

EMC TEST REPORT

Reference No. : WT05110894

Applicant : Gembird Electronics Ltd.

Equipment Under Test (EUT) :

Product Name : Card reader

Model No : USB2.0A LL-in-1

Standards : EN55022:1998+A2:2003
EN55024:1998+A2:2003

Date of Test : November 11, 2005

Test Engineer : Tiger Su

Reviewed By :

Test Result :	PASS *
----------------------	---------------

* The sample detailed above has been tested to the requirements of Council Directives 89/336/EEC (as amended by Directives 92/31/EEC and 93/68/EEC). The test results have been reviewed against the Directives above and found to meet their essential requirements.

WALTEK SERVICES

Reference No.: WT05110894

1 Test Summary

Test	Test Requirement	Test Method	Class / Severity	Result
Mains Terminal Disturbance Voltage, 150kHz to 30MHz	EN55022:1998+A2-2003	EN55022:1998+A2-2003	Class B	N/A
Radiation Emission, 30MHz to 1000MHz	EN55022:1998+A2-2003	EN55022:1998+A2-2003	Class B	PASS
Harmonic Emission on AC, 100Hz to 2kHz	EN 61000-3-2 : 2000	EN 61000-3-2 : 2000/A14:2001	Clause 7 of EN61000-3-2	N/A
Flicker Emission on AC	EN 61000-3-3 :1995 +A1:2001	EN 61000-3-3 :1995 +A1:2001	Clause 5 of EN61000-3-3	N/A
ESD	EN55024 : 1998+A2:2003	EN61000-4-2 :1995 + A1:2001	±4 kV Contact ±8 kV Air	PASS
Radiated Immunity (80MHz to 1GHz)	EN55024 : 1998+A2:2003	EN61000-4-3 : 2002 + A1:2002	3V/m, 80%, 1kHz, Amp. Mod.	PASS
Electrical Fast Transients (EFT) on AC and DC	EN55024 : 1998+A2:2003	EN61000-4-4 :2004	AC ±1.0kV DC ±0.5kV	N/A
Surge Immunity on AC	EN55024 : 1998+A2:2003	EN 61000-4-5 :1995 +A1:1996	±1kV D.M.† ±2kV C.M.‡	N/A
Injected Currents on AC & DC, 150kHz to 80MHz	EN55024 : 1998+A2:2003	EN 61000-4-6 :1996 +A1:2001	3Vrms(emf), 80%, 1kHz Amp. Mod.	N/A
Power-frequency magnetic field	EN55024 : 1998+A2:2003	EN 61000-4-8 :1993 +A1:2001	3A/m	N/A
Voltage Dips and Interruptions on AC	EN55024 : 1998+A2:2003	EN61000-4-11:2004	>95 % U _T * for 0.5per >95 % U _T * for 250per 70 % U _T * for 25per	N/A

Remark:

A.M. Amplitude Modulation.

P.M. Pulse Modulation.

† D.M. – Differential Mode

* U_T is the nominal supply voltage

2 Contents

	Page
1 TEST SUMMARY.....	2
2 CONTENTS	3
3 GENERAL INFORMATION.....	4
3.1 CLIENT INFORMATION	4
3.2 DETAILS OF E.U.T.	4
3.3 DESCRIPTION OF SUPPORT UNITS	4
3.4 STANDARDS APPLICABLE FOR TESTING.....	4
3.5 TEST FACILITY.....	6
3.6 TEST LOCATION.....	6
4 EQUIPMENT USED DURING TEST	7
5 EMISSION TEST RESULTS.....	9
5.1 RADIATION EMISSION DATA.....	9
5.1.1 <i>Measurement Uncertainty</i>	9
5.1.2 <i>EUT Setup</i>	9
5.1.3 <i>Spectrum Analyzer Setup</i>	9
5.1.4 <i>Test procedure</i>	10
5.1.5 <i>Corrected Amplitude & Margin Calculation</i>	10
5.1.6 <i>Summary of Test Results</i>	10
5.1.7 <i>Radiated Emissions Test Data</i>	11
5.1.8 <i>Radiated Emissions Test Data</i>	12
5.1.9 <i>Photographs – Radiation Emission Test Setup</i>	12
6 IMMUNITY TEST RESULTS.....	13
6.1 PERFORMANCE CRITERIA DESCRIPTION.....	13
6.2 ESD.....	13
6.2.1 <i>E.U.T. Operation</i>	13
6.2.2 <i>Direct Application Test Results</i>	14
6.2.3 <i>Indirect Application Test Results</i>	14
6.2.4 <i>Photographs - ESD Test Setup</i>	15
6.3 RADIATED IMMUNITY	16
6.3.1 <i>E.U.T. Operation</i>	16
6.3.2 <i>Test Results</i>	16
6.3.3 <i>Photographs - Radiated Immunity Test Setup For X-Direction</i>	17
7 PHOTOGRAPHS - CONSTRUCTIONAL DETAILS	18
7.1 EUT – FRONT VIEW	18
7.2 EUT – BACK VIEW	18
7.3 PCB – FRONT VIEW.....	19
7.4 PCB – BACK VIEW	19

3 General Information

3.1 Client Information

Applicant: Gembird Electronics Ltd.

Address of Applicant: Room 1709, News Building, #2 Shennan Zhong Lu, Shenzhen, China

Product Name: Card reader

Model No.: USB2.0A LL-in-1

3.2 Details of E.U.T.

Power Supply: USB Signal Input

3.3 Description of Support Units

The EUT has been tested as an independent unit.

3.4 Standards Applicable for Testing

The customer requested EMC tests for a Card reader. The standards used were EN55022 Class B for emissions & EN55024 for immunity.

Table 1 : Tests Carried Out Under EN55022:1998+A2:2003

Standard		Status
EN55022: 1998+A2:2003	Radiation Emission, 30MHz to 1000MHz	√
EN55022: 1998+A2:2003	Mains Terminal Disturbance Voltage, 150KHz to 30MHz	×

Table 2 : Tests Carried Out Under EN 61000-3-2: 2000/A14:2001 & EN61000-3-3: 1995 + A1: 2001

EN61000-3-2: 2000 +A14: 2001	Harmonic Emissions on AC	×
EN61000-3-3: 1995 + A1: 2001	Flicker Emissions on AC	×

- √ Indicates that the test is applicable
 × Indicates that the test is not applicable

Table 3 : Tests Carried Out Under EN55024:1998+A2: 2003

Standard		Status
EN61000-4-2:1995 + A2:2001	Electro-static discharge	√
EN61000-4-3:2002	Radio frequency EM fields (80MHz to 1GHz)	√
EN61000-4-4:2004	Fast transients	×
EN61000-4-5:1995 +A1:2001	Surges	×
EN61000-4-6:1996+A1:2001	Radio frequency continuous conducted (150kHz to 80MHz)	×
EN61000-4-8:1993+A1:2001	Power-frequency magnetic field (50Hz)	×
EN61000-4-11:2004	Voltage dips & interruptions	×

- √ Indicates that the test is applicable
 × Indicates that the test is not applicable

3.5 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

- **CNAL – LAB Code: L1225**

Shenzhen Huatongwei International Inspection Co., Ltd, EMC Laboratory has been assessed and in compliance with CNAL/AC01:2003 accreditation criteria for testing laboratories (identical to ISO/IEC 17025:1999 General Requirements) for the Competence of Testing Laboratories.

- **FCC – Registration No.: 662850**

Shenzhen Huatongwei International Inspection Co., Ltd, EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 662850, November 17, 2003..

3.6 Test Location

All Emissions tests were performed at:-

Shenzhen Huatongwei International Inspection Co., Ltd. at Keji S, 12th, Road, Hi-tech Industrial Park, Shenzhen, Guangdong, China..

4 Equipment Used during Test

Conducted Emission Test						
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Due date
1	CE Variac	GZ Debao Factory	TS/DGC ₂ -5	N/A	N/A	N/A
2	LISN	SCHAFFNER CHASE	MNZ050D11	1421	05-11-2005	04-11-2006
3	Shielding Room	Frankonia	12 x 4 x 4 m ³	N/A	N/A	N/A
4	EMI Receiver	ROHDE & SCHWARZ	ESCS30	100086	05-11-2005	04-11-2006
5	Coaxial Cable	SZHTW	2m	N/A	05-11-2005	04-11-2006
Radiated Emission Test						
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Due date
1	3m Semi- Anechoic Chamber	Frankonia	N/A	N/A	05-11-2005	04-11-2006
2	EMI Test Receiver	ROHDE & SCHWARZ	ESCS30	100085	05-11-2005	04-11-2006
3	EMI Test Software	ROHDE & SCHWARZ	ES-K1	N/A	N/A	N/A
4	Coaxial cable	SZHTW	N/A	N/A	05-11-2005	04-11-2006
5	Bilog Antenna	SCHAFFNER CHASE	CBL6143	N/A	05-11-2005	04-11-2006
Radiated Power						
Item	Test Equipment	Manufacturer	Model No.	Series No.	Cal. Date	Due date
1.	Shielding Room	Frankonia	12 x 4 x 4 m ³	EMC0103	N/A	N/A
2.	Absorbing Clamp	Schwarzbeck	MDS 20	901997	05-11-2005	04-11-2006
3.	EMI Test Receiver	Rohde & Schwarz	ESCS30	100086	05-11-2005	04-11-2006
4.	7m Coaxial Cable	SZHTW	7m	EMC0303	05-11-2005	04-11-2006
Harmonic and Flicker						
Item	Test Equipment	Manufacturer	Model No.	Series No.	Cal. Date	Due date
1	AC Source	EM Test	DPA 500	303278	05-11-2005	04-11-2006
2	Analyzer	EM Test	ACS 500	303105	05-11-2005	04-11-2006
3	Harmonic and Flicker Emissions Test Software	EM Test	ISMDBI	N/A	05-11-2005	04-11-2006
ESD						
Item	Test Equipment	Manufacturer	Model No.	Series No.	Cal. Date	Due date
2	ESD Tester	EM Test	N/A	302105	05-11-2005	04-11-2006
Radiated Immunity						
Item	Test Equipment	Manufacturer	Model No.	Series No.	Cal. Date	Due date
1.	GTEM	Lindgreen-Rayproof	1750	EMC0401	05-11-2005	04-11-2006

2.	Signal Generator	Rohde & Schwarz	SMY01	825675/018	05-11-2005	04-11-2006
3.	Function Generator	Philips	PM5134	LO-263813	05-11-2005	04-11-2006
4.	Amplifier 0.08-1GHz	SCHAFFNER	CBA9413A	4004	05-11-2005	04-11-2006
5.	Power Meter	Rohde & Schwarz	NRVS	825770/074	05-11-2005	04-11-2006
6.	Power Sensor	Rohde & Schwarz	NRV-Z5	825802/013	05-11-2005	04-11-2006
7.	Dual Directional Coupler	WERLATONE INC.	C1795	6634	05-11-2005	04-11-2006
8.	Electric Field Probe	Wandel & Goltermann	EMC-20	M-0063	05-11-2005	04-11-2006
EFT, Surge, Voltage dips and Interruptioion Test						
Item	Test Equipment	Manufacturer	Model No.	Series No.	Cal. Date	Due date
1	Transient 1000 Pro Package	EMC Partner	TRA1HO1B	TRA1000-267	05-11-2005	04-11-2006
2	Digital Oscilloscope	Tektronix	TDS3012	B015508	05-11-2005	04-11-2006
3	TRACS-Lite Ver. 2.4 (3M.144855 - INSTALL P/W)	EMC PARTNER	TRA1Z65B	3529N7884 (P/W TEST)	05-11-2005	04-11-2006
4	Ultra Compact Generator	EM Test	UCS500-M4	303279	05-11-2005	04-11-2006
Conducted Immunity Test						
Item	Test Equipment	Manufacturer	Model No.	Series No.	Cal. Date	Due date
1	Signal Generator	ROHDE & SCHWARZ	SMY01	825675/016	05-11-2005	04-11-2006
2	Amplifier 0.15-230MHz	OPHIRRF	GRF5048	1003	05-11-2005	04-11-2006
3	Power Meter	ROHDE & SCHWARZ	NRVS	825770/079	05-11-2005	04-11-2006
4	Power Sensor	ROHDE & SCHWARZ	NRV-Z5	825802/012	05-11-2005	04-11-2006
5	Dual Directional Coupler	WERLATONE INC.	C1795	6635	05-11-2005	04-11-2006
6	Oscilloscope Type 485	TEKTRONIX	485	B144408	N/A	N/A
7	CDN M2	SCHAFFNER CHASE	CDN-M2-16	9863	05-11-2005	04-11-2006
8	Immunity S/W Ver 4.31	SCHAFFNER CHASE	CIS9942	WHHPKB	N/A	N/A
9	C/S Tester	EM Test	CWS 500	303277	05-11-2005	04-11-2006
Common Used Equipment						
Item	Test Equipment	Manufacturer	Model No.	Series No.	Cal. Date	Due date
1	Temperature, Humidity & Barometer	OREGON SCIENTIFIC	BA-888	EMC0001 to EMC0004	05-11-2005	04-11-2006
2	DMM	FLUKE	73	70681569 or 70671122	05-11-2005	04-11-2006
3	Notebook	PC	X31	N/A	N/A	N/A

5 Emission Test Results

5.1 Radiation Emission Data

Test Requirement:	EN 55022 Class B
Test Method:	EN 55022 Class B
Test Date:	November 11, 2005
Frequency Range:	30MHz to 1000MHz
Class/Severity:	Table 1 of EN55022
Detector:	Peak for pre-scan (120kHz Resolution Bandwidth) Quasi-Peak & Average if maximised peak within 6dB of Average Limit

5.1.1 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in the 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 HTW is ± 4.0 dB.

5.1.2 EUT Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site, using the setup accordance with the CISPR16-1, The specification used in this report was the EN55022 Class B limits.

The EUT was placed on the test table in Transferring data mode connecting with the Notebook.

5.1.3 Spectrum Analyzer Setup

According to EN55022 Class B Rules, the system was tested to 1000 MHz.

Start Frequency	30 MHz
Stop Frequency	1000 MHz
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

5.1.4 Test procedure

For the radiated emissions test, since the EUT does not have a power source, there was no connection to AC outlets.

Maximizing procedure was performed on the six (6) highest emissions to ensure EUT is compliant 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 dBμV of specification limits), and are distinguished with a "**Qp**" in the data table.

The EUT was under normal mode during the final qualification test and the configuration was used to represent the worst case results.

5.1.5 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:

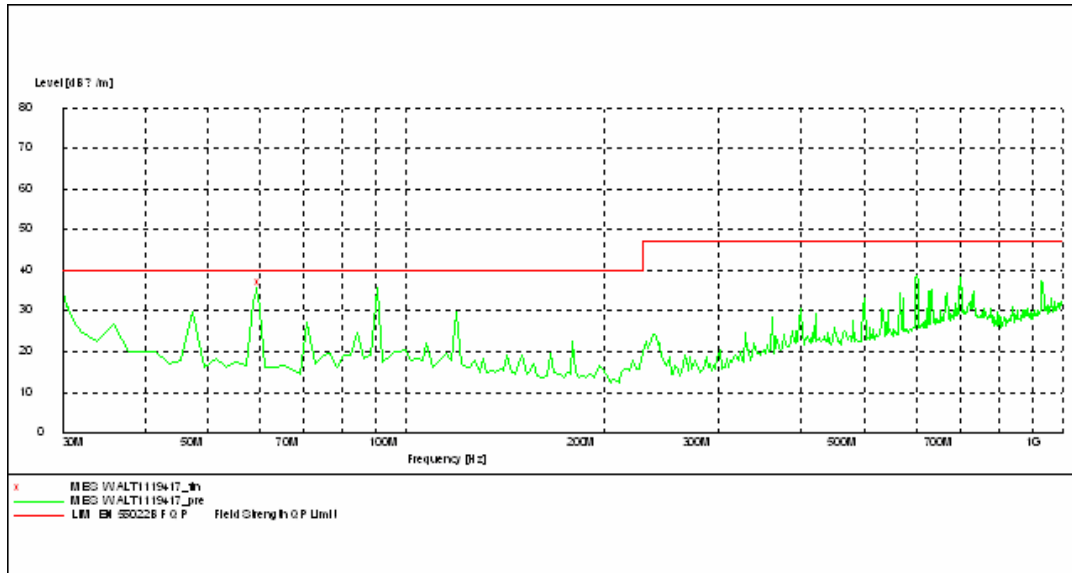
$$\text{Margin} = \text{Corr. Ampl.} - \text{Class B Limit}$$

5.1.6 Summary of Test Results

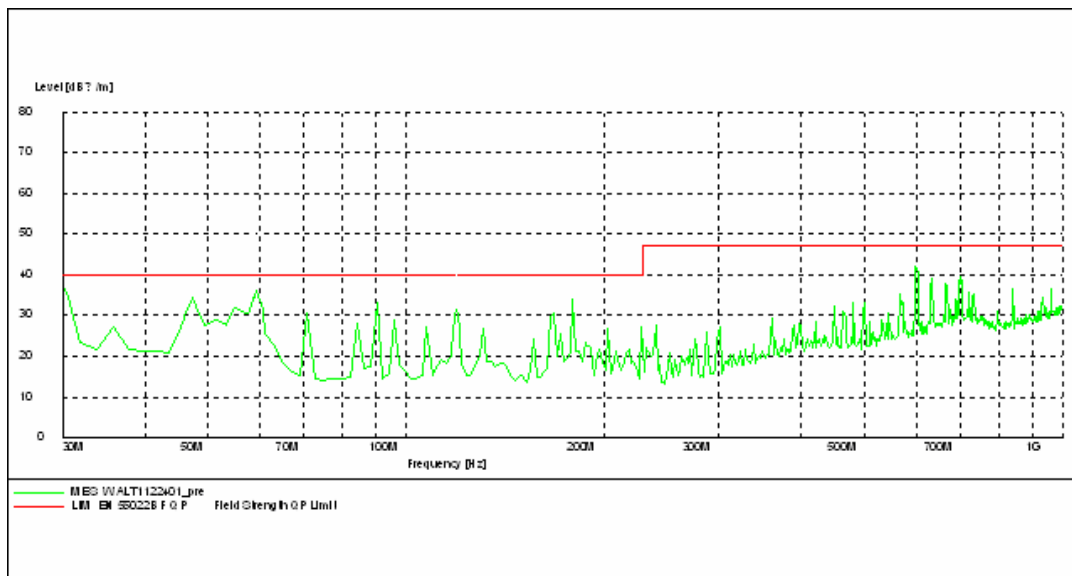
According to the data in section 5.1.7, the EUT complied with the EN55022 Class B standards, and had the worst margin of:

5.1.7 Radiated Emissions Test Data

Vertical:



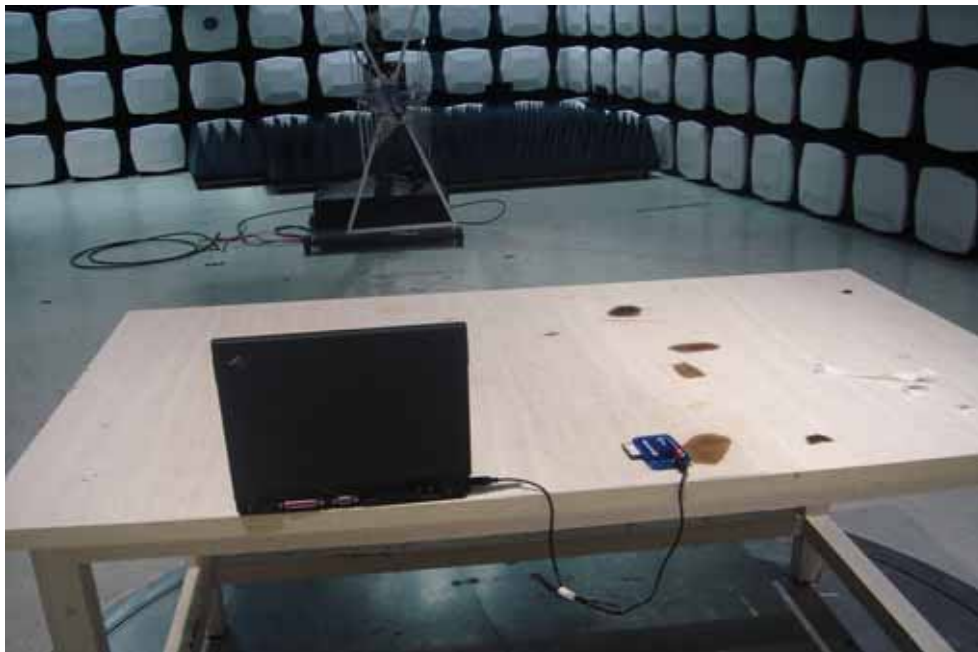
Horizontal:



5.1.8 Radiated Emissions Test Data

Frequency (MHz)	Antenna Polarization	Emission Level (dBuV/m)	EN55022 Class B Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Turntable Angle (°)
60.00000	Vertical	36.9	40.0	3.1	1.5	227

5.1.9 Photographs – Radiation Emission Test Setup



6 Immunity Test Results

6.1 Performance Criteria Description

Criterion A: The apparatus shall continue to operate as intended. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended.

Criterion B: The apparatus shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended.

Criterion C: Temporary loss of function is allowed, provided the function is self recoverable or can be restored by the operation of the controls.

For further details, please refer to of EN55024.

6.2 ESD

Test Requirement:	EN55024	
Test Method:	EN61000-4-2	
Test Date:	November 11, 2005	
Discharge Impedance:	330 Ω / 150 pF	
Discharge Voltage:	Air Discharge:	8 kV
	Contact Discharge:	4 kV
	HCP & VCP:	4 kV
Polarity:	Positive & Negative	
Number of Discharge:	Minimum 10 times at each test point	
Discharge Mode:	Single Discharge	
Discharge Period:	1 second minimum	

6.2.1 E.U.T. Operation

Operating Environment:

Temperature :	24.0 °C
Humidity :	52 % RH
Barometric Pressure :	1012 mbar

EUT Operation:

The EUT was placed on the test table in Transferring data mode connecting with the Notebook.

6.2.2 Direct Application Test Results

Observations : Test points : 1. All Exposed Surface & Seams;
2. All metallic part

Direct Application			Test Results	
Discharge Level (kV)	Polarity (+/-)	Test Point	Contact Discharge	Air Discharge
8	+/-	1	N/A	A
4	+/-	2	A	N/A

Results

A: No degradation in the performance of the E.U.T. was observed.

N/A: Not applicable.

6.2.3 Indirect Application Test Results

Observations : Test points : 1. All sides.

Indirect Application			Test Results	
Discharge Level (kV)	Polarity (+/-)	Test Point	Horizontal Coupling	Vertical Coupling
4	+/-	1	A	A

Results

A: No degradation in the performance of the E.U.T. was observed.

6.2.4 Photographs - ESD Test Setup



6.3 Radiated Immunity

Test Requirement: EN55024
 Test Method: EN61000-4-3
 Frequency Range: 80MHz–1GHz
 Face Under Test: Three Mutually Orthogonal Faces
 Severity: 3V/m, 1kHz, 80% Amp. Mod. from 80MHz to 1GHz
 Test Date: November 11, 2005

6.3.1 E.U.T. Operation

Operating Environment:
 Temperature: 24.0 °C
 Humidity: 52 % RH
 Barometric Pressure: 1012 mbar

EUT Operation:

The EUT was placed on the test table in Transferring data mode connecting with the Notebook.

6.3.2 Test Results

Frequency	Level	Modulation	EUT Face	Result / Observations
80MHz-1GHz	3V/m	1kHz, 80%, Amp. Mod.	X Y Z	During test, noise can be heard. After test EUT recovers to normal (B).

Remarks:

AM : Amplitude Modulation.
 PM : Pulse Modulation.
 X : EUT as per photograph in section 6.3.3 of this report.
 Y : As X, but rotate EUT by 90° clockwise.
 Z : As Y, but rotate EUT by 90° vertically.

Results

B : During test, noise can be heard. This was within the minimum performance criteria set by the applicant. Please refer to section 6.1 of this report for further details.

6.3.3 Photographs - Radiated Immunity Test Setup For X-Direction

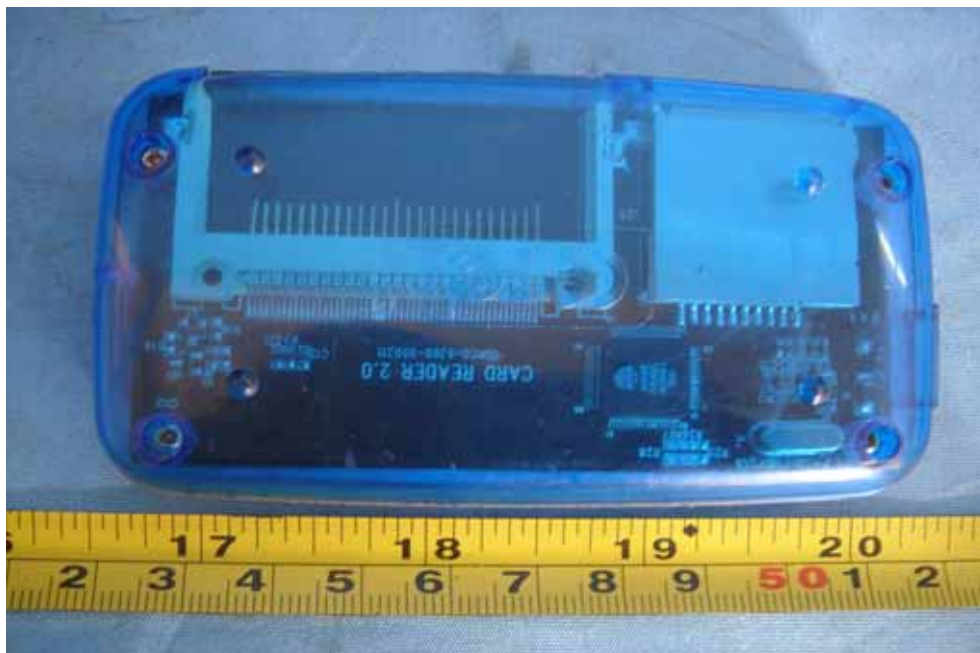


7 Photographs - Constructional Details

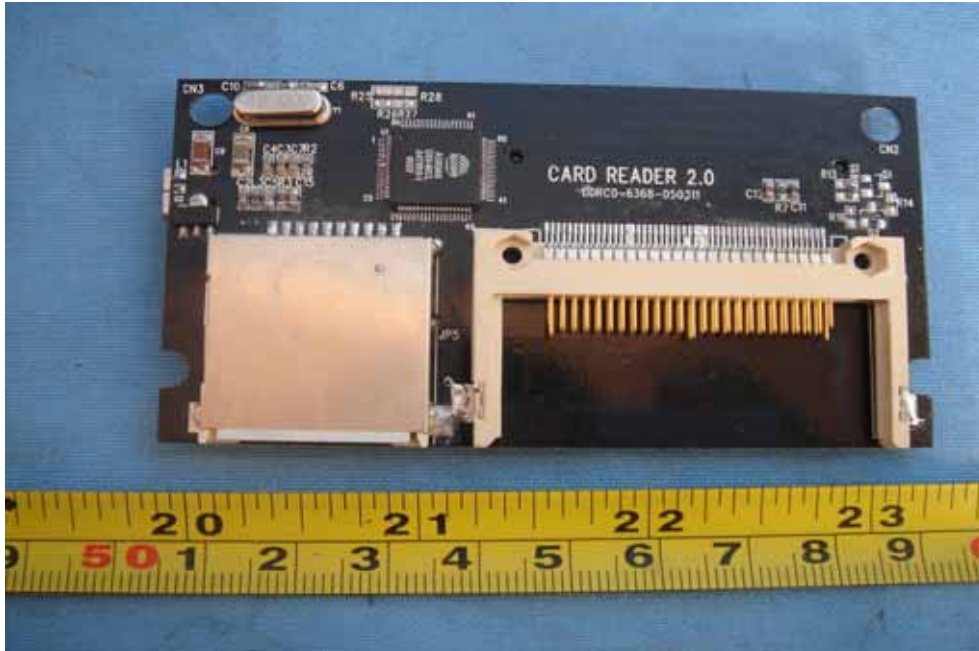
7.1 EUT – Front View



7.2 EUT – Back View



7.3 PCB – Front View



7.4 PCB – Back View

