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RADC-TDR-63-363

**SPECTRUM SIGNATURE MEASUREMENTS  
ON  
AIR ROUTE SURVEILLANCE RADAR (ARSR-1B-A)  
AT POINT ARGUELLO, CALIFORNIA**

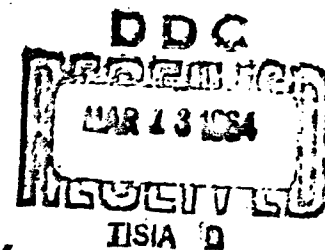
**TECHNICAL DOCUMENTARY REPORT NO. RADC-TDR-63-363**

**Prepared Under**

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**Prepared for**

**ELECTROMAGNETIC VULNERABILITY LABORATORY  
ROME AIR DEVELOPMENT CENTER  
RESEARCH and TECHNOLOGY DIVISION  
AIR FORCE SYSTEMS COMMAND  
UNITED STATES AIR FORCE  
GRIFFISS AIR FORCE BASE, NEW YORK**



**JANSKY & BAILEY**

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## FOREWORD

The work reported herein was carried out by the following members of the staff of Jansky and Bailey, A Division of Atlantic Research Corporation, Washington, D.C. and Alexandria, Virginia; and the Frederick Research Corporation, Wheaton, Maryland:

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The spectrum signature measurement team received very valuable assistance and advice from Richard E. Filarsky and Wesley D. Becker of the Plans and Programs Department, U.S. Naval Missile Facility, Point Arguello, California. Assistance was also given the measurement team by the following personnel from the Federal Electric Corporation.

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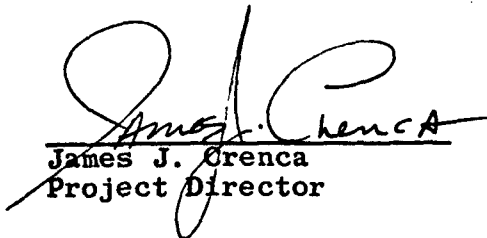
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### ABSTRACT

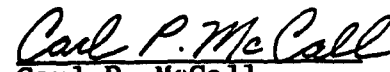
This report describes the spectrum signature measurements made on an Air Route Surveillance Radar (ARSR-1B-A) located at the U.S. Naval Missile Facility, Point Arguello, California.

Description of the tests and results of the measurements are given for the ARSR-1B-A transmitter and were made in accordance with the specifications and procedures of MIL-STD-449A. Data reported herein will be used as an input to the DOD Electromagnetic Compatibility Analysis Center library of spectrum signatures.

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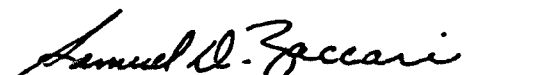
### PUBLICATION REVIEW

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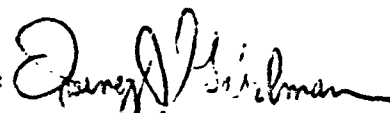
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Section 1  
INTRODUCTION

1.1 GENERAL

Spectrum characteristics for both existing transmitters and receivers and for developmental and planned equipments are needed to predict the mutual interference effects of electromagnetic equipment. The data obtained from the collection of spectrum signatures will comprise one of the principal aids in predicting the performance in and effect on the electromagnetic environment of other equipments and systems by a particular equipment or system. A spectrum signature is defined as the package of data which describes the electromagnetic radiating and receiving characteristics of an equipment. In order to collect spectrum signatures that are both meaningful and valid, a technical standard (MIL-STD-449A) has been adopted which establishes uniform measurement techniques that are applicable to the determination of the spectral characteristics of radio-frequency transmitters and receivers. Measurements made under this task were made according to the specifications and procedures outlined in MIL-STD-449A and Order No. 11. These measurements will be used as an input to the DOD Electromagnetic Compatibility Analysis Center library of spectrum signatures. The numbered MIL-STD-449A tests to be made on pulsed radar equipment are listed below.

TRANSMITTER

- 5.2.2 Power Output
- 5.2.3 Spurious Emission
- 5.2.4 Emission Spectrum
- 5.2.5 Modulation Characteristics
- 5.2.8 Carrier Frequency Stability

### RECEIVER

- 5.3.4 Sensitivity
- 5.3.5 Selectivity
- 5.3.6 Spurious Response
- 5.3.7 Over-all Susceptibility
- 5.3.8 Intermodulation
- 5.3.9 Adjacent Signal Interference
- 5.3.10 Pulse Desensitization
- 5.3.11 CW Desensitization
- 5.3.12 Dynamic Range
- 5.3.13 Oscillator Radiation

### ANTENNAS

- 5.4.2 Antenna Patterns

Tests added and deleted from this schedule are discussed in Section 1.3.

This report describes the measurement details and presents the spectrum signature of the Air Route Surveillance Radar (ARSR-1B-A) located at the Naval Missile Facility in Point Arguello, California.

## 1.2 EQUIPMENT MEASURED

Air Route Surveillance Radar (ARSR-1B-A) is a pulse type dual radar system designed to be incorporated into the civil airways system as an aid to air navigation. This radar normally operates in a frequency range of 1280 - 1350 Mc. The radar, however, may be operated at frequencies as low as 1240 Mc. Each equipment consists of dual transmitting, receiving, and moving target indication channels to permit constant surveillance of aircraft to a greater than 200-mile radius of the radar site. A four-part waveguide switch and an RF dummy load enables radiation of one channel directly into the antenna while the remaining channel can be completely energized and radiated into the dummy load for maintenance purposes. The amplatron output of the transmitter delivers a nominal 2 microsecond pulse at a 360 cycle repetition rate with a peak power of approximately 99 dbm to the antenna.

The antenna assembly is a large high gain antenna with nominal beam width dimensions of 1.35 degrees horizontal by 6.2 degrees vertical. The array dimension of this antenna is 40 by 11 feet compound curved which results in a nominal antenna gain of 34.3 db along the axis of maximum radiation. Antenna polarization may be horizontal, linear, or circular, remotely selectable over the band with no tuning adjustments required. Azimuth rotational speeds of 6, 9, and 12 rpm are available.

### 1.3 EQUIPMENT CHARACTERISTICS MEASURED

Spectrum signature measurements on the ARSR-1B-A radar at Point Arguello were limited to the period of time between December 2, 1962, and December 21, 1962. As a consequence, all receiver tests as specified by MIL-STD-449A were exempted by Order No. 11. A priority schedule was established for the remaining spectrum signature tests. The order of priority is listed below.

1. Transmitter measurements through second harmonic.
2. Antenna Patterns through the second harmonic taken with an azimuth rotational speed of not greater than 1 rpm. Antenna Patterns to be taken at only one test site.
3. Pulse Count Test (not specified by MIL-STD-449A).
4. Transmitter measurements above second harmonic to be continued to completion or to December 21, 1962.

Antenna Patterns were not obtained due to the high wind velocities and limited time permitted for restoring the antenna to normal operation. This is explained in more detail in Section 5.4.2.

## 1.4

MEASUREMENT FREQUENCIES

The nominal frequency range of the ARSR-1B-A is 1280 - 1350 Mc. At the time these measurements were started, however, Naval regulations limited the operating frequencies to the range below 1310 Mc. In view of this, the normal operating frequency of this radar (1297.8 Mc) was selected as the mean standard test frequency. At a later date, authorization was secured to operate at one frequency (1348 Mc) above the 1310 Mc limit. This frequency was used as the higher standard test frequency. Although the nominal frequency range of the radar is 1280 - 1350 Mc, the radar's lower frequency limit is 1240 Mc. Since a spectrum signature should be representative of the radar's full capability, a lower standard test frequency of 1257.8 Mc was selected. To recap, the three standard test frequencies are listed below.

$$f_{oe} = 1257.8 \text{ Mc}$$

$$f_{om} = 1297.8 \text{ Mc}$$

$$f_{oh} = 1348 \text{ Mc}$$

The actual frequencies used from day to day may differ from the above by as much as 1 Mc due to the difficulty in tuning the radar's magnetron. The radar was "talked" on frequency by measuring the radar frequency at the far-field test site.

## Section 2

### DESCRIPTION OF SITES AND SITE ENVIRONMENT

The Air Route Surveillance Radar (ARSR-1B-A) is located on the Remote Radar site in the Naval Missile Facility at Point Arguello, Lompoc, California. This site is on the southern boundary of the Missile Range as shown in Figure 2-1. Coordinates of the site are  $120^{\circ} 35' 18''$  W and  $34^{\circ} 35' 48''$  N. Figure 2-2 is an aerial view looking southwest of Lompoc, California, and the Naval Missile Facility. Lompoc is in the valley in the foreground with the Missile Facility in the mountainous terrain in the background. The Pacific Ocean is seen in the upper part of the photograph. Tranquillon Peak is the high point just to the left of center near the Pacific Ocean. Figures 2-3 and 2-4 are aerial views of the Remote Radar site looking north. In the photograph from left to right are the APS-20, ARSR Antenna, operations building, microwave tower and FPS-6. Most of the site is at a ground elevation of 1545 feet except for the portion on which the FPS-6 is located. This ground is at an elevation of 1533 feet. The total elevation of the various components of the Remote Radar Site is as follows:

APS-20, 1560 ft; ARSR Antenna, 1582 ft; microwave tower, 1685 ft; FPS-6, 1598 ft.

Only one test site was used in this spectrum signature collection. This test site was at the FIC (Frequency Interference Control) installation. The test site was at a distance of 21,560 feet and on a bearing of  $65^{\circ} 20'$  from the Remote Radar site. Figure 2-5 is a photograph taken from the Remote Radar site looking toward the Test Site at FIC. Figure 2-6 is a photograph taken from the Test Site at FIC looking toward the Remote Radar Site. Figure 2-7 is a photograph of the measurement van on the FIC (Test Site) installation. The test antenna (horn) is shown mounted atop a pole which is mounted to the measurement van. Power for the van test equipment was obtained from the FIC installation.

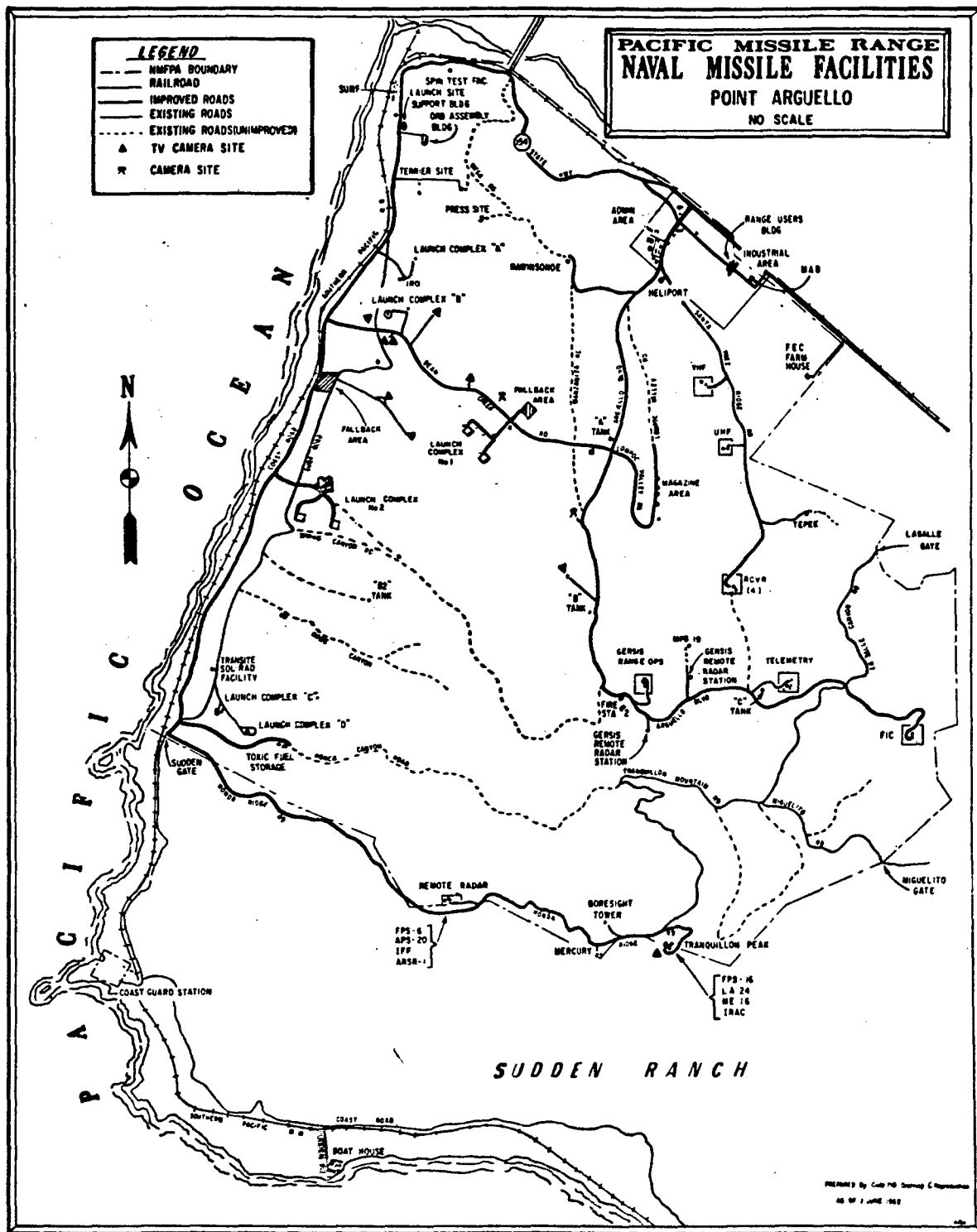


Figure 2-1. U.S. Naval Missile Facility-Point Arguello.

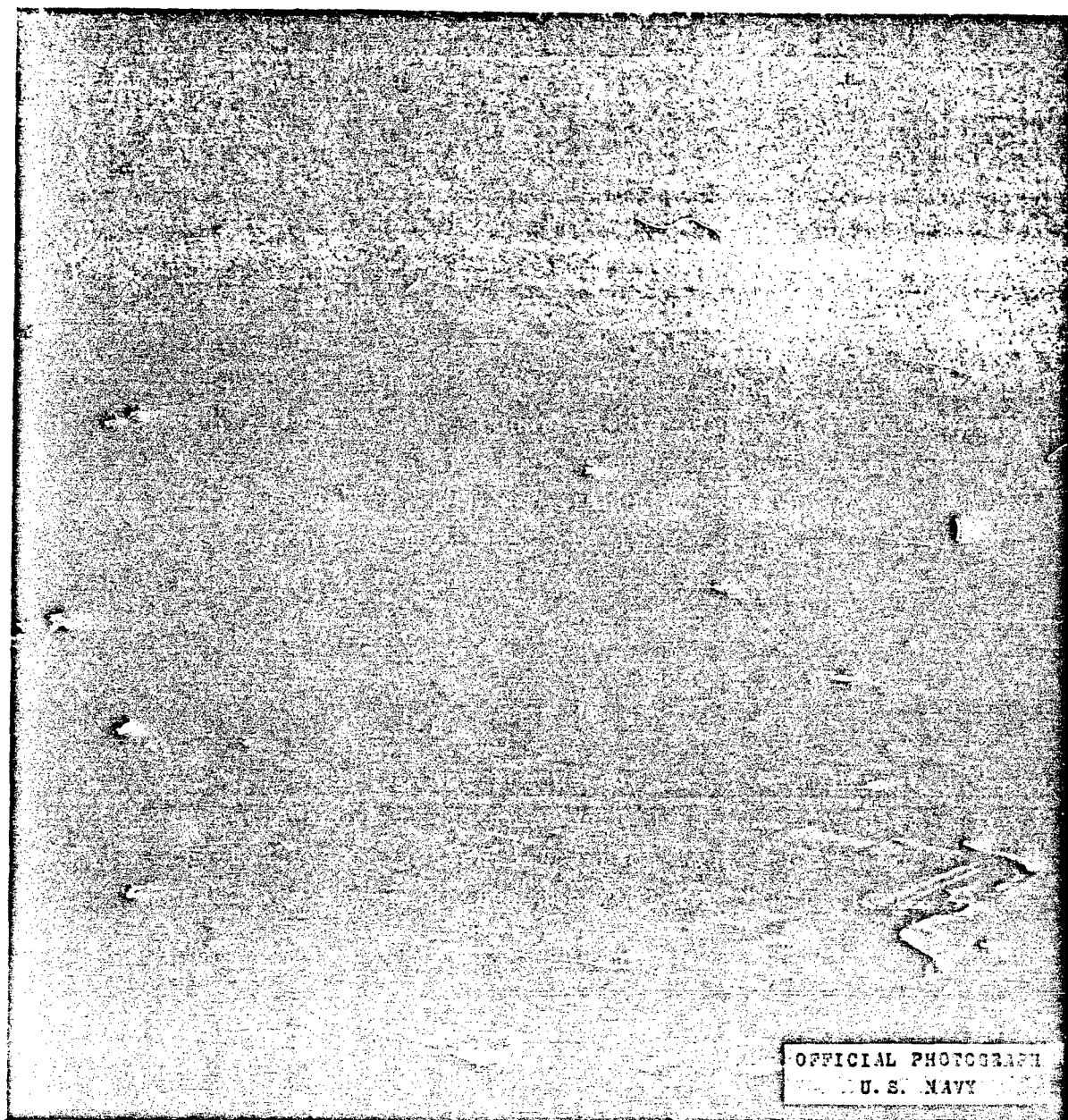


Figure 2-2. Photograph of Lompoc, California and Point Arguello Looking South-West.

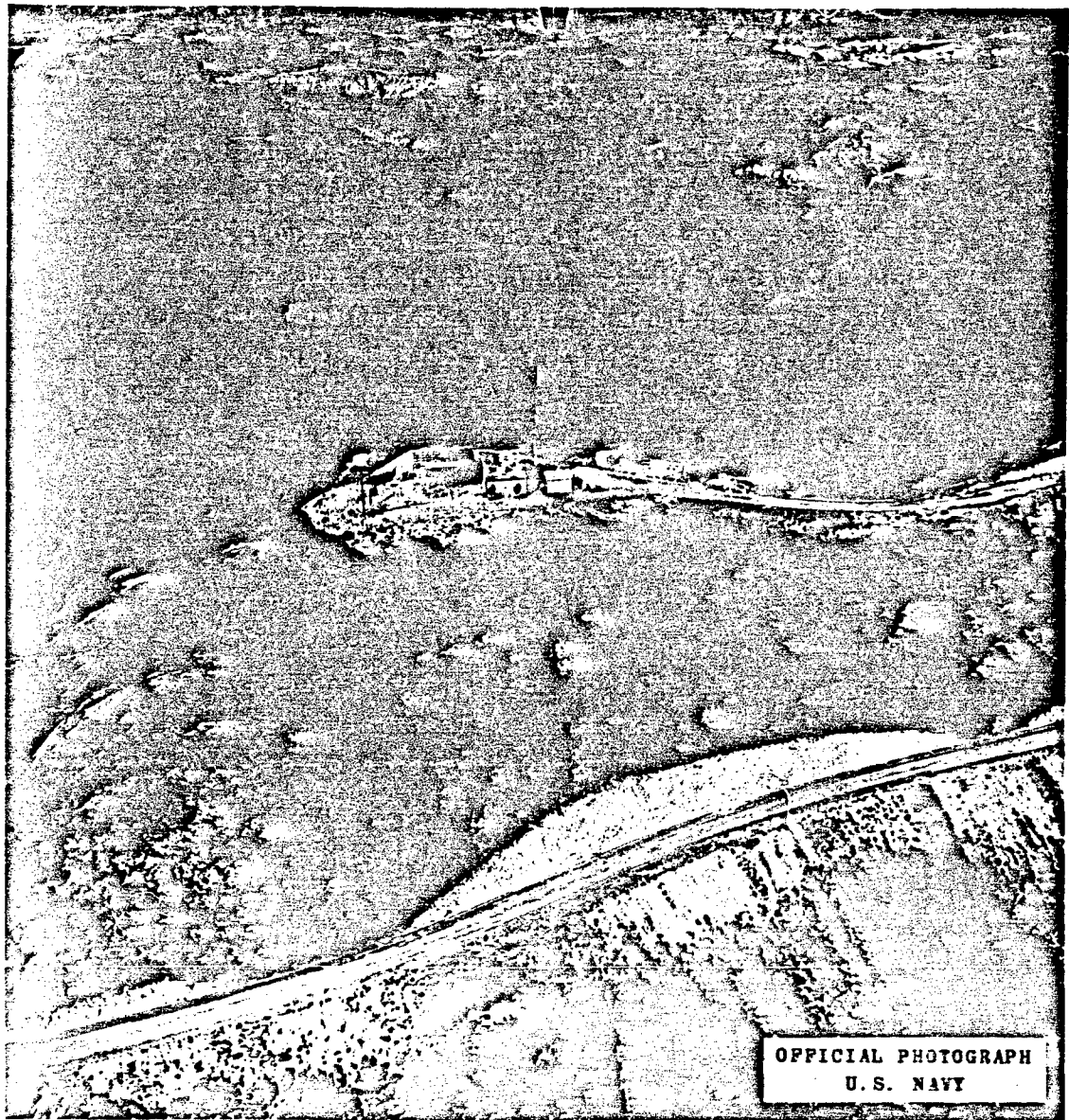


Figure 2-3. Photograph of Remote Radar Site.

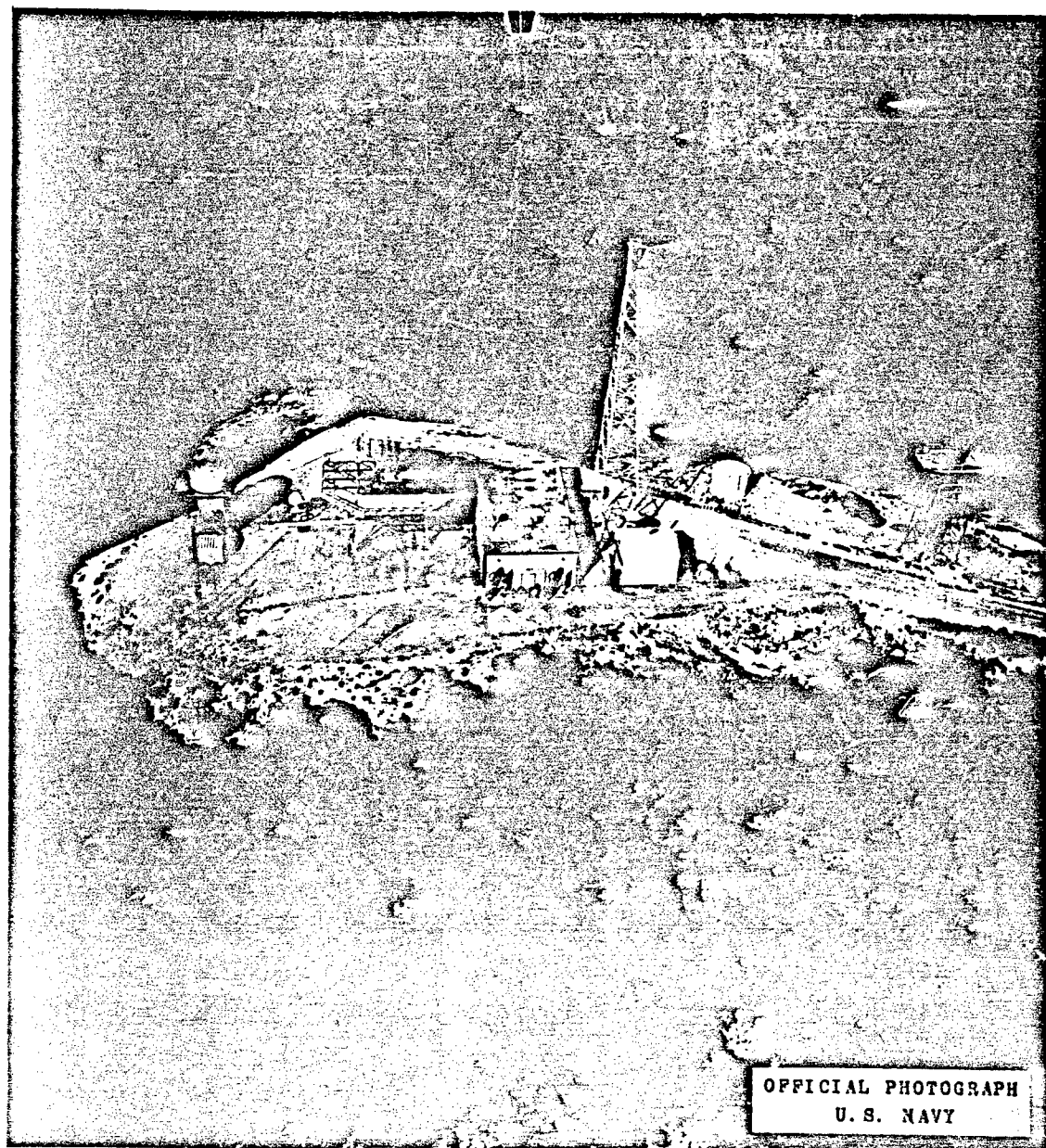


Figure 2-4. Photograph of Remote Radar Site.

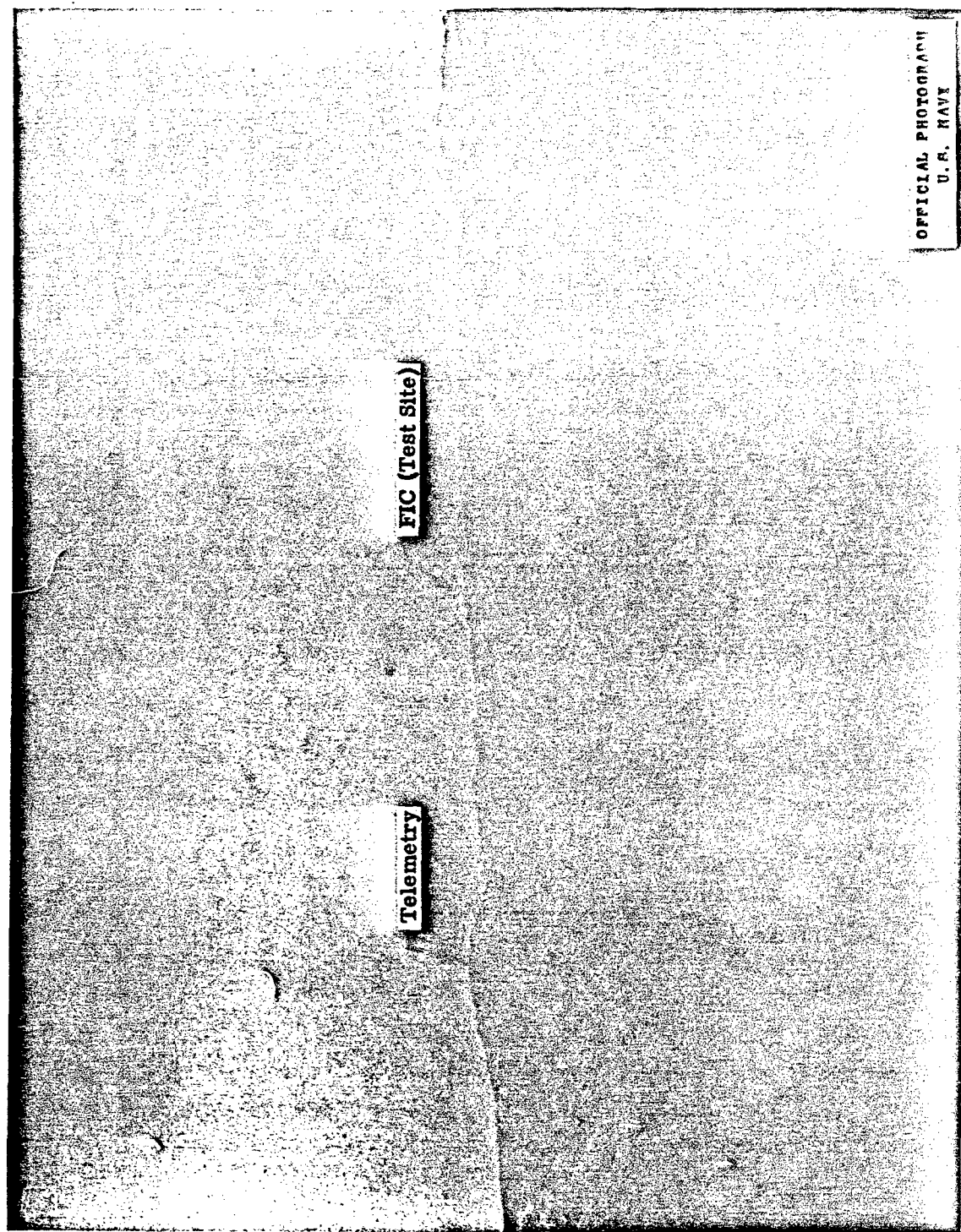


Figure 2-5. Photograph Looking to Test Site from Remote Radar Site.

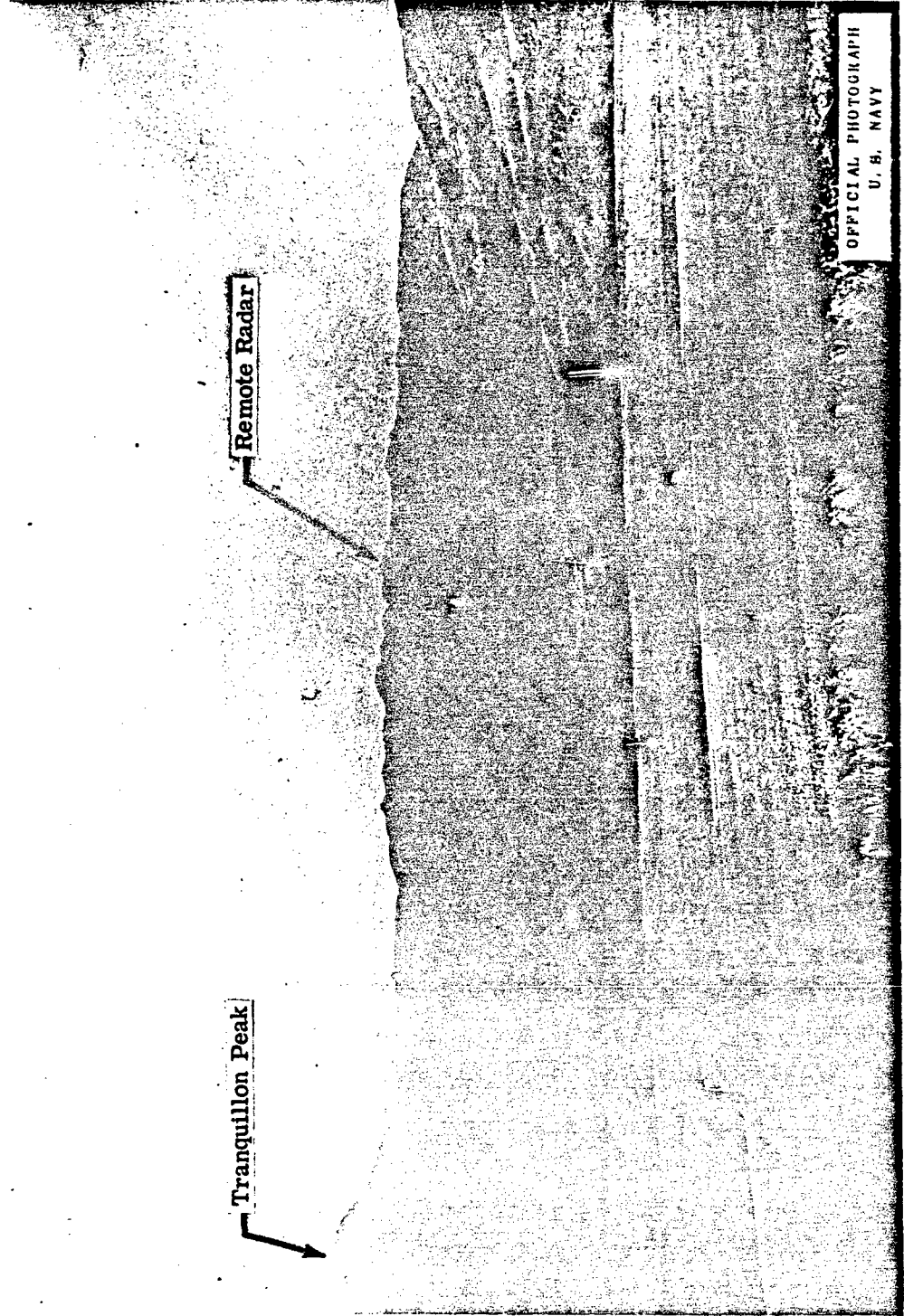


Figure 2-6. Photograph Looking to Remote Radar from Test Site.

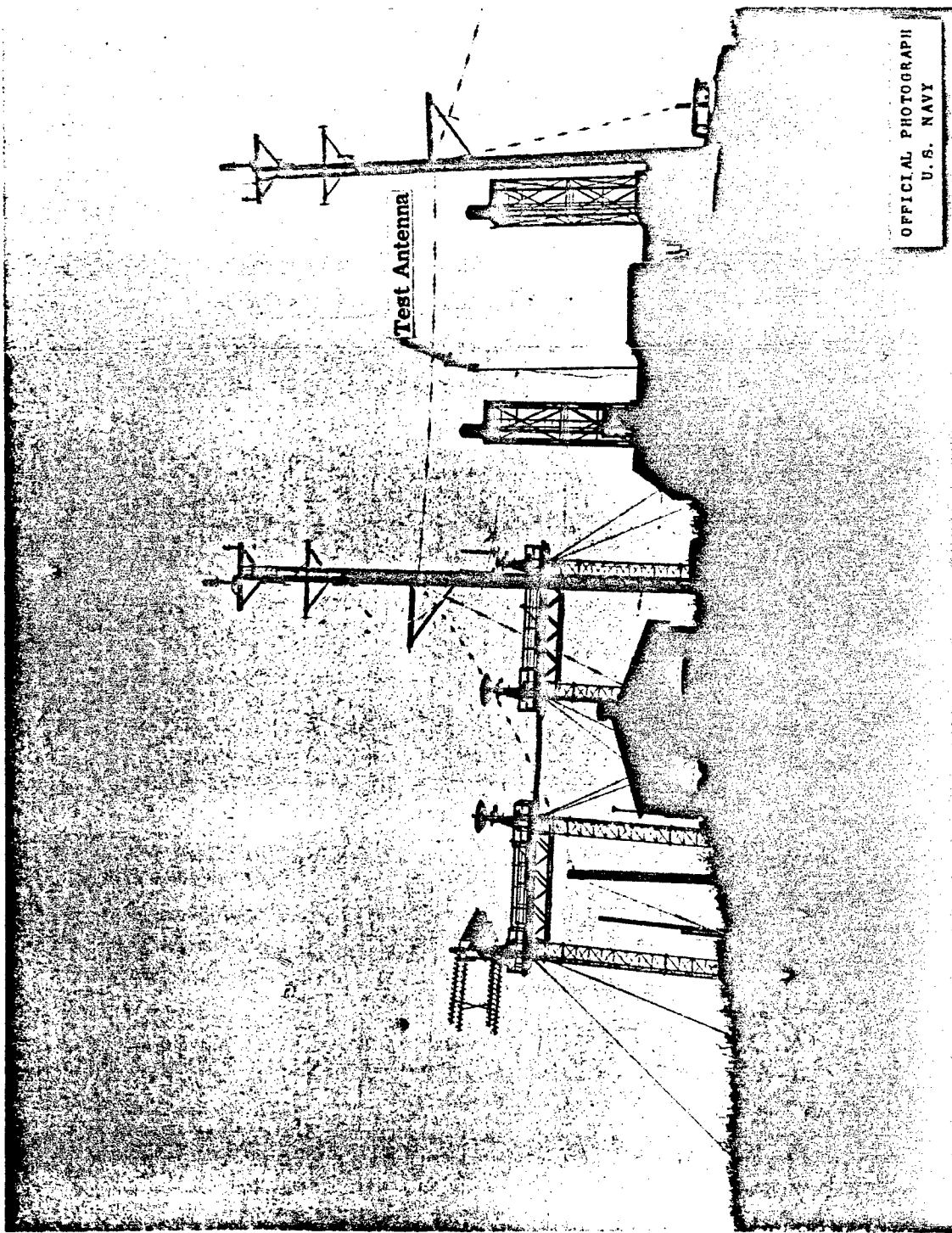


Figure 2-7. Mobile Measurement Van at Test Site (FIC).

MIL-STD-449A states that the open-field measurements shall be made at the far-field distance of the radar fundamental frequency. The far-field distance is defined as  $D^2/\lambda$  where D is the maximum aperture dimension of the antenna and  $\lambda$  is the wavelength of the fundamental test frequency. The far-field distance from the ARSR antenna at the highest standard test frequency of 1348 Mc is

$$\begin{aligned}\text{Far-field} &= D^2/\lambda = \frac{(40 \text{ ft.})^2}{\frac{300}{f_{\text{mc}}}} \text{ meters} \times 3.28 \text{ ft./meter} \\ &= \frac{(40 \text{ ft.})^2}{\frac{300}{1348}} \text{ meters} \times 3.28 \text{ ft./meter} \\ &= 2190 \text{ ft.}\end{aligned}$$

Since the Test Site is at a distance of 21,560 feet from the radar site, the test antenna was in the far-field of the fundamental and all harmonics measured.

The tall (140 ft.) microwave tower shown in Figures 2-3 and 2-4 was not in the line of sight between the radar antenna and the test site. This tower is directly in line between the radar antenna and Tranquillon Peak.

The terrain for both sites is arid, barren, and mountainous. An analysis of the soil would probably show it to be of ore-bearing composition.

For most of the spectrum signature measurements, the mountains were shrouded in fog during the morning hours. However, the Radar and Test Sites located on the peaks were usually above the fog in the morning. In the late afternoon and evening, a wet, dripping fog would usually move into the sites. Winds appeared to be continuous on the mountain peaks. Wind velocities were at a minimum in the morning hours and at a maximum during the early evening hours.

### Section 3

#### DESCRIPTION OF MEASURED EQUIPMENT

The original Air Route Surveillance Radar, designated as ARSR-1, was designed to be incorporated into the civil airways system structure as an aid to navigation. The ARSR-1 is a pulse type radar which consists of dual transmitting, receiving, and moving target indication channels to permit constant surveillance of aircraft within a 200-mile radius of the radar site. This range has been increased in the modified ARSR-1 (ARSR-1B-A). The modified ARSR-1 includes an Amplitron rf amplifier in addition to the magnetron and its associated circuits. A four-port waveguide switch and an rf dummy load enables one channel to radiate directly from the antenna while the remaining channel can be completely energized and loaded into the dummy load for maintenance purposes. An electronic map of the region being scanned by the radar antenna is displayed on the PPI's. Normal, integrated normal, or MTI video can be displayed.

The nominal system characteristics for the ARSR-1 radar are tabulated below. These characteristics are essentially those of the ARSR-1B-A radar located at Point Arguello, California, with the exception of the power output. Radar power output with the Amplitron rf amplifier incorporated in the circuit is approximately 12 db greater than the magnetron output.

#### RADAR SYSTEM CHARACTERISTICS

##### GENERAL

|                             |                                                         |
|-----------------------------|---------------------------------------------------------|
| Nominal Range - - - - -     | 200 Nautical Range                                      |
| (ARSR-1B-A) - - - - -       | Has a greater range                                     |
| Frequency Band- - - - -     | 1280-1350 Mc                                            |
| Peak Power                  |                                                         |
| (Magnetron Output) - - - -  | 500 kw minimum, 600 kw maximum                          |
| (Amplitron Output) - - - -  | A nominal 10 db greater than the magnetron output       |
| Pulse Width - - - - -       | 2 $\mu$ sec                                             |
| Repetition Rate (PRF) - - - | 360 pps                                                 |
| Cancellation System - - - - | Coherent Type, 3 pulse comparison with velocity shaping |

### ANTENNA

Array Dimension - - - - - 40 x 11 feet compound curved  
Polarization - - - - - Horn feed with choice of  
horizontal linear or circular  
Beam Width (half power)- - - Azimuth  $1.35^\circ \pm 0.1^\circ$   
Elevation  $6.0^\circ \pm 0.3^\circ$   
Elevation Pattern- - - - - Coscant - squared from  $5.5^\circ$  to  
 $52.5^\circ$  normalized to  $2.5^\circ$   
Gain - - - - -  $34.3 \text{ db} \pm 0.25 \text{ db}$   
Sidelobe Attenuation - - - - At least 24 db down  
Backlobe Attenuation - - - - At least 30 db down  
Integrated Cancellation Ratio  
(Circular Polarization) - - More Than 24 db (Calculated)  
Rotary Joint - - - - - Dual (Radar and IFF)  
Azimuth Rotational Speed - - 6 rpm clockwise  
Also - - - - - 9 and 12 rpm at Pt. Arguello  
Beam Tilt Adjustment - - - - From  $-1^\circ$  to  $+5^\circ$  by means of  
manually operated worm-drive screw

### TRANSMITTING SYSTEM

Source of RF Power - - - - - Magnetron oscillator Type 5J26  
Frequency Range - - - - - 1280 - 1350 Mc  
Type of Frequency Control- - Manual tuning of magnetron cavity  
Type of Emission - - - - - Pulsed  
Duty Cycle - - - - - 0.00072

### RF SYSTEM

Over-all VSWR - - - - - 1.3:1 (Maximum)  
Duplexers - - - - - Ferrite circulator and 6322 tube  
Mixer  
AFC Crystal - - - - - 1N21C  
Signal Crystal - - - - - 1N21E  
Noise Figure (Over-all) - - 6.7 db average measured  
Waveguide Switch - - - - - Less than -85 db crosstalk between  
channels

### RECEIVING SYSTEM

Type - - - - - Superheterodyne  
Mixer - - - - - Broad-band crystal matched to  
waveguide  
Local Oscillator (Stalo) - - 2C40 Lighthouse Triode with AFC,  
tuned above magnetron frequency,  
manually controllable  
Stalo Frequency - - - - - 1270 - 1390 Mc  
AFC Pull-in range - - - - -  $\pm 7 \text{ Mc}$   
AFC desensitization range- - 50 - 200 kc  
Intermediate Frequency - - - 30 Mc  $\pm 0.5 \text{ Mc}$   
Bandwidth MTI - - - - - 3 Mc  $\pm 0.5 \text{ Mc}$  at 3 db points  
Bandwidth Normal - - - - - Between 880 kc and 1.125 Mc

### RECEIVING SYSTEM (Cont'd)

Normal Detector- - - - - Crystal Diode, nonlimiting AM detector

Sensitivity

Normal Channel - - - - - -109 dbm  $\pm$  2 dbm

MTI Channel - - - - - -108 dbm  $\pm$  2 dbm

Integrated Normal Channel - -111 dbm

Video Integration Gain - - - 20 db

MTI Feature - - - - - Dual clutter cancellers with adjustable feedback

Anti-Clutter Circuits - - - IAGC, STC, FTC

Sensitivity Time Control (Normal and MTI)

Amplitude - - - - - Adjustable to 80 db (30 db common)

Duration - - - - - Adjustable from 20 to 1000  $\mu$ sec

Flat - - - - - Adjustable from 30 to 720  $\mu$ sec

Fast Time Constant (Normal Receiver only)- - - 1.5  $\mu$  sec in Position 1  
0.5  $\mu$  sec in Position 2

Instantaneous AGC (Normal Receiver only)- - - Breaks up clutter areas to permit detection of aircraft appearing in or superimposed on clutter

### MOVING TARGET INDICATION

Modes of Operation - - - - - 1. Cancellor No. 1  
2. Cancellor No. 2  
3. Double cancellers in cascade without feedback  
4. Double cancellers in cascade with feedback (normal operation)

Delay Line - - - - - Quartz Triple Delay Line, 2777  $\mu$ sec,  $\pm$  1%, each line matched to within  $\pm$  0.2  $\mu$ sec, 2 for MTI, 1 for video int.

Pulse to Pulse Jitter- - - - Less than 7.0 millimicroseconds

Video Cancellation Ratio - - 33 db each canceller

Over-all subclutter visibility Greater than 27 db at 40 miles

Cancellation Ratio (overall) Greater than 33 db at 40 miles

Velocity Response- - - - - Response capability of being adjusted better than that obtained in a single canceller, to below that obtained in a double canceller without feedback

Figure 3-1 is a block diagram of the rf system of the ARSR-1B-A radar. Since both channels are identical, only one channel is shown with the common equipment. The transmitting system of each channel of the ARSR-1B-A equipment includes an Amplitron rf amplifier in addition to the magnetron and its associated circuits in the ARSR-1 radar. The Amplitron functions as a saturated amplifier that increases the power of the magnetron rf pulses by approximately 10 db. In addition to performing its normal functions, the trigger system in each channel of the ARSR-1B-A synchronizes the firing of the Amplitron with that of the magnetron. The Amplitron trigger circuits develop the pulses necessary to synchronize the triggering of the Amplitron with that of the magnetron. Such synchronization insures that rf output of the magnetron is available at the input to the Amplitron 0.1  $\mu$ sec before the Amplitron is fired. In order to achieve this synchronization between the firing of the magnetron and that of the Amplitron, it is necessary to compensate for the inherent variable anode delay of the thyatron switch tubes used in the Amplitron and magnetron modulators. Anode delay times for these tubes vary between 0.5 and 2.0  $\mu$ sec. To compensate for these variable delays, a sample of the output pulse from each switch tube is applied to trigger synchronizing circuits that sense the difference in time between the two pulse samples over a given period of time. When the time between the two pulses exceeds the predetermined limit, the synchronizing circuits adjust the time of application of the Amplitron modulator trigger pulses to the switch tube in the Amplitron modulator and therefore, maintain the desired time between the Amplitron and the magnetron triggers. Figure 3-2 is a block diagram which shows the points of pulse sample in the transmitting system. The trigger system and time relationships are illustrated in Figures 3-3 and 3-4. In the absence of an Amplitron trigger, the rf signal from the magnetron traverses the rf circuit of the Amplitron and is fed to the rf system

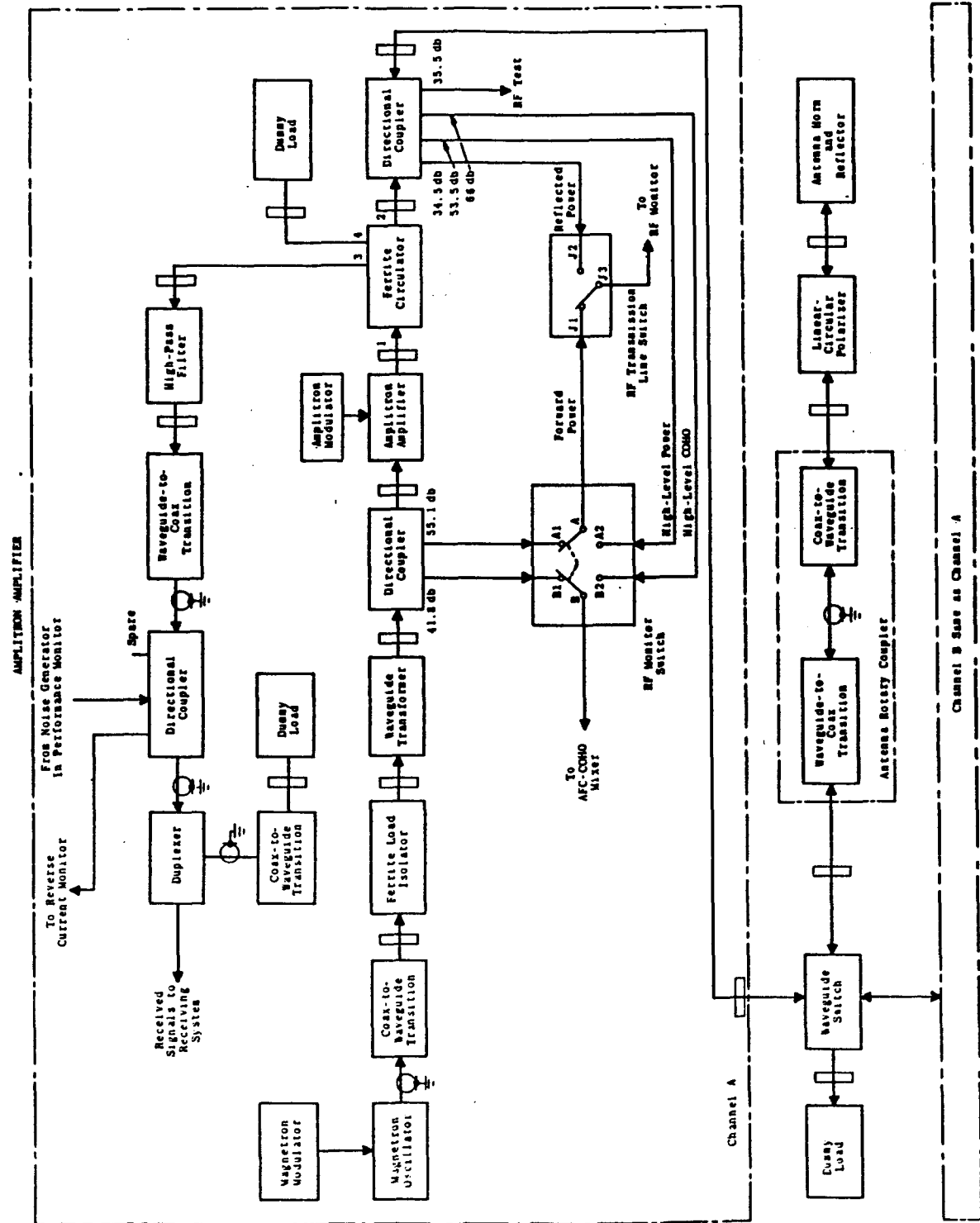


Figure 3-1. ARSR-1B-A Simplified Block Diagram.

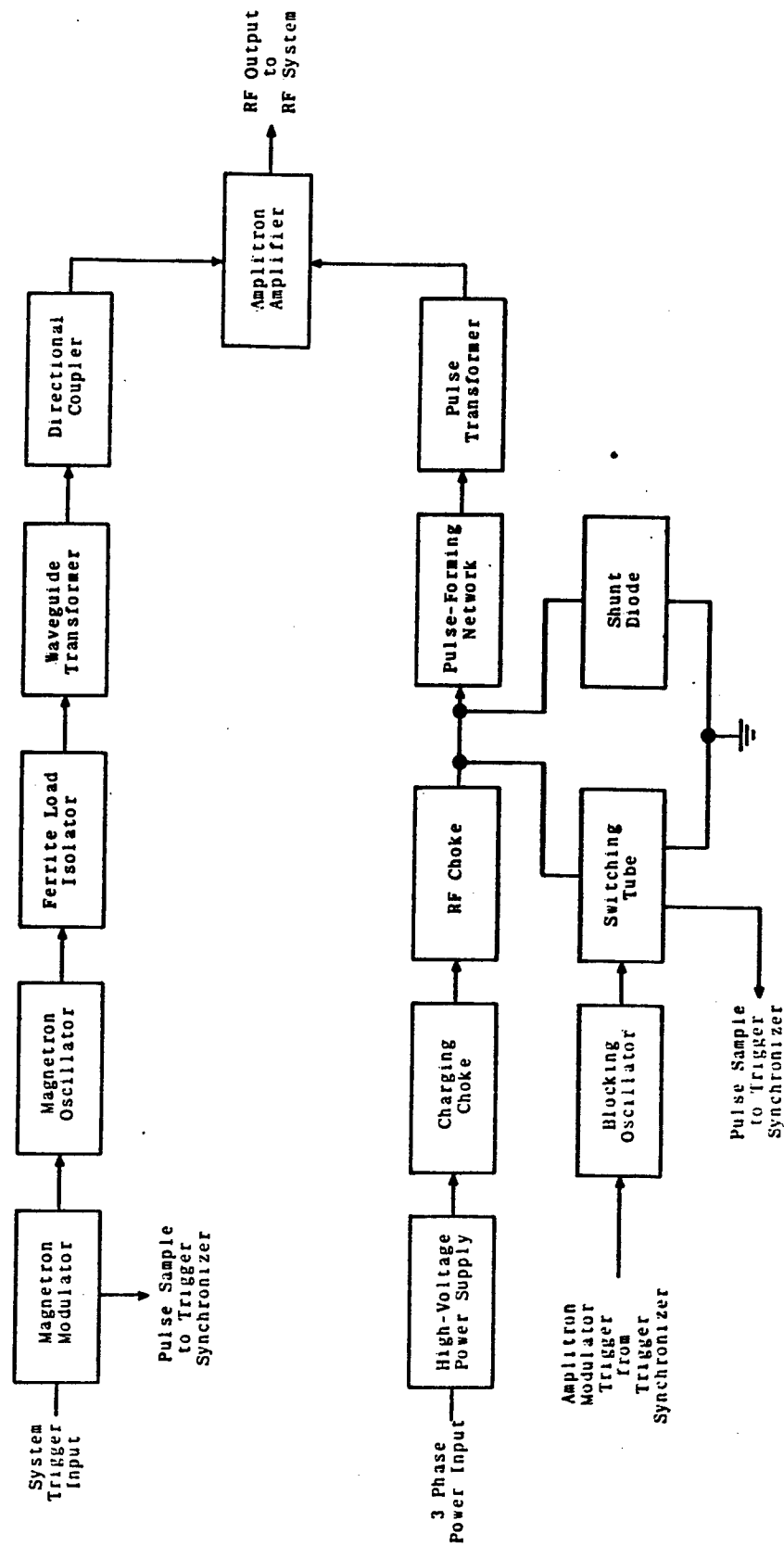


Figure 3-2. Transmitting System, Block Diagram.

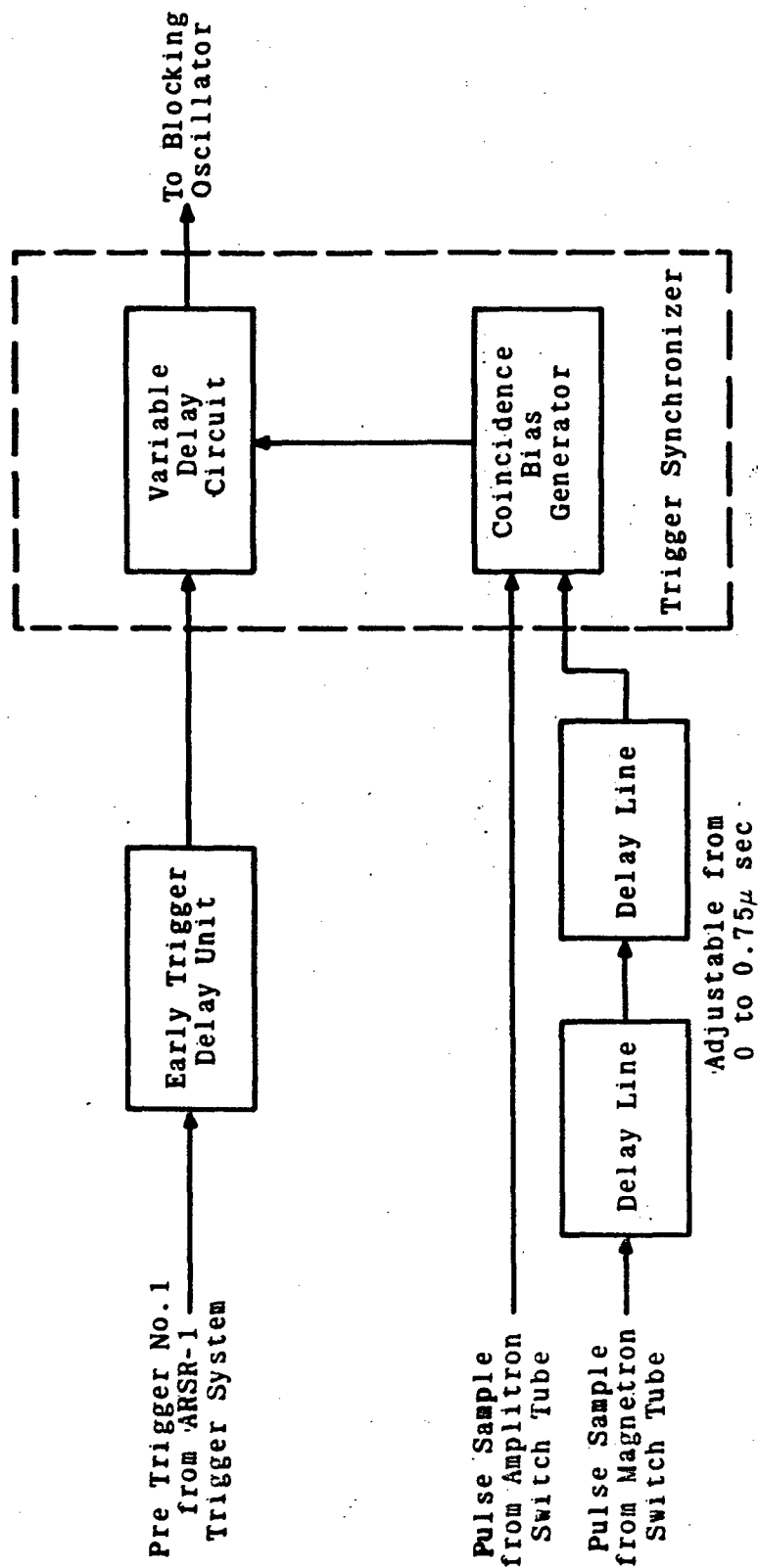


Figure 3-3. Trigger System, Block Diagram.

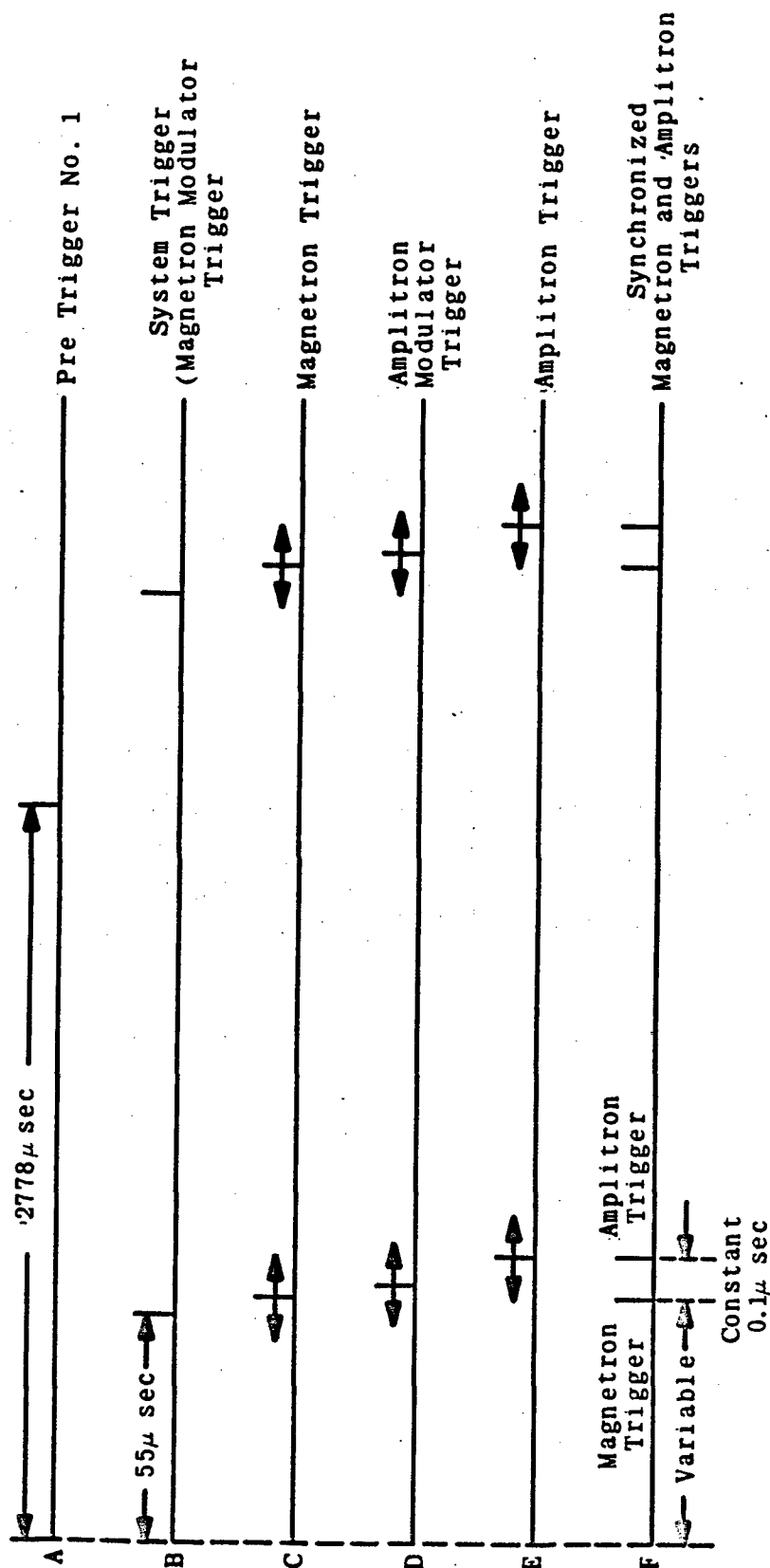


Figure 3-4. Trigger Time Relationship.

without any change in frequency or gain in amplitude. This makes it possible to operate the ARSR-1B-A equipment with the output from the magnetron only.

ARSR-1B-A common channel components shown in Figure 3-1 are identical to the components common to both channels in the ARSR-1, except that the ARSR-1B-A antenna rotary coupler and the waveguide run between the waveguide switch and the antenna pedestal are pressurized. The rf components used in Channel A and Channel B of the ARSR-1 rf system are similar to the components used in the ARSR-1B-A equipment. In addition the ARSR-1B-A system includes a ferrite circulator and high-pass filter.

The rf output of the magnetron oscillator is fed through a section of 1 5/8-inch rigid coaxial transmission line to a coaxial-to-waveguide transition. The transition transfers the rf energy from the coaxial mode of the transmission line to the waveguide mode in a half-height waveguide. The output of this transition is applied to a ferrite load isolator.

This ferrite load isolator offers a low impedance to the rf energy from the coaxial-to-waveguide transition and a high impedance to any reflected energy from the waveguide transformer to which the output of the isolator is applied. This minimizes the effect of any mismatch in the rf system upon the operation of the magnetron oscillator. The low impedance of the ferrite load isolator output is matched to the impedance of a full-height waveguide by a waveguide transformer. The output of the transformer is applied to a directional coupler.

This directional coupler couples the rf energy from the waveguide transformer to the Amplitron and also applies two attenuated output signals to the RF MONITOR.

The high-power rf output of the Amplitron is applied to connection 1 of the ferrite circulator. The rf output of the Amplitron is circulated from connection 1 to connection 2, and

fed through the directional coupler and the common channel rf components to the antenna. Subsequent echo signals received by the antenna are fed through the common-channel rf components and directional coupler to connection 2 of the circulator, circulated to connection 3 and then applied through various components to the receiving system. Any rf energy reflected into connection 3 of the circulator from the receiving system is circulated to and absorbed by the dummy load on connection 4. The circulator, therefore, performs the function of a duplexer. The high-pass filter from connection 3 of the circulator is designed to pass all signals above approximately 1150 Mc. Figure 3-5 is a photograph showing the ferrite circulator and the following directional coupler of Channel B. This photograph shows the location of the ferrite circulator connections and the 66.2 db connection of the directional coupler. The lead from the 66.2 db connections goes to the HP-430C power meter used to monitor power in the spectrum signature tests.

The rf energy leaving connection 2 of the ferrite circulator travels through the directional coupler to the waveguide switch. This switch functions to deliver the rf energy to either the dummy load or the antenna. Figure 3-6 is a photograph of the waveguide switch showing the inputs from Channel A, Channel B, dummy load and antenna.

The rf energy to be radiated leaves the waveguide switch and travels through the antenna rotary coupler to the Linear-Circular polarizer. Either linear or circular polarization may be selected.

The linear-circular polarizer is a device that applies either linearly or circularly polarized rf energy to the reflector. A linearly polarized wave is one in which the direction of the electric field does not change except for the 180 degree phase reversal during one cycle. The electric field in a linearly polarized wave may be horizontal, vertical, or any other angle, but it must remain the same. A circular polarized wave is one

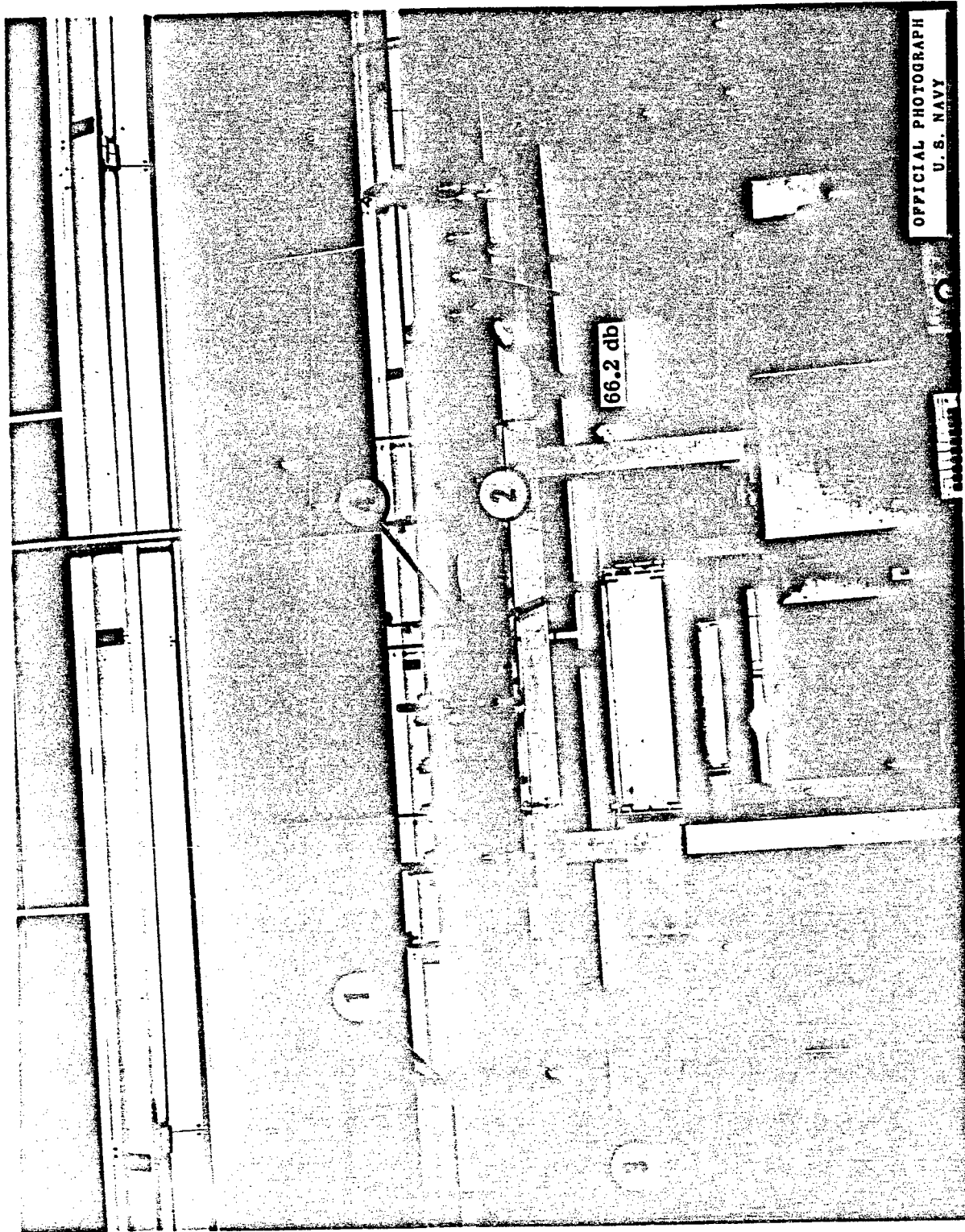


Figure 3-5. Photograph of Ferrite Circulator and Directional Coupler.

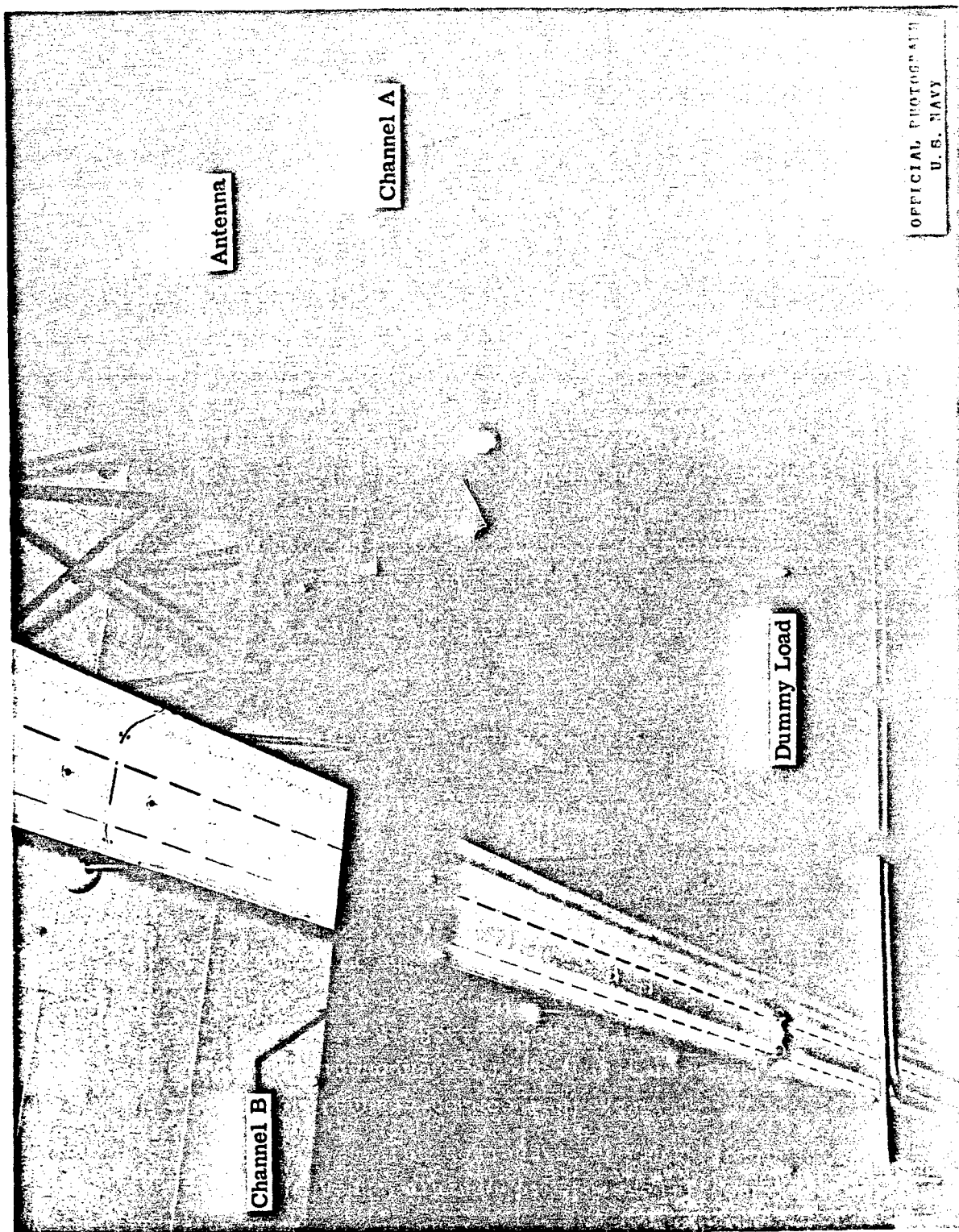


Figure 3-6. Photograph of Wave Guide Switch.

in which the direction of the electric field rotates in a circular motion and has a constant amplitude throughout its rotation cycle. When circular polarization is used, no signal will be received when the return echo is rotating in the opposite direction. Echoes from symmetrical targets, such as a flat metal sheet or a sphere, return to the antenna rotating in the opposite direction and are therefore, not received. Raindrops, being roughly symmetrical spheres, return echoes that are rotating in the opposite direction and are thereby not as readily received as those echoes from nonsymmetrical bodies. As a consequence, circular polarization is used to reduce rain clutter signals. Since some loss occurs in echoes from all targets because of the presence of symmetrical components, circular polarization is not ordinarily used unless an advantage is realized due to the presence of rain.

In view of this, linear (horizontal) polarization was used for nearly all spectrum signature measurements. The Linear-Circular Polarizer is seen in the close-up photograph of the antenna in Figure 3-7. Figure 3-8 is a photograph of the ARSR antenna taken from the platform just below the FPS-6 antenna.

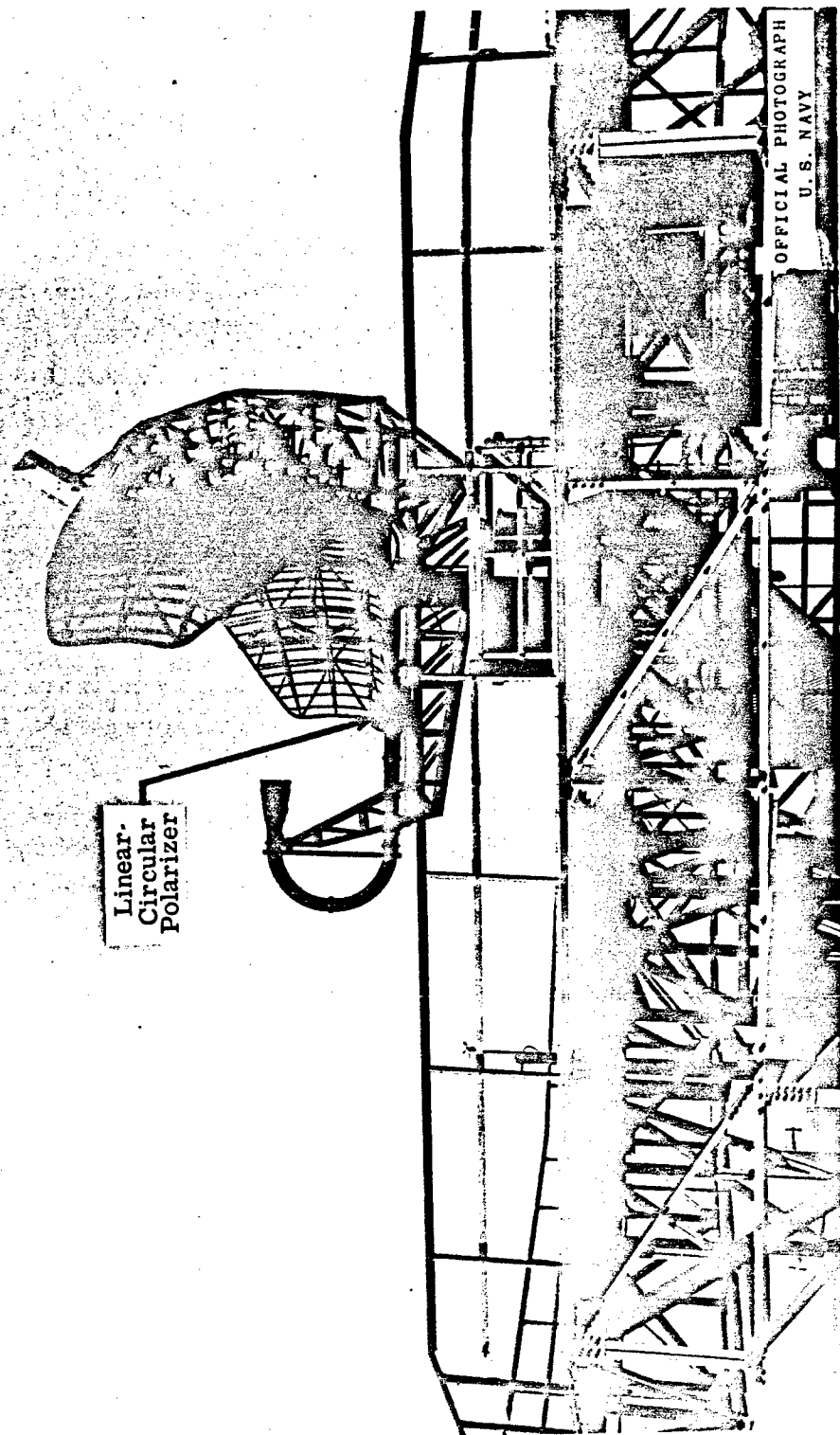


Figure 3-7. Photograph of ARSR-1B-A Antenna (close up).

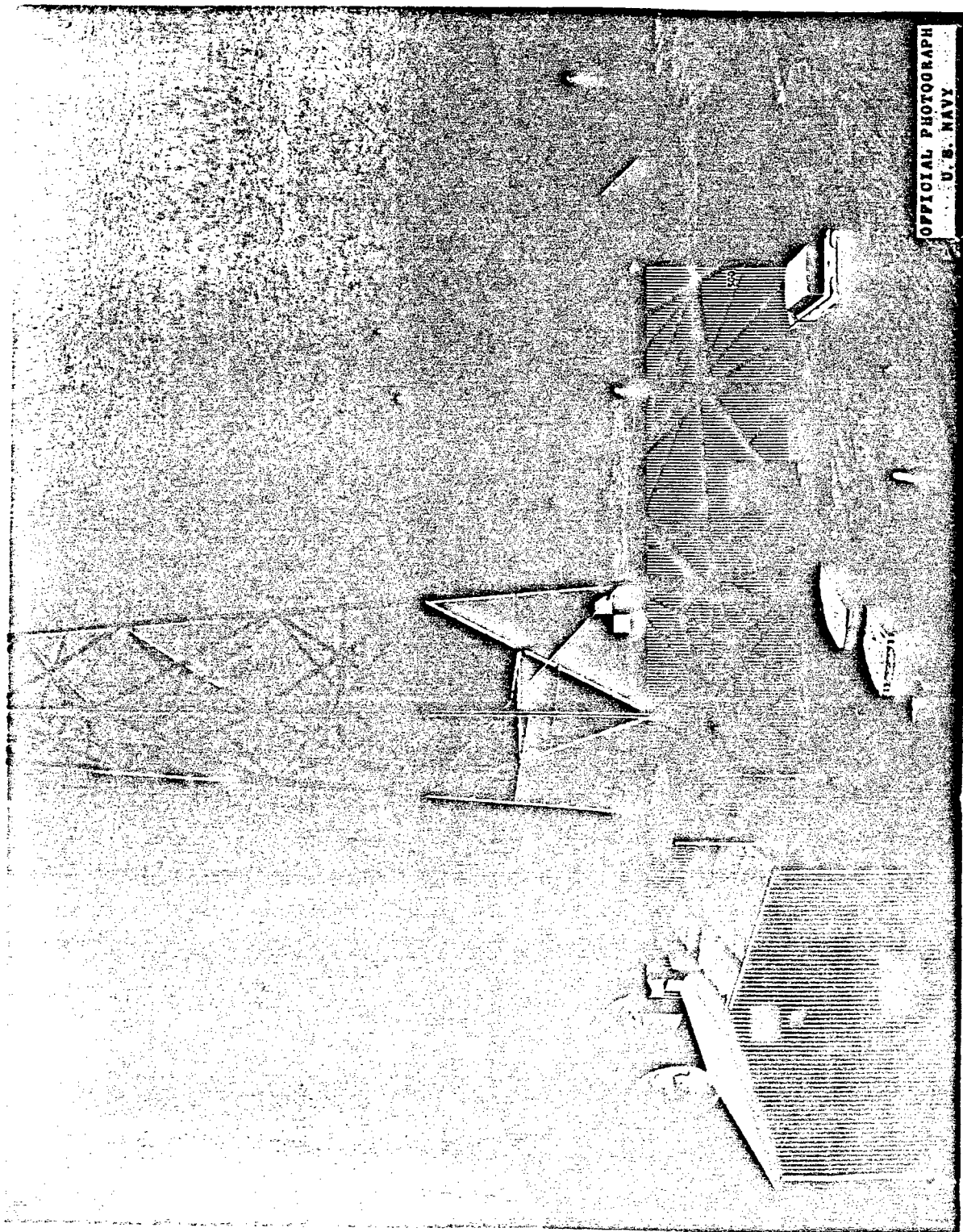


Figure 3-8. Photograph of ARSR-1B-A Antenna (long shot).

## Section 4

### TEST EQUIPMENT

A large quantity of the test equipment used in the spectrum signature measurement was housed in a Frederick Research Corporation Mobile Measurement Van. This van is shown in Figure 2-7 parked at the Test Site for the far-field measurements. Shielding for this type of van has been measured and recorded. Additional test equipment was supplied from the home laboratory of Jansky & Bailey. In some instances, site equipment may be used when it is available. Any special equipment needed, which is not ordinarily used in spectrum signature measurements and therefore may not be part of either firm's equipment list, is procured or fabricated by Jansky & Bailey. Equipment purchased on prior tasks is also used when needed. A record is kept of test equipment calibration and bandwidth. This record is kept continually up to date.

#### 4.1 MOBILE MEASUREMENT VAN TEST EQUIPMENT

| <u>EQUIPMENT</u>              | <u>MODEL</u> | <u>SERIAL NO.</u> | <u>FREQUENCY RANGE</u> |
|-------------------------------|--------------|-------------------|------------------------|
| <u>SIGNAL GENERATORS</u>      |              |                   |                        |
| General Radio                 | 1001-A       | 3599              | 5kc-50Mc               |
| Hewlett-Packard               | 608C         | 369-02403         | 10Mc-480Mc             |
| Hewlett-Packard               | 612A         | 299-01688         | 450Mc-1230Mc           |
| Hewlett-Packard               | 614A         | 211-03092         | 800Mc-2100Mc           |
| Hewlett-Packard               | 616B         | 148-01241         | 1800Mc-4200Mc          |
| Hewlett-Packard               | 618B         | 151-02920         | 3800Mc-7600Mc          |
| Hewlett-Packard               | 620A         | 216-02566         | 7000Mc-11,000Mc        |
| Polarad                       | MSG-1        | 366               | 950Mc-2400Mc           |
| Polarad                       | MSG-2A       | 396               | 2150Mc-4600Mc          |
| <u>FIELD INTENSITY METERS</u> |              |                   |                        |
| Stoddart                      | NM-10A       | 239-32            | 14kc-250kc             |
| Stoddart                      | NM-20B       | 251-18            | 150kc-25Mc             |
| Stoddart                      | NM-30A       | 243-2             | 20Mc-400Mc             |
| Stoddart                      | NM-50A       | 249-22            | 375Mc-1000Mc           |
| Stoddart                      | NM-62A       | 356-2             | 1.0kMc-10kMc           |

| <u>EQUIPMENT</u>         | <u>MODEL</u> | <u>SERIAL NO.</u> | <u>FREQUENCY RANGE</u> |
|--------------------------|--------------|-------------------|------------------------|
| <u>RECEIVERS</u>         |              |                   |                        |
| National                 | HRO-60R      | 868               | 50kc-30Mc              |
| Nems-Clarke              | 1905         | 3                 | 30Mc-900Mc             |
| Nems-Clarke              | REU-300B     | 229               |                        |
| <u>PANADAPTORS</u>       |              |                   |                        |
| Panoramic                | SA-8B2-T200  | 26J111            | 455kc                  |
| Panoramic                | SA-3-T3000C1 | 15H407            | 21.4Mc                 |
| <u>SPECTRUM ANALYZER</u> |              |                   |                        |
| Polarad                  | SA-84        | 214/197           | 10Mc-40,880Mc          |
| <u>POWER METER</u>       |              |                   |                        |
| Hewlett-Packard          | 430C         | 261               |                        |
| <u>THERMISTOR MOUNTS</u> |              |                   |                        |
| Hewlett-Packard          | 477B         |                   | 10Mc-10,000Mc          |
| Hewlett-Packard          | X487B        |                   | 8200Mc-12,400Mc        |
| Hewlett-Packard          | P487B        |                   | 12,400Mc-18,000Mc      |
| Hewlett-Packard          | K487B        |                   | 18,000Mc-26,500Mc      |
| <u>FREQUENCY METERS</u>  |              |                   |                        |
| Lavoie                   | LA-70A       | 202               | 10kc-3000Mc            |
| Narda                    | 802B         | 248               | 2350Mc-10,500Mc        |
| Hewlett-Packard          | X532A        |                   | 8200Mc-10,500Mc        |
| Hewlett-Packard          | K532A        |                   | 12,400Mc-18,000Mc      |
| Hewlett-Packard          | P532A        |                   | 18,000Mc-26,500Mc      |
| <u>ATTENUATORS</u>       |              |                   |                        |
| Weinschel                | 50-5         | 52492             | DC-1kMc                |
| Weinschel                | 50-10        | 54101             | DC-1kMc                |
| Weinschel                | 50-20        | 54052             | DC-1kMc                |
| Weinschel                | 50-40        | 54351             | DC-1kMc                |
| Weinschel                | 50-50        | 52561             | DC-1kMc                |
| Weinschel                | 210-5        | 17933, 17936      | 1-10kMc                |
| Weinschel                | 210-10       | 13825             | 1-10kMc                |
| Weinschel                | 210-20       | 14823, 17397      | 1-10kMc                |
| <u>ANTENNAS</u>          |              |                   |                        |
| Stoddart, Loop           | 90117-3      |                   |                        |
| Stoddart, Loop           | 90114-3      |                   |                        |
| Stoddart, Rod            | 90291-2      |                   |                        |
| Stoddart, Loop           | 90298-2      |                   |                        |
| Stoddart, Loop           | 91077-2      |                   |                        |
| Stoddart, Dipole         | 90333-2      |                   |                        |
| Stoddart, Dipole         | 90330-3      |                   |                        |

| <u>EQUIPMENT</u>               | <u>MODEL</u> | <u>SERIAL NO.</u> | <u>FREQUENCY RANGE</u> |
|--------------------------------|--------------|-------------------|------------------------|
| <u>ANTENNAS (continued)</u>    |              |                   |                        |
| Polarad, Horn                  | CA-L         | 195               |                        |
| Polarad, Horn                  | CA-S         | 196               |                        |
| Polarad, Horn                  | CA-M         | 182               |                        |
| Polarad, Horn                  | CA-X         | 179               |                        |
| Polarad, Reflector             | CA-R         | 216               |                        |
| Polarad, Omni                  | CA-B         | 178               |                        |
| Polarad                        | KU           | 114               |                        |
| Polarad                        | K            | 115               |                        |
| <u>WAVEGUIDE EQUIPMENT</u>     |              |                   |                        |
| FXR Waveguide                  | WG34A        | 129               |                        |
| FXR Waveguide                  | C634A        | 181               |                        |
| FXR Waveguide                  | H634A        | 133               |                        |
| FXR Waveguide                  | S634A        | 133               |                        |
| Aircom Waveguide               | BL02         | 106               |                        |
| FXR Waveguide to Coax          | W601B        | 629,630           |                        |
| FXR Waveguide to Coax          | C601B        | 623,629           |                        |
| FXR Waveguide to Coax          | H601B        | 897,898           |                        |
| FXR Waveguide to Coax          | S601B        | 816,848           |                        |
| Aircom Waveguide to Coax       |              |                   |                        |
| <u>FILTERS</u>                 |              |                   |                        |
| Stoddart                       | LP11148      |                   | 25Mc low-pass          |
| Microphase                     | LP50AB       | 601               | 50Mc low-pass          |
| Microphase                     | LP-100AB     | 508               | 100Mc low-pass         |
| Microphase                     | LP-200       | 503               | 200Mc low-pass         |
| Microphase                     | LP-400       | 1119              | 400Mc low-pass         |
| Microphase                     | LP-600       | 502               | 600Mc low-pass         |
| Microphase                     | LP-1000      | 506               | 1000Mc low-pass        |
| Microphase                     | LP-2000      | 503               | 2000Mc low-pass        |
| Microphase                     | LTP-4000     | 506               | 4000Mc low-pass        |
| Microphase                     | LTP-8000     | 522               | 8000Mc low-pass        |
| Microphase                     | LTP-12,000   | 525               | 12,000Mc low-pass      |
| Microphase                     | LTP-12,000   | 501               | 12,000Mc low-pass      |
| Microphase                     | HT-12,000    | 501,504           | 12,000Mc high-pass     |
| <u>MISCELLANEOUS EQUIPMENT</u> |              |                   |                        |
| Kay Mega-Sweep                 | 100A         | 18506             | 50kc-1000Mc            |
| Tektronix Scope                | 545A         | 021615            |                        |
| Hewlett-Packard (VTVM)         | 400H         | 7396              |                        |
| Hickock Tube Tester            | 539B         | 18212470          |                        |
| Simpson (Multimeter)           | 260          | 5888              |                        |
| Dumont Camera Mount            | 2620         | 5433              |                        |
| Polaroid Camera                | 2620         | B025292           |                        |
| Esterline Angus Recorder       |              | 126630            |                        |
| HP Transfer Oscillator         | 540B         | 129-01700         |                        |
| Sanborn Amplifier              | 150-1400     |                   |                        |
| Sanborn Recorder               | 151          | 973               |                        |
| Microlab Power Divider         | DA-3FN       |                   |                        |
| Autograph XY Recorder          | M-135        |                   |                        |
| Transit, David White           | 8300         | 105X              |                        |

#### 4.2 ADDITIONAL TEST EQUIPMENT

Listed below is additional equipment supplied by the home laboratories of Jansky & Bailey, GFE and the Naval Missile Facility.

##### J&B TEST EQUIPMENT

###### CHOPPER

|                 |  |                     |
|-----------------|--|---------------------|
| Jansky & Bailey |  | 1000cps Square Wave |
|-----------------|--|---------------------|

###### DIRECTIONAL COUPLER

|       |      |     |               |
|-------|------|-----|---------------|
| Narda | 3022 | 202 | 1.0kMc-4.0kMc |
|-------|------|-----|---------------|

###### MOTOR

Variable Speed

###### TRANSCEIVER

|         |               |
|---------|---------------|
| RCA (2) | Citizens Band |
|---------|---------------|

##### GOVERNMENT FURNISHED EQUIPMENT

###### SIGNAL SAMPLER

|          |             |
|----------|-------------|
| Microlab | HY Series N |
|----------|-------------|

###### FILTERS (HIGH-PASS)

|                 |        |       |
|-----------------|--------|-------|
| Microlab        | HC-02N | 200Mc |
| Microlab        | HC-04N | 400Mc |
| RLC Electronics | F-20   | 800Mc |

###### ATTENUATOR

|                       |        |       |
|-----------------------|--------|-------|
| Weinschel (20db, 20W) | 693-20 | 51310 |
|-----------------------|--------|-------|

###### CABLE

|                 |          |
|-----------------|----------|
| Prodlein (100') | RG-260/U |
|-----------------|----------|

##### NAVAL MISSILE FACILITY

###### COUNTER

|                 |      |           |
|-----------------|------|-----------|
| Hewlett-Packard | 522B | 125-04870 |
|-----------------|------|-----------|

#### 4.3 COMPONENTS PROCURED

The following component was procured for this task. Small components such as connectors, crystals, film, recording paper, miscellaneous hardware items, etc., are not listed.

##### ADJUSTABLE ATTENUATOR

General Radio

GR-874-GA

#### 4.4 FABRICATION OF SPECIAL EQUIPMENT

In an experimental pulse count test, it was found that a pulse generator or some other threshold device was needed in order to isolate the receiver from the counter. A Tektronix scope used as a threshold device was found to work very well in these tests. However, in order to have a back up threshold device for the pulse count test or the ARSR radar in Point Arguello, a transistorized Schmitt trigger circuit was built in the J&B laboratory.

#### 4.5 CALIBRATION OF TEST EQUIPMENT

All of the test equipment such as signal generators, field intensity meters, power meters, frequency meters and attenuators is either calibrated or checked shortly before each task assignment for the collection of spectrum signatures. During the course of the measurements, a continual cross check between instruments is made wherever possible in order to maintain a check on the accuracy of the equipment. If, during the measurements, an instrument's accuracy becomes suspect, the instrument is either replaced or recalibrated. At the completion of a task and before the van is moved from the measurement site, all signal generators 0 dbm settings are checked against a thermal power meter. Calibrated attenuators are also checked before leaving the measurement site.

Measurements such as cable losses and coupling factors of signal samplers and directional couplers are made during the course of the measurements or just prior to leaving the measurement site.

Data are discussed and tabulated below on mobile van shielding, van equipment calibration dates, test antenna gains, and cable losses.

#### 4.5.1 Mobile Van Shielding

Shielding attenuation versus frequency for this type of measurement van is listed below.

| <u>Frequency<br/>(Mc)</u> | <u>Attenuation<br/>(db)</u> |
|---------------------------|-----------------------------|
| 0.1                       | 66                          |
| 1.0                       | 46                          |
| 18.0                      | 0                           |
| 450.0                     | 55                          |
| 900.0                     | 45                          |
| 1200                      | 52                          |
| 2200                      | 43                          |
| 4200                      | 41                          |
| 6000                      | 51                          |
| 8000                      | >40                         |
| 10000                     | >40                         |

This hole in the shielding at 18 Mc is very narrow. Shielding is greater than 40 db at all other frequencies.

#### 4.5.2 Van Equipment Calibration Dates

Periodic calibrations are made on a large portion of the Mobile Van test equipment. The dates of the last calibration are tabulated below. This equipment was used on Task No. 11 between December 2, 1962, and December 21, 1962.

| <u>EQUIPMENT</u>         | <u>SERIAL NO.</u> | <u>DATE OF CALIBRATION</u> |
|--------------------------|-------------------|----------------------------|
| <u>SIGNAL GENERATORS</u> |                   |                            |
| General Radio            | 3599              | 11/8/62                    |
| Hewlett-Packard          | 211-03092         | 10/31/62                   |
| Hewlett-Packard          | 148-01241         | 10/30/62                   |
| Hewlett-Packard          | 151-02920         | 11/1/62                    |
| Hewlett-Packard          | 216-02566         | 11/2/62                    |

| <u>EQUIPMENT</u>                  | <u>SERIAL NO.</u> | <u>DATE OF CALIBRATION</u> |
|-----------------------------------|-------------------|----------------------------|
| <u>SIGNAL GENERATORS (cont'd)</u> |                   |                            |
| Polarad                           | 366               | 11/5/62                    |
| Polarad                           | 396               | 11/1/62                    |
| <u>FIELD INTENSITY METERS</u>     |                   |                            |
| Stoddart                          | 239-32            | 10/30/62                   |
| Stoddart                          | 251-18            | 11/1/62                    |
| Stoddart                          | 248-2             | 10/31/62                   |
| Stoddart                          | 249-22            | 10/5/62                    |
| Stoddart                          | 356-2             | 11/16/62                   |
| <u>POWER METER</u>                |                   |                            |
| Hewlett-Packard                   | 261               | 9/6/62                     |
| <u>FREQUENCY METER</u>            |                   |                            |
| Lavoie                            | 202               | 11/6/62                    |
| <u>ATTENUATORS</u>                |                   |                            |
| Weinschel                         | 52492             | 8/24/62                    |
| Weinschel                         | 54101             | 8/24/62                    |
| Weinschel                         | 54052             | 8/24/62                    |
| Weinschel                         | 54351             | 8/24/62                    |
| Weinschel                         | 52561             | 8/24/62                    |
| Weinschel                         | 17933, 17936      | 7/9/62                     |
| Weinschel                         | 13825             | 7/9/62                     |
| Weinschel                         | 14823, 17397      | 7/9/62                     |
| <u>MISCELLANEOUS EQUIPMENT</u>    |                   |                            |
| Tektronix Scope                   | 021615            | 10/31/62                   |
| Hewlett-Packard (VTVM)            | 7396              | 7/19/62                    |
| Simpson (Multimeter)              | 5888              | 10/17/62                   |

### 4.5.3 Test Antenna Gains

The manufacturer's calibration of the gain of the test antennas with respect to an isotropic antenna are listed below. Antenna gain figures are used in computing power densities.

| <u>ANTENNA</u>                         | <u>FREQUENCY<br/>(Mc)</u> | <u>GAIN<br/>(db)</u> |
|----------------------------------------|---------------------------|----------------------|
| Tuned Dipole                           | 200                       | 2.2                  |
| Tuned Dipole                           | 1000                      | 2.2                  |
| Polarad CA-L                           | 1000                      | 8.1                  |
|                                        | 1200                      | 9.7                  |
|                                        | 1300                      | 10.3                 |
|                                        | 1500                      | 11.2                 |
|                                        | 1750                      | 12.4                 |
|                                        | 2000                      | 13.6                 |
|                                        | 2200                      | 14.5                 |
| Polarad CA-S                           | 2000                      | 15.1                 |
|                                        | 2200                      | 15.9                 |
|                                        | 2500                      | 16.8                 |
|                                        | 3000                      | 17.8                 |
|                                        | 4000                      | 19.8                 |
|                                        | 4300                      | 20.4                 |
| Polarad CA-M<br>with CA-R<br>Reflector | 4100                      | 22.8                 |
|                                        | 4500                      | 23.0                 |
|                                        | 5000                      | 23.4                 |
|                                        | 5500                      | 24.0                 |
|                                        | 6000                      | 24.5                 |
|                                        | 6500                      | 25.2                 |
|                                        | 7000                      | 25.8                 |
|                                        | 7700                      | 26.7                 |
| Polarad CA-X<br>with CA-R<br>Reflector | 7400                      | 27.0                 |
|                                        | 8000                      | 27.5                 |
|                                        | 8500                      | 28.0                 |
|                                        | 9000                      | 28.5                 |
|                                        | 9500                      | 29.0                 |
|                                        | 10,000                    | 29.5                 |

#### 4.5.4 Cable Losses

Test and calibration cable losses must be known in order to compute the power density at the test antenna. These losses were measured by inserting the lengths of cable between a signal generator and a tuned RF voltmeter. The same indication is obtained on the receiver with and without the cable inserted. The difference in signal generator outputs is the cable loss. The net cable loss in the open-field measurements was that of a 100' of RG-260/U plus a 6' length of RG-8/U. In the power output measurement a 20' length of RG-9/U was used to connect the power meter to the directional coupler in the ARSR transmission line. These cable losses are tabulated below.

| <u>Frequency<br/>(Mc)</u> | <u>100' RG-260/U<br/>plus 6' RG-8/U<br/>(db)</u> | <u>20' RG-9/U<br/>(db)</u> |
|---------------------------|--------------------------------------------------|----------------------------|
| 100                       | 1.6                                              |                            |
| 500                       | 3.1                                              |                            |
| 1000                      | 4.0                                              |                            |
| 1200                      | 4.9                                              |                            |
| 1258                      |                                                  | 1.6                        |
| 1298                      |                                                  | 2.1                        |
| 1348                      |                                                  | 2.1                        |
| 1400                      | 5.5                                              |                            |
| 1600                      | 5.9                                              |                            |
| 1800                      | 6.1                                              |                            |
| 2000                      | 6.4                                              |                            |
| 2500                      | 7.5                                              |                            |
| 3000                      | 8.2                                              |                            |
| 3500                      | 9.6                                              |                            |
| 4000                      | 10.8                                             |                            |
| 4500                      | 12.1                                             |                            |
| 5000                      | 13.0                                             |                            |
| 5500                      | 13.1                                             |                            |
| 6000                      | 13.5                                             |                            |
| 6500                      | 15.0                                             |                            |
| 7000                      | 14.9                                             |                            |
| 7500                      | 17.0                                             |                            |
| 8000                      | 15.7                                             |                            |
| 8500                      | 16.0                                             |                            |
| 9000                      | 16.8                                             |                            |
| 9500                      | 17.1                                             |                            |
| 10,000                    | 18.6                                             |                            |

#### 4.6 TEST EQUIPMENT BANDWIDTHS

Bandwidth and IF frequencies of the receiving test equipment must be known when analyzing data from tests such as the Spurious Emission, Emission Spectrum, and Modulation Characteristics.

The receiving equipment used in this task included the Polarad SA-84 spectrum analyzer and the Stoddart NM-10A, NM-20B, NM-30A, NM-50A receivers.

The Polarad SA-84 spectrum analyzer has a frequency range of 10-40,880 Mc which is covered in eight bands. Spectrum analyzer intermediate frequencies are 160 Mc, 64 Mc and 500 kc. The first local oscillator is tuned 160 Mc above the signal input while the second local oscillator frequency is centered at 224 Mc. Since the bandwidth of the final narrow band amplifier is 20 kc, the resolution bandwidth of the spectrum analyzer is 20 kc.

The Stoddart NM-62A has a frequency range of 1000 Mc to 10,000 Mc which is covered in four bands. Bands 1 to 4 have frequency ranges as follows: 1.0-2.3 kMc, 2.3-4.4 kMc, 4.4-7.3 kMc, and 7.3-10.0 kMc. In bands 1 and 3, the first local oscillator is tuned above and in bands 2 and 4 below the incoming signal by 160 Mc. The second local oscillator is set at 220 Mc to give an IF frequency of 60 Mc. Receiver bandwidths of either 5.0 Mc or 0.5 Mc may be obtained by a front panel switch.

Since no spurious emissions were found below 1000 Mc, no bandwidth data on the Stoddart NM-10A, NM-20B, NM-30A and NM-50A will be given here.

## Section 5

### MEASUREMENTS

#### 5.1 GENERAL

Transmitter measurements were made on the ARSR-1B-A radar according to MIL-STD-449A insofar as time permitted. All transmitter tests were made on Channel B of the radar. Task Order 11 deleted receiver measurements and the requirement for more than one test site. Antenna patterns were to be made after the far-field transmitter tests were completed through the second harmonic and then only if they could be taken with the antenna rotating at a speed of 1 rpm or less. The antenna measurements had priority over the special Pulse Count test. Far-field transmitter measurements above the second harmonic had the next priority after the Pulse Count test. Antenna speeds of 1 rpm or less could not be obtained and as a consequence, no antenna patterns were made.

The three standard test frequencies used for the spectrum signature measurements were 1257.8 Mc, 1297.8 Mc, and 1348 Mc. These may be referred to at times as the low, center (mean) and high standard test frequencies. Since the radar is manually tuned (magnetron), some slight variation in the standard test frequency is seen in the day-to-day measurement of frequency. Notation for the radar fundamental and harmonic is  $f_0$ ,  $2f_0$ , etc. Vertical polarization of the test antenna is identified variously as Vert., VP, and V. Horizontal polarization of the test antenna is identified at times as Hor., HP, and H.

All the transmitter tests can be classified as either open-field or closed-system. MIL-STD-449A specifies that all open-field tests shall be made in the far-field of the fundamental frequency. Far-field distance between the radar and test antennas is defined as  $D^2/\lambda$  where D is the maximum aperture dimension of the

radar antenna, and  $\lambda$  is the wavelength of the fundamental frequency. The test site used in this task was in the far-field for all the spurious frequencies. Closed-system tests are those that are made in the transmission line of the radar.

The numbering in this section of the report is made to correspond to the numbering in MIL-STD-449A. For instance, the transmitter Spurious Emission test is described in Section 5.2.3 in MIL-STD-449A. In this section, the Spurious Emission test is reported in Section 5.2.3. Furthermore, the measurement setup block diagram for this test is Figure 5.2.3-1 and the automatic spurious emission scans follow in Figures 5.2.3-2, 5.2.3-3, etc.

In this section, a description of the test for each measurement will be made. This will be followed by block diagrams, photographs or curves, and data sheets.

## 5.2 TRANSMITTER MEASUREMENTS

All open-field transmitter measurements were made in the far-field at the Test Site (FIC). These tests are listed below:

|                            |         |
|----------------------------|---------|
| Spurious Emission          | (5.2.3) |
| Emission Spectrum          | (5.2.4) |
| Modulation Characteristics | (5.2.5) |

The following tests were made in closed-system

|                             |         |
|-----------------------------|---------|
| Power Output                | (5.2.2) |
| Carrier Frequency Stability | (5.2.8) |

In addition, power output was monitored and recorded at frequent intervals during the open-field transmitter tests.

### 5.2.2 Power Output

Since the fundamental power output of the radar is measured at frequent intervals during all transmitter measurements, no formal test was made where power output was the only quantity measured. A continual measurement of power output at frequent intervals was made during the radiation tests such as spurious emission, emission spectrum, etc. Closed-system power output measurements were made at the three standard test frequencies of 1257.8 Mc, 1297.8 Mc, and 1348 Mc on Channel B of the radar. Measurements were made with a thermal type power indicator as shown in Figure 5.2.2-1.

Forward power was measured at the directional coupler output which has a nominal coupling factor of 66 db. The calibrated coupling factor was actually 66.2 db. Power meter readings taken from the HP-430C power indicator are tabulated in the data sheets under the power meter reading column. Coupling factor in the directional coupler and cable loss between the directional coupler and power meter must be added to the power meter reading to obtain the average power output. Cable loss is shown under the attenuation inserted column. Average power output in equation form is

$$\text{Power Output (avg.)} = \text{power meter reading} + \text{coupling factor} + \text{attenuation inserted}$$

From line 1 of the power output data sheet of 12/3/62

$$\begin{aligned}\text{Power Output (avg.)} &= -1.1 \text{ dbm} + 66.2 \text{ db} + 2.1 \text{ db} \\ &= 67.2 \text{ dbm}\end{aligned}$$

Peak power may be obtained from the average if the output duty cycle is known. The measured duty cycle is

$$\begin{aligned}\text{Duty cycle} &= \text{PRF (pulsewidth)} \\ &= 360 \text{ (1.8 microsecond)} \\ &= 648 \times 10^{-6}\end{aligned}$$

$$\begin{aligned}
 \text{Peak Power} &= \text{avg. power (dbm)} + 10 \log 1/\text{duty cycle} \\
 &= 67.2 \text{ dbm} + 10 \log 1/648 \times 10^{-6} \\
 &= 67.2 \text{ dbm} + 31.9 \text{ db} \\
 &= 99.1 \text{ dbm}
 \end{aligned}$$

Since the forward power was sampled, a correction must be made for reflected power to determine the actual power output. The measured VSWR for each of the three standard test frequencies and the correction to the power output as shown above is tabulated below.

| <u>Frequency</u><br>(Mc) | <u>VSWR</u> | <u>Correction</u><br>(db) |
|--------------------------|-------------|---------------------------|
| 1257.8                   | 1.20        | -0.1                      |
| 1297.8                   | 1.28        | -0.1                      |
| 1348                     | 1.21        | -0.1                      |

$$\begin{aligned}
 \text{Corrected Power Output (avg.)} &= 67.2 \text{ dbm} + (-0.1 \text{ db}) \\
 &= 67.1 \text{ dbm} \\
 \text{Corrected Power Output (peak)} &= 99.1 \text{ dbm} + (-0.1 \text{ db}) \\
 &= 99.0 \text{ dbm}
 \end{aligned}$$

The power output from Channel B is recorded on 11 data sheets.

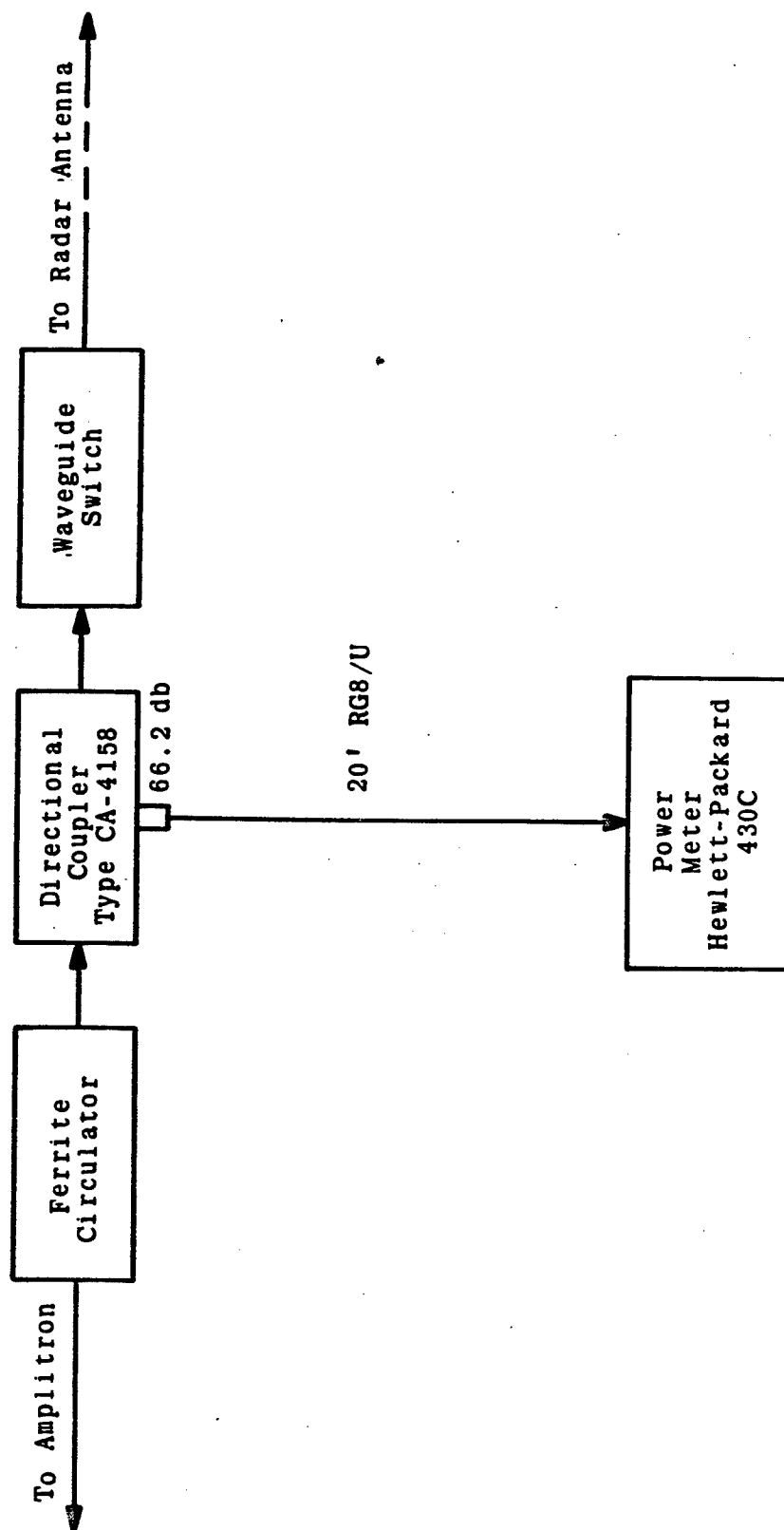


Figure 5.2.2-1. Power Output Test Block Diagram.

# TRANSMITTER MEASUREMENTS

## POWER OUTPUT

Xmtr.: ARSR-1B-A Site Code: 5110.11 Date: 12/3/62  
 Xmtr. Serial No.: 54 Radio Set: \_\_\_\_\_  
 Tuning Band (Mc): 1240-1350  
 Modulation: Pulse PW( $\mu$ s): 1.8 PRF(pps) 360  
 Significant Control Positions: Linear Polarization, Transmitter B  
 \_\_\_\_\_  
 Measuring Devices: HP-430C, 20' RG-8/U  
 \_\_\_\_\_  
 \_\_\_\_\_

| Frequency<br>(Mc) | Time<br>of<br>Day | Power Meter<br>Reading |       | Coupling<br>Factor<br>(db) | Atten.<br>Inserted<br>(db) | Power Output<br>(dbm) |      |
|-------------------|-------------------|------------------------|-------|----------------------------|----------------------------|-----------------------|------|
|                   |                   | (mw)                   | (dbm) |                            |                            | Avg.                  | Peak |
| 1297.2            | 1832              | .77                    | -1.1  | 66.2                       | 2.1                        | 67.1                  | 99.0 |
|                   | 1846              | .78                    | -1.1  |                            |                            | 67.1                  | 99.0 |
|                   | 1900              | .76                    | -1.2  |                            |                            | 67.0                  | 98.9 |
|                   | 1915              | .79                    | -1.0  |                            |                            | 67.2                  | 99.1 |
|                   | 1930              | .79                    | -1.0  |                            |                            | 67.2                  | 99.1 |
|                   | 1945              | .78                    | -1.1  |                            |                            | 67.1                  | 99.0 |
|                   | 2000              | .78                    | -1.1  |                            |                            | 67.1                  | 99.0 |
|                   | 2015              | .80                    | -1.0  |                            |                            | 67.2                  | 99.1 |
|                   | 2030              | .80                    | -1.0  |                            |                            | 67.2                  | 99.1 |
|                   | 2045              | .79                    | -1.0  |                            |                            | 67.2                  | 99.1 |
|                   | 2100              | .80                    | -1.0  |                            |                            | 67.2                  | 99.1 |
|                   | 2115              | .80                    | -1.0  |                            |                            | 67.2                  | 99.1 |
|                   | 2130              | .79                    | -1.0  |                            |                            | 67.2                  | 99.1 |
|                   | 2145              | .79                    | -1.0  |                            |                            | 67.2                  | 99.1 |
|                   | 2200              | .79                    | -1.0  |                            |                            | 67.2                  | 99.1 |
|                   | 2215              | .80                    | -1.0  |                            |                            | 67.2                  | 99.1 |
|                   | 2230              | .80                    | -1.0  |                            |                            | 67.2                  | 99.1 |
|                   |                   |                        |       |                            |                            |                       |      |
|                   |                   |                        |       |                            |                            |                       |      |
|                   |                   |                        |       |                            |                            |                       |      |

### Measurement Instructions

Measure power output at standard test frequencies of each tuning band. Output for AM and FM transmitters is AO or FO. This sheet is not applicable for SSB transmitters. Coupling factor is the sum of the coupling factors of all the directional couplers used.

Use reverse side for block diagram and remarks.

# TRANSMITTER MEASUREMENTS

## POWER OUTPUT

Xmtr.: ARSR-1B-A Site Code: 5110.11 Date: 12/6/62

Xmtr. Serial No.: 54 Radio Set: \_\_\_\_\_

Tuning Band (Mc): 1240-1350

Modulation: Pulse PW( $\mu$ s): 1.8 PRF(pps) 360

Significant Control Positions: Linear Polarization, Transmitter B

Measuring Devices: HP-430C, 20' RG-8/U

| Frequency<br>(Mc) | Time<br>of<br>Day | Power Meter<br>Reading |       | Coupling<br>Factor<br>(db) | Atten.<br>Inserted<br>(db) | Power Output<br>(dbm) |      |
|-------------------|-------------------|------------------------|-------|----------------------------|----------------------------|-----------------------|------|
|                   |                   | (mw)                   | (dbm) |                            |                            | Avg.                  | Peak |
| 1295              | 1115              | .720                   | -1.4  | 66.2                       | 2.1                        | 66.8                  | 98.7 |
|                   | 1130              | .700                   | -1.6  |                            |                            | 66.6                  | 98.5 |
|                   | 1145              | .720                   | -1.4  |                            |                            | 66.8                  | 98.7 |
|                   | 1200              | .710                   | -1.5  |                            |                            | 66.7                  | 98.6 |
|                   | 1215              | .720                   | -1.4  |                            |                            | 66.8                  | 98.7 |
|                   | 1230              | .720                   | -1.4  |                            |                            | 66.8                  | 98.7 |
|                   | 1245              | .720                   | -1.4  |                            |                            | 66.8                  | 98.7 |
|                   | 1300              | .710                   | -1.5  |                            |                            | 66.7                  | 98.6 |
|                   | 1315              | .710                   | -1.5  |                            |                            | 66.7                  | 98.6 |
|                   | 1330              | .725                   | -1.4  |                            |                            | 66.8                  | 98.7 |
|                   | 1345              | .745                   | -1.3  |                            |                            | 66.9                  | 98.8 |
|                   | 1400              | .720                   | -1.4  |                            |                            | 66.8                  | 98.7 |
|                   | 1415              | .725                   | -1.4  |                            |                            | 66.8                  | 98.7 |
|                   | 1430              | .720                   | -1.4  |                            |                            | 66.8                  | 98.7 |
| ↓                 | 1437              | .720                   | -1.4  | ↓                          | ↓                          | 66.8                  | 98.7 |
|                   |                   |                        |       |                            |                            |                       |      |
|                   |                   |                        |       |                            |                            |                       |      |
|                   |                   |                        |       |                            |                            |                       |      |
|                   |                   |                        |       |                            |                            |                       |      |
|                   |                   |                        |       |                            |                            |                       |      |

### Measurement Instructions

Measure power output at standard test frequencies of each tuning band. Output for AM and FM transmitters is A0 or F0. This sheet is not applicable for SSB transmitters. Coupling factor is the sum of the coupling factors of all the directional couplers used.

Use reverse side for block diagram and remarks.



# TRANSMITTER MEASUREMENTS

## POWER OUTPUT

Xmtr.: ARSR-1B-A Site Code: 5110.11 Date: 12/10/62  
 Xmtr. Serial No.: 54 Radio Set: \_\_\_\_\_  
 Tuning Band (Mc): 1240-1350  
 Modulation: Pulse PW( $\mu$ s): 1.8 PRF(pps) 360  
 Significant Control Positions: Linear Polarization, Transmitter B

---

Measuring Devices: HP-430C, 20' RG-8/U

---

| Frequency<br>(Mc) | Time<br>of<br>Day | Power Meter<br>Reading |       | Coupling<br>Factor<br>(db) | Atten.<br>Inserted<br>(db) | Power Output<br>(dbm) |      |
|-------------------|-------------------|------------------------|-------|----------------------------|----------------------------|-----------------------|------|
|                   |                   | (mw)                   | (dbm) |                            |                            | Avg.                  | Peak |
| 1300              | 1330              | .745                   | -1.3  | 66.2                       | 2.1                        | 66.9                  | 98.8 |
|                   | 1400              | .745                   | -1.3  |                            |                            | 66.9                  | 98.8 |
|                   | 1430              | .740                   | -1.3  |                            |                            | 66.9                  | 98.8 |
|                   | 1500              | .700                   | -1.6  |                            |                            | 66.6                  | 98.5 |
|                   | 1530              | .700                   | -1.6  |                            |                            | 66.6                  | 98.5 |
|                   | 1600              | .700                   | -1.6  |                            |                            | 66.6                  | 98.5 |
|                   | 1630              | .710                   | -1.5  |                            |                            | 66.7                  | 98.6 |
| ↓                 | 1700              | .690                   | -1.6  |                            |                            | 66.6                  | 98.5 |
| 1297              | 1730              | .700                   | -1.6  |                            |                            | 66.6                  | 98.5 |
|                   | 1800              | .700                   | -1.6  |                            |                            | 66.6                  | 98.5 |
|                   | 1830              | .700                   | -1.6  |                            |                            | 66.6                  | 98.5 |
|                   | 1900              | .710                   | -1.5  |                            |                            | 66.7                  | 98.6 |
|                   | 1930              | .700                   | -1.6  |                            |                            | 66.6                  | 98.5 |
|                   | 2000              | .700                   | -1.6  |                            |                            | 66.6                  | 98.5 |
| ↓                 | 2030              | .700                   | -1.6  | ↓                          | ↓                          | 66.6                  | 98.5 |
|                   | 2100              |                        |       |                            |                            |                       |      |
|                   |                   |                        |       |                            |                            |                       |      |
|                   |                   |                        |       |                            |                            |                       |      |
|                   |                   |                        |       |                            |                            |                       |      |

### Measurement Instructions

Measure power output at standard test frequencies of each tuning band. Output for AM and FM transmitters is A0 or F0. This sheet is not applicable for SSB transmitters. Coupling factor is the sum of the coupling factors of all the directional couplers used.

Use reverse side for block diagram and remarks.

# TRANSMITTER MEASUREMENTS

## POWER OUTPUT

Xmtr.: ARSR-1B-A Site Code: 5110.11 Date: 12/11/62  
 Xmtr. Serial No.: 54 Radio Set: \_\_\_\_\_  
 Tuning Band (Mc): 1240-1350  
 Modulation: Pulse PW( $\mu$ s): 1.8 PRF(pps) 360  
 Significant Control Positions: Linear Polarization, Transmitter B  
 \_\_\_\_\_  
 Measuring Devices: HP-430C, 20' RG-8/U  
 \_\_\_\_\_  
 \_\_\_\_\_

| Frequency<br>(Mc) | Time<br>of<br>Day | Power Meter<br>Reading |       | Coupling<br>Factor<br>(db) | Atten.<br>Inserted<br>(db) | Power Output<br>(dbm) |      |
|-------------------|-------------------|------------------------|-------|----------------------------|----------------------------|-----------------------|------|
|                   |                   | (mw)                   | (dbm) |                            |                            | Avg.                  | Peak |
| 1297.8            | 0900              | .720                   | -1.4  | 66.2                       | 2.1                        | 66.8                  | 98.7 |
|                   | 0930              | .730                   | -1.4  |                            |                            | 66.8                  | 98.7 |
|                   | 1000              | .710                   | -1.5  |                            |                            | 66.7                  | 98.6 |
|                   | 1030              | .720                   | -1.4  |                            |                            | 66.8                  | 98.7 |
|                   | 1100              | .710                   | -1.5  |                            |                            | 66.7                  | 98.6 |
|                   | 1130              | .710                   | -1.5  |                            |                            | 66.7                  | 98.6 |
|                   | 1200              | .700                   | -1.6  |                            |                            | 66.6                  | 98.5 |
|                   | 1230              | .710                   | -1.5  |                            |                            | 66.7                  | 98.6 |
|                   | 1300              | .700                   | -1.6  |                            |                            | 66.6                  | 98.5 |
|                   | 1330              | .690                   | -1.6  |                            |                            | 66.6                  | 98.5 |
|                   | 1400              | .690                   | -1.6  |                            |                            | 66.6                  | 98.5 |
|                   | 1430              | .700                   | -1.6  |                            |                            | 66.6                  | 98.5 |
| ↓                 | 1500              |                        |       |                            |                            |                       |      |
| 1243.4            | 1520              | .600                   | -2.2  |                            | 1.6                        | 65.5                  | 97.4 |
| 1257.8            | 1545              | .600                   | -2.2  |                            |                            | 65.5                  | 97.4 |
|                   | 1600              | .590                   | -2.3  |                            |                            | 65.4                  | 97.3 |
|                   | 1630              | .580                   | -2.4  |                            |                            | 65.3                  | 97.2 |
|                   | 1700              | .580                   | -2.4  |                            |                            | 65.3                  | 97.2 |
| ↓                 | 1730              | .580                   | -2.4  |                            |                            | 65.3                  | 97.2 |

### Measurement Instructions

Measure power output at standard test frequencies of each tuning band. Output for AM and FM transmitters is A0 or F0. This sheet is not applicable for SSB transmitters. Coupling factor is the sum of the coupling factors of all the directional couplers used.

Use reverse side for block diagram and remarks.

# TRANSMITTER MEASUREMENTS

## POWER OUTPUT

Xmtr.: ARSH-1B-A Site Code: 5110.11 Date: 12/13/82  
 Xmtr. Serial No.: 54 Radio Set: \_\_\_\_\_  
 Tuning Band (Mc): 1240-1350  
 Modulation: Pulse PW( $\mu$ s): 1.8 PRF(pps) 360  
 Significant Control Positions: Linear Polarization, Transmitter B  
 Measuring Devices: HP-430C, 20' PG-8/U

| Frequency<br>(Mc) | Time<br>of<br>Day | Power Meter<br>Reading |       | Coupling<br>Factor<br>(db) | Atten.<br>Inserted<br>(db) | Power Output<br>(dbm) |      |
|-------------------|-------------------|------------------------|-------|----------------------------|----------------------------|-----------------------|------|
|                   |                   | (mw)                   | (dbm) |                            |                            | Avg.                  | Peak |
| 1257.8            | 1530              | .600                   | -2.2  | 66.7                       | 1.6                        | 65.5                  | 97.4 |
|                   | 1600              | .590                   | -2.3  |                            |                            | 65.4                  | 97.3 |
|                   | 1630              | .580                   | -2.4  |                            |                            | 65.3                  | 97.2 |
|                   | 1700              | .590                   | -2.3  |                            |                            | 65.4                  | 97.3 |
|                   | 1730              | .580                   | -2.4  |                            |                            | 65.3                  | 97.2 |
|                   | 1800              |                        |       |                            |                            |                       |      |
|                   | 1830              |                        |       |                            |                            |                       |      |
|                   | 1900              |                        |       |                            |                            |                       |      |
|                   | 1930              |                        |       |                            |                            |                       |      |
|                   | 2000              |                        |       |                            |                            |                       |      |
|                   | 2030              |                        |       |                            |                            |                       |      |
|                   | 2100              |                        |       |                            |                            |                       |      |
|                   | 2130              |                        |       |                            |                            |                       |      |
|                   | 2200              |                        |       |                            |                            |                       |      |
|                   | 2230              |                        |       |                            |                            |                       |      |
|                   | 2300              |                        |       |                            |                            |                       |      |
|                   |                   |                        |       |                            |                            |                       |      |
|                   |                   |                        |       |                            |                            |                       |      |
|                   |                   |                        |       |                            |                            |                       |      |
|                   |                   |                        |       |                            |                            |                       |      |

### Measurement Instructions

Measure power output at standard test frequencies of each tuning band. Output for AM and FM transmitters is A0 or F0. This sheet is not applicable for SSB transmitters. Coupling factor is the sum of the coupling factors of all the directional couplers used.

Use reverse side for block diagram and remarks.

## POWER OUTPUT

Measuring Devices: HP-430C, 20' RG-8/U

## Measurement Instructions

Use reverse side for block diagram and remarks.

# TRANSMITTER MEASUREMENTS

## POWER OUTPUT

Xmtr.: APSR-1B-A Site Code: 5110.11 Date: 12-15/62  
 Xmtr. Serial No.: 54 Radio Set: \_\_\_\_\_  
 Tuning Band (Mc): 1240-1350  
 Modulation: Pulse PW( $\mu$ s): 1.8 PRF(pps) 360  
 Significant Control Positions: Linear Polarization, Transmitter B  
 \_\_\_\_\_  
 Measuring Devices: HP-430C, 20' FC-8/U  
 \_\_\_\_\_  
 \_\_\_\_\_

| Frequency<br>(Mc) | Time<br>of<br>Day | Power Meter<br>Reading |       | Coupling<br>Factor<br>(db) | Atten.<br>Inserted<br>(db) | Power Output<br>(dbm) |      |
|-------------------|-------------------|------------------------|-------|----------------------------|----------------------------|-----------------------|------|
|                   |                   | (mw)                   | (dbm) |                            |                            | Avg.                  | Peak |
| 1347              | 1220              | .680                   | -1.7  | 66.2                       | 2.1                        | 66.5                  | 98.4 |
|                   | 1240              | .640                   | -1.9  |                            |                            | 66.3                  | 98.2 |
|                   | 1300              | .670                   | -1.7  |                            |                            | 66.5                  | 98.4 |
|                   | 1330              | .650                   | -1.9  |                            |                            | 66.3                  | 98.2 |
|                   | 1410              | .660                   | -1.8  |                            |                            | 66.4                  | 98.3 |
|                   | 1430              | .640                   | -1.9  |                            |                            | 66.3                  | 98.2 |
|                   | 1500              |                        |       |                            |                            |                       |      |
|                   | 1530              |                        |       |                            |                            |                       |      |
|                   | 1600              |                        |       |                            |                            |                       |      |
|                   | 1630              |                        |       |                            |                            |                       |      |
|                   | 1700              |                        |       |                            |                            |                       |      |
|                   | 1730              |                        |       |                            |                            |                       |      |
|                   | 1800              | .660                   | -1.8  |                            |                            | 66.4                  | 98.3 |
|                   | 1830              |                        |       |                            |                            |                       |      |
|                   | 1900              |                        |       |                            |                            |                       |      |
|                   | 1915              |                        |       |                            |                            |                       |      |
|                   |                   |                        |       |                            |                            |                       |      |
|                   |                   |                        |       |                            |                            |                       |      |
|                   |                   |                        |       |                            |                            |                       |      |
|                   |                   |                        |       |                            |                            |                       |      |

### Measurement Instructions

Measure power output at standard test frequencies of each tuning band. Output for AM and FM transmitters is AO or FO. This sheet is not applicable for SSB transmitters. Coupling factor is the sum of the coupling factors of all the directional couplers used.

Use reverse side for block diagram and remarks.

## POWER OUTPUT

[illegible]

Measure power output at standard test frequencies of each tuning band. Output for AM and FM transmitters is AO or FO. This sheet is not applicable for SSB transmitters. Coupling factor is the sum of the coupling factors of all the directional couplers used.

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# TRANSMITTER MEASUREMENTS

## POWER OUTPUT

Xmtr.: ARRR-1B-A Site Code: 5110.11 Date: 12/17/62  
 Xmtr. Serial No.: 54 Radio Set: \_\_\_\_\_  
 Tuning Band (Mc): 1240-1350  
 Modulation: pulse PW( $\mu$ s): 1.8 PRF(pps) 360  
 Significant Control Positions: Linear Polarization, Transmitter B

Measuring Devices: HP-430C, 20' PC-8/U

| Frequency<br>(Mc) | Time<br>of<br>Day | Power Meter<br>Reading |       | Coupling<br>Factor<br>(db) | Atten.<br>Inserted<br>(db) | Power Output<br>(dbm) |      |
|-------------------|-------------------|------------------------|-------|----------------------------|----------------------------|-----------------------|------|
|                   |                   | (mw)                   | (dbm) |                            |                            | Avg.                  | Peak |
| 1298              | 0930              | ---                    |       | 66.2                       | 2.1                        |                       |      |
| 1298              | 1230              | ---                    |       |                            |                            |                       |      |
| 1298              | 1600              | ---                    |       |                            |                            |                       |      |
| 1297.8            | 1850              | .720                   | -1.4  |                            |                            | 66.8                  | 98.7 |
|                   | 1900              |                        |       |                            |                            |                       | 98.7 |
|                   | 1930              |                        |       |                            |                            |                       | 98.7 |
|                   | 2000              |                        |       |                            |                            |                       | 98.7 |
|                   | 2030              |                        |       |                            |                            |                       | 98.7 |
|                   | 2100              | .710                   | -1.5  |                            |                            | 66.7                  | 98.6 |
|                   | 2130              | .720                   | -1.4  |                            |                            | 66.8                  | 98.7 |
|                   | 2200              | .710                   | -1.5  |                            |                            | 66.7                  | 98.6 |
|                   | 2220              | .720                   | -1.4  |                            |                            | 66.8                  | 98.7 |
| 1296.7            | 2200              | .720                   | -1.4  |                            |                            | 66.8                  | 98.7 |
|                   |                   |                        |       |                            |                            |                       |      |
|                   |                   |                        |       |                            |                            |                       |      |
|                   |                   |                        |       |                            |                            |                       |      |
|                   |                   |                        |       |                            |                            |                       |      |
|                   |                   |                        |       |                            |                            |                       |      |
|                   |                   |                        |       |                            |                            |                       |      |
|                   |                   |                        |       |                            |                            |                       |      |
|                   |                   |                        |       |                            |                            |                       |      |
|                   |                   |                        |       |                            |                            |                       |      |

### Measurement Instructions

Measure power output at standard test frequencies of each tuning band. Output for AM and FM transmitters is A0 or F0. This sheet is not applicable for SSB transmitters. Coupling factor is the sum of the coupling factors of all the directional couplers used.

Use reverse side for block diagram and remarks.

# TRANSMITTER MEASUREMENTS

## POWER OUTPUT

Xmtr.: APSR-1B-A Site Code: 5110.11 Date: 12/19/62  
 Xmtr. Serial No.: 54 Radio Set: \_\_\_\_\_  
 Tuning Band (Mc): 1240-1350  
 Modulation: Pulse PW( $\mu$ s): 1.8 PRF(pps) 360  
 Significant Control Positions: Linear Polarization, Transmitter B  
 \_\_\_\_\_  
 Measuring Devices: HP-430C, 20' PG-8/U  
 \_\_\_\_\_  
 \_\_\_\_\_

| Frequency<br>(Mc) | Time<br>of<br>Day | Power Meter<br>Reading |       | Coupling<br>Factor<br>(db) | Atten.<br>Inserted<br>(db) | Power Output<br>(dbm) |      |
|-------------------|-------------------|------------------------|-------|----------------------------|----------------------------|-----------------------|------|
|                   |                   | (mw)                   | (dbm) |                            |                            | Avg.                  | Peak |
| 1296.9            | 0900              | .740                   | -1.3  | 66.2                       | 2.1                        | 66.9                  | 98.8 |
|                   | 0930              |                        |       |                            |                            | 66.9                  | 98.8 |
|                   | 1000              |                        |       |                            |                            | 66.9                  | 98.8 |
|                   | 1030              |                        |       |                            |                            | 66.9                  | 98.8 |
|                   | 1100              | ↓                      | ↓     |                            |                            | 66.9                  | 98.8 |
|                   | 1130              | .760                   | -1.2  |                            |                            | 67.0                  | 98.9 |
|                   | 1200              | .720                   | -1.4  |                            |                            | 66.8                  | 98.7 |
|                   | 1230              | .720                   | -1.4  |                            |                            | 66.8                  | 98.7 |
|                   | 1350              | .700                   | -1.6  |                            |                            | 66.6                  | 98.5 |
|                   | 1400              | .720                   | -1.4  |                            |                            | 66.8                  | 98.7 |
|                   | 1435              | .720                   | -1.4  |                            |                            | 66.8                  | 98.7 |
|                   | 1450              | .750                   | -1.3  |                            |                            | 66.9                  | 98.8 |
|                   | 1500              | .750                   | -1.3  |                            |                            | 66.9                  | 98.8 |
|                   | 1530              |                        |       |                            |                            |                       |      |
|                   | 1600              | .720                   | -1.4  |                            |                            | 66.8                  | 98.7 |
|                   | 1630              | .740                   | -1.3  |                            |                            | 66.9                  | 98.8 |
|                   | 1700              | .730                   | -1.4  |                            |                            | 66.8                  | 98.7 |
| ↓                 | 1730              | .740                   | -1.3  | ↓                          | ↓                          | 66.9                  | 98.8 |
|                   |                   |                        |       |                            |                            |                       |      |
|                   |                   |                        |       |                            |                            |                       |      |

### Measurement Instructions

Measure power output at standard test frequencies of each tuning band. Output for AM and FM transmitters is AO or FO. This sheet is not applicable for SSB transmitters. Coupling factor is the sum of the coupling factors of all the directional couplers used.

Use reverse side for block diagram and remarks.

### 5.2.3 Spurious Emission

Since the ARSR is designed to operate into only one antenna, open-field spurious emission measurements were made at the test site for the standard test frequencies of 1257.8 Mc, 1297.8 Mc and 1348 Mc. The radar antenna may have linear (horizontal) or circular polarization. Linear polarization is normally used except during periods of inclement weather. Therefore, nearly all spurious emission measurements were made with the radar antenna horizontally polarized. Spurious emission measurements were made on December 9, 1962, with the radar antenna circularly polarized and the test antenna horizontally polarized. This was made at the mean standard test frequency of 1297.8 Mc for comparison with the radar horizontally polarized. Measurements were made on the following day with the radar horizontally polarized at the 1297.8 Mc frequency. Measurements were made for both horizontal and vertical polarizations of the test antennas. The test antennas were rotated in the azimuth and moved in elevation for maximum received signal. The test antennas were mounted on a pole at the rear of the measurement van at a height of approximately 28 feet. Figure 2-7 is a photograph of the test site with the measurement van in position. The ground elevation at the test site is 1482 feet. This placed the test antenna at an elevation of 1510 feet which is 70 feet lower in elevation than the radar antenna at an elevation of 1580 feet. In normal operation, the radar antenna is elevated  $2^{\circ} 30'$ . For all the spectrum signature tests, the radar antenna was depressed to  $-17'$ .

Prior to the start of the spectrum signature measurements, the radar antenna brake was burned out and was not replaced until most of the measurements were completed. As a consequence, the radar antenna could not be jogged into the precise bearing for maximum received signal at the test site. In order to obtain the precise bearing of the test site from the radar site, a pulsed signal at the same PRF and pulse width of the radar signal was transmitted from the test site. At the radar site, the transmitter was turned off and the received signal displayed on an

oscilloscope external to the radar receiver. Syncing the signal with the internal sync of the oscilloscope resulted in a steady display of the received signal. The antenna was then rotated by hand for maximum received signal. The bearing for maximum received signal was found to be  $69^{\circ} 45'$  on the azimuth ring of the radar antenna. For all the far-field measurements except the special pulse count test, the antenna was depressed to  $-17'$  in elevation, rotated by hand to the  $69^{\circ} 45'$  point on the azimuth ring and secured by rope at this bearing.

Absolute measurements of spurious emissions by the signal substitution method were made at selected points through the third harmonic of the ARSR radar. The objective of this task was to take spurious emissions through the second harmonic of the radar frequency. These measurements were to be continued into the higher frequencies if time permitted after the antenna patterns and pulse count tests. Measurements were actually made through the second band of the Stoddart NM-62A which included the third harmonic of the radar fundamental frequencies.

Spurious emission measurements were first made on the lower standard test frequency of 1257.8 Mc on December 11, 1962. When measurements on this frequency were resumed on December 13th, the spectrum appeared to have changed. As a consequence, the measurements made on the 11th were repeated on December 13, 1962. The data taken on December 11th are left in the report for comparison.

Automatic spurious emission scans were recorded from 1.0 kMc to 4.4 kMc on all three standard test frequencies and from 4.4 kMc to 10.0 kMc on the mean standard test frequency of 1297.8 Mc.

The FIM ( field intensity meter) receivers were checked for spurious responses prior to commencing spurious emission tests. High-level signals (from -10 dbm to +13 dbm) at the standard test frequencies were fed into the FIM receivers and the receivers scanned throughout the frequency range of 14 kc to 10 kMc for

receiver spurious responses. A low-pass filter was placed in the signal generator output to prevent any harmonic of the generator from being mistaken for a receiver spurious response. Figure 5.2.3-2 is a recording of an automatic scan for spurious responses of the Stoddart NM-62A in the frequency range of 1.0 kMc to 2.3 kMc. Spurious emission scans were taken with the test antennas properly oriented but with the radar turned off. Typical spurious emission scans of the environment are shown in recorded form in Figures 5.2.3-3 through 5.2.3-6.

Figure 5.2.3-1 is the block diagram of the setup for the measurement of spurious emission. The signal is carried to the receivers in the measurement van by a length of 100' RG-260/U and 12' RG-8/U from the test antennas. On strong signals, an attenuator was required in the antenna lead. High-pass fundamental frequency rejection filters were placed in the lead before the receiver input during the search for spurious emissions. The signal strength is measured at the receiver input by the signal substitution method. Measurements were made with the receiver in the Direct Peak position. In the signal substitution method, the test receiver bandwidth was set to 5 Mc.

Signal power available ( $P_A$ ) at the test antenna terminals is the sum of the signal generator output plus the net cable losses plus any attenuation inserted before the receiver to attenuate the radar signal. Net cable losses are the difference between the losses in the test cable and the losses in the calibrating cable from the signal generator. In equation form, the power available at the test antenna terminals is

$$P_{A(\text{dbm})} = \text{Signal generator output (dbm)} + \text{net cable losses (db)} \\ + \text{attenuation inserted (db)}$$

The power density ( $P_D$ ) at the test antenna is then

$$P_{D(\text{dbm/m}^2)} = P_A/A$$

where

$$A = \text{effective area of test antenna in square meters} \\ = \lambda^2 G / 4\pi$$

$G$  = power gain of test antenna over an isotropic antenna = 1.64 for tuned dipole

$\lambda$  = wavelength of received spurious signal  
 $= 300/f_{mc}$  meters

$f_{mc}$  = frequency in megacycles

therefore

$$\begin{aligned} P_D(\text{dbm/m}^2) &= 10 \log P_{A/A} = 10 \log P_A / \lambda^2 G / 4\pi \\ &= 10 \log P_A + 10 \log \frac{4\pi}{300^2} + 20 \log f_{mc} - 10 \log G \\ &= 10 \log P_A - 38.6 + 20 \log f_{mc} - 10 \log G \end{aligned}$$

As an example, the power density at the test antenna will be computed for the mean standard test frequency of 1297.8 Mc with the radar antenna circularly polarized and the test antenna horizontally polarized. The data are recorded on the first line of the first data sheet dated December 9, 1962.

$$\begin{aligned} 10 \log P_A &= \text{Signal generator (dbm)} + \text{cable loss (db)} \\ &\quad + \text{attenuation inserted (db)} \\ &= -22.1 \text{ dbm} + 5.2 \text{ db} + 40 \text{ db} = 23.1 \text{ dbm} \end{aligned}$$

$$10 \log G = 10.2 \text{ db}$$

$$20 \log f_{mc} = 20 \log 1297.8 = 62.2 \text{ db}$$

$$\begin{aligned} P_D(\text{dbm/m}^2) &= 10 \log P_A - 38.6 + 20 \log f_{mc} - 10 \log G \\ &= 23.1 \text{ dbm} - 38.6 \text{ db} + 62.2 \text{ db} - 10.2 \text{ db} \\ &= 36.5 \text{ dbm/m}^2 \end{aligned}$$

As a check on the measured values of power density at the test antenna, computation will be made for the theoretical values expected at the test antenna at the three standard test frequencies of 1297.8 Mc, 1257.8 Mc, and 1343 Mc with both the radar and test antennas horizontally polarized. Measurements were made on December 10th, 13th, and 15th, 1962. The power density at one meter from an isotropic radar radiator is the radar power output ( $P_T$ ) divided by  $4\pi$ . Power density is then

$P_D = P_T/4\pi$ . However, the radar antenna has a stated gain  $G$  of 34.3 db over an isotropic antenna in the radar frequency range. The power density at the radar antenna is now

$$P_D = P_T G/4\pi$$

Since the field intensity varies inversely as the distance, the power density at the test antenna terminals is

$$P_D = P_T G/4\pi d^2$$

where  $d$  is the separation between the radar and test antenna in meters = 21,562 ft./3.28 ft./meter = 6560 meters

Computations will be made for the expected power density at the standard test frequency of 1297.8 Mc which was measured on December 10, 1962.

$$P_D = 10 \log P_T + 10 \log G - 10 \log 4\pi - 20 \log d$$

$$10 \log P_T = 98.8 \text{ dbm from power output of 12/10/62}$$

$$10 \log G = 34.3 \text{ dbm}$$

$$10 \log 4\pi = 11.0 \text{ db}$$

$$20 \log d = 20 \log 6560 = 76.4 \text{ db}$$

$$\begin{aligned} P_{D(\text{dbm/m}^2)} &= 10 \log P_T + 10 \log G - 10 \log 4\pi - 20 \log d \\ &= 98.8 \text{ dbm} + 34.3 \text{ db} - 11 \text{ db} - 76.4 \text{ db} \\ &= 45.7 \text{ dbm} \end{aligned}$$

The measured value was 39.8 dbm. Theoretical and measured values of power density for the three standard test frequencies are tabulated below.

| Frequency<br>(Mc) | Date<br>Measured | $P_T$<br>(dbm) | $P_D$<br>Measured<br>(dbm/m <sup>2</sup> ) | $P_D$<br>Theoretical<br>(dbm/m <sup>2</sup> ) |
|-------------------|------------------|----------------|--------------------------------------------|-----------------------------------------------|
| 1297.7            | 12/10/62         | 98.8           | 39.8                                       | 45.7                                          |
| 1258.7            | 12/13/62         | 97.2           | 42.4                                       | 44.1                                          |
| 1348.2            | 12/15/62         | 98.3           | 38.4                                       | 45.2                                          |

No attempt will be made to relate the differences to cancellation of the direct wave by a ground-reflected wave. It can be seen from Figures 2-5 and 2-6 that any theoretical values of reflection coefficient would not apply due to the roughness of the terrain. The roughness of this terrain is such that only diffuse reflection will occur. The actual power into the antenna may have been less than  $P_T$ . Additional losses would have occurred in the waveguide and rotary joint after the directional coupler where the transmitted power was measured. The measured data are recorded on nine (9) data sheets.

Since this radar had such a broad spurious emission spectrum, signal substitution measurements were limited to a selected number of frequencies. However, it was felt that this limited number of measurements could not give a complete picture of the spurious emission spectrum. In lieu of these measurements recordings of automatic spurious emission scans were made above 1.0 kMc. These spurious emission scans are shown in Figures 5.2.3-7 through 5.2.3-43. If it is desired, the levels in db above 1  $\mu$ v, can be easily converted to power in dbm. One  $\mu$ v into a 50-ohm receiver input is equal to -107 dbm. The level of the signal above 1  $\mu$ v must be added to this figure. This level is the sum of the signal amplitude on the ordinate and receiver attenuator setting. In an automatic scan, the receiver can be calibrated at one frequency only. Therefore, a gain correction must be made for all other frequencies in the scan. The receiver was calibrated for the standard test frequency.

As an example, the level in dbm will be obtained for the signal in Figure 5.2.3-7.

|                     |                         |
|---------------------|-------------------------|
| 1 $\mu$ v           | = -107 dbm              |
| Ordinate Level      | = 31 db above 1 $\mu$ v |
| Receiver Attenuator | = 100 db                |
| Gain Correction     | = 0 db                  |

$$\begin{aligned}\text{Signal level (dbm)} &= -107 \text{ dbm} + 31 \text{ db} + 100 \text{ db} + 0 \text{ db} \\ &= 24 \text{ dbm}\end{aligned}$$

The level at the receiver measured in the signal substitution test on December 13, 1962, was

$$\begin{aligned}\text{Signal level (dbm)} &= \text{Sig. generator (dbm)} + \text{attenuation} \\ &\quad \text{inserted} \\ &= -16.1 \text{ dbm} + 40.1 \text{ db} \\ &= 24 \text{ dbm}\end{aligned}$$

More than one scan was made around high-level signals in order to see the lower level spurious emissions. The lower level spurious emissions were observed by removing receiver attenuation. In some instances as many as five scans were made. Tabulated below are the number of scans made in each frequency range for each polarization of the test antenna.

| Std. Test<br>Frequency<br>(Mc) | Frequency<br>Range<br>(kMc) | No. of<br>Scans | Polarization | Figure<br>Numbers |
|--------------------------------|-----------------------------|-----------------|--------------|-------------------|
| 1257.8                         | 1.0 - 2.3                   | 4               | Hor.         | 5.2.3-7 to 11     |
|                                | 1.0 - 2.3                   | 4               | Vert.        | 5.2.3-11 to 15    |
|                                | 2.3 - 4.4                   | 2               | Hor.         | 5.2.3-15 to 17    |
|                                | 2.3 - 4.4                   | 2               | Vert.        | 5.2.3-17 to 19    |
| 1297.8                         | 1.0 - 2.3                   | 4               | Hor.         | 5.2.3-19 to 23    |
|                                | 1.0 - 2.3                   | 3               | Vert.        | 5.2.3-23 to 26    |
|                                | 2.3 - 4.4                   | 1               | Hor.         | 5.2.3-26          |
|                                | 2.3 - 4.4                   | 1               | Vert.        | 5.2.3-27          |
|                                | 4.4 - 7.3                   | 1               | Hor.         | 5.2.3-28          |
|                                | 4.4 - 7.3                   | 1               | Vert.        | 5.2.3-29          |
|                                | 7.3 - 10.0                  | 1               | Hor.         | 5.2.3-30          |
| 1348                           | 1.0 - 2.3                   | 5               | Hor.         | 5.2.3-31 to 36    |
|                                | 1.0 - 2.3                   | 4               | Vert.        | 5.2.3-36 to 40    |
|                                | 2.3 - 4.4                   | 2               | Hor.         | 5.2.3-40 to 42    |
|                                | 2.3 - 4.4                   | 2               | Vert.        | 5.2.3-42 to 44    |

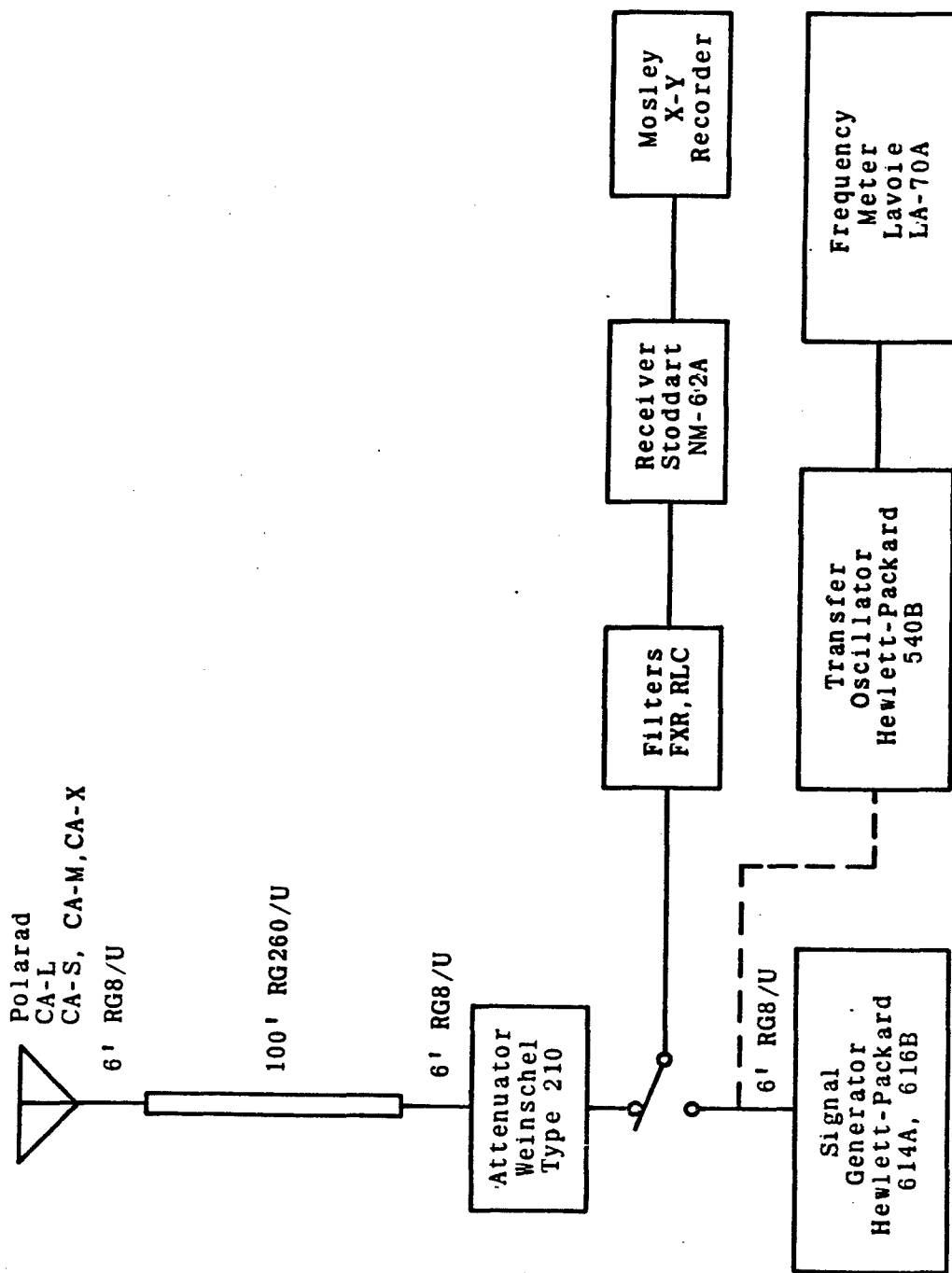


Figure 5.2.3-1. Spurious Emission Test Block Diagram.

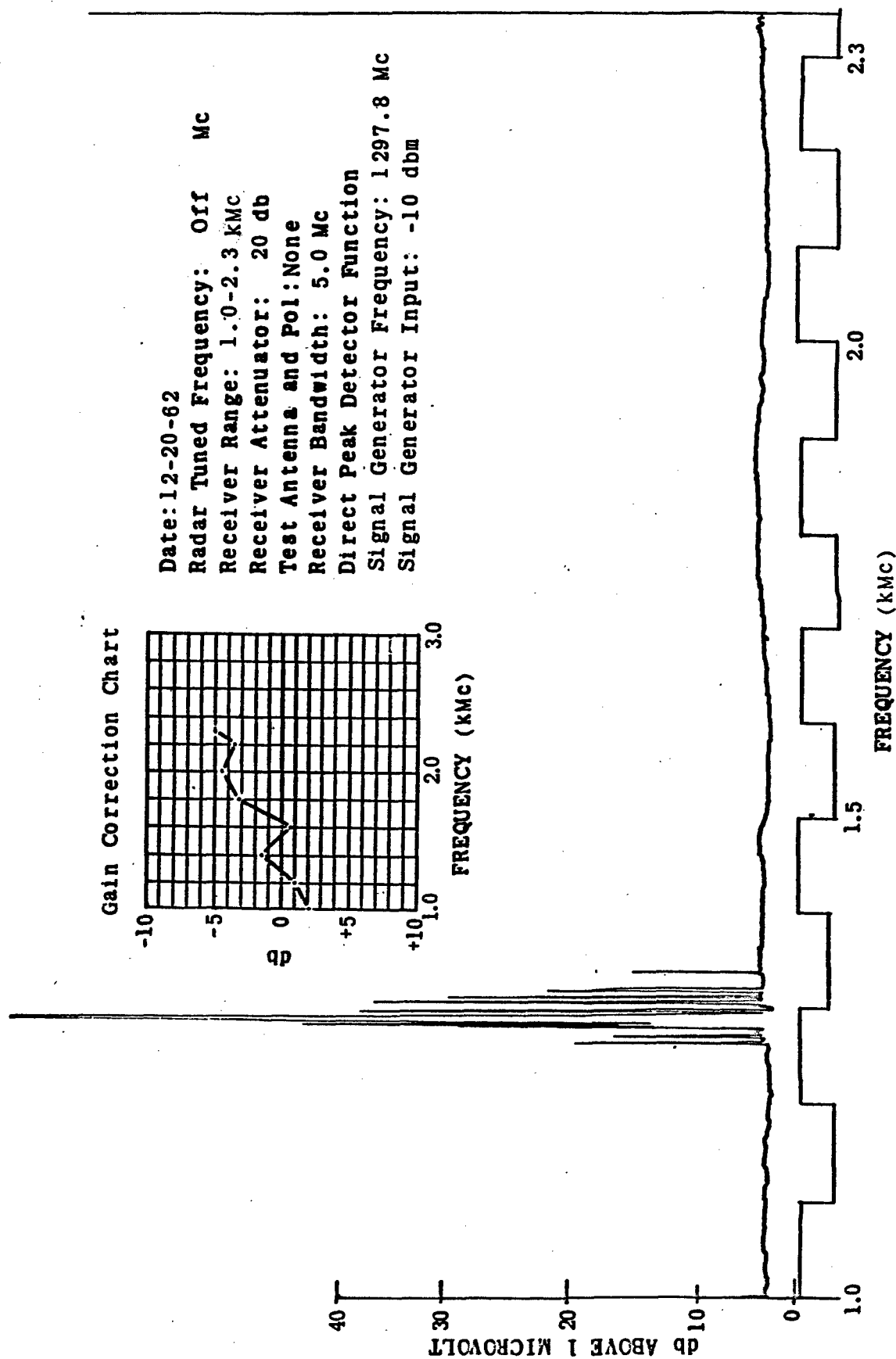
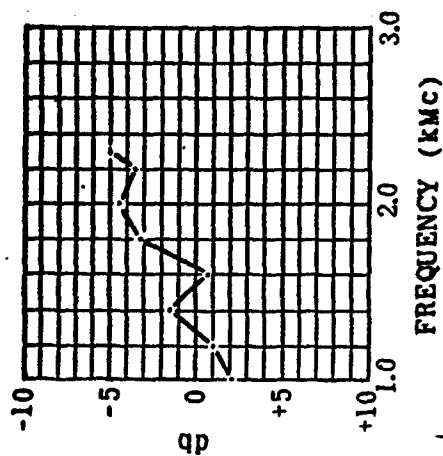


Figure 5.2.3-2. Spurious Response of Stoddart NM-62A.

## Gain Correction Chart



Date: 12-15-62 Hour: 1400  
 Radar Tuned Frequency: Off Mc  
 Receiver Range: 1.0-2.3 kMc  
 Receiver Attenuator: 20 db  
 Test Antenna and Pol: CA-L, Horizontal  
 Receiver Bandwidth: 0.5 Mc  
 Direct Peak Detector Function

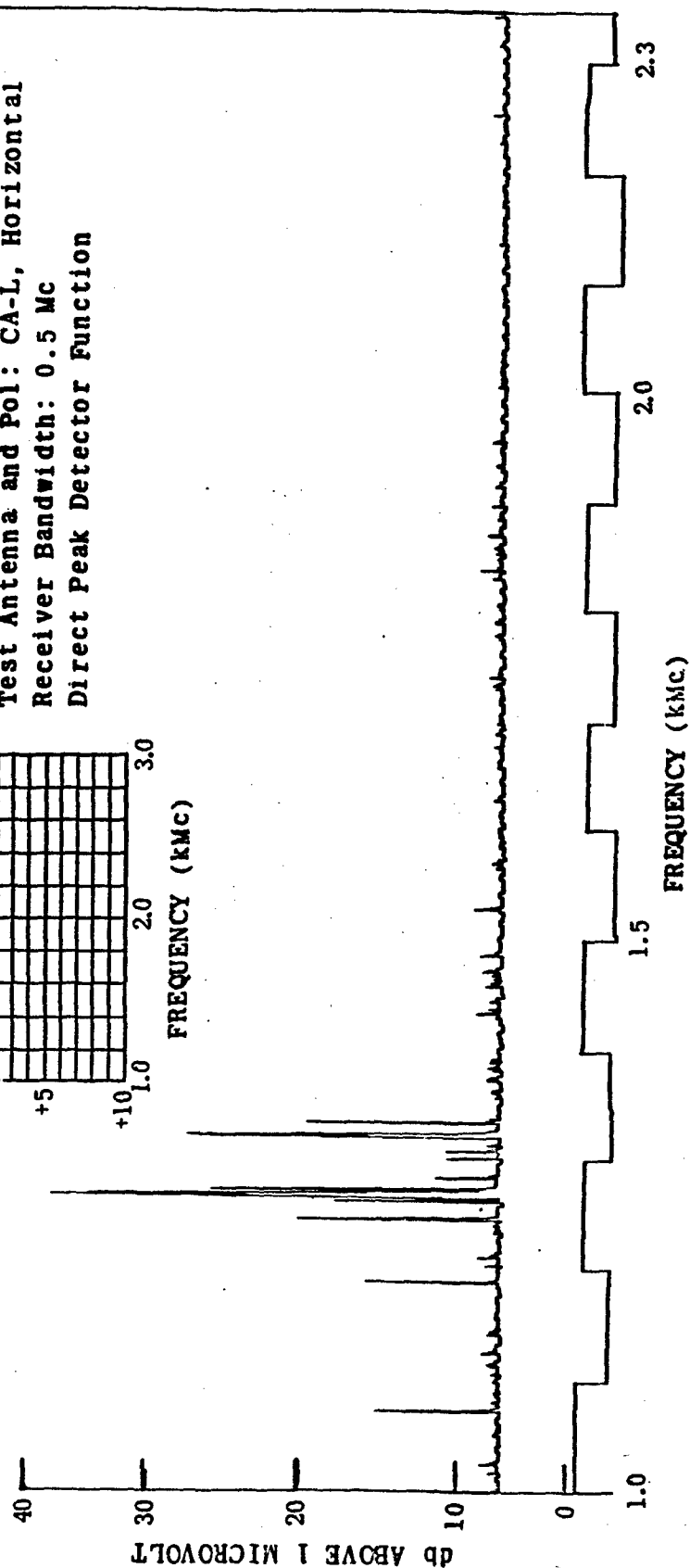
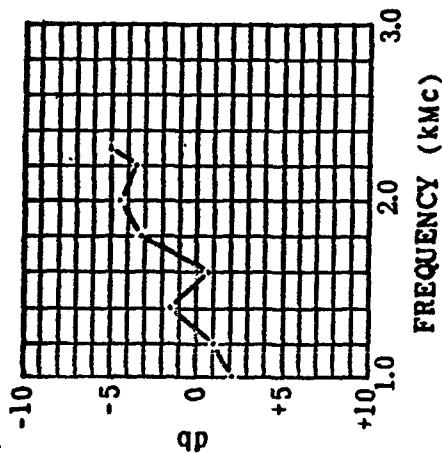


Figure 5.2.3-3. Spurious Emission Scan of Environment - Radar Off.

# Gain Correction Chart



Date: 12-15-62 Hour: 1700  
 Radar Tuned Frequency: Off Mc  
 Receiver Range: 1.0-2.3 kMc  
 Receiver Attenuator: 20 db  
 Test Antenna and Pol: CA-L, Vertical  
 Receiver Bandwidth: 0.5 Mc  
 Direct Peak Detector Function

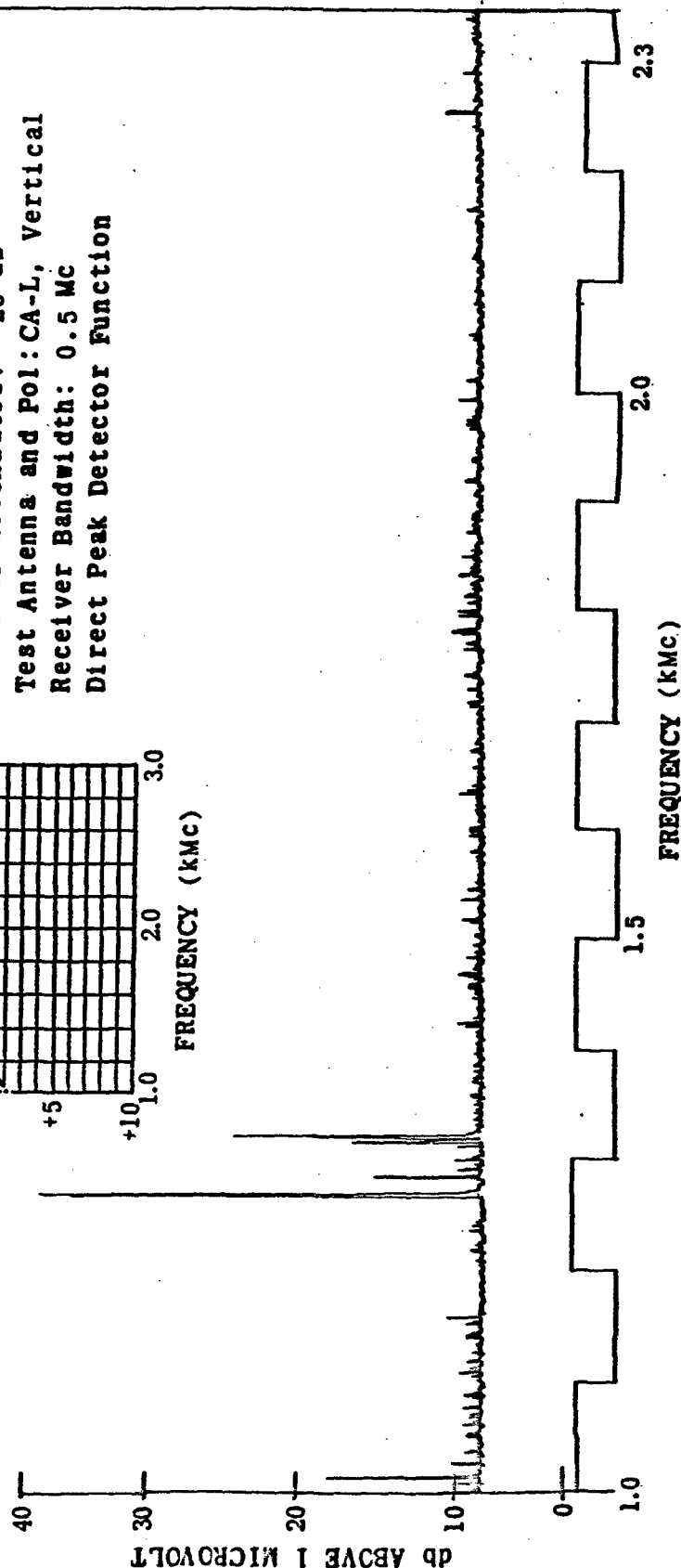


Figure 5.2.3-4. Spurious Emission Scan of Environment - Radar Off.

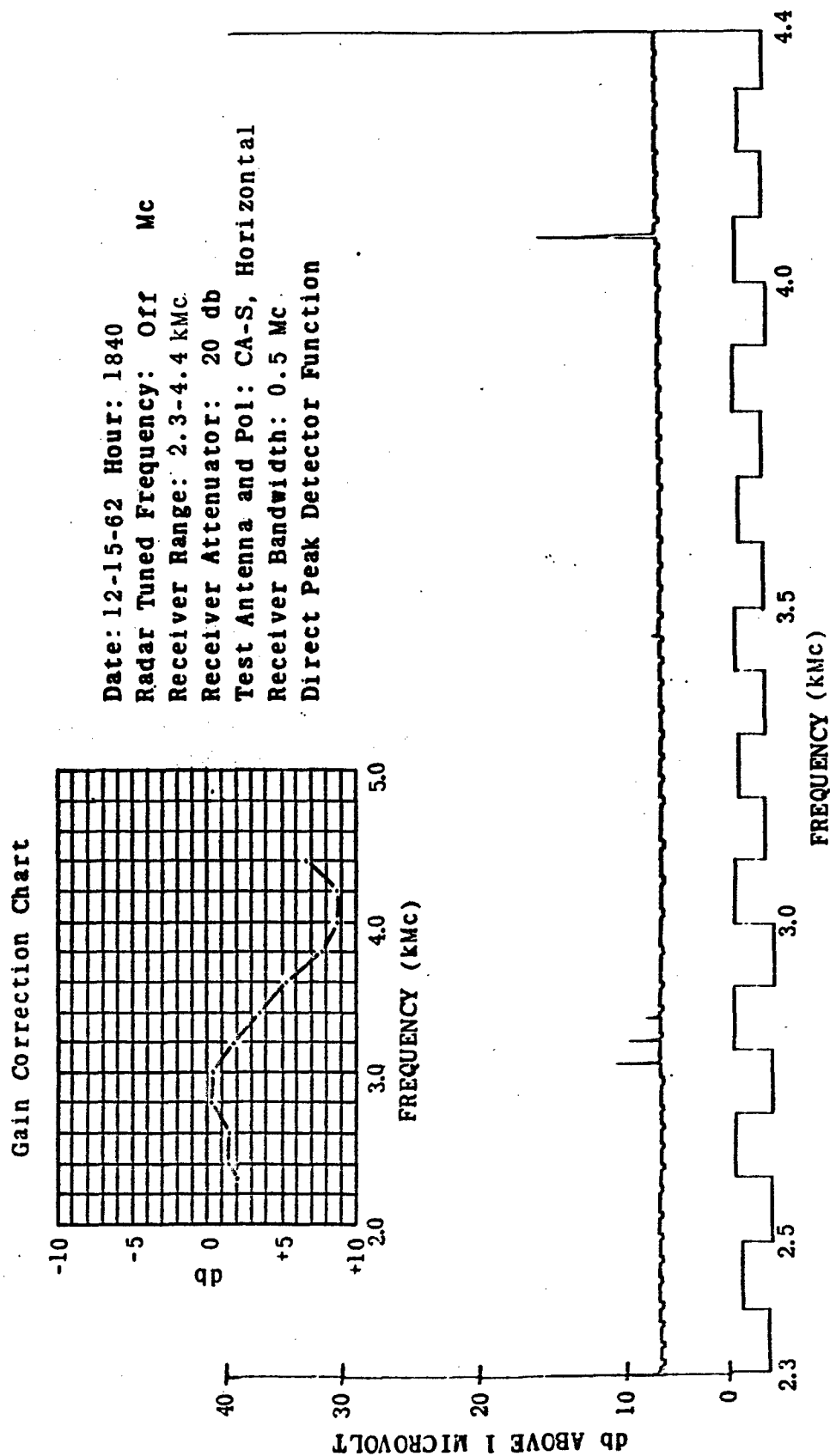
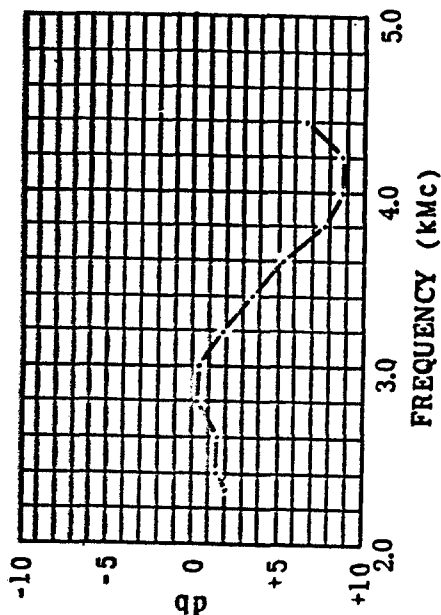


Figure 5.2.3-5. Spurious Emission Scan of Environment - Radar Off.

# Gain Correction Chart



Date: 12-15-62 Hour: 1825  
 Radar Tuned Frequency: Off Mc  
 Receiver Range: 2.3-4.4 KMC  
 Receiver Attenuator: 20 db  
 Test Antenna and Pol: CA-S, Vertical  
 Receiver Bandwidth: 0.5 Mc  
 Direct Peak Detector Function

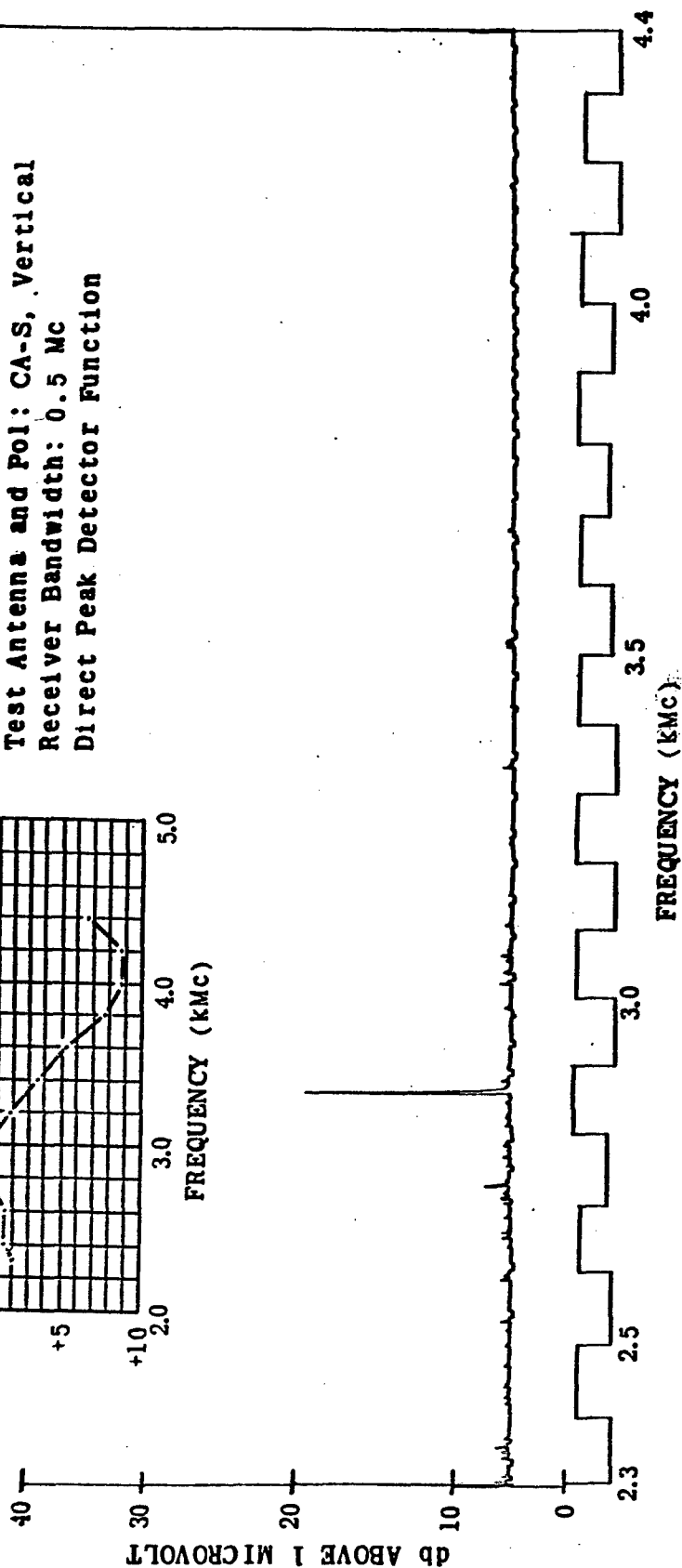
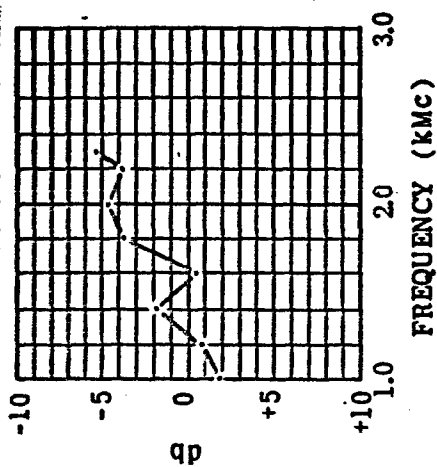


Figure 5.2.3-6. Spurious Emission Scan of Environment - Radar Off.

Gain Correction Chart



Date: 12-13-62 Hour: 2205  
 Radar Tuned Frequency: 1257.8 Mc  
 Receiver Range: 1.0-2.3 kMc  
 Receiver Attenuator: 100 db  
 Test Antenna and Pol: CA-L, Horizontal  
 Receiver Bandwidth: 0.5 Mc  
 Direct Peak Detector Function

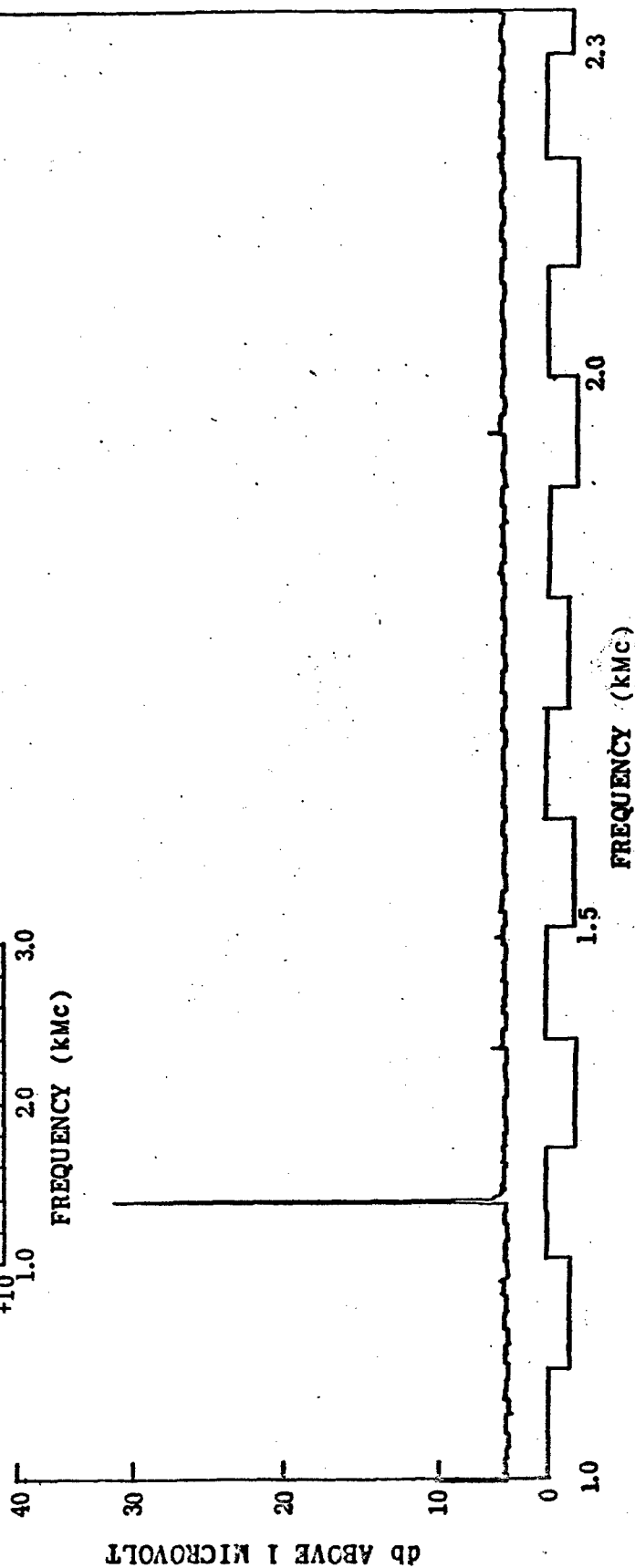
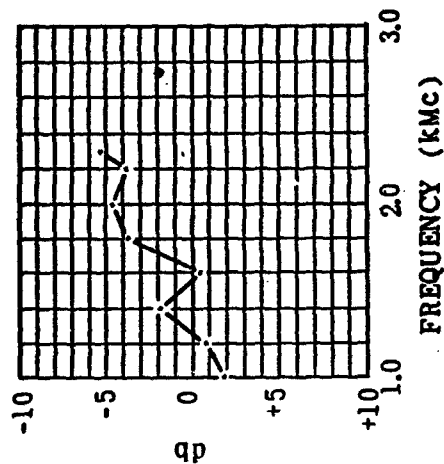


Figure 5.2.3-7. Spurious Emission Scan ( $f_o = 1257.8$  Mc) - H, 100 db.

# Gain Correction Chart



Date: 12-13-62 Hour: 2150  
 Radar Tuned Frequency: 1257.8 Mc  
 Receiver Range: 1.0-2.3 kMc  
 Receiver Attenuator: 80 db  
 Test Antenna and Pol: CA-L, Horizontal  
 Receiver Bandwidth: 0.5 Mc  
 Direct Peak Detector Function

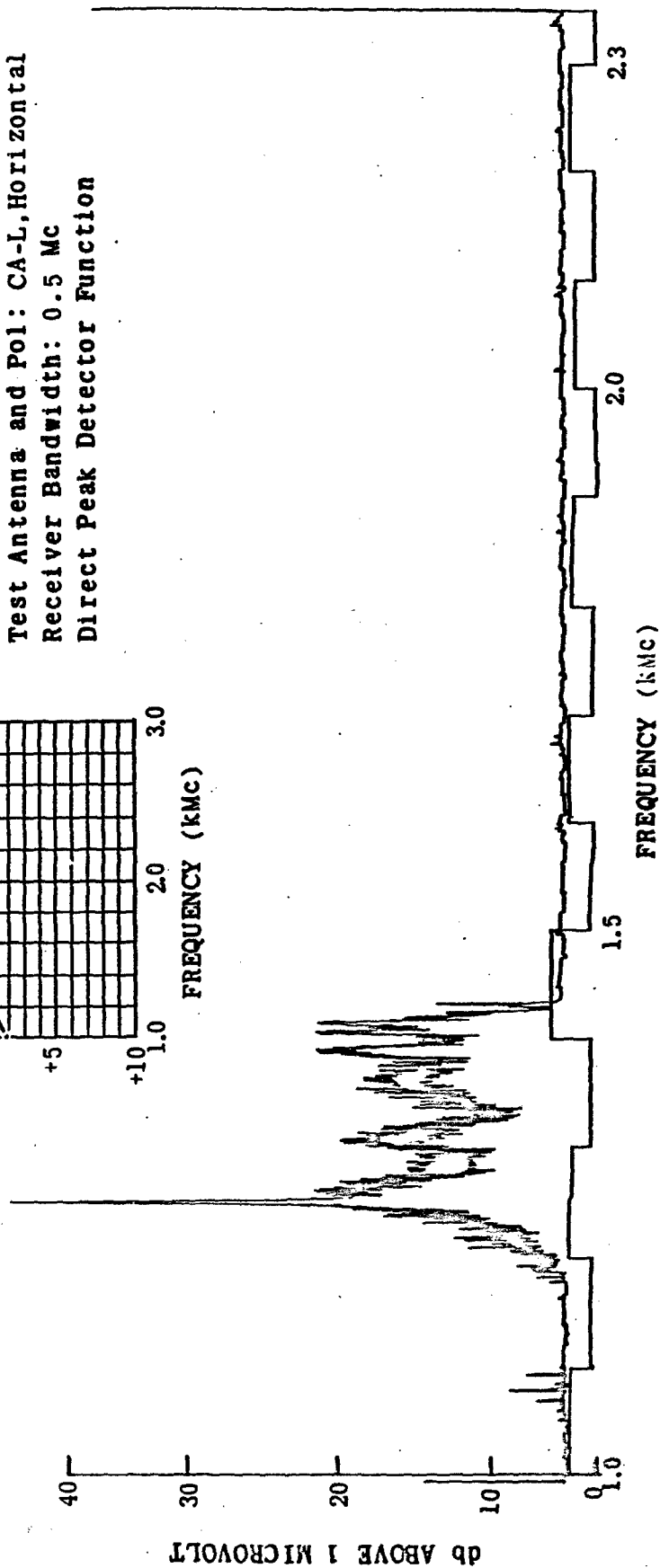
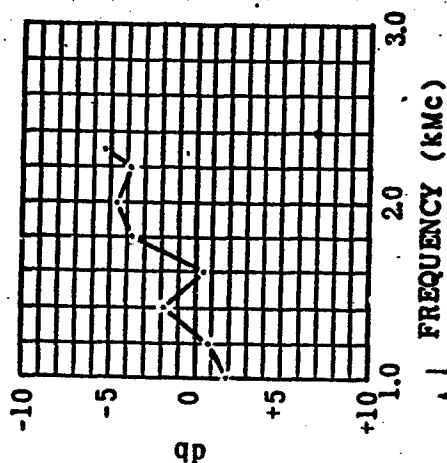


Figure 5.2.3-8. Spurious Emission Scan ( $f_o = 1257.8$  Mc) - H, 80 db.

## Gain Correction Chart



Date: 12-13-62 Hour: 2225  
 Radar Tuned Frequency: 1257.8 Mc  
 Receiver Range: 1.0 - 2.3 kMc  
 Receiver Attenuator: 60 db  
 Test Antenna and Pol: CA-L, Horizontal  
 Receiver Bandwidth: 0.5 Mc  
 Direct Peak Detector Function

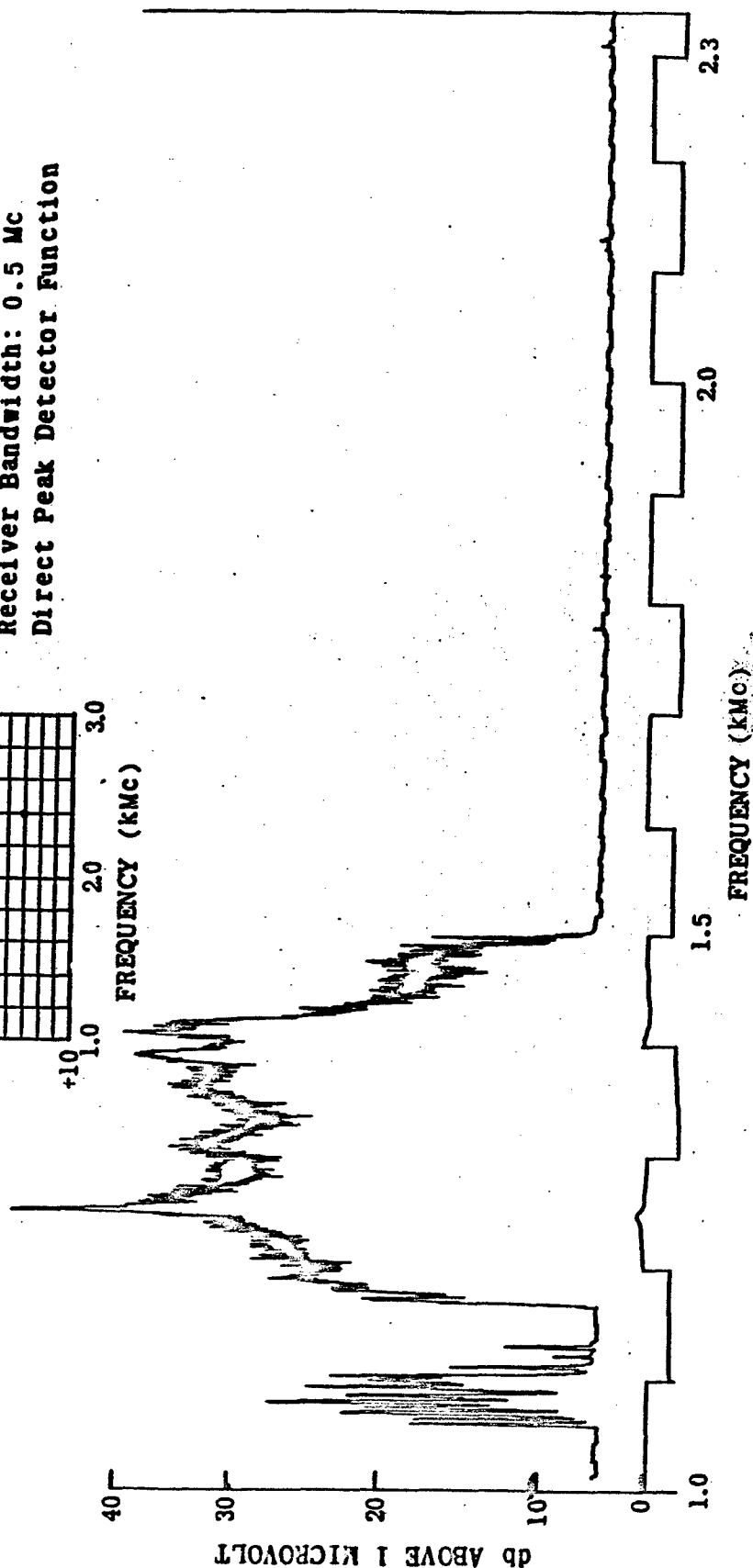
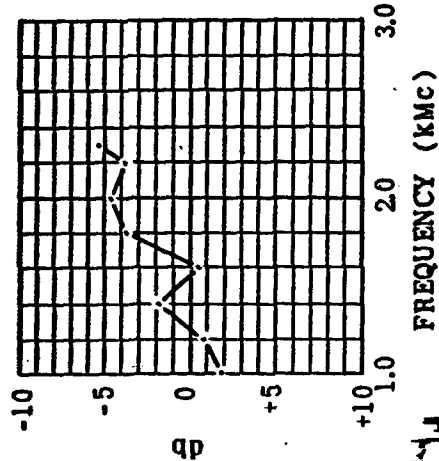


Figure 5.2.3-9. Spurious Emission Scan ( $f_0 = 1257.8$  Mc) - H, 60 db.

# Gain Correction Chart



Date: 12-13-62 Hour: 2235  
 Radar Tuned Frequency: 1257.8 Mc  
 Receiver Range: 1.0-2.3 kMc  
 Receiver Attenuator: 40 db  
 Test Antenna and Pol: CA-L, Horizontal  
 Receiver Bandwidth: 0.5 Mc  
 Direct Peak Detector Function

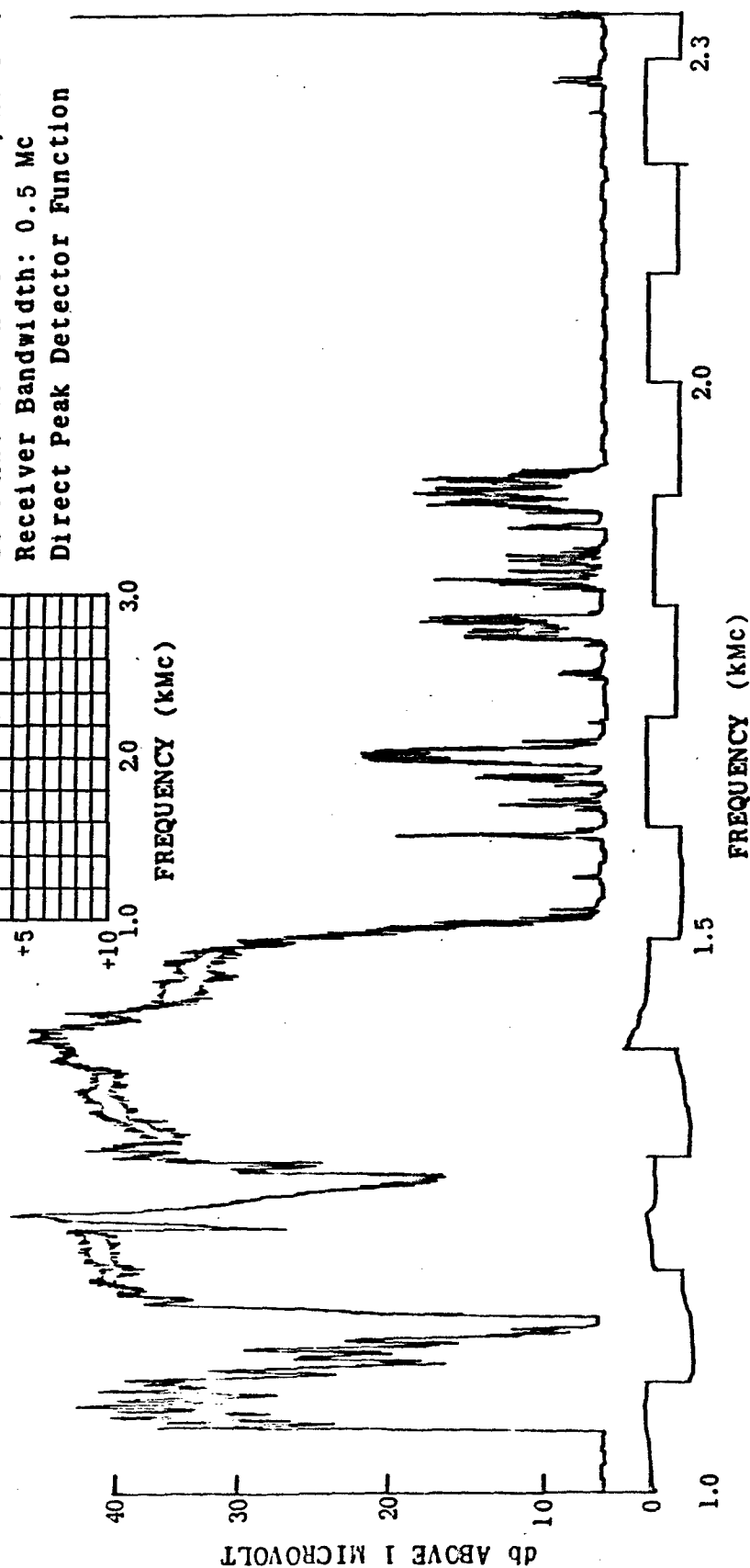
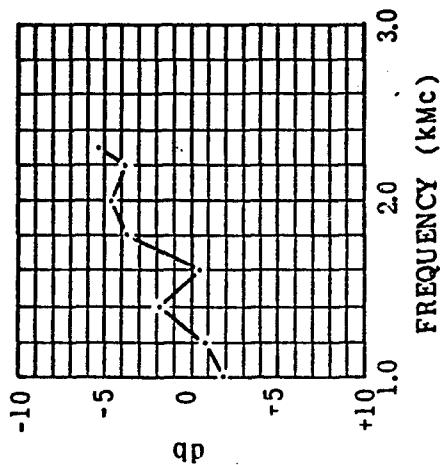
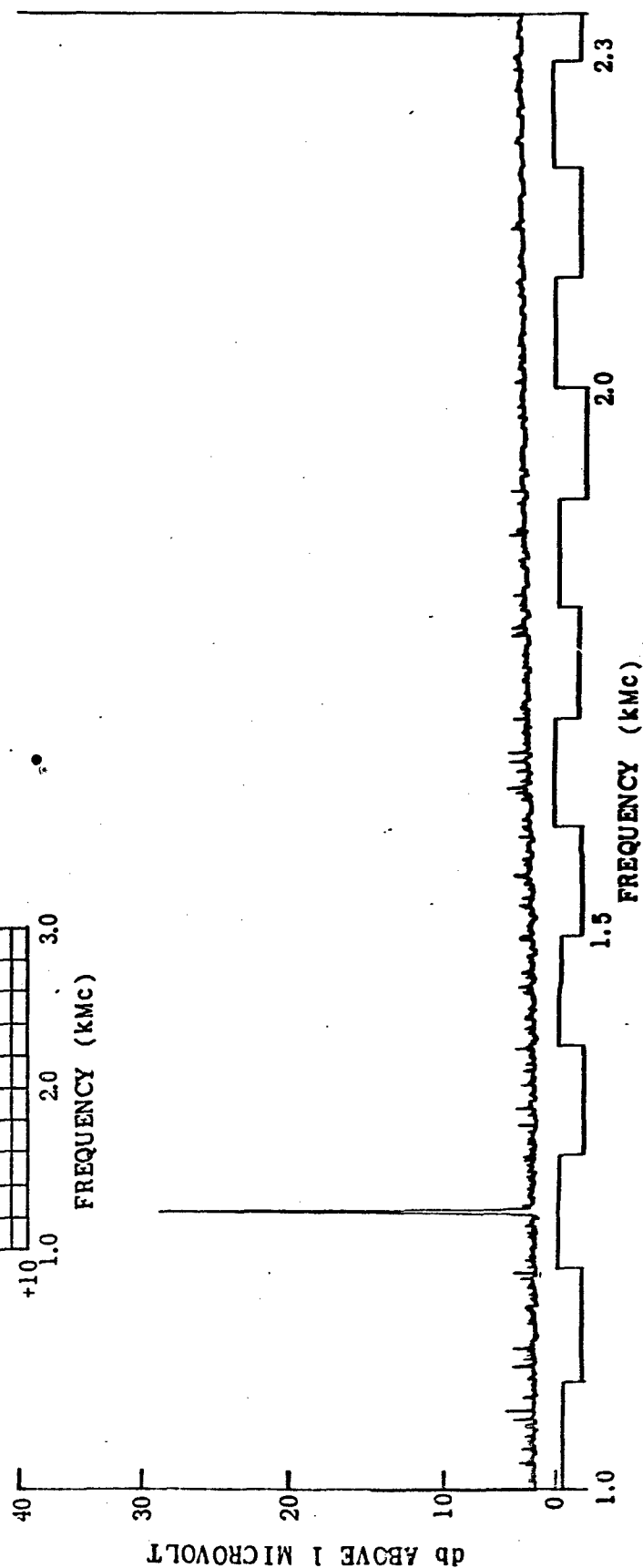


Figure 5.2.3-10. Spurious Emission Scan ( $f_o = 1257.8$  Mc) - H, 40 db.

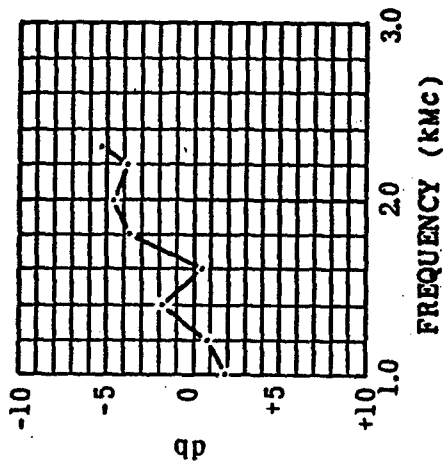
Gain Correction Chart



Date: 12-14-62 Hour: 1610  
 Radar Tuned Frequency: 1257.8 Mc  
 Receiver Range: 1.0-2.3 kMc  
 Receiver Attenuator: 80 db  
 Test Antenna and Pol: CA-L, Vertical  
 Receiver Bandwidth: 0.5 Mc  
 Direct Peak Detector Function

Figure 5.2.3-11. Spurious Emission Scan ( $f_o = 1257.8$  Mc) - V, 80 db.

# Gain Correction Chart



Date: 12-14-62 Hour: 1620  
 Radar Tuned Frequency: 1257.8 Mc  
 Receiver Range: 1.0 - 2.3 Kmc  
 Receiver Attenuator: 60 db  
 Test Antenna and Pol: CA-L, Vertical  
 Receiver Bandwidth: 0.5 Mc  
 Direct Peak Detector Function

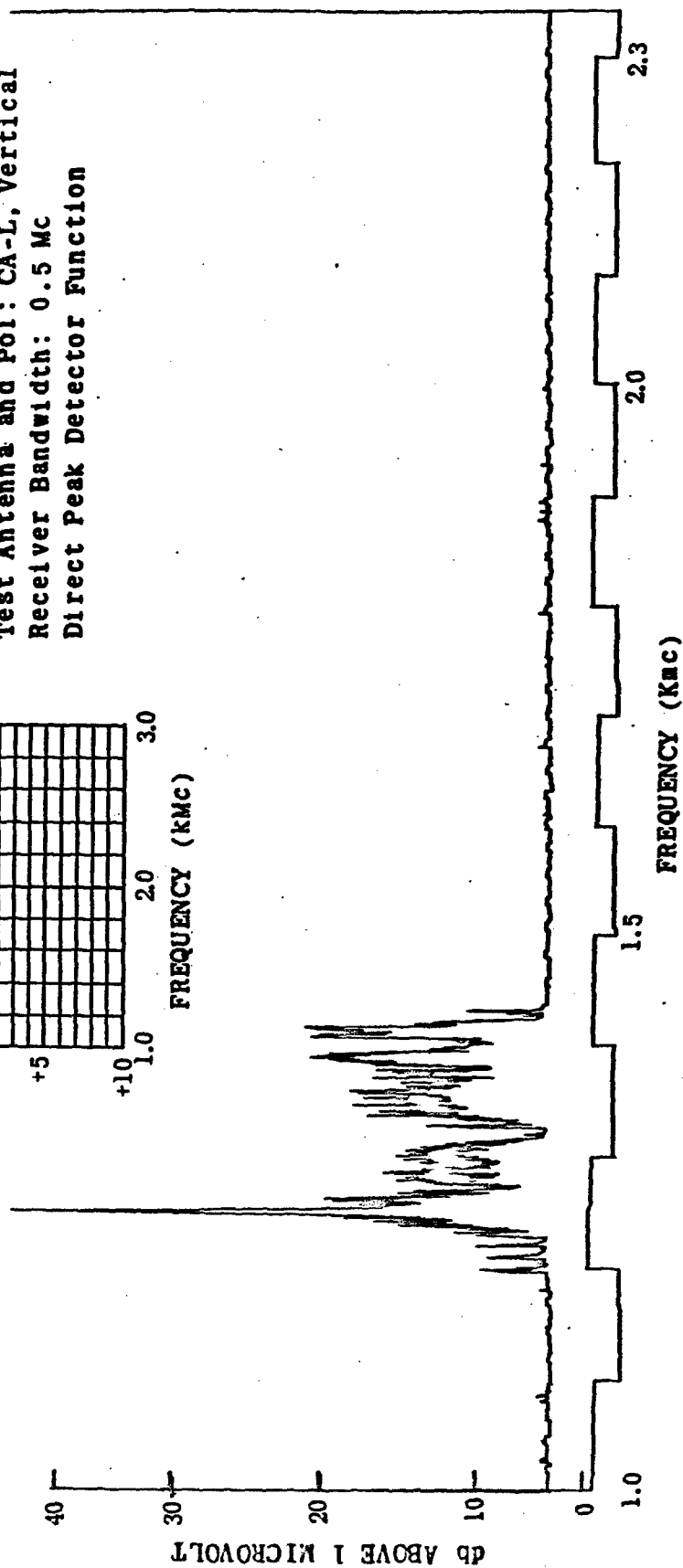
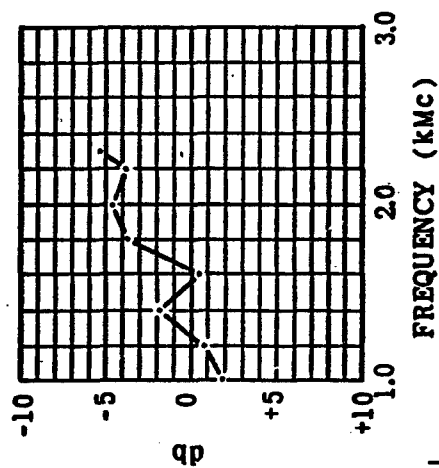


Figure 5.2.3-12. Spurious Emission Scan ( $f_o = 1257.8$  Mc) - V, 60. db.

## Gain Correction Chart



Date: 12-14-62 Hour: 1635  
 Radar Tuned Frequency: 1257.8 Mc  
 Receiver Range: 1.0-2.3 kMc  
 Receiver Attenuator: 40 db  
 Test Antenna and Pol: CA-L, Vertical  
 Receiver Bandwidth: 0.5 Mc  
 Direct Peak Detector Function

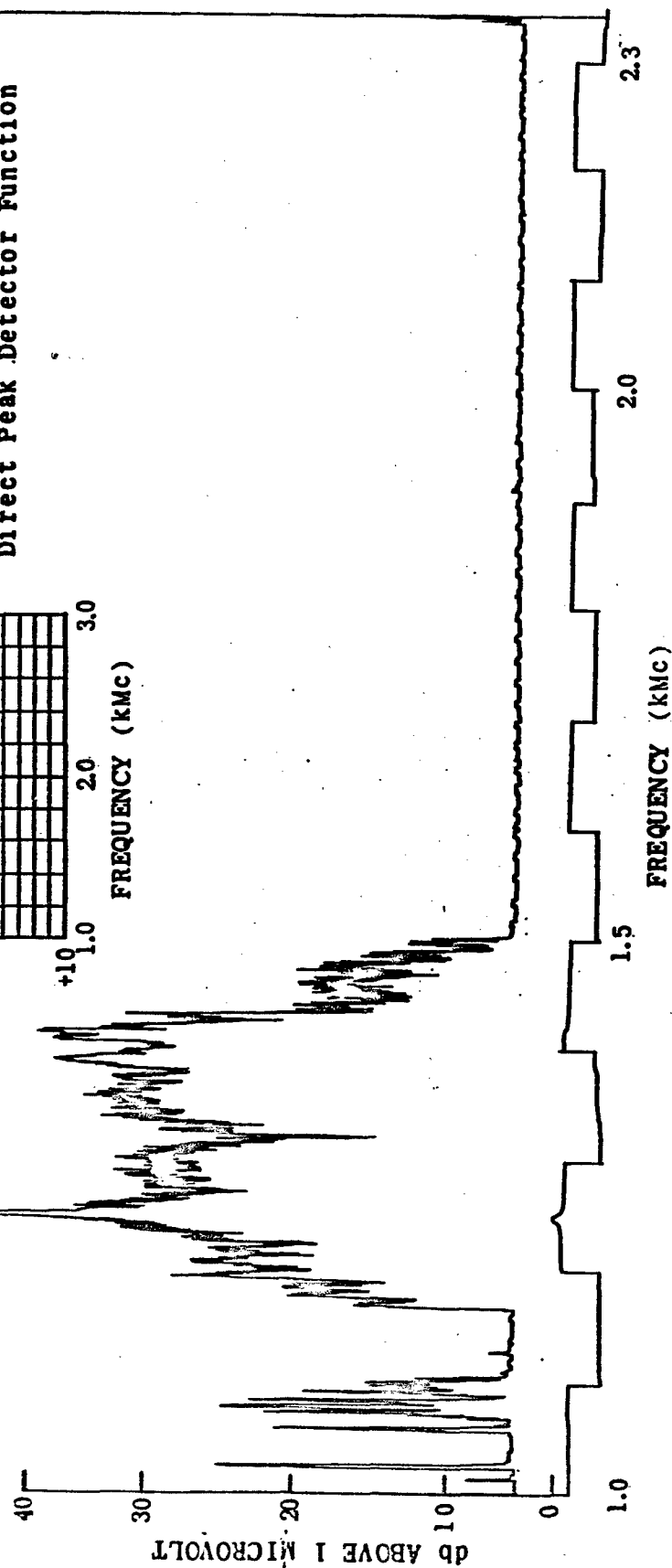
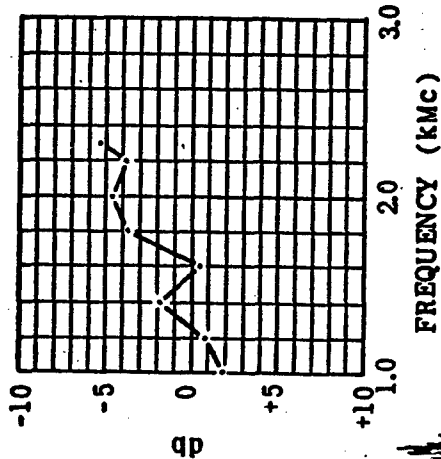


Figure 5.2.3-13. Spurious Emission Scan ( $f_o = 1257.8$  Mc) - V, 40 db.

# Gain Correction Chart



Date: 12-14-62 Hour: 1650  
 Radar Tuned Frequency: 1257.8 Mc  
 Receiver Range: 1.0-2.3 kMc  
 Receiver Attenuator: 20 db  
 Test Antenna and Pol: CA-L, Vertical  
 Receiver Bandwidth: 0.5 Mc  
 Direct Peak Detector Function

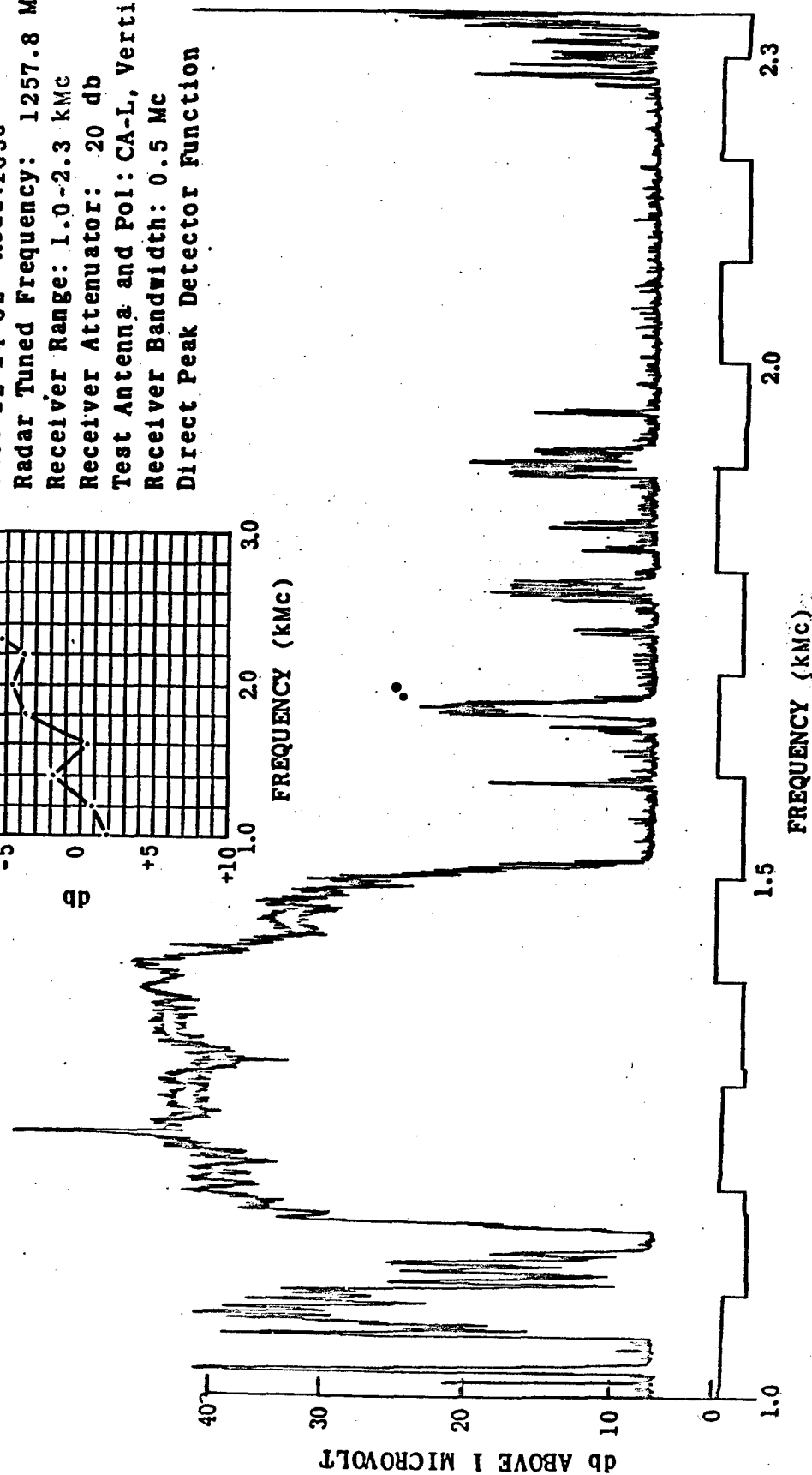
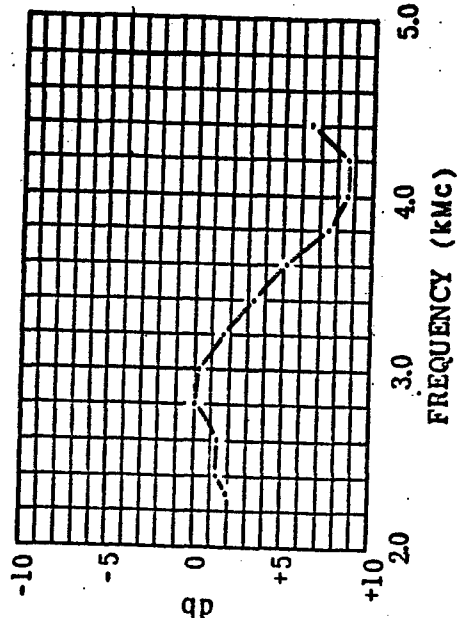


Figure 5.2.3-14. Spurious Emission Scan ( $f_o = 1257.8$  Mc) - V, 20. db.

Gain Correction Chart



Date: 12-14-62 Hour: 1820  
 Radar Tuned Frequency: 1257.8 Mc  
 Receiver Range: 2.3-4.4 kMc  
 Receiver Attenuator: 40 db  
 Test Antenna and Pol: CA-S, Horizontal  
 Receiver Bandwidth: 0.5 Mc  
 Direct Peak Detector Function

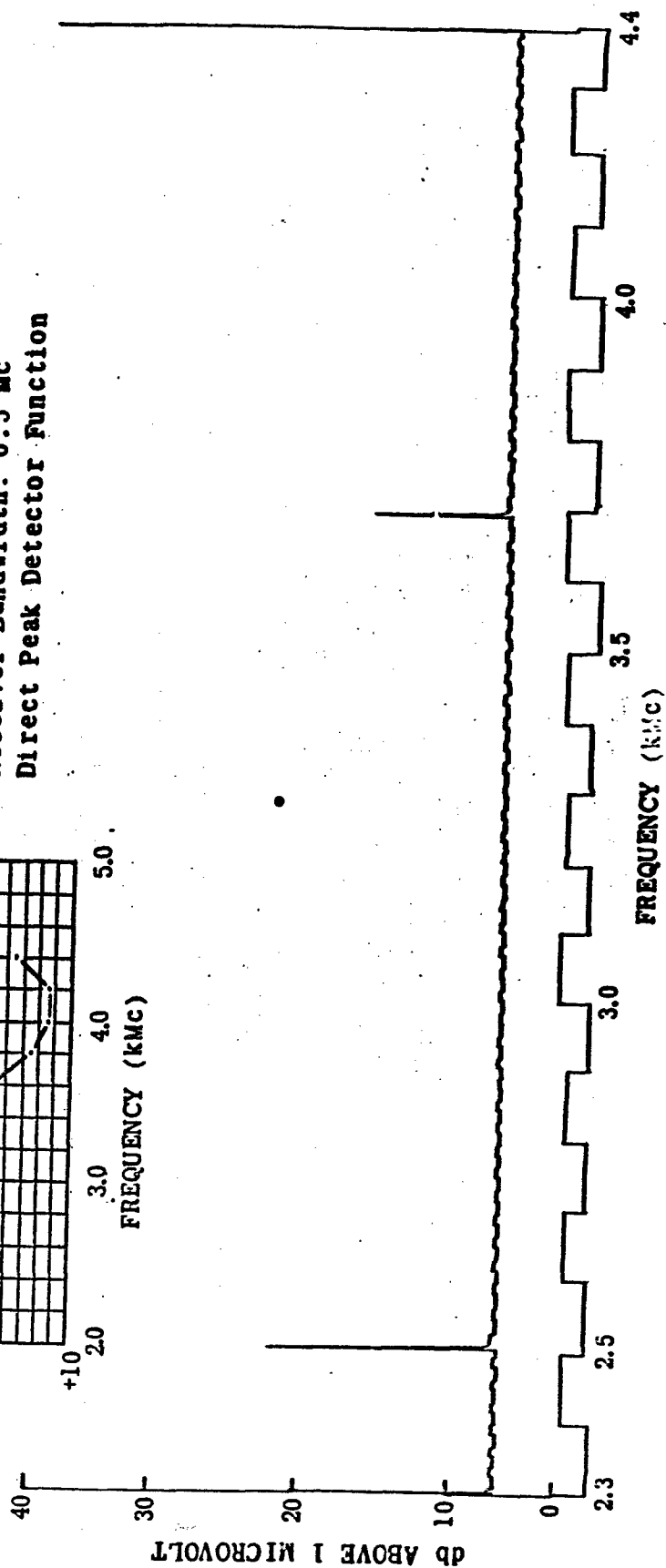
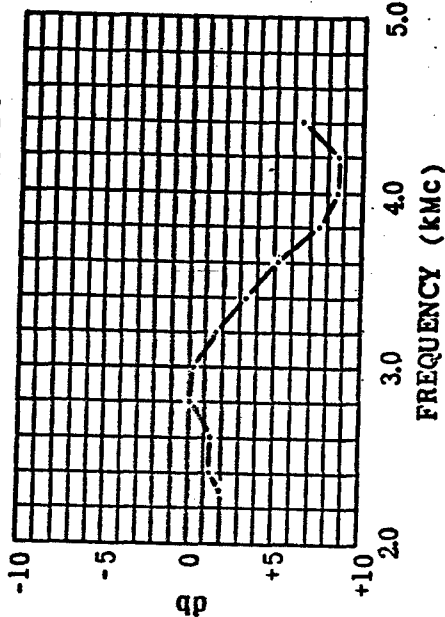


Figure 5.2.3-15. Spurious Emission Scan ( $f_o = 1257.8$  Mc) - H, 40 db.

# Gain Correction Chart



Date: 12-14-62 Hour: 1810  
 Radar Tuned Frequency: 1257.8 Mc  
 Receiver Range: 2.3-4.4 kMc  
 Receiver Attenuator: 20 db  
 Test Antenna and Pol: CA-S, Horizontal  
 Receiver Bandwidth: 0.5 Mc  
 Direct Peak Detector Function

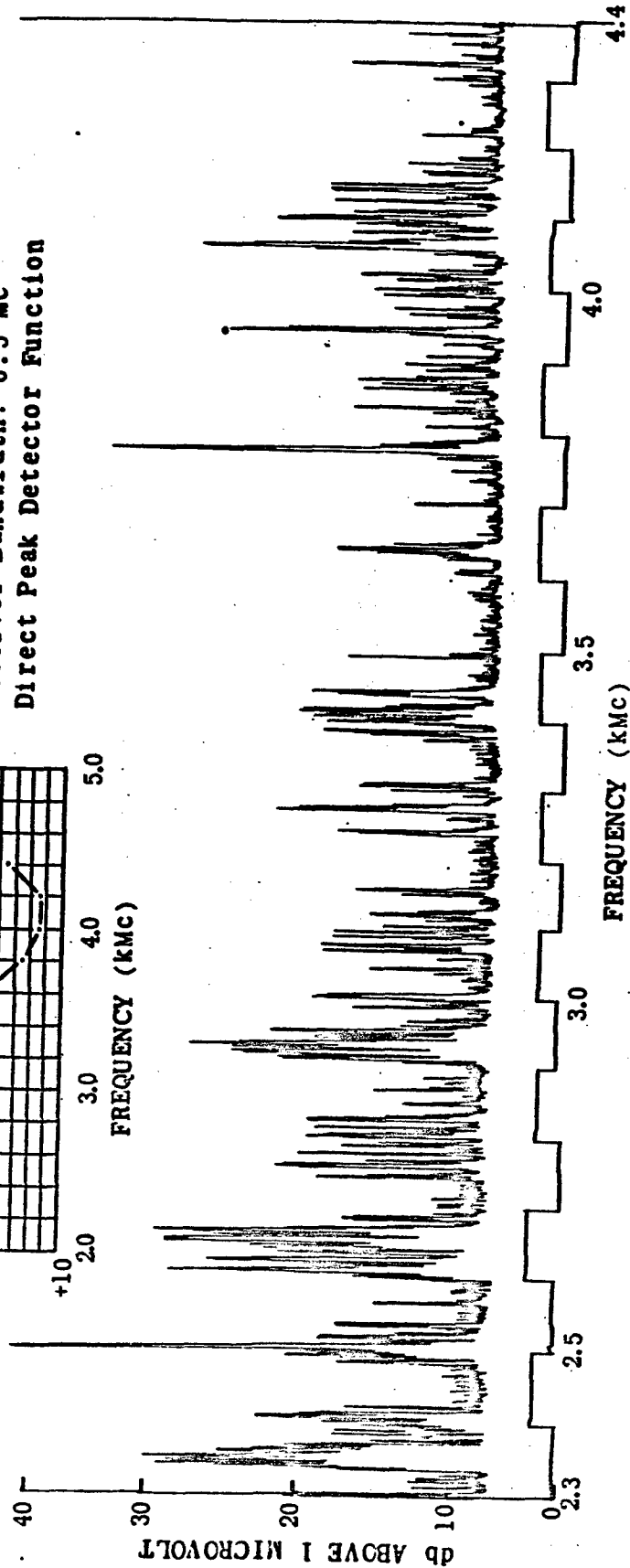
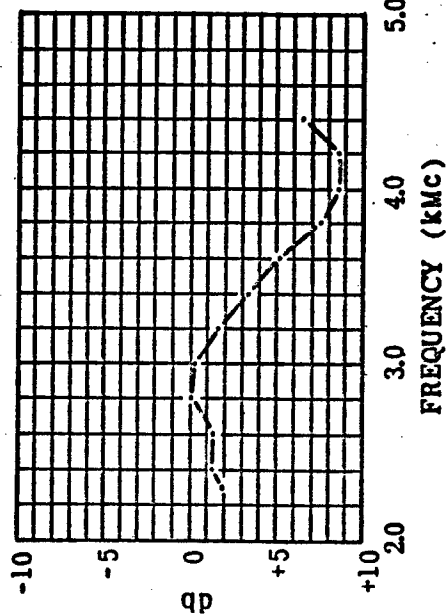


Figure 5.2.3-16. Spurious Emission Scan ( $f_o = 1257.8$  Mc) - H, 20 db.

# Gain Correction Chart



Date: 12-14-62 Hour: 1940  
 Radar Tuned Frequency: 1257.8 Mc  
 Receiver Range: 2.3-4.4 kMc  
 Receiver Attenuator: 40 db  
 Test Antenna and Pol: CA-S, Vertical  
 Receiver Bandwidth: 0.5 Mc  
 Direct Peak Detector Function

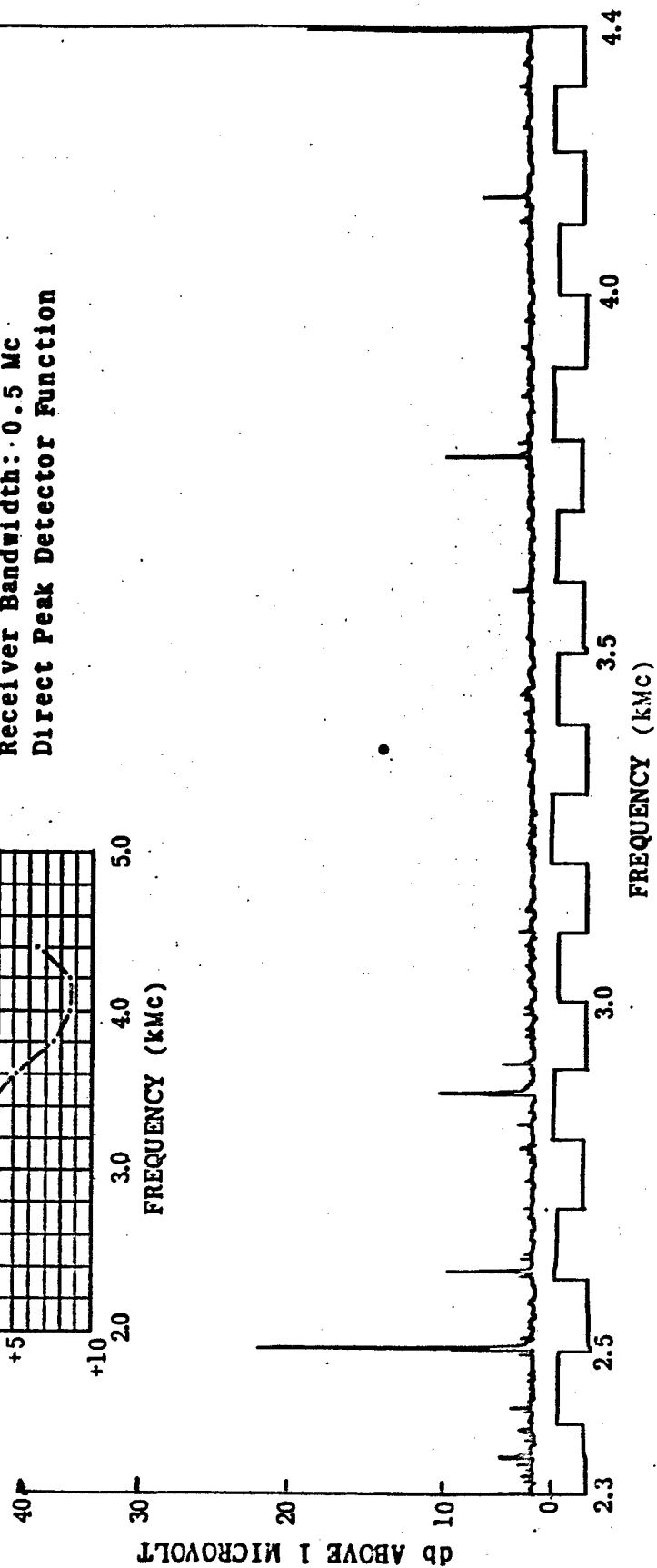
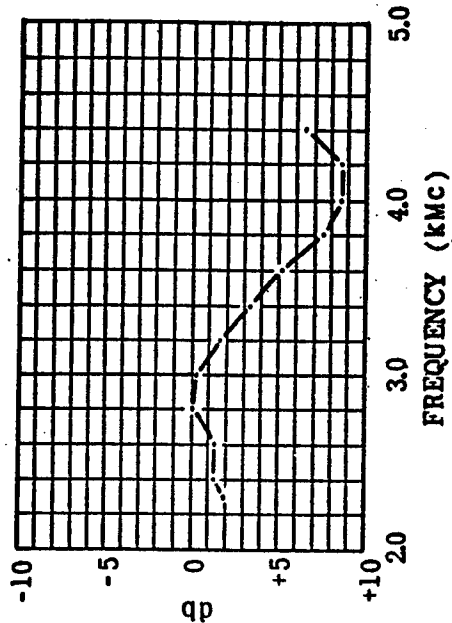


Figure 5.2.3-17. Spurious Emission Scan ( $f_o = 1257.8$  Mc) - V, 40 db.

# Gain Correction Chart



Date: 12-14-62 Hour: 1925  
 Radar Tuned Frequency: 1257.8 Mc  
 Receiver Range: 2.3-4.4 kMc  
 Receiver Attenuator: 20 db  
 Test Antenna and Pol: CA-S, Vertical  
 Receiver Bandwidth: 0.5 Mc  
 Direct Peak Detector Function

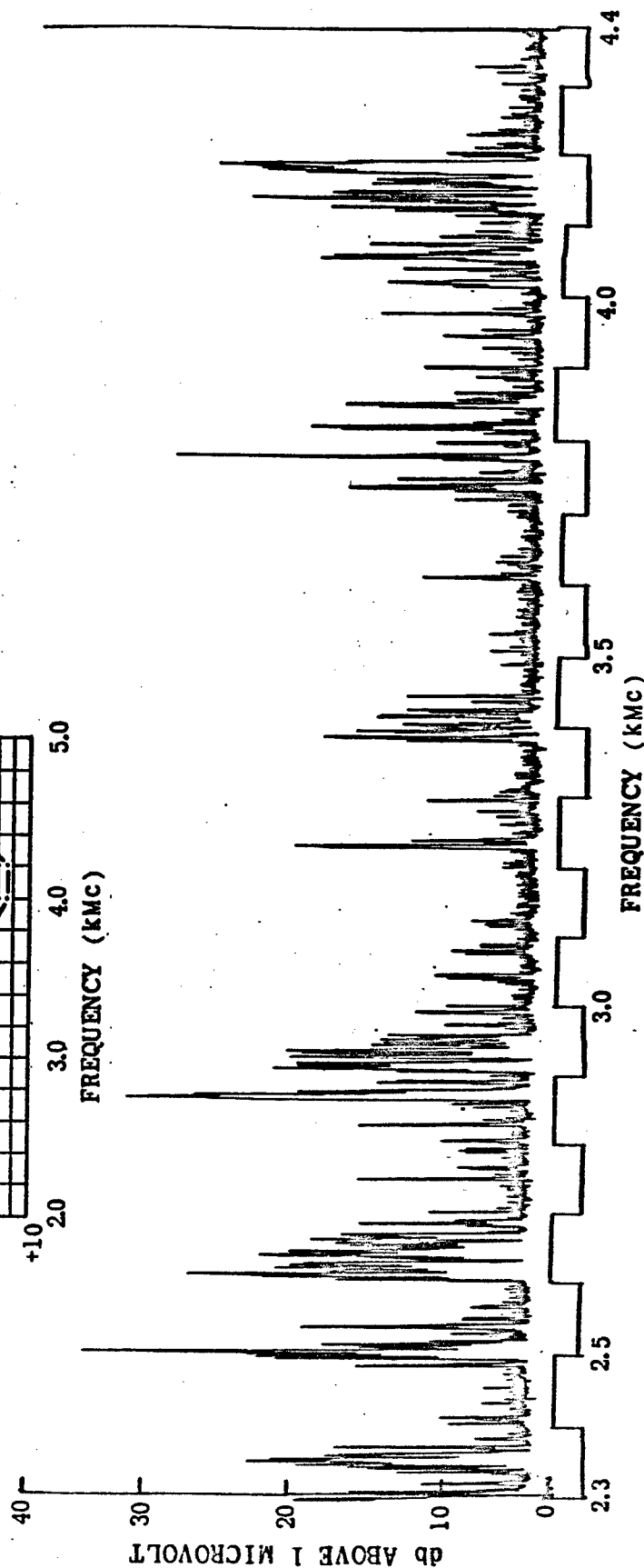
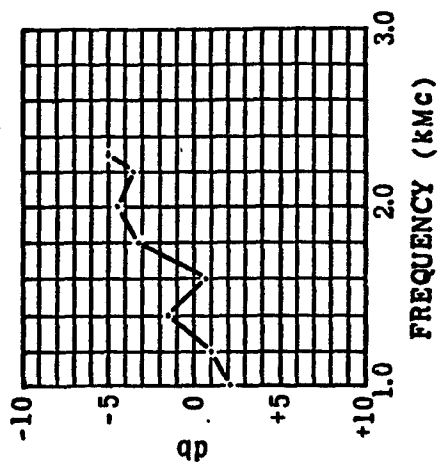


Figure 5.2.3-18. Spurious Emission Scan ( $f_o = 1257.8$  Mc) - V, 20 db.

## Gain Correction Chart



Date: 12-5-62  
 Radar Tuned Frequency: 1297.8 Mc  
 Receiver Range: 1.0-2.3 kMc  
 Receiver Attenuator: 100 db  
 Test Antenna and Pol: CA-L, Horizontal  
 Receiver Bandwidth: 5.0 Mc  
 Direct Peak Detector Function

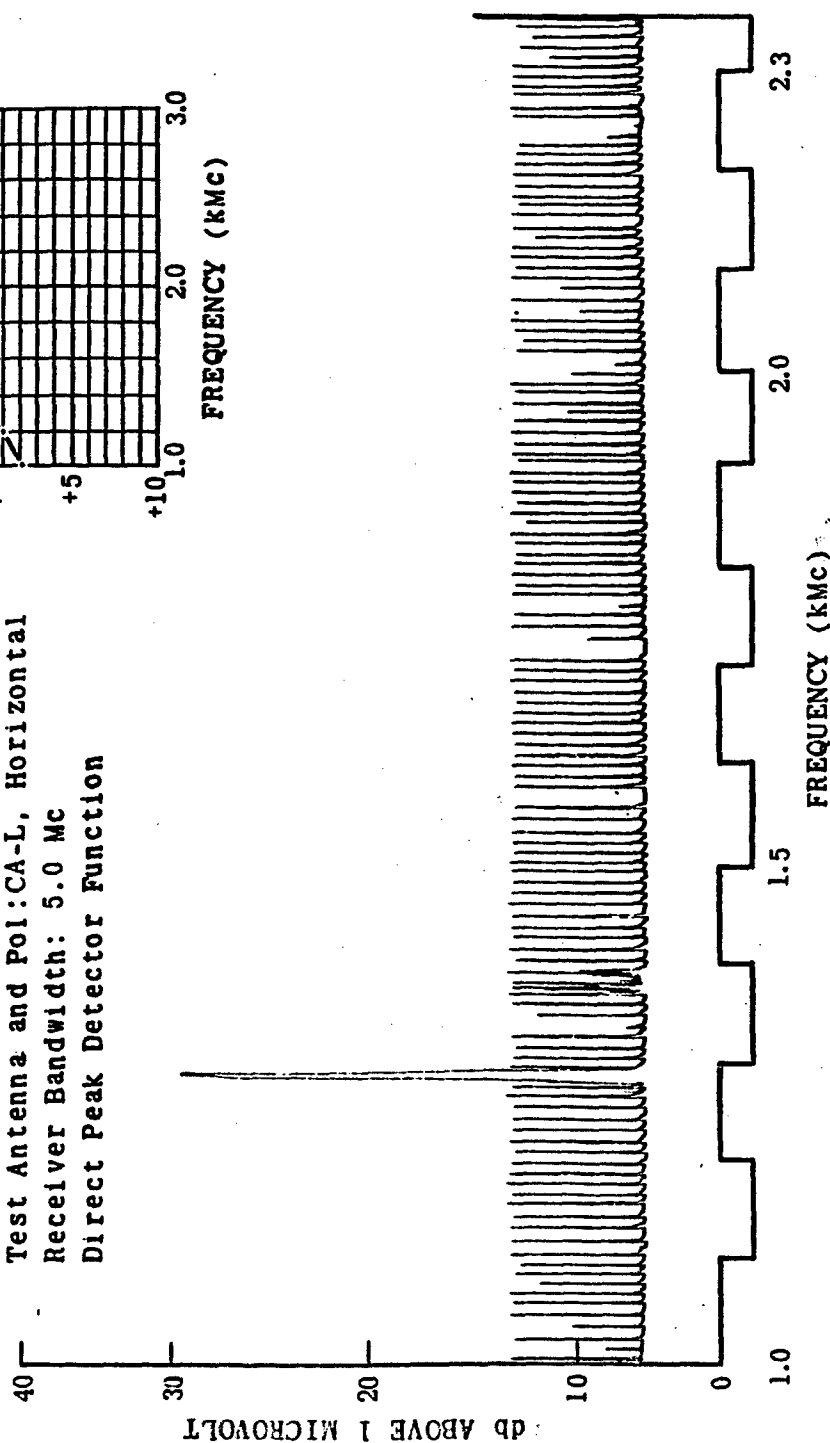


Figure 5.2.3-19. Spurious Emission Scan ( $f_o = 1297.8$  Mc) - H, 100 db.

Date: 12-5-62  
 Radar Tuned Frequency: 1297.8 Mc  
 Receiver Range: 1.0-2.3 kMc  
 Receiver Attenuator: 80 db  
 Test Antenna and Pol: CA-L, Horizontal  
 Receiver Bandwidth: 5.0 Mc  
 Direct Peak Detector Function

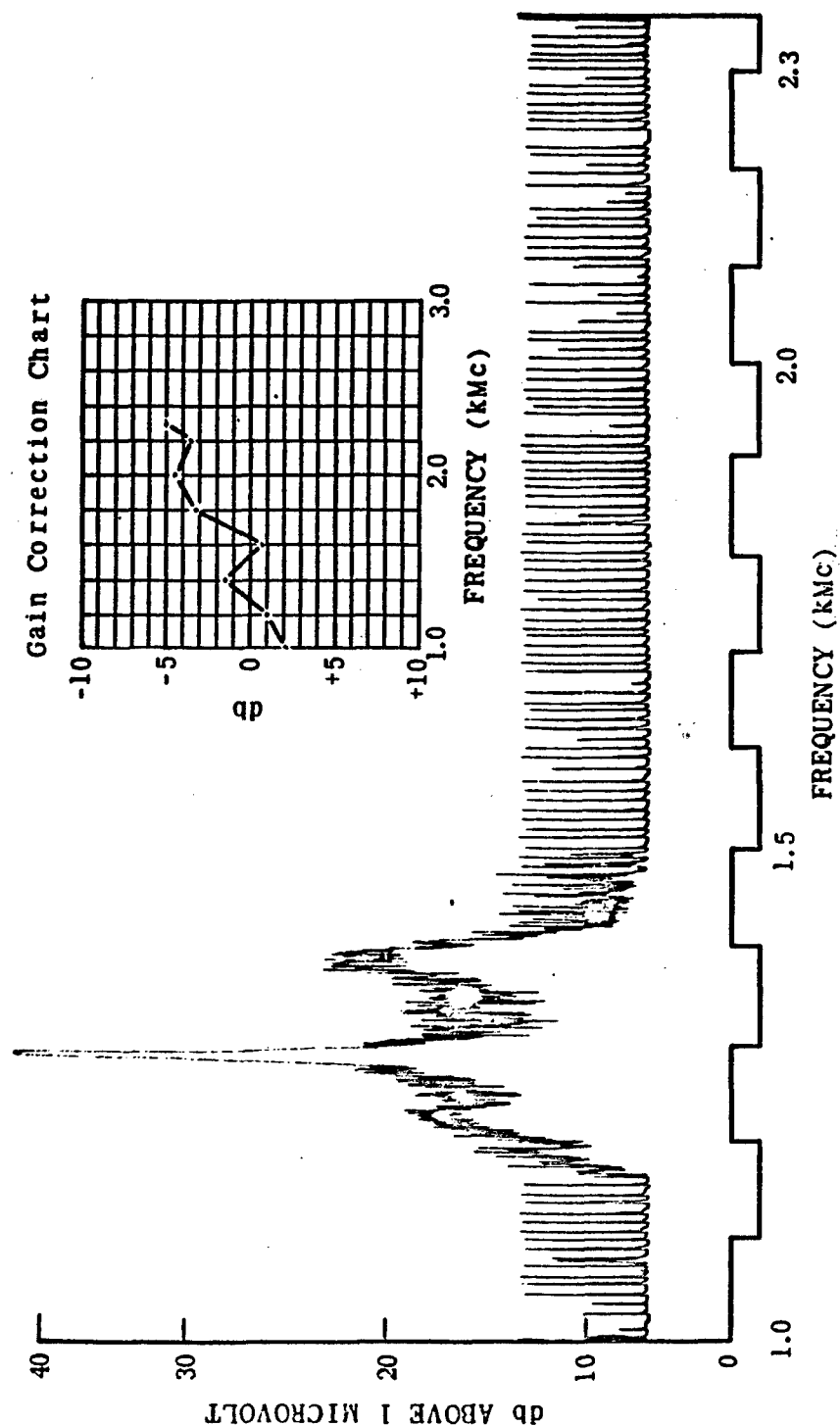


Figure 5.2.3-20. Spurious Emission Scan ( $f_o = 1297.8$  Mc) - H, 80 db.

Date: 12-5-62  
 Radar Tuned Frequency: 1297.8 Mc  
 Receiver Range: 1.0-2.3 kMc  
 Receiver Attenuator: 60 db  
 Test Antenna and Pol: CA-L, Horizontal  
 Receiver Bandwidth: 5.0 Mc  
 Direct Peak Detector Function

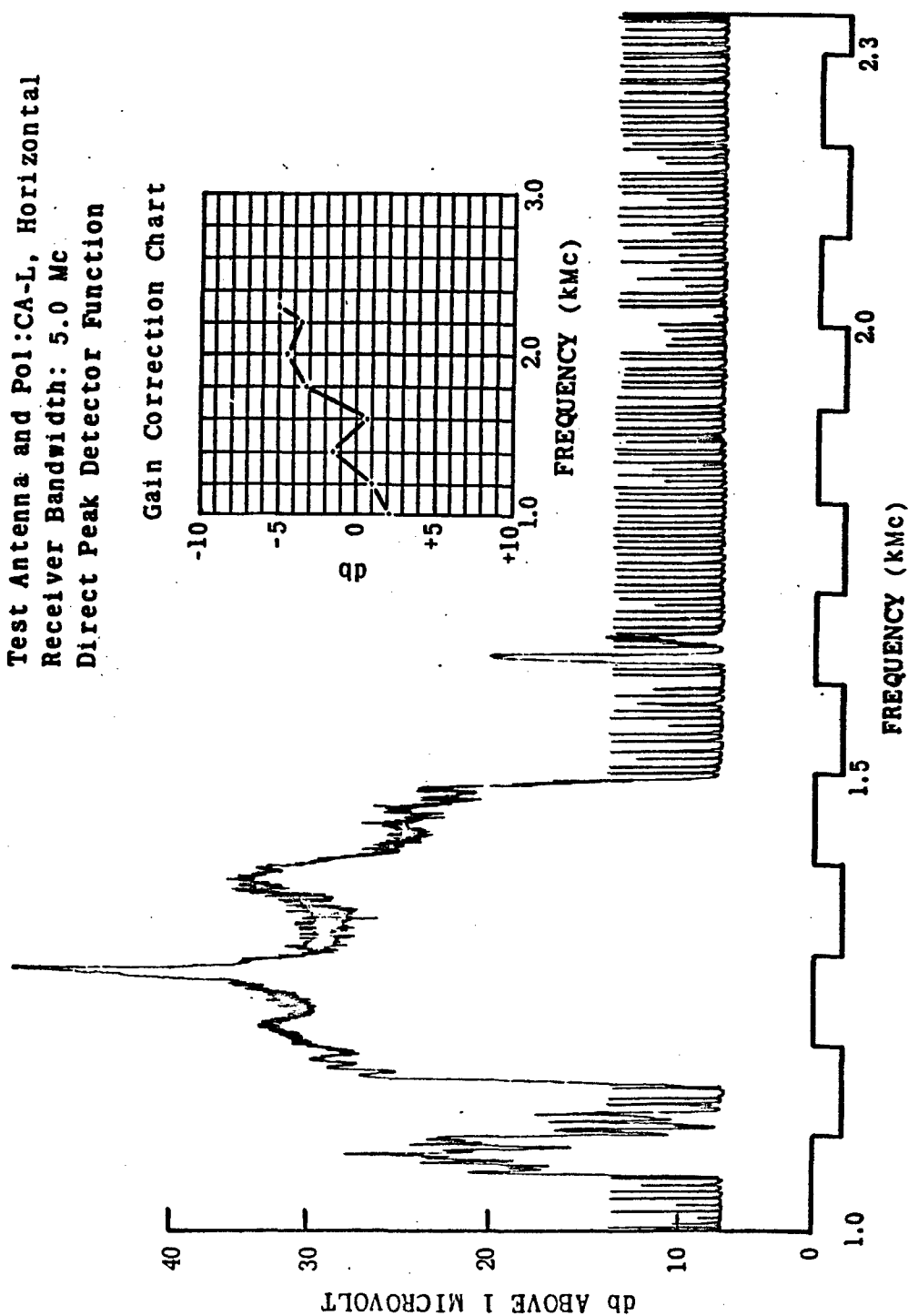


Figure 5.2.3-21. Spurious Emission Scan ( $f_o = 1297.8$  Mc) - H, 60 db.

Date: 12-5-62  
 Radar Tuned Frequency: 1297.8 Mc  
 Receiver Range: 1.0-2.3 kMc  
 Receiver Attenuator: 40 db  
 Test Antenna and Pol: CA-L, Horizontal  
 Receiver Bandwidth: 5.0 Mc  
 Direct Peak Detector Function

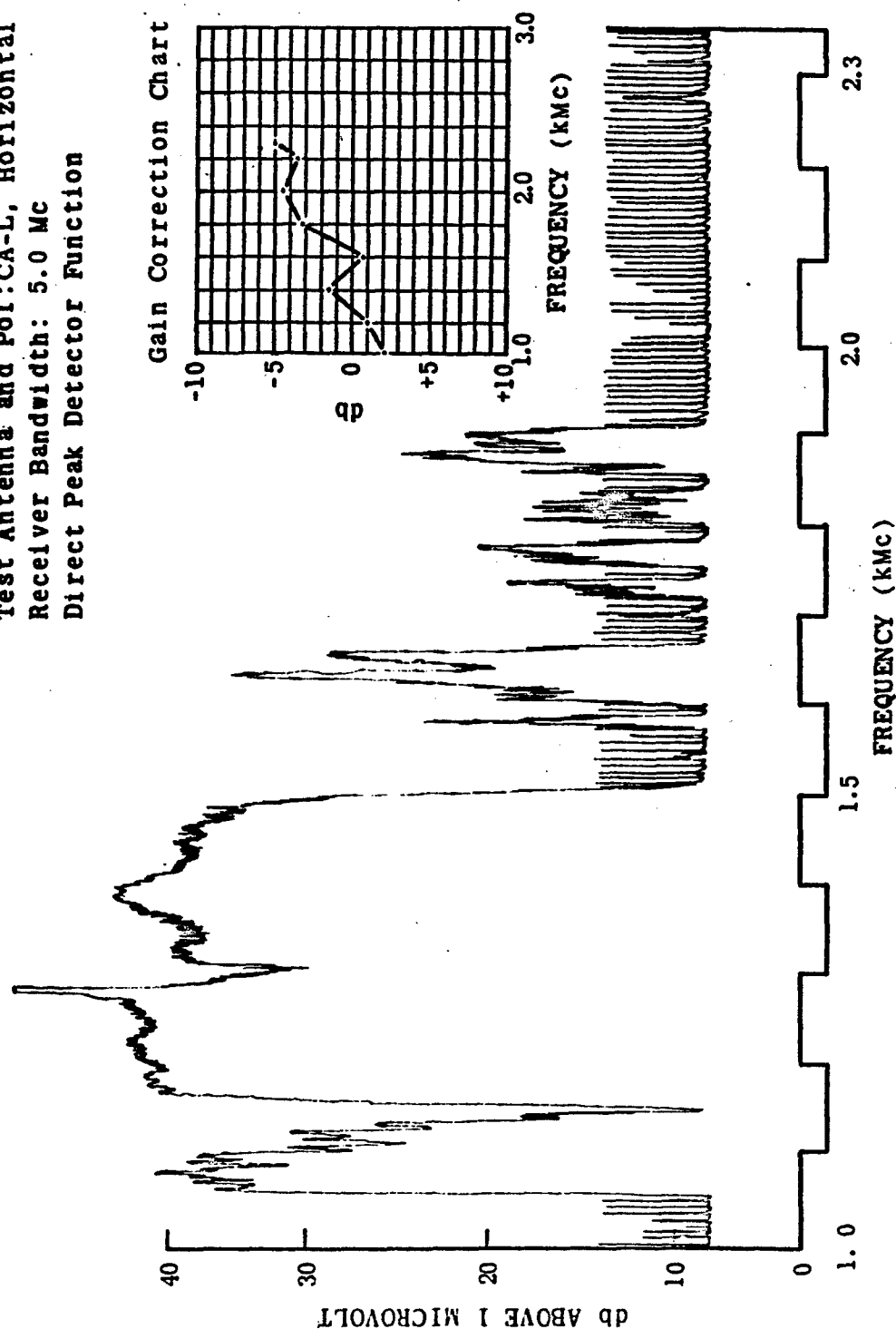
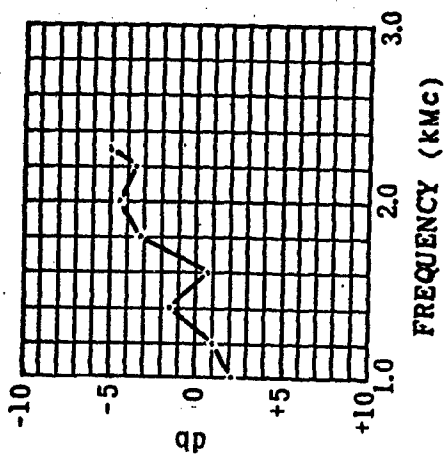


Figure 5.2.3-22. Spurious Emission Scan ( $f_o = 1297.8$  Mc) - H, 40 db.

Gain Correction Chart



Date: 12-11-62 Hour: 1050  
 Radar Tuned Frequency: 1297.8 Mc  
 Receiver Range: 1.0-2.3 KMc  
 Receiver Attenuator: 80 db  
 Test Antenna and Pol: CA-L, Vertical  
 Receiver Bandwidth: 5.0 Mc  
 Direct Peak Detector Function

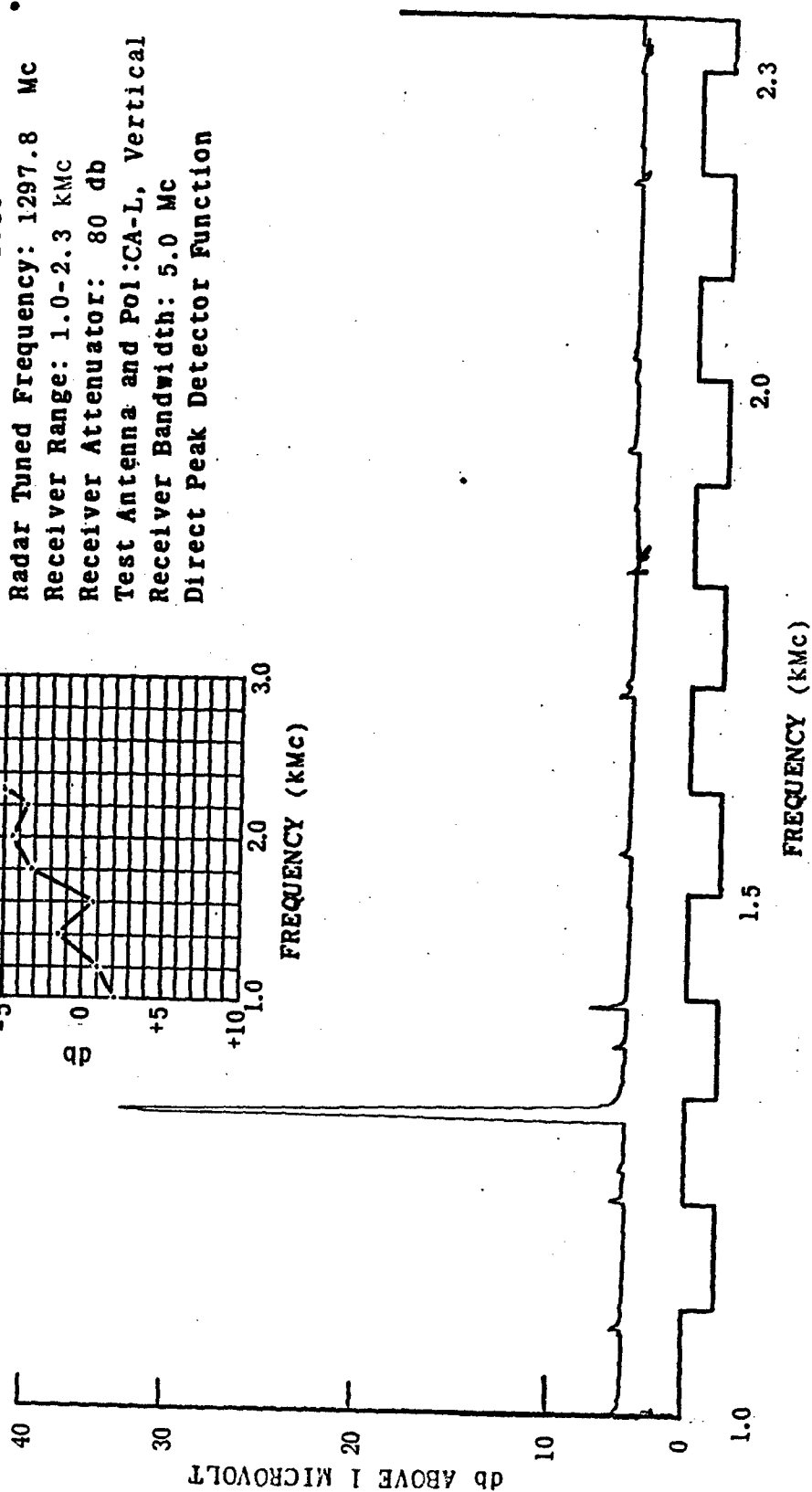


Figure 5.2.3-23. Spurious Emission Scan ( $f_o = 1297.8$  Mc) - V, 80 db.

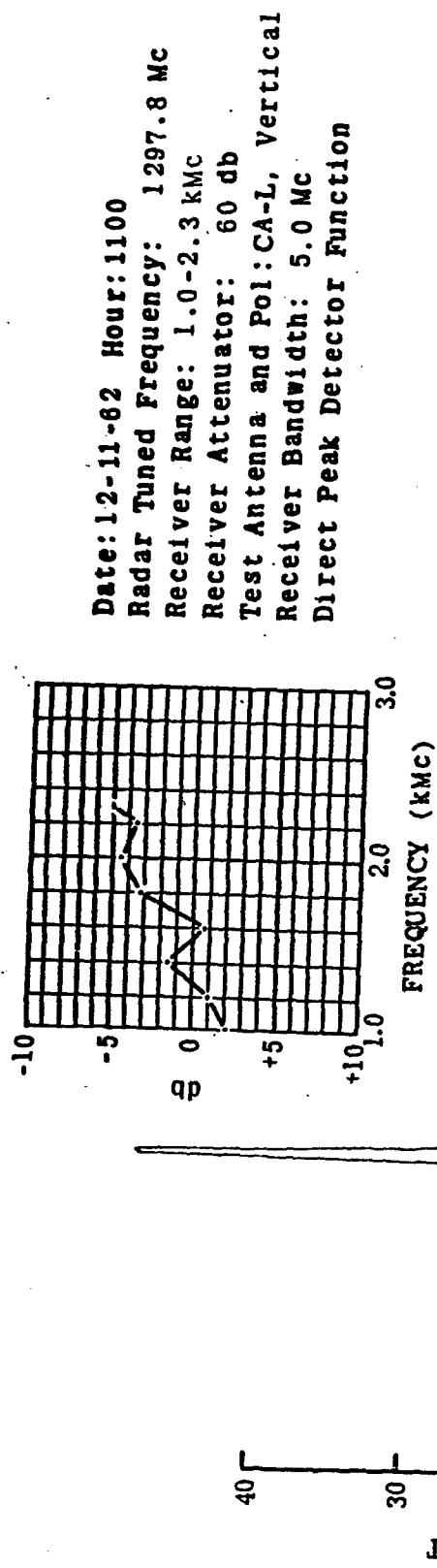


Figure 5.2.3-24. Spurious Emission Scan ( $f_o = 1297.8$  Mc) - V, 60 db.

Date: 12-11-62 Hour: 1105  
 Radar Tuned Frequency: 1297.8 Mc  
 Receiver Range: 1.0-2.3 kMc  
 Receiver Attenuator: 40 db  
 Test Antenna and Pol: CA-L, Vertical  
 Receiver Bandwidth: 0.5 Mc  
 Direct Peak Detector Function

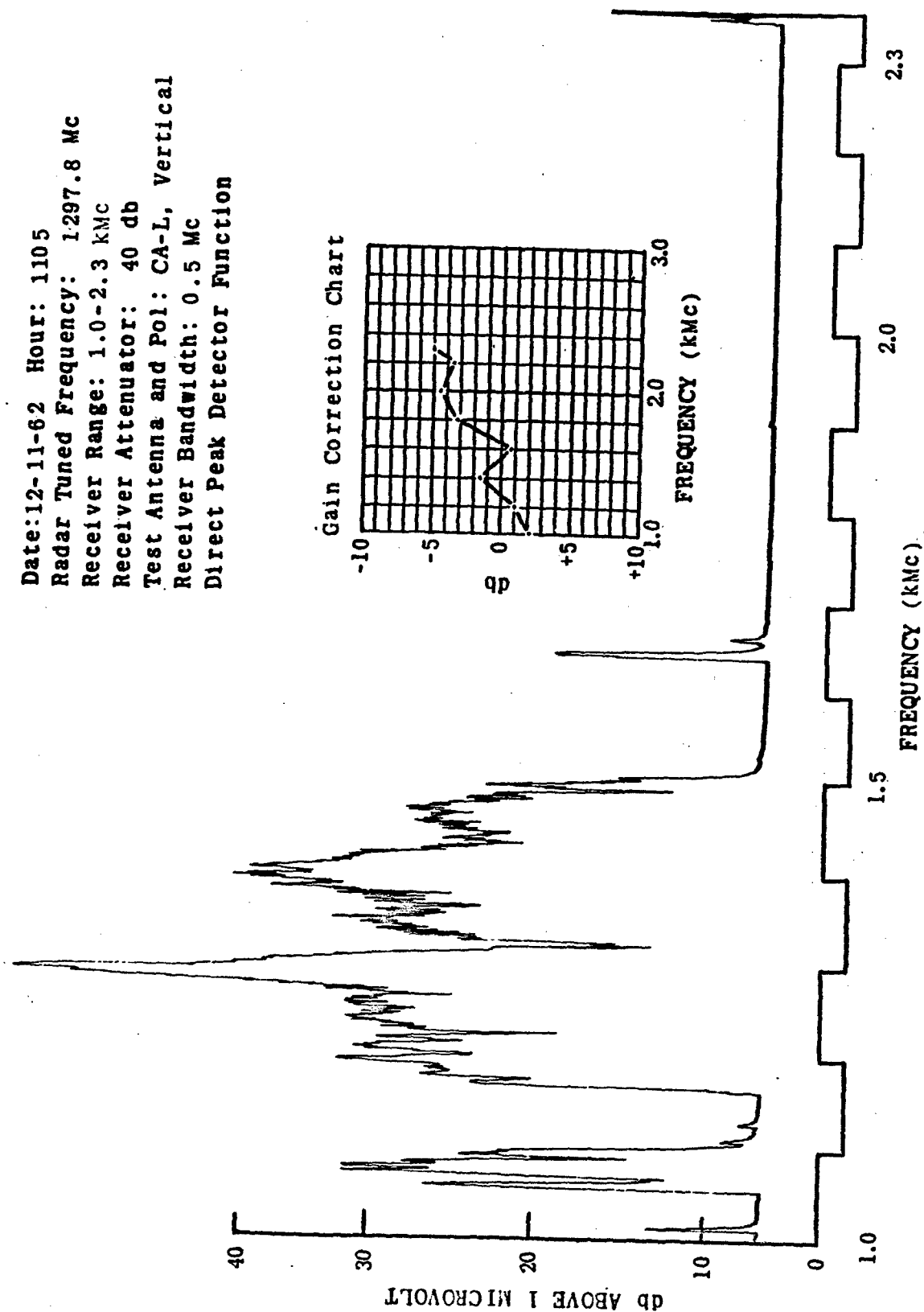


Figure 5.2.3-25. Spurious Emission Scan ( $f_o = 1297.8$  Mc) - V, 40 db.

Date: 12-11-62 Hour: 1230  
 Radar Tuned Frequency: 1297.8 Mc  
 Receiver Range: 2.3-4.4 kMc  
 Receiver Attenuator: 20 db  
 Test Antenna and Pol: CA-S, Horizontal  
 Receiver Bandwidth: 5.0 Mc  
 Direct Peak Detector Function

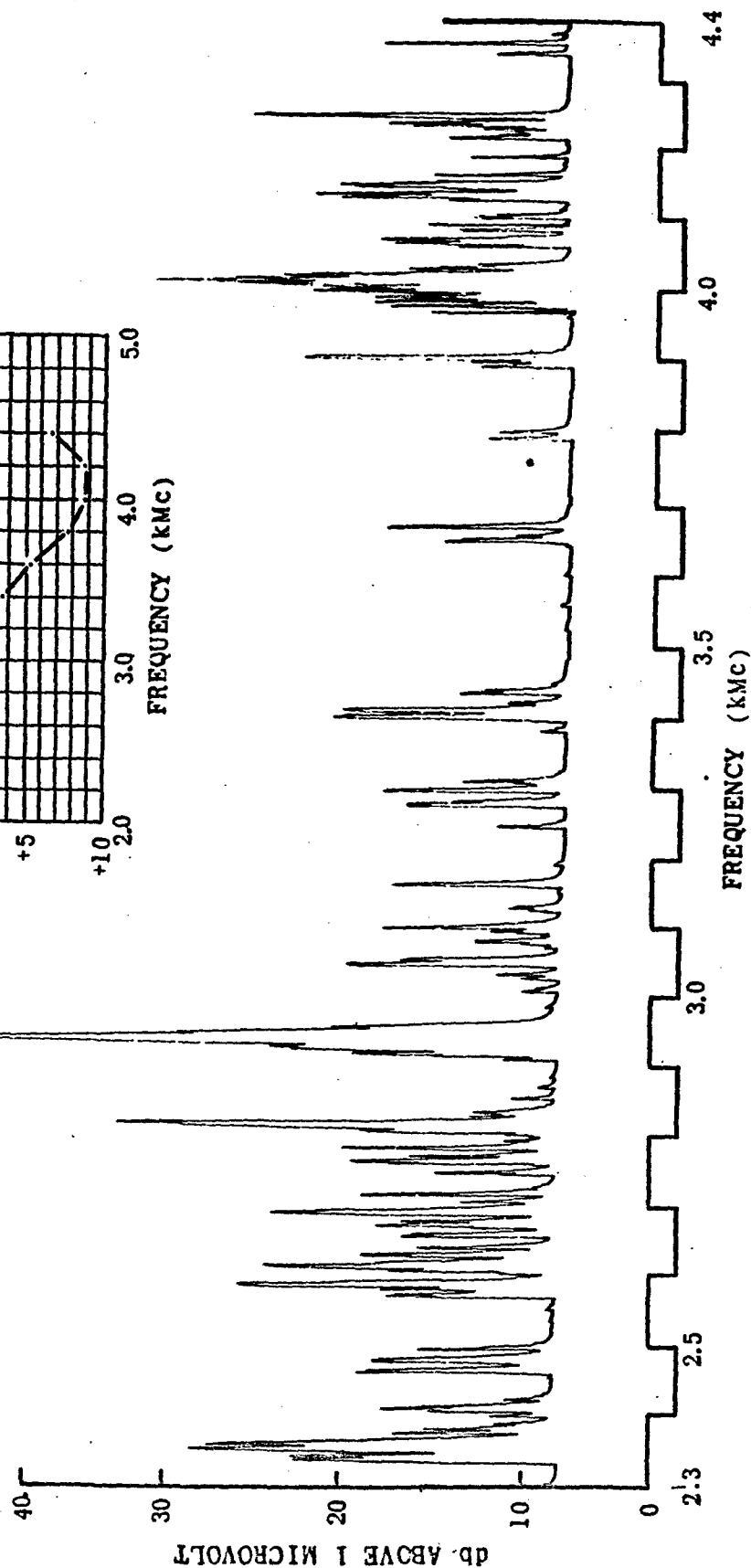
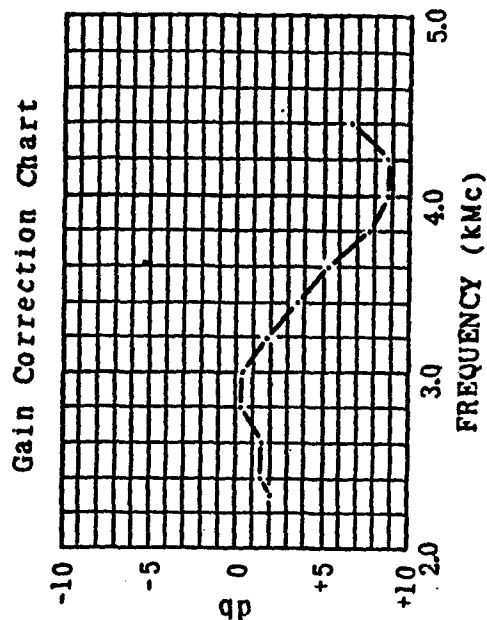


Figure 5.2.3-26. Spurious Emission Scan ( $f_o = 1297.8$  Mc) - H, 20 db.

Date: 12-11-62 Hour: 1420

Radar Tuned Frequency: 1297.8 Mc

Receiver Range: 2.3-4.4 kMc

Receiver Attenuator: 20 db

Test Antenna and Pol: CA-S, Vertical

Receiver Bandwidth: 5.0 Mc

Direct Peak Detector Function

Gain Correction Chart

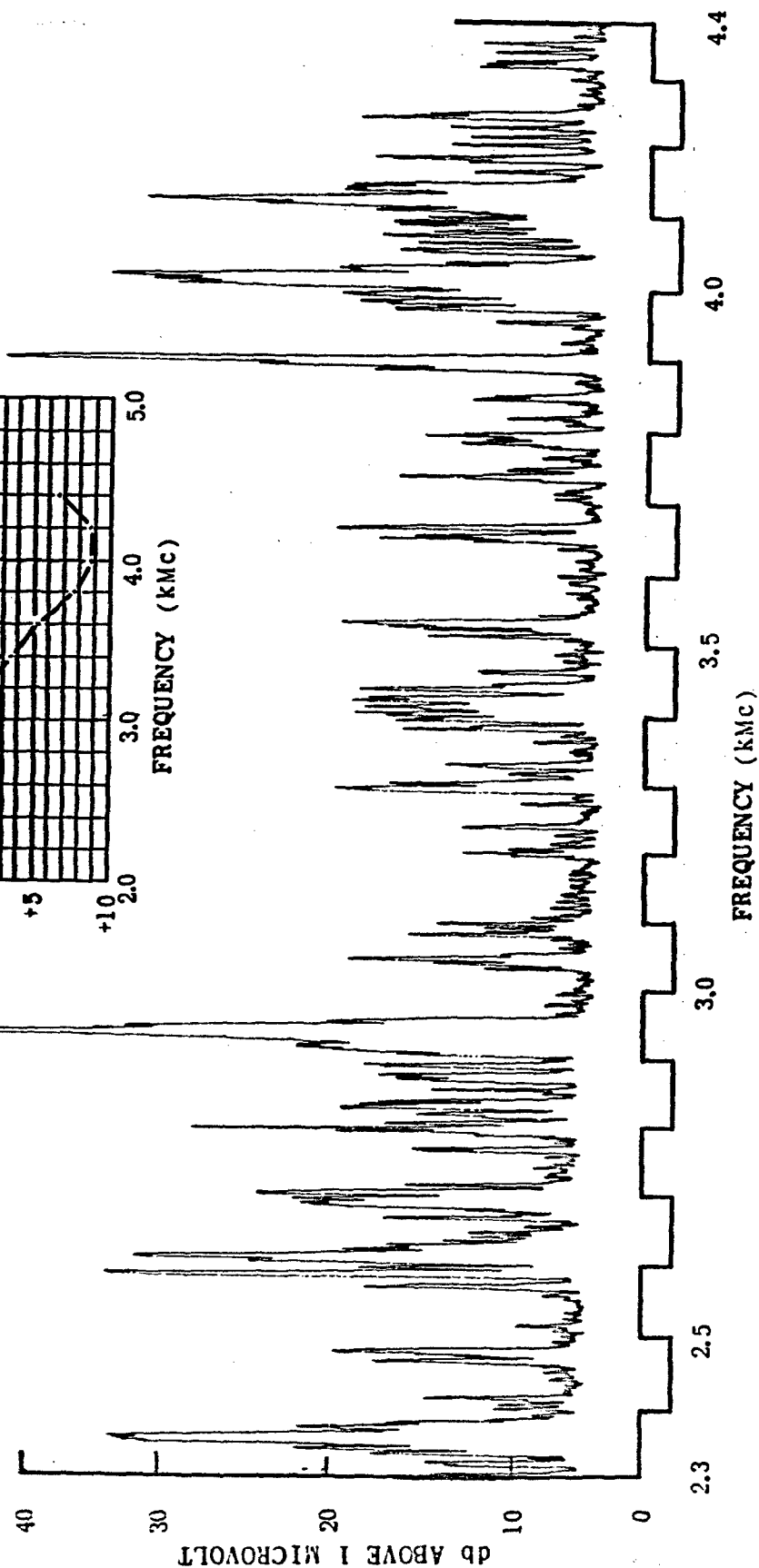
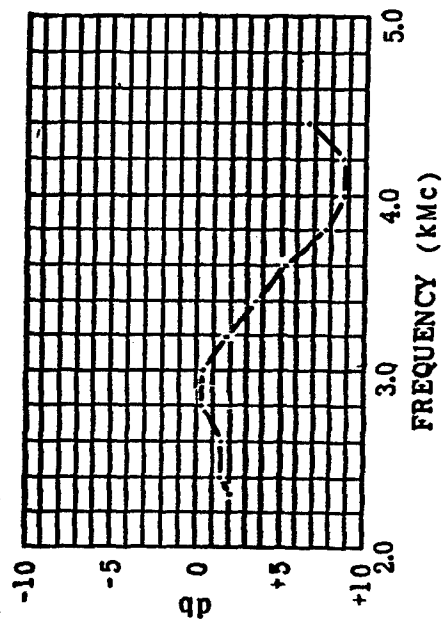


Figure 5.2.3-27. Spurious Emission Scan ( $f_o = 1297.8$  Mc) - V, 20 db.

Date: 12-19-62 Hour: 1650  
 Radar Tuned Frequency: 1297.8 Mc  
 Receiver Range: 4.4-7.3 kMc  
 Receiver Attenuator: 20 db  
 Test Antenna and Pol: CA-M, Horizontal  
 Receiver Bandwidth: 0.5 Mc  
 Direct Peak Detector Function

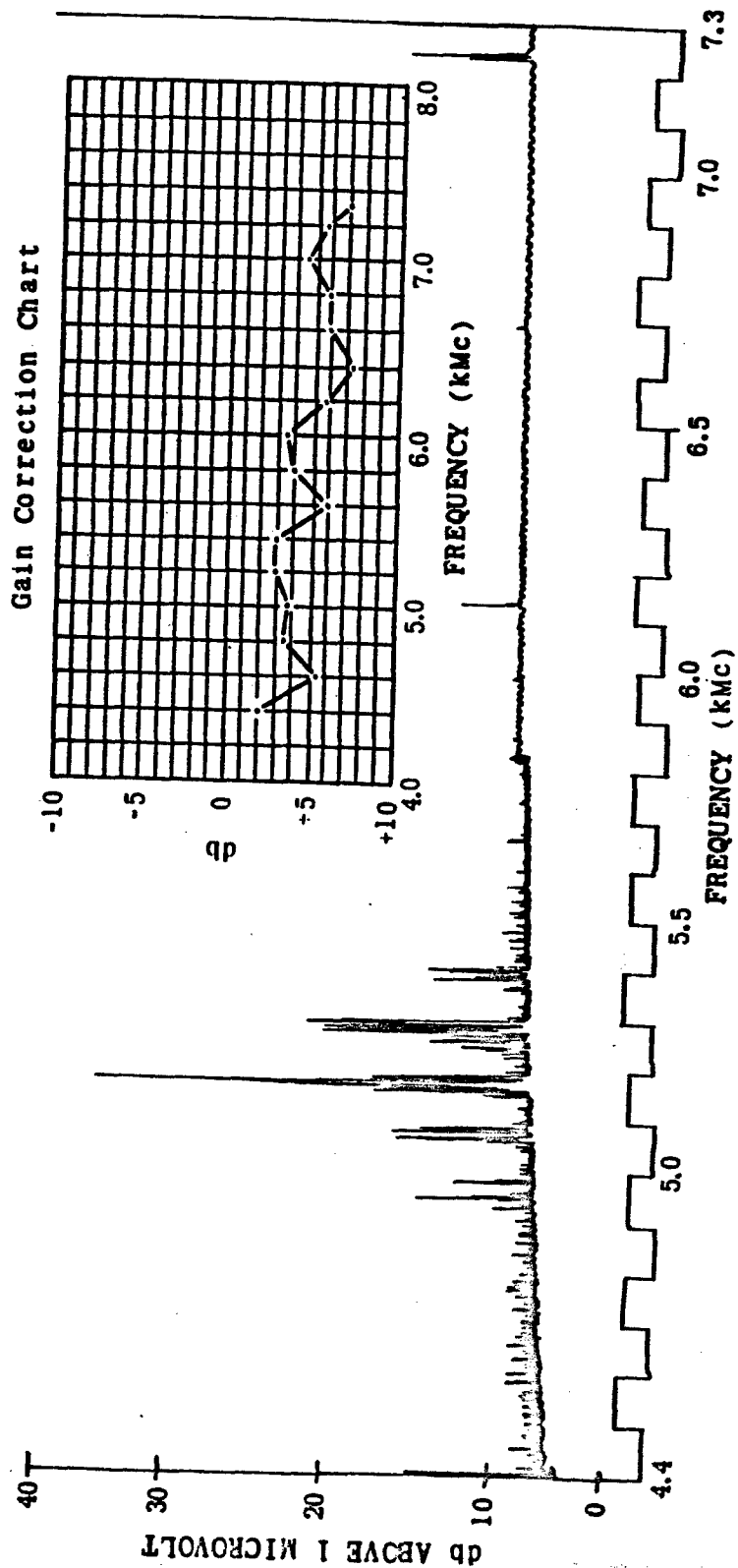
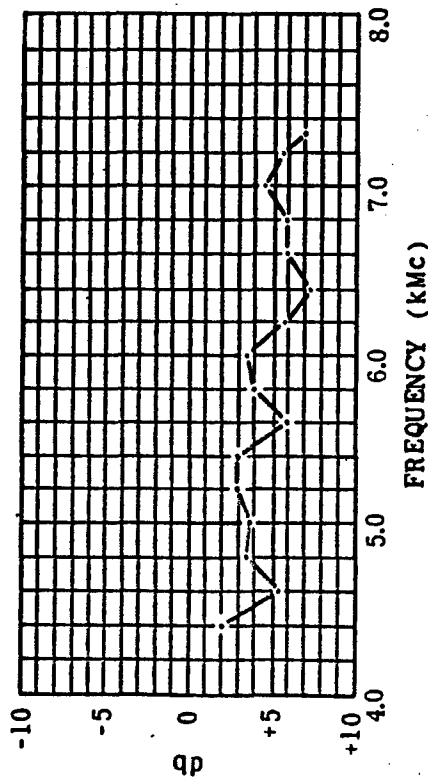


Figure 5.2.3-28. Spurious Emission Scan ( $f_o = 1297.8$  Mc) - H, 20 db.

# Gain Correction Chart



Date: 12-19-62 Hour: 1710  
 Radar Tuned Frequency: 1297.8 Mc  
 Receiver Range: 4.4-7.3 kMc  
 Receiver Attenuator: 20 db  
 Test Antenna and Pol: CA-M, Vertical  
 Receiver Bandwidth: 0.5 Mc  
 Direct Peak Detector Function

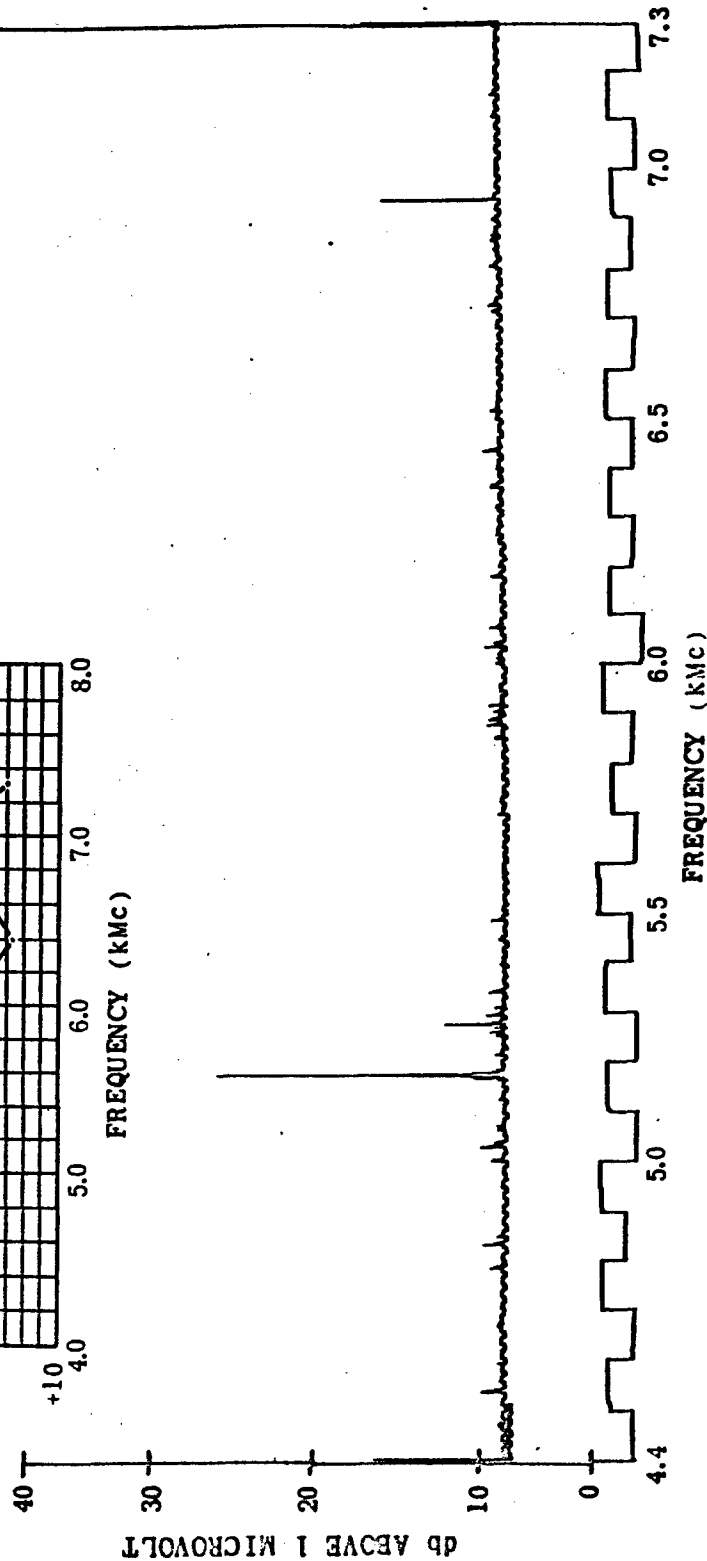
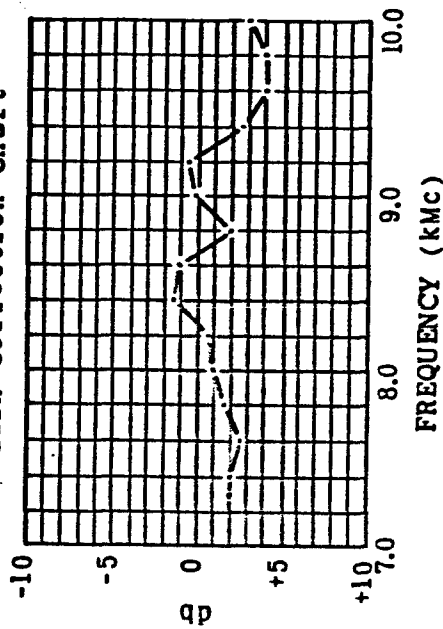


Figure 5.2.3-29. Spurious Emission Scan ( $f_o = 1297.8$  Mc) - V, 20 db.

Gain Correction Chart



Date: 12-19-62 Hour: 1720  
 Radar Tuned Frequency: 1297.8 Mc  
 Receiver Range: 7.3-10.0 kMc  
 Receiver Attenuator: 20 db  
 Test Antenna and Pol: CA-X, Horizontal  
 Receiver Bandwidth: 0.5 Mc  
 Direct Peak Detector Function

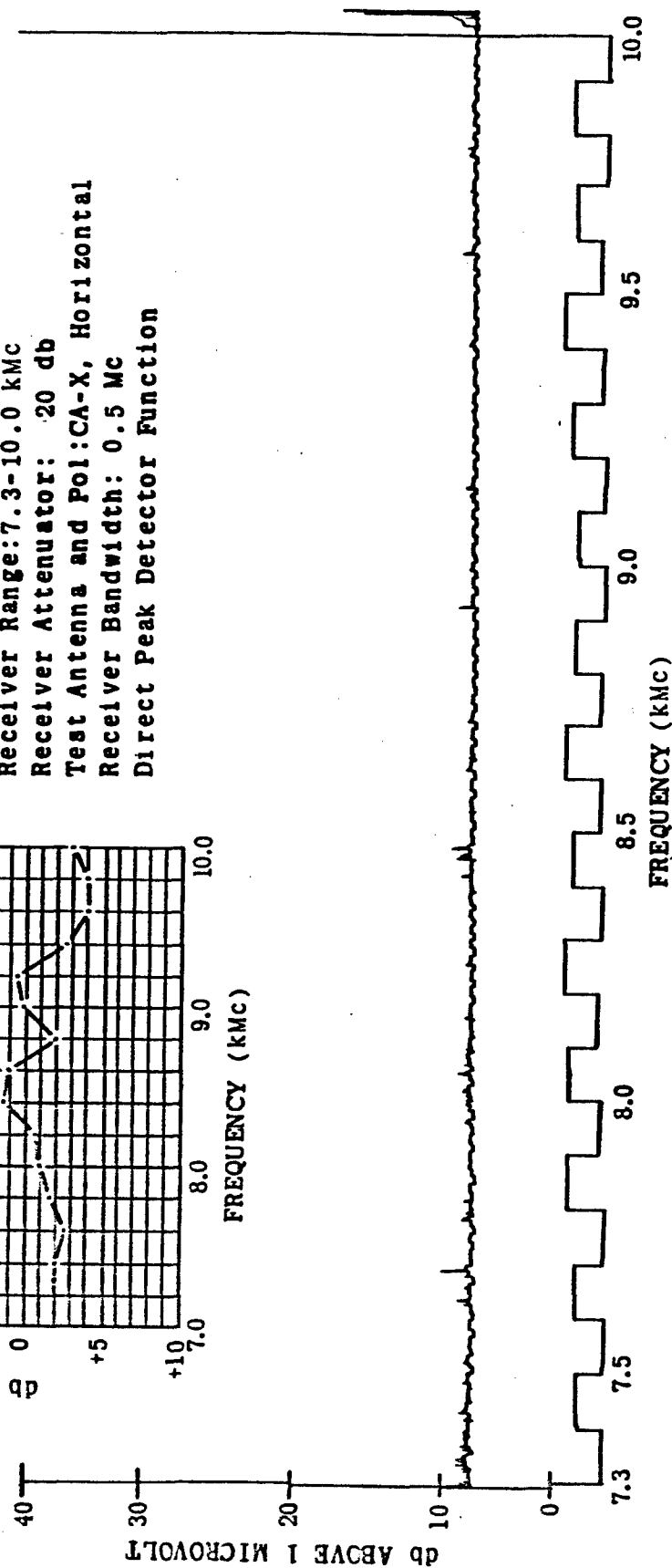
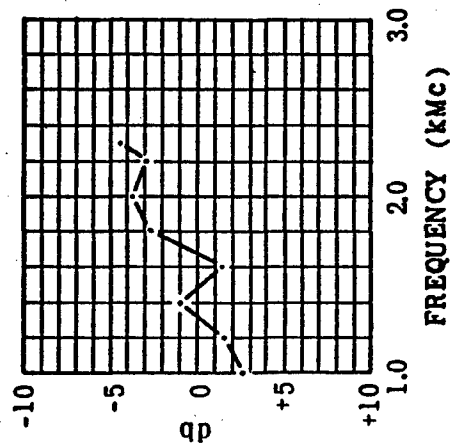


Figure 5.2.3-30. Spurious Emission Scan ( $f_o = 1297.8$  Mc) - H, 20 db.

## Gain Correction Chart



Date: 12-15-62 Hour: 1250  
 Radar Tuned Frequency: 1348 Mc  
 Receiver Range: 1.0-2.3 kMc  
 Receiver Attenuator: 100 db  
 Test Antenna and Pol: CA-L, Horizontal  
 Receiver Bandwidth: 0.5 Mc  
 Direct Peak Detector Function

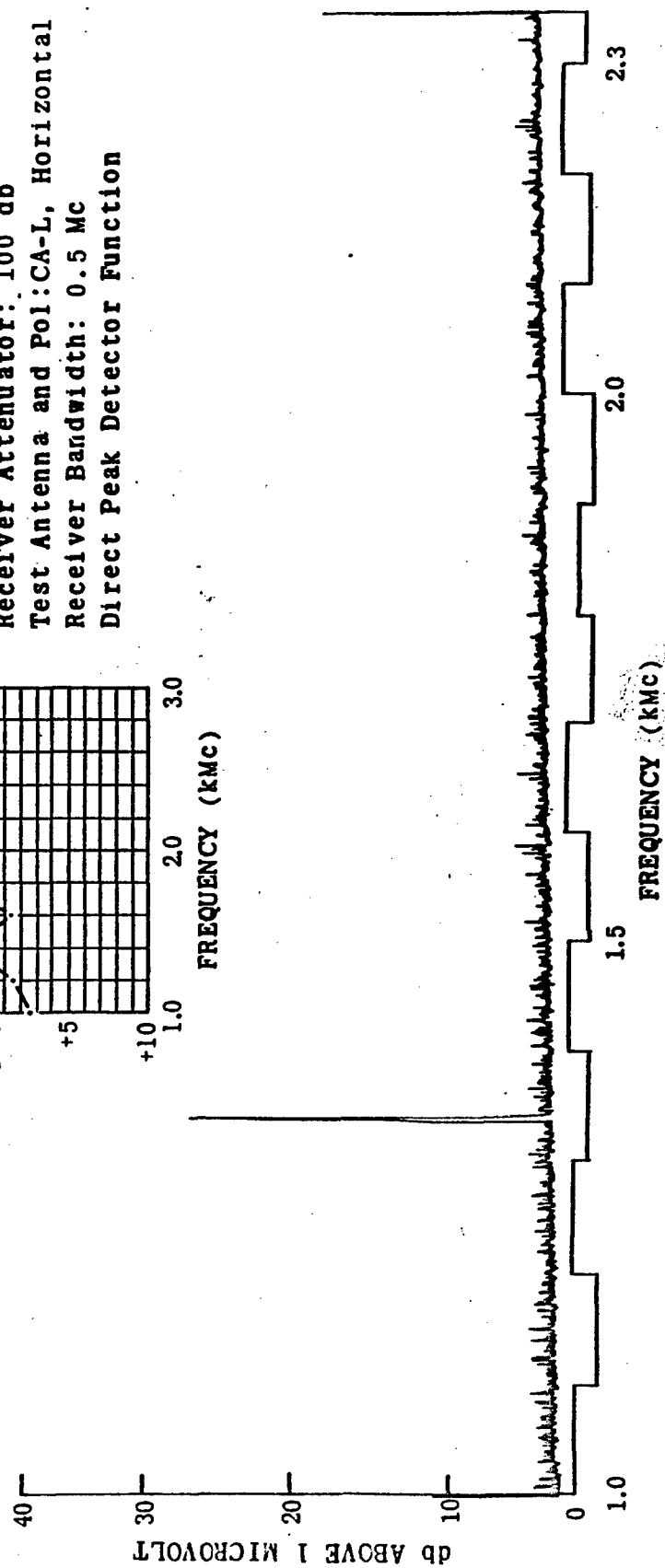
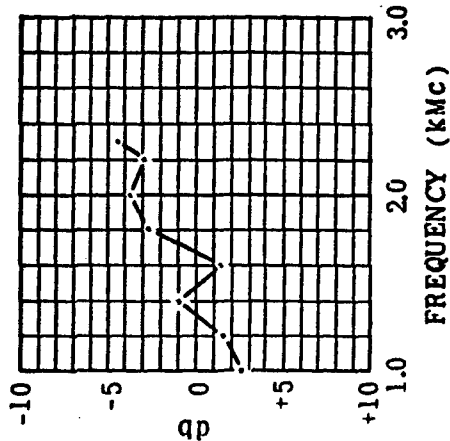


Figure 5.2.3-31. Spurious Emission Scan ( $f_o = 1348$  Mc) - H, 100 db.

# Gain Correction Chart



Date: 12-15-62 Hour: 1305  
 Radar Tuned Frequency: 1348 Mc  
 Receiver Range: 1.0-2.3 kMc  
 Receiver Attenuator: 80 db  
 Test Antenna and Pol: CA-L, Horizontal  
 Receiver Bandwidth: 0.5 Mc  
 Direct Peak Detector Function

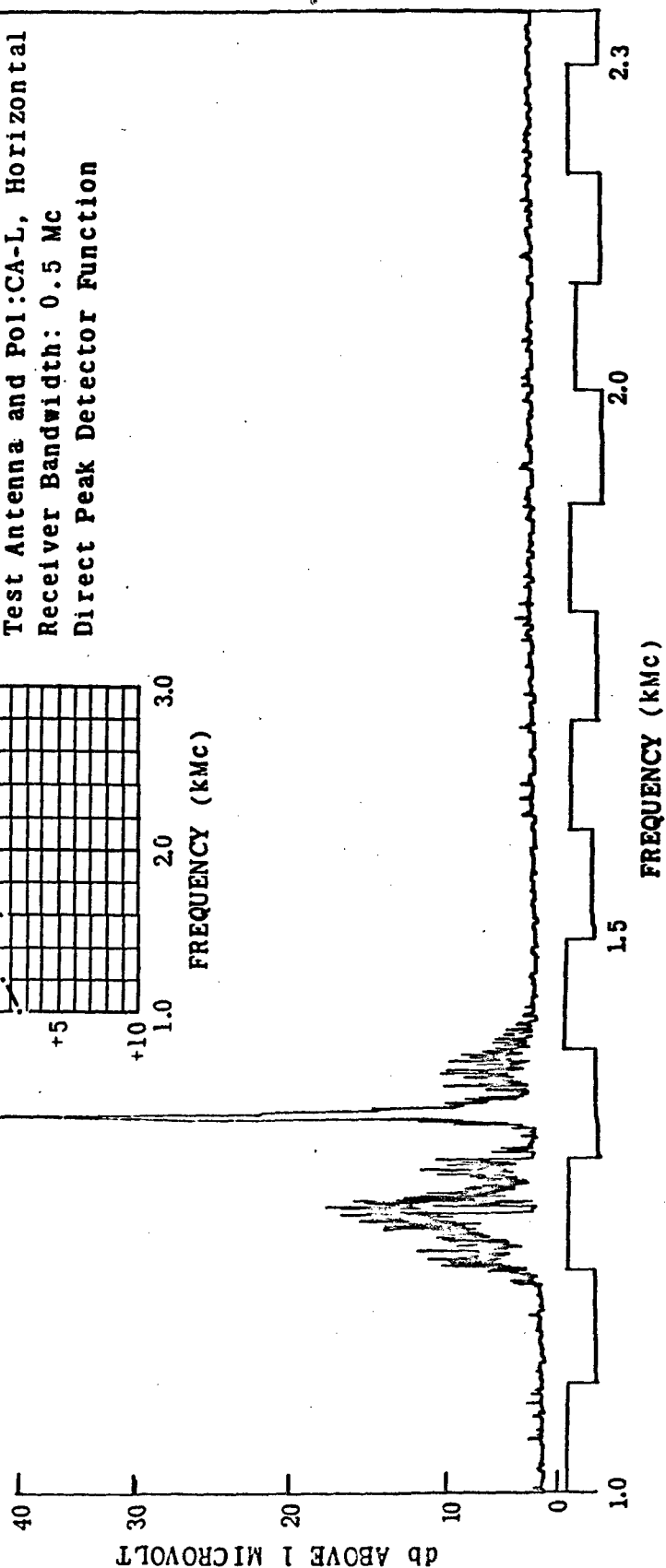


Figure 5.2.3-32. Spurious Emission Scan ( $f_o = 1348$  Mc) - H, 80 db.

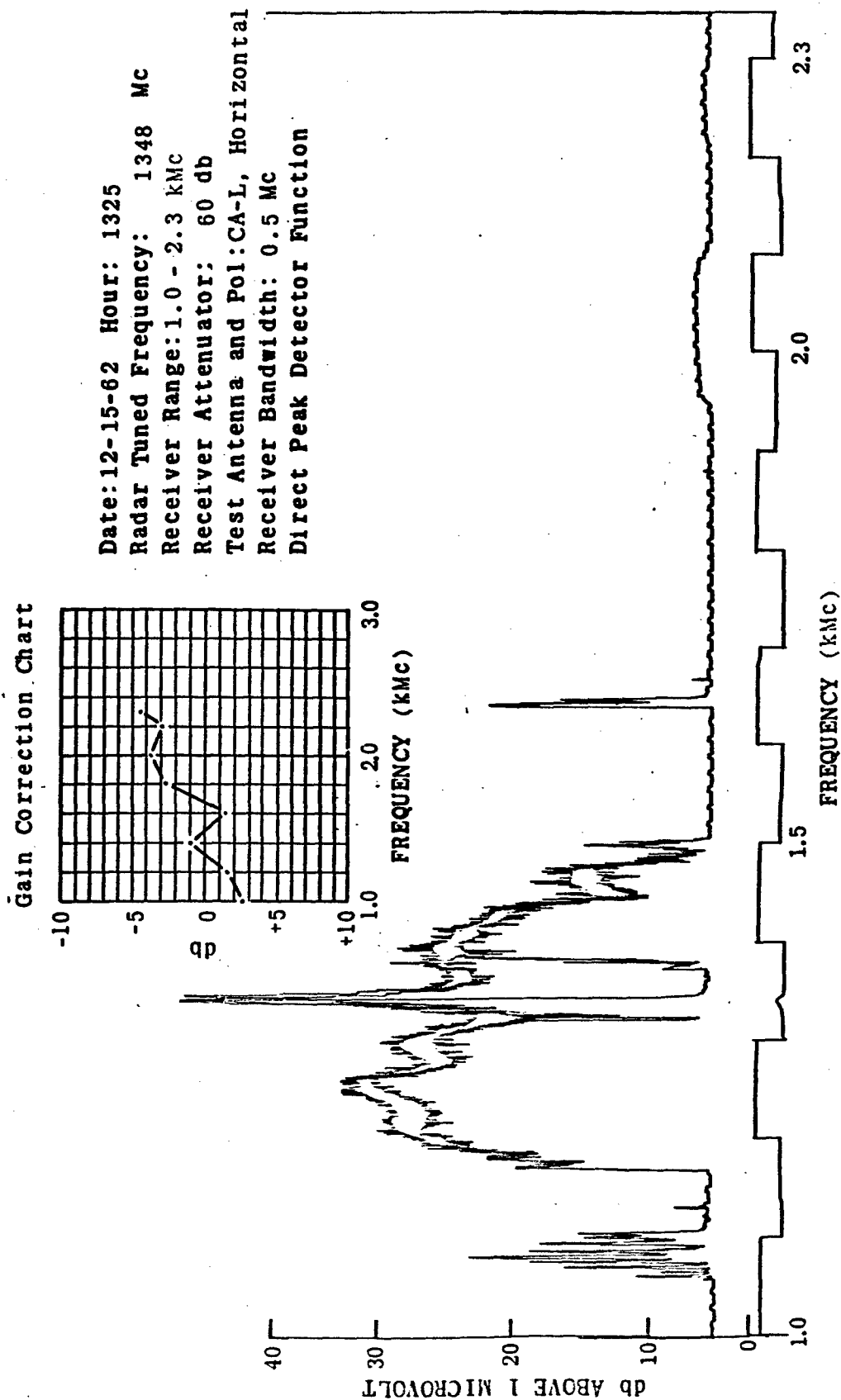


Figure 5.2.3-33. Spurious Emission Scan ( $f_o = 1348$  Mc) - H, 60 db.

Date: 12-15-62 Hour: 1335  
 Radar Tuned Frequency: 1348 Mc  
 Receiver Range: 1.0-2.3 Kmc  
 Receiver Attenuator: 40 db  
 Test Antenna and Pol: CA-L, Horizontal  
 Receiver Bandwidth: 0.5 Mc  
 Direct Peak Detector Function

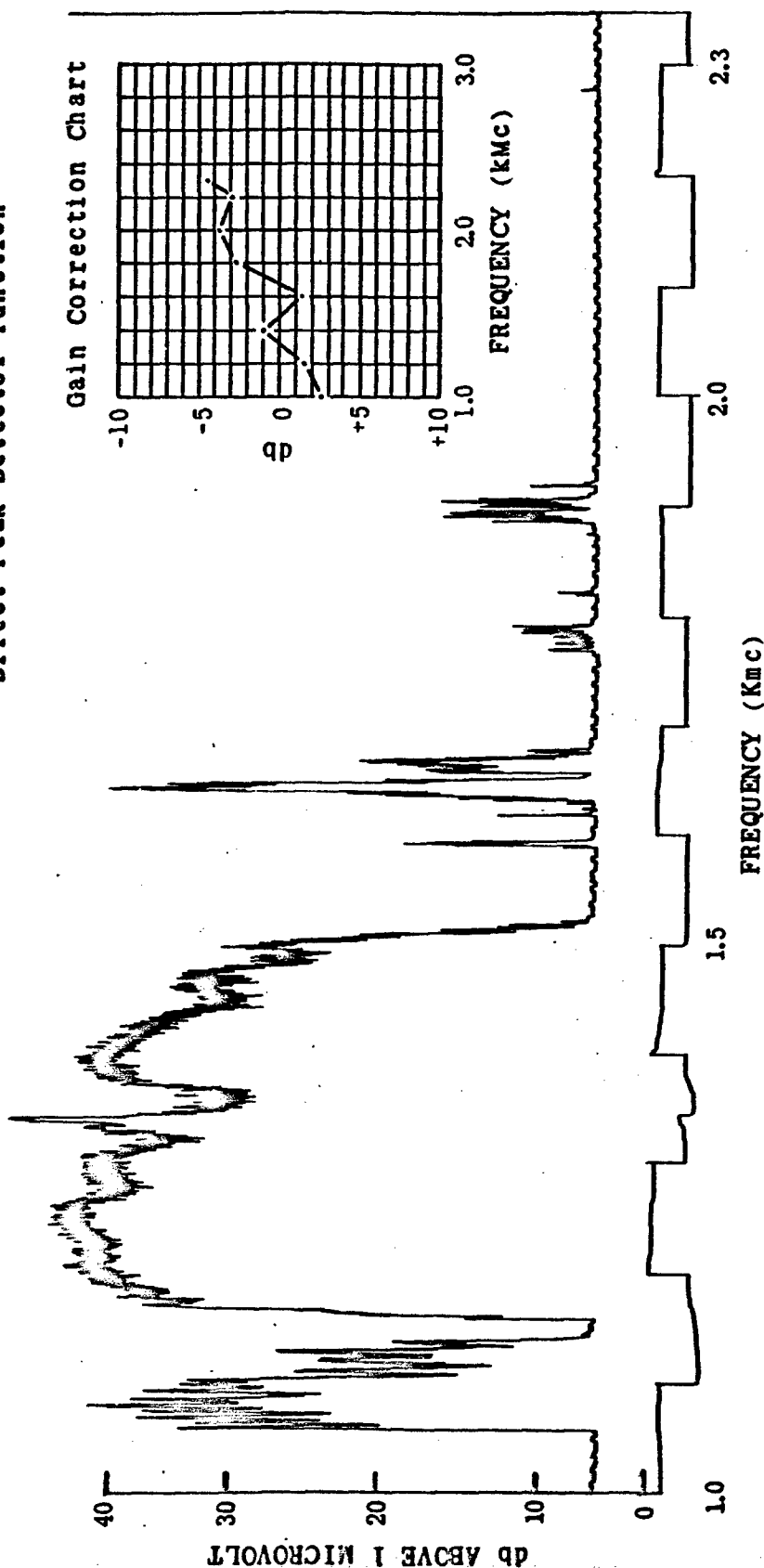


Figure 5.2.3-34. Spurious Emission Scan ( $f_o = 1348$  Mc) - H, 40 db.

Date: 12-15-62 Hour: 1350  
 Radar Tuned Frequency: 1348 Mc  
 Receiver Range: 1.0-2.3 kMc  
 Receiver Attenuator: 20 db  
 Test Antenna and Pol: CA-L, Horizontal  
 Receiver Bandwidth: 0.5 Mc  
 Direct Peak Detector Function

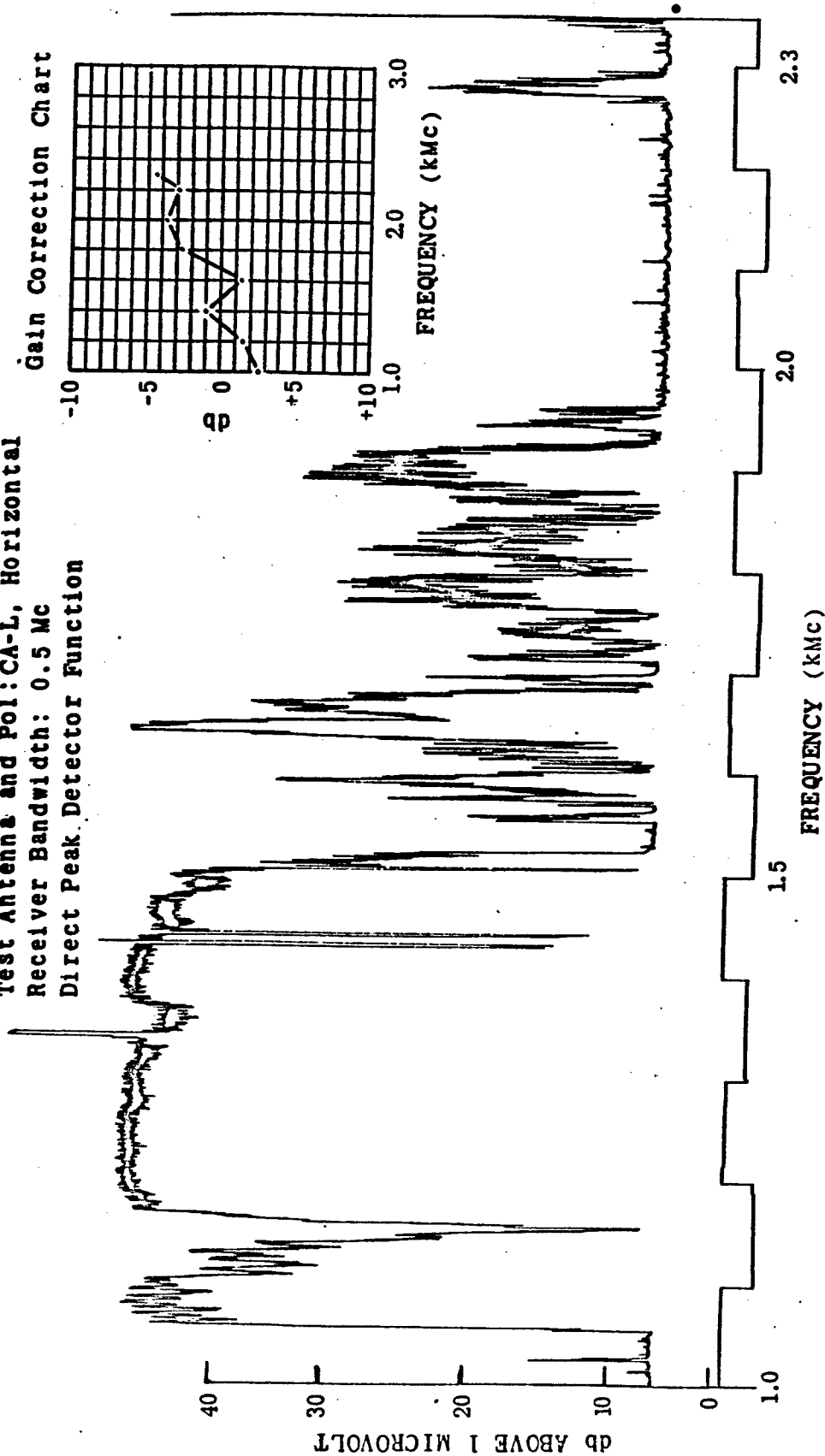
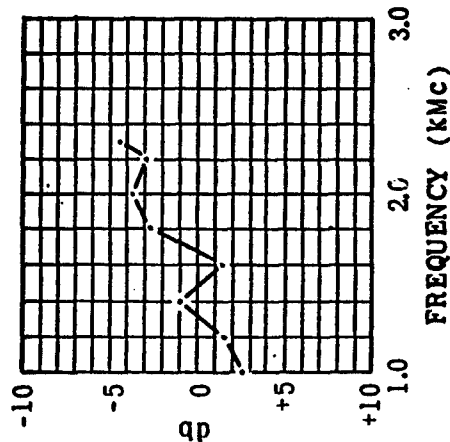


Figure 5.2.3-35. Spurious Emission Scan ( $f_o = 1348$  Mc) - H, 20 db.

# Gain Correction Chart



Date: 12-15-62 Hour: 1615  
 Radar Tuned Frequency: 1348 Mc  
 Receiver Range: 1.0-2.3 kMc  
 Receiver Attenuator: 80 db  
 Test Antenna and Pol: CA-L, Vertical  
 Receiver Bandwidth: 0.5 Mc  
 Direct Peak Detector Function

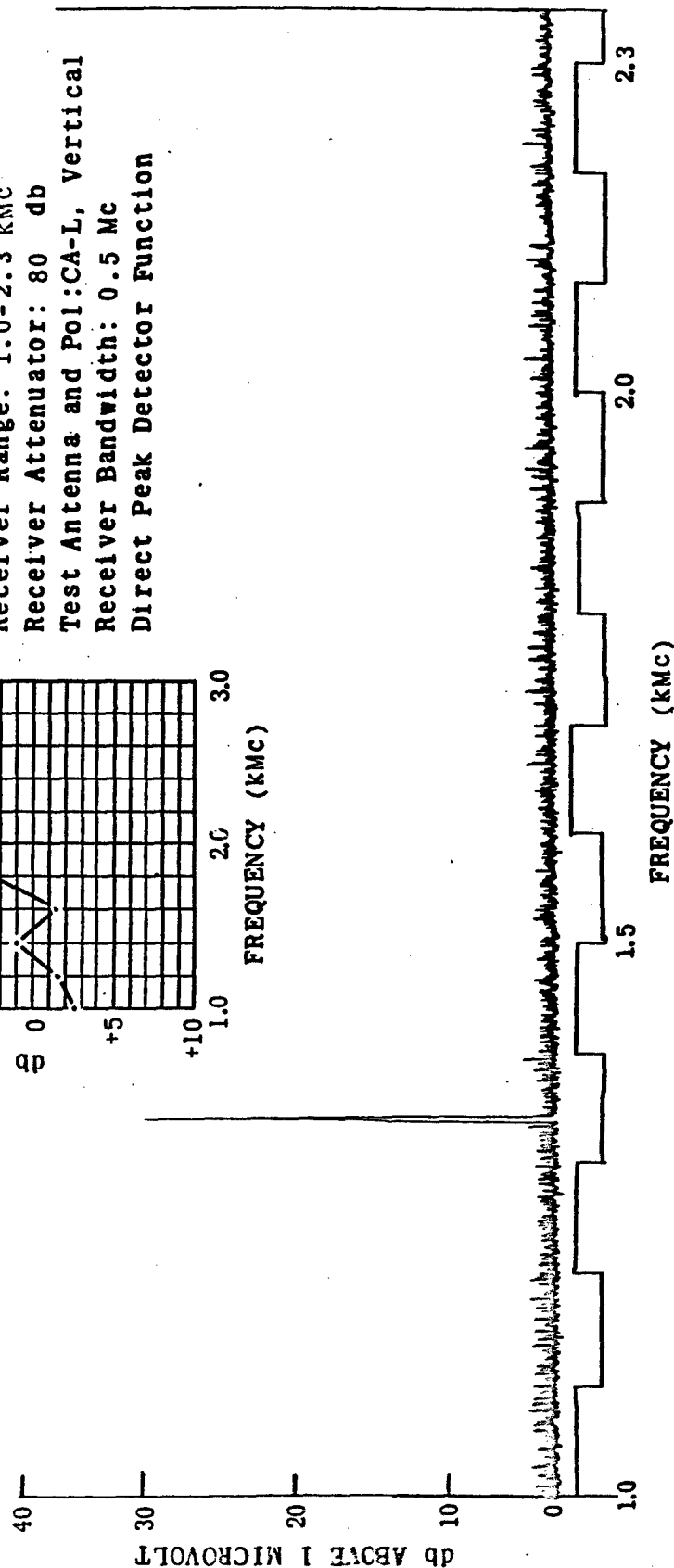
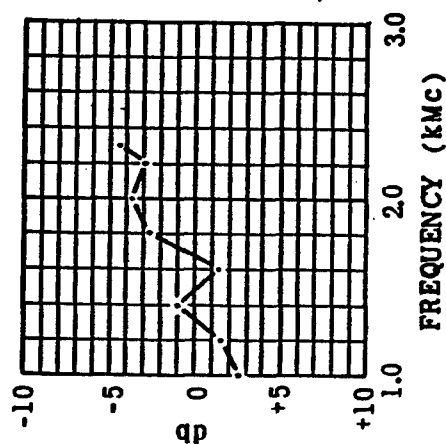


Figure 5.2.3-36. Spurious Emission Scan ( $f_o = 1348$  Mc) - V, 80 db.

Gain Correction Chart



Date: 12-15-62 Hour: 1625  
 Radar Tuned Frequency: 1348 Mc  
 Receiver Range: 1.0 - 2.3 kMc  
 Receiver Attenuator: 60 db  
 Test Antenna and Pol: CA-L, Vertical  
 Receiver Bandwidth: 0.5 Mc  
 Direct Peak Detector Function

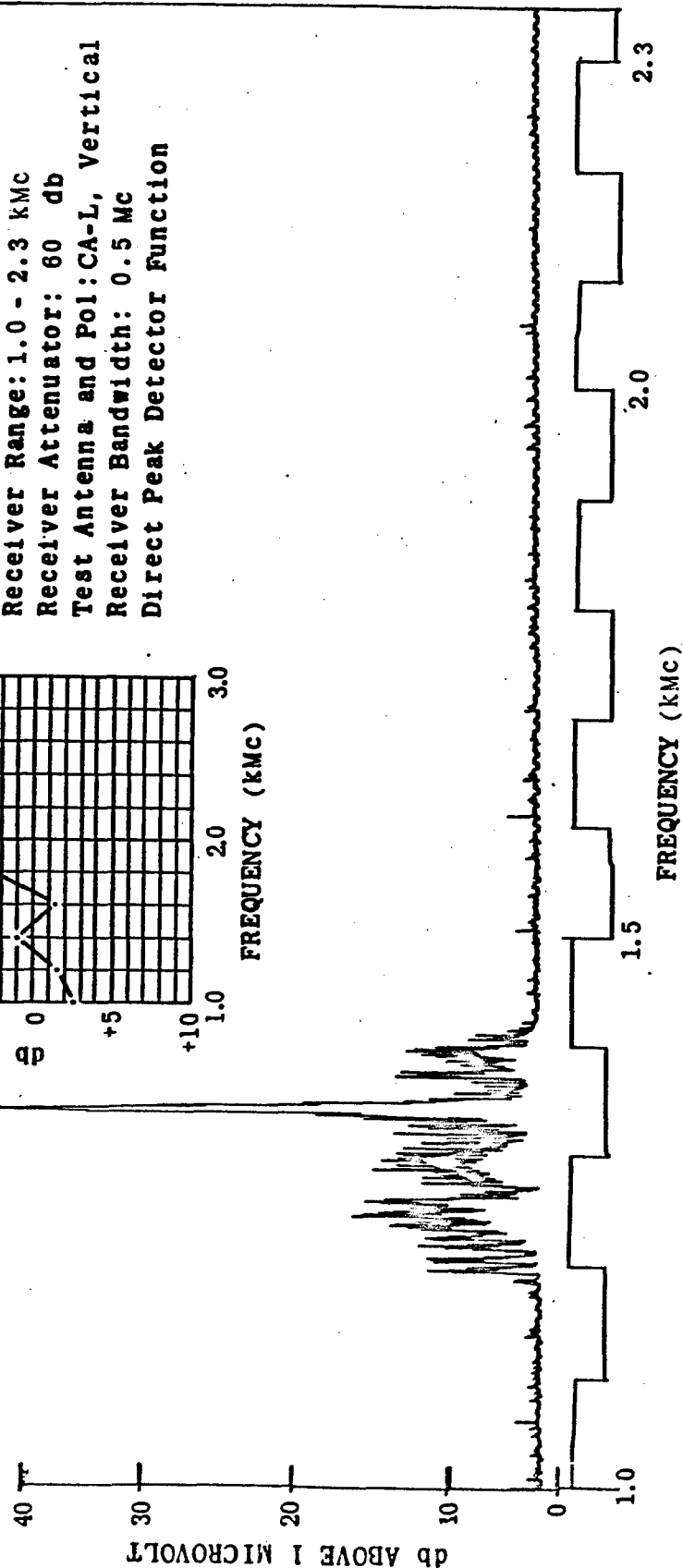
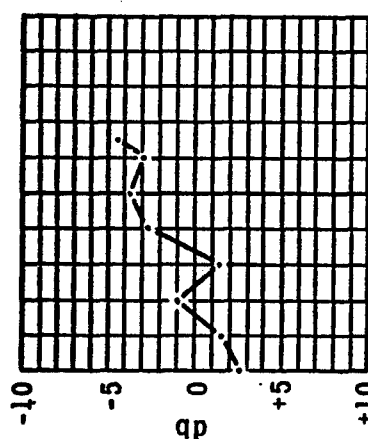


Figure 5.2.3-37. Spurious Emission Scan ( $f_o = 1348$  Mc) - V, 60 db.

# Gain Correction Chart



Date: 12-15-62 Hour: 1640  
 Radar Tuned Frequency: 1348 Mc  
 Receiver Range: 1.0 - 2.3 kMc  
 Receiver Attenuator: 40 db  
 Test Antenna and Pol: CA-L, Vertical  
 Receiver Bandwidth: 0.5 Mc  
 Direct Peak Detector Function

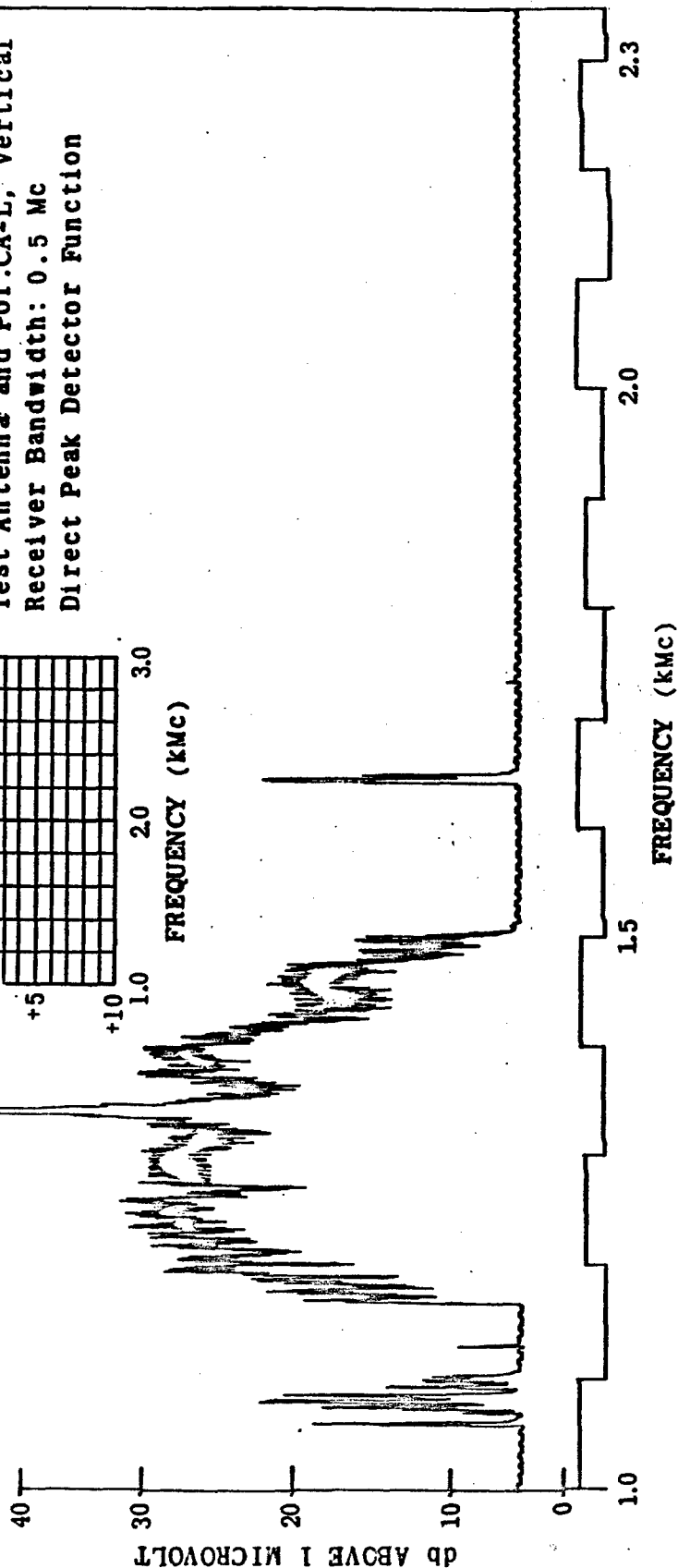


Figure 5.2.3-38. Spurious Emission Scan ( $f_o = 1348$  Mc) - V, 40 db.

Date: 12-15-62 Hour: 1650  
 Radar Tuned Frequency: 1348 Mc  
 Receiver Range: 1.0-2.3 kMc  
 Receiver Attenuator: 20 db  
 Test Antenna and Pol: CA-L, Vertical  
 Receiver Bandwidth: 0.5 Mc  
 Direct Peak Detector Function

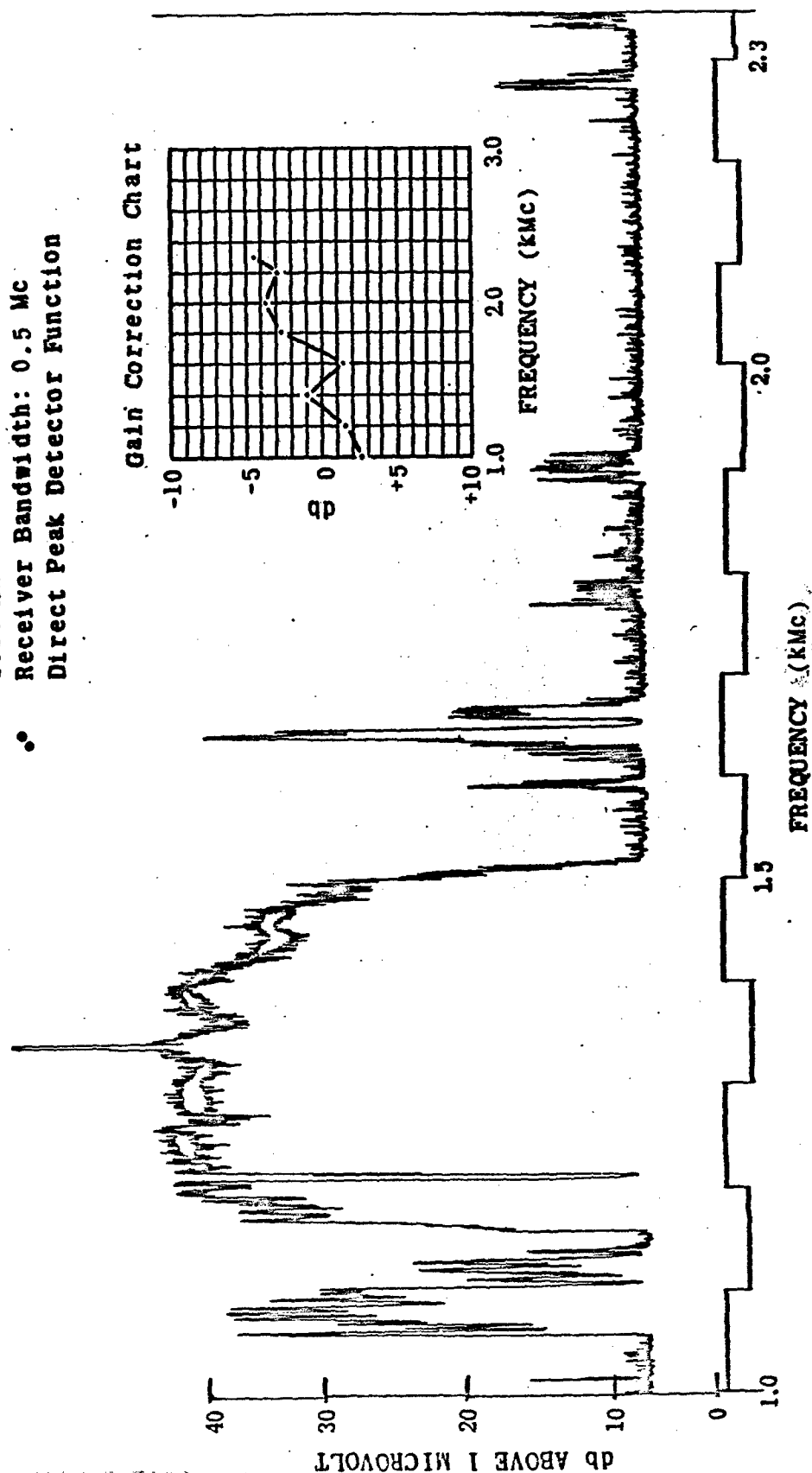
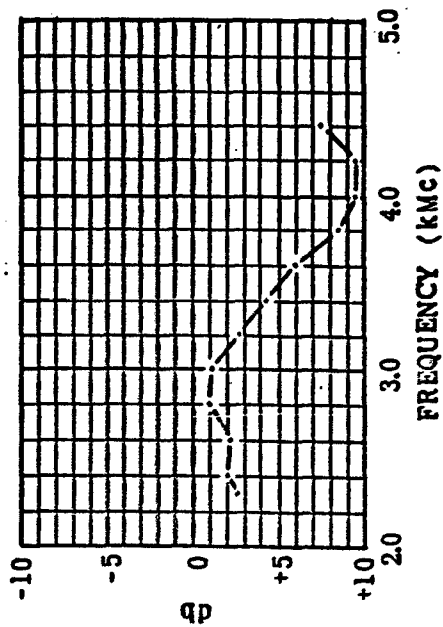


Figure 5.2.3-39. Spurious Emission Scan ( $f_o = 1348$  Mc) - V, 20 db.

# Gain Correction Chart



Date: 12-15-62 Hour: 1800  
 Radar Tuned Frequency: 1348 Mc  
 Receiver Range: 2.3-4.4 KMc  
 Receiver Attenuator: 40 db  
 Test Antenna and Pol: CA-S, Horizontal  
 Receiver Bandwidth: 0.5 Mc  
 Direct Peak Detector Function

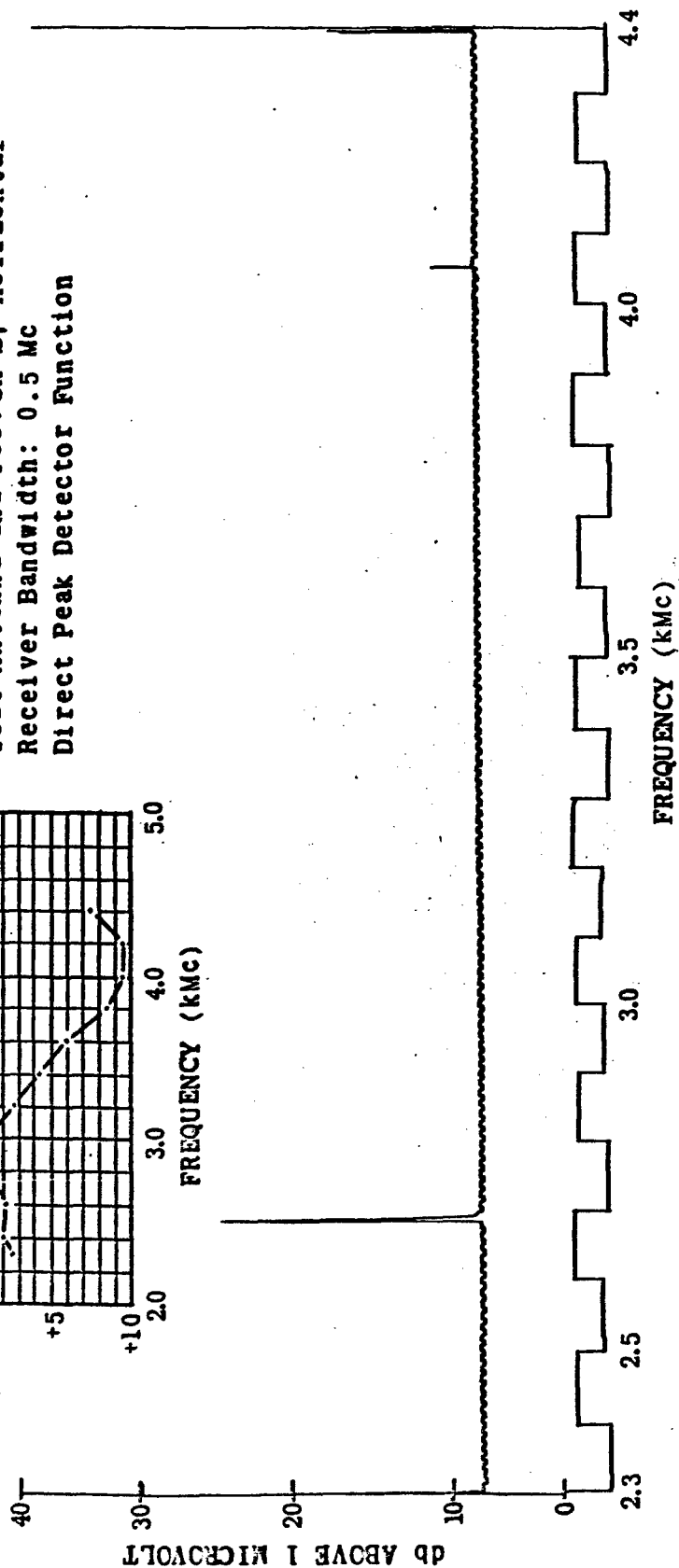
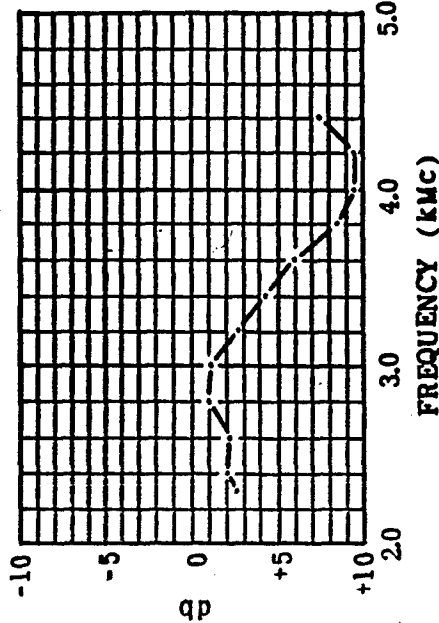


Figure 5.2.3-40. Spurious Emission Scan ( $f_o = 1348$  Mc) - H, 40 db.

# Gain Correction Chart



Date: 12-15-62 Hour: 1810  
 Radar Tuned Frequency: 1348 Mc  
 Receiver Range: 2.3-4.4 kMc  
 Receiver Attenuator: 20 db  
 Test Antenna and Pol: CA-S, Horizontal  
 Receiver Bandwidth: 0.5 Mc  
 Direct Peak Detector Function

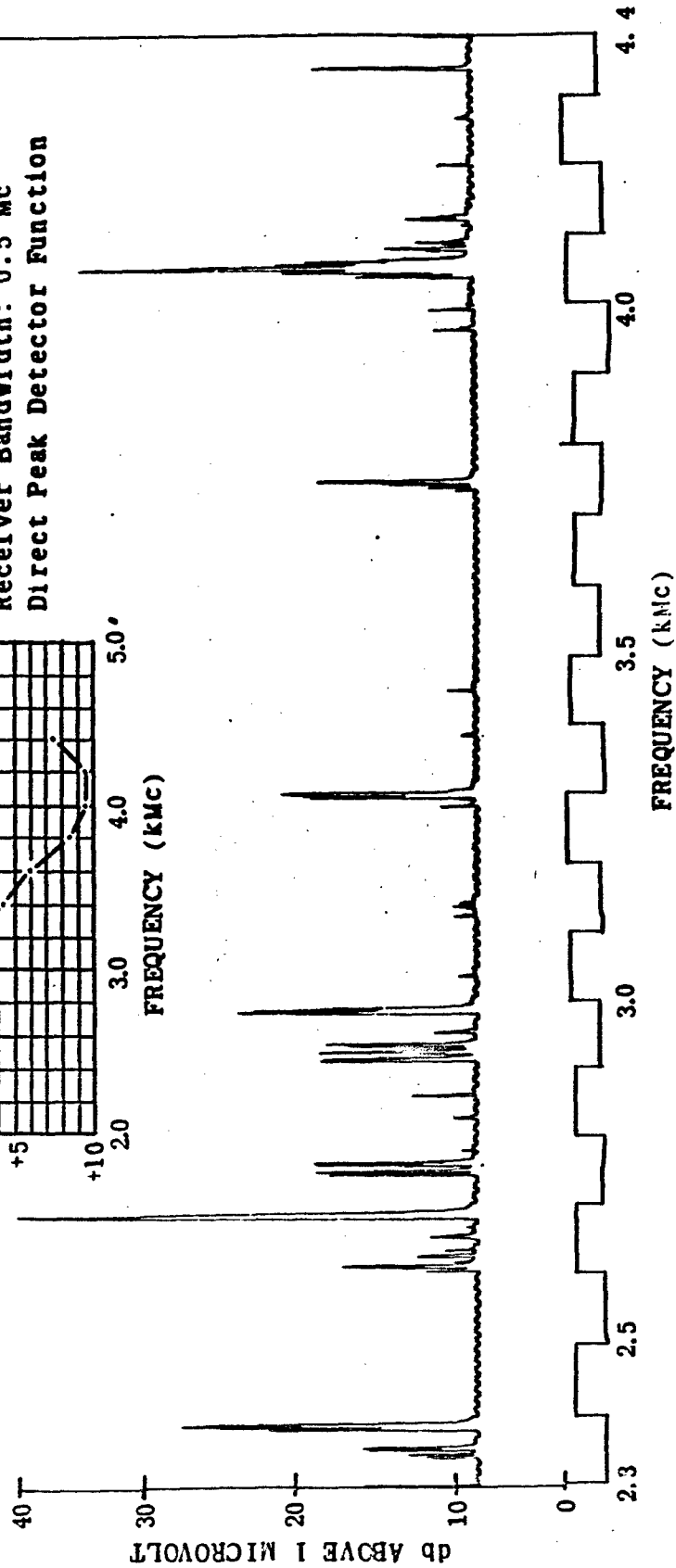
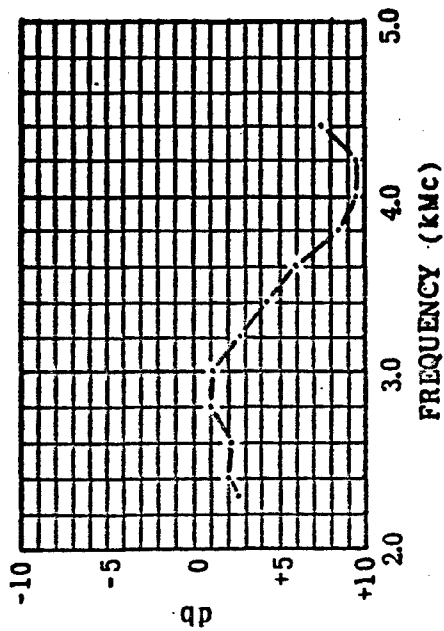


Figure 5.2.3-41. Spurious Emission Scan ( $f_o = 1348$  Mc) - H, 20 db.

# Gain Correction Chart



Date: 12-15-62 Hour: 1910  
 Radar Tuned Frequency: 1348 Mc  
 Receiver Range: 2.3 - 4.4 KMc  
 Receiver Attenuator: 40 db  
 Test Antenna and Pol: CA-S, Vertical  
 Receiver Bandwidth: 0.5 Mc  
 Direct Peak Detector Function

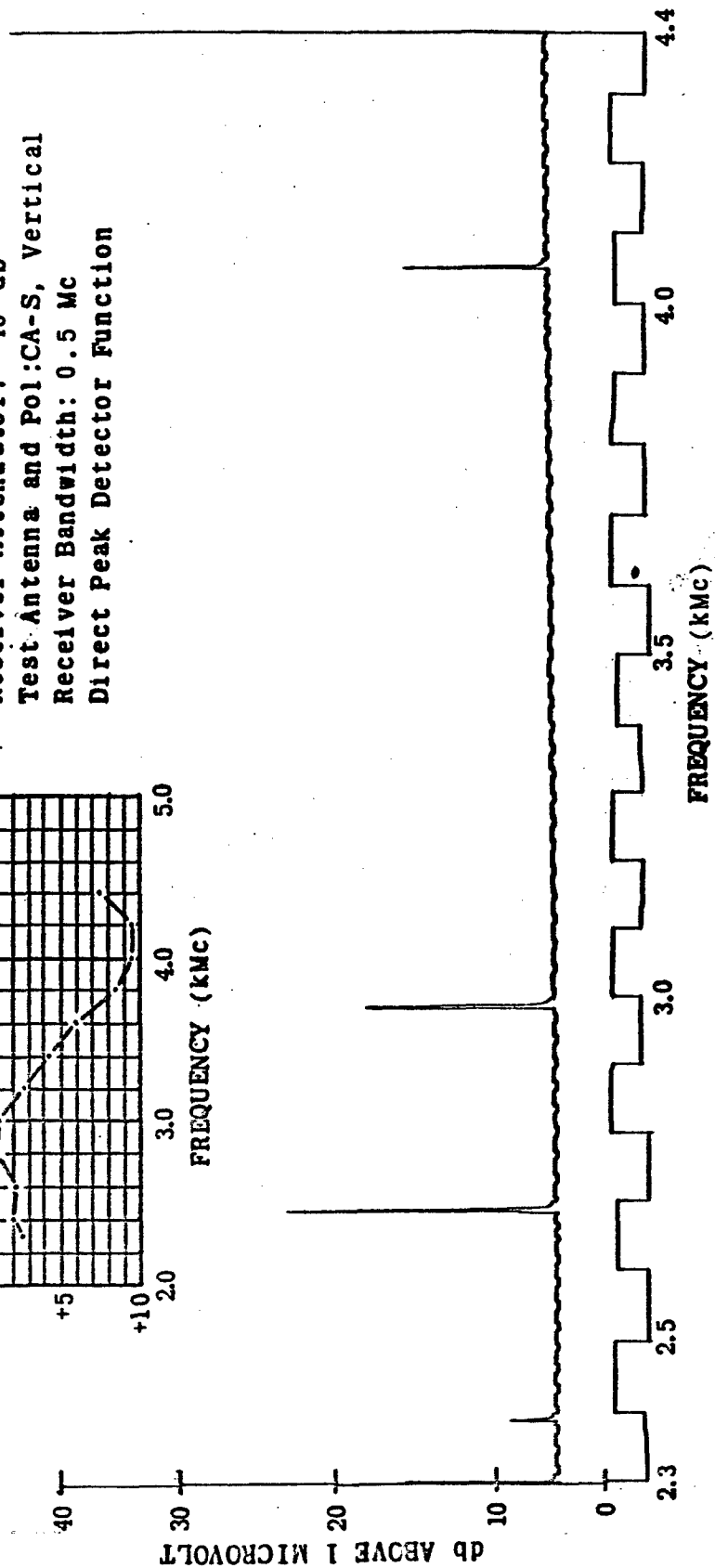


Figure 5.2.3-42. Spurious Emission Scan ( $f_0 = 1348$  Mc) - V, 40 db.

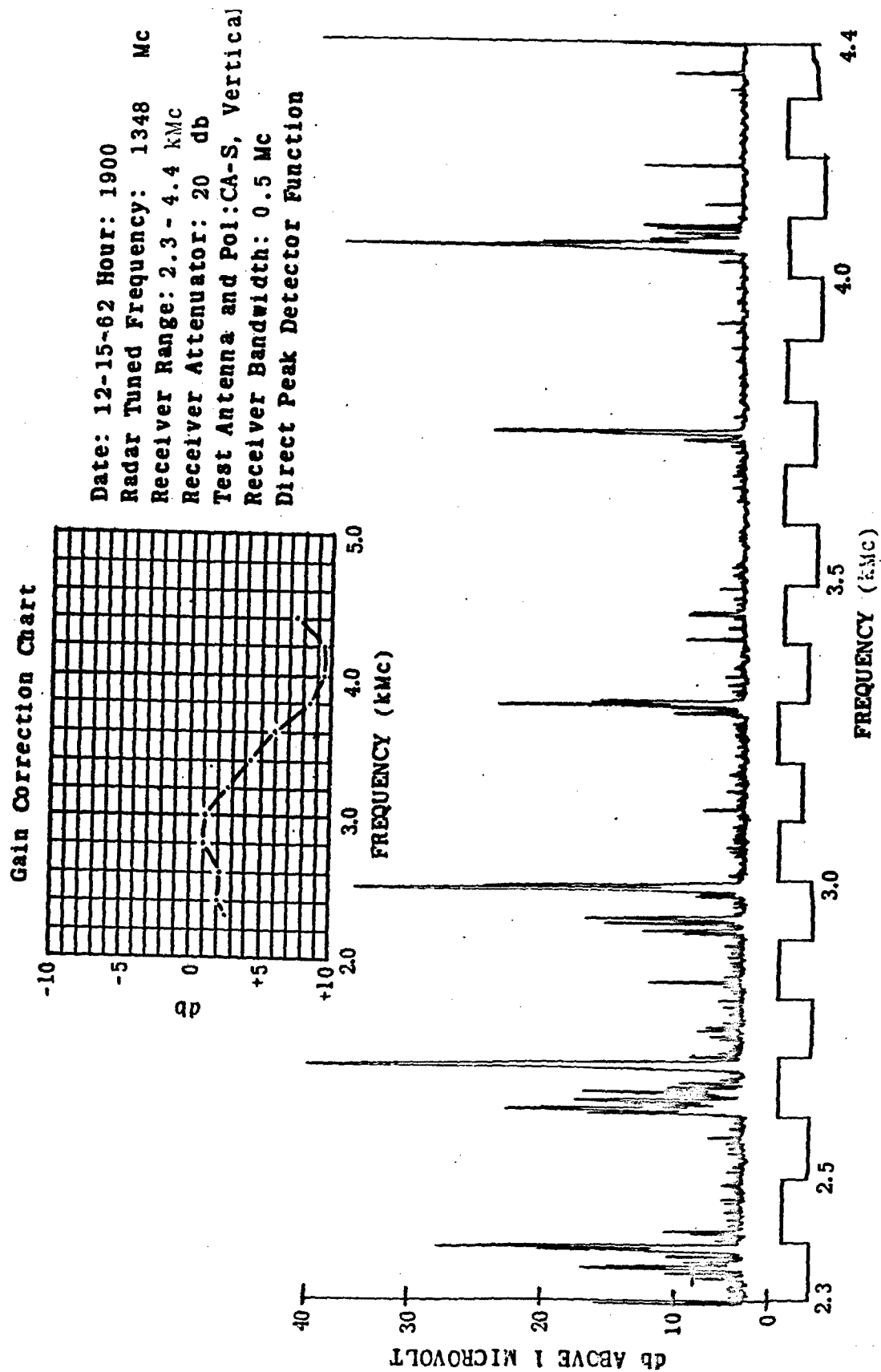


Figure 5.2.3-43. Spurious Emission Scan ( $f_o = 1348$  Mc) - V, 20 db.

# TRANSMITTER MEASUREMENTS

## SPURIOUS EMISSION (OPEN-FIELD)

Xmtr.: ARSR-1B-A Site Code: 5110.11 Date: 12/11/62  
 Xmtr. Serial No.: 54 Radio Set: \_\_\_\_\_  
 Tuning Band (Mc): 1240-1350 Xmtr. Tuned Freq.  $f_o$  (Mc): 1257.8  
 Modulation: Pulse PW( $\mu$ s): 1.8 PRF(pps): 360  
 Significant Control Positions: Radar Antenna Linear Polarization  
(Horizontal) Transmitter B  
 Test Antenna Position:  $\theta$  0  $\phi$  0  $\omega$  0  
 Measuring Devices: Weinschel Attenuators Type 210, HP-540B,  
Lavoie LA-70A, Stoddart NM-62A, FXR & RLC Filters, Mosley  
X-Y Recorder, HP-614A  
 Test Antenna & Polarization: CA-L, \* Horizontal  
 Cable Type & Length: 100' RG-260/U, 6' RG-8/U Net

| Spurious Frequency |    |            | Origin | Time of Day | Cable Loss (db) | Test Ant. Gain (db) | Atten. Inserted (db) | Sig. Gen. (dbm) | Power Density (dbm/m <sup>2</sup> ) |      |
|--------------------|----|------------|--------|-------------|-----------------|---------------------|----------------------|-----------------|-------------------------------------|------|
| Dial Reading       | x  | Freq. (Mc) |        |             |                 |                     |                      |                 | Peak                                | Avg. |
| * 52.42449         | 24 | 1258.2     | $f_o$  | 1633        | 5.1             | 10.1                | 40.1                 | -17.2           | 41.3                                |      |
| * 54.45610         | 24 | 1306.9     |        | 1638        | 5.2             | 10.3                | 20.0                 | -12.0           | 26.6                                |      |
| * 48.54108         | 28 | 1357.1     |        | 1644        | 5.4             | 10.5                | 20.0                 | -19.5           | 19.4                                |      |
| * 49.89091         | 28 | 1396.9     |        | 1652        | 5.5             | 10.8                | 20.0                 | -25.1           | 13.9                                |      |
| * 54.25270         | 20 | 1085.1     |        | 1658        | 4.4             | 8.8                 | 20.0                 | -38.9           | -1.3                                |      |
| * 50.64040         | 28 | 1417.9     |        | 1704        | 5.5             | 10.9                | 20.0                 | -25.0           | 14.0                                |      |
| * 52.02040         | 28 | 1456.6     |        | 1709        | 5.6             | 11.0                | 20.0                 | -29.9           | 9.3                                 |      |
| * 52.88422         | 28 | 1480.8     |        | 1713        | 5.7             | 11.1                |                      | -24.7           | -5.3                                |      |
| * 52.16730         | 32 | 1669.4     |        | 1722        | 6.0             | 12.1                |                      | -45.0           | -25.3                               |      |
| * 49.73076         | 36 | 1790.3     |        | 1726        | 6.1             | 12.6                |                      | -57.9           | -37.9                               |      |
| * 52.74052         | 36 | 1898.7     |        | 1732        | 6.2             | 13.1                |                      | -53.6           | -33.6                               |      |
|                    |    |            |        |             |                 |                     |                      |                 |                                     |      |
|                    |    |            |        |             |                 |                     |                      |                 |                                     |      |
|                    |    |            |        |             |                 |                     |                      |                 |                                     |      |
|                    |    |            |        |             |                 |                     |                      |                 |                                     |      |

### Measurement Instructions

For each standard test frequency determine received power density for each spurious output. In "origin" column, indicate suspected spurious frequency source. Record azimuth ( $\theta$ ) and elevation ( $\phi$ ) angle between radar antenna boresight axis and test antenna axis for position of maximum received signal. Record angle ( $\omega$ ) between radar and test antenna polarization planes for position of maximum signal. Use reverse side for block diagram and remarks.

# TRANSMITTER MEASUREMENTS

## SPURIOUS EMISSION (OPEN-FIELD)

Xmtr.: ARSR-1B-A Site Code: 5110.11 Date: 12/13/62  
 Xmtr. Serial No.: 54 Radio Set: \_\_\_\_\_  
 Tuning Band (Mc): 1240-1350 Xmtr. Tuned Freq.  $f_o$ (Mc): 1257.8  
 Modulation: Pulse PW( $\mu$ s): 1.8 PRF(pps): 360  
 Significant Control Positions: Radar Antenna Linear Polarization  
(Horizontal) Transmitter B  
 Test Antenna Position:  $\theta$  0  $\phi$  0  $\omega$  0  
 Measuring Devices: Weinschel Attenuators Type 210, HP-540B,  
Lavoie LA-70A, Stoddart NM-62A, FXR & RLC Filters,  
Mosley X-Y Recorder, HP-614A  
 Test Antenna & Polarization: CA-L, Horizontal  
 Cable Type & Length: 100' RG-260/U, 6' RG-8/U Net

| Spurious Frequency |    |            | Origin | Time of Day | Cable Loss (db) | Test Ant. Gain (db) | Atten. Inserted (db) | Sig. Gen. (dbm) | Power Density (dbm/m <sup>2</sup> ) |      |
|--------------------|----|------------|--------|-------------|-----------------|---------------------|----------------------|-----------------|-------------------------------------|------|
| Dial Reading       | x  | Freq. (Mc) |        |             |                 |                     |                      |                 | Peak                                | Avg. |
| 52.44425           | 24 | 1258.7     |        | 2240        | 5.1             | 10.1                | 40.1                 | -16.1           | 42.4                                |      |
| 48.96004           | 28 | 1370.9     |        | 2246        | 5.4             | 10.6                | 20.0                 | -31.0           | 7.9                                 |      |
| 49.90202           | 28 | 1397.2     |        | 2248        | 5.5             | 10.8                | 20.0                 | -26.0           | 13.0                                |      |
| 54.27526           | 20 | 1085.5     |        | 2250        | 4.4             | 8.8                 | 20.0                 | -39.6           | -2.0                                |      |
| 50.67470           | 28 | 1418.9     |        | 2252        | 5.5             | 10.9                | 20.0                 | -25.6           | 13.4                                |      |
| 52.86148           | 28 | 1479.9     |        | 2254        | 5.7             | 11.1                |                      | -30.9           | -11.5                               |      |
| 52.17325           | 32 | 1669.5     |        | 2255        | 6.0             | 12.1                |                      | -45.9           | -26.2                               |      |
| 49.77108           | 36 | 1791.8     |        | 2257        | 6.1             | 12.6                |                      | -57.2           | -37.2                               |      |
| 52.72134           | 36 | 1898.0     |        | 2258        | 6.2             | 13.1                |                      | -54.8           | -34.8                               |      |
|                    |    |            |        |             |                 |                     |                      |                 |                                     |      |
|                    |    |            |        |             |                 |                     |                      |                 |                                     |      |
|                    |    |            |        |             |                 |                     |                      |                 |                                     |      |
|                    |    |            |        |             |                 |                     |                      |                 |                                     |      |
|                    |    |            |        |             |                 |                     |                      |                 |                                     |      |
|                    |    |            |        |             |                 |                     |                      |                 |                                     |      |

### Measurement Instructions

For each standard test frequency determine received power density for each spurious output. In "origin" column, indicate suspected spurious frequency source. Record azimuth ( $\theta$ ) and elevation ( $\phi$ ) angle between radar antenna boresight axis and test antenna axis for position of maximum received signal. Record angle ( $\omega$ ) between radar and test antenna polarization planes for position of maximum signal. Use reverse side for block diagram and remarks.

# **TRANSMITTER MEASUREMENTS**

## **SPURIOUS EMISSION (OPEN-FIELD)**

Xmtr.: ARSR-1B-A Site Code: 5110.11 Date: 12/14/62  
 Xmtr. Serial No.: 54 Radio Set: \_\_\_\_\_  
 Tuning Band (Mc): 1240-1350 Xmtr. Tuned Freq.  $f_0$ (Mc): 1257.8  
 Modulation: Pulse PW( $\mu$ s): 1.8 PRF(pps): 360  
 Significant Control Positions: Radar Antenna Linear Polarization  
(Horizontal) Transmitter B  
 Test Antenna Position:  $\theta$  0  $\phi$  0  $\omega$  0  
 Measuring Devices: Weinschel Attenuators Type 210, HP-540B  
Lavoie LA-70A, Stoddart NM-62A, FXR & RLC Filters  
Mosley X-Y Recorder, HP-614A  
 Test Antenna & Polarization: CA-L, Vertical  
 Cable Type & Length: 100' RG-260/U, 6' RG-8/U Net

| Spurious Frequency |    |            | Origin | Time of Day | Cable Loss (db) | Test Ant. Gain (db) | Atten. Inserted (db) | Sig. Gen. (dbm) | Power Density (dbm/m <sup>2</sup> ) |      |
|--------------------|----|------------|--------|-------------|-----------------|---------------------|----------------------|-----------------|-------------------------------------|------|
| Dial Reading       | x  | Freq. (Mc) |        |             |                 |                     |                      |                 | Peak                                | Avg. |
| 52.41622           | 24 | 1258.0     | $f_0$  | 1657        | 5.1             | 10.0                |                      | 0.9             | 17.6                                |      |
| 52.45180           | 20 | 1049.0     |        | 1701        | 4.2             | 8.5                 |                      | -41.2           | -23.7                               |      |
| 54.02288           | 20 | 1080.5     |        | 1705        | 4.4             | 8.8                 |                      | -49.0           | -31.4                               |      |
| 50.11682           | 24 | 1202.8     |        | 1710        | 4.9             | 9.7                 |                      | -38.5           | -20.4                               |      |
| 50.66486           | 28 | 1418.6     |        | 1712        | 5.5             | 10.9                |                      | -27.2           | -8.2                                |      |
| 52.18434           | 32 | 1669.9     |        | 1715        | 6.0             | 12.1                |                      | -87.1           | -52.8                               |      |
| 53.02601           | 36 | 1908.3     |        | 1720        | 6.3             | 13.2                |                      | -72.9           | -52.8                               |      |
| 53.25952           | 44 | 2343.4     |        | 1722        | 7.2             | 15.3                |                      | -63.9           | -48.2                               |      |
| 49.92897           | 32 | 1597.7     |        | 1727        | 5.9             | 11.7                |                      | -64.1           | -44.5                               |      |
| 49.81392           | 36 | 1793.3     |        | 1730        | 6.1             | 12.6                |                      | -75.6           | -55.6                               |      |
| 52.06268           | 44 | 2290.8     |        | 1733        | 7.1             | 15.0                |                      | -70.2           | -49.5                               |      |
|                    |    |            |        |             |                 |                     |                      |                 |                                     |      |
|                    |    |            |        |             |                 |                     |                      |                 |                                     |      |
|                    |    |            |        |             |                 |                     |                      |                 |                                     |      |
|                    |    |            |        |             |                 |                     |                      |                 |                                     |      |

### **Measurement Instructions**

For each standard test frequency determine received power density for each spurious output. In "origin" column, indicate suspected spurious frequency source. Record azimuth ( $\theta$ ) and elevation ( $\phi$ ) angle between radar antenna boresight axis and test antenna axis for position of maximum received signal. Record angle ( $\omega$ ) between radar and test antenna polarization planes for position of maximum signal. Use reverse side for block diagram and remarks.

TRANSMITTER MEASUREMENTSSPURIOUS EMISSION  
(OPEN-FIELD)

Xmtr.: ARSR-1B-A Site Code: 5110.11 Date: 12/14/62  
 Xmtr. Serial No.: 54 Radio Set: \_\_\_\_\_  
 Tuning Band (Mc): 1240-1350 Xmtr. Tuned Freq.  $f_o$ (Mc): 1257.8  
 Modulation: Pulse PW( $\mu$ s): 1.8 PRF(pps): 360  
 Significant Control Positions: Radar Antenna Linear Polarization  
(Horizontal) Transmitter B  
 Test Antenna Position:  $\theta$  0  $\phi$  0  $\omega$  0  
 Measuring Devices: Weinschel Attenuators Type 210, HP 540B,  
Lavoie LA-70A, Stoddart NM-62A, FXR & RLC Filters,  
Mosley X-Y Recorder, HP-616B,  
 Test Antenna & Polarization: CA-S, \*Horizontal, Vertical  
 Cable Type & Length: 100' RG-260/U, 6' RG-8/U

| Spurious Frequency |    |            | Origin | Time of Day | Cable Loss (db) | Test Ant. Gain (db) | Atten. Inserted (db) | Sig. Gen. (dbm) | Power Density (dbm/m <sup>2</sup> ) |      |
|--------------------|----|------------|--------|-------------|-----------------|---------------------|----------------------|-----------------|-------------------------------------|------|
| Dial Reading       | x  | Freq. (Mc) |        |             |                 |                     |                      |                 | Peak                                | Avg. |
| * 52.40912         | 48 | 2515.6     | 2fo    | 1830        | 7.5             | 16.8                |                      | -42.1           | -22.0                               |      |
| * 52.40200         | 72 | 3772.9     | 3fo    | 1835        | 10.3            | 19.3                |                      | -46.0           | -22.1                               |      |
|                    |    |            |        |             |                 |                     |                      |                 |                                     |      |
| 52.39968           | 48 | 2515.2     | 2fo    | 1941        | 7.5             | 16.8                |                      | -44.0           | -23.9                               |      |
| 52.40096           | 72 | 3772.9     | 3fo    | 1944        | 10.3            | 19.3                |                      | -51.4           | -27.5                               |      |
|                    |    |            |        |             |                 |                     |                      |                 |                                     |      |
|                    |    |            |        |             |                 |                     |                      |                 |                                     |      |
|                    |    |            |        |             |                 |                     |                      |                 |                                     |      |
|                    |    |            |        |             |                 |                     |                      |                 |                                     |      |
|                    |    |            |        |             |                 |                     |                      |                 |                                     |      |
|                    |    |            |        |             |                 |                     |                      |                 |                                     |      |
|                    |    |            |        |             |                 |                     |                      |                 |                                     |      |
|                    |    |            |        |             |                 |                     |                      |                 |                                     |      |
|                    |    |            |        |             |                 |                     |                      |                 |                                     |      |
|                    |    |            |        |             |                 |                     |                      |                 |                                     |      |

Measurement Instructions

For each standard test frequency determine received power density for each spurious output. In "origin" column, indicate suspected spurious frequency source. Record azimuth ( $\theta$ ) and elevation ( $\phi$ ) angle between radar antenna boresight axis and test antenna axis for position of maximum received signal. Record angle ( $\omega$ ) between radar and test antenna polarization planes for position of maximum signal. Use reverse side for block diagram and remarks.

## TRANSMITTER MEASUREMENTS

**SPURIOUS EMISSION  
(OPEN-FIELD)**

Xmtr.: ARKM-1B-A Site Code: 5110.11 Date: 12/9/62  
Xmtr. Serial No.: 54 Radio Set: \_\_\_\_\_  
Tuning Band (Mc): 1240-1350 Xmtr. Tuned Freq.  $f_0$ (Mc): 1297.8  
Modulation: Pulse PW( $\mu$ s): 1.8 PRF(pps): 360  
Significant Control Positions: Padar Antenna Circular Polarization  
Transmitter B  
Test Antenna Position:  $\theta$  0  $\phi$  0  $\omega$  0  
Measuring Devices: Weinschel Attenuators Type 210, HP-540B  
Lavoie LA-70A, Stoddart NM-62A, F&N & RLC Filters,  
Mosley X-Y Recorder, HP-614A  
Test Antenna & Polarization: CA-L, \* Horizontal  
Cable Type & Length: 100' PG-260/U, 6' PG-8/U Net

[illegible]

## Measurement Instructions

For each standard test frequency determine received power density for each spurious output. In "origin" column, indicate suspected spurious frequency source. Record azimuth ( $\theta$ ) and elevation ( $\phi$ ) angle between radar antenna boresight axis and test antenna axis for position of maximum received signal. Record angle ( $\psi$ ) between radar and test antenna polarization planes for position of maximum signal. Use reverse side for block diagram and remarks.

TRANSMITTER MEASUREMENTSSPURIOUS EMISSION  
(OPEN-FIELD)Xmtr.: ARRN-1B-A Site Code: 5110.11 Date: 12/10/62Xmtr. Serial No.: 54 Radio Set: \_\_\_\_\_Tuning Band (Mc): 1240-1350 Xmtr. Tuned Freq.  $f_o$ (Mc): 1297.8Modulation: Pulse PW( $\mu$ s): 1.8 PRF(pps): 360Significant Control Positions: Padar Antenna, Linear Polarization  
(Horizontal) Transmitter BTest Antenna Position:  $\theta$  0  $\phi$  0  $\omega$  0Measuring Devices: Weinschel Attenuators Type 210, HP-540B,LA-70A, Stoddart NM-62A, Fik & RLC Filters, Mosley X-Y  
Recorder, HP-614ATest Antenna & Polarization: CA-L, \*Horizontal, VerticalCable Type & Length: 100' PG-260/U, 6' PG-8/U Net

| Spurious Frequency |    |            | Origin | Time of Day | Cable Loss (db) | Test Ant. Gain (db) | Atten. Inserted (db) | Sig. Gen. (dbm) | Power Density (dbm/m <sup>2</sup> ) |      |
|--------------------|----|------------|--------|-------------|-----------------|---------------------|----------------------|-----------------|-------------------------------------|------|
| Dial Reading       | x  | Freq. (Mc) |        |             |                 |                     |                      |                 | Peak                                | Avg. |
| * 54.07271         | 24 | 1297.7     | $f_o$  | 1410        | 5.2             | 10.2                | 40.1                 | -18.9           | 39.8                                |      |
| * 45.22718         | 24 | 1085.4     |        | 1420        | 4.4             | 8.8                 |                      | -19.0           | -1.4                                |      |
| * 49.91712         | 24 | 1198.0     |        | 1422        | 4.9             | 9.6                 |                      | -15.5           | 2.8                                 |      |
| * 49.91301         | 24 | 1397.6     |        | 1427        | 5.5             | 10.8                |                      | -15.0           | 4.0                                 |      |
| * 51.45352         | 24 | 1646.5     |        | 1429        | 5.9             | 12.0                |                      | -35.1           | -15.5                               |      |
| * 52.73546         | 24 | 1898.4     |        | 1432        | 6.2             | 13.1                |                      | -51.0           | -31.0                               |      |
| Date: 12/11/62     |    |            |        |             |                 |                     |                      |                 |                                     |      |
| 54.01331           | 20 | 1080.3     |        | 1114        | 4.4             | 8.8                 |                      | -43.2           | -25.6                               |      |
| 50.15607           | 24 | 1203.7     |        | 1116        | 4.9             | 9.7                 |                      | -40.5           | -22.6                               |      |
| 54.07513           | 24 | 1297.8     | $f_o$  | 1124        | 5.2             | 10.2                | 20.0                 | -20.5           | 17.9                                |      |
| 50.12436           | 23 | 1403.5     |        | 1128        | 5.5             | 10.8                |                      | -33.0           | -19.0                               |      |
| 51.45023           | 32 | 1648.4     |        | 1131        | 5.9             | 12.0                |                      | -30.1           | -40.5                               |      |

Measurement Instructions

For each standard test frequency determine received power density for each spurious output. In "origin" column, indicate suspected spurious frequency source. Record azimuth ( $\theta$ ) and elevation ( $\phi$ ) angle between radar antenna boresight axis and test antenna axis for position of maximum received signal. Record angle ( $\omega$ ) between radar and test antenna polarization planes for position of maximum signal. Use reverse side for block diagram and remarks.

TRANSMITTER MEASUREMENTSSPURIOUS EMISSION  
(OPEN-FIELD)

Xmtr.: ARSR-1B-A Site Code: 5110.11 Date: 12/11/62  
 Xmtr. Serial No.: 54 Radio Set: \_\_\_\_\_  
 Tuning Band (Mc): 1240-1350 Xmtr. Tuned Freq.  $f_0$ (Mc): 1297.8  
 Modulation: Pulse PW( $\mu$ s): 1.8 PRF(pps): 360  
 Significant Control Positions: Radar Antenna, Linear Polarization  
(Horizontal) Transmitter B  
 Test Antenna Position:  $\theta$  0  $\phi$  0  $\omega$  0  
 Measuring Devices: Weinschel Attenuators Type 210, HP-540B,  
Lavoie LA-70A, Stoddart NM-62A, FXR & RLC Filters  
Mosley X-Y Recorder, HP-616B  
 Test Antenna & Polarization: CA-S \*Horizontal, Vertical  
 Cable Type & Length: 100' RG-260/U, 6' RG-8/U Net

| Spurious Frequency |    |            | Origin  | Time of Day | Cable Loss (db) | Test Ant. Gain (db) | Atten. Inserted (db) | Sig. Gen. (dbm) | Power Density (dbm/m <sup>2</sup> ) |      |
|--------------------|----|------------|---------|-------------|-----------------|---------------------|----------------------|-----------------|-------------------------------------|------|
| Dial Reading       | x  | Freq. (Mc) |         |             |                 |                     |                      |                 | Peak                                | Avg. |
| * 53.69808         | 44 | 2362.7     |         | 1243        | 7.2             | 16.5                |                      | -59.2           | -39.7                               |      |
| * 54.05417         | 48 | 2594.6     | 2 $f_0$ | 1250        | 7.6             | 17.0                |                      | -55.0           | -34.7                               |      |
| * 50.41500         | 56 | 2823.2     |         | 1303        | 7.9             | 17.5                |                      | -66.8           | -46.0                               |      |
| * 52.58532         | 56 | 2944.8     |         | 1317        | 8.1             | 17.7                |                      | -40.6           | -19.4                               |      |
| * 49.97740         | 68 | 3398.5     |         | 1325        | 9.3             | 18.6                |                      | -69.0           | -46.3                               |      |
| * 54.05700         | 72 | 3892.1     | 3 $f_0$ | 1336        | 10.5            | 19.6                |                      | -56.8           | -32.7                               |      |
| * 50.05474         | 80 | 4004.4     |         | 1340        | 10.8            | 19.8                |                      | -53.0           | -23.6                               |      |
| 53.68164           | 44 | 2362.0     |         | 1427        | 7.2             | 16.5                |                      | -55.5           | -36.0                               |      |
| 54.08072           | 48 | 2595.9     | 2 $f_0$ | 1430        | 7.6             | 17.0                |                      | -58.0           | -37.7                               |      |
| 52.58189           | 56 | 2944.6     |         | 1436        | 8.1             | 17.7                |                      | -42.9           | -21.7                               |      |
| 54.06338           | 72 | 3892.6     | 3 $f_0$ | 1438        | 10.5            | 19.6                |                      | -43.5           | -19.4                               |      |
| 50.05144           | 80 | 4004.1     |         | 1440        | 10.8            | 19.8                |                      | -52.1           | -27.7                               |      |
| 51.55828           | 80 | 4124.7     |         |             | 11.0            | 20.1                |                      | -48.9           | -24.3                               |      |

Measurement Instructions

For each standard test frequency determine received power density for each spurious output. In "origin" column, indicate suspected spurious frequency source. Record azimuth ( $\theta$ ) and elevation ( $\phi$ ) angle between radar antenna boresight axis and test antenna axis for position of maximum received signal. Record angle ( $\omega$ ) between radar and test antenna polarization planes for position of maximum signal. Use reverse side for block diagram and remarks.

TRANSMITTER MEASUREMENTSSPURIOUS EMISSION  
(OPEN-FIELD)

Xmtr.: ARSR-1B-A Site Code: 5110.11 Date: 12/15/62  
 Xmtr. Serial No.: 54 Radio Set: \_\_\_\_\_  
 Tuning Band (Mc): 1240-1350 Xmtr. Tuned Freq.  $f_0$ (Mc): 1348  
 Modulation: Pulse PW( $\mu$ s): 1.8 PRF(pps): 360  
 Significant Control Positions: Radar Antenna Linear Polarization  
(Horizontal) Transmitter B  
 Test Antenna Position:  $\theta$  0  $\phi$  0  $\omega$  0  
 Measuring Devices: Weinschel Attenuators Type 210, HP-540B  
Lavoie LA-70A, Stoddart NM-62A, FXR & RLC Filters,  
Mosley X-Y Recorder, HP-614A  
 Test Antenna & Polarization: CA-L, \*Horizontal, Vertical  
 Cable Type & Length: 100' RG-260/U, 6' RG-8/U Net

| Spurious Frequency |    |            | Origin | Time of Day | Cable Loss (db) | Test Ant. Gain (db) | Atten. Inserted (db) | Sig. Gen. (dbm) | Power Density (dbm/m <sup>2</sup> ) |      |
|--------------------|----|------------|--------|-------------|-----------------|---------------------|----------------------|-----------------|-------------------------------------|------|
| Dial Reading       | x  | Freq. (Mc) |        |             |                 |                     |                      |                 | Peak                                | Avg. |
| * 48.15077         | 28 | 1348.2     | fo     | 1414        | 5.3             | 10.5                | 40.1                 | -20.5           | 38.4                                |      |
| * 54.27158         | 20 | 1085.4     |        | 1417        | 4.4             | 8.8                 |                      | -23.2           | -5.6                                |      |
| * 52.77026         | 24 | 1266.5     |        | 1424        | 5.1             | 10.1                |                      | -10.9           | 7.5                                 |      |
| * 50.07856         | 28 | 1402.2     |        | 1429        | 5.5             | 10.8                |                      | -20.0           | -1.0                                |      |
| * 51.39182         | 32 | 1644.5     |        | 1433        | 5.9             | 11.9                |                      | -23.9           | -4.2                                |      |
| * 52.65214         | 36 | 1895.5     |        | 1435        | 6.2             | 13.1                |                      | -56.2           | -36.2                               |      |
| 48.14094           | 28 | 1357.9     | fo     | 1706        | 5.3             | 10.5                | 10                   | -11.0           | 17.8                                |      |
| 54.25268           | 20 | 1085.1     |        | 1708        | 4.4             | 8.8                 |                      | -15.9           | 1.7                                 |      |
| 52.74250           | 24 | 1265.8     |        | 1710        | 5.1             | 10.1                |                      | -38.4           | -20.0                               |      |
| 50.04970           | 28 | 1401.4     |        | 1711        | 5.5             | 10.8                |                      | -40.2           | -21.2                               |      |
| 51.38481           | 32 | 1644.3     |        | 1713        | 5.9             | 11.9                |                      | -44.5           | -24.8                               |      |
| 53.06550           | 36 | 1910.4     |        | 1716        | 6.2             | 13.1                |                      | -78.2           | -58.1                               |      |
|                    |    |            |        |             |                 |                     |                      |                 |                                     |      |
|                    |    |            |        |             |                 |                     |                      |                 |                                     |      |

Measurement Instructions

For each standard test frequency determine received power density for each spurious output. In "origin" column, indicate suspected spurious frequency source. Record azimuth ( $\theta$ ) and elevation ( $\phi$ ) angle between radar antenna boresight axis and test antenna axis for position of maximum received signal. Record angle ( $\omega$ ) between radar and test antenna polarization planes for position of maximum signal. Use reverse side for block diagram and remarks.

TRANSMITTER MEASUREMENTSSPURIOUS EMISSION  
(OPEN-FIELD)Xmtr.: ARSR-1B-A Site Code: 5110.11 Date: 12/15/62Xmtr. Serial No.: 54 Radio Set: \_\_\_\_\_Tuning Band (Mc): 1240-1350 Xmtr. Tuned Freq.  $f_o$ (Mc): 1348Modulation: Pulse PW( $\mu$ s): 1.8 PRF(pps): 360Significant Control Positions: Radar Antenna Linear Polarization  
(Horizontal) Transmitter BTest Antenna Position:  $\theta$  0  $\phi$  0  $\omega$  0Measuring Devices: Weinschel Attenuators Type 210, HP-540B,  
Lavoie LA-70A, Stoddart NM-62A, FXR & RLC FiltersMosley X-Y Recorder, HP-616BTest Antenna & Polarization: CA-S, \*Horizontal, VerticalCable Type & Length: 100' RG-260/U, 6' RG-8/U Net

| Spurious Frequency |    |            | Origin | Time of Day | Cable Loss (db) | Test Ant. Gain (db) | Atten. Inserted (db) | Sig. Gen. (dbm) | Power Density (dbm/m <sup>2</sup> ) |      |
|--------------------|----|------------|--------|-------------|-----------------|---------------------|----------------------|-----------------|-------------------------------------|------|
| Dial Reading       | x  | Freq. (Mc) |        |             |                 |                     |                      |                 | Peak                                | Avg. |
| * 48.10954         | 56 | 2694.1     | 2fo    | 1816        | 7.8             | 17.2                |                      | -43.0           | -22.4                               |      |
| * 48.12750         | 84 | 4042.7     | 3fo    | 1822        | 10.9            | 19.9                |                      | -42.3           | -17.8                               |      |
| 48.12702           |    | 2695.1     | 2fo    | 1914        | 7.8             | 17.2                |                      | -47.0           | -26.4                               |      |
| 48.11426           |    | 4041.6     | 3fo    | 1916        | 10.9            | 19.9                |                      | -45.5           | -21.0                               |      |
|                    |    |            |        |             |                 |                     |                      |                 |                                     |      |
|                    |    |            |        |             |                 |                     |                      |                 |                                     |      |
|                    |    |            |        |             |                 |                     |                      |                 |                                     |      |
|                    |    |            |        |             |                 |                     |                      |                 |                                     |      |
|                    |    |            |        |             |                 |                     |                      |                 |                                     |      |
|                    |    |            |        |             |                 |                     |                      |                 |                                     |      |
|                    |    |            |        |             |                 |                     |                      |                 |                                     |      |
|                    |    |            |        |             |                 |                     |                      |                 |                                     |      |
|                    |    |            |        |             |                 |                     |                      |                 |                                     |      |
|                    |    |            |        |             |                 |                     |                      |                 |                                     |      |
|                    |    |            |        |             |                 |                     |                      |                 |                                     |      |
|                    |    |            |        |             |                 |                     |                      |                 |                                     |      |
|                    |    |            |        |             |                 |                     |                      |                 |                                     |      |
|                    |    |            |        |             |                 |                     |                      |                 |                                     |      |
|                    |    |            |        |             |                 |                     |                      |                 |                                     |      |
|                    |    |            |        |             |                 |                     |                      |                 |                                     |      |
|                    |    |            |        |             |                 |                     |                      |                 |                                     |      |
|                    |    |            |        |             |                 |                     |                      |                 |                                     |      |

Measurement Instructions

For each standard test frequency determine received power density for each spurious output. In "origin" column, indicate suspected spurious frequency source. Record azimuth ( $\theta$ ) and elevation ( $\phi$ ) angle between radar antenna boresight axis and test antenna axis for position of maximum received signal. Record angle ( $\omega$ ) between radar and test antenna polarization planes for position of maximum signal. Use reverse side for block diagram and remarks.

#### 5.2.4 Emission Spectrum

Emission spectrum measurements consist of measuring the general amplitude distribution of the spectral components of a pulse signal. The spectrum of a pulse signal is the power versus frequency distribution of a pulse about the fundamental or spurious frequencies of the transmitter.

Emission spectrum measurements were made at the test site with the radar transmitter tuned to each of the standard test frequencies of 1257.8 Mc, 1297.8 Mc, and 1348 Mc. An attempt was made to measure each of the spurious signals recorded in the spurious emission test (5.2.3); however, some of these signals were too weak to photograph.

The procedure for the emission spectrum measurement is as follows. Initially, the output of the sampled signal is adjusted so that no overload exists. A convenient amplitude reference is established with a variable external RF attenuator and the analyzer gain setting. The picture is photographed, and the width of the sweep measured without changing the spectrum analyzer control settings. A signal generator's CW output is substituted for the spurious frequency and the spectrum analyzer vertical divisions calibrated in dbm. The RF attenuation inserted in the antenna leads which is not calibrated out by the signal generator must be recorded. In order to obtain more detail on the skirts of a strong signal, the dynamic range of the spectrum analyzer is exploited by taking out some of the external RF attenuation to bring up the skirts. This new presentation is photographed and the spectrum analyzer calibrated in the same manner as the first picture. Additional emission spectrum pictures may be made by taking out more attenuation. Attenuation should not be taken out beyond the point where the spectrum analyzer overloads. The sweep width is usually widened on the second and third cuts in order to show the detail on the skirts. In this report, the spectrum analyzer calibration is plotted alongside the photograph. The data scaled from the photograph of each spurious emission are recorded on separate data sheets. Where more than one cut is required on

strong signals, the data from all the cuts are used to plot a composite emission spectrum curve.

These emission spectrum curves are plotted as power density per kilocycle bandwidth versus frequency. Computations must be made in order to convert the scaled data in dbm to power density. The spectral power density at the various frequencies in the spectrum is computed in the same manner as the power density in the spurious emission test. Power density in this test is obtained per kilocycle bandwidth. Figure 5.2.5-1 shows a block diagram of the measurement setup. Signal power available ( $P_A$ ) at the test antenna terminals is the sum of the signal generator output plus the net cable losses plus any attenuation inserted in the antenna lead to attenuate the radar signal. Net cable losses are the difference between the losses in the test cable and the losses in the calibrating cable from the signal generator. In equation form, the power available at the test antenna terminals is

$$P_A(\text{dbm}) = \text{signal generator output (dbm), plus net cable loss (db), plus attenuation inserted (db)}$$

The spectral power density ( $P_D$ ) at the test antenna terminals is then

$$P_D(\text{dbm/m}^2/\text{kc}) = P_A/A/\text{kc}$$

where

kc = bandwidth of measuring instrument in kilocycles

A = effective area of test antenna =  $\lambda^2 G/4\pi$

G = power gain of test antenna over an isotropic antenna

$\lambda$  = wavelength of received spurious signal  
 =  $300/f_{mc}$  meters

$f_{mc}$  = frequency in megacycles

therefore,

$$\begin{aligned}
 P_D(\text{dbm/m}^2/\text{kc}) &= 10 \log P_A/A/\text{kc} \\
 &= 10 \log P_A - 10 \log A - 10 \log \text{kc} \\
 &= 10 \log P_A - 10 \log(\lambda^2 G/4\pi) - 10 \log \text{kc} \\
 &= 10 \log P_A - 10 \log 300^2/4\pi + 20 \log f_{\text{mc}} \\
 &\quad - 10 \log G - 10 \log \text{kc} \\
 &= 10 \log P_A - 38.6 + 20 \log f_{\text{mc}} - 10 \log G \\
 &\quad - 10 \log \text{kc}
 \end{aligned}$$

As an example, computations will be made for one point on the spectral power density curve of the 1257.8 Mc emission of the radar. The spectral power densities on the first three data sheets are derived from data scaled from the photographs shown in Figure 5.2.4-2. The point selected is on the eleventh (11) line of the second data sheet. The point selected is the highest amplitude in the first cut. The signal generator output scaled from the photograph is -39 dbm. The net cable loss is obtained from Section 4.5.4. 30 db of attenuation was inserted in the antenna lead to attenuate the radar signal. These two figures are added to the signal generator output to give the power ( $P_A$ ) at the antenna terminals. The equation for the spectral power density is

$$\begin{aligned}
 P_D(\text{dbm/m}^2/\text{kc}) &= 10 \log P_A - 38.6 + 20 \log f_{\text{mc}} \\
 &\quad - 10 \log G - 10 \log \text{kc}
 \end{aligned}$$

where

$$\begin{aligned}
 10 \log P_A &= \text{signal generator (dbm) plus cable loss (db)} \\
 &\quad \text{plus attenuation inserted (db)} \\
 &= -39 \text{ dbm} + 5.1 \text{ db} + 30 \text{ db} = -3.9 \text{ dbm} \\
 20 \log f_{\text{mc}} &= 20 \log 1257.8 = 62 \text{ db} \\
 10 \log G &= 10 \text{ db} \\
 10 \log \text{kc} &= 10 \log 20 = 13 \text{ db}
 \end{aligned}$$

Therefore,

$$\begin{aligned}
 P_D &= -3.9 \text{ dbm} - 38.6 \text{ db} + 62 \text{ db} - 10 \text{ db} - 13 \text{ db} \\
 &= -3.5 \text{ dbm/m}^2/\text{kc}
 \end{aligned}$$

The composite curve for this radar emission for all the points is seen in Figure 5.2.4-11.

Emission spectrum photographs of spurious emissions are shown in Figures 5.2.4-2 through 5.2.4-10. Data scaled from these photographs are recorded on 20 data sheets. Composite curves of emission spectral distribution are plotted in Figures 5.2.4-11 through 5.2.4-25.

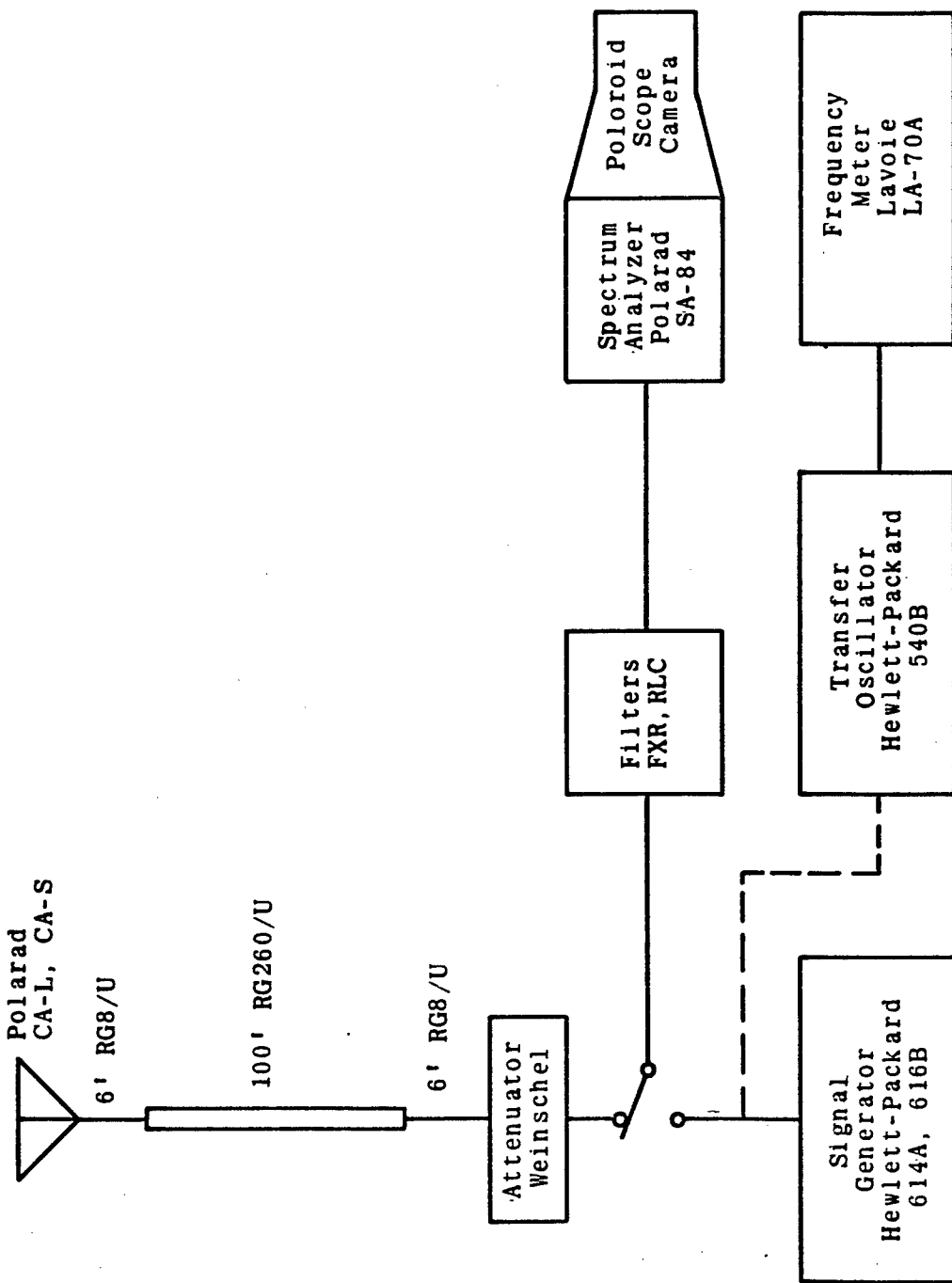


Figure 5.2.4-1. Emission Spectrum Test Block Diagram.

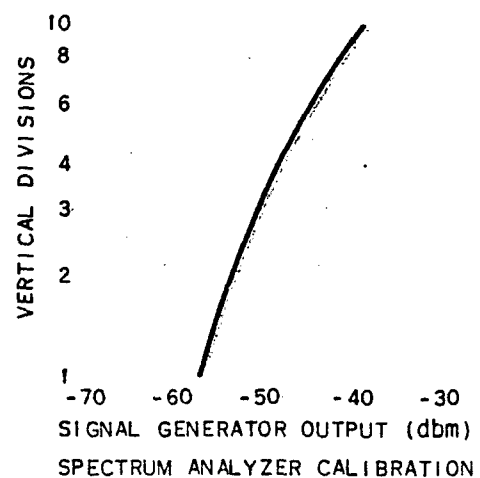
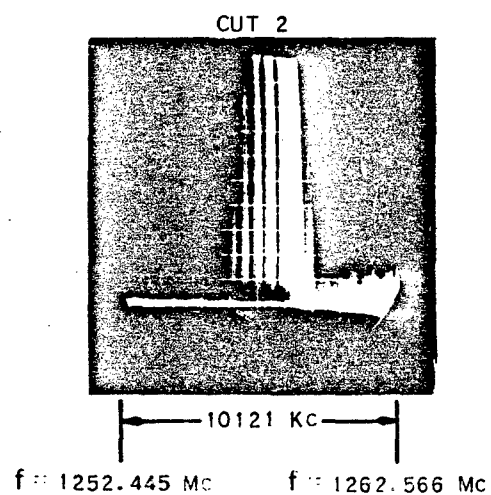
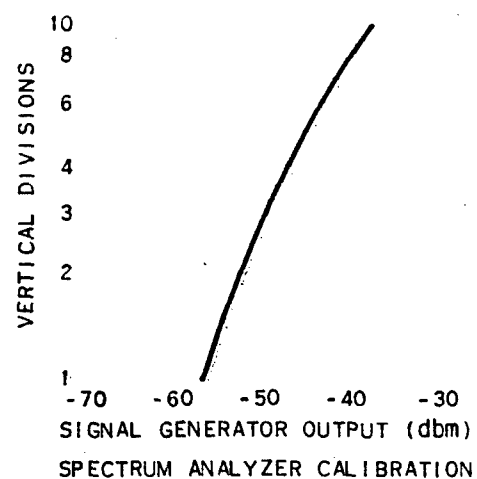
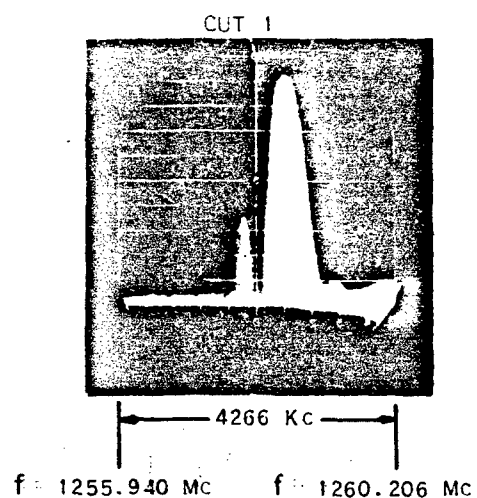


Figure 5.2.4-2. Emission Spectrum Photographs ( $f_0 = 1257.8 \text{ Mc}$ ).

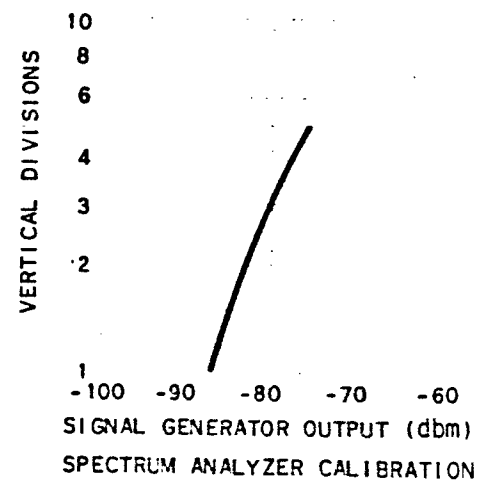
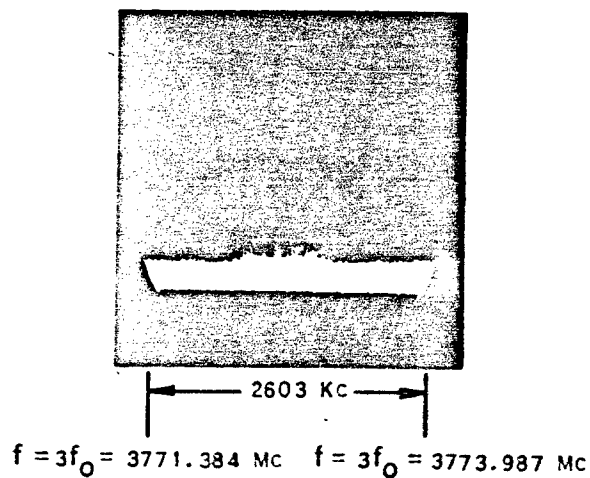
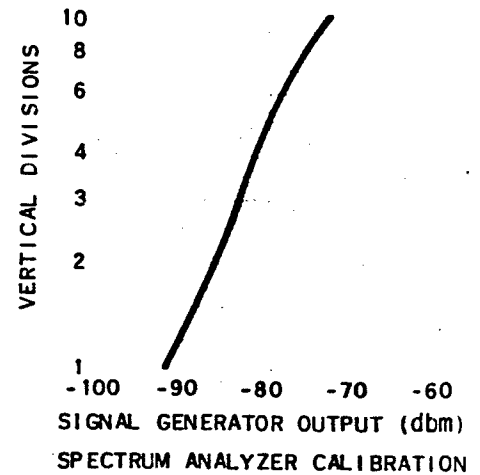
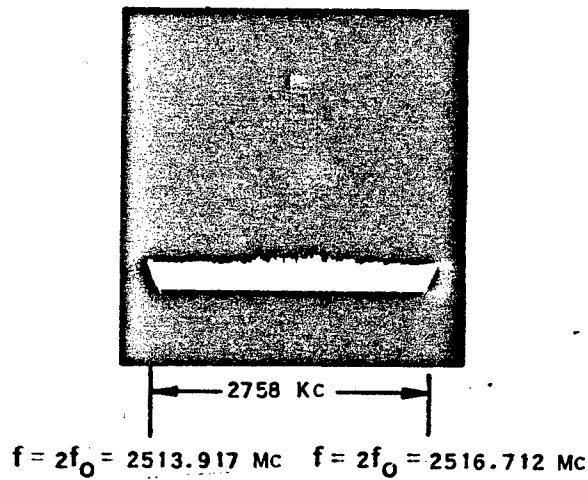
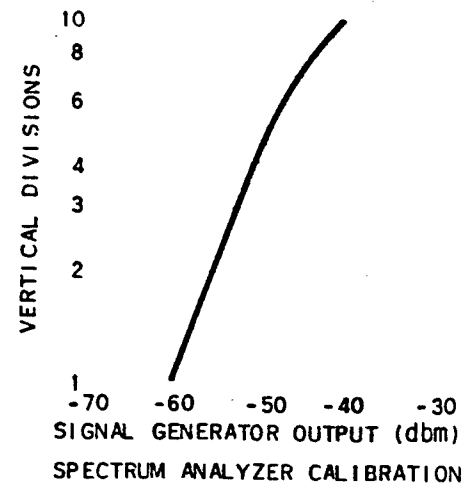
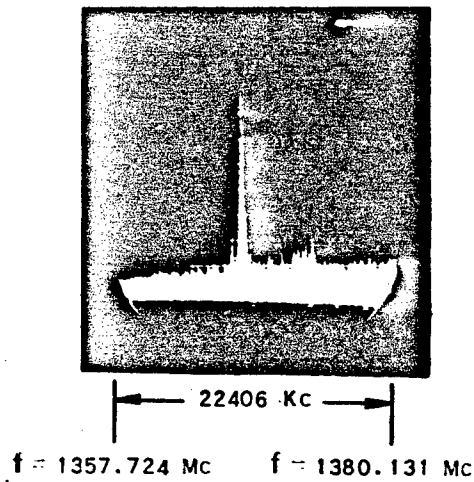
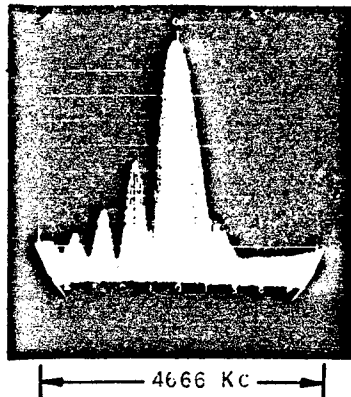
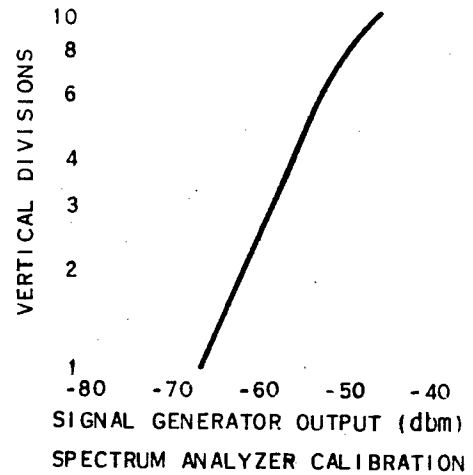


Figure 5.2.4-3. Emission Spectrum Photographs ( $f_0 = 1257.8 \text{ Mc}$ ).

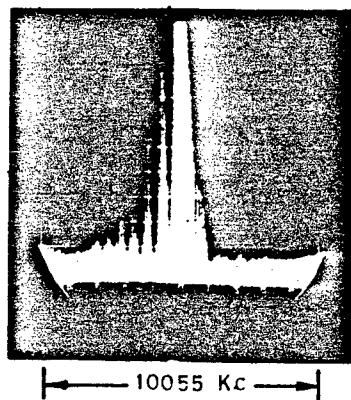
CUT 1



$$f - f_0 = 1295.198 \text{ Mc} \quad f - f_0 = 1299.864 \text{ Mc}$$



CUT 2



$$f - f_0 = 1292.518 \text{ Mc} \quad f - f_0 = 1302.573 \text{ Mc}$$

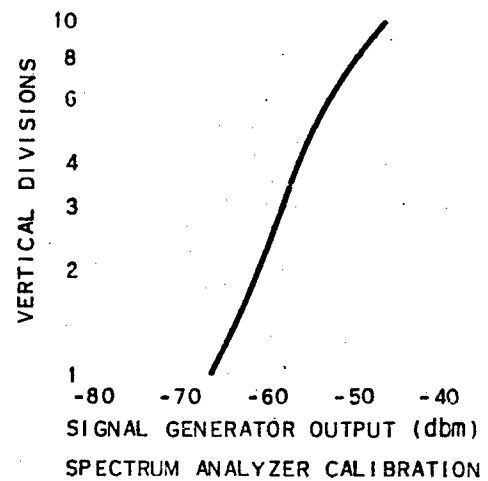


Figure 5.2.4-4. Emission Spectrum Photographs ( $f_0 = 1297.8 \text{ Mc}$ ).

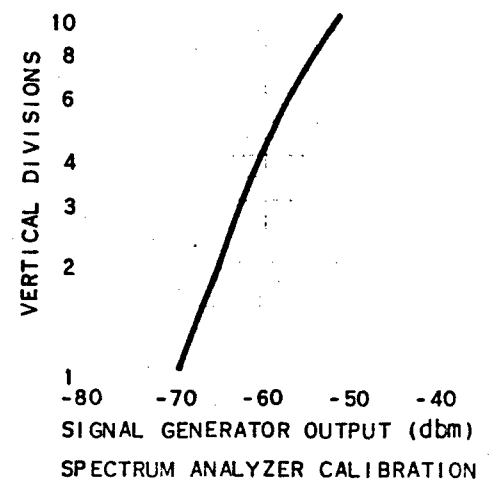
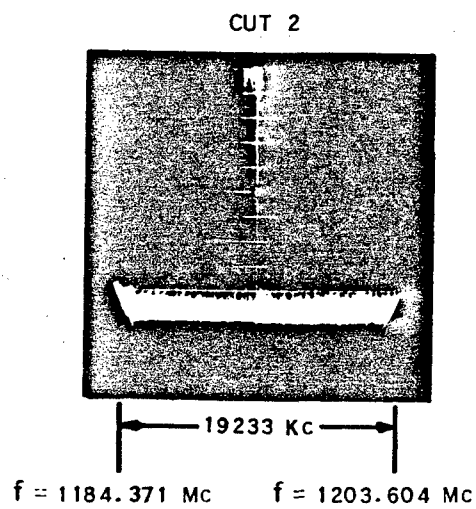
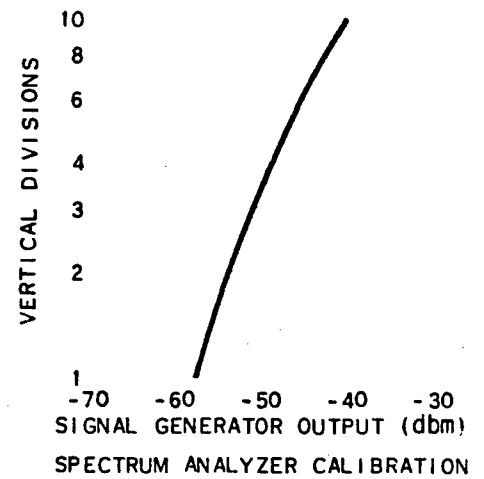
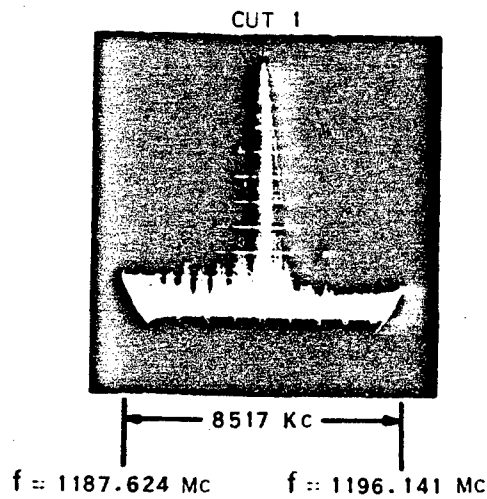


Figure 5.2.4-5. Emission Spectrum Photographs ( $f_0 = 1297.8 \text{ Mc}$ ).

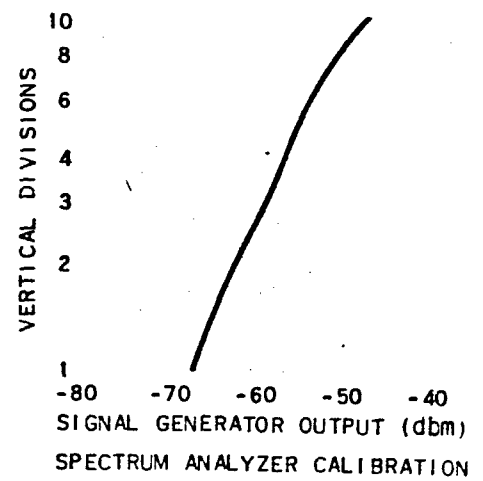
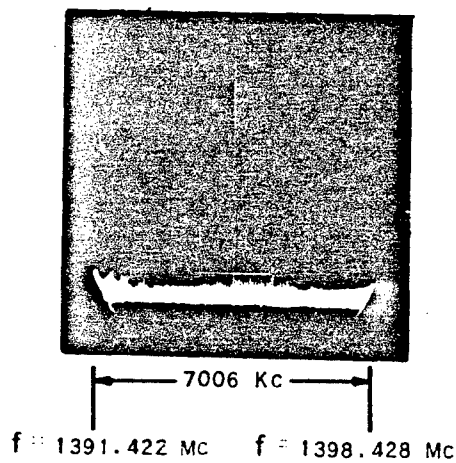
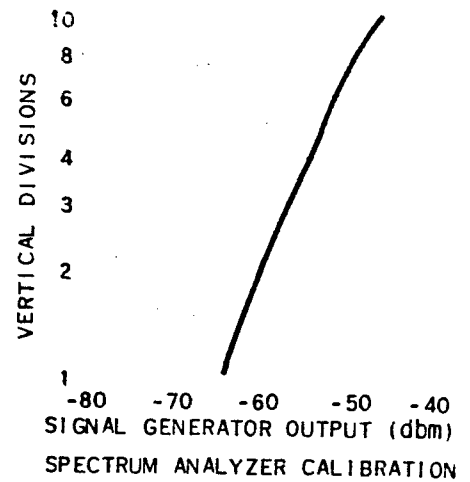
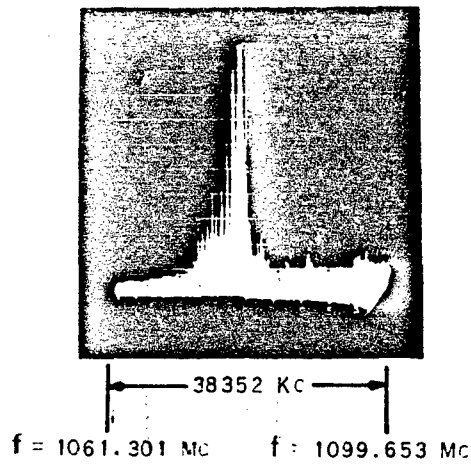


Figure 5.2.4-6. Emission Spectrum Photographs ( $f_0 = 1297.8 \text{ Mc}$ ).

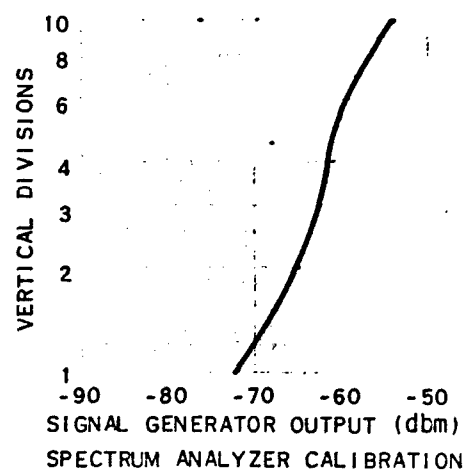
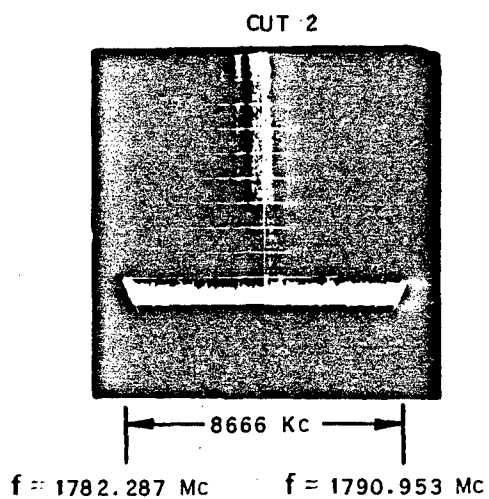
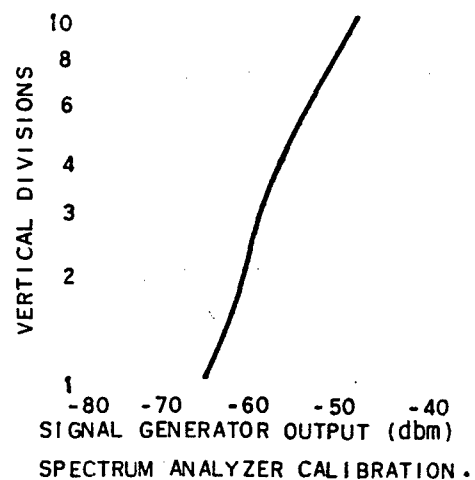
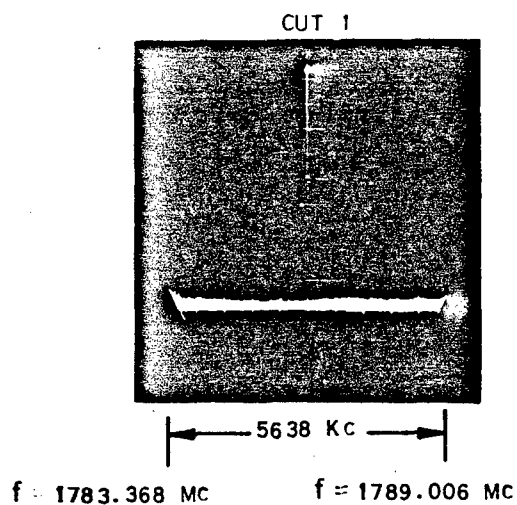


Figure 5.2.4-7. Emission Spectrum Photographs ( $f_0 = 1297.8 \text{ Mc}$ ).

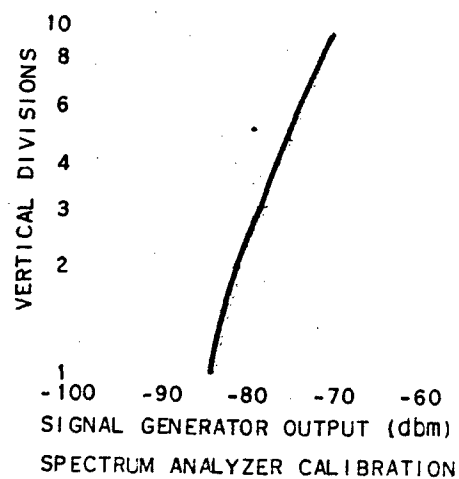
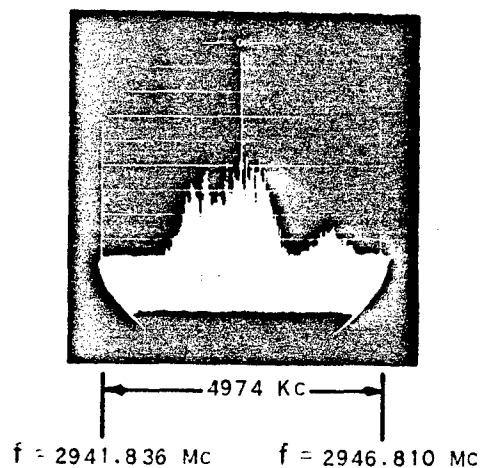
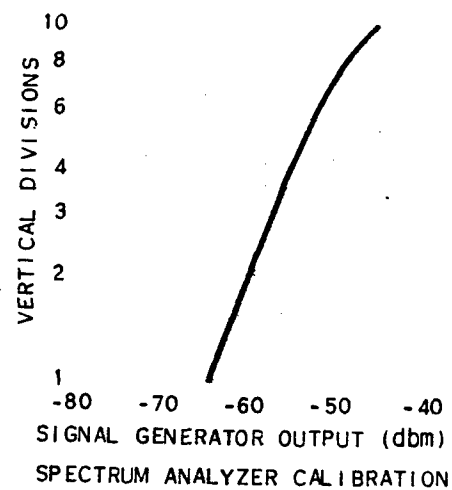
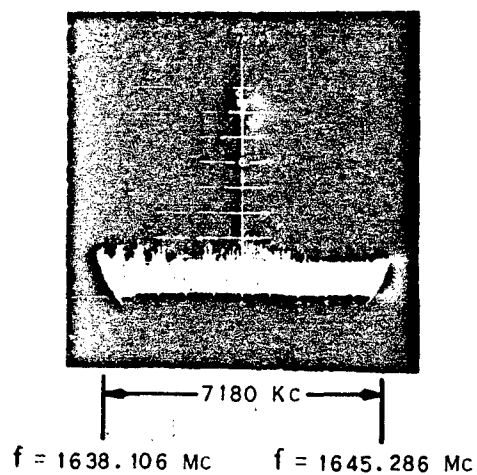


Figure 5.2.4-8. Emission Spectrum Photographs ( $f_0 = 1297.8 \text{ Mc}$ ).

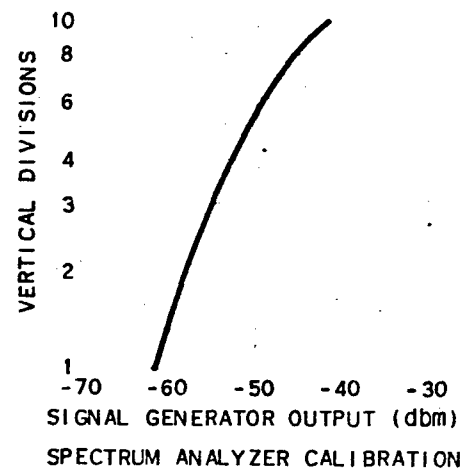
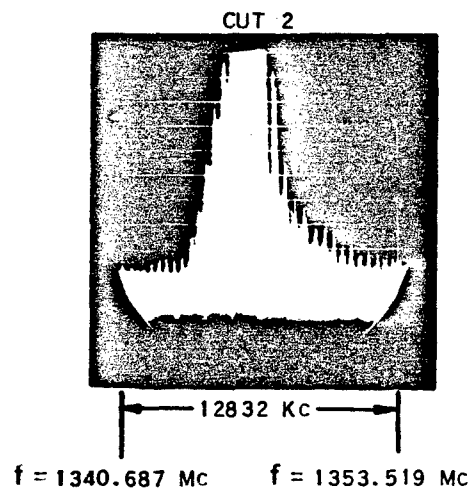
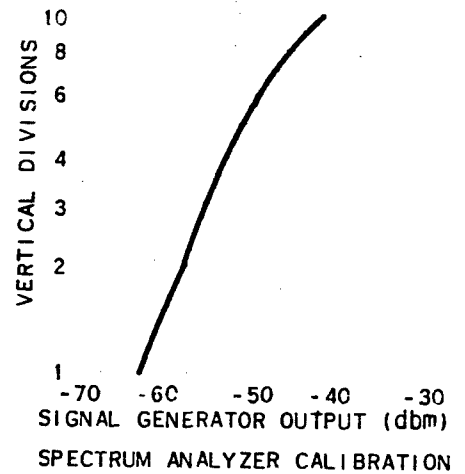
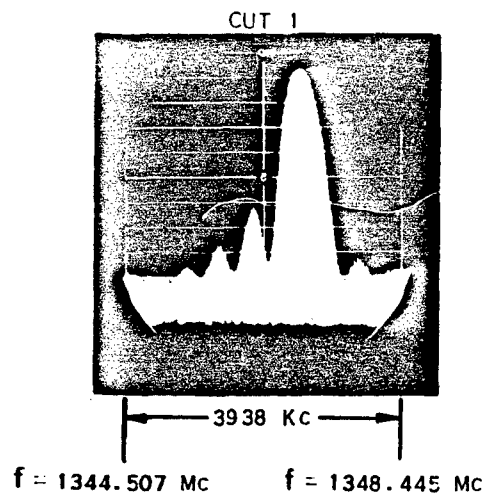


Figure 5.2.4-9. Emission Spectrum Photographs ( $f_o = 1348.2 \text{ Mc}$ ).

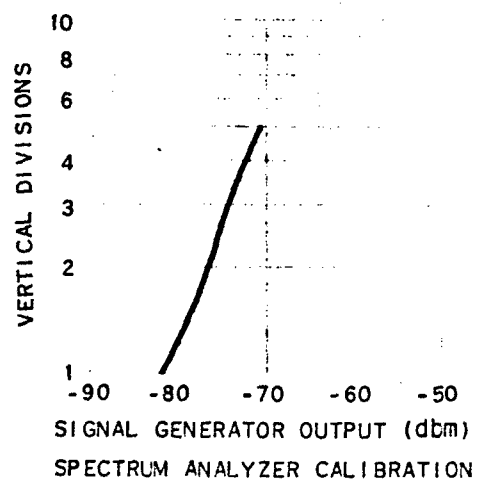
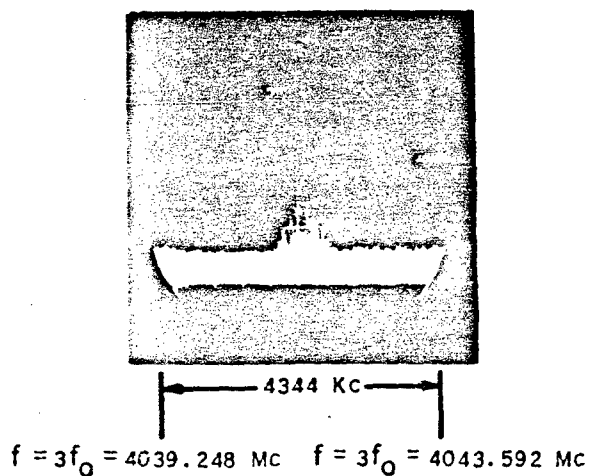
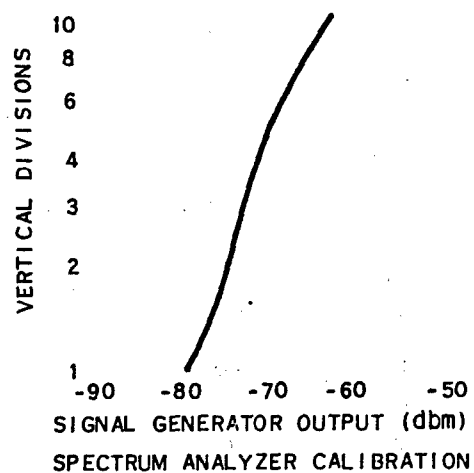
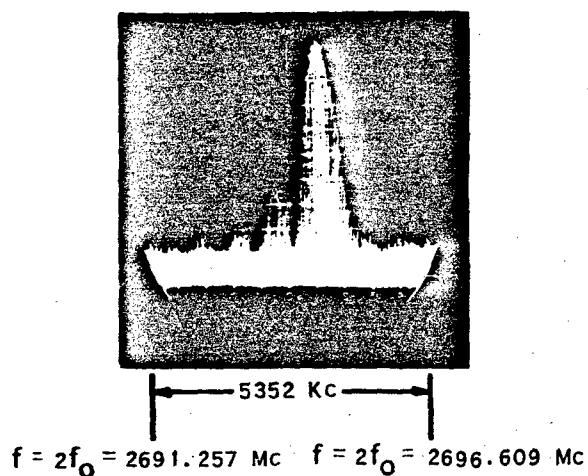
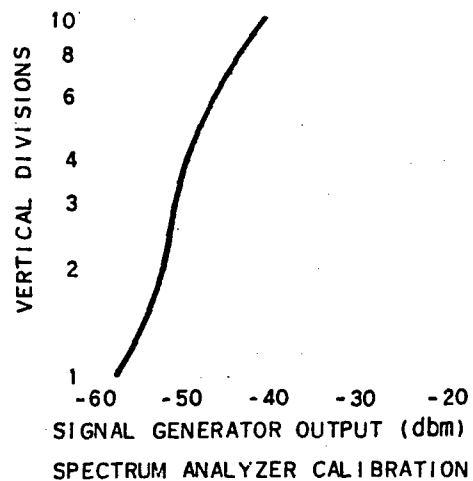
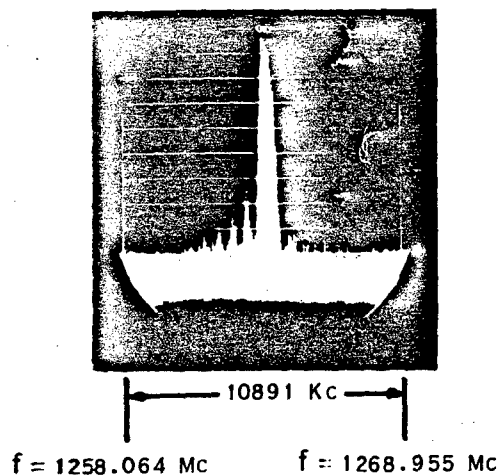


Figure 5.2.4-10. Emission Spectrum Photographs ( $f_0 = 1348.2 \text{ Mc}$ ).

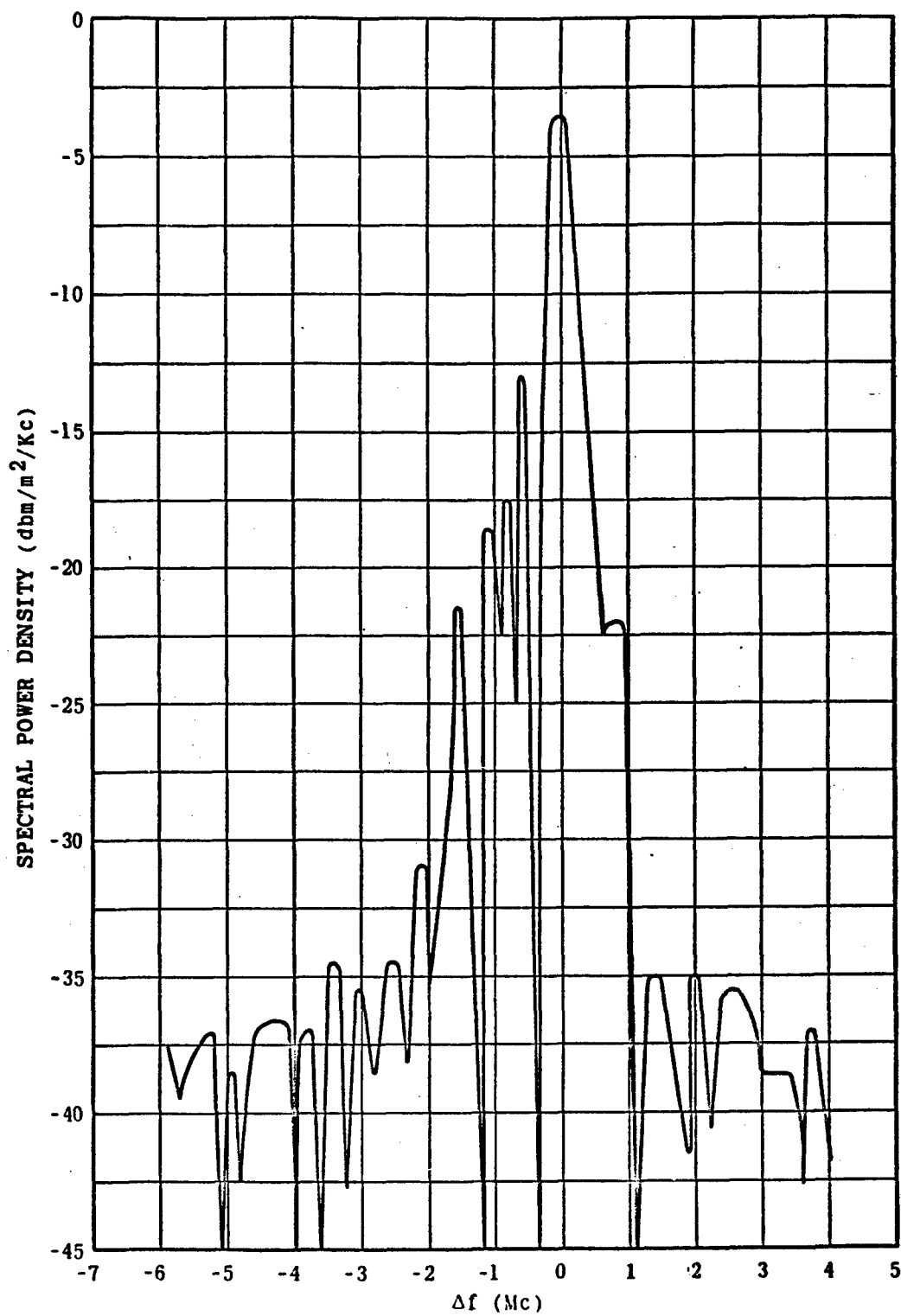


Figure 5.2.4-11. Emission Spectral Distribution  
 $f = 1257.8 \text{ Mc}$  ( $f_0 = 1257.8 \text{ Mc}$ ).

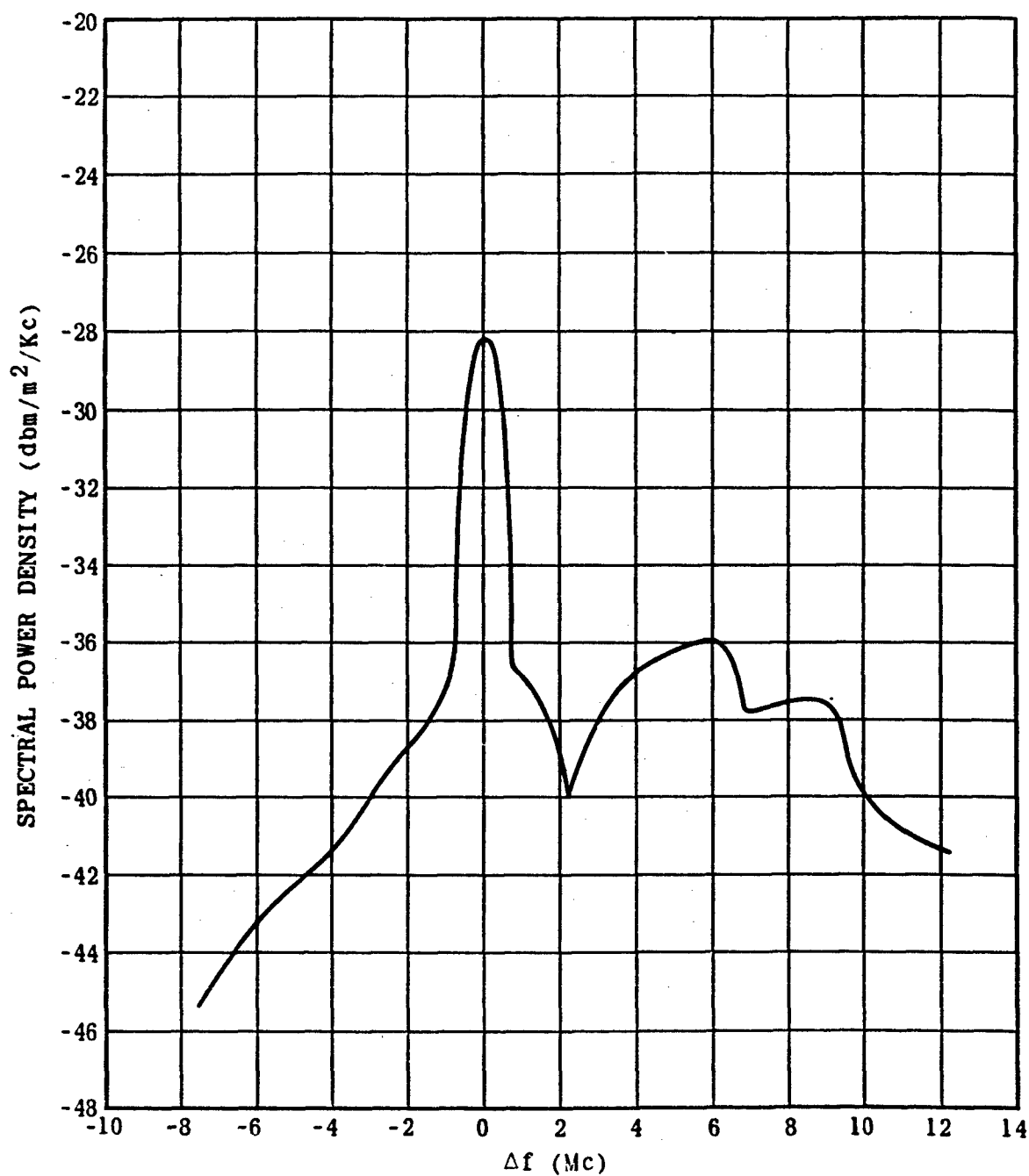


Figure 5.2.4-12. Emission Spectral Distribution  
 $f = 1367.8 \text{ Mc}$  ( $f_0 = 1257.8 \text{ Mc}$ ).

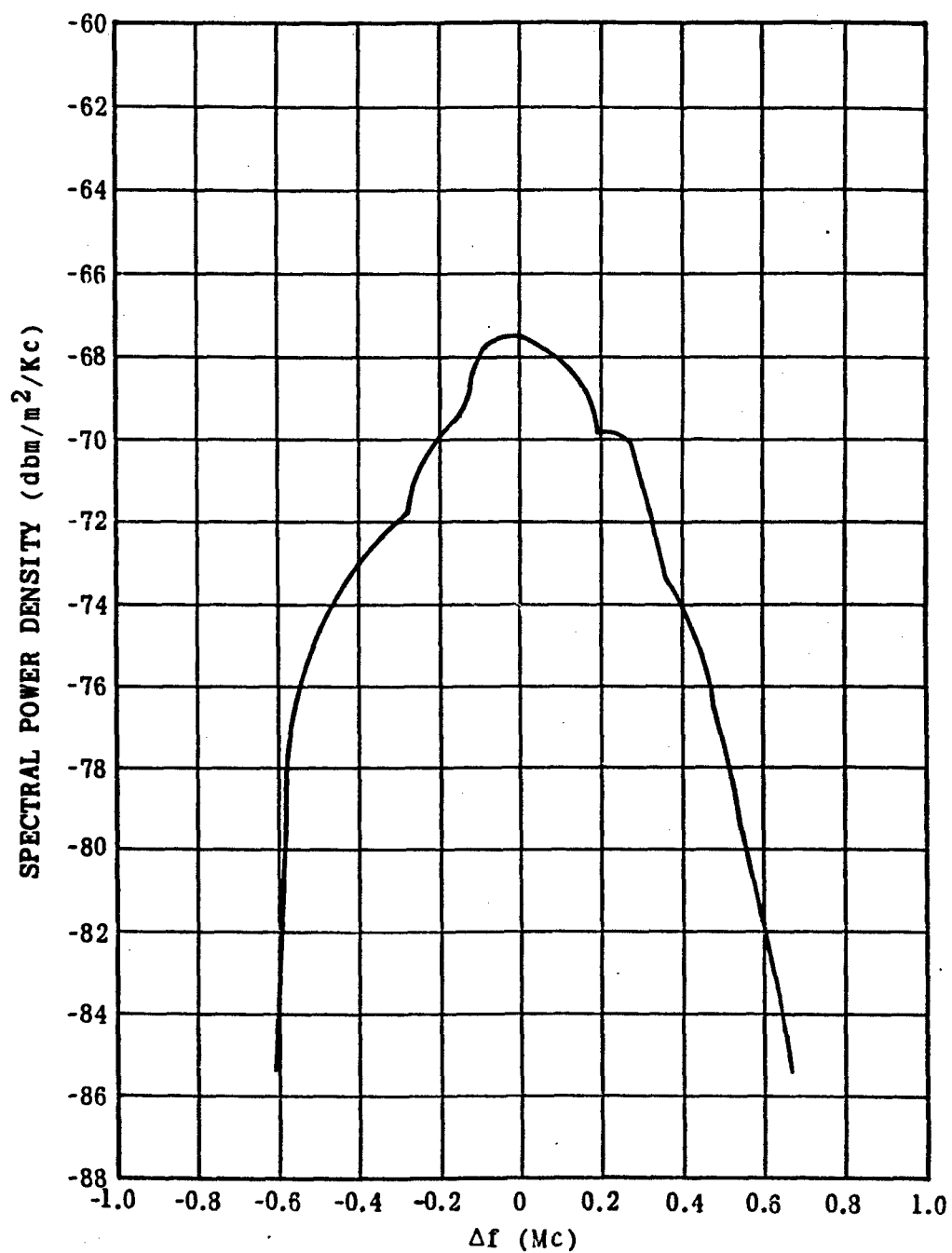


Figure 5.2.4-13. Emission Spectral Distribution  
 $f = 2f_0 = 2515.3 \text{ Mc}$  ( $f_0 = 1257.3 \text{ Mc}$ ).

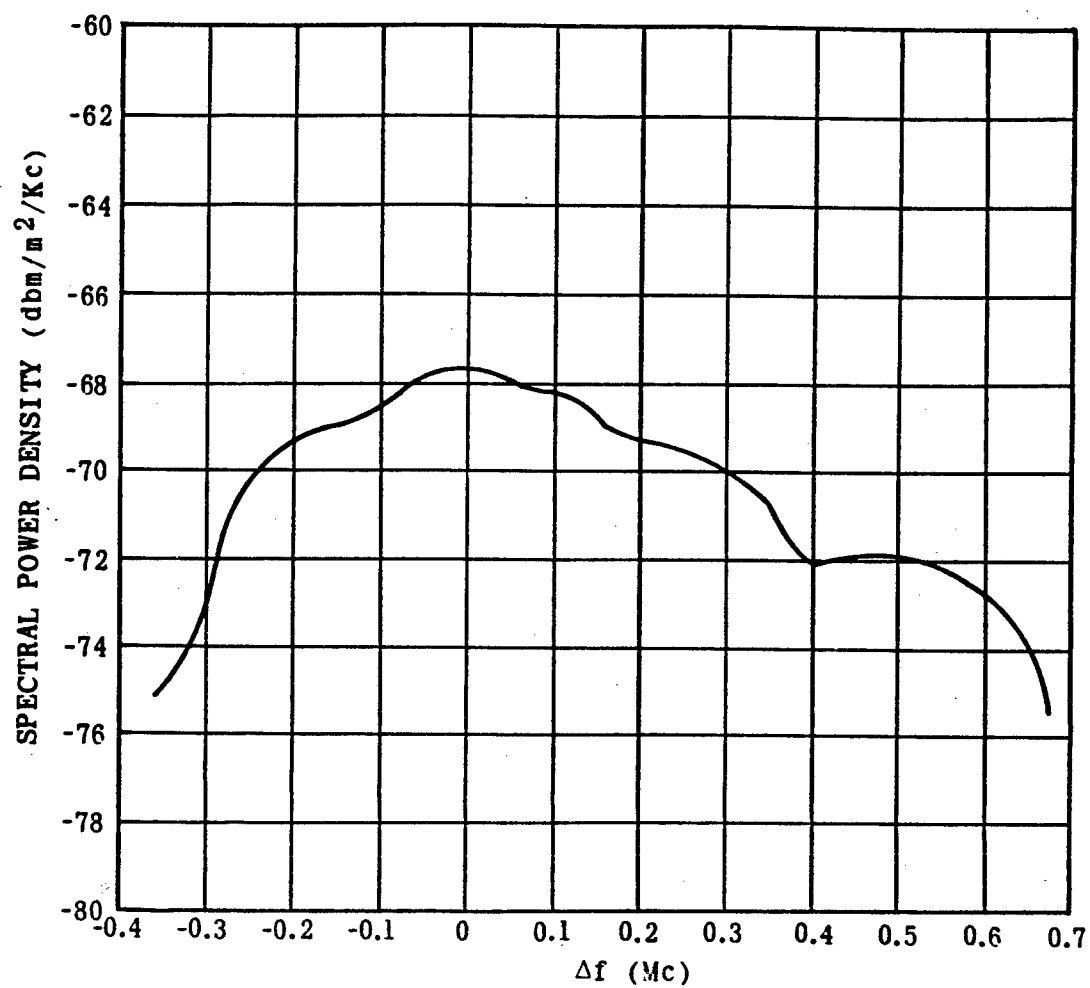


Figure 5.2.4-14. Emission Spectral Distribution  
 $f = 3f_0 = 3772.5 \text{ Mc}$  ( $f_0 = 1257.8 \text{ Mc}$ ).

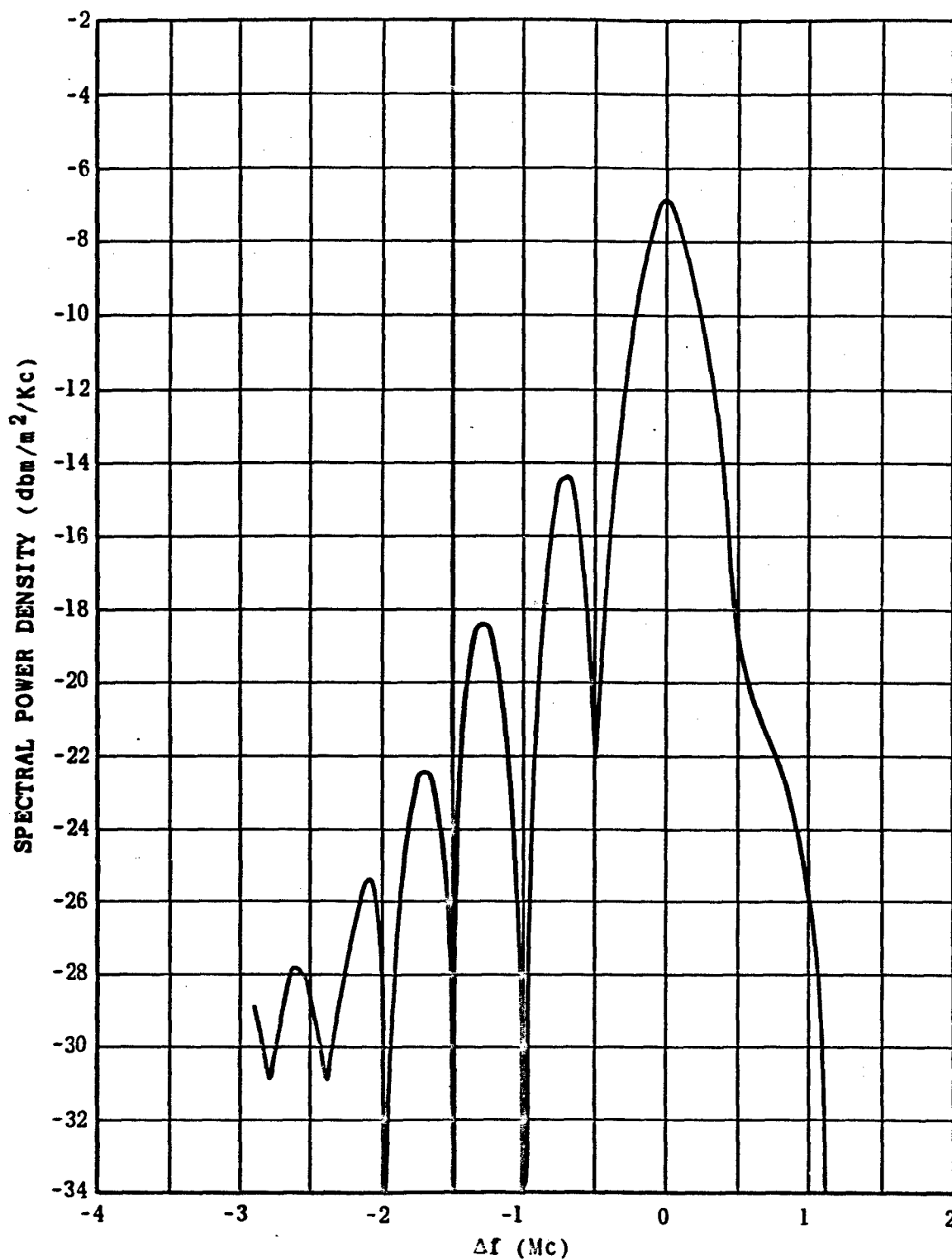


Figure 5.2.4-15. Emission Spectral Distribution  
 $f = 1297.8$  Mc ( $f_0 = 1297.8$  Mc).

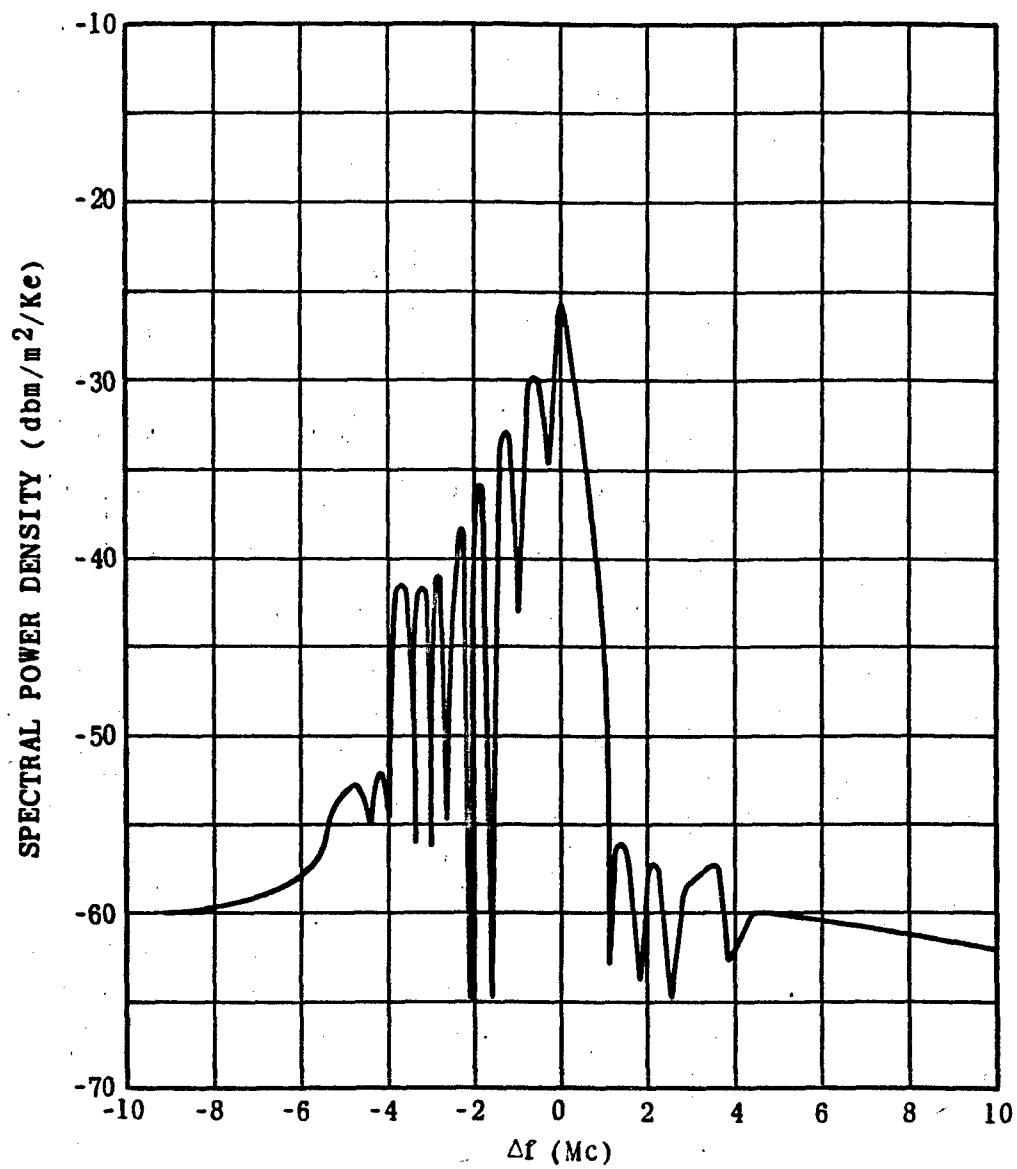


Figure 5.2.4-16. Emission Spectral Distribution  
 $f = 1191.9 \text{ Mc}$  ( $f_0 = 1297.3 \text{ Mc}$ ).

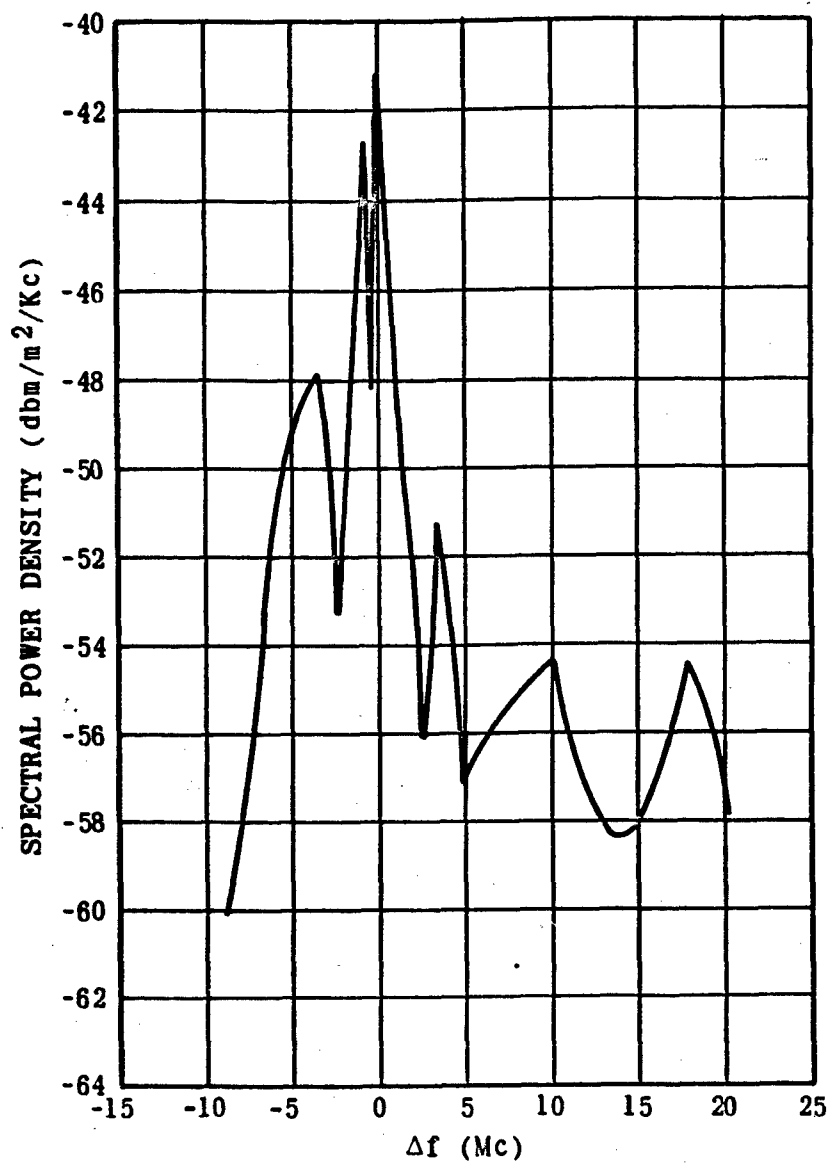


Figure 5.2.4-17. Emission Spectral Distribution  
 $f = 1079.3$  Mc ( $f_0 = 1297.8$  Mc).

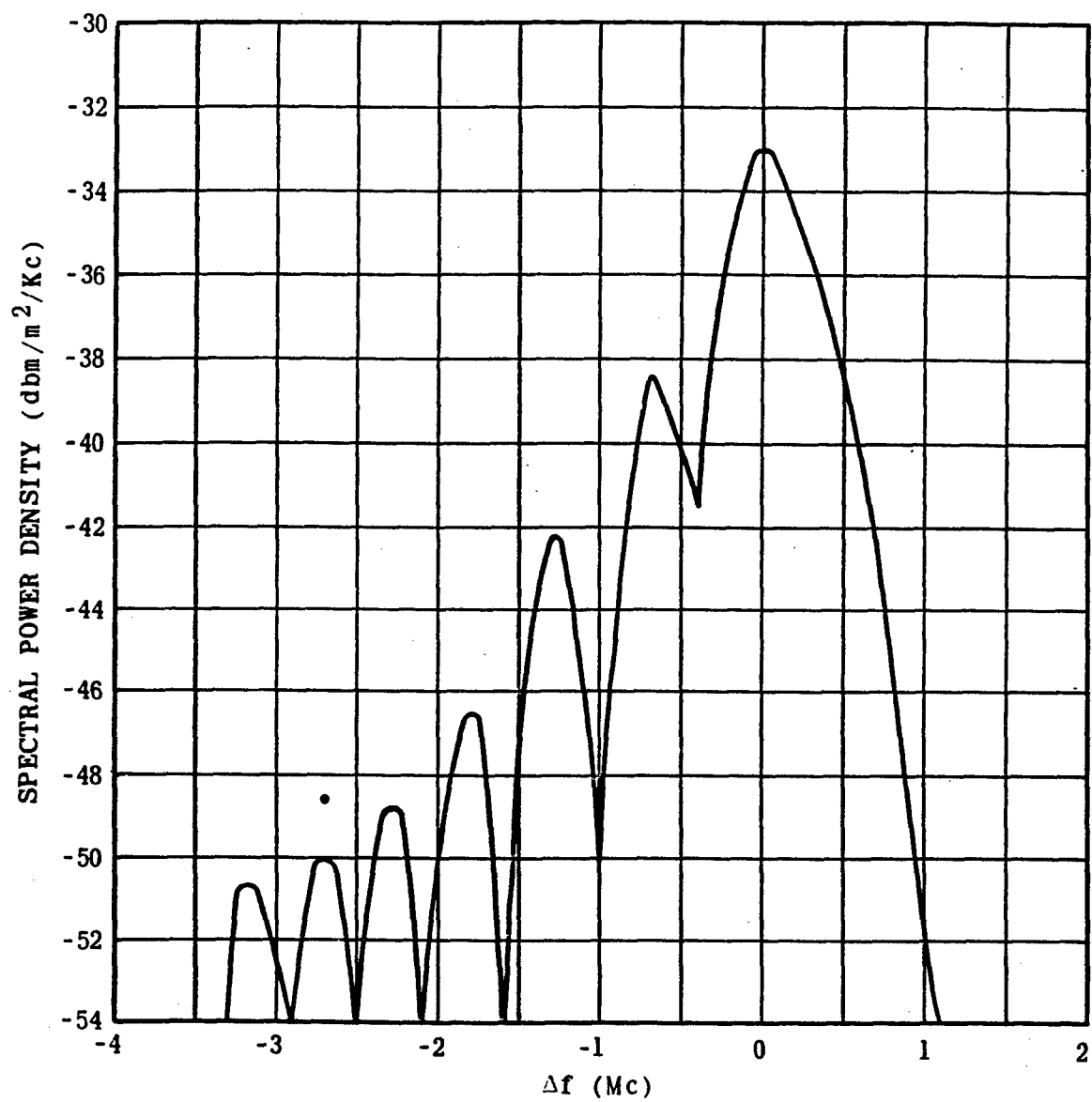


Figure 5.2.4-18. Emission Spectral Distribution  
 $f = 1394.9$  Mc ( $f_0 = 1297.8$  Mc).

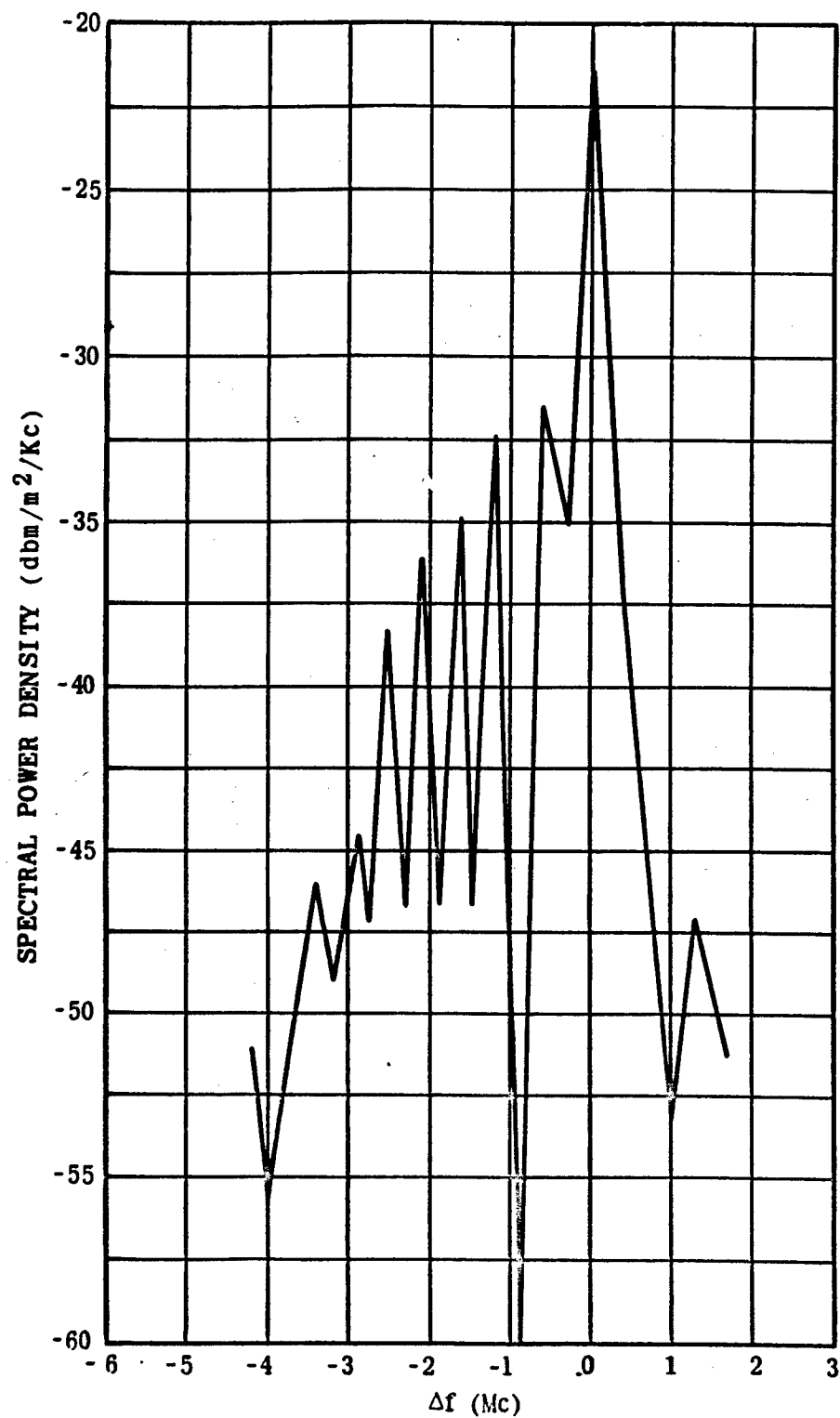


Figure 5.2.4-19. Emission Spectral Distribution  
 $f = 1786.2 \text{ Mc}$  ( $f_0 = 1297.8 \text{ Mc}$ ).

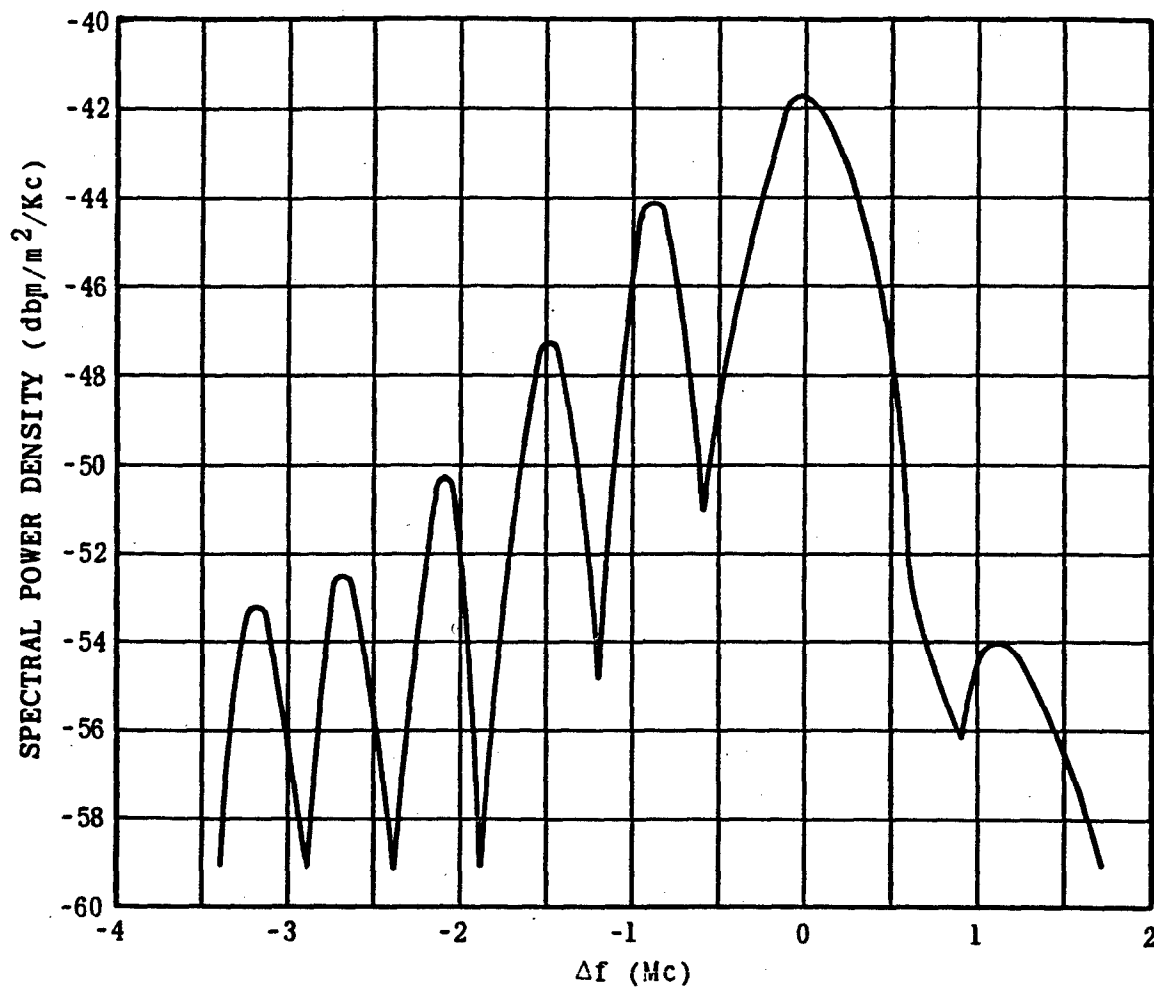


Figure 5.2.4-20. Emission Spectral Distribution  
 $f = 1641.7$  Mc ( $f_0 = 1297.8$  Mc).

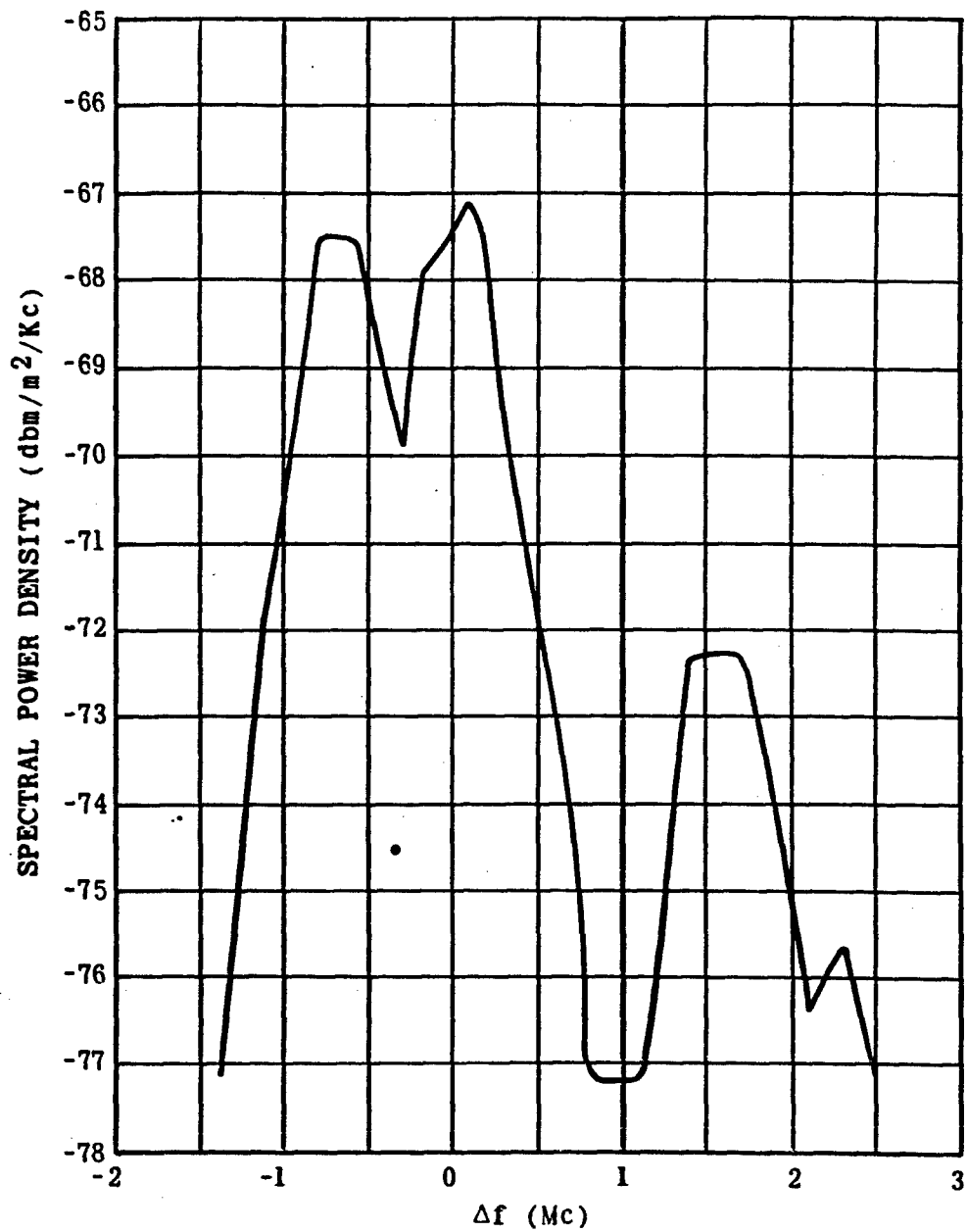


Figure 5.2.4-21. Emission Spectral Distribution  
 $f = 2944.3$  Mc ( $f_0 = 1297.8$  Mc).

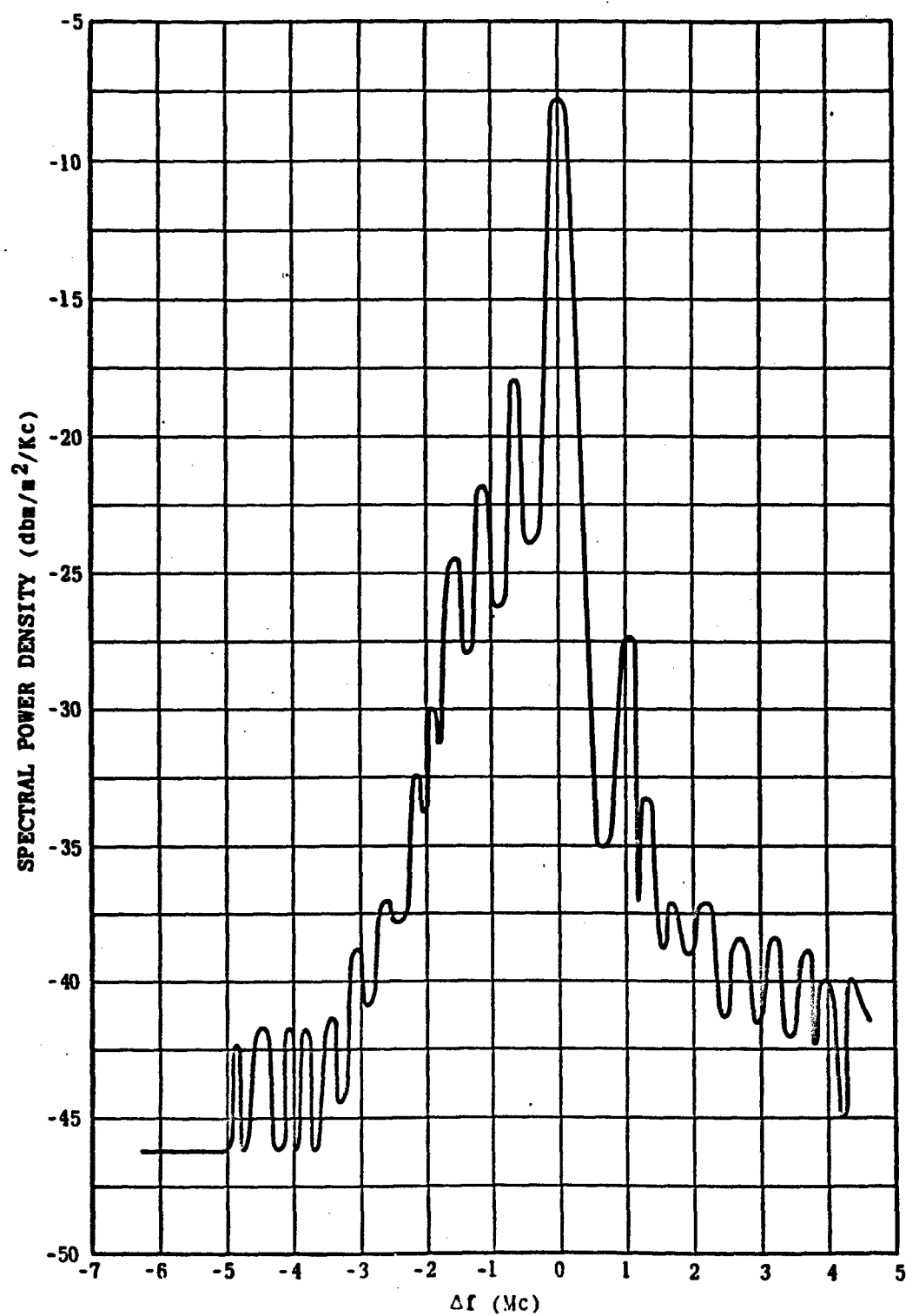


Figure 5.2.4-22. Emission Spectral Distribution  
 $f = 1347.0$  Mc ( $f_0 = 1348.2$  Mc).

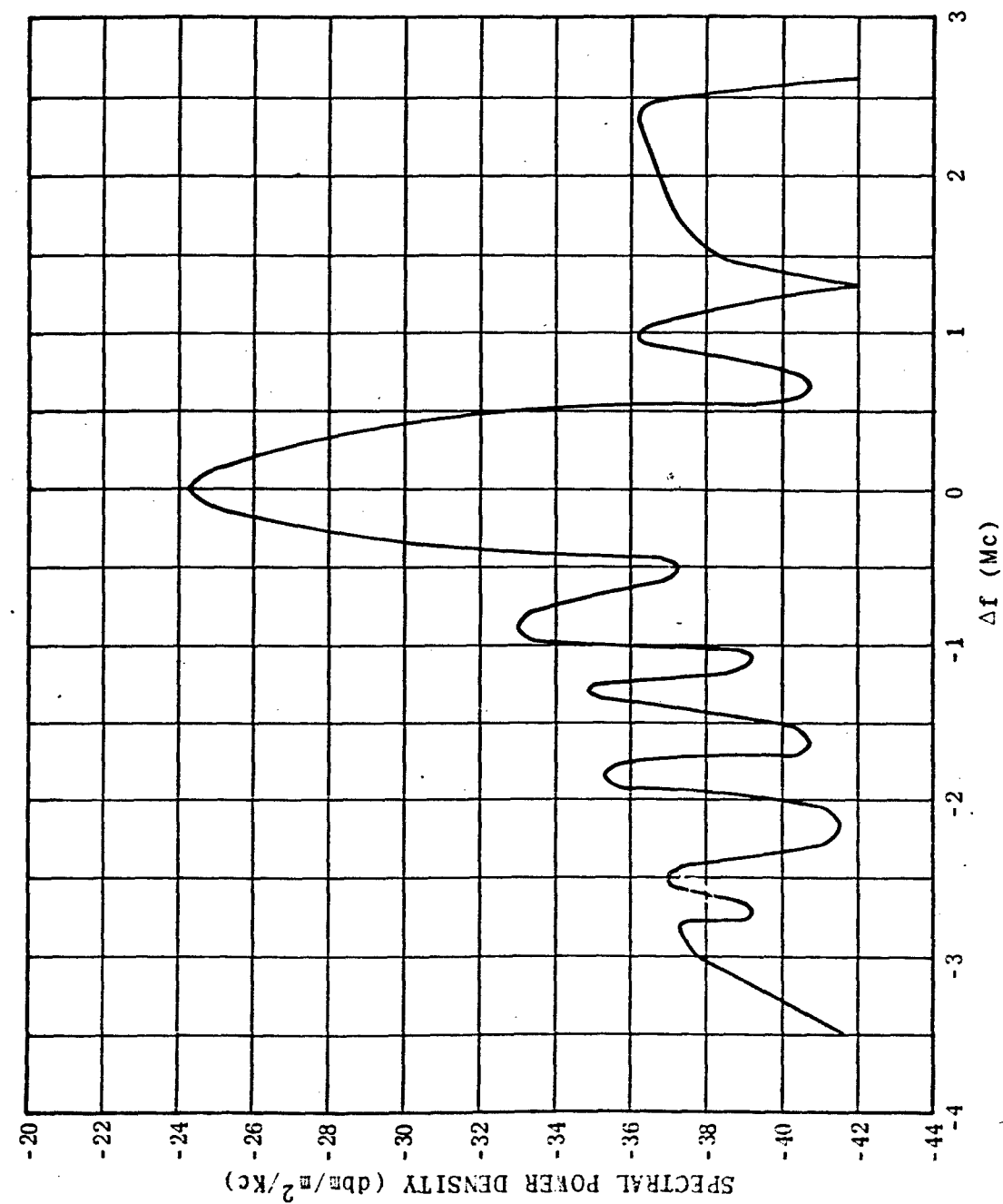


Figure 5.2.4-23. Emission Spectral Distribution  
 $f = 1263.7$  Mc ( $f_0 = 1348.2$  Mc).

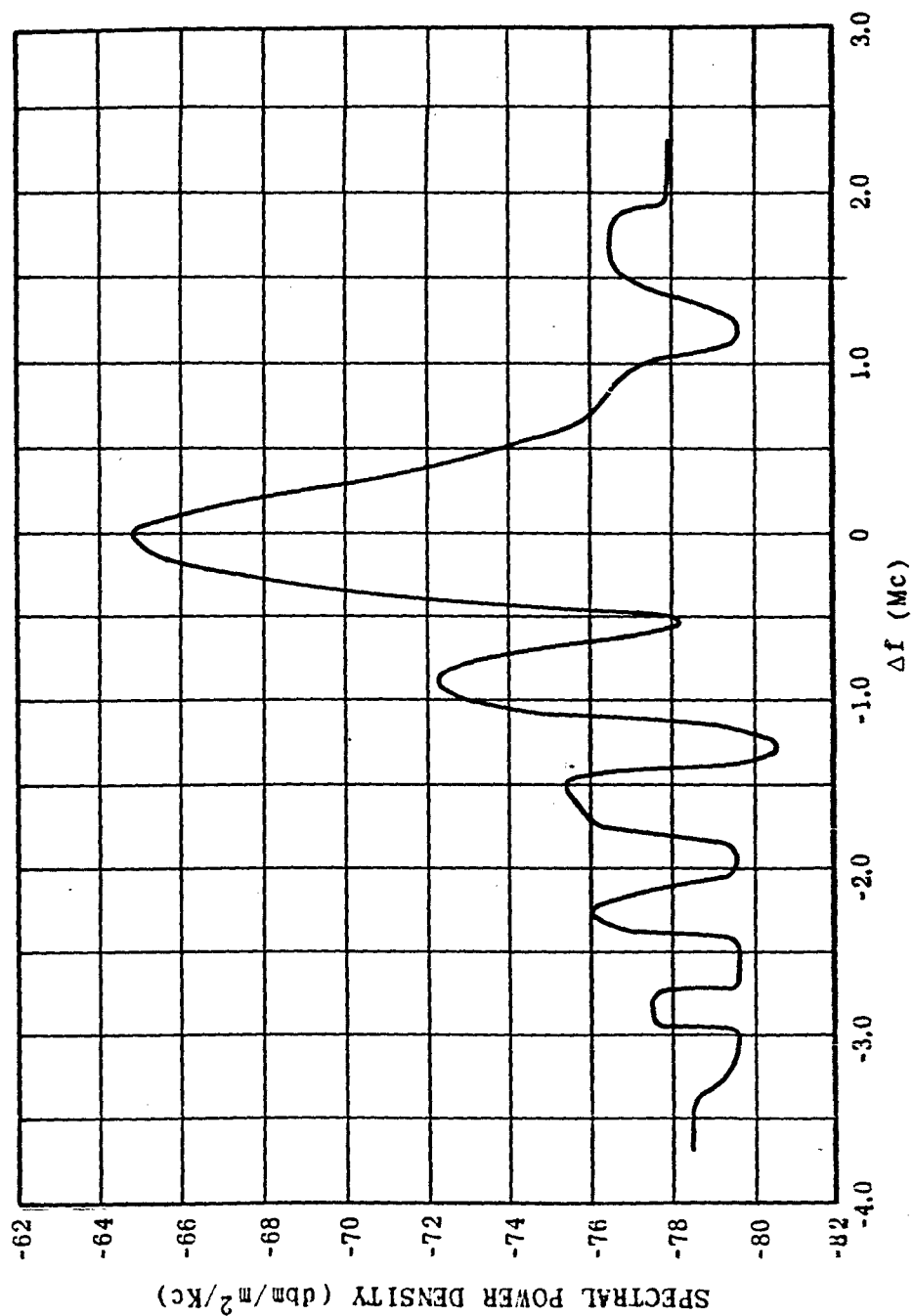


Figure 5.2.4-24. Emission Spectral Distribution  
 $f = 2694.6$  Mc ( $f_0 = 1348.2$  Mc).

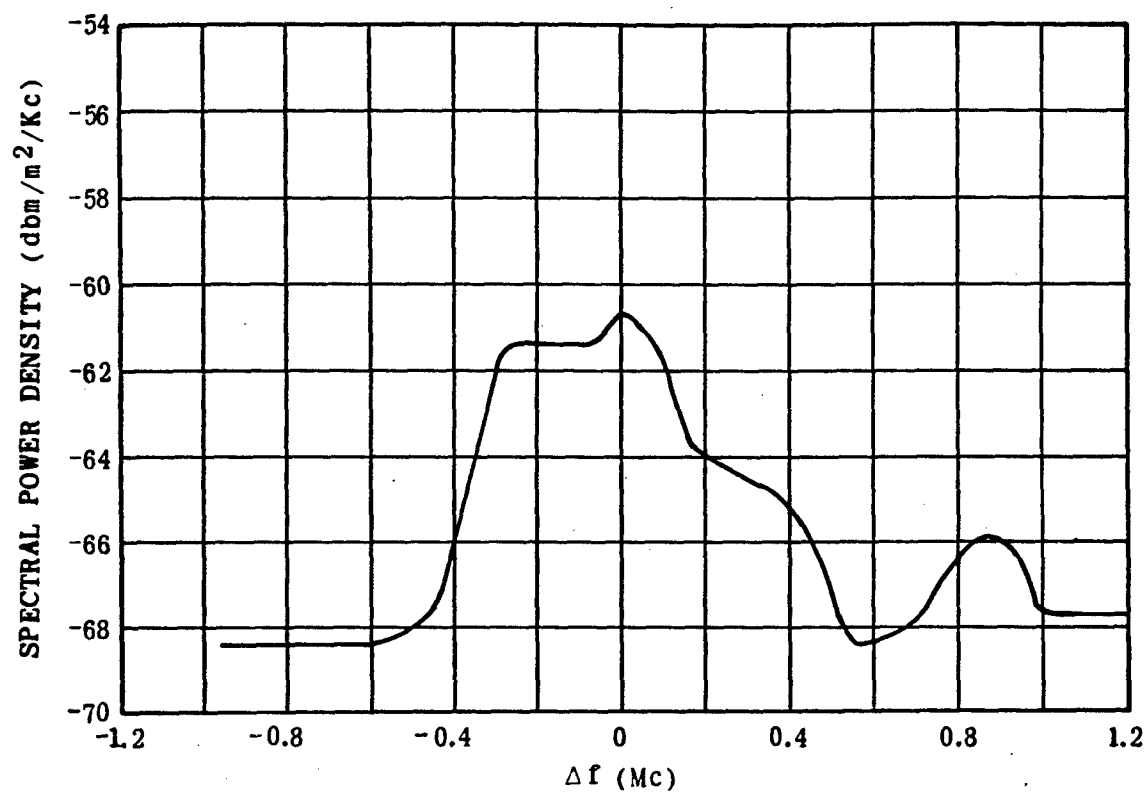


Figure 5.2.4-25. Emission Spectral Distribution  
 $f = 4041.4 \text{ Mc}$  ( $f_o = 1348.2 \text{ Mc}$ ).

# TRANSMITTER MEASUREMENT

## EMISSION SPECTRUM

Photographs are required.

Xmtr. & Site Identification: ARSR-1B-A 5110.11 Date: 12/13/62

Xmtr. Serial No.: 54 BW of Measuring Instrument: 20 kc

Tuning Band (Mc): 1240-1350 Cable Type & Length: 100'RG-260/U

Significant Control Positions: Radar Antenna Linear 6'RG-8/U

Polarization (Horizontal) Transmitter B, Time 1543, 1601

Measuring Devices: Weinschel Attenuators Type 210, FXR & RLC Filters

Polarad SA-84, HP 614A, HP-540B, Lavoie LA-70A, Polarad CA-L

Modulation: Pulse PW( $\mu$ s): 1.8 PRF(pps): 360

| Xmtr.<br>Tuned<br>Freq.<br>(Mc) | Freq.<br>Analyzed<br>(Mc) | $\Delta f$<br>( $\pm$ Mc) | Signal<br>Gen.<br>Output<br>(dbm) | Test<br>Ant.<br>Gain<br>(db) | Atten-<br>uation<br>Inserted<br>(db) | Cable<br>Losses<br>(db) | Spectral<br>Power<br>Density<br>(dbm/kc/m <sup>2</sup> ) |
|---------------------------------|---------------------------|---------------------------|-----------------------------------|------------------------------|--------------------------------------|-------------------------|----------------------------------------------------------|
| 1257.8                          | 1258.5                    | -5.9                      | -53                               | 10                           | 10                                   | 5.1                     | -37.5                                                    |
|                                 |                           | -5.7                      | -55                               |                              |                                      |                         | -39.5                                                    |
|                                 |                           | -5.5                      | -53                               |                              |                                      |                         | -37.5                                                    |
|                                 |                           | -5.2                      | -52.5                             |                              |                                      |                         | -37.0                                                    |
|                                 |                           | -5.1                      |                                   |                              |                                      |                         |                                                          |
|                                 |                           | -5.0                      | -54                               |                              |                                      |                         | -38.5                                                    |
|                                 |                           | -4.8                      | -58                               |                              |                                      |                         | -42.5                                                    |
|                                 |                           | -4.6                      | -52.5                             |                              |                                      |                         | -37.0                                                    |
|                                 |                           | -4.1                      | -52.0                             |                              |                                      |                         | -36.5                                                    |
|                                 |                           | -4.0                      |                                   |                              |                                      |                         |                                                          |
|                                 |                           | -3.8                      | -52.5                             |                              |                                      |                         | -37.0                                                    |
|                                 |                           | -3.6                      |                                   |                              |                                      |                         |                                                          |
|                                 |                           | -3.4                      | -50                               |                              |                                      |                         | -34.5                                                    |
|                                 |                           | -3.2                      | -57                               |                              |                                      |                         | -42.5                                                    |
|                                 |                           | -3.0                      | -51                               |                              |                                      |                         | -35.5                                                    |
|                                 |                           | -2.8                      | -54                               |                              |                                      |                         | -38.5                                                    |
|                                 |                           | -2.5                      | -50                               |                              |                                      |                         | -34.5                                                    |
|                                 |                           | -2.3                      | -53.5                             |                              |                                      |                         | -38                                                      |
|                                 |                           | -2.1                      | -46.5                             |                              |                                      |                         | -31                                                      |
|                                 |                           | -2.0                      | -50.5                             |                              |                                      |                         | -35                                                      |
|                                 |                           | -1.7                      | -44                               |                              |                                      |                         | -23.5                                                    |
|                                 |                           | -1.6                      | -57                               |                              |                                      |                         | -21.5                                                    |
|                                 |                           | -1.4                      | -40                               |                              |                                      |                         | -24.5                                                    |

### Measurement Instructions

For each transmitter standard test frequency take data to determine the received power density per kc of bandwidth for each transmitter spurious output. Take enough points  $\Delta f$  about the spurious output maximum to describe the envelope of the spurious output.

Use reverse side for block diagram and remarks.

# TRANSMITTER MEASUREMENT

## EMISSION SPECTRUM

Photographs are required.

Xmtr. & Site Identification: ARSR-1B-A 5110.11 Date: 12/13/62

Xmtr. Serial No.: 54 BW of Measuring Instrument: 20 kc

Tuning Band (Mc): 1240-1350 Cable Type & Length: 100' RG-260/U

Significant Control Positions: Radar Antenna Linear 6' RG-8/U

Polarization (Horizontal) Transmitter B, Time 1543, 1601

Measuring Devices: Weinschel Attenuators Type 210, FXR&RIC Filters

Polarad SA-84, HP 614A, HP-540B, Lavoie LA-70A, Polarad CA-L

Modulation: Pulse PW( $\mu$ s): 1.8 PRF(pps): 360

| Xmtr.<br>Tuned<br>Freq.<br>(Mc) | Freq.<br>Analyzed<br>(Mc) | $\Delta f$<br>( $\pm$ Mc) | Signal<br>Gen.<br>Output<br>(dbm) | Test<br>Ant.<br>Gain<br>(db) | Atten-<br>uation<br>Inserted<br>(db) | Cable<br>Losses<br>(db) | Spectral<br>Power<br>Density<br>(dta/kc/m <sup>2</sup> ) |
|---------------------------------|---------------------------|---------------------------|-----------------------------------|------------------------------|--------------------------------------|-------------------------|----------------------------------------------------------|
| 1257.8                          | 1258.5                    | -1.2                      |                                   | 10                           | 10                                   | 5.1                     |                                                          |
|                                 |                           | -1.1                      | -54                               |                              | 30                                   |                         | -18.5                                                    |
|                                 |                           | -.9                       | -38                               |                              | 10                                   |                         | -22.5                                                    |
|                                 |                           | -.8                       | -53                               |                              | 30                                   |                         | -17.5                                                    |
|                                 |                           | -.7                       | -38                               |                              | 10                                   |                         | -22.5                                                    |
|                                 |                           | -.6                       | -48.5                             |                              | 30                                   |                         | -13.0                                                    |
|                                 |                           | -.5                       | -53                               |                              | 30                                   |                         | -17.5                                                    |
|                                 |                           | -.4                       |                                   |                              | 10                                   |                         |                                                          |
|                                 |                           | -.3                       | -50                               |                              | 30                                   |                         | -14.5                                                    |
|                                 |                           | -.2                       | -42.5                             |                              | 30                                   |                         | -7.0                                                     |
|                                 |                           | 0                         | -39                               |                              | 30                                   |                         | -3.5                                                     |
|                                 |                           | .2                        | -42.5                             |                              | 30                                   |                         | -7.0                                                     |
|                                 |                           | .40                       | -50                               |                              | 30                                   |                         | -14.5                                                    |
|                                 |                           | .6                        | -38                               |                              | 10                                   |                         | -22.5                                                    |
|                                 |                           | .8                        | -57.5                             |                              | 30                                   |                         | -22.0                                                    |
|                                 |                           | .9                        | -57.5                             |                              | 30                                   |                         | -22.0                                                    |
|                                 |                           | 1.0                       | -43.5                             |                              | 10                                   |                         | -23.0                                                    |
|                                 |                           | 1.1                       |                                   |                              |                                      |                         |                                                          |
|                                 |                           | 1.2                       | -54.5                             |                              | 10                                   |                         | -39.0                                                    |
|                                 |                           | 1.4                       | -50.5                             |                              | 10                                   |                         | -35.0                                                    |
|                                 |                           | 1.7                       | -54                               |                              | 10                                   |                         | -38.5                                                    |
|                                 |                           | 1.9                       | -57                               |                              | 10                                   |                         | -41.5                                                    |
|                                 |                           | 2.0                       | -59.5                             |                              | 10                                   |                         | -35.0                                                    |

### Measurement Instructions

For each transmitter standard test frequency take data to determine the received power density per kc of bandwidth for each transmitter spurious output. Take enough points  $\Delta f$  about the spurious output maximum to describe the envelope of the spurious output.

Use reverse side for block diagram and remarks.

## TRANSMITTER MEASUREMENT EMISSION SPECTRUM

**Photographs are required.**

Xmtr. & Site Identification: ARSR-1B-A 5110.11 Date: 12/13/62

**Xmtr. Serial No.:** 54      **BW of Measuring Instrument:** 20 kc

**Tuning Band (Mc): 1240-1350**      **Cable Type & Length: 100'RG-260/U**

**Significant Control Positions: Radar Antenna Linear** 6'RG-8/U

**Polarization (Horizontal) Transmitter B, Time 1543, 1601**

**Measuring Devices:** Weinschel Attenuators Type 210, FXR&RLC Filters.

**Polarad SA-84, HP-614A, HP-540B, Lavoie LA-70A, Polarad CA-L**

Modulation: Pulse PW( $\mu$ s): 1.8 PRF(pps): 360

[illegible]

### Measurement Instructions

For each transmitter standard test frequency take data to determine the received power density per kc of bandwidth for each transmitter spurious output. Take enough points  $\Delta f$  about the spurious output maximum to describe the envelope of the spurious output.

Use reverse side for block diagram and remarks.

TRANSMITTER MEASUREMENT  
EMISSION SPECTRUM

Photographs are required.

Xmtr. & Site Identification: ARSR-1B-A 5110.11 Date: 12/13/62

Xmtr. Serial No.: 54 BW of Measuring Instrument: 20 kc

Tuning Band (Mc): 1240-1350 Cable Type & Length: 100'RG-260/U

Significant Control Positions: Radar Antenna Linear 6'RG-8/U

Polarization (Horizontal) Transmitter B, Time 1617

Measuring Devices: Weinschel Attenuators Type 210, FXR&RLC Filters

Polarad SA-84, HP-614A, HP-540B, Lavoie LA-70A, Polarad CA-L

Modulation: Pulse PW( $\mu$ s): 1.8 PRF(pps): 360

| Xmtr.<br>Tuned<br>Freq.<br>(Mc) | Freq.<br>Analyzed<br>(Mc) | $\Delta f$<br>( $\pm$ Mc) | Signal<br>Gen.<br>Output<br>(dbm) | Test<br>Ant.<br>Gain<br>(db) | Atten-<br>uation<br>Inserted<br>(db) | Cable<br>Losses<br>(db) | Spectral<br>Power<br>Density<br>(dbm/kc/m <sup>2</sup> ) |
|---------------------------------|---------------------------|---------------------------|-----------------------------------|------------------------------|--------------------------------------|-------------------------|----------------------------------------------------------|
| 1257.8                          | 1367.8                    | -7.4                      | -61.0                             | 10.6                         | 10.0                                 | 5.4                     | -45.1                                                    |
|                                 |                           | -5.6                      | -58.5                             |                              |                                      |                         | -42.6                                                    |
|                                 |                           | -3.4                      | -56.5                             |                              |                                      |                         | -40.6                                                    |
|                                 |                           | -2.9                      | -55.5                             |                              |                                      |                         | -39.6                                                    |
|                                 |                           | -1.1                      | -53.4                             |                              |                                      |                         | -37.5                                                    |
|                                 |                           | -0.7                      | -51.5                             |                              |                                      |                         | -35.6                                                    |
|                                 |                           | 0.0                       | -44.0                             |                              |                                      |                         | -28.1                                                    |
|                                 |                           | 0.7                       | -52.5                             |                              |                                      |                         | -36.5                                                    |
|                                 |                           | 1.1                       | -53.0                             |                              |                                      |                         | -37.0                                                    |
|                                 |                           | 2.2                       | -56.0                             |                              |                                      |                         | -40.5                                                    |
|                                 |                           | 3.8                       | -52.8                             |                              |                                      |                         | -36.8                                                    |
|                                 |                           | 5.6                       | -51.9                             |                              |                                      |                         | -35.9                                                    |
|                                 |                           | 6.3                       | -52.1                             |                              |                                      |                         | -36.1                                                    |
|                                 |                           | 6.9                       | -53.8                             |                              |                                      |                         | -37.8                                                    |
|                                 |                           | 9.0                       | -53.5                             |                              |                                      |                         | -37.5                                                    |
|                                 |                           | 10.0                      | -56.0                             |                              |                                      |                         | -40.0                                                    |
| ✓                               | ✓                         | 12.3                      | -57.6                             | ✓                            | ✓                                    | ✓                       | -41.6                                                    |
|                                 |                           |                           |                                   |                              |                                      |                         |                                                          |
|                                 |                           |                           |                                   |                              |                                      |                         |                                                          |
|                                 |                           |                           |                                   |                              |                                      |                         |                                                          |
|                                 |                           |                           |                                   |                              |                                      |                         |                                                          |

Measurement Instructions

For each transmitter standard test frequency take data to determine the received power density per kc of bandwidth for each transmitter spurious output. Take enough points  $\Delta f$  about the spurious output maximum to describe the envelope of the spurious output.

Use reverse side for block diagram and remarks.

TRANSMITTER MEASUREMENT  
EMISSION SPECTRUM

Photographs are required.

Xmtr. & Site Identification: ARSR-1B-A, 5110.11 Date: 12/14/62

Xmtr. Serial No.: 54 BW of Measuring Instrument: 20 kc

Tuning Band (Mc): 1240-1350 Cable Type & Length: 100'RG-260/U

Significant Control Positions: Radar Antenna Linear 6'RG-8/U

Polarization (Horizontal) Transmitter B, Time 1847

Measuring Devices: Weinschel Attenuators Type 210, FXR&RLC Filters

Polarad SA-84, HP-616B, HP-540B, Lavoie LA-70A, Polarad CA-S

Modulation: Pulse PW( $\mu$ s): 1.8 PRF(pps): 360

| Xmtr.<br>Tuned<br>Freq.<br>(Mc) | Freq.<br>Analyzed<br>(Mc) | $\Delta f$<br>( $\pm$ Mc) | Signal<br>Gen.<br>Output<br>(dbm) | Test<br>Ant.<br>Gain<br>(db) | Atten-<br>uation<br>Inserted<br>(db) | Cable<br>Losses<br>(db) | Spectral<br>Power<br>Density<br>(dbm/kc/m <sup>2</sup> ) |
|---------------------------------|---------------------------|---------------------------|-----------------------------------|------------------------------|--------------------------------------|-------------------------|----------------------------------------------------------|
| 1257.8                          | 2515.3                    | -.61                      | -92.5                             | 16.8                         | 0                                    | 7.5                     | -85.4                                                    |
|                                 |                           | -.58                      | -86.4                             |                              |                                      |                         | -79.3                                                    |
|                                 |                           | -.55                      | -83.3                             |                              |                                      |                         | -76.2                                                    |
|                                 |                           | -.50                      | -81.7                             |                              |                                      |                         | -74.6                                                    |
|                                 |                           | -.41                      | -80.4                             |                              |                                      |                         | -73.3                                                    |
|                                 |                           | -.28                      | -78.8                             |                              |                                      |                         | -71.7                                                    |
|                                 |                           | -.28                      | -77.4                             |                              |                                      |                         | -70.3                                                    |
|                                 |                           | -.17                      | -76.7                             |                              |                                      |                         | -69.6                                                    |
|                                 |                           | -.14                      | -76.3                             |                              |                                      |                         | -69.2                                                    |
|                                 |                           | -.11                      | -75.0                             |                              |                                      |                         | -67.9                                                    |
|                                 |                           | 0                         | -74.7                             |                              |                                      |                         | -67.6                                                    |
|                                 |                           | .17                       | -76.3                             |                              |                                      |                         | -69.2                                                    |
|                                 |                           | .19                       | -77.0                             |                              |                                      |                         | -69.9                                                    |
|                                 |                           | .25                       | -76.9                             |                              |                                      |                         | -69.8                                                    |
|                                 |                           | .28                       | -77.4                             |                              |                                      |                         | -70.3                                                    |
|                                 |                           | .30                       | -78.0                             |                              |                                      |                         | -70.9                                                    |
|                                 |                           | .33                       | -78.8                             |                              |                                      |                         | -71.7                                                    |
|                                 |                           | .36                       | -80.4                             |                              |                                      |                         | -73.3                                                    |
|                                 |                           | .44                       | -81.7                             |                              |                                      |                         | -74.6                                                    |
|                                 |                           | .47                       | -83.3                             |                              |                                      |                         | -76.2                                                    |
|                                 |                           | .55                       | -86.4                             |                              |                                      |                         | -79.3                                                    |
|                                 |                           | .66                       | -92.5                             |                              |                                      |                         | -85.4                                                    |

Measurement Instructions

For each transmitter standard test frequency take data to determine the received power density per kc of bandwidth for each transmitter spurious output. Take enough points  $\Delta f$  about the spurious output maximum to describe the envelope of the spurious output.

Use reverse side for block diagram and remarks.

**TRANSMITTER MEASUREMENT**  
**EMISSION SPECTRUM**

**Photographs are required.**

Xmtr. & Site Identification: ARSR-1B-A 5110.11 Date: 12/14/62

Xmtr. Serial No.: 54 BW of Measuring Instrument: 20 kc

**Tuning Band (Mc):** 1240-1350 **Cable Type & Length:** 100' RG-260/U

Significant Control Positions: Radar Antenna Linear

Polarization, (Horizontal), Transmitter B, Time 1900

**Measuring Devices:** Weinschel Attenuators Type 210, FXR&RLC Filters

Polarad SA-84, HP-616B, HP-540B, Lavoie LA-70A, Polarad CA-S

Modulation: Pulse PW( $\mu$ s): 1.8 PRF(pps): 360

[illegible]

### Measurement Instructions

For each transmitter standard test frequency take data to determine the received power density per kc of bandwidth for each transmitter spurious output. Take enough points  $\Delta f$  about the spurious output maximum to describe the envelope of the spurious output.

Use reverse side for block diagram and remarks.

## TRANSMITTER MEASUREMENT EMISSION SPECTRUM

**Photographs are required.**

Xmtr. & Site Identification: ARSR-1B-A 5110.11 Date: 12/10/62

Xmtr. Serial No.: 54      BW of Measuring Instrument: 20 kc

**Tuning Band (Mc): 1240-1350      Cable Type & Length: 100'RG-260/U**

**Significant Control Positions: Radar Antenna Linear**

**Polarization (Horizontal) Transmitter B, Time 1750, 1800**

**Measuring Devices:** Weinschel Attenuators Type 210. FXR&RLC Filters

Polarad SA-84. HP-614A. HP-540B. Iavoie LA-70A. Polarad CA-1.

Modulation: Pulse PW( $\mu$ s): 1.8 PRF(pps): 360

[illegible]

## Measurement Instructions

For each transmitter standard test frequency take data to determine the received power density per kc of bandwidth for each transmitter spurious output. Take enough points  $\Delta f$  about the spurious output maximum to describe the envelope of the spurious output.

Use reverse side for block diagram and remarks.

**TRANSMITTER MEASUREMENT**  
**EMISSION SPECTRUM**

Photographs are required.

Xmtr. & Site Identification: ARSR-1B-A 5110.11 Date: 12/10/62

Xmtr. Serial No.: 54 BW of Measuring Instrument: 20 kc

Tuning Band (Mc): 1240-1350 Cable Type & Length: 100'RG-260/U

Significant Control Positions: Radar Antenna Linear 6'RG-8/U

Polarization, (Horizontal), Transmitter B, Time 1535

Measuring Devices: Weinschel Attenuators Type 210, FXR&RLC Filters

Polarad SA-84, HP-614A, HP-540B, Lavoie LA-70A, Polarad CA-L

Modulation: Pulse PW( $\mu$ s): 1.8 PRF(pps): 360

| Xmtr.<br>Tuned<br>Freq.<br>(Mc) | Freq.<br>Analyzed<br>(Mc) | $\Delta f$<br>( $\pm$ Mc) | Signal<br>Gen.<br>Output<br>(dbm) | Test<br>Ant.<br>Gain<br>(db) | Atten-<br>uation<br>Inserted<br>(db) | Cable<br>Losses<br>(db) | Spectral<br>Power<br>Density<br>(dbm/kc/m <sup>2</sup> ) |
|---------------------------------|---------------------------|---------------------------|-----------------------------------|------------------------------|--------------------------------------|-------------------------|----------------------------------------------------------|
| 1297.8                          | 1079.3                    | -8.8                      | -64.8                             | 8.8                          | 0                                    | 4.5                     | -60.1                                                    |
|                                 |                           | -7.3                      | -60.0                             |                              |                                      |                         | -55.3                                                    |
|                                 |                           | -5.4                      | -54.3                             |                              |                                      |                         | -49.6                                                    |
|                                 |                           | -3.5                      | -52.5                             |                              |                                      |                         | -47.8                                                    |
|                                 |                           | -2.3                      | -57.8                             |                              |                                      |                         | -53.1                                                    |
|                                 |                           | -1.9                      | -54.3                             |                              |                                      |                         | -49.6                                                    |
|                                 |                           | -1.2                      | -51.0                             |                              |                                      |                         | -46.3                                                    |
|                                 |                           | -0.8                      | -47.5                             |                              |                                      |                         | -42.7                                                    |
|                                 |                           | -0.4                      | -53.0                             |                              |                                      |                         | -48.2                                                    |
|                                 |                           | 0                         | -46.0                             |                              |                                      |                         | -41.2                                                    |
|                                 |                           | 1.2                       | -53.2                             |                              |                                      |                         | -48.4                                                    |
|                                 |                           | 1.9                       | -55.8                             |                              |                                      |                         | -51.0                                                    |
|                                 |                           | 2.7                       | -60.8                             |                              |                                      |                         | -56.0                                                    |
|                                 |                           | 3.5                       | -56.0                             |                              |                                      |                         | -51.2                                                    |
|                                 |                           | 5.0                       | -61.8                             | 8.9                          |                                      |                         | -57.0                                                    |
|                                 |                           | 10.4                      | -59.2                             |                              |                                      |                         | -54.4                                                    |
|                                 |                           | 13.4                      | -63.0                             |                              |                                      |                         | -58.2                                                    |
|                                 |                           | 15.0                      | -63.0                             |                              |                                      |                         | -58.2                                                    |
|                                 |                           | 18.0                      | -59.2                             |                              |                                      |                         | -54.4                                                    |
|                                 |                           | 20.3                      | -62.5                             |                              |                                      |                         | -57.7                                                    |
|                                 |                           |                           |                                   |                              |                                      |                         |                                                          |
|                                 |                           |                           |                                   |                              |                                      |                         |                                                          |
|                                 |                           |                           |                                   |                              |                                      |                         |                                                          |

**Measurement Instructions**

For each transmitter standard test frequency take data to determine the received power density per kc of bandwidth for each transmitter spurious output. Take enough points  $\Delta f$  about the spurious output maximum to describe the envelope of the spurious output.

Use reverse side for block diagram and remarks.

# **TRANSMITTER MEASUREMENT** **EMISSION SPECTRUM**

Photographs are required.

Xmtr. & Site Identification: ARSR-1B-A 5110.11 Date: 12/10/62

Xmtr. Serial No.: 54 BW of Measuring Instrument: 20 kc

Tuning Band (Mc): 1240-1350 Cable Type & Length: 100'RG-260/U

Significant Control Positions: Radar Antenna Linear 6'RG-8/U

Polarization (Horizontal), Transmitter B, Time 1845, 1910

Measuring Devices: Weinschel Attenuators Type 210, FXR&RLC Filters

Polarad SA-84, HP-614A, HP-540B, Lavoie LA-70A, Polarad CA-L

Modulation: Pulse PW(μs): 1.8 PRF(pps): 360

| Xmtr.<br>Tuned<br>Freq.<br>(Mc) | Freq.<br>Analyzed<br>(Mc) | Δf<br>(±Mc) | Signal<br>Gen.<br>Output<br>(dbm) | Test<br>Ant.<br>Gain<br>(db) | Atten-<br>uation<br>Inserted<br>(db) | Cable<br>Losses<br>(db) | Spectral<br>Power<br>Density<br>(dbm/kc/m²) |
|---------------------------------|---------------------------|-------------|-----------------------------------|------------------------------|--------------------------------------|-------------------------|---------------------------------------------|
| 1297.8                          | 1191.9                    | -9.2        | -65.2                             | 9.6                          | 0                                    | 4.9                     | -60.0                                       |
|                                 |                           | -5.8        | -62.7                             |                              |                                      |                         | -57.5                                       |
|                                 |                           | -5.4        | -59.8                             |                              |                                      |                         | -54.6                                       |
|                                 |                           | -4.8        | -57.9                             |                              |                                      |                         | -52.7                                       |
|                                 |                           | -4.4        | -60.0                             |                              |                                      |                         | -54.8                                       |
|                                 |                           | -4.2        | -57.2                             |                              |                                      |                         | -52.0                                       |
|                                 |                           | -3.9        | -59.8                             |                              |                                      |                         | -54.6                                       |
|                                 |                           | -3.7        | -56.8                             |                              | 10                                   |                         | -41.6                                       |
|                                 |                           | -3.4        | -61.2                             |                              | 0                                    |                         | -56.0                                       |
|                                 |                           | -3.2        | -56.8                             |                              | 10                                   |                         | -41.6                                       |
|                                 |                           | -3.0        | -61.5                             |                              | 0                                    |                         | -56.3                                       |
|                                 |                           | -2.8        | -56.2                             |                              | 10                                   |                         | -41.0                                       |
|                                 |                           | -2.6        | -59.9                             |                              | 0                                    |                         | -54.7                                       |
|                                 |                           | -2.3        | -53.5                             |                              | 10                                   |                         | -33.3                                       |
|                                 |                           | -2.1        | -70.0                             |                              | 0                                    |                         | -64.8                                       |
|                                 |                           | -1.9        | -51.0                             |                              | 10                                   |                         | -35.8                                       |
|                                 |                           | -1.6        | -70.0                             |                              | 0                                    |                         | -64.8                                       |
|                                 |                           | -1.3        | -48.0                             |                              | 10                                   |                         | -32.3                                       |
|                                 |                           | -1.0        | -53.1                             |                              |                                      |                         | -42.9                                       |
|                                 |                           | -0.6        | -45.0                             |                              |                                      |                         | -29.8                                       |
|                                 |                           | -0.3        | -50.0                             |                              |                                      |                         | -34.3                                       |
|                                 |                           | 0.0         | -41.0                             |                              |                                      |                         | -25.8                                       |
|                                 |                           | 0.9         | -53.1                             |                              |                                      |                         | -42.9                                       |

## **Measurement Instructions**

For each transmitter standard test frequency take data to determine the received power density per kc of bandwidth for each transmitter spurious output. Take enough points Δf about the spurious output maximum to describe the envelope of the spurious output.

Use reverse side for block diagram and remarks.

## TRANSMITTER MEASUREMENT EMISSION SPECTRUM

**Photographs are required.**

Xmtr. & Site Identification: ARSR-1B-A 5110.11 Date: 12/10/62

Xmtr. Serial No.: 54 BW of Measuring Instrument: 20 kc

**Tuning Band (Mc):** 1240-1350      **Cable Type & Length:** 100' RG-260/U

**Significant Control Positions: Radar Antenna Linear** 6' RG-8/U

Polarization. (Horizontal). Transmitter B. Time 1845. 1910

**Measuring Devices:** Weinschel Attenuators Type 210, FXR&RLC Filters.

Polarad SA-84, HP-614A, HP-540B, Lavoie LA-70A, Polarad CA-L

Modulation: Pulse PW( $\mu$ s): 1.8 PRF(pps): 360

[illegible]

## Measurement Instructions

For each transmitter standard test frequency take data to determine the received power density per kc of bandwidth for each transmitter spurious output. Take enough points  $\Delta f$  about the spurious output maximum to describe the envelope of the spurious output.

Use reverse side for block diagram and remarks.

**TRANSMITTER MEASUREMENT**  
**EMISSION SPECTRUM**

Photographs are required.

Xmtr. & Site Identification: ARSR-1B-A 5110.11 Date: 12/10/62

Xmtr. Serial No.: 54 BW of Measuring Instrument: 20 kc

Tuning Band (Mc): 1240-1350 Cable Type & Length: 100'RG-260/U

Significant Control Positions: Radar Antenna Linear 6'RG-8/U

Polarization (Horizontal) Transmitter B, Time 1925

Measuring Devices: Weinschel Attenuators Type 210, RXL&RLC Filters

Polarad SA-84, HP-614A, HP-540B, Lavoie LA-70A, Polarad CA-L

Modulation: Pulse PW( $\mu$ s): 1.8 PRF(pps): 360

| Xmtr.<br>Tuned<br>Freq.<br>(Mc) | Freq.<br>Analyzed<br>(Mc) | $\Delta f$<br>( $\pm$ Mc) | Signal<br>Gen.<br>Output<br>(dbm) | Test<br>Ant.<br>Gain<br>(db) | Atten-<br>uation<br>Inserted<br>(db) | Cable<br>Losses<br>(db) | Spectral<br>Power<br>Density<br>(dbm/kc/m <sup>2</sup> ) |
|---------------------------------|---------------------------|---------------------------|-----------------------------------|------------------------------|--------------------------------------|-------------------------|----------------------------------------------------------|
| 1297.8                          | 1394.9                    | -3.3                      | null                              | 10.8                         | 10.0                                 | 5.5                     |                                                          |
|                                 |                           | -3.2                      | -66.8                             |                              |                                      |                         | -50.8                                                    |
|                                 |                           | -2.9                      | null                              |                              |                                      |                         |                                                          |
|                                 |                           | -2.7                      | -66.1                             |                              |                                      |                         | -50.1                                                    |
|                                 |                           | -2.5                      | null                              |                              |                                      |                         |                                                          |
|                                 |                           | -2.3                      | -64.8                             |                              |                                      |                         | -48.8                                                    |
|                                 |                           | -2.1                      | null                              |                              |                                      |                         |                                                          |
|                                 |                           | -1.8                      | -62.5                             |                              |                                      |                         | -46.5                                                    |
|                                 |                           | -1.6                      | null                              |                              |                                      |                         |                                                          |
|                                 |                           | -1.3                      | -58.2                             |                              |                                      |                         | -42.2                                                    |
|                                 |                           | -1.0                      | -66.1                             |                              |                                      |                         | -50.1                                                    |
|                                 |                           | -0.7                      | -54.4                             |                              |                                      |                         | -38.4                                                    |
|                                 |                           | -0.4                      | -57.5                             |                              |                                      |                         | -41.5                                                    |
|                                 |                           | 0.0                       | -49.0                             |                              |                                      |                         | -33.0                                                    |
|                                 |                           | 0.6                       | -56.7                             |                              |                                      |                         | -40.7                                                    |
|                                 |                           | 1.0                       | -67.6                             |                              |                                      |                         | -51.6                                                    |
|                                 |                           | -1.1                      | null                              |                              |                                      |                         |                                                          |
|                                 |                           |                           |                                   |                              |                                      |                         |                                                          |
|                                 |                           |                           |                                   |                              |                                      |                         |                                                          |
|                                 |                           |                           |                                   |                              |                                      |                         |                                                          |
|                                 |                           |                           |                                   |                              |                                      |                         |                                                          |
|                                 |                           |                           |                                   |                              |                                      |                         |                                                          |
|                                 |                           |                           |                                   |                              |                                      |                         |                                                          |

**Measurement Instructions**

For each transmitter standard test frequency take data to determine the received power density per kc of bandwidth for each transmitter spurious output. Take enough points  $\Delta f$  about the spurious output maximum to describe the envelope of the spurious output.

Use reverse side for block diagram and remarks.

# **TRANSMITTER MEASUREMENT** **EMISSION SPECTRUM**

Photographs are required.

Xmtr. & Site Identification: ARSR-1B-A 5110.11 Date: 12/10/62

Xmtr. Serial No.: 54 BW of Measuring Instrument: 20 kc

Tuning Band (Mc): 1240-1350 Cable Type & Length: 100'RG-260/U

Significant Control Positions: Radar Antenna Linear 6'RG-8/U

Polarization, (Horizontal), Transmitter B, Time 1940

Measuring Devices: Weinschel Attenuators Type 210, FXR&RLC Filters

Polarad SA-84, HP-614, HP-540B, Lavoie LA-70A, Polarad CA-L

Modulation: Pulse PW( $\mu$ s): 1.8 PRF(pps): 360

| Xmtr.<br>Tuned<br>Freq.<br>(Mc) | Freq.<br>Analyzed<br>(Mc) | $\Delta f$<br>( $\pm$ Mc) | Signal<br>Gen.<br>Output<br>(dbm) | Test<br>Ant.<br>Gain<br>(db) | Atten-<br>uation<br>Inserted<br>(db) | Cable<br>Losses<br>(db) | Spectral<br>Power<br>Density<br>(dbm/kc/m <sup>2</sup> ) |
|---------------------------------|---------------------------|---------------------------|-----------------------------------|------------------------------|--------------------------------------|-------------------------|----------------------------------------------------------|
| 1297.8                          | 1641.7                    | -3.4                      | -65.8                             | 12.0                         | 0                                    | 6.0                     | -59.1                                                    |
|                                 |                           | -3.2                      | -59.9                             |                              |                                      |                         | -53.2                                                    |
|                                 |                           | -2.9                      | -65.8                             |                              |                                      |                         | -59.1                                                    |
|                                 |                           | -2.7                      | -59.2                             |                              |                                      |                         | -52.5                                                    |
|                                 |                           | -2.4                      | -65.8                             |                              |                                      |                         | -59.1                                                    |
|                                 |                           | -2.1                      | -57.0                             |                              |                                      |                         | -50.3                                                    |
|                                 |                           | -1.9                      | -65.8                             |                              |                                      |                         | -59.1                                                    |
|                                 |                           | -1.5                      | -54.0                             |                              |                                      |                         | -47.3                                                    |
|                                 |                           | -1.2                      | -61.5                             |                              |                                      |                         | -54.8                                                    |
|                                 |                           | -0.9                      | -50.8                             |                              |                                      |                         | -44.1                                                    |
|                                 |                           | -0.6                      | -57.7                             |                              |                                      |                         | -51.0                                                    |
|                                 |                           | 0.0                       | -48.5                             |                              |                                      |                         | -41.8                                                    |
|                                 |                           | 0.3                       | -50.8                             |                              |                                      |                         | -44.1                                                    |
|                                 |                           | 0.7                       | -60.8                             |                              |                                      |                         | -54.1                                                    |
|                                 |                           | 0.9                       | -62.8                             |                              |                                      |                         | -56.1                                                    |
|                                 |                           | 1.1                       | -60.8                             |                              |                                      |                         | -54.1                                                    |
|                                 |                           | 1.7                       | -65.8                             |                              |                                      |                         | -59.1                                                    |
|                                 |                           |                           |                                   |                              |                                      |                         |                                                          |
|                                 |                           |                           |                                   |                              |                                      |                         |                                                          |
|                                 |                           |                           |                                   |                              |                                      |                         |                                                          |
|                                 |                           |                           |                                   |                              |                                      |                         |                                                          |
|                                 |                           |                           |                                   |                              |                                      |                         |                                                          |
|                                 |                           |                           |                                   |                              |                                      |                         |                                                          |

## **Measurement Instructions**

For each transmitter standard test frequency take data to determine the received power density per kc of bandwidth for each transmitter spurious output. Take enough points  $\Delta f$  about the spurious output maximum to describe the envelope of the spurious output.

Use reverse side for block diagram and remarks.

# **TRANSMITTER MEASUREMENT** **EMISSION SPECTRUM**

Photographs are required.

Xmtr. & Site Identification: ARSR-1B-A 5110.11 Date: 12/10/62

Xmtr. Serial No.: 54 BW of Measuring Instrument: 20 kc

Tuning Band (Mc): 1240-1350 Cable Type & Length: 100' RG-260/U

Significant Control Positions: Radar Antenna Linear 6' RG-8/U

Polarization (Horizontal) Transmitter B. Time 2010. 2018

Measuring Devices: Weinschel Attenuators Type 210: EXR&RIC Filters

Polarad SA-84, HP-614A, HP-540B, Lavoie LA-70A, Polarad CA-L

Modulation: Pulse PW( $\mu$ s): 1.8 PRF(pps): 360

| Xmtr.<br>Tuned<br>Freq.<br>(Mc) | Freq.<br>Analyzed<br>(Mc) | $\Delta f$<br>( $\pm$ Mc) | Signal<br>Gen.<br>Output<br>(dbm) | Test<br>Ant.<br>Gain<br>(db) | Atten-<br>uation<br>Inserted<br>(db) | Cable<br>Losses<br>(db) | Spectral<br>Power<br>Density<br>(dbm/kc/m <sup>2</sup> ) |
|---------------------------------|---------------------------|---------------------------|-----------------------------------|------------------------------|--------------------------------------|-------------------------|----------------------------------------------------------|
| 1297.8                          | 1786.2                    | -4.2                      | -68                               | 12.6                         | 10                                   | 6.1                     | -51.1                                                    |
|                                 |                           | -4.0                      | -72.5                             |                              |                                      |                         | -55.6                                                    |
|                                 |                           | -3.4                      | -62.9                             |                              |                                      |                         | -46.0                                                    |
|                                 |                           | -3.2                      | -65.8                             |                              |                                      |                         | -48.9                                                    |
|                                 |                           | -2.9                      | -61.5                             |                              |                                      |                         | -44.6                                                    |
|                                 |                           | -2.8                      | -64.0                             |                              |                                      |                         | -47.1                                                    |
|                                 |                           | -2.5                      | -65.2                             |                              | 20                                   |                         | -38.3                                                    |
|                                 |                           | -2.3                      | -63.5                             |                              | 10                                   |                         | -46.6                                                    |
|                                 |                           | -2.1                      | -63.0                             |                              | 20                                   |                         | -36.1                                                    |
|                                 |                           | -1.9                      | -63.5                             |                              | 10                                   |                         | -46.6                                                    |
|                                 |                           | -1.6                      | -61.7                             |                              | 20                                   |                         | -34.8                                                    |
|                                 |                           | -1.5                      | -63.5                             |                              | 10                                   |                         | -46.6                                                    |
|                                 |                           | -1.2                      | -59.2                             |                              | 20                                   |                         | -32.3                                                    |
|                                 |                           | -0.9                      | null                              |                              | 20                                   |                         |                                                          |
|                                 |                           | -0.6                      | -55.9                             |                              | 20                                   |                         | -29.0                                                    |
|                                 |                           | -0.3                      | -62.0                             |                              | 20                                   |                         | -35.1                                                    |
|                                 |                           | 0                         | -43.3                             |                              | 20                                   |                         | -21.4                                                    |
|                                 |                           | 0.4                       | -53.0                             |                              | 10                                   |                         | -39.1                                                    |
|                                 |                           | 1.0                       | -72.5                             |                              | 10                                   |                         | -55.6                                                    |
|                                 |                           | 1.3                       | -64.0                             |                              | 10                                   |                         | -47.1                                                    |
|                                 |                           | 1.7                       | -63.0                             |                              | 10                                   |                         | -51.1                                                    |
|                                 |                           |                           |                                   |                              |                                      |                         |                                                          |
|                                 |                           |                           |                                   |                              |                                      |                         |                                                          |

## **Measurement Instructions**

For each transmitter standard test frequency take data to determine the received power density per kc of bandwidth for each transmitter spurious output. Take enough points  $\Delta f$  about the spurious output maximum to describe the envelope of the spurious output.

Use reverse side for block diagram and remarks.

# TRANSMITTER MEASUREMENT EMISSION SPECTRUM

Photographs are required.

Xmtr. & Site Identification: ARSR-1B-A 5110.11 Date: 12/11/62

Xmtr. Serial No.: 54 BW of Measuring Instrument: 20 kc

Tuning Band (Mc): 1240-1350 Cable Type & Length: 100'RG-260/U

Significant Control Positions: Radar Antenna Linear 6'RG-8/U

Polarization (Horizontal) Transmitter B, Time 1350

Measuring Devices: Weinschel Attenuators Type 210, FXR&RLC Filters

Polarad SA-84, HP-616B, HP-540B, Lavoie LA-70A, Polarad CA-S

Modulation: Pulse PW( $\mu$ s): 1.8 PRF(pps): 360

| Xmtr.<br>Tuned<br>Freq.<br>(Mc) | Freq.<br>Analyzed<br>(Mc) | $\Delta f$<br>( $\pm$ Mc) | Signal<br>Gen.<br>Output<br>(dbm) | Test<br>Ant.<br>Gain<br>(db) | Atten-<br>uation<br>Inserted<br>(db) | Cable<br>Losses<br>(db) | Spectral<br>Power<br>Density<br>(dbm/kc/m <sup>2</sup> ) |
|---------------------------------|---------------------------|---------------------------|-----------------------------------|------------------------------|--------------------------------------|-------------------------|----------------------------------------------------------|
| 1297.8                          | 2944.3                    | -1.4                      | -85.3                             | 17.8                         | 0                                    | 8.2                     | -77.1                                                    |
|                                 |                           | -1.1                      | -80.0                             |                              |                                      |                         | -71.8                                                    |
|                                 |                           | -0.8                      | -75.7                             |                              |                                      |                         | -67.5                                                    |
|                                 |                           | -0.6                      | -75.7                             |                              |                                      |                         | -67.5                                                    |
|                                 |                           | -0.3                      | -78.0                             |                              |                                      |                         | -69.8                                                    |
|                                 |                           | -0.2                      | -76.1                             |                              |                                      |                         | -67.9                                                    |
|                                 |                           | 0                         | -75.7                             |                              |                                      |                         | -67.5                                                    |
|                                 |                           | 0.1                       | -75.3                             |                              |                                      |                         | -67.1                                                    |
|                                 |                           | 0.5                       | -77.3                             |                              |                                      |                         | -69.1                                                    |
|                                 |                           | 0.7                       | -82.3                             |                              |                                      |                         | -74.1                                                    |
|                                 |                           | 0.8                       | -85.3                             |                              |                                      |                         | -77.1                                                    |
|                                 |                           | 1.1                       | -85.3                             |                              |                                      |                         | -77.1                                                    |
|                                 |                           | 1.3                       | -82.3                             |                              |                                      |                         | -74.1                                                    |
|                                 |                           | 1.4                       | -80.5                             |                              |                                      |                         | -72.3                                                    |
|                                 |                           | 1.7                       | -80.5                             |                              |                                      |                         | -72.3                                                    |
|                                 |                           | 1.9                       | -82.3                             |                              |                                      |                         | -74.1                                                    |
|                                 |                           | 2.1                       | -84.5                             |                              |                                      |                         | -76.3                                                    |
|                                 |                           | 2.3                       | -83.8                             |                              |                                      |                         | -75.6                                                    |
|                                 |                           | 2.5                       | -85.3                             |                              |                                      |                         | -77.1                                                    |
|                                 |                           |                           |                                   |                              |                                      |                         |                                                          |
|                                 |                           |                           |                                   |                              |                                      |                         |                                                          |
|                                 |                           |                           |                                   |                              |                                      |                         |                                                          |

## Measurement Instructions

For each transmitter standard test frequency take data to determine the received power density per kc of bandwidth for each transmitter spurious output. Take enough points  $\Delta f$  about the spurious output maximum to describe the envelope of the spurious output.

Use reverse side for block diagram and remarks.

**TRANSMITTER MEASUREMENT**  
**EMISSION SPECTRUM**

Photographs are required.

Xmtr. & Site Identification: ARSR-1B-A 5110.11 Date: 12/15/62

Xmtr. Serial No.: 54 BW of Measuring Instrument: 20 kc

Tuning Band (Mc): 1240-1350 Cable Type & Length: 100' RG-260/U

Significant Control Positions: Radar Antenna Linear 6' RG-8/U

Polarization (Horizontal) Transmitter B, Time 1448, 1500

Measuring Devices: Weinschel Attenuators Type 210, FXR&RLC Filters

Polarad SA-84, HP-614A, HP-540B, Lavoie LA-70A, Polarad CA-L

Modulation: Pulse PW( $\mu$ s): 1.8 PRF(pps): 360

| Xmtr.<br>Tuned<br>Freq.<br>(Mc) | Freq.<br>Analyzed<br>(Mc) | $\Delta f$<br>( $\pm$ Mc) | Signal<br>Gen.<br>Output<br>(dbm) | Test<br>Ant.<br>Gain<br>(db) | Atten-<br>uation<br>Inserted<br>(db) | Cable<br>Losses<br>(db) | Spectral<br>Power<br>Density<br>(dbm/kc/m <sup>2</sup> ) |
|---------------------------------|---------------------------|---------------------------|-----------------------------------|------------------------------|--------------------------------------|-------------------------|----------------------------------------------------------|
| 1348.2                          | 1347.0                    | -6.27                     | -61.9                             | 10.8                         | 10.0                                 | 5.5                     | -46.2                                                    |
|                                 |                           | -4.98                     | -61.9                             |                              |                                      |                         | -46.2                                                    |
|                                 |                           | -4.86                     | -58.0                             |                              |                                      |                         | -42.3                                                    |
|                                 |                           | -4.73                     | -61.9                             |                              |                                      |                         | -46.2                                                    |
|                                 |                           | -4.48                     | -57.4                             |                              |                                      |                         | -41.7                                                    |
|                                 |                           | -4.22                     | -61.9                             |                              |                                      |                         | -46.2                                                    |
|                                 |                           | -4.09                     | -57.4                             |                              |                                      |                         | -41.7                                                    |
|                                 |                           | -3.97                     | -61.9                             |                              |                                      |                         | -46.2                                                    |
|                                 |                           | -3.84                     | -57.4                             |                              |                                      |                         | -41.7                                                    |
|                                 |                           | -3.71                     | -61.9                             |                              |                                      |                         | -46.2                                                    |
|                                 |                           | -3.45                     | -57.0                             |                              |                                      |                         | -41.3                                                    |
|                                 |                           | -3.33                     | -60.1                             |                              |                                      |                         | -44.4                                                    |
|                                 |                           | -3.07                     | -54.5                             |                              |                                      |                         | -38.8                                                    |
|                                 |                           | -2.94                     | -56.6                             |                              |                                      |                         | -40.9                                                    |
|                                 |                           | -2.68                     | -52.8                             |                              |                                      |                         | -37.1                                                    |
|                                 |                           | -2.43                     | -53.5                             |                              |                                      |                         | -37.8                                                    |
|                                 |                           | -2.17                     | -48.1                             |                              |                                      |                         | -32.4                                                    |
|                                 |                           | -2.05                     | -49.6                             |                              |                                      |                         | -33.9                                                    |
|                                 |                           | -1.92                     | -45.6                             |                              |                                      |                         | -29.9                                                    |
|                                 |                           | -1.79                     | -47.0                             |                              |                                      |                         | -31.3                                                    |
|                                 |                           | -1.77                     | -63.7                             |                              | 30.0                                 |                         | -28.0                                                    |
|                                 |                           | -1.57                     | -60.2                             |                              |                                      |                         | -24.5                                                    |
|                                 |                           | -1.33                     | -63.7                             |                              |                                      |                         | -28.0                                                    |

**Measurement Instructions**

For each transmitter standard test frequency take data to determine the received power density per kc of bandwidth for each transmitter spurious output. Take enough points  $\Delta f$  about the spurious output maximum to describe the envelope of the spurious output.

Use reverse side for block diagram and remarks.

**TRANSMITTER MEASUREMENT**  
**EMISSION SPECTRUM**

Photographs are required.

Xmtr. & Site Identification: ARSR-1B-A 5110.11 Date: 12/15/62

Xmtr. Serial No.: 54 BW of Measuring Instrument: 20 kc

Tuning Band (Mc): 1240-1350 Cable Type & Length: 100'RG-260/U

Significant Control Positions: Radar Antenna Linear 6'RG-8/U

Polarization (Horizontal) Transmitter B, Time 1448, 1500

Measuring Devices: Weinschel Attenuators Type 210, FXR&RLC Filters  
Polarad SA-84, HP-614A, HP-540B, Lavoie LA-70A, Polarad CA-L

Modulation: Pulse PW( $\mu$ s): 1.8 PRF(pps): 360

| Xmtr.<br>Tuned<br>Freq.<br>(Mc) | Freq.<br>Analyzed<br>(Mc) | $\Delta f$<br>( $\pm$ Mc) | Signal<br>Gen.<br>Output<br>(dbm) | Test<br>Ant.<br>Gain<br>(db) | Atten-<br>uation<br>Inserted<br>(db) | Cable<br>Losses<br>(db) | Spectral<br>Power<br>Density<br>(dbm/kc/m <sup>2</sup> ) |
|---------------------------------|---------------------------|---------------------------|-----------------------------------|------------------------------|--------------------------------------|-------------------------|----------------------------------------------------------|
| 1348.2                          | 1347.0                    | -1.14                     | -57.5                             | 10.8                         | 30.0                                 | 5.5                     | -21.8                                                    |
|                                 |                           | -.91                      | -62.0                             |                              |                                      |                         | -26.3                                                    |
|                                 |                           | -.67                      | -53.6                             |                              |                                      |                         | -17.9                                                    |
|                                 |                           | -.43                      | -59.6                             |                              |                                      |                         | -23.9                                                    |
|                                 |                           | 0                         | -43.5                             |                              |                                      |                         | -7.8                                                     |
|                                 |                           | .64                       | -50.8                             |                              | 10.0                                 |                         | -35.1                                                    |
|                                 |                           | 1.03                      | -43.0                             |                              |                                      |                         | -27.3                                                    |
|                                 |                           | 1.16                      | -52.8                             |                              |                                      |                         | -37.1                                                    |
|                                 |                           | 1.28                      | -49.0                             |                              |                                      |                         | -33.3                                                    |
|                                 |                           | 1.53                      | -54.5                             |                              |                                      |                         | -38.8                                                    |
|                                 |                           | 1.66                      | -52.9                             |                              |                                      |                         | -37.2                                                    |
|                                 |                           | 1.92                      | -54.7                             |                              |                                      |                         | -39.0                                                    |
|                                 |                           | 2.17                      | -52.9                             |                              |                                      |                         | -37.2                                                    |
|                                 |                           | 2.43                      | -57.0                             |                              |                                      |                         | -41.3                                                    |
|                                 |                           | 2.69                      | -54.1                             |                              |                                      |                         | -33.4                                                    |
|                                 |                           | 2.94                      | -57.3                             |                              |                                      |                         | -41.6                                                    |
|                                 |                           | 3.20                      | -54.1                             |                              |                                      |                         | -33.4                                                    |
|                                 |                           | 3.45                      | -57.7                             |                              |                                      |                         | -42.0                                                    |
|                                 |                           | 3.71                      | -54.6                             |                              |                                      |                         | -33.9                                                    |
|                                 |                           | 3.94                      | -53.0                             |                              |                                      |                         | -42.3                                                    |
|                                 |                           | 3.98                      | -55.7                             |                              |                                      |                         | -40.0                                                    |
|                                 |                           | 4.22                      | -60.7                             |                              |                                      |                         | -45.0                                                    |
|                                 |                           | 4.35                      | -55.7                             |                              |                                      |                         | -40.0                                                    |

**Measurement Instructions**

For each transmitter standard test frequency take data to determine the received power density per kc of bandwidth for each transmitter spurious output. Take enough points  $\Delta f$  about the spurious output maximum to describe the envelope of the spurious output.

Use reverse side for block diagram and remarks.

# TRANSMITTER MEASUREMENT EMISSION SPECTRUM

Photographs are required.

Xmtr. & Site Identification: ARSR-1B-A 5110.11 Date: 12/15/62

Xmtr. Serial No.: 54 BW of Measuring Instrument: 20 kc

Tuning Band (Mc): 1240-1350 Cable Type & Length: 100' RG-260/U

Significant Control Positions: Radar Antenna Linear 6' RG-8/U

Polarization (Horizontal) Transmitter B, Time 1535

Measuring Devices: Weinschel Attenuators Type 210, FXR&RLC Filters

Polarad SA-84, HP-614A, HP-540B, Lavoie LA-70A, Polarad CA-L

Modulation: Pulse PW( $\mu$ s): 1.8 PRF(pps): 360

| Xmtr.<br>Tuned<br>Freq.<br>(Mc) | Freq.<br>Analyzed<br>(Mc) | $\Delta f$<br>( $\pm$ Mc) | Signal<br>Gen.<br>Output<br>(dbm) | Test<br>Ant.<br>Gain<br>(db) | Atten-<br>uation<br>Inserted<br>(db) | Cable<br>Losses<br>(db) | Spectral<br>Power<br>Density<br>(dbm/kc/m <sup>2</sup> ) |
|---------------------------------|---------------------------|---------------------------|-----------------------------------|------------------------------|--------------------------------------|-------------------------|----------------------------------------------------------|
| 1348.2                          | 1263.7                    | -3.49                     | -57.9                             | 10.0                         | 10.0                                 | 5.9                     | -41.6                                                    |
|                                 |                           | -2.83                     | -53.6                             |                              |                                      |                         | -37.3                                                    |
|                                 |                           | -2.72                     | -55.5                             |                              |                                      |                         | -39.2                                                    |
|                                 |                           | -2.51                     | -53.3                             |                              |                                      |                         | -37.0                                                    |
|                                 |                           | -2.18                     | -57.9                             |                              |                                      |                         | -41.6                                                    |
|                                 |                           | -1.85                     | -51.6                             |                              |                                      |                         | -35.3                                                    |
|                                 |                           | -1.63                     | -57.0                             |                              |                                      |                         | -40.7                                                    |
|                                 |                           | -1.31                     | -51.1                             |                              |                                      |                         | -34.8                                                    |
|                                 |                           | -1.09                     | -55.5                             |                              |                                      |                         | -39.2                                                    |
|                                 |                           | -0.87                     | -49.2                             |                              |                                      |                         | -32.9                                                    |
|                                 |                           | -0.50                     | -53.5                             |                              |                                      |                         | -37.2                                                    |
|                                 |                           | 0.00                      | -40.5                             |                              |                                      |                         | -24.2                                                    |
|                                 |                           | 0.65                      | -57.0                             |                              |                                      |                         | -40.7                                                    |
|                                 |                           | 0.98                      | -52.5                             |                              |                                      |                         | -36.2                                                    |
|                                 |                           | 1.31                      | Null                              |                              |                                      |                         | Null                                                     |
|                                 |                           | 1.53                      | -54.3                             |                              |                                      |                         | -38.0                                                    |
|                                 |                           | 1.74                      | -53.5                             |                              |                                      |                         | -37.2                                                    |
|                                 |                           | 2.40                      | -53.2                             |                              |                                      |                         | -36.9                                                    |
|                                 |                           | 2.62                      | Null                              |                              |                                      |                         | Null                                                     |
|                                 |                           |                           |                                   |                              |                                      |                         |                                                          |
|                                 |                           |                           |                                   |                              |                                      |                         |                                                          |
|                                 |                           |                           |                                   |                              |                                      |                         |                                                          |
|                                 |                           |                           |                                   |                              |                                      |                         |                                                          |

## Measurement Instructions

For each transmitter standard test frequency take data to determine the received power density per kc of bandwidth for each transmitter spurious output. Take enough points  $\Delta f$  about the spurious output maximum to describe the envelope of the spurious output.

Use reverse side for block diagram and remarks.

TRANSMITTER MEASUREMENT  
EMISSION SPECTRUM

Photographs are required.

Xmtr. & Site Identification: ARSR-1B-A 5110.11 Date: 12/15/62

Xmtr. Serial No.: 54 BW of Measuring Instrument: 20 kc

Tuning Band (Mc): 1240-1350 Cable Type & Length: 100' RG-260/U

Significant Control Positions: Radar Antenna Linear 6' RG-8/U

Polarization (Horizontal) Transmitter B, Time 1830

Measuring Devices: Weinschel Attenuators Type 210, FXR&RLC Filters

Polarad SA-84, HP-616B, HP-540B, Lavoie LA-70A, Polarad CA-S

Modulation: Pulse PW( $\mu$ s): 1.8 PRF(pps): 360

| Xmtr.<br>Tuned<br>Freq.<br>(Mc) | Freq.<br>Analyzed<br>(Mc) | $\Delta f$<br>( $\pm$ Mc) | Signal<br>Gen.<br>Output<br>(dbm) | Test<br>Ant.<br>Gain<br>(db) | Atten-<br>uation<br>Inserted<br>(db) | Cable<br>Losses<br>(db) | Spectral<br>Power<br>Density<br>(dbm/kc/m <sup>2</sup> ) |
|---------------------------------|---------------------------|---------------------------|-----------------------------------|------------------------------|--------------------------------------|-------------------------|----------------------------------------------------------|
| 1348.2                          | 2694.6                    | -3.32                     | -86.2                             | 17.3                         | 0                                    | 7.8                     | -78.6                                                    |
|                                 |                           | -3.00                     | -87.2                             |                              |                                      |                         | -79.6                                                    |
|                                 |                           | -2.89                     | -85.1                             |                              |                                      |                         | -77.5                                                    |
|                                 |                           | -2.78                     | -85.1                             |                              |                                      |                         | -77.5                                                    |
|                                 |                           | -2.68                     | -87.2                             |                              |                                      |                         | -79.6                                                    |
|                                 |                           | -2.46                     | -87.2                             |                              |                                      |                         | -79.6                                                    |
|                                 |                           | -2.36                     | -84.3                             |                              |                                      |                         | -76.7                                                    |
|                                 |                           | -2.25                     | -83.6                             |                              |                                      |                         | -76.0                                                    |
|                                 |                           | -2.14                     | -85.1                             |                              |                                      |                         | -77.5                                                    |
|                                 |                           | -1.98                     | -87.2                             |                              |                                      |                         | -79.6                                                    |
|                                 |                           | -1.83                     | -86.6                             |                              |                                      |                         | -79.0                                                    |
|                                 |                           | -1.71                     | -83.6                             |                              |                                      |                         | -76.0                                                    |
|                                 |                           | -1.50                     | -83.0                             |                              |                                      |                         | -75.4                                                    |
|                                 |                           | -1.39                     | -84.9                             |                              |                                      |                         | -73.3                                                    |
|                                 |                           | -1.23                     | -87.2                             |                              |                                      |                         | -79.6                                                    |
|                                 |                           | -1.07                     | -83.0                             |                              |                                      |                         | -75.4                                                    |
|                                 |                           | -0.86                     | -79.8                             |                              |                                      |                         | -72.2                                                    |
|                                 |                           | -0.54                     | -85.8                             |                              |                                      |                         | -73.2                                                    |
|                                 |                           | -0.43                     | -81.6                             |                              |                                      |                         | -74.0                                                    |
|                                 |                           | -0.11                     | -73.2                             |                              |                                      |                         | -65.6                                                    |
|                                 |                           | 0                         | -72.4                             |                              |                                      |                         | -64.8                                                    |
|                                 |                           | 0.32                      | -73.1                             |                              |                                      |                         | -70.5                                                    |
| ↓                               | ↓                         | 0.64                      | -83.2                             | ↓                            | ↓                                    | ↓                       | -75.3                                                    |

Measurement Instructions

For each transmitter standard test frequency take data to determine the received power density per kc of bandwidth for each transmitter spurious output. Take enough points  $\Delta f$  about the spurious output maximum to describe the envelope of the spurious output.

Use reverse side for block diagram and remarks.



## TRANSMITTER MEASUREMENT EMISSION SPECTRUM

**Photographs are required.**

**Xmtr. & Site Identification: ARSR-1B-A 5110.11 Date: 12/15/62**

**Xmtr. Serial No.:** 54      **BW of Measuring Instrument:** 20 kc

**Tuning Band (Mc): 1240-1350**      **Cable Type & Length: 100' RG-260/U**

**Significant Control Positions: Radar Antenna Linear**

**Polarization (Horizontal) Transmitter B, Time 1838**

**Measuring Devices:** Weinschel Attenuators Type 210, FXR&RLC Filters

**Polarad SA-84, HP-616B, HP-540B, Lavoie LA-70A, Polarad CA-S**

Modulation: Pulse PW( $\mu$ s): 1.8 PRF(pps): 360

[illegible]

## Measurement Instructions

For each transmitter standard test frequency take data to determine the received power density per kc of bandwidth for each transmitter spurious output. Take enough points  $\Delta f$  about the spurious output maximum to describe the envelope of the spurious output.

Use reverse side for block diagram and remarks.

### 5.2.5 Modulation Characteristics

The purpose of this test is to recover information on the amplitude versus time characteristics of system radiated output. Figure 5.2.5-1 is a block diagram of the setup for the modulation characteristics test. The receiver is tuned to the fundamental or spurious emission of the radar transmitter. The pulse envelope is recovered, displayed on the oscilloscope, and photographed. In order to permit a low distortion recovery of the pulse envelope, the 3 db bandwidth of the receiver should be at least  $2/W$ , where  $W$  is the nominal pulse width. A bandwidth of at least 1 megacycle is then required for the 2 microsecond pulse of the ARSR radar. Two bandwidths are available in the Stoddart NM-62A. These bandwidths are 0.5 megacycle and 5.0 megacycles. All pulse envelopes were recovered with the bandwidth switch in the 5.0 megacycle position.

Fundamental frequency rejection filters were used wherever possible when recovering the pulse envelopes of spurious emissions above the radar fundamental.

Pulse envelopes of spurious emissions were obtained with the radar transmitter tuned to the three standard test frequencies. Photographs of these pulse envelopes are shown in Figures 5.2.5-2 through 5.2.5-6. Data are recorded on three (3) data sheets.

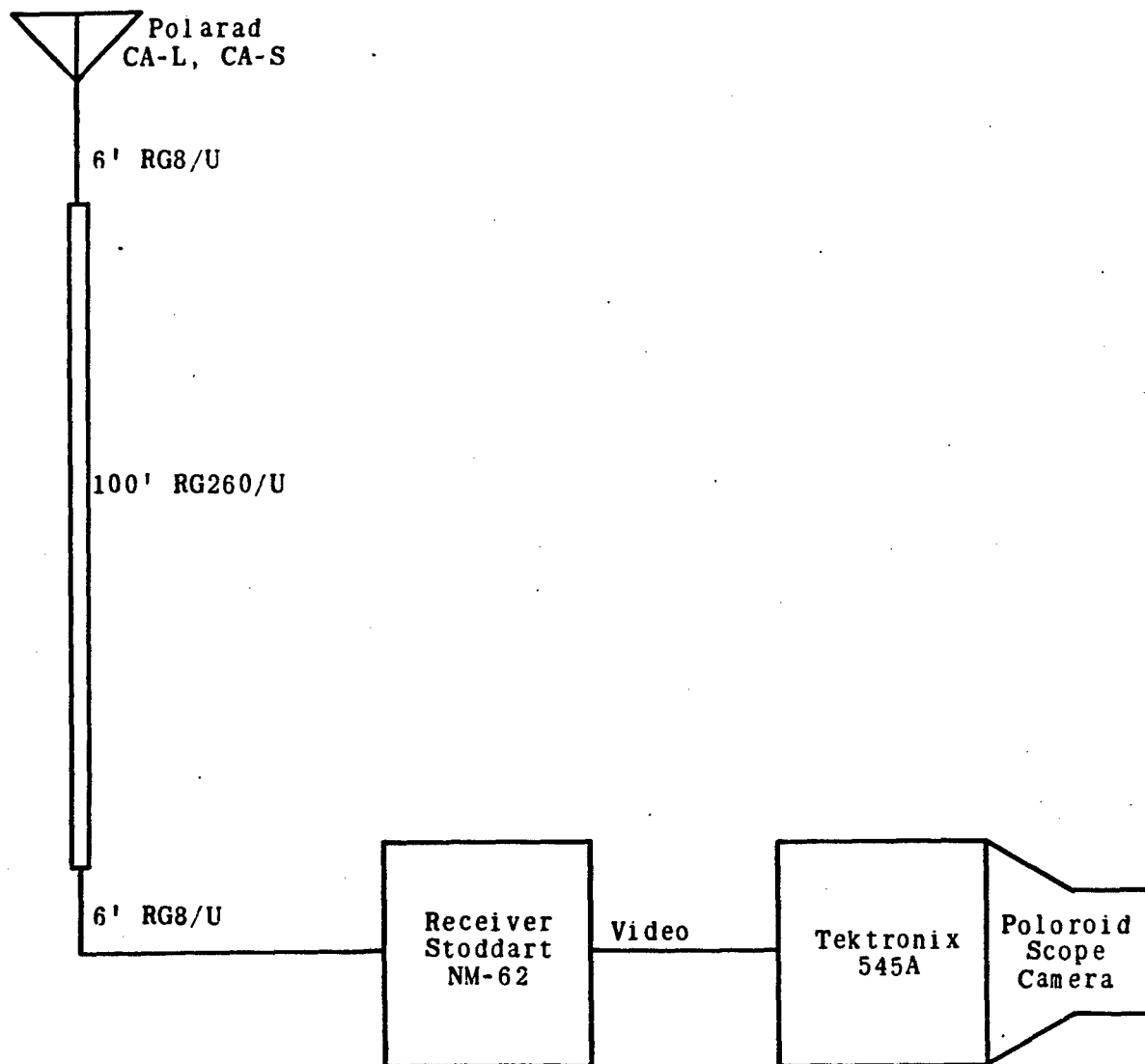
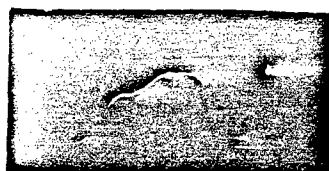
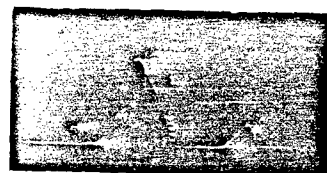


Figure 5.2.5-1. Modulation Characteristics Test Block Diagram.



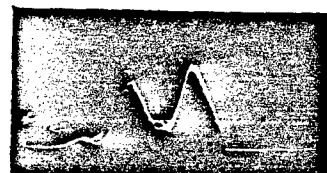
(A<sub>L</sub>)  $f = f_0 = 1257.8$  Mc



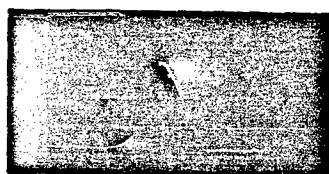
(E<sub>L</sub>)  $f = 1396.9$  Mc



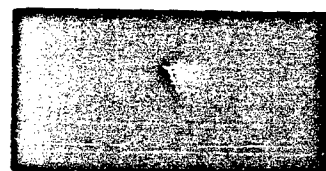
(B<sub>L</sub>)  $f = 1085.1$  Mc



(F<sub>L</sub>)  $f = 1417.9$  Mc



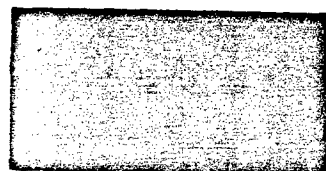
(C<sub>L</sub>)  $f = 1306.9$  Mc



(G<sub>L</sub>)  $f = 1456.6$  Mc



(D<sub>L</sub>)  $f = 1357.1$  Mc

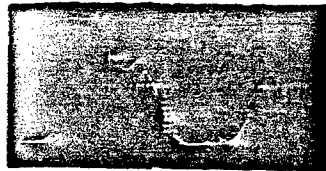


(H<sub>L</sub>)  $f = 1480.8$  Mc

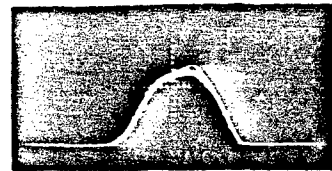
SWEEP TIME =  $0.5 \mu\text{s}/\text{CM}$

SWEEP LENGTH =  $10.0$  CM

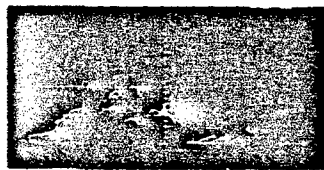
Figure 5.2.5-2. Modulation Characteristics Photographs ( $f_0 = 1257.8$  Mc).



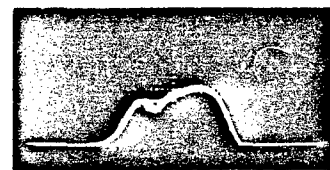
(I<sub>L</sub>)  $f = 1669.4 \text{ Mc}$



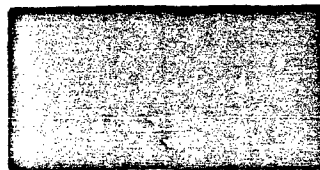
(L<sub>L</sub>)  $f = 2f_0 = 2515.6 \text{ Mc}$



(J<sub>L</sub>)  $f = 1790.3 \text{ Mc}$



(M<sub>L</sub>)  $f = 3f_0 = 3773.4 \text{ Mc}$

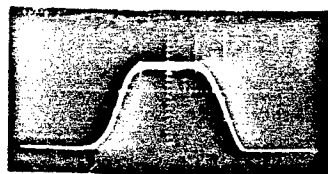


(K<sub>L</sub>)  $f = 1898.7 \text{ Mc}$

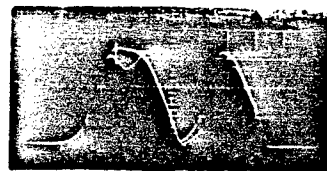
SWEEP TIME =  $0.5 \mu\text{s}/\text{CM}$

SWEEP LENGTH =  $10.0 \text{ CM}$

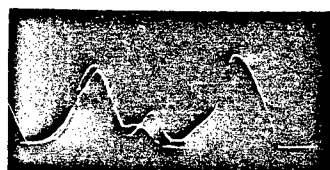
Figure 5.2.5-3. Modulation Characteristics Photographs ( $f_0 = 1257.8 \text{ Mc}$ ).



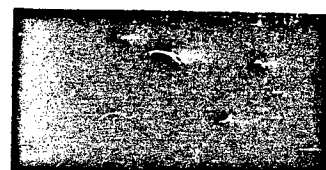
(A<sub>C</sub>)  $f = f_0 - 1297.8$  Mc



(D<sub>C</sub>)  $f = 1397$  Mc



(B<sub>C</sub>)  $f = 1085$  Mc



(E<sub>C</sub>)  $f = 1647$  Mc



(C<sub>C</sub>)  $f = 1197$  Mc



(F<sub>C</sub>)  $f = 1898$  Mc

SWEEP TIME =  $0.5 \mu\text{s}/\text{CM}$

SWEEP LENGTH =  $10.0$  CM

Figure 5.2.5-4. Modulation Characteristics Photographs ( $f_0 = 1297.8$  Mc).



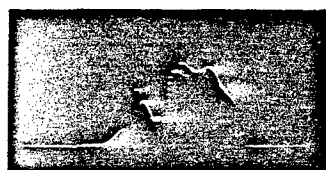
(G<sub>C</sub>)  $f = 2362.7$  Mc



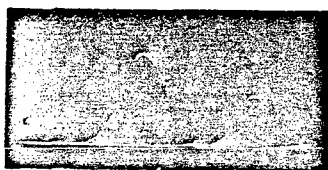
(J<sub>C</sub>)  $f = 3398.5$  Mc



(H<sub>C</sub>)  $f = 2f_0 = 2595.6$  Mc



(K<sub>C</sub>)  $f = 3f_0 = 2893.4$  Mc



(I<sub>C</sub>)  $f = 2944.8$  Mc

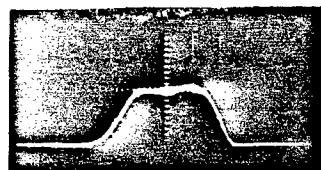


(L<sub>C</sub>)  $f = 4004.4$  Mc

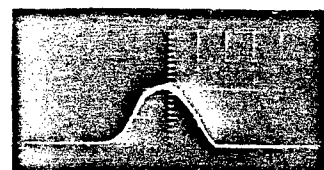
SWEEP TIME =  $0.5 \mu\text{s}/\text{CM}$

SWEEP LENGTH =  $10.0$  CM

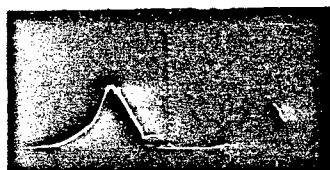
Figure 5.2.5-5. Modulation Characteristics Photographs ( $f_0 = 1297.8$  Mc).



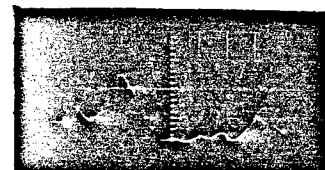
(A<sub>H</sub>)  $f = f_0 = 1348.2 \text{ Mc}$



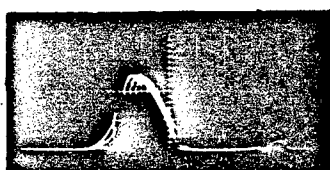
(E<sub>H</sub>)  $f = 1644.5 \text{ Mc}$



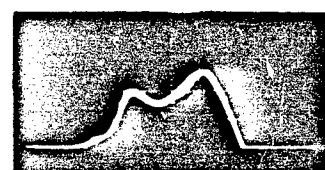
(B<sub>H</sub>)  $f = 1085.4 \text{ Mc}$



(F<sub>H</sub>)  $f = 1895.5 \text{ Mc}$



(C<sub>H</sub>)  $f = 1266.5 \text{ Mc}$



(G<sub>H</sub>)  $f = 2f_0 = 2696.4 \text{ Mc}$



(D<sub>H</sub>)  $f = 1402.2 \text{ Mc}$



(H<sub>H</sub>)  $f = 3f_0 = 4044.6 \text{ Mc}$

SWEEP TIME =  $0.5 \mu\text{s/cm}$

SWEEP LENGTH =  $10.0 \text{ cm}$

Figure 5.2.5-6. Modulation Characteristics Photographs ( $f_0 = 1348.2 \text{ Mc}$ ).

**TRANSMITTER MEASUREMENTS**  
**MODULATION CHARACTERISTICS**

\*12/14/62

Xmtr. & Site Identification: ARSR-1B-A 5110.11 Date: 12/11/62

Xmtr. Serial No.: 54 Tuning Band (Mc): 1240-1350

Measuring Devices: Stoddart NM-62A, Tektronix 545A, Polaroid Scope  
Camera, Polarad CA-L, CA-S

Significant Control Positions: Transmitter B, Linear Polarization  
(Horizontal)

Modulation: Pulse PW( $\mu$ s): 1.8 PRF(pps): 360

| Transmitter Data           |                         | Photo Identification | Scope Data       |                          |                  |                    |
|----------------------------|-------------------------|----------------------|------------------|--------------------------|------------------|--------------------|
| Xmtr. Tuned Frequency (Mc) | Frequency Analyzed (Mc) |                      | Sweep Lgth. (cm) | Sweep Time ( $\mu$ s/cm) | Vert. Dist. (cm) | Vert. Ampl. (v/cm) |
| 1257.8                     | 1257.8                  | A <sub>L</sub>       | 10               | 0.5                      | 4                | 2                  |
|                            | 1085.1                  | B <sub>L</sub>       |                  |                          |                  |                    |
|                            | 1306.9                  | C <sub>L</sub>       |                  |                          |                  |                    |
|                            | 1357.1                  | D <sub>L</sub>       |                  |                          |                  |                    |
|                            | 1396.9                  | E <sub>L</sub>       |                  |                          |                  |                    |
|                            | 1417.9                  | F <sub>L</sub>       |                  |                          |                  |                    |
|                            | 1456.6                  | G <sub>L</sub>       |                  |                          |                  |                    |
|                            | 1480.8                  | H <sub>L</sub>       |                  |                          |                  |                    |
|                            | 1669.4                  | I <sub>L</sub>       |                  |                          |                  |                    |
|                            | 1790.3                  | J <sub>L</sub>       |                  |                          |                  |                    |
|                            | 1898.7                  | K <sub>L</sub>       |                  |                          |                  |                    |
| *                          | 2515.6                  | L <sub>L</sub>       |                  |                          |                  |                    |
| *                          | 3773.4                  | M <sub>L</sub>       |                  |                          |                  |                    |

**Measurement Instructions**

Purpose of test is to obtain information on amplitude versus time characteristics of the system radiated output. Make test at each standard test frequency for the fundamental and all spurious signals analyzed in the Spurious Emission test.

Photographs are required.

Use reverse side for block diagram and remarks.

**TRANSMITTER MEASUREMENTS**  
**MODULATION CHARACTERISTICS**

\*12/19/62

Xmtr. & Site Identification: ARSR-1B-A 5110.11 Date: 12/11/62

Xmtr. Serial No.: 54 Tuning Band (Mc): 1240-1350

Measuring Devices: Stoddart NM-62A, Tektronix 545A, Polaroid Scope  
Camera, Polarad CA-L, CA-S

Significant Control Positions: Transmitter B, Linear Polarization  
(Horizontal)

Modulation: Pulse PW( $\mu$ s): 1.8 PRF(pps): 360

| Transmitter Data           |                         | Photo Identification | Scope Data       |                          |                  |                    |
|----------------------------|-------------------------|----------------------|------------------|--------------------------|------------------|--------------------|
| Xmtr. Tuned Frequency (Mc) | Frequency Analyzed (Mc) |                      | Sweep Lgth. (cm) | Sweep Time ( $\mu$ s/cm) | Vert. Dist. (cm) | Vert. Ampl. (v/cm) |
| 1297.8 *                   | 1297.8                  | A <sub>C</sub>       | 10               | 0.5                      | 4                | 2                  |
|                            | 1085                    | B <sub>C</sub>       |                  |                          |                  |                    |
|                            | 1197                    | C <sub>C</sub>       |                  |                          |                  |                    |
|                            | 1397                    | D <sub>C</sub>       |                  |                          |                  |                    |
|                            | 1647                    | E <sub>C</sub>       |                  |                          |                  |                    |
|                            | 1898                    | F <sub>C</sub>       |                  |                          |                  |                    |
|                            | 2362.7                  | G <sub>C</sub>       |                  |                          |                  |                    |
|                            | 2595.6                  | H <sub>C</sub>       |                  |                          |                  |                    |
|                            | 2944.8                  | I <sub>C</sub>       |                  |                          |                  |                    |
|                            | 3398.5                  | J <sub>C</sub>       |                  |                          |                  |                    |
|                            | 3893.4                  | K <sub>C</sub>       |                  |                          |                  |                    |
| ↓                          | 4004.4                  | L <sub>C</sub>       | ↓                | ↓                        | ↓                | ↓                  |

**Measurement Instructions**

Purpose of test is to obtain information on amplitude versus time characteristics of the system radiated output. Make test at each standard test frequency for the fundamental and all spurious signals analyzed in the Spurious Emission test.

Photographs are required.

Use reverse side for block diagram and remarks.

**TRANSMITTER MEASUREMENTS**  
**MODULATION CHARACTERISTICS**

Xmtr. & Site Identification: ARSR-1B-A 5110.11 Date: 12/15/62

Xmtr. Serial No.: 54 Tuning Band (Mc): 1240-1350

Measuring Devices: Stoddart NM-62A, Tektronix 545A, Polaroid Scope  
Camera, Polarad CA-L, CA-S

Significant Control Positions: Transmitter B, Linear Polarization  
(Horizontal)

Modulation: Pulse PW( $\mu$ s): 1.8 PRF(pps): 360

| Transmitter Data           |                         | Photo Identification | Scope Data       |                          |                  |                    |
|----------------------------|-------------------------|----------------------|------------------|--------------------------|------------------|--------------------|
| Xmtr. Tuned Frequency (Mc) | Frequency Analyzed (Mc) |                      | Sweep Lgth. (cm) | Sweep Time ( $\mu$ s/cm) | Vert. Dist. (cm) | Vert. Ampl. (v/cm) |
| 1348.2                     | 1348.2                  | A <sub>H</sub>       | 10               | 0.5                      | 4                | 2                  |
|                            | 1085.4                  | B <sub>H</sub>       |                  |                          |                  |                    |
|                            | 1266.5                  | C <sub>H</sub>       |                  |                          |                  |                    |
|                            | 1402.2                  | D <sub>H</sub>       |                  |                          |                  |                    |
|                            | 1644.5                  | E <sub>H</sub>       |                  |                          |                  |                    |
|                            | 1895.5                  | F <sub>H</sub>       |                  |                          |                  |                    |
|                            | 2696.4                  | G <sub>H</sub>       |                  |                          |                  |                    |
| ↓                          | 4044.6                  | H <sub>H</sub>       | ↓                | ↓                        | ↓                | ↓                  |
|                            |                         |                      |                  |                          |                  |                    |
|                            |                         |                      |                  |                          |                  |                    |
|                            |                         |                      |                  |                          |                  |                    |
|                            |                         |                      |                  |                          |                  |                    |
|                            |                         |                      |                  |                          |                  |                    |

**Measurement Instructions**

Purpose of test is to obtain information on amplitude versus time characteristics of the system radiated output. Make test at each standard test frequency for the fundamental and all spurious signals analyzed in the Spurious Emission test.

Photographs are required.

Use reverse side for block diagram and remarks.

#### 5.2.8 Carrier Frequency Stability

The purpose of this test is to determine the transmitter frequency stability. This test is usually deleted where the transmitter frequency is derived from a crystal whose frequency stability is better than the accuracy of the measuring equipment. In the case of the ARSR transmitter, the frequency is obtained from the magnetron oscillator whose frequency stability is not as good as the accuracy of the measuring equipment. Figure 5.2.8-1 is a block diagram of the measurement setup for this test.

Frequency is measured by the Interpolation method where a special interpolation or transfer oscillator is used to zero beat against the frequency being measured. The transfer oscillator contains a highly stable 100 to 220 Mc oscillator generating harmonics for comparison. The transfer oscillator is tuned until one of its harmonics beat with the unknown frequency. The transfer oscillator frequency multiplied by the harmonic number is the frequency of the unknown. A frequency meter with an accuracy of 1 part in  $10^6$  is used to measure the frequency of the transfer oscillator.

Frequency measurements were made on the ARSR transmitter at 15 minute intervals for a period of four hours. The output signal was sampled at the same directional coupler output in this test as in the Power Output test.

Maximum frequency deviation measured in this test was 359 kc.

The data are recorded on one (1) data sheet.

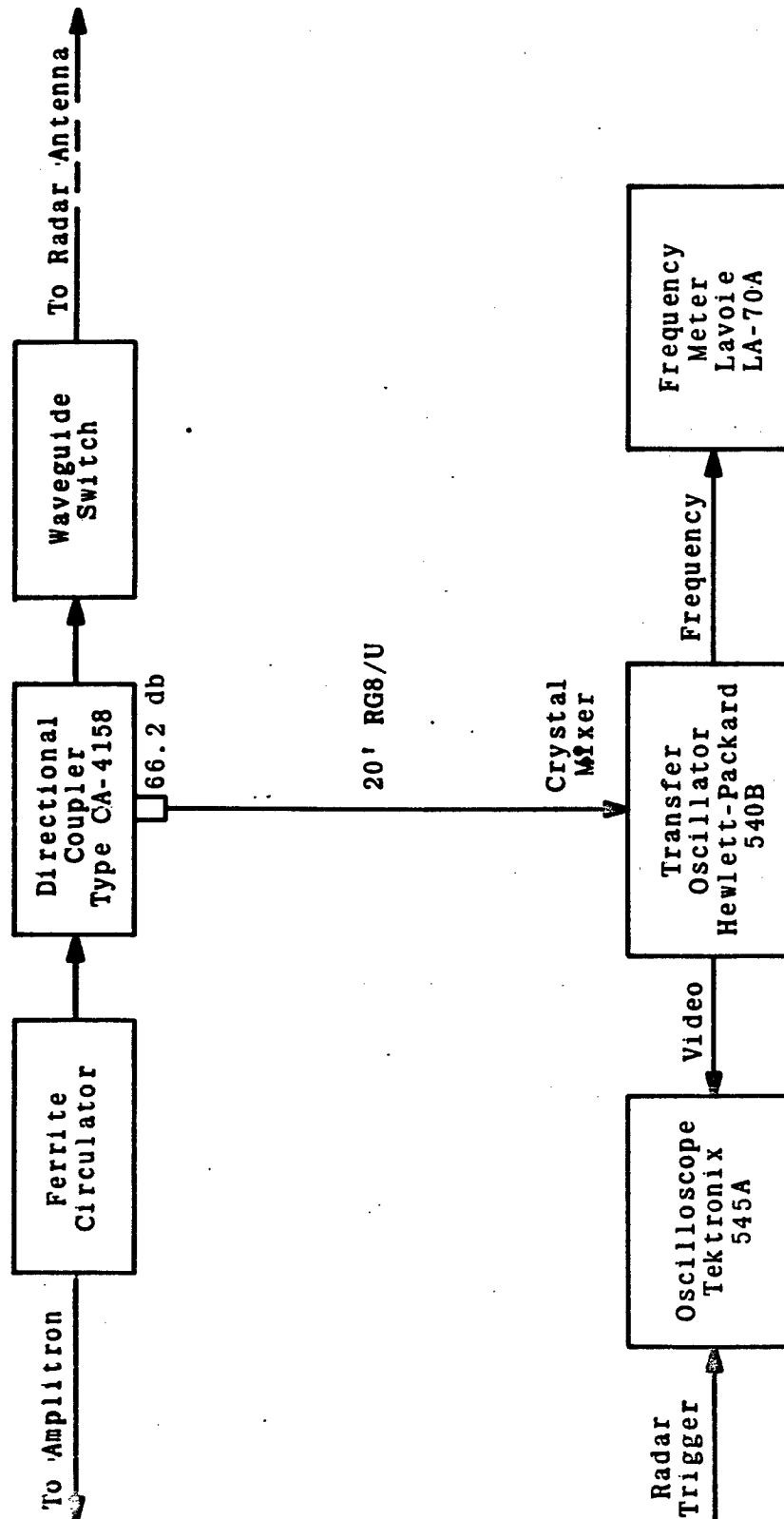


Figure 5.2.8-1. Carrier Frequency Stability Test Block Diagram.

**TRANSMITTER MEASUREMENTS**  
**CARRIER FREQUENCY STABILITY**

Xmtr. & Site Identification: AKSK-1B-A Date: 12-2-62  
 Xmtr. Serial No.: 54 Radio Set: \_\_\_\_\_  
 Tuning Band:(Mc): 1240-1350 Xmtr. Tuned Freq.  $f_o$  (Mc): \_\_\_\_\_  
 Modulation: Pulse PW( $\mu$ s): 1.8 PRF(pps): 360  
 Significant Control Positions: Radar Antenna Linear Polarization  
(Horizontal), Transmitter B  
 Measuring Devices: Lavoie La-70A, HP-540B, Tektronix 545A

| Time<br>of<br>Day | Relative<br>Time<br>(min) | Frequency<br>Meter Dial<br>Reading | x | Frequency<br>(Mc) | Frequency<br>Deviation<br>$\Delta f$<br>(kc) |
|-------------------|---------------------------|------------------------------------|---|-------------------|----------------------------------------------|
| 1830              | 0                         |                                    |   | 1297.2138         | 0                                            |
| 1845              | 15                        |                                    |   | 1296.8552         | -358.6                                       |
| 1900              | 30                        |                                    |   | 1297.1830         | -30.8                                        |
| 1915              | 45                        |                                    |   | 1297.2467         | 32.9                                         |
| 1930              | 60                        |                                    |   | 1297.0680         | -145.8                                       |
| 1945              | 75                        |                                    |   | 1297.1386         | -75.8                                        |
| 2000              | 90                        |                                    |   | 1297.2195         | 5.7                                          |
| 2015              | 105                       |                                    |   | 1297.2649         | 51.1                                         |
| 2030              | 120                       |                                    |   | 1296.9762         | -237.6                                       |
| 2045              | 135                       |                                    |   | 1297.1394         | -74.4                                        |
| 2100              | 150                       |                                    |   | 1297.4747         | 260.9                                        |
| 2115              | 165                       |                                    |   | 1297.0084         | -205.4                                       |
| 2130              | 180                       |                                    |   | 1297.1504         | -63.4                                        |
| 2145              | 195                       |                                    |   | 1297.1542         | -59.6                                        |
| 2200              | 210                       |                                    |   | 1297.2924         | 73.6                                         |
| 2215              | 225                       |                                    |   | 1297.2654         | 51.6                                         |
| 2230              | 240                       |                                    |   | 1297.0409         | -172.9                                       |
|                   |                           |                                    |   |                   |                                              |
|                   |                           |                                    |   |                   |                                              |
|                   |                           |                                    |   |                   |                                              |

**Measurement Instructions**

Tune transmitter to mean frequency of each band. Obtain frequency readout 15 minutes after transmitter is turned on and at 15-minute intervals thereafter up to 4 hours, or until a definite trend in data is established, whichever time is less. Frequency accuracy of at least one part per million is required.

Use reverse side for block diagram and remarks.

#### 5.4 ANTENNA MEASUREMENTS

Antenna patterns were to be made only if they could be obtained with the antenna rotating at a speed of 1 rpm or less. The ARSR-1B-A antenna normally operates at 6 rpm and can be operated at speeds of 9 and 12 revolutions per minute. There are no provisions for rotating the antenna at speeds slower than 6 rpm. Since the measurement team was required to restore the antenna to normal operation within a period of 30 minutes, no elaborate modification could be used for driving the antenna. The large antenna drive motor could not be disconnected from the drive shaft of the antenna. A small variable speed motor which had been used successfully in other tasks to reduce the antenna speeds was used to drive the ARSR antenna. A flat-belt pulley was used on a collar between the motor and antenna drive shaft. No trouble was experienced in driving the antenna when the wind speed was down to a few miles an hour. However, when the wind speeds were above 5 miles per hour the speed of the antenna would vary depending upon the antenna bearing and wind direction. At high wind speeds, the motor would stall when the antenna came into the wind.

During the time of the spectrum signature measurements, the radar was never obtained during periods of very low wind velocities due to missile firing priority. Due to these circumstances, no antenna patterns were obtained.

## Section 6

### PULSE COUNT INVESTIGATION

This test was made as part of a continuing investigation into the possibility of using a pulse counting technique for emission spectrum measurement of a radar with scanning antenna.

Figure 6-1 is a block diagram of the setup for the Pulse Count test. In some of the earlier tests in this program, it had been found that the counter would read as much as three times the PRF when the receiver was connected directly to the counter. It was determined at the time that a pulse generator or some other threshold device was needed in order to isolate the receiver from the counter. The Tektronix scope was found to have a built-in threshold device in the input triggering system. By placing the sync selector to external and by adjusting the trigger level, it was found the voltage level could be adjusted to the point where the trace is triggered. The scope will trigger a trace for each pulse that exceeds the trigger threshold and will not trigger again until the trace has completed its horizontal sweep. The sweep must be set to a speed such that the trace is completed before the time for the next pulse. A pulse is present at the "A" gate output of the oscilloscope each time the trace is triggered. The total pulse count can be obtained by connecting this output to the input of the counter.

The receiver is tuned to the radar transmitter fundamental frequency. With the counter threshold set just above the level at which noise pulses are counted, the signal generator is connected to the receiver input and tuned to the receiver frequency. A calibration is then made to determine the minimum pulse power required for the counter to register the full count of signal generator pulses. The signal generator pulse output is set to the same PRF (360) and pulse width (2 microseconds) as the ARSR radar.

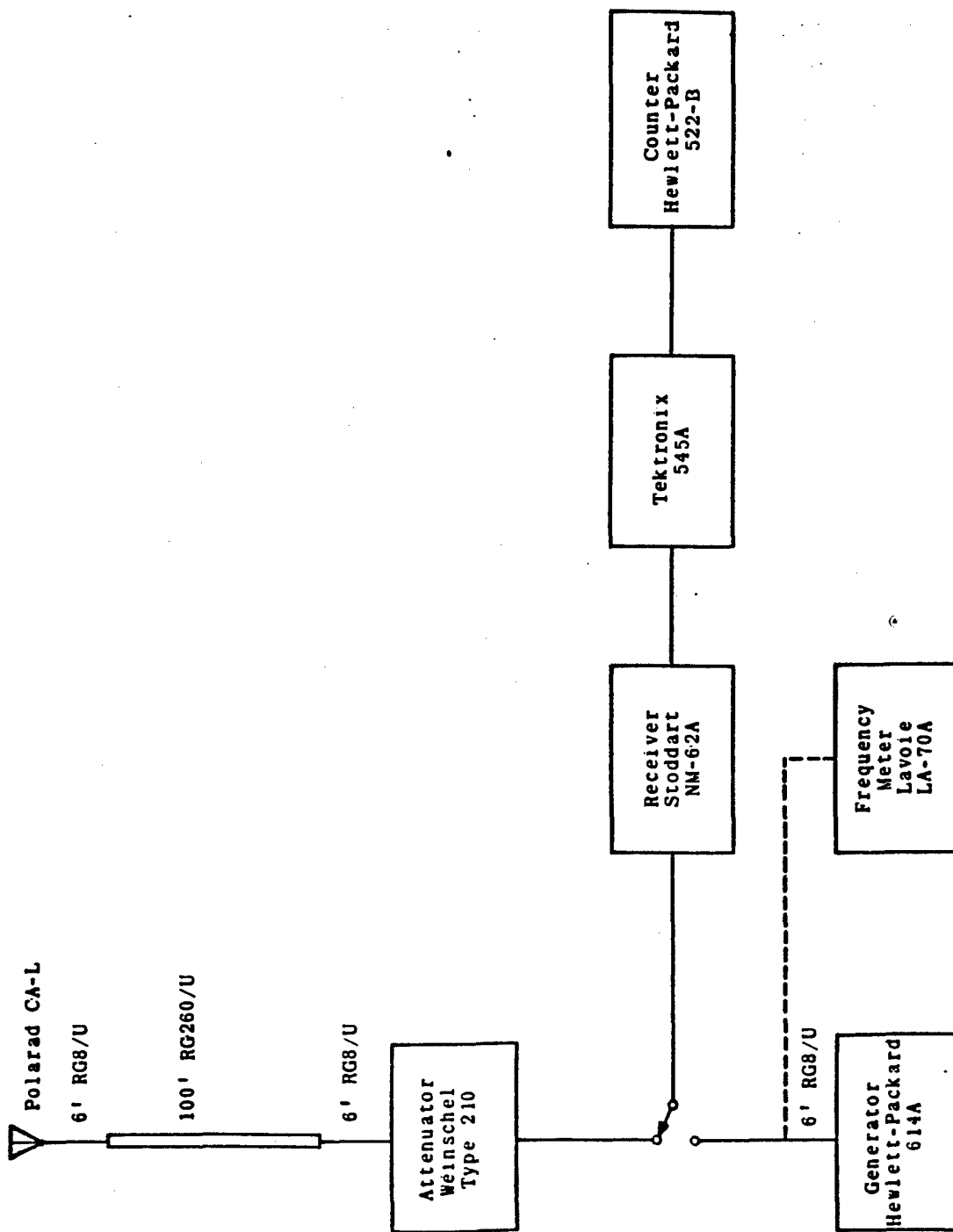


Figure 6-1. Pulse Count Test, Block Diagram.

Signal generator power and pulse count for a ten-second interval are tabulated below.

| Signal Generator Output<br>(dbm) | Pulse Count<br>(10 seconds) |
|----------------------------------|-----------------------------|
| -81                              | 68                          |
| -80                              | 133                         |
| -79                              | 222                         |
| -78                              | 386                         |
| -77                              | 668                         |
| -76                              | 1050                        |
| -75                              | 1521                        |
| -74                              | 2011                        |
| -73                              | 2571                        |
| -72                              | 3032                        |
| -71                              | 3372                        |
| -70                              | 3537                        |
| -69                              | 3611                        |
| -68                              | 3624                        |
| -67                              | 3628                        |
| -66                              | 3629                        |

The receiver is now connected to the test antenna which is directed toward the radar. With the radar restored to normal operation (6 rpm and antenna elevated 2.5°), the pulse count for a single scan is taken with the receiver at maximum sensitivity.

The counter is set to count for 10 seconds which is the time of a single scan for an antenna rotating at 6 rpm. Attenuation is then inserted between the antenna and receiver input and the 10 second pulse count taken for each attenuator setting. Attenuation is inserted until the false count level is reached. The receiver is tuned in discrete frequency steps above and below the radar tuned frequency and the above procedure is repeated. The radar transmitter was tuned to the mean standard test frequency of 1296.8 Mc for the Pulse Count test. The data obtained in this test are tabulated below.

Receiver Tuned Below  $f_o$

| $f_o$<br>(Mc) | Deviation<br>(Mc) | Receiver<br>Frequency<br>(Mc) | Receiver<br>Attenuation<br>(db) | Pulse<br>Count |
|---------------|-------------------|-------------------------------|---------------------------------|----------------|
| 1296.8        | 0                 | 1296.8                        | 0                               | 3585           |
|               |                   |                               | 10                              | 3576           |
|               |                   |                               | 20                              | 3556           |
|               |                   |                               | 25                              | 3531           |
|               |                   |                               | 30                              | 3500           |
|               |                   |                               | 35                              | 3450           |
|               |                   |                               | 40                              | 3315           |
|               |                   |                               | 45                              | 3062           |
|               |                   |                               | 50                              | 2668           |
|               |                   |                               | 55                              | 2075           |
|               |                   |                               | 60                              | 1204           |
|               |                   |                               | 65                              | 409            |
|               |                   |                               | 70                              | 108            |
|               |                   |                               | 75                              | 45             |
|               |                   |                               | 80                              | 37             |
|               |                   |                               | 85                              | 28             |
|               |                   |                               | 90                              | 27             |
|               |                   |                               | 95                              | 18             |
| 1296.8        | -1.0              | 1295.8                        | 0                               | 3577           |
|               |                   |                               | 10                              | 3554           |
|               |                   |                               | 20                              | 3496           |
|               |                   |                               | 30                              | 3279           |
|               |                   |                               | 40                              | 2589           |
|               |                   |                               | 45                              | 2008           |
|               |                   |                               | 50                              | 1242           |
|               |                   |                               | 55                              | 454            |
|               |                   |                               | 60                              | 114            |
|               |                   |                               | 65                              | 42             |
|               |                   |                               | 70                              | 30             |
|               |                   |                               | 75                              | 28             |
|               |                   |                               | 80                              | 23             |
|               |                   |                               | 85                              | 16             |
|               |                   |                               | 90                              | 12             |
| 1296.8        | -2.0              | 1294.8                        | 0                               | 3567           |
|               |                   |                               | 10                              | 3525           |
|               |                   |                               | 20                              | 3429           |
|               |                   |                               | 30                              | 3020           |
|               |                   |                               | 35                              | 2597           |
|               |                   |                               | 40                              | 1949           |
|               |                   |                               | 45                              | 1110           |
|               |                   |                               | 50                              | 380            |

| $f_o$<br>(Mc) | Deviation<br>(Mc) | Receiver<br>Frequency<br>(Mc) | Receiver<br>Attenuation<br>(db) | Pulse<br>Count |
|---------------|-------------------|-------------------------------|---------------------------------|----------------|
| 1296.8        | -2.0              | 1294.8                        | 55                              | 106            |
|               |                   |                               | 60                              | 51             |
|               |                   |                               | 65                              | 33             |
|               |                   |                               | 70                              | 27             |
|               |                   |                               | 75                              | 23             |
|               |                   |                               | 80                              | 12             |
| 1296.8        | -3.0              | 1293.8                        | 0                               | 3553           |
|               |                   |                               | 10                              | 3495           |
|               |                   |                               | 20                              | 3339           |
|               |                   |                               | 30                              | 2675           |
|               |                   |                               | 35                              | 2243           |
|               |                   |                               | 40                              | 1433           |
|               |                   |                               | 45                              | 607            |
|               |                   |                               | 50                              | 183            |
|               |                   |                               | 55                              | 59             |
|               |                   |                               | 60                              | 34             |
|               |                   |                               | 65                              | 26             |
|               |                   |                               | 70                              | 22             |
|               |                   |                               | 75                              | 14             |
| 1296.8        | -4.0              | 1292.8                        | 0                               | 3532           |
|               |                   |                               | 10                              | 3413           |
|               |                   |                               | 20                              | 3182           |
|               |                   |                               | 30                              | 2442           |
|               |                   |                               | 35                              | 1722           |
|               |                   |                               | 40                              | 921            |
|               |                   |                               | 45                              | 265            |
|               |                   |                               | 50                              | 78             |
|               |                   |                               | 55                              | 34             |
|               |                   |                               | 60                              | 28             |
|               |                   |                               | 65                              | 27             |
|               |                   |                               | 70                              | 21             |
|               |                   |                               | 75                              | 10             |
| 1296.8        | -5.0              | 1291.8                        | 0                               | 3477           |
|               |                   |                               | 10                              | 3319           |
|               |                   |                               | 20                              | 2839           |
|               |                   |                               | 30                              | 1655           |
|               |                   |                               | 35                              | 846            |
|               |                   |                               | 40                              | 282            |
|               |                   |                               | 45                              | 84             |
|               |                   |                               | 50                              | 39             |
|               |                   |                               | 55                              | 27             |
|               |                   |                               | 60                              | 25             |
|               |                   |                               | 65                              | 19             |
|               |                   |                               | 70                              |                |

| $f_o$<br>(Mc) | Deviation<br>(Mc) | Receiver<br>Frequency<br>(Mc) | Receiver<br>Attenuation<br>(db) | Pulse<br>Count |
|---------------|-------------------|-------------------------------|---------------------------------|----------------|
| 1296.8        | -6.0              | 1290.8                        | 0                               | 3459           |
|               |                   |                               | 10                              | 3252           |
|               |                   |                               | 20                              | 2553           |
|               |                   |                               | 30                              | 1056           |
|               |                   |                               | 35                              | 441            |
|               |                   |                               | 40                              | 117            |
|               |                   |                               | 45                              | 51             |
|               |                   |                               | 50                              | 29             |
|               |                   |                               | 55                              | 25             |
|               |                   |                               | 60                              | 21             |
|               |                   |                               | 65                              | 10             |
| 1296.8        | -7.0              | 1289.8                        | 0                               | 3406           |
|               |                   |                               | 10                              | 3086           |
|               |                   |                               | 20                              | 2283           |
|               |                   |                               | 30                              | 872            |
|               |                   |                               | 35                              | 277            |
|               |                   |                               | 40                              | 89             |
|               |                   |                               | 45                              | 41             |
|               |                   |                               | 50                              | 27             |
|               |                   |                               | 55                              | 25             |
|               |                   |                               | 60                              | 16             |
| 1296.8        | -8.0              | 1288.8                        | 0                               | 3329           |
|               |                   |                               | 10                              | 2945           |
|               |                   |                               | 20                              | 1985           |
|               |                   |                               | 30                              | 640            |
|               |                   |                               | 35                              | 204            |
|               |                   |                               | 40                              | 69             |
|               |                   |                               | 45                              | 33             |
|               |                   |                               | 50                              | 32             |
|               |                   |                               | 55                              | 23             |
|               |                   |                               | 60                              | 12             |
| 1296.8        | -9.0              | 1287.8                        | 0                               | 3106           |
|               |                   |                               | 10                              | 2532           |
|               |                   |                               | 20                              | 1315           |
|               |                   |                               | 30                              | 292            |
|               |                   |                               | 35                              | 80             |
|               |                   |                               | 40                              | 45             |
|               |                   |                               | 45                              | 25             |
|               |                   |                               | 50                              | 21             |
|               |                   |                               | 55                              | 19             |
|               |                   |                               | 60                              | 10             |

| $f_o$<br>(Mc) | Deviation<br>(Mc) | Receiver<br>Frequency<br>(Mc) | Receiver<br>Attenuation<br>(db) | Pulse<br>Count |
|---------------|-------------------|-------------------------------|---------------------------------|----------------|
| 1296.8        | -11.0             | 1285.8                        | 0                               | 3398           |
|               |                   |                               | 10                              | 3066           |
|               |                   |                               | 20                              | 2245           |
|               |                   |                               | 30                              | 427            |
|               |                   |                               | 35                              | 288            |
|               |                   |                               | 40                              | 86             |
|               |                   |                               | 45                              | 58             |
|               |                   |                               | 50                              | 29             |
|               |                   |                               | 55                              | 23             |
|               |                   |                               | 60                              | 20             |
|               |                   |                               | 65                              | 9              |
| 1296.8        | -15.0             | 1281.8                        | 0                               | 2556           |
|               |                   |                               | 10                              | 1666           |
|               |                   |                               | 20                              | 662            |
|               |                   |                               | 25                              | 332            |
|               |                   |                               | 30                              | 165            |
|               |                   |                               | 35                              | 48             |
|               |                   |                               | 40                              | 33             |
|               |                   |                               | 45                              | 23             |
|               |                   |                               | 50                              | 16             |
|               |                   |                               | 55                              | 10             |
| 1296.8        | -19.0             | 1277.8                        | 0                               | 2669           |
|               |                   |                               | 10                              | 1884           |
|               |                   |                               | 20                              | 871            |
|               |                   |                               | 25                              | 417            |
|               |                   |                               | 30                              | 168            |
|               |                   |                               | 35                              | 62             |
|               |                   |                               | 40                              | 31             |
|               |                   |                               | 45                              | 20             |
|               |                   |                               | 50                              | 15             |
|               |                   |                               | 55                              | 11             |
| 1296.8        | -27.0             | 1269.8                        | 0                               | 2875           |
|               |                   |                               | 10                              | 2203           |
|               |                   |                               | 20                              | 1225           |
|               |                   |                               | 25                              | 691            |
|               |                   |                               | 30                              | 311            |
|               |                   |                               | 35                              | 101            |
|               |                   |                               | 40                              | 34             |
|               |                   |                               | 45                              | 27             |
|               |                   |                               | 50                              | 26             |
|               |                   |                               | 55                              | 16             |
|               |                   |                               | 60                              | 16             |

| $f_o$<br>(Mc) | Deviation<br>(Mc) | Receiver<br>Frequency<br>(Mc) | Receiver<br>Attenuation<br>(db) | Pulse<br>Count |
|---------------|-------------------|-------------------------------|---------------------------------|----------------|
| 1296.8        | -32.0             | 1265.8                        | 0                               | 2785           |
|               |                   |                               | 10                              | 2131           |
|               |                   |                               | 20                              | 1156           |
|               |                   |                               | 30                              | 254            |
|               |                   |                               | 35                              | 67             |
|               |                   |                               | 40                              | 30             |
|               |                   |                               | 45                              | 24             |
|               |                   |                               | 50                              | 21             |
|               |                   |                               | 55                              | 13             |
|               |                   |                               | 60                              | 15             |
| 1296.8        | -39.0             | 1257.8                        | 0                               | 2769           |
|               |                   |                               | 10                              | 2039           |
|               |                   |                               | 20                              | 1065           |
|               |                   |                               | 25                              | 538            |
|               |                   |                               | 30                              | 231            |
|               |                   |                               | 35                              | 69             |
|               |                   |                               | 40                              | 47             |
|               |                   |                               | 45                              | 30             |
|               |                   |                               | 50                              | 28             |
|               |                   |                               | 55                              | 12             |
| 1296.8        | -65.1             | 1231.7                        | 0                               | 2415           |
|               |                   |                               | 10                              | 1385           |
|               |                   |                               | 20                              | 407            |
|               |                   |                               | 25                              | 156            |
|               |                   |                               | 30                              | 56             |
|               |                   |                               | 35                              | 35             |
|               |                   |                               | 40                              | 30             |
|               |                   |                               | 45                              | 21             |
|               |                   |                               | 50                              | 9              |
|               |                   |                               | 55                              | 13             |
| 1296.8        | -114.7            | 1182.1                        | 0                               | 1502           |
|               |                   |                               | 10                              | 319            |
|               |                   |                               | 15                              | 73             |
|               |                   |                               | 20                              | 39             |
|               |                   |                               | 25                              | 32             |
|               |                   |                               | 30                              | 32             |
|               |                   |                               | 35                              | 27             |
|               |                   |                               | 40                              | 15             |
| 1296.8        | -124.7            | 1172.1                        | 0                               | 132            |
|               |                   |                               | 5                               | 54             |
|               |                   |                               | 10                              | 38             |
|               |                   |                               | 15                              | 31             |
|               |                   |                               | 20                              | 22             |
|               |                   |                               | 25                              | 16             |

Receiver Tuned Above  $f_o$

| $f_o$<br>(Mc) | Deviation<br>(Mc) | Receiver<br>Frequency<br>(Mc) | Receiver<br>Attenuation<br>(db) | Pulse<br>Count |
|---------------|-------------------|-------------------------------|---------------------------------|----------------|
| 1296.9        | 0                 | 1296.9                        | 0                               | 3581           |
|               |                   |                               | 10                              | 3555           |
|               |                   |                               | 20                              | 3537           |
|               |                   |                               | 30                              | 3421           |
|               |                   |                               | 40                              | 3052           |
|               |                   |                               | 45                              | 2673           |
|               |                   |                               | 50                              | 2161           |
|               |                   |                               | 55                              | 1449           |
|               |                   |                               | 60                              | 522            |
|               |                   |                               | 65                              | 69             |
|               |                   |                               | 70                              | 43             |
|               |                   |                               | 75                              | 31             |
|               |                   |                               | 80                              | 24             |
|               |                   |                               | 85                              | 21             |
|               |                   |                               | 90                              | 16             |
| 1296.9        | 1.0               | 1297.9                        | 0                               | 3551           |
|               |                   |                               | 10                              | 3494           |
|               |                   |                               | 20                              | 3262           |
|               |                   |                               | 30                              | 2628           |
|               |                   |                               | 35                              | 2138           |
|               |                   |                               | 40                              | 1297           |
|               |                   |                               | 45                              | 279            |
|               |                   |                               | 50                              | 66             |
|               |                   |                               | 55                              | 33             |
|               |                   |                               | 60                              | 27             |
|               |                   |                               | 65                              | 22             |
|               |                   |                               | 70                              | 17             |
|               |                   |                               | 75                              | 9              |
| 1296.9        | 2.0               | 1298.9                        | 0                               | 3423           |
|               |                   |                               | 10                              | 3217           |
|               |                   |                               | 20                              | 2936           |
|               |                   |                               | 30                              | 1619           |
|               |                   |                               | 35                              | 1011           |
|               |                   |                               | 40                              | 307            |
|               |                   |                               | 45                              | 44             |
|               |                   |                               | 50                              | 31             |
|               |                   |                               | 55                              | 23             |
|               |                   |                               | 60                              | 21             |
|               |                   |                               | 65                              | 17             |
|               |                   |                               | 70                              | 7              |

| $f_o$<br>(Mc) | Deviation<br>(Mc) | Receiver<br>Frequency<br>(Mc) | Receiver<br>Attenuation<br>(db) | Pulse<br>Count |
|---------------|-------------------|-------------------------------|---------------------------------|----------------|
| 1296.9        | 3.0               | 1299.0                        | 0                               | 3464           |
|               |                   |                               | 10                              | 3160           |
|               |                   |                               | 20                              | 2117           |
|               |                   |                               | 25                              | 1651           |
|               |                   |                               | 30                              | 589            |
|               |                   |                               | 35                              | 374            |
|               |                   |                               | 40                              | 65             |
|               |                   |                               | 45                              | 33             |
|               |                   |                               | 50                              | 21             |
|               |                   |                               | 55                              | 27             |
|               |                   |                               | 60                              | 13             |
| 1296.9        | 4.0               | 1300.9                        | 0                               | 3328           |
|               |                   |                               | 10                              | 2982           |
|               |                   |                               | 20                              | 2159           |
|               |                   |                               | 25                              | 1323           |
|               |                   |                               | 30                              | 517            |
|               |                   |                               | 35                              | 69             |
|               |                   |                               | 40                              | 35             |
|               |                   |                               | 45                              | 27             |
|               |                   |                               | 50                              | 26             |
|               |                   |                               | 55                              | 24             |
|               |                   |                               | 60                              | 7              |
|               |                   |                               | 65                              | 0              |
| 1296.9        | 5.0               | 1301.9                        | 0                               | 3399           |
|               |                   |                               | 10                              | 3021           |
|               |                   |                               | 20                              | 1931           |
|               |                   |                               | 25                              | 1168           |
|               |                   |                               | 30                              | 407            |
|               |                   |                               | 35                              | 121            |
|               |                   |                               | 40                              | 40             |
|               |                   |                               | 45                              | 37             |
|               |                   |                               | 50                              | 29             |
|               |                   |                               | 55                              | 23             |
|               |                   |                               | 60                              | 10             |
| 1296.9        | 6.0               | 1302.9                        | 0                               | 3292           |
|               |                   |                               | 10                              | 2821           |
|               |                   |                               | 20                              | 1772           |
|               |                   |                               | 25                              | 934            |
|               |                   |                               | 30                              | 233            |
|               |                   |                               | 35                              | 32             |
|               |                   |                               | 40                              | 34             |
|               |                   |                               | 45                              | 25             |
|               |                   |                               | 50                              | 36             |
|               |                   |                               | 55                              | 32             |

| $f_o$<br>(Mc) | Deviation<br>(Mc) | Receiver<br>Frequency<br>(Mc) | Receiver<br>Attenuation<br>(db) | Pulse<br>Count |
|---------------|-------------------|-------------------------------|---------------------------------|----------------|
| 1296.9        | 7.0               | 1303.9                        | 0                               | 2855           |
|               |                   |                               | 10                              | 2664           |
|               |                   |                               | 20                              | 1190           |
|               |                   |                               | 25                              | 478            |
|               |                   |                               | 30                              | 137            |
|               |                   |                               | 35                              | 55             |
|               |                   |                               | 40                              | 26             |
|               |                   |                               | 45                              | 24             |
|               |                   |                               | 50                              | 25             |
|               |                   |                               | 55                              | 14             |
|               |                   |                               | 60                              | 14             |
|               |                   |                               | 65                              | 9              |
|               |                   |                               | 70                              | 12             |
| 1296.9        | 8.0               | 1304.9                        | 0                               | 3236           |
|               |                   |                               | 10                              | 2509           |
|               |                   |                               | 20                              | 977            |
|               |                   |                               | 25                              | 397            |
|               |                   |                               | 30                              | 124            |
|               |                   |                               | 35                              | 63             |
|               |                   |                               | 40                              | 42             |
|               |                   |                               | 45                              | 37             |
|               |                   |                               | 50                              | 41             |
|               |                   |                               | 55                              | 19             |
|               |                   |                               | 60                              | 11             |
|               |                   |                               | 65                              | 9              |
| 1296.9        | 9.0               | 1305.9                        | 0                               | 3238           |
|               |                   |                               | 10                              | 2453           |
|               |                   |                               | 20                              | 908            |
|               |                   |                               | 25                              | 359            |
|               |                   |                               | 30                              | 103            |
|               |                   |                               | 35                              | 45             |
|               |                   |                               | 40                              | 46             |
|               |                   |                               | 45                              | 34             |
|               |                   |                               | 50                              | 30             |
|               |                   |                               | 55                              | 20             |
|               |                   |                               | 60                              | 8              |
| 1296.9        | 10.0              | 1306.9                        | 0                               | 3027           |
|               |                   |                               | 10                              | 2132           |
|               |                   |                               | 20                              | 604            |
|               |                   |                               | 25                              | 230            |
|               |                   |                               | 30                              | 82             |
|               |                   |                               | 35                              | 34             |
|               |                   |                               | 40                              | 32             |
|               |                   |                               | 45                              | 24             |
|               |                   |                               | 46                              | 25             |
|               |                   |                               | 50                              | 25             |
|               |                   |                               | 55                              | 7              |

| $f_o$<br>(Mc) | Deviation<br>(Mc) | Receiver<br>Frequency<br>(Mc) | Receiver<br>Attenuation<br>(db) | Pulse<br>Count |
|---------------|-------------------|-------------------------------|---------------------------------|----------------|
| 1296.9        | 11.0              | 1307.9                        | 0                               | 2994           |
|               |                   |                               | 10                              | 2093           |
|               |                   |                               | 20                              | 653            |
|               |                   |                               | 25                              | 316            |
|               |                   |                               | 30                              | 101            |
|               |                   |                               | 35                              | 46             |
|               |                   |                               | 40                              | 29             |
|               |                   |                               | 45                              | 26             |
|               |                   |                               | 50                              | 33             |
|               |                   |                               | 55                              | 22             |
|               |                   |                               | 60                              | 26             |
|               |                   |                               | 65                              | 13             |
| 1296.9        | 15.0              | 1311.9                        | 0                               | 2996           |
|               |                   |                               | 10                              | 2106           |
|               |                   |                               | 20                              | 743            |
|               |                   |                               | 25                              | 346            |
|               |                   |                               | 30                              | 121            |
|               |                   |                               | 35                              | 48             |
|               |                   |                               | 40                              | 35             |
|               |                   |                               | 45                              | 24             |
|               |                   |                               | 50                              | 29             |
|               |                   |                               | 55                              | 17             |
| 1296.9        | 19.0              | 1315.9                        | 0                               | 2800           |
|               |                   |                               | 10                              | 1759           |
|               |                   |                               | 20                              | 549            |
|               |                   |                               | 25                              | 219            |
|               |                   |                               | 30                              | 79             |
|               |                   |                               | 35                              | 46             |
|               |                   |                               | 40                              | 35             |
|               |                   |                               | 45                              | 29             |
|               |                   |                               | 50                              | 21             |
|               |                   |                               | 55                              | 14             |
|               |                   |                               | 60                              | 11             |
|               |                   |                               | 65                              | 9              |
| 1296.9        | 23.0              | 1319.9                        | 0                               | 2488           |
|               |                   |                               | 10                              | 1425           |
|               |                   |                               | 20                              | 419            |
|               |                   |                               | 25                              | 205            |
|               |                   |                               | 30                              | 68             |
|               |                   |                               | 35                              | 38             |
|               |                   |                               | 40                              | 29             |
|               |                   |                               | 45                              | 26             |
|               |                   |                               | 50                              | 22             |
|               |                   |                               | 55                              | 11             |
|               |                   |                               | 60                              | 11             |

| $f_o$<br>(Mc) | Deviation<br>(Mc) | Receiver<br>Frequency<br>(Mc) | Receiver<br>Attenuation<br>(db) | Pulse<br>Count |
|---------------|-------------------|-------------------------------|---------------------------------|----------------|
| 1296.9        | 27.0              | 1323.9                        | 0                               | 2099           |
|               |                   |                               | 10                              | 1238           |
|               |                   |                               | 20                              | 360            |
|               |                   |                               | 25                              | 139            |
|               |                   |                               | 30                              | 59             |
|               |                   |                               | 35                              | 35             |
|               |                   |                               | 40                              | 27             |
|               |                   |                               | 45                              | 14             |
|               |                   |                               | 50                              | 20             |
|               |                   |                               | 55                              | 13             |
| 1296.9        | 31.0              | 1327.9                        | 0                               | 1931           |
|               |                   |                               | 10                              | 901            |
|               |                   |                               | 15                              | 536            |
|               |                   |                               | 20                              | 253            |
|               |                   |                               | 25                              | 103            |
|               |                   |                               | 30                              | 45             |
|               |                   |                               | 35                              | 31             |
|               |                   |                               | 40                              | 31             |
|               |                   |                               | 45                              | 22             |
|               |                   |                               | 50                              | 16             |
| 1296.9        | 35.0              | 1331.9                        | 0                               | 1864           |
|               |                   |                               | 10                              | 783            |
|               |                   |                               | 15                              | 394            |
|               |                   |                               | 20                              | 175            |
|               |                   |                               | 25                              | 71             |
|               |                   |                               | 30                              | 39             |
|               |                   |                               | 35                              | 36             |
|               |                   |                               | 40                              | 20             |
|               |                   |                               | 45                              | 15             |
|               |                   |                               | 50                              | 14             |
| 1296.9        | 39.0              | 1335.9                        | 0                               | 1816           |
|               |                   |                               | 10                              | 709            |
|               |                   |                               | 15                              | 333            |
|               |                   |                               | 20                              | 148            |
|               |                   |                               | 25                              | 83             |
|               |                   |                               | 30                              | 40             |
|               |                   |                               | 35                              | 26             |
|               |                   |                               | 40                              | 25             |
|               |                   |                               | 45                              | 22             |
|               |                   |                               | 50                              | 24             |
|               |                   |                               | 55                              | 23             |
|               |                   |                               | 60                              | 13             |

| $f_o$<br>(Mc) | Deviation<br>(Mc) | Receiver<br>Frequency<br>(Mc) | Receiver<br>Attenuation<br>(db) | Pulse<br>Count |
|---------------|-------------------|-------------------------------|---------------------------------|----------------|
| 1296.9        | 43.0              | 1339.9                        | 0                               | 1840           |
|               |                   |                               | 10                              | 679            |
|               |                   |                               | 15                              | 358            |
|               |                   |                               | 20                              | 148            |
|               |                   |                               | 25                              | 78             |
|               |                   |                               | 30                              | 40             |
|               |                   |                               | 35                              | 33             |
|               |                   |                               | 40                              | 28             |
|               |                   |                               | 45                              | 27             |
|               |                   |                               | 50                              | 11             |
| 1296.9        | 83.9              | 1380.8                        | 0                               | 2370           |
|               |                   |                               | 10                              | 1467           |
|               |                   |                               | 15                              | 960            |
|               |                   |                               | 20                              | 582            |
|               |                   |                               | 25                              | 263            |
|               |                   |                               | 30                              | 92             |
|               |                   |                               | 35                              | 46             |
|               |                   |                               | 40                              | 39             |
|               |                   |                               | 45                              | 21             |
|               |                   |                               | 50                              | 17             |
|               |                   |                               | 55                              | 15             |
| 1296.9        | 137.2             | 1434.1                        | 0                               | 1949           |
|               |                   |                               | 10                              | 651            |
|               |                   |                               | 15                              | 243            |
|               |                   |                               | 20                              | 92             |
|               |                   |                               | 25                              | 45             |
|               |                   |                               | 30                              | 36             |
|               |                   |                               | 35                              | 32             |
|               |                   |                               | 40                              | 30             |
|               |                   |                               | 45                              | 27             |
|               |                   |                               | 50                              | 14             |
| 1296.9        | 182.2             | 1479.1                        | 0                               | 827            |
|               |                   |                               | 10                              | 164            |
|               |                   |                               | 15                              | 68             |
|               |                   |                               | 20                              | 56             |
|               |                   |                               | 25                              | 50             |
|               |                   |                               | 30                              | 40             |
|               |                   |                               | 35                              | 33             |
|               |                   |                               | 40                              | 25             |
|               |                   |                               | 45                              | 17             |

| $f_o$<br>(Mc) | Deviation<br>(Mc) | Receiver<br>Frequency<br>(Mc) | Receiver<br>Attenuation<br>(db) | Pulse<br>Count |
|---------------|-------------------|-------------------------------|---------------------------------|----------------|
| 1296.9        | 214.6             | 1511.5                        | 0                               | 110            |
|               |                   |                               | 5                               | 55             |
|               |                   |                               | 10                              | 36             |
|               |                   |                               | 15                              | 37             |
|               |                   |                               | 20                              | 30             |
|               |                   |                               | 25                              | 17             |
|               |                   |                               | 30                              | 15             |
| 1296.6        | 335.9             | 1632.8                        | 0                               | 290            |
|               |                   |                               | 5                               | 66             |
|               |                   |                               | 10                              | 39             |
|               |                   |                               | 15                              | 31             |
|               |                   |                               | 20                              | 30             |
|               |                   |                               | 25                              | 18             |
|               |                   |                               | 30                              | 14             |
| 1296.9        | 486.2             | 1783.1                        | 0                               | 45             |
|               |                   |                               | 5                               | 35             |
|               |                   |                               | 10                              | 22             |
|               |                   |                               | 15                              | 17             |

Data obtained with the receiver tuned below  $f_o$  is plotted in Figure 6-2. In this figure, the pulse count with the maximum attenuation before the receiver is plotted as the 0 db level. All other points are plotted relative to this maximum attenuation. From plots of these data, the relative power level to that at the fundamental, at each measured frequency, can be scaled at a constant pulse rate. Data obtained with the receiver tuned above  $f_o$  are shown plotted in Figure 6-3. A receiver bandwidth of 0.5 Mc was selected for this test. Relative power level scaled at a pulse rate of 100 pulses per scan is plotted in Figure 6-4. A comparison of Figure 6-4 with the automatic spurious emission scans in Figures 5.2.3-19, 20, and 21 shows a great amount of similarity between the curves.

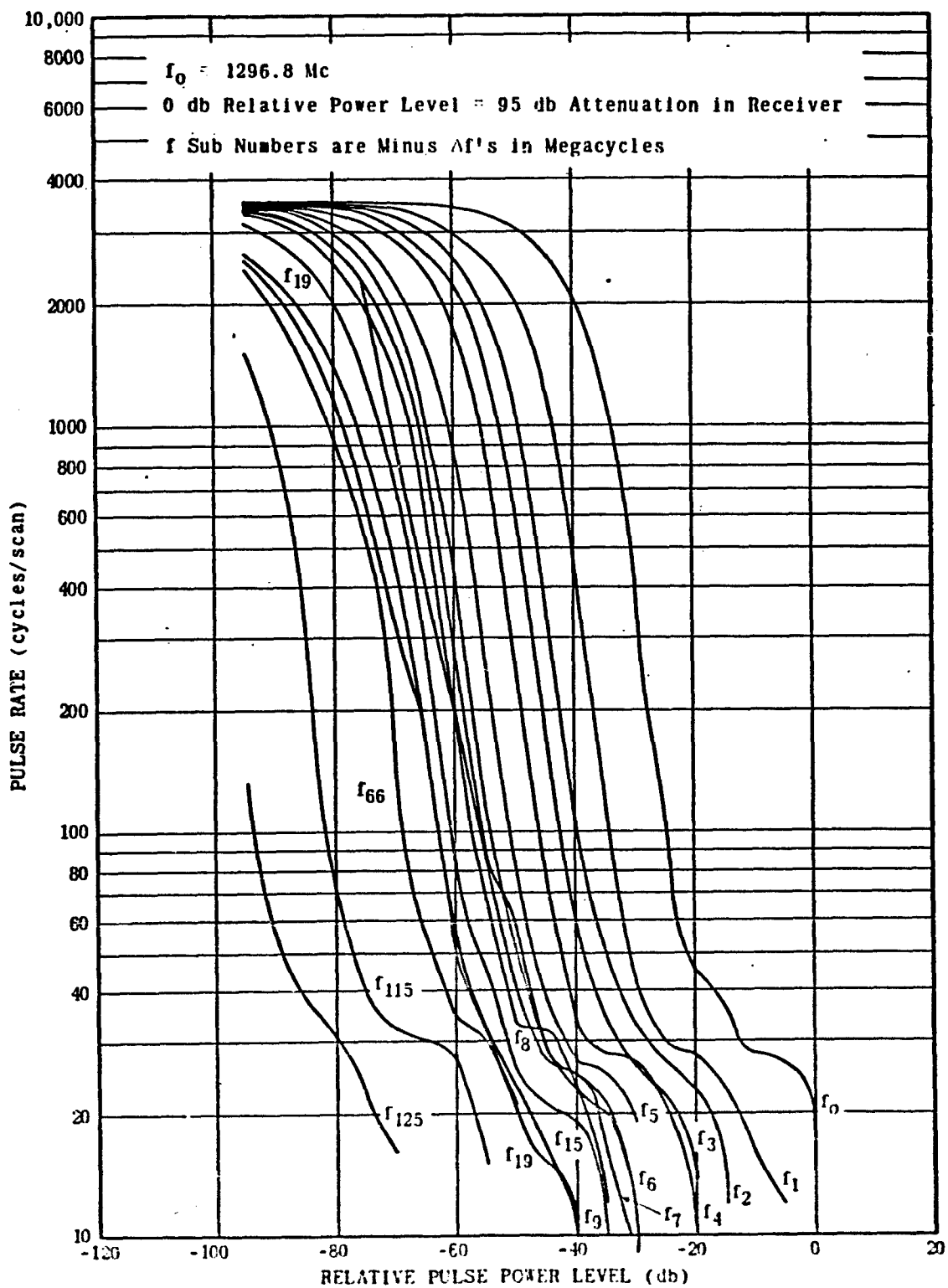


Figure 6-2. Pulse Rate as a Function of Receiver Sensitivity,  $(-\Delta f)$ .

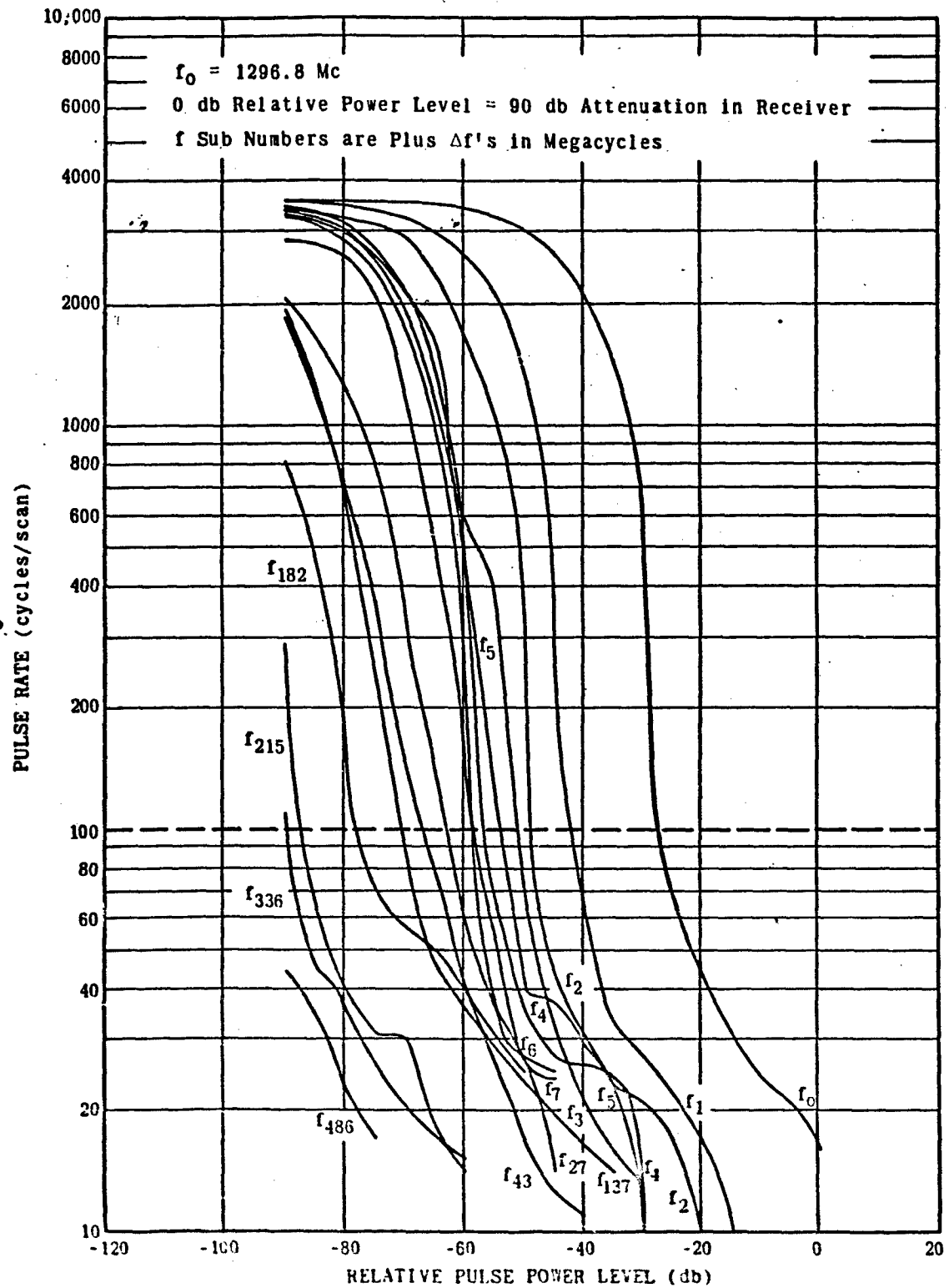


Figure 6-3. Pulse Rate as a Function of Receiver Sensitivity, ( $+\Delta f$ ).

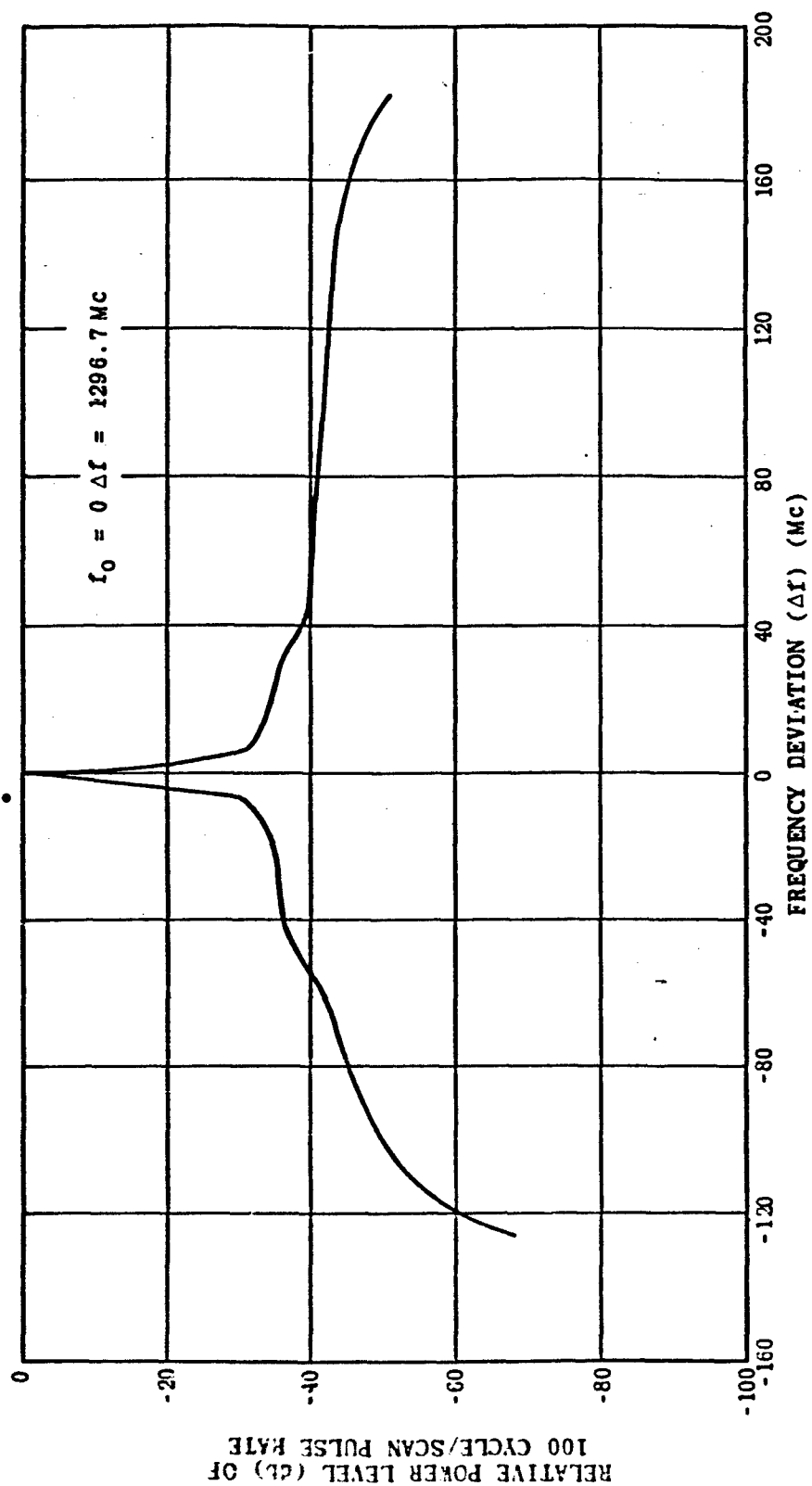


Figure 6-4. Relative Pulse Power for Constant Pulse Rate.