CE Class B EMC Test Report

for

ADI Engineering, Inc.

on the

Cinnamon Bay SBC A5x0P

ADI Engineering, Inc.
Tom Brown
1758 Worth Park
Charlottesville, VA 22911
434-978-2888

Result: Pass

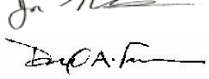
Document Number: 2009217/ QRTL09-270

Test Overview:

Model No.:	Cinnamon Bay SBC A5x0P
Manufacturer's Name:	ADI Engineering, Inc.
Manufacturer's Address:	1758 Worth Park Charlottesville, VA 22911
Type of Equipment:	Single Board Computer
Serial No.:	N/A
Year of Manufacture:	2009
Location of Testing:	Rhein Tech Laboratories, Inc., 360 Herndon Parkway, Suite 1400, Herndon, VA 703-689-0368
Date of Receipt:	July 14, 2009
Date(s) of Testing:	July 14, 2009
Purpose of Testing:	CE Class B verification
CE Directives:	Council Directive: 98/34/EEC: Technical Standards & Regulations Directive-procedure for the provision of information in the field of technical regulations and rules on information society services EMC Directive: 2004/108/EC: Electromagnetic Compatibility with Amending Directives: 92/31/EEC, 93/68/EEC, 91/263/EEC

Standard(s) to which device was tested:

Standards	Test Specification	Applicability ☒ *Tested* ☐ *Not Tested*
EN 55022: 2006	Emissions (EN 55022: 2006)	☒

Test Engineer:	Jon Wilson	**Signature:**	
Report Written By:	Jon Wilson	**Signature:**	
Report Approved By:	Desmond Fraser	**Signature:**	
Report Number:	2009217		
Report Date:	July 24, 2009		

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1 INTRODUCTION

The following report for CE testing of a Class B Information Technology Equipment (ITE) is prepared on behalf of **ADI Engineering, Inc.**, in accordance with: EMC Directive (2004/108/EC Amending Directives: 92/31/EEC, 93/68/EEC, 91/263/EEC) of the European Economic Community. The Equipment Under Test (EUT): **Cinnamon Bay SBC A5x0P**. The test results reported in this document relate only to the item that was tested.

All measurements contained in this report were conducted in accordance with the directives listed above. The instrumentation utilized for the measurements conforms to CISPR 22 Specification for Radio Disturbance and Immunity Measuring Apparatus and Methods. Calibrations are performed yearly on all test equipment by a calibration lab, with traceability to the National Institute of Standards and Technology (NIST). All other accessory calibrations, including the high pass filter, preamplifier and cables, are performed periodically in our test facility.

All radiated and conducted emission measurements were performed manually at Rhein Tech Laboratories, Inc. The radiated emissions measurements were performed on the open air test site maintained by Rhein Tech Laboratories, Inc., 360 Herndon Parkway, Suite 1400, Herndon, Va., 20170. The power line conducted emission measurements were performed in a shielded enclosure also located at the Herndon, Virginia facility. Complete descriptions and Site Attenuation Measurement data records are maintained at the test facility and have been placed on file with the appropriate compliance bodies.

1.1 DEVIATIONS

There were no deviations from the test standard(s) and/or methods.

1.2 ACCREDITATION STATEMENTS

- A2LA (USA): Accredited under A2LA Certificate # 2653.01
- FCC (USA): Listing of test sites, Registration # 90902
- IC (Canada): Listing of test sites, IC 2956-1 and IC 2956-2
- US TCB (ATCB): Certification of cooperation, granted in 2005
- US CAB: Australia, Canada, China, Korea, accepted CAB under Phase I of APEC Telecommunication MRA. Identification number US0079
- VCCI (Japan): Approval and registration of RTL test sites as R-1113 and C-1172

2 TEST DETAILS

2.1 PRODUCT DESCRIPTION

ADI Engineering's Cinnamon Bay Single Board Computer (SBC) product line is a family of full-function SBCs for the Intel® Atom Z510P, Z530P and Z520PT processors. The Cinnamon Bay SBC family consists of three models targeting a wide range of deeply embedded applications such as IP media, military, medical, wireless access, industrial controls, general-purpose embedded computing, digital signage, gaming, and point of sale (PoS) terminals.

The basic Cinnamon Bay SBC architecture is illustrated in the block diagram below.

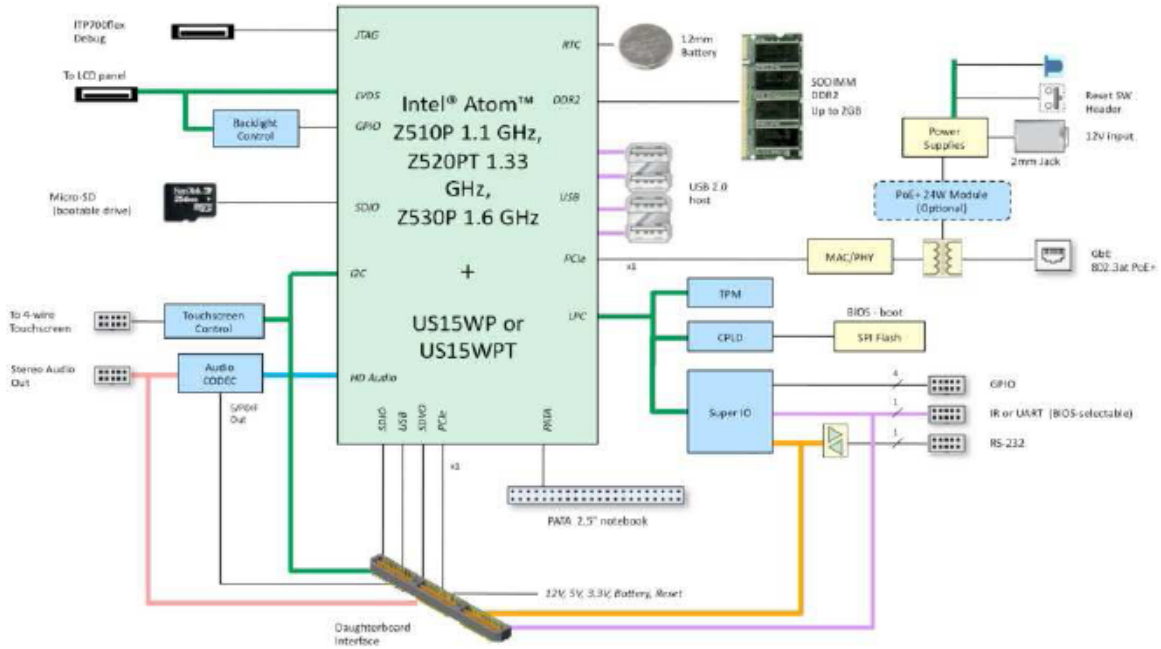


Figure 1 CB SBC System Block Diagram

Feature	CB SBC A530P	CB SBC A510P	CB SBC A520 EXT (Extended Temperature)
Form Factor	88 x 110mm		
CPU	Intel® Atom Z530P, 1.6 GHz	Intel® Atom Z510P, 1.1 GHz	Intel® Atom Z520PT, 1.33 GHz, extended
System Controller Hub (SCH)	Intel US15WP		Intel US15WPT, extended temperature
System Memory	DDR2 SO-DIMM socket, supporting 256MB - 2GB		
Ethernet	One RJ45 Gigabit Ethernet port (connector on board)		
USB 2.0 Host	Four (connectors on board)		
Bootable MicroSD	One (connector on board)		
Boot Flash	16Mbit Serial Boot Flash		
Trusted Platform Module	Yes		Yes
Video	LVDS (connector on board)		LVDS (connector on board)
4-wire Touchscreen Controller	Yes (via header)		Yes (via header)
LCD Backlight Power (5V, 3.3V)	Yes (connector on board)		Yes (connector on board)
802.3at Draft 3.0 PoE+	Via ADI's optional PoE+ module • 1500VRMS electrical isolation • 24W total power output when connected to a PoE+ power injector • 20W available for your peripherals Backwards compatible with 802.3af power injectors (contingent on sufficiency of the lower 802.3af limit in powering user-supplied peripherals)		
12V Power Input Jack	Yes (connector on board)		
PATA 2.5" HDD Connector	Yes (connector on board)		
RS-232	1 header		1 header
IR Port / UART (BIOS Selectable)	1 header		1 header
ADI daughterboard connector	1 header		1 header
Audio	Intel HD Audio CODEC, with stereo line out (via header)		Intel HD Audio CODEC, with stereo line out (via header)
Discrete I/O	4 bits via header		4 bits via header
Voltage and Temperature Monitor	Yes (connector on board)		Yes (connector on board)
Battery-Backed Real-Time Clock	Yes (accurate within 20 ppm)		
On-Board Hardware Watchdog Timer	Yes		Yes
LEDs	Power, Hard Drive		
External Reset	Pushbutton		
ITP700Flex Debug connector	Yes (connector on board)		
Operating Temperature Range	0 to 70C	0 to 70C	-40 to 85C
Power Consumption	15 Watts for Cinnamon Bay SBC with 15" LVDS flat panel monitor and 2.5" PATA HDD (no daughter cards)		

2.2 EUT EXERCISE DESCRIPTION

- A high-end Cinnamon Bay SBC (A530P) will be used for all FCC test runs since it is the highest speed SBC in the product line.
- The SODIMM memory slot will be populated with a 1GB, DDR2 module capable of running at a 533MHz data rate (267MHz clock).
- The four USB ports will be connected to loopback "pods" using standard off the shelf USB cables of at least 1m in length.
- A CAT5e patch cable longer than 1m will be used to connect the SBC's Ethernet port to a small switch.
- The Cinnamon Bay SBC will drive a 15" TFT Flan Panel display via the LVDS connector on the SBC.
- A 2.5" laptop style hard disk drive will be connected to the SBC's PATA interface. The hard drive will contain a Windows XP installation along with "BurnIn Test" from PassMark Software. Additionally, the hard drive will contain a VNC server installation so the system under test can be controlled via a remote terminal.
- For the initial test run, the Cinnamon Bay SBC will be powered via a POE daughter board. The POE daughter board is connected to a POE injector. If this combination is too noisy, the power source will be switched to a "Wall Wart" style power brick.
- Onboard headers are populated for development and debug purposes and therefore are outside the scope of testing a realistic field application.
- A host PC/laptop with a VNC viewer application will be attached to the same switch as the SBC. The VNC view will be used to provide mouse and keyboard functionality necessary to launch the test software.

"BurnIn Test" from PassMark Software will be used to exercise the processor on the SBC and its major peripherals. The table below outlines the manner that the Cinnamon Bay SBC is exercised during the FCC test.

SBC Component	Tests Executed
Processor	The primary method for exercising the processor is by continually executing both integer and floating point math tests. Testing the other SBC features will provide additional loading on the processor. Throughout the test, CPU utilization will be kept near 100% (as reported by the BurnIn Test application).
Memory	The memory test works by writing a pattern in RAM, then verifying the contents read from RAM match what was written. The pattern written will change from one cycle to the next. Any RAM not in active use by Windows will be grabbed by the memory test.
Ethernet	The Ethernet port will be exercised using both internal and external loopbacks. For the external loopback, a packet is sent to a remote host and echoed back. The packet sent to the remote host contains a data payload and a checksum. Every time a packet is echoed from the remote host the checksum is verified and the data payload is compared byte by byte with the data that was sent. The data payload is 64 bytes in length.
USB	Testing the 4 USB ports on the Cinnamon Bay SBC requires 4 loopback plugs from PassMark Software. The USB test sends data to the USB loopback plugs in 0.5KB blocks. The USB loopback plug receives the data, copies it to a new buffer and transmits it back to the SBC. The SBC compares the data in the block for an exact match, and then builds a new packet of random data bytes. Any differences between the data sent and received is flagged as an error.
Hard Disk Drive	During each test cycle, a file is created and verified on the HDD. The size of the file transferred is equal to 1% of the size of the disk (i.e. for a 30GB hard drive, the file size is 300MB). Each test file is filled with a number sequence (pattern) that is used to verify the correct operation of disk when the file is read. Files are created on the HDD until the disk is 94% full. When the disk has reached the 94% full limit, all the test files are deleted and the test starts again.
MicroSD	Same test method as for the Hard Disk Drive
Display	The "BurnIn Test" software will launch a window for each of the tests described above. Each window continually updates as the test progresses. Additionally, an analog style clock window is launched to provide a visual indication that the display is updating as expected (not locked up).

2.3 MODIFICATIONS

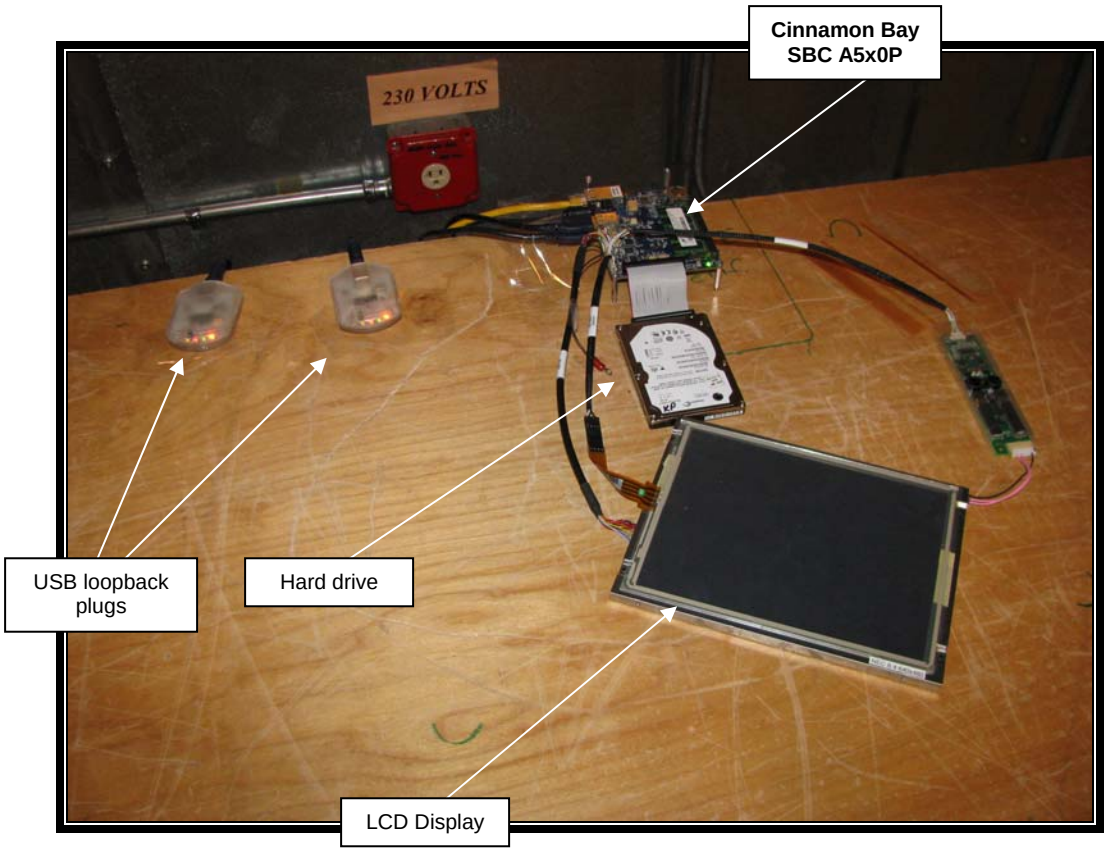
Installed ferrite on DC input. 600 Ohm Steward 24V2220-ISO

2.4 EQUIPMENT UNDER TEST

Equipment Under Test

Part	Manufacturer	Model	Serial Number	FCC ID	Cable Description	RTL Bar Code	Equipment Arrival Date
Single Board Computer	ADI Engineering, Inc.	Cinnamon Bay SBC A5x0P	N/A	No	Unshielded power	N/A	July 14, 2009

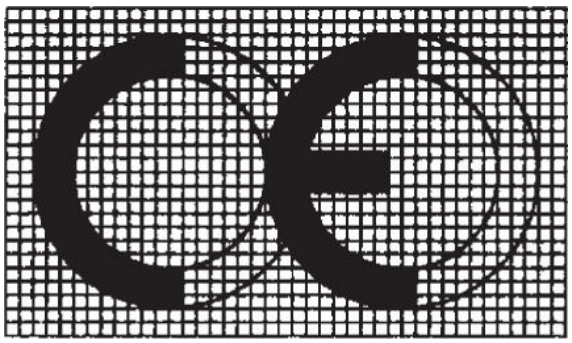
2.5 CONFIGURATION PHOTOGRAPH OF SYSTEM UNDER TEST



3 PRODUCT LABELING

3.1 CE MARKING

The 'CE' marking shall consist in the initials 'CE' taking the following form:



1) The 'CE' marking must have a height of at least 5 mm. If the 'CE' marking is reduced or enlarged the proportions given in the above graduated drawing must be respected.
2) The 'CE' marking must be affixed to the apparatus or to its data plate. Where this is not possible or not warranted on account of the nature of the apparatus, it must be affixed to the packaging, if any, and to the accompanying documents.
3) Where the apparatus is the subject of other Directives covering other aspects and which also provide for the 'CE' marking, the latter shall indicate that the apparatus also conforms with those other Directives.
4) However, where one or more of those Directives allow the manufacturer, during a transitional period, to choose which arrangements to apply, the 'CE' marking shall indicate conformity only with the Directives applied by the manufacturer. In that case, particulars of the Directives applied, as published in the *Official Journal of the European Union*, must be given in the documents, notices or instructions required by the Directives and accompanying such apparatus.

3.2 OTHER MARKS AND INFORMATION

1) Each apparatus shall be identified in terms of type, batch, serial number or any other information allowing for the identification of the apparatus.
2) Each apparatus shall be accompanied by the name and address of the manufacturer and, if he is not established within the Community, the name and address of his authorised representative or of the person in the Community responsible for placing the apparatus on the Community market.
3) The manufacturer shall provide information on any specific precautions that must be taken when the apparatus is assembled, installed, maintained or used, in order to ensure that, when put into service, the apparatus is in conformity with the protection requirements set out in Annex I, point 1.
4) Apparatus for which compliance with the protection requirements is not ensured in residential areas shall be accompanied by a clear indication of this restriction of use, where appropriate also on the packaging.
5) The information required to enable apparatus to be used in accordance with the intended purpose of the apparatus shall be contained in the instructions accompanying the apparatus.

4 EMISSIONS INFORMATION EN 55022

EN 55022/ CISPR 22 is the applicable regulation that applies to ITE. The intention of these standards is to establish uniform requirements for the radio disturbance level of the equipment contained in the scope, to fix limits of disturbance, to describe method of measurement and to standardize operation conditions and interpretation of the results.

EN 55022/ CISPR 22 defines ITE (Information Technology Equipment) for Radio Frequency Equipment as follows:

Any equipment:

a. Which has a primary function of either (or a combination of) entry, storage, display, retrieval, transmission, processing, switching, or control, of data and of telecommunication messages and which may be equipped with one or more terminal ports typically operated for information transfer;
b. With a rated supply voltage not exceeding 600 V.

EN 55022/ CISPR 22 defines Class B ITE as follows:

Class B ITE is a category of apparatus that satisfies the Class B ITE disturbance limits. The Class B ITE is intended primarily for use in the domestic environment.

EN55022/ CISPR22 defines Class A ITE as follows:

Class A ITE is a category of all other ITE that satisfies the Class A ITE limits but not the Class B ITE limits. Such equipment should not be restricted in its sale but the following warning shall be included in the instructions for use:

WARNING:

This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

4.1 MEASUREMENT UNCERTAINTY

Measurement uncertainties shown for these tests are expanded uncertainties expressed at 95% confidence level using a coverage factor k = 2.

Conducted Emissions: + 4.1 dB and – 3.6 dB
Radiated Emissions: + 5.0 dB and – 4.3 dB

5 CONDUCTED EMISSIONS

5.1 SITE AND TEST DESCRIPTION

The power line conducted emission measurements were performed in a Series 81 type shielded enclosure manufactured by Rayproof. The EUT was placed on a wooden table (for table-top devices) or on the floor (for floor mount devices). Power was fed to the EUT through a 50-ohm/50 microhenry Line Impedance Stabilization Network (LISN). The EUT LISN was fed power through an AC filter box on the outside of the shielded enclosure. The filter box and EUT LISN housing are bonded to the ground plane of the shielded enclosure. A second LISN, the peripheral LISN, provides isolation for the EUT test peripherals. This peripheral LISN was also fed AC power. A metal power outlet box, which is bonded to the ground plane and electrically connected to the peripheral LISN, powers the EUT host peripherals.

The spectrum analyzer was connected to the AC line through an isolation transformer. The 50-ohm output of the EUT LISN was connected to the spectrum analyzer input through a Solar 100 kHz high-pass filter. The filter is used to prevent overload of the spectrum analyzer from noise below 100 kHz. Conducted emission levels were measured on each current-carrying line with the spectrum analyzer operating in the CISPR quasi-peak mode (or peak mode if applicable). The analyzer's 6 dB bandwidth was set to 9 kHz. Video filter less than 10 times the resolution bandwidth is not used. Average measurements are performed in linear mode using a 10 kHz resolution bandwidth, a 1 Hz video bandwidth, by increasing the sweep time in order to obtain a calibrated measurement. The emission spectrum was scanned from 150 kHz to 30 MHz. The highest emission amplitudes relative to the appropriate limits were measured and have been recorded.

Conducted measurements at telecommunications ports (if applicable) were performed per EN55022: 2006. The limits for Class A and Class B are contained therein.

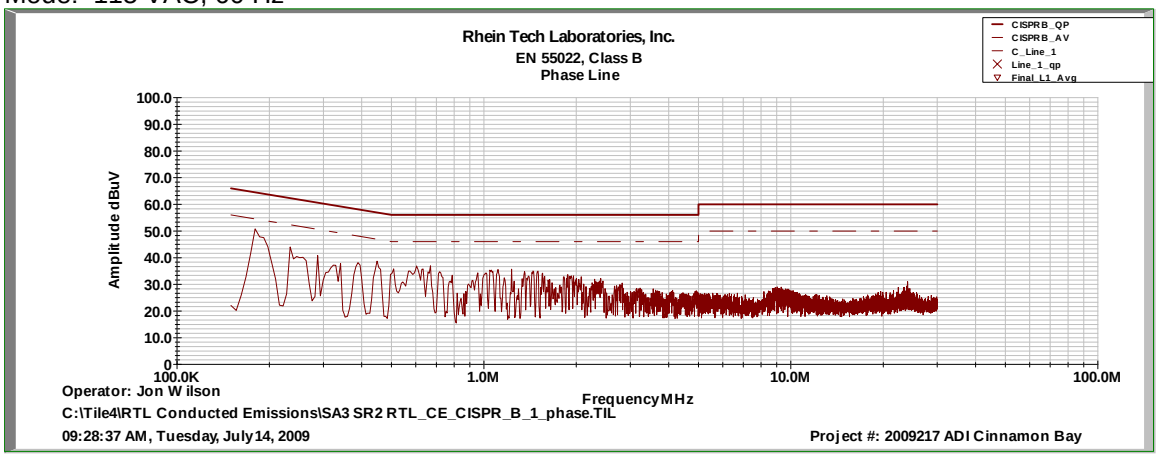
5.2 TEST LIMITS

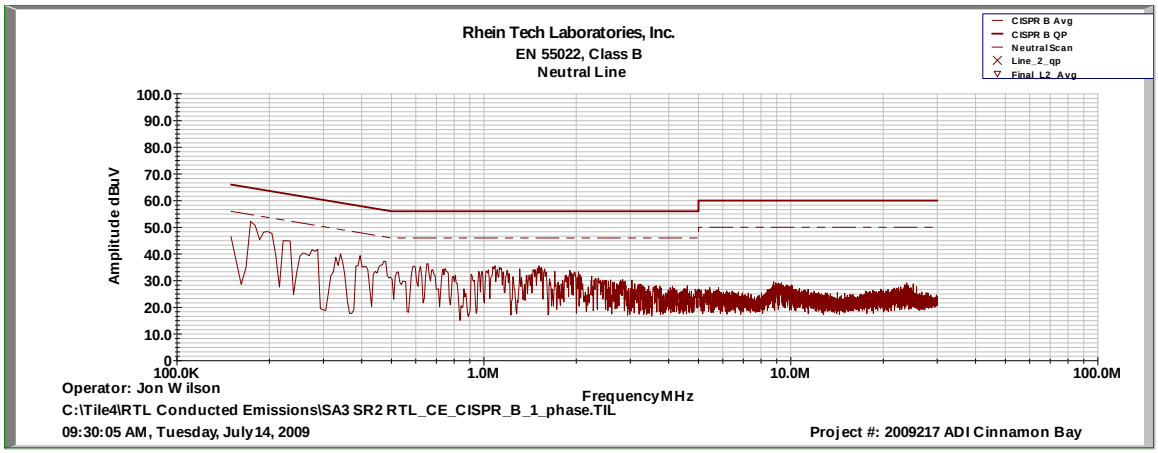
Class A Line-Conducted Emissions		
	Limit (dBµV)	
Frequency (MHz)	Quasi-Peak	Average
0.15 to 0.50	79	66
0.50 to 30.0	73	60

Class B Line-Conducted Emissions		
	Limit (dBµV)	
Frequency (MHz)	Quasi-Peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5.00	56	46
5.00 to 30.00	60	50

5.3 CONDUCTED EMISSIONS TEST RESULTS

Mode: 115 VAC, 60 Hz





Result: Pass

Test Personnel:

Jon Wilson		July 14, 2009
Tester	Signature	Date of Test

5.4 CONDUCTED TEST PHOTOGRAPH

6 RADIATED EMISSIONS

6.1 SITE AND TEST DESCRIPTION

Before final measurements of radiated emissions were made on the ten-meter, open area test site, the EUT was scanned indoors at both one and three meter distances. This was done in order to determine its emission spectrum signature. The physical arrangement of the test system and associated cabling was varied in order to determine the effect on the EUT's emissions in amplitude, direction and frequency. This process was repeated during final radiated emission measurements on the open-field test site, at each frequency, in order to ensure that maximum emission amplitudes were attained.

Final radiated emissions measurements between 30 and 1000 MHz were made on the OATS at a distance of 10 meters. The EUT was placed on a nonconductive turntable 0.8 meters above the ground plane.

At each frequency, the EUT was rotated 360°, and the antenna was raised and lowered from 1 to 4 meters in order to determine the maximum emission levels. Measurements were taken using both horizontal and vertical antenna polarization. The spectrum analyzer's 6 dB bandwidth was set to 120 kHz, and the analyzer was operated in the CISPR quasi-peak detection mode. Video filters less than 10 times the resolution bandwidth are not used.

The radiated data lists the significant emission frequencies, measured levels, correction factor (includes cable and antenna corrections), the corrected reading, plus the limit.

6.2 TEST LIMITS

Class A Radiated Emissions			
Frequency (MHz)	At 30m (dBμV/m)	At 10m (dBμV/m)	At 3m (dBμV/m)
30 to 230	30	40	50
230 to 1000	37	47	57

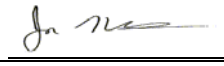
Class B Radiated Emissions		
Frequency (MHz)	At 10m (dBμV/m)	At 3m (dBμV/m)
30 to 230	30	40
230 to 1000	37	47

6.3 RADIATED EMISSIONS TEST RESULTS

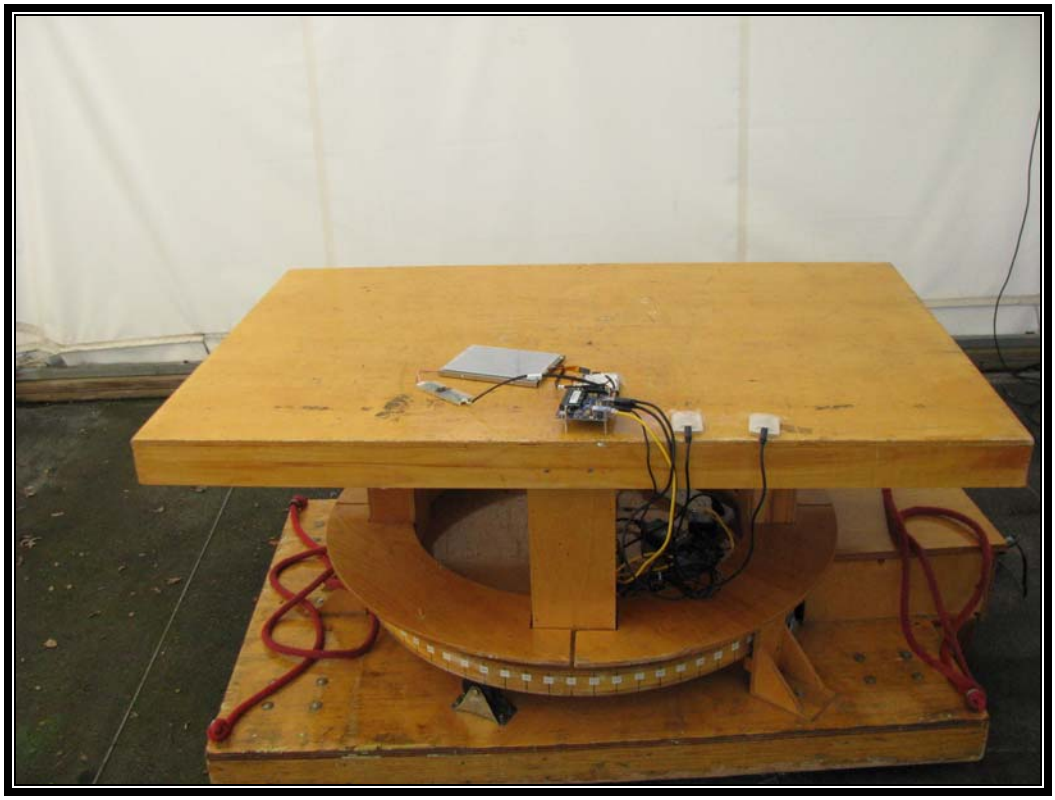
Temperature: 75°F Humidity: 34%											
Emission Frequency (MHz)	Test Detector	Antenna Polarity (H/V)	Turntable Azimuth (deg)	Antenna Height (m)	Analyzer Reading (dBuV)	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Pass/ Fail	
50.290	Qp	V	75	1.0	43.9	-23.6	20.3	30.0	-9.7	Pass	
70.810	Qp	V	260	1.0	46.8	-26.3	20.5	30.0	-9.5	Pass	
79.090	Qp	V	45	1.0	42.0	-25.4	16.6	30.0	-13.4	Pass	
91.360	Qp	V	170	1.0	37.0	-22.7	14.3	30.0	-15.7	Pass	
116.100	Qp	V	210	1.0	38.8	-19.6	19.2	30.0	-10.8	Pass	
133.210	Qp	V	90	1.5	41.4	-20.4	21.0	30.0	-9.0	Pass	
144.000	Qp	V	170	2.0	41.6	-20.5	21.1	30.0	-8.9	Pass	
166.000	Qp	V	10	2.0	42.3	-20.7	21.6	30.0	-8.4	Pass	
183.195	Qp	V	180	1.0	40.0	-21.2	18.8	30.0	-11.2	Pass	
199.152	Qp	H	180	4.0	46.0	-20.9	25.1	30.0	-4.9	Pass	
226.415	Qp	V	20	1.0	40.4	-21.1	19.3	30.0	-10.7	Pass	
299.870	Qp	V	45	1.0	44.7	-16.9	27.8	37.0	-9.2	Pass	

Result: Pass

Test Personnel:

Jon Wilson		July 14, 2009
EMC Test Engineer	Signature	Date Of Test

6.4 RADIATED TEST PHOTOGRAPHS



7 EQUIPMENT LIST

The following is the list of equipment Rhein Tech used to perform testing.

Part Type	Manufacturer	Model	Serial Number	Barcode	Cal Due Date
Conducted Emissions					
Spectrum Analyzer (100Hz-.15GHz)	Hewlett Packard	8567A	2602A00160	900968	9/8/2009
Spectrum Analyzer Display Section	Hewlett Packard	85662A	2542A11239	900970	9/8/2009
Quasi-Peak Adapter	Hewlett Packard	85650A	2521A00743	900339	9/11/2009
Filter	Solar	8130	947306	900729	8/19/2009
16A LISN	AFJ International	LS16/110VAC	16010020081	901083	10/23/2009
Emissions testing software	Quantum Change	Tile!	4.0.A.8	N/A	N/A
Radiated Emissions (OATS1)					
Amplifier (20MHz-2GHz)	RTL	PR-1040	900905	900905	6/2/2010
Bi-Log Antenna (20MHz-2GHz)	Schaffner Chase	CBL6112B	2099	900791	12/12/2010
EMI Receiver RF Section, 9 KHz - 6.5 GHz	Hewlett Packard	85462A	3325A00159	900913	4/15/2010
RF Filter Section, 100 KHz to 6.5 GHz	Hewlett Packard	85460A	3330A00107	900914	4/15/2010
Emissions testing software	Rhein Tech Laboratories, Inc.	Automated Emission Tester	Rev. 14.0.2	N/A	N/A