

Test Report No. 7191053040-EEC13/01
dated 05 Feb 2013



PSB Singapore

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FORMAL REPORT ON TESTING IN ACCORDANCE WITH
EN 50121-4 : 2006
OF A
IP55 OUTDOOR DIGITAL SIGNAGE
[Model : DS-8842]

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QUOTATION NUMBER 219155626 & 219165203

JOB NUMBER 7191041733 & 7191053040

TEST PERIOD 05 Sep 2012 – 22 Nov 2012

PREPARED BY

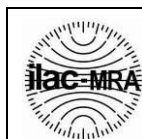
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LA-2007-0380-A
LA-2007-0381-F
LA-2007-0382-B
LA-2007-0383-G
LA-2007-0384-G
LA-2007-0385-E
LA-2007-0386-C
LA-2010-0464-D

The results reported herein have been performed in accordance with the laboratory's terms of accreditation under the Singapore Accreditation Council - Singapore Laboratory Accreditation Scheme. Tests/Calibrations marked "Not SAC-SINGLAS Accredited" in this Report are not included in the SAC-SINGLAS Accreditation Schedule for our laboratory.

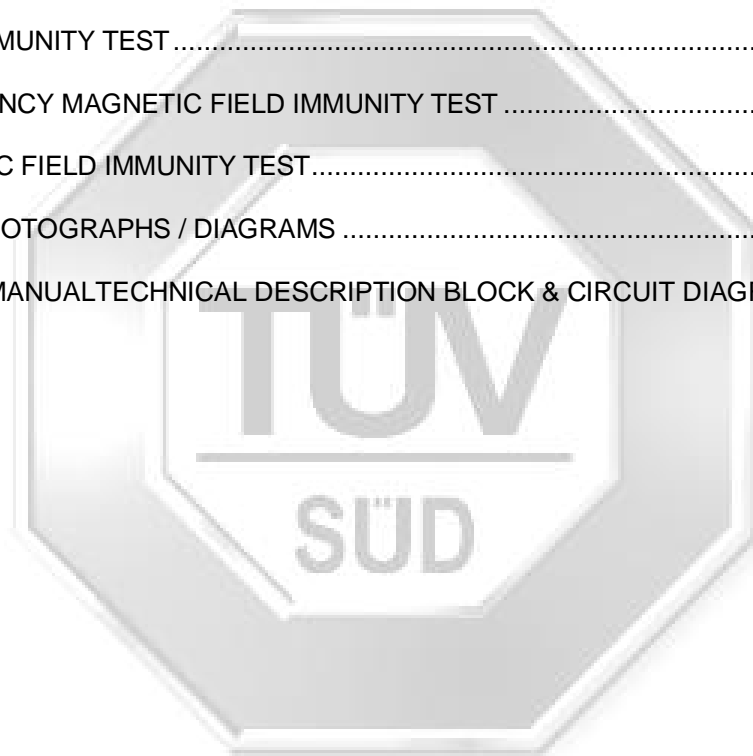
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TEST SUMMARY

The product was tested in accordance with the customer's specifications.

Test Results Summary

Test Standard	Description	Pass / Fail
EN 50121-4 : 2006		
EN 55016-2-1 : 2009 + A1 : 2011 Clause 7.4.1 EN 55016-1-2 : 2006 Clause 4.3	Conducted Emissions (Class A)	Pass *See Note 1
EN 55016-2-3 : 2010 + A1 : 2010	Radiated Emissions (Class A)	Pass *See Note 1
IEC 61000-4-2 : 2008	Electrostatic Discharge Immunity	Pass
IEC 61000-4-3 : 2010	RF Radiated Immunity	Pass *See Modification
IEC 61000-4-4 : 2004 + A1 : 2010	Electrical Fast Transient / Burst Immunity	Pass *See Note 1
IEC 61000-4-5 : 2005	Voltage Surge Immunity	Pass *See Note 1
IEC 61000-4-6 : 2008	Conducted Disturbance Immunity	Pass *See Note 1
IEC 61000-4-8 : 2009	Power Frequency Magnetic Field Immunity	Pass
IEC 61000-4-9 : 2001	Pulse Magnetic Field Immunity	Pass

Notes

1. Please refer to the report number: 7191024570-EEC12/02 for the results for this test.
2. This report 7191053040-EEC13/01 was reproduced from the test report 7191041733-EEC12/01 to change the applicant name, description of EUT & model name as follow :
 - i. Singapore Technologies Electronics Limited to Closed-Loop Technology Pte Ltd.
 - ii. IP55 LCD Display Panel to IP55 Outdoor Digital Signage.
 - iii. Model ST-6837 to DS-8842.

TEST SUMMARY

Modifications

The EUT was brought to compliance to RF Radiated Immunity by following modifications:



2 x ferrite cores P/N: EMH13UH26X29.2X13 (1330-R) were added on both ends of the input power cable



2 x ferrite cores P/N: EMH2UH19X30X10.2 (LF-100S) were added on both ends of the ATX power cable



PRODUCT DESCRIPTION

Description : The Equipment Under Test (EUT) is a **IP55 OUTDOOR DIGITAL SIGNAGE.**

Applicant : Closed-loop Technology Pte Ltd
No. 10 Admiralty Street, #01-63,
Northlink Building Singapore 757695

Manufacturer : Closed-loop Technology Pte Ltd
No. 10 Admiralty Street, #01-63,
Northlink Building Singapore 757695

Factor(ies) : Closed-loop Technology Pte Ltd
No. 10 Admiralty Street, #01-62,
Northlink Building Singapore 757695

Model Number : DS-8842

Trade Name : Closed-Loop

Serial Number : 201201003

Microprocessor : Refer to manufacturer

Operating Frequency : 340kHz

Clock / Oscillator Frequency : 380kHz

Port / Connectors : Refer to manufacturer's user manual / operating manual.

Rated Input Power : 230V 50Hz

Accessories : Refer to manufacturer's user manual / operating manual.



SUPPORTING EQUIPMENT DESCRIPTION

The EUT was tested as a stand-alone unit without any supporting equipment.





EUT OPERATING CONDITIONS

EN 50121-4

1. **Electrostatic Discharge Immunity**
2. **RF Radiated Immunity**
3. **Power Frequency Magnetic Field Immunity**
4. **Pulse Magnetic Field Immunity**

The EUT was exercised in its typical operating mode as listed below throughout the tests:

- a. Display Mode – The EUT was powered on via 230V 50Hz. During the test, the EUT was made to run and display an audio / video file provided by the client.





ELECTROSTATIC DISCHARGE IMMUNITY TEST

IEC 61000-4-2 Electrostatic Discharge Immunity Test Pass / Fail Criteria

Test: Electrostatic Discharge Immunity
Performance Criteria: B
PASS Criteria: The EUT shall meet the minimum criteria as specified: a. The EUT shall continue to operate as intended without operator intervention after the test. b. The EUT may show degradation of performance or loss of function during the test, which it must be recoverable to its intended operation after the test. The degradation of performance is regarded as a degradation to a level not below a minimum performance level specified by the manufacturer for the EUT as its intended. c. The EUT shall show no change of operating mode during and after the test.
FAIL Criteria: For the parameters observed, anything contrary to the pass criteria is considered as FAIL.
Monitoring Method(s): The performance of the EUT was monitored by observing the EUT operation as according to its intended condition.

IEC 61000-4-2 Electrostatic Discharge Immunity Test Instrumentation

Instrument	Model	S/No	Cal Due Date
Noiseken ESD Simulator	ESS-2000	ESS01Z0452	17 Jan 2013
Noiseken ESD Gun	TC-815R	ESS0868584	17 Jan 2013



ELECTROSTATIC DISCHARGE IMMUNITY TEST

IEC 61000-4-2 Electrostatic Discharge Immunity Test Setup

1. The test setup was in accordance with the standard.
2. The electrostatic discharge (ESD) gun was loaded with the correct charging / discharge network specified by the standard.
3. A 0.8m high, non-metallic table, with a Horizontal Coupling Plane (HCP) placed on the tabletop, was used as a test bench. The EUT and supporting equipment were placed on the test bench, isolated from the HCP by a thin insulating sheet.
4. The HCP was grounded to the ground plane via two 470 k Ω "bleed" resistors at each end of the ground cable.
5. A Vertical Coupling Plane (VCP) was also used during the test. The VCP was also grounded to the ground plane in a similar manner as the HCP.

IEC 61000-4-2 Electrostatic Discharge Immunity Test Method

1. Direct Air & Contact Discharges
Application of direct air and contact discharges to the discharge points specified by the customer were carried out in the following manner:
 - a. The EUT was switched on and allowed to warm up to its normal operating condition.
 - b. The test discharge points are shown in the report.
 - c. For air discharges, the charged rounded electrode was positioned at a distance away from the test point and moved towards the EUT as fast as possible until contact between the electrode and the EUT was made.
 - d. For contact discharges, the pointed electrode was applied directly to the test point, in contact with the conductive surface of the EUT. The discharges were then made with the electrode in contact with the EUT.
 - e. The required number of positive and negative discharges were applied at each test point; with a one second interval between discharges.
 - f. The EUT was monitored during the test in accordance with the Pass / Fail criteria declared by the customer.
2. Indirect Coupling Plane Discharges
Indirect application of discharges using the HCP & VCP were performed on the sides of the EUT in the following manner:
 - a. The EUT was switched on and allowed to warm up to its normal operating condition.
 - b. The discharges to the HCP / VCP were made 0.1m away from one side of the EUT.
 - c. The required number of positive and negative discharges was applied at each test point; with one second interval between discharges.
 - d. The EUT was monitored during the test in accordance with the Pass / Fail criteria declared by the customer.
 - e. The test was then repeated on the remaining necessary sides of the EUT.

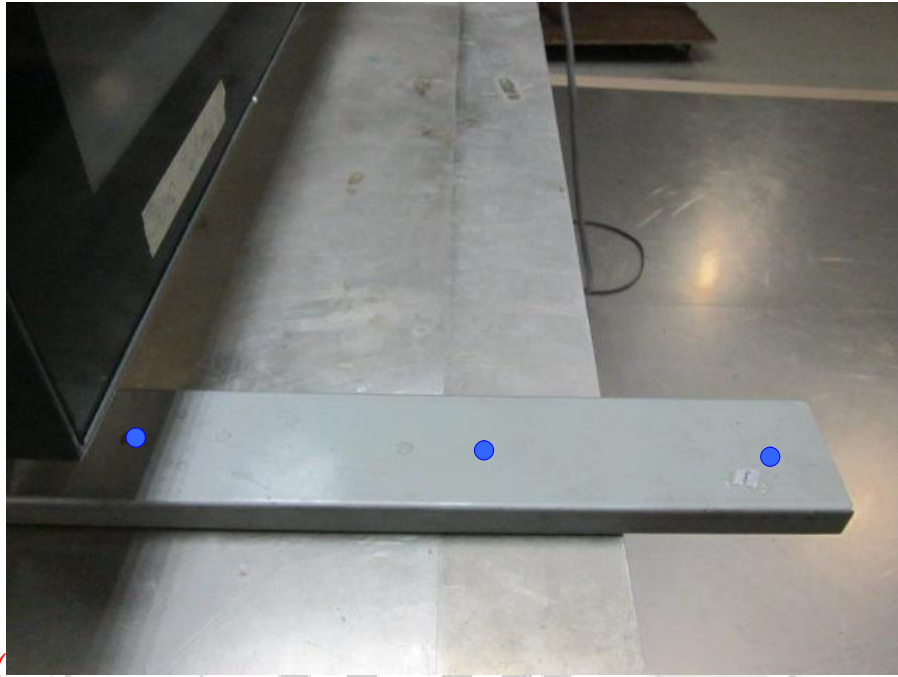
ELECTROSTATIC DISCHARGE IMMUNITY TEST



Electrostatic Discharge Immunity Test Setup



ELECTROSTATIC DISCHARGE IMMUNITY TEST



ESD TEST POINTS



ESD TEST POINTS

- Air Discharge
- Contact Discharge

ELECTROSTATIC DISCHARGE IMMUNITY TEST



ESD TEST POINTS



ESD TEST POINTS

- Air Discharge
- Contact Discharge

ELECTROSTATIC DISCHARGE IMMUNITY TEST



ESD TEST POINTS



ESD TEST POINTS

- Air Discharge
- Contact Discharge

ELECTROSTATIC DISCHARGE IMMUNITY TEST



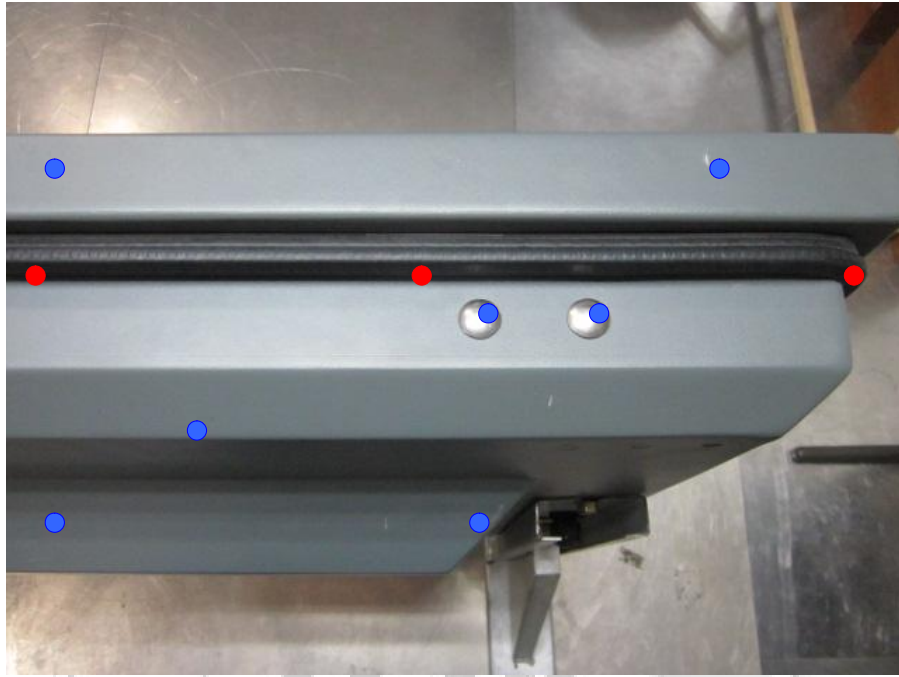
ESD TEST POINTS



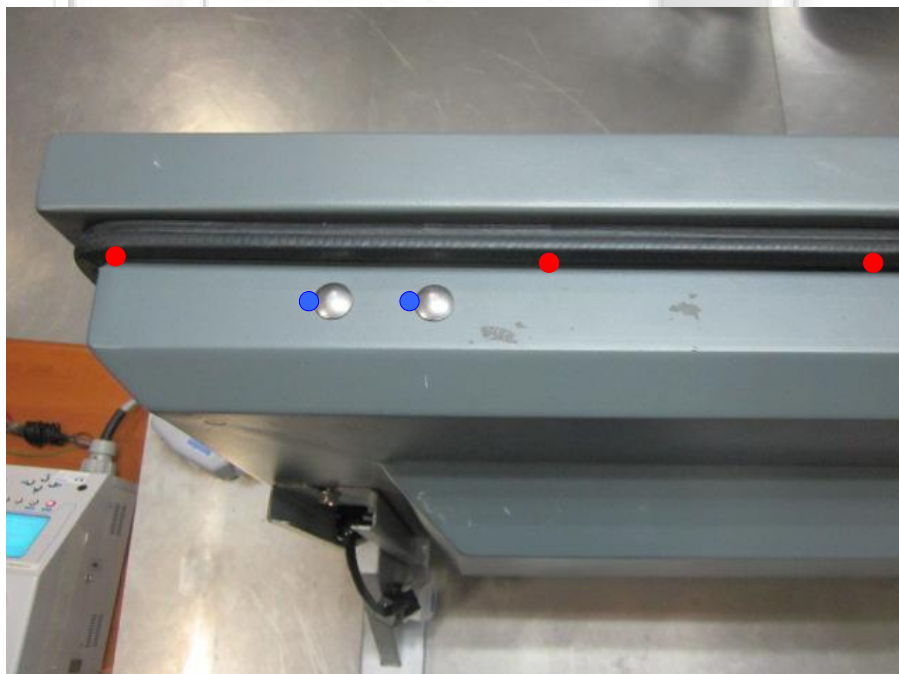
ESD TEST POINTS

- Air Discharge
- Contact Discharge

ELECTROSTATIC DISCHARGE IMMUNITY TEST



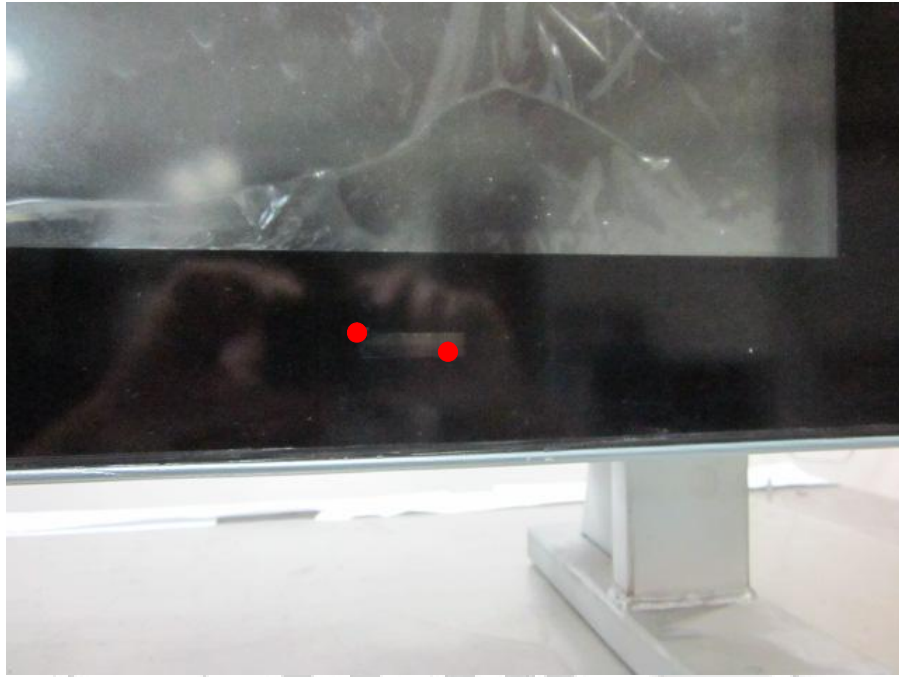
ESD TEST POINTS



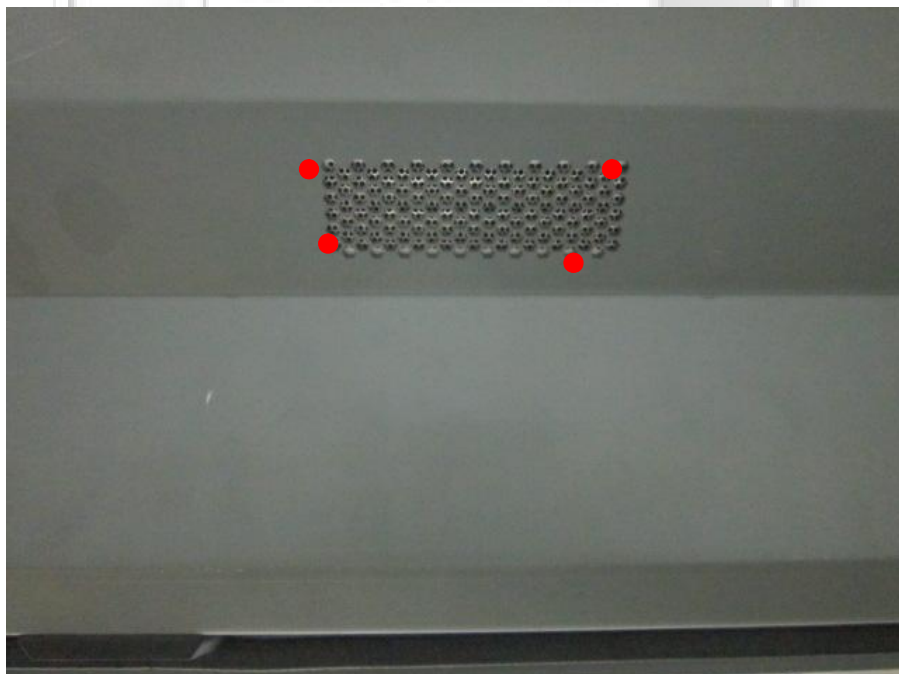
ESD TEST POINTS

- Air Discharge
- Contact Discharge

ELECTROSTATIC DISCHARGE IMMUNITY TEST



ESD TEST POINTS



ESD TEST POINTS

- Air Discharge
- Contact Discharge



ELECTROSTATIC DISCHARGE IMMUNITY TEST

IEC 61000-4-2 Electrostatic Discharge Immunity Results

Operating Mode	Audio Video Playback	Temperature	22°C
Test Input Power	230V 50Hz	Relative Humidity	55%
		Atmospheric Pressure	1030mbar
		Tested By	Jason Lai

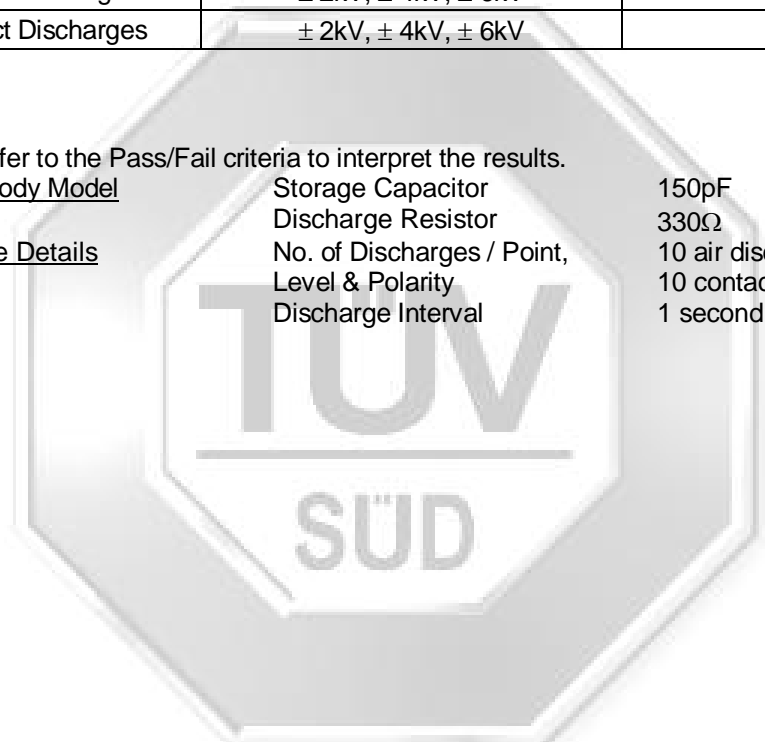
Discharge Type	Test Severity Level	Results
Air Discharges	± 2kV, ± 4kV, ± 8kV	Pass
Direct Contact Discharges	± 2kV, ± 4kV, ± 6kV	Pass
Indirect Contact Discharges	± 2kV, ± 4kV, ± 6kV	Pass

Notes

- Please refer to the Pass/Fail criteria to interpret the results.
- Human Body Model

Storage Capacitor	150pF
Discharge Resistor	330Ω
- Discharge Details

No. of Discharges / Point, Level & Polarity	10 air discharges
Discharge Interval	10 contact discharges
	1 second





RF RADIATED IMMUNITY TEST

IEC 61000-4-3 RF Radiated Immunity Test Pass / Fail Criteria

Test: RF Radiated Immunity
Performance Criteria: A
<p>PASS Criteria: The EUT shall meet the minimum criteria as specified:</p> <p>a. The EUT shall continue to operate as intended without operator intervention during and after the test.</p> <p>b. The EUT shall show no degradation of performance or loss of function during the test during and after the test. The degradation of performance is regarded as a degradation to a level not below a minimum performance level specified by the manufacturer for the EUT as its intended.</p>
<p>FAIL Criteria: For the parameters observed, anything contrary to the pass criteria is considered as FAIL.</p>
<p>Monitoring Method(s):</p> <p>The performance of the EUT was monitored by observing the EUT operation as according to its intended condition.</p>

IEC 61000-4-3 RF Radiated Immunity Test Instrumentation

Instrument	Model	S/No	Cal Due Date
Teseq Bilog Antenna (26-3000MHz)	CBL 6144	30366	Output Monitored
Agilent Signal Generator (9k – 3200MHz)	8648C	3847M01344	12 Oct 2013
Agilent 20MHz Function / Arbitrary Waveform Generator	33220A	MY44013389	12 Oct 2013
Agilent EPM Series Power Meter	E4419B	GB43312680	29 Aug 2013
Agilent E-Series Avg Power Sensor 1nW – 100mW (-60 to +20dBm) (9kHz - 6GHz)	E9304A	MY41496639	29 Aug 2013
Agilent E-Series Avg Power Sensor 1nW – 100mW (-60 to +20dBm) (9kHz - 6GHz)	E9304A	MY41496637	29 Aug 2013
AR Directional Coupler (0.8 - 4.2GHz) 40dB, 400Watts	DC7144A	313053	24 Jul 2013
Schaffner High Power Directional Coupler (80MHz-1GHz), 200Watts	CHA 9652 B	Nil	24 Jul 2013
Schaffner Power Amplifier (80MHz-1GHz), 200W	CBA 9433	T43588	Output Monitored



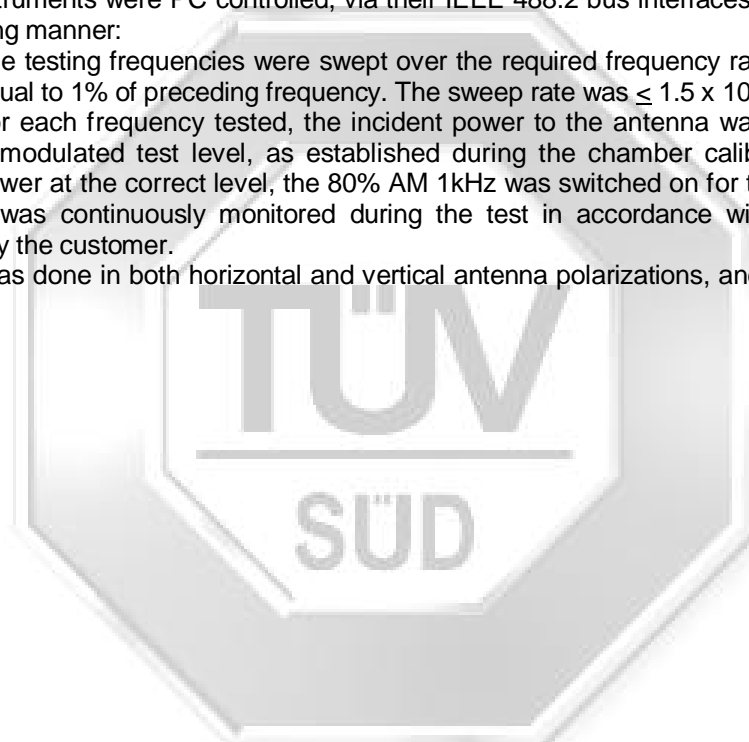
RF RADIATED IMMUNITY TEST

IEC 61000-4-3 RF Radiated Immunity Test Setup

1. The EUT was set up inside a fully anechoic chamber in accordance with the standard.
2. An isotropic field probe was placed adjacent to the EUT.

IEC 61000-4-3 RF Radiated Immunity Test Method

1. The EUT was switched on and allowed to warm up to its normal operating condition.
2. The EUT was exercised and monitored in the manner specified by the customer.
3. All test instruments were PC controlled, via their IEEE 488.2 bus interfaces, and the test conducted in the following manner:
 - a. The testing frequencies were swept over the required frequency range, with a step frequency equal to 1% of preceding frequency. The sweep rate was $\leq 1.5 \times 10^{-3}$ decades/s.
 - b. For each frequency tested, the incident power to the antenna was adjusted to the required unmodulated test level, as established during the chamber calibration. With the incident power at the correct level, the 80% AM 1kHz was switched on for the specified dwell time.
4. The EUT was continuously monitored during the test in accordance with the Pass / Fail criteria declared by the customer.
5. The test was done in both horizontal and vertical antenna polarizations, and for all necessary sides of the EUT.



RF RADIATED IMMUNITY TEST



RF Radiated Immunity Test Setup

IEC 61000-4-3 RF Radiated Immunity Results

Operating Mode	Audio Video Playback	Temperature	18°C
Test Input Power	230V 50Hz	Relative Humidity	58%
		Atmospheric Pressure	1030mbar
		Tested By	Jason Lai

Sides Tested	Frequency	Test Severity Level	Results
Front, Back, Left, Right	80MHz – 1000MHz	20V/m, 80%AM (1kHz)	Pass
Front, Back, Left, Right	800MHz – 1000MHz	20V/m, 80%AM (1kHz)	Pass
Front, Back, Left, Right	1400MHz – 2100MHz	10V/m, 80%AM (1kHz)	Pass
Front, Back, Left, Right	2100MHz – 2500MHz	5V/m, 80%AM (1kHz)	Pass

Notes

- Please refer to the Pass/Fail criteria to interpret the results.
- Radiated Immunity Details

Frequency Step	1% of preceding frequency
Sweep Rate	≤ 1.5 X 10 ⁻³ decades/s



POWER FREQUENCY MAGNETIC FIELD IMMUNITY TEST

IEC 61000-4-8 Power Frequency Magnetic Field Immunity Test Pass / Fail Criteria

Test: Power Frequency Magnetic Field Immunity
Performance Criteria: A
PASS Criteria: The EUT shall meet the minimum criteria as specified: a. The EUT shall continue to operate as intended without operator intervention during and after the test. b. The EUT shall show no degradation of performance or loss of function during the test during and after the test. The degradation of performance is regarded as a degradation to a level not below a minimum performance level specified by the manufacturer for the EUT as its intended.
FAIL Criteria: For the parameters observed, anything contrary to the pass criteria is considered as FAIL.
Monitoring Method(s): The performance of the EUT was monitored by observing the EUT operation as according to its intended condition.

IEC 61000-4-8 Power Frequency Magnetic Field Immunity Test Instrumentation

Instrument	Model	S/No	Cal Due Date
Schaffner Advanced Coupling Unit	CCN1000-1	72061	02 Dec 2012
Schaffner 5kVA Power Source	NSG 1007-5-400	54854	02 Dec 2012
Schaffner Proflin 2100 AC Switching Unit	NSG 2200-1	200226-001EK	02 Dec 2012
Magnetic Field 1m Loop Antenna	INA2171 B	34011	20 Jun 2013



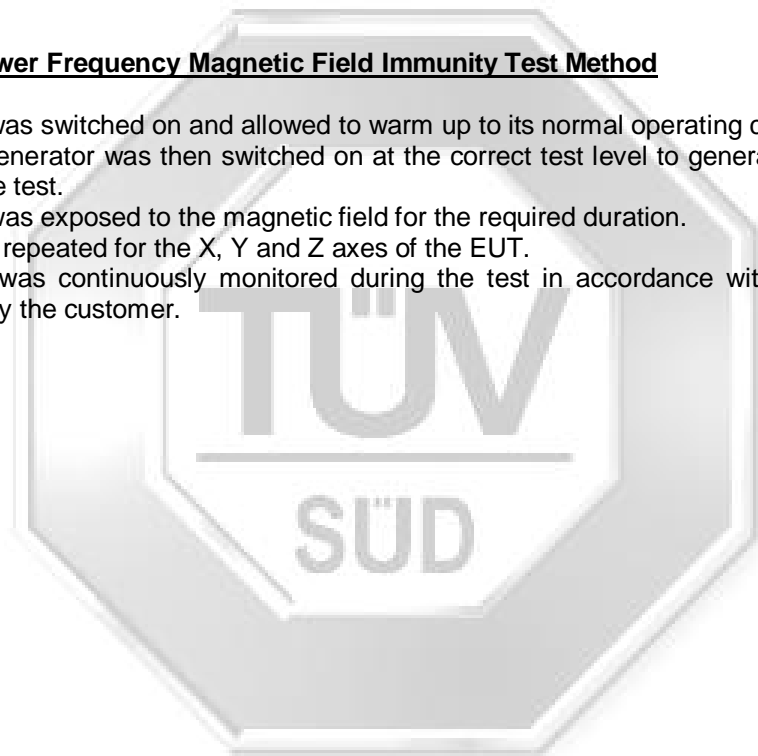
POWER FREQUENCY MAGNETIC FIELD IMMUNITY TEST

IEC 61000-4-8 Power Frequency Magnetic Field Immunity Test Setup

1. The test setup was in accordance with the standard.
2. The EUT was kept 0.4m away from walls and conductive surfaces.
3. The EUT cables were arranged in such a way as to expose at least 1m of the cables to the magnetic field.
4. The induction coil is arranged centrally (as far as possible) around the EUT, and connected to the respective test generator.
5. With the test generator switched on, the required test level is set by adjusting the output setting of the test generator.

IEC 61000-4-8 Power Frequency Magnetic Field Immunity Test Method

1. The EUT was switched on and allowed to warm up to its normal operating condition.
2. The test generator was then switched on at the correct test level to generate the required magnetic field for the test.
3. The EUT was exposed to the magnetic field for the required duration.
4. The test is repeated for the X, Y and Z axes of the EUT.
5. The EUT was continuously monitored during the test in accordance with the Pass / Fail criteria declared by the customer.



POWER FREQUENCY MAGNETIC FIELD IMMUNITY TEST



Power Frequency Magnetic Field Immunity Test Setup

IEC 61000-4-8 Power Frequency Magnetic Field Immunity Results

Operating Mode	Audio Video Playback	Temperature	22°C
Test Input Power	230V 50Hz	Relative Humidity	58%
		Atmospheric Pressure	1030mbar
		Tested By	Anthony Toh

Side / Axis	Test Severity Level	Results
X, Y, Z	100A/m (50Hz)	Pass
X, Y, Z	100A/m (16.7Hz)	Pass
X, Y, Z	300A/m (0Hz)	Pass

Notes

1. Please refer to the Pass/Fail criteria to interpret the results.



PULSE MAGNETIC FIELD IMMUNITY TEST

IEC 61000-4-9 Pulse Magnetic Field Immunity Test Pass / Fail Criteria

Test: Pulse Magnetic Field Immunity
Performance Criteria: A
<p>PASS Criteria: The EUT shall meet the minimum criteria as specified:</p> <p>c. The EUT shall continue to operate as intended without operator intervention during and after the test.</p> <p>d. The EUT shall show no degradation of performance or loss of function during the test during and after the test. The degradation of performance is regarded as a degradation to a level not below a minimum performance level specified by the manufacturer for the EUT as its intended.</p> <p>FAIL Criteria: For the parameters observed, anything contrary to the pass criteria is considered as FAIL.</p>
<p>Monitoring Method(s):</p> <p>The performance of the EUT was monitored by observing the EUT operation as according to its intended condition.</p>

IEC 61000-4-9 Pulse Magnetic Field Immunity Test Instrumentation

Instrument	Model	S/No	Cal Due Date
Noiseken Lightning Surge Simulator	LSS-6030	1010E00574	19 Jan 2013
Magnetic Field 1m Loop Antenna	INA2171 B	34011	20 Jun 2013



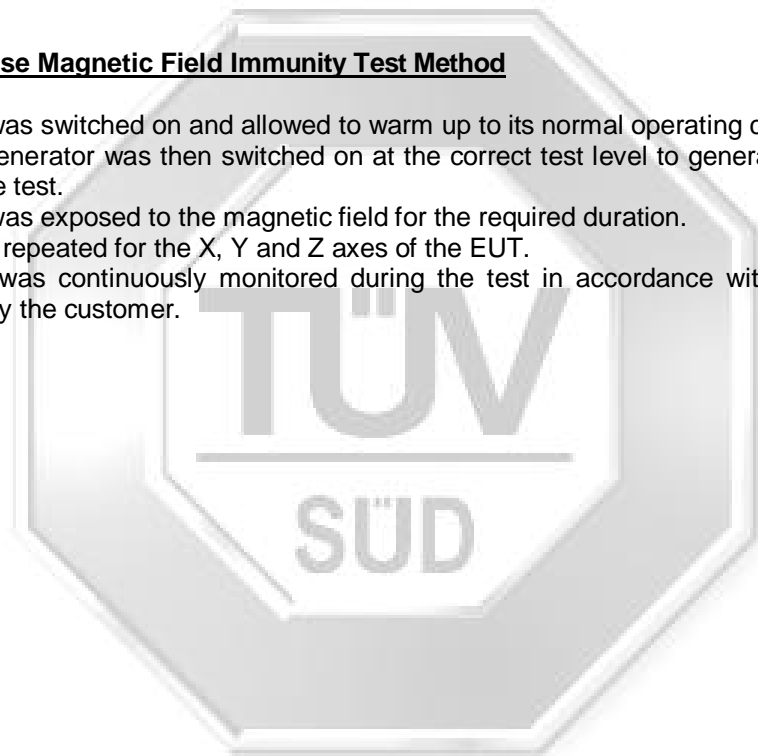
PULSE MAGNETIC FIELD IMMUNITY TEST

IEC 61000-4-9 Pulse Magnetic Field Immunity Test Setup

1. The test setup was in accordance with the standard.
2. The EUT was kept 0.4m away from walls and conductive surfaces.
3. The EUT cables were arranged in such a way as to expose at least 1m of the cables to the magnetic field.
4. The induction coil is arranged centrally (as far as possible) around the EUT, and connected to the respective test generator.
5. With the test generator switched on, the required test level is set by adjusting the output setting of the test generator.

IEC 61000-4-9 Pulse Magnetic Field Immunity Test Method

1. The EUT was switched on and allowed to warm up to its normal operating condition.
2. The test generator was then switched on at the correct test level to generate the required magnetic field for the test.
3. The EUT was exposed to the magnetic field for the required duration.
4. The test is repeated for the X, Y and Z axes of the EUT.
5. The EUT was continuously monitored during the test in accordance with the Pass / Fail criteria declared by the customer.



PULSE MAGNETIC FIELD IMMUNITY TEST



Pulse Magnetic Field Immunity Test Setup

IEC 61000-4-9 Pulse Magnetic Field Immunity Results

Operating Mode	Audio Video Playback	Temperature	22°C
Test Input Power	230V 50Hz	Relative Humidity	58%
		Atmospheric Pressure	1030mbar
		Tested By	Anthony Toh

Side / Axis	Test Severity Level	Results
X, Y, Z	300A/m	Pass

Notes

1. Please refer to the Pass/Fail criteria to interpret the results.



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5. Unless otherwise stated, the tests were carried out in TÜV SÜD PSB Pte Ltd, No.1 Science Park Drive Singapore 118221.

July 2011





ANNEX A EUT PHOTOGRAPHS / DIAGRAMS



ANNEX A EUT PHOTOGRAPHS / DIAGRAMS

EUT PHOTOGRAPHS



Front View



Rear View

ANNEX B USER MANUAL TECHNICAL DESCRIPTION BLOCK & CIRCUIT DIAGRAMS

