

# FCC Test Report

## (TR-1212-002-01)

**Applicant** : Carewell Electric Technology (Zhongshan) Co., Ltd.

**Address** : Torch Development Zone, No.2, Ouya Road, Zhongshan City, Guangdong Province, China

**Manufacturer** : Carewell Electric Technology (Zhongshan) Co., Ltd.

**Address** : Torch Development Zone, No.2, Ouya Road, Zhongshan City, Guangdong Province, China

**Product Name** : REMOTE CONTROL

**Trademark** : None

**Model(s)** : FAN-35TI

**Standard(s)** : FCC Part 15 Subpart C

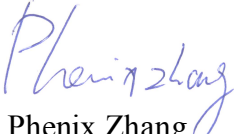

**Test Result** : Pass

**Date of Test** : Dec 13, 2012 to Dec 21, 2012

**Report issued Dated** : Jan 15, 2014

The report shall not be reproduced except in full, without the written approval of the TDK EMC Center.

The results in this report apply only to the sample(s) tested. The production units are required to conform to the initial sample as received when the units are placed in the market.

Responsible Engineer	:		Approved by	:	
		Phenix Zhang	Technical manager		CHAN king-chui
Date	:	2014.01.15	Date	:	2014.01.15

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## 1. Description of the Test Site

### 1.1 Test Site Location:

Laboratory : TDK South China EMC Center  
SAE Technologies Development (Dongguan) Co.,  
Ltd. Changan Branch  
Address : Zhenan Hi-tech Industrial Park, Dongguan City,  
Guangdong Province, China  
Phone no. : (86)-769-8564-4678  
Fax no. : (86)-769-8564-4499  
Email : [emc@cn.tdk.com](mailto:emc@cn.tdk.com)

### 1.2 Site Registration

VCCI ( November 2011) : Reg. No. R-4814, C-3733,  
G-473, T-1212  
FCC site registration (August 2011) : Reg. No. 732901  
IC registration (January,2011) : Reg. No. 7993A  
CNAS (August 2010) : Reg. No. L4677

### 1.3 Test Scope

EMC and RF testing according to national / international standards

## 2. Description of the Tested Samples

### 2.1 Customer Information

Customer : Carewell Electric Technology (Zhongshan) Co., Ltd.  
Address : Torch Development Zone, No.2, Ouya Road, Zhongshan City, Guangdong Province, China  
Phone no. : +86-760-88582800  
Fax no. : +86-760-85215432

### 2.2 Identification of EUT

Trademark : None  
Model(s) No. : FAN-35TI  
Serial No. : None

### 2.3 Spec of EUT

Description of EUT : This product is a remote controller with 303.875MHz.  
Description of Antenna : fixed permanent antenna, 1.0dBi gain  
Power Supply : battery 12V DC (alkaline 23A)  
Operation Frequency : 303.875MHz  
Number of Channels : 1  
Bandwidth : 266kHz  
Type of Modulation : ASK

### 2.4 Test Standards List

FCC Part 15 (2012)  
RADIO FREQUENCY DEVICES

### 3. Test Specifications

#### 3.1 Standard(s) Used

FCC Rules	Description Of Test	Result
15.203	Antenna Requirement	Pass
15.207	Conducted Emission	N/A
15.231(b)	Radiated Emission	Pass
15.231(c)	20dB Bandwidth	Pass
15.231(a)(1)	Release Time	Pass

#### 3.2 Test Mode

This EUT is portable device. In the pretest, we have made prescan for X/Y/Z directions. The worst case has chosen for the final test which is the X direction (horizontal).

#### 3.3 Deviations from the Test Specification

N/A

## 4. Test Result

### 4.1 Antenna Requirement

#### 4.1.1 Standard Applicable

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 shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna James or electrical connector is prohibited.

#### 4.1.2 Antenna Connected Construction

The antenna connector is designed with permanent attachment and no consideration of replacement.

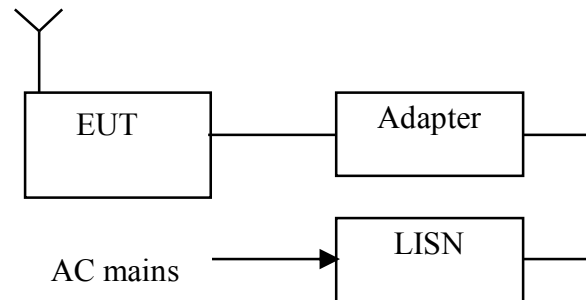
Transmitter antenna of directional gain is 1.0dBi.

## 4.2 Conducted Emission (mains)

### 4.2.1 Test Summary

Test Room	:	Shielded Room
Power Source	:	AC 120V / 60Hz
Standards:	:	FCC Part15 B : 2012
EUT Type	:	Table Top
EUT configuration	:	EUT's highest possible emission level

### 4.2.2 Block diagram of test setup



### 4.2.3 Measurement method

The EUT along with its peripherals were placed on a 1.0m (W) x 1.5m(L) and 0.8m in height wooden table and the EUT was adjusted to maintain a 0.4m space from a vertical reference plane. The EUT was connected to power mains through a Artificial Mains Network(AMN), which provided 50 ohm coupling impedance for measuring instrument and the chassis ground was bounded to the horizontal ground plane of shielded room.

The excess power cable between the EUT and the AMN was bundled. All connecting cables of EUT and peripherals were moved to find the maximum emission.

### 4.2.4. Result

N/A

**Because the power of EUT is with internal battery, this test item is not applicable.**

### 4.3 Radiated Emission Test

#### 4.3.1 Limit

a. Radiation emission measurement limits according to FCC Part 15 Section 15.231(b).

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	1250 to 3750 **	125 to 375 **
174-260	3750	375
260-470	3750 to 12500 **	375 to 1250 **
Above 470	12500	1250

\*\* linear interpolations

[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,  $\mu\text{V}/\text{m}$  at 3 meters =  $56.81818(F) - 6136.3636$ ; for the band 260-470 MHz,  $\mu\text{V}/\text{m}$  at 3 meters =  $41.6667(F) - 7083.3333$ . The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level.]

b. Restricted band radiation emission measurement limits according to FCC part 15 Section 15.205 and Section 15.209.

#### 4.3.2 Block diagram of test setup

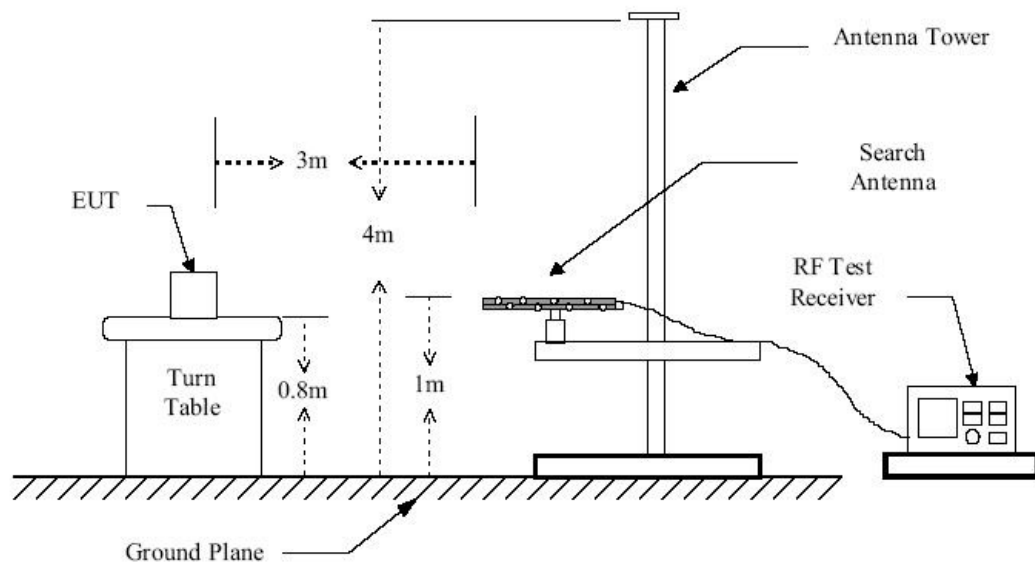


Figure 1 : Frequencies measured below 1 GHz configuration



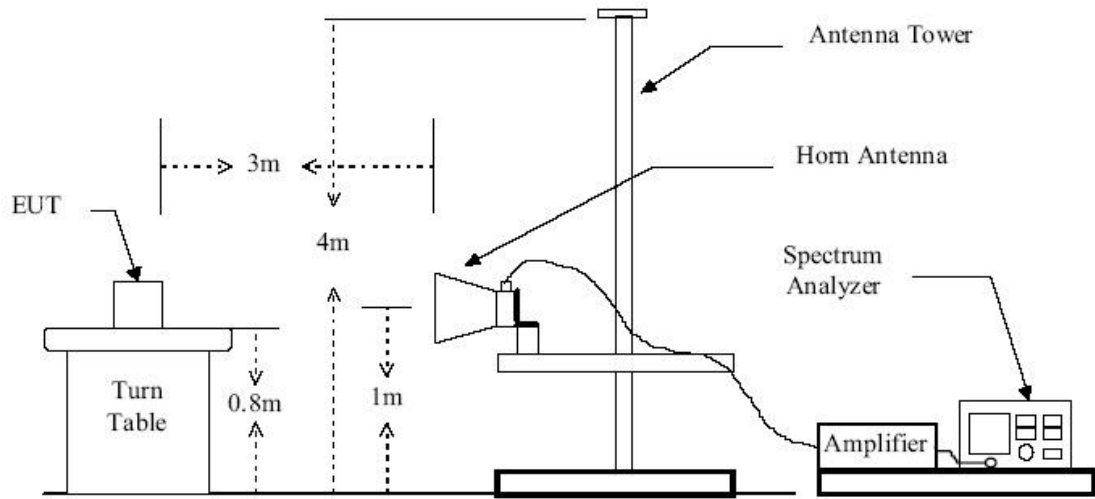


Figure 2 : Frequencies measured above 1 GHz configuration

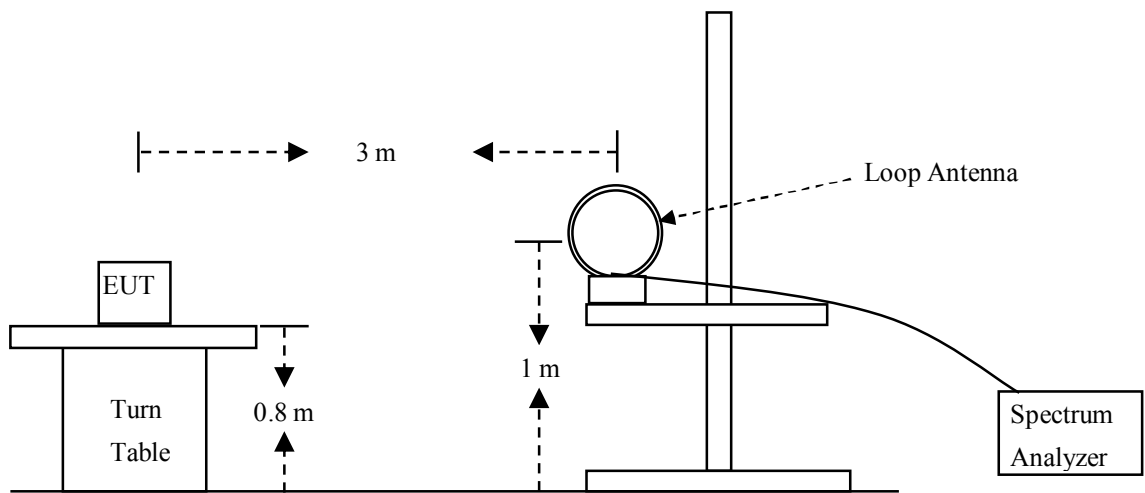


Figure 3: Frequencies measured below 30MHz configuration

#### 4.3.3 Measurement method

1. Configure the EUT according to ANSI C63.4 (2003).
2. The EUT was placed on the top of the turntable 0.8 meter above ground.
3. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
4. Power on the EUT and all the supporting units.
5. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
6. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emission field strength of both horizontal and vertical polarization.
7. For each suspected emission, the antenna tower was scanned (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
8. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.

**Note:**

The new battery has been used for the test.

#### 4.3.4. Result

In pretesting, we found out the III button generated higher power than other buttons. This test item was base on the setting.

#### Below 30MHz:

No further spurious emissions found between lowest internal used or generated frequency and 30 MHz.

#### 30M- 1GHz:

2012/12/14 13:44:41

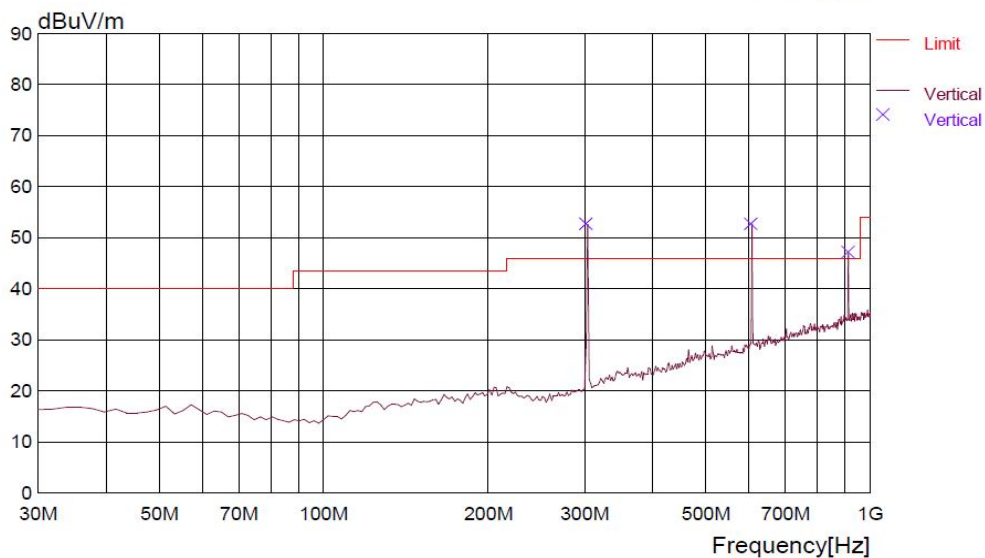
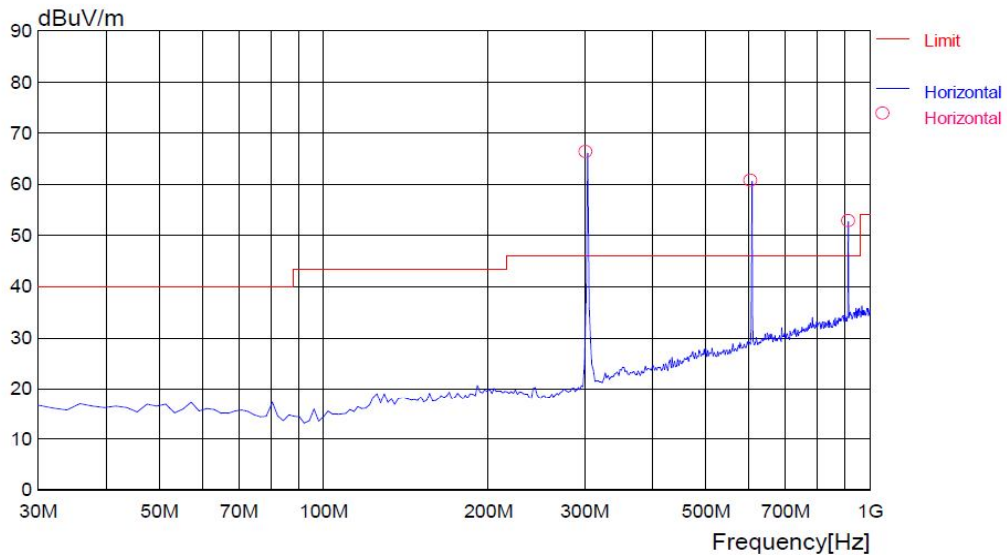
### RADIATED EMISSION

Date : 2012/12/14 13:37:48

Trade Name : FAN-35TI	Document No. : DC 12V
Model Name : REMOTE CONTROL	Power Supply : 27/55RH%
Product Name : TX ON	Temp/Humi : pang
Test Condition : TX ON	Operator :

Memo :

LIMIT : FCC Part15 Class B(3m)/USA



2012/12/14 13:44:41

## RADIATED EMISSION

Date : 2012/12/14 13:37:48

Trade Name : FAN-35TI	Document No. :
Model Name : REMOTE CONTROL	Power Supply : DC 12V
Product Name : TX ON	Temp/Humi : 27/55RH%
Test Condition :	Operator : pang

Memo :

LIMIT : FCC Part15 Class B(3m)/USA

No.	FREQ [MHz]	READING PEAK [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT PK [dBuV/m]	RESULT AV [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]	COMMENT
---- Horizontal ----												
1	304.088	75.2	13.8	8.7	31.6	66.1	53.2	74.9	21.7	100	272	
2	607.335	61.8	20.2	9.9	31.3	60.6	47.7	54.9	7.2	200	280	
3	912.528	49.7	23.3	10.7	31.0	52.7	39.8	54.9	15.1	100	231	
---- Vertical ----												
4	304.088	61.7	13.8	8.7	31.6	52.6	39.7	74.9	35.2	100	333	
5	607.335	53.7	20.2	9.9	31.3	52.5	39.6	54.9	15.3	200	174	
6	912.528	43.9	23.3	10.7	31.0	46.9	34.0	54.9	20.9	100	181	

Note: for the Average value calculation, see appendix 9.2

**Above 1GHz:**

2012/12/17 14:19:41

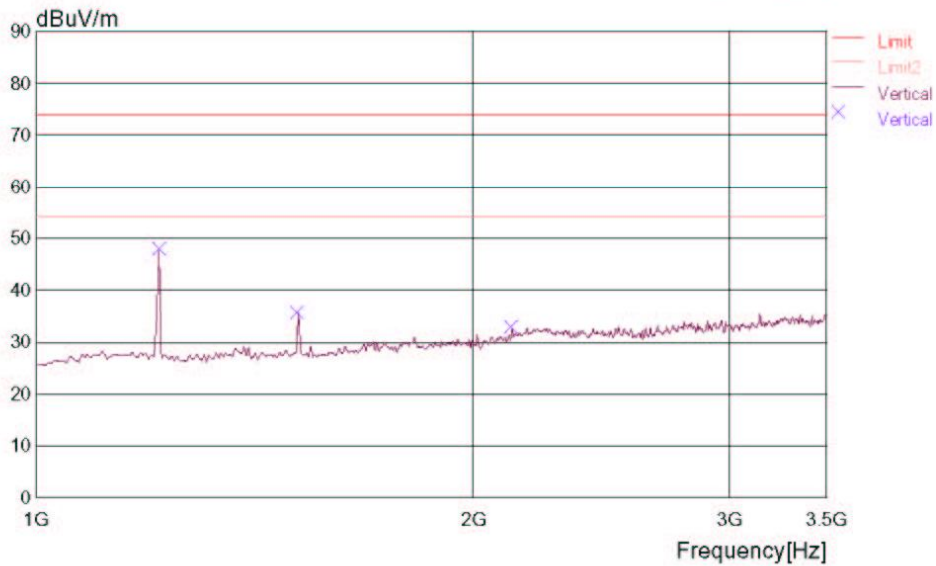
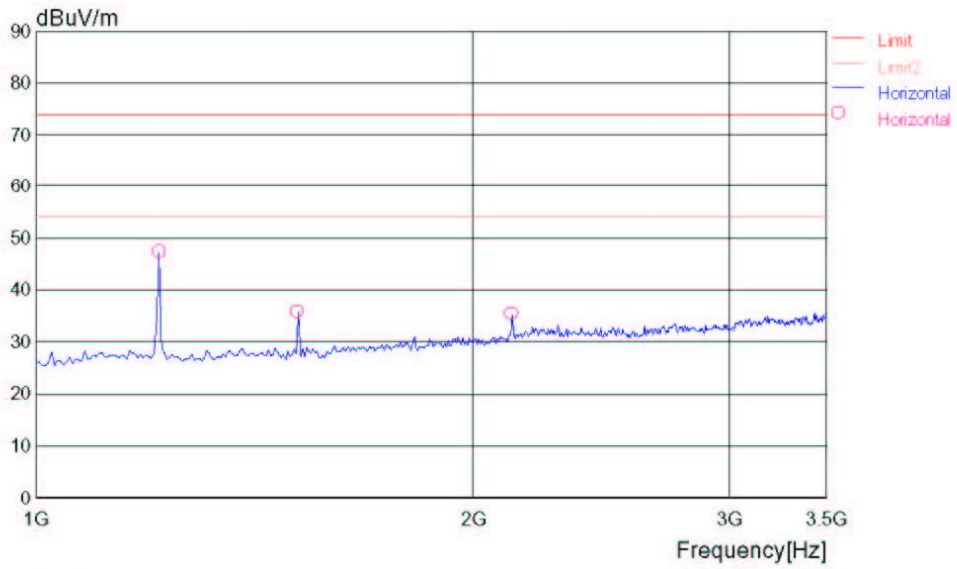
**RADIATED EMISSION**

Date : 2012/12/17 14:19:27

Trade Name	:		Document No.	:	
Model Name	:	FAN-35TI	Power Supply	:	DC 12V
Product Name	:	REMOTE CONTROL	Temp/Humi	:	27/55RH%
Test Condition	:	TX ON	Operator	:	Eliy zhang

Memo :

LIMIT : FCC Part15 C transmitter spurious above1G(peak)  
 FCC Part15 C transmitter spurious above1G(average)



2012/12/17 14:19:41

## RADIATED EMISSION

Date : 2012/12/17 14:19:27

Trade Name : FAN-35TI	Document No. :
Model Name : REMOTE CONTROL	Power Supply : DC 12V
Product Name : TX ON	Temp/Humi : 27/55RH%
Test Condition :	Operator : Eliy zhang

Memo :

LIMIT : FCC Part15 C transmitter spurious above1G(peak)  
 FCC Part15 C transmitter spurious above1G(average)

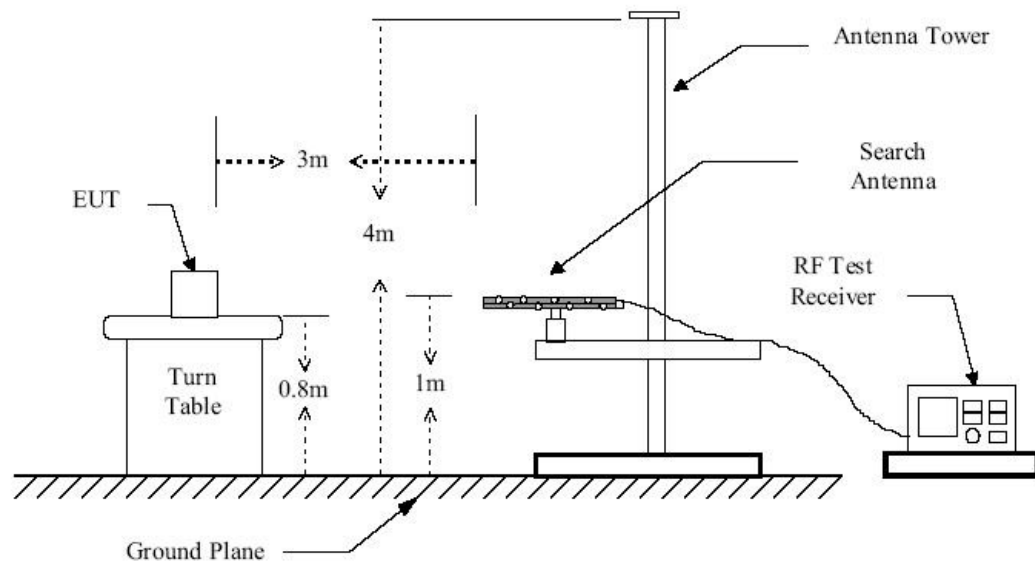
Frequency [MHz]	Meter (PK) [dBuV]	Ant. Type	Detector	Antenna Factor [dB/m]	Total Loss [dB]	Level (PK) [dBuV/m]	Angle [degree]	Height [m]	Pola.	Limit [dBuV/m]	Margin [dB]
1215.430	55.5	HRN	PK	28.3	-36.6	47.2	356	3.00	Hori.	74.0	26.8
1215.430	56.0	HRN	PK	28.3	-36.6	47.7	327	2.00	Vert.	74.0	26.3
1516.031	42.5	HRN	PK	29.0	-35.8	35.7	14	3.00	Hori.	74.0	38.3
1516.031	42.4	HRN	PK	29.0	-35.8	35.6	359	1.00	Vert.	74.0	38.4
2127.252	38.2	HRN	PK	31.3	-34.4	35.1	10	1.00	Hori.	74.0	38.9
2127.252	35.7	HRN	PK	31.3	-34.4	32.6	8	3.00	Vert.	74.0	41.4

## 4.4 20dB Occupied Bandwidth

### 4.4.1 Applicable Standard

According to section 15.231(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.

### 4.4.2 Block diagram of test setup



### 4.4.3 Measurement method

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Set the spectrum analyzer as RBW=100 kHz, VBW=300 kHz, Span=2.5MHz, Sweep=auto.
3. Set Detector to Peak, Trace to Max Hold and Sweep Time is auto.
4. Mark the peak frequency and -20dB(upper and lower) frequency.

**Note:**

The new battery has been used for the test.

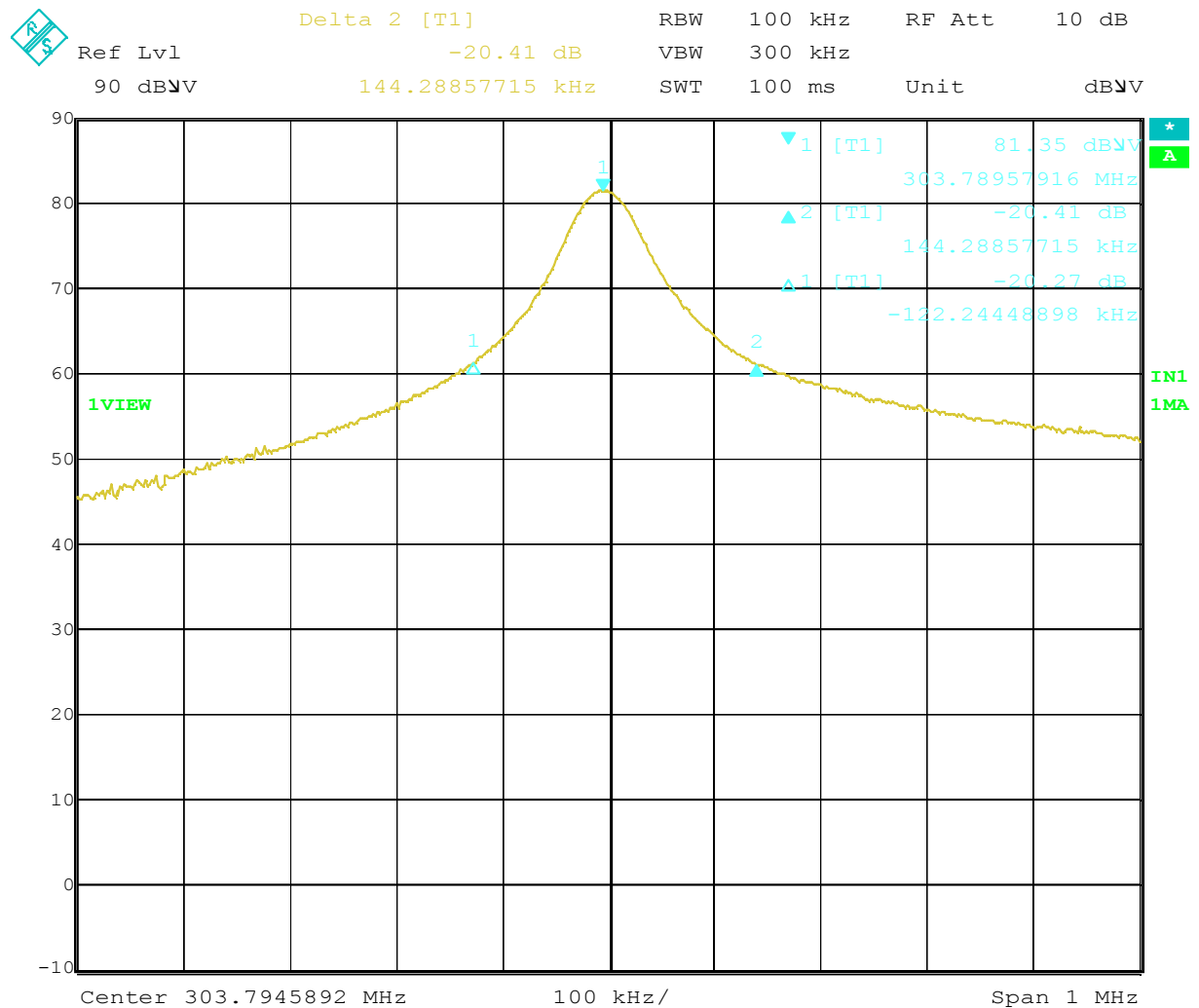
#### 4.4.4. Result

In pretesting, we found out the III button generated higher bandwidth than other buttons. This test item was base on the setting.

Temperature ( °C ) : 22~23	EUT: REMOTE CONTROL
Humidity (%RH) : 50~54	M/N: FAN-35TI
Barometric Pressure ( mbar ) : 950~1000	Operation Condition: Tx Mode
Test data: Dec 21, 2012	Test engineer: Phenix

Frequency (MHz)	20dB Bandwidth (kHz)	Limits (kHz)
303.875	266.53	759.68

#### Test Plot:



Date: 21.DEC.2012 09:47:50

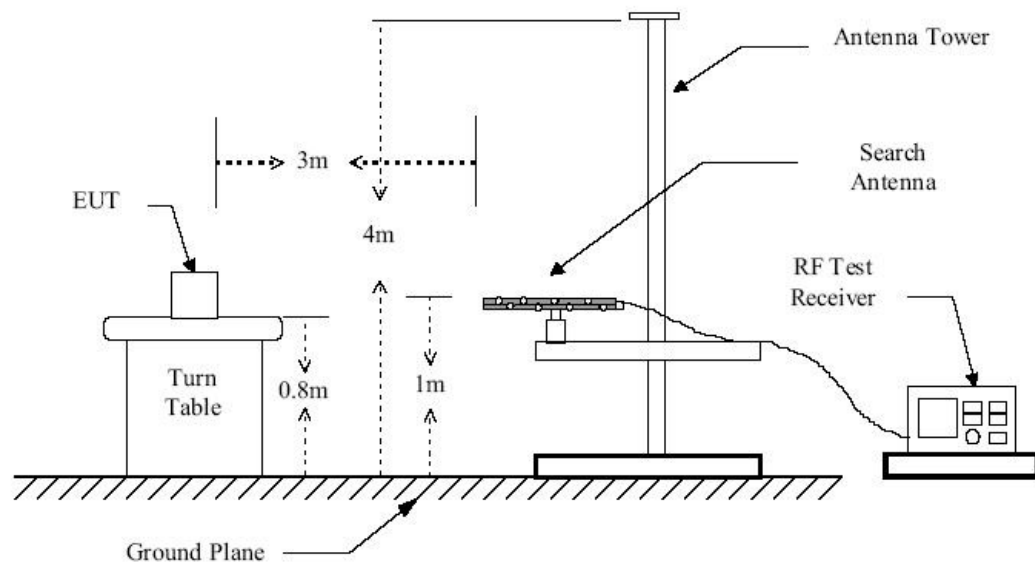


## 4.5 Release Time Measurement

### 4.5.1 Applicable Standard

According to 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.

### 4.5.2 Block diagram of test setup



### 4.5.3 Measurement method

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Set the spectrum analyzer Center Frequency = Fundamental Frequency, RBW=100kHz,VBW=300kHz,Span=0Hz,Sweep time=5 seconds.
3. set EUT as normal operation and press transmitter button.
4. set spectrum analyzer view, Delta Mark time.

#### Note:

The new battery has been used for the test.

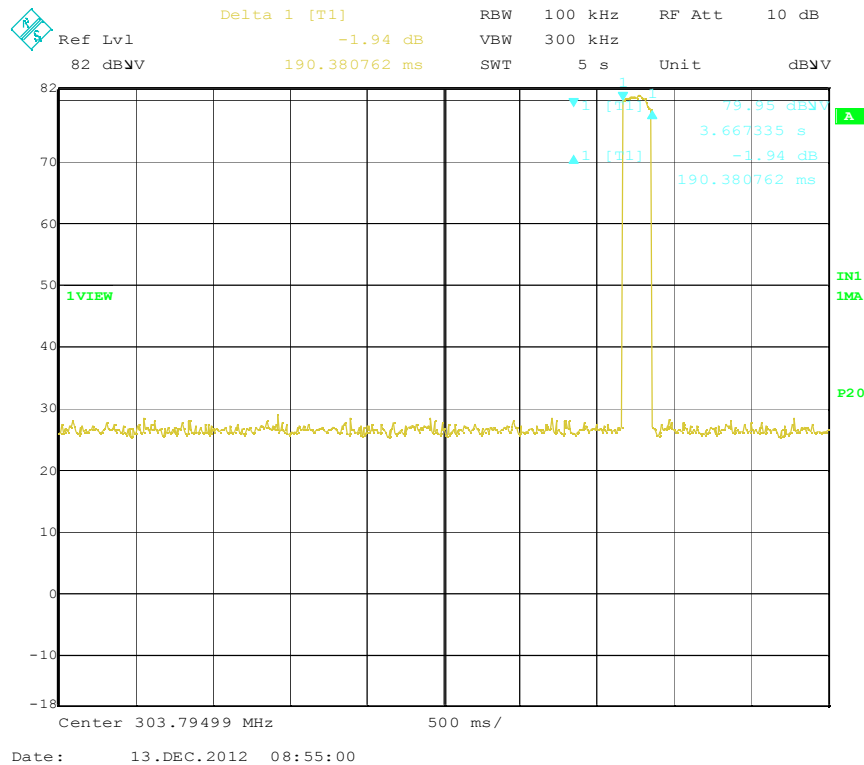
#### 4.5.4. Result

In pretesting, we found out the III button generated longer release time than other buttons. This test item was base on the setting.

Temperature ( °C ) : 22~23	EUT: REMOTE CONTROL
Humidity (%RH) : 50~54	M/N: FAN-35TI
Barometric Pressure ( mbar ) : 950~1000	Operation Condition: Tx Mode
Test data: Dec 13, 2012	Test engineer: Phenix

Frequency (MHz)	Release time (ms)	Limits (s)
303.875	190.38	5

#### Test Plot:



#### Comment:

The method of calculation for release time:

1. Start: the tester press the button of TX, then the TX is transmitting. We can snatch the rise edge of pulse.
2. Stop: The RX received the signal, then it's working. At the moment, the tester loosens the button of TX. We can snatch the down edge of pulse.

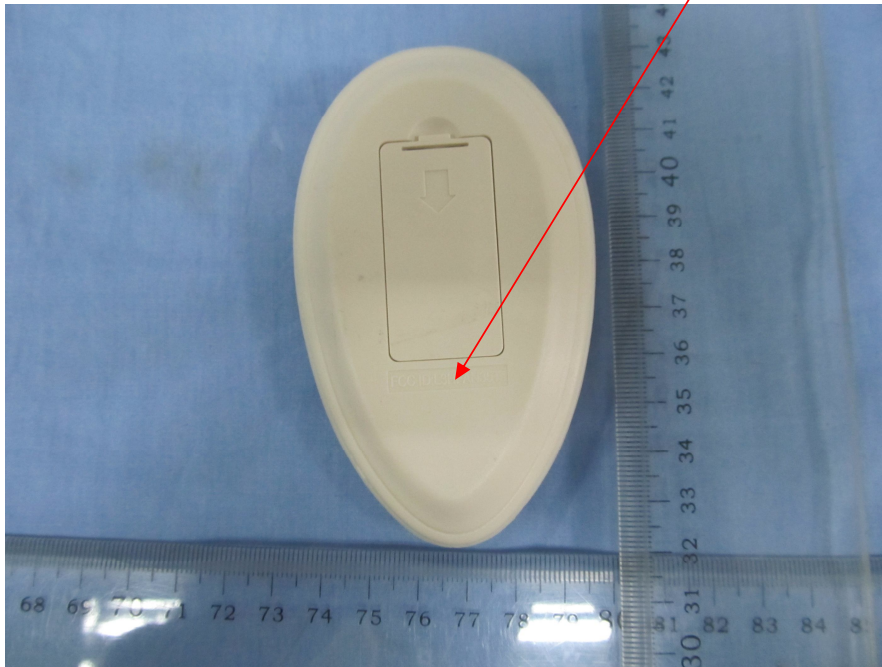
The time of deactivate:

The receiver recorded down edge of pulse when the tester loosened the TX button. It means the transmission is over. The time of down edge is deactivation time. It's very short and can not be measured.

## 5. FCC ID Label

**Mark Location:**

FCC ID:2AAZPFAN35TI  
MODEL:FAN-35TI

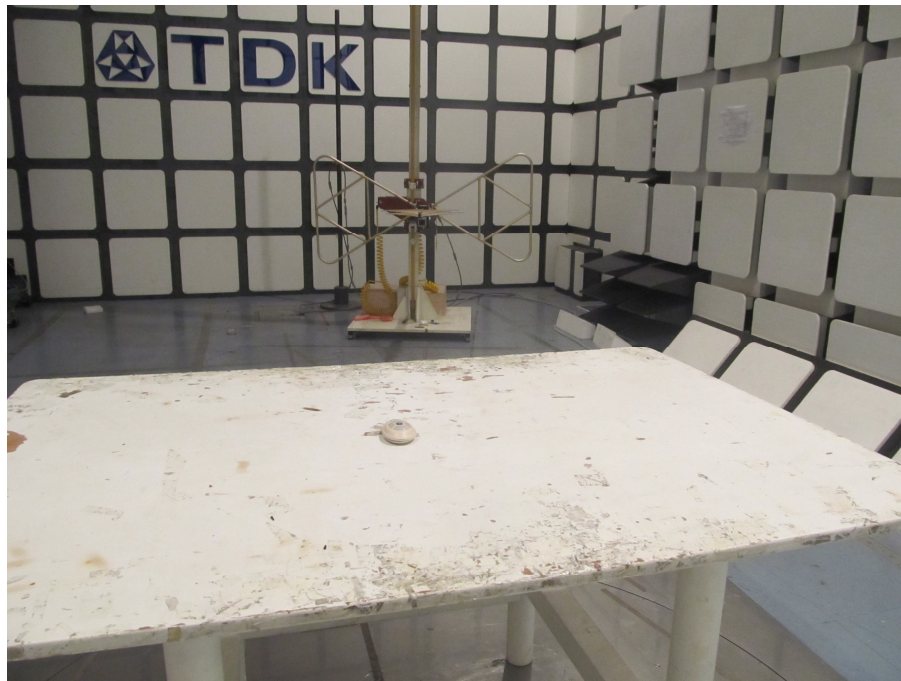


## 6. Test Setup

### 6.1 Photographs of the Test Configuration

Radiated emission:

Below 1GHz:



Above 1GHz:





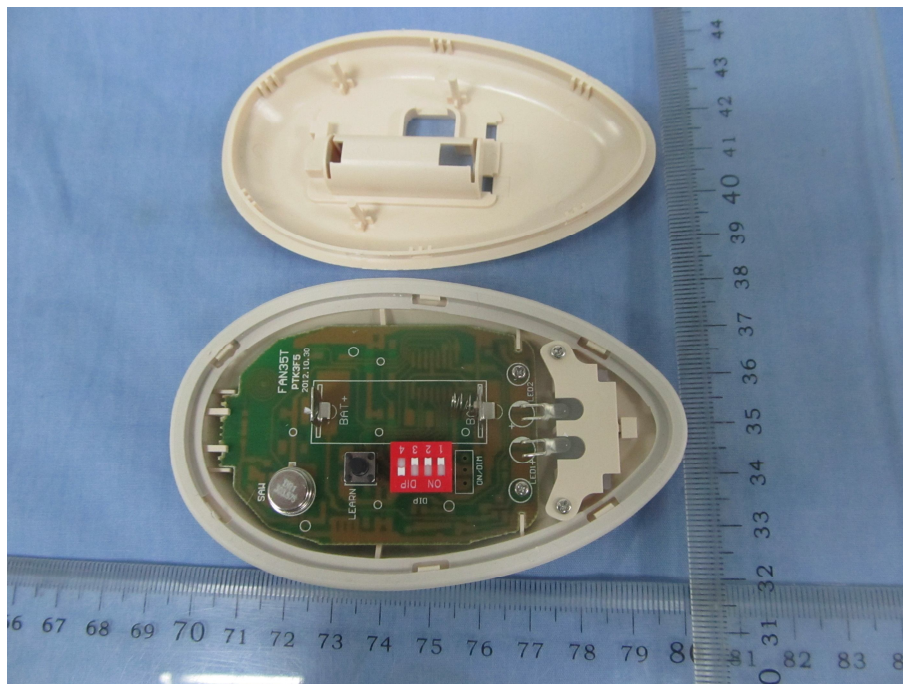
## 6.2 Photographs of the EUT



Enclosure of EUT



Enclosure of EUT



Internal Photo

## 7. Equipment List

No.	Equipment	Manufacturer	Model	Serial No.	Last Cal. Date	Cal. period
1	Precision Biconical Antenna	TDK Co.	PBA-2030	090500	2013-09-09	1Y
2	Precision Log Periodic Antenna	TDK Co.	PLP-3003	061001	2013-09-09	1Y
3	Hybrid Log Periodic Antenna	TDK	HLP-3003 C	130174	2013-09-09	1Y
4	Horn antenna	TDK	HRN-0118	130186	2013-09-18	1Y
5	Attenuator 6 dB	Agilent	8491B	MY39260147	2013-09-16	1Y
6	Preamplifier	TDK Sonoma	310	242803	2013-04-10	1Y
7	Preamplifier	ELENA	EAU-3718GXA	A070701	2013-09-18	1Y
8	EMI Receiver	Rohde & Schwarz	ESIB26	100234	2013-04-10	1Y
9	EMI Receiver	Rohde & Schwarz	ESCS30	100350	2013-04-10	1Y
10	Spectrum Analyzer	Agilent	E4403B	MY44210199	2013-04-10	1Y
11	Art. Mains Network	EMCO	3816/2	00044921	2013-04-10	1Y
12	Transient Limiter(10 dB)	Agilent	11947A	3107A03736	2013-04-10	1Y
13	Personal Computer	HP	DX2000MT	MXD4250FZM	N/A	N/A
14	Personal Computer	HP	DX2000MT	MXD4130B2N	N/A	N/A
15	Semi-Anechoic Chamber	TDK Co.	N/A	N/A	2013-07-15	1Y
16	Shielded Room	TDK Co.	N/A	N/A	N/A	N/A
17	Loop Antenna	EMCO	6502	9107-2440	2013-04-02	1Y

## 8. Test Uncertainty

Test	Range	Confidence Level	Calculated Uncertainty
Radiated emission(3m)	0.009-30MHz	95%	3.8dB
Radiated emission(3m)	30-1000MHz	95%	4.3dB
Radiated emission(3m)	1G-18GHz	95%	5.1dB
Conducted emission	0.15-30MHz	95%	3.3dB

## 9. Appendix

### 9.1 Confirmation of Compliance within the Limits

Method of calculating measurement result

Radiated Emission

	Reading	+	Antenna factor	+	Cable loss	-	Gain	=	Result
Example	73.1	+	13.8	+	8.7	-	31.6	=	64.0

### 9.2 Average Calculating with Duty Cycle Factor

AV value = PK level \* Duty Cycle

Duty Cycle = on time / period

$$= (N_1L_1 + N_2L_2) / 25.6\text{ms} = (10 * 0.3607\text{ms} + 3 * 0.7214\text{ms}) / 25.6\text{ms}$$

$$= 0.2254 = -12.9\text{dB}$$

Test Plot of Duty Cycle:



