ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 95 SUBPART B REQUIREMENT

OF

WALKIE TALKIE

MODEL No.: T-9701

BRAND NAME: N/A

FCC ID: SCUMICROLABT-9701

REPORT NO:SZE0407008

ISSUE DATE: August 23, 2004

Prepared for

MICROLAB TECHNOLOGY COMPANY LIMITED
XINQIAOTANG INDUSTRIAL ZONE, DALANG,
LONGHUA, SHENZHEN, CHINA

Prepared by

COMPLIANCE CERTIFICATION SERVICES (SHENZHEN) INC.

d.b.a.

COMPLIANCE CERTIFICATION SERVICES (SHENZHEN) INC.
NO. 6, JINAO INDUSTRIAL PARK, NO. 35 JUKENG ROAD,
DASHUIKENG VILLAGE, GUANLAN TOWN, BAOAN
DISTRICT, SHENZHEN, CHINA
TEL: 86-755-28055000
FAX: 86-755-28055221

VERIFICATION OF COMPLIANCE

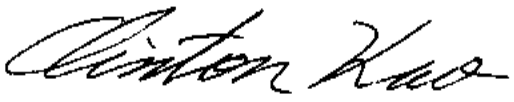
Applicant:	Microlab Technology company limited Xinqiaotang Industrial Zone, Dalang, Longhua, Shenzhen, China
Product Description:	Walkie talkie
Brand Name:	N/A
Model Number:	T-9701
Serial Number:	N/A
File Number:	SZE0407008
Date of Test:	July 18,2004 ~ August 19, 2004

We hereby certify that:

The above equipment was tested by COMPLIANCE CERTIFICATION SERVICES (SHENZHEN) INC. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C 63.4:2001 and the sample tested as described in this report is in compliance with the FCC Rules Part 95 Subpart B.

The test results of this report relate only to the tested sample identified in this report.

Approved By ***Reviewed By***



Clinton Kao / Q.A. Manager
COMPLIANCE CERTIFICATION SERVICES (SHENZHEN) INC.

Jimmy
COMPLIANCE CERTIFICATION SERVICES (SHENZHEN) INC.

Table of Contents

1. GENERAL INFORMATION ……...4

2. SYSTEM TEST CONFIGURATION ……6

3. SUMMARY OF TEST RESULTS ……9

4. DESCRIPTION OF TEST MODES ...…….……9

5. TYPES OF COMMUNICATIONS ……..10

6. FREQUENCY TOLERANCE ……..11

7. EMISSION TYPE ……...14

8. EMISSION BANDWIDTH ……..15

9. UNWANTED RADIATION ……17

10. MODULATION CHARACTERISTICS ……23

11. MAXIMUM TRANSMITTER POWRE ……29

12. TRANSMITTER ANTENNA ……33

13. POWER CAPABILITY ……..34

APPENDIX 1

PHOTOGRAPHS OF SETUP ……...36

APPENDIX 2

PHOTOGRAPHS OF EUT ……38

APPENDIX 3

TUNE-UP PROCEDURE ……44

1. GENERAL INFORMATION

1.1 Product Description

The Microlab Technology company limited, Model: T-9701 (referred to as the EUT in this report). The EUT is a 14-channels Walkie talkie designed as FRS Device for voice communication only. It is designed by way of utilizing the FM modulation achieves the system operating.

A major technical descriptions of EUT is described as following:

A). Frequency Tolerance: 0.00011026% (0.00025%)
B). Communication Type: Voice/Tone only
C). Modulation: FM
D). Emission type: F3E
E). Emission designator: 3K95F3E (2M+2DK, M=1.2, D=0.776, K=1, Necessary Bandwidth =3.95 KHz)
F). Emission Bandwidth: 4.6 KHz (Limit: 12.5 KHz)
G).Peak Frequency Deviation: 0.776 KHz at 0 dB reference (Limit<±2.5 KHz)
H).Audio Frequency Response: 1 KHz (Limit<3.125 KHz)
G). Maximum Transmitter Power: 164.44 mW (Limit: 500 mW)
H). Output power Modification: Fixed can't be change
I). Unwanted Radiation:

1). At least 35 (Limit 25 dB) on any frequency removed from the center of the authorized bandwidth by more than 50% up to and including 100% of the authorized bandwidth.

2). At least 50 (Limit 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.

3). At least 51 (Limit $43+10\log_{10}$ (T) dB) on any frequency removed from the center of authorized bandwidth by more than 250%)

J). Antenna Designation: Non-User Replaceable (Fixed)
K). Power Supply: 6 V dc by battery
L). DC Voltage= 4.9 V and DC Current= 105 mA into the final stage for normal operation over the power range
M). Battery Endpoint: DC 4.9 V
N). Operating Frequency Range and Channels
Frequency Range: 462.5625~467.7125 MHz
Total 14 channels:

CH 01 ---- 462.5625 MHz	CH 02 ---- 462.5875 MHz
CH 03 ---- 462.6125 MHz	CH 04 ---- 462.6375 MHz
CH 05 ---- 462.6625 MHz	CH 06 ---- 462.6875 MHz
CH 07 ---- 462.7125 MHz	CH 08 ---- 467.5625 MHz
CH 09 ---- 467.5875 MHz	CH 10 ---- 467.6125 MHz
CH 11 ---- 467.6375 MHz	CH 12 ---- 467.6625 MHz
CH 13 ---- 467.6875 MHz	CH 14 ---- 467.7125 MHz

O). Effective distance: Nominal 3 miles, with 500 mW power output

1.2 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: SCUMICROLABT-9701 filing to comply with the FCC Part 95, Subpart B Rules.

1.3 Test Methodology

The radiated emission testing was performed according to the procedures of ANSI C63.4 and FCC CFR 47 2.1046, 2.1047, 2.1049, 2.1051, 2.1053, 2.1055 and 2.1057

1.4 Test Facility

The open area test site used to collect the radiated data is located on the address of COMPLIANCE CERTIFICATION SERVICES (SHENZHEN) INC. No. 6, Jinao industrial park, No.35 Jukeng Road, Dashuikeng Village, Guanlan Town, Baoan District, Shenzhen, China. The Open Area Test Site is constructed and calibrated to meet the FCC requirements in documents ANSI C63.4: 2001 and CISPR 22/EN 55022 requirements.

1.5 Special Accessories

Not available for this EUT intended for grant.

1.6 Equipment Modifications

Not available for this EUT intended for grant.

2. System Test Configuration

2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commission's requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

2.2 EUT Exercise

The Transmitter was operated in the normal operating mode. the TX frequency was fixed which was for the purpose of the measurements.

2.3 GENERAL TECHNICAL REQUIREMENTS

a). Section 95.193: Communication Type shall be Voice/Tone only
b). Section 95.627: Frequency Tolerance less than 0.00025%
c). Section 95.631: Emission Type shall be F3E
d). Section 95.633: Emission Bandwidth shall less than 12.5KHz
e). Section 95.635: Unwanted radiation
According to Section 95.635(b), the power of each unwanted emission shall be less than Transmitted Power as specified below:
1). At least 25 db on any frequency removed from the center of the authorized bandwidth by more than 50% up to and including 100% of the authorized bandwidth.
2). 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.
4). At least $43 + 10 \log_{10} (T)$ db on any frequency removed from the center of the authorized bandwidth by more than 250%.
f). Section 95.637: Peak Frequency Deviation less than ±2.5 KHz, and Audio Frequency Response less than 3.125 KHz
g). Section 95.639: Maximum transmitter power less than 0.5W
h). Section 95.647: Antenna shall be a dedicate type
i). Section 95.649: Output power can't be change
j). RSS-119 Section 6.5: Frequency shift<6.25 KHz in t2, and frequency shift< 12.5 KHz in t3.

2.4 Configuration of Tested System

Fig. 2-1 Configuration of Tested System

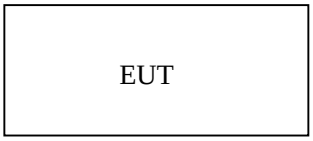


Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	FCC ID	Series No.	Note
E-1	Walkie talkie	N/A	T-9701	SCUMICROLABT-9701	N/A	***EUT***

3. SUMMARY OF TEST RESULTS

FCC Rules	Description Of Test	Result
§ 95.193	Communication Type	Compliant
§ 95.627	Frequency tolerance	Compliant
§ 95.631	Emission type	Compliant
§ 95.633	Emission bandwidth	Compliant
§ 95.635	Unwanted radiation	Compliant
§ 95.637	Modulation characteristic	Compliant
§ 95.639	Maximum transmitter power	Compliant
§ 95.647	Transmitter antenna	Compliant
§ 95.649	Power capability	Compliant

4. DESCRIPTION OF TEST MODES

The EUT (Walkie talkie) has been tested under normal operating condition. Fourteen channels are chosen for testing.

5. TYPES OF COMMUNICATIONS

5.1 PROVISIONS APPLICABLE

According to FCC Part 95 Section 95.193, the communication type shall be voice/tone only.

5.2 COMPLIANCE

The EUT designed as a 14-channels Walkie talkie conducts one-way voice/tone communication with other FRS units and it lasts no longer than 15 seconds at one time while communicating with a particular FRS unit.

6. FREQUENCY TOLERANCE

6.1 PROVISIONS APPLICABLE

a). According to FCC Part 2 Section 2.1055(a)(1), the frequency stability shall be measured with variation of ambient temperature from –30℃ to +50℃ centigrade.

b). According to FCC Part 2 Section 2.1055(d)(2), for hand carried battery powered equipment, the frequency stability shall be measured with reducing primary supply voltage to the battery operating end point, which is specified by the manufacture.

c). According to FCC Part 95 Section 95.627(b), the frequency tolerance must be maintained within 0.00025%.

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℃. 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℃ decreased per stage until the lowest temperature -30℃ 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. Install new battery in the EUT.

2. Set SA center frequency to the EUT radiated frequency. Set SA Resolution Bandwidth to 1KHz and Video Resolution Bandwidth to 1KHz. Record this frequency as reference frequency.

3. For battery operated only device, 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(block diagram of configuration)

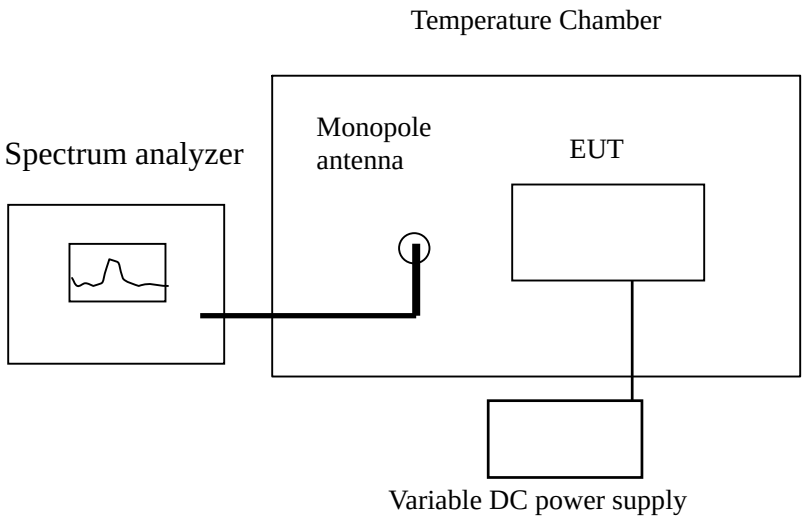


Figure 1

6.4 Test equipment used:

Equipment	Model No.	Serial No.	Cal. Due.
Advantest Spectrum Analyzer	R3132	120901472	06/07/2005
Shihin Temperature Chamber	BM50-CB	908	06/29/2005
DC Power Supply	WYK-605	N/A	05/29/2005
Huber + suhner low loss cable	N/A	N/A	06/07/2005
Monopole Antenna	N/A	N/A	N/A

6.5 TEST RESULT

a. Frequency stability versus input voltage (battery operation end point voltage is 4.9V)

Channel	Reference Frequency (MHz)	Frequency Measured at end point voltage	Frequency Deviation (%)	Limit (%)
01	462.56045	462.56053	0.00001730	0.00025
14	467.71045	467.71053	0.00001710	0.00025

b. Frequency stability versus ambient temperature

Channel 01

Reference Frequency: 462.56045 MHz		Limit: ±0.00025%	
Environment Temperature (℃)	Power Supply	Frequency deviation measured with time Elapse (10 minutes)	
		(MHz)	%
50	New Battery	462.56012	-0.00007134
40	New Battery	462.56033	-0.00002594
30	New Battery	462.56045	0.00000000
20	New Battery	462.56045	0.00000000
10	New Battery	462.56048	0.00000649
0	New Battery	462.56057	0.00002594
-10	New Battery	462.56066	0.00004540
-20	New Battery	462.56073	0.00006053
-30	New Battery	462.56096	0.00011026

Channel 14

Reference Frequency: 467.71045 MHz		Limit: ±0.00025%	
Environment Temperature (℃)	Power Supply	Frequency deviation measured with time Elapse (10 minutes)	
		(MHz)	%
50	New Battery	467.71015	-0.00006414
40	New Battery	467.71041	-0.00000855
30	New Battery	467.71045	0.00000000
20	New Battery	467.71045	0.00000000
10	New Battery	467.71048	0.00000641
0	New Battery	467.71055	0.00002138
-10	New Battery	467.71064	0.00004062
-20	New Battery	467.71073	0.00005987
-30	New Battery	467.71095	0.00010690

7. EMISSION TYPE

7.1 PROVISIONS APPLICABLE

According to FCC Part 95 Section 95.631(d): An FRS unit may transmit only emission type F3E.

7.2 COMPLIANCE

The EUT employs the Emission Type of F3E to achieve its voice/tone communication with a particular FRS unit.

8. EMISSION BANDWIDTH

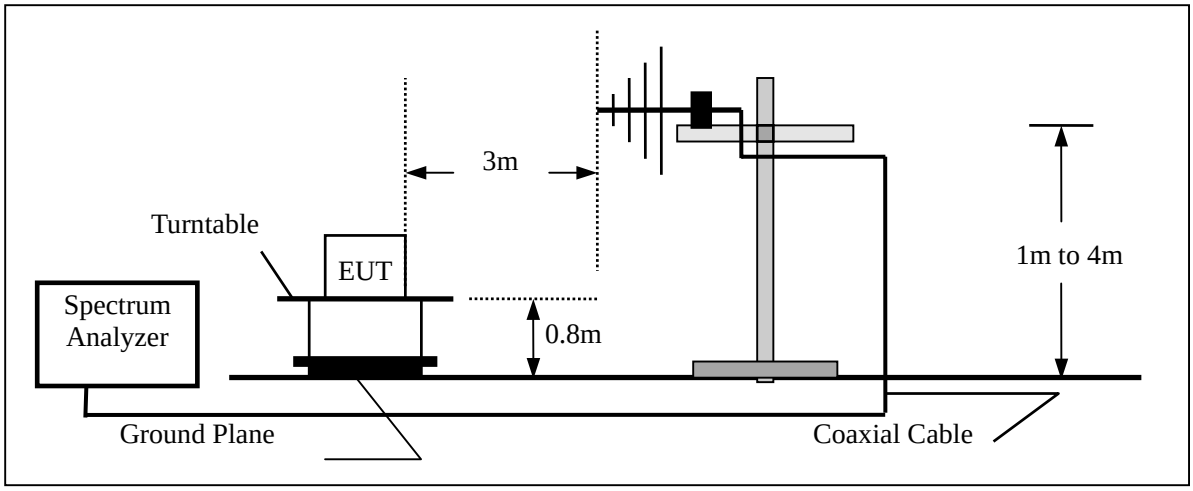
8.1 PROVISIONS APPLICABLE

According to FCC Part 95 Section 95.633 (c): The authorized bandwidth for emission type F3E transmitted by a FRS unit is 12.5 KHz.

8.2 MEASUREMENT PROCEDURE

1). The EUT was placed on a turn table which is 0.8m above ground plane.
2). Set EUT as normal operation
3). Set SPA Center Frequency = fundamental frequency , RBW,VBW= 1KHz, Span =50KHz.
4). Set SPA Max hold. Mark peak, -20dB.

8.3 TEST SETUP BLOCK DIAGRAM (Block Diagram of Configuration)



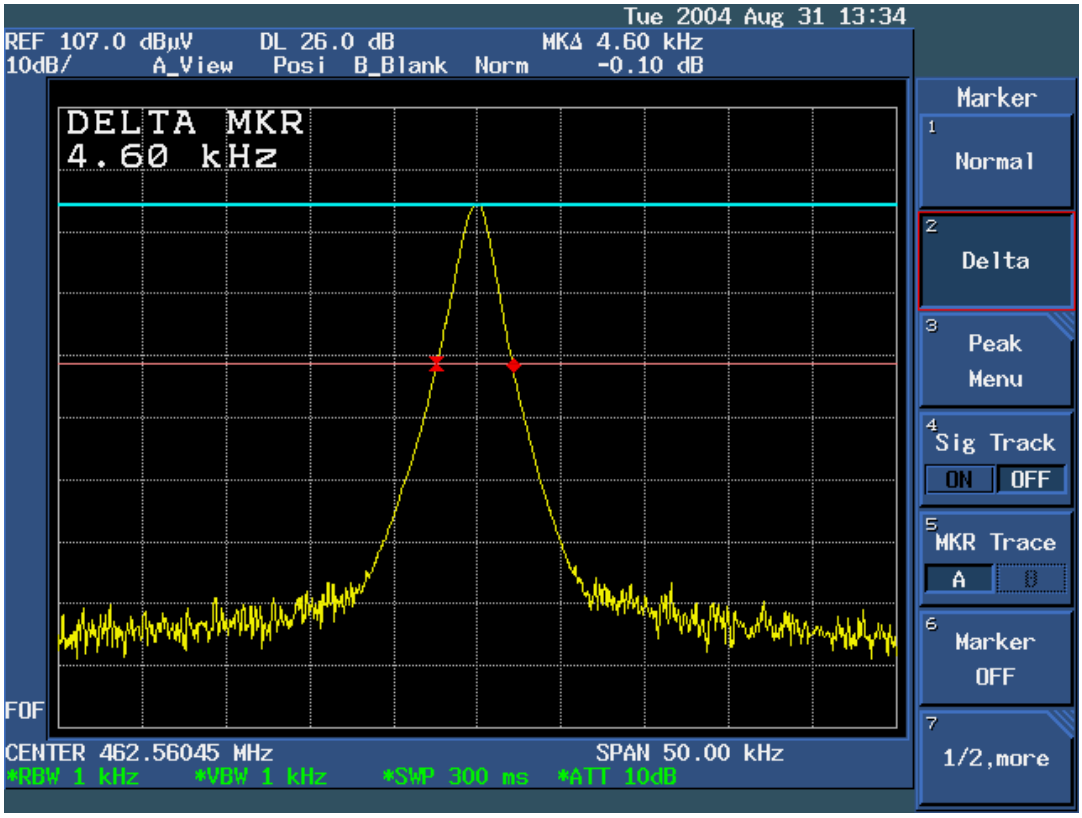
8.4 MEASUREMENT EQUIPMENT USED:

Open Area Test Site # 3					
EQUIPMENT TYPE	**MFR**	**MODEL NUMBER**	**SERIAL NUMBER**	**LAST CAL.**	**CAL DUE.**
Spectrum Analyzer	ADVANTEST	R3132	120901472	06/08/2004	06/07/2005
EMI Test Receiver	HP	8546A	3448A00232	06/08/2004	06/07/2005
Pre-Amplifier	HP	8447D	2944A07999	06/08/2004	06/07/2005
Bi-log Antenna	EMCO	3142	9910-1436	06/08/2004	05/07/2005

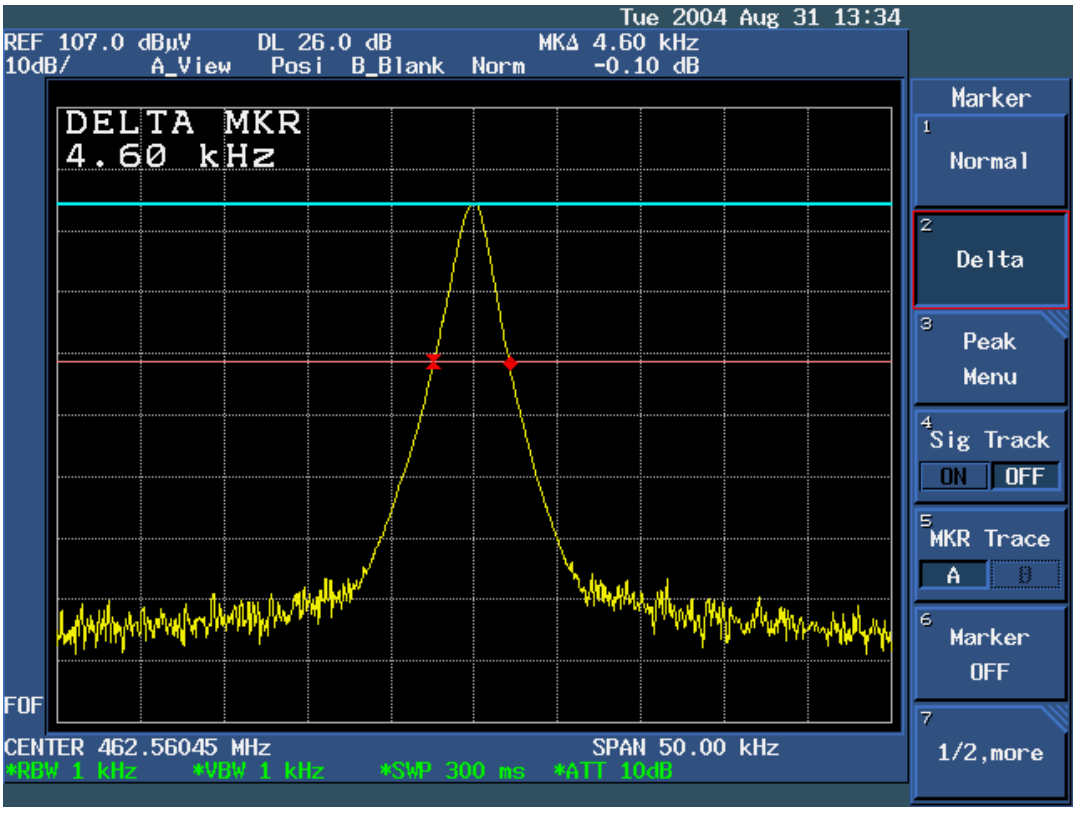
8.5 MEASUREMENT RESULT:

20dB bandwidth = 3.7 KHz
Refer to attached data chart.

Channel 01



Channel 14



9. UNWANTED RADIATION

9.1 PROVISIONS APPLICABLE

According to Section 95.635(b), the power of each unwanted emission shall be less than Transmitted Power as specified below:

1). At least 25 db on any frequency removed from the center of the authorized bandwidth by more than 50% up to and including 100% of the authorized bandwidth.

2). 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.

4). At least $43 + 10 \log_{10}$ (TP) db on any frequency removed from the center of the authorized bandwidth by more than 250%.

9.2 MEASUREMENT PROCEDURE

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.

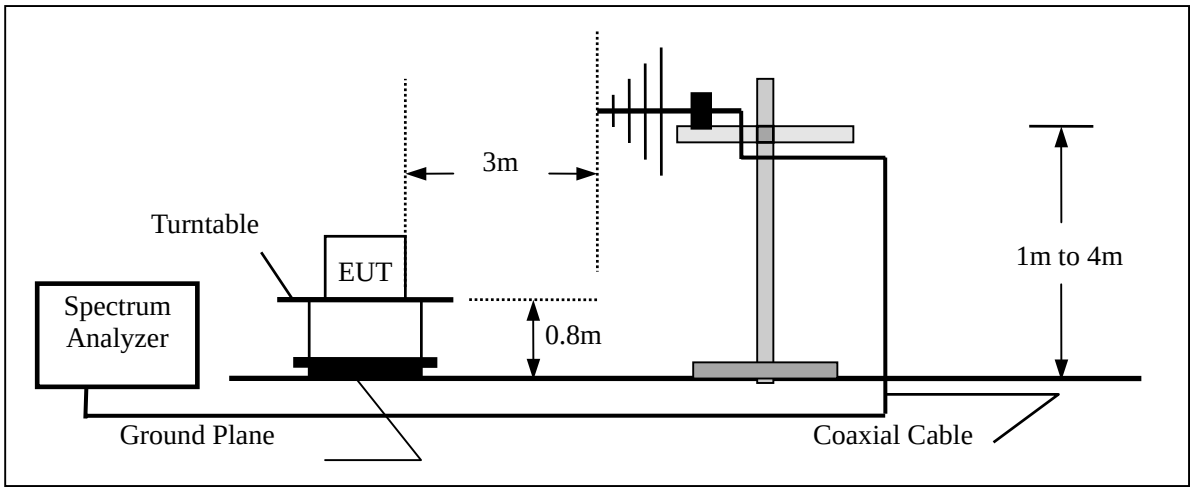
14). The test antenna shall be raised and lowered through the specified range of the height to ensure that the maximum signal is received.

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.

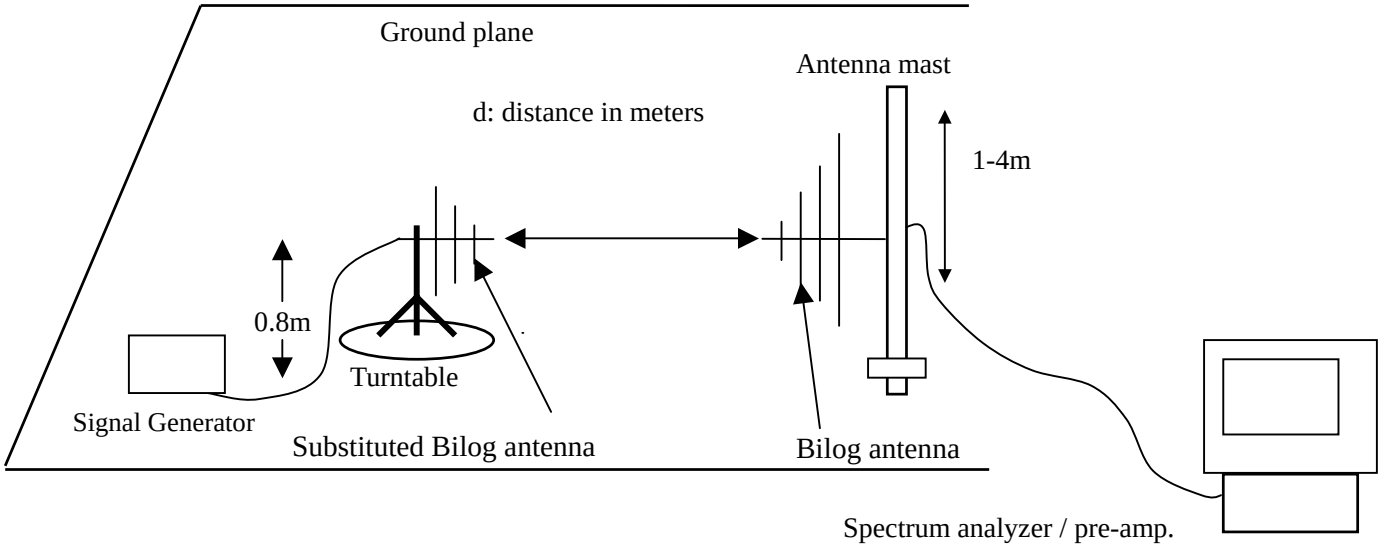
16). The input level to the substitution antenna shall be recorded as power level in dBm, corrected for any change of input attenuator setting of the measuring receiver.

17). The measurement shall be repeated with the test antenna and the substitution antenna oriented for horizontal polarization.

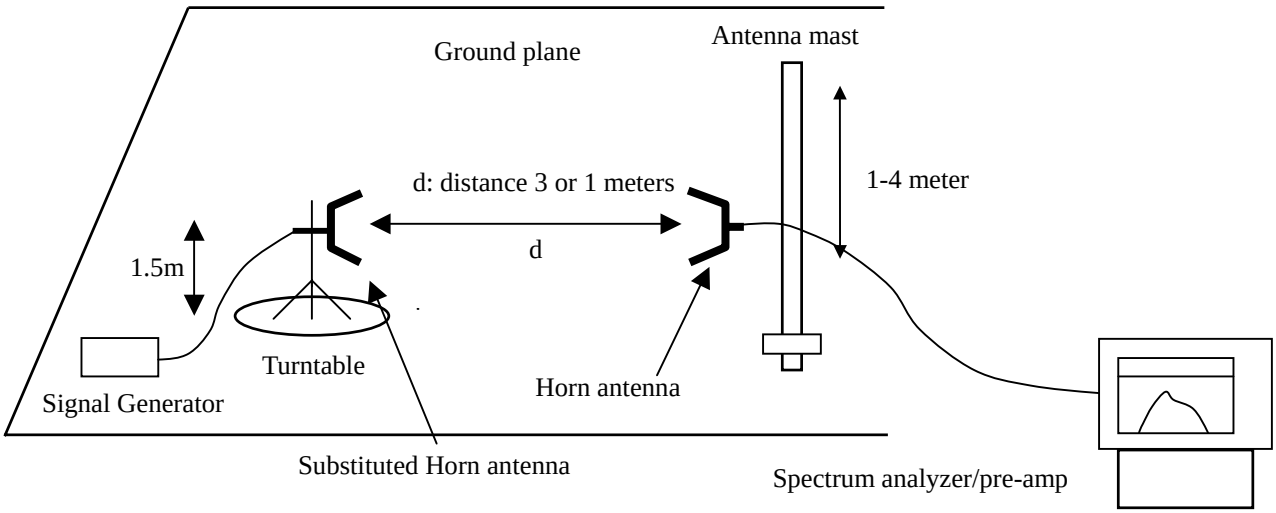
9.3 TEST SETUP BLOCK DIAGRAM (block diagram of configuration)



Radiation below 1GHz



Radiation above 1GHz



9.4 MEASUREMENT EQUIPMENT USED:

Open Area Test Site					
EQUIPMENT TYPE	**MFR**	**MODEL NO.**	**SERIAL NO.**	**LAST CAL.**	**CAL DUE.**
Spectrum Analyzer	ADVANTEST	R3132	N/A	06/08/2004	06/07/2005
EMI Test Receiver	HP	8546A	3448A00232	06/08/2004	06/07/2005
Pre-Amplifier	HP	8447D	2944A07999	06/08/2004	06/07/2005
Bi-Log Antenna	EMCO	3142	9910-1436	06/08/2004	06/07/2005
Bi-Log Antenna	SCHAFFNER	CBL6143	5082	06/08/2004	06/07/2005
CABLE	TIME MICROWAVE	LMR-400	N-TYPE04	06/08/2004	06/07/2005
Horn Antenna	ARA	DRG-118/A	104	06/08/2004	06/07/2005

9.5 MEASUREMENT RESULTS:

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

Notes: EL is the emission level of the Output Power expressed in dBm,, in this application, the EL is 22.16 dBm.

Limit (dBm)=22.16-43-10log $_{10}$ (0.16444) = -13

Channel 01

Frequency (MHz)	Reading level (dBuV)	Antenna Polarization	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dB)	Emission level (dBm)	Limit (dBm)	Margin (dB)
462.56	92.83	V	16.7	0.94	6.4	22.16	26.98	-4.82
925.13	64.39	V	-40.1	1.64	8.30	-33.44	-13	-20.44
1387.69	48.46	V	-55.1	1.85	9.00	-47.95	-13	-34.95
1850.25	41.33	V	-52.8	2.08	9.10	-45.78	-13	-32.78
2312.81	46.65	V	-59.6	2.30	9.70	-52.20	-13	-39.20
2775.38	49.35	V	-58.1	2.53	9.90	-50.73	-13	-37.73
3237.94	37.52	V	-65.3	2.78	9.60	-58.48	-13	-45.48
3700.50	46.54	V	-53.4	2.78	9.60	-46.58	-13	-33.58
4163.06	36.16	V	-47.7	2.78	9.80	-40.68	-13	-27.68
4625.63	48.52	V	-44.3	2.78	11.20	-35.88	-13	-22.88

Frequency (MHz)	Reading level (dBuV)	Antenna Polarization	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dB)	Emission level (dBm)	Limit (dBm)	Margin (dB)
462.56	75.35	H	-2.8	0.94	6.4	2.66	26.98	-24.32
925.13	53.42	H	-35.7	1.64	8.30	-29.04	-13	-16.04
1387.69	38.08	H	-48.6	1.85	9.00	-41.45	-13	-28.45
1850.25	30.72	H	-56.7	2.08	9.10	-49.68	-13	-36.68
2312.81	31.44	H	-53.1	2.30	9.70	-45.70	-13	-32.70
2775.38	32.57	H	-53.8	2.53	9.90	-46.43	-13	-33.43
3237.94	22.79	H	-68.9	2.78	9.60	-62.08	-13	-49.08
3700.50	35.15	H	-50.8	2.78	9.60	-43.98	-13	-30.98
4163.06	27.93	H	-61.7	2.78	9.80	-54.68	-13	-41.68
4625.63	34.41	H	-63.5	2.78	11.20	-55.08	-13	-42.08

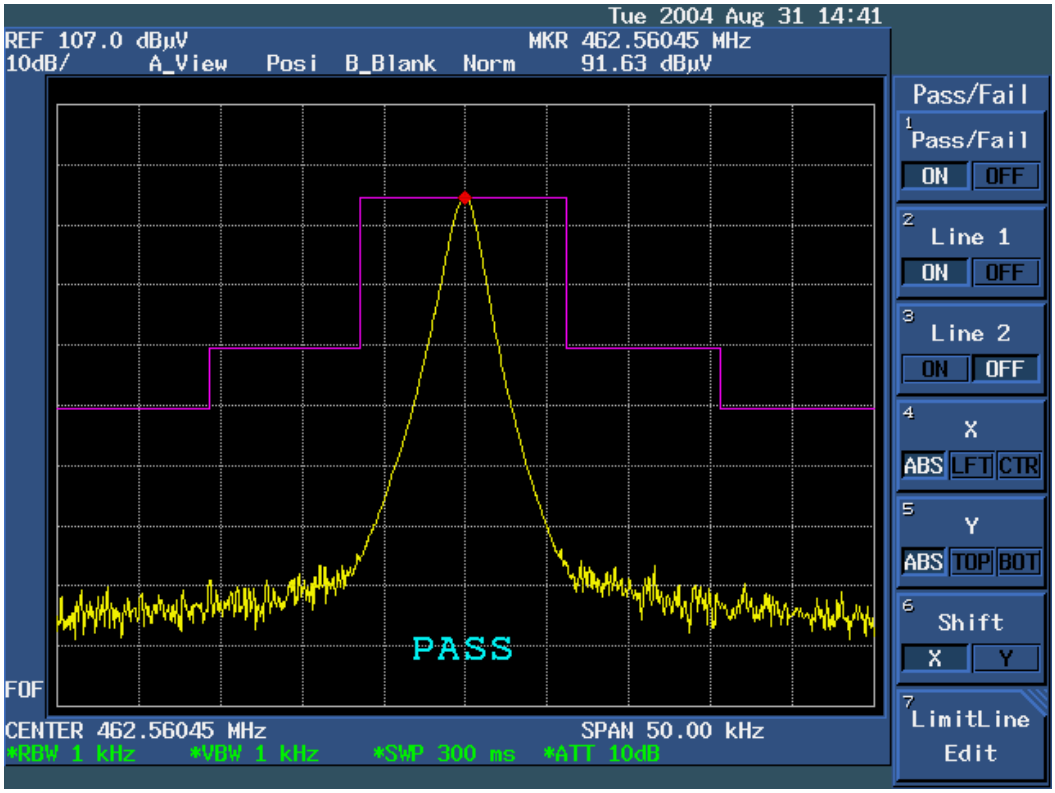
Channel 14

Frequency (MHz)	Reading level (dBuV)	Antenna Polarization	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dB)	Emission level (dBm)	Limit (dBm)	Margin (dB)
467.71	92.83	V	16.7	0.94	6.4	22.16	26.98	-4.82
935.43	64.28	V	-40.1	1.64	8.30	-33.44	-13	-20.44
1403.14	48.41	V	-55.2	1.85	9.00	-48.05	-13	-35.05
1870.85	41.18	V	-52.9	2.08	9.10	-45.88	-13	-32.88
2338.56	46.63	V	-59.6	2.30	9.70	-52.20	-13	-39.20
2806.28	49.40	V	-58.0	2.53	9.90	-50.63	-13	-37.63
3273.99	37.58	V	-65.2	2.78	9.60	-58.38	-13	-45.38
3741.70	46.60	V	-53.3	2.78	9.60	-46.48	-13	-33.48
4209.41	36.08	V	-47.8	2.78	9.80	-40.78	-13	-27.78
4677.13	48.66	V	-44.0	2.78	11.20	-35.58	-13	-22.58

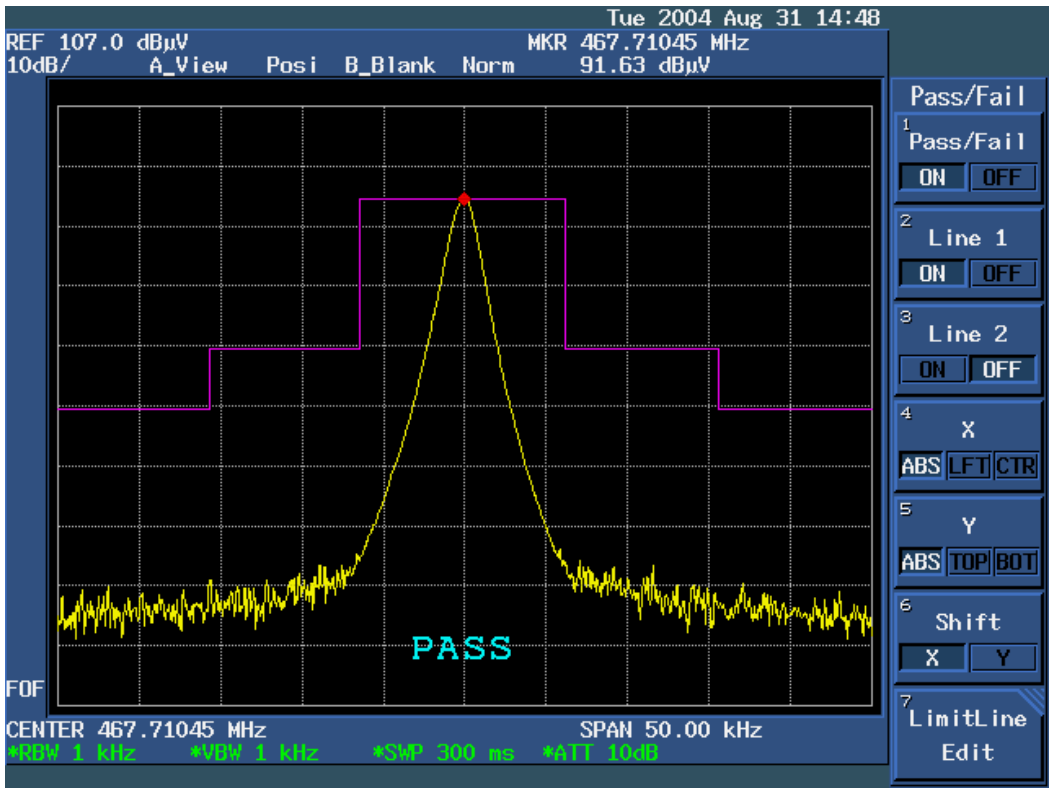
Frequency (MHz)	Reading level (dBuV)	Antenna Polarization	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dB)	Emission level (dBm)	Limit (dBm)	Margin (dB)
467.71	75.35	H	-2.8	0.94	6.4	2.66	26.98	-24.32
935.43	53.47	H	-35.6	1.64	8.30	-28.94	-13	-15.94
1403.14	38.28	H	-48.4	1.85	9.00	-41.25	-13	-28.25
1870.85	30.56	H	-56.8	2.08	9.10	-49.78	-13	-36.78
2338.56	31.57	H	-53.0	2.30	9.70	-45.60	-13	-32.60
2806.28	32.73	H	-53.5	2.53	9.90	-46.13	-13	-33.13
3273.99	22.69	H	-68.1	2.78	9.60	-61.28	-13	-48.28
3741.70	35.35	H	-50.3	2.78	9.60	-43.48	-13	-30.48
4209.41	28.45	H	-60.5	2.78	9.80	-53.48	-13	-40.48
4677.13	34.48	H	-63.5	2.78	11.20	-55.08	-13	-42.08

9.6 RADIATION EMISSION MASK:

Channel 01



Channel 14



10. MODULATION CHARACTERISTICS

10.1 PROVISIONS APPLICABLE

a).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.

b). According to CFR 47 section 95.637(a), a FRS unit that transmits emission type F3E must not exceed a peak frequency deviation of ±2.5 KHz, and audio frequency response shall not exceed 3.125 KHz

10.2 MEASUREMENT METHOD

10.2.1 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 300,1004, and 2500Hz in sequence.

10.2.2 Audio Frequency Response

1). Configure the EUT as shown in figure 1.

2). Adjust the audio input for 20% of rated system deviation at 1 KHz using this level as a reference (0 dB).

3). Vary the Audio frequency from 100 Hz to 10 KHz and record the frequency deviation.

4). Audio Frequency Response = $20\log_{10}$ (Deviation of test frequency/Deviation of 1KHz reference).

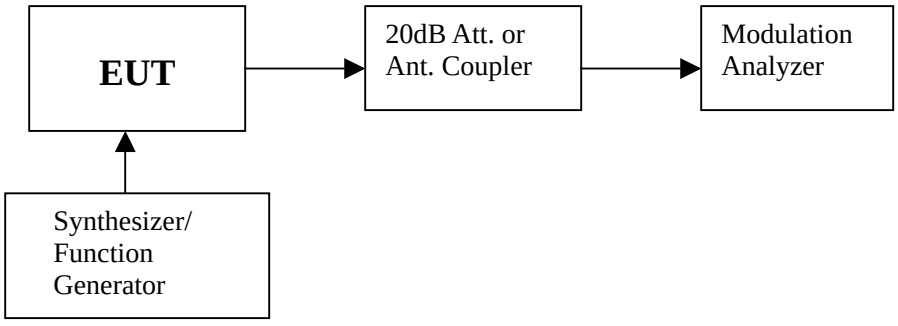


Figure 1: Modulation characteristic measurement configuration

10.3 MEASUREMENT INSTRUMENTS

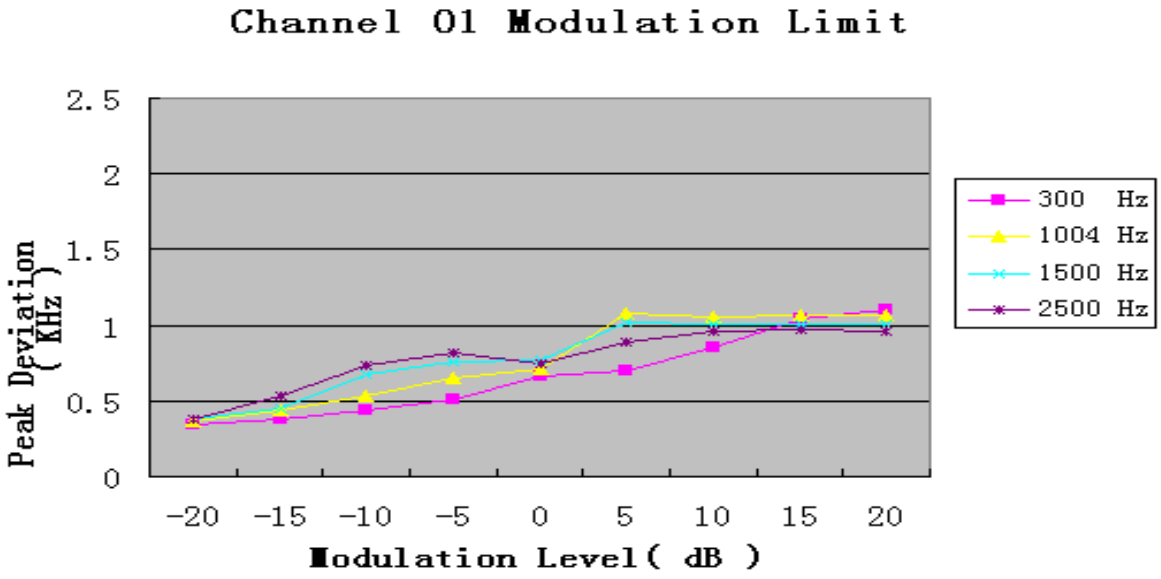
EQUIPMENT TYPE	MFR	MODEL NUMBER	LAST CAL.	CAL DUE.
Audio Signal Generator	HP	3325A	06/08/2004	06/07/2005
Modulation Analyzer	HP	8920B	06/08/2004	06/07/2005
Attenuator	MINI CIRCUITS	MCL BW-S20W2	06/08/2004	06/07/2005

10.4 MEASUREMENT RESULT

a). Modulation Limit:

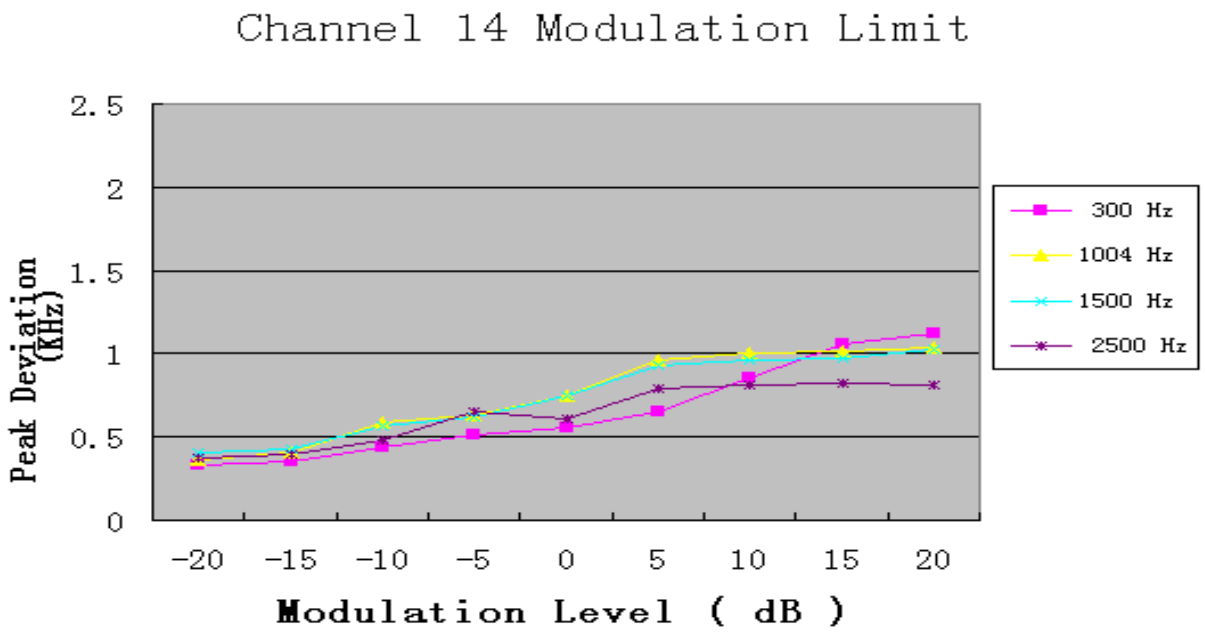
Channel 01- 462.5625 MHz

Modulation Level (dB)	Peak Freq. Deviation At 300 Hz (KHz)	Peak Freq. Deviation At 1004 Hz (KHz)	Peak Freq. Deviation At 1500 Hz (KHz)	Peak Freq. Deviation At 2500 Hz (KHz)
-20	0.349	0.370	0.384	0.383
-15	0.374	0.444	0.451	0.535
-10	0.444	0.530	0.677	0.739
-5	0.507	0.650	0.757	0.814
0	0.665	0.705	0.776	0.741
+5	0.694	1.074	1.022	0.885
+10	0.855	1.052	1.003	0.957
+15	1.040	1.068	1.009	0.976
+20	1.105	1.071	1.013	0.965



Channel 14- 467.7125 MHz

Modulation Level (dB)	Peak Freq. Deviation At 300 Hz (KHz)	Peak Freq. Deviation At 1004 Hz (KHz)	Peak Freq. Deviation At 1500 Hz (KHz)	Peak Freq. Deviation At 2500 Hz (KHz)
-20	0.327	0.368	0.403	0.369
-15	0.350	0.410	0.425	0.396
-10	0.437	0.583	0.564	0.483
-5	0.515	0.631	0.621	0.648
0	0.558	0.751	0.749	0.609
+5	0.651	0.963	0.927	0.791
+10	0.860	1.006	0.957	0.814
+15	1.059	1.015	0.968	0.826
+20	1.125	1.033	1.024	0.807

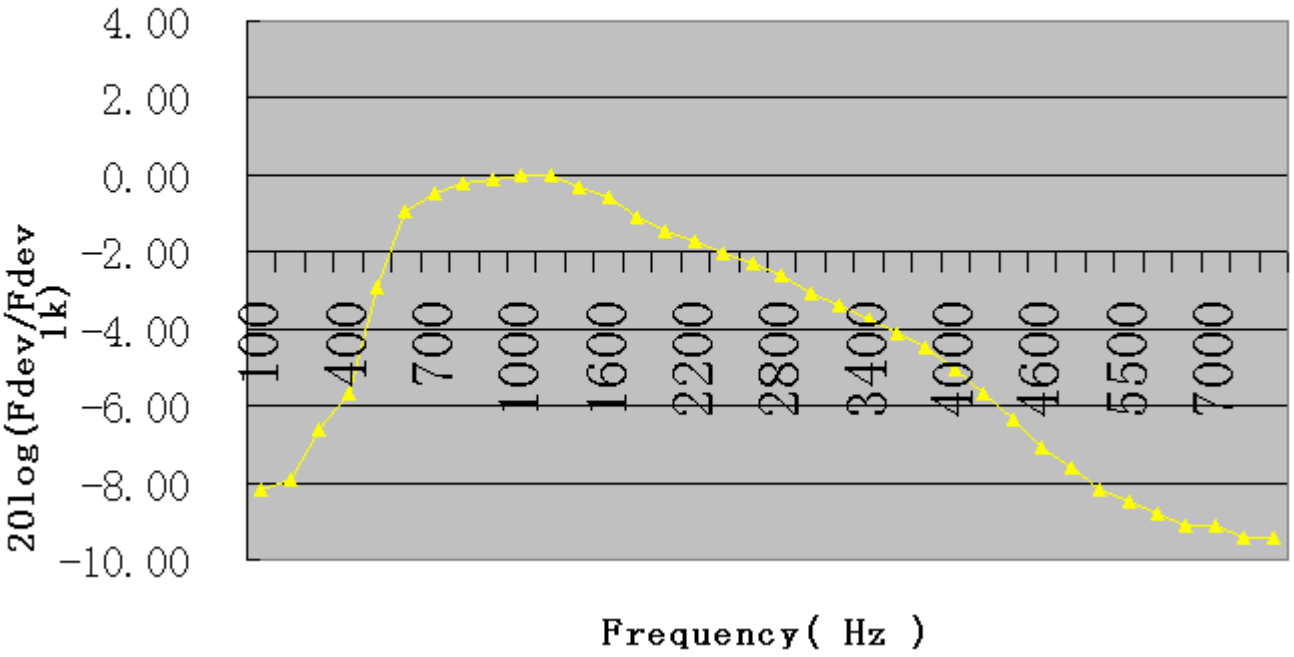


b). Audio Frequency Response:

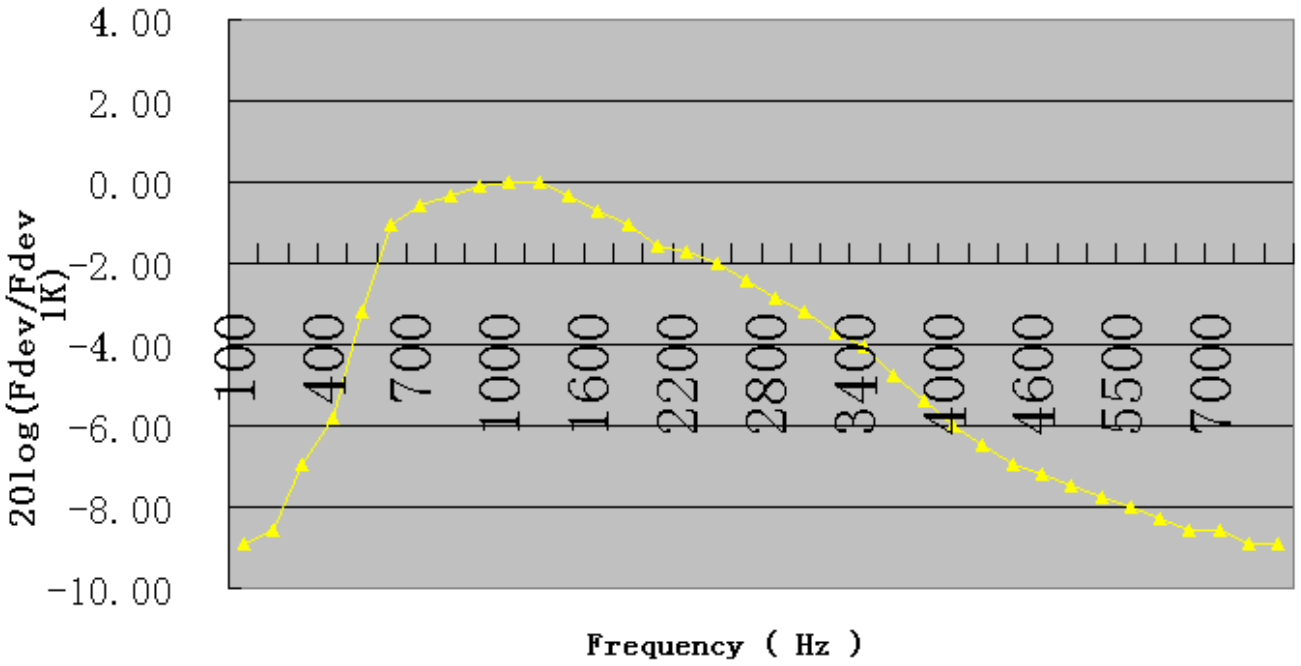
Channel 01- 462.5625 MHz

Frequency (Hz)	Deviation (KHz)
100	0.30
200	0.31
300	0.36
400	0.40
500	0.55
600	0.69
700	0.73
800	0.75
900	0.76
1000	0.77
1200	0.77
1400	0.74
1600	0.72
1800	0.68
2000	0.65
2200	0.63
2400	0.61
2600	0.59
2800	0.57
3000	0.54
3200	0.52
3400	0.50
3600	0.48
3800	0.46
4000	0.43
4200	0.40
4400	0.37
4600	0.34
4800	0.32
5000	0.30
5500	0.29
6000	0.28
6500	0.27
7000	0.27
8500	0.26
10000	0.26

Channel 01 Audio Frequency Response



Channel 14 Audio Frequency Response



Channel 14- 467.7125 MHz

Frequency (Hz)	Deviation (KHz)
100	0.28
200	0.29
300	0.35
400	0.40
500	0.54
600	0.69
700	0.73
800	0.75
900	0.77
1000	0.78
1200	0.78
1400	0.75
1600	0.72
1800	0.69
2000	0.65
2200	0.64
2400	0.62
2600	0.59
2800	0.56
3000	0.54
3200	0.51
3400	0.49
3600	0.45
3800	0.42
4000	0.39
4200	0.37
4400	0.35
4600	0.34
4800	0.33
5000	0.32
5500	0.31
6000	0.30
6500	0.29
7000	0.29
8500	0.28
10000	0.28

11. MAXIMUMN TRANSMITTER POWER

11.1 PROVISIONS APPLICABLE

According to FCC Part 95 Section 95.639(d), No FRS unit, under any condition of modulation, shall exceed 0.5 W effective radiated power(ERP).

11.2 MEASUREMENT PROCEDURE

Notes: The instrument setting used during the measurement procedure is as follow.

HP 8546A: RW=120KHz, VBW=300KHz, C.F.=fundamental frequency, SPAN 5MHz, A trace MAX HOLD, B trace CLEAR WRIT

ADVANTEST: RW=100KHz, VBW=100KHz, C.F.=Maximum peak Frequency, SPAN 0,TG ON

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). 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.

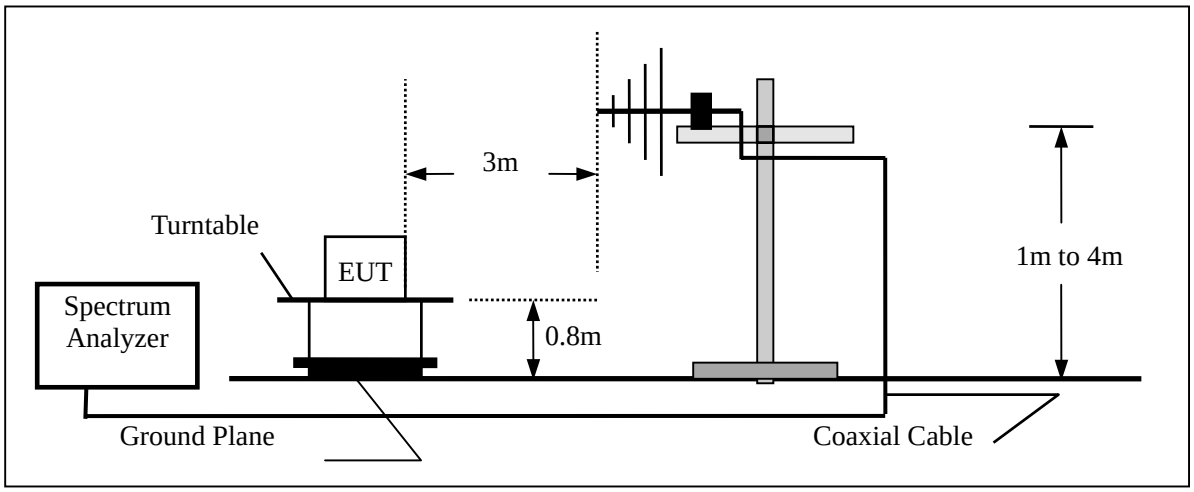
15). The input level to the substitution antenna shall be recorded as power level in dBm, corrected for any change of input attenuator setting of the measuring receiver.

16). The measurement shall be repeated with the test antenna and the substitution antenna oriented for horizontal polarization.

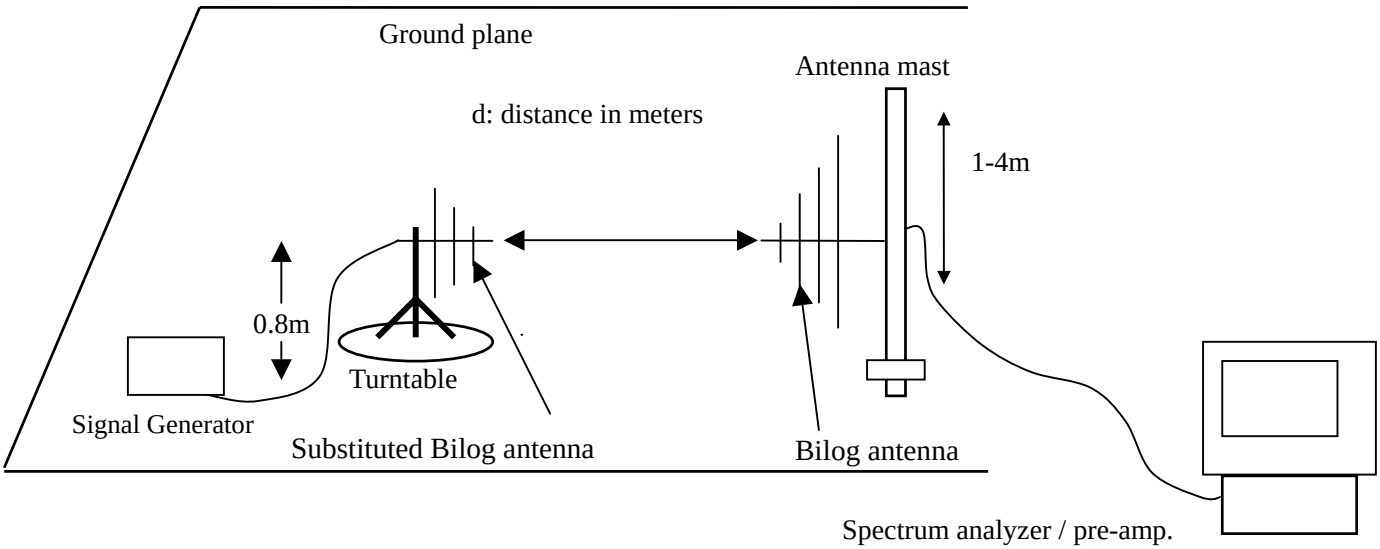
17). The measure of the effective radiated power is the larger of the two levels recorded, at the input to the substitution antenna, corrected for the gain of the substitution antenna if necessary.

11.3 TEST SETUP BLOCK DAIGRAM(setup block diagram of configuration)

TEST SETUP:



SUBSTITUTION METHOD:



11.4 MEASUREMENT EQUIPMENT USED:

Open Area Test Site					
EQUIPMENT TYPE	**MFR**	**MODEL NO.**	**SERIAL NO.**	**LAST CAL.**	**CAL DUE.**
Spectrum Analyzer	ADVANTEST	R3132	N/A	06/08/2004	06/07/2005
EMI Test Receiver	HP	8546A	3448A00232	06/08/2004	06/07/2005
Pre-Amplifier	HP	8447D	2944A07999	06/08/2004	06/07/2005
Bi-Log Antenna	EMCO	3142	9910-1436	06/08/2004	06/07/2005
Bi-Log Antenna	SCHAFFNER	CBL6143	5082	06/08/2004	06/07/2005
CABLE	TIME MICROWAVE	LMR-400	N-TYPE04	06/08/2004	06/07/2005

11.5 TEST RESULT

The Output Power of the 14 channels

Freq. (MHz)	Antenna Polarity	Reading (dBuV)	SG O/P (dBm)	Ant. Gain (dB)	Dipole Gain (dBi)	Cable (dB)	Corrected Power (dBm)	Corrected Power (mW)	Limit (W)
462.5625	V	92.83	16.7	6.4	0	0.94	22.16	164.44	0.5
462.5875	V	92.83	16.7	6.4	0	0.94	22.16	164.44	0.5
462.6125	V	92.83	16.7	6.4	0	0.94	22.16	164.44	0.5
462.6375	V	92.83	16.7	6.4	0	0.94	22.16	164.44	0.5
462.6625	V	92.83	16.7	6.4	0	0.94	22.16	164.44	0.5
462.6875	V	92.83	16.7	6.4	0	0.94	22.16	164.44	0.5
462.7125	V	92.83	16.7	6.4	0	0.94	22.16	164.44	0.5
467.5625	V	92.83	16.7	6.4	0	0.94	22.16	164.44	0.5
467.5875	V	92.83	16.7	6.4	0	0.94	22.16	164.44	0.5
467.6125	V	92.83	16.7	6.4	0	0.94	22.16	164.44	0.5
467.6375	V	92.83	16.7	6.4	0	0.94	22.16	164.44	0.5
467.6625	V	92.83	16.7	6.4	0	0.94	22.16	164.44	0.5
467.6875	V	92.83	16.7	6.4	0	0.94	22.16	164.44	0.5
467.7125	V	92.83	16.7	6.4	0	0.94	22.16	164.44	0.5

12. TRANSMITTER ANTENNA

12.1 PROVISIONS APPLICABLE

According to FCC Part 95 Section 95.647, the antenna of each FRS unit must be an integral part of the transmitter. The antenna must have no gain and must be vertically polarized.

12.2 COMPLIANCE

The antenna is designed as a fixed, non-user replaceable with no gain and vertically polarized unit integrated to EUT.

13. POWER CAPABILITY

13.1 PROVISIONS APPLICABLE

According to FCC Part 95 Section 95.649, no FRS unit shall incorporate provisions for increasing its transmitter power to any level in excess of the limits specified in § 95.639

13.2 COMPLIANCE

All the components employed by EUT have the power capability less than 0.5W either being assembled or individual. The output power was measured to be 164.44 mW on each of the fourteen channels.

APPENDIX 1

PHOTOGRAPHS OF SET UP

Radiated Emission Setup Photos

APPENDIX 2

PHOTOGRAPHS OF EUT

Front View of TX

Back View of TX

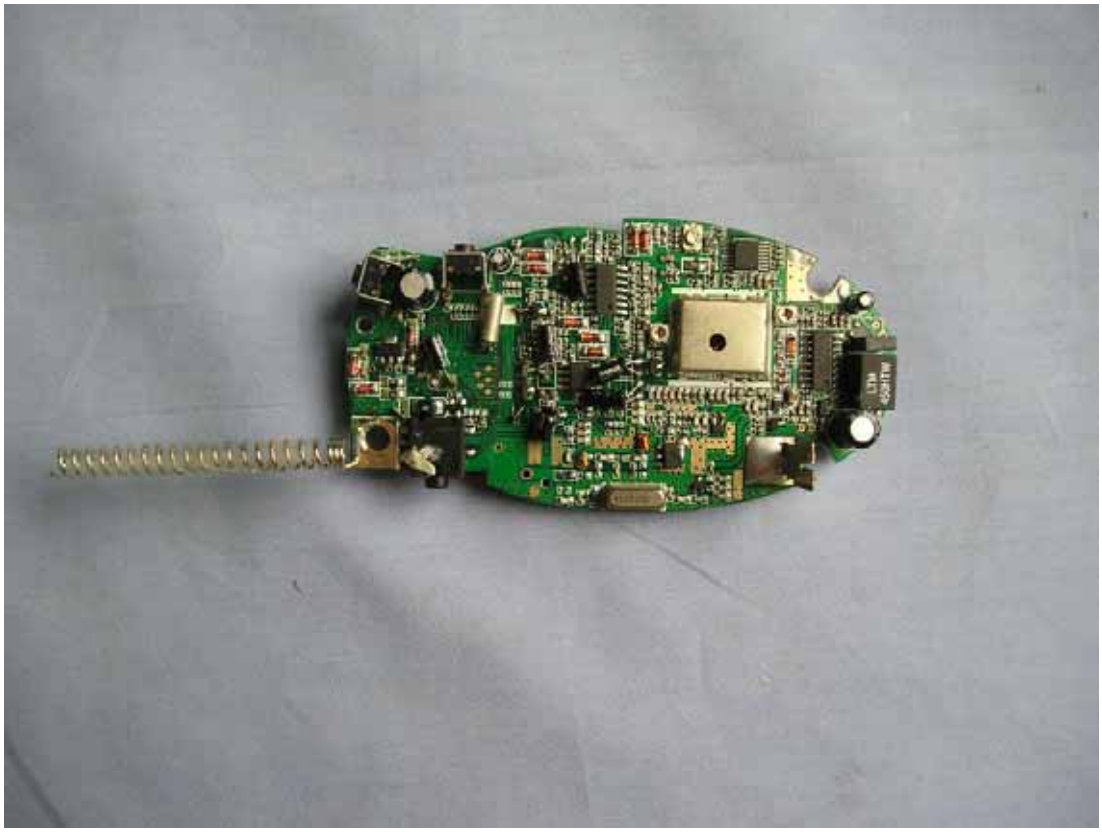
Top View of TX

Bottom View of TX

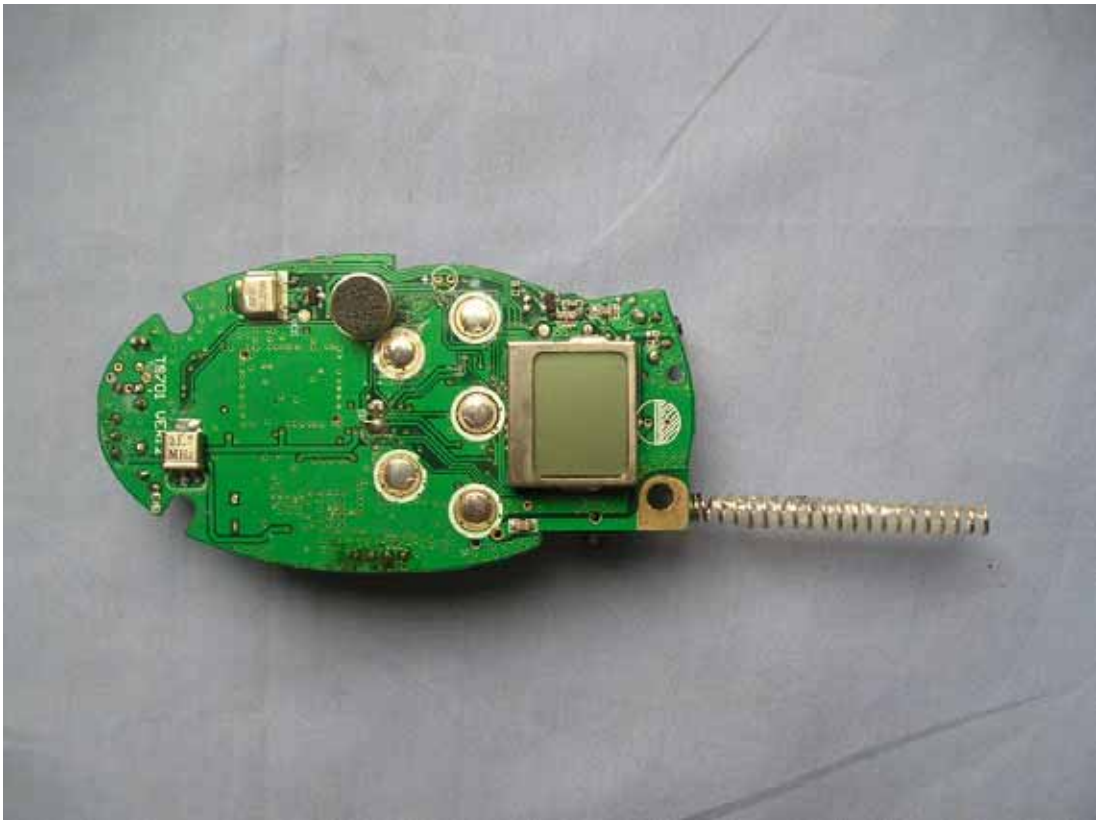
Left View of TX

Right View of TX

Internal of TX– 1



Internal of TX– 2



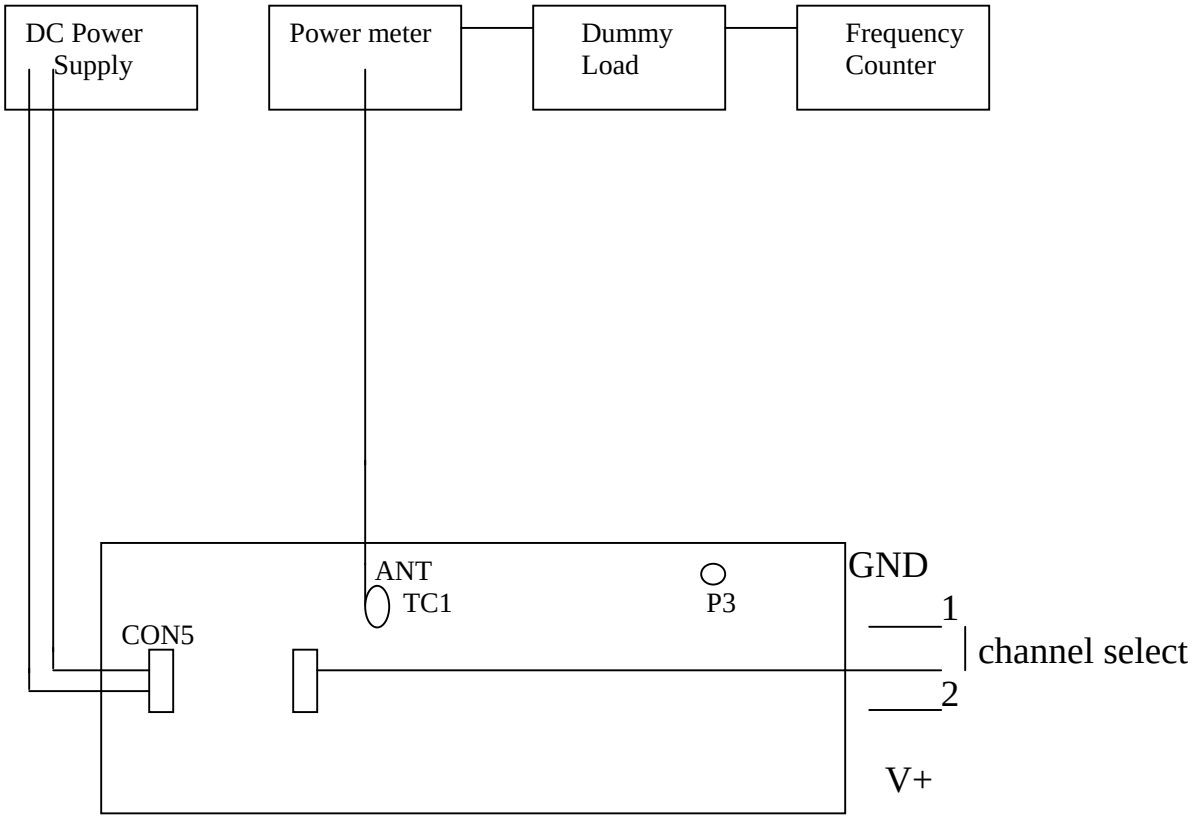
APPENDIX 3

TUNE-UP PROCEDURE

ADJUSTMENT PROCEDURES OF T-9701

1. Transmitter Power Adjustment
   a). Adjust the DC power supply so that 6.0V is obtained at the battery terminals. Confirm that the power meter, dummy load and output tester are prepared.
   b). Turn the power on and monitor a XT1 element (21.25MHz) into the crystal on the pcb board.
   c). Adjust TC1 in this order so that the power meter reading become maximum.
   d). Repeat procedure c several times. The RF power meter reading should be more than 0.35W when the power is on and at a normal temperature. Then check the current meter reading should be less than 350mA.
2. Transmission Deviation Adjustment
   a). Set up the unit for the transmission mode.
   b). Set the unit to channel 4, then adjust P3 so that the frequency counter reading is –1.0KHz (462.6375MHz)
   c). Repeat procedure a, b so that the maximum deviation is ±2.0KHz Adjustment setup block diagram

ADJUSTMENT SETUP BLOCK DIAGRAM



NOTE: The elements illustrated above are solely for explaining the adjustment procedure.