

**FCC 47 CFR PART 15 SUBPART C**  
**CERTIFICATION TEST REPORT**

*For*

Doorbell 6, Indoor Siren 6

MODEL No.: ZW162-A, ZW164-A

FCC ID: 2AOGIZW162

Trade Mark: **Aeotec**

REPORT NO.: ES180920005W

ISSUE DATE: November 05, 2018

*Prepared for*

**Aeotec Limited**

#704, Bright Way Tower, 33 Mong Kok Rd, Mong Kok, Hong Kong

*Prepared by*

**EMTEK (SHENZHEN) CO., LTD.**

Bldg 69, Majialong Industry Zone, Nanshan District,  
Shenzhen, Guangdong, China

TEL: 86-755-26954280

FAX: 86-755-26954282

**TABLE OF CONTENTS**

**1 TEST RESULT CERTIFICATION .....3**

**2 EUT TECHNICAL DESCRIPTION .....4**

**3 SUMMARY OF TEST RESULT .....5**

**4 TEST METHODOLOGY.....6**

4.1 GENERAL DESCRIPTION OF APPLIED STANDARDS .....6

4.2 MEASUREMENT EQUIPMENT USED .....6

4.3 DESCRIPTION OF TEST MODES .....7

**5 FACILITIES AND ACCREDITATIONS .....8**

5.1 FACILITIES.....8

5.2 LABORATORY ACCREDITATIONS AND LISTINGS .....8

**6 TEST SYSTEM UNCERTAINTY .....9**

**7 SETUP OF EQUIPMENT UNDER TEST .....10**

7.1 RADIO FREQUENCY TEST SETUP 1.....10

7.2 RADIO FREQUENCY TEST SETUP 2.....10

7.3 CONDUCTED EMISSION TEST SETUP .....12

7.4 BLOCK DIAGRAM CONFIGURATION OF TEST SYSTEM.....13

7.5 SUPPORT EQUIPMENT.....13

**8 TEST REQUIREMENTS .....14**

8.1 BANDWIDTH TEST .....14

8.2 PERIODIC OPERATION .....16

8.3 RADIATED SPURIOUS EMISSION .....18

8.4 CONDUCTED EMISSIONS TEST .....30

8.5 ANTENNA APPLICATION .....33

**9 PHOTOS OF TEST SETUP .....34**

**10 PHOTOS OF THE EUT .....36**


**1 TEST RESULT CERTIFICATION**

Applicant: Aeotec Limited  
 #704, Bright Way Tower, 33 Mong Kok Rd, Mong Kok, Hong Kong

Manufacturer: Fantem Technologies (Shenzhen) Co., Ltd.  
 5th Floor, Yingtang Building South 5th rd, High Technology Park, Nanshan District  
 Shenzhen,Guangdong, China

EUT Description: Doorbell 6, Indoor Siren 6

Model Number: ZW162-A, ZW164-A  
 (Two models are identical in circuitry and electrical, mechanical and physical construction; the only difference is ZW162-A Kit with Button, ZW164-A Kit without Button; We prepare ZW162-A for test.)

Trade Mark: 

File Number: ES180920005W

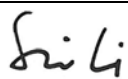
Measurement Procedure Used:

APPLICABLE STANDARDS	
STANDARD	TEST RESULT
FCC 47 CFR Part 2, Subpart J FCC 47 CFR Part 15, Subpart C	PASS

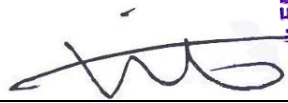
The above equipment was tested by EMTEK (SHENZHEN) CO., LTD.. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10 (2013) and the energy emitted by the sample EUT tested as described in this report is in compliance with the requirements of FCC Rules Part 2 and Part 15.249

The test results of this report relate only to the tested sample identified in this report.

Date of Test : October 08, 2018 to November 05, 2018

Prepared by :   
 Sevin Li/Editor

Reviewer :   
 Joe Xia/Supervisor

Approve & Authorized Signer :   
 Lisa Wang/Manager



## 2 EUT TECHNICAL DESCRIPTION

Characteristics	Description
Device Type	Z-WAVE
Modulation:	FSK
Operating Frequency Range(s):	908.40MHz, 908.42MHz
Number of Channels:	2 channels
Channel space:	20KHz
Antenna Type :	Monopole antenna
Antenna Gain:	1.0 dBi
Power supply:	<input checked="" type="checkbox"/> DC 3.7V internal rechargeable lithium battery <input checked="" type="checkbox"/> DC 5V from Adapter
	<input checked="" type="checkbox"/> Adapter1: Model: SAW12-050-2000UD Input: AC 100-240V, 50/60Hz, 0.3A Output: DC 5V, 2A <input checked="" type="checkbox"/> Adapter2: Model: A122-0502000UD Input: AC 100-240V, 50/60Hz, 0.4A Output: DC 5V, 2A
Battery information:	Rating: DC 3.7V, 400mAh, 1.48Wh

**Note:** for more details, please refer to the User's manual of the EUT.

### 3 SUMMARY OF TEST RESULT

FCC Part Clause	Test Parameter	Verdict	Remark
15.207	Conducted Emission	Pass	
15.205 15.209 15.249	Radiated Emission	Pass	
15.249 15.209	Band edge test	Pass	
15.249	20dB Bandwidth	Pass	
15.35(c)	Periodic Operation	Pass	
15.203	Antenna Requirement	Pass	
NOTE1: N/A (Not Applicable) NOTE2: The report use radiated measurements in the restricted frequency bands. In addition, the radiated test is also performed to ensure the emissions emanating from the device cabinet also comply with the applicable limits.			

RELATED SUBMITTAL(S) / GRANT(S):

This submittal(s) (test report) is intended for FCC ID: 2AOGIZW162 filing to comply with Section 15.249 of the FCC Part 15, Subpart C Rules.

The system is compliance with Subpart B is authorized under a DOC procedure

## 4 TEST METHODOLOGY

### 4.1 GENERAL DESCRIPTION OF APPLIED STANDARDS

According to its specifications, the EUT must comply with the requirements of the following standards:  
 FCC 47 CFR Part 2, Subpart J  
 FCC 47 CFR Part 15, Subpart C

### 4.2 MEASUREMENT EQUIPMENT USED

#### 4.2.1 Conducted Emission Test Equipment

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LASTCAL.	DUE CAL.
Test Receiver	Rohde & Schwarz	ESCI	26115-010-0027	May 19, 2018	May 18, 2019
L.I.S.N.	Rohde & Schwarz	ENV216	101161	May 19, 2018	May 18, 2019
50Ω Coaxial Switch	Anritsu	MP59B	6100175589	May 20, 2018	May 19, 2019
Voltage Probe	Rohde & Schwarz	ESH2-Z3	100122	May 20, 2018	May 19, 2019
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100006	May 19, 2018	May 19, 2019
I.S.N	Teseq GmbH	ISN T800	30327	May 20, 2018	May 19, 2019

#### 4.2.2 Radiated Emission Test Equipment

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	DUE CAL.
EMI Test Receiver	Rohde & Schwarz	ESU	1302.6005.26	May 20, 2018	May 19, 2019
Pre-Amplifier	HP	8447F	2944A07999	May 19, 2018	May 18, 2019
Bilog Antenna	Schwarzbeck	VULB9163	142	May 19, 2018	May 18, 2019
Loop Antenna	ARA	PLA-1030/B	1029	May 19, 2018	May 18, 2019
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170399	May 20, 2018	May 19, 2019
Horn Antenna	Schwarzbeck	BBHA 9120	D143	May 19, 2018	May 18, 2019
Cable	Schwarzbeck	AK9513	ACRX1	May 20, 2018	May 19, 2019
Cable	Rosenberger	N/A	FP2RX2	May 20, 2018	May 19, 2019
Cable	Schwarzbeck	AK9513	CRPX1	May 20, 2018	May 19, 2019
Cable	Schwarzbeck	AK9513	CRRX2	May 20, 2018	May 19, 2019

#### 4.2.3 Radio Frequency Test Equipment

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LASTCAL.	DUE CAL.
Spectrum Analyzer	Agilent	E4407B	88156318	May 20, 2018	May 19, 2019
Signal Analyzer	Agilent	N9010A	My53470879	May 20, 2018	May 19, 2019
Power meter	Anritsu	ML2495A	0824006	May 20, 2018	May 19, 2019
Power sensor	Anritsu	MA2411B	0738172	May 20, 2018	May 19, 2019

**Remark:** Each piece of equipment is scheduled for calibration once a year.

**4.3 DESCRIPTION OF TEST MODES**

The EUT has been tested under its typical operating condition.

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

The Transmitter was operated in the normal operating mode. The TX frequency was fixed which was for the purpose of the measurements.

Test of channel included the lowest and middle and highest frequency to perform the test, then record on this report.

Those modulation FSK were used for all test.

Pre-defined engineering program for regulatory testing used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

Frequency and Channel list:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	908.40	2	908.42		

Test Frequency and Channel list:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
2	908.42MHz				

## 5 FACILITIES AND ACCREDITATIONS

### 5.1 FACILITIES

All measurement facilities used to collect the measurement data are located at

Bldg 69, Majialong Industry Zone District, Nanshan District, Shenzhen, China

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.10 and CISPR Publication 22.

### 5.2 LABORATORY ACCREDITATIONS AND LISTINGS

#### Site Description

#### EMC Lab.

- : Accredited by CNAS, 2016.10.24  
The certificate is valid until 2022.10.28  
The Laboratory has been assessed and proved to be in compliance with CNAS-CL01: 2006(identical to ISO/IEC17025: 2005)  
The Certificate Registration Number is L2291
  
- : Accredited by TUV Rheinland Shenzhen, 2016.5.19  
The Laboratory has been assessed according to the requirements ISO/IEC 17025.
  
- : Accredited by FCC, August 06, 2018  
The certificate is valid until August 07, 2020  
Designation Number: CN1204  
Test Firm Registration Number: 882943
  
- : Accredited by Industry Canada, November 24, 2015  
The Certificate Registration Number is 4480A



## 6 TEST SYSTEM UNCERTAINTY

The following measurement uncertainty levels have been estimated for tests performed on the apparatus:

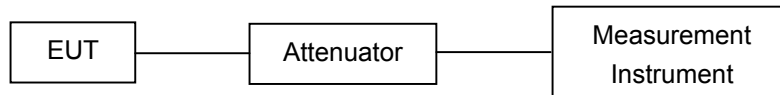
Parameter	Uncertainty
Radio Frequency	$\pm 1 \times 10^{-5}$
Maximum Peak Output Power Test	$\pm 1.0\text{dB}$
Conducted Emissions Test	$\pm 2.0\text{dB}$
Radiated Emission Test	$\pm 2.0\text{dB}$
Power Density	$\pm 2.0\text{dB}$
Occupied Bandwidth Test	$\pm 1.0\text{dB}$
Band Edge Test	$\pm 3\text{dB}$
All emission, radiated	$\pm 3\text{dB}$
Antenna Port Emission	$\pm 3\text{dB}$
Temperature	$\pm 0.5^{\circ}\text{C}$
Humidity	$\pm 3\%$

Measurement Uncertainty for a level of Confidence of 95%

## 7 SETUP OF EQUIPMENT UNDER TEST

### 7.1 RADIO FREQUENCY TEST SETUP 1

The Z-WAVE component's antenna port(s) of the EUT are connected to the measurement instrument per an appropriate attenuator. The EUT is controlled by PC/software/itself to emit the specified signals for the purpose of measurements.



### 7.2 RADIO FREQUENCY TEST SETUP 2

The test site semi-anechoic chamber has met the requirement of NSA tolerance 4 dB according to the standards: ANSI C63.10. The test distance is 3m. The setup is according to the requirements in Section 13.1.4.1 of ANSI C63.10-2013 and CAN/CSA-CEI/IEC CISPR 22.

Below 30MHz:

The EUT is placed on a turntable 0.8 meters above the ground in the chamber, 3 meter away from the antenna (loop antenna). The Antenna should be positioned with its plane vertical at the specified distance from the EUT and rotated about its vertical axis for maximum response at each azimuth about the EUT. The center of the loop shall be 1 m above the ground. For certain applications, the loop antenna plane may also need to be positioned horizontally at the specified distance from the EUT.

Above 30MHz:

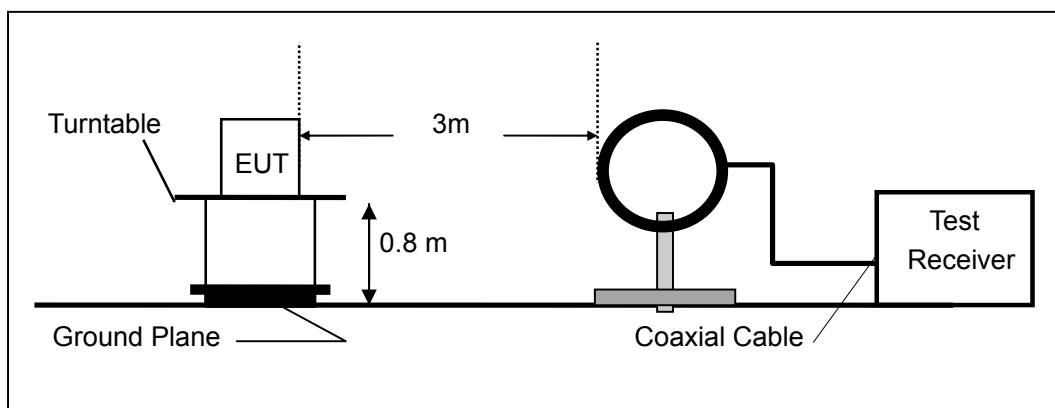
The EUT is placed on a turntable 0.8 meters above the ground in the chamber, 3 meter away from the antenna. The maximal emission value is acquired by adjusting the antenna height, polarisation and turntable azimuth. Normally, the height range of antenna is 1 m to 4 m, the azimuth range of turntable is 0° to 360°, and the receive antenna has two polarizations Vertical (V) and Horizontal (H).

Above 1GHz:

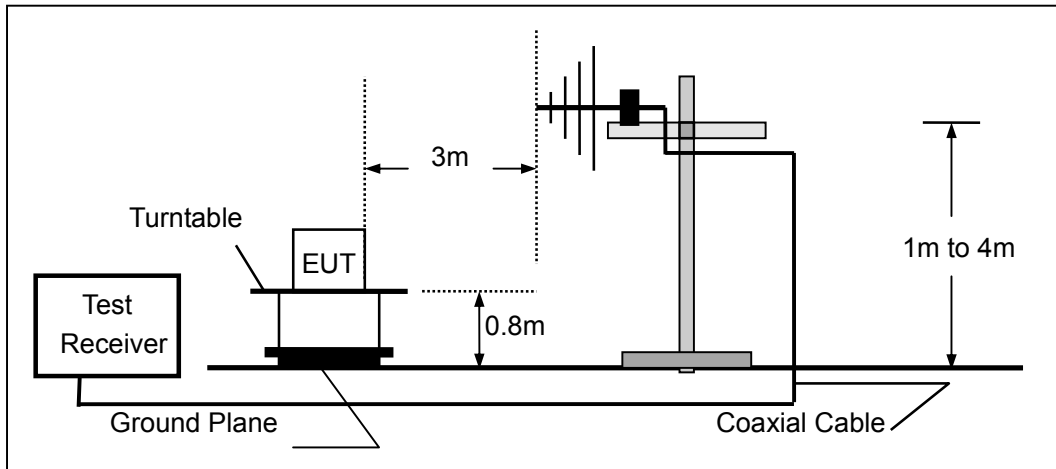
(Note: the FCC's permission to use 1.5m as an alternative per TCBC Conf call of Dec. 2, 2014.)

The EUT is placed on a turntable 1.5 meters above the ground in the chamber, 3 meter away from the antenna. The maximal emission value is acquired by adjusting the antenna height, polarisation and turntable azimuth. Normally, the height range of antenna is 1 m to 4 m, the azimuth range of turntable is 0° to 360°, and the receive antenna has two polarizations Vertical (V) and Horizontal (H).

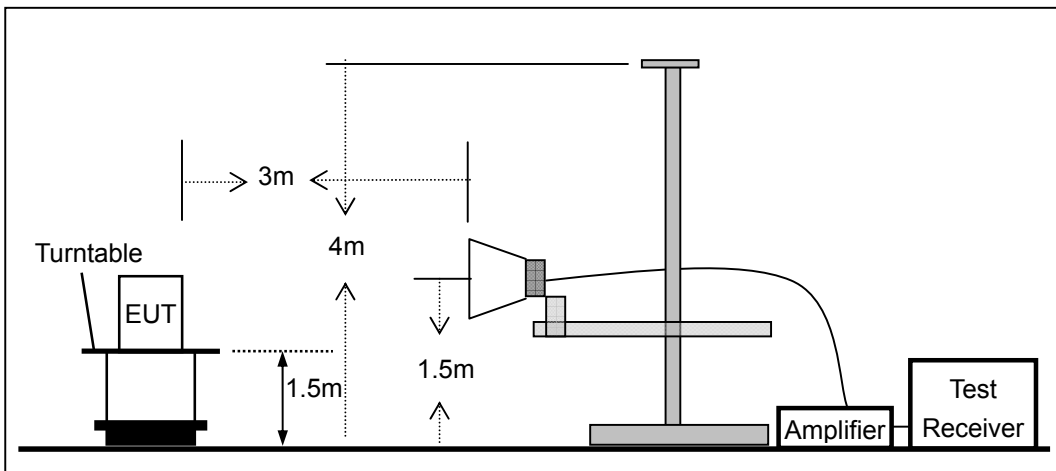
(a) Radiated Emission Test Set-Up, Frequency Below 30MHz



(b) Radiated Emission Test Set-Up, Frequency Below 1000MHz



(c) Radiated Emission Test Set-Up, Frequency above 1000MHz

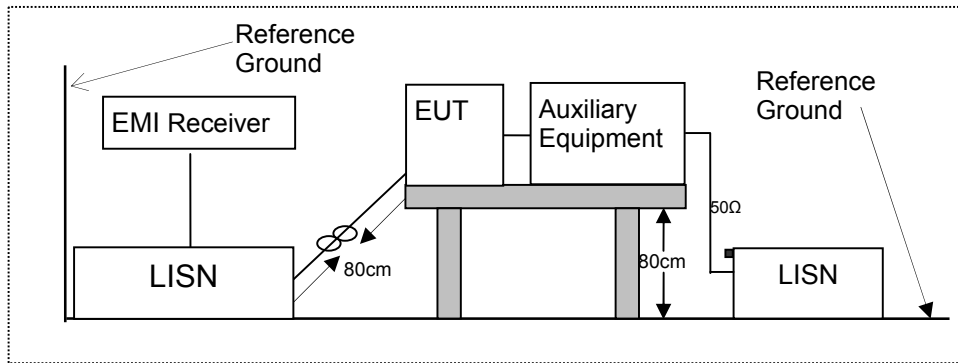


### 7.3 CONDUCTED EMISSION TEST SETUP

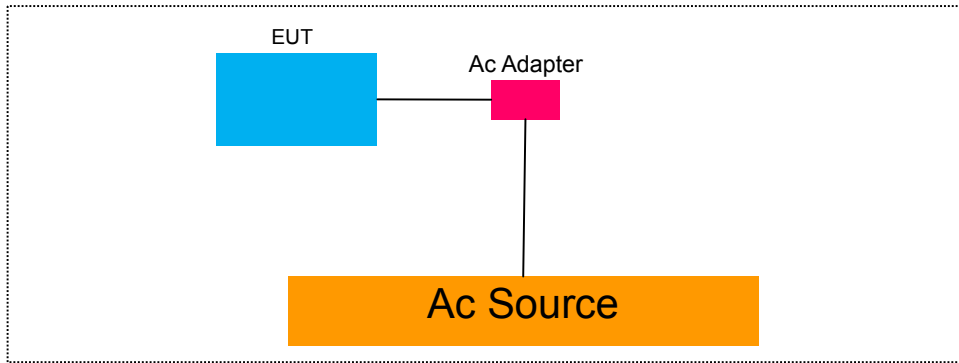
The mains cable of the EUT (maybe per AC/DC Adapter) must be connected to LISN. The LISN shall be placed 0.8 m from the boundary of EUT and bonded to a ground reference plane for LISN mounted on top of the ground reference plane. This distance is between the closest points of the LISN and the EUT. All other units of the EUT and associated equipment shall be at least 0.8m from the LISN.

Ground connections, where required for safety purposes, shall be connected to the reference ground point of the LISN and, where not otherwise provided or specified by the manufacturer, shall be of same length as the mains cable and run parallel to the mains connection at a separation distance of not more than 0.8 m.

According to the requirements in Section 13.1.4.1 of ANSI C63.10-2013 Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30 MHz using CISPR Quasi-Peak and average detector mode.



**7.4 BLOCK DIAGRAM CONFIGURATION OF TEST SYSTEM**



**7.5 SUPPORT EQUIPMENT**

Item	Equipment	Mfr/Brand	Model/Type No.	FCC ID	Series No.	Note
N/A	N/A	N/A	N/A	N/A	N/A	N/A

**Notes:**

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

## 8 TEST REQUIREMENTS

### 8.1 BANDWIDTH TEST

#### 8.1.1 Applicable Standard

According to FCC Part 15.249

#### 8.1.2 Conformance Limit

N/A

#### 8.1.3 Test Configuration

Test according to clause 7.1 radio frequency test setup

#### 8.1.4 Test Procedure

The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.

Set to the maximum power setting and enable the EUT transmit continuously

Set RBW = 1% to 5% of the anticipated emission bandwidth

Set the video bandwidth (VBW) = 3×RBW

Set Span= approximately 2 to 3 times the 20 dB bandwidth

Set Detector = Peak.

Set Trace mode = max hold.

Set Sweep = auto couple.

Allow the trace to stabilize.

X dB Bandwidth: 20 dB

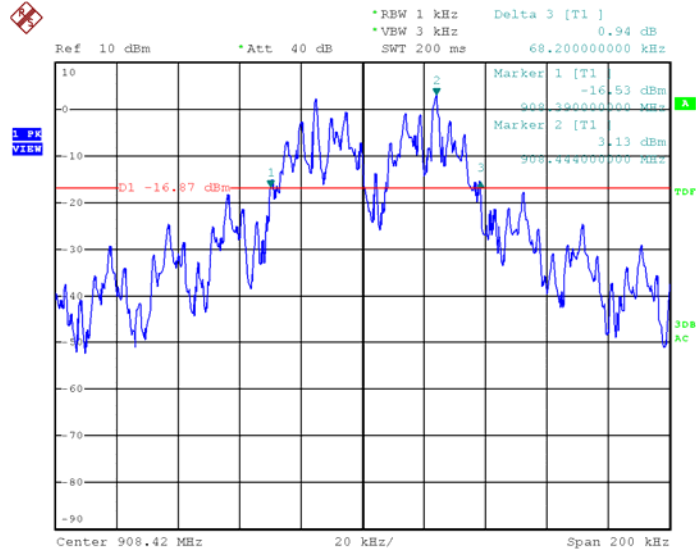
Note: The automatic bandwidth measurement capability of a spectrum analyzer or EMI receiver may be employed if it implements the functionality described above.

#### 8.1.5 Test Results

Temperature :	28 °C	Test By:	King Kong
Humidity :	65 %		

Operation Mode	Channel Number	Channel Frequency (MHz)	20dB Bandwidth (KHz)	Limit (kHz)
FSK	2	908.42	72.4	N/A

Test Model	Bandwidth Test
	FSK
	908.42MHz



Date: 10.OCT.2018 11:18:07

**8.2 PERIODIC OPERATION**

8.2.1 Applicable Standard

According to FCC Part 15.35C

8.2.2 Conformance Limit

N/A

8.2.3 Test Configuration

Test according to clause 7.1 radio frequency test setup

8.2.4 Test Procedure

The EUT was operating in controlled its channel. Printed out the test result from the spectrum by hard copy function.

The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.

Set to the maximum power setting and enable the EUT transmit continuously

Set RBW = 1MHz

Set the video bandwidth (VBW) = 3MHz

Set Span=0MHz

Set Detector = Peak.

Set Trace mode = max hold.

Set Sweep = 100ms.

Allow the trace to stabilize.

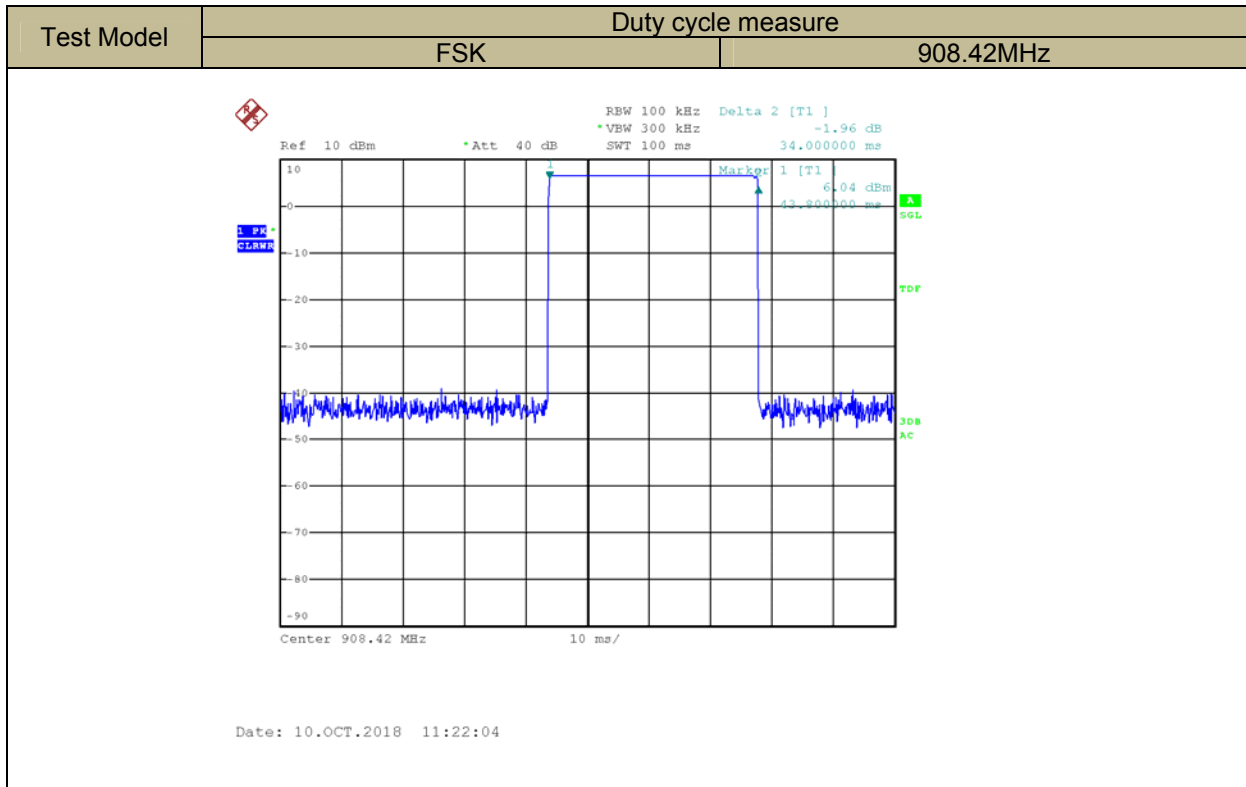
Measure and record the results in the test report.

8.2.5 Test Results

Temperature :	28°C	Test By:	King Kong
Humidity :	65 %		
Total transmission time(ms)	100.00		
Length of a complete transmission period(ms)	34		
Duty Cycle(%)	34		
Duty Cycle Correction Factor(dB)	-9.37		

Note: Duty Cycle(%)=Total On interval in a complete pulse train/ Length of a complete pulse train \* %  
 Duty Cycle Correction Factor(dB)=20 \* Log<sub>10</sub>(Duty Cycle(%))





### 8.3 RADIATED SPURIOUS EMISSION

#### 8.3.1 Applicable Standard

According to FCC Part 15.249, 15.209 and 15.205.

#### 8.3.2 Conformance Limit

According to FCC Part 15.249: radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

According to FCC Part 15.205, Restricted bands

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
10.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	(2)
13.36-13.41			

According to FCC Part 15.205, the level of any transmitter spurious emission in Restricted bands shall not exceed the level of the emission specified in the following table

Restricted Frequency(MHz)	Field Strength ( $\mu\text{V}/\text{m}$ )	Field Strength ( $\text{dB}\mu\text{V}/\text{m}$ )	Measurement Distance
0.009-0.490	2400/F(KHz)	20 log ( $\mu\text{V}/\text{m}$ )	300
0.490-1.705	2400/F(KHz)	20 log ( $\mu\text{V}/\text{m}$ )	30
1.705-30	30	29.5	30
30-88	100	40	3
88-216	150	43.5	3
216-960	200	46	3
Above 960	500	54	3

Remark :1. Emission level in  $\text{dB}\mu\text{V}/\text{m}=20 \log (\mu\text{V}/\text{m})$

2. Measurement was performed at an antenna to the closed point of EUT distance of meters.

3. Distance extrapolation factor =  $40 \log (\text{Specific distance} / \text{test distance})$  (dB);

Limit line = Specific limits (dBuV) + distance extrapolation factor.

for the frequency ranges below 30 MHz, a narrower RBW is used for these ranges but the measured value should add a RBW correction factor (RBWCF) where  $\text{RBWCF} [\text{dB}] = 10 * \lg (100 [\text{kHz}] / \text{narrower RBW} [\text{kHz}])$ . , the narrower RBW is 1 kHz and RBWCF is 20 dB for the frequency 9 kHz to 150 kHz, and the narrower RBW is 10 kHz and RBWCF is 10 dB for the frequency 150 kHz to 30 MHz.

Field strength of fundamental and Field strength of harmonics Limit:

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902-928 MHz	50(94 dBV/m)	500(54 dBV/m)
2400-2483.5 MHz	50(94 dBV/m)	500(54 dBV/m)
5725-5875 MHz	50(94 dBV/m)	500(54 dBV/m)
24.0-24.25 GHz	250(108 dBV/m)	2500(68 dBV/m)

### 8.3.3 Test Configuration

Test according to clause 7.2 radio frequency test setup

### 8.3.4 Test Procedure

This test is required for any spurious emission that falls in a Restricted Band, as defined in Section 15.205. It must be performed with the highest gain of each type of antenna proposed for use with the EUT. Use the following spectrum analyzer settings:

For Above 1GHz:

The EUT was placed on a turn table which is 1.5m above ground plane.

Maximum procedure was performed on the highest emissions to ensure EUT compliance.

Span = wide enough to fully capture the emission being measured

RBW = 1 MHz

VBW  $\geq$  RBW

Sweep = auto

Detector function = peak

Trace = max hold

For Below 1GHz:

The EUT was placed on a turn table which is 0.8m above ground plane.

Maximum procedure was performed on the highest emissions to ensure EUT compliance.

Span = wide enough to fully capture the emission being measured

RBW = 100 kHz for

VBW  $\geq$  RBW

Sweep = auto

Detector function = peak

Trace = max hold

For Below 30MHz:

The EUT was placed on a turn table which is 0.8m above ground plane.

Maximum procedure was performed on the highest emissions to ensure EUT compliance.

Span = wide enough to fully capture the emission being measured

RBW = 9kHz

VBW  $\geq$  RBW

Sweep = auto

Detector function = peak

Trace = max hold

For Below 150KHz:

The EUT was placed on a turn table which is 0.8m above ground plane.

Maximum procedure was performed on the highest emissions to ensure EUT compliance.

Span = wide enough to fully capture the emission being measured

RBW = 200Hz

VBW  $\geq$  RBW

Sweep = auto

Detector function = peak

Trace = max hold

Follow the guidelines in ANSI C63.10-2013 with respect to maximizing the emission by rotating the EUT,

measuring the emission while the EUT is situated in three orthogonal planes (if appropriate), adjusting the measurement antenna height and polarization, etc. A pre-amp and a high pass filter are required for this test, in order to provide the measuring system with sufficient sensitivity. Allow the trace to stabilize. The peak reading of the emission, after being corrected by the antenna factor, cable loss, pre-amp gain, etc., is the peak field strength, which must comply with the limit specified in Section 15.35(b). Submit this data. Now set the VBW to 10 Hz, while maintaining all of the other instrument settings. This peak level, once corrected, must comply with the limit specified in Section 15.209. If the dwell time per channel of the hopping signal is less than 100 ms, then the reading obtained with the 10 Hz VBW may be further adjusted by a “duty cycle correction factor”, derived from  $20\log(\text{dwell time}/100 \text{ ms})$ , in an effort to demonstrate compliance with the 15.209 limit. Submit this data.

Repeat above procedures until all frequency measured was complete.

### 8.3.5 Test Results

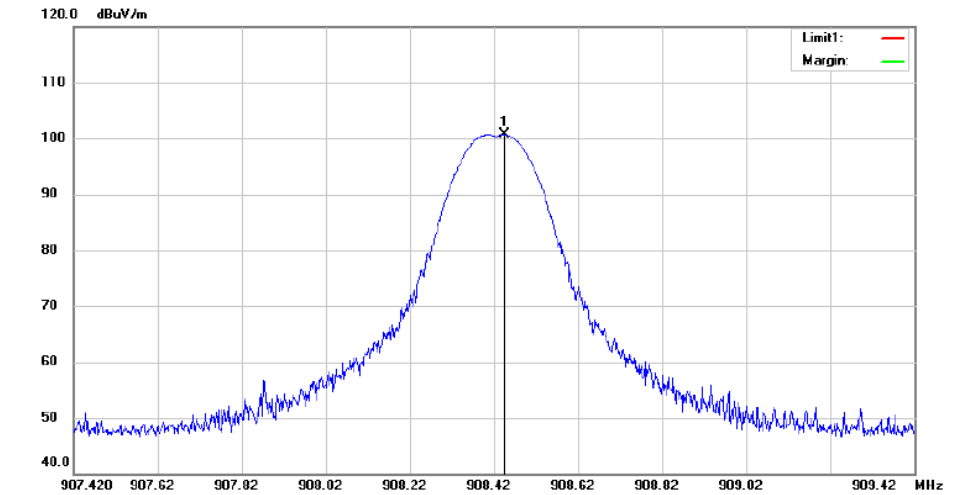
■ Field Strength of the fundamental signal

Temperature:	24 °C	Test By:	KK
Humidity:	53 %	Frequency:	Channel 2: 908.42MHz
Test mode:	FSK		

Freq. (MHz)	Ant.Pol. H/V	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Over(dB)	
		PK	AV	PK	AV	PK	AV
908.42	V	97.34	87.97	114.00	94.00	-16.66	-6.03
908.42	H	100.67	91.30	114.00	94.00	-13.33	-2.70

- Note:
- (1) Correct Factor= Antenna Factor +Cable Loss- Amplifier Gain
  - (2) Emission Level= Reading Level + Probe Factor +Cable Loss
  - (3) True Value = Emission Level + Correction Factor
  - (4) DF= Duty Cycle Correction Factor
  - (5) Duty Cycle Correction Factor (dB) = -9.37dB
  - (6) average results= peak results + Duty Cycle Correction Factor(dB)

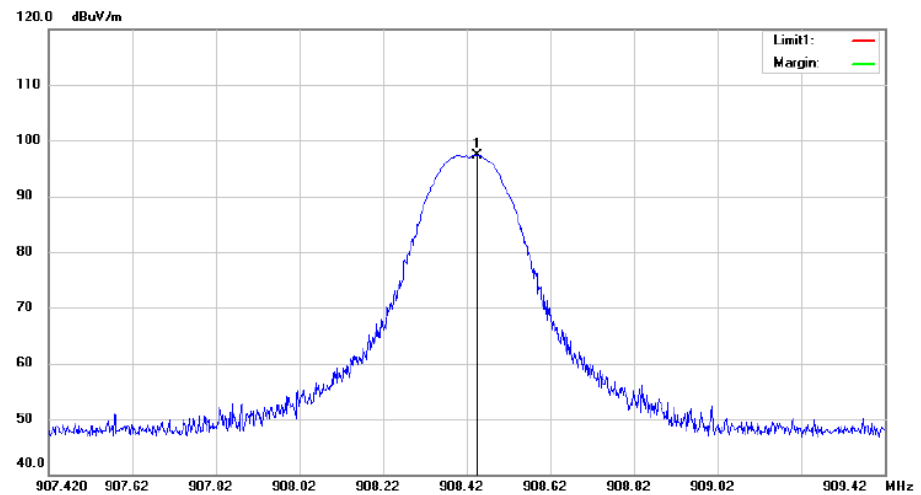
Fundamental signal-H



Site 3m Chamber #3 Polarization: **Horizontal** Temperature: 21 C  
 Limit: Power: AC 120V/60Hz Humidity: 65 %  
 Mode:908.42MHz  
 Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Antenna Height	Table Degree
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree
1	*	908.4440	101.38	-0.71	100.67			peak	

Fundamental signal-V



Site 3m Chamber #3 Polarization: **Vertical** Temperature: 24 C  
 Limit: Power: AC 120V/60Hz Humidity: 55 %  
 Mode:908.42MHz  
 Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Antenna Height	Table Degree
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree
1	*	908.4440	98.05	-0.71	97.34			peak	

■ Spurious Emission below 30MHz(9KHz to 30MHz)

Temperature: 24°C Test By: KK  
Humidity: 53 %  
Test mode: TX Mode

Freq. (MHz)	Ant.Pol. H/V	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Over(dB)	
		PK	AV	PK	AV	PK	AV
--	--	--	--	--	--	--	--

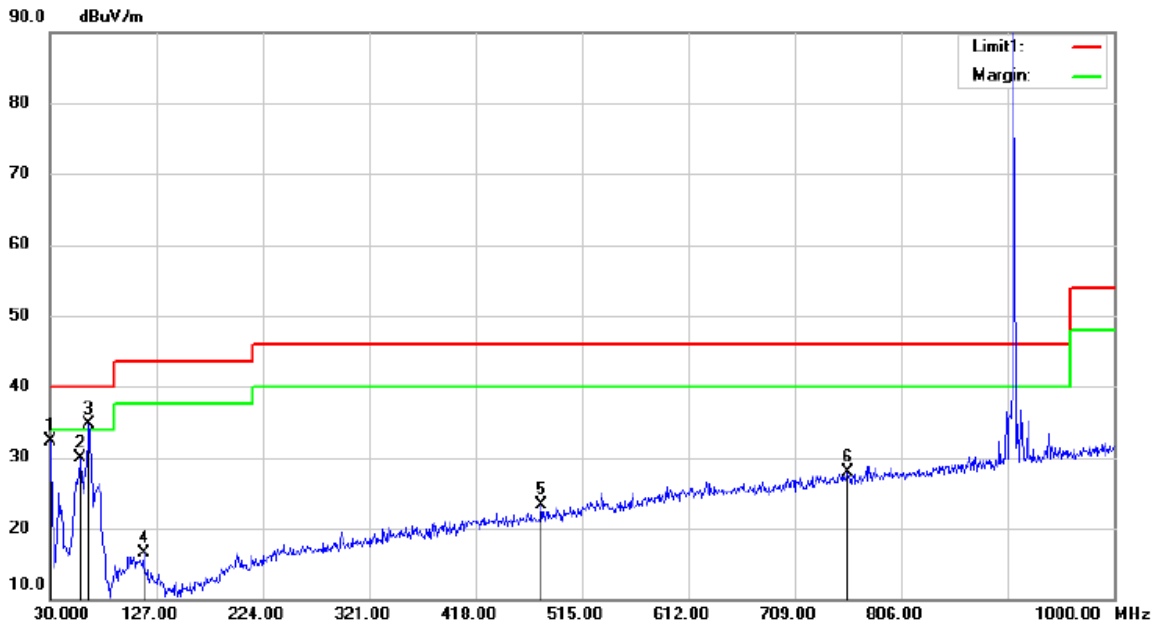
Note: the amplitude of spurious emission that is attenuated by more than 20dB below the permissible limit has no need to be reported.

Distance extrapolation factor =  $40 \log(\text{Specific distance} / \text{test distance})$  (dB);

Limit line = Specific limits(dBuV) + distance extrapolation factor

■ Radiated spurious emission 30MHz to 1GHz

For Adapter 1



Site 3m Chamber #3

Polarization: **Vertical**

Temperature: 24 C

Limit: (RE)FCC PART 15C

Power: AC 120V/60Hz

Humidity: 55 %

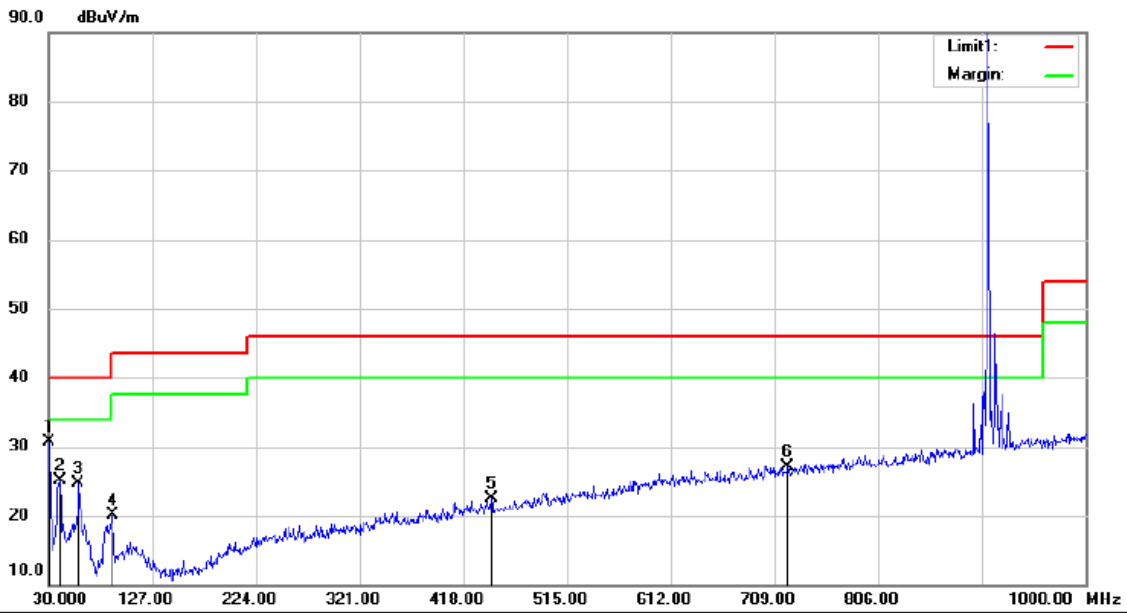
Mode: 908.42MHz

Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Antenna Height cm	Table Degree	Comment
1		30.0000	49.09	-16.73	32.36	40.00	-7.64	QP			
2		58.1300	45.11	-15.20	29.91	40.00	-10.09	QP			
3	*	65.8900	51.15	-16.41	34.74	40.00	-5.26	QP			
4		115.3600	33.20	-16.72	16.48	43.50	-27.02	QP			
5		478.1400	31.85	-8.64	23.21	46.00	-22.79	QP			
6		757.5000	31.02	-3.20	27.82	46.00	-18.18	QP			

\*:Maximum data x:Over limit l:over margin

Operator: KK



Site 3m Chamber #3

Polarization: **Horizontal**

Temperature: 24 C

Limit: (RE)FCC PART 15C

Power: AC 120V/60Hz

Humidity: 55 %

Mode: 908.42MHz

Note:

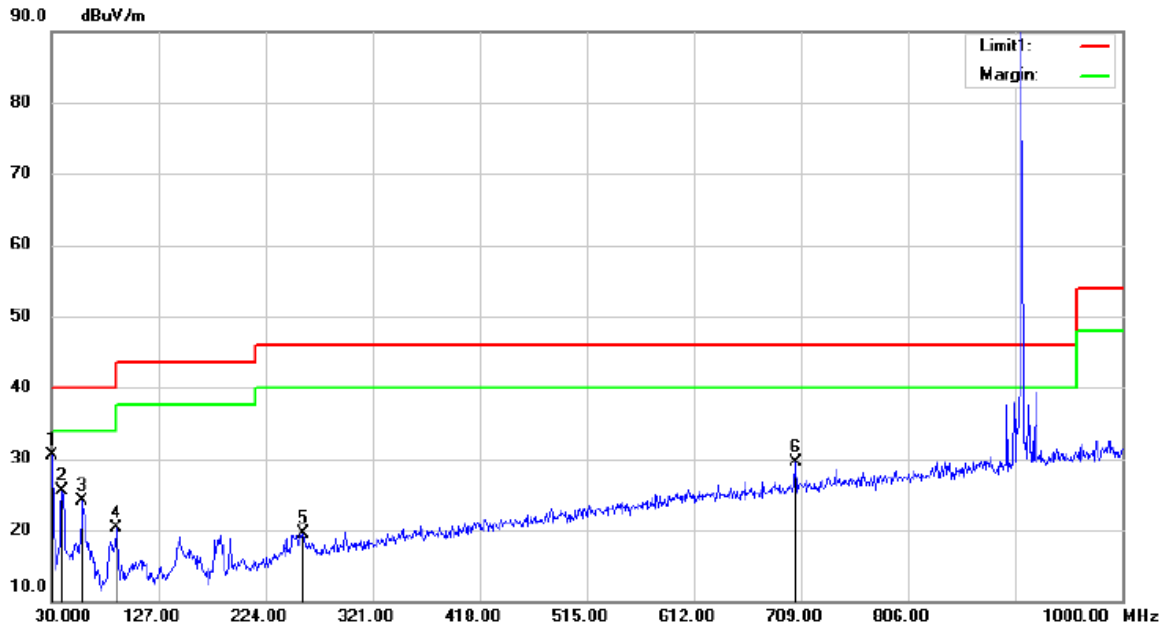
No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1	*	30.0000	47.39	-16.73	30.66	40.00	-9.34	QP		
2		40.6700	39.78	-14.60	25.18	40.00	-14.82	QP		
3		58.1300	39.90	-15.20	24.70	40.00	-15.30	QP		
4		90.1400	37.63	-17.59	20.04	43.50	-23.46	QP		
5		444.1900	31.86	-9.27	22.59	46.00	-23.41	QP		
6		721.6100	31.14	-3.97	27.17	46.00	-18.83	QP		

\*:Maximum data    x:Over limit    !:over margin

Operator: KK



For Adapter 2

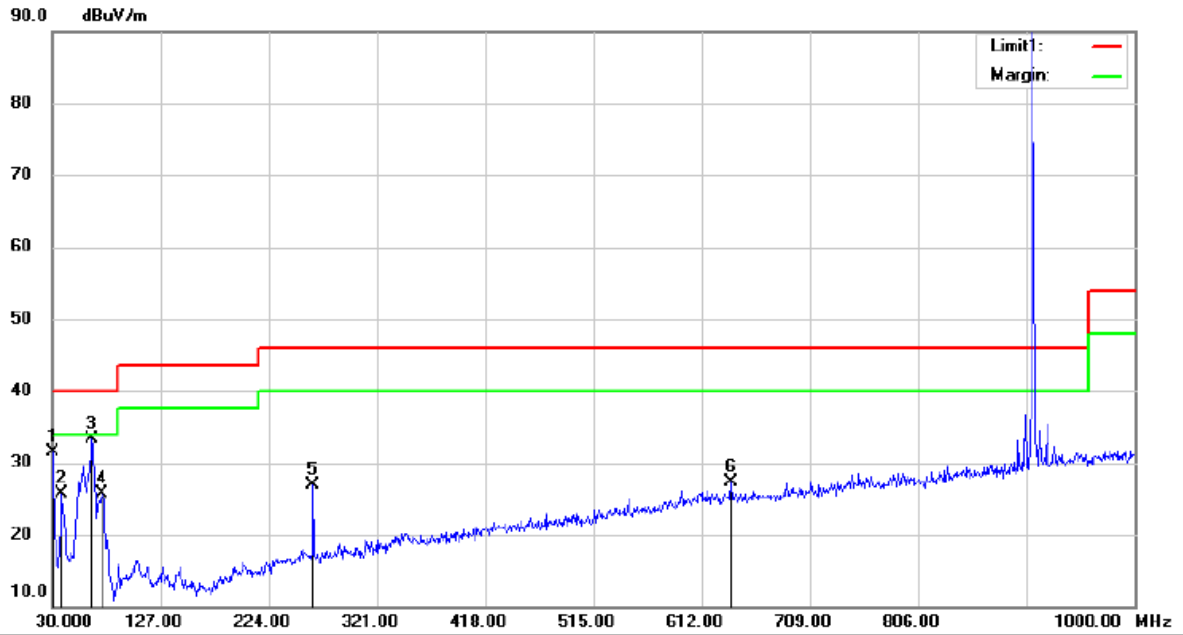


Site: 3m Chamber #3      Polarization: *Horizontal*      Temperature: 24 C  
 Limit: (RE)FCC PART 15C      Power: AC 120V/60Hz      Humidity: 55 %  
 Mode: 908.42MHz  
 Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Antenna Height cm	Table Degree	Detector	Comment
1	*	30.9700	47.25	-16.77	30.48	40.00	-9.52			QP	
2		39.7000	40.41	-14.96	25.45	40.00	-14.55			QP	
3		58.1300	39.32	-15.20	24.12	40.00	-15.88			QP	
4		89.1700	38.15	-17.89	20.26	43.50	-23.24			QP	
5		257.9500	33.14	-13.67	19.47	46.00	-26.53			QP	
6		704.1500	33.76	-4.17	29.59	46.00	-16.41			QP	

\*:Maximum data    x:Over limit    !:over margin

Operator: KK



Site 3m Chamber #3

Polarization: *Vertical*

Temperature: 24 C

Limit: (RE)FCC PART 15C

Power: AC 120V/60Hz

Humidity: 55 %

Mode: 908.42MHz

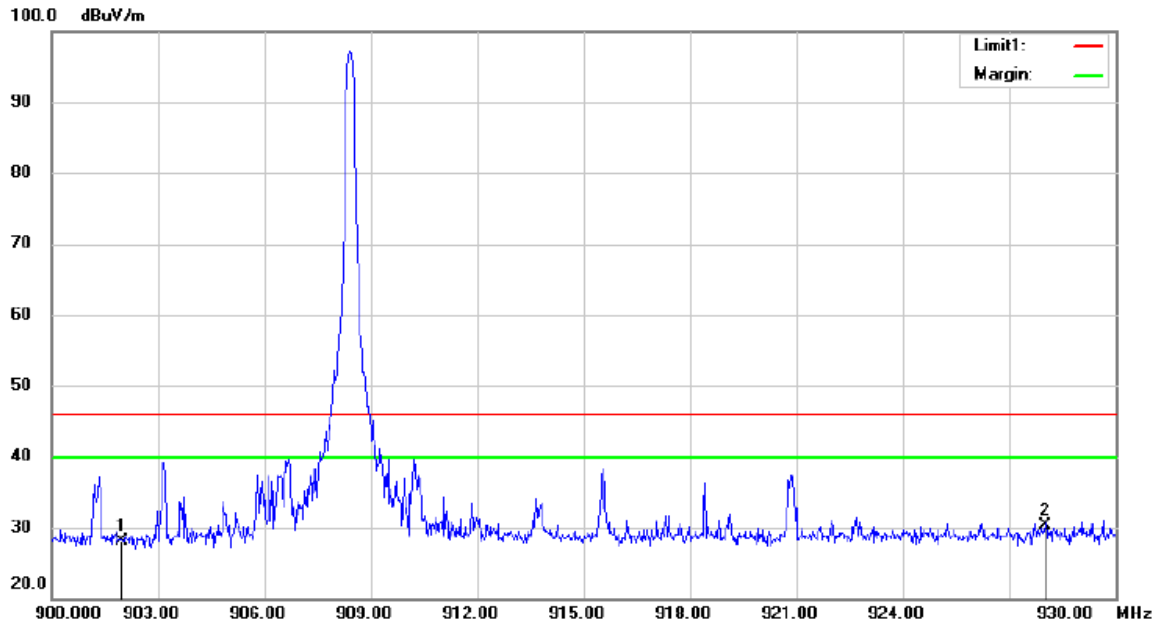
Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Antenna Height cm	Table Degree	Comment
1		30.0000	48.16	-16.73	31.43	40.00	-8.57	QP		
2		38.7300	40.99	-15.23	25.76	40.00	-14.24	QP		
3	*	65.8900	49.61	-16.41	33.20	40.00	-6.80	QP		
4		74.6200	45.31	-19.54	25.77	40.00	-14.23	QP		
5		263.7700	40.31	-13.50	26.81	46.00	-19.19	QP		
6		638.1900	32.44	-5.21	27.23	46.00	-18.77	QP		

\*:Maximum data    x:Over limit    !:over margin

Operator: KK

■ Transmitter Fundamental Field Strength and outside of the specified frequency bands

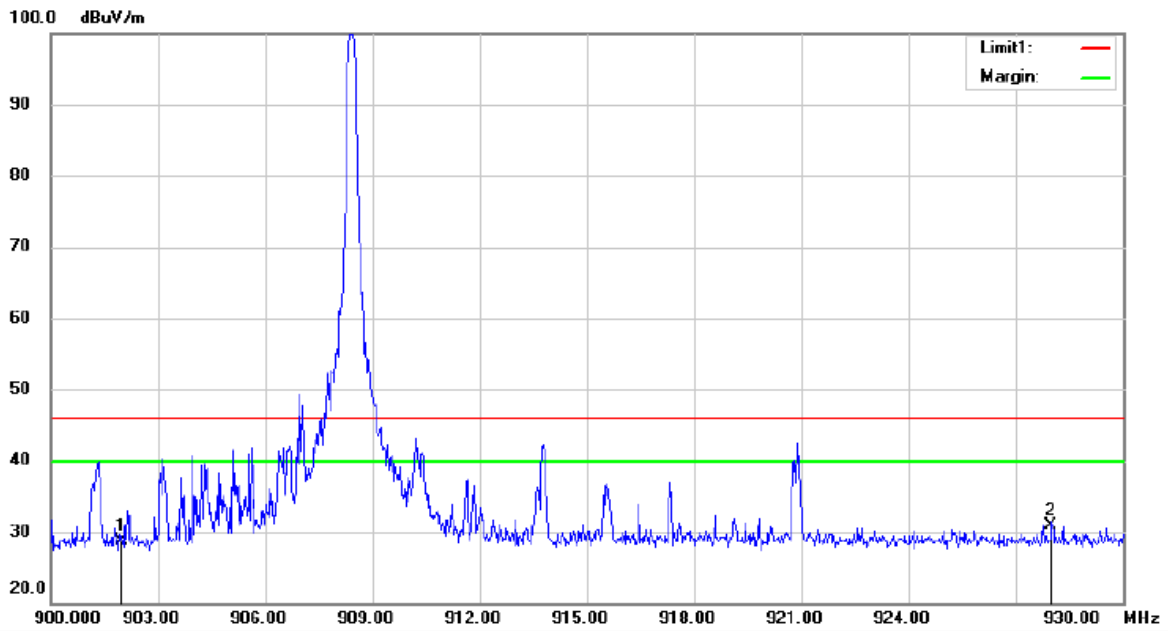


Site: 3m Chamber #3      Polarization: **Vertical**      Temperature: 24 C  
 Limit: (RE)FCC PART 15C      Power: AC 120V/60Hz      Humidity: 55 %  
 Mode: 908.42MHz  
 Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Antenna Height cm	Table Degree	Detector	Comment
1		902.0000	29.08	-0.94	28.10	46.00	-17.90			QP	
2	*	928.0000	30.58	-0.37	30.20	46.00	-15.80			QP	

\*:Maximum data    x:Over limit    !:over margin

Operator: KK



Site: 3m Chamber #3      Polarization: *Horizontal*      Temperature: 24 C  
 Limit: (RE)FCC PART 15C      Power: AC 120V/60Hz      Humidity: 55 %  
 Mode: 908.42MHz  
 Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1		902.0000	29.61	-0.94	28.70	46.00	-17.30	QP		
2	*	928.0000	31.32	-0.37	30.90	46.00	-15.10	QP		

\*:Maximum data    x:Over limit    !:over margin

Operator: KK

■ Spurious Emission Above 1GHz(1GHz to 25GHz)

Temperature: 24°C  
 Humidity: 53 %  
 Test mode: FSK

Test By: KK  
 Frequency: Channel 2: 908.42MHz

Freq. (MHz)	Ant.Pol. H/V	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Over(dB)	
		PK	AV	PK	AV	PK	AV
1816.84	V	42.06	32.69	74.00	54.00	-31.94	-21.31
2725.26	V	42.71	33.34	74.00	54.00	-31.29	-20.66
3633.68	V	44.36	34.99	74.00	54.00	-29.64	-19.01
4542.10	V	48.98	39.61	74.00	54.00	-25.02	-14.39
5450.52	V	50.93	41.56	74.00	54.00	-23.07	-12.44
6358.94	V	54.93	45.56	74.00	54.00	-19.07	-8.44
1816.84	H	42.89	33.52	74.00	54.00	-31.11	-20.48
2725.26	H	42.39	33.02	74.00	54.00	-31.61	-20.98
3633.68	H	44.99	35.62	74.00	54.00	-29.01	-18.38
4542.10	H	48.28	38.91	74.00	54.00	-25.72	-15.09
5450.52	H	50.14	40.77	74.00	54.00	-23.86	-13.23
6358.94	H	52.88	43.51	74.00	54.00	-21.12	-10.49

- Note:** (1) All Readings are Peak Value (VBW=3MHz) and Average Value=Peak Value + Duty Cycle Correction Factor(dB)  
 (2) Emission Level= Reading Level+Probe Factor +Cable Loss.  
 (3) Data of measurement within this frequency range shown “ -- ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

**8.4 CONDUCTED EMISSIONS TEST**

**8.4.1 Applicable Standard**

According to FCC Part 15.207(a)

**8.4.2 Conformance Limit**

Conducted Emission Limit		
Frequency(MHz)	Quasi-peak	Average
0.15-0.5	66-56	56-46
0.5-5.0	56	46
5.0-30.0	60	50

Note: 1. The lower limit shall apply at the transition frequencies  
 2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

**8.4.3 Test Configuration**

Test according to clause 7.3 conducted emission test setup

**8.4.4 Test Procedure**

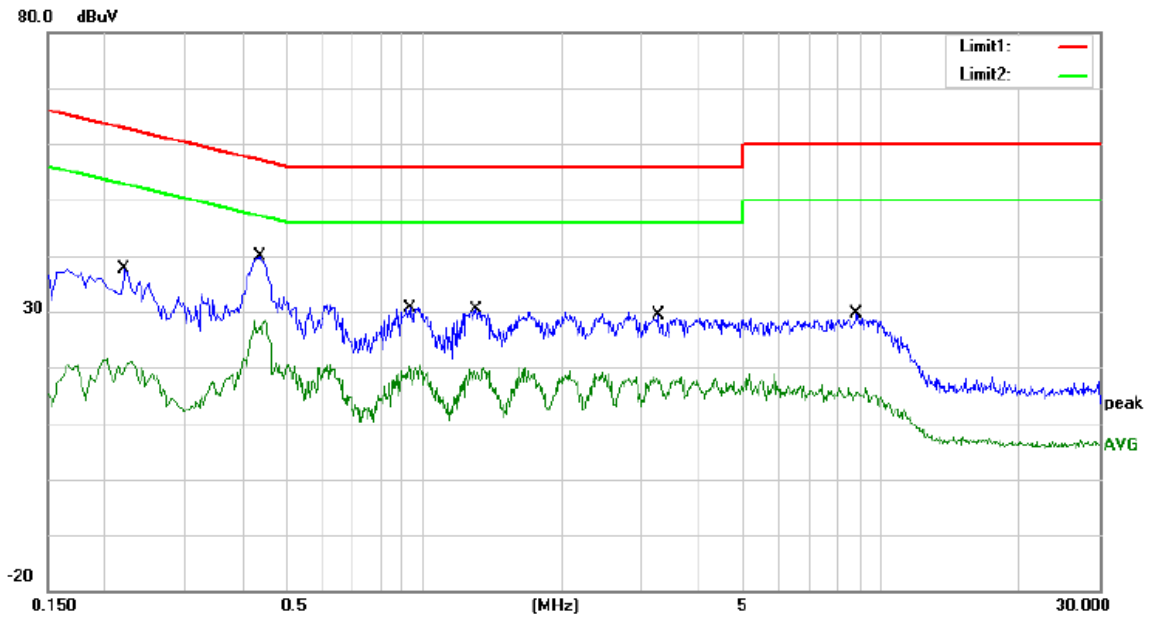
The EUT was placed on a table which is 0.8m above ground plane.  
 Maximum procedure was performed on the highest emissions to ensure EUT compliance.  
 Repeat above procedures until all frequency measured were complete.

**8.4.5 Test Results**

Pass

We test the EUT at 120V and 240V, and show the worst result as bellow.

For Adapter1



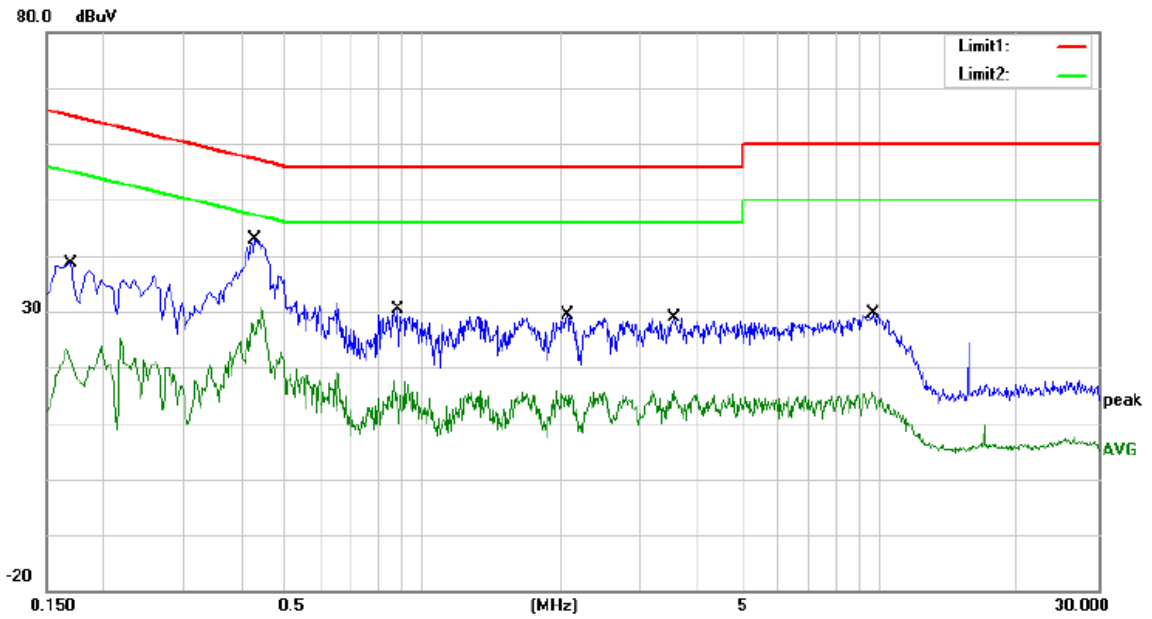
Site Conduction #1  
 Limit: (CE)FCC PART 15 class B\_QP  
 Mode: 908.42MHz  
 Note:

Phase: **N**  
 Power: AC 120V/60Hz

Temperature: 24.9  
 Humidity: 54 %

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.2220	27.95	9.56	37.51	62.74	-25.23	QP	
2		0.2220	11.95	9.56	21.51	52.74	-31.23	AVG	
3	*	0.4380	30.31	9.57	39.88	57.10	-17.22	QP	
4		0.4380	18.72	9.57	28.29	47.10	-18.81	AVG	
5		0.9300	21.05	9.59	30.64	56.00	-25.36	QP	
6		0.9300	10.69	9.59	20.28	46.00	-25.72	AVG	
7		1.3020	20.80	9.60	30.40	56.00	-25.60	QP	
8		1.3020	10.23	9.60	19.83	46.00	-26.17	AVG	
9		3.2420	19.63	9.63	29.26	56.00	-26.74	QP	
10		3.2420	8.46	9.63	18.09	46.00	-27.91	AVG	
11		8.8340	19.88	9.76	29.64	60.00	-30.36	QP	
12		8.8340	6.64	9.76	16.40	50.00	-33.60	AVG	

\*:Maximum data    x:Over limit    !:over margin    Comment: Factor build in receiver.    Operator:KK



Site Conduction #1 Phase: **L1** Temperature: 24.9  
 Limit: (CE)FCC PART 15 class B\_QP Power: AC 120V/60Hz Humidity: 54 %  
 Mode: 908.42MHz  
 Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.1700	29.08	9.56	38.64	64.96	-26.32	QP	
2		0.1700	13.79	9.56	23.35	54.96	-31.61	AVG	
3	*	0.4300	33.31	9.57	42.88	57.25	-14.37	QP	
4		0.4300	18.94	9.57	28.51	47.25	-18.74	AVG	
5		0.8820	20.73	9.59	30.32	56.00	-25.68	QP	
6		0.8820	8.15	9.59	17.74	46.00	-28.26	AVG	
7		2.0740	19.70	9.61	29.31	56.00	-26.69	QP	
8		2.0740	6.19	9.61	15.80	46.00	-30.20	AVG	
9		3.5580	19.35	9.63	28.98	56.00	-27.02	QP	
10		3.5580	6.34	9.63	15.97	46.00	-30.03	AVG	
11		9.6740	19.91	9.78	29.69	60.00	-30.31	QP	
12		9.6740	5.73	9.78	15.51	50.00	-34.49	AVG	

!:Maximum data x:Over limit !:over margin Comment: Factor build in receiver. Operator:KK



**8.5 ANTENNA APPLICATION**

**8.5.1 Antenna Requirement**

Standard	Requirement
FCC CRF Part 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 jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213, §15.217, §15.219, or §15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

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.

**8.5.2 Result**

PASS.

The EUT has 1 antenna: a monopole antenna 1dBi for Z-WAVE.

- Note:
- Antenna use a permanently attached antenna which is not replaceable.
  - Not using a standard antenna jack or electrical connector for antenna replacement
  - The antenna has to be professionally installed (please provide method of installation)

which in accordance to section 15.203, please refer to the internal photos.

**9 PHOTOS OF TEST SETUP**

- For Conducted Emission



■ For Radiated Spurious Emission



**10 PHOTOS OF THE EUT**



Adapter 1

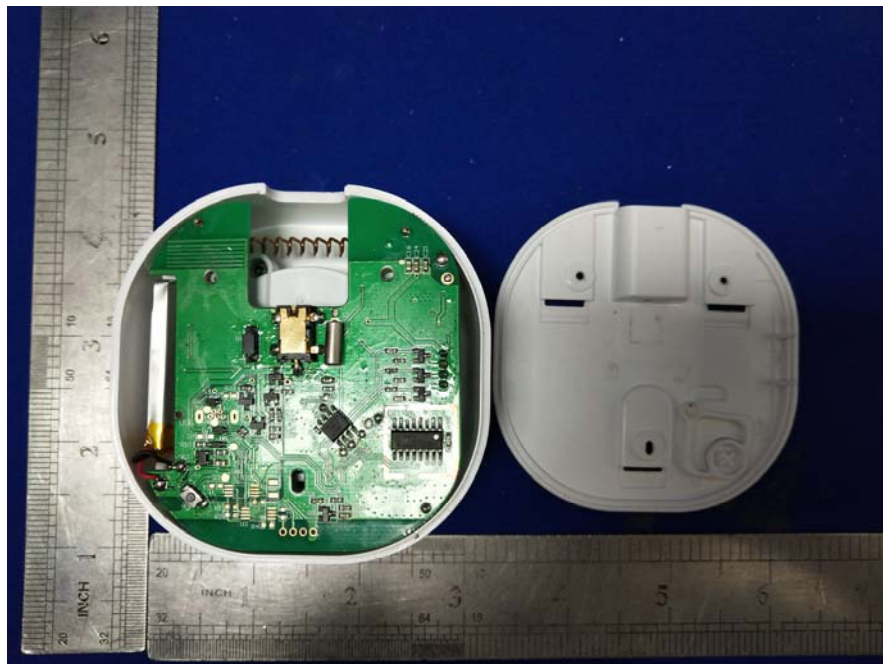
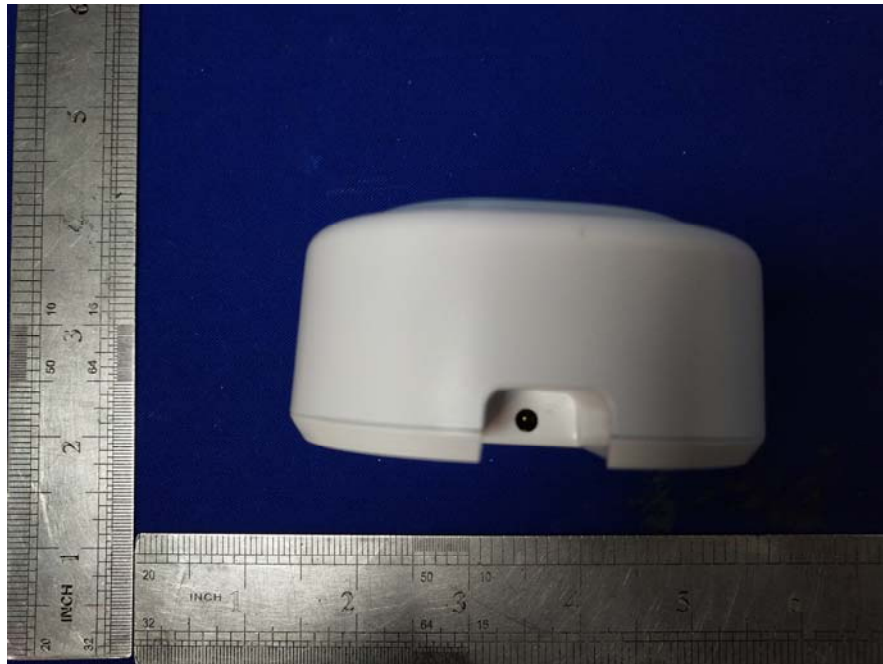


Adapter2

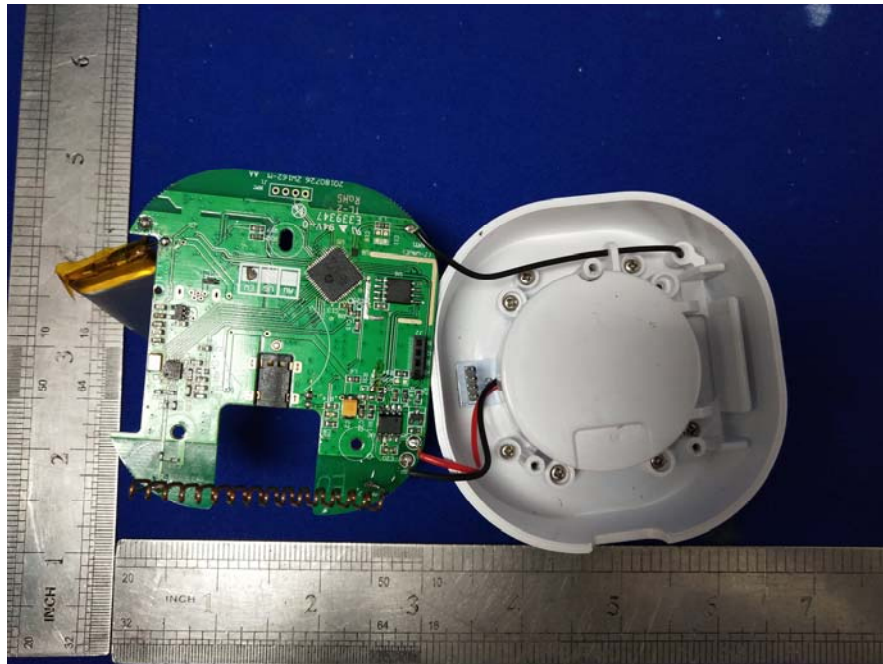






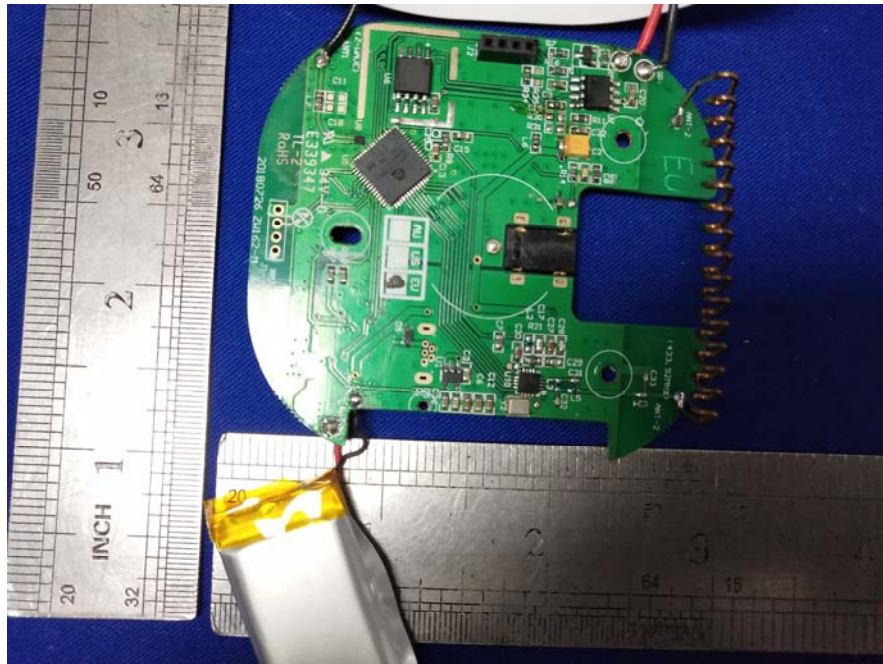


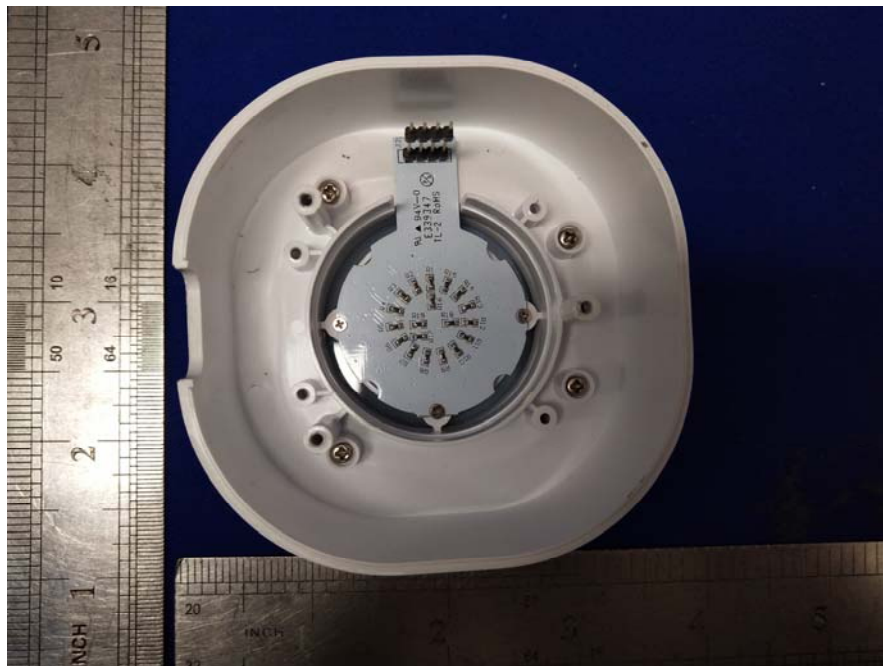
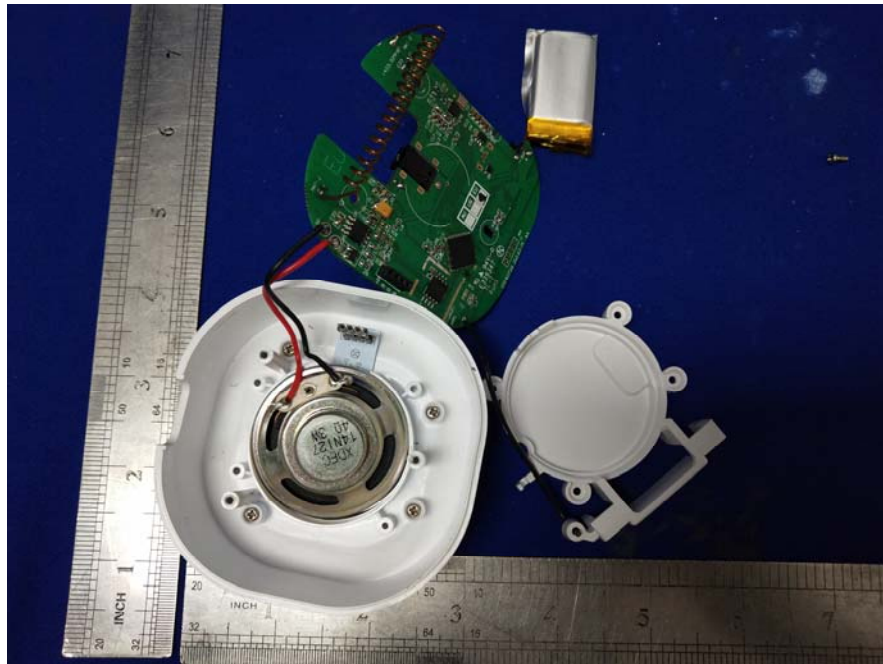




Z-wave Antenna









-----THE END-----