

## **ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT INTENTIONAL RADIATOR CERTIFICATION**

**Product Name** : Wireless Beacon Transmitter  
**Model Number** : TAG\_A\_0.0  
**Trade Name** : N/A  
**FCC ID** : YBB-BIST2400  
**Report Number** : SZEE100315934027-1  
**Date** : Apr. 12, 2010

Standards	Results
<input checked="" type="checkbox"/> 47 CFR FCC Part 15 Subpart C 15.249	PASS

Prepared for:

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*N/A means not applicable.*

## 1. CERTIFICATION INFORMATION

**Applicant & Address:** Shanghai Transportation Investment Information Technology Co., LTD  
F8, No.490, Guohe Road, Yangpu District, Shanghai

**Manufacturer & Address:** Shanghai Transportation Investment Information Technology Co., LTD  
F8, No.490, Guohe Road, Yangpu District, Shanghai

**Type of Test:** FCC Part 15 (Certification)

**FCC ID:** YBB-BIST2400

**Equipment Under Test:** Wireless Beacon Transmitter

**Test Model:** TAG\_A\_0.0

**Trade Name:** N/A

**Serial Number:** Not Applicable

**Technical Data:** DC 3V

**Date of test:** Mar. 15, 2010 to Apr. 12, 2010

**Condition of Test Sample:** Normal

The above equipment was tested by Centre Testing International for compliance with the requirements set forth in the FCC Rules and Regulations Part 15, Subpart C and the measurement procedure according to ANSI C63.4.

The test results of this report relate only to the tested sample identified in this report.

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Jim Zhang  
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Manager



Date

:

Apr. 12, 2010

## 2. TEST SUMMARY

Clause	Test Item	Rule	Result
1	Radiated Emission	FCC 15.209 FCC 15.249(a) (d)	<b>PASS</b>
2	20dB Bandwidth	FCC 15.215(c)	<b>PASS</b>
3	Out of Band Emission	FCC 15.249 (d)	<b>PASS</b>

## 3. MEASUREMENT UNCERTAINTY

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

Measurement items	Uncertainty
Radiated Emissions / Out of Band Emission	4.6dB

## 4. PRODUCT INFORMATION

Items	Description
Rating	DC 3V
EUT type	Intentional Transmitter
Modulation	GFSK
Operation Frequency	2423MHz

## 5. TEST EQUIPMENT LIST

Equipment	Manufacturer	Model Number	Serial Number	Due Date
Spectrum Analyzer	Agilent	E440A	MY46185649	08/25/2010
3M Chamber & Accessory Equipment	ETS-LINDGREN	FACT-3	3510	01/19/2011
Spectrum Analyzer	Agilent	E4443A	MY46185649	01/19/2011
Biconilog Antenna	ETS-LINGREN	3142C	920250	01/19/2011
Loop Antenna	ETS-LINDGREN	6502	71730	01/26/2011
Horn Antenna	ETS-LINDGREN	3117	00057407	06/27/2010
Microwave Preamplifier	Agilent	8449B	3008A02425	04/12/2011

## **6. SYSTEM TEST CONFIGURATION**

### **6.1. JUSTIFICATION**

For emission testing, the equipment under test (EUT) setup to transmit continuously to simplify the measurement methodology. Care was taken to ensure proper power supply voltages during testing. During testing, all cables were manipulated to produce worst case emissions. It was powered by 3 V DC of fastener cell. Only the worst case data were recorded in this test report.

The signal is maximized through rotation and placement in the three orthogonal axes. The antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters. Radiated emissions are taken at three meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance.

The unit was operated standalone and placed in the centre of the turntable.

All readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance. Analyzer resolution is 100 kHz or greater for frequencies below 1000 MHz. The resolution is 1 MHz or greater for frequencies above 1000 MHz. The spurious emissions more than 20 dB below the permissible value are not reported.

Radiated emission measurement were performed the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

### **6.2. EUT EXERCISING SOFTWARE**

No Software was used during testing.

## 7. Radiated Emissions Measurement

### 7.1.LIMITS

- (1) the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency	Field strength of fundamental (millivolts/ meter)	Field strength of harmonics (microvolts/ meter)
902–928 MHz	50	500
2400–2483.5 MHz	50	500
5725–5875 MHz	50	500
24.0–24.25 GHz	250	2500

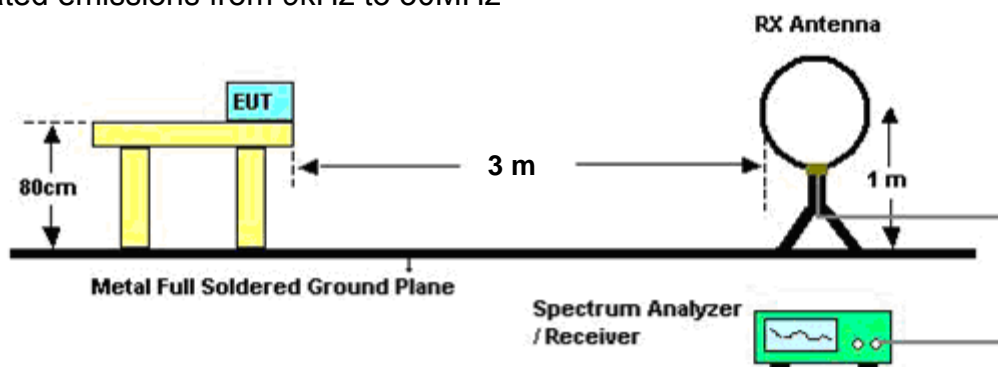
- (2) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in § 15.209 as the following , whichever is the lesser attenuation.

Frequency (MHz)	Field strength ( $\mu\text{V/m}$ )	Distance (m)
0.009-0.490	$2400/F(\text{kHz})$	300
0.490-1.705	$24000/F(\text{kHz})$	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

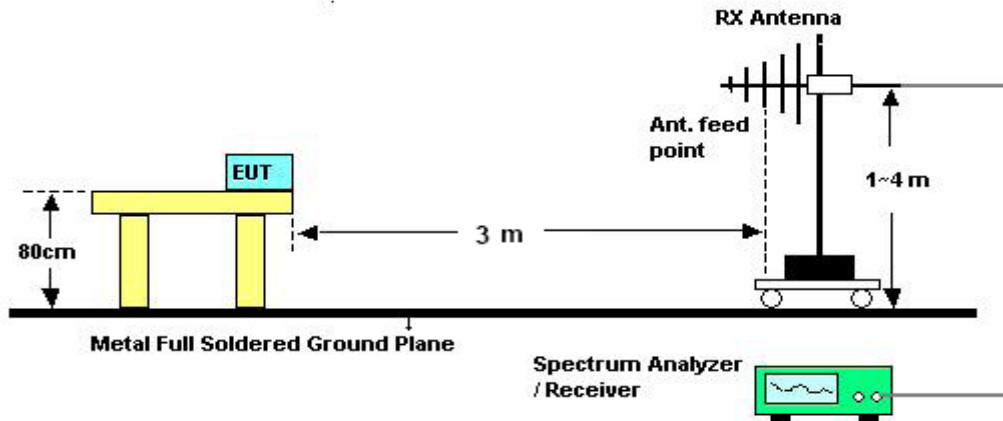
**Note:** the tighter limit applies at the band edges.

### 7.2.BLOCK DIAGRAM OF TEST SETUP

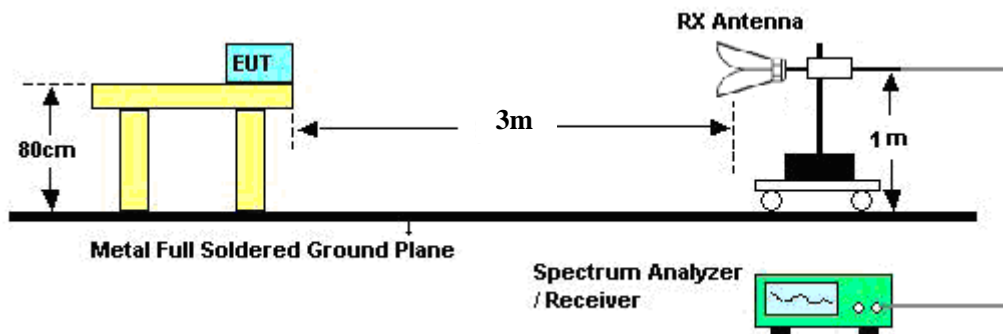
For radiated emissions from 9kHz to 30MHz



For radiated emissions from 30 - 1000MHz



For radiated emissions from 1GHz to 25GHz



### 7.3. TEST PROCEDURE

#### A. Above 30MHz

- The EUT was placed on the top of a turntable 0.8 meters above the ground in the chamber, 3 meters away from the antenna (wideband antenna), which was mounted on the top of a variable-height antenna tower. The maximum values of the field strength are recorded by adjusting the polarizations of the test antenna and rotating the turntable.
- For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the turn table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test frequency analyzer system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

#### B. Below 30MHz

- The EUT is placed on a turntable 0.8 meters above the ground in the chamber, 1 meter away from the antenna (loop antenna). The maximum values of the field strength are recorded by adjusting the polarizations of the test antenna and rotating the turntable.
- For each suspected emission, the EUT was arranged to its worst case and then turn table was turned from 0 degrees to 360 degrees to find the maximum reading.

c. The test frequency analyzer system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

#### 7.4. TEST RESULT

Note: Limit dB $\mu$ V/m @1m = Limit dB $\mu$ V/m @300m+ 90

Limit dB $\mu$ V/m @1m = Limit dB $\mu$ V/m @30m + 50

Limit dB $\mu$ V/m @1m = Limit dB $\mu$ V/m @3m +10

**EUT** : Wireless Beacon Transmitter

**Voltage** : DC 3V

**M/N** : TAG\_A\_0.0

**Temperature** : 26°C

**Mode** : Transmitting

**Humidity** : 50%

Test Results-(Measurement Distance: 3m)								
Frequency	Reading Level - peak	Factor	Measurement		Limit - AV	Limit - QP	Antenna	Result
			Peak	AV				
(MHz)	(dB $\mu$ V/m)	(dB)	(dB $\mu$ V/m)		(dB $\mu$ V/m)	(dB $\mu$ V/m)	(H/V)	(P/F)
30.000	6.41	17.63	24.04	---	---	40.0	H	P
590.983	8.38	21.92	30.30	---	---	46.0	H	P
2185.750	31.81	7.12	38.93	---	54.0	---	H	P
<b>2423.000</b>	<b>60.23</b>	<b>7.63</b>	<b>67.86</b>	---	<b>94.0</b>	---	<b>H</b>	<b>P</b>
4313.833	33.27	10.56	43.83	--	54.0	---	H	P
8059.083	33.56	17.57	51.13	---	54.0	---	H	P
620.083	8.84	23.05	31.89	---	---	46.0	V	P
893.300	8.83	26.50	35.33	---	---	46.0	V	P
2185.33	32.95	7.12	40.07	---	54.0	---	V	P
<b>2423.000</b>	<b>73.68</b>	<b>7.63</b>	<b>81.31</b>	---	<b>94.0</b>	---	<b>V</b>	<b>P</b>
3917.500	34.58	9.65	44.23	---	54.0	---	V	P
7540.000	32.25	18.19	50.44	---	54.0	---	V	P

\*: fundamental frequency

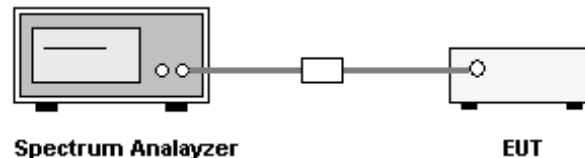


## 8. OUT OF BAND EMISSION MEASUREMENT

### 8.1. LIMITS

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in § 15.209, whichever is the lesser attenuation.

### 8.2. BLOCK DIAGRAM OF TEST SETUP



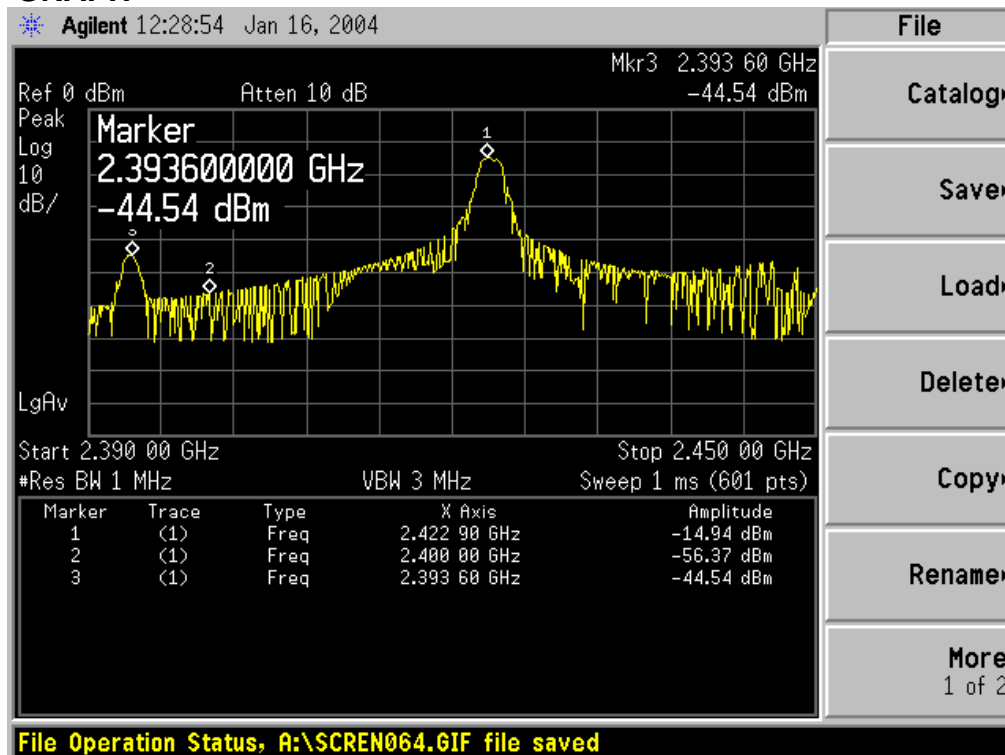
### 8.3. TEST PROCEDURE

1. The transmitter output (antenna port) was connected to the spectrum analyzer.
2. Set spectrum analyzer's RBW and VBW to applicable value with Peak in Max Hold.
3. Record the emission drops at the frequency 2400MHz & 2483.5MHz respectively.
4. Use the marker method to determine the frequency 2400MHz & 2483.5MHz compliance as required.

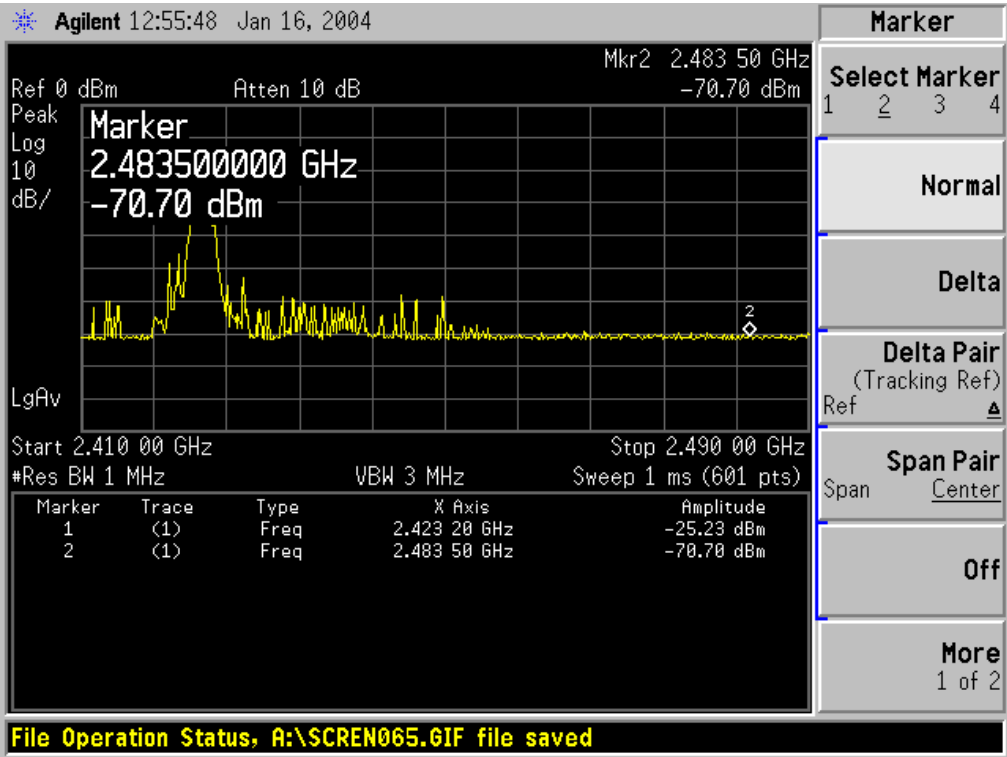
### 8.4. TEST RESULT

Freq. (MHz)	Fundamental Emission (dBμV/m)	Delta (dB)	Final Emission (dBμV/m)	Limit (dBμV/m)	Result
2393.6	81.31	29.60	51.71	54.0	Pass
2400.0	81.31	41.43	40.18	54.0	Pass
2483.5	81.31	45.47	35.84	54.0	Pass

### 8.5. TEST GRAPH



Graph 1



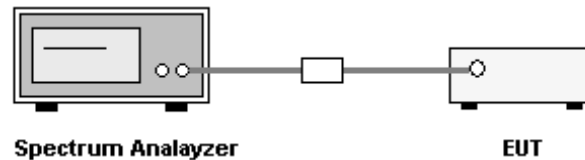
Graph 2

## 9. 20DB BANDWIDTH MEASUREMENT

### 9.1.LIMITS

The bandwidth should be contained within the frequency band which designed in the rule section under the equipment is operated

### 9.2.BLOCK DIAGRAM OF TEST SETUP



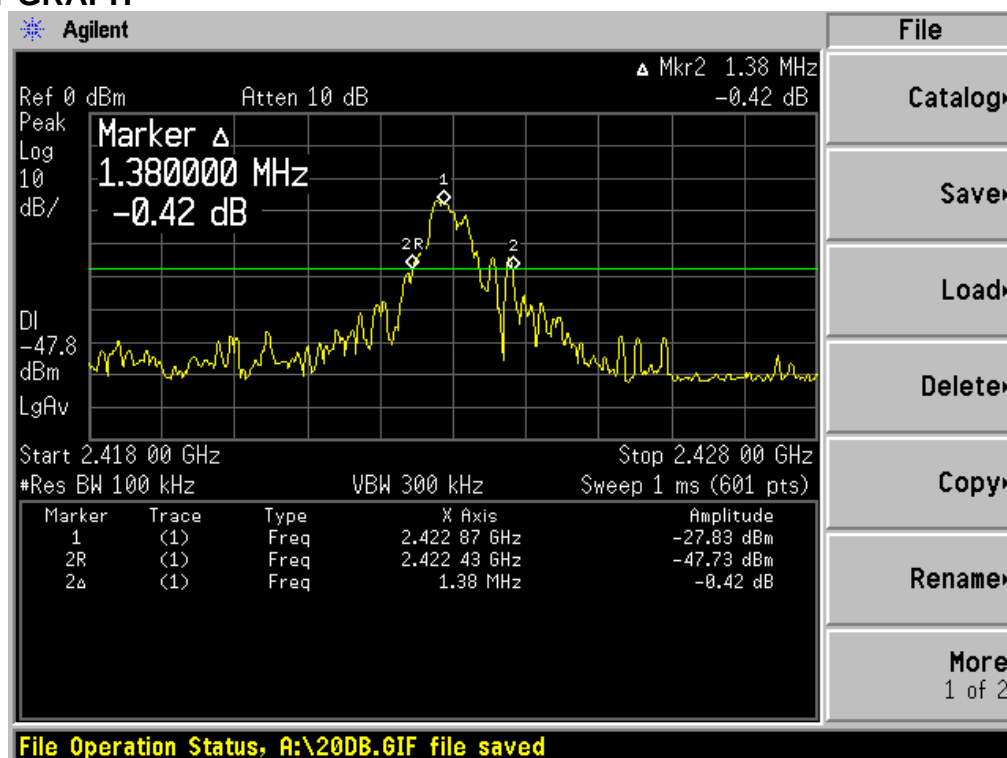
### 9.3.TEST PROCEDURE

1. The transmitter output (antenna port) was connected to the spectrum analyzer.
2. Set spectrum analyzer's RBW and VBW to applicable value with Peak in Max Hold.
3. A PEAK output reading was taken, a DISPLAY line was drawn 20 dB lower than PEAK level.
4. The 20dB bandwidth was determined from where the channel output spectrum intersected the display line.

### 9.4. TEST RESULT

Measured Freq. (GHz)	Limit (MHz)	Result
Lowest:2.42243	>2400.0	Pass
Highest:2.42481	<2483.5	Pass

### 9.5. TEST GRAPH

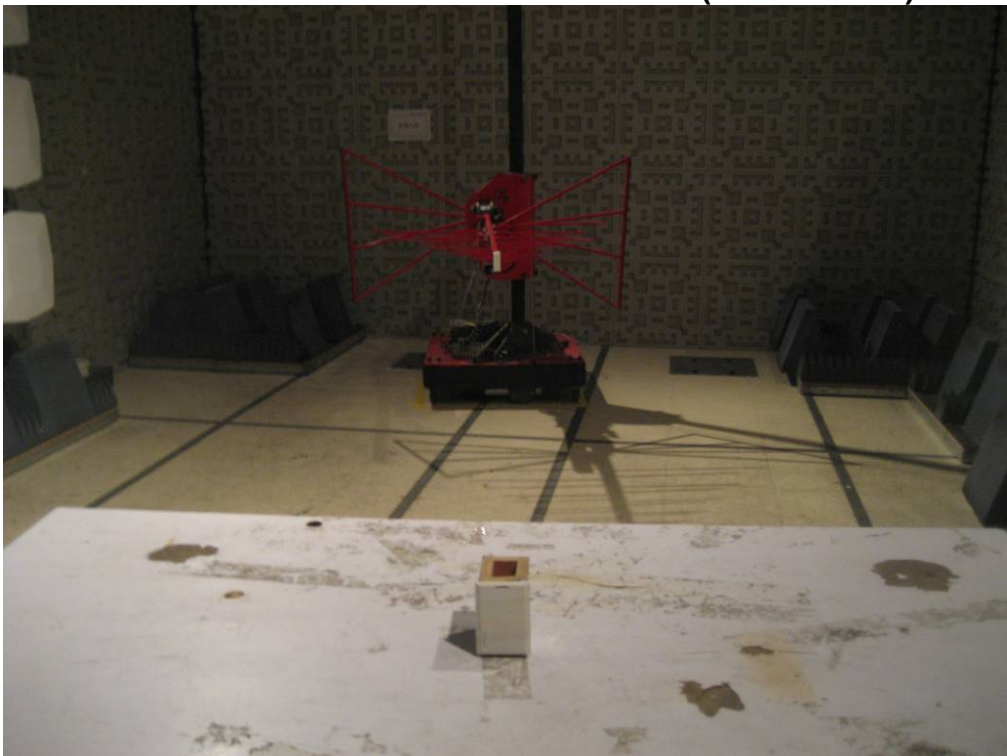


## **APPENDIX 1 PHOTOGRAPHS OF TEST SETUP**

### **TEST SETUP OF RADIATED EMISSION (9kHz-30MHz)**



### **TEST SETUP OF RADIATED EMISSION (30MHz-1GHz)**



### TEST SETUP OF RADIATED EMISSION (1GHz-25GHz)





## APPENDIX 2 EXTERNAL PHOTOGRAPHS OF EUT

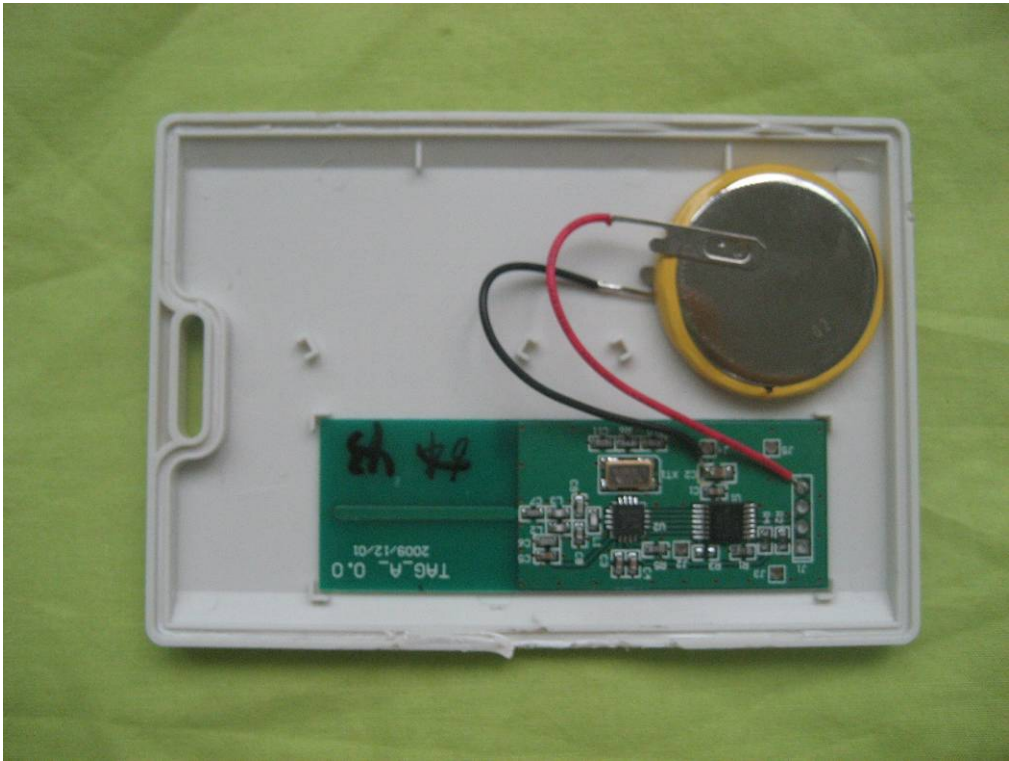


Front View of EUT

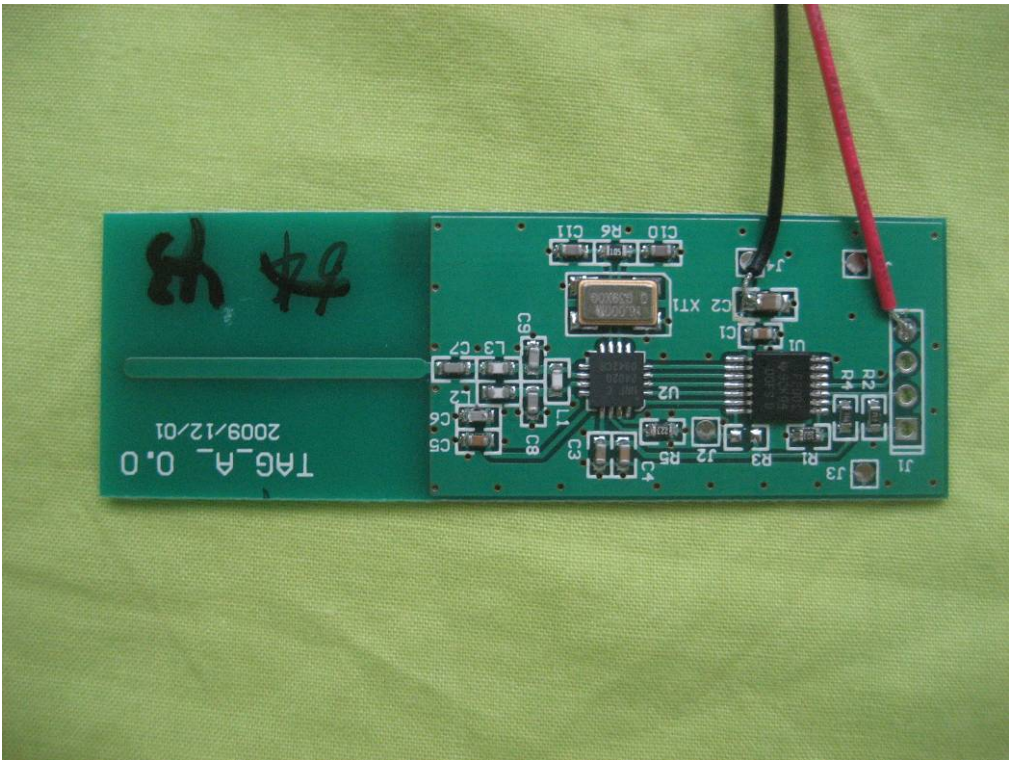


Rear View of EUT

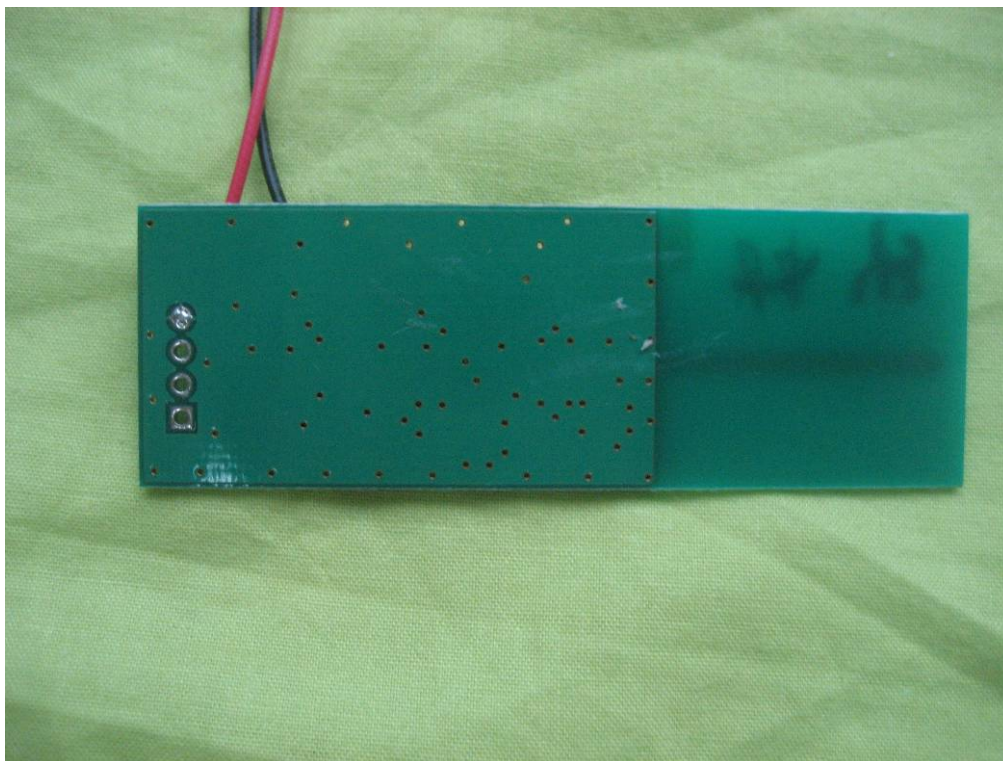
APPENDIX 3 INTERNAL PHOTOGRAPHS OF EUT



Uncovered View of EUT



Front view of PCB1



Back view of PCB1

----- End of report -----