20GHz

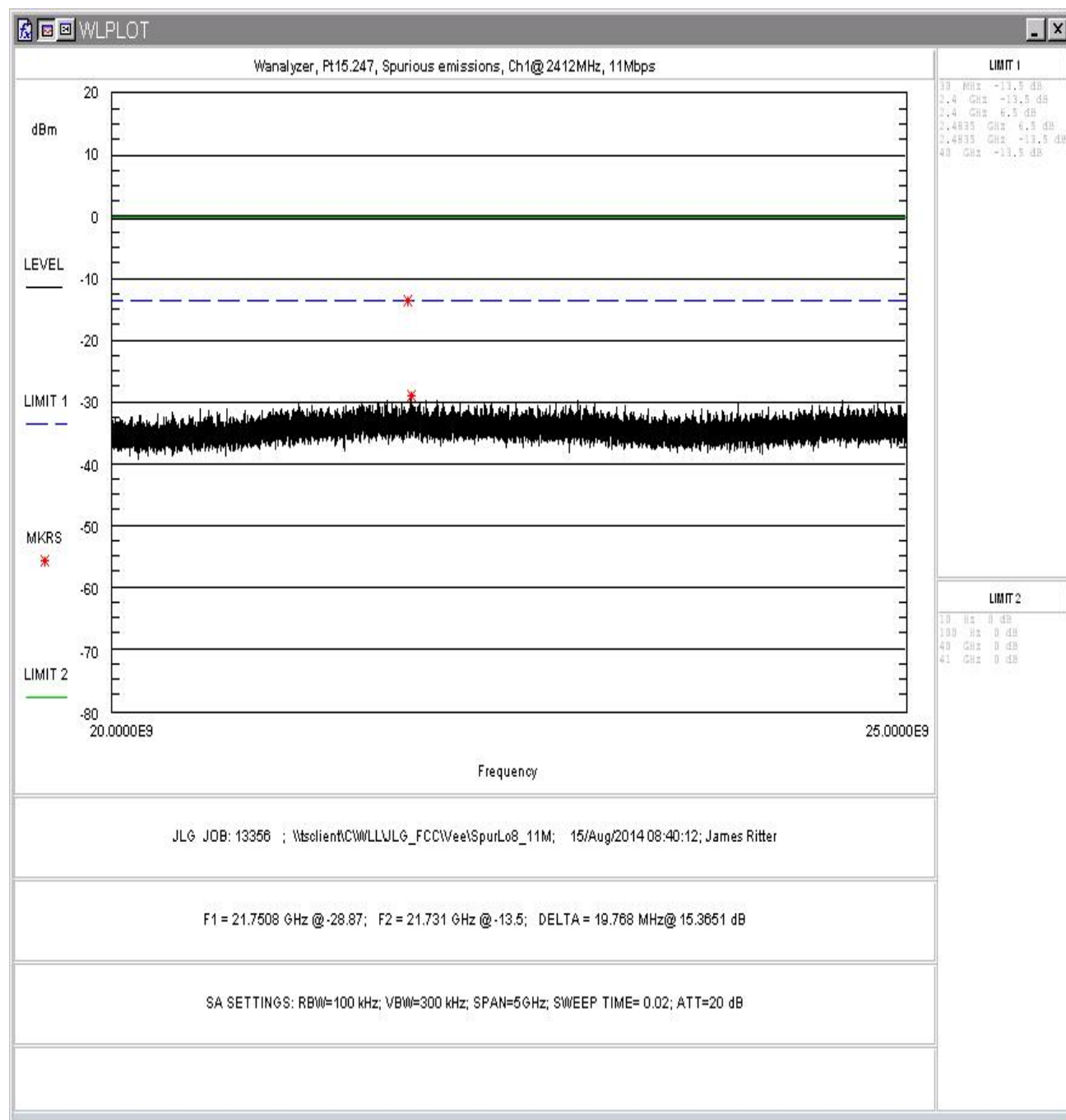


Figure 48: Conducted Spurious Emissions, Channel 11, 11Mbps, 20-25 GHz

3.5.1 Band Edge Compliance

Close-up plots of the upper and lower channels with respect to the nearest authorized band-edges are provided below. The tests were performed in the same manner as the above conducted spurious emissions tests

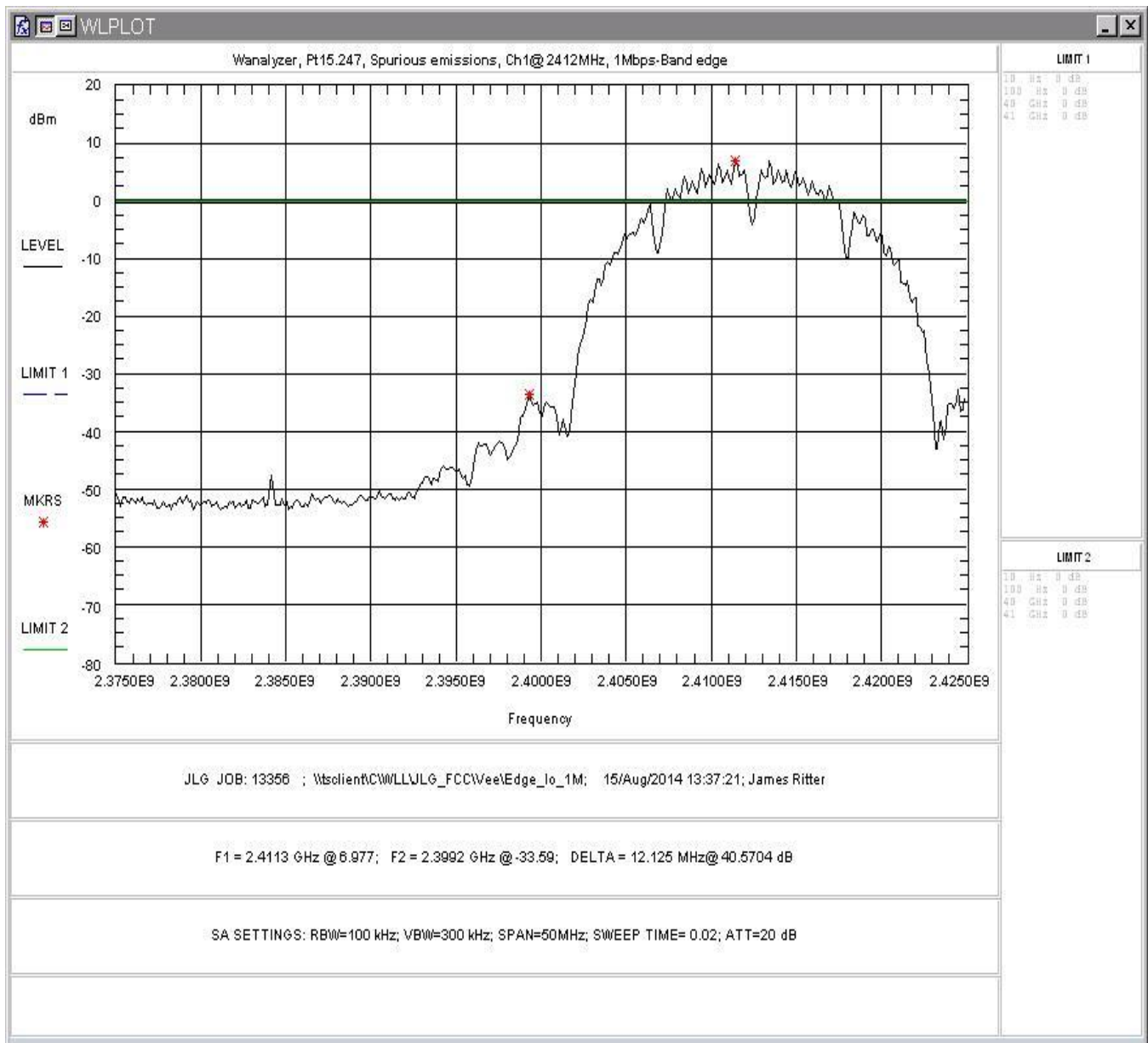


Figure 49: Lower Band-edge, Channel 1, 802.11b, 1Mbps

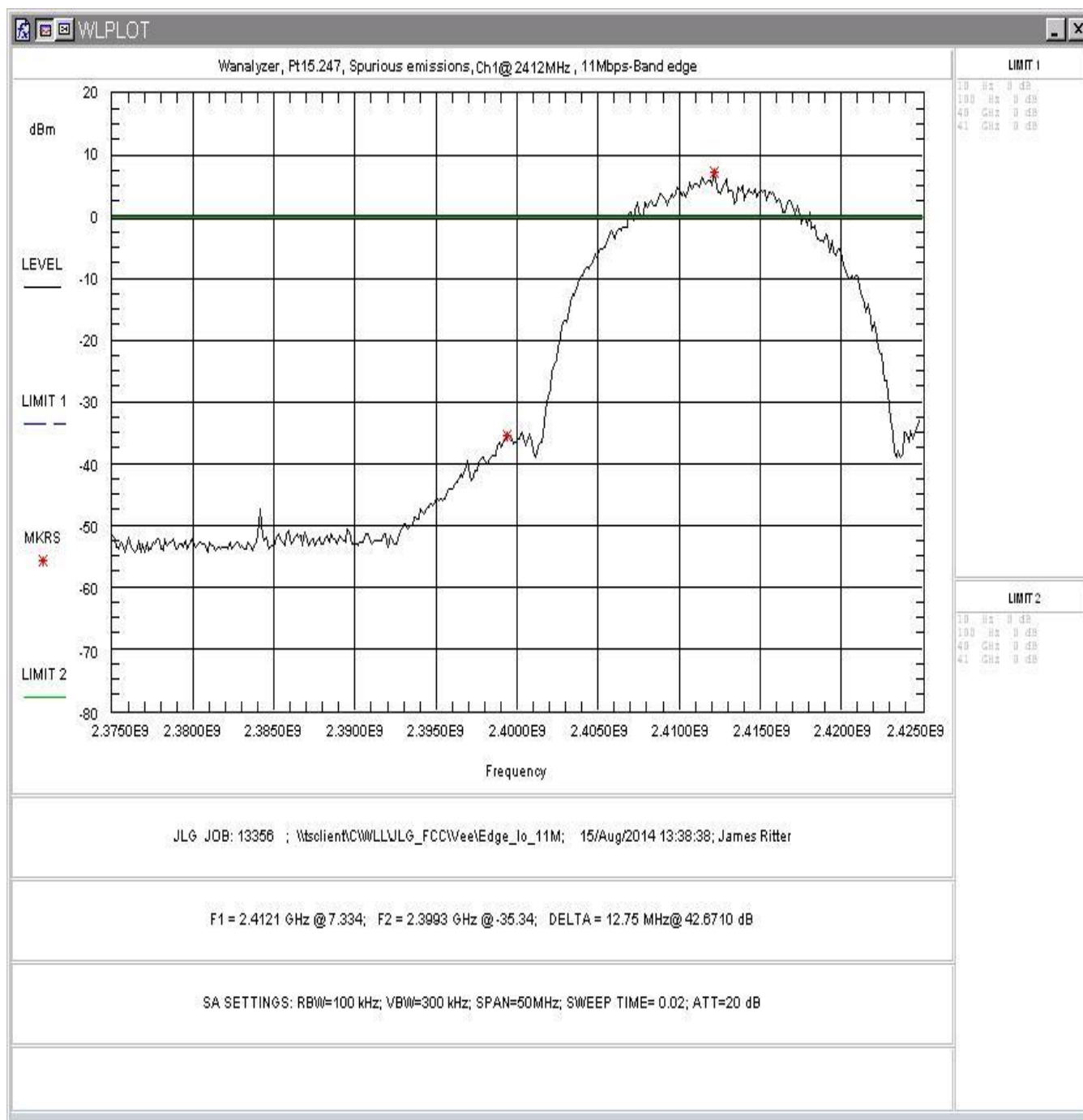


Figure 50: Lower Band-edge, Channel 1, 802.11b, 11Mbps

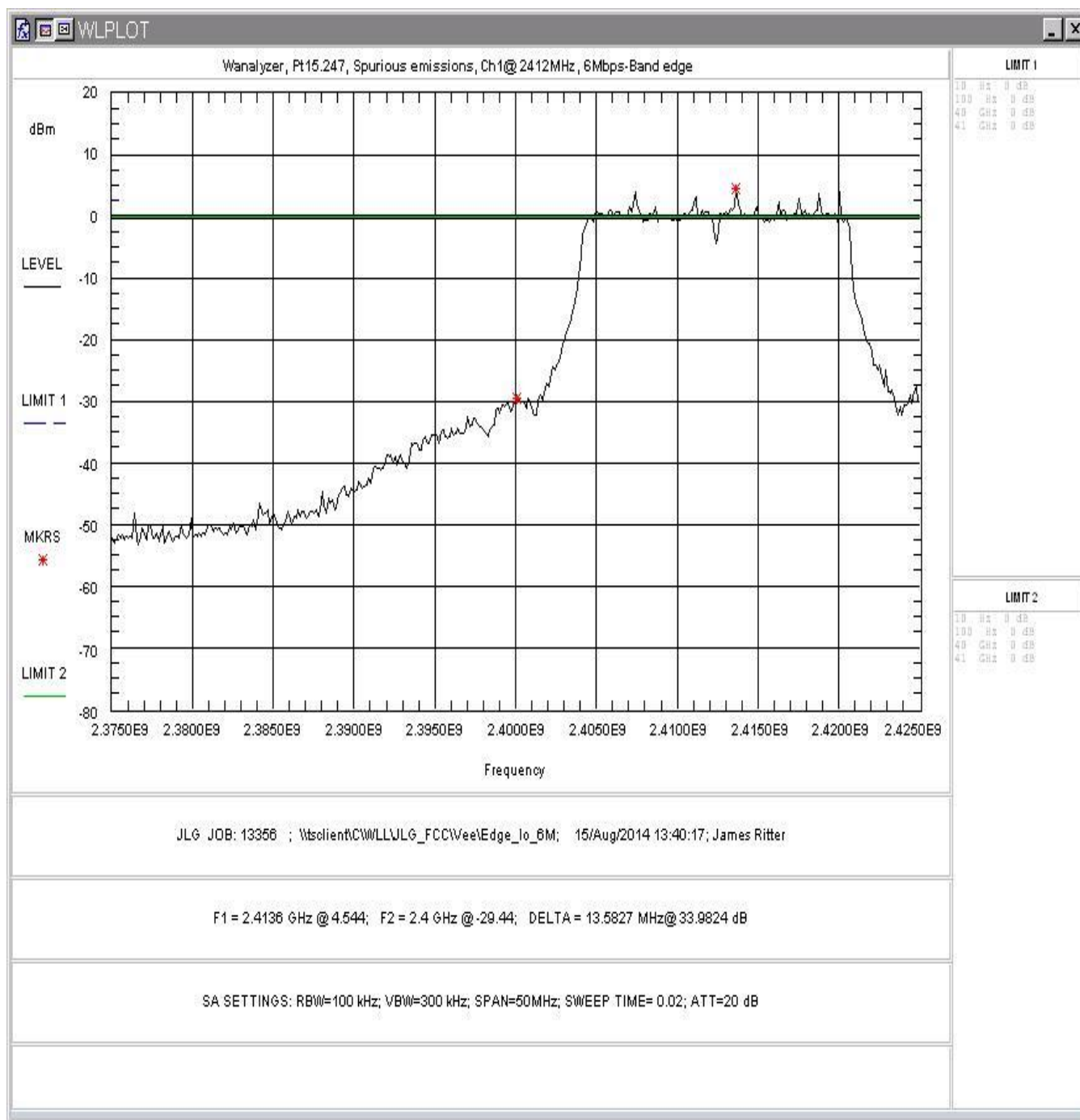


Figure 51: Lower Band-edge, Channel 1,802.11g, 6Mbps

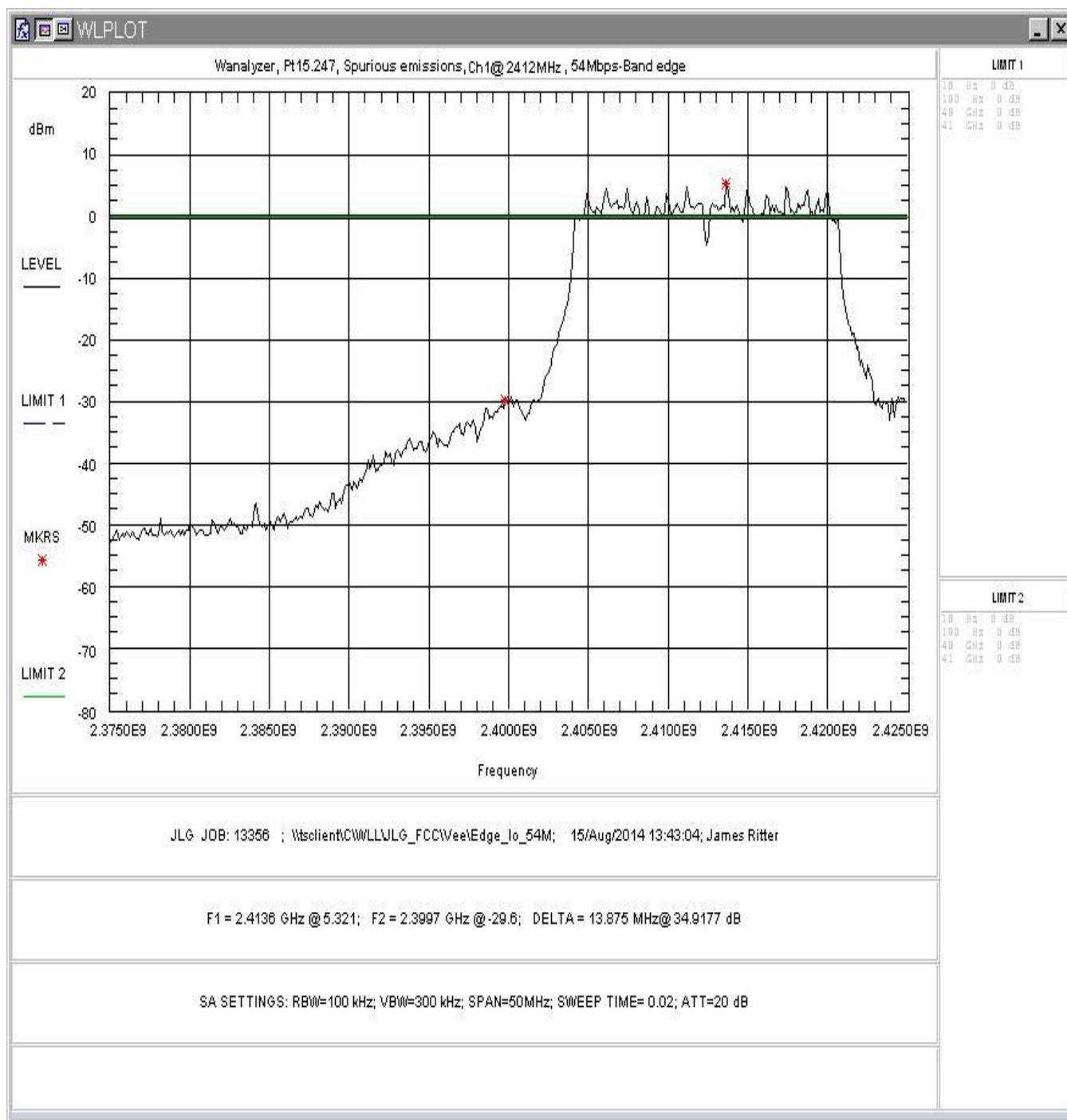


Figure 52: Lower Band-edge, Channel 1,802.11g, 54 Mbps

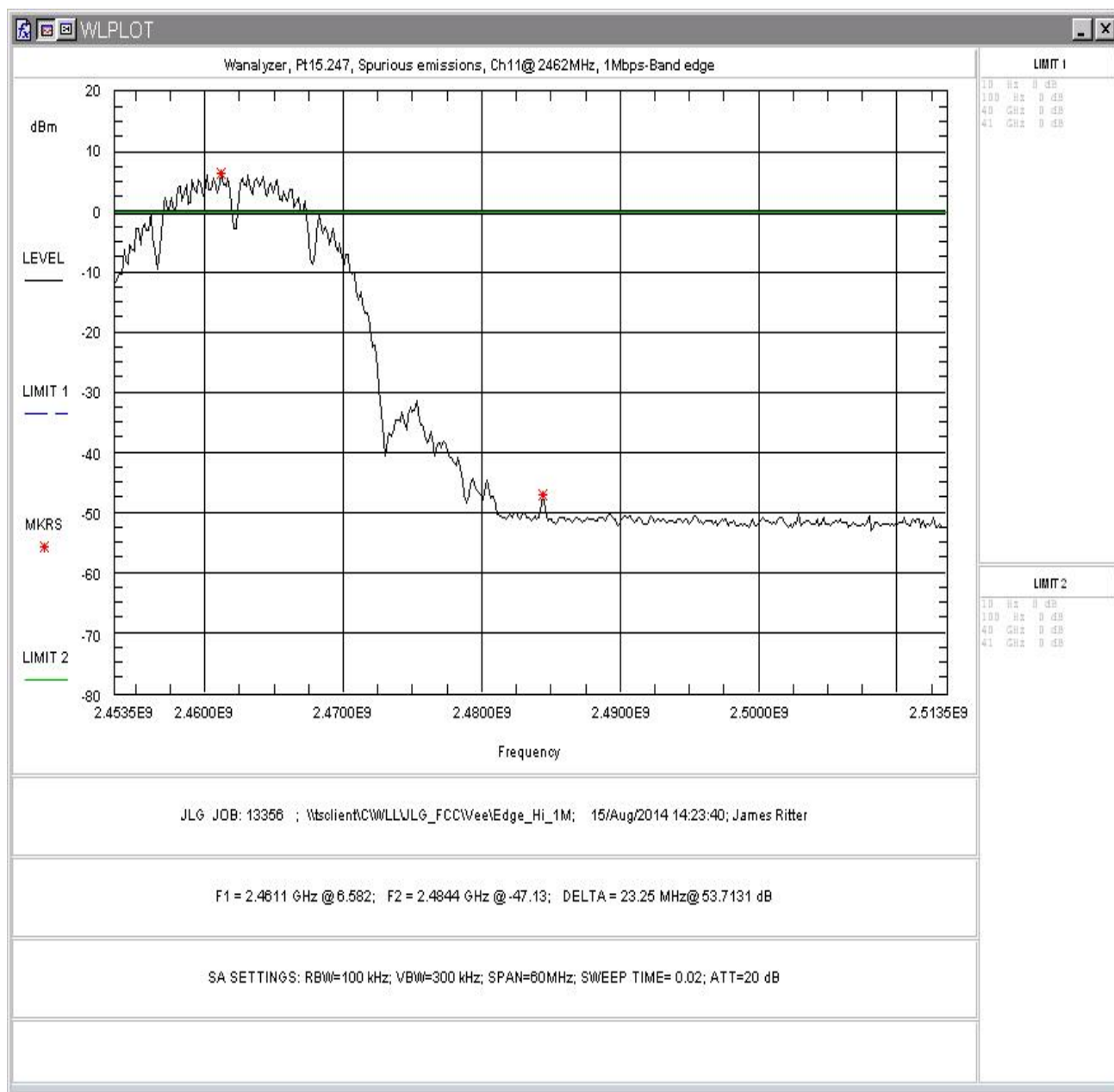


Figure 53: Upper Band-edge, Channel 11, 802.11b, 1Mbps

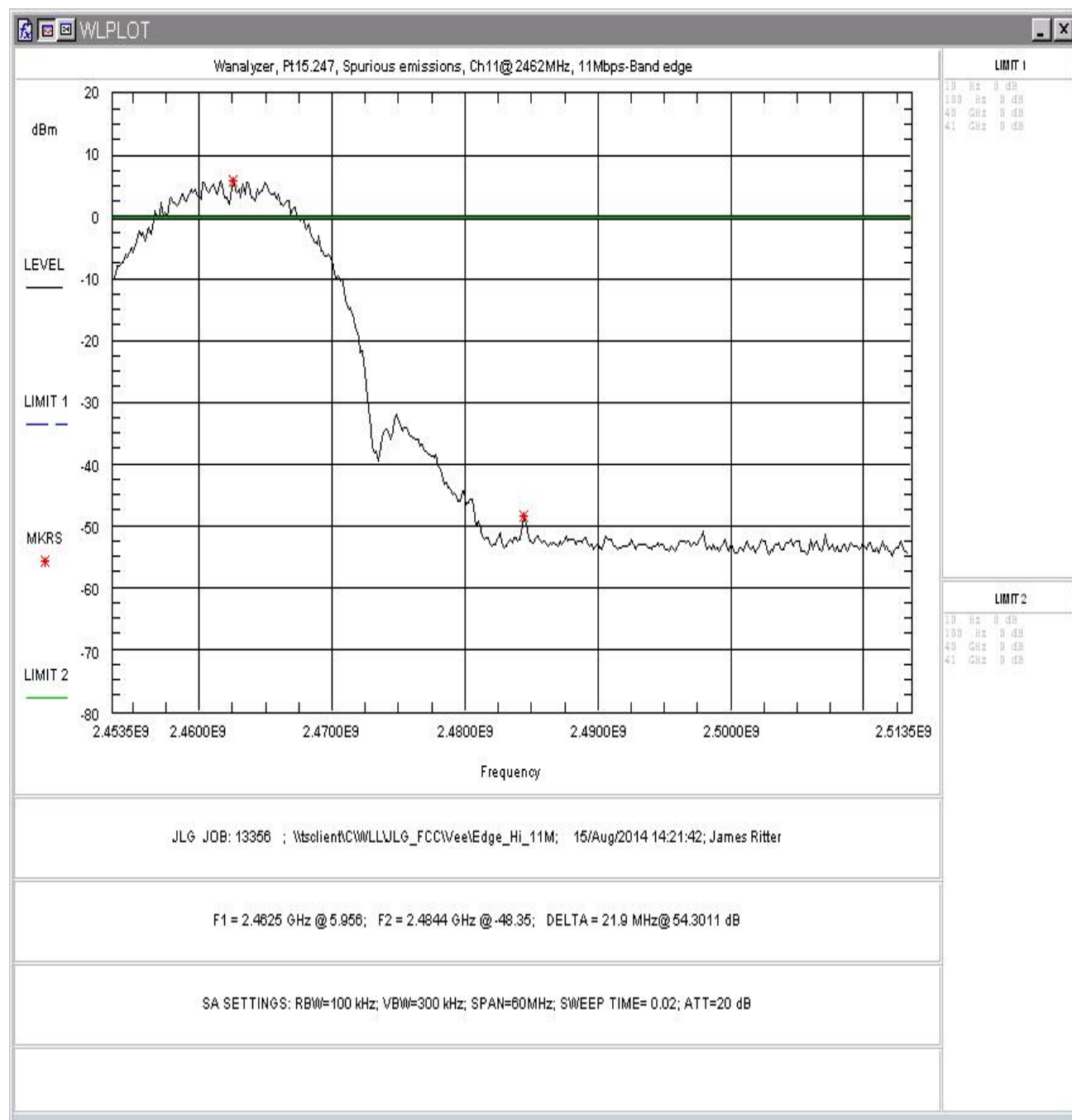


Figure 54: Upper Band-edge, Channel 11, 802.11b, 11Mbps

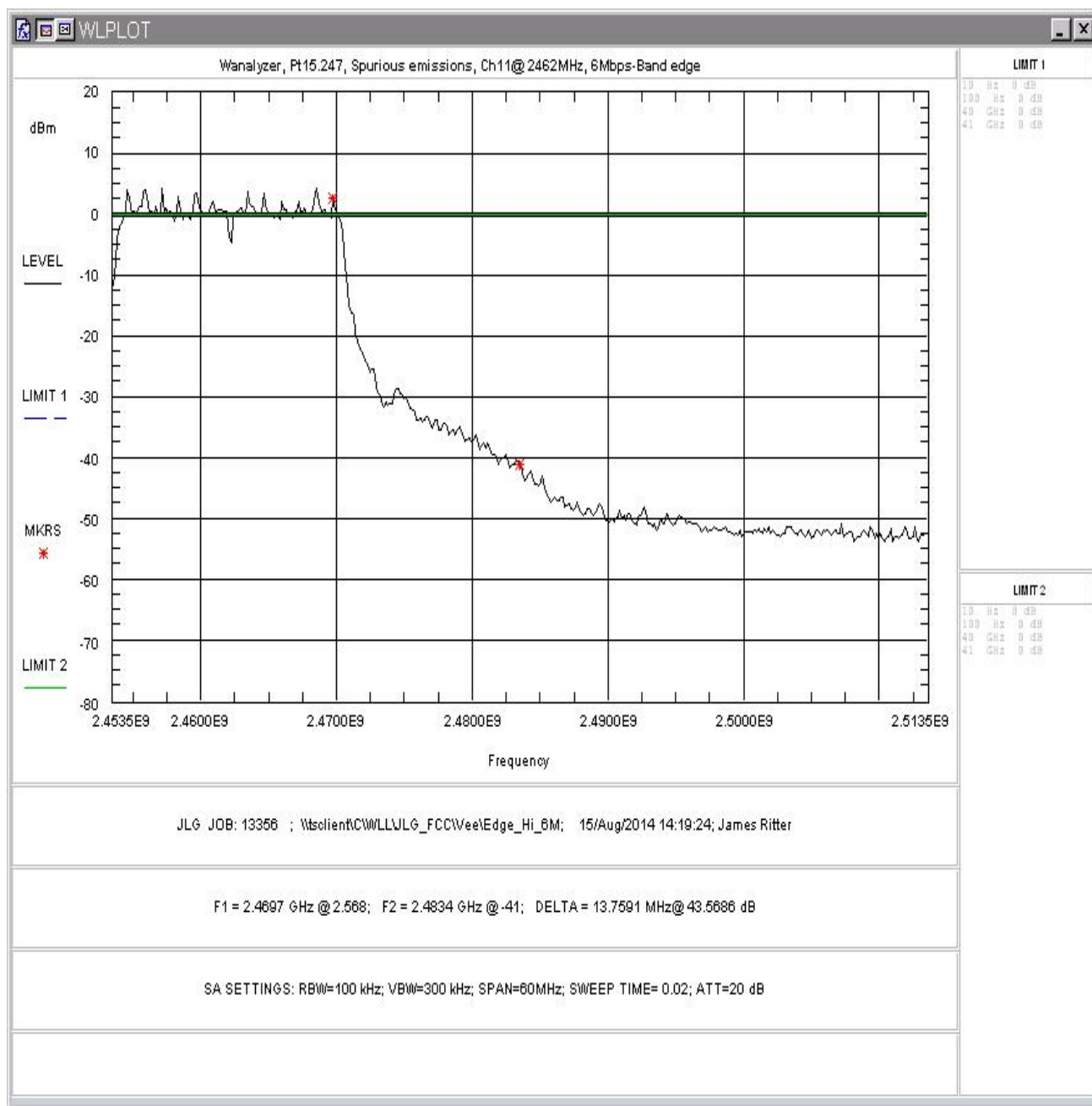


Figure 55: Upper Band-edge, Channel 11,802.11g, 6Mbps

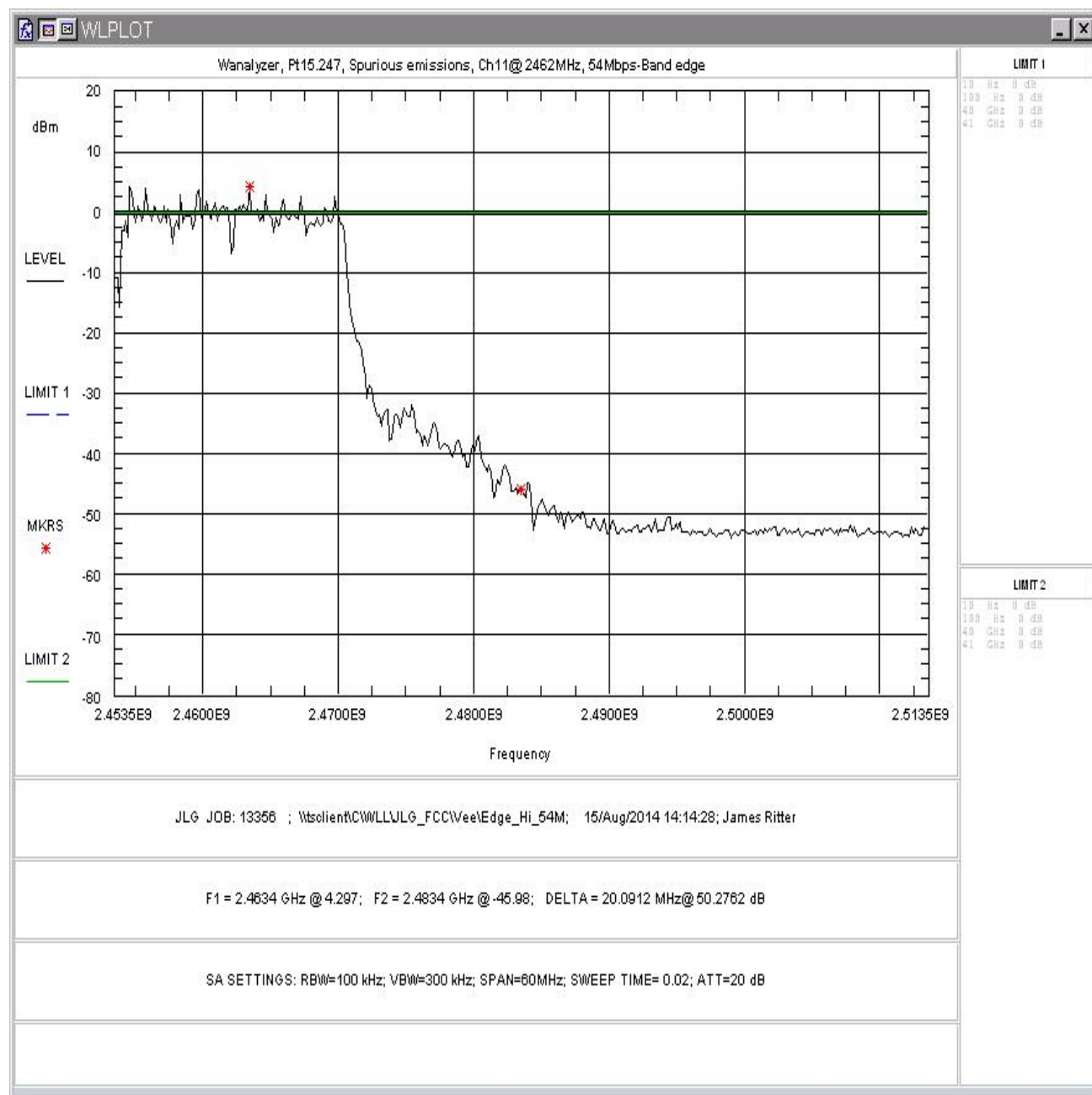


Figure 56: Upper Band-edge, Channel 11,802.11g, 54Mbps

3.6 AC Conducted Emissions (FCC Part §15.207)

3.6.1 Requirements

Test Arrangement: Table Top

Compliance Standard: FCC Class B

FCC Compliance Limits		
Frequency	Quasi-peak	Average
0.15 - 0.5MHz	66 to 56dB μ V	56 to 46dB μ V
0.5 - 5MHz	56dB μ V	46dB μ V
5 - 30MHz	60dB μ V	50dB μ V

3.6.2 Test Summary

As this unit a vehicular powered unit this test is not applicable.

3.7 Radiated Spurious Emissions: (FCC Part §15.205 & §15.209)

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.

3.7.1 Test Procedure

The EUT was placed on motorized turntable for radiated testing on a 3-meter open field test site. The emissions from the EUT were measured continuously at every azimuth by rotating the turntable. Receiving antennas were mounted on an antenna mast to determine the height of maximum emissions. The height of the antenna was varied between 1 and 4 meters. The 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 unit was pre-scanned in 3 orthogonal positions with full testing performed in the worst case position.

The emissions were measured using the following resolution bandwidths:

Table 8: Spectrum Analyzer Settings

Frequency Range	Resolution Bandwidth	Video Bandwidth
30MHz-1000 MHz	120kHz	>100 kHz
>1000 MHz	1 MHz	10 Hz (Avg.), 1MHz (Peak)

Worst case emissions are presented.

The following data shows the EUT with the highest gain of each antenna type. The unit was tested in 3 orthogonal positions with the worst case data presented.

Testing was performed in the 802.11b 11Mbps mode with the worst case shown, restricted band edges were also test in 802.11g 54Mbps mode.

Table 9: Radiated Emission Test Data, Low Channel (Restricted Bands)

Frequency (MHz)	Polarity H/V	Azimuth (Degree)	Ant. Height (m)	SA Level (dBuV)	Corr Factors (dB)	Corr. Level (uV/m)	Limit (uV/m)	Margin (dB)	Comments
115.57	V	270	1.00	6.00	14.3	10.3	150.0	-23.2	restricted edge B mode
142.16	V	270	1.00	4.40	12.3	6.8	150.0	-26.9	
145.60	V	270	1.00	8.70	12.1	10.9	150.0	-22.7	
149.96	V	270	1.00	8.90	12.3	11.4	150.0	-22.4	
156.52	V	270	1.00	6.00	13.9	9.9	150.0	-23.6	
170.79	V	270	1.00	5.20	14.4	9.5	150.0	-23.9	
204.80	V	270	1.00	13.10	15.3	26.4	150.0	-15.1	
220.87	V	270	1.00	4.70	17.0	12.1	200.0	-24.3	
4824.00	V	270	1.00	58.00	-8.7	292.9	5000.0	-24.6	
4824.00	V	10	1.80	45.67	-8.7	70.8	500.0	-17.0	
7236.00	V	180	1.90	55.67	-0.9	544.5	5000.0	-19.3	
7236.00	V	180	1.90	43.50	-0.9	134.1	500.0	-11.4	
12060.00	V	200	1.90	50.00	4.8	552.4	5000.0	-19.1	
12060.00	V	200	1.90	41.10	4.8	198.3	500.0	-8.0	
2390.00	V	170	1.90	50.60	-2.7	249.7	5000.0	-26.0	
2390.00	V	170	2.10	38.10	-2.7	59.2	500.0	-18.5	
2390.00	V	170	2.10	51.10	-2.7	264.5	5000.0	-25.5	
2390.00	V	170	2.10	39.30	-2.7	68.0	500.0	-17.3	
115.57	H	315	4.00	5.80	14.3	10.1	150.0	-23.4	restricted edge B mode
142.16	H	315	4.00	4.10	12.3	6.6	150.0	-27.2	
145.60	H	315	4.00	8.50	12.1	10.7	150.0	-22.9	
149.96	H	315	4.00	6.50	12.3	8.7	150.0	-24.8	
156.52	H	315	4.00	6.10	13.9	10.0	150.0	-23.5	
170.79	H	315	4.00	4.80	14.4	9.1	150.0	-24.3	
204.80	H	315	4.00	10.40	15.3	19.3	150.0	-17.8	
220.87	H	315	3.50	4.50	17.0	11.9	200.0	-24.5	
4824.00	H	180	1.35	56.83	-8.7	256.0	5000.0	-25.8	
4824.00	H	180	1.35	44.83	-8.7	64.3	500.0	-17.8	
7236.00	H	190	1.87	56.00	-0.9	565.6	5000.0	-18.9	
7236.00	H	190	1.87	43.60	-0.9	135.7	500.0	-11.3	
12060.00	H	190	1.60	51.67	4.8	669.5	5000.0	-17.5	
12060.00	H	190	1.60	40.00	4.8	174.7	500.0	-9.1	
2390.00	V	90	1.60	51.20	-2.7	267.5	5000.0	-25.4	
2390.00	V	90	1.60	38.90	-2.7	64.9	500.0	-17.7	
2390.00	V	90	1.60	50.10	-2.7	235.7	5000.0	-26.5	
2390.00	V	90	1.60	38.30	-2.7	60.6	500.0	-18.3	

above 18GHz performed with 10cm measurements (no signals noted)

Table 10: Radiated Emission Test Data, Center Channel (Restricted Bands)

Frequency (MHz)	Polarity H/V	Azimuth (Degree)	Ant. Height (m)	SA Level (dBuV)	Corr Factors (dB)	Corr. Level (uV/m)	Limit (uV/m)	Margin (dB)	Comments
115.57	V	270	1.00	5.90	14.3	10.2	150.0	-23.3	
142.16	V	270	1.00	4.30	12.3	6.7	150.0	-27.0	
145.60	V	270	1.00	8.80	12.1	11.1	150.0	-22.6	
149.96	V	270	1.00	8.60	12.3	11.0	150.0	-22.7	
156.52	V	270	1.00	6.20	13.9	10.1	150.0	-23.4	
170.79	V	270	1.00	5.30	14.4	9.7	150.0	-23.8	
204.80	V	270	1.00	13.00	15.3	26.1	150.0	-15.2	
220.87	V	270	1.00	4.90	17.0	12.4	200.0	-24.1	
4874.00	V	180	2.80	59.50	-8.3	365.2	5000.0	-22.7	
4874.00	V	180	2.80	47.60	-8.3	92.8	500.0	-14.6	
7311.00	V	190	2.00	53.60	-0.8	435.0	5000.0	-21.2	
7311.00	V	190	2.00	42.10	-0.8	115.7	500.0	-12.7	
12185.00	V	10	1.60	50.60	4.7	580.0	5000.0	-18.7	
12185.00	V	10	1.60	40.30	4.7	177.2	500.0	-9.0	
115.57	H	315	4.00	5.50	14.3	9.8	150.0	-23.7	
142.16	H	315	4.00	4.20	12.3	6.7	150.0	-27.1	
145.60	H	315	4.00	8.50	12.1	10.7	150.0	-22.9	
149.96	H	315	4.00	6.50	12.3	8.7	150.0	-24.8	
156.52	H	315	4.00	6.20	13.9	10.1	150.0	-23.4	
170.79	H	315	4.00	4.80	14.4	9.1	150.0	-24.3	
204.80	H	315	4.00	10.50	15.3	19.5	150.0	-17.7	
220.87	H	315	3.50	4.50	17.0	11.9	200.0	-24.5	
4874.00	H	190	1.45	62.00	-8.3	487.0	5000.0	-20.2	
4874.00	H	190	1.45	48.83	-8.3	106.9	500.0	-13.4	
7311.00	H	10	1.61	52.33	-0.8	375.8	5000.0	-22.5	
7311.00	H	10	1.61	40.60	-0.8	97.4	500.0	-14.2	
12185.00	H	200	1.70	51.10	4.7	614.3	5000.0	-18.2	
12185.00	H	200	1.70	41.20	4.7	196.5	500.0	-8.1	

above 18GHz performed with 10cm measurements (no signals noted)

Table 11: Radiated Emission Test Data, High Channel (Restricted Bands)

Frequency (MHz)	Polarity H/V	Azimuth (Degree)	Ant. Height (m)	SA Level (dBuV)	Corr Factors (dB)	Corr. Level (uV/m)	Limit (uV/m)	Margin (dB)	Comments
115.57	V	270	1.00	5.70	14.3	10.0	150.0	-23.5	restricted edge
142.16	V	270	1.00	4.30	12.3	6.7	150.0	-27.0	
145.60	V	270	1.00	8.90	12.1	11.2	150.0	-22.5	
149.96	V	270	1.00	8.60	12.3	11.0	150.0	-22.7	
156.52	V	270	1.00	6.20	13.9	10.1	150.0	-23.4	
170.79	V	270	1.00	5.30	14.4	9.7	150.0	-23.8	
204.80	V	270	1.00	14.00	15.3	29.2	150.0	-14.2	
220.87	V	270	1.00	5.00	17.0	12.6	200.0	-24.0	
4924.00	V	180	1.55	60.83	-7.8	449.2	5000.0	-20.9	
4924.00	V	180	1.55	45.83	-7.8	79.9	500.0	-15.9	
7386.00	V	180	1.50	52.18	-0.8	372.3	5000.0	-22.6	
7386.00	V	180	1.50	42.10	-0.8	116.6	500.0	-12.6	
12310.00	V	100	1.70	50.70	4.5	576.2	5000.0	-18.8	
12310.00	V	100	1.70	41.00	4.5	188.6	500.0	-8.5	
2483.50	V	190	1.40	52.50	0.0	421.7	5000.0	-21.5	
2483.50	V	190	1.40	39.20	0.0	91.2	500.0	-14.8	
2483.50	V	190	1.60	51.20	0.0	363.1	5000.0	-22.8	
2483.50	V	190	1.60	37.89	0.0	78.4	500.0	-16.1	
115.57	H	315	4.00	5.50	14.3	9.8	150.0	-23.7	restricted edge
142.16	H	315	4.00	4.30	12.3	6.7	150.0	-27.0	
145.60	H	315	4.00	8.50	12.1	10.7	150.0	-22.9	
149.96	H	315	4.00	6.50	12.3	8.7	150.0	-24.8	
156.52	H	315	4.00	6.20	13.9	10.1	150.0	-23.4	
170.79	H	315	4.00	5.00	14.4	9.3	150.0	-24.1	
204.80	H	315	4.00	11.20	15.3	21.2	150.0	-17.0	
220.87	H	315	3.50	4.50	17.0	11.9	200.0	-24.5	
4924.00	H	190	90.00	62.00	-7.8	514.0	5000.0	-19.8	
4924.00	H	190	90.00	48.90	-7.8	113.8	500.0	-12.9	
7386.00	H	190	1.30	53.33	-0.8	425.0	5000.0	-21.4	
7386.00	H	190	1.30	41.90	-0.8	114.0	500.0	-12.8	
12310.00	H	190	1.40	51.10	4.5	603.4	5000.0	-18.4	
12310.00	H	190	1.40	40.80	4.5	184.3	500.0	-8.7	
2483.50	H	180	1.90	52.00	-2.7	292.8	5000.0	-24.6	
2483.50	H	180	1.90	39.00	-2.7	65.6	500.0	-17.6	
2483.50	H	180	1.90	52.20	-2.7	299.7	5000.0	-24.4	
2483.50	H	180	1.90	38.10	-2.7	59.1	500.0	-18.5	

above 18GHz performed with 10cm measurements (no signals noted)

3.8 Receiver Radiated Spurious Emissions

As this receiver is above 960MHz this test is not required.