Shenzhen General Testing & Inspection Technology Co., Ltd.

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TEST REPORT

Product name ..... : Wireless Doorbell Ktis

Trademark ..... : /

Model Name..... : ZB203

Listed Model(s)..... : ZB205

FCC ID..... : 2AOALZB205

Test Standards..... : **FCC CFR Title 47 Part 15.231**

Report no. ..... : GTI20171082E

Applicant ..... : ShenZhen zhongbanghechuangTechnology Co., LTD

Address of applicant ..... : Building 1, the research and development building of phoenix zhihui innovation park, phoenix road, fuyong street, baoan district, shenzhen city

Date of Receipt..... : Nov 10, 2017

Date of Test Date..... : Nov 10, 2017 to Nov 29, 2017

Date of issue. ..... : Nov 30, 2017

Test result	**Pass ***

* In the configuration tested, the EUT complied with the standards specified above

GENERAL DESCRIPTION OF EUT	
Equipment:	Wireless Doorbell Ktis
Model Name:	ZB203
Listed Model(s)	ZB205
Models Differences	Only model name is different.
Manufacturer:	ShenZhen zhongbanghechuangTechnology Co., LTD
Manufacturer Address:	Building 1, the research and development building of phoenix zhihui innovation park, phoenix road, fuyong street, baoan district, shenzhen city
Factory:	/
Factory Address:	/
Power Rating:	Powered by Battery DC 12V

Compiled By: Zaki Zhang

(Zaki Zhang)

Reviewed By: Gavin shi

(Gavin Shi)

Approved By:

(Walter Chen)

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1. SUMMARY

1.1. Test Standards

The tests were performed according to following standards:

FCC Rules Part 15.231: Periodic operation in the band 40.66-40.70 MHz and above 70 MHz.

ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices

1.2. Test Description

Emission Measurement requirements		
Radiated Emission	Part15.209	PASS
Conducted Disturbance	Part15.207	N/A(Note 1)
20dB Bandwidth	Part15.231	PASS
Deactivation time	Part15.231	PASS
Antenna Requirement	Part15.203	PASS

.Note 1:EUT is battery power supply. conducted emission is not need

1.3. Test Facility

1.3.1 Address of the test laboratory

Shenzhen General Testing & Inspection Technology Co., Ltd.

Add: 1F, 2 Block,Jiaquan Building, Guanlan High-tech Park Baoan District, Shenzhen, Guangdong,China

1.3.2 Laboratory accreditation

The test facility is recognized, certified, or accredited by the following organizations:

IC Registration No.: 9783A

The 3m alternate test site of Shenzhen GTI Technology Co., Ltd.EMC Laboratory has been registered by Certification and Engineer Bureau of Industry Canada for the performance of with Registration NO.: 9783A on Jan, 2016.

1.4. Measurement Uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements and is documented in the Shenzhen General Testing & Inspection Technology Co., Ltd quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for General Testing & Inspection laboratory is reported:

Test Items	Measurement Uncertainty	Notes
Transmitter power conducted	0.57 dB	(1)
Transmitter power Radiated	2.20 dB	(1)
Conducted spurious emission 9KHz-40 GHz	1.60 dB	(1)
Radiated spurious emission 9KHz-40 GHz	2.20 dB	(1)
Conducted Emission 9KHz-30MHz	3.39 dB	(1)
Radiated Emission 30~1000MHz	4.24 dB	(1)
Radiated Emission 1~18GHz	5.16 dB	(1)
Radiated Emission 18-40GHz	5.54 dB	(1)
Occupied Bandwidth	---------	(1)

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=1.96.

2. GENERAL INFORMATION

2.1. General Description of EUT

Product Name:	Wireless Doorbell Ktis
Model/Type reference:	/
Power supply:	Input: 12V
Hardware version:	V1.2
Software version:	V1.2
Modulation:	OOk/ASK
Operation frequency:	433.92MHz
Channel number:	1
Channel separation:	/
Antenna type:	Spring Antenna
Antenna gain:	0dBi

Note: For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

2.2. Description of Test Modes

Peripherals Devices:

OUTSIDE SUPPORT EQUIPMENT						
No.	Equipment	Model	Serial No.	Manufacture	Trade name	Remark
1	/	/	/	/	/	/

Note: All the above equipment /cable were placed in worse case position to maximize emission signals during emission test.

Operation Frequency

Channel	Frequency (MHz)
1	**433.92**

2. 1. Measurement Instruments List

Duty cycle					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSU26	100105	Jan. 07,2018

Conducted Emission					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrate until
1	LISN	R&S	ENV216	101112	Jan. 07, 2018
2	LISN	R&S	ENV216	101113	Jan. 07, 2018
3	EMI Test Receiver	R&S	ESCI	100920	Jan. 07, 2018
4	Cable	Schwarzbeck	AK9515E	33156	Jan. 07, 2018

Radiated Emission					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
1	EMI Test Receiver	R&S	ESCI	100658	Jan. 07, 2018
2	High pass filter	micro-tranics	HPM50111	34202	Jan. 07, 2018
3	Log-Bicon Antenna	Schwarzbeck	CBL6141A	4180	Jan. 07, 2018
4	Ultra-Broadband Antenna	ShwarzBeck	BBHA9170	25841	Jan. 07, 2018
5	Loop Antenna	LAPLAC	RF300	9138	Jan. 07, 2018
6	Spectrum Analyzer	Rohde & Schwarz	FSU	100105	Jan. 07, 2018
7	Horn Antenna	Schwarzbeck	BBHA 9120D	647	Jan. 07, 2018
8	Pre-Amplifier	HP	8447D	1937A03050	Jan. 07, 2018
9	Pre-Amplifier	EMCI	EMC051835	980075	Jan. 07, 2018
10	Antenna Mast	UC	UC3000	N/A	N/A
11	Turn Table	UC	UC3000	N/A	N/A
12	Cable Below 1GHz	Schwarzbeck	AK9515E	33155	Jan. 07, 2018
13	Cable Above 1GHz	Hubersuhner	SUCOFLEX102	DA1580	Jan. 07, 2018

Note: 1. The Cal.Interval was one year.

2. The cable loss has calculated in test result which connection between each test instruments.

3. TEST CONDITIONS AND RESULTS

3.1. CONDUCTED EMISSION MEASUREMENT

Limit

POWER LINE CONDUCTED EMISSION (Frequency Range 150KHz-30MHz)

FREQUENCY (MHz)	Class B (dBuV)	
	Quasi-peak	Average
0.15 -0.5	66 - 56 *	56 - 46 *
0.50 -5.0	56.00	46.00
5.0 -30.0	60.00	50.00

Note:

(1) The tighter limit applies at the band edges.

(2) The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

The following table is the setting of the receiver

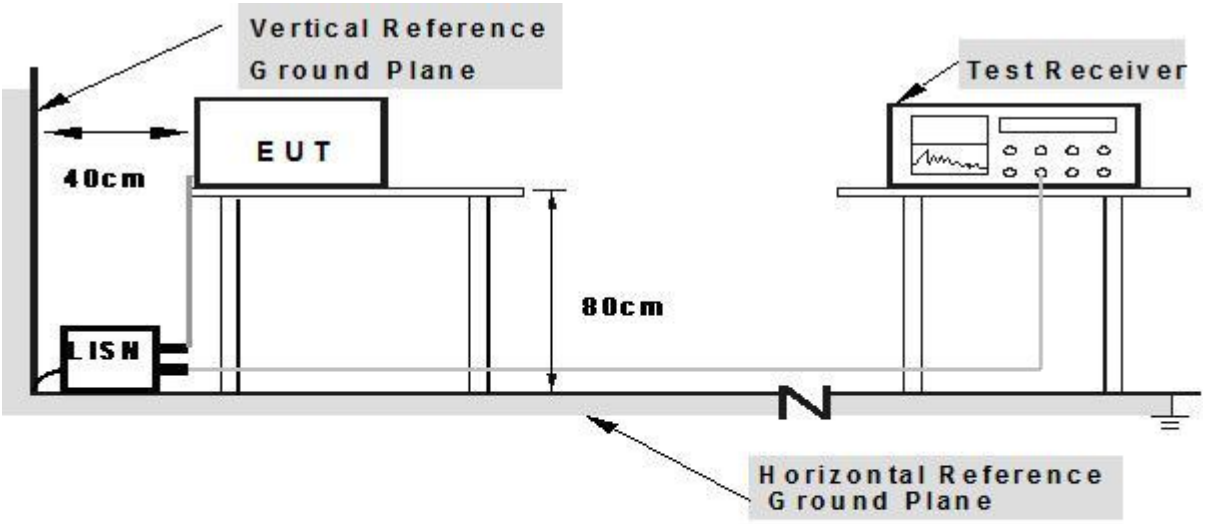
Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

Test Procedure

1. The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
2. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
3. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.Repeat above procedures until all frequency measurements have been completed.
4. LISN at least 80 cm from nearest part of EUT chassis.
5. For the actual test configuration, please refer to the related Item –EUT Test Photos.

Test Configuration

For the actual test configuration, please refer to the related Item –EUT Test Photos.



Note: 1.Support units were connected to second LISN.
2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

Test Results

EUT is battery power supply. conducted emission is not need

3. 2. Radiated Emission

Limit

Fundamental Frequency (MHz)	Field Strength of Fundamental (dBuV/m)	Field Strength of Fundamental (uV/m)	Field Strength of Spurious (dBuV/m)	Field Strength of Spurious (uV/m)
40.66 - 40.70	67.04	2,250	47.04	225
70 - 130	61.94	1,250	41.94	125
130 - 174	* 61.94 - 71.48	* 1,250 -3,750	* 41.94 - 51.48	* 125 - 375
174 - 260	71.48	3,750	51.48	375
260 - 470	* 71.48 - 81.94	* 3,750 - 12,500	* 51.48 - 61.94	* 375 - 1,250
above 470	81.94	12,500	61.94	1,250

Test Procedure

1. The EUT was placed on a turn table which is 0.8m above ground plane..
2. Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0℃ to 360℃ to acquire the highest emissions from EUT
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measurements have been completed.

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CL – AG

Where FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
RA = Reading Amplitude	AG = Amplifier Gain
AF = Antenna Factor	

For example

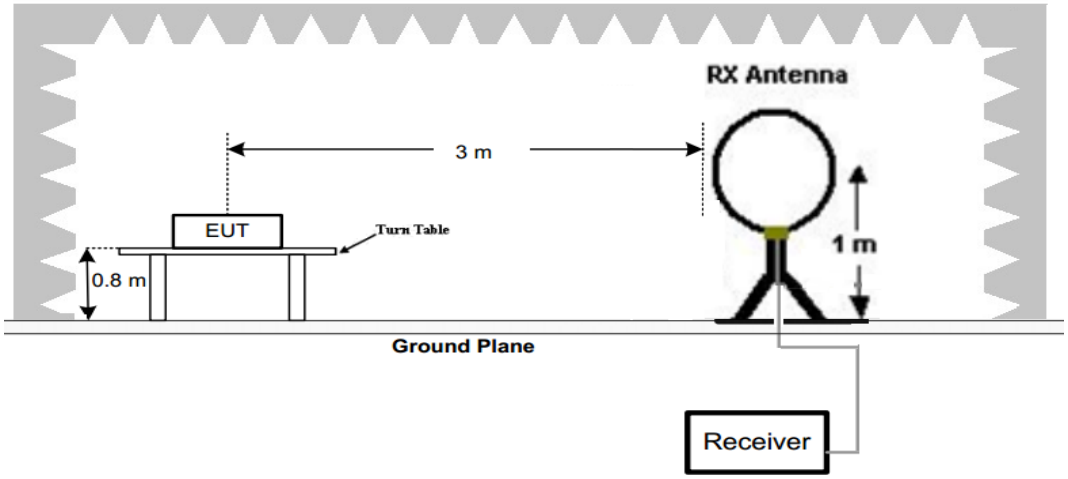
Frequency (MHz)	FS (dBμV/m)	RA (dBμV/m)	AF (dB)	CL (dB)	AG (dB)	Transd (dB)
150.00	40	58.1	12.2	1.6	31.90	-18.1

Transd=AF +CL-AG

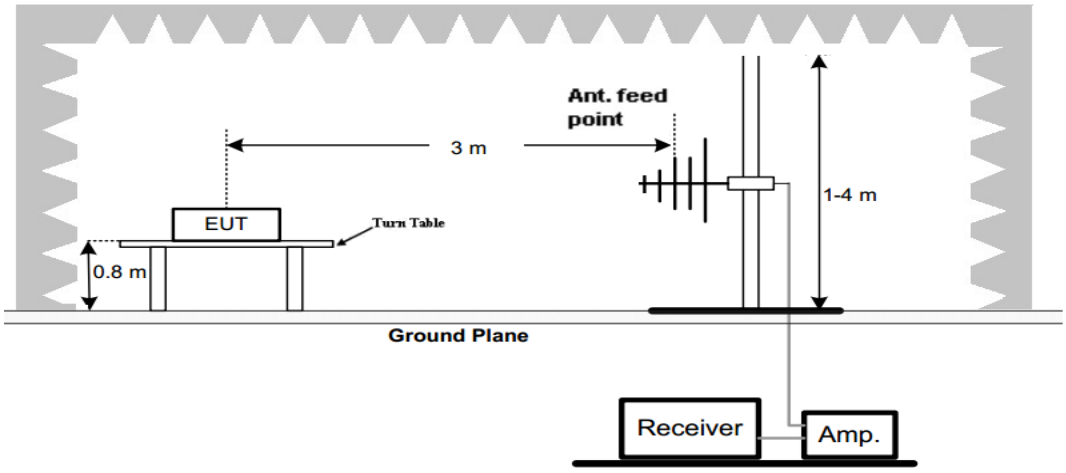
Test Configuration

For the actual test configuration, please refer to the related Item –EUT Test Photos.

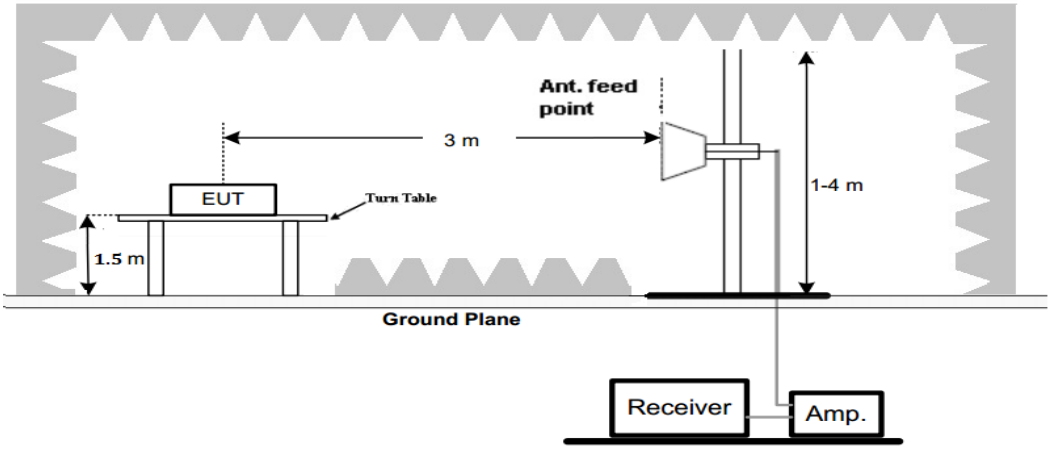
Frequency range 9 KHz – 30MHz



Frequency range 30MHz – 1000MHz



Frequency range above 1GHz-25GHz



Test Results

For 9 KHz-30MHz

The test results of 9kHz-30MHz is attenuated more than 20dB below the permissible limits, so the results don't record in the report.

fundamental

Frequency	Antenna	Reading	Cable Loss	Ant Factor	Amplifier	Average Factor	Corrected Level	Limits	Det
(MHz)	Polarization	(dBuV/m)	(dB)	(dB)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	Mode
434.06	H	62.15	4.50	17.30	28.60	--	55.35	100.80	PK
434.06	H	62.15	4.50	17.30	28.60	-1.80	53.55	80.80	AV
434.06	V	47.16	4.50	17.30	28.60	--	40.36	100.80	PK
434.06	V	47.16	4.50	17.30	28.60	-1.80	38.56	80.80	AV

Radiated Emission

Frequency	Antenna	Reading	Cable Loss	Ant Factor	Amplifier	Corrected Level	Limits	Margin	Det
(MHz)	Polarization	(dBuV/m)	(dB)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	Mode
141.52	H	47.23	4.50	11.30	42.01	21.02	43.50	-22.48	PK
297.96	H	45.53	4.50	13.02	41.78	21.27	46.00	-24.73	PK
621.43	H	46.72	4.50	12.58	39.63	24.17	46.00	-21.83	PK
166.98	V	42.46	4.50	10.49	38.56	18.89	43.50	-24.61	PK
262.04	V	43.32	4.50	13.22	41.02	20.02	46.00	-25.98	PK
710.23	V	41.15	4.50	14.15	40.07	19.73	46.00	-26.27	PK

Harmonics Emissions

Frequency	Antenna	Reading	Cable Loss	Ant Factor	Amplifier	Average Factor	Corrected Level	Limits	Det
(MHz)	Polarization	(dBuV/m)	(dB)	(dB)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	Mode
867.84	H	40.03	4.50	15.70	44.20	--	16.03	80.80	PK
867.84	H	40.03	4.50	15.70	44.20	-1.80	14.23	60.80	AV
867.84	V	38.72	4.50	15.70	44.20	--	14.72	80.80	PK
867.84	V	38.72	4.50	15.70	44.20	-1.80	12.92	60.80	AV
1301.76	H	53.25	4.50	13.50	43.70	--	27.55	75.62	PK

1301.76	H	53.25	4.50	13.50	43.70	-1.80	25.75	55.62	AV
1301.76	V	50.53	4.50	13.50	43.70	--	24.83	75.62	PK
1301.76	V	50.53	4.50	13.50	43.70	-1.80	23.03	55.62	AV
1735.68	H	59.50	4.50	13.50	43.70	--	33.80	74.00	PK
1735.68	H	59.50	4.50	13.50	43.70	-1.80	32.00	54.00	AV
1735.68	V	55.48	4.50	13.50	43.70	--	29.78	74.00	PK
1735.68	V	55.48	4.50	13.50	43.70	-1.80	27.98	54.00	AV
2169.6	H	--						74.00	PK
2169.6	H	--						54.00	AV
2169.6	V	--						74.00	PK
2169.6	V	--						54.00	AV

Remark ：

1. Corrected Level = Reading + Cable Loss+Ant Factor-Amplifier+Correction Factor
2. Correction Factor = 20 Log (duty cycle) Pls refer to section 6.3
3. AV=PK+20 Log (duty cycle)
4. “ -- ” Mark indicated Background Noise Level
5. Pulse Desensitization Correction Factor

   Pulse Width (PW)= 0.780ms

   2/PW=2/0.780=2.564kHz

   RBW(100kHz)＞ 2/PW (2.564kHz)

   Therefore PDCF is not needed.

3. 3. 20DB BANDWIDTH

Limit

In accordance with Part15.231(c), 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. Bandwidth is determined at the points 20 dB down from the modulated carrier.

Test Procedure

The radiated emission tests were performed in the in the 3m Semi-anechoic chamber, using the setup accordance with the ANSI C63.10-2013.

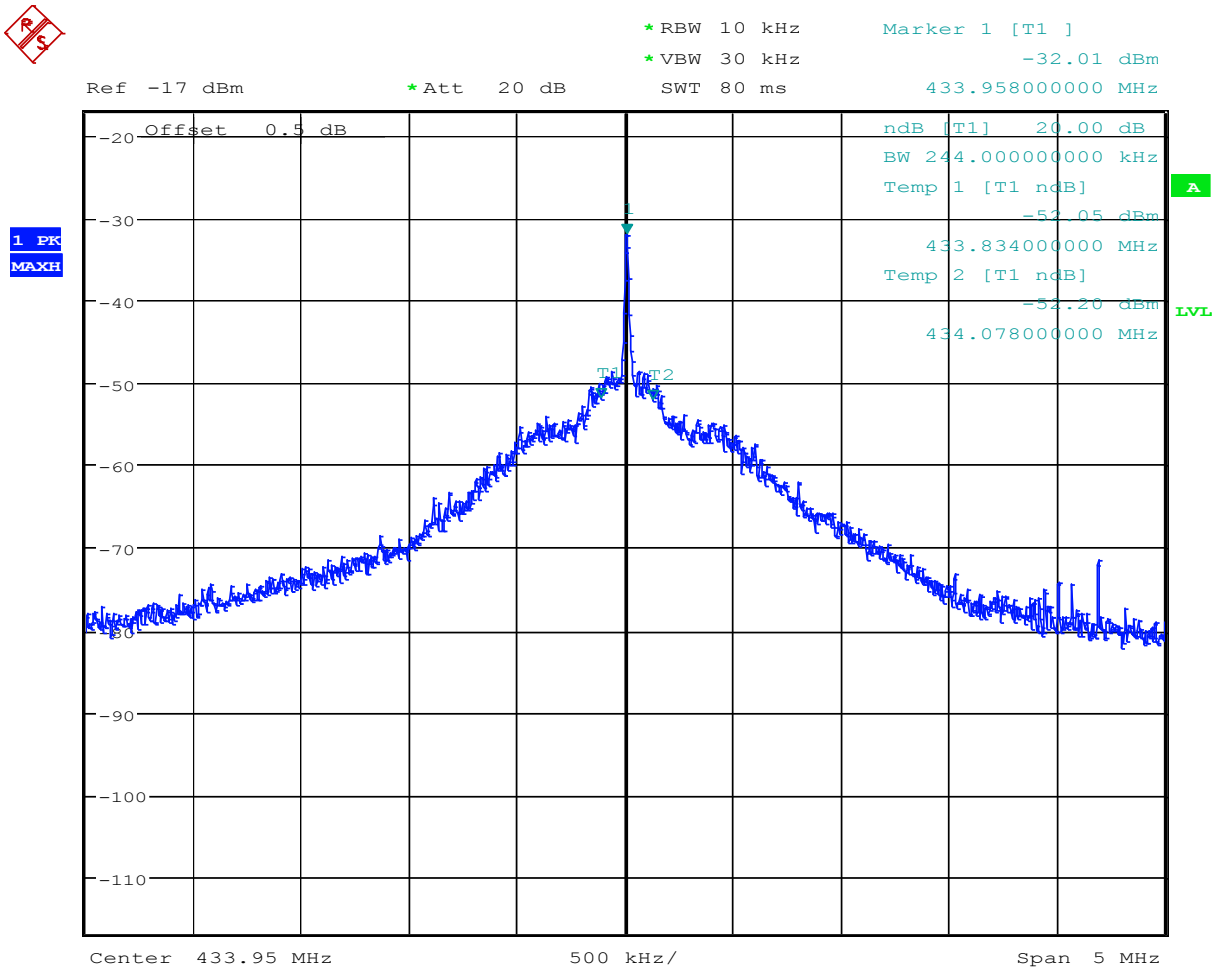
The EUT was placed on the center of the nonmetal table which is 0.8 meter above a grounded turntable. The turntable can rotate 360 degrees to determine the azimuth of the maximum emission level.

Maximum emission emitted from EUT was determined by manipulating the EUT, support equipment, interconnecting cables and varying the mode of operation and the levels in the final result of the test were recorded with the EUT running in the operating mode that maximum emission was emitted.

Test Results

Channel Frequency (MHz)	Measured 20dB Bandwidth(kHz)	Limit(kHz)	Result
433.92	244.0	1084.8	PASS

Test plot as follows:



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3. 4. Deactivation time

Limit

In accordance with Part15.231(a)

Test Procedure

Test Procedure tor conducted method

Set EUT operating in continuous transmitting mode
Set Test Receiver into spectrum analyzer mode, Tune the spectrum analyzer to the transmitter carrier frequency, and set the spectrum analyzer resolution bandwidth(RBW) to 100kHz and video bandwidth(VBW) to 100kHz, Span was set to 0Hz.
The Duty Cycle was measured and recorded.

Test Results

1. Regulation 15.231(a) The provisions of this Section are restricted to periodic operation within the band 40.66 -40.70 MHz and above 70 MHz. Except as shown in paragraph (e) of this Section, the intentional radiator is restricted to the transmission of a control signal such as those used with alarm systems, door openers, remote switches, etc. Continuous transmissions, voice, video and the radio control of toys are not permitted.
Result:
The EUT is a remote switch without audio or video transmitted.
The EUT meets the requirements of this section.

2. Regulation 15.231(a2) A transmitter activated automatically shall cease transmission within 5 seconds after activation.
Result:
The EUT doesn't have automatic transmission.

3. Regulation 15.231(a3) Periodic transmissions at regular predetermined intervals are not permitted.
However, polling or supervision transmissions, including data, to determine system integrity of
transmitters used in security or safety applications are allowed if the total duration of transmissions does not exceed more than one seconds per hour for each transmitter.
There is no limit on the number of

individual transmissions, provided the total transmission time does not exceed one seconds per hour.

Result:

The EUT doesn't employ periodic transmission.

4. Regulation 15.231(a4) Intentional radiators which are employed for radio control purposes during

emergencies involving fire, security, and safety of life, when activated to signal an alarm, may operate during the pendency of the alarm condition.

Result:

This section is not applicable to the EUT.

5. Regulation 15.231(a1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

Result:

Averaging factor in dB =20 log (duty cycle)

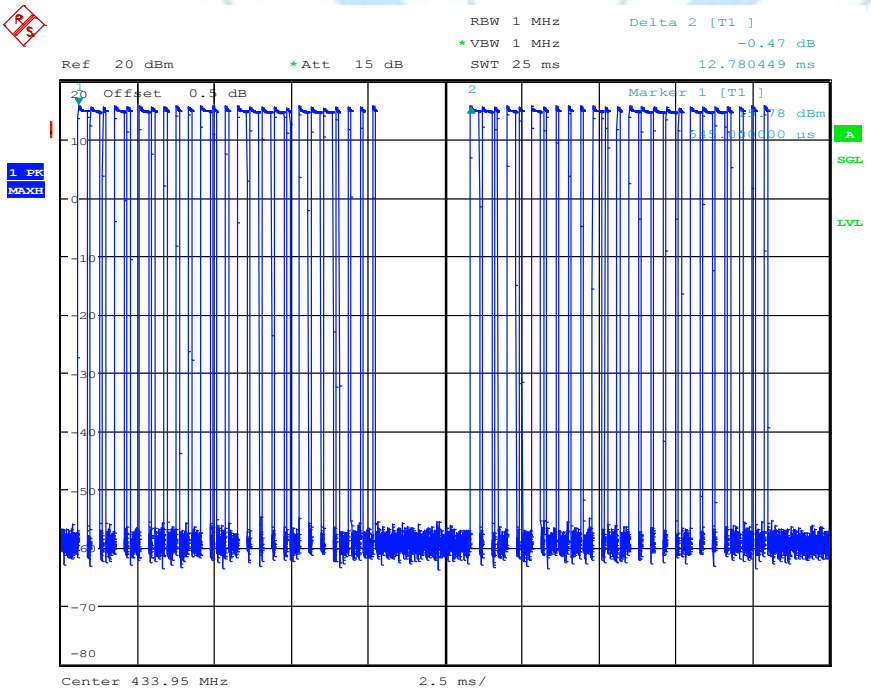
The duration of one cycle =12.78ms

Duty Cycle = (0.780ms*12+0.076ms*13)=10.348 ms / 12.78ms=0.809

Therefore, the averaging factor is found by 20 log 0.809 = -1.8dB

Please see the diagrams below.

Time Slot



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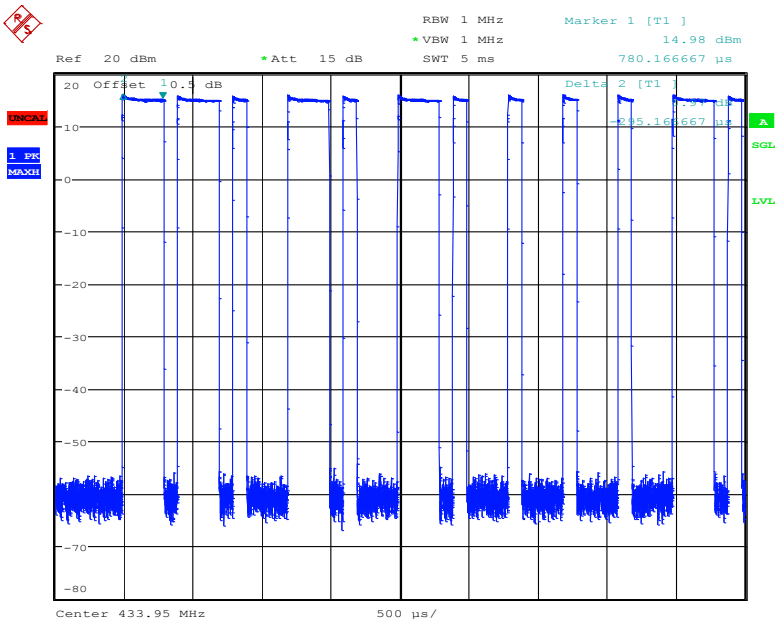
Duty Cycle



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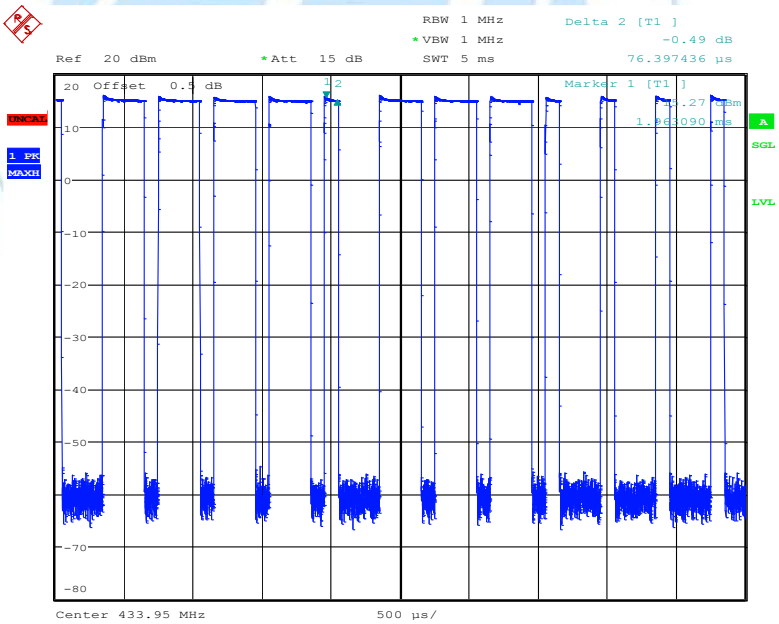

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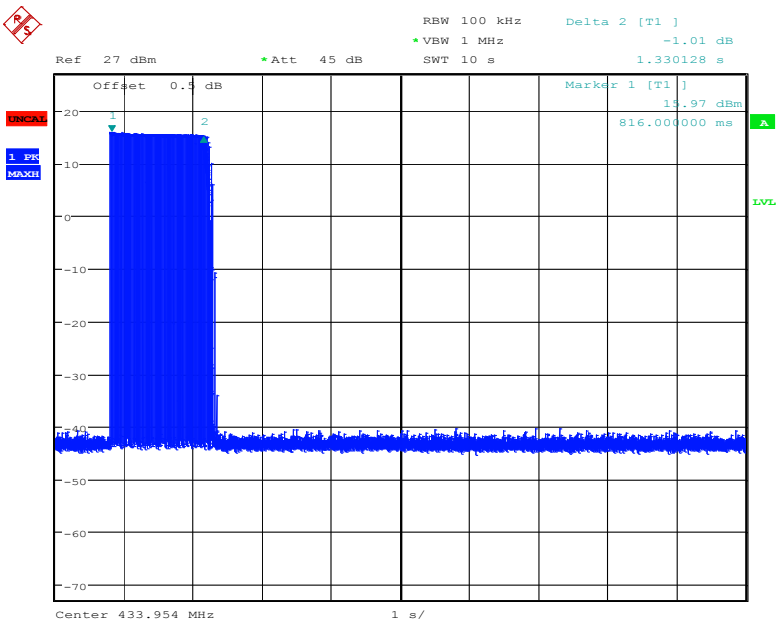
A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

Result:Pass



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3.5. Antenna Requirement

Standard Applicable

For intentional device, according to FCC 47 CFR Section 15.203:

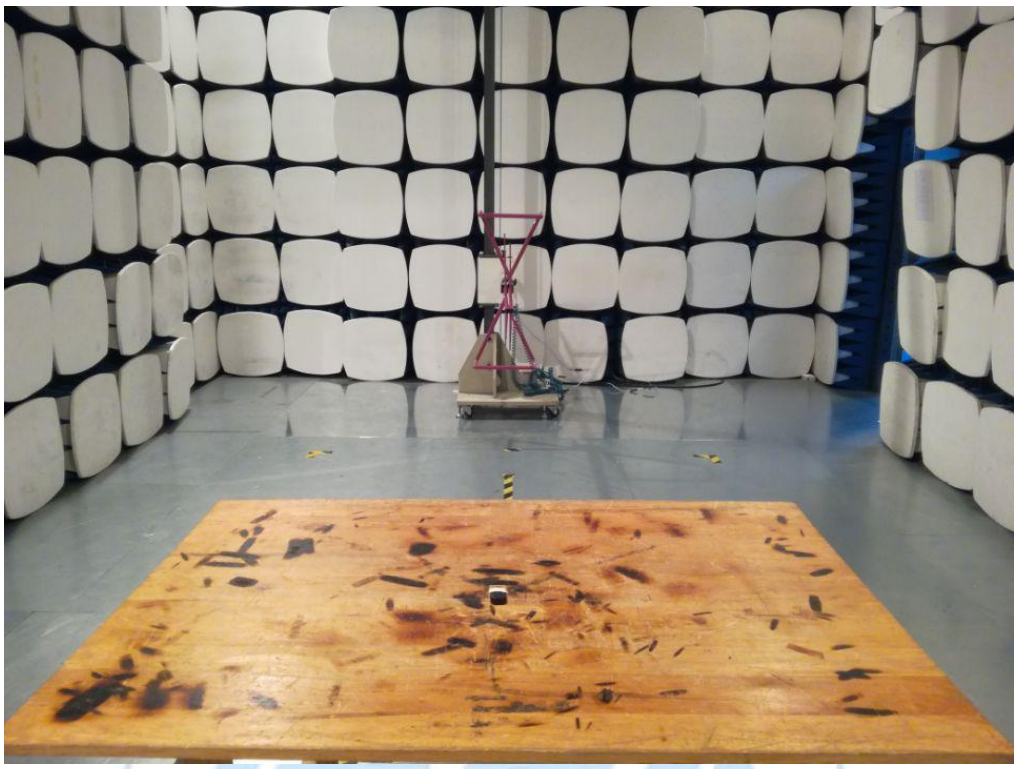
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited

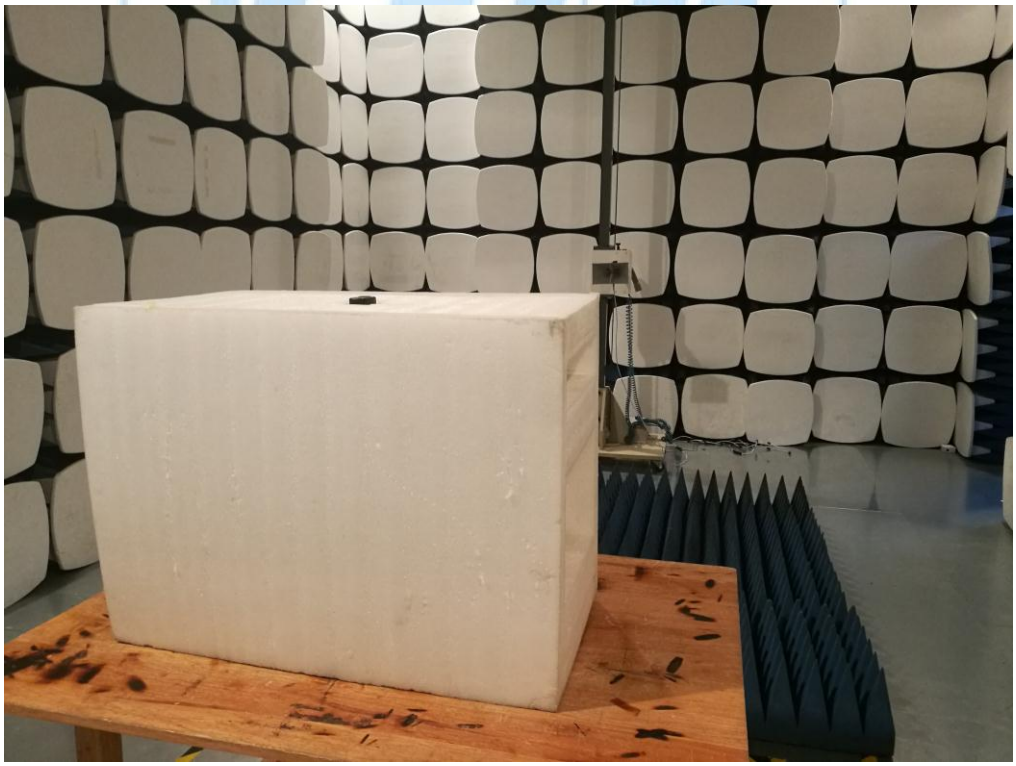
Test Result:

The EUT's antenna used a Spring Antenna, The antenna's gain is 0dBi and meets the requirement.

4. EUT TEST PHOTO

Radiated Emission

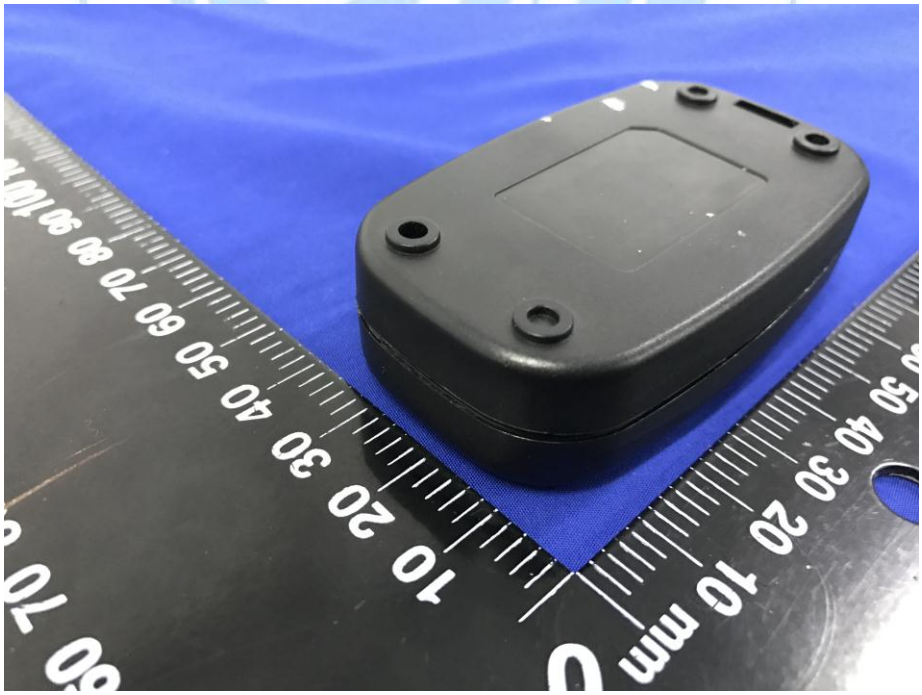




5. PHOTOGRAPHS OF EUT CONSTRUCTIONAL

1. Photo

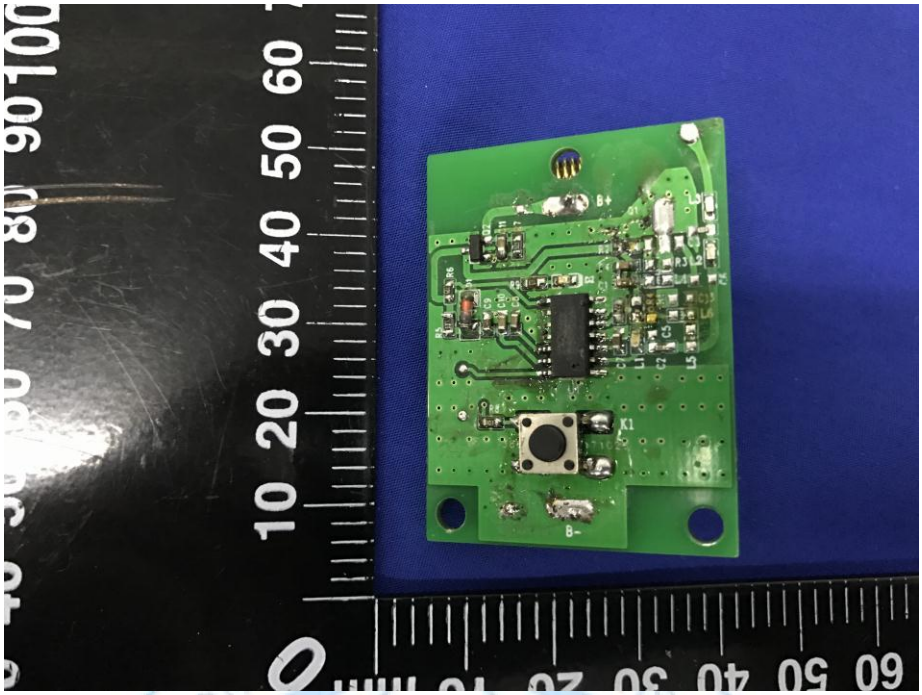
2. Photo



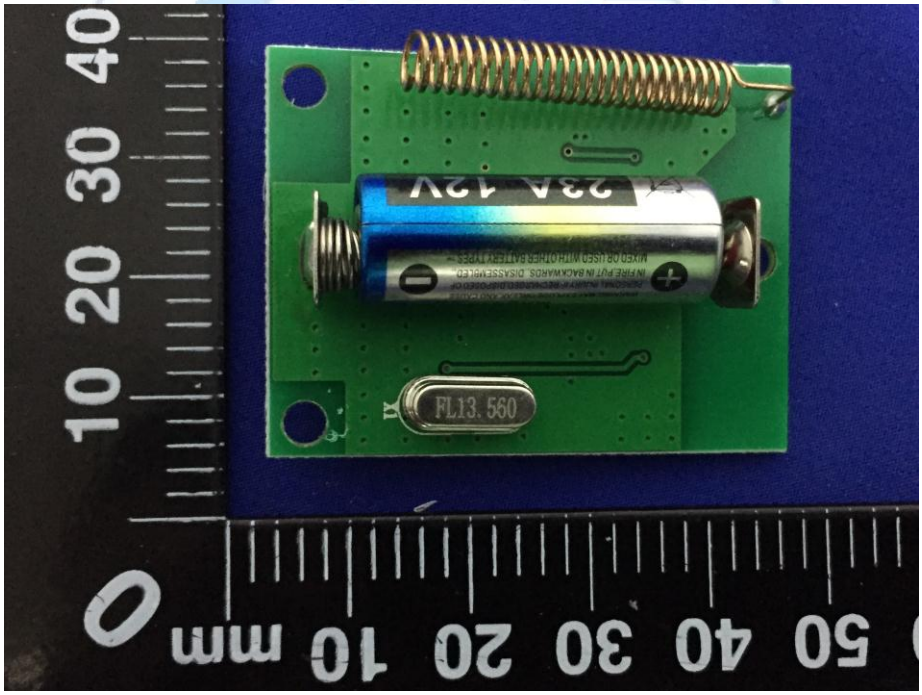
3. Photo

4. Photo

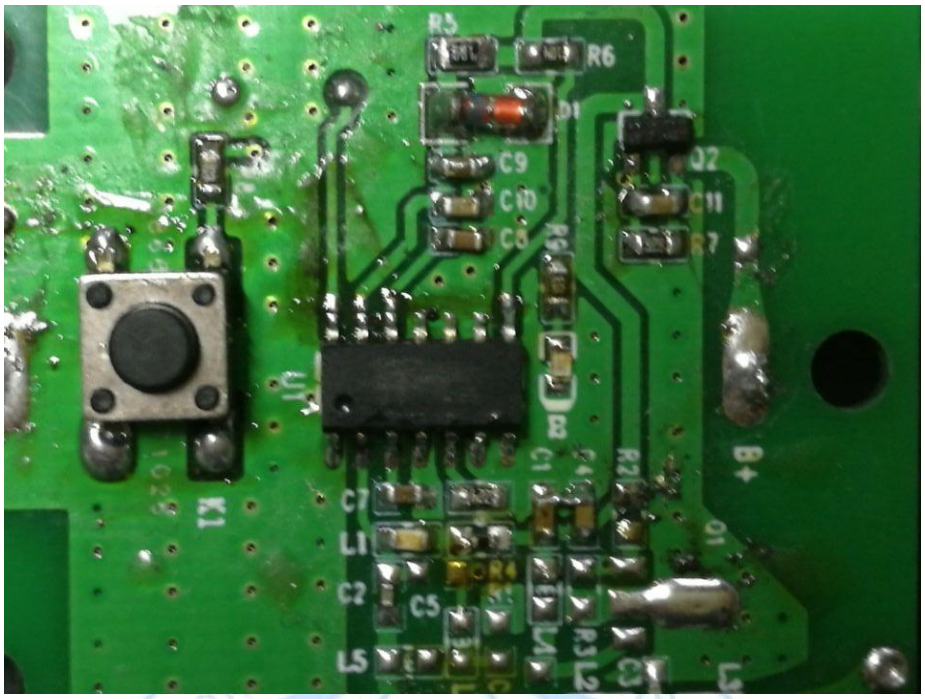
5. Photo



6. Photo



7. Photo



**********THE END**********