



## MEASUREMENT REPORT

### FCC PART 15.231(e)

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**FCC ID:** TTE-TSB44

**APPLICANT:** Suzhou Sate Auto Electronic Co., Ltd

**Application Type:** Certification

**Product:** Tire Pressure Monitoring System

**Model No.:** TSB44

**Brand Name:** S&T

**FCC Classification:** FCC Part 15 Security/Remote Control Transmitter  
(DSC)

**FCC Rule Part(s):** Part 15.231(e)

**Test Procedure(s):** ANSI C63.10-2013

**Test Date:** Jun. 01 ~ Jul. 11, 2015

Reviewed By : Robin Wu  
( Robin Wu )

Approved By : Marlin Chen  
( Marlin Chen )



The test results relate only to the samples tested.

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.10-2013. Test results reported herein relate only to the item(s) tested.

The test report shall not be reproduced except in full without the written approval of MRT Technology (Suzhou) Co., Ltd.

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## Revision History

Report No.	Version	Description	Issue Date
1505RSU00601	Rev. 01	Initial report	07-12-2015

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## §2.1033 General Information

<b>Applicant:</b>	Suzhou Sate Auto Electronic Co., Ltd
<b>Applicant Address:</b>	No.36 Building, Yangtai Road, Suzou Industrial Park, Suzhou, Jiangsu, P.R.China
<b>Manufacturer:</b>	Suzhou Sate Auto Electronic Co., Ltd
<b>Manufacturer Address:</b>	No.36 Building, Yangtai Road, Suzou Industrial Park, Suzhou, Jiangsu, P.R.China
<b>Test Site:</b>	MRT Technology (Suzhou) Co., Ltd
<b>Test Site Address:</b>	D8 Building, Youxin Industrial Park, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China
<b>MRT Registration No.:</b>	809388
<b>FCC Rule Part(s):</b>	Part 15.231(e)
<b>Model No.</b>	TSB44
<b>FCC ID:</b>	TTE-TSB44
<b>Test Device Serial No.:</b>	N/A <input type="checkbox"/> Production <input checked="" type="checkbox"/> Pre-Production <input type="checkbox"/> Engineering
<b>FCC Classification:</b>	FCC Part 15 Security/Remote Control Transmitter(DSC)

### Test Facility / Accreditations

Measurements were performed at MRT Laboratory located in Tian'edang Rd., Suzhou, China.

- MRT facility is a FCC registered (MRT Reg. No. 809388) test facility with the site description report on file and has met all the requirements specified in Section 2.948 of the FCC Rules.
- MRT facility is an IC registered (MRT Reg. No. 11384A-1) test laboratory with the site description on file at Industry Canada.
- MRT facility is a VCCI registered (R-4179, G-814, C-4664, T-2206) test laboratory with the site description on file at VCCI Council.
- MRT Lab is accredited to ISO 17025 by the American Association for Laboratory Accreditation (A2LA) under the American Association for Laboratory Accreditation Program (A2LA Cert. No. 3628.01) in EMC, Telecommunications and Radio testing for FCC, Industry Canada, EU and TELEC Rules.



## 1. INTRODUCTION

### 1.1. Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission and the Industry Canada Certification and Engineering Bureau.

### 1.2. MRT Test Location

The map below shows the location of the MRT LABORATORY, its proximity to the Taihu Lake. These measurement tests were conducted at the MRT Technology (Suzhou) Co., Ltd. Facility located at D8 Building, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China. The detailed description of the measurement facility was found to be in compliance with the requirements of § 2.948 according to ANSI C63.4-2009 on September 30, 2013.



## 2. PRODUCT INFORMATION

### 2.1. Equipment Description

Product Name	Tire Pressure Monitoring System
Model No.	TSB44
Frequency Range	433.92 MHz
Type of modulation	ASK, FSK
Antenna Type	Integral Antenna
Device Category	Fixed Device

### 2.2. Test Standards

The following report is prepared on behalf of the **Suzhou Sate Auto Electronic Co., Ltd** in accordance with FCC Part 15, Subpart C, and section 15.231, 15.203, 15.205 and 15.209 of the Federal Communication Commission rules.

The objective is to determine compliance with FCC Part 15, Subpart C, and section 15.231, 15.203, 15.205 and 15.209 of the Federal Communication Commission rules.

**Maintenance of compliance** is the responsibility of the manufacturer. Any modification of the product, which results in lowering the emission/immunity, should be checked to ensure compliance has been maintained.

### 2.3. Test Methodology

The measurement procedures described in the American National Standard for Testing Unlicensed Wireless Devices (ANSI C63.10-2013).

**Deviation from measurement procedure.....None**

### 2.4. EUT Setup and Test Mode

The EUT was operated at continuous transmitting mode that was for the purpose of the measurements. All testing shall be performed under maximum output power condition, and to measure its highest possible emissions level, more detailed description as follows:

Test Mode List		
Test Mode	Description	Remark
Mode 1	Transmitting	With ASK Modulation
Mode 2	Transmitting	With FSK Modulation

### 3. ANTENNA REQUIREMENTS

**Excerpt from §15.203 of the FCC Rules/Regulations:**

“An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can 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.”

- The antenna of the **Tire Pressure Monitoring System** is permanently attached.
- There are no provisions for connection to an external antenna.

**Conclusion:**

The Tire Pressure Monitoring System **FCC ID: TTE-TSB44** unit complies with the requirement of §15.203.



#### 4. TEST EQUIPMENT CALIBRATION DATA

##### Radiated Emission

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
Spectrum Analyzer	Agilent	N9020A	MRTSUE06028	1 year	2016/04/23
Preamplifier	Agilent	83017A	MRTSUE06076	1 year	2015/12/13
Loop Antenna	Schwarzbeck	FMZB1519	MRTSUE06025	1 year	2015/11/08
TRILOG Antenna	Schwarzbeck	VULB9162	MRTSUE06022	1 year	2015/11/08
Broad-Band Horn Antenna	Schwarzbeck	BBHA9120D	MRTSUE06023	1 year	2015/11/08
Broadband Horn Antenna	Schwarzbeck	BBHA9170	MRTSUE06024	1 year	2015/12/11
Temperature/Humidity Meter	Anymetre	TH101B	MRTSUE06046	1 year	2015/11/14

##### 20dB Bandwidth

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cal. Due. Date
Spectrum Analyzer	Agilent	N9020A	MRTSUE06028	1 year	2016/04/23
TRILOG Antenna	Schwarzbeck	VULB9162	MRTSUE06022	1 year	2015/11/08
Temperature/Humidity Meter	Anymetre	TH101B	MRTSUE06046	1 year	2015/11/15

##### Transmission Time

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cal. Due. Date
Spectrum Analyzer	Agilent	N9020A	MRTSUE06028	1 year	2016/04/23
TRILOG Antenna	Schwarzbeck	VULB9162	MRTSUE06022	1 year	2015/11/08
Temperature/Humidity Meter	Anymetre	TH101B	MRTSUE06046	1 year	2015/11/15

##### Duty Cycle

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cal. Due. Date
Spectrum Analyzer	Agilent	N9020A	MRTSUE06028	1 year	2016/04/23
TRILOG Antenna	Schwarzbeck	VULB9162	MRTSUE06022	1 year	2015/11/08
Temperature/Humidity Meter	Anymetre	TH101B	MRTSUE06046	1 year	2015/11/15

Software	Version	Function
e3	V8.3.5	EMI Test Software

## 5. MEASUREMENT UNCERTAINTY

Where relevant, the following test uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of  $k = 2$ .

Radiated Emission Measurement
Measuring Uncertainty for a Level of Confidence of 95% ( $U=2Uc(y)$ ):
9kHz ~ 1GHz: 4.18dB
1GHz ~ 18GHz: 4.76dB

## 6. TEST RESULT

### 6.1. Summary

**Company Name:** Suzhou Sate Auto Electronic Co., Ltd

**FCC ID:** TTE-TSB44

FCC Part Section(s)	Test Description	Test Condition	Test Result
15.205 15.231(e)	Radiated Spurious Emissions	Radiated	Pass
15.231(c)	20dB Bandwidth		Pass
15.231(e)	Transmission Time		Pass
15.231(e)	Duty Cycle		Pass

**Notes:**

- 1) All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst case emissions.
- 2) The analyzer plots shown in this section were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables and attenuators used as part of the system to connect the EUT to the analyzer at all frequencies of interest.
- 3) The radiation measurements are performed in X, Y, Z axis positioning. Only the worst case is shown in the report.

## 6.2. Radiated Emissions

### 6.2.1. Standard Applicable

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 emission (microvolts/meter)
40.66-40.70	1,000	100
70-130	500	50
130-174	500 to 1,500 <sup>1</sup>	50 to 150 <sup>1</sup>
174-260	1,500	150
260-470	1,500 to 5,000 <sup>1</sup>	150 to 500 <sup>1</sup>
Above 470	5,000	500

The limits on the field strength of the spurious emissions in the above table are based on the fundamental frequency of the intentional radiator. Spurious emissions shall be attenuated to the average (or, alternatively, CISPR quasi-peak) limits shown in this table or to the general limits shown in §15.209, whichever limit permits a higher field strength.

The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply. Spurious Radiated Emissions measurements start below or at the lowest crystal frequency.

Compliance with the provisions of §15.205 shall be demonstrated using the measurement instrumentation specified in that section.

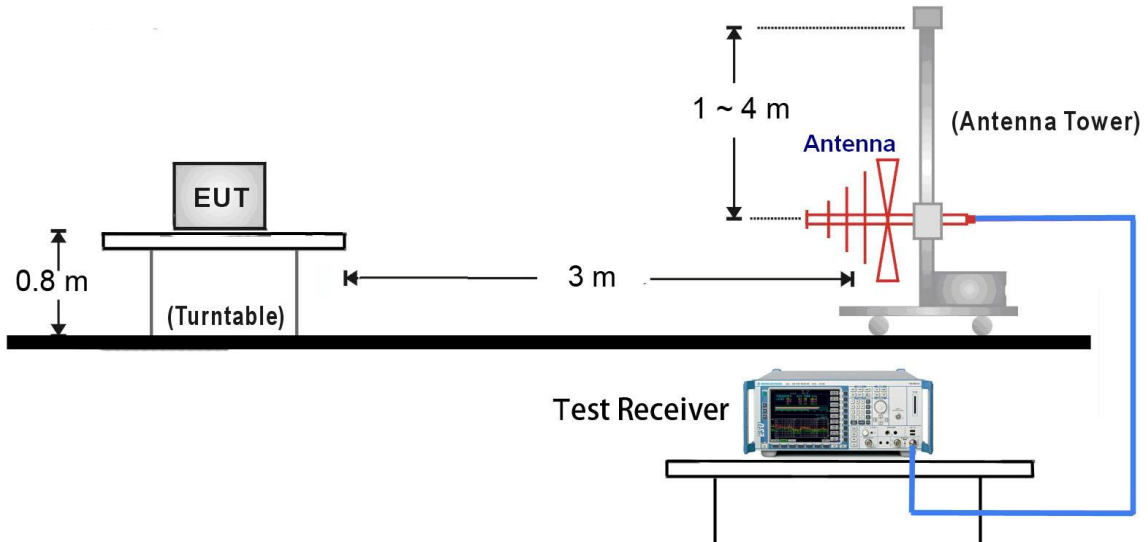
### 6.2.2. Test Procedure

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.231(e) and FCC Part 15.209 Limit.

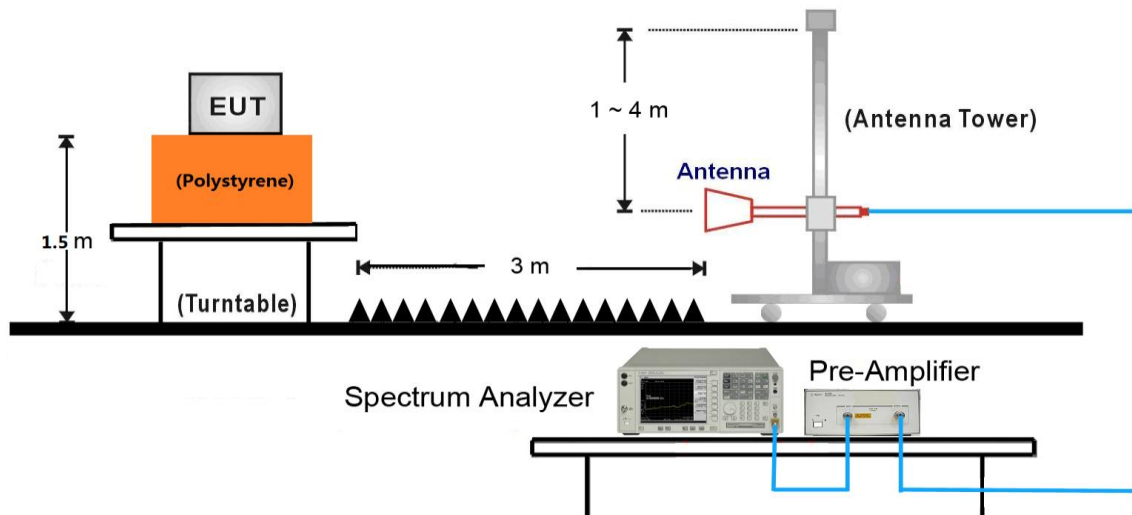
### 6.2.3. Test Setup

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.231(e) and FCC Part 15.209 Limit.

#### 30MHz ~ 1GHz Test Setup:

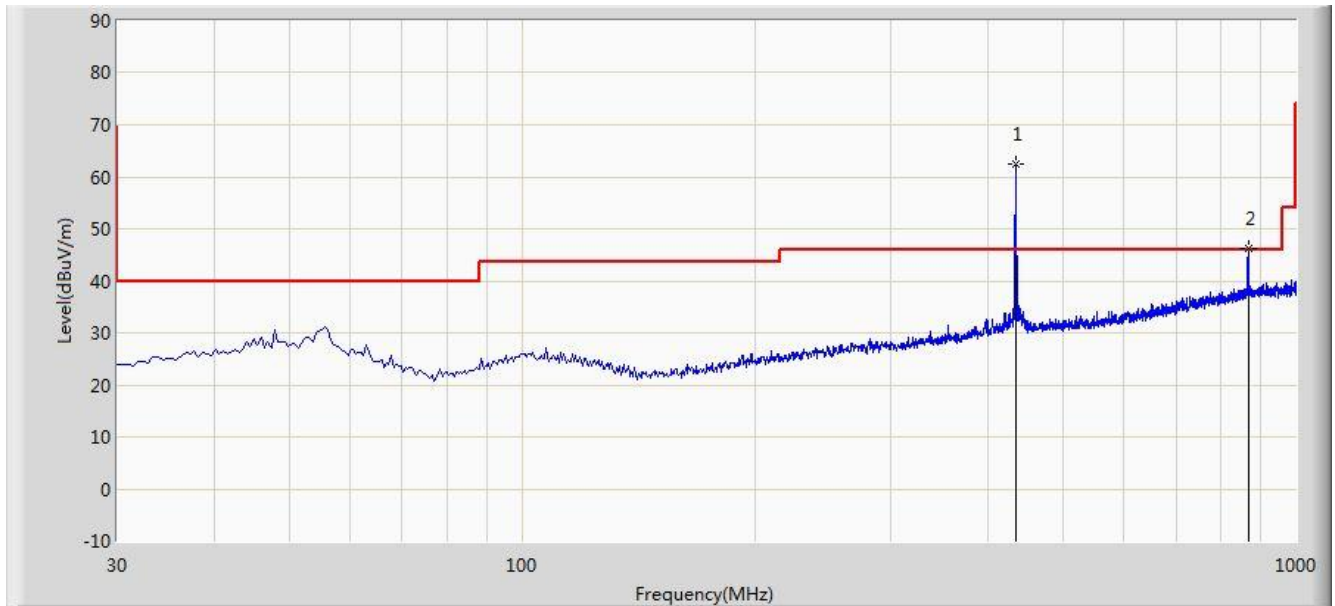


#### 1GHz ~ 18GHz Test Setup:



### 6.2.4. Test Results

Site: AC1	Time: 2015/07/11 - 18:02
Limit: FCC_Part15.209_RE(3m)	Engineer: Roy Cheng
Probe: VULB9162_0.03-8GHz	Polarity: Horizontal
EUT: Tire Pressure Monitoring System	Power: By Battery
Test Mode1: Transmit with ASK Modulation	



No	Frequency (MHz)	Reading Level (dBuV)	Factor (dB)	Duty Cycle Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Ant Pos (cm)	Table Pos (deg)	Type
1	433.920	45.413	17.103	N/A	62.516	92.872	-30.356	100	23	PK
	433.920	45.413	17.103	-12.01	60.506	72.872	-12.366	100	23	AV
2	867.595	22.512	23.694	N/A	46.206	72.872	-26.666	100	61	PK
	867.595	22.512	23.694	-12.01	34.196	52.872	-18.676	100	61	AV

Note 1: Testing is carried out with frequency rang 9 kHz to the tenth harmonics. There is the ambient noise within frequency range 9 kHz ~ 30 MHz, the permissible value is not show in the report.

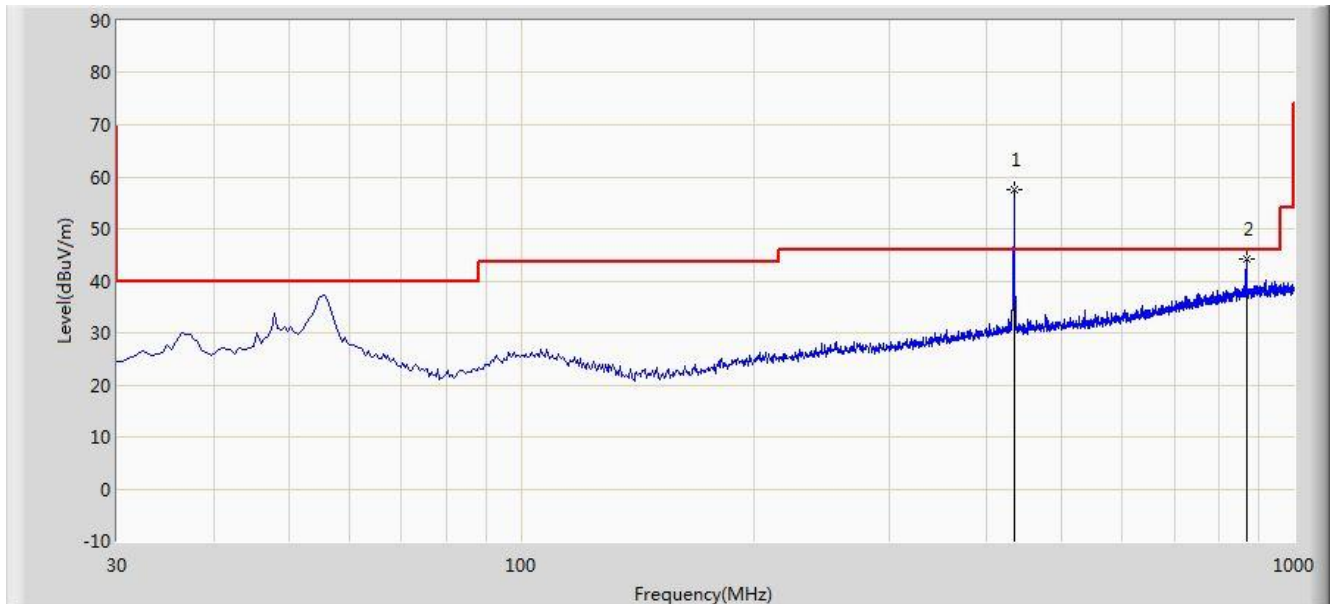
Note 2: The fundamental frequency is 433.92MHz, so the fundamental and spurious emissions radiated limit base on the operating frequency 433.92MHz.

Note 3: Peak Measure Level (dB $\mu$ V/m) = Reading Level (dB $\mu$ V) + Factor (dB).

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m).

AV Measure Level = Peak Measure Level + Duty Cycle Factor.

Site: AC1	Time: 2015/07/11 - 18:03
Limit: FCC_Part15.209_RE(3m)	Engineer: Roy Cheng
Probe: VULB9162_0.03-8GHz	Polarity: Vertical
EUT: Tire Pressure Monitoring System	Power: By Battery
Test Mode1: Transmit with ASK Modulation	



No	Frequency (MHz)	Reading Level (dBuV)	Factor (dB)	DutyCycle Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Ant Pos (cm)	Table Pos (deg)	Type
1	433.920	40.448	17.103	N/A	57.551	92.872	-35.321	100	106	PK
	433.920	40.448	17.103	-12.01	55.541	72.872	-17.331	100	106	AV
2	868.080	20.500	23.698	N/A	44.198	72.872	-28.674	100	83	PK
	868.080	20.500	23.698	-12.01	32.188	52.872	-20.684	100	83	AV

Note 1: Testing is carried out with frequency rang 9 kHz to the tenth harmonics. There is the ambient noise within frequency range 9 kHz ~ 30 MHz, the permissible value is not show in the report.

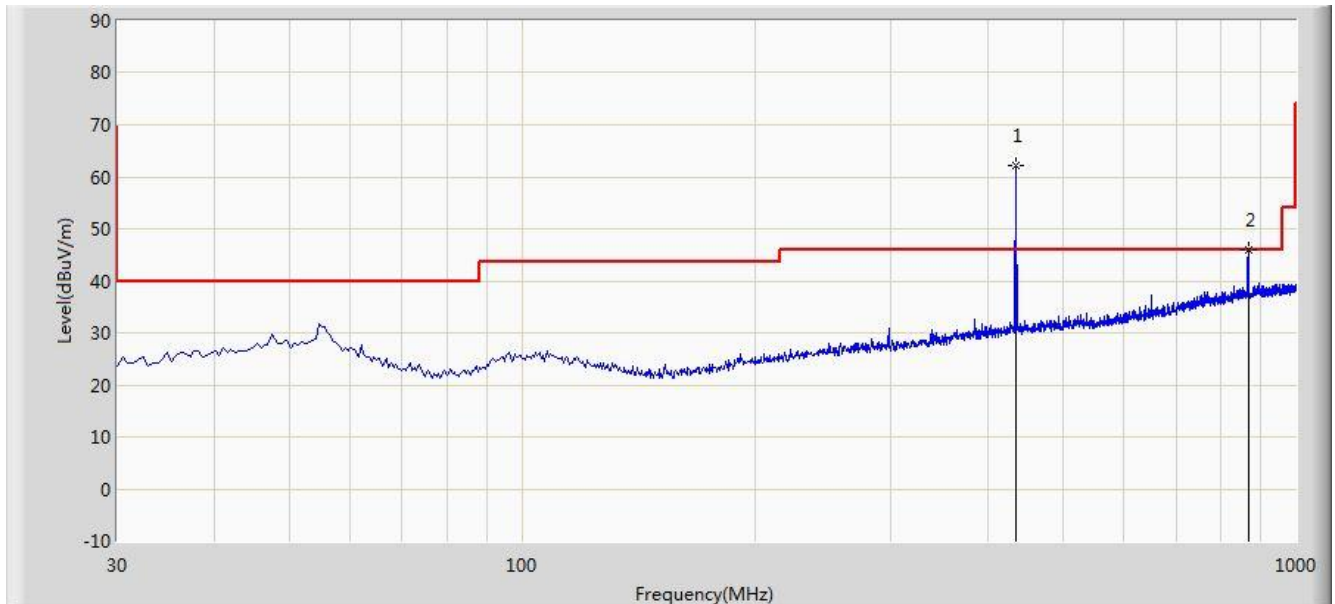
Note 2: The fundamental frequency is 433.92MHz, so the fundamental and spurious emissions radiated limit base on the operating frequency 433.92MHz.

Note 3: Peak Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB).

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m).

AV Measure Level = Peak Measure Level + Duty Cycle Factor.

Site: AC1	Time: 2015/07/11 - 18:04
Limit: FCC_Part15.209_RE(3m)	Engineer: Roy Cheng
Probe: VULB9162_0.03-8GHz	Polarity: Horizontal
EUT: Tire Pressure Monitoring System	Power: By Battery
Test Mode2: Transmit with FSK Modulation	



No	Frequency (MHz)	Reading Level (dBuV)	Factor (dB)	Duty Cycle Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Ant Pos (cm)	Table Pos (deg)	Type
1	433.920	45.182	17.103	N/A	62.285	92.872	-30.587	100	45	PK
	433.920	45.182	17.103	-14.59	47.695	72.872	-25.177	100	45	AV
2	867.595	22.127	23.694	N/A	45.821	72.872	-27.051	100	321	PK
	867.595	22.127	23.694	-14.59	31.231	52.872	-21.641	100	321	AV

Note 1: Testing is carried out with frequency rang 9 kHz to the tenth harmonics. There is the ambient noise within frequency range 9 kHz ~ 30 MHz, the permissible value is not show in the report.

Note 2: The fundamental frequency is 433.92MHz, so the fundamental and spurious emissions radiated limit base on the operating frequency 433.92MHz.

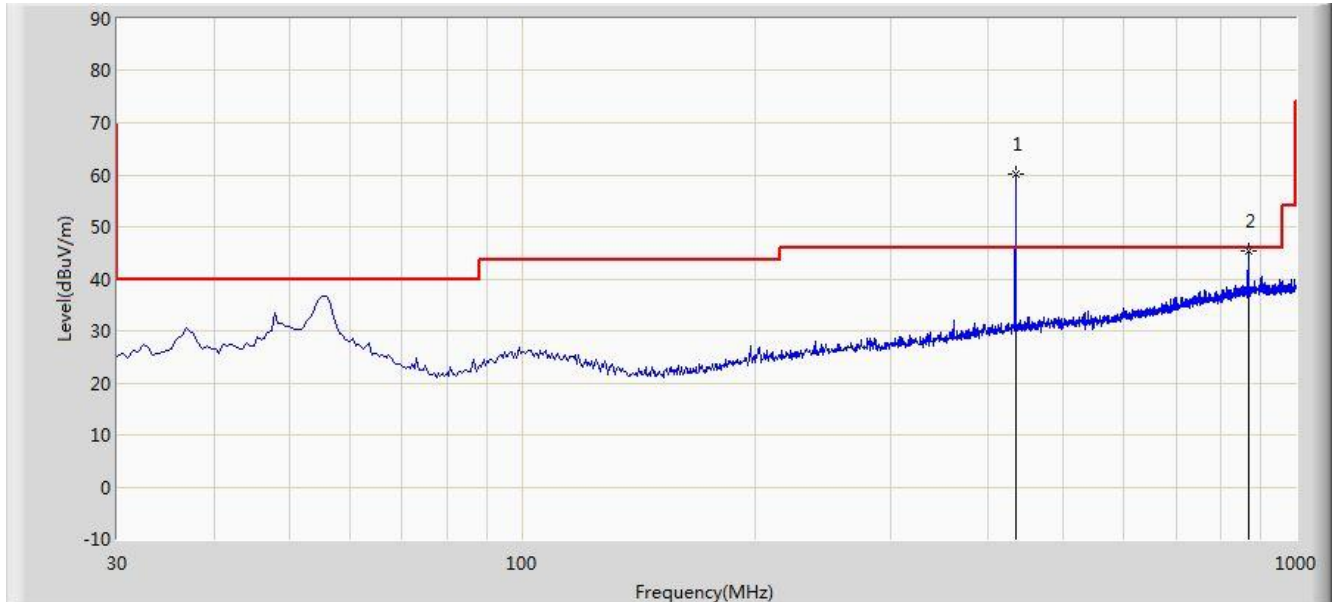
Note 3: Peak Measure Level (dB $\mu$ V/m) = Reading Level (dB $\mu$ V) + Factor (dB).

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m).

AV Measure Level = Peak Measure Level + Duty Cycle Factor.



Site: AC1	Time: 2015/07/11 - 18:05
Limit: FCC_Part15.209_RE(3m)	Engineer: Roy Cheng
Probe: VULB9162_0.03-8GHz	Polarity: Vertical
EUT: Tire Pressure Monitoring System	Power: By Battery
Test Mode2: Transmit with FSK Modulation	



No	Frequency (MHz)	Reading Level (dBuV)	Factor (dB)	DutyCycle Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Ant Pos (cm)	Table Pos (deg)	Type
1	433.920	43.127	17.103	N/A	60.23	92.872	-32.642	100	78	PK
	433.290	43.127	17.103	-14.59	45.64	72.872	-27.232	100	78	AV
2	868.080	21.657	23.698	N/A	45.355	72.872	-27.517	100	53	PK
	868.080	21.657	23.698	-14.59	30.765	52.872	-22.107	100	53	AV

Note 1: Testing is carried out with frequency rang 9 kHz to the tenth harmonics. There is the ambient noise within frequency range 9 kHz ~ 30 MHz, the permissible value is not show in the report.

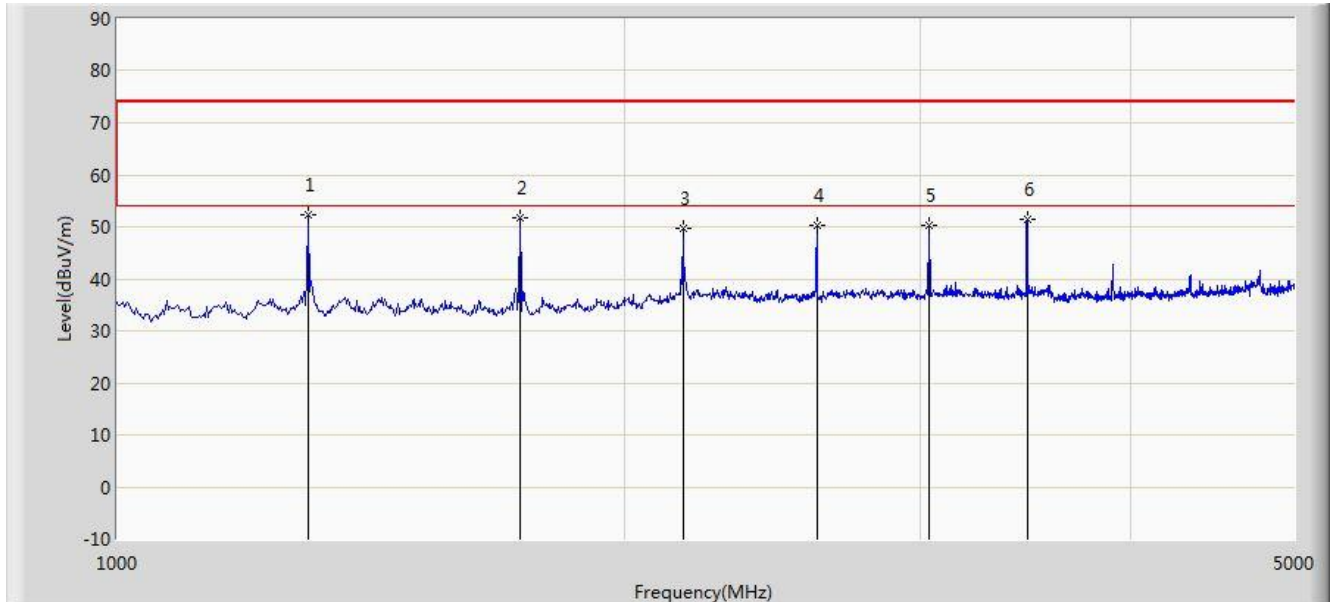
Note 2: The fundamental frequency is 433.92MHz, so the fundamental and spurious emissions radiated limit base on the operating frequency 433.92MHz.

Note 3: Peak Measure Level (dB $\mu$ V/m) = Reading Level (dB $\mu$ V) + Factor (dB).

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m).

AV Measure Level = Peak Measure Level + Duty Cycle Factor.

Site: AC1	Time: 2015/07/11 - 17:57
Limit: FCC_Part15.209_RE(3m)	Engineer: Roy Cheng
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: Tire Pressure Monitoring System	Power: By Battery
Test Mode1: Transmit with ASK Modulation	



No	Frequency (MHz)	Reading Level (dBuV)	Factor (dB)	Dutycycle Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Ant Pos (cm)	Table Pos (deg)	Type
1	1300.000	60.586	-8.246	N/A	52.340	74.00	-21.660	100	78	PK
	1300.000	60.586	-8.246	-12.01	40.330	54.00	-13.670	100	78	AV
2	1735.000	59.159	-7.319	N/A	51.840	74.00	-22.160	100	54	PK
	1735.000	59.159	-7.319	-12.01	39.830	54.00	-14.170	100	54	AV
3	2167.500	53.778	-3.967	N/A	49.811	74.00	-24.189	100	231	PK
	2167.500	53.778	-3.967	-12.01	37.801	54.00	-16.199	100	231	AV
4	2605.000	53.639	-3.277	N/A	50.362	74.00	-23.638	100	98	PK
	2605.000	53.639	-3.277	-12.01	38.352	54.00	-15.648	100	98	AV
5	3037.500	52.462	-2.042	N/A	50.420	74.00	-23.580	100	57	PK
	3037.500	52.462	-2.042	-12.01	38.410	54.00	-15.590	100	57	AV
6	3472.500	52.621	-1.284	N/A	51.337	74.00	-22.663	100	301	PK
	3472.500	52.621	-1.284	-12.01	39.327	54.00	-14.673	100	301	AV

Note 1: Testing is carried out with frequency rang 9 kHz to the tenth harmonics. There is the ambient noise within frequency range 9 kHz ~ 30 MHz, the permissible value is not show in the report.

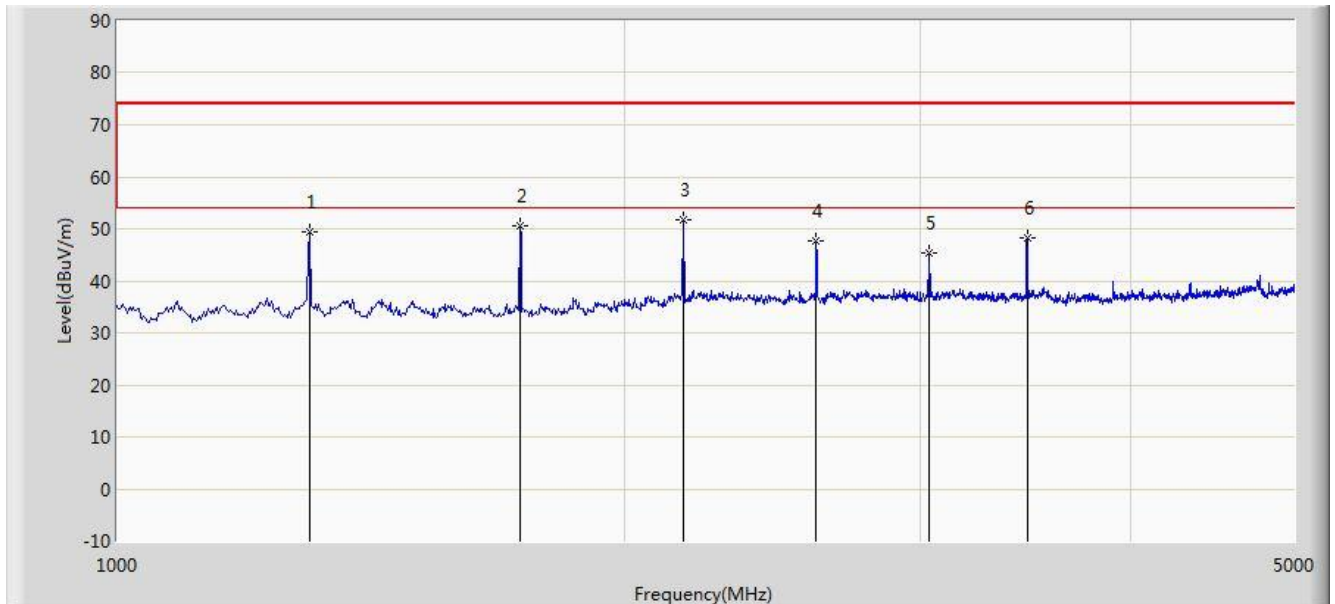
Note 2: The fundamental frequency is 433.92MHz, so the fundamental and spurious emissions radiated limit base on the operating frequency 433.92MHz.

Note 3: Peak Measure Level (dB $\mu$ V/m) = Reading Level (dB $\mu$ V) + Factor (dB).

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) – Pre\_Amplifier Gain (dB).

AV Measure Level = Peak Measure Level + Duty Cycle Factor.

Site: AC1	Time: 2015/07/11 - 17:59
Limit: FCC_Part15.209_RE(3m)	Engineer: Roy Cheng
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: Tire Pressure Monitoring System	Power: By Battery
Test Mode1: Transmit with ASK Modulation	



No	Frequency (MHz)	Reading Level (dBuV)	Factor (dB)	Dutycycle Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Ant Pos (cm)	Table Pos (deg)	Type
1	1302.500	57.779	-8.229	N/A	49.55	74.00	-24.45	100	352	PK
	1302.500	57.779	-8.229	-12.01	37.54	54.00	-16.46	100	352	AV
2	1735.000	57.850	-7.319	N/A	50.531	74.00	-23.469	100	21	PK
	1735.000	57.850	-7.319	-12.01	38.521	54.00	-15.479	100	21	AV
3	2170.000	55.802	-3.940	N/A	51.862	74.00	-22.138	100	67	PK
	2170.000	55.802	-3.940	-12.01	39.852	54.00	-14.148	100	67	AV
4	2602.500	51.056	-3.288	N/A	47.768	74.00	-26.232	100	93	PK
	2602.500	51.056	-3.288	-12.01	35.758	54.00	-18.242	100	93	AV
5	3037.500	47.542	-2.042	N/A	45.500	74.00	-28.500	100	107	PK
	3037.500	47.542	-2.042	-12.01	33.490	54.00	-20.510	100	107	AV
6	3472.500	49.518	-1.284	N/A	48.234	74.00	-25.766	100	59	PK
	3472.500	49.518	-1.284	-12.01	36.224	54.00	-17.776	100	59	AV

Note 1: Testing is carried out with frequency rang 9 kHz to the tenth harmonics. There is the ambient noise within frequency range 9 kHz ~ 30 MHz, the permissible value is not show in the report.

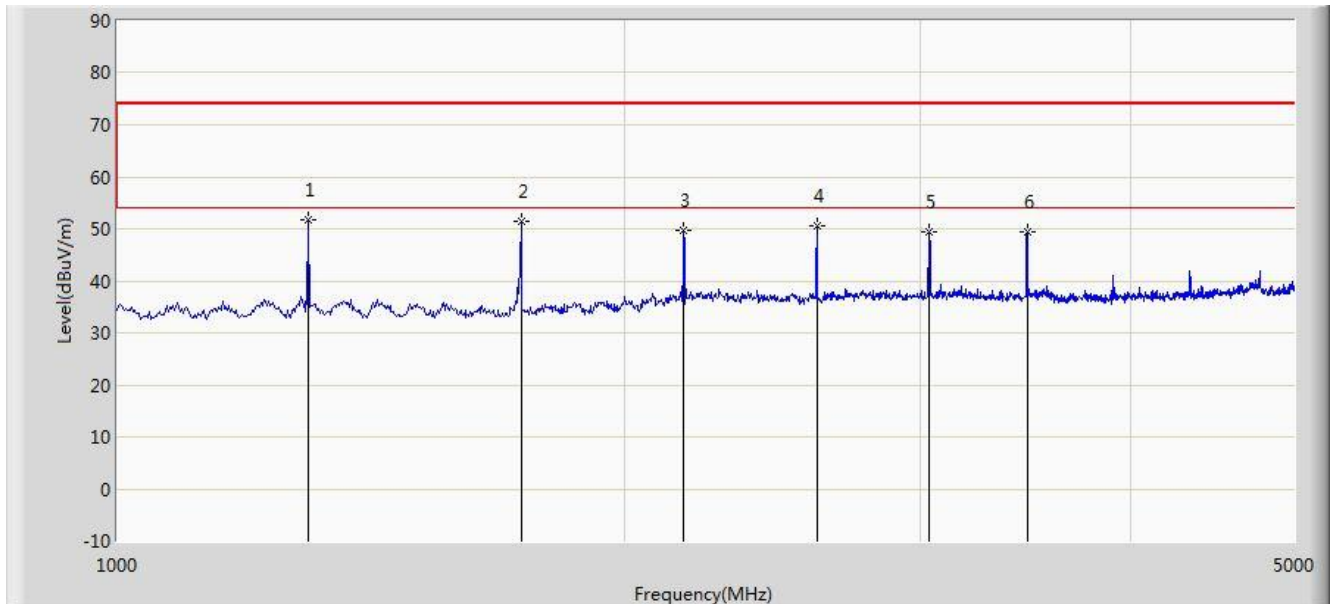
Note 2: The fundamental frequency is 433.92MHz, so the fundamental and spurious emissions radiated limit base on the operating frequency 433.92MHz.

Note 3: Peak Measure Level (dB $\mu$ V/m) = Reading Level (dB $\mu$ V) + Factor (dB).

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) – Pre\_Amplifier Gain (dB).

AV Measure Level = Peak Measure Level + Duty Cycle Factor.

Site: AC1	Time: 2015/07/11 - 18:00
Limit: FCC_Part15.209_RE(3m)	Engineer: Roy Cheng
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: Tire Pressure Monitoring System	Power: By Battery
Test Mode2: Transmit with FSK Modulation	



No	Frequency (MHz)	Reading Level (dBuV)	Factor (dB)	Dutycycle Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Ant Pos (cm)	Table Pos (deg)	Type
1	1300.000	59.933	-8.246	N/A	51.687	74.00	-22.313	100	76	PK
	1300.000	59.933	-8.246	-14.59	37.097	54.00	-16.903	100	76	AV
2	1737.500	58.655	-7.308	N/A	51.347	74.00	-22.653	100	54	PK
	1737.500	58.655	-7.308	-14.59	36.757	54.00	-17.243	100	54	AV
3	2170.000	53.676	-3.940	N/A	49.736	74.00	-24.264	100	231	PK
	2170.000	53.676	-3.940	-14.59	35.146	54.00	-18.854	100	231	AV
4	2605.000	53.902	-3.277	N/A	50.625	74.00	-23.375	100	79	PK
	2605.000	53.902	-3.277	-14.59	36.035	54.00	-17.965	100	79	AV
5	3037.500	51.576	-2.042	N/A	49.534	74.00	-24.466	100	208	PK
	3037.500	51.576	-2.042	-14.59	34.944	54.00	-19.056	100	207	AV
6	3472.500	50.755	-1.284	N/A	49.471	74.00	-24.529	100	57	PK
	3472.500	50.755	-1.284	-14.59	34.881	54.00	-19.119	100	57	AV

Note 1: Testing is carried out with frequency rang 9 kHz to the tenth harmonics. There is the ambient noise within frequency range 9 kHz ~ 30 MHz, the permissible value is not show in the report.

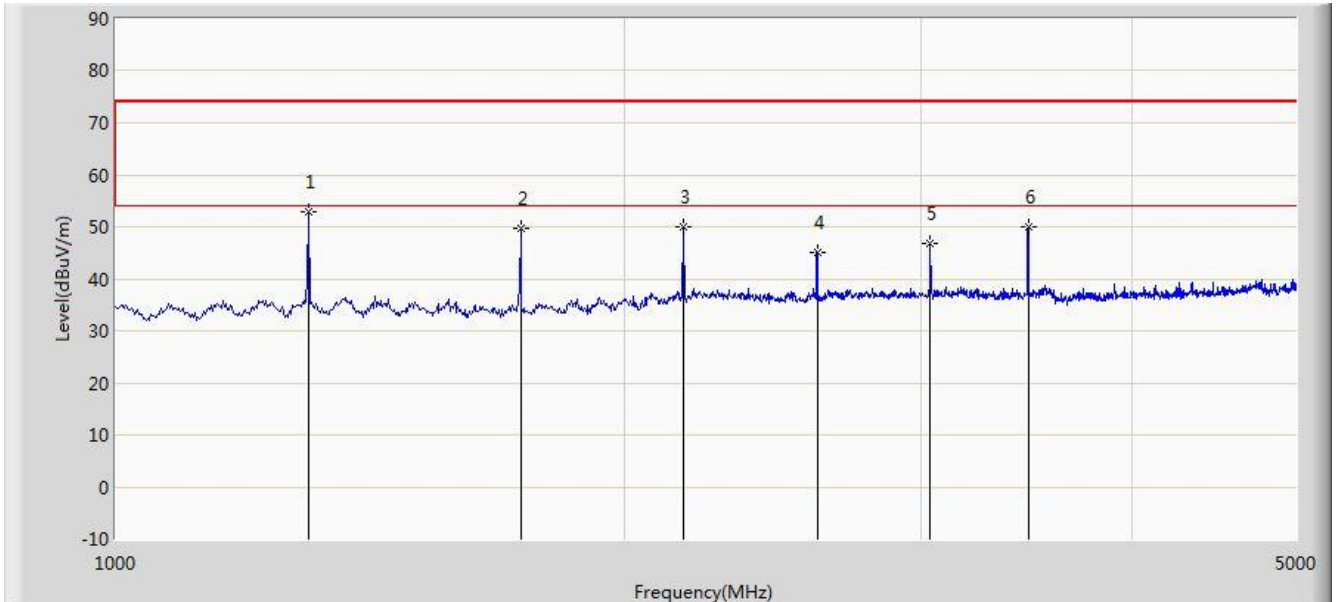
Note 2: The fundamental frequency is 433.92MHz, so the fundamental and spurious emissions radiated limit base on the operating frequency 433.92MHz.

Note 3: Peak Measure Level (dB $\mu$ V/m) = Reading Level (dB $\mu$ V) + Factor (dB).

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) – Pre\_Amplifier Gain (dB).

AV Measure Level = Peak Measure Level + Duty Cycle Factor.

Site: AC1	Time: 2015/07/11 - 18:01
Limit: FCC_Part15.209_RE(3m)	Engineer: Roy Cheng
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: Tire Pressure Monitoring System	Power: By Battery
Test Mode2: Transmit with FSK Modulation	



No	Frequency (MHz)	Reading Level (dBuV)	Factor (dB)	Dutycycle Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Ant Pos (cm)	Table Pos (deg)	Type
1	1302.500	60.985	-8.229	N/A	52.756	74.00	-21.244	100	23	PK
	1302.500	60.985	-8.229	-14.59	38.166	54.00	-15.834	100	23	AV
2	1737.500	56.980	-7.308	N/A	49.672	74.00	-24.328	100	98	PK
	1737.500	56.980	-7.308	-14.59	35.082	54.00	-18.918	100	98	AV
3	2167.500	53.952	-3.967	N/A	49.985	74.00	-24.015	100	149	PK
	2167.500	53.952	-3.967	-14.59	35.395	54.00	-18.605	100	149	AV
4	2605.000	48.470	-3.277	N/A	45.193	74.00	-28.807	100	263	PK
	2605.000	48.470	-3.277	-14.59	30.603	54.00	-23.397	100	263	AV
5	3037.500	48.964	-2.042	N/A	46.922	74.00	-27.078	100	76	PK
	3037.500	48.964	-2.042	-14.59	32.332	54.00	-21.668	100	76	AV
6	3472.500	51.178	-1.284	N/A	49.894	74.00	-24.106	100	106	PK
	3472.500	51.178	-1.284	-14.59	35.304	54.00	-18.696	100	106	AV

Note 1: Testing is carried out with frequency rang 9 kHz to the tenth harmonics. There is the ambient noise within frequency range 9 kHz ~ 30 MHz, the permissible value is not show in the report.

Note 2: The fundamental frequency is 433.92MHz, so the fundamental and spurious emissions radiated limit base on the operating frequency 433.92MHz.



Note 3: Peak Measure Level (dB $\mu$ V/m) = Reading Level (dB $\mu$ V) + Factor (dB).

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) – Pre\_Amplifier Gain (dB).

AV Measure Level = Peak Measure Level + Duty Cycle Factor.

### 6.3. 20dB Bandwidth

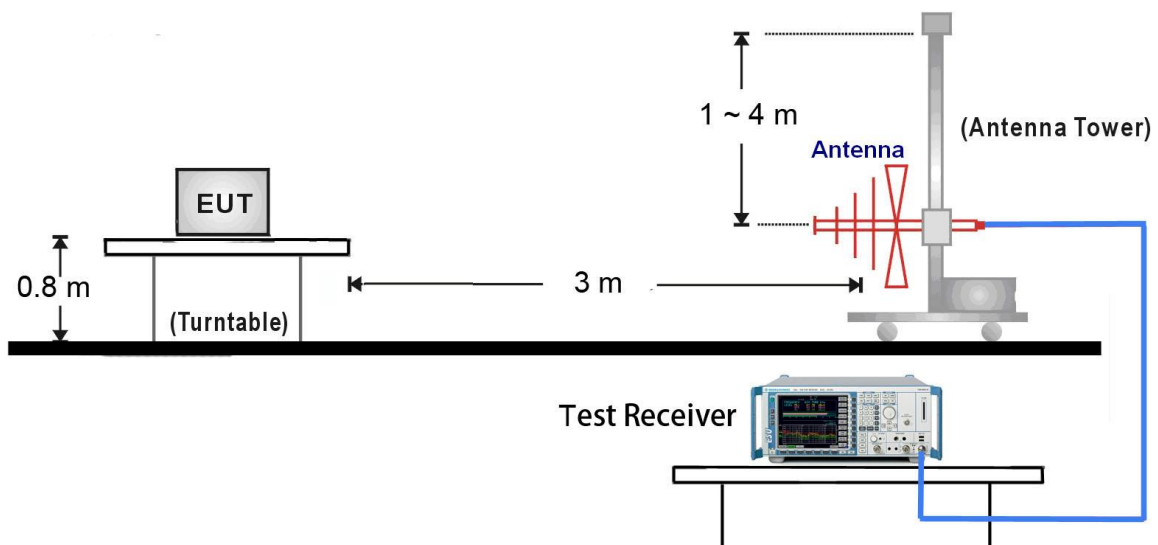
#### 6.3.1. Standard Applicable

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

#### 6.3.2. Test Procedure

With the EUT's antenna attached, the EUT's 20dB Bandwidth power was received by the test antenna, which was connected to the spectrum analyzer with the START, and STOP frequencies set to the EUT's operation band.

#### 6.3.3. Test Setup

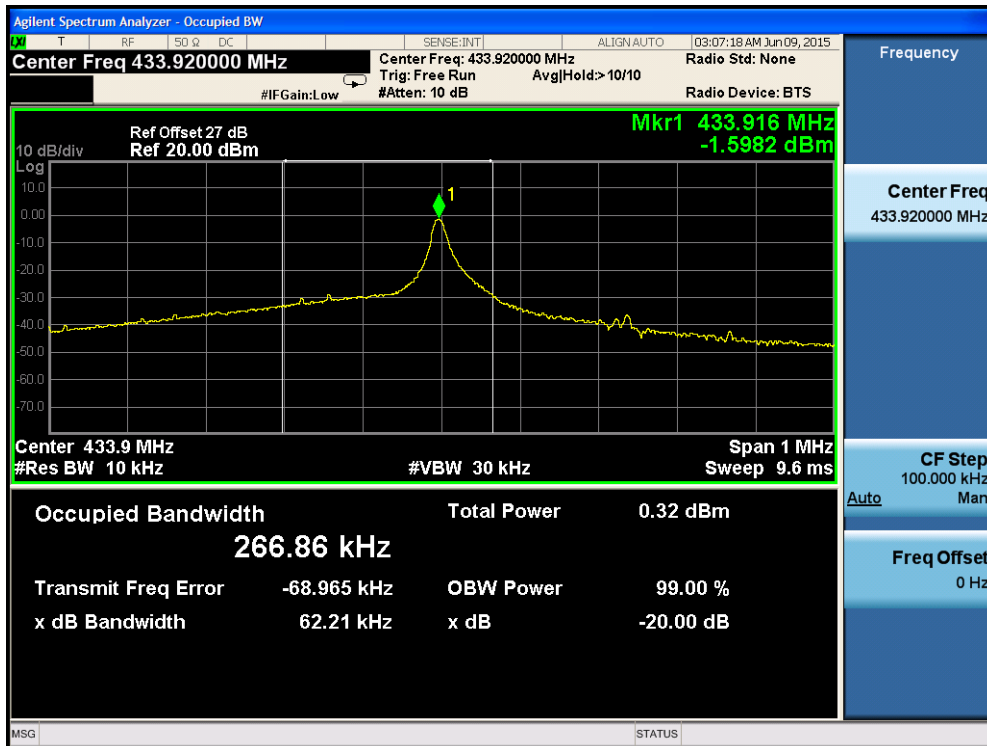


### 6.3.4. Test Result

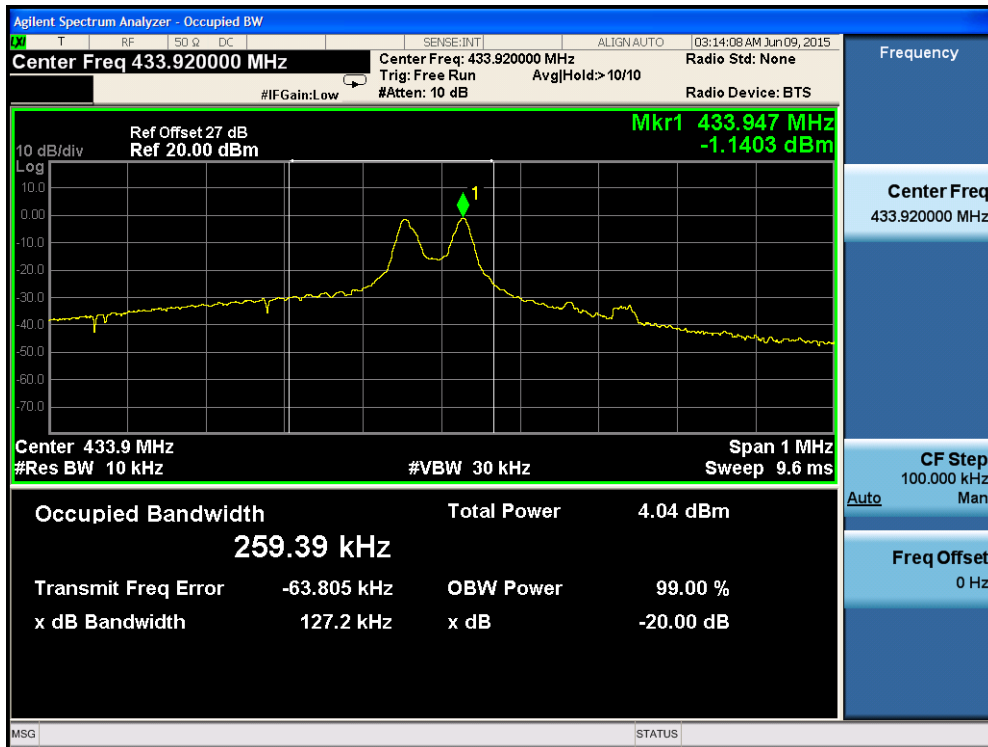
Test Frequency (MHz)	Modulation Type	20dB Bandwidth (kHz)	Limit (kHz)	Result
433.92	ASK	62.2	≤ 1084.8	Pass
	FSK	127.2	≤ 1084.8	Pass

Limit = Fundamental Frequency \* 0.25% = 433.92 MHz \* 0.25% = 1084.8 kHz

20dB Bandwidth Test Plot for ASK Modulation



## 20dB Bandwidth Test Plot for FSK Modulation



## 6.4. Transmission Time

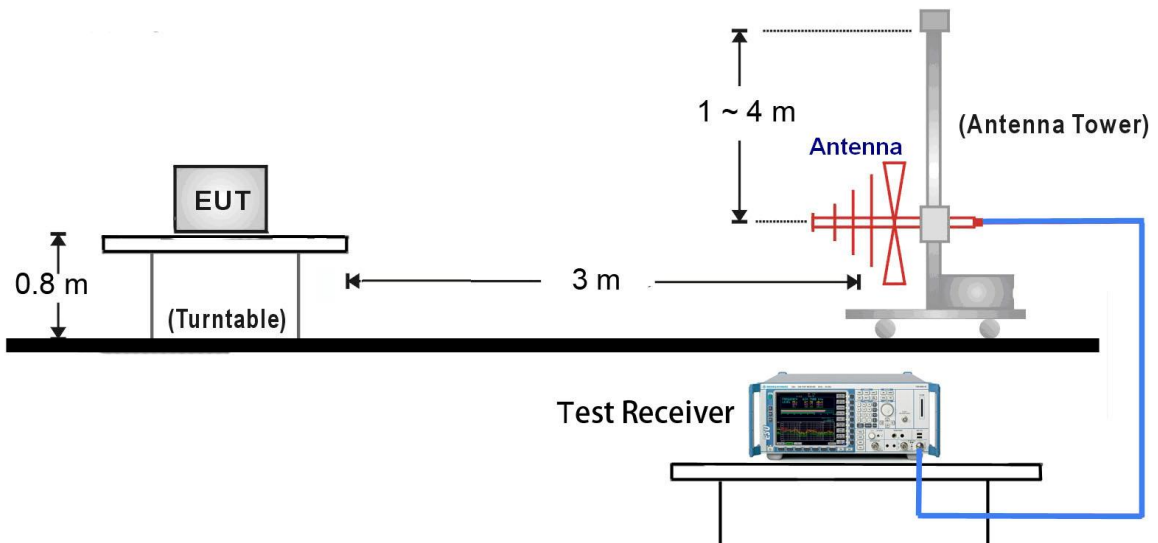
### 6.4.1. Standard Applicable

According to FCC 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.

### 6.4.2. Test Procedure

With the EUT's antenna attached, the EUT's output signal was received by the test antenna, which was connected to the spectrum analyzer. Set the center frequency to 433.92MHz, then set the spectrum analyzer to Zero Span for the release time reading. During the testing, the switch was released then the EUT automatically deactivated.

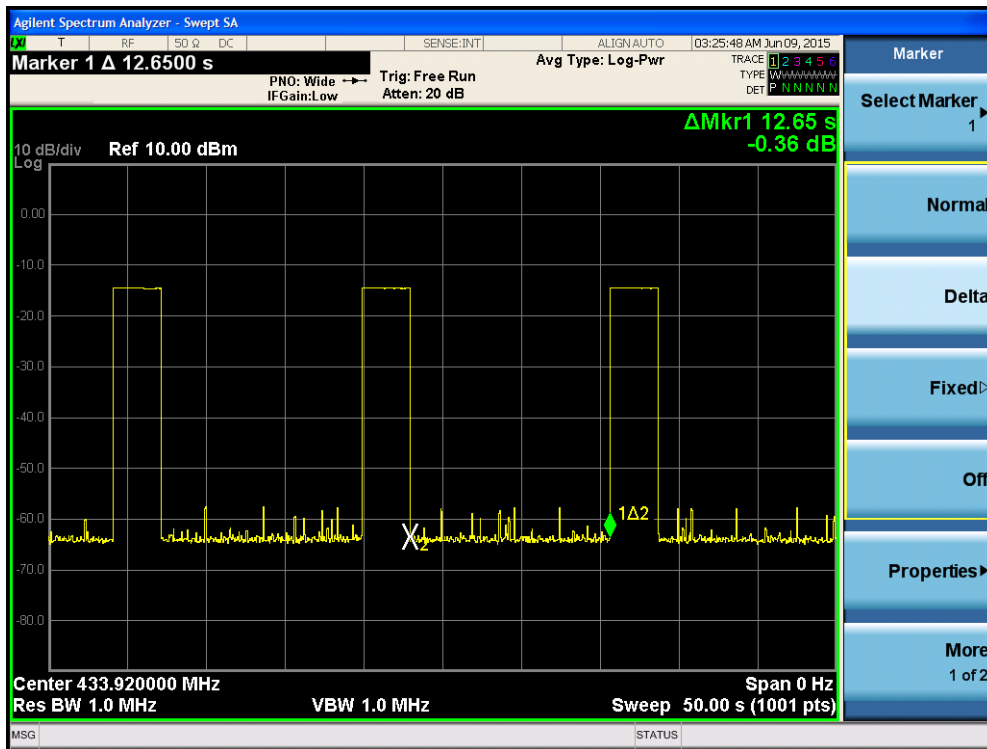
### 6.4.3. Test Setup



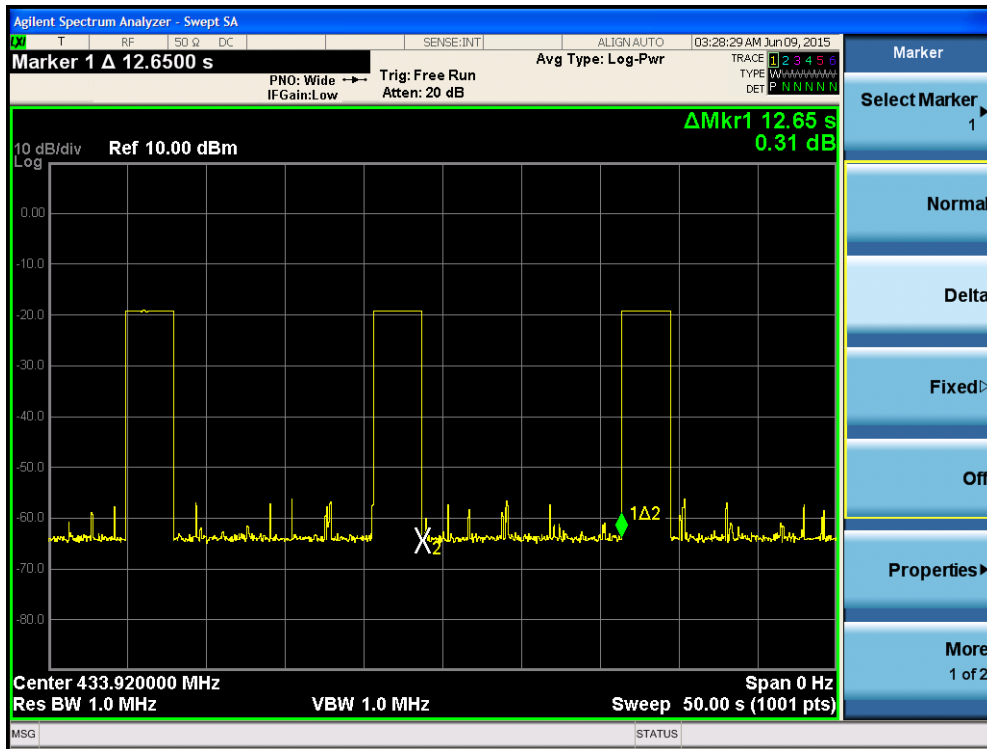
### 6.4.4. Test Result

Modulation Type	Item	Measured Value	Limit	Result
ASK	Transmission Time(Ton)	13.6 ms	$\leq 1$ s	Pass
	Silent Time	12.65 s	$\geq 10$ s	Pass
	Silent Time/Transmission Time	930.1	$\geq 30$ times	Pass
FSK	Transmission Time(Ton)	10.2 ms	$\leq 1$ s	Pass
	Silent Time	12.65 s	$\geq 10$ s	Pass
	Silent Time/Transmission Time	1240.2	$\geq 30$ times	Pass

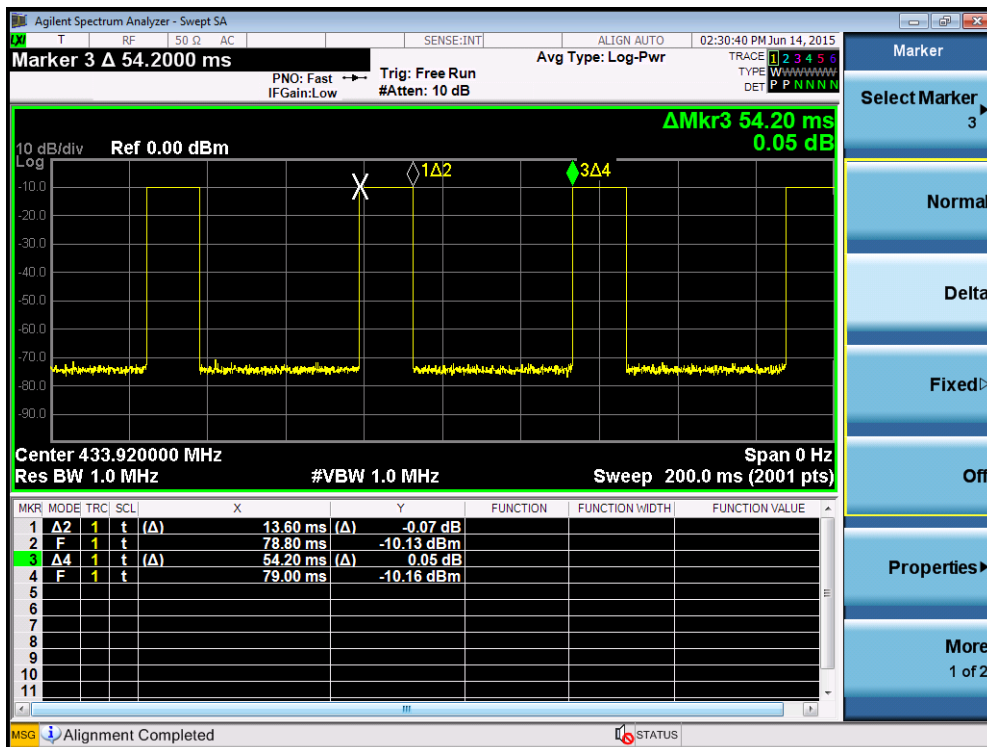
Silent Time for ASK Modulation



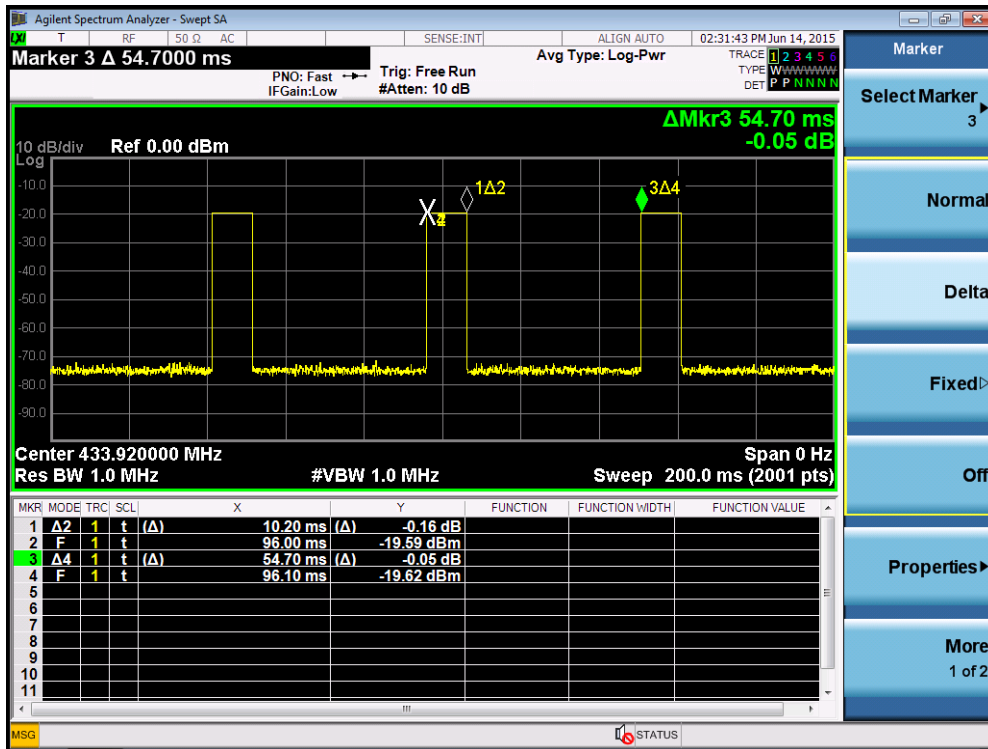
### Silent Time for FSK Modulation



### Transmission Time for ASK Modulation



### Transmission Time for FSK Modulation





## 6.5. Duty Cycle

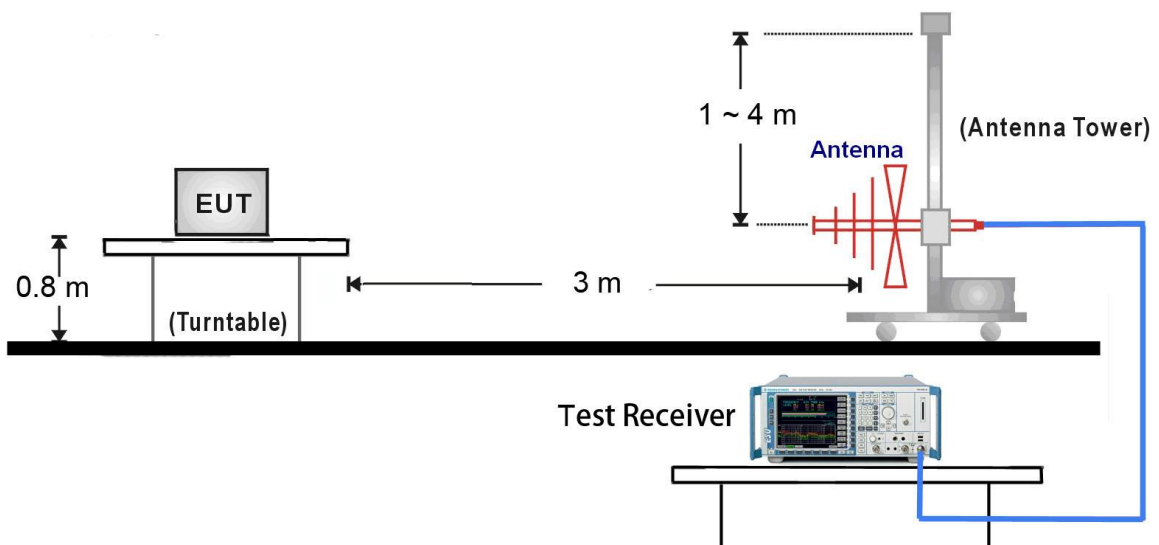
### 6.5.1. Standard Applicable

According to FCC Part 15.231(e) and 15.35(c), for pulse operation transmitter, the averaging pulsed emissions are calculated by peak value of measured emission plus duty cycle factor.

### 6.5.2. Test Procedure

With the EUT's antenna attached, the EUT's output signal was received by the test antenna, which was connected to the spectrum analyzer. Set the center frequency to 433.92MHz, then set the spectrum analyzer to Zero Span for the release time reading. During the testing, the switch was released then the EUT automatically deactivated.

### 6.5.3. Test Setup

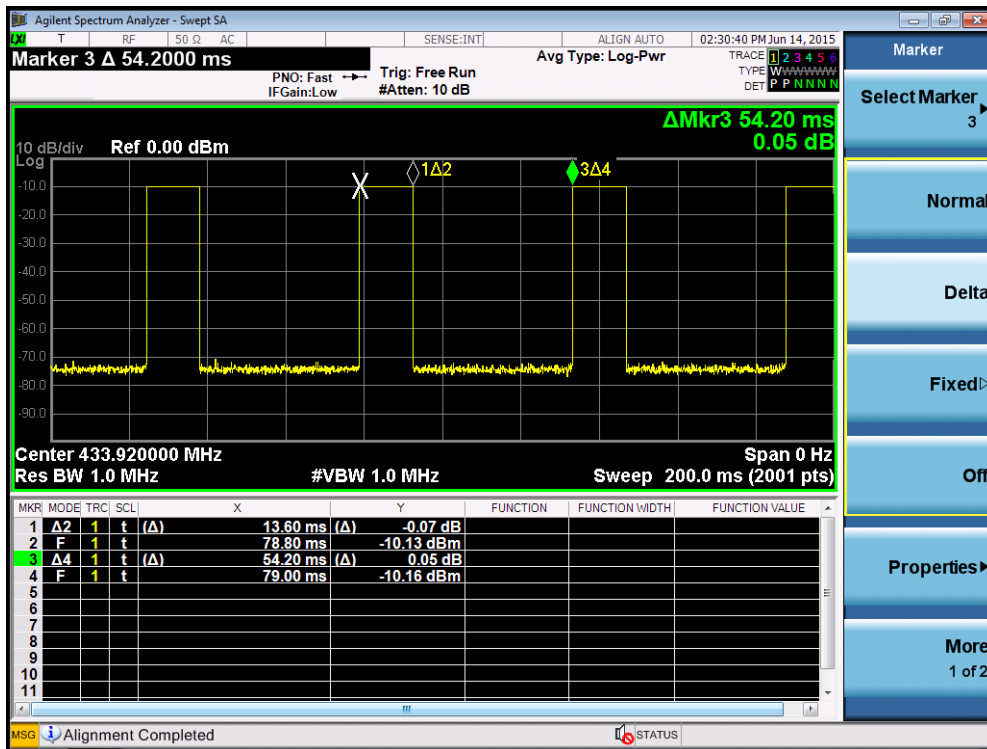


### 6.5.4. Test Result

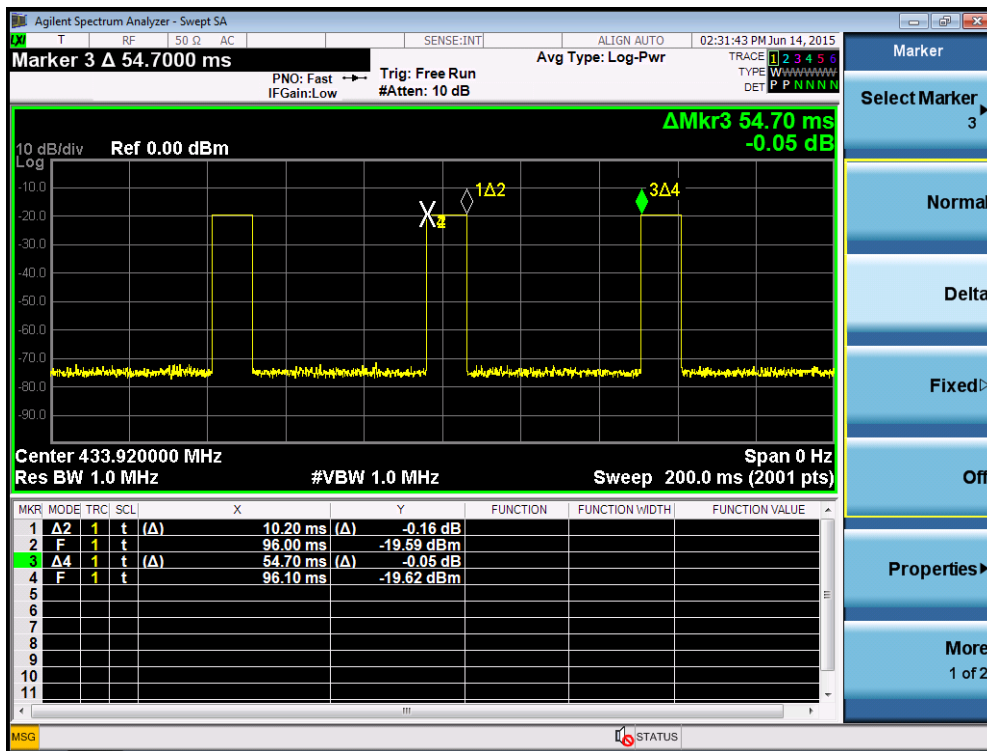
Modulation Type	Total Time (T <sub>on</sub> ) (ms)	The duration of one cycle (ms)	Duty Cycle (%)	Duty Cycle Factor (dB)
ASK	13.60	54.20	25.09	-12.01
FSK	10.20	54.70	18.65	-14.59

Note: Duty Cycle Factor =  $-20 \cdot \log(1/\text{Duty Cycle})$ .

Width of Pulse for ASK Modulation



## Width of Pulse for FSK Modulation



## 7. CONCLUSION

The data collected relate only the item(s) tested and show that the **Tire Pressure Monitoring System FCC ID: TTE-TSB44** is in compliance with FCC Part 15.231(e) of the FCC Rules.

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The End