



TEST REPORT

Reference No. : F17020401
FCC ID : CCRAH1K
Applicant : Sam Ash Music Corporation
Address : 262 Duffy Avenue Hicksville New York United States
Manufacturer : Sam Ash Music Corporation.
Address : 262 Duffy Avenue Hicksville New York United States
Product Name : Wireless System
Model No. : AH1
Standards : FCC CFR47 Part 74
Date of Receipt sample..... : Dec. 07, 2016
Date of Test : Dec. 08 – 28, 2016
Date of Issue : Dec. 29, 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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Compiled by:

Bell Wei/ Engineer

Approved by:

Mike Lee / 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	: Wireless System
Model No.	: AH1
Differences describe	: N/A
Operation Frequency	: 489.050MHz~492.425MHz
The Lowest Oscillator	: 489.167MHz
Antenna installation	: Integrated Antenna
Gain	: 0dBi

4.2 Details of E.U.T.

Technical Data	: Input: DC 1.5V
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4.3 Test Facility

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

- Fcc Registration No: 647536
- Open Site Address: No.120, Ln. 5, Hudong St., Xizhi Dist., New Taipei City 221, Taiwan (R.O.C.)
- Xizhi Office and lab Address: 7F., No.262, Sec. 3, Datong Rd., Xizhi Dist., New Taipei City 221, Taiwan (R.O.C.)



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	100091	Apr.29, 2016	Apr.28, 2017
2	EMI Test Receiver	R&S	ESCI	100947	Sep.12, 2016	Sep.11, 2017
3	Pre-amplifier	Agilent	8447F	3113A06717	Apr.19,2016	Apr.18,2017
4	Pre-amplifier	Compliance Direction	PAP-0118	24002	Sep.15,2016	Sep.14,2017
5	Trilog Broadband Antenna	SCHWARZBECK	VULB9163	336	Apr.09, 2016	Apr.08, 2017
6	Horn Antenna	ETS	3117	00086197	Apr.19,2016	Apr.18,2017
7	Horn Antenna	ETS	3116B	00088203	Mar.17,2016	Mar.16,2017
8	Loop Antenna	SCHWARZECK	HFRA 5165	9365	Apr.10,2016	Apr.09,2017
RF Conducted Testing						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1.	EMC Analyzer	R&S	ESCI	101155	Sep.17,2016	Sep.16,2017
2.	Humidity Chamber	GF	GTH-225-40-1P	IAA061213	May.15,2016	May.14,2017
3.	DC Power Supply	EVERFINE	WY305	1004002	Apr.10,2016	Apr.09,2017
4.	Modulation Analyzer	HP	8920B	-	Apr.10,2016	Apr.09,2017

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)



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

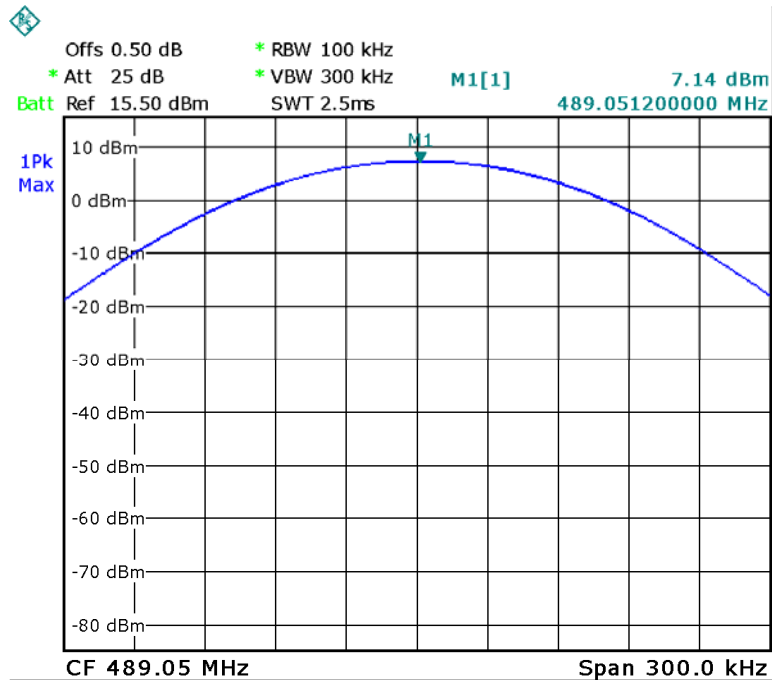
The maximum peak output power was measured with a spectrum analyzer connected to the antenna terminal (conducted measurement) while EUT was operating in normal situation.

6.2 Test result

Frequency (MHz)	RF Output Power (dBm)	Limit (dBm)	Result
489.050	7.14	23.98	PASS
492.425	6.66	23.98	PASS

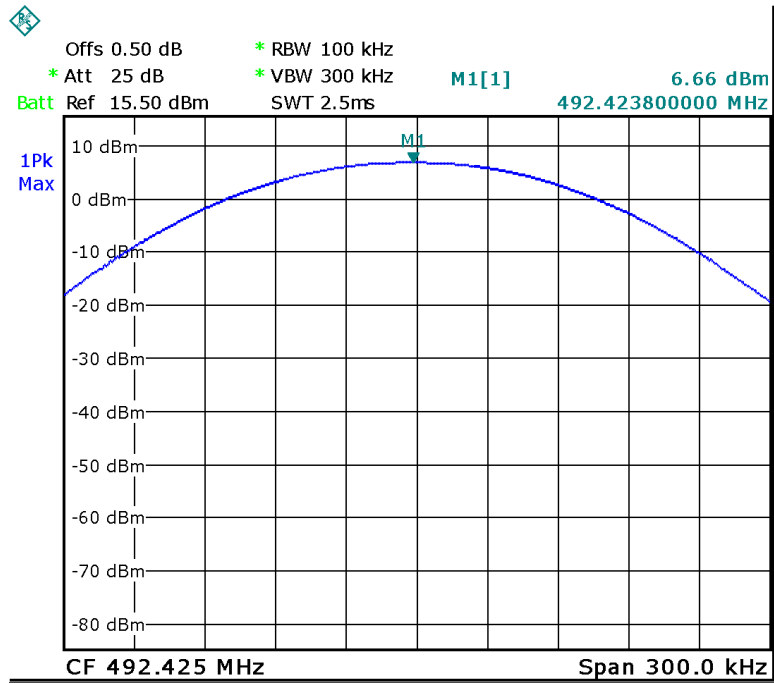
Please refer to following plot:

Low channel





High channel



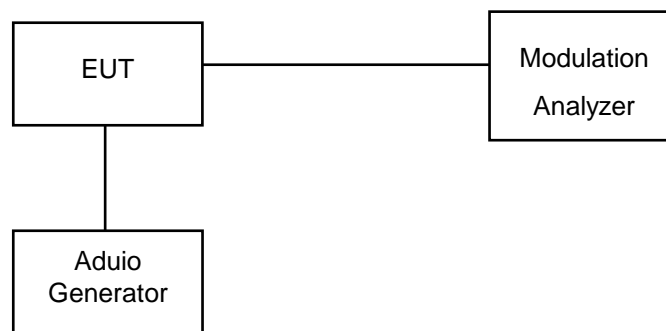


7 Modulation Characteristics

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:
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.

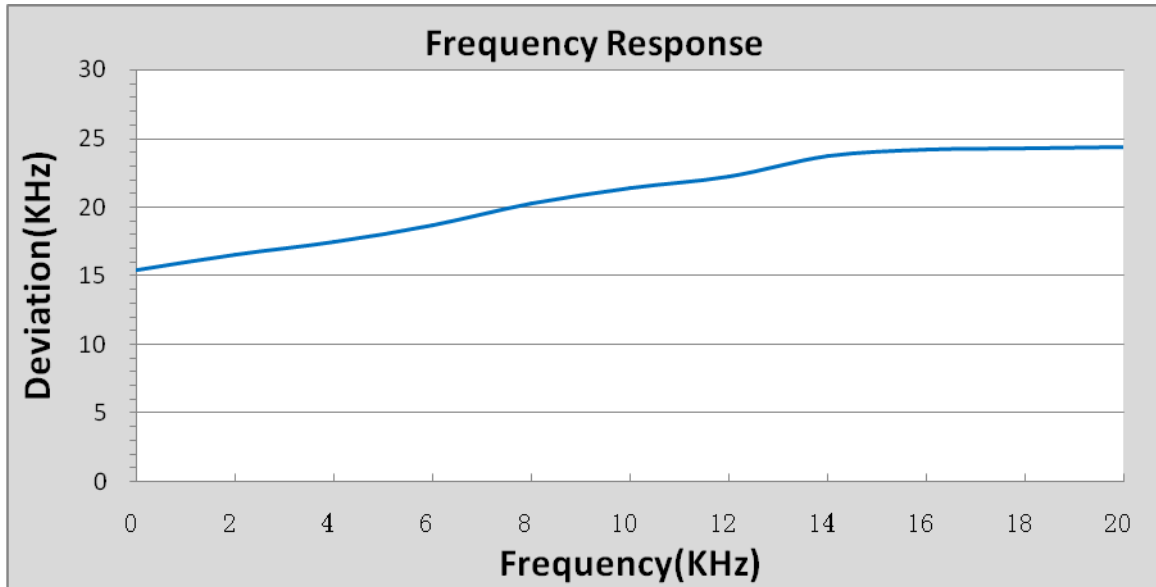


7.2 Test Result

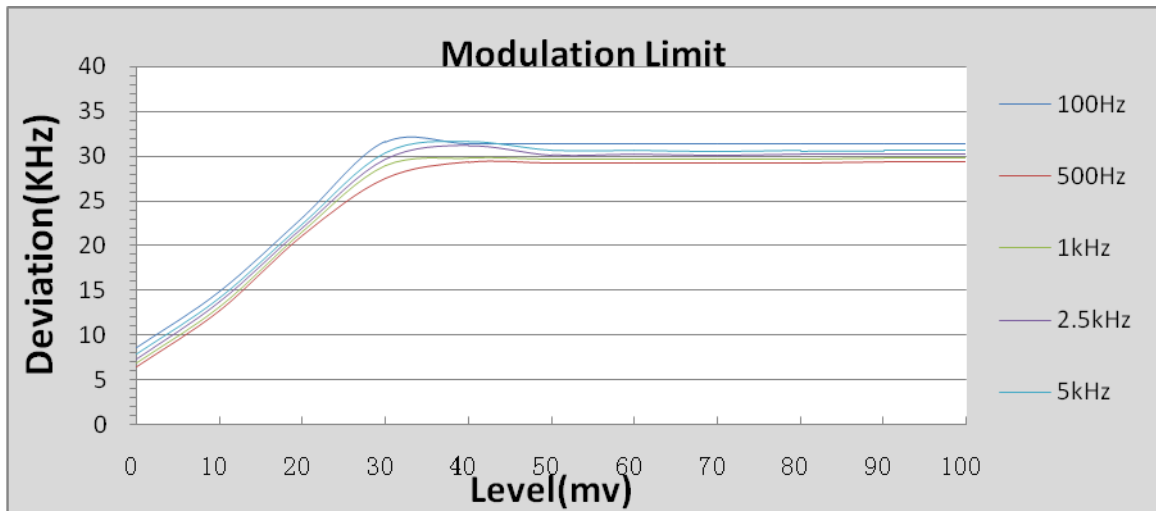
The test data of modulation characteristic is showing as below:

Audio Frequency Response

Low Channel



Level(mv)	100Hz	500Hz	1kHz	2.5kHz	5kHz	Limit(kHz)
0	8.65	6.48	6.90	7.36	7.83	±75.00
10	14.88	12.80	13.24	13.71	14.17	±75.00
20	23.17	21.15	21.65	22.06	22.53	±75.00
30	31.58	27.48	28.89	29.61	30.36	±75.00
40	31.38	29.29	29.77	31.18	31.58	±75.00
50	31.36	29.21	29.63	30.10	30.60	±75.00
60	31.29	29.21	29.66	30.14	30.57	±75.00
70	31.34	29.17	29.65	30.05	30.46	±75.00
80	31.32	29.22	29.66	30.15	30.57	±75.00
90	31.35	29.33	29.74	30.15	30.58	±75.00
100	31.37	29.34	29.77	30.17	30.64	±75.00





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

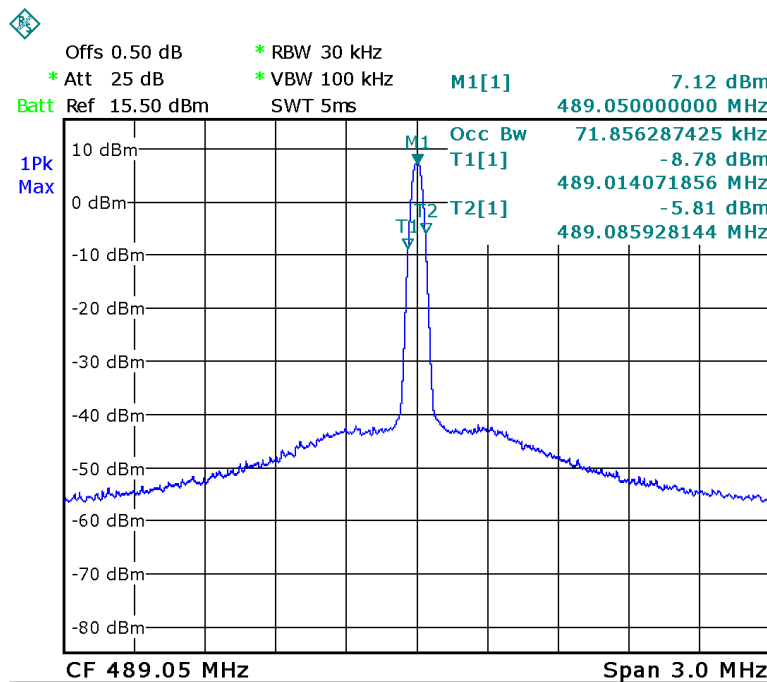
1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Turn on the EUT and set it to any one convenient frequency within its operating range.

8.2 Test Result

Frequency (MHz)	99% Bandwidth (kHz)	Limit (kHz)	Result
489.050	71.856	200	PASS
492.425	71.856	200	PASS

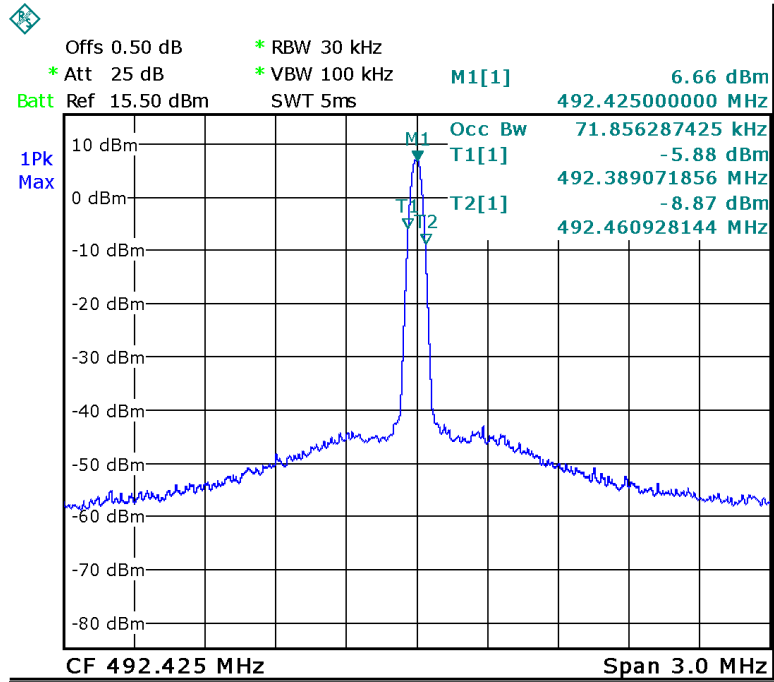
Test Plot:

Low 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 $43 + 10 \text{ Log}(\text{output power in watts})\text{dB}$.

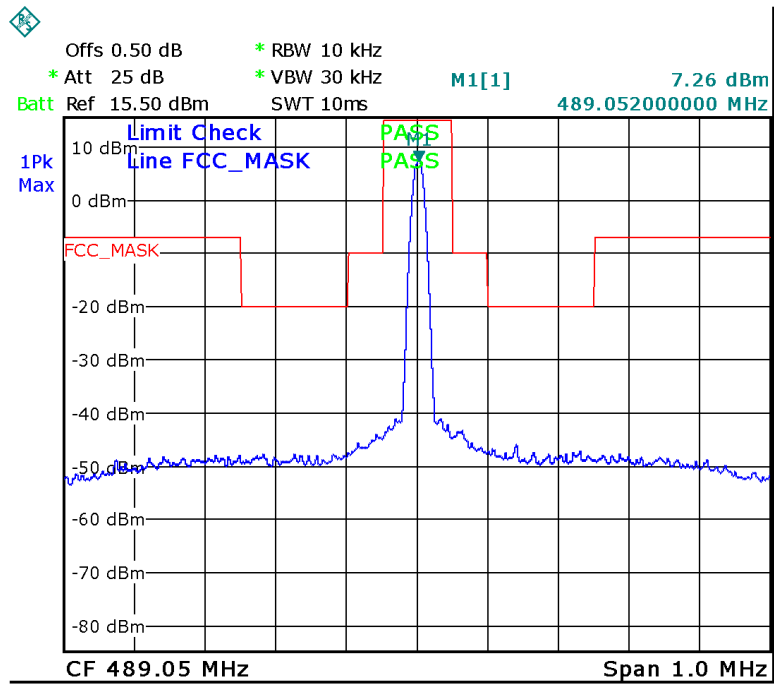
9.1 Test Procedure

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.

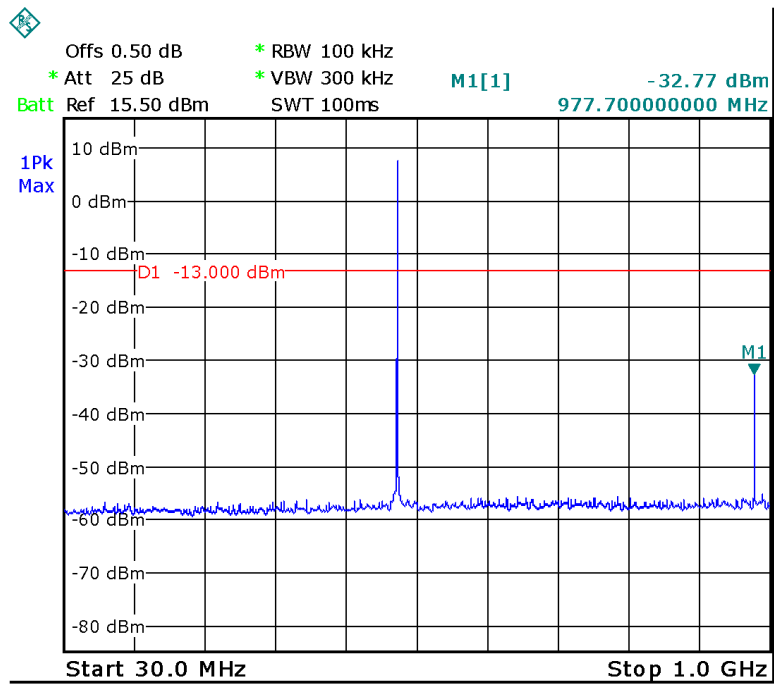


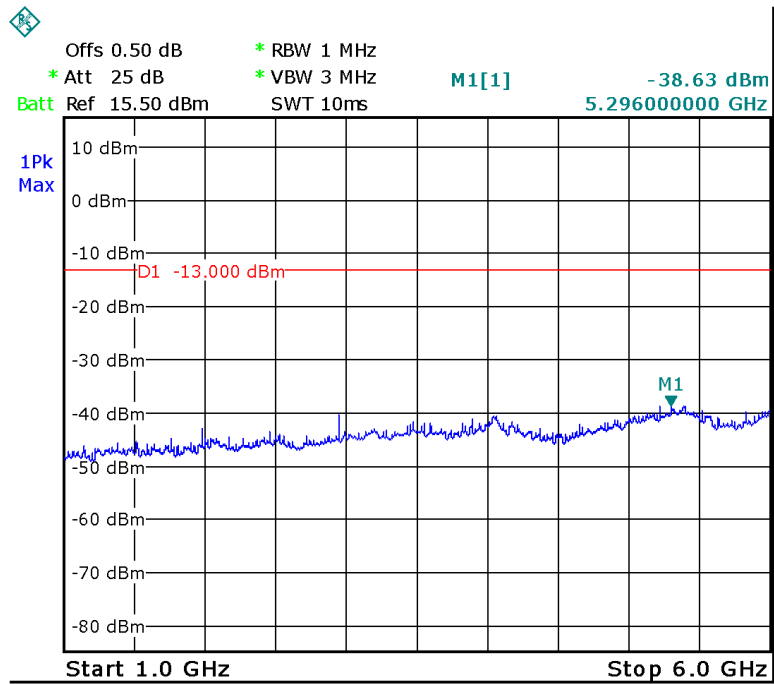
9.2 Test Data

Emission Mask Low Channel

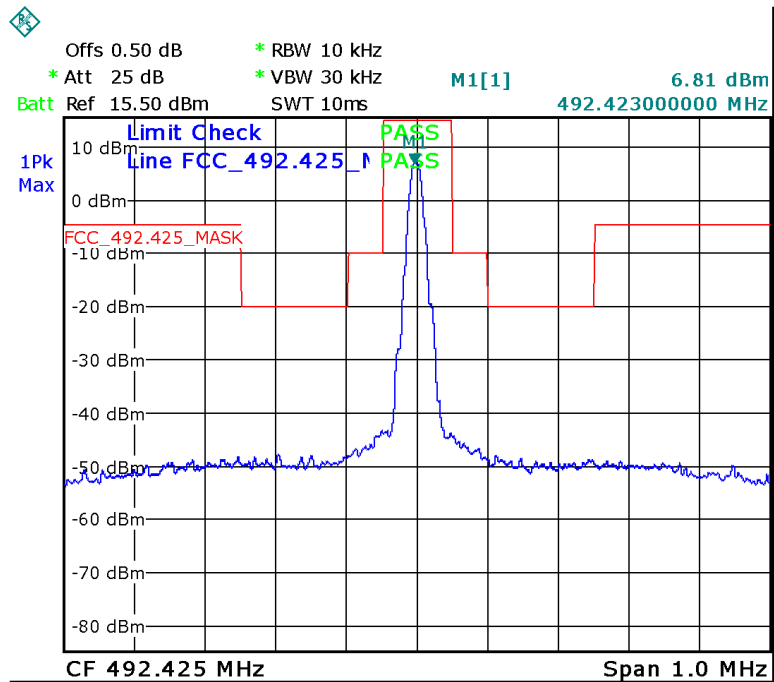


Low channel 30M-6G



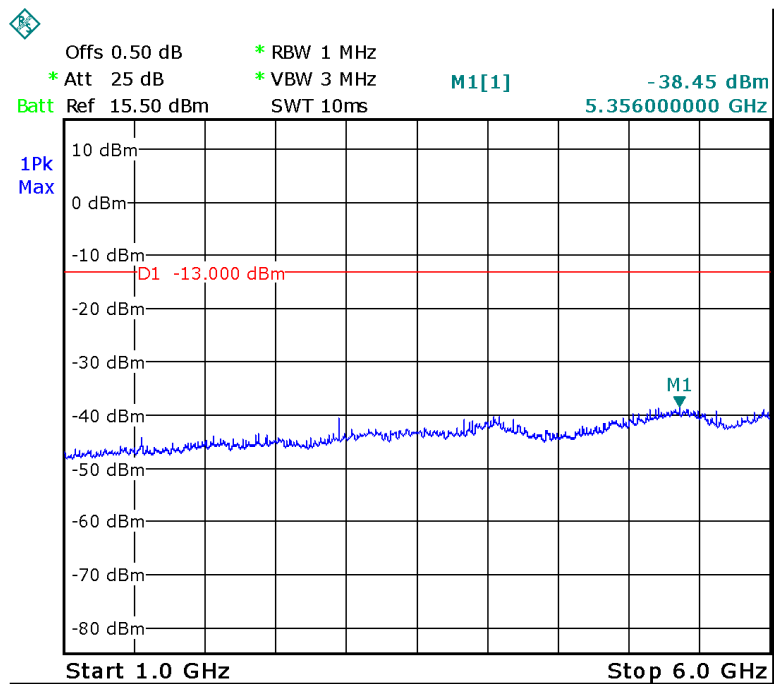
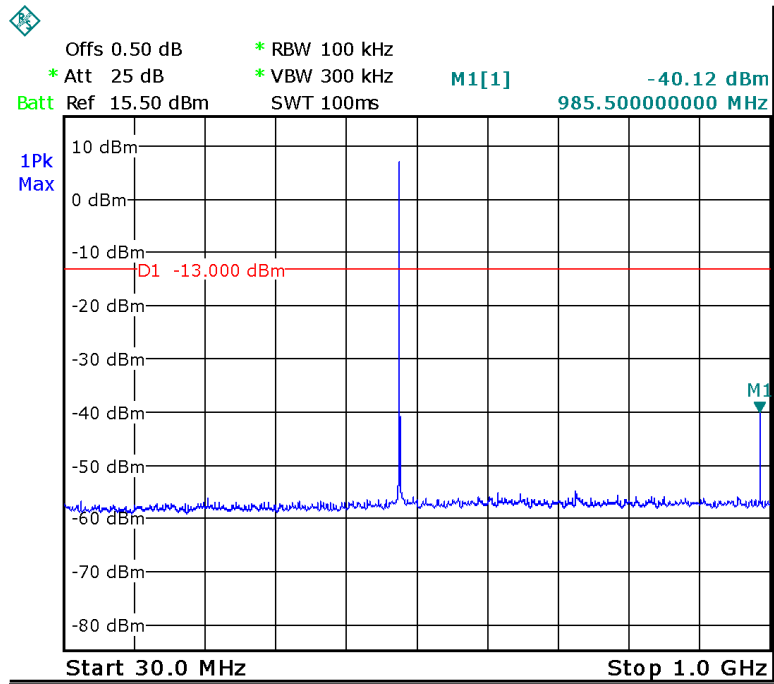


Emission Mask High Channel





High channel 30M-6G





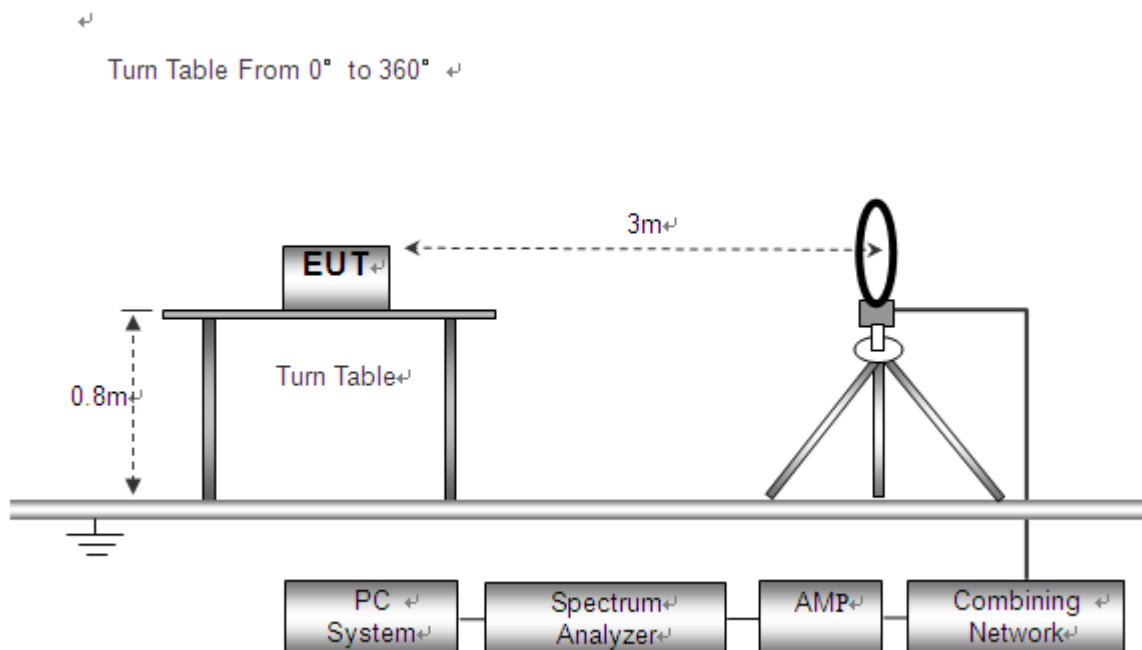
10 Radiated Emission Test

Test requirement:	FCC CFR47 Part 2 Section 2.1053
Test method:	Based on ANSI/TIA-603-D:2010 &ANSI C63.4:2014
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 $43 + 10 \text{ Log (output power in watts)}$ dB.

10.1 EUT Setup

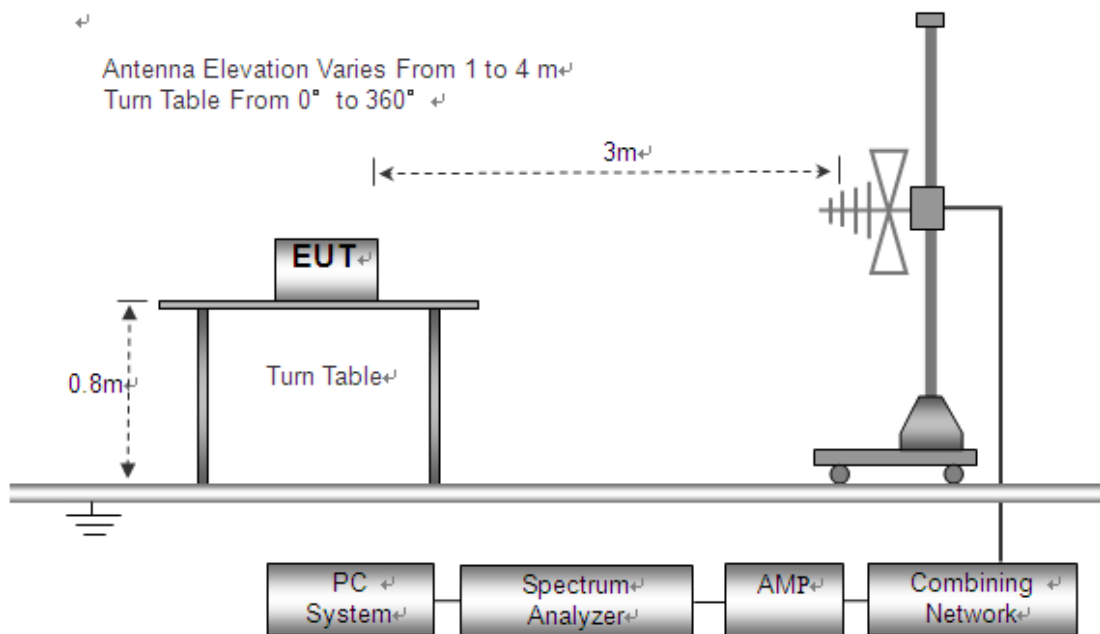
The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site, using the setup accordance with the ANSI C63.4

The test setup for emission measurement below 30MHz.

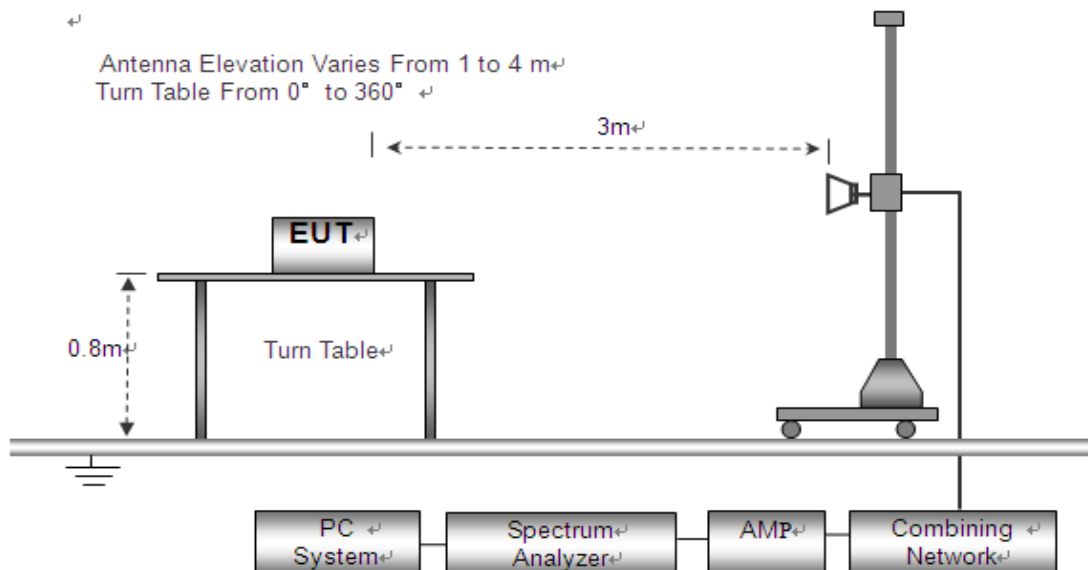




The diagram below shows the test setup that is utilized to make the measurements for emission from 30 MHz to 1 GHz Emissions.



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 9KHz to 6000MHz.

Below 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 Lowed 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

Test Frequency : 9kHz ~ 30MHz

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

Test Frequency : 30MHz ~ 1GHz

Frequency		Ant.	Antenna Height	Turntable Angle	Emission Level	Limit	Margin
(MHz)	Detector	Pol	(m)	(°)	(dBm)	(dBm)	(dB)
Low Channel: 489.050MHz							
978.10	Peak	H	1.1	259	-37.36	-13	-24.36
978.10	Peak	V	1.6	288	-36.52	-13	-23.52
1467.15	Peak	H	1.9	359	-49.63	-13	-36.63
1467.15	Peak	V	1.0	98	-51.25	-13	-38.25
1956.20	Peak	H	1.9	60	-50.47	-13	-37.47
1956.20	Peak	V	1.9	248	-51.57	-13	-38.57
High Channel: 492.425MHz							
984.85	Peak	H	1.2	95	-39.21	-13	-26.21
984.85	Peak	V	1.3	194	-40.54	-13	-27.54
1477.28	Peak	H	1.5	337	-51.35	-13	-38.35
1477.28	Peak	V	1.5	326	-52.34	-13	-39.34
1969.70	Peak	H	1.8	313	-51.54	-13	-38.54
1969.70	Peak	V	1.1	346	-49.62	-13	-36.62

The measurements above 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

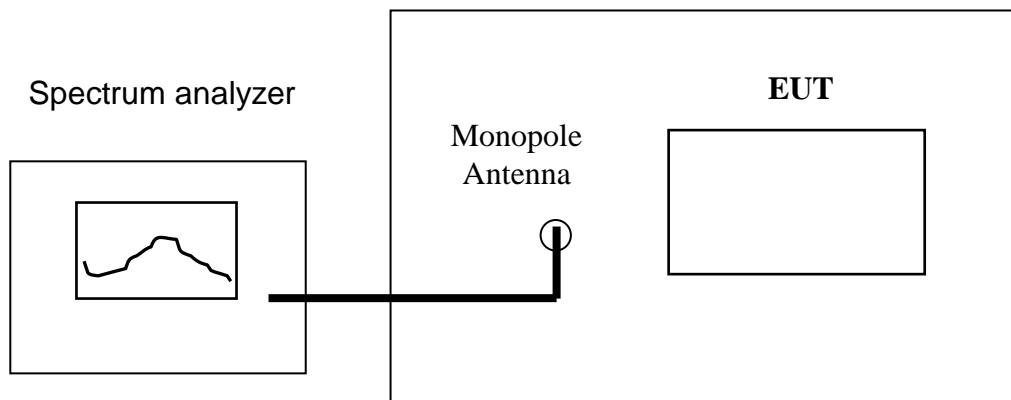


Figure 1

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 (%)
1.5V, DC	489.05	20	489.045	0.00095
1.35V, DC	489.05	20	489.049	0.00015

High channel

Power Supply	Reference Frequency (MHz)	Environment Temperature (°C)	Frequency Measured	Frequency Tolerance (%)
1.5V, DC	492.425	20	492.423	0.00047
1.35V, DC	492.425	20	492.426	0.00017

Remark: The 1.35V is the end point voltage which is specified by the manufacturer.



b) Frequency stability versus environmental temperature

Low Frequency: 489.050MHz, Limit: 0.005%			
Environment Temperature(°C)	Power Supply	Frequency Deviation measured with time Elapse(30 minutes)	
		MHz	%
50	1.5V, DC	489.051	0.00028
40	1.5V, DC	489.047	0.00057
30	1.5V, DC	489.049	0.00017
20	1.5V, DC	489.049	0.00018
10	1.5V, DC	489.044	0.00118
0	1.5V, DC	489.045	0.00096
-10	1.5V, DC	489.048	0.00032
-20	1.5V, DC	489.051	0.00026
-30	1.5V, DC	489.045	0.00095

High Frequency: 492.425MHz, Limit: 0.005%			
Environment Temperature(°C)	Power Supply	Frequency Deviation measured with time Elapse(30 minutes)	
		MHz	%
50	1.5V, DC	492.421	0.00072
40	1.5V, DC	492.427	0.00044
30	1.5V, DC	492.428	0.00055
20	1.5V, DC	492.428	0.00062
10	1.5V, DC	492.430	0.00097
0	1.5V, DC	492.426	0.00019
-10	1.5V, DC	492.420	0.00105
-20	1.5V, DC	492.430	0.00097
-30	1.5V, DC	492.422	0.00052

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 ≤ 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 ≤ 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 ≤ 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

Freq. (GHz)	conducted power (dBm)	Turn up power (mW)	Minimum test separation distance required for the exposure conditions (mm)	Computed value	SAR Test Exclusion Thresholds(mW)
0.489	7.140	7.00	5	0.979	3



13 Photographs –Model TX: AH1 Test Setup

13.1 Photograph – Radiation Spurious Emission Test Setup

Below 30MHz



30MHz-1GHz





Above 1GHz





14 Photographs – Constructional Details

14.1 EUT –Model TX: AH1 External Photos

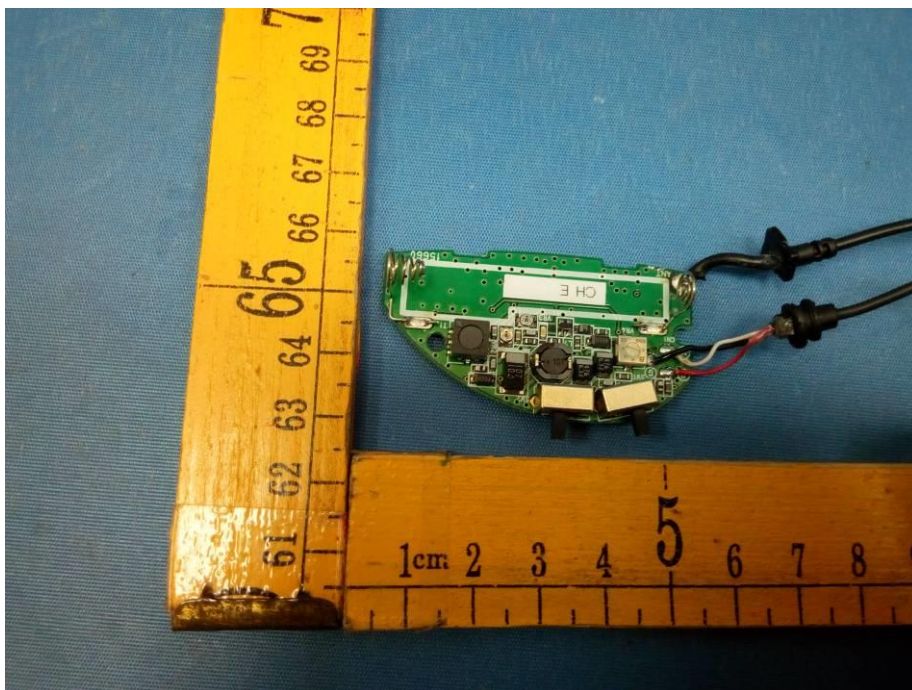


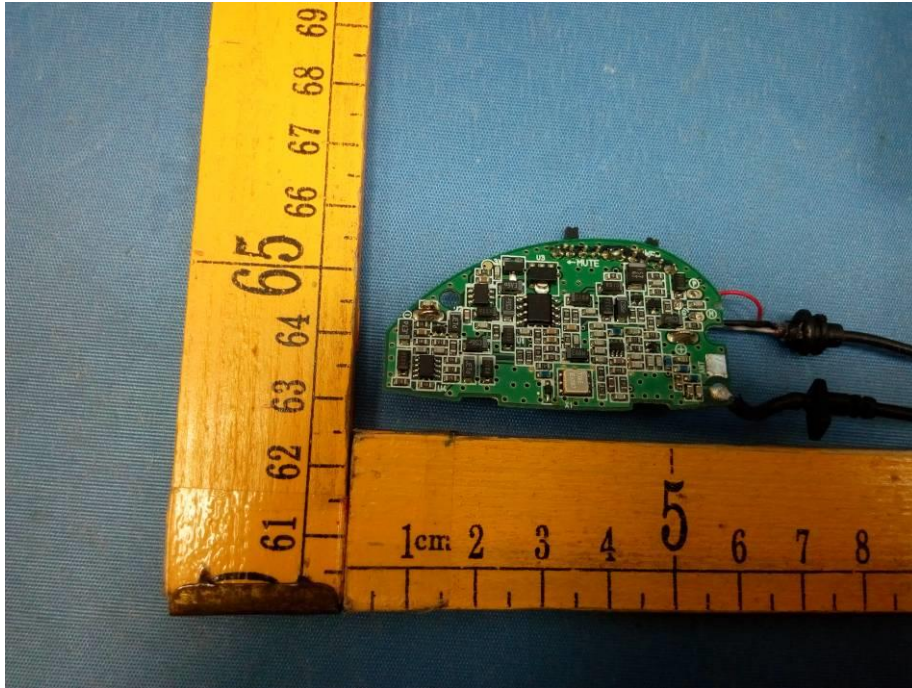






14.2 EUT –Model TX: AH1 Internal Photos





====End of Report====