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# FCC Test Report

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Report No.: AGC228120601-1F2

**FCC ID** : OAQYC-5962X0  
**PRODUCT DESIGNATION** : 2.4 GHz wireless mouse module  
**BRAND NAME** : N/A  
**MODEL NAME** : YC-5962X0  
**CLIENT** : Tunercom Technology Co., Ltd.  
**DATE OF ISSUE** : July 16, 2012  
**STANDARD(S)** : FCC Part 15 Rules  
**REPORT VERSION** : V1.0

**Attestation of Global Compliance (Shenzhen) Co., Ltd.**

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### VERIFICATION OF COMPLIANCE

Applicant	Tunercom Technology Co., Ltd.
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Manufacturer	Tunercom Technology Co., Ltd.
	The 6 <sup>th</sup> floor, Gate No.3 of HuaQiang logistics Building, Three-way of Longzhu, NanShan District, Shenzhen
Product Designation	2.4GHz wireless mouse module
Brand Name	N/A
Test Model	YC-5962X0
FCC ID	<b>OAQYC-5962X0</b>
Report Number	AGC228120601-1F2
Date of Test	July 05, 2012 to July 13, 2012

**WE HEREBY CERTIFY THAT:**

The above equipment was tested by Attestation of Global Compliance (Shenzhen) Co., Ltd. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.4 (2003) and the energy emitted by the sample EUT tested as described in this report is in compliance with radiated emission limits of FCC Rules Part 15.247.

*Leo Lee*

Tested By: \_\_\_\_\_  
Leo Lee                      July 16,2012

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## 1. GENERAL INFORMATION

### 1.1 PRODUCT DESCRIPTION

The EUT is a 2.4GHz wireless mouse module designed as a “Communication Device”. It is designed by way of utilizing the FHSS technology to achieve the system operation.

A major technical description of EUT is described as following:

Operation Frequency	2.408 GHz to 2.478GHz
Max. Output Power	-2.36dBm
Modulation	GFSK
Number of channels	71
Antenna Designation	Integrated Antenna
Antenna Gain	0.8dBi
Hardware Version	1
Software Version	A
Power Supply	DC1.5V by Battery

### 1.2 TABLE OF CARRIER FREQUENCIES

Frequency Band	Channel Number	Frequency
2400~2483.5MHZ	0	2408MHZ
	1	2409MHZ
	:	:
	34	2441 MHZ
	35	2442 MHZ
	36	2443 MHZ
	:	:
	69	2477 MHZ
	70	2478 MHZ

### **1.3 RECEIVER INPUT BANDWIDTH**

The input bandwidth of the receiver is 1.0 MHz. In every connection one device is the master and the other one is slave.

### **1.4 RELATED SUBMITTAL(S) / GRANT (S)**

This submittal(s) (test report) is intended for **FCC ID: OAQYC-5962X0**, filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules.

### **1.5 TEST METHODOLOGY**

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4 (2003). Radiated testing was performed at an antenna to EUT distance 3 meters.

### **1.6 MEASUREMENT UNCERTAINTY**

The uncertainty is calculated using the methods suggested in the "Guide to the Expression of Uncertainty in Measurement" (GUM) published by ISO.

- Uncertainty of Conducted Emission,  $U_c = \pm 2.75\text{dB}$
- Uncertainty of Radiated Emission,  $U_c = \pm 3.2\text{dB}$

### **1.7 TEST FACILITY**

All measurement facilities used to collect the measurement data are located at Attestation of Global Compliance (Shenzhen) Co., Ltd.

2/F., Building 2, No.1-No.4, Chaxi Sanwei Technical Industrial Park, Gushu, Xixiang, Bao'an District, Shenzhen, Guangdong, China

The test site is constructed and calibrated to meet the FCC requirements in documents ANSI C63.4: 2003. FCC register No.: 259865

### **1.8 SPECIAL ACCESSORIES**

Refer to section 2.2.

### **1.9 EQUIPMENT MODIFICATIONS**

Not available for this EUT intended for grant.

## 2. SYSTEM TEST CONFIGURATION

### 2.1 CONFIGURATION OF TESTED SYSTEM

**Configure** (Normal Hopping or Control continuous TX)



*Note: All the accessories have been used during the test if any.*

### 2.2 EQUIPMENT USED IN EUT SYSTEM

Item	Equipment	Mfr/Brand	Model/Type No.	Remark
1	2.4GHz wireless mouse module	N/A	YC-5962X0	EUT

### 3. SUMMARY OF TEST RESULTS

FCC RULES	DESCRIPTION OF TEST	RESULT
§15.247	Peak Output Power	Compliant
§15.247	20 dB Bandwidth	Compliant
§15.247	Conducted Spurious Emission	Compliant
§15.207	Conduction Emission	N/A
§15.209	Radiated Emission	Compliant
§15.247	Band Edges	Compliant
§15.247	Number of Hopping Frequency	Compliant
§15.247	Time of Occupancy	Compliant
§15.247	Frequency Separation	Compliant

### 4. DESCRIPTION OF TEST MODES

The EUT has been operated in GFSK modulation. The following operating modes were applied for the related test items. All 3axis have been tested.

No.	TEST MODES
1	Low Channel(TX)
2	Middle Channel(TX)
3	High Channel(TX)
4	Normal Hopping

\*\*\*Note: All the test modes were tested, only the result of the worst case was recorded in the report.

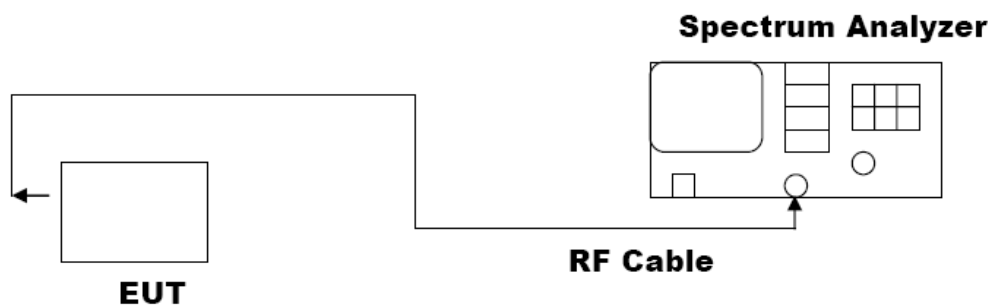


## 5. PEAK OUTPUT POWER

### 5.1 MEASUREMENT PROCEDURE

1. The EUT was placed on a table which is 0.8m above ground plane.
2. Connect EUT RF output port to the Spectrum Analyzer.
3. Set the EUT Work on the top, the middle and the bottom operation frequency individually.
4. Set Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel  
RBW > the 20 dB bandwidth of the emission being measured  
VBW  $\geq$  RBW; Sweep = auto; Detector function = peak.
5. Set SPA Trace 1 Max hold, then View.

### 5.2 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)



### 5.3 MEASUREMENT EQUIPMENT USED

Description	Manufacturer	Model	SERIAL NUMBER	Cal. Date	Cal. Due
Spectrum Analyzer	Agilent	E4440A	N/A	06/27/2012	06/26/2013

### 5.4 LIMITS AND MEASUREMENT RESULT

PEAK OUTPUT POWER MEASUREMENT RESULT FOR GFSK MODULATION			
Frequency (GHz)	Result (dBm)	Applicable Limits (dBm)	Pass or Fail
2.408	-2.36	30	Pass
2.442	-2.73	30	Pass
2.478	-3.17	30	Pass

## 6. 20 dB BANDWIDTH

### 6.1 MEASUREMENT PROCEDURE

1. The EUT was placed on a table which is 0.8m above ground plane.
2. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
3. Set the EUT Work on the top, the middle and the bottom operation frequency individually.
4. Set Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel  
RBW  $\geq$  1% of the 20 dB bandwidth, VBW  $\geq$  RBW; Sweep = auto; Detector function = peak
5. Set SPA Trace 1 Max hold, then View.

### 6.2 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)

The same as described in Section 5.2

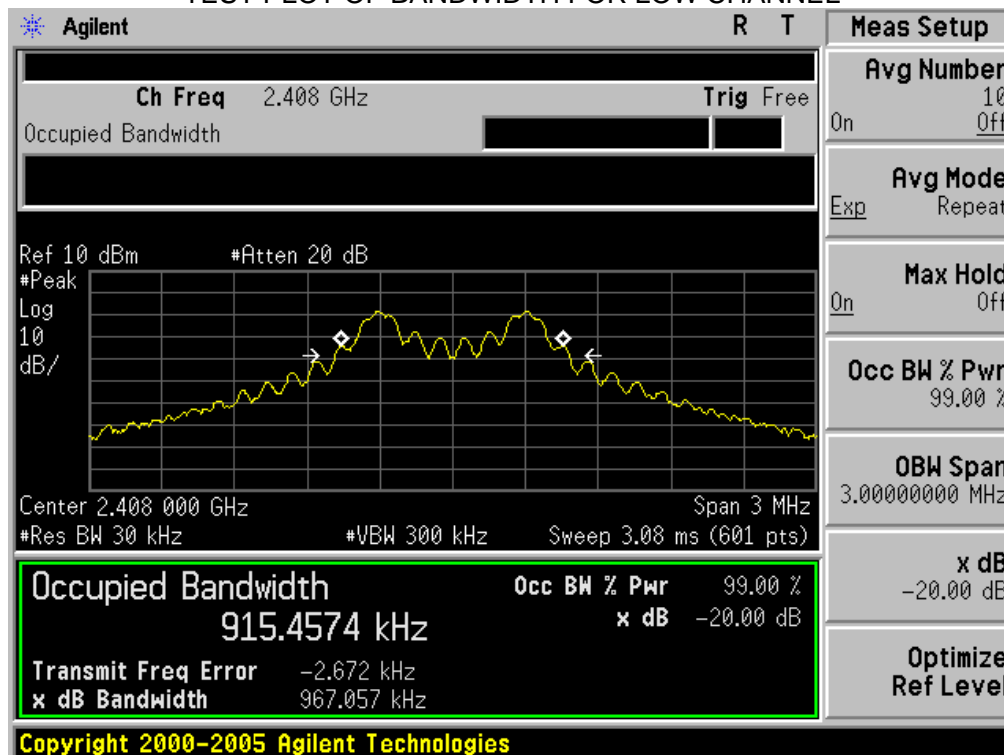
### 6.3 MEASUREMENT EQUIPMENT USED

The same as described in Section 5.3

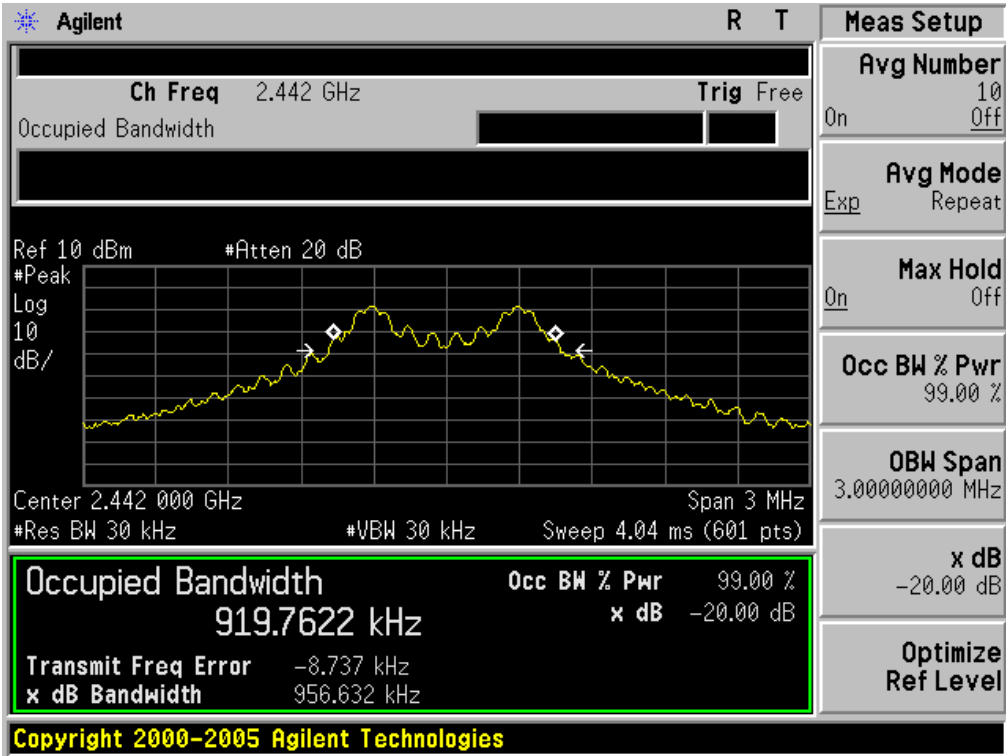
### 6.4 LIMITS AND MEASUREMENT RESULTS

THE MEASUREMENT RESULT FOR GFSK MODULATION			
Applicable Limits	Measurement Result		
	Test Data (KHz)		Criteria
--	Low Channel	967.06	PASS
	Middle Channel	956.63	PASS
	High Channel	959.10	PASS

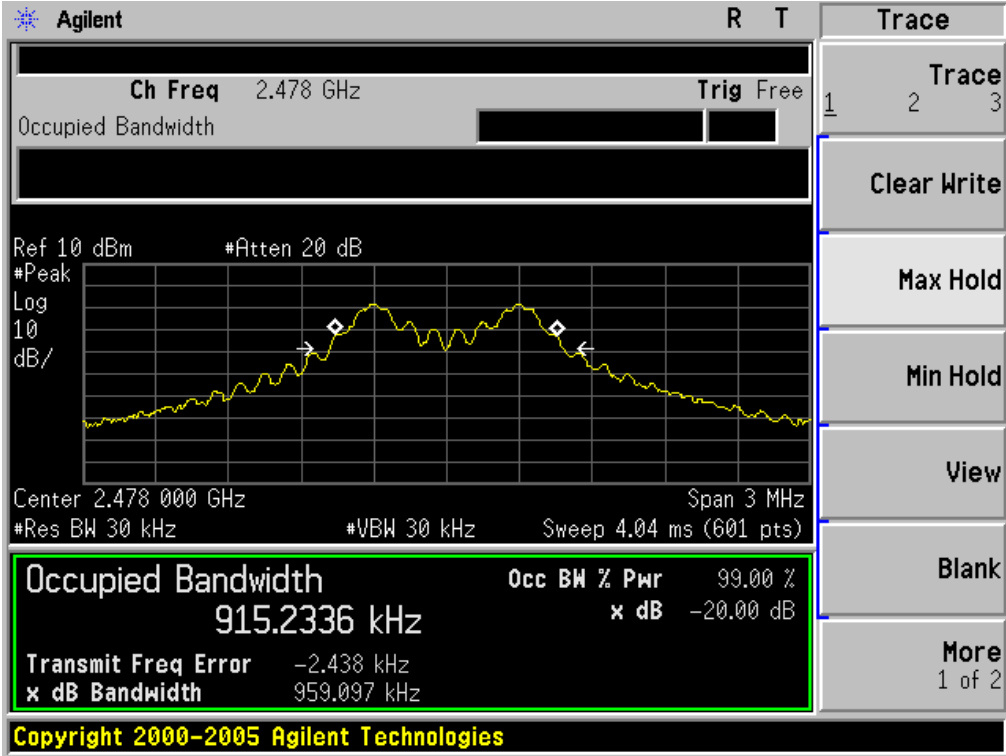
TEST PLOT OF BANDWIDTH FOR LOW CHANNEL



TEST PLOT OF BANDWIDTH FOR MIDDLE CHANNEL



TEST PLOT OF BANDWIDTH FOR HIGH CHANNEL



## 7. CONDUCTED SPURIOUS EMISSION

### 7.1 MEASUREMENT PROCEDURE

1. The EUT was placed on a table which is 0.8m above ground plane.
2. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
3. Set the EUT Work on the top, the middle and the bottom operation frequency individually.
4. Set the Span = wide enough to capture the peak level of the in-band emission and all spurious emissions from the lowest frequency generated in the EUT up through the 10th harmonic.  
RBW = 100 kHz; VBW  $\geq$  RBW; Sweep = auto; Detector function = peak.
5. Set SPA Trace 1 Max hold, then View.

### 7.2 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)

The same as described in section 5.2

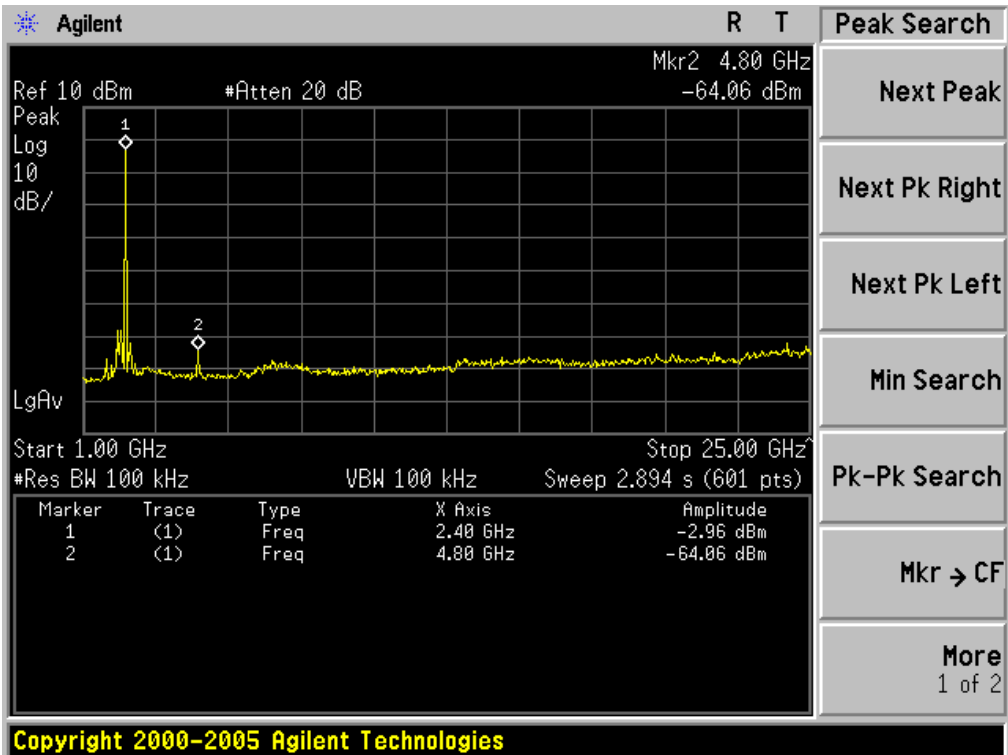
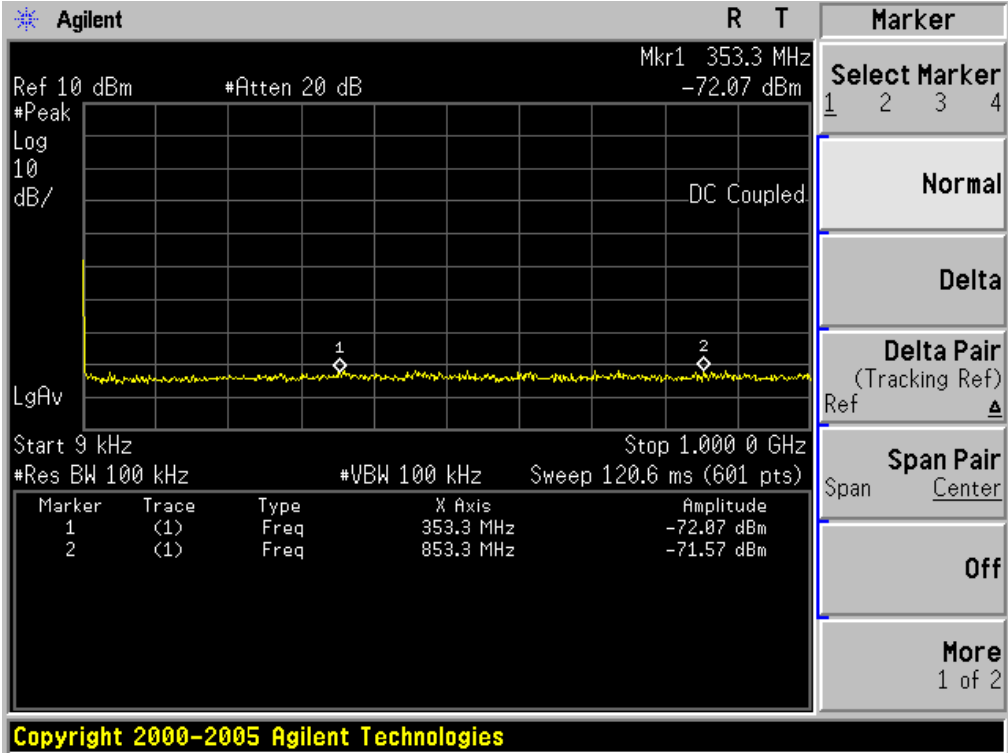
### 7.3 MEASUREMENT EQUIPMENT USED

The same as described in section 5.3

### 7.4 LIMITS AND MEASUREMENT RESULT

LIMITS AND MEASUREMENT RESULT		
Applicable Limits	Measurement Result	
	Test Data	Criteria
In any 100 KHz Bandwidth Outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produce by the intentional radiator shall be at least 20 dB below that in 100KHz bandwidth within the band that contains the highest level of the desired power.	At least -20dBc than the limit Specified on the BOTTOM Channel	PASS
In addition, radiation emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in§15.209(a)	At least -20dBc than the limit Specified on the TOP Channel	PASS

TEST PLOT OF OUT OF BAND EMISSIONS WITH THE WORST CASE FOR GFSK MODULATION IN LOW CHANNEL



## 8. RADIATED EMISSION

### 8.1 MEASUREMENT PROCEDURE

1. Configure the EUT according to ANSI C63.4. The EUT was placed on the top of the turntable 0.8 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
4. For each suspected emissions, the antenna tower was scan (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
5. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
6. For emissions above 1GHz, use 1MHz VBW and RBW for peak reading. Then 1MHz RBW and 10Hz VBW for average reading in spectrum analyzer.
7. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value.
8. If the emissions level of the EUT in peak mode was 3 dB lower than the average limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method for below 1GHz.
9. For testing above 1GHz, the emissions level of the EUT in peak mode was lower than average limit (that means the emissions level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
10. In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be QP measured by receiver. High – Low scan is not required in this case.

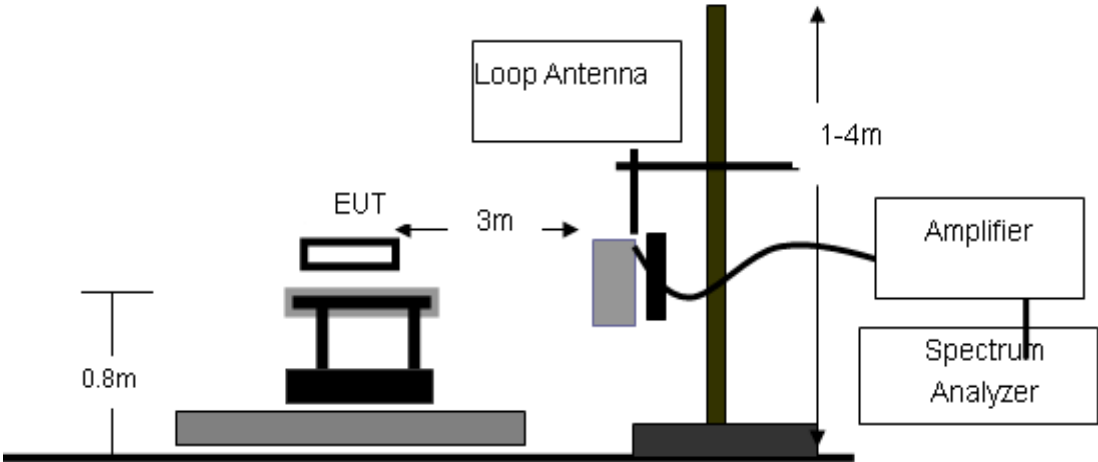
The following table is the setting of spectrum analyzer and receiver.'

Spectrum Parameter	Setting
Start Frequency	1GHz
Stop Frequency	26.5GHz
RB/VB(Emission in restricted band)	1MHz/1MHz for Peak, 1MHz/10Hz for Average
RB/VB(Emission in non-restricted band)	1MHz/1MHz for Peak

Receiver Parameter	Setting
Start ~Stop Frequency	9KHz~150KHz/RB 200Hz for QP
Start ~Stop Frequency	150KHz~30MHz/RB 9KHz for QP
Start ~Stop Frequency	30MHz~1000MHz/RB 120KHz for QP

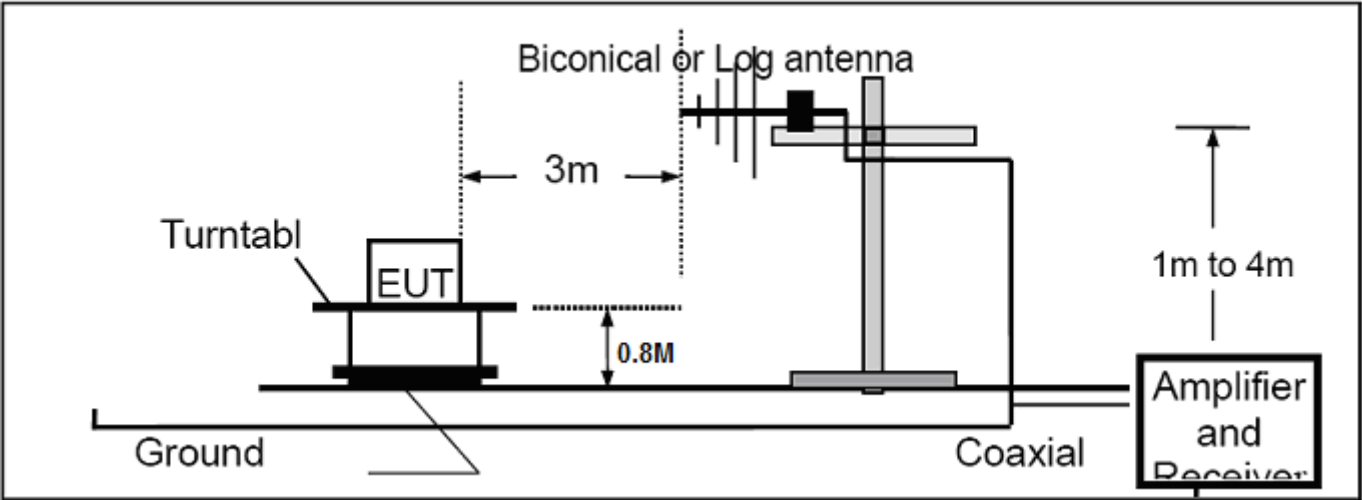
**8.2 TEST SETUP**

**RADIATED EMISSION TEST SETUP BELOW 30MHz**

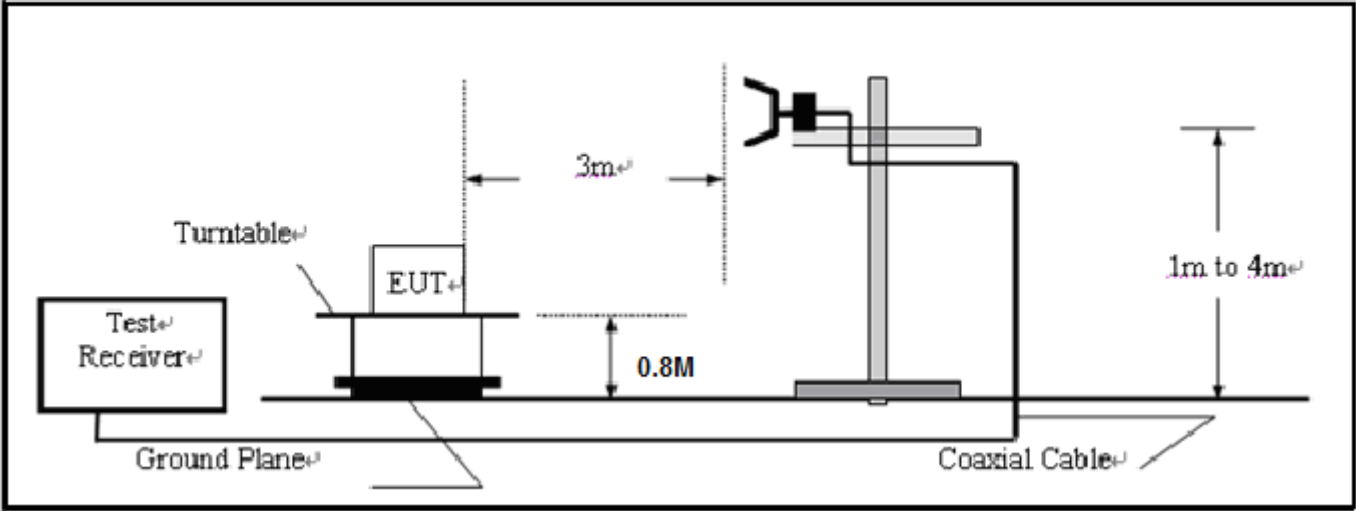




RADIATED EMISSION TEST SETUP 30MHz-1000MHz



RADIATED EMISSION TEST SETUP ABOVE 1000MHz



8.3 TEST EQUIPMENT LIST

Description	Manufacturer	Model	SERIAL NUMBER	Cal. Date	Cal. Due
Spectrum Analyzer	Agilent	E4440A	N/A	06/27/2012	06/26/2013
Amplifier	EM	EM30180	0607030	06/27/2012	06/26/2013
Horn Antenna	EM	EM-AH-10180	N/A	06/27/2012	06/26/2013
EMI Test Receiver	Rohde & Schwarz	ESCI	N/A	06/27/2012	06/26/2013
Amplifier	EM	EM30180	N/A	06/27/2012	06/26/2013
Biological Antenna	A.H. Systems Inc.	SAS-521-4	N/A	06/27/2012	06/26/2013
Loop Antenna	Daze	ZN30900N	SEL0097	06/27/2012	06/26/2013
Isolation Transformer	LETEAC	LTBK	--	06/27/2012	06/26/2013



















## 10. NUMBER OF HOPPING FREQUENCY

### 10.1 MEASUREMENT PROCEDURE

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer Start = 2.4GHz Stop = 2.4835GHz
4. Set the Spectrum Analyzer as RBW>=1%span, VBW>=RBW.

### 10.2 TEST SETUP (BLOCK DIAGRAM OF CONFIGURATION)

Same as described in section 5.2  
Conducted Method.

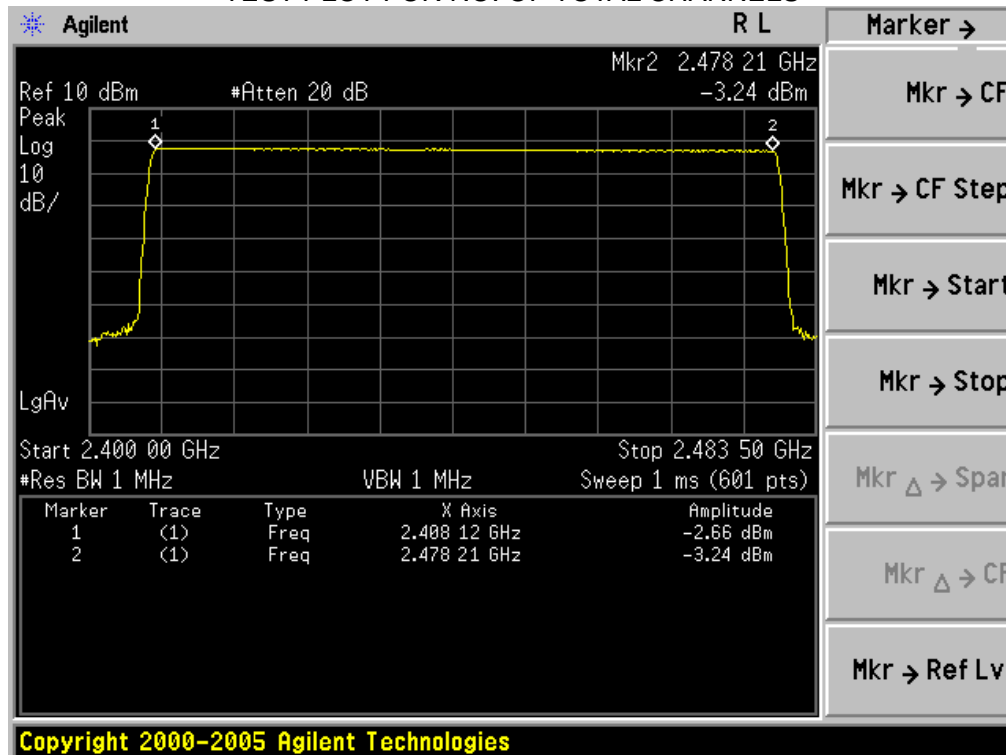
### 10.3 MEASUREMENT EQUIPMENT USED

The Same as described in section 5.3

### 10.4 LIMITS AND MEASUREMENT RESULT

TOTAL NO. OF HOPPING CHANNEL	LIMIT (NO. OF CH)	MEASUREMENT (NO. OF CH)	RESULT
	>=15	71	PASS

TEST PLOT FOR NO. OF TOTAL CHANNELS



**11. TIME OF OCCUPANCY (DWELL TIME)**

**11.1 MEASUREMENT PROCEDURE**

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum analyzer.
3. Set Span = zero span, centered on a hopping channel.
4. Set the spectrum analyzer as RBW=1MHz, VBW>=RBW, Span = 0 Hz.

**11.2 TEST SETUP (BLOCK DIAGRAM OF CONFIGURATION)**

Same as described in section 5.2  
 Conducted Method

**11.3 MEASUREMENT EQUIPMENT USED**

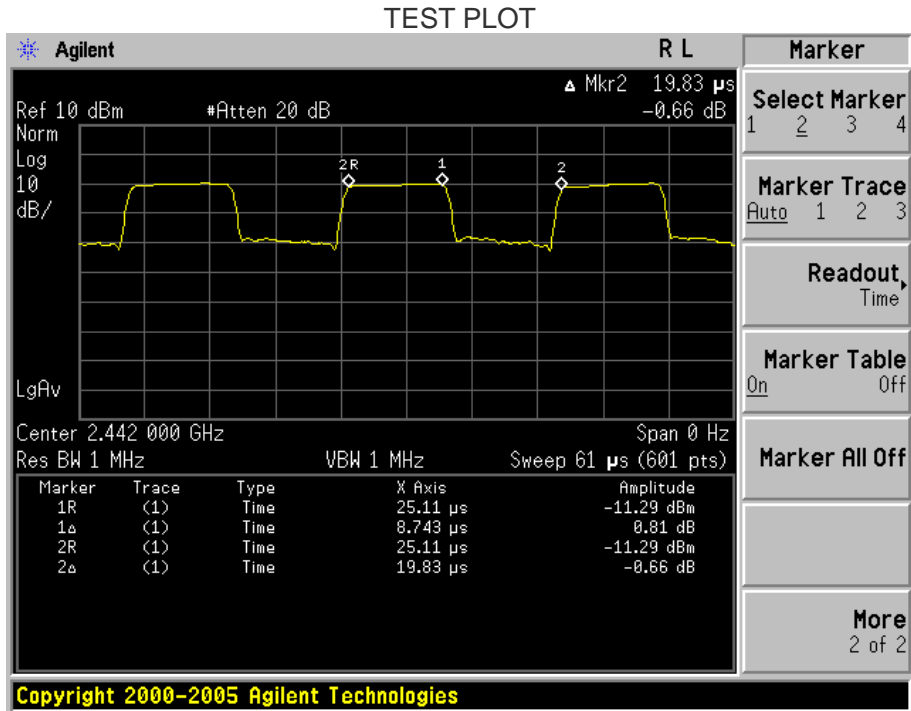
The same as described in section 5.3

**11.4 LIMITS AND MEASUREMENT RESULT**

**Middle Channel: (worst test result)**

Test Result (mS)	Limit (mS)	Pass / Fail
12.52	400	Pass

Interval Time of Two Pluse = 19.83us  
 Duration of A Pluse = 8.743us  
 Dwell Time =  $71 \cdot 0.4(S) \cdot 8.721us / 19.81us = 12.52ms$



## 12. FREQUENCY SEPARATION

### 12.1 MEASUREMENT PROCEDURE

1. Place the EUT on the table and set it in transmitting mode
2. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum analyzer
3. Set Span = wide enough to capture the peaks of two adjacent channels Resolution (or IF) Bandwidth (RBW)  $\geq$  1% of the span Video (or Average) Bandwidth (VBW)  $\geq$  RBW; Sweep = auto; Detector function = peak; Trace = max hold

### 12.2 TEST SETUP (BLOCK DIAGRAM OF CONFIGURATION)

Same as described in section 5.2

### 12.3 MEASUREMENT EQUIPMENT USED

The same as described in section 5.3

### 12.4 LIMITS AND MEASUREMENT RESULT

TEST RESULT			
CHANNEL	CHANNEL SEPARATION	LIMIT	RESULT
	KHz	KHz	
CH00-CH01	1000	$\geq$ 25 KHz or 2/3 20 dB BW	Pass

**APPENDIX I**  
**PHOTOGRAPHS OF THE EUT**  
**TOP VIEW OF EUT**



**BOTTOM VIEW OF EUT**



LEFT VIEW OF EUT



RIGHT VIEW OF EUT



FRONT VIEW OF EUT



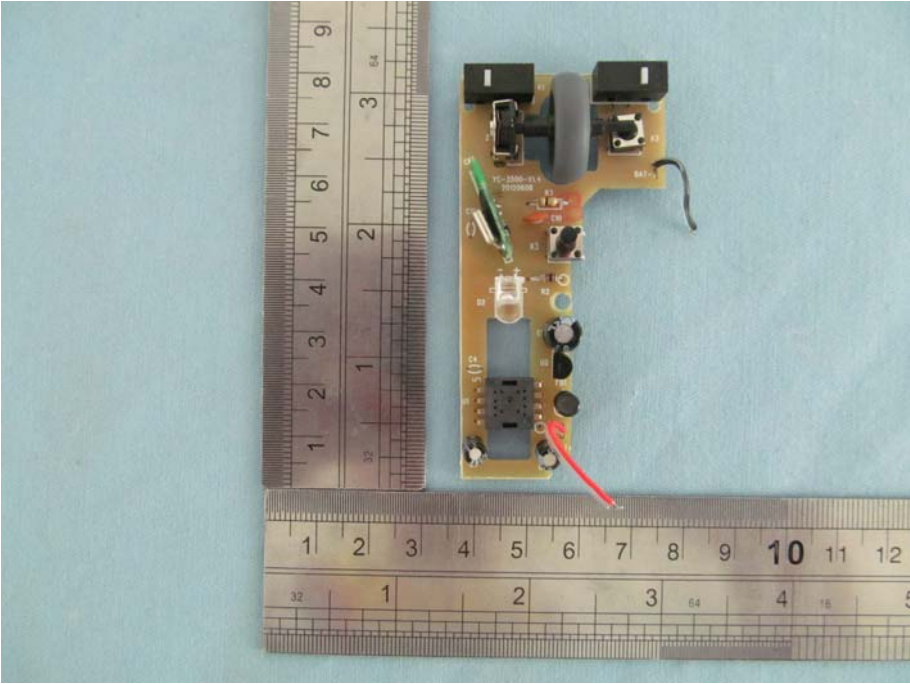
BACK VIEW OF EUT



OPEN VIEW OF EUT

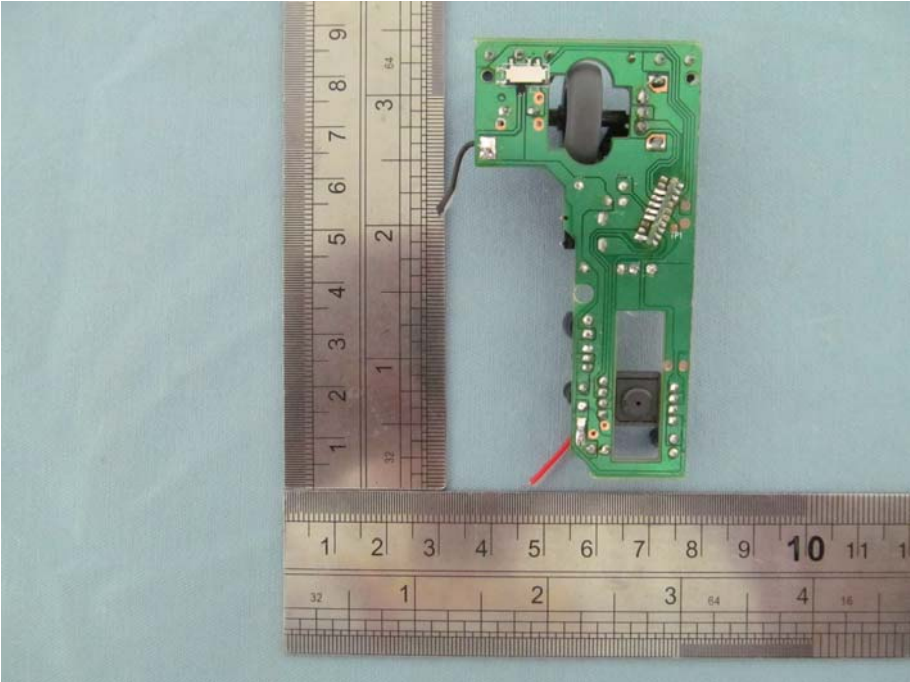


INTERNAL VIEW-1 OF EUT

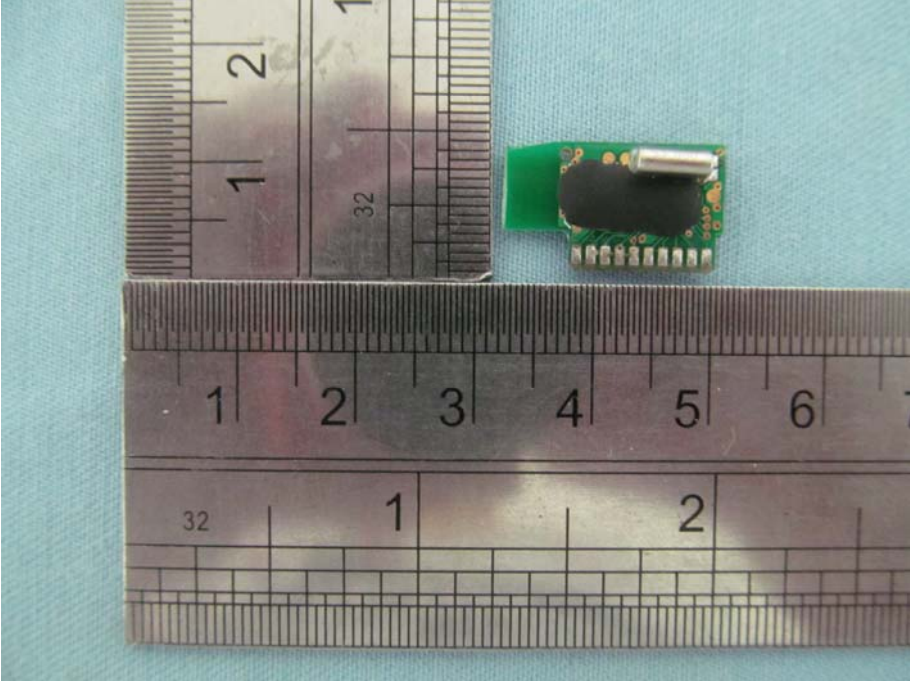




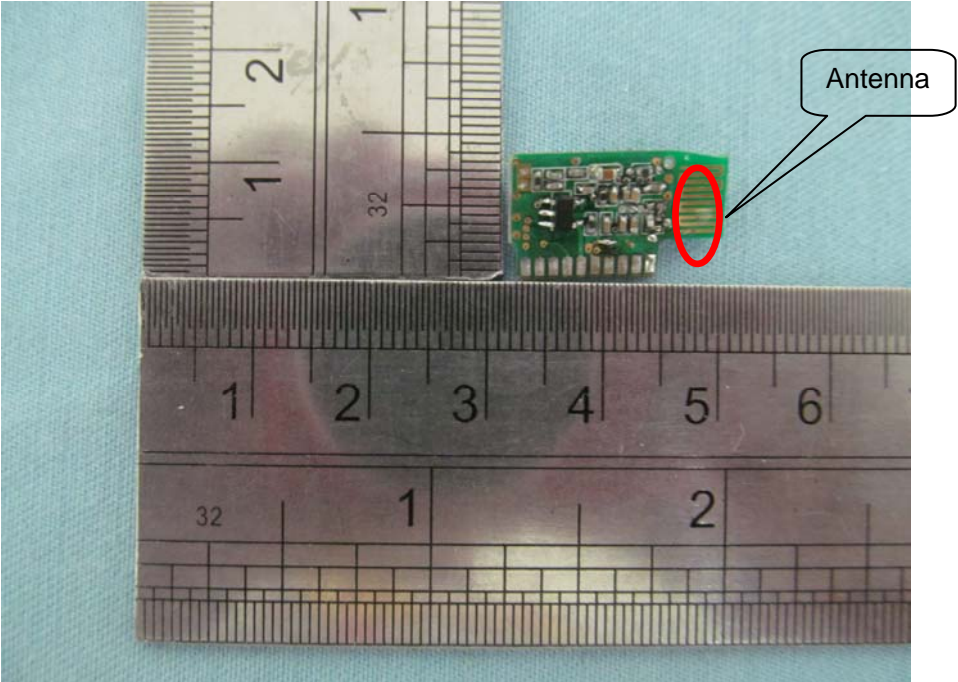
INTERNAL VIEW-2 OF EUT



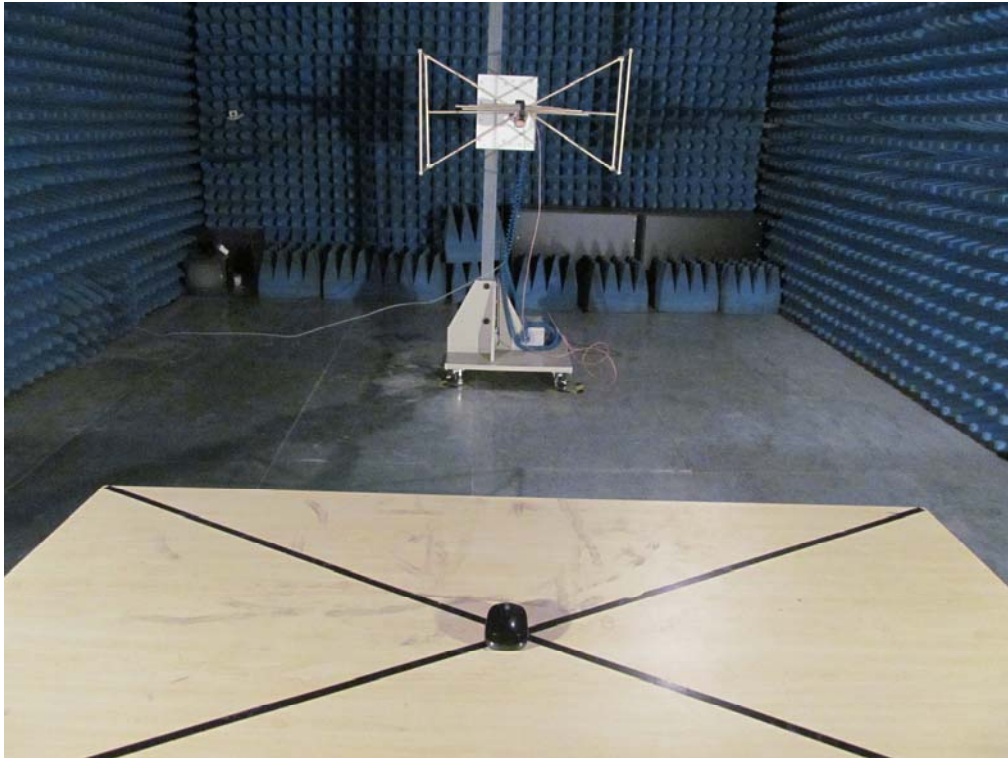
INTERNAL VIEW-3 OF EUT



INTERNAL VIEW-4 OF EUT



**APPENDIX II  
PHOTOGRAPHS OF THE TEST SETUP  
RADIATED EMISSION**



**---END OF REPORT---**