

FCC PART 15 Subpart C

EMI MEASUREMENT AND TEST REPORT

FOR

AI Tech International Corporation

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Fremont, CA 94538

FCC ID: H4BAL2CIO-70

June 6, 2001

This Report Concerns: ☒ Original Report	Equipment Type: RF Wireless VGA & Video to TV Converter (Transmitter)- ITE
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1 - GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

The AITech International Corporation's product, model no.: AL2CIO-70 or the "EUT" as referred to in this report is a RF Wireless VGA & Video to TV Converter. The EUT is a wireless PC-to-TV digital scan converter system capable of transmitting audio/video signals through walls up to 70 feet away. The 2.4 GHz transmitter/receiver scan converter system enables the user to control the PC with a remote keyboard/mouse, viewing everything on a TV monitor. The EUT was composed of two parts. One part is 2.4GHz receiver which measured 5.0" L x 3.75" W x 2.0"H, and the other part is 2.4GHz transmitter

1.2 Purpose

This document is a qualification test report based on the Electromagnetic Interference (EMI) tests performed on the RF Wireless VGA & Video to TV Converter (Transmitter), Model No.: AL2CIO-70. The EMI measurements were performed according to the measurement procedure described in ANSI C63.6: 1992. The tests were performed in order to determine whether the electromagnetic emissions from the equipment under test, referred to as EUT hereafter, are within the specification limits defined by FCC Title 47, Part 15, Subpart C, section 15.205, 15.207, and 15.249.

1.3 Related Submittal(s)/Grant(s)

No Related Submittals

1.4 Test Methodology

All measurements contained in this report were conducted with ANSI C63.4 –1992, 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. All radiated and conducted emissions measurement was performed at Bay Area Compliance Laboratory, Corp. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

1.5 Test Facility

The Open Area Test site used by Bay Area Compliance Laboratory Corporation to collect radiated and conducted emission measurement data is located in the back parking lot of the building at 230 Commercial Street, Suite 2, Sunnyvale, California, USA.

Test sites at Bay Area Compliance Laboratory Corporation has been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports has been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 11 and December 10, 1997 and Article 8 of the VCCI regulations on December 25, 1997. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-1992.

The Federal Communications Commission and Voluntary Control Council for Interference has the reports on file and is listed under FCC file 31040/SIT 1300F2 and VCCI Registration No.: C-1298 and R-1234. The test sites has been approved by the FCC and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, Bay Area Compliance Laboratory Corporation is a National Institute of Standards and Technology (NIST) accredited laboratory, under the National Voluntary Laboratory Accredited Program (NVLAP). The scope of the accreditation covers the FCC Method - 47 CFR Part 15 - Digital Devices, IEC/CISPR 22: 1998, and AS/NZS 3548: Electromagnetic Interference - Limits and Methods of Measurement of Information Technology Equipment test methods under NVLAP Lab Code 200167-0.

1.6 Test Equipment List

Manufacturer	Description	Model	Serial Number	Cal. Due Data
HP	Spectrum Analyzer	8566B	2610A02165	12/6/2001
HP	Spectrum Analyzer	8593B	2919A00242	12/20/2001
HP	Amplifier	8349B	2644A02662	12/20/2001
HP	Quasi-Peak Adapter	85650A	917059	12/6/2001
HP	Amplifier	8447E	1937A01046	12/6/2001
A.H. System	Horn Antenna	SAS0200/571	261	12/27/2001
Com-Power	Log Periodic Antenna	AL-100	16005	11/2/2001
Com-Power	Biconical Antenna	AB-100	14012	11/2/2001
Solar Electronics	LISN	8012-50-R-24-BNC	968447	12/28/2001
Com-Power	LISN	LI-200	12208	12/20/2001
Com-Power	LISN	LI-200	12005	12/20/2001
BACL	Data Entry Software	DES1	0001	12/20/2001

1.7 Equipment Under Test (EUT)

Manufacturer	Description	Model	Serial Number	FCCID
AITech International Corporation	RF Wireless VGA & Video to TV Converter (Transmitter)	AL2CIO-70	None	H4BAL2CIO-70

1.8 Local Support Equipment

Manufacturer	Description	Model	Serial Number	FCC ID
Microsoft	Keyboard	Elite	B7A051164	E5XKBM104 M1QUC
Microsoft	Mouse	1.1APS/2	01234316	C3KKPMS
Citizen	Printer	LSP-10	5047999-82	DLK66TLSP- 10
EVEREX	Modem	EV-945	None	E3E5UVEV- 945
GATEWAY	Monitor	VX720	7002201	DOC
GATEWAY	P.C System	Monterrey	002	DOC
SONY	TV	PVM-14N5U	6003126	DOC

1.9 Host Computer Configuration Details

Manufacturer	Description	Model	Serial Number	FCC ID
GATEWAY	Motherboard	E210882	4000656	DOC
NEC	Floppy Drive	None	1140001B6FX02 Z	DOC
MAXTOR	Hard Drive	54098U8	K806D1SC	DOC
Newton Power Ltd.	Power Supply	NPS-250CB A	CAT0038001940	DOC
NEC	DVD	DV-5800A/GW	F150E04M3800 018	DOC
GATEWAY	Chassis	Mid Tower ATX	None	None
CREATIVE	Sound Card	CT4870	6001548	DOC
NVIDIA	VGP	MS-8817	RD01040787	DOC

1.10 External I/O Cabling for the EUT

Cable Description	Length (M)	Port/From	To
Shielded KB Cable	1.8	KB Serial Port/Host	Microsoft Keyboard
Shielded Cable	1.8	Mouse Serial Port/Host	Microsoft Mouse
Shielded Serial Cable	1.8	Serial Port/Host	EVEREX Modem
Shielded Printer Cable	2.0	Parallel Port/Host	Citizen Printer
Shielded Video Cable(Bi- connector)	0.5	EUT Port	Monitor &VGP Card(PC System)
Shielded Composite Cable	1.2	EUT Audio Ports/TX	Sound Card Port
Shielded Composite Cable x 3	1.2	EUT Audio &Video Ports/RX	T.V

2 - SYSTEM TEST CONFIGURATION

2.1 Description of Test Configuration

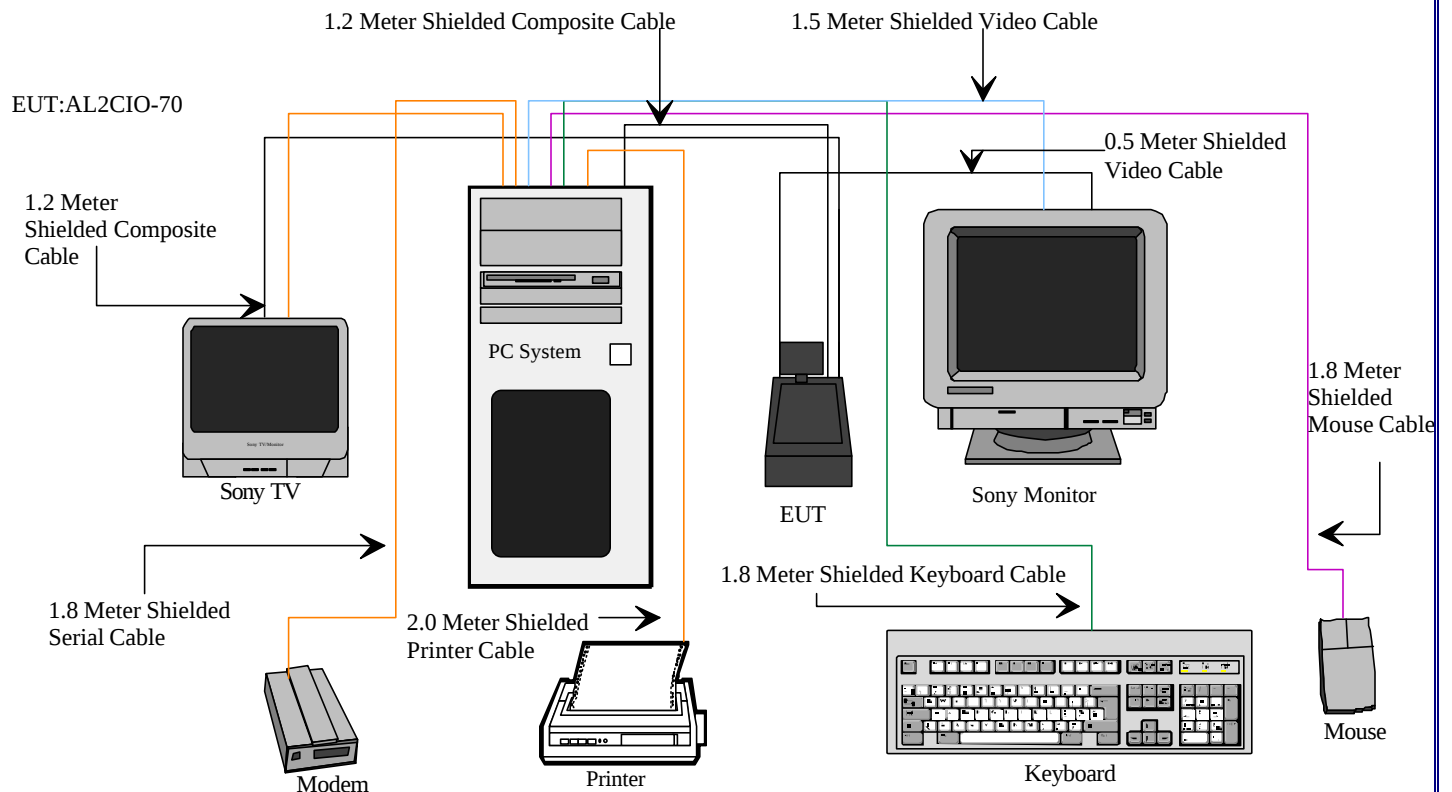
The EUT was configured for testing in a typical fashion (as normally used by a typical user).

Transmitter being tested: The EUT RF Wireless VGA & Video to TV Converter - transmitter, Model AL2CIO-70 was placed on the wooden table and tested in three orthogonal axis. The transmitter was connected to the PC system, the VGA monitor and SONY TV via its input ports. The four channels were tested. The transmitter was transmitting to and receiving from the PC system, the VGA monitor and SONY TV. The EUT was investigated for emissions while off hook. The radiated data was taken in this mode of operation. All initial and final investigations were performed with the EMI receiver in manual mode scanning the frequency range continuously. The cables were bundled and routed as shown in the 2.5.

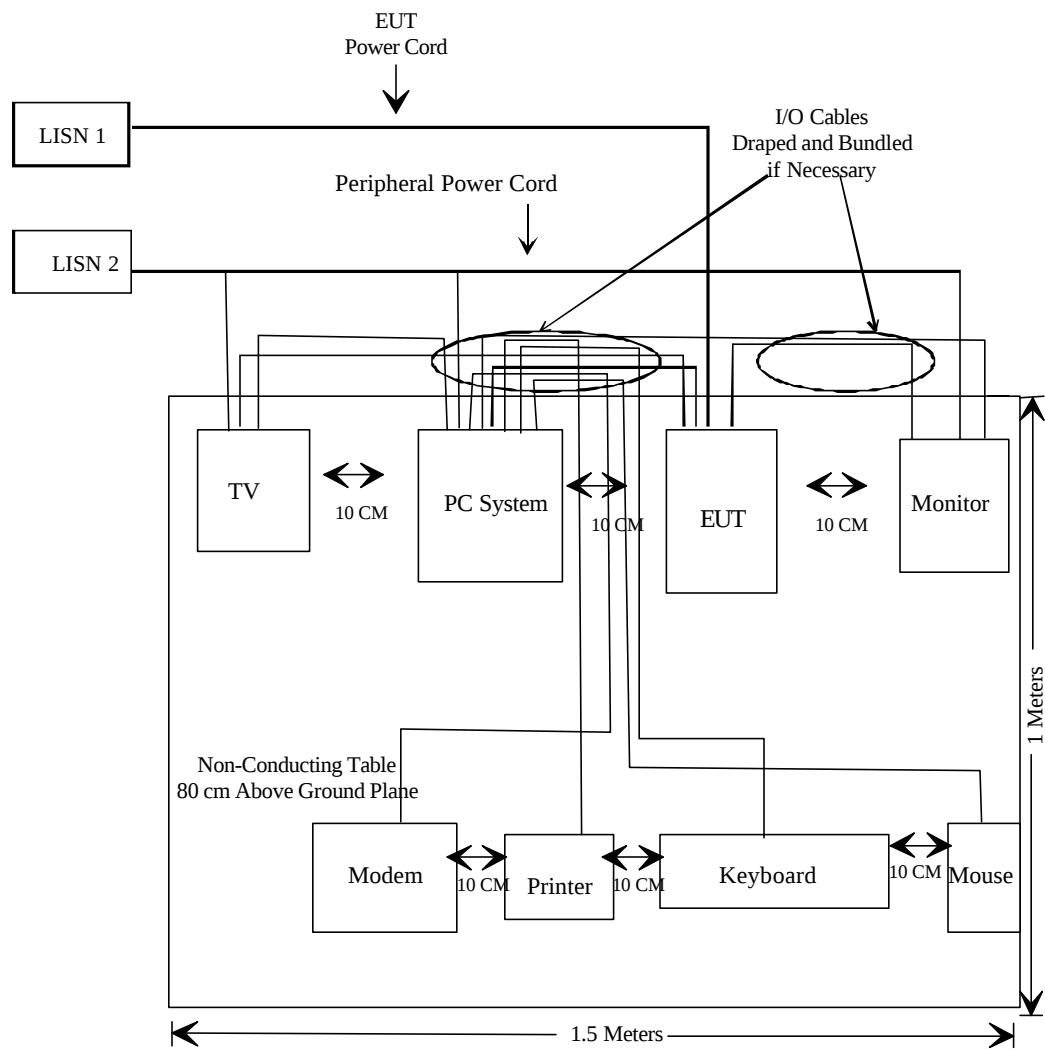
2.2 Equipment Modifications

No modification(s) to the EUT were made to comply with the applicable limits.

2.3 Configuration of Test System (Transmitter)



2.4 Configuration of Test System



3-CONDUCTED EMISSIONS TEST DATA

3.1 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, and LISN.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of any conducted emissions measurement at BACL is ± 2.4 dB.

3.2 EUT Setup

The measurement was performed at the **Open Area Test Site**, using the same setup per ANSI C63.4 - 1992 measurement procedure. Specification used was with the FCC Class B limits.

The EUT - Transmitter was connected to a 110 VAC / 60 Hz power source and it was placed center and the back edge of the test table. The SONY TV and the PC system were placed on left side of the EUT, and the VGA monitor was placed on the right side the EUT. The rear of the EUT and peripherals were placed flushed with the rear of the tabletop.

The keyboard was placed directly in front of the monitor. The modem and the printer were placed on one side of the EUT, and the mouse was placed on the other side of the EUT. The mouse is flush with the back of the keyboard.

The spacing between the peripherals was 10 centimeters.

Input / Output cables were draped over edge of the test table and bundle when necessary.

3.3 Spectrum Analyzer Setup

The spectrum analyzer was set with the following configurations during the conducted emission test:

Start Frequency.....	450 kHz
Stop Frequency.....	30 MHz
Sweep Speed	Auto
IF Bandwidth.....	100 kHz
Video Bandwidth.....	100 kHz
Quasi-Peak Adapter Bandwidth.....	9 kHz
Quasi-Peak Adapter Mode	Normal

3.4 Test Procedure

During the conducted emission test, the EUT power cord was connected to the auxiliary outlet of the first LISN with all support equipment power cords connected to the second.

The EUT was tested with the AI Tech AC Adapter to represent worst case results for the final qualification test. Therefore, these results were used for final test data recorded in the table listed under section 3.6 of this report.

Maximizing procedure was performed on the six (6) highest emissions to ensure EUT compliance using all installation combination. All data was recorded in the peak detection mode. Quasi-peak readings were only performed when an emission was found to be marginal (within -4 dB of specification limit). Quasi-peak readings are distinguished with a "Qp".

3.5 Summary of Test Results

According to the data in section 3.6, the EUT complied with the FCC Conducted margin for a Class B device, with the *worst* margin reading of:

-11.7 dBmV at 0.750 MHz in the **Neutral** mode for AI Tech AC Adapter, Model SCP41-120500, -0.45-30MHz.

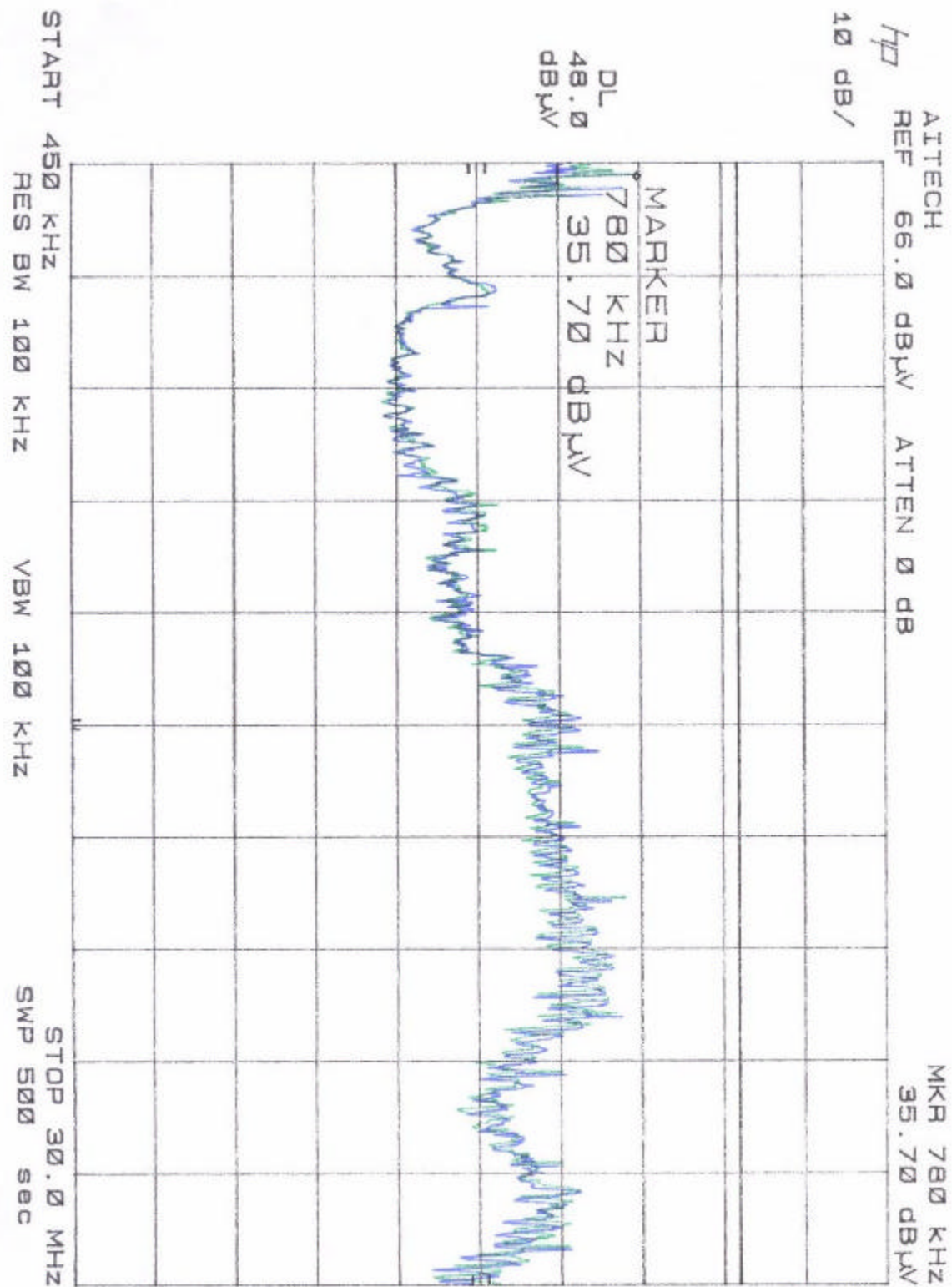
3.6 Conducted Emissions Test Data

3.6.1 Test Data for AI Tech AC Adapter, Model SCP41-120500, 0.45 - 30 MHz.

LINE CONDUCTED EMISSIONS				FCC CLASS B	
Frequency	Amplitude	Detector	Phase	Limit	Margin
MHz	dBμV	Qp/Ave/Peak	Line/Neutral	dBμV	dB
0.750	36.3	QP	Neutral	48	-11.7
0.780	35.7	QP	Line	48	-12.3
19.830	33.9	QP	Line	48	-14.1
22.970	33.6	QP	Neutral	48	-14.4
22.850	32.9	QP	Line	48	-15.1
19.890	32.3	QP	Neutral	48	-15.7

3.7 Plot of Conducted Emissions Test Data

Plot of Conducted Emissions test data for the AI Tech AC Adapter, Model SCP41-120500 is presented hereinafter as reference.



4 - RADIATED EMISSION DATA

4.1 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at BACL is ± 4.0 dB.

4.2 EUT Setup

The radiated emission tests were performed in the open area 3 meter test site, using the setup in accordance with the ANSI C63.4 - 1992. The specification used was the FCC 15 Subpart C limits.

The EUT - Transmitter was connected to a 110 VAC / 60 Hz power source and it was placed center and the back edge of the test table. The SONY TV and the PC system were placed on left side of the EUT, and the VGA monitor was placed on the right side the EUT. The rear of the EUT and peripherals were placed flushed with the rear of the tabletop.

The keyboard was placed directly in front of the monitor. The modem and the printer were placed on one side of the EUT, and the mouse was placed on the other side of the EUT. The mouse is flush with the back of the keyboard.

The spacing between the peripherals was 10 centimeters.

Input / Output cables were draped over edge of the test table and bundle when necessary.

4.3 Spectrum Analyzer Setup

According to FCC Rules, 47 CFR 15.33 (a) (1), the system was tested to 24.50GHz.

During the radiated emission test, the spectrum analyzer was set with the following configurations:

Start Frequency.....	30 MHz
Stop Frequency.....	24.50 GHz
Sweep Speed	Auto
IF Bandwidth.....	1 MHz
Video Bandwidth	1 MHz
Quasi-Peak Adapter Bandwidth.....	120 kHz
Quasi-Peak Adapter Mode	Normal
Resolution Bandwidth	1MHz

4.4 Test Procedure

For the radiated emissions test, both the EUT and all support equipment power cords was connected to the AC floor outlet since the AI Tech AC Adapter, Model SCP41-120500 used in the EUT did not provide an accessory power outlet.

Maximizing procedure was performed on the six (6) highest emissions to ensure EUT compliance is with all installation combinations. All data was recorded in the peak detection mode. Quasi-peak readings was performed only when an emission was found to be marginal (within -4 dB of specification limit), and are distinguished with a "Qp" in the data table.

4.5 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

$$\text{Corr. Ampl.} = \text{Indicated Reading} + \text{Antenna Factor} + \text{Cable Factor} - \text{Amplifier Gain}$$

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dBμV means the emission is 7dBμV below the maximum limit for Class B. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corr. Ampl.} - \text{Class B Limit}$$

4.6 Summary of Test Results

According to the data in section 4.7, the EUT complied with the FCC Title 47, Part 15, Subpart C, section 15.205, 15.207, and 15.249, and had the worst margin of:

-3.6 dBmV at 7301.60 MHz in the **Vertical** polarization, Channel 1, 30MHz to 24.50GHz, 3 meters.

-2.9 dBmV at 4905.80 MHz in the **Horizontal** polarization, Channel 2, 30MHz to 24.50GHz, 3 meters.

-2.5 dBmV at 9891.40 MHz in the **Horizontal** polarization, Channel 3, 30MHz to 24.50GHz, 3 meters.

-3.5 dBmV at 4820.00 MHz in the **Horizontal** polarization, Channel 4, 30MHz to 24.50GHz, 3 meters.

4.7 Radiated Emissions Test Result Data**4.7.1 Final Test Data, Transmitter, Channel 1, 30MHz to 24.50 GHz, 3 meters.**

INDICATED			TABLE	ANTENNA		CORRECTION FACTOR			CORRECTED AMPLITUDE	FCC 15 Subpart C	
Frequency MHz	Ampl. dBmV/m	Comments	Angle Degree	Height Meter	Polar H/ V	Antenna dBmV/m	Cable dB	Amp. dB	Corr. Ampl. dBmV/m	Limit dBmV/m	Margin dB
7301.60	42.0	Ave	270	1.2	V	35.1	5.6	32.3	50.4	54.0	-3.6
9735.60	41.5	Ave	270	1.2	V	35.1	5.6	32.3	49.9	54.0	-4.1
7301.60	41.0	Ave	180	1.4	H	35.1	5.6	32.3	49.4	54.0	-4.6
2434.00	90.2	Ave	180	1.6	H	28.1	3.4	32.3	89.4	94.0	-4.6
9735.60	39.6	Ave	180	1.4	H	35.1	5.6	32.3	48.0	54.0	-6.0
4867.60	40.4	Ave	180	1.4	H	32.5	4.9	32.3	45.5	54.0	-8.5
4867.60	39.8	Ave	270	1.2	H	32.5	4.9	32.3	44.9	54.0	-9.1
2434.00	85.2	Ave	360	1.2	V	28.1	3.4	32.3	84.4	94.0	-9.6
7301.60	48.0	peak	225	1.6	H	35.1	5.6	32.3	56.4	74.0	-17.6
9735.60	47.0	peak	180	1.3	V	35.1	5.6	32.3	55.4	74.0	-18.6
7301.60	46.0	peak	225	1.6	V	35.1	5.6	32.3	54.4	74.0	-19.6
4867.00	48.0	peak	185	1.6	H	32.5	4.9	32.3	53.1	74.0	-20.9
9735.60	43.0	peak	175	2.0	H	35.1	5.6	32.3	51.4	74.0	-22.6
4867.60	46.0	peak	90	1.2	H	32.5	4.9	32.3	51.1	74.0	-22.9

4.7.2 Final Test Data, Transmitter, Channel 2, 30MHz to 24.50 GHz, 3 meters.

INDICATED			TABLE	ANTENNA		CORRECTION FACTOR			CORRECTED AMPLITUDE	FCC 15 Subpart C	
Frequency MHz	Ampl. dBmV/m	Comments	Angle Degree	Height Meter	Polar H/ V	Antenna dBmV/m	Cable DB	Amp. dB	Corr. Ampl. dBmV/m	Limit dBmV/m	Margin dB
4905.80	46.0	Ave	180	1.4	H	32.5	4.9	32.3	51.1	54.0	-2.9
2452.90	91.2		360	1.2	V	28.1	3.4	32.3	90.4	94.0	-3.6
2452.90	90.1		150	1.4	H	28.1	3.4	32.3	89.3	94.0	-4.8
9811.60	40.1	Ave	45	1.2	V	35.1	5.6	32.3	48.5	54.0	-5.5
4905.80	41.6	Ave	45	1.2	V	32.5	4.9	32.3	46.7	54.0	-7.3
7358.70	36.9	Ave	45	1.2	V	35.1	5.6	32.3	45.3	54.0	-8.7
7358.70	36.8	Ave	180	1.4	H	35.1	5.6	32.3	45.2	54.0	-8.8
9811.60	35.3	Ave	180	1.4	H	35.1	5.6	32.3	43.7	54.0	-10.3
9811.60	47.0	peak	90	1.2	V	35.1	5.6	32.3	55.4	74.0	-18.6
9811.60	46.0	peak	180	1.4	H	35.1	5.6	32.3	54.4	74.0	-19.6
4905.80	49.0	peak	125	1.6	H	32.5	4.9	32.3	54.1	74.0	-19.9
4905.80	49.0	peak	45	1.2	V	32.5	4.9	32.3	54.1	74.0	-19.9
7358.70	42.8	peak	125	1.2	V	35.1	5.6	32.3	51.2	74.0	-22.8
7358.70	42.0	peak	225	1.4	H	35.1	5.6	32.3	50.4	74.0	-23.6

4.7.3 Final Test Data, Transmitter, Channel 3, 30MHz to 24.50 GHz, 3 meters.

INDICATED			TABLE	ANTENNA		CORRECTION FACTOR			CORRECTED AMPLITUDE	FCC 15 Subpart C	
Frequency MHz	Ampl. dBmV/m	Comments	Angle Degree	Height Meter	Polar H/ V	Antenna dBmV/m	Cable DB	Amp. dB	Corr. Ampl. dBmV/m	Limit dBmV/m	Margin dB
9891.40	43.1	Ave	180	1.4	H	35.1	5.6	32.3	51.5	54.0	-2.5
7418.40	43.0	Ave	90	1.2	V	35.1	5.6	32.3	51.4	54.0	-2.6
7418.40	42.0	Ave	180	1.4	H	35.1	5.6	32.3	50.4	54.0	-3.6
2473.00	90.2		45	1.4	V	28.1	3.4	32.3	89.4	94.0	-4.6
4954.50	42.4	Ave	180	1.4	H	32.5	4.9	32.3	47.5	54.0	-6.5
9891.40	39.0	Ave	90	1.2	V	35.1	5.6	32.3	47.4	54.0	-6.6
2473.00	87.5		45	1.4	H	28.1	3.4	32.3	86.7	94.0	-7.4
4954.50	39.1	Ave	90	1.2	V	32.5	4.9	32.3	44.2	54.0	-9.8
9891.40	49.0	peak	125	1.4	H	35.1	5.6	32.3	57.4	74.0	-16.6
7418.40	46.0	peak	180	1.6	V	35.1	5.6	32.3	54.4	74.0	-19.6
7418.40	46.0	peak	180	1.7	H	35.1	5.6	32.3	54.4	74.0	-19.6
9891.40	45.0	peak	125	1.2	V	35.1	5.6	32.3	53.4	74.0	-20.6
4954.50	47.0	peak	125	1.7	V	32.5	4.9	32.3	52.1	74.0	-21.9
4954.50	46.0	peak	180	1.4	H	32.5	4.9	32.3	51.1	74.0	-22.9

4.7.4 Final Test Data, Transmitter, Channel 4, 30MHz to 24.50GHz, 3 meters.

INDICATED			TABLE	ANTENNA		CORRECTION FACTOR			CORRECTED AMPLITUDE	FCC 15 Subpart C	
Frequency MHz	Ampl. dBmV/m	Comments	Angle Degree	Height Meter	Polar H/ V	Antenna dBmV/m	Cable dB	Amp. dB	Corr. Ampl. dBmV/m	Limit dBmV/m	Margin dB
4820.00	45.4	Ave	180	1.4	H	32.5	4.9	32.3	50.5	54.0	-3.5
4820.00	44.5	Ave	90	1.2	V	32.5	4.9	32.3	49.6	54.0	-4.4
2410.40	90.4		45	1.4	H	28.1	3.4	32.3	89.6	94.0	-4.5
9641.00	40.9	Ave	180	1.4	H	35.1	5.6	32.3	49.3	54.0	-4.7
7231.00	40.8	Ave	90	1.2	V	35.1	5.6	32.3	49.2	54.0	-4.8
9641.00	39.7	Ave	90	1.2	V	35.1	5.6	32.3	48.1	54.0	-5.9
2410.40	88.6		45	1.4	V	28.1	3.4	32.3	87.8	94.0	-6.3
7231.00	37.6	Ave	180	1.4	H	35.1	5.6	32.3	46.0	54.0	-8.0
7231.00	52.0	peak	125	1.4	H	35.1	5.6	32.3	60.4	74.0	-13.6
9641.00	49.7	peak	180	1.4	H	35.1	5.6	32.3	58.1	74.0	-15.9
9641.00	48.0	peak	125	1.2	V	35.1	5.6	32.3	56.4	74.0	-17.6
7231.00	46.0	peak	180	1.4	V	35.1	5.6	32.3	54.4	74.0	-19.6
4820.00	49.0	peak	125	1.6	V	32.5	4.9	32.3	54.1	74.0	-19.9
4820.00	49.0	peak	125	1.4	H	32.5	4.9	32.3	54.1	74.0	-19.9