

ELECTROMAGNETIC INTERFERENCE TEST REPORT


Doc. 20050713R02/Project No. 1231

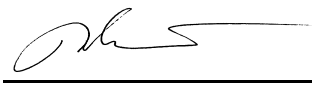
TEST STANDARDS: 47 CFR PART 15, RSS-210 ISSUE 5, ICS-003

LIBERTY FX - SHIELDED AND UNSHIELDED
FCC ID: D04LIBFX / IC ID: 3356B-LIBFX

CHECKPOINT SYSTEMS, INC.
THOROFARE, NJ 08086

TEST DATES: May 26th to July 21st, 2005
ISSUE: August 10th, 2005

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ERRATA SHEET

This document is revision 2 to document 20050713R01 and is marked as “PCTC Doc. No. 20050713R02”, dated 10 August 2005. This revision is issued to make the following corrections and clarifications:

Page	Change
5	Added paragraph to clarify configuration description.
8	Added pot settings for the shielded antenna.
9	Changed Frequency Table and description
19,20	Changed Limit on graphs/tables from CISPR 22 Class A to CISPR 22 Class B

PREFACE

This report documents product testing conducted to verify compliance of the specified EUT with applicable standards and requirements as identified herein. EUT, test instrument configurations, test procedures and recorded data are generally described in this report. The reader is referred to the applicable test standards for detailed procedures. The following table summarizes the test results obtained during this evaluation.

SUMMARY

The Liberty FX - Shielded and Unshielded was tested to the standards listed below, and found to have the following characteristics:

Emission Tests

TEST	STANDARDS		Frequency Range	RESULT
	FCC	Industry Canada		
Radiated Emissions Intentional Radiator, Fundamental	Part 15.223	RSS 210, Clause 6.2.2(c)	1.705 to 10 MHz	Below Max. Permissible Limit
Radiated Emissions Intentional Radiator, Harmonics	Part 15.209	RSS 210, Clause 6.2.2(c)	10 MHz to 1 GHz	Below Max. Permissible Limit
Radiated Emissions Unintentional Radiator (Related to Digital Circuitry)	Part 15.109	ICES-003	30 MHz to 1 GHz	Below Max. Permissible Limit
Conducted Emissions Unintentional & Intentional Radiators	Part 15.209	RSS 210, Clause 6.6, ICES-0003	450 kHz to 30 MHz	Below Max. Permissible Limit

EUT Modifications:

There were no modifications necessary to comply with the specified standards.

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1.0 Description of the Equipment Under Test (EUT)

Equipment Identification	Liberty FX – Shielded and Unshielded
Serial Number	None
Manufacturer	Checkpoint Systems, Inc.
Technical Contact	Bayode Olabisi
Condition Received	Acceptable for Test
Date Received	26 May 2005
Sample Type	Prototype
Equipment Classification	Non-residential, Information Technology Equipment (ITE)
Unisys Test Personnel	Paul Banker, Charles Cunningham

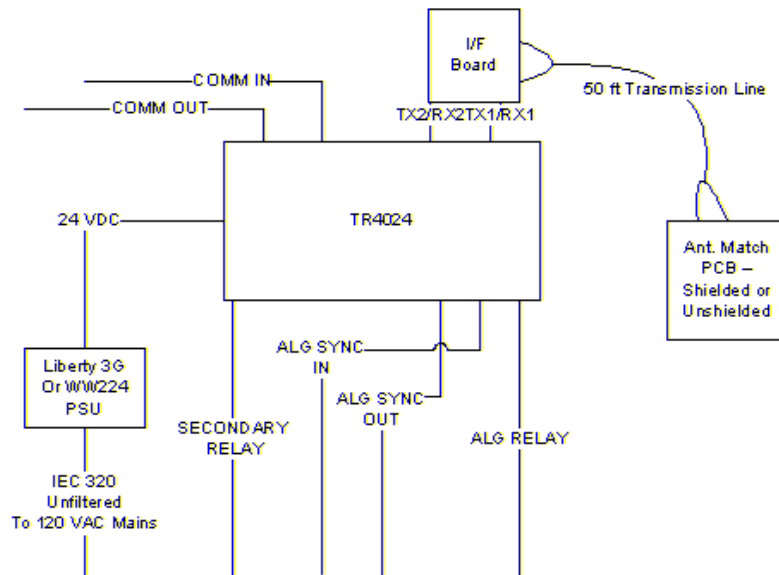
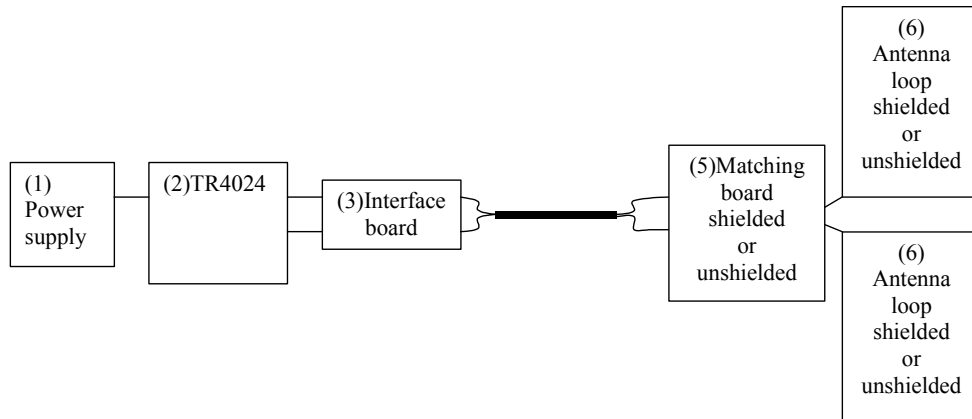
1.1 General Description

The five main subsystems of Liberty FX – Shielded and Unshielded are – the antenna panels, Antenna Match PCB, TR4024 Interface PCB, TR4024 PCB, and power supply. The TR4024 PCB is remotely mounted to drive RF signals through the 50 ft, 100 Ohm transmission line that is wired from the TR4024 Interface board (Checkpoint PCB # A1067 which plugs directly into the TR4024 control PCB), to the antenna matching board. The 6” pigtail from the Shielded and Unshielded antenna panels are wired into the antenna matching board, which is encased in a Hubbell Floor plastic enclosure. Either the WW224 Linear Power Supply or Liberty 3G Power Supplies can be used to power the systems.

1.2 Test Configurations

The Liberty FX System was tested as follows: the TR4024 control board, TR4024 Interface board and power supply were mounted on a cardboard box at a height of 1 meter to simulate a wall mounting installation for the TR4024 Control board & Interface board and Power supply. A 50 ft, 100 Ohm transmission line was run from the TR4024 Interface board (which plugs into the TR4024 Control board), into the antenna matching board. The 6” pigtails from the antenna panels were connected to the antenna matching board. The two antenna panels were elevated above the ground plane, on an 80-cm table, to minimize ground-coupling effects. An oscillating fan, with an attached PVC pipe was used to introduce a security tag into the Liberty FX antenna field. The movement of the tag, into and out of the antenna field, activated the alarm of the Liberty FX system.

The Liberty G3 power supply was tested with the TR4024 and the unshielded antenna. The Worldwide 224 power supply was tested with the TR4024 and the shielded antenna. The two configurations were used to demonstrate compliance of all system components in a minimum number of configurations. The configurations were agreed upon by the client and test facility.



Cable Listing

- 1 ALG Comm In and Comm Out Cables terminated in 100 ohm, ¼ W resistors
- 2 *ALG Sync In, Sync Out Cables (Sync In +/- , Sync Out +/- , ALG/GND) all terminated in 10 K resistor except SYNC In +/- which is not terminated*
- 3 ALG Relay Cable
- 4 Secondary Relay Cable with termination resistor installed
- 5 IEC 320 Unfiltered AC Power cord (To 120 VAC mains)
- 6 RJ-45 cable from Badge Board to TR4024
- 7 50 ft transmission line from the shielded/unshielded antenna matching board into the TR4024 Interface board

* Cables itemized in italics have donut ferrites (3 turns) installed on the TR4024 end. All excess I/O cables (Comm, Sync, Relay) are bundled to appropriate length from initial 14' approx. length.

EMI Test Setup Block Diagram of Liberty FX - Shielded and Unshielded

EUT Hardware:

Description	Manufacturer	Model#	Serial#
Liberty PX Antenna w/TR4024	Checkpoint	FX	N/A
Liberty 3G PSU	Globtek	GS-599 UF	N/A
TR4024 I/F PCB	Checkpoint	A1066	N/A
Worldwide 224 PSU	Power One/Checkpoint	CP683/WW224	N/A
Antenna Match PCB (Unshielded)	Checkpoint	A1067- UNSHIELDED	N/A
Antenna Match PCB (Shielded)	Checkpoint	SHIELDED	N/A

Support Equipment Hardware:

Description	Manufacturer	Model#	Serial#
Palm Tungsten T3	Palm	T3	00V5AA631HJ1

1.3 Rationale for the Chosen Configuration

The tested configurations represent the maximum installed I/O options; representative power supplies and interface PCBs.

1.4 EUT Modifications

There were no modifications necessary to comply with the specified standards.

2.0 Operation of the EUT During Testing**2.1 General****Climatic Environment**

The following were the ambient conditions in the laboratory during testing:

Temperature: $22^{\circ}\text{C} \pm 5^{\circ}\text{C}$ Relative Humidity $50\% \pm 10\% \text{RH}$

Selection of AC Power Voltage/Frequencies

The radiated and conducted emissions tests were performed with the EUT operating at 120 Vac / 60Hz.

2.2 Operating Mode

The Liberty FX – Shielded and Unshielded systems will be put into continuous operation during test. To verify normal operation of the system, a tag can be intermittently introduced into the antenna's field to trigger a tag detection event. Two transmitter potentiometer settings control the output level of the fundamental carrier signal. The settings for these pots differ between the shielded and unshielded antennae. **The pots are each set to 22 for the unshielded antennae and 25 for the shielded antennae.**

The TR4024 is the electronics PCB component of a pulse-listen Electronic Article Surveillance (EAS) detection system, which utilizes targets that are applied to merchandise. These targets resonate in the region of 8.2 MHz. When an article of merchandise is purchased, the target is deactivated which causes it to no longer resonate. The pulse-listen EAS system typically monitors an area 3 feet on either side of the antenna (and up to a 5 feet height from the antenna for Liberty FX) in the 7.4 MHz to 9.0 MHz band, and triggers an alarm when a non-deactivated target is detected. The TR4024 electronics PCB consists of two, class D HF transmitters, a synchronous I and Q receiver, an RF selector switch, a DDS, and a DSP-based computer used to detect the presence of the target. All control signals, interface signals and off-board communications, are generated and controlled by a digital logic subsystem consisting of a dedicated communications microprocessor and a FPGA.

The Direct Digital Synthesizer (DDS) generates a sequence of 16 discrete frequencies from 7.4 MHz to 9.0 MHz (digital sweep). The DSP loads the DDS with the desired frequency for transmission. The DSP on power-up is initialized with the frequencies for transmission by the communications controller.

Since the natural resonant frequency varies slightly from label to label, the RF transmission pattern must be a form of frequency hopping. The Liberty electronics will transmit (and receive) a slightly different frequency for each RF "blast". A typical transmission "frame" consists of 32 consecutive RF "blasts", at 16 distinct frequencies. Each "blast" is followed by a "listen" period. These frequencies cover the 7.4-9.0 MHz. frequency band specified for the standard EAS label family. The array, on the following page, contains the discrete frequencies, in Hertz, generated by the 4024. The columns are labeled 0 –15. The controller selects a row of 16 frequencies. The top row of frequencies is used most frequently.

0	1	2	3	4	5	6	7
7600000	7673333	7746667	7820000	7893333	7966667	8040000	8113333
7600000	7673333	7746667	7820000	7893333	7966667	8040000	8113333
7600000	7660000	7720000	7780000	7840000	7900000	7960000	8020000
7600000	7686667	7773333	7860000	7946667	8033333	8120000	8206667
7600000	7673333	7746667	7820000	7893333	7966667	8040000	8113333
7600000	7673333	7746667	7820000	7893333	7966667	8040000	8113333
7600000	7660000	7720000	7780000	7840000	7900000	7960000	8020000
7600000	7686667	7773333	7860000	7946667	8033333	8120000	8206667
7400000	7486667	7573333	7660000	7746667	7833333	7920000	8006667
7400000	7486667	7573333	7660000	7746667	7833333	7920000	8006667
7400000	7473333	7546667	7620000	7693333	7766667	7840000	7913333
7400000	7500000	7600000	7700000	7800000	7900000	8000000	8100000
7800000	7860000	7920000	7980000	8040000	8100000	8160000	8220000
7800000	7860000	7920000	7980000	8040000	8100000	8160000	8220000
7800000	7846667	7893333	7940000	7986667	8033333	8080000	8126667
7800000	7873333	7946667	8020000	8093333	8166667	8240000	8313333
8	9	10	11	12	13	14	15
8186667	8260000	8333333	8406667	8480000	8553333	8626667	8700000
8186667	8260000	8333333	8406667	8480000	8553333	8626667	8700000
8080000	8140000	8200000	8260000	8320000	8380000	8440000	8500000
8294100	8140000	8466667	8553333	8640000	8726667	8813333	8900000
8186667	8260000	8333333	8406667	8480000	8553333	8626667	8700000
8186667	8260000	8333333	8406667	8480000	8553333	8626667	8700000
8080000	8140000	8200000	8260000	8320000	8380000	8440000	8500000
8294100	8140000	8466667	8553333	8640000	8726667	8813333	8900000
8093333	8180000	8266667	8353333	8440000	8526667	8613333	8700000
8093333	8180000	8266667	8353333	8440000	8526667	8613333	8700000
7986667	8060000	8133333	8206667	8280000	8353333	8426667	8500000
8200000	8300000	8400000	8500000	8600000	8700000	8800000	8900000
8280000	8340000	8400000	8460000	8520000	8580000	8640000	8700000
8280000	8340000	8400000	8460000	8520000	8580000	8640000	8700000
8173333	8220000	8266667	8313333	8360000	8406667	8453333	8500000
8173333	8460000	8533333	8606667	8680000	8753333	8826667	8900000

The overall duty cycle for transmitter operation is **3.84 percent**. This rate is derived by taking the amount of time that the transmitter is operational (2 antenna * 16 bins * 2 blasts per bin * 6 microseconds per blast = 384 microseconds) and dividing it by the frame rate of 100Hz (10 milliseconds).

2.3 Rationale for the Chosen Mode of Operation

The chosen operating mode fully exercises and duplicates all normal activity that may be expected during normal operation of the Liberty FX – Shielded and Unshielded systems

3.0 Applicable Requirements, Methods and Procedures

The results of the measurement of the radio disturbance characteristics of the EUT described herein may be applied, and where appropriate provide a presumption of compliance to one or more of the following requirements or to other requirement at the discretion of the client, regulatory agencies, or other entities.

USA

47 CFR, Part 15, Subpart B, "Unintentional Radiators, General Rules and Regulations"

CANADA

RSS-210, Issue 5, November 2001, "Spectrum Management and Telecommunications Policy, Radio Standards Specification, Low Power Licence-Exempt Radiocommunication Devices (All Frequency Bands)."

ICES-003, Issue 4, February 2004, "Spectrum Management and Telecommunications Policy, Interference Causing Equipment Standard, Digital Apparatus."

Basic Test Methods and Procedures

The applicable regulatory product family or generic standards require that radio disturbance/interference and immunity tests be performed in accordance with the following:

Canadian Standards Association Standard C108.8-M1983, "Electromagnetic Emissions from Data Processing Equipment and Electronic Office Machines."

Canadian Standards Association Standard CAN/CSA-CISPR 22-2002, "Limits and Methods of Measurement of Radio Disturbance Characteristics of Information Technology Equipment."

Industry Canada RSS-212, Issue 1 (Provisional), February 27, 1999, Spectrum Management and Telecommunications Policy, Radio Standards Specification, "Test Facilities and Test Methods for Radio Equipment"

ICES-003, Issue 4, February 2004, "Spectrum Management and Telecommunications Policy, Interference Causing Equipment Standard, Digital Apparatus."

ANSI C63.4, 2003 "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".

CISPR 22: 1993, A1/1995, A2/1996 "Limits and Methods of Measurement of Radio Disturbance Characteristics of Information Technology Equipment."

Deviations or Exclusions from the Requirements and Standards

In agreement with FCC, for measurement of the fundamental and harmonic emissions in the band 1.705 MHz to 10 MHz, a 20 dB reduction from the true peak is to be compared to the limits of

100 μ V/meter (40 dB μ V/meter) at 30 meters. The EUT is to be modulated as normally installed. True peak is the point at which the analyzer bandwidth is adjusted for minimum pulse desensitization. A copy of the correspondence between Checkpoint and FCC is attached in Appendix B for reference.

Measurement of the fundamental, 7.4 to 9.0 MHz, was performed by setting a spectrum analyzer to “max-hold”, peak detector, a 300 kHz bandwidth, and a span from 6.5 to 10.5 MHz. Increasing the resolution bandwidth above 300 kHz did not increase fundamental signal level.

4.0 Test Results

4.1 Radiated Emissions

Test Standard:	USA: 47 CFR Parts 15 B, 15C; Canada: RSS 210
Frequency Range:	9 kHz to 1000 MHz
Test Distances:	3,10 and 30 Meters
Antenna Polarity and Height:	1.705 MHz – 30 MHz: Three orthogonal axes @ 1 meter 30MHz-1 GHz: Vertical and Horizontal @ 1 to 4 Meters
AC Power:	120 Vac, 60 Hz
EUT Type:	Floor standing and table top
Highest Oscillator Frequency:	50 MHz
Measurement Uncertainty:	5.0 dB (CISPR 16-4: 2002)
Field Strength Calculations:	Field Strength (dB μ V/m) = meter reading (dB μ V) + antenna factor (dB/m)+ Cable Loss (dB)

4.1.1 Radiated Emissions Test Results (7/21/05)

Radiated Emissions 9 kHz – 30 MHz (FCC 15.209, 15.223; IC RSS-210 6.2.2(c))

Measurement Distance is 30 meters. Vert | is antenna perpendicular, Vert = is antenna parallel

Liberty FX - Shielded

Frequency (MHz)	Description	Polarity @ 1m hght.	Azimuth (deg.)	Measured Level (dB μ V)	Antenna Correction Factor	Cable Loss (dB)	Corrected Level (dB μ V/m)	Limit	Δ	Detector
7.60	Fundamental	Vert	193	39.21	17.5	0.50	57.21	60.00	-2.79	Peak
8.20		Vert	193	40.26	17.5	0.50	58.26	60.00	-1.74	Peak
8.20		Vert =	320	33.77	17.5	0.50	51.77	60.00	-8.23	Peak
8.20		Horiz	340	33.58	17.5	0.50	51.58	60.00	-8.42	Peak
9.00		Vert	193	39.70	17.5	0.50	57.70	60.00	-2.30	Peak
16.40	2nd Harmonic	Vert	0	5.98	17.6	0.80	24.38	29.54	-5.16	QP
24.60	3rd Harmonic	Vert	0	3.97	17.6	0.95	22.52	29.54	-7.02	QP

Liberty FX - Unshielded

Frequency (MHz)	Description	Polarity @ 1 m hght.	Azimuth (deg.)	Measured Level (dBuV)	Antenna Correction Factor	Cable Loss (dB)	Corrected Level (dBuV/m)	Limit	Δ	Detector
7.60	Fundamental	Vert	0	40.66	17.5	0.50	58.66	60.00	-1.34	Peak
8.16		Vert	0	41.58	17.5	0.50	59.58	60.00	-0.42	Peak
8.43		Vert =	60	35.25	17.5	0.50	53.25	60.00	-6.75	Peak
8.20		Horiz	0	32.69	17.5	0.50	50.69	60.00	-9.31	Peak
9.00		Vert	0	41.03	17.5	0.50	59.03	60.00	-0.97	Peak
16.40	2nd Harmonic	Vert	0	-2.09	17.6	0.80	16.31	29.54	-13.23	QP
24.60	3rd Harmonic	Vert	0	-0.96	17.6	0.95	17.59	29.54	-11.95	QP

The 2nd and 3rd Harmonic signals were the maximum peak of the swept range. There were no other emissions within 20 dB of limit from 9 kHz to 30 MHz.

Spurious Emissions: 30 MHz - 1000 MHz (FCC 15.209; IC RSS-210 6.2.2(c))

The tables below show the highest amplitude quasi-peak detected field strengths of spurious emissions measured from the EUT over the frequency range from 30 MHz to 1000 MHz, at a distance of 3 meters compared to the maximum permissible 47 CFR Part 15C limit at 10 meters.

Liberty FX - Shielded

Freq [MHz]	Pk [dB μ V/m]	Q-Pk [dB μ V/m]	Pol	Angle [deg]	Ht [cm]	CF [dB]	Limit [dB μ V/m]	Delta [dB]
58.312	19.36	32.39	V	320	158	12.48	40	-7.61
59.865	16.62	38.8	V	152	100	11.99	40	-1.2
78.273	43.4	35.24	V	320	158	8.09	40	-4.76
200.002	38.3	35.86	H	200	138	11.79	43.5	-7.64
400	44.19	40.6	V	220	100	18.6	46	-5.4
900	46.53	42.92	V	17	139	26.92	46	-3.08

Liberty FX - Unshielded

Freq [MHz]	Pk [dB μ V/m]	Q-Pk [dB μ V/m]	Pol	Angle [deg]	Ht [cm]	CF [dB]	Limit [dB μ V/m]	Delta [dB]
73.657	41.99	32.52	V	327	100	8.57	40	-7.48
287.507	43.14	37.27	V	49	119	15.95	46	-8.73
300	45.15	41.92	H	149	100	16.31	46	-4.08
312.499	47.17	41.41	V	17	112	16.52	46	-4.59
412.493	48.88	42.28	V	4	104	19.11	46	-3.72
900.001	41.93	38.04	V	6	112	26.82	46	-7.96

Digital Emissions: 30 MHz - 1000 MHz (FCC 15.109; ICES-003)

Radiated emissions not related to the transmitter circuitry. Clock signals related to the receiver. Measured at 10 meters and compared to CISPR 22 Class A limit.

Liberty FX - Shielded

Freq [MHz]	Pk [dBμV/m]	Q-Pk [dBμV/m]	Pol	Angle [deg]	Ht [cm]	CF [dB]	Limit [dBμV/m]	Delta [dB]
174.995	25	16.95	V	87	108	11.86	30	-13.05
199.998	38.45	24.32	V	48	398	12.54	30	-5.68
237.501	38.03	29.66	V	3	100	15.09	37	-7.34
700.004	34.65	29.83	H	345	246	23.49	37	-7.17
799.999	35.34	30.1	V	347	108	24.91	37	-6.9
900.008	38.49	32.93	V	1	210	26.05	37	-4.07

Liberty FX – Unshielded

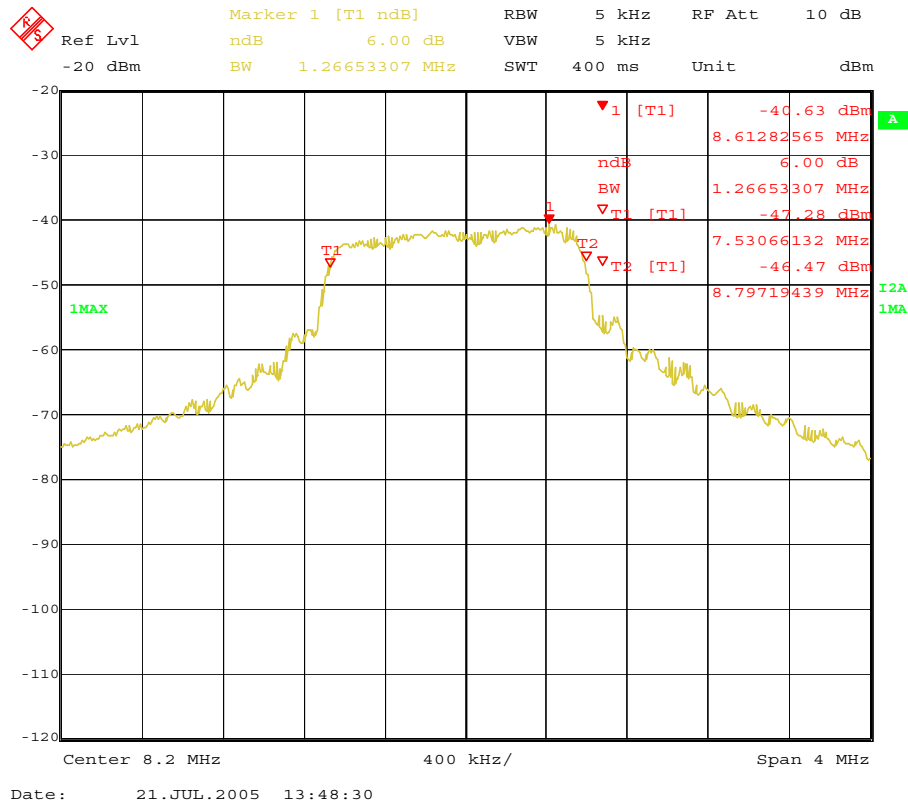
250.004	38.98	31.59	V	343	401	15.53	37	-5.41
299.997	37.77	31.18	H	350	321	17.42	37	-5.82
400.004	37.71	30.47	V	2	238	18.27	37	-6.53
475.736	33.25	30.59	V	261	361	19.95	37	-6.41
500.003	36.78	32.75	H	92	115	20.11	37	-4.25
700.001	36.13	30.49	V	32	130	23.49	37	-6.51

Overall Results: All radiated emissions are recorded at a various distances from the Liberty FX - Shielded and Unshielded are below the specified limits.

4.1.2 Occupied Bandwidth (7/21/05)

Occupied Bandwidth Plot (FCC)

The occupied bandwidth plot below is for both Liberty FX – Shielded and Liberty FX – Unshielded.



Test Setup Photos



**Photo: Liberty FX – Shielded, Radiated Emissions, Front View
(50' antenna transmission line bundle placed on box for maximum emission)**



Photo: Liberty FX – Shielded, Radiated Emissions, Back View



Photos: Liberty FX – Unshielded, Radiated Emissions, Front and Back Views

4.2 Conducted Emissions

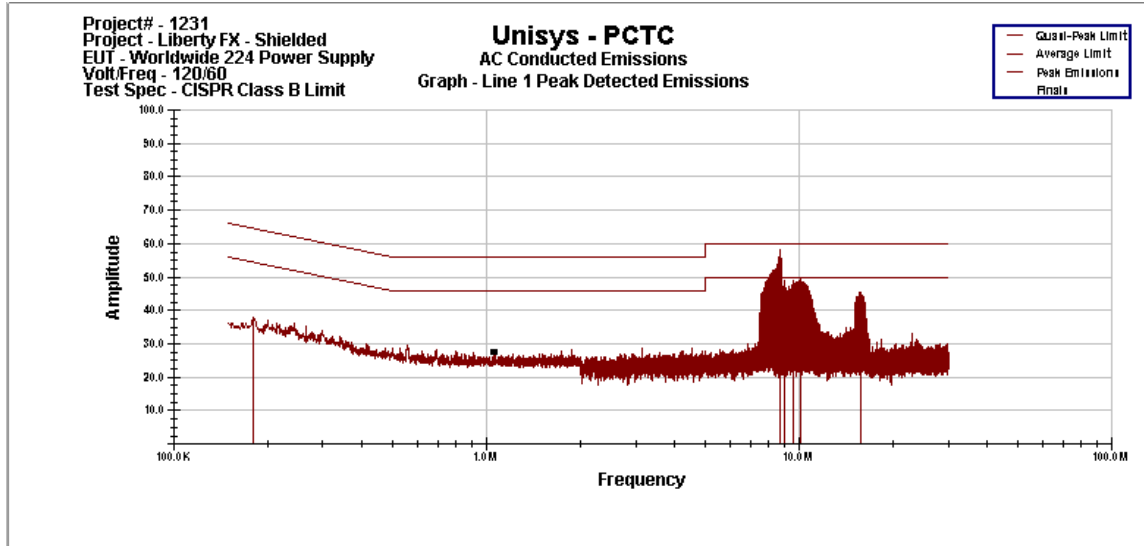
Test Standard:	USA: CISPR 22 Class A Canada: RSS-210 and ICES-003
Frequency Range:	150kHz to 30 MHz
AC Power:	120 Vac, 60 Hz
EUT Type:	Floor standing and table top
Highest Oscillator Frequency:	50 MHz
Measurement Uncertainty:	5.0 dB (CISPR 16-4: 2002)
Conducted Emission Calculation:	Peak Emission (dBuV Peak) = Meter reading (dBuV) + cable loss (dB) + Limiter loss (dB)

4.2.1 Conducted Emission Test Results (7/20/05)

The conducted emissions recorded on the EUT AC power cord (s), displayed against the limits for CISPR 22, Class A devices are presented on the following pages. Conducted emission amplitudes (dBuV PK) measured with a peak detector are compared with CISPR 22, Class A average limit and displayed on the graph. Where the measured peak detector emission exceeded the average limit, or found to be within 1 dB of average limit, re-measurement using quasi-peak and average detector functions was made. The re-measured emissions are presented in a table below the appropriate table of peak detector emissions, which displays quasi-peak measurements vs. the quasi-peak limit and the average measurements vs. the average limit.

Conducted Emission Test Results (FCC 15.207; IC RSS-210, ICES-003)

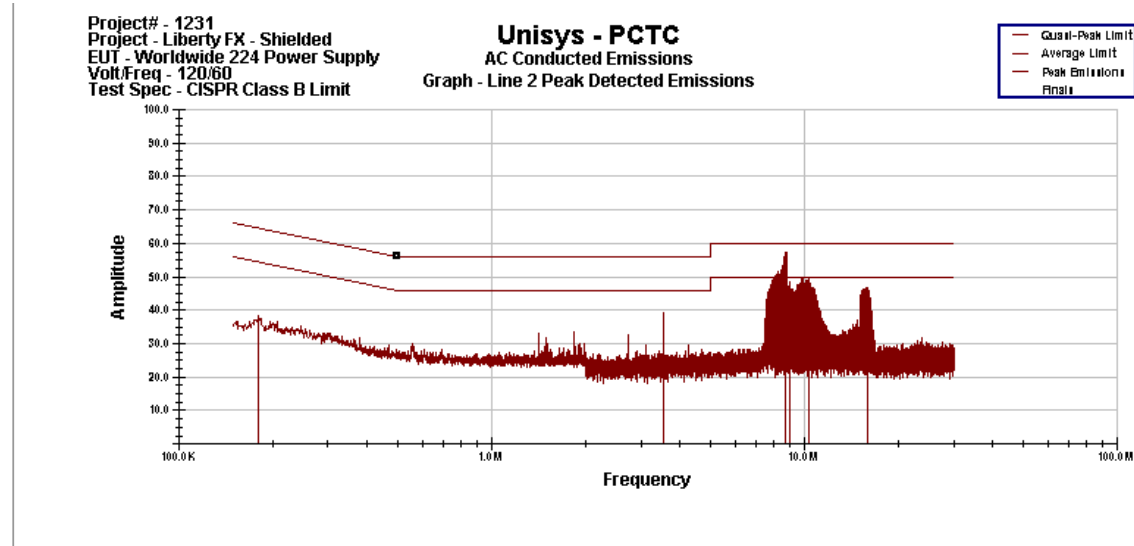
Liberty FX – Shielded, Worldwide 224 power supply, 120Vac/60Hz, neutral line



Unisys - PCTC
Line 1 Conducted Emissions
 11:47:49 AM, Wednesday, July 20, 2005

	1	2	3	4	5	6	7
Frequency	AVG	AVG	AVG	QP	QP	QP	Corr
MHz	dBuV	Limit	Margin	dBuV	Limit	Margin	Factor
180.000 KHz	29.82	55.14	-25.33	34.31	65.14	-30.83	12.372
8.714 MHz	31.50	50.00	-18.50	53.27	60.00	-6.73	10.237
8.950 MHz	26.42	50.00	-23.58	43.71	60.00	-16.29	10.241
9.619 MHz	30.12	50.00	-19.88	43.88	60.00	-16.12	10.253
10.149 MHz	32.70	50.00	-17.30	44.85	60.00	-15.15	10.263
15.769 MHz	21.20	50.00	-28.80	40.54	60.00	-19.46	10.391

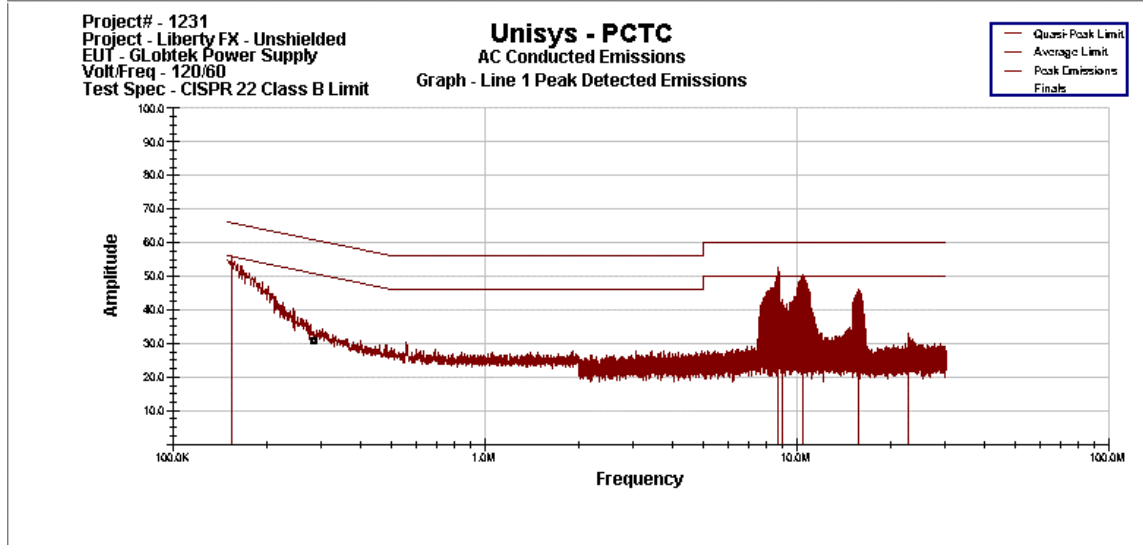
Liberty FX – Shielded, Worldwide 224 power supply, 120Vac/60Hz, phase line



Unisys - PCTC
 Line 2 Conducted Emissions
 01:01:20 PM, Wednesday, July 20, 2005

	1	2	3	4	5	6	7
Frequency	AVG	AVG	AVG	QP	QP	QP	Corr
MHz	dBuV	Limit	Margin	dBuV	Limit	Margin	Factor
180.000 KHz	29.854	55.143	-25.289	34.536	65.143	-30.606	12.372
3.561 MHz	15.600	46.000	-30.400	20.582	56.000	-35.418	10.127
8.699 MHz	31.201	50.000	-18.799	52.435	60.000	-7.565	10.237
8.934 MHz	26.271	50.000	-23.729	43.173	60.000	-16.827	10.241
10.309 MHz	32.543	50.000	-17.457	44.831	60.000	-15.169	10.266
15.931 MHz	22.084	50.000	-27.916	41.481	60.000	-18.519	10.397

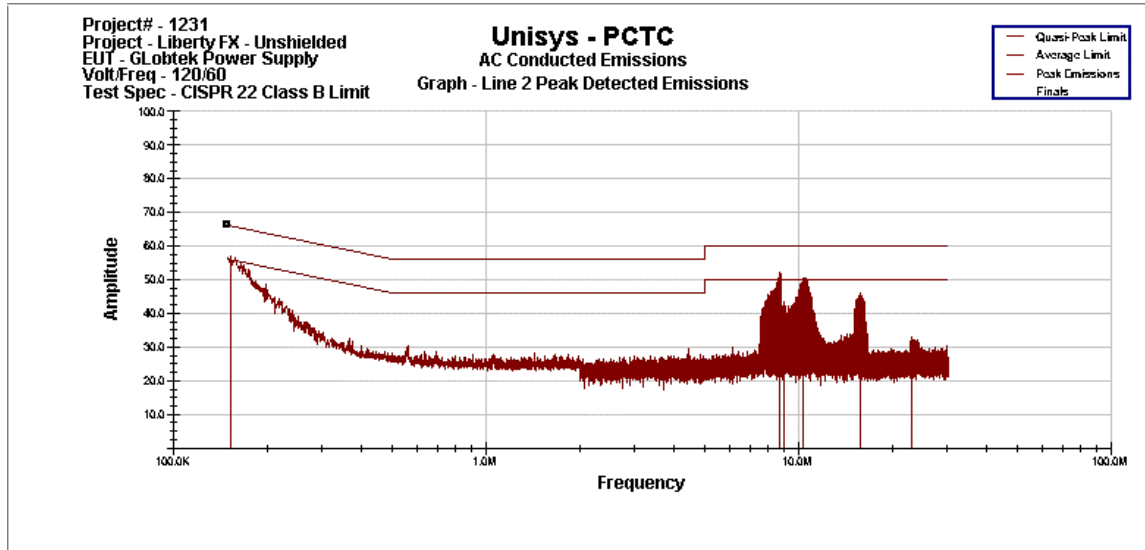
Liberty FX – Unshielded, Globtek G3 power supply, 120Vac/60Hz, neutral line



Unisys - PCTC
Line 1 Conducted Emissions
02:37:46 PM, Wednesday, August 10, 2005

	1	2	3	4	5	6	7
Frequency	AVG	AVG	AVG	QP	QP	QP	Corr
MHz	dBuV	Limit	Margin	dBuV	Limit	Margin	Factor
155.000 KHz	27.80	55.86	-28.06	47.34	65.86	-18.51	13.337
8.729 MHz	26.07	50.00	-23.93	47.32	60.00	-12.68	10.237
8.963 MHz	22.16	50.00	-27.84	37.41	60.00	-22.59	10.241
10.478 MHz	34.78	50.00	-15.22	46.41	60.00	-13.59	10.270
15.755 MHz	21.44	50.00	-28.56	40.26	60.00	-19.74	10.390
22.748 MHz	17.59	50.00	-32.41	23.45	60.00	-36.55	10.714

Liberty FX – Unshielded, Globtek G3 power supply, 120Vac/60Hz, phase line



Unisys - PCTC
Line 2 Conducted Emissions
 02:37:54 PM, Wednesday, August 10, 2005

	1	2	3	4	5	6	7
Frequency	AVG	AVG	AVG	QP	QP	QP	Corr
MHz	dBuV	Limit	Margin	dBuV	Limit	Margin	Factor
152.000 KHz	28.145	55.943	-27.798	48.388	65.943	-17.555	13.453
8.682 MHz	27.197	50.000	-22.803	47.198	60.000	-12.802	10.236
8.949 MHz	22.304	50.000	-27.696	38.426	60.000	-21.574	10.241
10.308 MHz	34.347	50.000	-15.653	46.611	60.000	-13.389	10.266
15.799 MHz	21.853	50.000	-28.147	40.891	60.000	-19.109	10.392
22.969 MHz	17.750	50.000	-32.250	24.104	60.000	-35.896	10.726

Overall Results: The conducted emissions measured of the input AC power lines of the Liberty FX - Shielded and Unshielded are below the specified limit.



Photo: Liberty FX – Shielded, Conducted Emissions Test Setup



Photo: Liberty FX – Unshielded, Conducted Emissions Test Setup

Appendix A – Test Equipment List**Emission Test Equipment**

Description	Freq Range (Hz)	Model Number	Manufacturer	ID / SN	Last Cal Date
EMI Test Receiver	20 – 40 G	ESIB40	Rohde & Schwarz	C-062	12/7/04
Antenna	25 M – 2 G	LPB-2520/A	ARA	B965	9/27/04
Antenna, Active Loop	1 k – 30 M	6507	EMCO	D-244	4/20/05
Controller, Tower and Turntable	NA	2090	EMCO	B812	NA
EMI Test Receiver	20 – 26.5 G	ESIB26	Rohde & Schwarz	C-232	3/18/05
Filter, Bandpass	0.15 M – 30 M	NA	Unisys	NA	NA
Limiter, Pulse	DC – 30 M	ESH3-Z2	Polarad	NA	NA
LISN	9 k – 30 M	8012-50-R-24-BNC	Chase	U775	9/21/04

Appendix B – FCC Correspondence

MAR 13 '97 10:59 TO-012105223396
JUL 29 '98 15:19 TO-018013443089

FROM-CHECKPOINT SYSTEMS INC
FROM-CHECKPOINT SYSTEMS INC

T-085 P.02/02 F-071
T-081 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.: (609) 384-2080

No. of Pages: 3
(Incl. Cover)

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

Telephone: (609) 384-2339 Direct
Toll Free: (800) 287-6640 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 fix dated 7/3/96:

- ✓ • Our pulsed emissions will be treated as frequency hopping, 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 28.2 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 ~~emissions outside the 1.785-10 MHz band~~ ~~emissions above 28.2 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