Sub-part 2.983(e): TEST AND MEASUREMENT DATA

All tests and measurement data shown were performed in accordance with FCC Rules and Regulations, Volume II; Part 2, Sub-part J, Sections 2.981, 2.983, 2.985, 2.987, 2.989, 2.991, 2.993, 2.995, 2.997, 2.999 and the following individual Parts:

___ 21 - Domestic Public Fixed Radio Services
_x_ 22 - Public Mobile Services
___ 22 Subpart H - Cellular Radiotelephone Service
___ 22.901(d) - Alternative technologies and auxiliary services
___ 23 - International Fixed Public Radiocommunication services
___ 24 - Personal Communications Services
_x_ 74 Subpart H - Low Power Auxiliary Stations
___ 80 - Stations in the Maritime Services
___ 80 Subpart E - General Technical Standards
___ 80 Subpart F - Equipment Authorization for Compulsory Ships
___ 80 Subpart K - Private Coast Stations and Marine Utility Stations
___ 80 Subpart S - Compulsory Radiotelephone Installations for Small Passenger Boats
___ 80 Subpart T - Radiotelephone Installation Required for Vessels on the Great Lakes
___ 80 Subpart U - Radiotelephone Installations Required by the Bridge-to-Bridge Act
___ 80 Subpart V - Emergency Position Indicating Radiobeacons (EPIRB'S)
___ 80 Subpart W - Global Maritime Distress and Safety System (GMDSS)
___ 80 Subpart X - Voluntary Radio Installations
___ 87 - Aviation Services
_x_ 90 - Private Land Mobile Radio Services
___ 94 - Private Operational-Fixed Microwave Service
_x_ 95 Subpart A - General Mobile Radio Service (GMRS)
___ 95 Subpart C - Radio Control (R/C) Radio Service
___ 95 Subpart D - Citizens Band (CB) Radio Service
___ 95 Subpart E - Family Radio Service
___ 95 Subpart F - Interactive Video and Data Service (IVDS)
___ 101 - Fixed Microwave Services

## STANDARD TEST CONDITIONS and ENGINEERING PRACTICES

Except as noted herein, the following conditions and procedures were observed during the testing:

| | |
|---|---|
| ROOM TEMPERATURE | = 25±5°C |
| ROOM HUMIDITY | = 20-50% |
| D.C. SUPPLY VOLTAGE, Vdc | = 12, 7 |
| A.C. SUPPLY VOLTAGE, Vac | = N/A |
| A.C. SUPPLY FREQUENCY, Hz | = N/A |

Prior to testing, the EUT was tuned up in accordance with the manufacturer's alignment procedures. All external gain controls were maintained at the position of maximum and/or optimum gain throughout the testing.

Measurement results, unless otherwise noted, are worst case measurements.

NAME OF TEST: Carrier Output Power (Conducted)

SPECIFICATION: FCC: 47 CFR 2.985(a)
IC: RSS-119, Section 6.2

GUIDE: TIA/EIA-603, Paragraph 2.2.1

TEST CONDITIONS: Standard Temperature and Humidity (S. T. & H.)

TEST EQUIPMENT: As per attached page

## MEASUREMENT PROCEDURE

1. The EUT was connected to a resistive coaxial attenuator of normal load impedance, and the unmodulated output power was measured by means of an R. F. Power Meter.

2. Measurement accuracy is ±3%.

## MEASUREMENT RESULTS

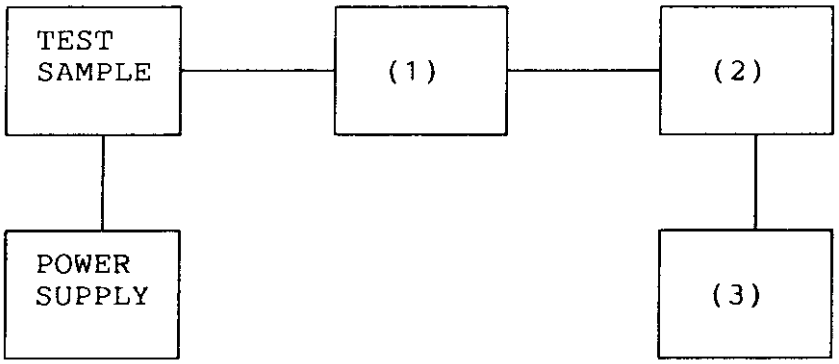
| NOMINAL, MHz | R.F. POWER OUTPUT, WATTS | |
|---|---|---|
| 452.9375 | 2 | 8 |

SUPERVISED BY: MORTON FLOM, P. Eng.

## TRANSMITTER POWER CONDUCTED MEASUREMENTS

TEST 1: R. F. POWER OUTPUT
TEST 2: FREQUENCY STABILITY

---




(1) COAXIAL ATTENUATOR

| | |
|---|---|
| NARDA 766-10 | ___ |
| SIERRA 661A-30 | x |
| BIRD 8329 (30 dB) | ___ |
| _____ | ___ |

(2) POWER METERS

| | |
|---|---|
| HP 435A | ___ |
| HP 436A | x |
| HP 8901A POWER MODE | x |
| _____ | ___ |

(3) FREQUENCY COUNTER

| | |
|---|---|
| HP 5383A | ___ |
| HP 5334B | x |
| HP 8901A FREQUENCY MODE | x |
| _____ | ___ |

NAME OF TEST: Unwanted Emissions (Transmitter Conducted)

SPECIFICATION: FCC: 47 CFR 2.991
IC: RSS-119, Section 6.3

GUIDE: TIA/EIA-603, Paragraph 2.2.13

TEST CONDITIONS: S. T. & H.

TEST EQUIPMENT: As per attached page

MEASUREMENT PROCEDURE

1. The emissions were measured for the worst case as follows:

   (a): within a band of frequencies defined by the carrier frequency plus and minus one channel.

   (b): from the lowest frequency generated in the EUT and to at least the 10th harmonic of the carrier frequency, or 40 GHz, whichever is lower.

2. The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified.

3. MEASUREMENT RESULTS: ATTACHED FOR WORST CASE

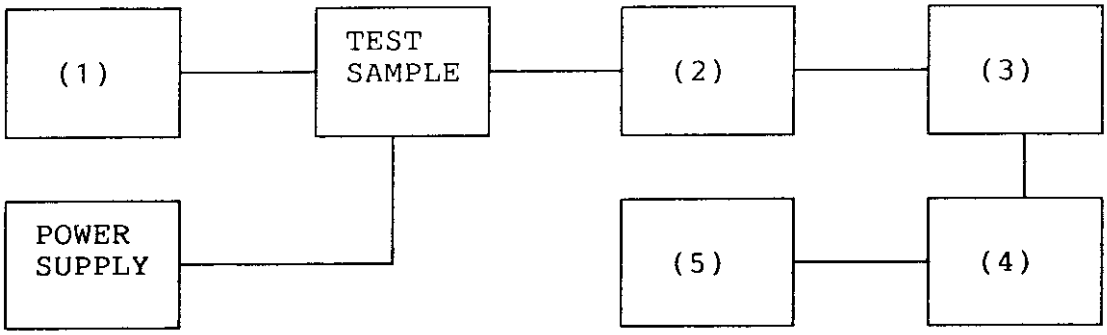
| | |
|---|---|
| FREQUENCY OF CARRIER, MHz | = 452.9375 |
| SPECTRUM SEARCHED, GHz | = 0 to 10 x $F_C$ |
| MAXIMUM RESPONSE, Hz | = N/A |
| ALL OTHER EMISSIONS | = ≥ 20 dB BELOW LIMIT |
| LIMIT, dBc: $-(43 + 10 \text{ LOG } P_0)$ | = -46 (2 Watts)<br>-52 (8 Watts) |

SUPERVISED BY: MORTON FLOM, P. Eng.

## TRANSMITTER SPURIOUS EMISSION

TEST A. OCCUPIED BANDWIDTH (IN-BAND SPURIOUS)
TEST B. OUT-OF-BAND SPURIOUS

---




(1) AUDIO OSCILLATOR/GENERATOR

| | |
|---|---|
| HP 204D | ___ |
| HP 8903A | ___ |
| HP 3312A | x |
| _____ | x |

(2) COAXIAL ATTENUATOR

| | |
|---|---|
| NARDA 766-10 | ___ |
| SIERRA 661A-30 | x |
| BIRD 8329 (30 dB) | x |
| _____ | ___ |

(3) FILTERS; NOTCH, HP, LP, BP

| | |
|---|---|
| CIRQTEL FHT | ___ |
| EAGLE TNF-1 | x |
| PHELPS DODGE PD-495-8 | ___ |
| _____ | ___ |

(4) SPECTRUM ANALYZER

| | |
|---|---|
| HP 8566B | x |
| HP 8563E | ___ |
| _____ | ___ |

(5) SCOPE

| | |
|---|---|
| HP 1741A | ___ |
| HP 181T | ___ |
| TEK 935 | ___ |
| HP 54502A | ___ |
| _____ | ___ |

G83U002
TRANSMITTER SPURIOUS EMISSIONS (CONDUCTED)
POWER: LOW

| FREQUENCY TUNED, MHz | FREQUENCY EMISSION, MHz | LEVEL, dBm | LEVEL, dBc | LEVEL, µW |
|---|---|---|---|---|
| 452.938 | 906.267 | -43.8 | -76.8 | 0 |
| 452.938 | 1358.362 | -43.4 | -76.4 | 0 |
| 452.938 | 1811.751 | -42.8 | -75.8 | 0 |
| 452.938 | 2265.083 | -41.2 | -74.2 | 0 |
| 452.938 | 2717.612 | -43.9 | -76.9 | 0 |
| 452.938 | 3170.559 | -37.2 | -70.2 | 0 |
| 452.938 | 3623.019 | -45.0 | -78.0 | 0 |
| 452.938 | 4076.830 | -44.3 | -77.3 | 0 |
| 452.938 | 4528.992 | -44.2 | -77.2 | 0 |
| 452.938 | 4982.153 | -45.0 | -78.0 | 0 |
| 452.938 | 5435.070 | -43.9 | -76.9 | 0 |
| 452.938 | 5888.477 | -39.2 | -72.2 | 0 |
| 452.938 | 6341.609 | -39.2 | -72.2 | 0 |
| 452.938 | 6794.235 | -38.4 | -71.4 | 0 |

G83U001
TRANSMITTER SPURIOUS EMISSIONS (CONDUCTED)
POWER: HIGH

| FREQUENCY TUNED, MHz | FREQUENCY EMISSION, MHz | LEVEL, dBm | LEVEL, dBc | LEVEL, µW |
|---|---|---|---|---|
| 452.938 | 905.540 | -44.4 | -83.4 | 0 |
| 452.938 | 1358.819 | -40.8 | -79.8 | 0 |
| 452.938 | 1811.756 | -36.2 | -75.2 | 0 |
| 452.938 | 2264.702 | -41.6 | -80.6 | 0 |
| 452.938 | 2718.067 | -43.5 | -82.5 | 0 |
| 452.938 | 3170.543 | -30.7 | -69.7 | 1 |
| 452.938 | 3623.514 | -45.2 | -84.2 | 0 |
| 452.938 | 4076.797 | -43.7 | -82.7 | 0 |
| 452.938 | 4528.931 | -45.1 | -84.1 | 0 |
| 452.938 | 4981.871 | -44.3 | -83.3 | 0 |
| 452.938 | 5435.114 | -44.5 | -83.5 | 0 |
| 452.938 | 5888.206 | -39.0 | -78.0 | 0 |
| 452.938 | 6340.819 | -38.4 | -77.4 | 0 |
| 452.938 | 6793.722 | -39.4 | -78.4 | 0 |

NAME OF TEST: Field Strength of Spurious Radiation

SPECIFICATION: FCC: 47 CFR 2.993(a)
IC: N/A

GUIDE: TIA/EIA-603, Section 2.2.12

TEST CONDITIONS: S. T. & H.

TEST EQUIPMENT: AS PER ATTACHED PAGE

## MEASUREMENT PROCEDURE

1. A description of the measurement facilities was filed with the FCC and was found to be in compliance with the requirements of Section 15.38, by letter from the FCC dated March 3, 1997, FILE 31040/SIT. All pertinent changes will be reported to the Commission by up-date prior to March 2000.

2. At first, in order to locate all spurious frequencies and approximate amplitudes, and to determine proper equipment functioning, the test sample was set up at a distance of three meters from the test instrument. Valid spurious signals were determined by switching the power on and off.

3. In the field, the test sample was placed on a wooden turntable above ground at three (or thirty) meters away from the search antenna. The test sample was connected to an R.F. Wattmeter and a 50 ohm dummy load, and adjusted to its rated output.

   In order to obtain the maximum response at each spurious frequency, the turntable was rotated. Also, the Search Antennas were raised and lowered vertically, and all cables were oriented. Excess power lead was coiled near the power supply.

4. A signal generator, connected with a non-radiating cable to a vertically polarized half-wave antenna (for each frequency involved) was substituted for the transmitter. The Search Antenna was raised and lowered to obtain maximum indicated.

5. The signal generator output was adjusted until a signal level indication equal to that from the transmitter was obtained.

6. Steps 4 and 5 were repeated, using a horizontally polarized half-wave antenna. The higher of the two observations was noted.

NAME OF TEST: Field Strength of Spurious Radiation

SPECIFICATION: FCC: 47 CFR 2.993(a)
IC: N/A

MEASUREMENT PROCEDURE (CONT.)

7. Power into the half-wave antenna was calculated from the characteristic impedance of the line, and the voltage output from the signal generator.

8. The level of each spurious radiation with reference to the transmitter power in dB, was calculated from:

$$\text{SPURIOUS LEVEL, dB} = 10 \text{ LOG } \frac{\text{(Calculated Spurious Power) [from para. 7].}}{\text{Tx Power (Wattmeter)}}$$

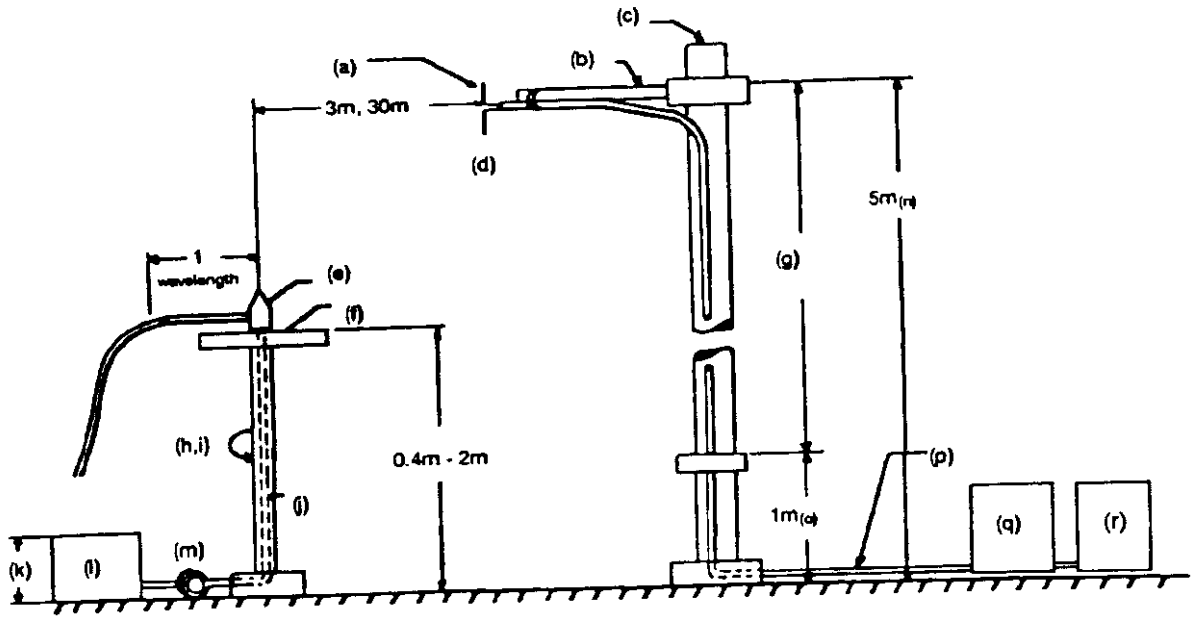
9. The worst case for all channels is shown.

10. Measurement summary:

| | |
|---|---|
| FREQUENCY OF CARRIER, MHz | = 452.9375 |
| SPECTRUM SEARCHED, GHz | = 0 to 10 x $F_C$ |
| ALL OTHER EMISSIONS | = ≥ 20 dB BELOW LIMIT |
| LIMIT, dBc | = -52 (8 Watts)<br>-46 (2 Watts) |

11. Measurement results: ATTACHED FOR WORST CASE

## RADIATED TEST SETUP




NOTES:

(a) Search Antenna - Rotatable on boom.
(b) Non-metallic boom.
(c) Non-metallic mast.
(d) Adjustable horizontally.
(e) Equipment Under Test.
(f) Turntable.
(g) Boom adjustable in height.
(h) External control cables routed horizontally at least one wavelength.
(i) Rotatable.
(j) Cables routed through hollow turntable center.
(k) 30 cm or less.
(l) External power source.
(m) 10 cm diameter coil of excess cable.
(n) 25 cm (V), 1 m-7 m (V, H).
(o) 25 cm from bottom end of 'V', 1 m normally.
(p) Calibrated Cable at least 10 m in length.
(q) Amplifier (optional).
(r) Spectrum Analyzer.

TRANSMITTER SPURIOUS EMISSIONS (RADIATED FIELD STRENGTH)

ALL OTHER EMISSIONS = ≥ 20 dB BELOW LIMIT

| EMISSION, MHz/HARMONIC | SPURIOUS LEVEL BELOW CARRIER, dBc | |
|---|---|---|
| | Lo | Hi |
| 2nd to 10th | <-70 | <-65 |

SUPERVISED BY:

MORTON FLOM, P. Eng.

NAME OF TEST: Emission Masks (Occupied Bandwidth)

SPECIFICATION: FCC: 47 CFR 2.989(c)(1)
IC: RSS-119, Section 6.4

GUIDE: TIA/EIA-603, Paragraph 2.2.11

TEST CONDITIONS: S. T. & H.

TEST EQUIPMENT: As per previous page

MEASUREMENT PROCEDURE

1. The EUT and test equipment were set up as shown on the following page, with the Spectrum Analyzer connected.

2. For EUTs supporting audio modulation, the audio signal generator was adjusted to the frequency of maximum response and with output level set for ±2.5 kHz deviation (or 50% modulation). With level constant, the signal level was increased 16 dB.

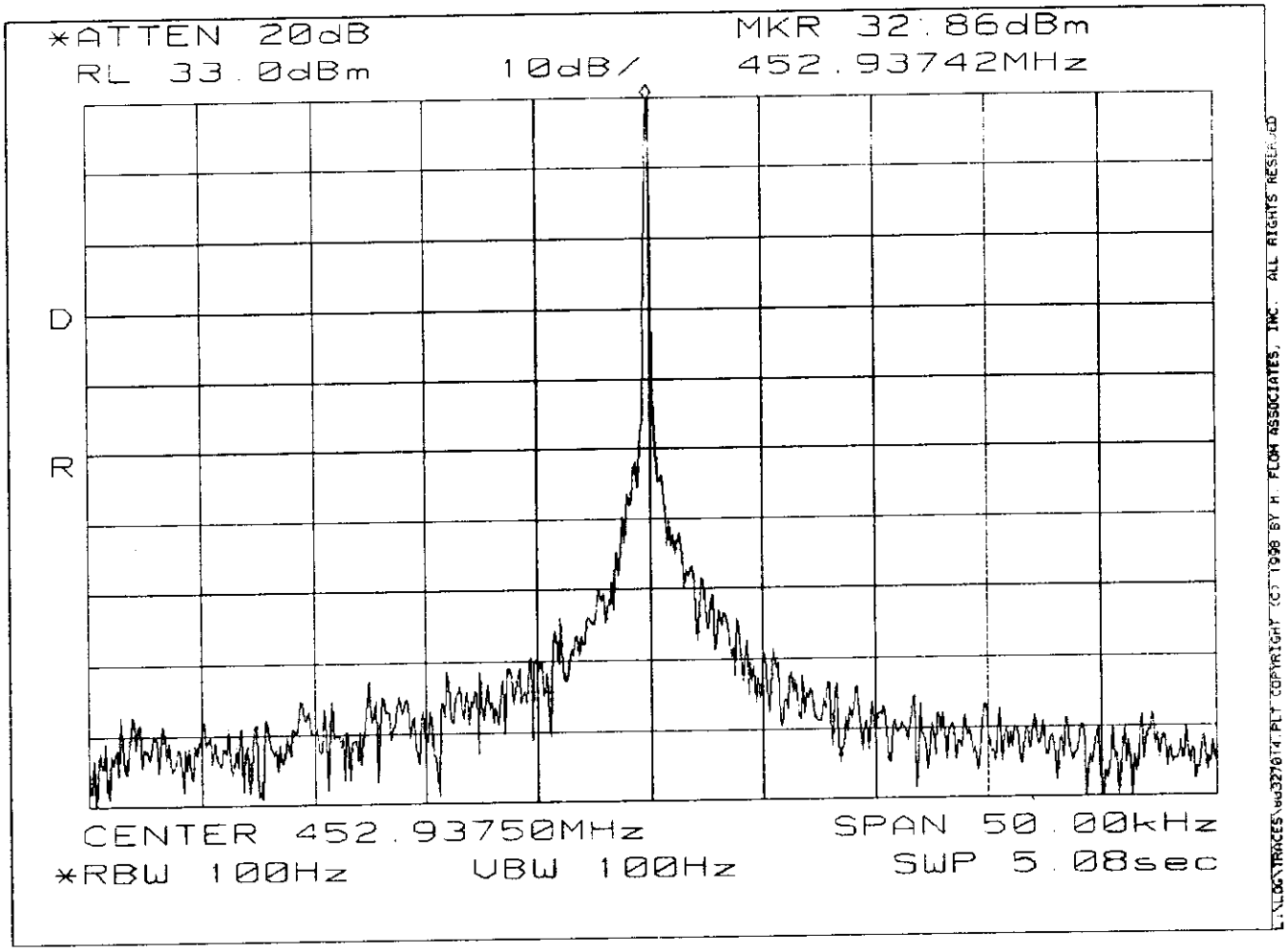
3. For EUTs supporting digital modulation, the digital modulation mode was operated to its maximum extent.

4. The Occupied Bandwidth was measured with the Spectrum Analyzer controls set as shown on the test results.

5. MEASUREMENT RESULTS: ATTACHED

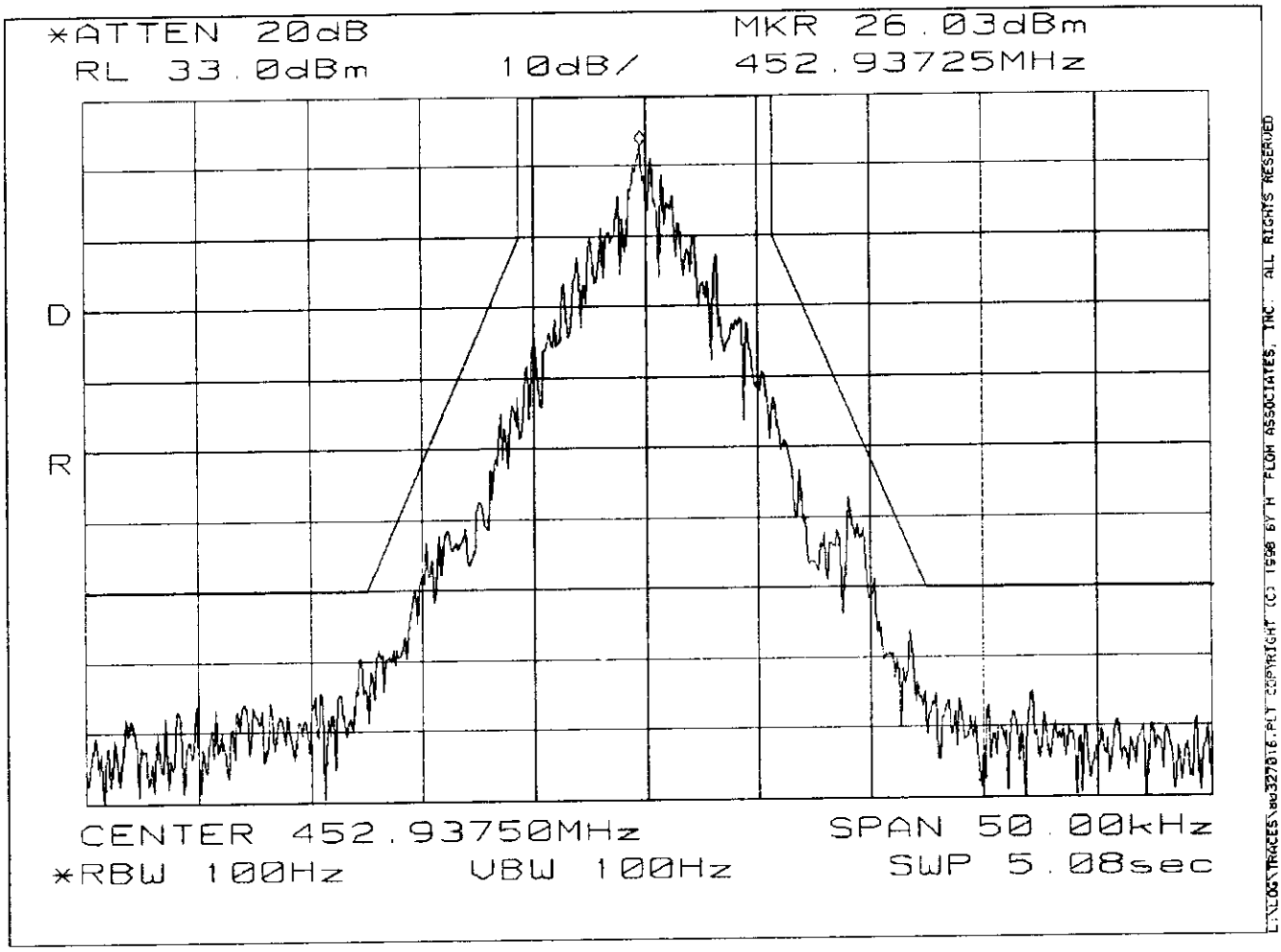
PAGE 15.1.
SPECTRUM ANALYZER PRESENTATION
PULSE ELECTRONICS, 15616
1998-MAR-27, 17:05, FRI

POWER: LOW
MODULATION: NONE



SPECTRUM ANALYZER PRESENTATION
PULSE ELECTRONICS, 15616
1998-MAR-27, 17:18, FRI

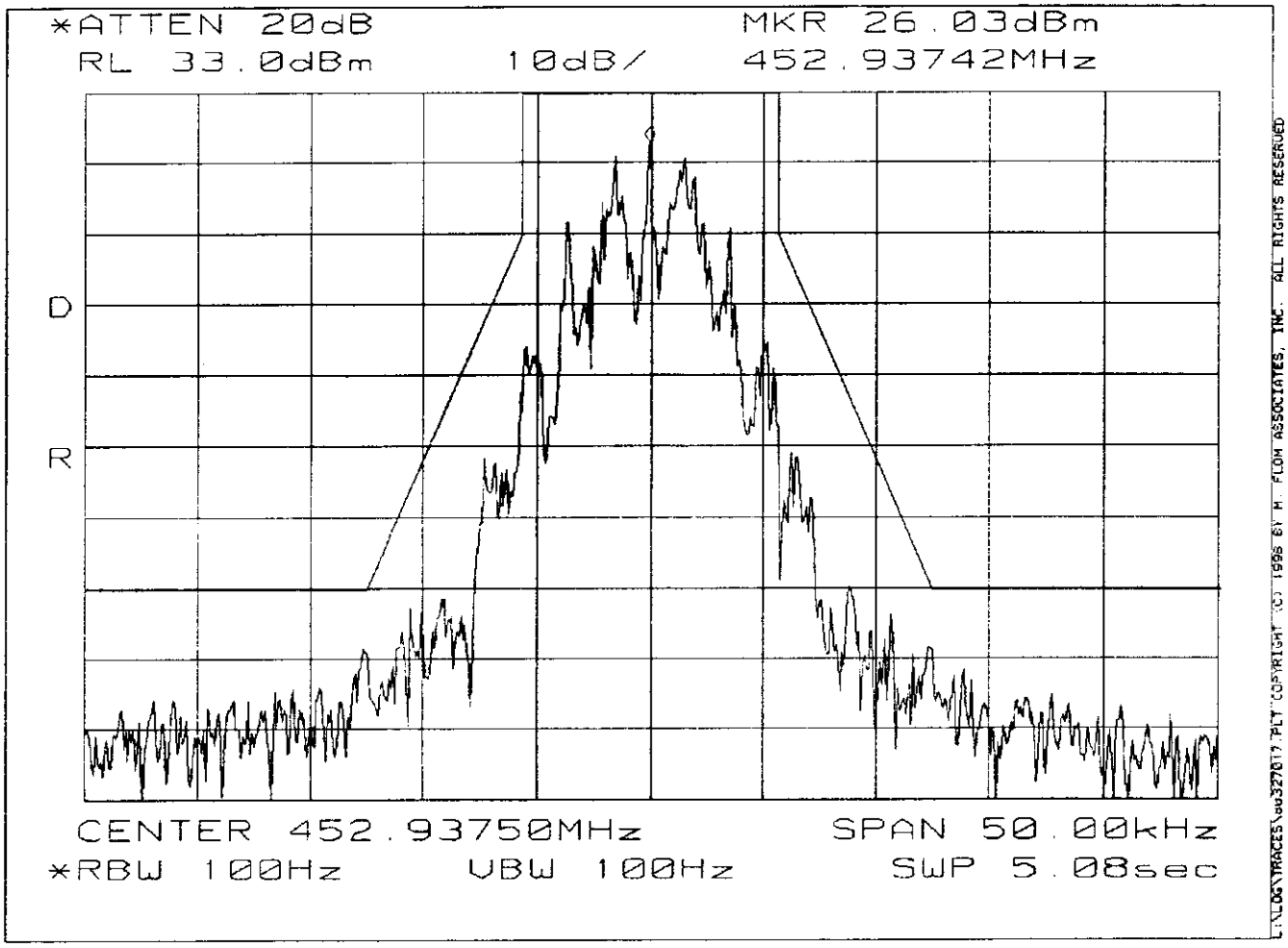
POWER: LOW
MODULATION: GMSK 9600 BPS
MASK: D, VHF/UHF 12.5kHz BW



CXY-15616

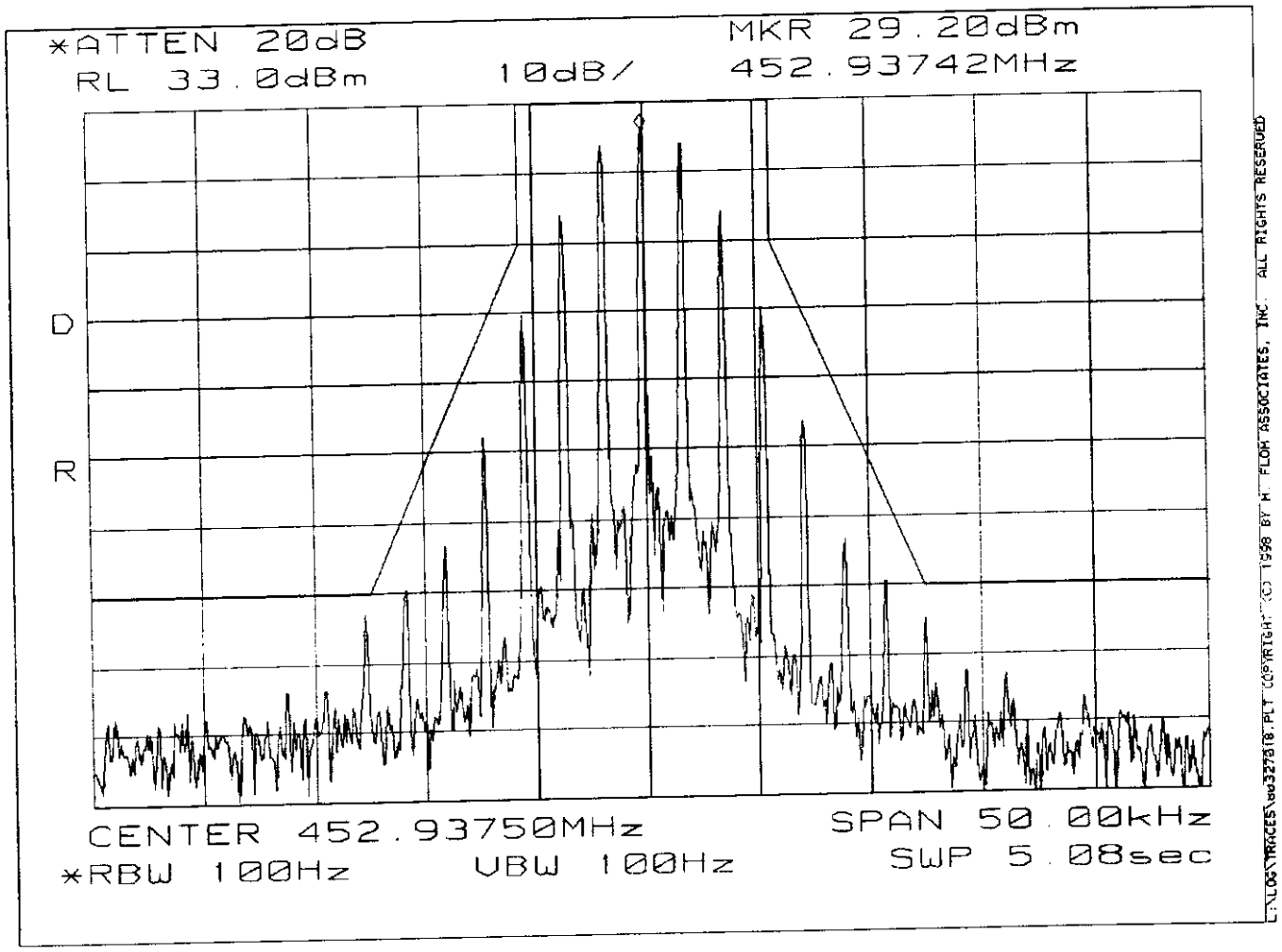
SPECTRUM ANALYZER PRESENTATION
PULSE ELECTRONICS, 15616
1998-MAR-27, 17:20, FRI

POWER: LOW
MODULATION: MSK 1200 BPS
MASK: D, VHF/UHF 12.5kHz BW



PAGE 15.4.
SPECTRUM ANALYZER PRESENTATION
PULSE ELECTRONICS, 15616
1998-MAR-27, 17:21, FRI

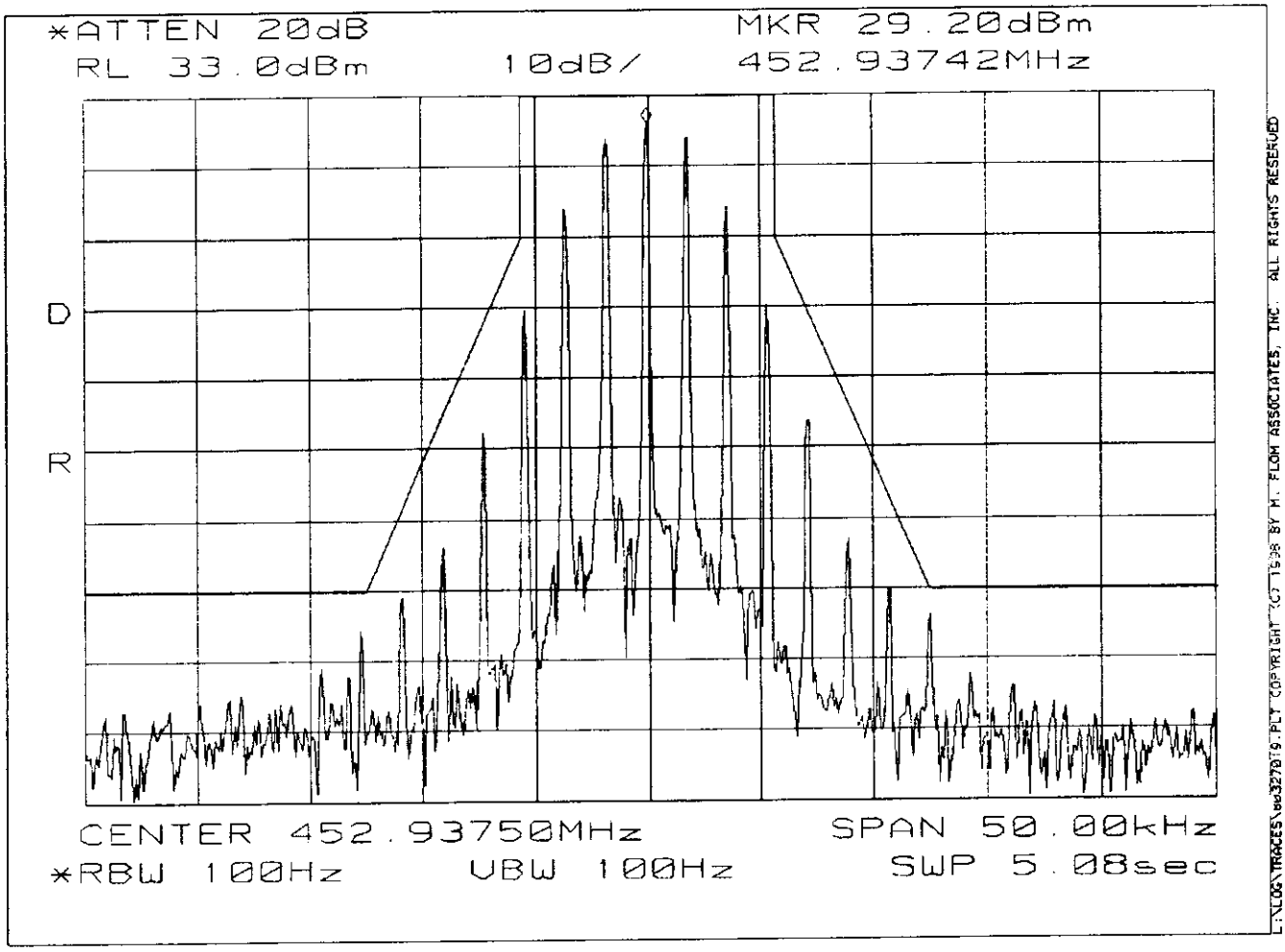
POWER: LOW
MODULATION: MSK 1800 HZ
MASK: D, VHF/UHF 12.5kHz BW



CXY-15616

SPECTRUM ANALYZER PRESENTATION
PULSE ELECTRONICS, 15616
1998-MAR-27, 17:23, FRI

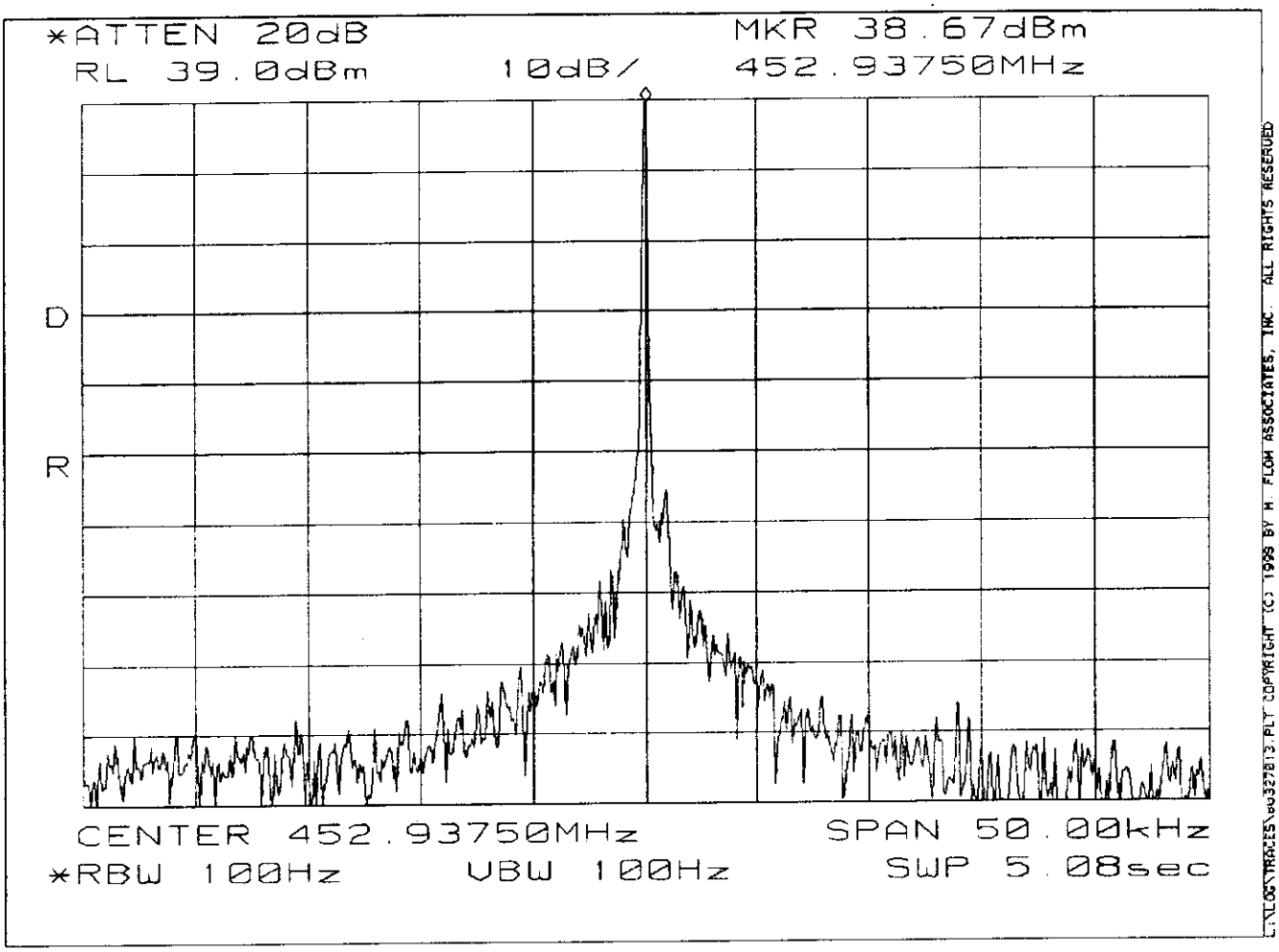
POWER: LOW
MODULATION: MSK 1200 HZ
MASK: D, VHF/UHF 12.5kHz BW



CXY-15616

SPECTRUM ANALYZER PRESENTATION
PULSE ELECTRONICS, 15616
1998-MAR-27, 17:01, FRI

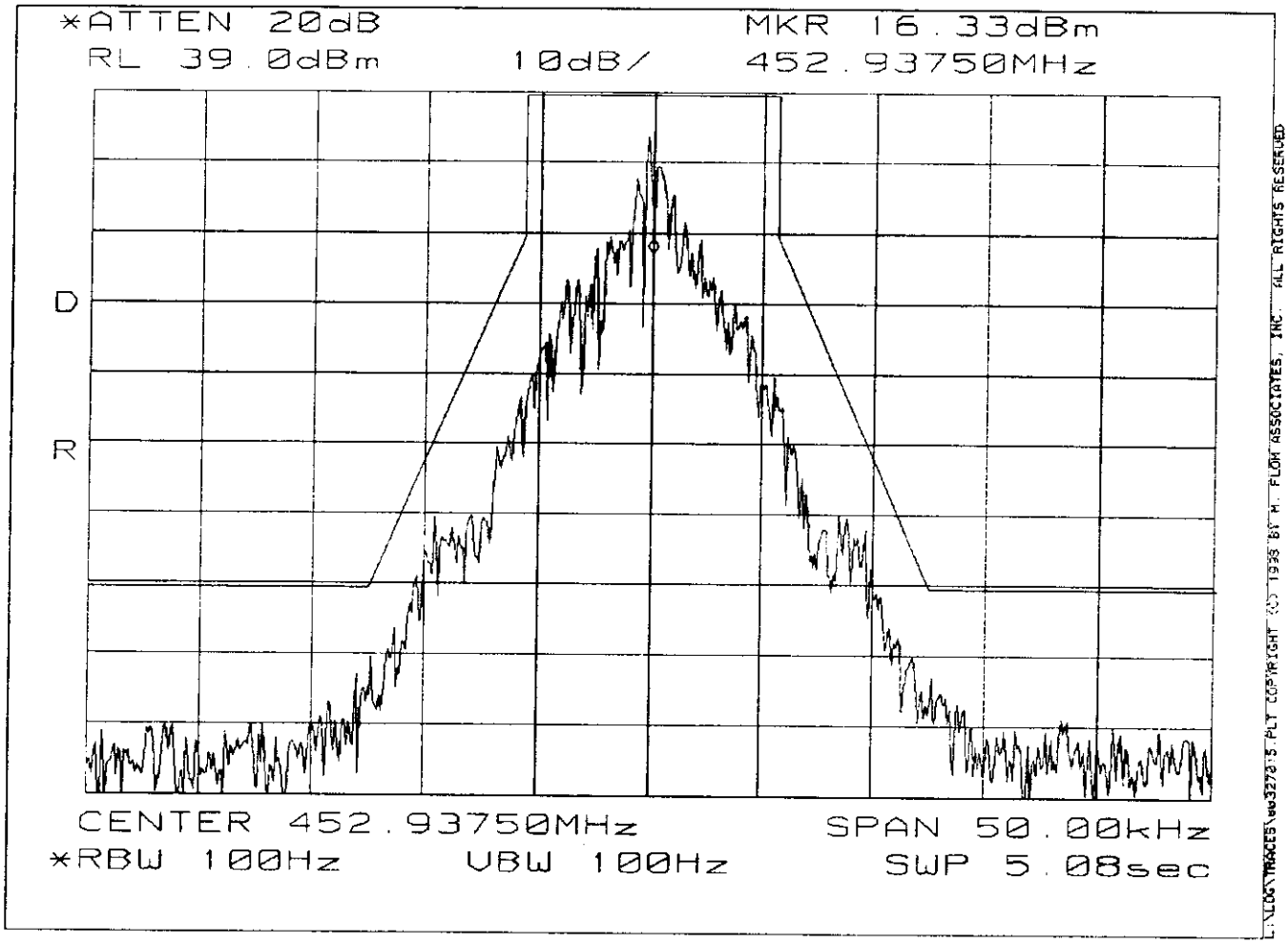
POWER: HIGH
MODULATION: NONE



CXY-15616

SPECTRUM ANALYZER PRESENTATION
PULSE ELECTRONICS, 15616
1998-MAR-27, 17:14, FRI

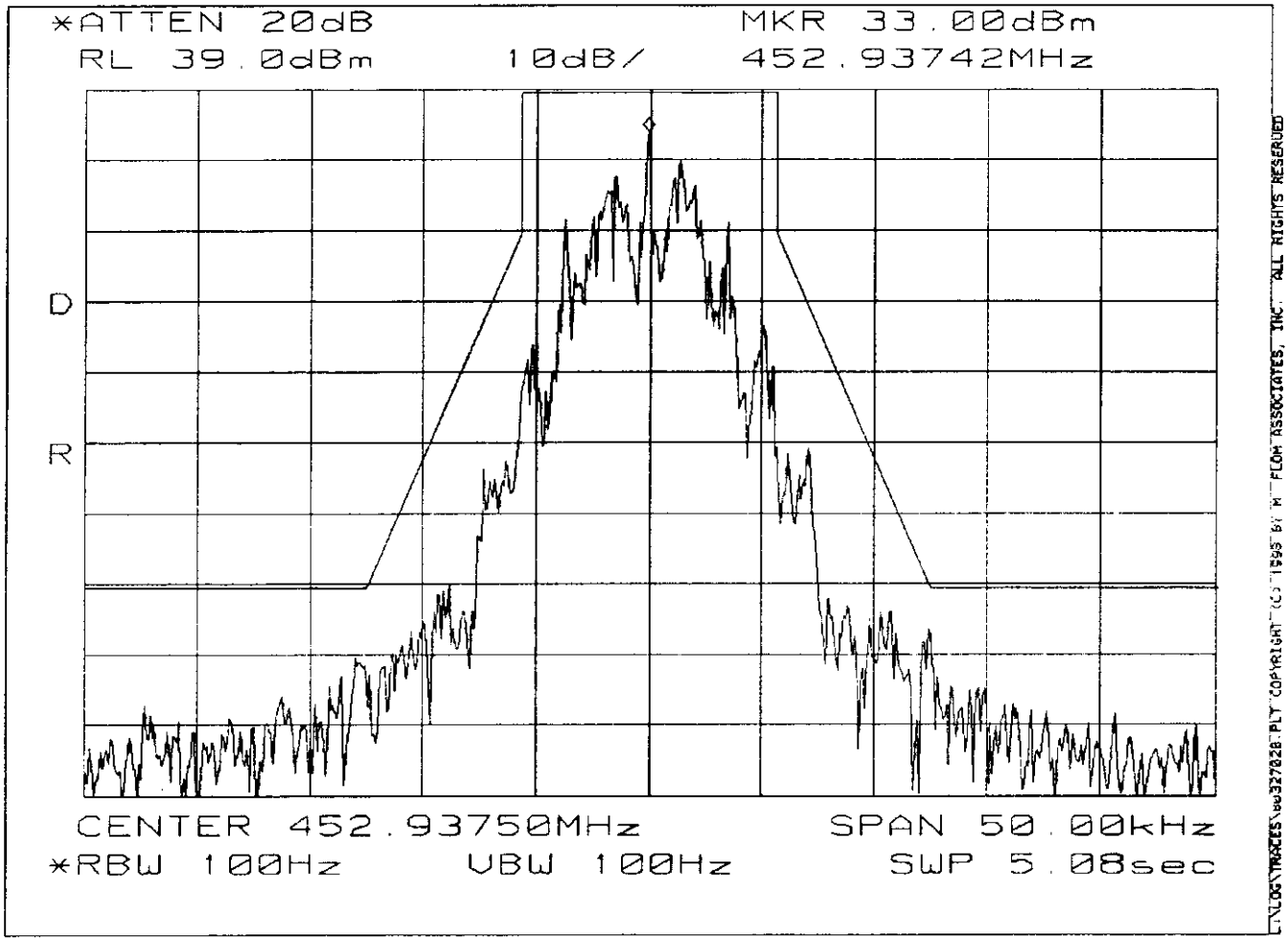
POWER: HIGH
MODULATION: GMSK 9600 BPS
MASK: D, VHF/UHF 12.5kHz BW



CXY-15616

SPECTRUM ANALYZER PRESENTATION
PULSE ELECTRONICS, 15616
1998-MAR-27, 17:25, FRI

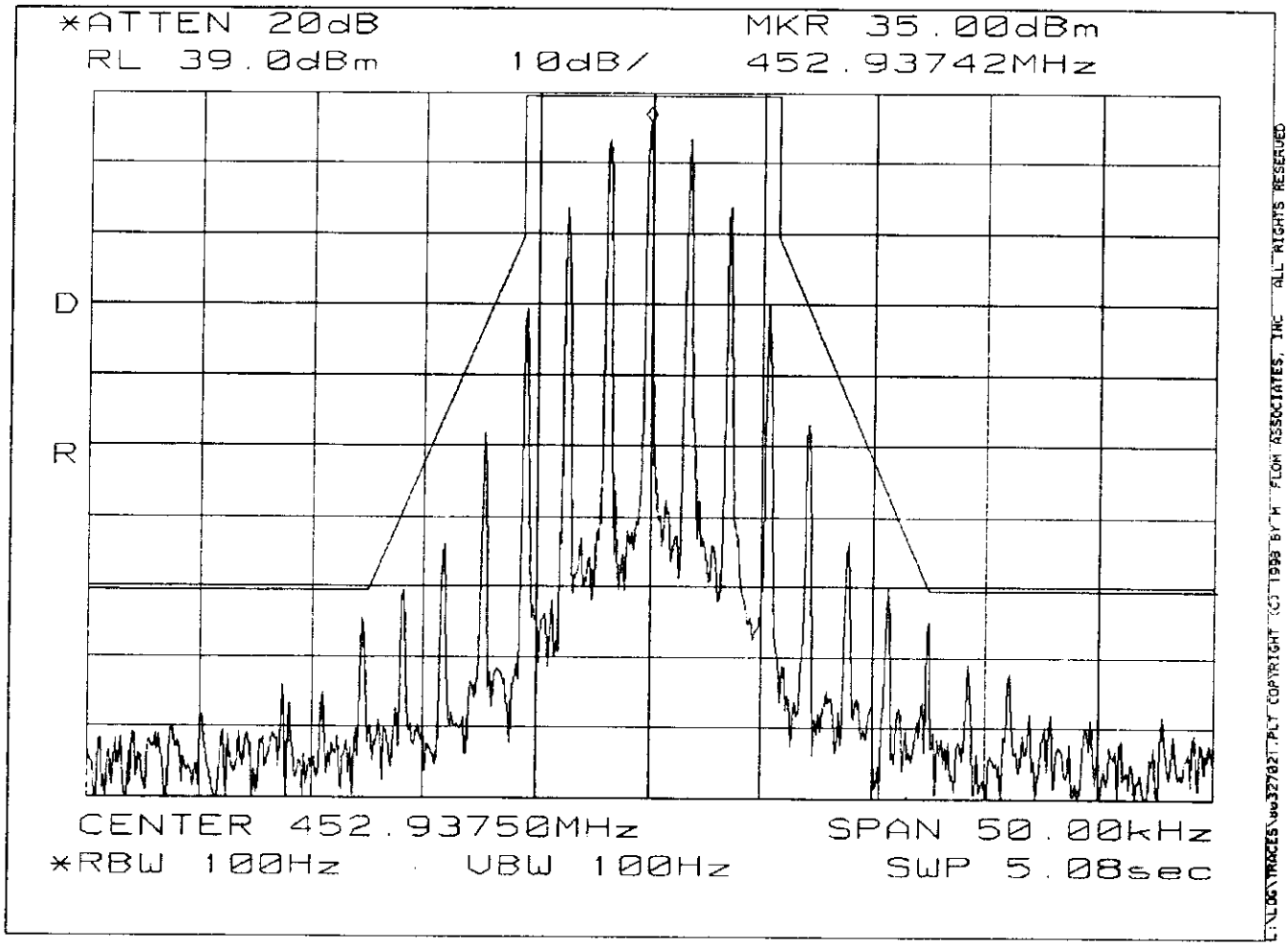
POWER: HIGH
MODULATION: MSK 1200 BPS
MASK: D, VHF/UHF 12.5kHz BW



CXY-15616

SPECTRUM ANALYZER PRESENTATION
PULSE ELECTRONICS, 15616
1998-MAR-27, 17:26, FRI

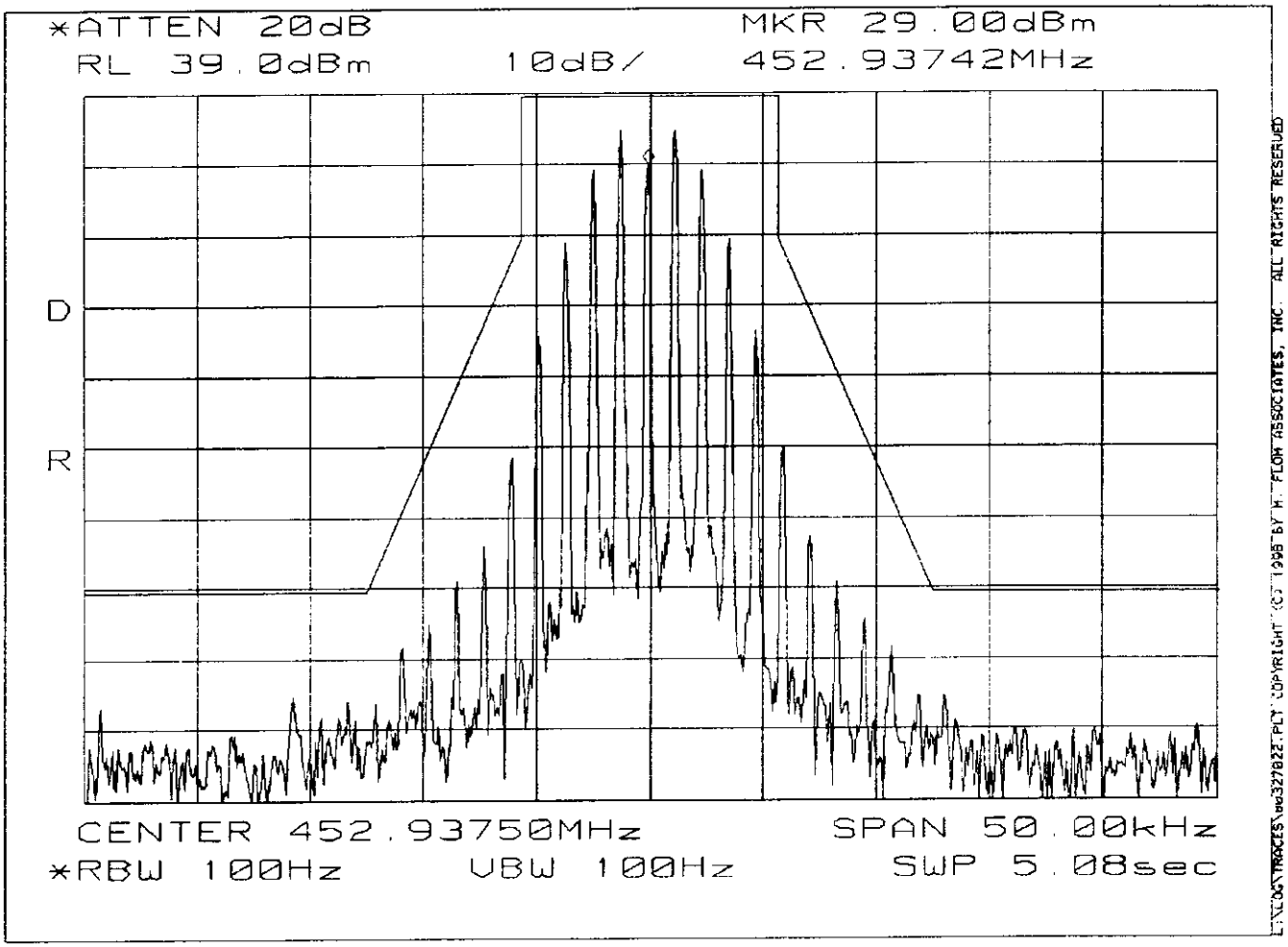
POWER: HIGH
MODULATION: MSK 1800 HZ
MASK: D, VHF/UHF 12.5kHz BW



CXY-15616

SPECTRUM ANALYZER PRESENTATION
PULSE ELECTRONICS, 15616
1998-MAR-27, 17:27, FRI

POWER: HIGH
MODULATION: MSK 1200 HZ
MASK: D, VHF/UHF 12.5kHz BW

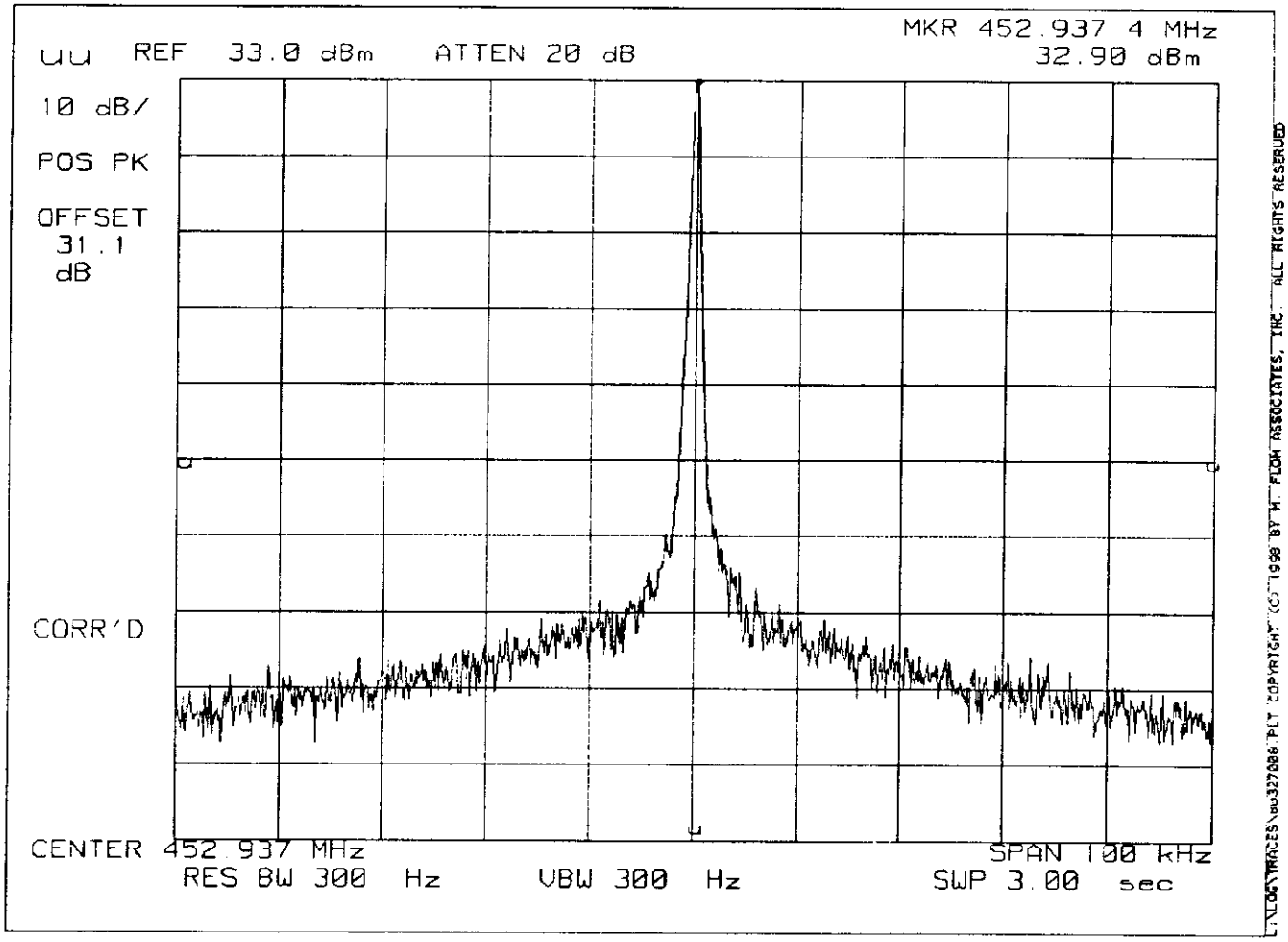


PAGE 15.11.

CXY-15616

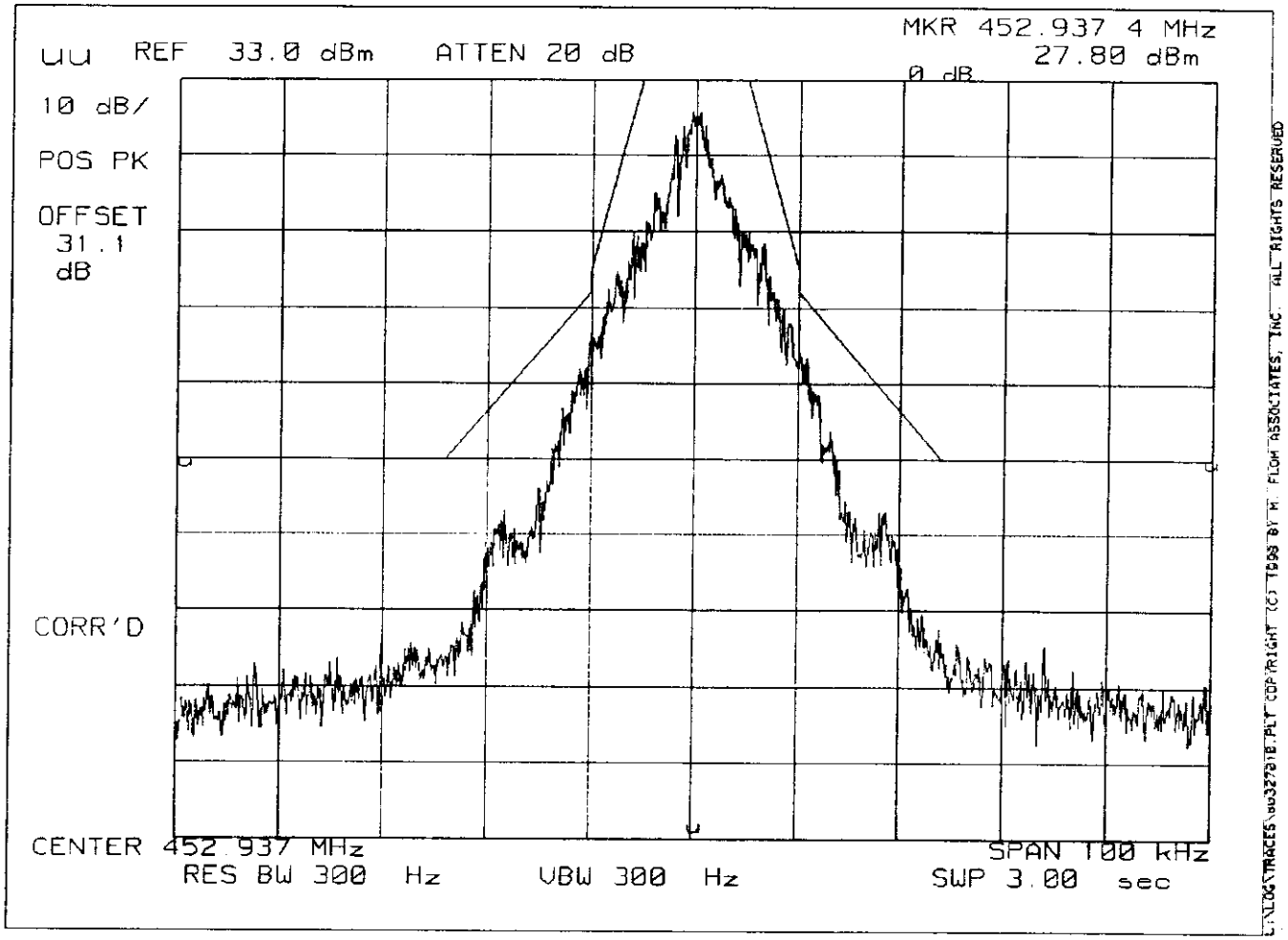
SPECTRUM ANALYZER PRESENTATION
PULSE ELECTRONICS, 15616
1998-MAR-27, 15:56, FRI

POWER: LOW
MODULATION: NONE



SPECTRUM ANALYZER PRESENTATION
PULSE ELECTRONICS, 15616
1998-MAR-27, 16:12, FRI

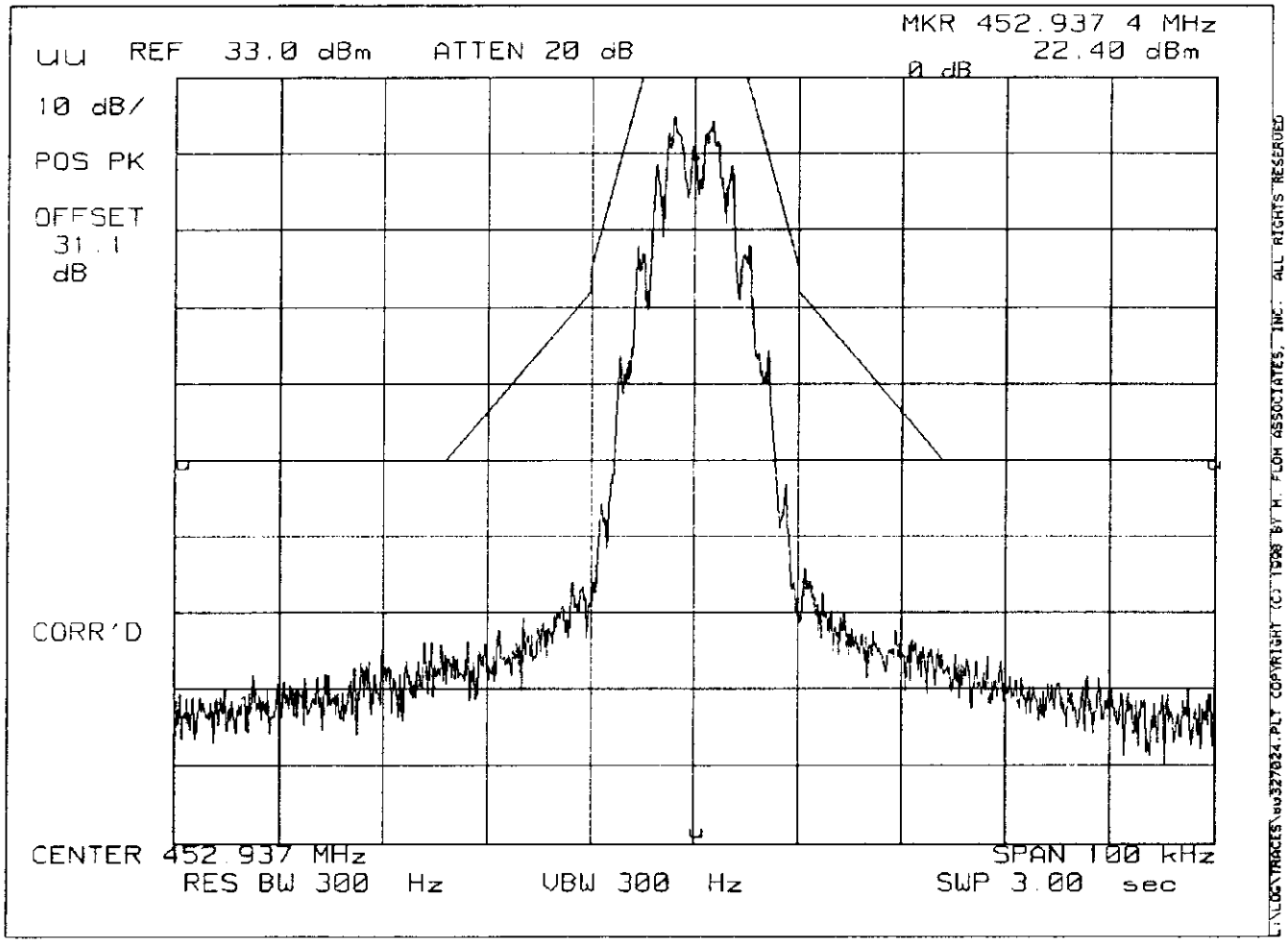
POWER: LOW
MODULATION: GMSK 19200 BPS
MASK: C, VHF/UHF 25KHZ, NO LPF



CXY-15616

SPECTRUM ANALYZER PRESENTATION
PULSE ELECTRONICS, 15616
1998-MAR-27, 17:34, FRI

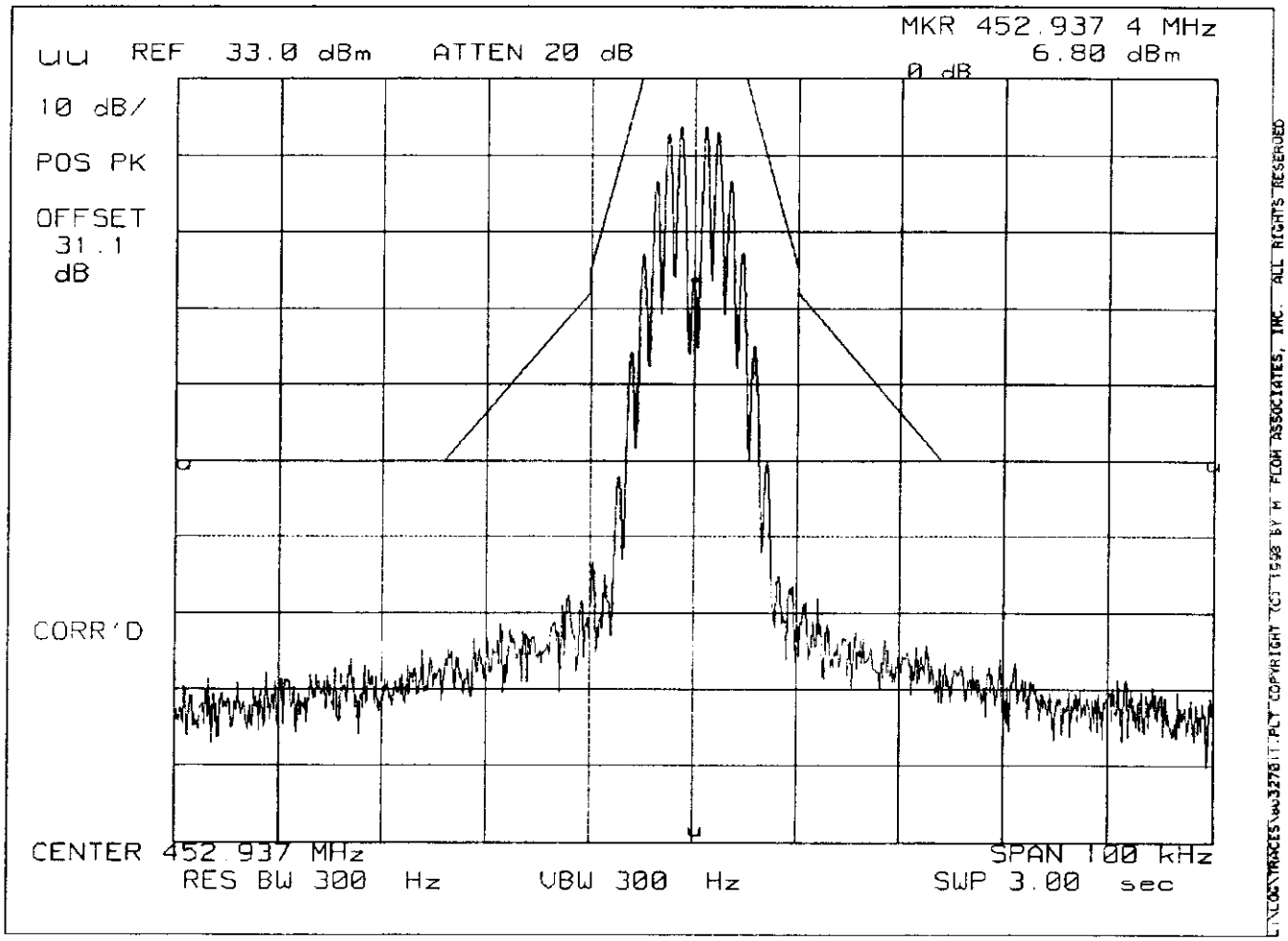
POWER: LOW
MODULATION: MSK 1200 BPS
MASK: C, VHF/UHF 25kHz, no LPF



CXY-15616

SPECTRUM ANALYZER PRESENTATION
PULSE ELECTRONICS, 15616
1998-MAR-27, 16:15, FRI

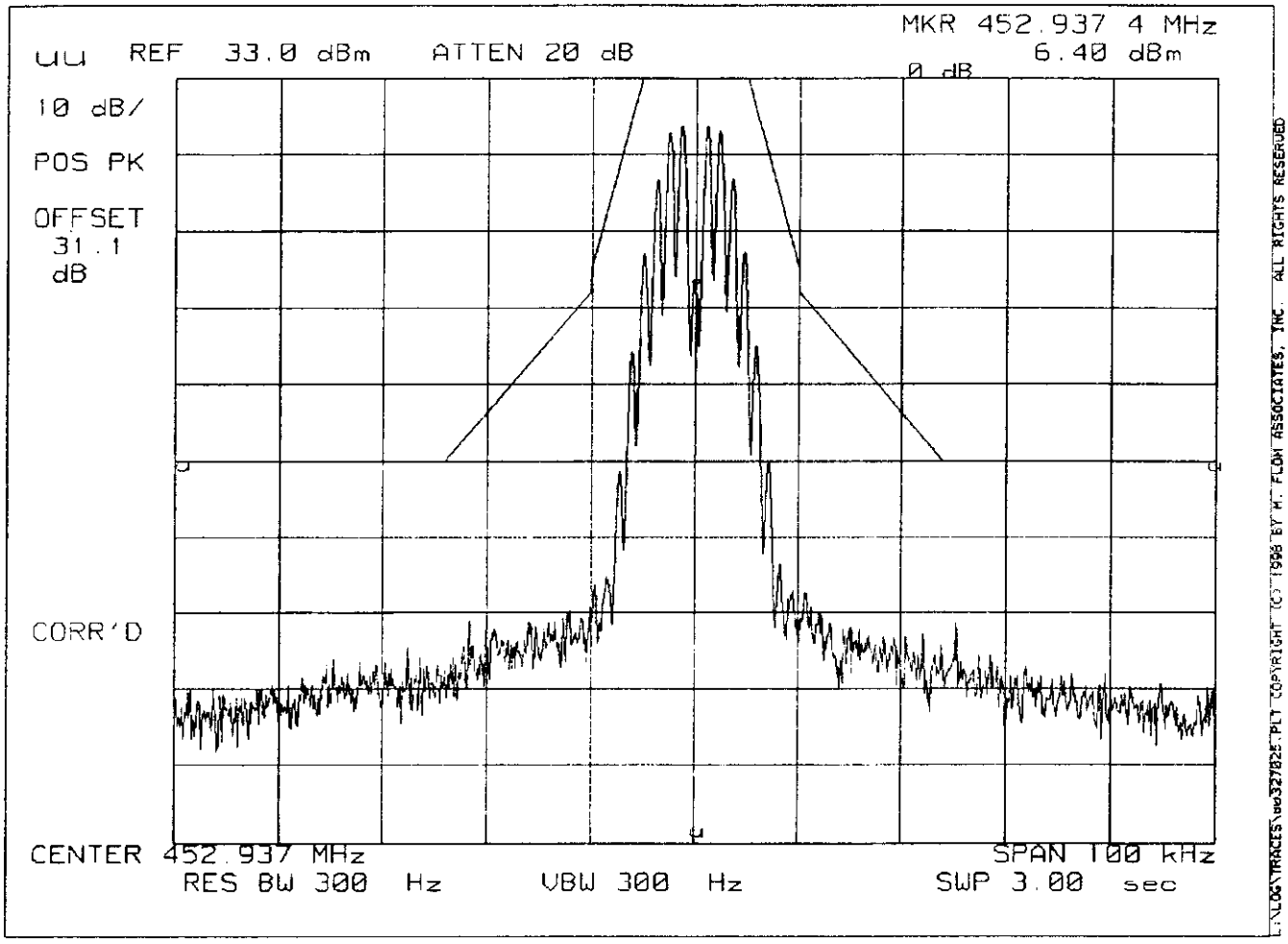
POWER: LOW
MODULATION: MSK 1800 HZ
MASK: C, VHF/UHF 25KHZ, NO LPF



CXY-15616

SPECTRUM ANALYZER PRESENTATION
PULSE ELECTRONICS, 15616
1998-MAR-27, 17:35, FRI

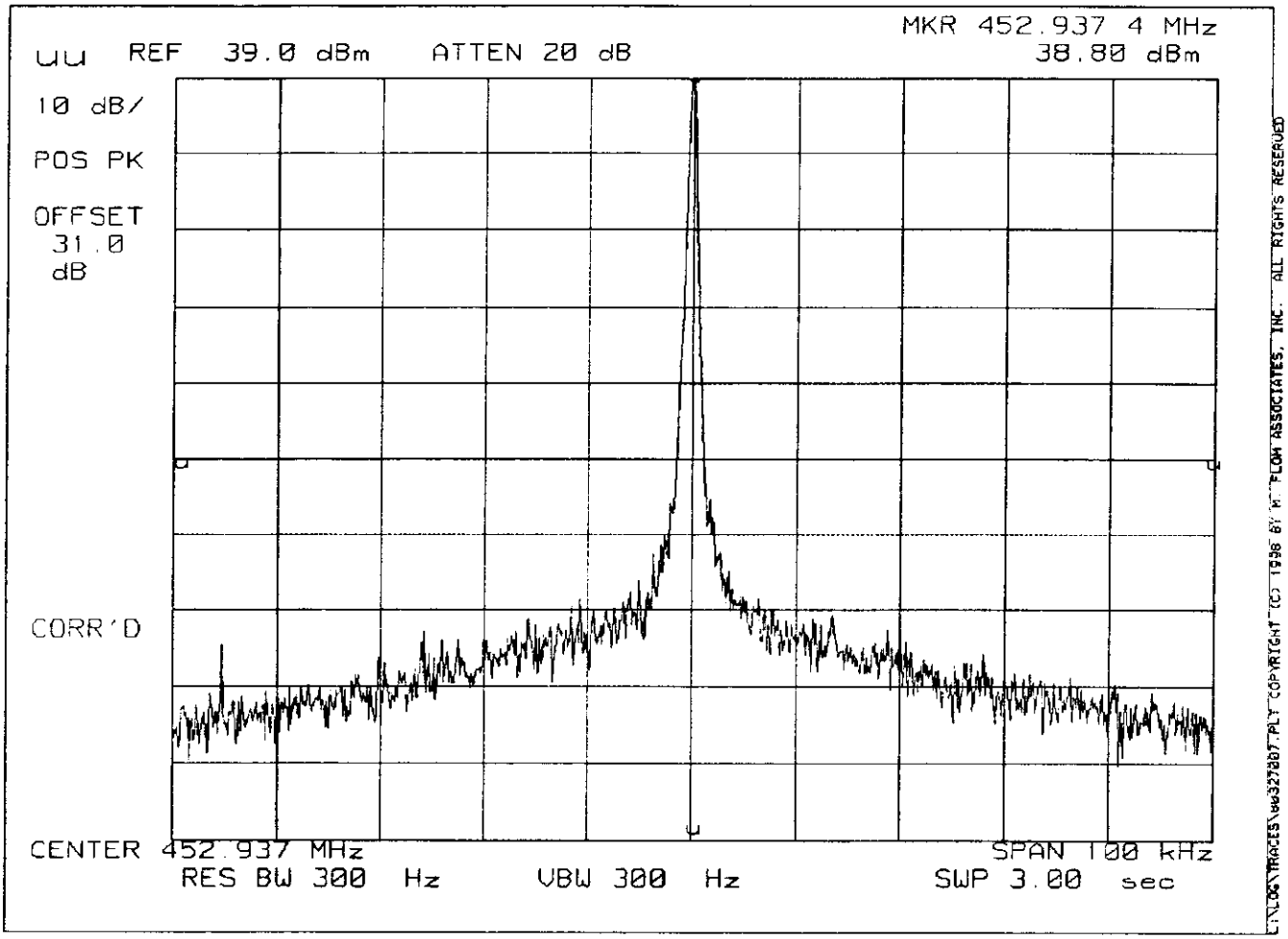
POWER: LOW
MODULATION: MSK 1200 HZ
MASK: C, VHF/UHF 25kHz, no LPF



CXY-15616

SPECTRUM ANALYZER PRESENTATION
PULSE ELECTRONICS, 15616
1998-MAR-27, 15:51, FRI

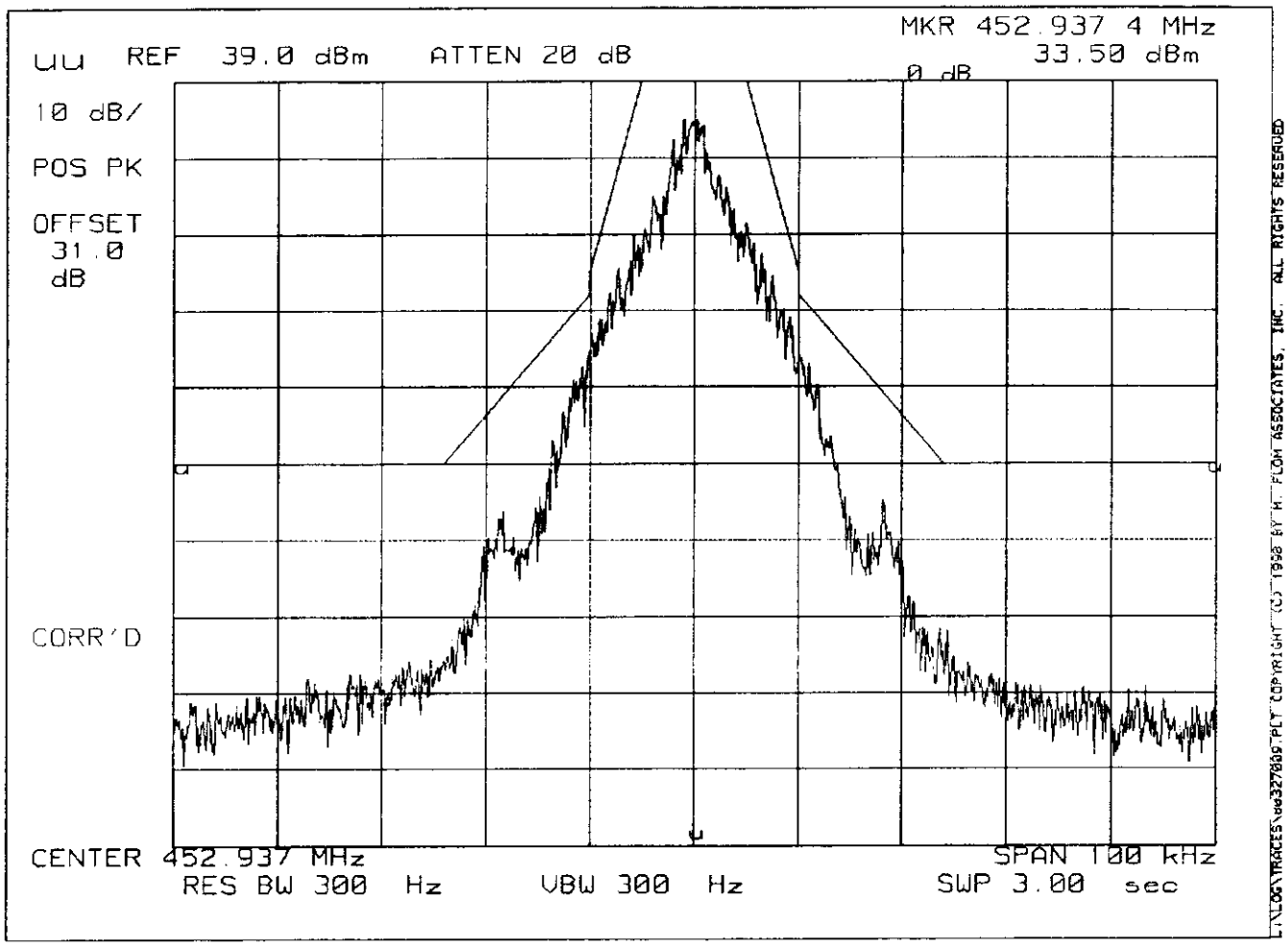
POWER: HIGH
MODULATION: NONE



CXY-15616

SPECTRUM ANALYZER PRESENTATION
PULSE ELECTRONICS, 15616
1998-MAR-27, 16:11, FRI

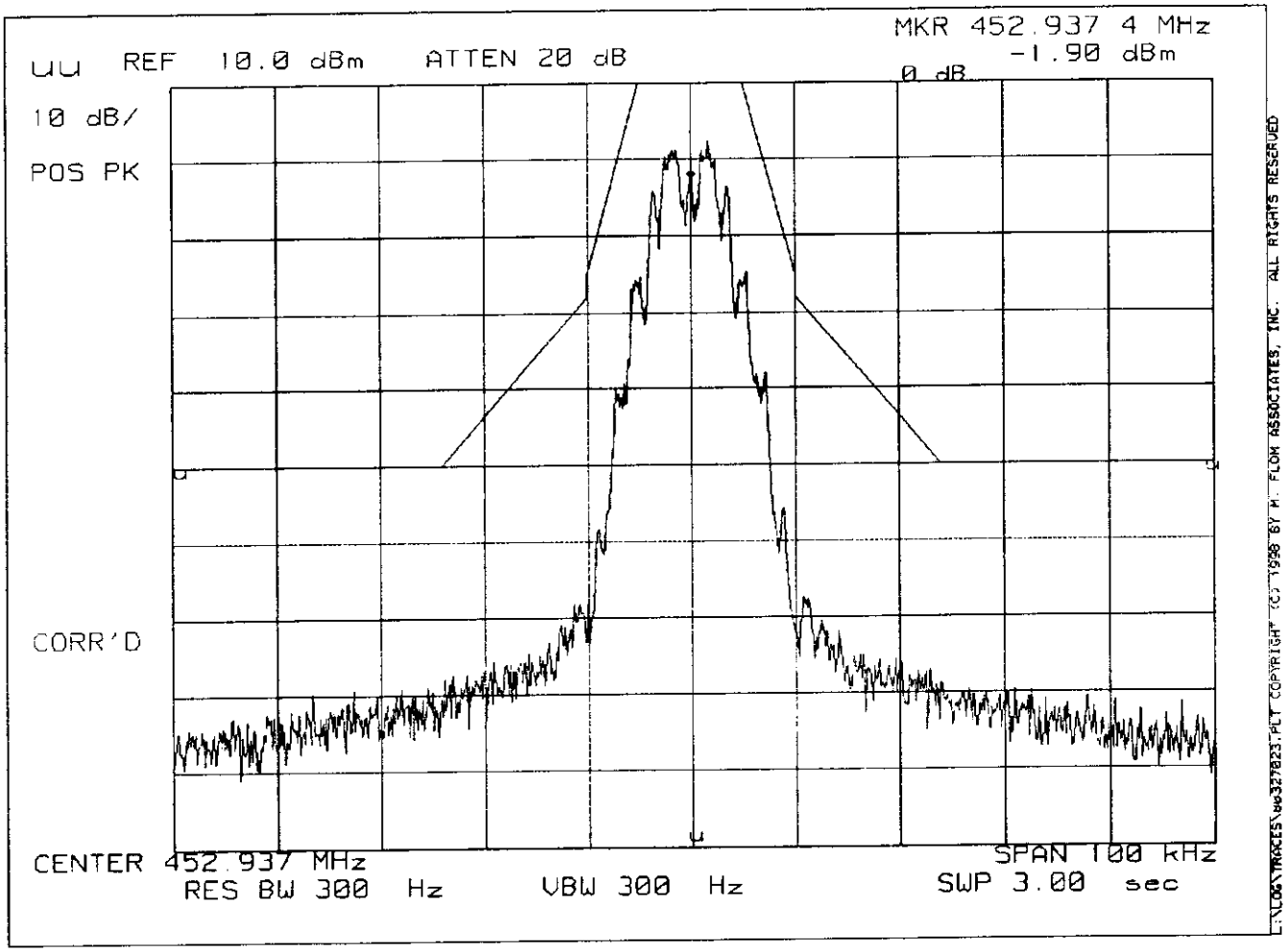
POWER: HIGH
MODULATION: GMSK 19200 BPS
MASK: C, VHF/UHF 25kHz, no LPF



CXY-15616

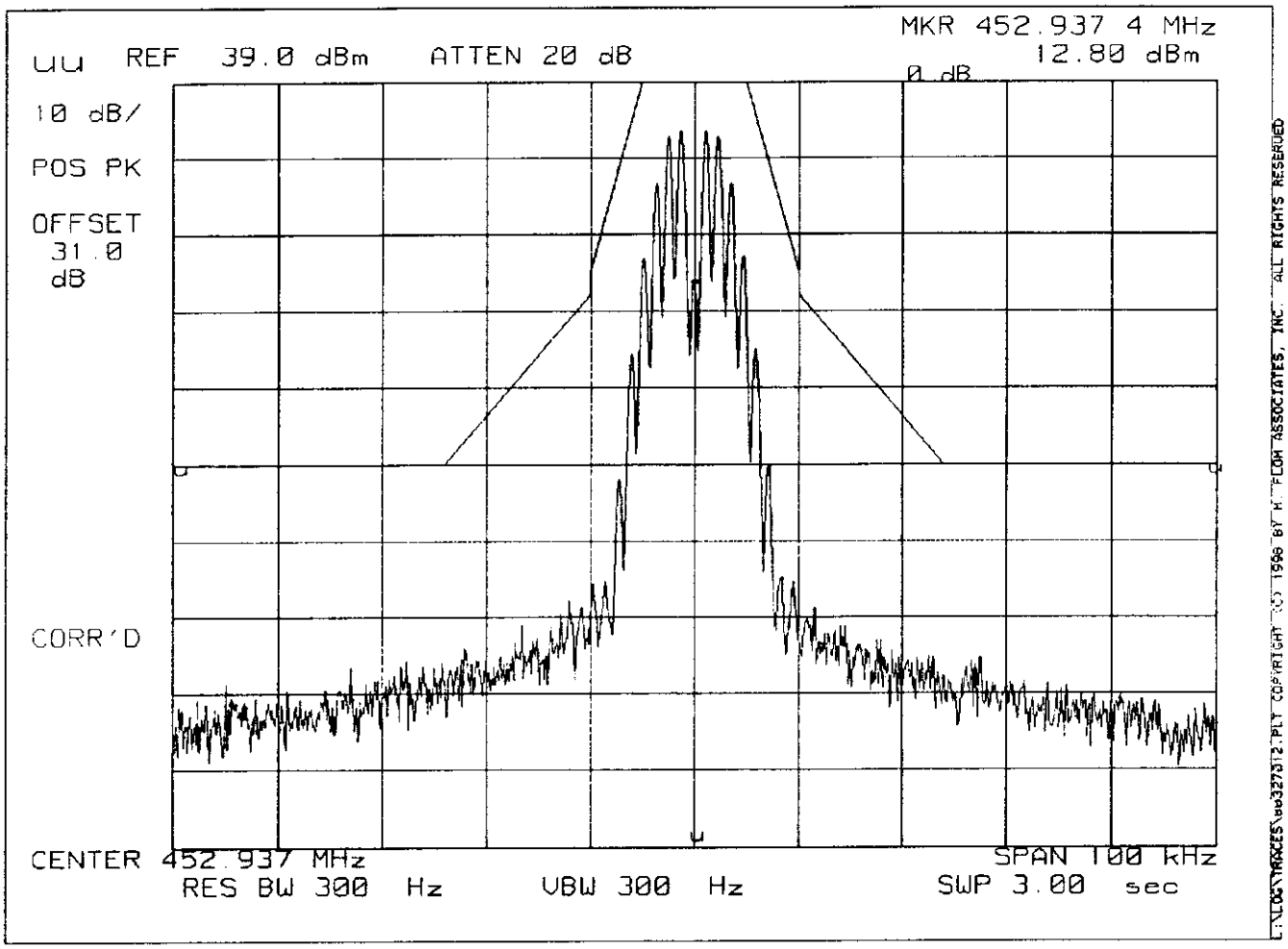
SPECTRUM ANALYZER PRESENTATION
PULSE ELECTRONICS, 15616
1998-MAR-27, 17:32, FRI

POWER: HIGH
MODULATION: MSK 1200 BPS
MASK: C, VHF/UHF 25kHz, no LPF



PAGE 15.19.
SPECTRUM ANALYZER PRESENTATION
PULSE ELECTRONICS, 15616
1998-MAR-27, 16:16, FRI

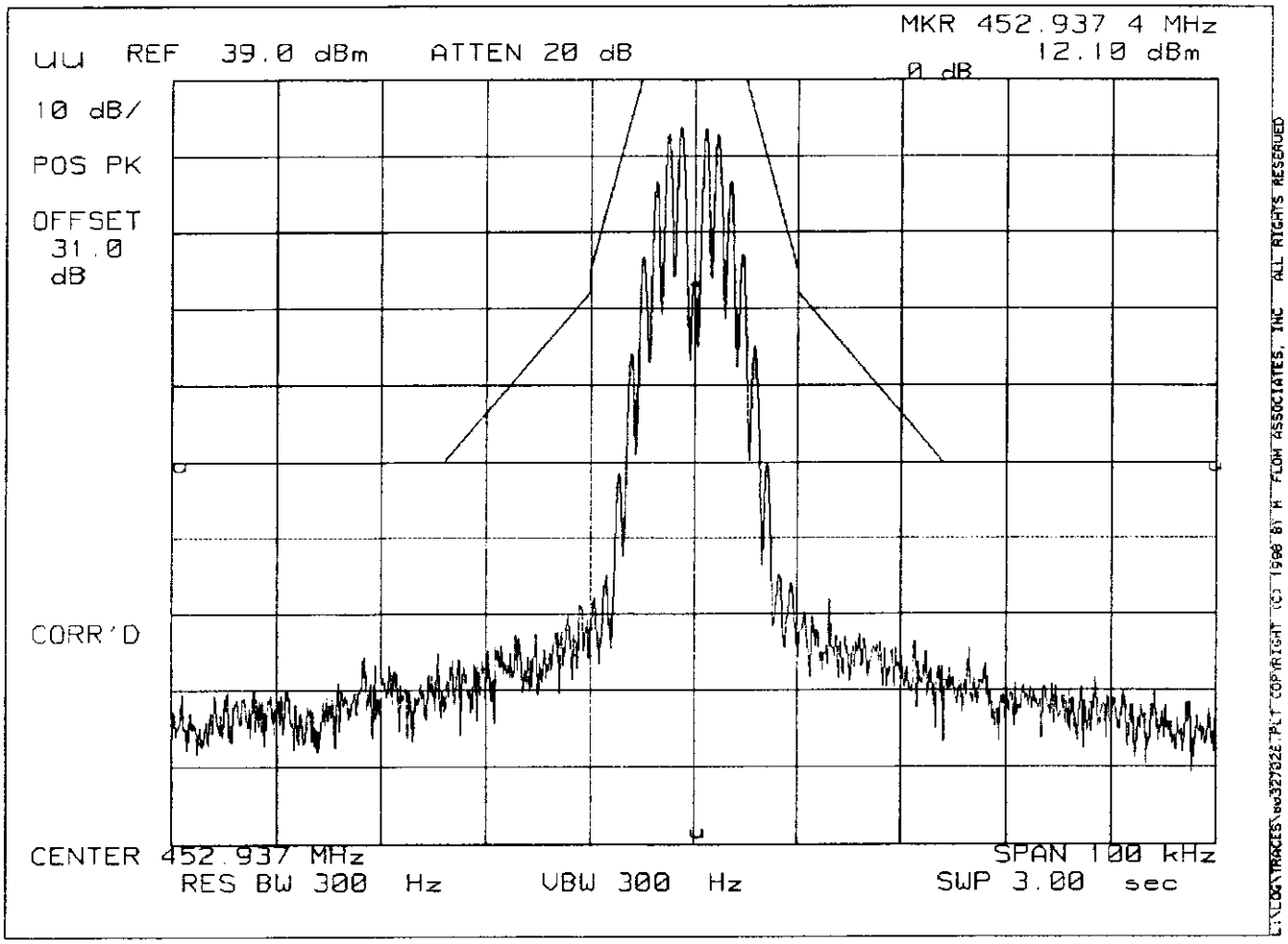
POWER: HIGH
MODULATION: MSK 1800 HZ
MASK: C, VHF/UHF 25KHZ, NO LPF



CXY-15616

SPECTRUM ANALYZER PRESENTATION
PULSE ELECTRONICS, 15616
1998-MAR-27, 17:37, FRI

POWER: HIGH
MODULATION: MSK 1200 HZ
MASK: C, VHF/UHF 25kHz, no LPF



NAME OF TEST: Transient Frequency Behavior

SPECIFICATION: FCC: 47 CFR 90.214
IC: RSS-119, Section 6.5

GUIDE: TIA/EIA-603, Paragraph 2.2.19

TEST CONDITIONS: S. T. & H.

TEST EQUIPMENT: As per attached page

MEASUREMENT PROCEDURE

1. The EUT was setup as shown on the attached page, following TIA/EIA-603 steps a, b, and c as a *guide*.

2. The transmitter was turned on.

3. Sufficient attenuation was provided so that the transmitter carrier level measured at the output of the combiner was 40 dB below the maximum input level of the test receiver. This level was recorded as step f.

4. The transmitter was turned off.

5. An RF signal generator (1) modulated with a 1 kHz tone at either 25, 12.5, or 6.25 kHz deviation, and set to the same frequency as the assigned transmitter frequency, (2) was adjusted to a level -20 dB below the level recorded for step f, as measured at the output of the combiner. This level was then fixed for the remainder of the test and is recorded at step h.

6. The oscilloscope was setup using TIA/EIA-603 steps j and k as a guide, and to either 10 ms/div (UHF) or 5 ms/div (VHF).

7. The 30 dB attenuator was removed, the transmitter was turned on, and the level of the carrier at the output of the combiner was recorded as step l.

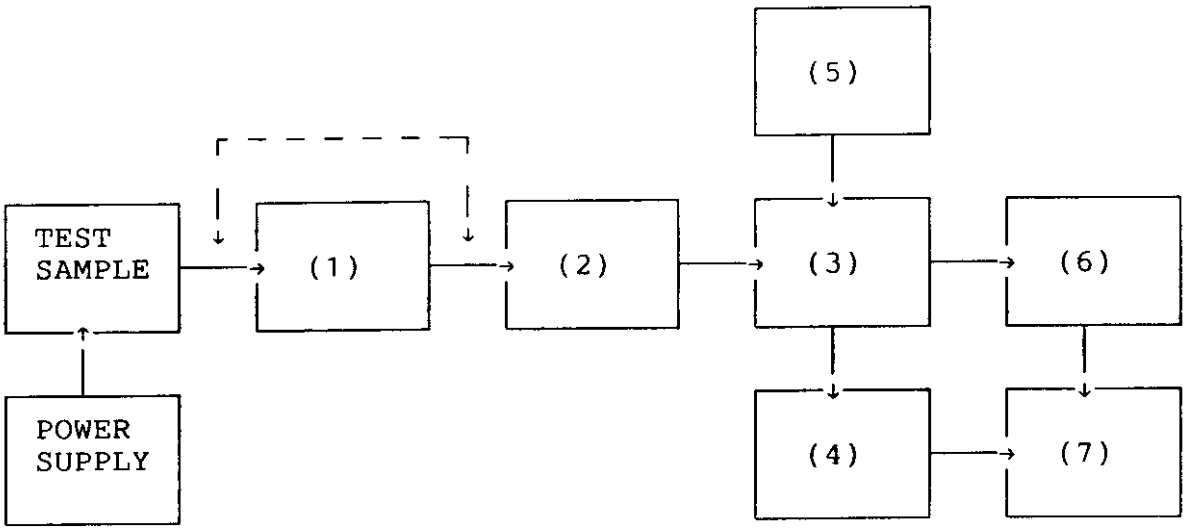
8. The carrier on-time as referenced in TIA/EIA-603 steps m, n, and o was captured and plotted. The carrier off-time as referenced in TIA/EIA-603 steps p, q, r, and s was captured and plotted.

LEVELS MEASURED:

| | |
|---|---|
| step f, dBm | = -10.2 |
| step h, dBm | = -32.3 |
| step l, dBm | = 18.0 |

SUPERVISED BY: MORTON FLOM, P. Eng.

TRANSIENT FREQUENCY BEHAVIOR




(1) ATTENUATOR
(NOTE: Removed after 1st step)
30 dB x

(2) ATTENUATOR
30 dB ___
20 dB x
10 dB ___
KAY VARIABLE ___

(3) COMBINER
4 x 25 Ω COMBINER x

(4) CRYSTAL DETECTOR
HP 8470B x

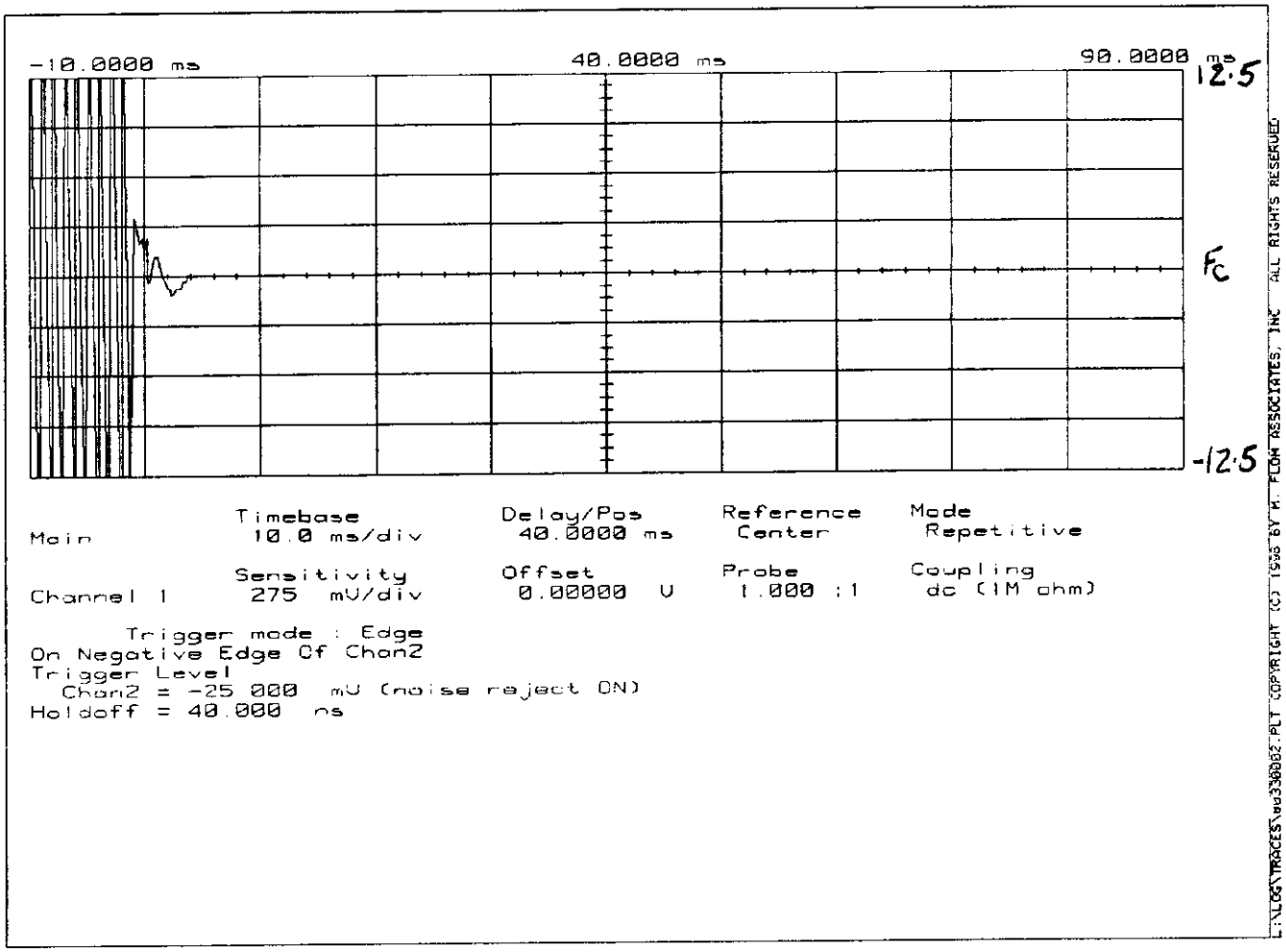
(5) RF SIGNAL GENERATOR
HP 8656A ___
HP 8920A x

(6) MODULATION ANALYZER
HP 8901A x

(7) SCOPE
HP 54502A x

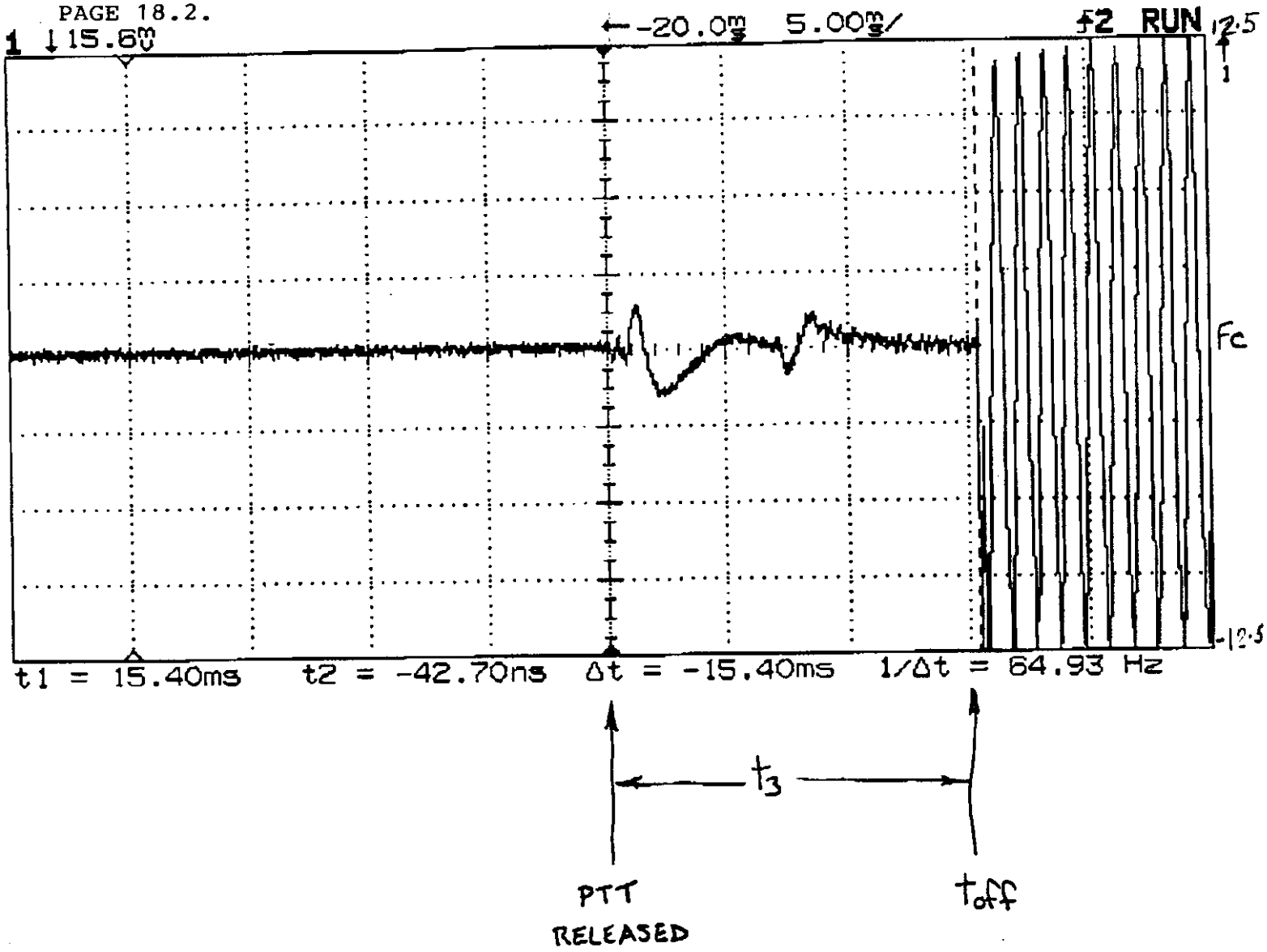
PAGE 18.1.
OSCILLOSCOPE PRESENTATION
PULSE ELECTRONICS, 15616
1998-MAR-30, 12:25, MON

MODULATION: Ref Gen=12.5 kHz Deviation
REMARK: CARRIER ON TIME




NOTE: This plot meets the efficiency standard of Part 90.203(j)(3)

TRANFRE2.PCX HP54601B <1> 04/02/98 11:30:13 AM CXY-15616




This plot was taken by Hans Glista of Pulse Electronics.

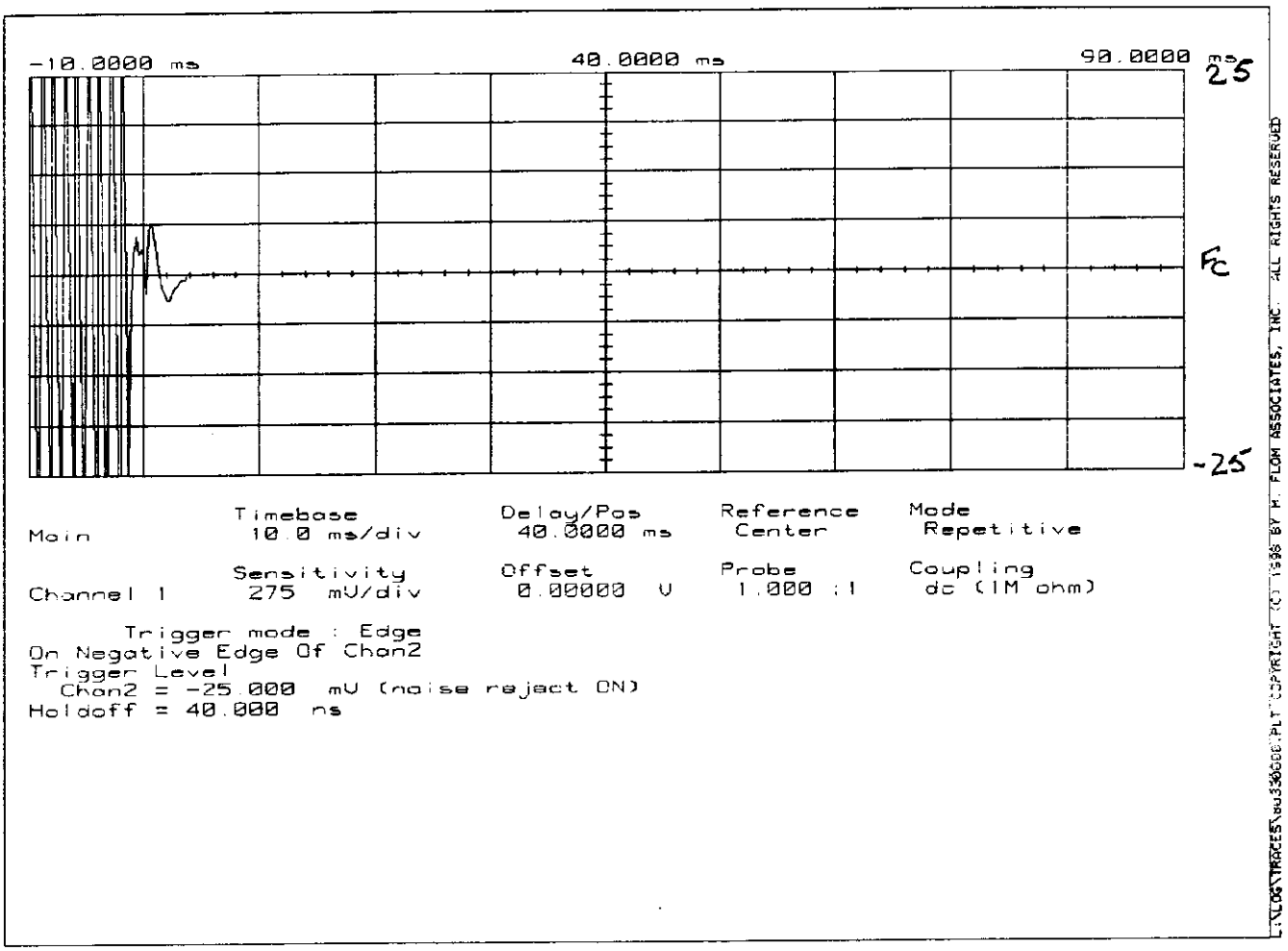
It shows that the transmit frequency deviates only after PTT is released. The plot was triggered directly by the low-to-high transition of the PTT line.

This plot meets efficiency standard of Part 90.203(j)(3)

CXY-15616

OSCILLOSCOPE PRESENTATION
PULSE ELECTRONICS, 15616
1998-MAR-30, 12:16, MON

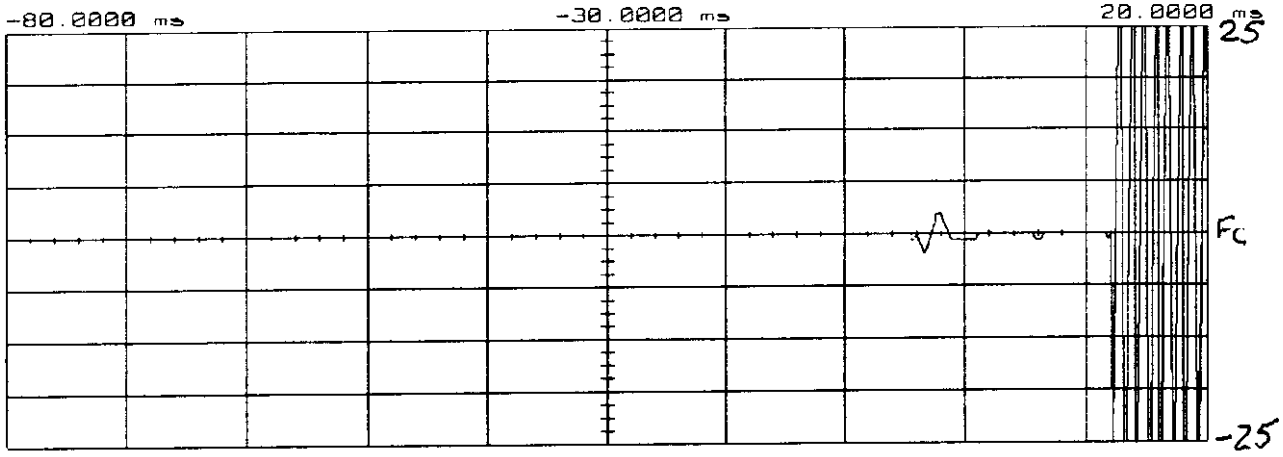
MODULATION: Ref Gen=25 kHz Deviation
REMARK: CARRIER ON TIME



CXY-15616

OSCILLOSCOPE PRESENTATION
PULSE ELECTRONICS, 15616
1998-MAR-30, 12:22, MON

MODULATION: Ref Gen=25 kHz Deviation
REMARK: CARRIER OFF TIME




| | Timebase | Delay/Pos | Reference | Mode |
|---|---|---|---|---|
| Main | 10 0 ms/div | -30.0000 ms | Center | Repetitive |
| | **Sensitivity** | **Offset** | **Probe** | **Coupling** |
| Channel 1 | 275 mV/div | 0.00000 V | 1.000 :1 | dc (1M ohm) |

Trigger mode : Edge
On Positive Edge Of Chan2
Trigger Level
Chan2 = -600.000 mV (noise reject ON)
Holdoff = 40.000 ns

NAME OF TEST: Audio Low Pass Filter (Voice Input)

SPECIFICATION: FCC: 47 CFR 2.987(a)
IC: RSS-119, Section 6.6

GUIDE: TIA/EIA-603, Paragraph 2.2.15

TEST CONDITIONS: S. T. & H.

TEST EQUIPMENT: As per attached page

## MEASUREMENT PROCEDURE

1. The EUT and test equipment were set up such that the audio input was connected at the input to the modulation limiter, and the modulated stage.

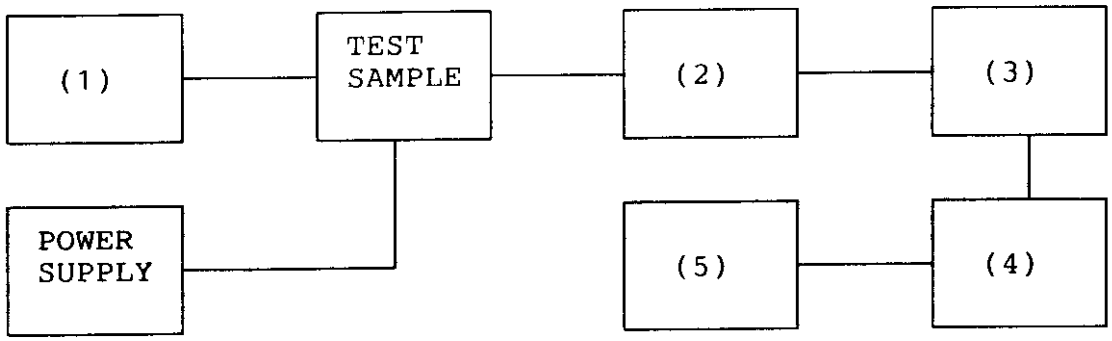
2. The audio output was connected at the output to the modulated stage.

3. MEASUREMENT RESULTS: ATTACHED

## TRANSMITTER TEST SET-UP

TEST A. MODULATION CAPABILITY/DISTORTION
TEST B. AUDIO FREQUENCY RESPONSE
TEST C. HUM AND NOISE LEVEL
TEST D. RESPONSE OF LOW PASS FILTER
TEST E. MODULATION LIMITING

---




(1) AUDIO OSCILLATOR/GENERATOR

| | |
|---|---|
| HP 204D | ___ |
| HP 8903A | ___ |
| HP 3312A | x |
| _____ | x |

(2) COAXIAL ATTENUATOR

| | |
|---|---|
| NARDA 766-10 | ___ |
| SIERRA 661A-30 | x |
| BIRD 8329 (30 dB) | ___ |
| _____ | ___ |

(3) MODULATION ANALYZER

| | |
|---|---|
| HP 8901A | x |
| _____ | ___ |

(4) AUDIO ANALYZER

| | |
|---|---|
| HP 8903A | x |
| _____ | ___ |

(5) SCOPE

| | |
|---|---|
| HP 1741A | ___ |
| HP 181T | ___ |
| TEK 935 | ___ |
| _____ | ___ |

NAME OF TEST: Audio Low Pass Filter (Voice Input)

NOT APPLICABLE

NAME OF TEST: Audio Frequency Response

SPECIFICATION: FCC: 47 CFR 2.987(a)
IC: N/A

GUIDE: TIA/EIA-603, Section 2.2.6

TEST CONDITIONS: S. T. & H.

TEST EQUIPMENT: As per previous page

## MEASUREMENT PROCEDURE

1. The EUT and test equipment were set up as shown on the following page.

2. The audio signal generator was connected to the audio input circuit/microphone of the EUT.

3. The audio signal input was adjusted to obtain 20% modulation at 1 kHz, and this point was taken as the 0 dB reference level.

4. With input levels held constant and below limiting at all frequencies, the audio signal generator was varied from 100 Hz to 50 kHz.

5. The response in dB relative to 1 kHz was then measured, using the HP 8901A Modulation Analyzer.

6. MEASUREMENT RESULTS: ATTACHED

NAME OF TEST: Audio Frequency Response

NOT APPLICABLE

NAME OF TEST: Modulation Limiting

SPECIFICATION: IC: RSS-119, Section 6.6
FCC: 47 CFR 2.987(b)

GUIDE: TIA/EIA-603, Paragraph 2.2.3

TEST CONDITIONS: S. T. & H.

TEST EQUIPMENT: As per attached page

## MEASUREMENT PROCEDURE

1. The signal generator was connected to the input of the EUT as for "Frequency Response of the Modulating Circuit."

2. The modulation response was measured for each of three frequencies (one of which was the frequency of maximum response), and the input voltage was varied and was observed on an HP 8901A Modulation Analyzer.

3. The input level was varied from 30% modulation (±1.5 kHz deviation) to at least 20 dB higher than the saturation point.

4. Measurements were performed for both negative and positive modulation and the respective results were recorded.

5. MEASUREMENT RESULTS: ATTACHED

NAME OF TEST: Modulation Limiting

NOT APPLICABLE

NAME OF TEST: Frequency Stability (Temperature Variation)

SPECIFICATION: FCC: 47 CFR 2.995(a)(1)
IC: RSS-119, Section 7.0

GUIDE: TIA/EIA-602, Section 2.2.2

TEST CONDITIONS: As indicated

TEST EQUIPMENT: As per attached page

## MEASUREMENT PROCEDURE

1. The EUT and test equipment were set up as shown on the following page.

2. With all power removed, the temperature was decreased to -30°C and permitted to stabilize for three hours. Power was applied and the maximum change in frequency was noted within one minute.

3. With power OFF, the temperature was raised in 10°C steps. The sample was permitted to stabilize at each step for at least one-half hour. Power was applied and the maximum frequency change was noted within one minute.

4. The temperature tests were performed for the worst case.

5. MEASUREMENT RESULTS: ATTACHED

## TRANSMITTER TEST SET-UP

TEST A. OPERATIONAL STABILITY
TEST B. CARRIER FREQUENCY STABILITY
TEST C. OPERATIONAL PERFORMANCE STABILITY
TEST D. HUMIDITY
TEST E. VIBRATION
TEST F. ENVIRONMENTAL TEMPERATURE
TEST G. FREQUENCY STABILITY: TEMPERATURE VARIATION
TEST H. FREQUENCY STABILITY: VOLTAGE VARIATION

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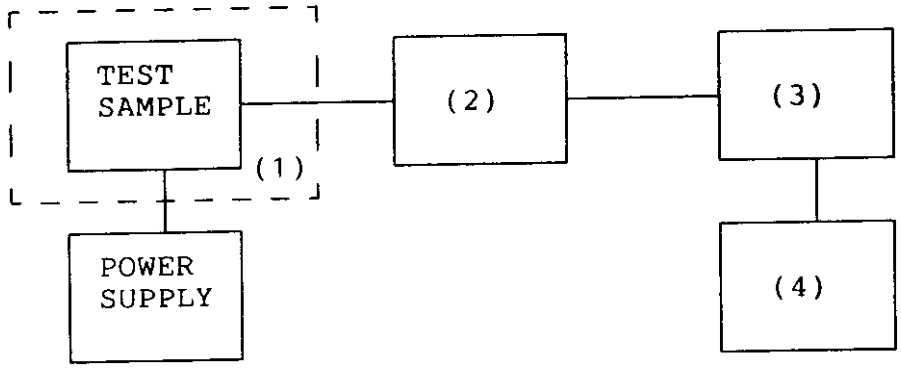



(1) TEMPERATURE, HUMIDITY, VIBRATION

| | |
|---|---|
| TENNEY TEMPERATURE CHAMBER | x |
| WEBER HUMIDITY CHAMBER | |
| L.A.B. RVH 18-100 | |
| | |

(2) COAXIAL ATTENUATOR

| | |
|---|---|
| NARDA 766-10 | |
| SIERRA 661A-30 | x |
| BIRD 8329 (30 dB) | x |
| | |

(3) R.F. POWER

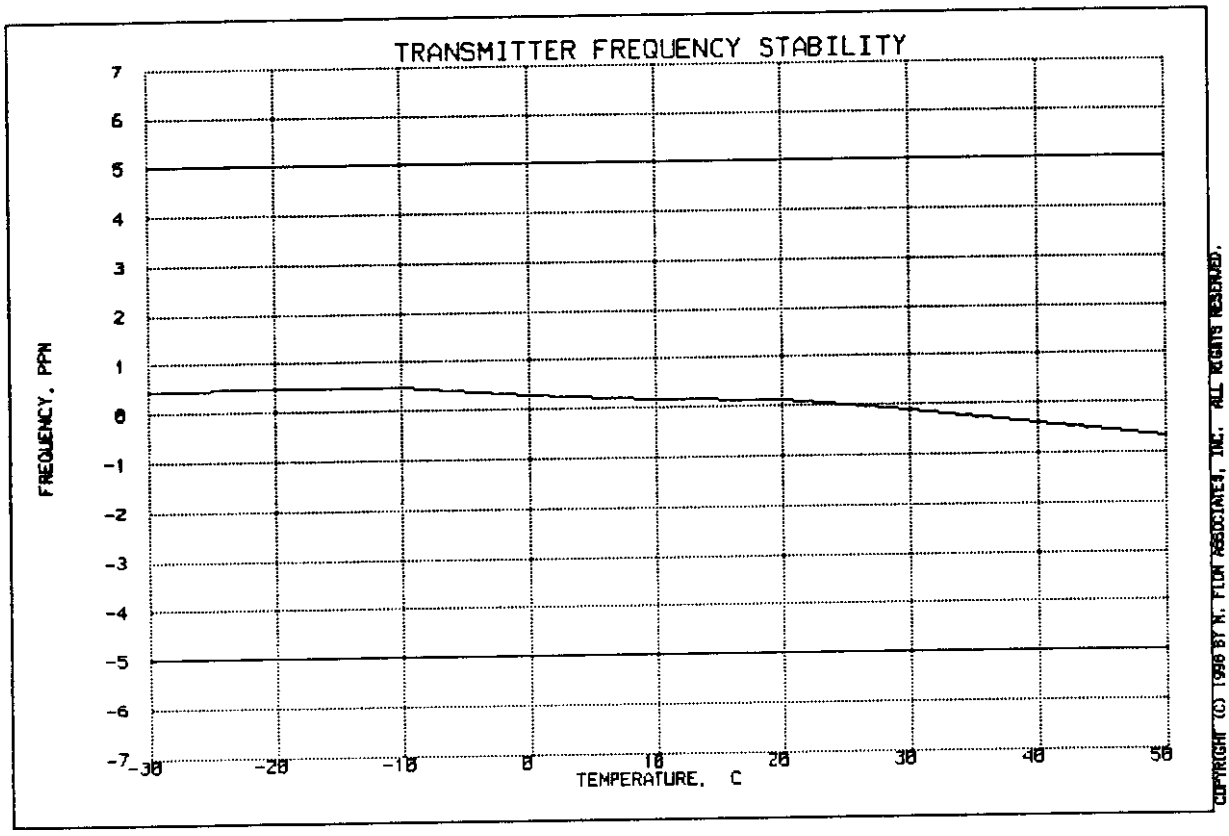
| | |
|---|---|
| HP 435A POWER METER | |
| HP 436A POWER METER | x |
| HP 8901A POWER MODE | x |
| | |

(4) FREQUENCY COUNTER

| | |
|---|---|
| HP 5383A | |
| HP 5334B | x |
| HP 8901A | x |
| | |

CXY-15616

TRANSMITTER FREQUENCY STABILITY
PULSE ELECTRONICS, 15616
1 APR 1998, 09:42




FREQUENCY OF CARRIER, MHz = 452.93738

LIMIT, ppm = 5

LIMIT, Hz = 2265

SUPERVISED BY:

MORTON FLOM, P. Eng.

NAME OF TEST: Frequency Stability (Voltage Variation)

SPECIFICATION: FCC: 47 CFR 2.995 (b)(1)
IC: RSS-119, Section 7.0

GUIDE: TIA/EIA-602, Section 2.2.2

TEST CONDITIONS: As indicated

TEST EQUIPMENT: As per attached page

## MEASUREMENT PROCEDURE

1. The EUT was placed in a temperature chamber at 25±5°C and connected as for "Frequency Stability - Temperature Variation" test.
2. The power supply voltage to the EUT was varied from 85% to 115% of the nominal value measured at the input to the EUT.
3. The variation in frequency was measured for the worst case.

## MEASUREMENT RESULTS

LIMIT, ppm = 5
LIMIT, Hz = 2265

| STV, % | Vdc | CHANGE IN FREQUENCY, Hz | |
|---|---|---|---|
| 85 | 10.2 | 452937530 | 30 |
| 100 | 12.0 | 452937500 | 0 |
| 115 | 13.8 | 452937520 | 20 |
| BATTERY END POINT: | 9.8 | 452937460 | -40 |

SUPERVISED BY: MORTON FLOM, P. Eng.

NAME OF TEST: Necessary Bandwidth and Emission Bandwidth

PARAGRAPH: 47 CFR 2.202(g)

EMISSION DESIGNATOR = 16K0F2D

NECESSARY BANDWIDTH CALCULATION:

| | |
|---|---|
| MAXIMUM MODULATION (M), kHz | = 3 |
| MAXIMUM DEVIATION (D), kHz | = 5 |
| CONSTANT FACTOR (K) | = 1 |
| NECESSARY BANDWIDTH ($B_N$), kHz | = (2 x M) + (2 x D x K) |
| | = 16.0 |

EMISSION DESIGNATOR = 8K6F2D

NECESSARY BANDWIDTH CALCULATION:

| | |
|---|---|
| MAXIMUM MODULATION (M), kHz | = 1.8 |
| MAXIMUM DEVIATION (D), kHz | = 2.5 |
| CONSTANT FACTOR (K) | = 1 |
| NECESSARY BANDWIDTH ($B_N$), kHz | = (2 x M) + (2 x D x K) |
| | = 8.6 |

SUPERVISED BY: MORTON FLOM, P. Eng.

# TESTIMONIAL
# AND
# STATEMENTOF CERTIFICATION

CXY-15616

THIS IS TO CERTIFY:

1. THAT the application was prepared either by, or under the direct supervision of, the undersigned.

2. THAT the technical data supplied with the application was taken under my direction and supervision.

3. THAT the data was obtained on representative units, randomly selected.

4. THAT, to the best of my knowledge and belief, the facts set forth in the application and accompanying technical data are true and correct.

CERTIFYING ENGINEER:

MORTON FLOM, P. Eng.

# STATEMENT OF QUALIFICATIONS

EDUCATION:

1. B. ENG. in ENGINEERING PHYSICS, 1949, McGill University, Montreal, Canada.

2. Post Graduate Studies, McGill University & Sir George Williams University, Montreal.

PROFESSIONAL AFFILIATIONS:

1. ARIZONA SOCIETY OF PROFESSIONAL ENGINEERS (NSPE), #026 031 821.

2. ORDER OF ENGINEERS (QUEBEC) 1949. #4534.

3. ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOPHYSICISTS & GEOLOGISTS OF ALBERTA #5916.

4. REGISTERED ENGINEERING CONSULTANT - GOVERNMENT OF CANADA, DEPARTMENT OF COMMUNICATIONS. Radio Equipment Approvals.

5. IEEE, Lifetime Member No. 0417204 (member since 1947).

EXPERIENCE:

1. Research/Development/Senior Project Engineer, R.C.A. LIMITED (4 years).

2. Owner/Chief Engineer of Electronics. Design/Manufacturing & Cable TV Companies (10 years).

3. CONSULTING ENGINEER (over 25 years).

M. Flom P. Eng

MORTON FLOM, P. Eng.

# TEST INSTRUMENTATION LIST

*All equipment calibrated within last 90 days*

**ADAPTER**
HP X281 (Coaxial waveguide); HP S281; HP 85659 (Quasi peak)

**AMPLIFIER**
Pre-amp. HP 10885A (2-1300 MHz); HP 8447D, HP 8447E, HP 8449A

**ANTENNA** *See end*

**ATTENUATOR**
Kay 432D; Power, Sierra 661A-30; Narda 76610; Narda 4779-3, -6, -10 dB

**AUDIO OSCILLATOR**
HP 204D; AIEC DTC-1; Motorola S-1333B; HP 3312A; HP 8903A

**BATTERY**
Sears Diehard, Stock #4341

**CAMERA**
Oscilloscope, Tektronix C5A; Polaroid Impulse AF; Kodak DC-50

**CAPACITOR**
Feed-Thru, 10 µF, Solar 6512-106R; Solar 7525-1

**CLOSE FIELD PROBE**
HP 11940A, 11941A, HP 11945A

**COMPUTER**
HP 332; HP Vectra 486/25VL; Various PC COmpatables

**CONVERTOR, Down**
HP 117 10B

**COUPLER**
Narda 1080, Waveguide; HP S750E (Cross guide); Waveline 274/40; Solar 7415-3; Solar 7835-891 & -896

**CURRENT PROBE**
Solar 6741-1

**DETECTOR**
HP 8470B

**DIGITAL MULTIMETER**
HP 3476A w/H.F. Probe; Fluke 8030A-01; HP 3478A

**DISTORTION ANALYZER**
HP 334A; HP 8903A

**ELECTRONIC COUNTER**
HP 5383A; HP 5334B

**FILTER**
Cirqtel FHT/7-50-57/ 50-1A/1B (HP); Jerrold TLB-1; THB-1, Piezo 5064; Eagle TNF-I Series, Krohn-Hite 3202; Phelps-Dodge #PD-495-8; Newtone #PD6000 Line Protector; 870-890 MHz (Lab Design); 900 MHz (Lab Design); Solar High-Pass s/n 882029

**FREQ. DEV. METER**
HP 8901A

**FREQ. DOUBLER**
HP 11721A

**FREQUENCY METER**
HP 537A; HP 536A

**GENERATOR**
Solar 6550-1 (power sweep); HP 8640B, GAW 1012, HP 8656A (signal); Solar 8282-1 (spike)

**HUMIDITY CHAMBER**
Embem Co FW30; Bowser 0

**LIMITER, R.F**
HP 11867A; HP 11693A; HP 10509A

**LISN**
Singer 91221-1; Ailtech 94641-1 (50µH)

**LOAD, POWER**
Telewave TLW-25; Bird 8329

**MILLIAMETER**
HP 428B

**MIXER**
HP 10514A; Mini-Circuits TAK-1H

**OPEN FIELD SITE**
As filed with FCC & IC and kept up-dated.
TURNTABLES:
Up to 2000# capacity
GROUND SCREEN:
Complies with docket 80-284
ANTENNA MAST:
Complies as above

**OSCILLOSCOPE**
HP 1741A; HP 181T; Tektronix T935; HP 54502A

**PHANTOM**
M.F.A. Labs Left and Right human head

**PLOTTER**
HP 7470; HP7475A

**POWER METER**
AF GR 1840A; HP 435A with 8481A & 8482H Power Sensors; HP 436A; HP 8901A

**POWER SUPPLY**
HP 6286A; Heathkit 1P 2711; 1P 5220; Honda EM400 (portable gas gen.); HP 6012

**PRINTER**
Brother HL-8; Brother HL-10V; HP DeskJet 640C

**R. F. PRESELECTOR**
HP 85685A

**RADIATION METER**
Narda 8717 w/8010 Amp, 8021B and 8760 probes

**RESISTOR, PRECISION**
Solar 7144-1.0, 7144-10.0; Solar 8525-1

**SCALE**
Weigh-Tronix 3632T-50

**SCANNER**
HP 9190A Scanjet

**SCREEN ROOM**
Lindgren 22-2/2-0

**SIGNAL LEVEL METER**
Jerrold 704B

**SIGNAL SAMPLER**
R. F. Bird 4273-030, 4275-030

**SINAD/VOLTMETER**
Helper Sinadder

**SPECTRUM ANALYZER**
HP 8558B, 8557; HP 8563E; HP 853A; HP 8566B/8568B

**TEMPERATURE CHAMBER**
Tenney, Jr

**TEMPERATURE PROBE**
Fluke 80T-150C

**TERMINATION**
Narda 3208 Waveguide. Waveline #281

**TEST SET**
Semi-Automatic: HP 8953A; HP 8954A Interface: Computer / Controller; P.S. Programmer; HP 59501A; RF Communications: HP 8920A

**TRANSFORMERS**
Audio Isolation: Solar 6220-1A; Impedance: HP 11694A; Isolation: Solar 7032-1; Matching: Solar 7033-1

**TRANSMISSION & NOISE MEASURING SET**
HP 3555B

**VIBRATION CHAMBER**
Unholtz-Dickie T 500; Unholtz-Dickie T 4000

**VOLTMETER**
HP 410C; HP 3478A

**WATTMETER**
Bird 43, Sierra 174A-2

**ANTENNAS**

**30 - 50 Hz**
Emco 7603 M-Field; Emco 7604 M-Field

**20 - 200 MHz**
Aprel Biconical Model AAB20200

**20 - 300 MHz**
Emco Biconical H-Field

**25 - 1000 MHz**
Singer DM-105A; EMCO 3121C

**200 - 1000 MHz**
Aprel Log Periodic, Model AALP 2001

**10 kHz - 30 MHz**
Emco 3107B, E-Field; Emco 3101B/1, Rod E-Field

**10 kHz - 32 MHz**
Singer 94593-1 (Loop)

**150 kHz - 32 MHz**
Singer 92197-1 (41")

**150 kHz - 32 MHz**
Singer 93049-1 (9')

**1 - 10 GHz**
Singer 90794-A Discone

**1 - 18 GHz**
Horn: Aprel Model AAH-118

**18 - 40 GHz**
Emco 3116, Horn

**40 - 60 GHz**
Horn: HP 11970U, HP 11971U, HP 11975A (Lo Drive Amplifier)

**50 - 75 GHz**
Mixer, HP 11970V, HP 11971V

**75 - 110 GHz**
Mixer, HP 11970W