



FCC PART 90 SUBPART C TEST REPORT

FCC PART 95

Report Reference No.....: HK1906041542E

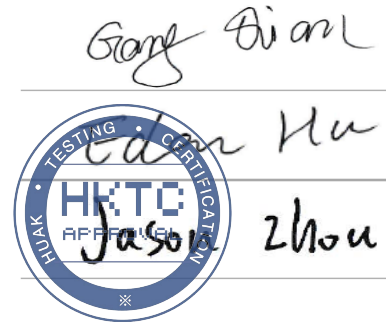
FCC ID.....: 2AONLML-339

Compiled by
(position+printed name+signature)..: Testing Engineer
Gary Qian

Supervised by
(position+printed name+signature)..: Technical Manager
Eden Hu

Approved by
(position+printed name+signature)..: Authorized Signatory
Jason Zhou

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Representative Laboratory Name : Shenzhen HUAK Testing Technology Co., Ltd.

Address: 1F, B2 Building, Junfeng Zhongcheng Zhizao Innovation Park,
Fuhai Street, Bao'an District, Shenzhen City, China

Testing Laboratory Name

Address: 1F, B2 Building, Junfeng Zhongcheng Zhizao Innovation Park,
Fuhai Street, Bao'an District, Shenzhen City, China

Applicant's name.....: Dongguan Mingliang Electronic Technology Co., Ltd

Address: NO. 34, Ludong avenue, Humen Town, Dongguan city, China

Test specification

Standard: **FCC Part 95**

TRF Originator.....: Shenzhen HUAK Testing Technology Co., Ltd.

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Test item description: Walkie-talkie

Trade Mark: N/A

Manufacturer.....: Dongguan Mingliang Electronic Technology Co., Ltd

Model/Type reference.....: ML-339

Listed Models: ML-339, ML-686, ML-668, ML-336, T-388, ML-628

Modulation Type: FM

Operation Frequency.....: 462.5500MHz - 462.7250MHz, 467.5625MHz - 467.7125MHz

Rating: DC 4.50V from Battery

Hardware version: V1.1

Software version: V1.0

Result.....: **PASS**



TEST REPORT

Test Result:	PASS
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The test report merely corresponds to the test sample.

It is not permitted to copy extracts of these test result without the written permission of the test laboratory.



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1 SUMMARY

1.1 TEST STANDARDS

The tests were performed according to following standards:

[FCC Rules Part 95](#): PERSONAL RADIO SERVICES.

[TIA/EIA 603 D:June 2010](#): Land Mobile FM or PM Communications Equipment Measurement and Performance Standards.

[FCC Part 2](#): FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS

[ANSI C63.10:2013](#) : American National Standard for Testing Unlicensed Wireless Devices

[ANSI C63.4: 2014](#) : –American National Standard for Methods of Measurement of Radio-Noise

Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40GHz

1.2 Test Description

Test specification clause	Test case	Verdict
FCC Part 95.567	Maximum Transmitter Power	PASS
FCC Part 2.1047 FCC Part 95.575	Modulation Characteristic	PASS
FCC Part 2.1049	Occupied Bandwidth	PASS
FCC Part 95.573 FCC Part 95.579	Emission Mask	PASS
FCC Part 90.213 FCC Part 95.565	Frequency Stability	PASS
FCC Part 95.579	Transmitter Radiated Spurious Emission	PASS
FCC Part 95.565	Spurious Emission On Antenna Port	PASS



1.3 Test Facility

Shenzhen HUAKE Testing Technology Co., Ltd.

1F, B2 Building, Junfeng Zhongcheng Zhizao Innovation Park, Fuhai Street, Bao'an District, Shenzhen City, China

1.4 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 „Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC

Measurements“ and is documented in the Shenzhen HUAKE Testing Technology Co., Ltd. quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for Shenzhen HUAKE Testing Technology Co., Ltd. is reported

Test Items	Measurement Uncertainty	Notes
Frequency error	25 Hz	(1)
Transmitter power conducted	0.57 dB	(1)
Transmitter power Radiated	2.20 dB	(1)
Adjacent and alternate channel power Conducted	1.20 dB	(1)
Conducted spurious emission 9KHz-12.75 GHz	1.60 dB	(1)
Radiated spurious emission 9KHz-12.75 GHz	2.20 dB	(1)
Intermodulation attenuation	1.00 dB	(1)
Maximum useable receiver sensitivity	2.80 dB	(1)
Co-channel rejection	2.80 dB	(1)
Adjacent channel selectivity	2.80 dB	(1)
Spurious response rejection	2.80 dB	(1)
Intermodulation response rejection	2.80 dB	(1)
Blocking or desensitization	2.80 dB	(1)

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.



2 GENERAL INFORMATION

2.1 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Normal Temperature:	25°C
Relative Humidity:	55 %
Air Pressure:	101 kPa

2.2 General Description of EUT

Name of EUT	Walkie-talkie
Model Number	ML-339, ML-686, ML-668, ML-336, T-388, ML-628
Power Supply	DC 4.50V from battery
Frequency Range	462.5500MHz - 462.7250MHz, 467.5625MHz - 467.7125MHz
Rate Power	0.5W
Modulation Type	FM
Channel Separation	25KHz
Antenna Type	Spring antenna

Note 1: For more details, please refer to the user's manual of the EUT.

2.3 Description of Test Modes and Test Frequency

The EUT has been tested under typical operating condition. As, test modes selected as below by the technical parameters of the EUT:

Operation Mode No.	Modulation	Channel Separation	Condition	
	FM	25KHz	TX	RX
1	☒	☒	☒	
2	☒	☒		☒

Test frequency list:

Modulation Type	Test Channel	Channel Separation	Test Frequency (MHz)
Analog/FM	Ch1	25KHz	462.5625
	Ch2		462.5875
	Ch3		462.6125
	Ch4		462.6375
	Ch5		462.6625
	Ch6		462.6875
	Ch7		462.7125
	Ch8		467.5625
	Ch9		467.5875
	Ch10		467.6125
	Ch11		467.6375
	Ch12		467.6625
	Ch13		467.6875
	Ch14		467.7125
	Ch15		462.5500
	Ch16		462.5750
	Ch17		462.6000
	Ch18		462.6250
	Ch19		462.6500
	Ch20		462.6750
	Ch21		462.7000
	Ch22		462.7250

Note: Gray indicates the channel tested



2.4 Measurement Instruments List

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Due Date
1	Spectrum analyzer	Agilent	N9020A	HKE-048	2018/12/28	2019/12/27
2	Signal generator	Agilent	N5182A	HKE-029	2018/12/28	2019/12/27
3	Signal generator	Agilent	83630A	HKE-028	2018/12/28	2019/12/27
4	RF automatic control unit	Tonscend	JS0806-2	HKE-060	2018/12/28	2019/12/27
5	Power Sensor	Agilent	E9300A	HKE-086	2018/12/28	2019/12/27
6	Spectrum analyzer	R&S	FSP40	HKE-025	2018/12/28	2019/12/27
7	Wireless Communication Test Set	R&S	CMU200	HKE-026	2018/12/28	2019/12/27
8	Wireless Communication Test Set	R&S	CMW500	HKE-027	2018/12/28	2019/12/27
9	RF automatic control unit	Tonscend	JS0806-2	HKE-060	2018/12/28	2019/12/27
10	Broadband antenna	Schwarzbeck	VULB 9163	HKE-012	2018/12/28	2019/12/27
11	Horn antenna	Schwarzbeck	9120D	HKE-013	2018/12/28	2019/12/27
12	Receiver	R&S	ESCI 7	HKE-010	2018/12/28	2019/12/27
13	Position controller	Taiwan MF	MF7802	HKE-011	2018/12/28	2019/12/27
14	Preamplifier	EMCI	EMC0518 45SE	HKE-015	2018/12/28	2019/12/27
15	Preamplifier	Agilent	83051A	HKE-016	2018/12/28	2019/12/27
16	High pass filter unit	Tonscend	JS0806-F	HKE-055	2018/12/28	2019/12/27
17	Spectrum analyzer	Agilent	N9020A	HKE-048	2018/12/28	2019/12/27

The calibration interval is 1 year.

2.5 Related Submittal(s) / Grant(s)

This submittal(s) (test report) is intended to comply with FCC Part 90 Rules.

2.6 Modifications

No modifications were implemented to meet testing criteria.



3 TEST CONDITIONS AND RESULTS

3.1 Maximum Transmitter Power

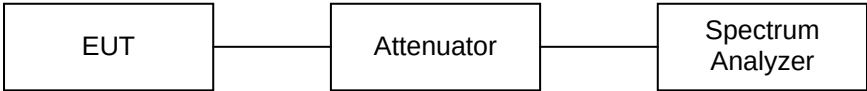
TEST APPLICABLE

The output power shall not exceed by more than 20 percent either the output power shown in the Radio Equipment List [available in accordance with §90.203(a)(1)] for transmitters included in this list or when not so listed, the manufacturer's rated output power for the particular transmitter specifically listed on the authorization.

TEST PROCEDURE

Measurements shall be made to establish the radio frequency power delivered by the transmitter the standard output termination. The power output shall be monitored and recorded and no adjustment shall be made to the transmitter after the test has begun, except as noted below:
If the power output is adjustable, measurements shall be made for the highest and lowest power levels.
The EUT connect to the Spectrum Analyzer through 20 dB attenuator.

TEST CONFIGURATION

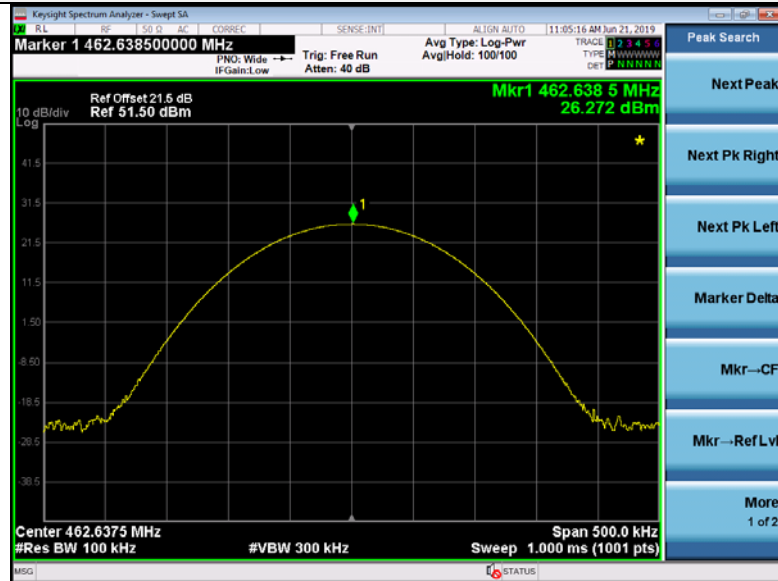


TEST RESULTS

Modulation Type	Test Channel	Test Frequency (MHz)	Test Results (dBm)	Test result
FM	Ch4	462.6375	26.272	Pass
	Ch11	467.6375	26.314	
	Ch19	462.6500	26.332	
Note: rated power is 0.5W=27dBm				



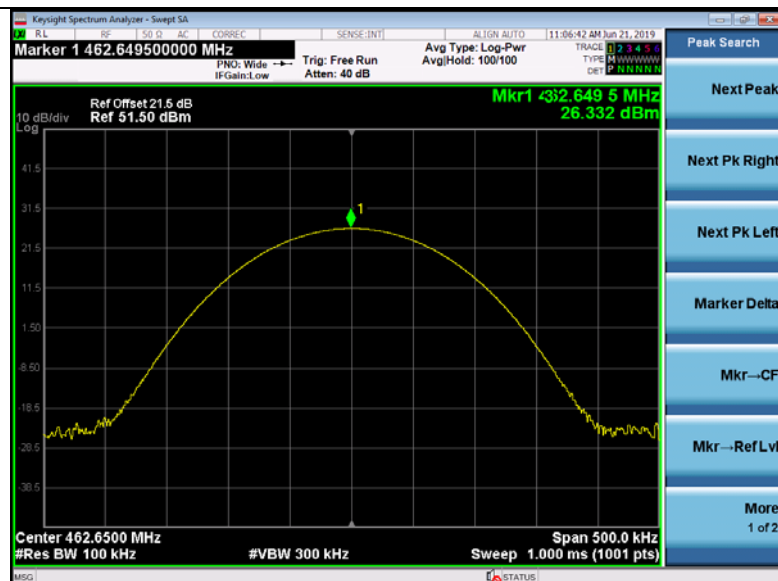
FM Modulation



CH4



CH11



CH19

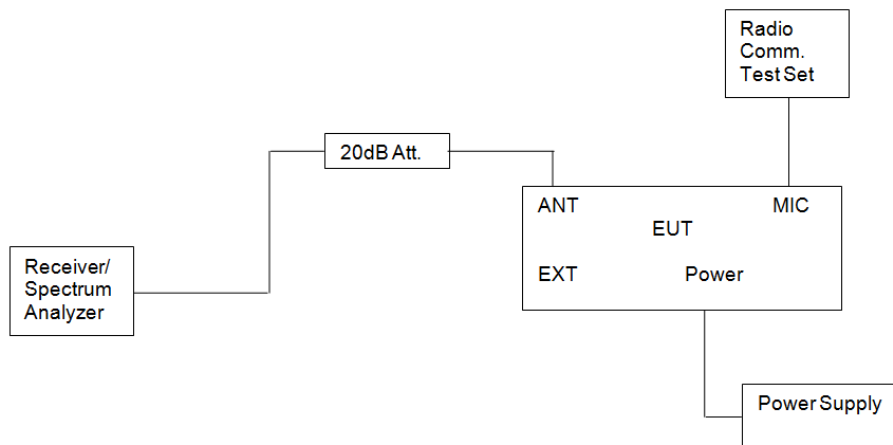


3.2 Occupied Bandwidth and Emission Mask

TEST APPLICABLE

- (a) 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.
- (b) **Emission Mask B:** For transmitters that are equipped with an audio low-pass filter pursuant to §90.211(a), the power of any emission must be below the unmodulated carrier power (P) as follows:
- (1) On any frequency removed from the assigned frequency by more than 50 percent, but not more than 100 percent of the authorized bandwidth: At least 25 dB.
 - (2) On any frequency removed from the assigned frequency by more than 100 percent, but not more than 250 percent of the authorized bandwidth: At least 35 dB.
 - (3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least $43 + 10 \log (P)$ dB.
- (c) **Emission Mask D, 12.5 kHz channel bandwidth equipment:** 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 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) 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) of more than 12.5 kHz: At least $50 + 10 \log (P)$ dB or 70 dB, whichever is the lesser attenuation.

TEST CONFIGURATION



TEST PROCEDURE

- 1 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) and 5 kHz (25 kHz channel spacing).
- 2 Set SPA Center Frequency = fundamental frequency, RBW=3kHz, VBW= 3 KHz, span =40 KHz.
- 3 Set SPA Max hold. Mark peak, Set 99% Occupied Bandwidth and 26dB Occupied Bandwidth.

**TEST RESULTS****Occupied Bandwidth:**

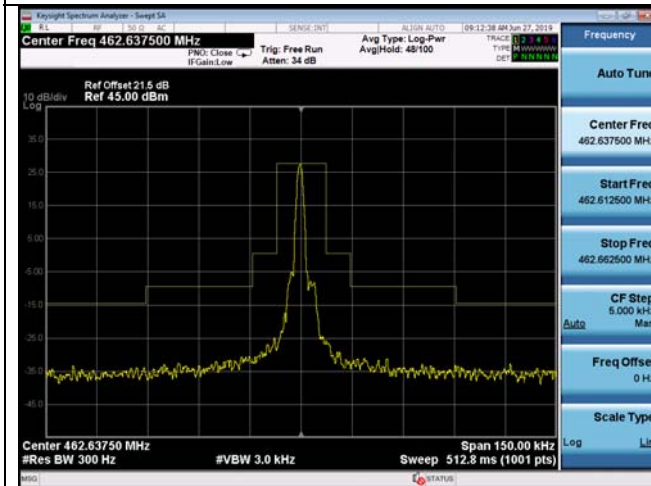
Modulation	Channel	99% OBW (kHz)	26dB bandwidth (kHz)	Limit (KHz)	Result
FM	CH4	7.773	10.45	12.5	Pass
	CH11	7.833	10.54		
	CH19	7.717	10.25		

FM Modulation**CH4****CH11****CH19**

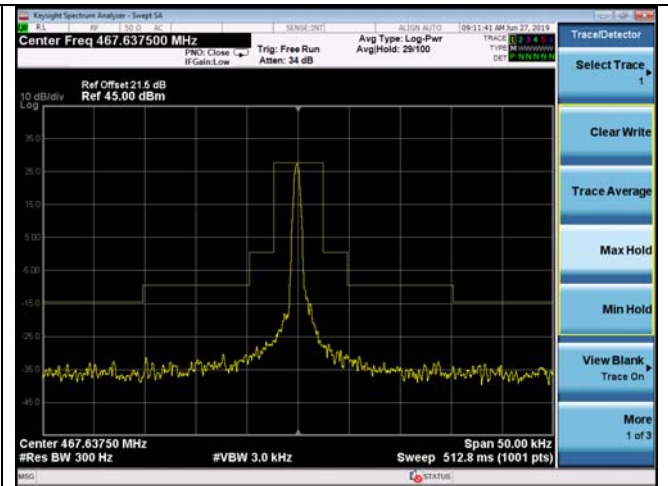


Emission Mask:

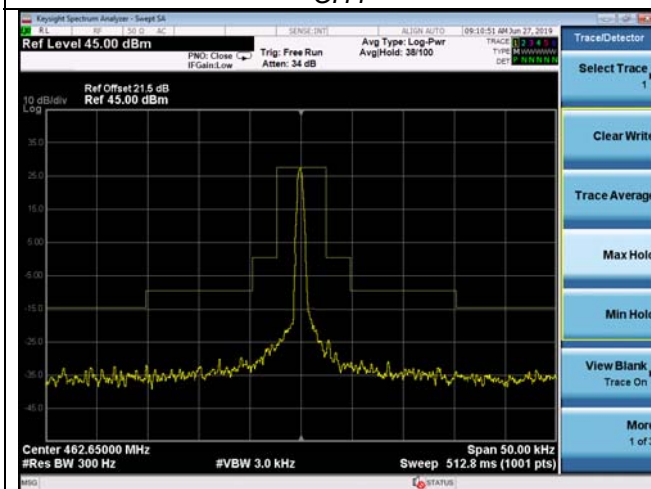
FM Modulation



CH4



CH11



CH19



3.3 Modulation Characteristic

TEST APPLICABLE

According to CFR47 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.

TEST PROCEDURE

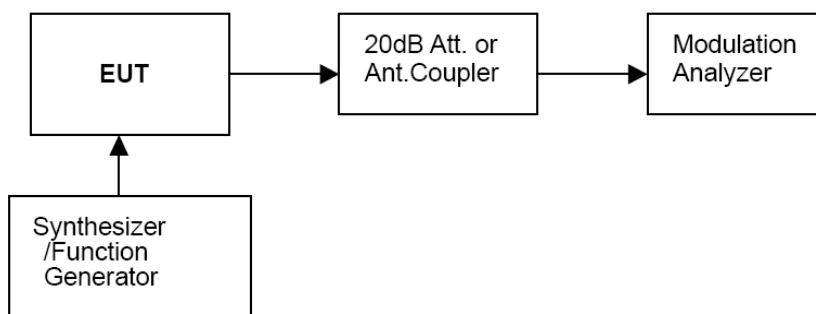
Modulation Limit

- 1 Configure the EUT as shown in figure 1, adjust the audio input for 60% of rated system deviation at 1 KHz 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, 1004, 1500 and 2500Hz in sequence.

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 (0dB).
- 3 Vary the Audio frequency from 100 Hz to 3 KHz and record the frequency deviation.
- 4 Audio Frequency Response = $20\log_{10}$ (Deviation of test frequency/Deviation of 1 KHz reference).

TEST CONFIGURATION



TEST RESULTS

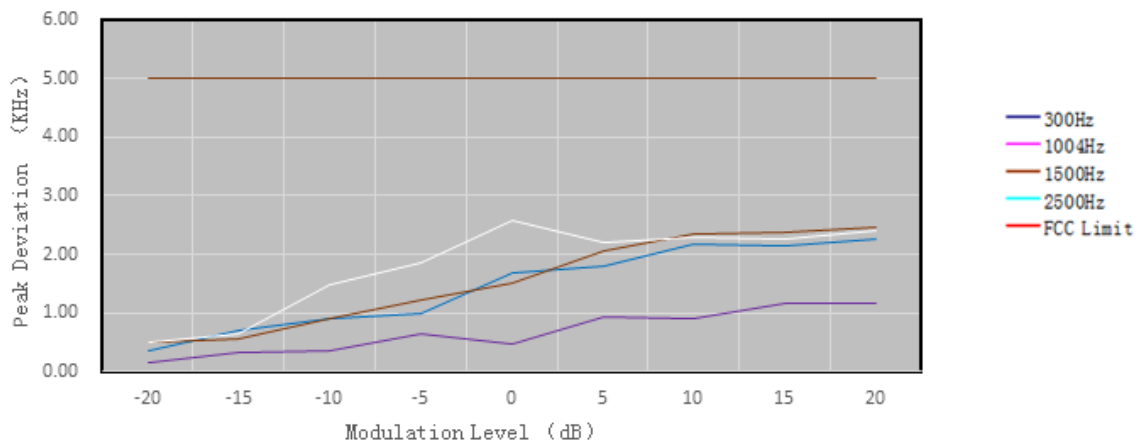
Modulation Limit:

CH4

Modulation Level (dB)	Peak Freq. Deviation At 300 Hz (KHz)	Peak Freq. Deviation At 1004 Hz (KHz)	Peak Freq. Deviation At 1500 Hz (KHz)	Peak Freq. Deviation At 2500 Hz (KHz)
-20	0.38	0.26	0.48	0.50
-15	0.26	0.64	0.61	0.69
-10	0.39	0.87	0.96	1.59
-5	0.56	1.14	1.44	1.89
0	0.72	1.75	1.64	2.33
+5	0.99	1.83	1.98	2.28
+10	0.94	1.96	2.36	2.38
+15	0.94	2.10	2.36	2.36
+20	1.22	2.32	2.51	2.31



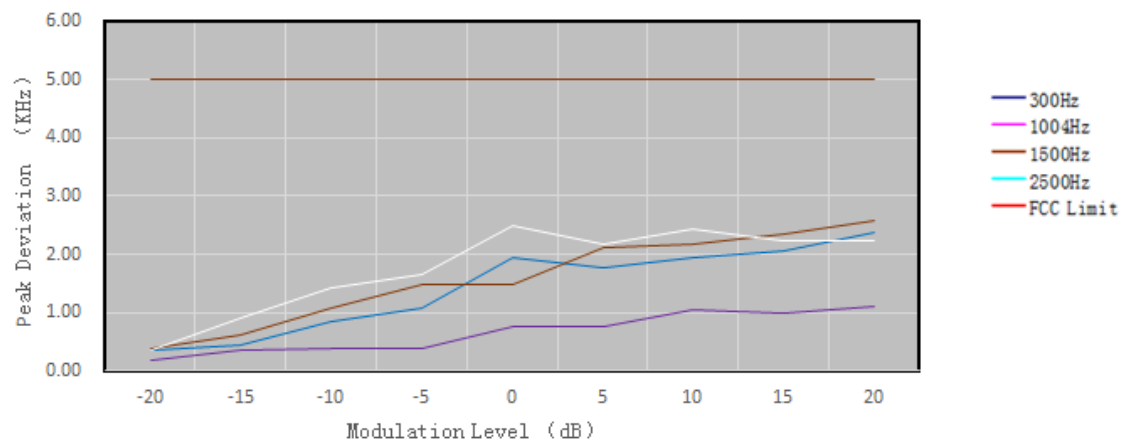
Modulation Limit for 25KHz



CH11

Modulation Level (dB)	Peak Freq. Deviation At 300 Hz (KHz)	Peak Freq. Deviation At 1004 Hz (KHz)	Peak Freq. Deviation At 1500 Hz (KHz)	Peak Freq. Deviation At 2500 Hz (KHz)
-20	0.19	0.35	0.40	0.34
-15	0.35	0.45	0.61	0.91
-10	0.39	0.84	1.09	1.43
-5	0.38	1.06	1.47	1.64
0	0.75	1.95	1.49	2.50
+5	0.76	1.78	2.11	2.17
+10	1.05	1.93	2.17	2.45
+15	0.99	2.06	2.36	2.24
+20	1.10	2.36	2.56	2.24

Modulation Limit for 25KHz

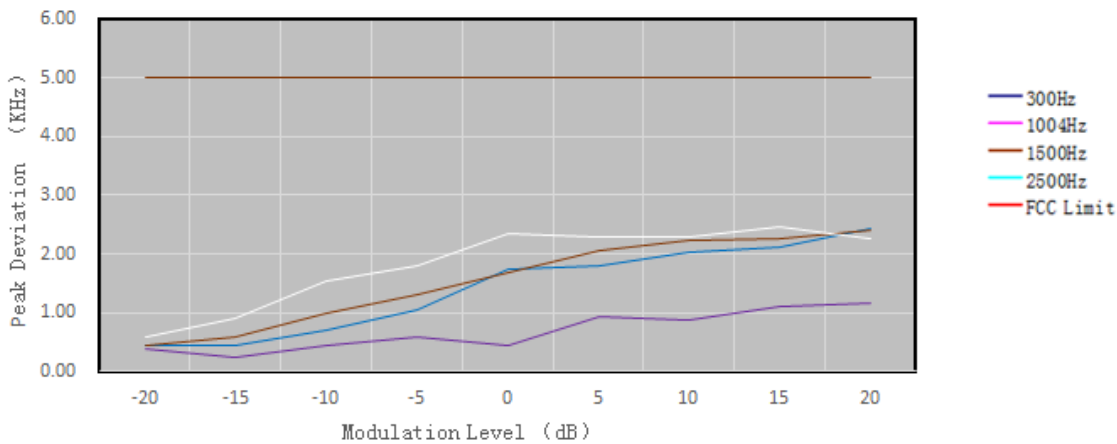


CH19



Modulation Level (dB)	Peak Freq. Deviation At 300 Hz (KHz)	Peak Freq. Deviation At 1004 Hz (KHz)	Peak Freq. Deviation At 1500 Hz (KHz)	Peak Freq. Deviation At 2500 Hz (KHz)
-20	0.38	0.43	0.44	0.57
-15	0.24	0.44	0.58	0.91
-10	0.44	0.70	1.00	1.53
-5	0.59	1.06	1.31	1.79
0	0.44	1.75	1.69	2.35
+5	0.94	1.81	2.05	2.29
+10	0.86	2.02	2.23	2.29
+15	1.11	2.12	2.27	2.46
+20	1.17	2.44	2.40	2.26

Modulation Limit for 25KHz

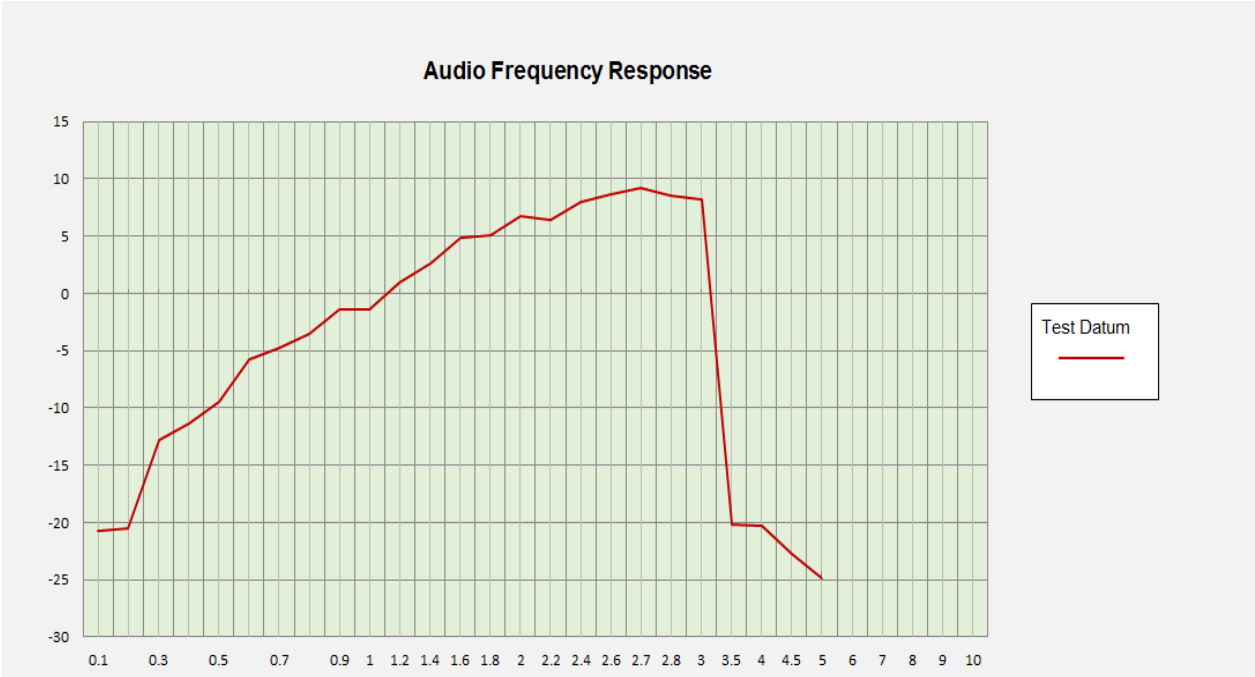




Audio Frequency Response:

CH4

Frequency (KHz)	Frequency Deviation (KHz)	1KHz Reference Deviation (KHz)	Audio Frequency Response (dB)
0.1	0.03	0.52	-22.80
0.2	0.04	0.52	-20.50
0.3	0.12	0.52	-12.78
0.4	0.16	0.52	-11.42
0.5	0.18	0.52	-9.44
0.6	0.27	0.52	-5.75
0.7	0.35	0.52	-4.80
0.8	0.36	0.52	-3.54
0.9	0.42	0.52	-1.38
1.0	0.50	0.52	-1.39
1.2	0.56	0.52	0.95
1.4	0.61	0.52	2.63
1.6	0.74	0.52	4.81
1.8	0.78	0.52	5.02
2.0	0.87	0.52	6.69
2.2	1.00	0.52	6.35
2.4	1.08	0.52	7.93
2.6	1.16	0.52	8.62
2.7	1.22	0.52	9.22
2.8	1.22	0.52	8.47
3.0	1.24	0.52	8.16
3.5	0.03	0.52	-20.22
4.0	0.03	0.52	-20.32
4.5	0.02	0.52	-22.78
5.0	0.02	0.52	-24.92



Note: This test records the worst test results in the report.



3.4 Frequency Stability

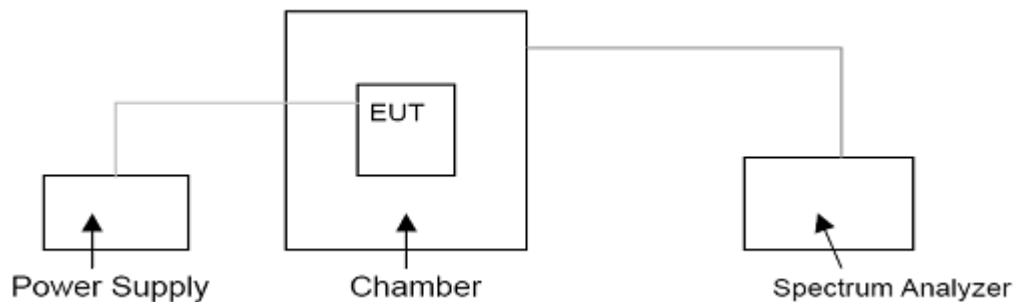
LIMITS

According to 90.213, Transmitters used must have minimum frequency stability as specified in the following table.

Frequency Range (MHz)	Channel Bandwidth (KHz)	Frequency Tolerance (ppm)		
		Fixed and Base Stations	Mobile Stations	
			> 2 W	≤ 2 W
150-174 MHz	6.25	1.0	2.0	2.0
	12.5	2.5	5.0	5.0
	25	5.0	5.0	50.0*
421-512 MHz	6.25	0.5	1.0	1.0
	12.5	1.5	2.5	2.5
	25	2.5	5.0	5.0

- Stations operating in the 154.45 to 154.49 MHz or the 173.2 to 173.4 MHz bands must have a frequency stability of 5 ppm.
- Paging transmitters operating on paging-only frequencies must operate with frequency stability of 5 ppm in the 150-174 MHz band and 2.5 ppm in the 421-512 MHz band.

TEST CONFIGURATION



TEST PROCEDURE

The EUT was set in the climate chamber and connected to an external DC power supply. The RF output was directly connected to Spectrum Analyzer. The coupling loss of the additional cables was recorded and taken in account for all the measurements. After temperature stabilization (approx. 20 min for each stage), the frequency for the lower, the middle and the highest frequency range was recorded. For Frequency stability Vs. Voltage the EUT was connected to a DC power supply and the voltage was adjusted in the required ranges. The result was recorded.

**TEST RESULTS**

Test conditions		Frequency error (ppm)			Limit (ppm)	Result
Voltage(V)	Temp(°C)	462.6375	467.6375	462.6500		
4.5	-30	0.82	0.88	0.85	2.5	Pass
	-20	0.34	0.49	0.92		
	-10	0.64	0.93	0.75		
	0	0.38	0.48	0.65		
	10	0.91	0.79	0.99		
	20	0.55	0.30	0.71		
	30	0.72	0.34	0.92		
	40	0.38	0.95	0.52		
	50	0.58	0.99	0.68		
3.83 (85% Rated)	20	0.69	0.84	0.47	2.5	Pass
5.18(115% Rated)	20	0.69	0.72	0.37		

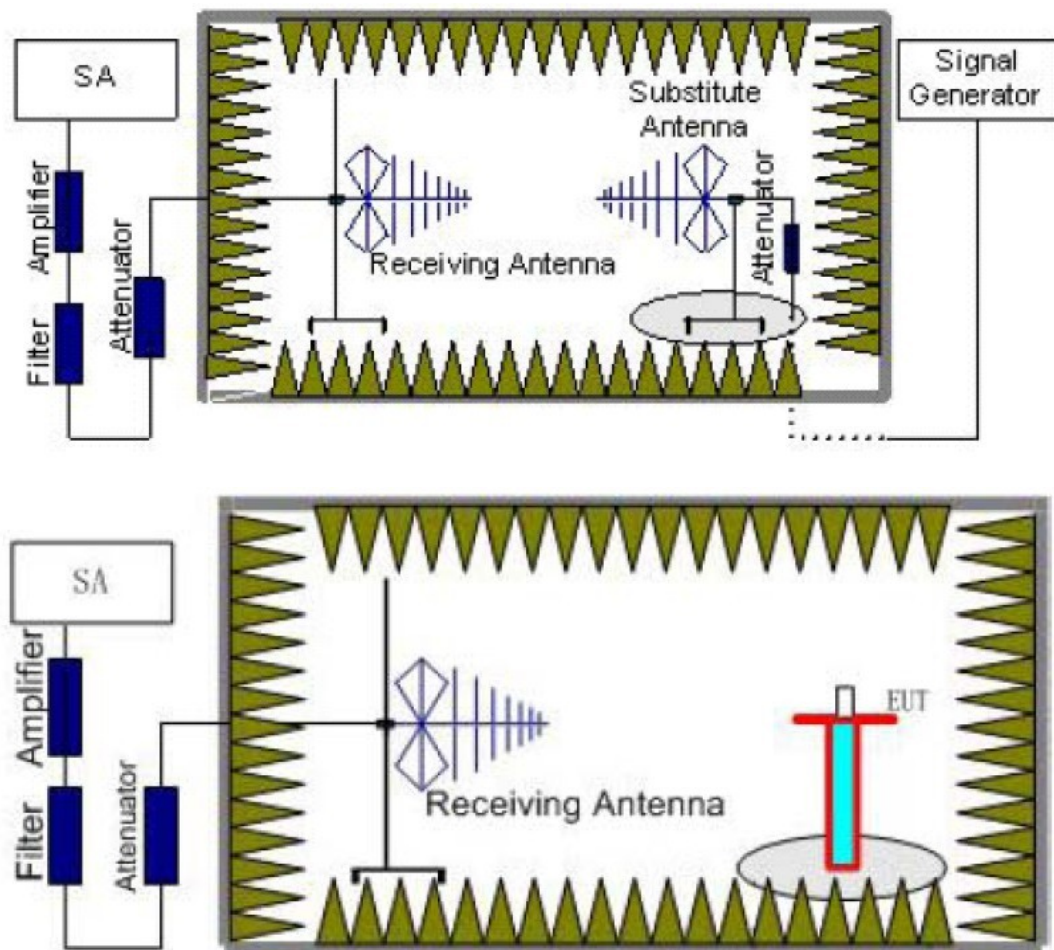
3.5 Transmitter Radiated Spurious Emission

Limit

According to the TIA/EIA 603 test method, and according to Section 90.210, the power of each unwanted emission shall be less than Transmitted Power as specified below for transmitters designed to operate with 12.5 KHz channel bandwidth:

- 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 7.27dB
- 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.

TEST CONFIGURATION



**TEST PROCEDURE**

- a. EUT was placed on a 0.8 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 1.0m. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all test transmit frequencies were measured with peak detector.
- b. A log-periodic antenna or double-ridged waveguide horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator and the level will be adjusted till the same power value on the spectrum analyzer or receiver. The level of the spurious emissions can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.
- c. The EUT is then put into continuously transmitting mode at its maximum power level during the test. Set Test Receiver or Spectrum 100 kHz below 1GHz and 1MHz above 1GHz, Sweep from 30MHz to the 10th harmonic of the fundamental frequency; and recorded the level of the concerned spurious emission point as (P_r).
- d. The EUT then replaced by a substitution antenna. In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (P_{Mea}) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach the previously recorded (P_r). The power of signal source (P_{Mea}) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization. The measurement results are obtained as described below:

$$\text{Power}_{(EIRP)} = P_{Mea} - P_{cl} + G_a$$

Where;

P_{Mea} is the recorded signal generator level

P_{cl} is the cable loss connect between instruments

G_a Substitution Antenna Gain

- e. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power.
- f. ERP can be calculated from EIRP by subtracting the gain of the dipole, $ERP = EIRP - 2.15\text{dBi}$.
- g. Test site anechoic chamber refer to ANSI C63.

**TEST RESULTS**

Remark: The measurement frequency range is from 30MHz to the 10th harmonic of the fundamental frequency;

worst spurious emissions recorded as below:

Test Frequency (MHz)	Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	Distance (m)	G _a Antenna Gain(dBi)	Peak ERP (dBm)	Limit (dBm)	Margin (dB)	Pol.
462.6375	925.28	-35.88	3.54	3	12.87	-26.55	-20	6.55	V
	1387.91	-42.97	4.21	3	15.48	-31.70	-20	11.70	V
	1850.55	-47.91	4.52	3	17.32	-35.11	-20	15.11	V
	2313.19	-52.02	5.24	3	18.76	-38.50	-20	18.50	V
	--	--	--	--	--	--	--	--	--
467.6375	935.28	-35.52	3.54	3	12.87	-26.19	-20	6.19	V
	1402.91	-43.21	4.21	3	15.48	-31.94	-20	11.94	V
	1870.55	-47.86	4.52	3	17.32	-35.06	-20	15.06	V
	2338.19	-51.20	5.24	3	18.76	-37.68	-20	17.68	V
	--	--	--	--	--	--	--	--	--
462.6500	925.30	-35.92	3.54	3	12.87	-26.59	-20	6.59	V
	1387.95	-43.19	4.21	3	15.48	-31.92	-20	11.92	V
	1850.60	-47.17	4.52	3	17.32	-34.37	-20	14.37	V
	2313.25	-51.61	5.24	3	18.76	-38.09	-20	18.09	V
	--	--	--	--	--	--	--	--	--

Remark:

1. $EIRP = P_{Mea}(dBm) - P_{cl}(dB) + G_a(dBi)$
2. -- Means other points for values lower than limits and not recorded.
3. $Margin = Limit - EIRP$

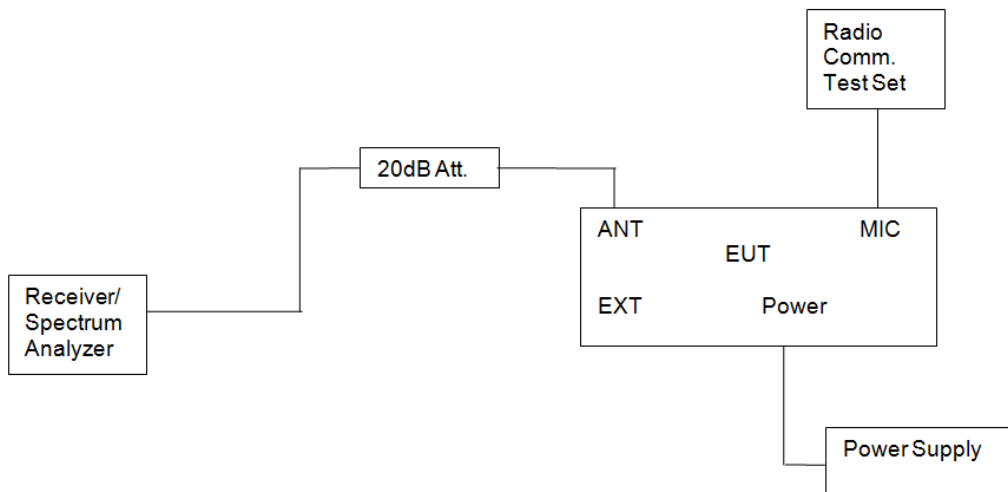


3.6 Spurious Emission on Antenna Port

Limit

The same as Section 3.7

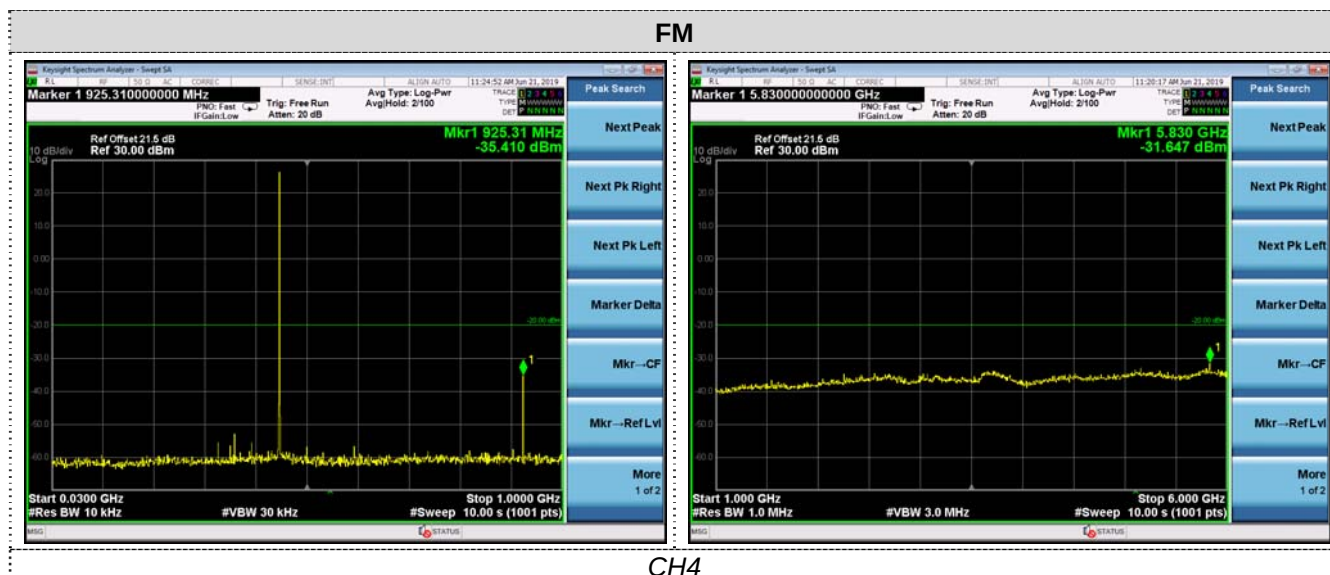
TEST CONFIGURATION



TEST PROCEDURE

The RF output of the EUT was connected to a spectrum analyzer through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set to 10 kHz/1MHz. Sufficient scans were taken to show any out of band emission up to 10th. Harmonic for the lower and the highest frequency range. Set RBW 10 kHz, VBW 30 kHz in the frequency band 30MHz to 1GHz, while set RBW=1MHz. VBW=3MHz from the 1GHz to 10th Harmonic.

TEST RESULTS



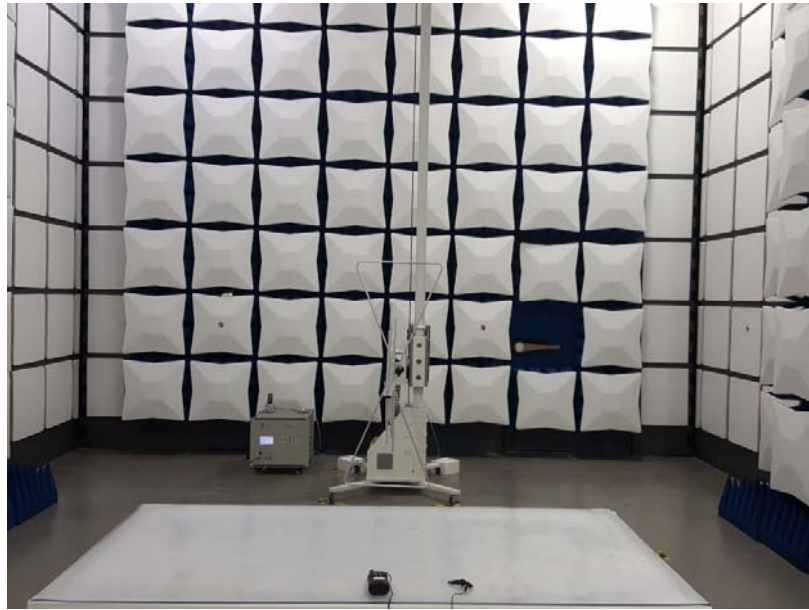


CH11



CH19

4 Test Setup Photos of the EUT

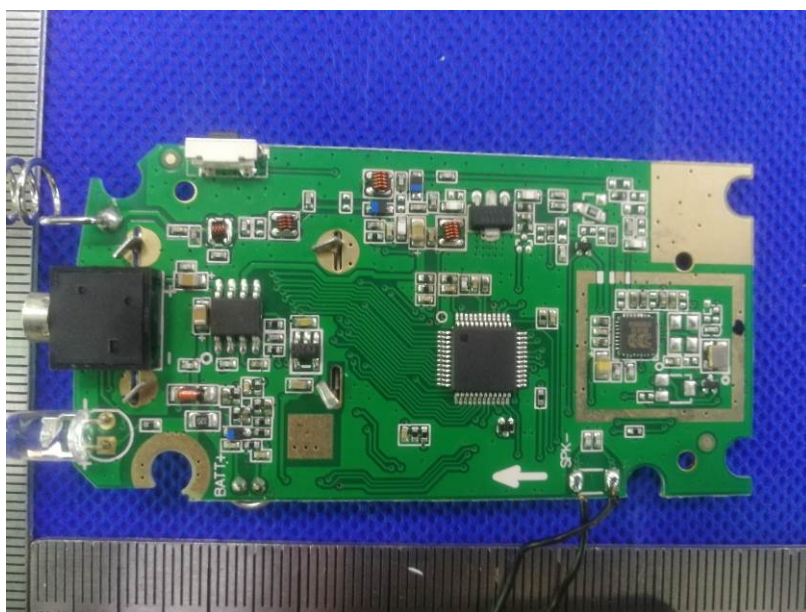
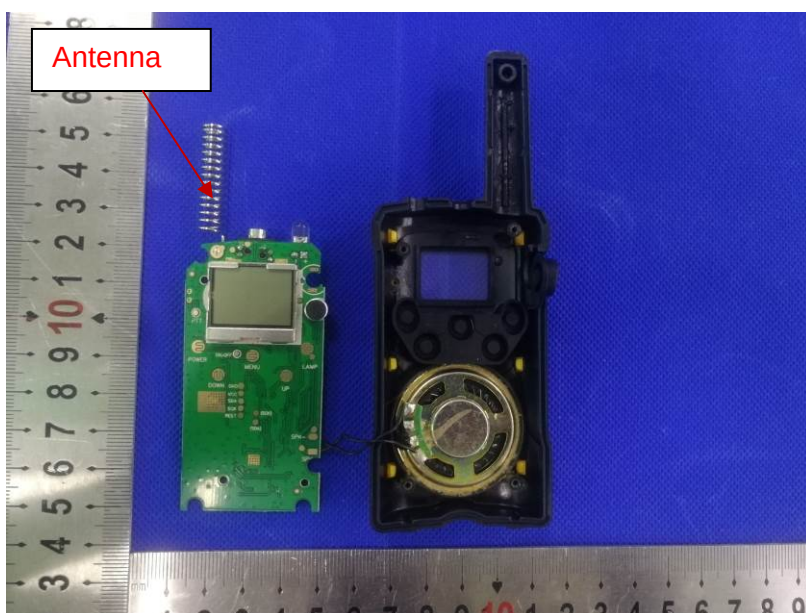
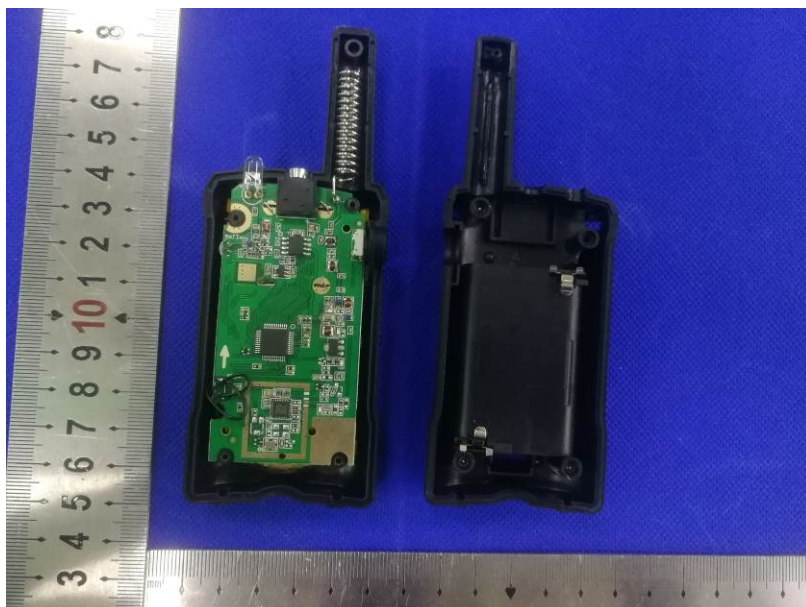


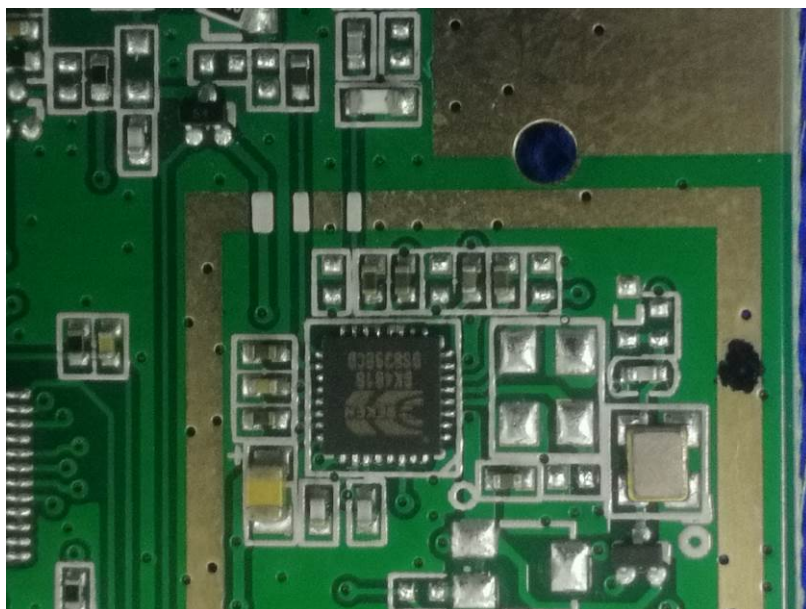
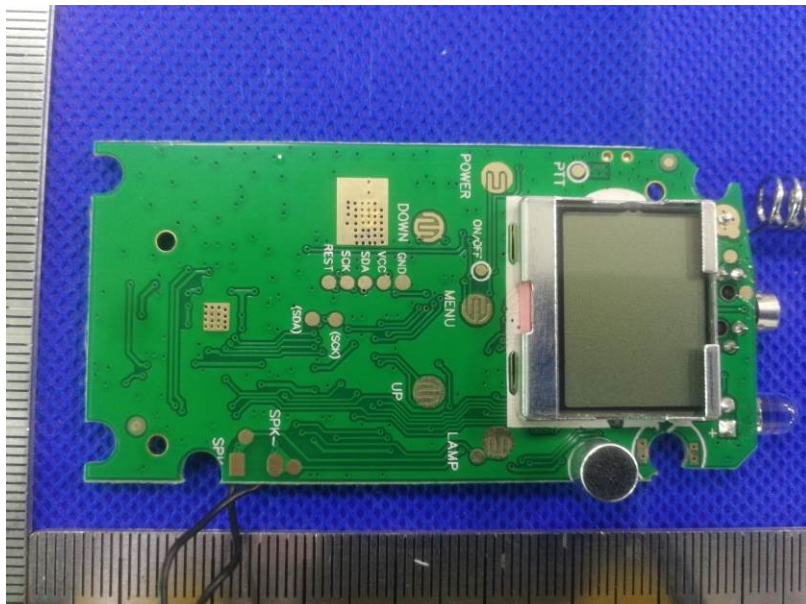
5 Photos of the EUT











***** End of Report *****