MRT Technology (Suzhou) Co., Ltd
Phone: +86-512-66308358
Fax: +86-512-66308368
Web: www.mrt-cert.com

Report No.: 1611RSU04401
Report Version: V01
Issue Date: 12-15-2016

MEASUREMENT REPORT

FCC PART 15.231(a) / RSS-210

FCC ID:	2AKKN-R002
IC:	22222-R002
APPLICANT:	HAINING ZHONGYUAN PLASTIC CO., LTD.
Application Type:	Certification
Product:	Remote Control
Model No.:	ZYPS-R002
FCC Classification:	FCC Part 15 Security/Remote Control Transmitter (DSC)
FCC Rule Part(s):	Part 15.231(a)
IC Rule(s):	RSS-210 Issue 9 – Annex A
Test Procedure(s):	ANSI C63.10-2013
Test Date:	November 25 ~ December 06, 2016

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 C63.10-2013. 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
1611RSU04401	Rev. 01	Initial report	12-15-2016	Valid

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 8

3. ANTENNA REQUIREMENTS 9

4. TEST EQUIPMENT CALIBRATION DATA 10

5. MEASUREMENT UNCERTAINTY 12

6. TEST RESULT 13

6.1. Summary 13
6.2. Radiated Emissions 14
6.2.1. Standard Applicable 14
6.2.2. Test Procedure 14
6.2.3. Test Setup 15
6.2.4. Test Results 17
6.3. 20dB Bandwidth 23
6.3.1. Standard Applicable 23
6.3.2. Test Procedure 23
6.3.3. Test Setup 23
6.3.4. Test Result 24
6.4. Release Time 25
6.4.1. Standard Applicable 25
6.4.2. Test Procedure 25
6.4.3. Test Setup 25
6.4.4. Test Result 26
6.5. Duty Cycle 27
6.5.1. Standard Applicable 27
6.5.2. Test Procedure 27
6.5.3. Test Setup 27
6.5.4. Test Result 28

7. CONCLUSION..... 29

§2.1033 General Information

Applicant:	HAINING ZHONGYUAN PLASTIC CO., LTD.
Applicant Address:	No.23 Shuangxue Road, Socks Industry Zone, Haining, Zhejiang Province, China
Manufacturer:	HAINING ZHONGYUAN PLASTIC CO., LTD.
Manufacturer Address:	No.23 Shuangxue Road, Socks Industry Zone, Haining, Zhejiang Province, 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)
IC Rule(s):	RSS-210 Issue 9 – Annex A
Model No.	ZYPS-R002
FCC ID:	2AKKN-R002
IC:	22222-R002
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.**

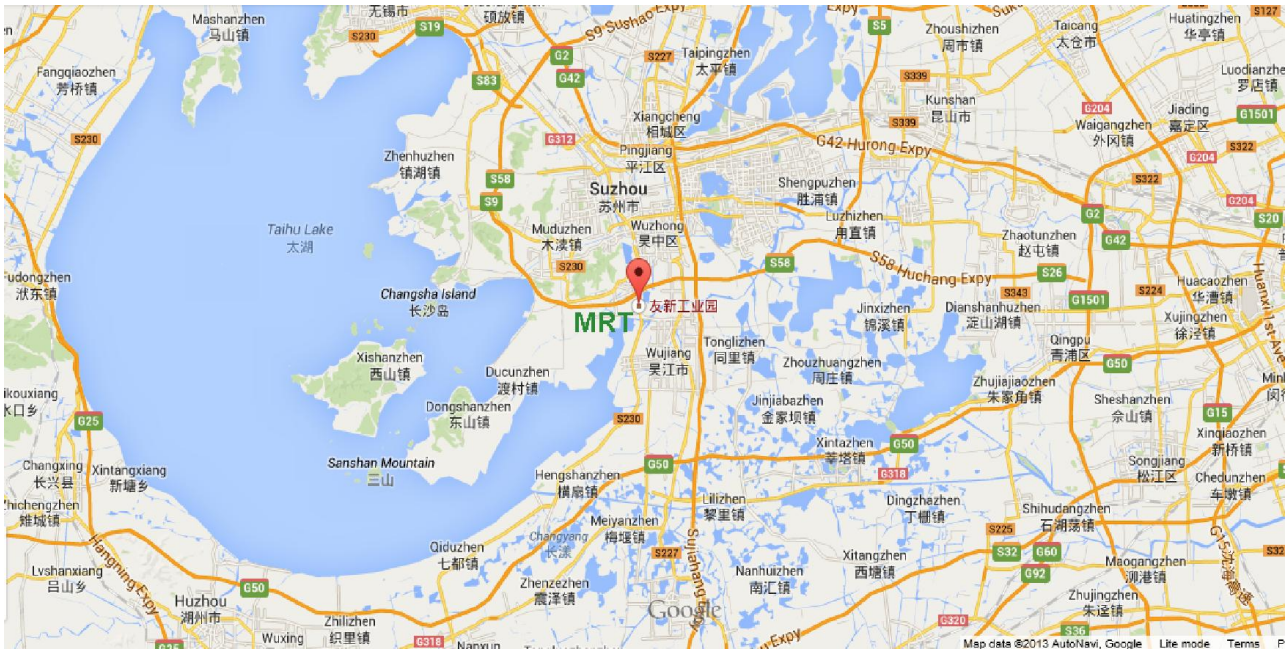
1. INTRODUCTION

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 Control
Model No.	ZYPS-R002
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 HAINING ZHONGYUAN PLASTIC 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 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 Control** is permanently attached.
- There are no provisions for connection to an external antenna.

Conclusion:

The Remote Control **FCC ID: 2AKKN-R002** unit complies with the requirement of §15.203.

4. TEST EQUIPMENT CALIBRATION DATA

Radiated Disturbance – AC2

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	2017/11/07
Preamplifier	Agilent	83017A	MRTSUE06076	1 year	2017/03/29
Loop Antenna	Schwarzbeck	FMZB1519	MRTSUE06025	1 year	2016/12/14
RF Cable	HUBER+SUHNER	Cable 01	MRTSUE06055-1	1 year	2017/03/29
RF Cable	HUBER+SUHNER	Cable 02	MRTSUE06055-2	1 year	2017/03/29
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 – AC2

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
RF Cable	HUBER+SUHNER	Cable 01	MRTSUE06055-1	1 year	2017/03/29
RF Cable	HUBER+SUHNER	Cable 02	MRTSUE06055-2	1 year	2017/03/29
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 – AC2

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
RF Cable	HUBER+SUHNER	Cable 01	MRTSUE06055-1	1 year	2017/03/29
RF Cable	HUBER+SUHNER	Cable 02	MRTSUE06055-2	1 year	2017/03/29
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 – AC2

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
RF Cable	HUBER+SUHNER	Cable 01	MRTSUE06055-1	1 year	2017/03/29
RF Cable	HUBER+SUHNER	Cable 02	MRTSUE06055-2	1 year	2017/03/29
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 – AC2
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 9kHz ~ 1GHz: 4.18dB 1GHz ~ 18GHz: 4.76dB
Release Time Measurement – AC2
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 0.09ms

6. TEST RESULT

6.1. Summary

Company Name: **HAINING ZHONGYUAN PLASTIC CO., LTD.**

FCC ID: **2AKKN-R002**

IC: **22222-R002**

FCC Part Section(s)	IC Section(s)	Test Description	Test Condition	Test Result
15.205 15.231(b)	RSS-210, A1.2	Radiated Spurious Emissions	Radiated	Pass
15.231(c)	RSS-210, A1.3	20dB Bandwidth / 99% Bandwidth		Pass
15.231(a)(1)	RSS-210, A1.1(a)	Release Time		Pass
15.231(b)	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) 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.

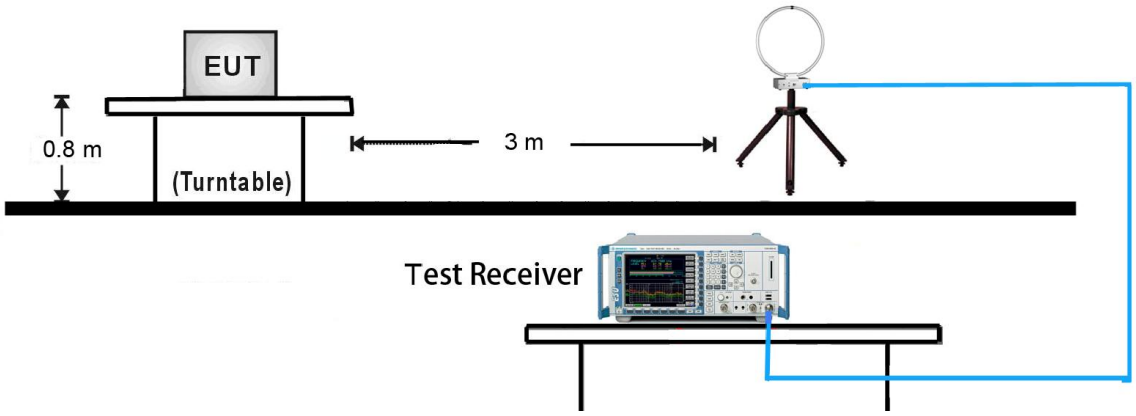
6.2.2. Test Procedure

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.

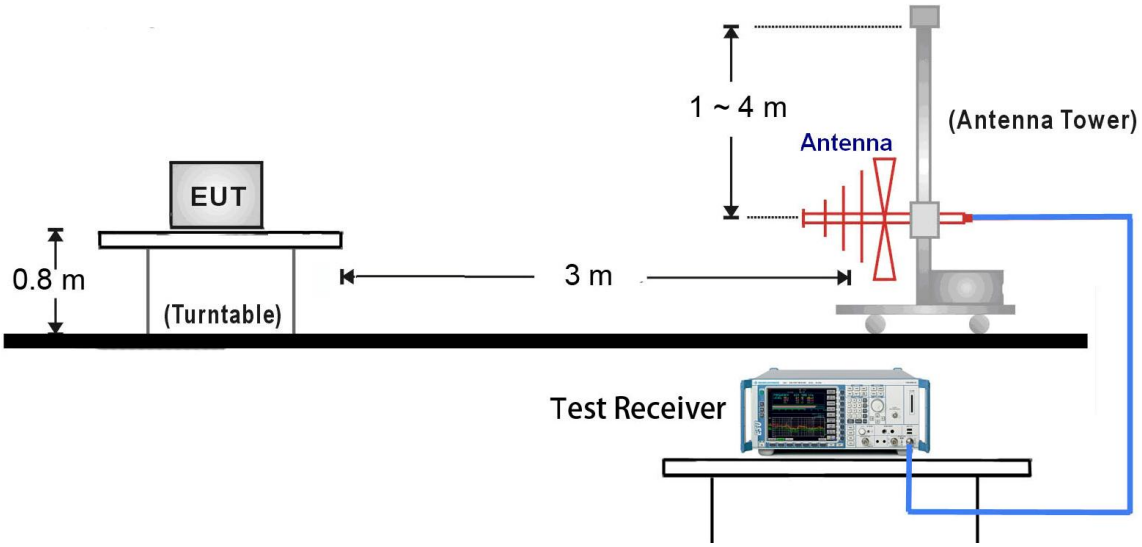
6.2.3. Test Setup

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.

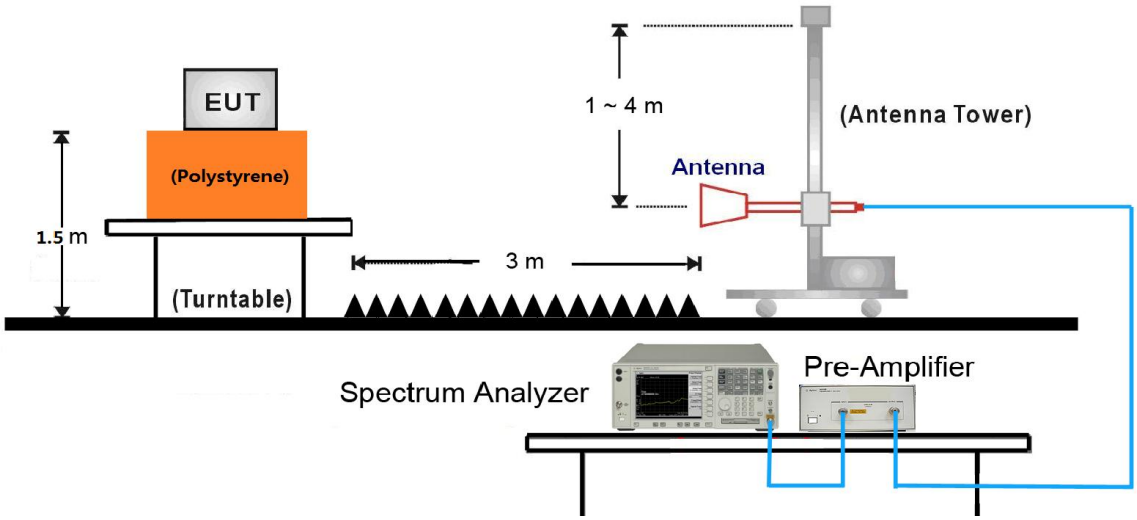
9kHz ~ 30MHz Test Setup:



30MHz ~ 1GHz Test Setup:

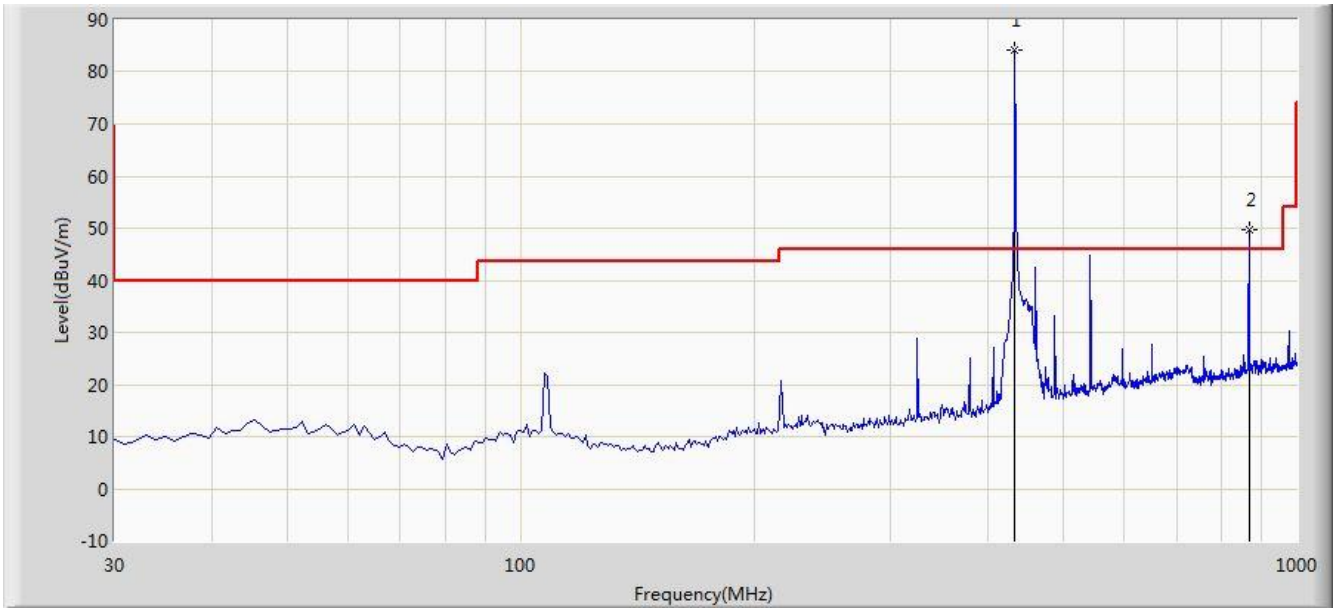


1GHz ~ 18GHz Test Setup:



6.2.4. Test Results

Site: AC2	Time: 2016/12/01 - 20:27
Limit: FCC_Part15.209_RE(3m)	Engineer: Dandy Li
Probe: VULB9162_0.03-8GHz	Polarity: Horizontal
EUT: ZYPS-P002	Power: DC 3V
Test Mode 1	



No	Frequency (MHz)	Reading Level (dBuV)	Factor (dB)	Duty Cycle Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Type
1	433.52	66.864	17.196	N/A	84.060	100.825	-16.765	PK
	433.52	66.864	17.196	11.54	72.520	80.825	-8.305	AV
2	868.08	25.801	23.872	N/A	49.673	80.825	-31.152	PK
	868.08	25.801	23.872	11.54	38.133	60.625	-22.692	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.

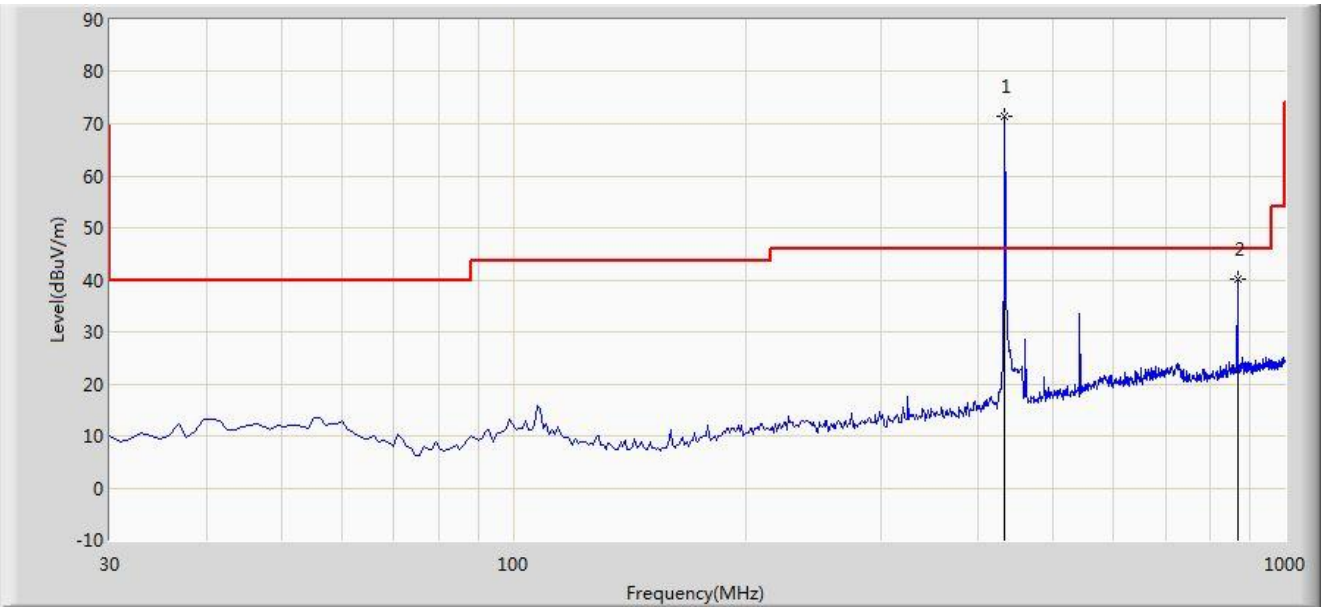
Note 2: The fundamental frequency is 433.92MHz, so the fundamental and spurious emissions radiated limit base on the operating frequency 433.92MHz.

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: AC2	Time: 2016/12/01 - 20:30
Limit: FCC_Part15.209_RE(3m)	Engineer: Dandy Li
Probe: VULB9162_0.03-8GHz	Polarity: Vertical
EUT: ZYPS-P002	Power: DC 3V
Test Mode 1	



No	Frequency (MHz)	Reading Level (dBuV)	Factor (dB)	Duty Cycle Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Type
1	433.52	54.356	17.196	N/A	71.552	100.825	-29.273	PK
	433.52	54.356	17.196	11.54	60.012	80.825	-20.813	AV
2	868.08	16.302	23.872	N/A	40.174	80.825	-40.651	PK
	868.08	16.302	23.872	11.54	28.634	60.625	-32.191	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.

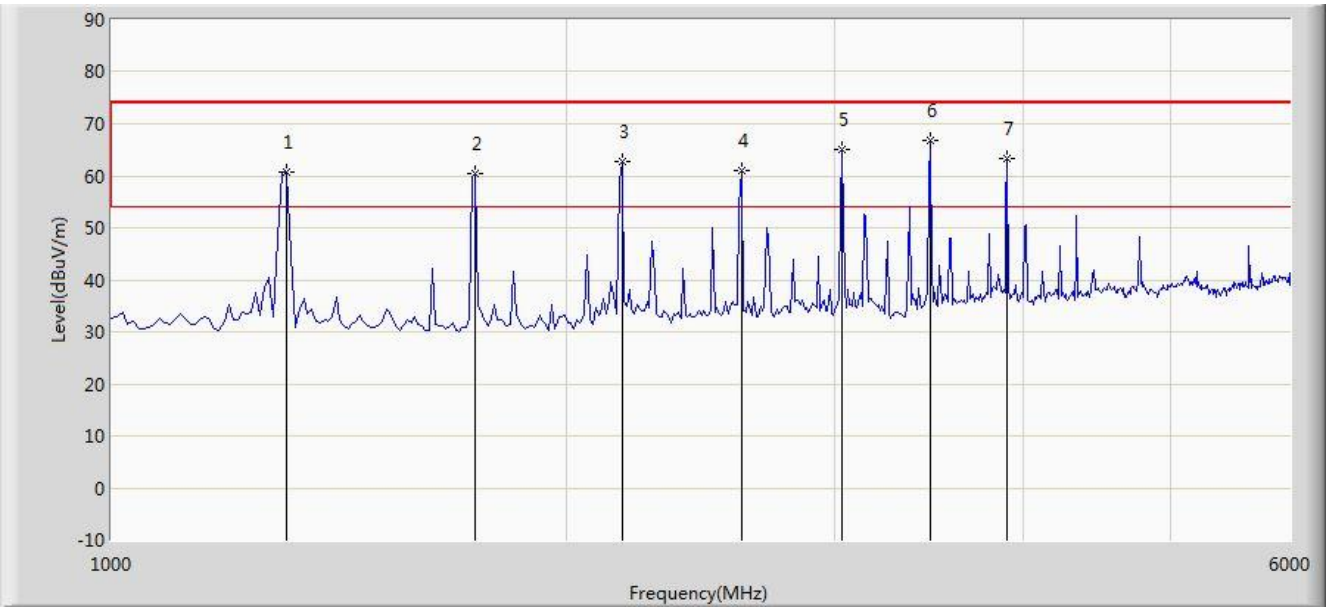
Note 2: The fundamental frequency is 433.92MHz, so the fundamental and spurious emissions radiated limit base on the operating frequency 433.92MHz.

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: AC2	Time: 2016/12/01 - 22:48
Limit: FCC_Part15.209_RE(3m)	Engineer: Dandy Li
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: ZYPS-P002	Power: DC 3V
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	1306.000	66.161	-5.310	N/A	60.851	74	-13.149	PK
	1306.000	66.161	-5.310	11.54	49.311	54	-4.689	AV
2	1739.500	66.477	-6.074	N/A	60.404	74	-13.596	PK
	1739.500	66.477	-6.074	11.54	48.864	54	-5.136	AV
3	2173.000	65.556	-2.798	N/A	62.758	74	-11.242	PK
	2173.000	65.556	-2.798	11.54	51.218	54	-2.782	AV
4	2606.500	63.893	-2.787	N/A	61.106	74	-12.894	PK
	2606.500	63.893	-2.787	11.54	49.566	54	-4.434	AV
5	3040.000	68.043	-2.895	N/A	65.147	74	-8.853	PK
	3040.000	68.043	-2.895	11.54	53.607	54	-0.393	AV
6	3473.500	68.414	-1.555	N/A	66.859	74	-7.141	PK
	3473.500	68.414	-1.555	11.54	55.319	54	1.319	AV
7	3907.000	63.844	-0.592	N/A	63.253	74	-10.747	PK
	3907.000	63.844	-0.592	11.54	51.713	54	-2.287	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.

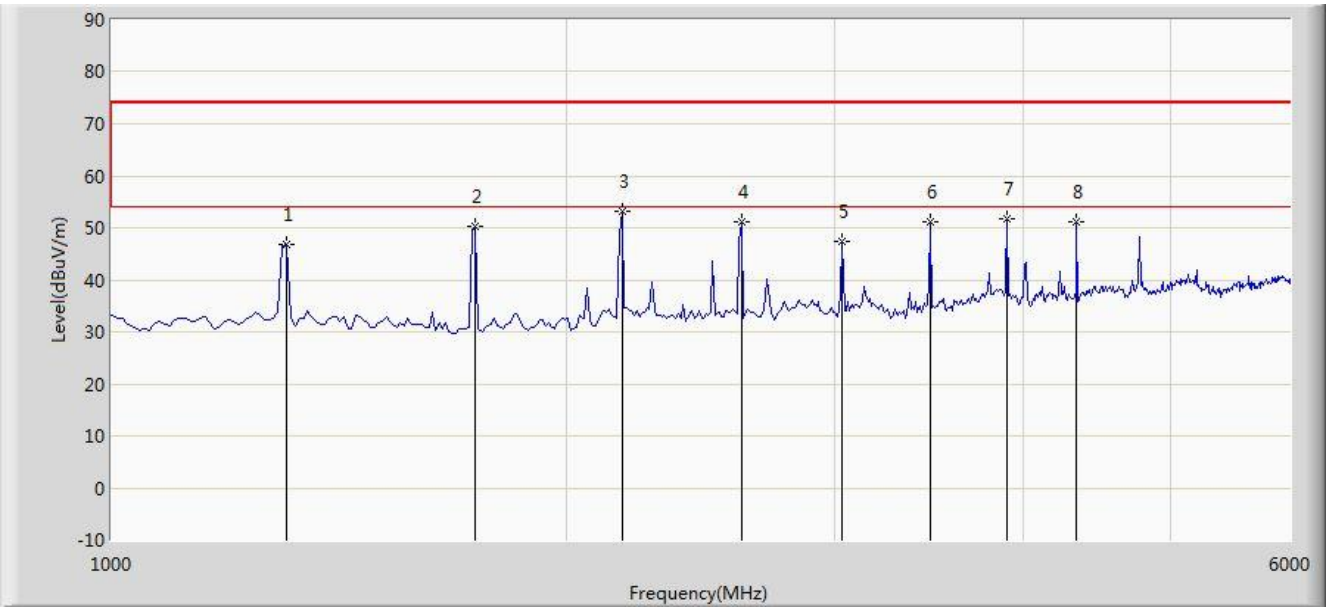
Note 2: The fundamental frequency is 433.92MHz, so the fundamental and spurious emissions radiated limit base on the operating frequency 433.92MHz.

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) – Pre_Amplifier Gain (dB).

Site: AC2	Time: 2016/12/01 - 22:53
Limit: FCC_Part15.209_RE(3m)	Engineer: Dandy Li
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: ZYPS-P002	Power: DC 3V
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	1306.000	52.079	-5.310	N/A	46.769	74	-27.231	PK
	1306.000	52.079	-5.310	11.54	35.229	54	-18.771	AV
2	1739.500	56.312	-6.074	N/A	50.239	74	-23.761	PK
	1739.500	56.312	-6.074	11.54	38.699	54	-15.301	AV
3	2173.000	56.073	-2.798	N/A	53.275	74	-20.725	PK
	2173.000	56.073	-2.798	11.54	41.735	54	-12.265	AV
4	2606.500	53.910	-2.787	N/A	51.123	74	-22.877	PK
	2606.500	53.910	-2.787	11.54	39.583	54	-14.417	AV
5	3040.000	50.268	-2.895	N/A	47.372	74	-26.628	PK
	3040.000	50.268	-2.895	11.54	35.832	54	-18.168	AV
6	3473.500	52.675	-1.555	N/A	51.120	74	-22.880	PK
	3473.500	52.675	-1.555	11.54	39.58	54	-14.42	AV
7	3907.000	52.231	-0.592	N/A	51.640	74	-22.360	PK
	3907.000	52.231	-0.592	11.54	40.100	54	-13.900	AV
8	4340.500	50.165	1.081	N/A	51.246	74	-22.754	PK
	4340.500	50.165	1.081	11.54	39.706	54	-14.294	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) – Pre_Amplifier Gain (dB).

6.3. 20dB Bandwidth

6.3.1. Standard Applicable

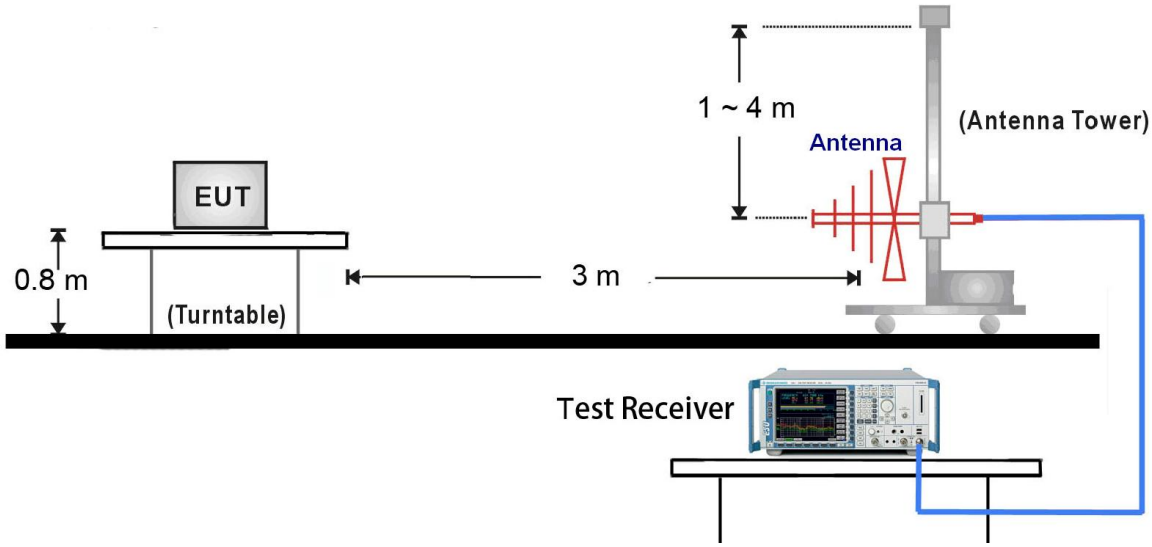
According to FCC Part 15.231(c), the bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70MHz and below 900MHz. Bandwidth is determined at the points 20 dB down from the modulated carrier.

According RSS-210, A1.3, the 99% bandwidth of momentarily operated devices shall be less or equal to 0.25% of the centre frequency for devices operating between 70 MHz and 900 MHz. For devices operating above 900 MHz, the 99% bandwidth shall be less or equal to 0.5% of the centre frequency.

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

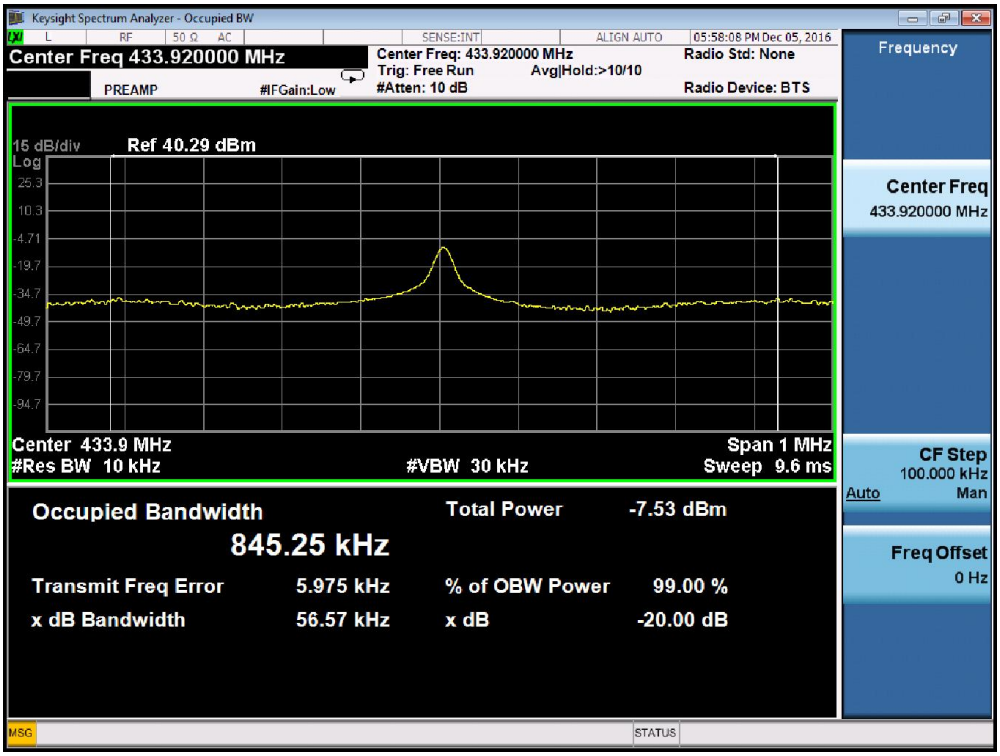


6.3.4. Test Result

Test Frequency (MHz)	20dB Bandwidth (KHz)	99% Bandwidth (KHz)	Limit (KHz)	Result
433.92	56.57	845.25	≤ 1084.8	Pass

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

20dB Bandwidth Test Plot



6.4. Release Time

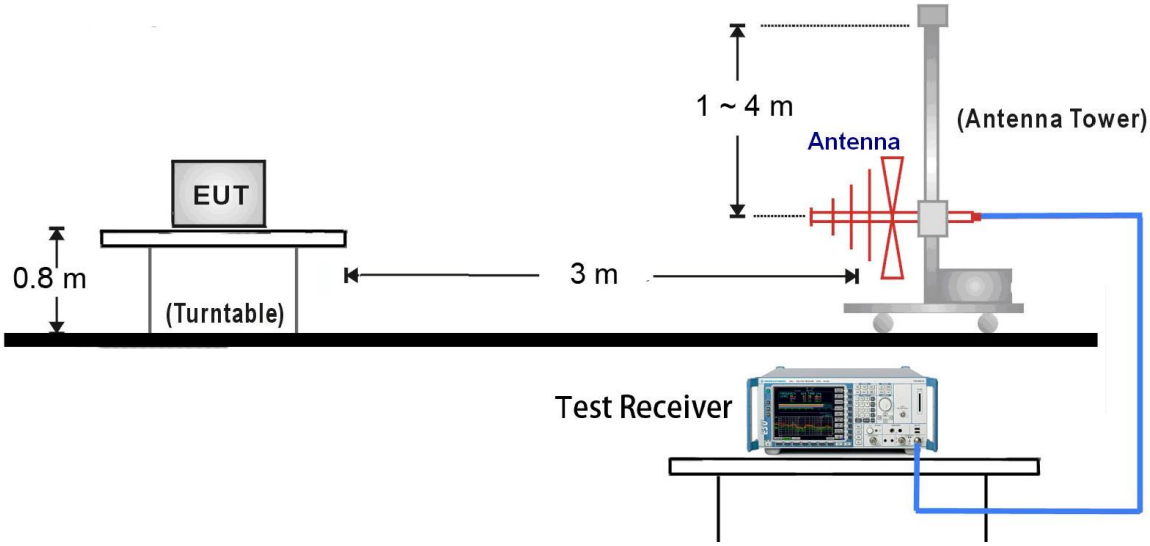
6.4.1. Standard Applicable

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, than set the spectrum analyzer to Zero Span for the release time reading. During the testing, the switch was released then the EUT automatically deactivated.

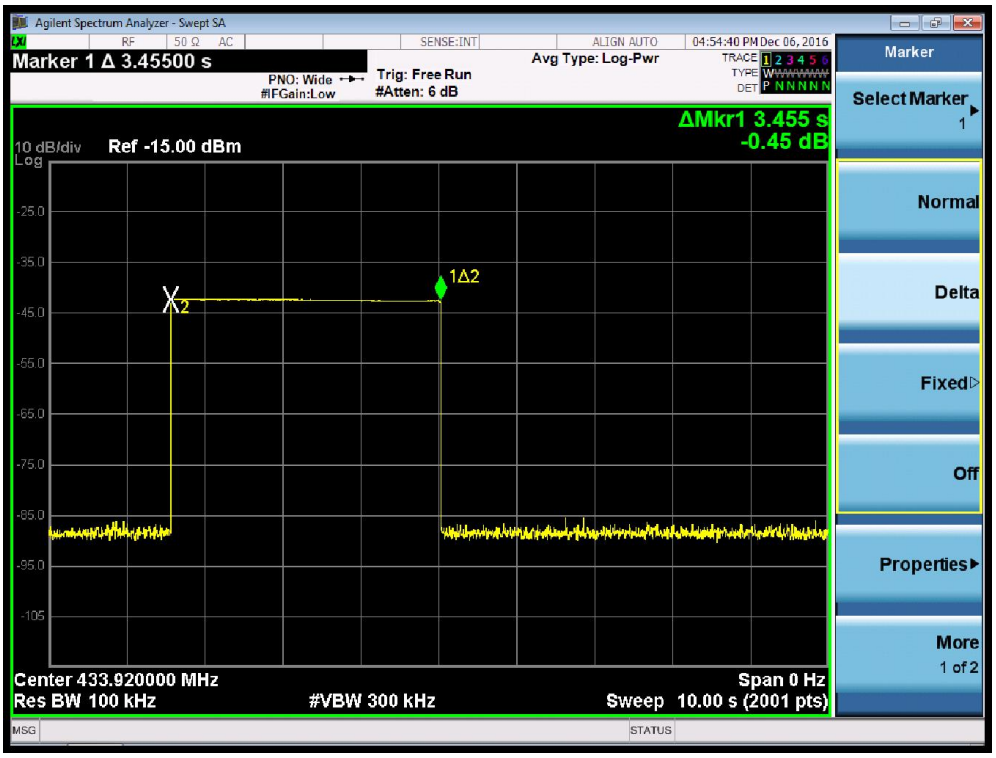
6.4.3. Test Setup



6.4.4. Test Result

Item	Measured Value	Limit	Result
Release Time	3.455 s	≤ 5 s	Pass

Release Time



6.5. Duty Cycle

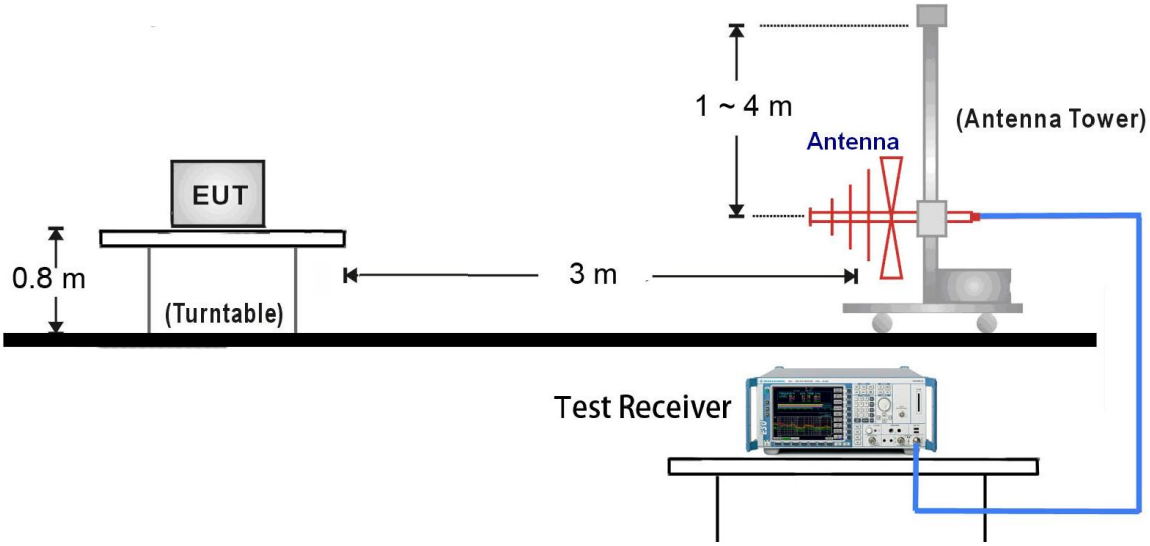
6.5.1. Standard Applicable

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, than 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



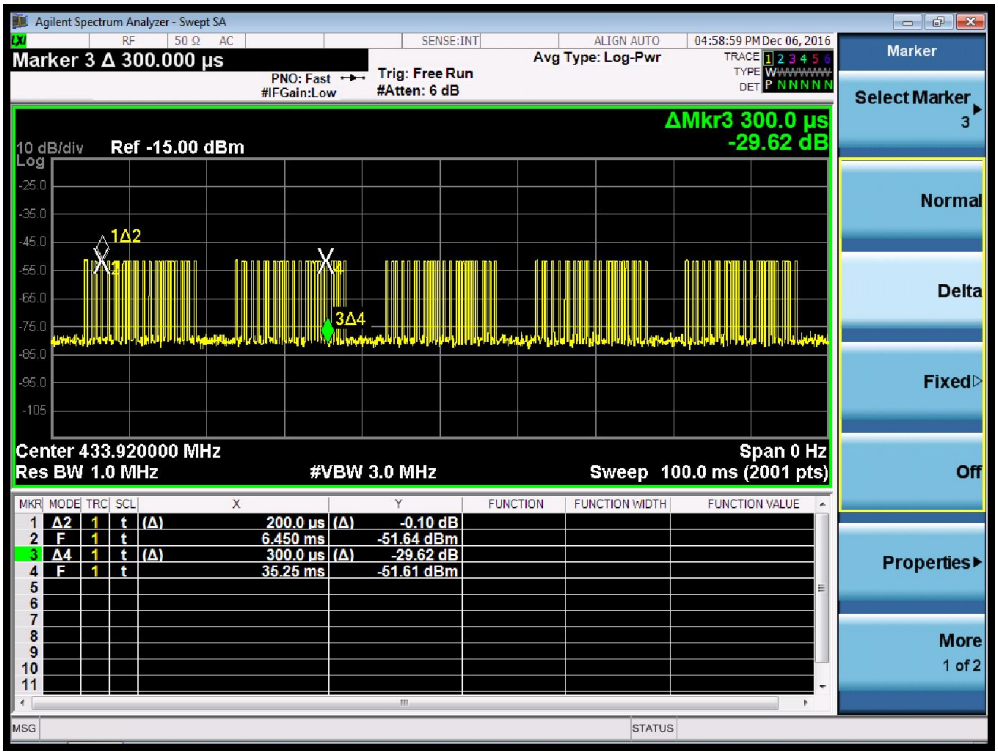
6.5.4. Test Result

Total Time (Ton) (ms)	The duration of one cycle (ms)	Duty Cycle (%)	Duty Cycle Factor (dB)
26.5	100	26.500	11.54

Note: Duty Cycle Factor = 20*Log(Duty Cycle).

Total Time (T_{on})(ms)=0.200*110+0.300*15=26.500(ms)

Width of Pulse



7. CONCLUSION

The data collected relate only the item(s) tested and show that the **Remote Control FCC ID: 2AKKN-R001 / IC: 22222-R001** is in compliance with FCC Part 15.231(a) of the FCC Rules and RSS-210 Issue 9 – Annex A of IC Rules.

The End