MEASUREMENT REPORT

FCC PART 15.231(e) & RSS 210

FCC ID:	TTETSB52
IC:	6707A-TSB52
APPLICANT:	Suzhou Sate Auto Electronic Co., Ltd.
Application Type:	Certification
Product:	Tire Pressure Monitoring System Sensor
Model No.:	TSB52
Brand Name:	SATE
FCC Classification:	FCC Part 15 Security/Remote Control Transmitter (DSC)
FCC Rule Part(s):	Part 15.231(e)
IC Rule(s):	RSS-210 Issue 9 – Annex A
Test Procedure(s):	ANSI C63.10-2013
Test Date:	November 29 ~ December 11, 2018

Reviewed By: Sunny Sun
(Sunny Sun)

Approved By: Robin Wu
(Robin Wu)

ACCREDITED
TESTING LABORATORY
CERTIFICATE #3628.01

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.

Revision History

Report No.	Version	Description	Issue Date	Note
1811RSU024-U1	Rev. 01	Initial report	12-17-2018	Valid

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Description Page

§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, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China
FCC Registration No.:	893164
IC Registration No.:	11384A-1
Test Device Serial No.:	N/A ☐ Production ☒ Pre-Production ☐ Engineering

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. 893164) test facility with the site description report on file and has met all the requirements specified in ANSI C63.4-2014.**
- **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-20025, G-20034, C-20020, T-20020) 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, Radio and SAR testing.**

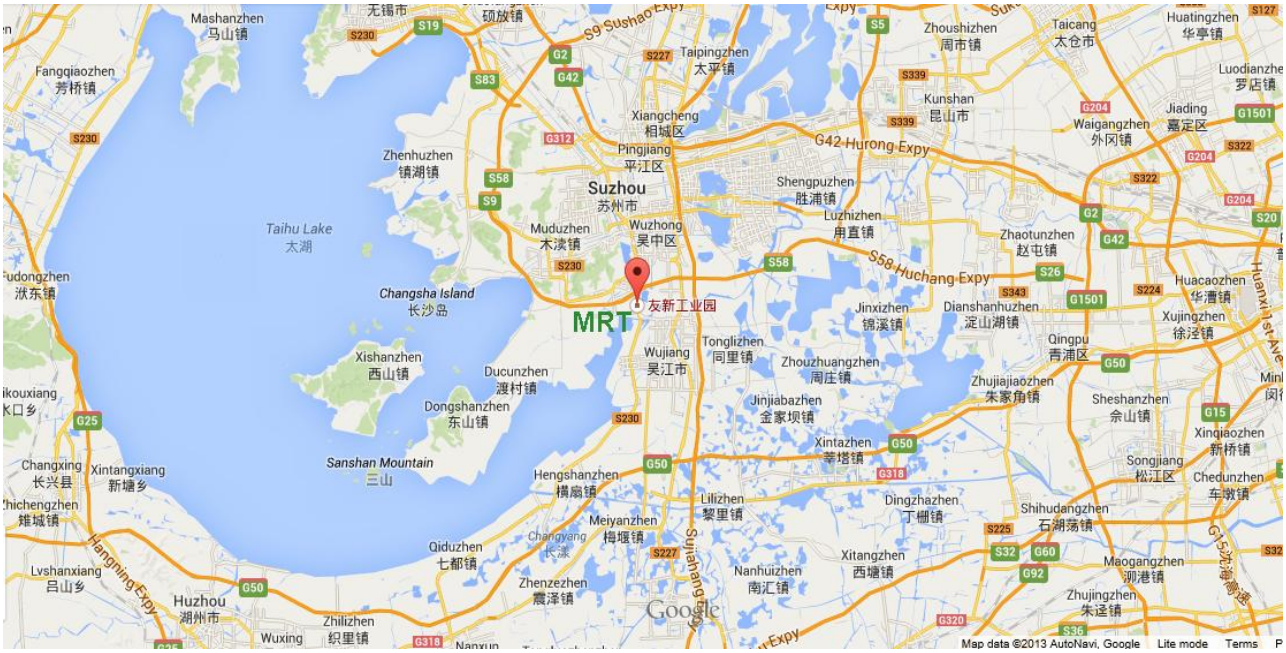
1. INTRODUCTION

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 measurement facility compliant with the test site requirements specified in ANSI C63.4-2014.



2. PRODUCT INFORMATION

2.1. Equipment Description

Product Name	Tire Pressure Monitoring System Sensor
Model No.	TSB52
Frequency Range	433.92MHz
Type of modulation	ASK, FSK
Antenna Gain	0dBi

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, and RSS-210 Issue 9 & RSS-Gen Issue 4 rules of IC 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, and RSS-210 Issue 9 & RSS-Gen Issue 4 rules of IC 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 433.92MHz ASK Modulation
Mode 2	Transmitting	With 433.92MHz 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 Sensor** is permanently attached.
- There are no provisions for connection to an external antenna.

Conclusion:

The Tire Pressure Monitoring System Sensor unit complies with the requirement of §15.203.

4. TEST EQUIPMENT CALIBRATION DATA

Radiated Emissions - AC1

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
PXA Signal Analyzer	Keysight	9030B	MRTSUE06395	1 year	2019/09/05
EMI Test Receiver	R&S	ESR7	MRTSUE06001	1 year	2019/08/14
Loop Antenna	Schwarzbeck	FMZB 1519	MRTSUE06025	1 year	2019/11/09
EXA Signal Analyzer	Agilent	N9020A	MRTSUE06106	1 year	2019/04/20
Microwave System Amplifier	Agilent	83017A	MRTSUE06076	1 year	2019/11/16
Bilog Period Antenna	Schwarzbeck	VULB 9168	MRTSUE06172	1 year	2019/04/12
Broad Band Horn Antenna	Schwarzbeck	BBHA9120D	MRTSUE06023	1 year	2019/10/20
Broad Band Horn Antenna	Schwarzbeck	BBHA 9170	MRTSUE06024	1 year	2018/12/14
Amplifier	Schwarzbeck	BBV 9721	MRTSUE06121	1 year	2019/06/13
Thermohygrometer	Testo	608-H1	MRTSUE06403	1 year	2019/08/15
Anechoic Chamber	TDK	Chamber-AC1	MRTSUE06212	1 year	2019/05/08

20dB Bandwidth - TR3

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cal. Due. Date
Spectrum Analyzer	Agilent	N9020A	MY52090106	1 year	2019/04/20
Bilog Period Antenna	Schwarzbeck	VULB 9168	662	1 year	2019/04/12
Thermohygrometer	Testo	608-H1	MRTSUE06403	1 year	2019/08/15

Transmission Time - AC1

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cal. Due. Date
Spectrum Analyzer	Agilent	N9020A	MY52090106	1 year	2019/04/20
Bilog Period Antenna	Schwarzbeck	VULB 9168	662	1 year	2019/04/12
Thermohygrometer	Testo	608-H1	MRTSUE06403	1 year	2019/08/15

Duty Cycle - AC1

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cal. Due. Date
Spectrum Analyzer	Agilent	N9020A	MY52090106	1 year	2019/04/20
Bilog Period Antenna	Schwarzbeck	VULB 9168	662	1 year	2019/04/12
Thermohygrometer	Testo	608-H1	MRTSUE06403	1 year	2019/08/15

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 - AC1
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 9kHz ~ 1GHz: 3.86dB 1GHz ~ 18GHz: 4.33dB

6. TEST RESULT

6.1. Summary

Company Name: **Suzhou Sate Auto Electronic Co., Ltd.**
FCC ID: **TTETSB52**
IC: **6707A-TSB52**

FCC Part Section(s)	IC Section(s)	Test Description	Test Condition	Test Result
15.205 15.231(e)	RSS-210, A1.4	Radiated Spurious Emissions	Radiated	Pass
15.231(c)	RSS-210, A1.3	20dB Bandwidth / 99% Bandwidth		Pass
15.231(e)	RSS-210, A1.4	Transmission Time		Pass
15.231(e)	RSS-Gen, 6.10	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 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)
40.66-40.77	1000	100
70-130	500	50
130-174	500 to 1500[1]	50 to 150[1]
174-260	1500	150
260-470	1500 to 5000[1]	150 to 500[1]
Above 470	5000	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.

For 15.205 requirement:

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a) of FCC part 15, must also comply with the radiated emission limits specified in Section 15.209(a).

Frequency (MHz)	Frequency (MHz)	Frequency (MHz)	Frequency (GHz)
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
[1] 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	([2])
13.36 - 13.41	--	--	--

For RSS-Gen Section 8.10 Requirement:

Radiated emissions which fall in the restricted bands, as defined in Section 8.10 of RSS-Gen, must also comply with the radiated emission limits specified in Section 8.9.

Frequency (MHz)	Frequency (MHz)	Frequency (MHz)	Frequency (GHz)
0.090 - 0.110	16.42 - 16.423	1645.5 - 1646.5	9.0 - 9.2
0.495 - 0.505	16.69475 - 16.69525	1660 - 1710	9.3 - 9.5
2.1735 - 2.1905	16.80425 - 16.80475	1718.8-1722.2	10.6 - 12.7
3.020 - 3.026	25.5 - 25.67	2200 - 2300	13.25 - 13.4
4.125 - 4.128	37.5 - 38.25	2310–2390	14.47 - 14.5
4.17725 - 4.17775	73 - 74.6	2483.5 - 2500	15.35 - 16.2
4.20725 - 4.20775	74.8 - 75.2	2655 - 2900	17.7 - 21.4
5.677 - 5.683	108 - 138	3260 - 3267	22.01 - 23.12
6.215 - 6.218	149.9 - 150.05	3332 - 3339	23.6 - 24.0
6.26775 - 6.26825	156.52475 - 156.52525	3345.8 - 3358	31.2 - 31.8
6.31175 - 6.31225	156.7 - 156.9	3500 - 4400	36.43 - 36.5
8.291 - 8.294	162.0125 - 167.17	4500 - 5150	Above 38.6
8.362 - 8.366	167.72 - 173.2	5350 - 5460	--
8.37625 - 8.38675	240 - 285	7250 - 7750	--
8.41425 - 8.41475	322 - 335.4	8025 - 8500	--
12.29 - 12.293	399.9 - 410	--	--
12.51975 - 12.52025	608 - 614	--	--
12.57675 - 12.57725	960 - 1427	--	--
13.36 -13.41	1435 - 1626.5	--	--

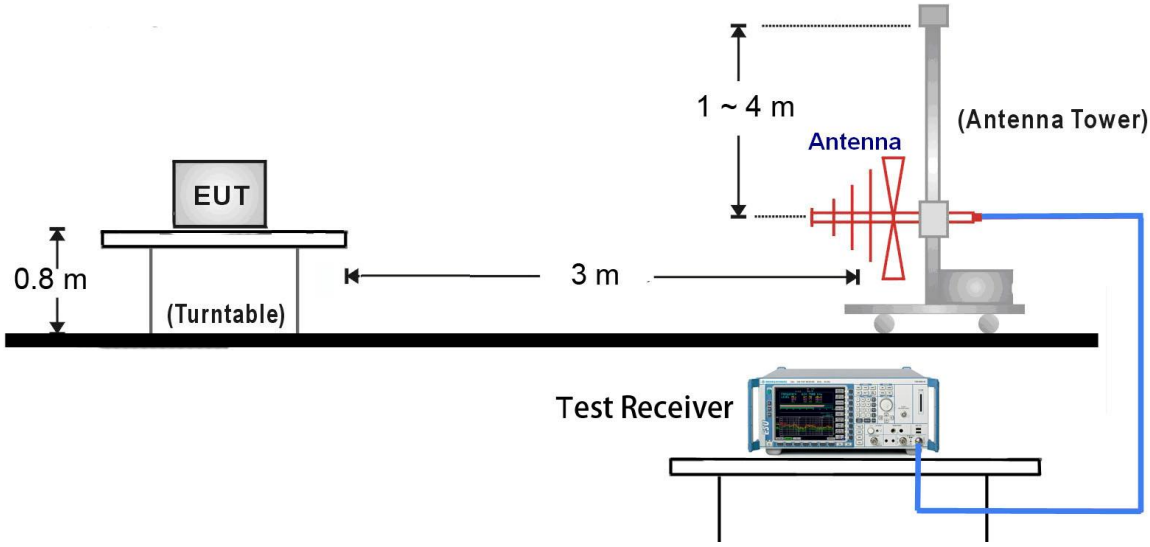
6.2.2.Test Procedure

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.

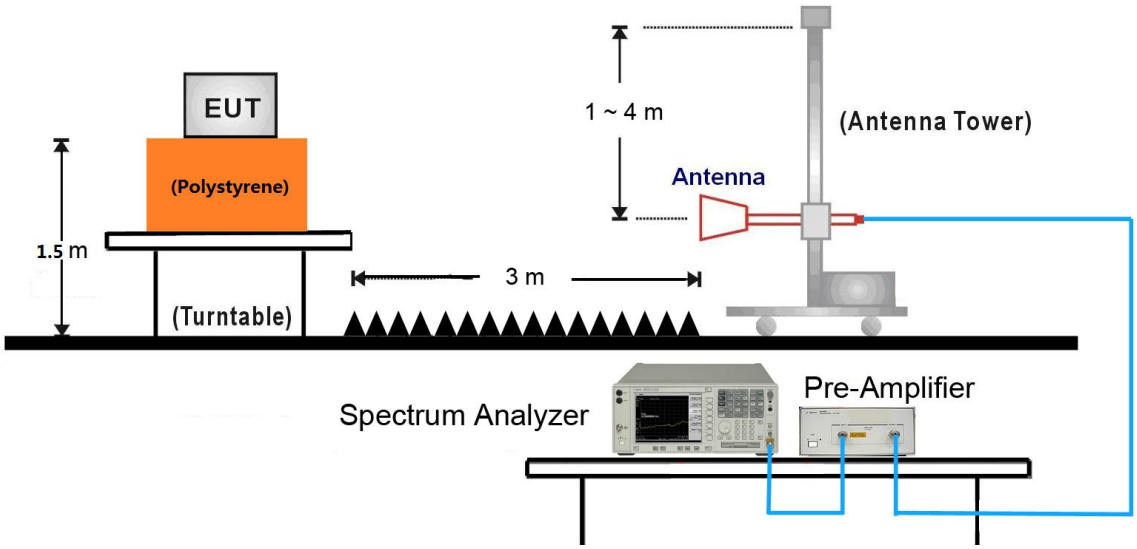
6.2.3.Test Setup

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:

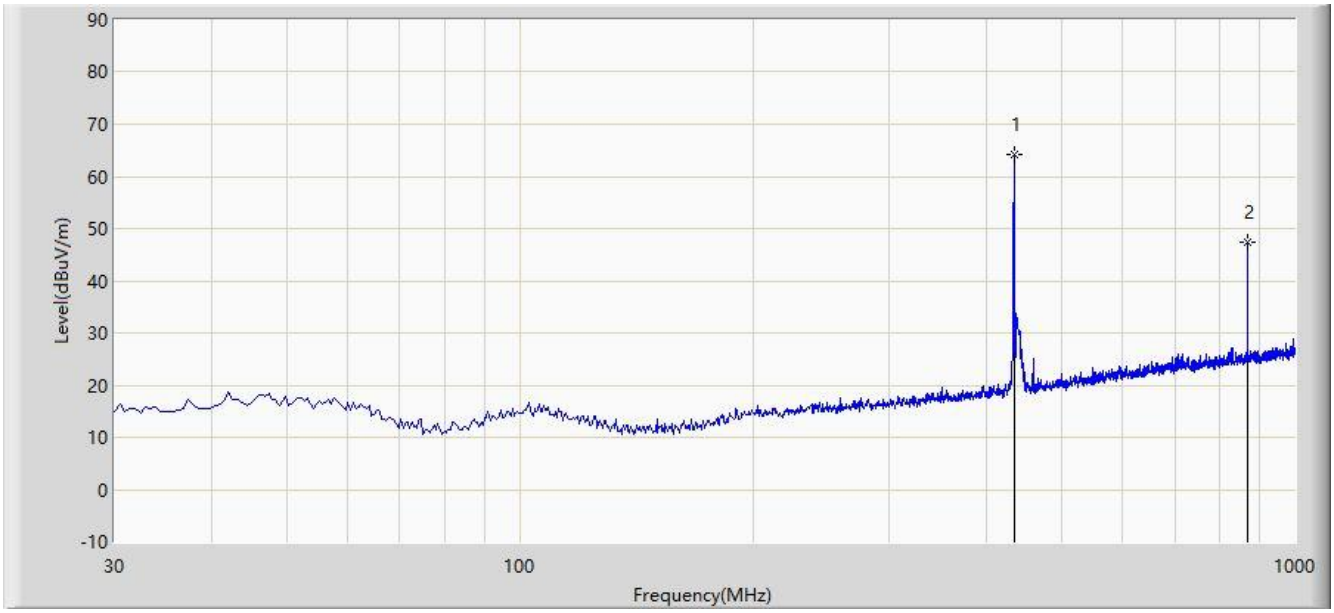


1GHz ~ 25GHz Test Setup:



6.2.4.Test Results

Site: AC1	Time: 2018/11/24 - 13:48
Limit: FCC 15.231(e)	Engineer: Snake Ni
Probe: VULB 9168 _20-2000MHz	Polarity: Horizontal
EUT: Tire Pressure Monitoring System Sensor	Power: By Battery
Test Mode: Transmit by ASK at Channel 433.92MHz	



No	Frequency (MHz)	Reading Level (dBuV)	Factor (dB)	Duty Cycle Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Type
1	434.005	45.046	19.073	N/A	64.119	92.866	-28.747	PK
	434.005	45.046	19.073	-19.480	44.639	72.866	-28.227	AV
2	868.080	22.533	24.938	N/A	47.471	72.866	-25.395	PK
	868.080	22.533	24.938	-19.480	27.991	52.866	-24.875	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.

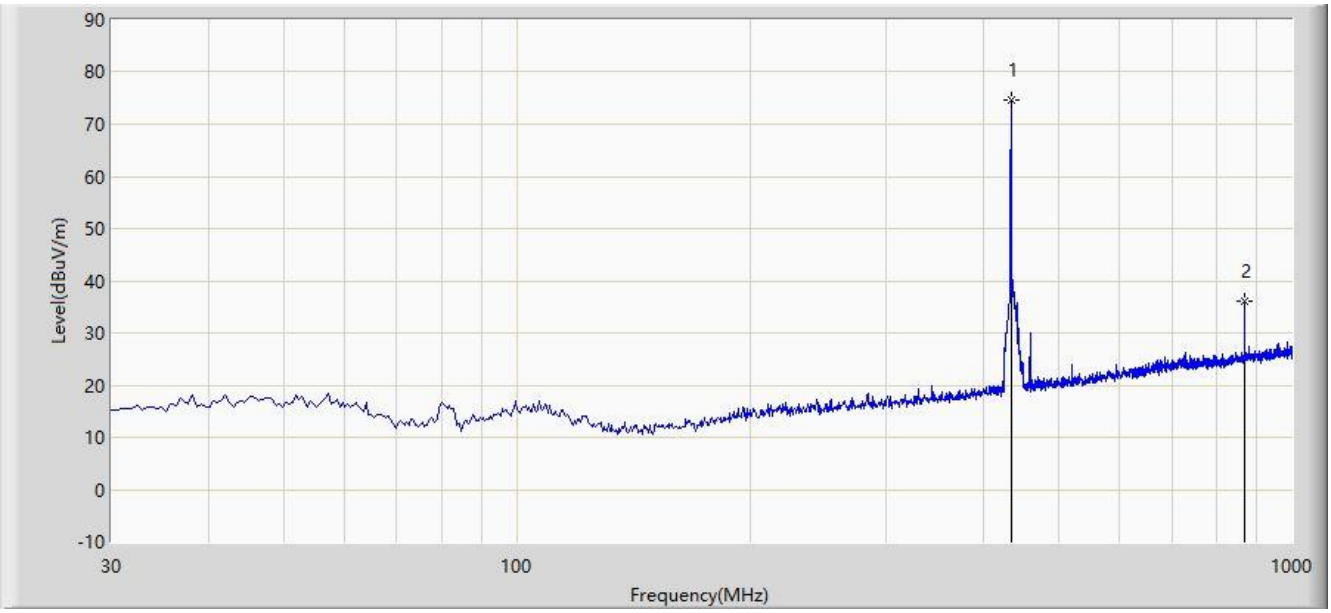
Note 2: The fundamental frequency is 433.92MHz, so the fundamental and spurious emissions radiated limit base on the operating frequency 433.92MHz.

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

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

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

Site: AC1	Time: 2018/11/24 - 13:49
Limit: FCC 15.231(e)	Engineer: Snake Ni
Probe: VULB 9168 _20-2000MHz	Polarity: Vertical
EUT: Tire Pressure Monitoring System Sensor	Power: By Battery
Test Mode: Transmit by ASK at Channel 433.92MHz	



No	Frequency (MHz)	Reading Level (dBuV)	Factor (dB)	Duty Cycle Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Type
1	434.005	55.587	19.073	N/A	74.660	92.866	-18.206	PK
	434.005	55.587	19.073	-19.480	55.180	72.866	-17.686	AV
2	868.080	11.022	24.938	N/A	35.960	72.866	-36.906	PK
	868.080	11.022	24.938	-19.480	16.480	52.866	-36.386	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.

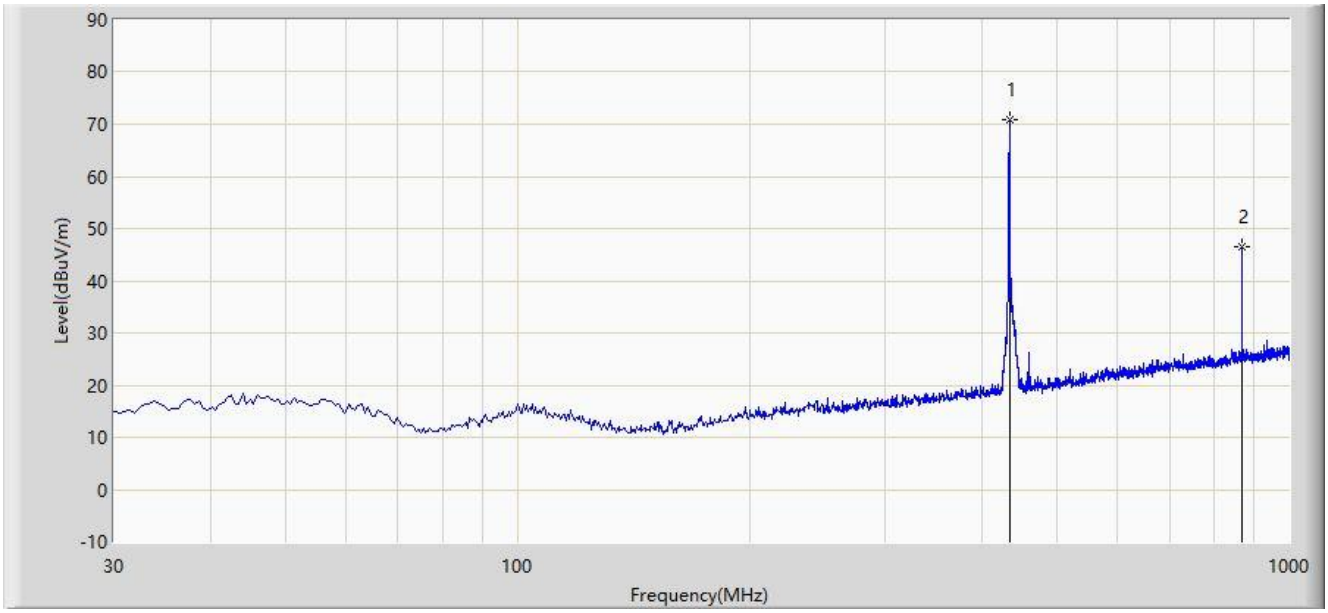
Note 2: The fundamental frequency is 433.92MHz, so the fundamental and spurious emissions radiated limit base on the operating frequency 433.92MHz.

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

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

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

Site: AC1	Time: 2018/11/24 - 13:54
Limit: FCC 15.231(e)	Engineer: Snake Ni
Probe: VULB 9168 _20-2000MHz	Polarity: Horizontal
EUT: Tire Pressure Monitoring System Sensor	Power: By Battery
Test Mode: Transmit by FSK at Channel 433.92MHz	



No	Frequency (MHz)	Reading Level (dBuV)	Factor (dB)	Duty Cycle Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Type
1	434.005	51.819	19.073	N/A	70.892	92.866	-21.974	PK
	434.005	51.819	19.073	-15.340	55.552	72.866	-17.314	AV
2	868.080	21.518	24.938	N/A	46.456	72.866	-26.410	PK
	868.080	21.518	24.938	-15.340	31.116	52.866	-21.750	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.

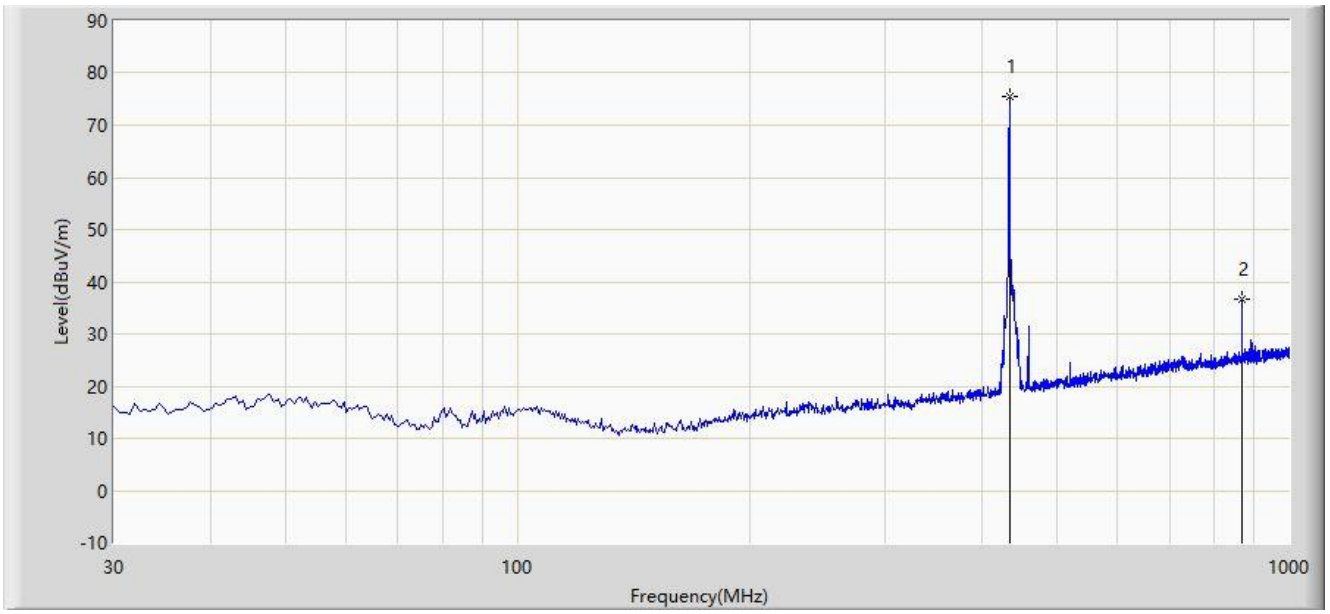
Note 2: The fundamental frequency is 433.92MHz, so the fundamental and spurious emissions radiated limit base on the operating frequency 433.92MHz.

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

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

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

Site: AC1	Time: 2018/11/24 - 14:04
Limit: FCC 15.231(e)	Engineer: Snake Ni
Probe: VULB 9168 _20-2000MHz	Polarity: Vertical
EUT: Tire Pressure Monitoring System Sensor	Power: By Battery
Test Mode: Transmit by FSK at Channel 433.92MHz	



No	Frequency (MHz)	Reading Level (dBuV)	Factor (dB)	Duty Cycle Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Type
1	434.005	56.475	19.073	N/A	75.548	92.866	-17.318	PK
	434.005	56.475	19.073	-15.340	60.208	72.866	-12.658	AV
2	868.080	11.593	24.938	N/A	36.531	72.866	-36.335	PK
	868.080	11.593	24.938	-15.340	21.191	52.866	-31.675	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.

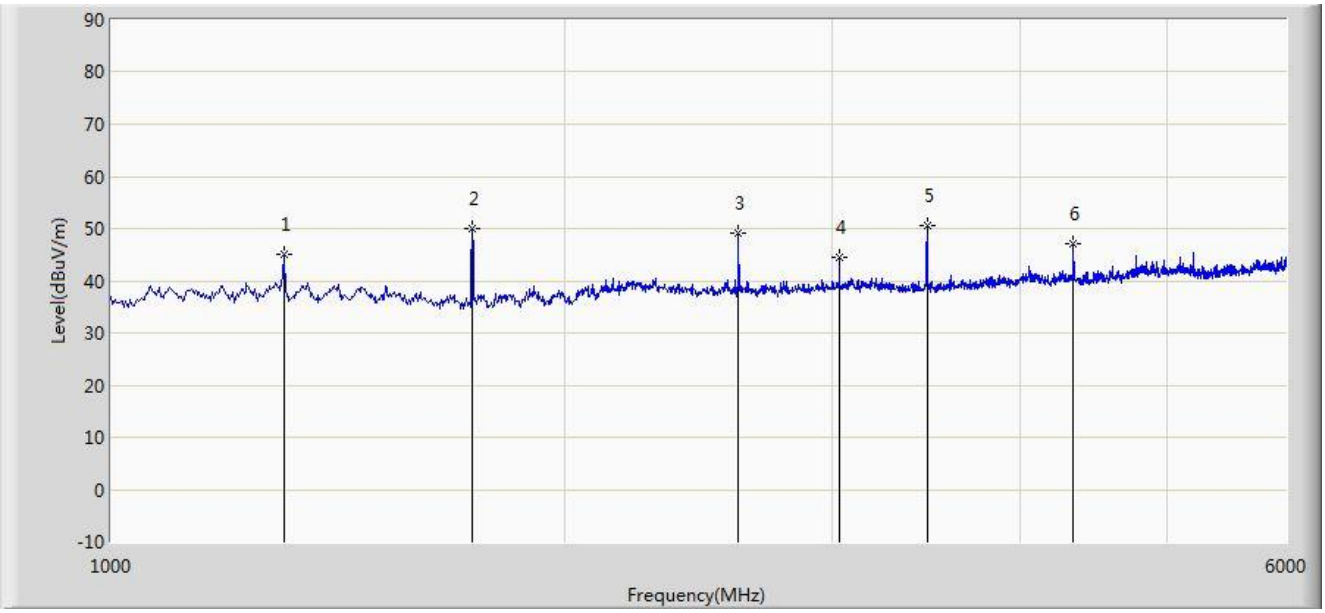
Note 2: The fundamental frequency is 433.92MHz, so the fundamental and spurious emissions radiated limit base on the operating frequency 433.92MHz.

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

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

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

Site: AC1	Time: 2018/11/24 - 13:04
Limit: FCC 15.231(e)	Engineer: Snake Ni
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: Tire Pressure Monitoring System Sensor	Power: By Battery
Test Mode: Transmit by ASK at Channel 433.92MHz	



No	Mark	Frequency (MHz)	Reading Level (dBuV)	Factor (dB)	Duty Cycle Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Type
1	*	1302.500	49.041	-4.110	N/A	44.931	74.000	-29.069	PK
		1302.500	49.041	-4.110	-19.480	25.451	54.000	-28.549	AV
2		1735.000	54.141	-4.025	N/A	50.116	72.866	-22.750	PK
		1735.000	54.141	-4.025	-19.480	30.636	52.866	-22.230	AV
3		2602.500	49.494	-0.397	N/A	49.097	72.866	-23.769	PK
		2602.500	49.494	-0.397	-19.480	29.617	52.866	-23.249	AV
4		3037.500	43.744	0.868	N/A	44.612	72.866	-28.254	PK
		3037.500	43.744	0.868	-19.480	25.132	52.866	-27.734	AV
5		3470.000	49.119	1.514	N/A	50.633	72.866	-22.233	PK
		3470.000	49.119	1.514	-19.480	31.153	52.866	-21.713	AV
6	*	4340.000	42.610	4.350	N/A	46.960	74.000	-27.040	PK
		4340.000	42.610	4.350	-19.480	27.480	54.000	-26.520	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: "*" is in restricted band, its limit shall not exceed the limits shown in §15.209 & RSS-Gen Issue 5

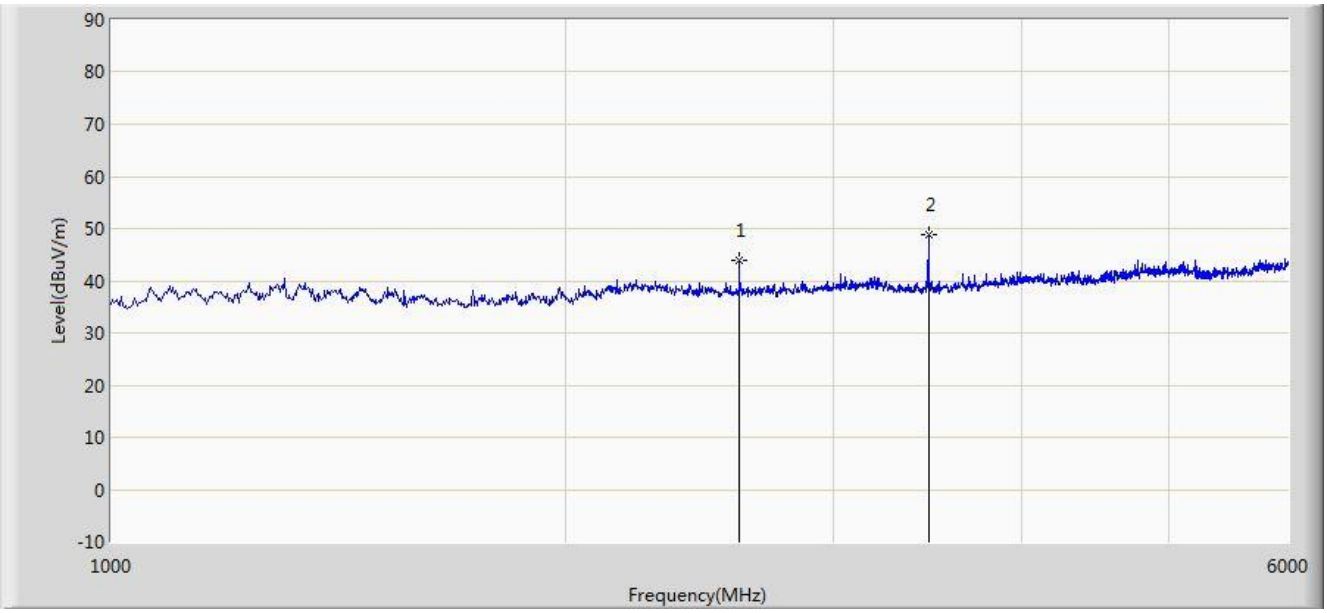
section 8.9.

Note 4: Peak Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB).

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

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

Site: AC1	Time: 2018/11/24 - 13:08
Limit: FCC 15.231(e)	Engineer: Snake Ni
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: Tire Pressure Monitoring System Sensor	Power: By Battery
Test Mode: Transmit by ASK at Channel 433.92MHz	



No	Frequency (MHz)	Reading Level (dBuV)	Factor (dB)	Duty Cycle Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Type
1	2602.500	44.403	-0.397	N/A	44.006	72.866	-28.860	PK
	2602.500	44.403	-0.397	-19.480	24.526	52.866	-28.340	AV
2	3472.500	47.322	1.539	N/A	48.861	72.866	-24.005	PK
	3472.500	47.322	1.539	-19.480	29.381	52.866	-23.485	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.

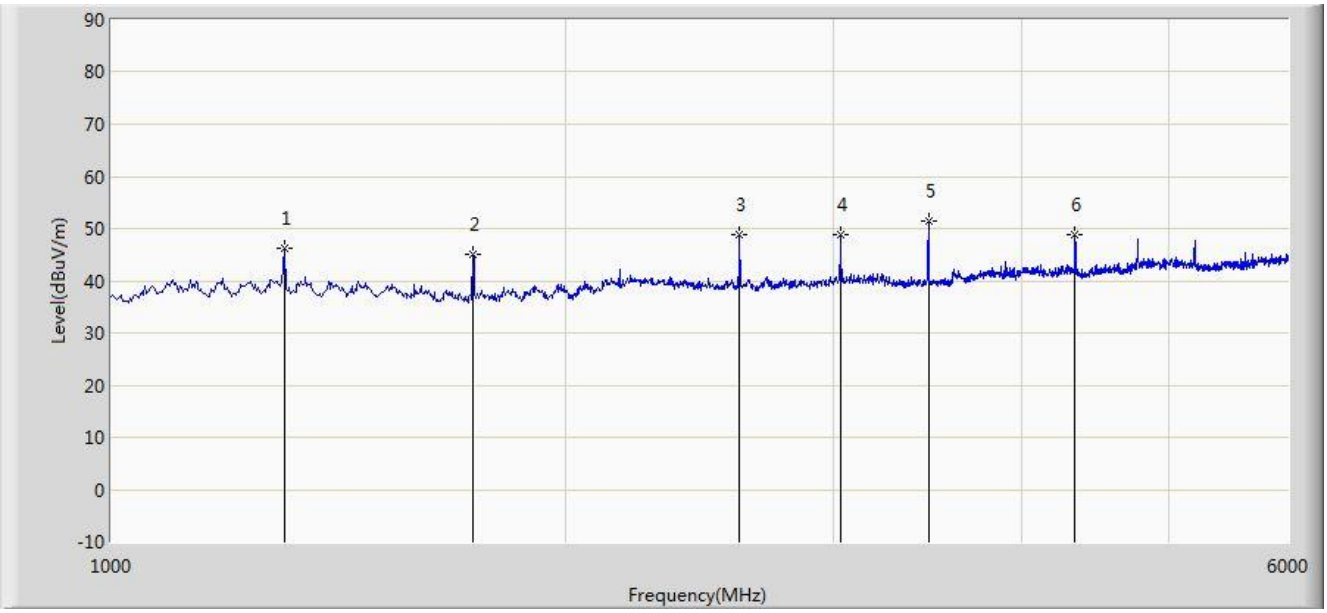
Note 2: The fundamental frequency is 433.92MHz, so the fundamental and spurious emissions radiated limit base on the operating frequency 433.92MHz.

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

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

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

Site: AC1	Time: 2018/11/24 - 12:52
Limit: FCC 15.231(e)	Engineer: Snake Ni
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: Tire Pressure Monitoring System Sensor	Power: By Battery
Test Mode: Transmit by FSK at Channel 433.92MHz	



No	Mark	Frequency (MHz)	Reading Level (dBuV)	Factor (dB)	Duty Cycle Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Type
1	*	1302.500	50.297	-4.110	N/A	46.187	74.000	-27.813	PK
		1302.500	50.297	-4.110	-15.340	30.847	54.000	-23.153	AV
2		1735.000	49.189	-4.025	N/A	45.164	72.866	-27.702	PK
		1735.000	49.189	-4.025	-15.340	29.824	52.866	-23.042	AV
3		2605.000	49.166	-0.386	N/A	48.780	72.866	-24.086	PK
		2605.000	49.166	-0.386	-15.340	33.440	52.866	-19.426	AV
4		3037.500	47.916	0.868	N/A	48.784	72.866	-24.082	PK
		3037.500	47.916	0.868	-15.340	33.444	52.866	-19.422	AV
5		3472.500	49.883	1.539	N/A	51.422	72.866	-21.444	PK
		3472.500	49.883	1.539	-15.340	36.082	52.866	-16.784	AV
6	*	4337.500	44.617	4.364	N/A	48.981	74.000	-25.019	PK
		4337.500	44.617	4.364	-15.340	33.641	54.000	-20.359	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 434MHz, so the fundamental and spurious emissions radiated limit base on the operating frequency 434MHz.

Note 3: "*" is in restricted band, its limit shall not exceed the limits shown in §15.209 & RSS-Gen Issue 5

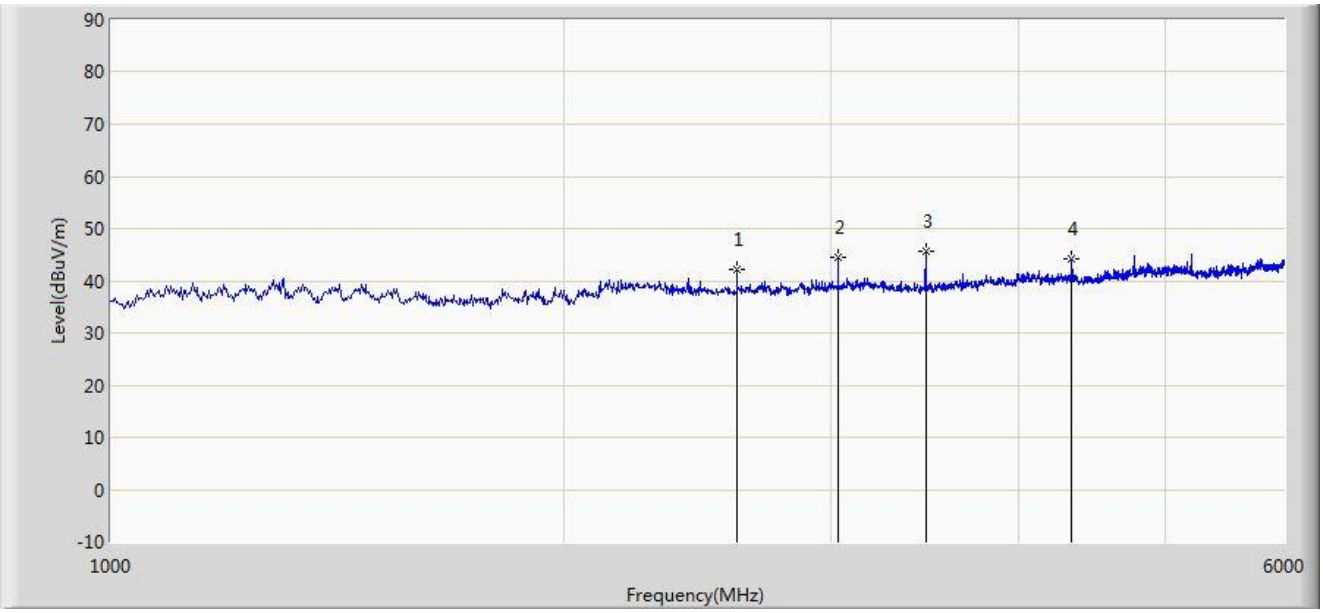
section 8.9.

Note 4: Peak Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB).

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

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

Site: AC1	Time: 2018/11/24 - 13:00
Limit: FCC 15.231(e)	Engineer: Snake Ni
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: Tire Pressure Monitoring System Sensor	Power: By Battery
Test Mode: Transmit by FSK at Channel 433.92MHz	



No	Mark	Frequency (MHz)	Reading Level (dBuV)	Factor (dB)	Duty Cycle Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Type
1		2602.500	42.586	-0.397	N/A	42.189	72.866	-30.677	PK
		2602.500	42.586	-0.397	-15.340	26.849	52.866	-26.017	AV
2		3037.500	43.727	0.868	N/A	44.595	72.866	-28.271	PK
		3037.500	43.727	0.868	-15.340	29.255	52.866	-23.611	AV
3		3472.500	44.087	1.539	N/A	45.626	72.866	-27.240	PK
		3472.500	44.087	1.539	-15.340	30.286	52.866	-22.580	AV
4	*	4340.000	39.986	4.350	N/A	44.336	74.000	-29.664	PK
		4340.000	39.986	4.350	-15.340	28.996	54.000	-25.004	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 434MHz, so the fundamental and spurious emissions radiated limit base on the operating frequency 434MHz.

Note 3: "*" is in restricted band, its limit shall not exceed the limits shown in §15.209 & RSS-Gen Issue 5 section 8.9.

Note 4: Peak Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB).

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

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

6.3. 20dB Bandwidth / 99% Bandwidth

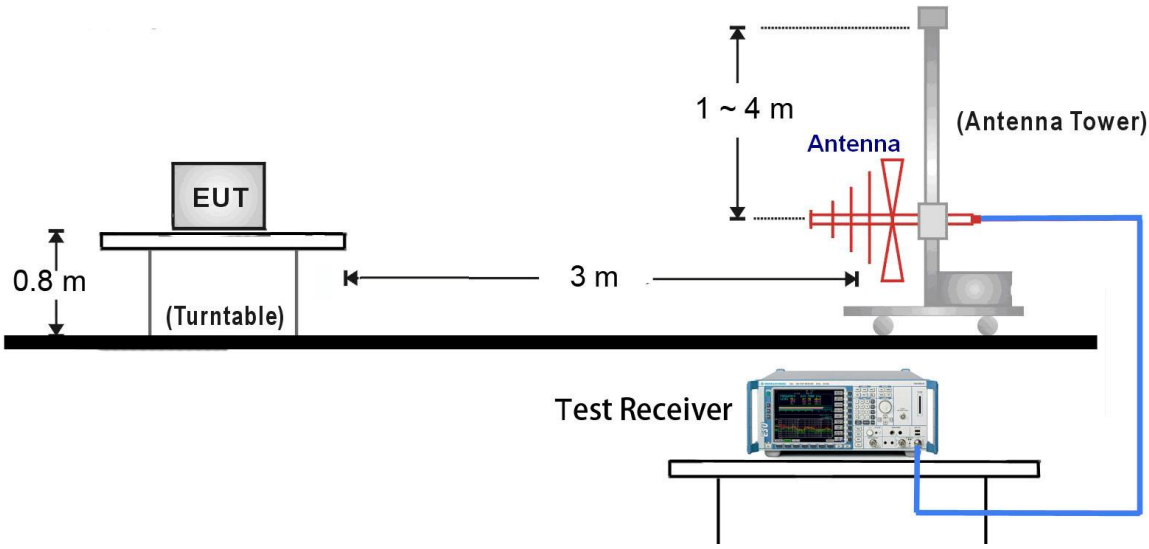
6.3.1. Standard Applicable

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



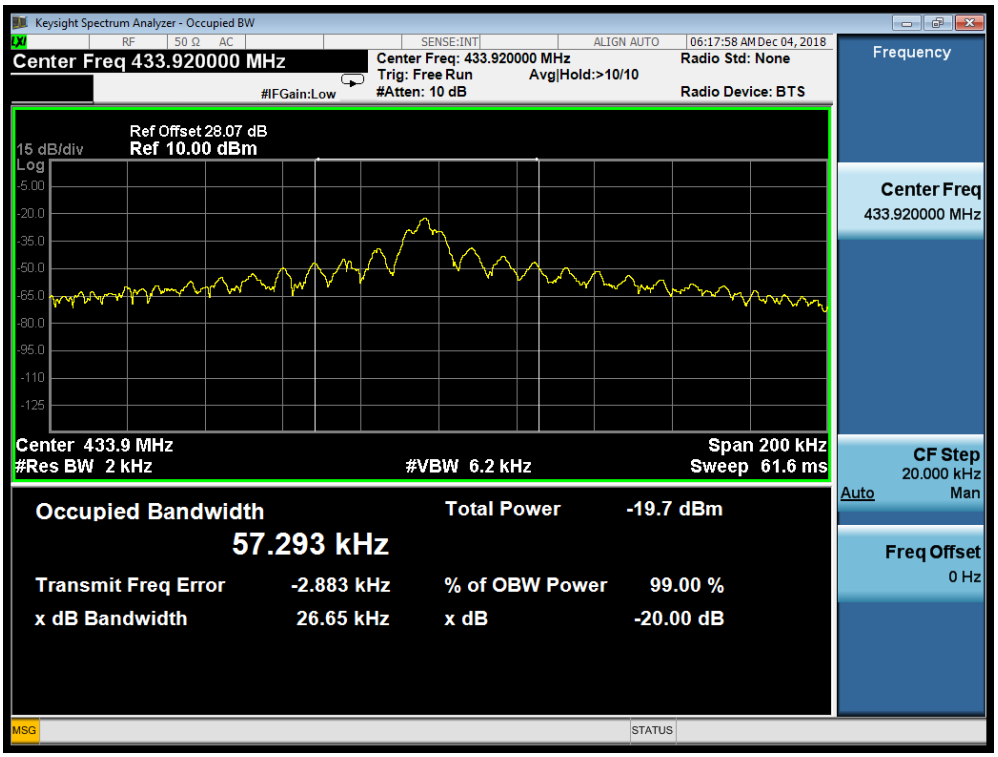
6.3.4. Test Result

Product	Tire Pressure Monitoring System Sensor	Temperature	25°C
Test Engineer	Snake Ni	Relative Humidity	52%
Test Site	AC1	Test Date	2018/12/04

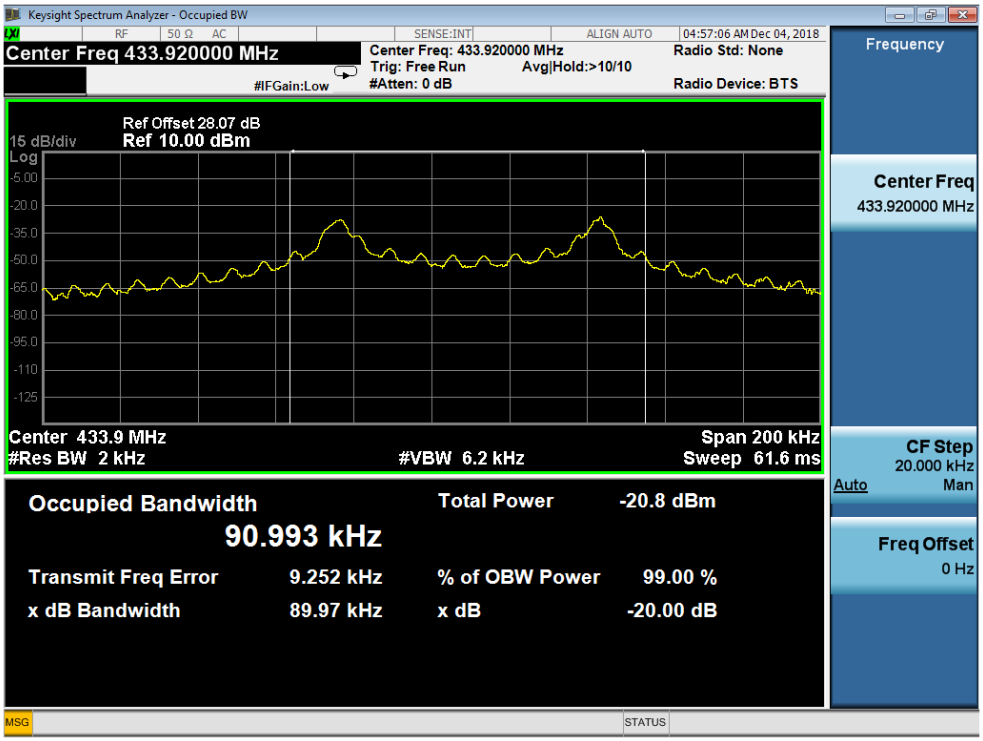
Test Frequency (MHz)	Modulation Type	20dB Bandwidth (KHz)	99% Bandwidth (KHz)	Limit (KHz)	Result
433.92	ASK	26.65	57.29	≤ 1084.8	Pass
	FSK	89.97	90.99	≤ 1084.8	Pass

Limit = Fundamental Frequency * 0.25% = 433.92 MHz * 0.25% = 1085.0 kHz

433.92MHz 20dB Bandwidth Test Plot for ASK



433.92MHz 20dB Bandwidth Test Plot for FSK



6.4. Transmission Time

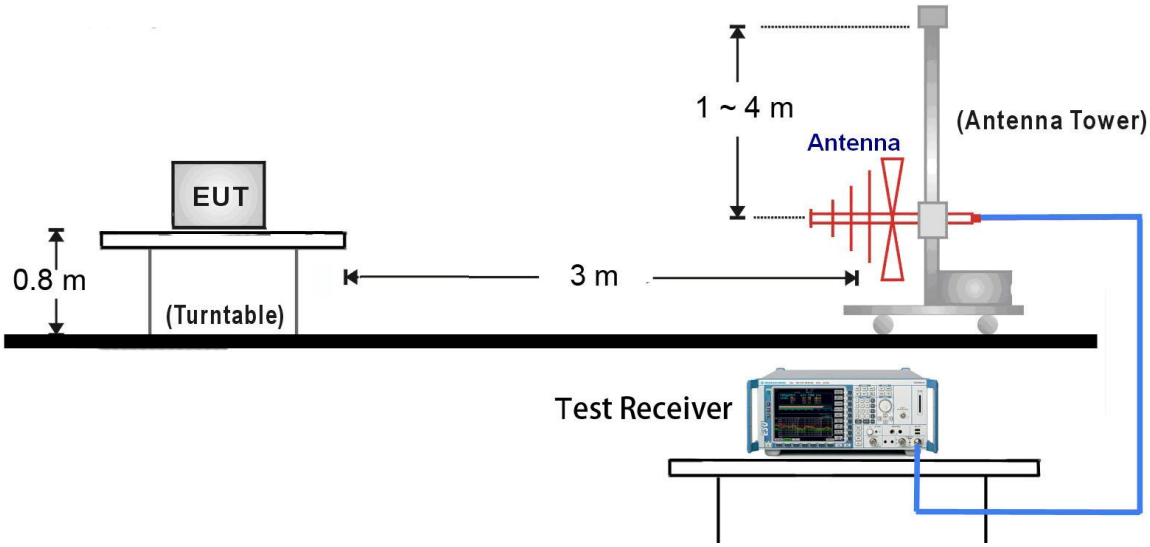
6.4.1. Standard Applicable

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, than 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

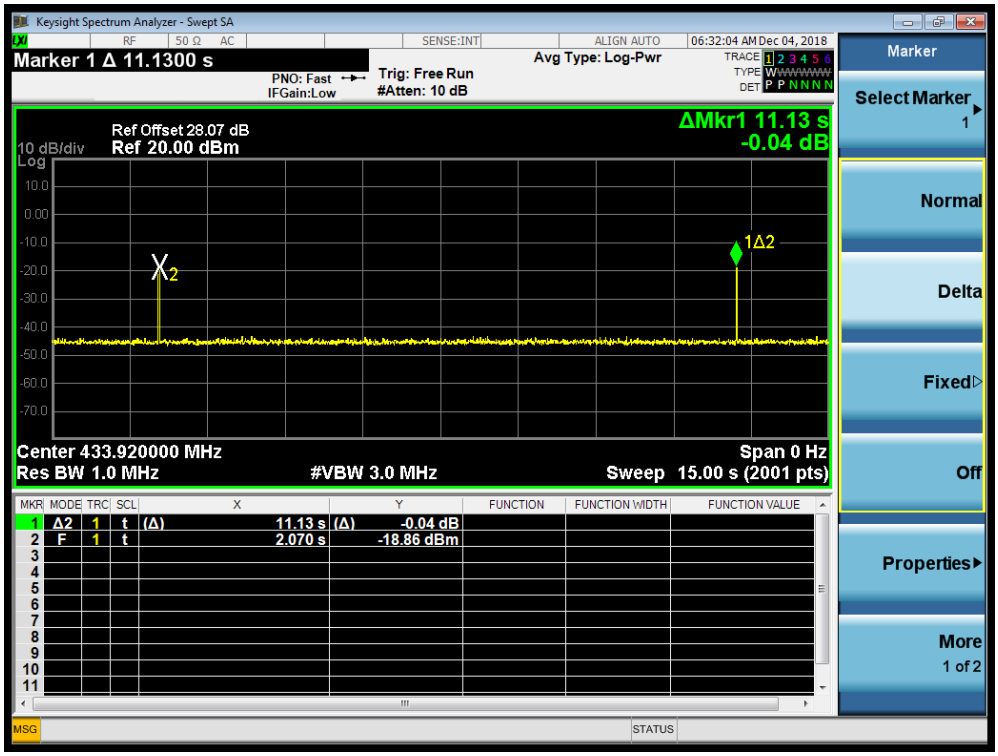


6.4.4. Test Result

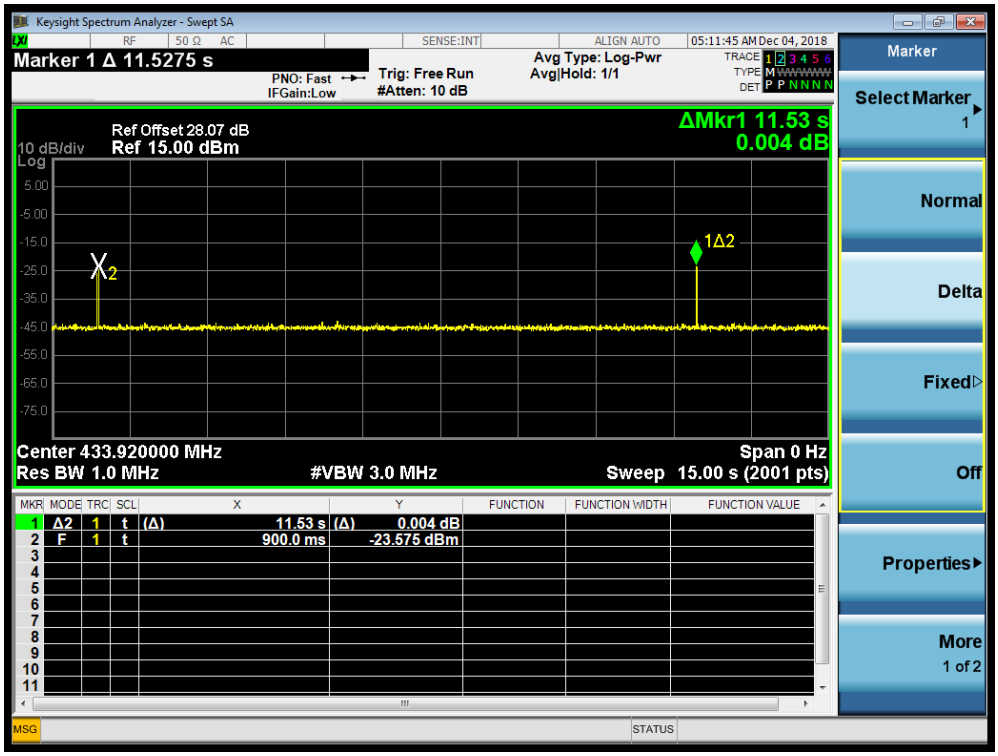
Product	Tire Pressure Monitoring System Sensor	Temperature	25°C
Test Engineer	Snake Ni	Relative Humidity	52%
Test Site	AC1	Test Date	2018/12/04

Test Mode	Modulation Type	Item	Measured Value	Limit	Result
433.92MHz	ASK	Transmission Time(T_{on})	17.0ms	≤ 1 s	Pass
		Silent Time	11.13s	≥ 10 s	Pass
		Silent Time/Transmission Time	654	≥ 30 times	Pass
	FSK	Transmission Time(T_{on})	17.10ms	≤ 1 s	Pass
		Silent Time	11.53s	≥ 10 s	Pass
		Silent Time/Transmission Time	674	≥ 30 times	Pass

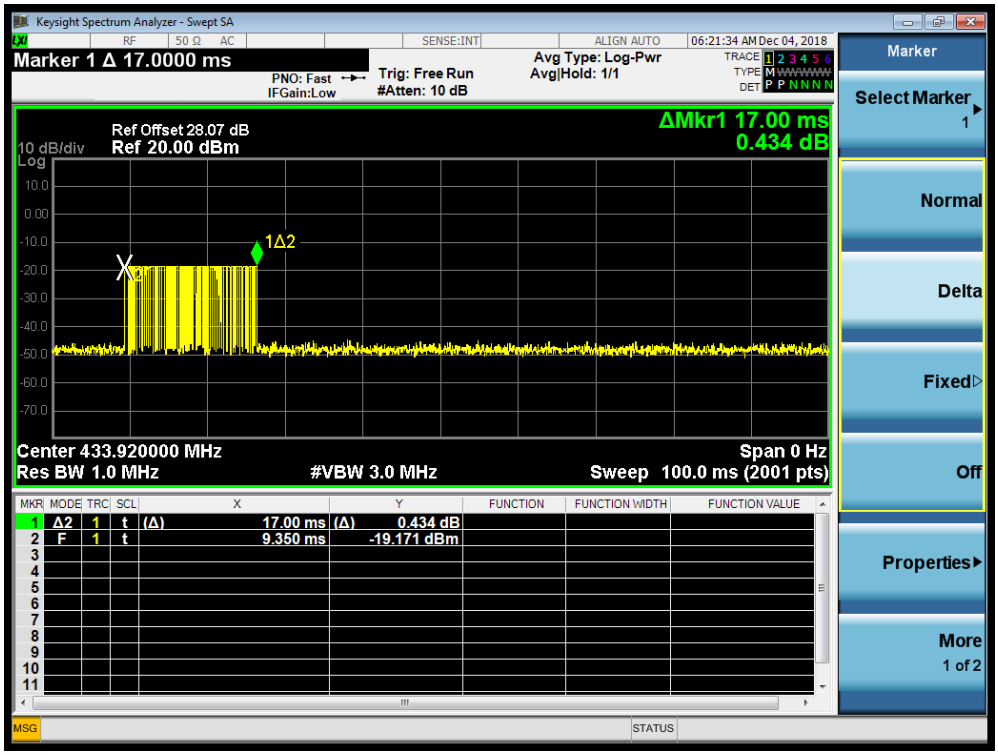
Silent Time for 433.92MHz ASK



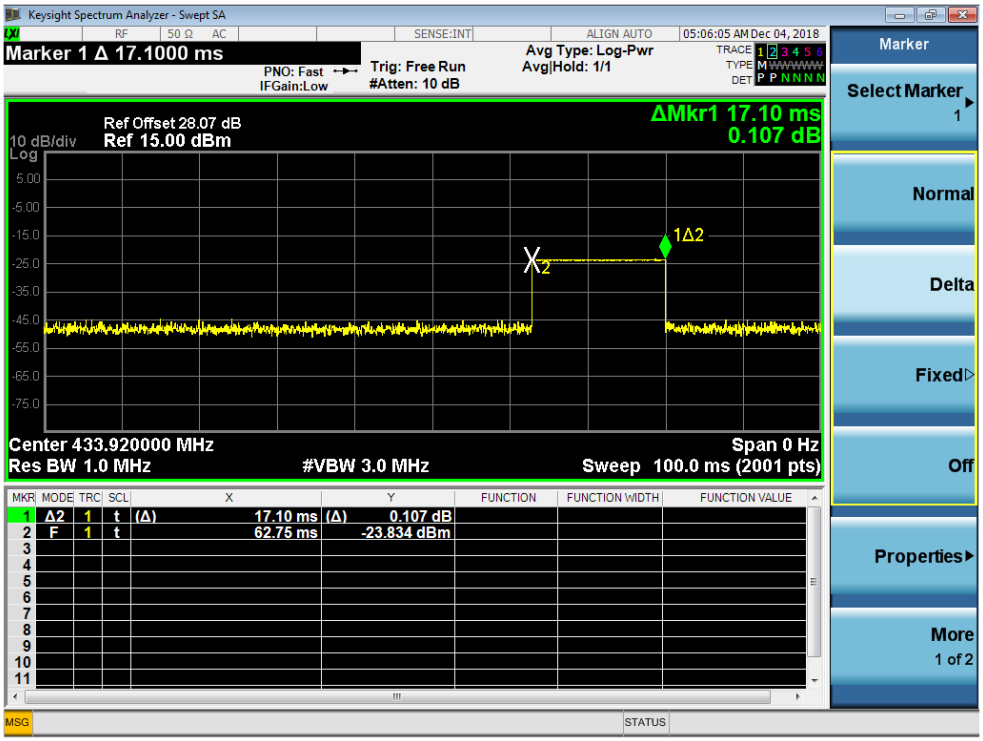
Silent Time for 433.92MHz FSK



Transmission Time for 433.92MHz ASK



Transmission Time for 433.92MHz FSK



6.5. Duty Cycle

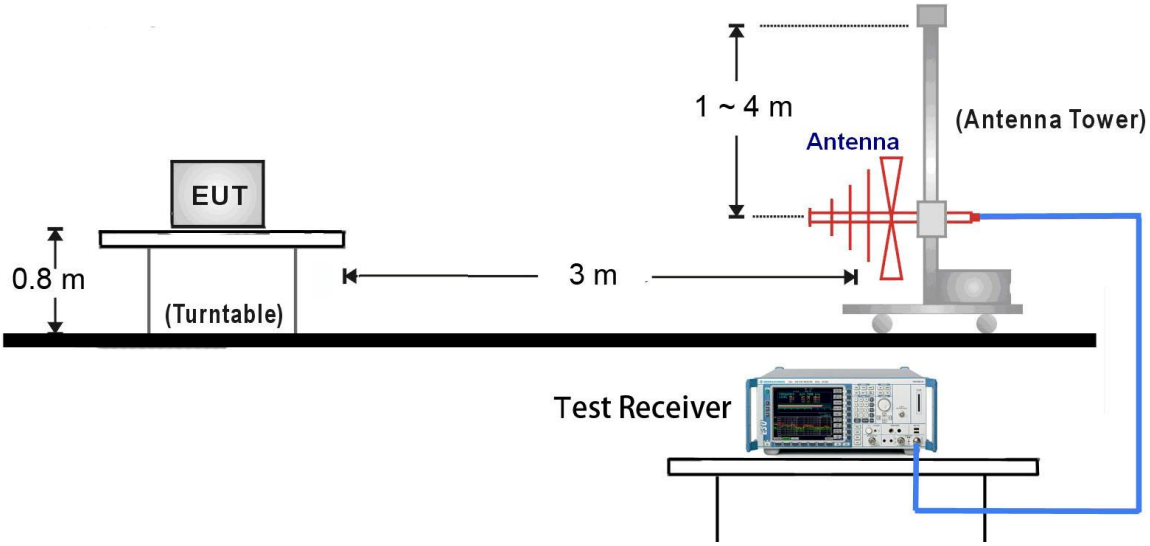
6.5.1. Standard Applicable

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 fundamental frequency, than 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

Product	Tire Pressure Monitoring System Sensor	Temperature	25°C
Test Engineer	Snake Ni	Relative Humidity	52%
Test Site	AC1	Test Date	2018/12/04

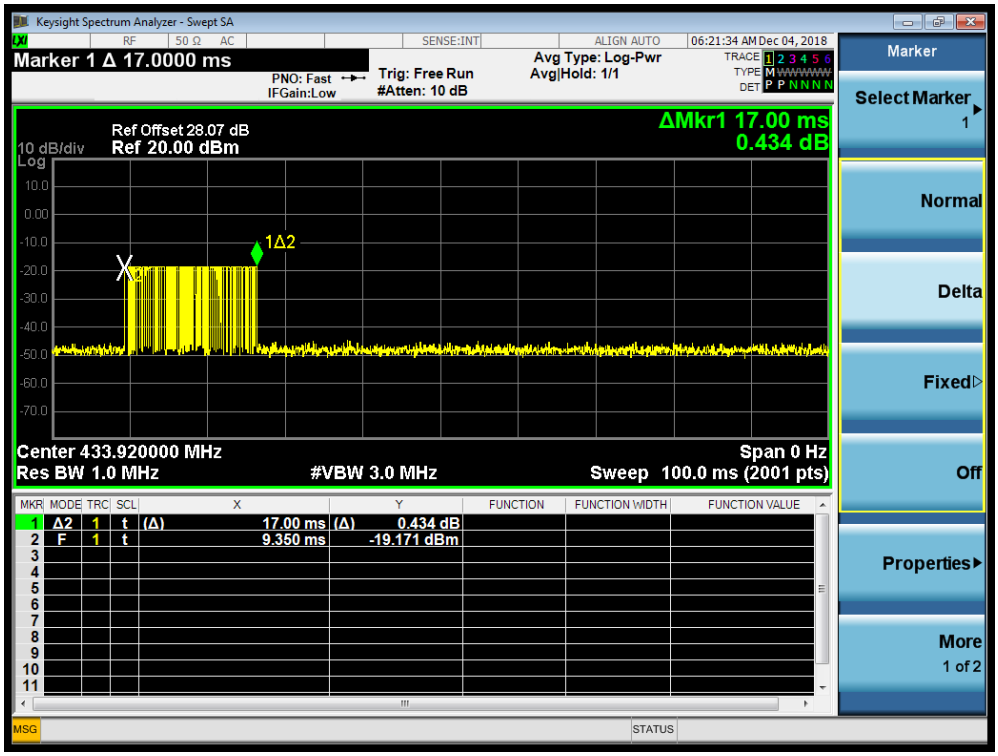
Test Mode	Modulation Type	Total Time (T_{on}) (ms)	The duration of one cycle (ms)	Duty Cycle (%)	Duty Cycle Factor (dB)
433.92MHz	ASK	10.62	100	10.68	19.48
	FSK	17.10	100	17.10	15.34

Note:

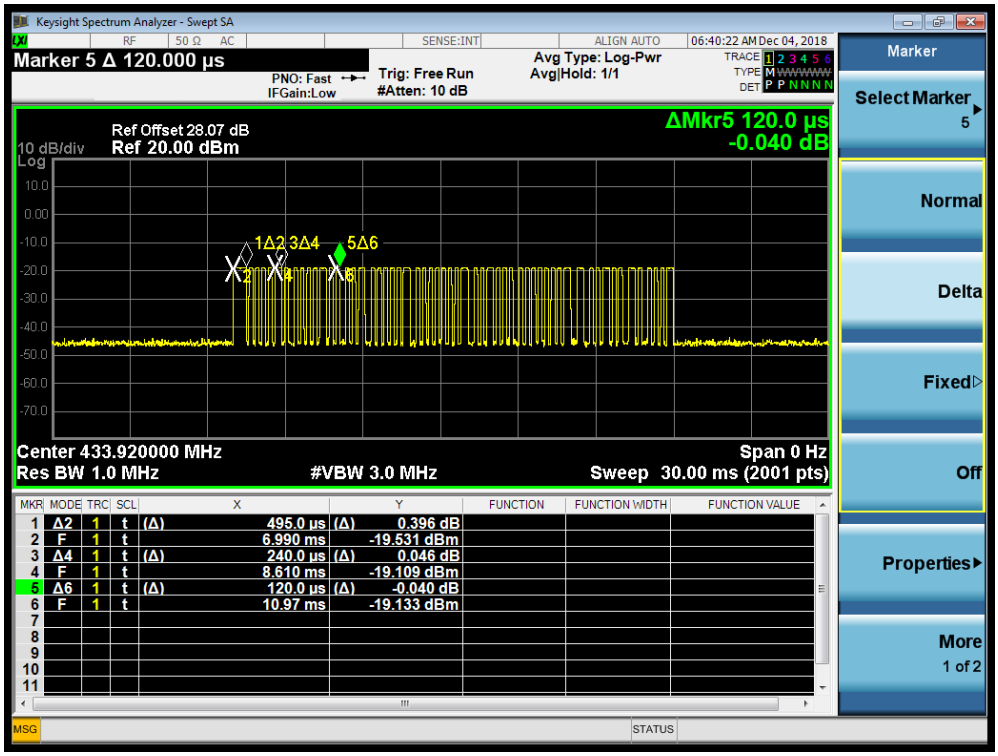
1 Duty Cycle Factor = 20*Log*(1/Duty Cycle).

2 For 433.92MHz ASK Modulation, Transmission time (T_{on}) (ms) = 4 * 0.495(ms) + 11*0.24(ms) + 50*0.12= 10.62 (ms)

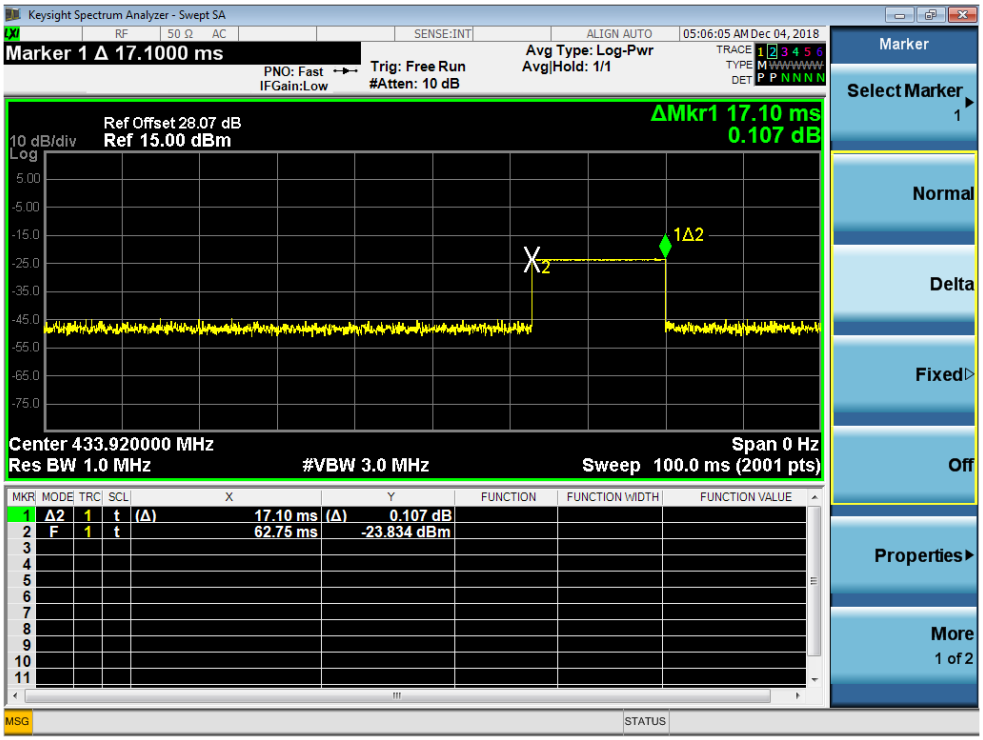
Width of Pulse for 433.92MHz ASK



Width of Pulse for 433.92MHz ASK



Width of Pulse for 433.92MHz FSK



7. CONCLUSION

The data collected relate only the item(s) tested and show that the **Tire Pressure Monitoring System Sensor** is in compliance with Part 15.231(e) of the FCC Rules and RSS-210 Issue 9 – Annex A of the ISED Rules.

The End

Appendix A - Test Setup Photograph

Refer to “1811RSU024-UT” file.

Appendix B - EUT Photograph

Refer to “1811RSU024-UE” file.