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Report No.: 1506RSU007
Report Version: V01
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MEASUREMENT REPORT

FCC PART 15.231

FCC ID: 2AE2Z-KK-360R

APPLICANT: Mercury Electronics LTD

Application Type: Certification

Product: Remote Dog Training Collar

Model No.: KK-360R

Brand Name: KoolKani

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

FCC Rule Part(s): Part 15.231

Test Procedure(s): ANSI C63.10-2009

Test Date: June 09 ~ 14, 2015

Reviewed By : Robin Wu
(Robin Wu)

Approved By : Marlinchen
(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
1506RSU00701	Rev. 01	Initial report	06-15-2015

CONTENTS

Description	Page
1. INTRODUCTION	6
1.1. Scope	6
1.2. MRT Test Location	6
2. PRODUCT INFORMATION	7
2.1. Equipment Description.....	7
2.2. Test Standards	7
2.3. Test Methodology	7
2.4. EUT Setup and Test Mode	7
3. ANTENNA REQUIREMENTS.....	8
4. TEST EQUIPMENT CALIBRATION DATA	9
5. MEASUREMENT UNCERTAINTY	10
6. TEST RESULT	11
6.1. Summary	11
6.2. Radiated Emissions	12
6.2.1. Standard Applicable	12
6.2.2. Test Procedure.....	12
6.2.3. Test Setup.....	13
6.2.4. Test Results	14
6.3. 20dB Bandwidth	20
6.3.1. Standard Applicable	20
6.3.2. Test Procedure.....	20
6.3.3. Test Setup.....	20
6.3.4. Test Result.....	21
6.4. Release Time.....	22
6.4.1. Standard Applicable	22
6.4.2. Test Procedure.....	22
6.4.3. Test Setup.....	22
6.4.4. Test Result.....	23
6.5. Duty Cycle	24
6.5.1. Standard Applicable	24
6.5.2. Test Procedure.....	24
6.5.3. Test Setup.....	24
6.5.4. Test Result.....	25

7. CONCLUSION.....	27
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§2.1033 General Information

Applicant:	Mercury Electronics LTD
Applicant Address:	UNIT 602, 6/F, CAUSEWAY BAY COMMERCIAL BUILDING, 1 SUGAR STREET, CAUSEWAY BAY, HONG KONG
Manufacturer:	Mercury Electronics LTD
Manufacturer Address:	UNIT 602, 6/F, CAUSEWAY BAY COMMERCIAL BUILDING, 1 SUGAR STREET, CAUSEWAY BAY, HONG KONG
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
Model No.	KK-360R
FCC ID:	2AE2Z-KK-360R
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	Remote Dog Training Collar
Model No.	KK-360R
Frequency Range	433.92 MHz
Type of modulation	ASK
Antenna Type	Integral Antenna
Antenna Gain	2.8dBi
Device Category	Portable Device

2.2. Test Standards

The following report is prepared on behalf of the **Mercury Electronics 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 **Remote Dog Training Collar** is permanently attached.
- There are no provisions for connection to an external antenna.

Conclusion:

The Remote Dog Training Collar **FCC ID: 2AE2Z-KK-360R** unit complies with the requirement of §15.203.

4. TEST EQUIPMENT CALIBRATION DATA

Radiated Emission

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
Spectrum Analyzer	Agilent	N9020A	MRTSUE06028	1 year	2016/04/23
Preamplifier	Agilent	83017A	MRTSUE06076	1 year	2015/12/13
Loop Antenna	Schwarzbeck	FMZB1519	MRTSUE06025	1 year	2015/11/08
TRILOG Antenna	Schwarzbeck	VULB9162	MRTSUE06022	1 year	2015/11/08
Broad-Band Horn Antenna	Schwarzbeck	BBHA9120D	MRTSUE06023	1 year	2015/11/08
Broadband Horn Antenna	Schwarzbeck	BBHA9170	MRTSUE06024	1 year	2015/12/11
Temperature/Humidity Meter	Anymetre	TH101B	MRTSUE06046	1 year	2015/11/14

20dB Bandwidth

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cal. Due. Date
Spectrum Analyzer	Agilent	N9020A	MRTSUE06028	1 year	2016/04/23
TRILOG Antenna	Schwarzbeck	VULB9162	MRTSUE06022	1 year	2015/11/08
Temperature/Humidity Meter	Anymetre	TH101B	MRTSUE06046	1 year	2015/11/15

Release Time

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cal. Due. Date
Spectrum Analyzer	Agilent	N9020A	MRTSUE06028	1 year	2016/04/23
TRILOG Antenna	Schwarzbeck	VULB9162	MRTSUE06022	1 year	2015/11/08
Temperature/Humidity Meter	Anymetre	TH101B	MRTSUE06046	1 year	2015/11/15

Duty Cycle

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cal. Due. Date
Spectrum Analyzer	Agilent	N9020A	MRTSUE06028	1 year	2016/04/23
TRILOG Antenna	Schwarzbeck	VULB9162	MRTSUE06022	1 year	2015/11/08
Temperature/Humidity Meter	Anymetre	TH101B	MRTSUE06046	1 year	2015/11/15

Software	Version	Function
e3	V8.3.5	EMI Test Software

5. MEASUREMENT UNCERTAINTY

Where relevant, the following test uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k = 2$.

Radiated Emission Measurement
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: Mercury Electronics LTD

FCC ID: 2AE2Z-KK-360R

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) 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	2,250	225
70-130	1,250	125
130-174	¹ 1,250 to 3,750	¹ 125 to 375
174-260	3,750	375
260-470	¹ 3,750 to 12,500	¹ 375 to 1,250
Above 470	12,500	1,250

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.

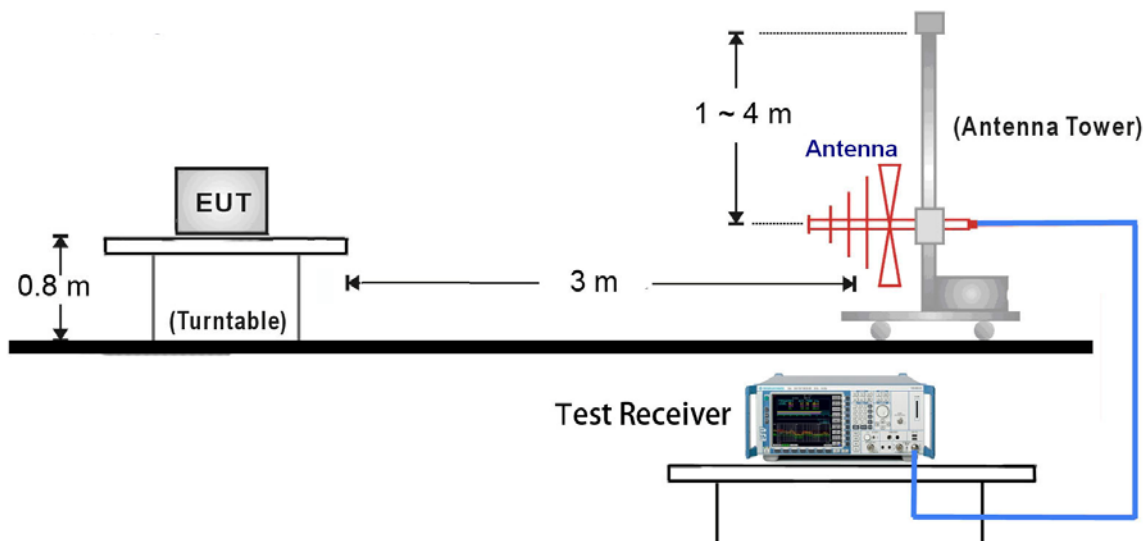
6.2.2. Test Procedure

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.

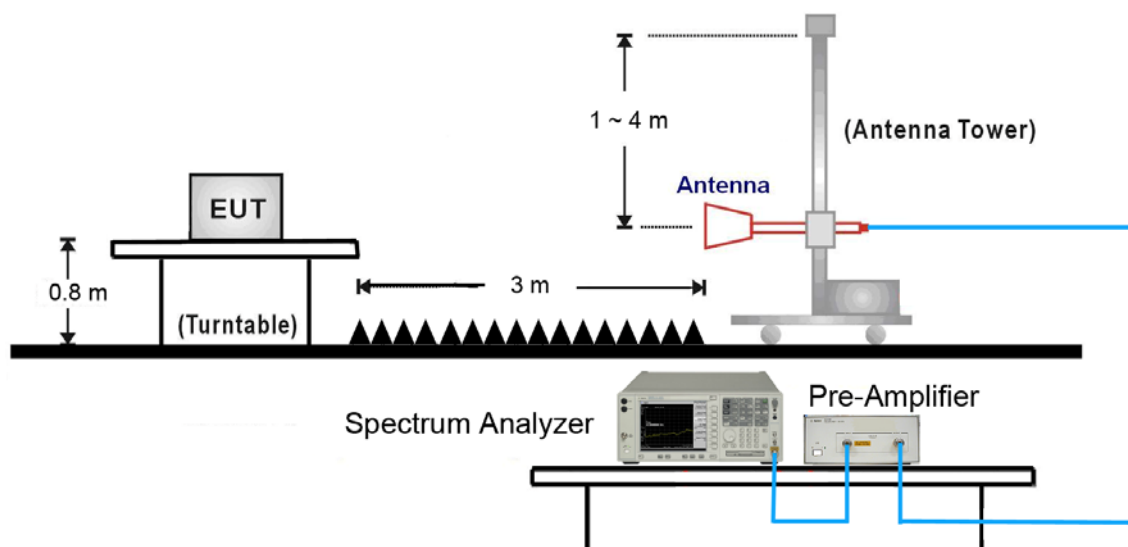
6.2.3. Test Setup

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

30MHz ~ 1GHz Test Setup:

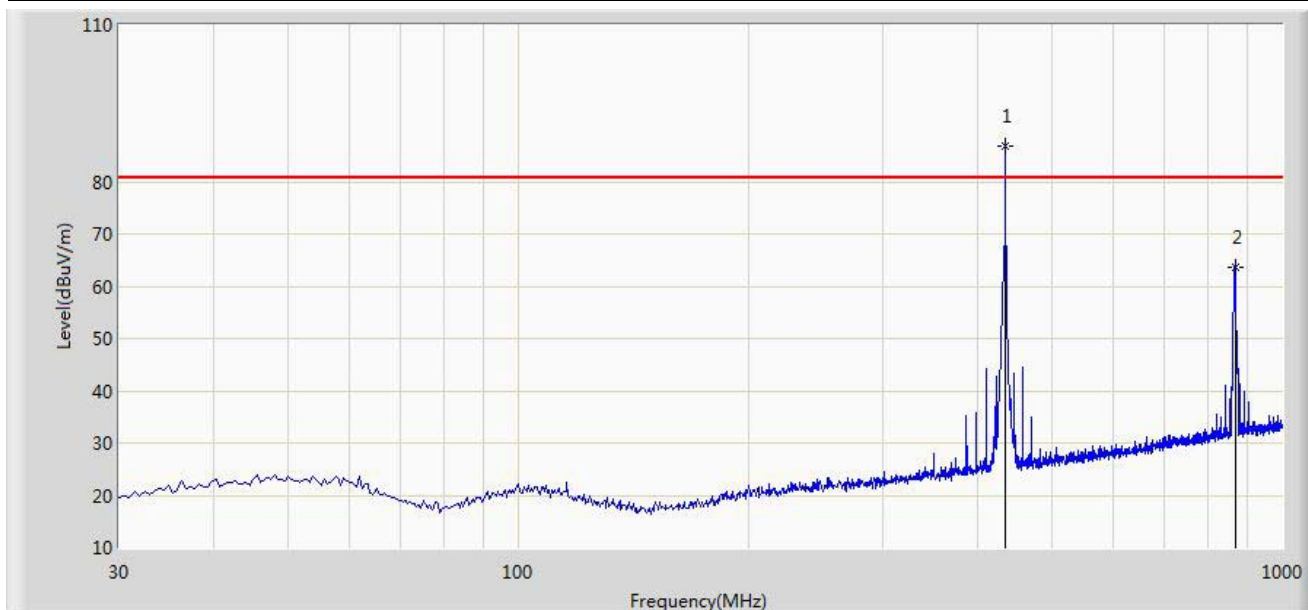


1GHz ~ 5GHz Test Setup:



6.2.4. Test Results

Site: AC1	Time: 2015/06/11 - 17:57
Limit: FCC_Part15.209_RE(3m)	Engineer: Roy Cheng
Probe: VULB9162_0.03-8GHz	Polarity: Horizontal
EUT: Remote Dog Training Collar	Power: AC 120V/60Hz
Note: Transmit	



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	433.920	100.735	-13.992	N/A	86.743	100.800	-14.057	100	124	PK
	433.920	91.865	-13.992	-8.870	77.873	80.800	-2.927	100	124	AV
2	867.595	70.929	-7.210	N/A	63.719	80.800	-17.081	100	168	PK
	867.595	62.059	-7.210	-8.870	54.849	60.800	-5.951	100	168	AV

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

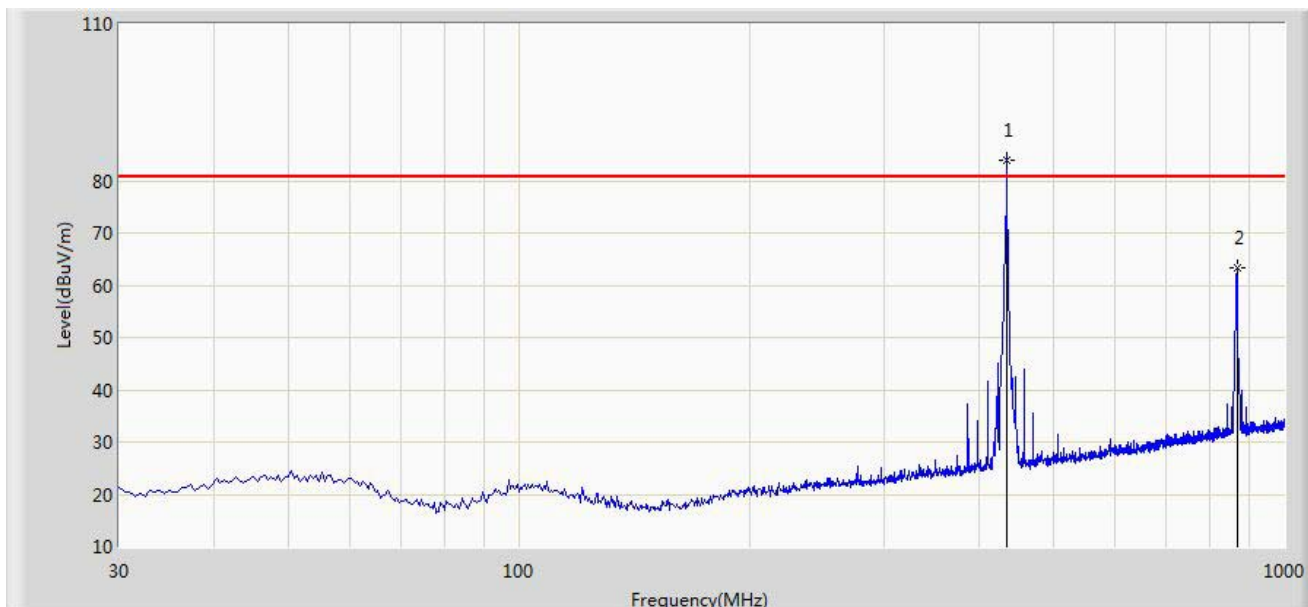
Note 2: The fundamental frequency is 433.92MHz, so the fundamental and spurious emissions radiated limit base on the operating frequency 433.92MHz.

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

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

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

Site: AC1	Time: 2015/06/11 - 17:58
Limit: FCC_Part15.209_RE(3m)	Engineer: Roy Cheng
Probe: VULB9162_0.03-8GHz	Polarity: Vertical
EUT: Remote Dog Training Collar	Power: AC 120V/60Hz
Note: Transmit	



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	433.920	97.865	-13.992	N/A	83.873	100.800	-16.927	100	118	PK
	433.920	88.995	-13.992	-8.870	75.003	80.800	-5.797	100	118	AV
2	867.595	70.679	-7.210	N/A	63.469	80.800	-17.331	100	145	PK
	867.595	61.809	-7.210	-8.870	54.599	60.800	-6.201	100	145	AV

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

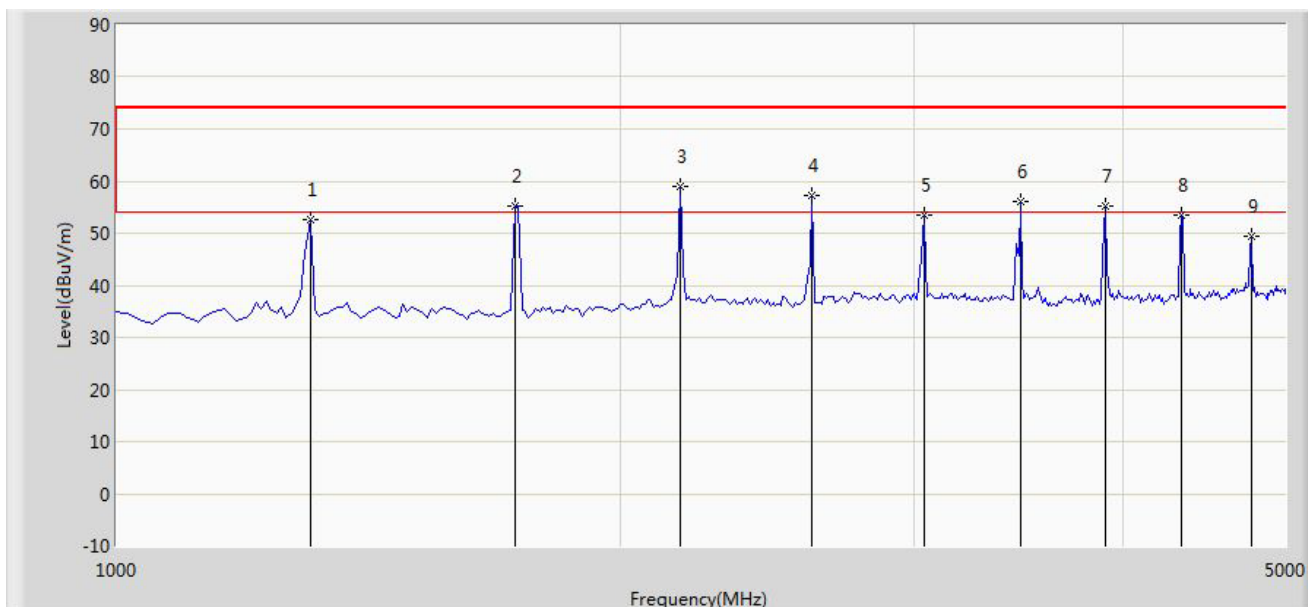
Note 2: The fundamental frequency is 433.92MHz, so the fundamental and spurious emissions radiated limit base on the operating frequency 433.92MHz.

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

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

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

Site: AC1	Time: 2015/06/11 - 17:21
Limit: FCC_Part15.209_RE(3m)	Engineer: Roy Cheng
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: Remote Dog Training Collar	Power: AC 120V/60Hz
Note: Transmit	



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	1306.000	60.768	-8.204	N/A	52.564	80.800	-28.236	100	144	PK
	1306.000	51.898	-8.204	-8.870	43.694	60.800	-17.106	100	144	AV
2	1731.000	62.577	-7.335	N/A	55.242	80.800	-25.558	100	167	PK
	1731.000	53.707	-7.335	-8.870	46.372	60.800	-14.428	100	167	AV
3	2173.000	62.820	-3.907	N/A	58.913	80.800	-21.887	100	136	PK
	2173.000	53.950	-3.907	-8.870	50.043	60.800	-10.757	100	136	AV
4	2606.500	60.503	-3.272	N/A	57.231	80.800	-23.569	100	186	PK
	2606.500	51.633	-3.272	-8.870	48.361	60.800	-12.439	100	186	AV
5	3040.000	55.604	-2.031	N/A	53.573	80.800	-27.227	100	117	PK
	3040.000	46.734	-2.031	-8.870	44.703	60.800	-16.097	100	117	AV
6	3473.500	57.266	-1.278	N/A	55.988	80.800	-24.812	100	269	PK
	3473.500	48.396	-1.278	-8.870	47.118	60.800	-13.682	100	269	AV
7	3907.000	54.908	0.214	N/A	55.122	74.000	-18.878	100	183	PK
	3907.000	46.038	0.214	-8.870	46.252	54.000	-7.748	100	183	AV
8	4332.000	52.117	1.272	N/A	53.389	74.000	-20.611	100	241	PK
	4332.000	43.247	1.272	-8.870	44.519	54.000	-9.481	100	241	AV
9	4774.000	46.646	2.644	N/A	49.290	74.000	-24.710	100	193	PK

	4774.000	37.776	2.644	-8.870	40.420	54.000	-13.580	100	193	AV
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Note 1: Testing is carried out with frequency rang 9 kHz to the tenth harmonics. There is the ambient noise within frequency range 9 kHz ~ 30 MHz, the permissible value is not show in the report.

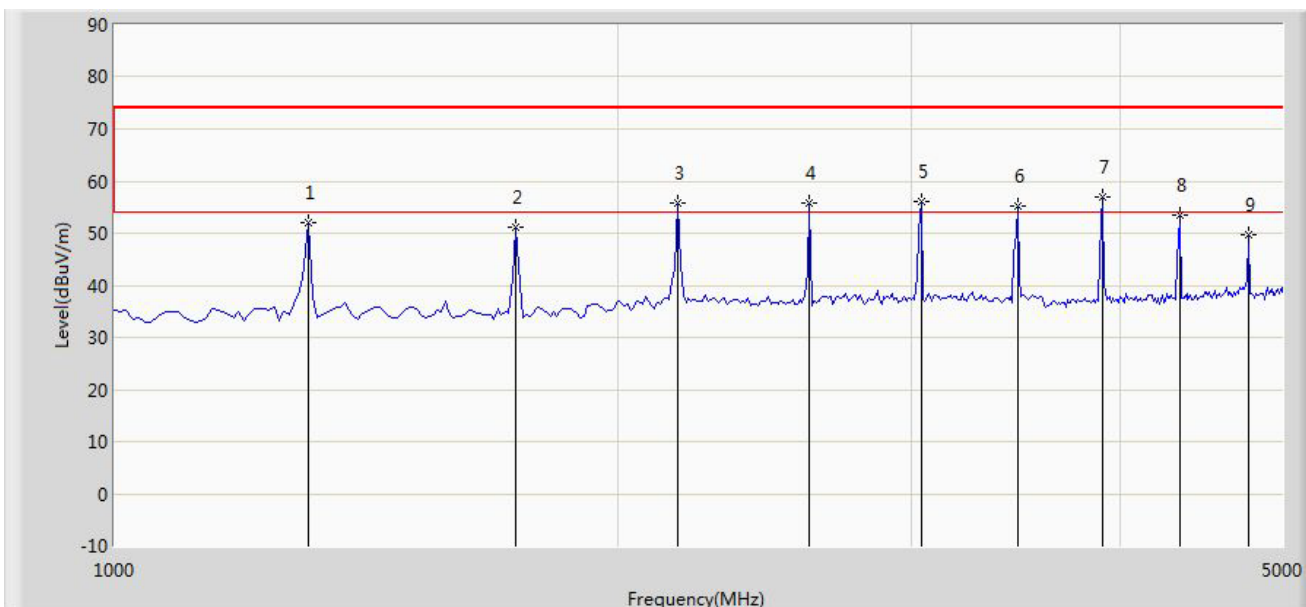
Note 2: The fundamental frequency is 433.92MHz, so the fundamental and spurious emissions radiated limit base on the operating frequency 433.92MHz.

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

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

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

Site: AC1	Time: 2015/06/11 - 17:32
Limit: FCC_Part15.209_RE(3m)	Engineer: Roy Cheng
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: Remote Dog Training Collar	Power: AC 120V/60Hz
Note: Transmit	



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	1306.000	60.129	-8.204	N/A	51.925	80.800	-28.875	100	223	PK
	1306.000	51.259	-8.204	-8.870	43.055	60.800	-17.745	100	223	AV
2	1739.500	58.526	-7.299	N/A	51.228	80.800	-29.572	100	207	PK
	1739.500	49.656	-7.299	-8.870	42.358	60.800	-18.442	100	207	AV
3	2173.000	59.585	-3.907	N/A	55.678	80.800	-25.122	100	169	PK
	2173.000	50.715	-3.907	-8.870	46.808	60.800	-13.992	100	169	AV
4	2606.500	59.054	-3.272	N/A	55.782	80.800	-25.018	100	149	PK
	2606.500	50.184	-3.272	-8.870	46.912	60.800	-13.888	100	149	AV
5	3040.000	58.236	-2.031	N/A	56.205	80.800	-24.595	100	255	PK
	3040.000	49.366	-2.031	-8.870	47.335	60.800	-13.465	100	255	AV
6	3473.500	56.481	-1.278	N/A	55.203	80.800	-25.597	100	199	PK
	3473.500	47.611	-1.278	-8.870	46.333	60.800	-14.467	100	199	AV
7	3907.000	56.611	0.214	N/A	56.825	74.000	-17.175	100	231	PK
	3907.000	47.741	0.214	-8.870	47.955	54.000	-6.045	100	231	AV
8	4340.500	52.216	1.287	N/A	53.503	74.000	-20.497	100	264	PK
	4340.500	43.346	1.287	-8.870	44.633	54.000	-9.367	100	264	AV
9	4774.000	46.943	2.644	N/A	49.587	74.000	-24.413	100	166	PK

	4774.000	38.073	2.644	-8.870	40.717	54.000	-13.283	100	166	AV
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Note 1: Testing is carried out with frequency rang 9 kHz to the tenth harmonics. There is the ambient noise within frequency range 9 kHz ~ 30 MHz, the permissible value is not show in the report.

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

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

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

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

6.3. 20dB Bandwidth

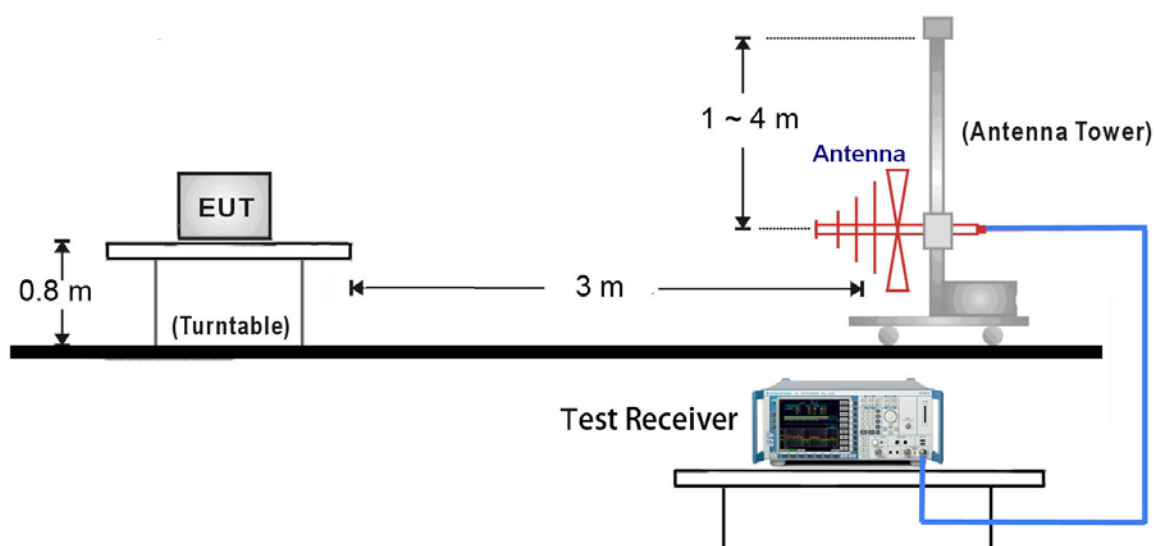
6.3.1. Standard Applicable

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

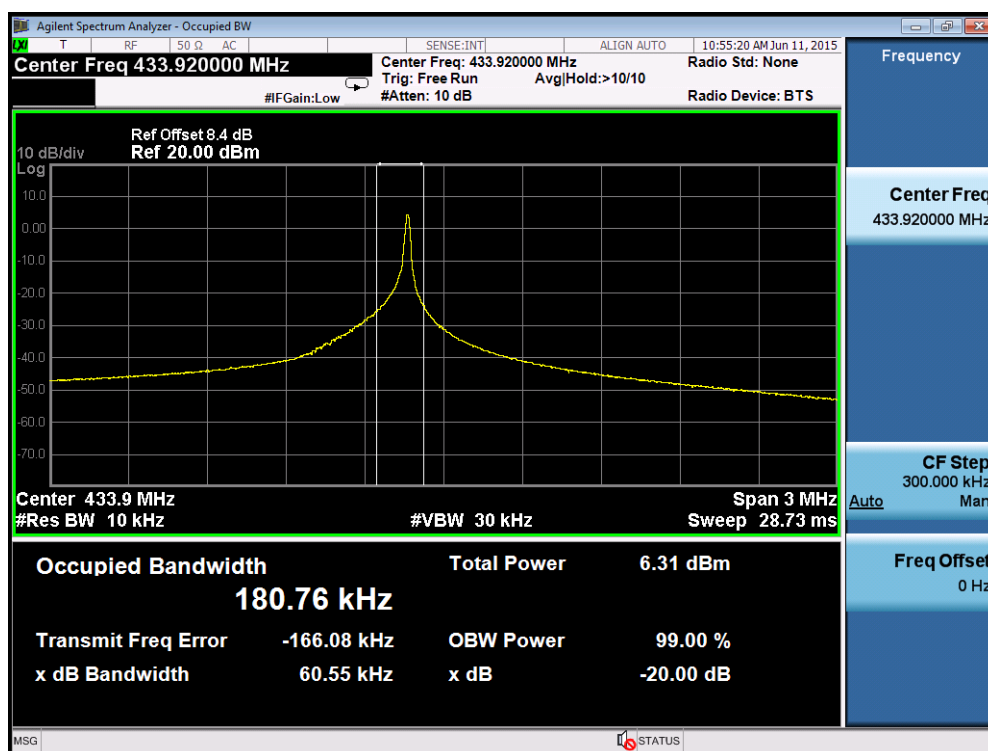


6.3.4. Test Result

Test Frequency (MHz)	20dB Bandwidth (kHz)	Limit (kHz)	Result
433.92	60.55	≤ 1084.80	Pass

Limit = Fundamental Frequency * 0.25% = 433.92 MHz * 0.25% = 1084.80 kHz

20dB Bandwidth Test Plot



6.4. Release Time

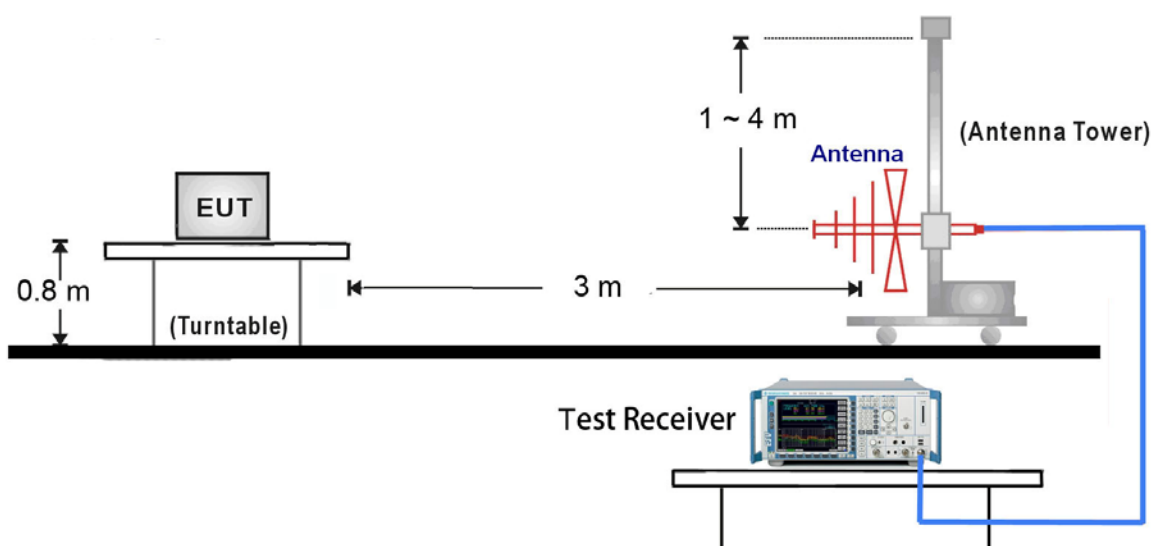
6.4.1. Standard Applicable

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.

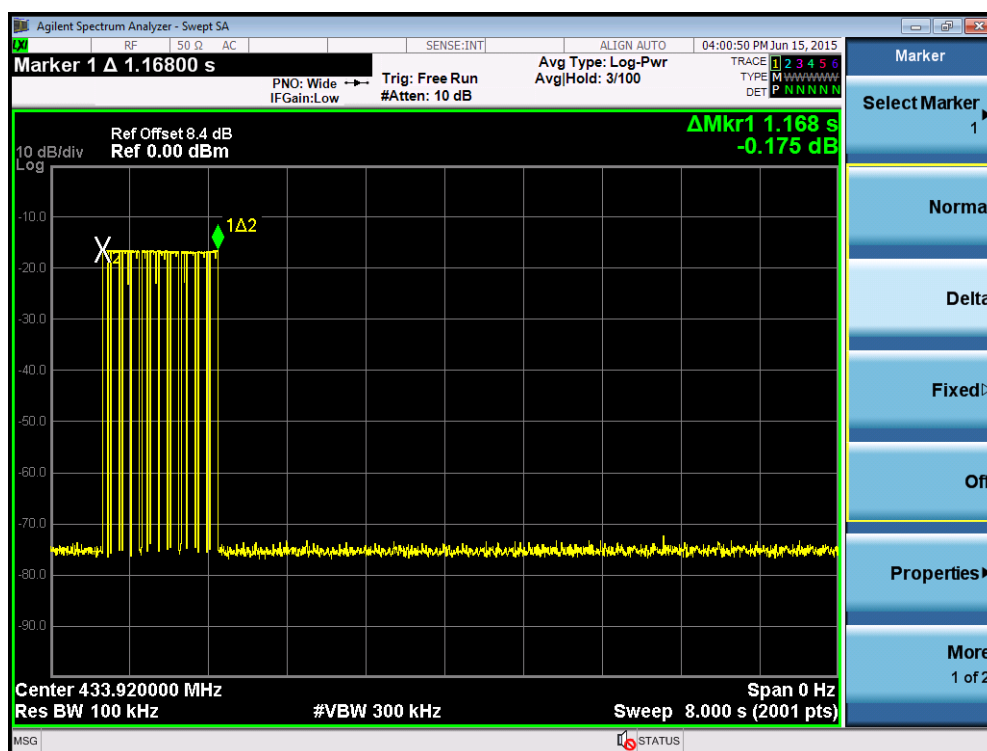
6.4.3. Test Setup



6.4.4. Test Result

Item	Measured Value	Limit	Result
Release Time	1.168 s	≤ 5 s	Pass

Release Time



6.5. Duty Cycle

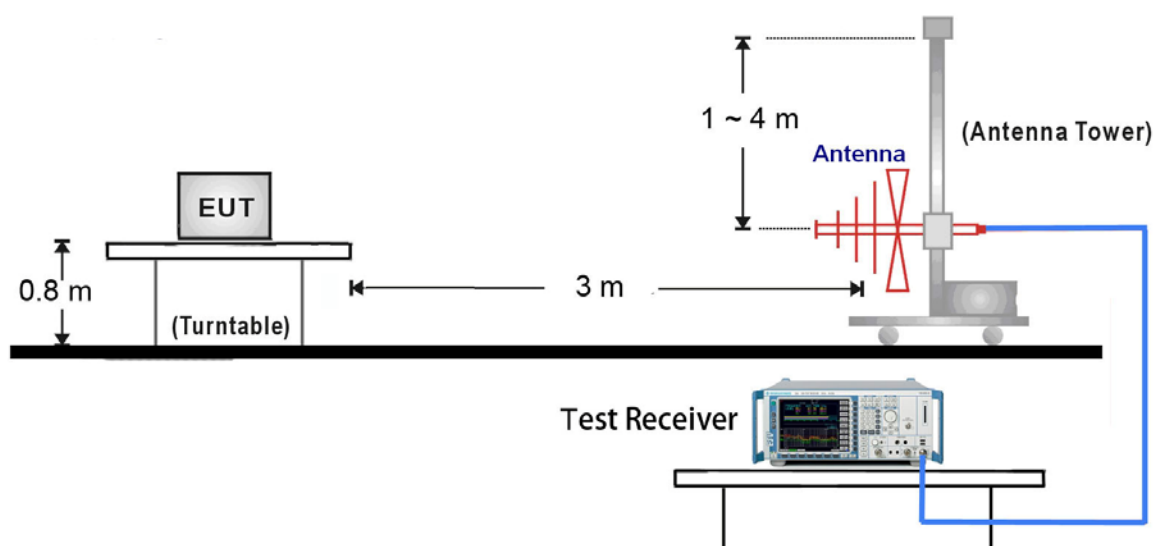
6.5.1. Standard Applicable

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



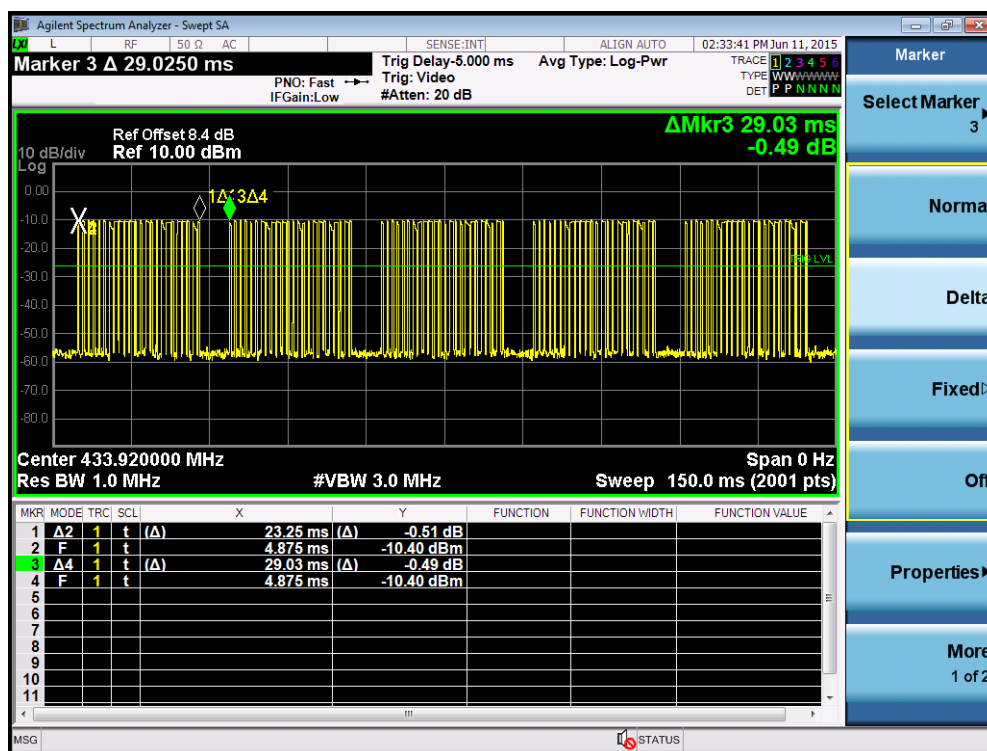
6.5.4. Test Result

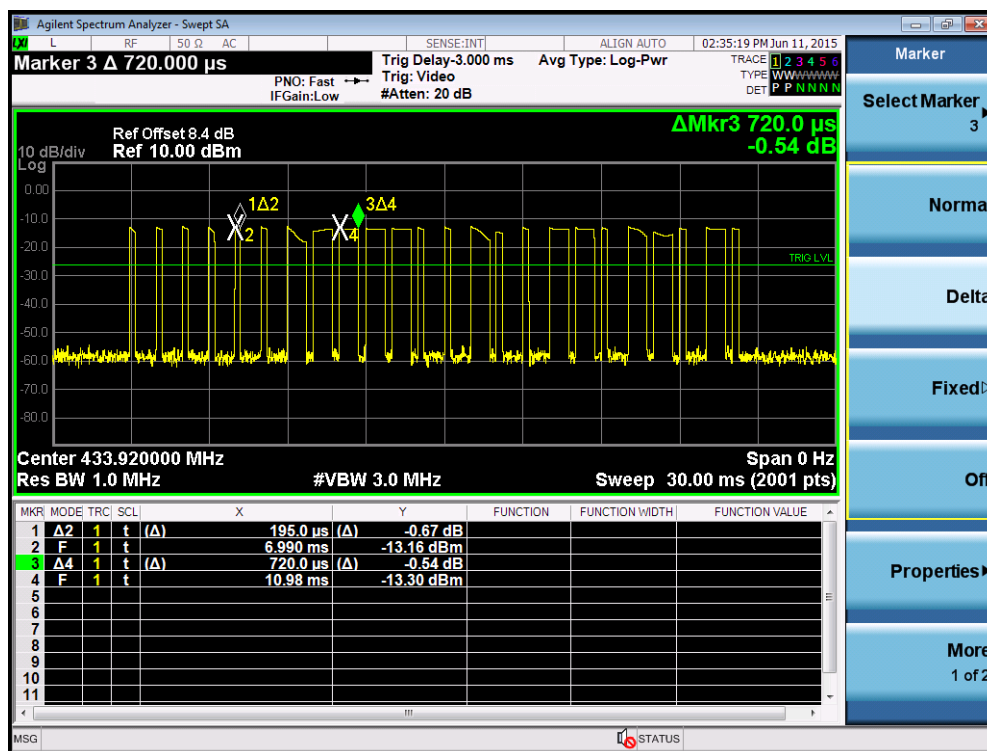
Total Time (Ton) (ms)	The duration of one cycle (ms)	Duty Cycle (%)	Duty Cycle Factor (dB)
10.455	29.030	36.010	-8.870

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

Total Time (Ton)(ms)= $0.195 \cdot 13 + 0.720 \cdot 11 = 10.455(\text{ms})$

Width of Pulse





7. CONCLUSION

The data collected relate only the item(s) tested and show that the **Remote Dog Training Collar**

FCC ID: 2AE2Z-KK-360R is in compliance with FCC Part 15.231 of the FCC Rules.

The End