



FCC Part 74 Test Report

FCC ID: 2AHS62022

Product Name:	WIRELESS MIC
Trademark:	N/A
Model Name :	202.2
Prepared For :	TIAN RUI HOLDINGS GROUP CO.,LTD
Address :	Feiyang Industrial Zone, Baiyun District, Guangzhou, China
Prepared By :	Shenzhen BCTC Technology Co., Ltd.
Address :	No.101,Yousong Road,Longhua New District, Shenzhen,China
Test Date:	Mar. 16 – Mar. 29, 2016
Date of Report :	Mar. 30, 2016
Report No.:	BCTC-160302683E



VERIFICATION OF COMPLIANCE

Applicant's name : **TIAN RUI HOLDINGS GROUP CO.,LTD**

Address..... : Feiyang Industrial Zone, Baiyun District, Guangzhou, China

Manufacture's Name : **TIAN RUI HOLDINGS GROUP CO.,LTD**

Address..... : Feiyang Industrial Zone, Baiyun District, Guangzhou, China

Product description

Product name..... : WIRELESS MIC

Trademark: N/A

Model Name: 202.2

Test Standards FCC Part 74.861e: 2014

This device described above has been tested by BCTC, and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

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Test Result..... : **Pass**

Testing Engineer :

(Eric Yang)

Technical Manager :

(Sophia Lee)

Authorized Signatory :

(Carson. Zhang)





Table of Contents	Page
1 . SUMMARY OF TEST RESULTS	4
1.1 TEST FACILITY	4
1.2 MEASUREMENT UNCERTAINTY	4
2 . GENERAL INFORMATION	5
2.1 GENERAL DESCRIPTION OF EUT	5
2.2 DESCRIPTION OF TEST MODES	6
2.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED	6
2.4 DESCRIPTION OF SUPPORT UNITS(CONDUCTED MODE)	6
2.5 EQUIPMENTS LIST FOR ALL TEST ITEMS	7
3 . EMC EMISSION TEST	8
3.1 CARRIER RADIATED POWER & RADIATED SPURIOUS EMISSIONS	8
3.1.1 LIMIT	8
3.1.2 TEST PROCEDURE FOR	8
3.1.3 TEST SETUP	10
3.1.4 EUT OPERATING CONDITIONS	10
3.1.5 TEST RESULTS	11
4 . MODULATION CHARACTERISTICS	13
4.1 APPLIED PROCEDURES / LIMIT	13
4.1.1 TEST PROCEDURE	13
5 .OCCUPIED BANDWIDTH	16
5.1 APPLIED PROCEDURES / LIMIT	16
5.1.1 TEST PROCEDURE	16
5.1.2 TEST SETUP	16
5.1.3 TEST RESULTS	17
6 . FREQUENCY STABILITY	19
6.1 TEST RESULTS	20
7 . EUT TEST PHOTO	21
8 . PHOTOS OF THE EUT	22



1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

FCC Part 74.861			
Standard Section	Test Item	Standard Paragraph	Judgment
FCC Part 2.1046	Carrier Radiated Power	74.861 e) 1) 54–72, 76–88 & 174–216 MHz bands, 50 mW 470–608 and 614–806 MHz bands, 250 mW	PASS
FCC Part 2.1047	Modulation Deviation	74.861 e) 3) Within 75kHz	PASS
FCC Part 2.1055	Frequency Stability	74.861 e) 4) <0.005% 50 ppm	PASS
FCC Part 2.1049 c)	Operating Bandwidth	74.861 e) 5) Within 200kHz	PASS
FCC Part 2.1049 c)	Unwanted Radiation	74.861 e) 6) within the mask	PASS
FCC Part 2.1053	Radiated Spurious Emission	74.861 d) 3) < 43+10lgP(W) dB	

NOTE:

(1) "N/A" denotes test is not applicable in this Test Report

1.1 TEST FACILITY

Shenzhen BCTC Technology Co., Ltd.

Add.:No.101,Yousong Road,Longhua New District, Shenzhen,China

FCC Registration No.:187086

1.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement $y \pm U$, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately **95 %**.

No.	Item	Uncertainty
1	Conducted Emission Test	$\pm 1.38\text{dB}$
2	RF power,conducted	$\pm 0.16\text{dB}$
3	Spurious emissions,conducted	$\pm 0.21\text{dB}$
4	All emissions,radiated(<1G)	$\pm 4.68\text{dB}$
5	All emissions,radiated(>1G)	$\pm 4.89\text{dB}$
6	Temperature	$\pm 0.5^{\circ}\text{C}$
7	Humidity	$\pm 2\%$



2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Equipment	WIRELESS MIC	
Trade Name	N/A	
Model Name	202.2	
Model Difference	N/A	
Product Description	Operation Frequency:	202.2 MHz
	Modulation Type:	FM
	Antenna Designation:	Please see Note 3.
	Based on the application, features, or specification exhibited in User's Manual, the EUT is considered as an ITE/Computing Device. More details of EUT technical specification, please refer to the User's Manual.	
Channel List	1 channel	
Power	DC 3V(1.5V AA battery*2)	
Connecting I/O Port(s)	Please refer to the User's Manual	
hardware version	--	
Software version	--	
Serial number	--	

Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

3. Table for Filed Antenna

Ant	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	NOTE
1	N/A	N/A	PCB Antenna	N/A	0	



2.2 DESCRIPTION OF TEST MODES

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

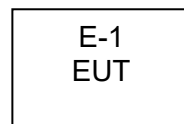
Final Test Mode	Description
Mode 1	TX Mode

Note:

- (1) The measurements are performed at the highest, middle, lowest available channels.
- (2) Fully-charged battery is used during the test

2.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

Emission Test



2.4 DESCRIPTION OF SUPPORT UNITS(CONDUCTED MODE)

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Note
E-1	WIRELESS MIC	N/A	202.2	N/A	EUT

Item	Shielded Type	Ferrite Core	Length	Note

Note:

- (1) The support equipment was authorized by Declaration of Confirmation.
- (2) For detachable type I/O cable should be specified the length in cm in 『Length』 column.
- (3) “YES” is means “shielded” “with core”; “NO” is means “unshielded” “without core”.



2.5 EQUIPMENTS LIST FOR ALL TEST ITEMS

Radiation test, Band-edge test and 20db bandwidth test quipment

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	Spectrum Analyzer	Agilent	E4407B	MY45108040	2015.06.05	2016.06.05	1 year
2	Test Receiver	R&S	ESPI	101318	2015.06.05	2016.06.05	1 year
3	Bilog Antenna	R&S	VULB 9168	VULB9168-438	2015.06.05	2016.06.05	1 year
4	50Ω Coaxial Switch	Anritsu	MP59B	6200264416	2015.06.05	2016.06.05	1 year
5	Spectrum Analyzer	ADVANTEST	R3132	150900201	2015.06.05	2016.06.05	1 year
6	Horn Antenna	R&S	HF906	10027	2015.06.05	2016.06.05	1 year
7	Horn Ant	Schwarzbeck	BBHA 9170	9170-181	2015.06.05	2016.06.05	1 year
8	Amplifier	R&S	BBV9743	9743-019	2015.12.22	2016.12.21	1 year
9	Loop Antenna	ARA	PLA-1030/B	1029	2015.06.05	2016.06.05	1 year
10	RF cables	R&S	R203	R20X	2015.06.05	2016.06.05	1 year
11	Antenna connector	Florida RFLabs	Lab-Fle	RF 01#	2015.06.05	2016.06.05	1 year
12	Transient Limiter	SCHWARZCEK	VTSD 9561F	9655	2015.06.05	2016.06.05	1 year
13	High-Pass Filter	K&L	9SH10-2700/X12750-O/O	005	2015.06.05	2016.06.05	1 year
14	High-Pass Filter	K&L	41H10-1375/U12750-O/O	003	2015.06.05	2016.06.05	1 year



3. EMC EMISSION TEST

3.1 CARRIER RADIATED POWER & RADIATED SPURIOUS EMISSIONS

3.1.1 LIMIT

According to §74.861(e)(1)(i), the output power shall not exceed 50 milliwatts.

(1) The power of the measured unmodulated carrier power at the output of the transmitter power amplifier (antenna input power) may not exceed the following:

- (i) 54–72, 76–88, and 174–216 MHz bands—50 mW
- (ii) 470–608 and 614–806 MHz bands—250 mW

According to §2.1053, measurements shall be made to detect spurious emission that may be radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal condition of installation and operation. Information submitted shall include the relative radiated power of spurious emission with reference to the rated power output of the transmitter, assuming all emissions are radiated from a halfwave dipole antenna.

According to §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 of the authorized bandwidth shall be attenuated below the unmodulated carrier by at least 43 plus 10 Log(output power in watts) dB.

Unmodulated carrier output power is 7.21 dBm , or 5.26mW (EIRP). The limit of spurious or harmonics is calculated as following : $7.21 - [43 + 10\log(\text{carrier output power in W})]$, or -13dBm

3.1.2 TEST PROCEDURE FOR

- a. EUT was placed on a 1.5 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 1.5m. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all test transmit frequencies were measured with peak detector.
- b. A log-periodic antenna or double-ridged waveguide horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator and the level will be adjusted till the same power value on the spectrum analyzer or receiver. The level of the spurious emissions can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.
- c. The EUT is then put into continuously transmitting mode at its maximum power level during the test. Set Test Receiver or Spectrum RBW=1MHz, VBW=3MHz, And the maximum value of the receiver should be recorded as (Pr).
- d. The EUT shall be replaced by a substitution antenna. In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (PMea) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach the previously recorded (Pr). The power of signal source (PMea) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.



An amplifier may be connected to the Signal Source output port. And the cable should be connect between the Amplifier and the Substitution Antenna. The cable loss (Pcl) ,the Substitution Antenna Gain (Ga) and the Amplifier Gain (PAg) should be recorded after test.

The measurement results are obtained as described below:

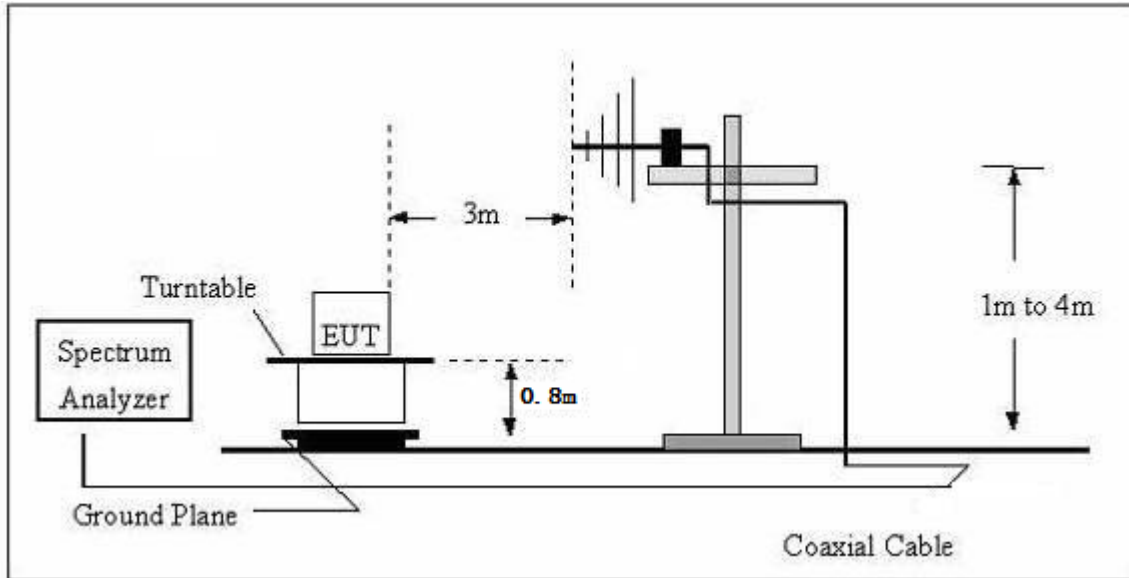
$$\text{Power(EIRP)} = \text{PMea} + \text{PAg} - \text{Pcl} + \text{Ga}$$

FIELD STRENGTH OF EMISSION

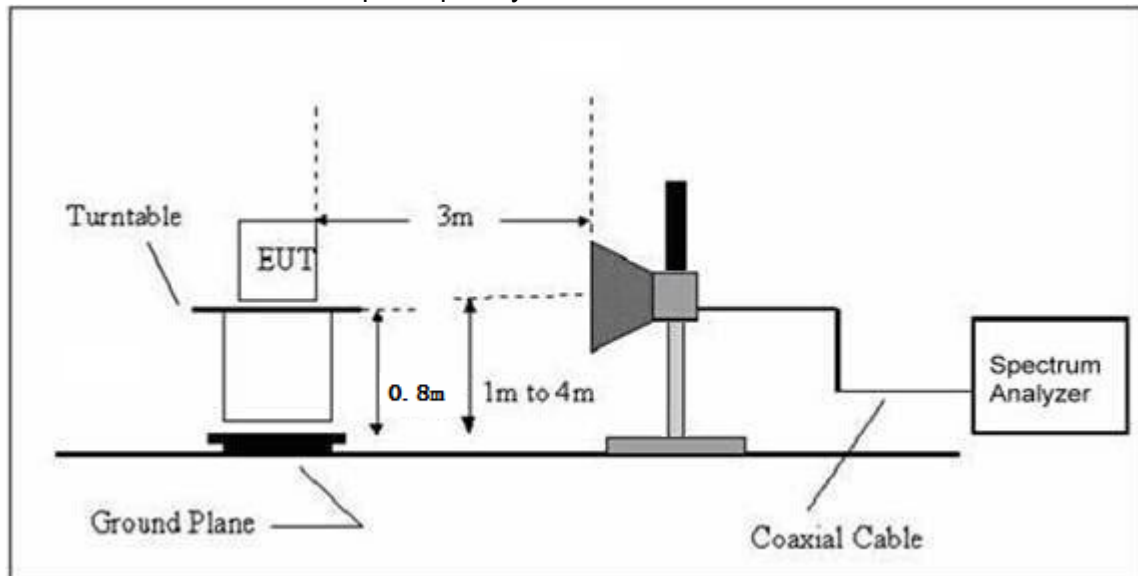
- 1 Setup the configuration per figure 1 and 2 for frequencies measured below and above 1 GHz respectively, adjusting the input voltage to produce the maximum power as measured in chapter 3..
- 2 Adjust the analyzer for each frequency measured in chapter 6 on a 1 MHz frequency span and 1MHz resolution bandwidth.
- 3 The search antenna is to be raised and lowered over a range from 1 to 4 meters in horizontally polarized orientation. Position the highness when the highest value is indicated on spectrum analyzer, then change the orientation of EUT on test table over a range from 0° to 360° , and record the highest value indicated on spectrum analyzer as reference value.
- 4 Repeat step 3 until all frequencies need to be measured were complete.
- 5 Repeat step 4 with search antenna in vertical polarized orientations.
- 6 Replace the EUT with a tuned dipole antenna (horn antenna for above 1 GHz) relative to each frequency in horizontally polarized orientation and as the same polarized orientation with search antenna. Connect the tuned dipole antenna to a standard signal generator (SG) via a low loss cable. Power on the SG and tune the right frequency in measuring as well as set SG at a appreciated output level. Rise and lower the search antenna to get the highest value on spectrum analyzer, and then hold this position. Adjust the SG output to get a identical value derived from step 3 on spectrum analyzer. Record this value for result calculated
- 7 Repeat step 6 until all frequencies need to be measured were complete.
- 8 Repeat step 7 with both dipole antenna (horn antenna for above 1 GHz) and search antenna in vertical polarized orientations.

3.1.3 TEST SETUP

(B) Radiated Emission Test-Up Frequency 30MHz~1GHz



(C) Radiated Emission Test-Up Frequency Above 1GHz



3.1.4 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.



3.1.5 TEST RESULTS

Note: 1. The field strength of radiation emission was measured in the following position: EUT stand-up position (Zaxis), lie-down position (X, Y axis). The data show in this report only with the worst case setup. After exploratory measurement the worst case of Z axis was reported.

EUT :	WIRELESS MIC	Model Name :	202.2
Temperature :	26 °C	Relative Humidity :	54%
Pressure :	1010 hPa	Polarization :	

Test Frequency (MHz)	Polarization	PMea (dBm)	Pcl (dB)	Ga Antenna Gain(dBi)	PAg (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
202.2	H	-51.61	1.25	13.51	28.55	-8.30	16.99	-25.29
202.2	V	-51.11	1.25	13.51	28.55	-7.80	16.99	-24.79

Remark:

1. $EIRP = P_{Mea}(dBm) + P_{Ag}(dB) - P_{cl}(dB) + G_a(dBi)$



EUT :	WIRELESS MIC	Model Name :	202.2
Temperature :	26 °C	Relative Humidity :	54%
Pressure :	1010 hPa	Polarization :	Vertical

Test Frequency (MHz)	Polarization	PMea (dBm)	Pcl (dB)	Ga Antenna Gain(dBi)	PAg (dB)	Result (dBm)	Limit (dBm)	Margin (dB)
404.40	H	-63.84	1.31	14.68	27.38	-20.47	-13.00	-7.47
606.60	H	-68.67	1.52	15.66	28.97	-22.52	-13.00	-9.52
808.80	H	-70.48	2.26	17.52	29.31	-21.39	-13.00	-8.39
1011.00	H	-88.32	10.02	20.43	25.31	-32.56	-13.00	-19.56
1213.20	H	-93.51	11.36	21.35	25.18	-35.62	-13.00	-22.62
1415.40	H	-93.21	12.05	20.76	24.37	-36.03	-13.00	-23.03
1617.60	H	-94.46	13.31	22.04	23.37	-35.74	-13.00	-22.74
1819.80	H	-95.47	14.34	22.18	24.79	-34.16	-13.00	-21.16
2022.00	H	-95.59	14.63	22.67	24.53	-33.76	-13.00	-20.76
2224.20	H	-95.05	15.08	23.11	24.99	-31.87	-13.00	-18.87
404.40	V	-64.60	1.31	14.68	27.38	-21.23	-13.00	-8.23
606.60	V	-69.67	1.52	15.66	28.97	-23.52	-13.00	-10.52
808.80	V	-71.27	2.26	17.52	29.31	-22.18	-13.00	-9.18
1011.00	V	-88.81	10.02	20.43	25.31	-33.05	-13.00	-20.05
1213.20	V	-92.65	11.36	21.35	25.18	-34.76	-13.00	-21.76
1415.40	V	-93.12	12.05	20.76	24.37	-35.94	-13.00	-22.94
1617.60	V	-94.83	13.31	22.04	23.37	-36.11	-13.00	-23.11
1819.80	V	-96.89	14.34	22.18	24.79	-35.58	-13.00	-22.58
2022.00	V	-96.61	14.63	22.67	24.53	-34.78	-13.00	-21.78
2224.20	V	-95.76	15.08	23.11	24.99	-32.58	-13.00	-19.58

4. MODULATION CHARACTERISTICS

4.1 APPLIED PROCEDURES / LIMIT

Test Standard: FCC Part 74.861(e)(3)

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

Test Standard: FCC Part 2.1047(a) & (b)

(a) Voice modulated communication equipment. A curve or equivalent data showing the frequency response of the audio modulating circuit over a range of 100 to 5000 Hz shall be submitted. For equipment required to have an audio low-pass filter, a curve showing the frequency response of the filter or of all circuitry installed between the modulation limiter and the modulated stage shall be submitted.

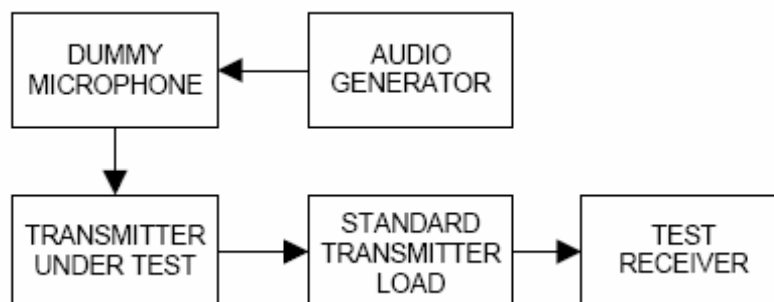
(b) Equipment which employs modulation limiting. A curve or family of curves showing the percentage of modulation versus the modulation input voltage shall be supplied. The information submitted shall be sufficient to show modulation limiting capability throughout the range of modulating frequencies and input modulating signal levels employed.

4.1.1 TEST PROCEDURE

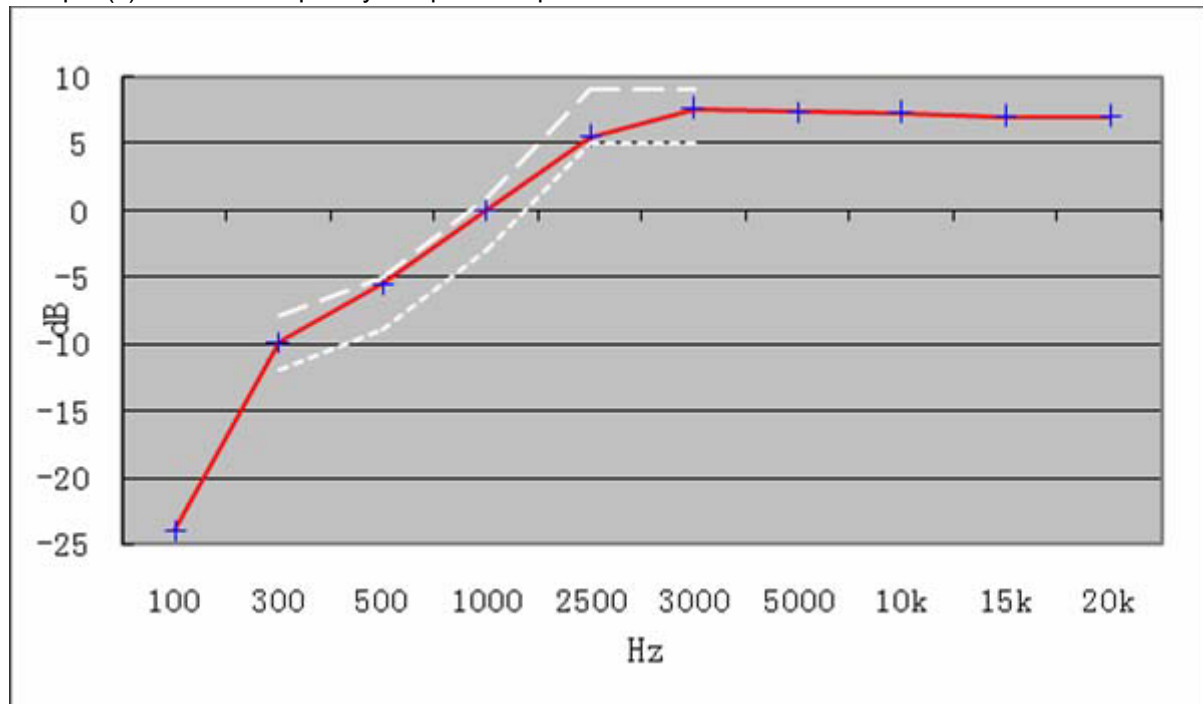
a. Audio Frequency Response

The RF output of the transceiver was connected to the input of FSP 30 with FM deviation module through sufficient attenuation so as not to overload the meter or distort the reading. An audio signal generator was connected to the audio input of microphone.

The audio signal input level was adjusted to obtain 20% of the maximum rated system deviation at 1 kHz, and recorded as DEV_{REF} . With the audio signal generator level unchanged, set the generator frequency between 100 to 5000 Hz. The transmitter deviations (DEV_{FREQ}) were measured and the audio frequency response was calculated as $20\log_{10} [DEV_{FREQ} / DEV_{REF}]$



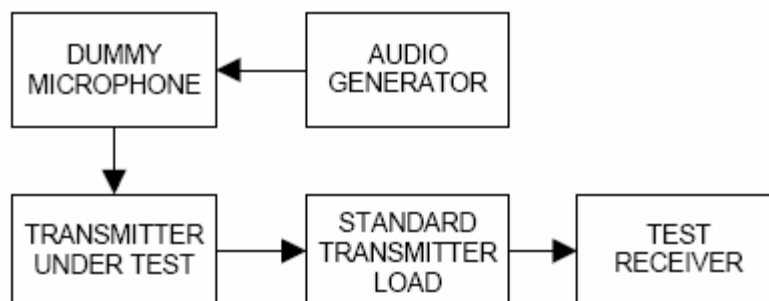
The plot(s) of Audio Frequency Response is presented hereinafter as reference.



0dB=10mV at 1kHz (20% of the maximum rated system deviation).

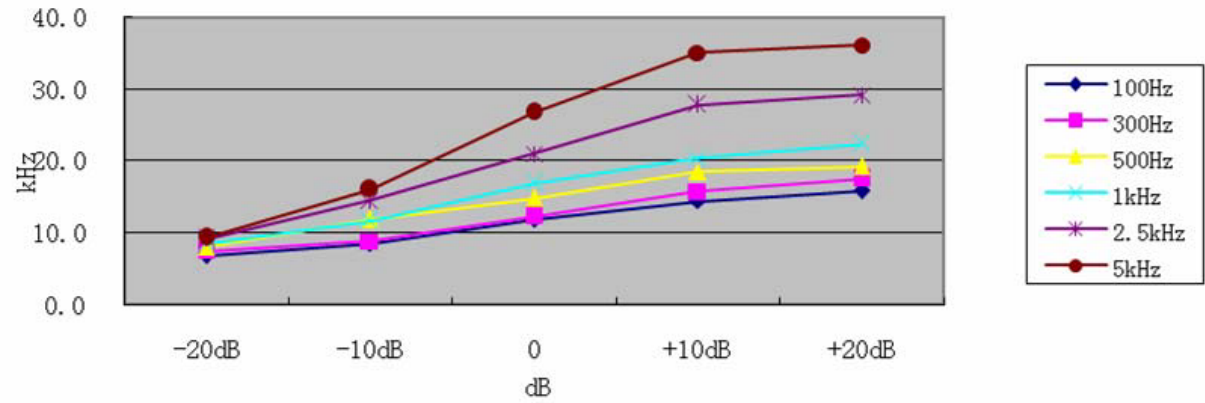
Modulation Limiting

- Adjust the transmitter per the manufacturer's procedure for full rated system deviation.
- Set the test receiver to measure peak positive deviation. Set the audio bandwidth for ≤ 0.25 Hz to $\geq 15,000$ Hz. Turn the de-emphasis function off.
- 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.
- 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).
- Measure both the instantaneous and steady-state deviation at and after the time of increasing the audio input level.
- With the level from the audio frequency generator held constant at the level obtained in step e), slowly vary the audio frequency from 100 to 5000 Hz and observe the steady-state deviation. Record the maximum deviation.



Test at five different modulating frequencies (100Hz, 300Hz, 500Hz, 1KHz, 2.5kHz, 5kHz), the output level of the audio generator was varied up to 1V and the FM deviation level was recorded.

Positive peak deviation



5.OCCUPIED BANDWIDTH

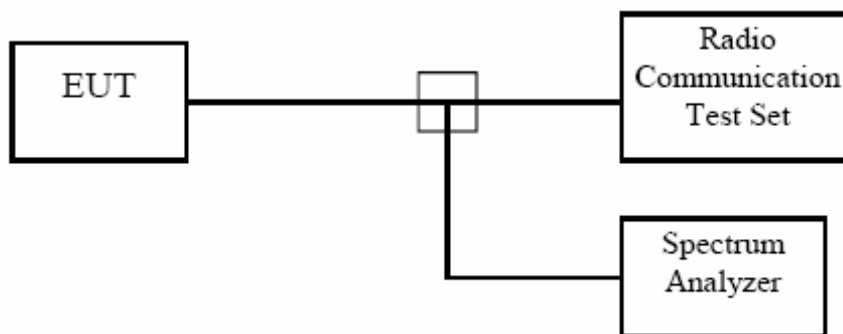
5.1 APPLIED PROCEDURES / LIMIT

According to §2.1049 (c)(1), For radiotelephone transmitter, other than single sideband or indenpent sideband transmitter, when modulateed by a 2.5kHz tone at an input level 16 dB greater than that necessary to produce 50 percent modulation. According to §74.861(e)(5), the frequency emission bandwidth shall not exceed 200 kHz.

5.1.1 TEST PROCEDURE

- Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- Position the EUT as shown in figure 4, and Install new batteries in the EUT. Turn on the EUT ant set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
- Apply a 2.5 kHz modulation signal to EUT and measure the frequencies of the modulated signal from the EUT where it is the specified number of dB below the reference level set in step 2. This is the occupied bandwidth specified.

5.1.2 TEST SETUP

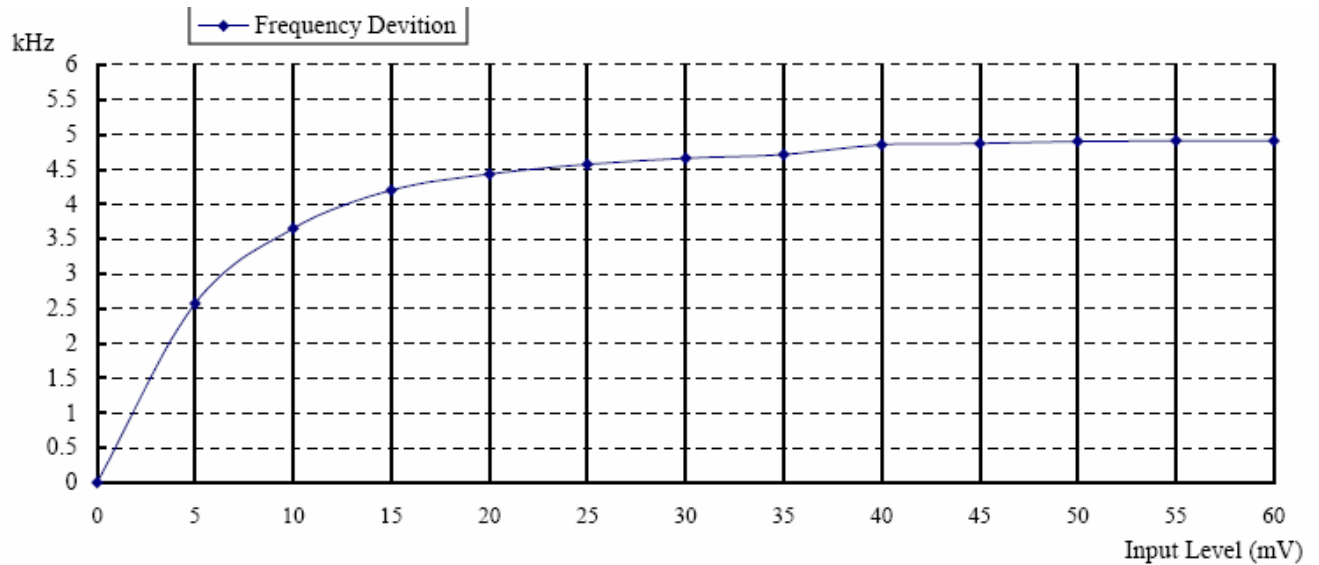




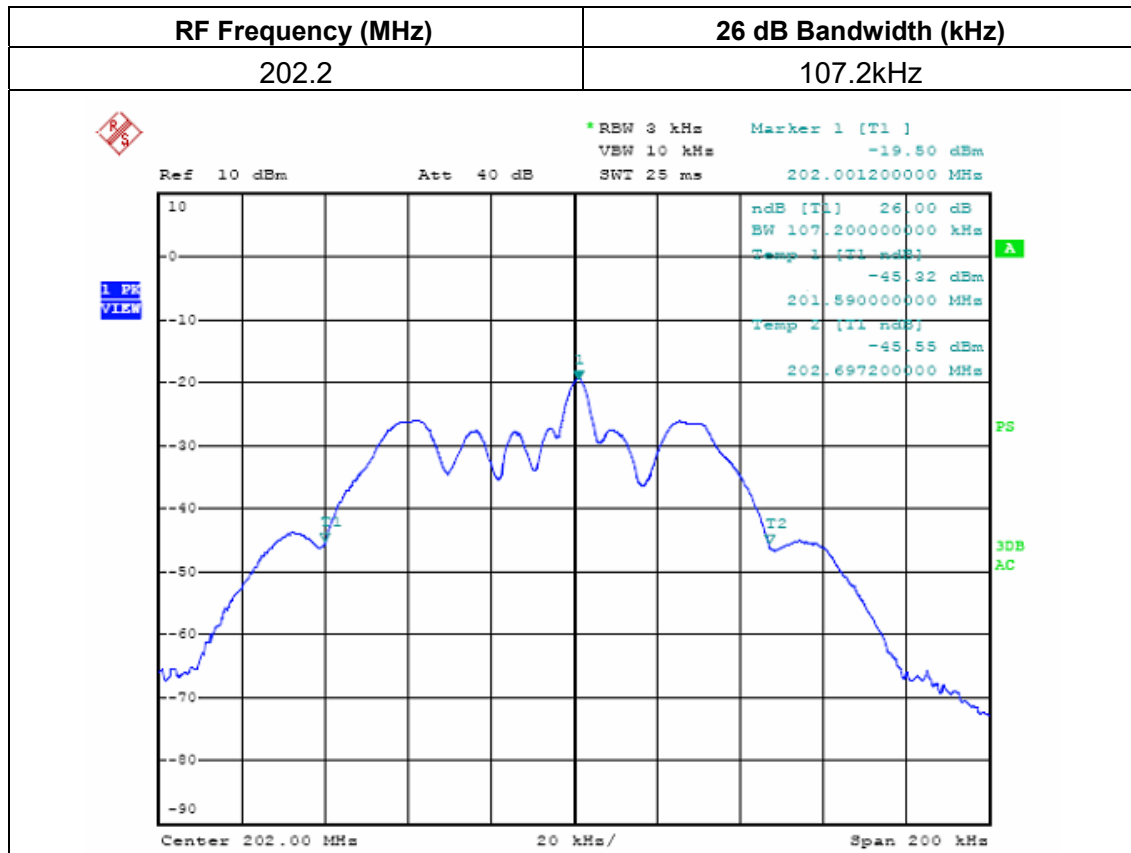
5.1.3 TEST RESULTS

RF Frequency : 202.2MHz

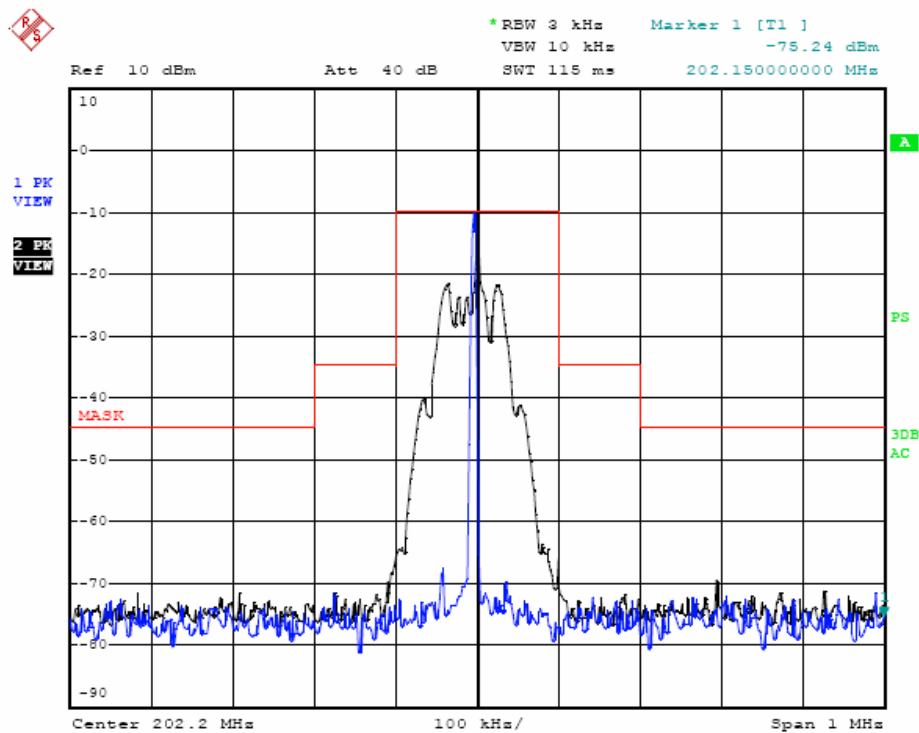
Input Audio Frequency: 2.5 kHz, Sine Wave



The Level input to produce 50% modulation is 5 mV, therefore the magnitude 16 dB greater than it is 31.6 mV.



Emission mask plots:



6. FREQUENCY STABILITY

APPLICABLE STANDARD

FCC CFR 47 Part 74.e) 4)

(e) For low power auxiliary stations operating in the bands allocated for TV broadcasting, the following technical requirements apply:

(4) The frequency tolerance of the transmitter shall be 0.005 percent.

TEST PROCEDURE

Frequency stability versus Environmental Temperature

1. Setup the configuration per figure 5 for frequencies measured at ambient temperature if it is within 15°C to 25°C. Otherwise, an environmental chamber set for a temperature of 20°C shall be used.

2. Turn on EUT and set SA center frequency to the right frequency needs to be measured. Then set SA RBW to 30 kHz, 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.

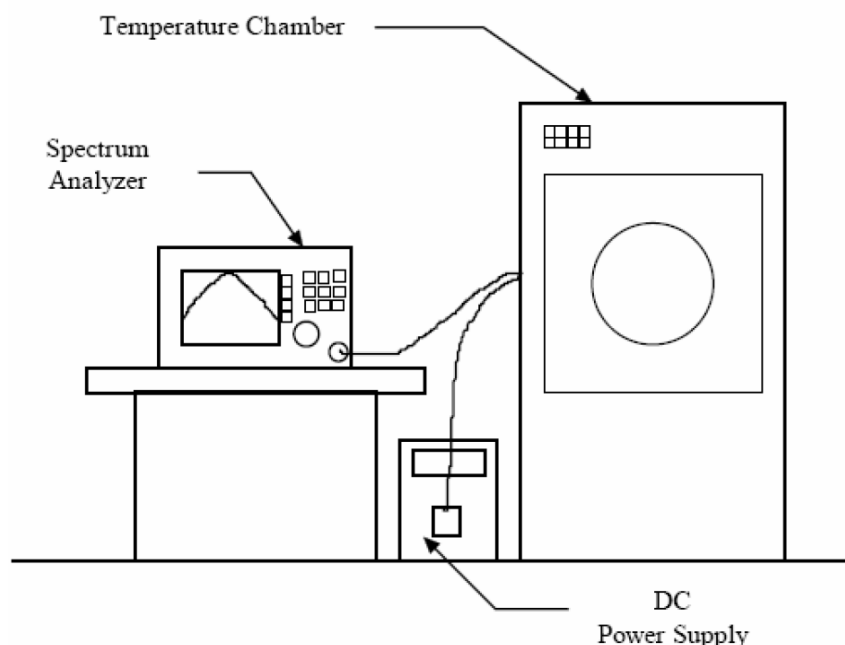
4. Repeat step 2 with a 10°C decreased per stage until the lowest temperature 0°C is measured, record all measurement frequencies.

Frequency Stability versus Input Voltage

1. Setup the configuration per figure 7 for frequencies measured at ambient temperature if it is within 15°C to 25°C. Otherwise, an environmental chamber set for a temperature of 20°C shall be used. Install new batteries in the EUT.

2. Set SA center frequency to the right frequency needs to be measured. Then set SA RBW to 30 kHz, VBW to 100kHz and frequency span to 500 kHz. Record this frequency to be a reference.

3. For non hand carried, battery operated device, supply the EUT primary voltage with 85 and 115 percent of the nominal value and record the frequency.



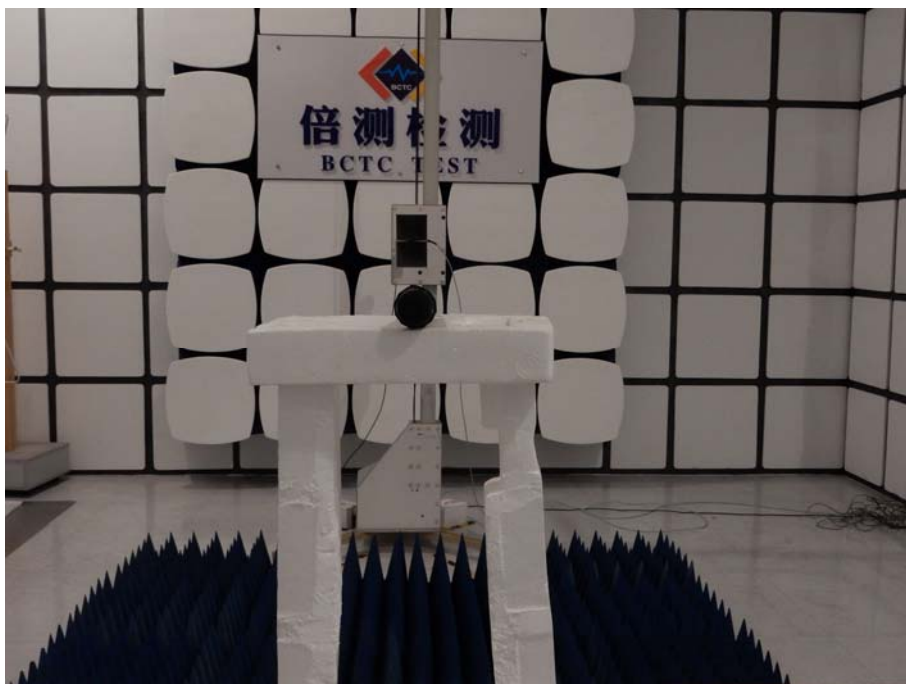


6.1 TEST RESULTS

Reference Frequency :202.20 MHz Limit : 0.005%							
Enviroment	Power	Frequency measured with time elapsed					
Tempature	Supplied	2 minutes		5 minutes		10 minutes	
(°C)	(Vdc)	MHz	ppm	MHz	ppm	MHz	ppm
50	3.0	202.2024	11.87	202.2026	12.86	202.2031	15.33
40		202.2043	21.27	202.2038	18.79	202.2022	10.88
30		202.2018	8.90	202.2016	7.91	202.2041	20.28
20		202.2011	5.44	202.2019	9.40	202.2031	15.33
10		202.2063	31.16	202.2055	27.20	202.2019	9.40
0		202.2058	28.68	202.2033	16.32	202.2037	18.30
25	2.55	202.2044	21.76	202.2019	9.40	202.2048	23.74
25	3.45	202.2039	19.29	202.2037	18.30	202.2069	34.12

7. EUT TEST PHOTO

Radiated Measurement Photos



8. PHOTOS OF THE EUT



