



# CE EMC TEST REPORT

for

**Embedded Computing System**

**MODEL: DE-1000; DE-1001; DE-1002**

Test Report Number:  
T141003D05-E

Issued to:

**CINCOZE CO., LTD.**

**7F.,No.4, Aly. 1, Ln. 235, Baociao Rd., Sindian Dist.,  
New Taipei City 23145 Taiwan**

Issued by:

**Compliance Certification Services Inc.**

**Xindian Lab.**

**No.163-1, Jhongsheng Rd., Xindian Dist.,  
New Taipei City, 23151 Taiwan.**

**TEL: 886-2-22170894**

**FAX: 886-2-22171029**

**Issued Date: November 5, 2014**



**Note:** This report shall not be reproduced except in full, without the written approval of Compliance Certification Services Inc. This document may be altered or revised by Compliance Certification Services Inc. personnel only, and shall be noted in the revision section of the document. The client should not use it to claim product endorsement by TAF, A2LA, NVLAP, NIST or any government agencies. The test results in the report only apply to the tested sample.



**Revision History**

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	November 5, 2014	Initial Issue	ALL	Linda Wu



**TABLE OF CONTENTS**

**1 TEST CERTIFICATION ..... 4**

**2 TEST RESULT SUMMARY ..... 5**

**3 EUT DESCRIPTION ..... 6**

**4 TEST METHODOLOGY ..... 6**

    4.1. DECISION OF FINAL TEST MODE ..... 7

    4.2. EUT SYSTEM OPERATION ..... 8

**5 SETUP OF EQUIPMENT UNDER TEST ..... 9**

    5.1. DESCRIPTION OF SUPPORT UNITS..... 9

    5.2. CONFIGURATION OF SYSTEM UNDER TEST ..... 9

**6 FACILITIES AND ACCREDITATIONS..... 11**

    6.1. FACILITIES ..... 11

    6.2. ACCREDITATIONS ..... 11

    6.3. MEASUREMENT UNCERTAINTY ..... 11

**7 EMISSION TEST ..... 12**

    7.1. CONDUCTED EMISSION MEASUREMENT ..... 12

    7.2. RADIATED EMISSION MEASUREMENT ..... 22

**8 IMMUNITY TEST ..... 27**

    8.1. GENERAL DESCRIPTION..... 27

    8.2. GENERAL PERFORMANCE CRITERIA DESCRIPTION ..... 28

    8.3. ELECTROSTATIC DISCHARGE (ESD)..... 29

    8.4. RADIATED, RADIO-FREQUENCY, ELECTROMAGNETIC FIELD (RS) ..... 36

    8.5. ELECTRICAL FAST TRANSIENT (EFT)..... 39

    8.6. SURGE IMMUNITY TEST..... 42

    8.7. CONDUCTED RADIO FREQUENCY DISTURBANCES (CS)..... 45

**9 PHOTOGRAPHS OF THE TEST CONFIGURATION ..... 48**

**APPENDIX 1 - PHOTOGRAPHS OF EUT ..... A1-1**



# 1 TEST CERTIFICATION

<b>Product:</b>	Embedded Computing System
<b>Model:</b>	DE-1000; DE-1001; DE-1002
<b>Brand:</b>	CINCOZE
<b>Applicant:</b>	<b>CINCOZE CO., LTD.</b> 7F.,No.4, Aly. 1, Ln. 235, Baociao Rd., Sindian Dist., New Taipei City 23145 Taiwan
<b>Manufacturer:</b>	<b>CINCOZE CO., LTD.</b> 7F.,No.4, Aly. 1, Ln. 235, Baociao Rd., Sindian Dist., New Taipei City 23145 Taiwan
<b>Tested:</b>	August 13, 2014 ~ November 3, 2014
<b>Test Voltage:</b>	230VAC / 50Hz
<b>Applicable Standards:</b>	<b>EN 50155:2007 Clause 5.4, 5.5</b> <b>EN 50121-1: 2006</b> <b>EN 50121-3-2: 2006, including</b> EN 55011: 2009 + A1: 2010 EN 61000-4-2: 2009 EN 61000-4-3: 2006 + A1: 2008 + A2: 2010 EN 61000-4-4: 2012 EN 61000-4-5: 2006 EN 61000-4-6: 2009

Deviation from Applicable Standard
None

The above equipment was tested by Compliance Certification Services Inc. for compliance with the requirements of technical standards specified above under the EMC Directive 2004/108/EC. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

**Approved by:**

Sam Hu  
Assistant Manager

**Reviewed by:**

Vesta Hsu  
Supervisor of report document dept.



## 2 TEST RESULT SUMMARY

EMISSION			
Standard	Item	Result	Remarks
EN 55011: 2009 + A1: 2010 EN 50155: 2007 Clause 5.4, 5.5	Conducted (Power Port)	PASS	Meet Class A limit
	Conducted (Process measurement and control ports)	PASS	Meet Class A limit
	Radiated	PASS	Meet Class A limit

IMMUNITY			
Standard	Item	Result	Remarks
EN 61000-4-2: 2009	ESD	PASS	Meets the requirements of Performance Criterion A
EN 61000-4-3: 2006 + A1: 2008 + A2: 2010	RS	PASS	Meets the requirements of Performance Criterion A
EN 61000-4-4: 2012	EFT	PASS	Meets the requirements of Performance Criterion A
EN 61000-4-5: 2006	Surge	PASS	Meets the requirements of Performance Criterion A
EN 61000-4-6: 2009	CS	PASS	Meets the requirements of Performance Criterion A

- Note:**
1. The statements of test result on the above are decided by the request of test standard only; the measurement uncertainties are not factored into this compliance determination.
  2. The information of measurement uncertainty is available upon the customer's request.



### 3 EUT DESCRIPTION

<b>Product</b>	Embedded Computing System
<b>Brand Name</b>	CINCOZE
<b>Model</b>	DE-1000; DE-1001; DE-1002
<b>Applicant</b>	CINCOZE CO., LTD.
<b>Housing material</b>	Metal case
<b>Identify Number</b>	T140731D01
<b>Received Date</b>	July 31, 2014
<b>EUT Power Rating</b>	24VDC from Adaptor
<b>AC Power During Test</b>	230VAC / 50Hz to AC Adaptor
<b>Adaptor Manufacturer</b>	1) MEAN WELL 2) MEAN WELL
<b>Adaptor Model Number</b>	1) GS120A24 2) GSM60A12
<b>Adaptor Power Rating</b>	1) I/P: 100-240VAC, 50/60Hz, 1.4A O/P: 24VDC, 5.0A, 120W MAX. 2) I/P: 100-240VAC, 50/60Hz, 1.4-0.7A O/P: 12VDC, 5.0A, 60W MAX.
<b>DC Power Cable Type</b>	1) Unshielded, 1.0m (Non-detachable, with two cores) 1) Unshielded, 1.0m (Non-detachable, with a core)

#### Model Differences

Model Name	Differences	Tested (Check)
DE-1000	The system does not provide any slot application for customer to use.	<input checked="" type="checkbox"/>
DE-1001	The system provides one slots applications for customers to use.	<input checked="" type="checkbox"/>
DE-1002	The system provides two slots applications for customers to use.	<input checked="" type="checkbox"/>



**I/O PORT**

I/O PORT TYPES	Q'TY	TESTED WITH
1. SIO Port	6	6
2. PS/2 Keyboard/Mouse Port	1	1
3. DVI-I Port	1	1
4. Earphone Port	1	1
5. Microphone Port	1	1
6. USB Port	5	5
7. LAN Port	6	6
8. Display Port	1	1
9. DIO Port	1	1
10. Reset Port	1	1
11. SW Port	1	1

**Note:** None.

**4 TEST METHODOLOGY**

**4.1. DECISION OF FINAL TEST MODE**

The EUT was tested together with the below additional components, and a configuration, which produced the worst emission levels, was selected and recorded in this report.

The test configuration modes are as the following:

**Conduction Mode (Power port):**

No.	Model	Adaptor	Operate State
1	DE-1000	MEAN WELL / GS120A24	Normal Mode
2	DE-1001	MEAN WELL / GS120A24	Normal Mode
3	DE-1002	MEAN WELL / GS120A24	Normal Mode
4		MEAN WELL / GSM60A12	Normal Mode



**Conduction Modes (Telecom port):**

1	LAN 1	1Gbps
2	LAN 2	10Mbps
3		100Mbps
4		1Gbps
5	LAN 3	10Mbps
6		100Mbps
7		1Gbps
8	LAN 6	1Gbps

**Radiation Mode:**

No.	Model	Adaptor	Operate State
1	DE-1000	MEAN WELL / GS120A24	Normal Mode
2	DE-1001	MEAN WELL / GS120A24	Normal Mode
3	DE-1002	MEAN WELL / GS120A24	Normal Mode
4		MEAN WELL / GSM60A12	Normal Mode

**Worst:**

**Conduction (Power port):** Mode 3

**Conduction (Telecom port):** Mode 3

**Radiation:** Mode 3

## 4.2. EUT SYSTEM OPERATION

1. Windows 7 boots system.
2. Run Emctest.exe to activate all peripherals and display "H" pattern on monitor screen.
3. Run Winemc.exe and choose media player to play music.
4. Run Winemc.exe and choose "F:/ & G:/ & H:/ & I:/ & J:/" to test EUT.
5. Press the start menu, select executive and type ping 192.168.0.2~7 -t (EUT), ping 192.168.0.1 -t (Server PC).

**Note:** Test program is self-repeating throughout the test.





## 5 SETUP OF EQUIPMENT UNDER TEST

### 5.1. DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

#### EUT Devices:

No	Equipment	Model No.	Brand Name
1	MotherBoard	DE-100	CINCOZE
2	CPU (1.91GHz)	Intel® Atom(TM) CPU E3845	Intel
3	Memory	CIR-S3SULSI1302G	CERVOZ
4	CF	CFast D150Q	innodisk
5	Adapter	GS60A12	MEAN WELL
		GS120A24	MEAN WELL

#### Peripherals Devices:

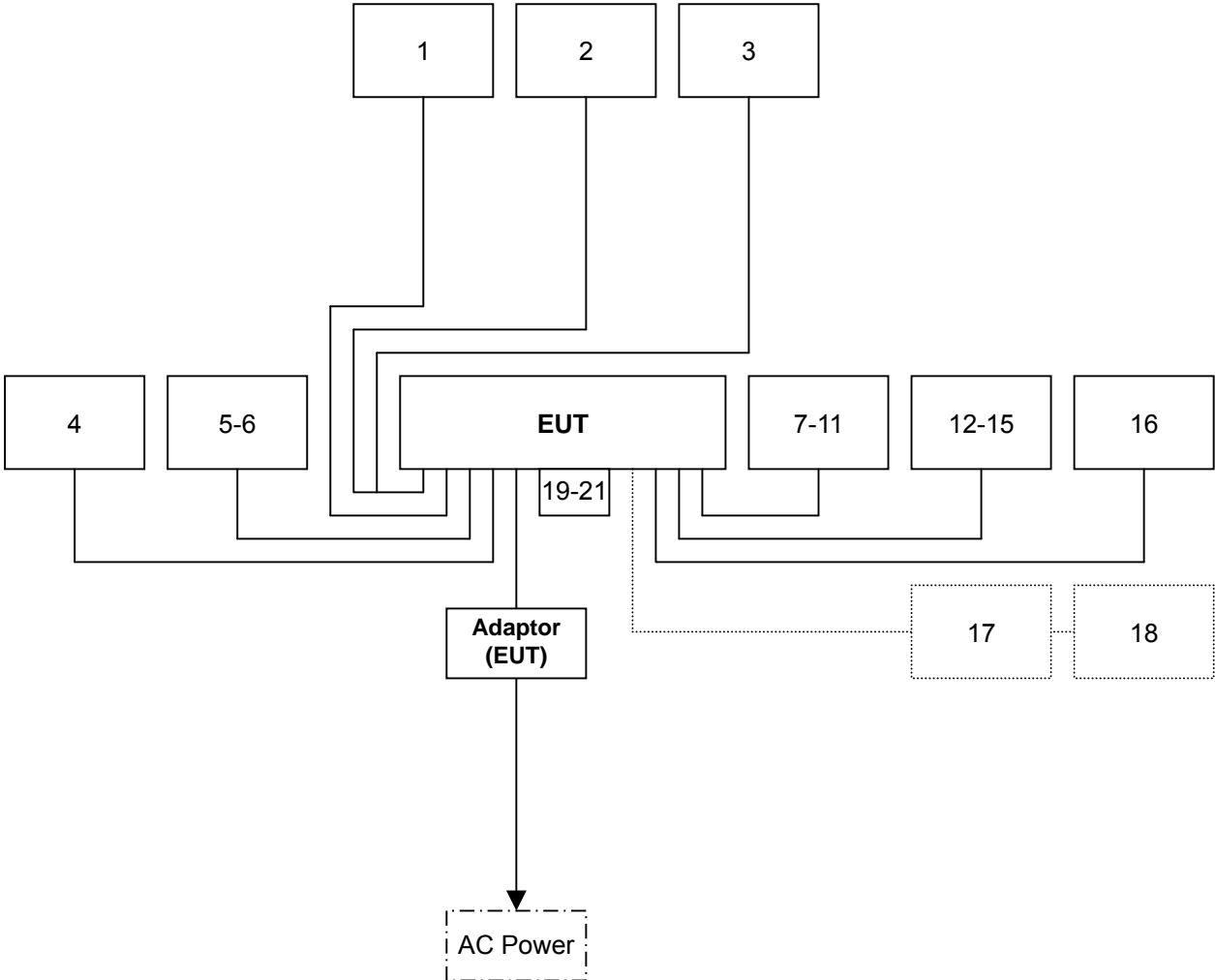
No.	Equipment	Model No.	Serial No.	FCC ID / BSMI ID	Brand Name	Data Cable	Power Cord
1	PS/2 Mouse	M071KC	443029438	DOC BSMI: R41108	DELL	Shielded, 1.8m	N/A
2	PS/2 Keyboard	SK-2880	BAUEL0HCPY76G7	DOC BSMI: T3A002	hp	Shielded, 1.8m	N/A
3	Earphone & Microphone	SEP912	N/A	N/A	Atayal	Unshielded, 1.8m	N/A
4	Monitor	U2713HMT	N/A	N/A	DELL	DVI: Shielded, 1.8m	Unshielded, 1.5m
5-6	Modem	AL-56ERM	0MERM04A0212	DOC	GALILEO	Shielded, 1.2m	Unshielded, 1.5m
7-11	USB HDD	HD-EG5	N/A	N/A	SONY	Shielded, 0.8m	N/A
12-15	Modem	AL-56ERM	0MERM04A0212	DOC	GALILEO	Shielded, 1.2m	Unshielded, 1.5m
16	Monitor	U2713HMT	N/A	N/A	DELL	Display: Shielded, 1.8m	Unshielded, 1.5m
17	Hub	DGS-1008D	042829	DoC	D-Link	Unshielded, 20m X6	Unshielded, 1.8m
18	Server PC	T3500	8X36VBX	DOC BSMI: R33002	DELL	Unshielded, 1.8m	Unshielded, 1.8m
19	DIO Load	N/A	N/A	N/A	N/A	N/A	N/A
20	Reset Load	N/A	N/A	N/A	N/A	N/A	N/A
21	SW Load	N/A	N/A	N/A	N/A	N/A	N/A

#### Note:

- 1) All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
- 2) Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.



**5.2. CONFIGURATION OF SYSTEM UNDER TEST**





## 6 FACILITIES AND ACCREDITATIONS

### 6.1. FACILITIES

All measurement facilities used to collect the measurement data are located at CCSrf Taiwan Xindian Lab. at No.163-1, Jhongsheng Rd., Xindian Dist., New Taipei City, 23151 Taiwan.

The sites are constructed in conformance with the requirements of ANSI C63.4 and CISPR Publication 22. All receiving equipment conforms to CISPR 16-1-1, CISPR 16-1-2, CISPR 16-1-3, CISPR 16-1-4 and CISPR 16-1-5.

### 6.2. ACCREDITATIONS

Our laboratories are accredited and approved by the following accreditation body according to ISO/IEC 17025.

Taiwan	TAF
USA	A2LA

The measuring facility of laboratories has been authorized or registered by the following approval agencies.

Canada	Industry Canada
Norway	Nemko
Japan	VCCI
Taiwan	BSMI
USA	FCC

Copies of granted accreditation certificates are available for downloading from our web site, <http://www.ccsrf.com>

### 6.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement	Frequency	Uncertainty
Conducted emissions (Power port)	0.15MHz ~ 30MHz	± 1.59
Conducted emissions (Telecom port)	0.15MHz ~ 30MHz	± 2.91
Radiated emissions	30MHz ~ 1000MHz	± 3.71

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Consistent with industry standard (e.g. CISPR 22: 2005, clause 11, Measurement Uncertainty) determining compliance with the limits shall be base on the results of the compliance measurement. Consequently the measure emissions being less than the maximum allowed emission result in this be a compliant test or passing test.

The acceptable measurement uncertainty value without requiring revision of the compliance statement is base on conducted and radiated emissions being less than  $U_{CISPR}$  which is 3.6dB and 5.2dB respectively. CCS values (called  $U_{Lab}$  in CISPR 16-4-2) is less than  $U_{CISPR}$  as shown in the table above. Therefore, MU need not be considered for compliance.



## 7 EMISSION TEST

### 7.1. CONDUCTED EMISSION MEASUREMENT

#### 7.1.1. LIMITS

FREQUENCY (MHz)	LIMIT (dBuV)
	Quasi-peak
0.15 - 0.5	99
0.50 -30.0	93

**NOTE:**

- (1) The lower limit shall apply at the transition frequencies.
- (2) The limit decreases in line with the logarithm of the frequency in the range 0.15 to 0.50 MHz.
- (3) All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

#### 7.1.2. TEST INSTRUMENTS

Conducted Emission room # A				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
TEST RECEIVER	R&S	ESCI	101201	08/31/2015
LISN (EUT)	SCHWARZBECK	NSLK 8127	8127527	08/28/2015
LISN	SCHWARZBECK	NSLK 8127	8127526	08/28/2015
BNC CABLE	EMCI	CFD300-NL	BNC A6	06/23/2015
Pulse Limiter	R&S	ESH3-Z2	C3010026-2	08/26/2015
THERMO-HYGRO METER	WISEWIND	201A	No. 02	05/12/2015
Test S/W	EZ-EMC			

- NOTE:** 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.  
2. N.C.R = No Calibration Request.



**7.1.3. TEST PROCEDURES** (please refer to measurement standard or CCS SOP PA-031)

**Procedure of Preliminary Test**

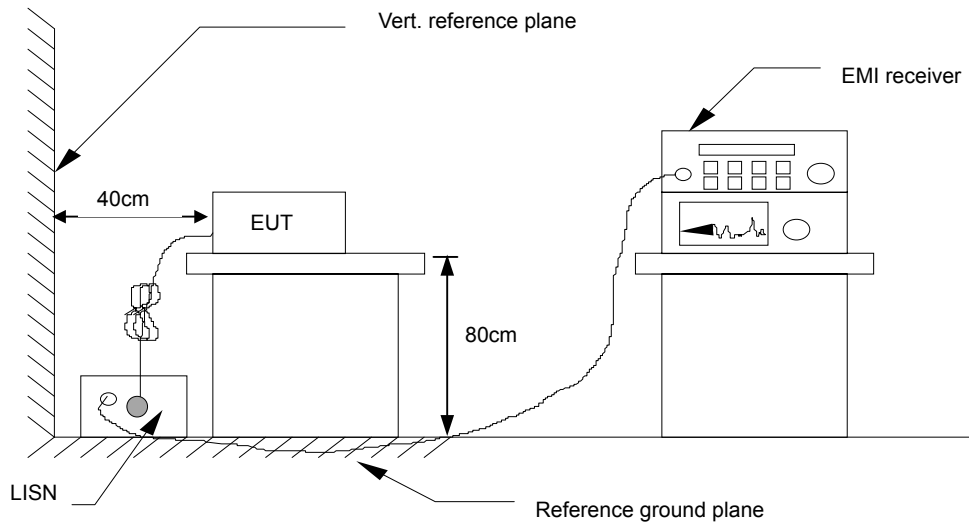
- The EUT and support equipment, if needed, were set up as per the test configuration to simulate typical usage per the user's manual. When the EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per EN 55011 (see Test Facility for the dimensions of the ground plane used). When the EUT is a floor standing equipment, it is placed on the ground plane, which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane.
- All I/O cables were positioned to simulate typical actual usage as per EN 55011.
- The test equipment EUT installed by AC main power, through a Line Impedance Stabilization Network (LISN), which supplied power source and was grounded to the ground plane.
- All support equipment power by from a second LISN.
- The test program of the EUT was started. Emissions were measured on each current carrying line of the EUT using an EMI Test Receiver connected to the LISN powering the EUT.
- The Receiver scanned from 150kHz to 30MHz for emissions in each of the test modes.
- During the above scans, the emissions were maximized by cable manipulation.
- The test mode(s) described in Item 3.1 were scanned during the preliminary test.
- After the preliminary scan, we found the test mode described in Item 3.1 producing the highest emission level.
- The worst configuration of EUT and cable of the above highest emission level were recorded for reference of the final test.

**Procedure of Final Test**

- EUT and support equipment were set up on the test bench as per the configuration with highest emission level in the preliminary test.
- A scan was taken on both power lines, Line 1 and Line 2, recording at least the six highest emissions. Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit.
- The test data of the worst-case condition(s) was recorded.



**7.1.4. TEST SETUP**



- For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

**7.1.5. DATA SAMPLE**

Freq. (MHz)	Reading (dBUV)	Factor (dB)	Result (dBUV)	Limit (dBUV)	Margin (dB)	Detector (Q)	Line (L1/L2)
x.xx	42.95	0.55	43.50	73	-29.50	Q	L1

- Freq. = Emission frequency in MHz
- Reading = Uncorrected Analyzer/Receiver reading
- Factor = Insertion loss of LISN + Cable Loss
- Result = Read Level + Factor
- Limit = Limit stated in standard
- Margin = Reading in reference to limit
- Q = Quasi-peak Reading
- L1 = Hot side
- L2 = Neutral side

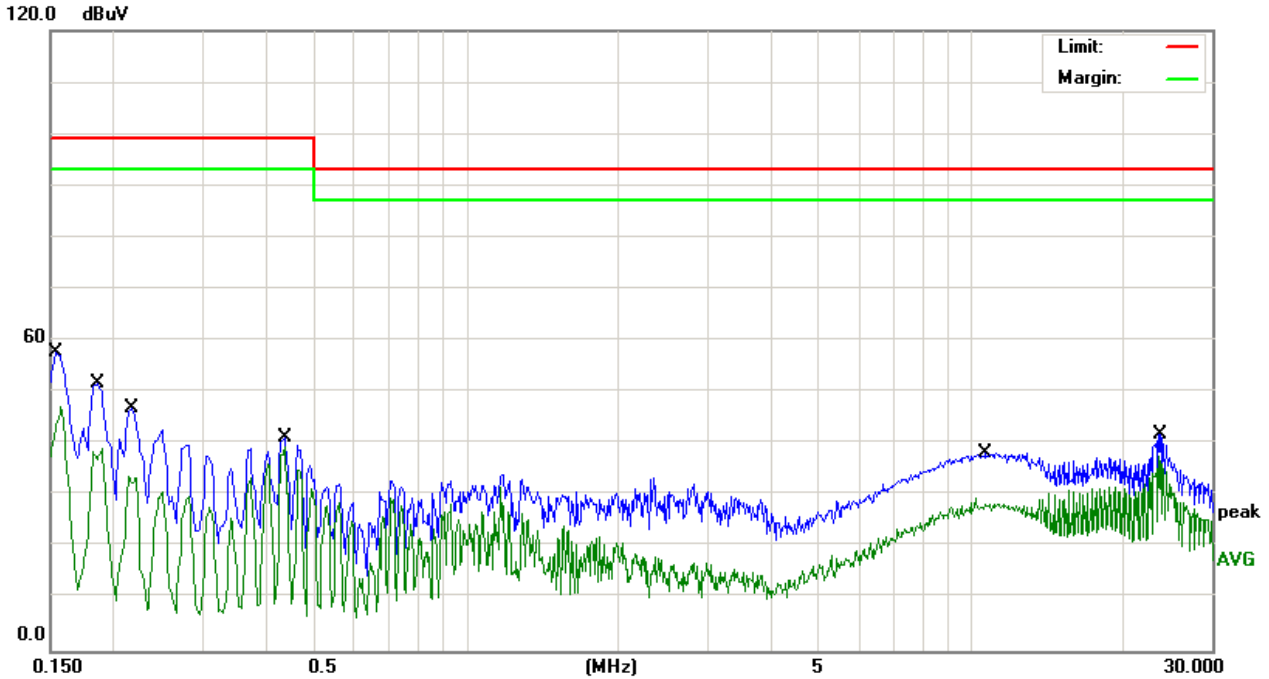
**Calculation Formula**

Margin (dB) = Result (dBUV) – Limit (dBUV)



**7.1.6. TEST RESULTS**

<b>Model No.</b>	DE-1002	<b>6dB Bandwidth</b>	9 kHz
<b>Environmental Conditions</b>	25°C, 58% RH	<b>Test Mode</b>	Mode 3
<b>Tested by</b>	Kirin Ho	<b>Phase</b>	L1
<b>Standard</b>	EN 55011		

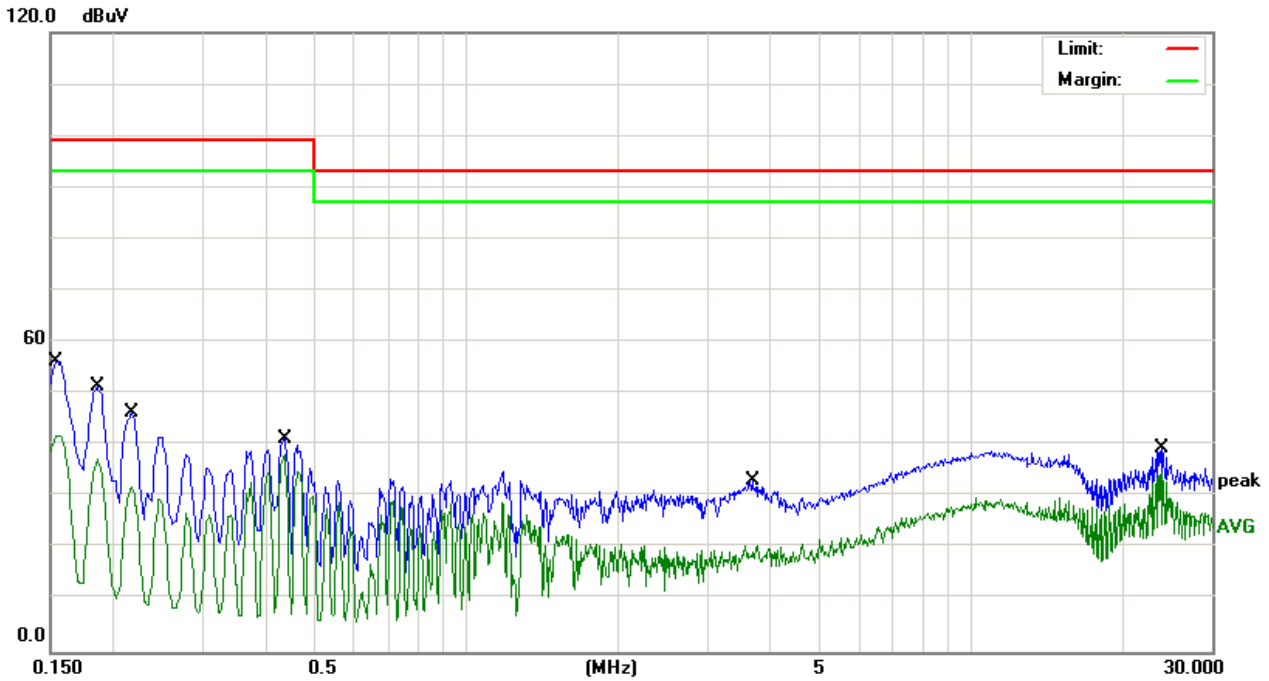


<b>Conducted Emission Readings</b>							
<b>Frequency Range Investigated</b>				<b>150 kHz to 30 MHz</b>			
Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector (Q)	Line (L1/L2)
0.1539	47.59	10.01	57.60	99.00	-41.40	Q	L1
0.1860	41.71	10.02	51.73	99.00	-47.27	Q	L1
0.2180	36.87	10.02	46.89	99.00	-52.11	Q	L1
0.4380	31.20	10.04	41.24	99.00	-57.76	Q	L1
10.6779	27.79	10.57	38.36	93.00	-54.64	Q	L1
23.7340	30.99	11.00	41.99	93.00	-51.01	Q	L1

**Note:** L1 = Line One (Live Line) / L2 = Line Two (Neutral Line).



<b>Model No.</b>	DE-1002	<b>6dB Bandwidth</b>	9 kHz
<b>Environmental Conditions</b>	25°C, 58% RH	<b>Test Mode</b>	Mode 3
<b>Tested by</b>	Kirin Ho	<b>Phase</b>	L2
<b>Standard</b>	EN 55011		



Conducted Emission Readings							
Frequency Range Investigated				150 kHz to 30 MHz			
Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector (Q)	Line (L1/L2)
0.1539	46.33	10.01	56.34	99.00	-42.66	Q	L2
0.1860	41.45	10.02	51.47	99.00	-47.53	Q	L2
0.2180	36.25	10.02	46.27	99.00	-52.73	Q	L2
0.4380	31.30	10.04	41.34	99.00	-57.66	Q	L2
3.6820	22.90	10.34	33.24	93.00	-59.76	Q	L2
23.9380	28.42	11.00	39.42	93.00	-53.58	Q	L2

**Note:** L1 = Line One (Live Line) / L2 = Line Two (Neutral Line).





## 7.2. CONDUCTED EMISSION MEASUREMENT AT PRCESS SUREMENT AND CONTROL PORTS

### 7.2.1. LIMITS

FREQUENCY (MHz)	LIMIT (dBuV)
	Quasi-peak
0.15 - 0.5	99
0.50 -30.0	93

- NOTE:** 1. At transitional frequencies the lower limit applies.  
 2. The limits decrease linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.  
 3. The current and voltage disturbance limits are derived for use with an impedance stabilization network (ISN) which presents a common mode (asymmetric mode) impedance of 150 to the telecommunication port under test (conversion factor is  $20 \log_{10} 150 / 1 = 44 \text{ dB}$ ).

### 7.2.2. TEST INSTRUMENTS

Conducted Emission room # A				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
TEST RECEIVER	R&S	ESCI	101201	08/31/2015
LISN (EUT)	SCHWARZBECK	NSLK 8127	8127527	08/28/2015
LISN	SCHWARZBECK	NSLK 8127	8127526	08/28/2015
BNC CABLE	EMCI	CFD300-NL	BNC A6	06/23/2015
Pulse Limiter	R&S	ESH3-Z2	C3010026-2	08/26/2015
THERMO-HYGRO METER	WISEWIND	201A	No. 02	05/12/2015
ISN	TESEQ	ISN T800	29449	08/31/2015
Test S/W	EZ-EMC			

- NOTE:** 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.  
 2. N.C.R = No Calibration Request.



**7.2.3. TEST PROCEDURE** (please refer to measurement standard or CCS SOP PA-031)

- Selecting ISN for unscreened cable or a current probe for screened cable to take measurement.
- The port of the EUT was connected to the remote side support equipment through the ISN/Current Probe and communication in normal condition.
- Making a overall range scan by using the test receiver controlled by controller and record at least six highest emissions for showing in the test report.
- Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit.
- In case of measuring on the screened cable, the current limit shall be applied; otherwise the voltage limit should be applied.
- The following test modes was scanned during the preliminary test:

**Modes:**

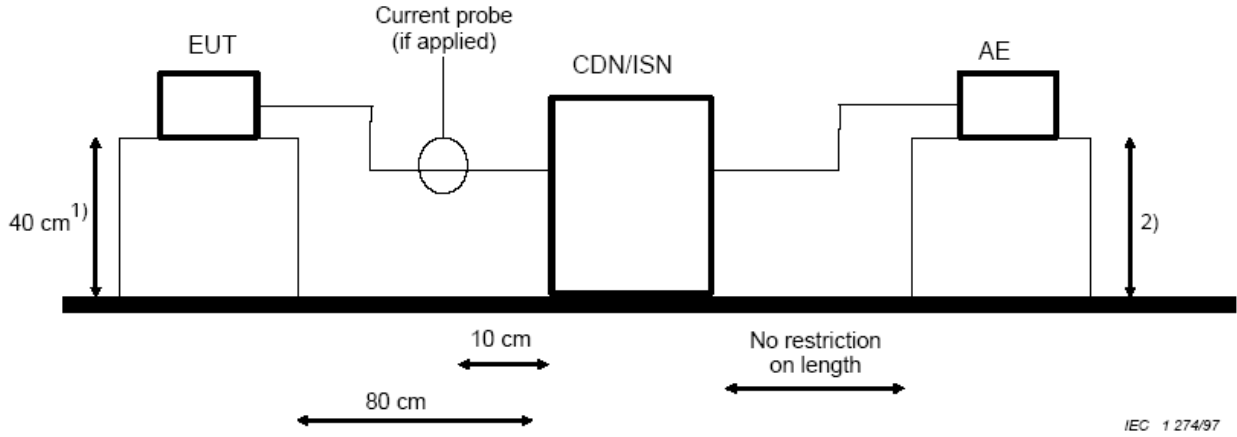
1	LAN 1	1Gbps
2	LAN 2	10Mbps
3		100Mbps
4		1Gbps
5	LAN 3	10Mbps
6		100Mbps
7		1Gbps
8	LAN 6	1Gbps

- After the preliminary scan, we found the following test mode(s) producing the highest emission level and test data of the worst case was recorded.

**Mode: 3.**

**7.2.4. TEST SETUP**

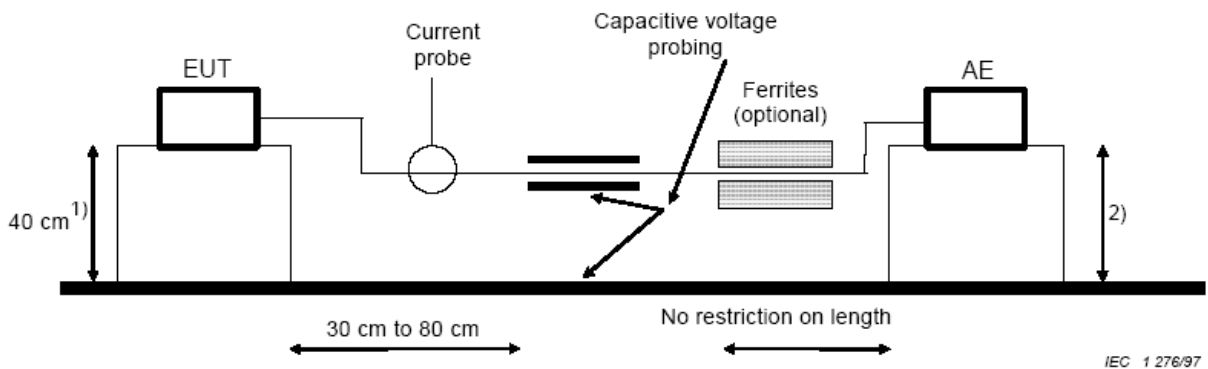
**For ISN & Current Probe:**



AE = Associated equipment  
EUT = Equipment under test

- 1) Distance to the reference groundplane (vertical or horizontal).
- 2) Distance to the reference groundplane is not critical.

**For Voltage & Current Probe:**



AE = Associated equipment  
EUT = Equipment under test

- 1) Distance to the reference groundplane (vertical or horizontal).
- 2) Distance to the reference groundplane is not critical.

- For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.



**DATA SAMPLE**

Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector (Q)
x.xx	62.95	0.55	63.50	99	-35.5	Q

- Freq. = Emission frequency in MHz
- Reading = Uncorrected Analyzer/Receiver reading
- Factor = Insertion loss of LISN + Cable Loss + Pulse Limit
- Result = Reading + Factor
- Limit = Limit stated in standard
- Margin = Reading in reference to limit
- Q = Quasi-peak Reading

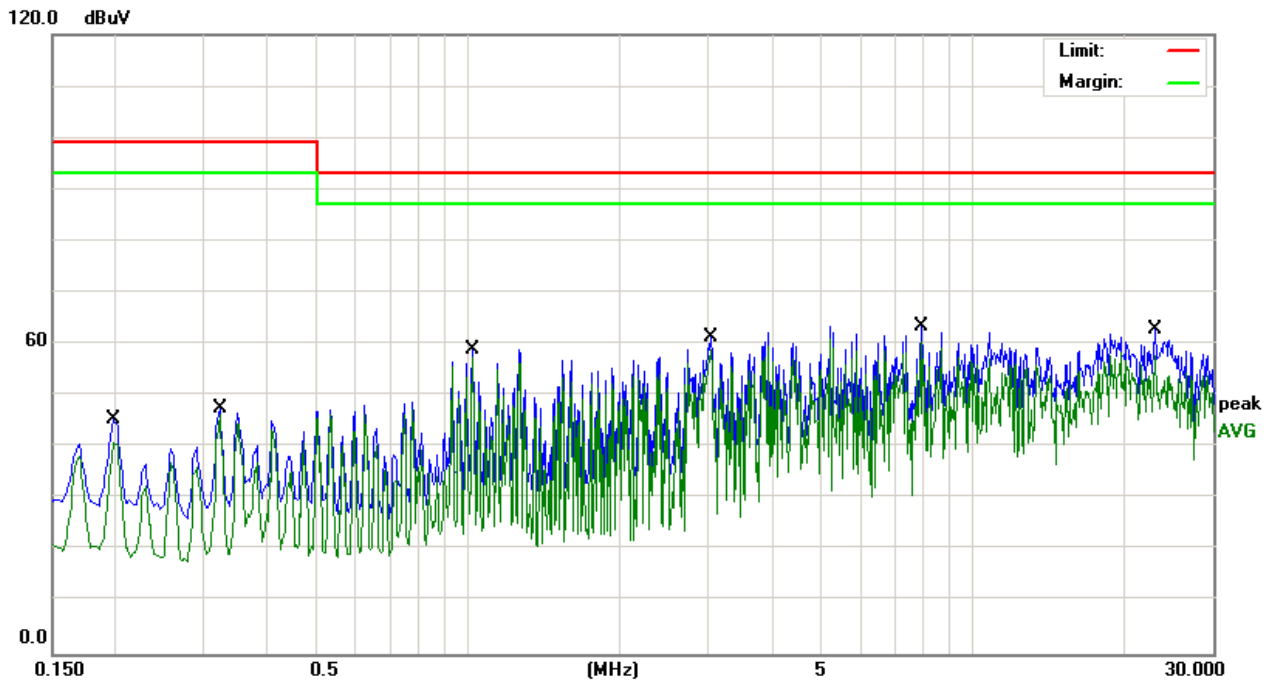
**Calculation Formula**

Margin (dB) = Result (dBuV) – Limit (dBuV)



**7.2.5. TEST RESULTS**

<b>Model No.</b>	DE-1002	<b>6dB Bandwidth</b>	9 kHz
<b>Environmental Conditions</b>	25°C, 58% RH	<b>Test Mode</b>	Mode 3
<b>Tested by</b>	Kirin Ho	<b>Standard</b>	EN 55011



<b>Conducted Emission Readings</b>						
<b>Frequency Range Investigated</b>				<b>150 kHz to 30 MHz</b>		
Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector (Q)
0.1975	25.31	20.13	45.44	99.00	-53.56	Q
0.3215	27.70	20.00	47.70	99.00	-51.30	Q
1.0210	39.26	19.83	59.09	93.00	-33.91	Q
3.0253	41.53	19.90	61.43	93.00	-31.57	Q
7.8933	43.53	19.87	63.40	93.00	-29.60	Q
23.0181	42.59	20.20	62.79	93.00	-30.21	Q



### 7.3. RADIATED EMISSION MEASUREMENT

#### 7.3.1. LIMITS

FREQUENCY (MHz)	dBuV/m (At 10m)
30 ~ 230	40
230 ~ 1000	47

**NOTE:** (1) The lower limit shall apply at the transition frequencies.  
(2) Emission level (dBuV/m) = 20 log Emission level (uV/m).

#### 7.3.2. TEST INSTRUMENTS

Open Area Test Site # I				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
MEASURE RECEIVER	R&S	ESCI	101299	09/29/2015
ANTENNA	SUNOL	JB1	A100209-3	08/17/2015
AMPLIFIER	SCHAFFNER	CPA9231A	3626	10/02/2015
CABLE	EMCI	8Dr	N-TYPE #15, I6	02/04/2015
THERMO-HYGRO METER	WISEWIND	201A	No. 03	06/08/2015
Test S/W	EZ-EMC			

**NOTE:** 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.  
2. N.C.R = No Calibration Request.



**7.3.3. TEST PROCEDURE** (please refer to measurement standard or CCS SOP PA-031)

**Procedure of Preliminary Test**

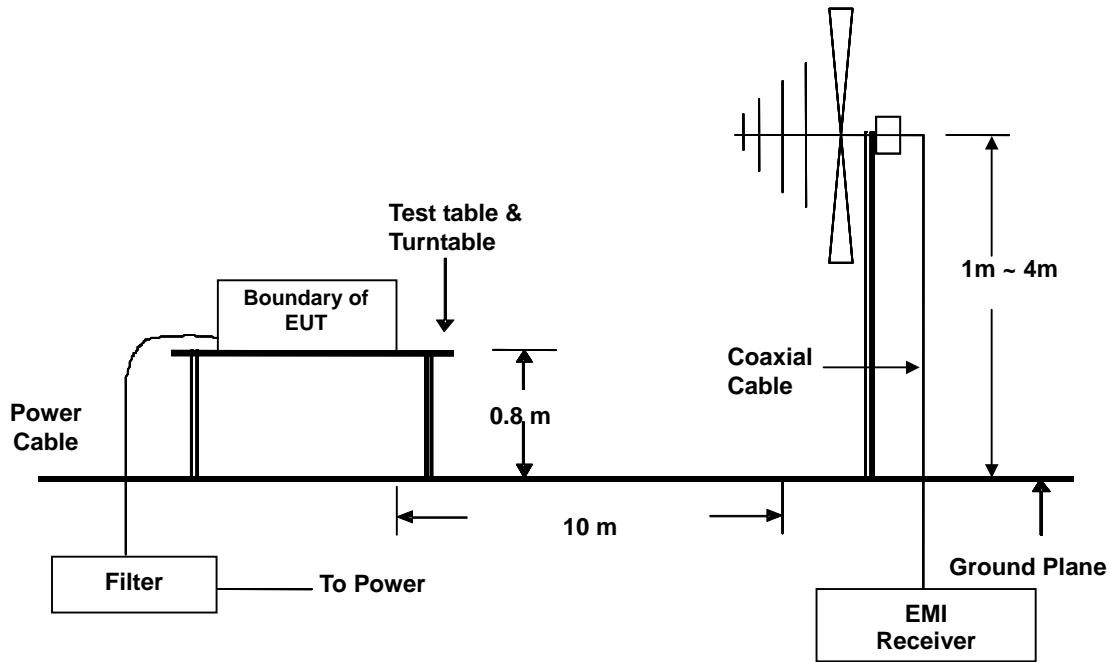
- The equipment was set up as per the test configuration to simulate typical usage per the user's manual. When the EUT is a tabletop system, a wooden turntable with a height of 0.8 meters is used which is placed on the ground plane. When the EUT is a floor standing equipment, it is placed on the ground plane which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane.
- Support equipment, if needed, was placed as per EN 55011.
- All I/O cables were positioned to simulate typical usage as per EN 55011.
- The EUT received AC power source from the outlet socket under the turntable. All support equipment power received from another socket under the turntable.
- The antenna was placed at 10 meter away from the EUT as stated in EN 55011. The antenna connected to the Spectrum Analyzer via a cable and at times a pre-amplifier would be used.
- The Analyzer / Receiver quickly scanned from 30MHz to 1000MHz. The EUT test program was started. Emissions were scanned and measured rotating the EUT to 360 degrees and positioning the antenna 1 to 4 meters above the ground plane, in both the vertical and the horizontal polarization, to maximize the emission reading level.
- The test mode(s) described in Item 3.1 were scanned during the preliminary test:
- After the preliminary scan, we found the test mode described in Item 3.1 producing the highest emission level.
- The worst configuration of EUT and cable, antenna position, polarization and turntable position of the above highest emission levels were recorded for the final test.

**Procedure of Final Test**

- EUT and support equipment were set up on the turntable as per the configuration with highest emission level in the preliminary test.
- The Analyzer / Receiver scanned from 30MHz to 1000MHz. Emissions were scanned and measured rotating the EUT to 360 degrees, varying cable placement and positioning the antenna 1 to 4 meters above the ground plane, in both the vertical and the horizontal polarization, to maximize the emission reading level.
- Recording at least the six highest emissions. Emission frequency, amplitude, antenna position, polarization and turntable position were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit and only Q.P. reading is presented.
- The test data of the worst-case condition(s) was recorded.



**7.3.4. TEST SETUP**



- For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

**7.3.5. DATA SAMPLE**

Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector (Q)	Pol. (H/V)
x.xx	14.0	12.2	26.2	40	-13.8	Q	H

- Freq. = Emission frequency in MHz
- Reading = Uncorrected Analyzer/Receiver reading
- Factor = Antenna Factor + Cable Loss - Amplifier Gain
- Result = Reading + Factor
- Limit = Limit stated in standard
- Margin = Reading in reference to limit
- Q = Quasi-peak Reading
- H = Antenna Polarization: Horizontal
- V = Antenna Polarization: Vertical

**Calculation Formula**

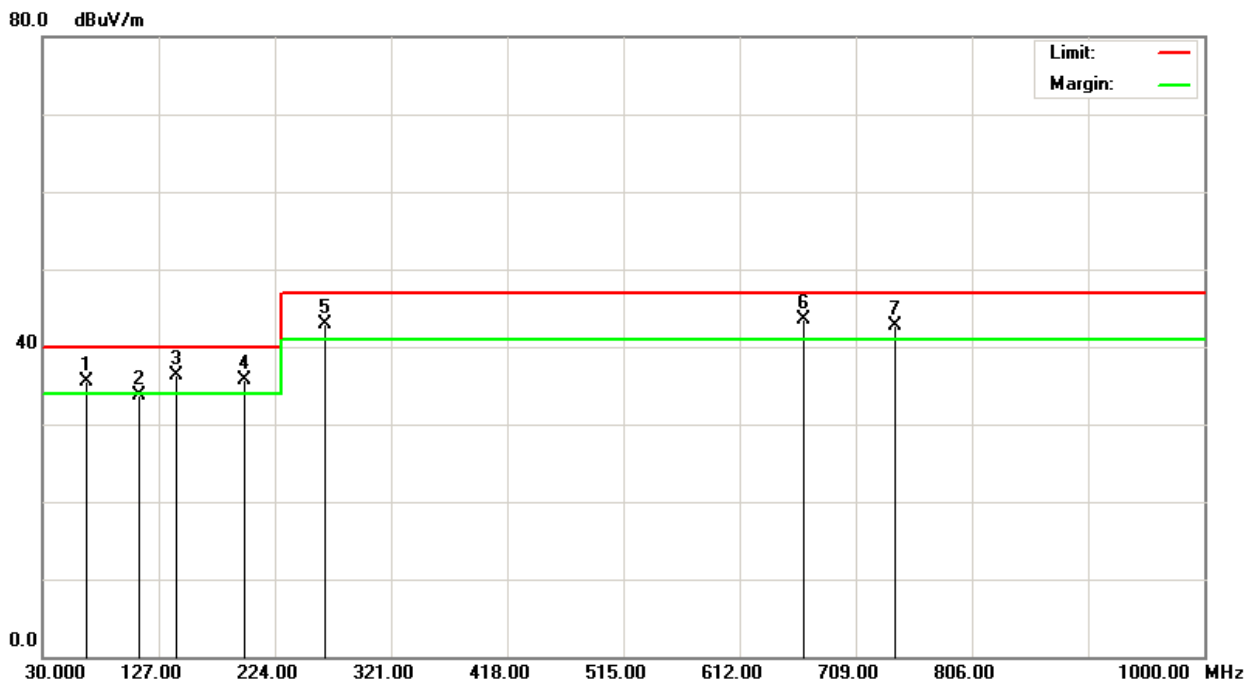
Margin (dB) = Result (dBuV/m) – Limit (dBuV/m)





**7.3.6. TEST RESULTS**

<b>Model No.</b>	DE-1002	<b>Test Mode</b>	Mode 3
<b>Environmental Conditions</b>	22°C, 60% RH	<b>6dB Bandwidth</b>	120 kHz
<b>Antenna Pole</b>	Vertical	<b>Antenna Distance</b>	10m
<b>Detector Function</b>	Quasi-peak.	<b>Tested by</b>	David Cheng
<b>Standard</b>	EN 55011		

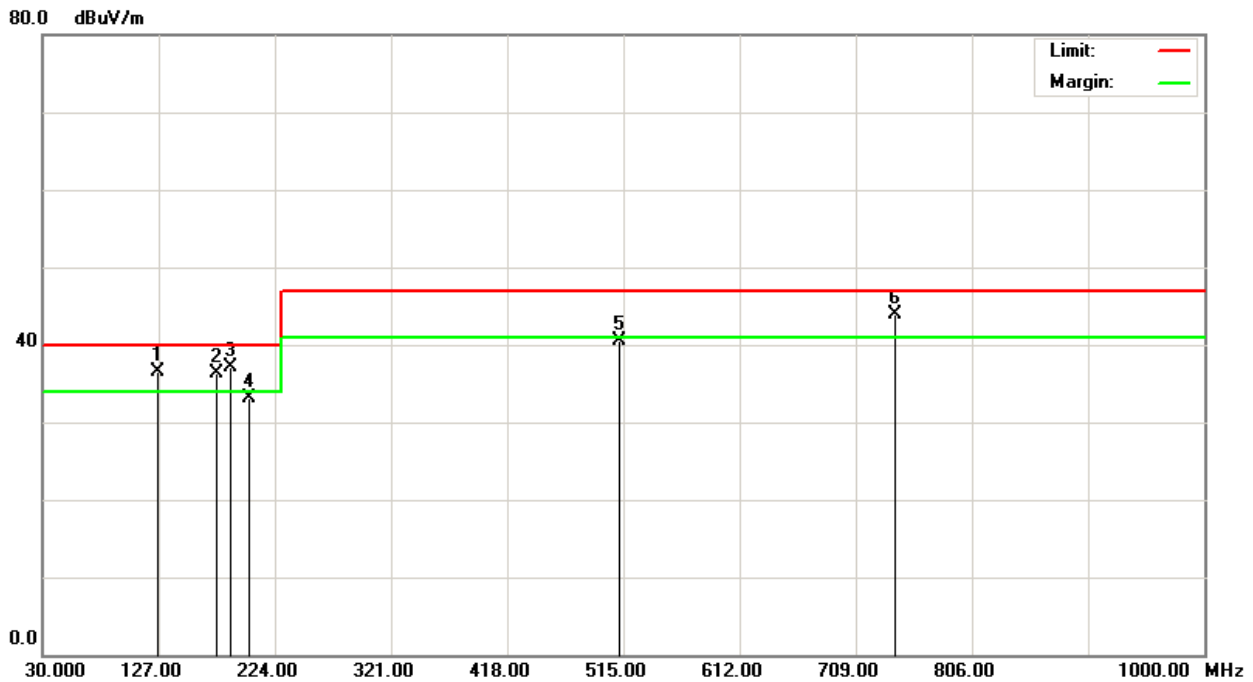


<b>Radiated Emission Readings</b>									
<b>Frequency Range Investigated</b>				<b>30 MHz to 1000 MHz at 10m</b>					
Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Detector (Q)	Pol. (H/V)
66.3500	55.34	-19.76	35.58	40.00	-4.42	100	224	Q	V
111.2000	49.20	-15.56	33.64	40.00	-6.36	100	159	Q	V
142.3600	50.34	-14.12	36.22	40.00	-3.78	100	333	Q	V
198.5200	50.26	-14.59	35.67	40.00	-4.33	100	250	Q	V
266.4100	57.41	-14.41	43.00	47.00	-4.00	100	360	Q	V
666.2700	48.33	-4.77	43.56	47.00	-3.44	400	114	Q	V
742.3900	46.20	-3.54	42.66	47.00	-4.34	400	158	Q	V

**Note:** P= Peak Reading; Q= Quasi-peak Reading.



<b>Model No.</b>	DE-1002	<b>Test Mode</b>	Mode 3
<b>Environmental Conditions</b>	22°C, 60% RH	<b>6dB Bandwidth</b>	120 kHz
<b>Antenna Pole</b>	Horizontal	<b>Antenna Distance</b>	10m
<b>Detector Function</b>	Quasi-peak.	<b>Tested by</b>	David Cheng
<b>Standard</b>	EN 55011		



Radiated Emission Readings									
Frequency Range Investigated				30 MHz to 1000 MHz at 10m					
Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Detector (Q)	Pol. (H/V)
126.9300	50.60	-14.04	36.56	40.00	-3.44	100	114	Q	H
175.2400	52.10	-15.75	36.35	40.00	-3.65	100	214	Q	H
187.1100	52.52	-15.36	37.16	40.00	-2.84	100	333	Q	H
203.2500	47.93	-14.79	33.14	40.00	-6.86	100	163	Q	H
511.3300	48.12	-7.61	40.51	47.00	-6.49	400	220	Q	H
742.3900	47.37	-3.54	43.83	47.00	-3.17	400	147	Q	H

**Note:** P= Peak Reading; Q= Quasi-peak Reading.



## 8 IMMUNITY TEST

### 8.1. GENERAL DESCRIPTION

Product Standard	EN 50121-3-2	
	Test Type	Minimum Requirement
<b>Basic Standard, Specification, and Performance Criterion required</b>	EN 61000-4-2	Electrostatic Discharge – ESD: 8kV air discharge, 6kV Contact discharge, Performance Criterion B
	EN 61000-4-3	Radio-Frequency Electromagnetic Field Susceptibility Test – RS: 80 ~ 1000 MHz, 20V/m, 80% AM (1kHz), 800 ~ 1000 MHz, 20V/m, 80% AM (1kHz)(From digital mobile telephones), 1400 ~ 2100 MHz, 10V/m, 80% AM (1kHz) (From digital mobile telephones), 2100 ~ 2500 MHz, 5V/m, 80% AM (1kHz) (From digital mobile telephones), Performance Criterion A
	EN 61000-4-4	Electrical Fast Transient/Burst - EFT, AC Power Port: 2kV Battery referenced Port: 2kV Signal Ports and Telecommunication Ports: 2kV Performance Criterion A
	EN 61000-4-5	Surge Immunity Test: 1.2/50 $\mu$ s Open Circuit Voltage, 8/20 $\mu$ s Short Circuit Current, AC Power Port ~ line to line: 1kV, line to earth (ground): 2kV Battery referenced Port ~ line to line: 1kV, line to earth (ground): 2kV Performance Criterion B
	EN 61000-4-6	Conducted Radio Frequency Disturbances Test – CS: 0.15 ~ 80 MHz, 10Vrms, 80% AM, 1kHz, Performance Criterion A



**8.2. GENERAL PERFORMANCE CRITERIA DESCRIPTION**

<b>Criteria A:</b>	The apparatus shall continue to operate as intended during and 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. The performance level may be replaced by a permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, either of these may be derived from the product description and documentation, and from what the user may reasonably expect from the apparatus if used as intended.
<b>Criteria B:</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. The performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed. No change of actual operating state or stored data is allowed. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, either of these may be derived from the product description and documentation, and from what the user may reasonably expect from the apparatus if used as intended.
<b>Criteria C:</b>	Temporary loss of function is allowed, provided the function is self recoverable or can be restored by the operation of the controls.



### 8.3. ELECTROSTATIC DISCHARGE (ESD)

#### 8.3.1. TEST SPECIFICATION

<b>Basic Standard:</b>	EN 61000-4-2
<b>Discharge Impedance:</b>	330 ohm / 150 pF
<b>Discharge Voltage:</b>	Air Discharge: 2; 4; 8 kV (Direct) Contact Discharge: 2; 4; 6 kV (Direct/Indirect)
<b>Polarity:</b>	Positive & Negative
<b>Number of Discharge:</b>	Minimum 20 times at each test point
<b>Discharge Mode:</b>	Single Discharge 1 second minimum

#### 8.3.2. TEST INSTRUMENT

IMMUNITY SHIELDED ROOM				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
ESD Generator	Teseq	NSG 437	249	12/16/2014
Aneroid Barometer	Sato	7610-20	89090	10/20/2014
Thermo-Hygro meter	TECPEL	DTM-303	080269	04/20/2015

**NOTE:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.



**8.3.3. TEST PROCEDURE** (please refer to measurement standard or CCS SOP PA-022)

The discharges shall be applied in two ways:

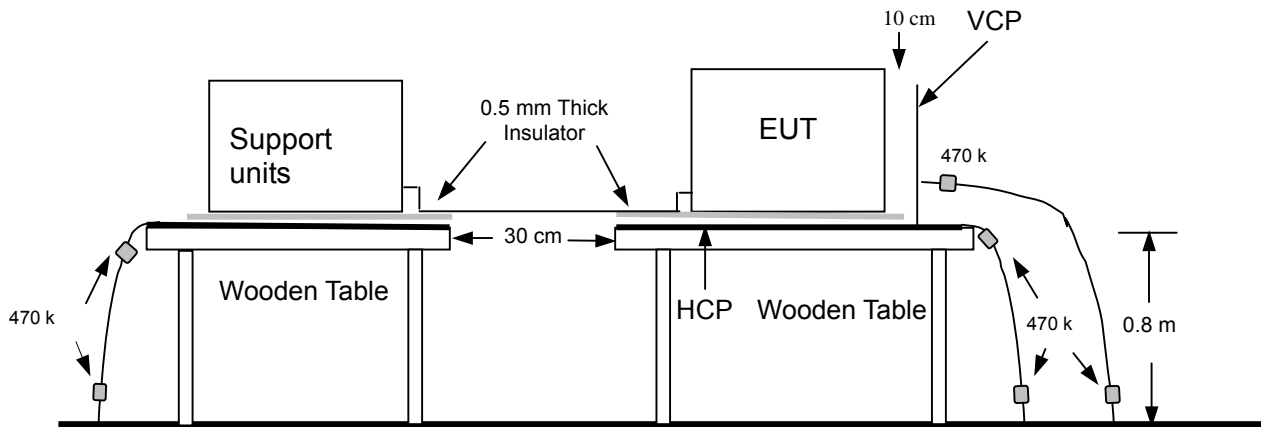
- a) Contact discharges to the conductive surfaces and coupling planes:  
The EUT shall be exposed to at least 20 discharges, 10 each at negative and positive polarity, at a minimum of four test points. One of the test points shall be subjected to at least 10 indirect discharges to the center of the front edge of the **Horizontal Coupling Plane (HCP)**. The remaining three test points shall each receive at least 10 direct contact discharges. If no direct contact test points are available, then at least 20 indirect discharges shall be applied in the indirect mode. Test shall be performed at a maximum repetition rate of one discharge per second.
- b) Air discharges at slots and apertures and insulating surfaces:  
On those parts of the EUT where it is not possible to perform contact discharge testing, the equipment should be investigated to identify user accessible points where breakdown may occur. Such points are tested using the air discharge method. This investigation should be restricted to those area normally handled by the user. A minimum of 10 single air discharges shall be applied to the selected test point for each such area.

The basic test procedure was in accordance with EN 61000-4-2:

- a) The EUT was located 0.1 m minimum from all side of the **HCP** (dimensions 1.6m x 0.8m).
- b) The support units were located another table 30 cm away from the EUT, but direct support unit was/were located at same location as EUT on the HCP and keep at a distance of 10 cm with EUT.
- c) The time interval between two successive single discharges was at least 1 second.
- d) Contact discharges were applied to the non-insulating coating, with the pointed tip of the generator penetrating the coating and contacting the conducting substrate.
- e) Air discharges were applied with the round discharge tip of the discharge electrode approaching the EUT as fast as possible (without causing mechanical damage) to touch the EUT. After each discharge, the ESD generator was removed from the EUT and re-triggered for a new single discharge. The test was repeated until all discharges were complete.
- f) At least ten single discharges (in the most sensitive polarity) were applied at the front edge of each **HCP** opposite the center point of each unit of the EUT and 0.1 meters from the front of the EUT. The long axis of the discharge electrode was in the plane of the **HCP** and perpendicular to its front edge during the discharge.
- g) At least ten single discharges (in the most sensitive polarity) were applied to the center of one vertical edge of the **Vertical Coupling Plane (VCP)** in sufficiently different positions that the four faces of the EUT were completely illuminated. The **VCP** (dimensions 0.5m x 0.5m) was placed vertically to and 0.1 meters from the EUT.



### 8.3.4. TEST SETUP



#### Ground Reference Plane

- For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

#### NOTE:

##### TABLE-TOP EQUIPMENT

The configuration consisted of a wooden table 0.8 meters high standing on the **Ground Reference Plane**. The **GRP** consisted of a sheet of aluminum at least 0.25mm thick, and 2.5 meters square connected to the protective grounding system. A **Horizontal Coupling Plane** (1.6m x 0.8m) was placed on the table and attached to the **GRP** by means of a cable with 940k  $\Omega$  total impedance. The equipment under test, was installed in a representative system as described in section 7 of IEC 61000-4-2, and its cables were placed on the **HCP** and isolated by an insulating support of 0.5mm thickness. A distance of 1-meter minimum was provided between the EUT and the walls of the laboratory and any other metallic structure.

##### FLOOR-STANDING EQUIPMENT

The equipment under test was installed in a representative system as described in section 7 of IEC 61000-4-2, and its cables were isolated from the Ground Reference Plane by an insulating support of 0.1-meter thickness. The GRP consisted of a sheet of aluminum that is at least 0.25mm thick, and 2.5 meters square connected to the protective grounding system and extended at least 0.5 meters from the EUT on all sides.



**8.3.5. TEST RESULTS**

Temperature	18°C	Humidity	58% RH
Pressure	1010mbar	Tested By	Kirin Ho
Required Passing Performance		Criterion B	

Air Discharge								
Test Points	Test Levels			Results				
	± 2 kV	± 4 kV	± 8 kV	Pass	Fail	Performance Criterion		Observation
Front	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> A	<input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2
Back	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> A	<input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2

Contact Discharge								
Test Points	Test Levels			Results				
	± 2 kV	± 4 kV	± 6 kV	Pass	Fail	Performance Criterion		Observation
Front	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> A	<input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2
Back	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> A	<input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2
Left	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> A	<input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2
Right	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> A	<input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2
Top	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> A	<input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2

Please refer to ESD test photo on next page for detail discharge point

Discharge To Horizontal Coupling Plane								
Side of EUT	Test Levels			Results				
	± 2 kV	± 4 kV	± 6 kV	Pass	Fail	Performance Criterion		Observation
Front	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> A	<input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2
Back	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> A	<input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2
Left	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> A	<input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2
Right	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> A	<input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2

Discharge To Vertical Coupling Plane								
Side of EUT	Test Levels			Results				
	± 2 kV	± 4 kV	± 6 kV	Pass	Fail	Performance Criterion		Observation
Front	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> A	<input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2
Back	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> A	<input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2
Left	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> A	<input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2
Right	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> A	<input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2

**NOTE:** 1. There was no change compared with initial operation during the test.





**The Photo for Discharge Points of EUT  
Front**

**T140731D01**



**Back**

**T140731D01**



Red Dot —Air Discharged  
Blue Dot —Contact Discharged



Left

**T140731D01**



Right

**T140731D01**



Red Dot —Air Discharged  
Blue Dot —Contact Discharged



Top



Red Dot —Air Discharged  
Blue Dot —Contact Discharged



### 8.4. RADIATED, RADIO-FREQUENCY, ELECTROMAGNETIC FIELD (RS)

#### 8.4.1. TEST SPECIFICATION

<b>Basic Standard:</b>	EN 61000-4-3
<b>Frequency Range:</b>	80 MHz ~ 2500 MHz
<b>Field Strength:</b>	80 ~ 1000MHz, 20V/m; 800 ~ 1000MHz, 20V/m; 1400 ~ 2100MHz, 10V/m; 2100 ~ 2500MHz, 5V/m
<b>Modulation:</b>	1kHz Sine Wave, 80%, AM Modulation
<b>Frequency Step:</b>	1 % of preceding frequency value
<b>Polarity of Antenna:</b>	Horizontal and Vertical
<b>Test Distance:</b>	3 m
<b>Antenna Height:</b>	1.5m

#### 8.4.2. TEST INSTRUMENT

844 RS Chamber				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Calibration of Field	N/A	Chamber#RS	80-1000MHz	04/05/2015
Signal Generator	Agilent	E4421B	MY43350597	05/22/2015
Electric Field Probe	AR	FL7006	0338955	06/08/2015
RF Power Meter	Boonton	4242-01-02	14357	03/19/2015
Amplifier	AR	500W1000A	320994	No Calibration Required
Direction Coupler	AR	DC6180A	312189	No Calibration Required
Broadband Antenna	AR	AT1080	311819	No Calibration Required
Thermo-Hygro meter	TFA	N/A	NO.6	11/11/2014
Calibration of Field	N/A	Chamber#RS	1000-3000MHz	04/07/2015
Amplifier	AR	60S1G3	302728	No Calibration Required
Horn Antenna	EMCO	3115	5761	No Calibration Required
Direction Coupler	AR	DC7144A	306217	No Calibration Required
Software	Emcware Ver. 2.6.0.16			

**NOTE:** 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.  
2. N.C.R.= No Calibration required

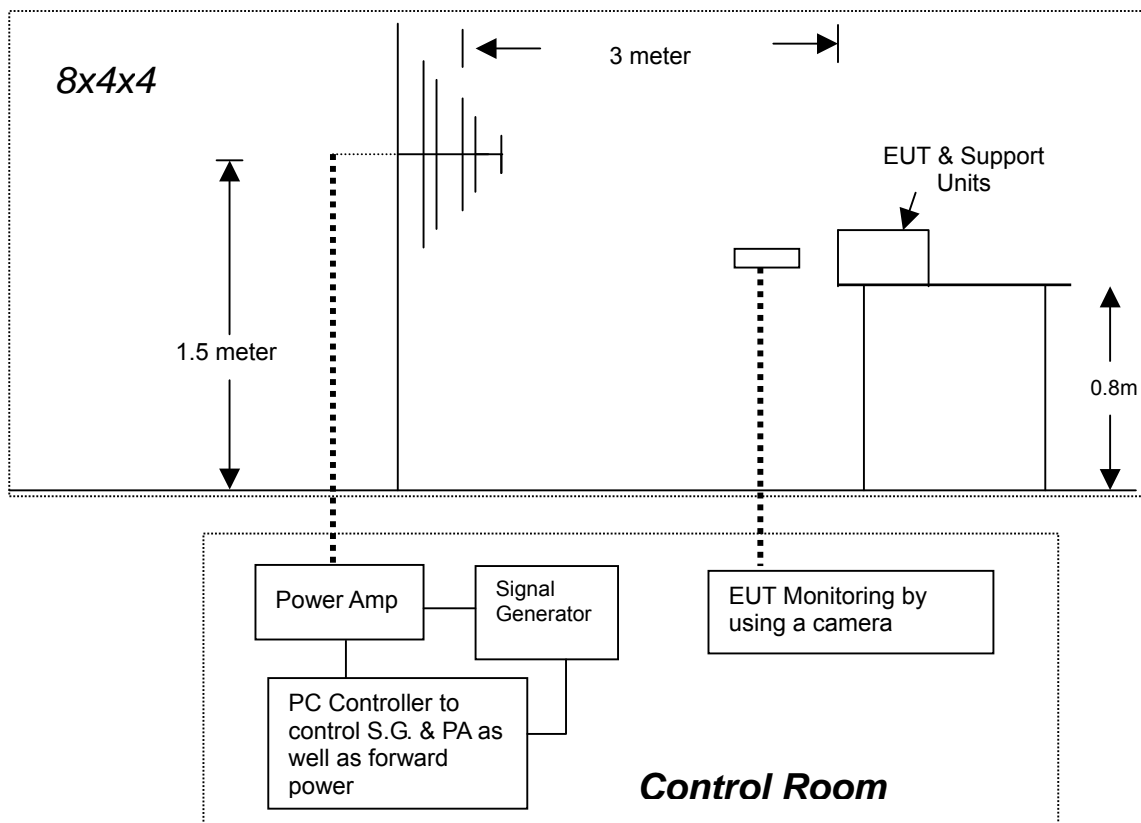


**8.4.3. TEST PROCEDURE** (please refer to measurement standard or CCS SOP PA-023)

The test procedure was in accordance with EN 61000-4-3

- a) The testing was performed in a fully anechoic chamber. The transmit antenna was located at a distance of 3 meters from the EUT.
- b) The frequency range is swept from 80 MHz to 1000 MHz, 1400MHz to 2100MHz, 2100MHz to 2500MHz with the signal 80% amplitude modulated with a 1kHz sine-wave. The rate of sweep did not exceed  $1.5 \times 10^{-3}$  decade/s, where the frequency range is swept incrementally, the step size was 1% of preceding frequency value.
- c) The dwell time at each frequency shall be not less than the time necessary for the EUT to be able to respond.
- e) The test was performed with the EUT exposed to both vertically and horizontally polarized fields on each of the four sides.

**8.4.4. TEST SETUP**



- For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.



**NOTE:**

TABLETOP EQUIPMENT

The EUT installed in a representative system as described in section 7 of IEC 61000-4-3 was placed on a non-conductive table 0.8 meters in height. The system under test was connected to the power and signal wire according to relevant installation instructions.

FLOOR STANDING EQUIPMENT

The EUT installed in a representative system as described in section 7 of IEC 61000-4-3 was placed on a non-conductive wood support 0.1 meters in height. The system under test was connected to the power and signal wire according to relevant installation instructions.

**8.4.5. TEST RESULTS**

<b>Temperature</b>	20°C	<b>Humidity</b>	55% RH
<b>Pressure</b>	1010mbar	<b>Dwell Time</b>	3 sec.
<b>Tested By</b>	Kevin Chang	<b>Required Passing Performance</b>	<b>Criterion A</b>

Frequency (MHz)	Polarity	Azimuth	Field Strength (V/m)	Performance Criterion	Observation	Result
80 ~ 1000	V&H	0	20	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note	PASS
80 ~ 1000	V&H	90	20	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note	PASS
80 ~ 1000	V&H	180	20	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note	PASS
80 ~ 1000	V&H	270	20	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note	PASS
800 ~ 1000	V&H	0	20	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note	PASS
800 ~ 1000	V&H	90	20	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note	PASS
800 ~ 1000	V&H	180	20	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note	PASS
800 ~ 1000	V&H	270	20	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note	PASS
1400 ~ 2100	V&H	0	10	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note	PASS
1400 ~ 2100	V&H	90	10	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note	PASS
1400 ~ 2100	V&H	180	10	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note	PASS
1400 ~ 2100	V&H	270	10	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note	PASS
2100 ~ 2500	V&H	0	5	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note	PASS
2100 ~ 2500	V&H	90	5	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note	PASS
2100 ~ 2500	V&H	180	5	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note	PASS
2100 ~ 2500	V&H	270	5	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note	PASS

**NOTE:** There was no change compared with the initial operation during the test.





## 8.5. ELECTRICAL FAST TRANSIENT (EFT)

### 8.5.1. TEST SPECIFICATION

<b>Basic Standard:</b>	EN 61000-4-4
<b>Test Voltage:</b>	AC Power Port: 2kV Signal Ports and Telecommunication Ports: 2kV
<b>Polarity:</b>	Positive & Negative
<b>Impulse Frequency:</b>	5 kHz
<b>Impulse Wave-shape:</b>	5/50 ns
<b>Burst Duration:</b>	15 ms
<b>Burst Period:</b>	300 ms
<b>Test Duration:</b>	Not less than 1 min.

### 8.5.2. TEST INSTRUMENT

Immunity Shield Room				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EMC Immunity Tester	EMC Partner	TRANSIENT 2000	1117	03/04/2015
Capacitive Clamp	EMC-Partner	CN-EFT1000	589	07/23/2015
Software	Genecs Ver. 3.27			

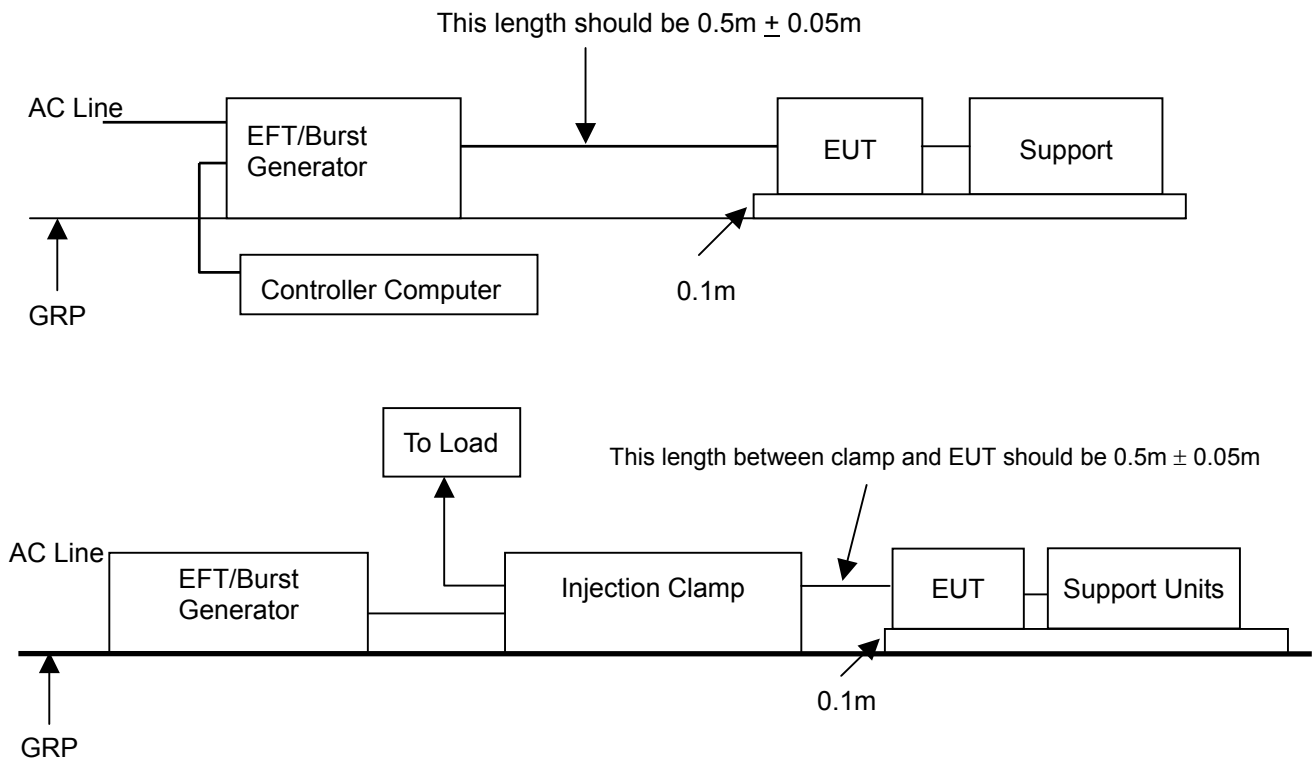
**NOTE:** 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.  
2. N.C.R.= No Calibration required

### 8.5.3. TEST PROCEDURE (please refer to measurement standard or CCS SOP PA-024)

- a) Both positive and negative polarity discharges were applied.
- b) The length of the “ hot wire ” from the coaxial output of the EFT generator to the terminals on the EUT should not exceed 1 meter.
- c) The duration time of each test sequential was 1 minute.
- d) The transient/burst waveform was in accordance with EN 61000-4-4, 5/50ns.



### 8.5.4. TEST SETUP



- For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

#### NOTE:

##### TABLETOP EQUIPMENT

The configuration consisted of a wooden table (0.8m high) standing on the Ground Reference Plane. The GRP consisted of a sheet of aluminum (at least 0.25mm thick and 2.5m square) connected to the protective grounding system. A minimum distance of 0.5m was provided between the EUT and the walls of the laboratory or any other metallic structure.

##### FLOOR STANDING EQUIPMENT

The EUT installed in a representative system as described in section 7 of IEC 61000-4-4 and its cables, were isolated from the Ground Reference Plane by an insulating support that is 0.1-meter thick. The GRP consisted of a sheet of aluminum (at least 0.25mm thick and 2.5m square) connected to the protective grounding system.





**8.5.5. TEST RESULTS**

<b>Temperature</b>	20°C	<b>Humidity</b>	58% RH
<b>Pressure</b>	1010mbar	<b>Tested By</b>	Kirin Ho
<b>Required Passing Performance</b>		<b>Criterion A</b>	

Test Point	Polarity	Test Level (kV)	Performance Criterion	Observation	Result
L	+/-	2	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
N	+/-	2	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
L - N	+/-	2	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
PE	+/-	2	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
L - PE	+/-	2	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
N - PE	+/-	2	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
L - N - PE	+/-	2	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
RJ45	+/-	2	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS

**NOTE:** 1. There was no change compared with initial operation during the test.



### 8.6. SURGE IMMUNITY TEST

#### 8.6.1. TEST SPECIFICATION

<b>Basic Standard:</b>	EN 61000-4-5
<b>Wave-Shape:</b>	Combination Wave 1.2/50 µs Open Circuit Voltage 8/20 µs Short Circuit Current
<b>Test Voltage:</b>	AC Power Port ~ line to line: 1kV, line to earth (ground): 2kV
<b>Surge Input/Output:</b>	AC Power Line: L-N / L-PE / N-PE
<b>Generator Source / Impedance:</b>	42 ohm between networks / 0,5uF 42 ohm between network and ground / 0,5uF
<b>Polarity:</b>	Positive/Negative
<b>Phase Angle:</b>	0 / 90 / 180 / 270
<b>Pulse Repetition Rate:</b>	1 time / min. (maximum)
<b>Number of Tests:</b>	5 positive and 5 negative at selected points

#### 8.6.2. TEST INSTRUMENT

Immunity Shield Room				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EMC Immunity Tester	EMC Partner	TRANSIENT 2000	1117	03/04/2015
CDN	EMC Partner	CDN-UTP8	CDN-UTP8-1505	03/05/2015
DCN	EMC Partner	CN-R40C05	1504	No Calibration Required
CDN	EMC Partner	CDN2000-06-32	0170	No Calibration Required
Software	Genecs Ver. 3.27			

**NOTE:** 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.  
2. N.C.R.= No Calibration required



**8.6.3. TEST PROCEDURE** (please refer to measurement standard or CCS SOP PA-025)

a) For EUT power supply:

The surge is applied to the EUT power supply terminals via the capacitive coupling network. Decoupling networks are required in order to avoid possible adverse effects on equipment not under test that may be powered by the same lines, and to provide sufficient decoupling impedance to the surge wave. The power cord between the EUT and the coupling/decoupling networks was shorter than 2 meters in length.

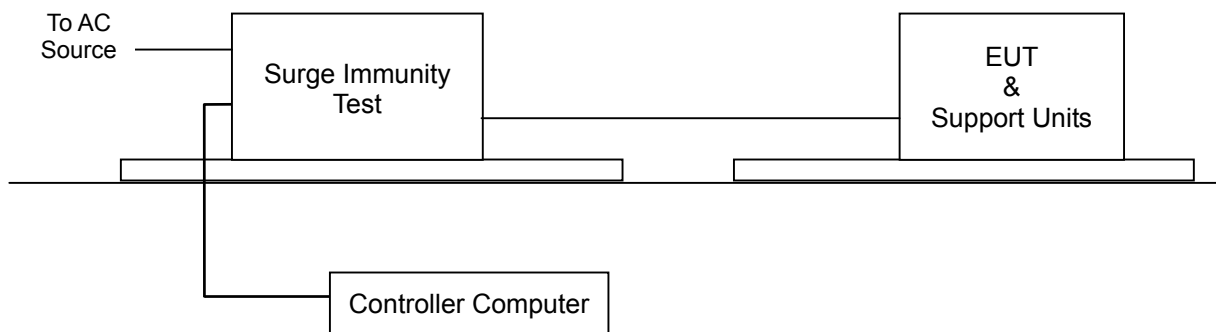
b) For test applied to unshielded un-symmetrically operated interconnection lines of EUT:

The surge was applied to the lines via the capacitive coupling. The coupling / decoupling networks didn't influence the specified functional conditions of the EUT. The interconnection line between the EUT and the coupling/decoupling networks was shorter than 2 meters in length.

c) For test applied to unshielded symmetrically operated interconnection / telecommunication lines of EUT:

The surge was applied to the lines via gas arrestors coupling. Test levels below the ignition point of the coupling arrestor were not specified. The interconnection line between the EUT and the coupling/decoupling networks was shorter than 2 meters in length.

**8.6.4. TEST SETUP**



- For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.



**8.6.5. TEST RESULTS**

<b>Temperature</b>	20°C	<b>Humidity</b>	58% RH
<b>Pressure</b>	1010mbar	<b>Tested By</b>	Kirin Ho
<b>Required Passing Performance</b>		<b>Criterion B</b>	

Test Point	Polarity	Test Level (kV)	Performance Criterion	Observation	Result
L - N	+/-	1	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	<b>Note</b> <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
L - PE	+/-	2	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	<b>Note</b> <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
N - PE	+/-	2	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	<b>Note</b> <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS

**Note:** 1. There was no change compared with initial operation during the test.



## 8.7. CONDUCTED RADIO FREQUENCY DISTURBANCES (CS)

### 8.7.1. TEST SPECIFICATION

<b>Basic Standard:</b>	EN 61000-4-6
<b>Frequency Range:</b>	0.15 MHz ~ 80 MHz
<b>Field Strength:</b>	10Vrms
<b>Modulation:</b>	1kHz Sine Wave, 80%, AM Modulation
<b>Frequency Step:</b>	1 % of preceding frequency value
<b>Coupled cable:</b>	Power Mains, Unshielded
<b>Coupling device:</b>	CDN-M3 (3 wires)

### 8.7.2. TEST INSTRUMENT

CS Room				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
CWS Generator	EM Test	CWS 500N1	V0935105080	09/25/2015
CDN (EUT)	Teseq	CDN M016	35820	06/12/2015
CDN	Teseq	CDN M016	35821	06/12/2015
Software	icd.control Ver. 5.1.9			

- NOTE:** 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.  
2. N.C.R.= No Calibration required



**8.7.3. TEST PROCEDURE** (please refer to measurement standard or CCS SOP PA-026)

The EUT shall be tested within its intended operating and climatic conditions.

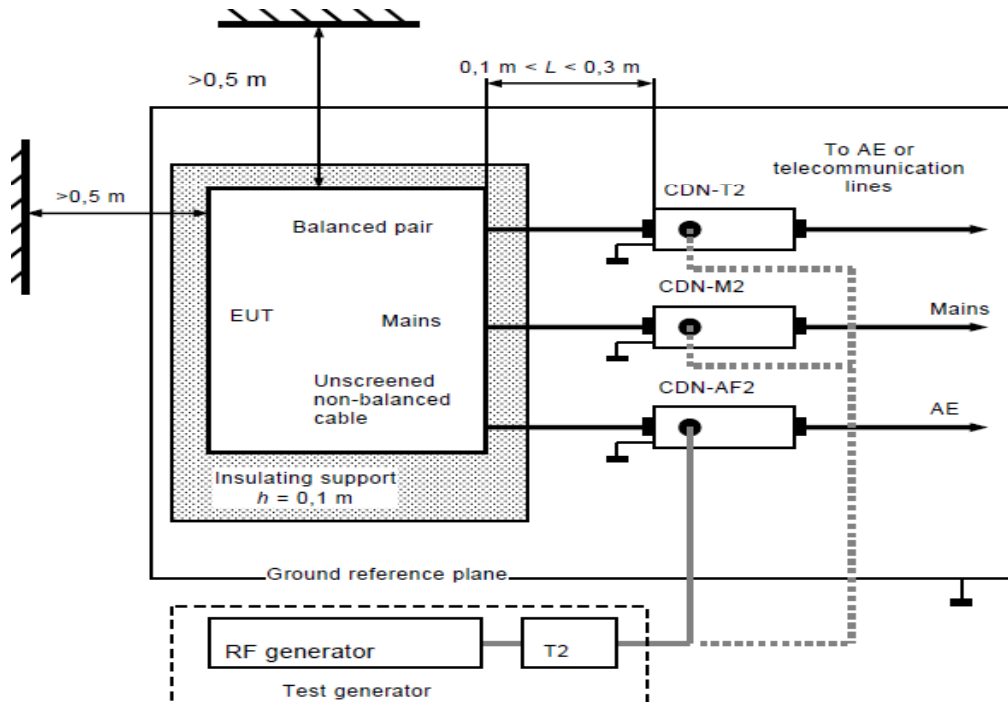
The test shell performed with the test generator connected to each of the coupling and decoupling devices in turn, while the other non-excited RF input ports of the coupling devices are terminated by a 50-ohm load resistor.

The frequency range was swept from 150 kHz to 80 MHz, using the signal level established during the setting process and with a disturbance signal of 80 % amplitude. The signal was modulated with a 1 kHz sine wave, pausing to adjust the RF signal level or the switch coupling devices as necessary. The sweep rate was  $1.5 \times 10^{-3}$  decades/s. Where the frequency range is swept incrementally, the step size was 1 % of preceding frequency value from 150 kHz to 80 MHz.

The dwell time at each frequency was less than the time necessary for the EUT to be exercised, and able to respond. Sensitive frequencies such as clock frequency(ies) and harmonics or frequencies of dominant interest, was analyzed separately.

Attempts was made to fully exercise the EUT during testing, and to fully interrogate all exercise modes selected for susceptibility.

**8.7.4. TEST SETUP**



**Note:** 1. The CDNs and / or EM clamp used for real test depends on ports and cables configuration of EUT.  
2. The EUT clearance from any metallic obstacles shall be at least 0.5m

- For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.



**NOTE:**

TABLE-TOP AND FLOOR-STANDING EQUIPMENT

The equipment to be tested was placed on an insulating support of 0.1 meters height above a ground reference plane. All relevant cables shall be provided with the appropriate coupling and decoupling devices at a distance between 0.1 meters and 0.3 meters from the projected geometry of the EUT on the ground reference plane.

**8.7.5. TEST RESULTS**

<b>Temperature</b>	20°C	<b>Humidity</b>	59% RH
<b>Pressure</b>	1010mbar	<b>Tested By</b>	Kirin Ho
<b>Required Passing Performance</b>		<b>Criterion A</b>	

Frequency Band (MHz)	Field Strength (Vrms)	Cable	Injection Method	Performance Criterion	Observation	Result
0.15 ~ 80	10	AC Power Line (0.3m)	CDN-M3	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	<b>Note</b> <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS

**NOTE:** 1. There was no change compared with initial operation during the test.



## 9 PHOTOGRAPHS OF THE TEST CONFIGURATION CONDUCTED EMISSION TEST







**CONDUCTED EMISSION TEST AT TELECOMMUNICATION PORTS  
RJ45 Telecom Port with ISN (10Mbps & 100Mbps & 1Gbps)**



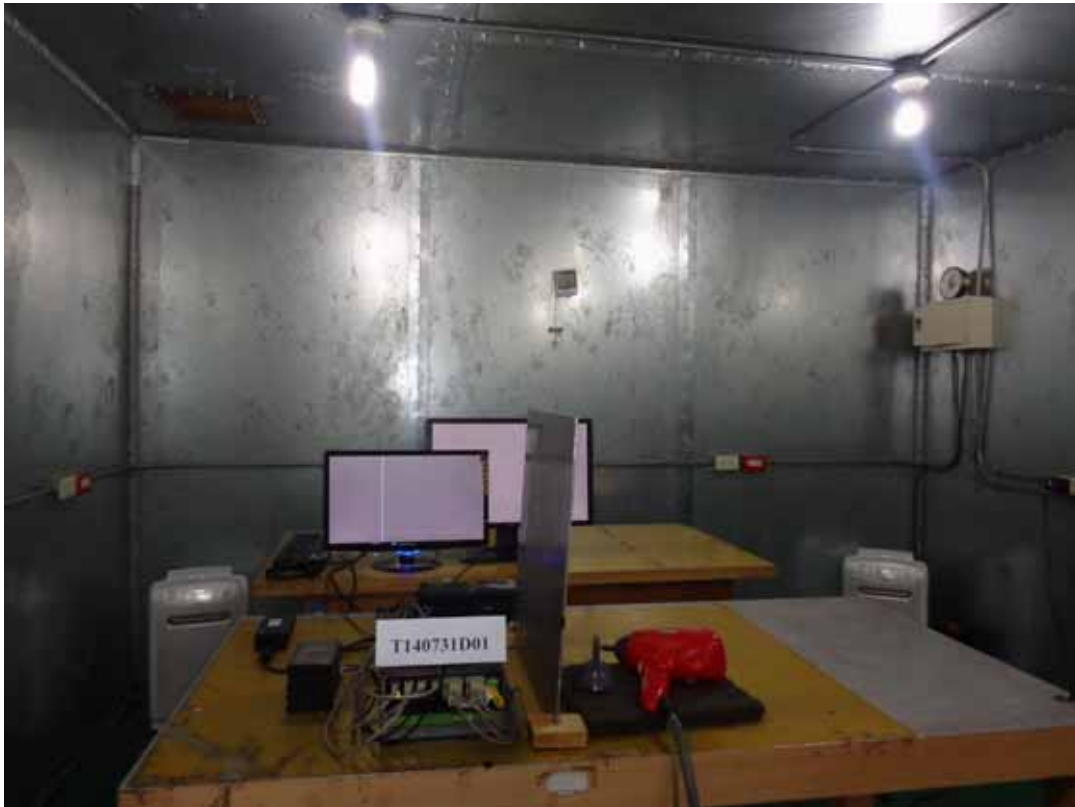


## **RADIATED EMISSION TEST**





**ESD Test**



**RS Test**





**EFT Test**



**EFT For I/O Test**







**Surge Test**



**CS Test**

