Certification Test Report

Certification Test Report for Checkpoint Systems Inc. FCC ID: DO4CSRO7500 IC ID: 3356B-CSRO7500

May 17, 2004

Prepared for:

Checkpoint Systems Inc.
101 Wolf Drive
Thorofare, NJ 08086

Prepared By:

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

Certification Test Program

Certification Test Report
for the
Checkpoint Systems Inc.
Checkstation II RFID System
FCC ID: DO4CSRO7500
IC ID: 3356B-CSRO7500

May 17, 2004

WLL JOB# 8079

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 an Intentional Radiator under FCC Part 15.225 and Industry Canada RSS-210. This Certification Test Report documents the test configuration and test results for a Checkpoint Systems Inc. Checkstation II 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 Industry Canada (Industry Canada file numbers IC 3035-1 [Site 1] and IC 3035-2 [Site 2]) and approved by NIST NVLAP (NVLAP Lab Code 200066-0) as an independent laboratory. The application was prepared by Washington Laboratories Ltd. in Gaithersburg, MD.

The Checkpoint Systems Inc. Checkstation II RFID System complies with the limits for an Intentional Radiator device under FCC Part 15.225 and Industry Canada RSS-210.

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1 Introduction

1.1 Compliance Statement

The Checkpoint Systems Inc. Checkstation II RFID System complies with the limits for an Intentional Radiator device under FCC Part 15.225 and Industry Canada RSS-210.

1.2 Test Scope

Tests for radiated and conducted emissions were performed. All measurements were performed according to the 2001 version of ANSI C63.4. The measurement equipment conforms to ANSI C63.2 Specifications for Electromagnetic Noise and Field Strength Instrumentation.

1.3 Contract Information

Customer:	Checkpoint Systems Inc. 101 Wolf Drive Thorofare, NJ 08086
Purchase Order Number:	249209
Quotation Number:	61322-C

1.4 Test Dates

Testing was performed from April 7 to April 28, 2004.

1.5 Test and Support Personnel

Washington Laboratories, LTD	Steve Koster, James Ritter, Thuan Ta
Customer	Bayode Olabisi, Gerry Laramee

1.6 Abbreviations

A	Ampere
Ac	alternating current
AM	Amplitude Modulation
Amps	Amperes
b/s	bits per second
BW	Bandwidth
CE	Conducted Emission
Cm	centimeter
CW	Continuous Wave
DB	decibel
Dc	direct current
EMI	Electromagnetic Interference
EUT	Equipment Under Test
FM	Frequency Modulation
G	giga - prefix for 10^9 multiplier
Hz	Hertz
IF	Intermediate Frequency
K	kilo - prefix for 10^3 multiplier
M	Mega - prefix for 10^6 multiplier
M	Meter
μ	micro - prefix for 10^{-6} multiplier
NB	Narrowband
LISN	Line Impedance Stabilization Network
RE	Radiated Emissions
RF	Radio Frequency
Rms	root-mean-square
SN	Serial Number
S/A	Spectrum Analyzer
V	Volt

2 Equipment Under Test

2.1 EUT Identification & Description

The Checkpoint Systems Inc. Checkstation II RFID System is a 13.56 MHz RFID system for use as a self checkout station in a library. The Checkstation II system contains a display monitor and a keyboard. Data output is via a Network connection provided on the unit.

The EUT is powered via 120 VAC power supply. The monitor is separately powered via 120 VAC.

Table 1. Device Summary

ITEM	DESCRIPTION
Manufacturer:	Checkpoint Systems Inc.
FCC ID Number	DO4CSRO7500
Industry Canada Number	3356B-CSRO7500
EUT Name:	RFID System
Model:	Checkstation II
FCC Rule Parts:	§15.225
Frequency Range:	13.56 MHz Fixed
Maximum Output Power: (Radiated)	860 µV/m at 10 meters
Modulation:	None
Occupied Bandwidth:	3.04 kHz
Type of Information:	Data
Number of Channels:	1
Power Output Level	Fixed
Antenna Type	Internal - PCB
Frequency Tolerance:	±0.01% (±100 ppm)
Interface Cables:	Power, LAN to Hub
Power Source & Voltage:	-24Vdc from 120-240Vac

2.2 Test Configuration

The EUT was setup to simulate normal use. The Checkstation II monitor was connected to the Checkpoint RFID reader through a Video and DB9 Cable. A shielded CAT-5 Ethernet cable connected the support Desktop computer to the main RFID Reader. The RFID (Checkpoint II unit) was powered through a Deltron power supply (120-240 VAC - 24 VDC output) via a 4 pin cable. The Checkpoint monitor has a separate AC/DC power supply.

2.3 Testing Algorithm

The Checkstation II was set to continuously read a RFID TAG unit via a DOS Program. A Scanner tag was placed under the bar code scanner part of unit so the continuous operation could occur. Also, a support laptop was used to constantly ping the EUT for activity on the Network port.

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. Washington Laboratories, Ltd. has been accepted by the FCC and approved by NIST NVLAP (NVLAP Lab Code: 200066-0) as an independent FCC test laboratory.

2.5 Measurements

2.5.1 References

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

ANSI C63.4 American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

2.6 Measurement Uncertainty

All results reported herein relate only to the equipment tested. For the purposes of the measurements performed by Washington Laboratories, the measurement uncertainty is ±2.3 dB. This has been calculated for a *worst-case situation* (radiated emissions measurements performed on an open area test site).

The following measurement uncertainty calculation is provided:

$$\text{Total Uncertainty} = (A^2 + B^2 + C^2)^{1/2}/(n-1)$$

where:

A = Antenna calibration uncertainty, in dB = 2 dB

B = Spectrum Analyzer uncertainty, in dB = 1 dB

C = Site uncertainty, in dB = 4 dB

n = number of factors in uncertainty calculation = 3

Thus, Total Uncertainty = $0.5\ (2^2 + 1^2 + 4^2)^{1/2} = \pm 2.3$ dB.

3 Test Equipment

Table 2 shows a list of the test equipment used for measurements along with the calibration information.

Table 2: Test Equipment List

Manufacturer	Model/Type	Function	Identification	Cal. Due
HP	8568B	Spectrum Analyzer	2634A02888	7/07/04
HP	85650A	Quasi-Peak Adapter	3303A01786	7/08/04
HP	85685A	RF Preselector	3221A01395	7/07/04
HP	Spectrum Analyzer	HP 8593A	3009A00739	6/25/04
Solar	8012-50-R-24BNC	LISN	8379493	6/30/04
ARA	LPB-2520	BiconiLog Antenna	1044	6/20/04
EMCO	6502	Loop Antenna	8903-2333	8/18/04

4 Test Results

4.1 Summary of Test Results for Industry Canada

Equipment Model:	Test Report Page or References
Transmitter tested to RSS-210 Section 6.2.2(e)	
Field Strength 890 µV/m at a distance of 10 meters	Table 5
RF Power N/A Watts	N/A
Peak-to-average ratio dB or □ CISPR	N/A
Test Conditions: **X** Radiated (sections 11 & 13)	
□ Terminated (section 10)	N/A
□ DC Input Power (section 12)	N/A
Transmitter Frequency: 13.56 MHz	
Bandwidth: 3.04kHz	Table 3
Frequency Tuning Range: N/A, Transmit is fixed frequency	N/A
Frequency Stability: ±0.01%	Section 4.5
Transmitter Spurious (worst case)	Section 4.3
Field Strength: 8.8 µV/m at a distance of 10.0 meters	Table 5
Frequency: 27.118 MHz	Table 5
Momentary Operation? □ Yes X No	
Holdover time after manual release: N/A seconds or Duration of transmission after automatic activation: N/A seconds	N/A
Transmitter/Receiver AC Wireline Conducted Emissions (worst case)	Section 4.4
Transmitter: RF level 139.6 microvolts Frequency 158 kHz	Table 8
Receiver : RF level N/A microvolts Frequency N/A	N/A
Receiver Spurious (worst case)	N/A
Field Strength N/A µV/m, at a distance of N/A meters or RF N/A nanowatts Frequency N/A	N/A
Attestation: The radio apparatus identified in this application has been subject to all the applicable test conditions specified in RSS-210 and all of the requirements of the Standard have been met.	
Title Gregory M. Snyder, Chief EMC Engineer	
Name (print) Signature Date	

4.2 Occupied Bandwidth

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

The occupied bandwidth was measured as shown:

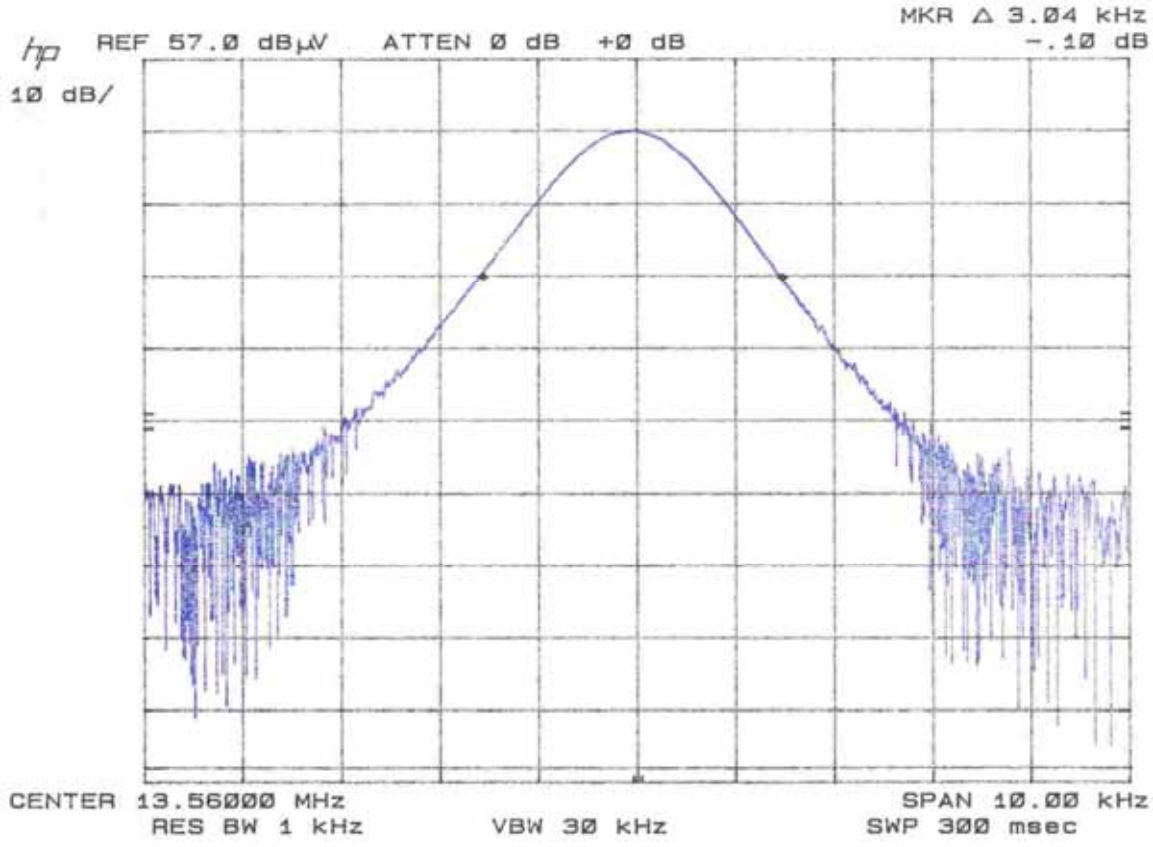

Figure 1. Occupied Bandwidth

Table 3 provides a summary of the Occupied Bandwidth Results.

Table 3. Occupied Bandwidth Results

Frequency	Bandwidth	Limit	Pass/Fail
13.56MHz	3.04kHz	N/A	Pass

4.3 Radiated Spurious Emissions, §15.225, §15.209, and RSS-210

Radiated emissions from the EUT must comply with the field strength limits as specified in FCC Part 15.225 and 15.209 and Industry Canada RSS-210. The limits for the radiated emissions are as shown in the following table.

Table 4. Radiated Spurious Emissions Limits

Frequency (MHz)	Limit (μV/m)	Rule Part Reference
13.553 - 13.567	15,848 (@ 30m)	§15.225(a), RSS-210 6.2.2(e)
13.410 – 13.553	334 (@ 30m)	§15.225(b), RSS-210 6.2.2(e)
13.567 – 13.710	334 (@ 30m)	§15.225(b), RSS-210 6.2.2(e)
13.110 – 13.410	106 (@ 30m)	§15.225(c), RSS-210 6.2.2(e)
13.710 – 14.010	106 (@ 30m)	§15.225(c), RSS-210 6.2.2(e)
1.705 – 13.110 14.010 – 30.0	30 (@ 30m)	§15.225(d), §15.209, RSS-210 6.2.2(e)
30 - 88	100 (@ 3m)	§15.225(d), §15.209, RSS-210 6.2.2(e)
88 - 216	150 (@ 3m)	§15.225(d), §15.209, RSS-210 6.2.2(e)
216 - 960	200 (@ 3m)	§15.225(d), §15.209, RSS-210 6.2.2(e)
Above 960	500 (@ 3m)	§15.225(d), §15.209, RSS-210 6.2.2(e)

4.3.1 **Test Procedure**

The EUT was placed on motorized turntable for radiated testing on an Open Area 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 C63.4-2001. Cables were varied in position to produce maximum emissions. Both the horizontal and vertical field components were measured

Testing at frequencies below 30 MHz was performed at ten meters with a loop antenna. Limits were interpolated from the 30 meter limit to the equivalent at 10 meters. Three orientations of the loop antenna were tested.

Emissions were scanned up to 2 GHz. Only the 2nd harmonic of the fundamental frequency was detected. No other emissions were detected that were related to the RFID Transmitter. All other emissions detected were related to digital emissions of the Checkstation II electronics. Since the EUT is used in a commercial application, these

digital emissions were compared to the Class A limit of §15.109(b). For emissions up to 30 MHz and above 1 GHz peak levels were recorded. Emissions from 30 MHz to 1000 MHz were measured using a Quasi-peak detector. Worst case emissions are reported in the data table.

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

Sample Calculation:

Spectrum Analyzer Voltage (SA Level): VdBμV

Antenna Factor (Ant Corr): AFdB/m

Cable Loss Correction (Cable Corr): CCdB

Amplifier Gain: GdB (if applicable)

Electric Field (Corr Level): EdBμV/m = VdBμV + AFdB/m + CCdB - GdB

To convert to linear units: EμV/m = antilog (EdBμV/m/20)

4.3.2 Test Results

The EUT complies with the radiated emission requirements of §15.225 and RSS-210 6.2.2(e). Test data is included in Table 5. Additionally, test data for the digital emissions are listed in Table 6.

Table 5: Radiated Spurious Emissions, §15.225, §15.209 and RSS-210

CLIENT: Checkpoint Systems, Inc.
DATE: 4/1/04
TESTER: James Ritter
JOB #: 8078

EUT Information:
EUT: CheckStation II
TEST STANDARD: FCC15.225, RSS-210 6.2.2(e)
CONFIGURATION: Continuous RFID tag reading (constant TX)
DISTANCE: 10m
CLASS: B

Frequency (MHz)	Polarity H/V	Azimuth Degree	Ant. Height (m)	SA Level (Peak) (dBµV)	Ant. Corr. (dB/m)	Cable Corr. (dB)	Corr. Level (dBµV/m)	Corr. Level (µV/m)	Limit (10m) (µV/m)	Margin dB
13.559	X	0.0	1.0	40.6	10.7	1.4	52.7	430.8	50116.0	-41.3
13.559	Y	300.0	1.0	46.6	10.7	1.4	58.7	859.5	50116.0	-35.3
13.559	Z	125.0	1.0	31.6	10.7	1.4	43.7	152.8	50116.0	-50.3
13.567	Y	100.0	1.0	2.5	10.7	1.4	14.6	5.4	1056.0	-45.9
13.553	Y	90.0	1.0	1.6	10.7	1.4	13.7	4.8	1056.0	-46.8
27.118	Y	0.0	1.0	8.4	9.1	1.4	18.9	8.8	94.0	-20.5

Table 6: Radiated Emissions Data, §15.109 and RSS-210

Digital Section Emissions

CLIENT:	Checkpoint Systems Inc	DATE:	4/6/2004
TESTER:	James Ritter	JOB #:	8079
EUT:	Checkstation II	DISTANCE:	10m
STANDARDS:	FCC Part 15, IC RSS-210	CLASS:	A
CONFIGURATION:	Continuous RFID tag reading (constant TX)		
CLOCKS:	1.25 MHz, 40 MHz, 400 MHz, 66 MHz, 3.6 MHz, 14.3 MHz		
Test Equipment/Limit:			
ANTENNA:	A_00007	LIMIT:	LFCC_10m_Class_A
CABLE:	CSITE2_10m	AMPLIFIER (dB)	None

Frequency (MHz)	Polarity H/V	Azimuth Degree	Ant. Hght (m)	SA Level (QP) (dBµV)	Ant. Corr. (dB/m)	Cable Corr. (dB)	Corr. Level (dBµV/m)	Corr. Level (µV/m)	Limit (µV/m)	Margin dB
132.12	V	90.0	1.3	9.0	10.4	3.0	22.4	13.1	150.0	-21.1
135.59	V	280.0	1.2	15.5	9.9	2.8	28.2	25.7	150.0	-15.3
143.98	V	90.0	1.3	9.2	8.8	3.0	20.9	11.1	150.0	-22.6
199.99	V	270.0	1.3	12.0	9.8	3.3	25.1	18.0	150.0	-18.4
200.09	V	280.0	1.0	13.5	9.8	3.3	26.6	21.4	150.0	-16.9
240.00	V	290.0	1.2	14.6	12.4	3.5	30.5	33.7	210.0	-15.9
280.00	V	45.0	1.2	13.5	13.2	3.8	30.4	33.3	210.0	-16.0
332.73	V	180.0	1.0	19.8	14.2	4.1	38.0	79.6	210.0	-8.4
399.28	V	300.0	1.3	13.1	14.9	4.3	32.3	41.1	210.0	-14.2
499.09	V	90.0	1.0	14.1	16.8	4.8	35.8	61.5	210.0	-10.7
84.00	H	90.0	4.0	14.4	7.2	2.5	24.0	15.9	90.0	-15.1
133.00	H	180.0	3.0	10.8	10.3	3.0	24.0	15.9	150.0	-19.5
135.59	H	0.0	4.0	9.9	9.9	2.8	22.6	13.5	150.0	-20.9
143.98	H	180.0	3.5	10.3	8.8	3.0	22.0	12.6	150.0	-21.5
159.99	H	0.0	3.0	14.6	8.9	3.0	26.5	21.2	150.0	-17.0
200.09	H	180.0	3.5	12.2	9.8	3.3	25.3	18.4	150.0	-18.2
240.00	H	0.0	3.7	16.8	12.4	3.5	32.7	43.4	210.0	-13.7
240.00	H	270.0	3.5	14.3	12.4	3.5	30.2	32.5	210.0	-16.2
332.75	H	90.0	3.0	19.8	14.2	4.1	38.0	79.6	210.0	-8.4
360.00	H	245.0	3.0	14.2	14.4	4.2	32.8	43.5	210.0	-13.7
399.31	H	90.0	1.5	20.0	14.9	4.3	39.2	90.9	210.0	-7.3
499.10	H	90.0	1.3	14.0	16.8	4.8	35.7	60.8	210.0	-10.8

Table 7: Radiated Emissions Data, §15.109 and RSS-210

Digital Section Emissions

CLIENT:	Checkpoint Systems, Inc	DATE:	4/7/2004
TESTER:	James Ritter	JOB #:	8079
EUT:	Checkstation II	DISTANCE:	3m
STANDARD(S):	FCC Part 15, RSS-210		
CONFIGURATION:	Continuous RFID tag reading (constant TX)		
CLOCKS:	1.25 MHz, 40 MHz, 400 MHz, 66 MHz, 3.6 MHz, 14.3 MHz		

Test Equipment/Limit:

ANTENNA:	A_00425	LIMIT:	LFCC_10m_Class_A **Limit adjusted to 3 meters**
CABLE:	CSITE2_HF	AMPLIFIER (dB)	A_00066

Frequency (MHz)	Pol H/V	Azimuth Degree	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
1000.00	H	0.0	1.0	36.5	25.1	1.1	36.5	26.2	20.5	1000.0	-33.8 **a**
1070.50	H	190.0	1.0	37.2	25.5	1.3	36.4	27.7	24.2	1000.0	-32.3
1497.38	H	90.0	1.0	37.5	27.5	2.5	35.9	31.6	37.8	1000.0	-28.4
1600.00	H	0.0	1.0	32.1	27.9	2.7	35.8	26.9	22.0	1000.0	-33.1 **a**
1890.00	H	0.0	1.0	33.2	28.9	3.2	35.6	29.8	30.7	1000.0	-30.2 **a**
2000.00	H	0.0	1.0	32.0	29.2	3.4	35.5	29.2	28.7	1000.0	-30.9 **a**
1000.03	V	180.0	1.0	38.6	25.1	1.1	36.5	28.3	26.1	1000.0	-31.7
1070.50	V	190.0	1.0	36.8	25.5	1.3	36.4	27.3	23.1	1000.0	-32.7
1497.38	V	90.0	1.0	38.4	27.5	2.5	35.9	32.4	41.9	1000.0	-27.6
1600.00	V	0.0	1.0	35.7	27.9	2.7	35.8	30.5	33.4	1000.0	-29.5 **a**
1890.00	V	0.0	1.0	34.3	28.9	3.2	35.6	30.9	34.9	1000.0	-29.1 **a**
2000.00	V	0.0	1.0	32.2	29.2	3.4	35.5	29.4	29.4	1000.0	-30.6 **a**

a = ambient

4.4 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 Quasi-peak and Average measurements were made during the conducted emissions testing.

Two different conducted emissions tests were performed on the monitor. One test was with a filtered power cord (EUPEN type IMX-04). The second emissions test was performed with a ferrite (Fair-Rite P/N: 0431176451) placed on the power cord and wrapped 4 times through the ferrite.

Data is recorded in Table 8 through Table 10.

Table 8: Conducted Emissions Test Data, Main Unit

CLIENT: Checkpoint Systems, Inc.
DATE: 4/26/04
TEST STANDARD: FCC Part 15 and RSS-210
TESTER: James Ritter
JOB #: 8078
CLASS: FCC_A
TEST SITE: CSITE2_CE
TEST VOLTAGE: 120 VAC

LINE 1 - NEUTRAL

Frequency MHz	Level QP dBuV	Cable Loss dB	Limit QP dBuV	Margin QP dB	Level AVG dBuV	Cable Loss dB	Limit AVG dBuV	Margin AVG dB
0.158	31.5	10.7	65.6	-23.4	31.5	10.7	55.6	-13.4
0.266	28.2	10.7	61.2	-22.3	28.2	10.7	51.2	-12.3
0.213	23.1	10.7	63.1	-29.3	23.1	10.7	53.1	-19.3
0.528	18.1	10.8	56.0	-27.1	18.1	10.8	46.0	-17.1
0.320	13.0	10.7	59.7	-36.0	13.0	10.7	49.7	-26.0
13.558	8.7	12.2	60.0	-39.1	8.7	12.2	50.0	-29.1

LINE 2 - PHASE

Frequency MHz	Level QP dBuV	Cable Loss dB	Limit QP dBuV	Margin QP dB	Level AVG dBuV	Cable Loss dB	Limit AVG dBuV	Margin AVG dB
0.158	32.2	10.7	65.6	-22.7	32.2	10.7	55.6	-12.7
0.266	29.1	10.7	61.2	-21.4	29.1	10.7	51.2	-11.4
0.213	26.6	10.7	63.1	-25.8	26.6	10.7	53.1	-15.8
0.528	17.7	10.8	56.0	-27.5	17.7	10.8	46.0	-17.5
0.320	19.4	10.7	59.7	-29.6	19.4	10.7	49.7	-19.6
13.558	10.5	12.2	60.0	-37.3	10.5	12.2	50.0	-27.3

Table 9. Conducted Emissions Test Data, Monitor Unit (with Eupen IMX-04 Power Cord)

LINE 1 - NEUTRAL

Frequency MHz	Level QP dBuV	Cable Loss dB	Limit QP dBuV	Margin QP dB	Level AVG dBuV	Cable Loss dB	Limit AVG dBuV	Margin AVG dB
0.188	47.9	10.7	64.1	-5.5	36.1	10.7	54.1	-7.3
0.251	44.7	10.7	61.7	-6.3	36.4	10.7	51.7	-4.6
0.316	30.1	10.7	59.8	-19.0	24.1	10.7	49.8	-15.0
0.379	22.7	10.7	58.3	-24.9	18.9	10.7	48.3	-18.7
0.443	15.9	10.7	57.0	-30.4	14.4	10.7	47.0	-21.9
13.558	10.2	12.2	60.0	-37.6	4.3	12.2	50.0	-33.5

LINE 2 - PHASE

Frequency MHz	Level QP dBuV	Cable Loss dB	Limit QP dBuV	Margin QP dB	Level AVG dBuV	Cable Loss dB	Limit AVG dBuV	Margin AVG dB
0.188	47.5	10.7	64.1	-5.9	36.5	10.7	54.1	-6.9
0.251	44.4	10.7	61.7	-6.6	37.4	10.7	51.7	-3.6
0.316	28.7	10.7	59.8	-20.4	23.8	10.7	49.8	-15.3
0.379	20.9	10.7	58.3	-26.7	17.1	10.7	48.3	-20.5
0.443	16.0	10.7	57.0	-30.3	11.9	10.7	47.0	-24.4
13.558	11.7	12.2	60.0	-36.1	7.3	12.2	50.0	-30.5

Table 10. Conducted Emissions Data, Monitor Unit (with Ferrite)

CLIENT: Checkpoint
DATE: 4/28/04
TEST STANDARD: FCC Part 15
MODEL: CheckStation II
JOB #: 8078
CLASS: FCC_B
TESTER: Steve Koster
TEST VOLTAGE: 120 VAC

LINE 1 - NEUTRAL

Frequency	Level QP	Cable Loss	Limit QP	Margin QP	Level AVG	Cable Loss	Limit AVG	Margin AVG
MHz	dBuV	dB	dBuV	dB	dBuV	dB	dBuV	dB
0.188	43.8	10.7	64.1	-9.6	29.3	10.7	54.1	-14.1
0.251	34.3	10.7	61.7	-16.7	34.3	10.7	51.7	-6.7
0.316	30.1	10.7	59.8	-19.0	30.1	10.7	49.8	-9.0
1.880	22.7	11.2	56.0	-22.1	22.7	11.2	46.0	-12.1
6.450	24.3	11.6	60.0	-24.1	24.3	11.6	50.0	-14.1
13.558	29.7	12.2	60.0	-18.1	29.7	12.2	50.0	-8.1

LINE 2 - PHASE

Frequency	Level QP	Cable Loss	Limit QP	Margin QP	Level AVG	Cable Loss	Limit AVG	Margin AVG
MHz	dBuV	dB	dBuV	dB	dBuV	dB	dBuV	dB
0.190	43.9	10.7	64.0	-9.4	30.6	10.7	54.0	-12.7
0.254	35.5	10.7	61.6	-15.4	35.5	10.7	51.6	-5.4
0.636	26.8	10.8	56.0	-18.4	26.8	10.8	46.0	-8.4
5.640	23.4	11.6	60.0	-25.0	23.4	11.6	50.0	-15.0
13.558	30.6	12.2	60.0	-17.2	30.6	12.2	50.0	-7.2
15.760	29.2	12.4	60.0	-18.4	29.2	12.4	50.0	-8.4
25.43	21.6	12.8	60.0	-25.6	21.6	12.8	50.0	-15.6

4.5 Frequency Stability, §15.225(e) and RSS-210 6.2.2(e)

Frequency as a function of temperature and voltage variation shall be maintained within the FCC and Industry Canada prescribed tolerances.

The temperature stability was measured with the unit in an environmental chamber used to vary the temperature of the sample. The sample was held at each temperature step to allow the temperature of the sample to stabilize.

The EUT is powered by AC voltage supplied externally. The manufacturer's power requirements for the EUT are 120 VAC. Testing was performed at 85% (102 VAC) and 115% (138 VAC) of the rated voltage.

The frequency stability of the transmitter was examined at the voltage extremes and for the temperature range of -20°C to +50°C. The carrier frequency was measured while the EUT was in the temperature chamber. The reference frequency of the EUT was measured at the ambient room temperature with the frequency counter.

The following tables are the results of the frequency stability testing.

Table 11. Frequency Deviation as a Function of Temperature

Temperature Degrees C	Frequency MHz	Difference Hz	Deviation (%)
Ambient	13.560031	0.0	0
-20	13.560019	-12.0	0.000088
-10	13.560011	-20.0	0.000147
0	13.560005	-26.0	0.000192
10	13.560034	3.0	0.000022
20	13.560033	2.0	0.000015
30	13.560034	3.0	0.000022
40	13.560032	1.0	0.000007
50	13.560027	-4.0	0.000029

Table 12. Frequency Deviation as a Function of Voltage

Voltage Volts	Frequency MHz	Difference Hz	Deviation (%)	Voltage Volts
At rated	13.559701	0	0.0	120.0
At 85%	13.559760	-59	0.000435	102.0
At 115%	13.559810	-109	0.000804	138.0