

TEST REPORT

Reference No. : WTD14S0111065E
FCC ID : 2ABWXWA700
Applicant : Metek Industrial Co. Ltd.
Address : Unit7,17/F Grandtech Centre,8 On Ping Street,Shatin,N.T.,Hong Kong.
Manufacturer : Dongguan Metek Electronics Co. Ltd.
Address : 86 Diao Lang Road, Diao Lang Village, Huang Jiang Town,
Dongguan, China
Product Name : WATER ALARM SYSTEM
Model No. : WA700
Standards : FCC CFR47 Part 15 Section 15.231: 2012
Date of Receipt sample : Jan.21, 2014
Date of Test : Jan.26~Feb.12, 2014
Date of Issue : Mar.11, 2014
Test Result : **Pass ***

Remarks:

The results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

Prepared By:

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Testing location: 1/F., Fukangtai Building, West Baima Road, Songgang Street, Baoan District, Shenzhen, Guangdong, China

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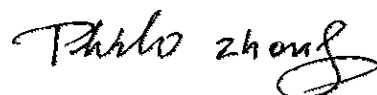
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Compiled by:



Zero Zhou / Project Engineer

Approved by:



Philo Zhong / Manager

2 Test Summary

Test Items	Test Requirement	Result
Conducted Emissions	15.207	PASS
Radiated Spurious Emissions	15.205(a) 15.209 15.231(b)	PASS
Periodic Operation	15.231(a)	PASS
20dB Bandwidth	15.231(c)	PASS
Antenna Requirement	15.203	PASS

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4 General Information

4.1 General Description of E.U.T.

Product Name	:WATER ALARM SYSTEM
Model No.	:WA700
Type of Modulation	: ASK
Frequency Range	: 433.92 MHz
The Lowest Oscillator	: 433.92MHz
Antenna installation	: Monopole Antenna

4.2 Details of E.U.T.

Technical Data	:(1)DC 9V, 200mA powered by adapter (Adapter Input: AC120V~60Hz) (2) DC 9V Powered by Battery
Adapter	:M/N:TD-28-090200

4.3 Test Facility

The test facility has a test site registered with the following organizations:

- **IC – Registration No.: 7760A-1**

Waltek Services (Shenzhen) Co., Ltd. has been registered and fully described in a report filed with the Industry Canada. The acceptance letter from the Industry Canada is maintained in our files. Registration 7760A-1, July 12, 2012.

- **FCC – Registration No.: 880581**

Waltek Services (Shenzhen) Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 880581, May 26, 2011.

4.4 Test Location

All Emissions tests were performed at:-

Waltek Services(Shenzhen) Co., Ltd. at 1/F, Fukangtai Building, West Baima Rd., Songgang Street, Baoan District, Shenzhen 518105, China.

5 Equipment Used during Test

5.1 Equipments List

Conducted Emissions at Mains Terminals Disturbance Voltage						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1.	EMI Test Receiver	R&S	ESCI	100947	Sep.18,2013	Sep.17,2014
2.	LISN	R&S	ENV216	101215	Nov. 29,2013	Nov. 28,2014
3.	Cable	Top	TYPE16(3.5M)	-	Sep.18,2013	Sep.17,2014
3m Semi-anechoic Chamber for Radiation						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1	EMC Analyzer	Agilent	E7405A	MY45114943	Sep.18,2013	Sep.17,2014
2	Active Loop Antenna	Beijing Dazhi	ZN30900A	-	Sep.18,2013	Sep.17,2014
3	Trilog Broadband Antenna	SCHWARZBECK	VULB9163	336	Apr.20,2013	Apr.19,2014
4	Coaxial Cable (below 1GHz)	Top	TYPE16(13M)	-	Sep.18,2013	Sep.17,2014
5	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9120 D	667	Apr.20,2013	Apr.19,2014
6	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9170	335	Apr.20,2013	Apr.19,2014
7	Broadband Preamplifier	COMPLIANCE DIRECTION	PAP-1G18	2004	Apr.07,2013	Apr.06,2014
8	Coaxial Cable (above 1GHz)	Top	1GHz-25GHz	EW02014-7	Apr.20,2013	Apr.19,2014

5.2 Measurement Uncertainty

Test Item	Frequency Range	Uncertainty	Note
Conduction disturbance	150kHz~30MHz	$\pm 3.64\text{dB}$	(1)
Radiation Emission	30MHz~1000MHz	$\pm 5.03\text{dB}$	(1)
	1000M~5000MHz	$\pm 5.47\text{ dB}$	(1)

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.

5.3 Test Equipment Calibration

All the test equipments used are valid and calibrated by CEPREI Certification Body that address is No.110 Dongguan Zhuang RD. Guangzhou, P.R.China.

6 Conducted Emission Test

Test Requirement:	FCC CFR 47 Part 15 Section 15.207
Test Method:	ANSI C63.4:2003
Frequency Range:	150kHz to 30MHz
Class:	Class B
Limit:	66-56 dB μ V between 0.15MHz & 0.5MHz 56 dB μ V between 0.5MHz & 5MHz 60 dB μ V between 5MHz & 30MHz
Detector:	Peak for pre-scan (9kHz Resolution Bandwidth) Quasi-Peak & Average if maximised peak within 6dB of Average Limit
Test Result:	PASS

6.1 E.U.T. Operation

Operating Environment:

Temperature:	23.5 °C
Humidity:	53.5 % RH
Atmospheric Pressure:	101.0kPa

EUT Operation:

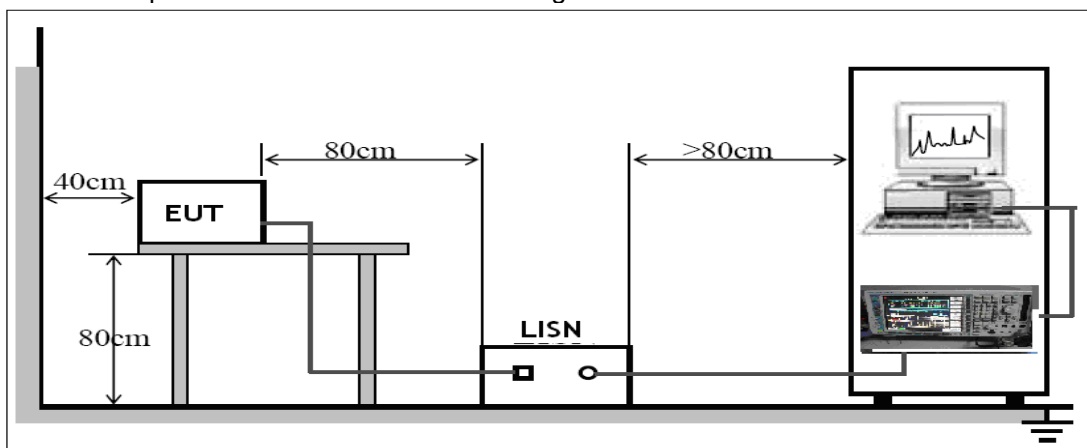
The test was performed in Transmitting mode, and the test data were shown in the report.

The EUT was tested according to ANSI C63.4:2003. The frequency spectrum from 150kHz to 30MHz was investigated.

The maximised peak emissions from the EUT were scanned and measured for both the Live and Neutral Lines. Quasi-peak & average measurements were performed if peak emissions were within 6dB of the average limit line.

6.2 EUT Setup

The EUT was placed on the test table in shielding room.

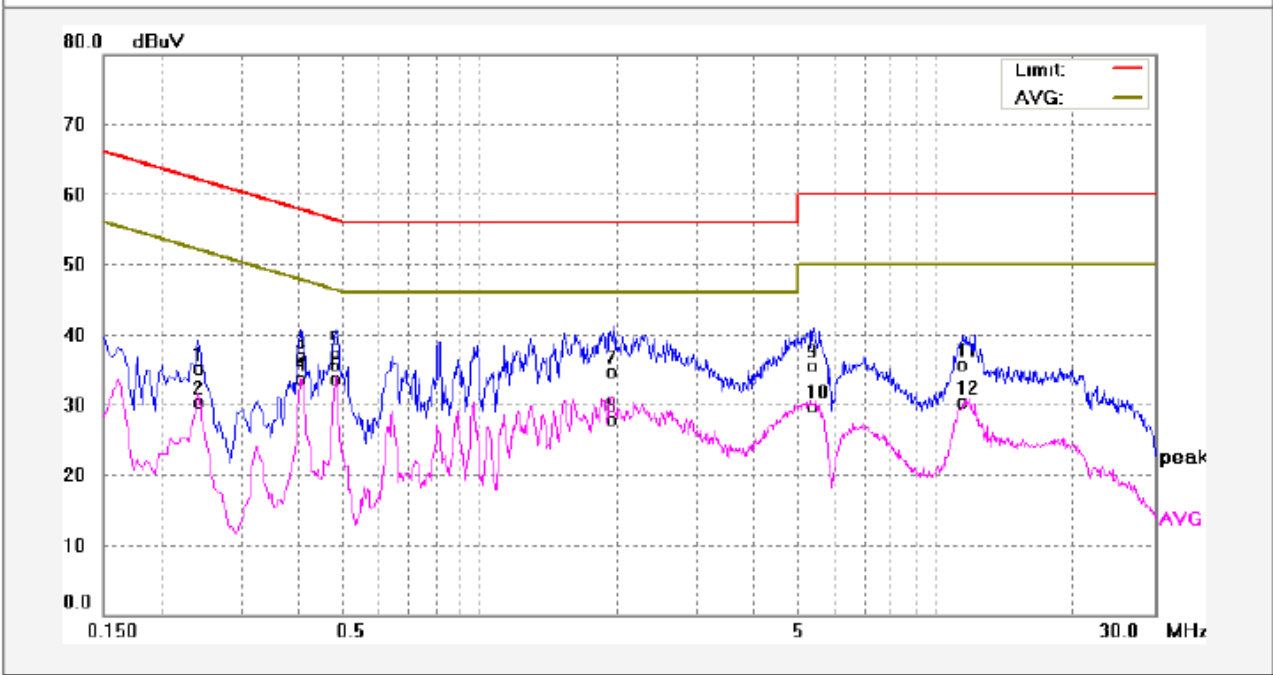


6.3 Conducted Emission Test Result

An initial pre-scan was performed on the live and neutral lines.

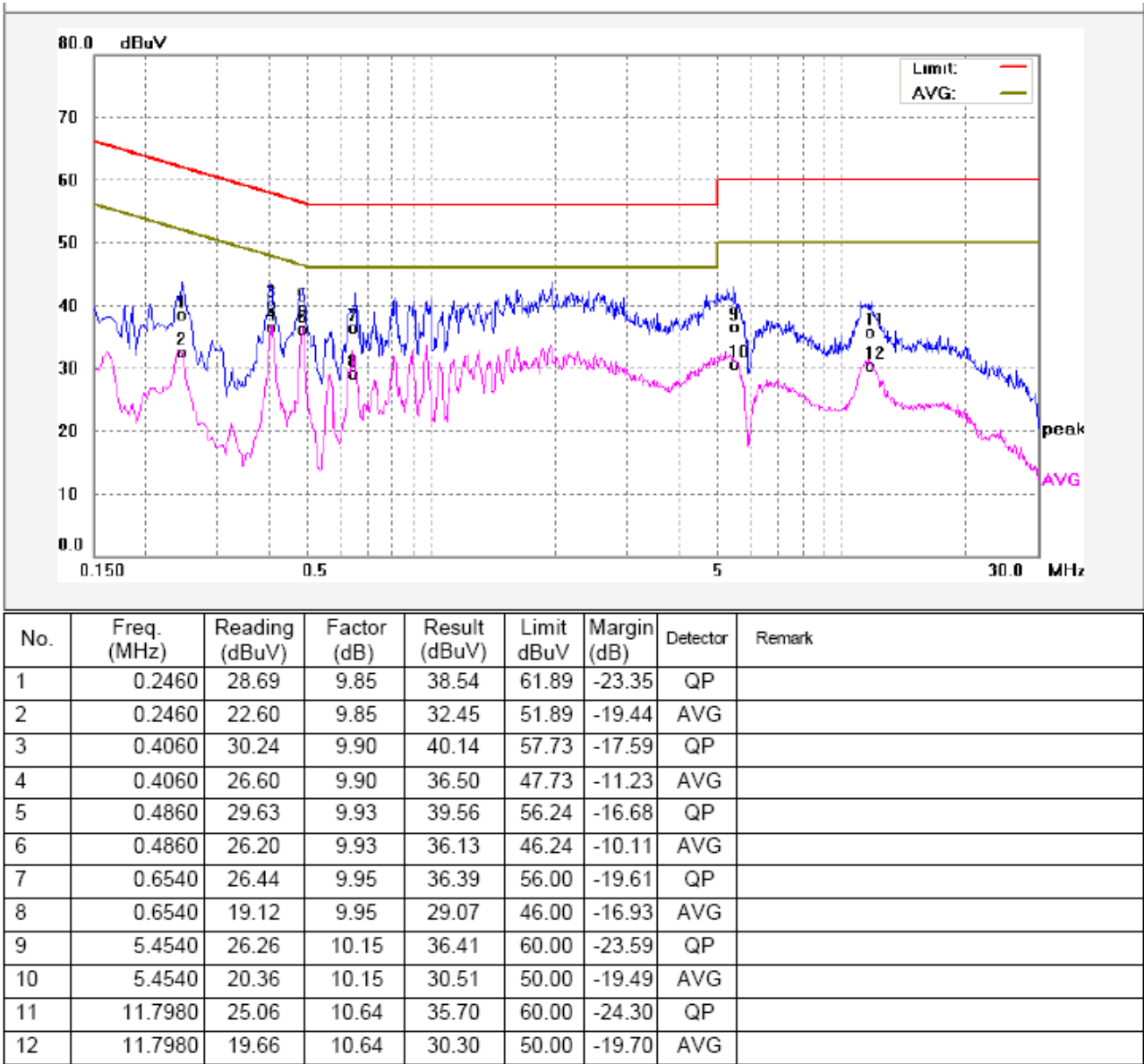
Test mode: Transmittingmode

Live line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.2420	25.31	9.85	35.16	62.02	-26.86	QP	
2	0.2420	20.42	9.85	30.27	52.02	-21.75	AVG	
3	0.4060	26.91	9.90	36.81	57.73	-20.92	QP	
4	0.4060	23.88	9.90	33.78	47.73	-13.95	AVG	
5	0.4860	27.42	9.93	37.35	56.24	-18.89	QP	
6	0.4860	23.86	9.93	33.79	46.24	-12.45	AVG	
7	1.9740	24.70	10.00	34.70	56.00	-21.30	QP	
8	1.9740	17.99	10.00	27.99	46.00	-18.01	AVG	
9	5.3620	25.43	10.14	35.57	60.00	-24.43	QP	
10	5.3620	19.53	10.14	29.67	50.00	-20.33	AVG	
11	11.4220	25.01	10.61	35.62	60.00	-24.38	QP	
12	11.4220	19.60	10.61	30.21	50.00	-19.79	AVG	

Neutral line:



7 Radiation Emission Test

Test Requirement:	FCC Part15 Paragraph 15.231
Test Method:	Based on FCC Part15 Paragraph 15.33
Frequency Range:	30MHz to 5GHz
Measurement Distance:	3m
Test Result:	PASS

7.1 EUT Operation:

Operating Environment:

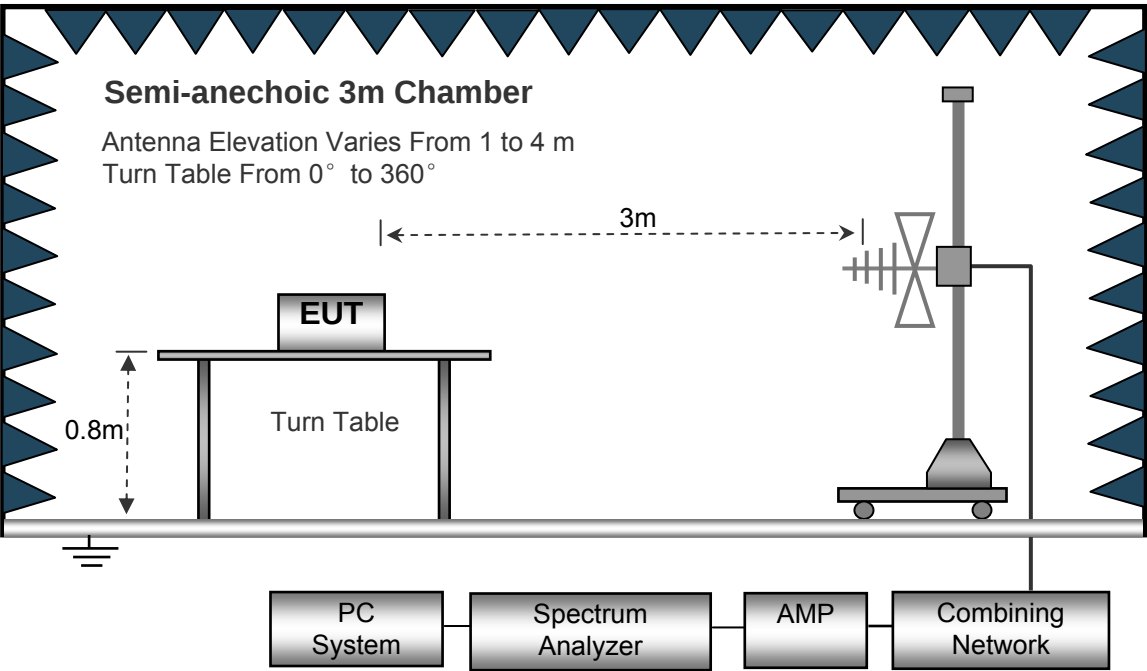
Temperature:	23.5 °C
Humidity:	52.1 % RH
Atmospheric Pressure:	101.0 kPa

Operation Mode:

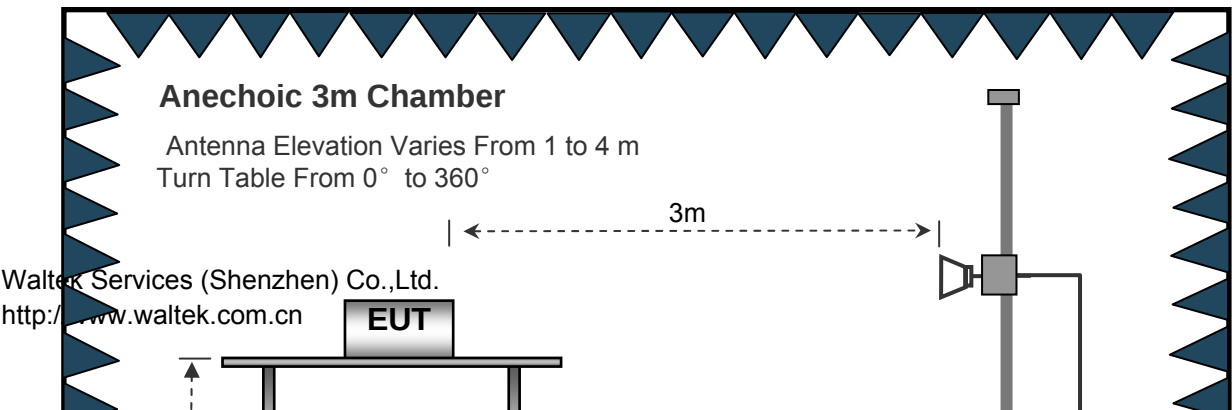
The EUT was tested in Transmitting mode, and the test data were shown as follow.

7.2 Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site, using the setup accordance with the ANSI C63.4: 2003.
The test setup for emission measurement from 30 MHz to 1 GHz.



The test setup for emission measurement above 1 GHz.



7.3 Spectrum Analyzer Setup

According to FCC Part15 Rules, the system was tested from 30MHz to 5GHz.

30MHz ~ 1GHz

Sweep SpeedAuto
 DetectorPK
 Resolution Bandwidth.....100kHz
 Video Bandwidth.....300kHz

Above 1GHz

Sweep SpeedAuto
 DetectorPK
 Resolution Bandwidth.....1MHz
 Video Bandwidth.....3MHz

7.4 Test Procedure

1. The EUT is placed on a turntable, which is 0.8m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is moved from 1m to 4m to find out the maximum emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.
7. The radiation measurements are tested under 3-axes(X, Y, Z) position(X denotes lying on the table, Y denotes side stand and Z denotes vertical stand). After pre-test, It was found that the worse radiation emission was get at the X position. So the data shown was the X position only.

7.5 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

Corr. Ampl. = Indicated Reading + Antenna Factor + Cable Factor - Amplifier Gain the “Margin” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB means the emission is 7dB below the maximum limit for Class B. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corr. Ampl.} - \text{Limit}$$

7.6 Summary of Test Results

Test Frequency : 30MHz ~ 5GHz

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.231/15.209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
433.92	63.41	PK	140	1.7	H	19.68	83.09	100.82	-17.73
433.92	61.24	PK	268	1.1	V	19.68	80.92	100.82	-19.90
867.84	30.25	PK	170	1.5	H	29.71	59.96	80.82	-20.86
867.84	29.74	PK	314	1.6	V	29.71	59.45	80.82	-21.37
1735.68	54.21	PK	10	1.9	H	-16.38	37.83	74.00	-36.17
1735.68	52.47	PK	328	1.7	V	-16.38	36.09	74.00	-37.91
2624.02	52.67	PK	255	1.5	H	-14.87	37.80	74.00	-36.20
2624.02	51.34	PK	247	1.3	V	-14.87	36.47	74.00	-37.53

AV = Peak +20Log₁₀(duty cycle) =PK+(-5.61) [refer to section 8 for more detail]

Frequency	PK	Turn table Angle	RX Antenna		Duty cycle Factor	AV	FCC Part 15.231/209/205	
			Height	Polar			Limit	Margin
(MHz)	(dBμV/m)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
433.92	83.09	140	1.7	H	-5.61	77.48	80.82	-3.34
433.92	80.92	268	1.1	V	-5.61	75.31	80.82	-5.51
867.84	59.96	170	1.5	H	-5.61	54.35	60.82	-6.47
867.84	59.45	314	1.6	V	-5.61	53.84	60.82	-6.98
1735.68	37.83	10	1.9	H	-5.61	32.22	54.00	-21.78
1735.68	36.09	328	1.7	V	-5.61	30.48	54.00	-23.52
2624.02	37.80	255	1.5	H	-5.61	32.19	54.00	-21.81
2624.02	36.47	247	1.3	V	-5.61	30.86	54.00	-23.14

8 Periodic Operation

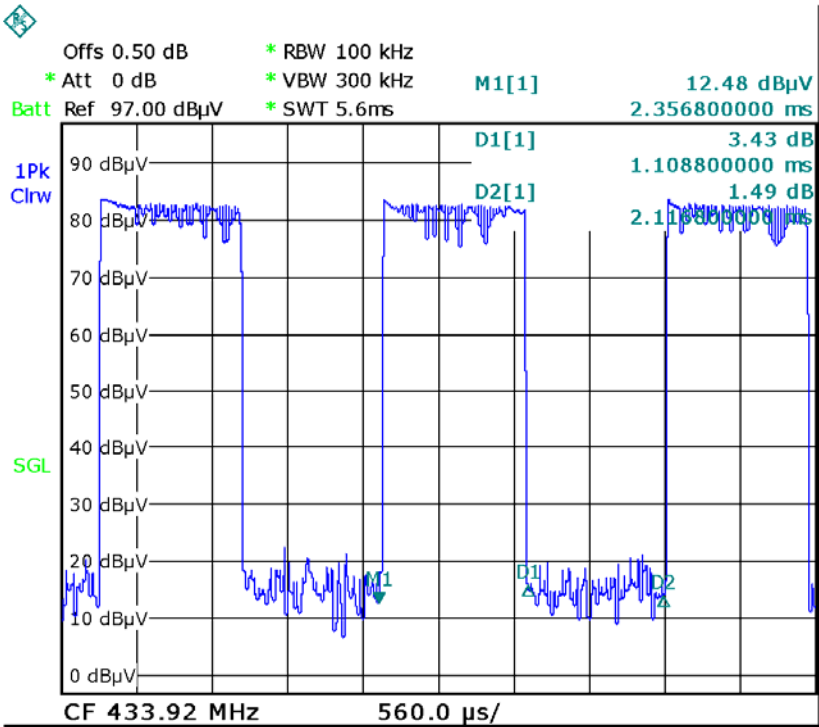
The duty cycle was determined by the following equation:
To calculate the actual field intensity, The duty cycle correction factor in decibel is needed for later use and can be obtained from following conversion

Duty Cycle(%)=Total On interval in a complete pulse train/ Length of a complete pulse train * %
Duty Cycle Correction Factor(dB)=20 * Log₁₀(Duty Cycle(%))

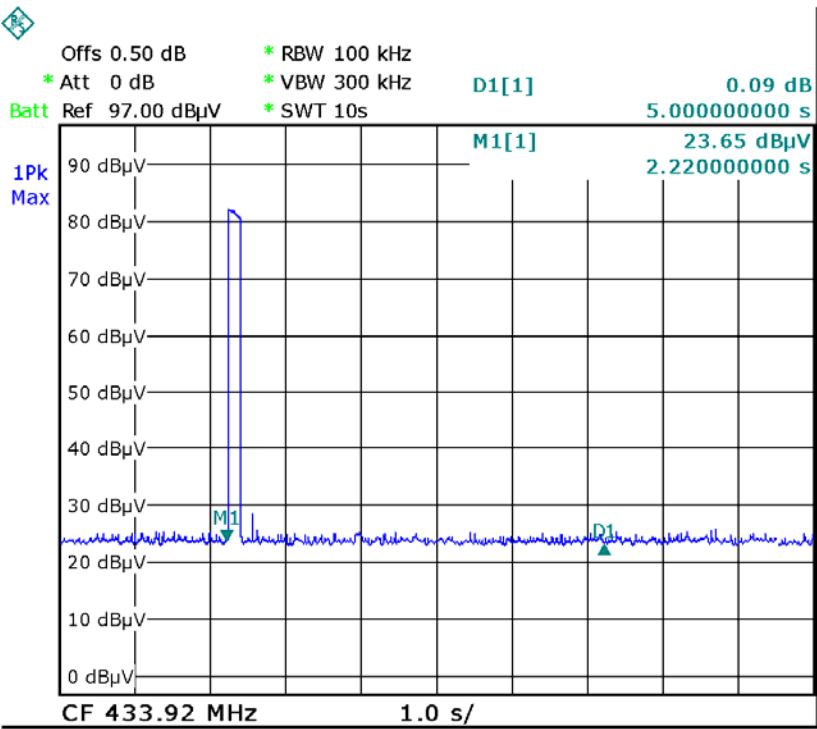
Total On interval in a complete pulse train(ms)	1.108
Length of a complete pulse train(ms)	2.117
Duty Cycle(%)	52.34
Duty Cycle Correction Factor(dB)	-5.61

Refer to the duty cycle plot (as below), This device meets the FCC requirement.
Length of a complete pulse train:

Remark: FCC part15.35(c) required that a complete pulse train is more than 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value.



Refer to the plot (as below),We find a manually operated transmitter shall employ a switch that will automatically deactivate the transmitter immediately, within not more than 5 seconds of being released.



9 20dB Bandwidth

Test Requirement: FCC Part15 C

Test Method: FCC Part15 Paragraph 15.231(c)

Limit The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency.

9.1 Test Procedure

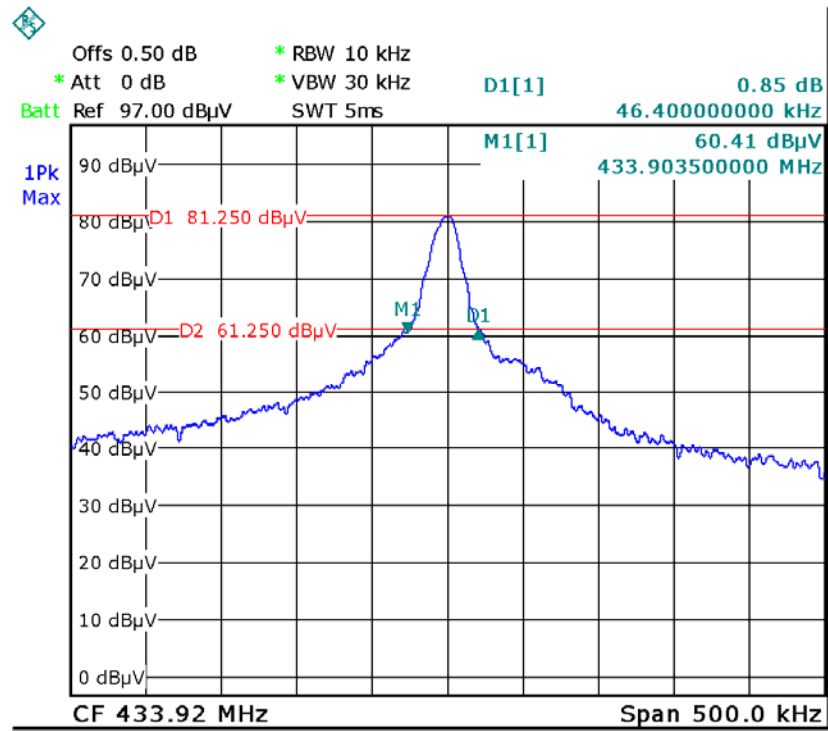
- 1. The transmitter output (antenna port) was connected to the spectrum analyzer.EUT and its simulators are placed on a table, let EUT working in test mode,then test it.
- 2. The bandwidth of the fundamental frequency was measure by spectrum analyser with 10kHz RBW and 30kHz VBW.The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power 20dB.

9.2 Test Result

Frequency (MHz)	Bandwidth Emission (KHz)	Limit (kHz)	Result
433.92	46.40	1084.80	Pass

Limit=Center Frequency*0.25%

Test Plot



10 Antenna Requirement

According to the FCC Part 15 Paragraph 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna to the intentional radiator shall be considered sufficient to comply with the provisions of this section. This product use a permanent Monopole antenna, fulfill the requirement of this section

11 Photographs of Testing

11.1 Photograph – Conducted Emission Test Setup



11.2 Radiation Emission Test Setup

From 30MHz to 1GHz



Above 1GHz



12 Photographs - Constructional Details

12.1 EUT - Appearance View



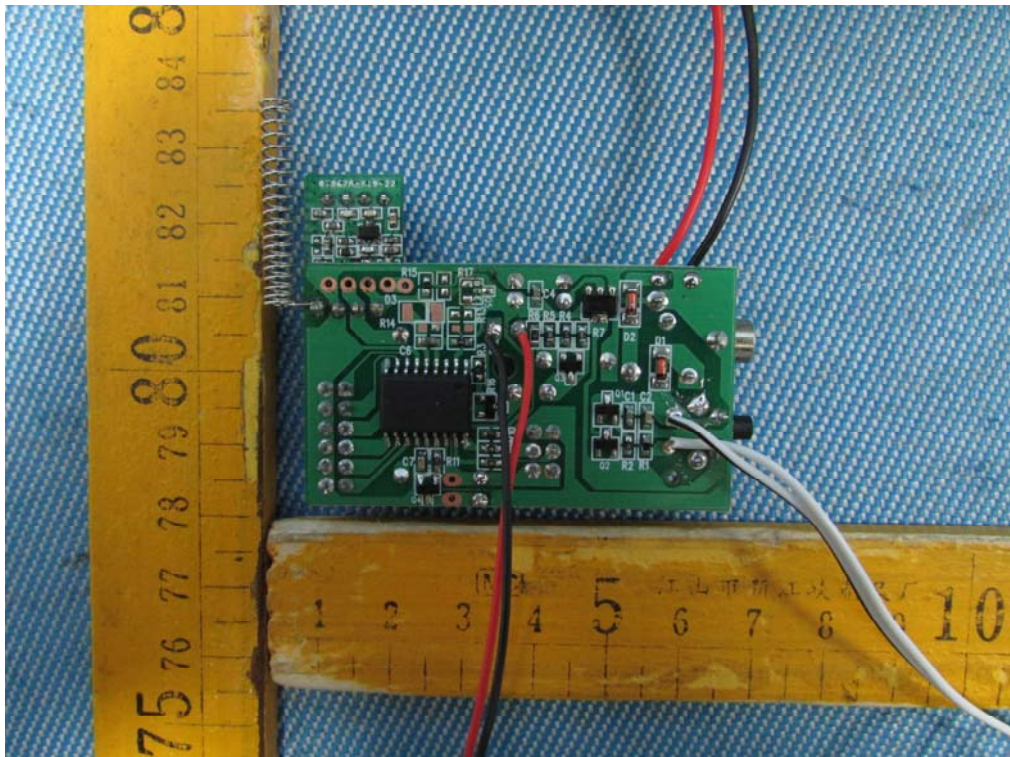


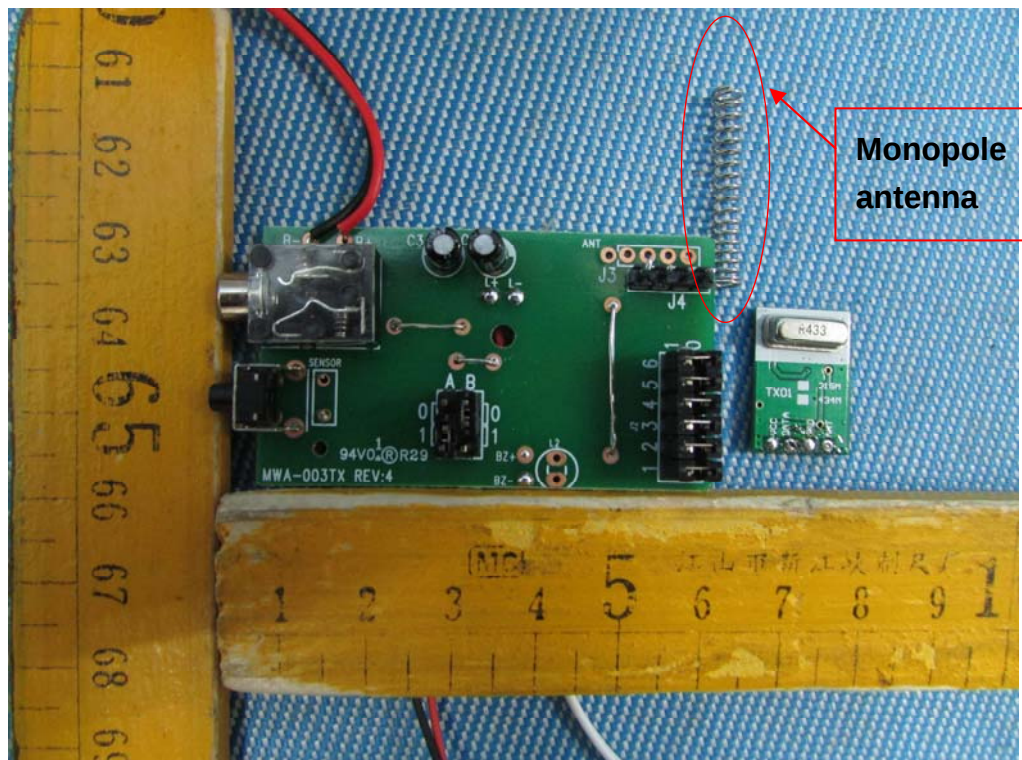
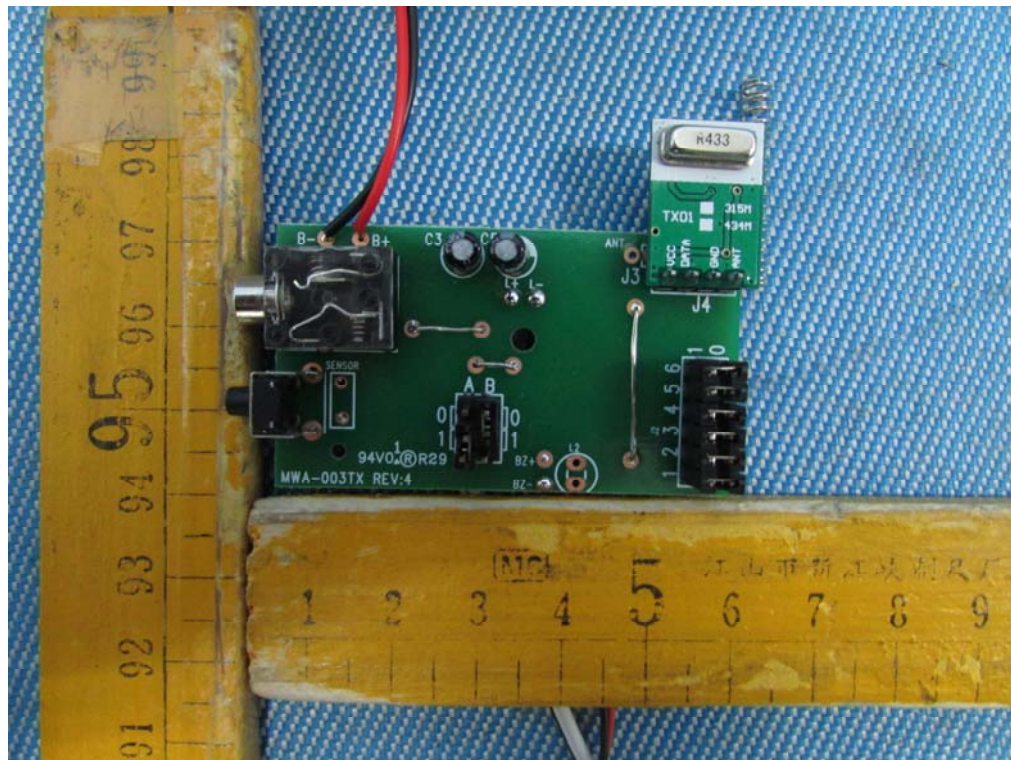


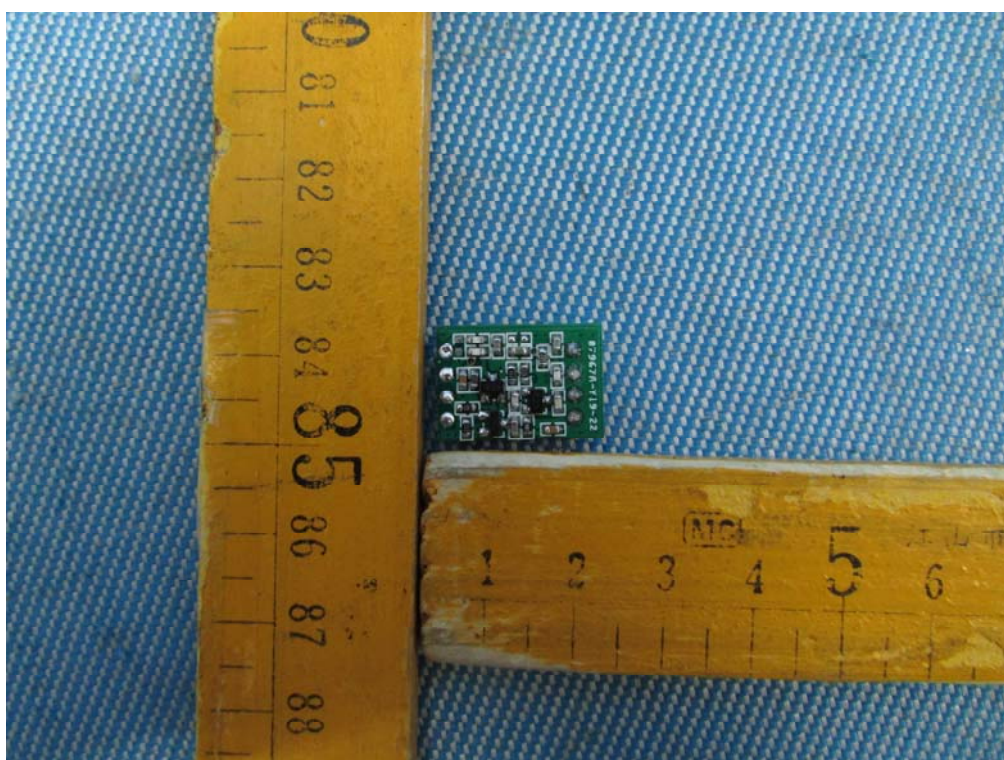




12.2 EUT- Internal View







=====End of Report=====