

APPLICATION CERTIFICATION  
On Behalf of  
Carewell Electric Technology (Zhongshan) Co., Ltd.

REMOTE CONTROL  
Model No.: FAN-11T2

FCC ID: 2AAZPFAN11T2

Prepared for : Carewell Electric Technology (Zhongshan) Co., Ltd.  
Address : Torch Development Zone, No.2, Ouya Road, Zhongshan,  
Guangdong, China

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Report Number : ATE20182014  
Date of Test : November 15, 2018  
Date of Report : November 16, 2018

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## Test Report Certification

Applicant : Carewell Electric Technology (Zhongshan) Co., Ltd.  
Manufacturer : Carewell Electric Technology (Zhongshan) Co., Ltd.  
EUT Description : REMOTE CONTROL  
Model No. : FAN-11T2

Measurement Procedure Used:

### FCC Rules and Regulations Part 15 Subpart C Section 15.231a ANSI C63.10: 2013

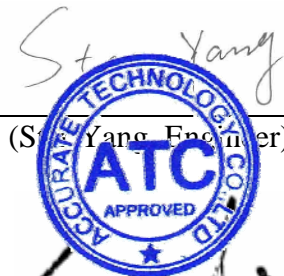
The device described above is tested by Shenzhen Accurate Technology Co., Ltd. to determine the maximum emission levels emanating from the device. The maximum emission levels are compared to the FCC Part 15 Subpart C Section 15.231a. The measurement results are contained in this test report and Shenzhen Accurate Technology Co., Ltd. is assumed full responsibility for the accuracy and completeness of these measurements. Also, this report shows that the Equipment Under Test (EUT) is to be technically compliant with the FCC requirements.

This report applies to above tested sample only. This report shall not be reproduced in part without written approval of Shenzhen Accurate Technology Co., Ltd.

Date of Test : November 15, 2018  
Date of Report : November 16, 2018

Prepared by : St. Yang  
(St. Yang, Engineer)

Approved & Authorized Signer : Sean Liu  
(Sean Liu, Manager)



## 1. GENERAL INFORMATION

### 1.1. Description of Device (EUT)

EUT	:	REMOTE CONTROL
Model Number	:	FAN-11T2
Power Supply	:	DC 9V
Modulation Mode	:	ASK
Operation Frequency	:	315MHz
Antenna type	:	PCB antenna
Antenna gain	:	0dBi
RF power setting in test	:	Max power
Applicant Address	:	Carewell Electric Technology (Zhongshan) Co., Ltd. Torch Development Zone, No.2, Ouya Road, Zhongshan, Guangdong, China
Manufacturer Address	:	Carewell Electric Technology (Zhongshan) Co., Ltd. Torch Development Zone, No.2, Ouya Road, Zhongshan, Guangdong, China

## 1.2. Description of Test Facility

EMC Lab	:	Recognition of accreditation by Federal Communications Commission (FCC) The Designation Number is CN1189 The Registration Number is 708358
		Listed by Innovation, Science and Economic Development Canada (ISED) The Registration Number is 5077A-2
		Accredited by China National Accreditation Service for Conformity Assessment (CNAS) The Registration Number is CNAS L3193
		Accredited by American Association for Laboratory Accreditation (A2LA) The Certificate Number is 4297.01
Name of Firm	:	Shenzhen Accurate Technology Co., Ltd.
Site Location	:	1/F., Building A, Changyuan New Material Port, Science & Industry Park, Nanshan District, Shenzhen, Guangdong, P.R. China

## 1.3. Measurement Uncertainty

Conducted Emission Expanded Uncertainty	=	2.23dB, k=2
Radiated emission expanded uncertainty (9kHz-30MHz)	=	3.08dB, k=2
Radiated emission expanded uncertainty (30MHz-1000MHz)	=	4.42dB, k=2
Radiated emission expanded uncertainty (Above 1GHz)	=	4.06dB, k=2

## 2. MEASURING DEVICE AND TEST EQUIPMENT

**Table 1: List of Test and Measurement Equipment**

Kind of equipment	Manufacturer	Type	S/N	Calibrated dates	Cal. Interval
EMI Test Receiver	Rohde&Schwarz	ESR	101817	Jan. 06, 2018	One Year
Spectrum Analyzer	Rohde&Schwarz	FSV-40	101495	Jan. 06, 2018	One Year
Pre-Amplifier	Rohde&Schwarz	CBLU118354 0-01	3791	Jan. 06, 2018	One Year
Loop Antenna	Schwarzbeck	FMZB1516	1516131	Jan. 06, 2018	One Year
Bilog Antenna	Schwarzbeck	VULB9163	9163-323	Jan. 06, 2018	One Year
Horn Antenna	Schwarzbeck	BBHA9120D	9120D-655	Jan. 06, 2018	One Year
Horn Antenna	Schwarzbeck	BBHA9170	9170-359	Jan. 06, 2018	One Year
Highpass Filter	Wainwright Instruments	WHKX3.6/18 G-10SS	N/A	Jan. 06, 2018	One Year
Band Reject Filter	Wainwright Instruments	WRCG2400/2 485-2375/2510 -60/11SS	N/A	Jan. 06, 2018	One Year
Radiated Emission Measurement Software: EZ_EMV V1.1.4.2					

### 3. SUMMARY OF TEST RESULTS

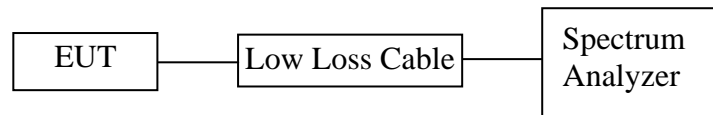
<b>FCC Rules</b>	<b>Description of Test</b>	<b>Result</b>
Section 15.207	Conducted Emission	N/A
Section 15.231(b)	Radiated Emission	Compliant
Section 15.231(c)	20dB Bandwidth	Compliant
Section 15.231(a)(1)	Release Time Measurement	Compliant
Section 15.203	Antenna Requirement	Compliant

The product is a manually operated transmitter.  
Section 15.231 (a) (2), (3), (4) and (5) are not applicable.

Note: The power supply mode of the EUT is DC 9V, According to the FCC standard requirements, conducted emission is not applicable.

## 4. AVERAGE FACTOR MEASUREMENT

### 4.1. Block Diagram of Test Setup



### 4.2. Average factor Measurement according to ANSI C63.10: 2013

**ANSI C63.10-2013 Section 7.5** Unless otherwise specified, when the radiated emission limits are expressed in terms of the average value of the emission, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 s (100 ms). In cases where the pulse train exceeds 0.1 s, the measured field strength shall be determined during a 0.1 s interval.<sup>64</sup> The following procedure is an example of how the average value may be determined. The average field strength may be found by measuring the peak pulse amplitude (in log equivalent units) and determining the duty cycle correction factor (in dB) associated with the pulse modulation as shown in Equation (10):

**Average factor in dB = 20 log (duty cycle)**

### 4.3. EUT Configuration on Measurement

The equipment are installed on average factor Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

### 4.4. Operating Condition of EUT

4.4.1. Setup the EUT and simulator as shown as Section 4.1.

4.4.2. Turn on the power of all equipment.

4.4.3. Let the EUT work in TX mode measure it.



#### 4.5. Test Procedure

- 4.5.1. The time period over which the duty cycle is measured is 100 milliseconds, or the repetition cycle, whichever is a shorter time frame. The worst case (highest percentage on) duty cycle is used for the calculation.
- 4.5.2. Set SPA Center Frequency = Fundamental frequency, RBW = 100 kHz, VBW = 300 kHz, Span = 0 Hz.
- 4.5.3. Set EUT as normal operation.
- 4.5.4. Set SPA View. Delta Mark time.

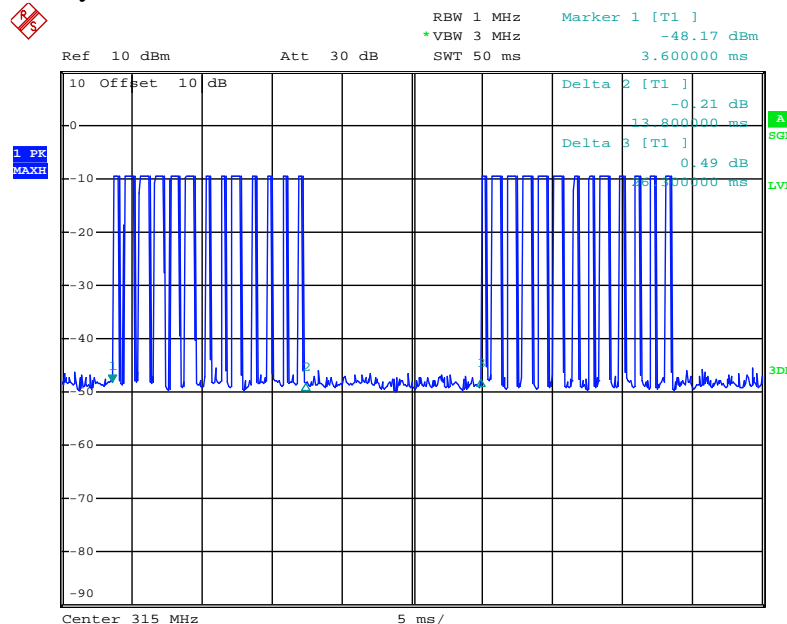
#### 4.6. Measurement Result

**The duty cycle is simply the on time divided by the period:**

The duration of one cycle = 26.3ms  
 Effective period of the cycle =  $(0.78 \times 6) + (0.42 \times 7) \text{ms} = 7.62 \text{ms}$   
 DC =  $7.62 \text{ms} / 26.3 \text{ms} = 0.29$

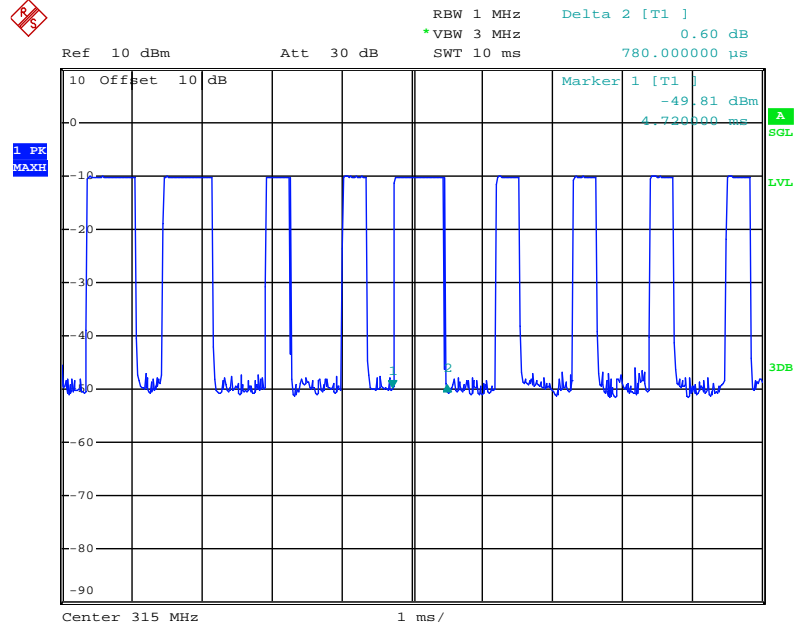
**Therefore, the average factor is found by  $20 \log 0.29 = -10.75 \text{dB}$**

The graph shows the pattern of coding during the signal transmission. The duration of one cycle is 26.3ms.



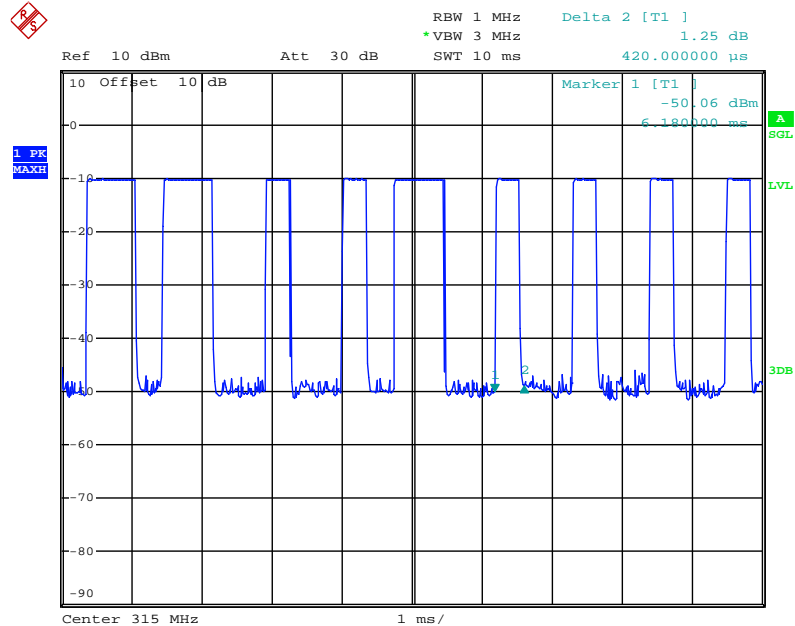
Date: 15.NOV.2018 10:27:33

The graph shows the duration of 'on' signal. From marker 1 to marker 2, Duration is 0.78ms.



Date: 15.NOV.2018 10:28:18

The graph shows the duration of 'on' signal. From marker 1 to marker 2, Duration is 0.42ms.



Date: 15.NOV.2018 10:28:40

## 5. THE FIELD STRENGTH OF RADIATION EMISSION

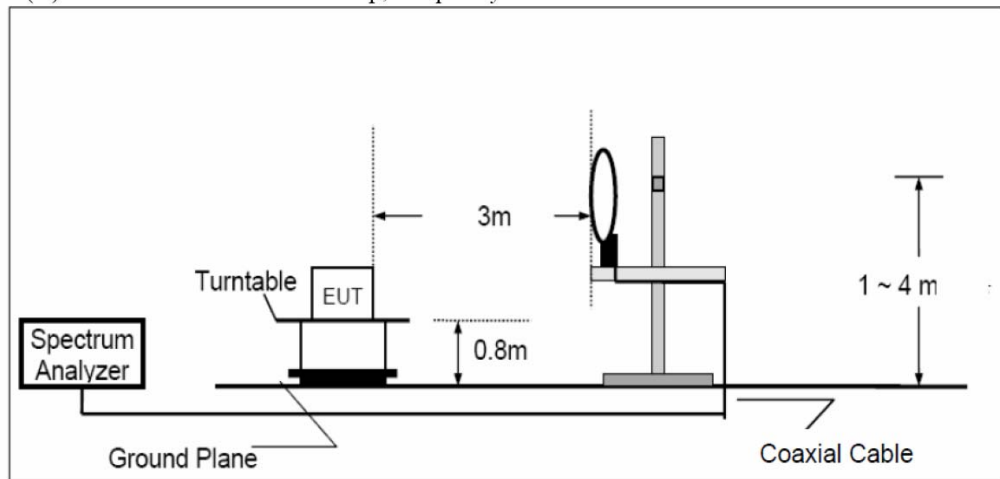
### 5.1. Block Diagram of Test Setup

#### 5.1.1. Block diagram of connection between the EUT and simulators

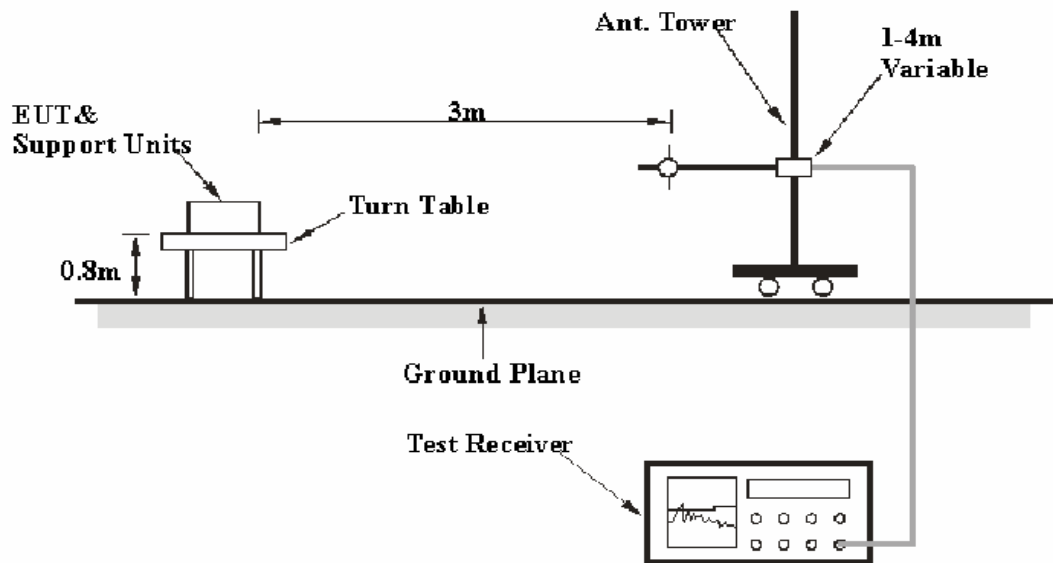


#### 5.1.2. Semi-Anechoic Chamber Test Setup Diagram

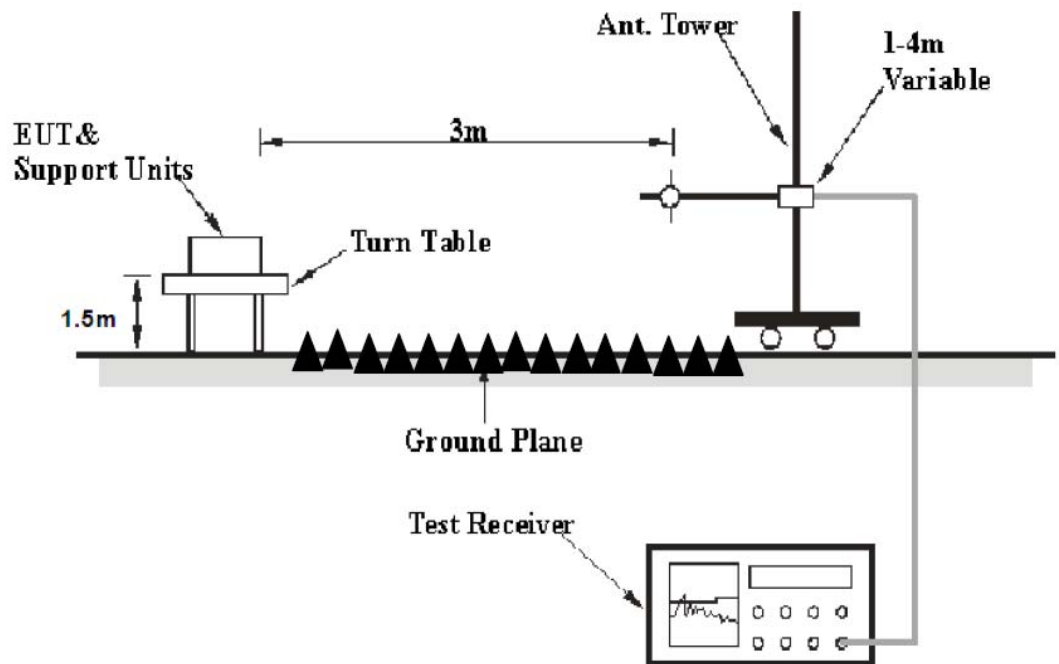
(A) Radiated Emission Test Set-Up, Frequency below 30MHz



(B) Radiated Emission Test Set-Up, Frequency 30-1000MHz



(C) Radiated Emission Test Set-Up, Frequency above 1GHz



## 5.2. The Field Strength of Radiation Emission Measurement Limits

### 5.2.1. Radiation Emission Measurement Limits According to FCC Part 15 Section 15.231(b)

Frequency Range of Fundamental [MHz]	Field Strength of Fundamental Emission [Average] [ $\mu\text{V/m}$ ]	Field Strength of Spurious Emission [Average] [ $\mu\text{V/m}$ ]
40.66-40.70	2250	225
70-130	1250	125
130-174	1250-3750	125-375
174-260	3750	375
260-470	3750-12500	375-1250
Above 470	12500	1250

Where F is the frequency in MHz, the formulas for calculating the maximum permitted fundamental field strengths are as follows: for the band 130-174 MHz,  $\mu\text{V/m}$  at 3 meters =  $56.82(F) - 6136$ ; for the band 260-470 MHz,  $\mu\text{V/m}$  at 3 meters =  $41.67(F) - 7083$ . The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level.

### 5.2.2. Restricted Band Radiation Emission Measurement Limits According to FCC part 15 Section 15.205 and Section 15.209.

### 5.3. Configuration of EUT on Measurement

The equipment is installed on Radiated Emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

### 5.4. Operating Condition of EUT

5.4.1. Setup the EUT and simulator as shown as Section 5.1.

5.4.2. Turn on the power of all equipment.

5.4.3. Let the EUT work in TX mode measure it.

### 5.5. Test Procedure

The EUT and its simulators are placed on a turntable, which is 0.8 meter high above ground (Below 1GHz). The EUT and its simulators are placed on a turntable, which is 1.5 meter high above ground (Above 1GHz). The turntable can rotate 360 degrees to determine the position of the maximum emission level. EUT is set 3.0 meters away from the receiving antenna, which is mounted on an antenna tower. The antenna can be moved up and down between 1.0 meter and 4 meters to find out the maximum emission level. Broadband antenna (calibrated bi-log antenna) is used as receiving antenna. Both horizontal and vertical polarizations of the antenna are set on measurement. In order to find the maximum emission levels, all of the EUT location must be manipulated according to ANSI C63.10:2013 on radiated emission measurement. The EUT was tested in 3 orthogonal planes.

The bandwidth of test receiver is set at 120 kHz in 30-1000 MHz, and 1 MHz in 1000 MHz.

### 5.6.Data Sample

Frequency (MHz)	Reading (dB $\mu$ v)	Factor (dB/m)	Result (dB $\mu$ v/m)	Limit (dB $\mu$ v/m)	Margin (dB)	Remark
X.XX	48.69	-13.35	35.34	46	-10.66	QP

Frequency(MHz) = Emission frequency in MHz

Reading(dB $\mu$ v) = Uncorrected Analyzer/Receiver reading

Factor (dB/m) = Antenna factor + Cable Loss – Amplifier gain

Result(dB $\mu$ v/m) = Reading(dB $\mu$ v) + Factor(dB/m)

Limit (dB $\mu$ v/m) = Limit stated in standard

Margin (dB) = Result(dB $\mu$ v/m) - Limit (dB $\mu$ v/m)

QP = Quasi-peak Reading

Calculation Formula:

Margin(dB) = Result (dB $\mu$ V/m)–Limit(dB $\mu$ V/m)

Result(dB $\mu$ V/m)= Reading(dB $\mu$ V)+ Factor(dB/m)

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 limit.

### 5.7.The Field Strength of Radiation Emission Measurement Results

**PASS.**

Note: The radiation emissions from 9KHz-30MHz are not reported, because the test values lower than the limits of 20dB.

The frequency range from 30MHz to 4000MHz is checked.

The spectrum analyzer plots are attached as below.

EUT : REMOTE CONTROL											
Model No. : FAN-11T2				Power Supply : DC 9V							
Test Mode : TX				Test Engineer : Star							
Frequency (MHz)	Reading (dBμV/m)	Factor Corr.	Average Factor	Result(dBμV/m)		Limit(dBμV/m)		Margin(dB)		Polarization	
	PEAK	(dB)	(dB)	AV	PEAK	AV	PEAK	AV	PEAK		
<b>315.0806</b>	<b>89.86</b>	<b>-8.58</b>	<b>-10.75</b>	<b>70.53</b>	<b>81.28</b>	<b>75.63</b>	<b>95.63</b>	<b>-5.10</b>	<b>-14.35</b>	Horizontal	
630.0884	64.69	-1.95	-10.75	51.99	62.74	55.63	75.63	-3.64	-12.89		
945.0397	53.28	3.03	-10.75	45.56	56.31	55.63	75.63	-10.07	-19.32		
1260.057	68.27	-6.20	-10.75	51.32	62.07	55.63	75.63	-4.31	-13.56		
1575.025	62.51	-5.01	-10.75	46.75	57.50	55.63	75.63	-8.88	-18.13		
1890.094	57.46	-2.25	-10.75	44.46	55.21	55.63	75.63	-11.17	-20.42		
<b>315.0806</b>	<b>88.29</b>	<b>-8.58</b>	<b>-10.75</b>	<b>68.96</b>	<b>79.71</b>	<b>75.63</b>	<b>95.63</b>	<b>-6.67</b>	<b>-15.92</b>	Vertical	
629.9772	60.72	-1.97	-10.75	48.00	58.75	55.63	75.63	-7.63	-16.88		
945.0397	50.92	3.03	-10.75	43.17	53.95	55.63	75.63	-12.46	-21.68		
1260.057	62.16	-6.20	-10.75	45.21	55.96	55.63	75.63	-10.42	-19.67		
1575.025	56.81	-5.01	-10.75	41.05	51.80	55.63	75.63	-14.58	-23.83		
1890.094	45.71	-2.25	-10.75	32.71	43.46	55.63	75.63	-22.92	-32.17		

Note: 1. Emissions attenuated more than 20 dB below the permissible value are not reported.

2. The field strength is calculated by adding the antenna factor, high pass filter loss(if used) and cable loss, and subtracting the amplifier gain(if any)from the measured reading. The basic equation calculation is as follows:

$$\text{Result} = \text{Reading} + \text{Corrected Factor}$$

$$\text{Where Corrected Factor} = \text{Antenna Factor} + \text{Cable Loss} + \text{High Pass Filter Loss} - \text{Amplifier Gain}$$

$$3. \text{FCC Limit for Average Measurement} = 41.67(315)-7083 = 6043.05\mu\text{V/m} = 75.63\text{dB}\mu\text{V/m}$$

4. The spectral diagrams in appendix I display the measurement of peak values.

5. Average value= PK value + Average Factor (duty factor)

6. If the peak-detected amplitude can be shown to comply with the average limit, then it is not necessary to perform a separate average measurement.

7. The EUT is tested radiation emission in three axes(X,Y,Z). The worst emissions are reported in three axes.

8. Pulse Desensitization Correction Factor

$$\text{Pulse Width (PW)} = 0.42\text{ms}$$

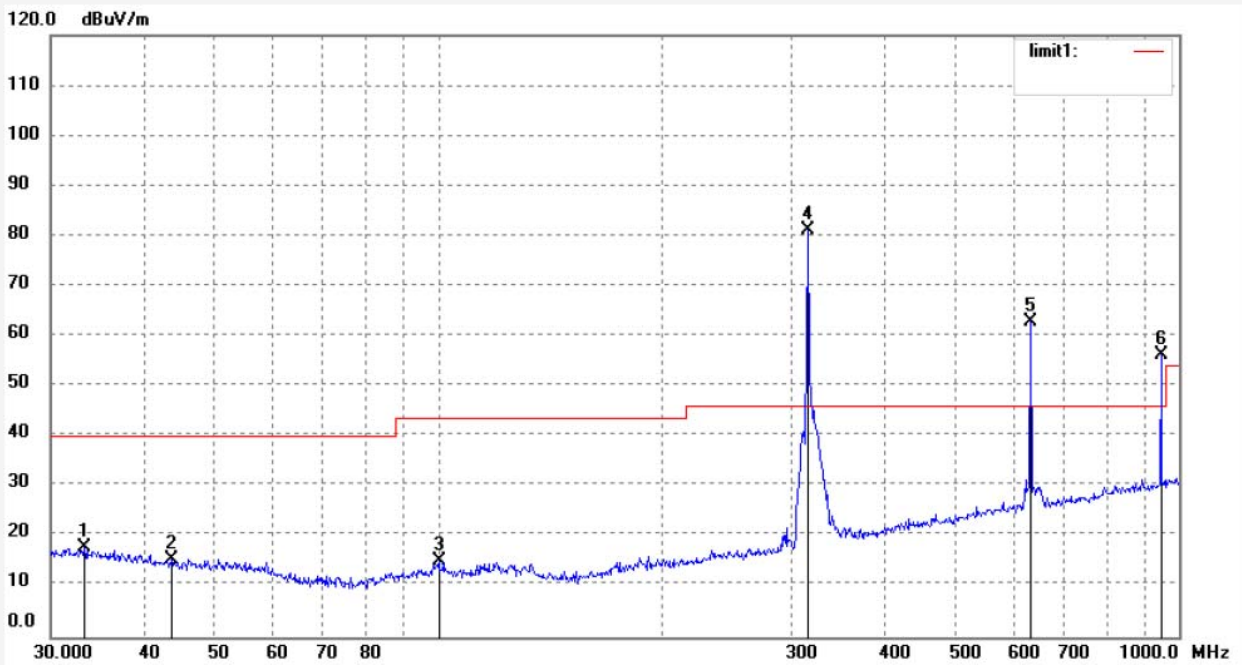
$$2/\text{PW} = 2/0.42\text{ms} = 4.762\text{kHz}$$

$$\text{RBW (100 kHz)} > 2/\text{PW} (4.762 \text{ kHz})$$

Therefore PDCF is not needed.

Job No.: star2016 #2765	Polarization: Horizontal
Standard: FCC Part 15C 3M Radiated	Power Source: DC 9V
Test item: Radiation Test	Date: 18/11/15/
Temp.( C)/Hum.(%) 23 C / 48 %	Time: 9/06/34
EUT: REMOTE CONTROL	Engineer Signature: star
Mode: TX	Distance: 3m
Model: FAN-11T2	
Manufacturer: Carewell	

Note: Report No.: ATE20182014



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	33.3278	28.01	-10.25	17.76	40.00	-22.24	peak	200	142	spurious emissions
2	43.6584	27.84	-12.33	15.51	40.00	-24.49	peak	200	123	spurious emissions
3	100.2286	28.12	-13.09	15.03	43.50	-28.47	peak	200	236	spurious emissions
4	315.0806	89.86	-8.58	81.28	95.63	-14.35	peak	200	222	fundamental
5	630.0884	64.69	-1.95	62.74	75.63	-12.89	peak	200	41	harmonics
6	945.0397	53.28	3.03	56.31	75.63	-19.3	peak	200	364	harmonics

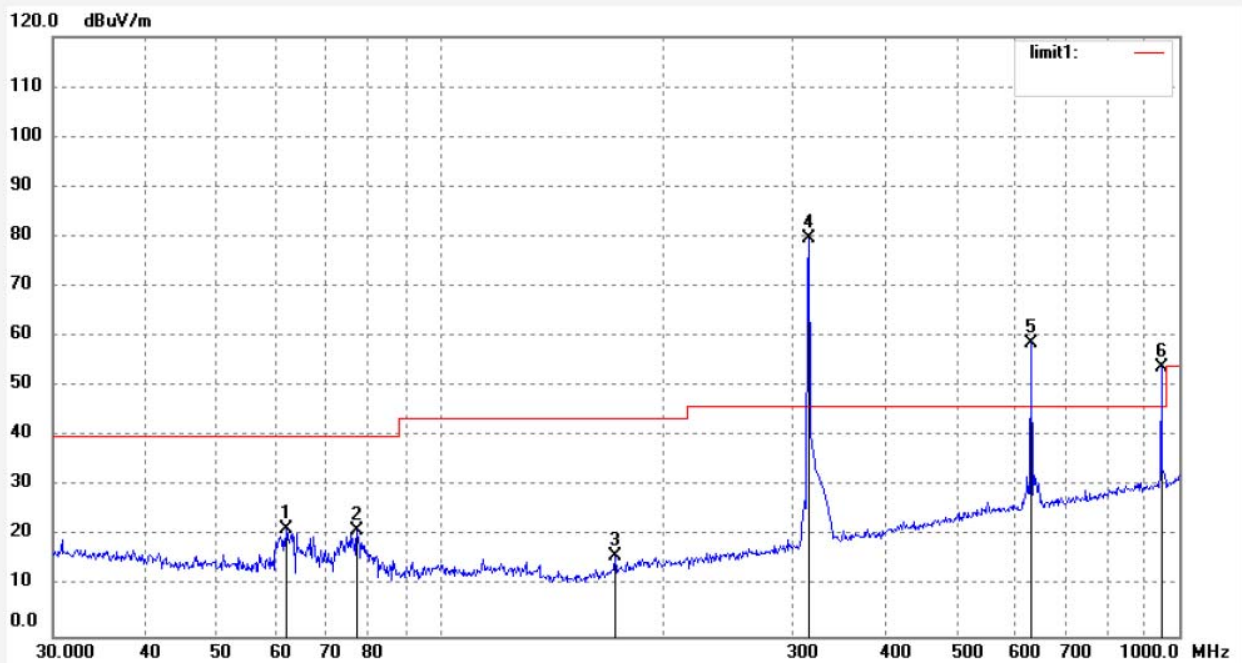
Note: The figure shows the spurious emissions limit



Job No.: star2016 #2766  
Standard: FCC Part 15C 3M Radiated  
Test item: Radiation Test  
Temp.( C)/Hum.(%) 23 C / 48 %  
EUT: REMOTE CONTROL  
Mode: TX  
Model: FAN-11T2  
Manufacturer: Carewell

Polarization: Vertical  
Power Source: DC 9V  
Date: 18/11/15/  
Time: 9/08/29  
Engineer Signature: star  
Distance: 3m

Note: Report No.: ATE20182014



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	61.9951	36.00	-14.62	21.38	40.00	-18.62	peak	100	102	spurious emissions
2	77.3212	37.82	-16.60	21.22	40.00	-18.78	peak	100	156	spurious emissions
3	172.5988	29.66	-13.50	16.16	43.50	-27.34	peak	100	145	spurious emissions
4	315.0806	88.29	-8.58	79.71	95.63	-15.92	peak	100	250	fundamental
5	629.9772	60.72	-1.97	58.75	75.63	-16.88	peak	100	178	harmonics
6	945.0397	50.92	3.03	53.95	75.63	-21.68	peak	100	214	harmonics

Note: The figure shows the spurious emissions limit



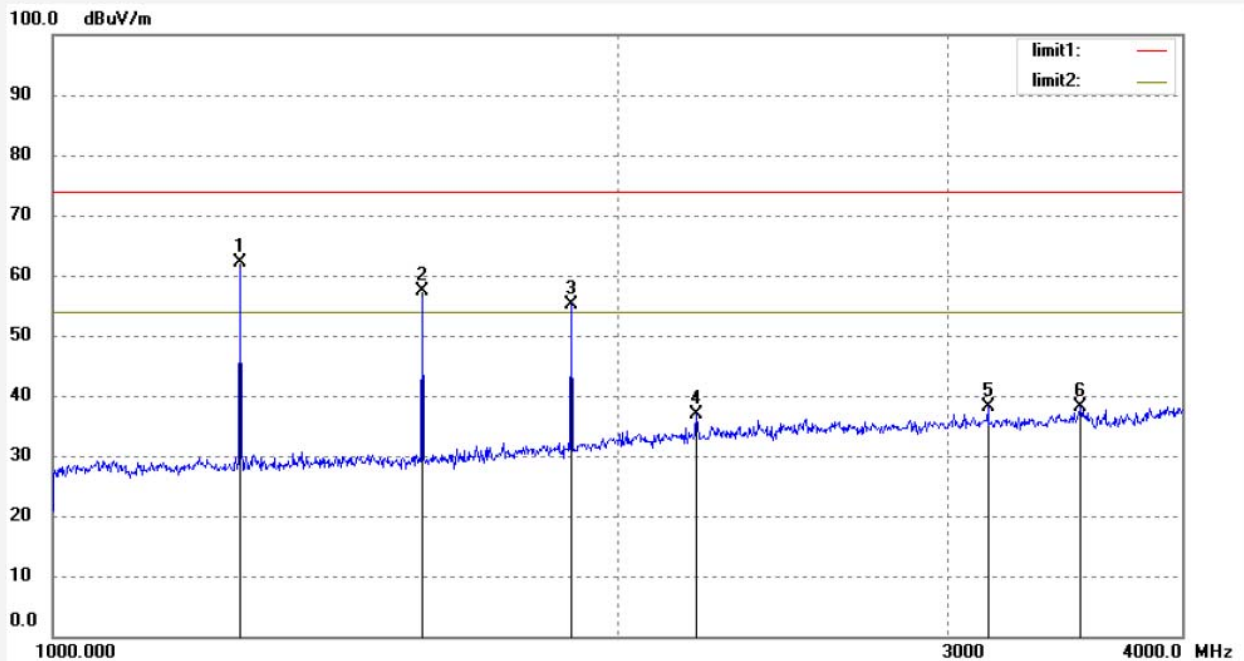
**ACCURATE TECHNOLOGY CO., LTD.**

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Job No.: STAR2016 #2769	Polarization: Horizontal
Standard: FCC Part 15C 3M Radiated	Power Source: DC 9V
Test item: Radiation Test	Date: 18/11/15/
Temp.( C)/Hum.(%) 23 C / 48 %	Time: 9/16/56
EUT: REMOTE CONTROL	Engineer Signature: star
Mode: TX	Distance: 3m
Model: FAN-11T2	
Manufacturer: Carewell	

Note: Report No.: ATE20182014



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	1260.057	68.27	-6.20	62.07	75.63	-13.56	peak	200	178	harmonics
2	1575.025	62.51	-5.01	57.50	75.63	-18.13	peak	200	62	harmonics
3	1890.094	57.46	-2.25	55.21	75.63	-20.42	peak	200	55	harmonics
4	2203.810	37.05	-0.05	37.00	74.00	-37.00	peak	200	145	spurious emissions
5	3151.416	35.84	2.32	38.16	74.00	-35.84	peak	200	102	spurious emissions
6	3530.812	35.07	3.11	38.18	74.00	-35.82	peak	200	225	spurious emissions

Note: The figure shows the spurious emissions limit

Job No.: STAR2016 #2770

Standard: FCC Part 15C 3M Radiated

Test item: Radiation Test

Temp.( C)/Hum.(%) 23 C / 48 %

EUT: REMOTE CONTROL

Mode: TX

Model: FAN-11T2

Manufacturer: Carewell

Polarization: Vertical

Power Source: DC 9V

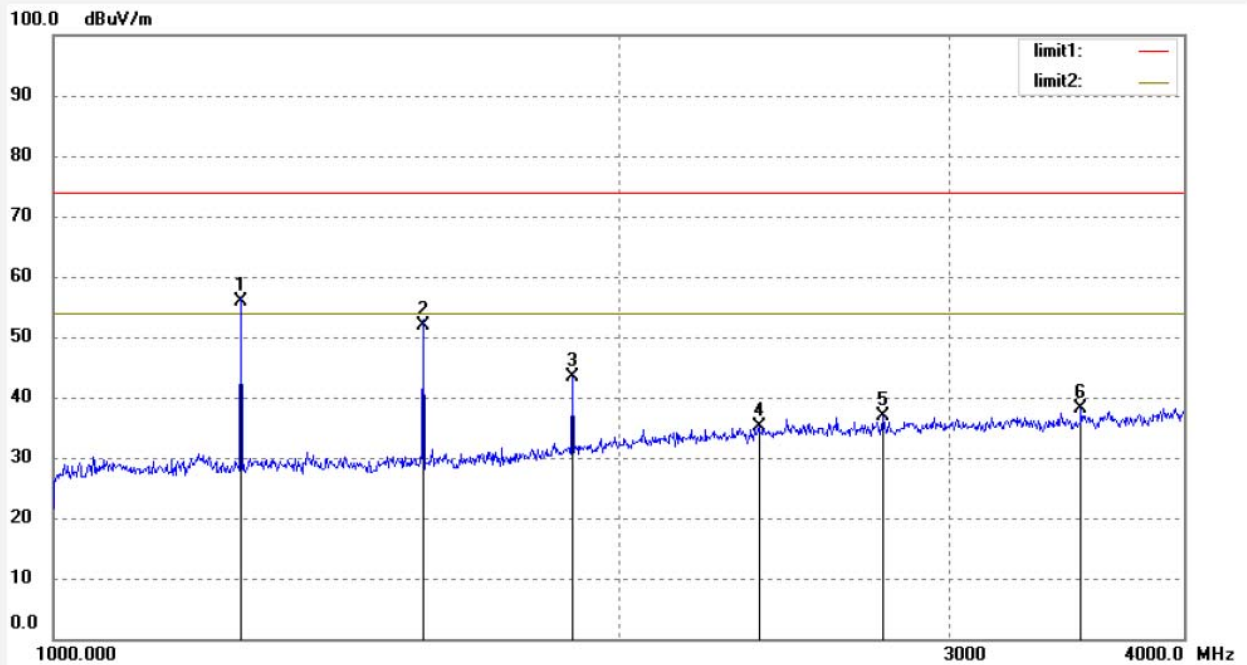
Date: 18/11/15/

Time: 9/17/57

Engineer Signature: star

Distance: 3m

Note: Report No.: ATE20182014



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	1260.057	62.16	-6.20	55.96	75.63	-19.67	peak	150	230	harmonics
2	1575.025	56.81	-5.01	51.80	75.63	-23.83	peak	150	286	harmonics
3	1890.094	45.71	-2.25	43.46	75.63	-32.17	peak	150	300	harmonics
4	2375.119	34.55	0.68	35.23	74.00	-38.77	peak	150	58	spurious emissions
5	2766.381	35.32	1.54	36.86	74.00	-37.14	peak	150	247	spurious emissions
6	3525.921	35.13	3.10	38.23	74.00	-35.77	peak	150	314	spurious emissions

Note: The figure shows the spurious emissions limit

## 6. 20DB OCCUPIED BANDWIDTH

### 6.1. Block Diagram of Test Setup



### 6.2. The Bandwidth of Emission Limit According To FCC Part 15 Section

#### 15.231(c)

The bandwidth of emission shall be no wider than 0.25% of the center frequency. Therefore, the bandwidth of the emission limit is  $315\text{MHz} \times 0.25\% = 0.7875\text{MHz}$ . Bandwidth is determined at the two points 20 dB down from the top of modulated carrier.

### 6.3. EUT Configuration on Measurement

The equipment are installed on the bandwidth of emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

### 6.4. Operating Condition of EUT

6.4.1. Setup the EUT and simulator as shown as Section 6.1.

6.4.2. Turn on the power of all equipment.

6.4.3. Let the EUT work in TX mode measure it.

### 6.5. Test Procedure

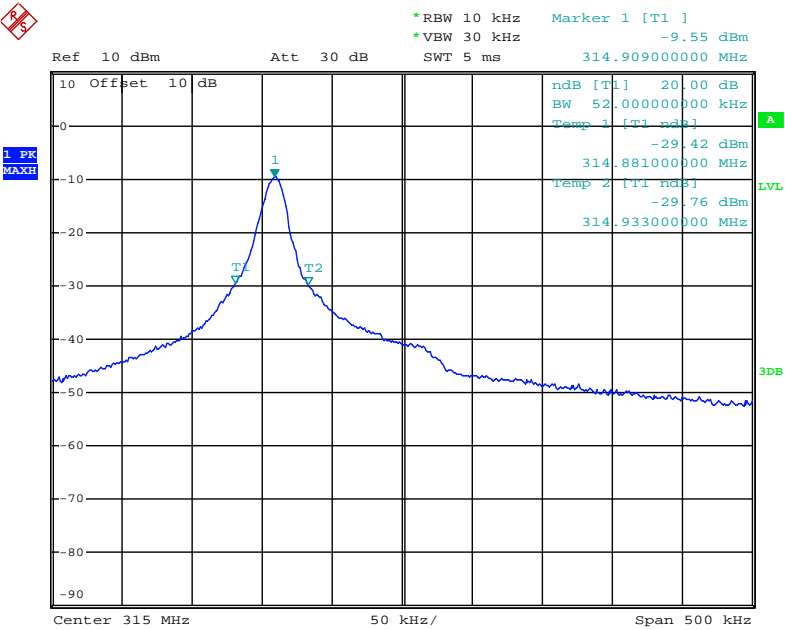
6.5.1. Set SPA Center Frequency = Fundamental frequency, RBW = 10kHz, VBW = 30kHz, Span = 500KHz.

6.5.2. Set SPA Max hold, Mark peak, -20 dB.

### 6.6.Measurement Result

Frequency (MHz)	-20 dB bandwidth (MHz)	Limit (MHz)	Result
315	0.052	≤0.7875	Pass

The spectral following:



Date: 15.NOV.2018 10:10:07

## 7. RELEASE TIME MEASUREMENT

### 7.1. Block Diagram of Test Setup



### 7.2. Release Time Measurement According To FCC Part 15 Section 15.231(a)

Section 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.

### 7.3. EUT Configuration on Measurement

The equipment are installed on Release Time Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

### 7.4. Operating Condition of EUT

7.4.1. Setup the EUT and simulator as shown as Section 7.1.

7.4.2. Turn on the power of all equipment.

7.4.3. Let the EUT work in TX mode measure it.

### 7.5. Test Procedure

7.5.1. Set SPA Center Frequency = Fundamental frequency, RBW = 100kHz, VBW = 300kHz, Span = 0Hz. Sweep time = 10s.

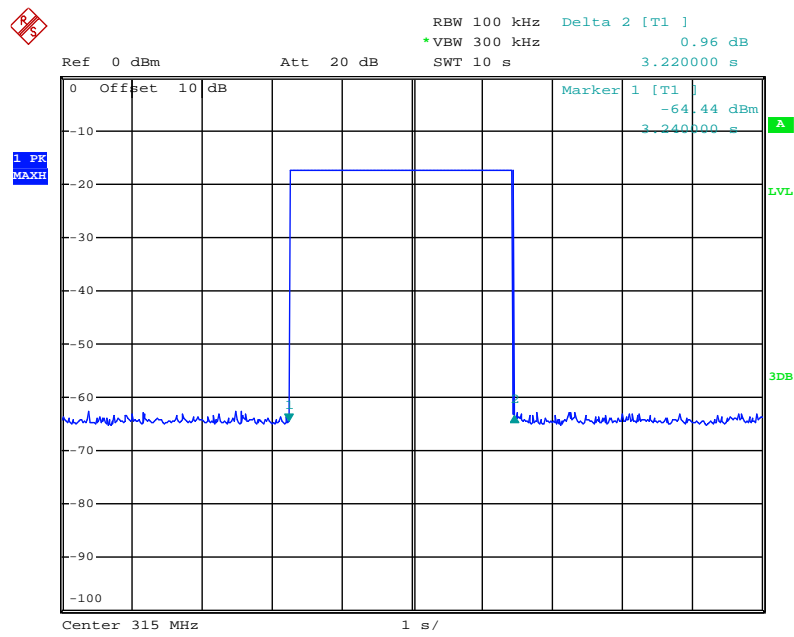
7.5.2. Set EUT as normal operation and press Transmitter button.

7.5.3. Set SPA View. Delta Mark time.

### 7.6.Measurement Result

Frequency (MHz)	Release Time (seconds)	Limit (seconds)	Result
315	3.22	< 5	Pass

The spectral following:



Date: 15.NOV.2018 10:37:00

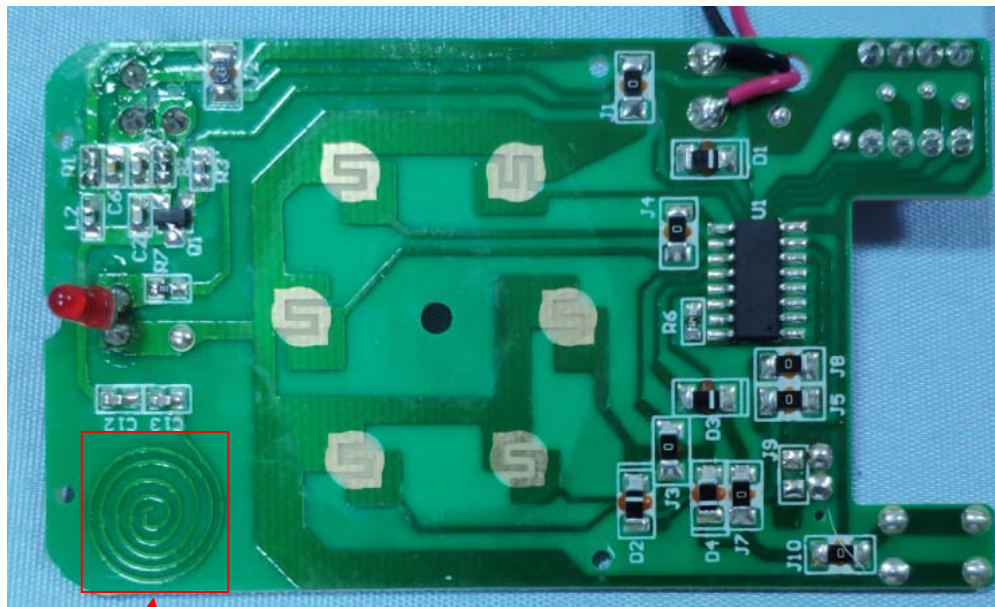
## 8. ANTENNA REQUIREMENT

### 8.1.The Requirement

According to 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.

### 8.2.Antenna Construction

Device is equipped with permanent attached antenna, which isn't displaced by other antenna. The Antenna gain of EUT is 0dBi. Therefore, the equipment complies with the antenna requirement of Section 15.203.



Antenna

\*\*\*\*\* End of Test Report \*\*\*\*\*