FCC Certification Test Report

FCC Certification Test Report for Checkpoint Systems Inc. Liberty UHX RFID System FCC ID: DO4LIBUHX

April 4, 2005

Prepared for:

Checkpoint Systems Inc.
101 Wolf Drive
Thorofare, NJ 08086

Prepared By:

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

FCC Certification Test Report
for the
Checkpoint Systems Inc.
Liberty UHX RFID System
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WLL JOB# 8602

Prepared by: Brian J. Dettling
Documentation Specialist

Reviewed by: Gregory M. Snyder
Chief EMC Engineer

Abstract

This report has been prepared on behalf of Checkpoint Systems Inc. to support the attached Application for Equipment Authorization. The test report and application are submitted for a co-located Frequency Hopping Spread Spectrum Transmitter under Part 15.247 and an EAS system operating at 8.2MHz under Part 15.223 of the FCC Rules. This Certification Test Report documents the test configuration and test results for the Checkpoint Systems Inc. Liberty UHX RFID System.

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. 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 Checkpoint Systems Inc. Liberty UHX RFID System complies with the limits for a low power intentional radiator under FCC Part 15.223 and a Frequency Hopping Spread Spectrum Transmitter device under FCC Part 15.247.

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1 Introduction

1.1 Compliance Statement

The Checkpoint Systems Inc. Liberty UHX RFID System complies with the limits for a Frequency Hopping Spread Spectrum Transmitter device under FCC Part 15.247 and an intentional radiator under FCC Part 15.223.

1.2 Test Scope

Tests for radiated and conducted (at antenna terminal) emissions were performed. Measurements were performed per the 2003 version of ANSI C63.4. Additionally, measurements for the FHSS section were performed in accordance with FCC Public Notice DA 00-705. The measurement equipment conforms to ANSI C63.2 Specifications for Electromagnetic Noise and Field Strength Instrumentation.

1.3 Contract Information

Customer:	Checkpoint Systems Inc. 101 Wolf Drive Thorofare, NJ 08086
Purchase Order	275209
Quotation Number:	61821

1.4 Test Dates

Testing was performed from February 22 to February 25, 2005.

1.5 Test and Support Personnel

Washington Laboratories, LTD	James Ritter
Client Representative	Greg Sleet

2 Equipment Under Test

2.1 EUT Identification & Description

The Checkpoint Systems Inc. Liberty UHX RFID System is a hybrid system that combines the 8.2 MHz pulse-listen EAS technology with a 915 MHz UHF RFID capability. The UHF RFID capability is achieved by fitting “off the shelf” components from Symbol Technologies (Model AR400) onto a Checkpoint Liberty PX platform. The resulting hybrid system allows concurrent detection of the 8.2 MHz EAS tags and EPC compliant Class 0 and Class 1 UHF RFID tags.

The UHF RFID capability is added to the Liberty PX by mounting of disc-shaped circularly polarized patch antennas within the existing loops of the Liberty PX structure. There are a total of eight patch antennas in all, four right hand circularly polarized (RHCP) and four left hand circularly polarized (LHCP). The RHCP and LHCP patch antennas are alternated vertically and back-to-back. Air is the patch dielectric and each pair of back-to-back patch antennas share a groundplane constructed of dual-sided copper-clad FR4 PCB. The AR400 transmit power should be adjusted to no more than 500mW. The Symbol Technologies AR400 operates in the 902-928 MHz frequency band and is capable of reading all UHF EPC compliant Class 0 and Class 1 tags.

The patch antennas are each 50 ohm and driven by a Symbol Technologies AR400 reader. The AR400 provides four transmit antenna ports and four receive antenna ports, so each UHX antenna is arranged as a pair of adjacent transmit and receive patch antennas. Each antenna has a 10K pulldown resistor across its feedpoint to indicate to the reader a valid antenna load is present. The patch antenna disc is mounted such that DC isolation is maintained so the pulldown resistor can be sensed. The Symbol Technologies AR400 system electronics are installed in the Liberty PX electronics mounting area. There is a shield placed around the Symbol Technologies AR400 board, but it is not installed in the metal cabinet as shipped by Symbol Technologies. The RFID tag data and AR400 reader controls are communicated via Ethernet from a host PC running the Symbol Technologies control application.

The Liberty PX pulse-listen system is controlled by a TR4024 transceiver board. The PDA settings for TX1 and TX2 RF output should be set to 22. A common 120-240VAC input/24VDC, 2.1A output power supply powers both the Symbol Technologies AR400 and TR4024. There is only one supply used per pedestal, they are not intended to be “daisy-chained”.

See illustration below.

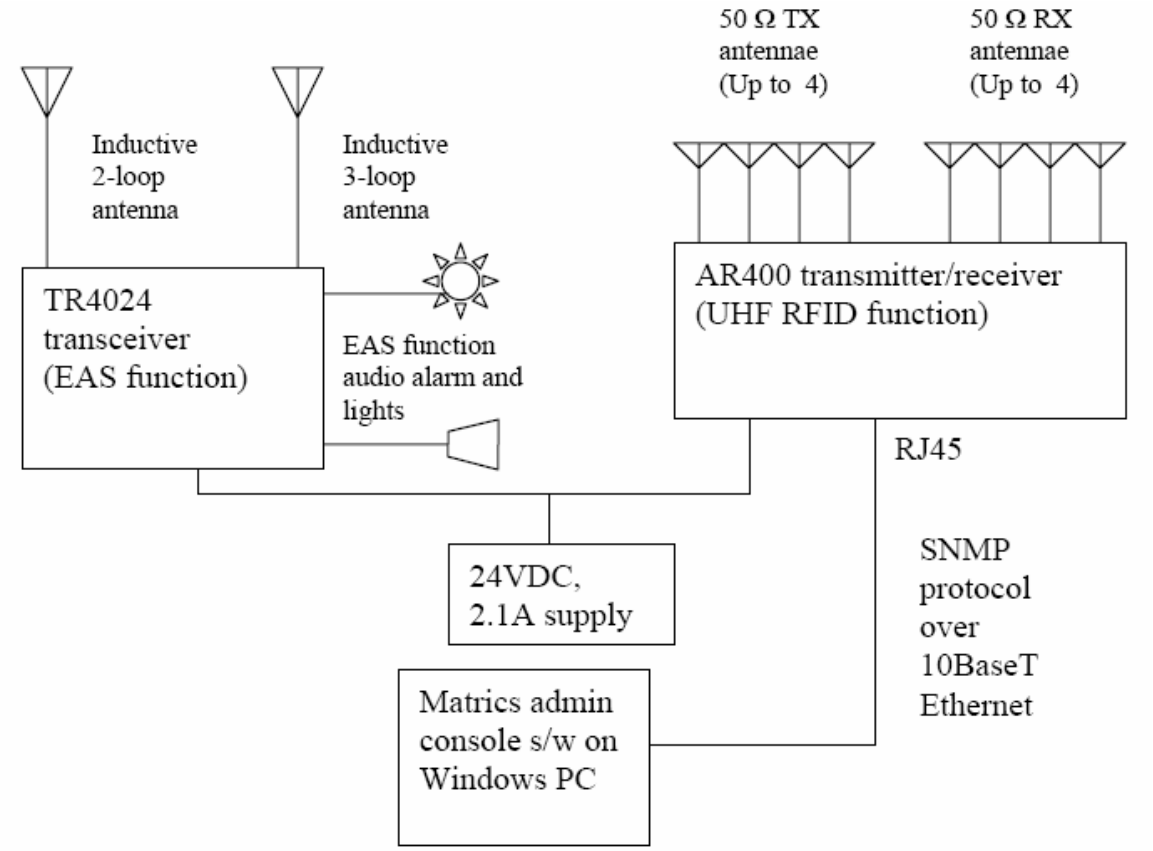


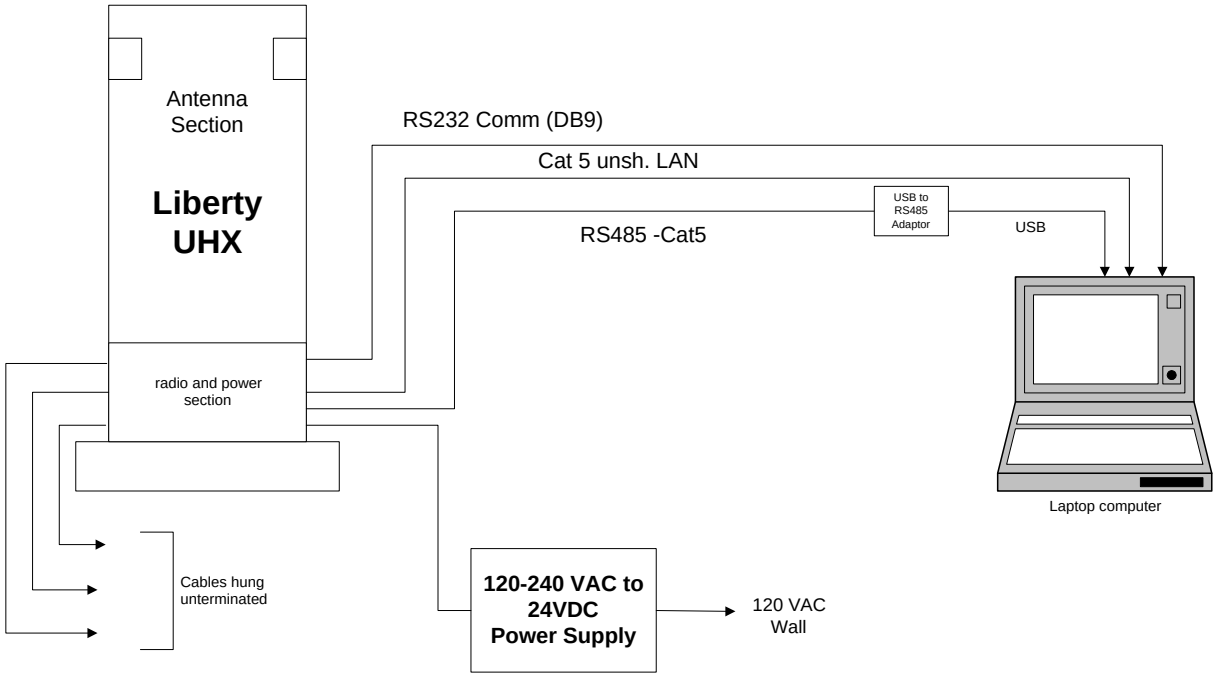
Table 1. Device Summary

ITEM	DESCRIPTION
Manufacturer:	Checkpoint Systems Inc.
FCC ID:	DO4LIBUHX
EUT Name:	EAS/RFID System
Model:	Liberty UHX
FCC Rule Parts:	§15.247 and §15.223
Frequency Range:	AR400 (RFID) = 902.75- 927.25MHz TR4024 (EAS Device) = 7.6- 8.7 MHz
Maximum Output Power:	AR400 RFID = 500mW TR4024 = TX1 and TX2 PDA setting = 22
Modulation:	FSK
Occupied Bandwidth:	RFID = 356.79kHz EAS = 1.224MHz
Keying:	Automatic
Type of Information:	Data
Number of Channels:	UHF RFID = 50
Antenna Connector	Fixed
Antenna Type	4 Circularly polarized patch antennas
Power Source & Voltage:	24Vdc from 120Vac power converter

2.2 Test Configuration

For conducted measurements of the RFID unit the Liberty UHX was connected via RS232 comm cable to the support laptop.

A spectrum analyzer was connected to the AR400 radio transmit port 1 to measure transmitter characteristics. For radiated emissions tests the EUT was connected to the support laptop via a RS232 line, RS485 line (through 485 to USB adaptor), and a LAN port connector. The unit was powered from a power supply which provided 24Vdc. The unused connecters had un-terminated cables connected and bundled to 1 meter in length. See illustration below.



2.3 Testing Algorithm

For Conducted tests – the AR400's internal ART Hyperterminal program was used via RS 232 comm line from support laptop to set power levels and frequencies. Power was set via this program to 500 mW. The FHSS tests were performed using the Symbol Tag Tracker program v4.0.2. This software allowed the unit to be placed into the normal hopping sequence.

For radiated tests of the EUT the AR400 was again setup via the ART settings to control the channels and power. The TR4024 (7.6-8.7 Radio) comes up automatically at power up and is in a continuous transmission mode. Both radios were operating during the test to cover any co-location issues.

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. 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

Equipment	WLL Asset #	Calibration Due
Hewlett-Packard 8568B Spectrum Analyzer	0073	7/08/05
Hewlett-Packard 85650A Quasi-Peak Adapter	0069	7/08/05
Hewlett-Packard 8593A Spectrum Analyzer	0074	8/17/05
Hewlett-Packard 8449B Microwave Preamp	0312	9/29/05
Solar Electronics 8012-50-R-24BNC LISN	0125	10/01/05
Solar Electronics 8012-50-R-24BNC LISN	0126	10/01/05
Sunol JB1 BiconiLog Antenna	0382	1/6/06
ARA DRG118/A Microwave Horn Antenna	0004	2/17/06
EMCO 6502 Active Loop Antenna	0031	1/10/06
Hewlett-Packard 85685A RF Preselector	0071	7/08/05
EMCO 3110B Biconical Antenna	0026	6/22/05
EMCO 3146A Log Periodic Antenna	0029	6/24/05

4 Test Results

4.1 Occupied Bandwidth: (FCC Part §2.1049, §15.223, §15.247)

Occupied bandwidth for the EAS system was performed via coupling the transmit signal to the spectrum analyzer via an antenna. Per a fax received by Checkpoint from the FCC (see attached fax), the bandwidth of the EAS system is considered the spectrum contained between the lowest and highest carrier pulsed.

For the FHSS component the BW measurement was performed by connecting the output of the EUT to the input of a spectrum analyzer through appropriate attenuators. For Frequency Hopping Spread Spectrum Systems operating in the 902M – 928MHz band the maximum 20 dB channel bandwidth shall not exceed 500kHz.

At full modulation, the occupied bandwidth of each system was measured as shown in the following figures:

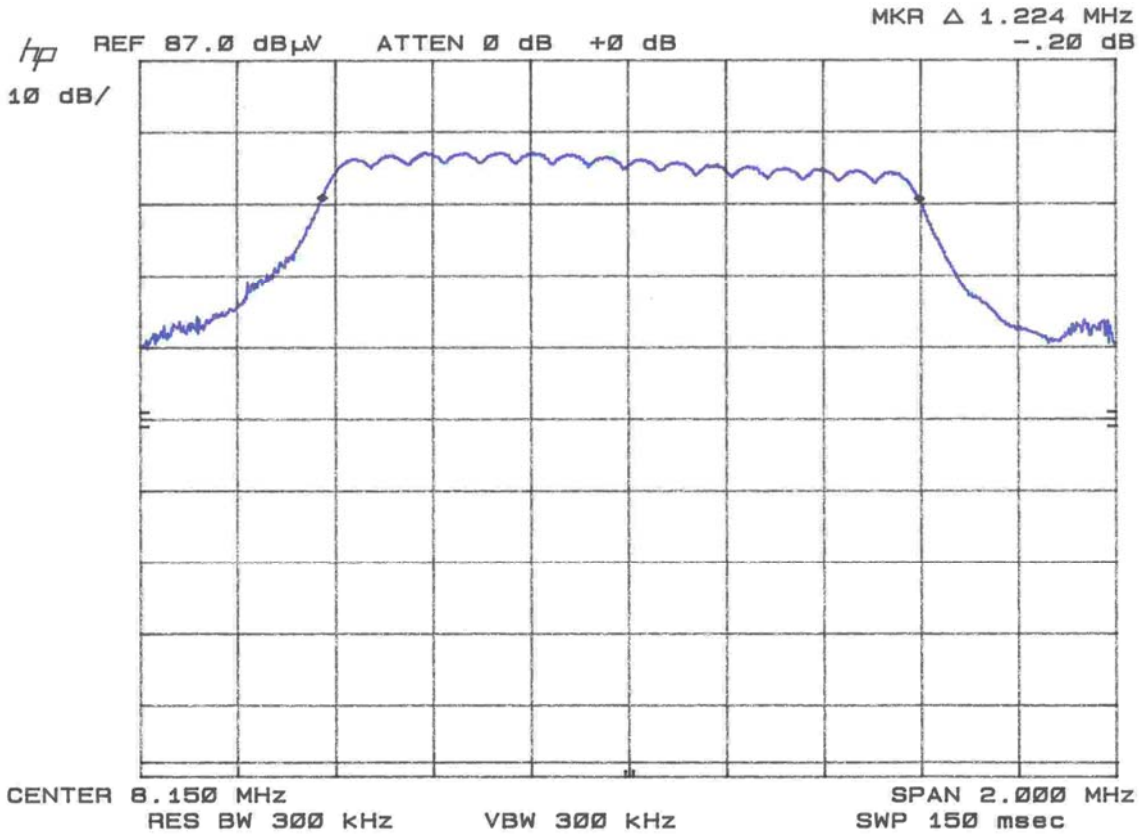


Figure 4-1. Occupied Bandwidth, EAS

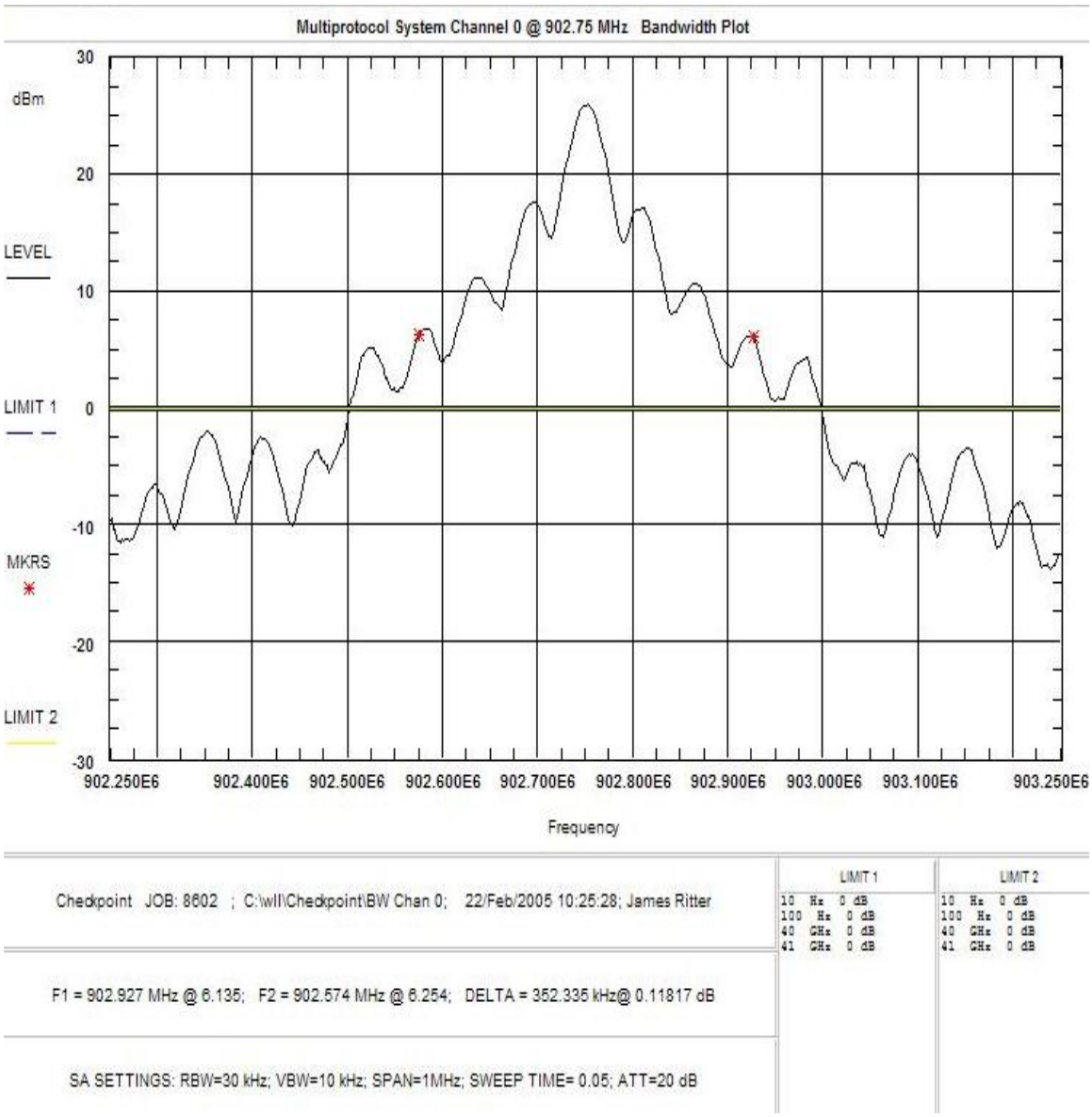


Figure 4-2. Occupied Bandwidth, UHF RFID- Low Channel

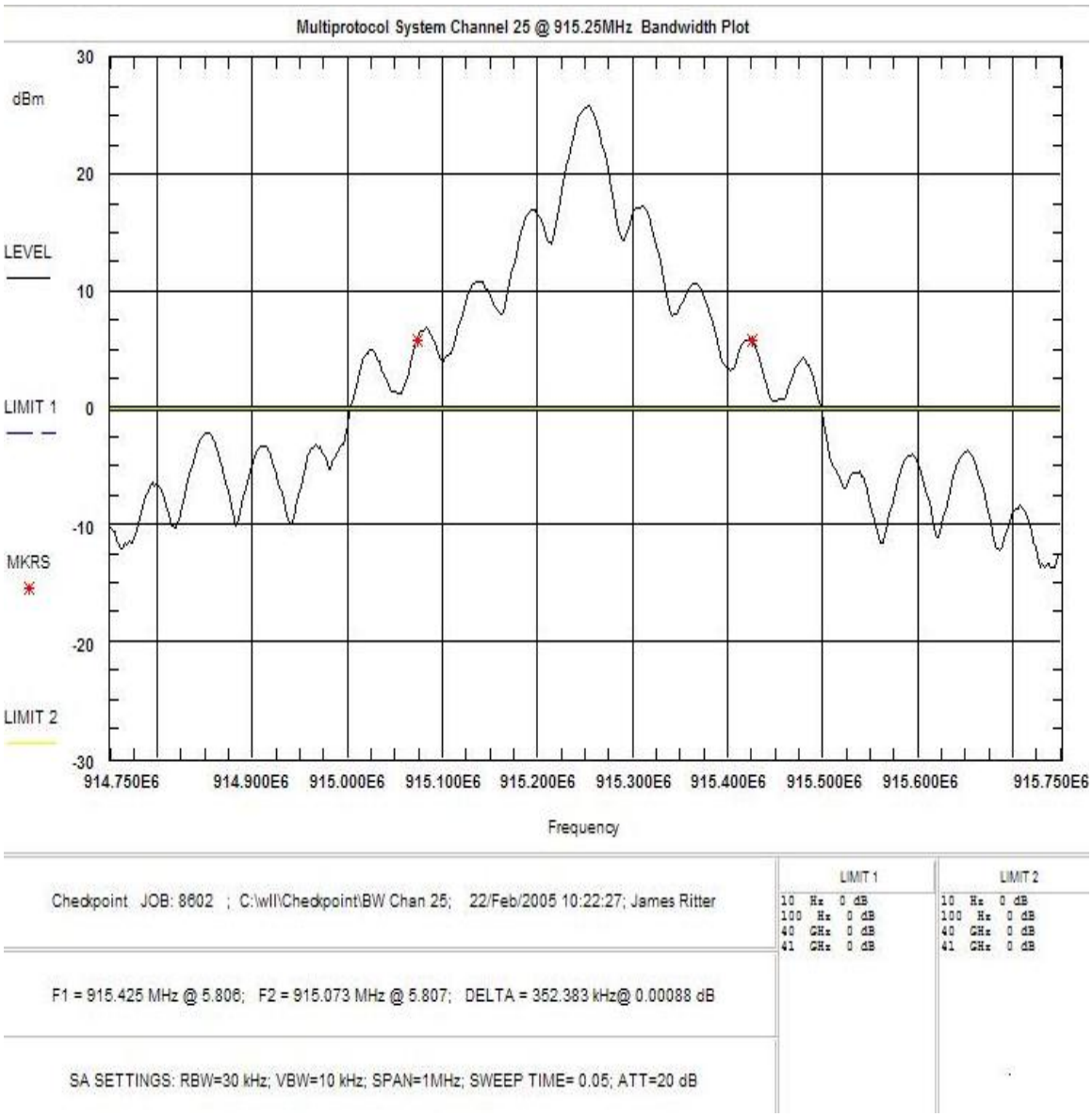


Figure 4-3. Occupied Bandwidth, UHF RFID- Mid Channel

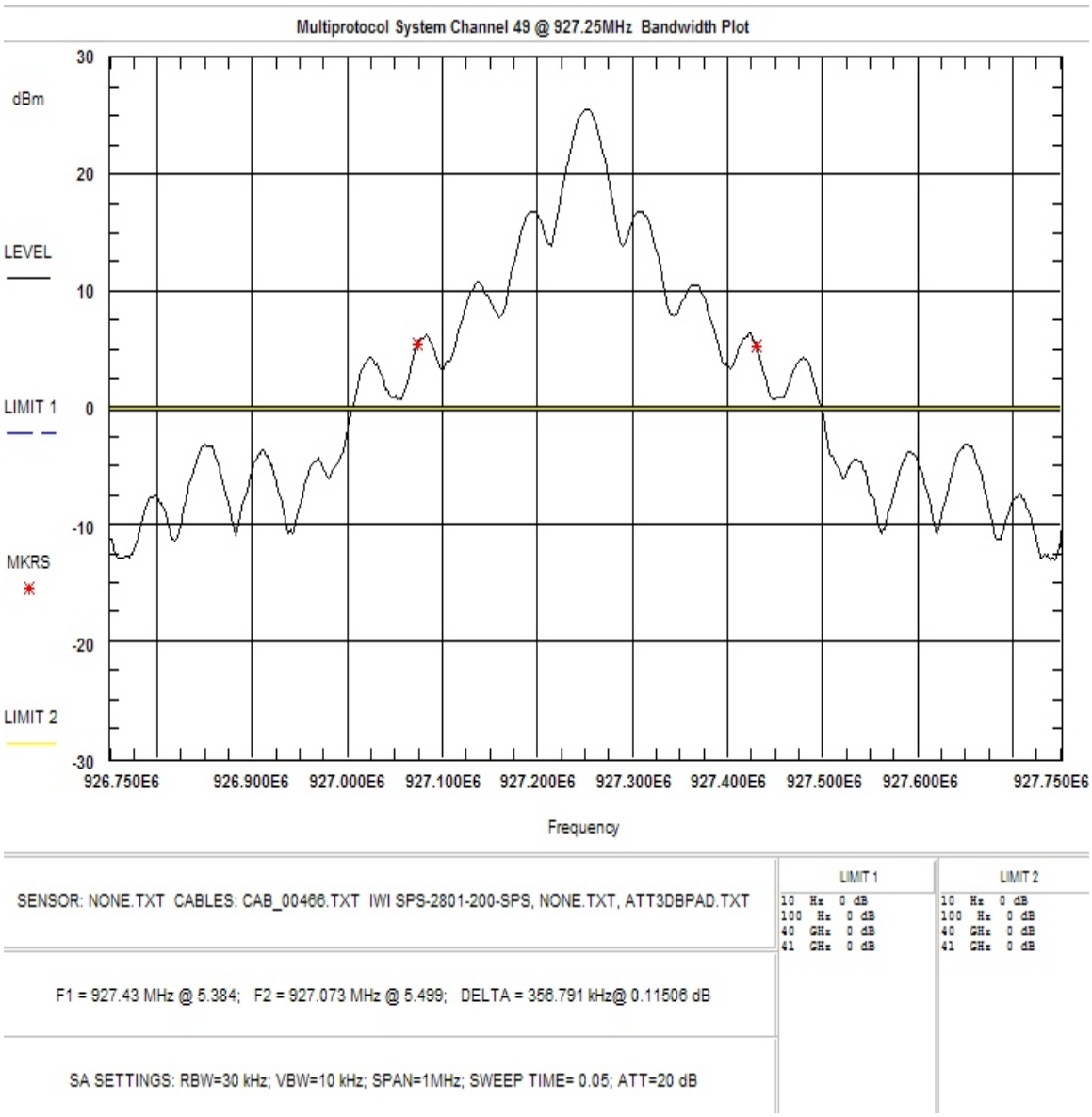


Figure 4-4. Occupied Bandwidth, UHF RFID- High Channel

Table 3 provides a summary of the Occupied Bandwidth Results.

Table 3. Occupied Bandwidth Results

Frequency	Bandwidth	Limit	Pass/Fail
EAS 8.15Mhz	1.224MHz	1.705 – 10MHz	Pass
UHF RFID Low Channel 902.75MHz	352.33kHz	500kHz	Pass
UHF RFID Mid Channel 915.25MHz	352.38kHz	500kHz	Pass
UHF RFID High Channel 927.25MHz	356.79kHz	500kHz	Pass

4.2 Operation Within the Restricted Band: (FCC Part §15.205(d)(1))

The Checkpoint EAS system makes use of the spectrum from 7.6M – 8.7MHz falling into the ranges listed in §15.205(a). However, in accordance with §15.205(d)(1) the frequency sweep is not stopped and the fundamental emission is outside the restricted band more than 99% of the time the device is actively transmitting. Based on a facsimile between Checkpoint and the FCC concerning this type of operation this requirement is satisfied by a simple ratio of the maximum single restricted band infringed upon divided by the bandwidth of the EUT fundamental emission to satisfy the 1% requirement. This is calculated as follows:

The largest band of restricted frequencies is 10.5kHz from 8.37625M to 8.38675MHz. Since the device is continuously scanning over the 7.6M – 8.7MHz range the actual time spent in a band would be:

10.5kHz/1.224MHz ~=0.8%

Thus the unit would be out of a restricted band more than 99% of the time.

Additionally, from review of the actual 8.2MHz sweep table used by the TR4024 EAS system (reference Theory of Operation) the frequencies used do not fall within the restricted bands listed in §15.205.

A copy of the facsimile between the FCC and Checkpoint is included at the end of this test report.

4.3 Number of Hopping Frequencies: (FCC Part §15.247(a)(1)(i))

In accordance with §15.247(a)(1)(i) a frequency hopping system in the 902M – 928MHz band with a 20dB bandwidth greater than 250kHz shall use at least 25 hopping frequencies.

With the unit set to the hopping mode, the number of hopping frequencies were measured. As shown in Figure 4-5 the unit uses 50 channels.

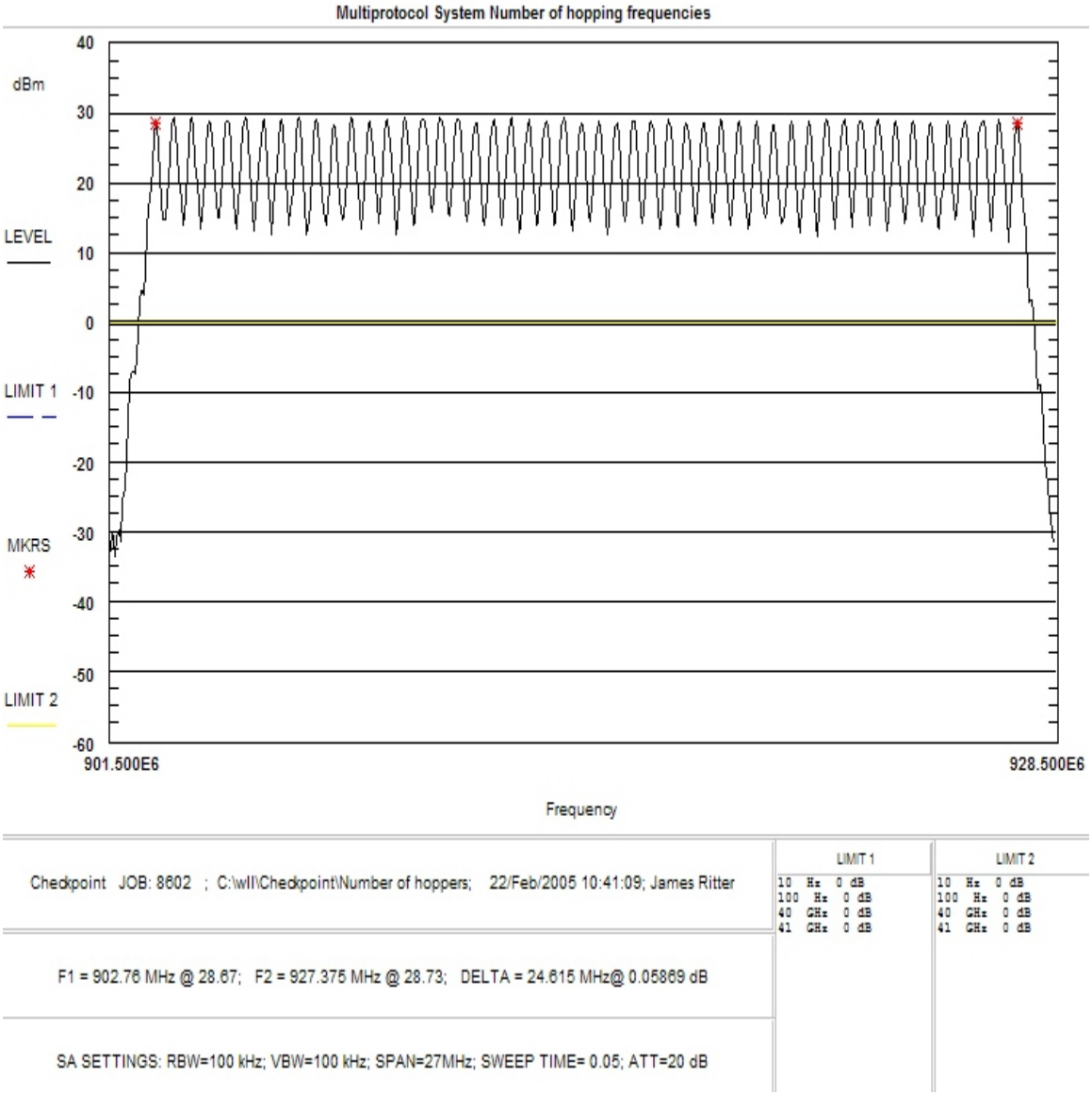


Figure 4-5. Number of Hopping Channels, UHF RFID

4.4 Carrier Frequency Separation: (FCC Part §15.247(a)(1))

In accordance with the FCC Rules a frequency hopping system shall have hopping channel carriers frequencies separated by a minimum of 25kHz or the 20dB bandwidth of the hopping channel, whichever is greater.

As the maximum 20dB channel bandwidth of the EUT was measured at 356.8kHz the channel spacing must also be greater than 356.8kHz.

Figure 4-6 is a plot of the EUT in the hopping mode which shows the spacing between adjacent channels. The carrier frequency separation was measured at 500kHz and therefore is compliant with the requirements.

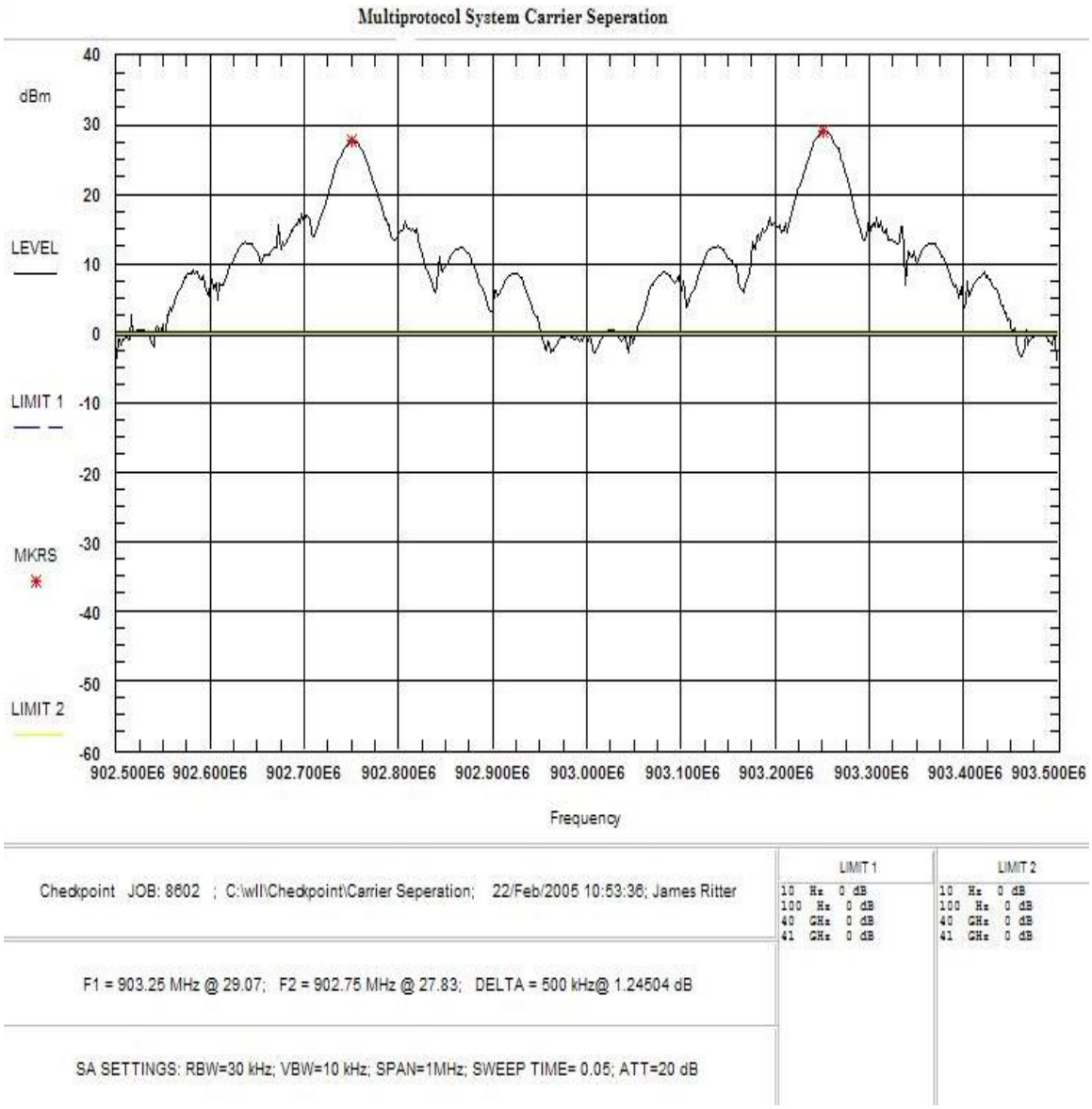


Figure 4-6. Carrier Frequency Separation

4.5 Time of Occupancy and Duty Cycle Correction: (FCC Part §15.247(a)(1)(i))

Per FCC Part 15.247(a)(1)(i), the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period.

Additionally, 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 dwell time of the UHF RFID AR400 in any 100ms was measured and is shown in Figure 4-7. From Figure 4-8 it can be seen that the pulse appears twice and then repeats to this channel at 1.4sec. Based on this plot the dwell time per hop is 26.34ms. The signal was then observed for a period of 20 seconds to determine the total channel occupancy time over a 10 second period. With all channels being used equally Figure 4-9 shows that the channel will used every 1.4seconds (~8 times/10seconds) for a total occupancy time of 210.72ms. Since only one pulse will appear on the channel in any 100ms period, the duty cycle is calculated as:

20 x LOG(13.17ms/100ms) = -17.6dB

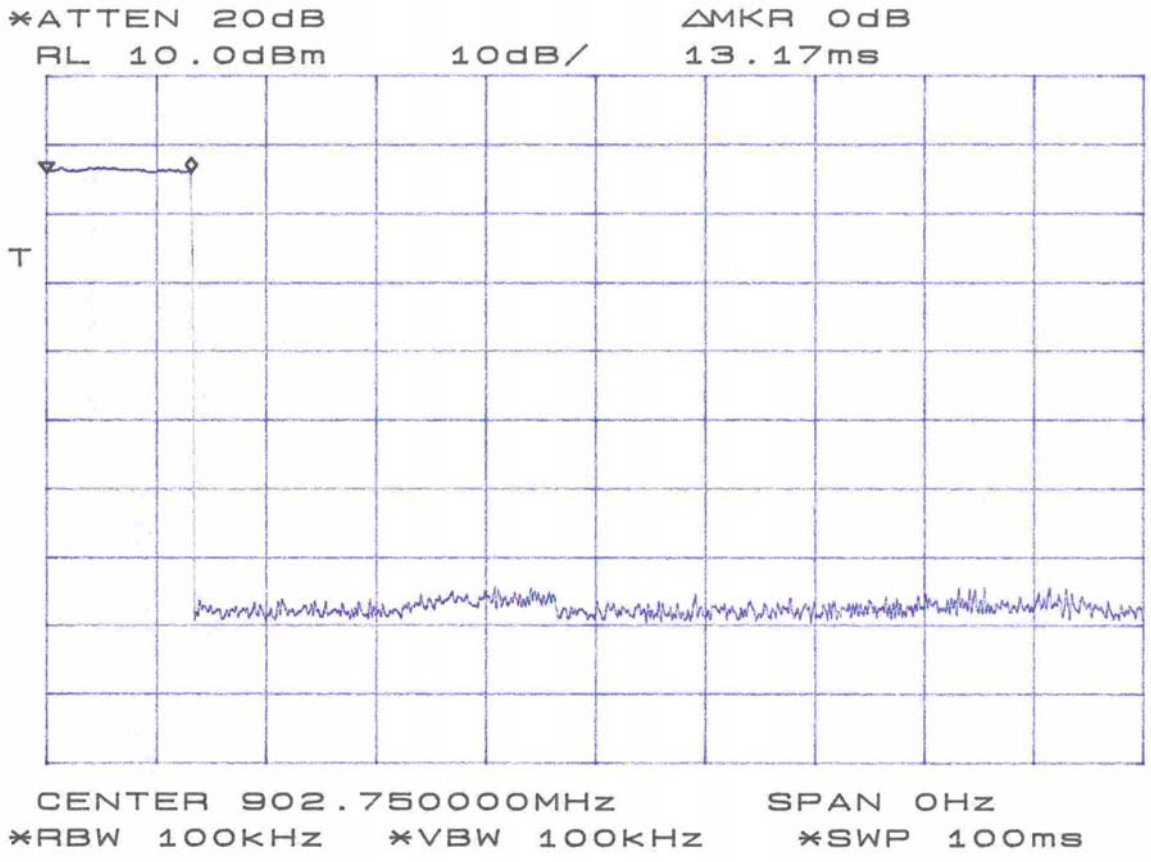


Figure 4-7. Dwell Time Plot/Duty Cycle 100ms

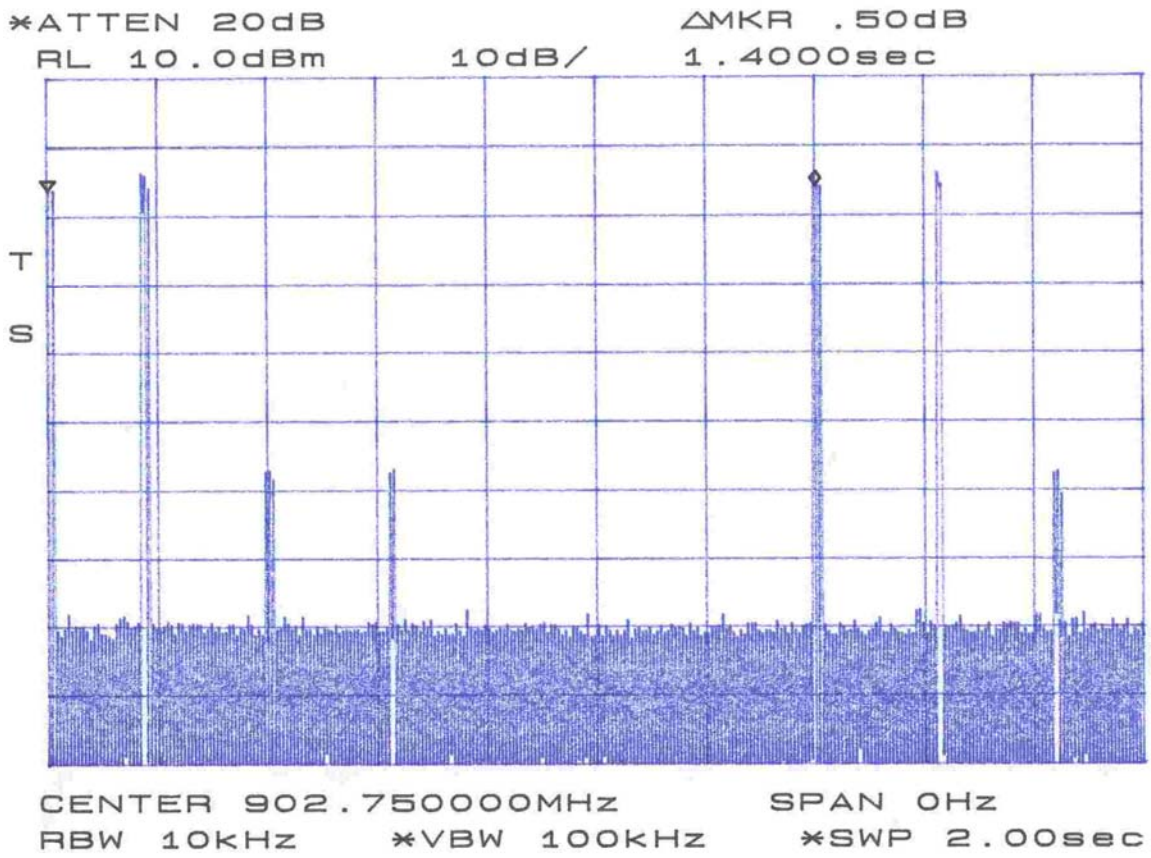


Figure 4-8, Dwell Time Plot

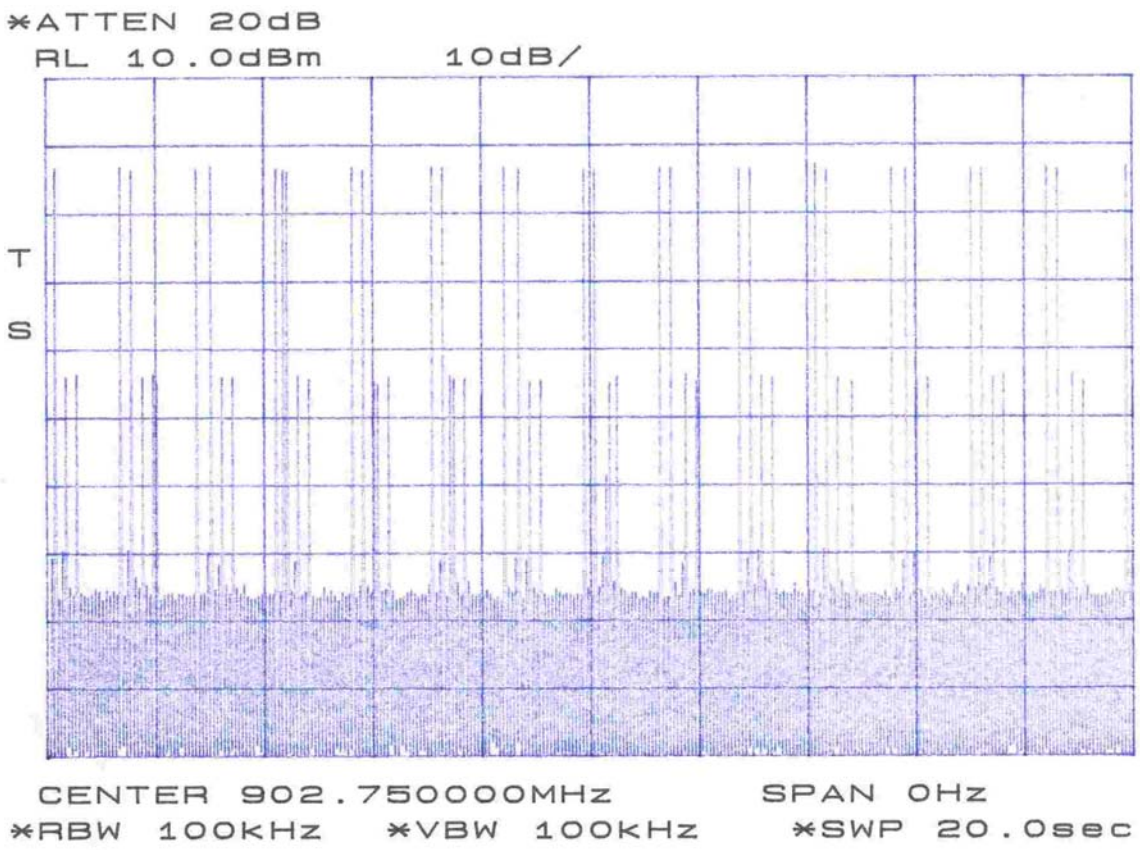


Figure 4-9. 20 Second Plot Showing Occupancy per 10 Second Period

4.6 RF Power Output: (FCC Part §2.1046 and §15.247)

To measure the output power of the FHSS system 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 was set to the center frequency of the selected channel with a span greater than 5 times the 20dB bandwidth. The RBW was set to a value greater than the 20dB bandwidth while the VBW was set much higher than the RBW. The analyzer offset was adjusted to compensate for the attenuator and other losses in the system.

The limit for systems operating in the 902M – 928MHz band with at least 50 hopping channels is 1 watt.

Table 4. RF Power Output

Frequency	Level	FCC Limit	Pass/Fail
Low Channel 902.75MHz	26.91 dBm	30 dBm	Pass
Mid Channel 915.25MHz	26.74 dBm	30 dBm	Pass
High Channel 927.25MHz	26.49 dBm	30 dBm	Pass

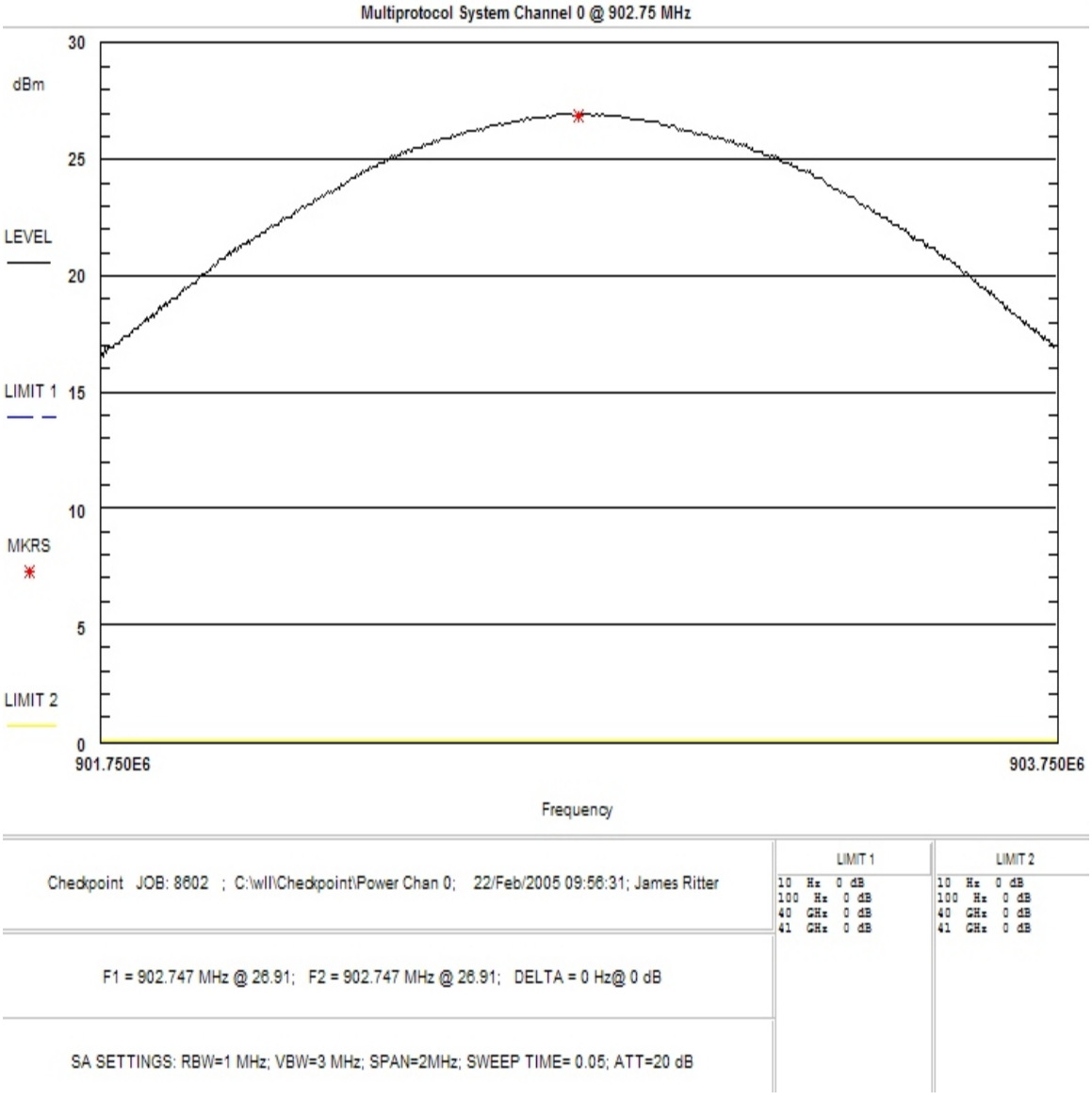


Figure 4-10. RF Peak Power, Low Channel

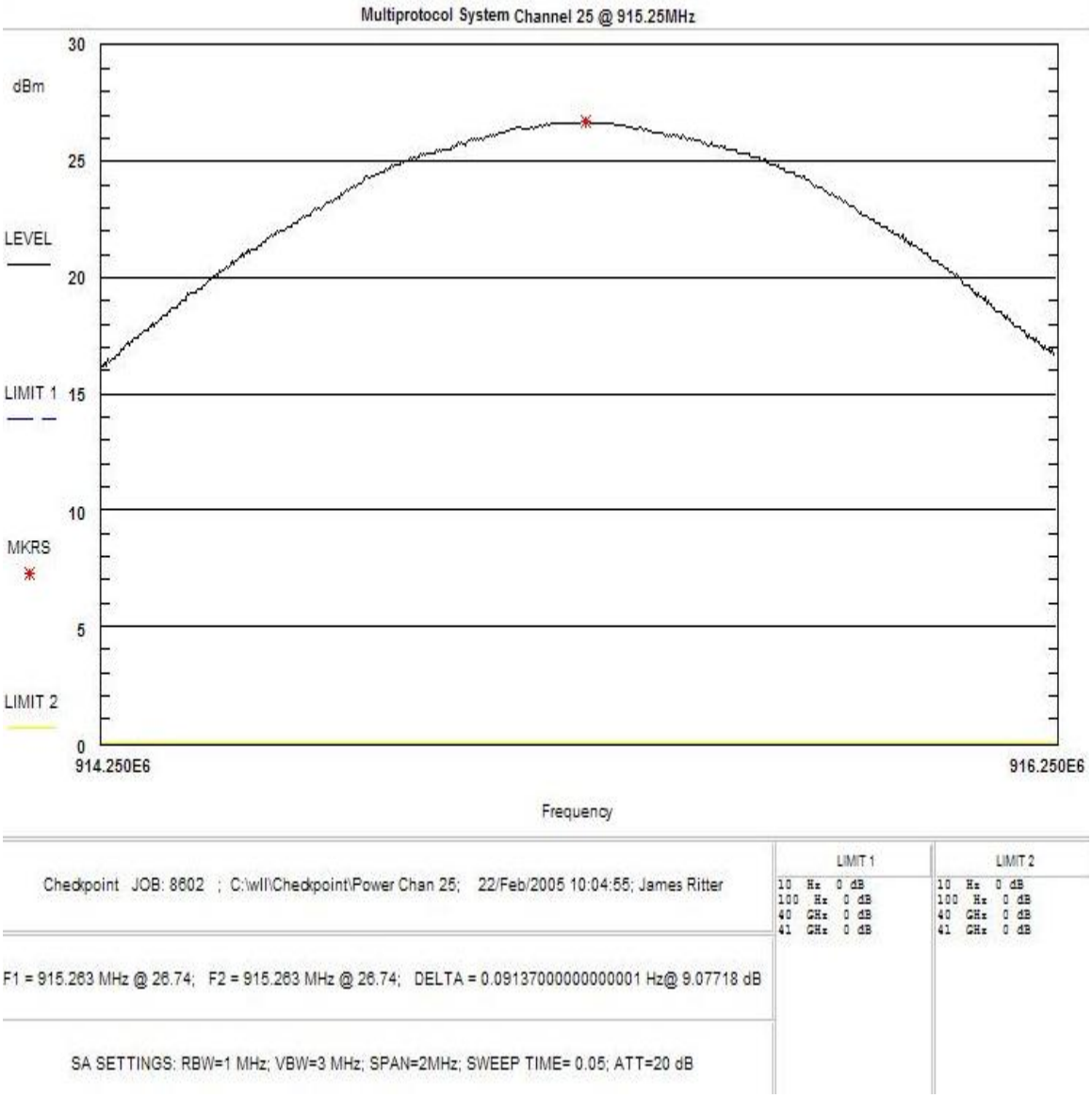


Figure 4-11. RF Peak Power, Mid Channel

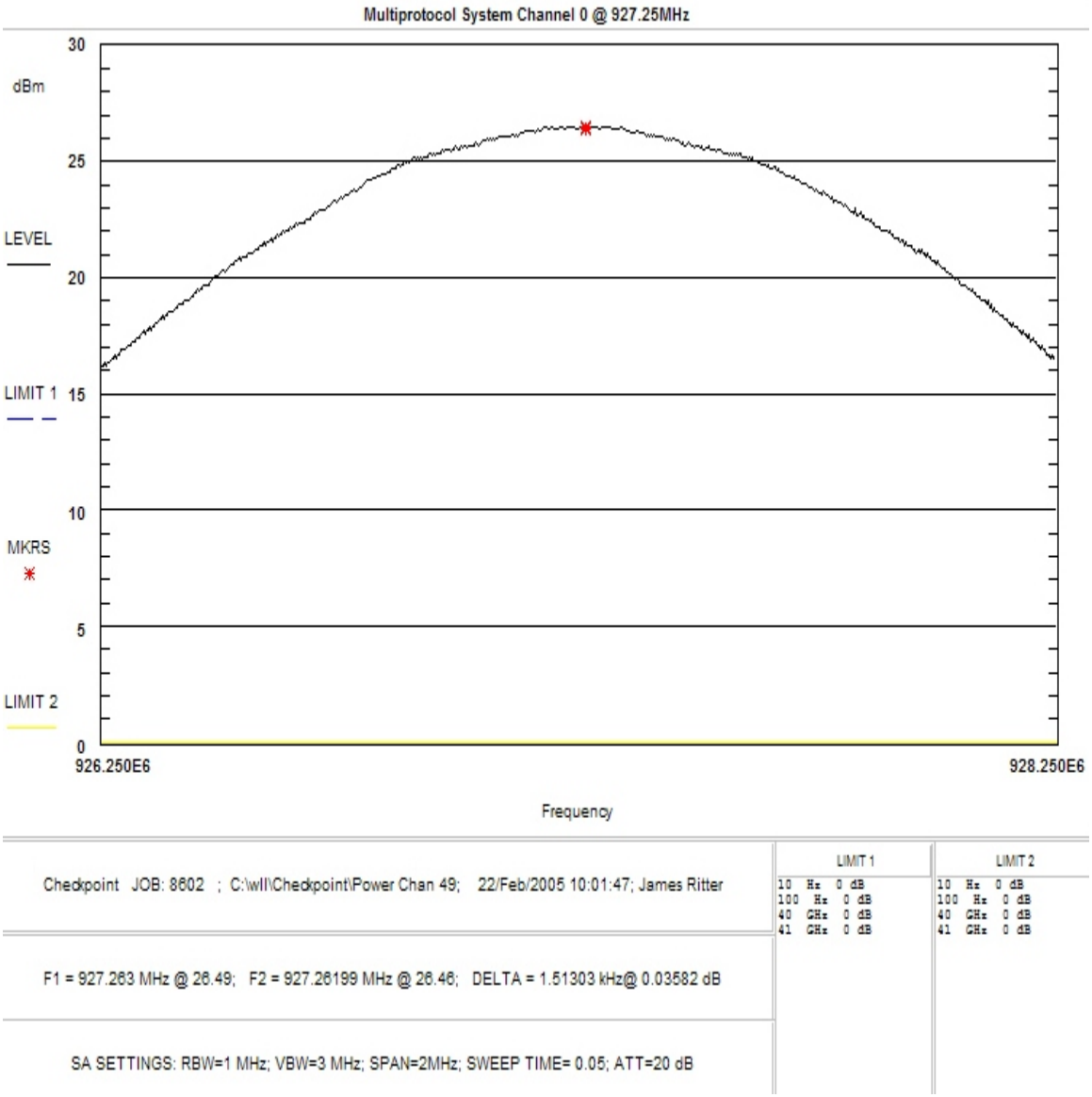


Figure 4-12. RF Peak Power, High Channel

4.7 Conducted Spurious Emissions at Antenna Terminals (FCC Part §2.1051 and §15.247)

The EUT must comply with requirements for spurious emissions at antenna terminals. Per §15.247(d) 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.

To perform the conducted spurious emissions testing, the EUT antenna was removed and the cable was connected directly into a spectrum analyzer through an attenuator. The correction for the external attenuator and test cable(s) are corrected in the data collection software. The spectrum analyzer resolution bandwidth was set to 100 kHz and the video bandwidth was set to 1 MHz. To determine the limit, the amplitude of the EUT carrier frequency was measured using the same settings. The limit was then set to 20 dB below the carrier frequency amplitude. The emissions outside of the allocated frequency band of 902M – 928MHz were then scanned from 30 MHz up to the tenth harmonic of the carrier.

The following are plots of the conducted spurious emissions data.

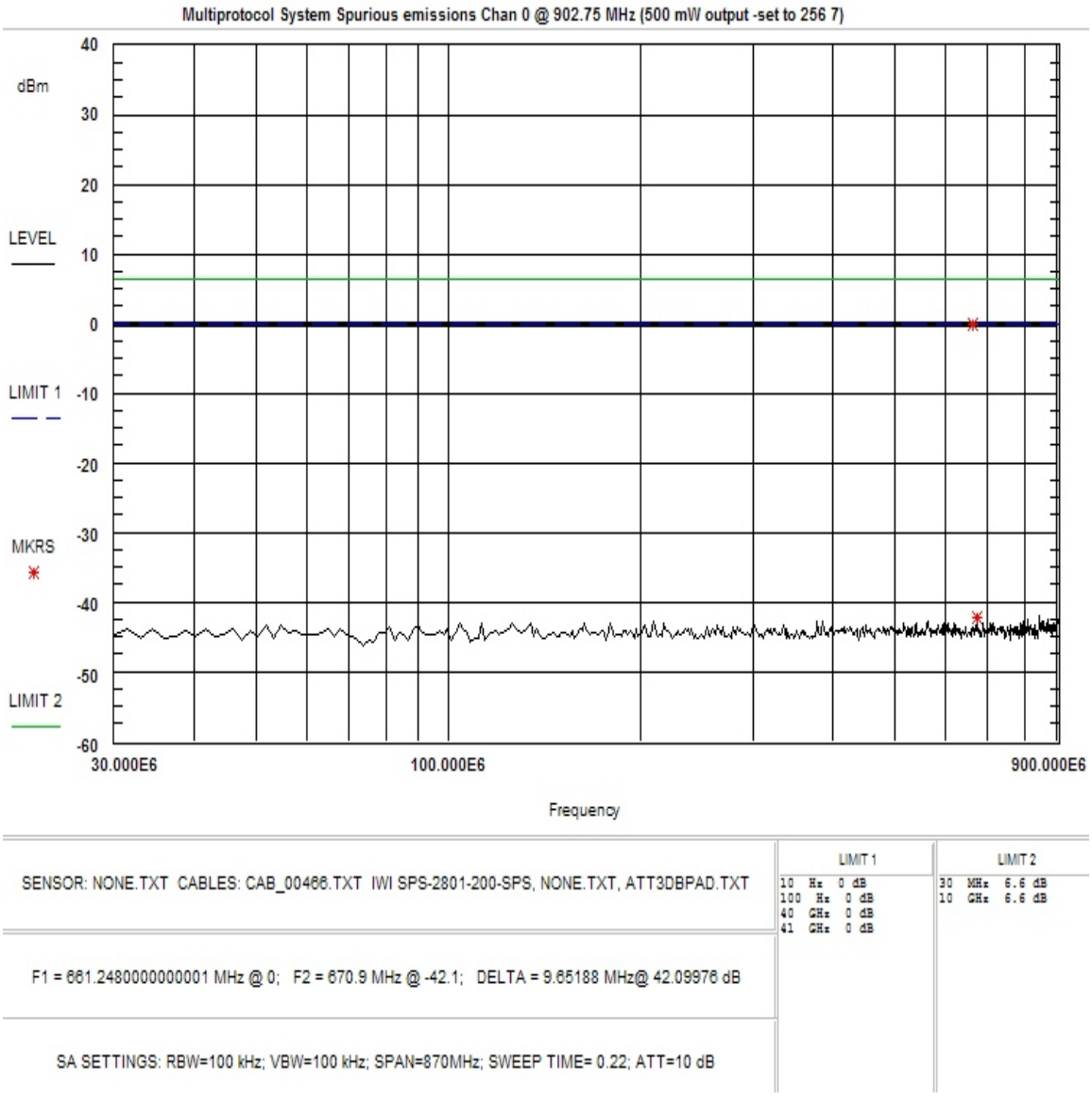


Figure 4-13. Conducted Spurious Emissions, Low Channel 30 - 900MHz

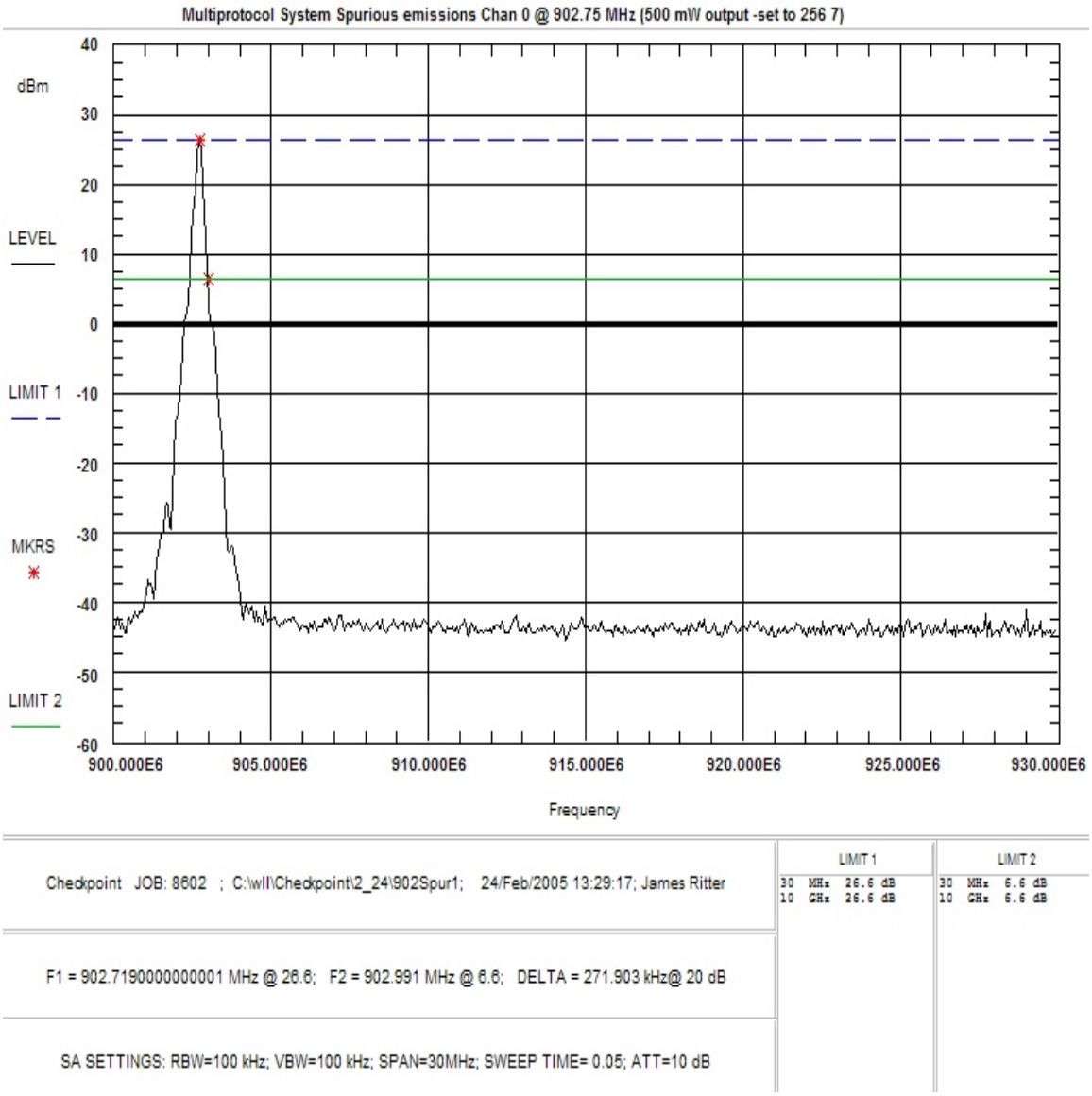


Figure 4-14. Conducted Spurious Emissions, Low Channel 900 – 930MHz

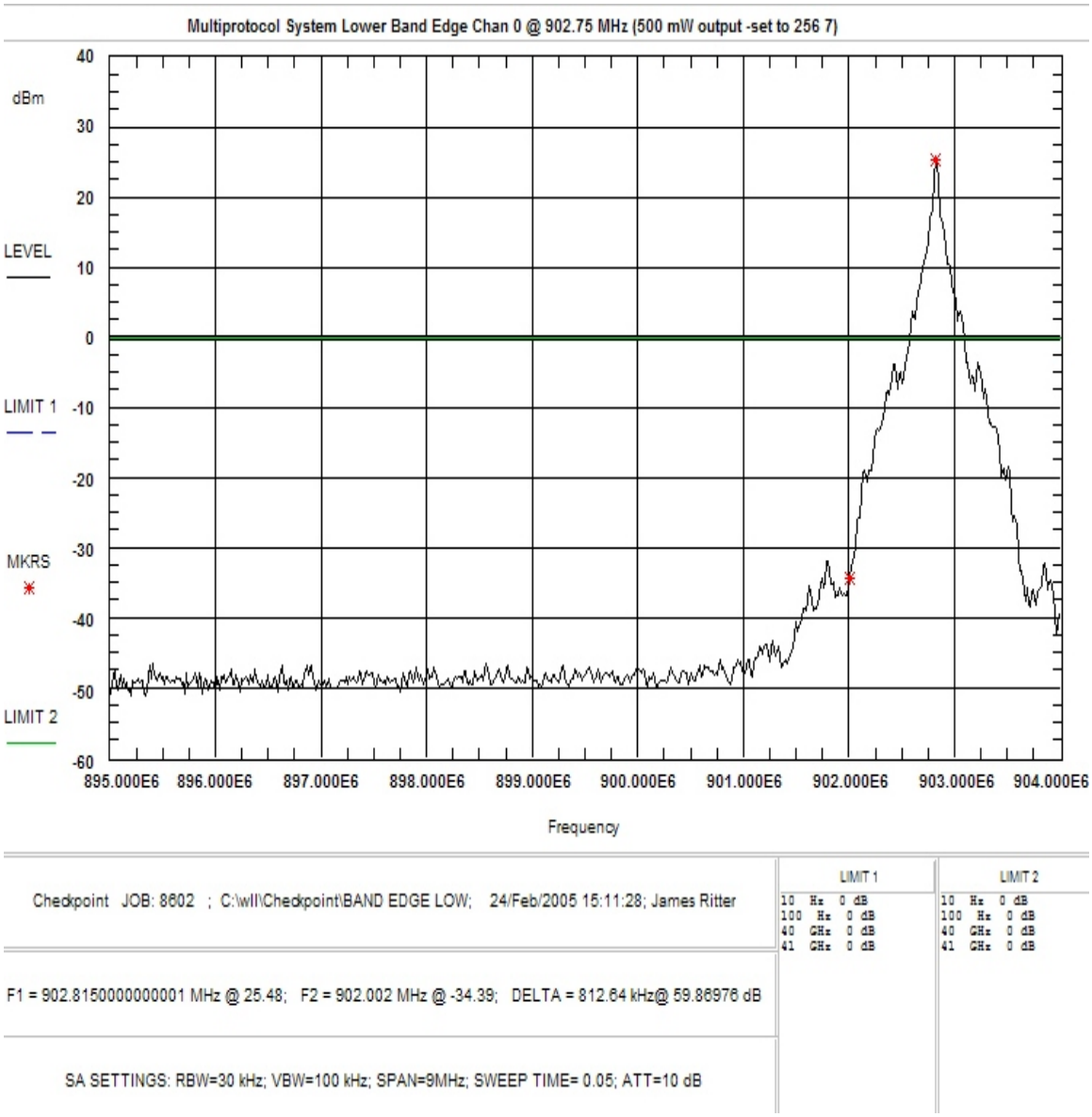


Figure 4-15. Conducted Spurious Emissions, Low Channel, Bandedge

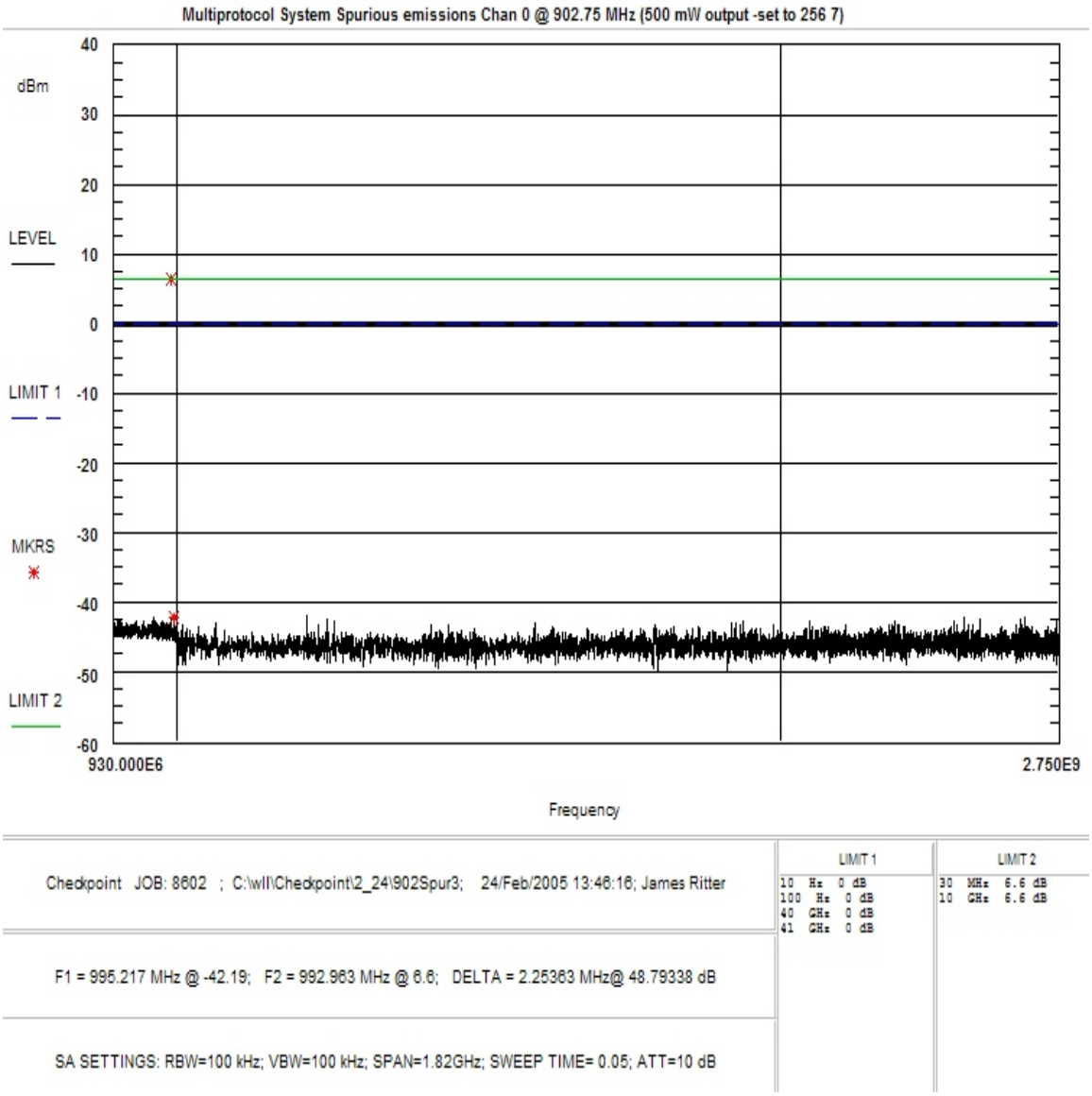


Figure 4-16. Conducted Spurious Emissions, Low Channel 930MHz – 2.75GHz

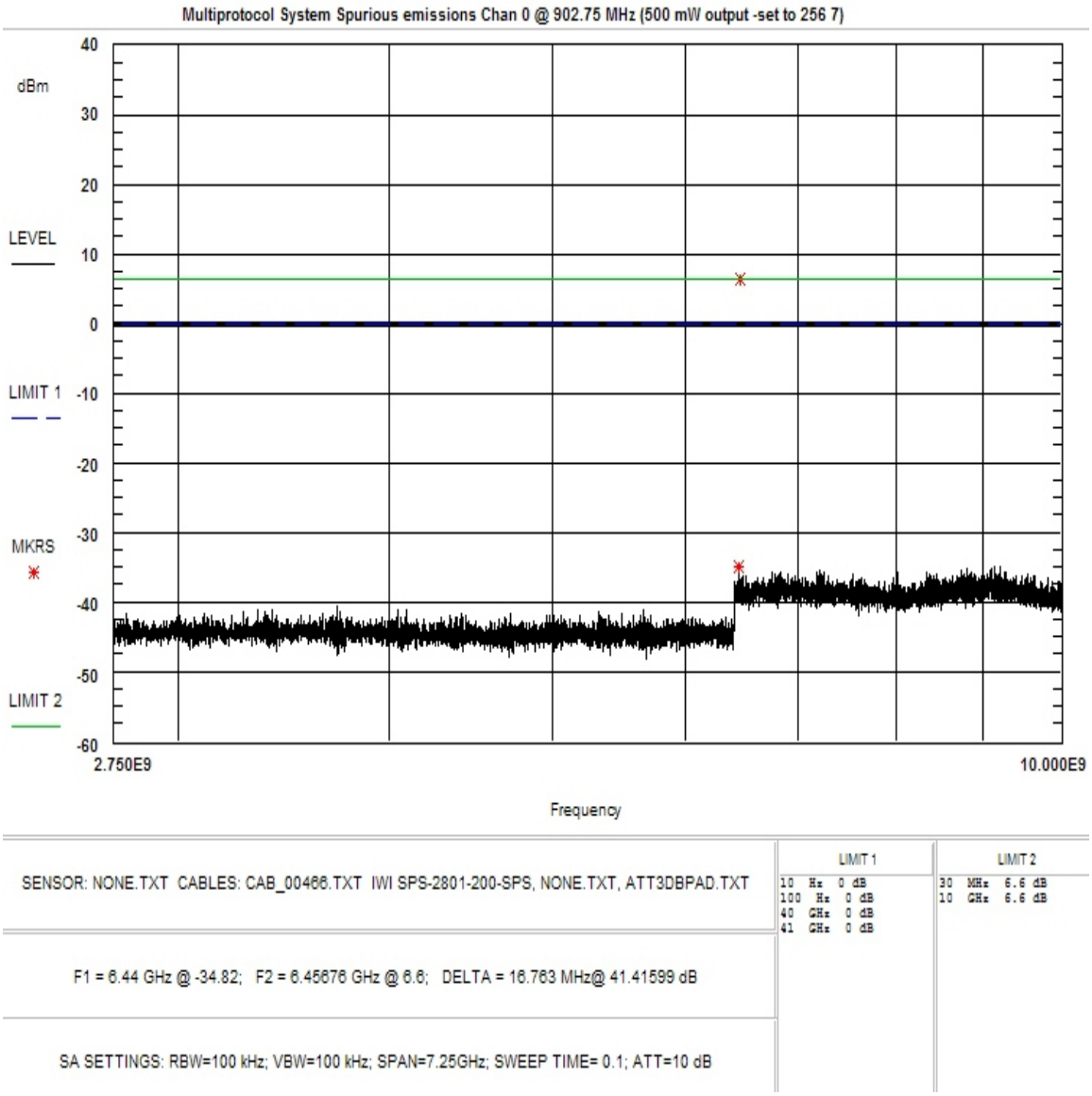


Figure 4-17. Conducted Spurious Emissions, Low Channel 2.75 - 10GHz

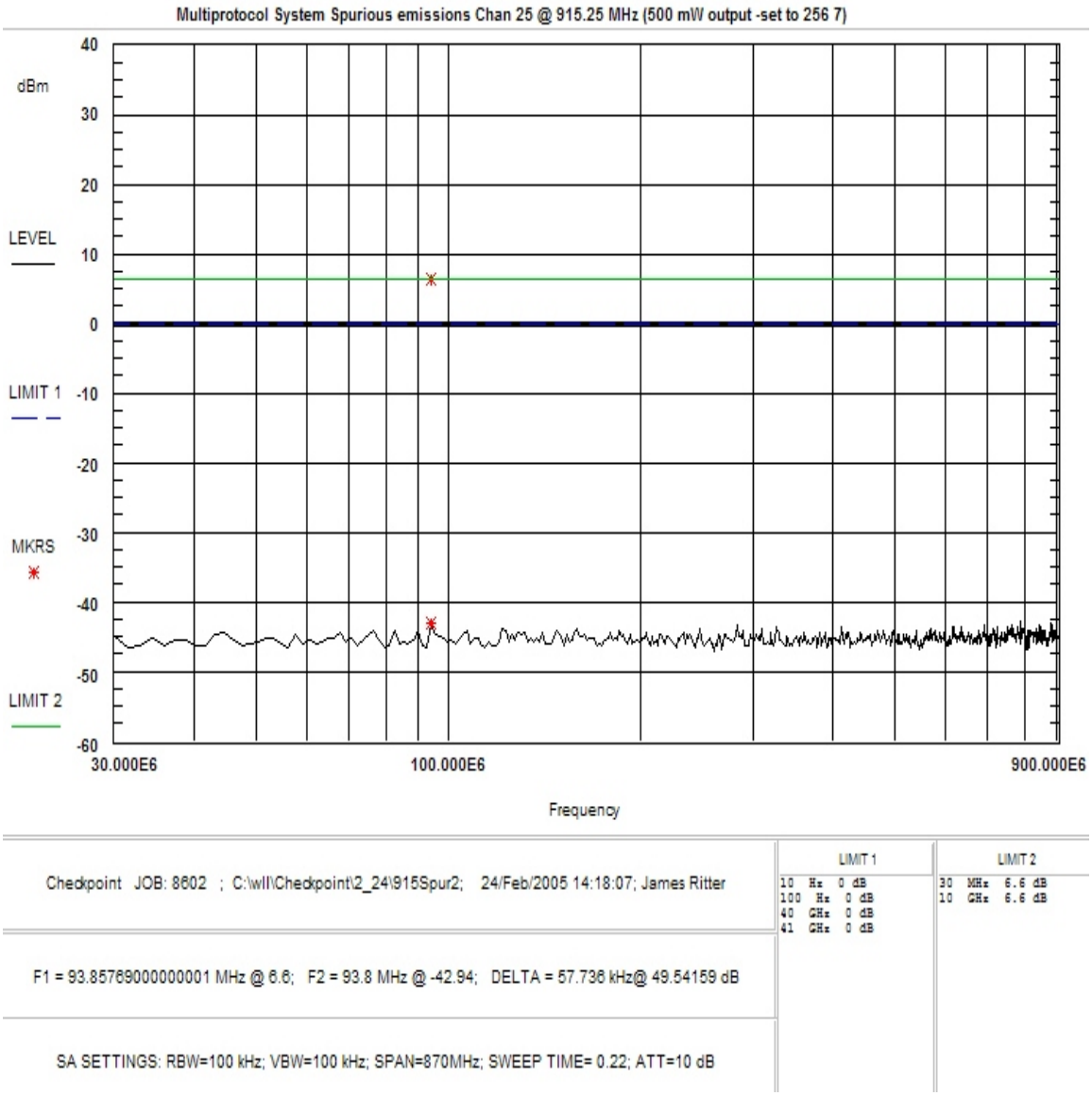


Figure 4-18. Conducted Spurious Emissions, Mid Channel 30 - 900MHz

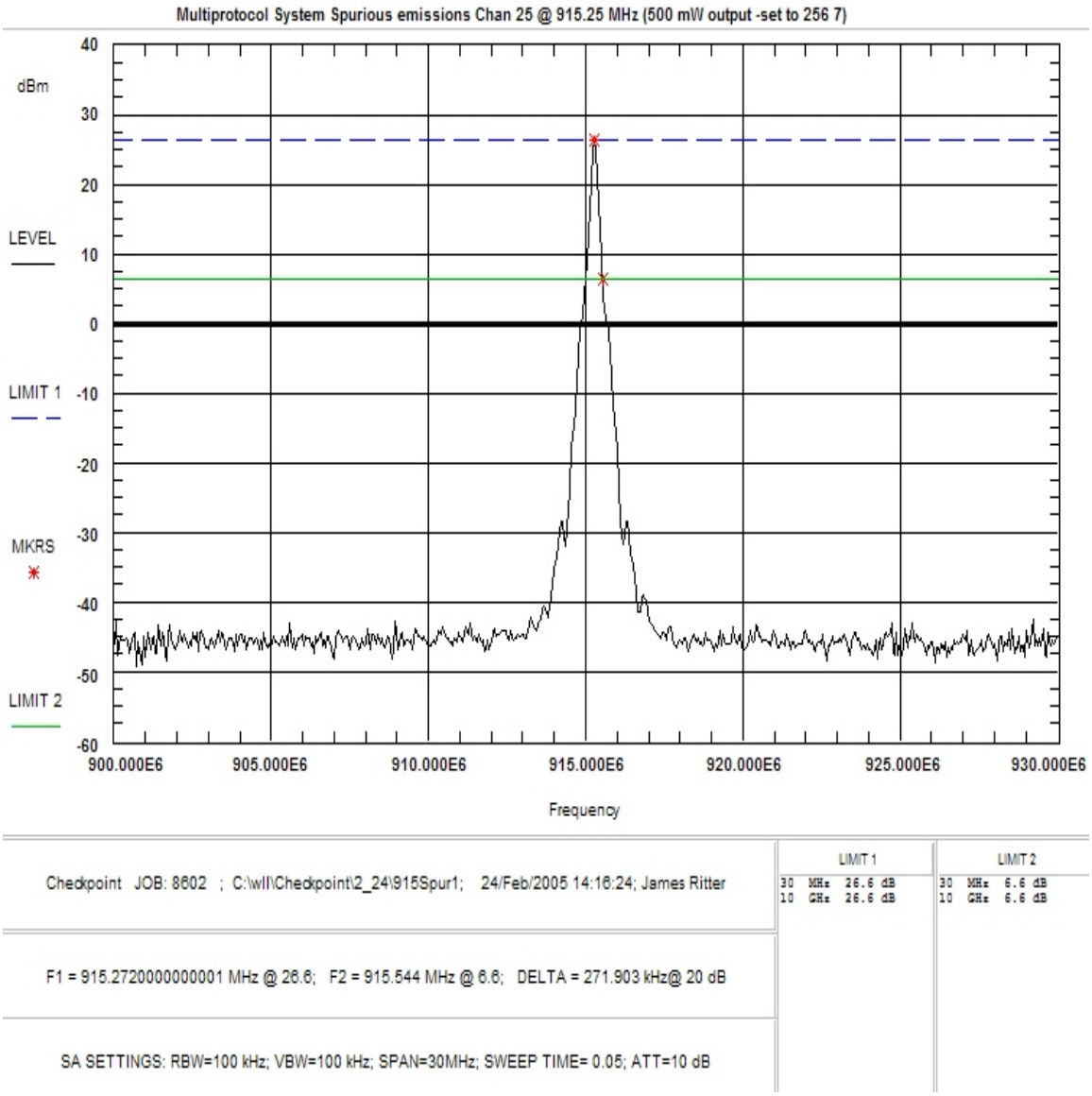


Figure 4-19. Conducted Spurious Emissions, Mid Channel 900 – 930MHz

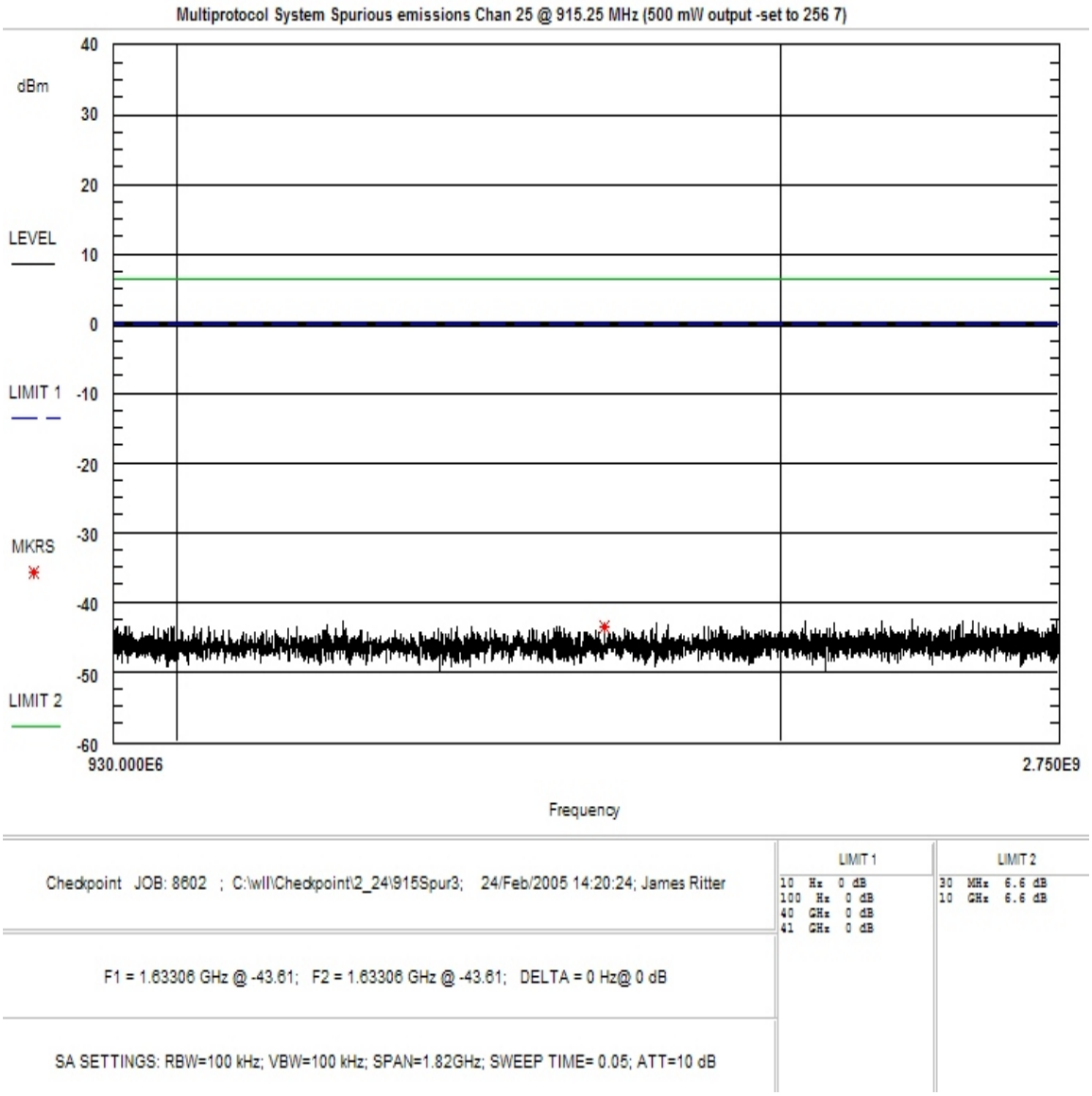


Figure 4-20. Conducted Spurious Emissions, Mid Channel 930MHz – 2.75GHz

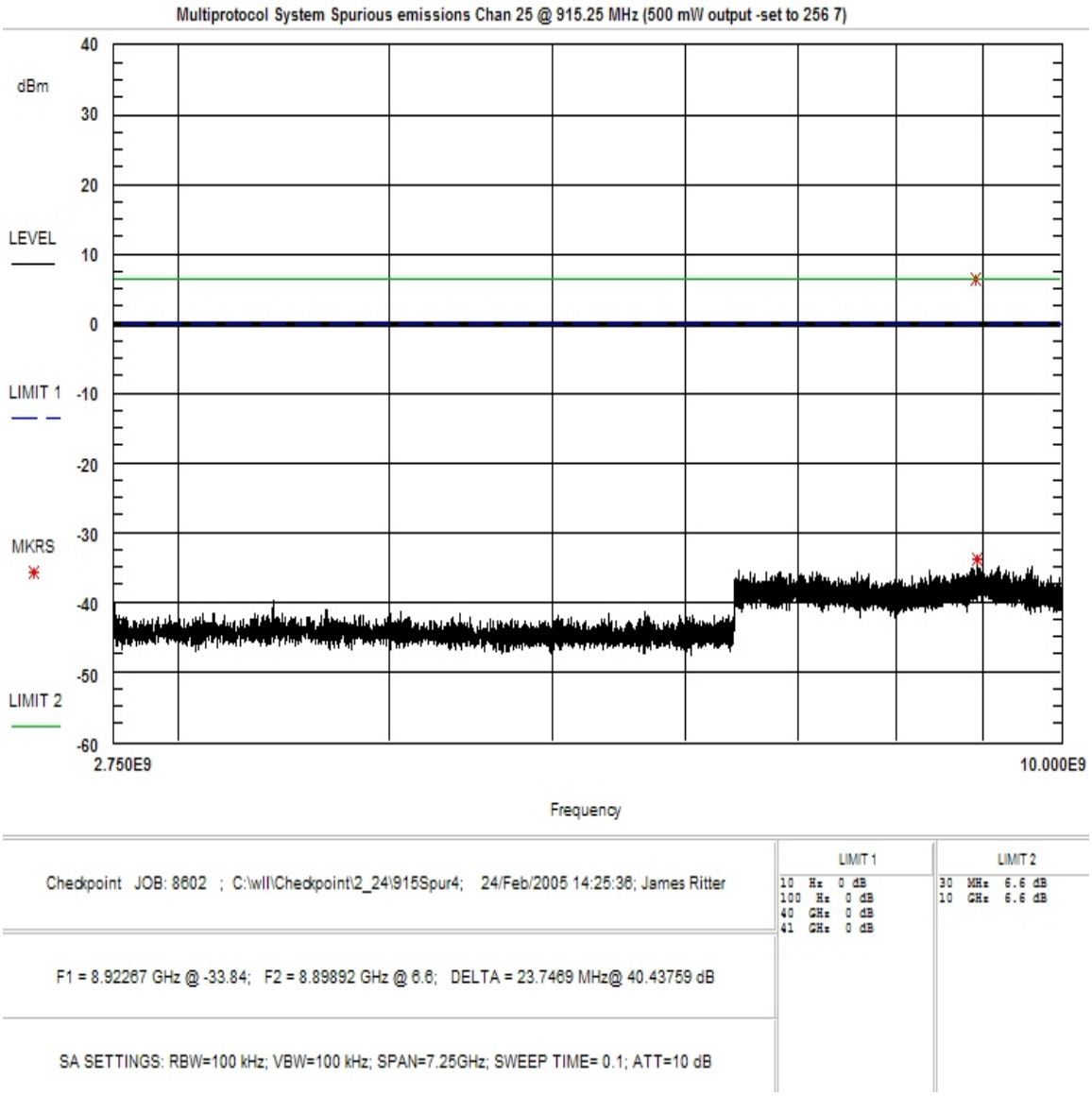


Figure 4-21. Conducted Spurious Emissions, Mid Channel 2.75 - 10GHz

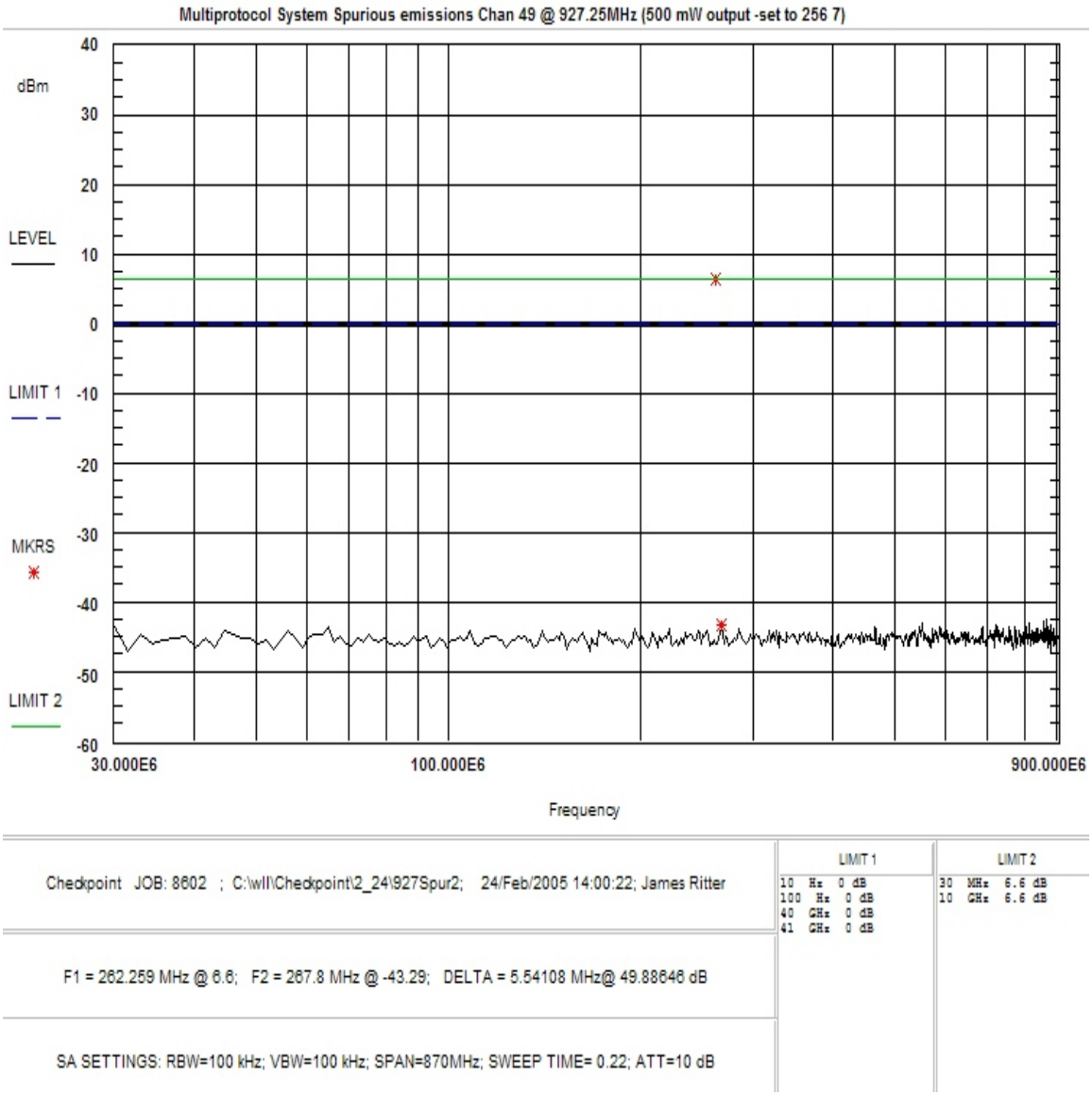


Figure 4-22. Conducted Spurious Emissions, High Channel 30 - 900MHz

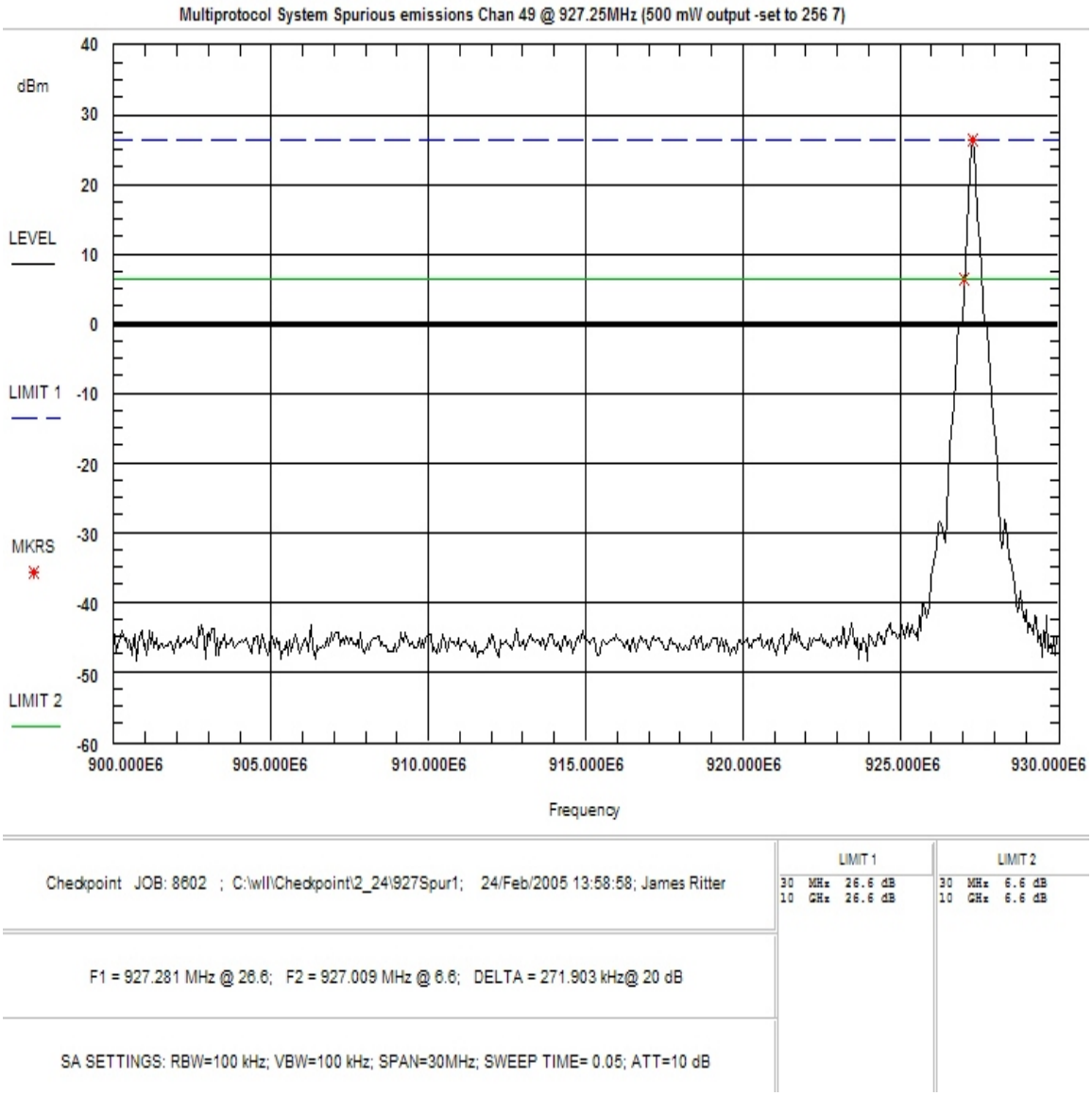


Figure 4-23. Conducted Spurious Emissions, High Channel 900 – 930MHz

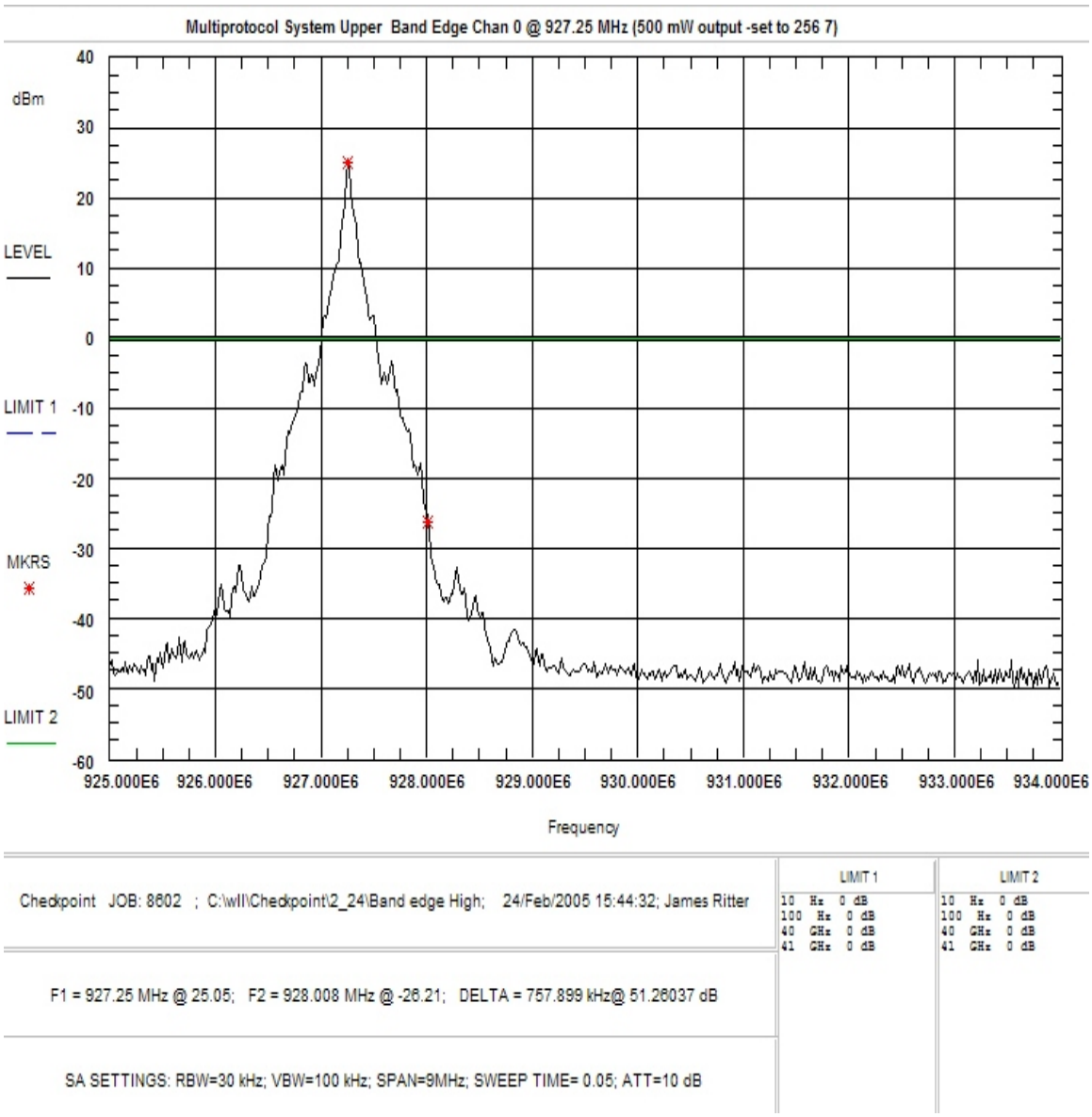


Figure 4-24. Conducted Spurious Emissions, High Channel, Bandedge

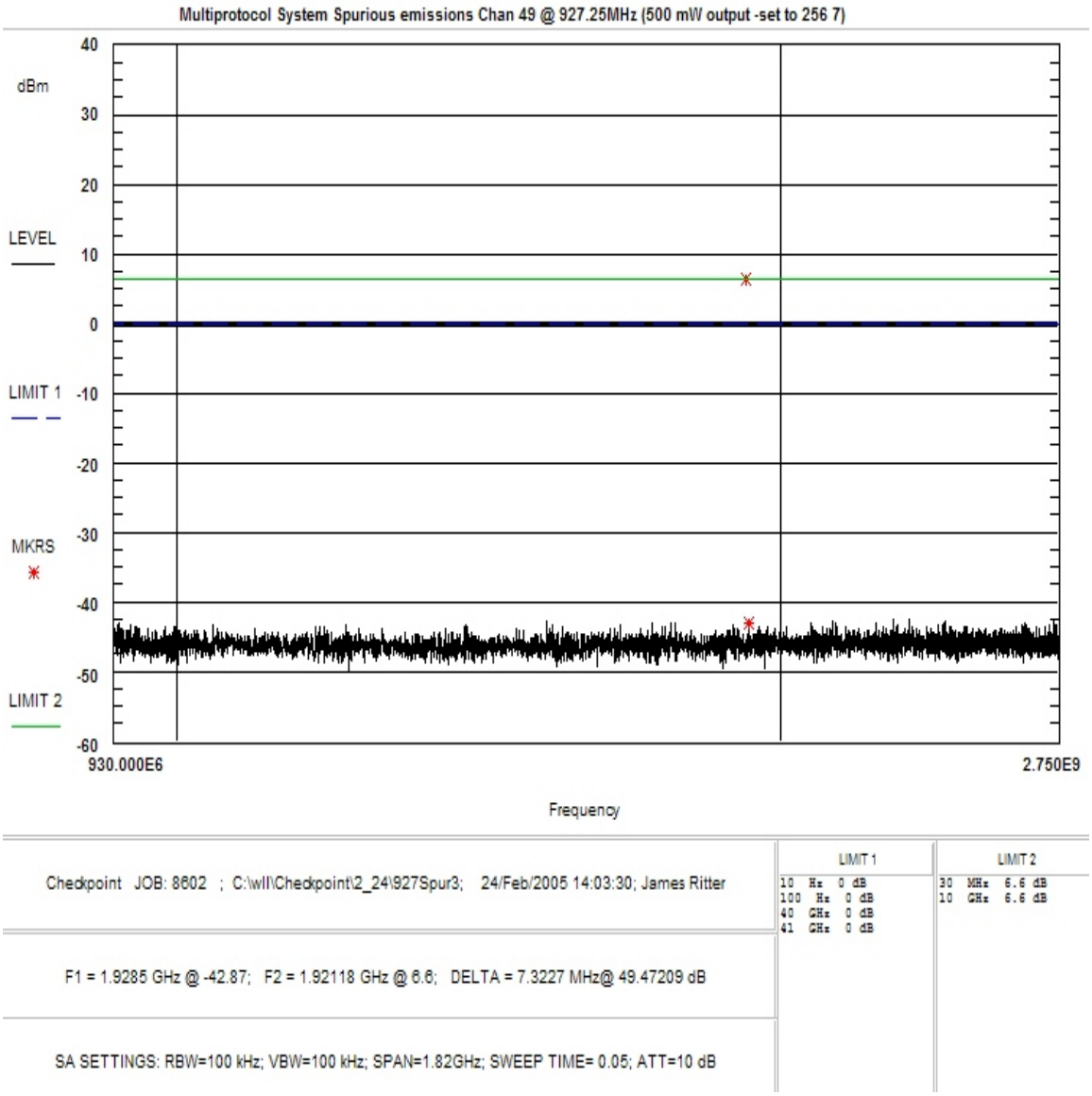


Figure 4-25. Conducted Spurious Emissions, High Channel 930MHz – 2.75GHz

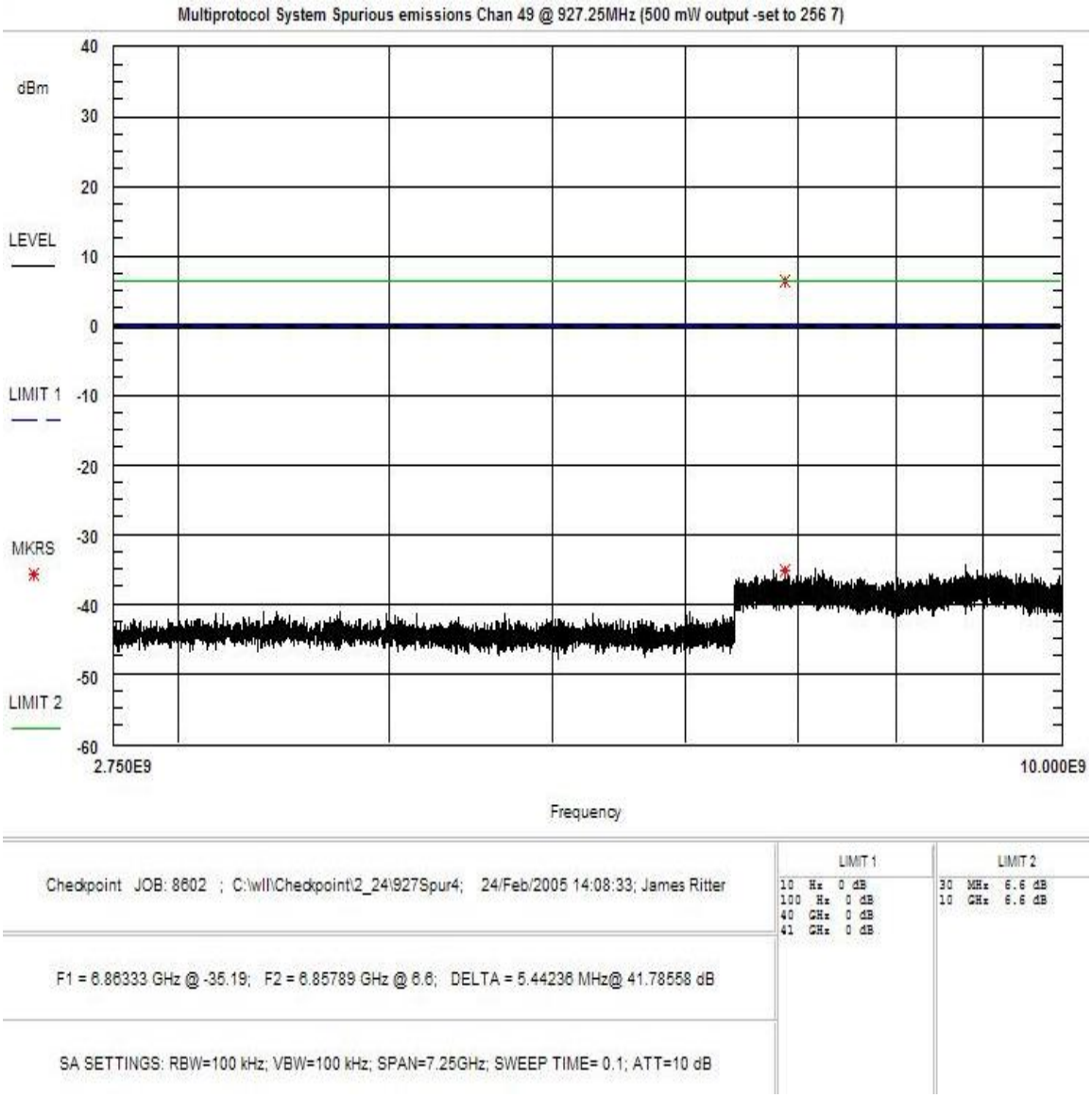


Figure 4-26. Conducted Spurious Emissions, High Channel 2.75 - 10GHz

4.8 Radiated Spurious Emissions: RFID System (FCC Part §2.1053, §15.247)

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.

4.8.1 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.

Measurements were made in accordance with the procedure described in the Public Notice DA 00-705. The unit was set to the selected channel for continuous transmissions at the maximum rate. For the average measurements the VBW was set to 100Hz based on the maximum transmit on time of 13.17ms.

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	100 Hz (Avg.) 1MHz (Peak)

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

Sample Calculation:

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

Worst case data are supplied in the following tables. Testing was performed to the tenth harmonic at the highest power setting. Both peak and average measurements are listed. Testing for spurious emissions was performed while both the RFID radio and the EAS radio were operating to cover any co-location issues.

Table 5: Radiated Spurious Emissions, 30M – 2GHz

(Restricted Bands and Digital Emissions)

CLIENT:	Checkpoint	DATE:	2/22/2005
TESTER:	James Ritter	JOB #:	8602

EUT Information:

EUT:	Mulitiprotocol System
TEST CONFIG:	AR400 hopping 902.75-927.25 MHz, (Max power, 27dBm @ 256-7 setting) TR4024 TX hopping from 7.6-8.7 MHz, PDA =22

DISTANCE:	3m	CLASS:	B

Test Equipment/Limit:

ANTENNA:	A_00382	LIMIT:	LFCC_3m_Class_B
CABLE:	CSITE1_3m	AMPLIFIER (dB)	A_00312 (>1000MHz)

Freq. (MHz)	Pol 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
32.29	V	180.0	1.0	10.9	19.3	1.0	0.0	31.2	36.3	100.0	-8.8	BB
35.00	V	190.0	1.0	10.8	17.5	1.1	0.0	29.3	29.3	100.0	-10.7	BB
42.68	V	280.0	1.0	22.0	12.0	1.1	0.0	35.1	57.0	100.0	-4.9	BB
45.35	V	180.0	1.0	20.5	10.2	1.2	0.0	31.8	39.1	100.0	-8.2	BB
50.00	V	180.0	1.0	24.5	8.0	1.2	0.0	33.7	48.1	100.0	-6.3	Digital
54.19	V	85.0	1.2	19.0	7.3	1.2	0.0	27.5	23.7	100.0	-12.5	Digital
56.14	V	350.0	1.0	24.4	7.3	1.3	0.0	33.0	44.4	100.0	-7.0	BB
58.75	V	90.0	1.2	18.6	7.4	1.2	0.0	27.3	23.1	100.0	-12.7	Digital
64.77	V	90.0	0.0	15.4	7.9	1.2	0.0	24.5	16.9	100.0	-15.5	BB
75.03	V	180.0	1.2	17.1	8.2	1.3	0.0	26.6	21.4	100.0	-13.4	Digital
85.51	V	90.0	1.3	27.8	7.8	1.4	0.0	37.0	70.7	100.0	-3.0	Digital
86.06	V	270.0	1.3	23.2	7.9	1.4	0.0	32.4	41.8	100.0	-7.6	Digital
125.04	V	270.0	1.3	11.1	14.2	1.6	0.0	26.8	21.9	150.0	-16.7	Digital
135.90	V	0.0	1.2	8.7	13.6	1.6	0.0	23.9	15.7	150.0	-19.6	Digital
150.00	V	190.0	1.6	28.1	12.5	1.6	0.0	42.2	129.5	150.0	-1.3	Digital
200.00	V	120.0	1.3	16.6	12.4	1.9	0.0	30.9	35.1	150.0	-12.6	Digital
225.01	V	90.0	1.5	23.5	11.1	2.1	0.0	36.7	68.1	200.0	-9.4	Digital
250.00	V	250.0	1.3	26.3	11.8	2.1	0.0	40.2	102.1	200.0	-5.8	Digital
275.00	V	200.0	1.6	14.7	13.5	2.1	0.0	30.3	32.8	200.0	-15.7	Digital
300.03	V	190.0	1.5	25.0	13.6	2.2	0.0	40.8	109.5	200.0	-5.2	Digital
350.00	V	45.0	1.3	17.9	14.7	2.4	0.0	35.0	56.5	200.0	-11.0	Digital
400.00	V	190.0	1.5	17.2	15.5	2.5	0.0	35.2	57.7	200.0	-10.8	Digital
500.00	V	280.0	1.8	18.2	17.9	2.8	0.0	38.9	88.2	200.0	-7.1	Digital
700.00	V	180.0	2.0	16.0	20.4	3.3	0.0	39.7	97.1	200.0	-6.3	Digital
750.00	V	270.0	1.4	18.0	21.4	3.5	0.0	43.0	140.8	200.0	-3.0	Digital
800.00	V	190.0	2.5	11.3	21.0	3.6	0.0	35.8	61.9	200.0	-10.2	Digital
900.00	V	0.0	2.5	12.0	22.6	3.9	0.0	38.5	83.9	200.0	-7.5	Digital
950.00	V	180.0	1.4	7.5	22.6	3.9	0.0	34.0	50.4	200.0	-12.0	Digital
32.29	H	90.0	3.5	6.1	19.3	1.0	0.0	26.4	20.9	100.0	-13.6	Digital
42.68	H	0.0	3.5	14.1	12.0	1.1	0.0	27.2	22.9	100.0	-12.8	BB
45.35	H	90.0	2.0	8.1	10.2	1.2	0.0	19.4	9.4	100.0	-20.6	Digital

Freq. (MHz)	Pol 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
50.00	H	280.0	2.5	18.5	8.0	1.2	0.0	27.7	24.1	100.0	-12.3	Digital
54.19	H	0.0	2.5	16.0	7.3	1.2	0.0	24.5	16.7	100.0	-15.5	Digital
64.77	H	0.0	3.5	13.8	7.9	1.2	0.0	22.9	14.0	100.0	-17.1	Digital
75.03	H	100.0	2.6	18.7	8.2	1.3	0.0	28.2	25.8	100.0	-11.8	BB
85.51	H	45.0	3.0	23.7	7.8	1.4	0.0	32.9	44.1	100.0	-7.1	BB
86.06	H	180.0	2.5	24.0	7.9	1.4	0.0	33.2	45.9	100.0	-6.8	BB
125.04	H	180.0	2.5	8.6	14.2	1.6	0.0	24.3	16.5	150.0	-19.2	Digital
150.00	H	190.0	2.7	28.0	12.5	1.6	0.0	42.1	127.6	150.0	-1.4	Digital
200.00	H	0.0	1.7	21.9	12.4	1.9	0.0	36.2	64.5	150.0	-7.3	Digital
225.01	H	10.0	1.7	23.8	11.1	2.1	0.0	37.0	70.4	200.0	-9.1	Digital
250.00	H	45.0	1.5	26.2	11.8	2.1	0.0	40.1	100.9	200.0	-5.9	Digital
275.00	H	90.0	3.0	21.2	13.5	2.1	0.0	36.8	69.4	200.0	-9.2	Digital
300.03	H	0.0	1.5	24.8	13.6	2.2	0.0	40.6	107.0	200.0	-5.4	Digital
350.00	H	300.0	1.6	19.5	14.7	2.4	0.0	36.6	68.0	200.0	-9.4	Digital
400.00	H	10.0	1.5	18.8	15.5	2.5	0.0	36.8	69.4	200.0	-9.2	Digital
500.00	H	45.0	1.3	20.0	17.9	2.8	0.0	40.7	108.5	200.0	-5.3	Digital
700.00	H	270.0	1.6	18.8	20.4	3.3	0.0	42.5	134.1	200.0	-3.5	Digital
750.00	H	345.0	1.5	17.1	21.4	3.5	0.0	42.1	126.7	200.0	-4.0	Digital
800.00	H	300.0	1.3	7.7	21.0	3.6	0.0	32.2	40.9	200.0	-13.8	Digital
900.00	H	180.0	1.3	12.0	22.6	3.9	0.0	38.5	83.9	200.0	-7.5	Digital
950.00	H	200.0	1.5	6.0	22.6	3.9	0.0	32.5	42.4	200.0	-13.5	Digital
850.00	H	180.0	1.3	8.8 Peak	22.4	3.7	0.0	34.9	55.5	200.0	-11.1	Digital
1000.00	H	90.0	1.0	31.0	24.6	2.2	32.2	25.6	19.1	500.0	-28.4	Digital
1668.83	H	270.0	1.0	31.7	27.1	2.4	31.4	29.8	30.8	500.0	-24.2	Digital
1772.10	H	90.0	1.0	34.7	27.4	2.4	31.3	33.2	45.7	500.0	-20.8	Digital
1829.45	H	0.0	1.0	36.5	27.6	2.4	31.2	35.2	57.8	500.0	-18.7	Digital
1931.42	H	0.0	1.0	35.5	27.8	2.5	31.2	34.7	54.2	500.0	-19.3	Digital
2000.00	H	0.0	1.0	28.5	28.0	2.6	31.1	28.0	25.1	500.0	-26.0 **a**	Digital
1000.00	V	0.0	1.0	37.6	24.6	2.2	32.2	32.2	40.7	500.0	-21.8	Digital
1440.02	V	220.0	1.0	34.2	26.4	2.3	31.6	31.3	36.6	500.0	-22.7	Digital
1668.83	V	180.0	1.0	35.0	27.1	2.4	31.4	33.1	45.2	500.0	-20.9	Digital
1746.80	V	180.0	1.0	31.0	27.3	2.4	31.3	29.4	29.5	500.0	-24.6	Digital
1772.10	V	180.0	1.0	33.6	27.4	2.4	31.3	32.1	40.3	500.0	-21.9	Digital
1829.45	V	270.0	1.0	39.3	27.6	2.4	31.2	38.1	80.0	500.0	-15.9	Digital
1931.42	V	280.0	1.0	41.0	27.8	2.5	31.2	40.2	102.2	500.0	-13.8	Digital
2000.00	V	0.0	1.0	28.2	28.0	2.6	31.1	27.7	24.2	500.0	-26.3 **a**	Digital

a = ambient reading

Table 6: Radiated Emission Test Data >1GHz, RFID Low Channel

CLIENT:	Checkpoint	DATE:	2/22/2005
TESTER:	James Ritter	JOB #:	8602
EUT Information:		**Test Requirements:**	
EUT:	Mulitiprotocol System	TEST STANDARD:	FCC Part 15
CONFIGURATION:	AR400 Tx at 902.75 MHz (Max power, 27dBm @ 256-7 setting)		
	TR4024 TX hopping from 7.6-8.7 MHz, PDA =22		
CLASS:	B	DISTANCE:	3m
Test Equipment/Limit:			
ANTENNA:	A_00004	LIMIT:	LFCC_3m_Class_B
CABLE:	CSITE1_HF	AMPLIFIER (dB)	A_00312

Frequency (MHz)	Polarity H/V	Az Deg	Ant. Hght (m)	SA Level (dBµV)	Ant. Corr. (dB/m)	Cable Corr. (dB)	Amp Gain (dB)	Duty Cycle dB	Corr. Level (dBµV/m)	Corr. Level (µV/m)	Limit (µV/m)	Margin dB
Peak												
2708.25	H	290.0	1.0	55.7	29.5	3.2	34.4	0.0	53.9	497.0	5000.0	-20.1
3611.00	H	45.0	1.0	49.8	30.7	3.7	35.2	0.0	49.1	283.8	5000.0	-24.9
4513.75	H	290.0	1.0	45.0	32.0	4.0	34.8	0.0	46.2	204.5	5000.0	-27.8
5416.50	H	270.0	1.0	41.7	33.5	4.2	34.6	0.0	44.8	172.8	5000.0	-29.2
8124.75	H	0.0	1.0	40.5	37.4	5.3	34.9	0.0	48.2	258.2	5000.0	-25.7 **a**
9027.50	H	0.0	1.0	40.3	38.0	5.5	35.0	0.0	48.8	276.7	5000.0	-25.1 **a**
2708.25	V	220.0	1.0	56.2	29.5	3.2	34.4	0.0	54.4	525.8	5000.0	-19.6
3611.00	V	0.0	1.0	47.8	30.7	3.7	35.2	0.0	47.1	225.4	5000.0	-26.9
4513.75	V	350.0	1.0	45.3	32.0	4.0	34.8	0.0	46.5	212.4	5000.0	-27.4
5416.50	V	190.0	1.0	39.8	33.5	4.2	34.6	0.0	42.9	139.4	5000.0	-31.1
8124.75	V	0.0	1.0	40.3	37.4	5.3	34.9	0.0	48.1	253.2	5000.0	-25.9 **a**
9027.50	V	0.0	1.0	40.1	38.0	5.5	35.0	0.0	48.6	270.4	5000.0	-25.3 **a**
AVG												
2708.25	H	290.0	1.0	47.8	29.5	3.2	34.4	-17.6	28.5	26.6	500.0	-25.5
3611.00	H	45.0	1.0	40.2	30.7	3.7	35.2	-17.6	21.8	12.3	500.0	-32.2
4513.75	H	290.0	1.0	34.2	32.0	4.0	34.8	-17.6	17.8	7.7	500.0	-36.2
5416.50	H	270.0	1.0	29.1	33.5	4.2	34.6	-17.6	14.6	5.3	500.0	-39.4
8124.75	H	0.0	1.0	28.0	37.4	5.3	34.9	-17.6	18.1	8.1	500.0	-35.8 **a**
9027.50	H	0.0	1.0	33.7	38.0	5.5	35.0	-17.6	24.6	17.0	500.0	-29.4 **a**
2708.25	V	220.0	1.0	48.8	29.5	3.2	34.4	-17.6	29.5	29.8	500.0	-24.5
3611.00	V	0.0	1.0	39.5	30.7	3.7	35.2	-17.6	21.1	11.4	500.0	-32.8
4513.75	V	350.0	1.0	35.5	32.0	4.0	34.8	-17.6	19.1	9.0	500.0	-34.9
5416.50	V	190.0	1.0	28.2	33.5	4.2	34.6	-17.6	13.6	4.8	500.0	-40.4
8124.75	V	0.0	1.0	28.0	37.4	5.3	34.9	-17.6	18.1	8.1	500.0	-35.8 **a**
9027.50	V	0.0	1.0	28.7	38.0	5.5	35.0	-17.6	19.6	9.6	500.0	-34.4 **a**

a = ambient reading

Table 7: Radiated Emission Test Data >1GHz, RFID Mid Channel

CONFIGURATION: AR400 Tx at 915.25 MHz (Max power, 27dBm @ 256-7 setting)
TR4024 TX hopping from 7.6-8.7 MHz, PDA =22

Frequency (MHz)	Polarity H/V	Az Degree	Ant. Hght (m)	SA Level (dBµV)	Ant. Corr. (dB/m)	Cable Corr. (dB)	Amp Gain (dB)	Duty Cycle dB	Corr. Level (dBµV/m)	Corr. Level (µV/m)	Limit (µV/m)	Margin dB
Peak												
2745.75	H	10.0	1.0	57.5	29.6	3.2	34.5	0.0	55.7	609.6	5000.0	-18.3
3661.00	H	45.0	1.0	48.2	30.8	3.7	35.1	0.0	47.5	237.0	5000.0	-26.5
4576.25	H	0.0	1.0	40.8	32.1	4.0	34.8	0.0	42.2	128.7	5000.0	-31.8
7322.00	H	0.0	1.0	39.8	37.1	5.0	34.8	0.0	47.1	226.4	5000.0	-26.9 **a**
8237.25	H	0.0	1.0	40.5	37.5	5.3	34.9	0.0	48.3	261.2	5000.0	-25.6 **a**
9152.50	H	0.0	1.0	41.0	38.1	5.5	34.9	0.0	49.8	307.5	5000.0	-24.2
2745.75	V	0.0	1.0	54.3	29.6	3.2	34.5	0.0	52.5	423.2	5000.0	-21.4
3661.00	V	0.0	1.0	45.7	30.8	3.7	35.1	0.0	45.0	177.7	5000.0	-29.0
4576.25	V	0.0	1.0	43.7	32.1	4.0	34.8	0.0	45.0	178.4	5000.0	-28.9
7322.00	V	0.0	1.0	42.0	37.1	5.0	34.8	0.0	49.3	291.6	5000.0	-24.7 **a**
8237.25	V	10.0	1.0	41.5	37.5	5.3	34.9	0.0	49.3	293.1	5000.0	-24.6 **a**
9152.50	V	0.0	1.0	41.5	38.1	5.5	34.9	0.0	50.3	325.8	5000.0	-23.7
AVG												
2745.75	H	10.0	1.0	54.5	29.6	3.2	34.5	-17.6	35.1	56.9	500.0	-18.9
3661.00	H	45.0	1.0	38.1	30.8	3.7	35.1	-17.6	19.8	9.8	500.0	-34.2
4576.25	H	0.0	1.0	30.4	32.1	4.0	34.8	-17.6	14.2	5.1	500.0	-39.8
7322.00	H	0.0	1.0	24.7	37.1	5.0	34.8	-17.6	14.4	5.2	500.0	-39.6 **a**
8237.25	H	0.0	1.0	28.6	37.5	5.3	34.9	-17.6	18.8	8.7	500.0	-35.1 **a**
9152.50	H	0.0	1.0	28.3	38.1	5.5	34.9	-17.6	19.5	9.4	500.0	-34.5
2745.75	V	0.0	1.0	50.8	29.6	3.2	34.5	-17.6	31.4	37.2	500.0	-22.6
3661.00	V	0.0	1.0	38.0	30.8	3.7	35.1	-17.6	19.7	9.7	500.0	-34.3
4576.25	V	0.0	1.0	30.5	32.1	4.0	34.8	-17.6	14.3	5.2	500.0	-39.7
7322.00	V	0.0	1.0	29.3	37.1	5.0	34.8	-17.6	19.0	8.9	500.0	-35.0
8237.25	V	10.0	1.0	30.0	37.5	5.3	34.9	-17.6	20.2	10.3	500.0	-33.7
9152.50	V	0.0	1.0	28.3	38.1	5.5	34.9	-17.6	19.5	9.4	500.0	-34.5

a = ambient reading

Table 8: Radiated Emission Test Data >1GHz, RFID High Channel

CONFIGURATION: AR400 Tx at 927.25 MHz (Max power, 27dBm @ 256-7 setting)
TR4024 TX hopping from 7.6-8.7 MHz, PDA =22

Frequency (MHz)	Polarity H/V	Az Degree	Ant. Hght (m)	SA Level (dBµV)	Ant. Corr. (dB/m)	Cable Corr. (dB)	Amp Gain (dB)	Duty Cycle dB	Corr. Level (dBµV/m)	Corr. Level (µV/m)	Limit (µV/m)	Margin dB
Peak												
2781.75	H	10.0	1.0	56.2	29.6	3.2	34.7	0.0	54.3	519.9	5000.0	-19.7
3709.00	H	0.0	1.0	49.8	30.8	3.7	35.1	0.0	49.2	289.9	5000.0	-24.7
4636.25	H	350.0	1.0	46.5	32.2	4.0	34.7	0.0	48.0	251.1	5000.0	-26.0
7418.00	H	290.0	1.0	40.7	37.1	5.1	34.8	0.0	48.0	251.6	5000.0	-26.0
8345.25	H	0.0	1.0	40.0	37.6	5.3	34.9	0.0	47.9	249.4	5000.0	-26.0 **a**
2781.75	V	220.0	1.0	55.5	29.6	3.2	34.7	0.0	53.6	481.3	5000.0	-20.3
3709.00	V	180.0	1.0	49.8	30.8	3.7	35.1	0.0	49.2	289.9	5000.0	-24.7
4636.25	V	0.0	1.0	46.7	32.2	4.0	34.7	0.0	48.2	255.8	5000.0	-25.8
7418.00	V	0.0	1.0	47.0	37.1	5.1	34.8	0.0	54.3	521.5	5000.0	-19.6 **a**
8345.25	V	0.0	1.0	47.0	37.6	5.3	34.9	0.0	54.9	558.2	5000.0	-19.0 **a**
AVG												
2781.75	H	10.0	1.0	49.5	29.6	3.2	34.7	-17.6	30.0	31.8	500.0	-23.9
3709.00	H	0.0	1.0	40.5	30.8	3.7	35.1	-17.6	22.3	13.1	500.0	-31.7
4636.25	H	350.0	1.0	35.2	32.2	4.0	34.7	-17.6	19.1	9.0	500.0	-34.9
7418.00	H	290.0	1.0	29.2	37.1	5.1	34.8	-17.6	18.9	8.9	500.0	-35.0 **a**
8345.25	H	0.0	1.0	28.2	37.6	5.3	34.9	-17.6	18.5	8.4	500.0	-35.4 **a**
2781.75	V	220.0	1.0	49.2	29.6	3.2	34.7	-17.6	29.7	30.6	500.0	-24.3
3709.00	V	180.0	1.0	39.3	30.8	3.7	35.1	-17.6	21.1	11.4	500.0	-32.8
4636.25	V	0.0	1.0	33.8	32.2	4.0	34.7	-17.6	17.7	7.7	500.0	-36.3
7418.00	V	0.0	1.0	34.5	37.1	5.1	34.8	-17.6	24.2	16.3	500.0	-29.7 **a**
8345.25	V	0.0	1.0	29.2	37.6	5.3	34.9	-17.6	19.5	9.4	500.0	-34.5 **a**

a = ambient reading

4.9 Radiated Spurious Emissions: EAS System (FCC Part §2.1053, §15.223)

The EUT must comply with the requirements for radiated spurious emissions per the §15.223. Emissions within the band of 1.7M – 10MHz shall not exceed 100uV/m at 30m test distance. Emissions occurring outside the band shall comply with the general emission limits as specified in §15.209.

4.9.1 Test Procedure

The EUT was placed on motorized turntable for radiated testing on a 30-meter open field test site. The emissions from the EUT were measured continuously at every azimuth by rotating the turntable. A loop antenna was used for measuring the emissions below 30MHz. Additionally, measurements below 30MHz were performed with an average measurement and peak measurement.

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

Sample Calculation:

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

Worst case data are supplied in the following table. Testing was performed while both the RFID radio and the EAS radio were operating to cover any co-location issues.

Table 9, Radiated Spurious Emissions to 30MHz, EAS System, §15.223

CLIENT: Checkpoint DATE: 2/22/2005
TESTER: James Ritter JOB #: 8602

EUT Information:

EUT: Mulitiprotocol System
CONFIGURATION: AR 400 hopping 902.75-927.25 MHz (Max power, 27dBm @ 256-7 setting)
TR4024 TX hopping from 7.6-8.7 MHz, PDA =22

Test Requirements:

TEST STANDARD: FCC Part 15.223

Test Equipment/Limit:

ANTENNA: A_00031 LIMIT: Pt 15.223
CABLE: CSITE1_30m AMPLIFIER (dB) None

Freq. (MHz)	Pol H/V	Az Deg	Ant. Hght (m)	SA Level dBµV	Ant. Corr. dB/m	Cable Corr. (dB)	Corr. Level dBµV/m	Corr. Level µV/m	Limit µV/m	Margin dB	Comments
7.68	Y	0.0	1.0	43.1	10.3	1.2	54.7	542.1	1000.0	-5.3	@30m peak-300kHz RBW (pulse desense)
7.68	Y	0.0	1.0	12.5	10.3	1.2	24.1	16.0	100.0	-15.9	@30m avg
7.68	X	0.0	1.0	45.1	10.3	1.2	56.7	682.5	1000.0	-3.3	@30m peak-300kHz RBW (pulse desense)
7.68	X	0.0	1.0	6.8	10.3	1.2	18.4	8.3	100.0	-21.6	@30m avg
7.68	Z	0.0	1.0	42.0	10.3	1.2	53.6	477.6	1000.0	-6.4	@30m peak-300kHz RBW (pulse desense)
7.68	Z	0.0	1.0	11.1	10.3	1.2	22.7	13.6	100.0	-17.3	@30m avg
10.00	X	0.0	1.0	11.7	10.5	1.3	23.5	14.9	30.0	-6.1	ambient – Band edge
1.705	X	0.0	1.0	8.3	10.4	1.1	19.8	9.7	30.0	-9.8	ambient – Band edge
10.66	X	190.0	1.0	10.1	10.6	1.3	22.0	12.5	30.0	-7.6	30m BB
12.23	X	190.0	1.0	9.5	10.7	1.3	21.5	11.9	30.0	-8.0	30m BB
14.29	X	0.0	1.0	9.4	10.9	1.3	21.7	12.1	30.0	-7.9	30m BB
23.04	X	0.0	1.0	9.3	9.9	1.4	20.6	10.7	30.0	-9.0	30m BB
10.66	Y	190.0	1.0	11.0	10.6	1.3	22.9	13.9	30.0	-6.7	30m BB
12.23	Y	190.0	1.0	8.2	10.7	1.3	20.2	10.3	30.0	-9.3	30m BB
14.29	Y	0.0	1.0	8.0	10.9	1.3	20.2	10.3	30.0	-9.3	30m BB
23.04	Y	10.0	1.0	6.8	9.9	1.4	18.0	8.0	30.0	-11.5	30m BB
10.66	Z	180.0	1.0	10.0	10.6	1.3	21.9	12.4	30.0	-7.7	30m BB
12.23	Z	180.0	1.0	8.0	10.7	1.3	20.0	10.0	30.0	-9.5	30m BB
14.29	Z	0.0	1.0	8.4	10.9	1.3	20.6	10.8	30.0	-8.9	30m BB
23.04	Z	10.0	1.0	6.9	9.9	1.4	18.1	8.1	30.0	-11.4	30m BB

4.10 AC Powerline Conducted Emissions: (FCC Part §15.207)

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

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

Both the RFID radio and EAS radio were active during the test.

Data is recorded in Table 10.

Table 10. Conducted Emissions Test Data Sheet

CLIENT:	Checkpoint	DATE:	2/22/2005
TESTER:	James Ritter	JOB #:	8602
EUT:	Mulitiprotocol System		
CONFIGURATION:	AR 400 hopping 902.75-927.25 MHz (Max power, 27dBm @ 256-7 setting) TR4024 TX hopping from 7.6-8.7 MHz, PDA =22		
TEST STANDARD:	FCC_B	LISN 1:	A_00125
TEST SITE:	CSITE1_CE		
VOLTAGE:	120 VAC	LISN 2:	A_00126

LINE 1 - NEUTRAL (LISN 1)

Frequency MHz	Level QP dBuV	Cable Loss dB	LISN Corr dB	Corr Level dBuV	Limit QP dBuV	Margin QP dB	Level AVG dBuV	Corr Level dBuV	Limit AVG dBuV	Margin AVG dB
0.20	34.9	10.6	1.4	46.8	63.8	-17.0	20.9	32.8	53.8	-21.0
1.16	31.8	10.8	0.3	42.9	56.0	-13.1	27.3	38.4	46.0	-7.6
4.33	26.9	11.1	0.4	38.4	56.0	-17.6	16.6	28.1	46.0	-17.9
7.74	45.0	11.4	0.5	56.8	60.0	-3.2	25.0	36.8	50.0	-13.2
8.01	42.2	11.4	0.5	54.1	60.0	-5.9	22.9	34.8	50.0	-15.2
8.24	43.1	11.3	0.5	54.9	60.0	-5.1	18.8	30.6	50.0	-19.4
13.70	29.4	11.7	0.8	41.9	60.0	-18.1	25.4	37.9	50.0	-12.1
15.36	26.7	11.8	0.9	39.4	60.0	-20.6	12.0	24.7	50.0	-25.3

LINE 2 - PHASE (LISN 2)

Frequency MHz	Level QP dBuV	Cable Loss dB	LISN Corr dB	Corr Level dBuV	Limit QP dBuV	Margin QP dB	Level AVG dBuV	Corr Level dBuV	Limit AVG dBuV	Margin AVG dB
0.20	35.6	10.6	0.9	47.1	63.8	-16.8	22.0	33.5	53.8	-20.4
1.16	28.7	10.8	0.3	39.8	56.0	-16.2	23.8	34.9	46.0	-11.1
4.33	27.4	11.1	0.4	38.9	56.0	-17.1	16.7	28.2	46.0	-17.8
7.74	46.5	11.4	0.4	58.3	60.0	-1.7	25.2	37.0	50.0	-13.0
8.01	44.7	11.4	0.5	56.6	60.0	-3.4	22.6	34.5	50.0	-15.5
8.24	44.9	11.3	0.5	56.6	60.0	-3.4	20.3	32.1	50.0	-17.9
13.70	25.1	11.7	0.7	37.5	60.0	-22.5	18.7	31.1	50.0	-18.9
15.36	28.3	11.8	0.8	40.9	60.0	-19.1	13.0	25.6	50.0	-24.4

4.11 Checkpoint/FCC Correspondence Fax

MAR 13 '97 10:59 TO-912105223396 FROM-CHECKPOINT SYSTEMS INC T-085 P.02/02 F-071
JUL 29 '96 15:19 TO-918013442060 FROM-CHECKPOINT SYSTEMS INC T-031 P.01/02 F-074

CHECKPOINT SYSTEMS, INC.

FACSIMILE TRANSMISSION COVER

To: F.C.C. Lab — Date: 7/26/96

Attention: Mr. Ed Gibbons

Fax No: (301) 344-2050 — No. of Pages: 2 (Incl. Cover)

From: Mr. Gregory E. Sleet
CHECKPOINT SYSTEMS, INC.
101 WOLF DRIVE, P.O. BOX 188
THOROFARE, N.J. 08086

Telephone: (609) 384-2339 Direct
Toll Free: (800) 257-5540 Ext. 2339
Fax. No.: (609) 384-2366

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Dear Mr. Gibbons:

Following up on our recent phone conversations, please confirm and if necessary correct our understanding of the points discussed below. Based on the details of our fax dated 7/3/96:

✓ • Our pulsed emissions will be treated as frequency hoping, where the bandwidth will be considered the spectrum contained between the lowest and highest carrier frequency we pulse.

✓ • A simple ratio of the maximum single restricted band infringed upon divided by the bandwidth of our fundamental emission must be less the 1% to satisfy section 15.205 of the rules.

→ • For fundamental and harmonic emissions ~~below 30 MHz~~, a 20 dB reduction from the true peak is to be compared to the limits of 100uV/meter ~~and 30uV/meter respectively~~ at 30 meters. The unit is modulated as normally installed. True peak refers to the point at which the analyzer bandwidth is adjusted for minimum pulse desensitization.

→ • For ~~harmonics above 30 MHz~~ CISPR quasi-peak measurements will be made with the unit modulating as normally installed. Based on the bandwidth plot, care must be given to measure multiples of the worst case emission points. Limits are as specified in section 15.209.

✓ • Conducted emissions remain as specified in part 15 of the rules.

Ed Gibbons
8/2/96