



MEASUREMENT REPORT

FCC PART 15.231(e)

FCC ID: 2AP2YMATA-1E
APPLICANT: SINOTEK CO., LTD.
Application Type: Certification
Product: Tire Pressure Monitoring System
Model No.: MATA-1E
Serial Model No.: MATA-1E-10, MATA-1E-8, MATA-1E-6, MATA-1E-2
Brand Name: Promata
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 02 ~ June 25, 2018

Reviewed By : Kevin Guo
(Kevin Guo)
Approved By : Robin Wu
(Robin Wu)



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	Note
1805RSU006-U1	Rev. 01	Initial report	06-25-2018	Valid

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§2.1033 General Information

Applicant:	SINOTEK CO., LTD.
Applicant Address:	Industry Zone, High and New Technology Industry Development Zone, Zhaoqing City, Guangdong Province 526238, P.R.China
Manufacturer:	SINOTEK CO., LTD.
Manufacturer Address:	Industry Zone, High and New Technology Industry Development Zone, Zhaoqing City, Guangdong Province 526238, 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.:	893164
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 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-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 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.	MATA-1E
Serial Model No.	MATA-1E-10, MATA-1E-8, MATA-1E-6, MATA-1E-2
Frequency Range	433.92MHz
Type of modulation	FSK
Antenna Type	Integral Antenna
Device Category	Fixed Device

Note: All the different model samples have the same designation and hardware, but it will be shown different model name for different marketing.

2.2. Test Standards

The following report is prepared on behalf of the **SINOTEK 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

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 device is permanently attached.
- There are no provisions for connection to an external antenna.

Conclusion:

The device complies with the requirement of §15.203.

4. TEST EQUIPMENT CALIBRATION DATA

Radiated Emissions – AC1

Instrument	Manufacturer	Type No.	Serial No.	Cali. Interval	Cali. Due Date
Spectrum Analyzer	Agilent	N9020A	MY52090106	1 year	2019/04/20
EMI Test Receiver	R&S	ESR 3.6	102030	1 year	2019/04/20
Preamplifier	Schwarzbeck	BBV 9718	302	1 year	2018/11/17
Preamplifier	Schwarzbeck	BBV9721	9721-008	1 year	2019/06/13
Loop Antenna	Schwarzbeck	FMZB1519	1519-041	1 year	2018/11/20
Bilog Period Antenna	Schwarzbeck	VULB 9168	662	1 year	2019/04/12
Broad-Band Horn Antenna	Schwarzbeck	BBHA9120D	1457	1 year	2018/11/18
Broadband Horn Antenna	Schwarzbeck	BBHA9170	BBHA9170549	1 year	2018/12/14
Temperature/Humidity Meter	Yuhuaze	ETH529	N/A	1 year	2018/12/12
Anechoic Chamber	TDK	Chamber-AC1	N/A	1 year	2019/05/02

20dB Bandwidth

Instrument	Manufacturer	Type No.	Serial 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
Temperature/Humidity Meter	Yuhuaze	ETH529	N/A	1 year	2018/12/12

Transmission Time – AC1

Instrument	Manufacturer	Type No.	Serial 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
Temperature/Humidity Meter	Yuhuaze	ETH529	N/A	1 year	2018/12/12

Duty Cycle – AC1

Instrument	Manufacturer	Type No.	Serial 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
Temperature/Humidity Meter	Yuhuaze	ETH529	N/A	1 year	2018/12/12

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: SINOTEK CO., LTD

FCC ID: 2AP2YMATA-1E

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 / 99% 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.

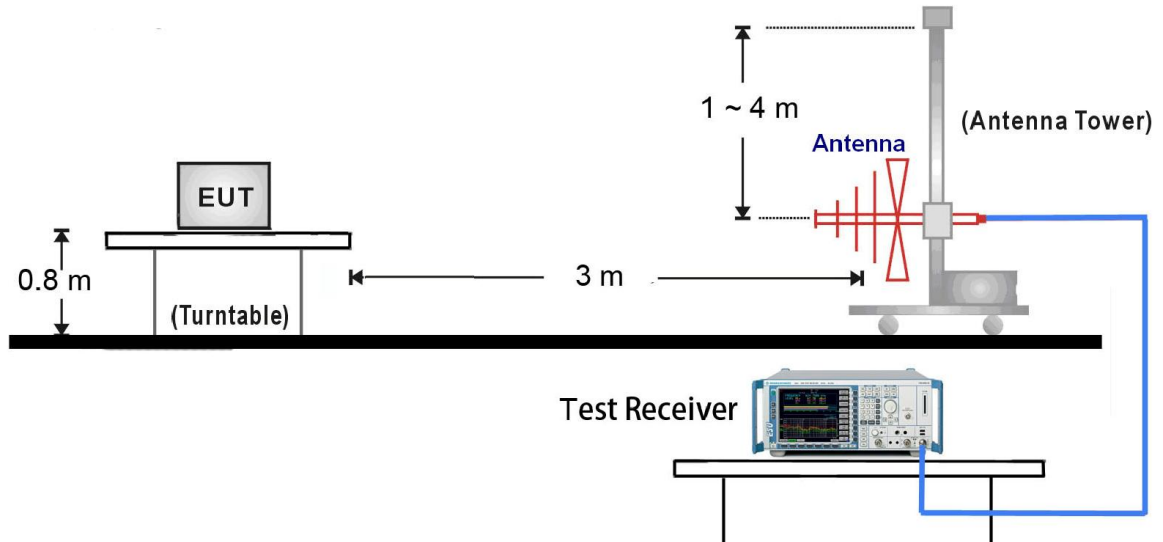
6.2.2. Test Procedure

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.

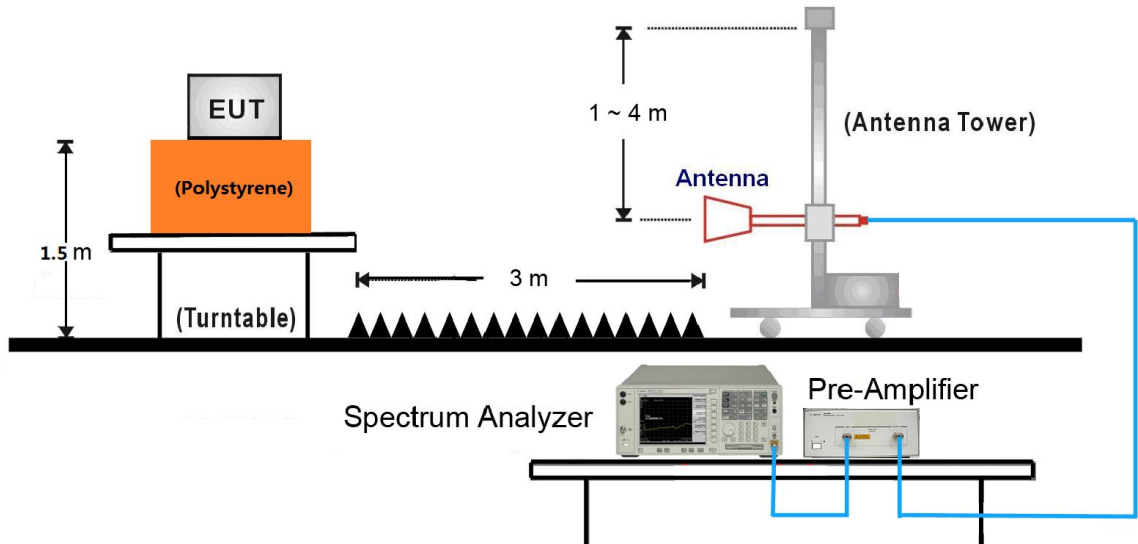
6.2.3. Test Setup

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:

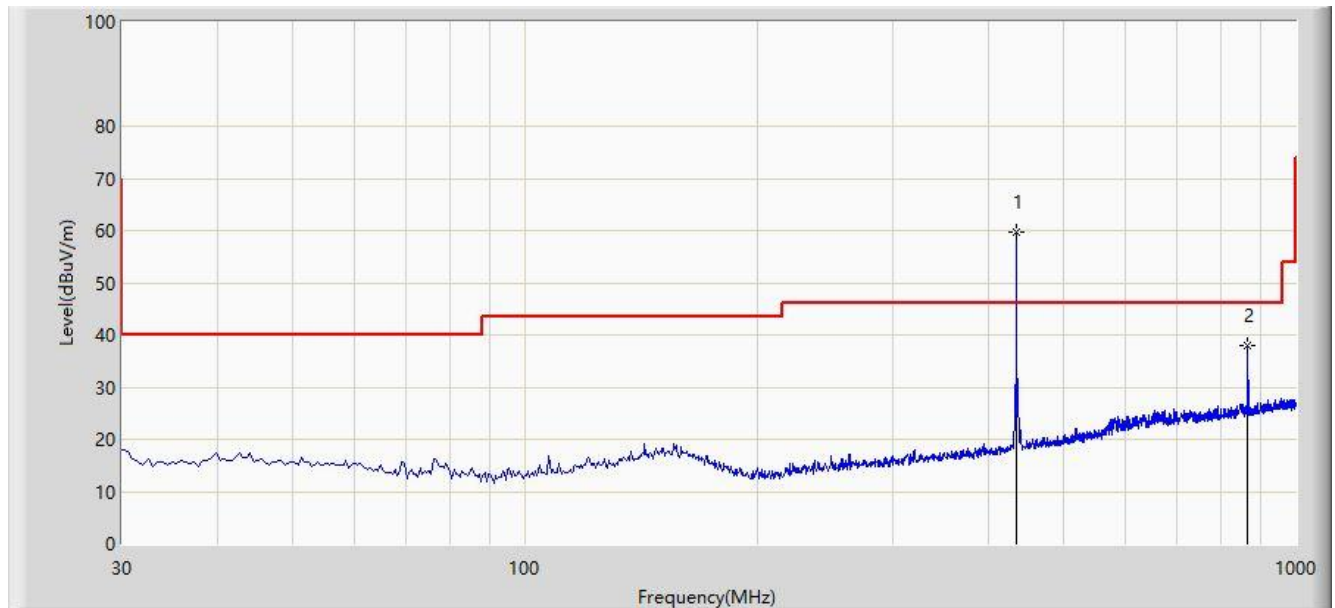


1GHz ~ 25GHz Test Setup:



6.2.4. Test Results

Site: AC1	Time: 2018/06/02 - 20:11
Limit: FCC_Part15.209_RE(3m)	Engineer: Dandy Li
Probe: VULB 9168 _20-2000MHz	Polarity: Horizontal
EUT: Tire Pressure Monitoring System	Power: By Battery
Test Mode: Transmit at 433.92MHz FSK	



No	Frequency (MHz)	Reading Level (dBuV)	Factor (dB)	Dutycycle Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Type
1	434.005	42.113	17.508	N/A	59.621	92.866	-33.245	PK
	434.005	42.113	17.508	10.87	48.751	72.866	-24.115	AV
2	868.080	14.101	23.952	N/A	38.053	72.866	-34.813	PK
	868.080	14.101	23.952	10.87	27.183	52.866	-25.683	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.

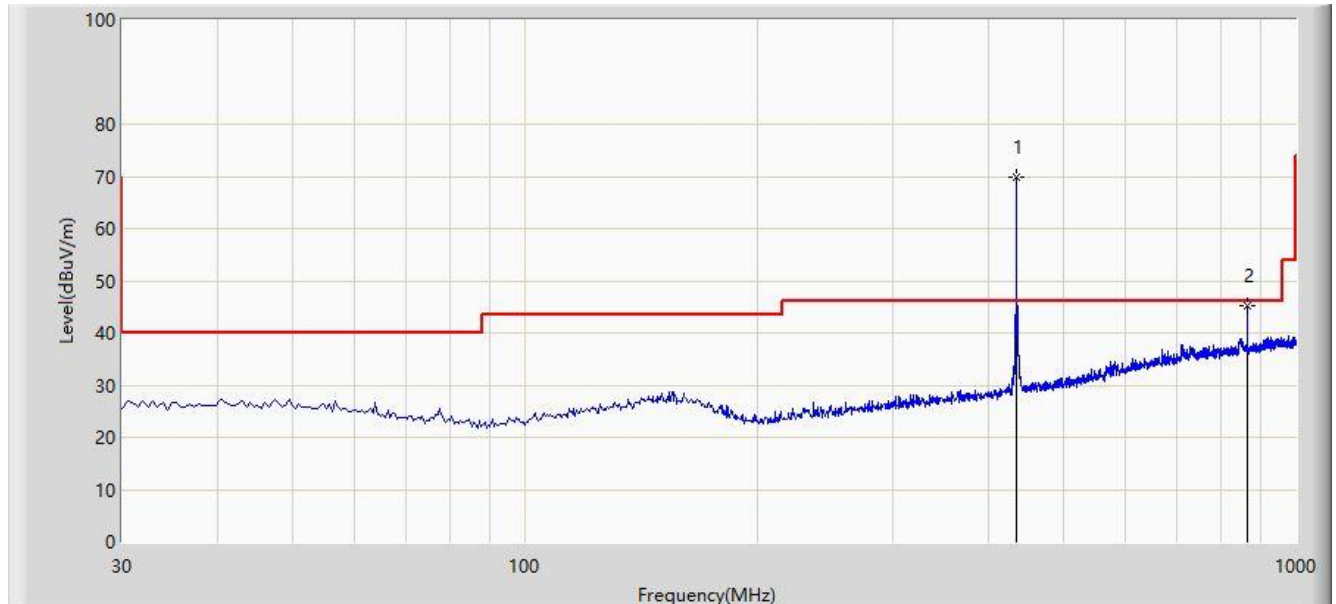
Note 2: The fundamental frequency is 434MHz, so the fundamental and spurious emissions radiated limit base on the operating frequency 434MHz.

Note 3: 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: 2018/06/02 - 20:19
Limit: FCC_Part15.209_RE(3m)	Engineer: Dandy Li
Probe: VULB 9168 _20-2000MHz	Polarity: Vertical
EUT: Tire Pressure Monitoring System	Power: By Battery
Test Mode: Transmit at 433.92MHz FSK	



No	Frequency (MHz)	Reading Level (dBuV)	Factor (dB)	Dutycycle Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Type
1	434.005	52.432	17.508	N/A	69.940	92.866	-22.926	PK
	434.005	52.432	17.508	10.87	59.07	72.866	-13.796	AV
2	868.080	21.216	23.945	N/A	45.161	72.866	-27.705	PK
	868.080	21.216	23.945	10.87	34.291	52.866	-18.575	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.

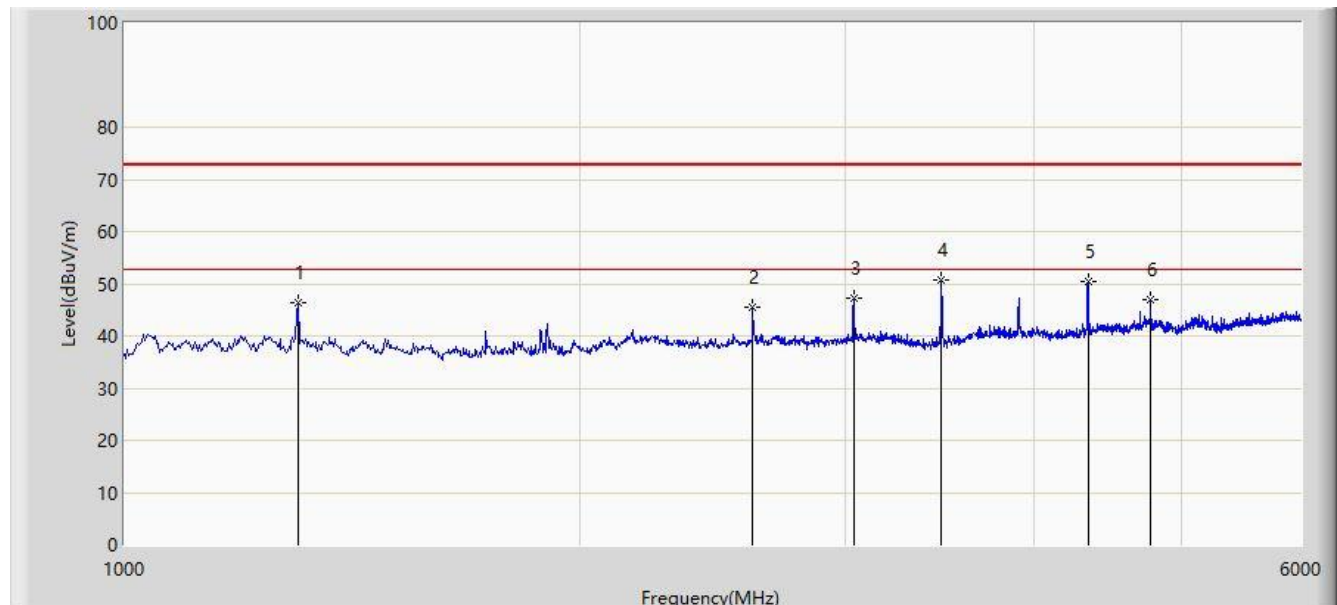
Note 2: The fundamental frequency is 434MHz, so the fundamental and spurious emissions radiated limit base on the operating frequency 434MHz.

Note 3: 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: 2018/06/02 - 17:22
Limit: FCC 15.231	Engineer: Dandy Li
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: Tire Pressure Monitoring System	Power: By Battery
Test Mode: Transmit at 433.92MHz FSK	



No	Frequency (MHz)	Reading Level (dBuV)	Factor (dB)	Dutycycle Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Type
1	1302.500	50.506	-4.110	N/A	46.396	72.866	-26.470	PK
	1302.500	50.506	-4.110	10.87	35.526	52.866	-17.340	AV
2	2602.500	17.602	27.804	N/A	45.406	72.866	-27.460	PK
	2602.500	17.602	27.804	10.87	34.536	52.866	-18.330	AV
3	3037.500	18.702	28.605	N/A	47.307	72.866	-25.559	PK
	3037.500	18.702	28.605	10.87	36.437	52.866	-16.429	AV
4	3472.500	49.178	1.539	N/A	50.716	72.866	-22.150	PK
	3472.500	49.178	1.539	10.87	39.846	52.866	-13.020	AV
5	4340.000	19.984	30.482	N/A	50.466	72.866	-22.400	PK
	4340.000	19.984	30.482	10.87	39.596	52.866	-13.270	AV
6	4772.500	15.363	31.480	N/A	46.843	72.866	-26.023	PK
	4772.500	15.363	31.480	10.87	35.973	52.866	-16.893	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.

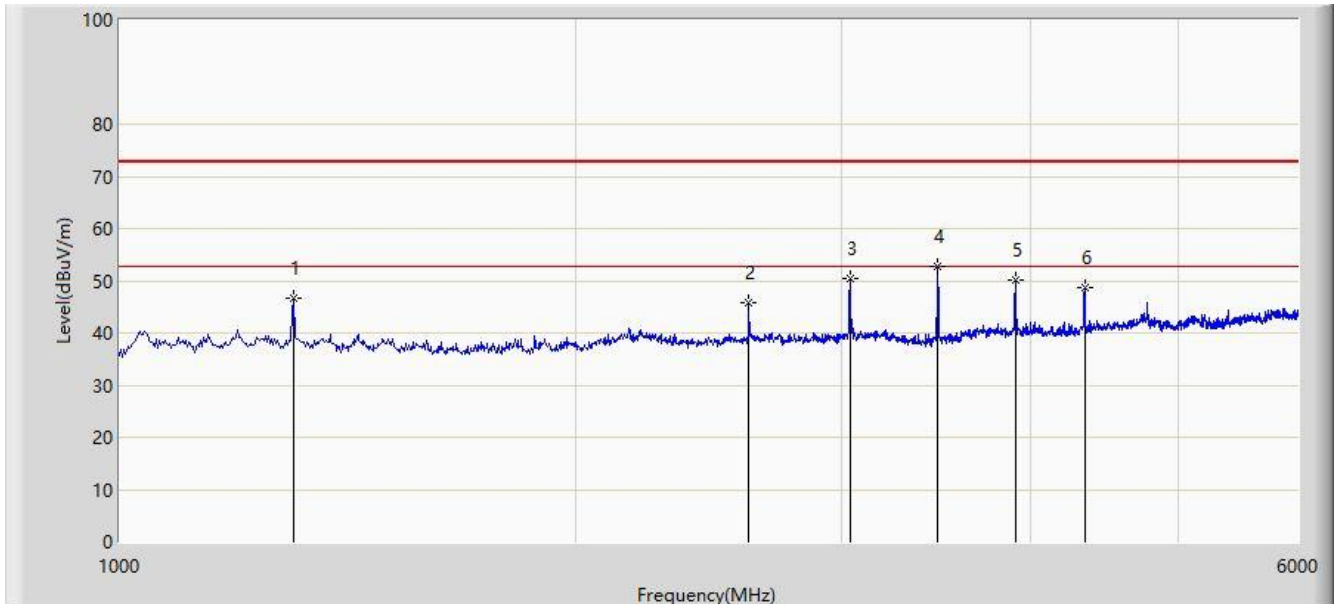
Note 2: The fundamental frequency is 434MHz, so the fundamental and spurious emissions radiated limit base on the operating frequency 434MHz.

Note 3: Peak Measure Level (dBuV/m) = Reading Level (dBuV) + 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: 2018/06/02 - 17:31
Limit: FCC 15.231	Engineer: Dandy Li
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: Tire Pressure Monitoring System	Power: By Battery
Test Mode: Transmit at 433.92MHz FSK	



No	Frequency (MHz)	Reading Level (dBuV)	Factor (dB)	Dutycycle Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Type
1	1302.500	50.729	-4.110	N/A	46.619	72.866	-26.247	PK
	1302.500	50.729	-4.110	10.87	35.749	52.866	-17.117	AV
2	2602.500	46.329	-0.397	N/A	45.932	72.866	-26.934	PK
	2602.500	46.329	-0.397	10.87	35.062	52.866	-17.804	AV
3	3037.500	49.585	0.868	N/A	50.453	72.866	-22.413	PK
	3037.500	49.585	0.868	10.87	39.583	52.866	-13.283	AV
4	3472.500	51.242	1.539	N/A	52.780	72.866	-20.086	PK
	3472.500	51.242	1.539	10.87	41.91	52.866	-10.956	AV
5	3905.000	46.911	3.135	N/A	50.046	72.866	-22.820	PK
	3905.000	46.911	3.135	10.87	39.176	52.866	-13.690	AV
6	4340.000	44.268	4.350	N/A	48.618	72.866	-24.248	PK
	4340.000	44.268	4.350	10.87	37.748	52.866	-15.118	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: Peak Measure Level (dBuV/m) = Reading Level (dBuV) + 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

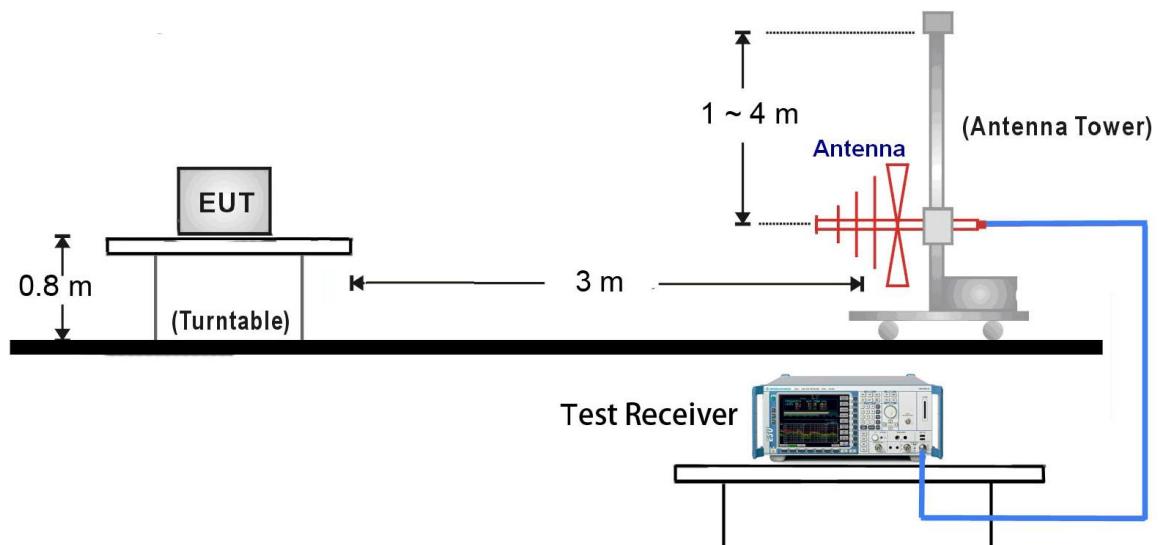
6.3.1. Standard Applicable

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

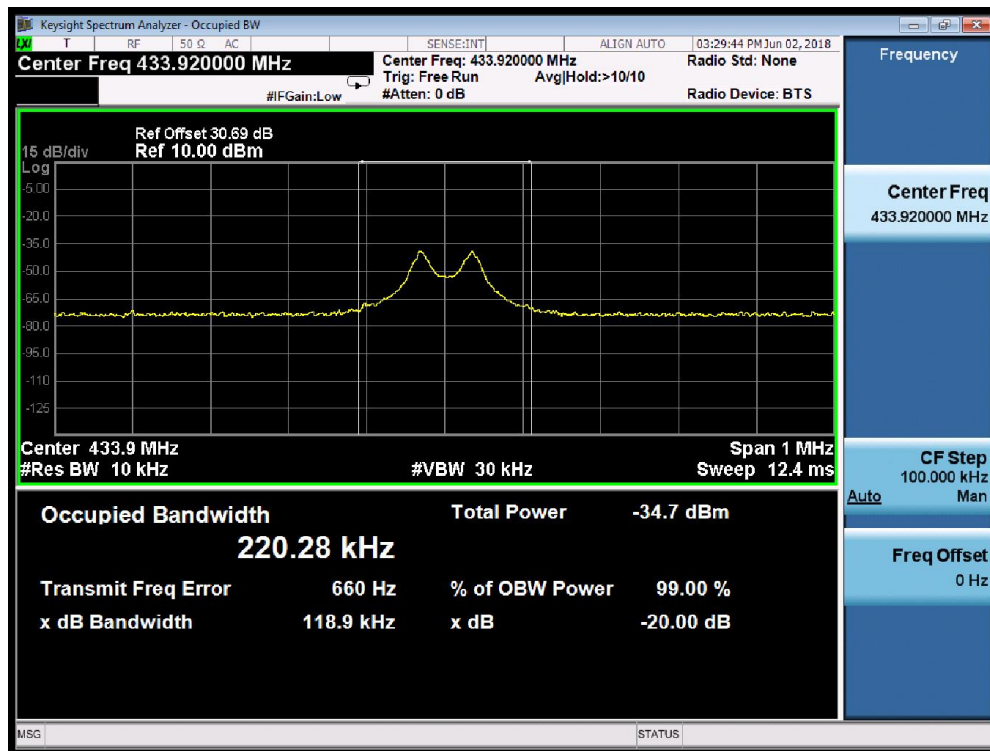


6.3.4. Test Result

Test Frequency (MHz)	Modulation Type	20dB Bandwidth (KHz)	99% Bandwidth (KHz)	Limit (KHz)	Result
433.92	FSK	118.9	220.3	≤1084.8	Pass

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

433.92MHz 20dB Bandwidth Test Plot for FSK



6.4. Transmission Time

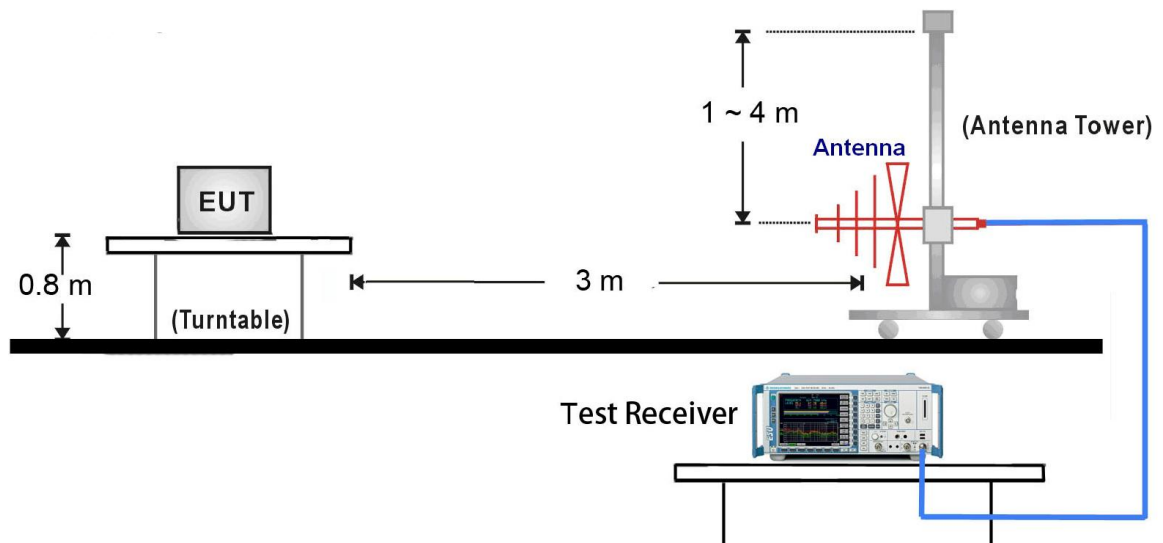
6.4.1. Standard Applicable

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, 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

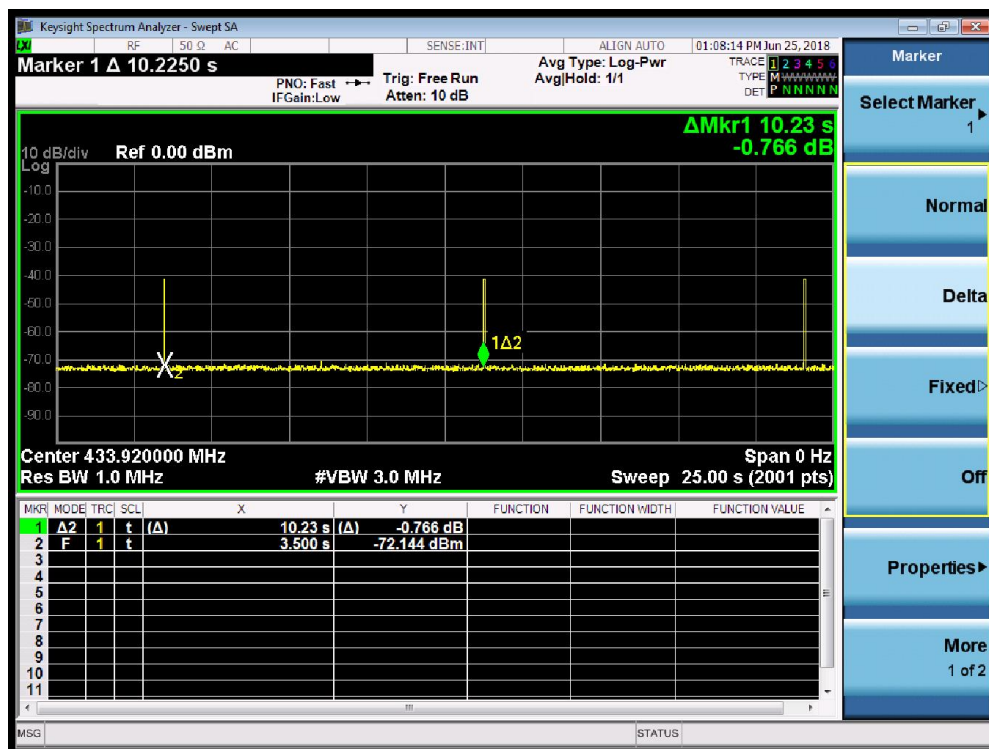


6.4.4. Test Result

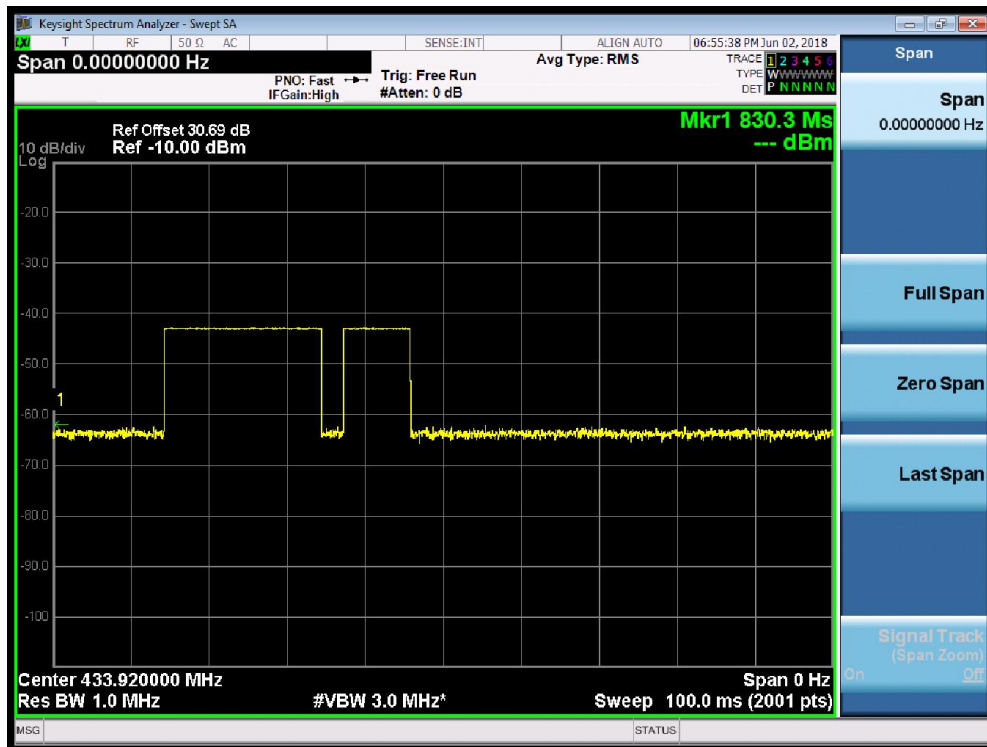
Test Mode	Modulation Type	Item	Measured Value	Limit	Result
433.92MHz	FSK	Transmission Time(T_{on})	28.60ms	≤ 1 s	Pass
		Silent Time	10.23s	≥ 10 s	Pass
		Silent Time/Transmission Time	357	≥ 30 times	Pass

Note: For 433.92MHz FSK Modulation, Transmission time (T_{on}) (ms) = 20.15(ms) + 8.45(ms) = 28.60(ms)

Silent Time for 433.92MHz FSK



Transmission Time for 433.92MHz FSK



6.5. Duty Cycle

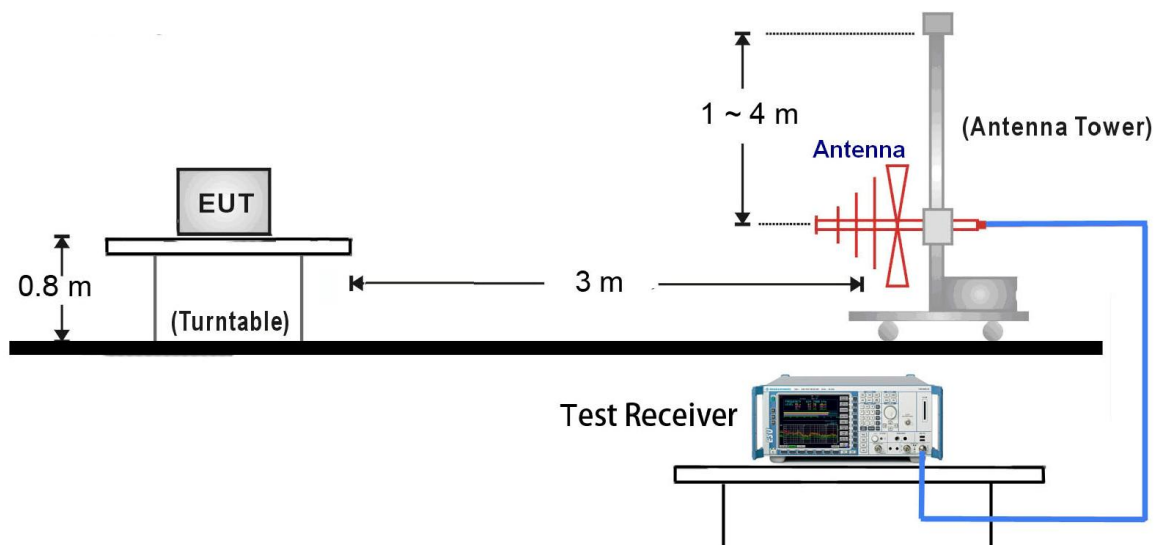
6.5.1. Standard Applicable

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, 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

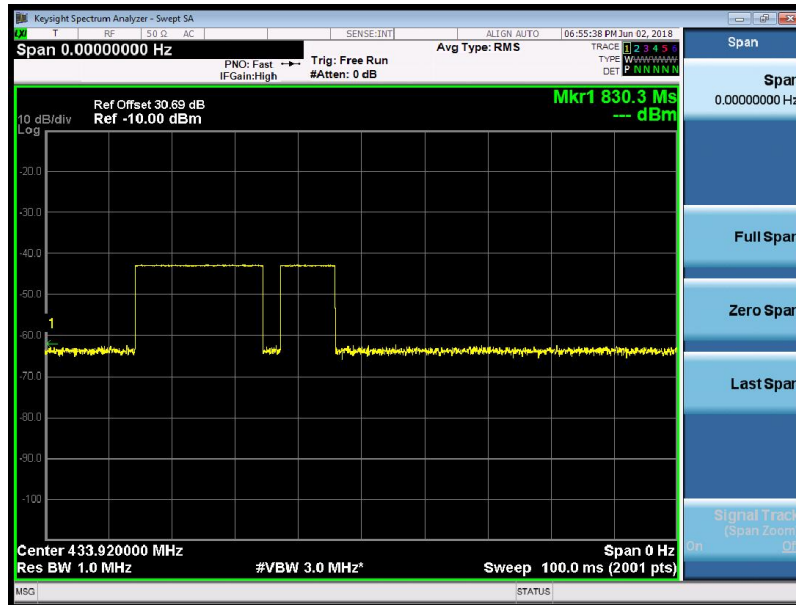


6.5.4. Test Result

Test Mode	Modulation Type	Total Time (T _{on}) (ms)	The duration of one cycle (ms)	Duty Cycle (%)	Duty Cycle Factor (dB)
433.92MHz	FSK	28.60	100	28.60	10.87

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

Width of Pulse for 315MHz FSK



7. CONCLUSION

The data collected relate only the item(s) tested and show that the device is in compliance with FCC Part 15.231(e) of the FCC Rules.

The End