

# TEST REPORT

**Reference No.** ..... : WTD15S0628385E  
**FCC ID** ..... : B5DH227C  
**Applicant** ..... : Bosch Security Systems ,Inc.  
**Address** ..... : 8601 East Cornhusker Highway Lincoln, Nebraska 68507 United States  
**Manufacturer** ..... : Bardl Professional Audio Co., Ltd.  
**Address** ..... : No.8, E zone, Dongan Industrial District, Dongcheng Town, Enping City, Guangdong China  
**Product Name** ..... : UHF Wireless Microphone  
**Model No.** ..... : HT-300C (where C is Frequency Band)  
**Brand**..... : EV Electro-Voice  
**Standards**..... : FCC CFR47 Part 74  
**Date of Receipt sample**..... : Jun. 17, 2015  
**Date of Test**..... : Jun. 23 – Jul. 20, 2015  
**Date of Issue** ..... : Jul. 24, 2015  
**Test Result**..... : **Pass**

Remarks:

The results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

**Prepared By:**

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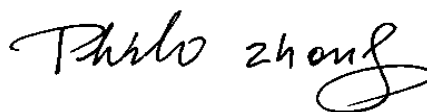
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Compiled by:



Zero Zhou / Project Engineer

Approved by:



Philo Zhong / Manager

## 2 Test Summary

Test Items	Test Requirement	Test Method	Result
RF Output Power	74.861(e)(1)(ii)	ANSI/TIA-603-D:2010	PASS
Modulation Characteristics	2.1047(a)	ANSI/TIA-603-D:2010	PASS
Occupied Bandwidth	2.1049(c)(1)	ANSI/TIA-603-D:2010	PASS
Radiated Emissions	2.1053 & 74.861(e)(6)	ANSI/TIA-603-D:2010	PASS
Spurious emissions at antenna terminals	2.1051	ANSI/TIA-603-D:2010	PASS
Frequencies Stability	2.1055(a)(1)	ANSI/TIA-603-D:2010	PASS
RF Exposure	1.1307(b)(1)	KDB 447498 D01	PASS

Remark:

PASS means that the test results complies with related requirements.

N/A means that the test is not applicable for the EUT.

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## 4 General Information

### 4.1 General Description of E.U.T.

**Product Name** : UHF Wireless Microphone  
**Model No.** : HT-300C (where C is Frequency Band)  
**Differences describe** : N/A  
**Operation Frequency** : 516.5-531.5MHz, 32channels  
**The Lowest Oscillator** : 32.768 KHz  
**Antenna installation** : PCB folded ¼ wave antenna

### 4.2 Details of E.U.T.

**Technical Data:** : DC 3V by 2\*1.5V(size "AA" ) batteries

### 4.3 Channel Plan & List

Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
1	516.500	9	516.900	17	517.300	25	517.700
2	520.700	10	518.100	18	518.500	26	518.900
3	522.400	11	519.500	19	519.900	27	520.300
4	526.300	12	521.100	20	521.500	28	521.900
5	526.800	13	522.900	21	523.300	29	523.700
6	528.700	14	524.925	22	525.325	30	525.725
7	529.400	15	527.325	23	527.725	31	528.125
8	531.500	16	530.075	24	530.475	32	530.875

### 4.4 Test Facility

The test facility has a test site registered with the following organizations:

- Industry Canada (IC) Registration No.: 11464A**  
 The 3m Semi-anechoic chamber of Shenzhen SEM.Test Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 11464A.
- FCC – Registration No.: 934118**  
 Shenzhen SEM.Test Technology Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files and the Registration is 934118.

## 5 Equipment Used during Test

### 5.1 Equipments List

3m Semi-anechoic Chamber for Radiation Emissions Test site						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1	Spectrum Analyzer	R&S	FSP	836079/035	2015-05-07	2016-05-06
2	EMI Test Receiver	R&S	ESVB	825471/005	2015-05-07	2016-05-06
3	Pre-amplifier	Agilent	8447F	3113A06717	2015-05-07	2016-05-06
4	Pre-amplifier	Compliance Direction	PAP-0118	24002	2015-05-07	2016-05-06
5	Trilog Broadband Antenna	SCHWARZBECK	VULB9163	9163-333	2015-04-20	2016-04-19
6	Horn Antenna	ETS	3117	00086197	2015-04-20	2016-04-19
7	Horn Antenna	ETS	3116B	00088203	2015-04-20	2016-04-19
8	Loop Antenna	SCHWARZECK	HFRA 5165	9365	2015-04-20	2016-04-19
RF Conducted Testing						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1.	EMC Analyzer	R&S	ESCI	101155	Sep.17,2014	Sep.16,2015
2.	Humidity Chamber	GF	GTH-225-40-1P	IAA061213	May.15,2015	May.14,2016
3.	DC Power Supply	EVERFINE	WY305	1004002	Apr.10,2015	Apr.09,2016
4.	Modulation Analyzer	HP	8920B	-	Apr.10,2015	Apr.09,2016

### 5.2 Measurement Uncertainty

Parameter	Uncertainty
Radio Frequency	$\pm 1 \times 10^{-6}$
RF Power	$\pm 1.0$ dB
RF Power Density	$\pm 2.2$ dB
Radiated Spurious Emissions test	$\pm 5.03$ dB (Bilog antenna 30M~1000MHz)
	$\pm 4.74$ dB (Horn antenna 1000M~25000MHz)

### 5.3 Test Equipment Calibration

All the test equipments used are valid and calibrated by CEPREI Certification Body that address is No.110 Dongguan Zhuang RD. Guangzhou, P.R.China.

## 6 RF Output Power

Test requirement:	FCC CFR47 Part 74 Section 74.861(e)(1)(ii)
Test method:	Based on ANSI/TIA-603-D:2010
Limit:	According to Part 74.861(e)(1)(ii), the output power shall not exceed 250mW (23.98 dBm).

### 6.1 Test Procedure

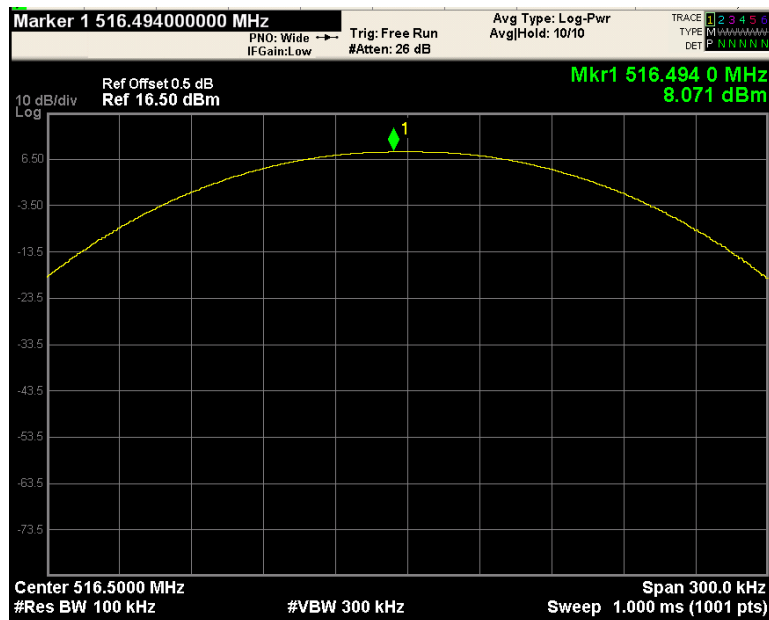
The maximum peak output power was measured with a spectrum analyzer connected to the antenna terminal (conducted measurement) while EUT was operating in normal situation.

### 6.2 Test result

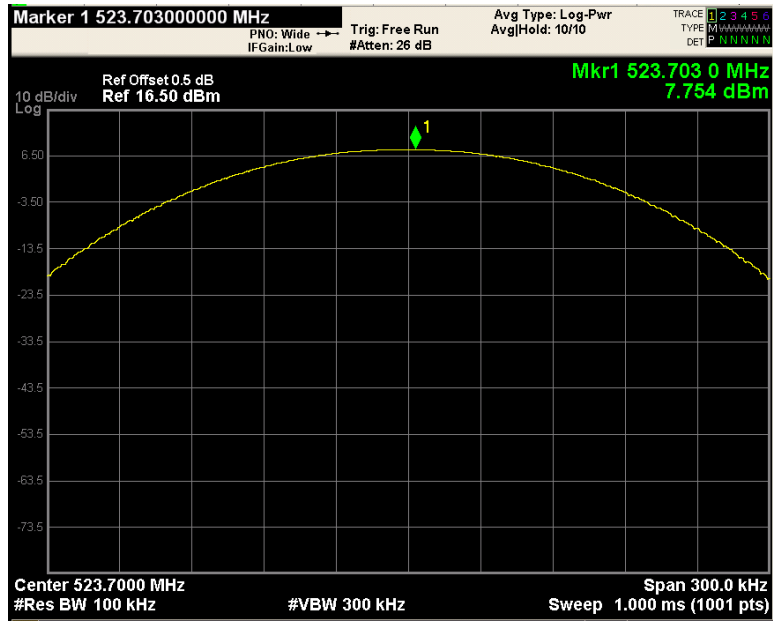
Frequency (MHz)	RF Output Power (dBm)	Limit (dBm)	Result
516.50	8.07	23.98	PASS
523.70	7.75	23.98	PASS
531.50	7.30	23.98	PASS

Please refer to following plot:

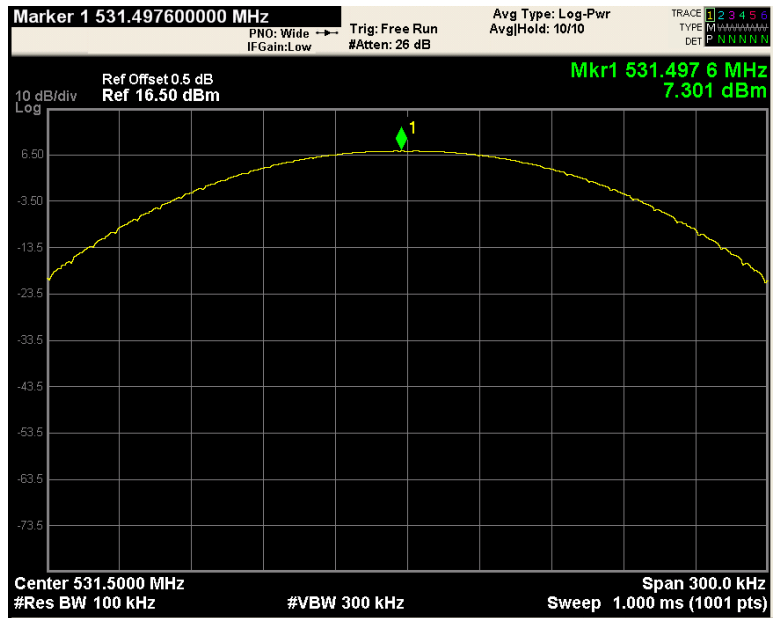
Low channel



Middle channel



High channel



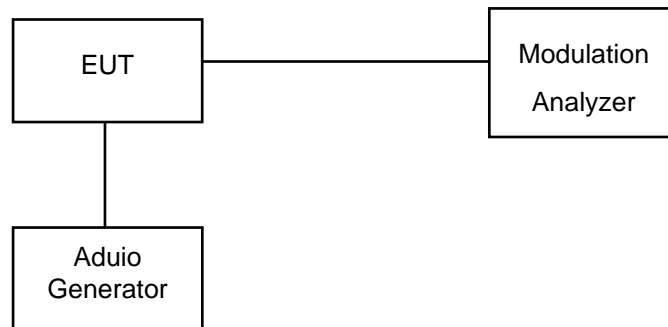


## 7 Modulation Characteristics

Test requirement:	FCC CFR47 Part 2 Section 2.1047(a)
Test method:	Based on ANSI/TIA-603-D:2010
Requirement:	According to Part 2.1047(a), for Voice Modulated Communication Equipment, the frequency response of the audio modulating circuit over a range of 100Hz to 5000Hz shall be measured.

### 7.1 Test Procedure

#### (a) Test Configuration



#### (b) Audio Frequency Response:

- 1) Apply a 1000 Hz tone and adjust the audio frequency generator to produce 20% of the rated system deviation.
- 2) Set the test receiver to measure rms deviation and record the deviation reading as  $DEV_{REF}$ .
- 3) Set the audio frequency generator to the desired test frequency between 100 Hz and 5000 Hz.
- 4) Record the test receiver deviation reading as  $DEV_{FREQ}$ .
- 5) Calculate the audio frequency response at the present frequency as:  

$$\text{audio frequency response} = 20\lg(DEV_{FREQ} / DEV_{REF})$$
- 6) Repeat steps 4) through 5) for all the desired test frequencies.

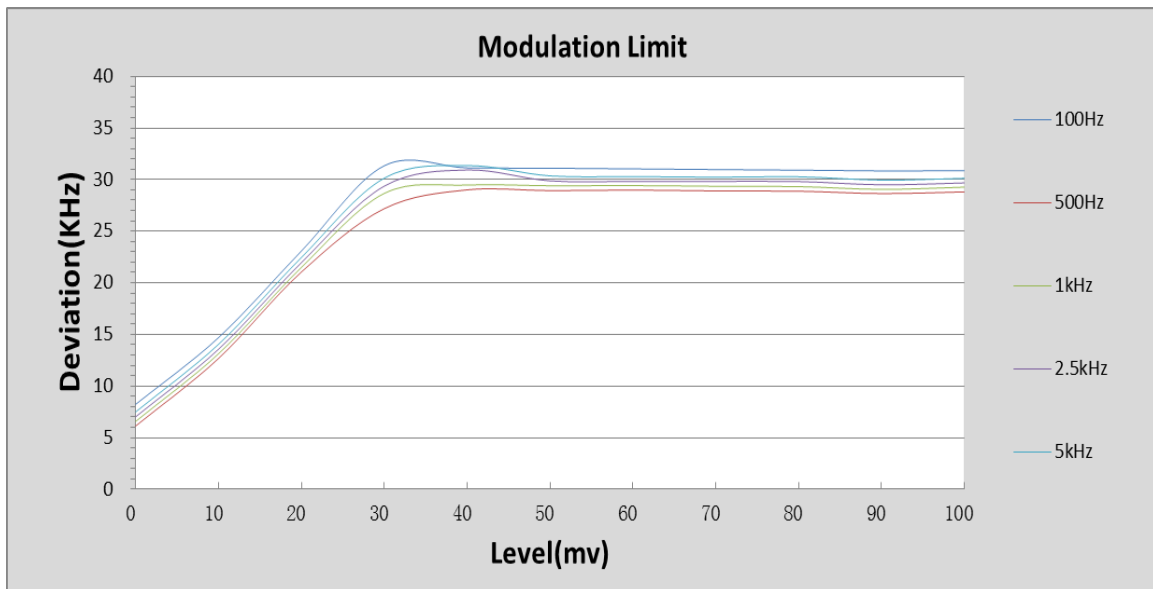
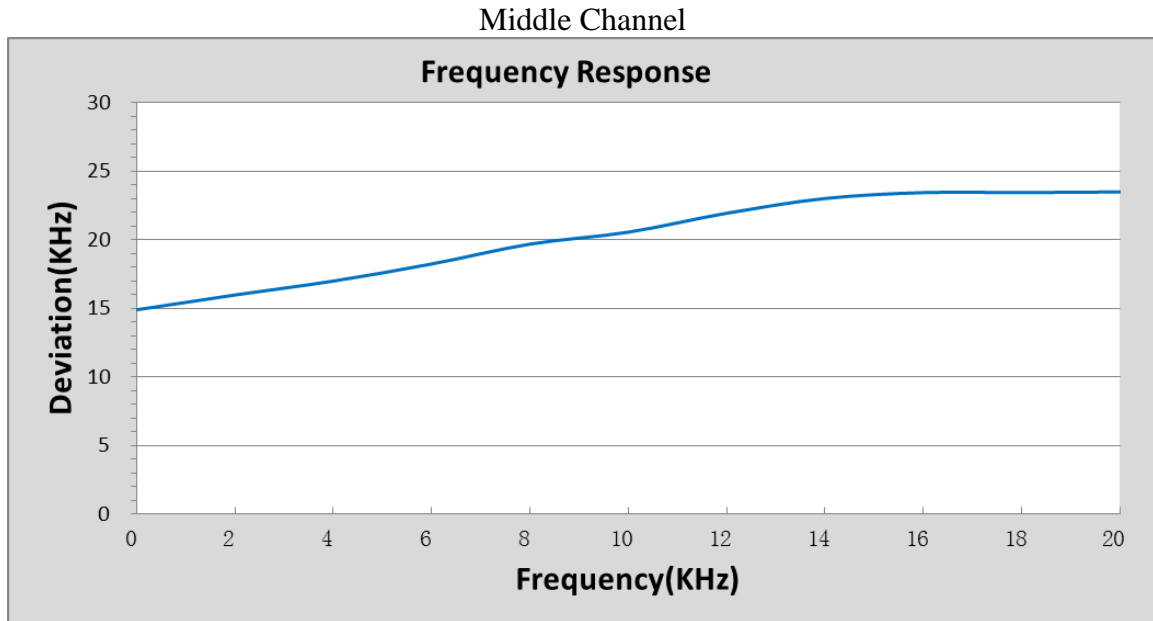
#### (c) Modulation Limiting:

- 1) Apply a 1000 Hz modulating signal to the transmitter from the audio frequency generator, and adjust the level to obtain 60% of full rated system deviation.
- 2) Measure both the instantaneous and steady-state deviation at and after the time of increasing the audio input level.
- 3) With the level from the audio frequency generator held constant at the level obtained in step e), slowly vary the audio frequency from 300 Hz to 3000 Hz and observe the steady-state deviation. Record the maximum deviation.
- 4) Set the test receiver to measure peak negative deviation and repeat steps 1) through 3).
- 5) The values recorded in steps 3) and 4) are the modulation limiting.

## 7.2 Test Result

The test data of modulation characteristic is showing as below:

Audio Frequency Response



## 8 Occupied Bandwidth of Emission

Test requirement:	FCC CFR47 Part 2 Section 2.1049©(1)
Test method:	Based on ANSI/TIA-603-D:2010
Limit:	According to FCC 74.861 (e)(5), the frequency emission bandwidth shall not exceed 200 kHz.

### 8.1 Test Procedure

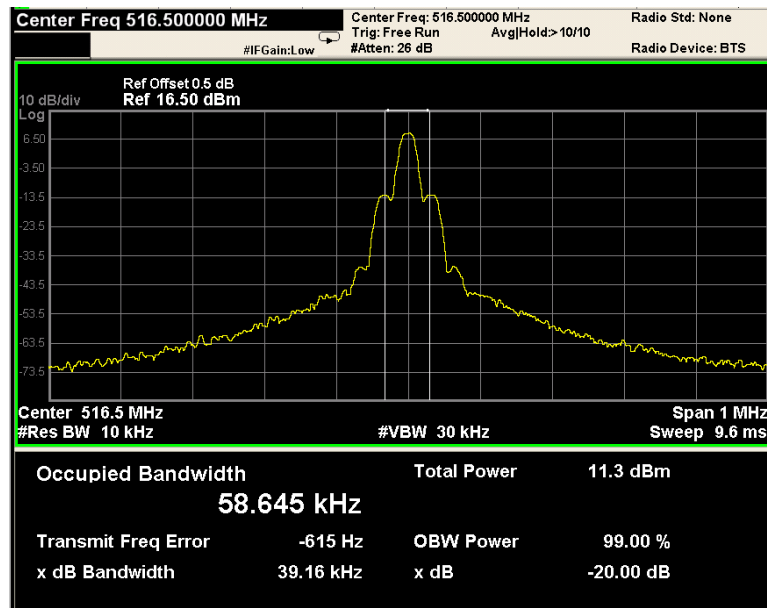
1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Turn on the EUT and set it to any one convenient frequency within its operating range.

### 8.2 Test Result

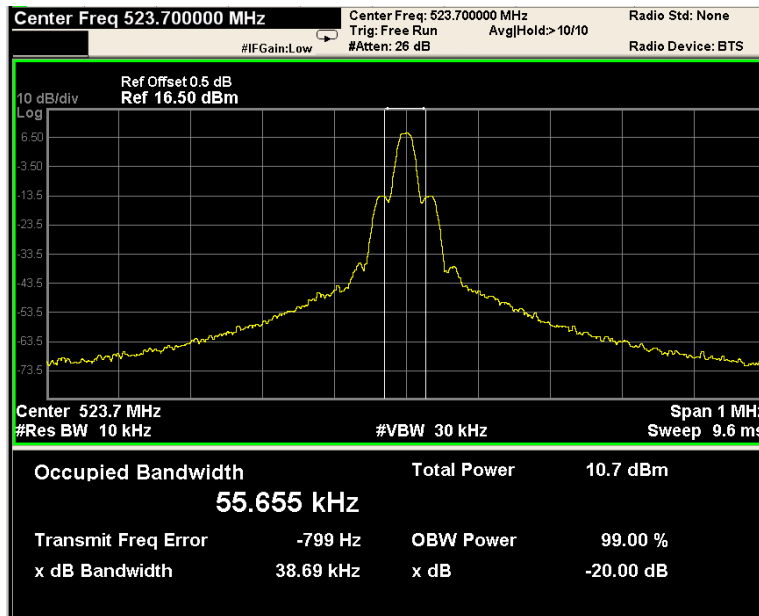
Frequency (MHz)	99% Bandwidth (kHz)	Limit (kHz)	Result
516.50	58.65	200	PASS
523.70	55.66	200	PASS
531.50	53.52	200	PASS

Test Plot:

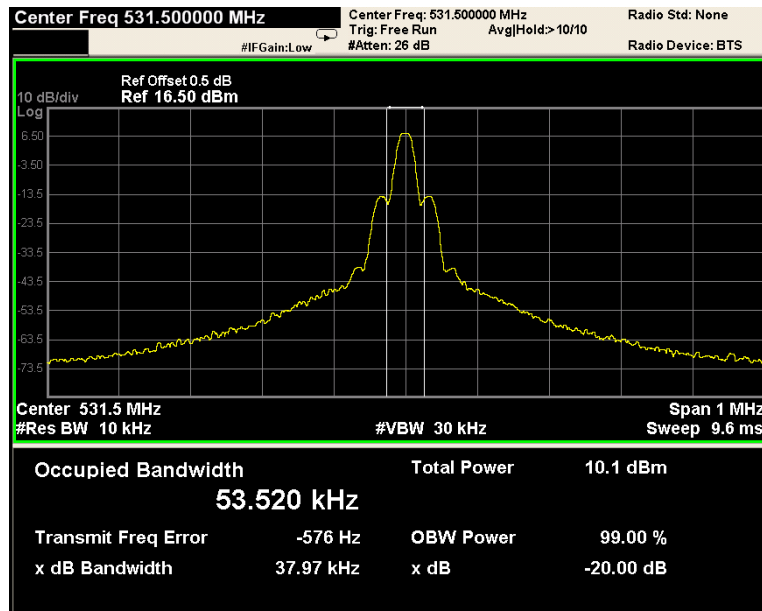
Low channel



Middle channel



High channel



## 9 Spurious Emissions at Antenna Terminals

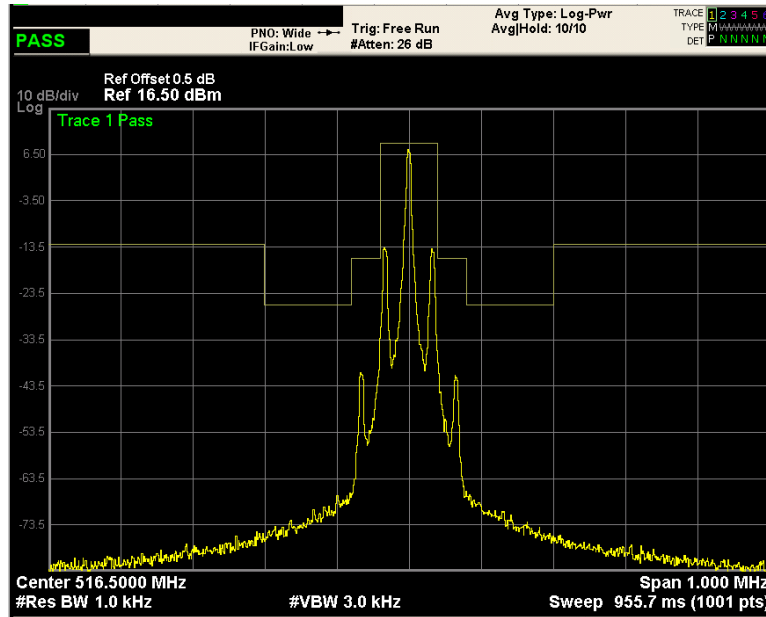
Test requirement:	FCC CFR47 Part 2 Section 2.1053
Test method:	Based on ANSI/TIA-603-D:2010
Limit:	According to Part 74.861 (e)(6), the mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the following schedule: (i) on any frequency removed from the operating frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: at least 25 dB. (ii) on any frequency removed from the operating frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth: at least 35 dB. (iii) on any frequency removed from the operating frequency by more than 250 percent up to and the authorized bandwidth shall be attenuated below the un-modulated carrier by at least $43 + 10 \text{ Log} (\text{output power in watts})\text{dB}$ .

### 9.1 Test Procedure

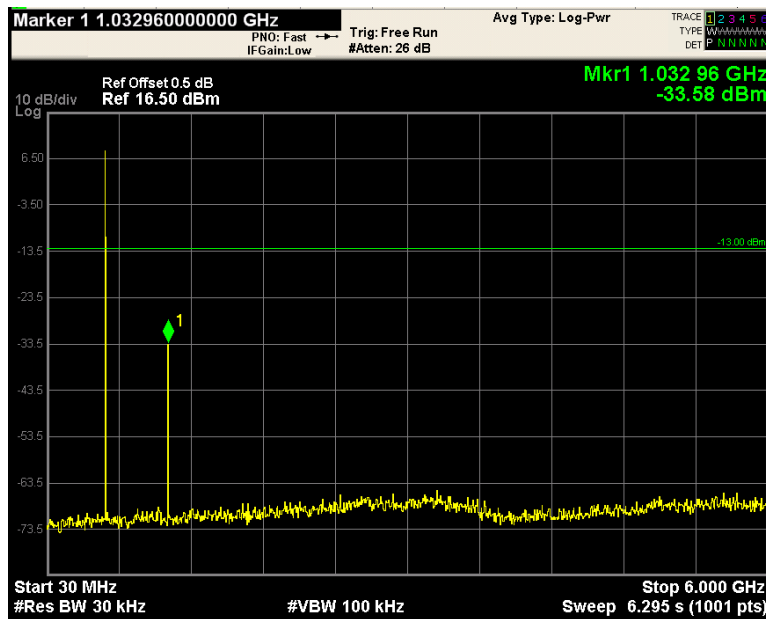
1. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
2. Set the SA on Max-Hold Mode, and then keep the EUT in transmitting mode. Record all the signals from each channel until each one has been recorded.
3. Set the SA on View mode and then plot the result on SA screen.
4. Repeat above procedures until all frequencies measured were complete.

### 9.2 Test Data

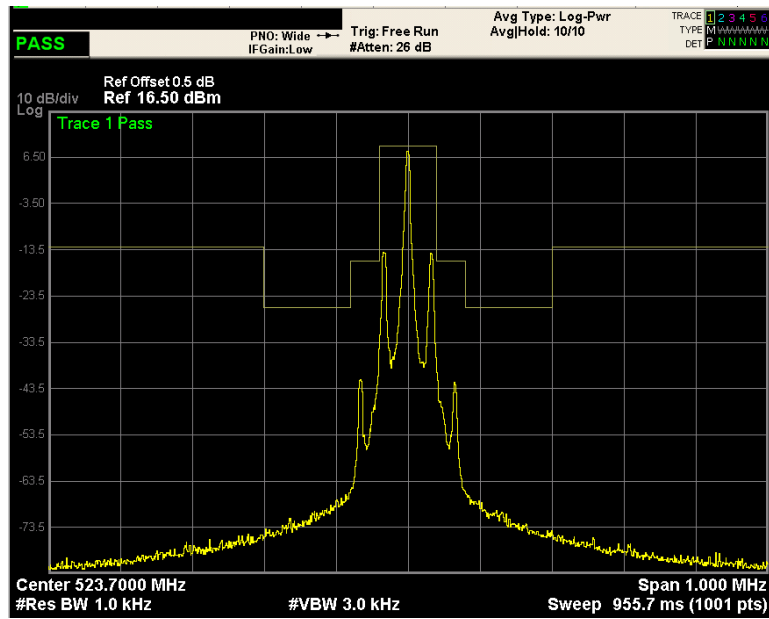
#### Emission Mask Low Channel



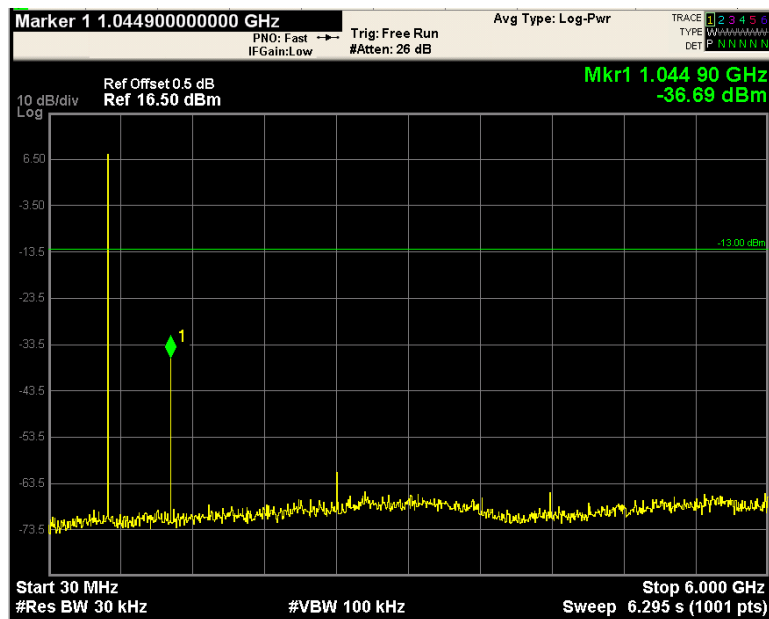
#### Low channel 30M-6G



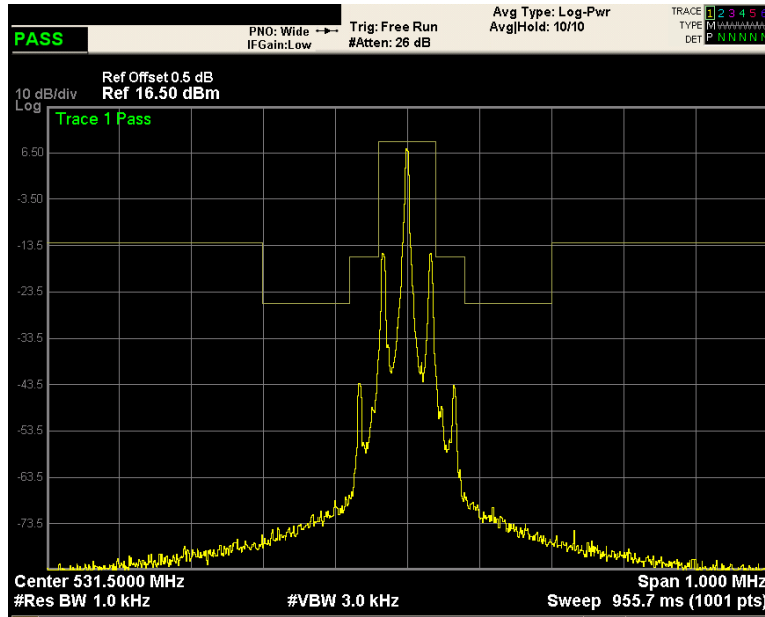
### Emission Mask Middle Channel



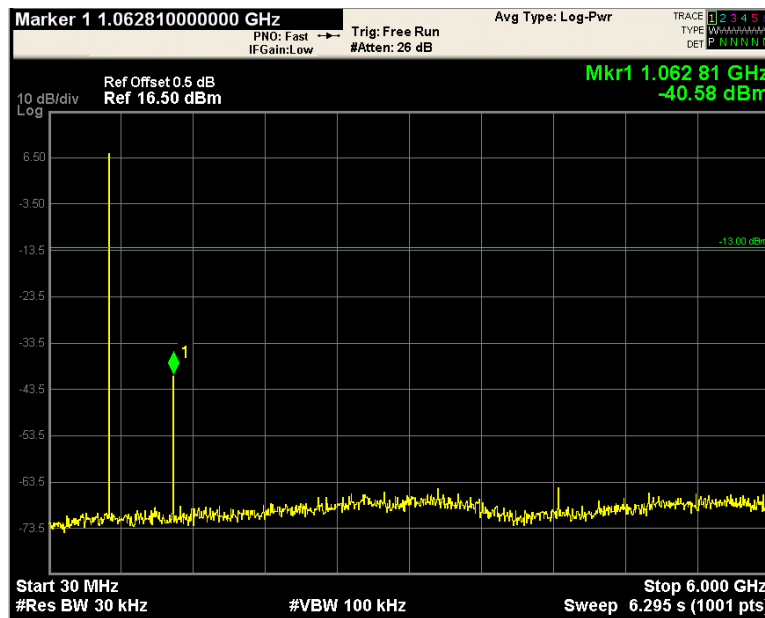
### Middle channel 30M-6G



### Emission Mask High Channel



### High channel 30M-6G





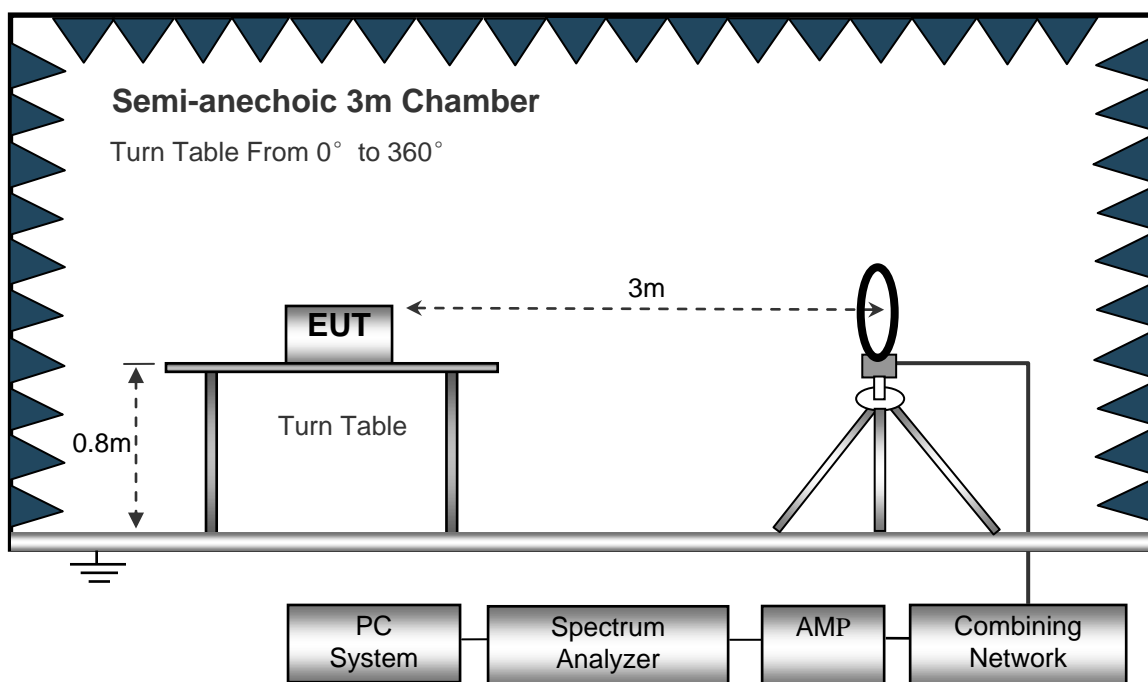
## 10 Radiated Emission Test

Test requirement:	FCC CFR47 Part 2 Section 2.1053
Test method:	Based on ANSI/TIA-603-D:2010
Limit:	According to Part 74.861 (e)(6), the mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the following schedule: <ul style="list-style-type: none"> <li>(i) on any frequency removed from the operating frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: at least 25 dB.</li> <li>(ii) on any frequency removed from the operating frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth: at least 35 dB.</li> <li>(iii) on any frequency removed from the operating frequency by more than 250 percent up to and the authorized bandwidth shall be attenuated below the un-modulated carrier by at least <math>43 + 10 \text{ Log} (\text{output power in watts})\text{dB}</math>.</li> </ul>

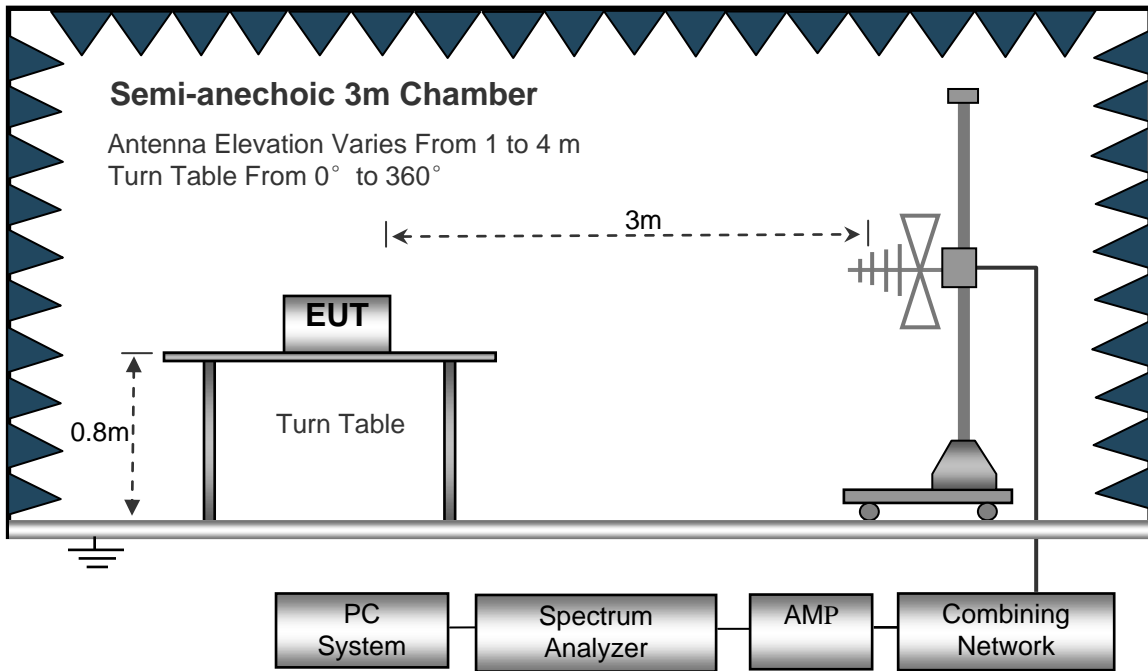
### 10.1 EUT Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site, using the setup accordance with the ANSI C63.4:2003.

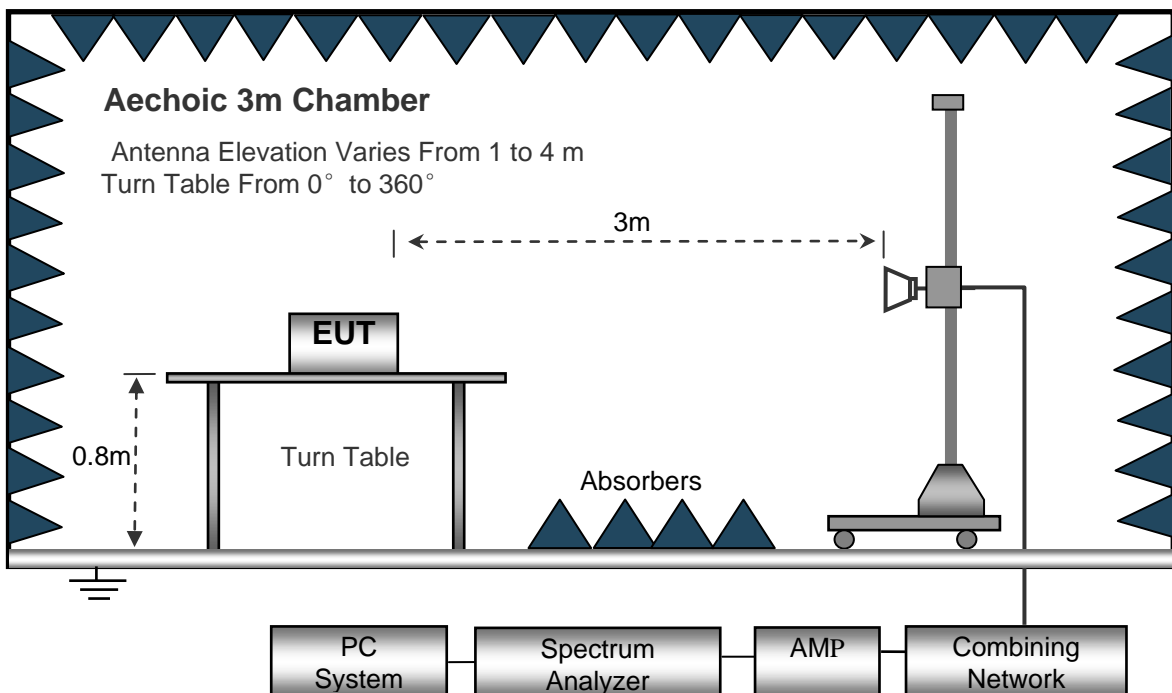
The diagram below shows the test setup that is utilized to make the measurements for emission from 9 KHz to 30 MHz Emissions.



The diagram below shows the test setup that is utilized to make the measurements for emission from 30 MHz to 1 GHz Emissions.



The diagram below shows the test setup that is utilized to make the measurements for emission above 1GHz Emissions.



## 10.2 Spectrum Analyzer Setup

According to FCC Part 2 Section 2.1053 Rules, the system was tested 25MHz to 6000MHz.

9kHz ~ 30MHz

Start Frequency .....9kHz  
 Stop Frequency .....30MHz  
 Sweep Speed .....Auto  
 IF Bandwidth.....10KHz  
 Video Bandwidth.....10KHz  
 Resolution Bandwidth .....10KHz

30MHz ~ 1GHz

Start Frequency .....30 MHz  
 Stop Frequency.....1000MHz  
 Sweep Speed.....Auto  
 IF Bandwidth .....120 KHz  
 Video Bandwidth .....300KHz  
 Quasi-Peak Adapter Bandwidth.....120 KHz  
 Quasi-Peak Adapter Mode .....Normal  
 Resolution Bandwidth .....100KHz

Above 1GHz

Start Frequency .....1000 MHz  
 Stop Frequency.....7000MHz  
 Sweep Speed.....Auto  
 IF Bandwidth .....120 KHz  
 Video Bandwidth .....3MHz  
 Quasi-Peak Adapter Bandwidth.....120 KHz  
 Quasi-Peak Adapter Mode .....Normal  
 Resolution Bandwidth .....1MHz

## 10.3 Test Procedure

1. Place the transmitter to be tested on the turntable in the standard test site. The transmitter is Transmitting into a non-radiating load, which is placed on the turntable.
2. The output of the antenna was connected to the measuring receiver and a peak detector was used for the measurement as indicated on the report.
3. The transmitter was switched on; if possible, without the modulation and the measurement receiver shall be tuned to the frequency of the transmitter under test.
4. The test antenna shall be raised and Lowed through the specified range of height until the measuring receiver detects a maximum signal level.
5. The transmitter shall than be rotated through 360° in the horizontal plane, until the maximum signal level is detected by the measuring receiver.

6. The test antenna shall be raised and Lowered again through the specified range of height until the measuring receiver detects a maximum signal level.
7. The maximum signal level detected by the measuring receiver shall be noted.
8. The measurement shall be repeated with the test antenna set to horizontal polarization.
9. Replace the antenna with a proper antenna (substitution antenna).
10. 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.
11. The substitution antenna shall be connected to a calibrated signal generator.
12. If necessary, the input attenuator setting of the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.
13. The test antenna shall be raised and Lowered through the specified range of the height to ensure that the maximum signal is received.
14. 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.
15. 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.
16. The measurement shall be repeated with the test antenna and the substitution antenna oriented for horizontal polarization.
17. The radiation emission was tested under 3-axes(X,Y,Z) position(X denotes lying on the table, Y denotes side stand and Z denotes vertical stand),After pre-test, It was found that the worse radiation emission was get at the X position. So the data shown was the X position only.
18. The EUT was under working mode during the final qualification test and the configuration was used to represent the worst case results.

## 10.4 Test Result

Frequency (MHz)	Detector	Ant. Pol	Antenna Height (m)	Turntable Angle (°)	Emission Level (dBm)	Limit (dBm)	Margin (dB)
<b>Low Channel:516.50MHz</b>							
1033.00	Peak	H	1.5	313	-33.14	-13.00	-20.14
1033.00	Peak	V	1.9	151	-37.89	-13.00	-24.89
1549.50	Peak	H	1.7	205	-51.05	-13.00	-38.05
1549.50	Peak	V	1.8	340	-52.76	-13.00	-39.76
2066.00	Peak	H	1.4	90	-51.05	-13.00	-38.05
2066.00	Peak	V	1.7	141	-52.76	-13.00	-39.76
<b>Middle Channel:523.70MHz</b>							
1047.40	Peak	H	1.7	84	-36.54	-13.00	-23.54
1047.40	Peak	V	1.0	147	-37.74	-13.00	-24.74
1571.10	Peak	H	1.1	347	-51.25	-13.00	-38.25
1571.10	Peak	V	1.5	232	-52.19	-13.00	-39.19
2094.80	Peak	H	1.7	206	-50.70	-13.00	-37.70
2094.80	Peak	V	1.6	13	-52.51	-13.00	-39.51
<b>High Channel:531.50MHz</b>							
1063.00	Peak	H	1.9	241	-39.18	-13.00	-26.18
1063.00	Peak	V	1.4	271	-40.33	-13.00	-27.33
1594.50	Peak	H	1.6	201	-51.66	-13.00	-38.66
1594.50	Peak	V	1.5	264	-52.64	-13.00	-39.64
2126.00	Peak	H	1.2	301	-51.77	-13.00	-38.77
2126.00	Peak	V	1.5	255	-52.50	-13.00	-39.51

The measurements below 1G were more than 20 dB below the limit and not reported.

## 11 Frequency Stability

Test requirement:	FCC CFR47 Part 2 Section 2.1055(a)(a)
Test method:	Based on ANSI/TIA-603-D:2010
Limit:	According to FCC 74.86(e)(4), the frequency tolerance of the transmitter shall be 0.005 percent.

### 11.1 Test Configuration

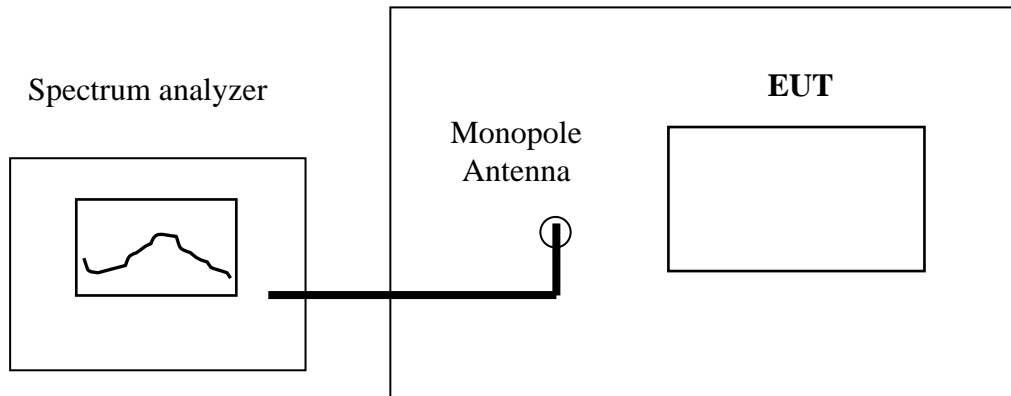


Figure 1

### 11.2 Test Procedure

#### A) Frequency stability versus input voltage

1. Setup the configuration per figure 1 for frequencies measured at an environmental chamber whose temperature is set to 20 °C. Install new batteries in the EUT.
2. Set SA center frequency to the EUT operation frequency. Then set SA RBW to 30 kHz, VBW to 100kHz and frequency span to 500 kHz. Record this frequency to be a reference.
3. Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

#### B) Frequency stability versus environmental temperature

1. Setup the configuration per figure 1 for frequencies measured at an environmental chamber, Install new batteries in the EUT.
2. Turn on EUT and set SA center frequency to the EUT operation frequency, then set SA RBW to 30kHz, VBW to 100kHz and frequency span to 500 kHz. Record this frequency to be a reference.
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 measurement frequencies.

### 11.3 Test Result

a) Frequency stability versus input voltage

Low channel

Power Supply	Reference Frequency (MHz)	Environment Temperature (°C)	Frequency Measured	Frequency Tolerance (%)
2.7V, DC	516.500	20	516.504	0.00079
3.3V, DC	516.500	20	516.501	0.00013

Middle channel

Power Supply	Reference Frequency (MHz)	Environment Temperature (°C)	Frequency Measured	Frequency Tolerance (%)
2.7V, DC	523.700	20	523.703	0.00066
3.3V, DC	523.700	20	523.701	0.00016

High channel

Power Supply	Reference Frequency (MHz)	Environment Temperature (°C)	Frequency Measured	Frequency Tolerance (%)
2.7V, DC	531.500	20	531.504	0.00067
3.3V, DC	531.500	20	531.502	0.00045

## b) Frequency stability versus environmental temperature

<b>Low Frequency: 516.50MHz, Limit: 0.005%</b>			
<b>Environment Temperature(°C)</b>	<b>Power Supply</b>	<b>Frequency Deviation measured with time Elapse(30 minutes)</b>	
		<b>MHz</b>	<b>%</b>
50	3V, DC	516.498	0.00031
40	3V, DC	516.501	0.00010
30	3V, DC	516.496	0.00079
20	3V, DC	516.502	0.00042
10	3V, DC	516.503	0.00067
0	3V, DC	516.504	0.00074
-10	3V, DC	516.497	0.00053
-20	3V, DC	516.500	0.00007
-30	3V, DC	516.503	0.00055

<b>Middle Frequency: 523.70MHz, Limit: 0.005%</b>			
<b>Environment Temperature(°C)</b>	<b>Power Supply</b>	<b>Frequency Deviation measured with time Elapse(30 minutes)</b>	
		<b>MHz</b>	<b>%</b>
50	3V, DC	523.695	0.00098
40	3V, DC	523.695	0.00086
30	3V, DC	523.700	0.00006
20	3V, DC	523.702	0.00047
10	3V, DC	523.700	0.00008
0	3V, DC	523.703	0.00055
-10	3V, DC	523.694	0.00111
-20	3V, DC	523.702	0.00038
-30	3V, DC	523.699	0.00021



High Frequency: 531.50MHz, Limit: 0.005%			
Environment Temperature(°C)	Power Supply	Frequency Deviation measured with time Elapse(30 minutes)	
		MHz	%
50	3V, DC	531.506	0.00109
40	3V, DC	531.495	0.00103
30	3V, DC	531.498	0.00039
20	3V, DC	531.506	0.00111
10	3V, DC	531.504	0.00074
0	3V, DC	531.499	0.00013
-10	3V, DC	531.499	0.00023
-20	3V, DC	531.505	0.00096
-30	3V, DC	531.504	0.00080

Test Result: The max frequency tolerance rating is 0.00111% < 0.005%. Passed.

## 12 RF Exposure

Test Requirement:	FCC Part 1.1307
Evaluation Method	447498 D01 General RF Exposure Guidance v05r02

### 12.1 Requirements

1) The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances  $\leq 50$  mm are determined by:

$[(\text{max. power of channel, including tune-up tolerance, mW})/(\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}] \leq 3.0$  for 1-g SAR and  $\leq 7.5$  for 10-g extremity SAR where

1.  $f(\text{GHz})$  is the RF channel transmit frequency in GHz
2. Power and distance are rounded to the nearest mW and mm before calculation
3. The result is rounded to one decimal place for comparison

The test exclusions are applicable only when the minimum test separation distance is  $\leq 50$  mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is  $< 5$  mm, a distance of 5 mm is applied to determine SAR test exclusion.

### 12.2 The procedures / limit

Conducted Peak power(dBm)	Conducted Peak power(mW)	Source-based time-averaged maximum conducted output power(mW)	Minimum test separation distance required for the exposure conditions (mm)	SAR Test Exclusion Thresholds(mW)
8.07	6.41	6.41	5	20

Remark: Max. duty factor is 100%

Calculation formula: Source-based time-averaged maximum conducted output power(mW) =Conducted peak power(mW)\*Duty factor

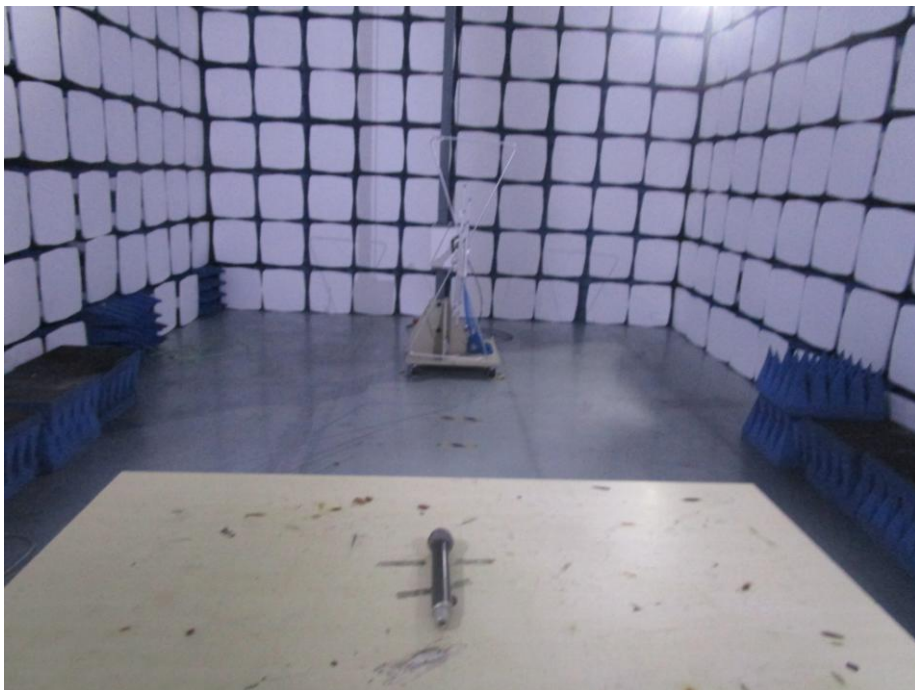
### 13 Photographs –Model HT-300C Test Setup

#### 13.1 Photograph – Radiation Spurious Emission Test Setup

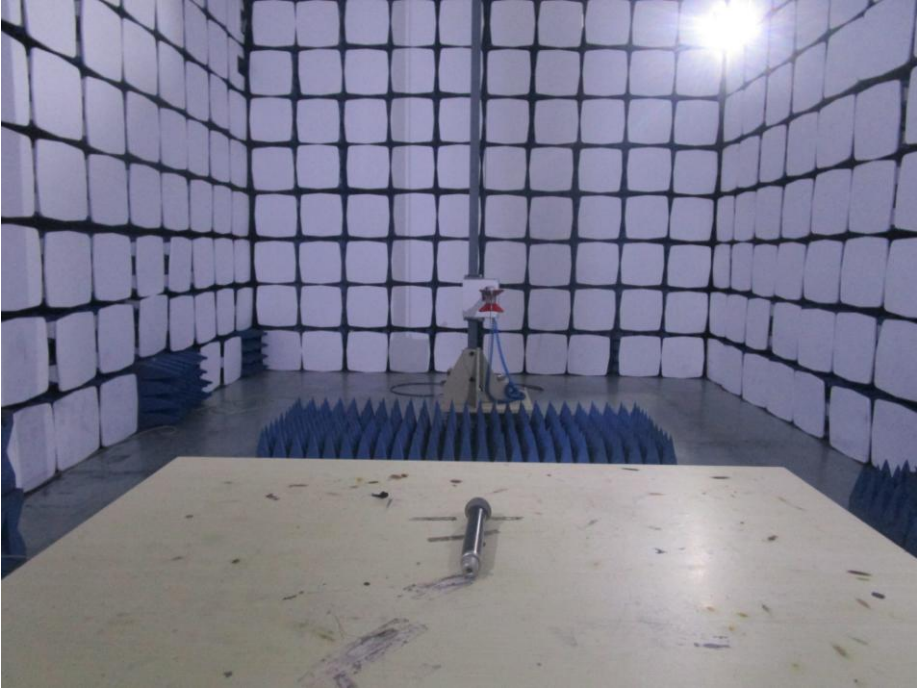
9KHz ~30MHz



30MHz-1GHz



Above 1GHz



### 14 Photographs – Constructional Details

#### 14.1 EUT –Model HT-300C External Photos







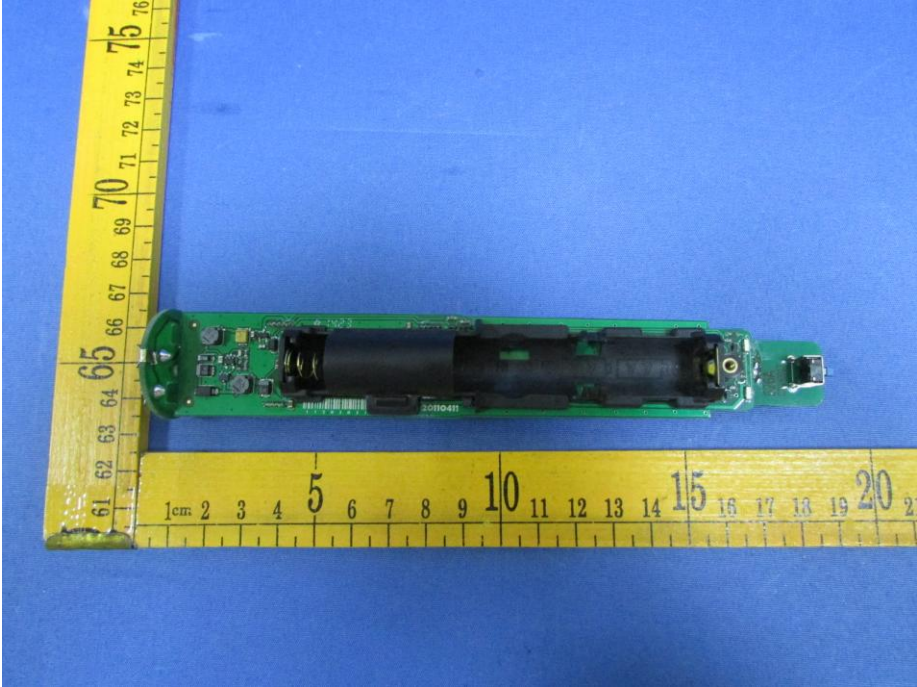


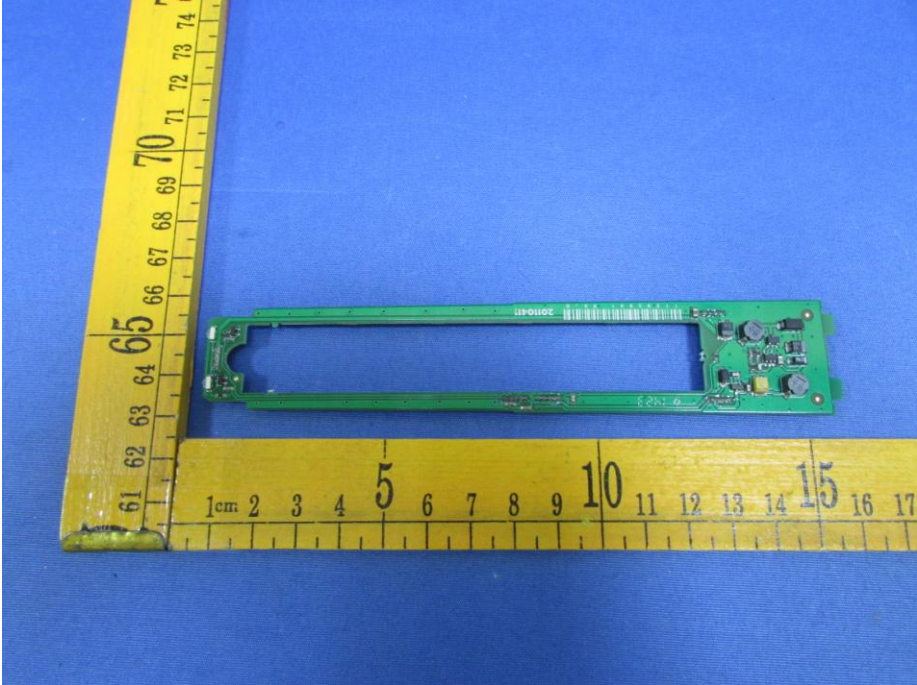
14.2 EUT –Model HT-300C Internal Photos



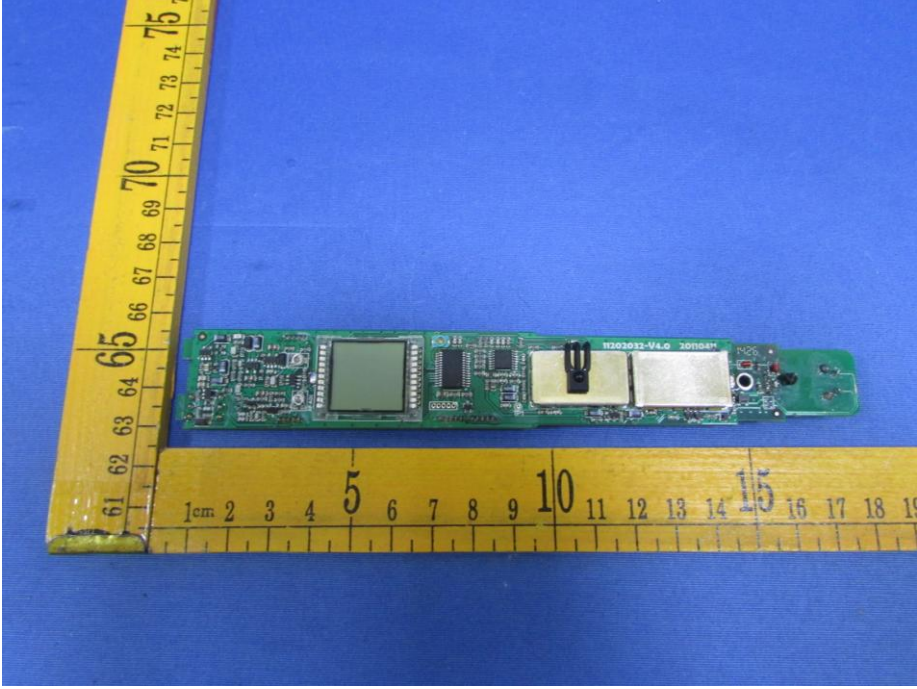
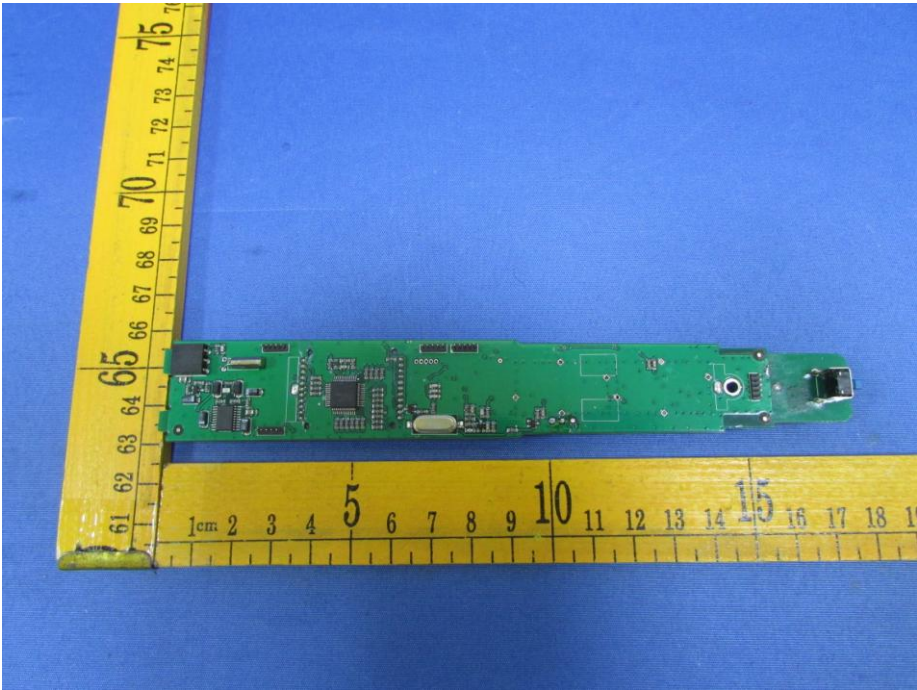
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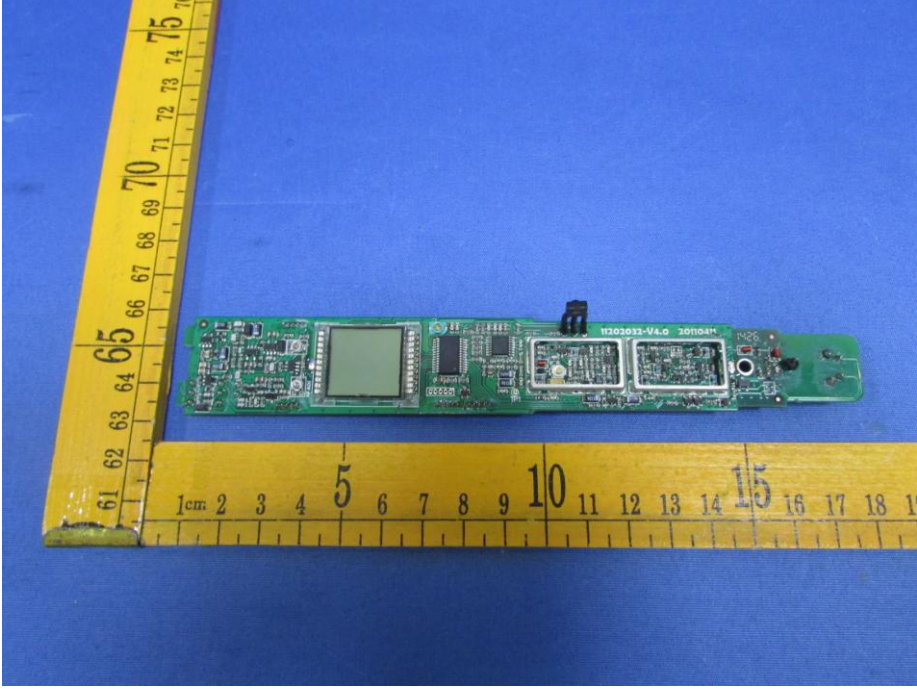
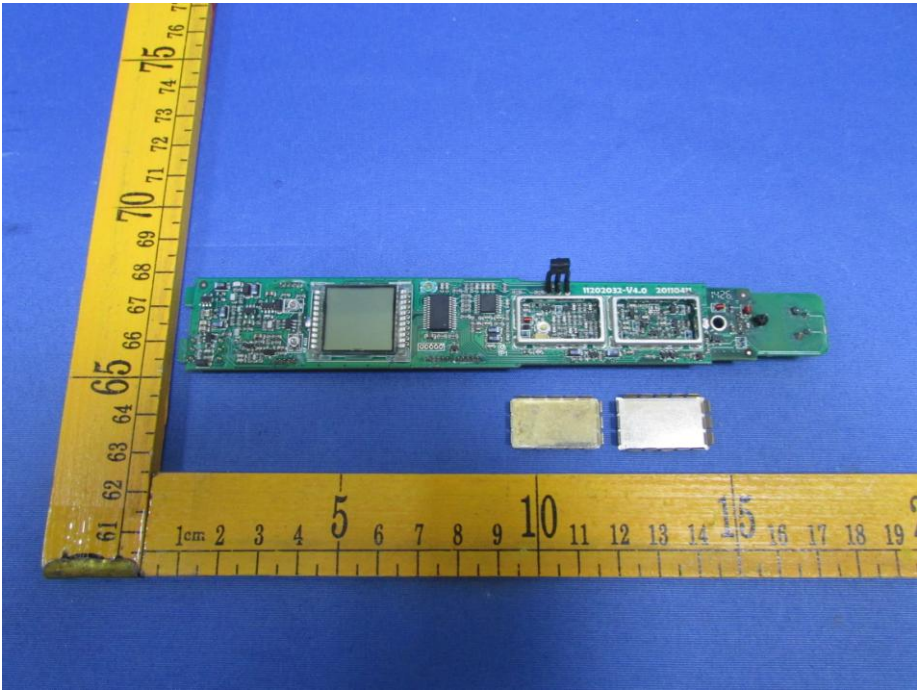


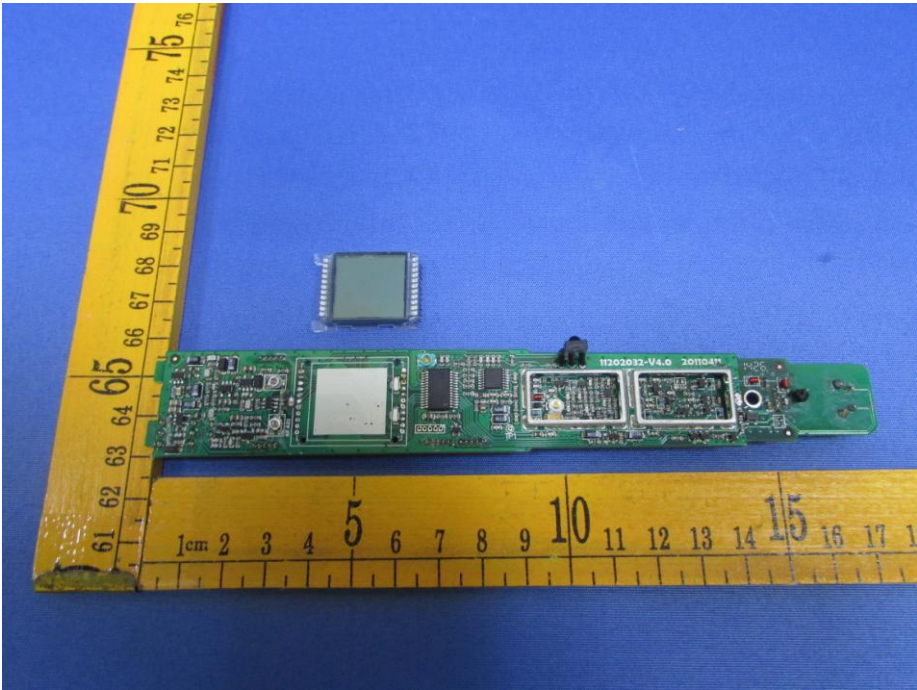












=====-End of Report=-====