



# **FCC CFR47 PART 95 REQUIREMENT**

## **CERTIFICATION REPORT**

*FOR*

**462-467MHZ WALKIE TALKIE**

**MODEL: TC-129A, TC-129B, TC-129C**

**FCC ID: OL4APT129210619**

**REPORT NUMBER: 01C0861-1**

**ISSUE DATE: JULY 23, 2001**

*Prepared for*

**ARTPROTECH CO., LTD.**

**UNIT 8, 10F, TOWER 2, HARBOUR CENTER  
8 HOK CHEUNG ST., HUNG HOM, KOWLOON  
HONG KONG**

*Prepared by*

**COMPLIANCE CERTIFICATION SERVICES**

**561F MONTEREY ROAD,  
MORGAN HILL, CA 95037, USA  
TEL: (408) 463-0885**



**LAB CODE:200065-0**

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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: ARTPROTECH CO., LTD.  
Manufacturer: ARTPROTECH CO., LTD  
Brand Name: ARTPROTECH  
Model No/Name: TC-129A, TC-129B, TC-129C      Serial No: N/A

| ITEM | TESTING ITEM              | APPLIED SPECIFICATION | TESTING RESULTS | TESTING EQUIPMENT | REMARK |
|------|---------------------------|-----------------------|-----------------|-------------------|--------|
| 1    | Channel Frequency         | Section 95.627(a)     | Complies        | Note 1            |        |
| 2    | Type of Communication     | Section 95.193        | Complies        | Note 1            |        |
| 3    | Frequency Toleration      | Section 95.627(b)     | Complies        | Note 1            |        |
| 4    | Emission Type             | Section 95.631        | Complies        | Note 1            |        |
| 5    | Emission Bandwidth        | Section 95.633        | Complies        | Note 1            |        |
| 6    | Unwanted Emission         | Section 95.635        | Complies        | Note 1            |        |
| 7    | Modulation Standards      | Section 95.637        | Complies        | Note 1            |        |
| 8    | Maximum Transmitter Power | Section 95.639        | Complies        | Note 1            |        |
| 9    | Transmitter Antenna       | Section 95.647        | Complies        | Note 1            |        |
| 10   | Power Capability          | Section 95.649        | Complies        | 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 B FRS. 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 & Reviewed By:

Approved & Released For CCS By:

THU CHAN / EMC SENIOR ENGINEER  
COMPLIANCE CERTIFICATION SERVICES

STEVE CHENG / EMC ENGINEERING MANAGER  
COMPLIANCE RTIFICATION SERVICES

## 2. GENERAL INFORMATION

### 2.1. PRODUCT DESCRIPTION

- a). Type of EUT: 462-267MHz Walkie Talkie
- b). Trade Name: N/A
- c). Model No: TC-1269A, TC-129B, TC129C
- d). FCC ID: OL4APT129210619
- e). Working Frequency: 14 Channels within frequency band from 462.5625 ~ 467.7125 MHz.
- f). Power Supply: 4.5 Vdc

### 2.2. MEASURED CHARACTERISTICS OF EUT

- a). Communication Type: Voice/Tone only
- b). Frequency Tolerance: 0.00024% (limit < 0.00025%)
- c). Emission Type: F3E
- d). Emission Bandwidth: 10.13 KHz (limit <12.5 KHz)
- e). Unwanted Radiation:
  - 1). At least: 45dB (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: 55dB (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: -15dBm (limit  $43+10 \log_{10}(TP)$  dB) on any frequency removed from the center of the authorized bandwidth by more than 250%.
- f). Peak Frequency Deviation: 1.836 KHz at 0dB reference (limit <  $\pm 2.5$  KHz)
- g). Audio Frequency Response: 2.6KHz (limit < 3.125 KHz)
- h). Maximum Transmitter Power: 0.014 W (limit < 0.5W)
- i). Antenna Type: Fixed wipe antenna solder to the EUT
- j). Output power Modification: Fixed can't be change
- k). Operating Frequency Range and Channels  
Frequency Range: 462.5625 ~ 467.7125 MHz  
Total 14 channels

|           |              |          |              |
|-----------|--------------|----------|--------------|
| CH 01---- | 462.5625 MHz | CH08---- | 467.5625 MHz |
| CH 02---- | 462.5875 MHz | CH09---- | 467.5875 MHz |
| CH 03---- | 462.6125 MHz | CH10---- | 467.6125 MHz |
| CH 04---- | 462.6375 MHz | CH11---- | 467.6375 MHz |
| CH 05---- | 462.6625 MHz | CH12---- | 467.6625 MHz |
| CH 06---- | 462.6875 MHz | CH13---- | 467.6875 MHz |
| CH 07---- | 462.7125 MHz | CH14---- | 467.7125 MHz |
- l). Effective distance: Nominal 2 miles, with 250mW power output.
- m). Battery Endpoint: 3.8 Vdc

### **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 95.193 – Communication Type shall be Voice/Tone only
- b). Section 95.627(b) – Frequency Tolerance less than 0.00025%
- c). Section 95.631 – Emission Type shall be F3E
- d). Section 95.633 – Emission Bandwidth shall less than 12.5 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  $43 + 10 \log_{10} (TP)$  (TP) 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  $\pm 2.5$  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  $t_2$ , and frequency shift  $< 12.5$  KHz in  $t_3$ .

#### 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 95.639(d), the output power shall not exceed 500 milliwatts (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 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 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.

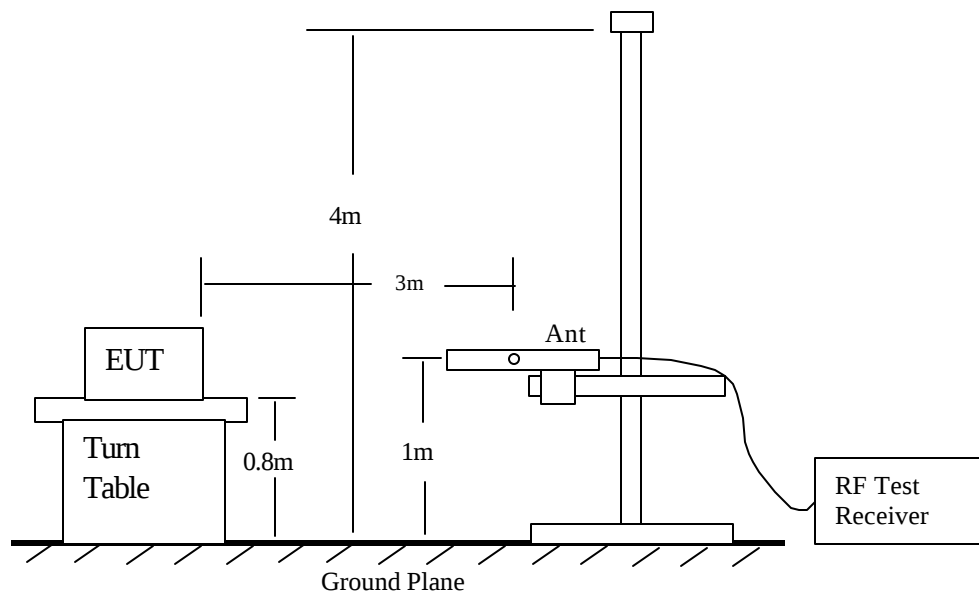


Figure 1: Radiated Emission Measurement 30 to 1000 MHz

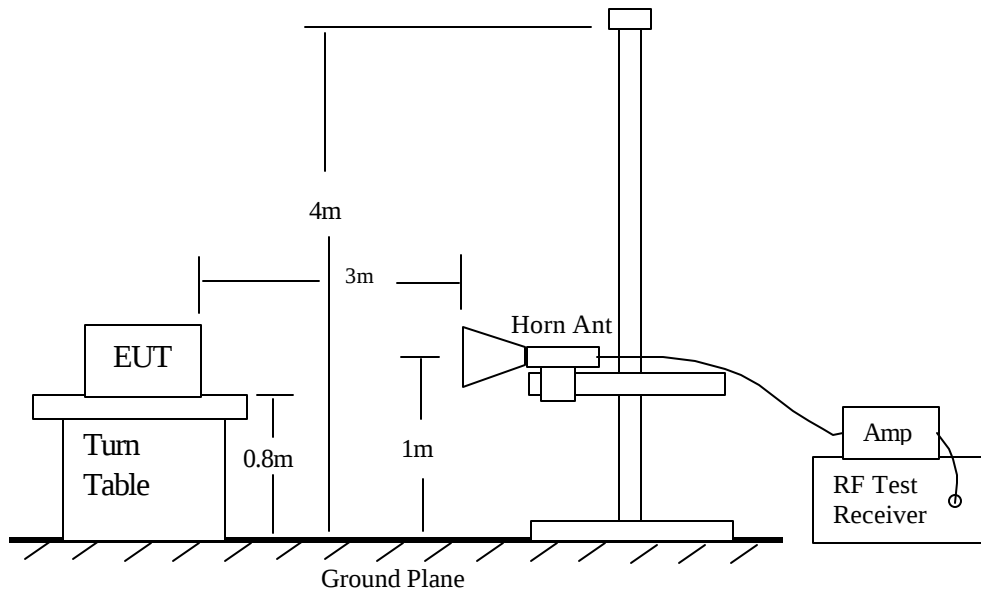


Figure 2: Radiated Emission Above 1000 MHz

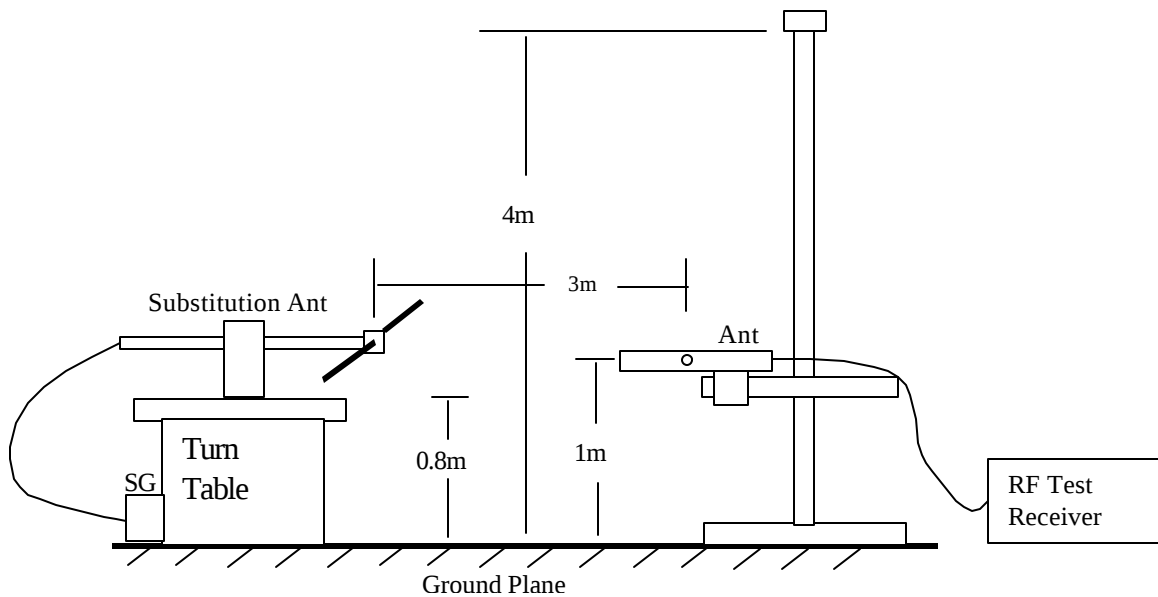


Figure 3: Radiated Emission – Substitution Method setup

**Setup Photos:**



#### 4.3. OUTPUT POWER TEST EQUIPMENT

| EQUIPMENT                 | MANUFACTURE          | MODEL NO.  | CAL. DUE DATE |
|---------------------------|----------------------|------------|---------------|
| Spectrum Analyzer         | HP                   | 8593EM     | 06/20/02      |
| Bilog Antenna             | CHASE EMC LTD        | CBL6112    | 11/23/01      |
| Dipole Antenna            | COMPLIANCE<br>DESIGN | ROBERTS    | 5/5/02        |
| Audio Signal<br>Generator | HP                   | 3325A      | 9/26/01       |
| Modulation Analyzer       | HP                   | 8901B      | 05/30/02      |
| Amplifier                 | MITEQ                | NSP2600-44 | 4/12/02       |
|                           |                      |            |               |

#### 4.4. MEASUREMENT RESULT

| Channel | Frequency<br>(MHz) | SA<br>Reading<br>(dBuV) | SG<br>Reading<br>(dBm) | Cable<br>Loss<br>(dB) | Gain<br>(dBd) | Result<br>(dBm) | Limit<br>(dBm) | Margin<br>dB |
|---------|--------------------|-------------------------|------------------------|-----------------------|---------------|-----------------|----------------|--------------|
| 1       | 462.5625           | 88.7                    | 12.00                  | .45                   | 0             | 11.55           | 27             | -15.45       |
| 2       | 462.5875           | 88.7                    | 12.00                  | .45                   | 0             | 11.55           | 27             | -15.45       |
| 3       | 462.6125           | 88.7                    | 12.00                  | .45                   | 0             | 11.55           | 27             | -15.45       |
| 4       | 462.6375           | 88.7                    | 12.00                  | .45                   | 0             | 11.55           | 27             | -15.45       |
| 5       | 462.6625           | 88.7                    | 12.00                  | .45                   | 0             | 11.55           | 27             | -15.45       |
| 6       | 462.6875           | 88.7                    | 12.00                  | .45                   | 0             | 11.55           | 27             | -15.45       |
| 7       | 462.7125           | 88.7                    | 12.00                  | .45                   | 0             | 11.55           | 27             | -15.45       |
| 8       | 467.5625           | 88.7                    | 12.00                  | .45                   | 0             | 11.55           | 27             | -15.45       |
| 9       | 467.5875           | 88.7                    | 12.00                  | .45                   | 0             | 11.55           | 27             | -15.45       |
| 10      | 467.6125           | 88.7                    | 12.00                  | .45                   | 0             | 11.55           | 27             | -15.45       |
| 11      | 467.6375           | 88.7                    | 12.00                  | .45                   | 0             | 11.55           | 27             | -15.45       |
| 12      | 467.6625           | 88.7                    | 12.00                  | .45                   | 0             | 11.55           | 27             | -15.45       |
| 13      | 467.6875           | 88.7                    | 12.00                  | .45                   | 0             | 11.55           | 27             | -15.45       |
| 14      | 467.7125           | 88.7                    | 12.00                  | .45                   | 0             | 11.55           | 27             | -15.45       |

**Maximum Output Power (ERP): 11.55dBm = 0.014 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 FRS unit that transmits emission type F3E must not exceed a peak frequency deviation of  $\pm 2.5\text{KHz}$ , and the audio frequency response shall not exceed 3.125 KHz.

### 5.2. MEASUREMENT METHOD

#### 5.2.1. Modulation Limit

- 1). Configure the EUT as shown in figure 4, 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 in figure 4.
- 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 =  $20 \log_{10} (\text{Deviation of test frequency} / \text{Deviation of 1KHz reference})$ .

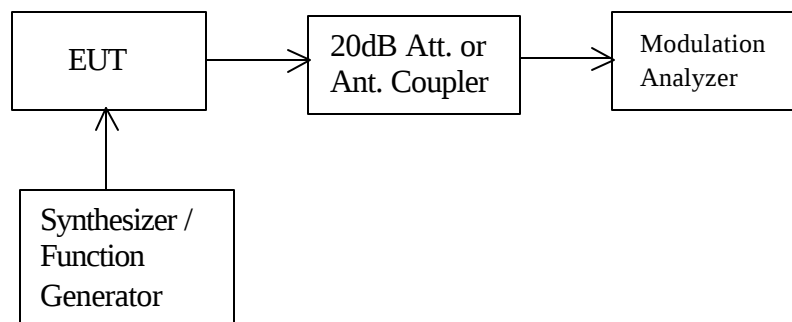
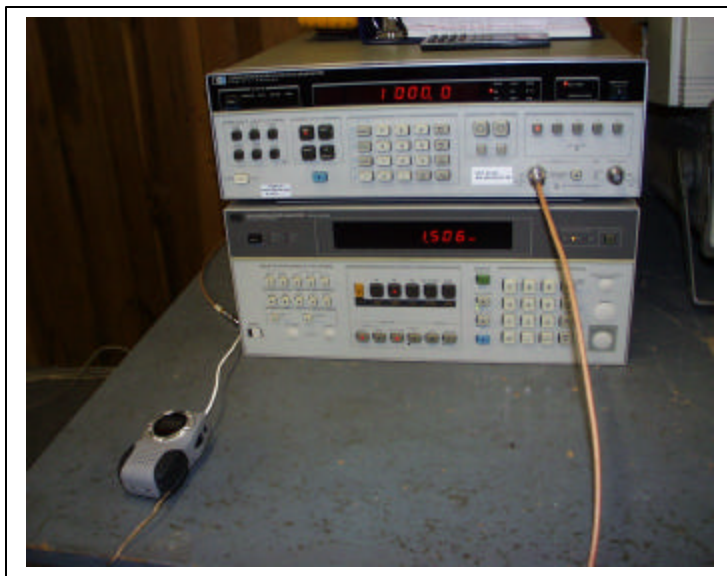


Figure 4: Modulation characteristic measurement configuration

**Setup Photos:**



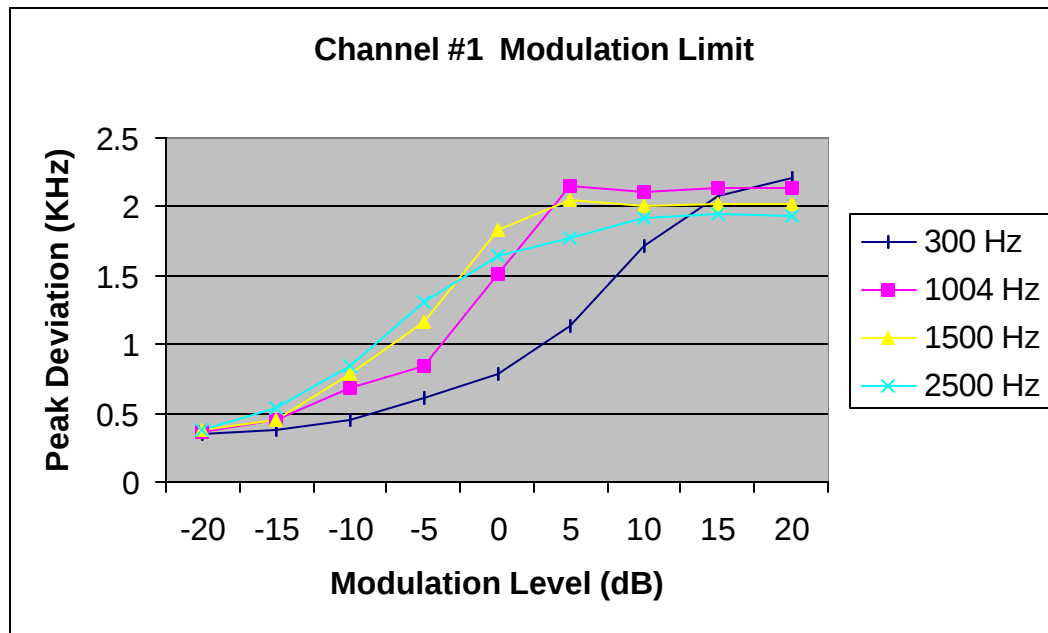
**5.3. MEASUREMENT INSTRUMENT**

| EQUIPMENT              | MANUFACTURE   | MODEL NO.    | CAL. DUE DATE |
|------------------------|---------------|--------------|---------------|
| Audio Signal Generator | HP            | 3325A        | 9/26/01       |
| Modulation Analyzer    | HP            | 8901B        | 05/30/02      |
| Attenuator             | MINI CIRCUITS | MCL BW-S20W2 | N/A           |

**5.4. MEASUREMENT RESULT**

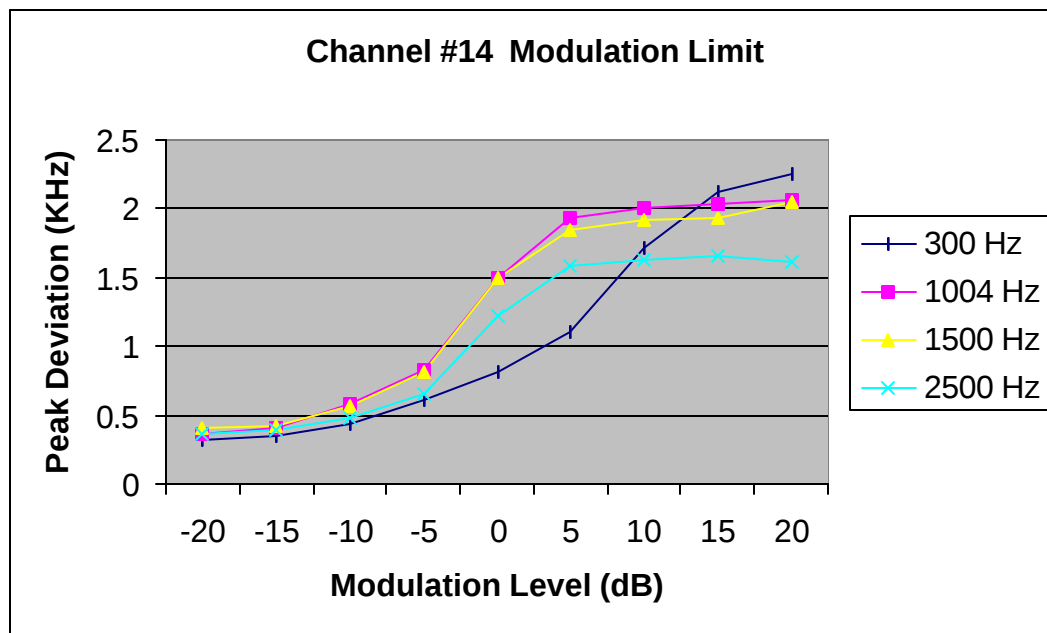
a). Modulation Limit: Channel #1 – 462.5625 MHz

| 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                                | 0.690                                 | 0.787                                 | 0.839                                 |
| -5                    | 0.607                                | 0.850                                 | 1.157                                 | 1.314                                 |
| 0                     | 0.785                                | 1.505                                 | 1.836                                 | 1.641                                 |
| +5                    | 1.128                                | 2.147                                 | 2.044                                 | 1.770                                 |
| +10                   | 1.710                                | 2.103                                 | 2.006                                 | 1.914                                 |
| +15                   | 2.080                                | 2.135                                 | 2.017                                 | 1.951                                 |
| +20                   | 2.210                                | 2.141                                 | 2.025                                 | 1.930                                 |



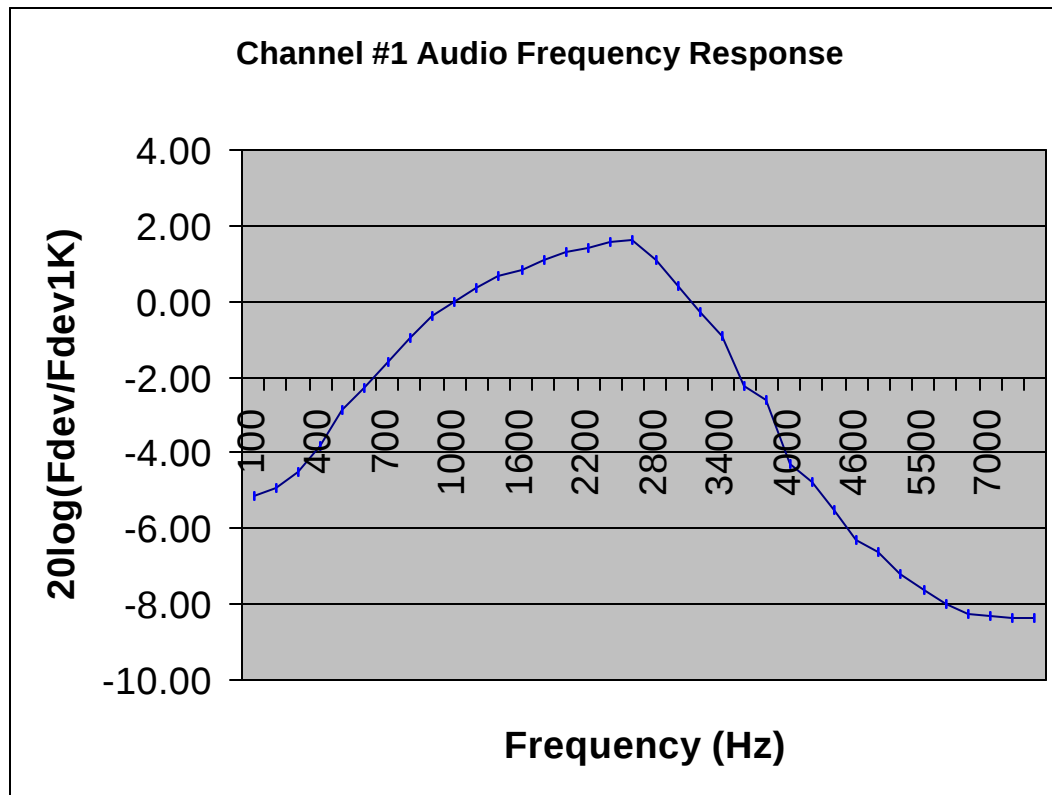
b). Modulation Limit: Channel #14 – 467.7125 MHz

| 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                    | 0.615                                | 0.831                                 | 0.821                                 | 0.648                                 |
| 0                     | 0.815                                | 1.502                                 | 1.498                                 | 1.218                                 |
| +5                    | 1.101                                | 1.926                                 | 1.853                                 | 1.582                                 |
| +10                   | 1.720                                | 2.011                                 | 1.914                                 | 1.628                                 |
| +15                   | 2.118                                | 2.029                                 | 1.936                                 | 1.651                                 |
| +20                   | 2.250                                | 2.066                                 | 2.048                                 | 1.614                                 |



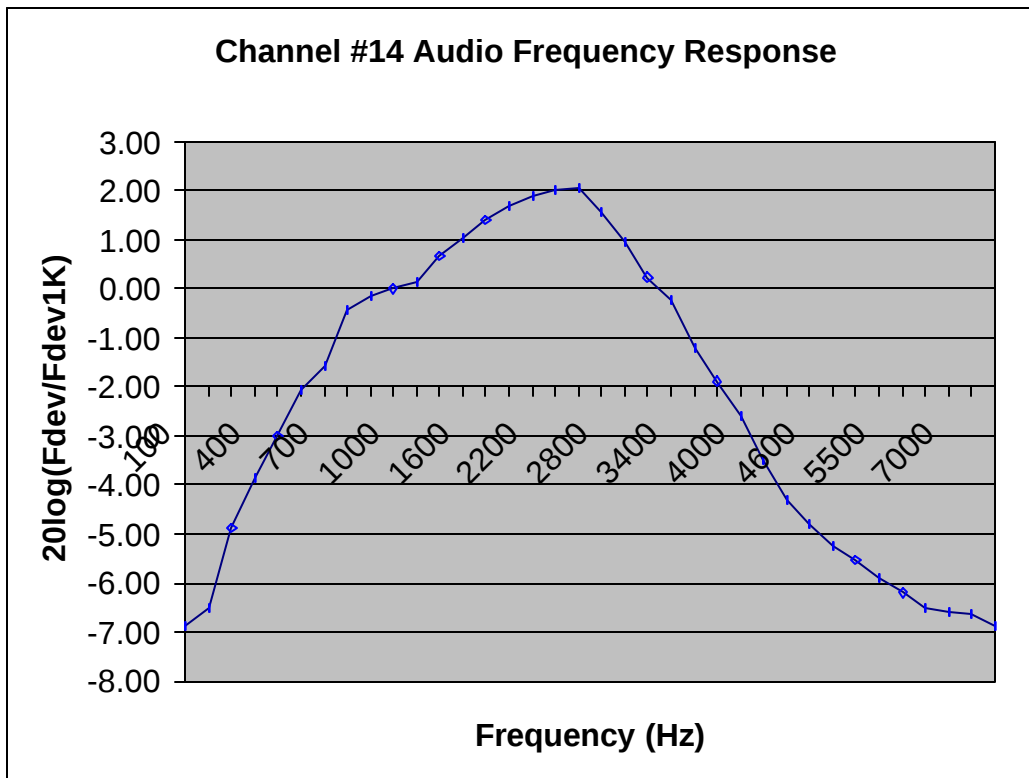
| Frequency (Hz) | Deviation (KHz) |
|----------------|-----------------|
| 100            | 0.34            |
| 200            | 0.35            |
| 300            | 0.37            |
| 400            | 0.40            |
| 500            | 0.44            |
| 600            | 0.47            |
| 700            | 0.51            |
| 800            | 0.55            |
| 900            | 0.59            |
| 1000           | 0.61            |
| 1200           | 0.64            |
| 1400           | 0.67            |
| 1600           | 0.68            |
| 1800           | 0.70            |
| 2000           | 0.71            |
| 2200           | 0.72            |
| 2400           | 0.74            |
| 2600           | 0.74            |
| 2800           | 0.70            |
| 3000           | 0.65            |
| 3200           | 0.60            |
| 3400           | 0.55            |
| 3600           | 0.48            |
| 3800           | 0.46            |
| 4000           | 0.38            |
| 4200           | 0.36            |
| 4400           | 0.33            |
| 4600           | 0.30            |
| 4800           | 0.29            |
| 5000           | 0.27            |
| 5500           | 0.26            |
| 6000           | 0.25            |
| 6500           | 0.24            |
| 7000           | 0.24            |
| 8500           | 0.23            |
| 10000          | 0.23            |

c). Audio Frequency Response: Channel #1 – 462.5625 MHz



d). 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            | 0.44            |
| 600            | 0.49            |
| 700            | 0.51            |
| 800            | 0.59            |
| 900            | 0.61            |
| 1000           | 0.62            |
| 1200           | 0.63            |
| 1400           | 0.67            |
| 1600           | 0.69            |
| 1800           | 0.72            |
| 2000           | 0.75            |
| 2200           | 0.77            |
| 2400           | 0.78            |
| 2600           | 0.78            |
| 2800           | 0.74            |
| 3000           | 0.69            |
| 3200           | 0.63            |
| 3400           | 0.60            |
| 3600           | 0.54            |
| 3800           | 0.50            |
| 4000           | 0.46            |
| 4200           | 0.41            |
| 4400           | 0.37            |
| 4600           | 0.35            |
| 4800           | 0.34            |
| 5000           | 0.33            |
| 5500           | 0.31            |
| 6000           | 0.30            |
| 6500           | 0.29            |
| 7000           | 0.29            |
| 8500           | 0.29            |
| 10000          | 0.28            |



## 6. EMISSION BANDWIDTH

### 6.1. PROVISIONS APPLICABLE

According to CFR 47 section 95.633(3), the authorized bandwidth for emission type FRS unit is 12.5 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 in the following Figure (5).

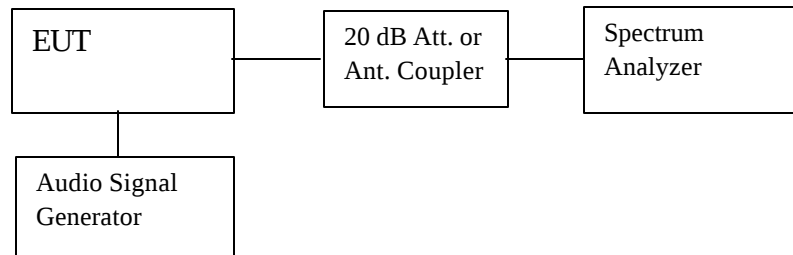


Figure 5: Emission Bandwidth measurement configuration

- 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.

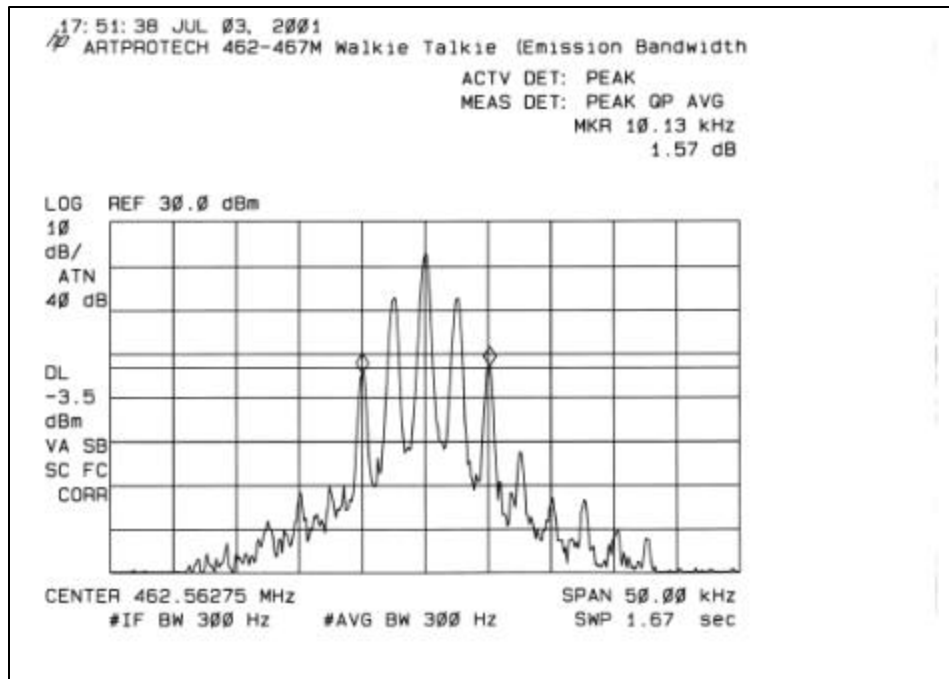
### 6.3. MEASUREMENT INSTRUMENT

| EQUIPMENT              | MANUFACTURE   | MODEL NO.    | CAL. DUE DATE |
|------------------------|---------------|--------------|---------------|
| Spectrum Analyzer      | HP            | 8566B        | 6/28/02       |
| Attenuator             | MINI CIRCUITS | MCL BW-S20W2 | NA            |
| Audio Signal Generator | HP            | 3325A        | 9/26/01       |

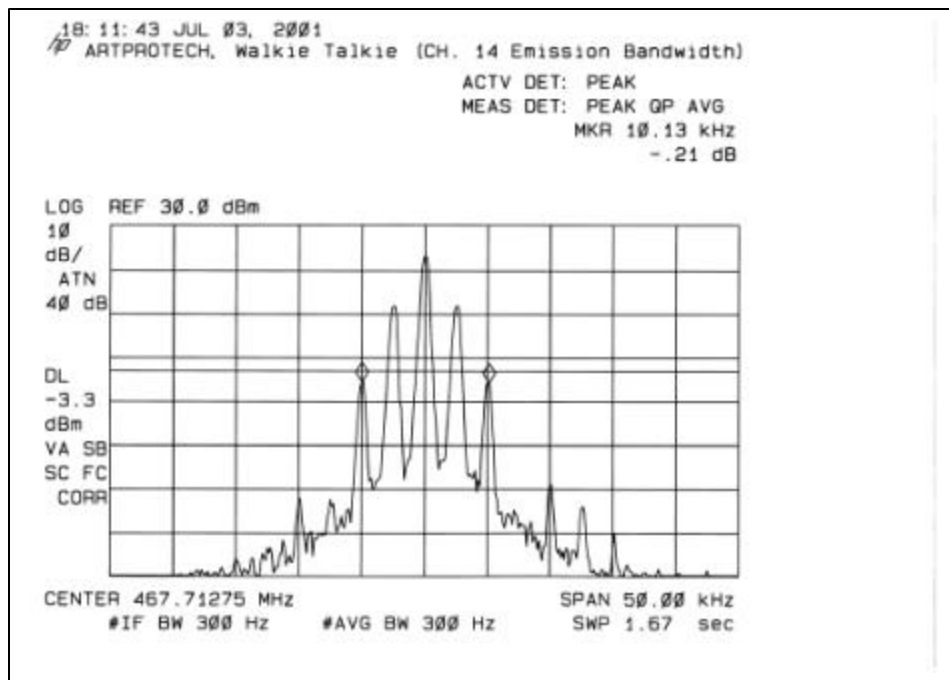
### 6.4. MEASUREMENT RESULT

**The Occupied Bandwidth is measured 10.13 KHz.**

### Channel 1



### Channel 14



## **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 the measuring receiver detects a maximum signal level.
- 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 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.

**--- 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        | 06/20/02      |
| Audio Signal Generator | HP                | 3325A         | 9/26/01       |
| Modulation Analyzer    | HP                | 8901B         | 5/30/02       |
| Amplifier              | MITEQ             | NSP2600-44    | 04/12/02      |
| Bilog Antenna          | CHASE EMC LTD     | CBL6112       | 11/23/02      |
| Horn Antenna           | EMCO              | 3115 SN: 2238 | 06/20/02      |
| Horn Antenna           | EMCO              | 3115 SN: 3245 | 06/20/02      |
| Dipole Antenna         | COMPLIANCE DESIGN | ROBERTS       | 05/05/02      |

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           |

## 7.4 MEASUREMENT RESULT

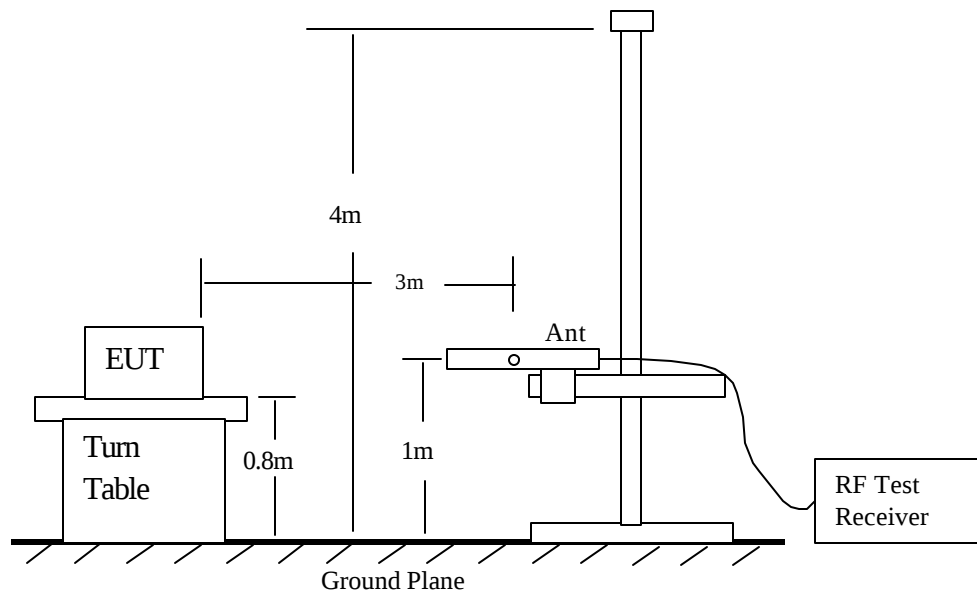


Figure 6: Radiated Emission Measurement 30 to 1000 MHz

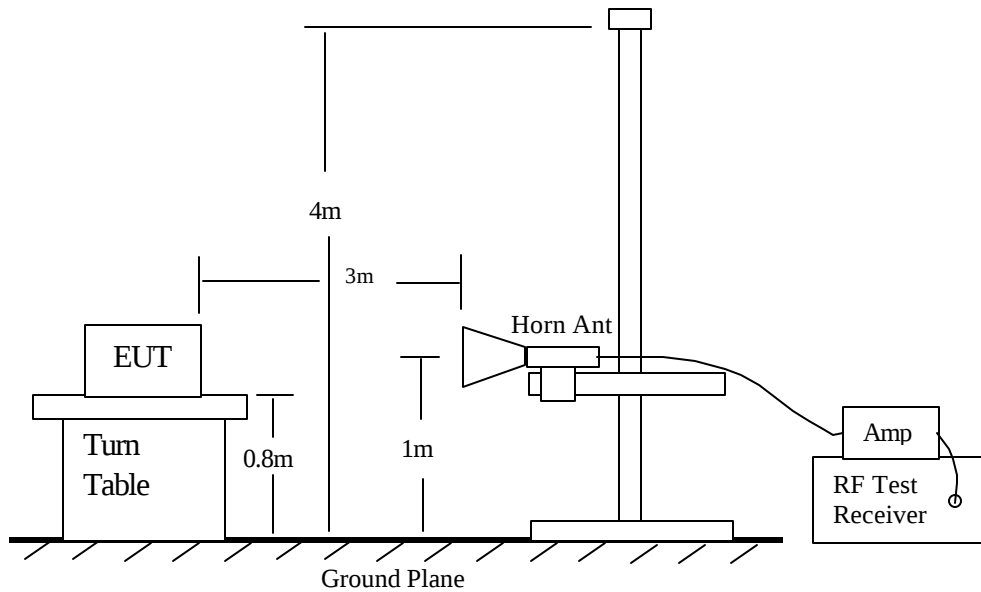


Figure 7: Radiated Emission Above 1000 MHz

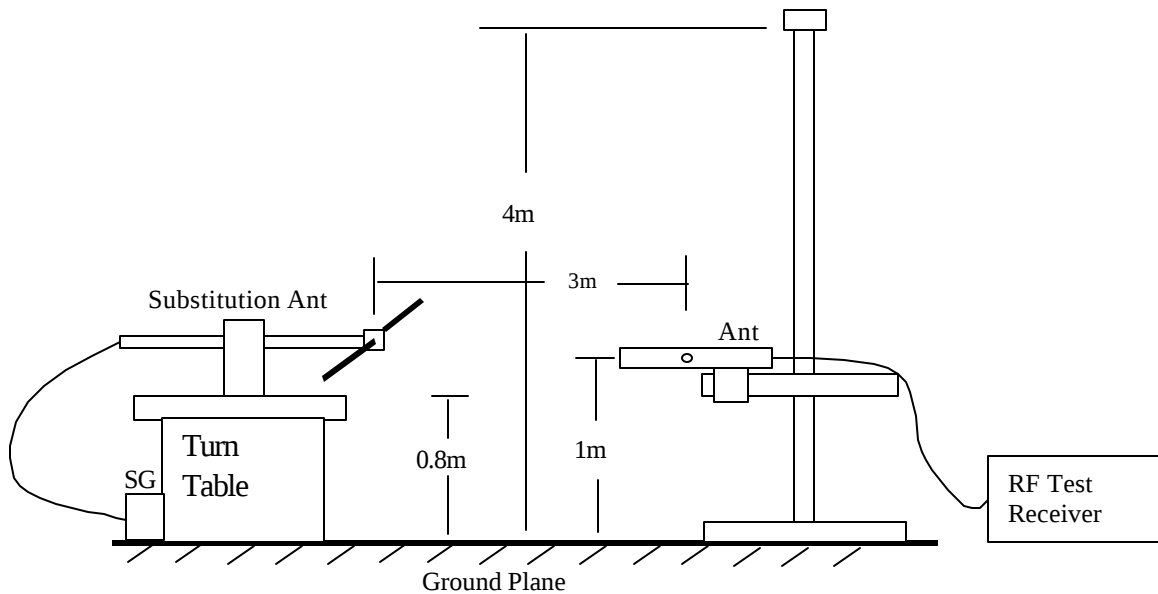
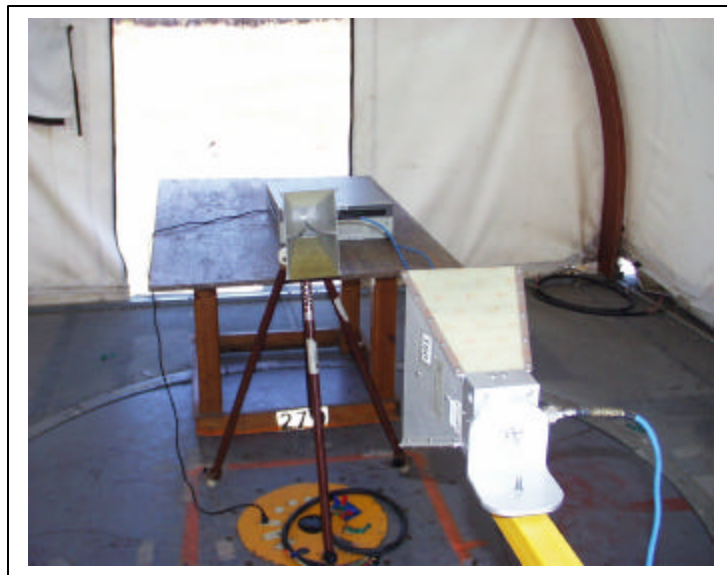


Figure 8: Radiated Emission – Substitution Method setup

**Setup Photos:**





a). Channel-1: 462.5625 MHz

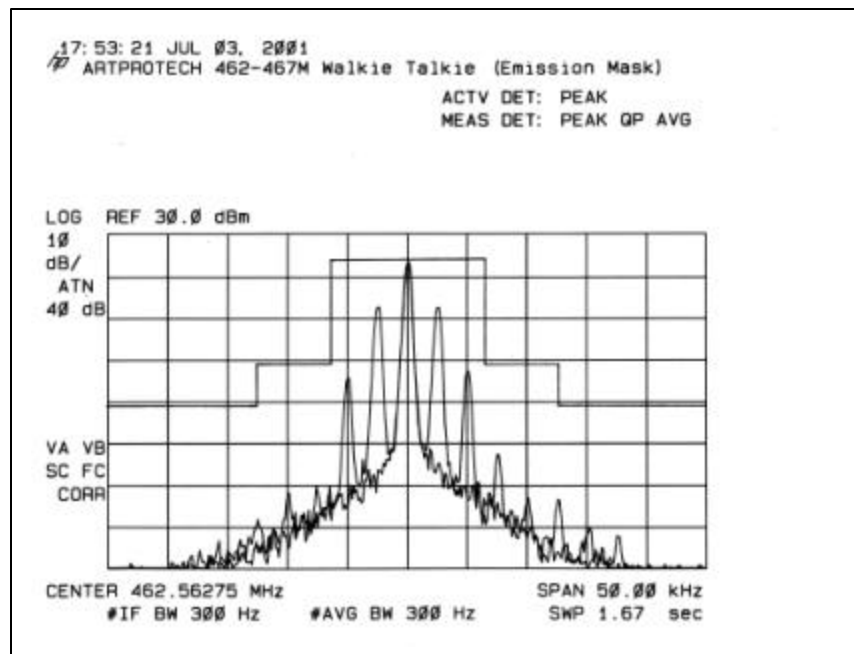
|                                                                                                                                     |                         |                        |                      | <b>Project #:</b> 01C0861-1<br><b>Report #:</b> 010702A1<br><b>Date &amp; Time:</b> 07/02/01 9:33 AM<br><b>Test Engr:</b> Hue Vang |                       |               |                 |                |                 |              |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|------------------------|----------------------|------------------------------------------------------------------------------------------------------------------------------------|-----------------------|---------------|-----------------|----------------|-----------------|--------------|
| FCC, VCCI, CISPR, CE, AUSTEL, NZ<br>UL, CSA, TUV, BSMI, DHHS, NVLAP<br>561F MONTEREY ROAD, SAN JOSE, CA 95037-9001<br>PHONE: (408) 463-0885 FAX: (408) 463-0888                                                      |                         |                        |                      |                                                                                                                                    |                       |               |                 |                |                 |              |
| <b>Company:</b> Artprotech<br><b>EUT Description:</b> Walkie Talkie<br><b>Test Configuration:</b> EUT only<br><b>Type of Test:</b> FCC 95<br><b>Mode of Operation:</b> Channel 1                                     |                         |                        |                      |                                                                                                                                    |                       |               |                 |                |                 |              |
| <input checked="" type="radio"/> A-Site <input type="radio"/> B-Site <input type="radio"/> C-Site <input type="radio"/> F-Site <input type="button" value="6 Worst Data"/> <input type="button" value="Descending"/> |                         |                        |                      |                                                                                                                                    |                       |               |                 |                |                 |              |
| Freq.<br>(MHz)                                                                                                                                                                                                       | SA<br>Reading<br>(dBuV) | SG<br>Setting<br>(dBm) | Ant<br>Gain<br>(dBi) | Dipole<br>Gain<br>(dBd)                                                                                                            | Cable<br>Loss<br>(dB) | Other<br>(dB) | Result<br>(dBm) | Limit<br>(dBm) | Margin<br>(dBm) | Pol<br>(H/V) |
| 462.56                                                                                                                                                                                                               | 88.70                   | 12.00                  | 0.00                 | 0.00                                                                                                                               | 0.52                  | 0.00          | 11.48           | 27.00          | -15.52          | V            |
| 462.56                                                                                                                                                                                                               | 71.70                   | -6.00                  | 0.00                 | 0.00                                                                                                                               | 0.52                  | 0.00          | -6.52           | 27.00          | -33.52          | H            |
| 925.13                                                                                                                                                                                                               | 71.50                   | -26.00                 | 8.30                 | 2.70                                                                                                                               | 1.60                  | 0.00          | -22.00          | -13.00         | -9.00           | V            |
| 925.13                                                                                                                                                                                                               | 52.00                   | -48.00                 | 8.30                 | 2.70                                                                                                                               | 1.60                  | 0.00          | -44.00          | -13.00         | -31.00          | H            |
| 1387.69                                                                                                                                                                                                              | 67.52                   | -46.67                 | 9.00                 | 3.00                                                                                                                               | 1.80                  | 0.00          | -42.47          | -13.00         | -29.47          | V            |
| 1387.69                                                                                                                                                                                                              | 61.10                   | -55.00                 | 9.00                 | 3.00                                                                                                                               | 1.80                  | 0.00          | -50.80          | -13.00         | -37.80          | H            |
| 1850.25                                                                                                                                                                                                              | 63.02                   | -52.00                 | 9.10                 | 3.75                                                                                                                               | 2.00                  | 0.00          | -48.65          | -13.00         | -35.65          | V            |
| 1850.25                                                                                                                                                                                                              | 59.90                   | -60.00                 | 9.10                 | 3.75                                                                                                                               | 2.00                  | 0.00          | -56.65          | -13.00         | -43.65          | H            |
| 2312.81                                                                                                                                                                                                              | 66.43                   | -46.00                 | 9.70                 | 4.35                                                                                                                               | 2.20                  | 0.00          | -42.85          | -13.00         | -29.85          | V            |
| 2312.81                                                                                                                                                                                                              | 59.81                   | -53.90                 | 9.70                 | 4.35                                                                                                                               | 2.20                  | 0.00          | -50.75          | -13.00         | -37.75          | H            |
| 2775.38                                                                                                                                                                                                              | 61.91                   | -53.00                 | 9.90                 | 4.95                                                                                                                               | 2.40                  | 0.00          | -50.45          | -13.00         | -37.45          | V            |
| 2775.38                                                                                                                                                                                                              | 47.68                   | -70.50                 | 9.90                 | 4.95                                                                                                                               | 2.40                  | 0.00          | -67.95          | -13.00         | -54.95          | H            |
| 3237.94                                                                                                                                                                                                              | 64.09                   | -50.00                 | 9.60                 | 5.40                                                                                                                               | 2.60                  | 0.00          | -48.40          | -13.00         | -35.40          | V            |
| 3237.94                                                                                                                                                                                                              | 52.30                   | -56.50                 | 9.60                 | 5.40                                                                                                                               | 2.60                  | 0.00          | -54.90          | -13.00         | -41.90          | H            |
| 3700.50                                                                                                                                                                                                              | 65.40                   | -48.00                 | 9.60                 | 5.70                                                                                                                               | 2.60                  | 0.00          | -46.70          | -13.00         | -33.70          | V            |
| 3700.50                                                                                                                                                                                                              | 56.90                   | -51.00                 | 9.60                 | 5.70                                                                                                                               | 2.60                  | 0.00          | -49.70          | -13.00         | -36.70          | H            |
| 4163.06                                                                                                                                                                                                              | 52.84                   | -53.50                 | 9.80                 | 6.00                                                                                                                               | 2.60                  | 0.00          | -52.30          | -13.00         | -39.30          | V            |
| 4163.06                                                                                                                                                                                                              | 44.22                   | -70.00                 | 9.80                 | 6.00                                                                                                                               | 2.60                  | 0.00          | -68.80          | -13.00         | -55.80          | H            |
| 4625.63                                                                                                                                                                                                              | 52.85                   | -55.00                 | 11.20                | 6.30                                                                                                                               | 2.60                  | 0.00          | -52.70          | -13.00         | -39.70          | V            |
| 4625.63                                                                                                                                                                                                              | 50.64                   | -60.00                 | 11.20                | 6.30                                                                                                                               | 2.60                  | 0.00          | -57.70          | -13.00         | -44.70          | H            |

Total data #: 20  
V.2c

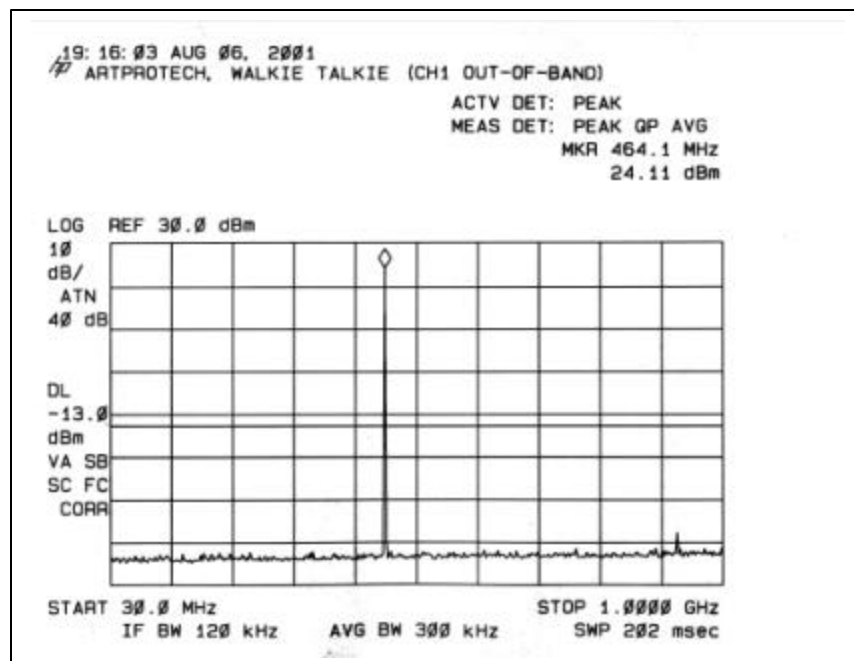
b). Channel-14: 467.7125 MHz

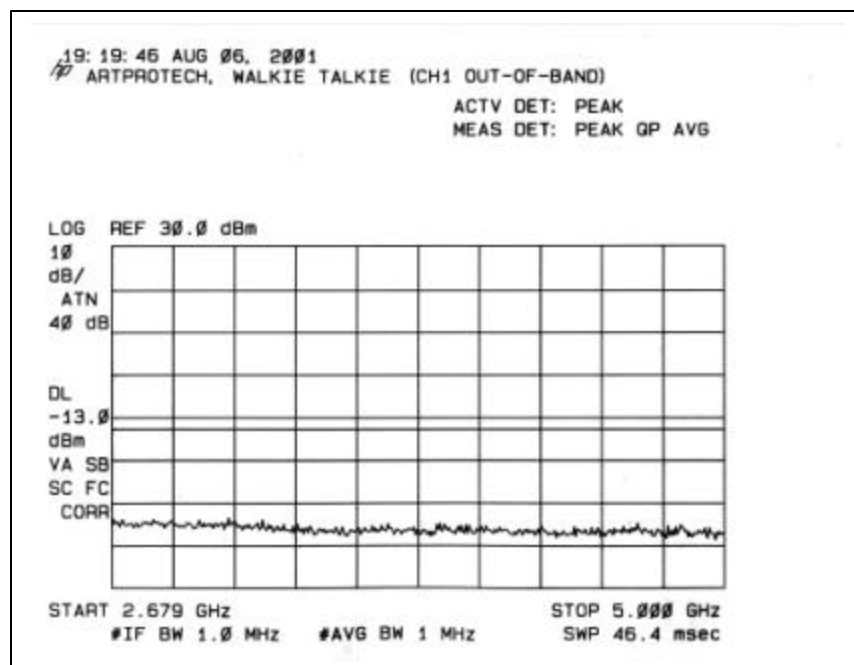
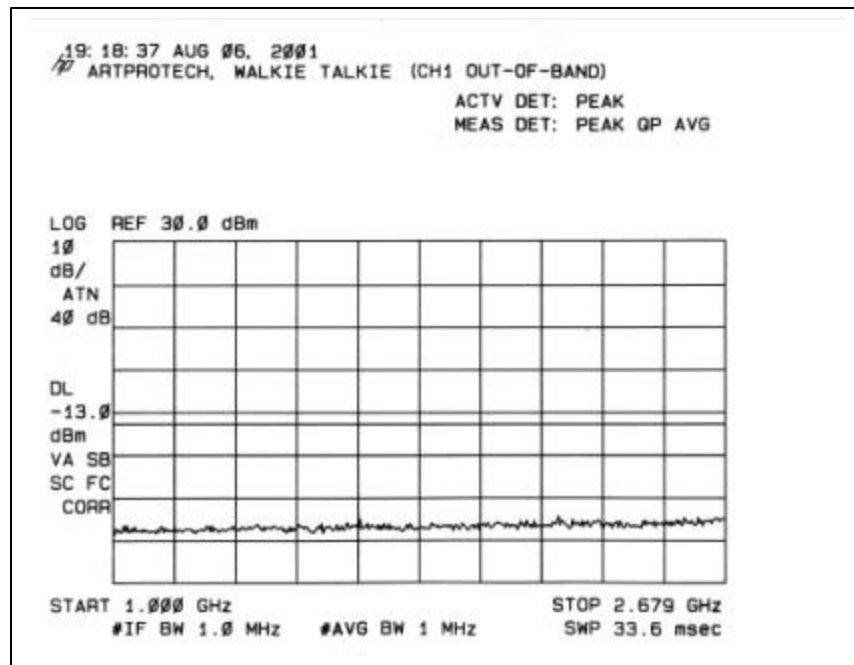
|                                                                                                             |                         |                                                                                        |                      | <p><i>Project #:</i> 01C0861-1</p> <p><i>Report #:</i> 010702A1</p> <p><i>Date &amp; Time:</i> 07/02/01 9:33 AM</p> <p><i>Test Engr:</i> Hue Vang</p> |                       |               |                 |                |                 |              |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|----------------------------------------------------------------------------------------|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|---------------|-----------------|----------------|-----------------|--------------|
| FCC, VCCI, CISPR, CE, AUSTEL, NZ<br>UL, CSA, TUV, BSMI, DHHS, NVLAP                                                                                                                          |                         |                                                                                        |                      |                                                                                                                                                       |                       |               |                 |                |                 |              |
| 561F MONTEREY ROAD, SAN JOSE, CA 95037-9001<br>PHONE: (408) 463-0885 FAX: (408) 463-0888                                                                                                     |                         |                                                                                        |                      |                                                                                                                                                       |                       |               |                 |                |                 |              |
| <p><i>Company:</i></p> <p><i>EUT Description:</i></p> <p><i>Test Configuration:</i></p> <p><i>Type of Test:</i></p> <p><i>Mode of Operation:</i></p>                                         |                         | <p>Artprotech</p> <p>Walkie Talkie</p> <p>EUT only</p> <p>FCC 95</p> <p>Channel 14</p> |                      |                                                                                                                                                       |                       |               |                 |                |                 |              |
| <input checked="" type="radio"/> A-Site <input type="radio"/> B-Site <input type="radio"/> C-Site <input type="radio"/> F-Site                    6 Worst Data                    Descending |                         |                                                                                        |                      |                                                                                                                                                       |                       |               |                 |                |                 |              |
| Freq.<br>(MHz)                                                                                                                                                                               | SA<br>Reading<br>(dBuV) | SG<br>Setting<br>(dBm)                                                                 | Ant<br>Gain<br>(dBi) | Dipole<br>Gain<br>(dBd)                                                                                                                               | Cable<br>Loss<br>(dB) | Other<br>(dB) | Result<br>(dBm) | Limit<br>(dBm) | Margin<br>(dBm) | Pol<br>(H/V) |
| 467.71                                                                                                                                                                                       | 88.70                   | 12.00                                                                                  | 0.00                 | 0.00                                                                                                                                                  | 0.52                  | 0.00          | 11.48           | 27.00          | -15.52          | V            |
| 467.71                                                                                                                                                                                       | 71.60                   | -6.00                                                                                  | 0.00                 | 0.00                                                                                                                                                  | 0.52                  | 0.00          | -6.52           | 27.00          | -33.52          | H            |
| 935.43                                                                                                                                                                                       | 70.50                   | -26.50                                                                                 | 8.30                 | 2.70                                                                                                                                                  | 1.60                  | 0.00          | -22.50          | -13.00         | -9.50           | V            |
| 935.43                                                                                                                                                                                       | 50.20                   | -52.00                                                                                 | 8.30                 | 2.70                                                                                                                                                  | 1.60                  | 0.00          | -48.00          | -13.00         | -35.00          | H            |
| 1403.14                                                                                                                                                                                      | 57.55                   | -57.50                                                                                 | 9.00                 | 3.00                                                                                                                                                  | 1.80                  | 0.00          | -53.30          | -13.00         | -40.30          | V            |
| 1403.14                                                                                                                                                                                      | 64.19                   | -51.50                                                                                 | 9.00                 | 3.00                                                                                                                                                  | 1.80                  | 0.00          | -47.30          | -13.00         | -34.30          | H            |
| 1870.85                                                                                                                                                                                      | 57.39                   | -55.00                                                                                 | 9.10                 | 3.75                                                                                                                                                  | 2.00                  | 0.00          | -51.65          | -13.00         | -38.65          | V            |
| 1870.85                                                                                                                                                                                      | 56.43                   | -59.00                                                                                 | 9.10                 | 3.75                                                                                                                                                  | 2.00                  | 0.00          | -55.65          | -13.00         | -42.65          | H            |
| 2338.56                                                                                                                                                                                      | 53.89                   | -62.50                                                                                 | 9.70                 | 4.35                                                                                                                                                  | 2.20                  | 0.00          | -59.35          | -13.00         | -46.35          | V            |
| 2338.56                                                                                                                                                                                      | 63.79                   | -49.00                                                                                 | 9.70                 | 4.35                                                                                                                                                  | 2.20                  | 0.00          | -45.85          | -13.00         | -32.85          | H            |
| 2806.28                                                                                                                                                                                      | 56.78                   | -50.00                                                                                 | 9.90                 | 4.95                                                                                                                                                  | 2.40                  | 0.00          | -47.45          | -13.00         | -34.45          | V            |
| 2806.28                                                                                                                                                                                      | 59.00                   | -54.00                                                                                 | 9.90                 | 4.95                                                                                                                                                  | 2.40                  | 0.00          | -51.45          | -13.00         | -38.45          | H            |
| 3273.99                                                                                                                                                                                      | 52.54                   | -57.00                                                                                 | 9.60                 | 5.40                                                                                                                                                  | 2.60                  | 0.00          | -55.40          | -13.00         | -42.40          | V            |
| 3273.99                                                                                                                                                                                      | 61.33                   | -47.50                                                                                 | 9.60                 | 5.40                                                                                                                                                  | 2.60                  | 0.00          | -45.90          | -13.00         | -32.90          | H            |
| 3741.70                                                                                                                                                                                      | 49.55                   | -52.50                                                                                 | 9.60                 | 5.70                                                                                                                                                  | 2.60                  | 0.00          | -51.20          | -13.00         | -38.20          | V            |
| 3741.70                                                                                                                                                                                      | 52.62                   | -55.00                                                                                 | 9.60                 | 5.70                                                                                                                                                  | 2.60                  | 0.00          | -53.70          | -13.00         | -40.70          | H            |
| 4209.41                                                                                                                                                                                      | 45.06                   | -65.00                                                                                 | 9.80                 | 6.00                                                                                                                                                  | 2.60                  | 0.00          | -63.80          | -13.00         | -50.80          | V            |
| 4209.41                                                                                                                                                                                      | 50.28                   | -57.50                                                                                 | 9.80                 | 6.00                                                                                                                                                  | 2.60                  | 0.00          | -56.30          | -13.00         | -43.30          | H            |
| 4677.13                                                                                                                                                                                      | 45.00                   | -64.00                                                                                 | 11.20                | 6.30                                                                                                                                                  | 2.60                  | 0.00          | -61.70          | -13.00         | -48.70          | V            |
| 4677.13                                                                                                                                                                                      | 50.00                   | -56.50                                                                                 | 11.20                | 6.30                                                                                                                                                  | 2.60                  | 0.00          | -54.20          | -13.00         | -41.20          | H            |
| Total data #: 20<br>V.2c                                                                                                                                                                     |                         |                                                                                        |                      |                                                                                                                                                       |                       |               |                 |                |                 |              |

Channel 1: Emissions Mask

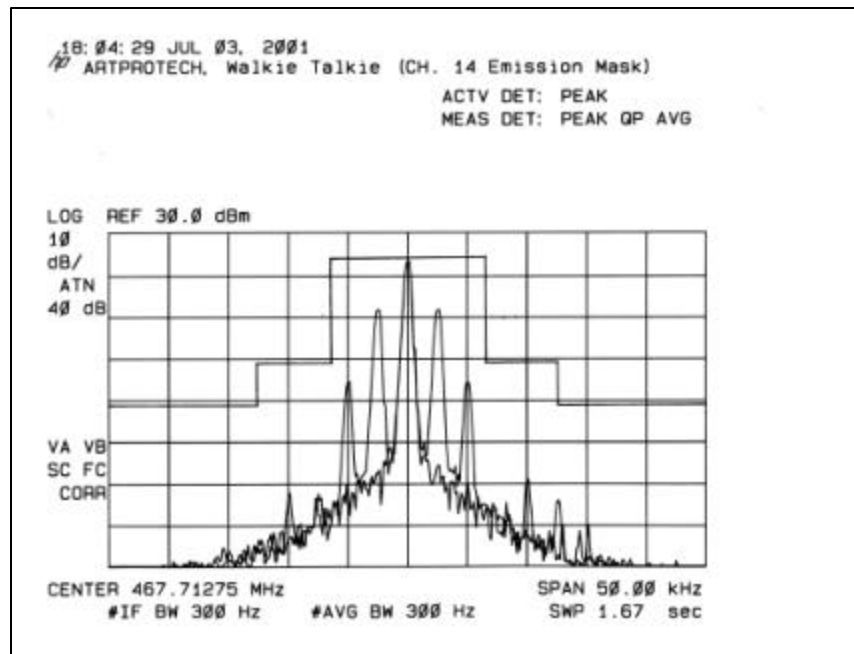


Channel 1: Out-Of-Band Emissions

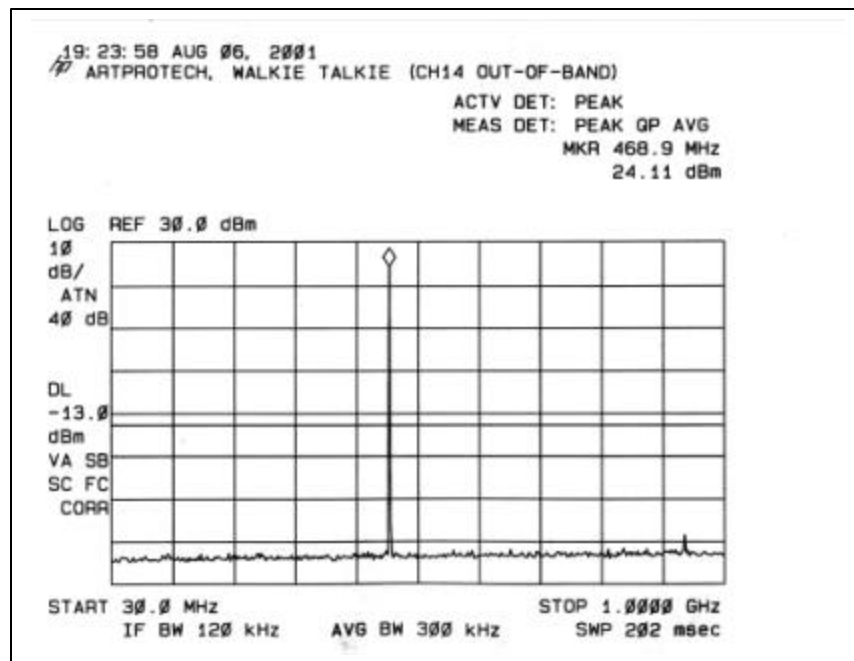


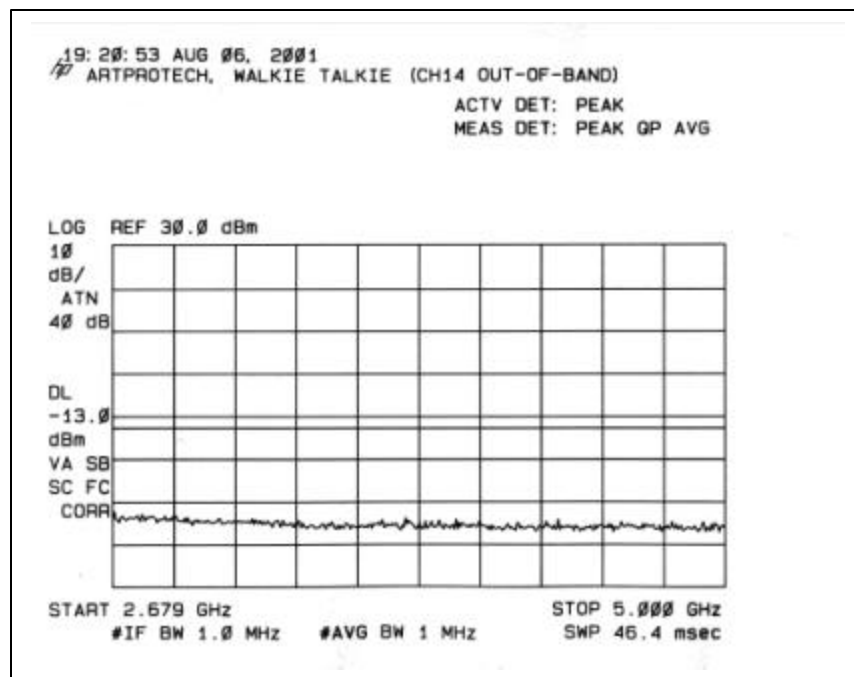
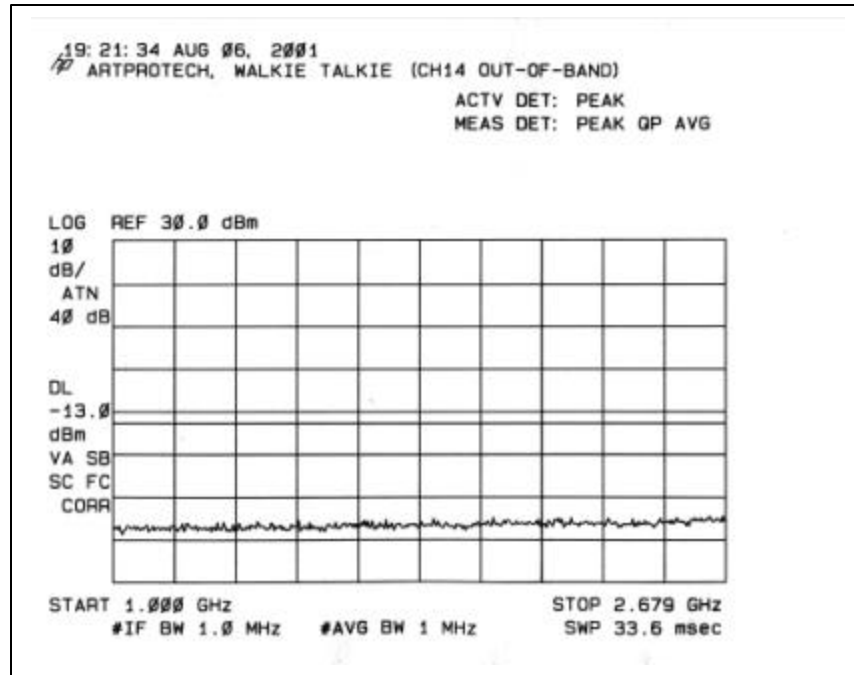


Channel 14: Emissions Mask



Channel 14: Out-Of-Band Emissions





P.S. Conducted measurement output power is greater than field strength output power, because EUT's antenna has a 12dB loss.

## **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 FRS unit must be maintained within a frequency tolerance of 0.00025%.

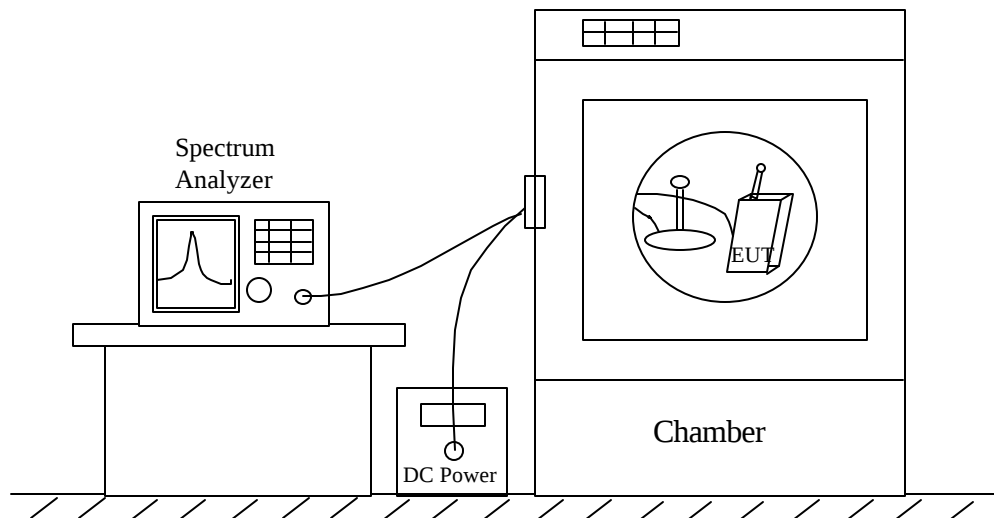
### **8.2 MEASUREMENT METHOD**

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

- 1). Setup the configuration per figure 6 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 per figure 6 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.



**Figure 9: Frequency stability measurement configuration**

### 8.3 MEASUREMENT INSTRUMENT

| EQUIPMENT             | MANUFACTURE   | MODEL NO.    | CAL. DUE DATE |
|-----------------------|---------------|--------------|---------------|
| Spectrum Analyzer     | HP            | 8593EM       | 06/20/02      |
| Attenuator            | MINI CIRCUITS | MCL BW-S20W2 | NA            |
| Environmental Chamber | TENNY         | TEN          | 5/12/02       |

### 8.4 MEASUREMENT RESULT

#### Channel 1

| Reference Frequency: 462.562950 |                    | Limit: 0.00025%                                            |           |
|---------------------------------|--------------------|------------------------------------------------------------|-----------|
| Environment Temperature (°C)    | Power Supply (Vdc) | Frequency deviation measured with time elapse (10 minutes) |           |
|                                 |                    | (MHz)                                                      | %         |
| 50                              | New Battery        | 462.562000                                                 | 0.0002054 |
| 40                              | New Battery        | 462.562463                                                 | 0.0001053 |
| 30                              | New Battery        | 462.562950                                                 | 0.0000000 |
| 20                              | New Battery        | 462.562950                                                 | 0.0000000 |
| 10                              | New Battery        | 462.563013                                                 | 0.0000136 |
| 0                               | New Battery        | 462.563125                                                 | 0.0000378 |
| -10                             | New Battery        | 462.563263                                                 | 0.0000677 |
| -20                             | New Battery        | 462.563613                                                 | 0.0001433 |
| -30                             | New Battery        | 462.563850                                                 | 0.0001946 |

**Channel 14**

| Reference Frequency: 467.712975 |                    | Limit: 0.00025%                                            |            |
|---------------------------------|--------------------|------------------------------------------------------------|------------|
| Environment Temperature (°C)    | Power Supply (Vdc) | Frequency deviation measured with time elapse (10 minutes) |            |
|                                 |                    | (MHz)                                                      | %          |
| 50                              | New Battery        | 467.711975                                                 | 0.0002138  |
| 40                              | New Battery        | 467.712575                                                 | 0.0000855  |
| 30                              | New Battery        | 467.712938                                                 | 0.0000079  |
| 20                              | New Battery        | 467.712975                                                 | 0.0000000  |
| 10                              | New Battery        | 467.712900                                                 | 0.0000160  |
| 0                               | New Battery        | 467.713138                                                 | -0.0000349 |
| -10                             | New Battery        | 467.71325                                                  | -0.0000588 |
| -20                             | New Battery        | 467.713688                                                 | -0.0001524 |
| -30                             | New Battery        | 467.714088                                                 | -0.0002380 |

b). Frequency stability versus input voltage (battery operation end point voltage is 3.8 Vdc)

| Channel | Reference Frequency (MHz) | Frequency measured at end point voltage | Frequency Deviation (%) | Limit (%) |
|---------|---------------------------|-----------------------------------------|-------------------------|-----------|
| 1       | 462.563060                | 462.563084                              | 0.0000052               | 0.0002500 |
| 14      | 467.713055                | 467.713101                              | 0.0000098               | 0.0002500 |

## **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>                |