

**ELECTROMAGNETIC INTERFERENCE TEST REPORT**

**Doc. 20060519R/Project# 1331**

**TEST STANDARDS: 47 CFR PART 15 (USA)**  
**RSS-GEN, RSS-210 ISSUE 6, ICES-003 (CANADA)**

**ISO ILS OPEN PLUS INTELLIGENT UNLOCKING STATION**  
**(IUS)**

**FCC ID: DO4FISOIUS / IC ID: 3356B-FISOIUS**

**CHECKPOINT SYSTEMS, INC.**  
**THOROFARE, NJ 08086**

**TEST DATES: April 20<sup>th</sup> to May 3<sup>rd</sup>, 2006**  
**ISSUE: May 30<sup>th</sup>, 2006**

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**AMERICAN ASSOCIATION FOR LABORATORY ACCREDITATION**

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 ISO ILS IUS 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 15.225	RSS-210, A2.6	13.110 to 14.010 MHz	Below Max. Permissible Limit
Radiated Emissions Intentional Radiator, Harmonics	Part 15.209	RSS-210, 2.7	9 kHz 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 15.207	RSS-Gen 7.2.2 ICES-0003	150 kHz to 30 MHz	Below Max. Permissible Limit
Frequency Stability	Part 15.225	RSS-GEN 4.5 RSS-210, A2.6	13.110 to 14.010 MHz	Below Max. Permissible Limit

**EUT Modifications:**

Modifications were not necessary to comply with the specified standards.

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**1.0 Description of the Equipment Under Test (EUT)**

Equipment Identification	ISO ILS IUS
Serial Number	7419104B0A00346005
Manufacturer	Checkpoint Systems, Inc.
Technical Contact	John Paranzino, Bayode Olabisi
Condition Received	Acceptable for Test
Date Received	20 April 2006
Sample Type	Prototype
Equipment Classification	Non-residential, Information Technology Equipment (ITE)
Unisys Test Personnel	Paul Banker, Charles Cunningham, Itamar Gonen

**1.1 General Description**

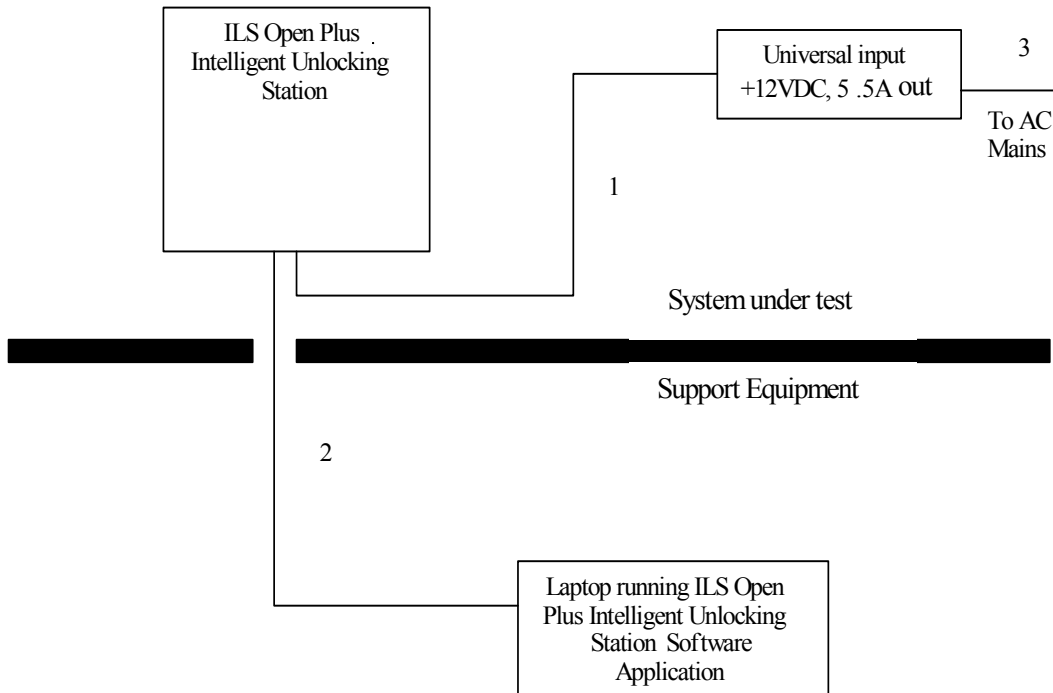
The ILS Open Plus Intelligent Unlocking Station is used in conjunction with the ILS Open Plus Patron Self Checkout Station allowing library patrons to check out DVDs and CDs without the help of library personnel. DVDs and CDs are kept in locked cases. After a DVD or CD is checked out using the Self Checkout Station, the patron inserts the DVD or CD case into the Unlocking Station which has an RFID reader in it that reads the tag contents of the CD or DVD case and sends the tag data to the Self Checkout Station over an RS-232 serial link. The Self Checkout Station queries a database to determine if the CD or DVD has been checked out. If the DVD or CD has been checked out, the Self Checkout Station sends an unlock command to the Unlocking Station which pulls the CD or DVD case into the unit and then ejects the unlocked case.

The cases are locked and unlocked by sliding a plastic bar that is inside of the case. The plastic bar has two steel slugs connected to it that allow the bar to be slid from the outside of the CD or DVD case using powerful fixed magnets. Movement is required to slide the CD or DVD locking bar. A manual unlocking device is available that requires a person to slide the CD or DVD case through it, like swiping a credit card. The manual method does not prevent the unlocking of a case that has not been checked out so this method is not appropriate for the application.

In order to control which CDs or DVDs that get unlocked, the IUS may use a motor to provide the movement of the checked out CD or DVD case. The motor can be controlled such that only checked out materials will allow the motor to start and pull the case through the IUS' magnets.

**1.2 Test Configurations**

The ISO ILS IUS will be tested as a typical unit operating in the field. All I/O ports will be connected and functional. A CD case, with RFID tag, will be used to stimulate a response from the Checkout Station.



#	Description	Length	Shielding
1	DC Power line	5'	None
2	RS232 I/O Cable	24'	Braid/foil
3	AC Line Cord	6'	Braid/foil

**EMI Test Setup Block Diagram of ISO ILS IUS**

**EUT Hardware:**

Description	Manufacturer	Model#	Serial#
ILS Open Plus Intelligent Unlocking Station	Checkpoint Systems	ILS Open Plus IUS	7328800B0A40676001
External Power Supply	Deltron	11985A	701200000298

**Support Equipment Hardware:**

Description	Manufacturer	Model#	Serial#
Laptop	IBM	2384-EHU	KM-0792K 0408
AC Adaptor	IBM	02K7085	11S02K708Z1Z6C048S0BR

### **1.3 Rationale for the Chosen Configuration**

This configuration represents a typical unit, under normal operation.

### **1.4 EUT Modifications**

Modifications were not 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 reader module in the ILS Open Plus Intelligent Unlocking Station is designed to read ISO 15693 Radio Frequency Identification (RFID) tags at an operating frequency of 13.56 MHz. This Intelligent Unlocking Station is used in conjunction with the FCC certified ILS Open Plus Patron Self Checkout Station to allow library patrons to check out DVDs and CDs kept in locked cases without the help of library personnel. After a DVD or CD is checked out using the Self Checkout Station, the patron inserts the DVD or CD case into the Unlocking Station which has an RFID reader in it that reads the tag contents of the CD or DVD case and sends the tag data to the Self Checkout Station over an RS-232 serial link.

During testing, a DVD jewel case with an ISO 15693 tag attached is inserted into the Unlocking Station; a Laptop PC (to simulate the ILS Open Plus Self-Checkout Station) running the Intelligent Unlocking Station software application is connected to the Unlocking Station via an RS-232 cable. Tag reads by the Unlocking Station's reader is displayed on the Unlocking Station software application running on the laptop.

### **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**

The low temperature for the frequency stability test was -30°C. USA 47 CFR Part 15.225 requires -20°C. Industry Canada RSS-Gen 4.5 requires -30°C.

**4.0 Test Results**

**4.1 Radiated Emissions**

<b>Test Standard:</b>	USA: 47 CFR Parts 15 B, 15C; Canada: RSS 210
<b>Frequency Range:</b>	9 kHz to 1 GHz
<b>Test Distances:</b>	3 and 30 Meters
<b>Antenna Polarity and Height:</b>	9 kHz – 30 MHz: Three orthogonal axes @ 1 meter 30MHz-1 GHz: Vertical and Horizontal @ 1 to 4 Meters
<b>AC Power:</b>	120 Vac, 60 Hz
<b>EUT Type:</b>	Table top
<b>Highest Oscillator Frequency:</b>	30 MHz
<b>Measurement Uncertainty:</b>	4.3 dB (CISPR 16-4: 2002)
<b>Field Strength Calculations:</b>	Field Strength (dBµV/m) = meter reading (dBµV) + antenna factor (dB/m)+ Cable Loss (dB)

**4.1.1 Radiated Emissions Test Results (4/20/06)**

**Radiated Emissions 9 kHz – 30 MHz (FCC 15.209, 15.225; IC RSS-210 A2.6)**

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

Frequency (MHz)	Description	Polarity (H / V)	Azimuth (degrees)	Indicated Level (dBµV)	Ant. Factor (dB 1/m)	Cable Loss (dB)	Corrected Level (dBµV/m)	Limit (dBµV/m)	Δ
13.56	Fundamental	Vert ^	265	25.03	17.60	0.65	43.28	84	-40.72
		Vert =	0	12.75			31.00	84	-53.00
		Horiz	192	10.9			29.15	84	-54.85
27.12	2nd Harmonic	Vert ^	154	3.45	17.55	1.00	22.00	29.54	-7.54
		Vert =	288	2.65			21.20	29.54	-8.34
		Horiz	76	2.65			21.20	29.54	-8.34



**Overall Results:** Measurements of the fundamental and second harmonic signals are below the specified 30-meter limit. No other signals from 9 kHz to 30 MHz were detected from the EUT. The band restrictions of the fundamental signal are met by examining the bandwidth plot. The level of the fundamental signal drops more than 30 dB at +/- 6 kHz. This level is below the maximum levels provided by the applicable standards.

**Spurious Emissions: 30 MHz - 1 GHz (FCC 15.209; IC RSS-210 2.7)**

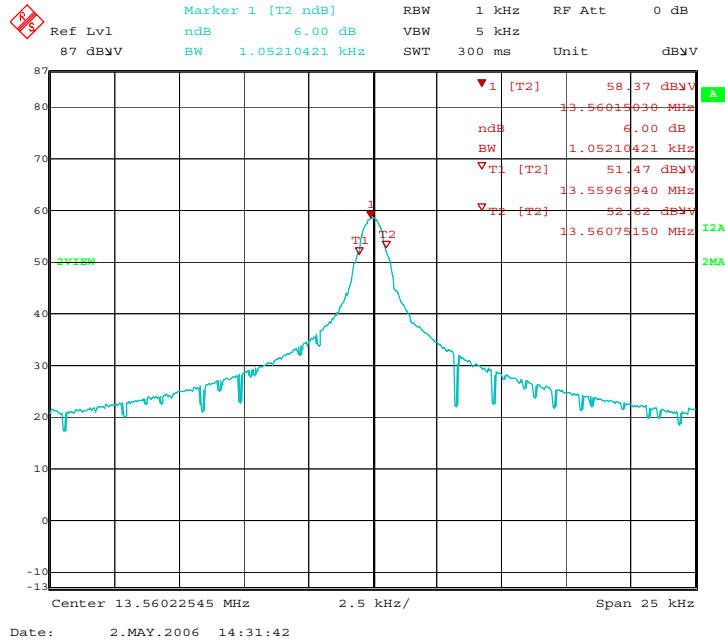
The tables below show the highest amplitude quasi-peak detected field strengths of spurious emissions measured from the EUT over the frequency range from 30 MHz to 1000 MHz, at a distance of 3 meters compared to the maximum permissible 47 CFR Part 15C / RSS-210 2.7 limit at 3 meters.

Freq [MHz]	Peak [dBuV/m]	Q-Pk [dBuV/m]	Pol [H/V]	Angle [deg]	Ht [cm]	CF [dB]	Limit [dBuV/m]	Delta [dB]
54.237	26.85	20.64	V	276	107	13.79	40	-19.36
54.237	24.45	20.20	H	332	317	13.79	40	-19.80
67.797	25.68	24.79	V	257	100	9.29	40	-15.21
67.797	29.60	19.24	H	228	295	9.29	40	-20.76
81.362	24.30	19.84	V	58	155	8.49	40	-20.16
81.362	18.41	14.60	H	220	207	8.49	40	-25.40
122.038	27.24	22.71	V	14	100	14.62	43.5	-20.79
122.038	22.71	19.55	H	104	289	14.62	43.5	-23.95
135.585	22.91	19.85	V	1	101	12.90	43.5	-23.65
135.585	19.29	14.17	H	318	100	12.90	43.5	-29.33
461.037	37.38	35.86	V	186	104	19.96	46	-10.14
461.037	38.57	37.31	H	208	157	19.96	46	-8.69
515.277	43.64	42.64	V	335	100	21.22	46	-3.36
515.277	43.90	42.93	H	306	144	21.22	46	-3.07

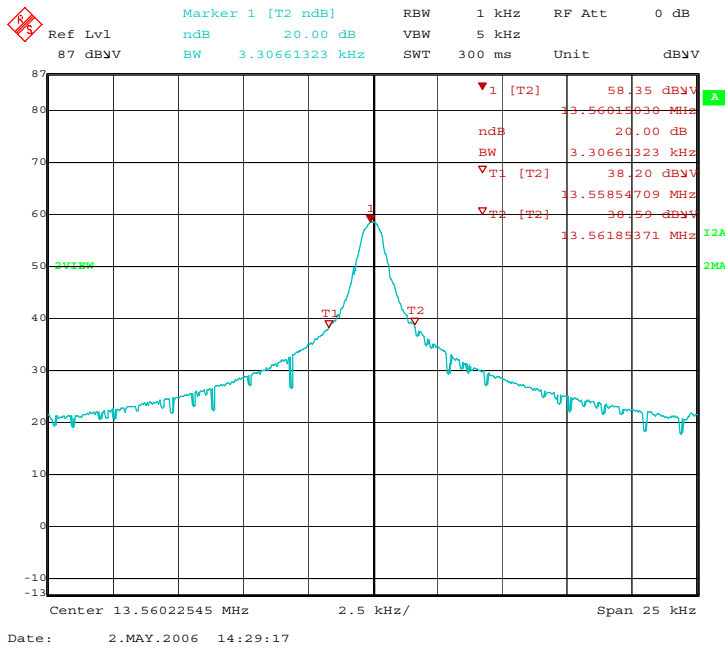
**Overall Results:** All radiated spurious emissions, recorded at a distance of 3 meters from the ISO ILS IUS, are below the FCC Class B limit @ 3 meters. There were no other signals detected from the EUT in the 30 MHz to 1 GHz range.

**4.1.2 Occupied Bandwidth (5/2/06)**

**Occupied Bandwidth Plots (FCC, IC)**



**6 dB Bandwidth**



**20 dB Bandwidth**

**Overall Results:** 6 dB bandwidth: 1.052 kHz, 20 dB bandwidth: 3.307 kHz

**Test Setup Photos**



ISO ILS IUS: Front View



ISO ILS IUS: Rear View

**4.2 Conducted Emissions**

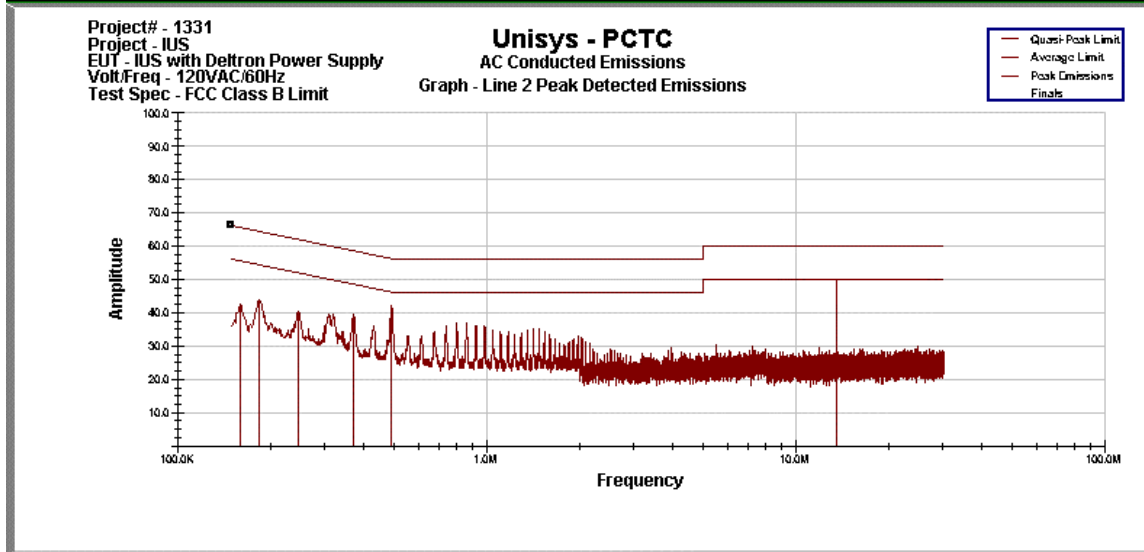
<b>Test Standards:</b>	USA: 47 CFR Part 15.207 Canada: RSS-GEN 7.2.2
<b>Frequency Range:</b>	150kHz to 30 MHz
<b>AC Power:</b>	120 Vac, 60 Hz
<b>EUT Type:</b>	Table top
<b>Highest Oscillator Frequency:</b>	30 MHz
<b>Measurement Uncertainty:</b>	5.0 dB (CISPR 16-4: 2002)
<b>Conducted Emission Calculation:</b>	Peak Emission (dBuV Peak) = Meter reading (dBuV) + cable loss (dB) + Limiter loss (dB)

**4.2.1 Conducted Emission Test Results (5/2/06)**

The conducted emissions recorded on the EUT AC power cord, displayed against the limits for CISPR 22; Class B devices are presented on the following pages. Conducted emission amplitudes (dBuV 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.



**ISO ILS IUS, 120 Vac / 60 Hz, Phase Line**



**Unisys - PCTC**  
**Line 2 Conducted Emissions**  
 01:44:16 PM, Tuesday, May 02, 2006

	1	2	3	4	5	6	7	
Frequency	AVG	AVG	AVG	QP	QP	QP	Corr	
MHz	dBuV	Limit	Margin	dBuV	Limit	Margin	Factor	
159.000 KHz	32.920	55.743	-22.822	36.798	65.743	-28.945	13.183	
183.000 KHz	36.996	55.057	-18.061	41.502	65.057	-23.555	12.256	
245.000 KHz	34.802	53.286	-18.483	38.103	63.286	-25.183	10.808	
371.000 KHz	32.762	49.686	-16.923	36.974	59.686	-22.712	10.532	
492.000 KHz	40.430	46.229	-5.799	40.943	56.229	-15.285	10.445	
13.560 MHz	47.787	50.000	-2.213	49.152	60.000	-10.848	10.331	
<b>Project# - 1331</b>								
<b>Project - IUS</b>								
<b>EUT - IUS with Deltron Power Supply</b>								
<b>Volt/Freq - 120VAC/60Hz</b>								
<b>Test Spec - FCC Class B Limit</b>								

**Overall Results:** The conducted emissions measured of the input AC power lines of the ISO ILS IUS are below the specified limit.



**ISO ILS IUS: Conducted Emission Test Setup**

**4.3 Frequency Stability (5/3/06)**

<b>Test Standards:</b>	USA: 47 CFR Part 15.225 Canada: RSS-210 A2.6
<b>Frequency Range:</b>	13.110 – 14.010
<b>Temperature Range:</b>	-30°C, +20°C and +50°C
<b>AC Power:</b>	102, 120 and 138 Vac/60 Hz
<b>EUT Type:</b>	Table top
<b>Maximum Allowed Fundamental Frequency Change:</b>	.01% (+ / – 1.356 kHz)

The tables below show the variation of transmitter frequency at ambient temperature of 20°C and extreme temperatures of -30°C and +50°C at nominal AC voltage. Variation is also shown with the AC input voltage at 120Vac, 102Vac and 138Vac.

120VAC/60Hz @ +20 deg C

Elapsed Time (minutes)	Frequency (Hz)	Deviation (Hz)	Deviation %
0	13,560,069.0	0.0	
2	13,560,039.0	-30.0	0.00022
5	13,560,024.0	-45.0	0.00033
10	13,560,014.0	-55.0	0.00041

120VAC/60Hz @ -30 deg C

Elapsed Time (minutes)	Frequency (Hz)	Deviation (Hz)	Deviation %
0	13,560,271.0	0.0	
2	13,560,264.0	-7.0	0.00005
5	13,560,261.0	-10.0	0.00007
10	13,560,261.0	-10.0	0.00007

120VAC/60Hz @ +50 deg C

Elapsed Time (minutes)	Frequency (Hz)	Deviation (Hz)	Deviation %
0	13,559,875.0	0.0	
2	13,559,849.0	-26.0	0.00019
5	13,559,835.0	-40.0	0.00029
10	13,559,825.0	-50.0	0.00037

120VAC/60Hz @ +20 deg C

Elapsed Time (minutes)	Frequency (Hz)	Deviation (Hz)	Deviation %
0	13,560,042.0	0.0	
2	13,560,031.0	-11.0	0.00008
5	13,560,026.0	-16.0	0.00012
10	13,560,018.0	-24.0	0.00018

102VAC/60Hz @ +20 deg C

Elapsed Time (minutes)	Frequency (Hz)	Deviation (Hz)	Deviation %
0	13,560,026.0	0.0	
2	13,560,021.0	-5.0	0.00004
5	13,560,016.0	-10.0	0.00007
10	13,560,015.0	-11.0	0.00008

138VAC/60Hz @ +20 deg C

Elapsed Time (minutes)	Frequency (Hz)	Deviation (Hz)	Deviation %
0	13,560,032.0	0.0	
2	13,560,025.0	-7.0	0.00005
5	13,560,019.0	-13.0	0.00010
10	13,560,019.0	-13.0	0.00010

**Overall Results:** The ISO ILS IUS exhibited a fundamental transmitter frequency variation of 55 Hz or .0041% during ambient temperature exposure. This was the highest variation noted in the stability tests and complies with the requirements of the specified standard.

#### **4.4 SAR Requirements**

The output power of the ISO ILS IUS is less than 2.5 watts. This level complies with the minimum power allowed by Industry Canada RSS-102, Section 2.5.2. The EUT are exempt from SAR requirements.



**Appendix A – Test Equipment List**

**Emission Test Equipment**

<b>Description</b>	<b>Freq Range (Hz)</b>	<b>Model Number</b>	<b>Manufacturer</b>	<b>ID / SN</b>	<b>Last Cal Date</b>
EMI Test Receiver	20 – 40 G	ESIB40	Rohde & Schwarz	C-062	12/19/05
Antenna	25 M – 2 G	LPB-2520/A	ARA	B-965	9/26/05
Antenna, Active Loop	1 k – 30 M	6507	EMCO	D-244	4/20/05*
Controller, Tower and Turntable	NA	2090	EMCO	B-812	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	U776	10/19/05
Power Supply	NA	5001ix	California Instruments	A-116	8/4/05
Temperature/Humidity Chamber	NA	SM32C	Thermotron	V733	12/12/05

\*extended to 5/17/06

\*\* extended to 5/15/06