



# **FCC CFR47 PART 95 REQUIREMENT**

## **CERTIFICATION REPORT**

*FOR*

**GMRS TRANSCEIVER**

**MODEL: GMRS 7000**

**FCC ID: PDHGMRS-7000**

**REPORT NUMBER: 01I1119-1**

**ISSUE DATE: JANUARY 22, 2002**

*Prepared for*

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*Prepared by*

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## 1. VERIFICATION OF COMPLIANCE

Inspection Institution: COMPLIANCE ENGINEERING SERVICES INC.  
561F MONTEREY ROAD,  
MORGAN HILL, CA 95037, USA  
TEL: (408) 463-0885 FAX: (604) 463-0888

Applicant: TTI TECH CO., LTD.  
Manufacturer: TTI TECH CO., LTD.  
Brand Name: TTI TECH CO., LTD.  
Model No/Name: GMRS 7000 Serial No: N/A



ITEM	TESTING ITEM	APPLIED SPECIFICATION	TESTING RESULTS	TESTING EQUIPMENT	REMARK
1	Channel Frequency	Section 95.621(a)	Complied	Note 1	
2	Permissible Communications	Section 95.181	Complied	Note 1	
3	Frequency Toleration	Section 95.621(b)	Complied	Note 1	
4	Emission Type	Section 95.631	Complied	Note 1	
5	Emission Bandwidth	Section 95.633	Complied	Note 1	
6	Unwanted Emission	Section 95.635	Complied	Note 1	
7	Modulation Standards	Section 95.637	Complied	Note 1	
8	Maximum Authorized Transmitting Power	Section 95.135(c)	Complied	Note 1	
9	Channel Available	Section 95.29	Complied	Note 1	

Note 1: Please refer to each test section for detailed instrument list.

The above equipment was tested by Compliance Certification Services for compliance with the requirements set forth in the FCC PART 95 Subpart A GMRS. The results of testing in this report apply to the product/system, which was tested only. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties. **Warning** : This document reports conditions under which testing was conducted and results of tests performed. This document may not be altered or revised in any way unless done so by Compliance Certification Services and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Compliance Certification will constitute fraud and shall nullify the document.

Tested By:

Approved & Released For CCS By:

THU CHAN  
SENIOR EMC ENGINEER  
COMPLIANCE CERTIFICATION SERVICES

STEVE CHENG  
ENGINEERING MANAGER  
COMPLIANCE CERTIFICATION SERVICES

## 2. GENERAL INFORMATION

### 2.1. PRODUCT DESCRIPTION

- a). Type of EUT: GMRS Transceiver
- b). Trade Name: TTI TECH CO., LTD.
- c). Model No: GMRS 7000
- d). FCC ID: PDHGMRS-7000
- e). Working Frequency: 15 Channels within frequency band from 462.5500 ~ 462.7250 MHz.
- f). Power Supply: 7.2 V (Ni-MH)

### 2.2. MEASURED CHARACTERISTICS OF EUT

- a). Communication Type: Voice/Tone only
- b). Frequency Tolerance: 0.00028% (limit < 0.0005%)
- c). Emission Type: F3E. Designator: 2M+2D=6+10.63=16K63
- d). Emission Bandwidth: 10.63KHz (limit < 20 KHz)
- e). Unwanted Radiation:
  - 1). At least: 55 dBc (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: 65 dBc (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: 65 dBc (limit  $43+10 \log_{10}(\text{TP})$  dB) on any frequency removed from the center of the authorized bandwidth by more than 250%.
- f). Peak Frequency Deviation: 2.191 KHz at 0dB reference (limit <  $\pm 5$  KHz)
- g). Audio Frequency Response: 2.4 KHz (limit < 3.125 KHz)
- h). Audio Frequency Low Pass Filter: Passed (Limit <  $60 \cdot \log_{10}(f(\text{KHz}) / 3)$ )
- i). Maximum Authorized Power Transmitter: High Power = 2.399 W (limit < 5 W)  
Low Power = 0.955 W (limit < 5 W)
- j). Antenna Type: Inverse Male-SMA 1/4 Wave antenna
- k). Output power Modification: Fixed can't be change
- k). Operating Frequency Range and Channels  
Frequency Range: 462.5500 ~ 462.7250 MHz  
Total 15 channels

CH 01----	462.5625 MHz	CH08----	462.5750 MHz
CH 02----	462.5875 MHz	CH09----	462.6250 MHz
CH 03----	462.6125 MHz	CH10----	462.6750 MHz
CH 04----	462.6375 MHz	CH11----	462.5500 MHz
CH 05----	462.6625 MHz	CH12----	462.6000 MHz
CH 06----	462.6875 MHz	CH13----	462.6500 MHz
CH 07----	462.7125 MHz	CH14----	462.7000 MHz
		CH15----	462.7250 MHz
- l). Battery Endpoint: 5.4Vdc

### **2.3. TEST METHODOLOGY**

Both conducted and radiated testing were performed according to the procedures documented in chapter 13 of ANSI C63.4 and FCC CFR 47 2.1046, 2.1047, 2.1049, 2.1051, 2.1053, 2.1055 and 2.1057.

### **2.4. TEST FACILITY**

The open area test sites and conducted measurement facilities used to collect the radiated data are located at 561F Monterey Road, Morgan Hill, California, USA. The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

### **2.5. ACCREDITATION AND LISTING**

The test facilities used to perform radiated and conducted emissions tests are accredited by National Voluntary Laboratory Accreditation Program for the specific scope of accreditation under Lab Code:200065-0 to perform Electromagnetic Interference tests according to FCC PART 15 AND CISPR 22 requirements. No part of this report may be used to claim or imply product endorsement by NVLAP or any agency of the US Government. In addition, the test facilities are listed with Federal Communications Commission (reference no: 31040/SIT (1300B3) and 31040/SIT(1300F2))

### **2.6. MEASURING INSTRUMENT CALIBRATION**

The measuring equipment which was utilized in performing the tests documented herein has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment which is traceable to recognized national standards.

### 3. REQUIREMENTS OF PROVISION

#### 3.1. GENERAL TECHNICAL REQUIREMENTS

- a). Section 95.181 – Communication Type shall be Voice/Tone only
- b). Section 95.621(b) – Frequency Tolerance less than 0.0005%
- c). Section 95.631 – Emission Type shall be F3E
- d). Section 95.633 – Emission Bandwidth shall less than 20 KHz
- e). Section 95.635 – Unwanted Radiation  
According to CFR 47 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.
  - 3). At least  $43 + 10 \log_{10}(TP)$  dB on any frequency removed from the center of the authorized bandwidth by more than 250%.
- f). Section 95.637(a) – Peak Frequency Deviation less than  $\pm 5$  KHz, and Audio Frequency Response less than 3.125 KHz
- g). Section 95.637(b) – Audio Frequency Low Pass Filter between the modulation limiter & the modulation stage of the transmitter. At any frequency (f in KHz) between 3 and 20 KHz, the filter must have an attenuation of at least  $60 \log_{10}(f/3)$  dB greater than the attenuation at 1 KHz. Above 20 KHz, it must have an attenuation of at least 50 dB greater than the attenuation at 1 KHz.
- h). Section 95.135(c) – Maximum Authorized Transmitting Power less than 5 W ERP

#### 3.2. LABELING REQUIREMENT

Each equipment for which a type acceptance application is filed on or after May 1, 1981 shall bear an identification plate or label pursuant to section 2.925 (Identification of equipment) and section 2.926 (FCC Identifier).

#### 3.3. USER INFORMATION

The users manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for the compliance could void the user's authority to operate the equipment.

## 4. OUTPUT POWER MEASUREMENT

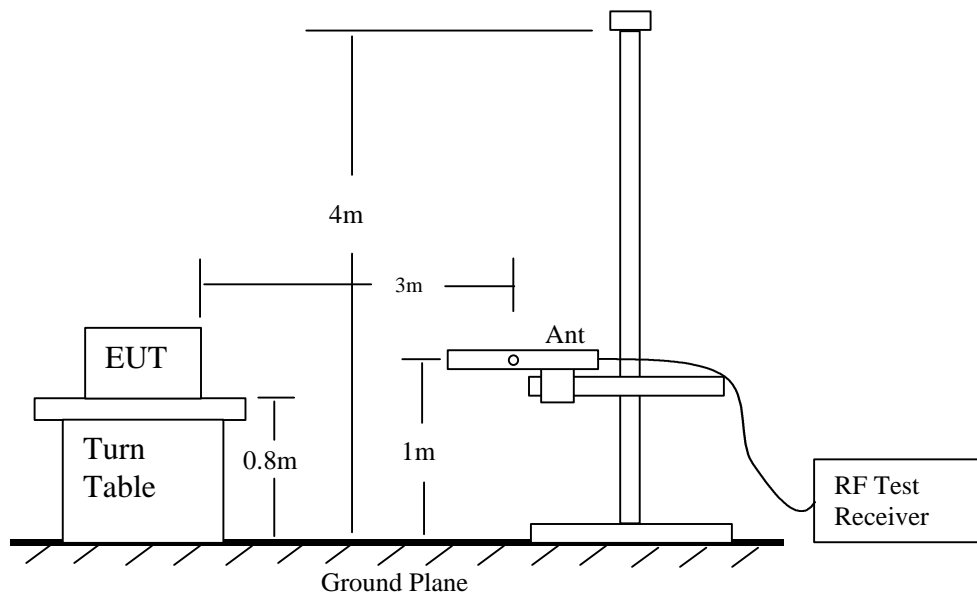
### 4.1. PROVISION APPLICABLE

According to section 95.135(c), the output power shall not exceed 5 W ERP.

### 4.2. MEASUREMENT PROCEDURE

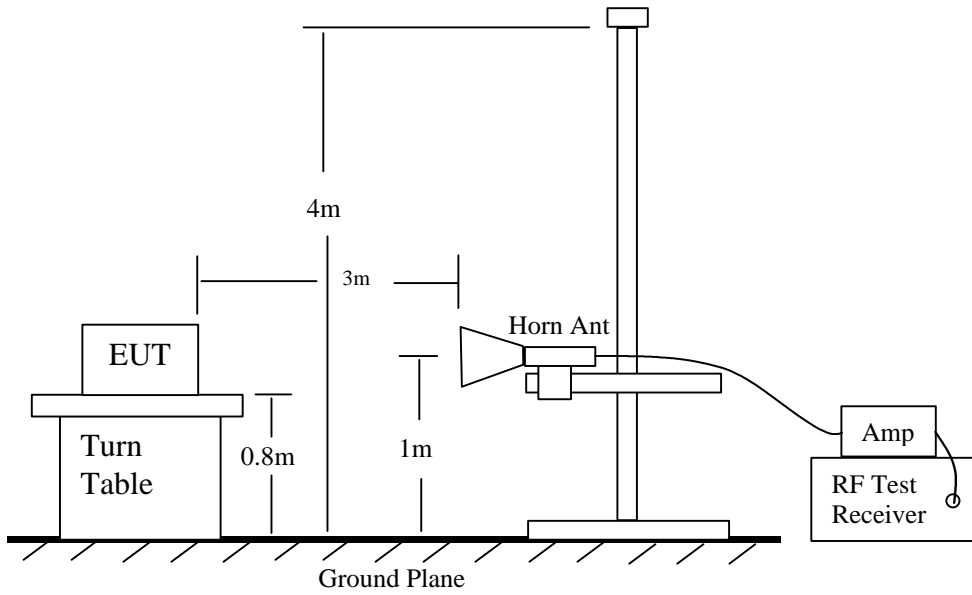
- 1). On a test site, the EUT shall be placed on a turntable, and in the position closest to the normal use as declared by the user.
- 2). The test antenna shall be oriented initially for vertical polarization located 3m from the EUT to correspond to the frequency of the transmitter.
- 3). The output of the test 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 a maximum signal level is detected by the measuring receiver.
- 6). The transmitter shall then 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 a maximum signal level is detected by the measuring receiver.
- 8). The maximum signal level detected by the measuring receiver shall be noted.
- 9). The transmitter shall be replaced by a tuned dipole (substitution antenna).
- 10). The substitution antenna shall be oriented for vertical polarization and the length of the substitution antenna shall be adjusted to correspond to the frequency of the transmitter.
- 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 the 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.

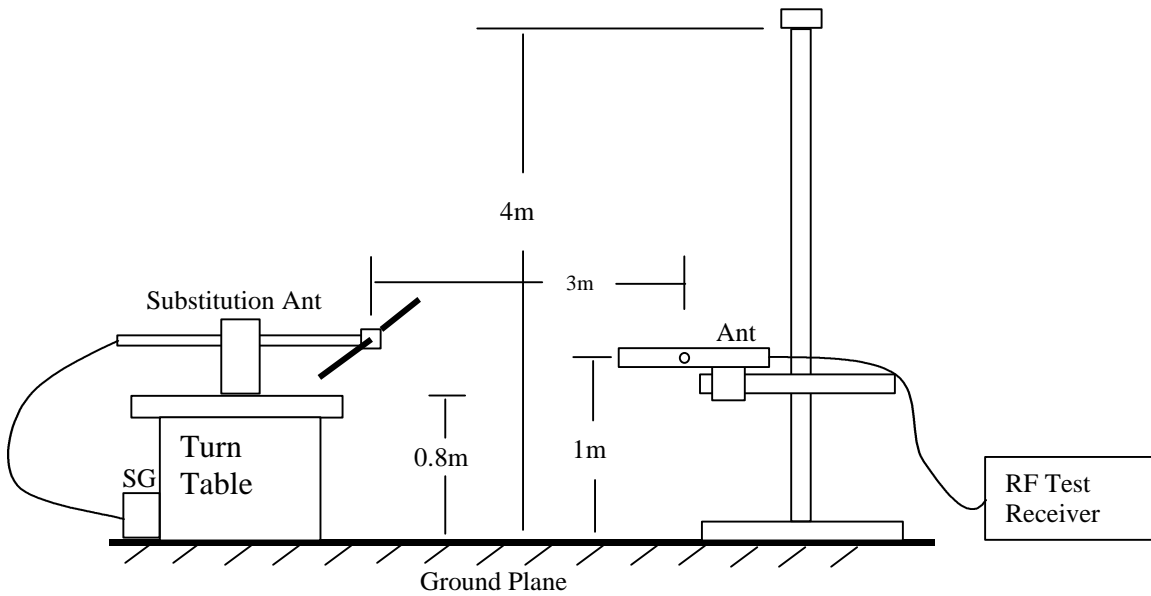


Radiated Emission Measurement 30 to 1000 MHz





Radiated Emission Above 1000 MHz



Radiated Emission – Substitution Method setup



#### 4.3. OUTPUT POWER TEST EQUIPMENT

EQUIPMENT	MANUFACTURE	MODEL NO.	CAL. DUE DATE
Spectrum Analyzer	HP	8593EM	6/20/02
Bilog Antenna	CHASE	CBL6112B	8/2/02
Dipole Antenna	COMPLIANCE DESIGN	ROBERTS	5/5/02
Synthesized Signal Generator	HP	83732B	3/21/02
Audio Signal Generator	HP	3325A	9/26/02
Amplifier	MINI-CIRCUITS	ZHL-42W	Cal before used
Amplifier	MITEQ	NSP2600-44	4/12/02

#### 4.4. MEASUREMENT RESULT

##### a). High Power

Channel	Frequency (MHz)	SA Reading (dBuV)	SG Reading (dBm)	Cable Loss (dB)	Gain (dBd)	Result (dBm)	Limit (dBm)	Margin dB
1	462.5625	110.1	34.10	.50	0	33.60	37.00	-3.40
8	462.5750	110.3	34.30	.50	0	33.80	37.00	-3.20
15	462.7250	110.2	34.20	.50	0	33.70	37.00	-3.30

**Maximum Output Power (ERP): 33.80 dBm = 2.399 W**

##### b). Low Power

Channel	Frequency (MHz)	SA Reading (dBuV)	SG Reading (dBm)	Cable Loss (dB)	Gain (dBd)	Result (dBm)	Limit (dBm)	Margin dB
1	462.5625	106.2	30.20	.50	0	29.70	37.00	-7.30
8	462.5750	106.3	30.30	.50	0	29.80	37.00	-7.20
15	462.7250	106.2	30.20	.50	0	29.70	37.00	-7.30

**Maximum Output Power (ERP): 29.80 dBm = 0.955 W**

## 5. MODULATION CHARACTERISTICS

### 5.1. PROVISIONS APPLICABLE

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

According to CFR 47 section 95.637 (a), a GMRS unit that transmits emission type F3E must not exceed a peak frequency deviation of  $\pm 5\text{KHz}$ , and the audio frequency response shall not exceed 3.125 KHz.

According to CFR 47 section 95.637(b) \_ Audio Frequency Low Pass Filter between the modulation limiter & the modulation stage of the transmitter. At any frequency (f in KHz) between 3 and 20 KHz, the filter must have an attenuation of at least  $60 \log_{10}(f/3)$  dB greater than the attenuation at 1 KHz. Above 20 KHz, it must have an attenuation of at least 50 dB greater than the attenuation at 1 KHz.

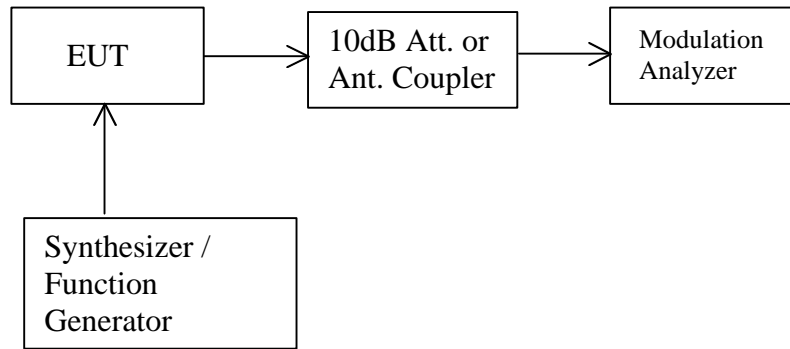
### 5.2. MEASUREMENT METHOD

#### 5.2.1. Modulation Limit

- 1). Configure the EUT as shown below, adjust the audio input for 60% of rated system deviation at 1 KHz using this level as a reference (0 dB) and vary the input level from -20 to +20 dB. Record the frequency deviation obtained as a function of the input level.
- 2). Repeat step 1 with input frequency changing to 300, 1004, and 2500 Hz in sequence.

#### 5.2.2. Audio Frequency Response

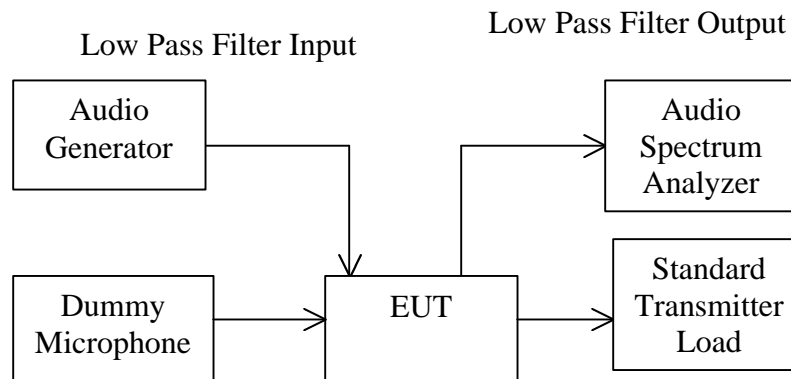
- 1). Configure the EUT as shown below.
- 2). Adjust the audio input for 20% of rated system deviation at 1 KHz using this level as a reference (0 dB).
- 3). Vary the Audio frequency from 100 Hz to 10 KHz and record the frequency deviation.
- 4). Audio Frequency Response =  $20 \log_{10} (\text{Deviation of test frequency} / \text{Deviation of 1KHz reference})$ .



Modulation characteristic measurement configuration

### 5.2.3. Audio Low Pass Filter Response

- 1). Configure the EUT as shown below.
- 2). Connect the audio frequency generator as close as possible the input of the post limiter low pass filter within the transmitter under test.
- 3). Connect the audio spectrum analyzer to the output of the post limiter low pass filter within the transmitter under test.
- 4). Apply 1000 Hz tone from the audio frequency generator and adjust the level per manufacturer's specifications.
- 5). Record the dB level of the 1000 Hz spectral line on the audio spectrum analyzer as  $LEV_{REF}$ .
- 6). Set the audio frequency generator to the desired test frequency between 3000 Hz and the upper low pass filter limit.
- 7). Record audio spectrum analyzer levels, at the frequency in step 6).
- 8). Record the dB level on the audio spectrum analyzer as  $LEV_{FREQ}$ .
- 9). Calculate the audio frequency response at the test frequency as:  
$$\text{low pass filter response} = LEV_{FREQ} - LEV_{REF}$$
- 10). Repeat the 6) through 9) for all the desired test frequencies.



Audio low pass filter response measurement configuration



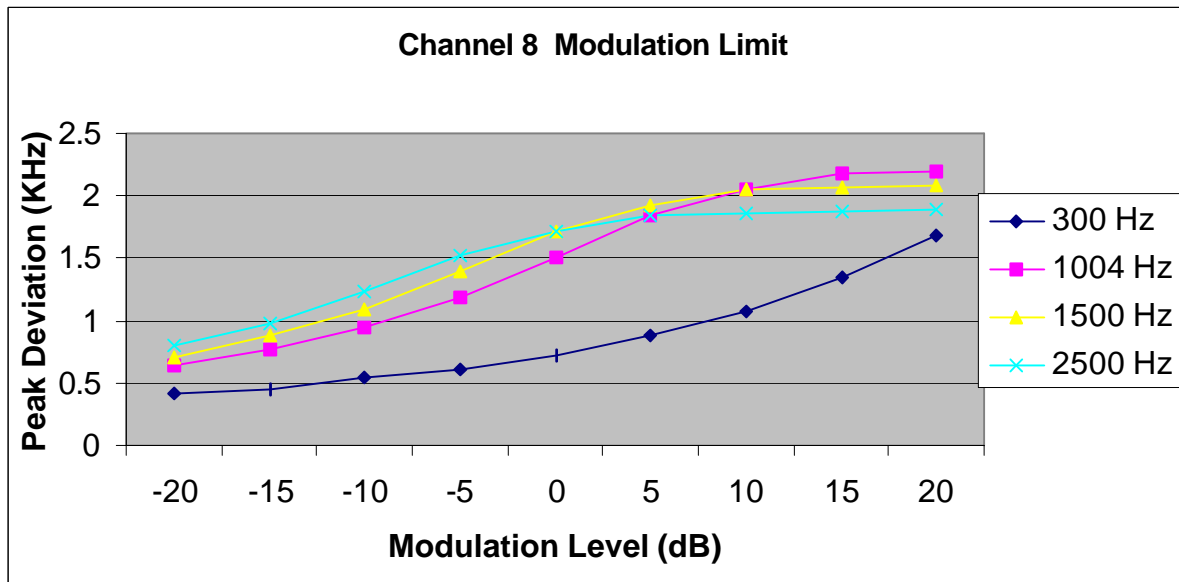
### 5.3. MEASUREMENT INSTRUMENT

EQUIPMENT	MANUFACTURE	MODEL NO.	CAL. DUE DATE
Modulation Analyzer	HP	8901b	5/30/02
Attenuator	MINI CIRCUITS	MCL BW-N10W5	N/A
Audio Signal Generator	HP	3325A	9/26/02

### 5.4. MEASUREMENT RESULT

- a). Modulation Limit: Channel #8 – 462.5750 MHz

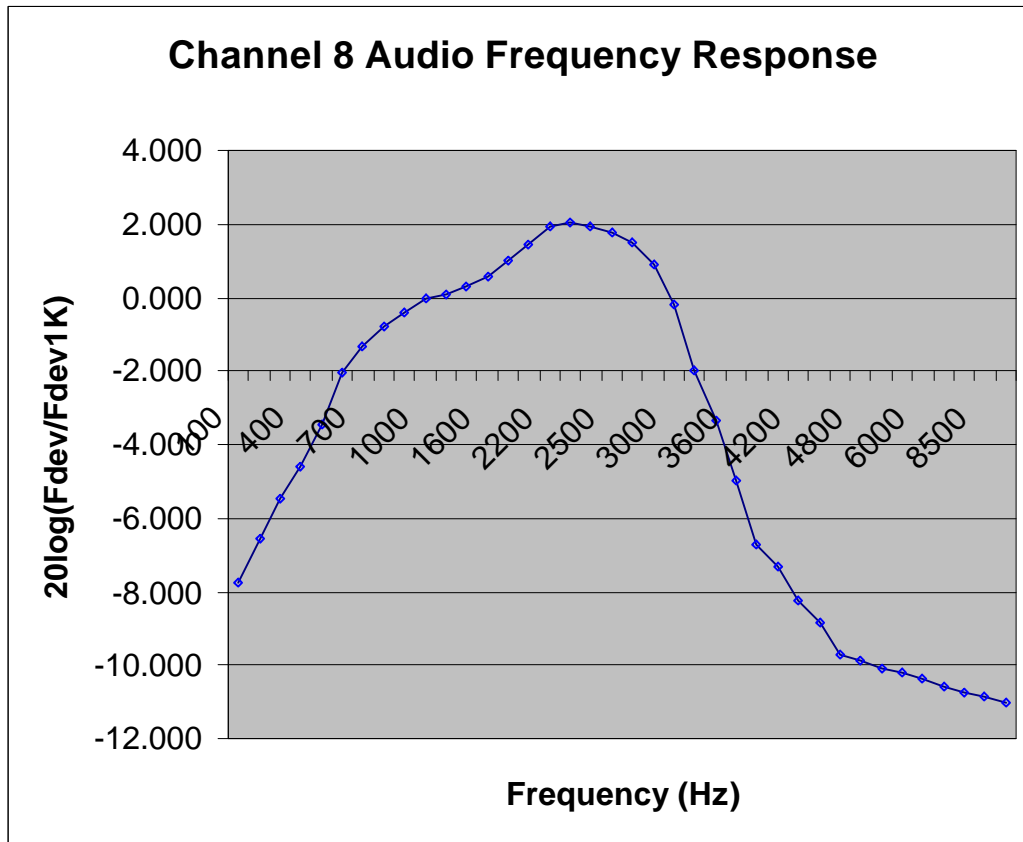
Modulation Level (dB)	Peak Freq. Deviation At 300 Hz (KHz)	Peak Freq. Deviation At 1004 Hz (KHz)	Peak Freq. Deviation At 1500 Hz (KHz)	Peak Freq. Deviation At 2500 Hz (KHz)
-20	0.415	0.641	0.712	0.797
-15	0.45	0.772	0.875	0.981
-10	0.538	0.948	1.093	1.23
-5	0.608	1.18	1.389	1.517
0	0.722	1.5	1.717	1.717
5	0.879	1.845	1.926	1.835
10	1.081	2.051	2.051	1.859
15	1.34	2.187	2.075	1.881
20	1.68	2.191	2.08	1.89



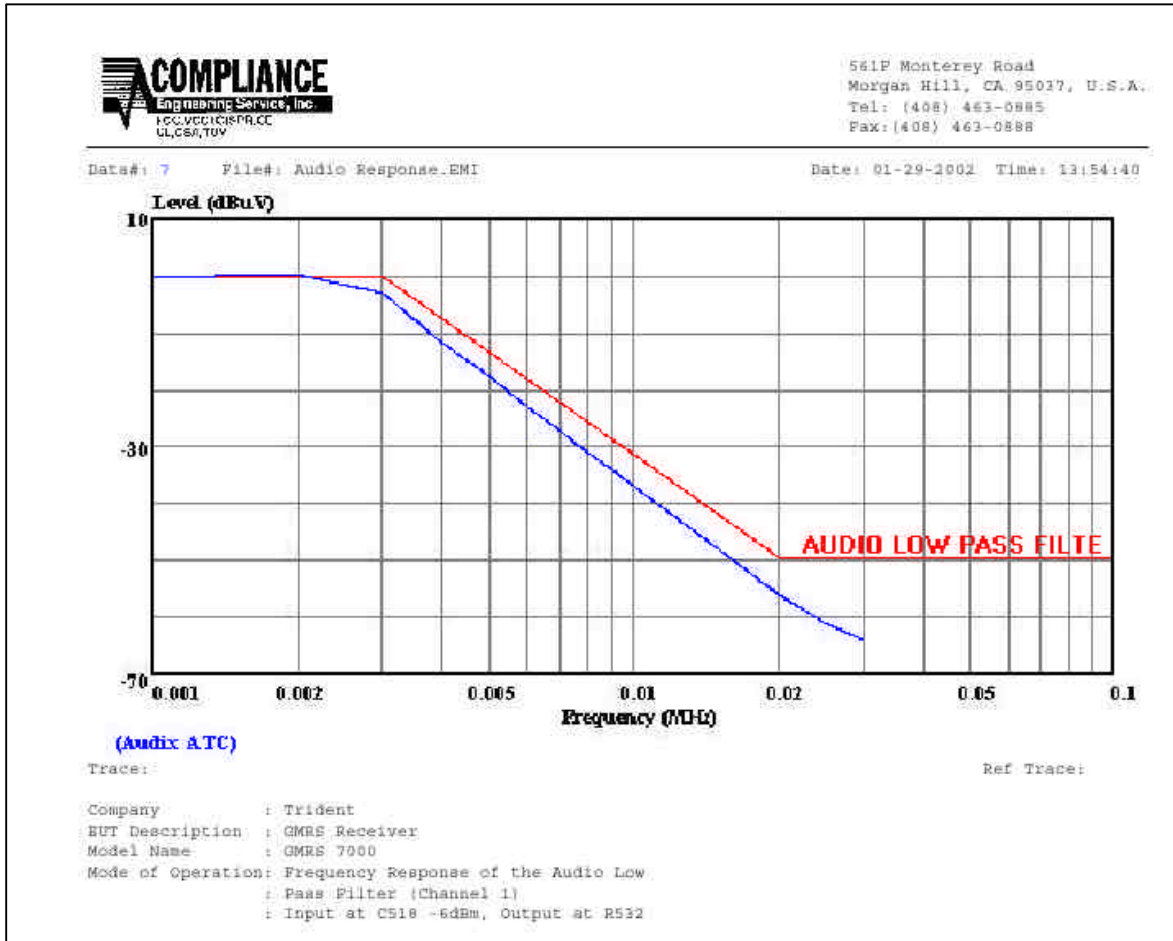
b). Audio Frequency Response: Channel #8 – 462.5750 MHz

Frequency (Hz)	Deviation (KHz)
100	0.205
200	0.235
300	0.267
400	0.295
500	0.335
600	0.396
700	0.428
800	0.456
900	0.477
1000	0.5
1200	0.505
1400	0.518
1600	0.533
1800	0.561
2000	0.59
2200	0.624
2400	0.631
2450	0.623
2500	0.612
2600	0.595
2800	0.556
3000	0.49
3200	0.398
3400	0.34
3600	0.281
3800	0.231
4000	0.215
4200	0.193
4400	0.181
4600	0.163
4800	0.16
5000	0.156
5500	0.154
6000	0.152
6500	0.148
7000	0.145
8500	0.143
10000	0.141





c). Audio low pass filter response:



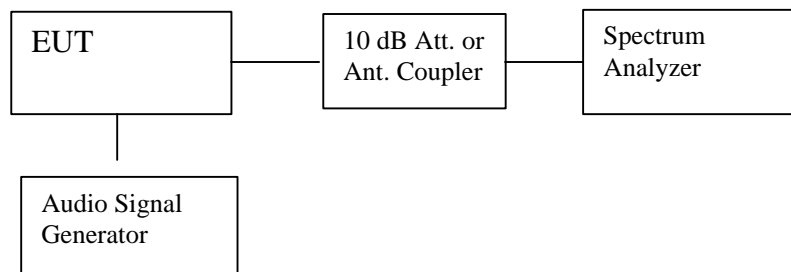
## 6. EMISSION BANDWIDTH

### 6.1. PROVISIONS APPLICABLE

According to CFR 47 section 95.633(3), the authorized bandwidth for GMRS emission type F3E unit is 20 KHz.

### 6.2. MEASUREMENT METHOD

- a). Check the calibration of the measurement instrument using either an internal calibrator or a known signal from an external generator.
- b). Set-up the test equipments as shown below.



Emission Bandwidth measurement configuration

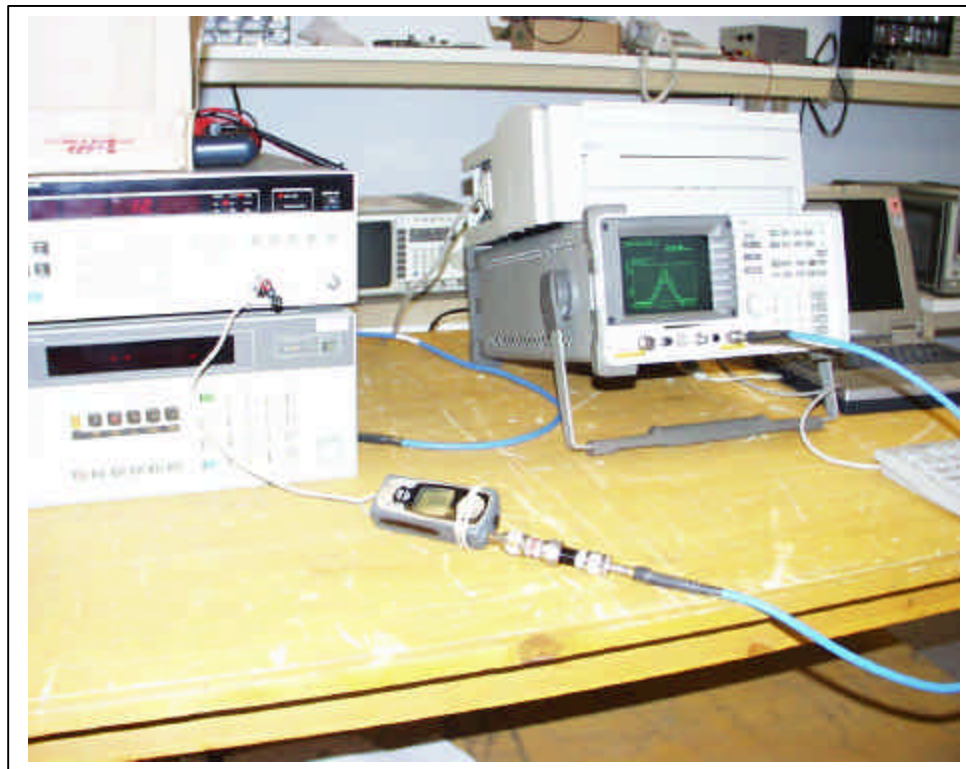
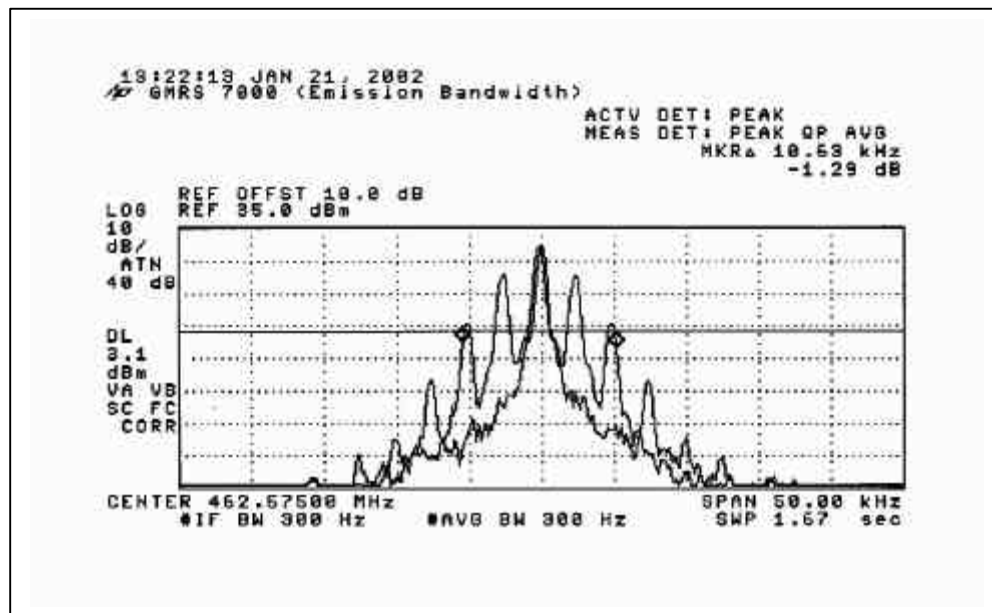
- c). Set the level of audio signal generator to obtain 16 dB greater than required for the rated 50% modulation.
- d). The occupied bandwidth is measured with the spectrum analyzer set at 5 KHz/div scan and 10 dB/div.

### 6.3. MEASUREMENT INSTRUMENT

EQUIPMENT	MANUFACTURE	MODEL NO.	CAL. DUE DATE
Spectrum Analyzer	HP	8593EM	6/20/02
Attenuator	MINI CIRCUITS	MCL BW-N10W5	N/A
Modulation Analyzer	HP	8901b	5/30/02
Audio Signal Generator	HP	3325A	9/26/02

### 6.4. MEASUREMENT RESULT

**The Occupied Bandwidth is measured 10.63 KHz.**



## 7. FIELD STRENGTH OF SPURIOUS EMISSION

### 7.1. PROVISIONS APPLICABLE

According to CFR47 section 2.1053(a), Measurement shall be made to detect spurious emission that may be radiated directly from the cabinet, control circuits, power leads or intermediate circuit element 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,

According to CFR 47 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.
- 3). At least  $43 + 10 \log_{10}(TP)$  dB on any frequency removed from the center of the authorized bandwidth by more than 250%.

### 7.2. MEASUREMENT PROCEDURE

#### --- For Frequency Range From 30 to 1000 MHz ---

- 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 frequency of the transmitter.
- 3). The output of the test 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 a maximum signal level is detected by the measuring receiver.
- 6). The transmitter shall then 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 a maximum signal level is detected by the measuring receiver.

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.

**--- For Frequency Above 1000 MHz ---**

10). Repeat procedures 1 to 9 with a proper Antenna (i.e. Horn antenna for 1 to 26 GHz)

11). After down with step 10. Replace the transmitter with a proper Antenna (substitution antenna).

12). 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 the transmitter.

13). The substitution antenna shall be connected to a calibrated signal generator.

14). If necessary, the input attenuator setting of the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.

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

16). The input signal to the 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 in step 10, corrected for the change of input attenuation setting of the measuring receiver.

17). 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.

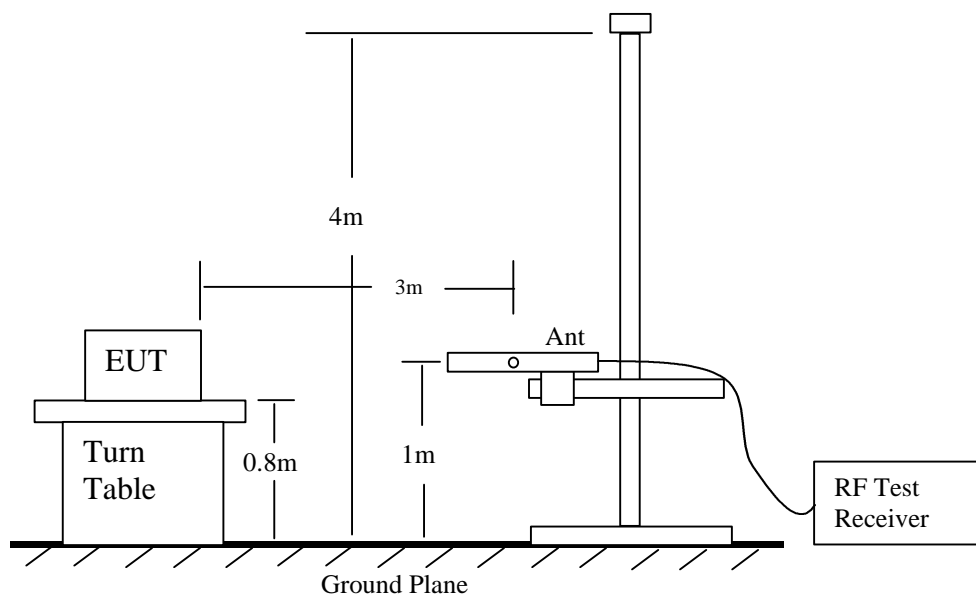
18). The measurement shall be repeated with the test antenna and the substitution antenna oriented for horizontal polarization.

### **7.3. MEASUREMENT INSTRUMENT**

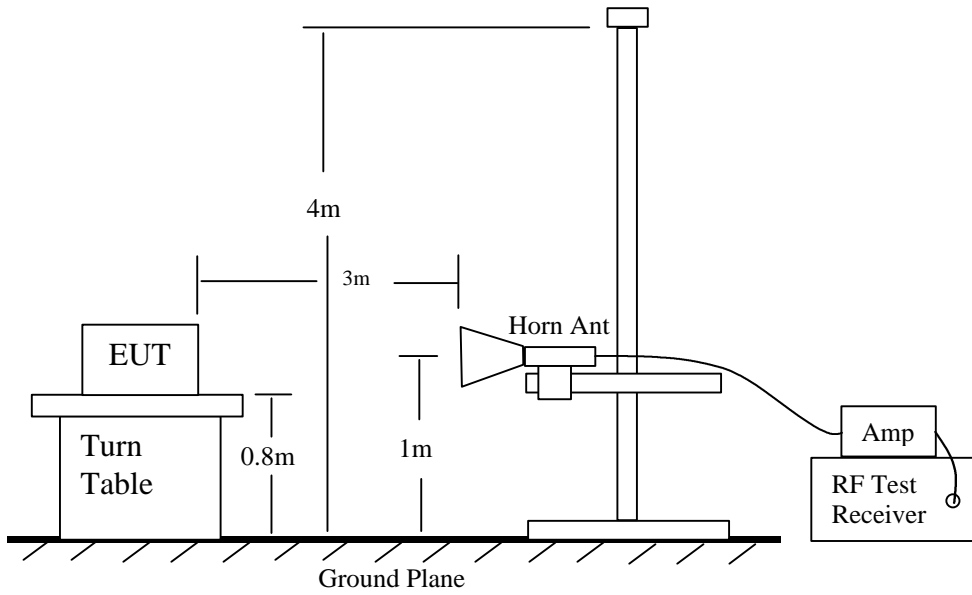
EQUIPMENT	MANUFACTURE	MODEL NO.	CAL. DUE DATE
Spectrum Analyzer	HP	8593EM	6/20/02
Synthesizer Signal Generator	HP	83732B	3/21/02
Amplifier	MITEQ	NSP2600-44	4/12/02
Bilog Antenna	CHASE	CBL6112B	8/2/02
Horn Antenna	EMCO	3115 SN: 2238	6/20/02
Horn Antenna	EMCO	3115 SN: 3245	6/20/02
Dipole Antenna	COMPLIANCE DESIGN	ROBERTS	5/5/02

Detector Function Setting of Test Receiver

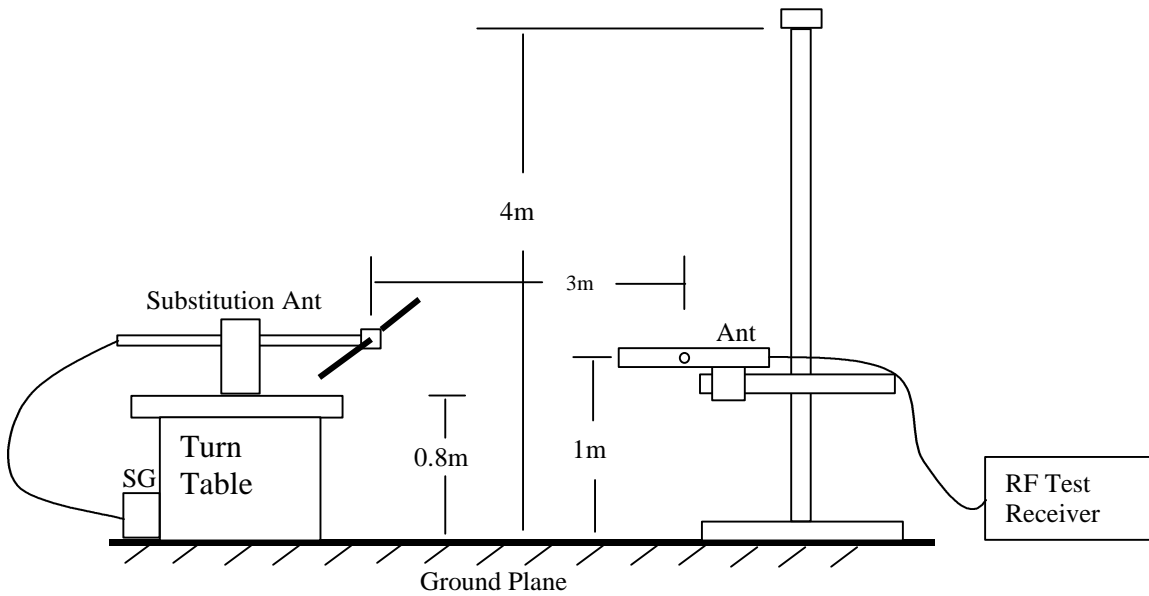
Frequency Range (MHz)	Detector Function	Resolution Bandwidth	Video Bandwidth
30 to 1000	Quasi Peak/Peak	120 KHz/100 KHz	120 KHz/100 KHz
Above 1000	Average/ Peak	1 MHz	1 MHz



Radiated Emission Measurement 30 to 1000 MHz



Radiated Emission Above 1000 MHz

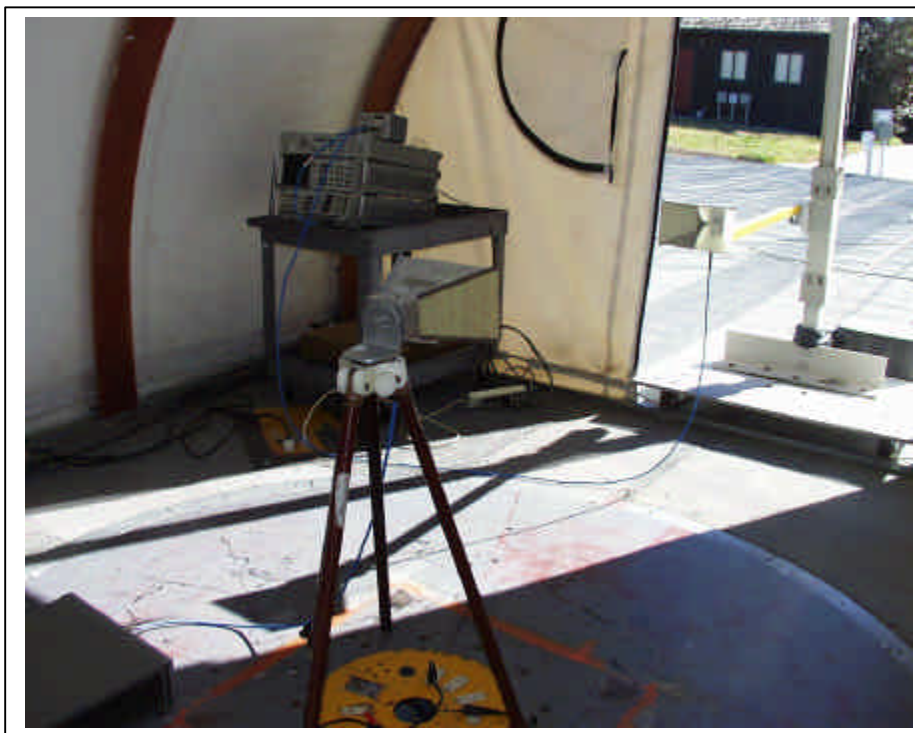
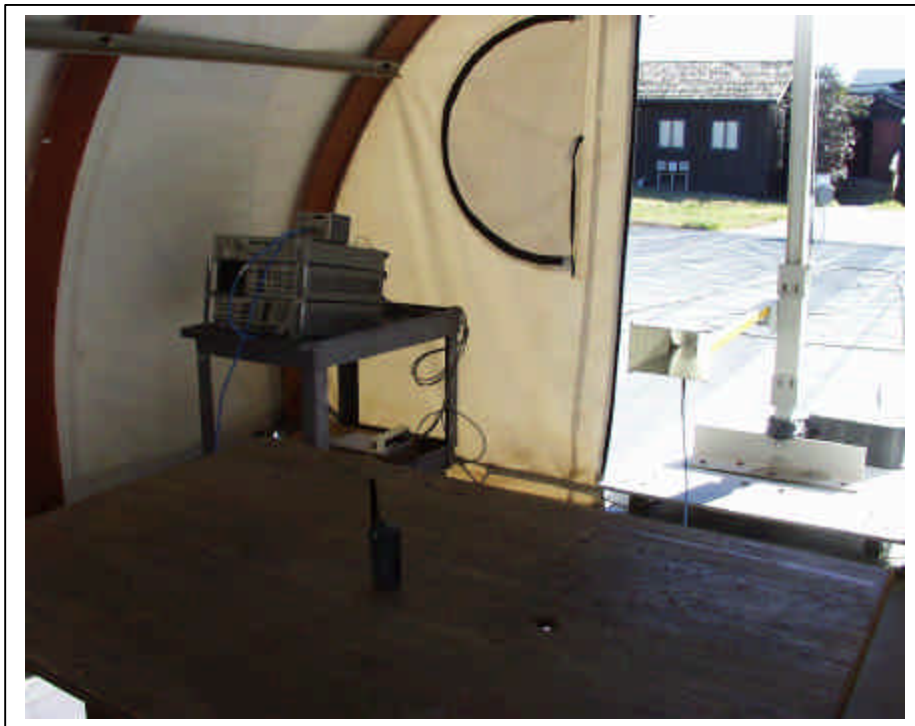


Radiated Emission – Substitution Method setup






Radiated Emissions & Substitution Method Below 1GHz



Radiated Emissions & Substitution Method Above 1GHz


## 7.4. MEASUREMENT RESULT

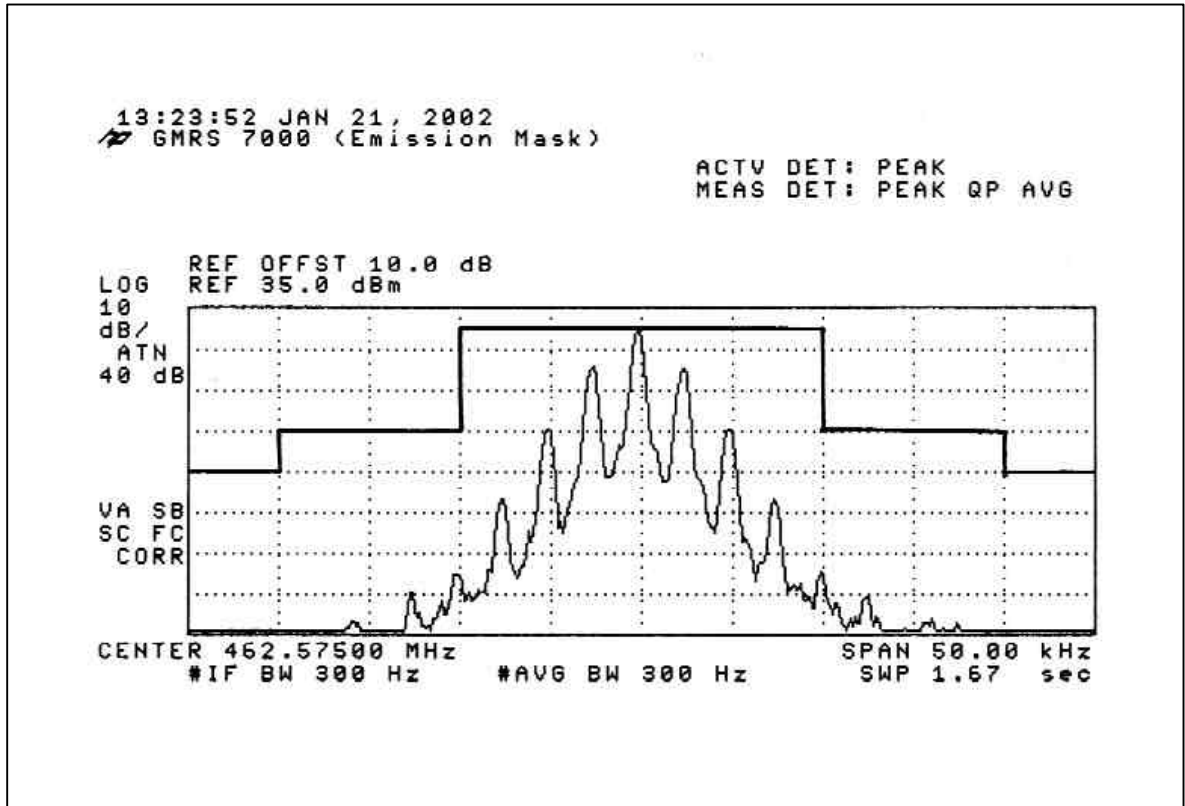
a). High Power Channel #8:

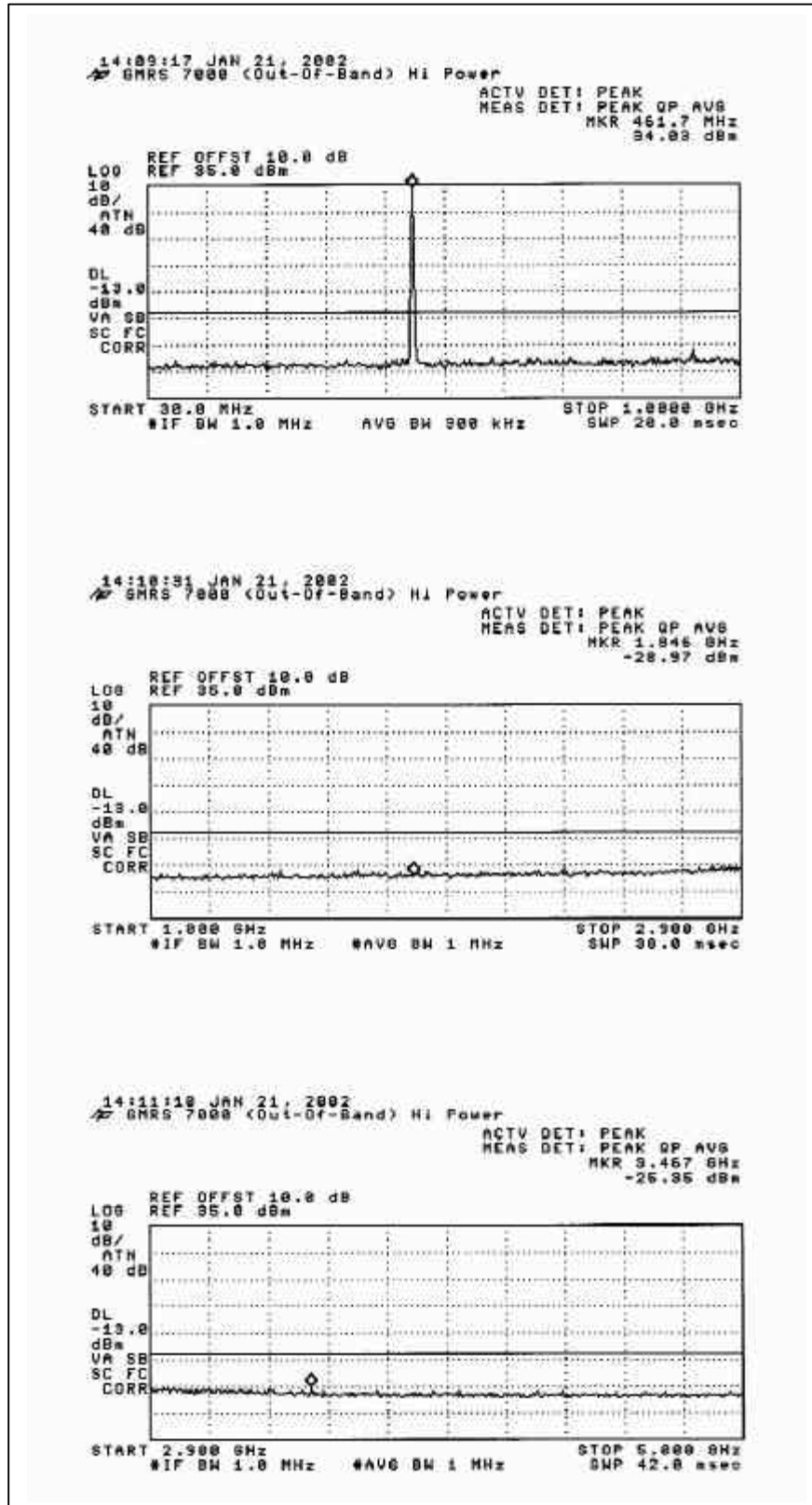
		<b>Project #:</b> 011119-1 <b>Report #:</b> 020115B1 <b>Date &amp; Time:</b> 01/15/02 3:33 PM <b>Test Engr:</b> Thu Chan								
FCC, VCCI, CISPR, CE, AUSTEL, NZ UL, CSA, TUV, BSMI, DHHS, NVLAP										
561F MONTEREY ROAD, SAN JOSE, CA 95037-9001 PHONE: (408) 463-0885 FAX: (408) 463-0888										
<b>Company:</b> Hyundai C-Tech <b>EUT Description:</b> 2 Way Portable Hand Held Radio (GMRS 7000) <b>Test Configuration:</b> EUT only <b>Type of Test:</b> FCC Part 95 <b>Mode of Operation:</b> Channel 8 (Hi Power)										
<div style="display: flex; justify-content: space-around;"> <span><input checked="" type="radio"/> A-Site</span> <span><input type="radio"/> B-Site</span> <span><input type="radio"/> C-Site</span> <span><input type="radio"/> F-Site</span> <span>6 Worst Data</span> <span>Descending</span> </div>										
Freq. (MHz)	SA Reading (dBuV)	SG Setting (dBm)	Ant Gain (dBi)	Dipole Gain (dBd)	Cable Loss (dB)	Other (dB)	Result (dBm)	Limit (dBm)	Margin (dBm)	Pol (H/V)
925.14	50.70	-20.50	0.00	0.00	1.60	0.00	-22.10	-13.00	-9.10	V
925.14	35.50	-39.00	0.00	0.00	1.60	0.00	-40.60	-13.00	-27.60	H
1387.71	53.00	-35.50	8.50	2.15	1.80	0.00	-30.95	-13.00	-17.95	V
1387.71	49.00	-35.50	8.50	2.15	1.80	0.00	-30.95	-13.00	-17.95	H
1850.28	87.50	-30.00	9.10	2.15	2.00	0.00	-25.05	-13.00	-12.05	V
1850.28	79.00	-37.50	9.10	2.15	2.00	0.00	-32.55	-13.00	-19.55	H
2312.85	87.20	-30.50	9.50	2.15	2.20	0.00	-25.35	-13.00	-12.35	V
2312.85	84.50	-33.50	9.50	2.15	2.20	0.00	-28.35	-13.00	-15.35	H
2775.42	72.50	-42.50	9.80	2.15	2.40	0.00	-37.25	-13.00	-24.25	V
2775.42	78.50	-37.50	9.80	2.15	2.40	0.00	-32.25	-13.00	-19.25	H
3237.99	75.50	-36.00	9.60	2.15	2.60	0.00	-31.15	-13.00	-18.15	V
3237.99	73.50	-37.50	9.60	2.15	2.60	0.00	-32.65	-13.00	-19.65	H
3700.56	70.00	-38.00	9.60	2.15	2.60	0.00	-33.15	-13.00	-20.15	V
3700.56	71.00	-36.00	9.60	2.15	2.60	0.00	-31.15	-13.00	-18.15	H
4163.13	67.00	-40.00	10.20	2.15	2.60	0.00	-34.55	-13.00	-21.55	V
4163.13	69.50	-37.00	10.20	2.15	2.60	0.00	-31.55	-13.00	-18.55	H
4625.70	62.50	-45.00	11.20	2.15	2.60	0.00	-38.55	-13.00	-25.55	V
4625.70	66.50	-41.50	11.20	2.15	2.60	0.00	-35.05	-13.00	-22.05	H
Total data # 18										
V.2c										

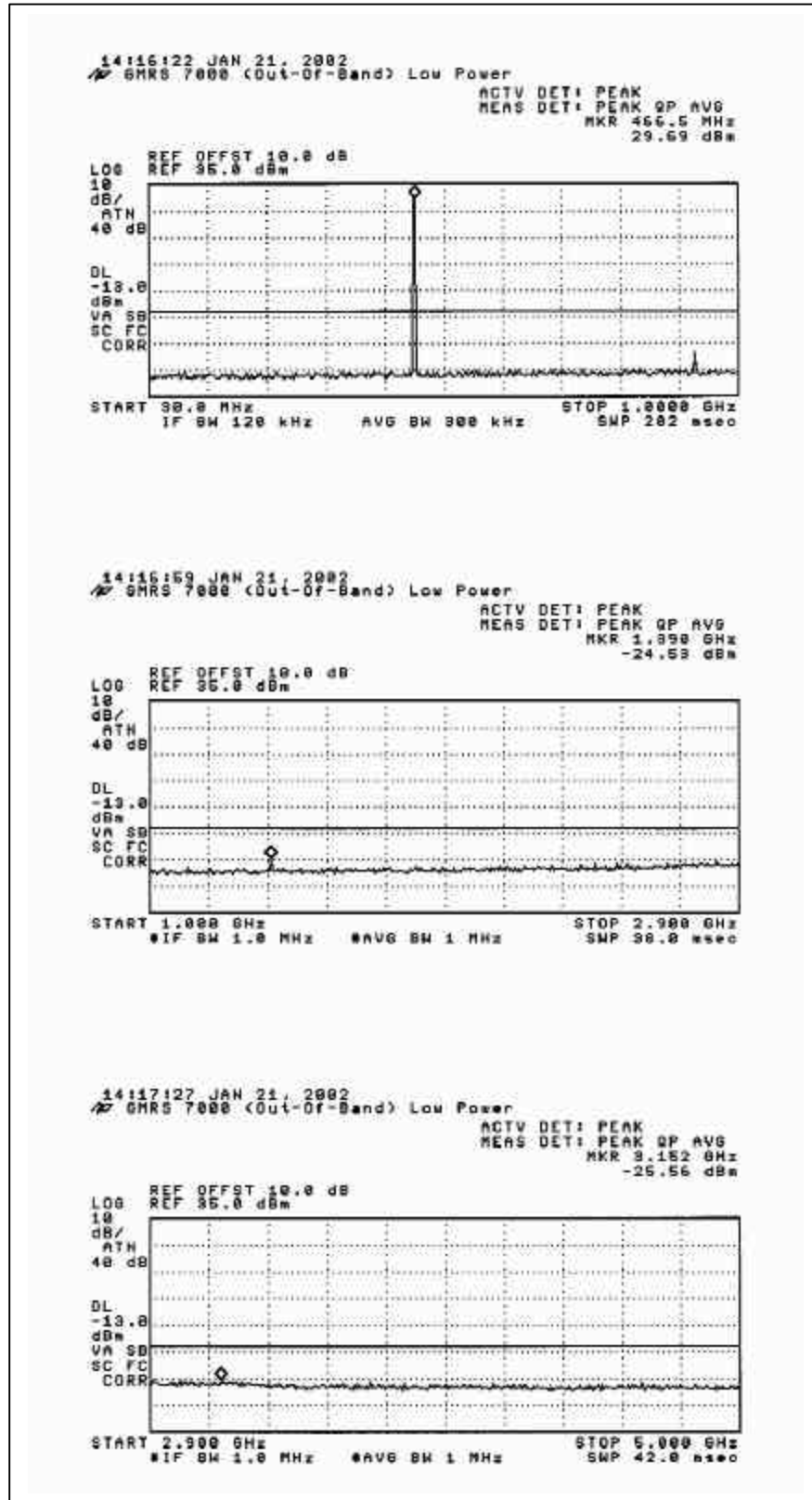


b). Low Power Channel #8:

		<b>Project #:</b> 011119-1 <b>Report #:</b> 020115B1 <b>Date &amp; Time:</b> 01/15/02 4:35 PM <b>Test Engr:</b> Thu Chan								
FCC, VCCI, CISPR, CE, AUSTEL, NZ UL, CSA, TUV, BSMI, DHHS, NVLAP										
561F MONTEREY ROAD, SAN JOSE, CA 95037-9001 PHONE: (408) 463-0885 FAX: (408) 463-0888										
<b>Company:</b> Hyundai C-Tech <b>EUT Description:</b> 2 Way Portable Hand Held Radio (GMRS 7000) <b>Test Configuration:</b> EUT only <b>Type of Test:</b> FCC Part 95 <b>Mode of Operation:</b> Channel 8 (Low Power)										
<input type="radio"/> A-Site		<input checked="" type="radio"/> B-Site								
<input type="radio"/> C-Site		<input type="radio"/> F-Site								
<input type="radio"/> 6 Worst Data		<input type="radio"/> Descending								
Freq. (MHz)	SA Reading (dBuV)	SG Setting (dBm)	Ant Gain (dBi)	Dipole Gain (dBd)	Cable Loss (dB)	Other (dB)	Result (dBm)	Limit (dBm)	Margin (dBm)	Pol (H/V)
925.14	49.20	-22.00	0.00	0.00	1.60	0.00	-23.60	-13.00	-10.60	V
925.14	38.80	-34.00	0.00	0.00	1.60	0.00	-35.60	-13.00	-22.60	H
1387.71	53.50	-35.00	8.50	2.15	1.80	0.00	-30.45	-13.00	-17.45	V
1387.71	51.00	-33.50	8.50	2.15	1.80	0.00	-28.95	-13.00	-15.95	H
1850.28	89.20	-27.50	9.10	2.15	2.00	0.00	-22.55	-13.00	-9.55	V
1850.28	84.50	-32.00	9.10	2.15	2.00	0.00	-27.05	-13.00	-14.05	H
2312.85	91.00	-27.00	9.50	2.15	2.20	0.00	-21.85	-13.00	-8.85	V
2312.85	90.00	-27.50	9.50	2.15	2.20	0.00	-22.35	-13.00	-9.35	H
2775.42	79.00	-36.00	9.80	2.15	2.40	0.00	-30.75	-13.00	-17.75	V
2775.42	80.00	-35.50	9.80	2.15	2.40	0.00	-30.25	-13.00	-17.25	H
3237.99	70.00	-41.50	9.60	2.15	2.60	0.00	-36.65	-13.00	-23.65	V
3237.99	70.50	-40.00	9.60	2.15	2.60	0.00	-35.15	-13.00	-22.15	H
3700.56	75.50	-32.50	9.60	2.15	2.60	0.00	-27.65	-13.00	-14.65	V
3700.56	81.50	-26.00	9.60	2.15	2.60	0.00	-21.15	-13.00	-8.15	H
4163.13	67.00	-40.00	10.20	2.15	2.60	0.00	-34.55	-13.00	-21.55	V
4163.13	66.00	-40.50	10.20	2.15	2.60	0.00	-35.05	-13.00	-22.05	H
4625.70	65.50	-42.00	11.20	2.15	2.60	0.00	-35.55	-13.00	-22.55	V
4625.70	70.00	-37.00	11.20	2.15	2.60	0.00	-30.55	-13.00	-17.55	H
Total data # 18										
V.2c										







## **8. FREQUENCY STABILITY MEASUREMENT**

### **8.1. PROVISIONS APPLICABLE**

- a). According to CFR 47 section 1055(a)(1), the frequency stability shall be measured with variation of ambient temperature from  $-30^{\circ}\text{C}$  to  $+50^{\circ}\text{C}$  centigrade.
- b). According to CFR 47 section 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 CFR 47 section 95.267(b), the GMRS unit must be maintained within a frequency tolerance of 0.0005%.

### **8.2. MEASUREMENT METHOD**

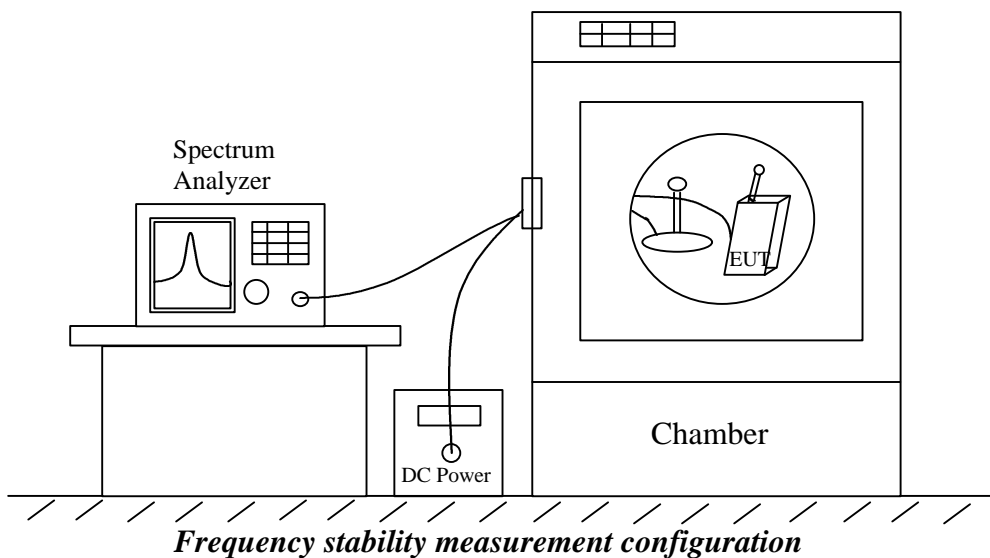
#### **8.2.1. Frequency stability versus environmental temperature**

- 1). Setup the configuration as shown below for frequencies measurement inside an environmental 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 10 KHz and Video Resolution Bandwidth to 100 KHz and Frequency Span to 100 KHz. Record this frequency as reference frequency.
- 3). Set the temperature of chamber to  $50^{\circ}\text{C}$ . 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  $10^{\circ}\text{C}$  decreased per stage until the lowest temperature  $-30^{\circ}\text{C}$  is measured, record all measured frequencies on each temperature step.

#### **8.2.2. Frequency stability versus input voltage**

- 1). Setup the configuration as shown below for frequencies measured at temperature if it is within  $15^{\circ}\text{C}$  to  $25^{\circ}\text{C}$ . Otherwise, an environmental chamber set for a temperature of  $20^{\circ}\text{C}$  shall be used. Install new battery in the EUT.
- 2). Set SA center frequency to the EUT radiated frequency. Set SA Resolution Bandwidth to 10 KHz and Video Resolution Bandwidth to 100 KHz and Frequency Span to 100 KHz. 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.





### 8.3. MEASUREMENT INSTRUMENT

EQUIPMENT	MANUFACTURE	MODEL NO.	CAL. DUE DATE
Spectrum Analyzer	HP	8593EM	6/20/02
Attenuator	MINI CIRCUITS	MCL BW-N10W5	NA
Environmental Chamber	TENNY	TEN	Internal cal before use

### 8.4. MEASUREMENT RESULT

Frequency Tolerance: 0.00028% (limit < 0.0005%)

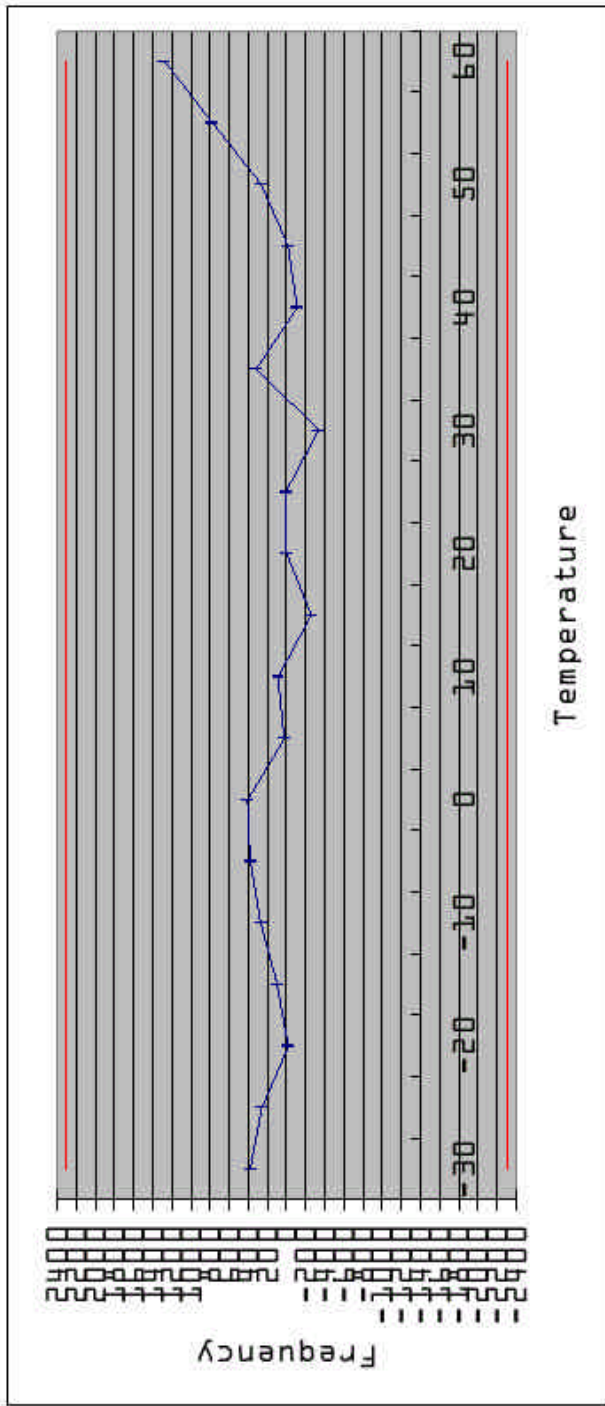
## TX Frequency over Temperature

Date: 2001. 12. 21

Model: GMRS 7000

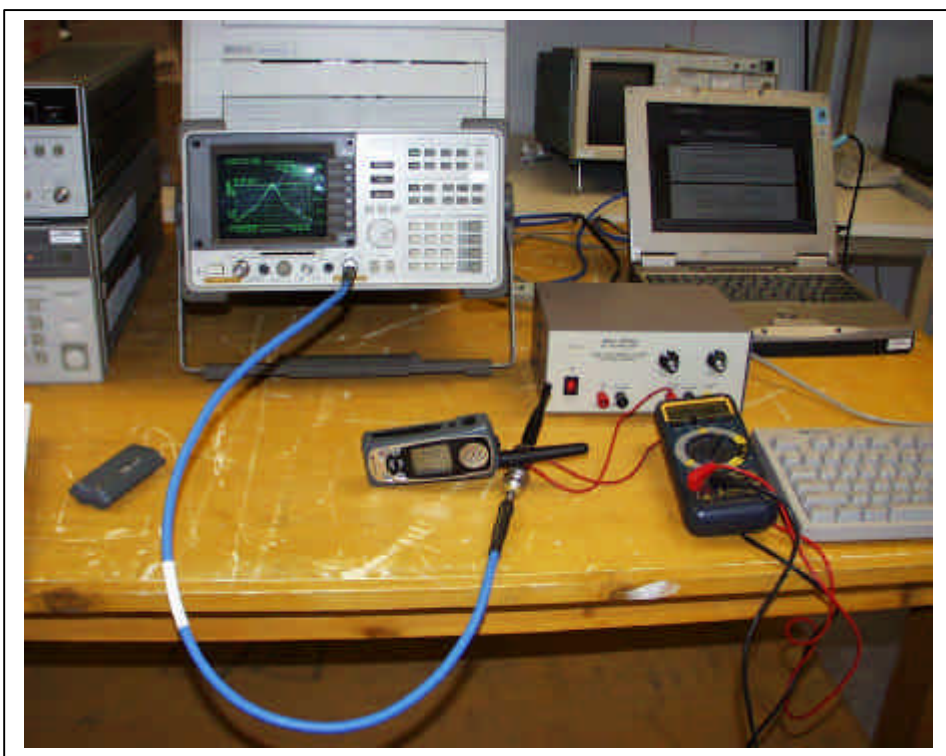
Test Frequency: 462.7125MHz (7 channel)

Frequency	382	250	-17	180	272	381	487	24	92	-257	0	14	-330	322	-110	-13	270	782	1284
Temperature(°C)	-30	-25	-20	-15	-10	-5	0	5	10	15	20	25	30	35	40	45	50	55	60
Upper Limit	2332	2332	2332	2332	2332	2332	2332	2332	2332	2332	2332	2332	2332	2332	2332	2332	2332	2332	2332
Lower Limit	-2332	-2332	-2332	-2332	-2332	-2332	-2332	-2332	-2332	-2332	-2332	-2332	-2332	-2332	-2332	-2332	-2332	-2332	-2332



b). Frequency stability versus input voltage (battery operation end point voltage is 5.4 Vdc)

Channel	Reference Frequency (MHz)	Frequency measured at end point voltage	Frequency Deviation (%)	Limit (%)
8	462.57500	462.57450	0.0001	0.0005



## 9. APPENDIX

<b>EXHIBIT 1:</b>	<b>User Manual</b>
<b>EXHIBIT 2:</b>	<b>EUT External Photos</b>
<b>EXHIBIT 3:</b>	<b>EUT Internal Photos</b>
<b>EXHIBIT 4:</b>	<b>Schematic</b>
<b>EXHIBIT 5:</b>	<b>Block Diagram</b>
<b>EXHIBIT 6:</b>	<b>Operational Description</b>
<b>EXHIBIT 7:</b>	<b>Report of Measurements</b>
<b>EXHIBIT 8:</b>	<b>Setup photo</b>
<b>EXHIBIT 9:</b>	<b>Labeling</b>