



## Test Report

Product Name	AIS SART
Model No.	PLOMO-500

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

Date of Receipt	July 26, 2011
Issued Date	Aug. 19, 2011
Report No.	118010R-RFCEP76V01
Report Version	V1.0

The Test Results relate only to the samples tested.

The test report shall not be reproduced except in full without the written approval of QuieTek Corporation.

# Test Report Certification

Issued Date: Aug. 19, 2011

Report No.: 118010R-RFCEP76V01



Accredited by DNV, Nemko and NIST (NVLAP)

Product Name	AIS SART
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.	PLOMO-500
EUT Rated Voltage	DC 6V(Power by Battery)
EUT Test Voltage	DC 6V(Power by Battery)
Trade Name	AMEC
Applicable Standard	ETSI EN 301 843-1:V1.2.1 (2004.06) ETSI EN 301 843-2:V1.2.1 (2004.06)
Test Result	Complied

The test results relate only to the samples tested.

The test report shall not be reproduced except in full without the written approval of Quietek Corporation.

Documented By :

( Senior Adm. Specialist / Genie Chang )

Tested By :

( Engineer / Henk Huang )

Approved By :

( Manager / Vincent Lin )

Testing Laboratory  
0914

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## 1. GENERAL INFORMATION

### 1.1. EUT Description

Product Name	AIS SART
Trade Name	AMEC
Model No.	PLOMO-500
Frequency Range	161.975MHz / 162.025MHz
Type of Modulation	GMSK
Data Rate	9600bps / per channel
Channel Separation	25KHz
Channel Control	Auto
Hardware	M-PCB-SARTV03
Software	SART Ver. 1.1

Note:

1. QuietTek 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	Mode 1: Normal Operation
EMS Mode	Mode 1: Normal Operation

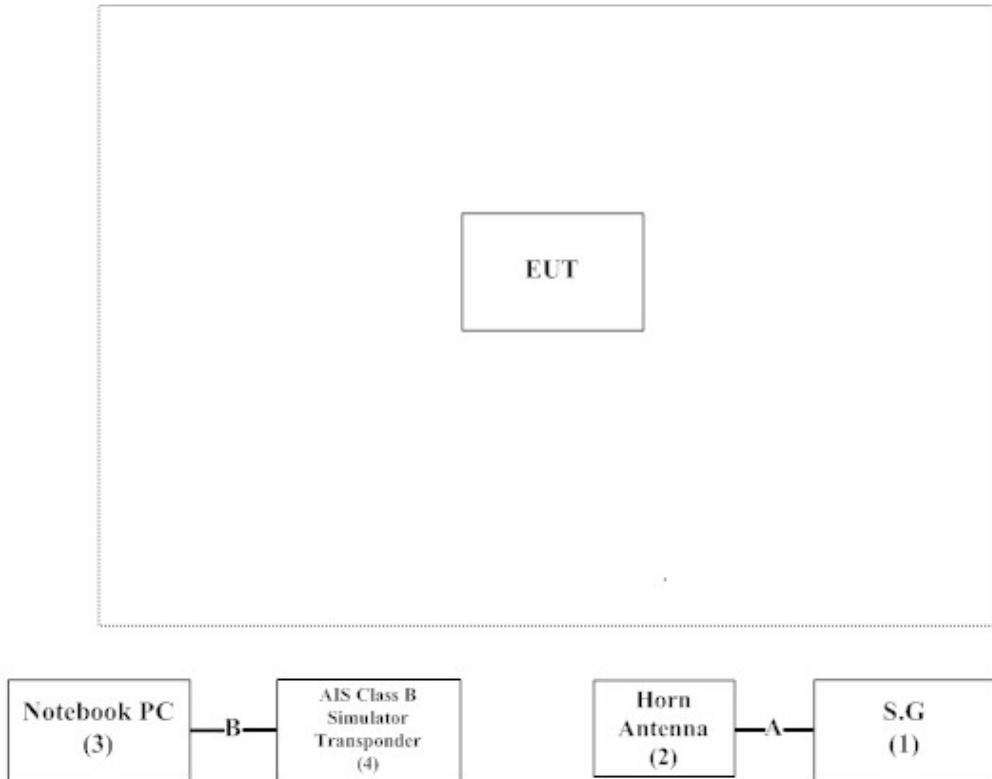
## 1.2. Tested System Details

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

Product		Manufacturer	Model No.	Serial No.	Power Cord
1	S.G	Agilent	E8257D	MY44320633	Non-Shielded, 1.8m
2	Horn Antenna	Schwarzbeck	3115	6348	N/A
3	Notebook PC	DELL	PPT	N/A	Non-Shielded, 1.8m
4	AIS Class B Simulator Transponder	AMEC	N/A	N/A	Non-Shielded, 1.8m

Signal Cable Type		Signal cable Description
A	Coaxial Cable	Shielded, 1.0m
B	RS-232 Cable	Non-Shielded, 1.8m,two PCS.

## 1.3. Configuration of tested System



#### **1.4. EUT Exercise Software**

- (1) Setup the EUT and Peripherals as shown on 1.3
- (2) Turn on the power of all equipments.
- (2) Enable the VHF and GPS function of the EUT.
- (3) The VHF and GPS function is used to perform the wireless data transmission.
- (5) Verify that the EUT works properly.

## 1.5. Test Facility

Ambient conditions in the laboratory:

Items	Test Item	Required	Actual
Temperature (°C)	IEC 61000-4-2	15-35	25
Humidity (%RH)		30-60	49
Barometric pressure (mbar)		860-1060	950-1000
Temperature (°C)	IEC 61000-4-3	15-35	25
Humidity (%RH)		25-75	54
Barometric pressure (mbar)		860-1060	950-1000
Temperature (°C)	IEC 61000-4-4	15-35	24
Humidity (%RH)		25-75	49
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	25
Humidity (%RH)		25-75	52
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/>

### Site Description:

Accredited by NVLAP  
NVLAP Lab Code: 200533-0



Accredited by DNV  
Statement No. : 413-99-LAB11



Accredited by Nemko  
Certificate No.: ELA 165



Accredited by TUV Rheinland  
Certificate No.: 10011438-1-2010



Site Name:  
Site Address:

Quietek Corporation  
No. 5-22, Ruei-Shu Valley, Ruei-Ping Tsuen,  
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Testing Laboratory

0914

## 2. Radiated Emission

### 2.1. Test Equipment

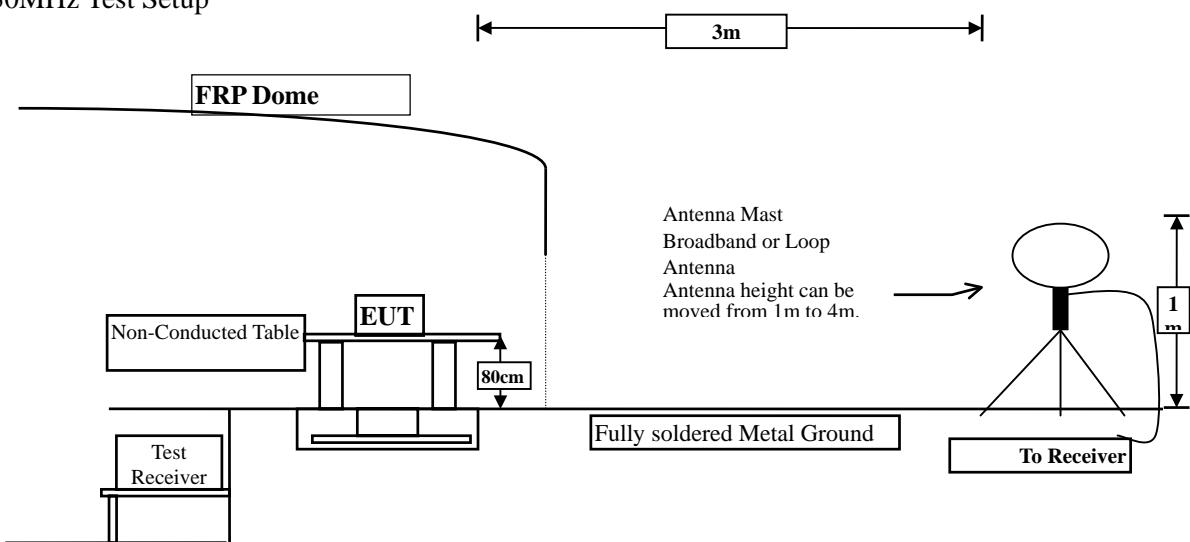
The following test equipment are used during the Radiated emission test:

Test Site	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
<input type="checkbox"/> Site # 1	Test Receiver	R & S	ESVS 10 / 834468/003	July, 2011
	Spectrum Analyzer	Advantest	R3162/ 00803480	May, 2011
	Pre-Amplifier	Advantest	BB525C/ 3307A01812	May, 2011
	Bilog Antenna	SCHAFFNER	CBL6112B / 2697	Nov., 2010
<input type="checkbox"/> Site # 2	Test Receiver	R & S	ESCS 30 / 836858 / 022	Nov., 2010
	Spectrum Analyzer	Advantest	R3162 / 100803466	May, 2011
	Pre-Amplifier	Advantest	BB525C/3307A01814	May, 2011
	Bilog Antenna	SCHAFFNER	CBL6112B / 2705	Oct., 2010
	Horn Antenna	ETS	3115 / 0005-6160	July, 2011
	Pre-Amplifier	QTK	QTK-AMP-01/ 0001	July, 2011
<input checked="" type="checkbox"/> Site # 3	Test Receiver	R & S	ESI 26 / 838786 / 004	May, 2011
	Spectrum Analyzer	Advantest	R3162 / 100803480	May, 2011
	Pre-Amplifier	QTK	QTK-AMP-03 / 0003	May, 2011
	Bilog Antenna	SCHAFFNER	CBL6112B / 2697	May, 2011
	Horn Antenna	ETS	3115 / 0005-6160	July, 2011
	Pre-Amplifier	QTK	QTK-AMP-01 / 0001	July, 2011
	Pre-Amplifier	QTK	AP-180C / CHM_0906076	Sep., 2010

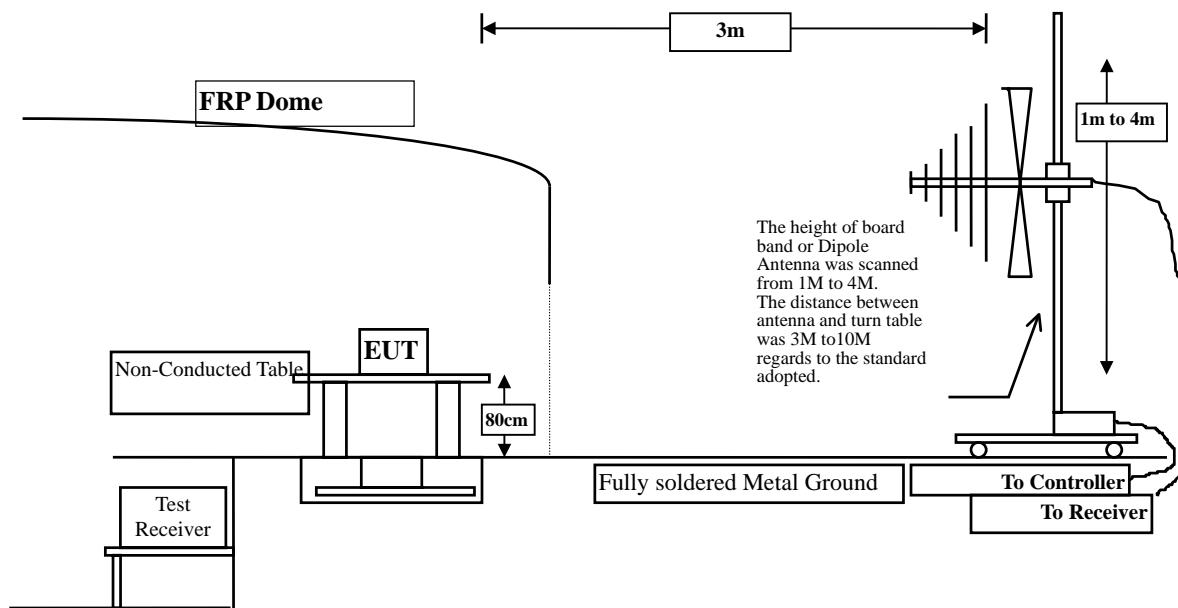
Note: 1. All equipments are calibrated every one year.  
2. The test instruments marked by “X” are used to measure the final test results.

### 2.2. Test Setup

Under 30MHz Test Setup



Above 30MHz Test Setup



### 2.3. Limits

Frequency range	Limit (Quasi Peak)	Limit (Peak)	Measuring distance
150kHz to 300kHz	80dBuV/m to 52dBuV/m		3m
300kHz to 30MHz	52dBuV/m to 34dBuV/m		3m
30MHz to 1GHz	54dBuV	Not defined	3m
1GHz to 2GHz	Not defined	54dBuV	3m
156MHz to 165MHz	24dBuV/m	30dBuV	3m

### 2.4. 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 3 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 according to ETSI EN 301 843-1: V1.2.1 (2004-06) on radiated measurement.

The measuring bandwidth shall be in accordance with table

Frequency range	Measuring bandwidth
30MHz to 2GHz	100kHz to 120kHz
156MHz to 165MHz	9kHz to 10kHz
150kHz to 30MHz	9kHz to 10kHz

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**2.5. Test Specification**

According to ETSI EN 301 843-1: V1.2.1 (2004-06)

**2.6. Uncertainty**

± 3.8 dB

**2.7. Test Result**

The emission from the EUT was below the specified limits. The worst-case emissions are shown in section 6. The EUT complies the acceptance criterion and passes the test.

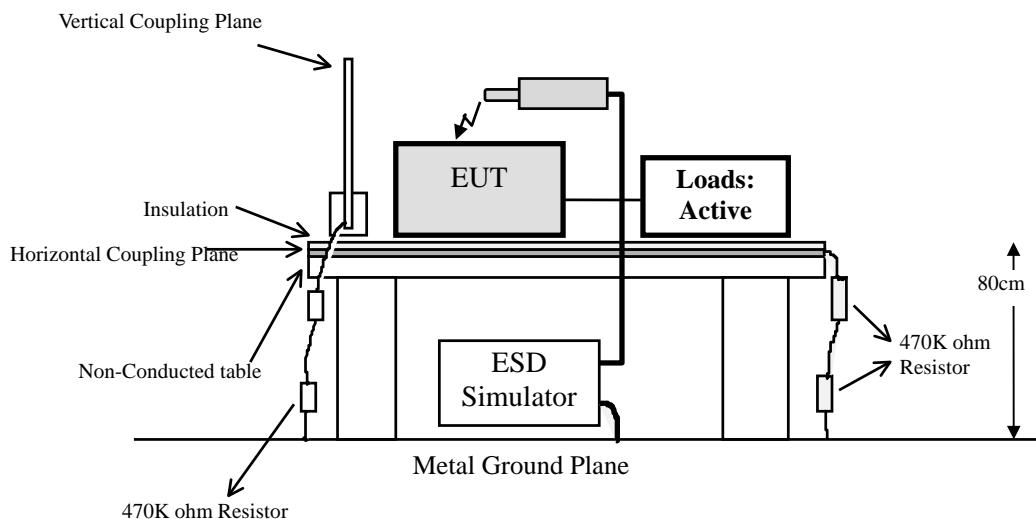
### 3. Electrostatic Discharge (ESD)

#### 3.1. Test Equipment

	Instrument	Manufacturer	Type No.	Serial No	Cal. Date
	ESD Simulator System	SCHAFFNER	NSG 438	695	May, 2011
X	ESD Simulator System	NoiseKen	TC-815R	ESS0929097	Aug, 2011
	ESD Simulator System	Thermo	MZ-15/EC/TPC-2A	0510189/ 0510190	June, 2011
	ESD Simulator System	EM TEST	dito	V0635101749	Sep, 2010
X	Horizontal Coupling Plane (HCP)	QuietTek	HCP AL50	N/A	N/A
X	Vertical Coupling Plane (VCP)	QuietTek	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.

#### 3.2. Test Setup



#### 3.3. Test Level

Item	Environmental Phenomena	Units	Test Specification	Performance Criteria
Enclosure Port				
	Electrostatic Discharge	kV(Charge Voltage)	±8 Air Discharge ±6 Contact Discharge	B

### **3.4. 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 kept 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.

### **3.5. Test Specification**

According to IEC 61000-4-2 : 2008

### **3.6. Uncertainty**

± 6.003 %

### **3.7. Test Result**

The measurement of the electrostatic discharge was investigated and test result was shown in section 6. The EUT complies the acceptance criterion and passes the test.

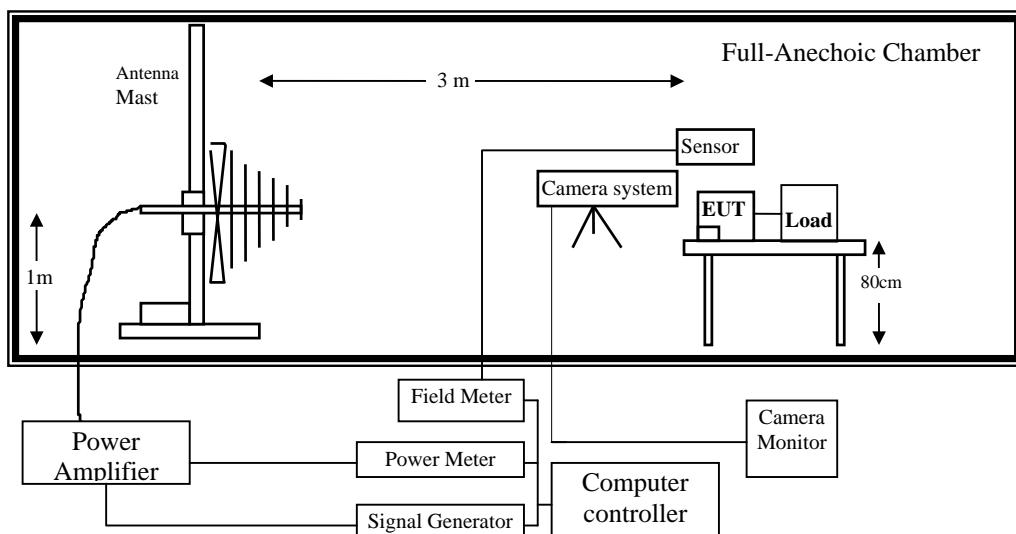
## 4. Radiated Susceptibility (RS)

### 4.1. Test Equipment

Item	Equipment	Manufacturer	Model No. / Serial No.	Last Cal.
1	Signal Generator	R & S	SML03/103330	Sep., 2010
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., 2011
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.

### 4.2. Test Setup



### 4.3. Test Level

Item	Environmental Phenomena	Units	Test Specification	Performance Criteria
Enclosure Port				
	Radio-Frequency Electromagnetic Field Amplitude Modulated	MHz V/m(Un-modulated, rms) % AM (400Hz)	80-1000 1400-2000 10 80	A

#### 4.4. 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	10 V/m Level 2
2. Radiated Signal	AM 80% Modulated with 400Hz sinusoidal audio signal
3. Scanning Frequency	80MHz - 1000MHz, 1400MHz - 2000MHz
4. Dwell Time	3 Seconds
5. Frequency step size $\Delta f$ :	1%
6. The rate of Swept of Frequency	$1.5 \times 10^{-3}$ decades/s

#### 4.5. Test Specification

According to IEC 61000-4-3: 2008

#### 4.6. Uncertainty

$\pm 6.17 \%$

#### 4.7. Test Result

The measurement of the radiated susceptibility was investigated and test result was shown in section 6. The EUT complies the acceptance criterion and passes the test.

**5. EMC Reduction Method During Compliance Testing**

No modification was made during testing.

## 6. 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	Mode 1: Normal Operation
EMS Mode	Mode 1: Normal Operation

## 6.1. Test Data of General Radiated Emissio

Product : AIS SART  
 Test Item : General Radiated Emission  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Normal Operation

Frequency MHz	Correct Factor	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
<b>Horizontal</b>					
38.083	16.613	-3.398	13.215	-40.785	54.000
206.217	13.167	2.477	15.644	-38.356	54.000
348.483	18.703	2.861	21.564	-32.436	54.000
616.850	23.960	-8.267	15.693	-38.307	54.000
810.850	26.460	-6.438	20.022	-33.978	54.000
972.517	28.654	-6.759	21.894	-32.106	54.000
<b>Vertical</b>					
57.483	8.416	4.877	13.294	-40.706	54.000
287.050	17.120	0.207	17.327	-36.673	54.000
356.567	18.920	3.413	22.333	-31.667	54.000
458.417	21.243	4.888	26.131	-27.869	54.000
644.333	24.263	-2.133	22.130	-31.870	54.000
891.683	27.553	-3.553	24.000	-30.000	54.000

Note:

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

Product : AIS SART  
Test Item : General Radiated Emission  
Test Site : No.3 OATS  
Test Mode : Mode 1: Normal Operation

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz		dB	dBuV	dB	dBuV/m

**Horizontal****Peak Detector:**

1812.500	-6.861	46.074	39.214	-14.786	54.000
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**Average Detector**

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**Vertical**

1800.000	-6.881	46.660	39.779	-14.221	54.000
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**Average Detector**

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Note:

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

## 6.2. Test Data of Electrostatic Discharge

Product : AIS SART  
 Test Item : Electrostatic Discharge  
 Test Site : No.3 Shielded Room  
 Test Mode : Mode 1: Normal Operation

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, +6kV	B	A	Pass
	25	-2kV,-4kV, -6kV	B	A	Pass
Indirect Discharge (HCP)	25	+2kV,+4kV, +6kV	B	A	Pass
	25	-2kV,-4kV, -6kV	B	A	Pass
Indirect Discharge (VCP Front)	25	+2kV,+4kV, +6kV	B	A	Pass
	25	-2kV,-4kV, -6kV	B	A	Pass
Indirect Discharge (VCP Left)	25	+2kV,+4kV, +6kV	B	A	Pass
	25	-2kV,-4kV, -6kV	B	A	Pass
Indirect Discharge (VCP Back)	25	+2kV,+4kV, +6kV	B	A	Pass
	25	-2kV,-4kV, -6kV	B	A	Pass
Indirect Discharge (VCP Right)	25	+2kV,+4kV, +6kV	B	A	Pass
	25	-2kV,-4kV, -6kV	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.

### 6.3. Test Data of Radiated Susceptibility

Product : AIS SART  
 Test Item : Radiated Susceptibility  
 Test Site : No.2 EMC fully Chamber  
 Test Mode : Mode 1: Normal Operation

Frequency (MHz)	Position (Angle)	Polarity (H or V)	Field Strength (V/m)	Required Criteria	Complied To Criteria (A, B, C)	Results
80-1000	Front	H	10	A	A	Pass
80-1000	Front	V	10	A	A	Pass
80-1000	Back	H	10	A	A	Pass
80-1000	Back	V	10	A	A	Pass
80-1000	Left	H	10	A	A	Pass
80-1000	Left	V	10	A	A	Pass
80-1000	Right	H	10	A	A	Pass
80-1000	Right	V	10	A	A	Pass
80-1000	Top	H	10	A	A	Pass
80-1000	Top	V	10	A	A	Pass
80-1000	Down	H	10	A	A	Pass
80-1000	Down	V	10	A	A	Pass
1000-2000	Front	H	10	A	A	Pass
1000-2000	Front	V	10	A	A	Pass
1000-2000	Back	H	10	A	A	Pass
1000-2000	Back	V	10	A	A	Pass
1000-2000	Left	H	10	A	A	Pass
1000-2000	Left	V	10	A	A	Pass
1000-2000	Right	H	10	A	A	Pass
1000-2000	Right	V	10	A	A	Pass
1000-2000	Top	H	10	A	A	Pass
1000-2000	Top	V	10	A	A	Pass
1000-2000	Down	H	10	A	A	Pass
1000-2000	Down	V	10	A	A	Pass

Note:

1. The exclusion band=center frequency±50kHz for Transmitter.

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.

**Attachment 1: EUT Test Photographs**

**Attachment 1: EUT Test Setup Photographs**

Front View of Radiated Emission Test (Bilog)



Back View of Radiated Emission Test (Bilog)



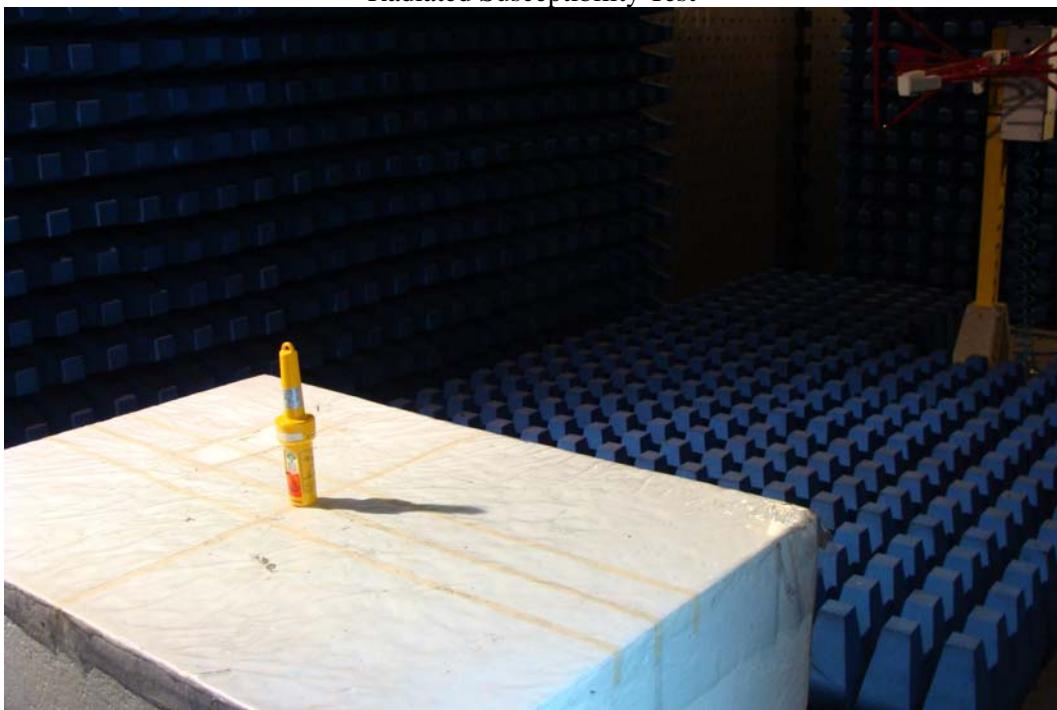
Front View of Radiated Emission Test (Horn)



Electrostatic Discharge Test



Radiated Susceptibility Test



**Attachment 2: EUT Detailed Photographs**

## Attachment 2 : EUT Detailed Photographs

### (1) EUT Photo



### (2) EUT Photo



(3) EUT Photo



(4) EUT Photo



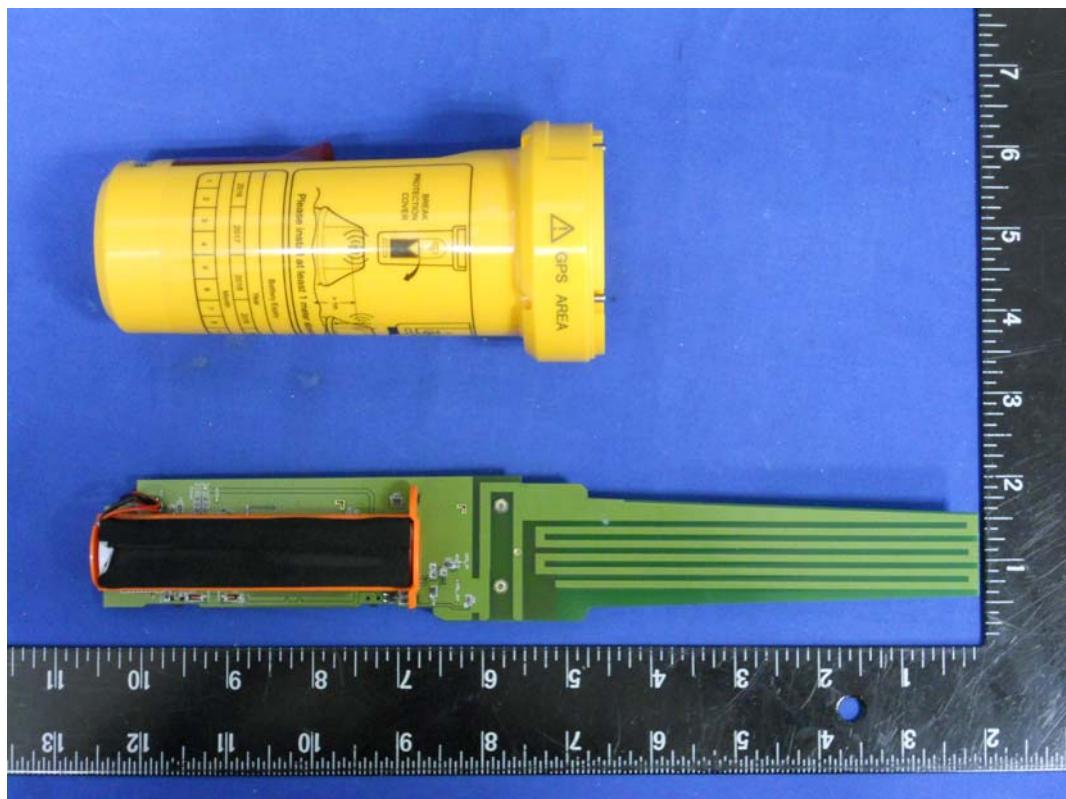
(5) EUT Photo



(6) EUT Photo



(7) EUT Photo



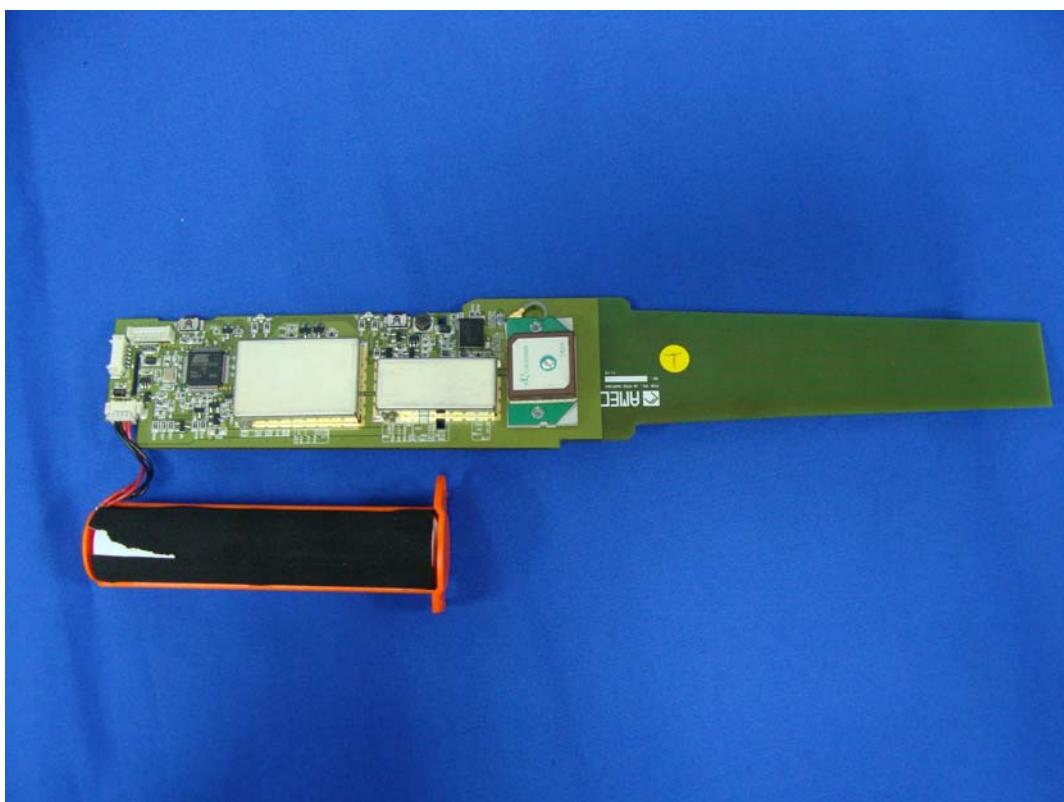
(8) EUT Photo



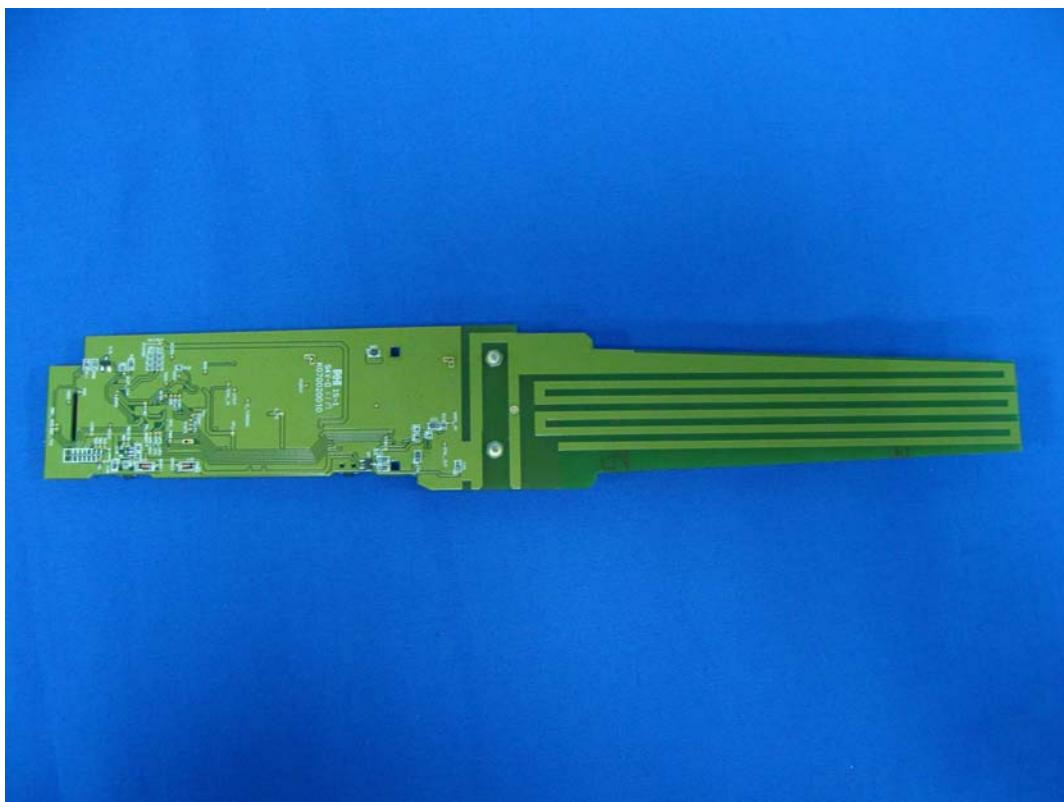
(9) EUT Photo



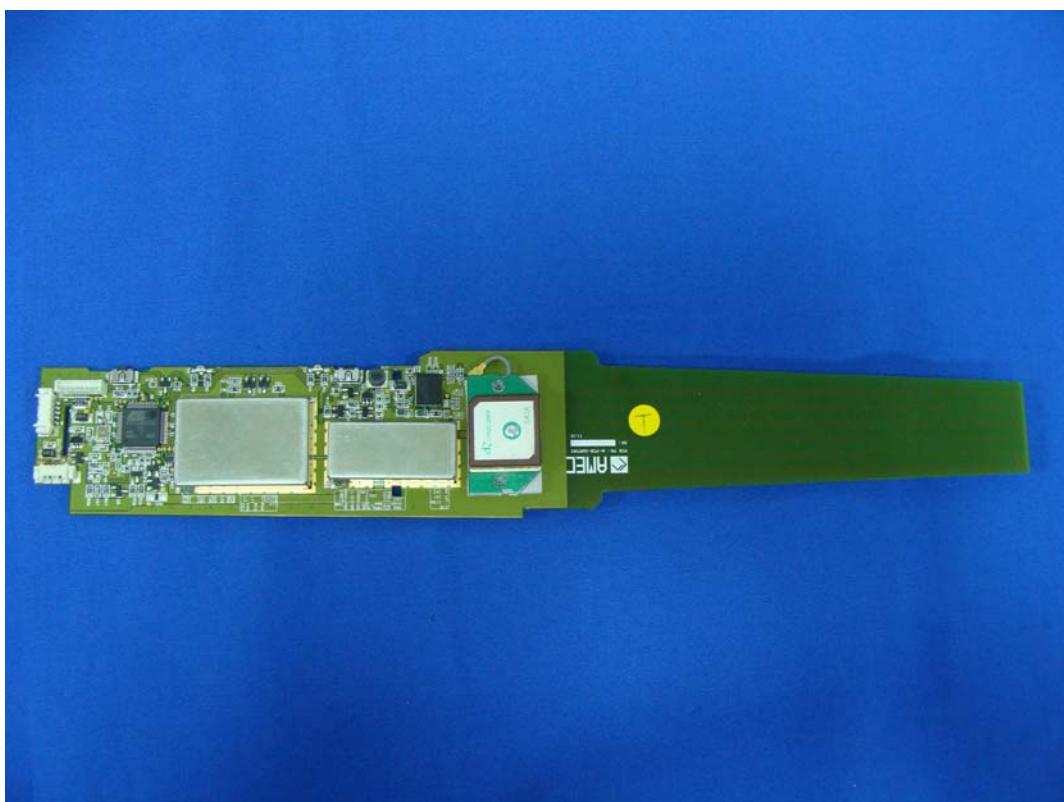
(10) EUT Photo



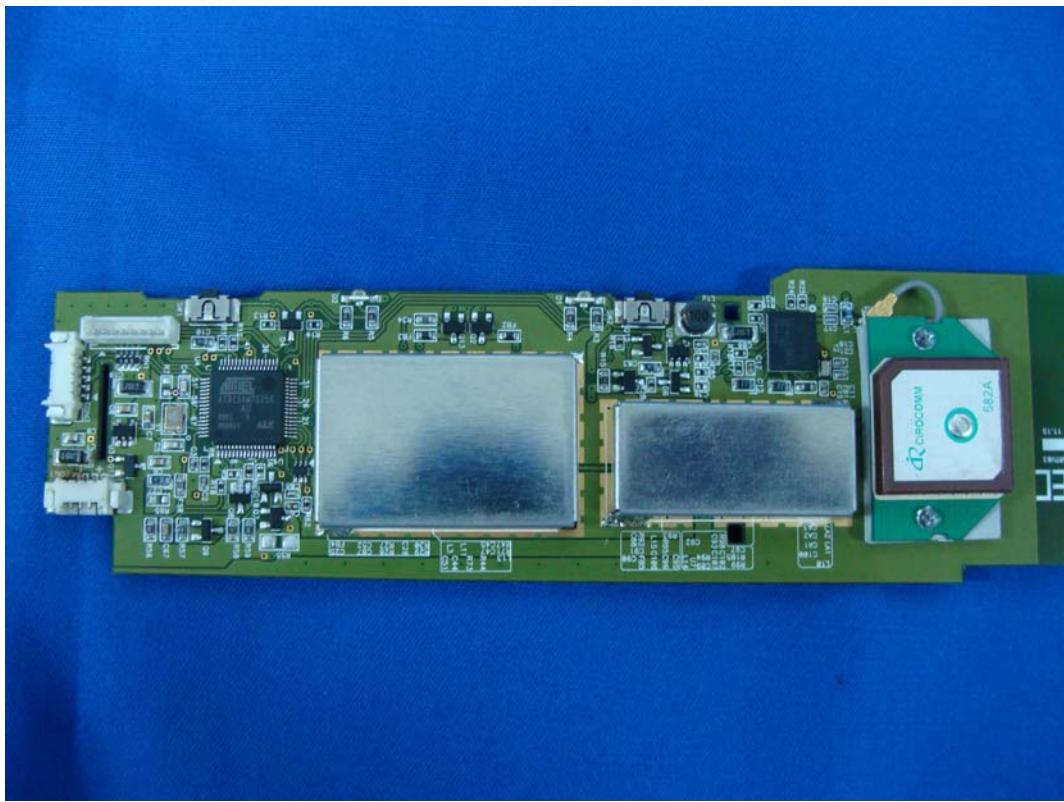
(11) EUT Photo



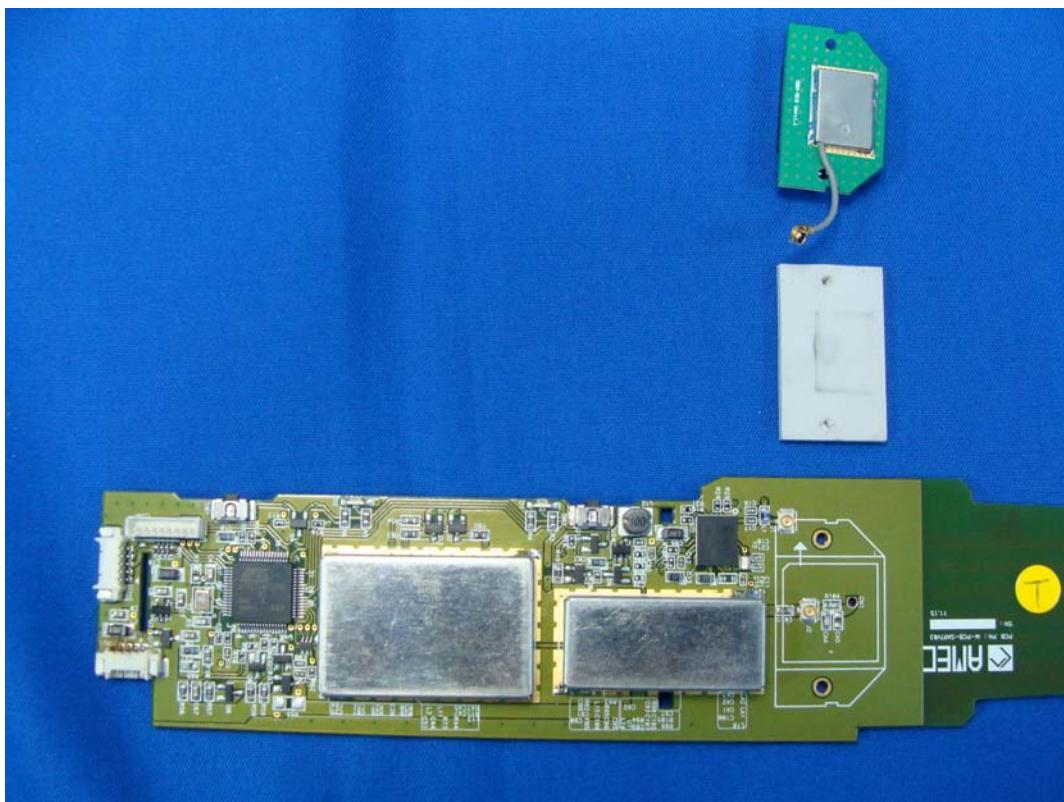
(12) EUT Photo



(13) EUT Photo



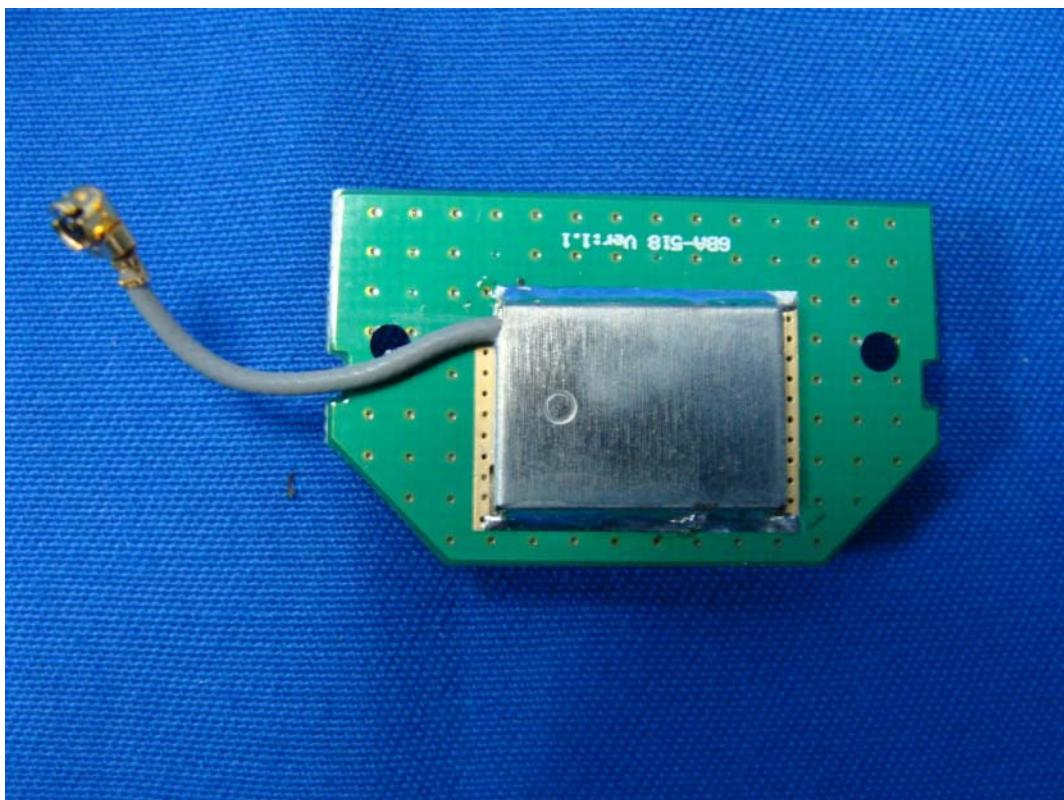
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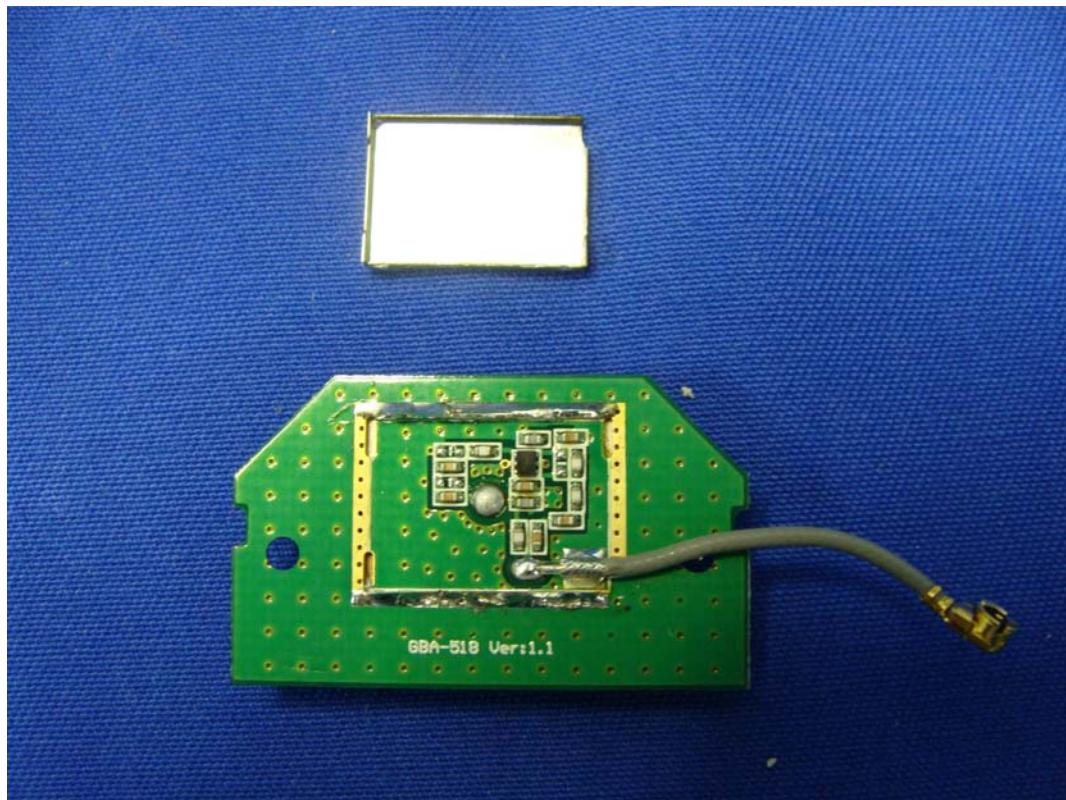
(15) EUT Photo



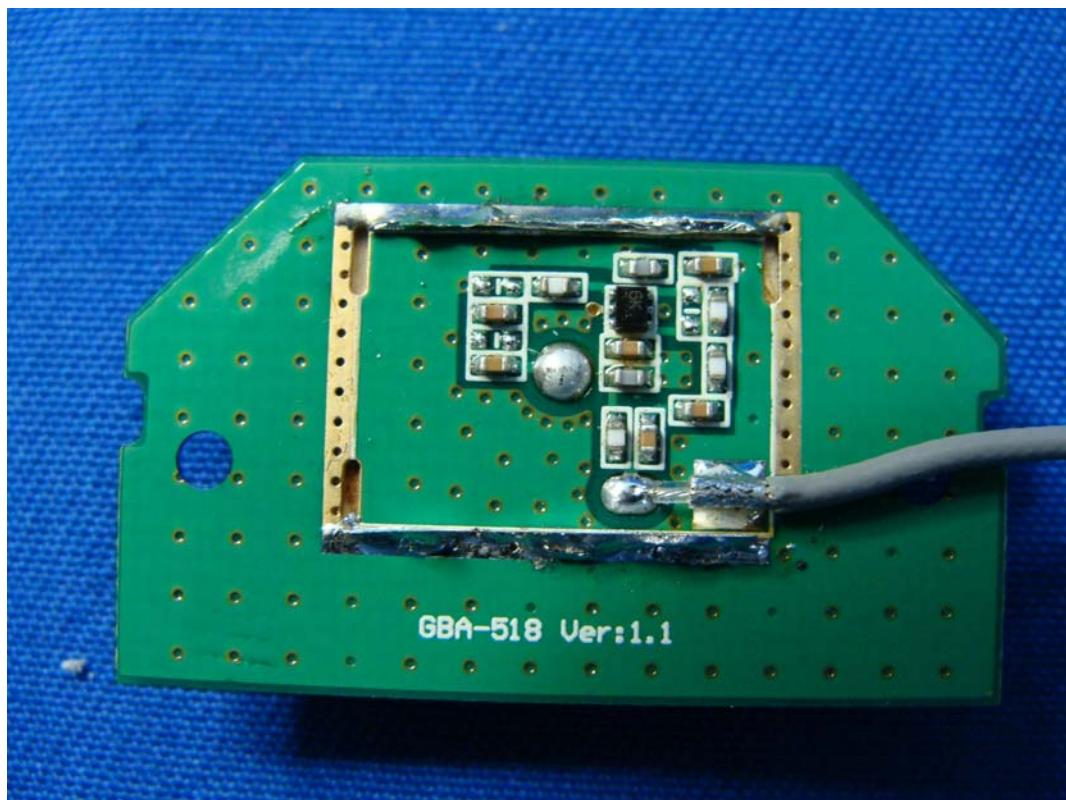
(16) EUT Photo



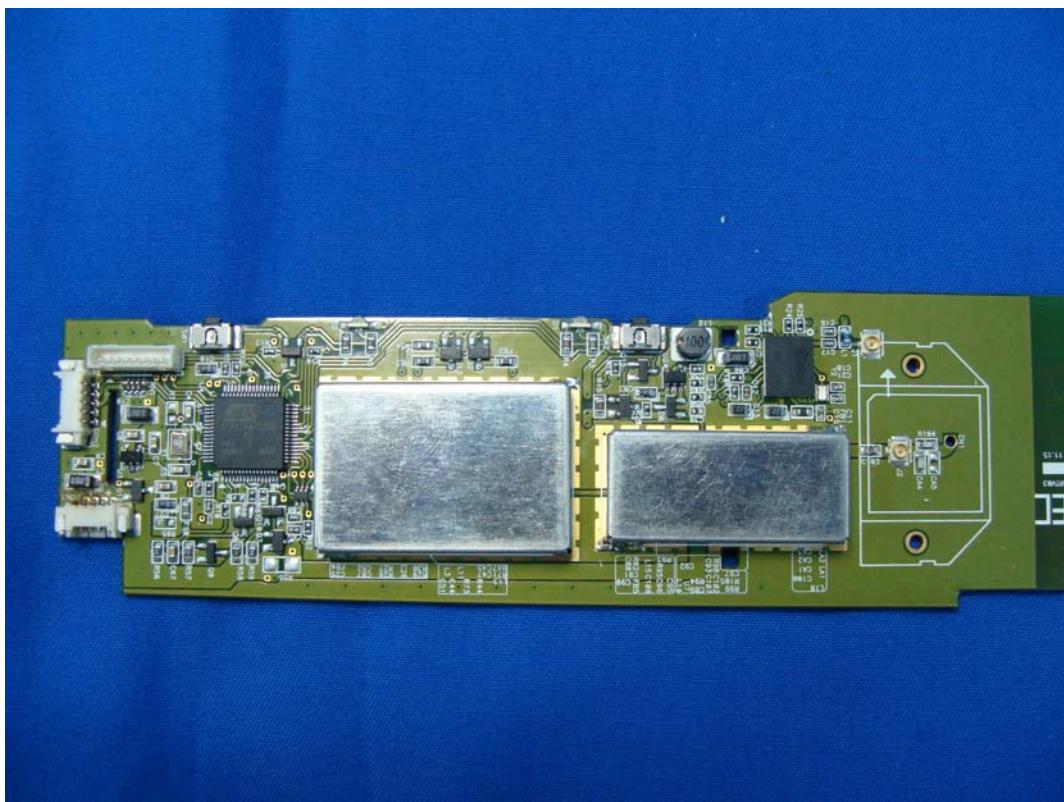
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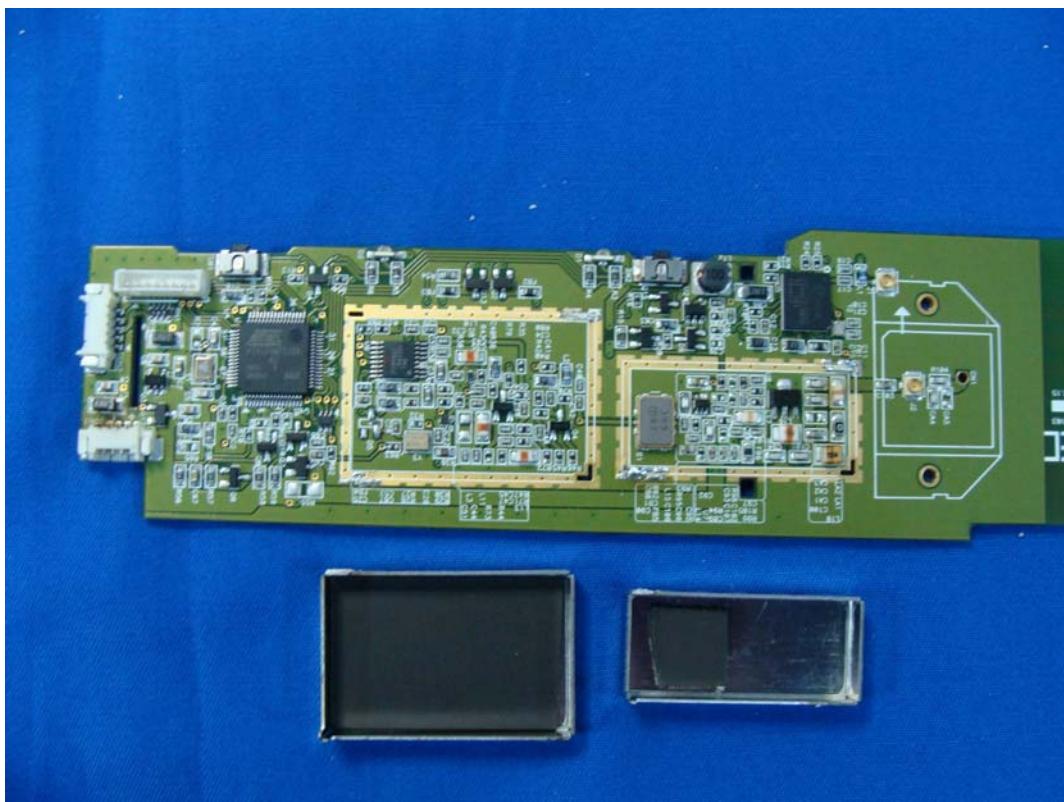
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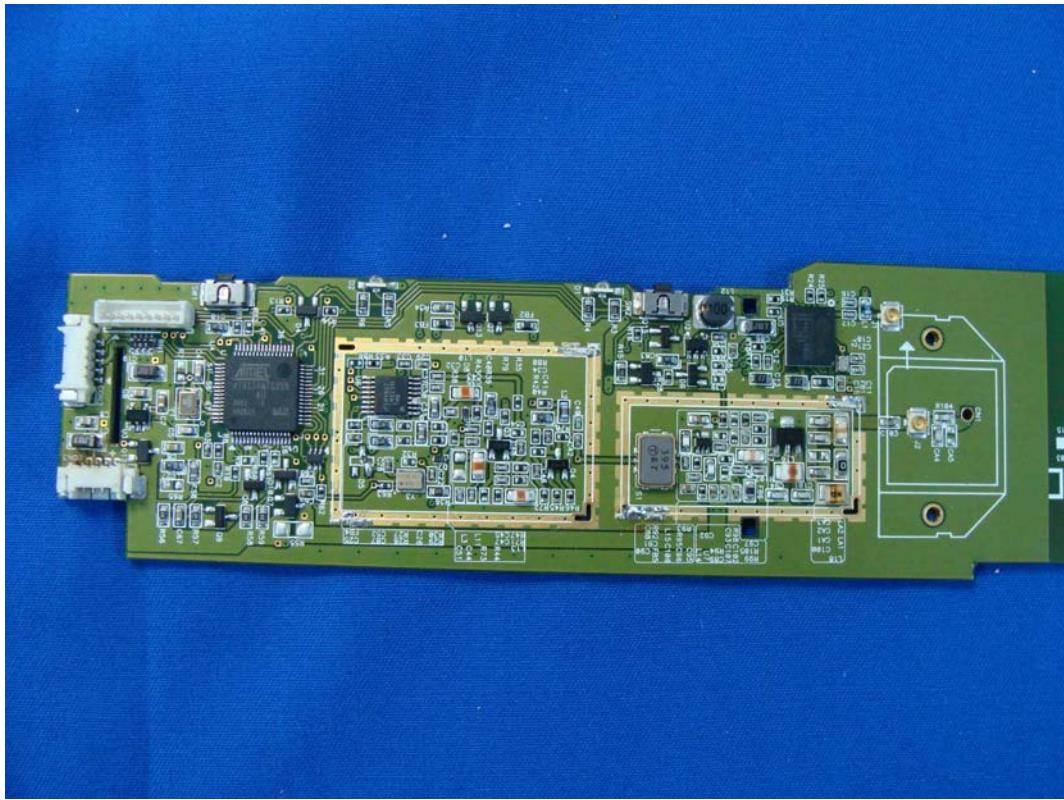
(19) EUT Photo



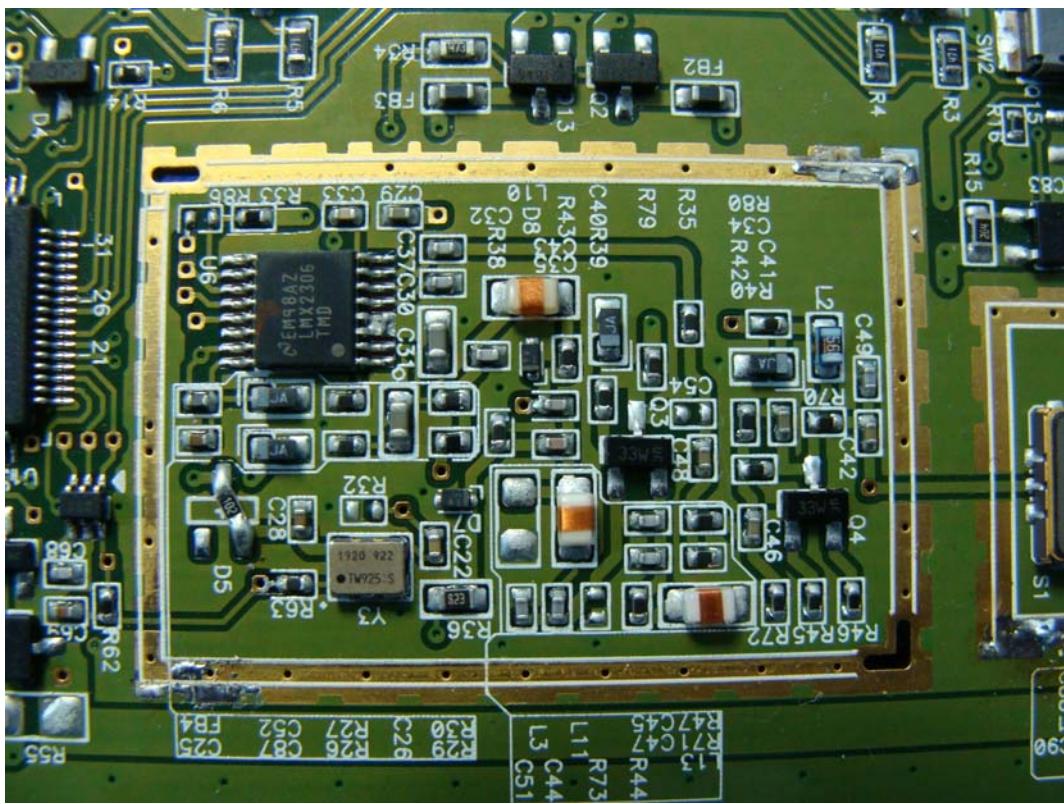
(20) EUT Photo



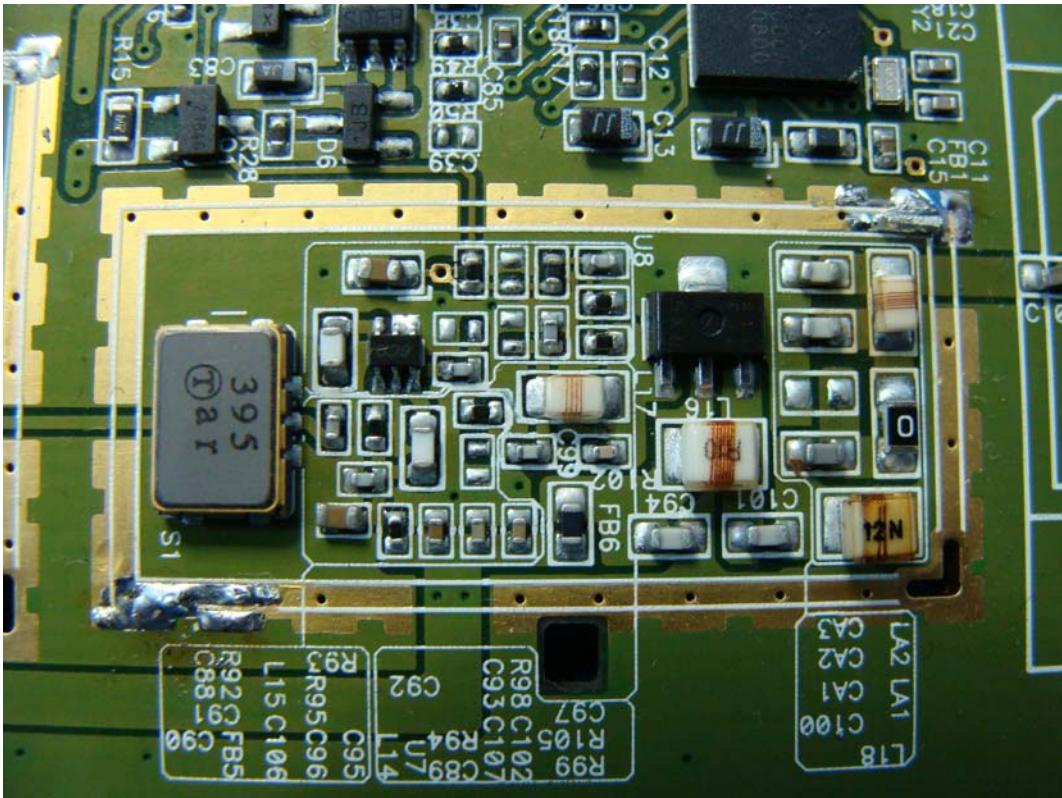
(21) EUT Photo



(22) EUT Photo



(23) EUT Photo



(24) EUT Photo

