

FCC TEST REPORT

Prepared For :	Calford Technology Ltd.
Product Name:	9 channel FM wireless intercom
Model :	AF388
Prepared By:	Shenzhen BATT Testing Technology Co., Ltd. 11F, Bldg.B, Xinbaoyuan, Xinanhu Commercial city, Bao'an District, Shenzhen, Guangdong, China. Tel: 86-755-27753991 Fax: 86-755-27754182
Test Date:	August 16 to Sep 11, 2013
Date of Report :	Sep 12, 2013
Report No.:	BATT201309022FCC

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1 TEST CERTIFICATION

Product: 9 channel FM wireless intercom

Model: AF388

Applicant: Calford Technology Ltd.

Room 107, Wah Wai Centre, 38 – 40 Au Pui Wan Street, Fo Tan, Shatin, N.T., Hong

Kong.

Manufacturer: Guangdong Samzuk Technology Development Co., Ltd

High-Tech Zone Xinggong Avenue East Heyuan City (2/F of Minghuang Electrical

Engineering Company Building

Trade Mark: N/A

Tested: August 16 to Sep 11, 2013

Test Voltage: DC6V Powered by power supply

Operational 462.5625MHz, 462.5875MHz, 462.6125MHz, 462.6375MHz, 462.6625MHz,

Frequency 462.6875MHz, 462.7125MHz, 467.5625MHz, 467.5875MHz

Range:

Modulation F3E

Type:

Frequency By Key button

Selection

Channel 9 Channel provided to the EUT

Number

Antenna: Integral antenna with Gain 2.0 dBi

Model No.: NLA080060W1A1 Power Supply:

Input: AC100-240V, 50/60Hz, 0.2A; Output: DC6V, 800mA

FCC ID: 2AAYF-AF388

Applicable FCC Part 95, Subpart B and Subpart E;

Standards:

The test report was prepared by Shenzhen BATT Testing Technology Co., Ltd.and found compliance with the requirements set forth in the technical standards mentioned above. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.



Prepared by:	Hellenxiao
Reviewer:	Hellen XiaoAssistant Mike Yong
	Mike Yong/Supervisor
Approved & Authorized Signer:	Fores Song
	Jones Song/ Manager



Analyzer

Shenzhen BATT Testing Technology Co., Ltd. Report No.: BATT201309022FCC

Sile	enznen BATT Testing	reciniology Co	o., Ltu. N	eport No.: BAI 12	013090221400
2.0 Test Equip	ments				
Instrument Type	Manufacturer	Model	Serial No.	Date of Cal.	Due Date
ESPI Test Receiver	ROHDE&SCHWA RZ	ESPI 3	100379	2013-05-27	2014-05-26
EMI Test Receiver	Rohde & Schwarz	ESU	1302.6005.26	2013-05-27	2014-05-26
Impuls-Begrenzer	ROHDE&SCHWA RZ	ESH3-Z2	100281	2013-05-27	2014-05-26
Loop Antenna	EMCO	6502	00042960	2013-05-27	2014-05-26
ESPI Test Receiver	ROHDE&SCHWA RZ	ESI26	838786/013	2013-05-27	2014-05-26
3m OATS			N/A	2013-05-27	2014-05-26
Horn Antenna	SCHWARZBECK	BBHA 9170	ВВНА9170399	2013-05-27	2014-05-26
Horn Antenna	SCHWARZBECK	BBHA 9120	D143	2013-05-27	2014-05-26
Power meter	Anritsu	ML2487A	6K00003613	2013-05-27	2014-05-26
Power sensor	Anritsu	MA2491A	32263	2013-05-27	2014-05-26
Bilog Antenna	Schwarebeck	VULB916	9163/142	2013-05-27	2014-05-26
LISN (Three Phase)	Schwarebeck	NSLK 8126	8126453	2013-05-27	2014-05-26
9*6*6 Anechoic			N/A	2013-05-27	2014-05-26
EMI Test Receiver	RS	ESCS30	100139	2013-05-27	2014-05-26
LISN	RS	ESH2-Z5	100225	2013-05-27	2014-05-26
LISN (Three Phase)	Schwarebeck	NSLK 8126	8126453	2013-05-27	2014-05-26
Pre-Amplifier	A.H.	PAM-0126	1415261	2013-05-27	2014-05-26
Modulation Analyzer	НР	8901B	3104A03367	2013-06-16	2014-06-15



3.0 Technical Details

3.1 Summary of test results

The EUT has been tested according to the following specifications:

6411	TD 4 TD	D 14	NT - 4
Standard	Test Type	Result	Notes
FCC Part 15.207	Conducted Emission	Pass	Complies
FCC Part 95.639	Maximum Transmitter	Pass	Complies
	Power		
FCC Part 95.637	Modulation Characteristic	Pass	Complies
FCC Part 95.633	Occupied Bandwidth	Pass	Complies
FCC Part 95.633	Emission Mask	Pass	Complies
FCC Part 95.626	Frequency Tolerance	Pass	Complies
FCC Part 95.635	Spurious Radiated	Pass	Complies
rec rait 93.033	Emissions	Fass	

4.0 Test LAB Details

All Tests Performed at

Name: Shenzhen Emtek Co., Ltd.

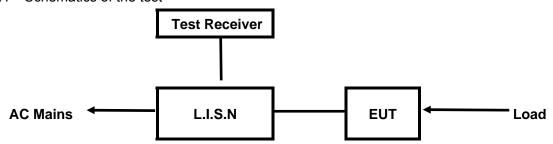
Address: Bldg. 69, Majialong Industry Zone,, Nanshan District, Shenzhen, Guangdong, 518052China

FCC Registration Number: 406365



5. Power Line Conducted Emission Test

5.1 Schematics of the test

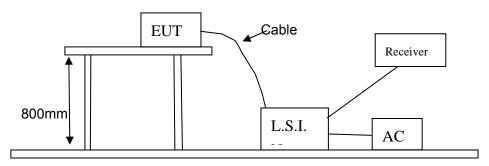


EUT: Equipment Under Test

5.2 Test Method and test Procedure

The EUT was tested according to ANSI C63.4-2003. The Frequency spectrum From 0.15MHz to 30MHz was investigated. The LISN used was 50ohm/50uH as specified by section 5.1 of ANSI C63.4 –2003.

Test Voltage: 120V~, 60Hz Block diagram of Test setup



5.3 Configuration of The EUT

The EUT was configured according to ANSI C63.4-2003. All interface ports were connected to the appropriate peripherals. All peripherals and cables are listed below.

One channels are provided to the EUT

A. EUT

Device	Manufacturer	Model	FCC ID
9 channel FM	Guangdong Samzuk Technology	AF388	2AAYF-AF388
wireless intercom	Development Co., Ltd.		



B. Internal Device

Device	Manufacturer	Model	FCC ID/DOC
N/A			

C. Peripherals

Device	Manufacturer	Model	FCC ID/DOC	Cable
N/A				

5.4 EUT Operating Condition

Operating condition is according to ANSI C63.4 -2003

- A Setup the EUT and simulators as shown on follow
- B Enable AF signal and confirm EUT active to normal condition

5.5 Power line conducted Emission Limit according to Paragraph 15.207

	Class A Li	mits (dBµV)	Class B Limits (dBµV)					
Frequency(MHz)	Quasi-peak	Average Level	Quasi-peak Level	Average Level				
	Level							
0.15 ~ 0.50	79.0	66.0	66.0~56.0*	56.0~46.0*				
0.50 ~ 5.00	73.0	60.0	56.0	46.0				
5.00 ~ 30.00	73.0	60.0	60.0	50.0				

Notes:

- 1. *Decreasing linearly with logarithm of frequency.
- 2. The tighter limit shall apply at the transition frequencies

5.6 Test Results

The frequency spectrum from 0.15MHz to 30MHz was investigated. All reading are quasi-peak values with a resolution bandwidth of 9kHz.

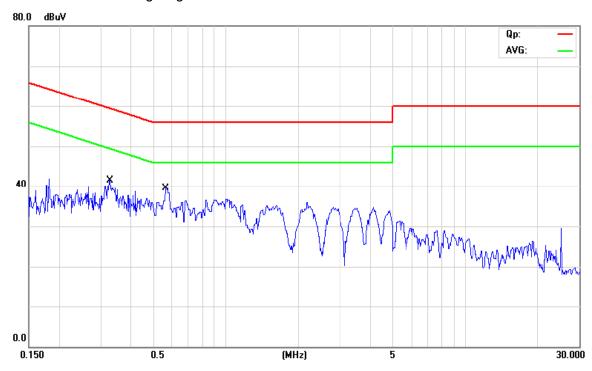


A Conducted Emission on Line Terminal of the power line (150kHz to 30MHz)

EUT set Condition: Charging

Results: Pass

Please refer to following diagram for individual



No. Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over		
	MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1	0.3260	23.00	11.19	34.19	59.55	-25.36	QP	
2 *	0.3260	19.30	11.19	30.49	49.55	-19.06	AVG	
3	0.5602	20.00	11.43	31.43	56.00	-24.57	QP	
4	0.5602	10.00	11.43	21.43	46.00	-24.57	AVG	

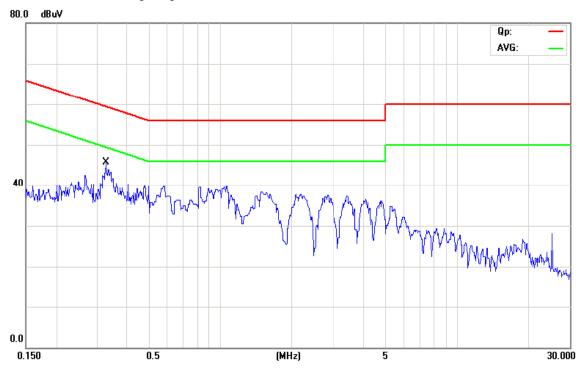


B Conducted Emission on Neutral Terminal of the power line (150kHz to 30MHz)

EUT set Condition: Charging

Results: Pass

Please refer to following diagram for individual



No. Mk.	Freq.	Reading Level		Measure- ment	Limit	Over		
	MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1	0.3271	27.00	11.19	38.19	59.52	-21.33	QP	
2 *	0.3271	24.30	11.19	35.49	49.52	-14.03	AVG	



6. Frequency Tolerance

6.1 Applicable standard

According to FCC §2.1055(a) (1), the frequency stability shall be measured with variation of ambient temperature from –30 °C to +50 °C, and according to FCC 2.1055(d) (2), the frequency stability shall be measured with reducing primary supply voltage to the battery operating end point which is specified by the manufacturer.

According to FCC §95.626(b), Each FRS Unit must be maintained within a frequency tolerance of 0.00025 %(2.5 ppm).

6.2 Measurement Procedure

6.2.1 Frequency stability versus environmental temperature

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

6.2.2 Frequency stability versus input voltage

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

6.3 TEST SETUP BLOCK DIAGRAM

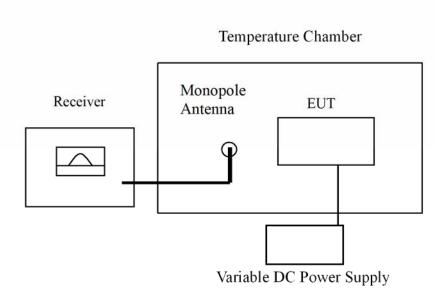


Figure 1

6.5 TEST RESULT

(1) Frequency stability versus input voltage (The end point voltage is 4.5V)

Channel	Power Supplied (Vdc)	Frequency Measured (MHz)	Frequency Deviation (ppm)	Nominal Frequency	Limit (ppm)
CH1	4.5V	462.562435	-0.14	462.5625MHz	±2.5
CH9	4.5V	467.587563	0.13	467.5875MHz	±2.5



(2)Frequency stability versus ambient temperature

Test Results

CH1

Environment Temperature(℃)	Power Supplied (Vdc)	Frequency Measured (MHz)	Frequency Deviation (ppm)	Nominal Frequency	Limit(pp m)
50	6.0	462.562428	-0.16	462.5625MHz	±2.5
40	6.0	462.562417	-0.18	462.5625MHz	±2.5
30	6.0	462.562436	-0.14	462.5625MHz	±2.5
20	6.0	462.562422	-0.17	462.5625MHz	±2.5
10	6.0	462.562420	-0.17	462.5625MHz	±2.5
0	6.0	462.562451	-0.11	462.5625MHz	±2.5
-10	6.0	462.562432	-0.15	462.5625MHz	±2.5
-20	6.0	462.562429	-0.15	462.5625MHz	±2.5
-30	6.0	462.562438	-0.13	462.5625MHz	±2.5

CH9

Environment Temperature(℃)	Power Supplied (Vdc)	Frequency Measured (MHz)	Frequency Error (ppm)	Nominal Frequency	Limit(pp m)
50	6.0	467.587569MHz	0.15	467.5875MHz	±2.5
40	6.0	467.587589MHz	0.19	467.5875MHz	±2.5
30	6.0	467.587612MHz	0.24	467.5875MHz	±2.5
20	6.0	467.587577MHz	0.16	467.5875MHz	±2.5
10	6.0	467.587552MHz	0.11	467.5875MHz	±2.5
0	6.0	467.587582MHz	0.18	467.5875MHz	±2.5
-10	6.0	467.587549MHz	0.10	467.5875MHz	±2.5
-20	6.0	467.587560MHz	0.13	467.5875MHz	±2.5
-30	6.0	467.587572MHz	0.15	467.5875MHz	±2.5

7. EMISSION BANDWIDTH and Mask

7.1 PROVISIONS APPLICABLE

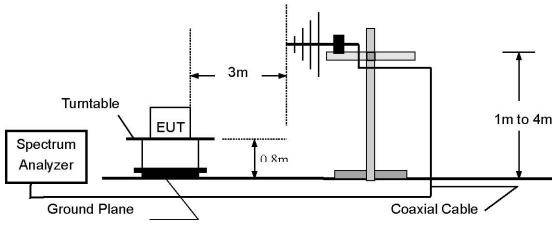
Per FCC §2.1049 and FCC §95.633(a) (c), the authorized bandwidth for emission type F3E or F2D transmitted by an FRS Unit is 12.5 kHz.

- (1)At least 25 dB (decibels) on any frequency removed from the center of the authorized bandwidth by more than 50% up to and including 100% of the authorized bandwidth.
- (3) At least 35 dB on any frequency removed from the center of the authorized bandwidth by more than 100% up to and including 250% of the authorized bandwidth.
- (7) At least 43 + 10 log10 (T) dB on any frequency removed from the center of the authorized bandwidth by more than 250%.

7.2 MEASUREMENT PROCEDURE

TIA-603-C, section 2.2.11

7.3 Test Setup Block Diagram



7.4 Measurement Rusult:

Bandwidth				
Operating Frequency	Test Data	Limits	Result	
467.5875 MHz	5.64kHz	12.5kHz	Pass	
462.5625MHz	5.68kHz	12.5kHz	Pass	

Emission Designator:

Bn=2M + 2DK

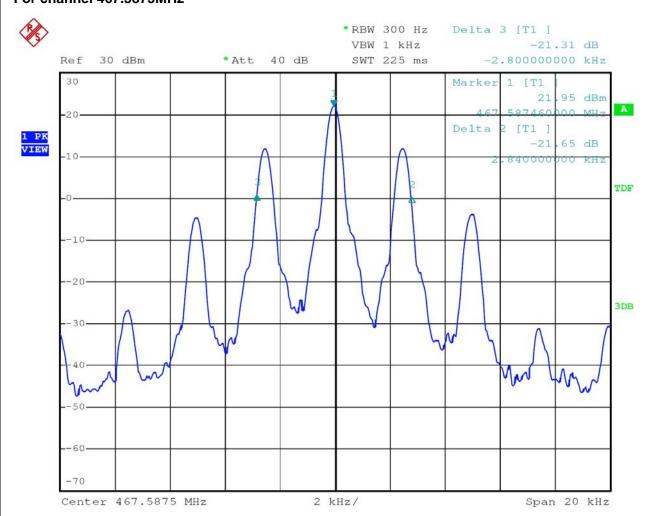
Where M = 3 KHz, D = 2.5 KHz, K = 1

Bn =2*3 + 2*2.5 = 11KHz

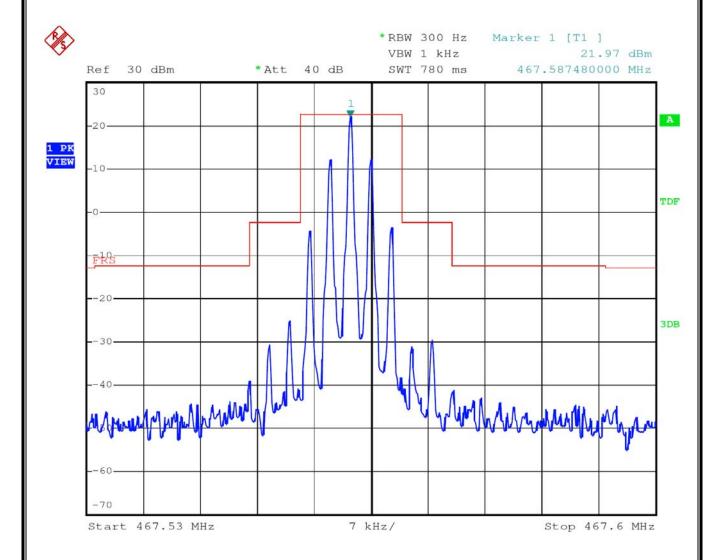
Type of emission: 11K0F3E

7.5 Test Plots:

For channel 467.5875MHz

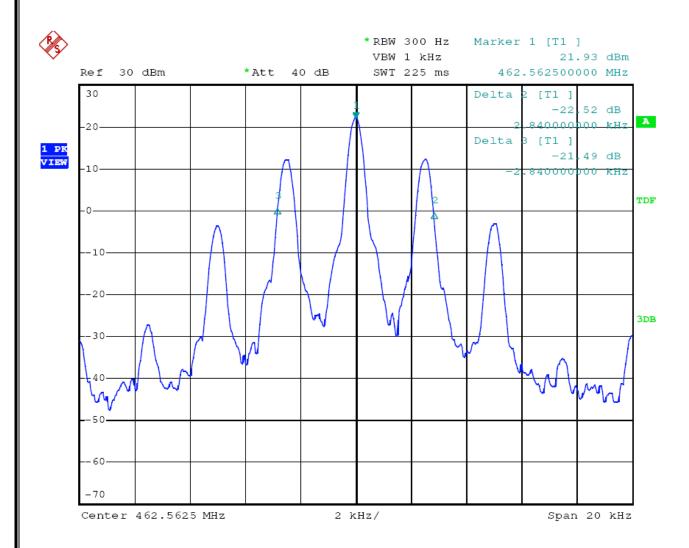




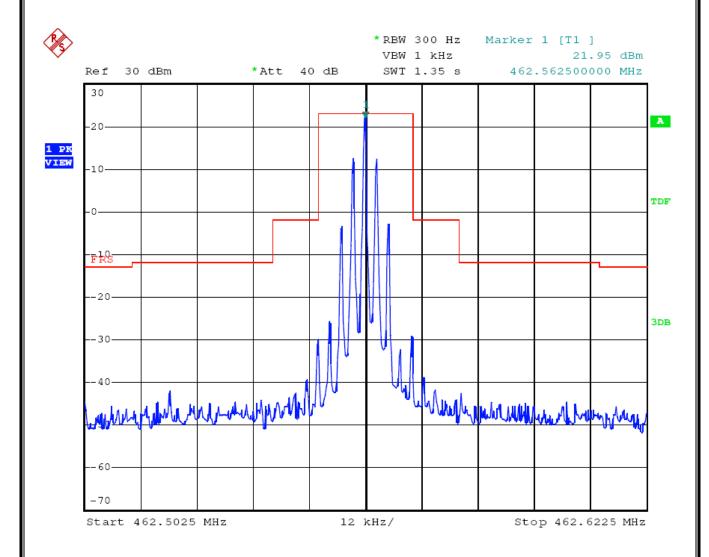




For channel 462.5625MHz

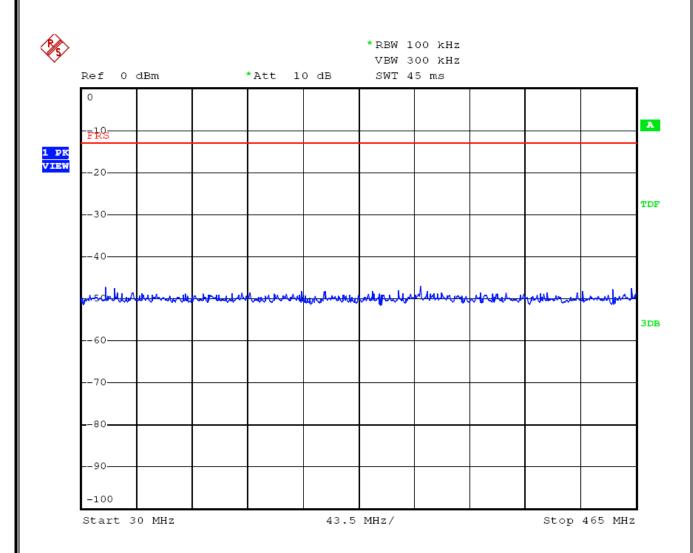








For Conducted emission test, Channel 467.5875MHz is selected to conduct the test because it has the higher output power. And it is the worse case. Please see the following plots.

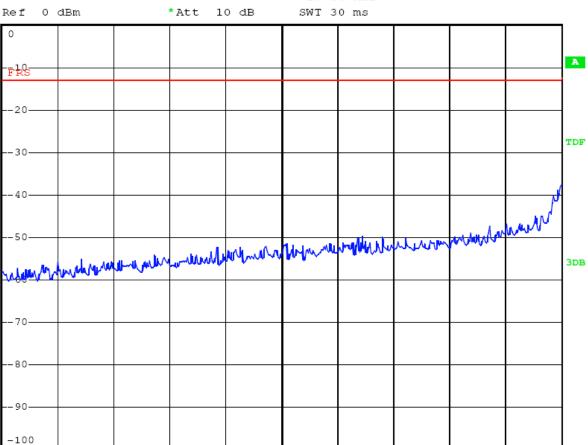






1 PK VIEW

*RBW 10 kHz VBW 30 kHz



Start 465 MHz

253 kHz/

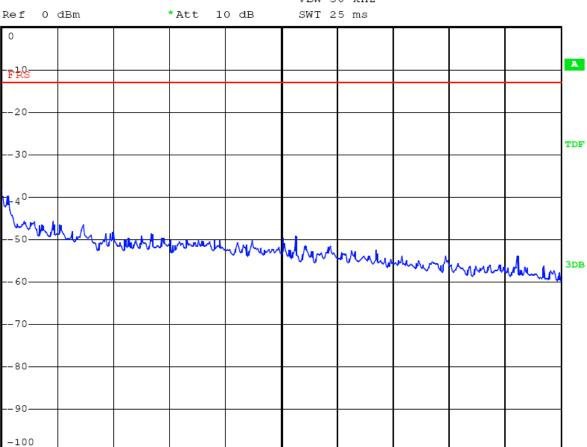
Stop 467.53 MHz





1 PK VIEW

*RBW 10 kHz VBW 30 kHz

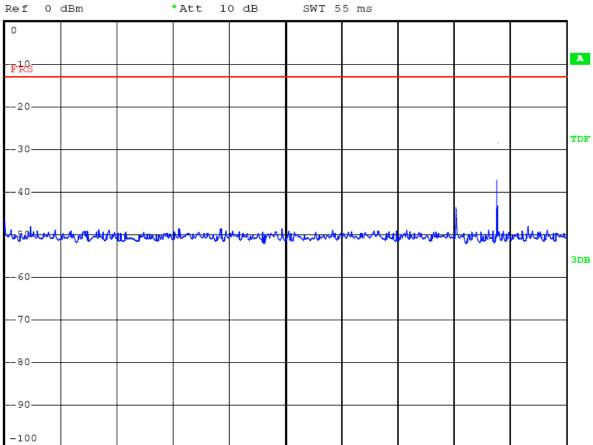






1 PK VIEW

*RBW 100 kHz VBW 300 kHz



Start 470 MHz

53 MHz/

Stop 1 GHz

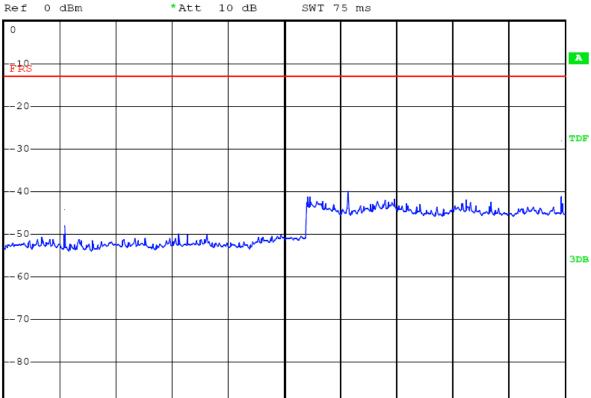




1 PK VIEW

-100

*RBW 1 MHz VBW 3 MHz



370 MHz/ Stop 4.7 GHz Start 1 GHz



8. UNWANTED RADIATION

8.1 PROVISIONS APPLICABLE

FCC §2.1053 and §95.635

8.2 MEASUREMENT PROCEDURE (Radiated Emissions)

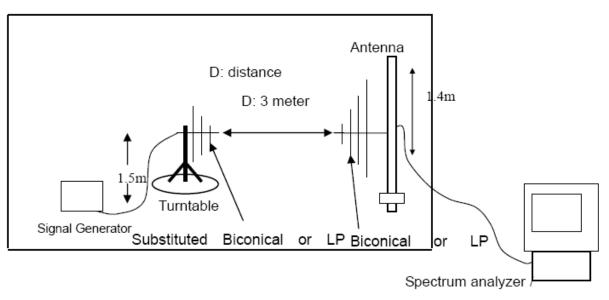
- (1). On a test site, the EUT shall be placed on a turntable, and in the position closest to the normal use as declared by the user.
- (2). The test antenna shall be oriented initially for vertical polarization located 3m from the EUT to correspond to the transmitter.
- (3). The output of the antenna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



8.3 Substitution Method: (Radiated Emissions)

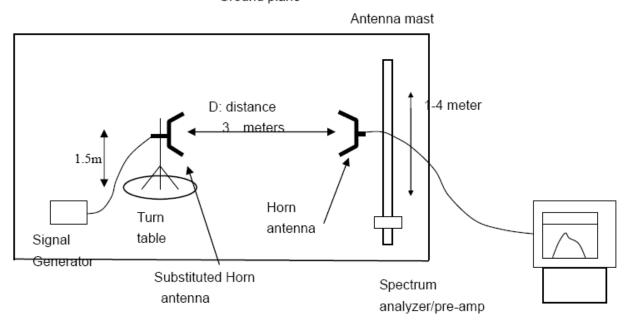
Radiated Below 1GHz

Ground Plane



Radiated Above 1 GHz

Ground plane





8.4 MEASUREMENT RESULTS:

Calculation: Limit (dBm)= EL-43-10log10 (T)=-13dBm

Notes: EL is the emission level of the Output Power expressed in dBm, in this application, the EL is 27

 dBm

CH1

Frequency (MHz)	Antennal Polarity	Emission (dBm)	Limit (dBm)
925.125	Vertical	-36.98	-13
1387.6875	Vertical	-42.00	-13
1850.25	Vertical	-46.90	-13
925.125	Horizontal	-40.60	-13
1387.6875	Horizontal	-44.21	-13

CH9

Frequency (MHz)	Antennal Polarity	Emission (dBm)	Limit (dBm)
935.175	Vertical	-38.03	-13
1402.7625	Vertical	-43.58	-13
1870.35	Vertical	-47.22	-13
935.175	Horizontal	-42.11	-13
1402.7625	Horizontal	-45.63	-13

Note: ERP was recorded.



9. Modulation Characteristics

9.1 PROVISIONS APPLICABLE

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

Part95.637: A FRS unit that transmits emission type F3E must not exceed a peak frequency deviation of plus or minus 2.5 kHz, and the audio frequency response must not exceed 3.125 kHz

9.2 MEASUREMENT METHOD

9.2.1 Modulation Limit

- (1). Configure the EUT as shown in figure 1, adjust the audio input for 60% of rated system deviation at 1KHz using this level as a reference (0dB) and vary the input level from –20 to +20dB. Record the frequency deviation obtained as a function of the input level.
- (2). Repeat step 1 with input frequency changing to 300, 1000, 1500 and 3000Hz in sequence.

9.2.2 Audio Frequency Response

- (1). The EUT and test equipment were set up as shown in figure 2.
- (2). Adjust the Modulation Analyzer for the following setting:

a) High-pass filter: off

b) Low-pass filter: 15 kHz

c) Detector: positive peak

d) Function: FM

- (3). The audio signal input was adjusted to obtain 20 % modulation at 1 kHz, and this point was taken as the 0 dB reference level.
- (4). With input levels held constant and below limiting at all frequencies, the audio signal generator was varied from 300 Hz to 5 kHz.
- (5). The response in dB relative to 1 kHz was then measured, using the Modulation Analyzer.



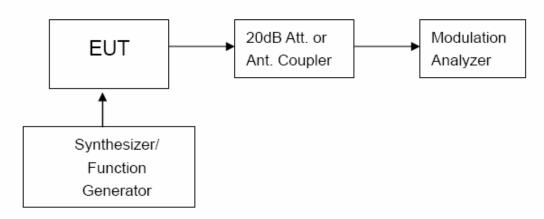


Figure 1: Modulation characteristic measurement configuration

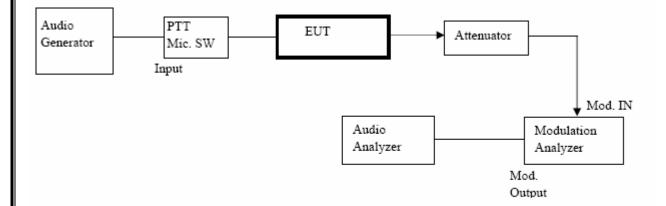


Figure 2: Audio Frequency Response Measurement Configure

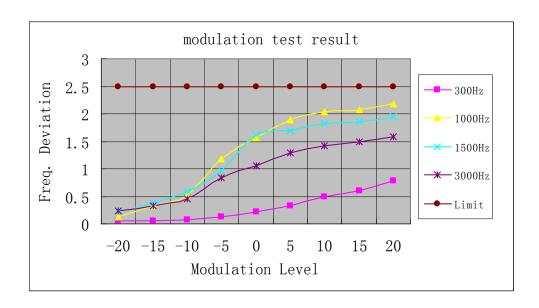


9.4 MEASUREMENT RESULT

(a). Modulation Limit:

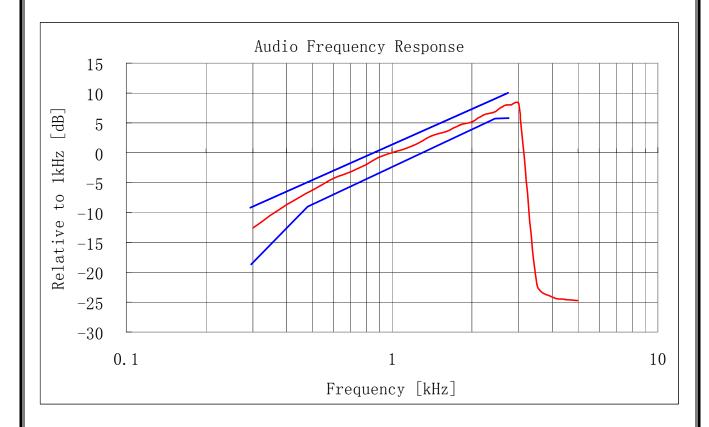
CH9

Modulation Level (dB)	Peak Freq. Deviation At 300 Hz	Peak Freq. Deviation At 1000 Hz	Peak Freq. Deviation At 1500 Hz	Peak Freq. Deviation At 3000 Hz
-20	0.05	0.12	0.21	0.23
-15	0.06	0.33	0.39	0.33
-10	0.07	0.52	0.59	0.46
-5	0.12	1.18	0.96	0.83
0	0.22	1.56	1.61	1.06
+5	0.32	1.9	1.7	1.3
+10	0.5	2.03	1.82	1.42
+15	0.6	2.08	1.86	1.49
+20	0.78	2.19	1.95	1.59





(b). Audio Frequency Response:





10. MAXIMUM TRANSMITTER POWER

10.1 PROVISIONS APPLICABLE

Per FCC §2.1046 and §95.639(d), No FRS Unit, under any condition of modulation, shall exceed a 0.5 W effective radiated power (ERP).

10.2 TEST PROCEDURE

The transmitter was placed on a wooden turntable, and it was transmitting into a non-radiating load, which was also placed on the turntable.

The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT .The test was performed by placing the EUT on 3-orthogonal axis. Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the emissions were measured by the substitution.

10.3 TEST RESULT

Power Measurement Results			
Channel	Measurement Result (dBm)		
CH1 (462.5625MHz)	23.33		
CH9(467.5875MHz)	23.58		

Note: ERP was recorded.



11. Radiated Emission on Receiving Mode

11.1 Provisions Applicable

FCC Part 15 Subpart B Section 15.109

11.2 TEST METHOD

ANSI C 63.4: 2003

11.4 MEASURE RESULT (MEASURED AT 3M USING FCC PART15 B LIMITS)

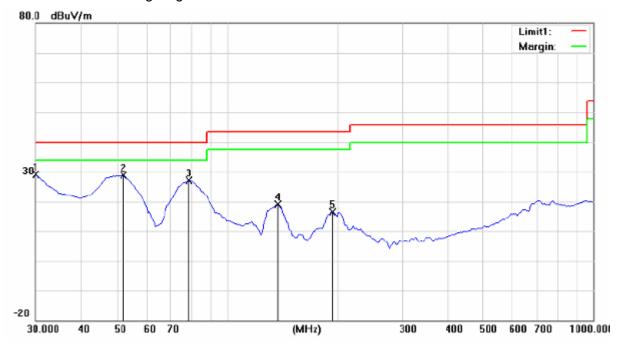


A Radiated Disturbance In Vertical (30MHz----1000MHz)

EUT set Condition: Receiving

Level: Class B
Results: PASS

Please refer to following diagram for individual



Frequency (MHz)	Level@3m (dBµV/m)	Antenna Polarity	Limit@3m (dBµV/m)
30.0000	29.23	V	40.00
51.8250	28.79	V	40.00
78.6888	27.02	V	40.00
136.6999	19.24	V	43.50
192.4749	16.56	V	43.50

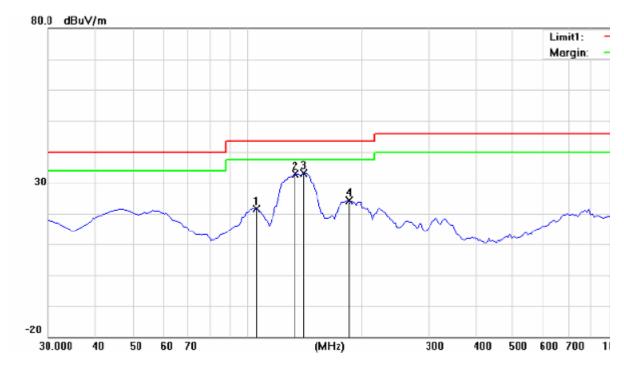


B Radiated Disturbance In Horizontal (30MHz----1000MHz)

EUT set Condition: Receiving

Level: Class B
Results: PASS

Please refer to following diagram for individual



Frequency (MHz)	Level@3m (dBµV/m)	Antenna Polarity	Limit@3m (dBµV/m)
105.7500	21.65	Н	43.50
134.2750	32.99	Н	43.50
141.5500	33.12	Н	43.50
185.2000	24.34	Н	43.50



FCC ID Label 12.0

FCC ID: 2AAYF-AF388

This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

The label must not be a stick-on paper label. The label on these products must be permanently affixed to the product and readily visible at the time of purchase and must last the expected lifetime of the equipment not be readily detachable.

Mark Location:





Photo of testing 13.0

13.1 Conducted test View--





13.2 Radiated emission test view







Outside View







Outside View







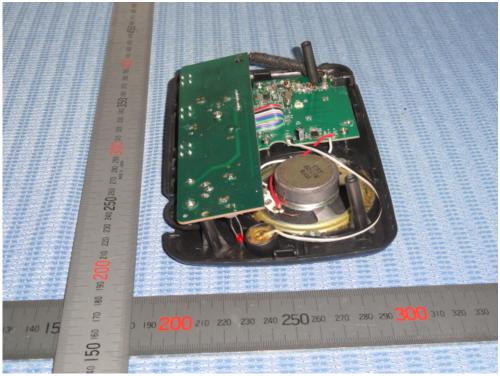
Outside View



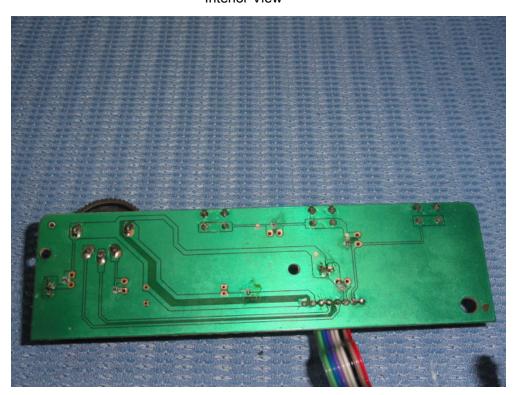








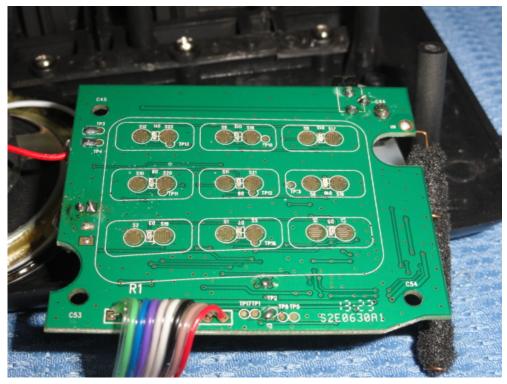




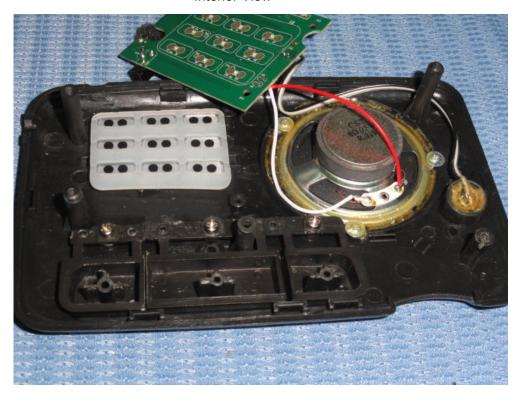












The Report End