



## MEASUREMENT REPORT

### FCC PART 15.231(e) & RSS 210

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**FCC ID:** TTETSB46

**IC:** 6707A-TSB46

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

**Application Type:** Certification

**Product:** Tire Pressure Monitoring System Sensor

**Model No.:** TSB46

**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:** May 23 ~ June 15, 2017

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	Note
1705RSU04701	Rev. 01	Initial report	06-15-2017	Valid

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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>IC Rule(s):</b>	RSS-210 Issue 9 – Annex A
<b>Model No.</b>	TSB46
<b>FCC ID:</b>	TTETSB46
<b>IC</b>	6707A-TSB46
<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 (A2LACert. 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 Sensor
Model No.	TSB46
Frequency Range	315MHz / 434MHz
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, 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 315MHz ASK Modulation
Mode 2	Transmitting	With 315MHz FSK Modulation
Mode 3	Transmitting	With 434MHz ASK Modulation
Mode 4	Transmitting	With 434MHz 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 **FCC ID: TTETSB46** unit 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	2018/05/08
EMI Test Receiver	R&S	ESR 3.6	102030	1 year	2018/05/08
Preamplifier	Schwarzbeck	BBV 9718	302	1 year	2018/04/16
Preamplifier	Schwarzbeck	BBV9721	9721-008	1 year	2018/04/16
Loop Antenna	Schwarzbeck	FMZB1519	1519-041	1 year	2017/11/21
Bilog Period Antenna	Schwarzbeck	VULB 9168	662	1 year	2017/11/18
Broad-Band Horn Antenna	Schwarzbeck	BBHA9120D	1457	1 year	2017/11/18
Broadband Horn Antenna	Schwarzbeck	BBHA9170	BBHA9170549	1 year	2018/01/03
Temperature/Humidity Meter	Yuhuaze	ETH529	N/A	1 year	2017/12/24
Anechoic Chamber	RIKEN	Chamber-AC2	N/A	1 year	2018/05/10

### 20dB Bandwidth

Instrument	Manufacturer	Type No.	Serial No.	Cali. Interval	Cal. Due. Date
Spectrum Analyzer	Agilent	N9020A	MY52090106	1 year	2018/05/08
Bilog Period Antenna	Schwarzbeck	VULB 9168	662	1 year	2017/11/18
Temperature/Humidity Meter	Yuhuaze	ETH529	N/A	1 year	2017/12/24

### Transmission Time – AC1

Instrument	Manufacturer	Type No.	Serial No.	Cali. Interval	Cal. Due. Date
Spectrum Analyzer	Agilent	N9020A	MY52090106	1 year	2018/05/08
Bilog Period Antenna	Schwarzbeck	VULB 9168	662	1 year	2017/11/18
Temperature/Humidity Meter	Yuhuaze	ETH529	N/A	1 year	2017/12/24

### Duty Cycle – AC1

Instrument	Manufacturer	Type No.	Serial No.	Cali. Interval	Cal. Due. Date
Spectrum Analyzer	Agilent	N9020A	MY52090106	1 year	2018/05/08
Bilog Period Antenna	Schwarzbeck	VULB 9168	662	1 year	2017/11/18
Temperature/Humidity Meter	Yuhuaze	ETH529	N/A	1 year	2017/12/24

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:** TTETSB46  
**IC:** 6707A-TSB46

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 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.

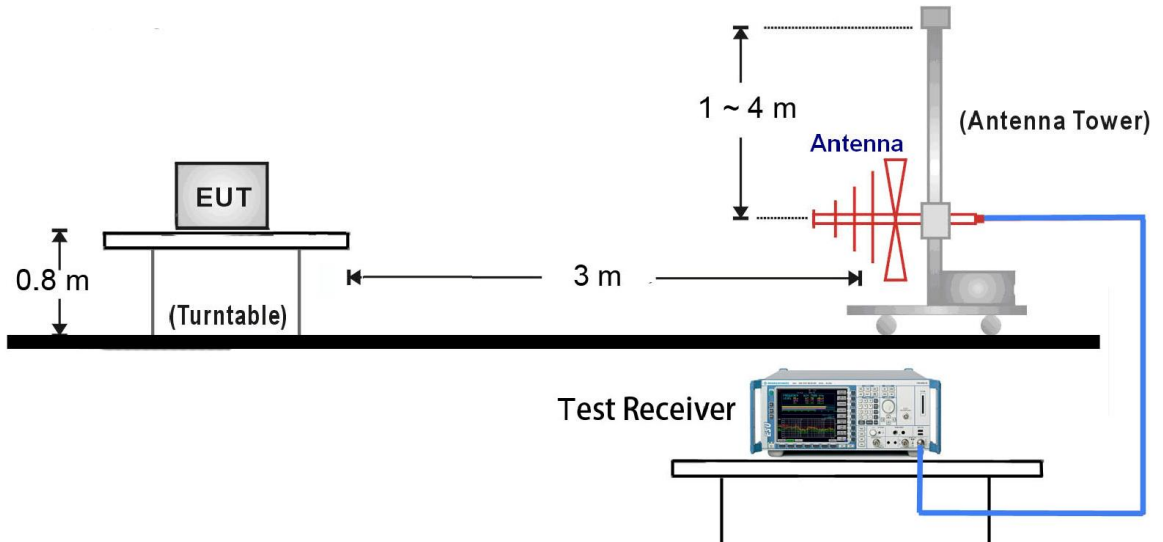
### 6.2.2. Test Procedure

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.

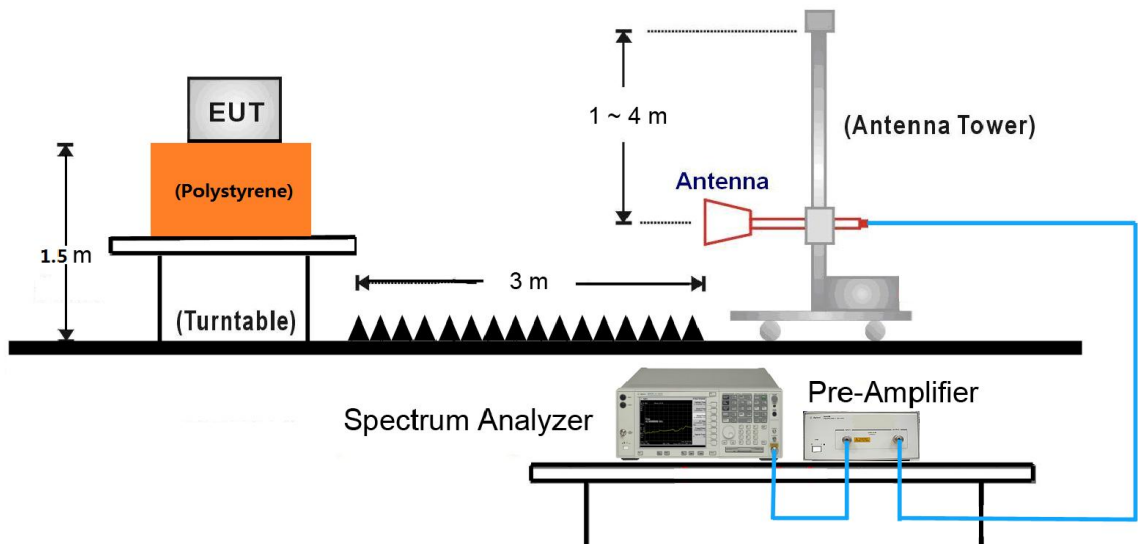
### 6.2.3. Test Setup

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:

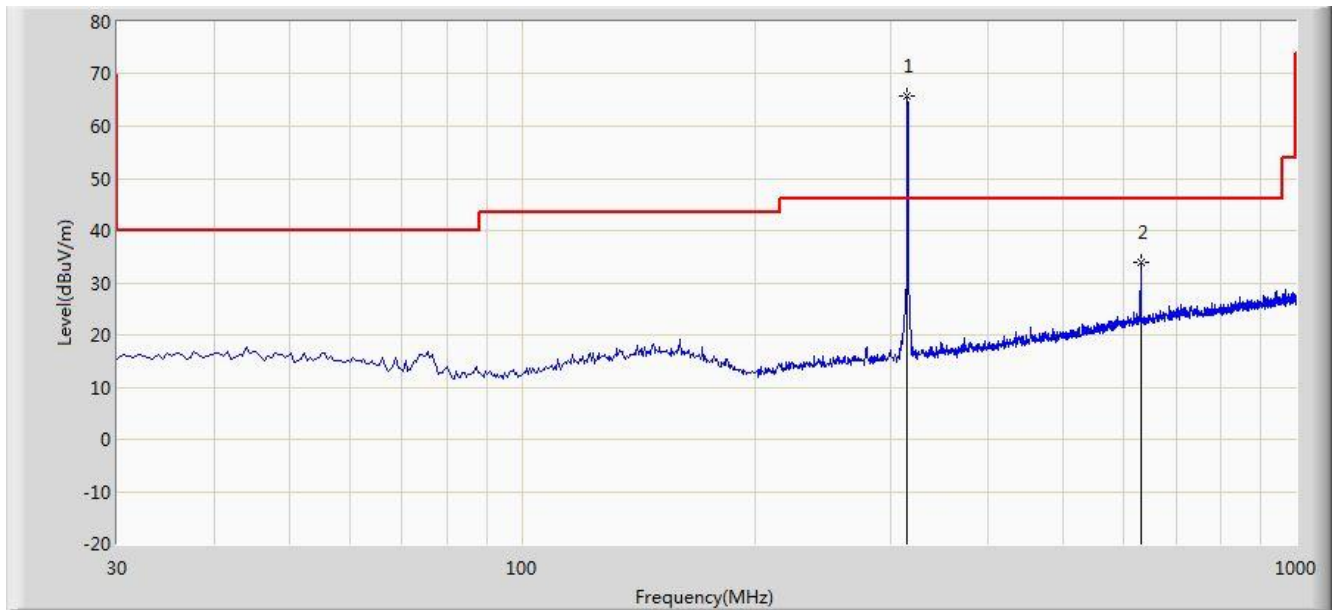


#### 1GHz ~ 25GHz Test Setup:



### 6.2.4. Test Results

Site: AC1	Time: 2017/06/12 - 19:08
Limit: FCC_Part15.209_RE(3m)	Engineer: Alex Ma
Probe: VULB 9168 _20-2000MHz	Polarity: Horizontal
EUT: TSB46	Power: By Battery
Note: Test Mode:315MHz ASK	



No	Frequency (MHz)	Reading Level (dBuV)	Factor (dB)	Dutycycle Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Type
1	314.695	51.224	14.708	N/A	65.932	87.664	-21.732	PK
	314.695	51.224	14.708	17.040	48.892	67.664	-18.772	AV
2	629.945	12.679	21.096	N/A	33.775	67.664	-33.889	PK
	629.945	12.679	21.096	17.040	16.735	47.664	-30.929	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.

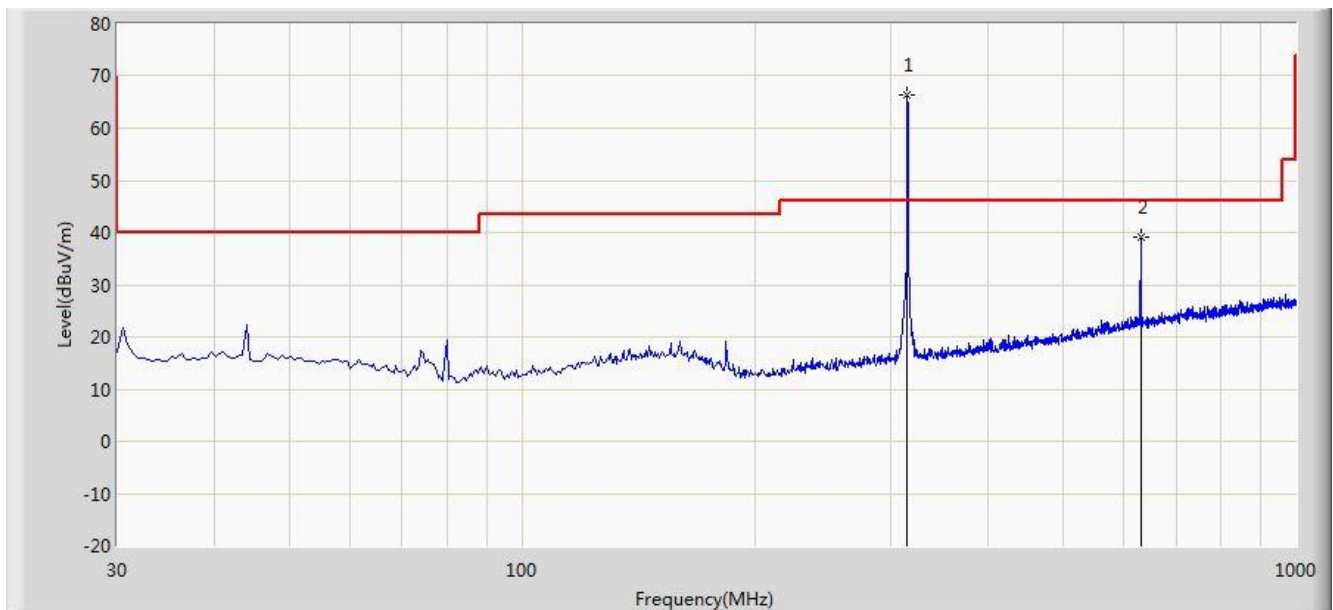
Note 2: The fundamental frequency is 315MHz, so the fundamental and spurious emissions radiated limit base on the operating frequency 315MHz.

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

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

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

Site: AC1	Time: 2017/06/12 - 19:09
Limit: FCC_Part15.209_RE(3m)	Engineer: Alex Ma
Probe: VULB 9168 _20-2000MHz	Polarity: Vertical
EUT: TSB46	Power: By Battery
Note: Test Mode:315MHz ASK	



No	Frequency (MHz)	Reading Level (dBuV)	Factor (dB)	Dutycycle Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Type
1	314.695	51.644	14.708	N/A	66.352	87.664	-21.312	PK
	314.695	51.644	14.708	17.040	49.312	67.664	-18.352	AV
2	629.945	17.904	21.096	N/A	39.000	67.664	-28.664	PK
	629.945	17.904	21.096	17.040	21.960	47.664	-25.704	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.

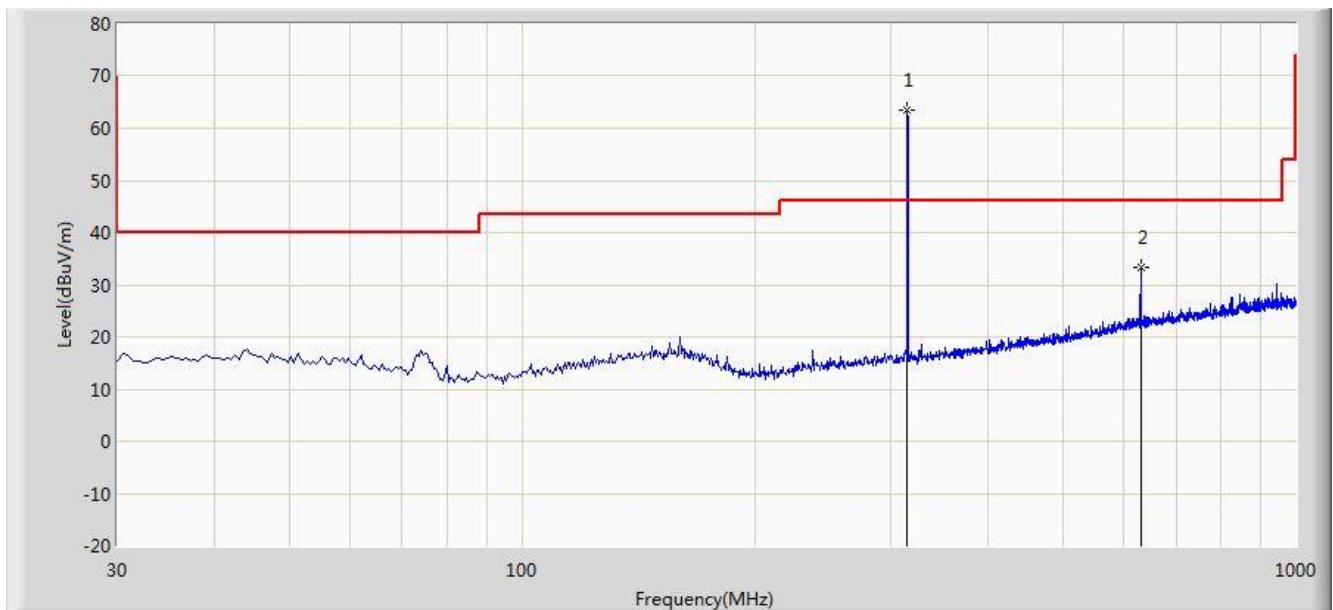
Note 3: Peak Measure Level (dB $\mu$ V/m) = Reading Level (dB $\mu$ V) + Factor (dB).

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

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



Site: AC1	Time: 2017/06/12 - 19:10
Limit: FCC_Part15.209_RE(3m)	Engineer: Alex Ma
Probe: VULB 9168 _20-2000MHz	Polarity: Horizontal
EUT: TSB46	Power: By Battery
Note: Test Mode:315MHz FSK	



No	Frequency (MHz)	Reading Level (dBuV)	Factor (dB)	Dutycycle Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Type
1	314.695	48.809	14.708	N/A	63.517	87.664	-24.147	PK
	314.695	48.809	14.708	16.330	47.187	67.664	-20.477	AV
2	629.945	12.158	21.096	N/A	33.254	67.664	-34.410	PK
	629.945	12.158	21.096	16.330	16.924	47.664	-30.740	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.

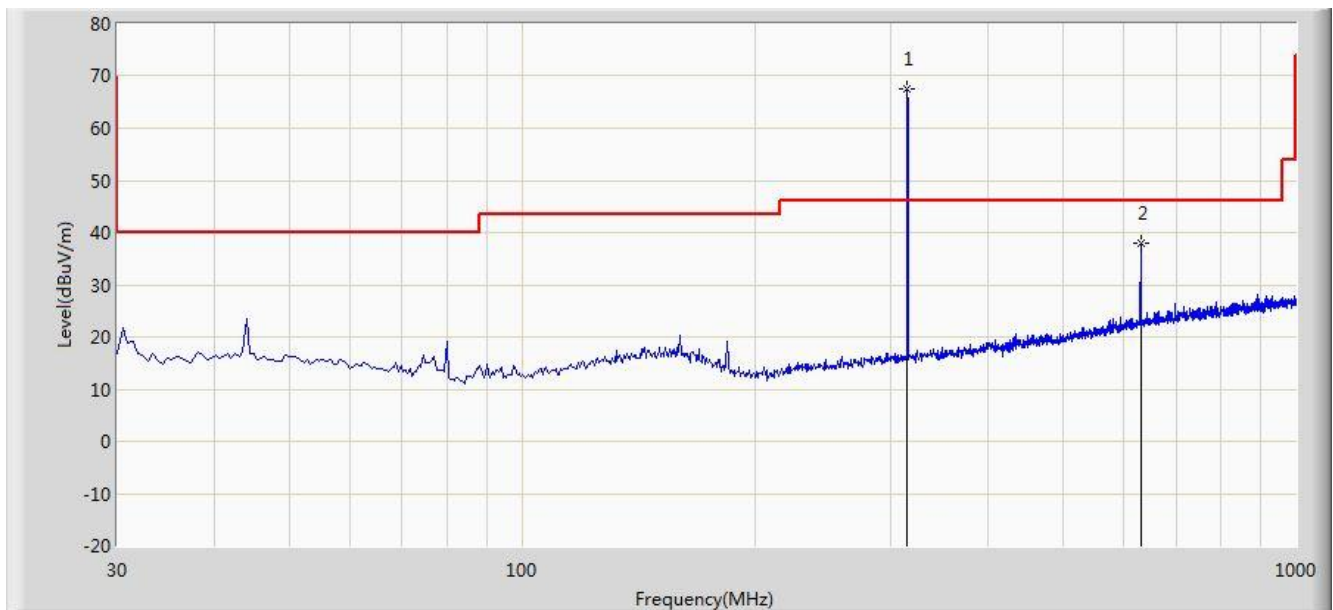
Note 2: The fundamental frequency is 315MHz, so the fundamental and spurious emissions radiated limit base on the operating frequency 315MHz.

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

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

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

Site: AC1	Time: 2017/06/12 - 19:11
Limit: FCC_Part15.209_RE(3m)	Engineer: Alex Ma
Probe: VULB 9168 _20-2000MHz	Polarity: Vertical
EUT: TSB46	Power: By Battery
Note: Test Mode:315MHz FSK	



No	Frequency (MHz)	Reading Level (dBuV)	Factor (dB)	Dutycycle Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Type
1	314.695	52.934	14.708	N/A	67.642	87.664	-20.022	PK
	314.695	52.934	14.708	16.330	51.312	67.664	-16.352	AV
2	629.945	16.962	21.096	N/A	38.058	67.664	-29.606	PK
	629.945	16.962	21.096	16.330	21.728	47.664	-25.936	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.

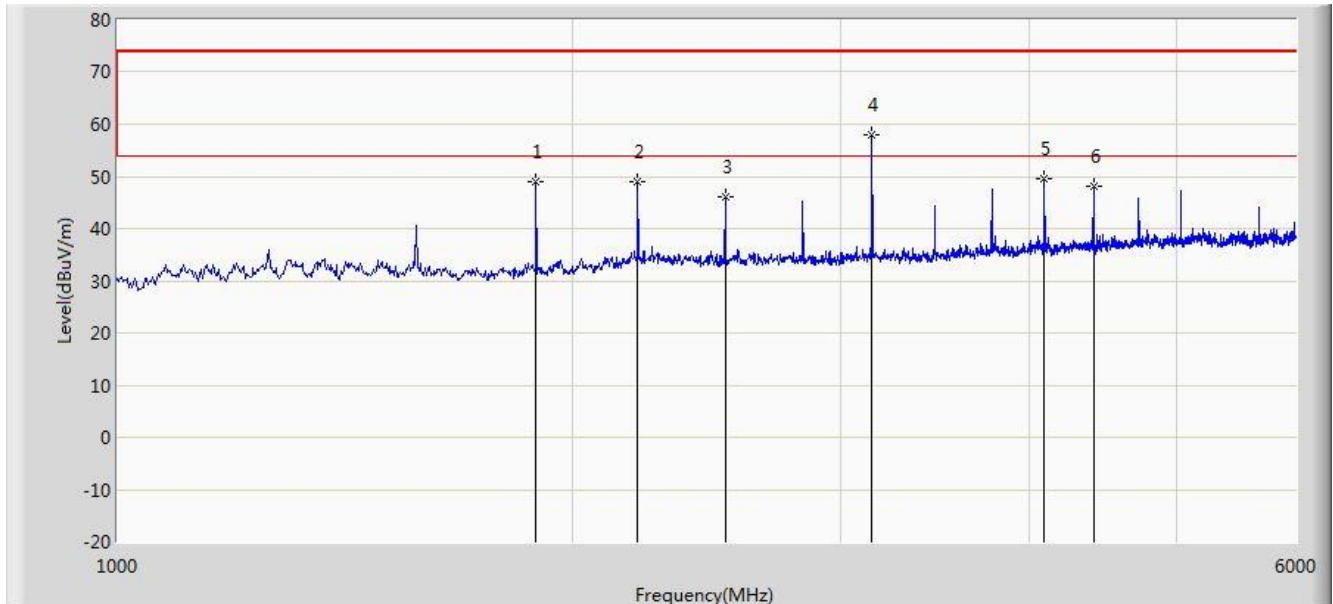
Note 2: The fundamental frequency is 315MHz, so the fundamental and spurious emissions radiated limit base on the operating frequency 315MHz.

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

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

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

Site: AC1	Time: 2017/05/27 - 23:00
Limit: FCC_Part15.209_RE(3m)	Engineer: Alex Ma
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: TSB46	Power: By Battery
Note: Test Mode:315MHz ASK	



No	Frequency (MHz)	Reading Level (dBuV)	Factor (dB)	Dutycycle Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Type
1	1890.000	55.318	-6.366	N/A	48.953	67.664	-18.711	PK
	1890.000	55.318	-6.366	17.040	31.913	47.664	-15.751	AV
2	2205.000	52.615	-3.606	N/A	49.009	67.664	-18.655	PK
	2205.000	52.615	-3.606	17.040	31.969	47.664	-15.695	AV
3	2520.000	49.739	-3.588	N/A	46.151	67.664	-21.513	PK
	2520.000	49.739	-3.588	17.040	29.111	47.664	-18.553	AV
4	3150.000	59.532	-1.534	N/A	57.999	67.664	-9.665	PK
	3150.000	59.532	-1.534	17.040	40.959	47.664	-6.705	AV
5	4095.000	48.984	0.646	N/A	49.630	67.664	-18.034	PK
	4095.000	48.984	0.646	17.040	32.590	47.664	-15.074	AV
6	4410.000	46.836	1.408	N/A	48.244	67.664	-19.420	PK
	4410.000	46.836	1.408	17.040	31.204	47.664	-16.460	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.

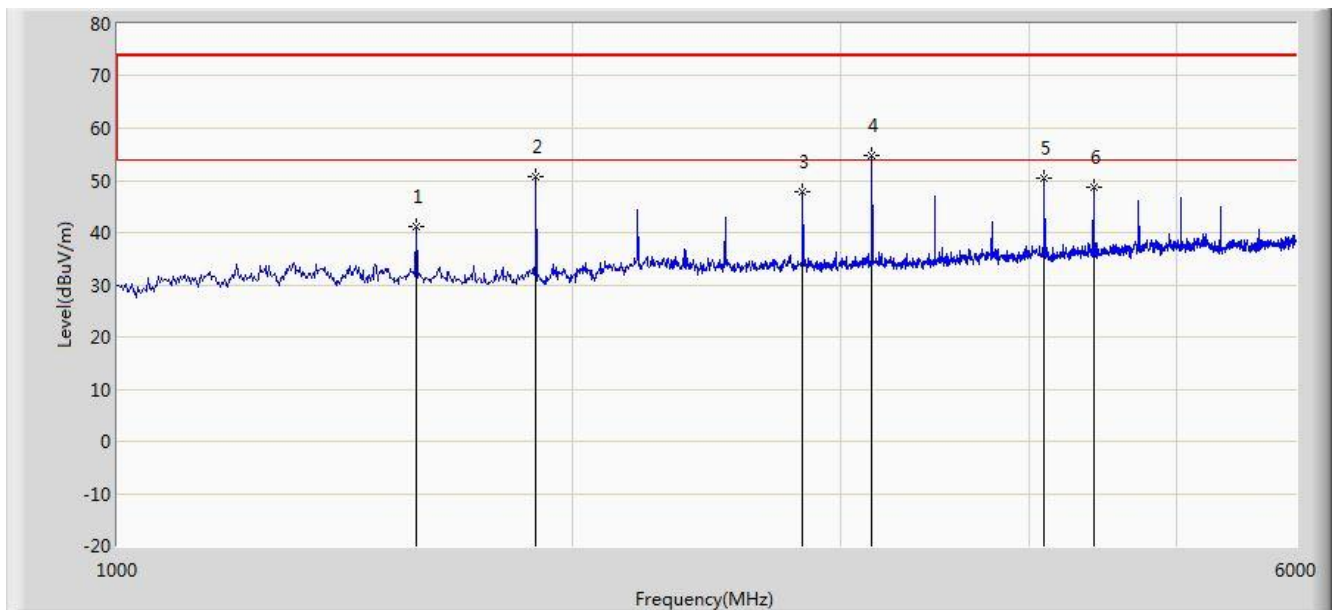
Note 2: The fundamental frequency is 315MHz, so the fundamental and spurious emissions radiated limit base on the operating frequency 315MHz.

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

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: 2017/05/27 - 23:03
Limit: FCC_Part15.209_RE(3m)	Engineer: Alex Ma
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: TSB46	Power: By Battery
Note: Test Mode:315MHz ASK	



No	Frequency (MHz)	Reading Level (dBuV)	Factor (dB)	Dutycycle Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Type
1	1575.000	48.787	-7.683	N/A	41.103	67.664	-26.561	PK
	1575.000	48.787	-7.683	17.040	24.063	47.664	-23.601	AV
2	1890.000	56.959	-6.366	N/A	50.594	67.664	-17.070	PK
	1890.000	56.959	-6.366	17.040	33.554	47.664	-14.110	AV
3	2835.000	50.164	-2.416	N/A	47.748	67.664	-19.916	PK
	2835.000	50.164	-2.416	17.040	30.708	47.664	-16.956	AV
4	3150.000	56.393	-1.534	N/A	54.860	67.664	-12.804	PK
	3150.000	56.393	-1.534	17.040	37.820	47.664	-9.844	AV
5	4095.000	49.653	0.646	N/A	50.299	67.664	-17.365	PK
	4095.000	49.653	0.646	17.040	33.259	47.664	-14.405	AV
6	4410.000	47.288	1.408	N/A	48.696	67.664	-18.968	PK
	4410.000	47.288	1.408	17.040	31.656	47.664	-16.008	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.

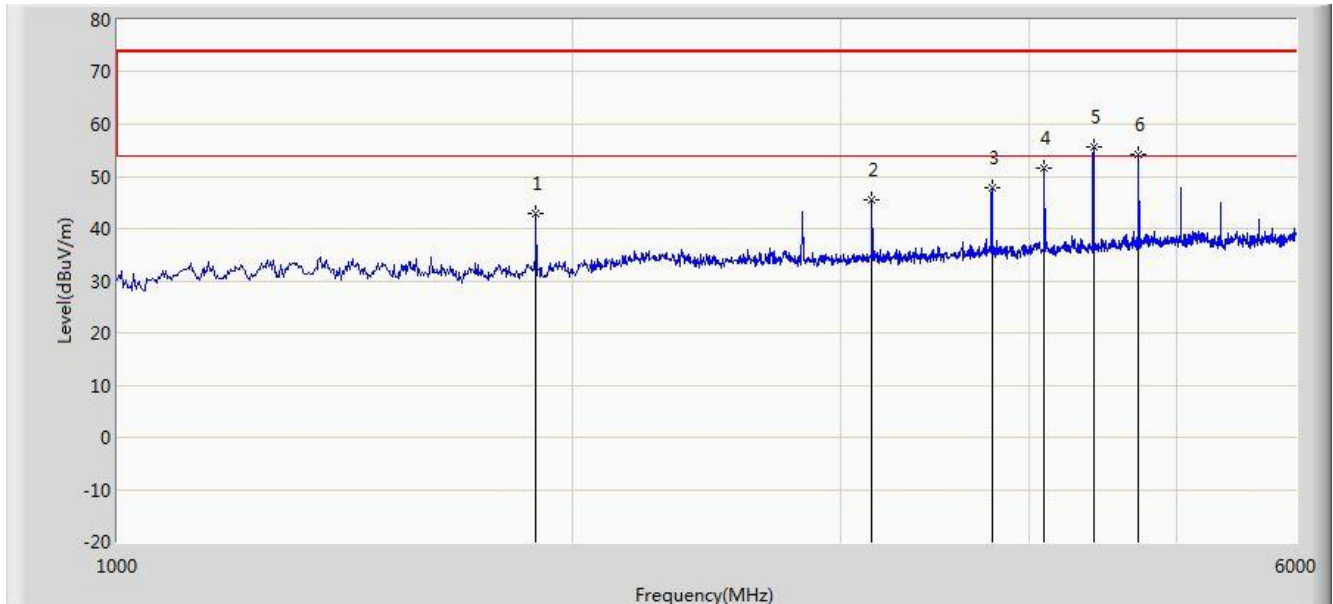
Note 2: The fundamental frequency is 315MHz, so the fundamental and spurious emissions radiated limit base on the operating frequency 315MHz.

Note 3: Peak Measure Level (dB $\mu$ V/m) = Reading Level (dB $\mu$ V) + 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: 2017/05/27 - 22:57
Limit: FCC_Part15.209_RE(3m)	Engineer: Alex Ma
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: TSB46	Power: By Battery
Note: Test Mode:315MHz FSK	



No	Frequency (MHz)	Reading Level (dBuV)	Factor (dB)	Dutycycle Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Type
1	1890.000	49.195	-6.366	N/A	42.830	67.664	-24.834	PK
	1890.000	49.195	-6.366	16.330	26.500	47.664	-21.164	AV
2	3150.000	47.095	-1.534	N/A	45.562	67.664	-22.102	PK
	3150.000	47.095	-1.534	16.330	29.232	47.664	-18.432	AV
3	3780.000	48.002	-0.285	N/A	47.717	67.664	-19.947	PK
	3780.000	48.002	-0.285	16.330	31.387	47.664	-16.277	AV
4	4095.000	51.006	0.646	N/A	51.652	67.664	-16.012	PK
	4095.000	51.006	0.646	16.330	35.322	47.664	-12.342	AV
5	4410.000	54.197	1.408	N/A	55.605	67.664	-12.059	PK
	4410.000	54.197	1.408	16.330	39.275	47.664	-8.389	AV
6	4725.000	51.899	2.445	N/A	54.344	67.664	-13.320	PK
	4725.000	51.899	2.445	16.330	38.014	47.664	-9.650	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.

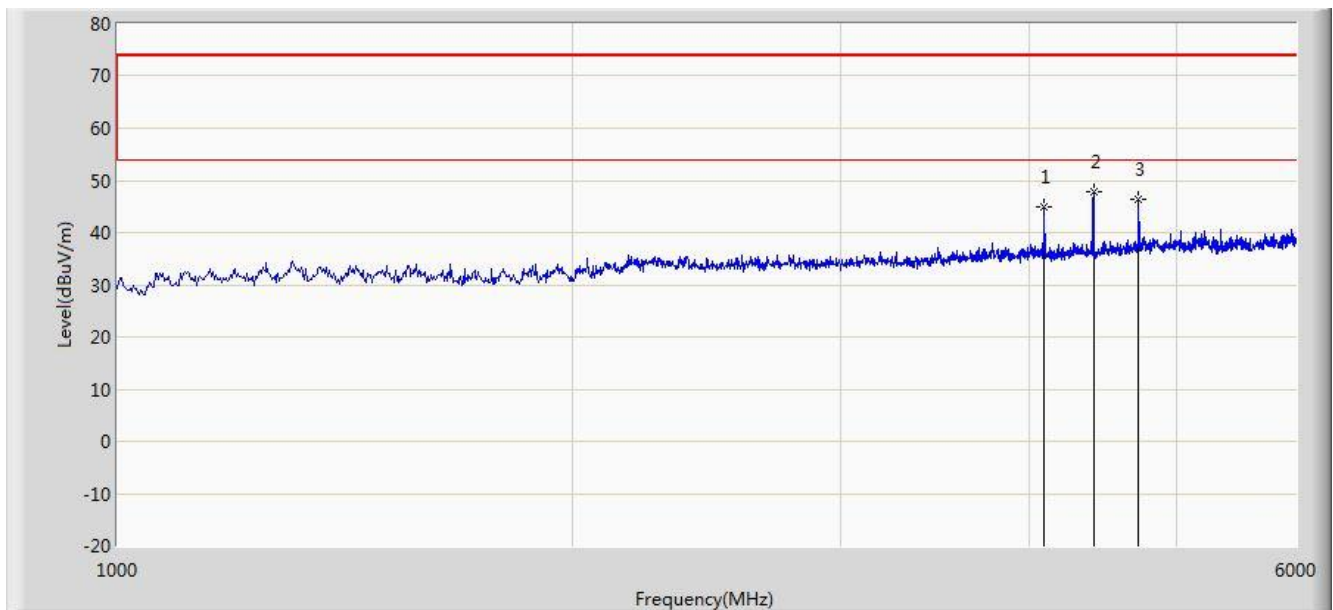
Note 3: Peak Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB).

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: 2017/05/27 - 22:59
Limit: FCC_Part15.209_RE(3m)	Engineer: Alex Ma
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: TSB46	Power: By Battery
Note: Test Mode:315MHz FSK	



No	Frequency (MHz)	Reading Level (dBuV)	Factor (dB)	Dutycycle Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Type
1	4095.000	44.179	0.646	N/A	44.825	67.664	-22.839	PK
	4095.000	44.179	0.646	16.330	28.495	47.664	-19.169	AV
2	4410.000	46.412	1.408	N/A	47.820	67.664	-19.844	PK
	4410.000	46.412	1.408	16.330	31.490	47.664	-16.174	AV
3	4725.000	44.075	2.445	N/A	46.520	67.664	-21.144	PK
	4725.000	44.075	2.445	16.330	30.190	47.664	-17.474	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.

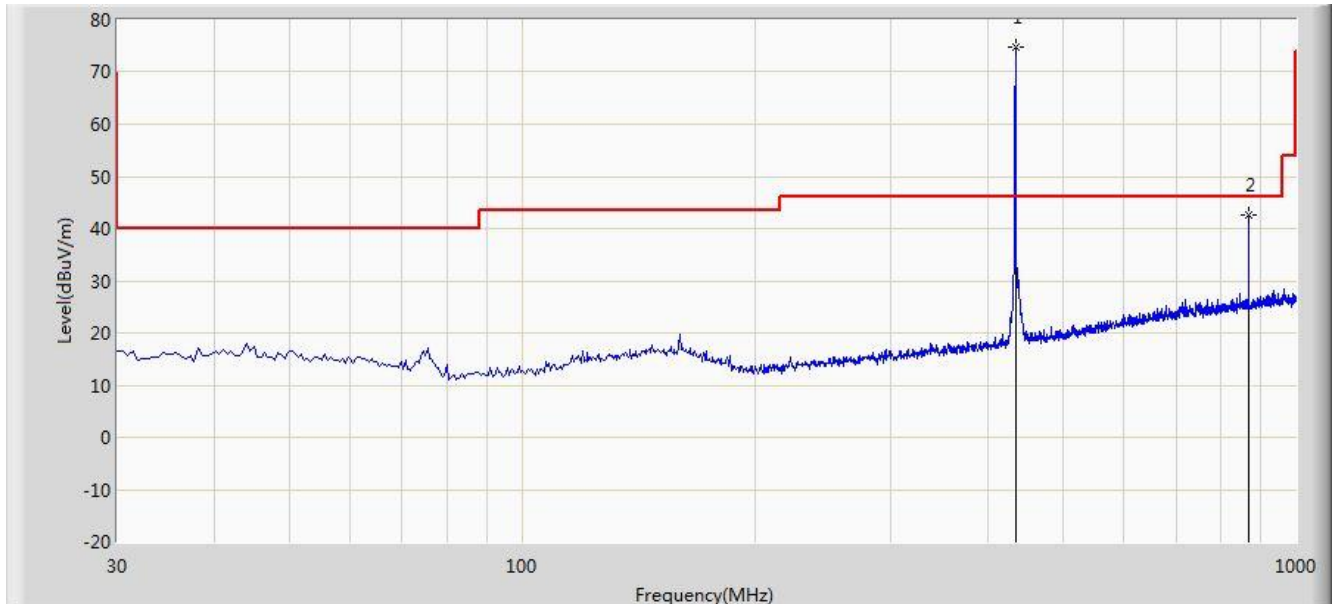
Note 2: The fundamental frequency is 315MHz, so the fundamental and spurious emissions radiated limit base on the operating frequency 315MHz.

Note 3: Peak Measure Level (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: 2017/05/27 - 17:13
Limit: FCC_Part15.209_RE(3m)	Engineer: Alex Ma
Probe: VULB 9168 _20-2000MHz	Polarity: Horizontal
EUT: TSB46	Power: By Battery
Note: 434 ASK	



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	57.460	17.427	N/A	74.887	92.866	-17.979	PK
	434.005	57.460	17.427	16.690	58.197	72.866	-14.669	AV
2	868.080	18.600	23.890	N/A	42.490	72.866	-30.376	PK
	868.080	18.600	23.890	16.690	25.800	52.866	-27.066	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.

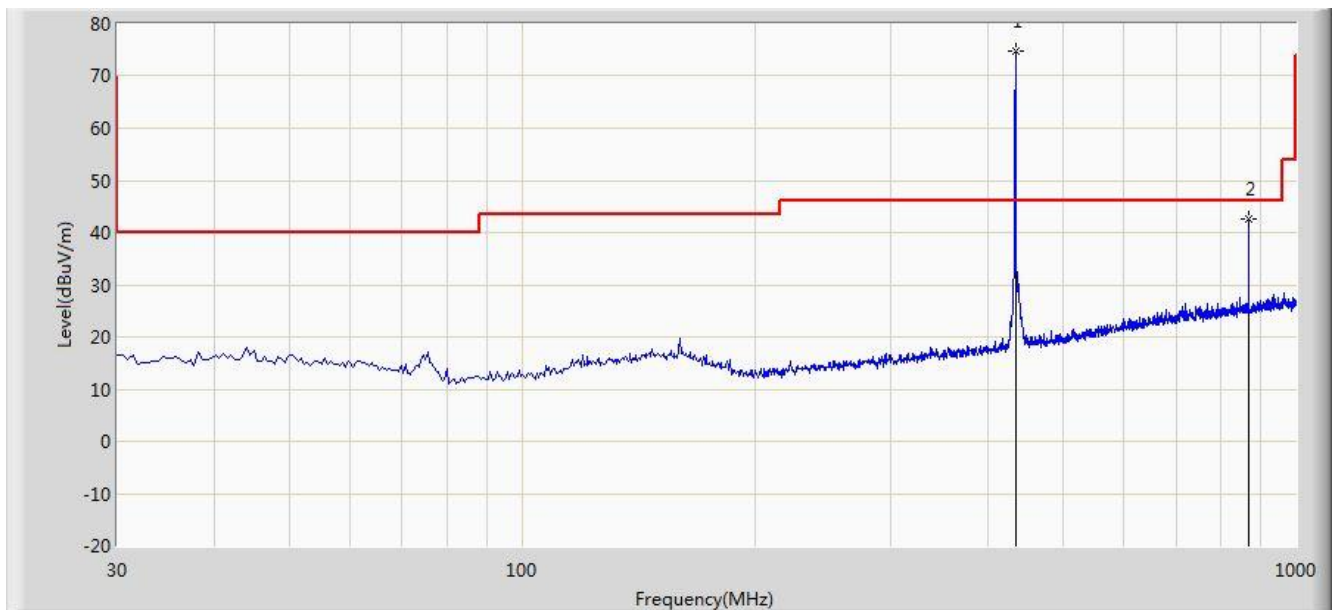
Note 2: The fundamental frequency is 434MHz, so the fundamental and spurious emissions radiated limit base on the operating frequency 434MHz.

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: 2017/05/27 - 17:16
Limit: FCC_Part15.209_RE(3m)	Engineer: Alex Ma
Probe: VULB 9168 _20-2000MHz	Polarity: Vertical
EUT: TSB46	Power: By Battery
Note: 434 ASK	



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	53.694	17.427	N/A	71.121	92.866	-21.745	PK
	434.005	53.694	17.427	16.690	54.431	72.866	-18.435	AV
2	868.080	10.677	23.890	N/A	34.567	72.866	-38.299	PK
	868.080	10.677	23.890	16.690	17.877	52.866	-34.989	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.

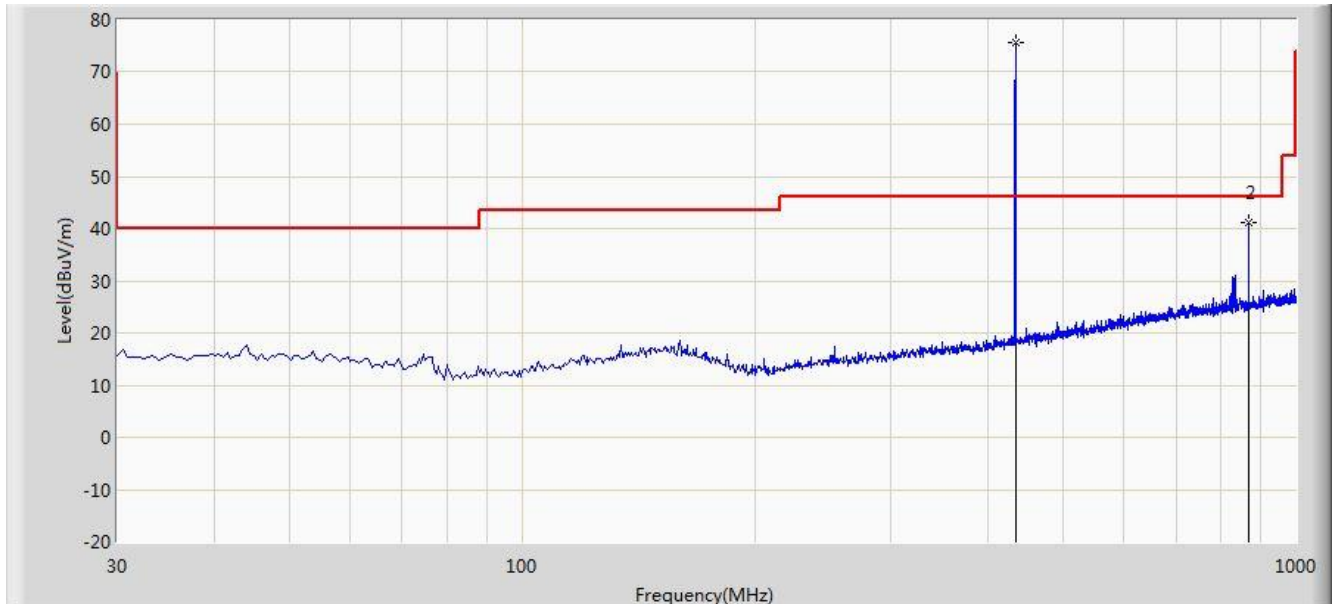
Note 2: The fundamental frequency is 434MHz, so the fundamental and spurious emissions radiated limit base on the operating frequency 434MHz.

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

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

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

Site: AC1	Time: 2017/06/12 - 19:17
Limit: FCC_Part15.209_RE(3m)	Engineer: Alex Ma
Probe: VULB 9168 _20-2000MHz	Polarity: Horizontal
EUT: TSB46	Power: By Battery
Note: 434 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	58.211	17.427	N/A	75.638	92.866	-17.228	PK
	434.005	58.211	17.427	16.310	59.328	72.866	-13.538	AV
2	868.080	17.258	23.890	N/A	41.148	72.866	-31.718	PK
	868.080	17.258	23.890	16.310	24.838	52.866	-28.028	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.

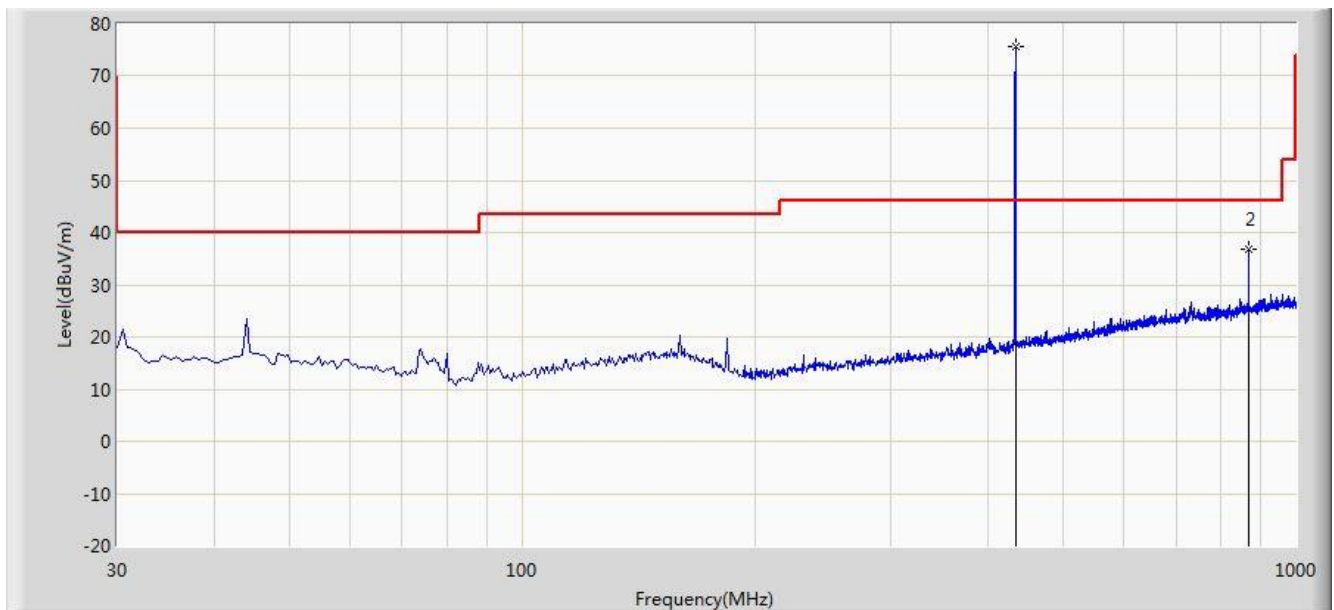
Note 2: The fundamental frequency is 434MHz, so the fundamental and spurious emissions radiated limit base on the operating frequency 434MHz.

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

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

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

Site: AC1	Time: 2017/06/12 - 19:18
Limit: FCC_Part15.209_RE(3m)	Engineer: Alex Ma
Probe: VULB 9168 _20-2000MHz	Polarity: Vertical
EUT: TSB46	Power: By Battery
Note: 434 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	58.144	17.427	N/A	75.571	92.866	-17.295	PK
	434.005	58.144	17.427	16.310	59.261	72.866	-13.605	AV
2	868.080	13.051	23.890	N/A	36.941	72.866	-35.925	PK
	868.080	13.051	23.890	16.310	20.631	52.866	-32.235	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.

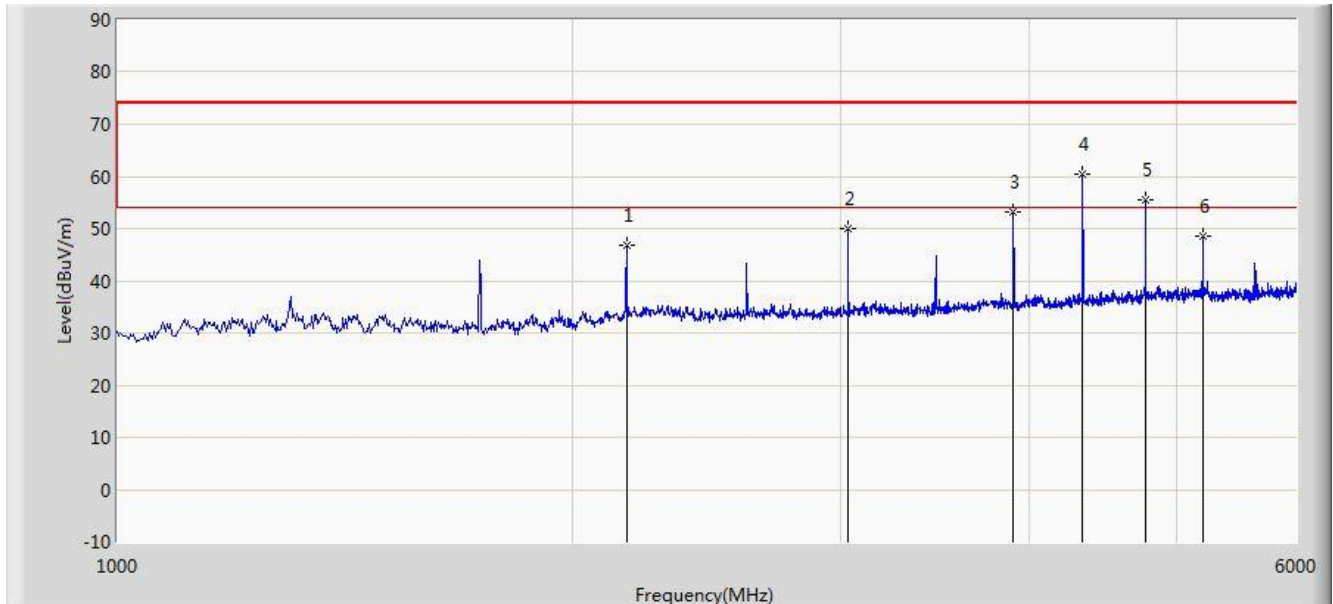
Note 2: The fundamental frequency is 434MHz, so the fundamental and spurious emissions radiated limit base on the operating frequency 434MHz.

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: 2017/05/27 - 22:53
Limit: FCC_Part15.209_RE(3m)	Engineer: Alex Ma
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: TSB46	Power: By Battery
Note: 434 ASK	



No	Frequency (MHz)	Reading Level (dBuV)	Factor (dB)	Dutycycle Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Type
1	2170.000	50.637	-3.940	N/A	46.697	72.866	-26.169	PK
	2170.000	50.637	-3.940	16.690	30.007	52.866	-22.859	AV
2	3037.500	52.082	-2.042	N/A	50.040	72.866	-22.826	PK
	3037.500	52.082	-2.042	16.690	33.350	52.866	-19.516	AV
3	3905.000	52.934	0.208	N/A	53.141	72.866	-19.725	PK
	3905.000	52.934	0.208	16.690	36.451	52.866	-16.415	AV
4	4340.000	59.130	1.286	N/A	60.416	72.866	-12.450	PK
	4340.000	59.130	1.286	16.690	43.726	52.866	-9.140	AV
5	4772.500	52.788	2.638	N/A	55.427	72.866	-17.439	PK
	4772.500	52.788	2.638	16.690	38.737	52.866	-14.129	AV
6	5207.500	45.356	3.232	N/A	48.588	72.866	-24.278	PK
	5207.500	45.356	3.232	16.690	31.898	52.866	-20.968	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.

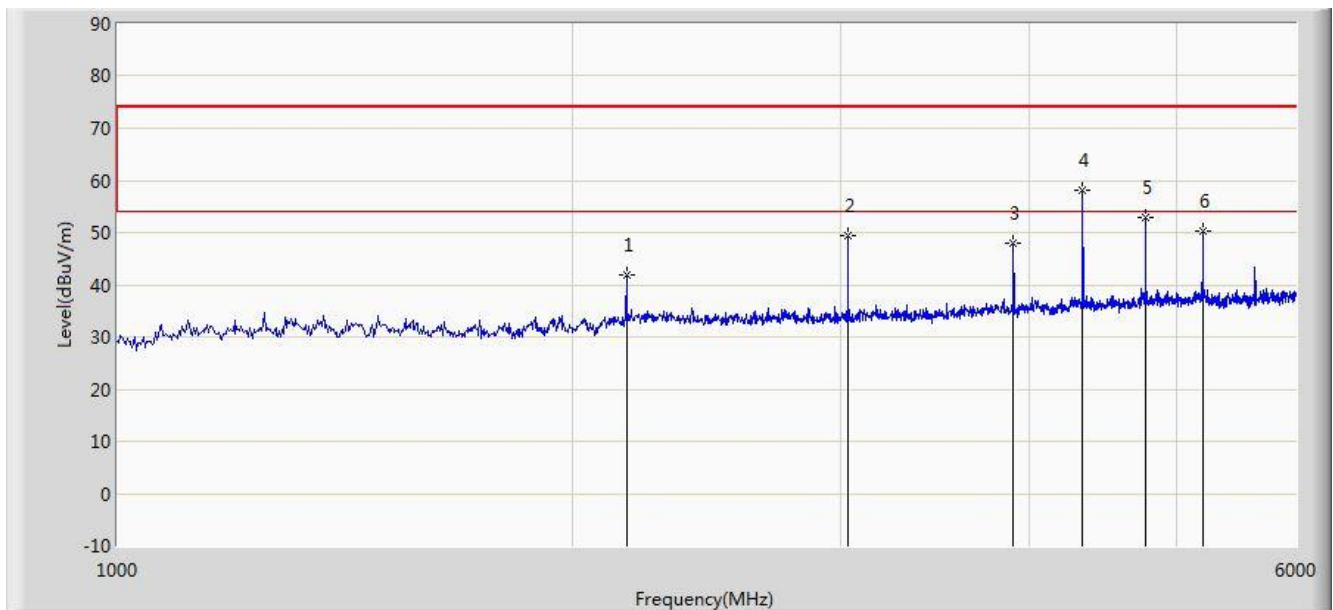
Note 2: The fundamental frequency is 434MHz, so the fundamental and spurious emissions radiated limit base on the operating frequency 434MHz.

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: 2017/05/27 - 22:55
Limit: FCC_Part15.209_RE(3m)	Engineer: Alex Ma
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: TSB46	Power: By Battery
Note: 434 ASK	



No	Frequency (MHz)	Reading Level (dBuV)	Factor (dB)	Dutycycle Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Type
1	2170.000	45.768	-3.940	N/A	41.828	72.866	-31.038	PK
	2170.000	45.768	-3.940	16.690	25.138	52.866	-27.728	AV
2	3037.500	51.330	-2.042	N/A	49.288	72.866	-23.578	PK
	3037.500	51.330	-2.042	16.690	32.598	52.866	-20.268	AV
3	3905.000	47.740	0.208	N/A	47.947	72.866	-24.919	PK
	3905.000	47.740	0.208	16.690	31.257	52.866	-21.609	AV
4	4340.000	56.699	1.286	N/A	57.985	72.866	-14.881	PK
	4340.000	56.699	1.286	16.690	41.295	52.866	-11.571	AV
5	4772.500	50.134	2.638	N/A	52.773	72.866	-20.093	PK
	4772.500	50.134	2.638	16.690	36.083	52.866	-16.783	AV
6	5207.500	47.094	3.232	N/A	50.326	72.866	-22.540	PK
	5207.500	47.094	3.232	16.690	33.636	52.866	-19.230	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.

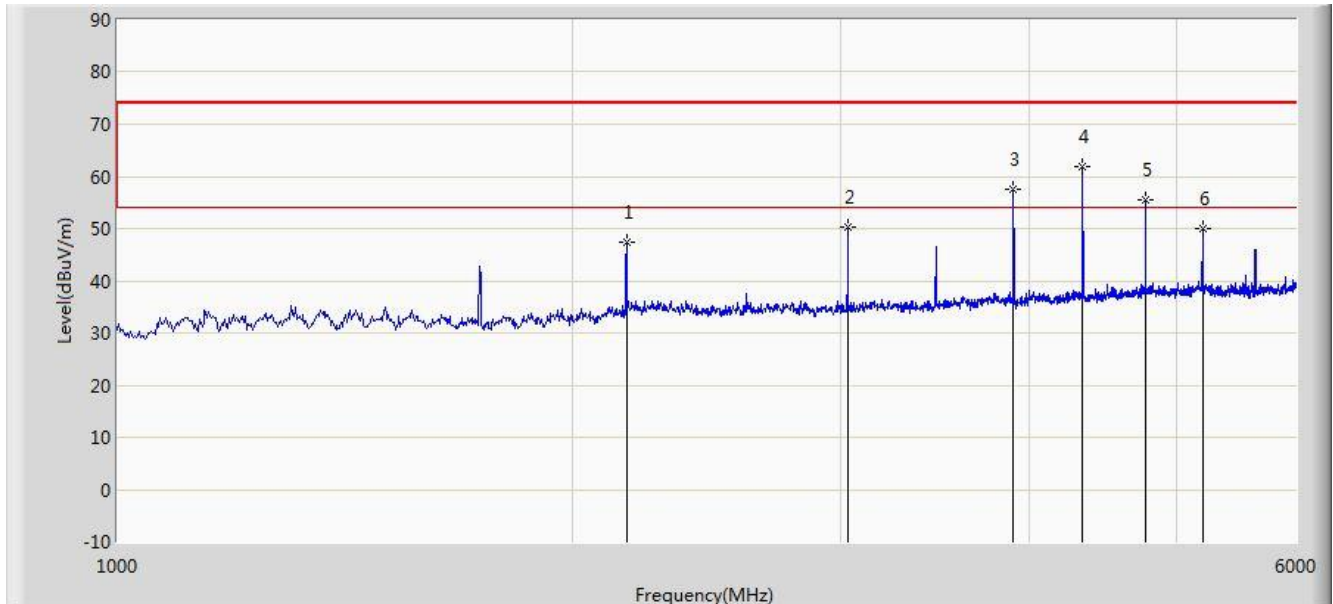


Note 3: Peak Measure Level (dB $\mu$ V/m) = Reading Level (dB $\mu$ V) + Factor (dB).

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: 2017/05/27 - 22:39
Limit: FCC_Part15.209_RE(3m)	Engineer: Alex Ma
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: TSB46	Power: By Battery
Note: 434 FSK	



No	Frequency (MHz)	Reading Level (dBuV)	Factor (dB)	Dutycycle Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Type
1	2170.000	51.389	-3.940	N/A	47.449	72.866	-25.417	PK
	2170.000	51.389	-3.940	16.310	31.139	52.866	-21.727	AV
2	3037.500	52.276	-2.042	N/A	50.234	72.866	-22.632	PK
	3037.500	52.276	-2.042	16.310	33.924	52.866	-18.942	AV
3	3905.000	57.202	0.208	N/A	57.409	72.866	-15.457	PK
	3905.000	57.202	0.208	16.310	41.099	52.866	-11.767	AV
4	4337.500	60.503	1.281	N/A	61.785	72.866	-11.081	PK
	4337.500	60.503	1.281	16.310	45.475	52.866	-7.391	AV
5	4772.500	52.786	2.638	N/A	55.425	72.866	-17.441	PK
	4772.500	52.786	2.638	16.310	39.115	52.866	-13.751	AV
6	5207.500	46.664	3.232	N/A	49.896	72.866	-22.970	PK
	5207.500	46.664	3.232	16.310	33.586	52.866	-19.280	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.

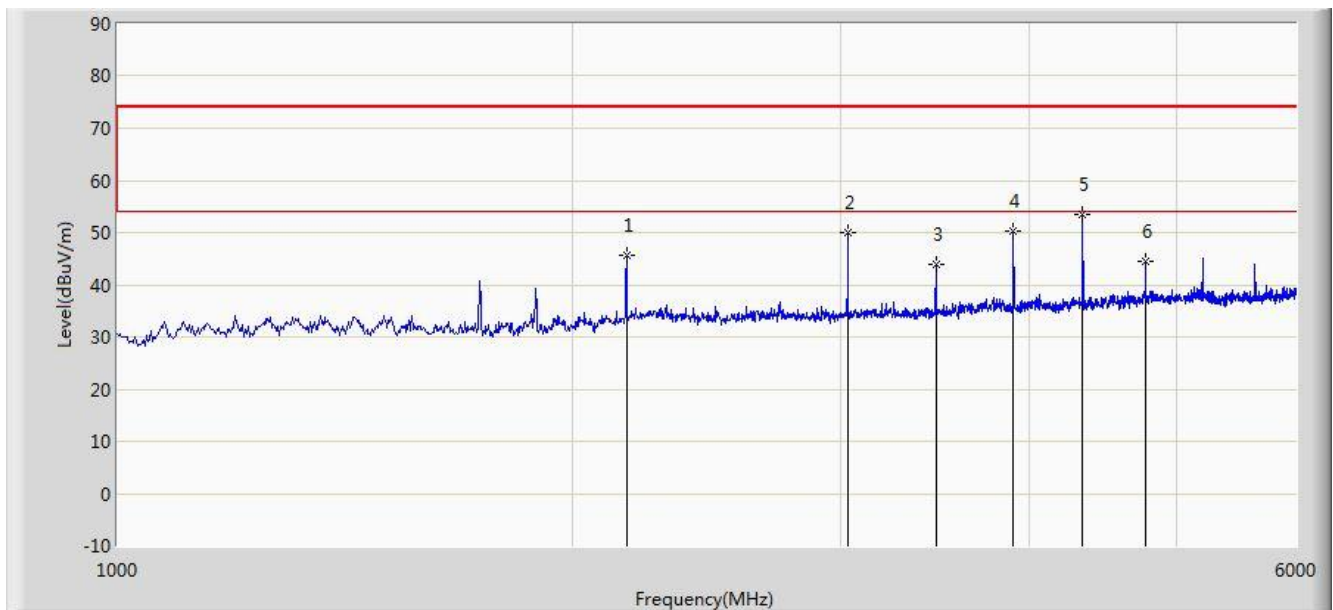
Note 2: The fundamental frequency is 434MHz, so the fundamental and spurious emissions radiated limit base on the operating frequency 434MHz.

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: 2017/05/27 - 22:41
Limit: FCC_Part15.209_RE(3m)	Engineer: Alex Ma
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: TSB46	Power: By Battery
Note: 434 FSK	



No	Frequency (MHz)	Reading Level (dBuV)	Factor (dB)	Dutycycle Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Type
1	2170.000	49.476	-3.940	N/A	45.536	72.866	-27.330	PK
	2170.000	49.476	-3.940	16.310	29.226	52.866	-23.640	AV
2	3037.500	52.023	-2.042	N/A	49.981	72.866	-22.885	PK
	3037.500	52.023	-2.042	16.310	33.671	52.866	-19.195	AV
3	3470.000	45.071	-1.300	N/A	43.771	72.866	-29.095	PK
	3470.000	45.071	-1.300	16.310	27.461	52.866	-25.405	AV
4	3905.000	50.023	0.208	N/A	50.230	72.866	-22.636	PK
	3905.000	50.023	0.208	16.310	33.920	52.866	-18.946	AV
5	4340.000	52.278	1.286	N/A	53.564	72.866	-19.302	PK
	4340.000	52.278	1.286	16.310	37.254	52.866	-15.612	AV
6	4772.500	41.907	2.638	N/A	44.546	72.866	-28.320	PK
	4772.500	41.907	2.638	16.310	28.236	52.866	-24.630	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 (dB $\mu$ V/m) = Reading Level (dB $\mu$ V) + 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

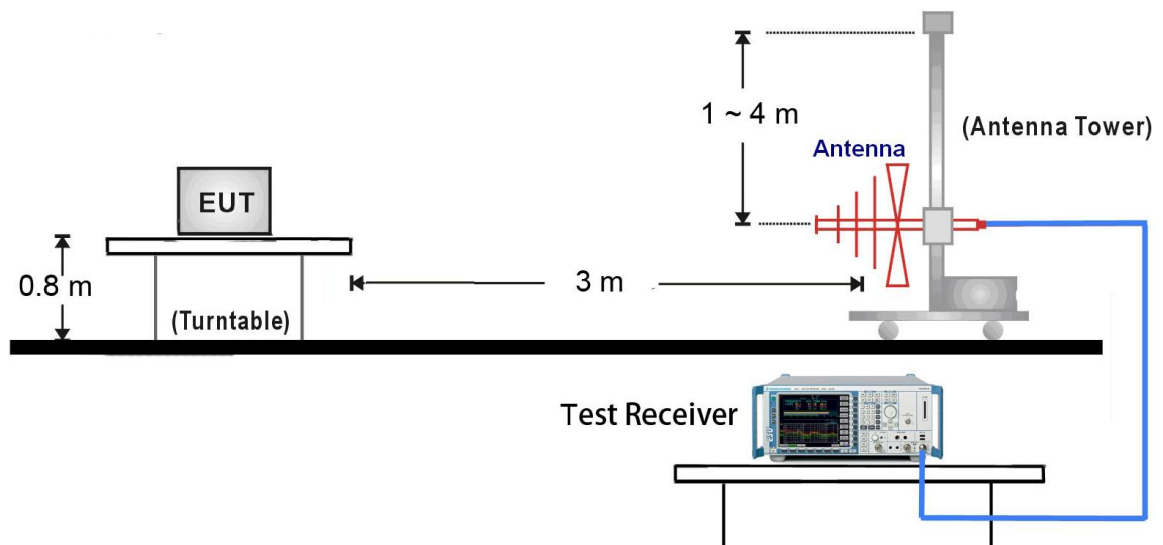
#### 6.3.1. Standard Applicable

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



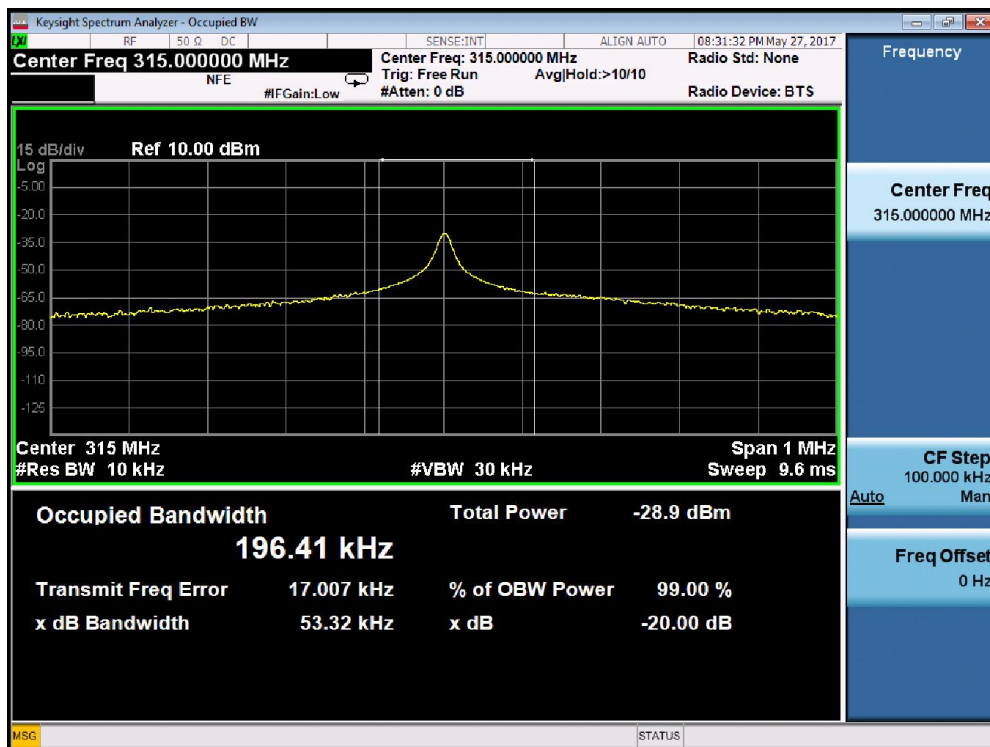
### 6.3.4. Test Result

Test Frequency (MHz)	Modulation Type	20dB Bandwidth (KHz)	99% Bandwidth (KHz)	Limit (KHz)	Result
315	ASK	53.3	196.4	≤ 787.5	Pass
	FSK	118.4	117.9	≤ 787.5	Pass
434	ASK	53.0	188.3	≤ 1085.0	Pass
	FSK	115.8	116.2	≤ 1085.0	Pass

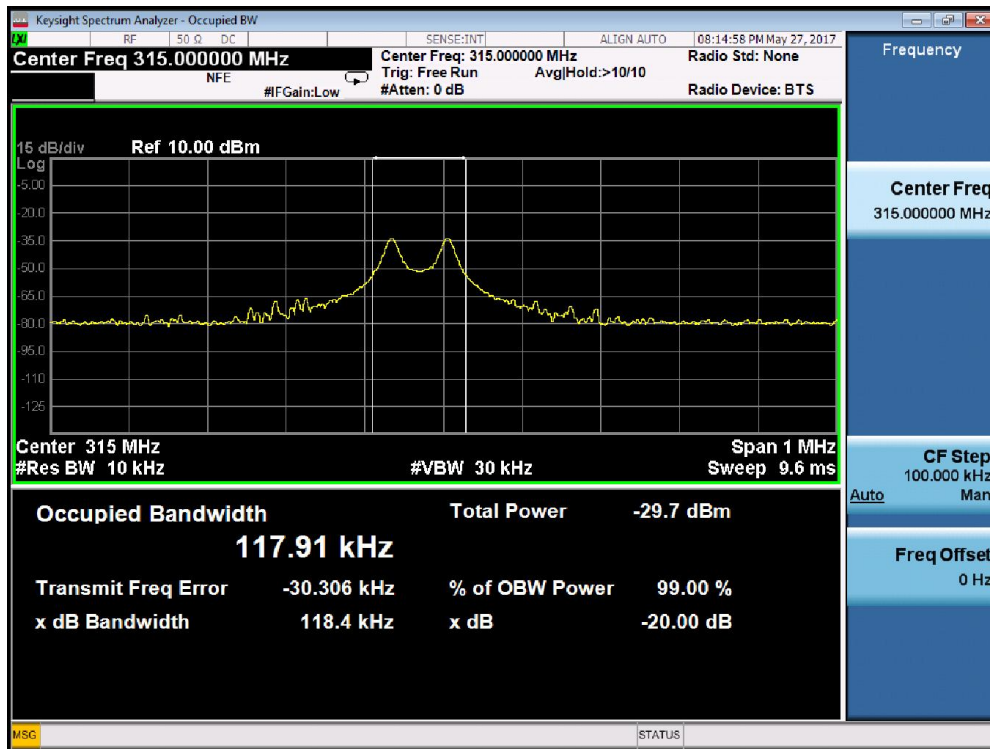
Limit 1 = Fundamental Frequency \* 0.25% = 315 MHz \* 0.25% = 787.5 kHz

Limit 2 = Fundamental Frequency \* 0.25% = 434 MHz \* 0.25% = 1085.0 kHz

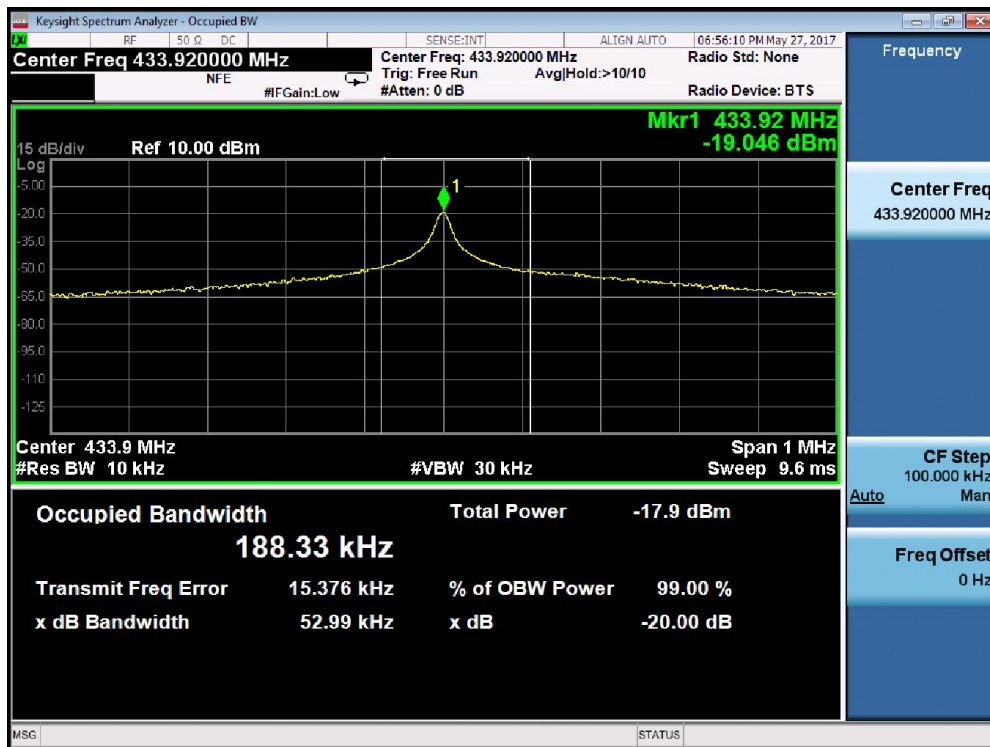
315MHz 20dB Bandwidth Test Plot for ASK



## 315MHz 20dB Bandwidth Test Plot for FSK

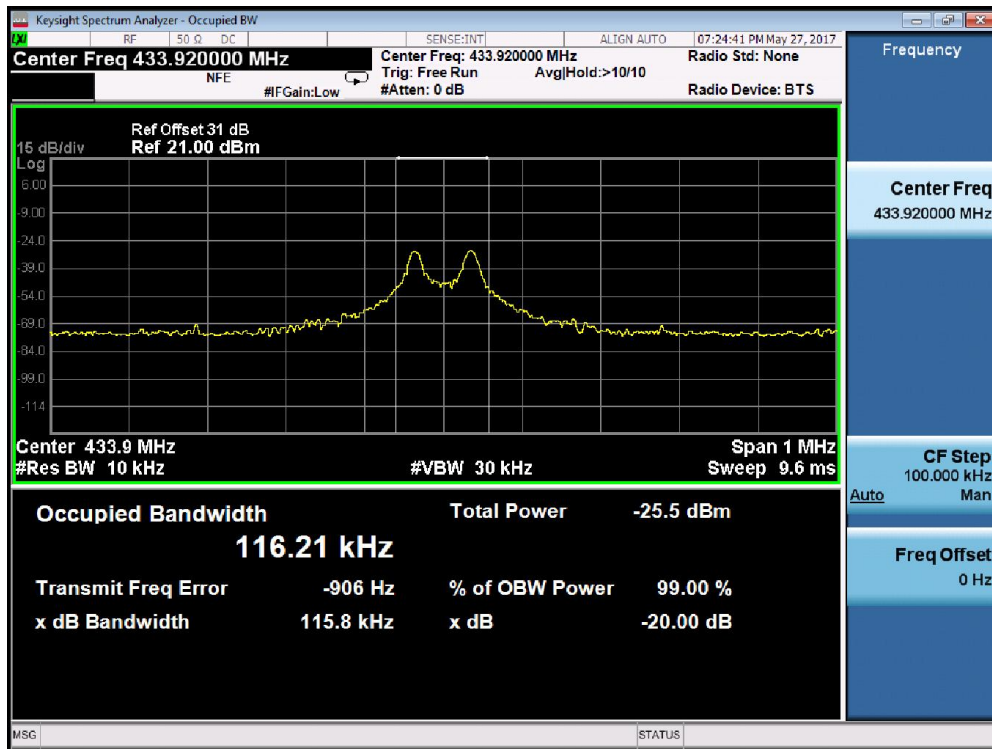


## 434MHz 20dB Bandwidth Test Plot for ASK





### 434MHz 20dB Bandwidth Test Plot for FSK



## 6.4. Transmission Time

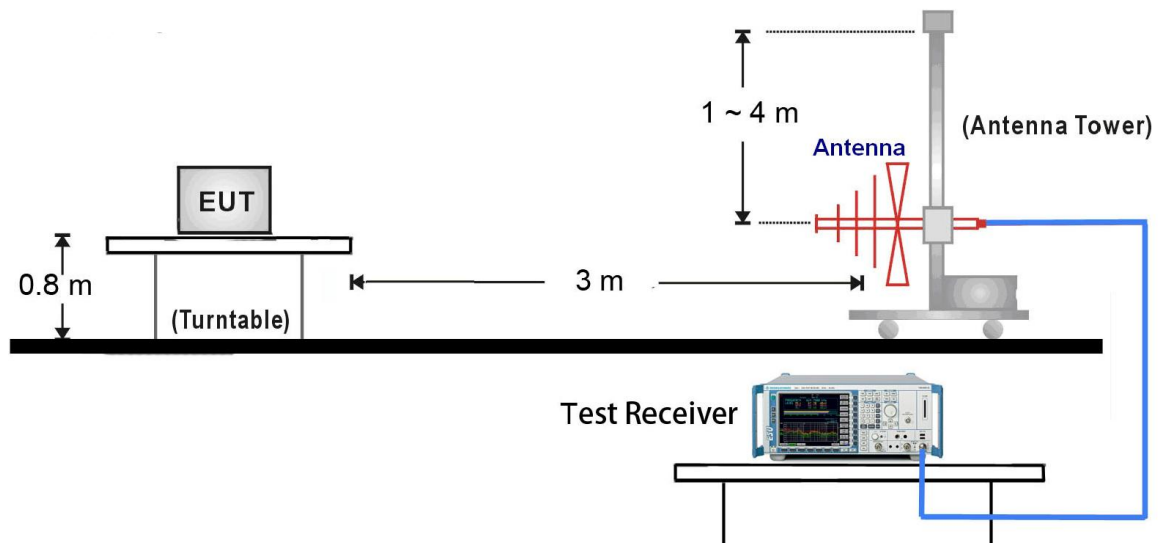
### 6.4.1. Standard Applicable

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

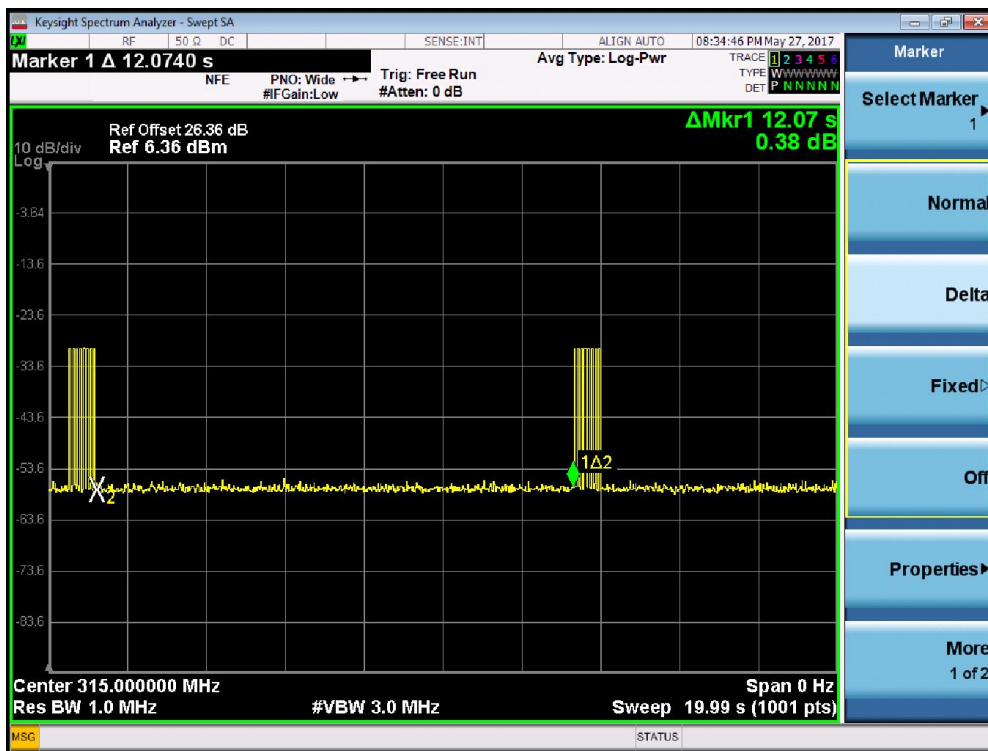
Test Mode	Modulation Type	Item	Measured Value	Limit	Result
315MHz	ASK	Transmission Time( $T_{on}$ )	14.06ms	$\leq 1$ s	Pass
		Silent Time	12.07s	$\geq 10$ s	Pass
		Silent Time/Transmission Time	858	$\geq 30$ times	Pass
	FSK	Transmission Time( $T_{on}$ )	15.26ms	$\leq 1$ s	Pass
		Silent Time	12.04s	$\geq 10$ s	Pass
		Silent Time/Transmission Time	789	$\geq 30$ times	Pass
434MHz	ASK	Transmission Time( $T_{on}$ )	14.64ms	$\leq 1$ s	Pass
		Silent Time	12.09s	$\geq 10$ s	Pass
		Silent Time/Transmission Time	826	$\geq 30$ times	Pass
	FSK	Transmission Time( $T_{on}$ )	15.29ms	$\leq 1$ s	Pass
		Silent Time	12.06s	$\geq 10$ s	Pass
		Silent Time/Transmission Time	789	$\geq 30$ times	Pass

Note:

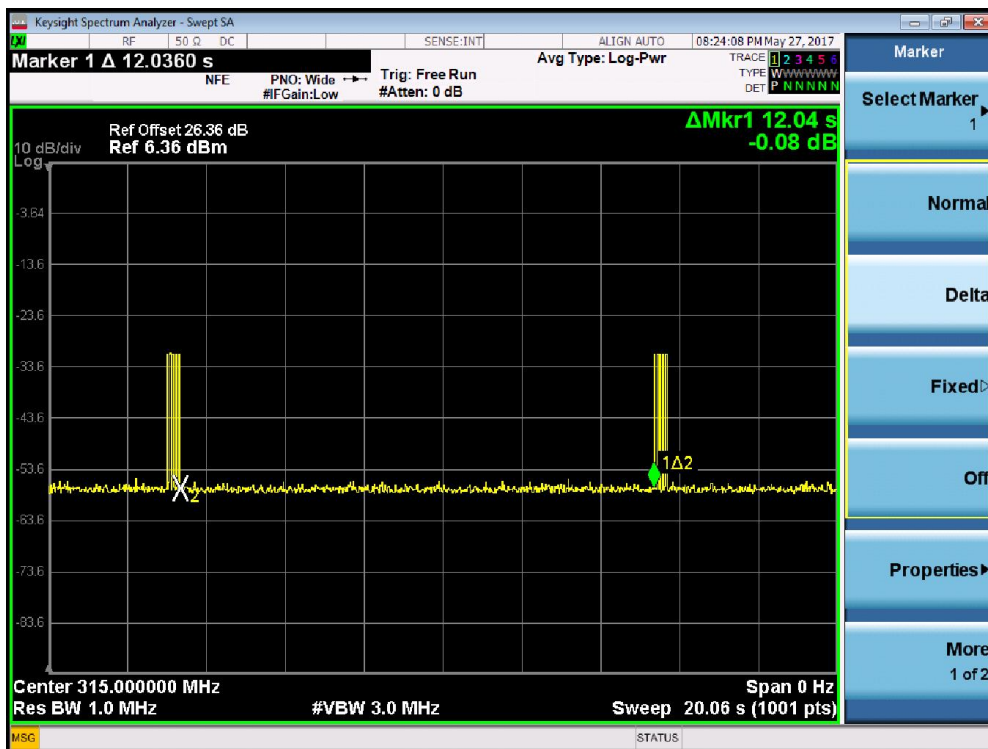
For 315MHz ASK Modulation, Transmission time ( $T_{on}$ ) (ms) =  $91 * 0.12(\text{ms}) + 11 * 0.22(\text{ms}) + 3 * 0.24(\text{ms}) = 14.06(\text{ms})$

For 434MHz ASK Modulation, Transmission time ( $T_{on}$ ) (ms) =  $88 * 0.12(\text{ms}) + 17 * 0.24(\text{ms}) = 14.64(\text{ms})$

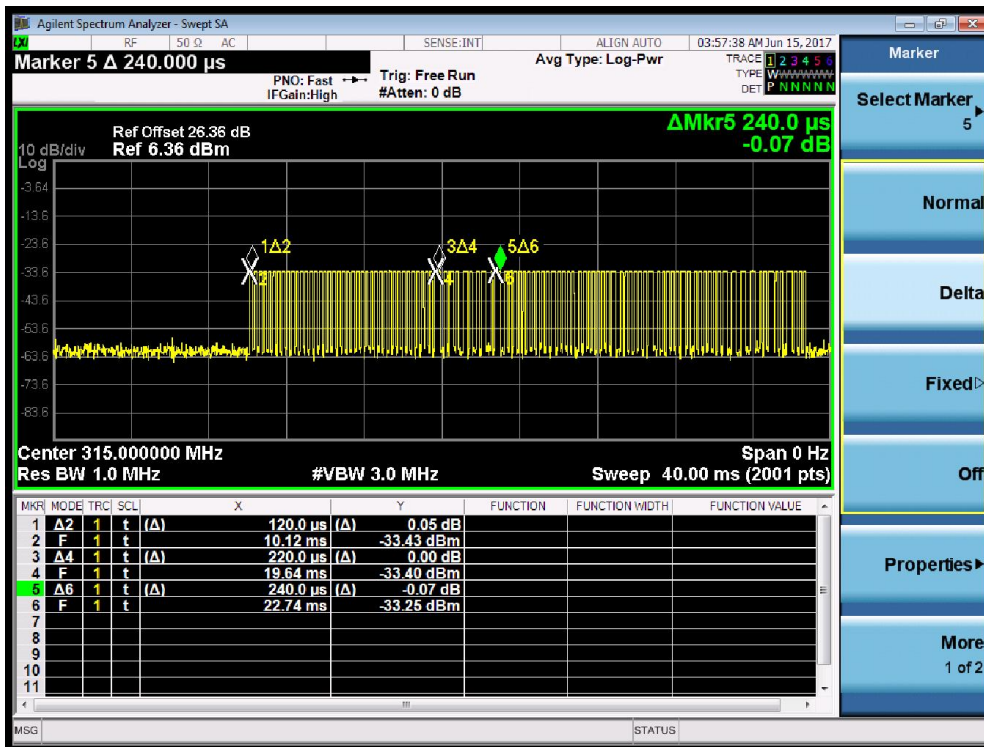
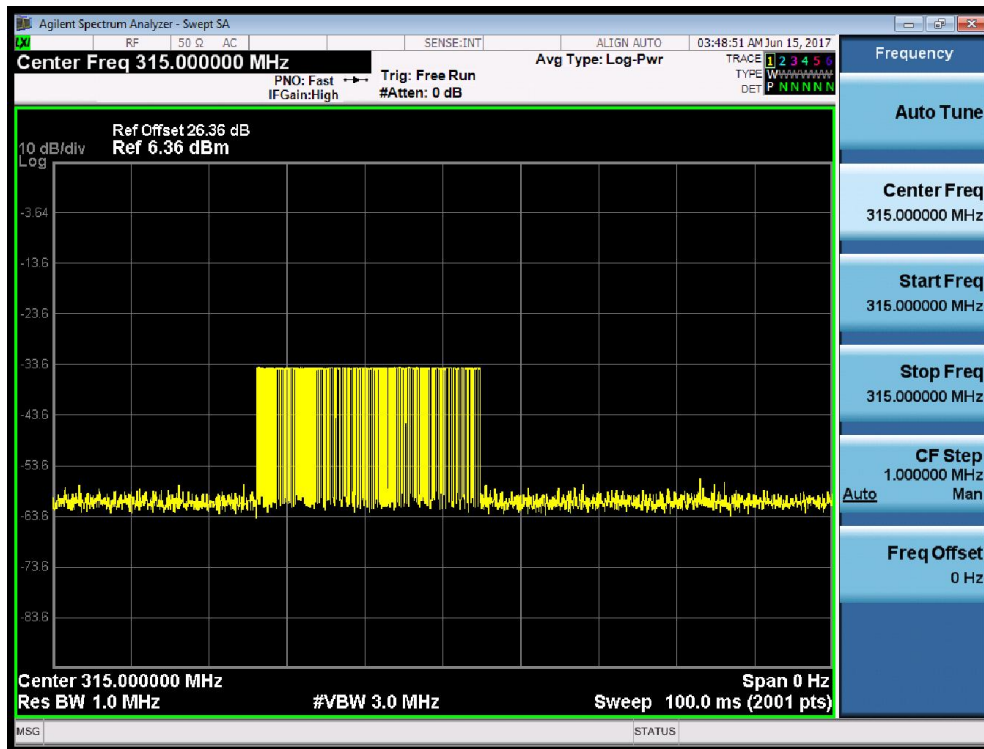
### Silent Time for 315MHz ASK



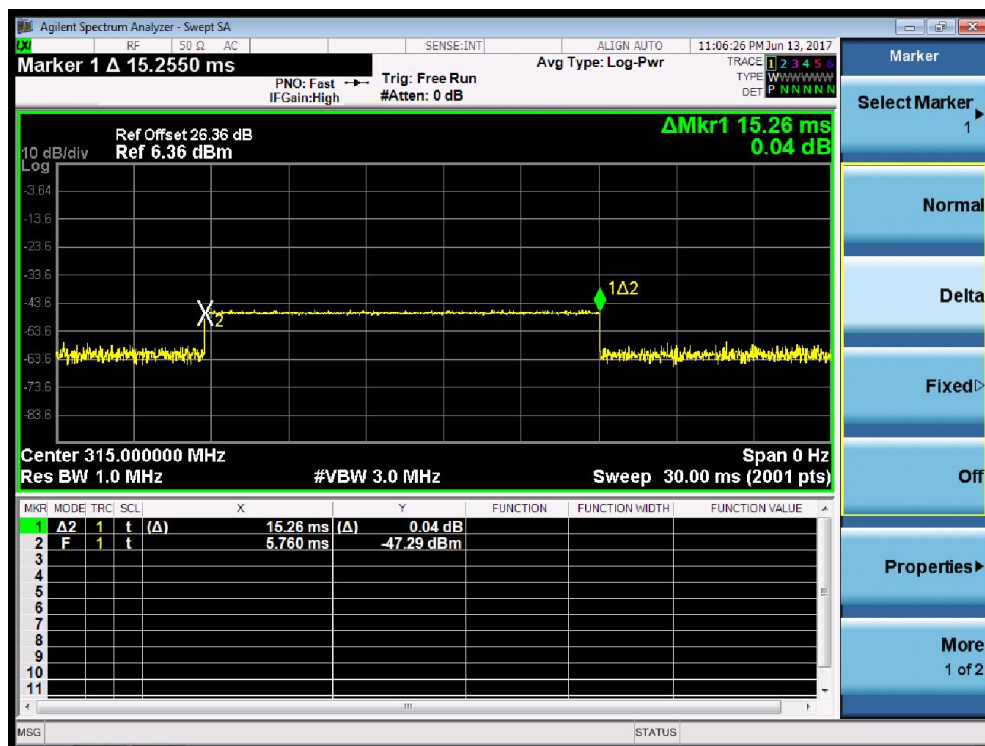
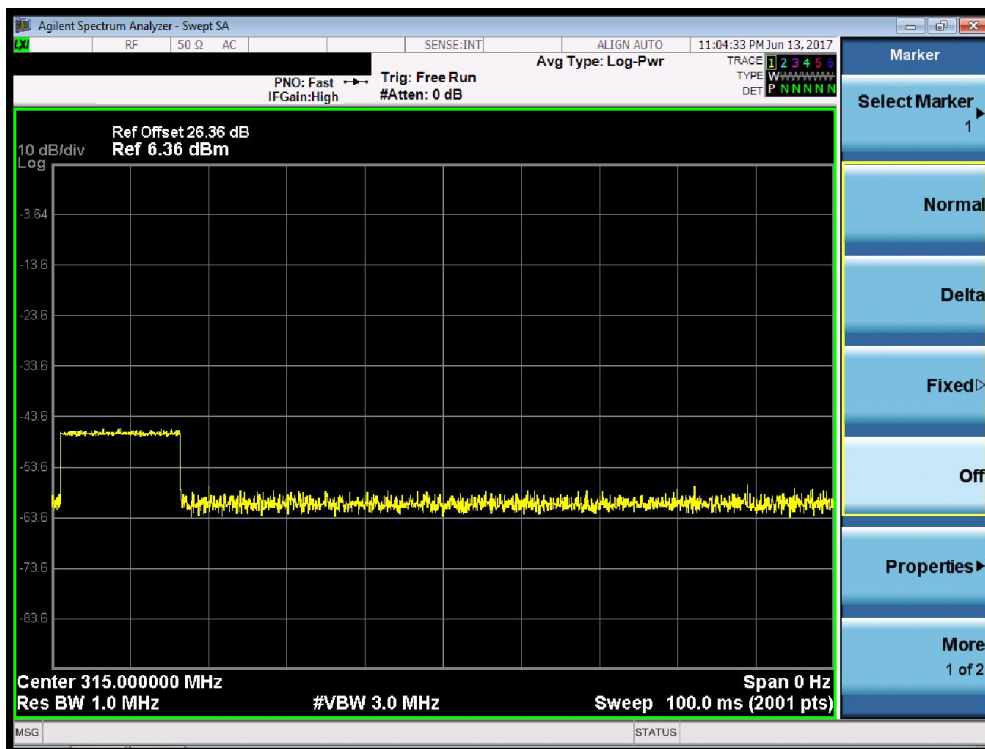
### Silent Time for 315MHz FSK



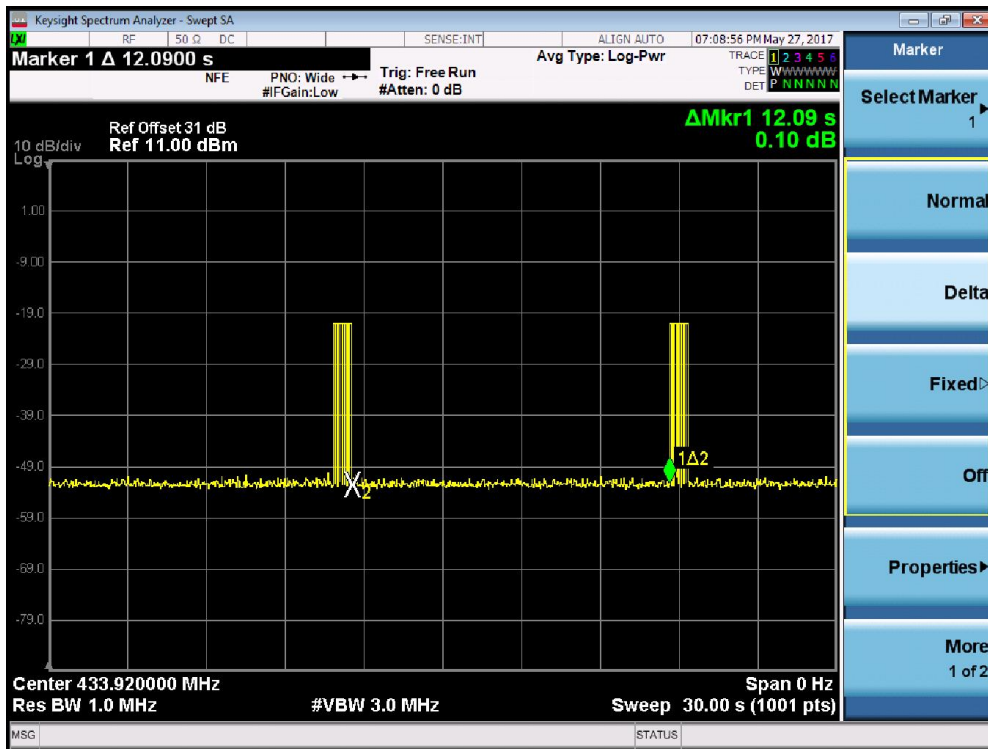
## Transmission Time for 315MHz ASK



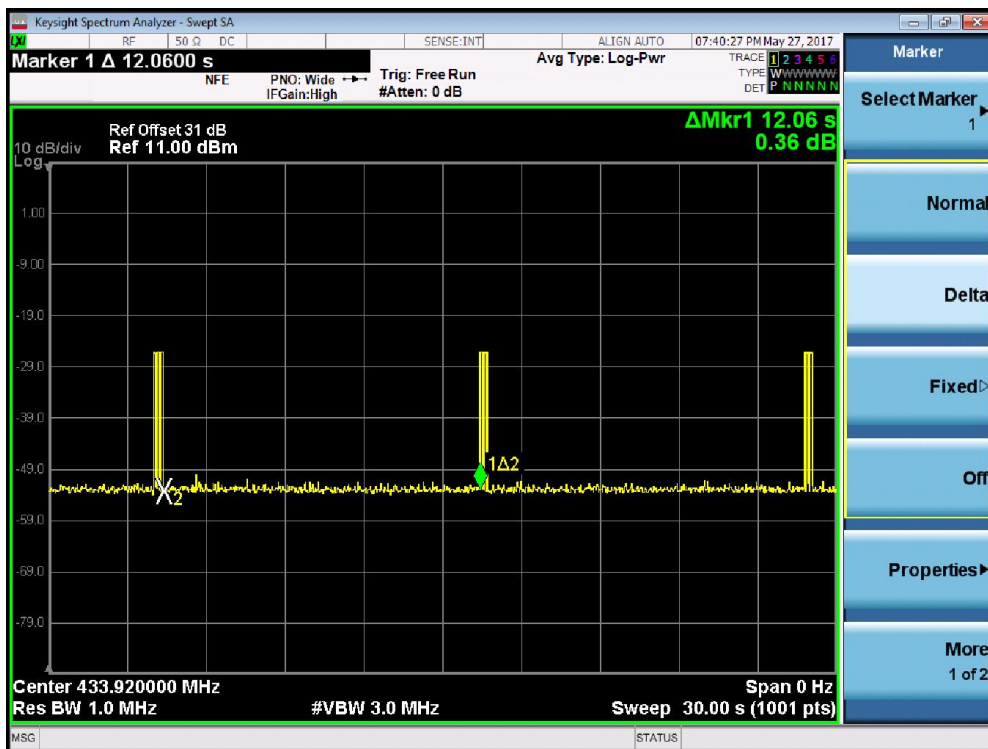
## Transmission Time for 315MHz FSK



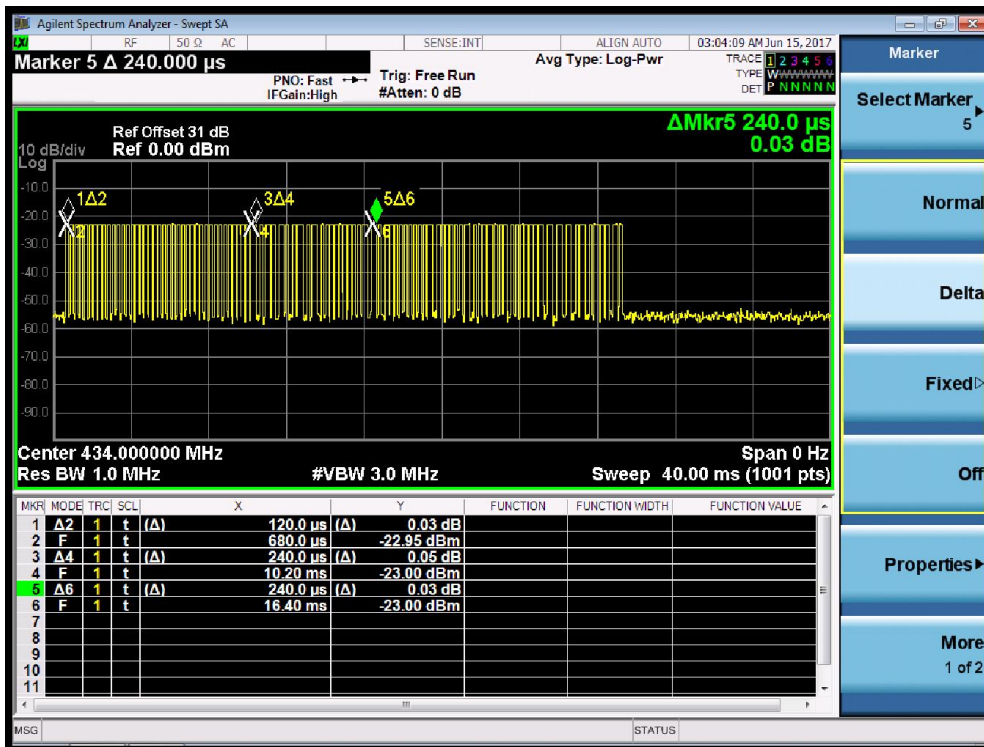
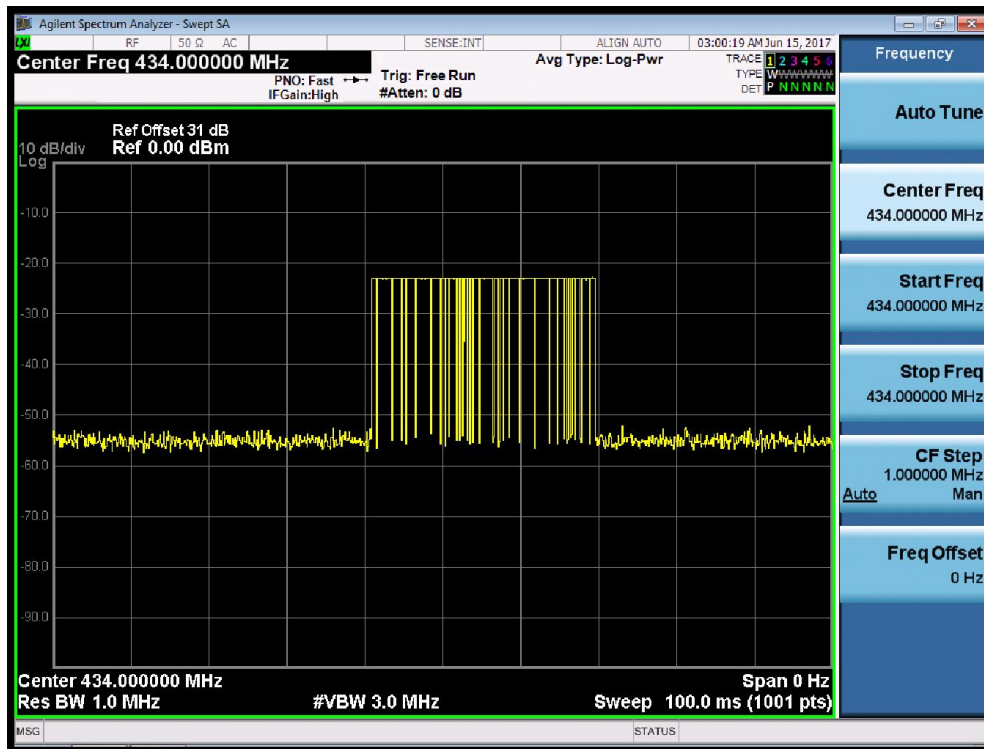
### Silent Time for 434MHz ASK



### Silent Time for 434MHz FSK

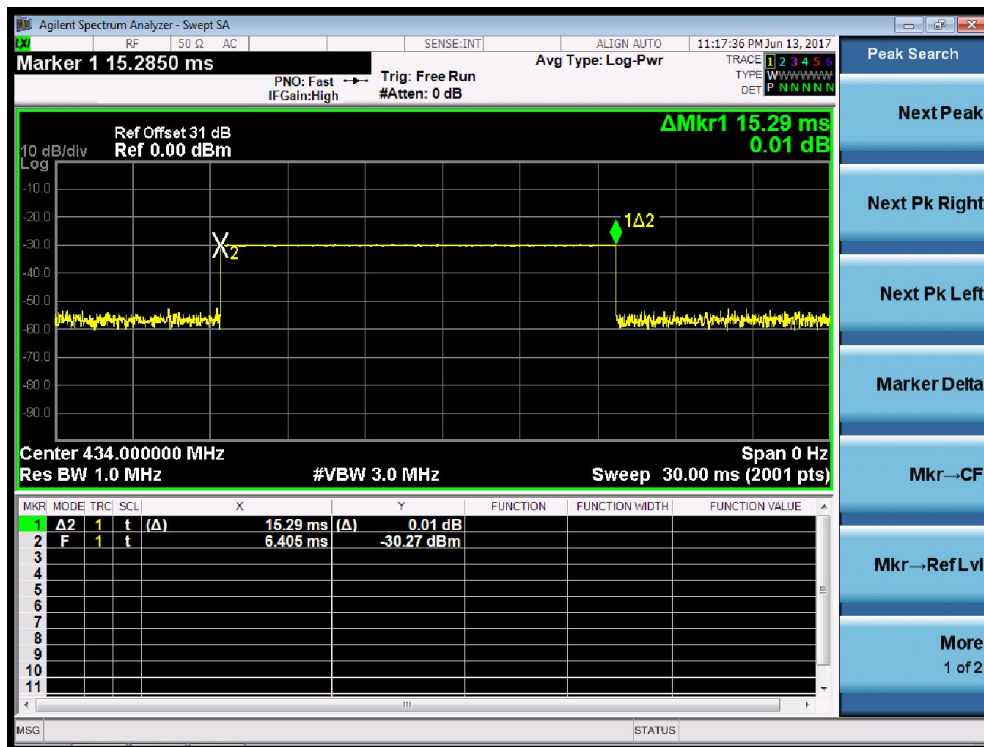
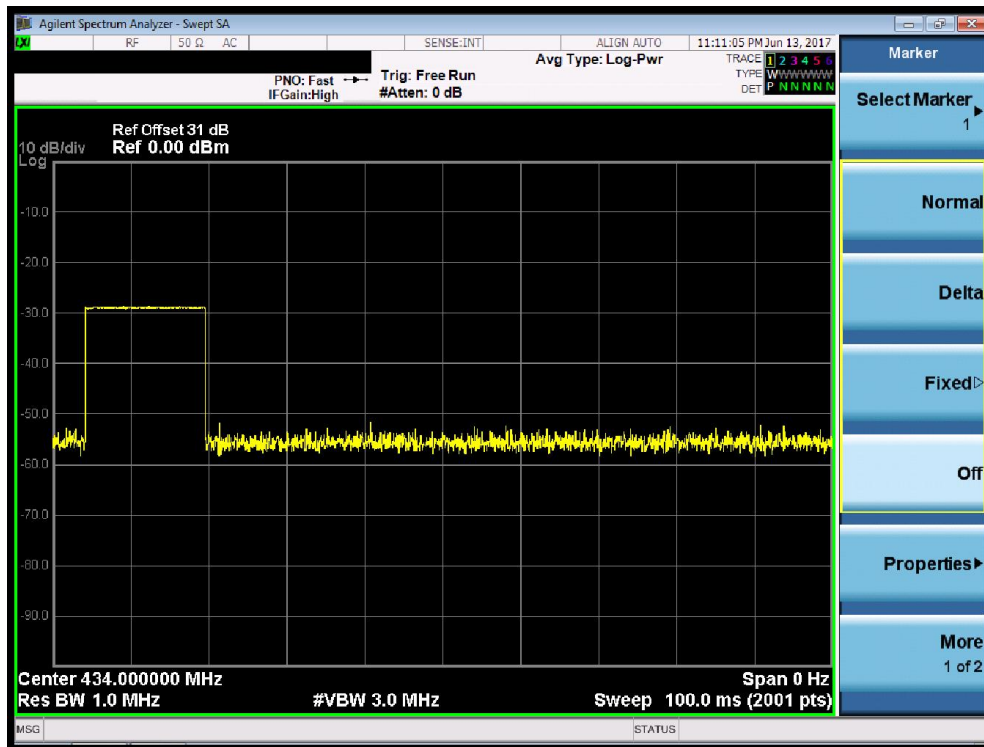


### Transmission Time for 434MHz ASK





### Transmission Time for 434MHz FSK



## 6.5. Duty Cycle

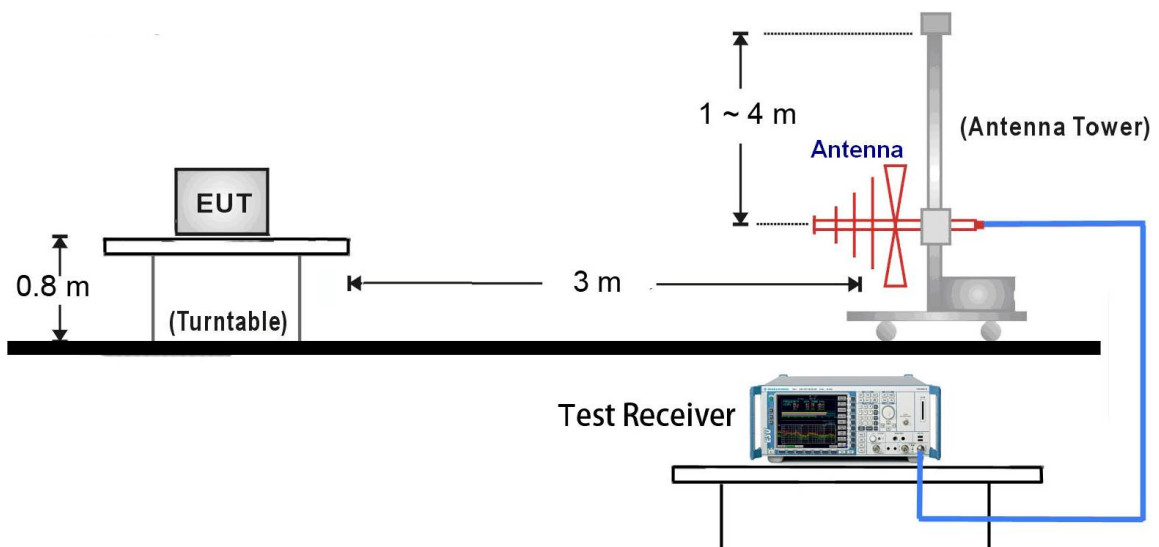
### 6.5.1. Standard Applicable

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

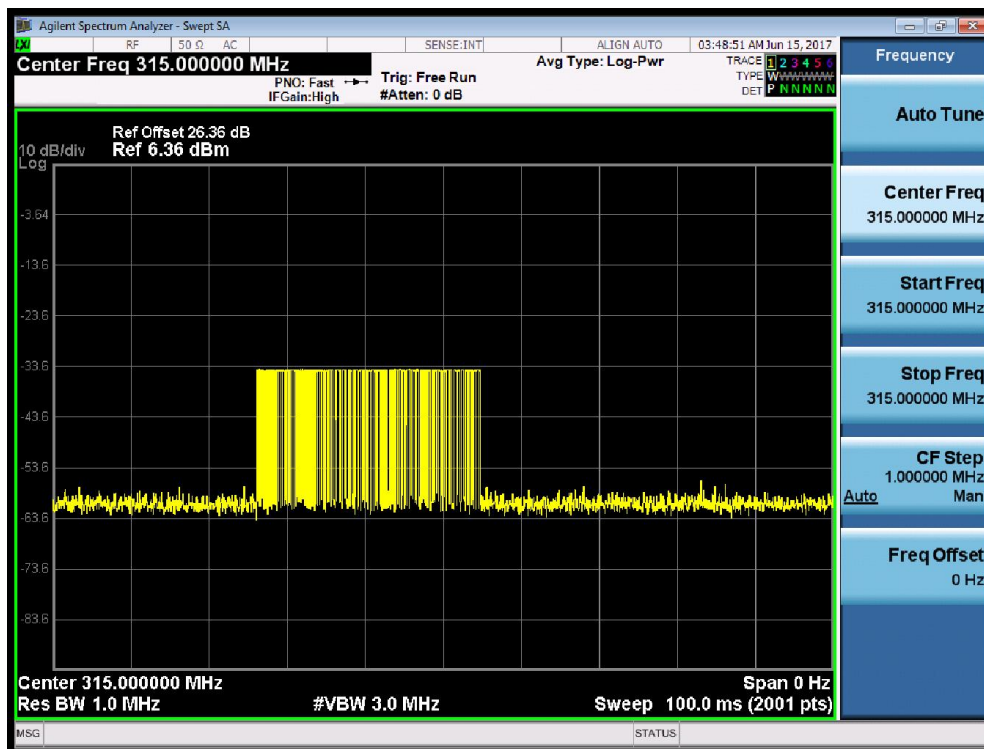


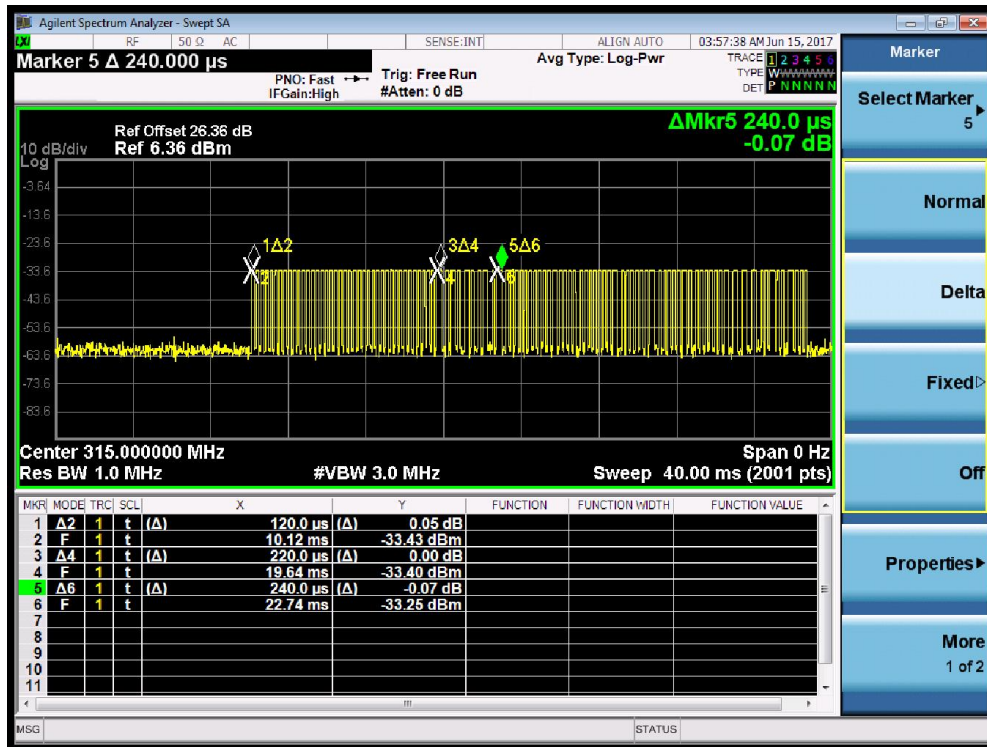
### 6.5.4. Test Result

Test Mode	Modulation Type	Total Time (T <sub>on</sub> ) (ms)	The duration of one cycle (ms)	Duty Cycle (%)	Duty Cycle Factor (dB)
315MHz	ASK	14.06	100	14.06	17.04
	FSK	15.26	100	15.26	16.33
434MHz	ASK	14.64	100	14.64	16.69
	FSK	15.29	100	15.29	16.31

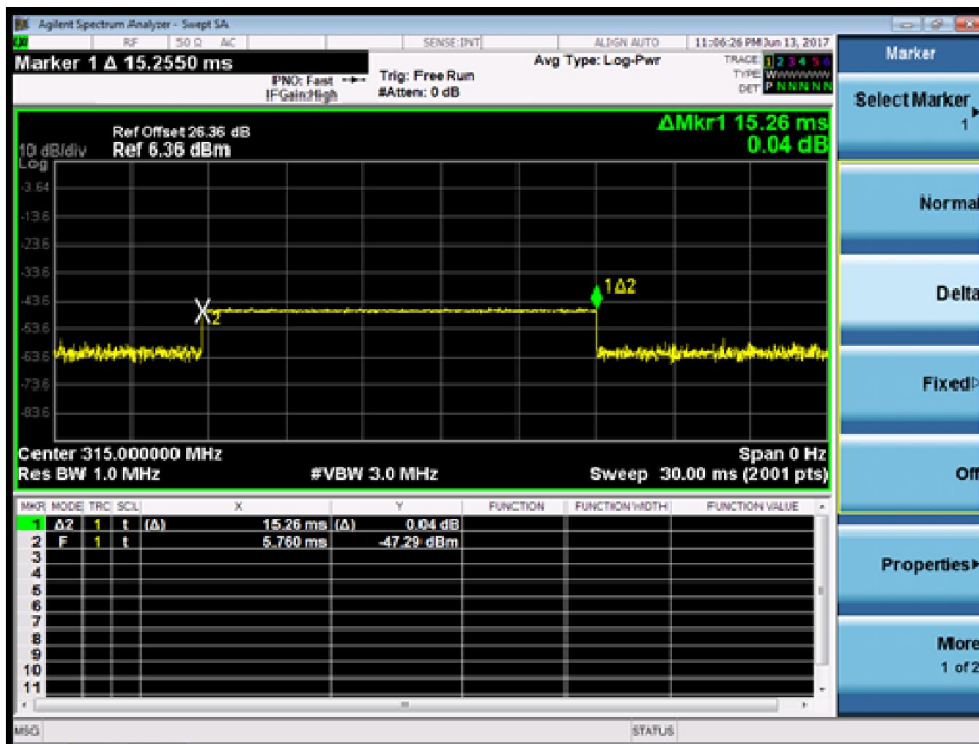
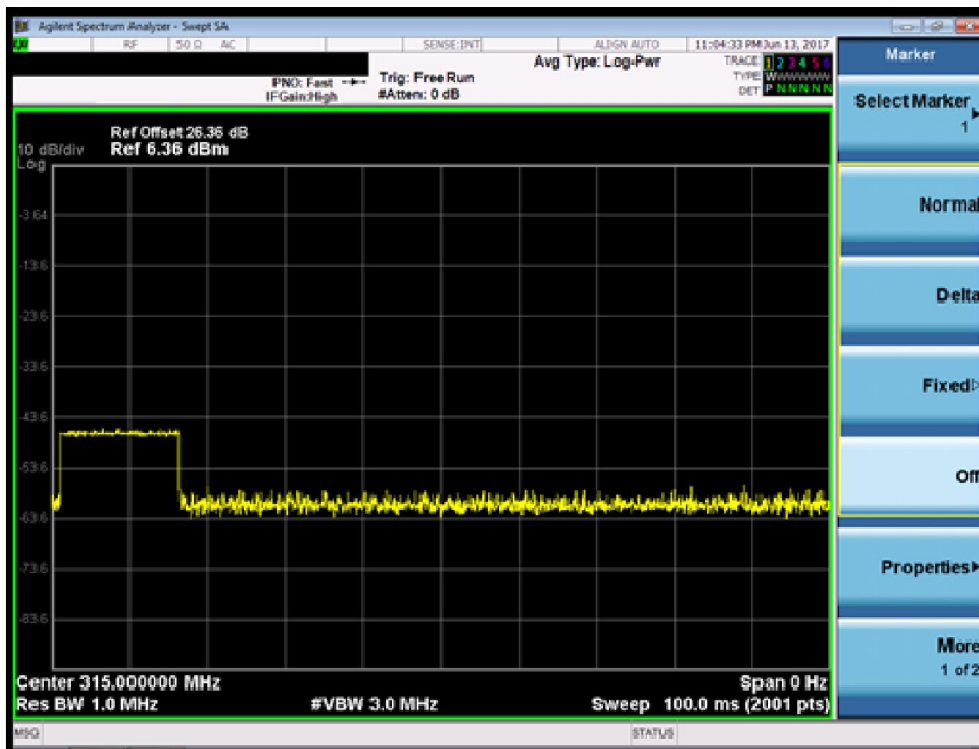
Note: Duty Cycle Factor =  $20 \cdot \log(1/\text{Duty Cycle})$ .

Width of Pulse for 315MHz ASK

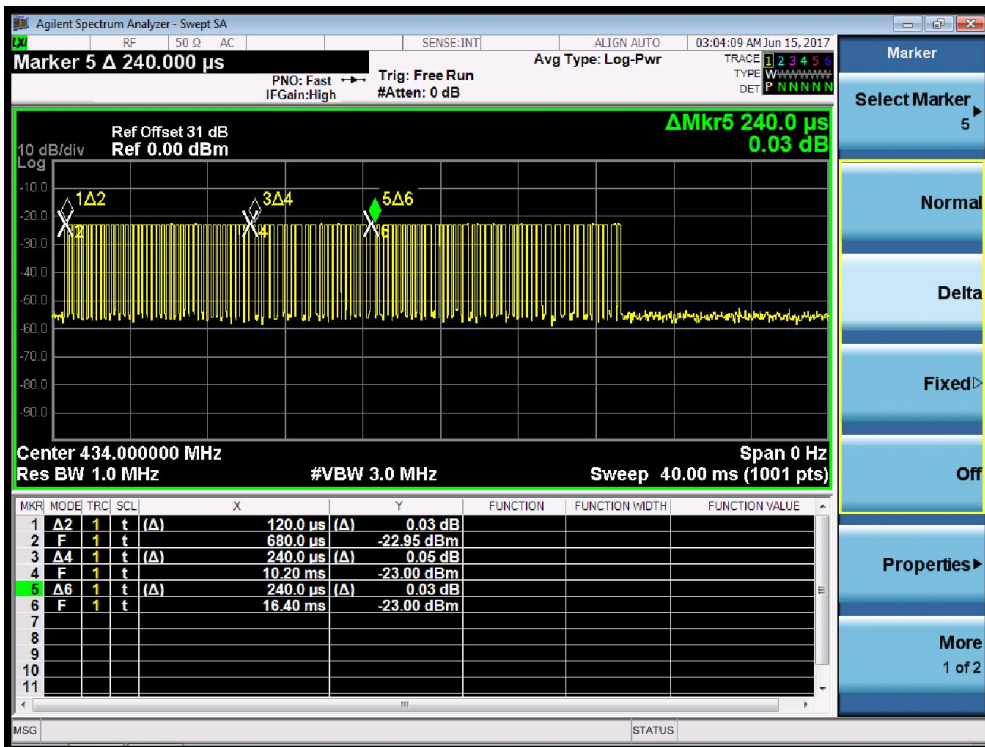
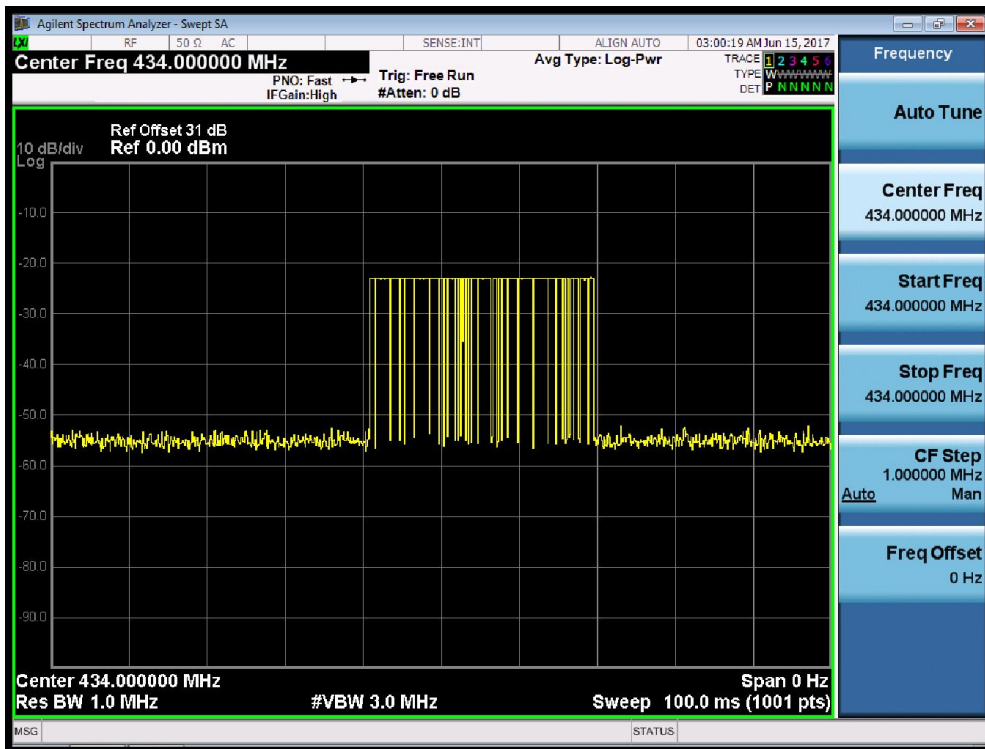




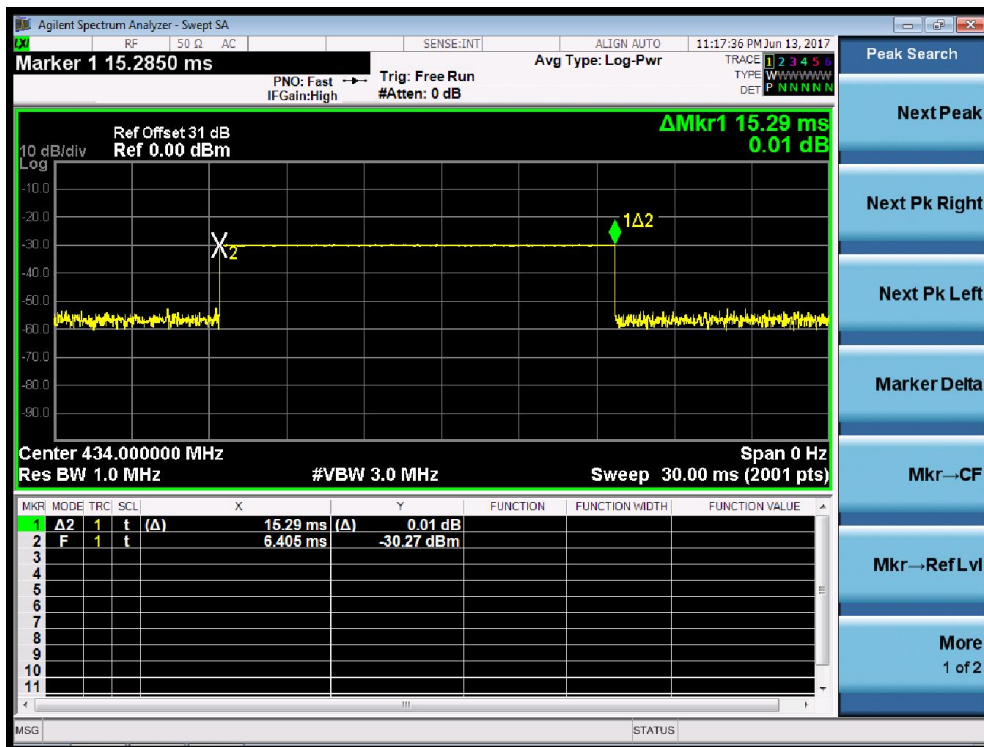
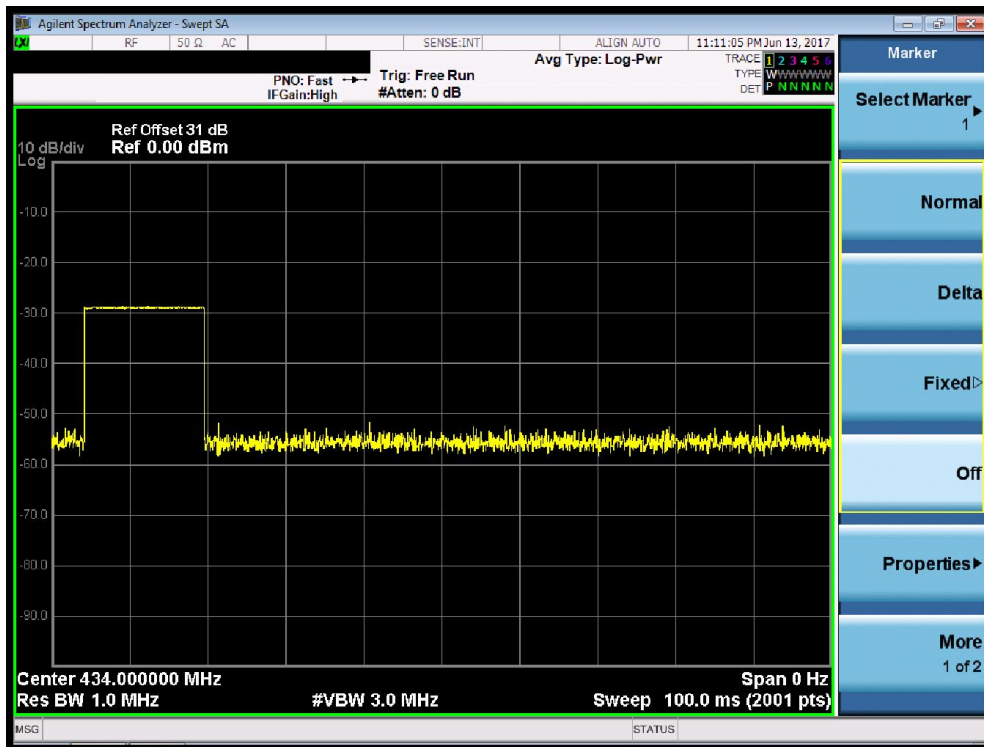
Width of Pulse for 315MHz FSK



### Width of Pulse for 434MHz ASK



## Width of Pulse for 434MHz FSK



## 7. CONCLUSION

The data collected relate only the item(s) tested and show that the **Tire Pressure Monitoring System Sensor FCC ID: TTETSB46 & IC: 6707A-TSB46** is in compliance with FCC Part 15.231(e) of the FCC Rules and RSS 210 Issue 9 – Annex A of IC Rules.

\_\_\_\_\_ The End \_\_\_\_\_