TEST REPORT

Reference No......	:	WTF16S0140891E
FCC ID.....	:	SZR-HD028
Applicant.....	:	Radio Engineering Industries Inc.
Address.....	:	6534 L Street, Omaha, Nebraska 68117, United States
Manufacturer	:	Enping Hengda Electronic Industry Co., Ltd.
Address.....	:	No.8, B District, Individual & Foreign Capital Industry Zone, Enping City, Guangdong, P. R. China.
Product Name.....	:	Wireless Microphone
Model No.....	:	ACT-8098, HD-026, HD-028
Standards.....	:	FCC CFR47 Part 74
Date of Receipt sample.....	:	Jan. 07, 2016
Date of Test.....	:	Jan. 09 – July 6, 2016
Date of Issue.....	:	July 15, 2016
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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Fax:+86-755-83552400

Tested by:

Zero Zhou / Test 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.			

3 Contents

Page

4 General Information

4.1 General Description of E.U.T.

Product Name : Wireless Microphone

Model No. : ACT-8098, HD-026, HD-028

Differences describe : Only the model name is different for different market requirement.

Operation Frequency : 660.35-689.75MHz, 99channels

The Lowest Oscillator : 4MHz

Antenna installation : wire antenna (0dBi)

Modulation :FSK

Max output power :3±1 dBm

Frequency tolerance :±10KHz

Rated System Deviation :± 1.8KHz

Maximum System Deviation :± 2.0KHz

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	660.35	2	660.65	3	660.95	4	661.25
5	661.55	6	661.85	7	662.15	8	662.45
9	662.75	10	663.05	11	663.35	12	663.65
13	663.95	14	664.25	15	664.55	16	664.85
17	665.15	18	665.45	19	665.75	20	666.05
21	666.35	22	666.65	23	666.95	24	667.25
25	667.55	26	667.85	27	668.15	28	668.45
29	668.75	30	669.05	31	669.35	32	669.65
33	669.95	34	970.25	35	670.55	36	670.85
37	671.15	38	671.45	39	671.75	40	672.05
41	672.35	42	672.65	43	672.95	44	973.25
45	673.55	46	673.85	47	674.15	48	674.45
49	674.75	50	675.05	51	675.35	52	675.65
53	675.95	54	676.25	55	676.55	56	676.85
57	677.15	58	677.45	59	677.75	60	678.05
61	678.35	62	678.65	63	678.95	64	679.25
65	679.55	66	679.85	67	680.15	68	680.45
69	680.75	70	681.05	71	681.35	72	681.65
73	681.95	74	682.25	75	682.55	76	682.85
77	683.15	78	683.45	79	683.75	80	684.05
81	684.35	82	684.65	83	684.95	84	685.25
85	685.55	86	685.85	87	686.15	88	686.45
89	686.75	90	687.05	91	687.35	92	687.65
93	687.95	94	688.25	95	688.55	96	688.85
97	689.15	98	689.45	99	689.75		

4.4 Test Facility

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

- **IC – Registration No.: 7760A-1**

  Waltek Services (Shenzhen) Co., Ltd. has been registered and fully described in a report filed with the Industry Canada. The acceptance letter from the Industry Canada is maintained in our files. Registration 7760A-1, October 15, 2015

- **FCC Test Site 1#– Registration No.: 880581**

  Waltek Services(Shenzhen) 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. Registration 880581, April 29, 2014.

- **FCC Test Site 2#– Registration No.: 328995**

  Waltek Services(Shenzhen) 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. Registration 328995, December 3, 2014.

5 Equipment Used during Test

5.1 Equipments List

3m Semi-anechoic Chamber for Radiation Emissions Test site 1#						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Calibration Date**	**Calibration Due Date**
1	EMC Analyzer	Agilent	E7405A	MY45114943	Sep.15,2015	Sep.14,2016
2	Active Loop Antenna	Beijing Dazhi	ZN30900A	-	Sep.15,2015	Sep.14,2016
3	Trilog Broadband Antenna	SCHWARZBECK	VULB9163	336	Apr.19,2016	Apr.18,2017
4	Coaxial Cable (below 1GHz)	Top	TYPE16(13M)	-	Sep.15,2015	Sep.14,2016
5	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9120 D	667	Apr.19,2016	Apr.18,2017
6	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9170	335	Apr.19,2016	Apr.18,2017
7	Broadband Preamplifier	COMPLIANCE DIRECTION	PAP-1G18	2004	Mar.17,2016	Mar.16,2017
8	Coaxial Cable (above 1GHz)	Top	1GHz-25GHz	EW02014-7	Apr.10,2016	Apr.09,2017
3m Semi-anechoic Chamber for Radiation Emissions Test site 2#						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No**	**Last Calibration Date**	**Calibration Due Date**
1	Test Receiver	R&S	ESCI	101296	Sep.15,2015	Sep.14,2016
2	Trilog Broadband Antenna	SCHWARZBECK	VULB9160	9160-3325	Sep.15,2015	Sep.14,2016
3	Amplifier	Compliance pirection systems inc	PAP-0203	22024	Sep.15,2015	Sep.14,2016
4	Cable	HUBER+SUHNER	CBL2	525178	Sep.15,2015	Sep.14,2016
RF Conducted Testing						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Calibration Date**	**Calibration Due Date**
1.	EMC Analyzer (9k~26.5GHz)	Agilent	E7405A	MY45114943	Sep.15,2015	Sep.14,2016
2.	Spectrum Analyzer (9k-6GHz)	R&S	FSL6	100959	Sep.15,2015	Sep.14,2016
3.	Signal Analyzer (9k~26.5GHz)	Agilent	N9010A	MY50520207	Sep.15,2015	Sep.14,2016

5.2 Measurement Uncertainty

Parameter	Uncertainty
Radio Frequency	± 1 x 10^{-6}
RF Power	± 1.0 dB
RF Power Density	± 2.2 dB
Radiated Spurious Emissions test	± 5.03 dB (Bilog antenna 30M~1000MHz)
	± 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

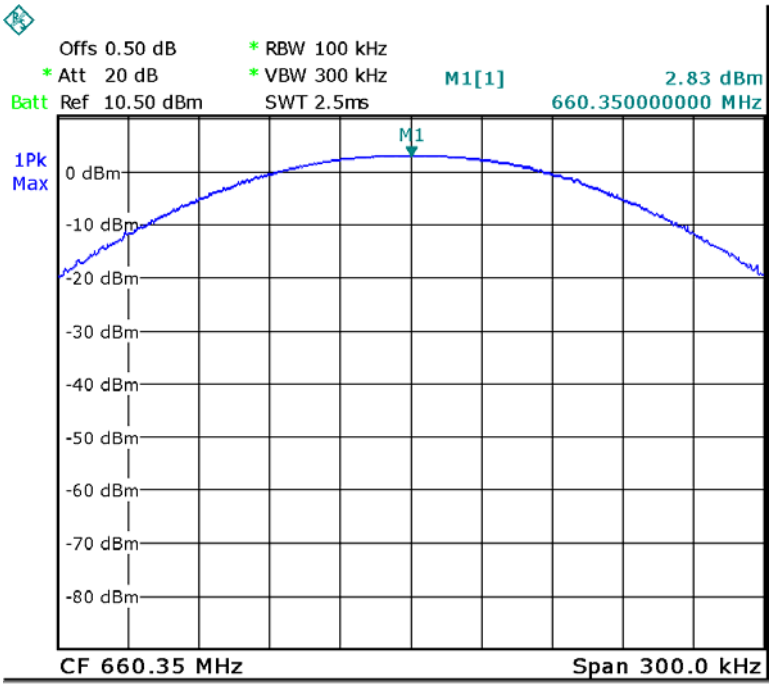
The maximum peak output power was measured with a spectrum analyzer connected to the antenna terminal (conducted measurement) while EUT was operating in normal situation.

6.2 Test result

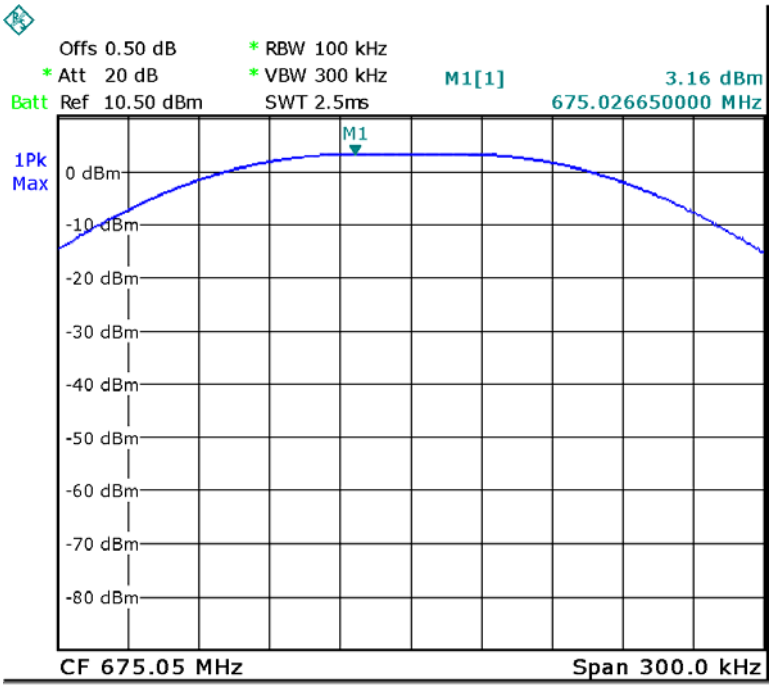
Frequency (MHz)	RF Output Power (dBm)	Limit (dBm)	Result
660.35	2.83	23.98	PASS
675.05	3.16	23.98	PASS
689.75	3.42	23.98	PASS

Please refer to following plot:

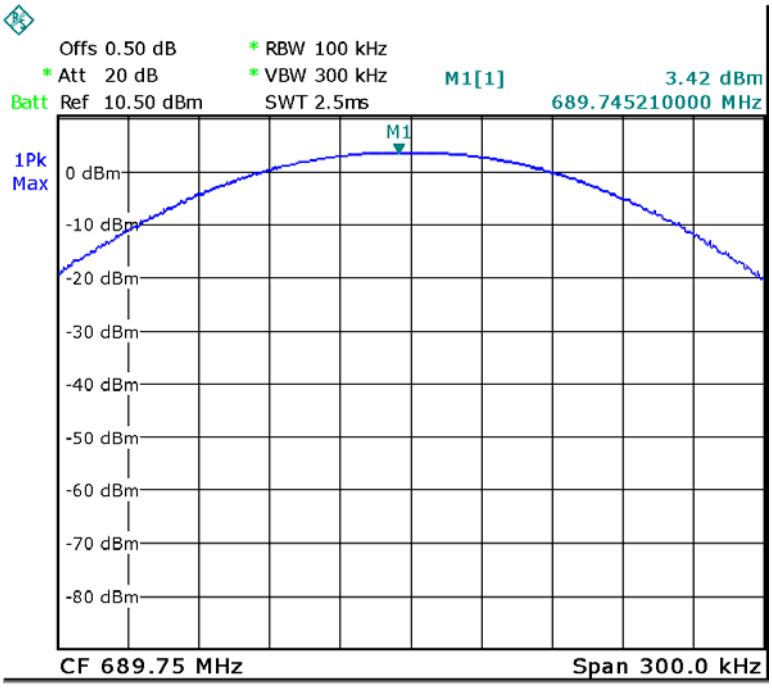
Low channel



Middle channel



High channel



7 Modulation Characteristics

Test requirement: FCC CFR47 § 74.861 (e) (3)

Test method: Based on ANSI/TIA-603-D: 2010

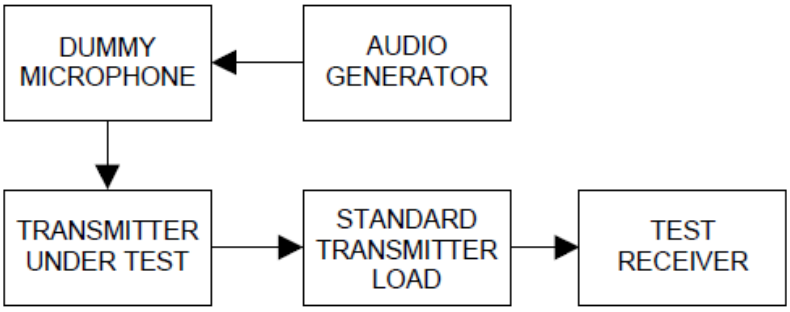
Requirement: Any form of modulation may be used. A maximum deviation of ±75kHz is permitted when frequency modulation is employed.

7.1 Test Procedure

Modulation Limiting (TIA-603D:2010 Section 2.2.3)

Modulation limiting is the transmitter circuit's ability to limit the transmitter from producing deviations in excess of a rated system deviation.

Method of Measurement



a) Connect the equipment as illustrated.

b) Adjust the transmitter per the manufacturer's procedure for full rated system deviation.

c) Set the test receiver to measure peak positive deviation. Set the audio bandwidth for ≤0.25 Hz to ≥15,000 Hz. Turn the de-emphasis function off.

d) 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.

e) Increase the level from the audio frequency generator by 20 dB in one step (rise time between the 10% and 90% points shall be 0.1 second maximum).

f) Measure both the instantaneous and steady-state deviation at and after the time of increasing the audio input level.

g) 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.

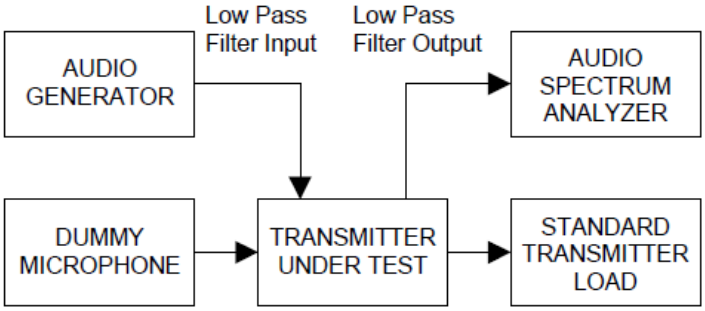
h) Set the test receiver to measure peak negative deviation and repeat steps d) through g).

i) The values recorded in steps g) and h) are the modulation limiting.

Audio Low Pass Filter Response (TIA-603D:2010 Section 2.2.15)

The audio low pass filter response is the frequency response of the post limiter low pass filter circuit above 3000 Hz.

Method of Measurement



a) Connect the equipment as illustrated.

b) Connect the audio frequency generator as close as possible the input of the post limiter low pass filter within the transmitter under test.

c) Connect the audio spectrum analyzer to the output of the post limiter low pass filter within the transmitter under test.

d) Apply a 1000 Hz tone from the audio frequency generator and adjust the level per manufacturer's specifications.

e) Record the dB level of the 1000 Hz spectral line on the audio spectrum analyzer as $LEV_{REF.}$

f) Set the audio frequency generator to the desired test frequency between 3000 Hz and the upper low pass filter limit.

g) Record audio spectrum analyzer levels, at the test frequency in step f).

h) Record the dB level on the audio spectrum analyzer as LEV_{FREQ} .

i) Calculate the audio frequency response at the test frequency as:

$$low\ pass\ frequency\ response = LEV_{FREQ} - LEV_{REF}$$

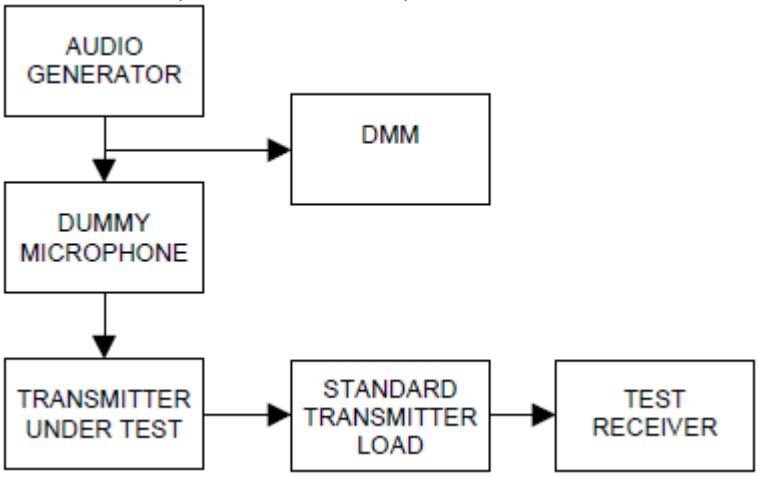
j) Repeat steps f) through i) for all the desired test frequencies.

Audio Frequency Response (TIA-603D:2010 Section 2.2.6)

The audio frequency response is the degree of closeness to which the frequency deviation of the transmitter follows a prescribed characteristic.

Method of Measurement

Constant deviation test method (300 Hz to 3000 Hz)



a) Connect the equipment as illustrated.

b) Set the test receiver to measure peak positive deviation. Set the audio bandwidth for ⩽50 Hz to ⩾15,000 Hz. Turn the de-emphasis function off.

c) Set the DMM to measure rms voltage.

d) Adjust the transmitter per the manufacturer's procedure for full rated system deviation.

e) Apply a 1000 Hz tone and adjust the audio frequency generator to produce 20% of the rated system deviation.

f) Set the test receiver to measure rms deviation and record the deviation reading.

g) Record the DMM reading as VREF .

h) Set the audio frequency generator to the desired test frequency between 300 Hz and 3000 Hz.

i) Vary the audio frequency generator output level until the deviation reading that was recorded in step f) is obtained.

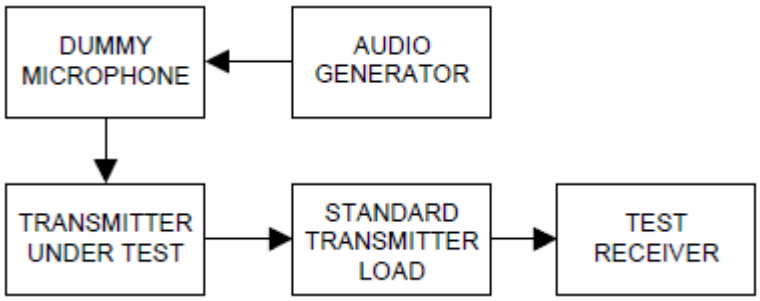
j) Record the DMM reading as VFREQ .

k) Calculate the audio frequency response at the present frequency as:

$$audio\ frequency\ response = 20\ \log_{10}\left(\frac{V_{FREQ}}{V_{REF}}\right)$$

l) Repeat steps h) through k) for all the desired test frequencies.

Constant Input Test Method (300 Hz to 3000 Hz)



a) Connect the equipment as illustrated.

b) Set the test receiver to measure peak positive deviation. Set the audio bandwidth for ≤50 Hz to ≥15,000 Hz. Turn the de-emphasis function off.

c) Adjust the transmitter per the manufacturer's procedure for full rated system deviation.

d) Apply a 1000 Hz tone and adjust the audio frequency generator to produce 20% of the rated system deviation.

e) Set the test receiver to measure rms deviation and record the deviation reading as DEVREF .

f) Set the audio frequency generator to the desired test frequency between 300 Hz and 3000 Hz.

g) Record the test receiver deviation reading as DEVFREQ .

h) Calculate the audio frequency response at the present frequency as:

$$audio\ frequency\ response = 20\ \log_{10}\left(\frac{DEV_{FREQ}}{DEV_{REF}}\right)$$

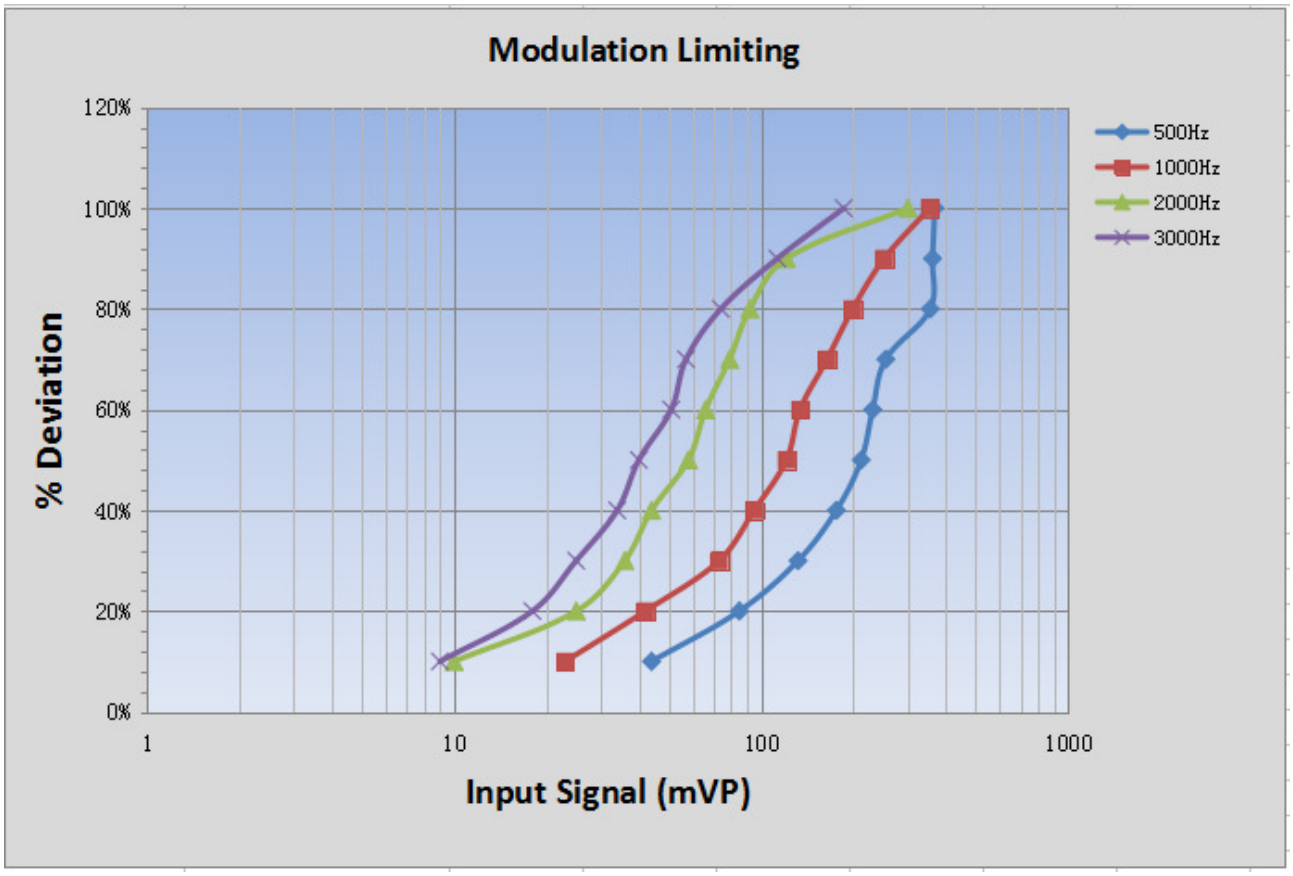
i) Repeat steps f) through h) for all the desired test frequencies.

7.2 Test Result

Modulation Limiting Test Result

Middle Channel

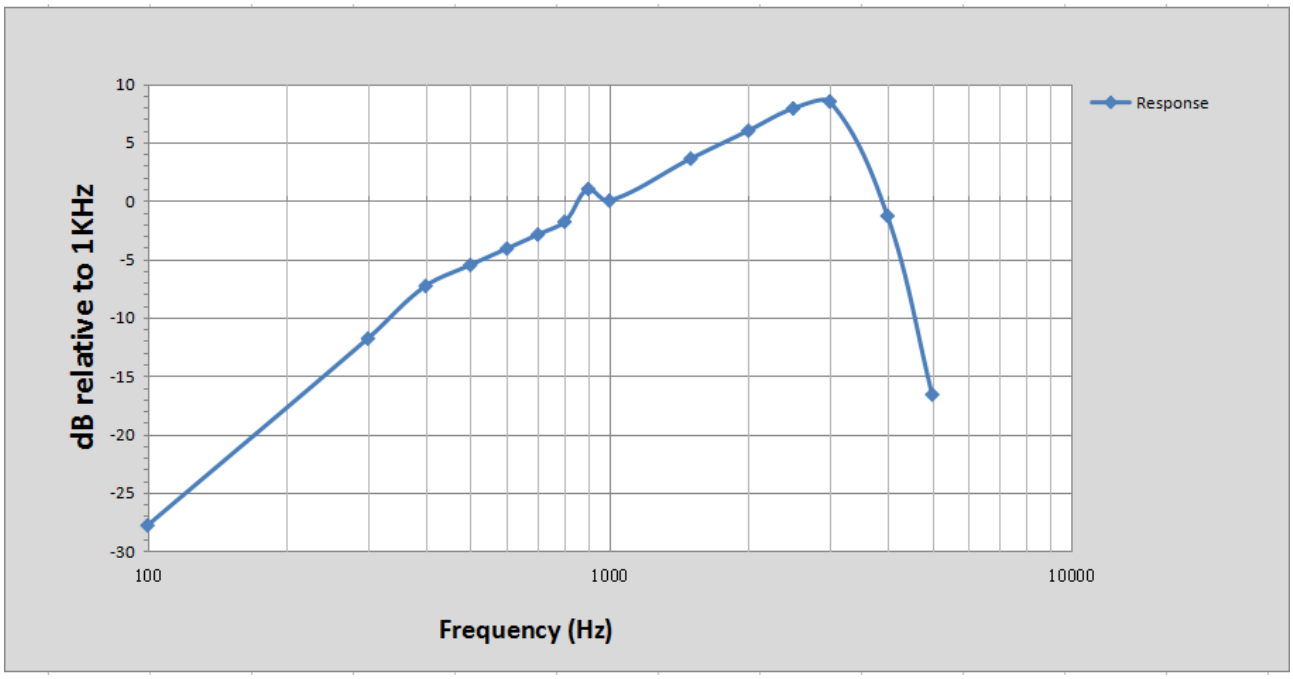
% Deviation	Input Signal (mVP)			
	500 Hz	1000 Hz	2000 Hz	3000 Hz
10%	44	23	10	9
20%	85	42	25	18
30%	132	73	36	25
40%	176	95	44	34
50%	212	121	58	40
60%	231	134	66	51
70%	255	164	79	57
80%	356	199	92	74
90%	362	252	121	113
100%	368	354	301	186



Audio Frequency Response Test Result

Middle channel

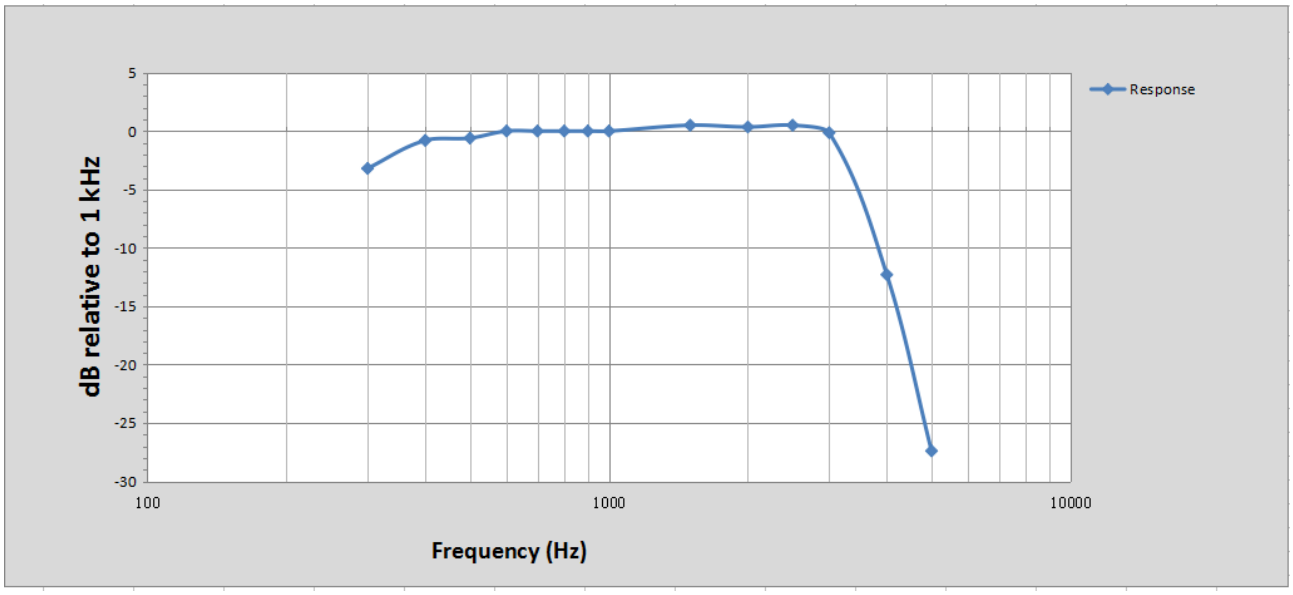
Frequency(Hz)	Audio Frequency Response(Hz)	Audio Frequency Response(dB)
100	30	-27.6
300	190	-11.5
400	320	-7.6
500	390	-5.58
600	460	-4.4
700	530	-3.2
800	600	-2.1
900	660	2
1000	740	0
1500	1120	3.7
2000	1480	6.2
2500	1840	8.3
3000	1980	7.8
4000	640	-1.4
5000	110	-16.8



Audio Low Pass Filter Response Test Result

Middle channel

Frequency(Hz)	Audio Frequency Response(Hz)	Audio Frequency Response(dB)
300	1053	-3.2
400	1418	-0.8
500	1479	-0.6
600	1488	0
700	1488	0
800	1488	0
900	1488	0
1000	1488	0
1500	1536	0.5
2000	1536	0.35
2500	1536	0.5
3000	1452	-0.14
4000	379	-12.3
5000	63	-27.4



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

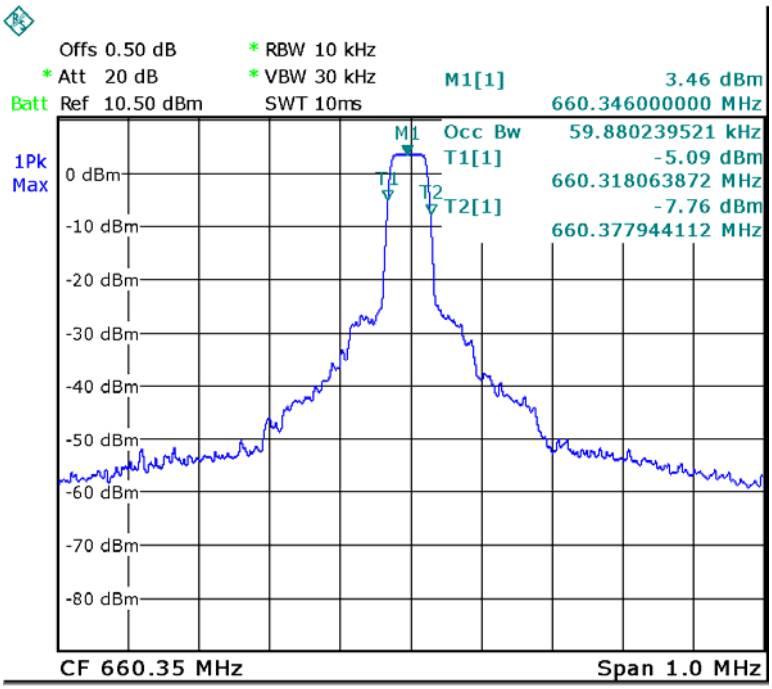
1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Turn on the EUT and set it to any one convenient frequency within its operating range.

8.2 Test Result

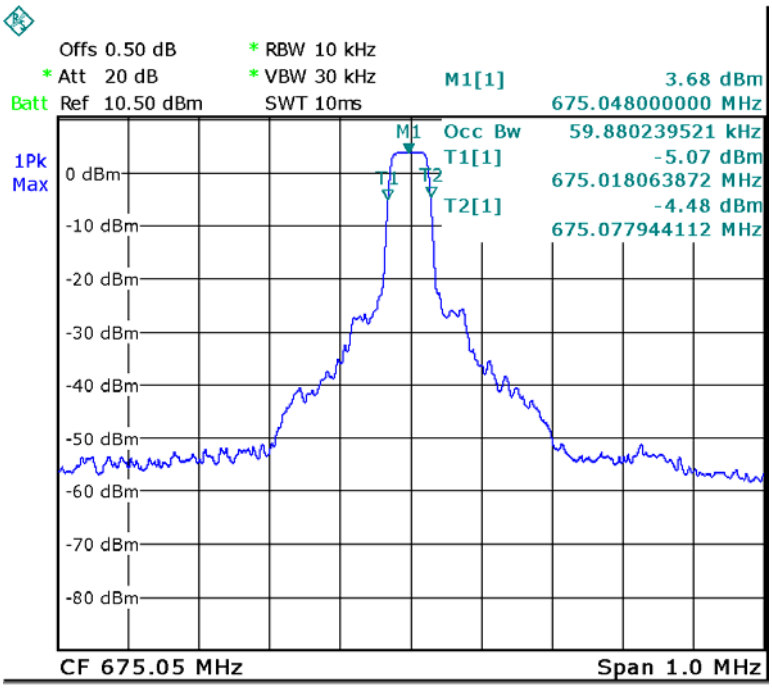
Frequency (MHz)	99% Bandwidth (kHz)	Limit (kHz)	Result
660.35	59.88	200	PASS
675.05	59.88	200	PASS
689.75	59.88	200	PASS

Test Plot:

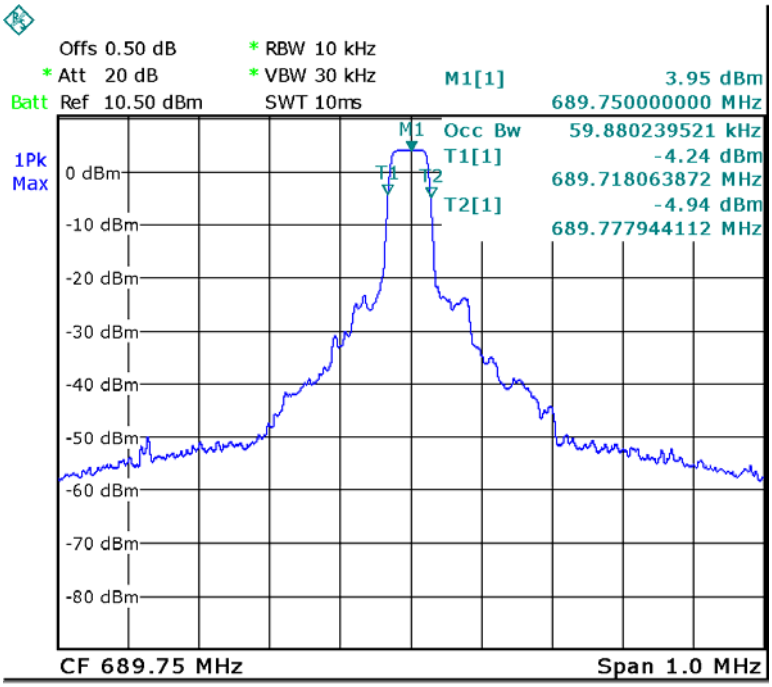
Low channel



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 Log (output power in watts)dB.

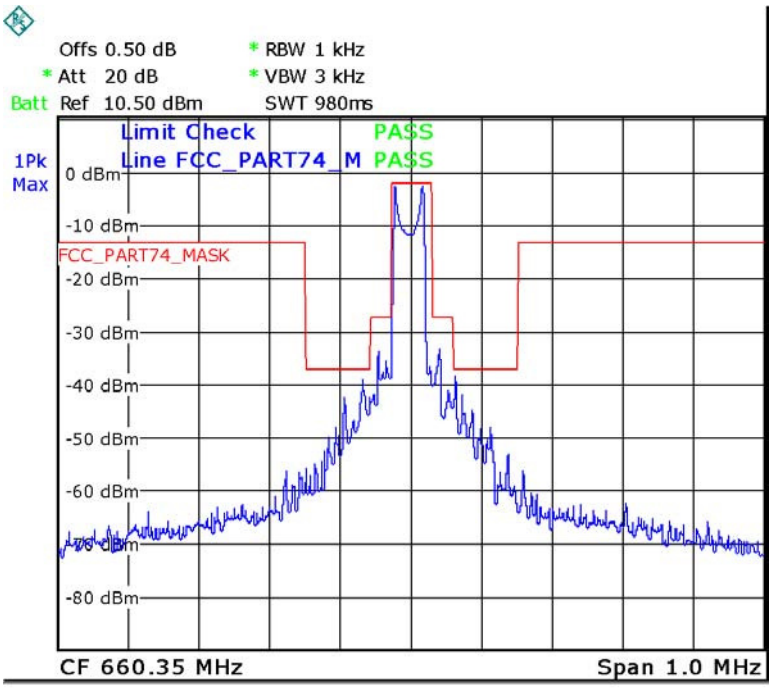
9.1 Test Procedure

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.

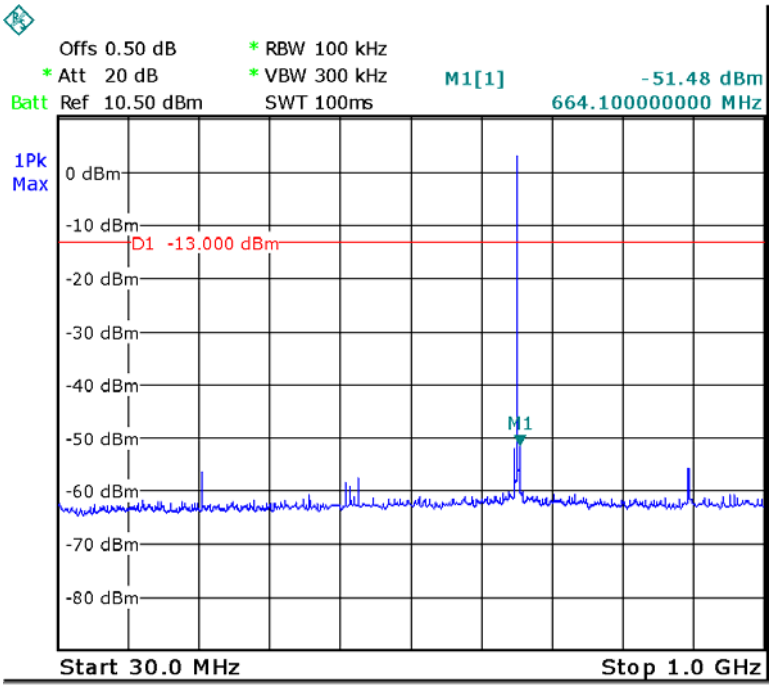
9.2 Test Data

Emission Mask

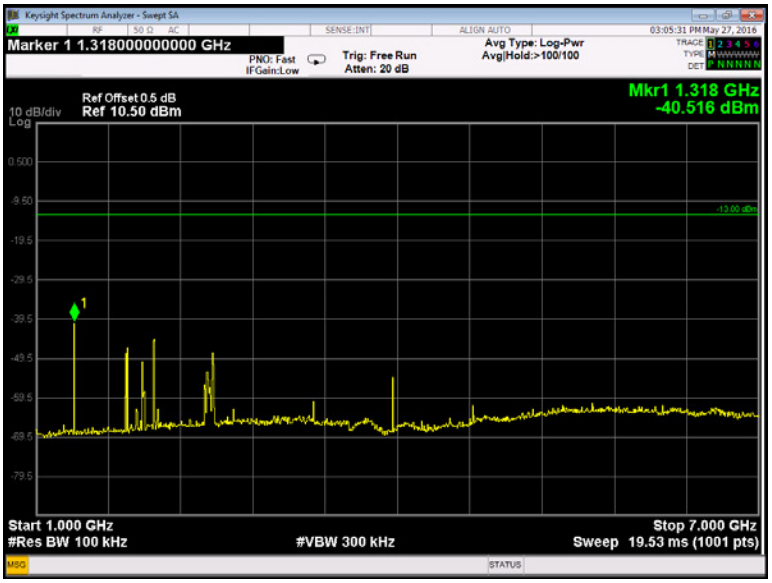
Low Channel



30MHz-1GHz

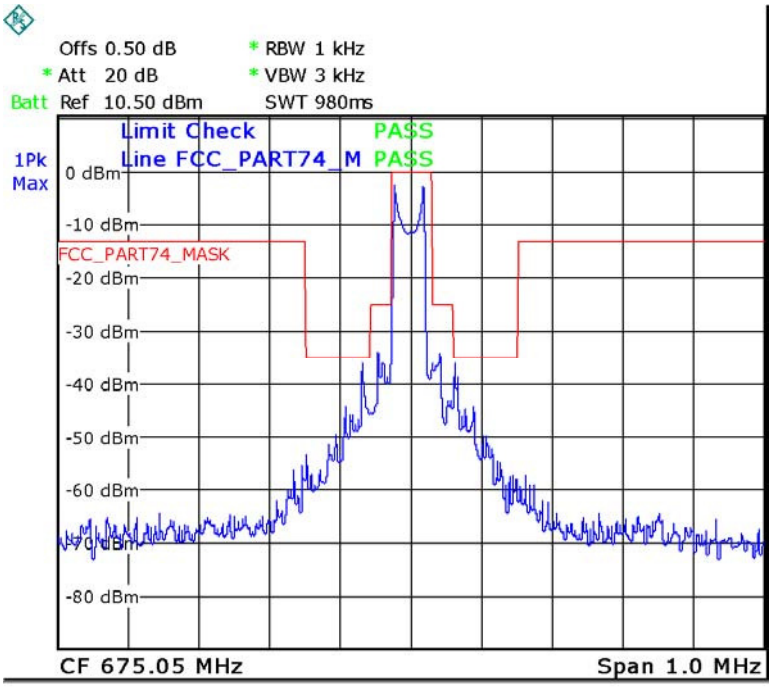


1GHz-6GHz

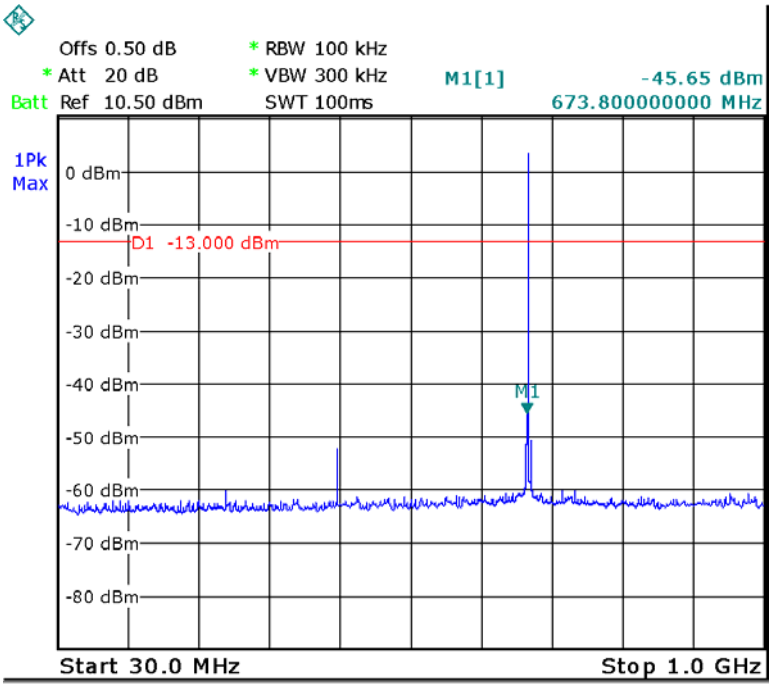

Keysight Spectrum Analyzer - Swept SA
Marker 1 1.318000000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
03:05:31 PM May 27, 2016
Ref Offset 0.5 dB
10 dB/div
Ref 10.50 dBm
Log
Mkr1 1.318 GHz
-40.516 dBm
0.500
-9.50
-19.5
-29.5
-39.5
-49.5
-59.5
-69.5
-79.5
-13.00 dBm
1
Start 1.000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 7.000 GHz
Sweep 19.53 ms (1001 pts)
MSG
STATUS

Emission Mask

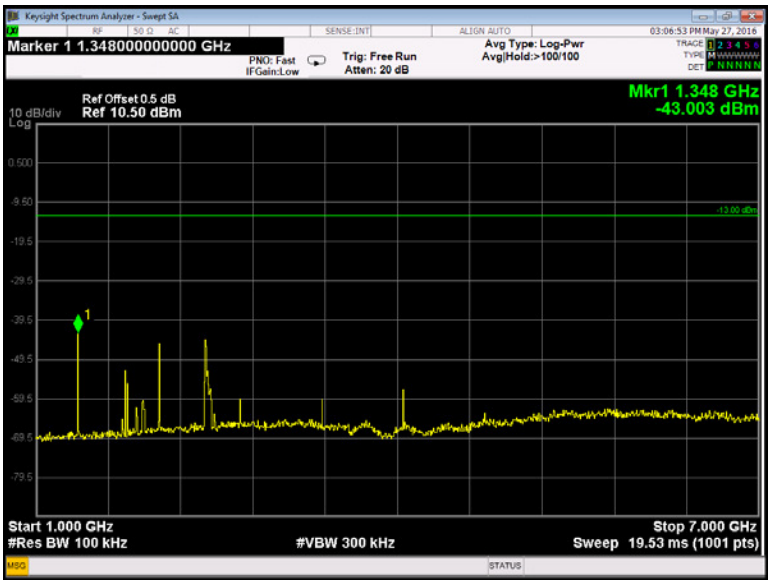
Middle Channel



30MHz-1GHz

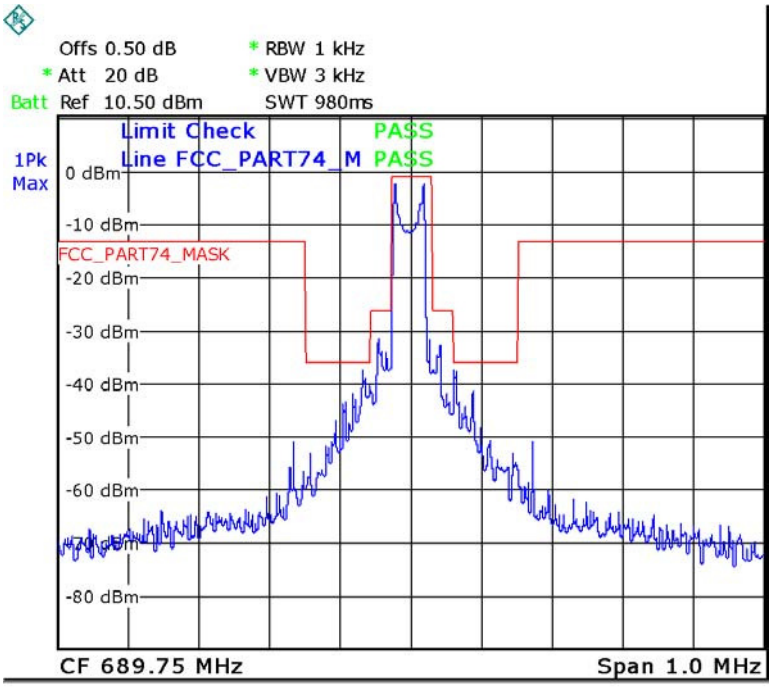


1GHz-7GHz

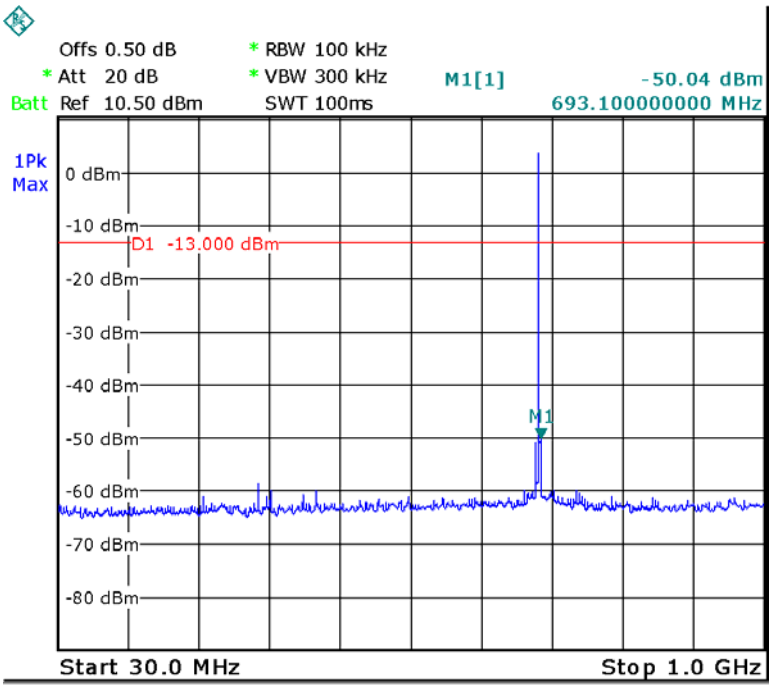

Keysight Spectrum Analyzer - Swept SA
Marker 1 1.348000000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
03:06:53 PM May 27, 2016
Ref Offset 0.5 dB
10 dB/div
Ref 10.50 dBm
Log
Mkr1 1.348 GHz
-43.003 dBm
0.500
-9.50
-19.5
-29.5
-39.5
-49.5
-59.5
-69.5
-79.5
-13.00 dBm
1
Start 1.000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 7.000 GHz
Sweep 19.53 ms (1001 pts)
MSG
STATUS

Emission Mask

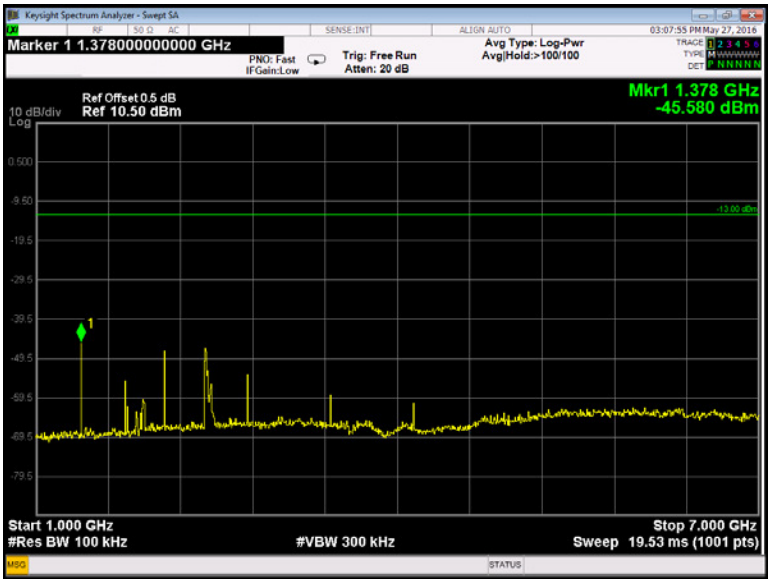
High Channel



30MHz-1GHz



1GHz-7GHz


Keysight Spectrum Analyzer - Swept SA
Marker 1 1.378000000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
03:07:55 PM May 27, 2016
Ref Offset 0.5 dB
10 dB/div
Ref 10.50 dBm
Log
Mkr1 1.378 GHz
-45.580 dBm
0.500
-9.50
-19.5
-29.5
-39.5
-49.5
-59.5
-69.5
-79.5
-13.00 dBm
1
Start 1.000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 7.000 GHz
Sweep 19.53 ms (1001 pts)
MSG
STATUS

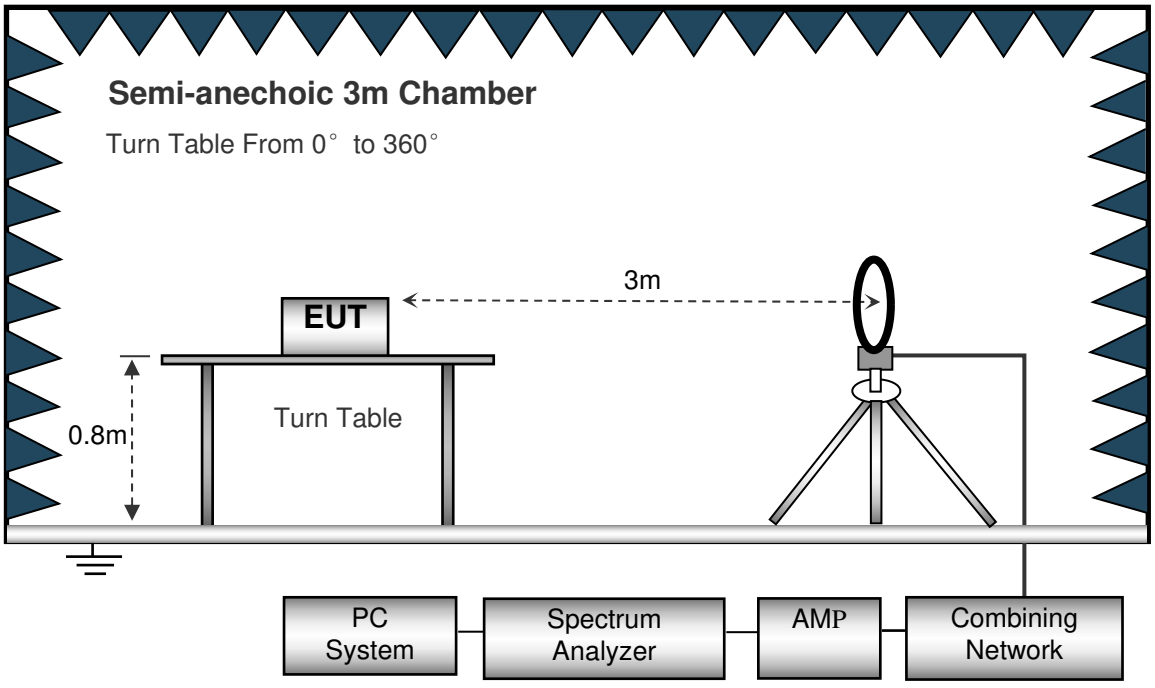
10 Radiated Emission Test

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: (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 Log (output power in watts)dB.

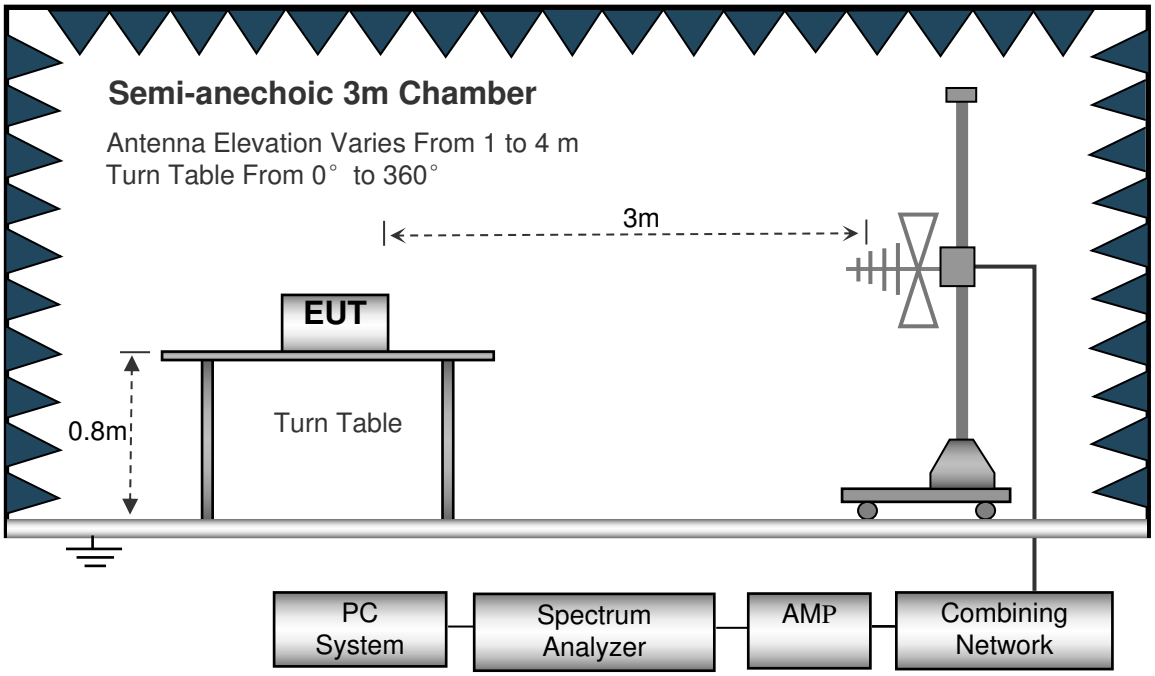
10.1 EUT Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site, using the setup accordance with the ANSI C63.10: 2013.

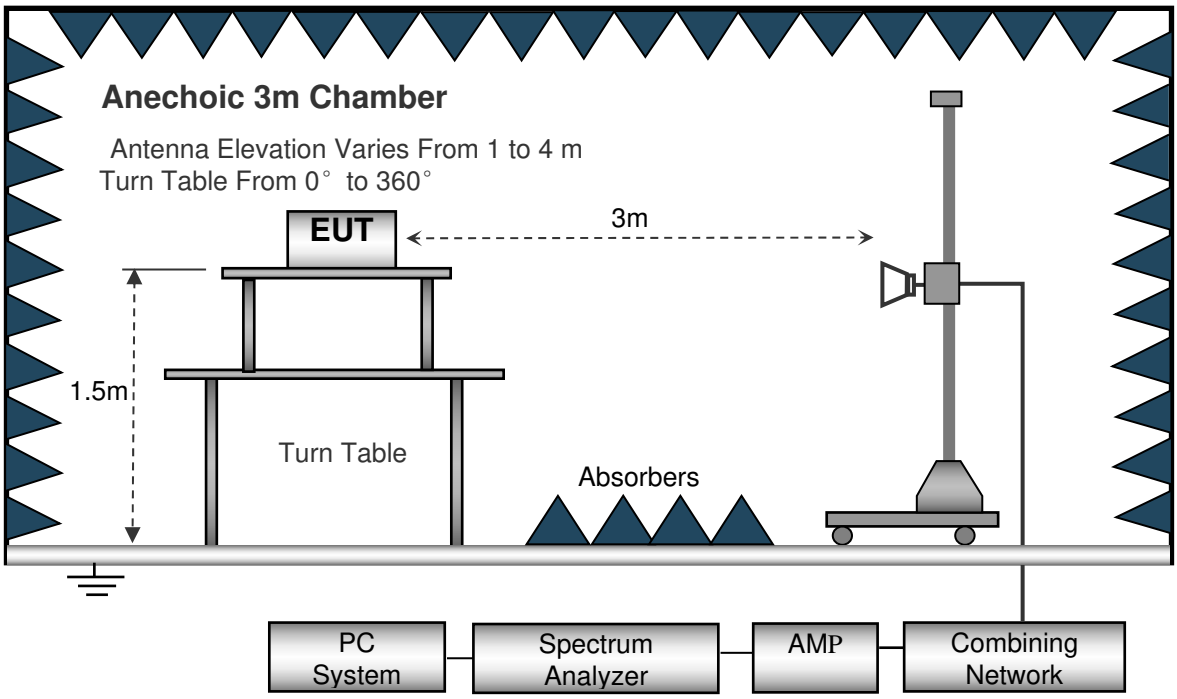
The diagram below shows the test setup that is utilized to make the measurements for emission from 9 KHz to 30 MHz Emissions.



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 4MHz to 7000MHz.

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. The EUT is placed on a turntable. For below 1GHz, the EUT is 0.8m above ground plane; For above1GHz, the EUT is 1.5m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is moved from 1m to 4m to find out the maximum emissions. The spectrum was investigated from the lowest radio frequency signal generated in the device, without going below 9 kHz, up to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.

7. The radiation measurements are 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.

10.4 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

Corr. Ampl. = Indicated Reading + Antenna Factor + Cable Factor - Amplifier Gain

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dBμV means the emission is 7dBμV below the maximum limit for Class B. The equation for margin calculation is as follows:

Margin = Corr. Ampl. – Class B Limit

10.5 Test Result

Frequency (MHz)	Detector	Ant. Pol	Antenna Height (m)	Turntable Angle (°)	Emission Level (dBm)	Limit (dBm)	Margin (dB)
Low Channel:660.35MHz							
1320.70	Peak	H	1.7	75	-40.15	-13	-27.15
1320.70	Peak	V	1.8	67	-46.28	-13	-33.28
1981.05	Peak	H	1.1	298	-45.17	-13	-32.17
1981.05	Peak	V	1.7	358	-43.02	-13	-30.02
2641.40	Peak	H	1.3	94	-50.36	-13	-37.36
2641.40	Peak	V	1.1	205	-53.45	-13	-40.45
Middle Channel:675.05MHz							
1350.10	Peak	H	1.9	240	-43.06	-13	-30.06
1350.10	Peak	V	1.6	178	-45.27	-13	-32.27
2025.15	Peak	H	1.8	184	-45.32	-13	-32.32
2025.15	Peak	V	1.2	75	-43.64	-13	-30.64
2700.20	Peak	H	1.5	229	-50.33	-13	-37.33
2700.20	Peak	V	1.2	256	-53.18	-13	-40.18
High Channel:689.75MHz							
1379.00	Peak	H	1.3	275	-45.62	-13	-32.62
1379.00	Peak	V	1.4	282	-44.31	-13	-31.31
2069.25	Peak	H	1.6	337	-45.32	-13	-32.32
2069.25	Peak	V	1.4	287	-43.64	-13	-30.64
2759.00	Peak	H	1.7	39	-50.24	-13	-37.24
2759.00	Peak	V	1.2	73	-53.95	-13	-40.95

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

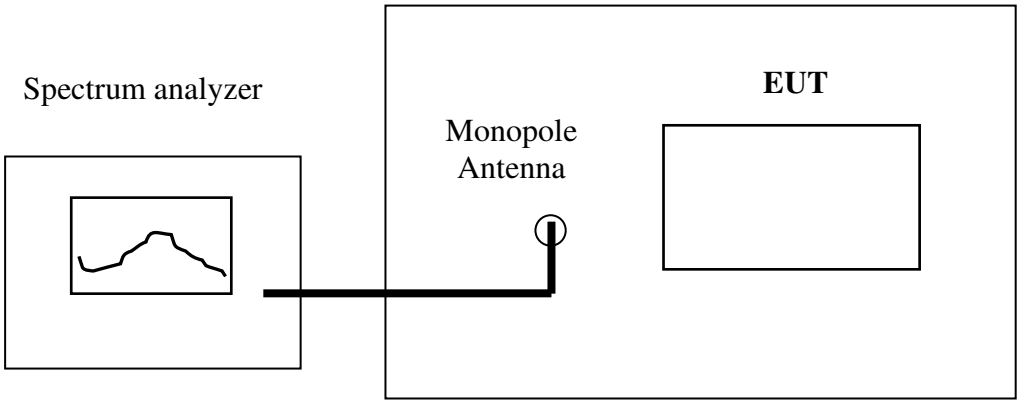


Figure 1

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 ºC. 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 50ºC. 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 10ºC decreased per stage until the lowest temperature -30ºC is measured, record all measurement frequencies.

11.3 Test Result

a) Frequency stability versus input voltage

b) The EUT is power by two 5# Non-rechargeable AA batteries. The nominal voltage is DC 3V .so we select the extreme condition ±10% according with TIA-C603D section 1.4.4.3. low voltage is 2.7V DC and high voltage is 3.3V DC.

Low channel

Power Supply	Reference Frequency (MHz)	Environment Temperature (ºC)	Frequency Measured	Frequency Tolerance (%)
2.7V，DC	660.350	20	660.352	0.00030
3.3V，DC	660.350	20	660.351	0.00015

Middle channel

Power Supply	Reference Frequency (MHz)	Environment Temperature (ºC)	Frequency Measured	Frequency Tolerance (%)
2.7V，DC	675.050	20	675.051	0.00015
3.3V，DC	675.050	20	675.052	0.00030

High channel

Power Supply	Reference Frequency (MHz)	Environment Temperature (ºC)	Frequency Measured	Frequency Tolerance (%)
2.7V，DC	689.750	20	689.749	0.00015
3.3V，DC	689.750	20	689.751	0.00015

c) Frequency stability versus environmental temperature

Low Frequency: 660.35MHz, Limit: 0.005%			
Environment Temperature(ºC)	Power Supply	Frequency Deviation measured with time Elapse(30 minutes)	
		MHz	%
50	3V，DC	660.347	0.00045
40	3V，DC	660.346	0.00061
30	3V，DC	660.345	0.00076
20	3V，DC	660.355	0.00076
10	3V，DC	660.351	0.00015
0	3V，DC	660.352	0.00030
-10	3V，DC	660.354	0.00061
-20	3V，DC	660.355	0.00076
-30	3V，DC	660.356	0.00091

Middle Frequency: 675.05MHz, Limit: 0.005%			
Environment Temperature(ºC)	Power Supply	Frequency Deviation measured with time Elapse(30 minutes)	
		MHz	%
50	3V，DC	675.053	0.00044
40	3V，DC	675.045	0.00074
30	3V，DC	675.045	0.00074
20	3V，DC	675.054	0.00059
10	3V，DC	675.054	0.00059
0	3V，DC	675.054	0.00059
-10	3V，DC	675.055	0.00074
-20	3V，DC	675.052	0.00030
-30	3V，DC	675.046	0.00059

High Frequency: 689.75MHz, Limit: 0.005%			
Environment Temperature(ºC)	Power Supply	Frequency Deviation measured with time Elapse(30 minutes)	
		MHz	%
50	3V，DC	689.749	0.00014
40	3V，DC	689.756	0.00087
30	3V，DC	689.754	0.00058
20	3V，DC	689.746	0.00058
10	3V，DC	689.752	0.00029
0	3V，DC	689.755	0.00072
-10	3V，DC	689.751	0.00014
-20	3V，DC	689.748	0.00029
-30	3V，DC	689.753	0.00043

Test Result: The max frequency tolerance rating is 0.00091% < 0.005%. Passed.

12 RF Exposure

Test Requirement: FCC Part 1.1307

Evaluation Method 447498 D01 General RF Exposure Guidance v06

12.1 Requirements

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

[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] • [√ f(GHz)] ≤3.0 for 1-g SAR and ≤7.5 for 10-g extremity SAR where

1. f(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 ≤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)
3.42	2.198	2.198	5	18.05

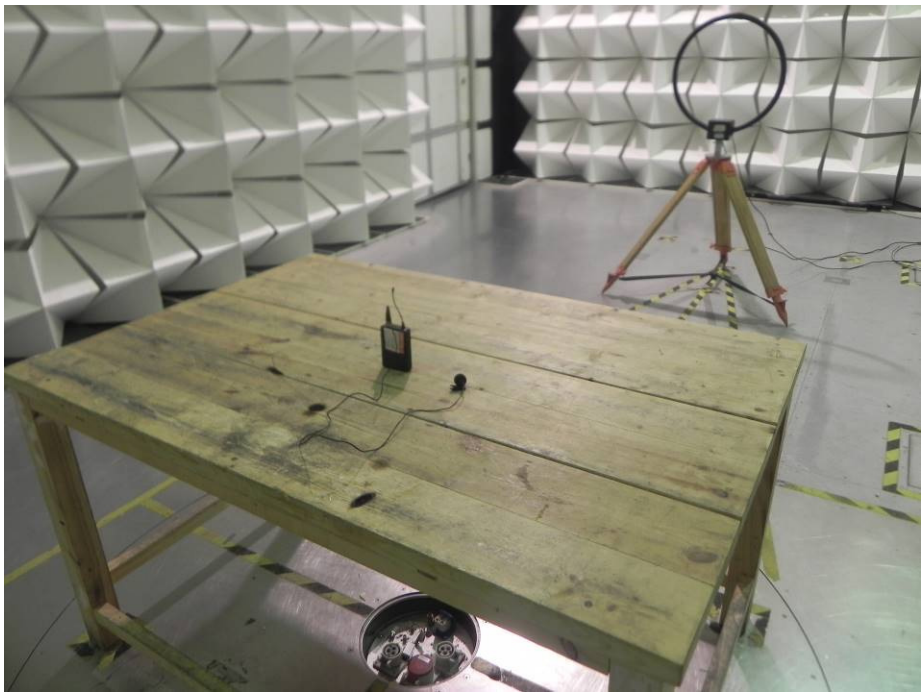
Remark: Max. duty factor is 100%

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

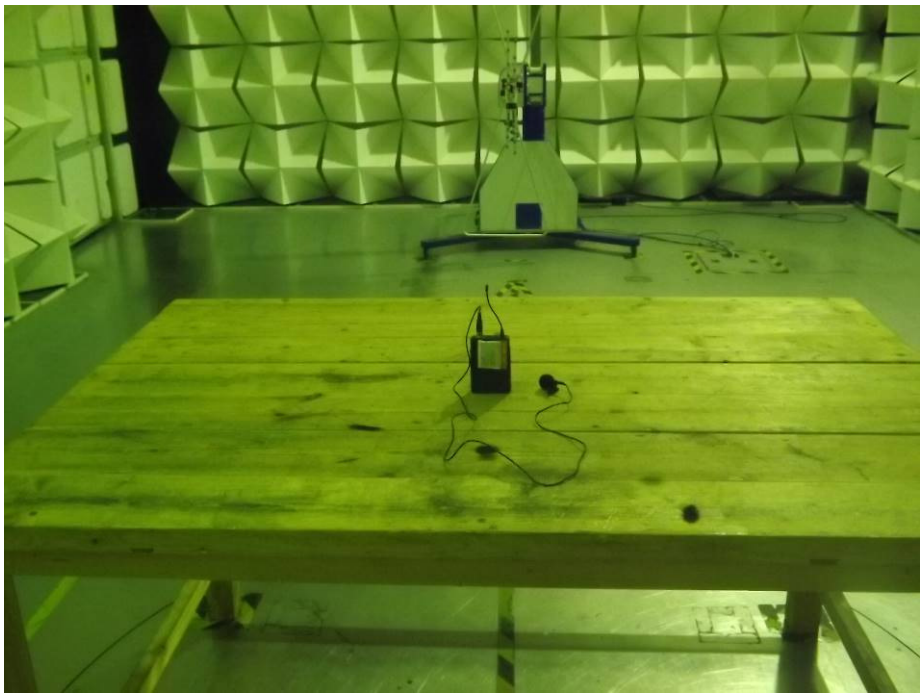
13 Photographs –Model HD-028 Test Setup Photos

13.1 Photograph – Radiation Spurious Emission Test Setup

4MHz ~30MHz at test site 2#



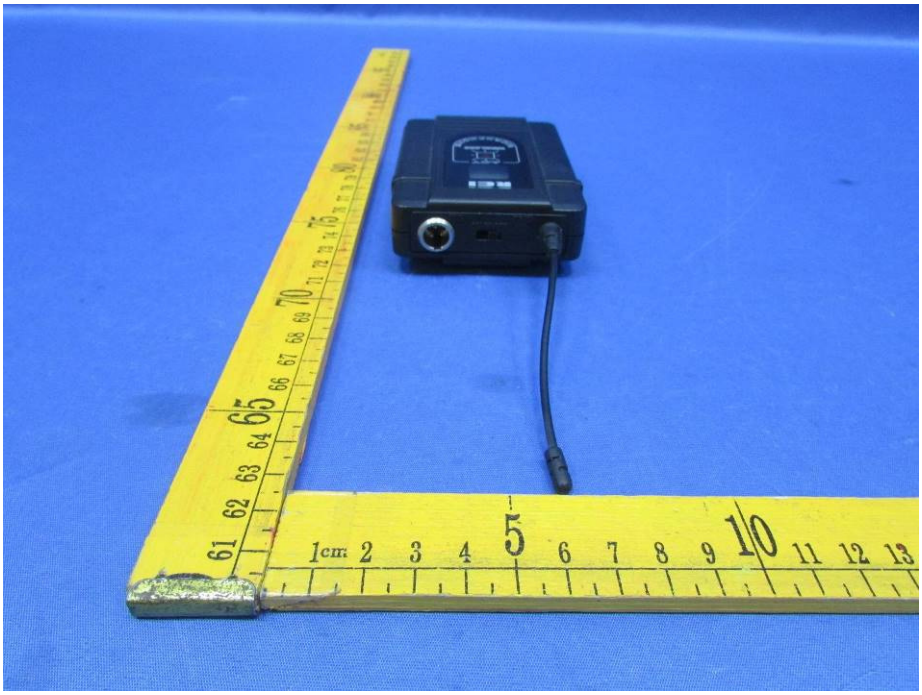
30MHz-1GHz at test site 2#



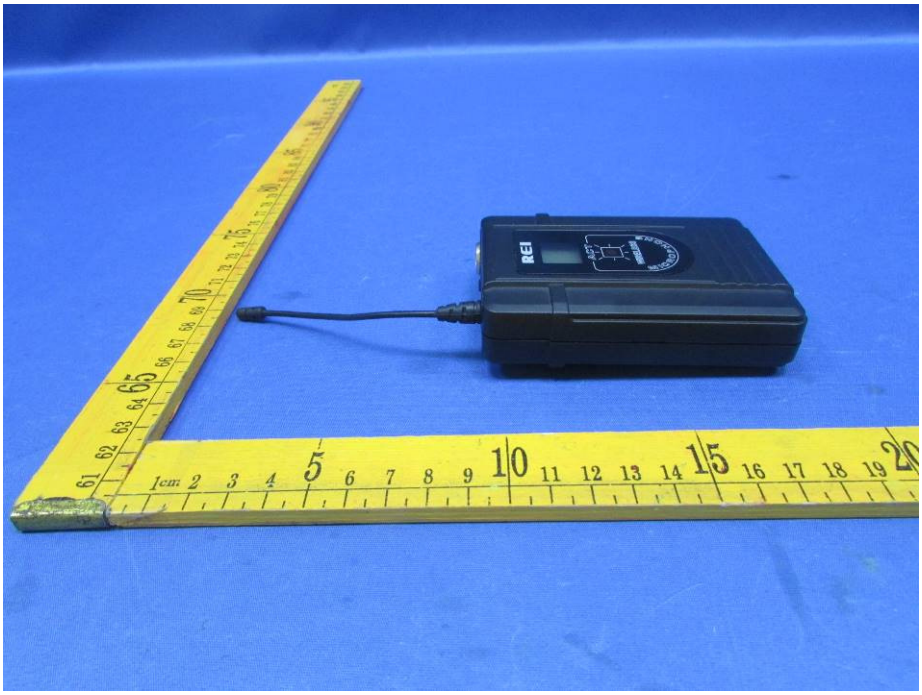
1GHz-7GHz at test site 1#

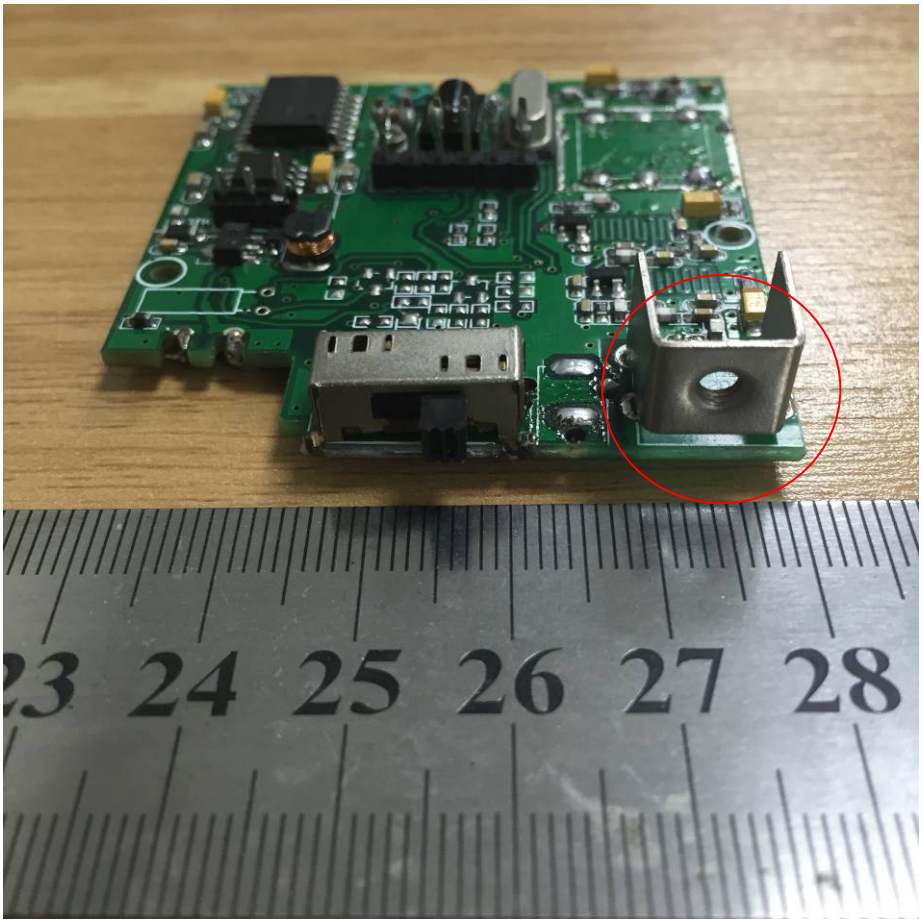
14 Photographs – Constructional Details

14.1 EUT –Model HD-028 External Photos

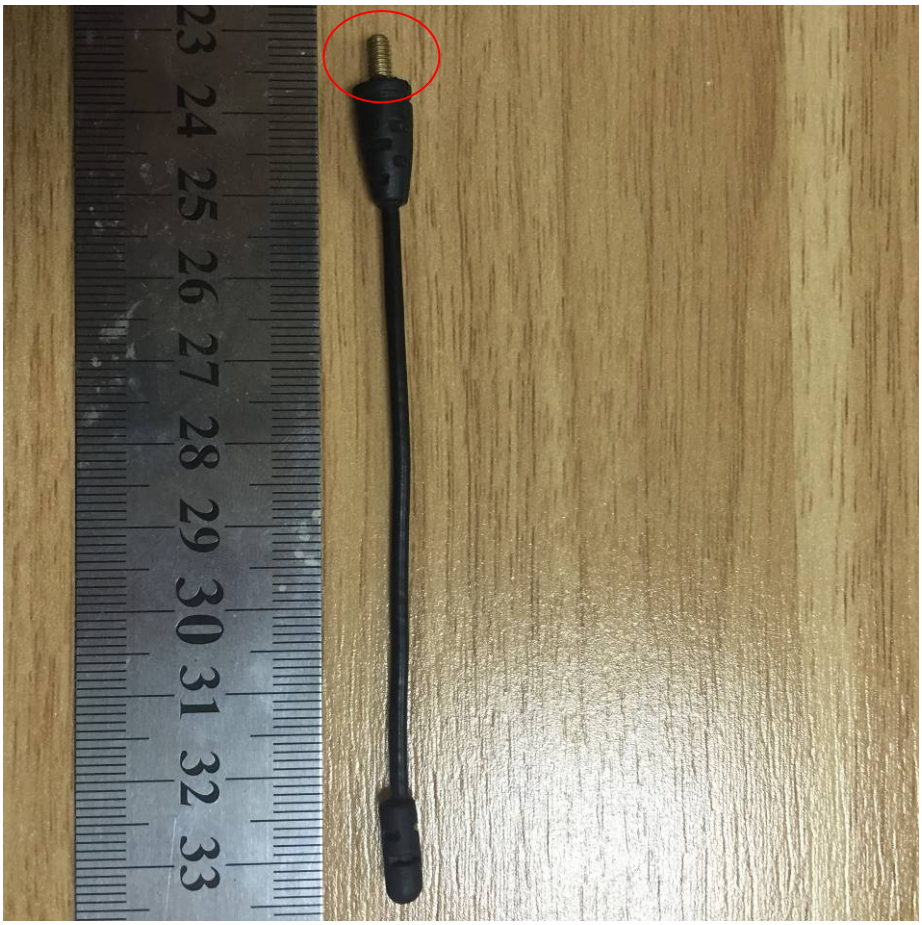



REI


REI

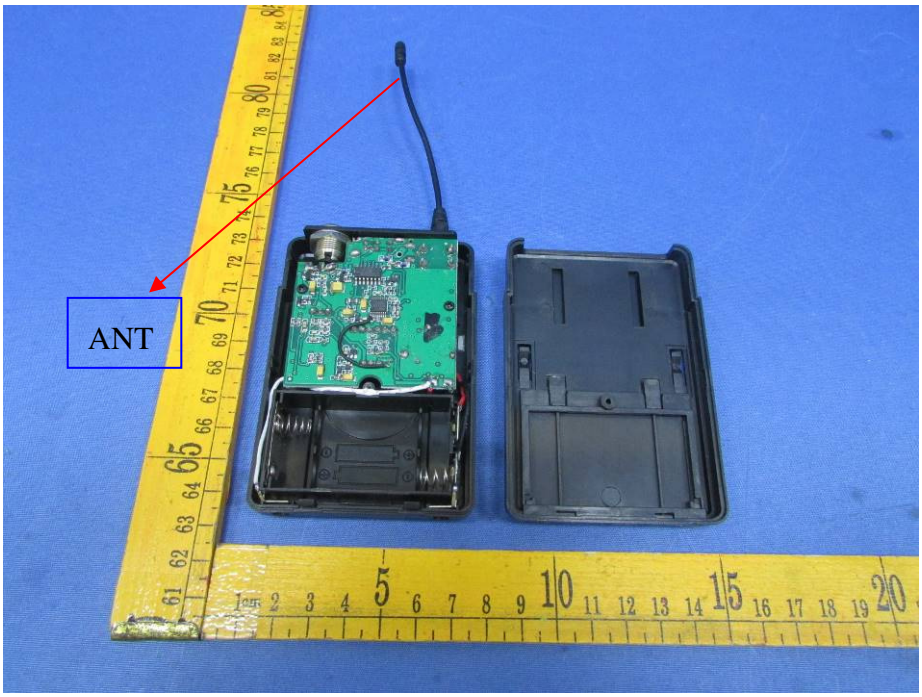


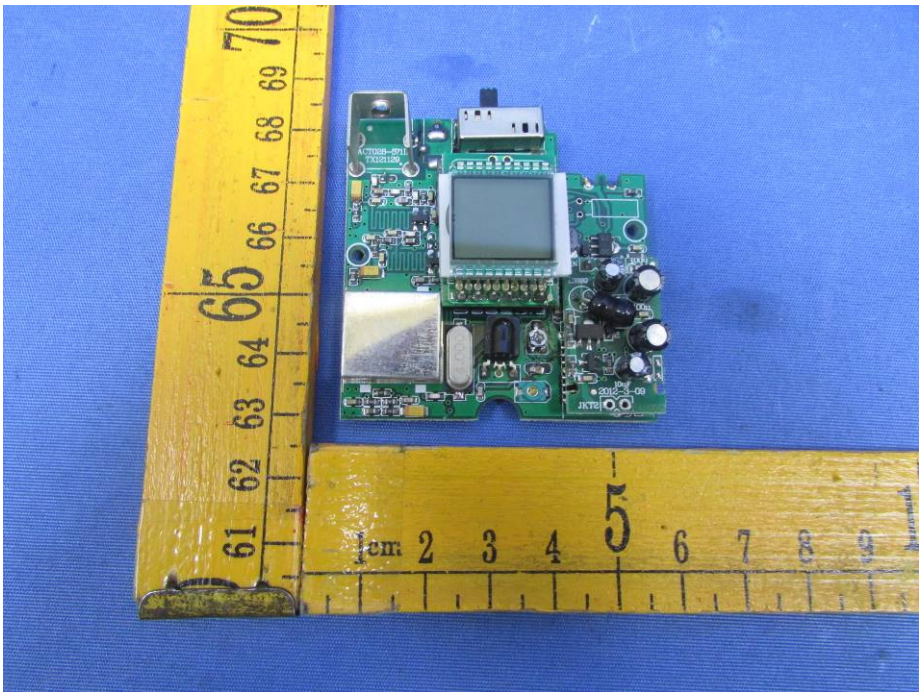
Antenna connector



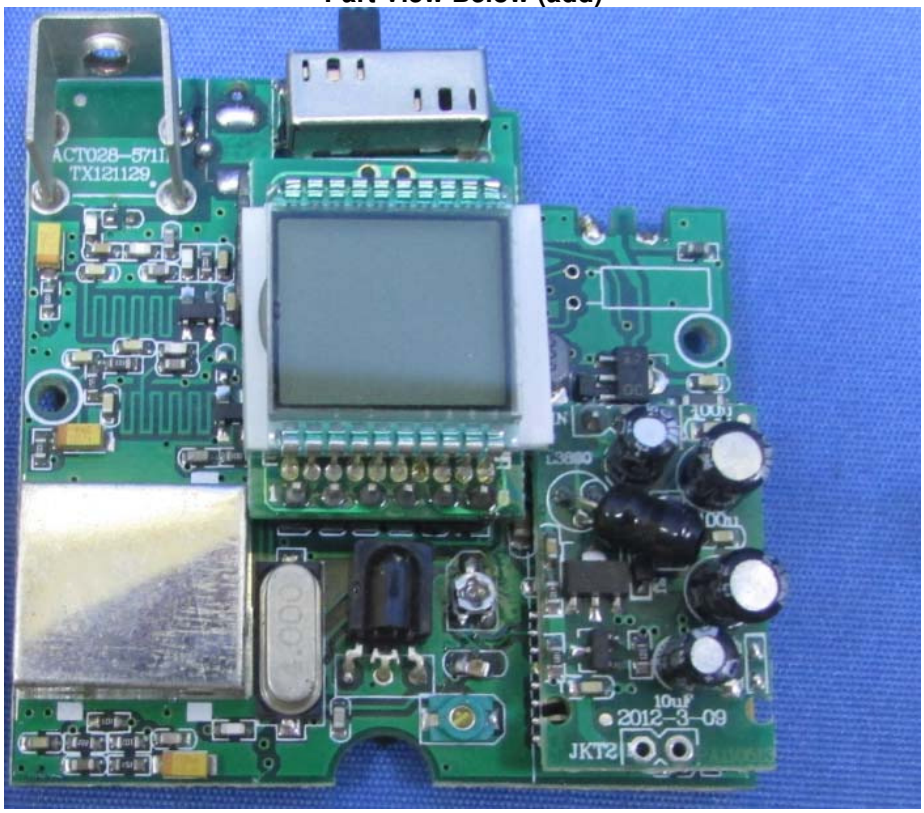
Antenna view

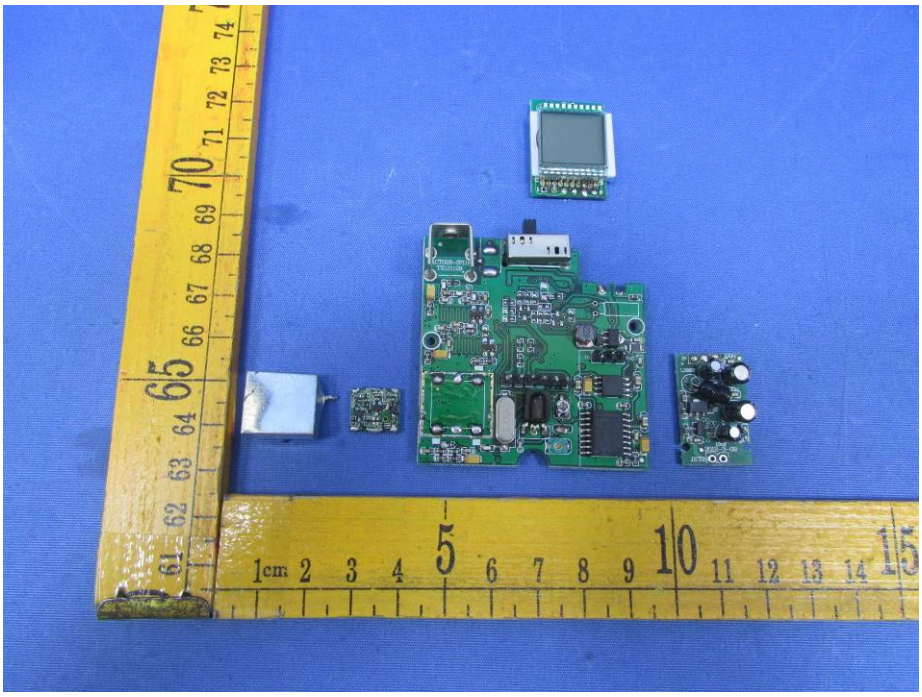
14.2 EUT –Model HD-028 Internal Photos

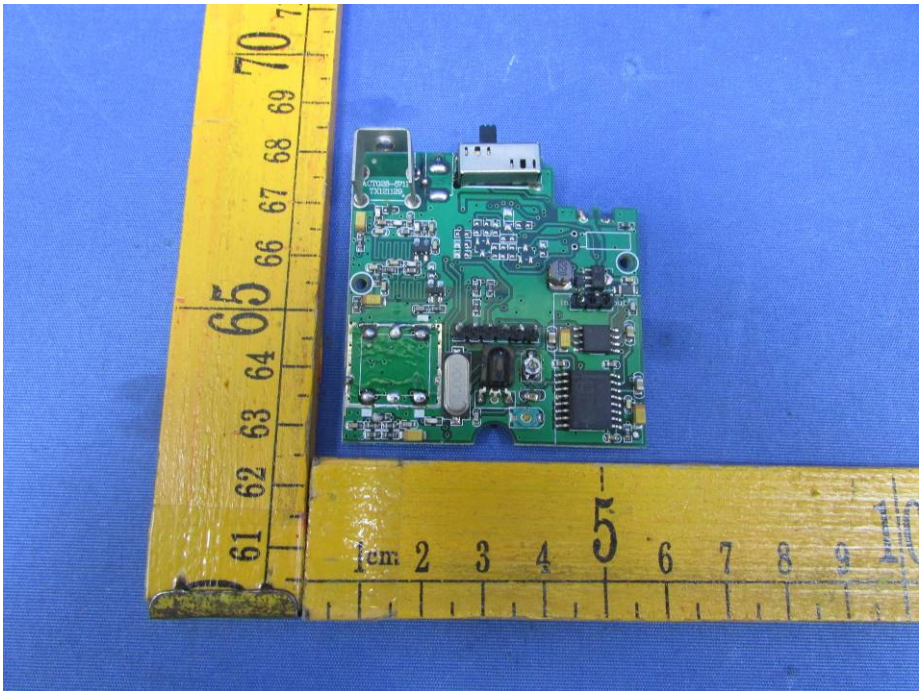




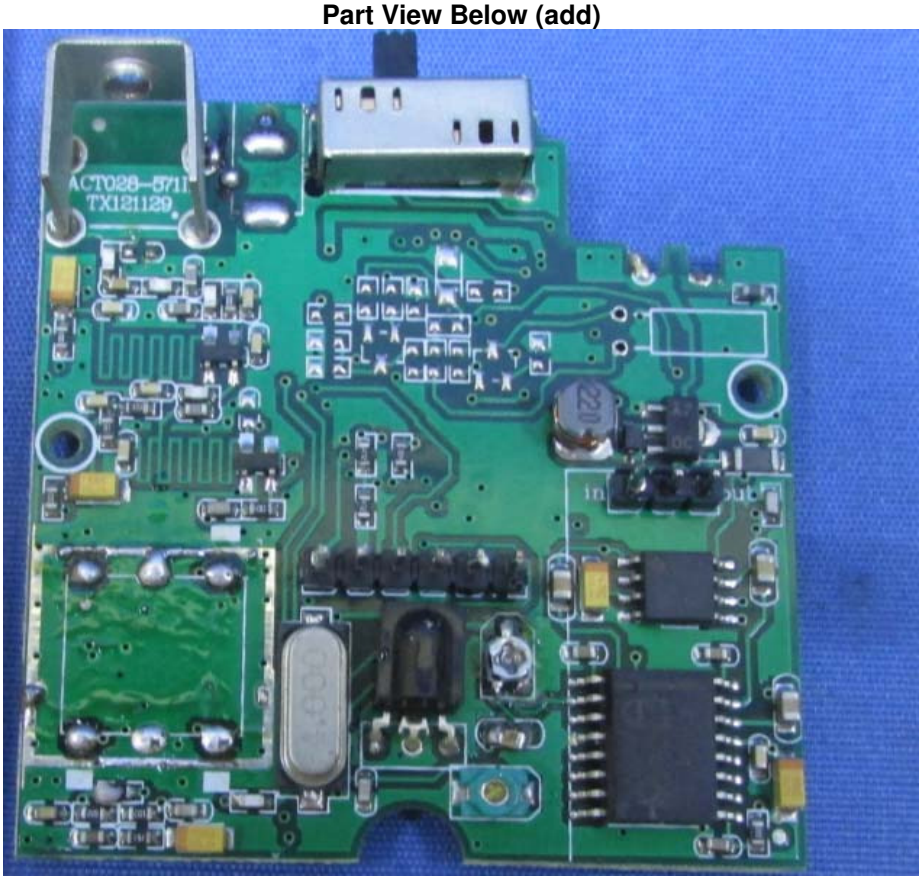
Part View Below (add)

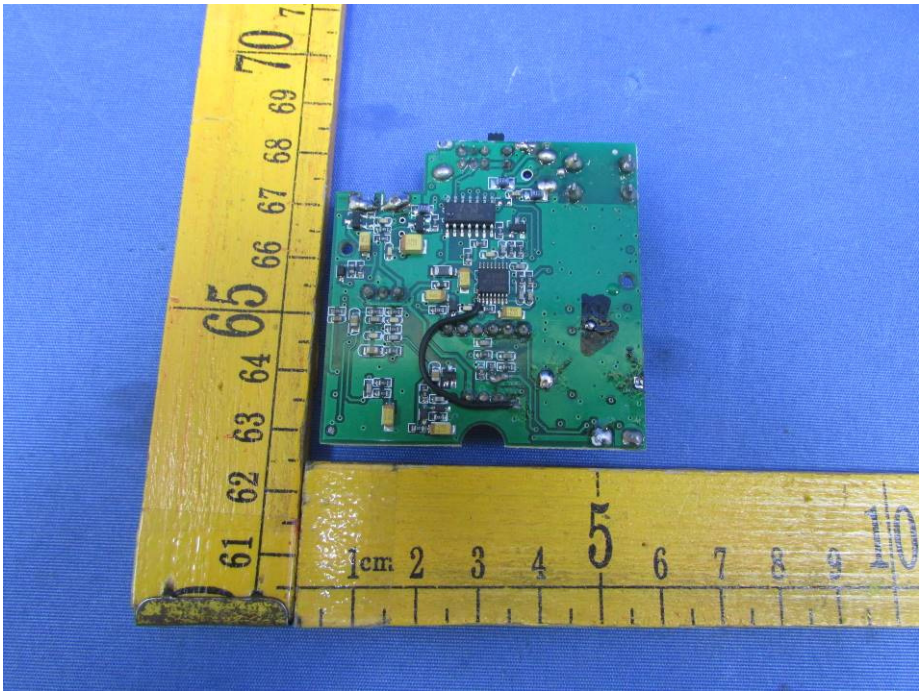






Part View Below (add)





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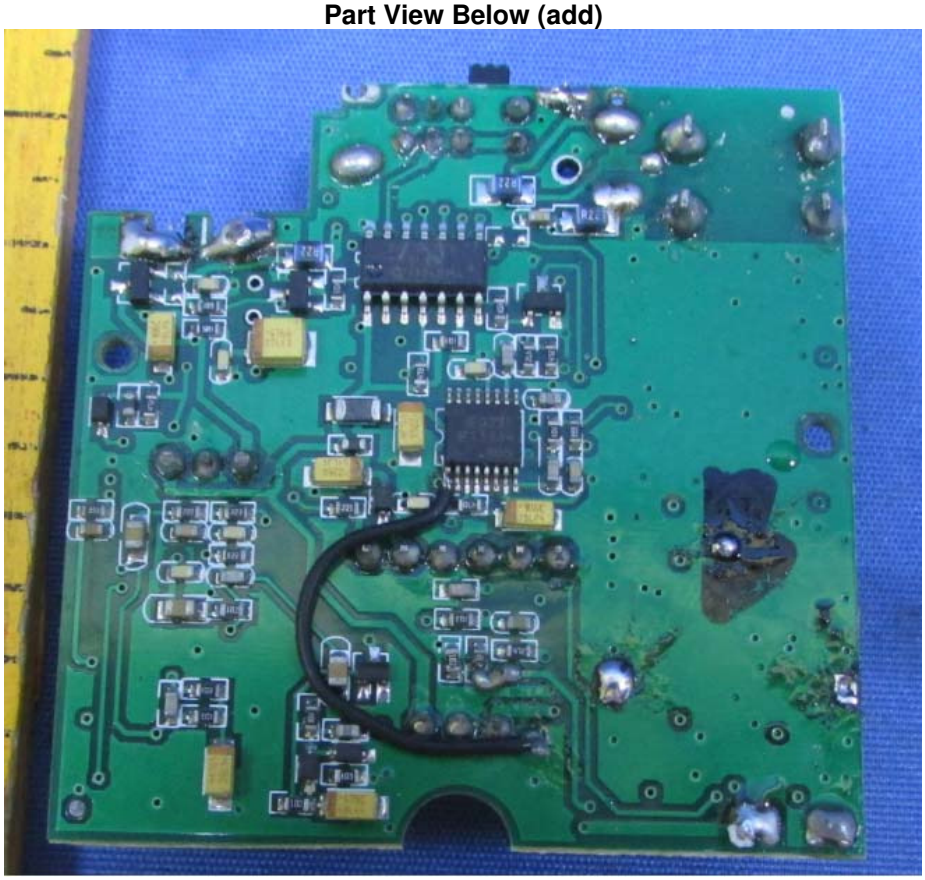
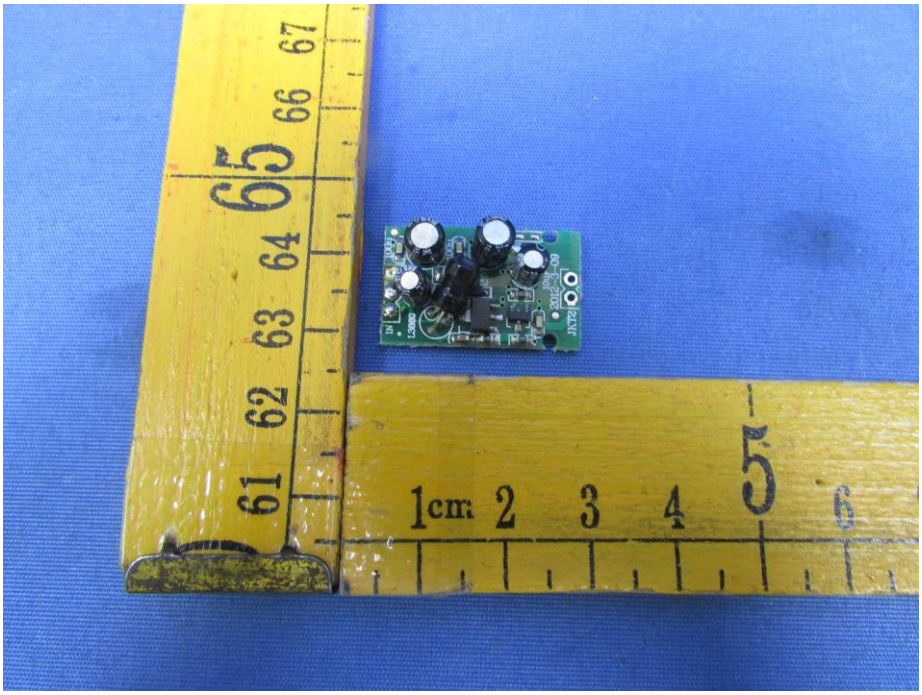
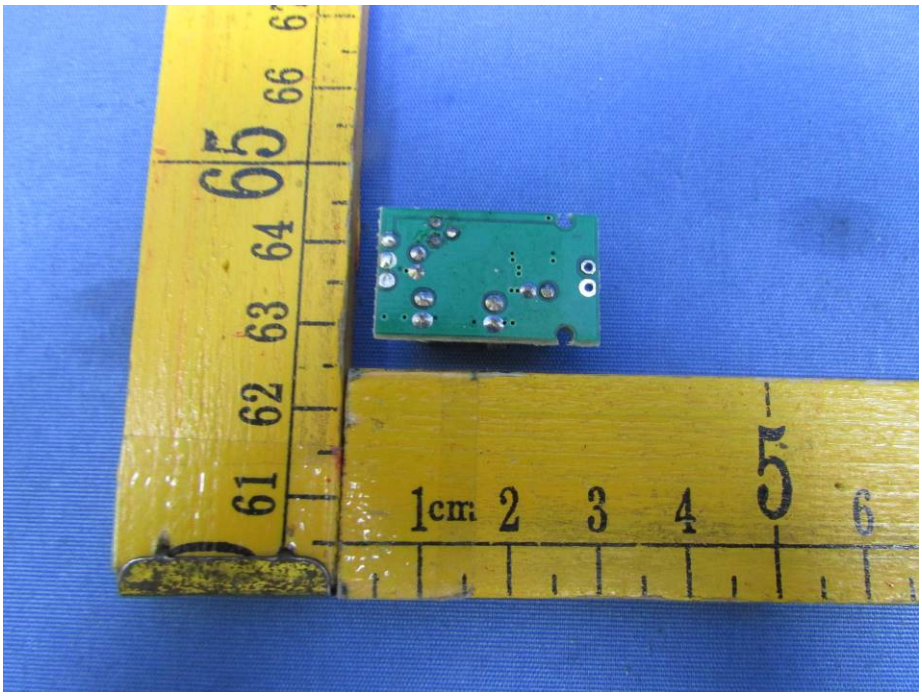
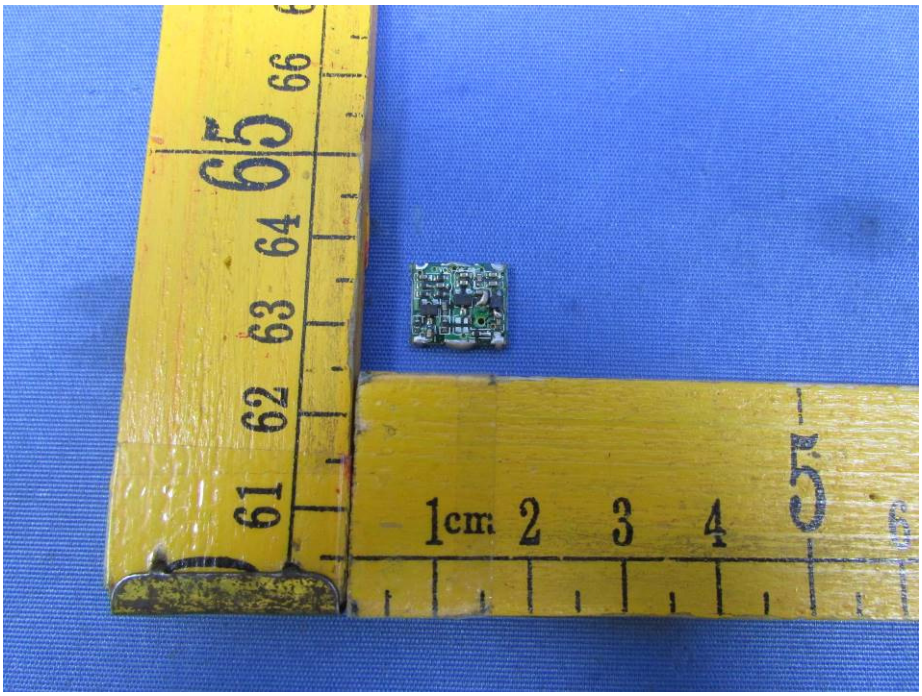
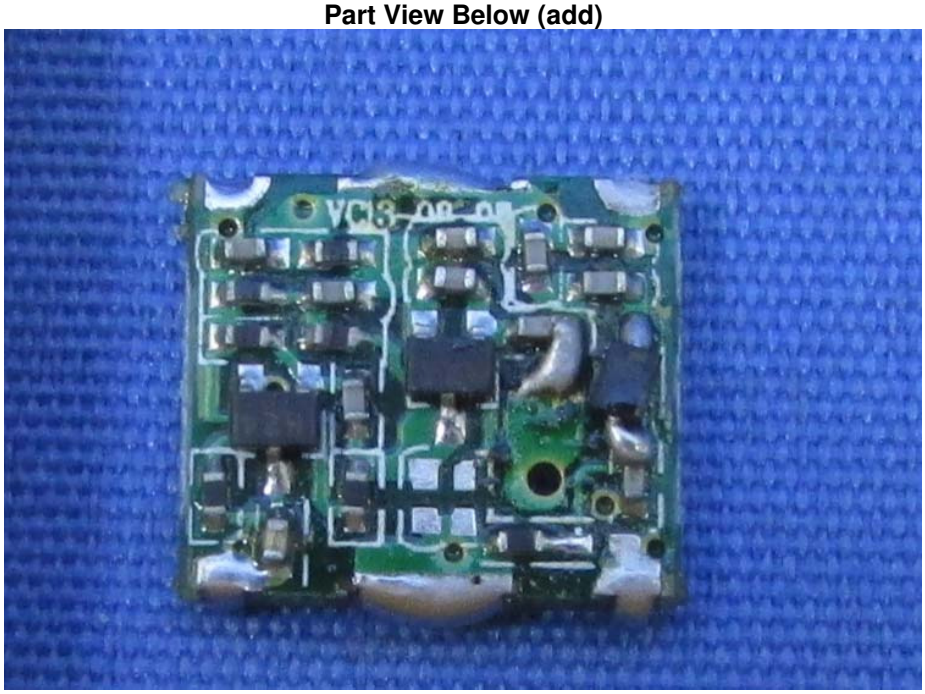


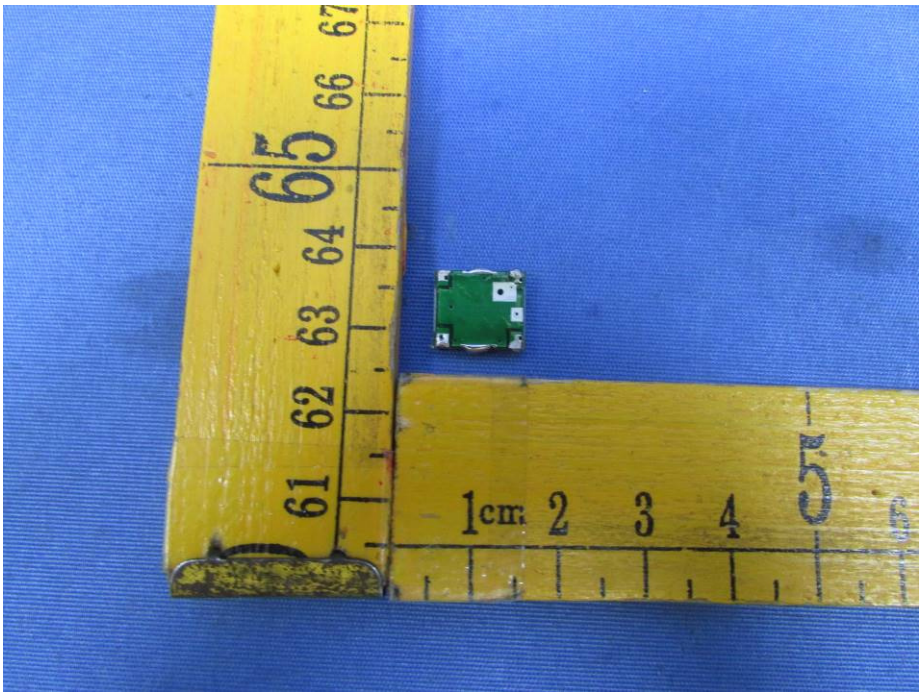


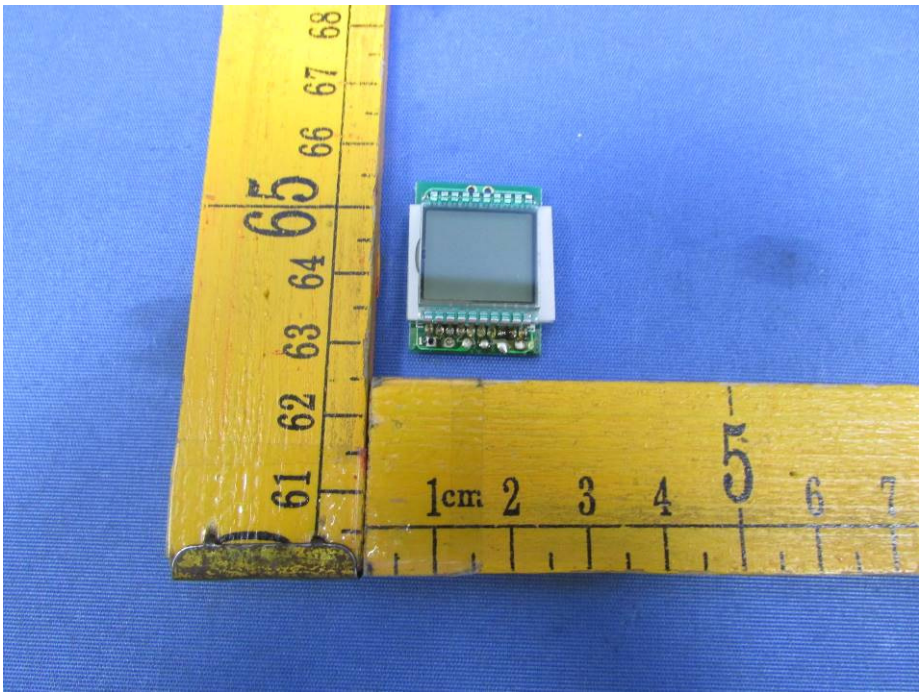

65
66
64
63
62
61
1cm
2
3
4
5
6


65
66
64
63
62
61
1cm
2
3
4
5

Part View Below (add)







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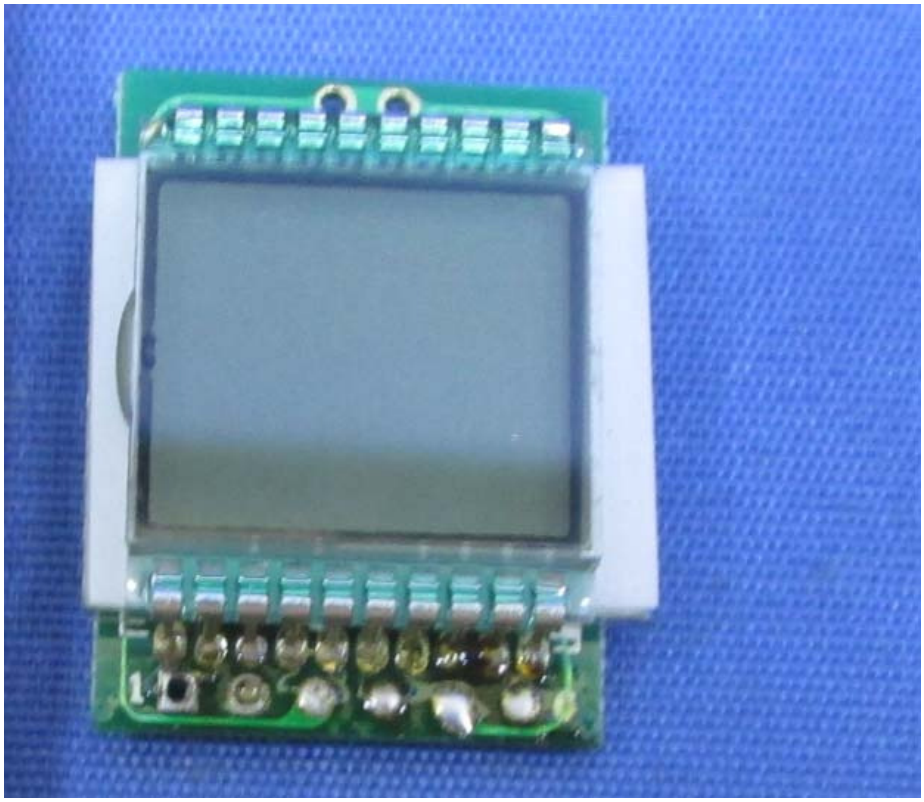
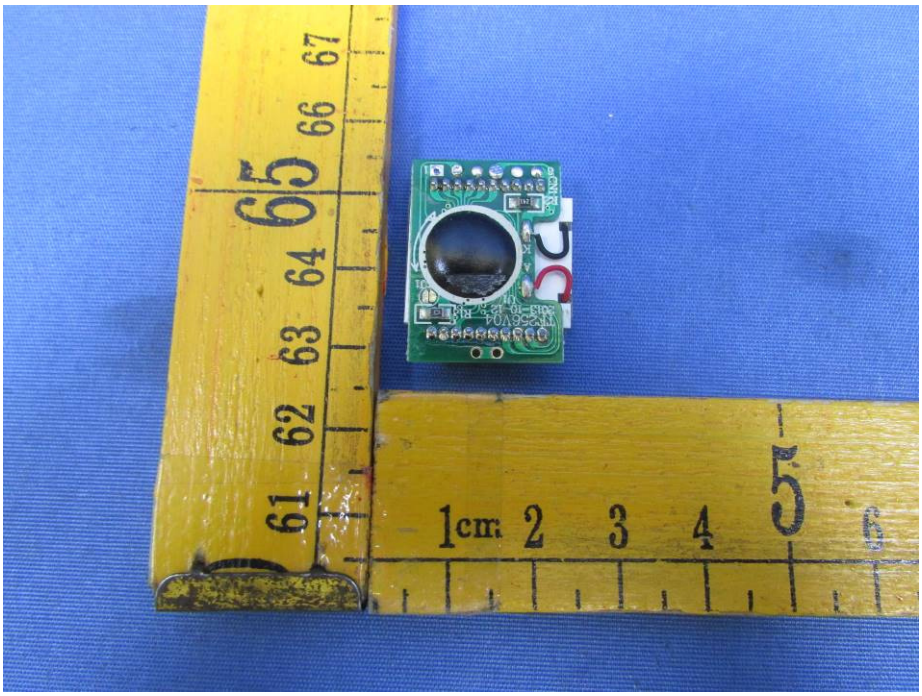
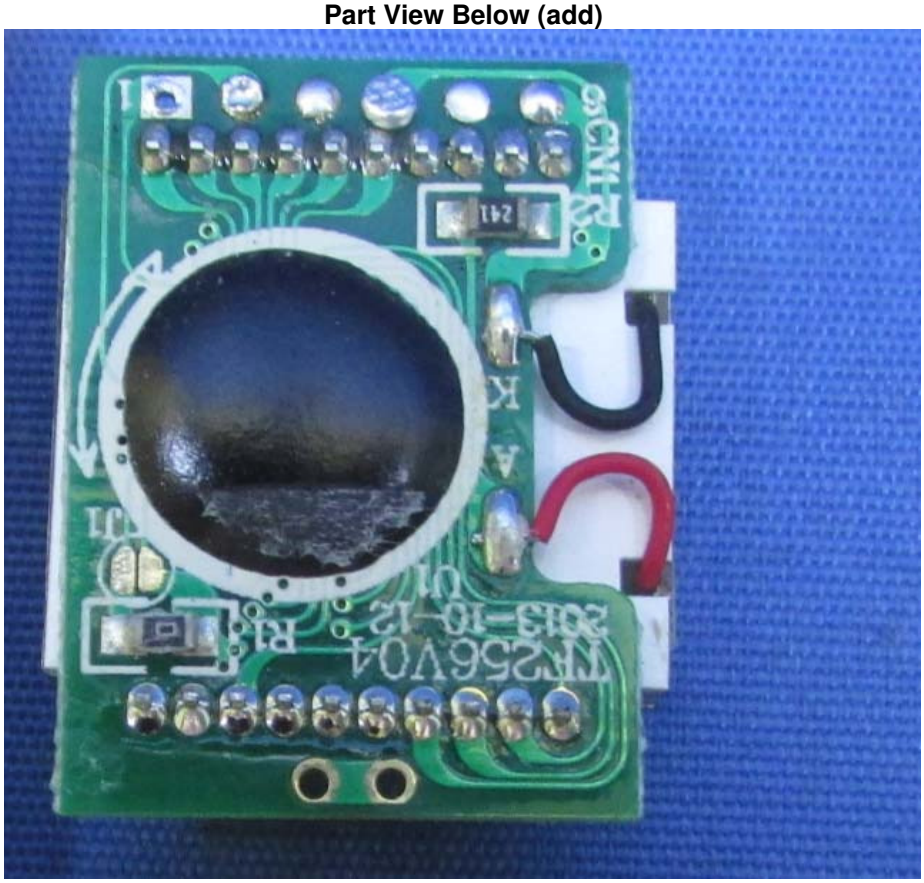


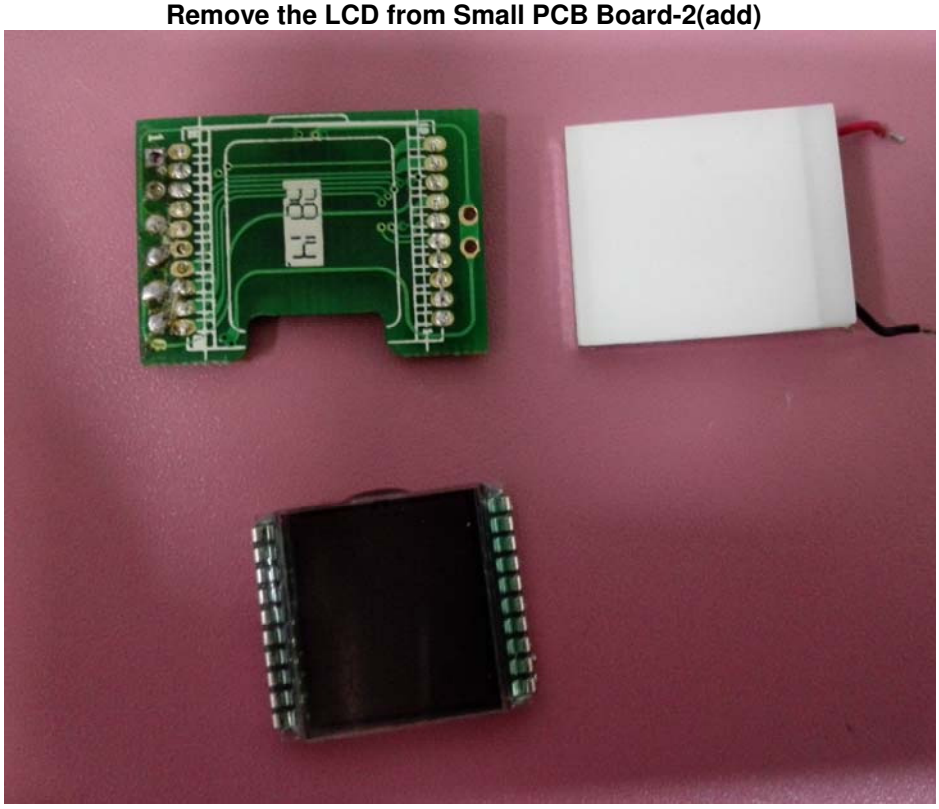


Part View Below (add)



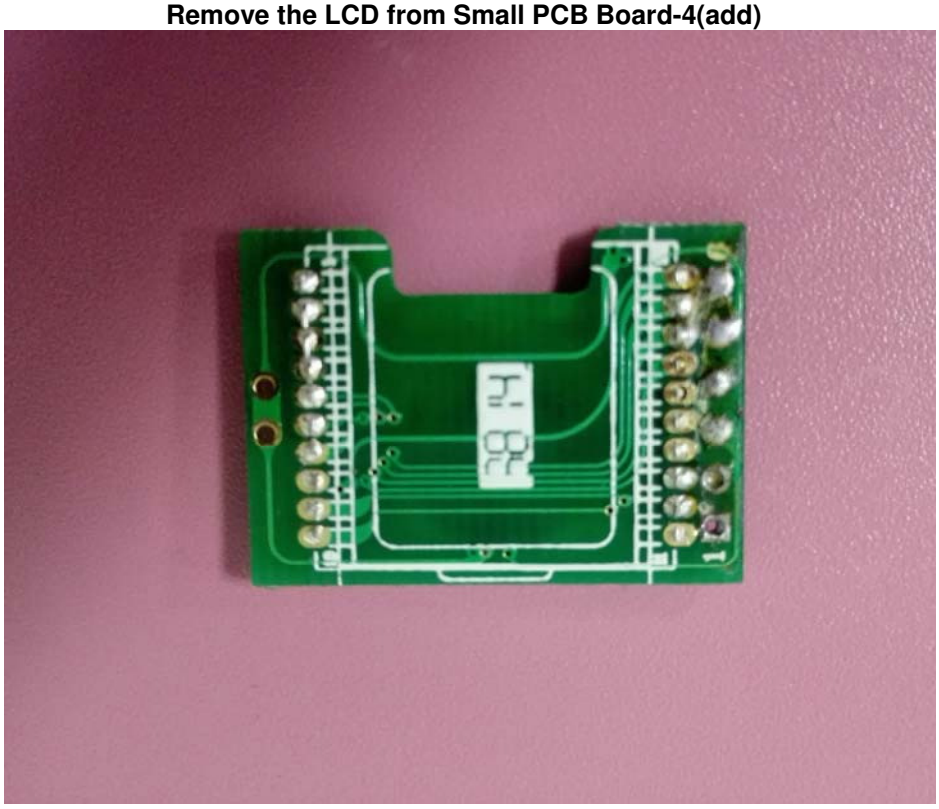
Remove the LCD from Small PCB Board-1(add)

Remove the LCD from Small PCB Board-2(add)

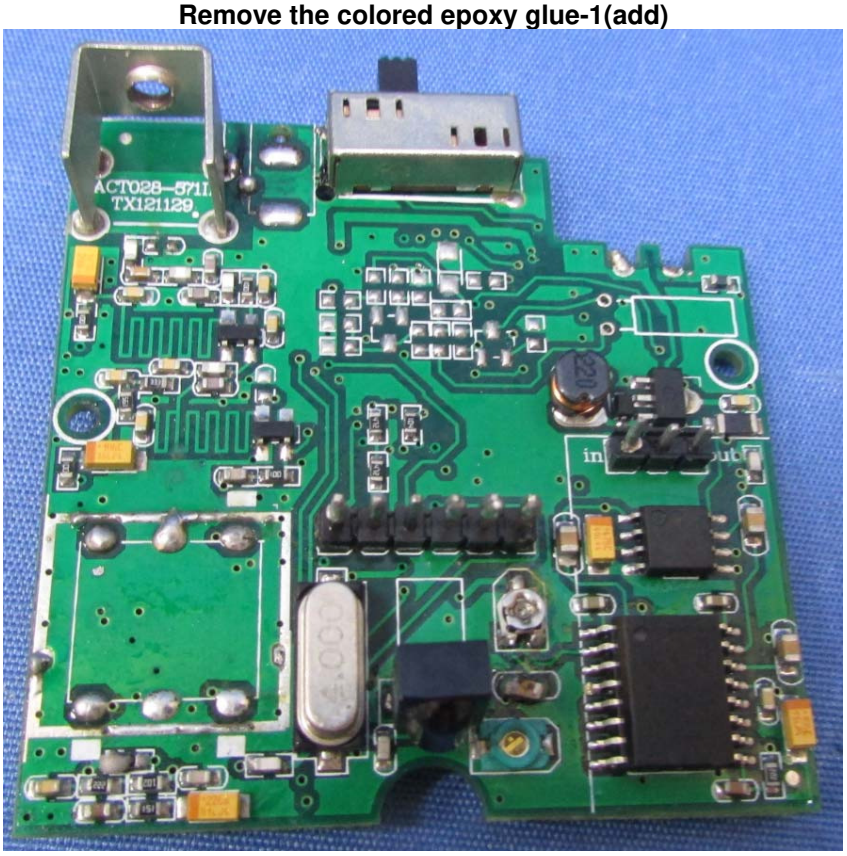


Remove the LCD from Small PCB Board-3(add)

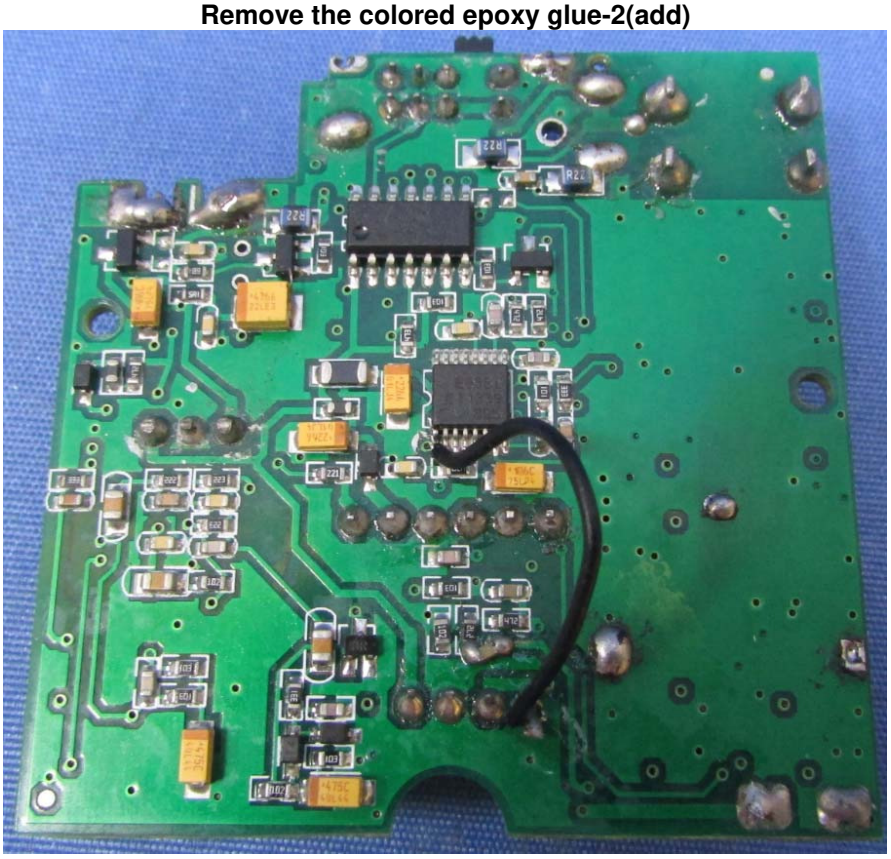
Remove the LCD from Small PCB Board-4(add)



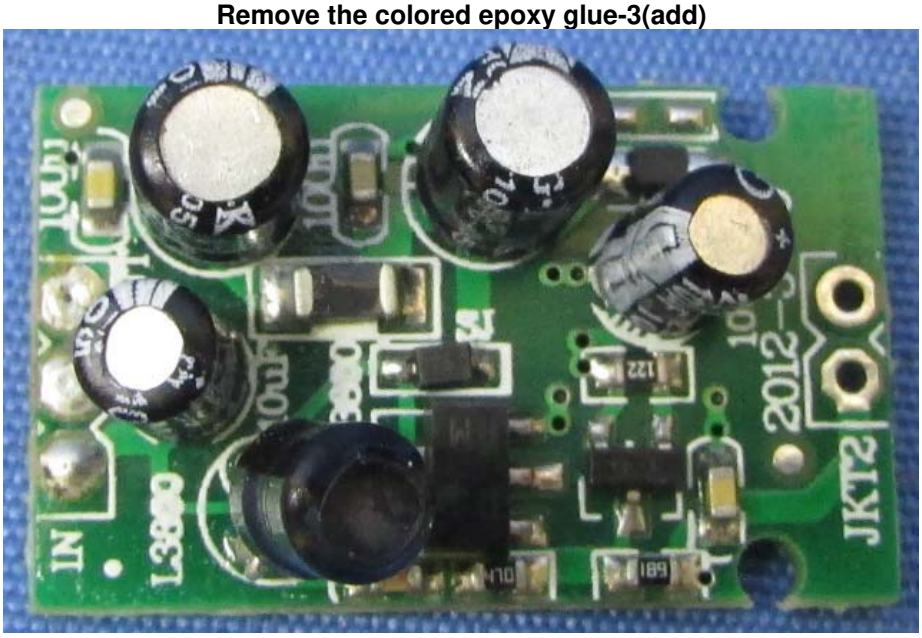
Remove the colored epoxy glue-1(add)



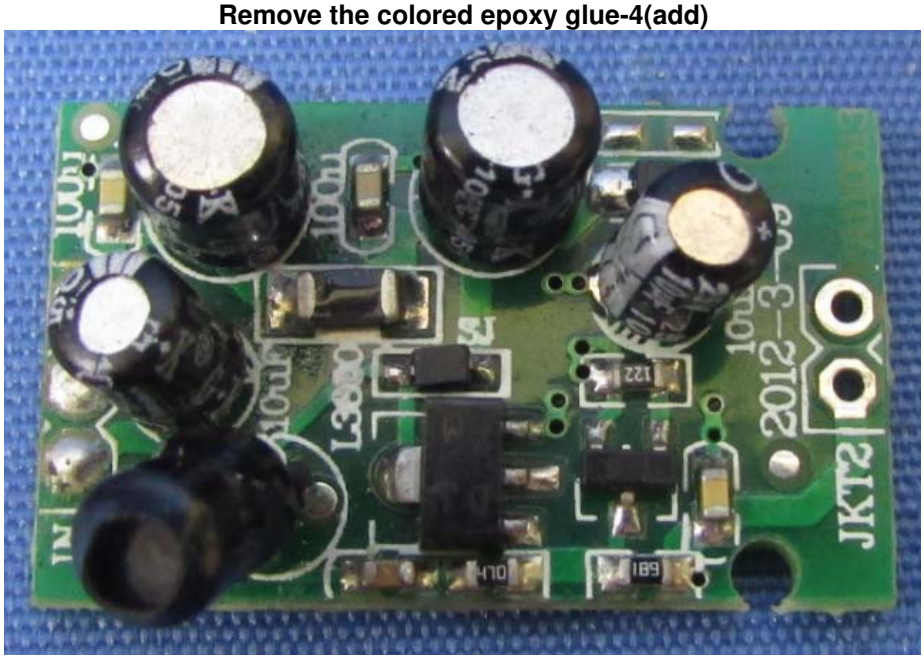
Remove the colored epoxy glue-2(add)



Remove the colored epoxy glue-3(add)



Remove the colored epoxy glue-4(add)



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