

KTL Test Report: 0R02665

Applicant: Daniels Electronics Ltd.
43 Erie Street
Victoria, BC
V8V 1P8

**Equipment Under Test:
(E.U.T.)** VHF Transmitter

FCC ID: H4JVT-4-150

In Accordance With: **FCC Part 22**
FCC Part 90

Tested By: KTL Ottawa Inc.
3325 River Road, R.R. 5
Ottawa, Ontario K1V 1H2

Authorized By:

K. Carr, Technologist

Date:

Total Number of Pages: 59

EQUIPMENT: VHF Transmitter
FCC ID: H4JVT-4-150

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EQUIPMENT: VHF Transmitter
FCC ID: H4JVT-4-150

Section 1. Summary of Test Results

General

All measurements are traceable to national standards.

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with FCC Part 22 and FCC Part 90.

New Submission

Production Unit

Class II Permissive Change

Pre-Production Unit

| | | |
|---|---|---|
| T | N | B |
|---|---|---|

Equipment Code

THIS TEST REPORT RELATES ONLY TO THE ITEM(S) TESTED.

THE FOLLOWING DEVIATIONS FROM, ADDITIONS TO, OR EXCLUSIONS FROM THE TEST SPECIFICATIONS HAVE BEEN MADE.

See " Summary of Test Data".



NVLAP LAB CODE: 100351-0

TESTED BY: _____ DATE: _____
Russell Grant, Wireless Group Manager

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This report applies only to the items tested.

EQUIPMENT: VHF Transmitter
FCC ID: H4JVT-4-150

Summary Of Test Data

| Name Of Test | Para. No. | Result |
|--|------------------|---------------|
| RF Power Output | 2.1046 | Complies |
| Audio Frequency Response | 2.1047 | Noted |
| Audio Low-Pass Filter Response | 2.1047 | Noted |
| Modulation Limiting | 2.1047 | Noted |
| Occupied Bandwidth | 2.1049 | Complies |
| Spurious Emissions at Antenna Terminals | 2.1051 | Complies |
| Field Strength of Spurious Emissions | 2.1053 | Complies |
| Frequency Stability | 2.1055 | Complies |
| Transient Frequency Behavior | — | Complies |

Footnotes For N/A's:

Indoor Temperature: 22 °C
 Humidity: 50 %

Outdoor Temperature: 26 °C
 Humidity: 65 %

EQUIPMENT: VHF Transmitter
FCC ID: H4JVT-4-150

Section 2. General Equipment Specification

| | |
|-------------------------------------|--|
| Manufacturer: | Daniels Electronics Ltd. |
| Model No.: | P25 |
| Date Received In Laboratory: | July 17, 2000 |
| KTL Identification No.: | Item #5 |
| | Tx 136 – 150 MHz, 150 – 174 MHz, 2 Bands |
| Power: | 13.8 VDC |
| RF Output Power: | 2 to 8 W Continuously Variable |
| Emission Designator: | 16K0F3E 11K0F3E 8K10F1E |

The P25 transmitter can be configured as either a base or repeater. Both configurations use identical RF and baseband voice/digital processing circuits. In the repeater mode the equipment receives demodulated data from the associated receiver. All tests were conducted in the base configuration.

EQUIPMENT: VHF Transmitter
FCC ID: H4JVT-4-150

Section 3. RF Power Output

Para. No.: 2.1046

| | |
|---|------------------------------------|
| Test Performed By: Russell Grant | Date of Test: July 18, 2000 |
|---|------------------------------------|

Minimum Standard: ± 1 dB

Test Results: Complies. The RF power output is within 1 dB of the manufacturer's rating.

Measurement Data:

| Measured | Rated |
|-----------------|--------------|
| 2.0W | 2.0W |
| 8.0W | 8.0W |

EQUIPMENT: VHF Transmitter
FCC ID: H4JVT-4-150

Section 4. Audio Frequency Response

Para. No.: 2.1047

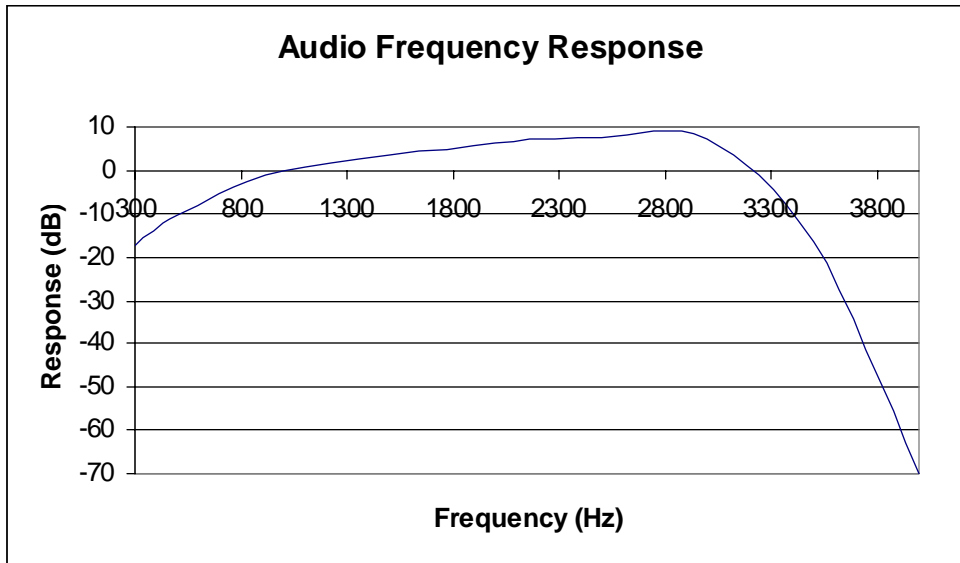
| | |
|---|------------------------------------|
| Test Performed By: Russell Grant | Date of Test: July 18, 2000 |
|---|------------------------------------|

Minimum Standard: Not applicable.

Test Results: Complies. The equipment exhibits a 6dB per-emphasis audio frequency characteristic.

Measurement Data: See attached graph.

EQUIPMENT: VHF Transmitter
FCC ID: H4JVT-4-150



EQUIPMENT: VHF Transmitter
FCC ID: H4JVT-4-150

Section 5. Audio Low-Pass Filter Response

Para. No.: 2.1047

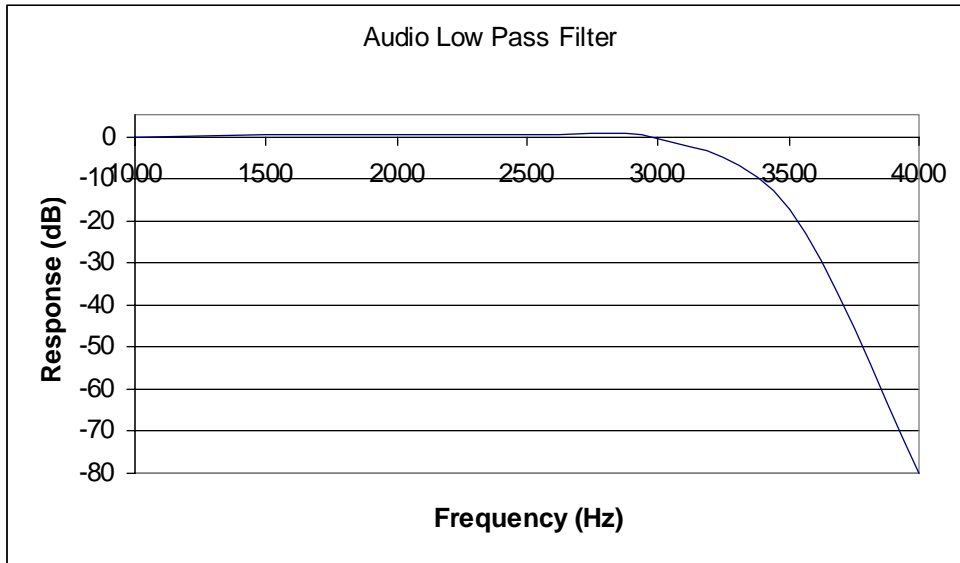
| | |
|---|------------------------------------|
| Test Performed By: Russell Grant | Date of Test: July 18, 2000 |
|---|------------------------------------|

Minimum Standard: Not applicable.

Test Results: Complies. The equipment has provision for audio low pass filter.

Measurement Data: See attached graph.

EQUIPMENT: VHF Transmitter
FCC ID: H4JVT-4-150



EQUIPMENT: VHF Transmitter
FCC ID: H4JVT-4-150

Section 6. Modulation Limiting

Para. No.: 2.1047

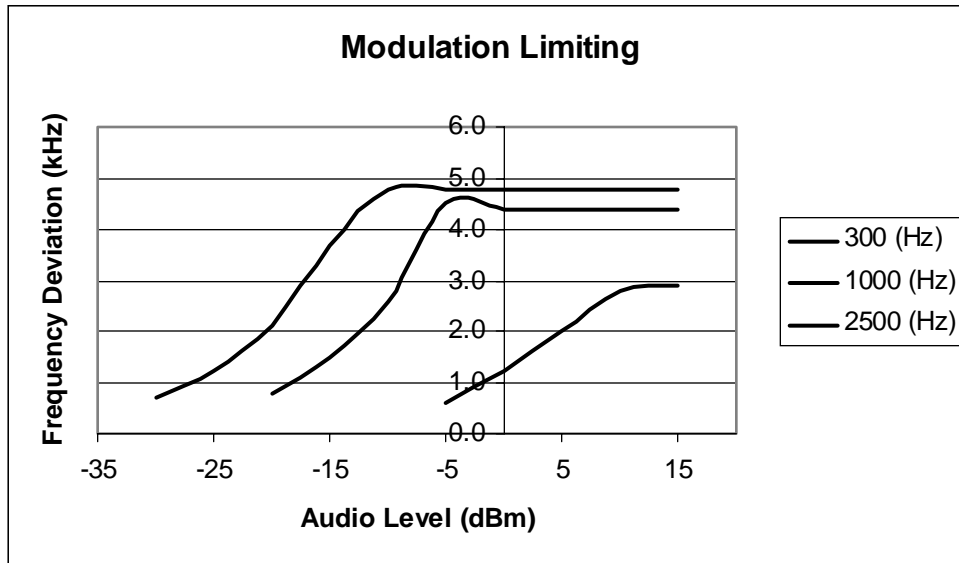
| | |
|---|------------------------------------|
| Test Performed By: Russell Grant | Date of Test: July 18, 2000 |
|---|------------------------------------|

Minimum Standard: Not Applicable

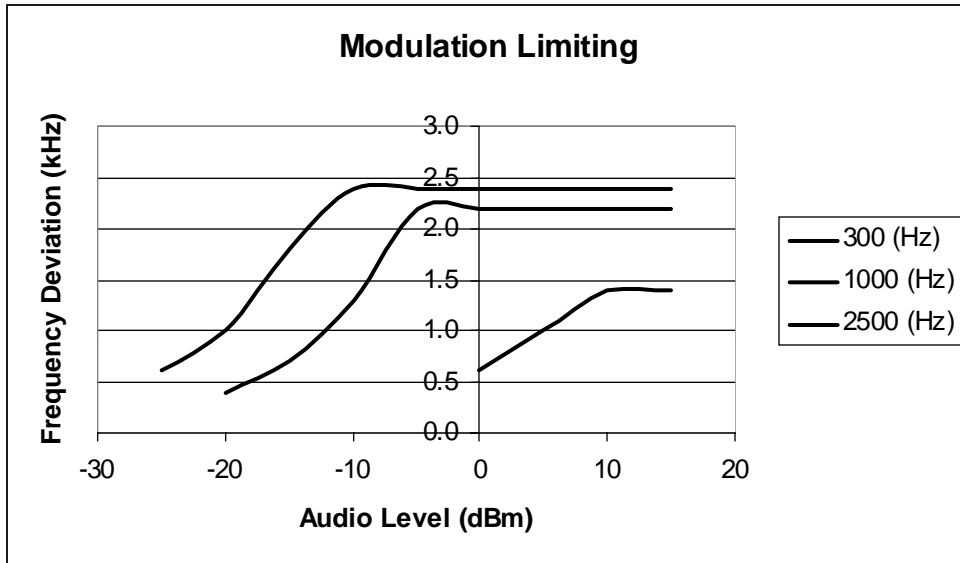
Test Results: Complies. The maximum frequency deviation is less than ± 5 kHz for wideband mode and less than ± 2.5 kHz for narrowband mode.

Measurement Data: See attached graphs.

EQUIPMENT: VHF Transmitter
FCC ID: H4JVT-4-150



EQUIPMENT: VHF Transmitter
FCC ID: H4JVT-4-150



EQUIPMENT: VHF Transmitter
FCC ID: H4JVT-4-150

Section 7. Occupied Bandwidth

Para. No.: 2.1049

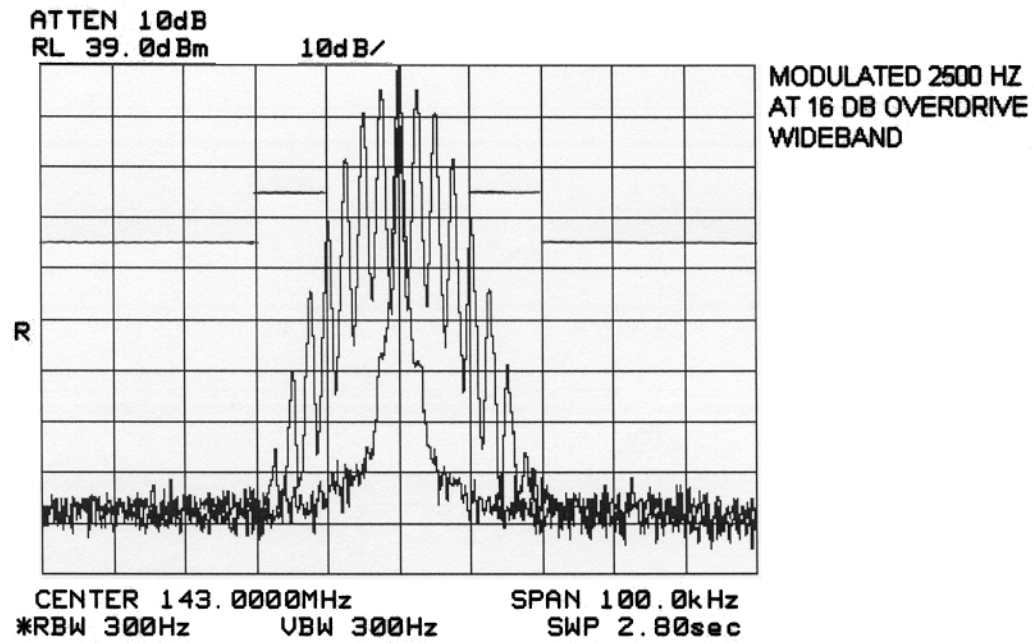
| | |
|---|------------------------------------|
| Test Performed By: Russell Grant | Date of Test: July 18, 2000 |
|---|------------------------------------|

Minimum Standard: Para. No.'s 90.210(b)
90.210(d)
22.359(a), (b)(1) & (b)(2)

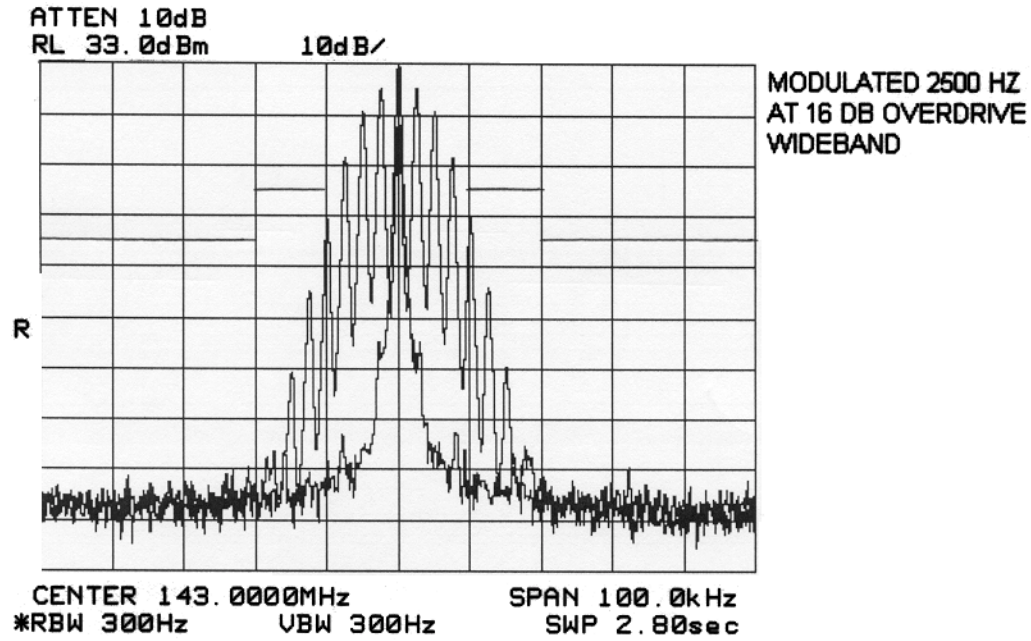
Test Results: Complies.

Measurement Data: See attached graphs.

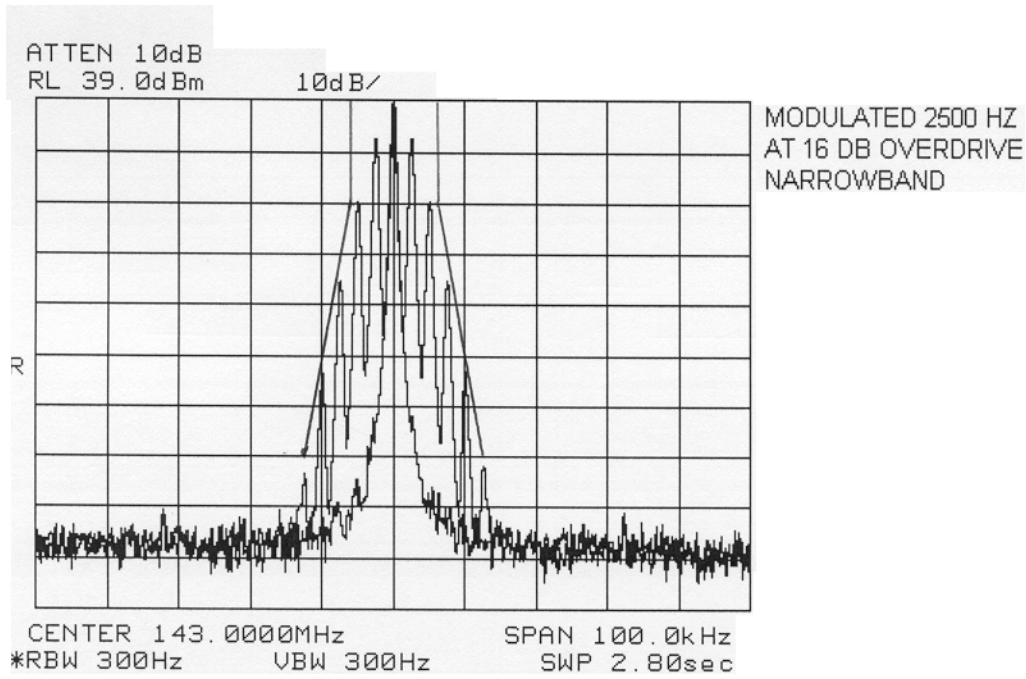
EQUIPMENT: VHF Transmitter
FCC ID: H4JVT-4-150



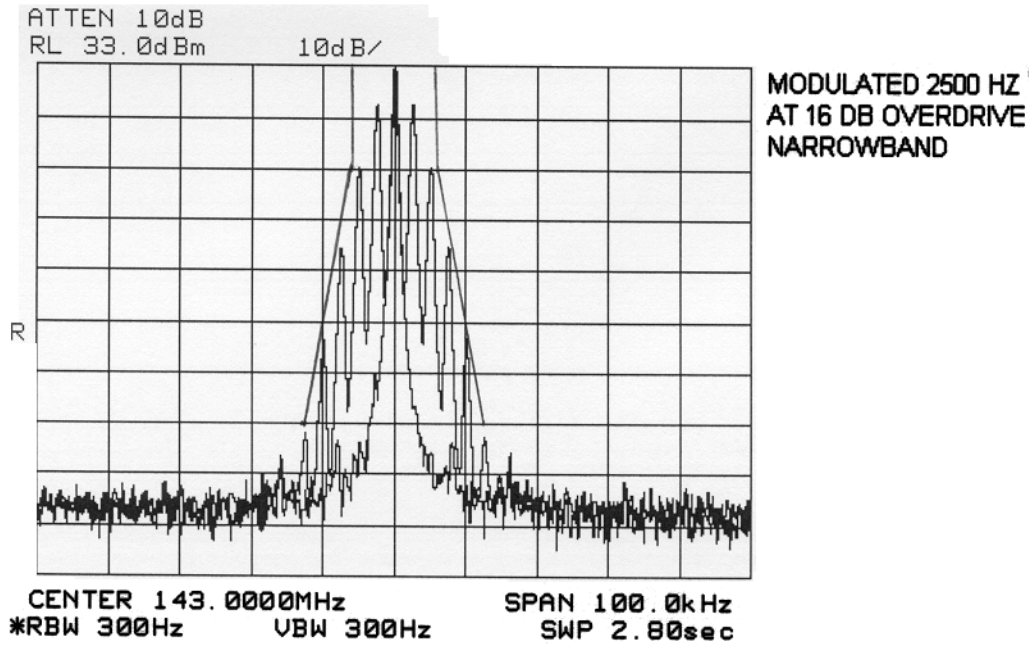
EQUIPMENT: VHF Transmitter
FCC ID: H4JVT-4-150



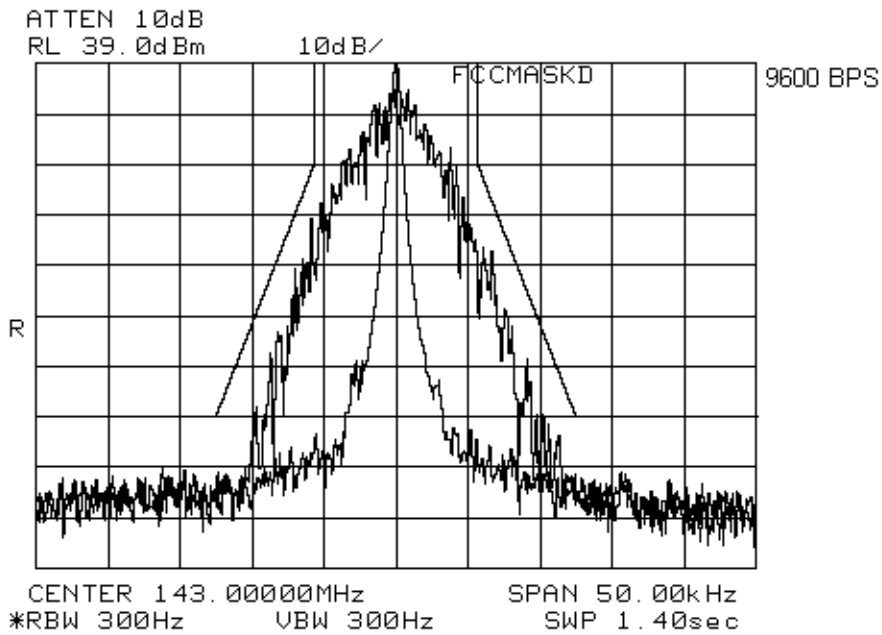
EQUIPMENT: VHF Transmitter
FCC ID: H4JVT-4-150



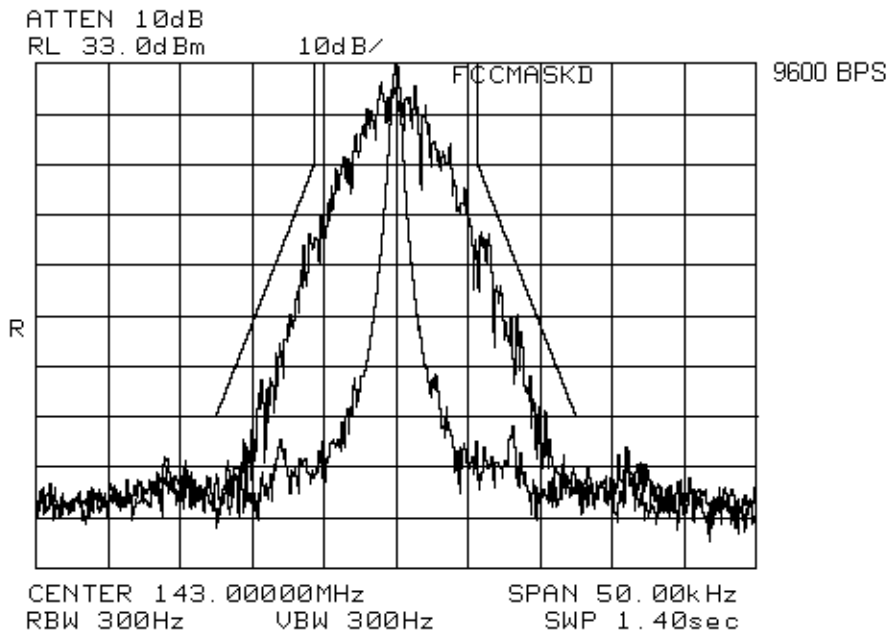
EQUIPMENT: VHF Transmitter
FCC ID: H4JVT-4-150



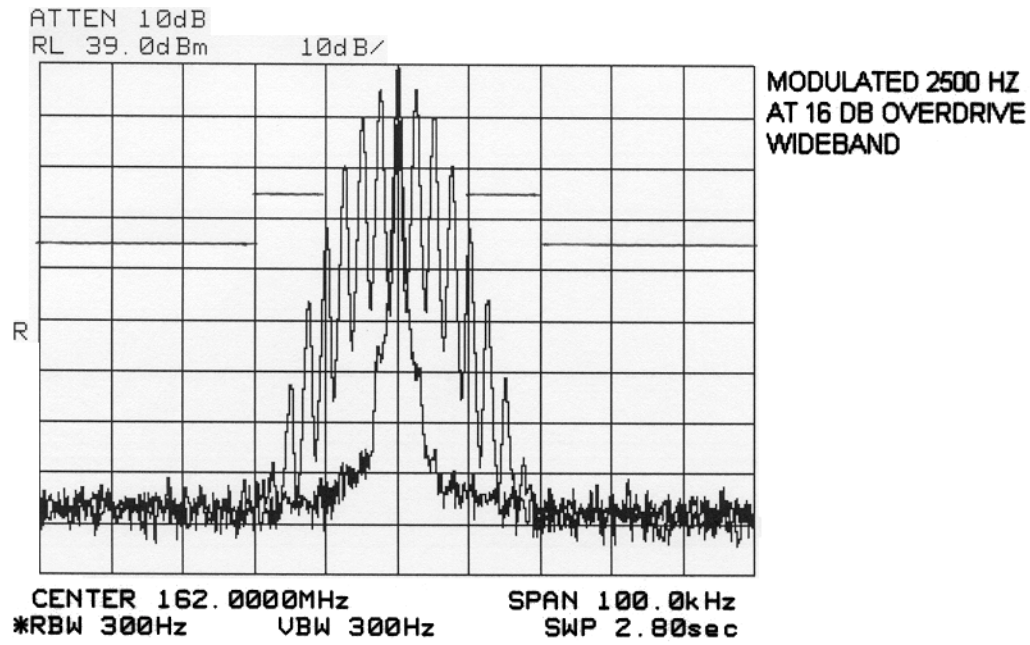
EQUIPMENT: VHF Transmitter
FCC ID: H4JVT-4-150



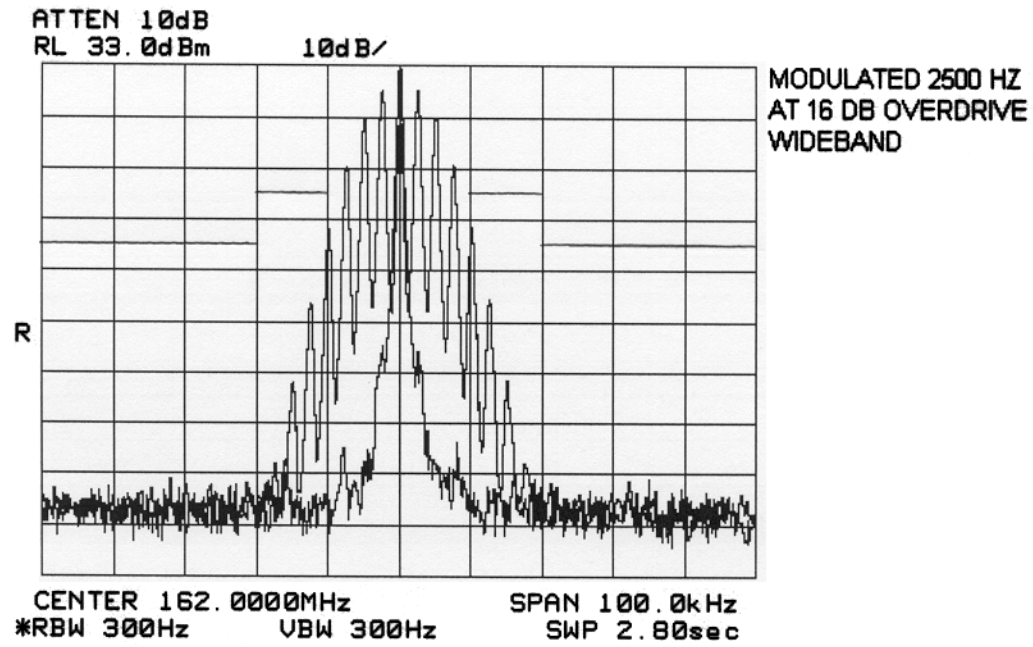
EQUIPMENT: VHF Transmitter
FCC ID: H4JVT-4-150



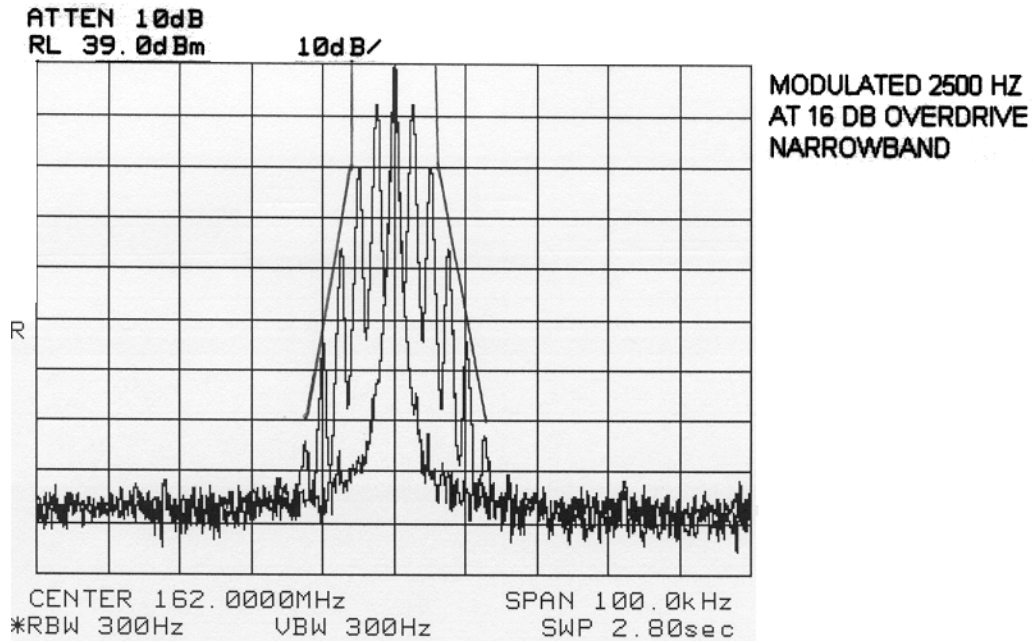
EQUIPMENT: VHF Transmitter
FCC ID: H4JVT-4-150



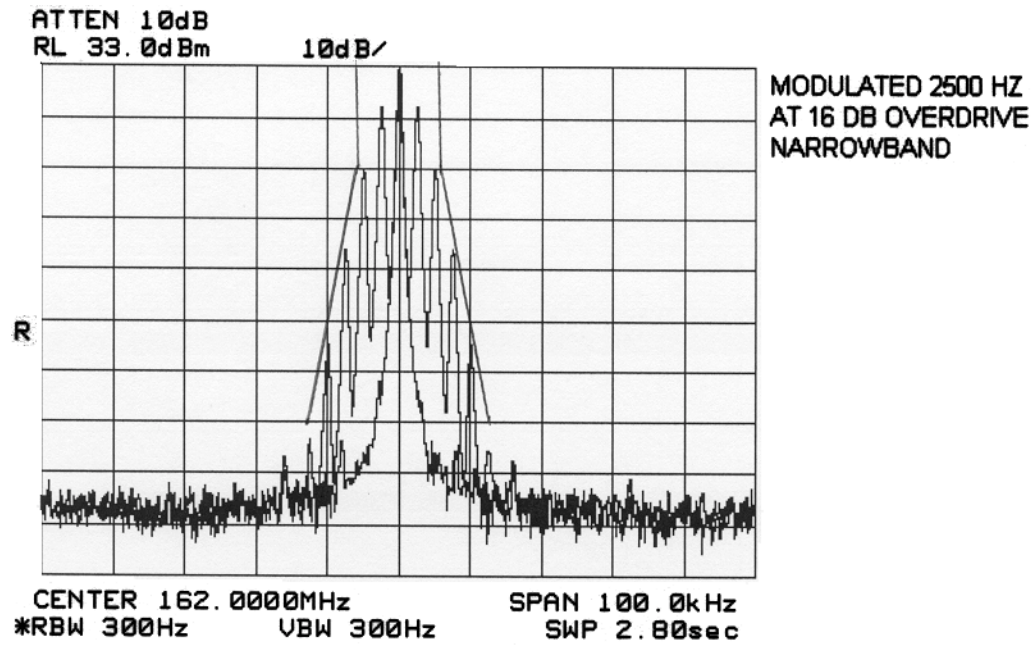
EQUIPMENT: VHF Transmitter
FCC ID: H4JVT-4-150



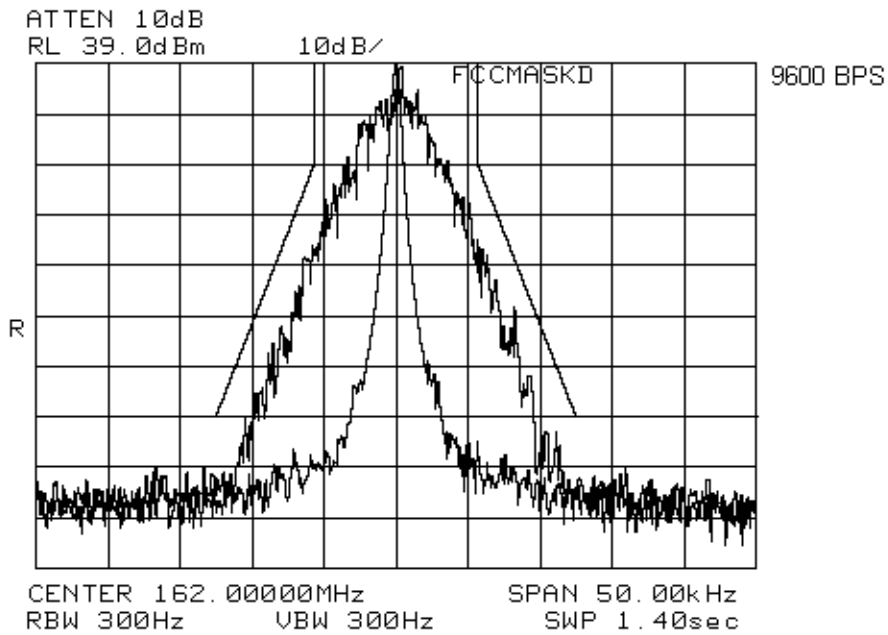
EQUIPMENT: VHF Transmitter
FCC ID: H4JVT-4-150



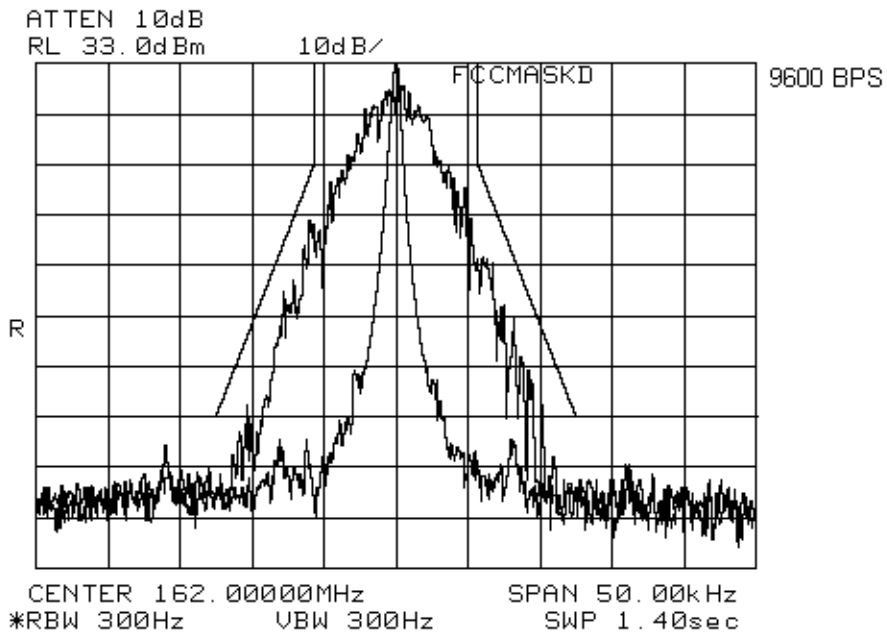
EQUIPMENT: VHF Transmitter
FCC ID: H4JVT-4-150



EQUIPMENT: VHF Transmitter
FCC ID: H4JVT-4-150



EQUIPMENT: VHF Transmitter
FCC ID: H4JVT-4-150



EQUIPMENT: VHF Transmitter
FCC ID: H4JVT-4-150

Section 8. Spurious Emissions at Antenna Terminals

Para. No.: 2.1051

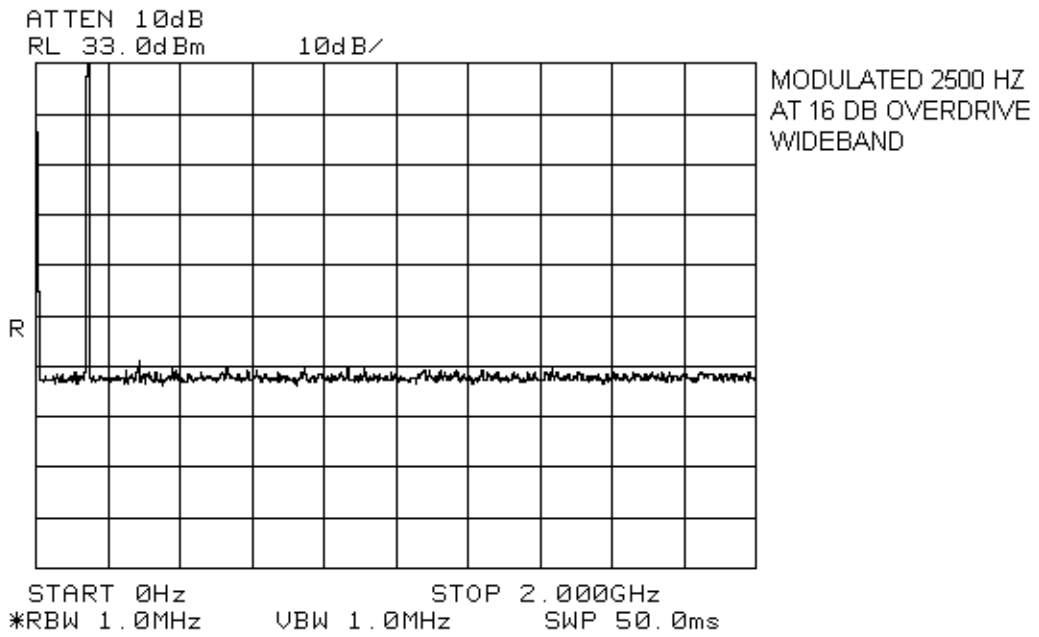
| | |
|---|------------------------------------|
| Test Performed By: Russell Grant | Date of Test: July 18, 2000 |
|---|------------------------------------|

Minimum Standard: Para. No.'s 90.210 (b)(d)
22.359(a), (b)(1) & (b)(2)

Test Results: Complies. The worst case emission is -25.8 dBm at 286 MHz.
This is 5.8 dB below the specification limit.

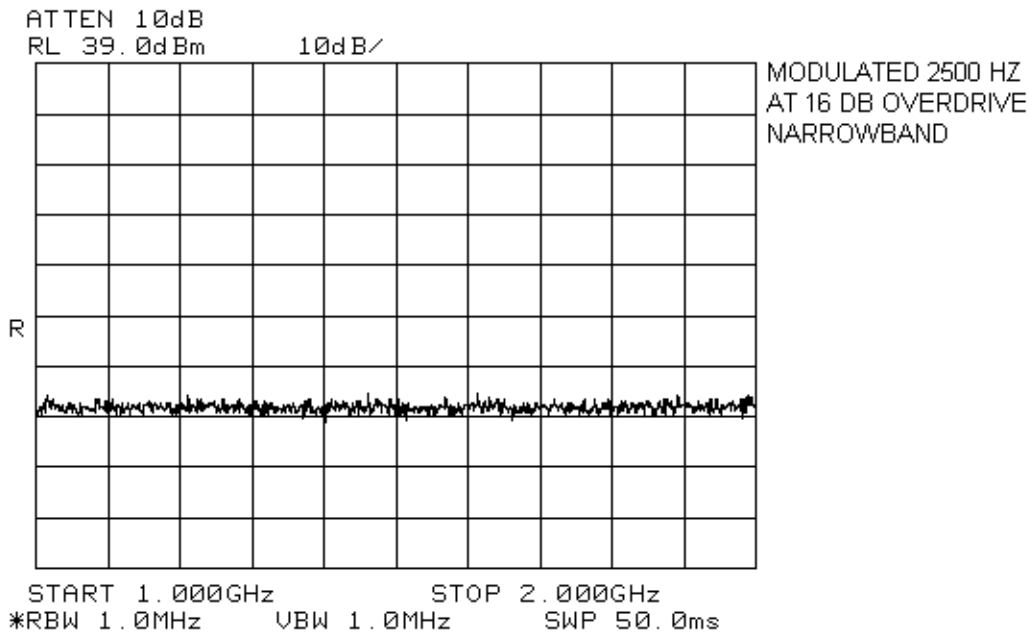
Measurement Data: See attached graphs.

EQUIPMENT: VHF Transmitter
FCC ID: H4JVT-4-150



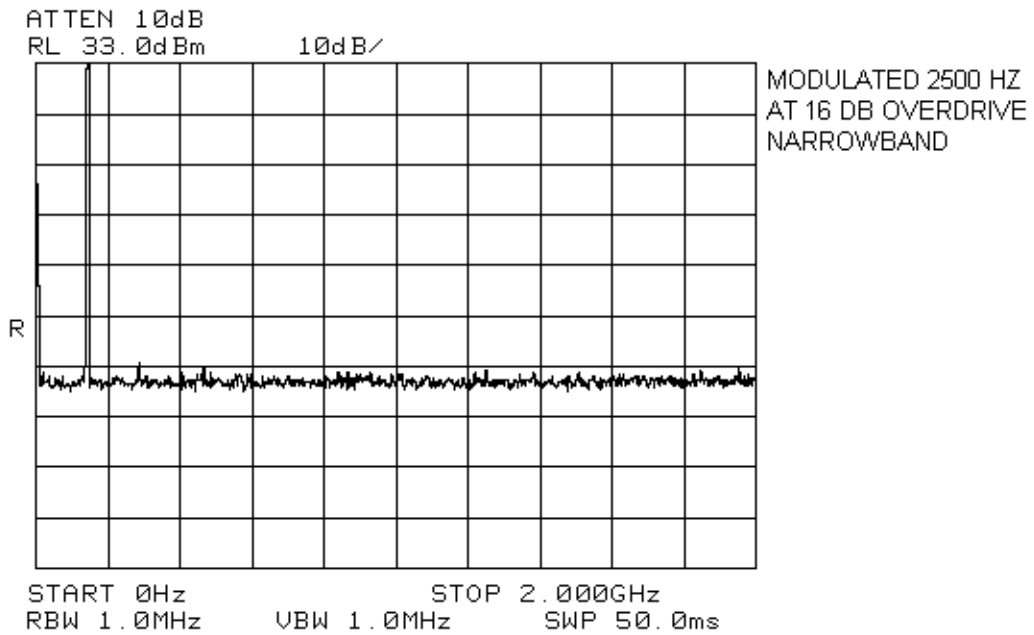
Tx 143 MHz

EQUIPMENT: VHF Transmitter
FCC ID: H4JVT-4-150



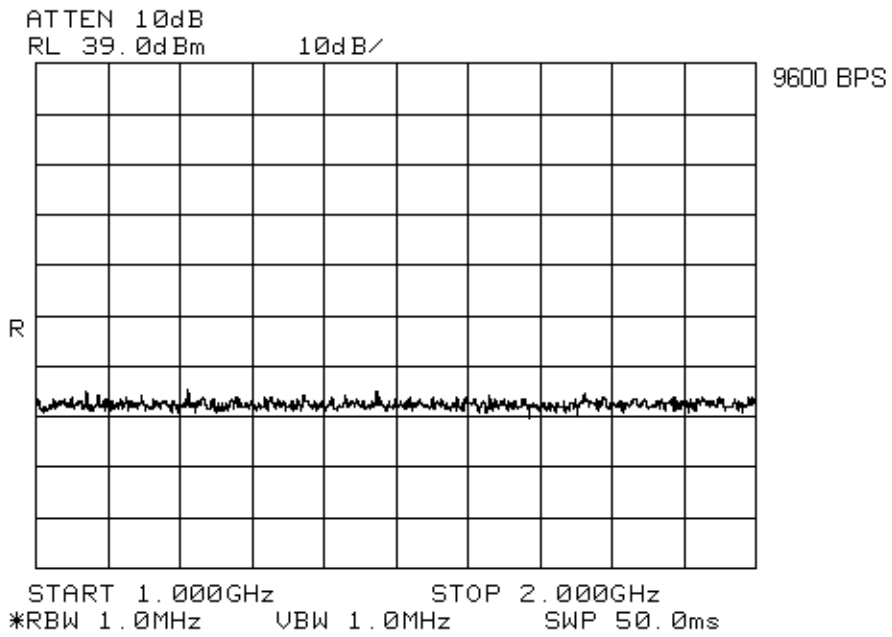
Tx 143 MHz

EQUIPMENT: VHF Transmitter
FCC ID: H4JVT-4-150



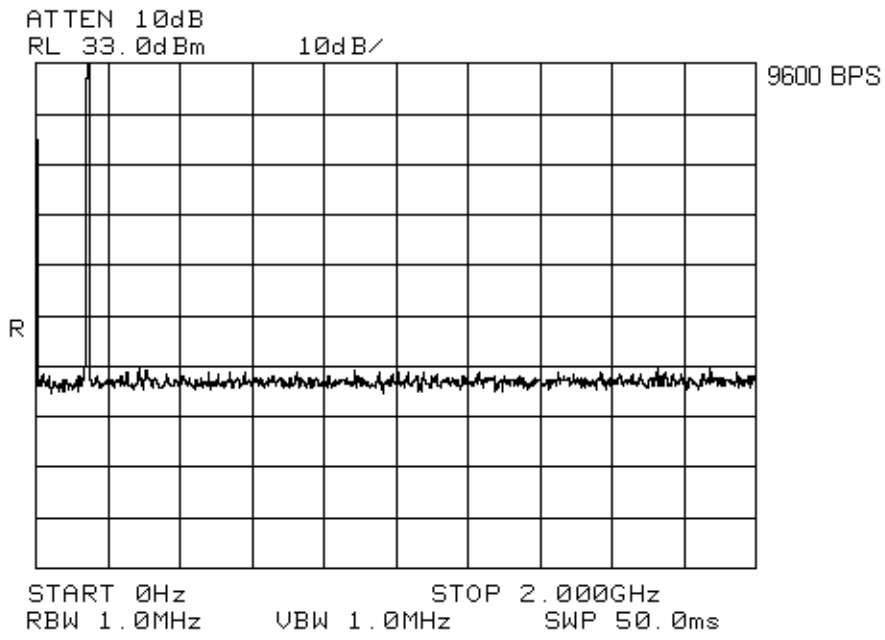
Tx 143 MHz

EQUIPMENT: VHF Transmitter
FCC ID: H4JVT-4-150



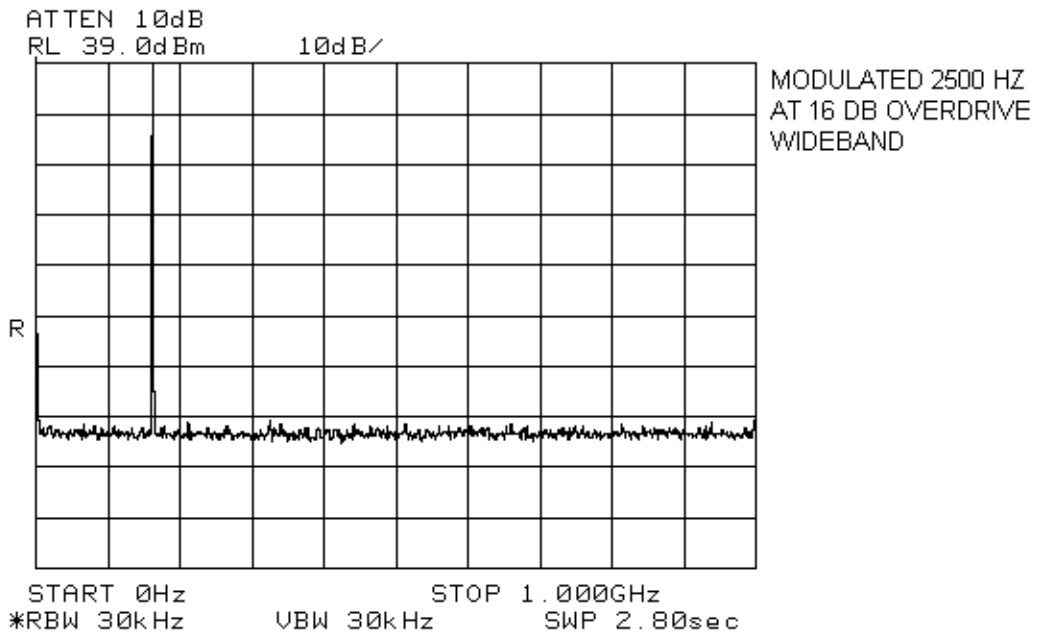
Tx 143 MHz

EQUIPMENT: VHF Transmitter
FCC ID: H4JVT-4-150



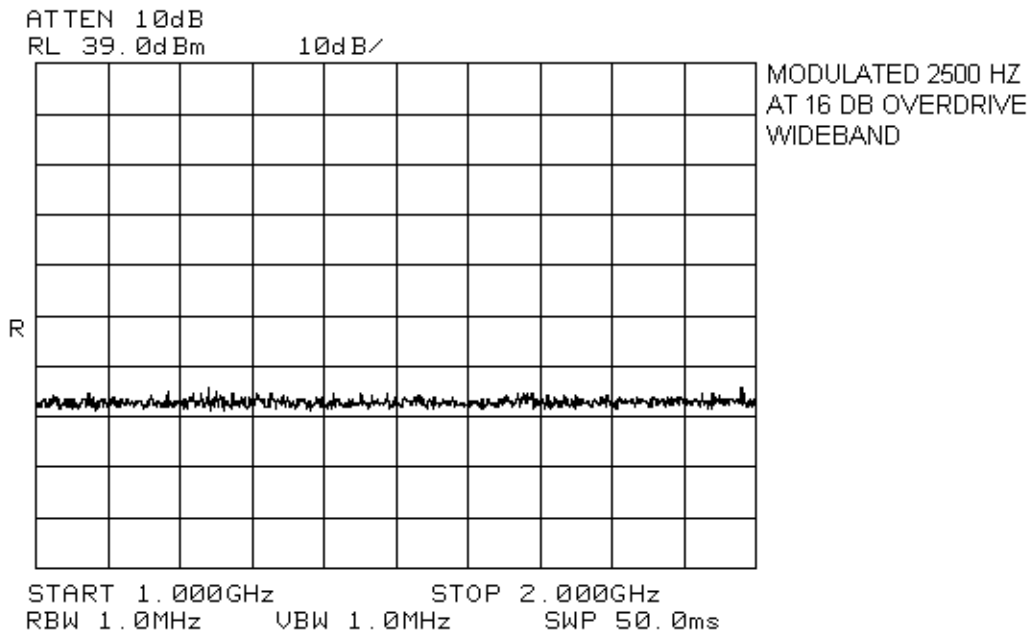
Tx 143 MHz

EQUIPMENT: VHF Transmitter
FCC ID: H4JVT-4-150



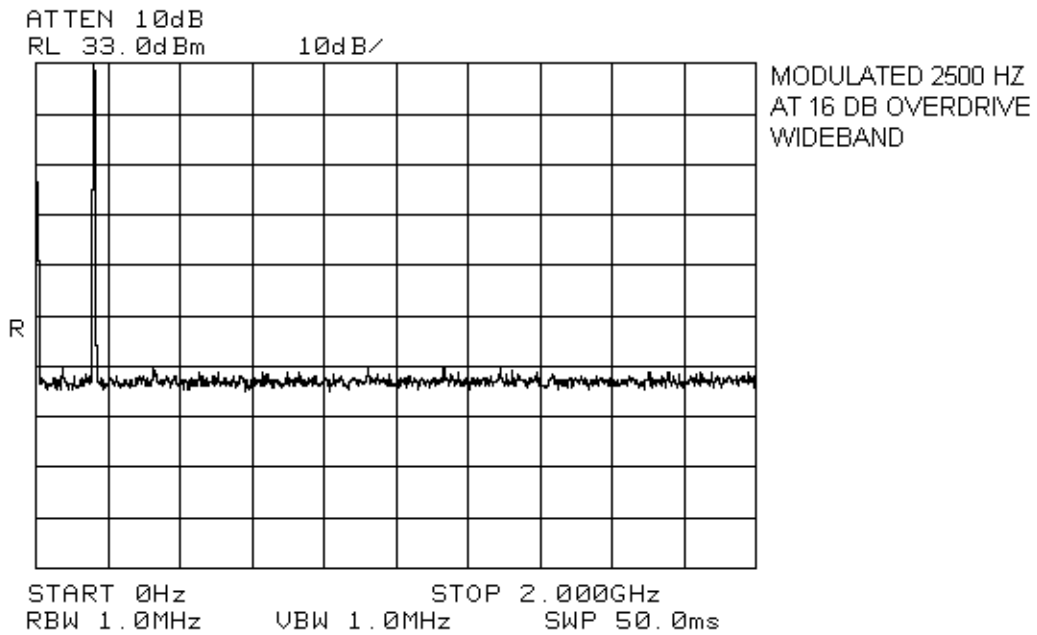
Tx 162 MHz

EQUIPMENT: VHF Transmitter
FCC ID: H4JVT-4-150



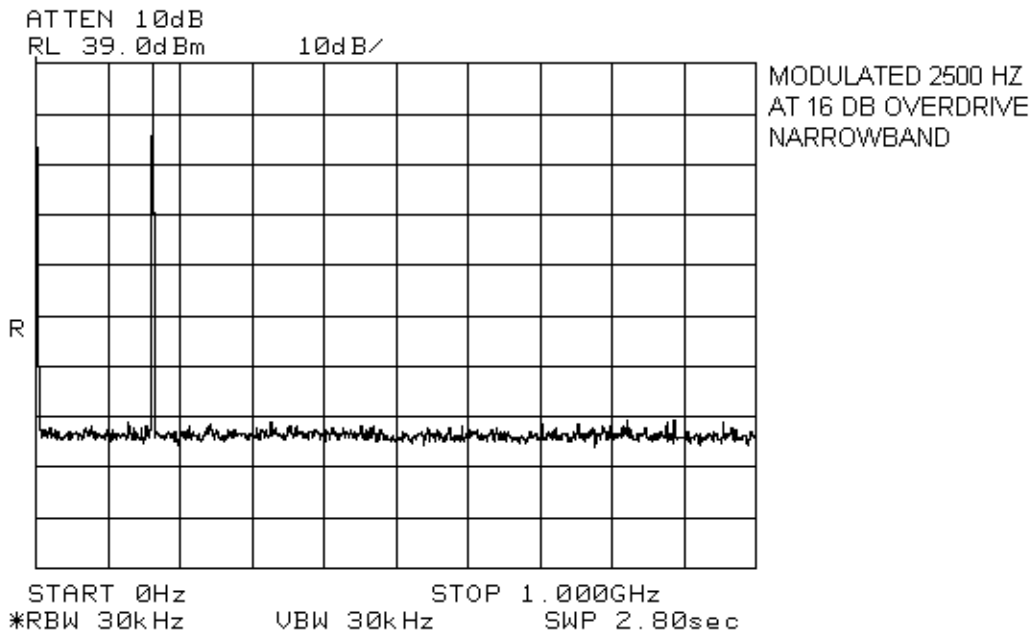
Tx 162 MHz

EQUIPMENT: VHF Transmitter
FCC ID: H4JVT-4-150



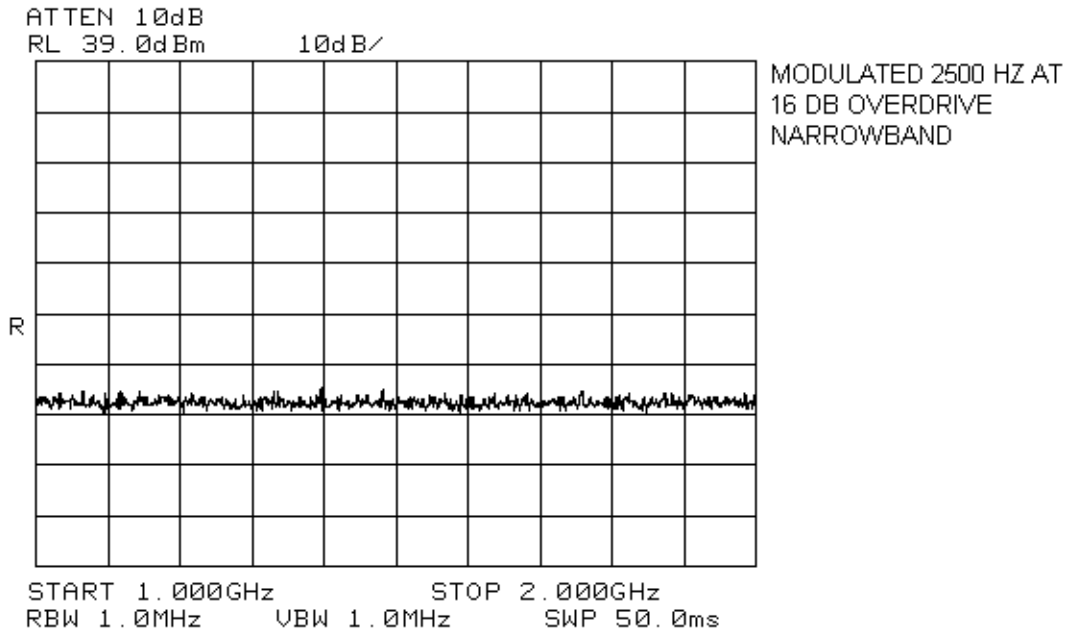
Tx 162 MHz

EQUIPMENT: VHF Transmitter
FCC ID: H4JVT-4-150



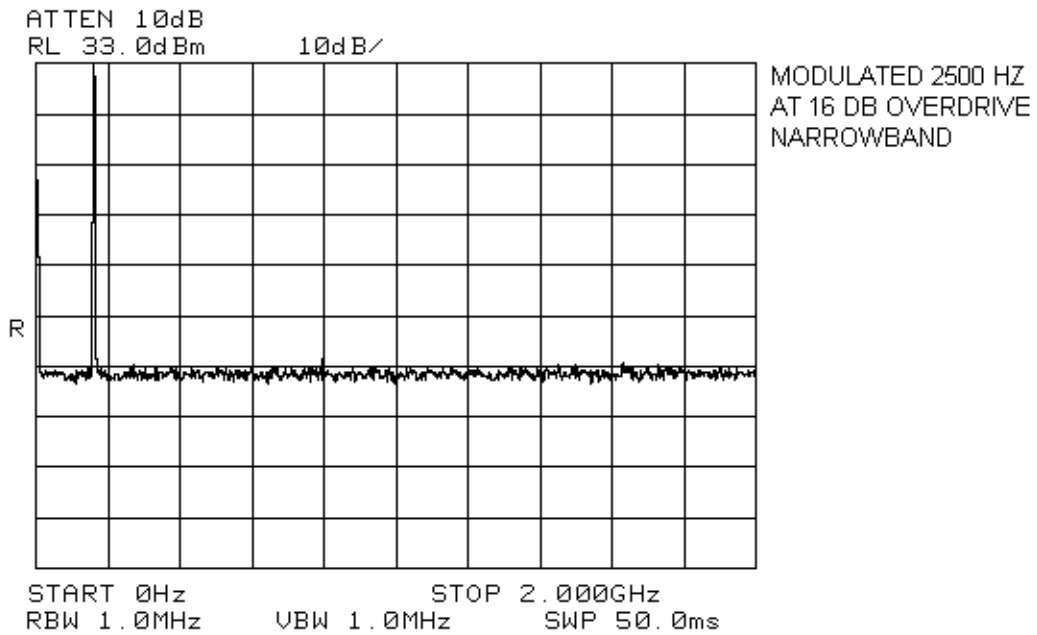
Tx 162 MHz

EQUIPMENT: VHF Transmitter
FCC ID: H4JVT-4-150



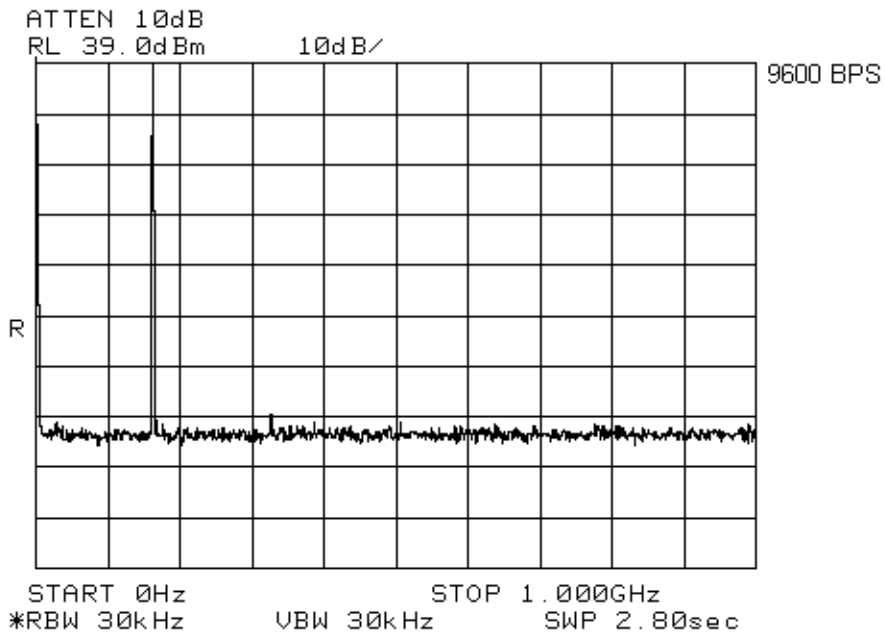
Tx 162 MHz

EQUIPMENT: VHF Transmitter
FCC ID: H4JVT-4-150



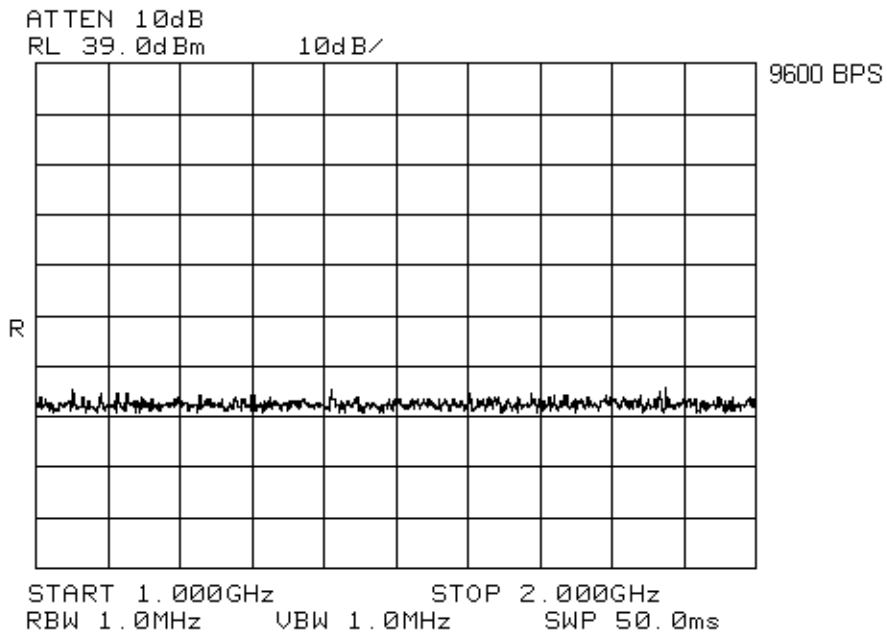
Tx 162 MHz

EQUIPMENT: VHF Transmitter
FCC ID: H4JVT-4-150



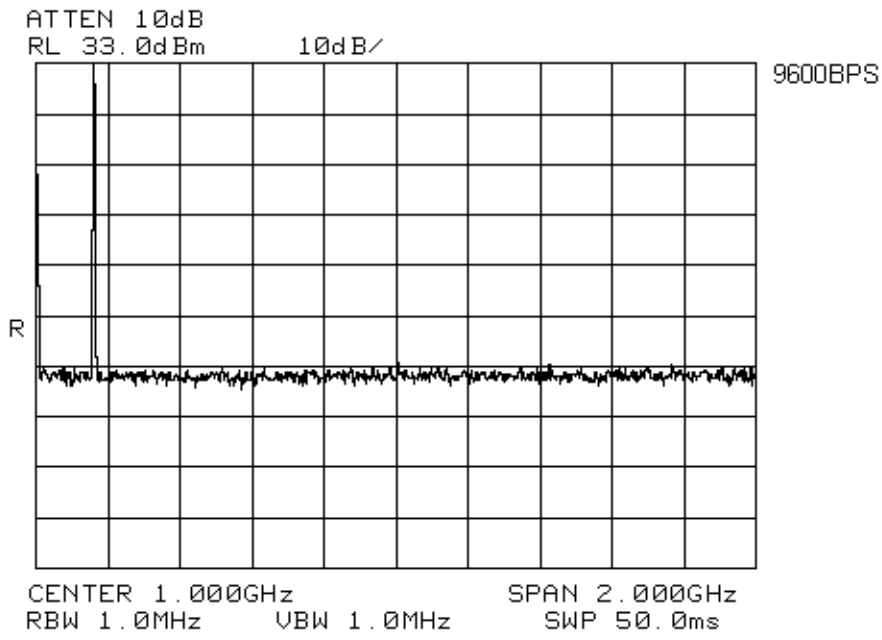
Tx 162 MHz

EQUIPMENT: VHF Transmitter
FCC ID: H4JVT-4-150



Tx 162 MHz

EQUIPMENT: VHF Transmitter
FCC ID: H4JVT-4-150



Tx 162 MHz

EQUIPMENT: VHF Transmitter
FCC ID: H4JVT-4-150

Section 9. Field Strength of Spurious Emissions

Para. No.: 2.1053

| | |
|---|------------------------------------|
| Test Performed By: Russell Grant | Date of Test: July 18, 2000 |
|---|------------------------------------|

Minimum Standard: Para. No.'s 90.210 (b), (d)
22.359 (a), (b)(1) & (b)(2)

Test Results: Complies. The worst case emission is 36.3 dB μ V/m @ 3m at 429 MHz. This is 41.1 dB below the specification limit.

Measurement Data: See attached tables.

EQUIPMENT: VHF Transmitter
 FCC ID: H4JVT-4-150

Test Data - Radiated Emissions – Tx 143 MHz

| Test Distance (meters) : 3 | | Range: A Tower | | Receiver: ESVP | | RBW(kHz): 120 | | Detector: Q-Peak | |
|-------------------------------|-----------|-------------------|----------------------------|--------------------------|-------------------------|------------------------|-------------------------------|---------------------|----------------|
| Freq. (MHz) | Ant. * | Pol. (V/H) | RCVD Signal (dBµV/m) | Ant. Factor (dB)** | Amp. Gain (dB)*** | Dist. Corr. (dB) | Field Strength (dBµV/m) | Limit (dBµV/m) | Margin (dB) |
| 286.0 | L/P | V | 2.0 | 17.6 | | | 19.6 | 77.4 | 57.8 |
| 286.0 | L/P | H | 12.0 | 17.6 | | | 29.6 | 77.4 | 47.8 |
| 429.0 | L/P | V | 15.5 | 20.8 | | | 36.3 | 77.4 | 41.1 |
| 429.0 | L/P | H | 7.8 | 20.8 | | | 28.6 | 77.4 | 48.8 |
| 572.0 | L/P | V | -5.0 | 23.8 | | | 18.8 | 77.4 | 58.6 |
| 572.0 | L/P | H | -8.0 | 23.8 | | | 15.8 | 77.4 | 61.6 |
| 715.0 | L/P | V | -7.0 | 27.4 | | | 20.4 | 77.4 | 57.0 |
| 715.0 | L/P | H | -7.0 | 27.4 | | | 20.4 | 77.4 | 57.0 |
| 858.0 | L/P | V | -4.0 | 28.9 | | | 24.9 | 77.4 | 52.5 |
| 858.0 | L/P | H | -3.0 | 28.9 | | | 25.9 | 77.4 | 51.5 |

Notes:
 B/C = Biconical, B/L = Biconilog, L/P = Log-Periodic, H = Horn, D/P = Dipole
 * Re-measured using dipole antenna.
 ** Includes cable loss when amplifier is not used.
 *** Includes cable loss.
 () Denotes failing emission level.
 N.D. = Not Detected

EQUIPMENT: VHF Transmitter
 FCC ID: H4JVT-4-150

Test Data - Radiated Emissions – Tx 162 MHz

| Test Distance (meters) : 3 | | Range: A Tower | | Receiver: ESVP | | RBW(kHz): 120 | | Detector: Q-Peak | |
|-------------------------------|-----------|-------------------|----------------------------|--------------------------|-------------------------|------------------------|-------------------------------|---------------------|----------------|
| Freq. (MHz) | Ant. * | Pol. (V/H) | RCVD Signal (dBµV/m) | Ant. Factor (dB)** | Amp. Gain (dB)*** | Dist. Corr. (dB) | Field Strength (dBµV/m) | Limit (dBµV/m) | Margin (dB) |
| 324.0 | L/P | V | -2.0 | 18.5 | | | 16.5 | 77.4 | 60.9 |
| 324.0 | L/P | H | 7.0 | 18.5 | | | 25.5 | 77.4 | 51.9 |
| 486.0 | L/P | V | -5.4 | 22.2 | | | 16.8 | 77.4 | 60.6 |
| 486.0 | L/P | H | -10.5 | 22.2 | | | 11.7 | 77.4 | 65.7 |
| 648.0 | L/P | V | -7.8 | 25.2 | | | 17.4 | 77.4 | 60.0 |
| 648.0 | L/P | H | -1.5 | 25.2 | | | 23.7 | 77.4 | 53.7 |
| 810.0 | L/P | V | -15.0 | 28.0 | | | 13.0 | 77.4 | 64.4 |
| 810.0 | L/P | H | -14.0 | 28.0 | | | 14.0 | 77.4 | 63.4 |

Notes:
 B/C = Biconical, B/L = Biconilog, L/P = Log-Periodic, H = Horn, D/P = Dipole
 * Re-measured using dipole antenna.
 ** Includes cable loss when amplifier is not used.
 *** Includes cable loss.
 () Denotes failing emission level.
 N.D. = Not Detected

EQUIPMENT: VHF Transmitter
FCC ID: H4JVT-4-150

Section 10. Frequency Stability

Para. No.: 2.1055

| | |
|---|------------------------------------|
| Test Performed By: Russell Grant | Date of Test: July 18, 2000 |
|---|------------------------------------|

Minimum Standard: Para. No.'s 22.355
 90.213

Test Results: Complies. The maximum frequency drift is 180 Hz.
 This is 1.11 ppm.

Measurement Data: Standard Test Voltage (STV): 13.8 VDC
 Test Frequency: 162.000 MHz

| Test Condition | Frequency (MHz) | Frequency Drift (Hz) |
|----------------|-----------------|----------------------|
| 115% STV | 161.999 980 | -20 |
| STV | 161.999 976 | -24 |
| 85% STV | 161.999 980 | -20 |
| -30 °C | 161.999 820 | -180 |
| -20 °C | 161.999 863 | -137 |
| -10 °C | 161.999 840 | -160 |
| 0 °C | 161.999 833 | -167 |
| +10 °C | 161.999 887 | -143 |
| +30 °C | 161.999 867 | -133 |
| +40 °C | 161.999 887 | -113 |
| +50 °C | 161.999 840 | -160 |

EQUIPMENT: VHF Transmitter
FCC ID: H4JVT-4-150

Section 11. Transient Frequency Behaviour

| | |
|---|------------------------------------|
| Test Performed By: Russell Grant | Date of Test: July 18, 2000 |
|---|------------------------------------|

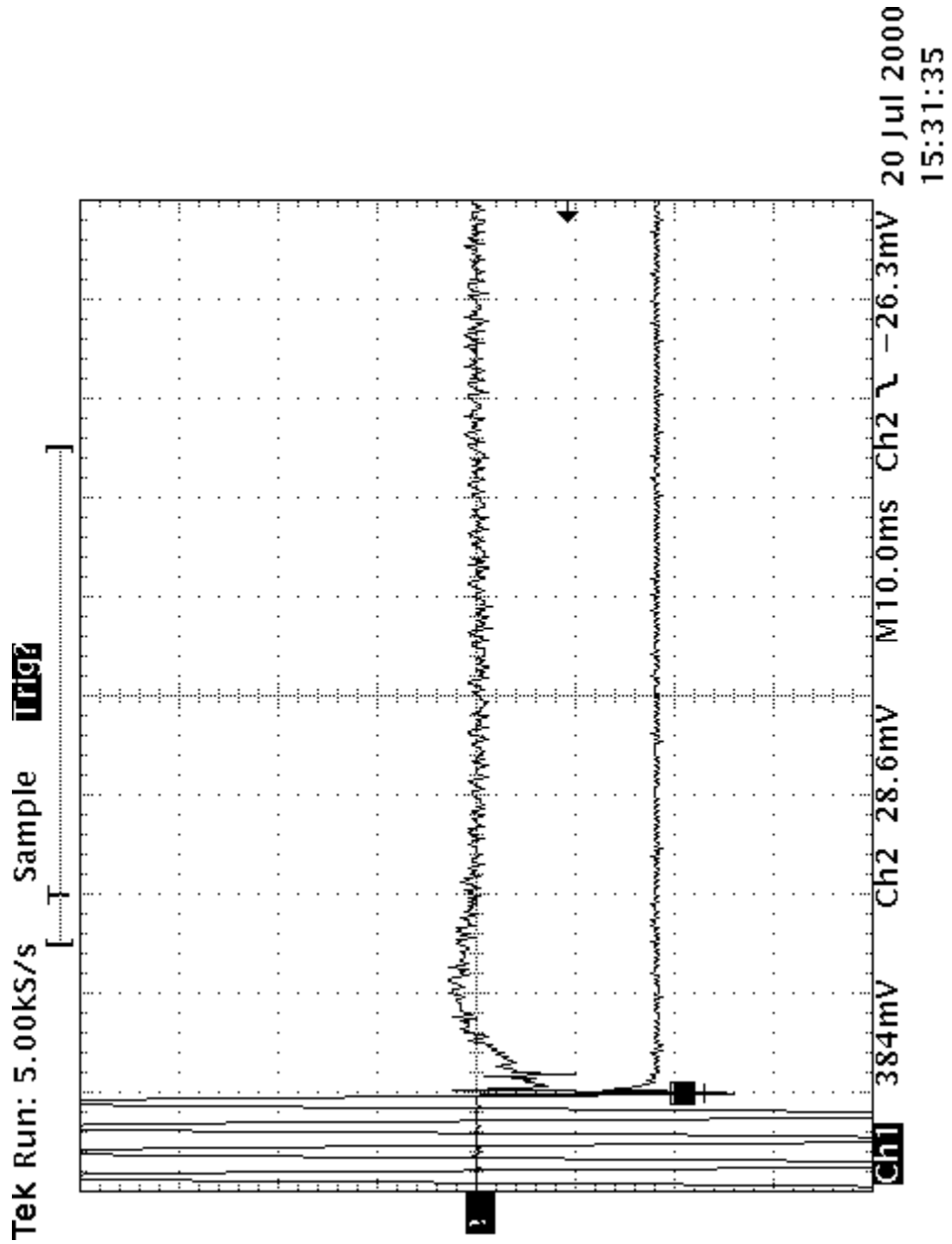
Minimum Standard: Para. No. 90.214

Test Results: Complies.

Measurement Data: See attached graphs.

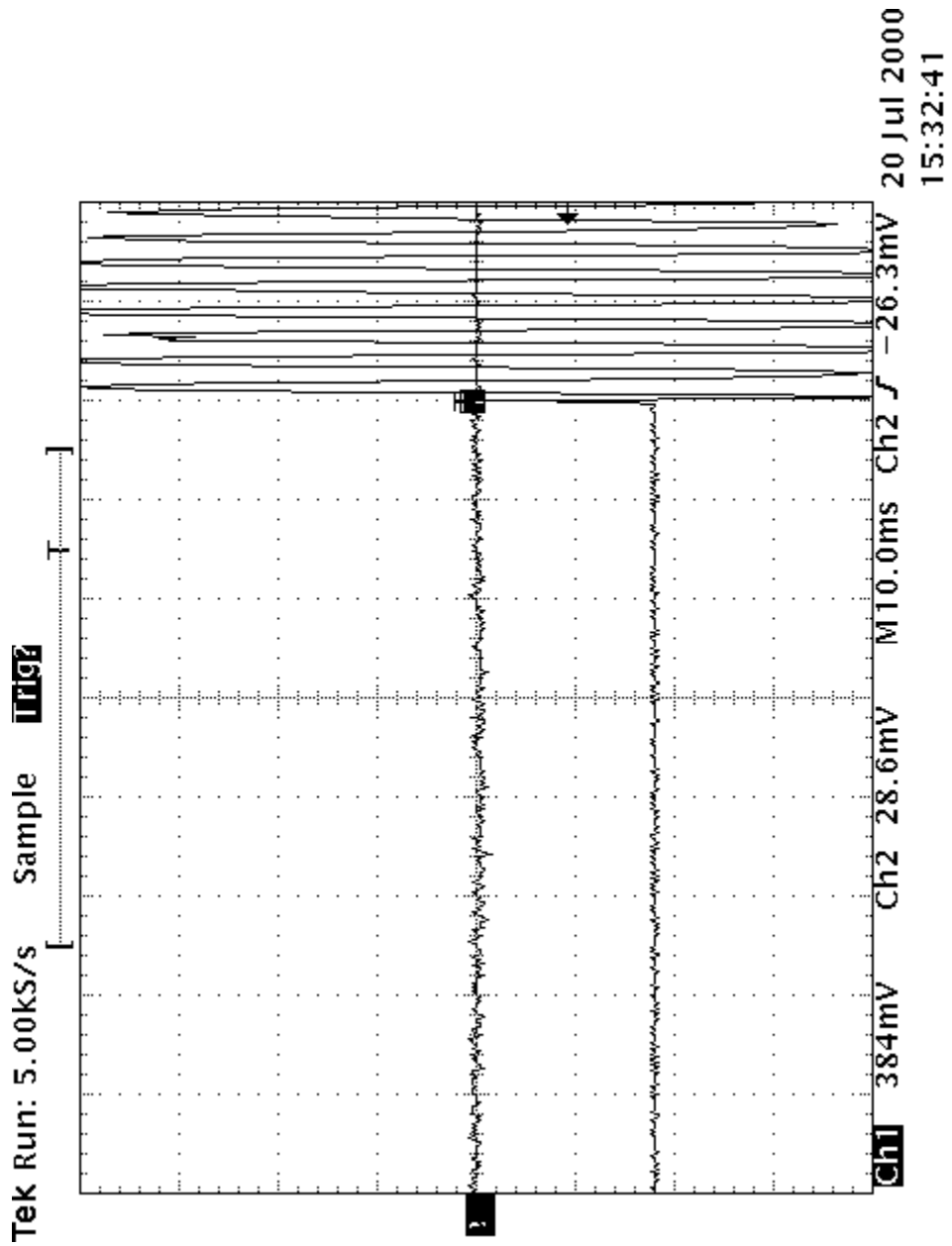
EQUIPMENT: VHF Transmitter
FCC ID: H4JVT-4-150

Wideband



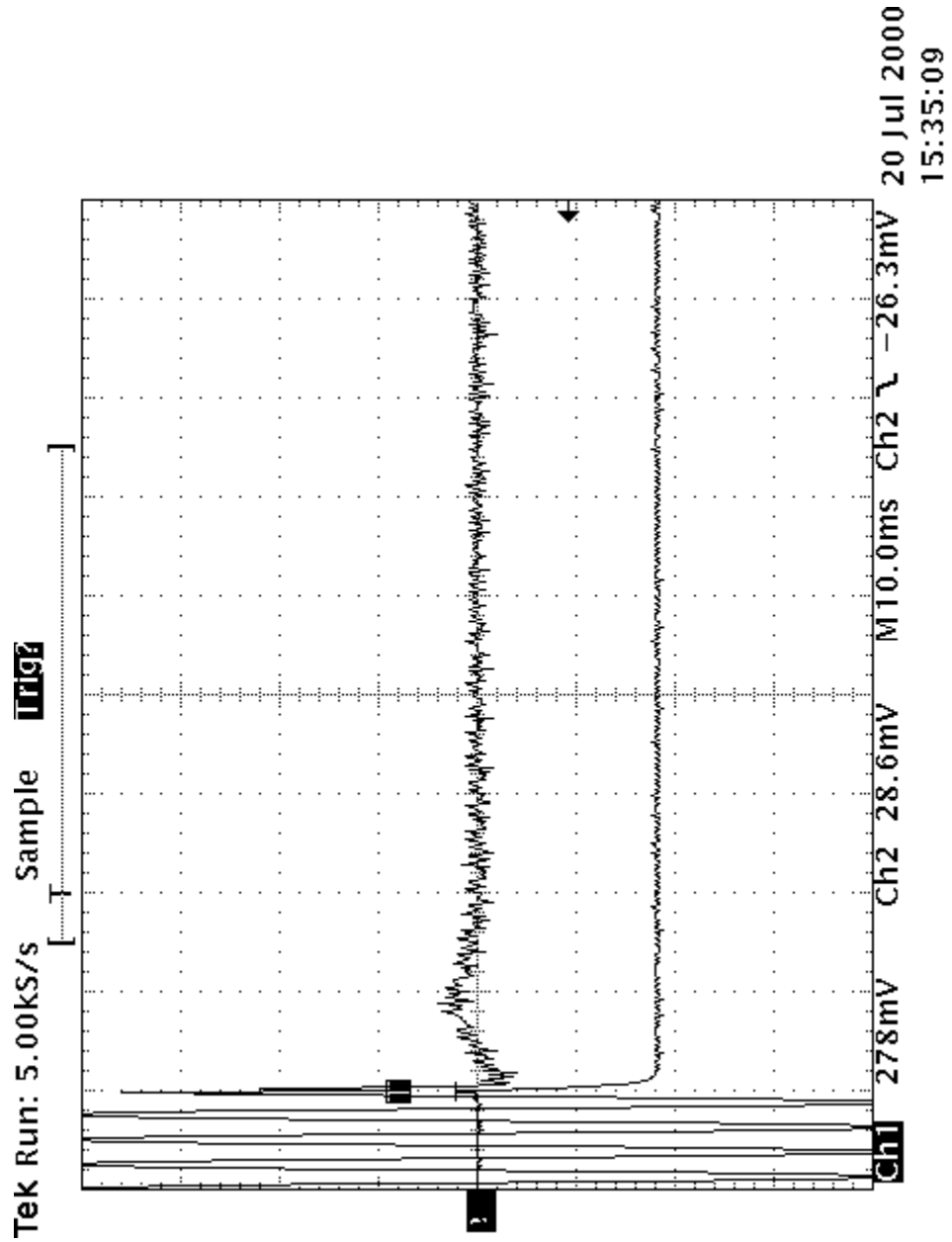
EQUIPMENT: VHF Transmitter
FCC ID: H4JVT-4-150

Wideband



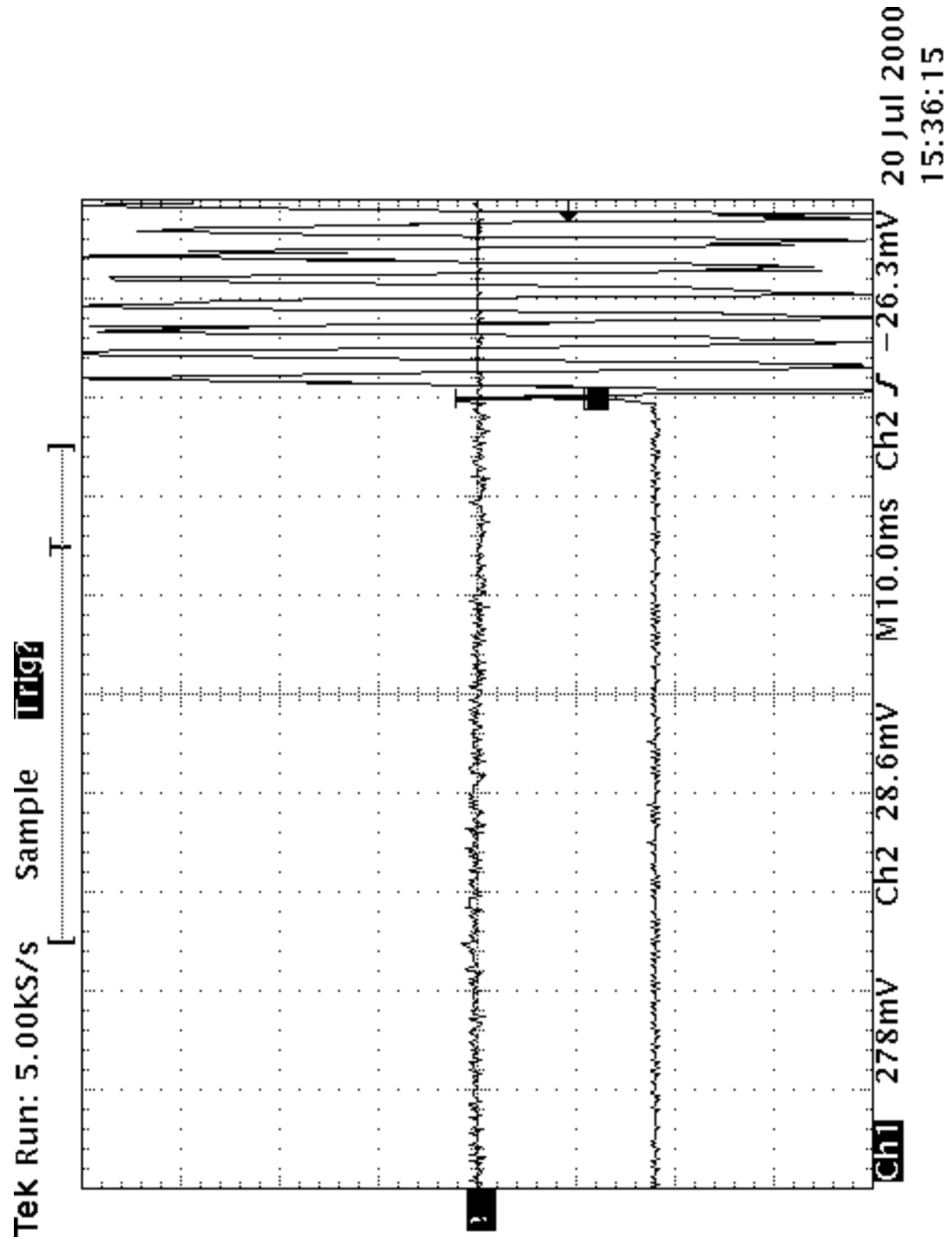
EQUIPMENT: VHF Transmitter
FCC ID: H4JVT-4-150

Narrowband



EQUIPMENT: VHF Transmitter
FCC ID: H4JVT-4-150

Narrowband



EQUIPMENT: VHF Transmitter
FCC ID: H4JVT-4-150

Section 12. Test Equipment List

| CAL CYCLE | EQUIPMENT | MANUFACTURER | MODEL | SERIAL | LAST CAL. | NEXT CAL. |
|------------------|----------------------|---------------------|--------------|---------------|------------------|------------------|
| 1 Year | Spectrum Analyzer | Hewlett Packard | 8565E | FA000981 | June 16/00 | June 16/01 |
| 1 Year | Radio Communications | Rohde & Schwarz | CMTA 54 | 840343/013 | Dec. 14/99 | Dec. 14/00 |
| 1 Year | Climate Chamber | Thermotron | SM-16C | 15649-S | COU | COU |
| | Power Supply | Astron | VS-50M | 8405071 | NCR | NCR |
| 1 Year | Attenuator | Narda | 768-20 | 9507 | Oct. 12/99 | Oct. 12/00 |
| 1 Year | Attenuator | Narda | 768-10 | 9707 | Aug. 23/99 | Aug. 23/00 |
| 1 Year | Receiver | Rohde & Schwarz | ESVP | 892661/014 | April 5/00 | April 5/01 |
| 1 Year | Horn Antenna | EMCO #2 | 3115 | 4336 | Nov. 11/99 | Nov. 11/00 |
| 1 Year | Dipole Antenna Set | EMCO #2 | 3121C | FA001349 | June 27/99 | June 27/00 |
| 1 Year | Frequency Counter | Hewlett Packard | HP5350A | 2444A00135 | May 7/00 | Nov. 7/00 |

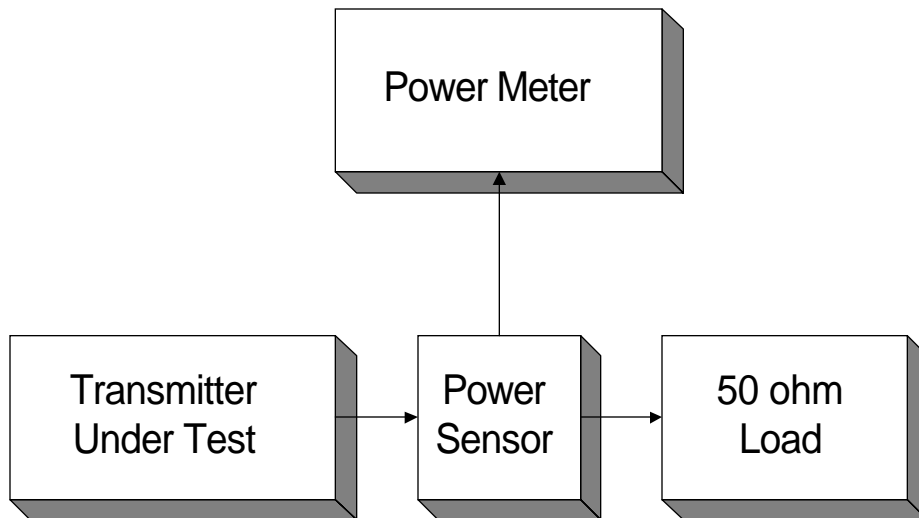
NA: Not Applicable
 NCR: No Cal Required
 COU: CAL On Use

EQUIPMENT: VHF Transmitter
FCC ID: H4JVT-4-150

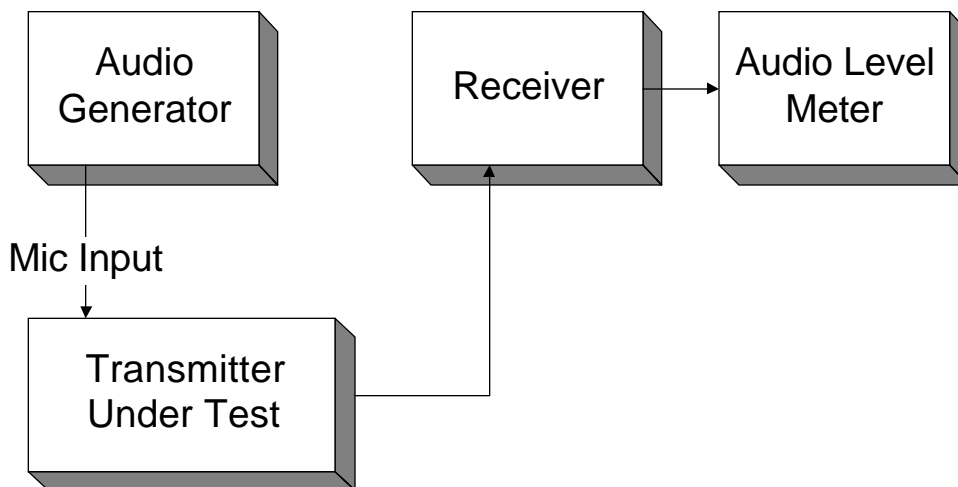
Annex A
Test Diagrams

EQUIPMENT: VHF Transmitter
FCC ID: H4JVT-4-150

Para. No. 2.1046 - R.F. Power Output

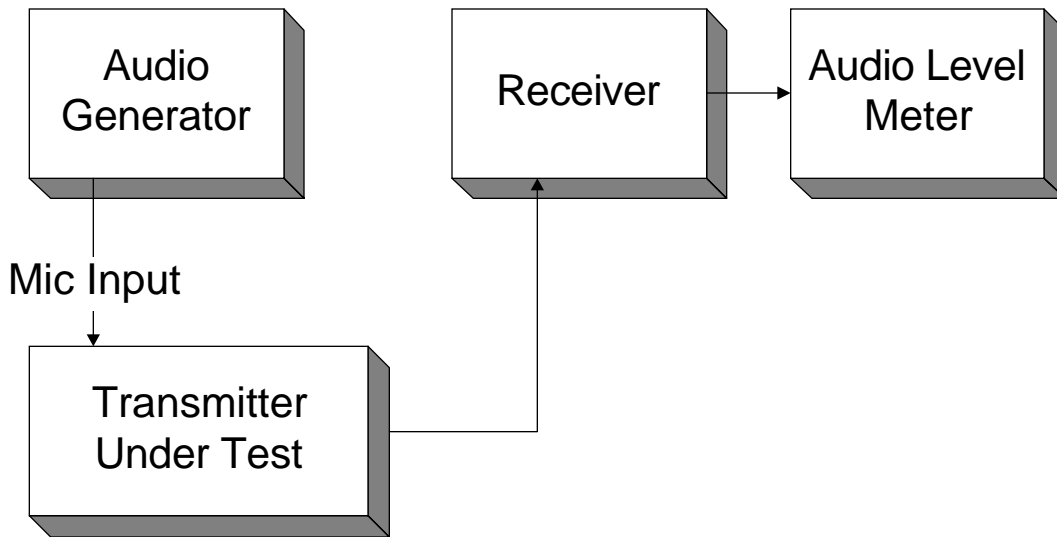


Para. No. 2.1047 - Audio Frequency Response

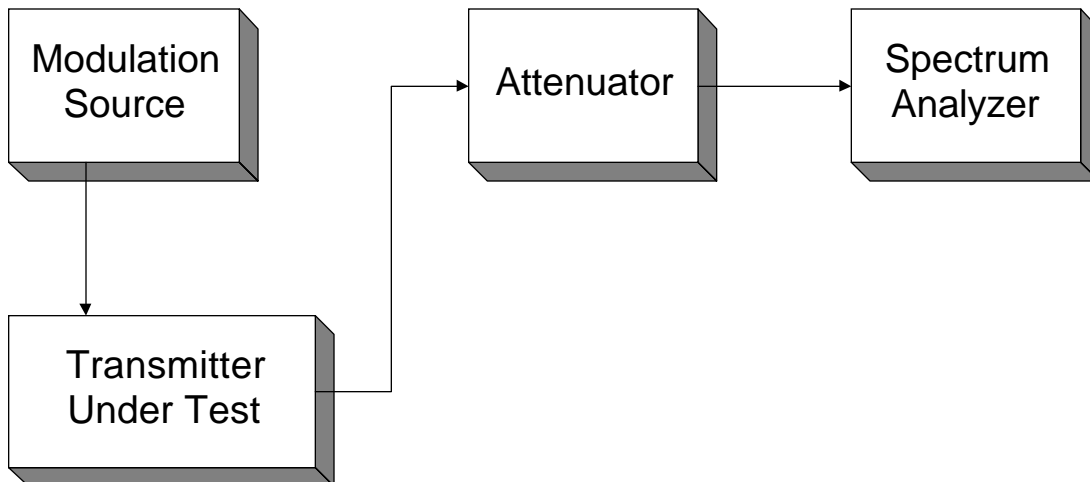


EQUIPMENT: VHF Transmitter
FCC ID: H4JVT-4-150

Para. No. 2.1047 - Modulation Limiting

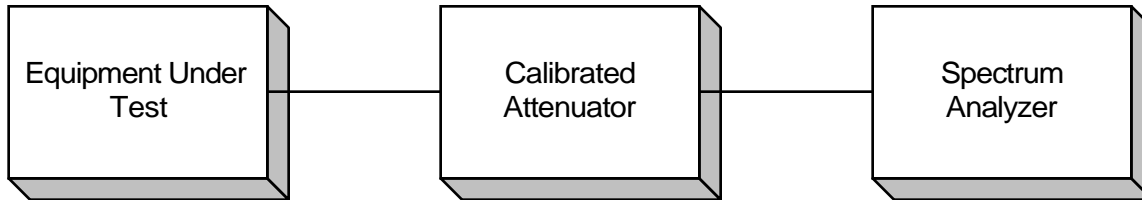


Para. No. 2.1049 - Occupied Bandwidth

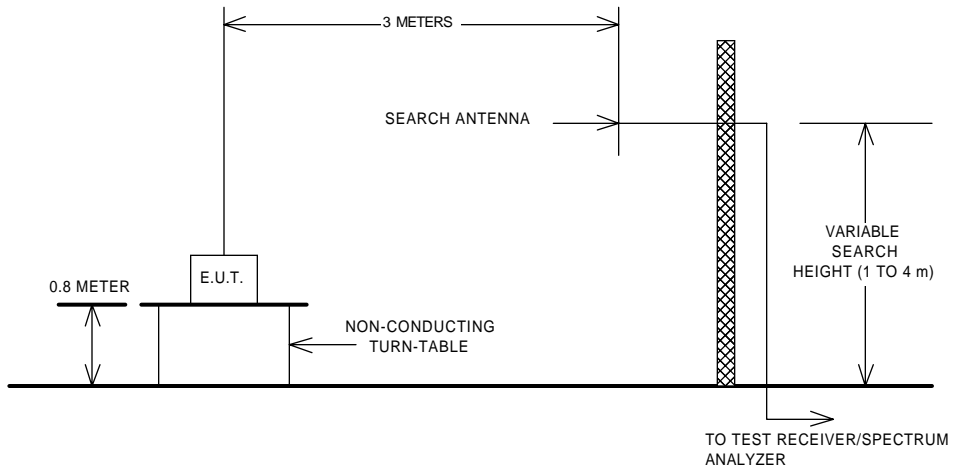


EQUIPMENT: VHF Transmitter
FCC ID: H4JVT-4-150

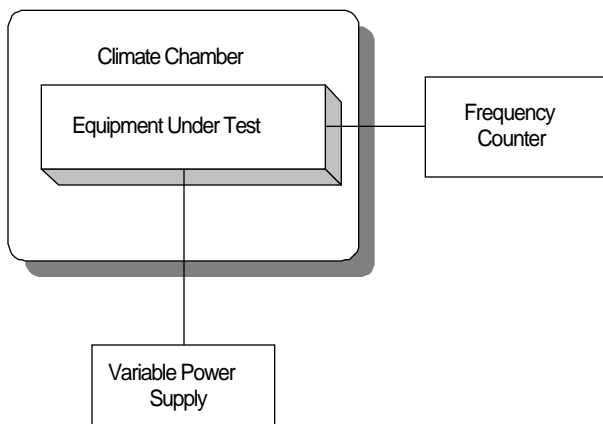
Para. No. 2.1051 - Spurious Emissions at Antenna Terminals



Para. No. 2.1053 - Field Strength of Spurious Radiation

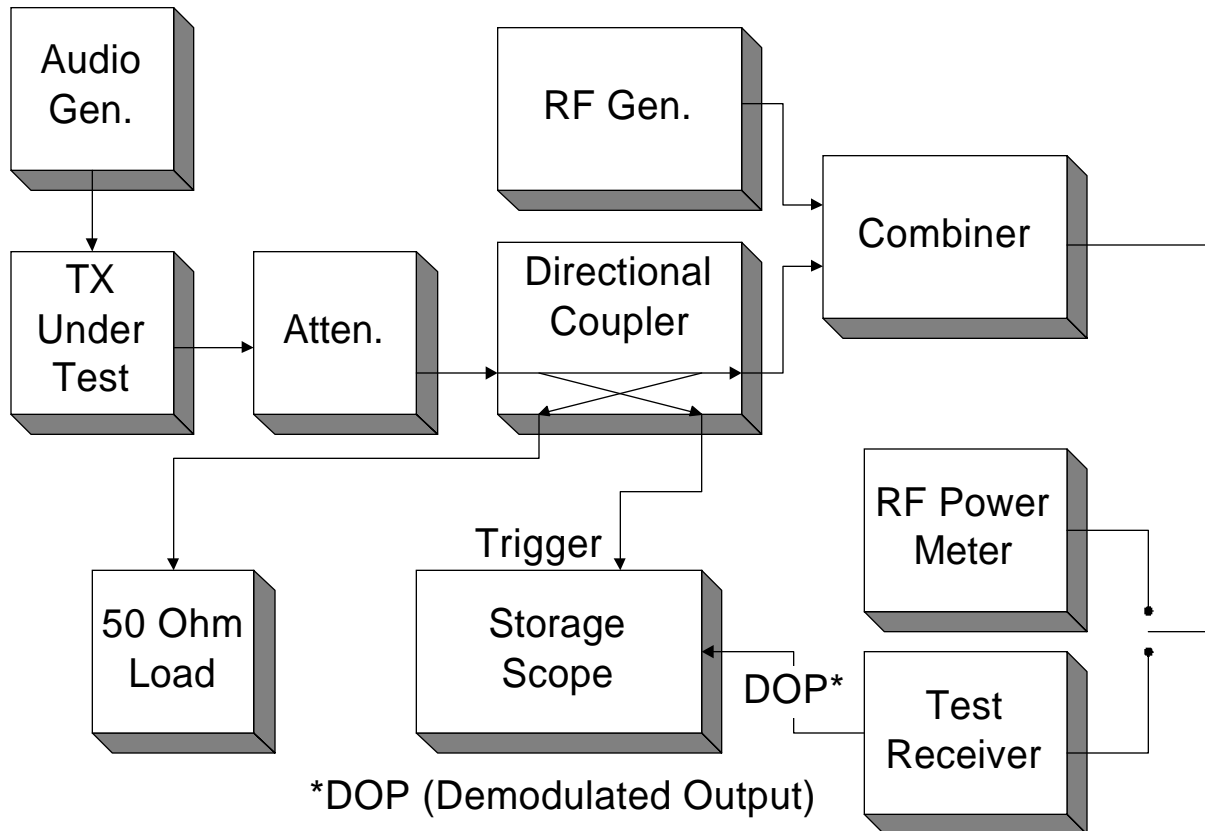


Para. No. 2.1055 - Frequency Stability



EQUIPMENT: VHF Transmitter
FCC ID: H4JVT-4-150

Para. No. 90.214 - Transient Frequency Behaviour



Voice

This measurement was made using measurement procedure TIA/EIA Land Mobile FM or PM Communications Equipment Measurement and Performance Standards TIA/EIA-603 February 1993 Telecommunications Industry Association (American National Standard ANSI/TIA/EIA-603-1992 Approved: October 27, 1992) Para. no. 2.2 Methods of Measurement for Transmitters Para. no. 2.2.19 Transient Frequency Behaviour (page no. 83).

Data

This measurement was made using measurement procedure TIA/EIA Digital C4FM/CQPSK Transceiver Measurement Methods TSB102.CAAA Para. no. 2.2.17 Transient Frequency Behaviour (page no. 74).