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FCC & Industry Canada Certification Test Report
For the
Motorola - Enterprise Mobility Solutions
DS9808RUS/DS9808RWW

FCC ID: UZ7DS9808RUS
IC: 109AN-DS9808RWW

WLL JOB# **11205-01 Rev 2**
November 20, 2009

Re-issued January 6, 2010

Prepared for:

Motorola - Enterprise Mobility Solutions
Jays Close
Viables Industrial Estate
Basingstoke
Hampshire
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Prepared By:

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7560 Lindbergh Drive
Gaithersburg, Maryland 20879

ACCREDITED
Testing Certificate 2675.01

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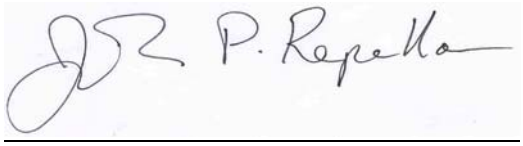

John P. Repella
QA Manager

Reviewed by:

Steven D. Koster
EMC Operations Manager

Abstract

This report has been prepared on behalf of Motorola-Enterprise Mobility Solutions 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 (7/2008) of the FCC Rules and Regulations and Spectrum Management and Telecommunications Policy RSS-210 of Industry Canada. This Certification Test Report documents the test configuration and test results for the Motorola-Enterprise Mobility Solutions DS9808RUS/DS9808RWW.

Testing was performed on an Open Area Test Site (OATS) of Washington Laboratories, Ltd, 7560 Lindbergh Drive, Gaithersburg, MD 20879. Site description and site attenuation data have been placed on file with the FCC's Sampling and Measurements Branch at the FCC laboratory in Columbia, MD. The Industry Canada OATS numbers are 3035A-1 and 3035A-2 for Washington Laboratories, Ltd. Site 1 and Site 2, respectively. Washington Laboratories, Ltd. has been accepted by the FCC and approved by the American Association for Laboratory Accreditation (A2LA) under Certificate 2675.01 as an independent FCC test laboratory.

The Motorola-Enterprise Mobility Solutions DS9808RUS/DS9808RWW complies with the limits for a Frequency Hopping Spread Spectrum Transmitter device under FCC Part 15.247 and Industry Canada RSS-210.

Revision History	Description of Change	Date
Rev 0	Initial Release	November 20, 2009
Rev 1	Correct the model number of the unit	November 24, 2009
Rev 2	Address comment from ATCB	January 6, 2010

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1 Introduction

1.1 Compliance Statement

The Motorola-Enterprise Mobility Solutions DS9808RUS/DS9808RWW complies with the limits for a Frequency Hopping Spread Spectrum Transmitter device under FCC Part 15.247 (7/2008) 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 FCC Public Notice DA 00-705, Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems. The measurement equipment conforms to ANSI C63.2 Specifications for Electromagnetic Noise and Field Strength Instrumentation.

1.3 Contract Information

Customer:	Motorola-Enterprise Mobility Solutions Jays Close Viables Industrial Estate Basingstoke Hampshire RG22 4PD United Kingdom
Purchase Order Number:	NP4909392
Quotation Number:	64816B

1.4 Test Dates

Testing was performed on the following date(s):	10/20/09 – 10/27/09

1.5 Test and Support Personnel

Washington Laboratories, LTD	John P. Repella, James Ritter
Customer Representative	Alan Parrish

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 Motorola-Enterprise Mobility Solutions DS9808RUS/DS9808RWW is a handheld or hands free scanner/imager. The scanner has the capability to read 1D and 2D barcodes as well as RFID tags.

Table 1: Device Summary

ITEM	DESCRIPTION
Manufacturer:	Motorola-Enterprise Mobility Solutions
FCC ID:	UZ7DS9808RUS
IC:	109AN-DS9808RWW
Model:	DS9808RUS/DS9808RWW
FCC Rule Parts:	§15.247
Industry Canada:	RSS210 Issue 7
Frequency Range:	902-928MHz
Maximum Output Power:	251.18mW (24.0dBm)
Modulation:	DB-ASK, PR-ASK
Occupied Bandwidth:	81.6kHz
Keying:	Automatic, Manual
Type of Information:	Data
Number of Channels:	50
Power Output Level	Fixed
Antenna Connector	Internal
Antenna Type	Dual Polarized Dipole(Horizontal and Vertical Components)
Antenna Gain:	-1.5dBi
Interface Cables:	RS232 & USB
Power Source & Voltage:	AC adapter (100-240VAC, 50-60Hz, 1.5A) DC 12VDC, 3.3A
Receiver spurious	30.2 µV/m at 3m
Transmitter spurious	312.2 µV/m at 3m
Emissions Designator	81K6GXD

2.2 Test Configuration

The DS9808RUS/DS9808RWW was configured for test with customer supplied software to exercise functionality. The scanner was tested with two cable configurations: with an RS 232 cable and a USB cable.

2.3 Testing Algorithm

The DS9808RUS/DS9808RWW was programmed for FHSS operation via RFIDDemo software provided by the customer.

Worst case emission levels are provided in the test results data.

2.4 Test Location

All measurements herein were performed at Washington Laboratories, Ltd. test center in Gaithersburg, MD. Site description and site attenuation data have been placed on file with the FCC's Sampling and Measurements Branch at the FCC laboratory in Columbia, MD. The Industry Canada OATS numbers are 3035A-1 and 3035A-2 for Washington Laboratories, Ltd. Site 1 and Site 2, respectively. Washington Laboratories, Ltd. has been accepted by the FCC and approved by the American Association for Laboratory Accreditation (A2LA) under Certificate 2675.01 as an independent FCC test laboratory.

2.5 Measurements

2.5.1 References

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

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

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.

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

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

Where u_c = standard uncertainty

a, b, c,.. = 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 ≤ 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

3 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: **Radiated Emissions**			Test Date: **10/22/2009**
Asset #	**Manufacturer/Model**	**Description**	**Cal. Due**
69	HP, 85650A	Adapter, QP	06/28/2010
73	HP, 8568B	Analyzer, Spectrum	06/28/2010
71	HP, 85685A	Preselector, RF	06/28/2010
528	Agilent, E4446A	Analyzer, Spectrum	09/04/2010
522	HP, 8449B	Pre-Amplifier, 1-26.5GHz	07/21/2010
644	Sunol Science JB1	BiConalog Antenna	12/29/2009
626	ARA, DRG-118/A	Antenna, Horn	06/03/2011
466	IWI, SPS-2801-200-SPS	Cable, Coaxial, 0.5-meter	10/26/2009
667	MegaPhase, LLC EM18-S1NK5-600	Test cable for OATS testing DC to 18 GHz SMA male	04/23/2010

Test Name: **Conducted Emissions Voltage**			Test Date: **10/27/2009**
Asset #	**Manufacturer/Model**	**Description**	**Cal. Due**
69	HP, 85650A	Adapter, QP	06/28/2010
73	HP, 8568B	Analyzer, Spectrum	06/28/2010
71	HP, 85685A	Preselector, RF	06/28/2010
125	Solar, 8028-50-TS-24-BNC	LISN	07/17/2010
126	Solar, 8028-50-TS-24-BNC	LISN	07/17/2010

4 Test Summary

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

Table 4: Test Summary Table

TX Test Summary (Frequency Hopping Spread Spectrum)			
FCC Rule Part	**IC Rule Part**	**Description**	**Result**
15.247 (a)(1)(i)	RSS-210 [A8. 1 (c)]	20dB Bandwidth	Pass
15.247 (b)(2)	RSS-210 [A8.4 (1)]	Transmit Output Power	Pass
15.247 (a)(1)	RSS-210 [A8.1 (b)]	Channel Separation	Pass
15.247 (a)(1)(i)	RSS-210 [A8. 1 (c)]	Number of Channels =50 minimum	Pass
15.247 (a)(1)(i)	RSS-210 [A8. 1 (c)]	Time of Occupancy	Pass
15.247 (d)	RSS-210 [A8. 5]	Occupied BW / Out-of-Band Emissions (Band Edge @ 20dB below)	Pass
15.205 15.209	RSS-210 Sect.2.2	General Field Strength Limits (Restricted Bands & RE Limits)	Pass
15.207	RSS-Gen [7.2.2]	AC Conducted Emissions	NA (battery powered)
RX/Digital Test Summary (Frequency Hopping Spread Spectrum)			
FCC Rule Part	**IC Rule Part**	**Description**	**Result**
15.207	RSS-Gen [7.2.2]	AC Conducted Emissions	NA (battery powered)
15.209	RSS-210 sect 2.6	General Field Strength Limits	Pass

5 Test Results

5.1 Time of Occupancy (15.247 (a)(1)(i) & RSS-210 [A8. 1 (c)])

247(a) 1(i) For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period

From Figures 1 and 2 it is determined that:

Single pulse duration is 24.33ms

In a 20 s sweep period 10 pulses occur, and

Therefore the total on time is 243.3ms

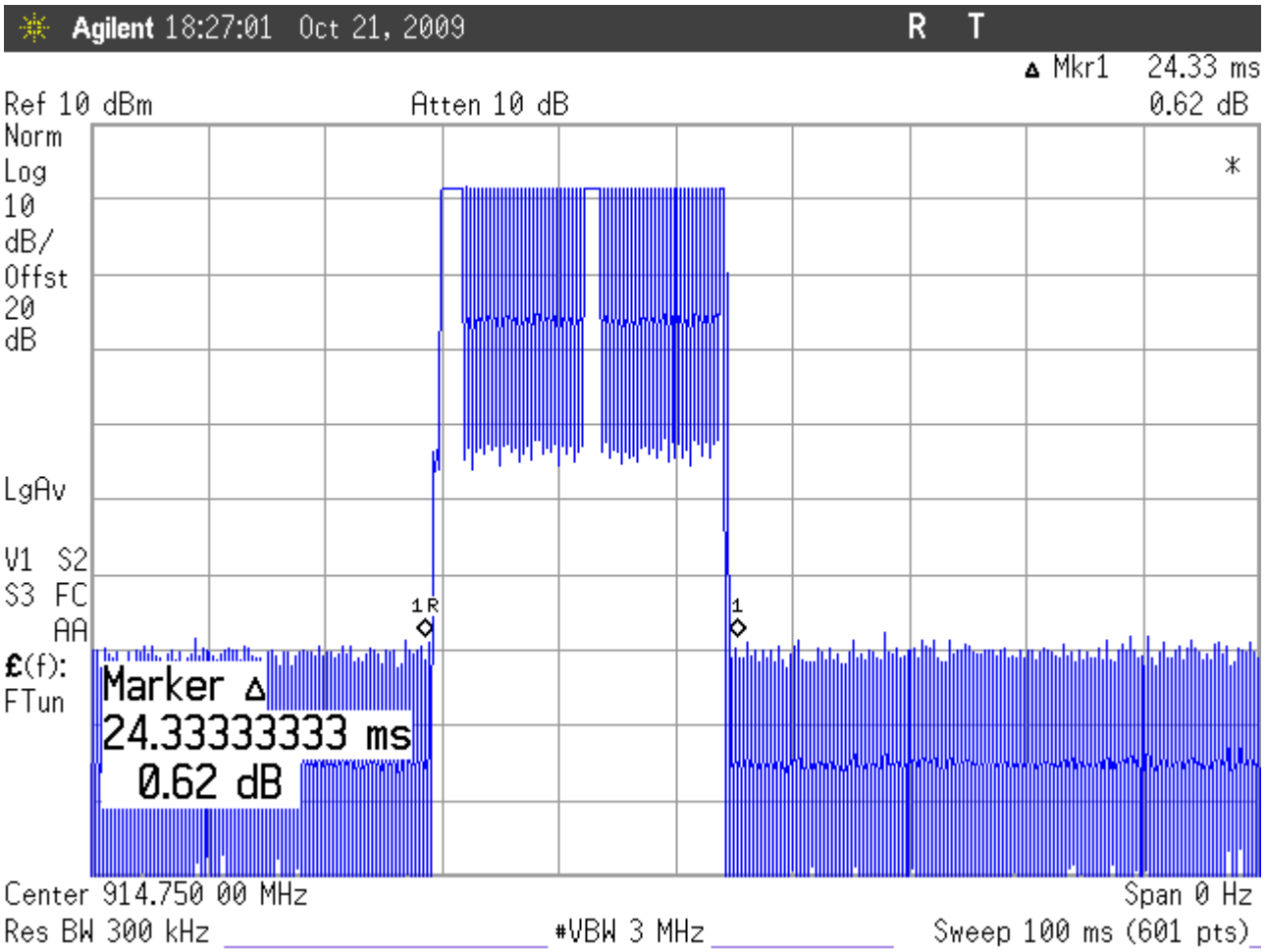

Figure 1: Duty Cycle Plot

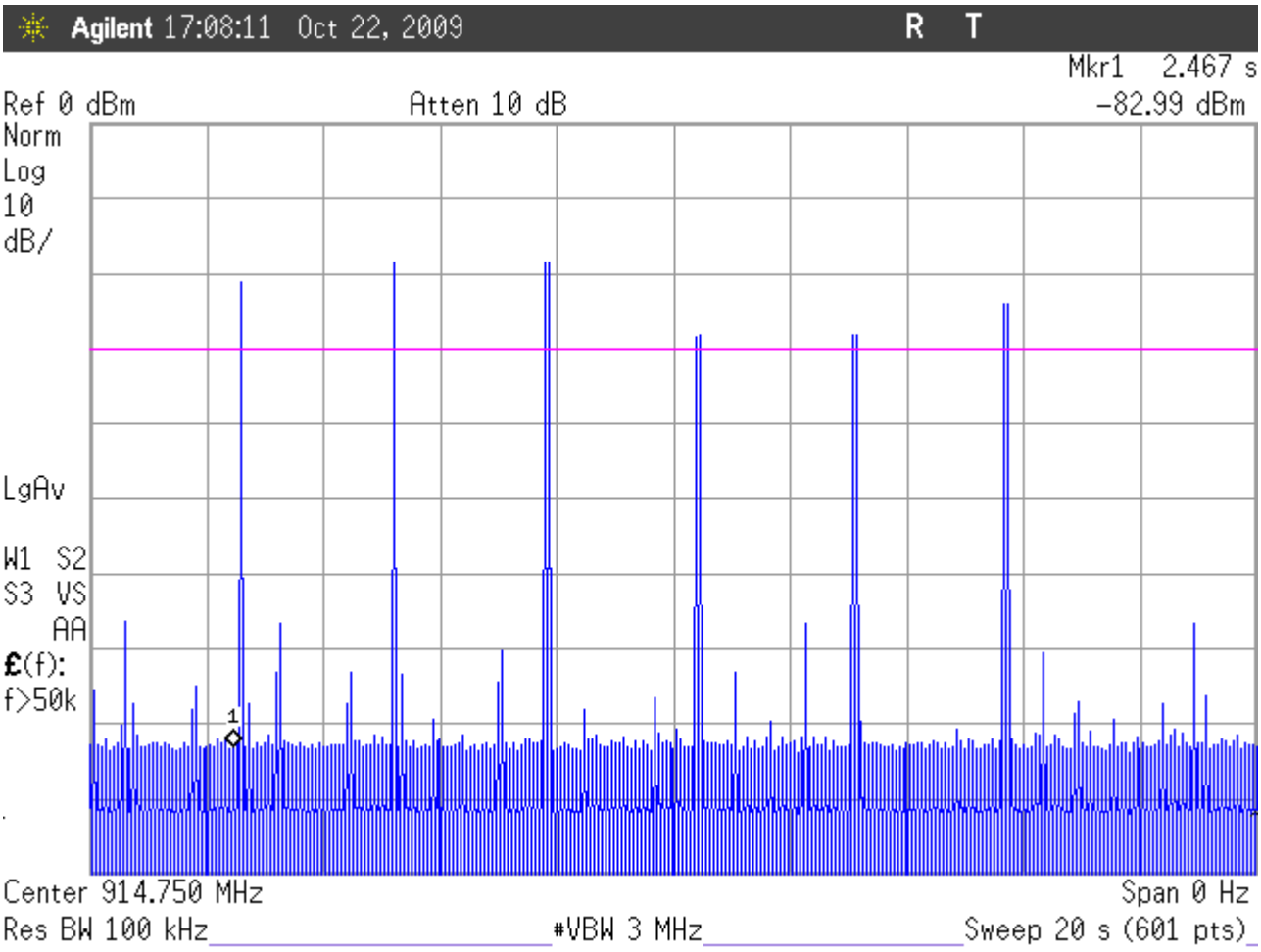

Figure 2: Total on Time

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

To measure the output power the hopping sequence was stopped while the frequency dwelled on a low, high and middle channel. The output from the transmitter was connected to an attenuator and then to the input of the RF Spectrum Analyzer. The analyzer offset was adjusted to compensate for the attenuator and other losses in the system.

Table 5: RF Power Output

Frequency /Antenna Port	Level	Limit	Pass/Fail
Low Channel: 902.75MHz (A0)	23.84 dBm	30 dBm	Pass
Low Channel: 902.75MHz (A1)	24.00 dBm	30 dBm	Pass
Mid Channel: 914.75MHz (A0)	23.75 dBm	30 dBm	Pass
Mid Channel: 914.75MHz (A1)	23.75 dBm	30 dBm	Pass
High Channel: 927.25MHz (A0)	23.67 dBm	30 dBm	Pass
High Channel: 927.25MHz (A1)	23.75 dBm	30 dBm	Pass

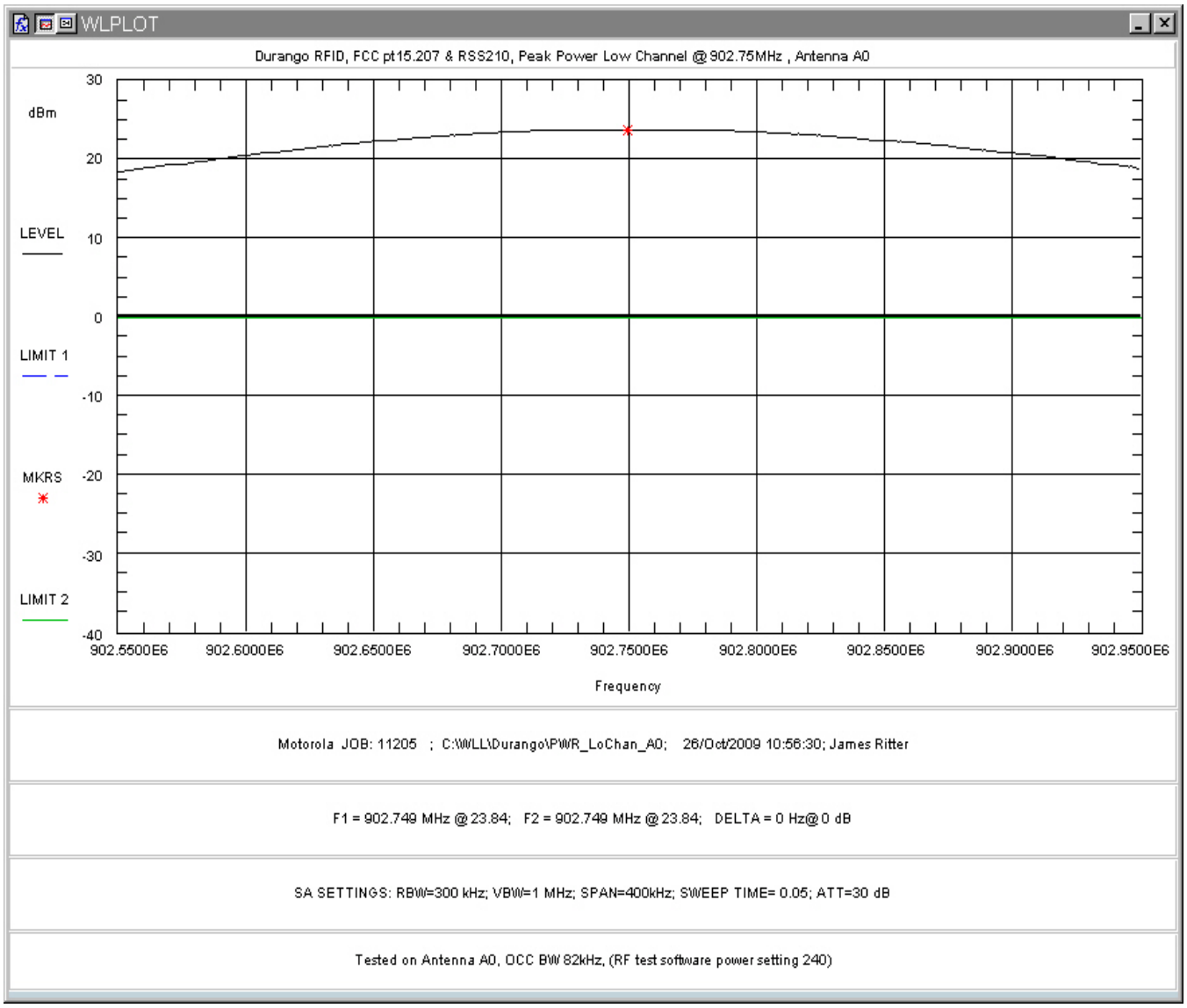

Figure 3: RF Peak Power, Low Channel (A0)

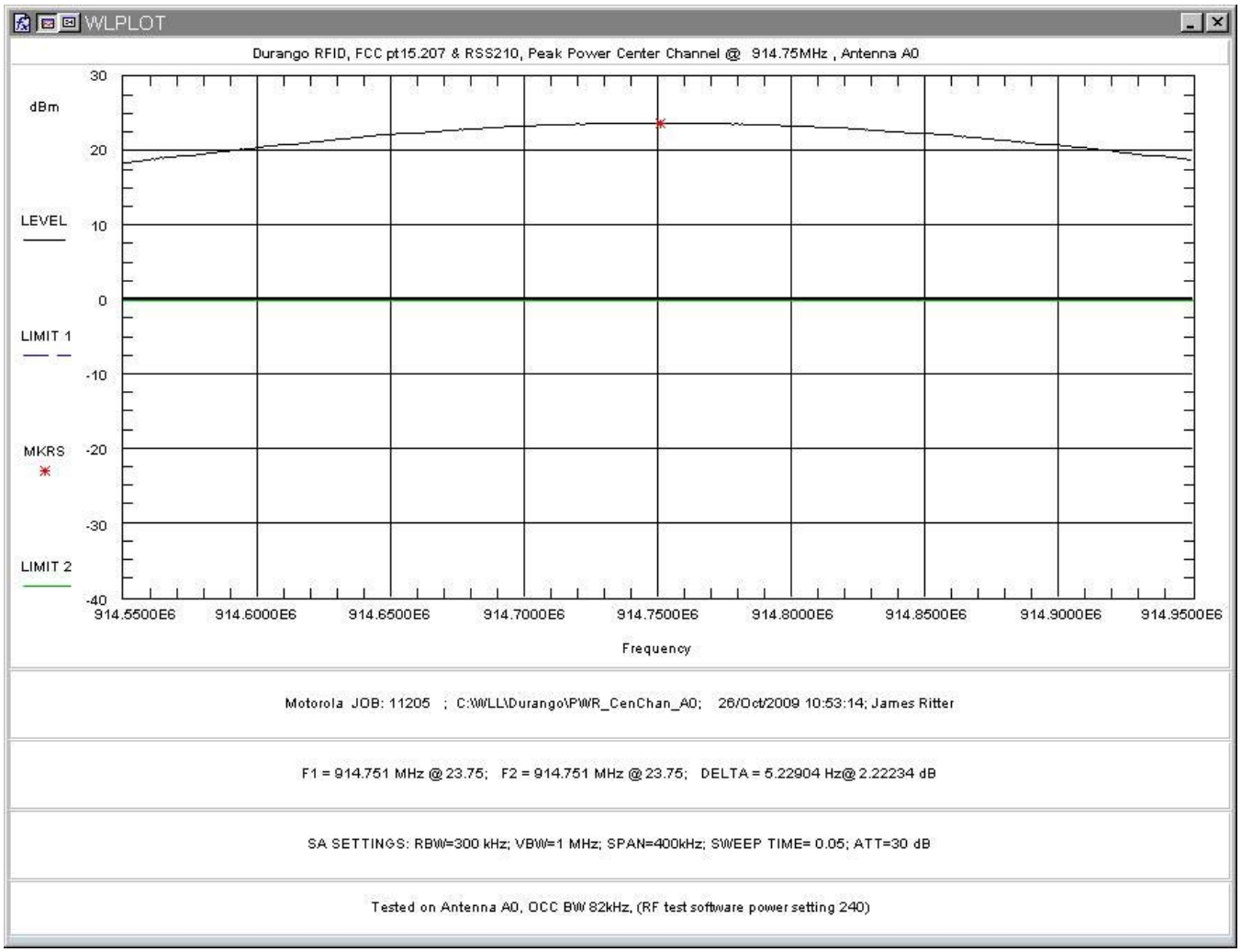

Figure 4: RF Peak Power, Mid Channel (A0)

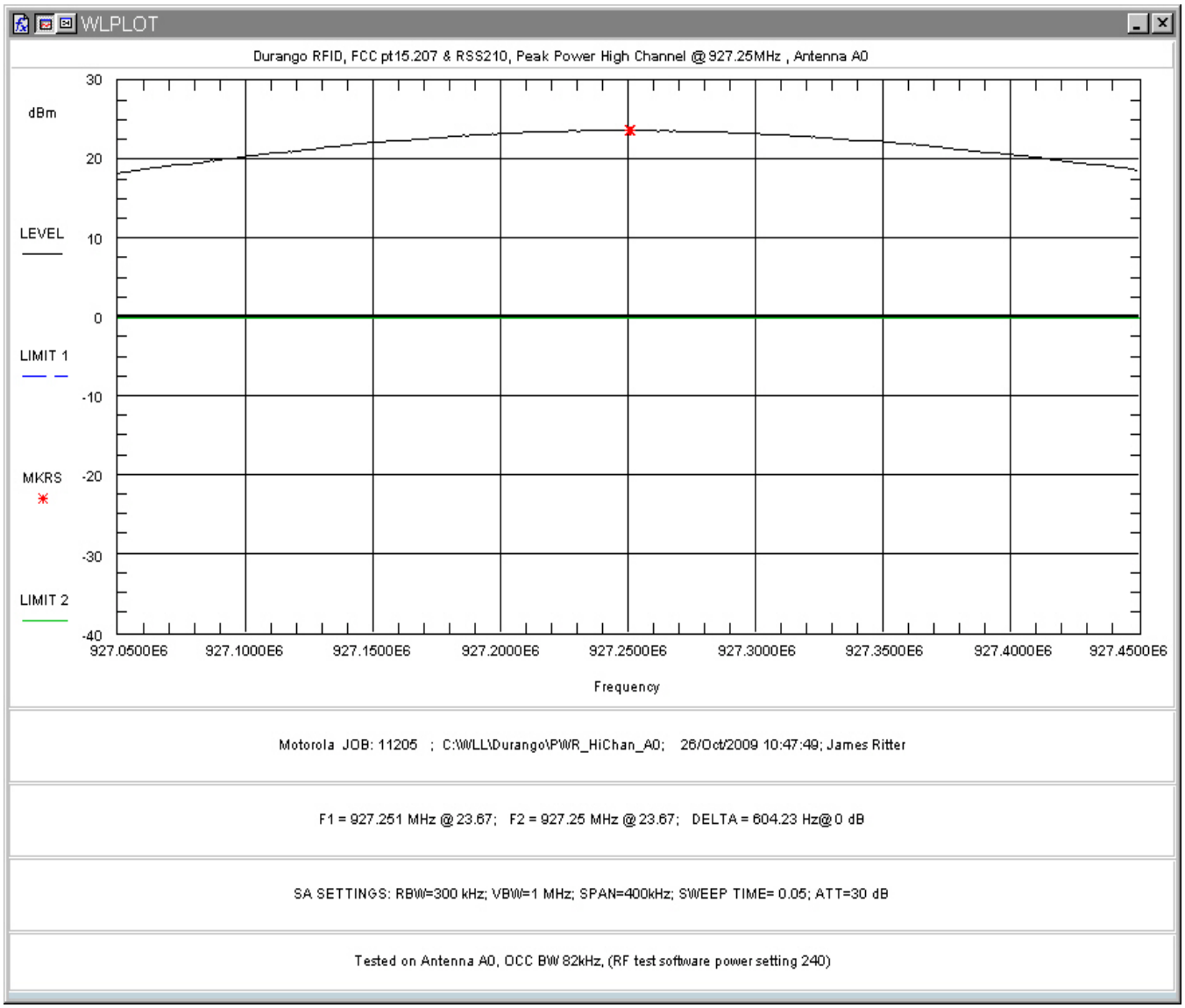

Figure 5: RF Peak Power, High Channel (A0)

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

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

For Frequency Hopping Spread Spectrum Systems, FCC Part 15.247 requires the maximum 20 dB bandwidth not exceed 1MHz.

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

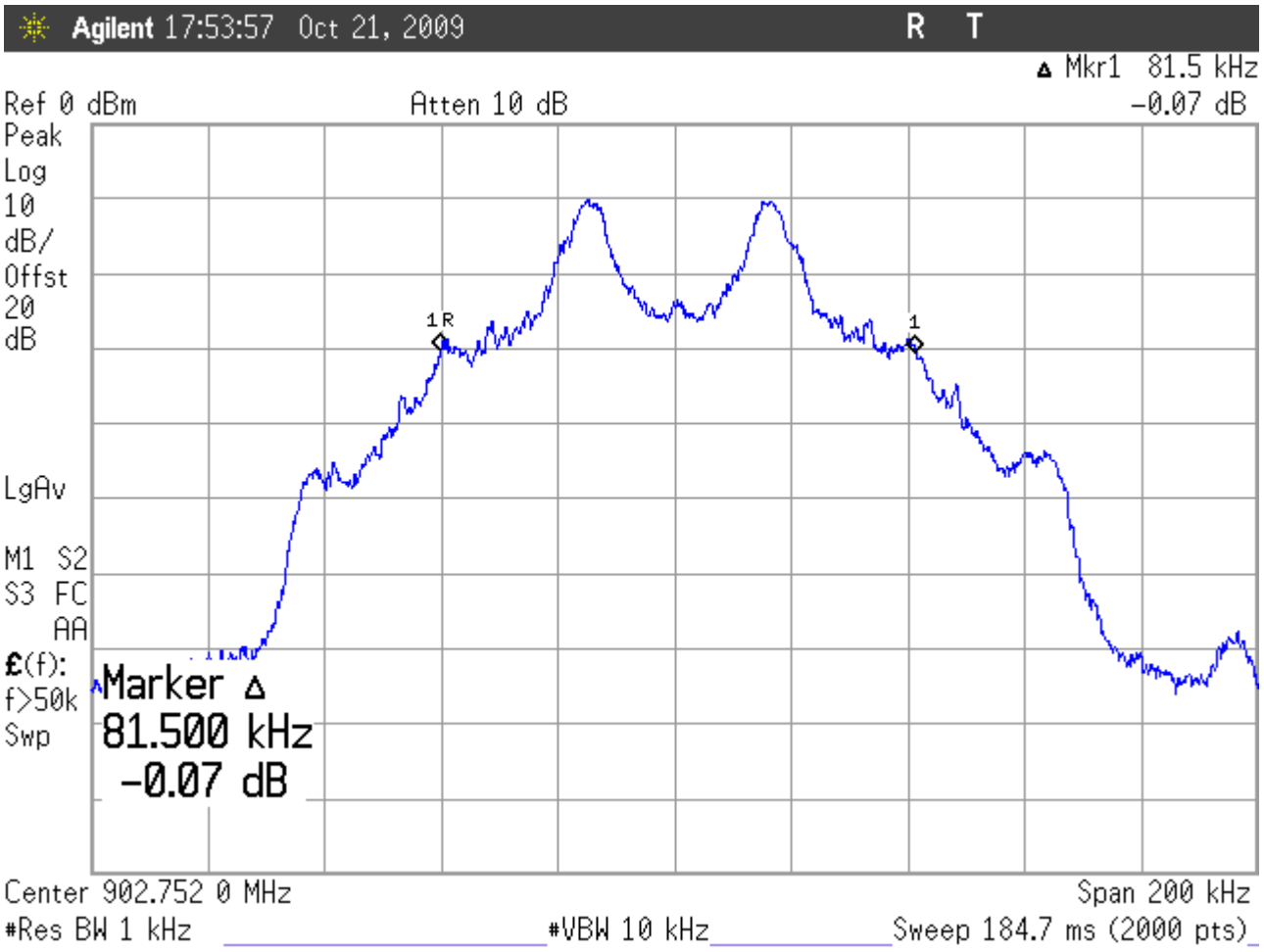

Figure 6: Occupied Bandwidth, Low Channel

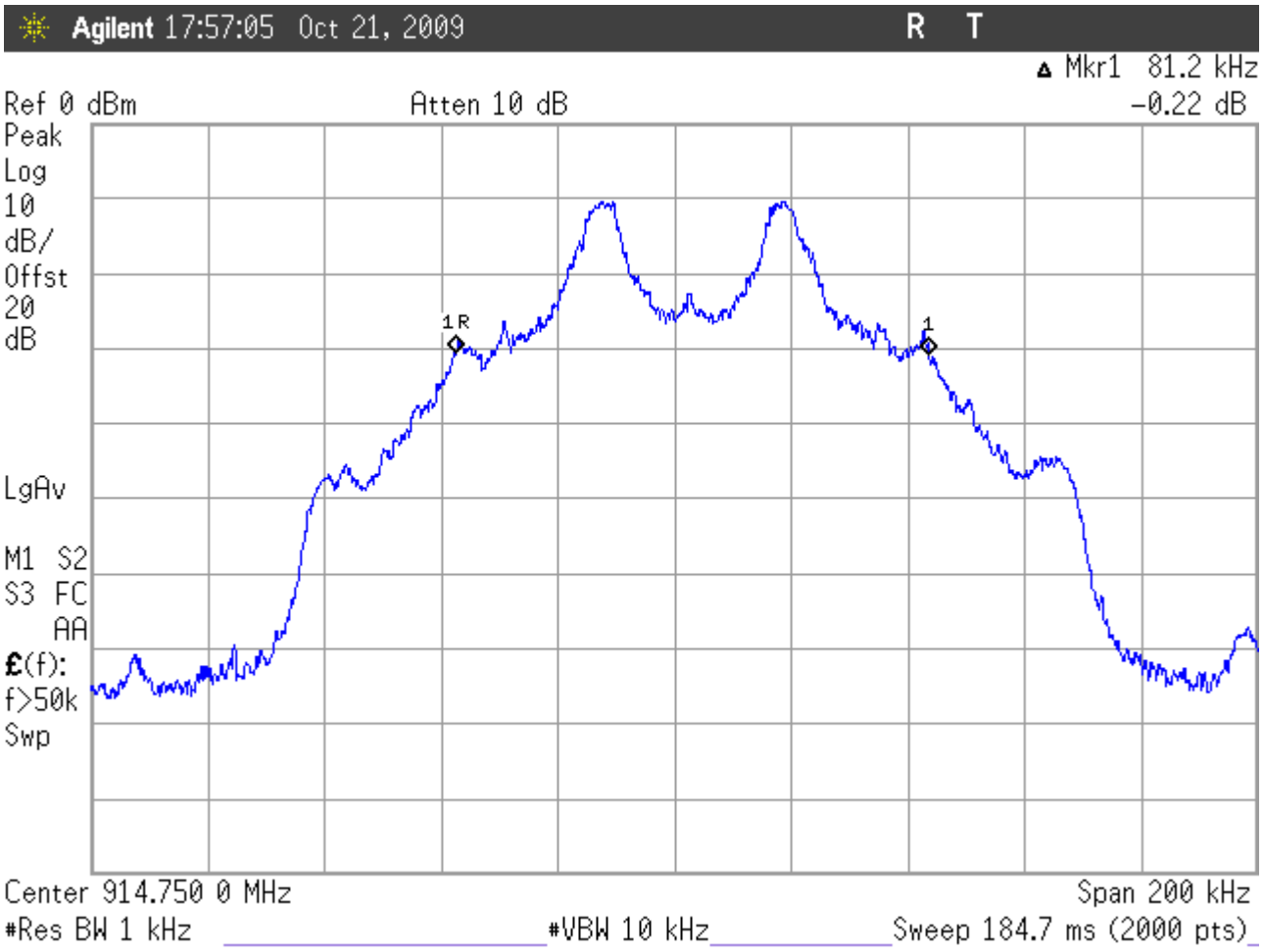

Figure 7: Occupied Bandwidth, Mid Channel

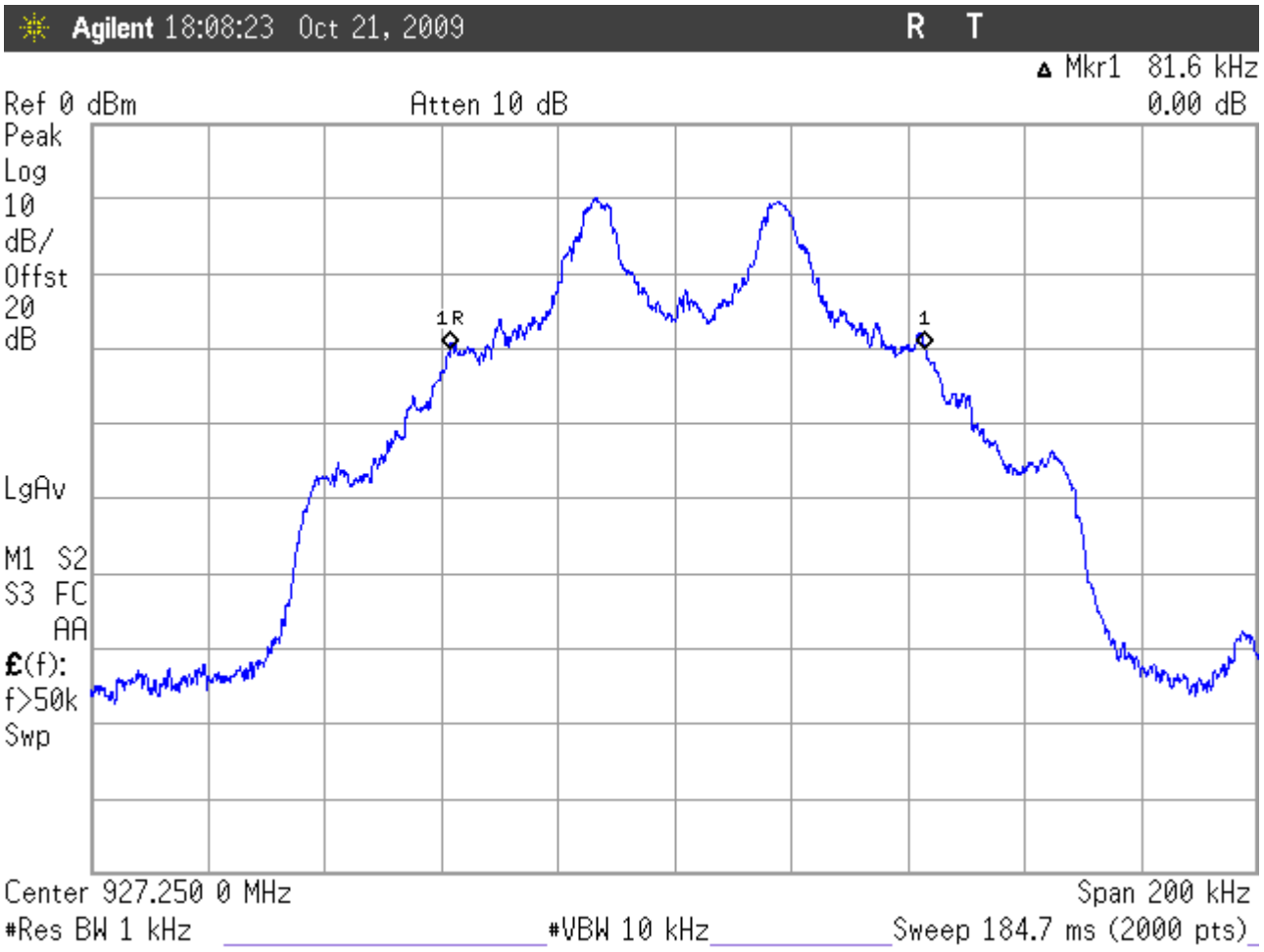

Figure 8: Occupied Bandwidth, High Channel

Table 6 provides a summary of the Occupied Bandwidth Results.

Table 6: Occupied Bandwidth Results

Frequency	Bandwidth	Limit	Pass/Fail
Low Channel: 902.75MHz	81.5kHz	1 MHz	Pass
Mid Channel: 914.75MHz	81.2kHz	1 MHz	Pass
High Channel: 927.25MHz	81.6kHz	1 MHz	Pass

5.4 Channel Spacing and Number of Hop Channels (FCC 15. 247(a)(1) & RSS-210 [A8.1 (b)]

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 81.6kHz so the channel spacing must be more than 81.6kHz. In addition, for a 902-928MHz transmitter 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 20 kHz and the video bandwidth was set to 200 kHz. The channel spacing of 2 adjacent channels was measured using a spectrum analyzer span setting of 2MHz. Also, the number of hopping channels was measured from 901.5MHz to 928.5MHz.

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

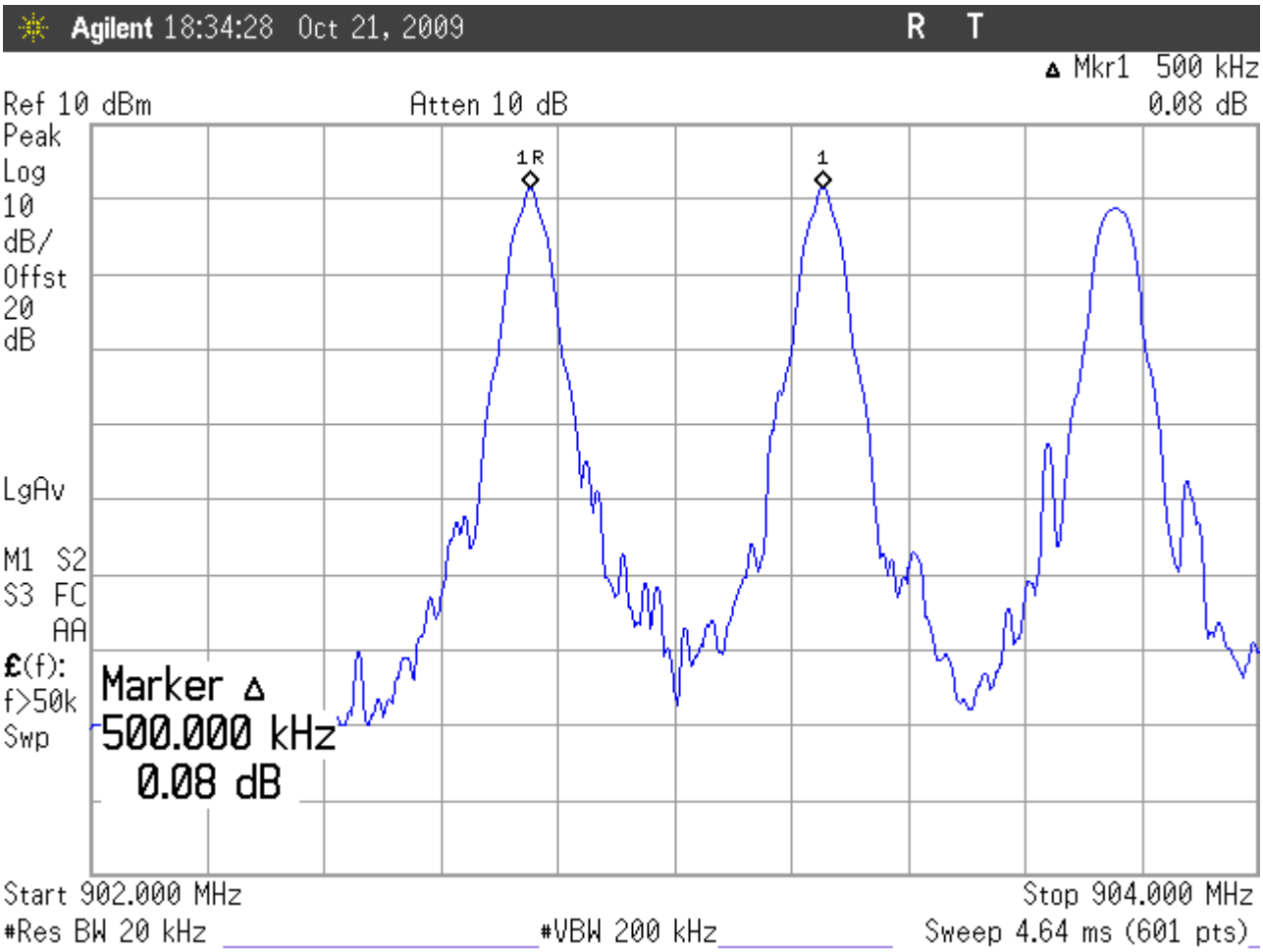

Figure 9: Channel Spacing

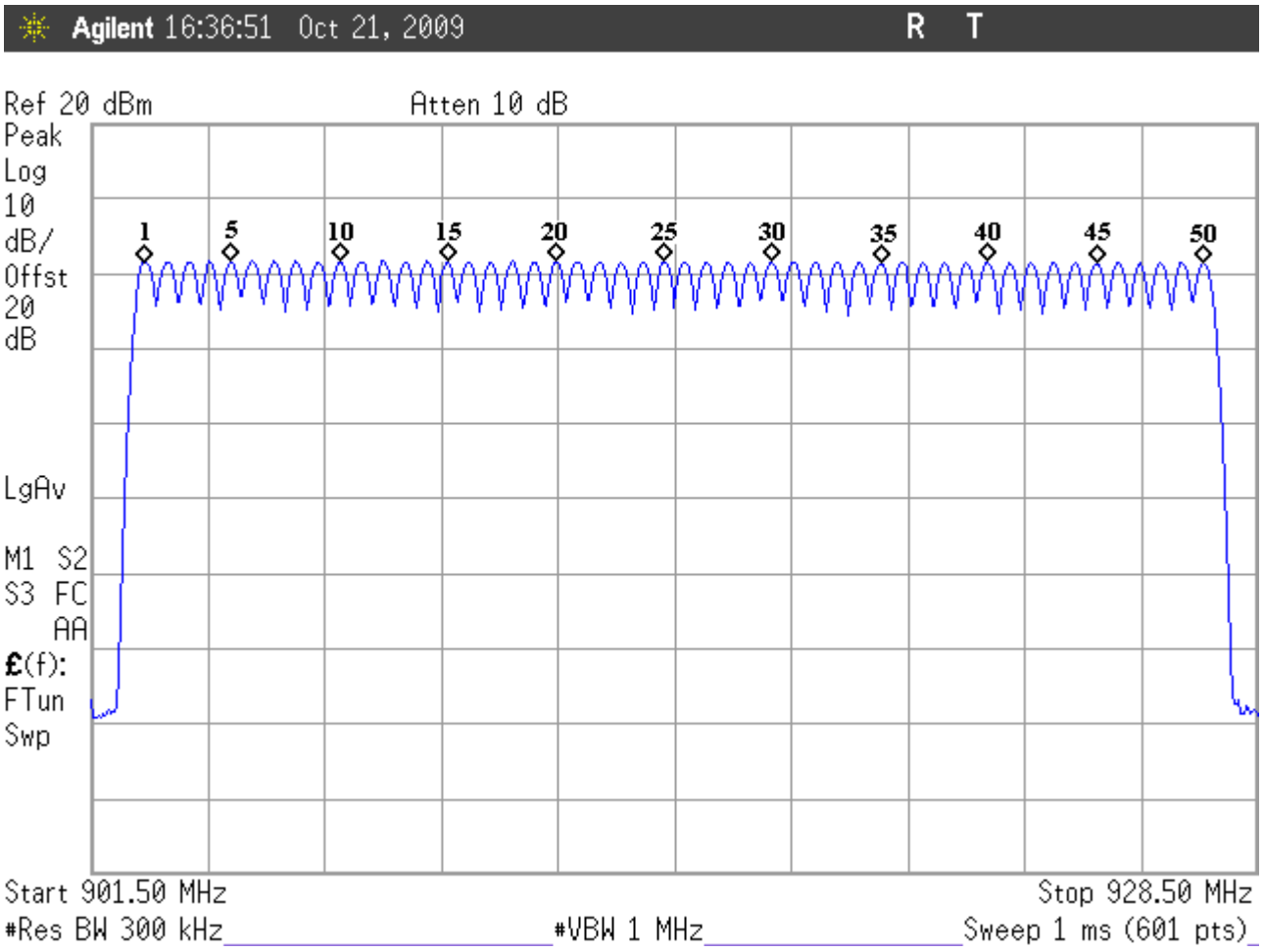

Figure 10: Number of Channels

5.5 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.

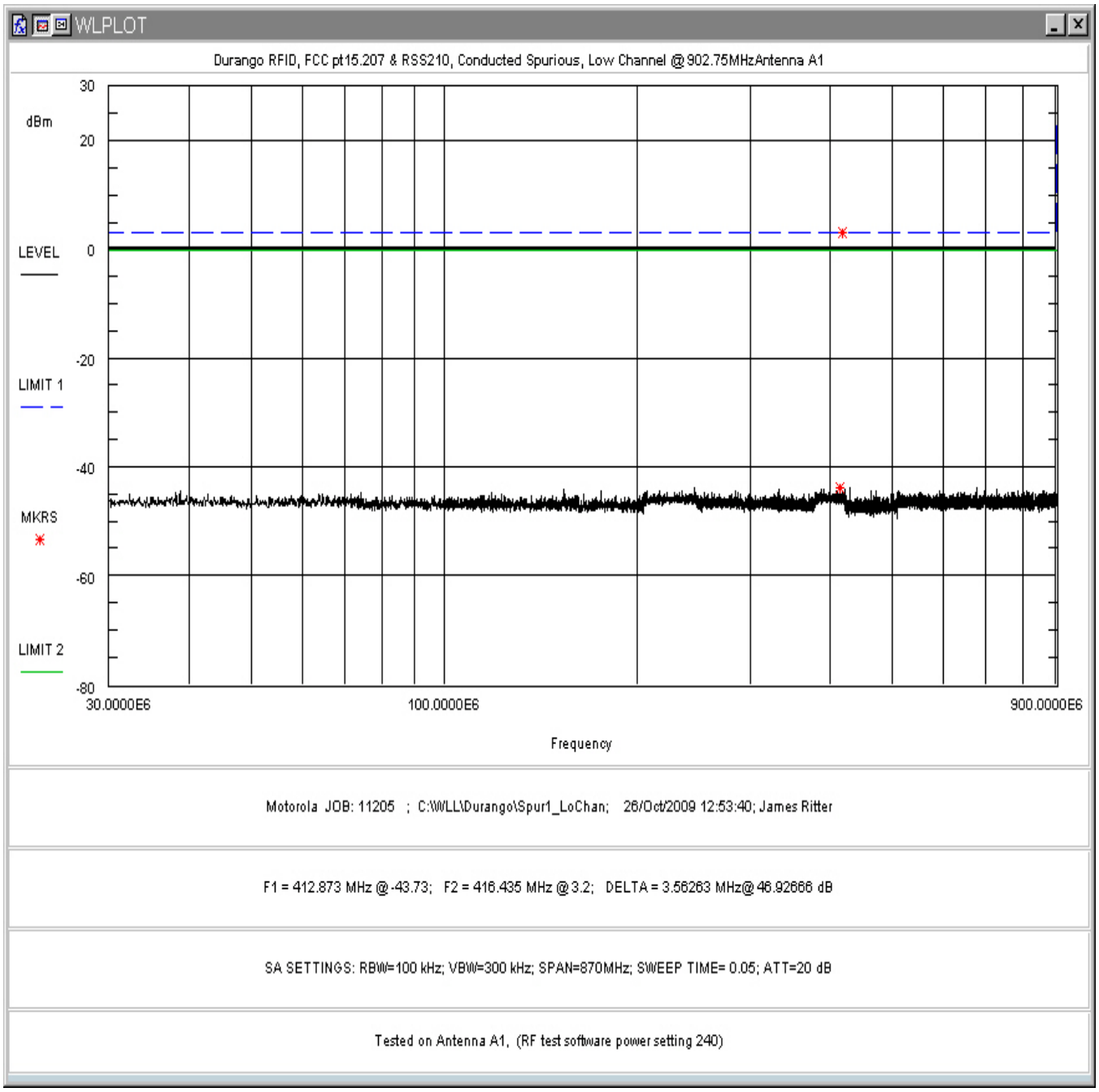

Figure 11: Conducted Spurious Emissions, Low Channel 30 - 900MHz

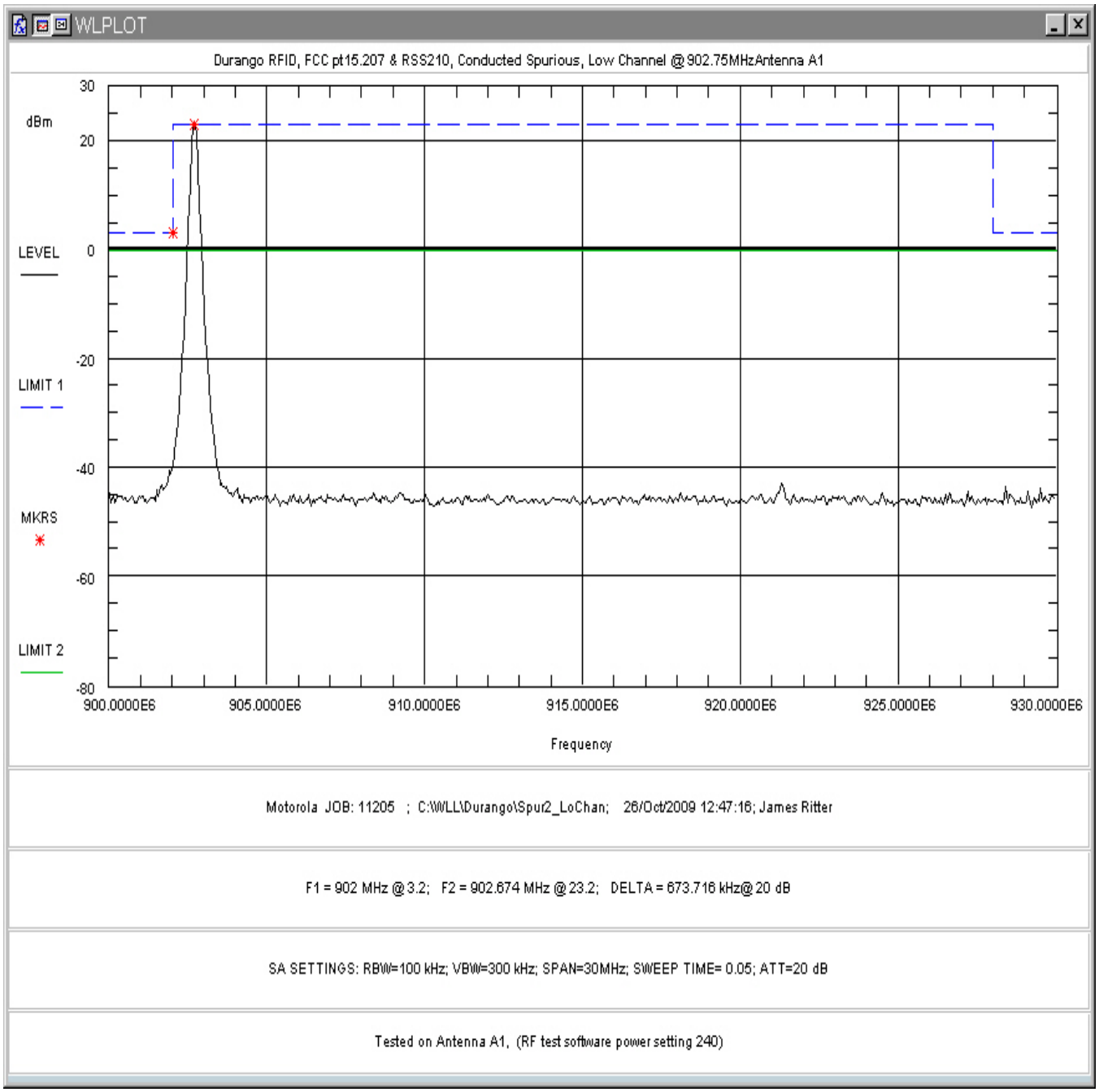

Figure 12: Conducted Spurious Emissions, Low Channel 900MHz – 930MHz

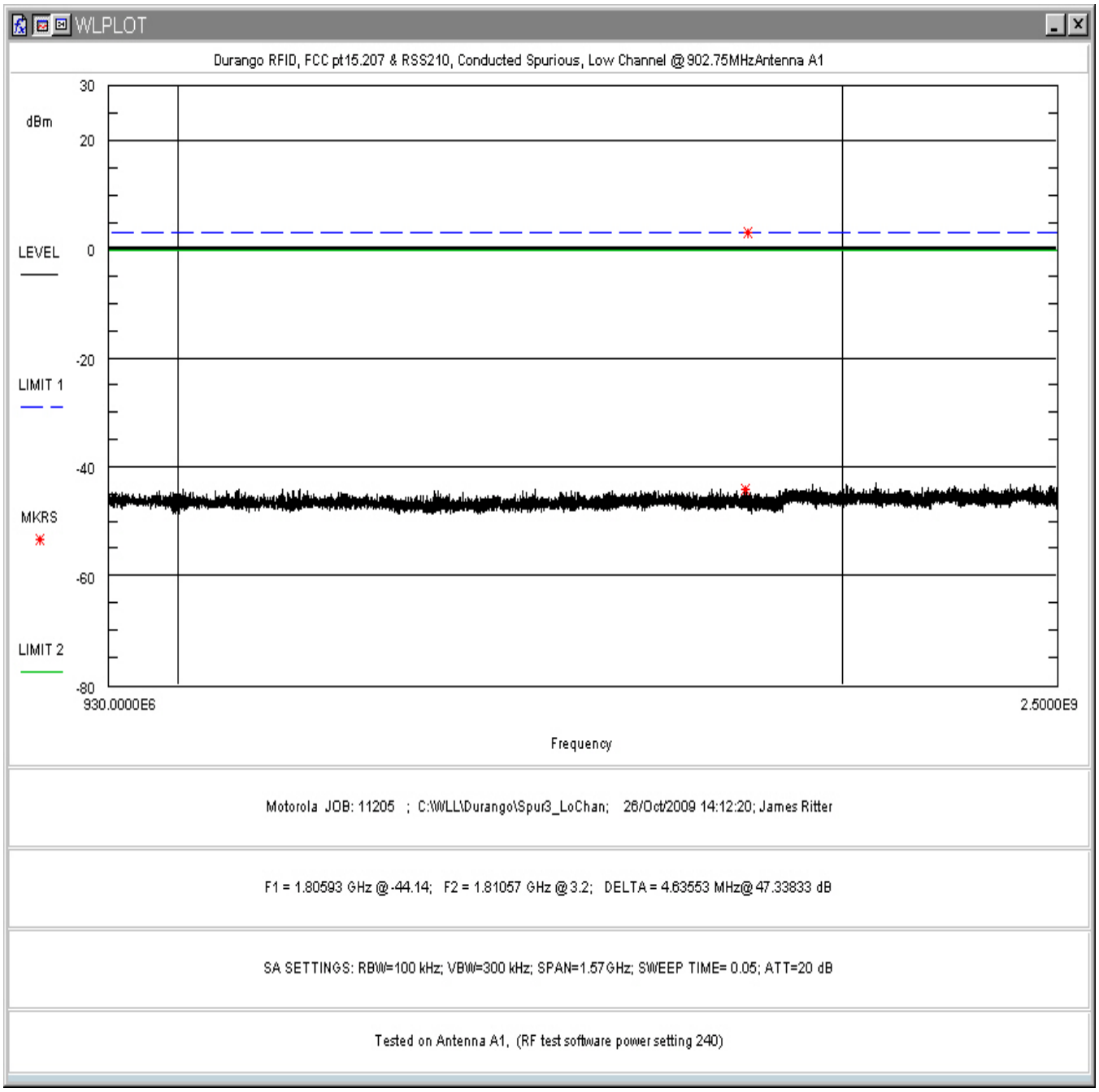

Figure 13: Conducted Spurious Emissions, Low Channel 930MHz – 2.5GHz

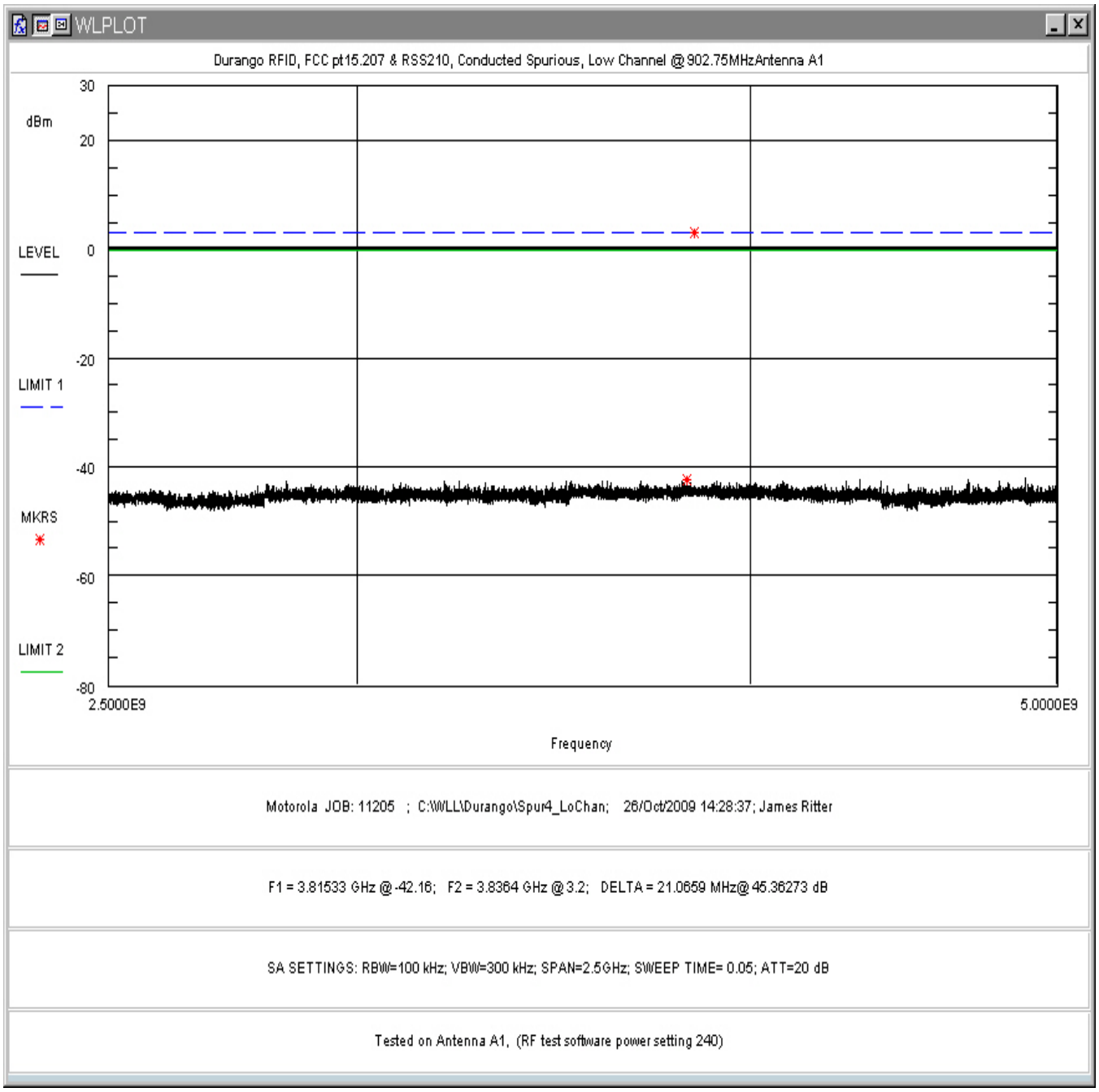

Figure 14: Conducted Spurious Emissions, Low Channel 2.5 - 5GHz

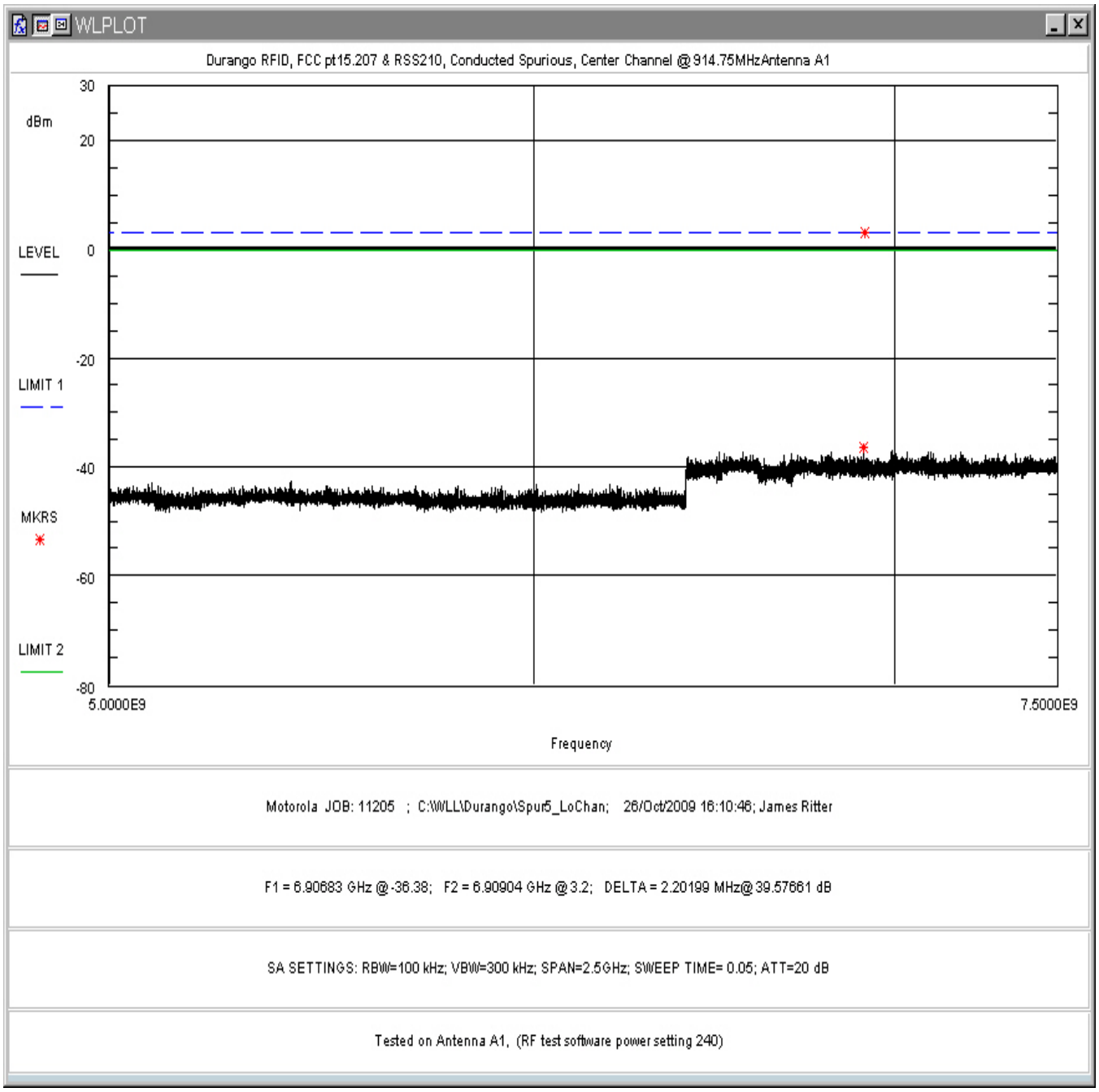

Figure 15: Conducted Spurious Emissions, Low Channel 5 – 7.5GHz

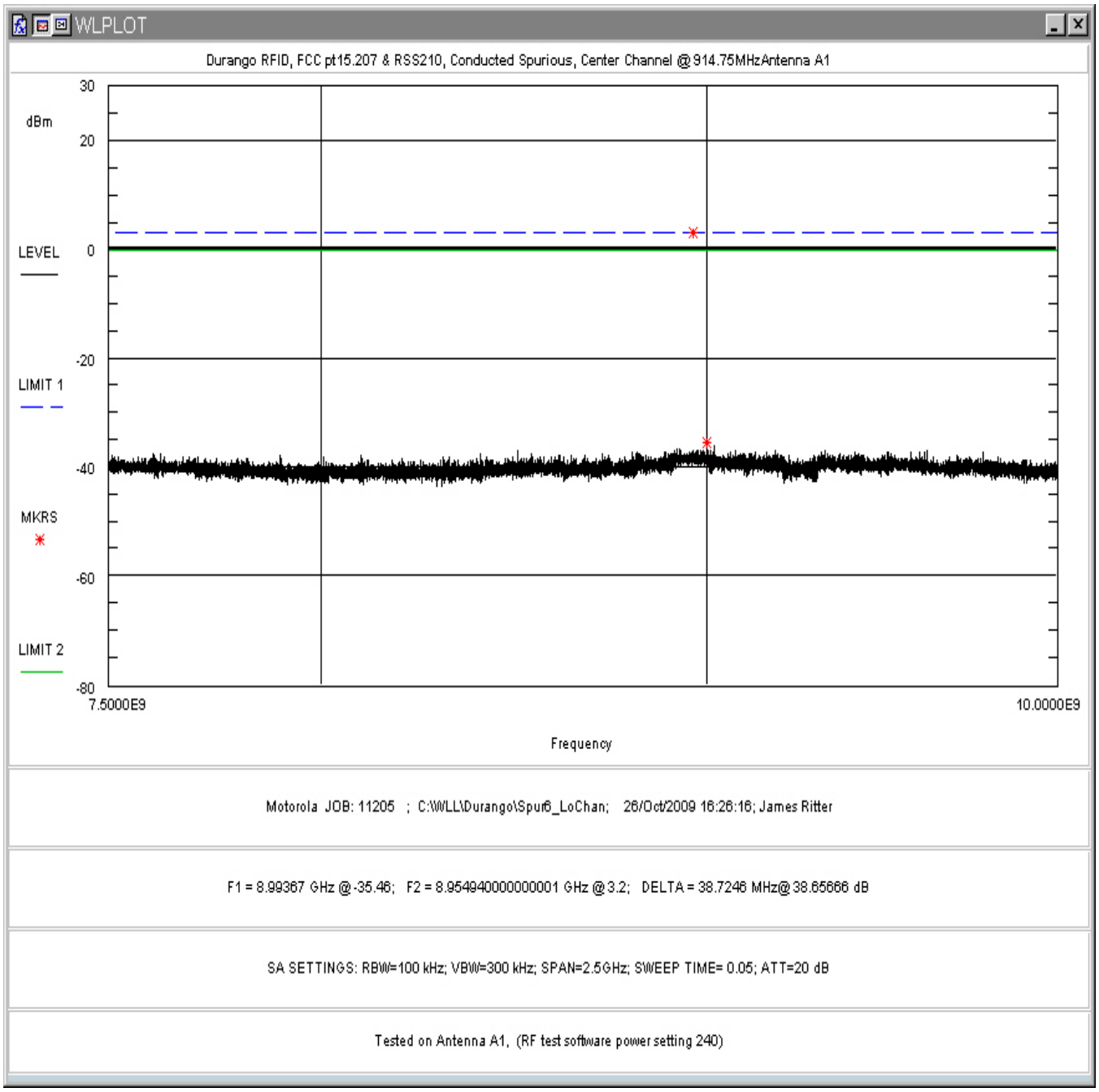

Figure 16: Conducted Spurious Emissions, Low Channel 7.5 - 10GHz

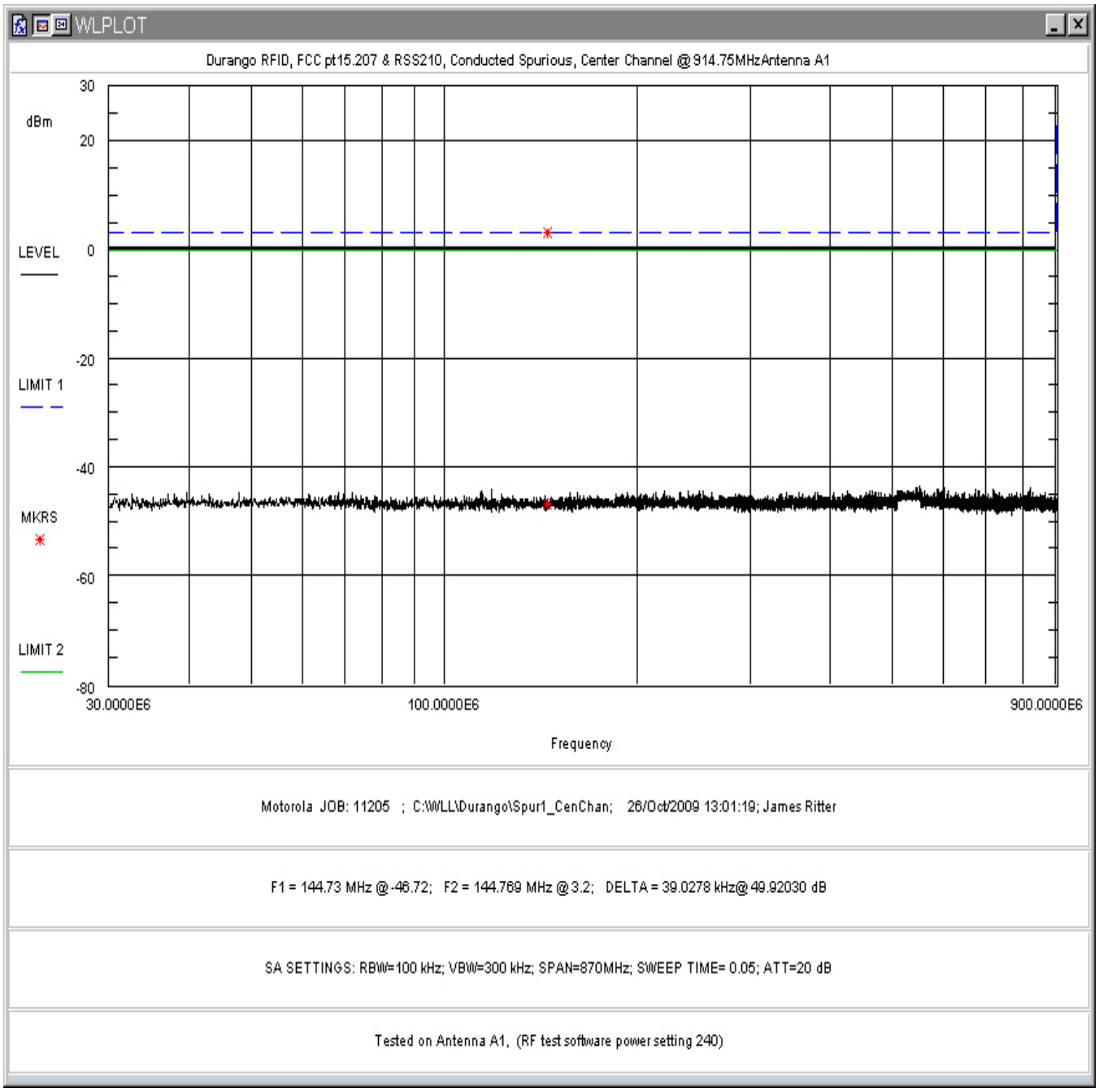

Figure 17: Conducted Spurious Emissions, Mid Channel 30 - 900MHz

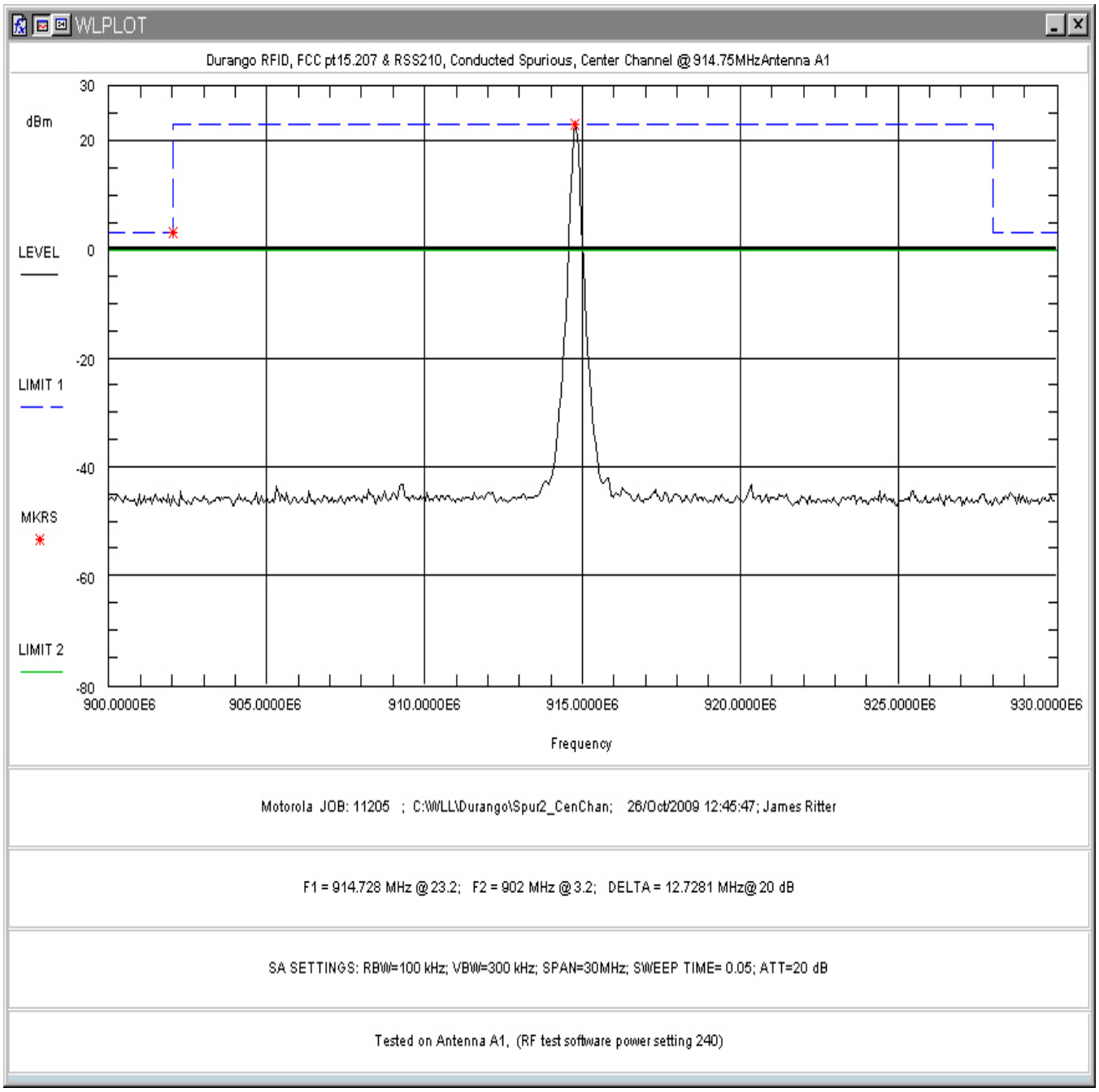

Figure 18: Conducted Spurious Emissions, Mid Channel 900MHz – 930MHz

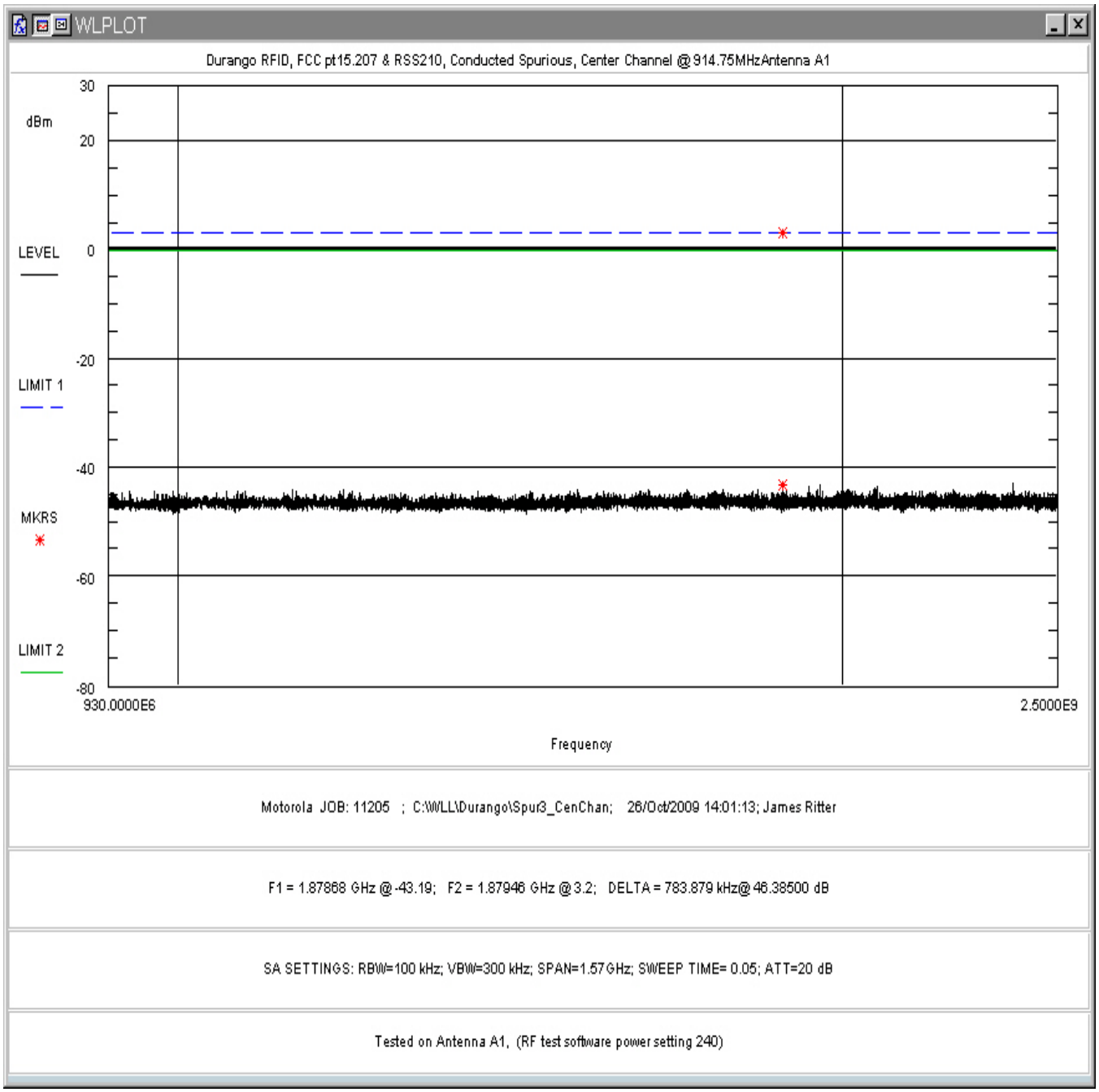

Figure 19: Conducted Spurious Emissions, Mid Channel 930MHz– 2.5GHz

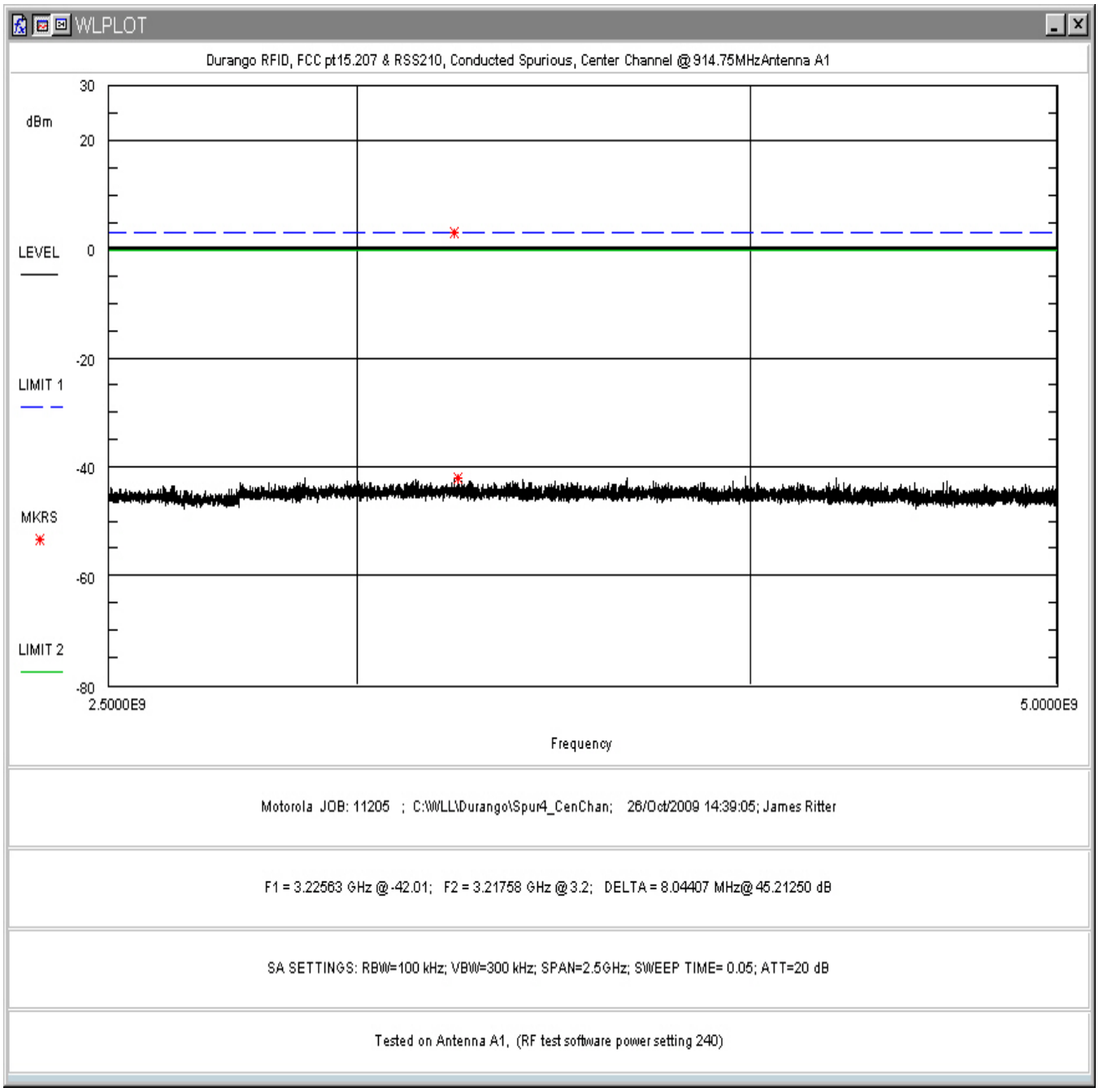

Figure 20: Conducted Spurious Emissions, Mid Channel 2.5 - 5GHz

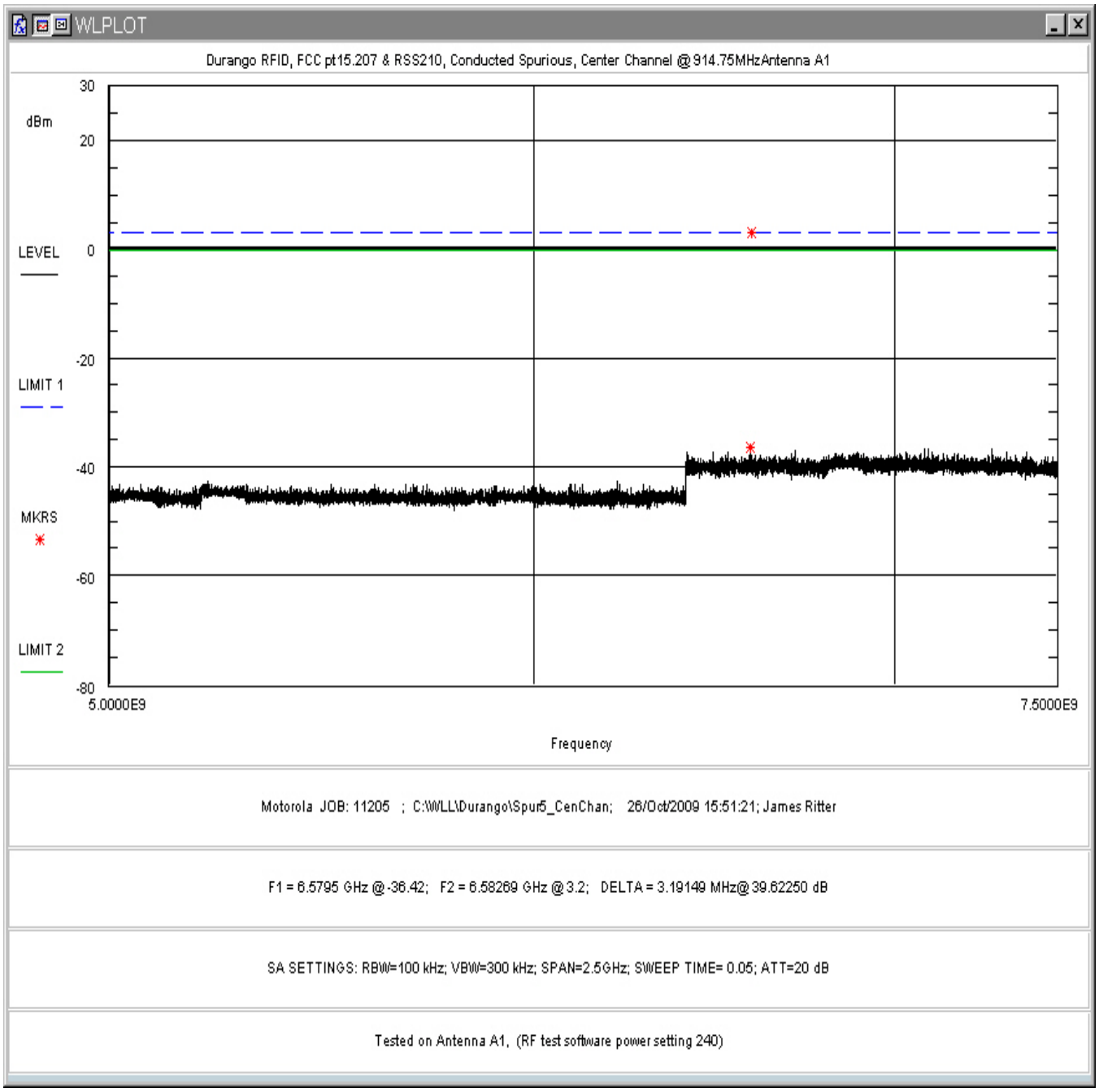

Figure 21: Conducted Spurious Emissions, Mid Channel 5 – 7.5GHz

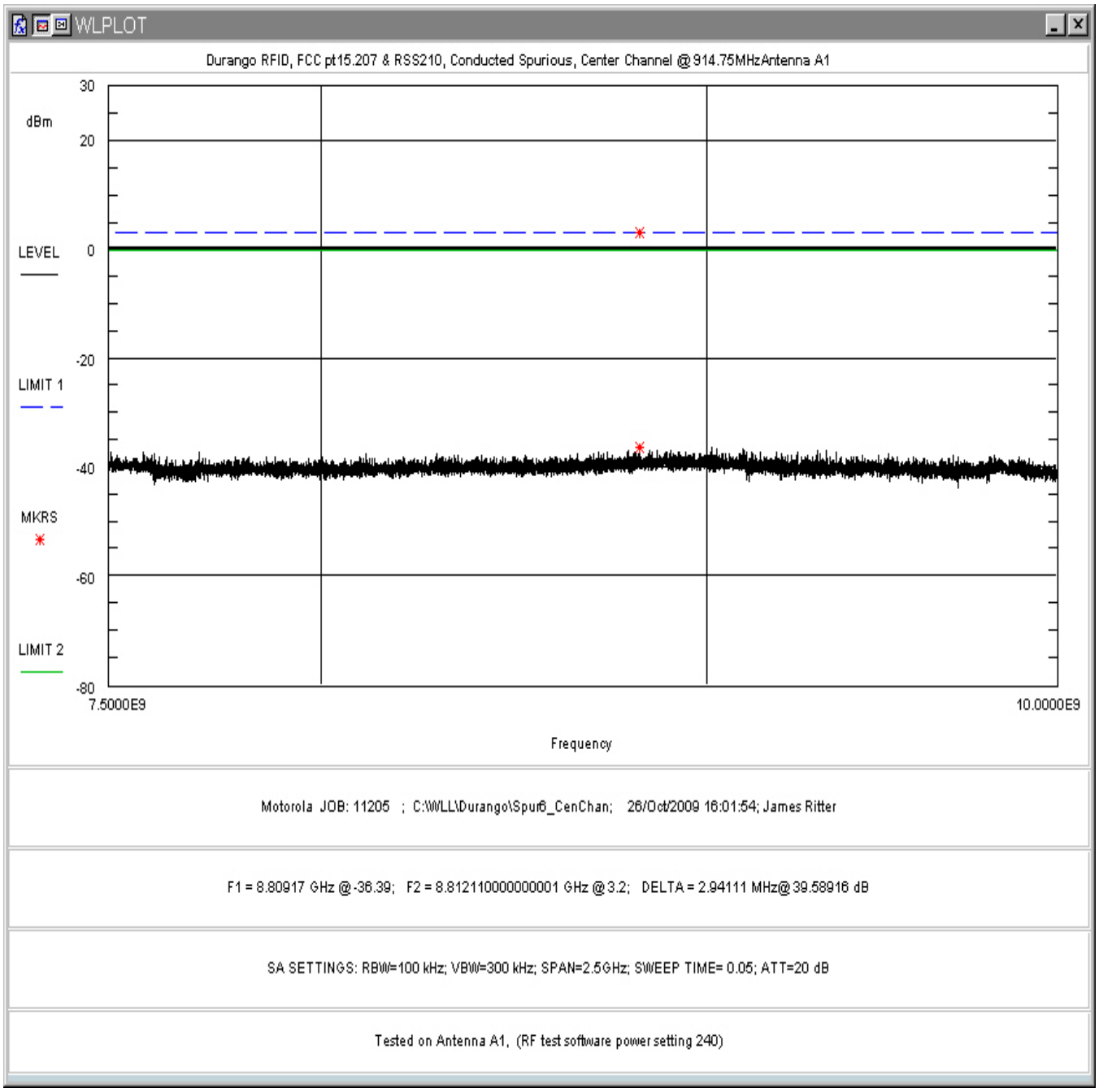

Figure 22: Conducted Spurious Emissions, Mid Channel 7.5 - 10GHz

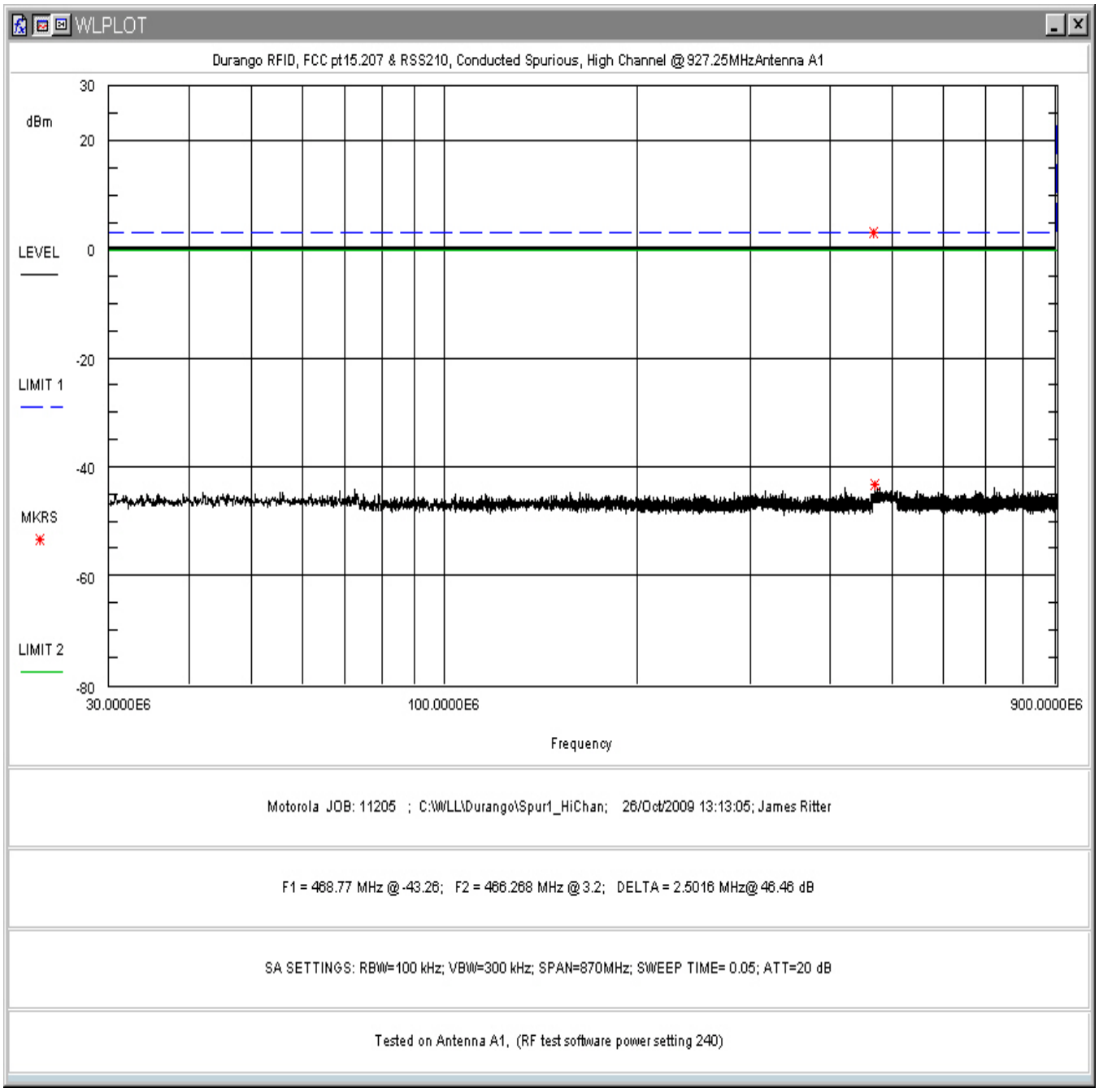

Figure 23: Conducted Spurious Emissions, High Channel 30 - 900MHz

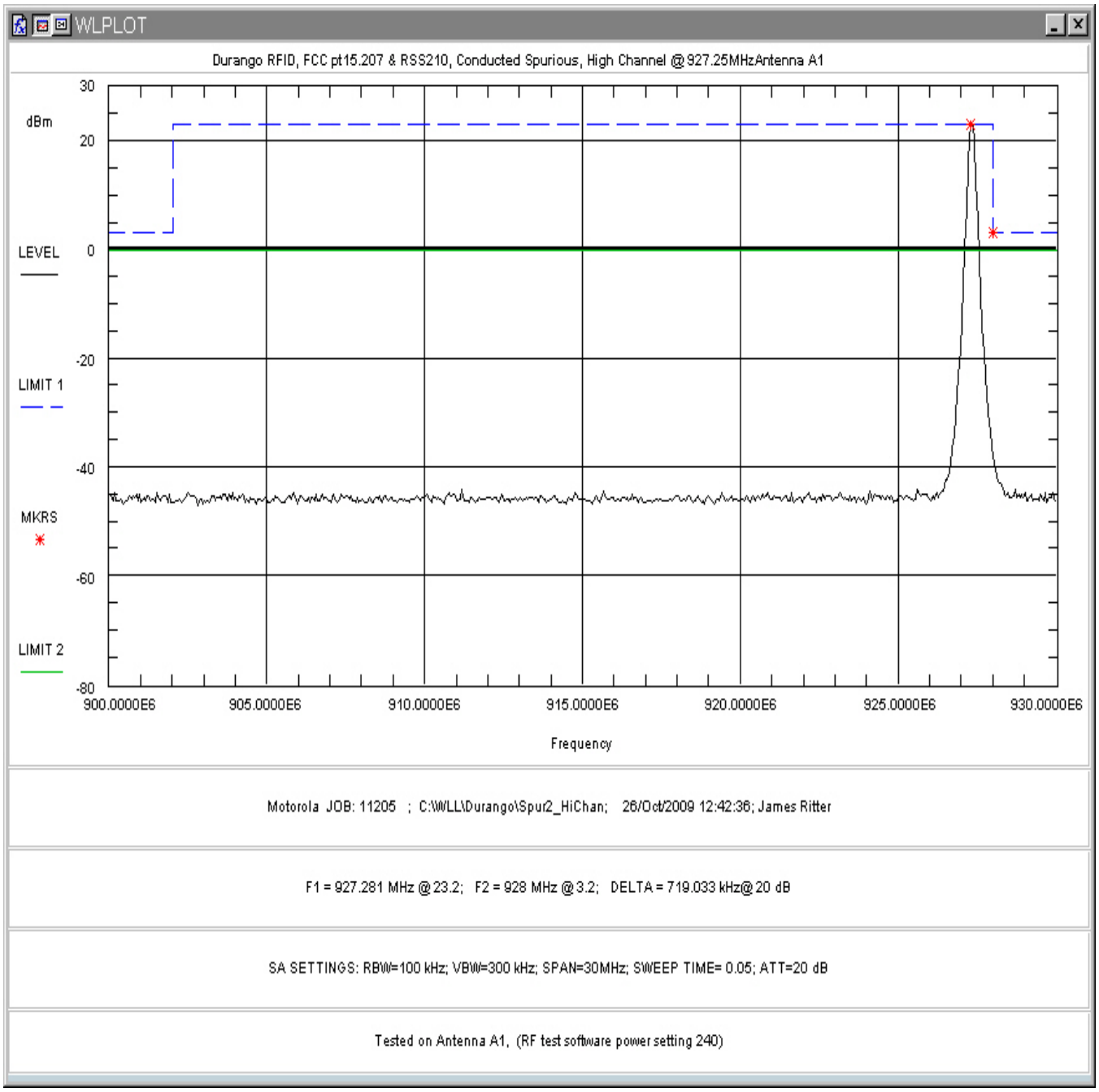

Figure 24: Conducted Spurious Emissions, High Channel 900MHz – 930MHz

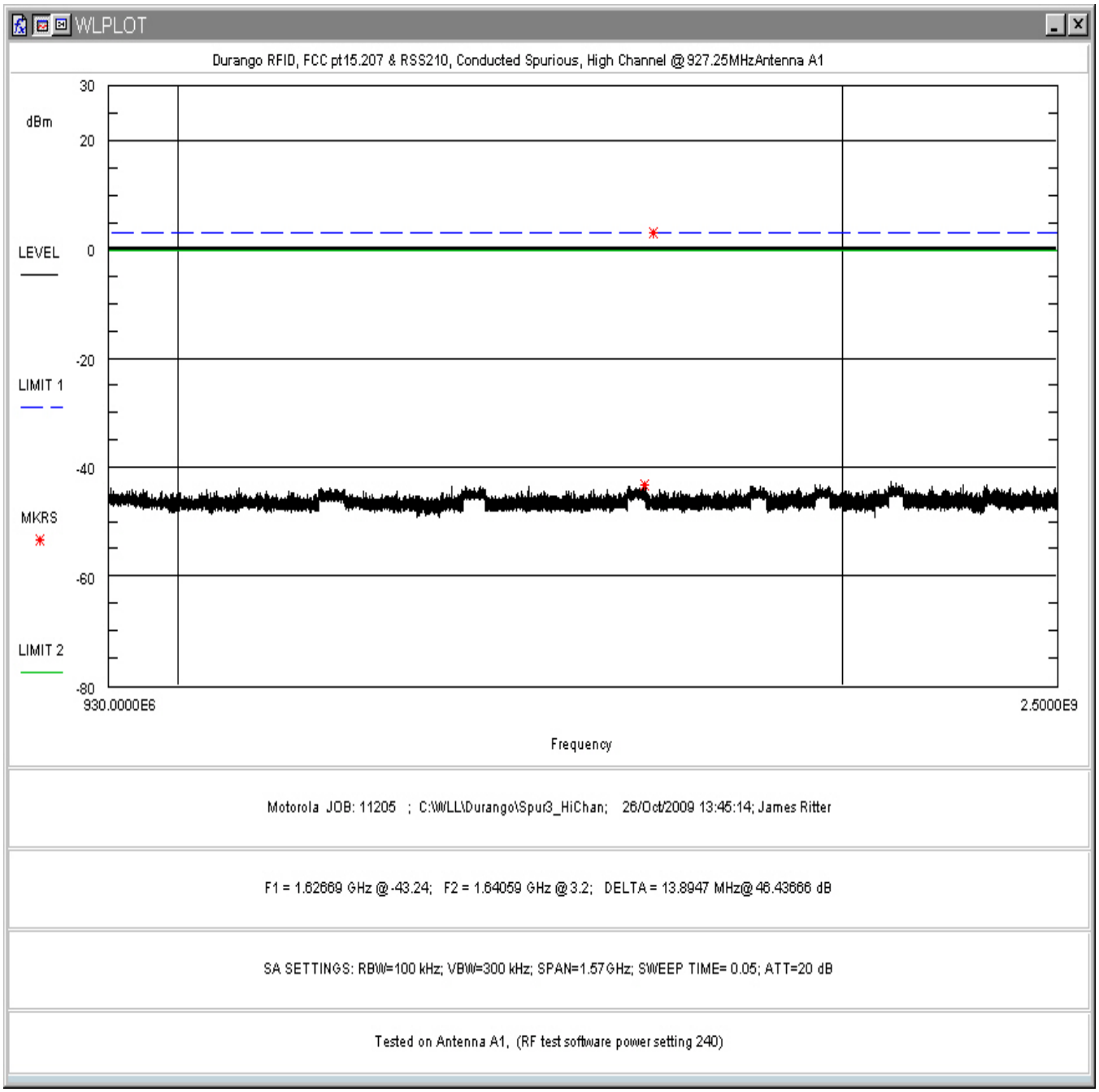

Figure 25: Conducted Spurious Emissions, High Channel 930MHz– 2.5GHz

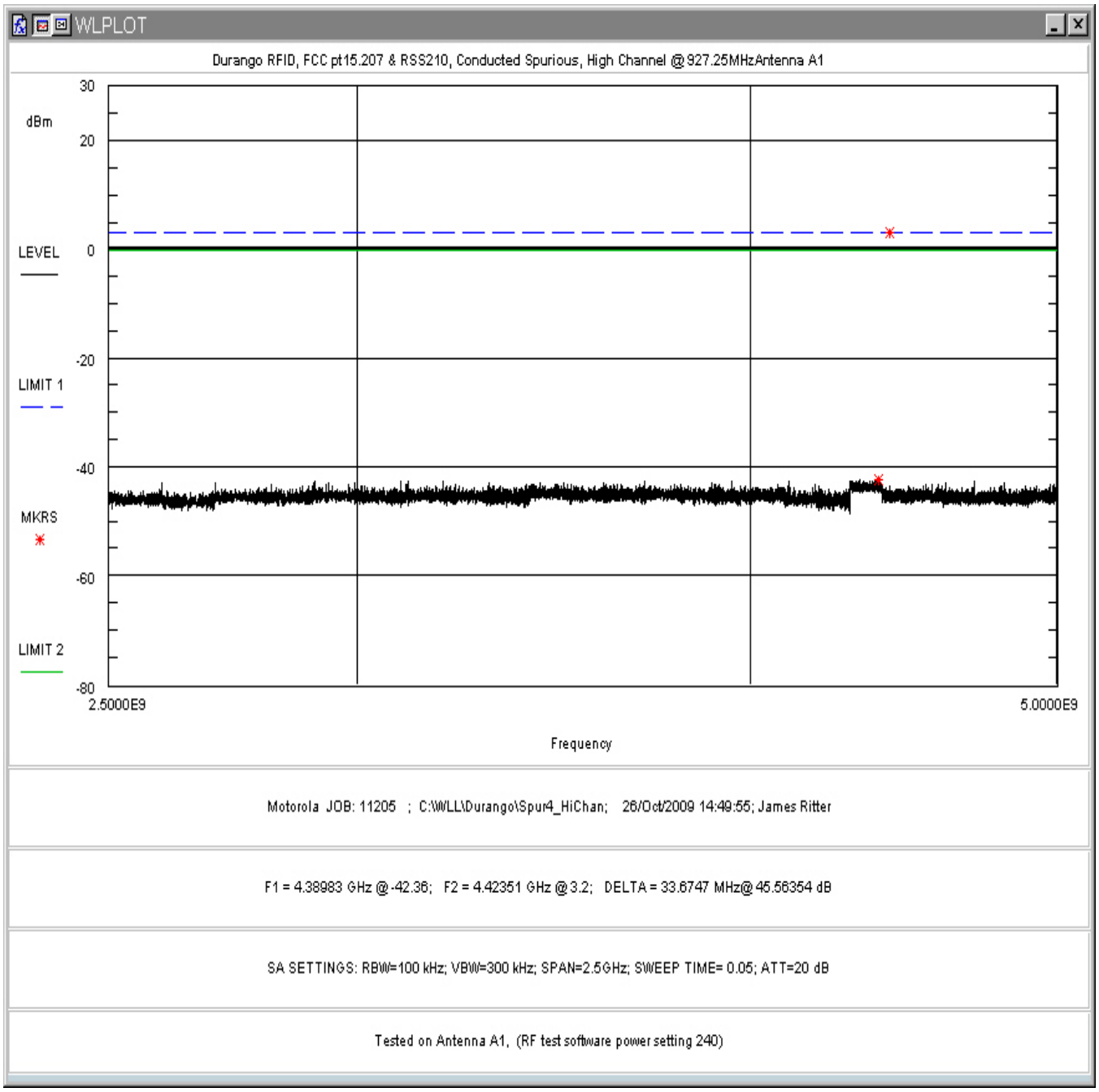

Figure 26: Conducted Spurious Emissions, High Channel 2.5 - 5GHz

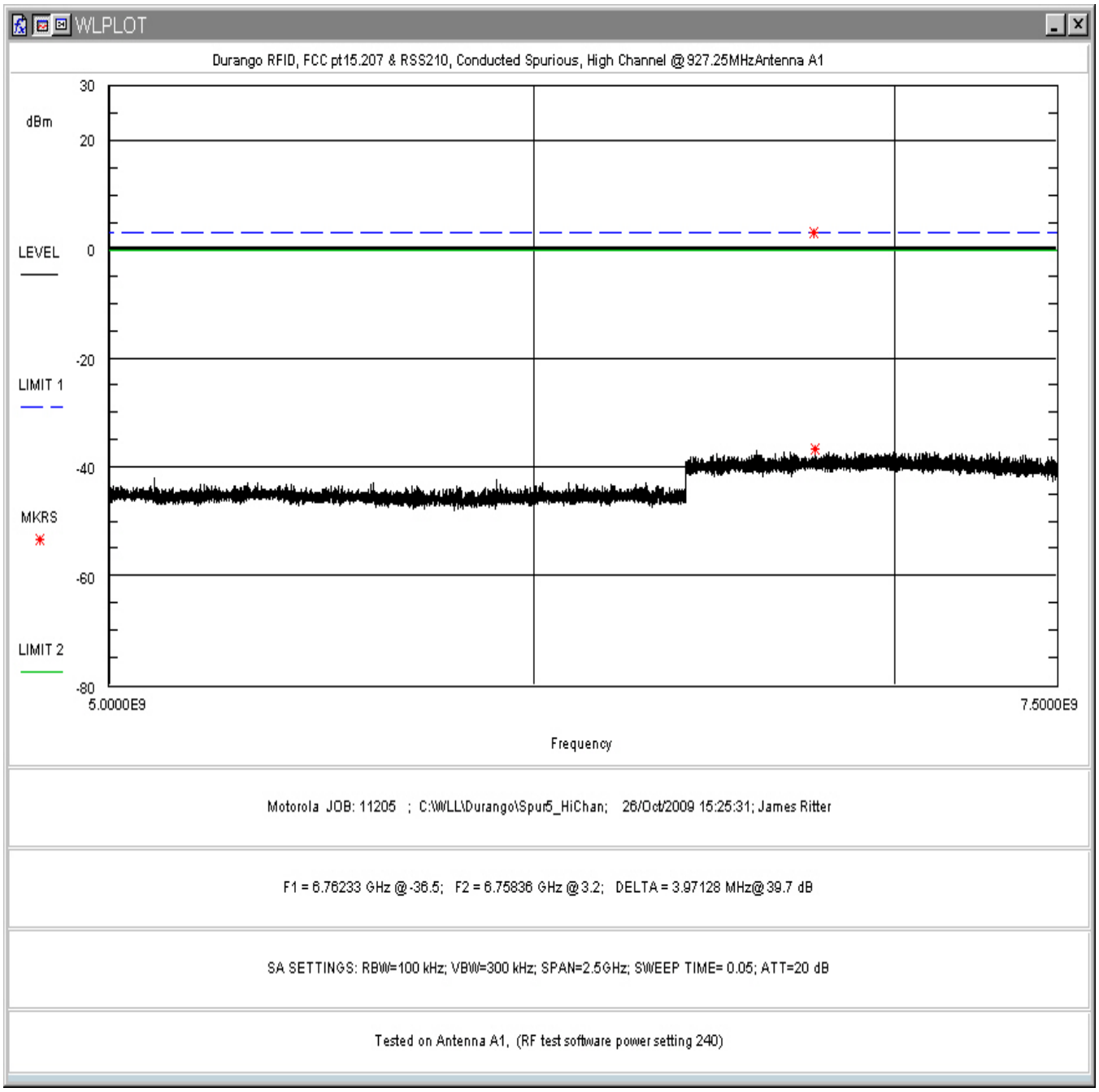

Figure 27: Conducted Spurious Emissions, High Channel 5 – 7.5GHz

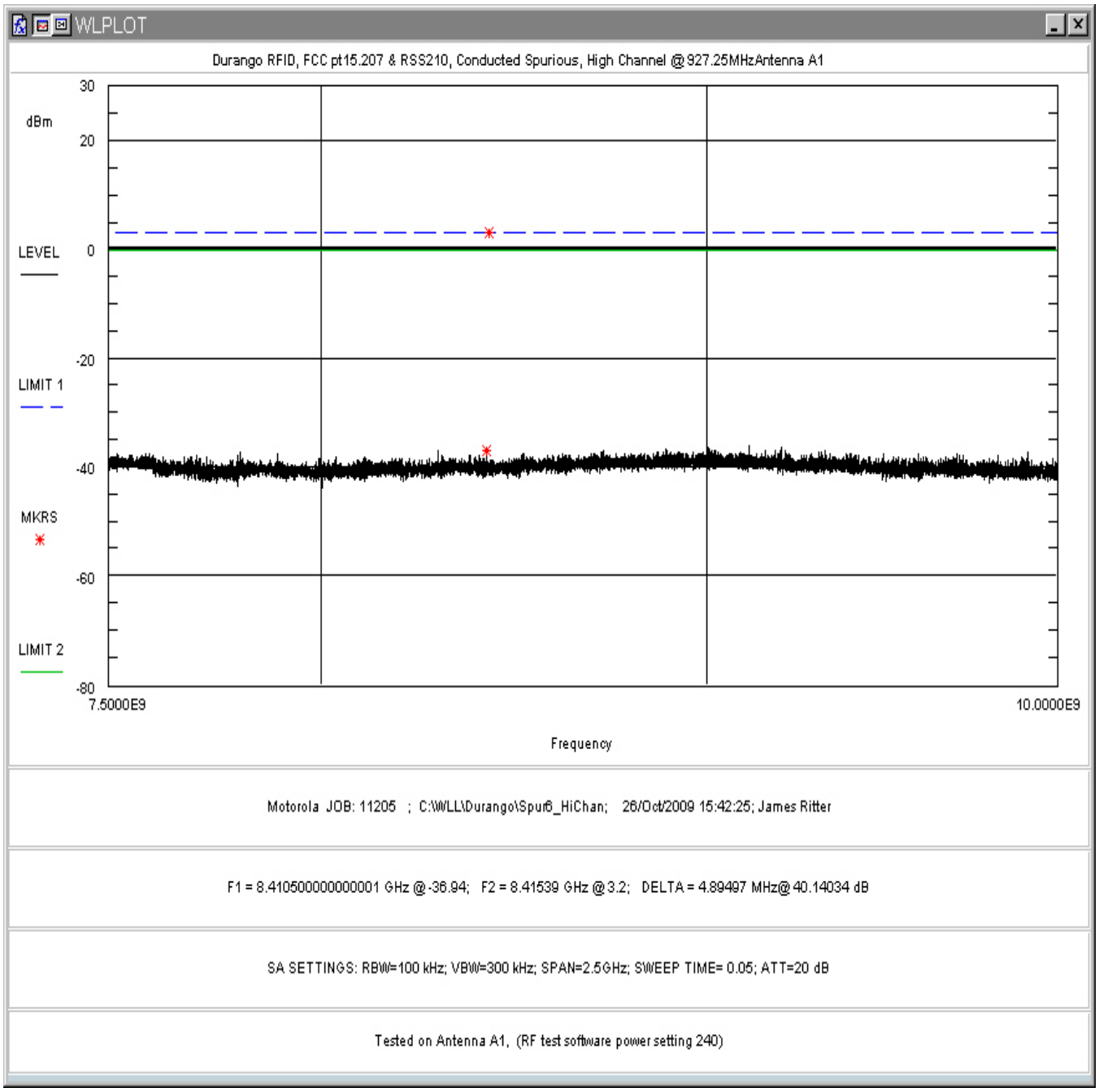

Figure 28: Conducted Spurious Emissions, High Channel 7.5 - 10GHz

5.6 Radiated Spurious Emissions: (FCC Part 15.205, 15.209 & RSS-210 [A8. 5])

The EUT must comply with the requirements for radiated spurious emissions that fall within the restricted bands. These emissions must meet the limits specified in §15.205, §15.209, §15.35(b) and RSS 210 Table 1 for peak measurements.

5.6.1 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:

Table 7: Spectrum Analyzer Settings

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

Table 8: Radiated Emission Test Data, Low Frequency Data (<1GHz)

Serial Cable

Frequency (MHz)	Polarity (H/V)	Azimuth (Degree)	Ant. Height (m)	SA Level (dBuV)	Corr Factors (dB)	Corr. Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Peak or Average	Comments
60.24	V	315.0	1.0	5.4	9.3	14.7	30.0	-15.3	Peak	
79.97	V	315.0	1.0	7.2	10.2	17.4	30.0	-12.6	Peak	
108.27	V	0.0	1.0	10.7	14.4	25.1	30.0	-4.9	QP	
118.61	V	0.0	1.0	4.3	15.9	20.2	30.0	-9.8	Peak	
123.94	V	0.0	1.0	3.5	16.1	19.6	30.0	-10.4	Peak	
156.39	V	0.0	1.0	5.4	14.3	19.7	30.0	-10.3	Peak	
167.84	V	0.0	1.0	6.5	14.2	20.7	30.0	-9.3	Peak	
219.29	V	180.0	1.0	13.3	13.6	26.9	30.0	-3.1	QP	
251.68	V	270.0	1.0	7.0	14.5	21.5	37.0	-15.5	Peak	
372.96	V	180.0	1.0	4.3	18.9	23.2	37.0	-13.8	Peak	
431.96	V	180.0	1.0	4.2	20.4	24.6	37.0	-12.4	Peak	
508.57	V	180.0	1.0	6.1	22.0	28.1	37.0	-8.9	Peak	
79.97	H	0.0	3.4	5.9	10.2	16.1	30.0	-13.9	Peak	
108.27	H	0.0	3.5	6.2	14.4	20.6	30.0	-9.4	Peak	
118.44	H	0.0	3.5	3.3	15.9	19.2	30.0	-10.8	Peak	
123.94	H	315.0	3.5	9.2	16.1	25.3	30.0	-4.7	QP	
156.24	H	180.0	3.4	8.7	14.3	23.0	30.0	-7.0	Peak	
167.84	H	0.0	3.5	4.8	14.2	19.0	30.0	-11.0	Peak	
219.29	H	225.0	3.5	8.2	13.6	21.8	30.0	-8.2	Peak	
251.68	H	270.0	3.5	3.9	14.5	18.4	37.0	-18.6	Peak	

USB Cable

Frequency (MHz)	Polarity (H/V)	Azimuth (Degree)	Ant. Height (m)	SA Level (dBuV)	Corr Factors (dB)	Corr. Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Peak or Average	Comments
47.82	V	0.0	1.3	6.0	9.2	15.2	30.0	-14.8	Peak	
57.23	V	270.0	1.1	9.6	7.7	17.3	30.0	-12.7	Peak	
70.49	V	50.0	1.1	6.6	9.1	15.7	30.0	-14.3	Peak	
122.73	V	45.0	1.4	10.5	15.0	25.5	30.0	-4.5	QP	
118.37	V	45.0	1.3	8.4	14.9	23.3	30.0	-6.7	QP	
136.23	V	190.0	1.3	7.9	13.9	21.8	30.0	-8.2	Peak	
158.51	V	90.0	1.5	5.0	12.9	17.9	30.0	-12.1	Peak	
173.39	V	180.0	1.6	10.5	12.7	23.2	30.0	-6.8	Peak	
209.05	V	190.0	1.2	11.6	11.6	23.2	30.0	-6.8	Peak	
216.61	V	180.0	1.2	11.1	11.7	22.8	30.0	-7.2	Peak	
251.67	V	0.0	1.4	3.8	12.7	16.5	37.0	-20.5	Peak	
371.90	V	270.0	1.5	3.4	17.9	21.3	37.0	-15.7	Peak	
438.48	V	228.0	1.3	4.3	19.7	24.0	37.0	-13.0	Peak	
750.03	V	100.0	1.7	3.0	24.6	27.6	37.0	-9.4	Peak	
	V									
46.22	H	0.0	3.7	3.5	10.1	13.6	30.0	-16.4	Peak	
66.04	H	90.0	3.8	4.9	8.6	13.5	30.0	-16.5	Peak	
77.62	H	190.0	3.6	4.5	9.0	13.5	30.0	-16.5	Peak	
85.90	H	270.0	3.7	5.3	8.6	13.9	30.0	-16.1	Peak	
122.00	H	45.0	3.3	5.5	15.0	20.5	30.0	-9.5	Peak	
130.00	H	190.0	3.3	6.8	14.6	21.4	30.0	-8.6	Peak	
161.71	H	60.0	3.2	5.2	13.0	18.2	30.0	-11.8	Peak	
173.27	H	170.0	3.4	6.4	12.7	19.1	30.0	-10.9	Peak	
228.42	H	90.0	2.9	5.3	12.2	17.5	30.0	-12.5	Peak	
250.00	H	270.0	2.8	5.7	12.7	18.4	37.0	-18.6	Peak	
371.90	H	234.0	2.6	3.8	17.9	21.7	37.0	-15.3	Peak	

Table 9: Radiated Emission Test Data, High Frequency Data (>1GHz)

(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
TX @ 902.75									
2708.25	V	0.00	1.90	46.98	-4.2	137.6	500.0	-11.2	A(Ave)
2708.25	V	0.00	1.90	46.98	-4.2	137.6	5000.0	-31.2	A(Peak)
4513.75	V	0.00	1.90	44.70	-2.3	131.6	500.0	-11.6	A(Ave)
4513.75	V	0.00	1.90	44.70	-2.3	131.6	5000.0	-31.6	A(Peak)
5416.50	V	0.00	1.90	43.68	0.2	155.9	500.0	-10.1	A(Ave)
5416.50	V	0.00	1.90	43.68	0.2	155.9	5000.0	-30.1	A(Peak)
8124.75	V	0.00	1.90	45.48	3.1	267.1	500.0	-5.4	A(Ave)
8124.75	V	0.00	1.90	45.48	3.1	267.1	5000.0	-25.4	A(Peak)
9027.50	V	0.00	1.90	44.80	5.1	312.2	500.0	-4.1	A(Ave)
9027.50	V	0.00	1.90	44.80	5.1	312.2	5000.0	-24.1	A(Peak)
2708.25	H	270.00	1.80	50.20	-4.2	199.3	500.0	-8.0	(Ave)
2708.25	H	270.00	1.80	50.20	-4.2	199.3	5000.0	-28.0	(Peak)
4513.75	H	0.00	1.80	44.50	-2.3	128.6	500.0	-11.8	A(Ave)
4513.75	H	0.00	1.80	44.50	-2.3	128.6	5000.0	-31.8	A(Peak)
5416.50	H	0.00	1.80	43.70	0.2	156.2	500.0	-10.1	A(Ave)
5416.50	H	0.00	1.80	43.70	0.2	156.2	5000.0	-30.1	A(Peak)
8124.75	H	0.00	1.80	45.60	3.1	270.8	500.0	-5.3	A(Ave)
8124.75	H	0.00	1.80	45.60	3.1	270.8	5000.0	-25.3	A(Peak)
9027.50	H	0.00	1.80	44.07	5.1	287.1	500.0	-4.8	A(Ave)
9027.50	H	0.00	1.80	44.07	5.1	287.1	5000.0	-24.8	A(Peak)
TX @ 914.75									
2744.25	V	0.00	1.90	46.48	-4.2	130.7	500.0	-11.7	A(Ave)
2744.25	V	0.00	1.90	46.48	-4.2	130.7	5000.0	-31.7	A(Peak)
4573.75	V	0.00	1.90	44.60	-2.2	132.3	500.0	-11.5	A(Ave)
4573.75	V	0.00	1.90	44.60	-2.2	132.3	5000.0	-31.5	A(Peak)
7318.00	V	0.00	1.90	43.60	3.3	220.8	500.0	-7.1	A(Ave)
7318.00	V	0.00	1.90	43.60	3.3	220.8	5000.0	-27.1	A(Peak)
8232.75	V	0.00	1.90	45.35	3.3	269.3	500.0	-5.4	A(Ave)
8232.75	V	0.00	1.90	45.35	3.3	269.3	5000.0	-25.4	A(Peak)
9147.50	V	0.00	1.90	44.75	4.7	297.5	500.0	-4.5	A(Ave)
9147.50	V	0.00	1.90	44.75	4.7	297.5	5000.0	-24.5	A(Peak)
2744.25	H	0.00	1.80	48.80	-4.2	170.8	500.0	-9.3	A(Ave)
2744.25	H	0.00	1.80	48.80	-4.2	170.8	5000.0	-29.3	A(Peak)
4573.75	H	0.00	1.90	46.15	-2.2	158.1	500.0	-10.0	A(Ave)
4573.75	H	0.00	1.90	46.15	-2.2	158.1	5000.0	-30.0	A(Peak)
7318.00	H	0.00	1.90	43.90	3.3	228.5	500.0	-6.8	A(Ave)

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
7318.00	H	0.00	1.90	43.90	3.3	228.5	5000.0	-26.8	A(Peak)
8232.75	H	0.00	1.90	45.70	3.3	280.4	500.0	-5.0	A(Ave)
8232.75	H	0.00	1.90	45.70	3.3	280.4	5000.0	-25.0	A(Peak)
9147.50	H	0.00	1.90	44.10	4.7	276.0	500.0	-5.2	A(Ave)
9147.50	H	0.00	1.90	44.10	4.7	276.0	5000.0	-25.2	A(Peak)
TX @ 927.25									
2781.75	V	0.00	1.90	46.48	-4.1	131.6	500.0	-11.6	A(Ave)
2781.75	V	0.00	1.90	46.48	-4.1	131.6	5000.0	-31.6	A(Peak)
3709.00	V	0.00	1.90	44.60	-3.1	118.8	500.0	-12.5	A(Ave)
3709.00	V	0.00	1.90	44.60	-3.1	118.8	5000.0	-32.5	A(Peak)
4636.25	V	0.00	1.90	43.60	-2.0	120.0	500.0	-12.4	A(Ave)
4636.25	V	0.00	1.90	43.60	-2.0	120.0	5000.0	-32.4	A(Peak)
7418.00	V	0.00	1.90	45.35	3.3	270.1	500.0	-5.3	A(Ave)
7418.00	V	0.00	1.90	45.35	3.3	270.1	5000.0	-25.3	A(Peak)
8345.25	V	0.00	1.90	44.75	3.5	257.4	500.0	-5.8	A(Ave)
8345.25	V	0.00	1.90	44.75	3.5	257.4	5000.0	-25.8	A(Peak)
2781.75	H	0.00	1.80	48.43	-4.1	164.7	500.0	-9.6	A(Ave)
2781.75	H	0.00	1.80	48.43	-4.1	164.7	5000.0	-29.6	A(Peak)
3709.00	H	0.00	1.80	45.08	-3.1	125.5	500.0	-12.0	A(Ave)
3709.00	H	0.00	1.80	45.08	-3.1	125.5	5000.0	-32.0	A(Peak)
4636.25	H	0.00	1.80	44.69	-2.0	136.0	500.0	-11.3	A(Ave)
4636.25	H	0.00	1.80	44.69	-2.0	136.0	5000.0	-31.3	A(Peak)
7418.00	H	0.00	1.80	45.70	3.3	281.2	500.0	-5.0	A(Ave)
7418.00	H	0.00	1.80	45.70	3.3	281.2	5000.0	-25.0	A(Peak)
8345.25	H	0.00	1.80	44.10	3.5	238.9	500.0	-6.4	A(Ave)
8345.25	H	0.00	1.80	44.10	3.5	238.9	5000.0	-26.4	A(Peak)

5.7 Receiver Radiated Spurious Emissions: (§15.209, RSS-Gen [7.2.3.2] & RSS-210 sect 2.6)

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

5.7.1 Test Procedure

The EUT was placed on motorized turntable for radiated testing on a 3-meter open field test site. The emissions from the EUT were measured continuously at every azimuth by rotating the turntable. Receiving antennas were mounted on an antenna mast to determine the height of maximum emissions. The height of the antenna was varied between 1 and 4 meters. The emissions were measured using the following resolution bandwidths:

The Unit was tested with the RS232 and USB cable options.

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

5.7.2 Test Summary

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

Table 10: Receiver Radiated Emission Test Data

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
60.24	V	315.00	1.00	6.50	8.0	5.3	100.0	-25.5	
79.97	V	315.00	1.00	7.80	9.4	7.2	100.0	-22.8	
108.27	V	0.00	1.00	6.40	13.4	9.7	150.0	-23.8	
118.61	V	0.00	1.00	8.80	14.7	14.9	150.0	-20.1	
123.94	V	0.00	1.00	12.40	14.9	23.1	150.0	-16.2	
156.39	V	0.00	1.00	8.40	13.2	12.1	150.0	-21.9	
167.84	V	0.00	1.00	10.90	13.1	15.9	150.0	-19.5	
219.29	V	180.00	1.00	13.30	12.7	20.0	200.0	-20.0	
251.68	V	270.00	1.00	6.20	13.8	10.0	200.0	-26.0	
372.96	V	180.00	1.00	7.30	18.4	19.3	200.0	-20.3	
431.96	V	180.00	1.00	9.90	19.7	30.2	200.0	-16.4	
508.57	V	180.00	1.00	6.10	21.2	23.1	200.0	-18.7	
60.24	H	0.00	0.00	0.00	8.0	2.5	100.0	-32.0	
79.97	H	0.00	3.40	10.20	9.4	9.5	100.0	-20.4	
108.27	H	0.00	3.50	6.20	13.4	9.5	150.0	-24.0	
118.44	H	0.00	3.50	7.00	14.7	12.1	150.0	-21.9	
123.94	H	315.00	3.50	9.20	14.9	16.0	150.0	-19.4	
156.24	H	180.00	3.35	8.70	13.2	12.5	150.0	-21.6	
167.84	H	0.00	3.45	4.80	13.1	7.9	150.0	-25.6	
219.29	H	225.00	3.50	12.80	12.7	18.9	200.0	-20.5	
251.68	H	270.00	3.54	3.90	13.8	7.7	200.0	-28.3	

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

5.8.1 Requirements

Test Arrangement: Table Top

Compliance Standard: FCC Class B

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

5.8.2 Test Procedure

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

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

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

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

Example:

Spectrum Analyzer Voltage: VdBµV

LISN Correction Factor: LISN dB

Cable Correction Factor: CF dB

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

5.8.3 Test Data

The EUT complied with the Class B Conducted Emissions requirements. This system runs off of 120VAC. The below table provides the test results for phase and neutral line power line conducted emissions.

Table 11: Conducted Emissions Test Data (Serial Cable)

NEUTRAL

Frequency (MHz)	Level QP (dBµV)	Level AVG (dBµV)	Cable Loss (dB)	LISN Corr (dB)	Level QP Corr (dBµV)	Level Corr Avg (dBµV)	Limit QP (dBµV)	Limit AVG (dBµV)	Margin QP (dB)	Margin AVG (dB)
0.203	24.6	5.8	10.2	0.6	35.3	16.5	63.5	53.5	-28.2	-37.0
0.377	12.2	4.5	10.3	0.9	23.4	15.7	58.3	48.3	-35.0	-32.7
0.755	15.4	13.6	10.4	0.4	26.1	24.3	56.0	46.0	-29.9	-21.7
3.450	23.3	16.3	10.8	0.6	34.7	27.7	56.0	46.0	-21.3	-18.3
4.947	16.0	8.8	11.0	0.6	27.6	20.4	56.0	46.0	-28.4	-25.6
7.658	16.1	8.7	11.3	0.3	27.7	20.3	60.0	50.0	-32.3	-29.7

PHASE

Frequency (MHz)	Level QP (dBµV)	Level AVG (dBµV)	Cable Loss (dB)	LISN Corr (dB)	Level QP Corr (dBµV)	Level Corr Avg (dBµV)	Limit QP (dBµV)	Limit AVG (dBµV)	Margin QP (dB)	Margin AVG (dB)
0.203	24.4	6.1	10.2	0.3	34.9	16.6	63.5	53.5	-28.6	-36.9
0.377	11.9	4.1	10.3	0.9	23.0	15.3	58.3	48.3	-35.3	-33.1
0.755	15.9	14.5	10.4	0.4	26.6	25.2	56.0	46.0	-29.4	-20.8
3.450	23.5	16.8	10.8	0.7	35.0	28.3	56.0	46.0	-21.0	-17.7
4.947	16.1	8.6	11.0	0.6	27.7	20.2	56.0	46.0	-28.3	-25.8
7.658	16.2	8.5	11.3	0.4	27.9	20.2	60.0	50.0	-32.1	-29.8

Table 12: Conducted Emissions Test Data (USB Cable)

NEUTRAL

Frequency (MHz)	Level QP (dBµV)	Level AVG (dBµV)	Cable Loss (dB)	LISN Corr (dB)	Level QP Corr (dBµV)	Level Corr Avg (dBµV)	Limit QP (dBµV)	Limit AVG (dBµV)	Margin QP (dB)	Margin AVG (dB)
0.201	35.1	20.1	10.1	0.6	45.8	30.8	63.6	53.6	-17.8	-22.8
0.300	27.2	10.7	10.2	0.4	37.8	21.3	60.2	50.2	-22.5	-29.0
0.401	23.8	13.7	10.2	0.9	35.0	24.9	57.8	47.8	-22.9	-23.0
0.705	20.9	14.9	10.4	0.4	31.7	25.7	56.0	46.0	-24.3	-20.3
1.752	23.4	12.6	10.6	0.3	34.3	23.5	56.0	46.0	-21.7	-22.5
2.277	26.7	13.5	10.6	0.4	37.7	24.5	56.0	46.0	-18.3	-21.5

PHASE

Frequency (MHz)	Level QP (dBµV)	Level AVG (dBµV)	Cable Loss (dB)	LISN Corr (dB)	Level QP Corr (dBµV)	Level Corr Avg (dBµV)	Limit QP (dBµV)	Limit AVG (dBµV)	Margin QP (dB)	Margin AVG (dB)
0.201	35.1	19.9	10.1	0.3	45.5	30.3	63.6	53.6	-18.1	-23.3
0.300	27.8	11.8	10.2	0.3	38.2	22.2	60.2	50.2	-22.0	-28.0
0.401	22.6	13.0	10.2	0.9	33.7	24.1	57.8	47.8	-24.1	-23.7
0.705	20.1	8.9	10.4	0.4	30.8	19.6	56.0	46.0	-25.2	-26.4
1.752	22.6	10.3	10.6	0.4	33.5	21.2	56.0	46.0	-22.5	-24.8
2.277	25.5	13.8	10.6	0.4	36.5	24.8	56.0	46.0	-19.5	-21.2