



MEASUREMENT REPORT

FCC PART 15.231(a)

FCC ID: 2ANHJFRG

APPLICANT: Shanghai shengzhen commercial & trade Ltd company

Application Type: Certification

Product: FRG Remote Key

Model No.: FRG

FCC Classification: FCC Part 15 Security/FRG Remote Key Transmitter (DSC)

FCC Rule Part(s): Part 15.231(a)

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

Test Date: November 15, 2017 ~ January 10, 2018

Reviewed By : Kevin Guo
(Kevin Guo)

Approved By : Marlin Chen
(Marlin Chen)



The test results relate only to the samples tested.

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

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

Revision History

Report No.	Version	Description	Issue Date	Note
1711RSU03801	Rev. 01	Initial report	01-10-2018	Valid

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§2.1033 General Information

Applicant:	Shanghai shengzhen commercial & trade Ltd company
Applicant Address:	Xinlong road No.1373 Room 606 Minhang Distirct Shanghai China
Manufacturer:	Shanghai shengzhen commercial & trade Ltd company
Manufacturer Address:	Xinlong road No.1373 Room 606 Minhang Distirct Shanghai 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
FCC Rule Part(s):	Part 15.231(a)
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-4179, G-814, C-4664, T-2206) test laboratory with the site description on file at VCCI Council.
- MRT Lab is accredited to ISO 17025 by the American Association for Laboratory Accreditation (A2LA) under the American Association for Laboratory Accreditation Program (A2LA Cert. No. 3628.01) in EMC, Telecommunications and Radio testing for FCC, Industry Canada, EU and TELEC Rules.



1. INTRODUCTION

1.1. Scope

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

1.2. MRT Test Location

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



2. PRODUCT INFORMATION

2.1. Equipment Description

Product Name	FRG Remote Key
Model No.	FRG
Frequency Range	433.92 MHz
Type of modulation	ASK
Antenna Type	Integral Antenna
Antenna Gain	0 dBi

2.2. Test Standards

The following report is prepared on behalf of the Shanghai shengzhen commercial & trade Ltd company in accordance with FCC Part 15, Subpart C, and section 15.231, 15.203, 15.205 and 15.209 of the Federal Communication Commission rules.

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

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

2.3. Test Methodology

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

Deviation from measurement procedure.....None

2.4. EUT Setup and Test Mode

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

Test Mode List		
Test Mode	Description	Remark
Mode 1	Transmitting	With 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 device is permanently attached.
- There are no provisions for connection to an external antenna.

Conclusion:

The device unit complies with the requirement of §15.203.

4. TEST EQUIPMENT CALIBRATION DATA

Radiated Disturbance / 20dB Bandwidth / Release Time / Duty Cycle – AC1

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
PXA Signal Analyzer	Keysight	9030B	MRTSUE06395	1 year	2018/09/13
EMI Test Receiver	R&S	ESR7	MRTSUE06001	1 year	2018/08/18
Loop Antenna	Schwarzbeck	FMZB 1519	MRTSUE06025	1 year	2018/11/20
EXA Signal Analyzer	Agilent	N9020A	MRTSUE06106	1 year	2018/04/25
Microwave System Amplifier	Agilent	83017A	MRTSUE06076	1 year	2018/11/17
Bilog Period Antenna	Schwarzbeck	VULB 9168	MRTSUE06172	1 year	2018/11/18
Broad Band Horn Antenna	Schwarzbeck	BBHA9120D	MRTSUE06023	1 year	2018/10/21
Broad Band Horn Antenna	Schwarzbeck	BBHA 9170	MRTSUE06024	1 year	2018/12/14
Amplifier	Schwarzbeck	BBV 9721	MRTSUE06121	1 year	2018/06/14
Hygrothermograph	Testo	608-H1	MRTSUE06403	1 year	2018/08/14
Anechoic Chamber	TDK	Chamber-AC1	MRTSUE06212	1 year	2018/05/10

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% ($U=2U_c(y)$): 9kHz ~ 1GHz: 4.18dB 1GHz ~ 18GHz: 4.76dB
Release Time Measurement – AC1
Measuring Uncertainty for a Level of Confidence of 95% ($U=2U_c(y)$): 0.09ms

6. TEST RESULT

6.1. Summary

Company Name: Shanghai shengzhen commercial & trade Ltd company

FCC ID: 2ANHJFRG

FCC Part Section(s)	Test Description	Test Condition	Test Result
15.205 15.231(b)	Radiated Spurious Emissions	Radiated	Pass
15.231(c)	20dB Bandwidth		Pass
15.231(a)(1)	Release Time		Pass
15.231(b)	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) All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables and attenuators.
- 4) 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(b), 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 Emissions (microvolts/meter)
40.66 - 40.70	2250	225
70 - 130	1250	125
130 - 174	¹ 1250 to 3750	¹ 125 to 375
174 - 260	3750	375
260 - 470	¹ 3750 to 12500	¹ 375 to 1250
Above 470	12500	1250

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.

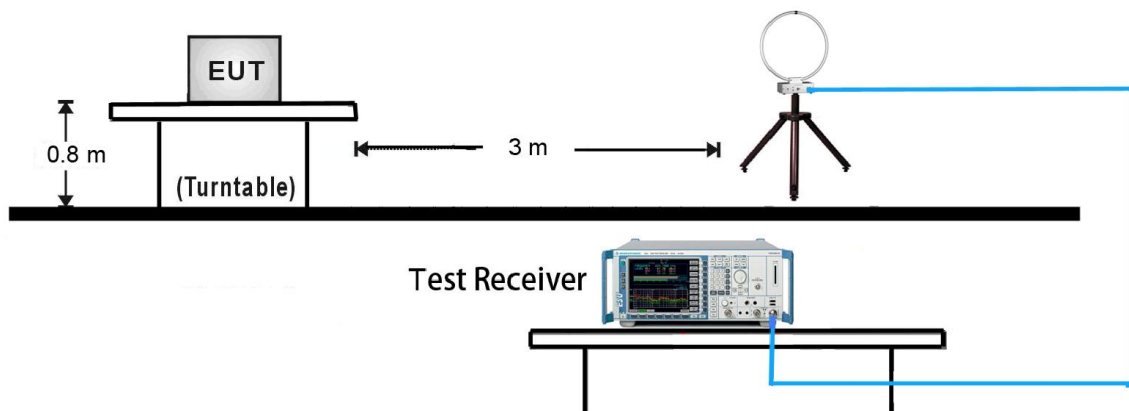
6.2.2. Test Procedure

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

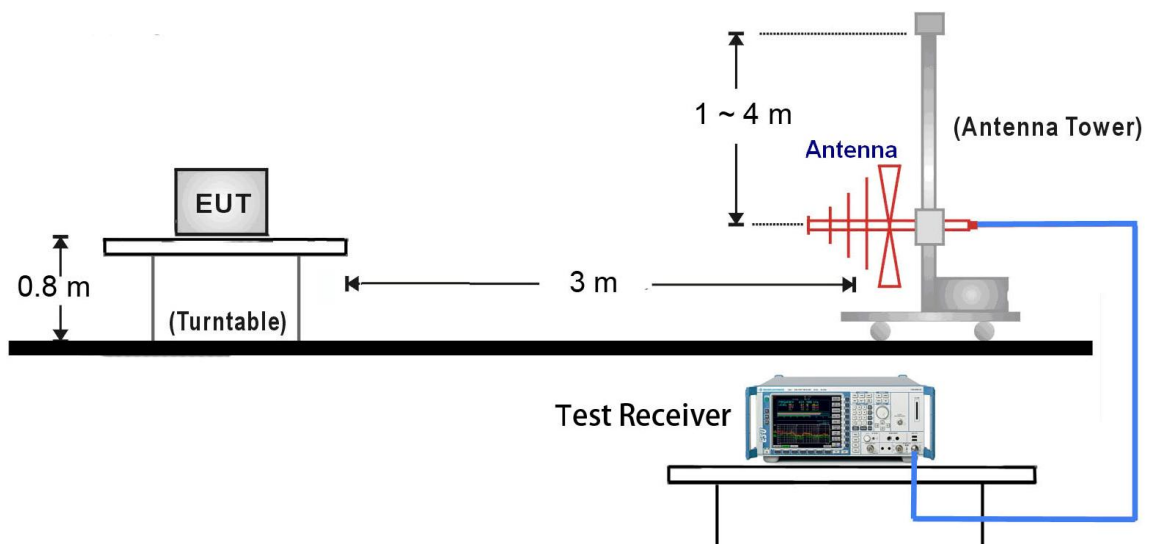
6.2.3. Test Setup

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

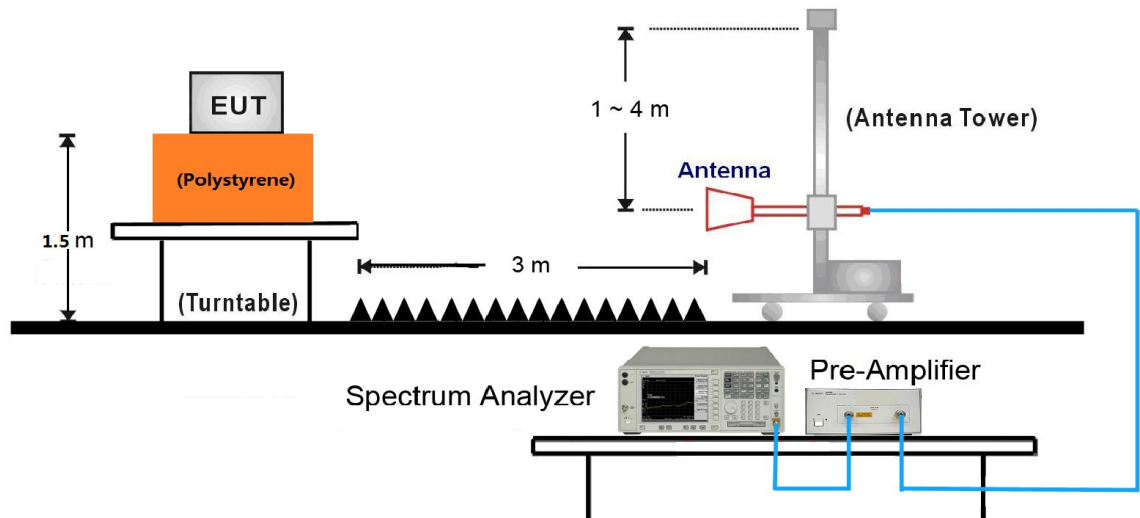
9kHz ~ 30MHz Test Setup:



30MHz ~ 1GHz Test Setup:

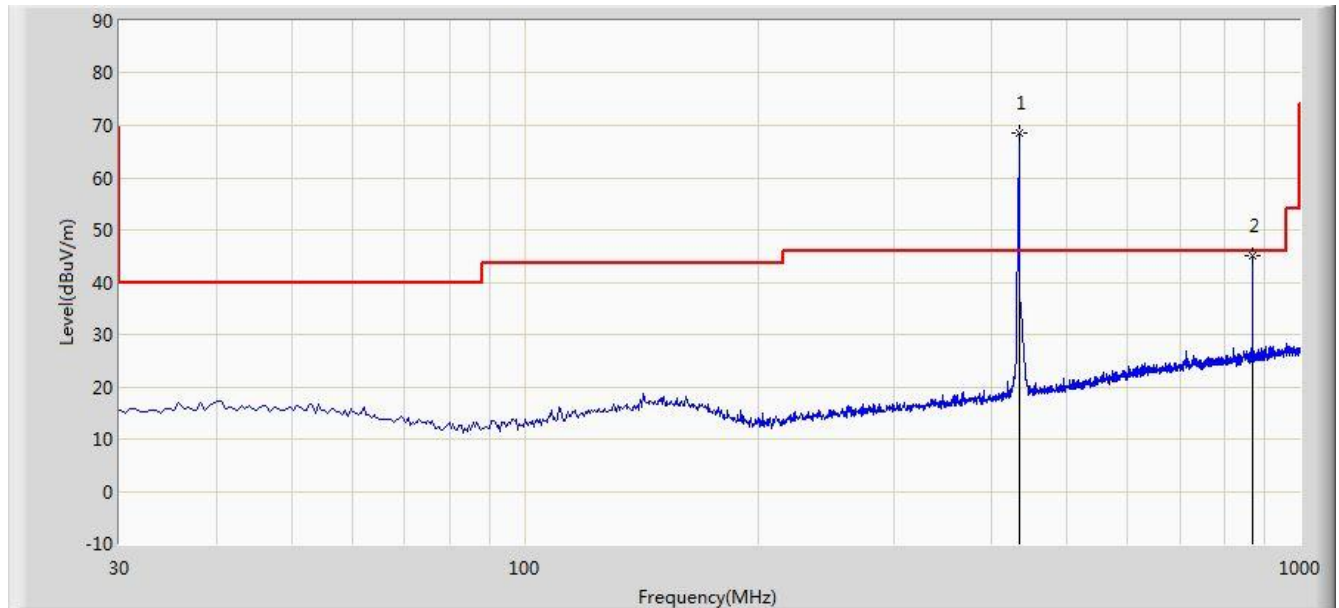


1GHz ~ 18GHz Test Setup:



6.2.4. Test Results

Site: AC1	Time: 2017/12/15 - 22:19
Limit: FCC_Part15.209_RE(3m)	Engineer: Bruce Wang
Probe: VULB 9168 _20-2000MHz	Polarity: Horizontal
EUT: FRG Remote Key	Power: By Battery
Note: Transmit 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	51.137	17.508	N/A	68.645	100.825	-32.180	PK
	434.005	51.137	17.508	11.518	57.127	80.825	-23.698	AV
2	868.080	20.976	23.972	N/A	44.949	80.825	-35.876	PK
	868.080	20.976	23.972	11.518	33.431	60.825	-27.394	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.

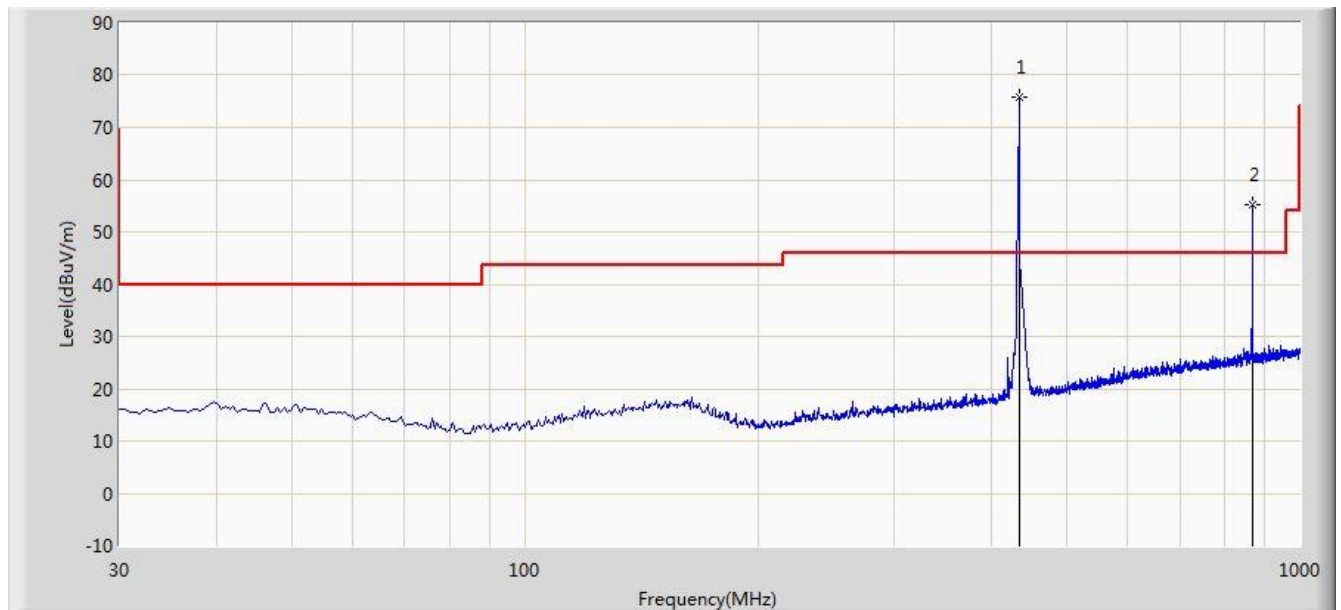
Note 2: The fundamental frequency is 433.92MHz, so the fundamental and spurious emissions radiated limit base on the operating frequency 433.92MHz.

Note 3: Peak Measure Level (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).

Site: AC1	Time: 2017/12/15 - 22:19
Limit: FCC_Part15.209_RE(3m)	Engineer: Bruce Wang
Probe: VULB 9168 _20-2000MHz	Polarity: Vertical
EUT: FRG Remote Key	Power: By Battery
Note: Transmit 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	58.356	17.508	N/A	75.864	100.825	-24.961	PK
	434.005	58.356	17.508	11.518	64.346	80.825	-16.479	AV
2	868.080	31.386	23.972	N/A	55.359	80.825	-25.466	PK
	868.080	31.386	23.972	11.518	43.841	60.825	-16.984	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.

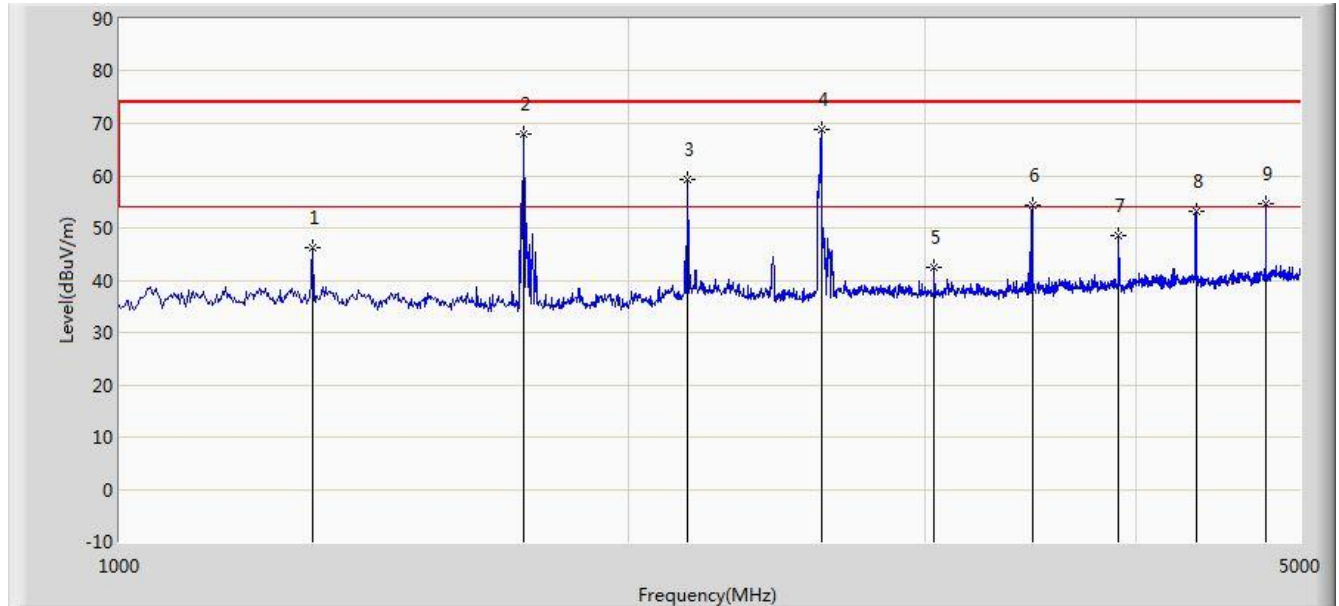
Note 2: The fundamental frequency is 433.92MHz, so the fundamental and spurious emissions radiated limit base on the operating frequency 433.92MHz.

Note 3: Peak Measure Level (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).

Site: AC1	Time: 2017/12/16 - 00:43
Limit: FCC_Part15.209_RE(3m)	Engineer: Bruce Wang
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: FRG Remote Key	Power: By Battery
Note: Transmit 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	1302.000	50.453	-4.111	N/A	46.342	80.825	-34.483	PK
	1302.000	50.453	-4.111	11.518	34.824	60.825	-26.001	AV
2	1736.000	71.970	-4.022	N/A	67.948	80.825	-12.877	PK
	1736.000	71.970	-4.022	11.518	56.430	60.825	-4.395	AV
3	2170.000	60.154	-0.940	N/A	59.214	80.825	-21.611	PK
	2170.000	60.154	-0.940	11.518	47.696	60.825	-13.129	AV
4	2604.000	69.325	-0.391	N/A	68.934	80.825	-11.891	PK
	2604.000	69.325	-0.391	11.518	57.416	60.825	-3.409	AV
5	3038.000	41.689	0.869	N/A	42.558	80.825	-38.267	PK
	3038.000	41.689	0.869	11.518	31.040	60.825	-29.785	AV
6	3472.000	52.892	1.534	N/A	54.426	80.825	-26.399	PK
	3472.000	52.892	1.534	11.518	42.908	60.825	-17.917	AV
7	3906.000	45.301	3.141	N/A	48.442	80.825	-32.383	PK
	3906.000	45.301	3.141	11.518	36.924	60.825	-23.901	AV
8	4340.000	48.800	4.350	N/A	53.150	80.825	-27.675	PK
	4340.000	48.800	4.350	11.518	41.632	60.825	-19.193	AV

9	4774.000	48.850	5.674	N/A	54.524	80.825	-26.301	PK
	4774.000	48.850	5.674	11.518	43.006	60.825	-17.819	AV

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

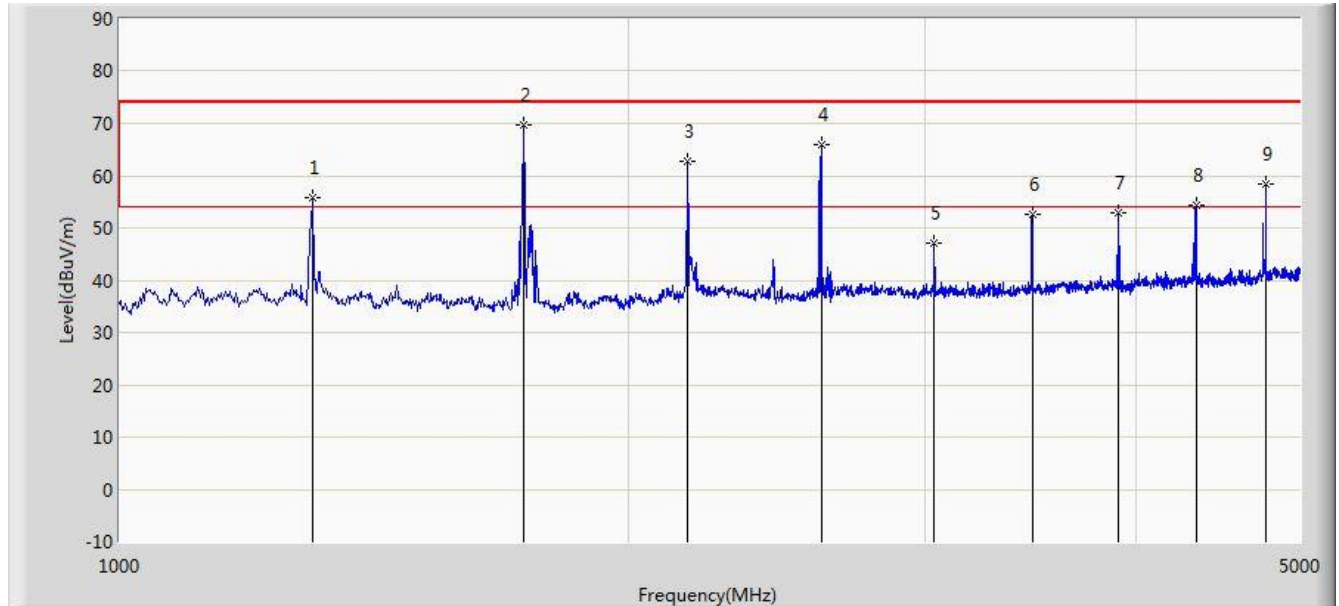
Note 2: The fundamental frequency is 433.92MHz, so the fundamental and spurious emissions radiated limit base on the operating frequency 433.92MHz.

Note 3: Peak Measure Level (dB μ V/m) = Reading Level (dB μ 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: 2017/12/16 - 00:57
Limit: FCC_Part15.209_RE(3m)	Engineer: Bruce Wang
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: FRG Remote Key	Power: By Battery
Note: Transmit 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	1302.000	59.938	-4.111	N/A	55.827	80.825	-24.998	PK
	1302.000	59.938	-4.111	11.518	44.309	60.825	-16.516	AV
2	1736.000	73.695	-4.022	N/A	69.673	80.825	-11.152	PK
	1736.000	73.695	-4.022	11.518	58.155	60.825	-2.670	AV
3	2170.000	63.616	-0.940	N/A	62.676	80.825	-18.149	PK
	2170.000	63.616	-0.940	11.518	51.158	60.825	-9.667	AV
4	2604.000	66.269	-0.391	N/A	65.878	80.825	-14.947	PK
	2604.000	66.269	-0.391	11.518	54.360	60.825	-6.465	AV
5	3038.000	46.355	0.869	N/A	47.224	80.825	-33.601	PK
	3038.000	46.355	0.869	11.518	35.706	60.825	-25.119	AV
6	3472.000	51.184	1.534	N/A	52.718	80.825	-28.107	PK
	3472.000	51.184	1.534	11.518	41.200	60.825	-19.625	AV
7	3906.000	49.788	3.141	N/A	52.929	80.825	-27.896	PK
	3906.000	49.788	3.141	11.518	41.411	60.825	-19.414	AV
8	4340.000	49.871	4.350	N/A	54.221	80.825	-26.604	PK
	4340.000	49.871	4.350	11.518	42.703	60.825	-18.122	AV

9	4774.000	52.589	5.674	N/A	58.263	80.825	-22.562	PK
	4774.000	52.589	5.674	11.518	46.745	60.825	-14.080	AV

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

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

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

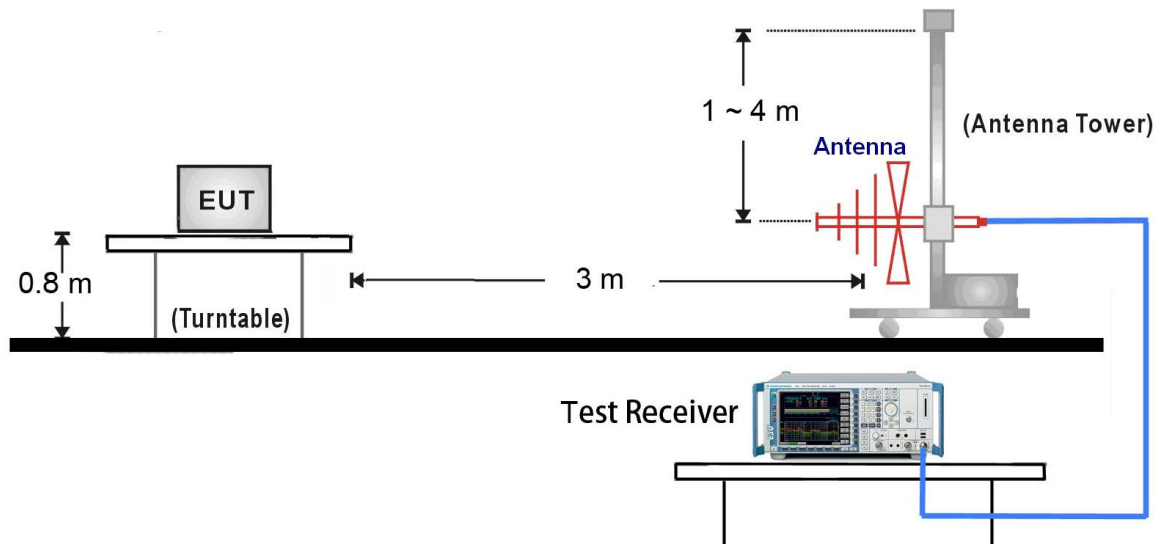
6.3.1. Standard Applicable

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

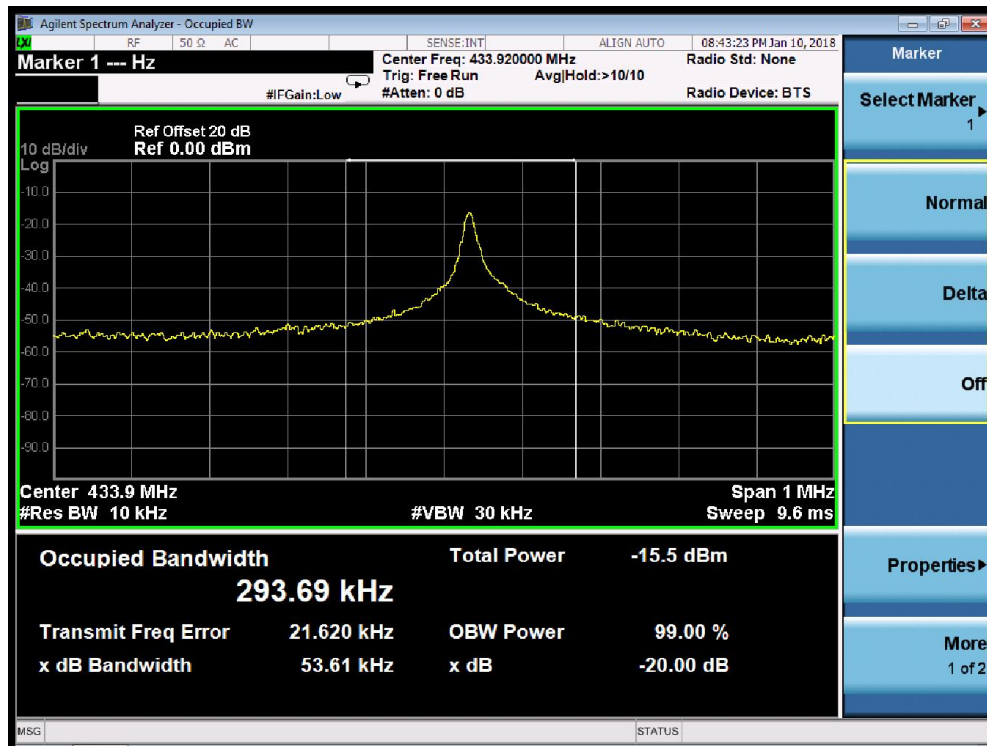


6.3.4. Test Result

Test Frequency (MHz)	20dB Bandwidth (KHz)	Limit (KHz)	Result
433.92	53.61	≤ 1084.8	Pass

Limit = Fundamental Frequency * 0.25% = 433.92MHz * 0.25% = 975KHz

20dB Bandwidth Test Plot



6.4. Release Time

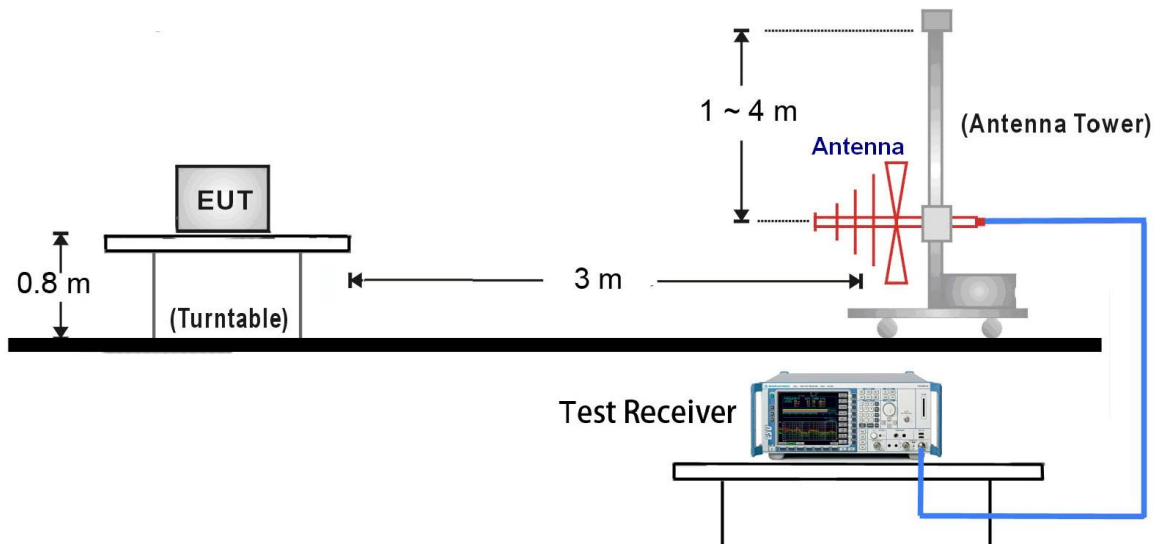
6.4.1. Standard Applicable

According to FCC 15.231(a), (1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

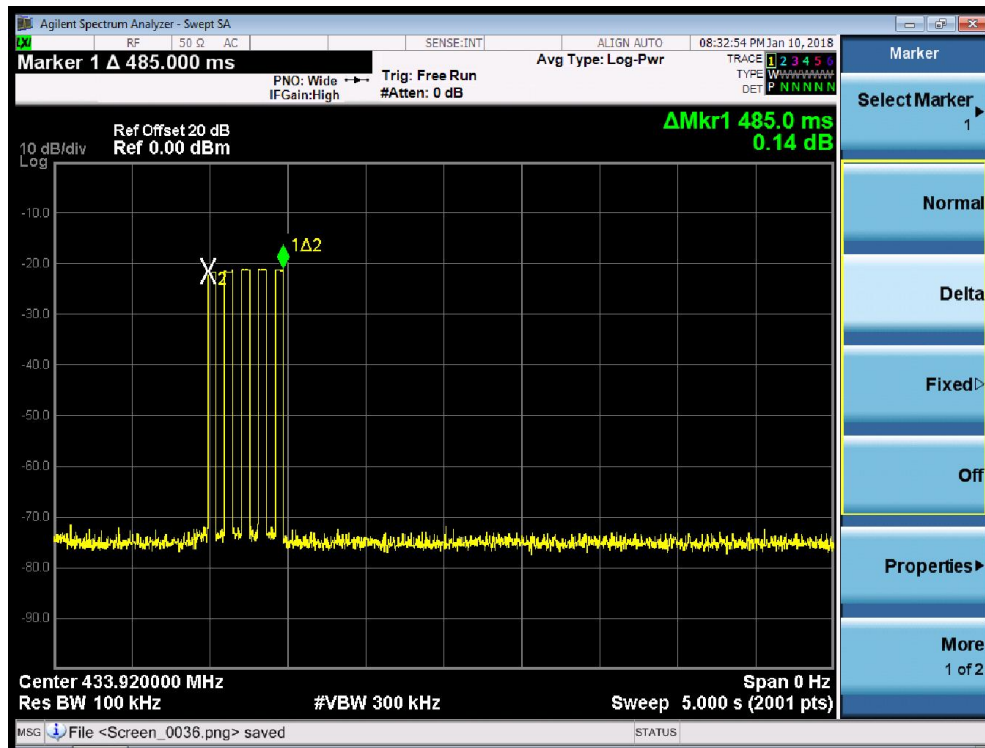
6.4.2. Test Procedure

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 390MHz, 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



Item	Measured Value	Limit	Result
Release Time	0.4850 s	≤ 5 s	Pass



6.5. Duty Cycle

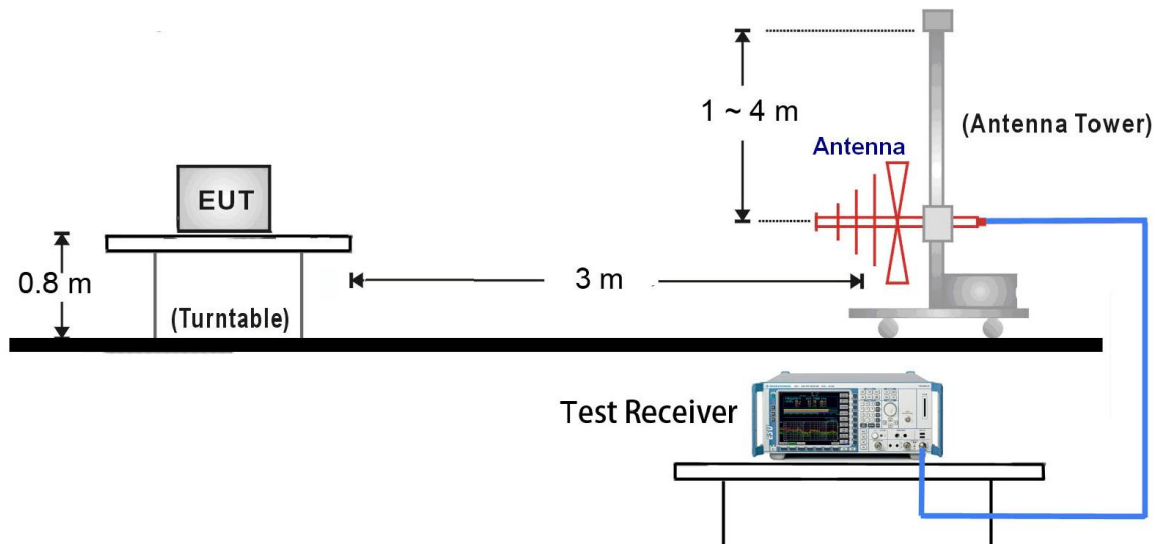
6.5.1. Standard Applicable

According to FCC Part 15.231(b) 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 390MHz, 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



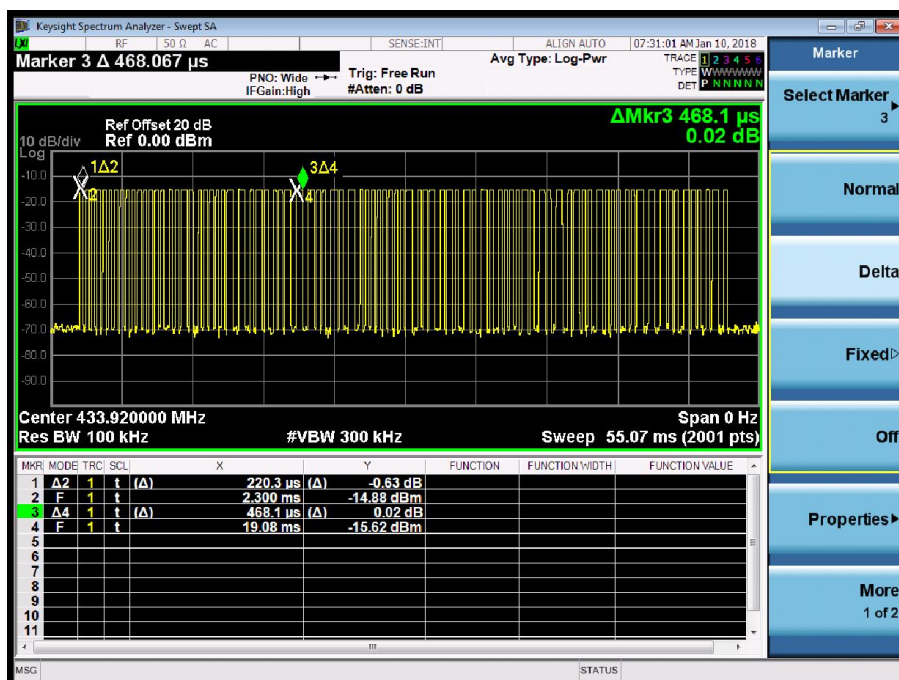
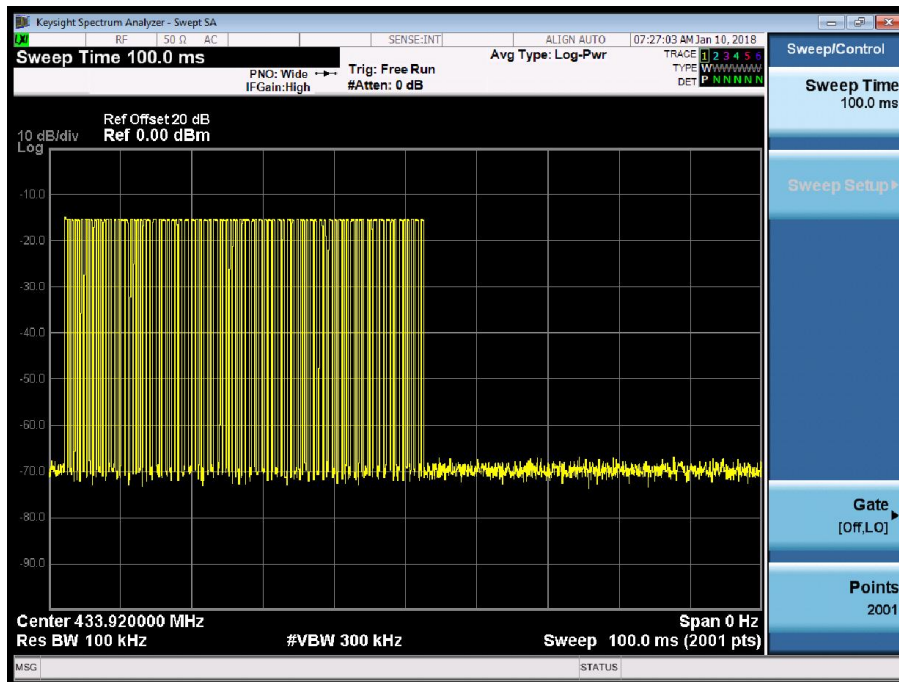
6.5.4. Test Result

Total Time (Ton) (ms)	The duration of one cycle (ms)	Duty Cycle (%)	Duty Cycle Factor (dB)
26.552	100	26.552	11.518

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

Total Time (T_{on})(ms)= $0.220 \cdot 59 + 0.468 \cdot 29 = 26.552(\text{ms})$

Width of Pulse



7. CONCLUSION

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

_____ The End _____