
FCC Part 90 Rules Test Report

Report No.: AGC03772170501FE10

FCC ID : TZ9SMM-107AV12
BRAND NAME : Singing Machine
MODEL NAME : SMM107A
CLIENT : Seatune Electronics Co.,Ltd.
DATE OF ISSUE : Jun, 02,2017
STANDARD(S) : FCC Part 90 Rules
REPORT VERSION : V 1.0

Attestation of Global Compliance (Shenzhen) Co., Ltd



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Report Revise Record

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	Jun, 02,2017	Valid	Original Report

VERIFICATION OF COMPLIANCE

Applicant:	Seatune Electronics Co., Ltd
	No.27, Shuikou Avenue, Shuikou Town, Huizhou, Guangdong, China
Manufacturer:	Seatune Electronics Co., Ltd
	No.27, Shuikou Avenue, Shuikou Town, Huizhou, Guangdong, China
Product Designation:	Wireless Microphone
Brand Name:	Singing Machine
Test Model	SMM107A
Date of Test:	May.25, 2017 to Jun, 02, 2017

WE HEREBY CERTIFY THAT:

The above equipment was tested by Dongguan Precise Testing Service Co., Ltd. The data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in TIA/EIA 603. The sample tested as described in this report is in compliance with the FCC Rules Part 90 requirements

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

Tested by



Steven Zhou(Zhou Pengyun) Jun, 02, 2017

Reviewed by



Bart Xie(Xie Xiaobin) Jun, 02, 2017

Approved by



Solger Zhang(Zhang Hongyi)
Authorized Officer Jun, 02, 2017

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1. GENERAL INFORMATION

1.1 PRODUCT DESCRIPTION

A major technical description of EUT is described as following:

Hardware Version	V1.2
Software Version	V1.0
Modulation	FM
Emission Bandwidth	12.86KHz
Maximum Transmitter Power	-7.03 dBm
Antenna Designation	PCB Antenna
Power Supply	DC 9V (by battery)
Limiting Voltage	DC 3.06 V-4.14 V
Operation Frequency	171.905 MHz
Frequency Tolerance	1.074

1.2 RELATED SUBMITTAL(S) / GRANT (S)

This submittal(s) (test report) is intended for FCC ID: TZ9SMM-107AV12, filing to comply with the FCC Part 90 requirements.

1.3 TEST METHODOLOGY.

The radiated emission testing was performed according to the procedures of TIA/EIA 603.

1.4 TEST FACILITY

Site	Dongguan Precise Testing Service Co., Ltd.
Location	Building D, Baoding Technology Park, Guangming Road2, Dongcheng District, Dongguan, Guangdong, China.
Description	The test site is constructed and calibrated to meet the FCC requirements in documents TIA/EIA 603
FCC Registration No.	371540

1.5 SPECIAL ACCESSORIES

Not available for this EUT intended for grant.

1.6 EQUIPMENT MODIFICATIONS

Not available for this EUT intended for grant.

2. SYSTEM TEST CONFIGURATION

2.1 EUT CONFIGURATION

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

2.2 EUT EXERCISE

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

2.4 CONFIGURATION OF TESTED SYSTEM

Fig. 2-1 Configuration of Tested System



Table 2-1 Equipment Used in Tested System

Item	Equipment	Model No.	Identifier	Note
1	Wireless Microphone	SMM107A	FCC ID: TZ9SMM-107AV12	EUT

3. SUMMARY OF TEST RESULTS

FCC Rules	Description Of Test	Result
§90.265(b)	Frequency stability	Compliant
§90.265(b)	Occupied Bandwidth	Compliant
FCC PART 2 §2.1047	Modulation Characteristic	Compliant
§90.265(b)	Output Power	Compliant
§90.217	Radiated Spurious Emission	Compliant

LIST OF EQUIPMENTS USED

NAME OF EQUIPMENT	MANUFACTURER	MODEL	SERIAL NO.	Cal. Date	Cal. Due
CLIMATE CHAMBER	EXPERY	TN-400	TN2007SR038	2016.07.02	2017.07.01
DC POWER SUPPLY	ZHAOXIN	RXN-605D	N/A	2016.07.02	2017.07.01
MODULATION ANALYZER	HP	8920B	3104A03367	2016.07.02	2017.07.01
SIGNAL GENERATOR	AGILENT	E4421B	122501288	2016.07.03	2017.07.02
SIGNAL GENERATOR	R&S	SMT03	A0304261	2016.07.03	2017.07.02
EMI Test Receiver	Rohde & Schwarz	ESCI	101417	2016.07.03	2017.07.02
Trilog Broadband Antenna	SCHWARZBECK	VULB9160	9160-3355	2016.07.03	2017.07.02
Substitution Antenna	SCHWARZBECK	VULB9160	9168-494	2016.07.03	2017.07.02
Signal Amplifier	SCHWARZBECK	BBV 9475	9745-0013	2016.07.03	2017.07.02
RF Cable	SCHWARZBECK	AK9515E	96221	2016.07.03	2017.07.02
3m Anechoic Chamber	CHENGYU	966	PTS-001	2016.06.03	2017.06.02
MULTI-DEVICE Positioning Controller	Max-Full	MF-7802	MF780208339	N/A	N/A
Active loop antenna (9K-30MHz)	Schwarzbeck	FMZB1519	1519-038	2016.06.03	2017.06.02
Spectrum analyzer	Agilent	E4407B	MY46185649	2016.06.03	2017.06.02
Double-Ridged Waveguide Horn	ETS LINDGREN	3117	00034609	2016.06.03	2017.06.02
Substitution ANTENNA	EM	EM-AH-10180	67	2016.06.03	2017.06.02
EMI Test Receiver	Rohde & Schwarz	ESCI	101417	2016.06.03	2017.06.02
RF Cable	SCHWARZBECK	AK9515E	96222	2016.06.03	2017.06.02
Shielded Room	CHENGYU	843	PTS-002	2016.06.03	2017.06.02

Note: 8920B can generate audio modulation frequency.

4. DESCRIPTION OF TEST MODES

RF TEST MODES

The EUT has been tested under normal operating condition.

Note: Only the result of the worst case was recorded in the report.

5. FREQUENCY TOLERANCE

5.1 PROVISIONS APPLICABLE

- a). According to FCC Part 2 Section 2.1055(a)(1), the frequency stability shall be measured with variation of ambient temperature from -30°C to $+50^{\circ}\text{C}$ centigrade.
- b). According to FCC Part 2 Section 2.1055(d)(2), for battery powered equipment, the frequency stability shall be measured with reducing primary supply voltage to the battery operating end point, which is specified by the manufacturer.
- c). According to §90.265, wireless microphone shall be within a frequency stability of $\pm 32.5\text{kHz}$.

5.2 MEASUREMENT PROCEDURE

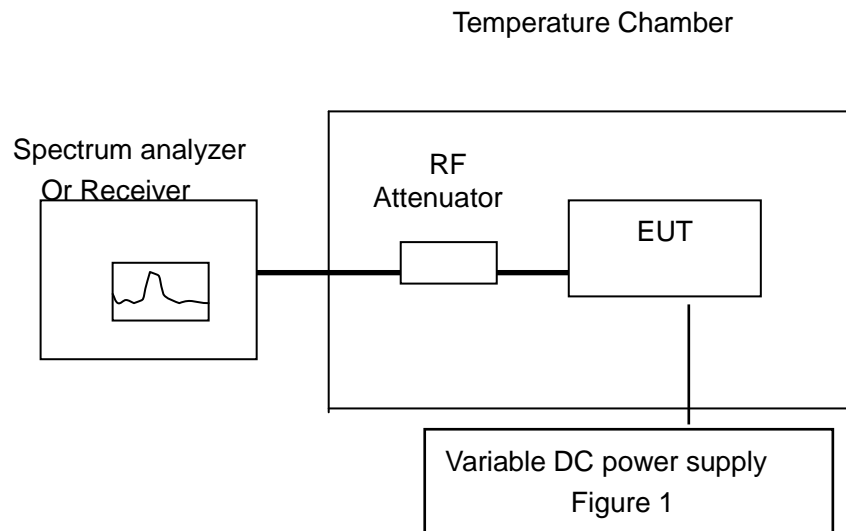
5.2.1 Frequency stability versus environmental temperature

1. Setup the configuration per figure 1 for frequencies measurement inside an environment chamber, Install new battery in the EUT.
2. Turn on EUT and set SA center frequency to the EUT radiated frequency. Set SA Resolution Bandwidth to 1KHz and Video Resolution Bandwidth to 1KHz and Frequency Span to 50KHz. Record this frequency as reference frequency.
3. Set the temperature of chamber to 50°C . Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize. While maintaining a constant temperature inside the chamber, turn the EUT on and measure the EUT operating frequency.
4. Repeat step 2 with a 10°C decreased per stage until the lowest temperature -30°C is measured, record all measured frequencies on each temperature step.

5.2.2 Frequency stability versus input voltage

1. Setup the configuration per figure 1 for frequencies measured at temperature if it is within 15°C to 25°C . Otherwise, an environment chamber set for a temperature of 20°C shall be used. The EUT shall be powered by DC 9.0V.
2. Set SA center frequency to the EUT radiated frequency. Set SA Resolution Bandwidth to 1 KHz and Video Resolution Bandwidth to 1KHz. Record this frequency as reference frequency.
3. Supply the EUT primary voltage at the operating end point which is specified by manufacturer and record the frequency.

5.3 TEST SETUP BLOCK DIAGRAM



5.4 TEST RESULT

(1) Frequency stability versus input voltage (Supply nominal voltage is 3.60V)

Environment Temperature(℃)	Power Supply (V)	Reference Frequency(171.905MHz) kHz	Limit: kHz
50	DC 9.0 V	-2.3	±32.5
40	DC 9.0 V	-1.8	
30	DC 9.0 V	-1.2	
20	DC 9.0 V	-0.5	
10	DC 9.0 V	-0.2	
0	DC 9.0 V	0.4	
-10	DC 9.0 V	0.8	
-20	DC 9.0 V	1.0	
-30	DC 9.0 V	0.5	
Result	Pass		

Environment	Power Supply	Reference Frequency(171.905MHz)	Limit:
Temperature(°C)	(V)	kHz	kHz
20	DC 9.0 V	-1.9	±32.5
20	DC 8.5 V	-2.0	
20	DC 8.0 V	-2.3	
20	DC 7.5 V	-2.2	
20	DC 7.0 V	-2.1	
20	DC 6.5 V	-2.3	
20	DC 6.0 V	-2.5	
20	DC 5.5 V	-2.7	
Result	Pass		

Note: Battery end point is DC 5.4V.

6. EMISSION BANDWIDTH

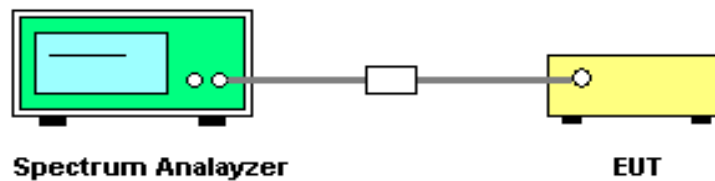
6.1 PROVISIONS APPLICABLE

Occupied Bandwidth: The EUT was connected to the audio signal generator and the spectrum analyzer via the main RF connector, and through an appropriate attenuator. The EUT was controlled to transmit its maximum power. Then the bandwidth of 99% power can be measured by the spectrum analyzer.

6.2 MEASUREMENT PROCEDURE

- 1). The EUT was placed on a turn table which is 0.8m above ground plane.
- 2). The EUT was modulated by 2.5 KHz Sine wave audio signal, The level of the audio signal employed is 16 dB greater than that necessary to produce 50% of rated system deviation. Rated system deviation is 2.5 kHz (12.5 kHz channel spacing).
- 3). Set SPA Center Frequency = fundamental frequency, RBW=100Hz, VBW= 300 Hz, Span =50 KHz.
- 4). Set SPA Max hold. Mark peak, -20 dB.

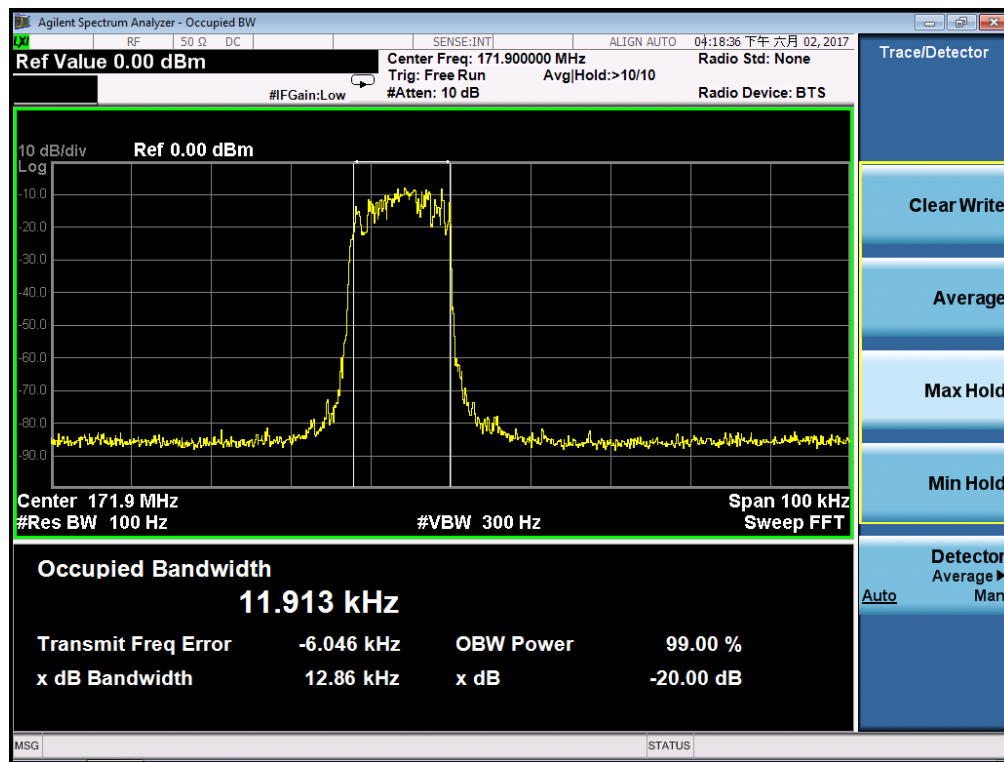
6.3 TEST SETUP BLOCK DIAGRAM



6.4 MEASUREMENT RESULT

20 dB Bandwidth Measurement Result		
Operating Frequency	25 KHz Channel Separation	
	Test Data	Result
171.905MHz	12.86KHz	Pass

Occupied bandwidth of Bottom Channel (Maximum)



7. UNWANTED RADIATION

7.1 PROVISIONS APPLICABLE

For transmitters designed to operate with a 12.5 kHz channel bandwidth, any emission must be attenuated below the power (P) of the highest emission contained within the authorized bandwidth as follows:

- (1). On any frequency removed from the center of the authorized bandwidth f_0 to 5.625 KHz removed from f_0 : Zero dB.
- (2). On any frequency removed from the center of the authorized bandwidth by a displacement Frequency (f_d in KHz) f_0 of more than 5.625 KHz but no more than 12.5 KHz: At least $7.27(f_d - 2.88 \text{ KHz})$ dB
- (3). On any frequency removed from the center of the authorized bandwidth by a displacement Frequency (f_d in KHz) f_0 of more than 12.5 KHz: At least $50 + 10 \log(P)$ dB or 70 dB, whichever is lesser attenuation.

7.2 MEASUREMENT PROCEDURE

- (1) On a test site, the EUT shall be placed on a turntable, and in the position closest to the normal use as declared by the user.
- (2) The test antenna shall be oriented initially for vertical polarization located 3m from the EUT to correspond to the transmitter.
- (3) The output of the antenna shall be connected to the measuring receiver and either a peak or quasi-peak detector was used for the measurement as indicated on the report. The detector selection is based on how close the emission level was approaching the limit.
- (4) The transmitter shall be switched on; if possible, without the modulation and the measurement receiver shall be tuned to the frequency of the transmitter under test.
- (5) The test antenna shall be raised and lowered through the specified range of height until the measuring receiver detects a maximum signal level.
- (6) The transmitter shall then be rotated through 360° in the horizontal plane, until the maximum signal level is detected by the measuring receiver.
- (7) The test antenna shall be raised and lowered again through the specified range of height until the measuring receiver detects a maximum signal level.
- (8) The maximum signal level detected by the measuring receiver shall be noted.
- (9) The measurement shall be repeated with the test antenna set to horizontal polarization.
- (10) Replace the antenna with a proper Antenna (substitution antenna).
- (11) The substitution antenna shall be oriented for vertical polarization and, if necessary, the length of the substitution antenna shall be adjusted to correspond to the frequency of transmitting.
- (12) The substitution antenna shall be connected to a calibrated signal generator.
- (13) If necessary, the input attenuator setting of the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.

(14) The test antenna shall be raised and lowered through the specified range of the height to ensure that the maximum signal is received.

(15) The input signal to substitution antenna shall be adjusted to the level that produces a level detected by the measuring receiver, that is equal to the level noted while the transmitter radiated power was measured, corrected for the change of input attenuation setting of the measuring receiver.

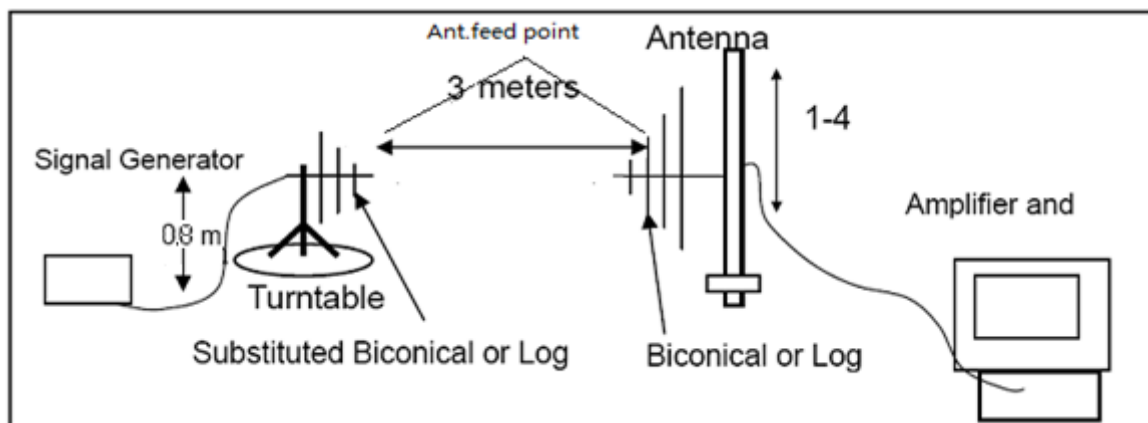
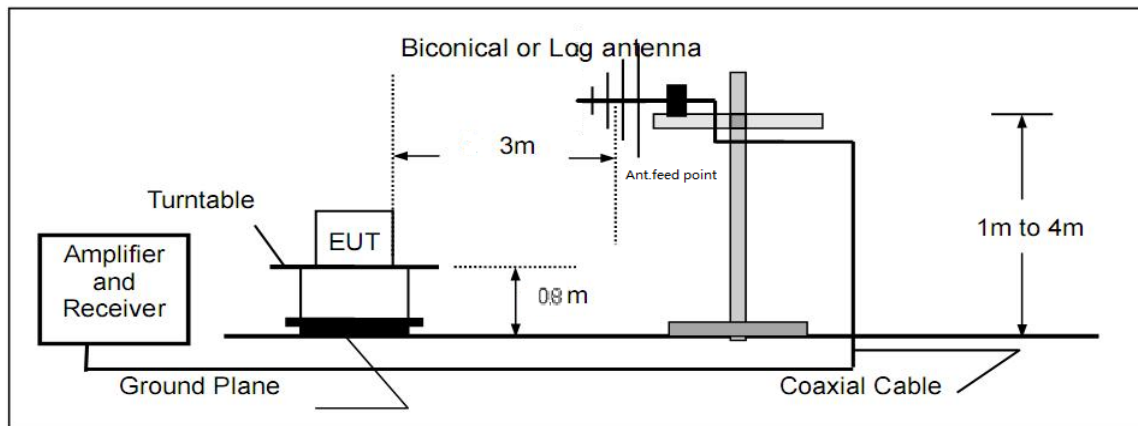
(16) The input level to the substitution antenna shall be recorded as power level in dBm, corrected for any change of input attenuator setting of the measuring receiver.

(17) The measurement shall be repeated with the test antenna and the substitution antenna oriented for horizontal polarization.

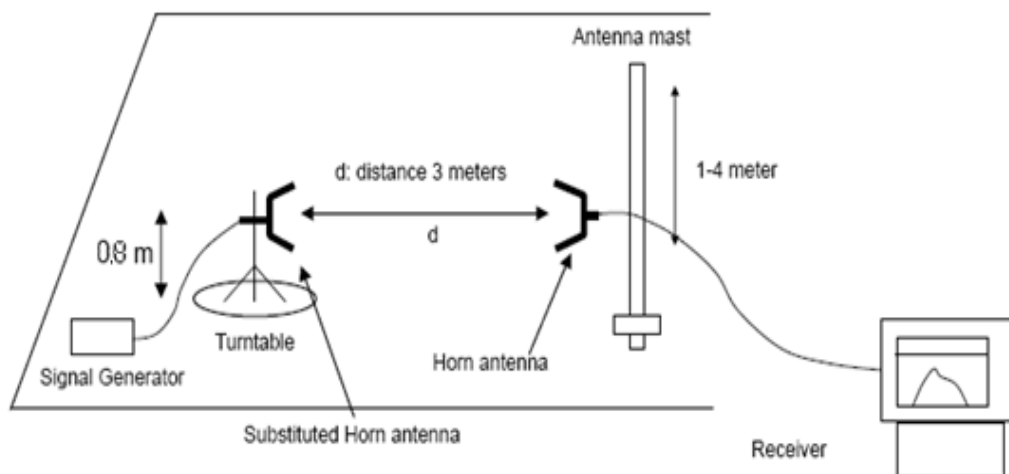
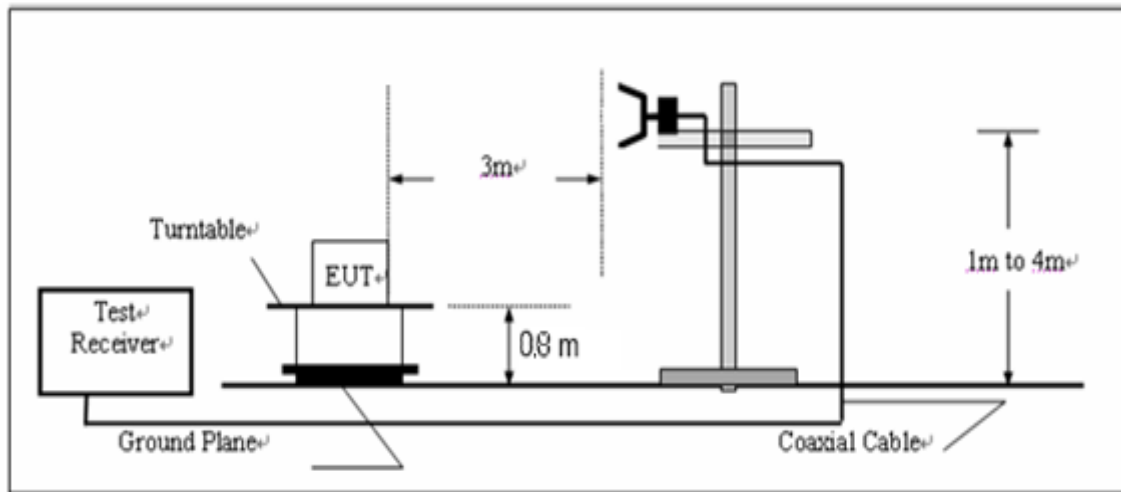
7.3 TEST SETUP BLOCK DIAGRAM

SUBSTITUTION METHOD: (Radiated Emissions)

Radiated Below 1GHz



Radiated Above 1 GHz



7.4 MEASUREMENT RESULTS:

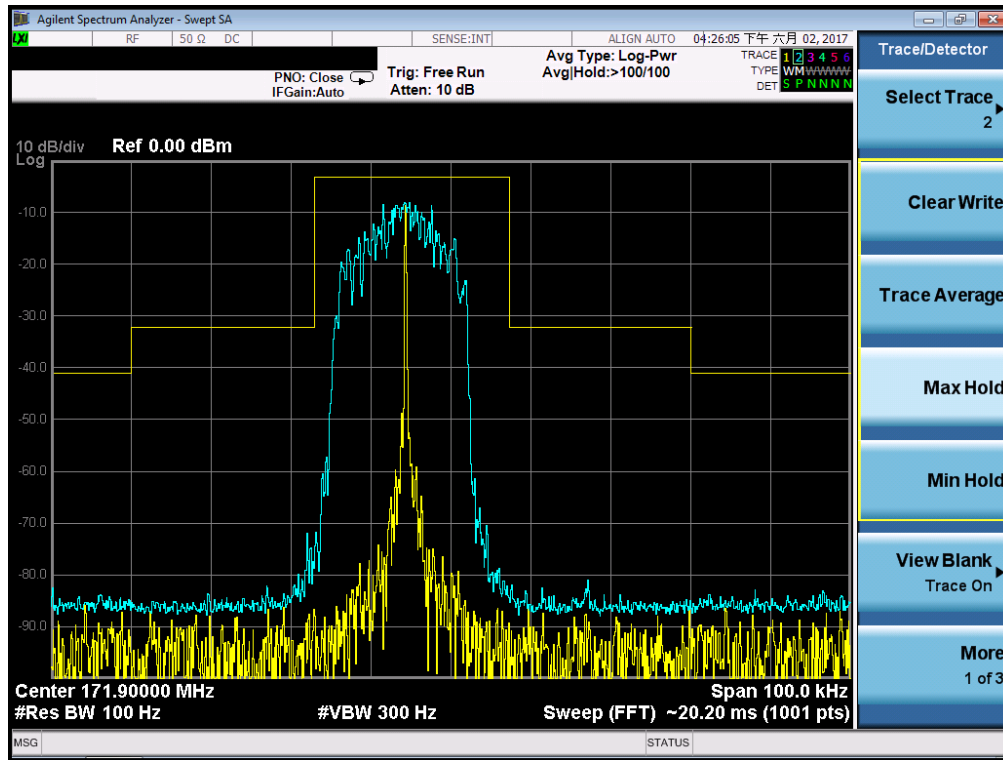
Frequency(TX)	polarity	Result(dBm)	Limit(dBm)	Margin(dB)
343.81	H	-59.82	-57	2.82
343.81	V	-58.16	-57	1.16
515.72	H	-62.15	-57	5.15
515.72	V	-62.03	-57	5.03

RESULT: PASS

7.5 EMISSION MASK PLOT

The detailed procedure employed for Emission Mask measurements are specified as following:

The Worst Emission Mask for 25 KHz channel Separation



8. MAXIMUM TRANSMITTER POWER

8.1 PROVISIONS APPLICABLE

Per FCC §2.1046 and §90.265: Maximum power shall not exceed 50mW

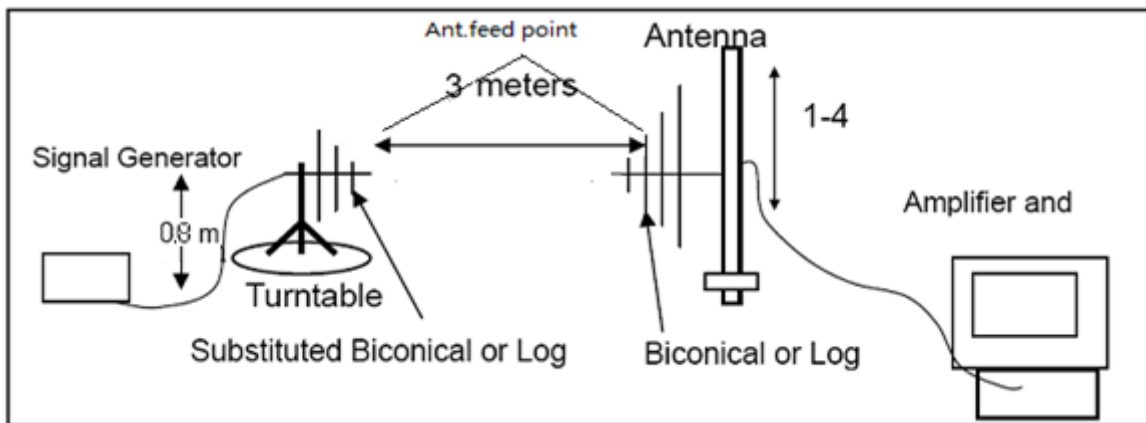
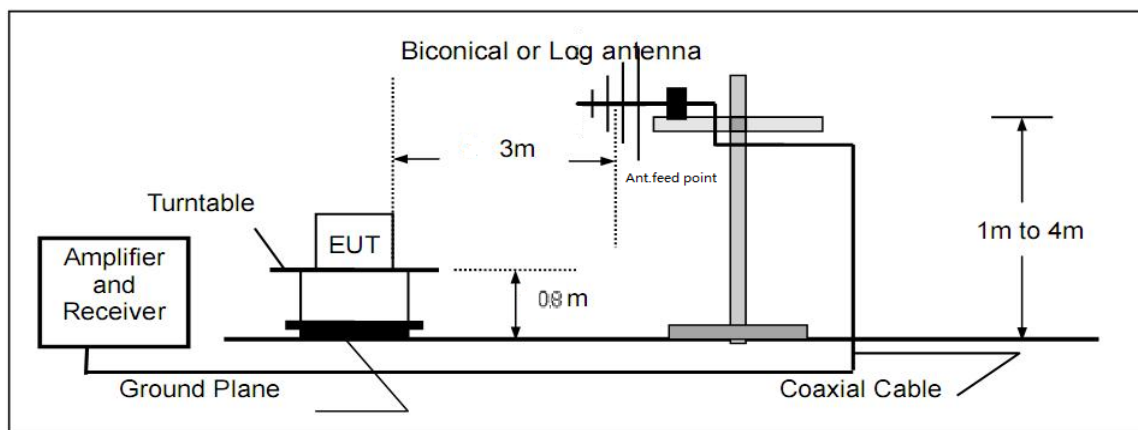
8.2 TEST PROCEDURE

The RF output of Two-way Radio was conducted to a spectrum analyzer through an appropriate attenuator.

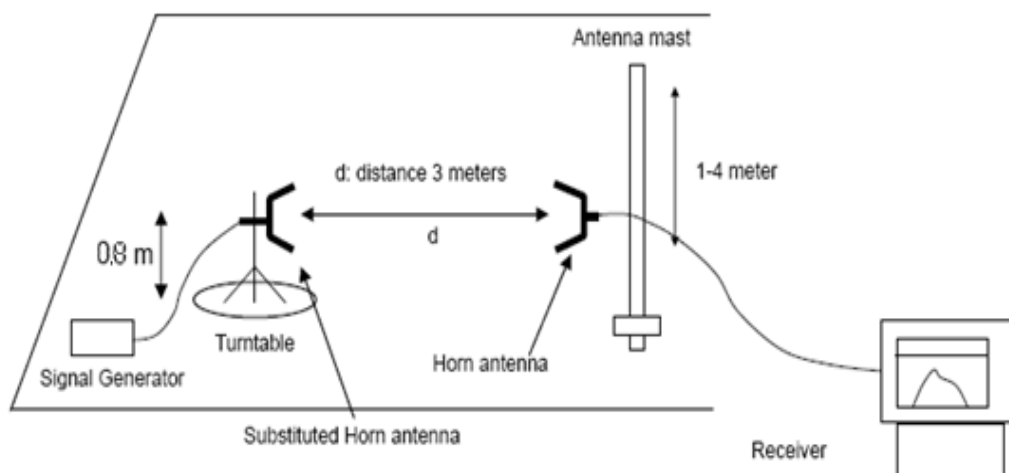
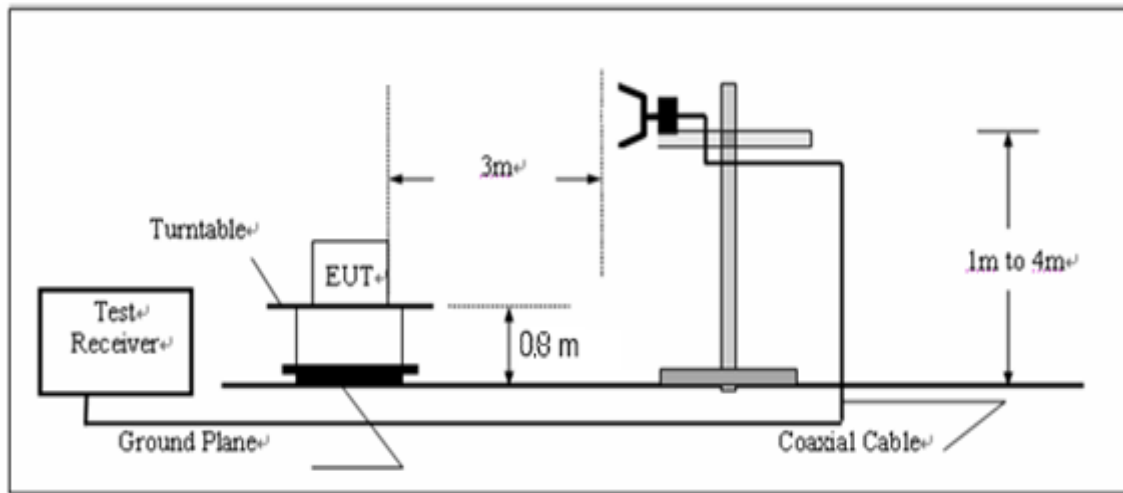
8.3 TEST CONFIGURATION

Effective Radiated Power

Radiated Below 1GHz



Radiated Above 1 GHz



8.4 TEST RESULT

Carrier Frequency	Test Result(dBm)	Test Result(mW)	Limit(mW)
171.905 MHz	-7.03	0.20	50

9. MODULATION CHARACTERISTICS

9.1 PROVISIONS APPLICABLE

According to CFR 47 section 2.1047(a), for Voice Modulation Communication Equipment, the frequency response of the audio modulation circuit over a range of 100 to 5000Hz shall be measured.

9.2 MEASUREMENT METHOD

9.2.1 Modulation Limit

- (1). Configure the EUT as shown in figure 1, adjust the audio input for 60% of rated system deviation at 1KHz using this level as a reference (0dB) and vary the input level from -20 to +20dB. Record the frequency deviation obtained as a function of the input level.
- (2). Repeat step 1 with input frequency changing to 300, 1000, 3000 and 15000 kHz in sequence.

9.2.2 Audio Frequency Response

- (1). Configure the EUT as shown in figure 1.
- (2). Adjust the audio input for 20% of rated system deviation at 1 KHz using this level as a reference (0 dB).
- (3). Vary the Audio frequency from 100 Hz to 10 KHz and record the frequency deviation.
- (4). Audio Frequency Response = $20\log_{10} (\text{Deviation of test frequency} / \text{Deviation of 1 KHz reference})$.

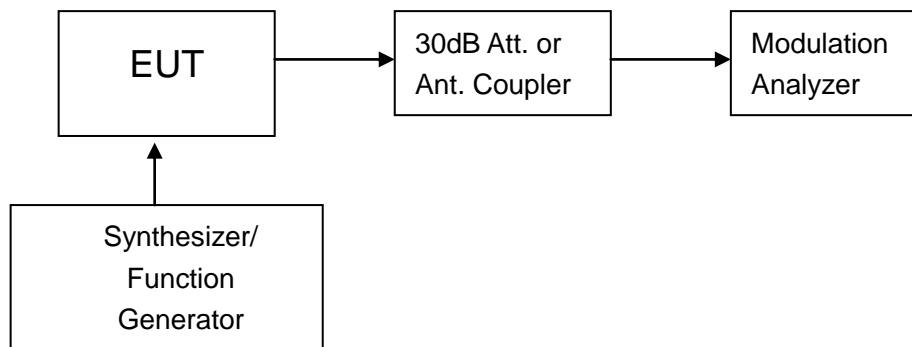


Figure 1: Modulation characteristic measurement configuration

9.3 MEASUREMENT RESULT

(A). MODULATION LIMIT

Modulation Level (dB)	Peak Freq. Deviation At 300 Hz	Peak Freq. Deviation At 1000 Hz	Peak Freq. Deviation At 3000 Hz	Peak Freq. Deviation At 15000 Hz
-20	1.3	1.5	2.3	0.8
-15	3.1	4.8	5.3	0.6
-10	4.2	5.2	25.6	1.3
-5	5.2	8.3	15.3	2.3
0	10.3	11.2	20.6	9.2
+5	16.3	23.6	16.2	4.3
+10	32.5	31.6	13.6	2.1
+15	41.5	33.6	9.6	1.9
+20	52.6	38.2	11.3	3.1

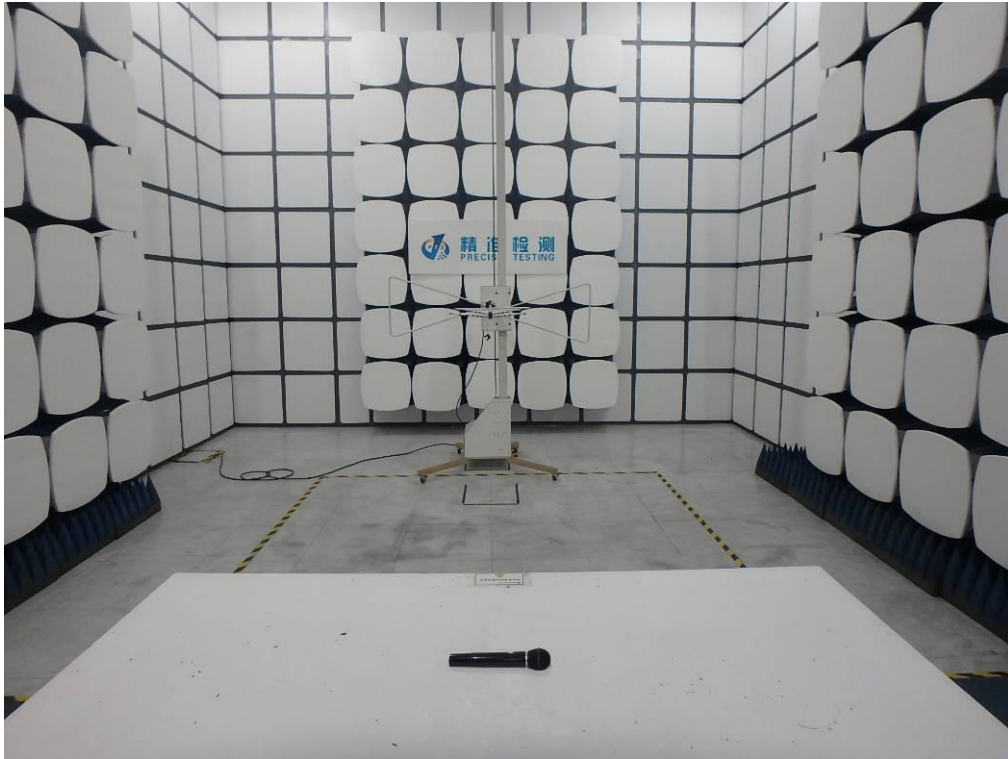
(B). AUDIO FREQUENCY RESPONSE:

Frequency (Hz)	Audio Frequency Response(dB)
100	-2.13
200	-0.81
300	-0.79
400	-0.77
500	-0.68
600	-0.53
700	-0.51
800	-0.46
900	-0.32
1000	0.13
1600	1.26
2000	3.09
2500	4.16
4000	6.11
4500	4.61
5000	8.16
6000	6.92
7000	1.26
9000	0.36
10000	-1.26
14000	-11.36
15000	-16.03

(B). AUDIO LOW-PASS FILTER RESPONSE:

Frequency (Hz)	Audio Low-pass(dB)
1000	0
2000	-0.21
3000	-4.15
5000	-6.85
8000	-9.62
10000	-8.52
12000	-17.62
15000	-25.26

APPENDIX I: PHOTOGRAPHS OF SETUP
RADIATED EMISSION TEST SETUP



APPENDIX II: EXTERNAL VIEW OF EUT
TOP VIEW OF EUT



BOTTOM VIEW OF EUT



FRONT VIEW OF EUT



BACK VIEW OF EUT



LEFT VIEW OF EUT



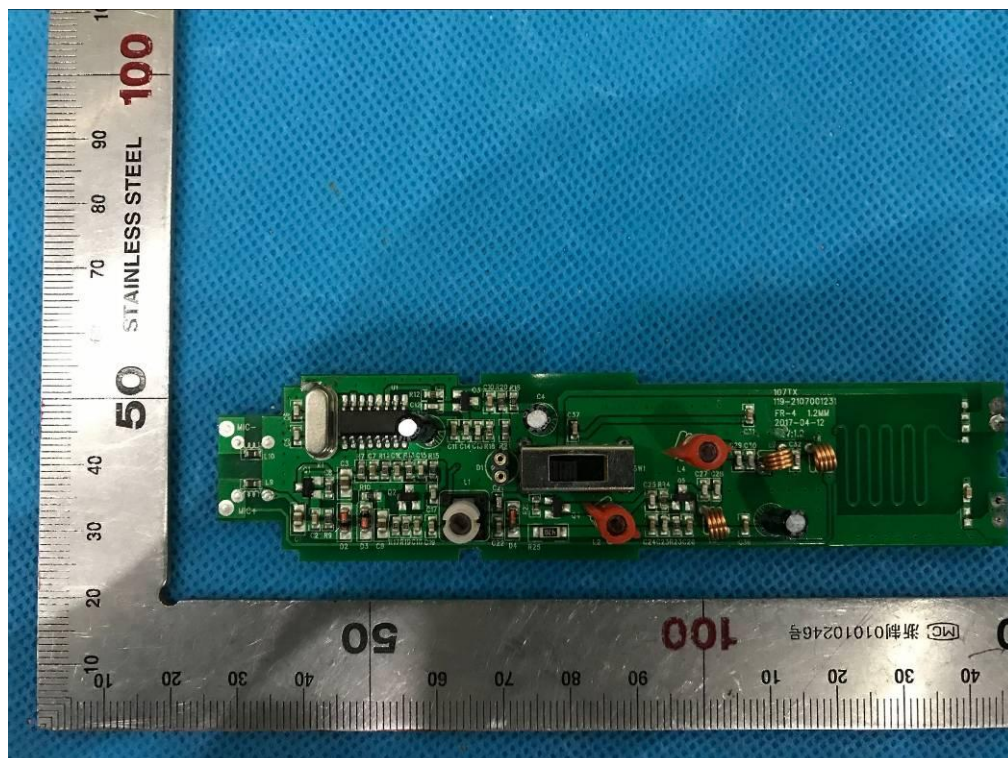
RIGHT VIEW OF EUT



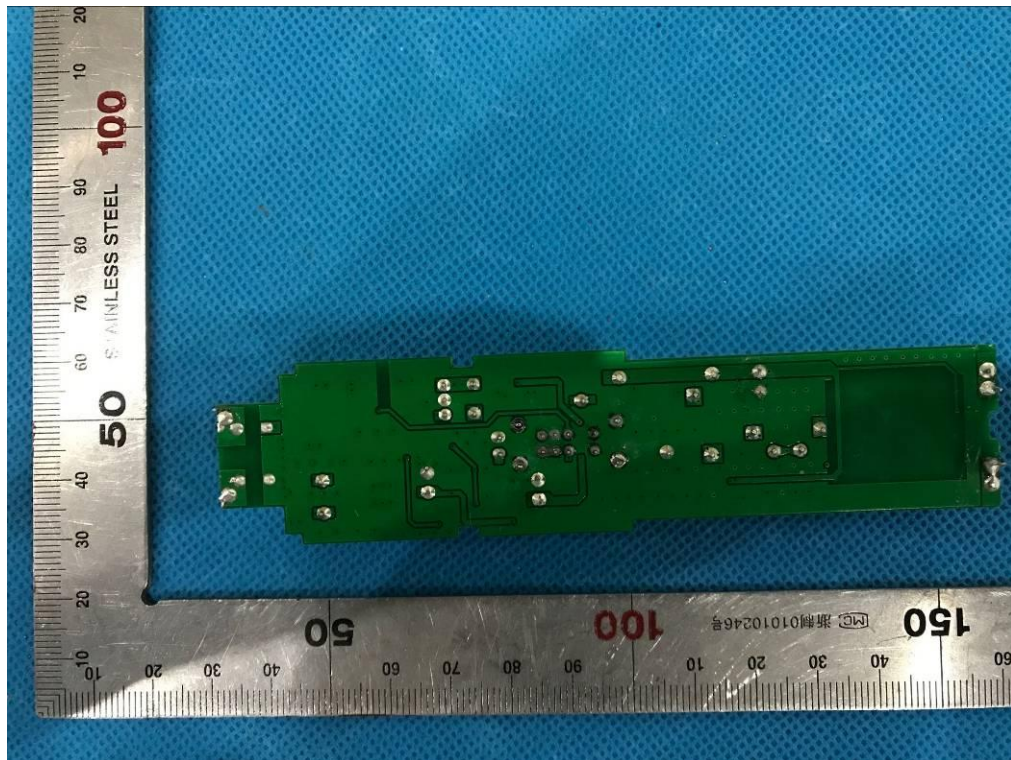
OPEN VIEW-1 OF EUT



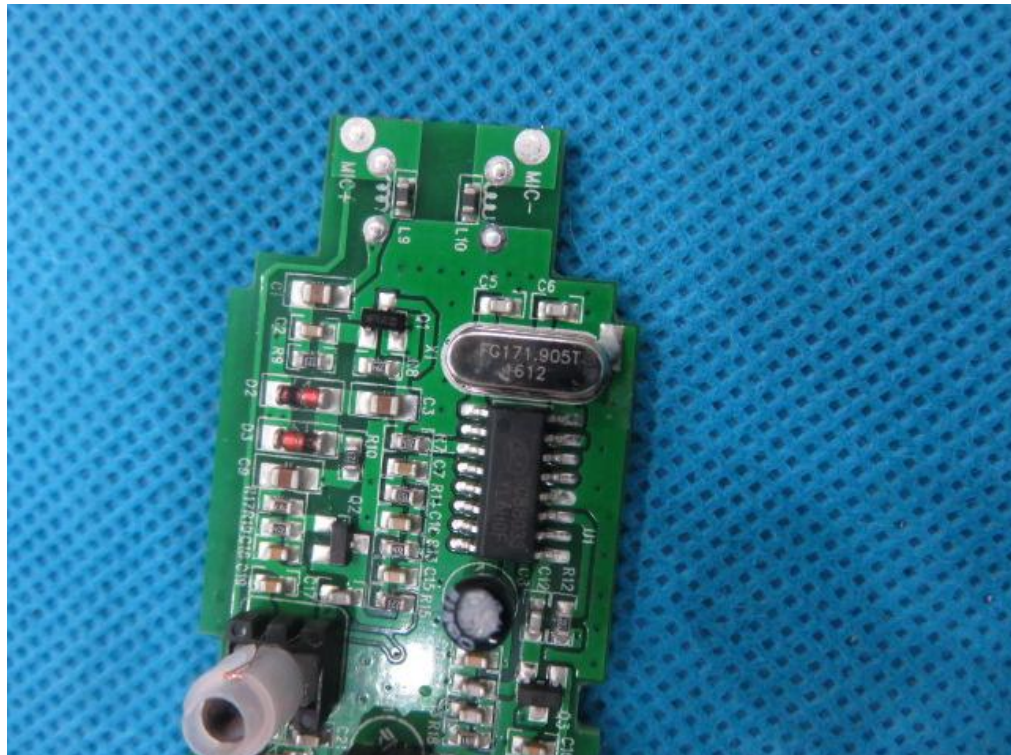
INTERNAL VIEW-1 OF EUT



INTERNAL VIEW-2 OF EUT



INTERNAL VIEW-3 OF EUT



----END OF REPORT----