



# TEST REPORT

for

**Class A AIS Transponder**

**MODEL: CAMINO-701**

Test Report Number:

T130218W04-E

Issued to:

**Alltek Marine Electronics Corp.**

**7F, No.605, Ruel Guang Rd., Neihu,  
Taipei, Taiwan, 114 R.O.C.**

Issued by:

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**Issued Date: April 30, 2013**



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**Revision History**

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	January 14, 2013	Initial Issue	ALL	Joy Hsiao
01	March 22, 2013	1) Sensor ports interface modifications; 2) For conducted emissions, a 0.8m shielded power cord to the EUT is used for the retest. 3) The 1.8m shielded data cable (to Junction Box) is changed from “with two cores” to “with one core”. 4) For immunity related retests, a second AIS transponder unit is used as auxilliary equipment to observe the communication between the two units during the tests. 5) Item 8.9 Power Supply Failure Test is verified and re-described.	ALL	Joy Hsiao
02	April 09, 2013	1) Add model names and serial numbers for GPS antenna and Junction box. 2) Modify Sections 7.1.3 and 7.2.3 - correct typo from “AC main power” to “DC power”. Modify section 7.1.4 – indicate DC power supply in the diagram. 3) Add Section 8.1.1 General EUT (AIS related) test setup environment. 4) Add Section 8.1.2 Performance check method. 5) Add the missed Satellite simulator in the report to reflect actual test environment. 6) Revise Section 8.2 General performance criteria description in accordance with IEC 60945, clause 10.1.	ALL	Joy Hsiao
03	April 30, 2013	1) Add GPS simulator description in Section 8.1 2) Add Section 10, Method and Screenshots of EUT’s Transmitting/Receiving Performance Check	ALL	Joy Hsiao



**TABLE OF CONTENTS**

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

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

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

**4 TEST METHODOLOGY ..... 7**

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

4.2. EUT SYSTEM OPERATION ..... 7

**5 SETUP OF EQUIPMENT UNDER TEST ..... 8**

5.1. DESCRIPTION OF SUPPORT UNITS ..... 8

5.2. CONFIGURATION OF SYSTEM UNDER TEST ..... 8

**6 FACILITIES AND ACCREDITATIONS ..... 9**

6.1. FACILITIES ..... 9

6.2. ACCREDITATIONS ..... 9

6.3. MEASUREMENT UNCERTAINTY ..... 9

**7 EMISSION TEST ..... 10**

7.1. CONDUCTED EMISSION MEASUREMENT ..... 10

7.2. RADIATED EMISSION MEASUREMENT ..... 17

**8 IMMUNITY TEST ..... 29**

8.1. GENERAL DESCRIPTION ..... 29

8.2. GENERAL PERFORMANCE CRITERIA DESCRIPTION ..... 31

8.3. ELECTROSTATIC DISCHARGE (ESD) ..... 32

8.4. RADIATED, RADIO-FREQUENCY, ELECTROMAGNETIC FIELD (RS) ..... 38

8.5. ELECTRICAL FAST TRANSIENT (EFT) ..... 41

8.6. SURGE IMMUNITY TEST ..... 43

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

8.8. POWER SUPPLY SHORT-TERM VARIATION TEST ..... 48

8.9. POWER SUPPLY FAILURE TEST ..... 50

**9 PHOTOGRAPHS OF THE TEST CONFIGURATION ..... 52**

**10 METHOD AND SCREENSHOTS OF EUT’S TRANSMITTING/RECEIVING  
PERFORMANCE CHECK ..... 59**

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



# 1 TEST CERTIFICATION

**Product:** Class A AIS Transponder

**Model:** CAMINO-701

**Brand:** AMEC

**Applicant:** **Alltek Marine Electronics Corp.**  
7F, No.605, Ruei Guang Rd., Neihu,  
Taipei, Taiwan, 114 R.O.C.

**Manufacturer:** **Alltek Marine Electronics Corp.**  
7F, No.605, Ruei Guang Rd., Neihu,  
Taipei, Taiwan, 114 R.O.C.

**Tested:** January 03, 2013 ~ March 21, 2013

**Applicable Standards:** **EN 60945: 2002 (For Clause 9, 10)**  
**IEC 60945: 2002 (For Clause 9, 10)**  
**IEC 60945 corrigendum 1: 2008**

IEC 61000-4-2: 2008  
IEC 61000-4-3: 2006 + A1: 2007 + A2: 2010  
IEC 61000-4-4: 2004 + A1: 2010  
IEC 61000-4-5: 2005  
IEC 61000-4-6: 2008  
Power supply short-term variation  
Power supply failure

Deviation from Applicable Standard
None

The above equipment has been tested by Compliance Certification Services Inc., and found compliance with the requirements set forth in the technical standards mentioned above. 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:**

**Reviewed by:**

Sam Hu  
Section Manager

Vesta Hsu  
Supervisor of report document dept.



## 2 TEST RESULT SUMMARY

EMISSION			
Standard	Item	Result	Remarks
EN 60945: 2002 (For Clause 9, 10) IEC 60945: 2002 (For Clause 9, 10) IEC 60945 corrigendum 1: 2008			
CISPR 16-1-1, CISPR 16-1-2	Conducted (Power Port)	PASS	Reference to EN 60945 clause 9.2 Table 5
CISPR 16-1-1, CISPR 16-1-4	Radiated	PASS	Reference to EN 60945 clause 9.3 Table 5

IMMUNITY			
Standard	Item	Result	Remarks
IEC 61000-4-2: 2008	ESD	PASS	Reference to EN 60945 clause 10.9
IEC 61000-4-3: 2006 + A1: 2007 + A2: 2010	RS	PASS	Reference to EN 60945 clause 10.4
IEC 61000-4-4: 2004 + A1: 2010	EFT	PASS	Reference to EN 60945 clause 10.5
IEC 61000-4-5: 2005	Surge	N/A	Please see the page 43
IEC 61000-4-6: 2008	CS	PASS	Reference to EN 60945 clause 10.3
POWER SUPPLY SHORT-TERM VARIATION		N/A	Please see the page 48
POWER SUPPLY FAILURE TEST		PASS	Reference to EN 60945 clause 10.8



### 3 EUT DESCRIPTION

<b>Product</b>	Class A AIS Transponder
<b>Brand Name</b>	AMEC
<b>Model</b>	CAMINO-701
<b>Applicant</b>	Alltek Marine Electronics Corp.
<b>Housing material</b>	Plastic w/ metal frame
<b>Identify Number</b>	T130102W05
<b>Received Date</b>	January 02, 2013
<b>EUT Power Rating</b>	12VDC/24VDC from DC Power Supply
<b>Accessory Cable Type</b>	37 Pin Cable: Shielded, 1.8m (Detachable, with a core) USB Cable: Shielded, 1.8m (Detachable)
<b>Hardware</b>	M-PCB-AISAMBV4; M-PCB-AISAPOWRV4
<b>Software</b>	1.0.6

### I/O PORT

I/O PORT TYPES	Q'TY	TESTED WITH
1. 37 Pin Port	1	1
2. USB Port	1	1
3. GPS Antenna Port	1	1
4. VHF Antenna Port	1	1

**Note:** Client consigns only one sample to test (Model Number: CAMINO-701).



## 4 TEST METHODOLOGY

### 4.1. DECISION OF FINAL TEST MODE

The EUT was tested together with the above 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 Modes:

1	12VDC MODE
2	24VDC MODE

#### Radiation Modes:

1	12VDC MODE
2	24VDC MODE

**Conduction:** Mode 2

**Radiation:** Mode 2

### 4.2. EUT SYSTEM OPERATION

1. All peripherals connect EUT to test.

**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.

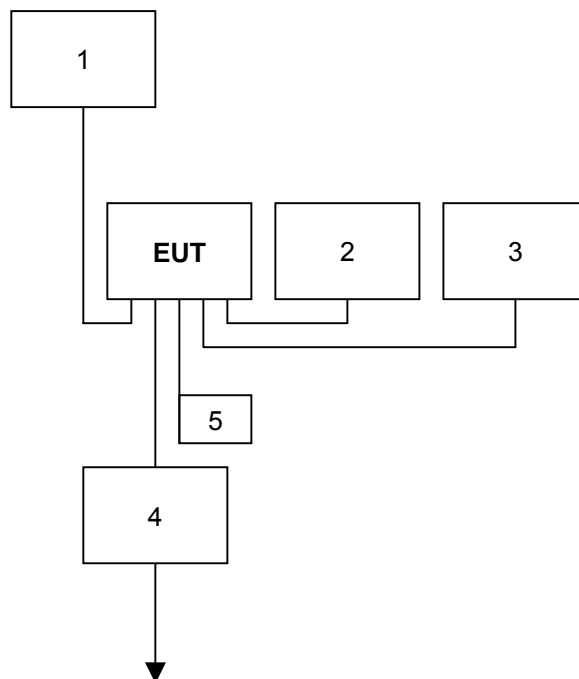
#### Peripherals Devices:

No.	Equipment	Model No.	Serial No.	FCC ID / BSMI ID	Brand Name	Data Cable	Power Cord
1	VHF Antenna	ANT-11 (TENTA-11)(AMEC P/N: AMEC-ANT-MFB-1200V)	N/A	N/A	AMEC	Shielded, 10m	N/A
2	Junction Box	JB-712	JB2A01099	N/A	AMEC	Shielded, 1.8m with a core	N/A
3	GPS Antenna	ANT-21 (AGGRESSOR-21) (AGGRESSOR-111-C) (AMEC P/N: M-ANT-C1283-570001-A)	A2K090052	N/A	AMEC	Shielded, 10m	N/A
4	DC Power Supply	SPD-3606	N/A	N/A	GWINSTEK	N/A	To EUT: Shielded, 0.8m
5	USB Cable	N/A	N/A	N/A	AMEC	Shielded, 1.8m	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	0.10MHz ~ 30MHz	± 1.56
Radiated emissions	30MHz ~ 1000MHz	± 3.81
	1000MHz ~ 2000MHz	± 3.23

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

**TEST STANDARD:** Reference to EN 60945 clause 9.2 Table 5

FREQUENCY (MHz)	Quasi-peak
0.10 – 0.15	96~50
0.15 - 0.35	60~50
0.35 - 30.0	50

- NOTE:** 1. The lower limit shall apply at the transition frequencies.  
2. All emanations from 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	09/10/2013
LISN (EUT)	SCHWARZBECK	NSLK 8127	8127527	12/11/2013
LISN	SCHWARZBECK	NSLK 8127	8127526	12/11/2013
BNC CABLE	EMCI	5Dr	BNC A6	12/11/2013
Pulse Limiter	R&S	ESH3-Z2	C3010026-2	09/07/2013
THERMO-HYGRO METER	WISEWIND	201A	No. 02	05/14/2013
Satellite Simulator	HJC	GPS-101	EN001	No Calibration Required
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**

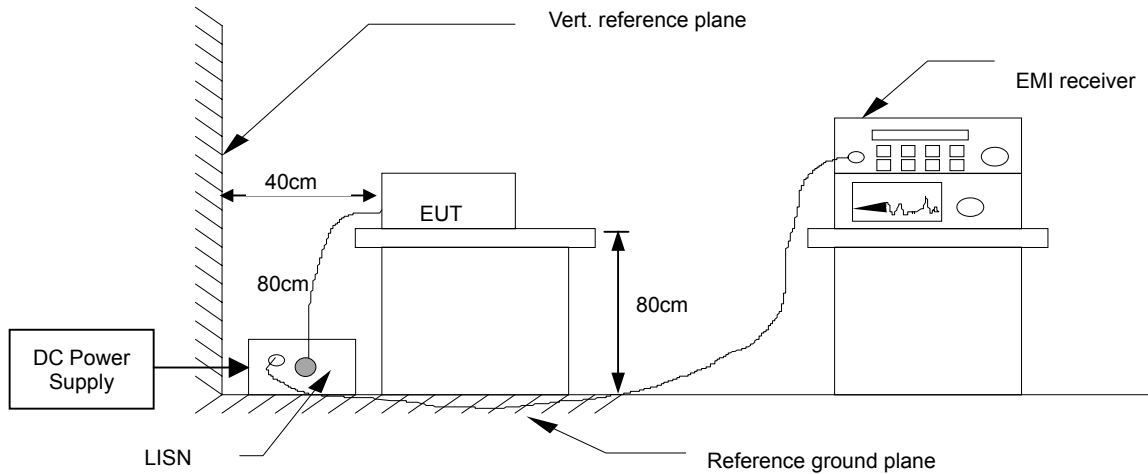
- The EUT was set up as per the test configuration to simulate typical usage per the user's manual. When the EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per CISPR 16-2-1, 7.4.1 (see Test Facility for the dimensions of the ground plane used). When the EUT is a floor-standing equipment, it is placed on the ground plane which has a 15 cm non-conductive covering to insulate the EUT from the ground plane.
- Support equipment, if needed, was placed as per CISPR 16-2-1, 7.4.1.
- All I/O cables were positioned to simulate typical actual usage as per CISPR 16-2-1, 7.4.1.
- The test equipment EUT installed received DC power, through a Line Impedance Stabilization Network (LISN), which supplied power source and was grounded to the ground plane.
- All support equipment received power from a second LISN.
- The EUT test program 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 10kHz 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 4.1 were scanned during the preliminary test.
- After the preliminary scan, we found the test mode described in Item 4.1 producing the highest emission level.
- The EUT configuration and cable configuration of the above highest emission level were recorded for reference of the final test.
- The power input cables between the a.c. and the d.c. power ports of the EUT and the artificial mains network shall be screened and not exceed 0.8 m in length.

**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 (P/Q/A)	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 + Pulse Limit
- Result = Read Level + Factor
- Limit = Limit stated in standard
- Margin = Reading in reference to limit
- P = Peak Reading
- Q = Quasi-peak Reading
- A = Average Reading
- L1 = Hot side
- L2 = Neutral side

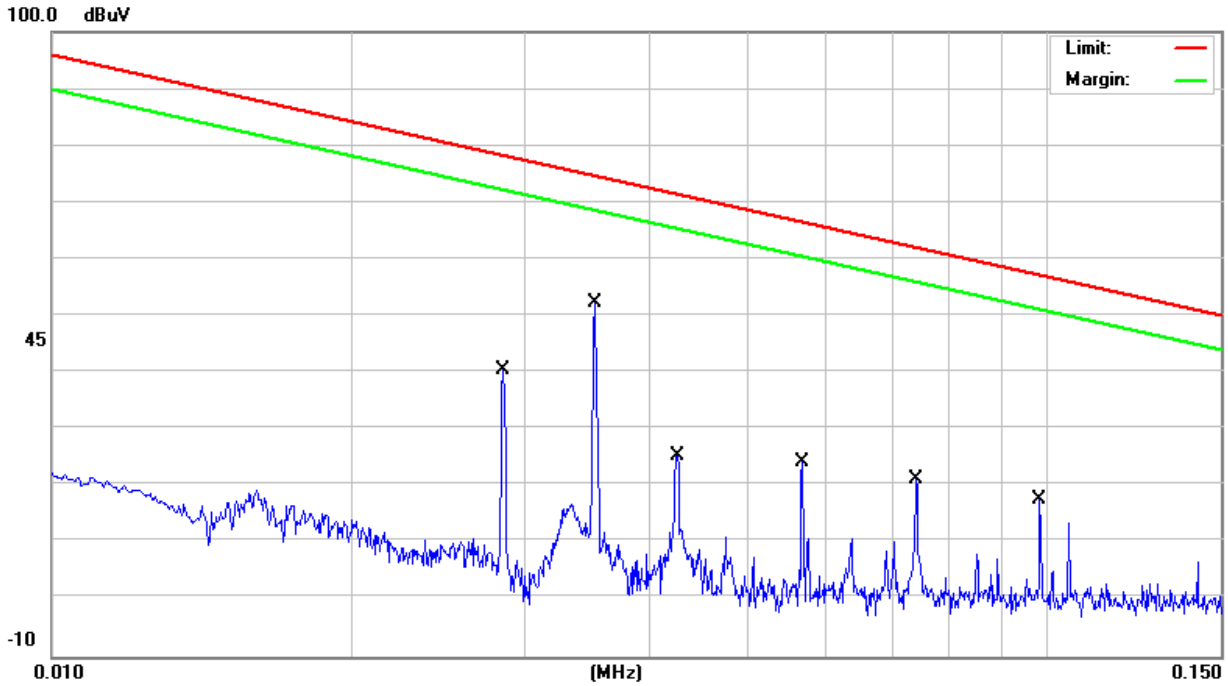
**Calculation Formula**

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



**7.1.6. TEST RESULTS**

<b>Model No.</b>	CAMINO-701	<b>6dB Bandwidth</b>	200 Hz
<b>Environmental Conditions</b>	22°C, 55% RH	<b>Test Mode</b>	Mode 2
<b>Tested by</b>	John Yen	<b>Phase</b>	L1
<b>Standard</b>	EN 60945		

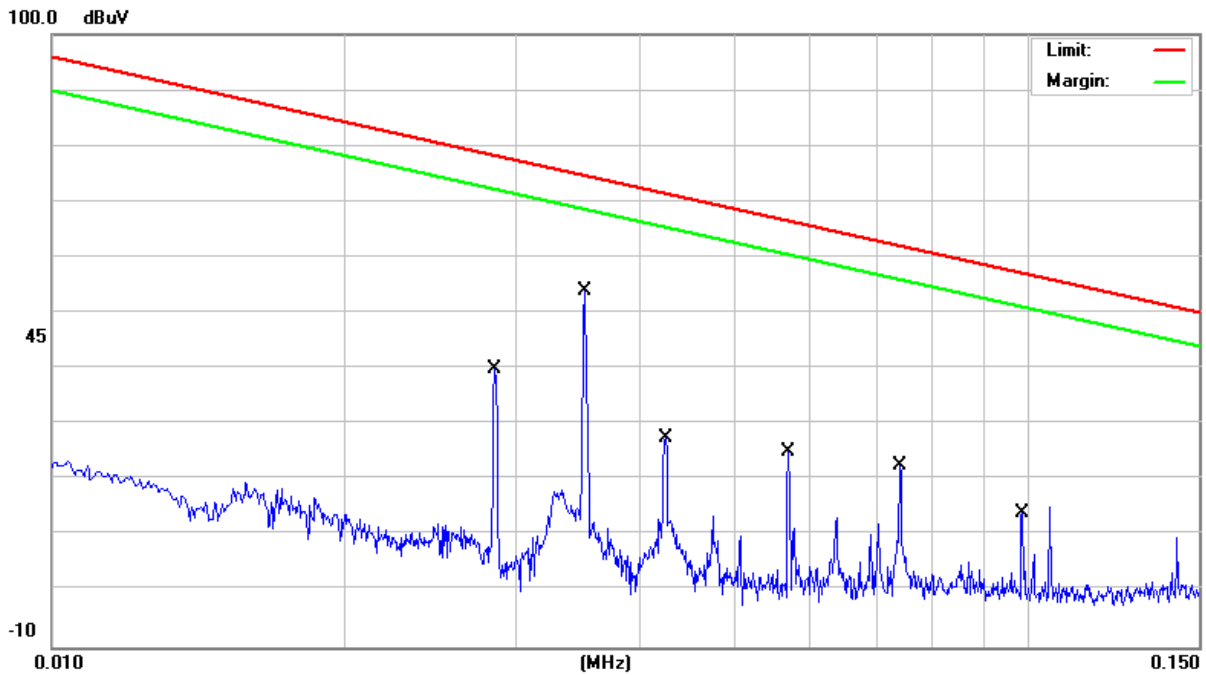


<b>Conducted Emission Readings</b>							
<b>Frequency Range Investigated</b>				<b>10 kHz to 150 kHz</b>			
Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector (P/Q/A)	Line (L1/L2)
0.0285	28.62	10.26	38.88	78.21	-39.33	Q	L1
0.0352	41.59	10.20	51.79	74.62	-22.83	Q	L1
0.0425	10.86	10.18	21.04	71.42	-50.38	Q	L1
0.0570	8.24	10.12	18.36	66.43	-48.07	Q	L1
0.0742	9.56	10.09	19.65	61.95	-42.30	Q	L1
0.0988	3.50	10.08	13.58	57.08	-43.50	Q	L1

**Note:** 1. L1 = Line One (Live Line) / L2 = Line Two (Neutral Line).  
2. The emission level was or more than 2dB below the Average limit, so no re-check anymore.



<b>Model No.</b>	CAMINO-701	<b>6dB Bandwidth</b>	200 Hz
<b>Environmental Conditions</b>	22°C, 55% RH	<b>Test Mode</b>	Mode 2
<b>Tested by</b>	John Yen	<b>Phase</b>	L2
<b>Standard</b>	EN 60945		

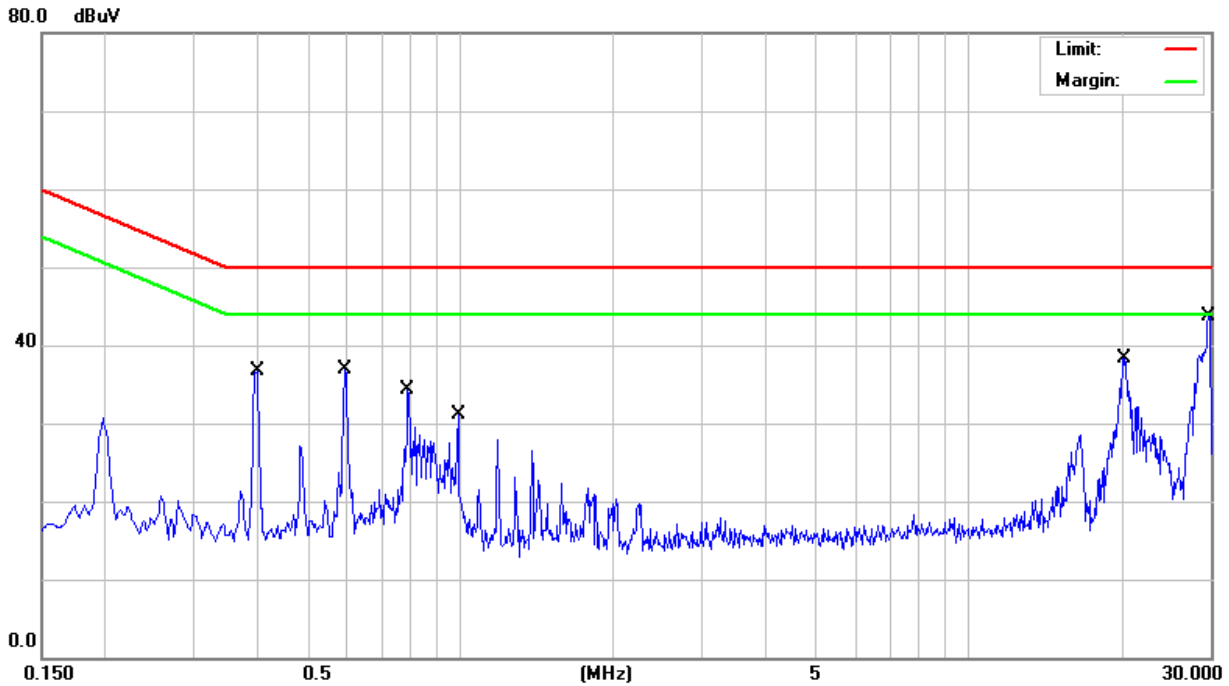


Conducted Emission Readings							
Frequency Range Investigated				10 kHz to 150 kHz			
Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector (P/Q/A)	Line (L1/L2)
0.0285	29.73	10.27	40.00	78.21	-38.21	Q	L2
0.0352	43.24	10.20	53.44	74.62	-21.18	Q	L2
0.0425	12.48	10.17	22.65	71.42	-48.77	Q	L2
0.0570	13.90	10.10	24.00	66.43	-42.43	Q	L2
0.0742	11.21	10.07	21.28	61.95	-40.67	Q	L2
0.0989	-0.77	10.06	9.29	57.07	-47.78	Q	L2

**Note:** 1. L1 = Line One (Live Line) / L2 = Line Two (Neutral Line).  
 2. The emission level was or more than 2dB below the Average limit, so no re-check anymore.



<b>Model No.</b>	CAMINO-701	<b>6dB Bandwidth</b>	9 kHz
<b>Environmental Conditions</b>	22°C, 55% RH	<b>Test Mode</b>	Mode 2
<b>Tested by</b>	John Yen	<b>Phase</b>	L1
<b>Standard</b>	EN 60945		

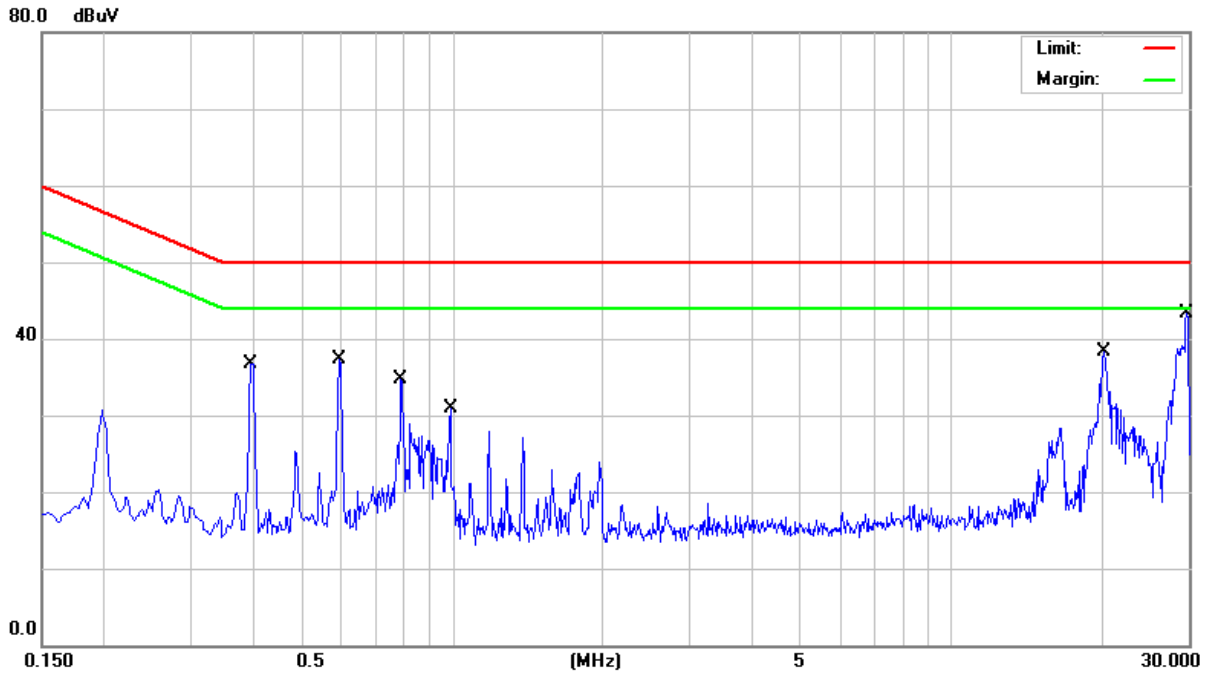


Conducted Emission Readings							
Frequency Range Investigated				150 kHz to 30 MHz			
Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector (P/Q/A)	Line (L1/L2)
0.3980	25.06	10.07	35.13	50.00	-14.87	Q	L1
0.5940	25.59	10.10	35.69	50.00	-14.31	Q	L1
0.7900	22.06	10.11	32.17	50.00	-17.83	Q	L1
0.9900	19.23	10.13	29.36	50.00	-20.64	Q	L1
20.2860	14.16	10.89	25.05	50.00	-24.95	Q	L1
29.7780	26.52	11.20	37.72	50.00	-12.28	Q	L1

**Note:** 1. L1 = Line One (Live Line) / L2 = Line Two (Neutral Line).  
 2. The emission level was or more than 2dB below the Average limit, so no re-check anymore.



<b>Model No.</b>	CAMINO-701	<b>6dB Bandwidth</b>	9 kHz
<b>Environmental Conditions</b>	22°C, 55% RH	<b>Test Mode</b>	Mode 2
<b>Tested by</b>	John Yen	<b>Phase</b>	L2
<b>Standard</b>	EN 60945		



<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 (P/Q/A)	Line (L1/L2)
0.3940	26.05	10.05	36.10	50.00	-13.90	Q	L2
0.5940	25.50	10.08	35.58	50.00	-14.42	Q	L2
0.7900	22.36	10.09	32.45	50.00	-17.55	Q	L2
0.9900	19.08	10.11	29.19	50.00	-20.81	Q	L2
20.2700	26.44	10.89	37.33	50.00	-12.67	Q	L2
29.7580	30.90	11.20	42.10	50.00	-7.90	Q	L2

**Note:** 1. L1 = Line One (Live Line) / L2 = Line Two (Neutral Line).  
2. The emission level was or more than 2dB below the Average limit, so no re-check anymore.





## 7.2. RADIATED EMISSION MEASUREMENT

### 7.2.1. LIMITS

**TEST STANDARD:** Reference to EN 60945 clause 9.3 Table 5

FREQUENCY (MHz)	dBuV/m (At 3m)
0.15 - 0.30	80 ~ 52 (Quasi-peak)
0.30 - 30	52 ~ 34 (Quasi-peak)
30 - 2000	54 (Quasi-peak)
156 - 165	30 (Peak) or 24 (Quasi-peak)

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

### 7.2.2. TEST INSTRUMENTS

Test Site # Chamber D				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
MEASURE RECEIVER	R&S	ESCI	101202	09/06/2013
ANTENNA (30-1000MHz)	SUNOL	JB1	A022310	09/26/2013
PRE-AMPLIFIER	EMCI	EMC330H	980111	09/11/2013
CABLE (20-1000MHz)	EMCI	EMCI-C-14	CH-D#13	01/29/2014
ATTENUATOR	MCL	BW-S6W5	CH-D#14	12/02/2013
SPECTRUM ANALYZER (9kHz-30GHz)	R&S	FSP 30	100112	10/21/2013
ANTENNA (1-18GHz)	ETS	3117	00139062	11/04/2013
AMPLIFIER (1-26.5GHz)	HP	8449B	3008A01266	12/16/2013
CABLE (1-40GHz)	HUBER +SUHNER	SUCOFLEX 102	33106/2	12/16/2013
CABLE (1-40GHz)	HUBER +SUHNER	SUCOFLEX 102	33633/2	12/16/2013
CABLE (1-26.5GHz)	HUBER +SUHNER	SUCOFLEX 104PEA	33960/4PEA	12/16/2013
THERMO-HYGRO METER	WISEWIND	201A	No. 02	05/14/2013
Satellite Simulator	HJC	GPS-101	EN001	No Calibration Required
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)

**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 15 cm non-conductive covering to insulate the EUT from the ground plane.
- Support equipment, if needed, was placed as per CISPR 16-2-3.
- All I/O cables were positioned to simulate typical usage as per CISPR 16-2-3.
- The EUT received DC 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 3 meter away from the EUT as stated in CISPR 16-2-3. 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 150KHz to 2000MHz. 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 4.1 were scanned during the preliminary test:
- After the preliminary scan, we found the test mode described in Item 4.1 producing the highest emission level.
- The EUT and cable configuration, antenna position, polarization and turntable position of the above highest emission level were recorded for the final test.

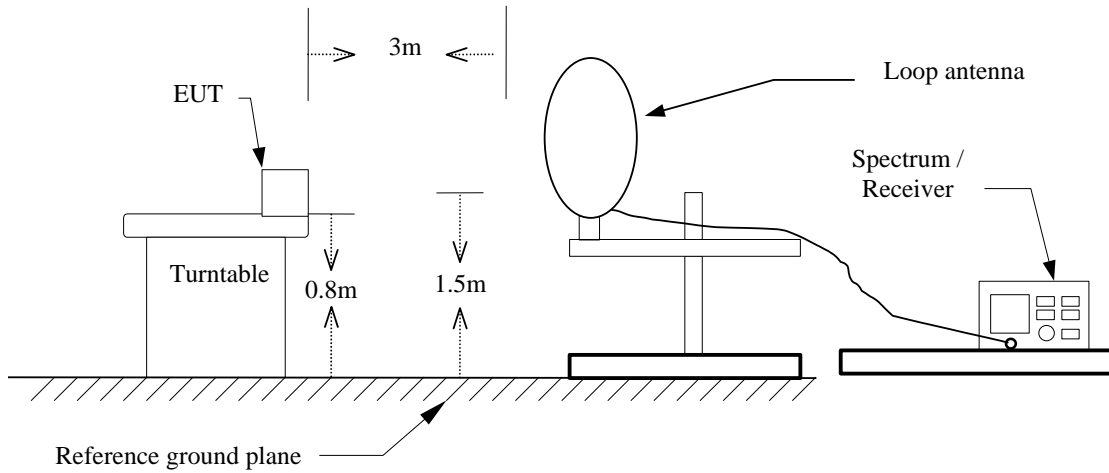
**Procedure of Final Test**

- 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 150KHz to 2000MHz. 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.
- Recorded 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.

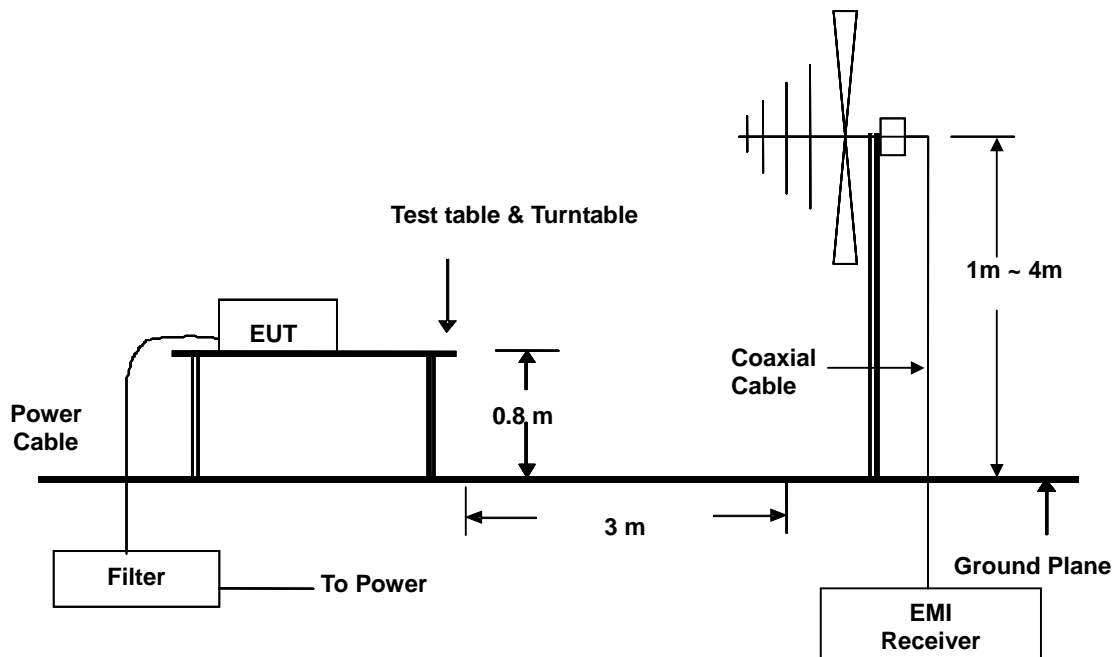


### 7.2.4. TEST SETUP

150kHz ~ 30MHz

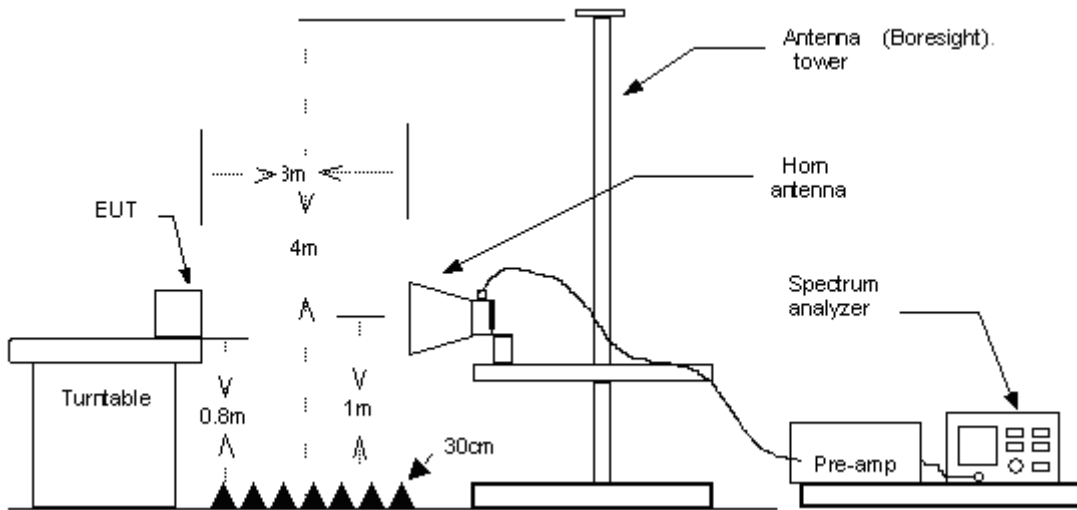


30MHz ~ 1GHz





**1GHz ~ 2GHz**



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

**7.2.5. DATA SAMPLE**

**30MHz ~ 1GHz**

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

**1GHz ~ 2GHz**

Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector (P/A)	Pol. (H/V)
x.xx	42.95	0.55	43.50	60	-16.50	A	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
- P = Peak Reading
- Q = Quasi-peak Reading
- H = Antenna Polarization: Horizontal
- V = Antenna Polarization: Vertical

**Calculation Formula**

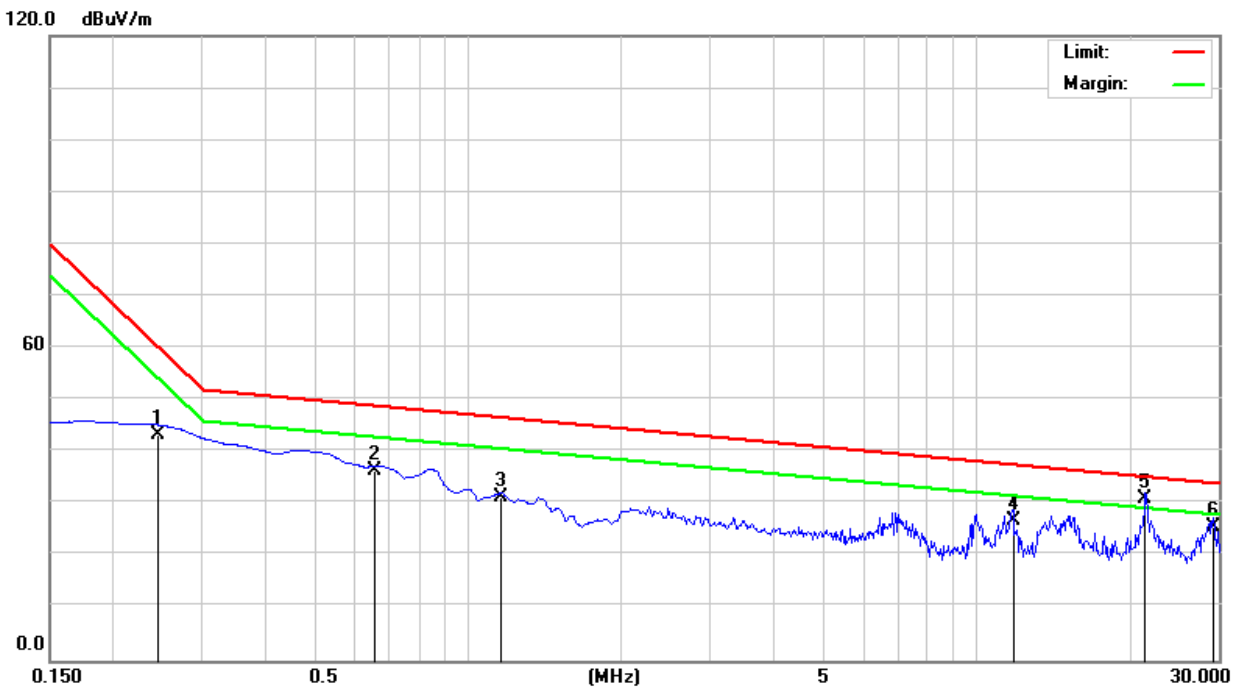
Margin (dB) = Result (dBuV/m) – Limit (dBuV/m)



7.2.6. TEST RESULTS

150kHz ~ 30MHz

Model No.	CAMINO-701	Test Mode	Mode 2
Environmental Conditions	26°C, 60% RH	6dB Bandwidth	9 kHz
Antenna Pole	Vertical	Antenna Distance	3m
Detector Function	Quasi-peak.	Tested by	Kevin Chang
Standard	EN 60945		

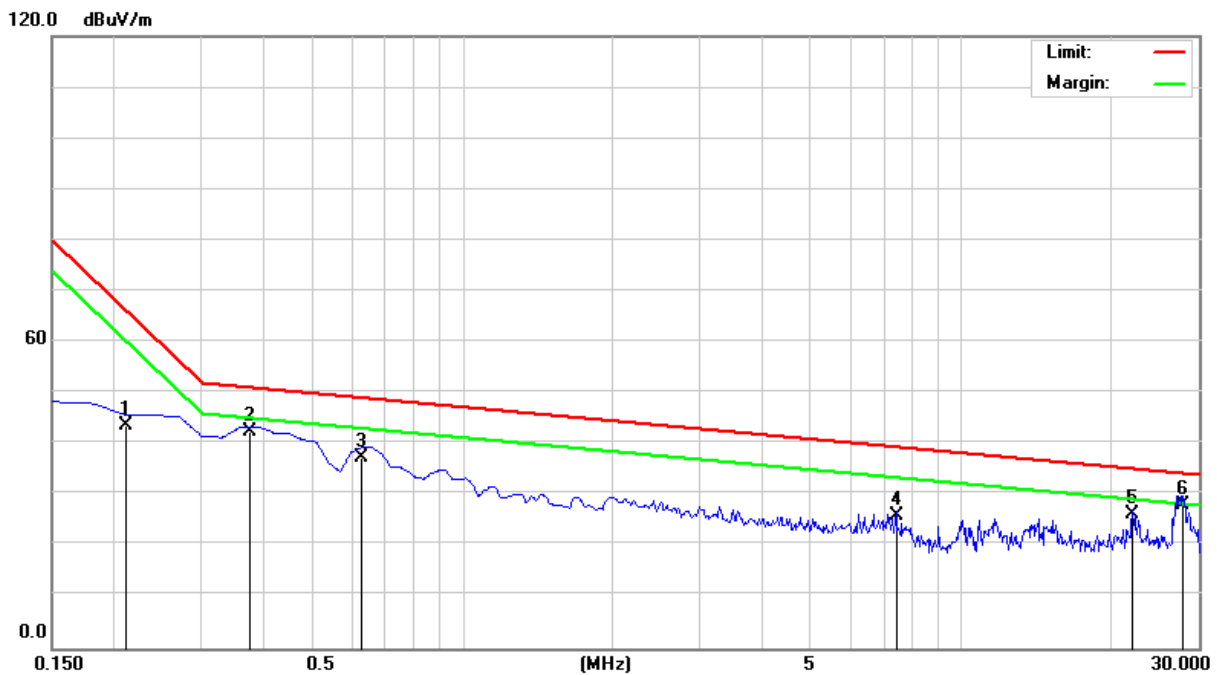


Radiated Emission Readings							
Frequency Range Investigated				150kHz to 30MHz at 3m			
Freq. (MHz)	Reading (dBUV)	Factor (dB/m)	Result (dBUV/m)	Limit (dBUV/m)	Margin (dB)	Detector (P/Q)	Pol. (H/V)
0.2455	32.92	10.38	43.30	60.07	-16.77	Q	V
0.6574	26.07	10.35	36.42	48.93	-12.51	Q	V
1.1649	20.81	10.44	31.25	46.70	-15.45	Q	V
11.8214	16.02	10.95	26.97	37.64	-10.67	Q	V
21.5823	20.70	10.46	31.16	35.29	-4.13	Q	V
29.2836	16.87	8.66	25.53	34.09	-8.56	Q	V

**Note:** 1. The other emission levels were very low against the limit.  
2. P= Peak Reading; Q= Quasi-peak Reading.



<b>Model No.</b>	CAMINO-701	<b>Test Mode</b>	Mode 2
<b>Environmental Conditions</b>	26°C, 60% RH	<b>6dB Bandwidth</b>	9 kHz
<b>Antenna Pole</b>	Horizontal	<b>Antenna Distance</b>	3m
<b>Detector Function</b>	Quasi-peak.	<b>Tested by</b>	Kevin Chang
<b>Standard</b>	EN 60945		



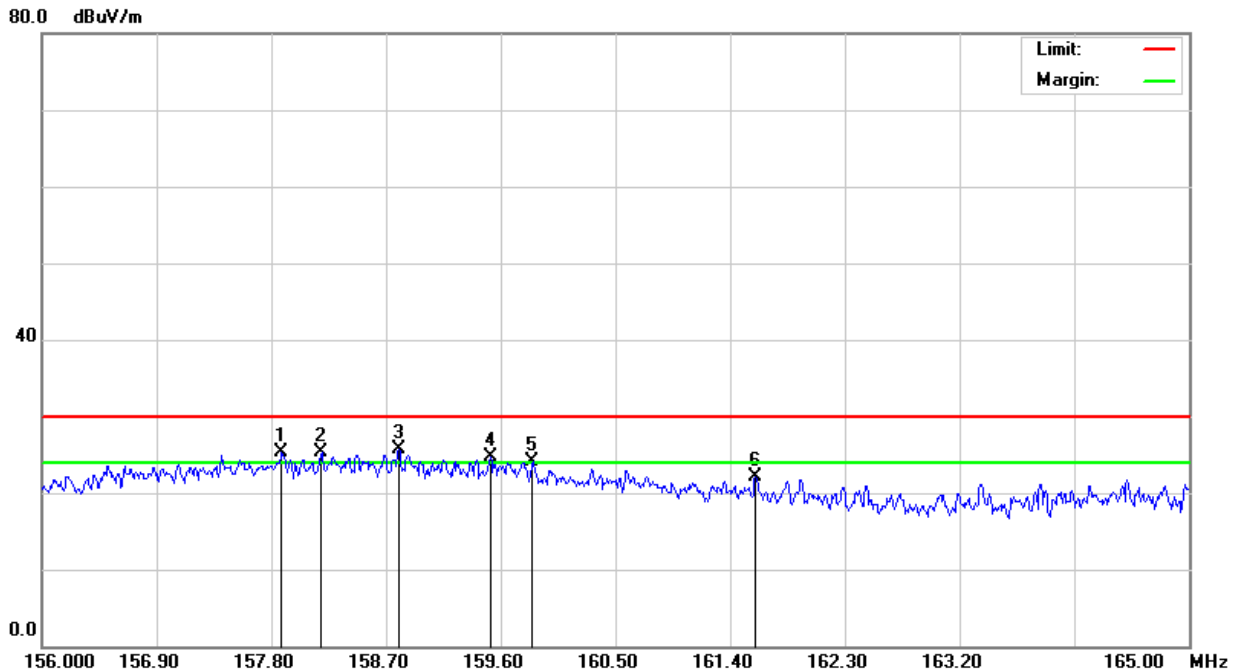
Radiated Emission Readings							
Frequency Range Investigated				150kHz to 30MHz at 3m			
Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector (P/Q)	Pol. (H/V)
0.2117	33.39	10.41	43.80	66.06	-22.26	Q	H
0.3751	32.13	10.33	42.46	51.12	-8.66	Q	H
0.6276	27.02	10.35	37.37	49.11	-11.74	Q	H
7.4334	14.97	10.99	25.96	39.45	-13.49	Q	H
22.0897	15.81	10.38	26.19	35.20	-9.01	Q	H
27.8806	18.88	9.08	27.96	34.29	-6.33	Q	H

**Note:** 1. The other emission levels were very low against the limit.  
2. P= Peak Reading; Q= Quasi-peak Reading.



156MHz ~ 165MHz

Model No.	CAMINO-701	Test Mode	Mode 2
Environmental Conditions	26°C, 60% RH	6dB Bandwidth	9 kHz
Antenna Pole	Vertical	Antenna Distance	3m
Detector Function	Peak	Tested by	Kevin Chang
Standard	EN 60945		

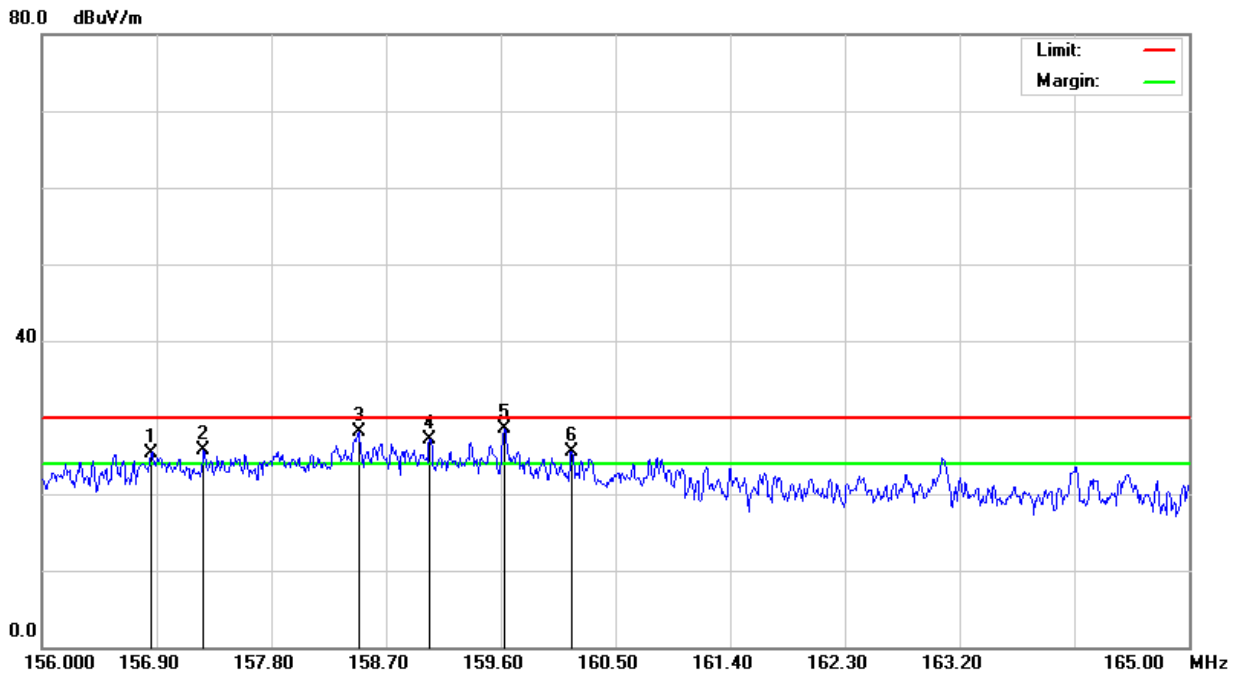


Radiated Emission Readings							
Frequency Range Investigated				156MHz to 165MHz at 3m			
Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector (P)	Pol. (H/V)
157.8810	37.59	-12.33	25.26	30.00	-4.74	P	V
158.1959	37.59	-12.36	25.23	30.00	-4.77	P	V
158.7990	38.07	-12.41	25.66	30.00	-4.34	P	V
159.5190	37.18	-12.48	24.70	30.00	-5.30	P	V
159.8519	36.66	-12.51	24.15	30.00	-5.85	P	V
161.5980	34.56	-12.53	22.03	30.00	-7.97	P	V

Note: 1. The other emission levels were very low against the limit.  
2. P= Peak Reading; Q= Quasi-peak Reading.



<b>Model No.</b>	CAMINO-701	<b>Test Mode</b>	Mode 2
<b>Environmental Conditions</b>	26°C, 60% RH	<b>6dB Bandwidth</b>	9 kHz
<b>Antenna Pole</b>	Horizontal	<b>Antenna Distance</b>	3m
<b>Detector Function</b>	Peak	<b>Tested by</b>	Kevin Chang
<b>Standard</b>	EN 60945		



Radiated Emission Readings							
Frequency Range Investigated				156MHz to 165MHz at 3m			
Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector (P)	Pol. (H/V)
156.8550	37.58	-12.23	25.35	30.00	-4.65	P	H
157.2690	37.89	-12.27	25.62	30.00	-4.38	P	H
158.4840	40.46	-12.38	28.08	30.00	-1.92	P	H
159.0420	39.52	-12.43	27.09	30.00	-2.91	P	H
159.6270	40.93	-12.49	28.44	30.00	-1.56	P	H
160.1580	38.06	-12.52	25.54	30.00	-4.46	P	H

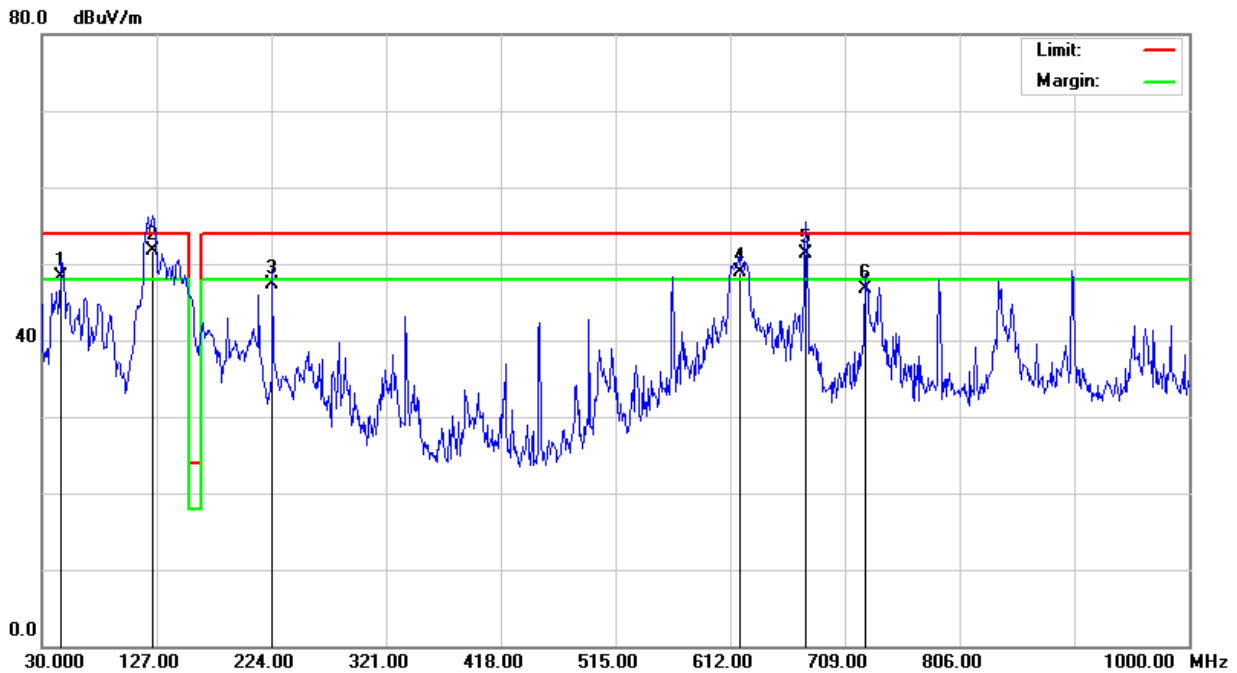
**Note:** 1. The other emission levels were very low against the limit.  
2. P= Peak Reading; Q= Quasi-peak Reading.





30MHz ~ 1GHz

<b>Model No.</b>	CAMINO-701	<b>Test Mode</b>	Mode 2
<b>Environmental Conditions</b>	26°C, 60% RH	<b>6dB Bandwidth</b>	120 kHz
<b>Antenna Pole</b>	Vertical	<b>Antenna Distance</b>	3m
<b>Detector Function</b>	Quasi-peak.	<b>Tested by</b>	Kevin Chang
<b>Standard</b>	EN 60945		

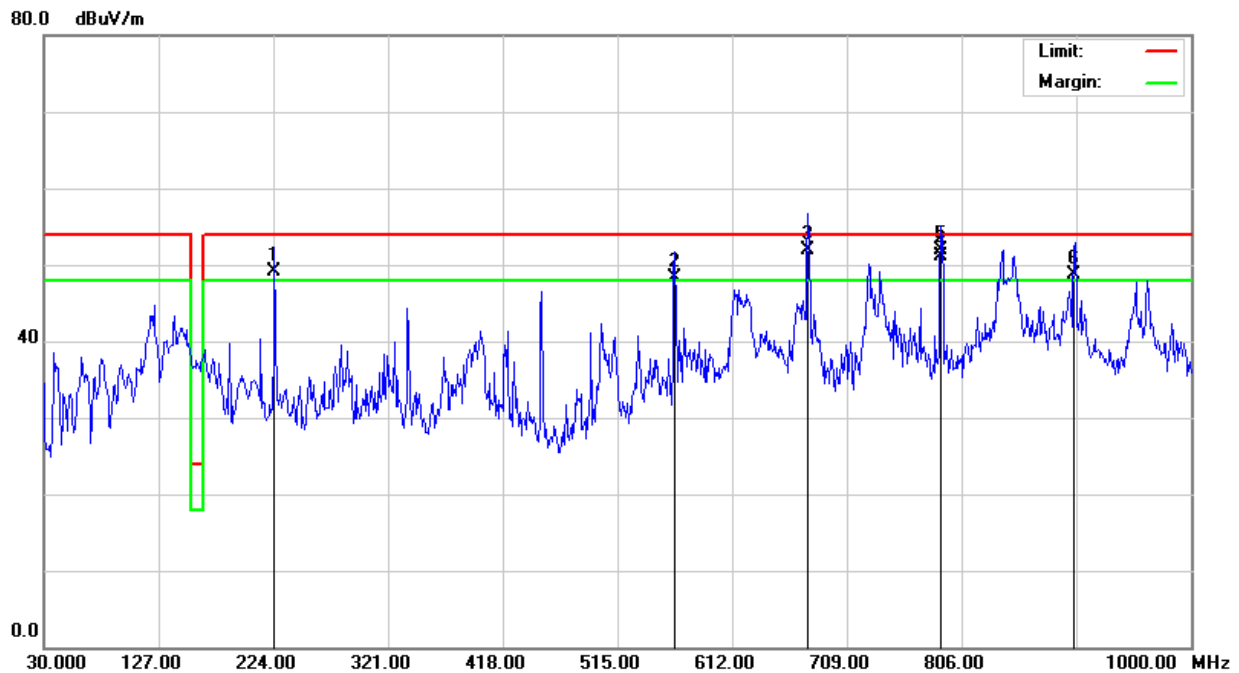


Radiated Emission Readings							
Frequency Range Investigated				30MHz to 1000MHz at 3m			
Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector (P/Q)	Pol. (H/V)
46.4900	63.20	-14.97	48.23	54.00	-5.77	Q	V
124.0900	62.30	-10.64	51.66	54.00	-2.34	Q	V
224.9699	60.47	-13.10	47.37	54.00	-6.63	Q	V
620.7300	52.76	-3.79	48.97	54.00	-5.03	Q	V
676.0198	54.20	-2.82	51.38	54.00	-2.62	Q	V
726.4600	48.66	-1.98	46.68	54.00	-7.32	Q	V

**Note:** 1. The other emission levels were very low against the limit.  
2. P= Peak Reading; Q= Quasi-peak Reading.



<b>Model No.</b>	CAMINO-701	<b>Test Mode</b>	Mode 2
<b>Environmental Conditions</b>	26°C, 60% RH	<b>6dB Bandwidth</b>	120 kHz
<b>Antenna Pole</b>	Horizontal	<b>Antenna Distance</b>	3m
<b>Detector Function</b>	Quasi-peak.	<b>Tested by</b>	Kevin Chang
<b>Standard</b>	EN 60945		



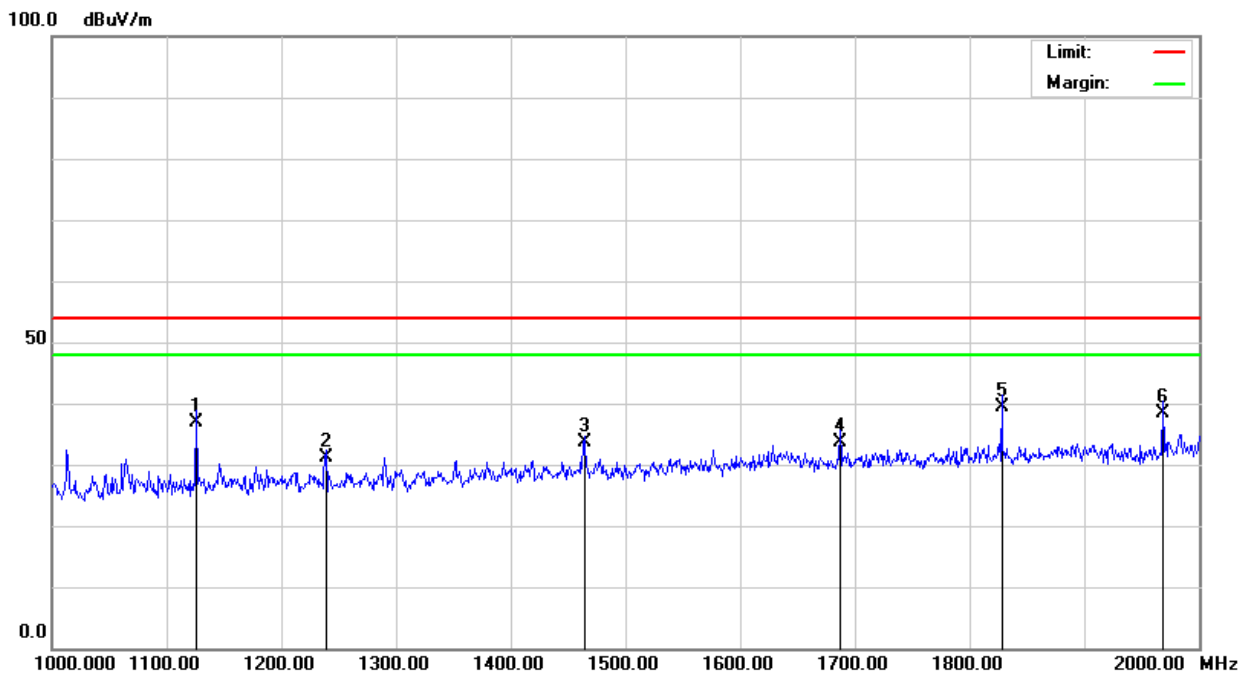
Radiated Emission Readings							
Frequency Range Investigated				30MHz to 1000MHz at 3m			
Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector (P/Q)	Pol. (H/V)
224.9700	62.30	-13.10	49.20	54.00	-4.80	Q	H
563.5000	53.11	-4.74	48.37	54.00	-5.63	Q	H
676.0200	54.80	-2.82	51.98	54.00	-2.02	Q	H
788.5400	51.60	-0.52	51.08	54.00	-2.92	Q	H
788.5400	52.40	-0.52	51.88	54.00	-2.12	Q	H
901.0600	47.90	0.75	48.65	54.00	-5.35	Q	H

**Note:** 1. The other emission levels were very low against the limit.  
 2. P= Peak Reading; Q= Quasi-peak Reading.



1GHz ~ 2GHz

<b>Model No.</b>	CAMINO-701	<b>Test Mode</b>	Mode 2
<b>Environmental Conditions</b>	26°C, 60% RH	<b>6dB Bandwidth</b>	120 kHz
<b>Antenna Pole</b>	Vertical	<b>Antenna Distance</b>	3m
<b>Detector Function</b>	Quasi-peak.	<b>Tested by</b>	Kevin Chang
<b>Standard</b>	EN 60945		

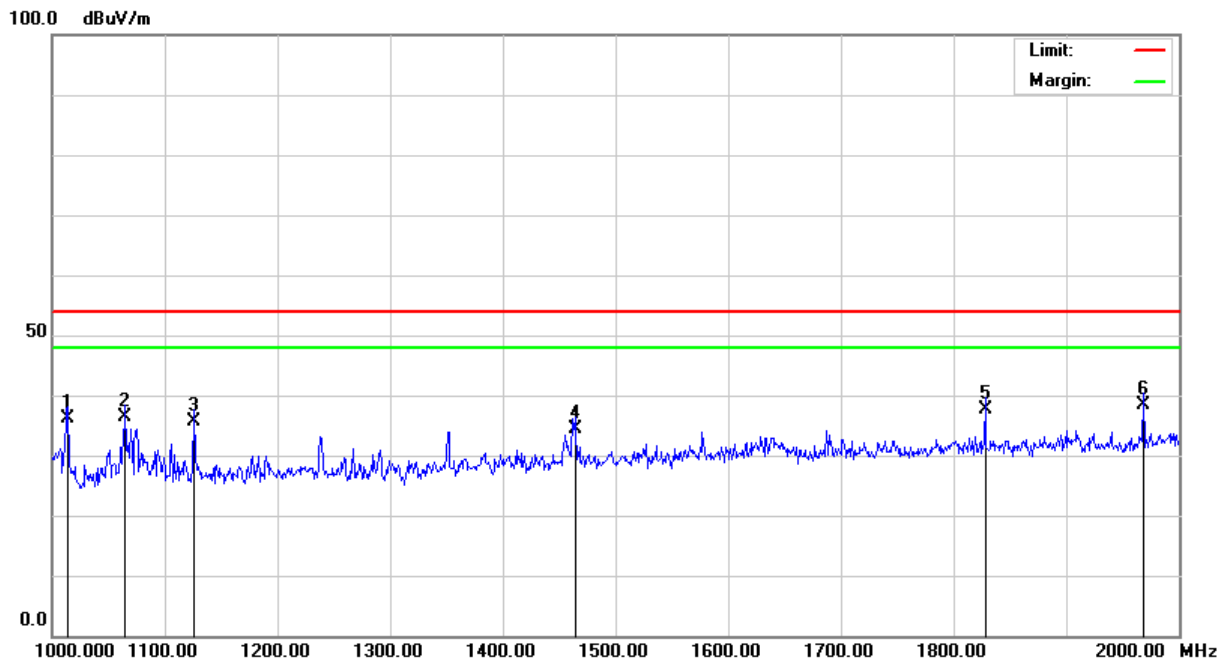


Radiated Emission Readings							
Frequency Range Investigated				1000MHz to 2000MHz at 3m			
Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector (P/Q)	Pol. (H/V)
1126.000	47.09	-10.16	36.93	54.00	-17.07	Q	V
1239.000	40.53	-9.28	31.25	54.00	-22.75	Q	V
1464.000	40.68	-7.06	33.62	54.00	-20.38	Q	V
1687.000	38.58	-5.04	33.54	54.00	-20.46	Q	V
1828.000	43.40	-4.10	39.30	54.00	-14.70	Q	V
1969.000	41.87	-3.52	38.35	54.00	-15.65	Q	V

**Note:** 1. The other emission levels were very low against the limit.  
2. P= Peak Reading; Q= Quasi-peak Reading.



<b>Model No.</b>	CAMINO-701	<b>Test Mode</b>	Mode 2
<b>Environmental Conditions</b>	26°C, 60% RH	<b>6dB Bandwidth</b>	120 kHz
<b>Antenna Pole</b>	Horizontal	<b>Antenna Distance</b>	3m
<b>Detector Function</b>	Quasi-peak.	<b>Tested by</b>	Kevin Chang
<b>Standard</b>	EN 60945		



Radiated Emission Readings							
Frequency Range Investigated				1000MHz to 2000MHz at 3m			
Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector (P/Q)	Pol. (H/V)
1014.000	47.46	-11.38	36.08	54.00	-17.92	Q	H
1065.000	47.46	-10.98	36.48	54.00	-17.52	Q	H
1126.000	45.80	-10.16	35.64	54.00	-18.36	Q	H
1464.000	41.39	-7.06	34.33	54.00	-19.67	Q	H
1828.000	41.82	-4.10	37.72	54.00	-16.28	Q	H
1969.000	42.02	-3.52	38.50	54.00	-15.50	Q	H

**Note:** 1. The other emission levels were very low against the limit.  
2. P= Peak Reading; Q= Quasi-peak Reading.



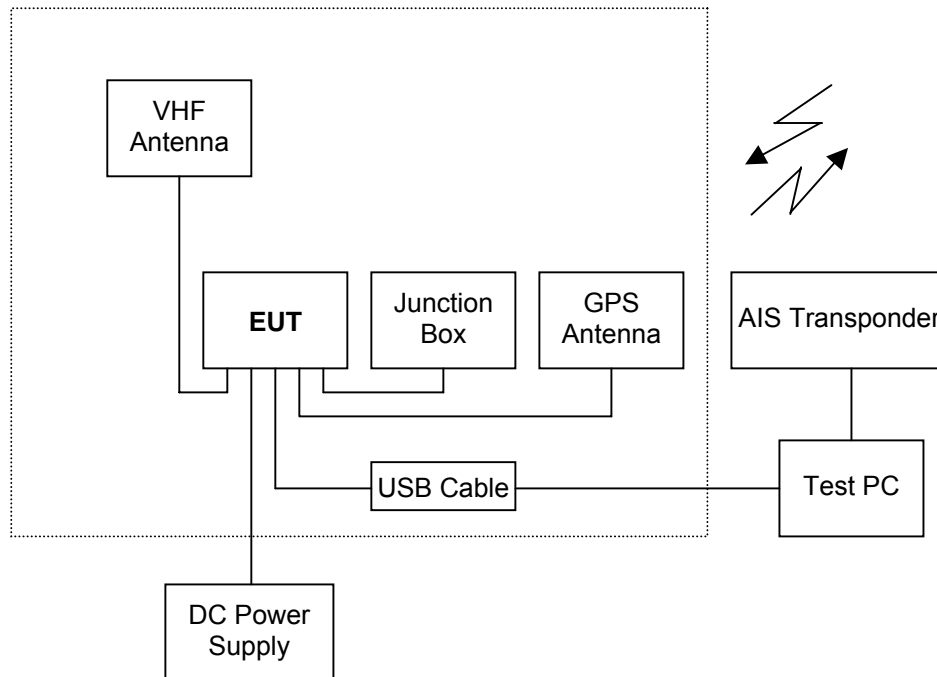
## 8 IMMUNITY TEST

### 8.1. GENERAL DESCRIPTION

Product Standard	EN 60945: 2002 (For Clause 9, 10) IEC 60945: 2002 (For Clause 9, 10) IEC 60945 corrigendum 1: 2008	
	Test Type	Minimum Requirement
Basic Standard, Specification, and Performance Criterion required	IEC 61000-4-2	Electrostatic Discharge - ESD: 8kV air discharge, 6kV Contact discharge, Performance Criterion B
	IEC 61000-4-3	Radio-Frequency Electromagnetic Field Susceptibility Test - RS: 80 ~ 2000 MHz, 10V/m, 80% AM(400Hz), Performance Criterion A
	IEC 61000-4-4	Electrical Fast Transient/Burst - EFT, AC Power line: 2kV, Common On Signal/Control line: 1 kV, Performance Criterion B
	IEC 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: 0.5kV, Line to ground: 1kV Performance Criterion B
	IEC 61000-4-6	Conducted Radio Frequency Disturbances Test - CS, AC Power Port; DC Power Port; Signal Ports and Telecommunication Ports: 0.15 ~ 80 MHz, 3Vrms, 80% AM, 400Hz, Other frequency: 2MHz, 3MHz, 4MHz, 6.2MHz, 8.2MHz, 12.6MHz, 16.5MHz, 18.8MHz, 22MHz and 25MHz, 10Vrms, 80% AM, 400Hz Performance Criterion A
	power supply short-term variation (all equipment categories except portable)	Voltage: nominal $\pm$ (20 $\pm$ 1) %, duration 1,5 s $\pm$ 0,2 s, Frequency: nominal $\pm$ (10 $\pm$ 0,5) %, duration 5 s $\pm$ 0,5 s, superimposed Performance Criterion B
	power supply failure (all equipment categories except portable)	60 s interruption a.c. and d.c. power ports Performance criterion C

### 8.1.1. GENERAL EUT (AIS RELATED) TEST SETUP ENVIRONMENT

In order to do performance-check during the EMC immunity tests, an equipment setup (AIS related) as shown in the following diagram is used in general. A Satellite Simulator is used during the tests to emulate GPS signal source for the EUT.



The Satellite Simulator (GPS simulator model GPS-101) is put outside the EMC chamber with a cable connecting to a Tx antenna placed inside the EMC chamber. This GPS-101's Tx antenna transmits simulated-GPS-source-signal wirelessly to the GPS antenna (AMEC model ANT-21/Aggressor-111-C) connected to the EUT.

### 8.1.2. PERFORMANCE CHECK METHOD

The EUT is set into autonomous mode using channels AIS 1 and AIS 2 with a reporting interval of 2 s in the test environment in Section 8.1.1. An additional AIS transponder is used to monitor the content of reports and the reporting intervals of EUT. The EUT performance shall not be degraded during or after the test. A PC software tool is used in parallel to record the AIS transmitting rate and receiving rate. The data is used to check if there is any degradation of performance or loss of function.

An IEC-61162-Datalogger software is used (running on PC) to check the EUT performance during and after the test together with the additional AIS transponder. The method and screenshots on how to verify the transmitting/receiving performance of the EUT are described in Section 10.



## 8.2. GENERAL PERFORMANCE CRITERIA DESCRIPTION

<b>Criteria A:</b>	The EUT shall continue to operate as intended during and after the test. No degradation of performance or loss of function is allowed, as defined in the relevant equipment standard and in the technical specification published by the manufacturer.
<b>Criteria B:</b>	The EUT shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed, as defined in the relevant equipment standard and in the technical specification published by the manufacturer. During the test, degradation or loss of function or performance which is self-recoverable is however, allowed, but no change of actual operating state or stored data is allowed.
<b>Criteria C:</b>	Temporary degradation or loss of function or performance is allowed during the test, provided the function is self-recoverable, or can be restored at the end of the test by the operation of the controls, as defined in the relevant equipment standard and in the technical specification published by the manufacturer.

**NOTE:** Reference to EN 60945 clause 10.1



### 8.3. ELECTROSTATIC DISCHARGE (ESD)

#### 8.3.1. TEST SPECIFICATION (Reference to EN 60945 clause 10.9)

<b>Basic Standard:</b>	IEC 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 10 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	12/18/2013
Aneroid Barometer	Sato	7610-20	89090	11/04/2013
Thermo-Hygro meter	TECPEL	DTM-303	080269	05/07/2013
Satellite Simulator	HJC	GPS-101	EN001	No Calibration Required

**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:

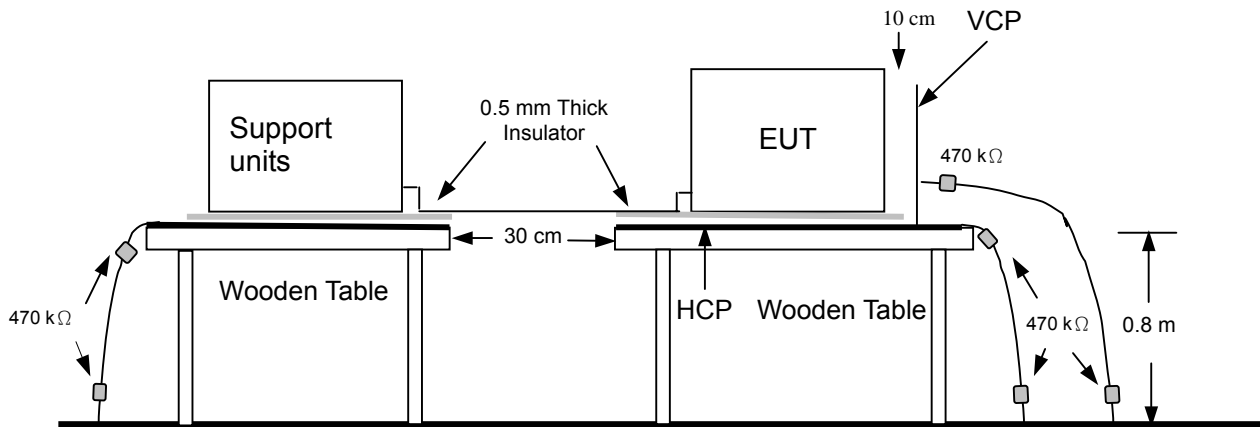
On those parts of the EUT where it is not possible to perform contact discharge testing, the equipment should be investigated to identify user accessible points where breakdown may occur. Such points are tested using the air discharge method. This investigation should be restricted to those area normally 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 IEC 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	17°C	Humidity	58% RH
Pressure	1009mbar	Tested By	Frank Liao
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 type="checkbox"/> 1 <input checked="" 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 type="checkbox"/> 1 <input checked="" 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 type="checkbox"/> 1 <input checked="" 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 type="checkbox"/> 1 <input checked="" type="checkbox"/> 2

Contact Discharge							
Test Points	Test Levels			Results			
	± 2 kV	± 4 kV	± 6 kV	Pass	Fail	Performance Criterion	Observation
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

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 degradation of performance or loss of function found on EUT during and after the test.  
 2. No discharge point.



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

**T130218W04**



**Back**

**T130218W04**



Red Dot —Air Discharged  
Blue Dot —Contact Discharged



Left

**T130218W04**



Right

**T130218W04**



Red Dot —Air Discharged  
Blue Dot —Contact Discharged



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

#### 8.4.1. TEST SPECIFICATION (Reference to EN 60945 clause 10.4)

<b>Basic Standard:</b>	IEC 61000-4-3
<b>Frequency Range:</b>	80 ~ 2000 MHz
<b>Field Strength:</b>	10 V/m
<b>Modulation:</b>	400Hz 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>	1.5 m

#### 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	04/19/2013
Signal Generator	Agilent	E4421B	MY43350597	05/27/2013
Electric Field Probe	AR	FL7006	0330722	08/06/2013
RF Power Meter	Boonton	4242-01-02	14357	02/28/2013
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	11/11/2013
Calibration of Field	N/A	Chamber#RS	1000-3000MHz	04/25/2013
Amplifier	AR	60S1G3	302728	No Calibration Required
Horn Antenna	EMCO	3115	5761	No Calibration Required
Direction Coupler	AR	DC7144A	306217	No Calibration Required
Satellite Simulator	HJC	GPS-101	EN001	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

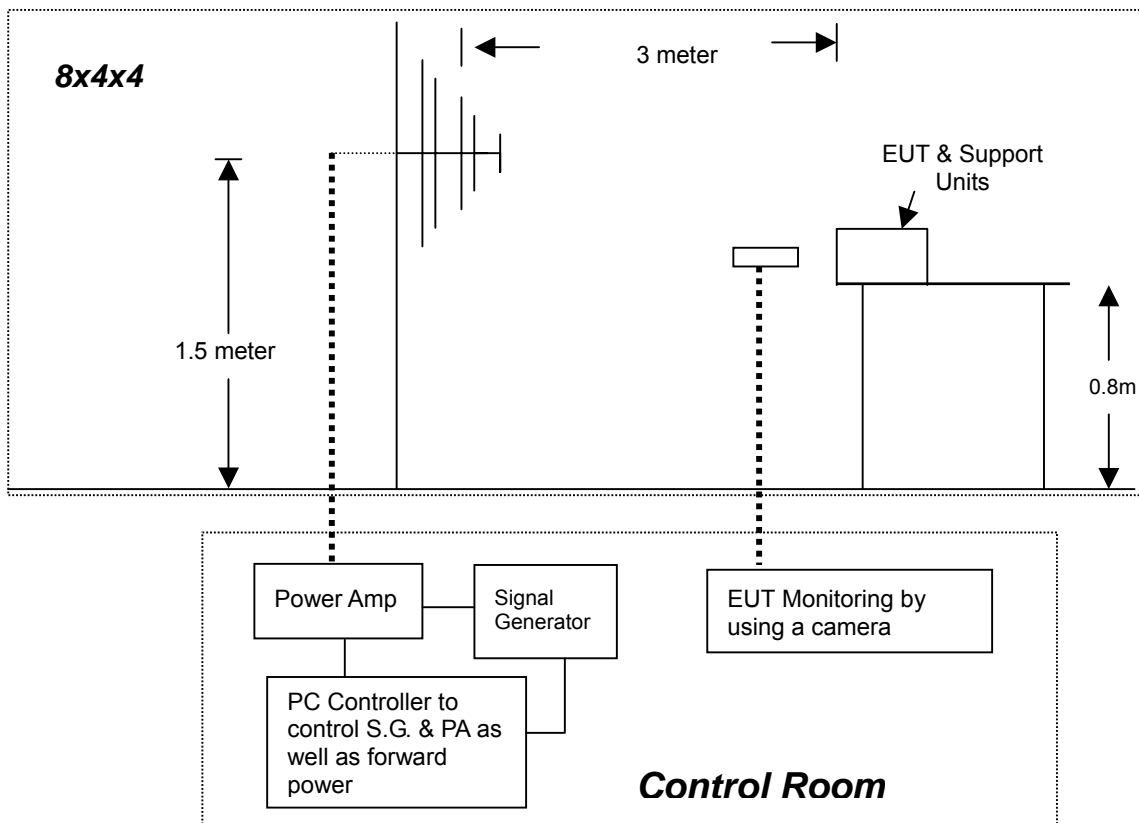


**8.4.3. TEST PROCEDURE** (please refer to measurement standard or CCS SOP PA-023)

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

- a) The testing was performed in a fully anechoic chamber. The transmit antenna was located at a distance of 3 meter from the EUT.
- b) The frequency range is swept from 80 MHz to 2000 MHz with the signal 80% amplitude modulated with a 400Hz 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.
- d) 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>	17°C	<b>Humidity</b>	58% RH
<b>Pressure</b>	1009mbar	<b>Dwell Time</b>	3 sec.
<b>Tested By</b>	Frank Liao	<b>Required Passing Performance</b>	<b>Criterion A</b>

Frequency (MHz)	Polarity	Azimuth	Field Strength (V/m)	Observation	Result
80 ~ 2000	V&H	0	10	Note	PASS
80 ~ 2000	V&H	90	10	Note	PASS
80 ~ 2000	V&H	180	10	Note	PASS
80 ~ 2000	V&H	270	10	Note	PASS

**NOTE:** There was no degradation of performance or loss of function found on EUT during and after the test.





### 8.5. ELECTRICAL FAST TRANSIENT (EFT)

#### 8.5.1. TEST SPECIFICATION (Reference to EN 60945 clause 10.5)

<b>Basic Standard:</b>	IEC 61000-4-4
<b>Test Voltage:</b>	Common On Signal/Control line: 1 kV
<b>Polarity:</b>	Positive & Negative
<b>Impulse Frequency:</b>	5 kHz at 1kV & 2.5kHz at 2kV
<b>Impulse Wave-shape:</b>	5/50 ns
<b>Burst Duration:</b>	15 ms
<b>Burst Period:</b>	300 ms
<b>Test Duration:</b>	3 min to 5 min for each of positive and negative polarity pulses

#### 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	03/05/2013
Capacitive Clamp	EMC-Partner	CN-EFT1000	589	No Calibration Required
Satellite Simulator	HJC	GPS-101	EN001	No Calibration Required
Software	Genecs Ver. 3.27			

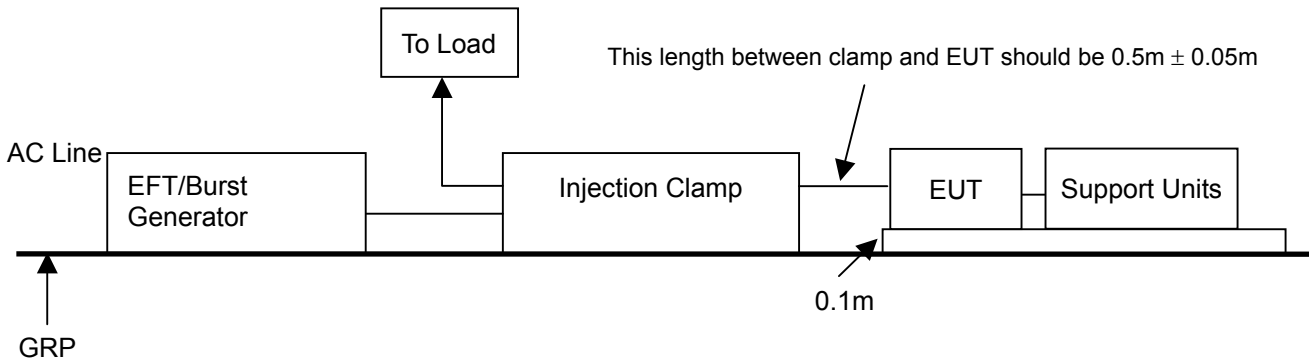
**NOTE:** 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.  
 2. N.C.R.= No Calibration required

#### 8.5.3. 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 0.5 meter.
- c) The duration time of each test sequential was 3 to 5 minute.
- d) The transient/burst waveform was in accordance with IEC 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 (0.1m 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>	17°C	<b>Humidity</b>	58% RH
<b>Pressure</b>	1009mbar	<b>Tested By</b>	Frank Liao
<b>Required Passing Performance</b>		<b>Criterion B</b>	

Test Point	Polarity	Test Level (kV)	Performance Criterion	Observation	Result
37 Pin	+/-	1	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	<b>Note</b> <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
USB	+/-	1	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	<b>Note</b> <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
GPS	+/-	1	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	<b>Note</b> <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
VHF	+/-	1	<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 degradation of performance or loss of function found on EUT during and after the test.



8.6. SURGE IMMUNITY TEST

8.6.1. TEST SPECIFICATION (Reference to EN 60945 clause 10.6)

<b>Basic Standard:</b>	IEC 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: Power Line ~ Line to Line: 0.5 kV; Line to Ground: 1 kV
<b>Surge Input/Output:</b>	Power Line: L-N / L-PE / N-PE
<b>Generator Source Impedance:</b>	2 ohm between networks 12 ohm between network and ground
<b>Polarity:</b>	Positive/Negative
<b>Phase Angle:</b>	AC Power: 0° / 90° / 180° / 270°
<b>Pulse Repetition Rate:</b>	1 time / min. (maximum)
<b>Number of Tests:</b>	5 min for each of positive and negative polarity pulses

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	03/05/2013
CDN	EMC Partner	CDN-UTP8	CDN-UTP8-1505	03/07/2013
DCN	EMC Partner	CN-R40C05	1504	No Calibration Required
CDN	EMC Partner	CDN2000-06-32	0170	No Calibration Required
Satellite Simulator	HJC	GPS-101	EN001	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.

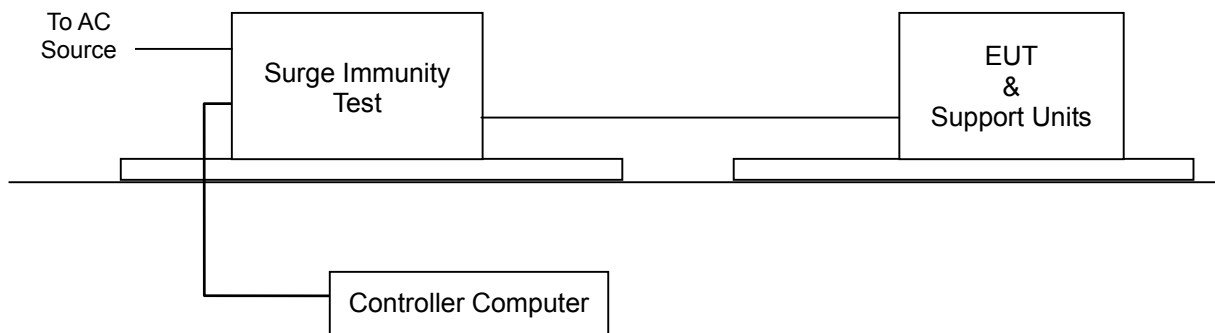
b) For test applied to unshielded un-symmetrically operated interconnection lines of EUT:

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**

Temperature	N/A	Humidity	N/A
Pressure	N/A	Tested By	N/A
Required Passing Performance		Criterion B	

Test Point	Polarity	Test Level (kV)	Performance Criterion	Observation	Result
L - N	+/-	0.5	<input type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	N/A
L - PE	+/-	1	<input type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	N/A
N - PE	+/-	1	<input type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	N/A

**Note:** 1. The subject equipment is not intended to be connected to AC mains supply. Therefore, this test is not applicable.



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

#### 8.7.1. TEST SPECIFICATION (Reference to EN 60945 clause 10.3)

<b>Basic Standard:</b>	IEC 61000-4-6
<b>Frequency Range:</b>	(1) 0.15MHz~80MHz (2) 2MHz, 3MHz, 4MHz, 6.2MHz, 8.2MHz, 12.6MHz, 16.5MHz, 18.8MHz, 22MHz, 25MHz
<b>Field Strength:</b>	(1) 3Vrms; (2) 10Vrms
<b>Modulation:</b>	400Hz Sine Wave, 80%, AM Modulation
<b>Frequency Step:</b>	1 % of preceding frequency value
<b>Coupled cable:</b>	DC Power Mains, Unshielded; All I/O Line, Unshielded
<b>Coupling device:</b>	CDN-M2 (2 wires); EM-Clamp

#### 8.7.2. TEST INSTRUMENT

CS Room				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
CWS Generator	EM Test	CWS 500N1	V0395105080	10/01/2013
CDN	Schaffner	CDN M216	19294	07/30/2013
EM Clamp	Schaffner	KEMZ 801	19227	03/12/2013
Attenuator	EMCI	SA3NL	10006F	No Calibration Required
Satellite Simulator	HJC	GPS-101	EN001	No Calibration Required
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 shall be 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.

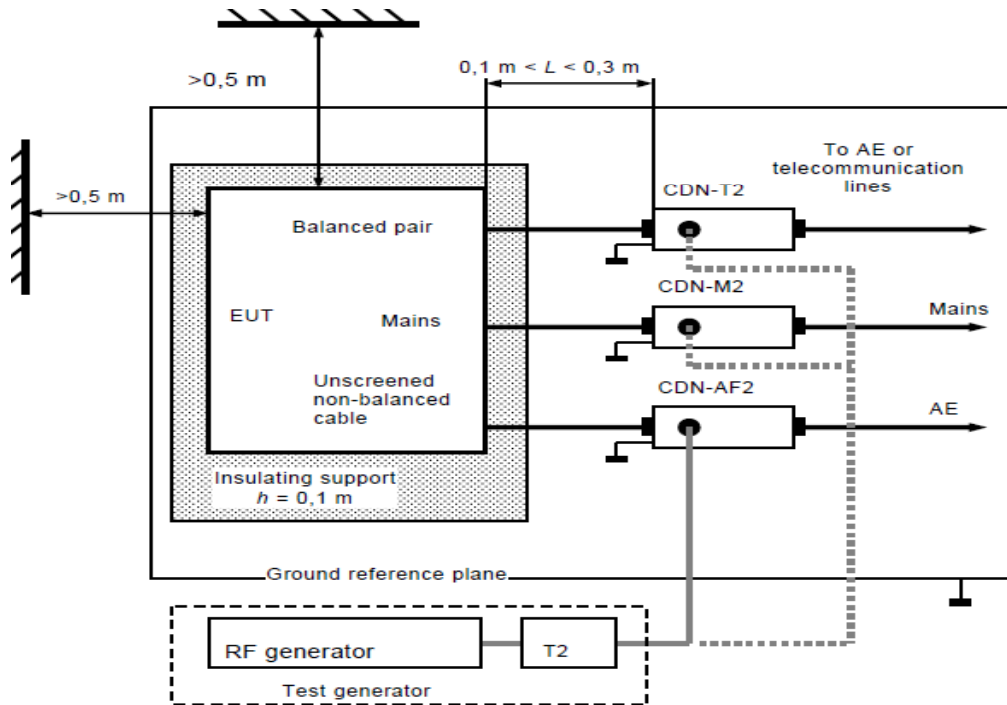
The frequency range was swept from 150 kHz to 80 MHz, using the signal level established during the setting process and with a disturbance signal of 80 % amplitude. The signal was modulated with a 400Hz sine wave, pausing to adjust the RF signal level or the switch coupling devices as necessary. The sweep rate was 1.5 x 10<sup>-3</sup> decades/s. Where the frequency range is swept incrementally, the step size was 1 % of preceding frequency value from 150 kHz to 80 MHz.

Additionally the following fixed frequencies 2 ,3 ,4 ,6.2 ,8.2 ,12.6 ,16.5 ,18.8 ,22 and 25 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 were 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 is 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>	17°C	<b>Humidity</b>	58% RH
<b>Pressure</b>	1009mbar	<b>Tested By</b>	Frank Liao
<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	3	DC Power Line (0.3m)	CDN-M2	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
2	10	DC Power Line (0.3m)	CDN-M2	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
3	10	DC Power Line (0.3m)	CDN-M2	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
4	10	DC Power Line (0.3m)	CDN-M2	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
6.2	10	DC Power Line (0.3m)	CDN-M2	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
8.2	10	DC Power Line (0.3m)	CDN-M2	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
12.6	10	DC Power Line (0.3m)	CDN-M2	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
16.5	10	DC Power Line (0.3m)	CDN-M2	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
18.8	10	DC Power Line (0.3m)	CDN-M2	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
22	10	DC Power Line (0.3m)	CDN-M2	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
25	10	DC Power Line (0.3m)	CDN-M2	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
0.15 ~ 80	3	All I/O Line (0.3m)	EM-Clamp	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
2	10	All I/O Line (0.3m)	EM-Clamp	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
3	10	All I/O Line (0.3m)	EM-Clamp	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
4	10	All I/O Line (0.3m)	EM-Clamp	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
6.2	10	All I/O Line (0.3m)	EM-Clamp	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
8.2	10	All I/O Line (0.3m)	EM-Clamp	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
12.6	10	All I/O Line (0.3m)	EM-Clamp	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
16.5	10	All I/O Line (0.3m)	EM-Clamp	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
18.8	10	All I/O Line (0.3m)	EM-Clamp	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
22	10	All I/O Line (0.3m)	EM-Clamp	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2	PASS
25	10	All I/O Line (0.3m)	EM-Clamp	<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 degradation of performance or loss of function found on EUT during and after the test.



## 8.8. POWER SUPPLY SHORT-TERM VARIATION TEST

### 8.8.1. TEST SPECIFICATION (Reference to EN 60945 clause 10.7)

<b>Basic Standard:</b>	IMMUNITY TO POWER SUPPLY SHORT-TERM VARIATION
<b>Test duration time:</b>	Minimum three test events in sequence
<b>Interval between event:</b>	1/10 min
<b>Voltage and frequency variation rise and decay:</b>	Voltage: nominal $\pm (20 \pm 1) \%$ , duration 1,5 s $\pm 0,2$ s, Frequency: nominal $\pm (10 \pm 0,5) \%$ , duration 5 s $\pm 0,5$ s, superimposed

### 8.8.2. TEST INSTRUMENT

Immunity shielded room				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EMC Immunity Tester	EMC Partner	TRANSIENT 2000	1117	03/05/2013
AC/DC Clamp Meter	Lutron	CM-9930R	I.200121	06/03/2013
Satellite Simulator	HJC	GPS-101	EN001	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

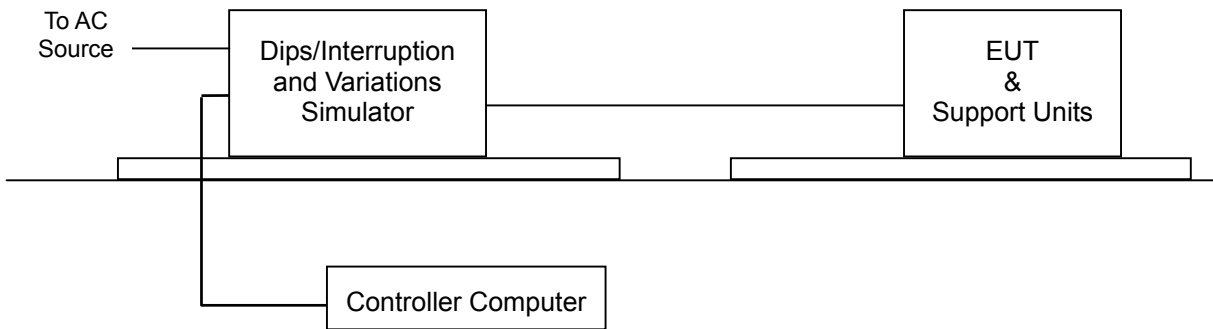
### 8.8.3. TEST PROCEDURE (please refer to measurement standard or CCS SOP PA-028)

1. The EUT and support units were located on a wooden table, 0.8 m away from ground floor.
2. Setting the parameter of tests and then perform the test software of test simulator.
3. Recording the test result in test record form.





**8.8.4. TEST SETUP**



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

**8.8.5. TEST RESULTS**

Temperature	N/A	Humidity	N/A
Pressure	N/A	Tested By	N/A
Required Passing Performance		Criterion B	

Test Power: 230Vac, 50Hz				
POWER	Duration (Sec)	Performance Criterion	Observation	Test Result
276/55	1.5/5	<input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3	N/A
184/45	1.5/5	<input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3	N/A

**NOTE:** 1. The subject equipment is not intended to be connected to AC mains supply. Therefore, this test is not applicable.



**8.9. POWER SUPPLY FAILURE TEST**

**8.9.1. TEST SPECIFICATION (Reference to EN 60945 clause 10.8)**

<b>Basic Standard:</b>	IMMUNITY TO POWER SUPPLY FAILURE
<b>Test duration time:</b>	60 Sec
<b>Requirement:</b>	3 TIMES

**8.9.2. TEST INSTRUMENT**

Immunity shielded room				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EMC Immunity Tester	EMC Partner	TRANSIENT 2000	1117	03/05/2013
AC/DC Clamp Meter	Lutron	CM-9930R	I.200121	06/03/2013
Satellite Simulator	HJC	GPS-101	EN001	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.

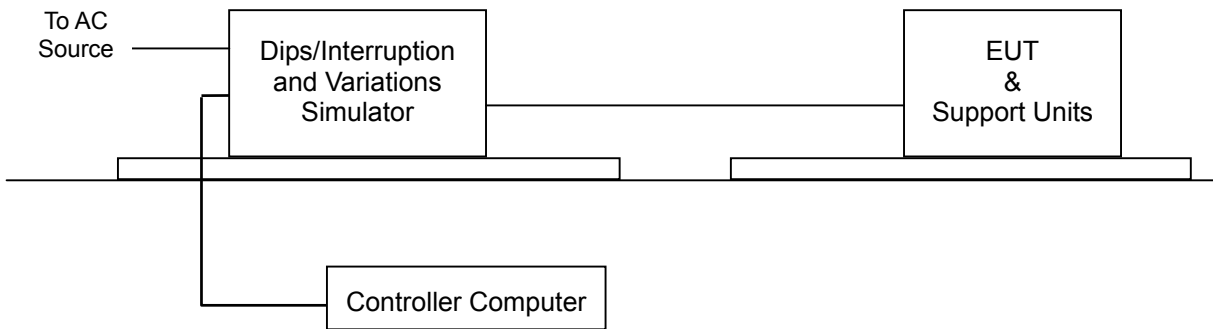
2. N.C.R.= No Calibration required

**8.9.3. TEST PROCEDURE** (please refer to measurement standard or CCS SOP PA-028)

1. The EUT and support units were located on a wooden table, 0.1 m away from ground floor.
2. Setting the parameter of tests and then perform the test software of test simulator.
3. Conditions changes to occur at 0 degree crossover point of the voltage waveform.
4. Recording the test result in test record form.



**8.9.4. TEST SETUP**



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

**8.9.5. TEST RESULTS**

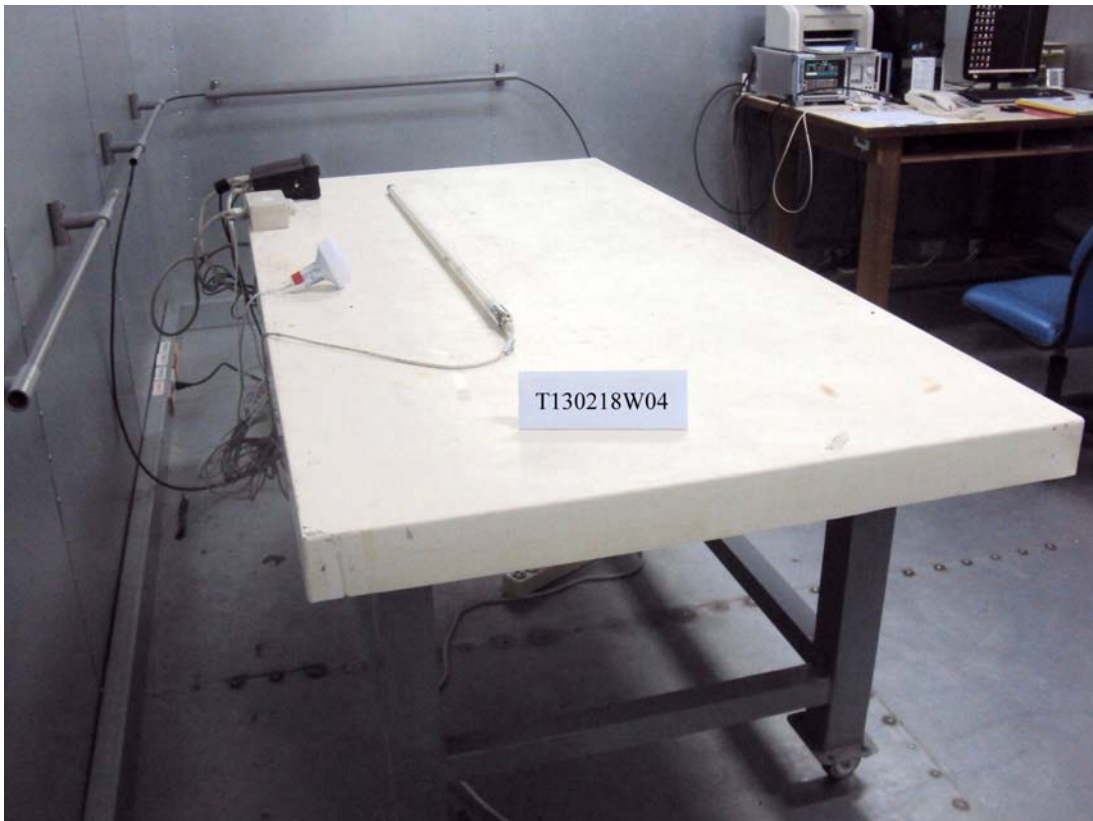
<b>Temperature</b>	18°C	<b>Humidity</b>	59% RH
<b>Pressure</b>	1010mbar	<b>Tested By</b>	David Cheng
<b>Required Passing Performance</b>		<b>Criterion C</b>	

<b>Test Power: 230Vac, 50Hz</b>				
<b>Voltage (% Reduction)</b>	<b>Duration (Sec)</b>	<b>Performance Criterion</b>	<b>Observation</b>	<b>Test Result</b>
100	60	<input type="checkbox"/> A <input type="checkbox"/> B <input checked="" type="checkbox"/> C	<b>Note</b> <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3	PASS

**NOTE:** 1. During power supply failure tests, EUT operates automatically and normally each time after power is restored.



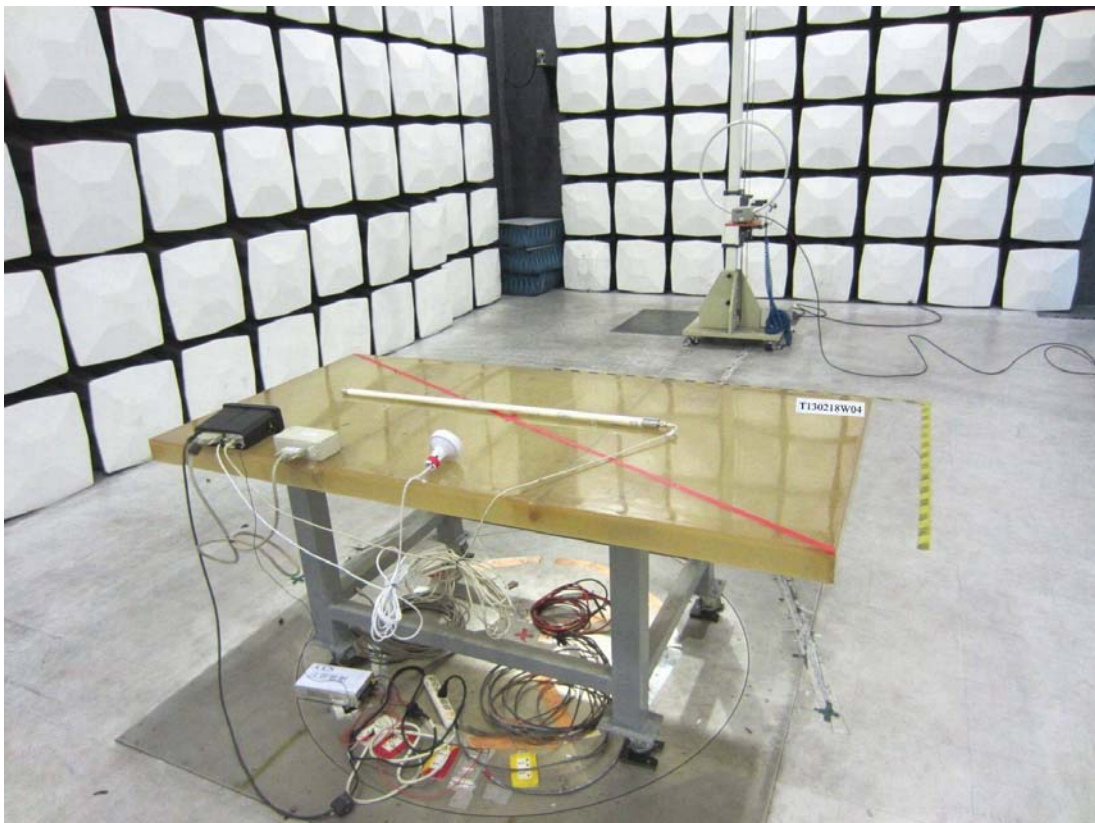
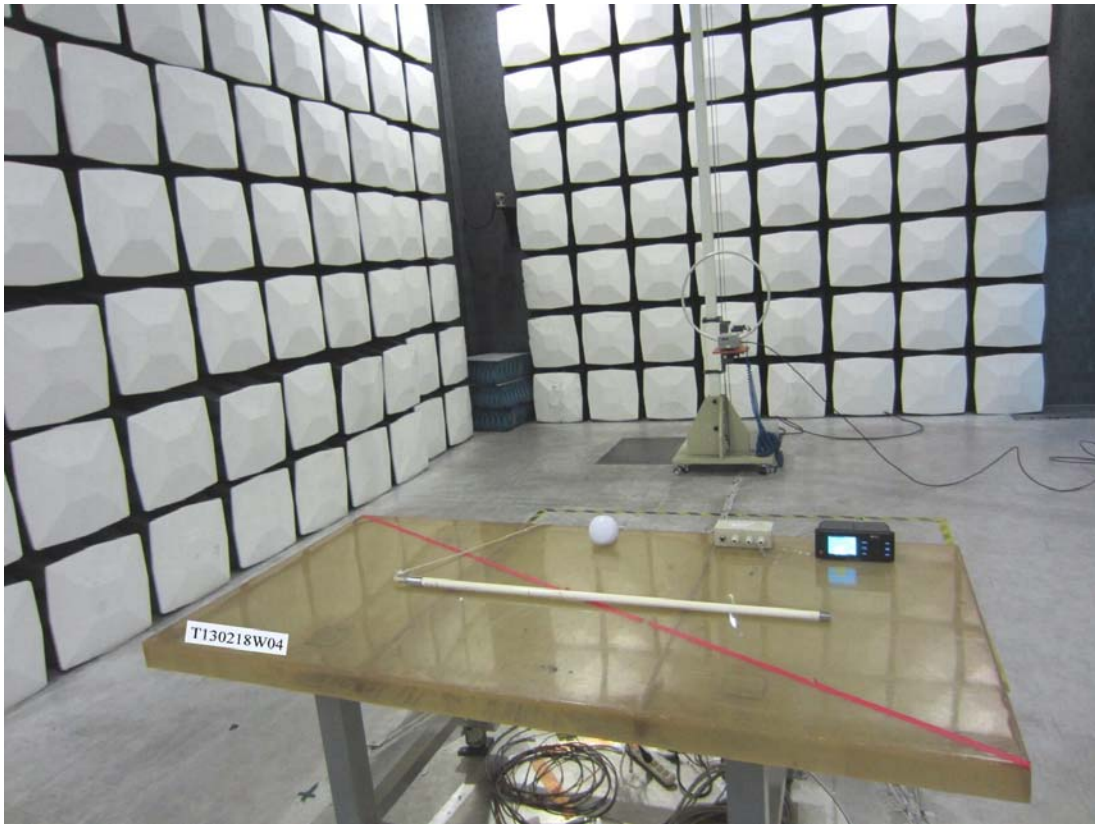
## 9 PHOTOGRAPHS OF THE TEST CONFIGURATION CONDUCTED EMISSION TEST





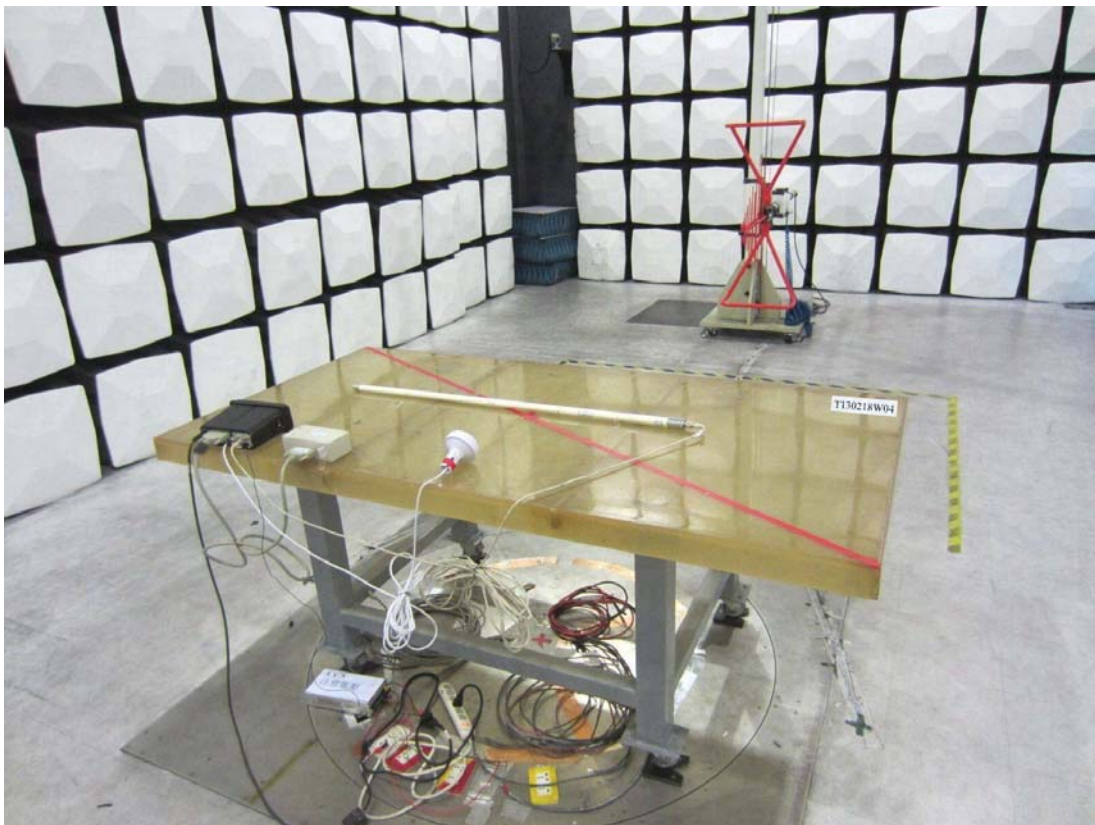
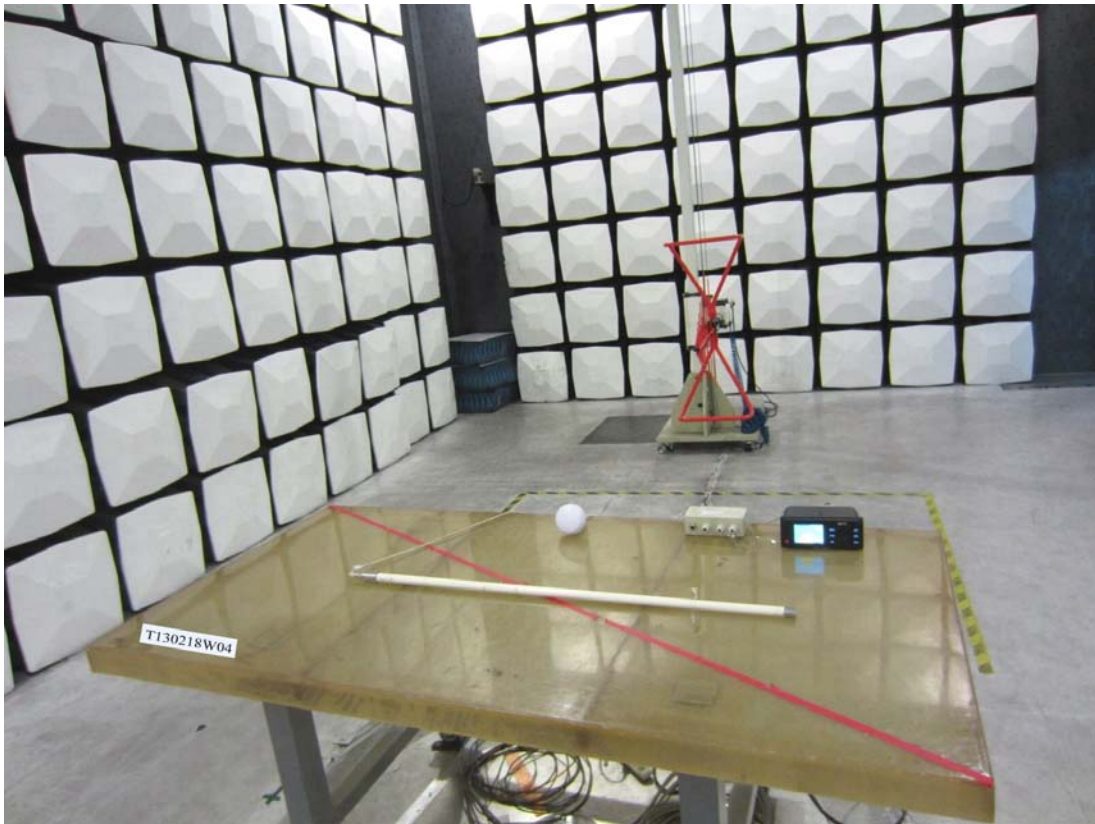
**RADIATED EMISSION TEST**

**150kHz ~ 30MHz**



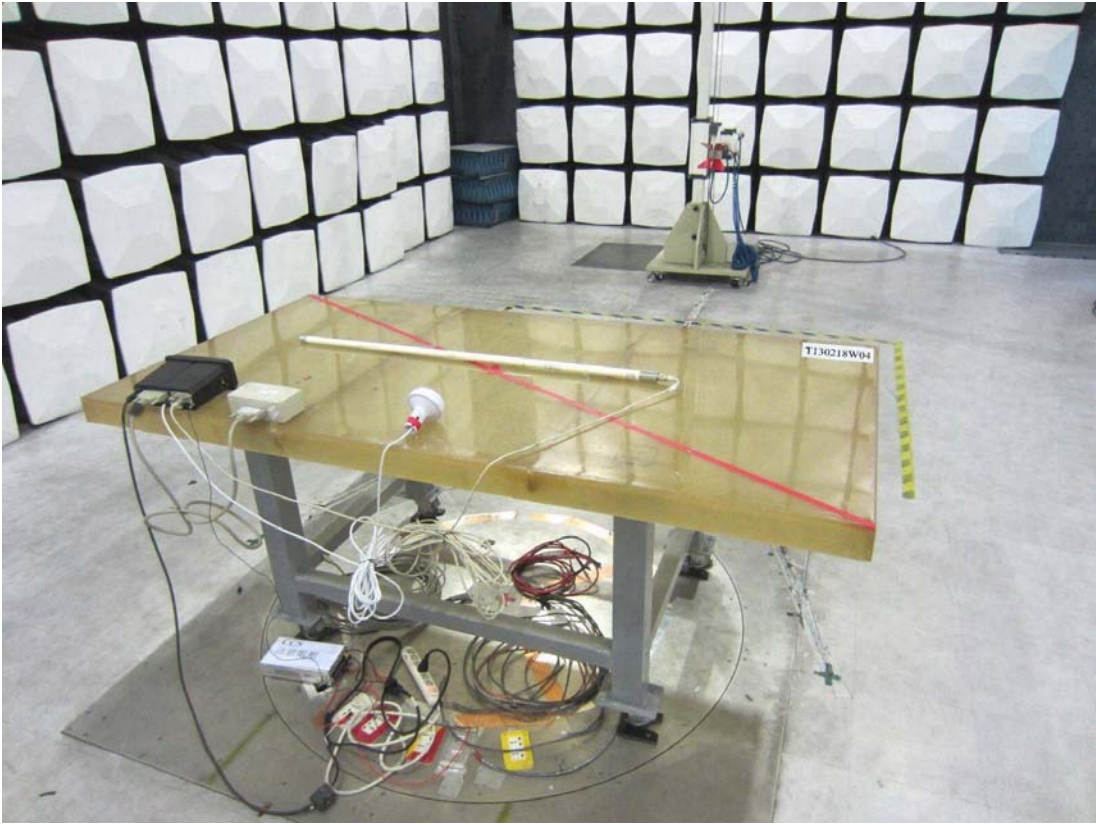
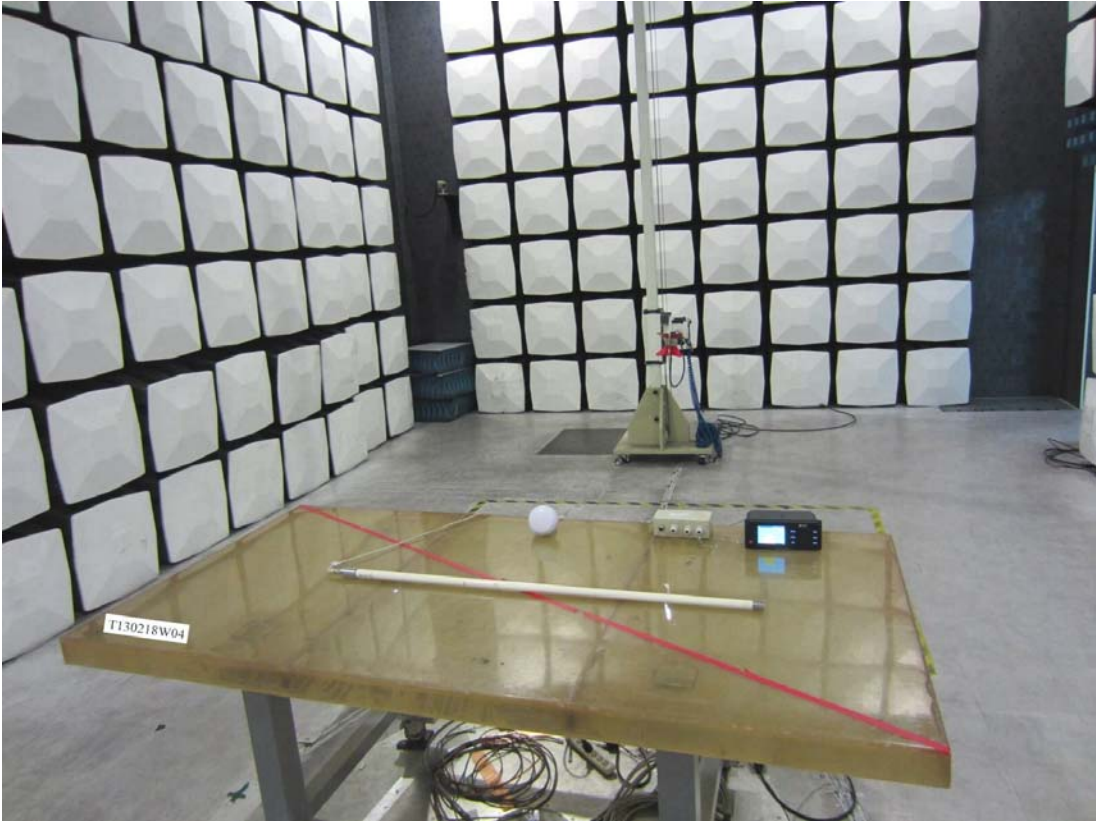


**30MHz ~ 1GHz**





**1GHz ~ 2GHz**

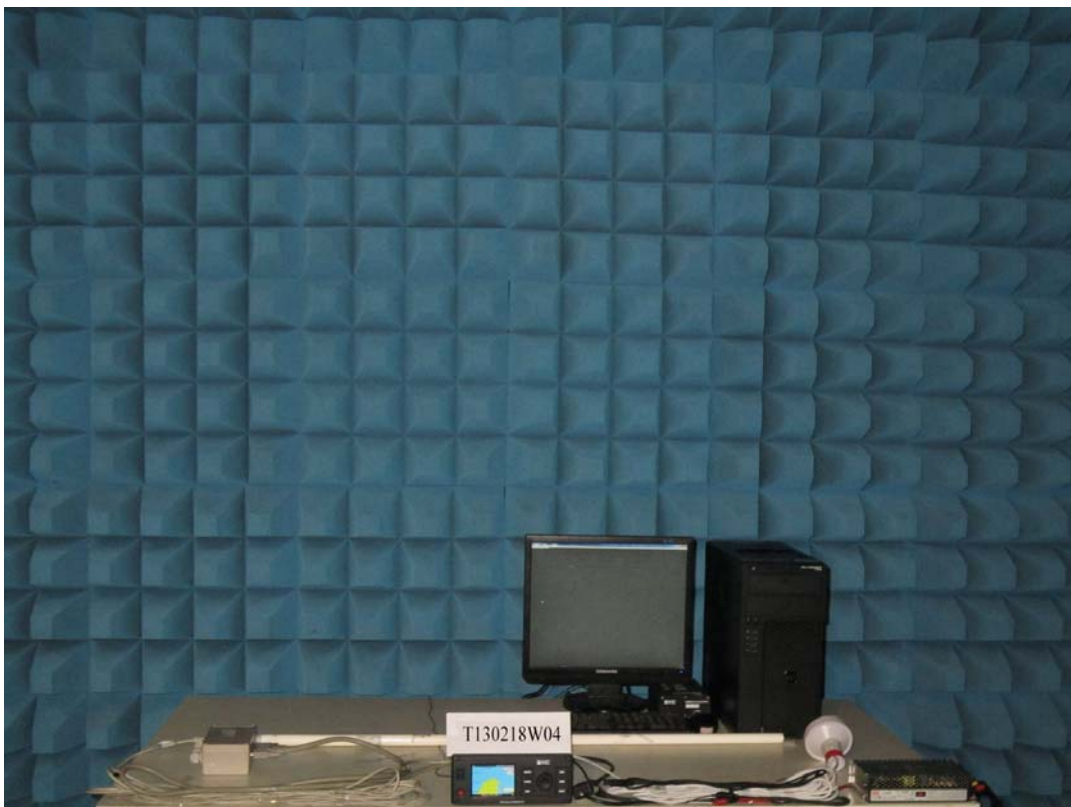




**ESD Test**



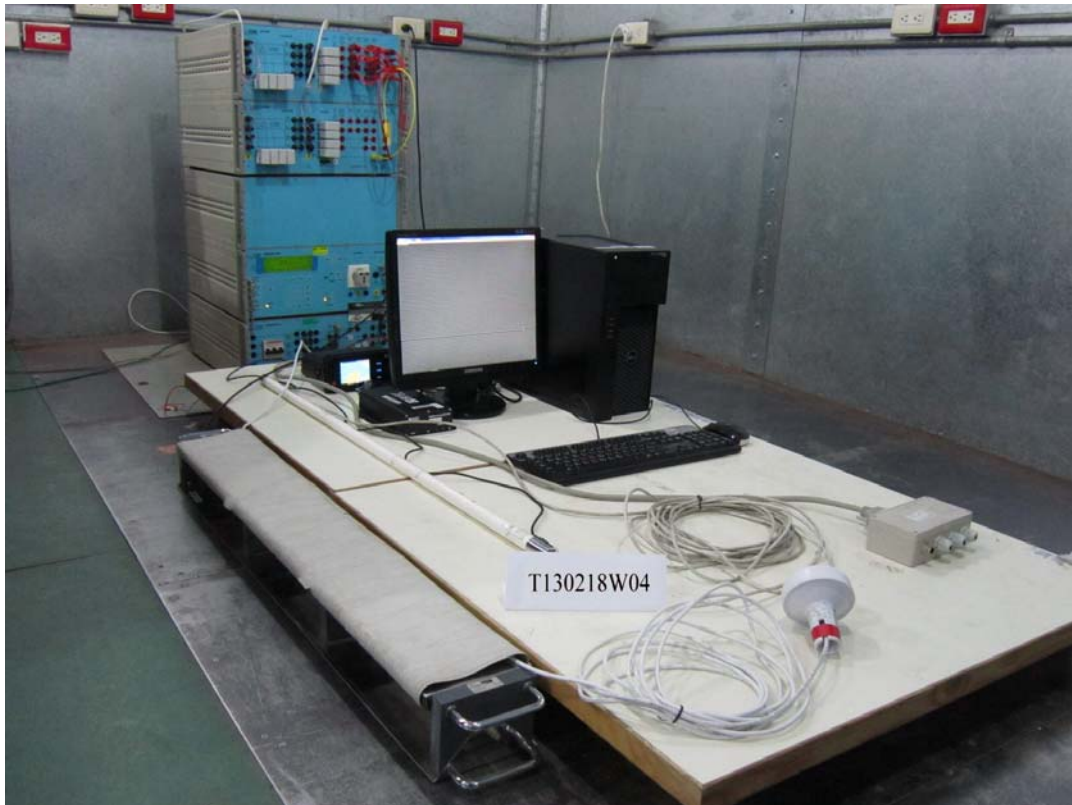
**RS Test**



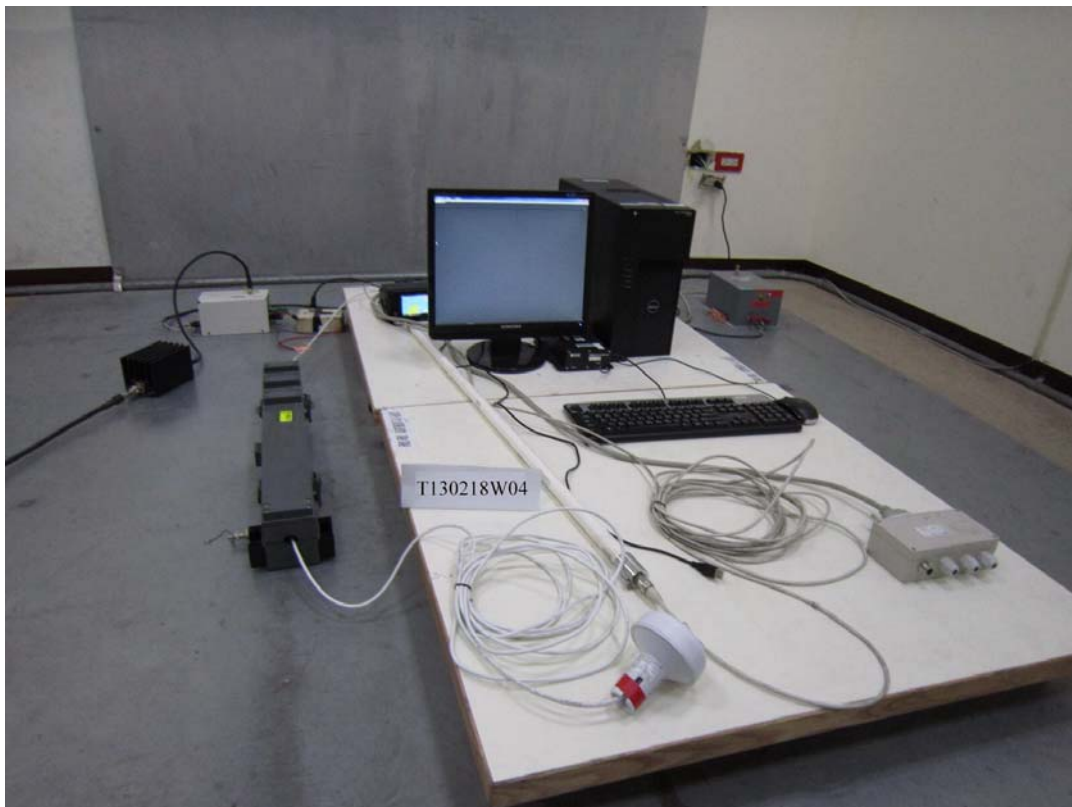




### EFT For I/O Test

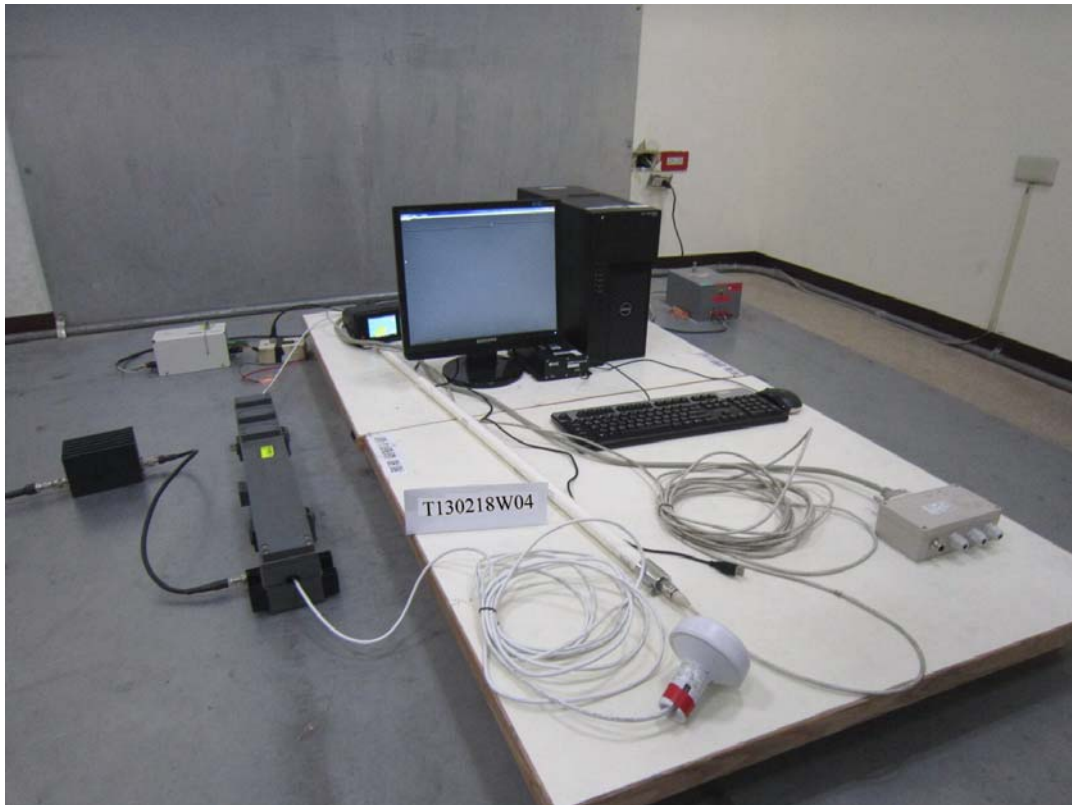


### CS Test





**CS For I/O Test**



**POWER SUPPLY FAILURE TEST**





# 10 METHOD AND SCREENSHOTS OF EUT'S TRANSMITTING/RECEIVING PERFORMANCE CHECK

## Screenshot of CS:

On the screenshot below, the transmitting packet quantity (of the additional AIS transponder) is marked by "Tx-packet" which is 1369 on the screenshot. The receiving packet quantity of the EUT is marked by "Rx-packet" which is 1364 on the screenshot. So the PER (packet error rate) of the EUT receiving performance under this test is 0.37%.

The image displays two side-by-side screenshots of the 'EC-61162/NMEA-0183 DATA LOGGER' software interface. Both windows show a 'SHIP LIST: 2' and an 'RX SUMMARY' table. In the left window, a row in the RX SUMMARY table is highlighted in blue, with a red arrow pointing to it and the label 'Tx-packet'. The row contains the following data: (001)416003878 [B-CS] (0) [1369] (0) [0]. In the right window, a similar row is highlighted in blue, with a red arrow pointing to it and the label 'Rx-packet'. The row contains the following data: (002)416003876 [B-CS] (1) [1364] (0) [0]. Below the tables, both windows have a 'DYNAMIC' information panel with fields for MMSI, Nav. Status, ROT, SOG, COG, Longitude, Latitude, RAM, Class B Flag, Assign Mode, Country, Record Time, and Start RX Time.



**Screenshot of RS:**

On the screenshot below, the transmitting packet quantity (of the additional AIS transponder) is marked by “Tx-packet” which is 5457 on the screenshot. The receiving packet quantity of the EUT is marked by “Rx-packet” which is 5444 on the screenshot. So the PER (packet error rate) of the EUT receiving performance under this test is 0.24%.

The image displays two side-by-side screenshots of the IEC-61162/NMEA-0183 DATA LOGGER software interface. Both windows show a log of AIS data and a 'DYNAMIC' data table for MMSI 416003839.

**Left Screenshot (Tx-packet):**

- Serial Port: 1, Baud Rate: 115200, Data Bits: 8, Stop Bits: 1, Parity: None, Enable Log: checked.
- Log entry: (001)416003839 [A] [1302/20 16:30:21] [0%] [0]
- Red arrow points to the log entry with a box labeled "Tx-packet".
- DYNAMIC table: MMSI 416003839, Nav. Status Under way using engine, ROT N/A, SOG 3.00kn, COG 298.0°, Longitude 121.5707550C, Latitude 24.94324684I, RAIM 1, T.Stamp 49, Pos. Accu. 1.

**Right Screenshot (Rx-packet):**

- Serial Port: 128, Baud Rate: 115200, Data Bits: 8, Stop Bits: 1, Parity: None, Enable Log: checked.
- Log entry: (002)416003839 [A] [1302/21 00:05:32] [0%] [0]
- Red arrow points to the log entry with a box labeled "Rx-packet".
- DYNAMIC table: MMSI 416003878, Nav. Status Under way using engine, ROT N/A, SOG 3.00kn, COG 298.0°, Longitude 121.5707550C, Latitude 24.94324684I, RAIM 1, T.Stamp 47, Pos. Accu. 1.



**Screenshot of EFT:**

On the screenshot below, the transmitting packet quantity (of the additional AIS transponder) is marked by “Tx-packet” which is 1395 on the screenshot. The receiving packet quantity of the EUT is marked by “Rx-packet” which is 1393 on the screenshot. So the PER (packet error rate) of the EUT receiving performance under this test is 0.14%.

The image displays two side-by-side screenshots of the IEC-61162NMEA-0183 DATA LOGGER software interface. Both windows show a list of AIS data on the left and an 'RX SUMMARY' table on the right. Red arrows point from the text 'Tx-packet' and 'Rx-packet' to specific rows in the summary tables.

**Left Screenshot (Serial Port 1):**

NO	MMSI	CLASS	RX	TX	R(m)	NAME	MSG18	CH:B
001	416003878	B	CS1	0	1395	0%	0	
002	416003839	A	1	3484	0%	0		

**Right Screenshot (Serial Port 128):**

NO	MMSI	CLASS	RX	TX	R(m)	NAME	MSG18	CH:B
001	416003839	A	1	0	3487	0%	0	
002	416003878	B	CS1	0	1393	0%	1393	

The 'RX SUMMARY' tables also include a 'DYNAMIC' section with fields for MMSI, Nav. Status, ROT, SOG, COG, Longitude, Latitude, RAM, Class B Flag, Assign Mode, Country, Record Time, and Start RX Time.



**Screenshot of ESD:**

On the screenshot below, the transmitting packet quantity (of the additional AIS transponder) is marked by “Tx-packet” which is 431 on the screenshot. The receiving packet quantity of the EUT is marked by “Rx-packet” which is 430 on the screenshot. So the PER (packet error rate) of the EUT receiving performance under this test is 0.23%.

The image displays two side-by-side screenshots of the IEC-61162/NMEA-0183 DATA LOGGER software interface. Both windows show a 'SHIP LIST: 2' and an 'RX SUMMARY' table. The left window's table has a row for MMSI 416003839 with TX=431, highlighted in blue and labeled 'Tx-packet' with a red arrow. The right window's table has a row for MMSI 416003839 with TX=430, highlighted in blue and labeled 'Rx-packet' with a red arrow. Below the tables, both windows show a 'DYNAMIC' data entry form for MMSI 416003839, with fields for Nav. Status, ROT, SOG, Longitude, Latitude, RAIM, Class B Flag, Assign Mode, Country, Record Time, and Start RX Time.