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MEASUREMENT REPORT

FCC PART 15.231(a)

FCC ID: 2AJ23-HY-W20

APPLICANT: QUANZHOU HEYI ELECTRONICS CO., LTD.

Application Type: Certification

Product: Network Alarm System

Model No.: HY-W20, HY-W5, HY-W6, HY-W7, HY-W21, HY-G20,
HY-L20, HY-W30, HY-G30, HY-L30

Brand Name: HEYI

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

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

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

Test Date: September 20 ~ October 10, 2016

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 C63.10-2009. 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
1608RSU02205	Rev. 01	Initial report	10-10-2016	Valid

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§2.1033 General Information

Applicant:	QUANZHOU HEYI ELECTRONICS CO., LTD.
Applicant Address:	No.4-12, Chongrui Street, Qingmeng Economic Development Zone, Quanzhou, China
Manufacturer:	QUANZHOU HEYI ELECTRONICS CO., LTD.
Manufacturer Address:	No.4-12, Chongrui Street, Qingmeng Economic Development Zone, Quanzhou, China
Test Site:	MRT Technology (Suzhou) Co., Ltd
Test Site Address:	D8 Building, Youxin Industrial Park, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China
MRT Registration No.:	809388
FCC Rule Part(s):	Part 15.231(a)
Model No.	HY-W20, HY-W5, HY-W6, HY-W7, HY-W21, HY-G20, HY-L20, HY-W30, HY-G30, HY-L30
FCC ID:	2AJ23-HY-W20
Test Device Serial No.:	N/A ☐ Production ☒ Pre-Production ☐ Engineering
FCC Classification:	FCC Part 15 Security/Remote Control Transmitter(DSC)

Test Facility / Accreditations

Measurements were performed at MRT Laboratory located in Tian'edang Rd., Suzhou, China.

- MRT facility is a FCC registered (MRT Reg. No. 809388) test facility with the site description report on file and has met all the requirements specified in Section 2.948 of the FCC Rules.
- MRT facility is an IC registered (MRT Reg. No. 11384A-1) test laboratory with the site description on file at Industry Canada.
- MRT facility is a VCCI registered (R-4179, G-814, C-4664, T-2206) test laboratory with the site description on file at VCCI Council.
- MRT Lab is accredited to ISO 17025 by the American Association for Laboratory Accreditation (A2LA) under the American Association for Laboratory Accreditation Program (A2LA Cert. No. 3628.01) in EMC, Telecommunications and Radio testing for FCC, Industry Canada, EU and TELEC Rules.



1. INTRODUCTION

1.1. Scope

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

1.2. MRT Test Location

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



2. PRODUCT INFORMATION

2.1. Equipment Description

Product Name	Network Alarm System
Model No.	HY-W20, HY-W5, HY-W6, HY-W7, HY-W21, HY-G20, HY-L20, HY-W30, HY-G30, HY-L30
Frequency Range	433.92 MHz
Type of modulation	ASK
Antenna Type	Integral Antenna
Antenna Gain	1.0dBi
GSM Operation Band(s)	GSM850 / PCS1900
Wi-Fi Specification	802.11b/g/n-HT20/n-HT40
Device Category	Alarm Systems

2.2. Test Standards

The following report is prepared on behalf of the **QUANZHOU HEYI ELECTRONICS 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 C63.10-2009).

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 **Network Alarm System** is permanently attached.
- There are no provisions for connection to an external antenna.

Conclusion:

The Network Alarm System **FCC ID: 2AJ23-HY-W20** unit complies with the requirement of §15.203.

4. TEST EQUIPMENT CALIBRATION DATA

Radiated Disturbance - AC1

Instrument	Manufacturer	Type No.	Serial No.	Cali. Interval	Cal. Due Date
Spectrum Analyzer	Agilent	N9020A	MY52090106	1 year	2017/05/07
Microwave System Amplifier	Agilent	83017A	MY53270040	1 year	2017/03/28
Bilog Period Antenna	Schwarzbeck	VULB 9168	662	1 year	2016/12/11
Horn Antenna	Schwarzbeck	BBHA9120D	9120D-1167	1 year	2016/11/07
Temperature/Humidity Meter	Yuhuaze	HTC-2	N/A	1 year	2016/12/20
Anechoic Chamber	TDK	Chamber-AC1	N/A	1 year	2017/05/10

20dB Bandwidth - AC1

Instrument	Manufacturer	Type No.	Serial No.	Cali. Interval	Cal. Due Date
Spectrum Analyzer	Agilent	N9020A	MY52090106	1 year	2017/05/07
Bilog Period Antenna	Schwarzbeck	VULB 9168	662	1 year	2016/12/11
Temperature/Humidity Meter	Yuhuaze	HTC-2	N/A	1 year	2016/12/20
Anechoic Chamber	TDK	Chamber-AC1	N/A	1 year	2017/05/10

Release Time - AC1

Instrument	Manufacturer	Type No.	Serial No.	Cali. Interval	Cal. Due Date
Spectrum Analyzer	Agilent	N9020A	MY52090106	1 year	2017/05/07
Bilog Period Antenna	Schwarzbeck	VULB 9168	662	1 year	2016/12/11
Temperature/Humidity Meter	Yuhuaze	HTC-2	N/A	1 year	2016/12/20
Anechoic Chamber	TDK	Chamber-AC1	N/A	1 year	2017/05/10

Duty Cycle - AC1

Instrument	Manufacturer	Type No.	Serial No.	Cali. Interval	Cal. Due Date
Spectrum Analyzer	Agilent	N9020A	MY52090106	1 year	2017/05/07
Bilog Period Antenna	Schwarzbeck	VULB 9168	662	1 year	2016/12/11
Temperature/Humidity Meter	Yuhuaze	HTC-2	N/A	1 year	2016/12/20
Anechoic Chamber	TDK	Chamber-AC1	N/A	1 year	2017/05/10

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

6. TEST RESULT

6.1. Summary

Company Name: QUANZHOU HEYI ELECTRONICS CO., LTD.

FCC ID: 2AJ23-HY-W20

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.

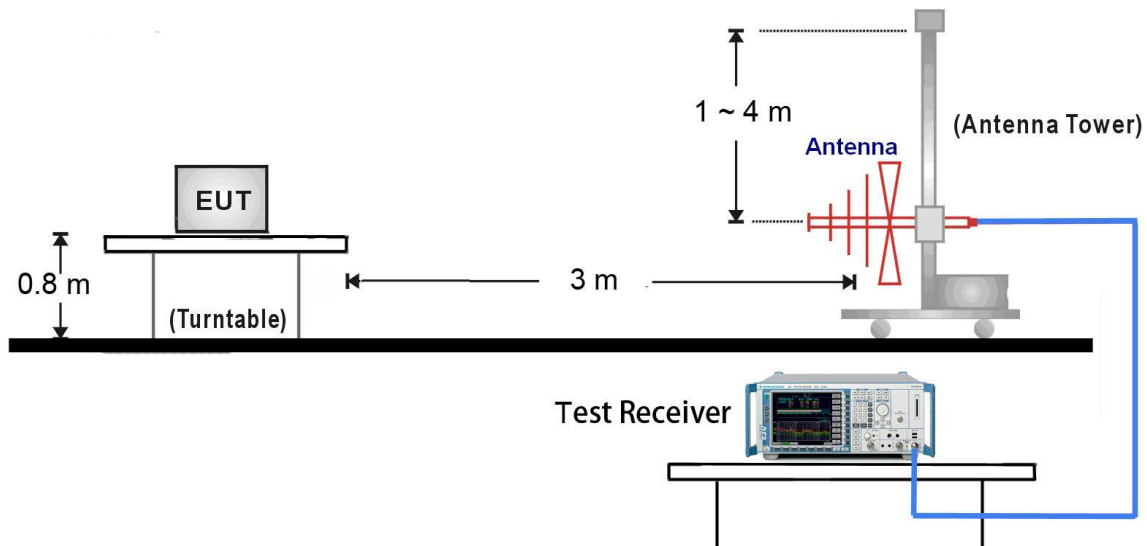
6.2.2. Test Procedure

The setup of EUT is according with per ANSI C63.10-2009 measurement procedure. The specification used was with the FCC Part 15.231(b) and FCC Part 15.209 Limit.

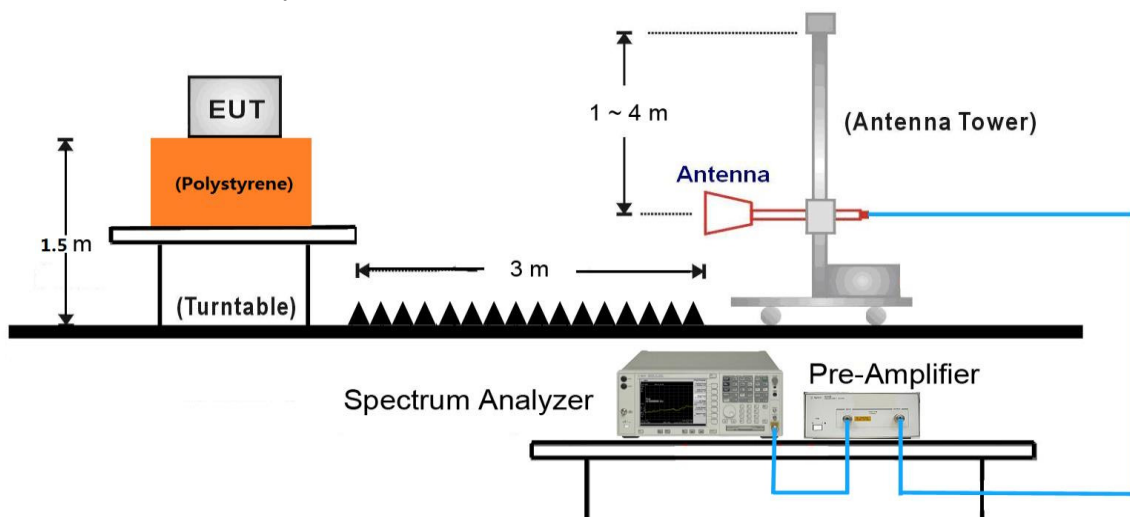
6.2.3. Test Setup

The setup of EUT is according with per ANSI C63.10-2009 measurement procedure. The specification used was with the FCC Part 15.231(b) and FCC Part 15.209 Limit.

30MHz ~ 1GHz Test Setup:

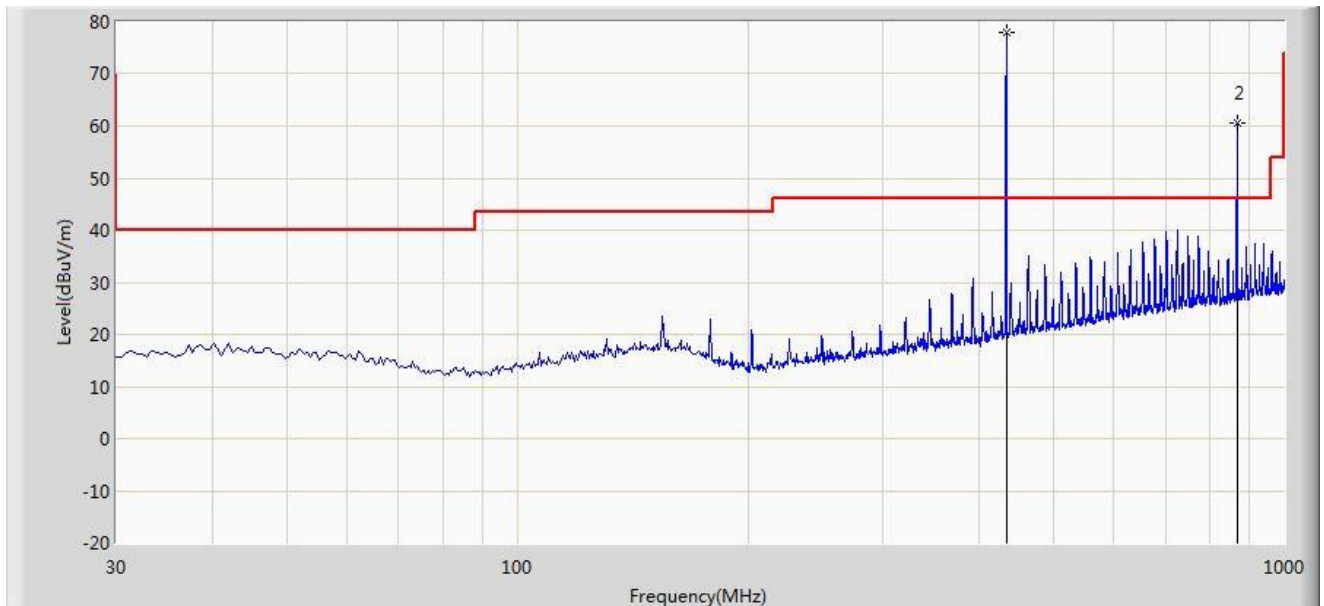


1GHz ~ 18GHz Test Setup:



6.2.4. Test Results

Site: AC1	Time: 2016/09/21 - 11:42
Limit: FCC_Part15.209_RE(3m)	Engineer: Roy Cheng
Probe: VULB 9168_20-2000MHz	Polarity: Horizontal
EUT: Network Alarm System	Power: DC 3.7V
Note: Test mode 1	



No	Frequency (MHz)	Reading Level (dBuV)	Factor (dB)	DutyCycle Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Ant Pos (cm)	Table Pos (deg)	Type
1	434.005	60.492	17.427	N/A	77.919	100.825	-22.906	100	109	PK
	434.005	60.492	17.427	-11.67	66.249	80.825	-14.576	100	109	AV
2	867.595	36.566	23.882	N/A	60.448	80.825	-20.377	100	165	PK
	867.595	36.566	23.882	-11.67	48.778	60.625	-11.847	100	165	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.

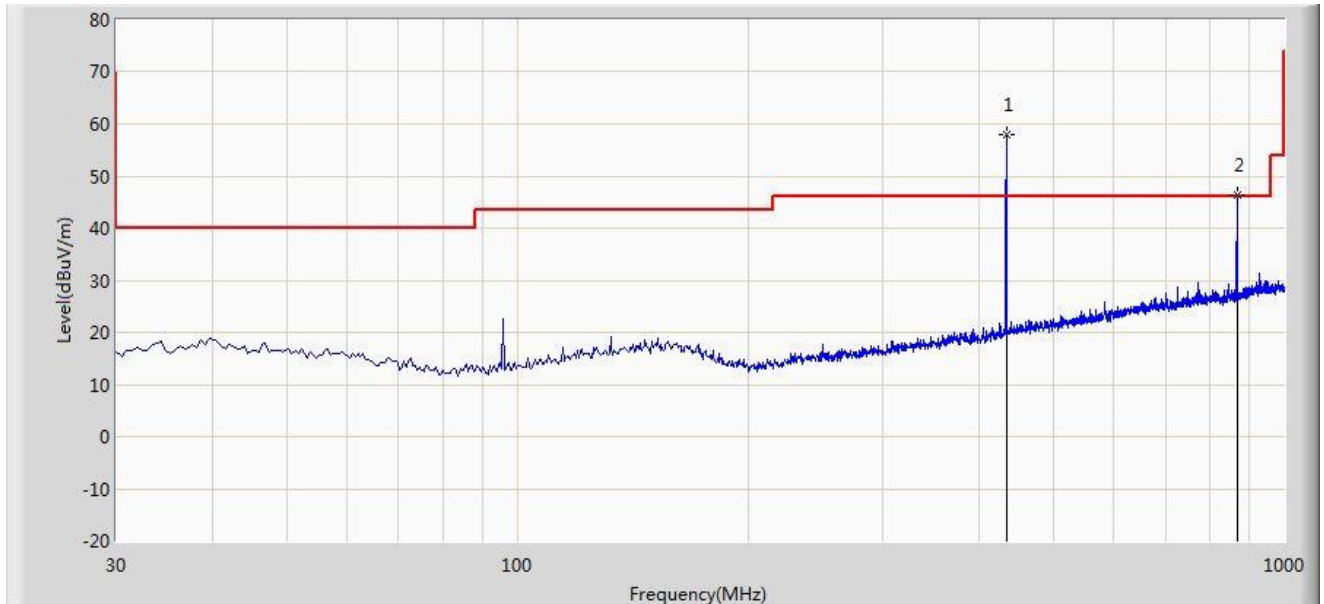
Note 2: The fundamental frequency is 433.92MHz, so the fundamental and spurious emissions radiated limit base on the operating frequency 433.92MHz.

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: 2016/09/21 - 11:45
Limit: FCC_Part15.209_RE(3m)	Engineer: Roy Cheng
Probe: VULB 9168_20-2000MHz	Polarity: Vertical
EUT: Network Alarm System	Power: DC 3.7V
Note: Test mode 1	



No	Frequency (MHz)	Reading Level (dBuV)	Factor (dB)	DutyCycle Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Ant Pos (cm)	Table Pos (deg)	Type
1	434.005	40.454	17.427	N/A	57.881	100.825	-42.944	100	97	PK
	434.005	40.454	17.427	-11.67	46.211	80.825	-34.614	100	97	AV
2	867.595	22.629	23.882	N/A	46.511	80.825	-34.314	100	219	PK
	867.595	22.629	23.882	-11.67	34.841	60.625	-25.784	100	219	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.

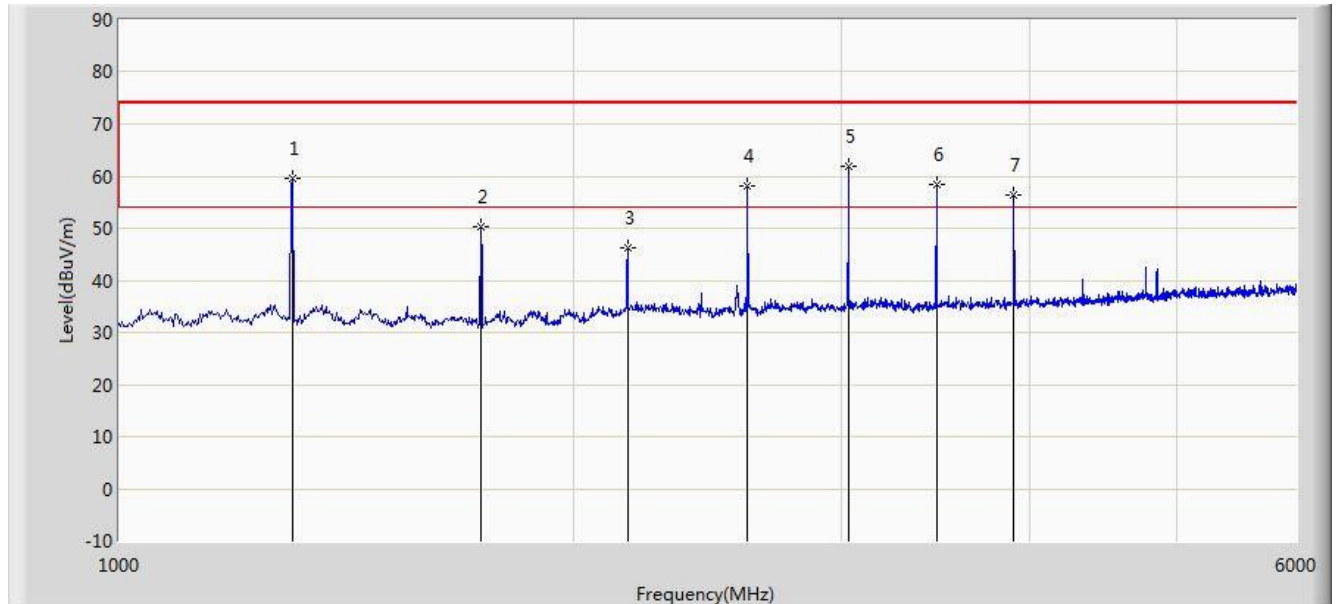
Note 2: The fundamental frequency is 433.92MHz, so the fundamental and spurious emissions radiated limit base on the operating frequency 433.92MHz.

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: 2016/09/10 - 15:24
Limit: FCC_Part15.209_RE(3m)	Engineer: Roy Cheng
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: Network Alarm System	Power: AC 120V/60Hz
Note: Test mode 1	



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	67.916	-8.229	N/A	59.687	74.000	-14.313	PK
	1302.500	67.916	-8.229	-11.67	48.017	54.000	-5.983	AV
2	1735.000	57.706	-7.319	N/A	50.387	74.000	-23.613	PK
	1735.000	57.706	-7.319	-11.67	38.717	54.000	-15.283	AV
3	2170.000	50.214	-3.940	N/A	60.687	74.000	-13.313	PK
	2170.000	50.214	-3.940	-11.67	49.017	54.000	-4.983	AV
4	2602.500	61.356	-3.288	N/A	51.387	74.000	-22.613	PK
	2602.500	61.356	-3.288	-11.67	39.717	54.000	-14.283	AV
5	3037.500	63.997	-2.042	N/A	61.687	74.000	-12.313	PK
	3037.500	63.997	-2.042	-11.67	50.017	54.000	-3.983	AV
6	3470.000	59.793	-1.300	N/A	52.387	74.000	-21.613	PK
	3470.000	59.793	-1.300	-11.67	40.717	54.000	-13.283	AV
7	3905.000	56.165	0.208	N/A	62.687	74.000	-11.313	PK
	3905.000	56.165	0.208	-11.67	51.017	54.000	-2.983	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.

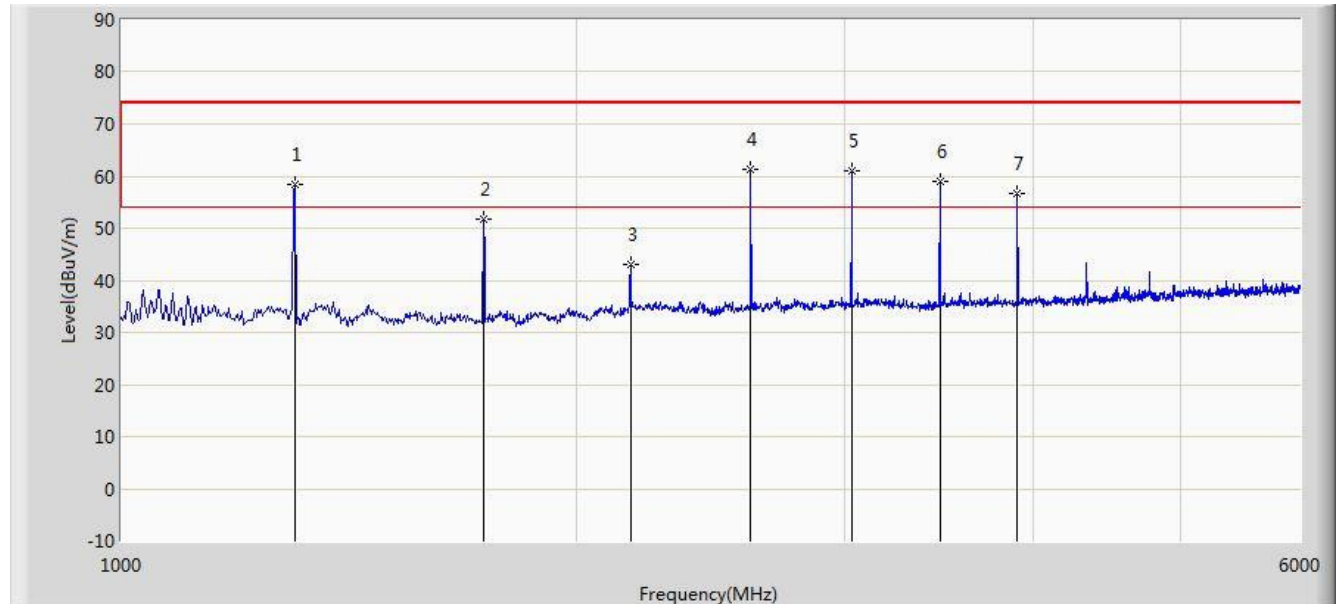
Note 2: The fundamental frequency is 433.92MHz, so the fundamental and spurious emissions radiated limit base on the operating frequency 433.92MHz.

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: 2016/09/09 - 09:52
Limit: FCC_Part15.209_RE(3m)	Engineer: Roy Cheng
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: Network Alarm System	Power: AC 120V/60Hz
Note: Test mode 1	



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	66.595	-8.229	N/A	58.367	74.000	-15.633	PK
	1302.500	66.595	-8.229	-11.67	46.697	54.000	-7.303	AV
2	1735.000	59.058	-7.319	N/A	51.740	74.000	-22.26	PK
	1735.000	59.058	-7.319	-11.67	40.070	54.000	-13.93	AV
3	2170.000	46.860	-3.940	N/A	42.920	74.000	-31.08	PK
	2170.000	46.860	-3.940	-11.67	31.250	54.000	-22.75	AV
4	2602.500	64.521	-3.288	N/A	61.233	74.000	-12.767	PK
	2602.500	64.521	-3.288	-11.67	49.563	54.000	-4.437	AV
5	3037.500	63.129	-2.042	N/A	61.087	74.000	-12.913	PK
	3037.500	63.129	-2.042	-11.67	49.417	54.000	-4.583	AV
6	3470.000	60.332	-1.300	N/A	59.032	74.000	-14.968	PK
	3470.000	60.332	-1.300	-11.67	47.362	54.000	-6.638	AV
7	3905.000	56.315	0.208	N/A	56.522	74.000	-17.478	PK
	3905.000	56.315	0.208	-11.67	44.852	54.000	-9.148	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

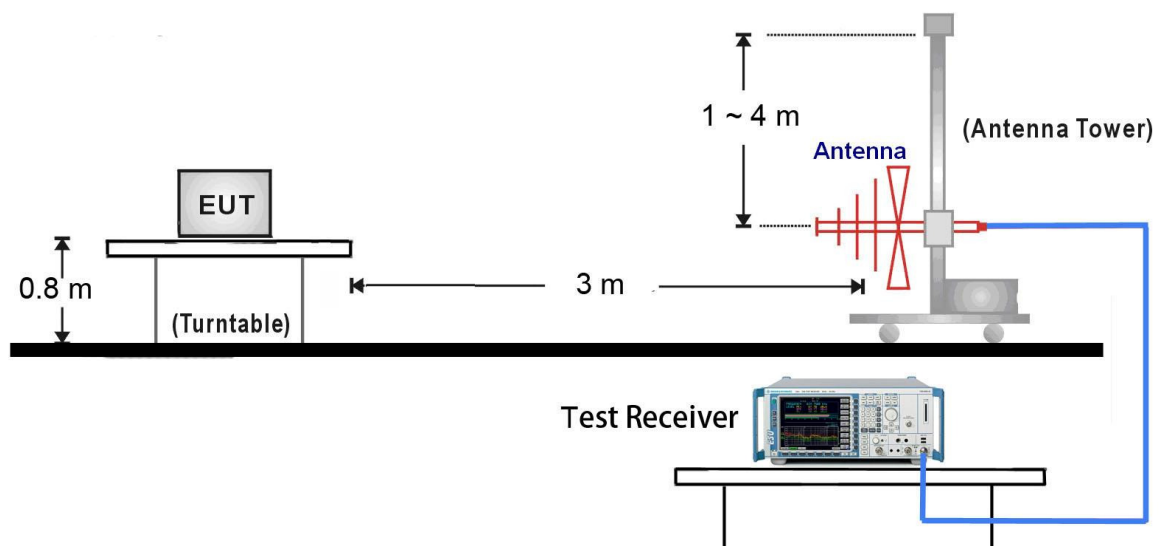
6.3.1. Standard Applicable

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

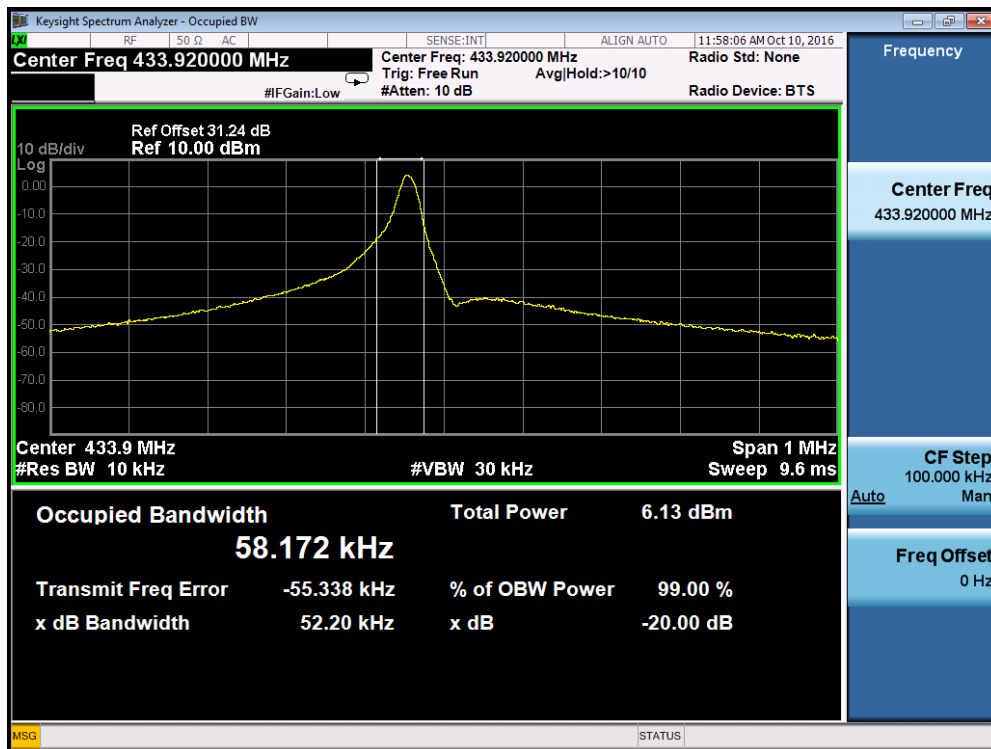


6.3.4. Test Result

Test Frequency (MHz)	20dB Bandwidth (KHz)	Limit (KHz)	Result
433.92	52.20	≤ 1084.8	Pass

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

20dB Bandwidth Test Plot



6.4. Release Time

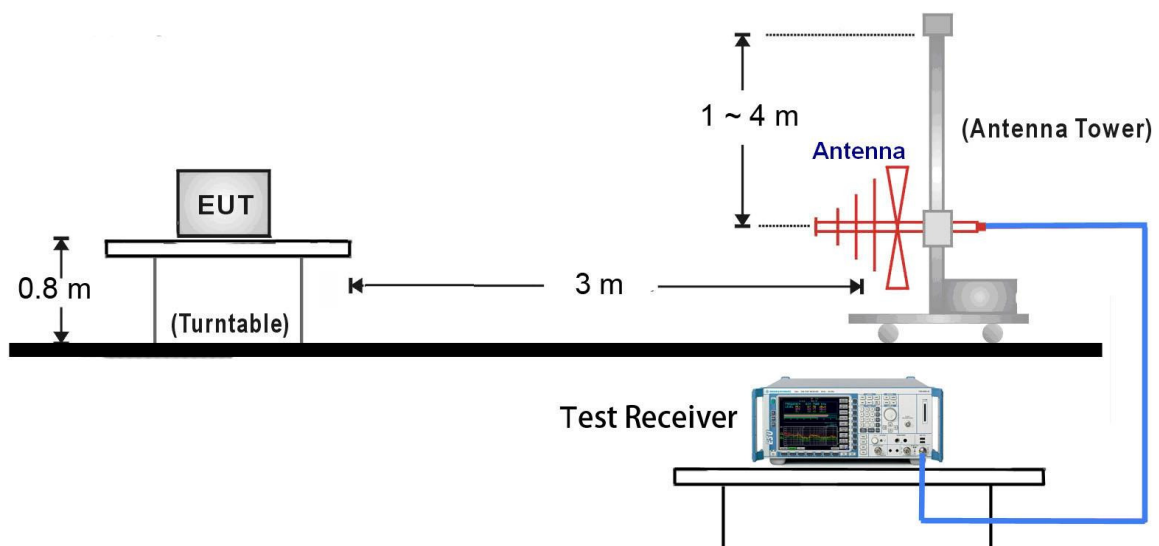
6.4.1. Standard Applicable

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 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.

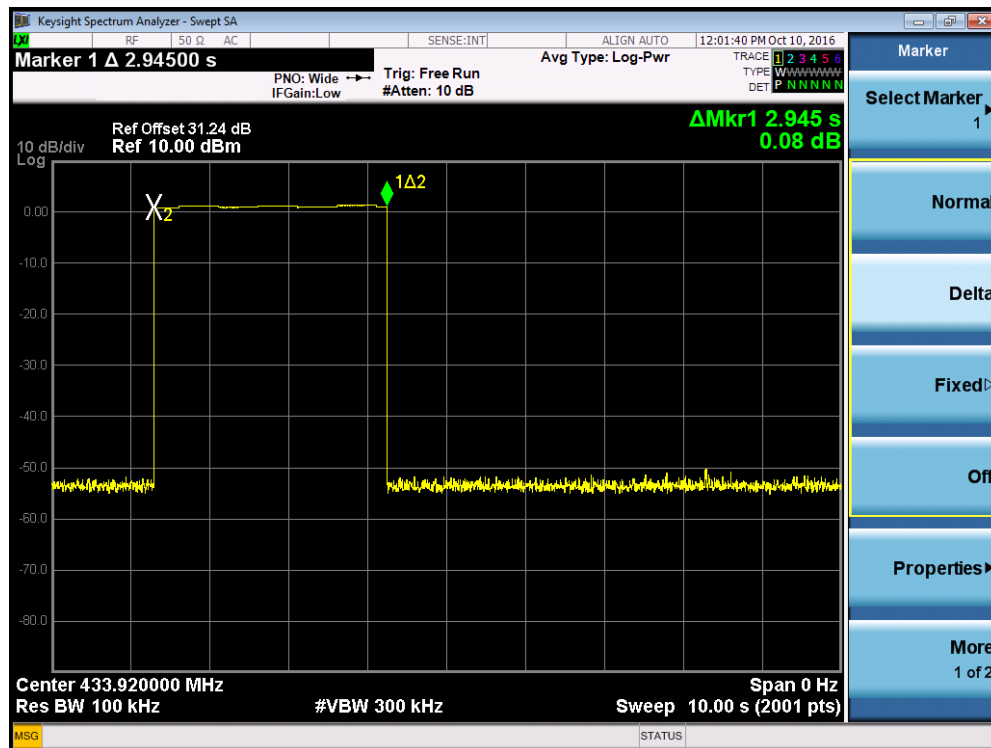
6.4.3. Test Setup



6.4.4. Test Result

Item	Measured Value	Limit	Result
Release Time	2.945 s	≤ 5 s	Pass

Release Time



6.5. Duty Cycle

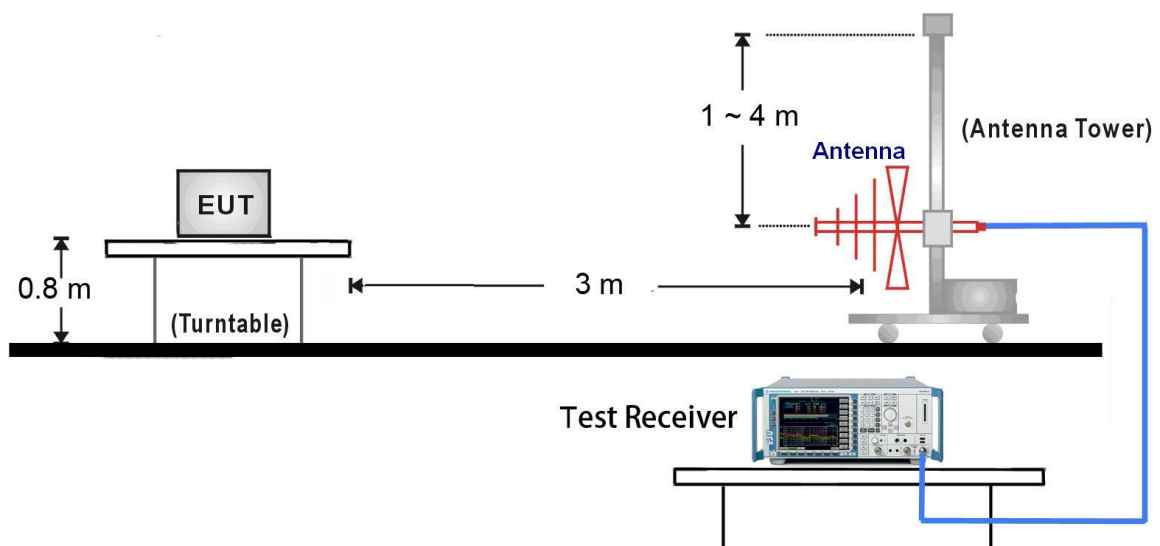
6.5.1. Standard Applicable

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 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.

6.5.3. Test Setup



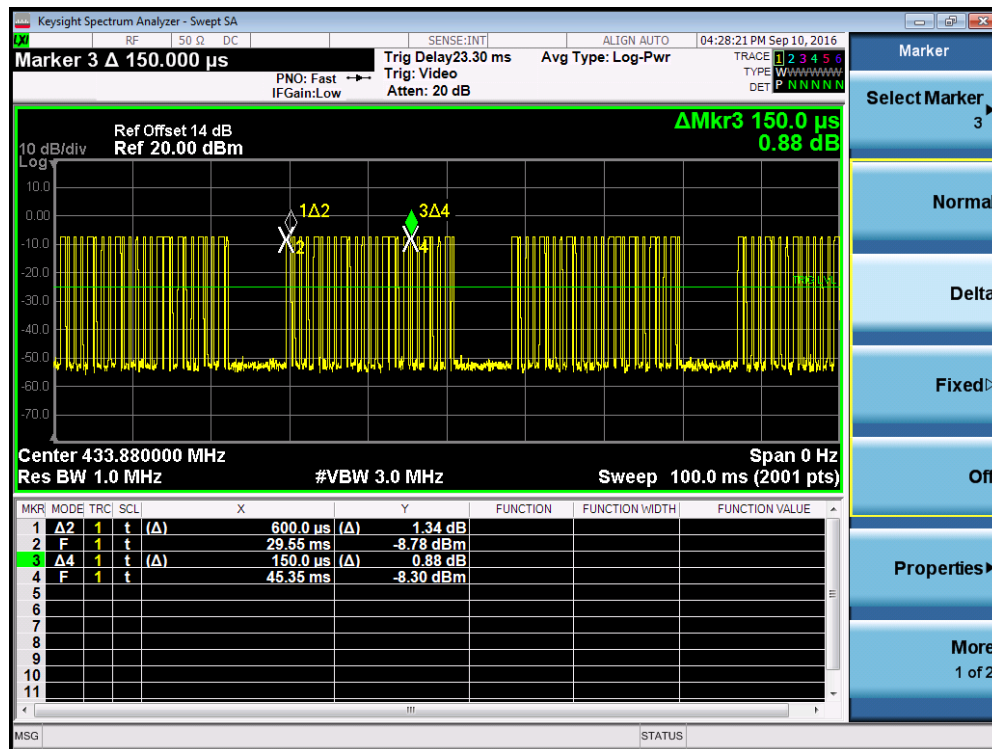
6.5.4. Test Result

Total Time (Ton) (ms)	The duration of one cycle (ms)	Duty Cycle (%)	Duty Cycle Factor (dB)
26.100	100	26.100	-11.67

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

Total Time (T_{on})(ms)= $0.600 \cdot 28 + 0.150 \cdot 62 = 42.900$ (ms)

Width of Pulse



7. CONCLUSION

The data collected relate only the item(s) tested and show that the **Network Alarm System FCC ID: 2AJ23-HY-W20** is in compliance with FCC Part 15.231(a) of the FCC Rules.

The End