UNISYS

PCTC
Product Compliance Test Center
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ELECTROMAGNETIC INTERFERENCE TEST REPORT

Doc. 20051106R/Project No. 1258

TEST STANDARDS: 47 CFR PART 15, RSS-210 ISSUE 6, ICS-003

SOURCE TAGGING TESTER (STT)
FCC ID: DO4OSTT / IC ID: 3356B-OSTT

CHECKPOINT SYSTEMS, INC.
THOROFARE, NJ 08086

TEST DATES: October 26th to November 13th, 2005
ISSUE: November 15th, 2005

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Certificate No: 1028.01

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 Source Tagging Tester (STT) was tested to the standards listed below, and found to have the following characteristics:

TEST	STANDARDS		Frequency Range	RESULT
	FCC	Industry Canada		
Radiated Emissions Intentional Radiator, Fundamental	Part 15.223	RSS-210, A2.4	1.705 to 10 MHz	Below Max. Permissible Limit
Radiated Emissions Intentional Radiator, Harmonics	Part 15.209	RSS-210, 2.7	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-Gen, Clause 7.2.2 ICES-0003	150 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	Source Tagging Tester
Serial Number	None
Manufacturer	Checkpoint Systems, Inc.
Technical Contact	Mark Leszczynski Bayode Olabisi
Condition Received	Acceptable for Test
Date Received	12 October 2005
Sample Type	Prototype
Equipment Classification	Non-residential, Information Technology Equipment (ITE)
Unisys Test Personnel	Paul Banker, Itamar Gonen, Minh Nguyen

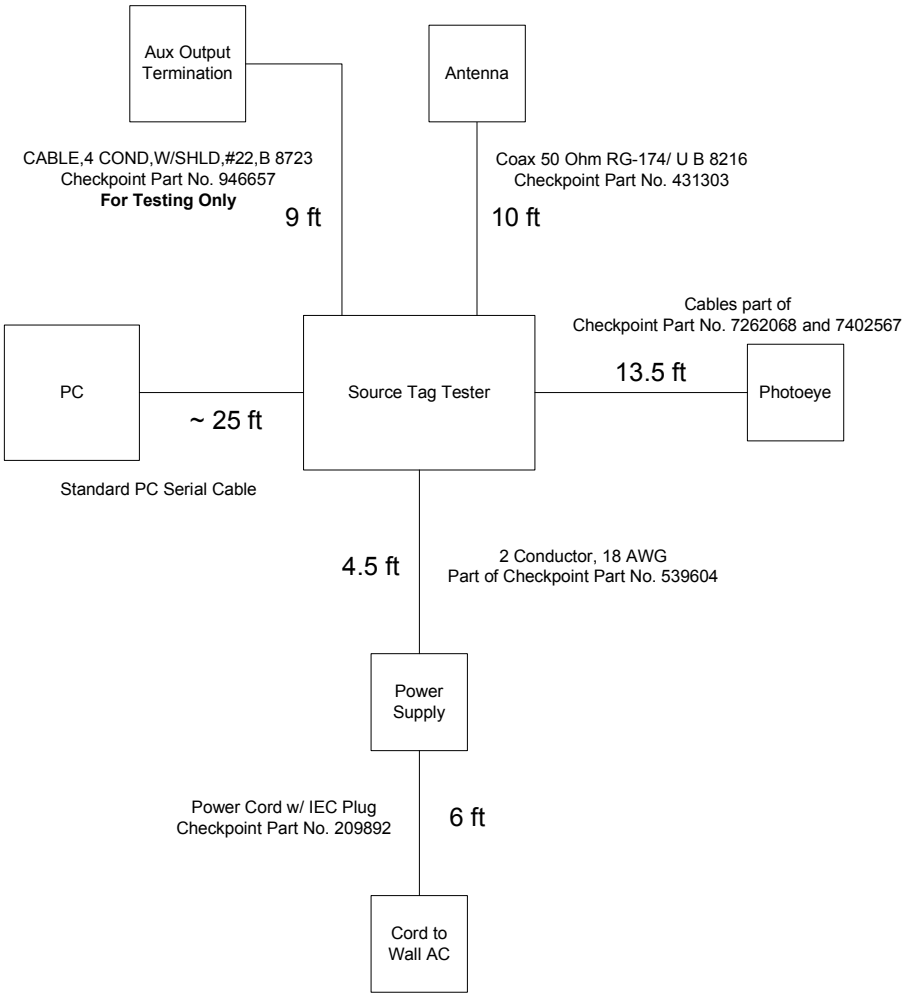
1.1 General Description

The Checkpoint Source Tagging Tester (STT) is designed to help Checkpoint Source Tagging customers test and verify Checkpoint labels in real time. The STT tests a series of Checkpoint labels and comes equipped with a counter mechanism that records the number of good, bad, and total Checkpoint labels run on the production line. The antenna attaches to the STT's chassis via BNC connectors (1 TX, 1 RX); other I/O ports on the chassis provide an interface to the STT peripherals – Photo eye (DB-9 Male), PC/Laptop running STT software application (DB-9 Female), and AUX Relay (DB-9 Male).

1.2 Test Configurations

The Source Tagging Tester will be tested as a typical unit operating in the field. All I/O ports will be connected and functional or have representative termination.

A spinning wheel with four black strips was used to trigger the fiber-optic Photo eye. The trigger instigated a sweep of the transmitter fundamental frequency.



Cable Listing

1) 9’ shielded #22 B8723, Aux Relay cable – Checkpoint P/N 946657
2) 10’ RG-174 /U B8216 Antenna cable - Checkpoint P/N 431303
3) 25’ RS-232 Serial cable to PC/Laptop running STT software application
4) 13.5’ Photoeye Cable, Part of 7262068 and 7402567
5) 4.5’ 2-conductor, 18 AWG Power cable
6) 6’ IEC 320 Power cordset

EMI Test Setup Block Diagram of Source Tagging Tester (STT)

EUT Hardware:

Description	Manufacturer	Model#	Serial#
Source Tagging Tester	Checkpoint		Pre-production
Source Tagging Tester Antenna	Checkpoint		Pre-production
Power Supply	Globtek	GT-21089-1515-T3	10287921/05
Photo Eye:Sensor	Omron	E32-DC200	None
Photo Eye Amplifier	Omron	E3X-A41	None

Support Equipment Hardware:

Description	Manufacturer	Model#	Serial#
ThinkCentre PC	IBM	MT-M 8185-E3U	KCLY65H
Video Display Terminal	NEC	FE770-BK	4370023YA
Keyboard	IBM	KB-0225	0896132
Mouse	IBM	MO28UO	23*154636
8.2 MHz non-deactivated tag	Checkpoint		None

1.3 Rationale for the Chosen Configuration

This configuration represents a typical unit, under normal operation. Only the Globtek GT-21089-1515-T3 will be qualified with the STT. All I/O options – Antenna, Photo eye, PC/Laptop running STT software application, and AUX Relay connector were part of the STT equipment setup during testing.

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^{o} C ± 5^{o} C Relative Humidity 50% ± 10% 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 unit will have application specific software running on a PC. The PC will be used to verify the unit is reporting data and reading tags properly. The sensor will be exercised by using a motor with tags attached to it. These tags will rotate in front of the unit to simulate an actual reel of tags. The AUX output will be testing using representative termination for devices to be used.

The TR4140 is the electronics PCB component of the Source Tagging Tester (STT), a testing device that is for Checkpoint Source Tagging customers. It monitors the functionality of Checkpoint RF labels as they are automatically applied and processed at the customer's production line.

The Source Tagging Tester consists of four main components: the antenna, electronics, housing, and power supply. The Source Tagging Tester connects to a host PC using custom SST software to display data to the user.

The antenna electronics radiates RF energy into and out of a target tag for measuring characteristics of the tag (center frequency, Q, etc.). Based on the response received, the unit can either pass or fail each tag. The antenna is an active, 9-loop solenoid, co-located transmit and receive design.

The TR4140 PCB is mounted in a sealed metal enclosure to prevent dust and foreign particles from interfering with the electronics, due to the manufacturing environmental conditions to which it is subject. All I/O have been run to connectors on the housing for easy installation which also helps to seal the electronics.

The TR4140 electronics PCB consists of two transmitters, two receivers, a Direct Digital Synthesizer (DDS), a Digital Signal Processor (DSP)-based computer used to detect the presence of the target, and an Field-Programmable Gate Array (FPGA) to handle control signals and interface signals. Off-board communications to a host computer are generated and controlled by the DSP. The external power supply is a linear type 15VDC 1.0 Amp design.

The TR4140 uses two transmitters that are functionally identical. The control signals are handled by the FPGA. The frequencies used are dictated by the digital sweep, which are controlled by the DSP. At the start of the frequency sweep, the initial frequency written to the DDS is transmitted for the dwell time. After the dwell time expires, a delta is added to the last DDS frequency and the sequence begins again until all deltas have expired.

The analog DDS signal is passed through a low pass filter (LPF). The analog signal is then sent to a voltage-controlled amplifier (VCA). The control signals from the FPGA drive a digital potentiometer (U13) that controls the low voltage, VCA (U10). The digipots are used to control the overall transmitter power and are pre-set at the factory for a specific level. The power levels may be changed using the Engineering Tag Tester Application. Finally a filtered 5VDC signal is added to the transmitted signal to power the external antenna

2.3 Rationale for the Chosen Mode of Operation

The chosen operating mode exercises and duplicates all normal activity that may be expected by a user.

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 6, September 2005, “Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment”

RSS-GEN, Issue 1, September 2005, “General Requirements and Information for the Certification of Radiocommunication Equipment.”

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”

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

There were no deviations or exclusions from the requirements and standards.

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 and 10 Meters
Antenna Polarity and Height:	9 kHz – 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:	Wall-mounted or Table top
Highest Oscillator Frequency:	15 MHz
Measurement Uncertainty:	4.3 dB (CISPR 16-4: 2002)
Field Strength Calculations:	Field Strength (dBµV/m) = meter reading (dBµV) + 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 A2.4)

Measurement Distance is 10 meters. Vert | is antenna perpendicular, Vert = is antenna parallel

Frequency (MHz)	Description	Polarity	Azimuth	Corrected Field Str Level (dBuV/m)	Cable Loss (dB)	Corrected Level (dBuV/m)	10 Meter Limit (dBuV/m	Δ (dB)	Detector
7.5	Fundamental	Vert ⊥	0	29.6	0.25	29.85	49.54	-19.69	QP
	Fundamental	Vert =	0	29.1	0.25	29.35	49.54	-20.19	QP
	Fundamental	Horiz	0	29.12	0.25	29.37	49.54	-20.17	QP
8.05	Fundamental	Vert ⊥	0	28.93	0.25	29.18	49.54	-20.36	QP
	Fundamental	Vert =	0	28.68	0.25	28.93	49.54	-20.61	QP
	Fundamental	Horiz	0	28.7	0.25	28.95	49.54	-20.59	QP
8.6	Fundamental	Vert ⊥	0	29.7	0.25	29.95	49.54	-19.59	QP
	Fundamental	Vert =	0	28.29	0.25	28.54	49.54	-21.00	QP
	Fundamental	Horiz	0	28.4	0.25	28.65	49.54	-20.89	QP
15.5	2nd Harmonic	Vert ⊥	0	24.21	0.45	24.66	39.08	-14.42	QP
22.5	3rd Harmonic	Vert ⊥	0	21.41	0.50	21.91	39.08	-17.17	QP

Overall Results: Measurements of the signals below 30 MHz, including the fundamental, 2nd and 3rd harmonics, are below the specified 30 meter limit extrapolated to the 10 meter measurement distance. The signals in the above table are all noise floor levels. The emissions from the EUT were below this level of detection. The swept FM signal, does pass through the restricted bands. However, the emission level is below the general requirements for emissions below 30 MHz.

Spurious Emissions: 30 MHz - 1000 MHz (FCC 15.209; IC RSS-210 2.7)

The tables below show the highest amplitude quasi-peak detected field strengths of spurious and digital 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/RSS-210 2.7 limit at 3 meters.

Source Tagging Tester: Lying Horizontal on table

Freq	Pk	Q-Pk	Pol	Angle	Ht	CF	Limit	Delta
[MHz]	[dBuV/m]	[dBuV/m	[H/V}	[deg]	[cm]	[dB]	[dBuV/m]	[dB]
119.99	47.09	31.12	V	86	101	14.81	43.5	-12.38
199.99	46.34	27.07	V	24	101	12.09	43.5	-16.43
319.982	40.49	32.19	V	113	101	16.65	46	-13.81
740.016	41.89	39.62	H	137	171	24.73	46	-6.38
799.98	40.83	37.75	H	313	104	25.61	46	-8.25
819.967	44.59	38.64	H	255	112	26.01	46	-7.36

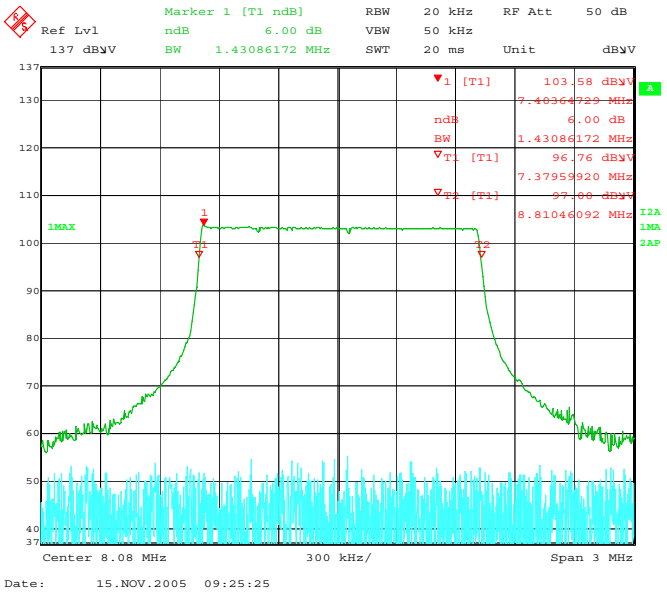
Source Tagging Tester: Mounted vertically on wooden fixture

119.99	53.86	29.69	V	1	100	14.81	43.5	-13.81
199.99	42.7	25.28	V	101	100	12.09	43.5	-18.22
319.982	34.3	30.83	H	17	100	16.65	46	-15.17
740.016	41.77	36.87	H	152	163	24.73	46	-9.13
800.016	35.81	34.08	H	15	100	25.61	46	-11.92
820.024	41.1	38.56	H	23	142	26.01	46	-7.44

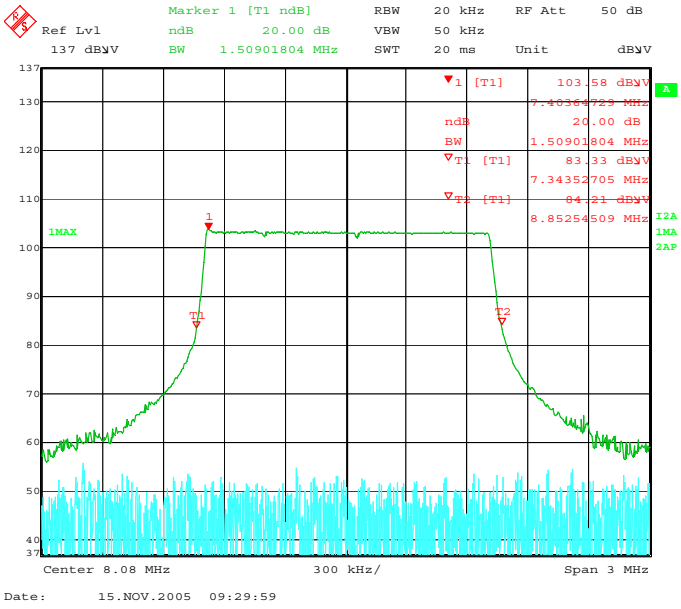
Overall Results: All radiated emissions, spurious and non-spurious, recorded at a distance of 3 meters from the Source Tagging Tester (STT) are below the FCC Class B limit @ 3 meters.

4.1.2 Occupied Bandwidth (7/21/05)

Occupied Bandwidth Plots (FCC, IC)



6 dB Bandwidth



20 dB Bandwidth

Overall Results: 6 dB bandwidth: 1.43 MHz, 20 dB bandwidth: 1.509 MHz

Test Setup Photos

STT (Horizontal) Front View

STT (Horizontal) Rear View

STT (Vertical) Rear View

4.2 Conducted Emissions

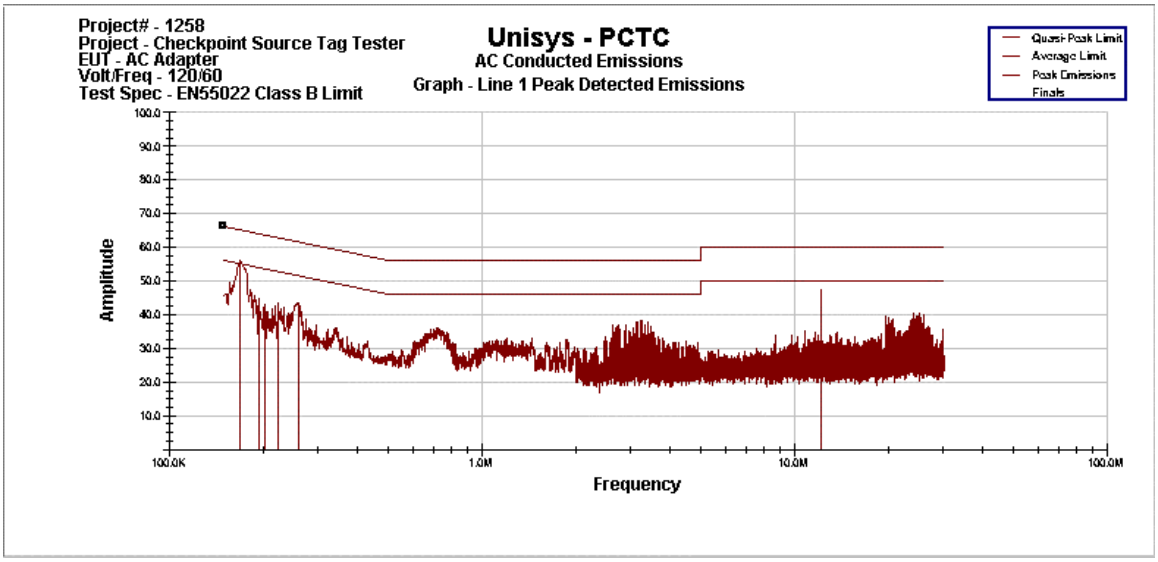
Test Standard:	USA: CISPR 22 Class A Canada: RSS-GEN and ICES-003
Frequency Range:	150kHz to 30 MHz
AC Power:	120 Vac, 60 Hz
EUT Type:	Wall Mounted or table top
Highest Oscillator Frequency:	15 MHz
Measurement Uncertainty:	5.0 dB (CISPR 16-4: 2002)
Conducted Emission Calculation:	Peak Emission (dBuV 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 B devices are presented on the following pages. Conducted emission amplitudes (dBµV PK) measured with a peak detector are compared with CISPR 22, Class B 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-GEN 7.2.2, ICES-003)

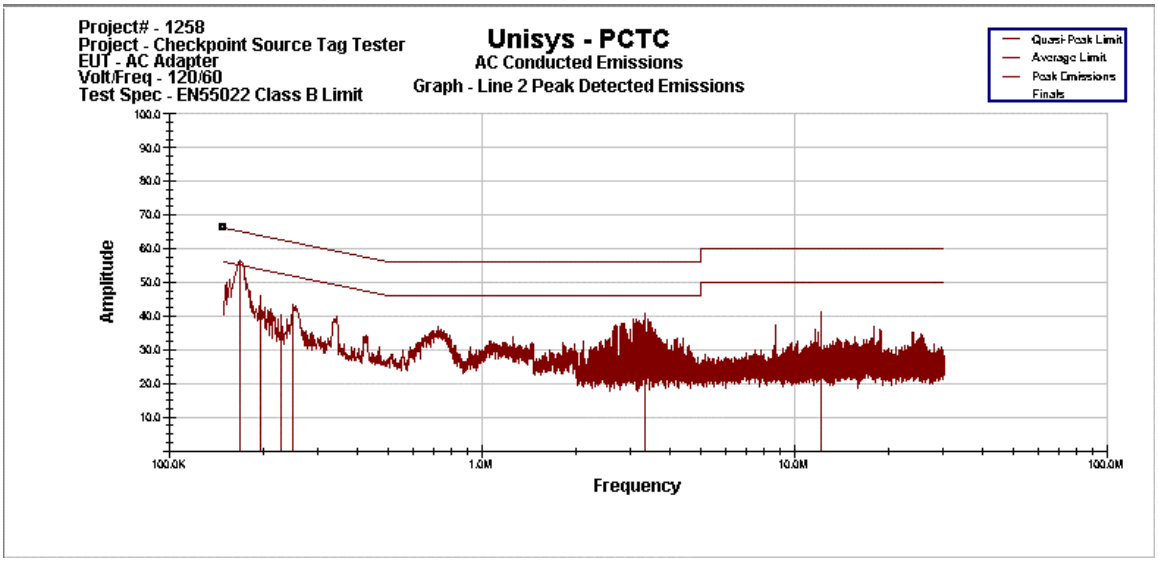
Source Tagging Tester, 120 Vac / 60 Hz, Neutral Line



Unisys - PCTC
Line 1 Conducted Emissions
04:36:41 PM, Monday, October 24, 2005

	1	2	3	4	5	6	7
Frequency	AVG	AVG	AVG	QP	QP	QP	Corr
MHz	dBuV	Limit	Margin	dBuV	Limit	Margin	Factor
169.000 KHz	39.94	55.46	-15.52	54.20	65.46	-11.26	12.797
193.000 KHz	24.64	54.77	-30.13	33.81	64.77	-30.97	11.870
202.000 KHz	25.36	54.51	-29.15	32.90	64.51	-31.61	11.565
224.000 KHz	23.60	53.89	-30.28	30.42	63.89	-33.47	11.178
260.000 KHz	23.27	52.86	-29.59	32.51	62.86	-30.35	10.688
12.160 MHz	46.16	50.00	-3.84	47.84	60.00	-12.16	10.303
Project# - 1258							
Project - Checkpoint Source Tag Tester							
EUT - AC Adapter							
Volt/Freq - 120/60							
Test Spec - EN55022 Class B Limit							

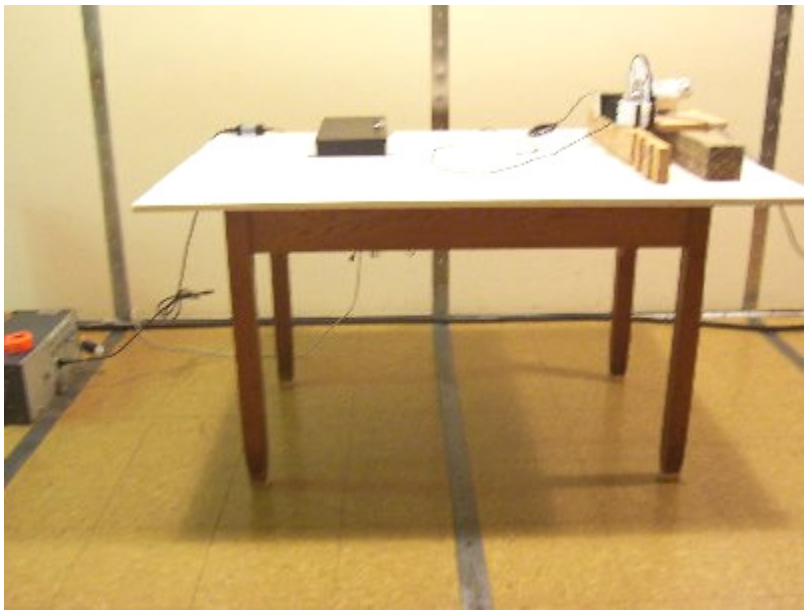
Source Tagging Tester, 120 Vac / 60 Hz, Phase Line



Unisys - PCTC
Line 2 Conducted Emissions
04:42:02 PM, Monday, October 24, 2005

	1	2	3	4	5	6	7
Frequency	AVG	AVG	AVG	QP	QP	QP	Corr
MHz	dBuV	Limit	Margin	dBuV	Limit	Margin	Factor
168.000 KHz	41.356	55.486	-14.130	54.307	65.486	-11.178	12.835
195.000 KHz	24.610	54.714	-30.105	32.486	64.714	-32.228	11.793
229.000 KHz	23.475	53.743	-30.267	32.301	63.743	-31.442	11.090
249.000 KHz	28.062	53.171	-25.110	39.933	63.171	-23.238	10.738
3.310 MHz	21.725	46.000	-24.275	37.352	56.000	-18.648	10.119
12.159 MHz	41.262	50.000	-8.738	44.395	60.000	-15.605	10.303
Project# - 1258							
Project - Checkpoint Source Tag Tester							
EUT - AC Adapter							
Volt/Freq - 120/60							
Test Spec - EN55022 Class B Limit							

Overall Results: The conducted emissions measured of the input AC power lines of the Source Tagging Tester (STT) are below the specified limit.



Source Tagging Tester: Conducted Emission 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	9/26/05
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	10/19/05