

## ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT INTENTIONAL RADIATOR CERTIFICATION

**Product Name** : Bluetooth communication system  
**Model Number** : VTCS3500  
**Trade Name** : V-Tune  
**FCC ID** : XKZVTCS3500  
**Report Number** : SZEE090626262306  
**Date** : July 22, 2009

Standards	Results
<input checked="" type="checkbox"/> FCC Part 15: 2008	PASS

Prepared for:

**Ningbo HD Powersports Safety Products Co.,Ltd**  
**#6,Xin Heng Ba Lu,Ci Cheng Jiang Bei District, Ningbo, China**  
**TEL: +86-574-8752 6400**  
**FAX: +86-574-8752 6404**

Prepared by:

**CENTRE TESTING INTERNATIONAL**  
**Building C, Hongwei Industrial Zone, Baoan 70 District,**  
**Shenzhen, Guangdong, China**  
**TEL: +86-755-3368 3668**  
**FAX: +86-755-3368 3385**

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广东省深圳市宝安区 70 区鸿威工业园 C 栋  
Building C, Hongwei Industrial Zone, Baoan 70 District, Shenzhen

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*N/A means not applicable.*

## 1. CERTIFICATION INFORMATION

**Applicant & Address:** Ningbo HD Powersports Safety Products Co.,Ltd  
#6,Xin Heng Ba Lu,Ci Cheng Jiang Bei District, Ningbo, China

**Manufacturer & Address:** Ningbo Yueny Electronic Co., Limited  
#579, Zhongshan Road (east) Ningbo, China

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

**FCC ID:** XKZVTCS3500

**Equipment Under Test:** Bluetooth communication system

**Test Model:** VTCS3500

**Trade Name:** V-Tune

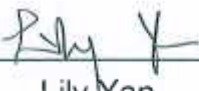
**Serial Number:** N/A

**Date of test:** June 26,2009 to July 21, 2009

**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 B 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.

Prepared by :   
Lily Yan

Reviewed by :   
Christy Chen

Approved by :   
Jim Zhang  
Manager

Date : Oct. 10, 2009

## 2. TEST SUMMARY

EMISSION -- FCC Part 15			
Clause	Test Item	Rule	Result
6	AC Power Line Conducted Emissions	15.207	PASS
7	Maximum Peak Conducted Output Power	15.247(b)(3)	PASS
8	Number of Hopping Frequency	15.247(a)(1)	PASS
9	20dB Spectrum Bandwidth	None	--
10	Carrier Frequency Separation	15.247(a)(1)	PASS
11	Time of Occupancy (Dwell time)	15.247(a)	PASS
12	Radiated Emission	15.209	PASS

TABLE FOR TEST MODES			
<b>Voltage:</b>	AC120V/ 60Hz	<b>Mode:</b>	Max. Transmitting & normal
<b>Temperature:</b>	24℃	<b>Humidity:</b>	53%
Test Item	Mode	Channel _ Frequency	
AC Power Line Conducted Emissions	Charging & transmitting	CH0 _ 2402MHz	
Maximum Peak Conducted Output Power	transmitting	CH0 _ 2402MHz CH39 _ 2441MHz CH78 _ 2480MHz	
Number of Hopping Frequency	transmitting	All channels	
20dB Spectrum Bandwidth	transmitting	CH0 _ 2402MHz CH39 _ 2441MHz CH78 _ 2480MHz	
Carrier Frequency Separation	transmitting	CH13 _ 2415MHz CH14 _ 2416MHz CH15 _ 2417MHz	
Time of Occupancy (Dwell time)	transmitting	CH39 _ 2441MHz	
Radiated Emission	Charging Transmitting	CH39 _ 2441MHz	

Note: in all the transmitting modes, the transmitting is generated with the help of software BEN\_TEST.exe provided by customer, or just by the product.

## 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
AC Power Line Conducted Emissions	2.6 dB
Maximum Peak Conducted Output Power	0.5 dB
Radiated Emissions	3.4 dB

## 4. PRODUCT INFORMATION

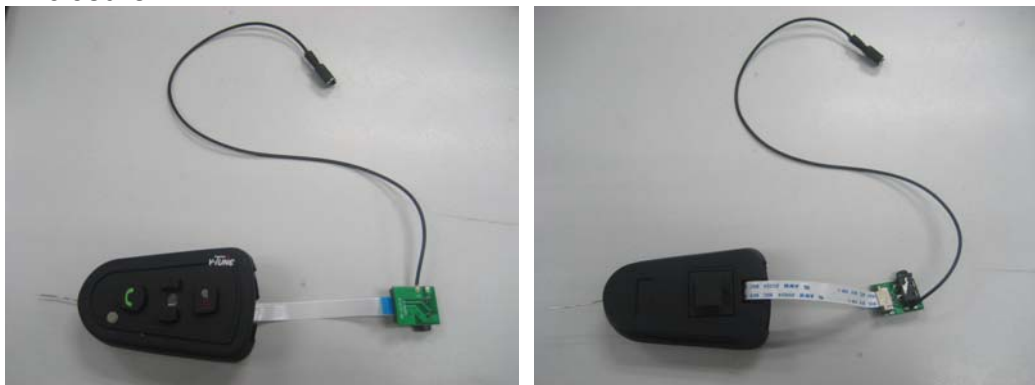
Items	Description
Rating	DC 3.7V by internal battery
Battery Information	Model Name: JK 062240P Capacitance: 600mAh Rated voltage: DC 3.7V
Port	USB port: input port for charging by adaptor or USB port of computer Audio port: output port to earphone
Adaptor information	Model Name: DNS-117GB0500500 Input: AC100V-240V 50/60Hz Output: DC5V 500mA
Intentional Transceiver	Intentional Transceiver
Modulation	Frequency Hopping Spread Spectrum (FHSS)
Frequency Range	2402 ~ 2480 MHz
Channel Number	79 (at intervals of 1MHz)
Antenna	internal Antenna (irremovable) Type: a simple cable made by manufacturer of the whole product Gain: 0 dBi

Statement: the product has two kinds of enclosure with the same material, PCB and electrics inside. The two enclosure are shown below. Enclosure 1 is the test model, and all data is applicable to enclosure 2.

Enclosure 1:



Enclosure 2:



## 5. TEST EQUIPMENT

Equipment	Manufacturer	Model Number	Serial Number	Due Date
Receiver	R&S	ESCI	100435	01/29/2010
LISN	R&S	ENV216	100098	06/13/2010
Spectrum Analyzer	Agilent	E4443A	MY45300910	09/07/2009
Biconilog Antenna	A.H.System	SAS-521-2	487	06/05/2010
Horn Antenna	ETS-LINDGREN	3117	00057407	06/27/2010
Loop Antenna	ETS-LINDGREN	6502	00071730	09/22/2009
3M Chamber & Accessories	ETS-LINDGREN	FACT-3	N/A	05/11/2010

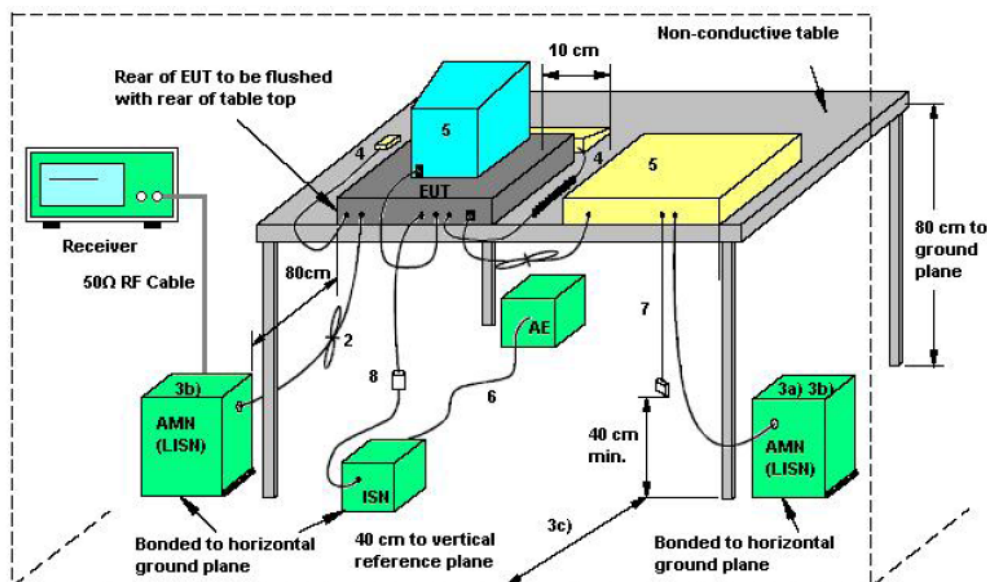
## 6. AC Power Line Conducted Emissions Measurement

## 6.1.LIMITS

Frequency (MHz)	Conducted Limit ( dBuV) – Class B Digital Device	
	Q.P.	Average( dBuV)
0.150 – 0.5	66-56	56-46
0.5 – 5	56	46
5 - 30	60	50

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

## 6.2. BLOCK DIAGRAM OF TEST SETUP



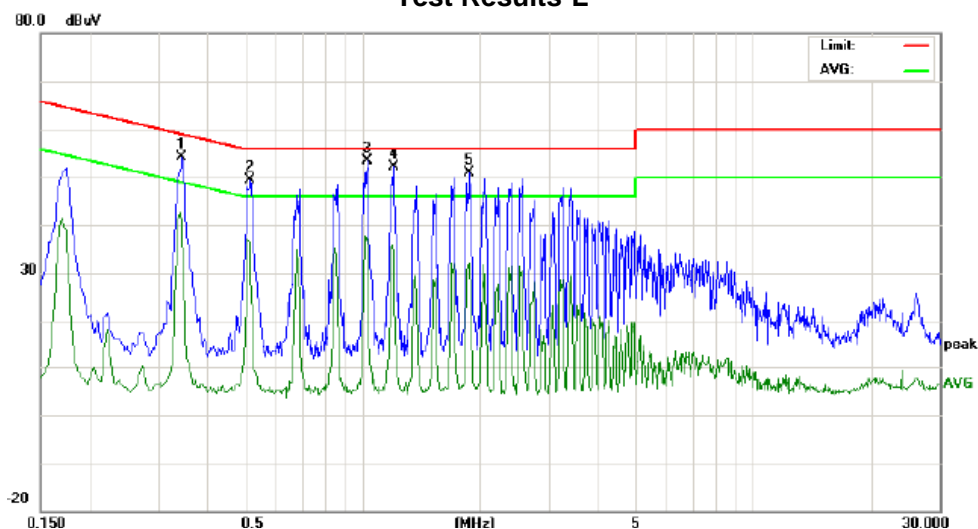
### 6.3. TEST PROCEDURE

- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room and connected to the main through Line Impedance Stability Network (LISN). This provided a 50ohm coupling impedance for the tested equipments.
- b. The bandwidth of the field strength meter (Receiver) was set at 9kHz in 150kHz ~ 30MHz.
- c. The disturbance levels and the frequencies of at least two highest disturbances were recorded from each power line which comprises the EUT.



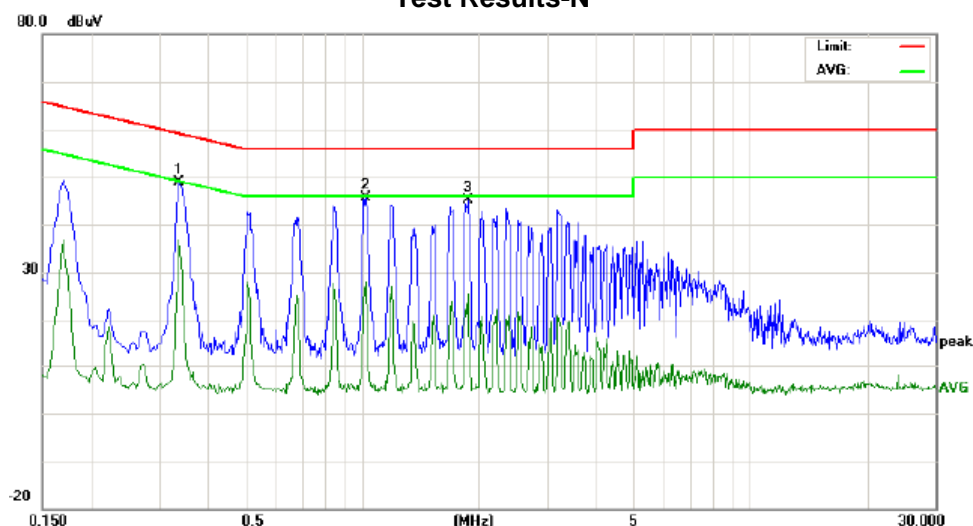
## 6.4. TEST RESULT

Test Results-L



No.	Freq. MHz	Reading_Level (dBuV)			Correct Factor dB	Measurement (dBuV)			Limit (dBuV)		Margin (dB)		P/F
		Peak	QP	AVG		peak	QP	AVG	QP	AVG	QP	AVG	
1	0.3460	44.27	37.87	24.92	9.98	54.25	47.85	34.90	59.06	49.06	-11.21	-14.16	P
2	0.5180	39.27	31.61	16.00	10.00	49.27	41.61	26.00	56.00	46.00	-14.39	-20.00	P
3	1.0300	43.52	37.57	21.06	9.85	53.37	47.42	30.91	56.00	46.00	-8.58	-15.09	P
4	1.2020	42.39	35.69	17.75	9.85	52.24	45.54	27.60	56.00	46.00	-10.46	-18.40	P
5	1.8860	41.10	33.38	14.51	9.83	50.93	43.21	24.34	56.00	46.00	-12.79	-21.66	P

Test Results-N



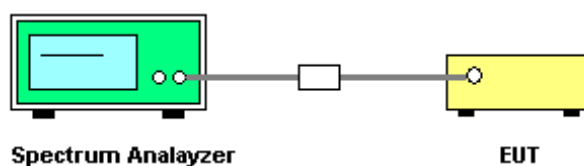
No.	Freq. MHz	Reading_Level (dBuV)			Correct Factor dB	Measurement (dBuV)			Limit (dBuV)		Margin (dB)		P/F
		Peak	QP	AVG		peak	QP	AVG	QP	AVG	QP	AVG	
1	0.3379	38.89	37.18	24.41	9.98	48.87	47.16	34.39	59.25	49.25	-12.09	-14.86	P
2	1.0220	35.75	33.93	16.69	9.85	45.60	43.78	26.54	56.00	46.00	-12.22	-19.46	P
3	1.8820	35.20	28.59	7.10	9.83	45.03	38.42	16.93	56.00	46.00	-17.58	-29.07	P

## 7. NUMBER OF HOPPING FREQUENCY

### 7.1.LIMITS

Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

### 7.2.BLOCK DIAGRAM OF TEST SETUP

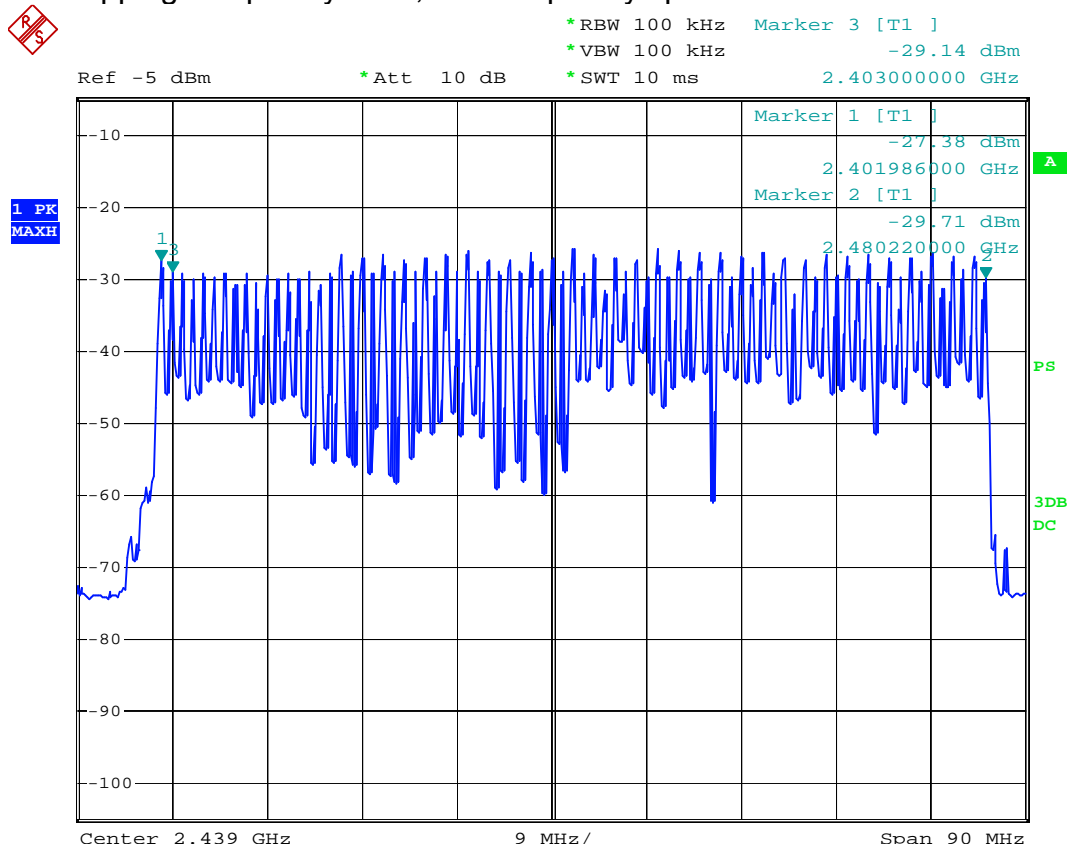


### 7.3.TEST PROCEDURE

1. The transmitter output (antenna port) was connected to the spectrum analyzer.
2. Set spectrum analyzer to Peak in Max Hold.
3. Make EUT work continually, till all operation channels were recorded.

### 7.4.TEST RESULT

Number of Hopping Frequency is 79, with frequency space = 1MHz.

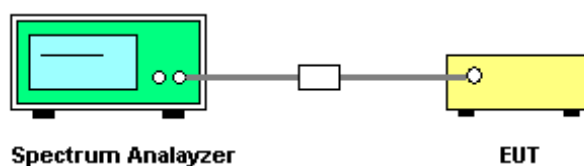


## 8. 20DB SPECTRUM BANDWIDTH MEASUREMENT

### 8.1.LIMITS

None

### 8.2.BLOCK DIAGRAM OF TEST SETUP

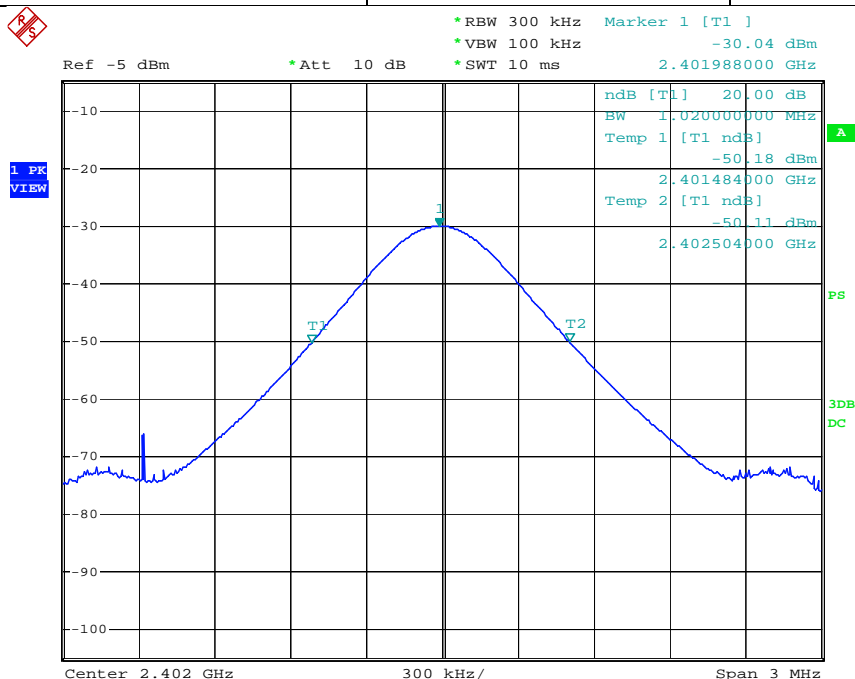


### 8.3.TEST PROCEDURE

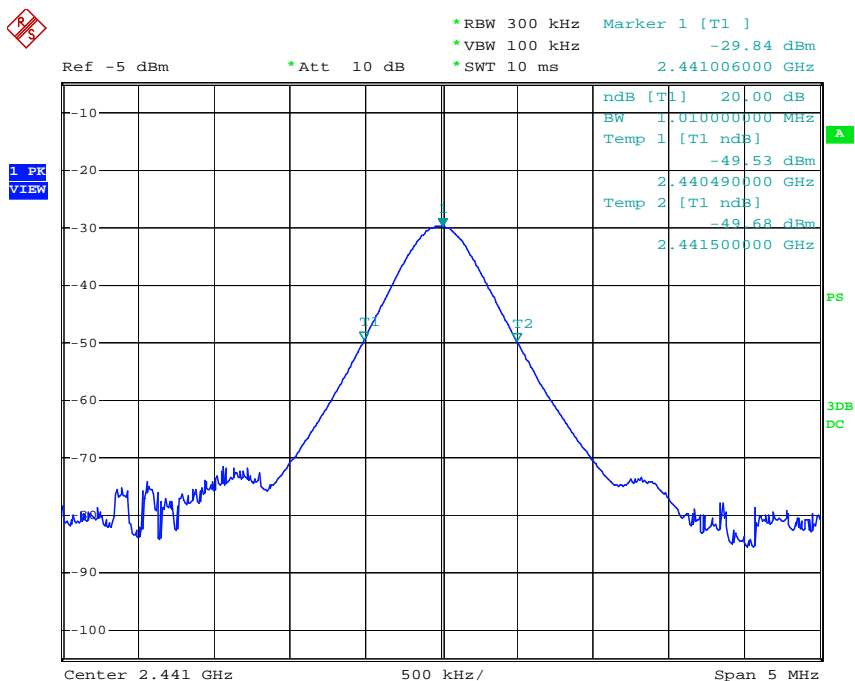
1. The transmitter output (antenna port) was connected to the spectrum analyzer.
2. Set spectrum analyzer's RBW and VBW to applicable value with Peak in Max Hold.
3. Measured the spectrum width with power higher than 20dB below carrier.

### 8.4.TEST RESULT

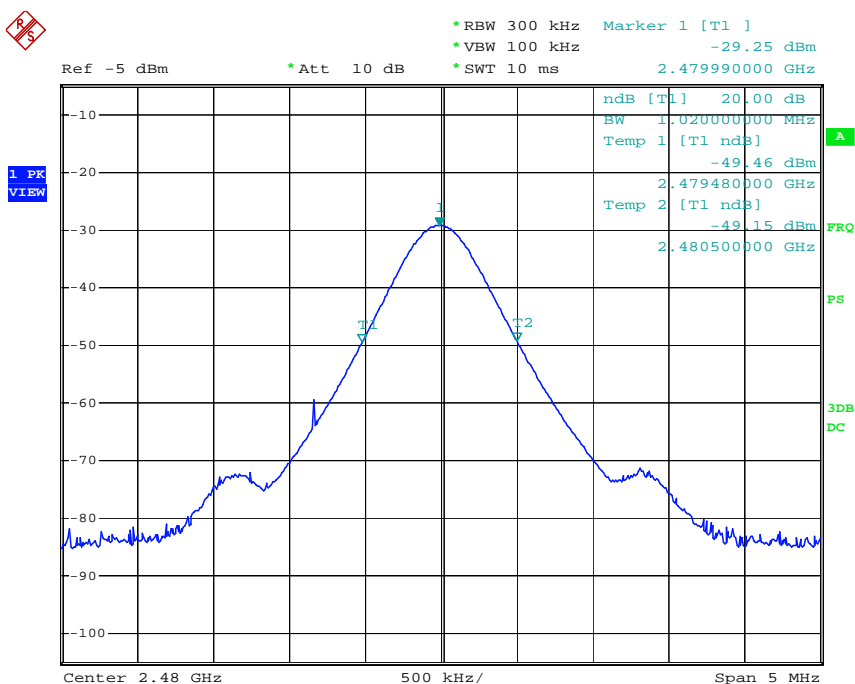
Channel	Frequency (MHz)	20 dB BW (MHz)	Result
CH0	2402	1.0200	1.0200 MHz
CH39	2441	1.0100	
CH78	2480	1.0200	



Channel 0 \_ 2402 MHz



Channel 39 \_ 2441 MHz



Channel 78 \_ 2480 MHz

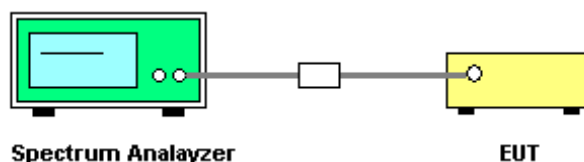
## 9. CARRIER FREQUENCY SEPARATION

### 9.1. LIMITS

Frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

As the system's 20 dB bandwidth is 1.0200 MHz, and output power is -18.67 dBm, thus, Carrier Frequency Separation should be greater than 0.6800 MHz.

### 9.2. BLOCK DIAGRAM OF TEST SETUP



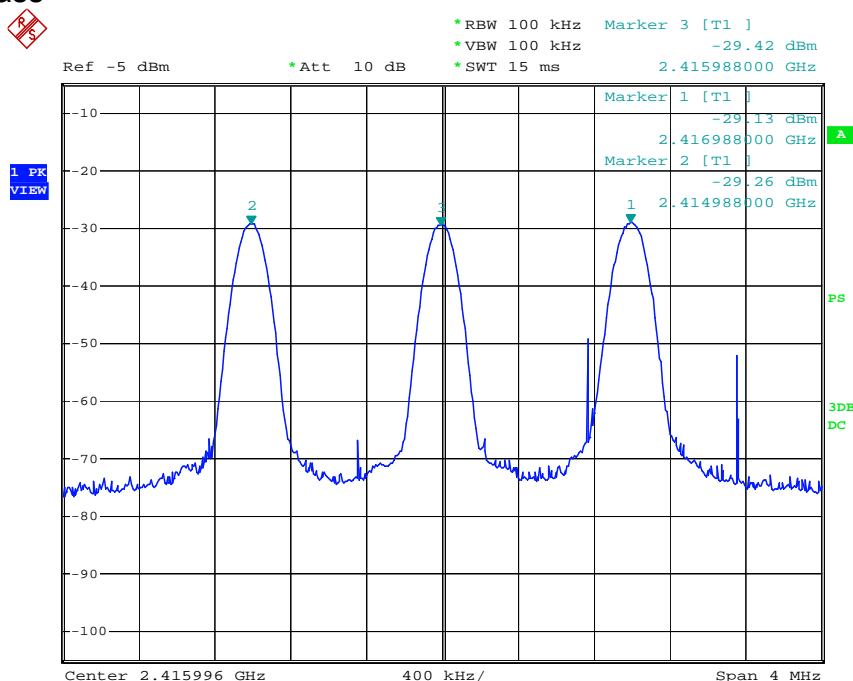
### 9.3. TEST PROCEDURE

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. Measured the spectrum width with power higher than 20dB below carrier.

### 9.4. TEST RESULT

Carrier Frequency Separation: 1 MHz

Test Result: Pass

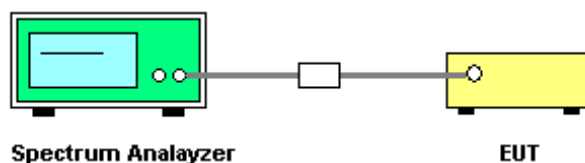


## 10. TIME OF OCCUPANCY (DWELL TIME)

### 10.1. LIMITS

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

### 10.2. BLOCK DIAGRAM OF TEST SETUP



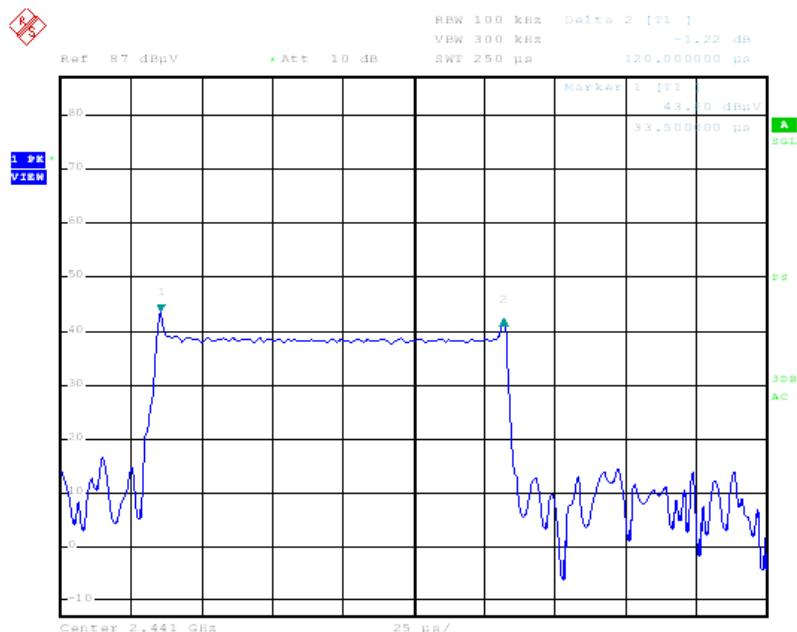
### 10.3. TEST PROCEDURE

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. Measured pulse time and Time separation.

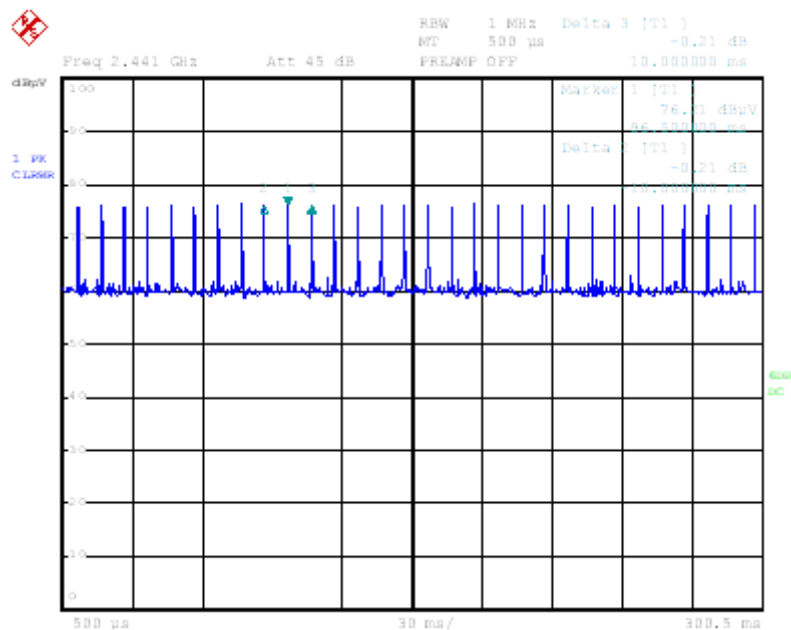
### 10.4. TEST RESULT

The average time of occupancy =  $120 \text{ us} * (30/300\text{ms}) * (79*0.4\text{s}) = 0.3792 \text{ s}$

Test Result: Pass



Pulse time: 120us



Total 30 pulses in a period of 300 ms

## 11. RADIATED EMISSIONS MEASUREMENT

### 11.1. LIMITS

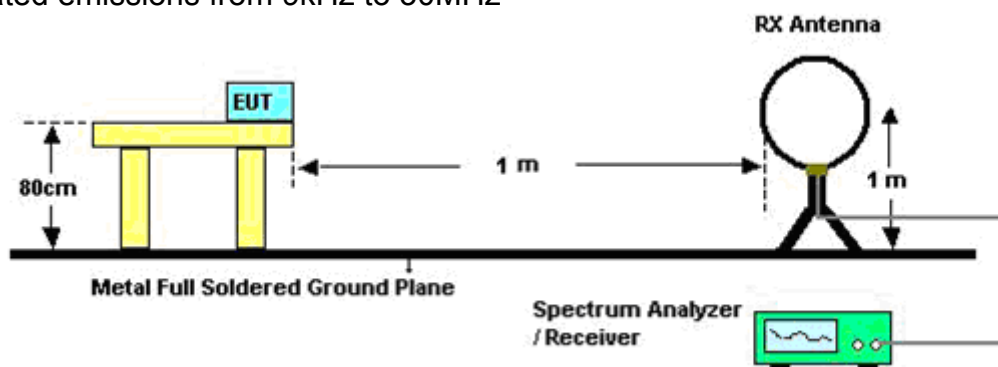
The field strength of any emissions, which appear outside of operating frequency band and restricted band specified on 15.205(a), shall not exceed the general radiated emission limits as below.

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

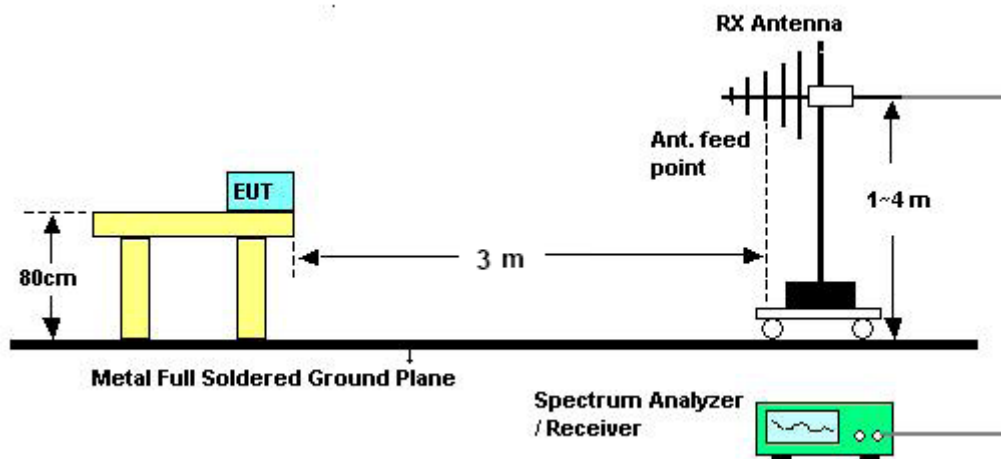
**Note:** the tighter limit applies at the band edges.

### 11.2. BLOCK DIAGRAM OF TEST SETUP

For radiated emissions from 9kHz to 30MHz

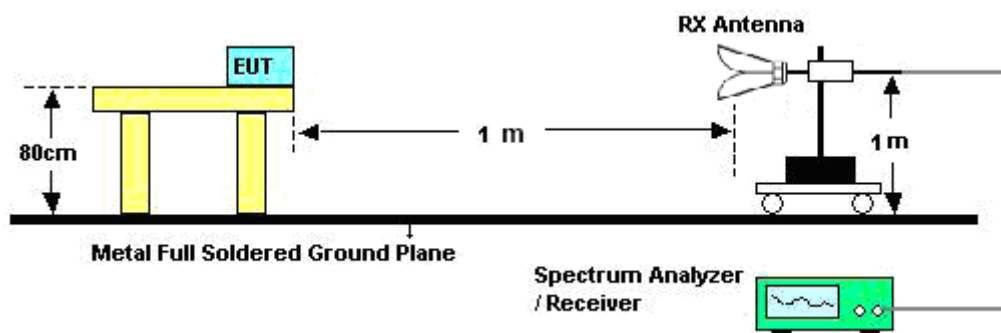


For radiated emissions from 30 - 1000MHz





For radiated emissions from 1GHz to 24GHz



## 11.3. 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

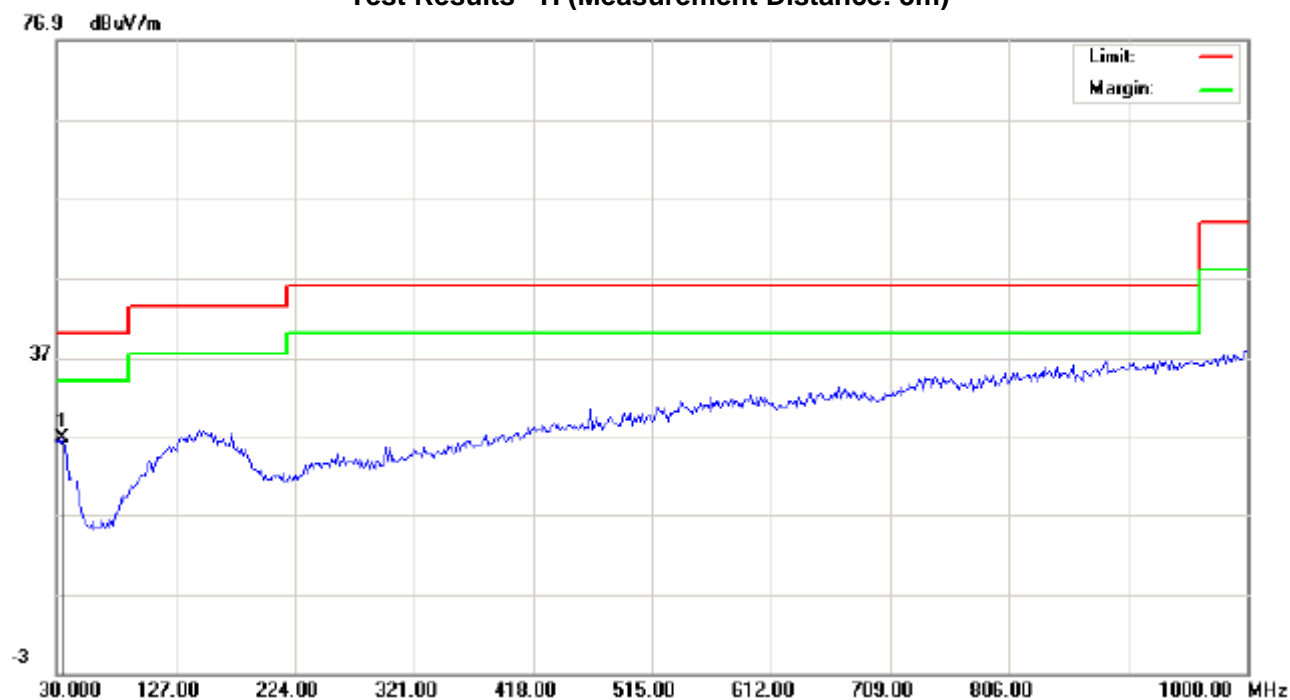
- The EUT is placed on a turntable 0.8 meters above the ground in the chamber, 1 meter away from the antenna (loop antenna). The maximum values of the field strength are recorded by adjusting the polarizations of the test antenna and rotating the turntable.
- For each suspected emission, the EUT was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

## 11.4. TEST RESULT

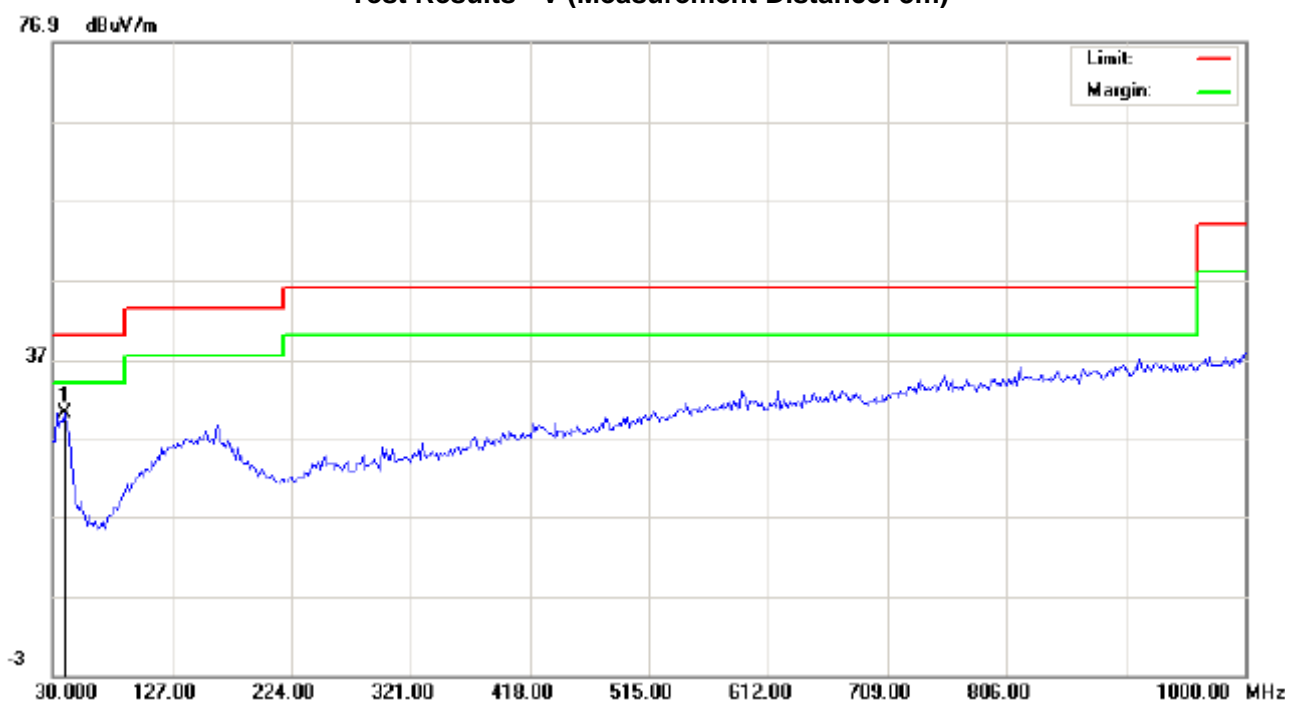
Note:     Limit dB $\mu$ V/m @1m = Limit dB $\mu$ V/m @300m+ 90  
               Limit dB $\mu$ V/m @1m = Limit dB $\mu$ V/m @30m + 50  
               Limit dB $\mu$ V/m @1m = Limit dB $\mu$ V/m @3m +10

## 10.4.1 Charging Mode

### Test Results - H (Measurement Distance: 3m)



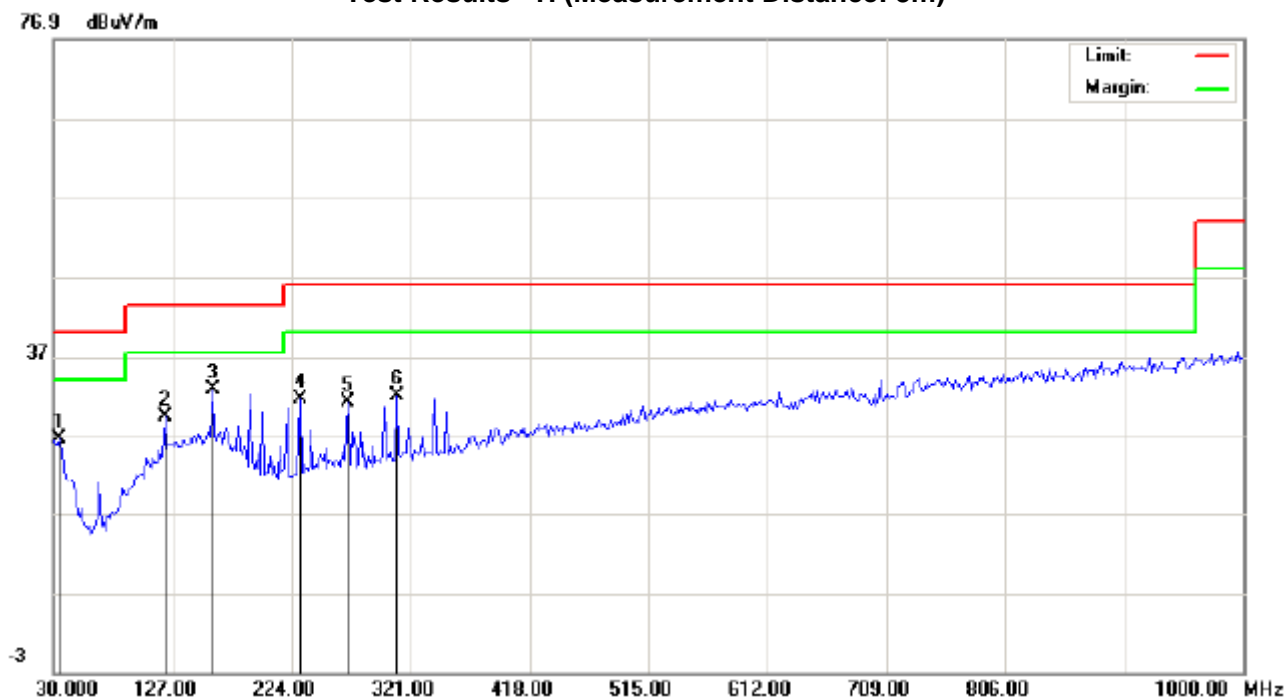
### Test Results - V (Measurement Distance: 3m)



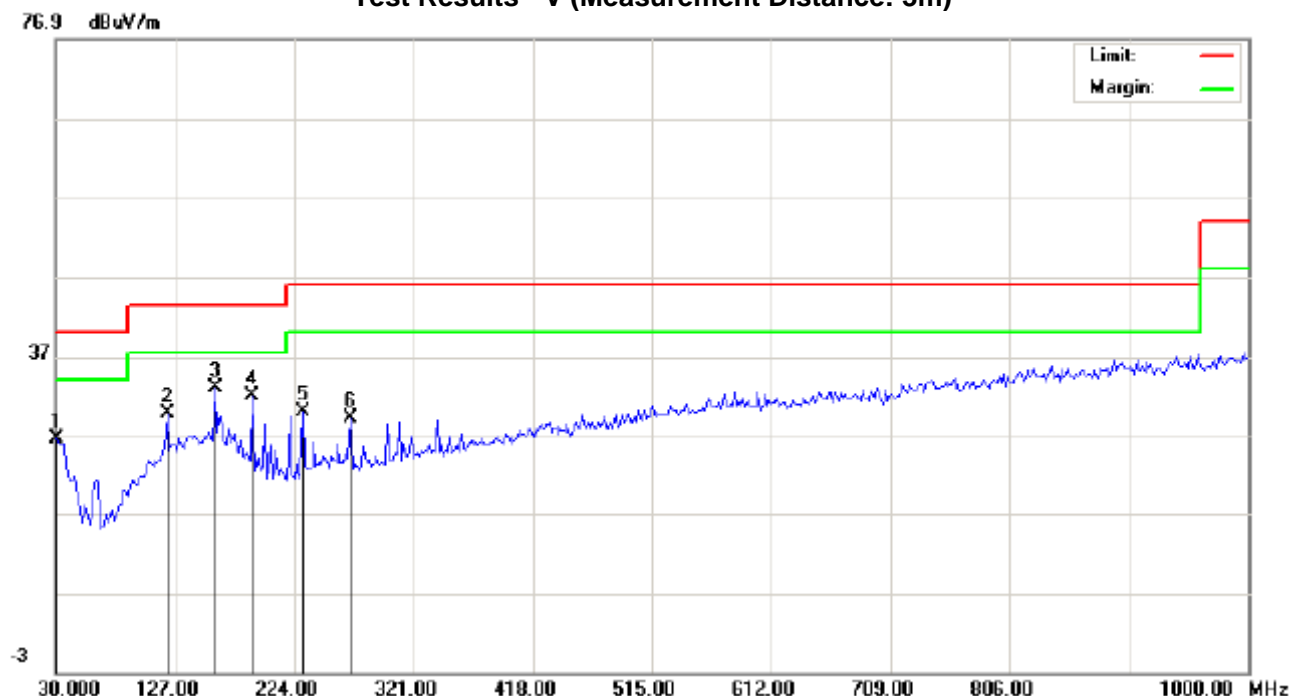
## 10.4.2 Transmitting Mode @ 2441MHz

### A. Below 1GHz

Test Results - H (Measurement Distance: 3m)

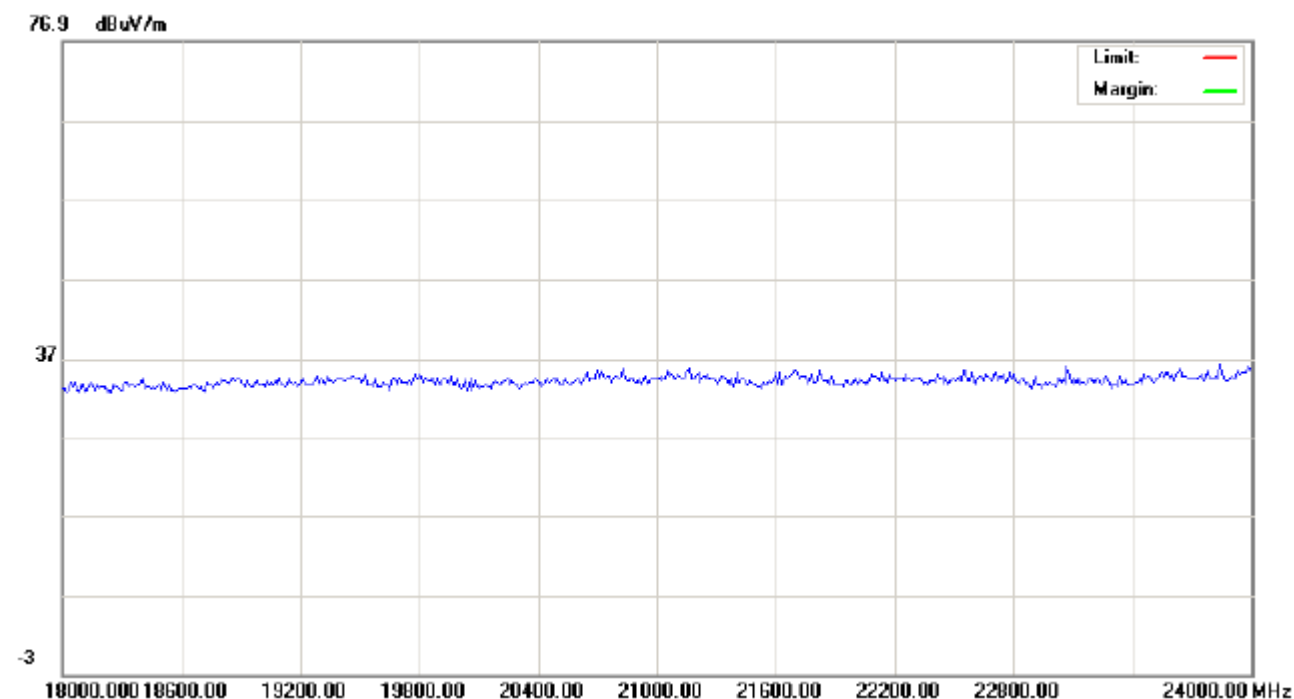


Test Results - V (Measurement Distance: 3m)

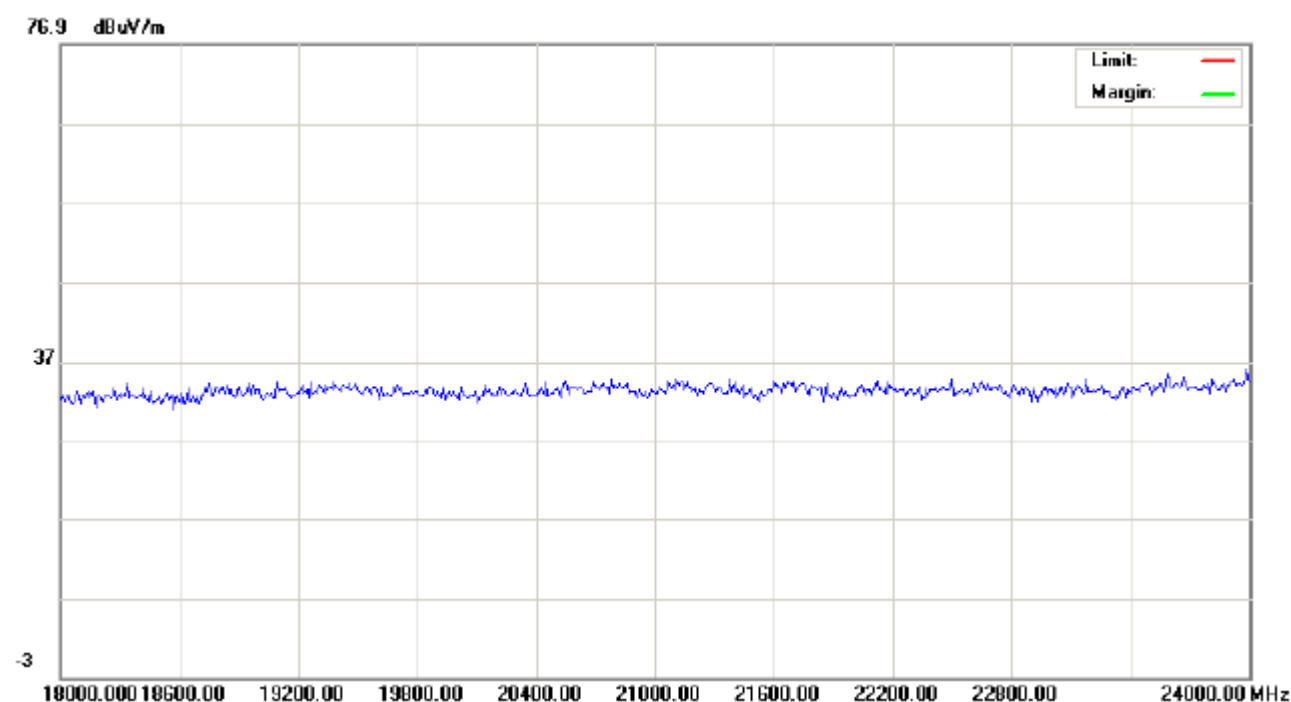
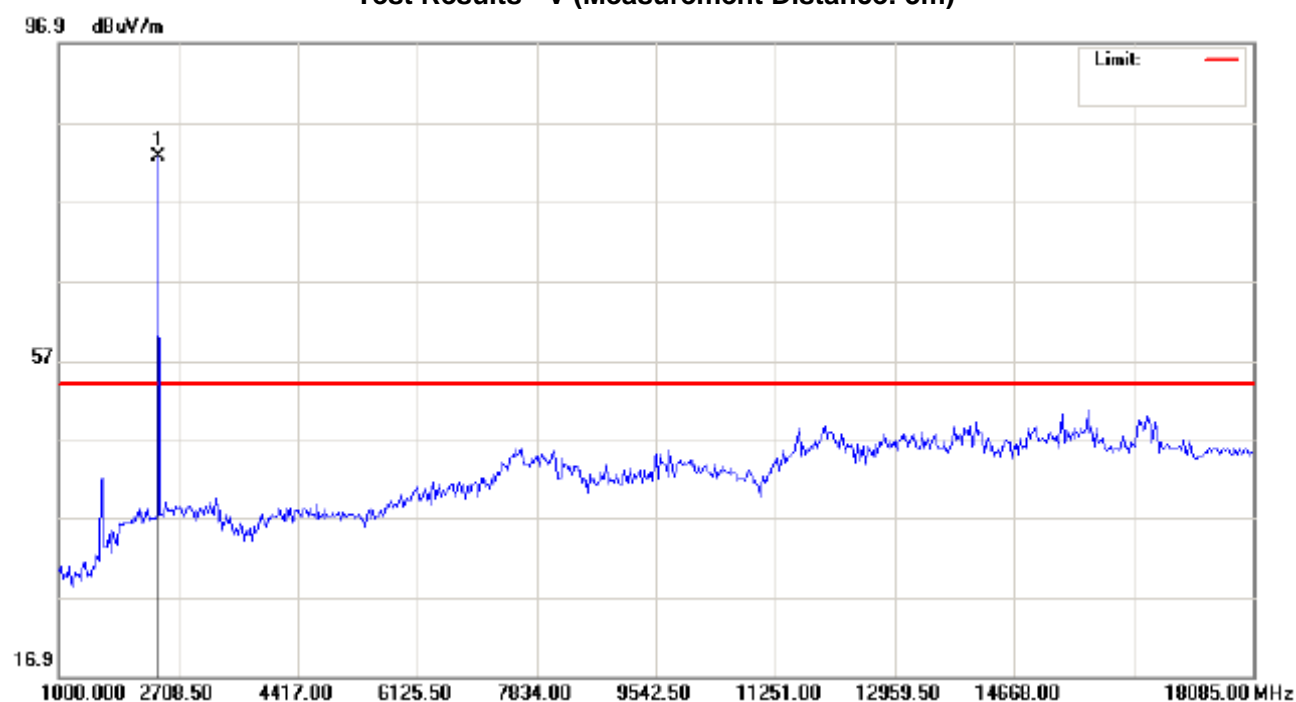


## B. Above 1GHz

### Test Results - H (Measurement Distance: 3m)



### Test Results - V (Measurement Distance: 3m)



### 10.4.3 Transmitting Mode @ 2402MHz & 2480MHz

#### Test Results – 2402MHz – Higher of V&H (Measurement Distance: 3m)



#### Test Results –2480MHz – Higher of V&H (Measurement Distance: 3m)



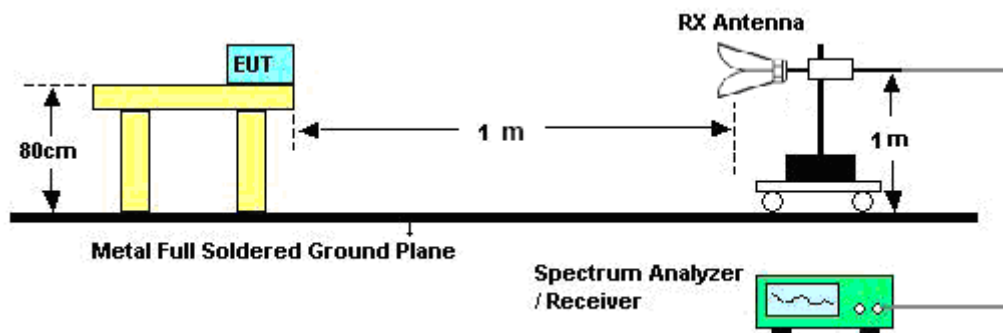
The other results in other freq. band is also compliant to the requirement without deviation.

## 12. MAXIMUM PEAK OUTPUT POWER MEASUREMENT

### 12.1. LIMITS

The limit for peak output power is 1 Watt.

### 12.2. BLOCK DIAGRAM OF TEST SETUP



### 12.3. TEST PROCEDURE

Same as 11.3

### 12.4. TEST RESULT

The following formula may be used to convert field strength (FS) in volts/metre to transmitter output power (TP) in watts:

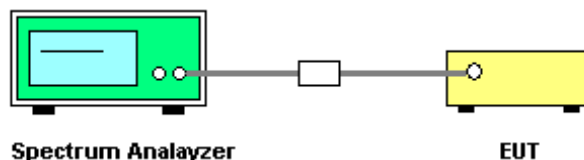
$$TP = (FS \times D)^2 / (30 \times G)$$

Where D is the distance in metres between the two antennas and G is the antenna numerical gain referenced to isotropic gain. (Note: In an open-area test measurement, the effect due to the metal ground plane should be subtracted from the maximum field strength value in order to reference it to free space, before calculating TP.)

Channel _ Freq. (MHz)	Higher Measured FS (dBuV/m)	Max FS (V/m)	Max Power (mW)	Max. Limit (W)	Result (P/F)
CH0 _ 2402	85.23	0.018	1.0003	1	P
CH39 _ 2441	82.51				
CH78 _ 2480	84.53				

## 13. BAND EDGE EMISSIONS MEASUREMENT

### 13.1. BLOCK DIAGRAM OF TEST SETUP



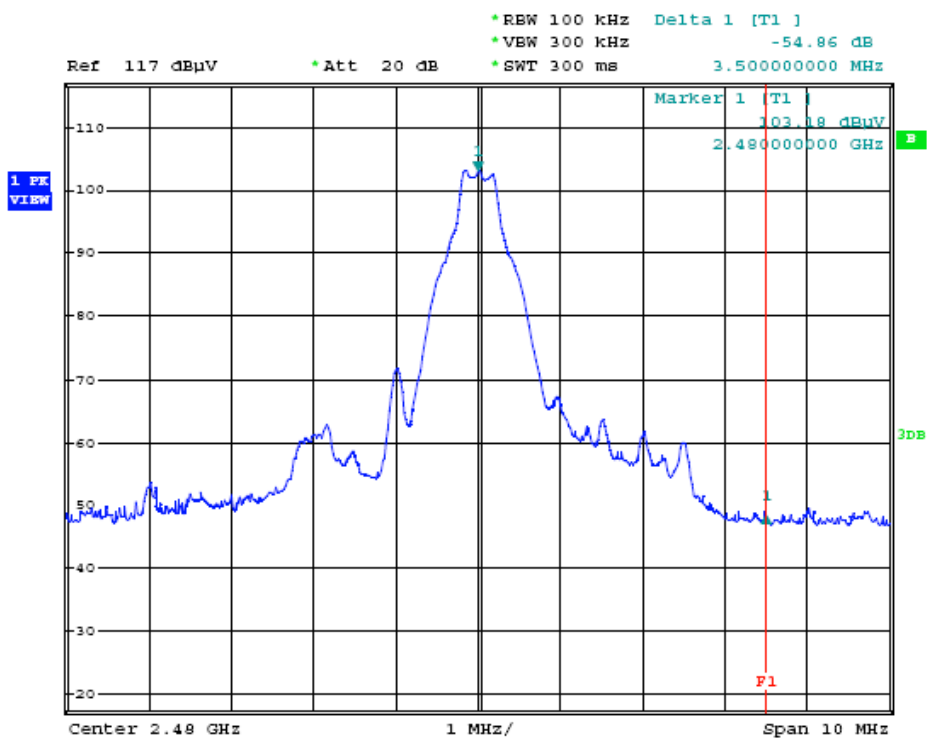
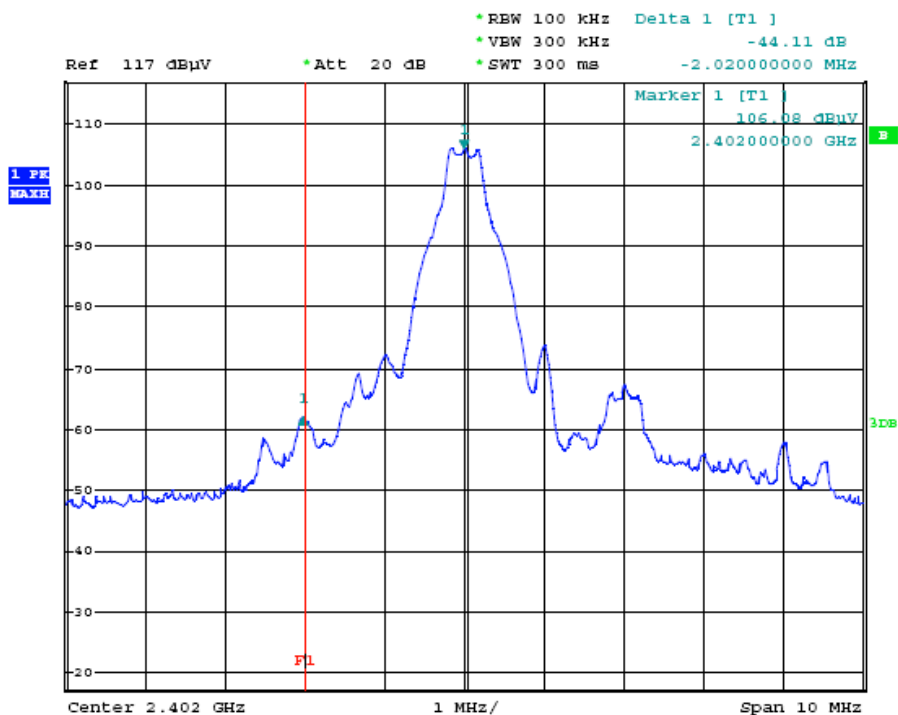
### 13.2. TEST PROCEDURE

- A. Set the spectrum analyzer as, Span = 10MHz; RBW = 100kHz; VBW = 300kHz; Sweep = auto; Detector function = peak; Trace = max hold
- B. Set the marker on the emission at the bandedge, or on the highest modulation product outside of the band, if this level is greater than that at the bandedge. Enable the marker-delta function, then use the marker-to-peak function to move the marker to the peak of the in-band emission. The marker-delta value now displayed must comply with the limit specified in this Section.
- C. Using the same instrument settings, enable the hopping function of the EUT. Allow the trace to stabilize. Follow the same procedure listed above to determine if any spurious emissions caused by the hopping function also comply with the specified limit.

### 13.3. TEST RESULT

Channel _ Freq. (MHz)	Fundamental Emission (dBuV/m)	Delta (dB)	Final Emission (dBuV/m)	Detector	Limit (dBuV/m)	Result (P/F)
CH0 _ 2402	85.23	-44.11	41.12	Peak	74 (Peak)	P
CH78 _ 2480	84.53	-54.86	29.67	Peak	54(AV)	P





## APPENDIX 1 PHOTOGRAPHS OF TEST SETUP



**TEST SETUP OF CONDUCTED EMISSION**



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



**TEST SETUP OF RADIATED EMISSION (above 1GHz)**

## APPENDIX 2 EXTERNAL PHOTOGRAPHS OF EUT



Full View of EUT (Enclosure 1) and Auxiliary Units



View of Adaptor





View of EUT(Enclosure 1) -front view



View of EUT(Enclosure 1) -side view



View of EUT(Enclosure 1) -back view



Uncovered



Covered

View of EUT(Enclosure 1) –port



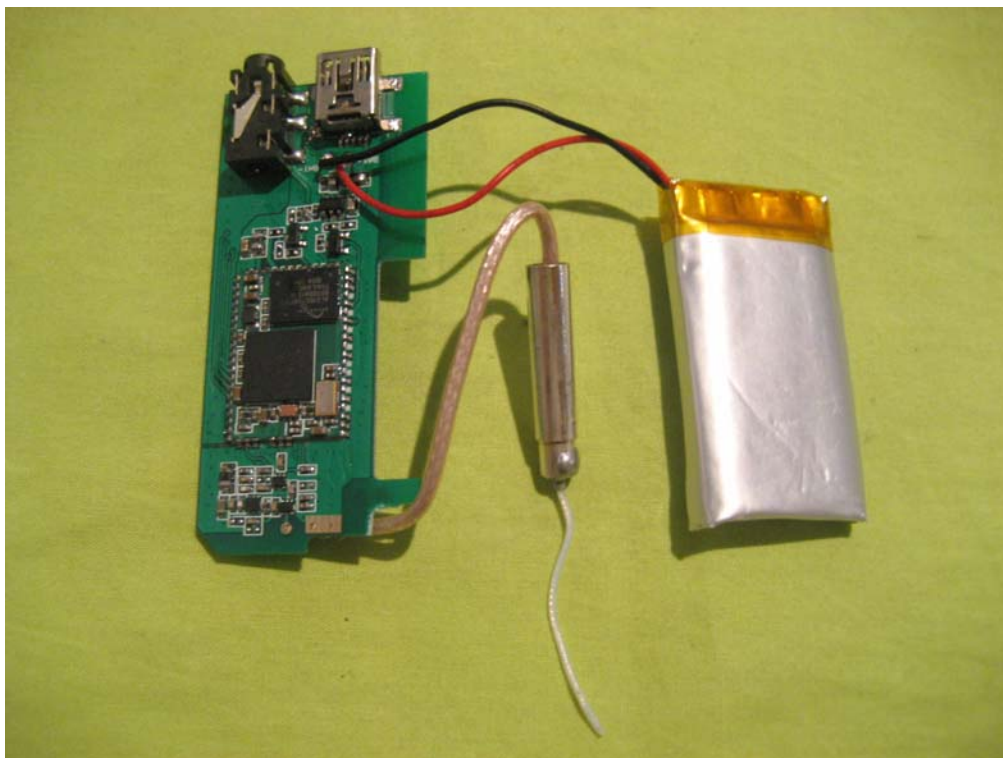
View of EUT(Enclosure 2) –1



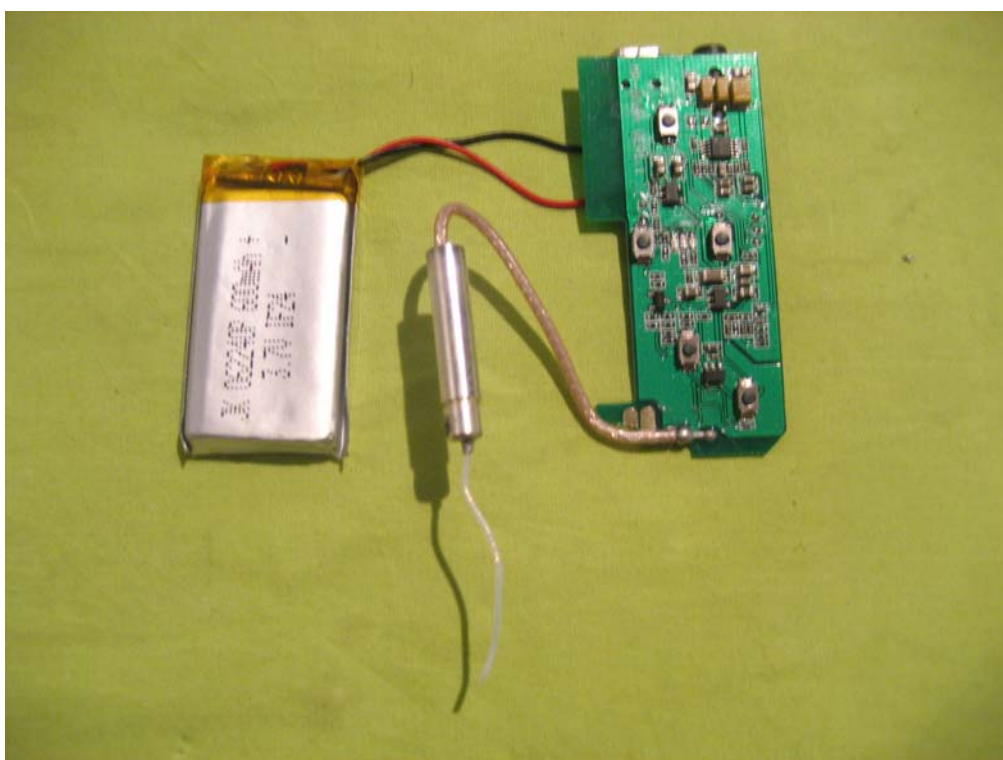
View of EUT(Enclosure 2) –2



## APPENDIX 3 INTERNAL PHOTOGRAPHS OF EUT



Internal View-Untied, front

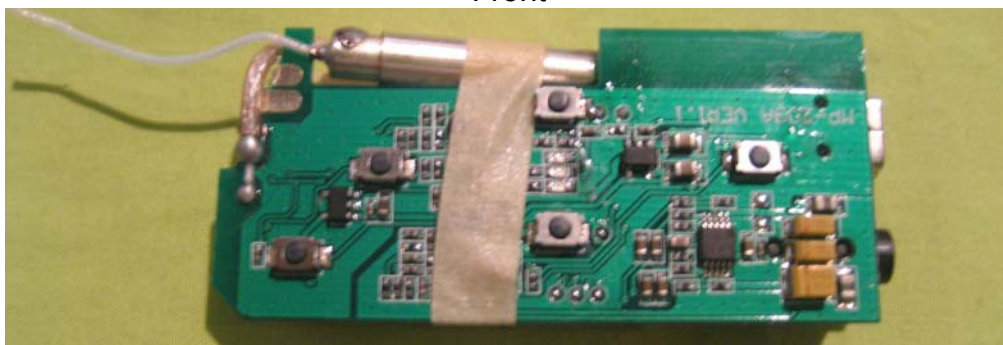


Internal View-Untied, back



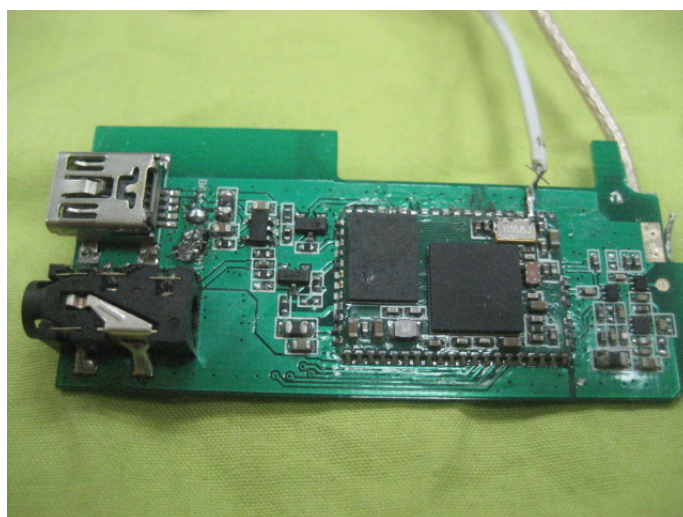


Front



Back

Internal View-tied



Detail view of PCB

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