



NVLAP LAB CODE 200707-0



## FCC PART 15.231

### MEASUREMENT AND TEST REPORT

For

### Wellgain Auto Technology Co., Ltd.

Dongcheng Science & Technology Industrial Area, Dongke Road, Dong Cheng District,  
Dongguan City, Guangdong Province, P.R.C

**FCC ID: YASTX001**

<b>Report Type:</b> Original Report	<b>Product Type:</b> Tire Pressure Monitoring Systems (Transmitter)
<b>Test Engineer:</b> <u>Bruce Zhang</u>	<i>Bruce Zhang</i>
<b>Report Number:</b> <u>RSZ10040251-15.231</u>	
<b>Report Date:</b> <u>2010-04-13</u>	
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**Note:** This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. This report **must not** be used by the customer to claim product certification, approval, or endorsement by NVLAP\*, NIST, or any agency of the Federal Government.

\* This report may contain data that are not covered by the NVLAP accreditation and are marked with an asterisk “\*” (Rev.2)

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## GENERAL INFORMATION

### Product Description for Equipment Under Test (EUT)

The Wellgain Auto Technology Co., Ltd's product, model: *WTTX001 (FCC ID:YASTX001)* or the "EUT" as referred to in this report is a *Tire Pressure Monitoring Systems (Transmitter)* which measures approximately: 7.5 cm L x 6.7 cm W x 2.5 cm H, rated input voltage: DC 3.6V Lithium Battery. The operating frequency of EUT is 433.92 MHz +/-12 kHz

*\*Note: The products, model WTTX001 have two appearances black and grey, they are electronically identify, and we selected the grey one to full test, please refer to the Product Similarity Declaration Letter provided by the manufacturer in Appendix A.*

*\* All measurement and test data in this report was gathered from production sample serial number: 1004501 (Assigned by BACL, Shenzhen). The EUT was received on 2010-04-02.*

### EUT Photograph



Black



Grey

### Objective

This document is a test report based on the Electromagnetic Interference (EMI) tests performed on the EUT. The EMI measurements were performed according to the measurement procedure described in ANSI C63.4-2003.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.209, 15.35(c) and 15.231 rules.

**Related Submittal(s)/Grant(s)**

No Related Submittals

**Test Methodology**

All measurements contained in this report were conducted with ANSI C63.4 - 2003, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz. All radiated and conducted emissions measurement was performed at Bay Area Compliance Laboratories Corp. (Shenzhen). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

**Test Facility**

The Test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located in the 6/F, the 3rd Phase of WanLi Industrial Building, ShiHua Road, FuTian Free Trade Zone Shenzhen, Guangdong, China.

Test site at Bay Area Compliance Laboratories Corp. (Shenzhen) has been fully described in reports submitted to the Federal Communication Commission (FCC). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on November 21, 2007. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2003.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 382179. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, Bay Area Compliance Laboratories Corp. (Shenzhen) is a National Institute of Standards and Technology (NIST) accredited laboratory, under the National Voluntary Laboratory Accredited Program (Lab Code 200707-0).



The current scope of accreditations can be found at <http://ts.nist.gov/Standards/scopes/2007070.htm>

## SYSTEM TEST CONFIGURATION

### Justification

The system was configured for testing in a typical fashion (as normally used by a typical user).

### Special Accessories

The special accessories were provided by Bay Area Compliance Laboratories Corp. (Shenzhen).

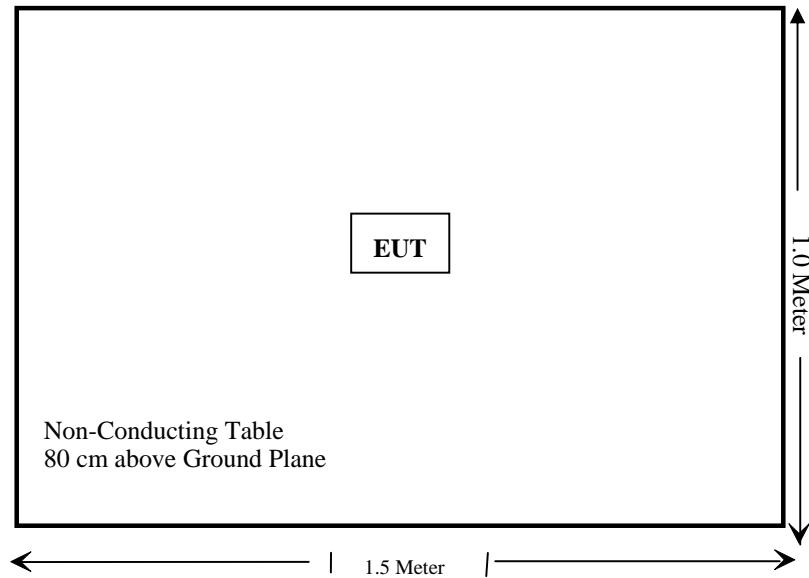
### Equipment Modifications

No modifications were made to the unit tested.

### Configuration of Test Setup



### Block Diagram of Test Setup



**SUMMARY OF TEST RESULTS**

FCC Rules	Description of Test	Result
§15.203	Antenna Requirement	Compliant
§15.207 (a)	Conducted Emissions	N/A*
§15.205, §15.209, 15.35 (c), §15.231 (e)	Radiated Emissions	Compliant
§15.231(c)	20 dB Band Width Testing	Compliant
§15.231(e)	Transmission Time, Silent Period	Compliant

Note: N/A \* The EUT is powered by battery only.

## **CFR47 §15.203 - ANTENNA REQUIREMENT**

### **Standard Applicable**

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 printed antenna PCB; it is permanently attached to the PCB. Please refer to the EUT Internal photos.

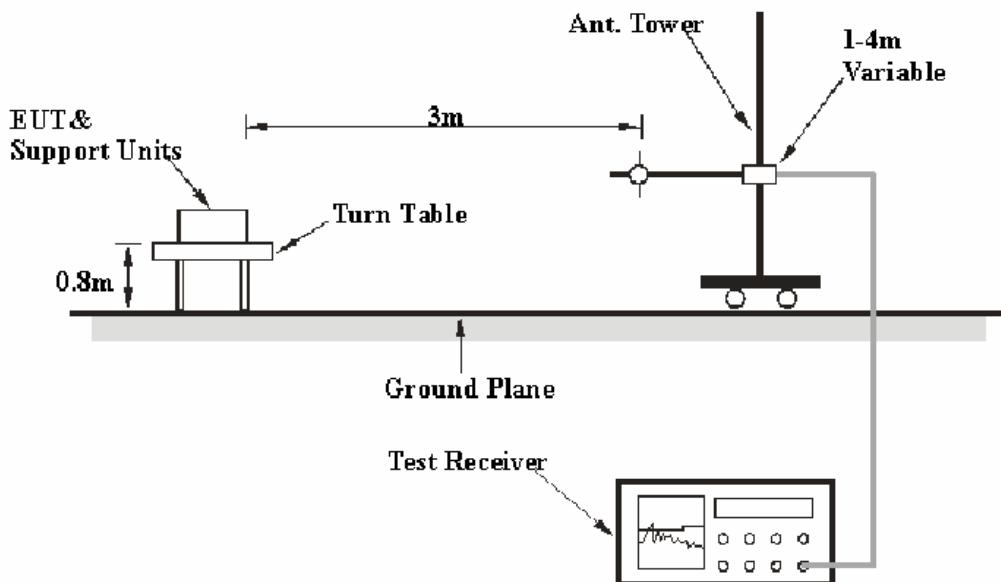
## CFR47 §15.205, §15.209, §15.35(c) & §15.231(e) - RADIATED EMISSIONS

### Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emission measurement at Bay Area Compliance Laboratories Corp. (Shenzhen) is  $\pm 4.0$  dB.

### EUT Setup



The radiated emission tests were performed in the 3 meters chamber B test site, using the setup accordance with the ANSI C63.4 - 2003. The specification used was the FCC 15 § 15.209 and 15.231.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

### EMI Test Receiver Setup

The system was investigated from 30 MHz to 5 GHz.

During the radiated emission test, the test receiver was set with the following configurations:

Frequency Range	RBW	Video B/W	Dectector
30MHz – 1000 MHz	100 kHz	300 kHz	QP
1000 MHz – 5 GHz	1 MHz	3 MHz	PK
1000 MHz – 5 GHz	1 MHz	10 Hz	AV

## Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
HP	Amplifier	HP8447D	2944A09795	2009-08-02	2010-08-02
Rohde & Schwarz	EMI Test Receiver	ESCI	100035	2009-11-07	2010-11-06
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2010-03-11	2011-03-11
HP	Amplifier	8449B	3008A00277	2009-09-12	2010-09-11
Sunol Sciences	Horn Antenna	DRH-118	A052604	2009-09-25	2010-09-25

\* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed per the NVLAP requirements, traceable to NIST.

## Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

All data was recorded in the Peak and Average detection mode.

## Applicable Standard

According to §15.231(e), 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)	Field Strength of spurious emissions ((Microvolts /meter)
40.66-40.70	1000	100
70-130	500	50
130-174	500 to 1500**	50 to 150**
174-260	1500	150
260-470	1500 to 5000**	150 to 500**
Above 470	5000	500

\*Linear interpolations.

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

## Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Loss and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

$$\text{Corrected Amplitude} = \text{Meter Reading} + \text{Antenna Loss} + \text{Cable Loss} - \text{Amplifier Gain}$$

The “Margin” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 5.8 dB means the emission is 5.8 dB below the limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

## Test Results Summary

According to the data in the following table, the EUT complied with the CFR47 §15.205, §15.209, §15.35(c), §15.231 (e), with the worst margin reading of:

### Peak Value:

**22.15 dB at 867.84 MHz** in the **Horizontal** polarization.

## Test Data

### Environmental Conditions

Temperature:	22 ° C
Relative Humidity:	50 %
ATM Pressure:	100.9 kPa

*The testing was performed by Bruce Zhang on 2010-04-07.*

### Test Mode: Transmitting

### Peak Value:

Frequency (MHz)	S.A. Reading (dB $\mu$ V/m)	Detector (PK/AV)	Direction (Degree)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Amp. (dB $\mu$ V/m)	FCC Part 15.231(e)		
				Height (m)	Polar (H/V)	Factor (dB)				Limit (dB $\mu$ V/m)	Margin (dB)	Remarks
433.92	95.90	PK	0	2.0	H	14.5	1.73	25.96	86.17	92.9	6.73	Fund.
433.92	94.80	PK	270	1.3	V	14.5	1.73	25.96	85.07	92.9	7.83	Fund.
867.84	52.63	PK	180	2.5	H	19.9	3.86	25.64	50.75	72.9	22.15	Harmonic
867.84	52.16	PK	305	1.3	V	19.9	3.86	25.64	50.28	72.9	22.62	Harmonic
2169.6	38.49	PK	0	1.8	H	28.30	2.90	27.54	42.15	72.9	30.75	Harmonic
1735.68	37.75	PK	85	1.8	V	28.30	2.53	26.83	41.75	72.9	31.15	Harmonic
2169.6	37.58	PK	270	1.8	V	28.60	2.90	27.54	41.54	72.9	31.36	Harmonic
1735.68	36.32	PK	205	2.2	H	28.80	2.53	26.83	40.82	72.9	32.08	Harmonic
1301.76	37.12	PK	210	1.0	V	26.70	2.18	26.83	39.17	74	34.83	Harmonic
1301.76	36.19	PK	330	1.7	H	25.80	2.18	26.83	37.34	74	36.66	Harmonic

## Field Strength of Average Emission:

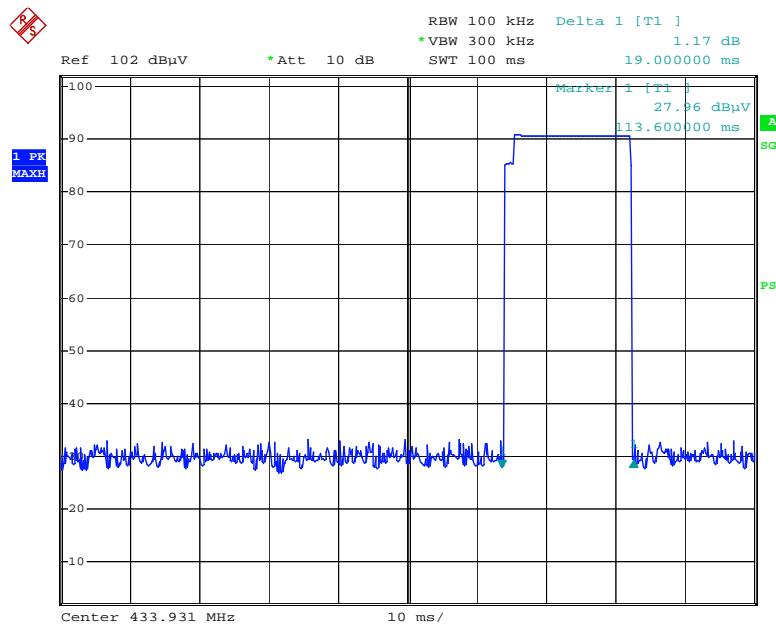
Frequency (MHz)	Cord. Amp. (Peak) (dB $\mu$ V/m)	Duty Cycle Factor (dB)	Cord. Amp. (Average) (dB $\mu$ V/m)	FCC Part 15.231(e)		
				Limit (dB $\mu$ V/m)	Margin (dB)	Remarks
433.92	86.17	-14.42	71.75	72.9	1.15	Fund.
433.92	85.07	-14.42	70.65	72.9	2.25	Fund.
867.84	50.75	-14.42	36.33	52.9	16.57	Harmonic
867.84	50.28	-14.42	35.86	52.9	17.04	Harmonic
2169.6	42.15	-14.42	27.73	52.9	25.17	Harmonic
1735.68	41.75	-14.42	27.33	52.9	25.57	Harmonic
2169.6	41.54	-14.42	27.12	52.9	25.78	Harmonic
1735.68	40.82	-14.42	26.40	52.9	26.50	Harmonic
1301.76	39.17	-14.42	24.75	52.9	28.15	Harmonic
1301.76	37.34	-14.42	22.92	52.9	29.98	Harmonic

Note: The limit for 433.92 MHz according to FCC Part 15.231(e) is 72.9 dB $\mu$ V/m (Average)

Duty cycle factor = $20\log(T_{on}/T_p) = 20\log(19/100) = -14.42$  dB

$$AV = PK + 20 \log(\text{Duty cycle})$$

$$\text{Duty Cycle} = (T_{on}/T_p) * 100\% = (19/100) * 100\% = 19\%$$



Date: 7.APR.2010 19:48:08

## CFR47 §15.231(c) – 20 dB BANDWIDTH TESTING

### Requirement

Per 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.

### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	100035	2009-11-07	2010-11-06
HP	Amplifier	8447E	1937A01046	2009-11-15	2010-11-15
Sunol Sciences	Bilog Antenna	JB1	A040904-2	2009-04-12	2010-04-12

\* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed per the NVLAP requirements, traceable to NIST.

### Test Procedure

With the EUT's antenna attached, the waveform was received by the test antenna which was connected to the spectrum analyzer, plot the 20 dB bandwidth.

### Test Data

#### Environmental Conditions

Temperature:	25 °C
Relative Humidity:	56 %
ATM Pressure:	100.9 kPa

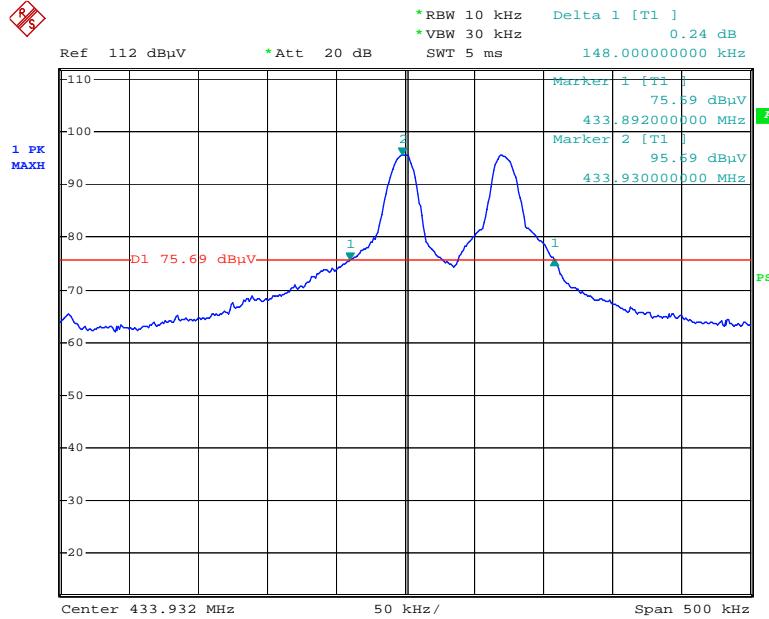
The testing was performed by Bruce Zhang on 2010-04-09.

Test Mode: Transmitting

Please refer to following table and plot.

Channel Frequency (MHz)	20 dB Bandwidth (kHz)	Limit (kHz)	Result
433.92	148	1084.8	Pass

**Note:** Limit = 0.25% \* Center Frequency = 0.25% \* 433.92 MHz = 1084.8 kHz  
 20 dB Bandwidth = 148 kHz < 1084.8 kHz

**20 dB Occupied Bandwidth**

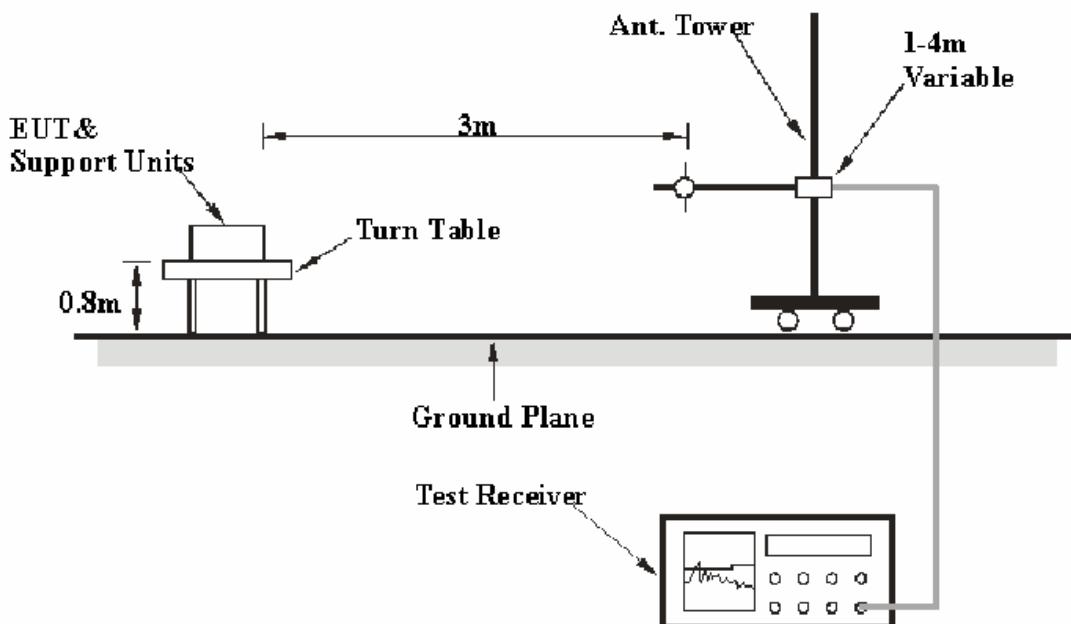
Date: 9.APR.2010 10:04:55

## CFR47 §15.231(e) – TRANSMISSION AND SILENT PERIOD

### Requirement

Per 15.231(e), devices operated under the provisions of this paragraph shall be provided with a means for automatically limiting operation so that the duration of each transmission shall not be greater than one second and the silent period between transmissions shall be at least 30 times the duration of the transmission but in no case less than 10 seconds.

### EUT Setup



The deactivation test was performed in the 3 meters chamber B test site, using the setup accordance with the ANSI C63.4 - 2003. The specification used was the FCC 15.231(e) limits.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	100035	2009-11-07	2010-11-06
HP	Amplifier	8447E	1937A01046	2009-11-15	2010-11-15
Sunol Sciences	Bilog Antenna	JB1	A040904-2	2009-04-12	2010-04-12

**\* Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed per the NVLAP requirements, traceable to NIST.

## Test 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 loss RF cable from the antenna port to the spectrum analyzer.
3. Set center frequency of spectrum analyzer=operating frequency.
4. Set the spectrum analyzer as RBW=100 kHz, VBW=300 kHz, Span=0Hz.
5. Repeat above procedures until all frequency measured was complete.

## Test Data

### Environmental Conditions

<b>Temperature:</b>	25 ° C
<b>Relative Humidity:</b>	56 %
<b>ATM Pressure:</b>	103.2 kPa

The testing was performed by Bruce Zhang on 2010-04-07.

Test Mode: Transmitting

Active Time:

Transmission Period (Second)	FCC Limit (Second)	Result
0.019	1.0	Pass

Silent Period:

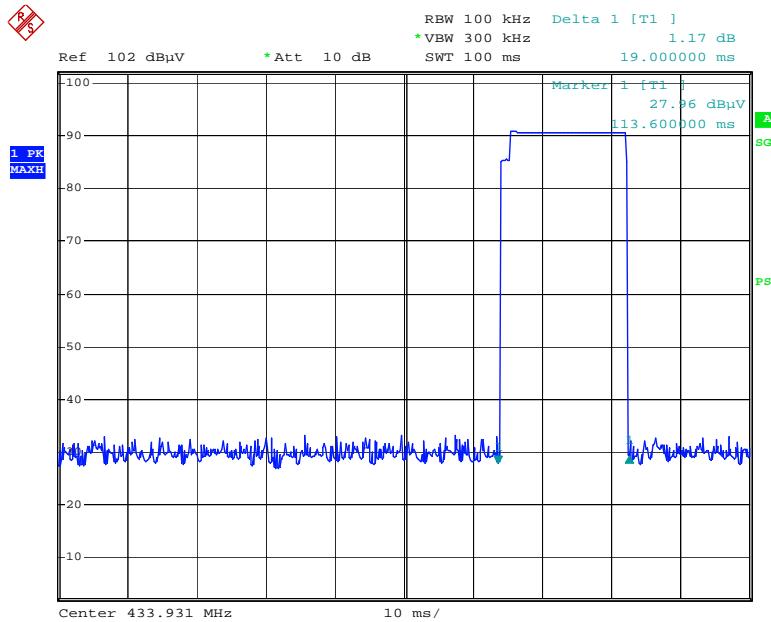
Silent Period (Second)	Limit (Second)	Result
75.96	10	Pass

Note: The silent period between transmissions shall be at least 30 times the duration of the transmission but in no case less than 10 seconds.

30 times the duration of the transmission =  $30 \times 0.019(s) = 0.57(s) < 75.96(s)$

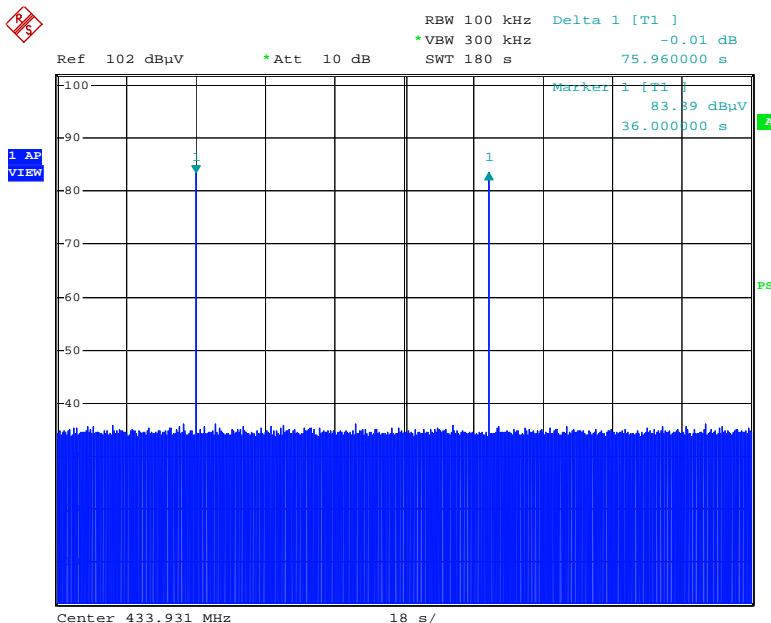
**Results:** Pass

### Transmission Period



Date: 7.APR.2010 19:48:08

### Silent Period



Date: 7.APR.2010 19:26:49

## **APPENDIX A – PRODUCT SIMILARITY DECLARATION LETTER**



Wellgain Auto Technology Co.Ltd  
Wellgain Auto Technology Co.Ltd

### **Different Declaration**

We, Wellgain Auto Technology Co.Ltd, declare our product: TPMS, model: WT110, for the transmitter of TPMS WT110, which have the same circuit diagram, PCB layout in side, and only have difference in appearance color, one is gray, the other is black. Thank you!

Date:2010-4-13

Sincerely.

Signature:

Company: Wellgain Auto Technology Co.Ltd

Title: Vice General manager

\*\*\*\*\* END OF REPORT \*\*\*\*\*