FCC Test Report

Product Name	：	Tire Pressure Monitoring System
Model No.	：	W408
FCC ID.	：	W55TIAFM1B2

Applicant	：	Oro Technology Co., LTD
Address	：	3F, No.32-1, 24th Road, Industrial Park, Taichung 408, Taiwan

Date of Receipt	：	2012/08/23
Issued Date	：	2013/06/19
Report No.	：	128447R-RFUSP41V01
Report Version	：	V1.0

Test Report Certification

Issued Date : 2013/06/19
Report No. : 128447R-RFUSP41V01

QuieTek

Product Name	:	Tire Pressure Monitoring System
Applicant	:	Oro Technology Co., LTD
Address	:	3F, No.32-1, 24th Road, Industrial Park, Taichung 408, Taiwan
Manufacturer	:	Oro Technology Co., LTD
Model No.	:	W408
FCC ID.	:	W55TIAFM1B2
EUT Voltage	:	Battery 3V
Trade Name	:	ORO
Applicable Standard	:	FCC 15 Subpart C Section 15.231(e): 2012
Test Result	:	Complied

The test results relate only to the samples tested.
The test report shall not be reproduced except in full without the written approval of QuieTek Corporation.
This report must not be used to claim product endorsement by NVLAP any agency of the U.S. Government

Documented By : 

(Carol Tsai / Engineering Adm. Specialist)

Reviewed By : 

(Quale Tang / Engineer)

Approved By : 

(Roy Wang / Manager)

Laboratory Information

We, **QuieTek Corporation**, are an independent RF consultancy that was established the whole facility in our laboratories. The test facility has been accredited/accepted (audited or listed) by the following related bodies in compliance with ISO 17025 specified testing scopes:

Taiwan R.O.C.	**:**	**TAF, Accreditation Number: 1313**
USA	**:**	**FCC, Registration Number: 365520**
Canada	**:**	**IC, Submission No: 150981**

The related certificate for our laboratories about the test site and management system can be downloaded from QuieTek Corporation's Web Site:http://www.quietek.com/tw/ctg/cts/accreditations.htm
The address and introduction of QuieTek Corporation's laboratories can be founded in our Web site : http://www.quietek.com/
If you have any comments, Please don't hesitate to contact us. Our contact information is as below:

HsinChu Testing Laboratory:
No.75-2, 3rd Lin, Wangye Keng, Yonghxing Tsuen, Qionglin Shiang, Hsinchu County 307, Taiwan, R.O.C.
TEL:+886-3-592-8858 / FAX:+886-3-592-8859 E-Mail : service@quietek.com

LinKou Testing Laboratory:
No.5-22, Ruishukeng, Linkou Dist., New Taipei City 24451, Taiwan, R.O.C.
TEL : 886-2-8601-3788 / FAX : 886-2-8601-3789 E-Mail : service@quietek.com

TABLE OF CONTENTS

1. General Information

1.1. EUT Description

Product Name	Tire Pressure Monitoring System
Trade Name	ORO
Model No.	W408
Frequency Range/ Channel Number	433.92 MHz / 1 Channel
Antenna Gain	0dBi
Type of Modulation	FSK, ASK
Antenna Type	Meander line

Working Frequency of Each Channel	
Channel	Frequency
001	433.92 MHz

Note:

1. This device is a Tire Pressure Monitoring System included a 433.92MHz transmitter function.
2. These tests are conducted on a sample for the purpose of demonstrating compliance with Part 15 Subpart C Paragraph 15.231.
3. The radiation measurements are performed in X, Y, Z axis positioning. Only the worst case is shown in the report.

1.3. Test Mode

QuieTek verified the construction and function in typical operation. All the test modes are performed in normal operation and are defined as:

Pre-Test Mode	
TX	Mode 1: Transmit
Final Test Mode	
TX	Mode 1: Transmit

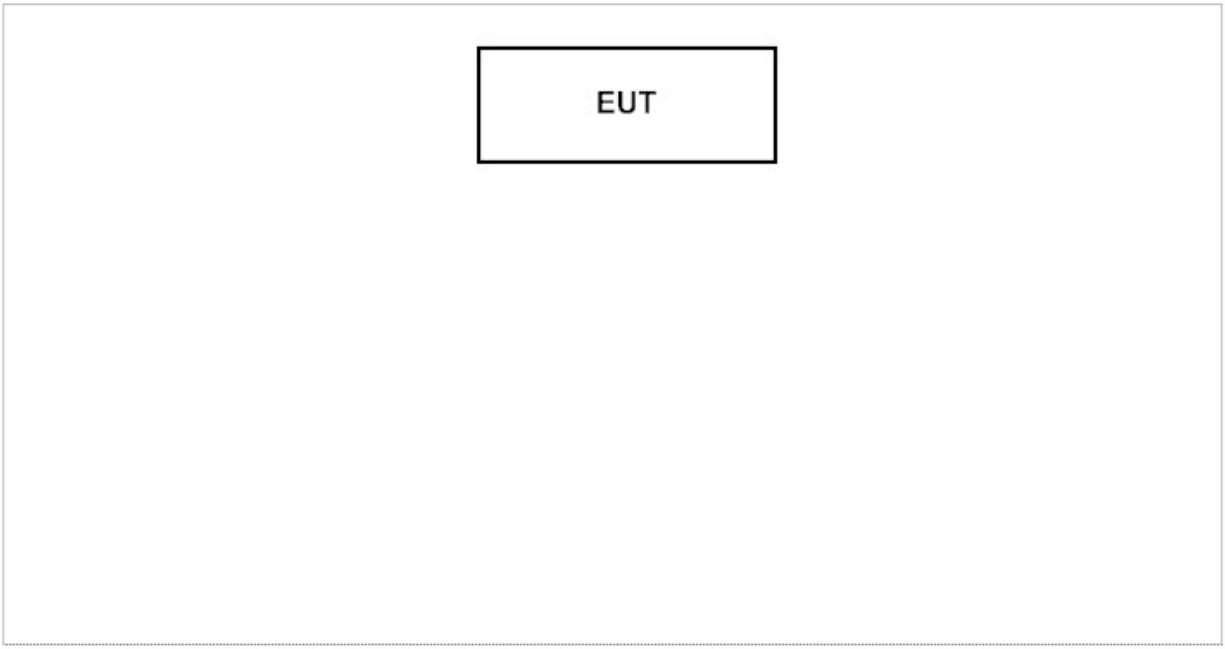
Emission	
Performed Item	
Conducted Emission	No
Radiated Emission	Yes
Occupied Bandwidth	Yes
Duty cycle	Yes
Transmitter time	Yes

1.4. Tested System Details

The types for all equipments, plus descriptions of all cables used in the tested system (including inserted cards) are:

N/A

1.5. Configuration of tested System

Connection Diagram


1.6. EUT Exercise Software

1	Setup the EUT as shown in section 1.5.
2	Turn on the EUT power.
3	The RF signal's status will continue transmit through EUT.
4	Repeat the above procedure.

1.7. Test Facility

Ambient conditions in the laboratory:

Items	Test Item	Required (IEC 68-1)	Actual
Temperature (°C)	FCC PART 15 C 15.231 Radiated Emission	15 - 35	25
Humidity (%RH)		25 - 75	48
Barometric pressure (mbar)		860 - 1060	950-1000
Temperature (°C)	FCC PART 15 C 15.231 Occupied Bandwidth	15 - 35	25
Humidity (%RH)		25 - 75	48
Barometric pressure (mbar)		860 - 1060	950-1000
Temperature (°C)	FCC PART 15 C 15.231 Duty Cycle	15 - 35	25
Humidity (%RH)		25 - 75	48
Barometric pressure (mbar)		860 - 1060	950-1000
Temperature (°C)	FCC PART 15 C 15.231 Transmitter Time	15 - 35	25
Humidity (%RH)		25 - 75	48
Barometric pressure (mbar)		860 - 1060	950-1000

2. Radiated Emission

2.1. Test Equipment

The following test equipments are used during the test:

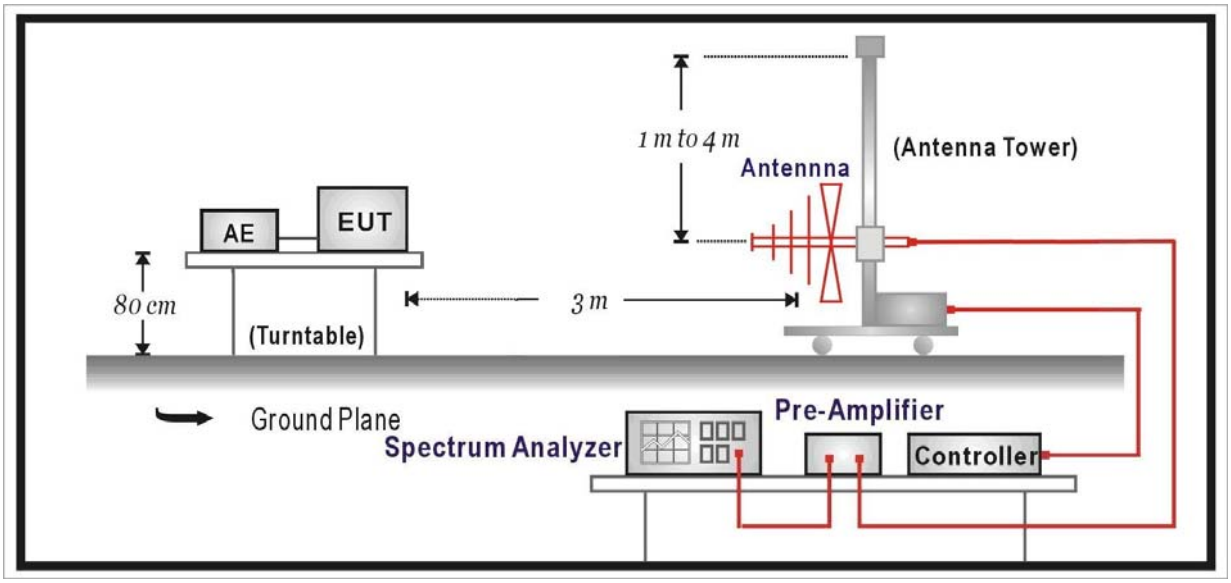
Radiated Emission / CB1

Instrument	Manufacturer	Model No.	Serial No	Next Cal. Date
Bilog Antenna	SCHAFFNER	CBL6112B	2895	2013/08/14
Double Ridged Guide Horn Antenna	Schwarzback	BBHA 9120	D743	2014/02/17
Pre-Amplifier	MITEQ	AMF-4D-005180-24-10P	888003	2013/12/02
Pre-Amplifier	QuieTek	AP-025C	CHM-0706049	2014/02/19
Spectrum Analyzer	Agilent	E4440A	MY46187335	2014/01/27
k Type Cable	Huber Suhner	Sucoflex 102	25623/2	2014/02/21

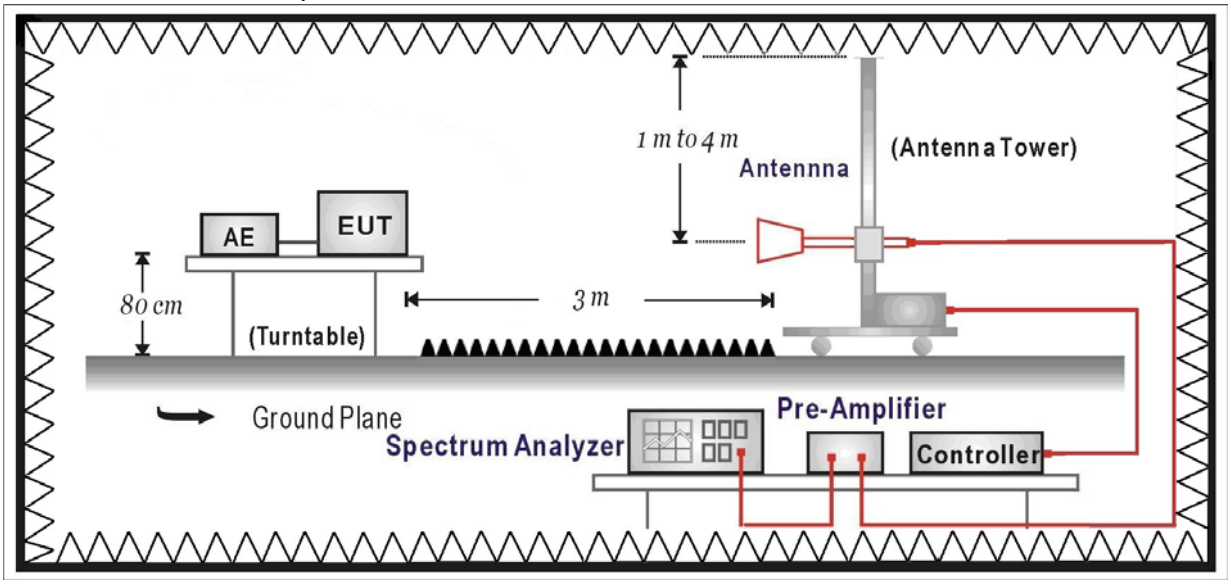
Note: 1. All equipments that need to calibrate are with calibration period of 1 year.

2.2. Test Setup

Under 1GHz Test Setup:



Above 1GHz Test Setup:



2.3. Limits

➢ Fundamental and Harmonics Emission Limits

FCC Part 15 Subpart C Paragraph 15.231(e) Limits				
Fundamental Frequency MHz	Field Strength of Fundamental		Field Strength of Harmonics	
	uV/m	dBuV/m	uV/m	dBuV/m
40.66-40.70	1000	60	100	40
70-130	500	53.98	50	33,98
130-174	500-1500	53.98-63.52	50-150	33.98-43.52
174-260	1500	63.52	150	43.52
260-470	1500-5000	53.52-73.98	150-500	33.52-53.98
above 470	5000	73.98	500	53.98

Remarks: 1. RF Voltage (dBuV) = 20 log RF Voltage (uV)

2. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

3. The emission limit in this paragraph is based on measurement instrumentation employing an average detector.

➢ Spurious electric field strength limits

FCC Part 15 Subpart C Paragraph 15.209 Limits			
Frequency MHz	uV/m	dBuV/m	Measurement distance (meter)
0.009-0.490	2400/F(kHz)	See Remark[1]	300
0.490-1.705	24000/F(kHz)	See Remark[1]	30
1.705-30	30	29.5	30
30-88	100	40	3
88-216	150	43.5	3
216-960	200	46	3
Above 960	500	54	3

Remarks : 1. RF Voltage (dBuV) = 20 log RF Voltage (uV)

2. In the Above Table, the tighter limit applies at the band edges.

3. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

2.4. Test Procedure

The EUT and its simulators are placed on a turn table which is 0.8 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level.

Both horizontal and vertical polarizations of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.4: 2009 on radiated measurement.

The resolution bandwidth below 1GHz setting on the field strength meter is 120 kHz and above 1GHz is 1MHz.

Radiated emission measurements below 1GHz are made using broadband Bilog antenna and above 1GHz are made using Horn Antennas.

The measurement is divided into the Preliminary Measurement and the Final Measurement.

The suspected frequencies are searched for in Preliminary Measurement with the measurement antenna kept pointed at the source of the emission both in azimuth and elevation, with the polarization of the antenna oriented for maximum response. The antenna is pointed at an angle towards the source of the emission, and the EUT is rotated in both height and polarization to maximize the measured emission. The emission is kept within the illumination area of the 3 dB beamwidth of the antenna.

The worst radiated emission is measured on the Final Measurement.

The frequency range from 30MHz to 10th harminics is checked.

2.5. Test Specification

According to FCC Part 15 Subpart C Paragraph 15.231(e): 2012

2.6. Uncertainty

± 3.8 dB below 1GHz

± 3.9 dB above 1GHz

2.7. Test Result

Product	Tire Pressure Monitoring System		
Test Item	Fundamental Radiated Emission		
Test Mode	Mode 1: Transmit		
Date of Test	2013/05/31	Test Site	CB1

Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Peak Measurement Level (dBuV/m)	Average Measurement Level (dBuV/m)	Average Limit (dBuV/m)
Horizontal					
433.920 (X-axis)	15.749	65.749	80.898	60.368	72.870
433.920 (Y-axis)	15.749	61.910	77.659	57.129	72.870
433.920 (Z-axis)	15.749	53.156	68.905	48.375	72.870
Vertical					
433.920 (X-axis)	15.749	56.823	72.572	52.042	72.870
433.920 (Y-axis)	15.749	59.804	75.553	55.023	72.870
433.920 (Z-axis)	15.749	63.588	79.339	58.809	72.870

Note1:

Peak Measurement Level = Reading Level + Correct Factor

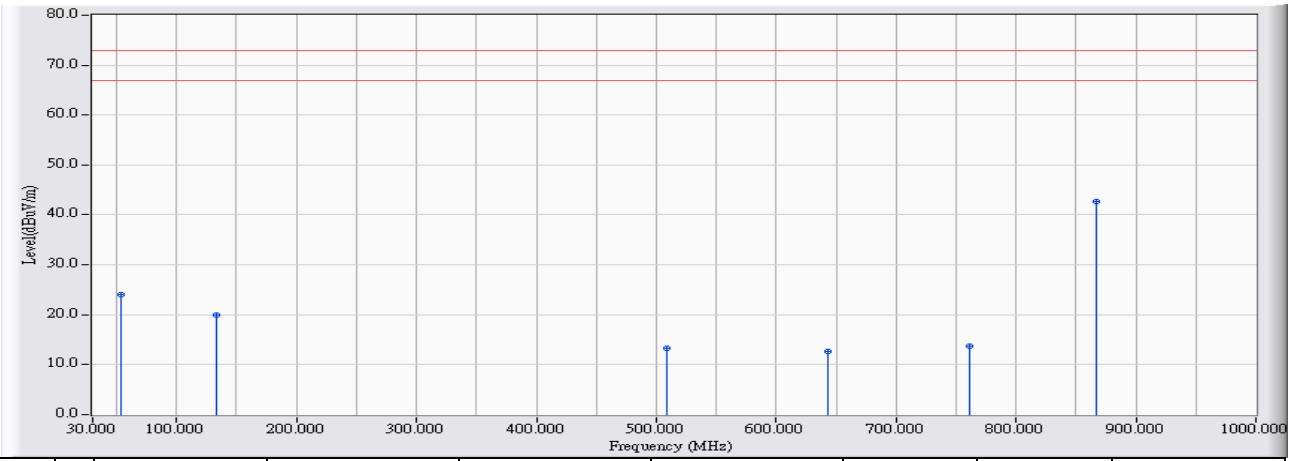
Average Measurement Level = Peak Measurement Level + 20Log (Duty Cycle)

Duty Cycle=(Ton/(Ton+Toff)) = 9.40/100 = 0.094

20*Log(Duty Cycle) = -20.53

30MHz-1GHz Spurious :

Site : CB1	**Time : 2013/05/31 - 16:49**
Limit : FCC_SpartC_15.231(e)_H_433.92MHz_03M_PK	**Margin : 6**
Probe : CB1_FCC_EFS_30-1G-2_1011 - HORIZONTAL	**Power : DC 3V**
EUT : Tire Pressure Monitoring System	**Note : Z Axis**

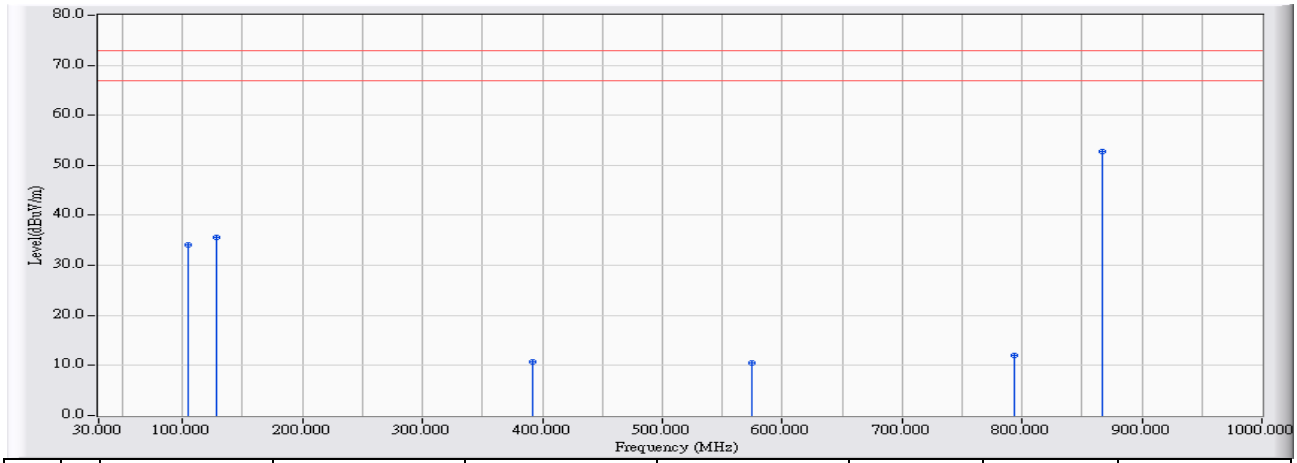


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		54.250	-47.549	71.656	24.107	-48.763	72.870	PEAK
2		133.467	-43.422	63.430	20.009	-52.861	72.870	PEAK
3		508.533	-35.880	49.103	13.222	-59.648	72.870	PEAK
4		642.717	-34.731	47.317	12.585	-60.285	72.870	PEAK
5		760.733	-33.607	47.306	13.699	-59.171	72.870	PEAK
6	*	867.433	-32.729	75.408	42.679	-30.191	72.870	PEAK

Note:

1. All reading above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurement::RBW=1MHz,VBW=3MHz,Sweep:Auto.
3. " * ", means this data is the worst emission level.
4. Measurement Level = Reading Level + Correct Factor.
5. Average Measurement Level = Peak Measurement Level + 20Log (Duty Cycle)
   Duty Cycle=(Ton/(Ton+Toff)) = 9.40/100 = 0.094
   20*Log(Duty Cycle) = -20.53
6. The average measurement was not performed when the peak measured data under the limit of peak detection.

Site : CB1	**Time : 2013/05/31 - 16:59**
Limit : FCC_SpartC_15.231(e)_H_433.92MHz_03M_PK	**Margin : 6**
Probe : CB1_FCC_EFS_30-1G-2_1011 - VERTICAL	**Power : DC 3V**
EUT : Tire Pressure Monitoring System	**Note : Z Axis**



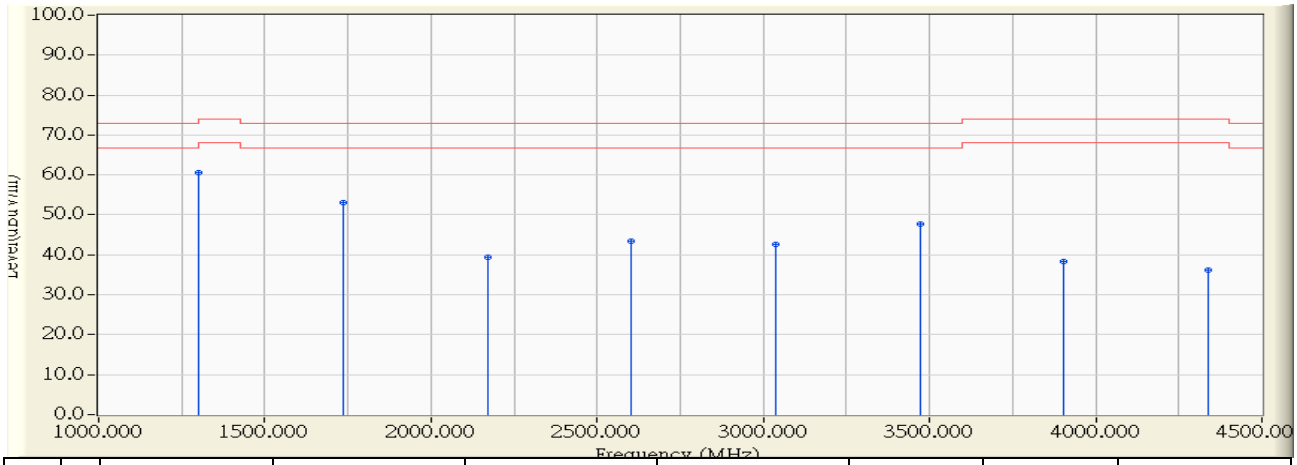
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		104.367	-43.723	77.806	34.083	-38.787	72.870	PEAK
2		128.617	-43.255	78.895	35.640	-37.230	72.870	PEAK
3		392.133	-38.331	49.122	10.792	-62.078	72.870	PEAK
4		574.817	-35.285	45.810	10.524	-62.346	72.870	PEAK
5		793.067	-33.267	45.198	11.931	-60.939	72.870	PEAK
6	*	867.433	-32.729	85.494	52.765	-20.105	72.870	PEAK

Note:

3. All reading above 1GHz are performed with peak and/or average measurements as necessary.
4. Peak measurement::RBW=1MHz,VBW=3MHz,Sweep:Auto.
3. " * ", means this data is the worst emission level.
4. Measurement Level = Reading Level + Correct Factor.
5. Average Measurement Level = Peak Measurement Level + 20Log (Duty Cycle)
   Duty Cycle=(Ton/(Ton+Toff)) = 9.40/100 = 0.094
   20*Log(Duty Cycle) = -20.53
6. The average measurement was not performed when the peak measured data under the limit of peak detection.

Above 1GHz Spurious:

Site : CB1	**Time : 2013/05/30 - 09:31**
Limit : FCC_SpartC_15.231(e)_H_433.92MHz_03M_PK	**Margin : 6**
Probe : CB1_FCC_EFS_1-18G-1_0901 - HORIZONTAL	**Power : DC 3V**
EUT : Tire Pressure Monitoring System	**Note : Z Axis**

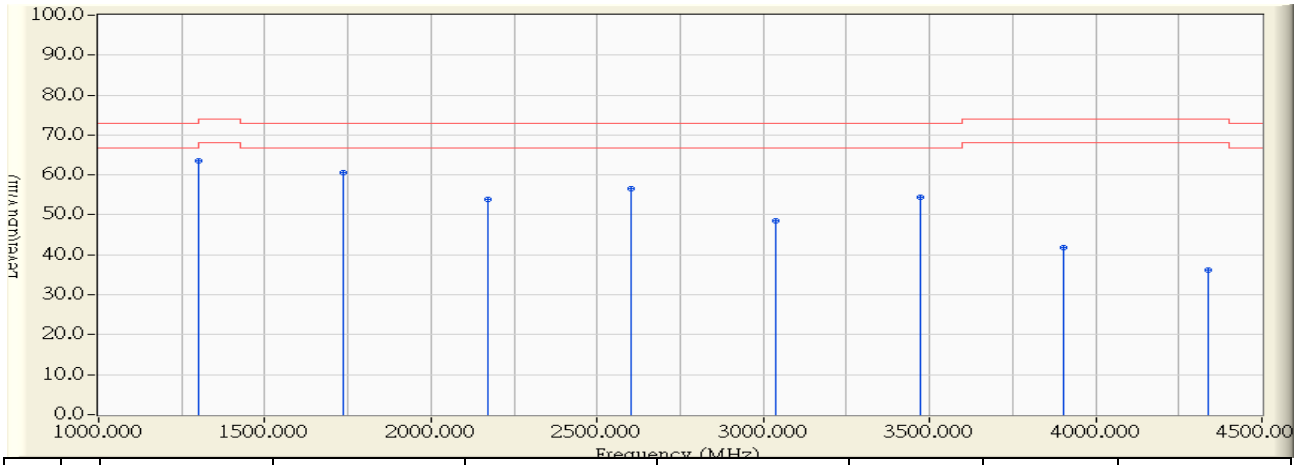


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	1301.000	-10.278	70.936	60.657	-13.343	74.000	PEAK
2		1735.000	-8.565	61.534	52.969	-19.901	72.870	PEAK
3		2169.000	-6.097	45.378	39.281	-33.589	72.870	PEAK
4		2603.000	-3.194	46.610	43.417	-29.453	72.870	PEAK
5		3037.000	-4.225	46.732	42.507	-30.363	72.870	PEAK
6		3471.000	-4.033	51.841	47.808	-25.062	72.870	PEAK
7		3905.000	-2.837	41.059	38.222	-35.778	74.000	PEAK
8		4339.000	-1.943	38.218	36.275	-37.725	74.000	PEAK

Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. " * ", means this data is the worst emission level.
4. Measurement Level = Reading Level + Correct Factor.
5. Average Measurement Level = Peak Measurement Level + 20Log (Duty Cycle)
   Duty Cycle=(Ton/(Ton+Toff)) = 9.40/100 = 0.094
   20*Log(Duty Cycle) = -20.53
6. The average measurement was not performed when the peak measured data under the limit of peak detection.

Site : CB1	**Time : 2013/05/30 - 09:44**
Limit : FCC_SpartC_15.231(e)_H_433.92MHz_03M_PK	**Margin : 6**
Probe : CB1_FCC_EFS_1-18G-1_0901 - VERTICAL	**Power : DC 3V**
EUT : Tire Pressure Monitoring System	**Note : Z Axis**



		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	1301.000	-10.278	73.935	63.656	-10.344	74.000	PEAK
2		1735.000	-8.565	69.137	60.572	-12.298	72.870	PEAK
3		2169.000	-6.097	60.069	53.972	-18.898	72.870	PEAK
4		2603.000	-3.194	59.883	56.690	-16.180	72.870	PEAK
5		3037.000	-4.225	52.669	48.444	-24.426	72.870	PEAK
6		3471.000	-4.033	58.342	54.309	-18.561	72.870	PEAK
7		3905.000	-2.837	44.555	41.718	-32.282	74.000	PEAK
8		4339.200	-1.943	38.251	36.309	-37.691	74.000	PEAK

Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. " * ", means this data is the worst emission level.
4. Measurement Level = Reading Level + Correct Factor.
5. Average Measurement Level = Peak Measurement Level + 20Log (Duty Cycle)
   Duty Cycle=(Ton/(Ton+Toff)) = 9.40/100 = 0.094
   20*Log(Duty Cycle) = -20.53
6. The average measurement was not performed when the peak measured data under the limit of peak detection.

3. Occupied Bandwidth

3.1. Test Equipment

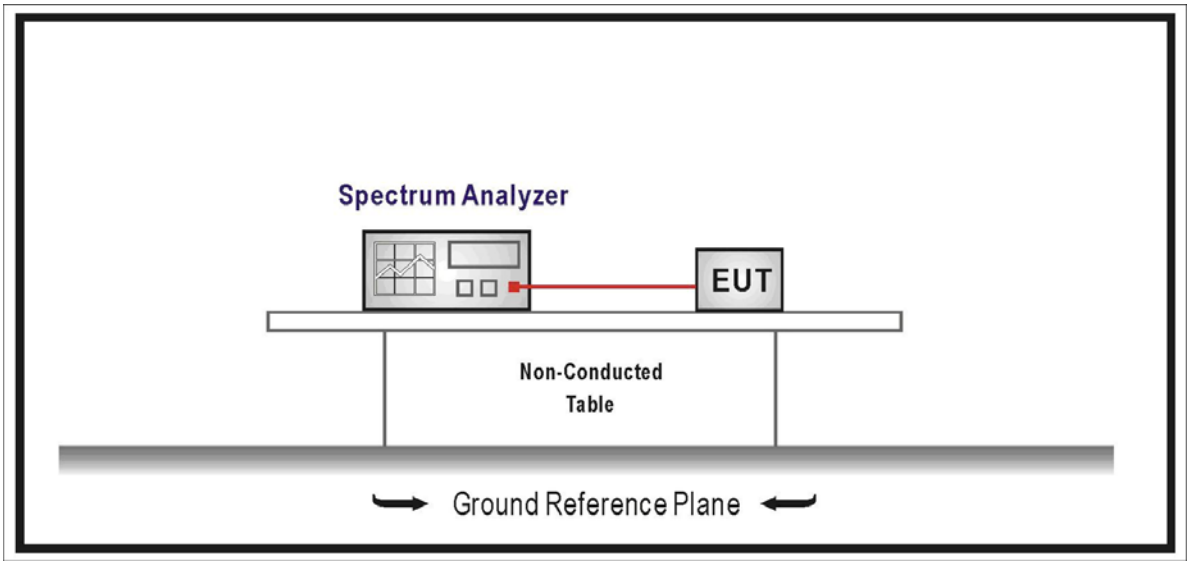
The following test equipments are used during the radiated emission tests:

Occupied Bandwidth / SR7

Instrument	Manufacturer	Model No.	Serial No	Next Cal. Date
Spectrum Analyzer	Agilent	N9010A-EXA	US47140172	2013/07/31

Note: 1. All equipments that need to calibrate are with calibration period of 1 year.

3.2. Test Setup



3.3. Limits

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. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

3.4. Test Specification

According to FCC Part 15 Subpart C Paragraph 15.231(e): 2012

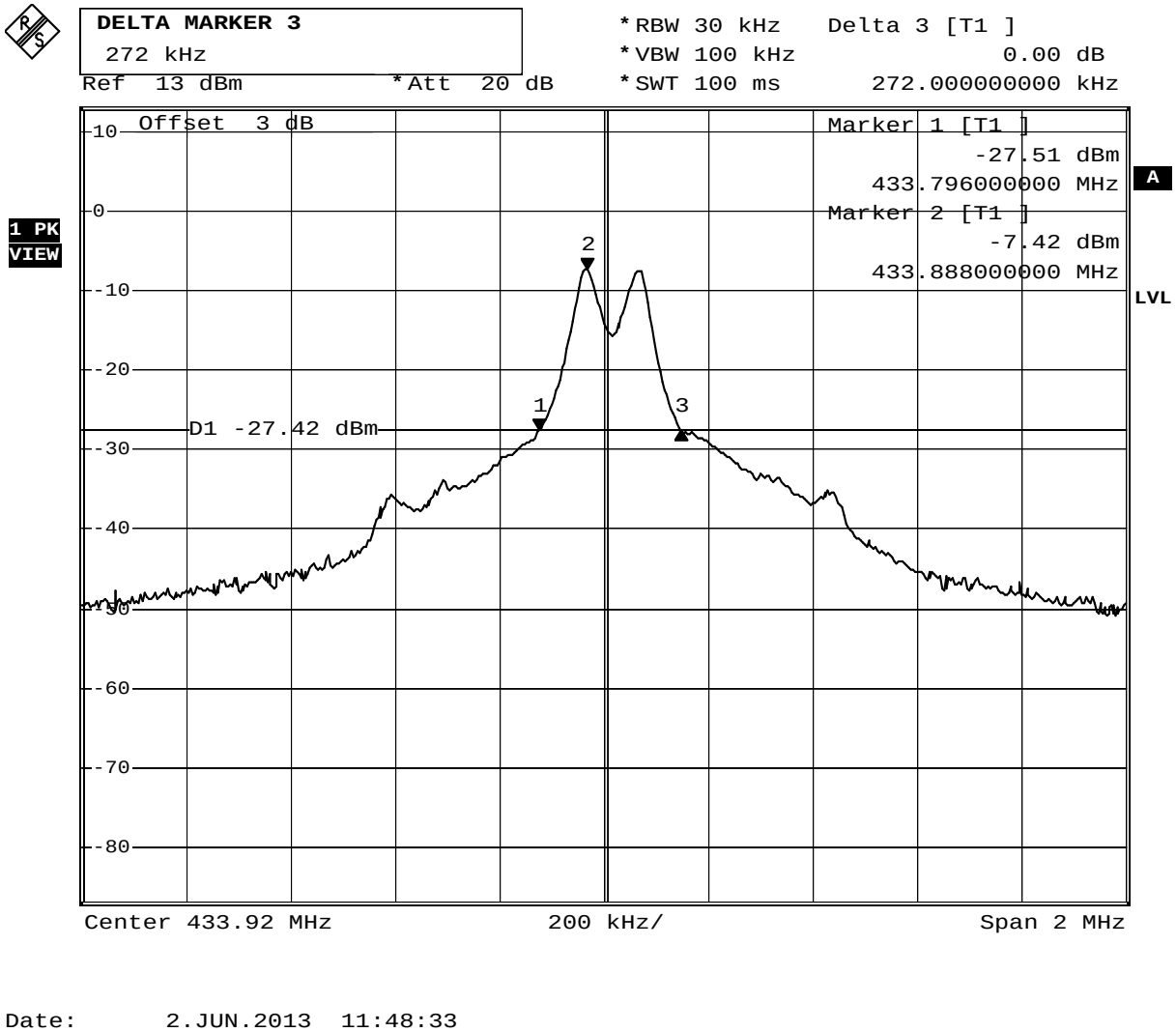
3.5. Uncertainty

± 150Hz

3.6. Test Result

Product	Tire Pressure Monitoring System		
Test Item	Occupied Bandwidth		
Test Mode	Mode 1: Transmit		
Date of Test	2013/06/02	Test Site	SR7

Center Frequency	433.92 MHz
Allowable Bandwidth (70-900 MHz: 0.25%, Above 900MHz: 0.5%)	1084.8 KHz
Bandwidth at 20dB down (Max)	272.0KHz
Result	PASS



4. Duty cycle

4.1. Test Equipment

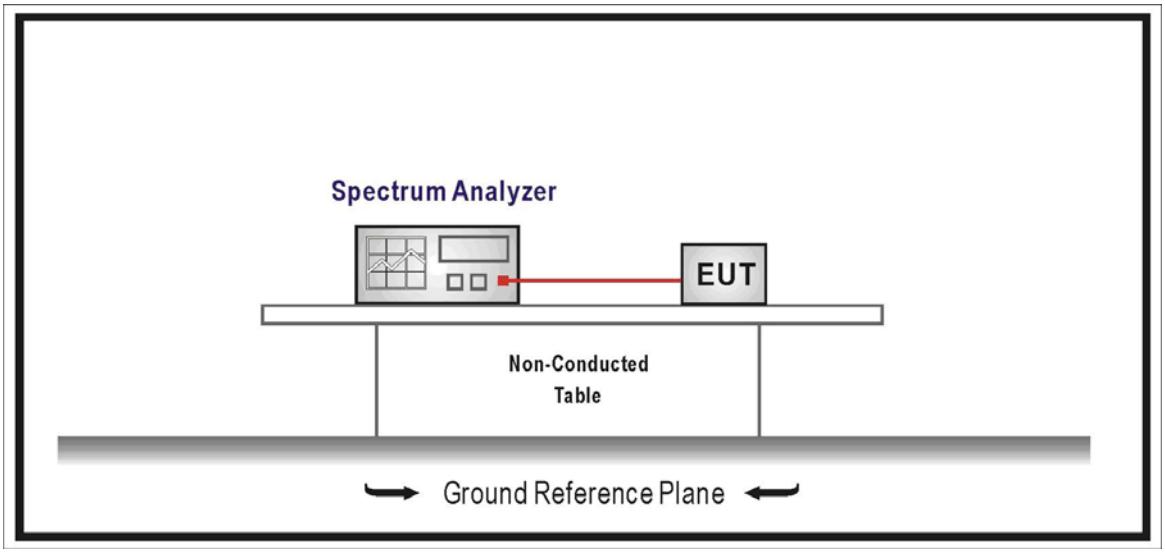
The following test equipments are used during the radiated emission tests:

Duty cycle / SR7

Instrument	Manufacturer	Model No.	Serial No	Next Cal. Date
Spectrum Analyzer	Agilent	N9010A-EXA	US47140172	2013/07/31

Note: 1. All equipments that need to calibrate are with calibration period of 1 year.

4.2. Test Setup



4.3. Limits

N/A

4.4. Test Specification

According to FCC Part 15 Subpart C Paragraph 15.231(e): 2012

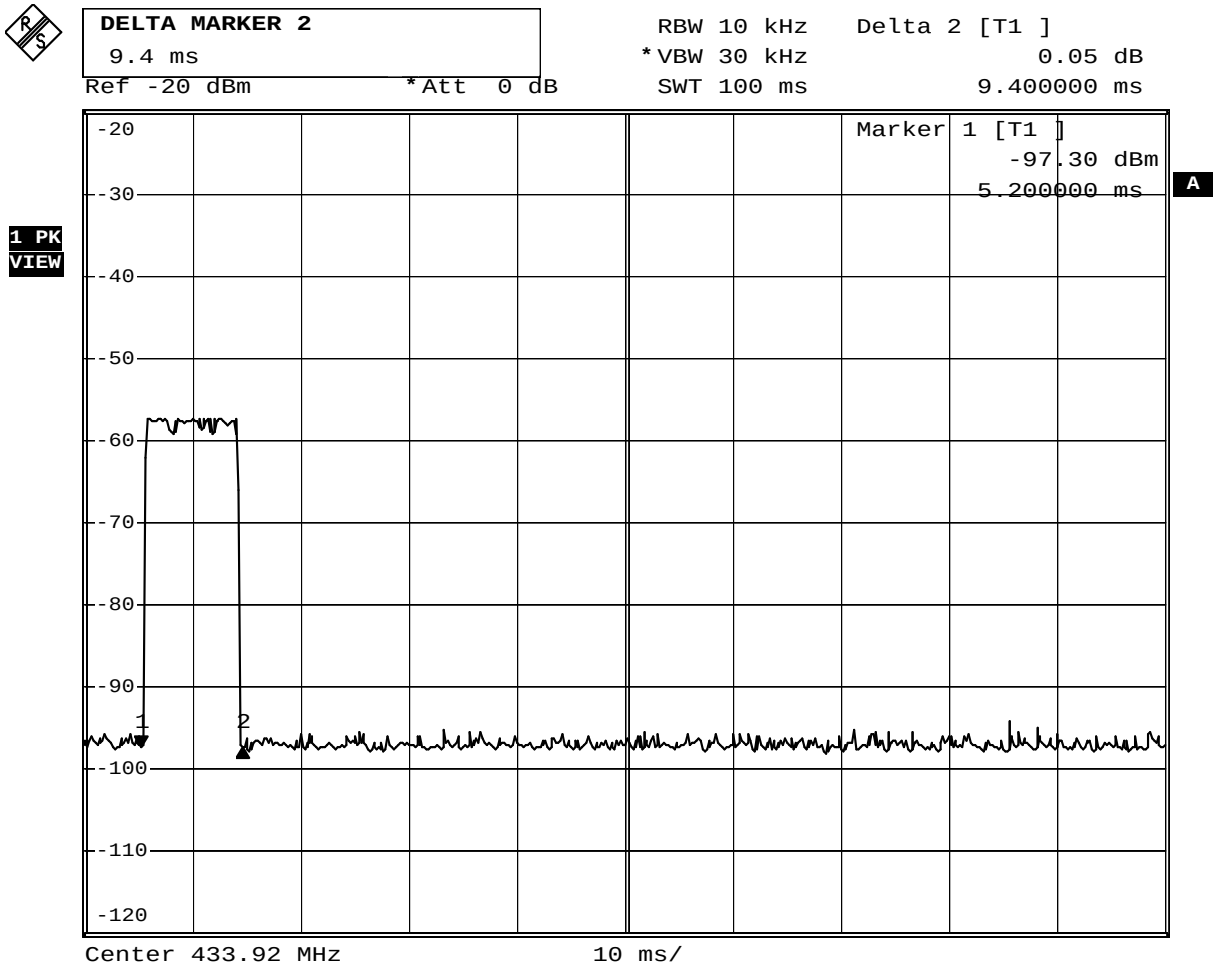
4.5. Uncertainty

± 25msec

4.6. Test Result

Product	Tire Pressure Monitoring System		
Test Item	Duty Cycle		
Test Mode	Mode 1: Transmit		
Date of Test	2013/06/02	Test Site	SR7

Center Frequency	433.92 MHz
Ton= 9.40ms Ton+Toff= 100ms	
Duty Cycle= 0.094/100%	9.40%



Date: 13.JUN.2013 18:58:56

5. Transmitter time

5.1. Test Equipment

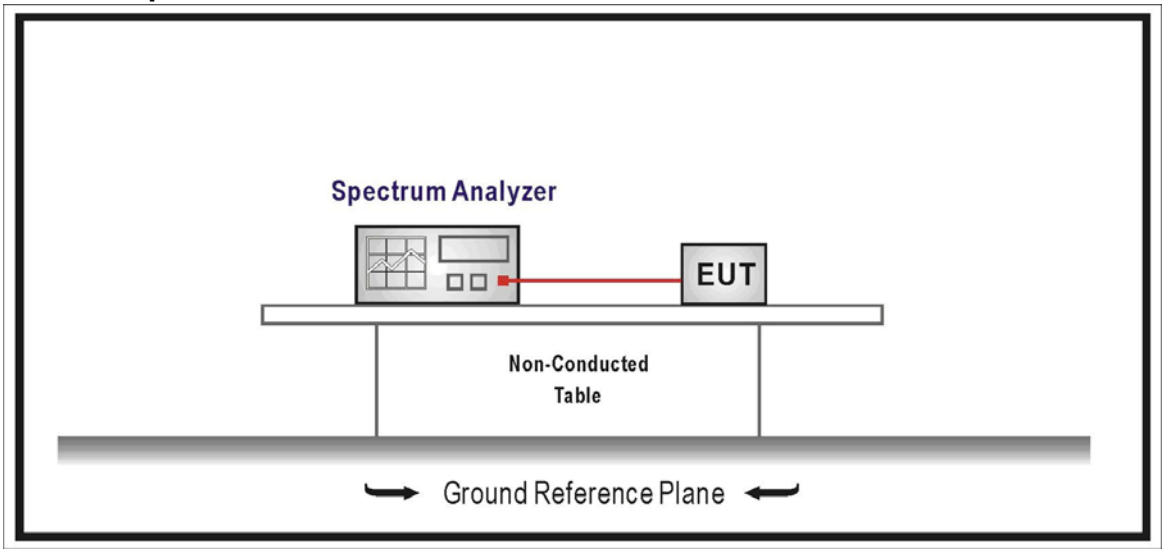
The following test equipments are used during the radiated emission tests:

Transmitter time / SR7

Instrument	Manufacturer	Model No.	Serial No	Next Cal. Date
Spectrum Analyzer	Agilent	N9010A-EXA	US47140172	2013/07/31

Note: 1. All equipments that need to calibrate are with calibration period of 1 year.

5.2. Test Setup



5.3. Limits

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.

5.4. Test Specification

According to FCC Part 15 Subpart C Paragraph 15.231(e): 2012

5.5. Uncertainty

± 25msec

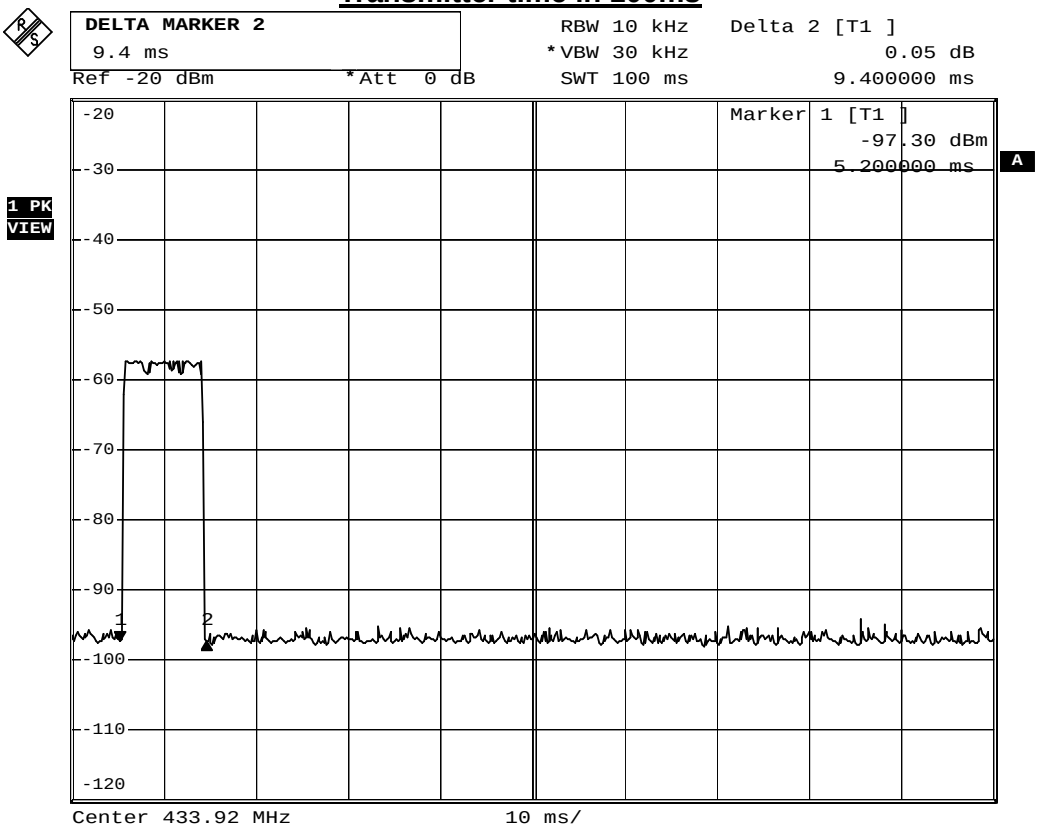
5.6. Test Result

Product	Tire Pressure Monitoring System		
Test Item	Transmitter time		
Test Mode	Mode 1: Transmit		
Date of Test	2013/06/14	Test Site	SR7

Frequency (MHz)	Transmitter time (ms.)		Silent period (sec.)	
	Measure value	Limit	Measure value	Limit
433.92	9.40	1000.00	30.08	10.00

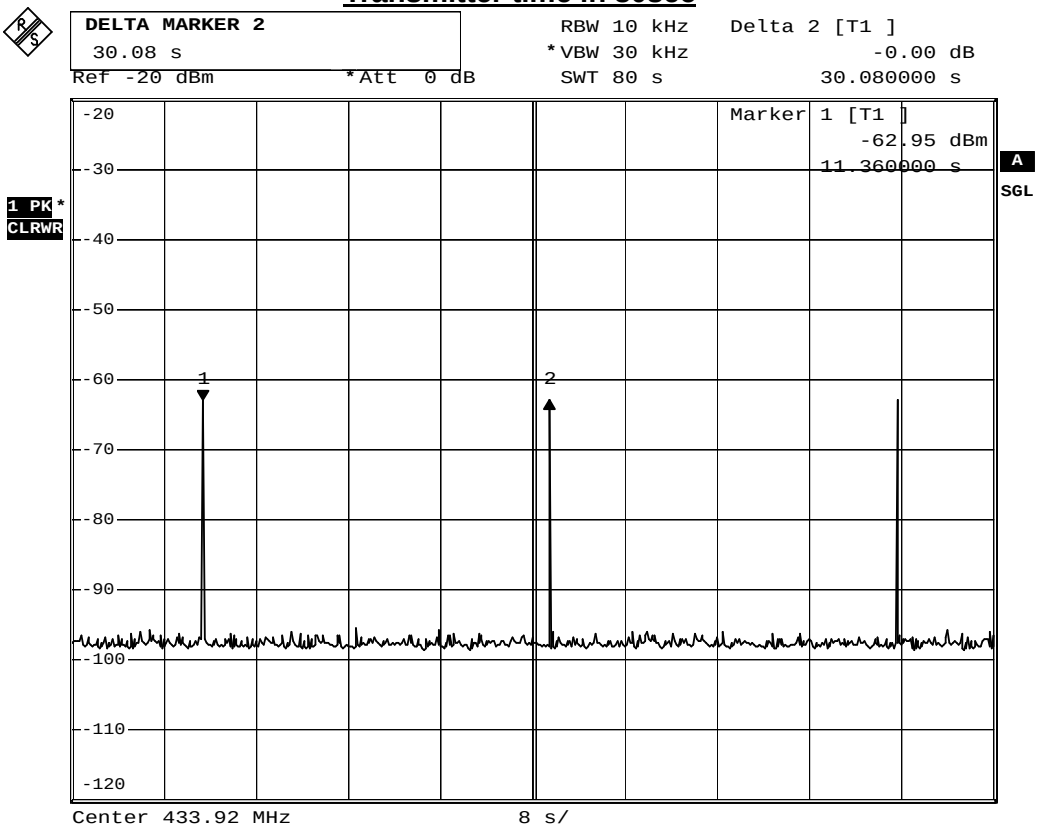
Result	PASS

Transmitter time in 100ms



Date: 13.JUN.2013 18:58:56

Transmitter time in 80sec



Date: 14.JUN.2013 11:04:20