

# CE Test Report

Product Name	AIS Class B Transponder
Model No.	CAMINO-108, CAMINO-108W

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

Date of Receipt	May 06, 2013
Issued Date	Oct. 21, 2013
Report No.	135096R-RFCEP01V01
Report Version	V2.0



The Test Results relate only to the samples tested.

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# Test Report Certification

Issued Date: Oct. 21, 2013

Report No. : 135096R-RFCEP01V01



Product Name	AIS Class B Transponder
Applicant	Alltek Marine Electronics Corp.
Address	7F, No.605, Ruei Guang Rd., Neihu, Taipei, Taiwan, 114 R.O.C.
Manufacturer	Alltek Marine Electronics Corp.
Model No.	CAMINO-108, CAMINO-108W
EUT Rated Voltage	DC 9.6~31.2V
EUT Test Voltage	DC 12V/24V
Trade Name	AMEC
Applicable Standard	ETSI EN 301 489-1:V1.9.2 (2008-04) ETSI EN 301 489-3:V1.4.1 (2002-08)
Test Result	Complied

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## Revision History

Rev.	Issue Date	Revisions	Effect page
V1.0	August 22, 2013	Initial Issue	All
V2.0	October 21, 2013	<ol style="list-style-type: none"><li>1) Add Revision History</li><li>2) Modify section 1.3 Tested System Details</li><li>3) Modify section 1.4EUT Test Setup Environment &amp; Configuration of AIS System</li><li>4) Add section 1.5 Performance Check Method</li><li>5) Modify section 1.6 Operation Procedures</li></ol>	6, 8, 9

## 1. GENERAL INFORMATION

### 1.1. EUT Description

Product Name	AIS Class B Transponder
Trade Name	AMEC
Model No.	CAMINO-108, CAMINO-108W
Frequency Range	1575.42MHz
Number of Channel	1
Antenna Type	Right Hand Circular Polarization
Type of Modulation	Phase Modulation
Channel Control	Auto
Hardware	M-PCB-B108MBV1
Software	V1.2.6

Working Frequency of Each Channel	
Channel	Frequency
01	1575.42MHz

Note:

1. The EUT is a AIS Class B Transponder with a built-in GPS Receiver at 1575.42MHz.
2. This device is a composite device in accordance with ETSI regulations. The SPECTRUM was measured and made a test report that the report number is 135096R-RFCEP71V01.

### 1.2. Test Mode

Quietek verified the construction and function in typical operation. All the test modes were carried out with the EUT in normal operation, which was shown in this test report and defined as:

EMI MODE	GPS mode
EMS MODE	GPS mode

### 1.3. Tested System Details

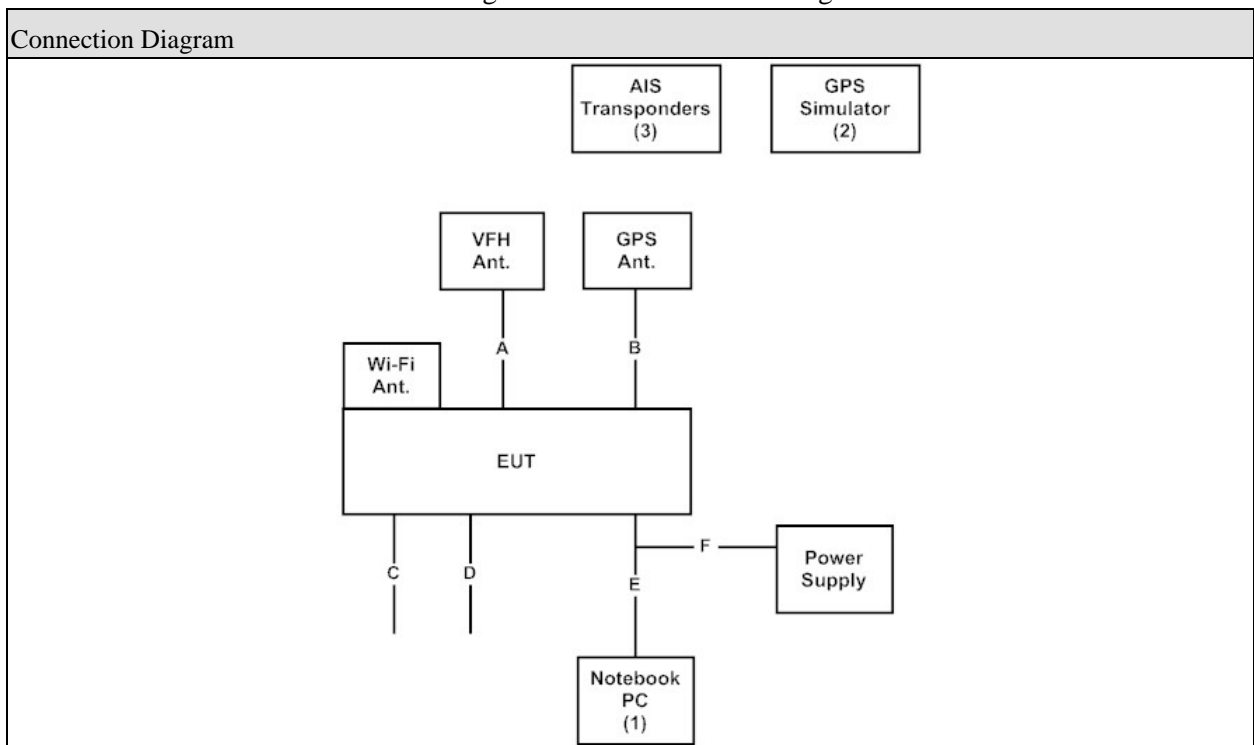
The types for all equipment, plus descriptions of all cables used in the tested system (including SD cards) are:

Product	Manufacturer	Model No.	Serial No.	Power Cord	
1	Notebook PC	DELL	PP04X	7607342512	Non-shielded, 1.8m
2	GPS Simulator	Agilent	E4438C	N/A	Non-shielded, 1.8m
3	AIS Transponders	AMEC	CAMINO-101 / CAMINO-701	N/A	Non-shielded, 1.8m

### 1.4. EUT Test Setup Environment & Configuration of AIS System

In order to do performance-check during 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.



Signal Cable Type	Signal cable Description
A	VHF Cable Shielded, 10m
B	GPS Cable Shielded, 10m
C	Mini USB to USB Cable Shielded, 1.8m
D	NMEA Cable Shielded, 3m
E	RS-232 Cable Shielded, 1.5m
F	Power/Data Cable Shielded, 1.4m



### 1.5. Performance Check Method

The EUT is set into autonomous mode with reporting interval of 180 seconds in the test environment in Section 1.4. Additional AIS transponders are 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 transponders.

### 1.6. EUT Operation Procedures

1	Setup the EUT and simulators as shown in section 1.4.
2	Execute "GPS Test Software" on the Notebook PC.
3	Configure the test mode
4	Watch the Notebook PC to observe the GPS signal.
5	Verify that the EUT works properly.

## 1.7. Test Facility

Ambient conditions in the laboratory:

Items	Test Item	Required	Actual
Temperature (°C)	IEC 61000-4-2	15-35	20
Humidity (%RH)		30-60	50
Barometric pressure (mbar)		860-1060	950-1000
Temperature (°C)	IEC 61000-4-3	15-35	23
Humidity (%RH)		25-75	50
Barometric pressure (mbar)		860-1060	950-1000
Temperature (°C)	IEC 61000-4-4	15-35	24
Humidity (%RH)		25-75	58
Barometric pressure (mbar)		860-1060	950-1000
Temperature (°C)	IEC 61000-4-5	15-35	25
Humidity (%RH)		10-75	49
Barometric pressure (mbar)		860-1060	950-1000
Temperature (°C)	IEC 61000-4-6	15-35	24
Humidity (%RH)		25-75	50
Barometric pressure (mbar)		860-1060	950-1000
Temperature (°C)	IEC 61000-4-11	15-35	25
Humidity (%RH)		25-75	49
Barometric pressure (mbar)		860-1060	950-1000

The related certificate for our laboratories about the test site and management system can be downloaded from Quietek Corporation's Web Site : <http://tw.quietek.com/modules/myalbum/>

THE ADDRESS AND INTRODUCTION OF QUIETEK CORPORATION'S LABORATORIES CAN BE FOUNDED IN OUR WEB SITE : <HTTP://WWW.QUIETEK.COM/>

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Accredited Number: 0914

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## 2. Conducted Emission

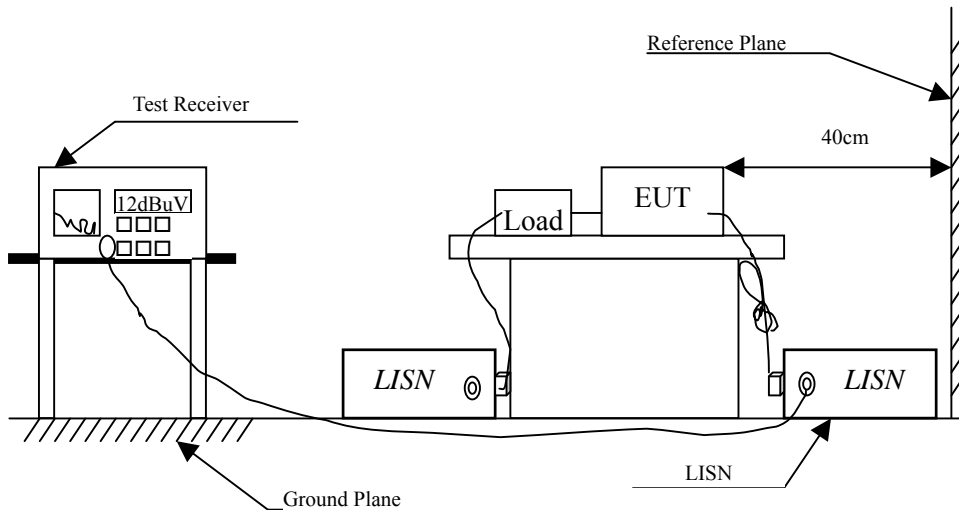
### 2.1. Test Equipment

	Equipment	Manufacturer	Model No. / Serial No.	Last Cal.	Remark
X	Test Receiver	R & S	ESCS 30 / 825442/018	Sep., 2012	
X	Artificial Mains Network	R & S	ENV4200 / 848411/10	Feb., 2013	Peripherals
X	LISN	R & S	ESH3-Z5 / 825562/002	Feb., 2013	EUT
	DC LISN	Schwarzbeck	8226 / 176	Mar, 2013	EUT
X	Pulse Limiter	R & S	ESH3-Z2 / 357.8810.52	Feb., 2013	
X	4-wire ISN	R & S	ENY41 / 837032/001	Feb., 2013	
X	Double 2-Wire ISN	R & S	ENY22 / 835354/008	Feb., 2013	
	No.1 Shielded Room				

Note:

1. All equipments are calibrated every one year.
2. The test instruments marked by “X” are used to measure the final test results.

### 2.2. Test Setup



### 2.3. Limits

#### (1) Mains terminal

Frequency MHz	<i>Limits (dBuV)</i>			
	<i>Limit for conducted emissions of equipment intended to be used in telecommunication centers only</i>		<i>Limit for conducted emissions</i>	
	QP	AV	QP	AV
0.15 - 0.50	79	66	66-56	56-46
0.50-5.0	73	60	56	46
5.0 - 30	73	60	60	50

Remarks: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz ~ 0.50 MHz.

#### (2) Telecommunication ports

Frequency MHz	<i>Limits (dBuV)</i>			
	<i>Limit for conducted emissions from telecommunication ports of equipment intended for use in telecommunication centers only</i>		<i>Limit for conducted emissions from telecommunication ports</i>	
	QP	AV	QP	AV
0.15 – 0.50	97-87	84-74	84-74	74-64
5.0 – 30	87	74	74	64

Remarks: In the above table, the tighter limit applies at the band edges.

## 2.4. Test Procedure

### AC Mains:

The EUT and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm /50uH coupling impedance with 50ohm termination. (Please refers to the block diagram of the test setup and photographs.)

Both sides of AC line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ETSI EN 301 489-1:V1.9.2 (2008-04) on conducted measurement.

The bandwidth of the field strength meter (R & S Test Receiver ESCS 30) is set at 9kHz.

### Telecommunication Port:

The mains voltage shall be supplied to the EUT via the LISN when the measurement of telecommunication port is performed. The common mode disturbances at the telecommunication port shall be connected to the ISN, which is 150ohm impedance. Both alternative cables are tested related to the LCL requested. The measurement range is from 150kHz to 30MHz. The bandwidth of measurement is set to 9kHz. The 60dB LCL ISN is used for cat. 5 cable, 50dB LCL ISN is used for cat. 3 and 80dB LCL is wed for alternative one.

## 2.5. Test Specification

According to ETSI EN 301 489-1:V1.9.2 (2008-04)

EN 55022:2010+AC:2011

## 2.6. Uncertainty

± 2.26 dB

## 2.7. Test Result

The emission from the EUT was below the specified limits. The worst-case emissions are shown in section 12.1. The acceptance criterion was met and the EUT passed the test.

### 3. Radiated Emission

#### 3.1. Test Equipment

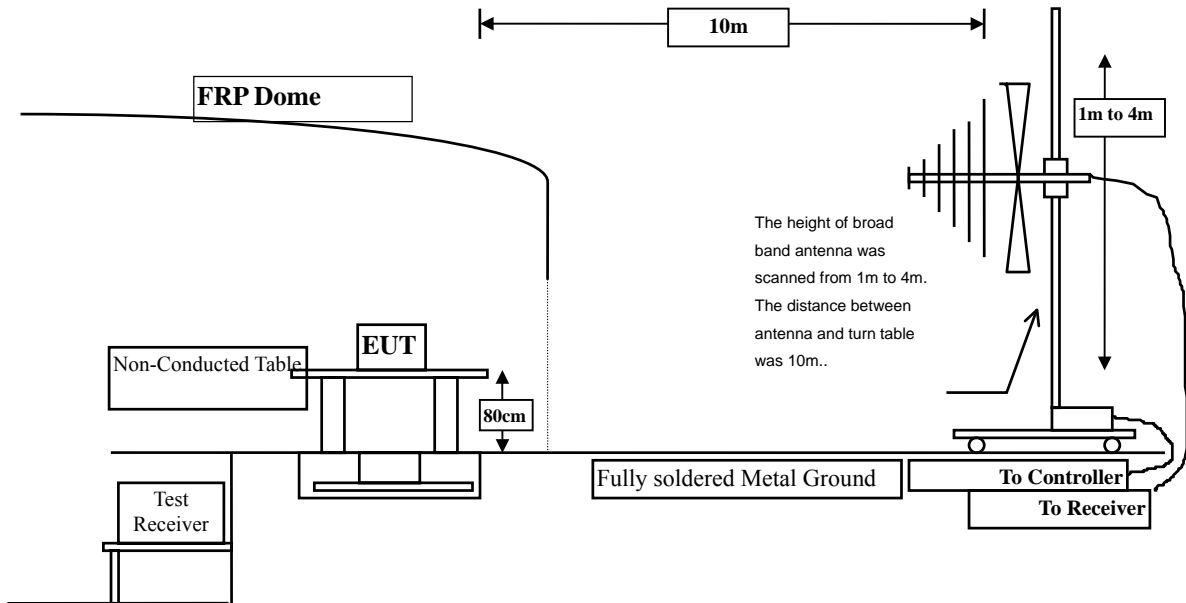
The following test equipment are used during the Radiated emission test:

Test Site	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
<input type="checkbox"/> Site # 1	Test Receiver	R & S	ESVS 10 / 834468/003	July, 2013
	Spectrum Analyzer	Advantest	R3162/ 00803480	May, 2013
	Pre-Amplifier	Advantest	BB525C/ 3307A01812	May, 2013
	Bilog Antenna	SCHAFFNER	CBL6112B / 2697	Nov., 2012
<input type="checkbox"/> Site # 2	Test Receiver	R & S	ESCS 30 / 836858 / 022	Nov., 2012
	Spectrum Analyzer	Advantest	R3162 / 100803466	May, 2013
	Pre-Amplifier	Advantest	BB525C/3307A01814	May, 2013
	Bilog Antenna	SCHAFFNER	CBL6112B / 2705	Oct., 2012
	Horn Antenna	ETS	3115 / 0005-6160	July, 2013
	Pre-Amplifier	QTK	QTK-AMP-01/ 0001	July, 2013
<input checked="" type="checkbox"/> Site # 3	Test Receiver	R & S	ESI 26 / 838786 / 004	May, 2013
	Spectrum Analyzer	Advantest	R3162 / 100803480	May, 2013
	Pre-Amplifier	QTK	QTK-AMP-03 / 0003	May, 2013
	Bilog Antenna	SCHAFFNER	CBL6112B / 2697	May, 2013
	Horn Antenna	ETS	3115 / 0005-6160	July, 2013
	Pre-Amplifier	QTK	QTK-AMP-01 / 0001	July, 2013
	Pre-Amplifier	QTK	AP-180C / CHM_0906076	Sep., 2012

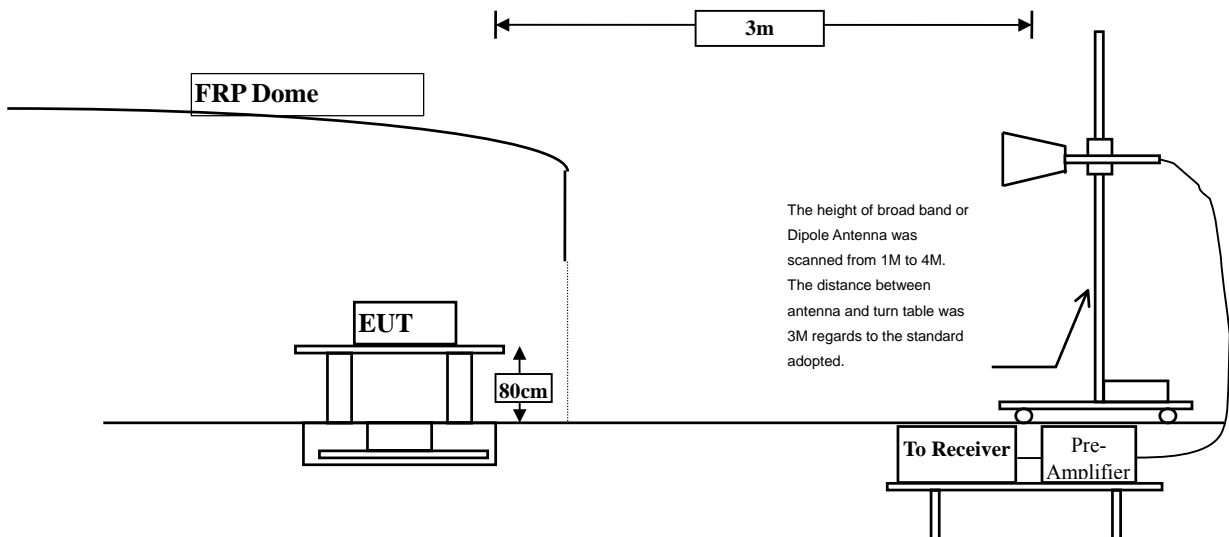
- Note:
1. All equipments are calibrated every one year.
  2. The test instruments marked by "X" are used to measure the final test results.

### 3.2. Test Setup

#### Radiated Emission Below 1GHz



#### Radiated Emission Above 1GHz



### 3.3. Limits

Limits for radiated disturbance under 1 GHz at a measurement distance of 10 m

Frequency MHz	<i>Limits (dBuV/m)</i>	
	<i>Limit for radiated emissions from ancillary equipment intended for use in telecommunication centers only, and measured on a stand alone basis</i>	<i>Limit for radiated emissions from ancillary equipment, measured on a stand alone basis</i>
	QP	QP
30-230	40	30
230-1000	47	37

Limits for radiated disturbance above 1 GHz at a measurement distance of 3 m

Frequency range	Average Limit (dB $\mu$ V/m)	Peak limit (dB $\mu$ V/m)
1 000 MHz to 3 000 MHz	50	70
3 000 MHz to 6 000 MHz	54	74
NOTE: The lower limit applies at the transition frequency.		

Limits above 1 GHz for radiated emissions from ancillary equipment intended for use in telecommunication centres only, and measured on a stand alone basis at a measurement distance of 3 m

Frequency range	Average Limit (dB $\mu$ V/m)	Peak limit (dB $\mu$ V/m)
1 000 MHz to 3 000 MHz	56	76
3 000 MHz to 6 000 MHz	60	80
NOTE: The lower limit applies at the transition frequency.		



### **3.4. Test Procedure**

The EUT and its simulators are placed on a turn table which is 0.8 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 10 meters.

The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level.

Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated on radiated measurement.

Radiated emissions were investigated over the frequency range from 30MHz to 1GHz using a receiver bandwidth of 120kHz. Radiated was performed at an antenna to EUT distance of 10 meters.

Radiated emissions were investigated over the frequency range from 1GHz to 6GHz using a receiver bandwidth of 1MHz. Radiated was performed at an antenna to EUT distance of 3 meters.

### **3.5. Test Specification**

According to ETSI EN 301489-1: V1.9.2 (2008-04)  
EN 55022:2010+AC:2011

### **3.6. Uncertainty**

± 3.8 dB

### **3.7. Test Result**

The emission from the EUT is below the specified limits. The worst-case emissions are shown in section 12.2. The EUT complies the acceptance criterion and passes the test.

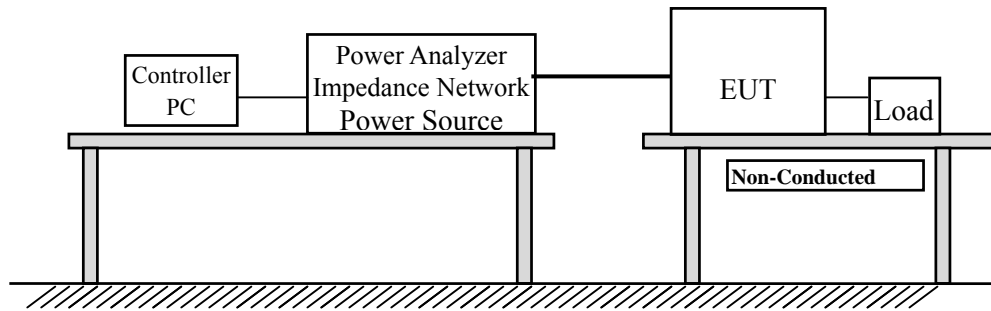
## 4. Power Harmonics, Voltage Fluctuation and Flicker

### 4.1. Test Equipment

Item	Instrument	Manufacturer	Type No/Serial No.	Last Calibration
1	Power Harmonics Tester	SCHAFFNER	Proflin 2105-400 S/N: HK54148	June, 2013
2	Analyzer	SCHAFFNER	CCN 1000-1/X71887	June, 2013
3	No.3 Shielded Room			

Note: All equipments are calibrated every one year.

### 4.2. Test Setup



### 4.3. Limits

➤Limits of Class A Harmonics Currents

Harmonics Order n	Maximum Permissible harmonic current A	Harmonics Order n	Maximum Permissible harmonic current A
Odd harmonics		Even harmonics	
3	2.30	2	1.08
5	1.14	4	0.43
7	0.77	6	0.30
9	0.40	8 ≤ n ≤ 40	0.23 * 8/n
11	0.33		
13	0.21		
15 ≤ n ≤ 39	0.15 * 15/n		

➤Limits of Class B Harmonics Currents

For Class B equipment, the harmonic of the input current shall not exceed the maximum permissible values given in table which is the limit of Class A multiplied by a factor of 1.5.

## ➤Limits of Class C Harmonics Currents

Harmonics Order n	Maximum Permissible harmonic current Expressed as a percentage of the input current at the fundamental frequency %
2	2
3	$30 \cdot \lambda^*$
5	10
7	7
9	5
$11 \leq n \leq 39$ (odd harmonics only)	3

\*  $\lambda$  is the circuit power factor

## ➤Limits of Class D Harmonics Currents

Harmonics Order n	Maximum Permissible harmonic current per watt mA/W	Maximum Permissible harmonic current A
3	3.4	2.30
5	1.9	1.14
7	1.0	0.77
9	0.5	0.40
11	0.35	0.33
$11 \leq n \leq 39$ (odd harmonics only)	$3.85/n$	See limit of Class A

#### **4.4. Test Procedure**

The EUT is supplied in series with power analyzer from a power source having the same normal voltage and frequency as the rated supply voltage and the equipment under test. And the rated voltage at the supply voltage of EUT of 0.94 times and 1.06 times shall be performed.

#### **4.5. Test Specification**

According to EN 61000-3-2:2006+A2:2009, EN 61000-3-3:2008

#### **4.6. Uncertainty**

$\pm 3.23 \%$

#### **4.7. Test Result**

Owing to the DC operation of EUT, this test item is not performed.

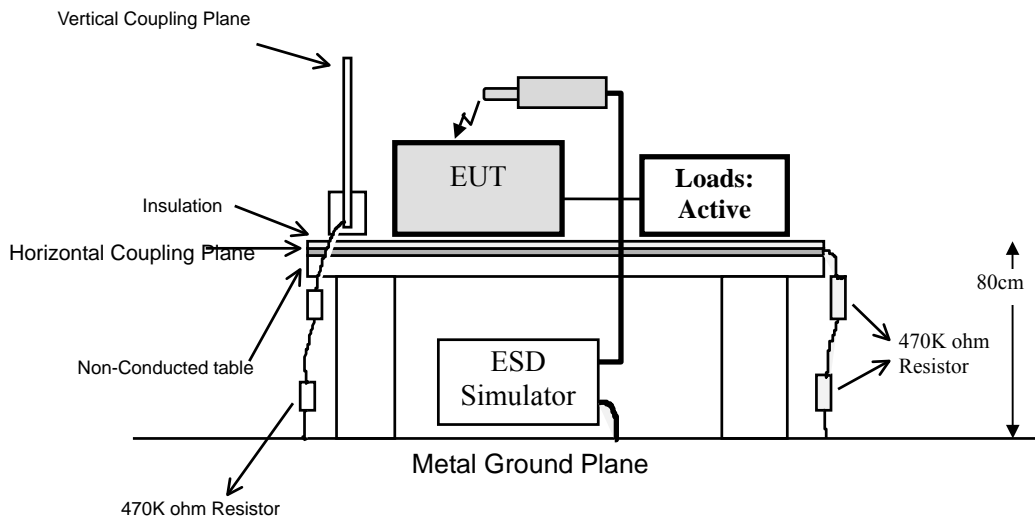
## 5. Electrostatic Discharge (ESD)

### 5.1. Test Equipment

	Instrument	Manufacturer	Type No.	Serial No	Cal. Date
	ESD Simulator System	SCHAFFNER	NSG 438	695	May, 2013
X	ESD Simulator System	NoiseKen	TC-815R	ESS0929097	Aug, 2013
	ESD Simulator System	Thermo	MZ-15/EC/ TPC-2A	0510189/ 0510190	June, 2013
	ESD Simulator System	EM TEST	dito	V0635101749	Sep, 2012
X	Horizontal Coupling Plane (HCP)	Quietek	HCP AL50	N/A	N/A
X	Vertical Coupling Plane (VCP)	Quietek	VCP AL50	N/A	N/A

- Note: 1. All equipments are calibrated every one year.  
 2. The test instruments marked by "X" are used to measure the final test results.

### 5.2. Test Setup



### 5.3. Test Level

Item	Environmental Phenomena	Units	Test Specification	Performance Criteria
Enclosure Port				
	Electrostatic Discharge	kV(Charge Voltage)	±8 (Air Discharge) ±4 (Contact Discharge)	B

## 5.4. Test Procedure

Direct application of discharges to the EUT:

Contact discharge was applied only to conductive surfaces of the EUT.

Air discharges were applied only to non-conductive surfaces of the EUT.

During the test, it was performed with single discharges. For the single discharge time between successive single discharges will be keep longer 1 second. It was at least ten single discharges with positive and negative at the same selected point.

The selected point, which was performed with electrostatic discharge, was marked on the red label of the EUT.

Indirect application of discharges to the EUT:

Vertical Coupling Plane (VCP):

The coupling plane, of dimensions 0.5m x 0.5m, is placed parallel to, and positioned at a distance 0.1m from, the EUT, with the Discharge Electrode touching the coupling plane.

The four faces of the EUT will be performed with electrostatic discharge. It was at least ten single discharges with positive and negative at the same selected point.

Horizontal Coupling Plane (HCP):

The coupling plane is placed under to the EUT. The generator shall be positioned vertically at a distance of 0.1m from the EUT, with the Discharge Electrode touching the coupling plane.

The four faces of the EUT will be performed with electrostatic discharge. It was at least ten single discharges with positive and negative at the same selected point.

## 5.5. Test Specification

According to IEC 61000-4-2: 2008

## 5.6. Uncertainty

The uncertainty of the voltage of the waveform is  $\pm 1.63 \%$

The uncertainty of the timing of the waveform is  $\pm 2.76\%$

## 5.7. Test Result

The test result is shown in section 12.4. The acceptance criterion is met and the EUT passed the test.

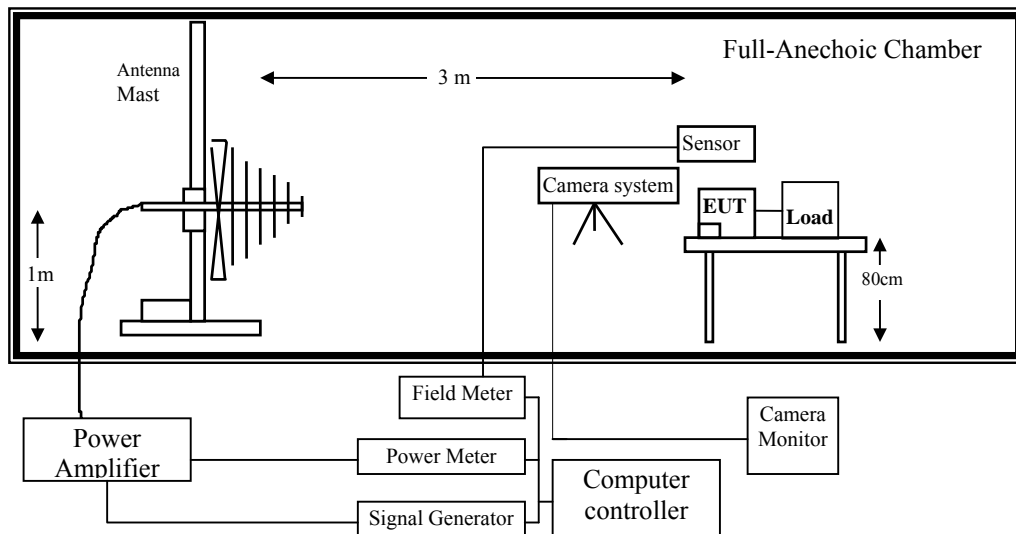
## 6. Radiated Susceptibility (RS)

### 6.1. Test Equipment

Item	Equipment	Manufacturer	Model No. / Serial No.	Last Cal.
1	Signal Generator	R & S	SML03/103330	Sep., 2012
2	Power Amplifier	Schaffner	CBA9413B/4020	N/A
3	Power Amplifier	A & R	30S1G3/309453	N/A
4	Biconilog Antenna	EMCO	3149/00071675	N/A
5	Power Meter	R & S	NRVD / 100219	Jan., 2013
6	Directional Coupler	A & R	DC6180/22735	N/A
7	Directional Coupler	A & R	DC7144A/312249	N/A
8	No.2 EMC Fully Chamber			

Note: All equipments are calibrated every one year.

### 6.2. Test Setup



### 6.3. Test Level

Item	Environmental Phenomena	Units	Test Specification	Performance Criteria
Enclosure Port				
	Radio-Frequency	MHz	80-1000 1400-2700	A
	Electromagnetic Field	V/m(Un-modulated, rms)	3	
	Amplitude Modulated	% AM (1kHz)	80	

#### 6.4. Test Procedure

The EUT and load, which are placed on a table that is 0.8 meter above ground, are placed with one coincident with the calibration plane such that the distance from antenna to the EUT was 3 meters.

Both horizontal and vertical polarization of the antenna and four sides of the EUT are set on measurement.

In order to judge the EUT performance, a CCD camera is used to monitor EUT screen.

All the scanning conditions are as follows:

Condition of Test	Remarks
1. Field Strength	3 V/m Level 2
2. Radiated Signal	AM 80% Modulated with 1kHz sinusoidal audio signal
3. Scanning Frequency	80MHz 1000M ,1400- 2700MHz
4. Exclusion Band	13.56MHz $\pm$ 5MHz
5. Dwell Time	3 Seconds
6. Frequency step size $\Delta f$ :	1% for class 1 and class 2; 10% for class 3
7. The rate of Swept of Frequency	$1.5 \times 10^{-3}$ decades/s

##### Exclusion Bands for transmitters:

For transmitters operating, or intended to operate, in a channelized frequency band, the exclusion band is three times the maximum occupied bandwidth allowed for that service, centred around the operating frequency.

For wide band transmitters, i.e. transmitters in a non-channelized frequency band, the exclusion band is twice the intended operating frequency band centred around the centre frequency of the intended operating frequency band.

In case the receiver and transmitter are tested together as a system (clause 4.2.5 of EN 301 489-0[1]) the exclusion band defined for receivers or the exclusion band defined for transmitters shall be used, whichever is greater.

##### Exclusion Bands for receivers:

Operating Receiver Frequency $f_0$	EMC exclusion band SRD equipment		
	Receiver Class 1	Receiver Class 2	Receiver Class 3
< 300kHz	$f_0 \pm 200\text{kHz}$ (see note 1)	$f_0 \pm 300\text{kHz}$ (see note 1)	$f_0 \pm 300\text{kHz}$ (see note 1)
300kHz to < 30 MHz	$f_0 \pm 2\text{MHz}$ (see note 1)	$f_0 \pm 3\text{MHz}$ (see note 1)	$f_0 \pm 5\text{MHz}$ (see note 1)
30MHz to < 1GHz	$f_0 \pm 10\text{MHz}$ , or $\pm 2\% * f_0$ , whichever is greater	$f_0 \pm 15\text{MHz}$ , or $\pm 5\% * f_0$ , whichever is greater	$f_0 \pm 15\text{MHz}$ , or $\pm 10\% * f_0$ , whichever is greater
1GHz to < 2GHz	$f_0 \pm 75\text{MHz}$ (see note 2)	$f_0 \pm 100\text{MHz}$ (see note 2)	$f_0 \pm 300\text{MHz}$ (see note 2)



NOTE 1: Measurements shall not be carried out below 150kHz.

NOTE 2: Operating frequencies above 2 GHz do not require an exclusion band as there are no immunity tests required above 2 GHz

## **6.5. Test Specification**

According to IEC 61000-4-3 : 2010

## **6.6. Uncertainty**

$\pm 2.72\text{dB}$

## **6.7. Test Result**

The test result is shown in section 12.5. The acceptance criterion is met and the EUT passed the test.

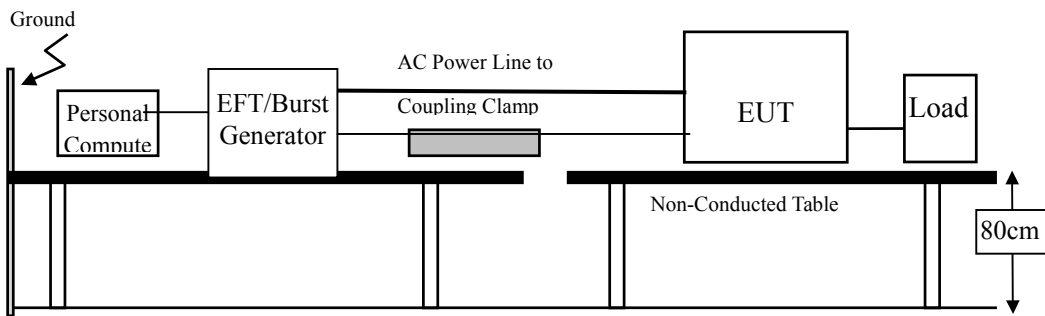
## 7. Electrical Fast Transient/Burst (EFT/B)

### 7.1. Test Equipment

	Instrument	Manufacturer	Type No.	Serial No	Cal. Date
	Schaffner NSG 2050 System Mainframe	Schaffner	N/A	N/A	Jan, 2013
	EMC immunity system	Thermo	EMC PRO PLUS	0411225	Mar, 2013
X	TRANSIENT TEST SYSTEM	EMC PARTNET	TRA2000IN6	1138	Mar, 2013

- Note:
1. All equipments are calibrated every one year.
  2. The test instruments marked by “X” are used to measure the final test results.

### 7.2. Test Setup



### 7.3. Test Level

Item	Environmental Phenomena	Units	Test Specification	Performance Criteria
Ports for signal lines and control lines				
	Fast Transients Common Mode	kV (Peak) Tr/Ts ns Rep. Frequency kHz	$\pm 0.5$ 5/50 5	B
Input DC Power Ports				
	Fast Transients Common Mode	kV (Peak) Tr/Ts ns Rep. Frequency kHz	$\pm 0.5$ 5/50 5	B
Input AC Power Ports				
	Fast Transients Common Mode	kV (Peak) Tr/Ts ns Rep. Frequency kHz	$\pm 1$ 5/50 5	B

#### **7.4. Test Procedure**

The EUT and load are placed on a table that is 0.8 meter above a metal ground plane measured 1m\*1m min. and 0.65mm thick min. And projected beyond the EUT by at least 0.1m on all sides.

For Signal Ports and Telecommunication Ports:

The EFT interference signal is through a coupling clamp device couples to the signal and control lines of the EUT with burst noise for 1min.

For Input DC and AC Power Ports:

The EUT is connected to the power mains through a coupling device that directly couples the EFT interference signal.

Each of the Line and Neutral conductors is impressed with burst noise for 1 min.

The length of power cord between the coupling device and the EUT shall be 1m.

#### **7.5. Test Specification**

According to IEC 61000-4-4: 2012

#### **7.6. Uncertainty**

The uncertainty of the voltage of the waveform is  $\pm 1.63 \%$

The uncertainty of the timing of the waveform is  $\pm 2.76\%$

#### **7.7. Test Result**

The test result is shown in section 12.6. The acceptance criterion is met and the EUT passed the test.

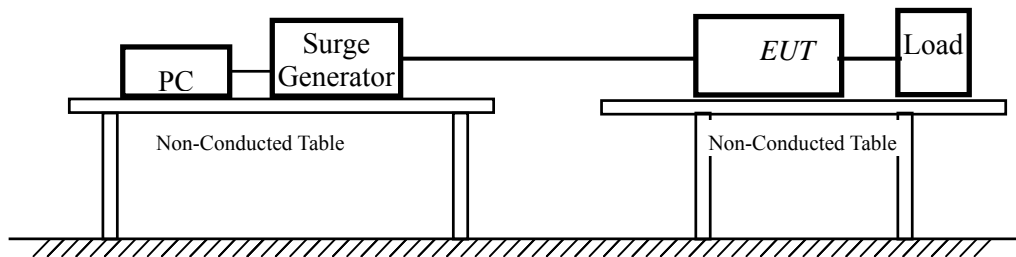
## 8. Surge

### 8.1. Test Equipment

	Instrument	Manufacturer	Type No.	Serial No	Cal. Date
	Schaffner NSG 2050 System Mainframe	Schaffner	N/A	N/A	Jan, 2013
	EMC immunity system	Thermo	EMCPRO PLUS	0411225	Mar, 2013
X	TRANSIENT TEST SYSTEM	EMC PARTNET	TRA2000IN6	1138	Mar, 2013

Note: 1. All equipments are calibrated every one year.  
 2. The test instruments marked by “X” are used to measure the final test results.

### 8.2. Test Setup



### 8.3. Test Level

Item	Environmental Phenomena	Units	Test Specification	Performance Criteria
Telecommunication Ports (See 1) and 2)				
	Surges Line to Ground	Tr/Th us kV	10/700 ± 1	C
Telecommunication Ports in Telecom Centres (See 1) and 2)				
	Surges Line to Ground	Tr/Th us kV	10/700 ± 0.5	C
AC Input and AC Output Power Ports				
	Surges Line to Line Line to Ground	Tr/Th us kV kV	1.2/50 (8/20) ±1 ± 2	B
AC Input and AC Output Power Ports in Telecom Centres				
	Surges Line to Line Line to Ground	Tr/Th us kV kV	1.2/50 (8/20) ±0.5 ± 1	B

Notes:

- 1) Applicable only to ports which according to the manufacturer’s may directly to outdoor cables.
- 2) Where normal functioning cannot be achieved because of the impact of the CDN on the EUT, no test shall be required.

#### **8.4. Test Procedure**

The EUT and its load are placed on a table that is 0.8 meter above a metal ground plane measured 1m\*1m min. and 0.65mm thick min. And projected beyond the EUT by at least 0.1m on all sides. The length of power cord between the coupling device and the EUT shall be 2m or less.

For Signal Ports and Telecommunication Ports

The disturbance signal is through a coupling and decoupling networks (CDN) device couples to the signal and Telecommunication lines of the EUT.

For Input and Output AC Power or DC Input and DC Output Power Ports:

The EUT is connected to the power mains through a coupling device that directly couples the Surge interference signal.

The surge noise shall be applied synchronized to the voltage phase at  $0^{\circ}$ ,  $90^{\circ}$ ,  $180^{\circ}$ ,  $270^{\circ}$  and the peak value of the a.c. voltage wave. (Positive and negative)

Each of Line-Earth and Line-Line is impressed with a sequence of five surge voltages with interval of 1 min.

#### **8.5. Test Specification**

According to IEC 61000-4-5 : 2005

#### **8.6. Uncertainty**

The uncertainty of the voltage of the waveform is 1.63 %

The uncertainty of the timing of the waveform is 2.76%

#### **8.7. Test Result**

Owing to the DC operation of EUT, this test item is not performed.

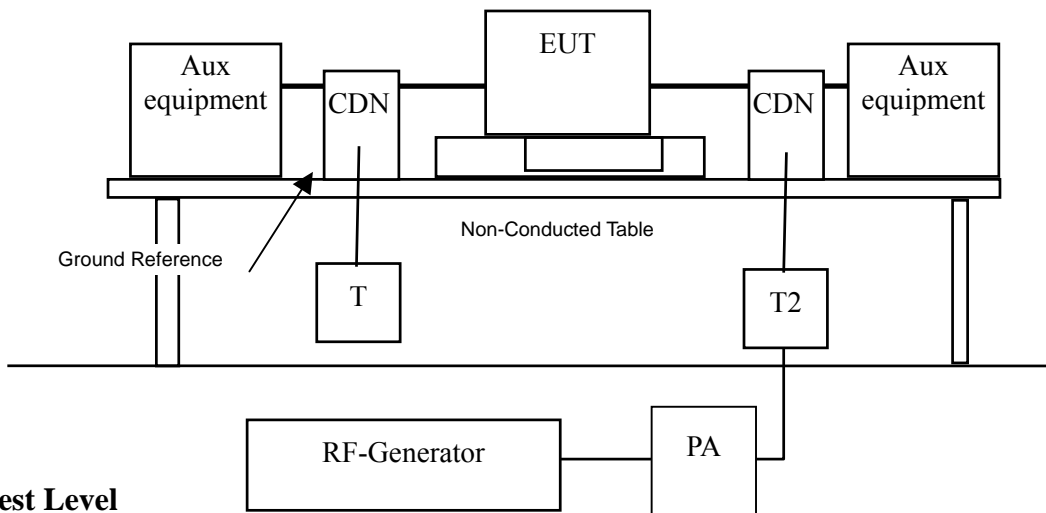
**9. Conducted Susceptibility (CS)**

**9.1. Test Equipment**

Item	Equipment	Manufacturer	Model No. / Serial No.	Last Cal.
1	CS SYSTEM	SCHAFFNER	NSG 2070	March, 2013
2	CDN	SCHAFFNER	CDN M016S / 20822	Dec., 2012
3	CDN	SCHAFFNER	CDN M016S / 20823	Dec., 2012
4	FIXED PAD	SCHAFFNER	INA 2070-1 / 2115	N/A
5	EM Clamp	KEMZ	801 / 21024	March, 2013
6	No.6 Shielded Room			

Note: All equipments are calibrated every one year.

**9.2. Test Setup**



**9.3. Test Level**

Item	Environmental Phenomena	Units	Test Specification	Performance Criteria
AC Input and AC Output & DC Input and DC output Power Ports & Functional Earth Ports				
	Radio-Frequency	MHz	0.15-80	A
	Common Mode.	V (rms, Unmodulated)	3	
	Amplitude Modulated	% AM (1kHz)	80	
		Source Impedance $\Omega$	150	

#### 9.4. Test Procedure

The EUT are placed on a table that is 0.8 meter height, and a Ground reference plane on the table, EUT are placed upon table and use a 10cm insulation between the EUT and Ground reference plane.

For Signal Ports and Telecommunication Ports

The disturbance signal is through a coupling and decoupling networks (CDN) or EM-clamp device couples to the signal and Telecommunication lines of the EUT.

For Input DC and AC Power Ports

The EUT is connected to the power mains through a coupling and decoupling networks for power supply lines. And directly couples the disturbances signal into EUT.

Used CDN-M2 for two wires or CDN-M3 for three wires.

All the scanning conditions are as follows:

Condition of Test	Remarks
1. Field Strength	130dBuV(3V) Level 2
2. Radiated Signal	AM 80% Modulated with 1kHz sinusoidal audio signal
3. Scanning Frequency	0.15MHz – 80MHz
4 Dwell Time	3 Seconds
5. Frequency step size $\Delta f$ :	0.15MHz-5MHz: 1% 5MHz-80MHz: 1% for class 1 and class 2 5MHz-80MHz: 10% for class 3
6. The rate of Swept of Frequency	$1.5 \times 10^{-3}$ decades/s

#### 9.5. Test Specification

According to IEC 61000-4-6 : 2008

#### 9.6. Uncertainty

The uncertainty of the injected modulated signal level through CDN is  $\pm 3.72$ dB

The uncertainty of the injected modulated signal level through EM Clamp/Direct Injection is  $\pm 2.78$ dB

#### 9.7. Test Result

The test result is shown in section 12.8. The acceptance criterion is met and the EUT passed the test.

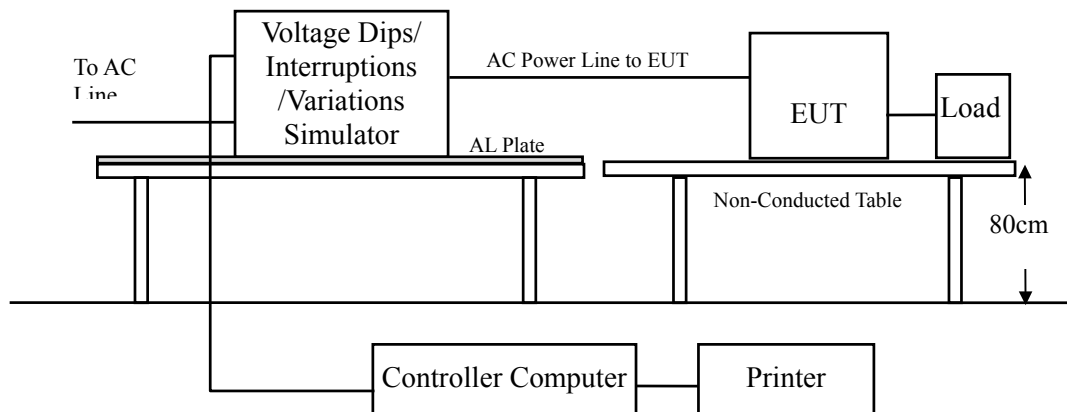
## 10. Voltage Dips and Interruption Measurement

### 10.1. Test Equipment

	Instrument	Manufacturer	Type No.	Serial No	Cal. Date
	Schaffner NSG 2050 System Mainframe	Schaffner	N/A	N/A	Jan, 2013
	EMC immunity system	Thermo	EMCPRO PLUS	0411225	Mar, 2013
X	TRANSIENT TEST SYSTEM	EMC PARTNET	TRA2000IN6	1138	Mar, 2013

- Note:
1. All equipments are calibrated every one year.
  2. The test instruments marked by “X” are used to measure the final test results.

### 10.2. Test Setup



### 10.3. Test Level

Item	Environmental Phenomena	Units	Test Specification	Performance Criteria
AC Input and AC Output Power Ports				
	Voltage Dips	% Reduction (ms)	30 % 10	B
	Voltage Dips	% Reduction (ms)	60 % 100	Class 1: A Class 2, Class 3: B
	Voltage Interruptions	% Reduction (ms)	95 % 5000	C

NOTE: Equipment is fitted with or connected to a battery back-up, the performance criteria is “B”.



#### **10.4. Test Procedure**

The EUT and its load are placed on a table which is 0.8 meter above a metal ground plane measured 1m\*1m min. and 0.65mm thick min. And projected beyond the EUT by at least 0.1m on all sides.

The power cord shall be used the shortest power cord as specified by the manufacturer.

For Voltage Dips/ Interruptions test:

The selection of test voltage is based on the rated power range. If the operation range is large than 20% of lower power range, both end of specified voltage shall be tested. Otherwise, the typical voltage specification is selected as test voltage.

The EUT is connected to the power mains through a coupling device that directly couples to the Voltage Dips and Interruption Generator.

The EUT shall be tested for 30% voltage dip of supplied voltage and duration 10ms, with a sequence of three voltage dips with intervals of 10 seconds, for 60% voltage dip of supplied voltage and duration 100ms with a sequence of three voltage dips with intervals of 10 seconds, and for 95% voltage interruption of supplied voltage and duration 5000ms with a sequence of three voltage interruptions with intervals of 10 seconds.

Voltage phase shifting are shall occur at 0°, 45°, 90°, 135°, 180°, 225°, 270°, 315° of the voltage.

#### **10.5. Test Specification**

According to IEC 61000-4-11 : 2004

#### **10.6. Uncertainty**

The uncertainty of the voltage of the waveform is  $\pm 1.63\%$

The uncertainty of the timing of the waveform is  $\pm 2.76\%$

#### **10.7. Test Result**

Owing to the DC operation of EUT, this test item is not performed.

## **11. EMC Reduction Method During Compliance Testing**

No modification was made during testing.

## 12. Test Result

The test results in the emission and the immunity were performed according to the requirements of measurement standard and process. Quietek Corporation is assumed full responsibility for the accuracy and completeness of these measurements. The test data of the emission is listed as below.

All the tests were carried out with the EUT in normal operation, which was defined as:

EMI MODE	GPS mode
EMS MODE	GPS mode

### 12.1. Test Data of Conducted Emission

Product : AIS Class B Transponder  
 Test Item : Conducted Emission  
 Test Site : No.1 Shielded Room  
 Power Line : Line 1  
 Test Mode : GPS mode (DC 24V)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV	Margin dB	Limit dBuV
<b>LINE (+)</b>					
<b>Quasi-Peak</b>					
0.542	0.150	39.860	40.010	-15.990	56.000
1.084	0.160	31.140	31.300	-24.700	56.000
1.627	0.170	30.880	31.050	-24.950	56.000
5.302	0.212	36.830	37.042	-22.958	60.000
13.392	0.484	43.790	44.274	-15.726	60.000
26.421	0.890	41.240	42.130	-17.870	60.000
<b>Average</b>					
0.542	0.150	39.850	40.000	-6.000	46.000
1.084	0.160	31.130	31.290	-14.710	46.000
1.627	0.170	30.870	31.040	-14.960	46.000
5.302	0.212	30.320	30.532	-19.468	50.000
13.392	0.484	38.270	38.754	-11.246	50.000
26.421	0.890	35.570	36.460	-13.540	50.000

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. "■" means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product : AIS Class B Transponder  
 Test Item : Conducted Emission  
 Test Site : No.1 Shielded Room  
 Power Line : Line 1  
 Test Mode : GPS mode (DC 24V)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV	Margin dB	Limit dBuV
<b>LINE (-)</b>					
<b>Quasi-Peak</b>					
0.297	0.224	31.610	31.834	-29.966	61.800
0.543	0.220	35.010	35.230	-20.770	56.000
5.302	0.262	35.020	35.282	-24.718	60.000
9.489	0.382	40.330	40.712	-19.288	60.000
13.954	0.527	45.680	46.207	-13.793	60.000
26.418	0.850	40.830	41.680	-18.320	60.000
<b>Average</b>					
0.297	0.224	31.600	31.824	-19.976	51.800
0.543	0.220	35.000	35.220	-10.780	46.000
5.302	0.262	28.680	28.942	-21.058	50.000
9.489	0.382	34.960	35.342	-14.658	50.000
13.954	0.527	40.280	40.807	-9.193	50.000
26.418	0.850	34.880	35.730	-14.270	50.000

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. "■" means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product : AIS Class B Transponder  
 Test Item : Conducted Emission  
 Test Site : No.1 Shielded Room  
 Power Line : Line 1  
 Test Mode : GPS mode (DC 12V)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV	Margin dB	Limit dBuV
<b>LINE (+)</b>					
<b>Quasi-Peak</b>					
0.542	0.150	40.150	40.300	-15.700	56.000
1.084	0.160	31.600	31.760	-24.240	56.000
1.626	0.170	31.200	31.370	-24.630	56.000
5.302	0.212	36.590	36.802	-23.198	60.000
13.396	0.484	44.260	44.744	-15.256	60.000
26.416	0.890	42.110	43.000	-17.000	60.000
<b>Average</b>					
0.542	0.150	40.140	40.290	-5.710	46.000
1.084	0.160	31.590	31.750	-14.250	46.000
1.626	0.170	31.190	31.360	-14.640	46.000
5.302	0.212	29.790	30.002	-19.998	50.000
13.396	0.484	38.620	39.104	-10.896	50.000
26.416	0.890	35.470	36.360	-13.640	50.000

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. "■" means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product : AIS Class B Transponder  
 Test Item : Conducted Emission  
 Test Site : No.1 Shielded Room  
 Power Line : Line 1  
 Test Mode : GPS mode (DC 12V)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV	Margin dB	Limit dBuV
<b>LINE (-)</b>					
<b>Quasi-Peak</b>					
0.542	0.220	35.310	35.530	-20.470	56.000
2.478	0.230	20.910	21.140	-34.860	56.000
3.435	0.240	27.940	28.180	-27.820	56.000
6.880	0.296	35.960	36.256	-23.744	60.000
13.482	0.516	45.290	45.806	-14.194	60.000
25.869	0.840	40.320	41.160	-18.840	60.000
<b>Average</b>					
0.542	0.220	35.300	35.520	-10.480	46.000
2.478	0.230	15.120	15.350	-30.650	46.000
3.435	0.240	22.350	22.590	-23.410	46.000
6.880	0.296	29.780	30.076	-19.924	50.000
13.482	0.516	39.510	40.026	-9.974	50.000
25.869	0.840	32.990	33.830	-16.170	50.000

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. "■" means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

## 12.2. Test Data of Radiated Emission

Product : AIS Class B Transponder  
 Test Item : Radiated Emission Test  
 Test Site : No.3 OATS  
 Test Mode : GPS mode (DC 24V)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
<b>Horizontal</b>					
144.010	-19.397	43.200	23.802	-6.198	30.000
192.010	-20.080	45.700	25.621	-4.379	30.000
288.100	-15.077	48.200	33.123	-3.877	37.000
312.020	-14.561	44.400	29.840	-7.160	37.000
432.000	-10.289	42.200	31.912	-5.088	37.000
624.010	-6.600	41.840	35.240	-1.760	37.000
739.020	-5.393	36.780	31.388	-5.612	37.000
982.000	-2.062	34.550	32.489	-4.511	37.000
<b>Vertical</b>					
54.500	-23.487	52.680	29.193	-0.807	30.000
144.010	-19.397	48.900	29.502	-0.498	30.000
192.010	-20.080	49.000	28.921	-1.079	30.000
288.010	-15.080	49.930	34.850	-2.150	37.000
312.000	-14.561	44.350	29.789	-7.211	37.000
624.000	-6.600	38.310	31.710	-5.290	37.000
739.010	-5.393	35.110	29.718	-7.282	37.000
862.000	-3.530	35.310	31.780	-5.220	37.000
987.910	-1.990	34.360	32.371	-4.629	37.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. "■" means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor



Product : AIS Class B Transponder  
 Test Item : Radiated Emission Test  
 Test Site : No.3 OATS  
 Test Mode : GPS mode (DC 24V)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
<b>Horizontal</b>					
(Peak)					
1000.000	-6.701	53.710	47.009	-22.991	70.000
1680.000	-3.849	48.640	44.791	-25.209	70.000
2490.000	-0.096	48.000	47.904	-22.096	70.000
<b>Horizontal</b>					
(Average)					
--					
<b>Vertical</b>					
(Peak)					
1000.000	-6.701	50.930	44.229	-25.771	70.000
1320.000	-5.006	49.270	44.264	-25.736	70.000
1650.000	-4.025	55.680	51.655	-18.345	70.000
<b>Vertical</b>					
(Average)					
1650.000	-4.025	33.860	29.835	-20.165	50.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. "■" means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product : AIS Class B Transponder  
 Test Item : Radiated Emission Test  
 Test Site : No.3 OATS  
 Test Mode : GPS mode (DC 12V)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
<b>Horizontal</b>					
144.000	-19.396	43.100	23.703	-6.297	30.000
192.000	-20.080	45.600	25.520	-4.480	30.000
288.000	-15.081	48.000	32.919	-4.081	37.000
312.000	-14.561	44.000	29.439	-7.561	37.000
432.000	-10.289	42.300	32.012	-4.988	37.000
624.000	-6.600	41.900	35.300	-1.700	37.000
739.000	-5.393	36.600	31.207	-5.793	37.000
982.000	-2.062	34.600	32.539	-4.461	37.000
<b>Vertical</b>					
54.510	-23.489	52.500	29.011	-0.989	30.000
144.000	-19.396	48.800	29.403	-0.597	30.000
192.000	-20.080	48.800	28.720	-1.280	30.000
288.000	-15.081	49.780	34.699	-2.301	37.000
312.000	-14.561	44.000	29.439	-7.561	37.000
624.000	-6.600	38.000	31.400	-5.600	37.000
739.000	-5.393	35.000	29.607	-7.393	37.000
862.100	-3.530	35.100	31.570	-5.430	37.000
981.900	-2.064	34.600	32.537	-4.463	37.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. "■" means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product : AIS Class B Transponder  
 Test Item : Radiated Emission Test  
 Test Site : No.3 OATS  
 Test Mode : GPS mode (DC 12V)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
<b>Horizontal</b>					
(Peak)					
1000.000	-6.701	52.880	46.179	-23.821	70.000
1680.000	-3.849	50.160	46.311	-23.689	70.000
2500.000	-0.173	48.620	48.447	-21.553	70.000
<b>Horizontal</b>					
(Average)					
--					
<b>Vertical</b>					
(Peak)					
1000.000	-6.701	51.270	44.569	-25.431	70.000
1320.000	-5.006	51.220	46.214	-23.786	70.000
1652.000	-3.978	56.310	52.332	-17.668	70.000
<b>Vertical</b>					
(Average)					
1652.000	-3.978	34.180	30.202	-19.798	50.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. "■" means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

### **12.3. Test Data of Power Harmonics, Voltage Flucturation and Flicker**

Owing to the DC operation of EUT, this test item is not performed.

#### 12.4. Test Data of Electrostatic Discharge

Product : AIS Class B Transponder  
 Test Item : Electrostatic Discharge  
 Test Site : No.3 Shielded Room  
 Test Mode : GPS mode (DC 24V)

Item	Amount of Discharge	Voltage	Required Criteria	Complied To Criteria (A, B, C)	Results
Air Discharge	10	+2KV ,+4KV ,+8kV	B	A	Pass
	10	-2KV ,-4KV ,-8kV	B	A	Pass
Contact Discharge	25	+2KV ,+4kV	B	A	Pass
	25	-2KV ,-4kV	B	A	Pass
Indirect Discharge (HCP)	25	+2KV ,+4kV	B	A	Pass
	25	-2KV ,-4kV	B	A	Pass
Indirect Discharge (VCP)	25	+2KV ,+4kV	B	A	Pass
	25	-2KV ,-4kV	B	A	Pass

Note:

The testing performed is from lowest level up to the highest level as required by standard, but only highest level is shown on the report.

NR: No Requirement

- Meet criteria A: Operate as intended during and after the test
- Meet criteria B: Operate as intended after the test
- Meet criteria C: Loss/Error of function
- Additional Information
  - EUT stopped operation and could / could not be reset by operator at \_\_\_\_ kV.
  - No false alarms or other malfunctions were observed during or after the test.

Product : AIS Class B Transponder  
 Test Item : Electrostatic Discharge  
 Test Site : No.3 Shielded Room  
 Test Mode : GPS mode (DC 12V)

Item	Amount of Discharge	Voltage	Required Criteria	Complied To Criteria (A, B, C)	Results
Air Discharge	10	+2KV ,+4KV ,+8kV	B	A	Pass
	10	-2KV ,-4KV ,-8kV	B	A	Pass
Contact Discharge	25	+2KV ,+4kV	B	A	Pass
	25	-2KV ,-4kV	B	A	Pass
Indirect Discharge (HCP)	25	+2KV ,+4kV	B	A	Pass
	25	-2KV ,-4kV	B	A	Pass
Indirect Discharge (VCP)	25	+2KV ,+4kV	B	A	Pass
	25	-2KV ,-4kV	B	A	Pass

Note:

The testing performed is from lowest level up to the highest level as required by standard, but only highest level is shown on the report.

NR: No Requirement

- Meet criteria A: Operate as intended during and after the test
- Meet criteria B: Operate as intended after the test
- Meet criteria C: Loss/Error of function
- Additional Information
  - EUT stopped operation and could / could not be reset by operator at \_\_\_\_ kV.
  - No false alarms or other malfunctions were observed during or after the test.

## 12.5. Test Data of Radiated Susceptibility

Product : AIS Class B Transponder  
 Test Item : Radiated Susceptibility  
 Test Site : No.2 EMC fully Chamber  
 Test Mode : GPS mode (DC 24V)

Frequency (MHz)	Position (Angle)	Polarity (H or V)	Field Strength (V/m)	Required Criteria	Complied To Criteria (A, B, C)	Results
80-1000	0°	H	3	A	A	Pass
80-1000	0°	V	3	A	A	Pass
80-1000	90°	H	3	A	A	Pass
80-1000	90°	V	3	A	A	Pass
80-1000	180°	H	3	A	A	Pass
80-1000	180°	V	3	A	A	Pass
80-1000	270°	H	3	A	A	Pass
80-1000	270°	V	3	A	A	Pass
1400-2700	0°	H	3	A	A	Pass
1400-2700	0°	V	3	A	A	Pass
1400-2700	90°	H	3	A	A	Pass
1400-2700	90°	V	3	A	A	Pass
1400-2700	180°	H	3	A	A	Pass
1400-2700	180°	V	3	A	A	Pass
1400-2700	270°	H	3	A	A	Pass
1400-2700	270°	V	3	A	A	Pass

Note:

The exclusion band = 13.56MHz  $\pm$  5MHz

- Meet criteria A: Operate as intended during and after the test
- Meet criteria B: Operate as intended after the test
- Meet criteria C: Loss/Error of function
- Additional Information
  - There was no observable degradation in performance.
  - EUT stopped operation and could / could not be reset by operator at \_\_\_\_\_ V/m at frequency \_\_\_\_\_MHz.
  - No false alarms or other malfunctions were observed during or after the test.

Product : AIS Class B Transponder  
 Test Item : Radiated Susceptibility  
 Test Site : No.2 EMC fully Chamber  
 Test Mode : GPS mode (DC 12V)

Frequency (MHz)	Position (Angle)	Polarity (H or V)	Field Strength (V/m)	Required Criteria	Complied To Criteria (A, B, C)	Results
80-1000	0°	H	3	A	A	Pass
80-1000	0°	V	3	A	A	Pass
80-1000	90°	H	3	A	A	Pass
80-1000	90°	V	3	A	A	Pass
80-1000	180°	H	3	A	A	Pass
80-1000	180°	V	3	A	A	Pass
80-1000	270°	H	3	A	A	Pass
80-1000	270°	V	3	A	A	Pass
1400-2700	0°	H	3	A	A	Pass
1400-2700	0°	V	3	A	A	Pass
1400-2700	90°	H	3	A	A	Pass
1400-2700	90°	V	3	A	A	Pass
1400-2700	180°	H	3	A	A	Pass
1400-2700	180°	V	3	A	A	Pass
1400-2700	270°	H	3	A	A	Pass
1400-2700	270°	V	3	A	A	Pass

Note:

The exclusion band = 13.56MHz  $\pm$  5MHz

- Meet criteria A: Operate as intended during and after the test
- Meet criteria B: Operate as intended after the test
- Meet criteria C: Loss/Error of function
- Additional Information
  - There was no observable degradation in performance.
  - EUT stopped operation and could / could not be reset by operator at \_\_\_\_\_ V/m at frequency \_\_\_\_\_MHz.
  - No false alarms or other malfunctions were observed during or after the test.



## 12.6. Test Data of Electrical Fast Transient

Product : AIS Class B Transponder  
 Test Item : Electrical Fast Transient  
 Test Site : No.6 Shielded Room  
 Test Mode : GPS mode (DC 24V)

Inject Line	Polarity	Voltage (kV)	Inject Time (Second)	Inject Method	Required Criteria	Complied to Criteria	Result
Power	±	1kV	300	Direct	B	A	Pass
Power Ground	±	1kV	300	Direct	B	A	Pass
Power - Power Ground	±	1kV	300	Direct	B	A	Pass
VHF	±	0.5kV	300	Clamp	B	A	Pass
GPS	±	0.5kV	300	Clamp	B	A	Pass
NMEA0183	±	0.5kV	300	Clamp	B	A	Pass
NMEA2000	±	0.5kV	300	Clamp	B	A	Pass

Note:

The testing performed is from lowest level up to the highest level as required by standard, but only highest level is shown on the report.

- Meet criteria A : Operate as intended during and after the test
- Meet criteria B : Operate as intended after the test
- Meet criteria C : Loss/Error of function
- Additional Information
  - EUT stopped operation and could / could not be reset by operator at \_\_\_\_\_ kV of Line \_\_\_\_\_.
- No false alarms or other malfunctions were observed during or after the test.

Product : AIS Class B Transponder  
 Test Item : Electrical Fast Transient  
 Test Site : No.6 Shielded Room  
 Test Mode : GPS mode (DC 12V)

Inject Line	Polarity	Voltage (kV)	Inject Time (Second)	Inject Method	Required Criteria	Complied to Criteria	Result
Power	±	1kV	300	Direct	B	A	Pass
Power Ground	±	1kV	300	Direct	B	A	Pass
Power - Power Ground	±	1kV	300	Direct	B	A	Pass
VHF	±	0.5kV	300	Clamp	B	A	Pass
GPS	±	0.5kV	300	Clamp	B	A	Pass
NMEA0183	±	0.5kV	300	Clamp	B	A	Pass
NMEA2000	±	0.5kV	300	Clamp	B	A	Pass

Note:

The testing performed is from lowest level up to the highest level as required by standard, but only highest level is shown on the report.

- Meet criteria A : Operate as intended during and after the test
- Meet criteria B : Operate as intended after the test
- Meet criteria C : Loss/Error of function
- Additional Information
  - EUT stopped operation and could / could not be reset by operator at \_\_\_\_\_ kV of Line \_\_\_\_\_.
- No false alarms or other malfunctions were observed during or after the test.

### 12.7. Test Data of Surge

Owing to the DC operation of EUT, this test item is not performed.

## 12.8. Test Data of Conducted Susceptibility

Product : AIS Class B Transponder  
 Test Item : Conducted Susceptibility  
 Test Site : No.6 Shielded Room  
 Test Mode : GPS mode (DC 24V)

Frequency Range (MHz)	Voltage Applied (dBuV(V))	Inject Method	Tested Port of EUT	Required Criteria	Performance Criteria Complied To	Result
0.15~80	130(3V)	CDN	DC 24V	A	A	PASS
0.15~80	130(3V)	Clamp	VHF	A	A	PASS
0.15~80	130(3V)	Clamp	GPS	A	A	PASS
0.15~80	130(3V)	Clamp	NMEA0183	A	A	PASS
0.15~80	130(3V)	Clamp	NMEA2000	A	A	PASS

Note:

The testing performed is from lowest level up to the highest level as required by standard, but only highest level is shown on the report.

- Meet criteria A: Operate as intended during and after the test
- Meet criteria B: Operate as intended after the test
- Meet criteria C: Loss/Error of function
- Additional Information
  - EUT stopped operation and could / could not be reset by operator at \_\_\_\_\_ kV of Line \_\_\_\_\_.
  - No false alarms or other malfunctions were observed during or after the test. The acceptance criteria were met, and the EUT passed the test.

Product : AIS Class B Transponder  
 Test Item : Conducted Susceptibility  
 Test Site : No.6 Shielded Room  
 Test Mode : GPS mode (DC 12V)

Frequency Range (MHz)	Voltage Applied (dBuV(V))	Inject Method	Tested Port of EUT	Required Criteria	Performance Criteria Complied To	Result
0.15~80	130(3V)	CDN	DC 12V	A	A	PASS
0.15~80	130(3V)	Clamp	VHF	A	A	PASS
0.15~80	130(3V)	Clamp	GPS	A	A	PASS
0.15~80	130(3V)	Clamp	NMEA0183	A	A	PASS
0.15~80	130(3V)	Clamp	NMEA2000	A	A	PASS

Note:

The testing performed is from lowest level up to the highest level as required by standard, but only highest level is shown on the report.

- Meet criteria A: Operate as intended during and after the test
- Meet criteria B: Operate as intended after the test
- Meet criteria C: Loss/Error of function
- Additional Information
  - EUT stopped operation and could / could not be reset by operator at \_\_\_\_\_ kV of Line \_\_\_\_\_.
  - No false alarms or other malfunctions were observed during or after the test. The acceptance criteria were met, and the EUT passed the test.

## 12.9. Test Data of Voltage Dips and Interruption

Owing to the DC operation of EUT, this test item is not performed.

## **Attachment 1 : EUT Test Setup Photographs**

**Attachment 1: EUT Test Setup Photographs**

Front View of Conducted Test



Back View of Conducted Test





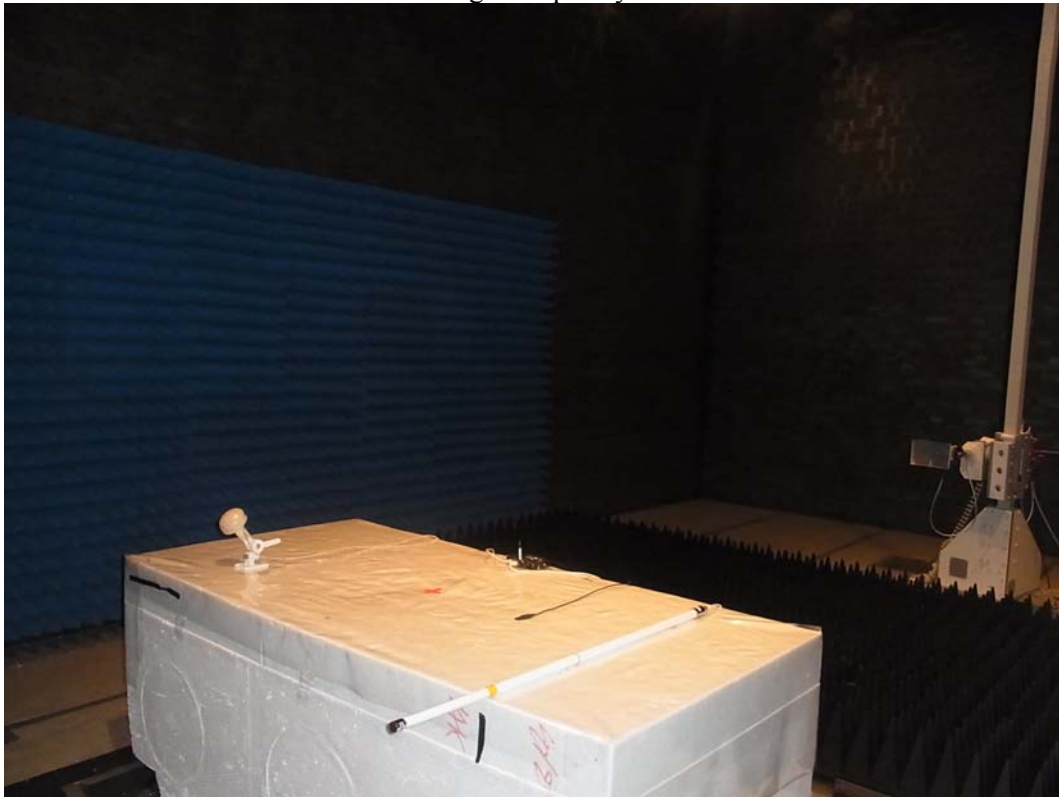
Front View of Radiated Test



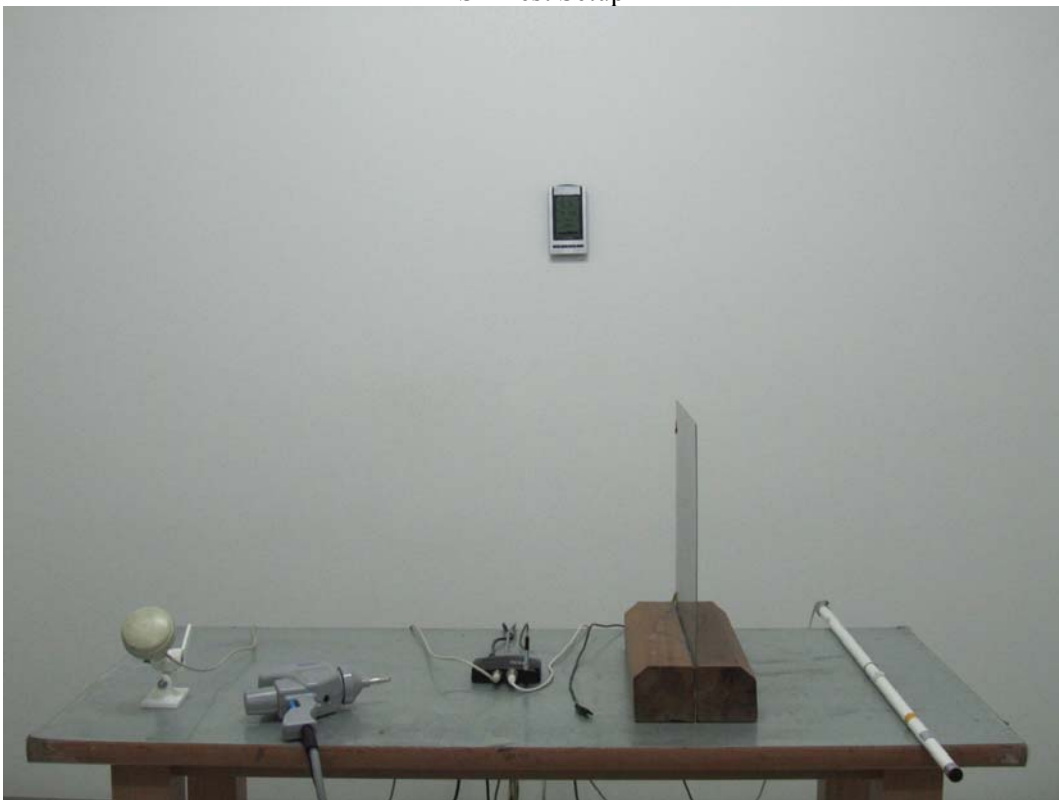
Back View of Radiated Test



Front View of High Frequency Radiated Test



ESD Test Setup



Radiated Susceptibility Test Setup



EFT/B Test Setup



EFT/B Test Setup – Clamp



Conducted Susceptibility Test Setup



Conducted Susceptibility Test Setup - Clamp



## **Attachment 2 : EUT Detailed Photographs**

**Attachment 2 : EUT Detailed Photographs**

(1) EUT Photo



(2) EUT Photo



(3) EUT Photo



(4) EUT Photo

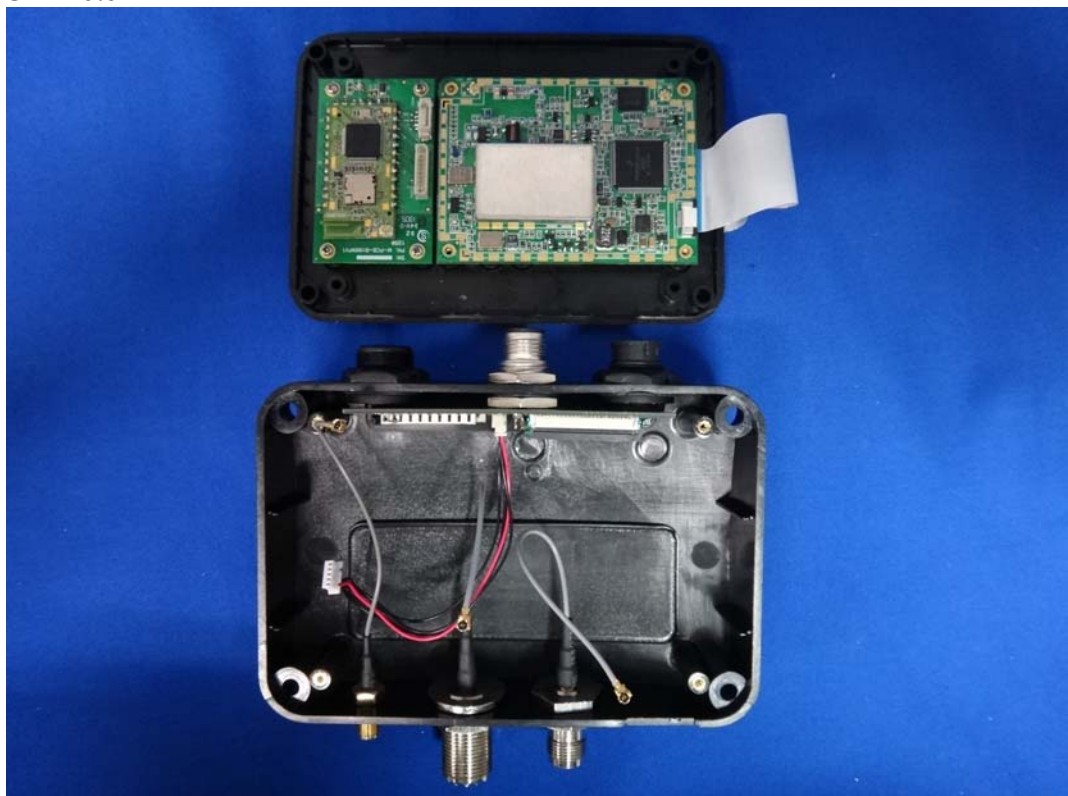




(5) EUT Photo



(6) EUT Photo



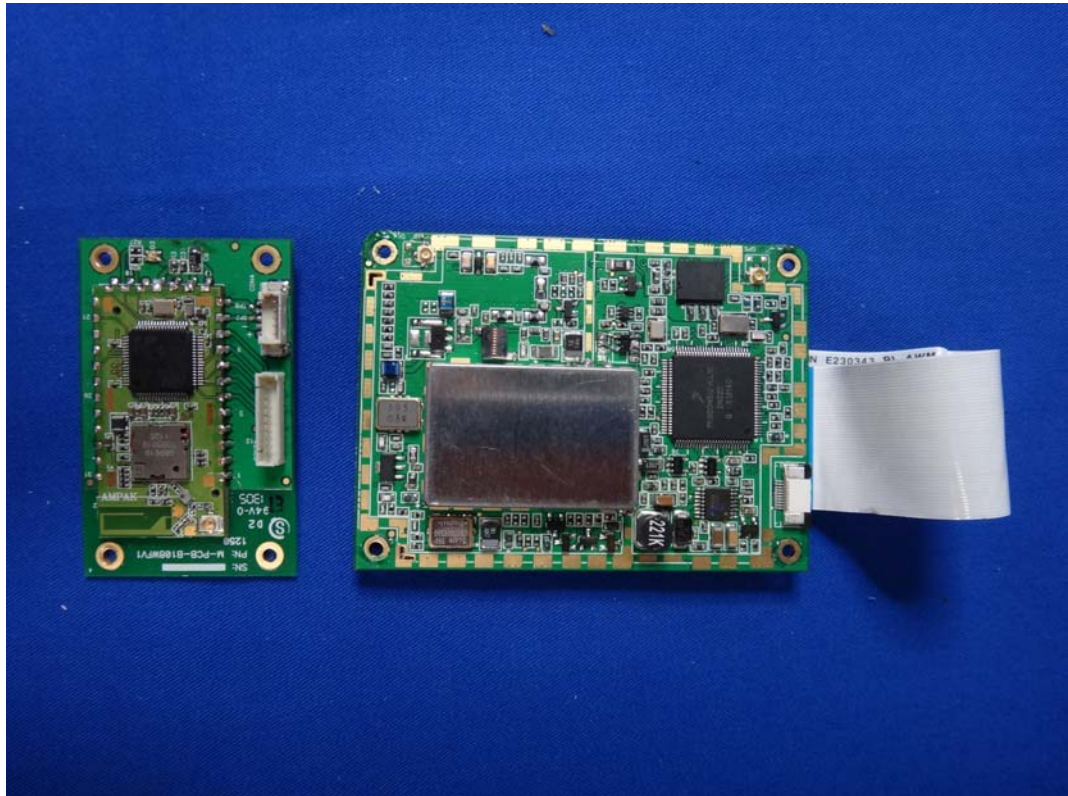
(7) EUT Photo



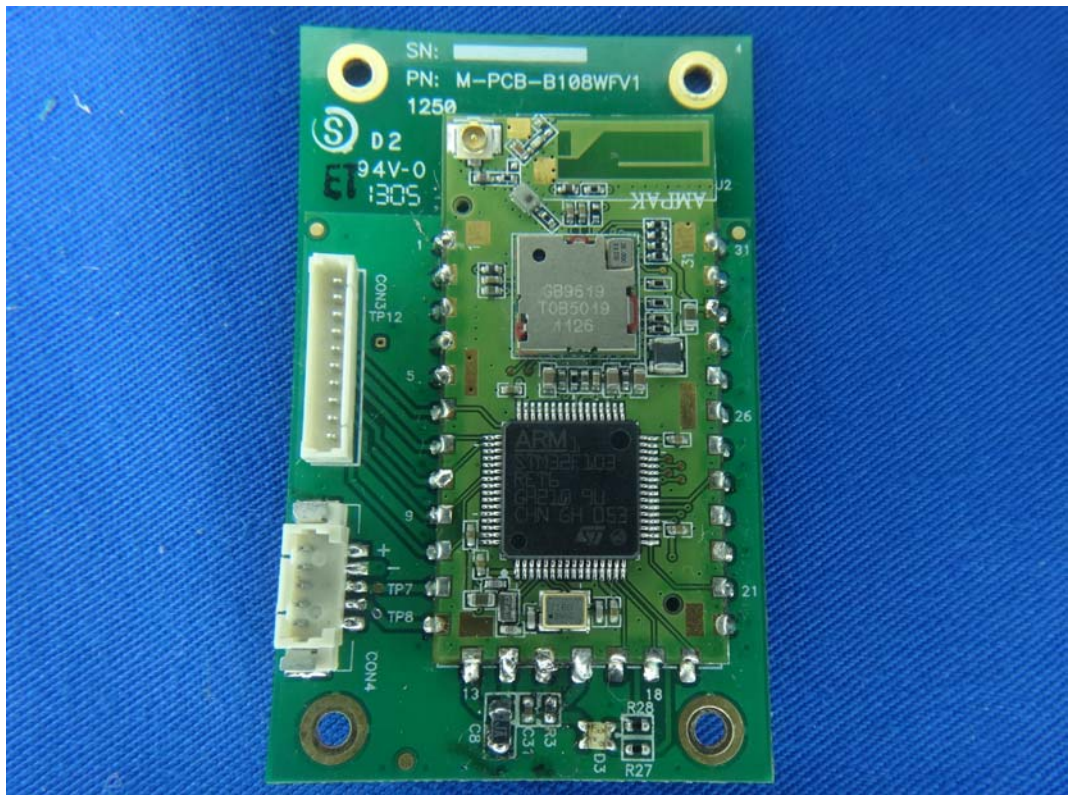
(8) EUT Photo



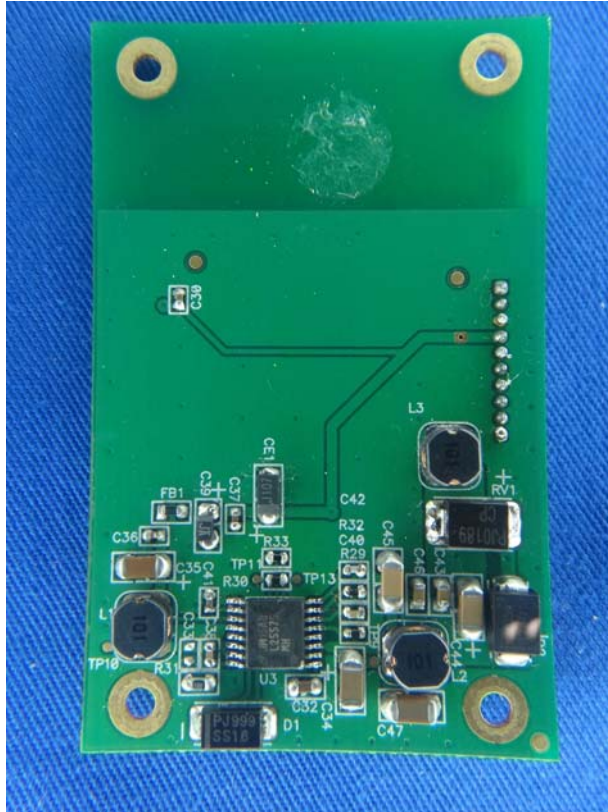
(9) EUT Photo



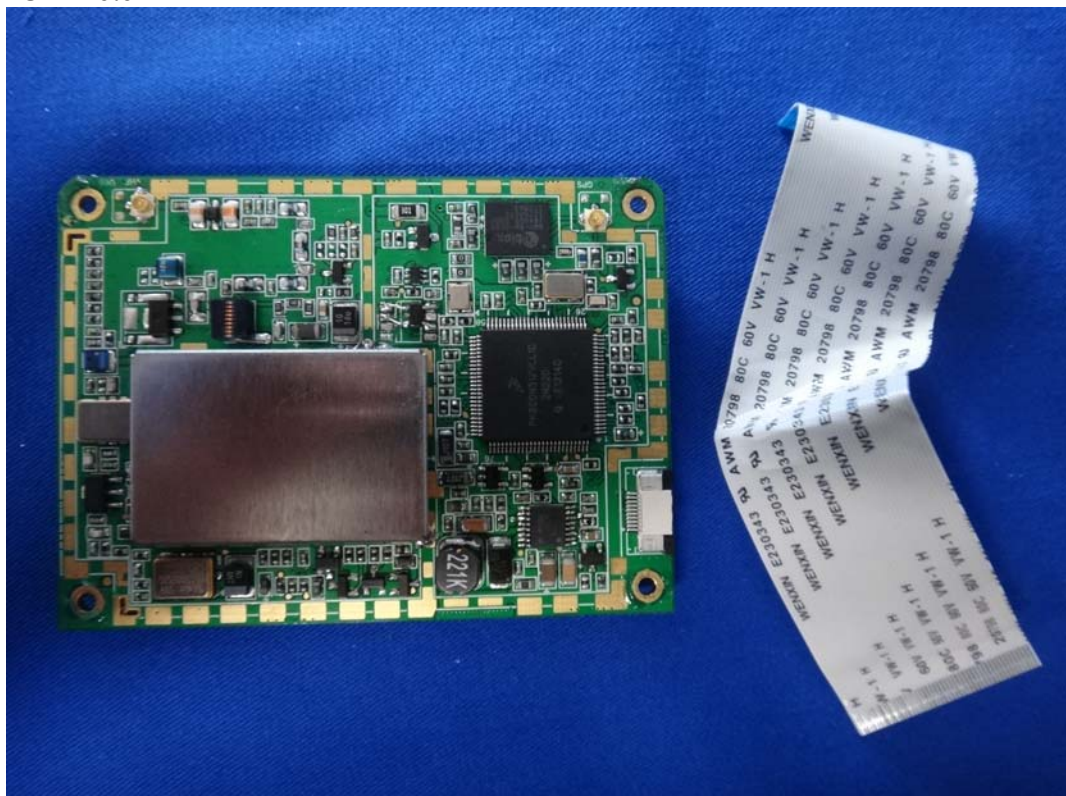
(10) EUT Photo



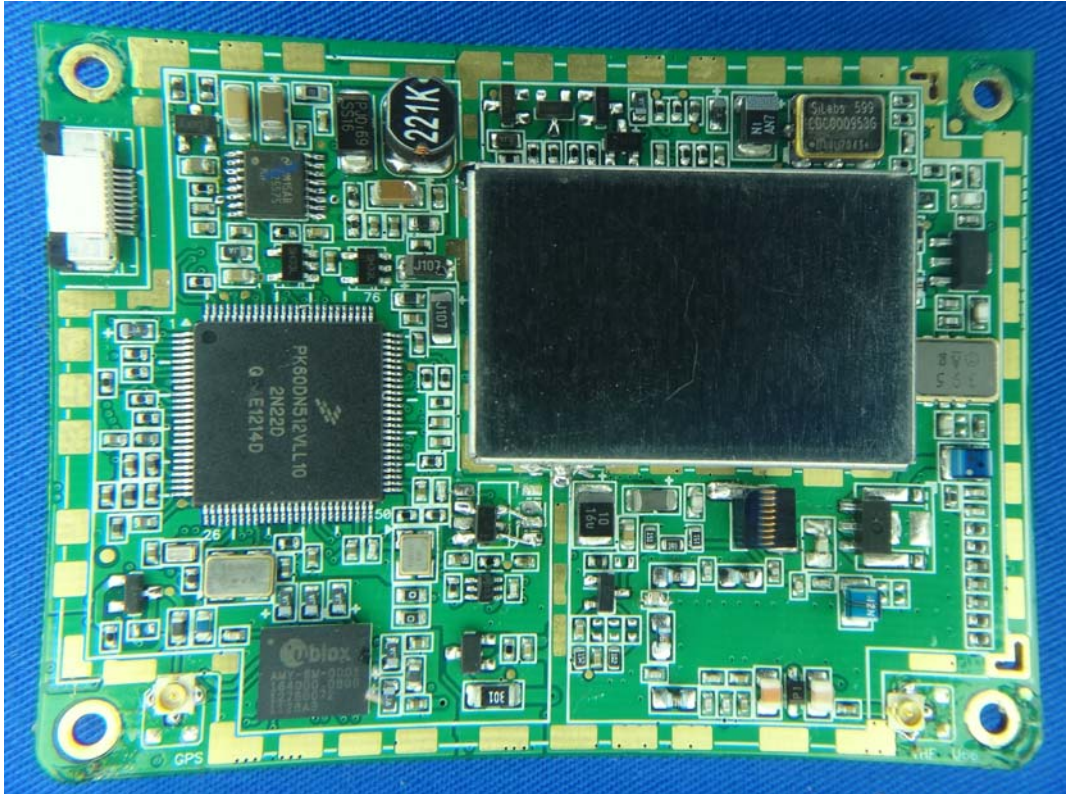
(11) EUT Photo



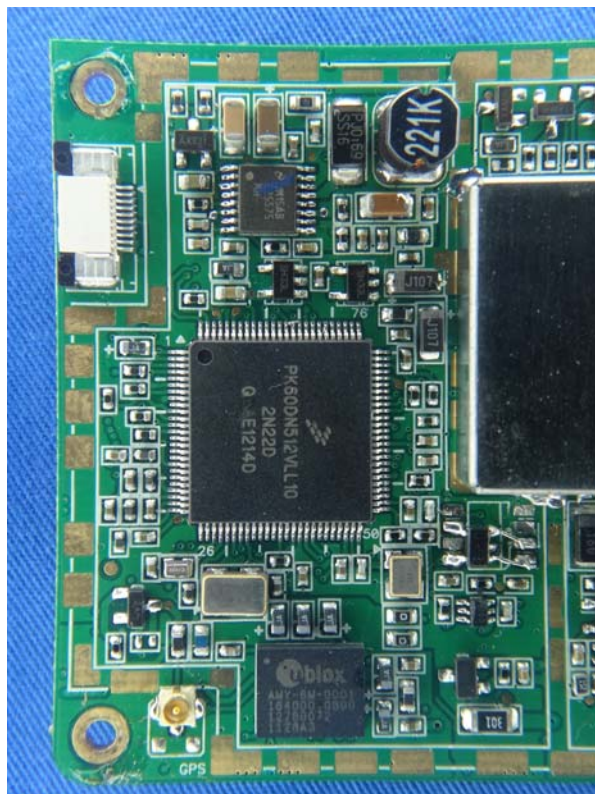
(12) EUT Photo



(13) EUT Photo



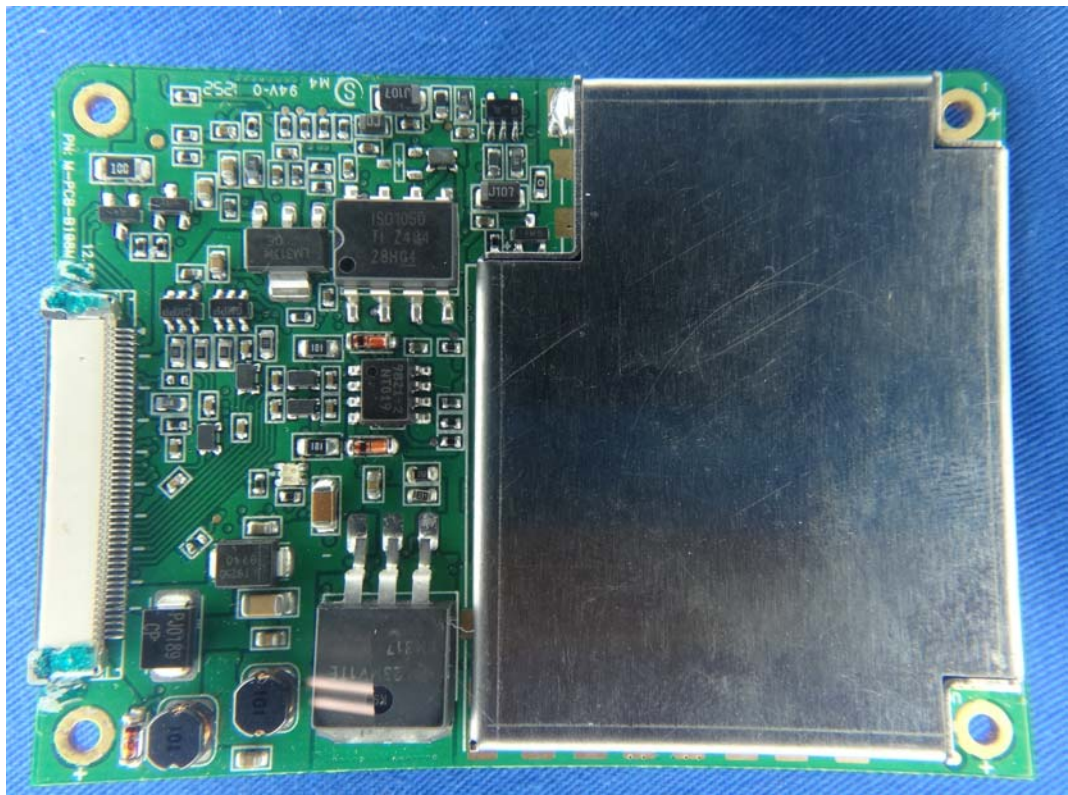
(14) EUT Photo



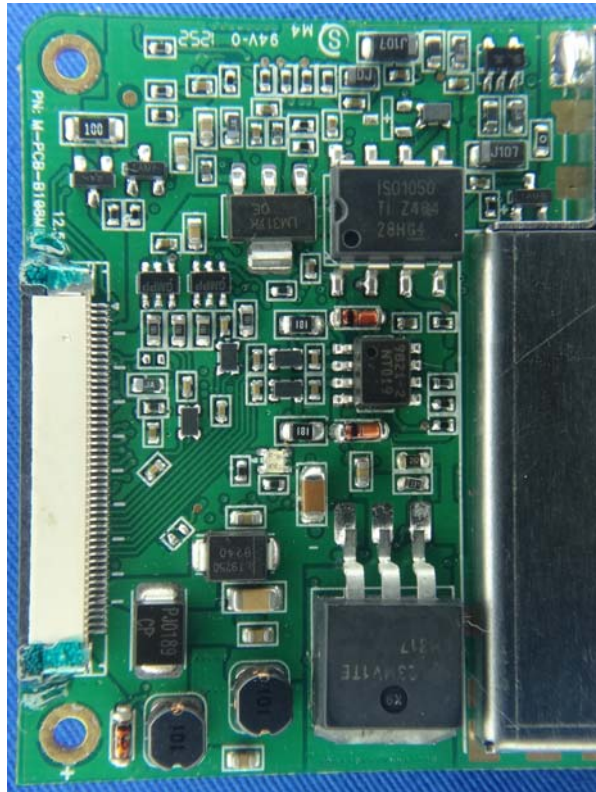
(15) EUT Photo



(16) EUT Photo



(17) EUT Photo



(18) EUT Photo (WLAN -ANT)



(19) EUT Photo (GPS Antenna-10m)



(20) EUT Photo (GPS Antenna-10m)





(21) EUT Photo (VHF Antenna)



(22) EUT Photo (VHF Antenna)



(23) EUT Photo (VHF Antenna Cable-10m)

