



Report No.:SZ11120131E01



# FCC TEST REPORT

Issued to

**GUANGDONG STEELMATE SECURITY CO., LTD.**

For

**TPMS**

Model Name: TP-81, TP-82, TP-12  
 Trade Name: Steel mate  
 Brand Name: Steel mate  
 FCC ID: Q6WBSE0001  
 Standard: 47 CFR Part 15 Subpart C  
 Test date: February 18, 2012 – April 23, 2012  
 Issue date: May 2, 2012

Shenzhen Morlab Communications Technology Co., Ltd.



Tested by Li Liang  
 Li Liang  
 Date 2012.5.2

Approved by Wei Yanjun  
 Wei Yanjun  
 Date 2012.5.2

Review by Huang Pulong  
 Huang Pulong  
 Date 2012.5.2

CTIA Authorized Test Lab  
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OFTA  
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 Reg. No. 741109

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Issue	Date	Reason for change
1.0	May 2, 2012	First edition



# 1. GENERAL INFORMATION

## 1.1 EUT Description

EUT Type..... TPMS  
Serial No. .... (n.a., marked #1 by test site)  
Hardware Version..... N/A  
Software Version..... N/A  
Applicant..... GUANGDONG STEELMATE SECURITY CO.,LTD.  
Renan Street, Dongfu Road, Dongfeng Town, Zhongshan, 528425 China  
Manufacturer..... GUANGDONG STEELMATE SECURITY CO., LTD.  
Renan Street, Dongfu Road, Dongfeng Town, Zhongshan, 528425 China  
Modulation Type ..... FSK  
Working Frequency..... 433.92MHz  
Working Voltage..... 2.2-3.6V

- Note 1:* The Pressure Monitoring System is a wireless RF sensing device designed to measure and display the tire pressure and temperature. The sensor was a part of the system and tested as the EUT in this report.
- Note 2:* The EUT has three different model name: TP-81, TP-82 and TP-12, and all of them point the same sample.
- Note 3:* For a more detailed description, please refer to Specification or User’s Manual supplied by the applicant and/or manufacturer.

## 1.2 Test Standards and Results

The objective of the report is to perform testing according to 47 CFR Part 15 Subpart C for the EUT FCC ID Certification:

No.	Identity	Document Title
1	47 CFR Part 15 (11-10-01Edition)	Radio Frequency Devices

Test detailed items/section required by FCC rules and results are as below:

No.	Section	Description	Result
1	15.203	Antenna Requirement	Compliance
2	15.207	Conducted Emission	N/A*
3	15.231(a)(1)	Manually Activated Transmitter	Compliance
4	15.231(a)(3)	Periodic Transmissions for Polling or Supervision	Compliance
5	15.231(a)(4)	Alarm Condition Mode Description	Compliance
6	15.231(c)	20dB Bandwidth Testing	Compliance
7	15.205;15.209; 15.231(b)	Radiated Emission	Compliance

(N/A\* This EUT is power by battery only.)

### NOTE:

All measurements contained in this report were conducted with ANSI C63.4-2009, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Equipment in the range of 9 kHz to 40GHz.

The equipment under test (EUT) was configured to measure its highest possible emission level. The test modes were adapted accordingly in reference to the Operating Instructions. The EUT was tested in all three orthogonal planes and the worse case was showed.

## 1.3 Test Equipments Used

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Receiver	Agilent	E7405A	US44210471	2011.05	1year
Amplifier	Lucix	S10M100L3802	46732	2011.05	1year
Full-Anechoic Chamber	Albatross	9m*6m*6m	(n.a.)	2011.05	1year
Test Antenna - Bi-Log	Schwarzbeck	VULB 9163	9163-274	2011.05	1year
Test Antenna - Horn	Schwarzbeck	BBHA 9120C	9120C-384	2011.05	1year
Test Antenna -Loop	R&S	HFH2-Z6	100231	2011.05	1year

## 1.4 Facilities and Accreditations

### 1.4.1 Facilities

Shenzhen Morlab Communications Technology Co., Ltd. Morlab Laboratory is a testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L3572.

All measurement facilities used to collect the measurement data are located at 3/F, Electronic Testing Building, Shahe Road, Xili, Nanshan District, Shenzhen, 518055 P. R. China. The test site is constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22; the FCC registration number is 741109.

### 1.4.2 Test Environment Conditions

During the measurement, the environmental conditions were within the listed ranges:

Temperature (°C):	15 - 35
Relative Humidity (%):	30 - 60
Atmospheric Pressure (kPa):	86 - 106

### 1.4.3 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:	$\pm 1.8\text{dB}$
Uncertainty of Radiated Emission:	$\pm 3.1\text{dB}$

## **2. 47 CFR PART 15C REQUIREMENTS**

### **2.1 FCC 15.203 Antenna requirement**

#### **2.1.1 Applicable Standard**

According to FCC 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

**Result:** Compliant

The EUT has a antenna which was welded with the PCB; it is permanently attached to the PCB. Please refer to the EUT internal photos.

## 2.2 FCC 15.231(a)(1) Manually Activated Transmitter

### 2.2.1 Applicable Standard

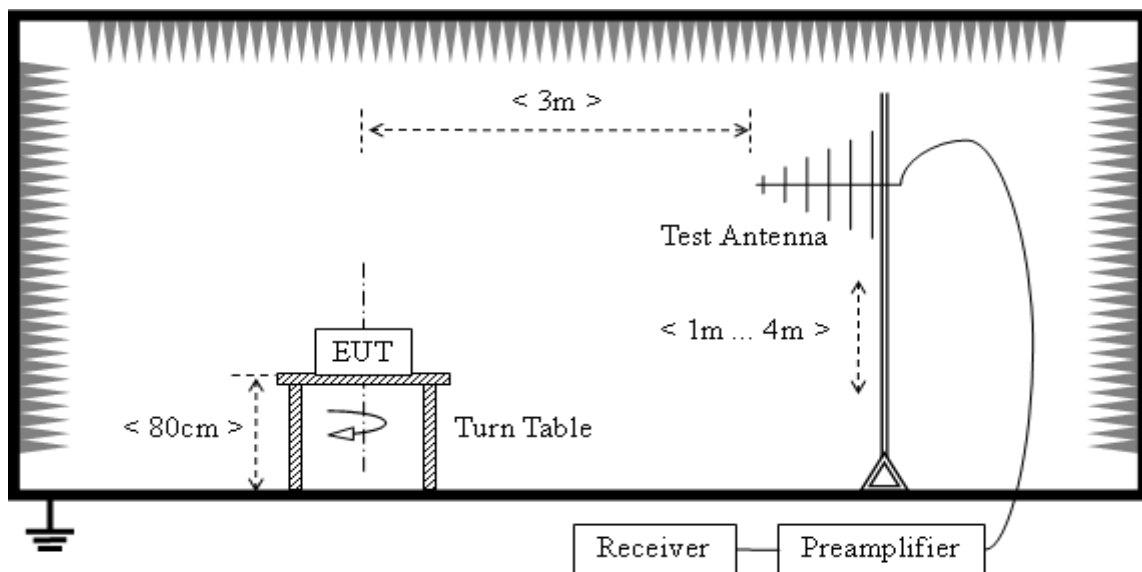
According to FCC 15.231(a)(1), a manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

The EUT is a sensor, before use the EUT, the sensor needs pair with the display for activate the sensor transmitting and work at programming mode, and the pairing process as following:

When the display perform the pairing programming, the display will send a active command to the sensor. For a more detailed description, please refer to Operational Descriptions supplied by the applicant and/or manufacturer.

The rules of 15.231(a)(1) appropriates for the programming mode.

### 2.2.2 Test Setup

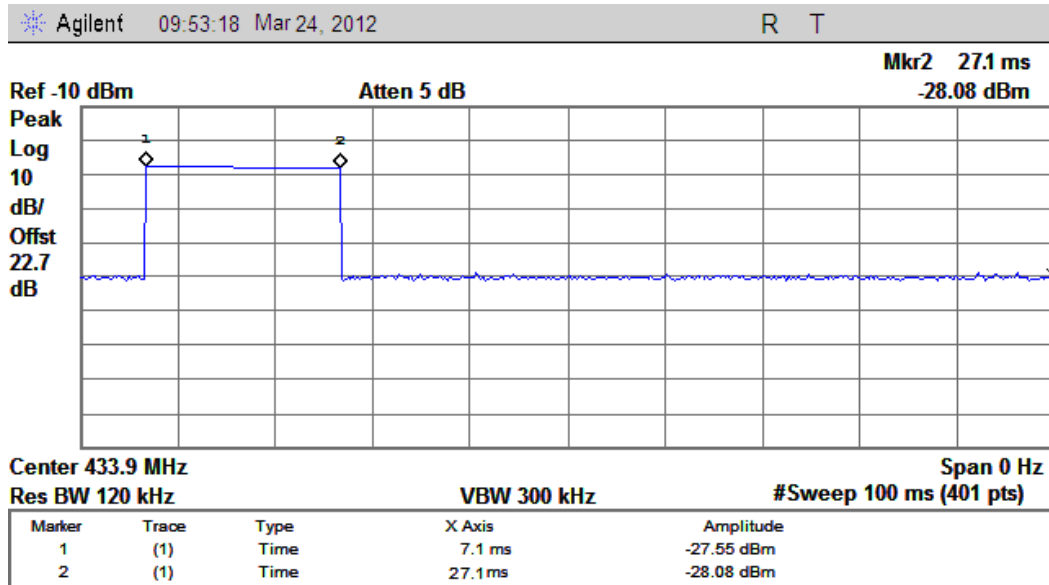


### 2.2.3 Summary of Test results

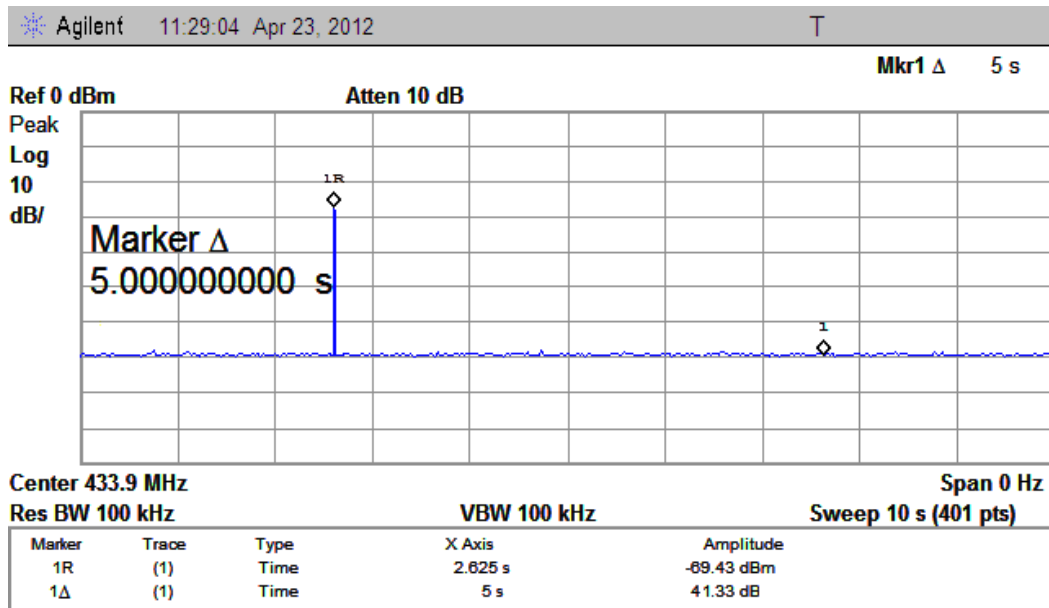
Work mode	activate Time	Limit	Plot	Conclusion
Programming Mode	20ms	5 s	A, B	Pass



### 2.2.4 Test plots



(Plot A: Activate Time)



(Plot B: Deactivate Time)

**Result:** Compliant

## 2.3 FCC 15.231(a)(3) Periodic Transmissions

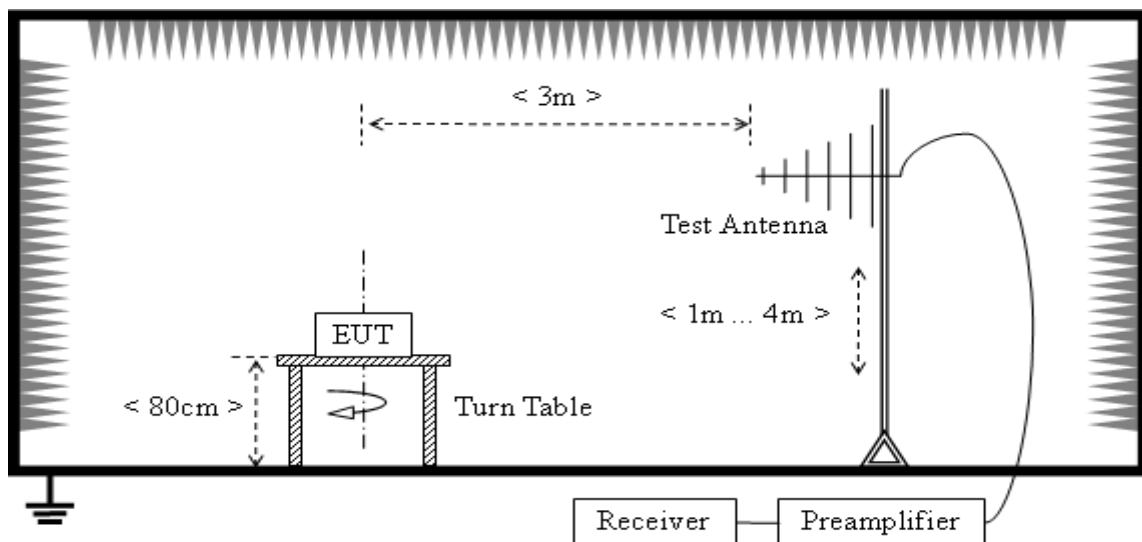
### 2.3.1 Applicable Standard

According to FCC 15.231(a)(3), polling or supervision transmissions, including data, to determine system integrity of transmitters used in security or safety applications are allowed if the total duration of transmissions does not exceed more than two seconds per hour for each transmitter. There is no limit on the number of individual transmissions, provided the total transmission time does not exceed two seconds per hour.

If the data is in the range of default scope (normal condition), the sensor will transmitting once every four minutes and once is less than 20 ms.

The rules of 15.231 a(3) appropriates for the normal condition.

### 2.3.2 Test Setup



### 2.3.3 Summary of Test results

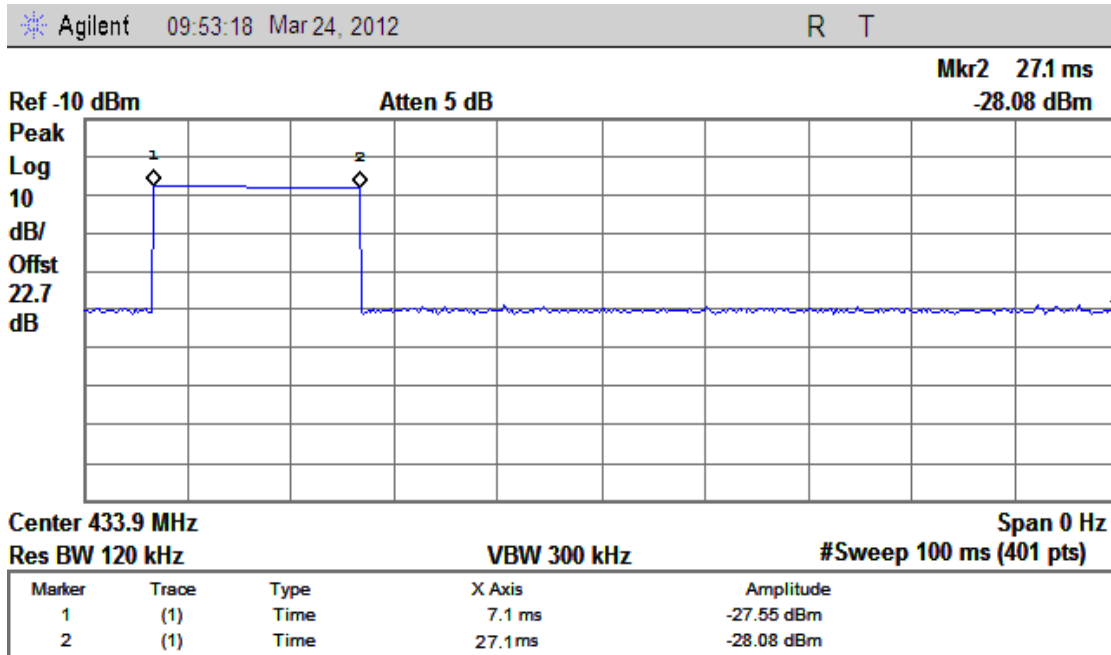
Work mode	total transmission time	Limit	Plot	Conclusion
Normal condition	0.3s/h	2s/h	A, B	Pass <sup>Note 1</sup>

Note 1: The once transmitting time is 20ms.

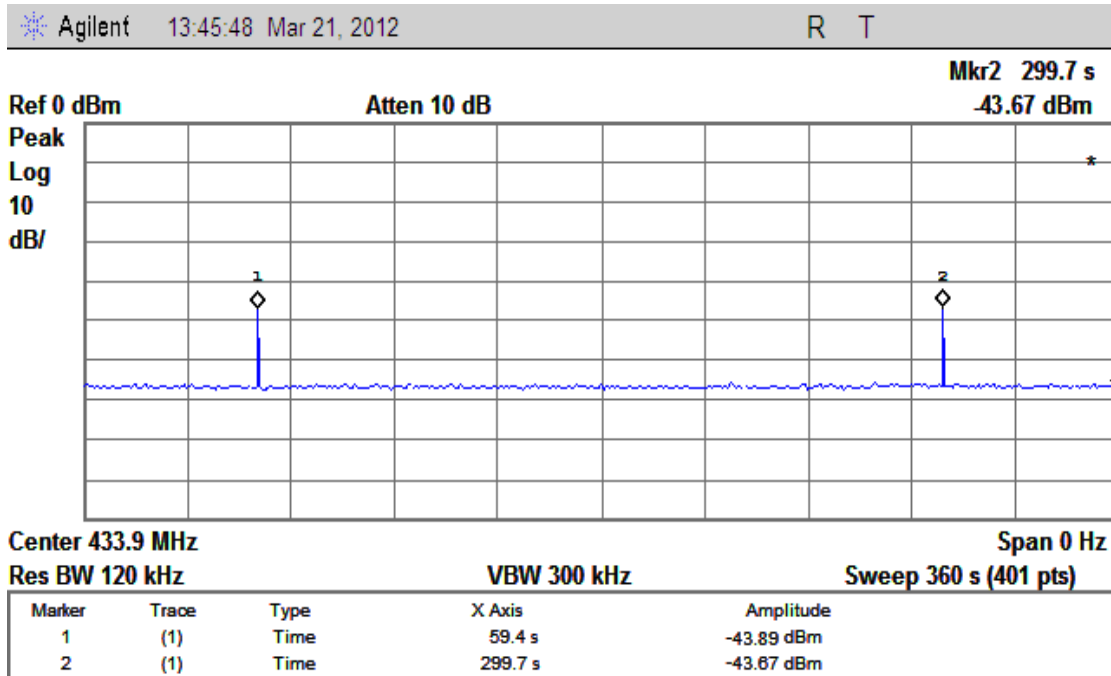
The provided at normal condition is once every four minutes.

Total transmission time per hour= $(60/4)*20(\text{ms/h})=0.3\text{s/h}$

### 2.3.4 Test plots



(Plot A: Activate Time)



(Plot B: The period of transmit)

**Result:** Compliant

## 2.4 FCC 15.231(a)(4) Alarm Condition Mode Description

### 2.4.1 Applicable Standard

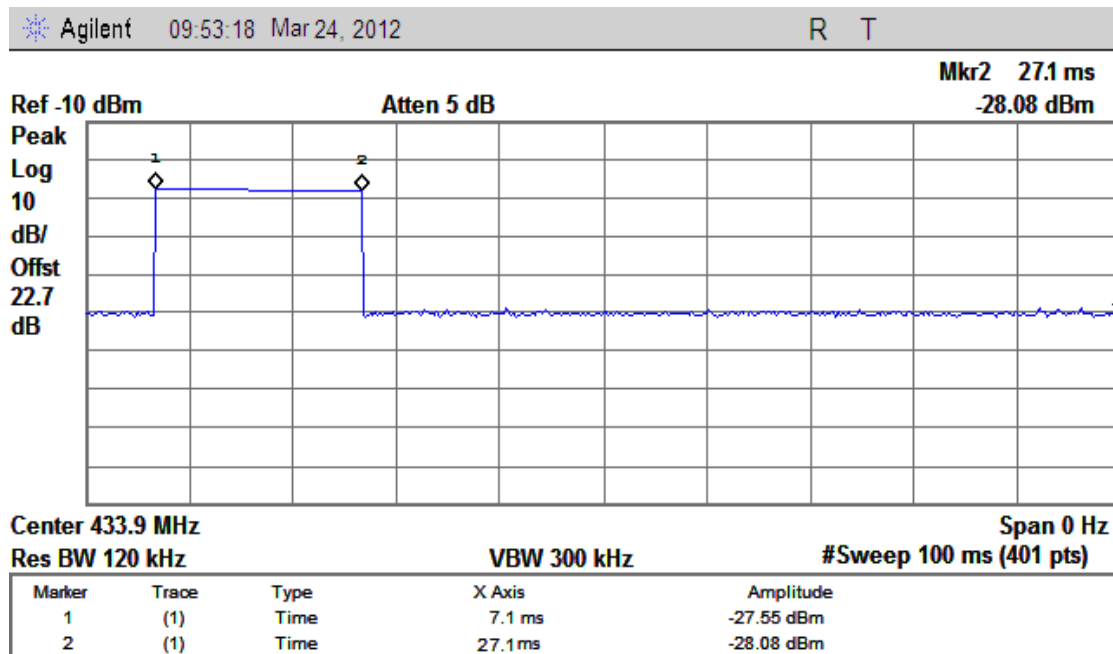
According to FCC 15.231(a)(4), intentional radiators which are employed for radio control purposes during emergencies involving fire, security, and safety of life, when activated to signal an alarm, may operate during the pendency of the alarm condition.

The EUT is a sensor, in working mode the pressure sensor, temperature sensor, voltage sensor (integrated in the EUT) detect the pressure, temperature and voltage information of tires. The information is analog signals, then amplify and send to A/D transducer to transmit into digital signals, these data will be compared with the default value data.

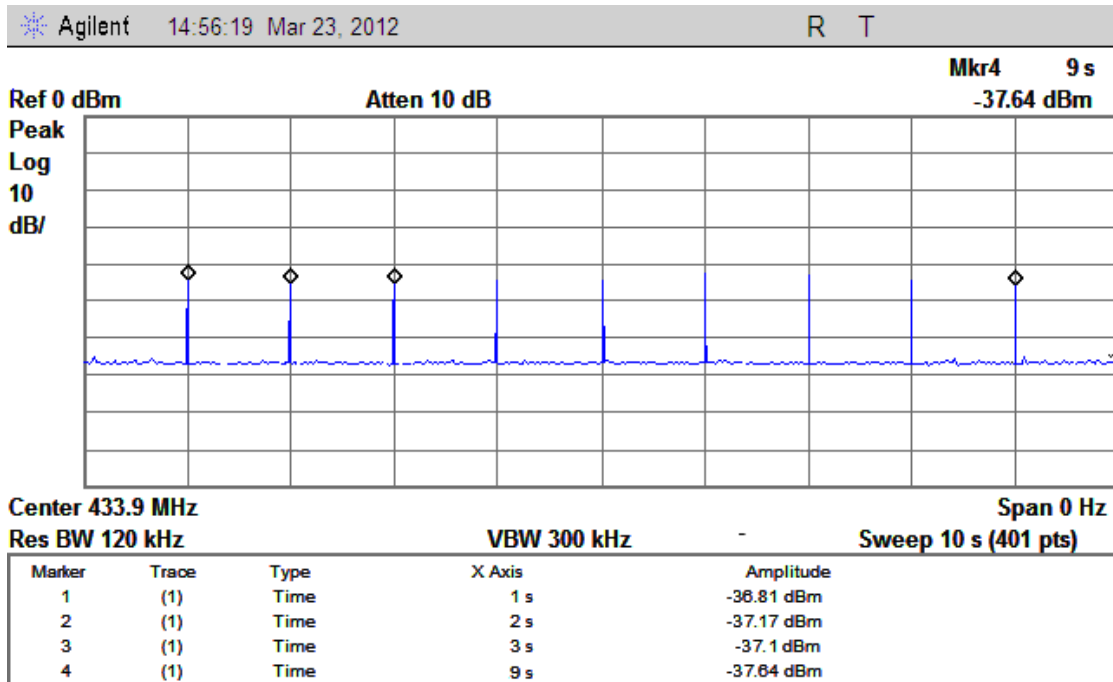
If the data isn't in the range of default scope (abnormal condition), the sensor will transmitting once every one second and less than 20ms, this abnormal condition is a safety hazard for human.

The rules of 15.231 a(4) appropriates for the abnormal condition.

### 2.4.2 Alarm Condition Mode plots



(Plot A: Activate Time)



(Plot B: The period of transmit)

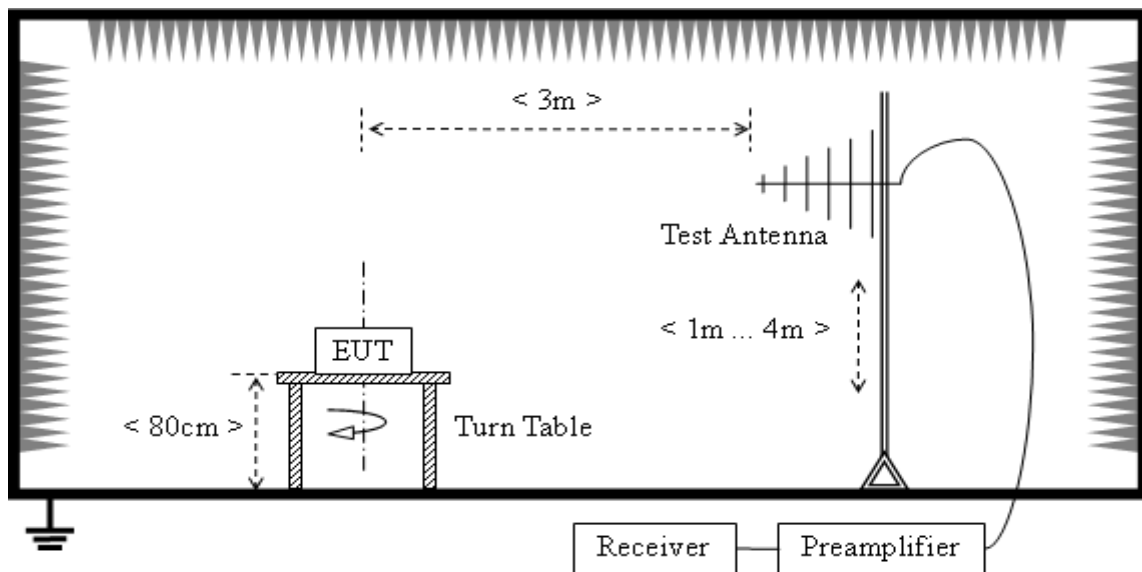
**Result:** Compliant

## 2.5 FCC 15.231(c) 20dB Bandwidth Testing

### 2.5.1 Applicable Standard

According to FCC 15.231(c), the bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. Bandwidth is determined at the points 20 dB down from the modulated carrier.

### 2.5.2 Test Setup



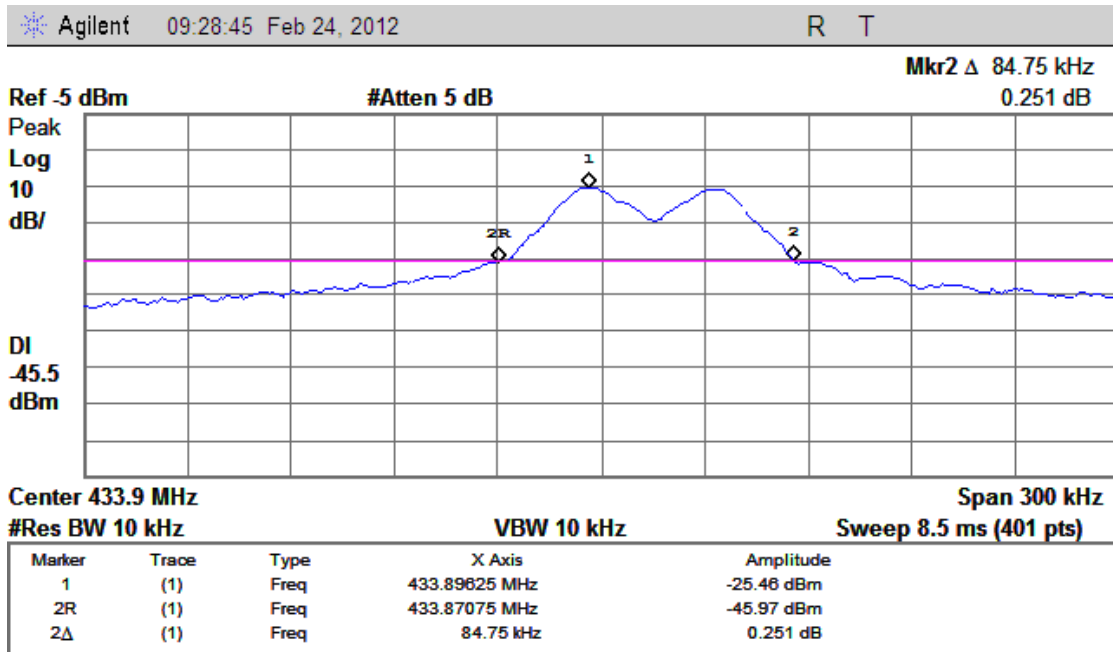
### 2.5.3 Summary of Test results

Work Mode	20dB Bandwidth	Limit	Plot	Conclusion
Transmitting	84.75 KHz	1084.8 KHz	A	Pass

Limit = Operating Frequency\*0.25% = 433.92MHz\*0.25% = 1084.8KHz.



### 2.5.4 20dB Bandwidth Plot



(Plot A: 20dB Bandwidth)

**Result:** Compliant

## 2.6 FCC 205, 209, 231(b) Radiated Emission

### 2.6.1 Standard Applicable

According to section 15.231(b), the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

Fundamental frequency(MHz)	Field strength of fundamental (Microvolts/meter)	Fied strength of spurious emissions(Microvolts/meter)
260-470	3750 to 12500*	375 to 1250*

\*Linear interpolations.

\*For the band 433.92MHz, the field strength of fundamental limit at 3m

$$20\lg(41.6*433.92-7083.3) = 80.8(\text{dB}\mu\text{V/m})$$

The field strength of spurious emissions:  $20\lg(4.17*433.92-709.2) = 60.8(\text{dB}\mu\text{V/m})$

According to FCC section 15.209 (a), except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency range (MHz)	Field Strength		Field Strength Limitation at 3m Measurement Dist	
	$\mu\text{V/m}$	Dist	$(\mu\text{V/m})$	$(\text{dB}\mu\text{V/m})$
0.009 - 0.490	2400/F(KHz)	300m	10000* 2400/F(KHz)	20log 2400/F(KHz) + 80
0.490 - 1.705	2400/F(KHz)	30m	100* 2400/F(KHz)	20log 2400/F(KHz) + 40
1.705 - 30.00	30	30m	100*30	20log 30 + 40
30.0 - 88.0	100	3m	100	20log 100
88.0 - 216.0	150	3m	150	20log 150
216.0 - 960.0	200	3m	200	20log 200
Above 960.0	500	3m	500	20log 500

The above field strength limits are specified at a distance of 3-meters the tighter limits apply at the band edges.

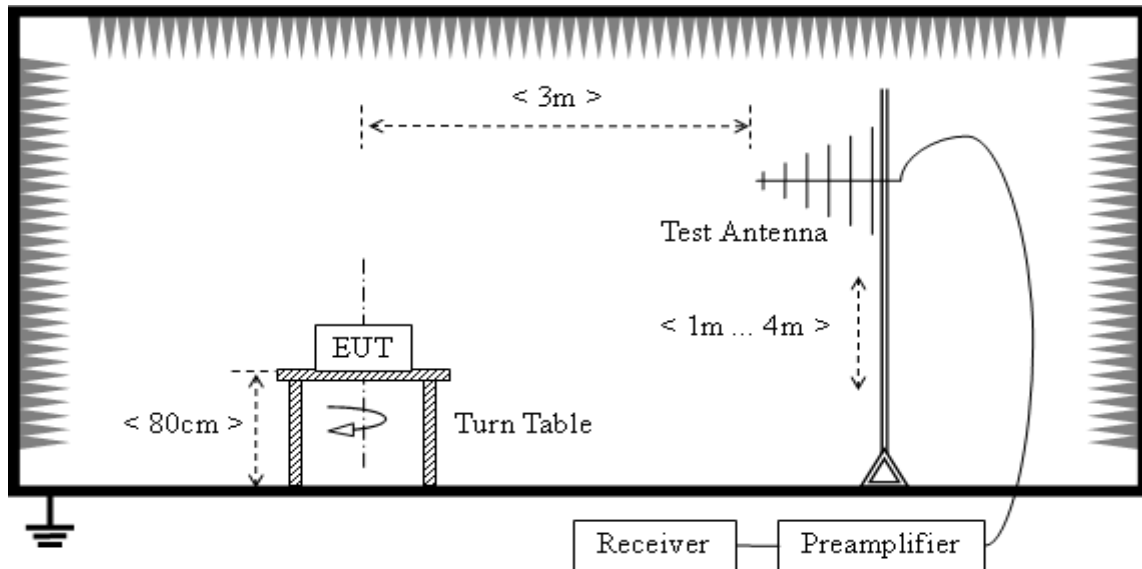
As shown in FCC section 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector. When average radiated emission measurements are specified in this part, including emission measurements below 1000MHz, there also is a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit for the frequency being investigated unless a different peak emission limit is otherwise specified in the rules.

The amplitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be reported.

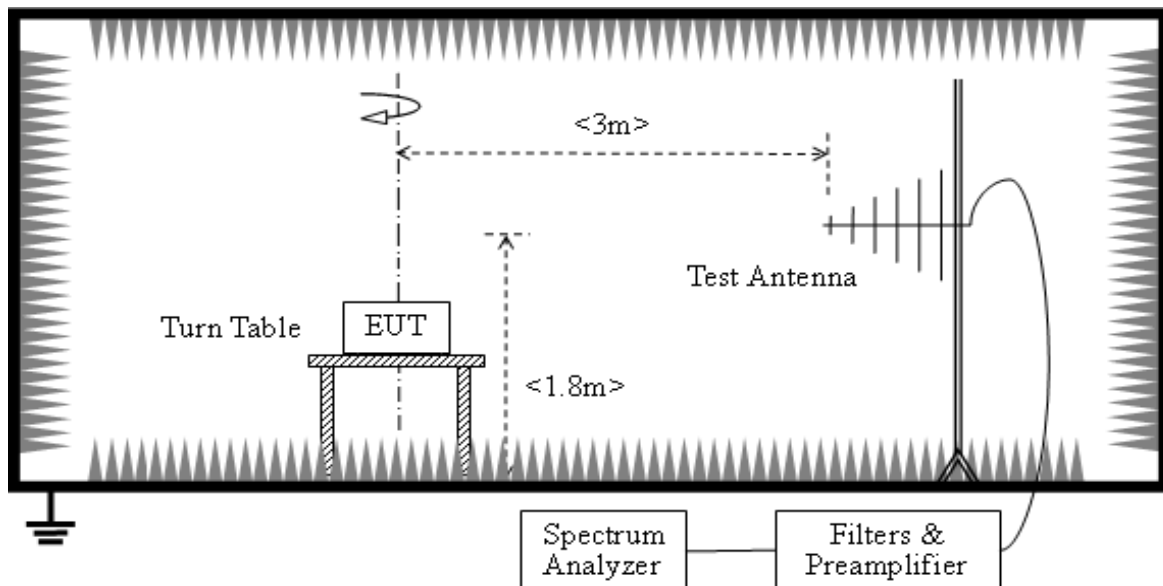


## 2.6.2 Test Setup

### 1) Below 1GHz



### 2) Above 1GHz



The Module is located in a 3m Semi-Anechoic Chamber; the antenna factors, cable loss and so on of the site as factors are calculated to correct the reading. During the measurement, the EUT was working continual.

The test site semi-anechoic chamber has met the requirement of NSA tolerance 4dB according to the standards: ANSI C63.4 (2009). The EUT was set-up on insulator 80cm above the Ground Plane. The set-up and test methods were according to ANSI C63.4.

For the Test Antenna:

(a) In the frequency range of 9kHz to 30MHz, magnetic field is measured with Loop Test Antenna. The Test Antenna is positioned with its plane vertical at 1m distance from the EUT. The center of the Loop Test Antenna is 1m above the ground. During the measurement the Loop Test Antenna rotates about its vertical axis for maximum response at each azimuth about the EUT.

(b) In the frequency range above 30MHz, Bi-Log Test Antenna (30MHz to 1GHz) and Horn Test Antenna (above 1GHz) are used. Test Antenna is 3m away from the EUT. Test Antenna height is varied from 1m to 4m above the ground to determine the maximum value of the field strength, the azimuth range of turntable was 0° to 360°, the receive antenna has two polarizations horizontal and vertical. When doing measurements above 1GHz, the EUT was placed within the 3dB beam width range of the horn antenna, and the EUT was tested in 3 orthogonal positions as recommended in ANSI C63.4 for Radiated Emissions and the worst-case data was presented.

### 2.6.3 Summary of test Results and Plots

Note: The AV results are from the AV Detector/Probe (RF parameter).

The Fundamental Emissions

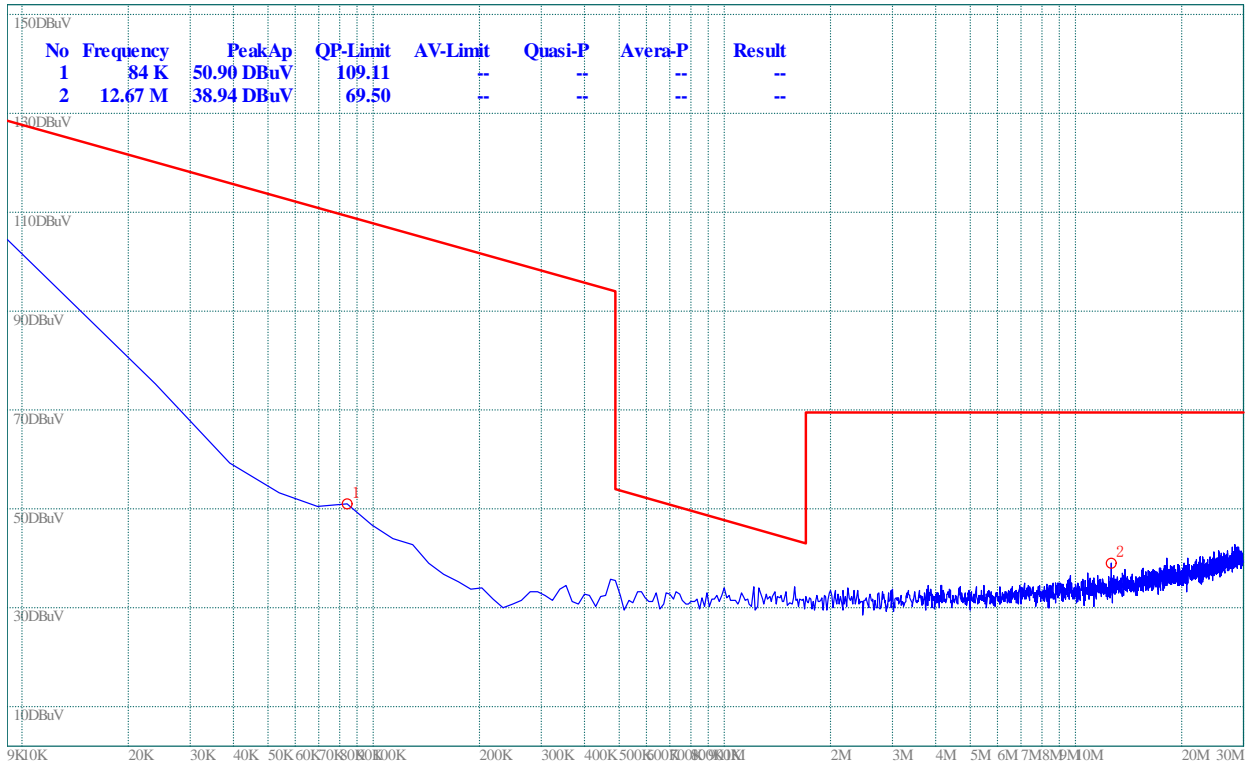
Frequency (MHz)	Fundamental Emission (dB $\mu$ V/m)		Limit		Ant Polarization
	PK	AV	PK	AV	
433.92MHz	72.4	70.3	100.8	80.8	H
	76.8	75.5			V

#### The un-wanted Emissions:

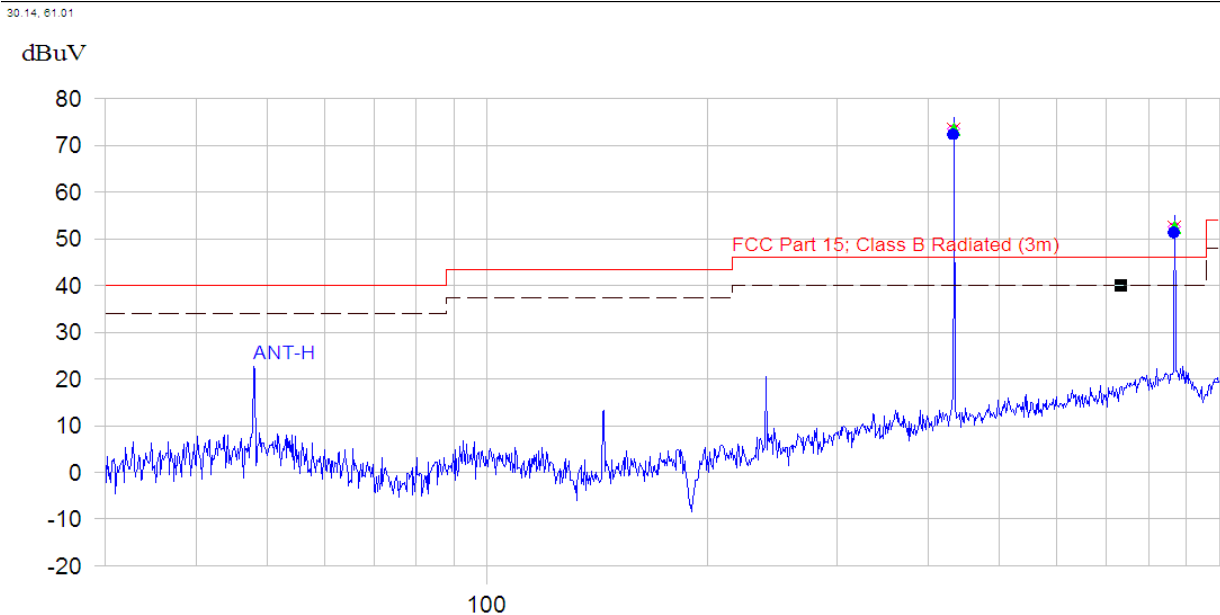
Frequency (MHz)	Detector(AV) (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Azimuth (deg)	Height (cm)	Ant Polarization
867.865	51.4	60.8	9.4	170	200	H
1301.72	48.3	54 <sup>Note 2</sup>	5.7	240	200	H
1735.77	47.6	60.8	13.2	160	220	H
2169.74	54.5	60.8	6.3	90	100	H
2603.49	44.7	60.8	16.1	90	160	H
867.864	52.7	60.8	8.1	70	180	V
1301.800	41.8	54 <sup>Note 2</sup>	12.2	150	100	V
1735.98	47.2	60.8	13.6	96	160	V
2169.650	48.7	60.8	12.1	270	100	V
2603.710	43.2	60.8	17.6	230	100	V

Note 1: the EUT was tested in all three orthogonal planes and frequency range 30MHz to the tenth harmonics, here we ranged to 5GHz.

Note 2: This frequency fall in the Restricted Bands in FCC 15.205 and the FCC 15.209 limit apply.



(Plot A: 9kHz to 30MHz)

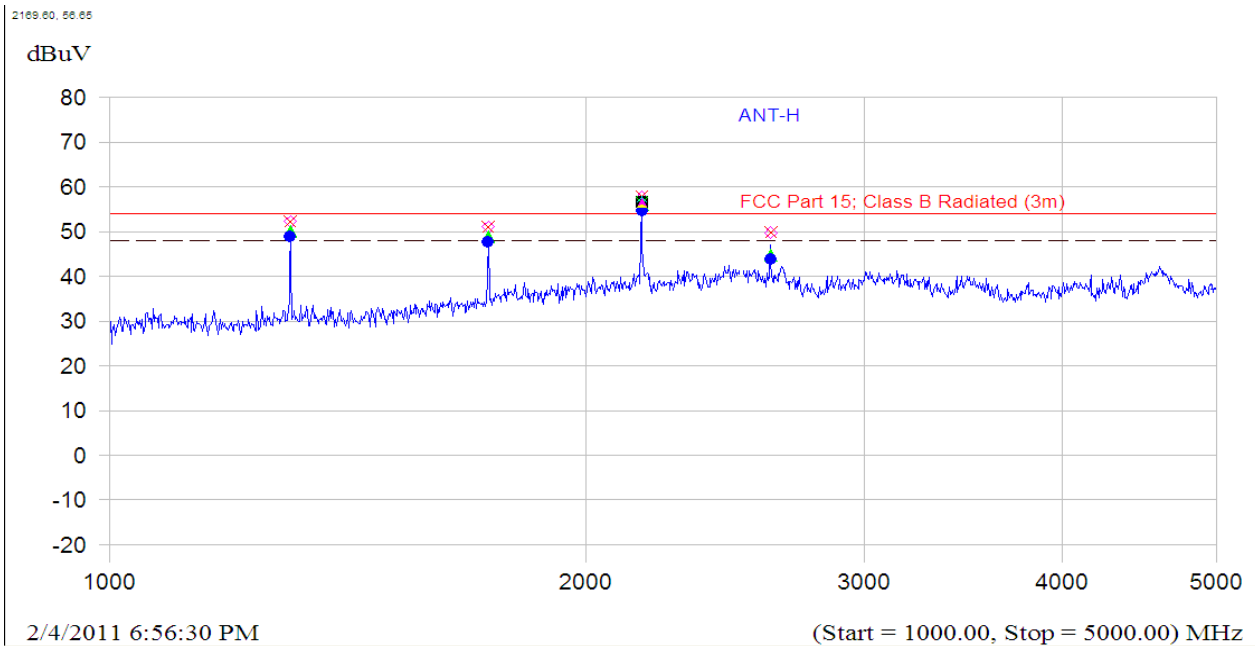


2/4/2011 6:15:24 PM

(Start = 30.00, Stop = 1000.00) MHz

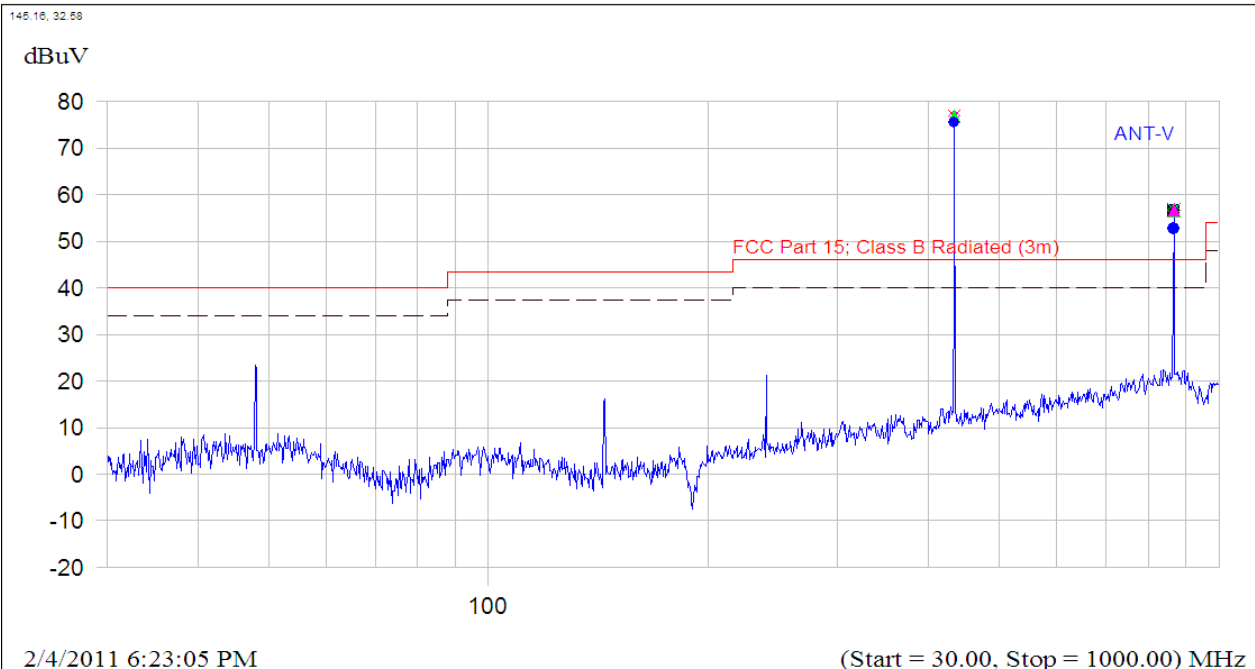
	Frequency MHz	Peak dBuV	QP dBuV	Avg dBuV	Trace Name	Comment
1	433.932	72.4	71.3	70.0	ANT-H	
2	867.865	52.6	52.6	51.4	ANT-H	

(Plot B.: Antenna Horizontal 30M-1G)



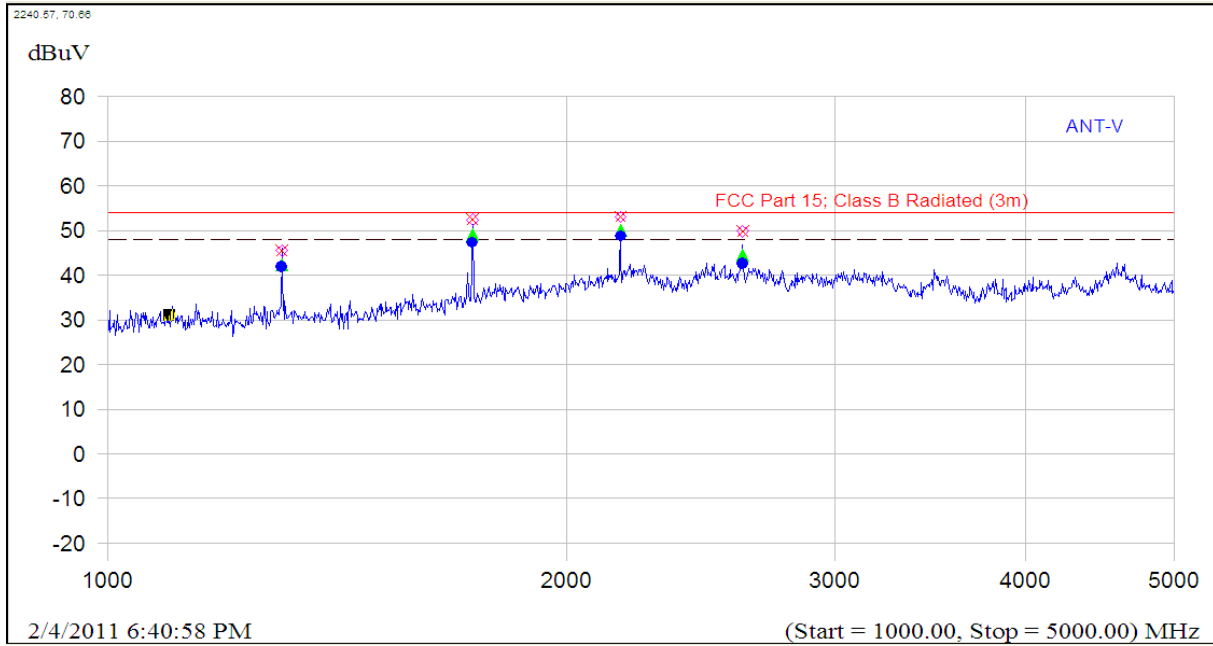
	Frequency MHz	Peak dBuV	QP dBuV	Avg dBuV	Trace Name	Comment
1	2603.490	49.6	44.6	44.7	ANT-H	
2	1301.720	52.3	49.3	48.3	ANT-H	
3	1735.770	51.0	48.9	47.6	ANT-H	
4	2169.740	57.7	56.0	54.5	ANT-H	

(Plot C.: Antenna Horizontal 1G-5G)



	Frequency MHz	Peak dBuV	QP dBuV	Avg dBuV	Trace Name	Comment
1	433.932	76.8	76.8	75.5	ANT-V	
2	867.864	56.7	56.5	52.7	ANT-V	

(Plot D.: Antenna Vertical 30M-1G)



	Frequency MHz	Peak dBuV	QP dBuV	Avg dBuV	Trace Name	Comment
1	1301.800	45.5	42.4	41.8	ANT-V	
2	1735.980	52.4	49.1	47.2	ANT-V	
3	2169.650	53.1	50.0	48.7	ANT-V	
4	2603.710	49.7	47.3	43.2	ANT-V	

(Plot E.: Antenna Vertical 1G-5G)

**Result:** Compliant

\*\* END OF REPORT \*\*