



MRT Technology (Suzhou) Co., Ltd
Phone: +86-512-66308358
Fax: +86-512-66308368
Web: www.mrt-cert.com

Report No.: 1505RSU00501
Report Version: V01
Issue Date: 07-12-2015

MEASUREMENT REPORT

FCC PART 15.231(e)

FCC ID: TTE-TSB41

APPLICANT: Suzhou Sate Auto Electronic Co., Ltd

Application Type: Certification

Product: Tire Pressure Monitoring System

Model No.: TSB41, TSB42, TSB43

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: June 01 ~ July 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.

Revision History

Report No.	Version	Description	Issue Date
1505RSU00501	Rev. 01	Initial report	07-12-2015

CONTENTS

Description	Page
1. INTRODUCTION	6
1.1. Scope	6
1.2. MRT Test Location	6
2. PRODUCT INFORMATION	7
2.1. Equipment Description	7
2.2. Test Standards	7
2.3. Test Methodology	7
2.4. EUT Setup and Test Mode	7
3. ANTENNA REQUIREMENTS	8
4. TEST EQUIPMENT CALIBRATION DATA	9
5. MEASUREMENT UNCERTAINTY	10
6. TEST RESULT	11
6.1. Summary	11
6.2. Radiated Emissions	12
6.2.1. Standard Applicable	12
6.2.2. Test Procedure	12
6.2.3. Test Setup	13
6.2.4. Test Results	14
6.3. 20dB Bandwidth	26
6.3.1. Standard Applicable	26
6.3.2. Test Procedure	26
6.3.3. Test Setup	26
6.3.4. Test Result	27
6.4. Transmission Time	29
6.4.1. Standard Applicable	29
6.4.2. Test Procedure	29
6.4.3. Test Setup	29
6.4.4. Test Result	30
6.5. Duty Cycle	33
6.5.1. Standard Applicable	33
6.5.2. Test Procedure	33
6.5.3. Test Setup	33
6.5.4. Test Result	34

7. CONCLUSION.....	36
--------------------	----

§2.1033 General Information

Applicant:	Suzhou Sate Auto Electronic Co., Ltd
Applicant Address:	No.36 Building, Yangtai Road, Suzou Industrial Park, Suzhou, Jiangsu, P.R.China
Manufacturer:	Suzhou Sate Auto Electronic Co., Ltd
Manufacturer Address:	No.36 Building, Yangtai Road, Suzou Industrial Park, Suzhou, Jiangsu, P.R.China
Test Site:	MRT Technology (Suzhou) Co., Ltd
Test Site Address:	D8 Building, Youxin Industrial Park, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China
MRT Registration No.:	809388
FCC Rule Part(s):	Part 15.231(e)
Model No.	TSB41, TSB42, TSB43
FCC ID:	TTE-TSB41
Test Device Serial No.:	N/A ☐ Production ☒ Pre-Production ☐ Engineering
FCC Classification:	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.	TSB41, TSB42, TSB43
Frequency Range	315 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-TSB41** 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% ($U=2U_c(y)$): 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-TSB41

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 ¹	50 to 150 ¹
174-260	1,500	150
260-470	1,500 to 5,000 ¹	150 to 500 ¹
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.

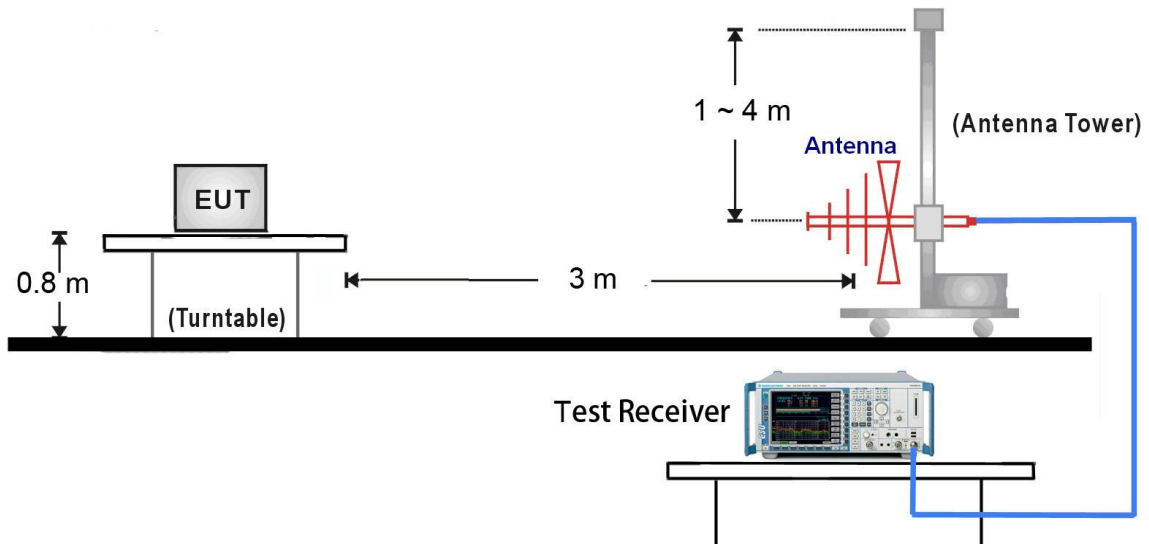
6.2.2. Test Procedure

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.

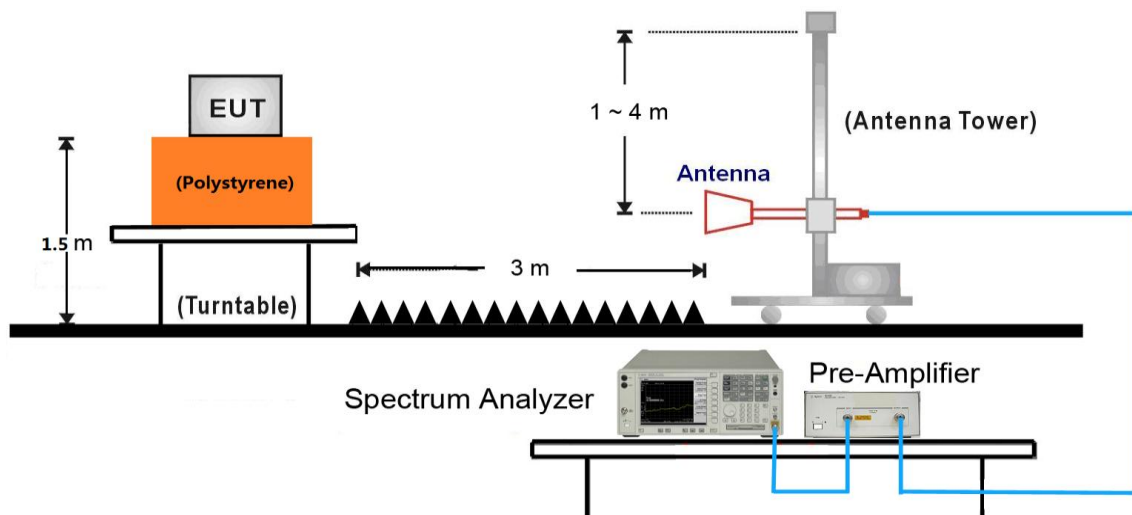
6.2.3. Test Setup

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:

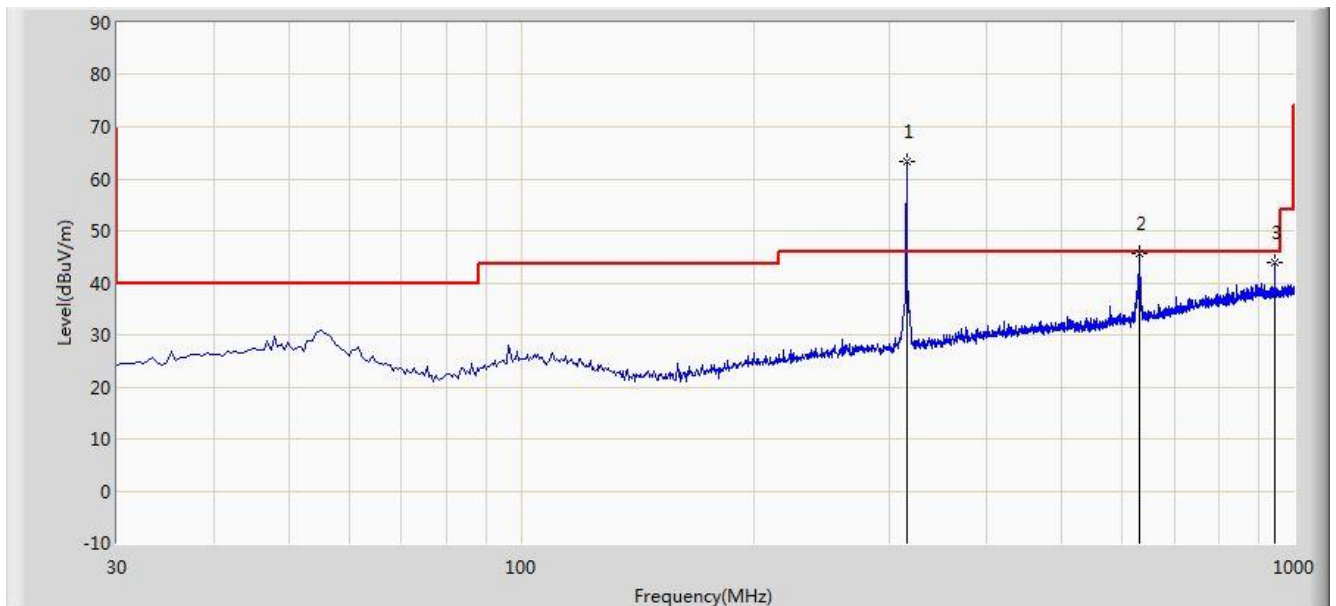


1GHz ~ 18GHz Test Setup:



6.2.4. Test Results

Site: AC1	Time: 2015/07/11 - 17:51
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 Mode 1: 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	315.000	48.451	14.892	N/A	63.343	87.66	-24.317	100	23	PK
	315.000	48.451	14.892	-5.61	57.733	67.66	-9.927	100	23	AV
2	630.430	25.442	20.324	N/A	45.766	67.66	-21.894	100	145	PK
	630.430	25.442	20.324	-5.61	40.156	47.66	-7.504	100	145	AV
3	945.195	19.752	24.303	N/A	44.055	67.66	-23.605	100	201	PK
	945.195	19.752	24.303	-5.61	38.445	47.66	-9.215	100	201	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.

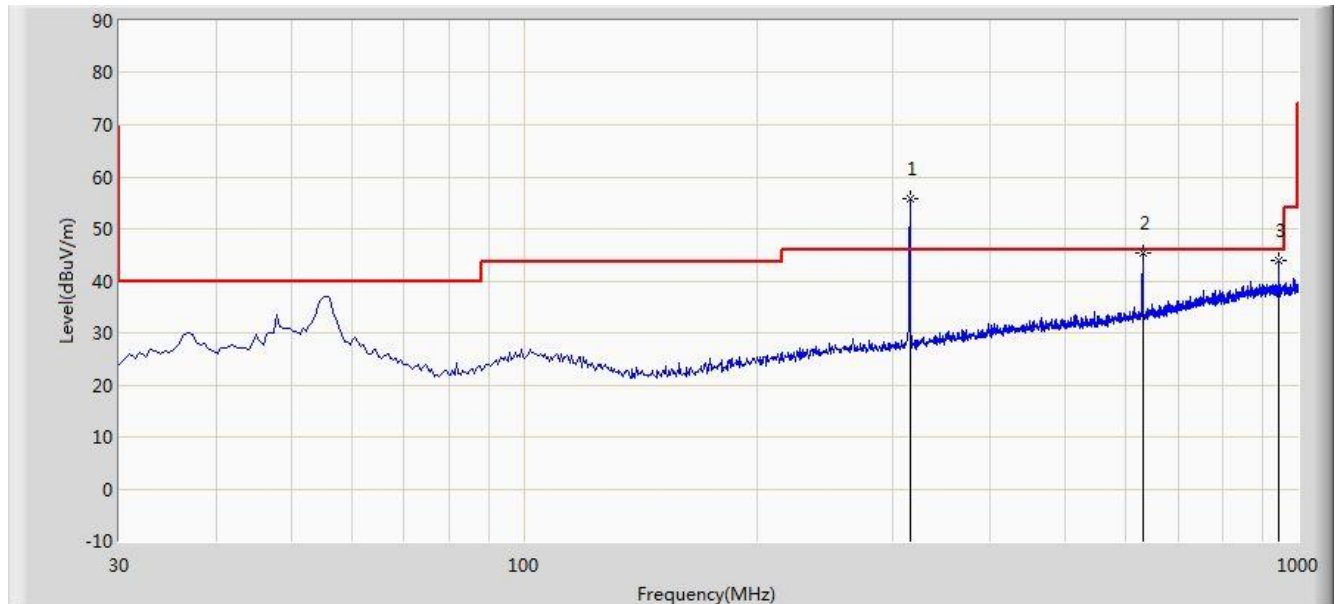
Note 2: The fundamental frequency is 315MHz, so the fundamental and spurious emissions radiated limit base on the operating frequency 315MHz.

Note 3: Peak Measure Level (dBuV/m) = Reading Level (dBuV) + 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 - 17:51
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 Mode 1: 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	315.000	40.810	14.892	N/A	55.702	87.66	-31.958	100	23	PK
	315.000	40.810	14.892	-5.61	50.092	67.66	-17.568	100	23	AV
2	629.945	24.937	20.319	N/A	45.256	67.66	-22.404	100	219	PK
	629.945	24.937	20.319	-5.61	39.646	47.66	-8.014	100	219	AV
3	945.195	19.527	24.303	N/A	43.830	67.66	-23.830	100	45	PK
	945.195	19.527	24.303	-5.61	38.220	47.66	-9.440	100	45	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.

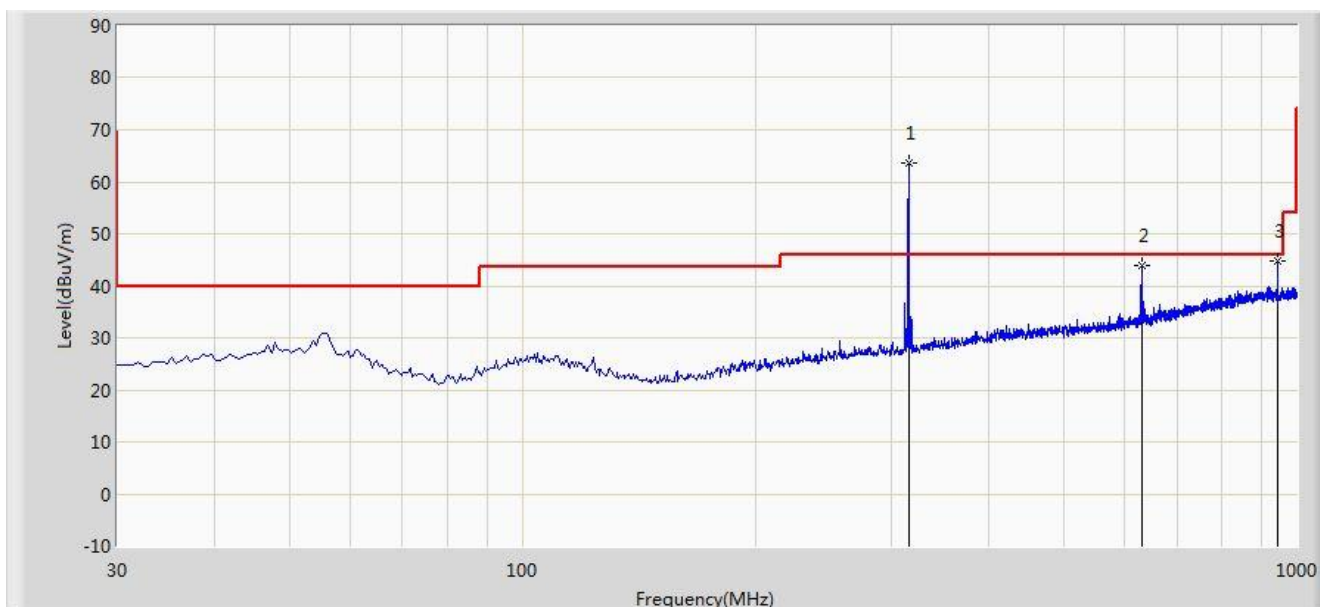
Note 2: The fundamental frequency is 315MHz, so the fundamental and spurious emissions radiated limit base on the operating frequency 315MHz.

Note 3: Peak Measure Level (dBuV/m) = Reading Level (dBuV) + 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 - 17:51
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 Mode 2: 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	315.000	48.641	14.892	N/A	63.533	87.66	-24.127	100	45	PK
	315.000	48.641	14.892	-11.76	51.773	67.66	-15.887	100	45	AV
2	630.430	23.667	20.319	N/A	43.986	67.66	-23.674	100	321	PK
	630.430	23.667	20.319	-11.76	32.226	47.66	-15.434	100	321	AV
3	945.195	20.458	24.303	N/A	44.761	67.66	-22.899	100	67	PK
	945.195	20.458	24.303	-11.76	33.001	47.66	-14.659	100	67	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.

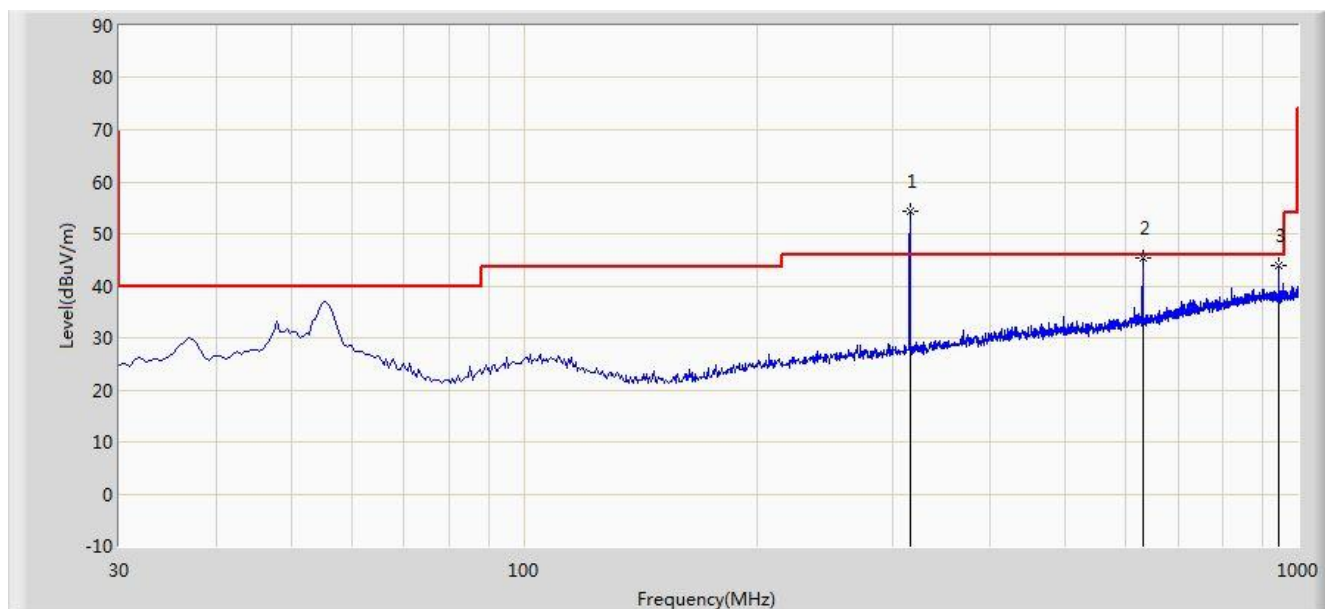
Note 2: The fundamental frequency is 315MHz, so the fundamental and spurious emissions radiated limit base on the operating frequency 315MHz.

Note 3: Peak Measure Level (dBuV/m) = Reading Level (dBuV) + 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 - 17:52
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 Mode 2: 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	315.000	39.517	14.892	N/A	54.409	87.66	-33.251	100	94	PK
	315.000	39.517	14.892	-11.76	42.649	67.66	-25.011	100	94	AV
2	629.945	24.940	20.319	N/A	45.259	67.66	-22.401	100	203	PK
	629.945	24.940	20.319	-11.76	33.499	47.66	-14.161	100	203	AV
3	944.710	19.717	24.298	N/A	44.015	67.66	-23.645	100	143	PK
	944.710	19.717	24.298	-11.76	32.255	47.66	-15.405	100	143	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.

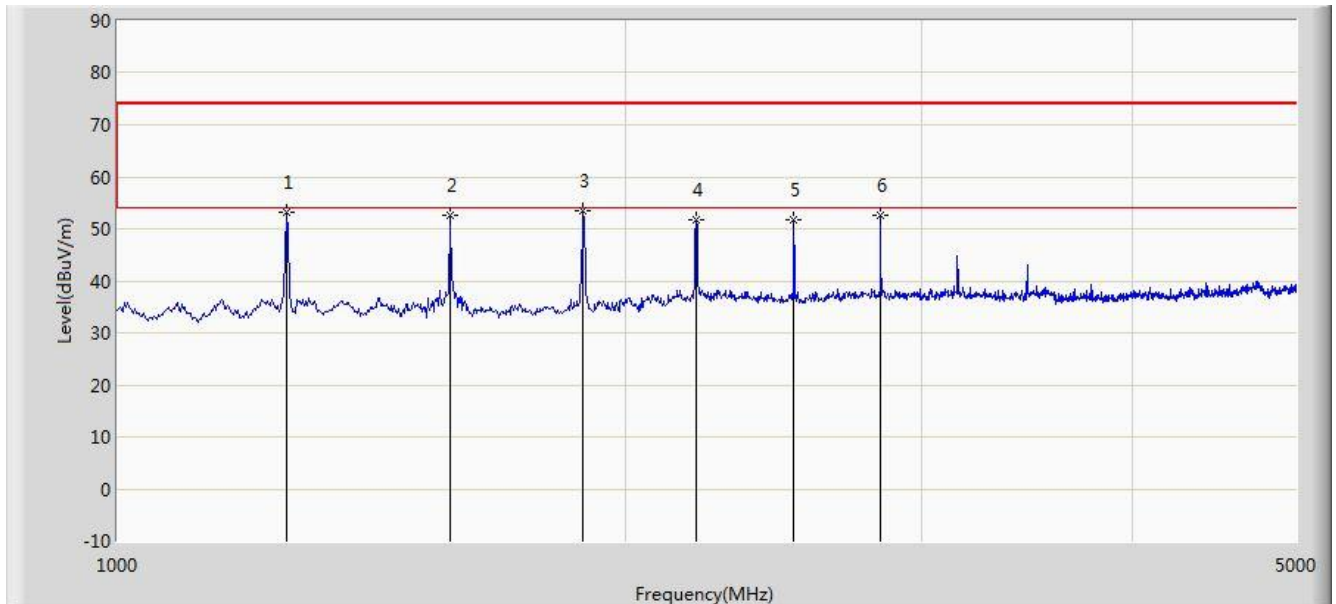
Note 2: The fundamental frequency is 315MHz, so the fundamental and spurious emissions radiated limit base on the operating frequency 315MHz.

Note 3: Peak Measure Level (dBuV/m) = Reading Level (dBuV) + 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 - 17:35
Limit: FCC_Part15.209_RE(3m)	Engineer: Roy Cheng
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: Tire Pressure Monitoring System	Power: By Battery
Test Mode 1: 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	1260.000	61.534	-8.46	N/A	53.074	74.00	-20.926	100	23	PK
	1260.000	61.534	-8.46	-5.61	47.464	54.00	-6.536	100	23	AV
2	1575.000	60.321	-7.683	N/A	52.638	74.00	-21.362	100	67	PK
	1575.000	60.321	-7.683	-5.61	47.028	54.00	-6.972	100	67	AV
3	1890.000	59.824	-6.366	N/A	53.458	74.00	-20.542	100	104	PK
	1890.000	59.824	-6.366	-5.61	47.848	54.00	-6.152	100	104	AV
4	2205.000	55.367	-3.606	N/A	51.761	74.00	-22.239	100	45	PK
	2205.000	55.367	-3.606	-5.61	46.151	54.00	-7.849	100	45	AV
5	2520.000	55.379	-3.588	N/A	51.791	74.00	-22.209	100	97	PK
	2520.000	55.379	-3.588	-5.61	46.181	54.00	-7.819	100	97	AV
6	2835.000	54.88	-2.416	N/A	52.464	74.00	-21.536	100	245	PK
	2835.000	54.88	-2.416	-5.61	46.854	54.00	-7.146	100	245	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.

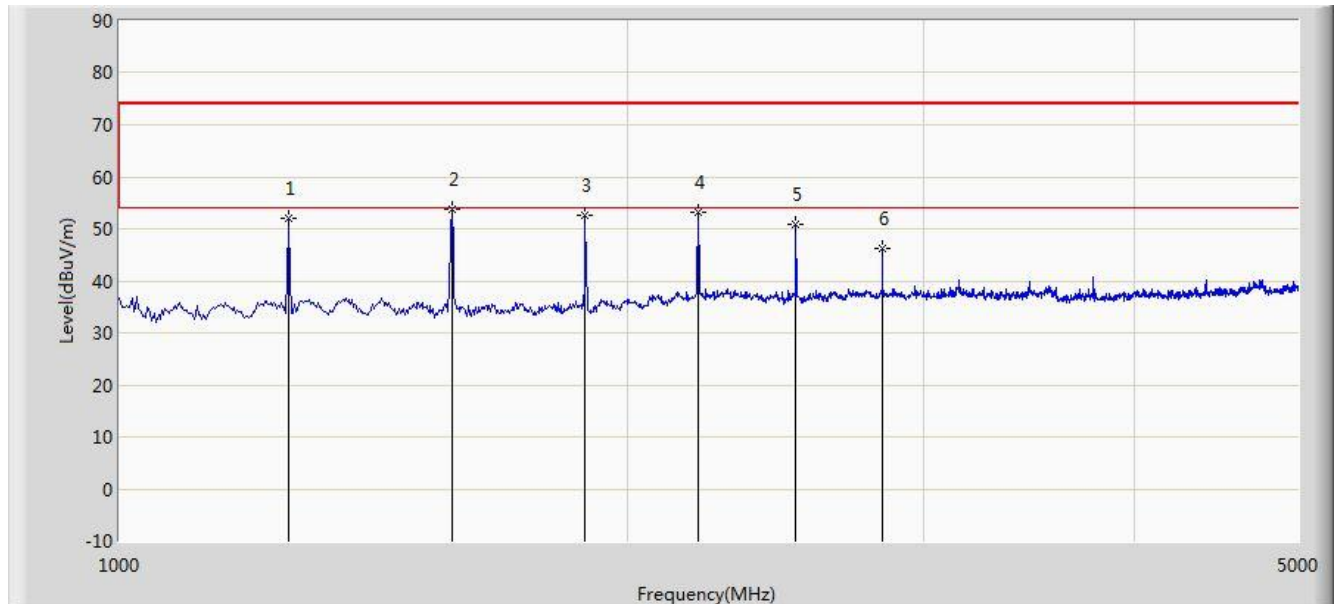
Note 2: The fundamental frequency is 315MHz, so the fundamental and spurious emissions radiated limit base on the operating frequency 315MHz.

Note 3: Peak Measure Level (dB μ V/m) = Reading Level (dB μ 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: 2015/06/13 - 17:36
Limit: FCC_Part15.209_RE(3m)	Engineer: Roy Cheng
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: Tire Pressure Monitoring System	Power: By Battery
Test Mode 1: 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	1260.000	60.444	-8.460	N/A	51.984	74.00	-22.016	100	125	PK
	1260.000	60.444	-8.460	-5.61	46.374	54.00	-7.626	100	125	AV
2	1575.000	61.503	-7.683	N/A	53.82	74.00	-20.180	100	14	PK
	1575.000	61.503	-7.683	-5.61	48.21	54.00	-5.790	100	14	AV
3	1890.000	58.847	-6.366	N/A	52.481	74.00	-21.519	100	101	PK
	1890.000	58.847	-6.366	-5.61	46.871	54.00	-7.129	100	101	AV
4	2205.000	56.790	-3.606	N/A	53.184	74.00	-20.816	100	24	PK
	2205.000	56.790	-3.606	-5.61	47.574	54.00	-6.426	100	24	AV
5	2520.000	54.428	-3.588	N/A	50.84	74.00	-23.160	100	302	PK
	2520.000	54.428	-3.588	-5.61	45.23	54.00	-8.770	100	302	AV
6	2835.000	48.572	-2.416	N/A	46.156	74.00	-27.844	100	152	PK
	2835.000	48.572	-2.416	-5.61	40.546	54.00	-13.454	100	152	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.

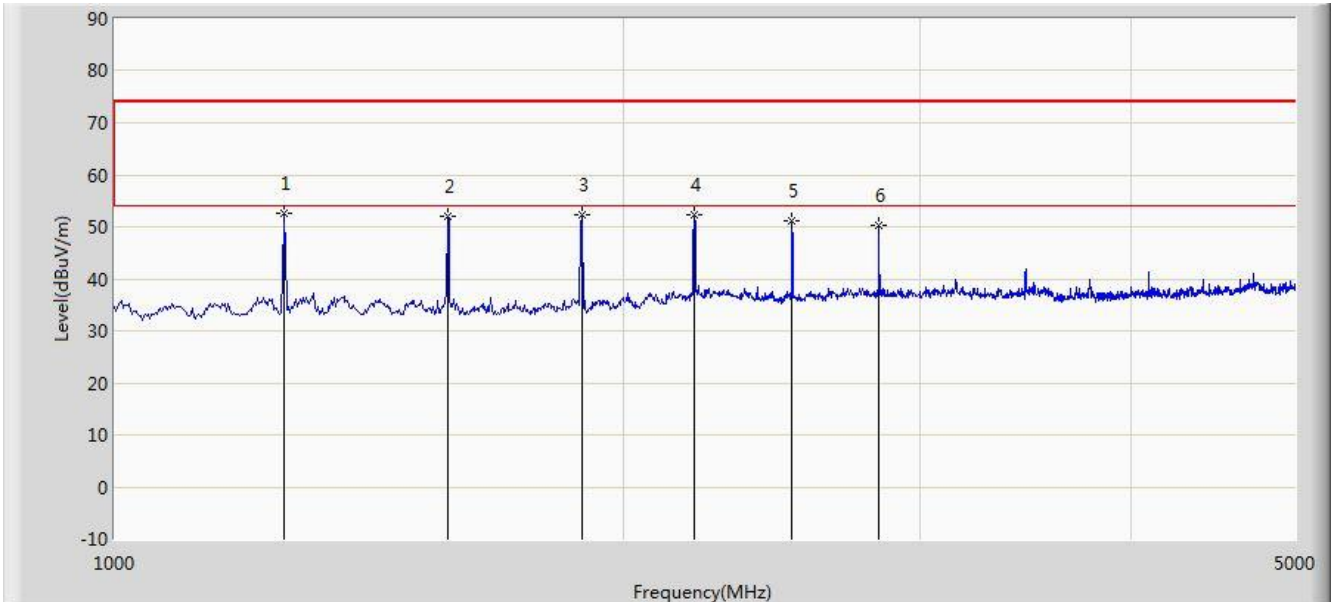
Note 2: The fundamental frequency is 315MHz, so the fundamental and spurious emissions radiated limit base on the operating frequency 315MHz.

Note 3: Peak Measure Level (dB μ V/m) = Reading Level (dB μ 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: 2015/06/13 - 17:38
Limit: FCC_Part15.209_RE(3m)	Engineer: Roy Cheng
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: Tire Pressure Monitoring System	Power: By Battery
Test Mode 2: 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	1260.000	61.146	-8.460	N/A	52.686	74.00	-21.314	100	104	PK
	1260.000	61.146	-8.460	-11.76	47.076	54.00	-6.924	100	104	AV
2	1575.000	59.815	-7.683	N/A	52.132	74.00	-21.868	100	56	PK
	1575.000	59.815	-7.683	-11.76	46.522	54.00	-7.478	100	56	AV
3	1892.500	58.600	-6.349	N/A	52.251	74.00	-21.749	100	345	PK
	1892.500	58.600	-6.349	-11.76	46.641	54.00	-7.359	100	345	AV
4	2205.000	56.000	-3.606	N/A	52.394	74.00	-21.606	100	94	PK
	2205.000	56.000	-3.606	-11.76	46.784	54.00	-7.216	100	94	AV
5	2520.000	54.672	-3.588	N/A	51.084	74.00	-22.916	100	73	PK
	2520.000	54.672	-3.588	-11.76	45.474	54.00	-8.526	100	73	AV
6	2835.000	52.636	-2.416	N/A	50.220	74.00	-23.780	100	211	PK
	2835.000	52.636	-2.416	-11.76	44.610	54.00	-9.390	100	211	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.

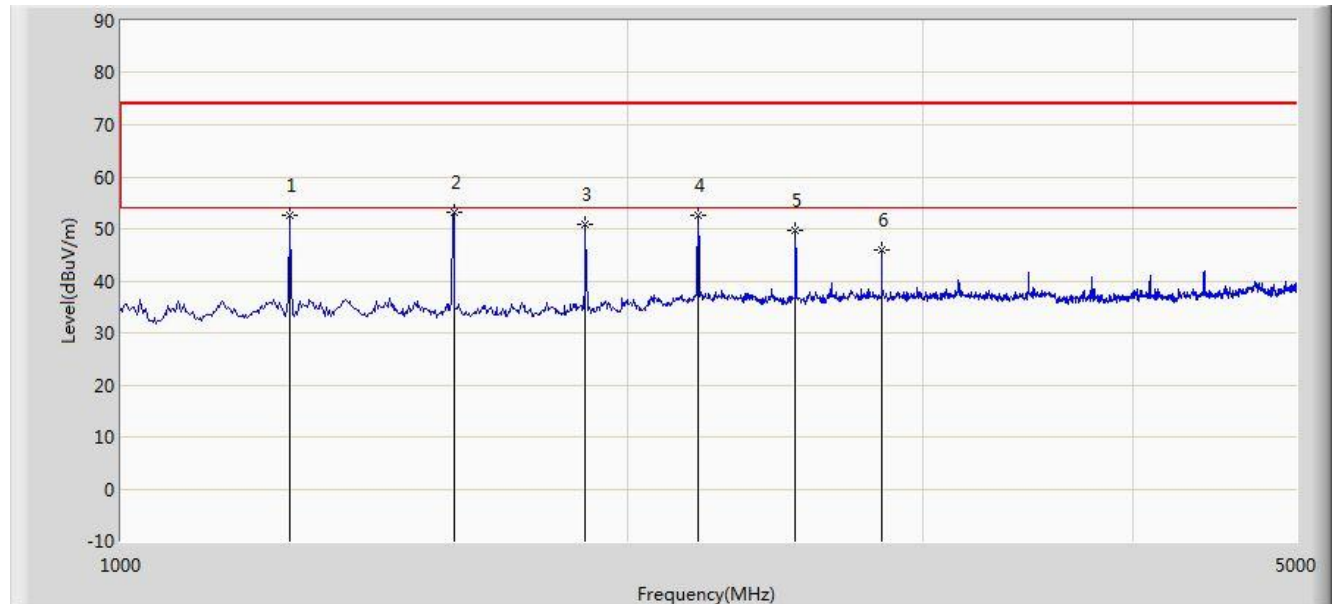
Note 2: The fundamental frequency is 315MHz, so the fundamental and spurious emissions radiated limit base on the operating frequency 315MHz.

Note 3: Peak Measure Level (dB μ V/m) = Reading Level (dB μ 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: 2015/06/13 - 17:46
Limit: FCC_Part15.209_RE(3m)	Engineer: Roy Cheng
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: Tire Pressure Monitoring System	Power: By Battery
Test Mode 2: Transmit with FSK Mode	



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	1260.000	61.003	-8.460	N/A	52.543	74.00	-21.457	100	102	PK
	1260.000	61.003	-8.460	-11.76	46.933	54.00	-7.067	100	102	AV
2	1577.500	60.910	-7.681	N/A	53.229	74.00	-20.771	100	98	PK
	1577.500	60.910	-7.681	-11.76	47.619	54.00	-6.381	100	98	AV
3	1890.000	57.317	-6.366	N/A	50.951	74.00	-23.049	100	35	PK
	1890.000	57.317	-6.366	-11.76	45.341	54.00	-8.659	100	35	AV
4	2205.000	56.098	-3.606	N/A	52.492	74.00	-21.508	100	238	PK
	2205.000	56.098	-3.606	-11.76	46.882	54.00	-7.118	100	238	AV
5	2520.000	53.342	-3.588	N/A	49.754	74.00	-24.246	100	86	PK
	2520.000	53.342	-3.588	-11.76	44.144	54.00	-9.856	100	86	AV
6	2835.000	48.414	-2.416	N/A	45.998	74.00	-28.002	100	39	PK
	2835.000	48.414	-2.416	-11.76	40.388	54.00	-13.612	100	39	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 315MHz, so the fundamental and spurious emissions radiated limit base on the operating frequency 315MHz.

Note 3: Peak Measure Level (dB μ V/m) = Reading Level (dB μ 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

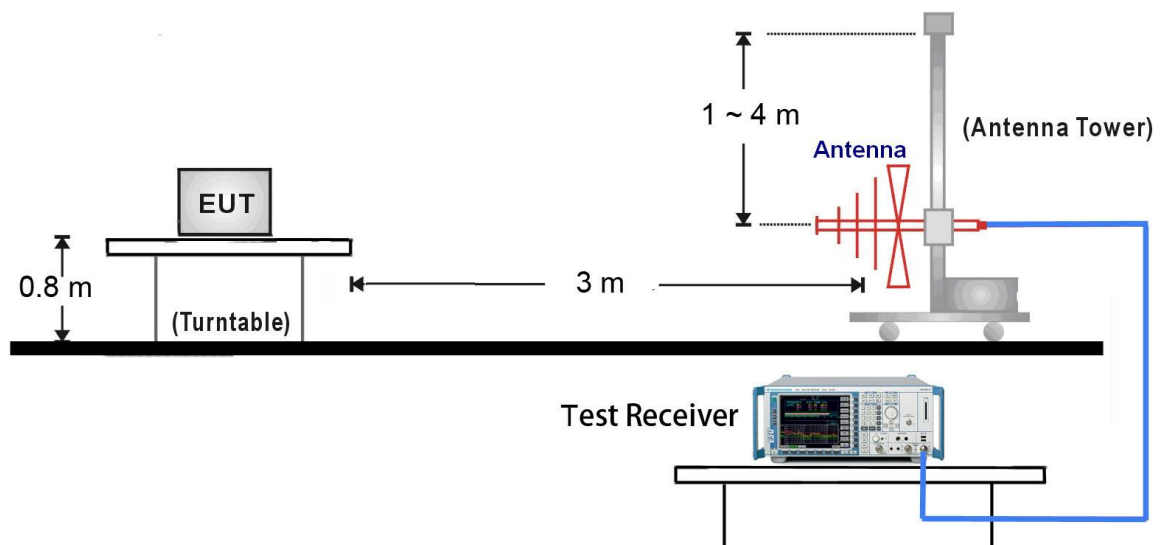
6.3.1. Standard Applicable

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

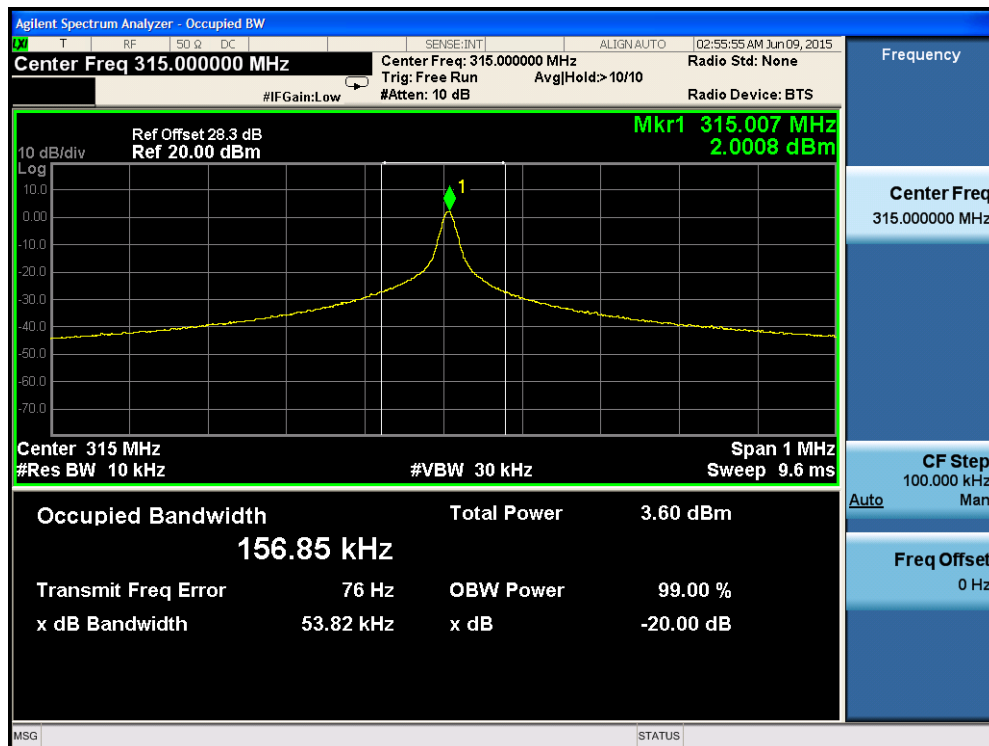


6.3.4. Test Result

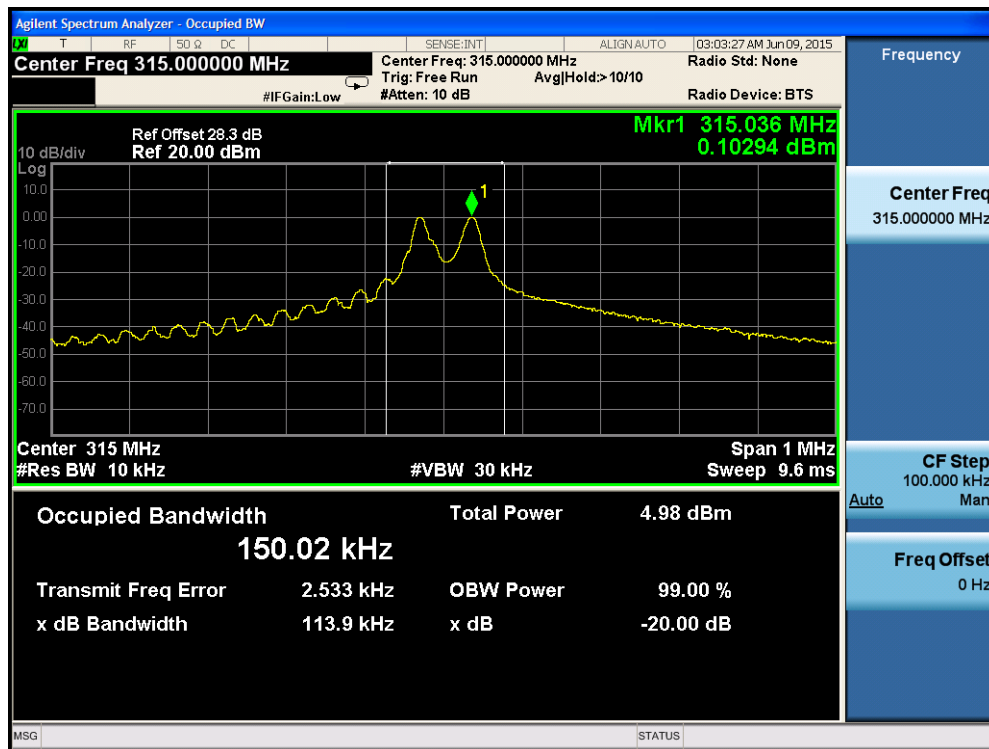
Test Frequency (MHz)	Modulation Type	20dB Bandwidth (kHz)	Limit (kHz)	Result
315	ASK	53.82	≤ 787.5	Pass
	FSK	113.90	≤ 787.5	Pass

Limit = Fundamental Frequency * 0.25% = 315 MHz * 0.25% = 787.5 kHz

20dB Bandwidth Test Plot for ASK Modulation



20dB Bandwidth Test Plot for FSK Modulation



6.4. Transmission Time

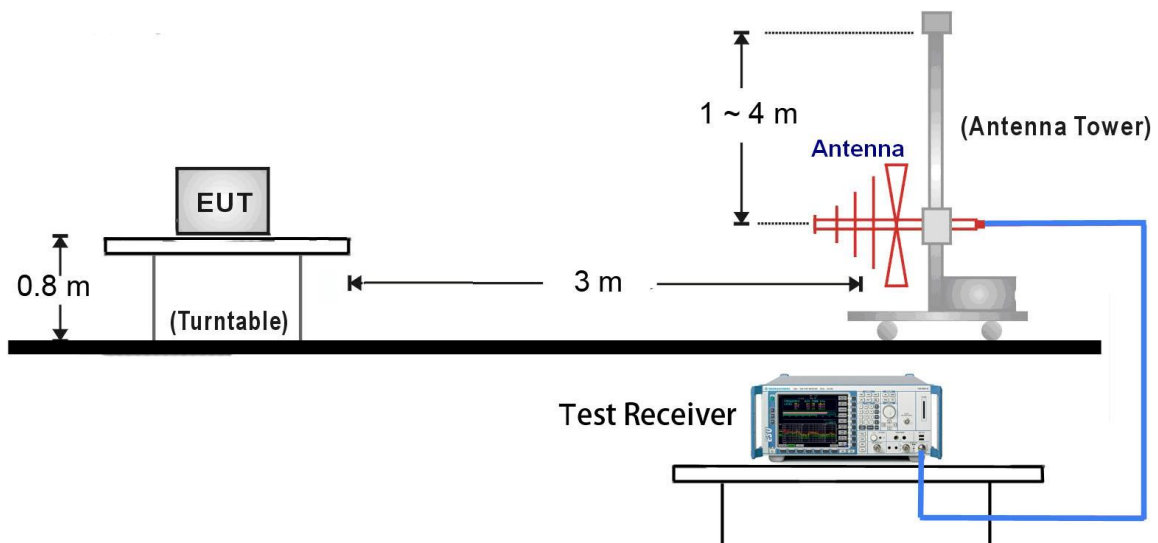
6.4.1. Standard Applicable

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 315MHz, 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.

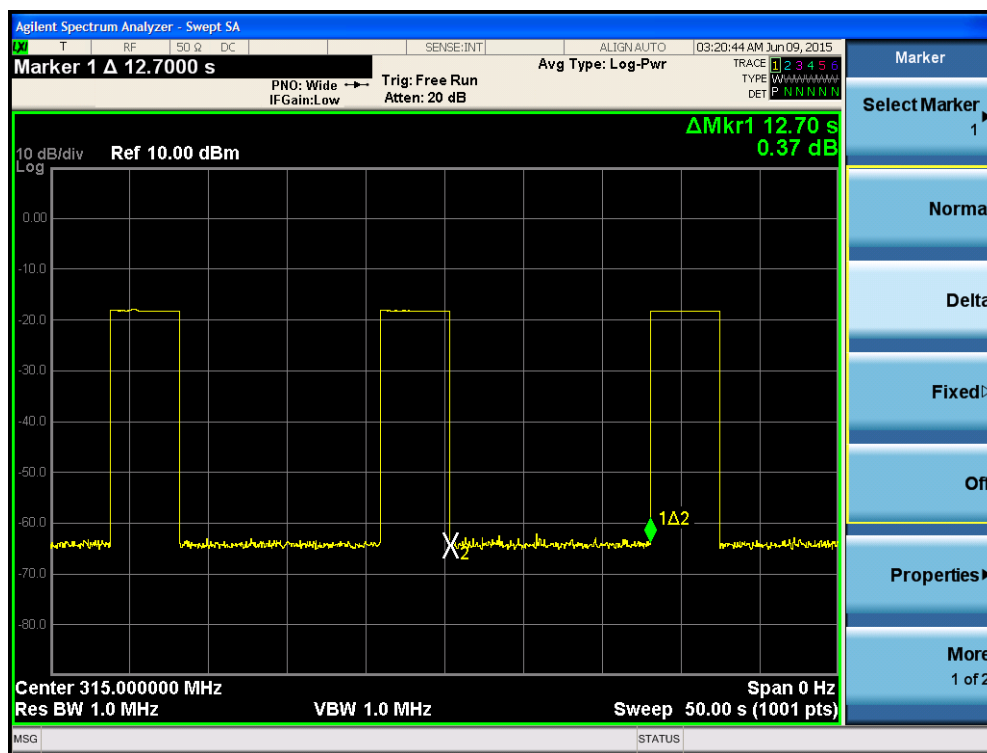
6.4.3. Test Setup



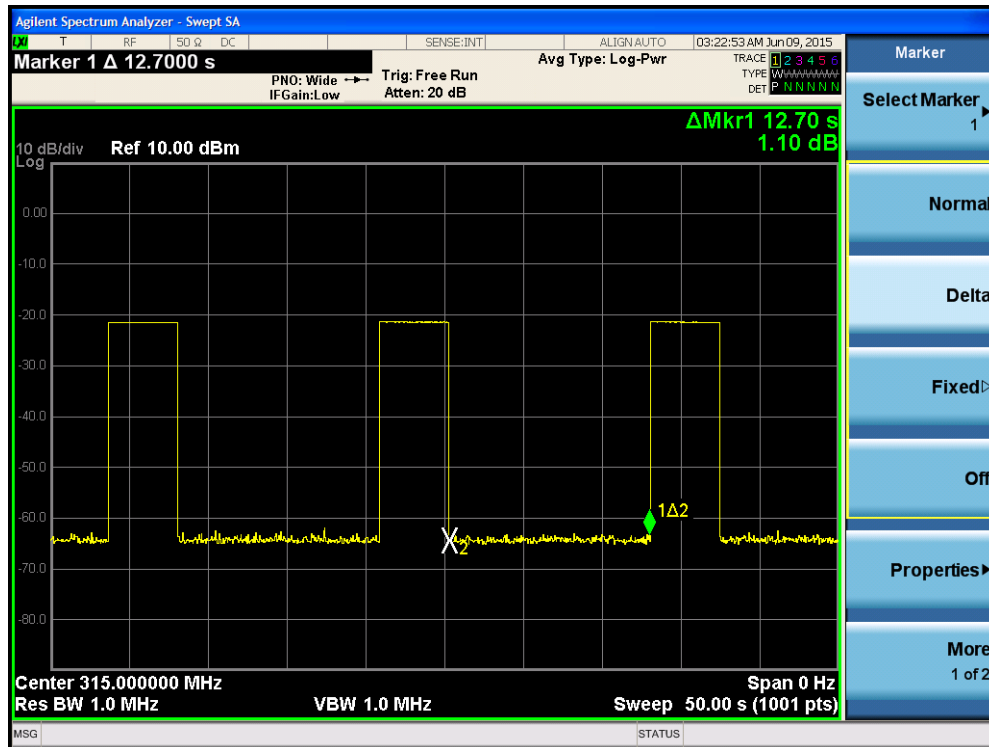
6.4.4. Test Result

Modulation Type	Item	Measured Value	Limit	Result
ASK	Transmission Time(Ton)	28.3 ms	≤ 1 s	Pass
	Silent Time	12.7 s	≥ 10 s	Pass
	Silent Time/Transmission Time	448.8	≥ 30 times	Pass
FSK	Transmission Time(Ton)	13.6 ms	≤ 1 s	Pass
	Silent Time	12.7 s	≥ 10 s	Pass
	Silent Time/Transmission Time	933.8	≥ 30 times	Pass

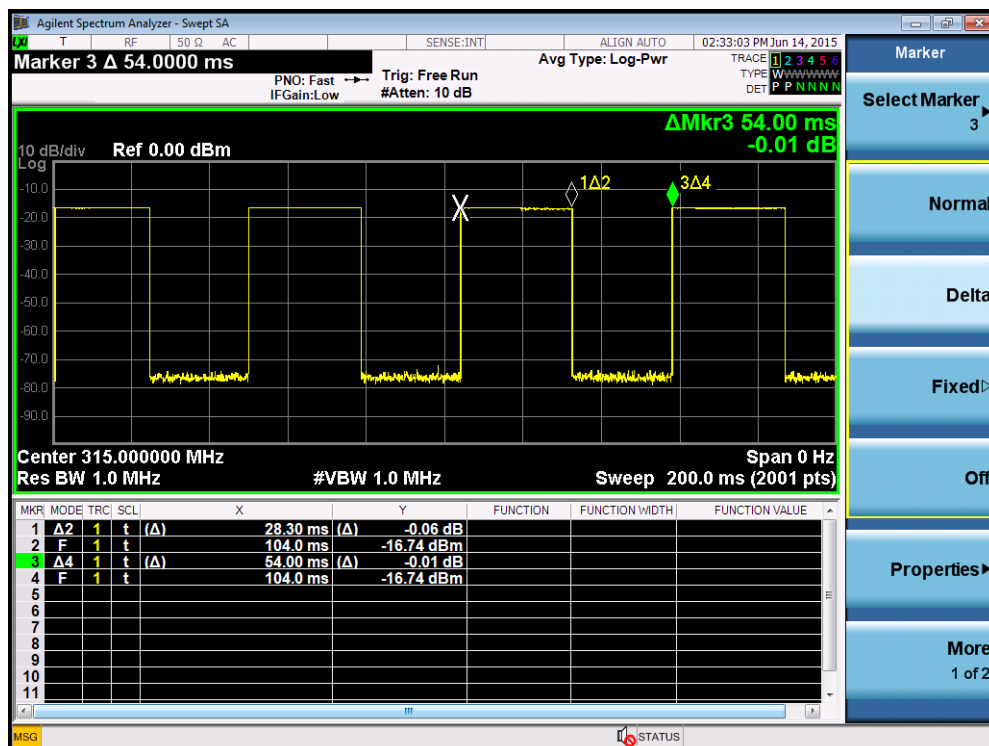
Silent Time for ASK Modulation



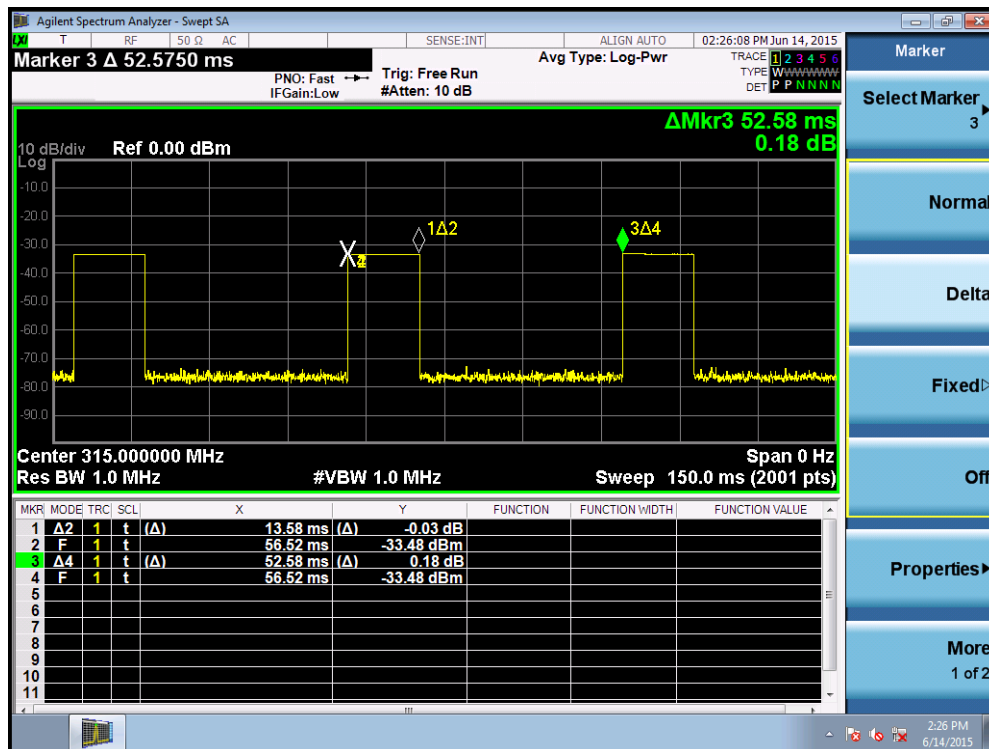
Silent Time for FSK Modulation



Transmission Time for ASK Modulation



Transmission Time for FSK Modulation



6.5. Duty Cycle

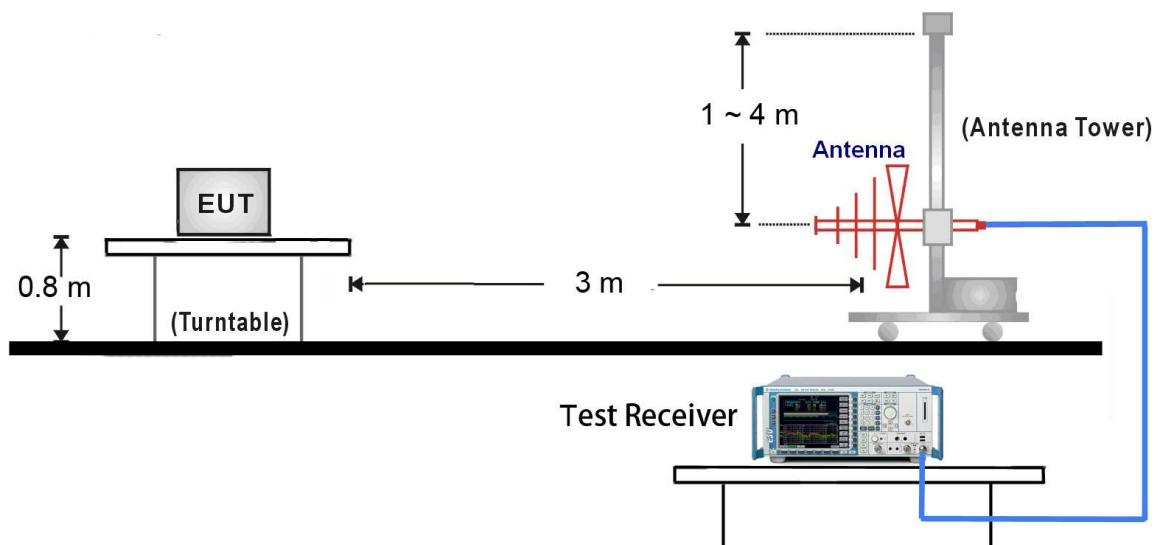
6.5.1. Standard Applicable

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 315MHz, 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

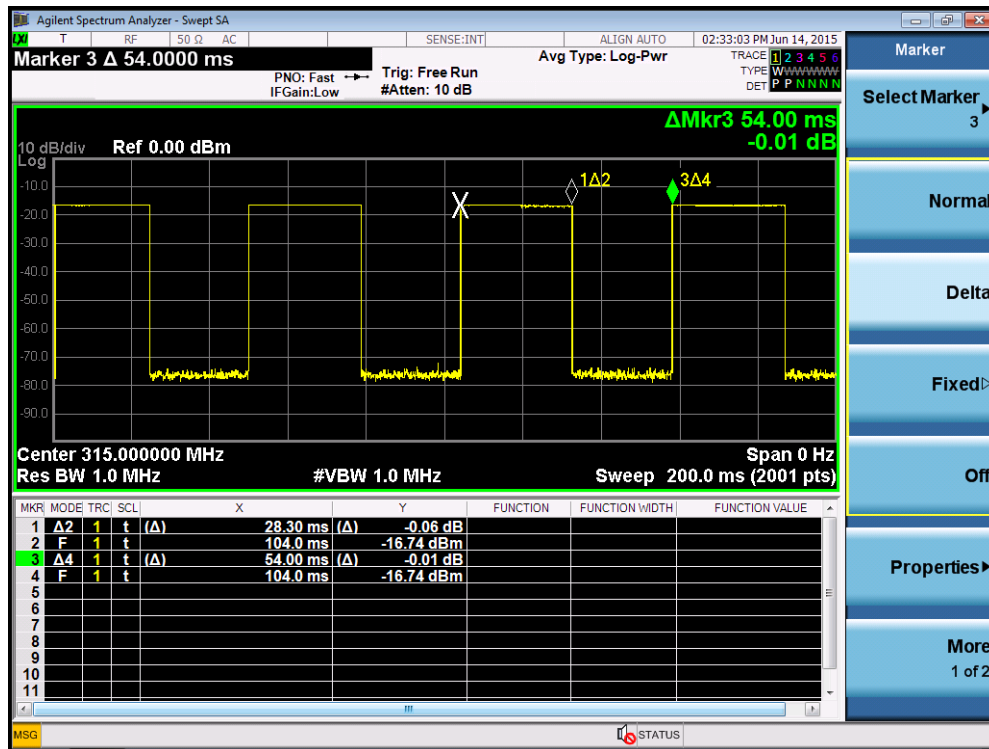


6.5.4. Test Result

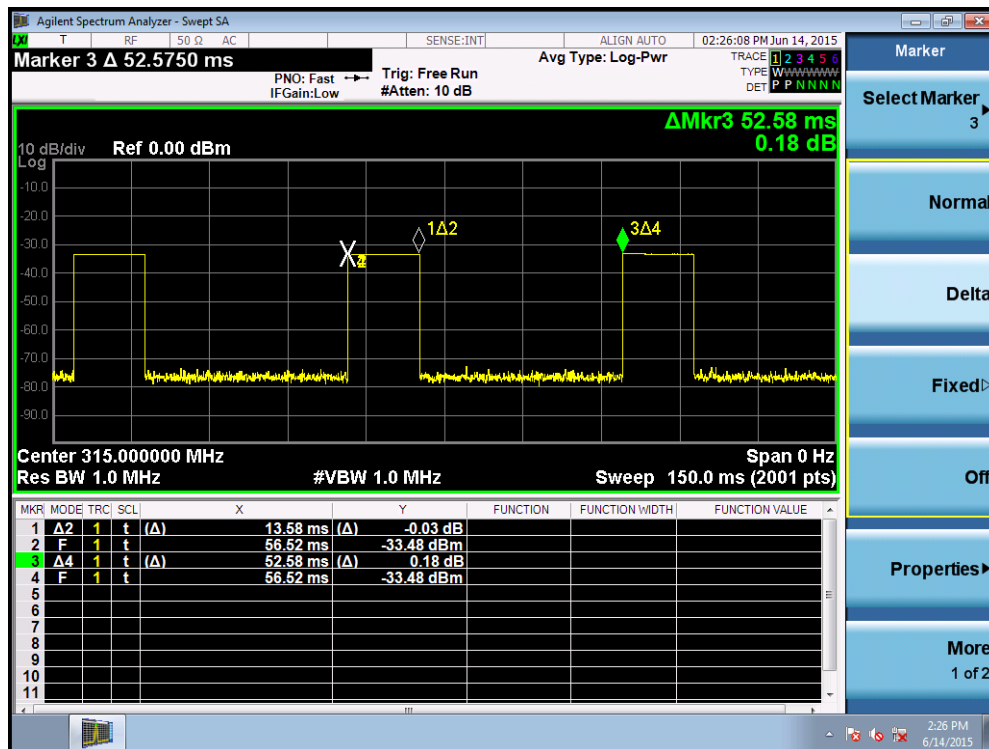
Modulation Type	Total Time (Ton) (ms)	The duration of one cycle (ms)	Duty Cycle (%)	Duty Cycle Factor (dB)
ASK	28.30	54.00	52.41	-5.61
FSK	13.58	52.58	25.83	-11.76

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-TSB41** is in compliance with FCC Part 15.231(e) of the FCC Rules.

The End