THE APPLICANT HAS BEEN CAUTIONED AS TO THE FOLLOWING:

15.21 INFORMATION TO USER.

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

15.27(a) SPECIAL ACCESSORIES.

Equipment marketed to a consumer must be capable of complying with the necessary regulations in the configuration in which the equipment is marketed. Where special accessories, such as shielded cables and/or special connectors are required to enable an unintentional or intentional radiator to comply with the emission limits in this part, the equipment must be marketed with, i.e. shipped and sold with, those special accessories. However, in lieu of shipping or packaging the special accessories with the unintentional or intentional radiator, the responsible party may employ other methods of ensuring that the special accessories are provided to the consumer, without additional charge.

Information detailing any alternative method used to supply the special accessories for a grant of equipment authorization or retained in the verification records, as appropriate. The party responsible for the equipment, as detailed in § 2.909 of this chapter, shall ensure that these special accessories are provided with the equipment. The instruction manual for such devices shall include appropriate instructions on the first page of text concerned with the installation of the device that these special accessories must be used with the device. It is the responsibility of the user to use the needed special accessories supplied with the equipment.

# TABLE OF CONTENTS

PAGE NO. 1 of 36.

*Required information per ISO/IEC Guide 25-1990, paragraph 13.2:*

a) TEST REPORT

b) Laboratory: (FCC: 31040/SIT) (Canada: IC 2044)
M. Flom Associates, Inc.
3356 N. San Marcos Place, Suite 107
Chandler, AZ 85224

c) Report Number: d98a0029

d) Client:
Kenwood Communications Corporation
P.O. Box 22745
Long Beach, CA 90801-5745

e) Identification: TKR-820(N)
FCC ID: ALHTKR-820N-4
Description: UHF REPEATER

f) EUT Condition: Not required unless specified in individual tests.

g) Report Date: October 15, 1998
EUT Received: September 18, 1998

h, j, k): As indicated in individual tests.

i) Sampling method: No sampling procedure used.

l) Uncertainty: In accordance with MFA internal quality manual.

m) Supervised by:

Morton Flom, P. Eng.

n) Results: The results presented in this report relate only to the item tested.

o) Reproduction: This report must not be reproduced, except in full, without written permission from this laboratory.

PAGE NO. 2 of 36.

LIST OF GENERAL INFORMATION REQUIRED FOR CERTIFICATION

IN ACCORDANCE WITH FCC RULES AND REGULATIONS,
VOLUME II, PART 2 AND TO

90

Sub-part 2.1033

(c)(1): NAME AND ADDRESS OF APPLICANT:

Kenwood Communications Corporation
2201 E. Dominguez St
P.O. Box 22745
Long Beach, CA 90801-5745

VENDOR:

Kenwood Communications Corporation
P.O. Box 22745
Long Beach, CA 90801-5745

(c)(2): FCC ID: ALHTKR-820N-4

MODEL NO: TKR-820(N)

(c)(3): INSTRUCTION MANUAL(S):

PLEASE SEE ATTACHED EXHIBITS

(c)(4): TYPE OF EMISSION: 11K0F3E

(c)(5): FREQUENCY RANGE, MHz: 406 to 430

(c)(6): POWER RATING, Watts: 2 to 25
_x_ Switchable ___ Variable ___ N/A

(c)(7): MAXIMUM POWER RATING, Watts: 500

PAGE NO. 3 of 36.

Subpart 2.1033 (continued)

(c)(8): VOLTAGES & CURRENTS IN ALL ELEMENTS IN FINAL R. F. STAGE, INCLUDING FINAL TRANSISTOR OR SOLID STATE DEVICE:

COLLECTOR CURRENT, A = per manual
COLLECTOR VOLTAGE, Vdc = per manual
SUPPLY VOLTAGE, Vac = 120

(c)(9): TUNE-UP PROCEDURE:

PLEASE SEE ATTACHED EXHIBITS

(c)(10): CIRCUIT DIAGRAM/CIRCUIT DESCRIPTION: Including description of circuitry & devices provided for determining and stabilizing frequency, for suppression of spurious radiation, for limiting modulation and limiting power.

PLEASE SEE ATTACHED EXHIBITS

(c)(11): LABEL INFORMATION:

PLEASE SEE ATTACHED EXHIBITS

(c)(12): PHOTOGRAPHS:

PLEASE SEE ATTACHED EXHIBITS

(c)(13): DIGITAL MODULATION DESCRIPTION:

___ ATTACHED EXHIBITS
_x_ N/A

(c)(14): TEST AND MEASUREMENT DATA:

FOLLOWS

PAGE NO. 4 of 36.

Sub-part 2.1033(c)(14): 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 2.947, 2.1033(c), 2.1041, 2.1046, 2.1047, 2.1079, 2.1051, 2.1053, 2.1055, 2.1057 and the following individual Parts:

____ 21 - Domestic Public Fixed Radio Services
____ 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
____ 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
____ 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:

In accordance with ANSI C63.4-1992, section 6.1.9, and unless otherwise indicated in the specific measurement results, the ambient temperature of the actual EUT was maintained within the range of 10° to 40°C (50° to 104 °F) unless the particular equipment requirements specify testing over a different temperature range. Also, unless otherwise indicated, the humidity levels were in the range of 10% to 90% relative humidity.

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.

PAGE NO. 6 of 36.

NAME OF TEST: Carrier Output Power (Conducted)

SPECIFICATION: 47 CFR 2.1046(a)

GUIDE: ANSI/TIA/EIA-603-1992, Paragraph 2.2.1

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
(Worst case)

FREQUENCY OF CARRIER, MHz = 415.05

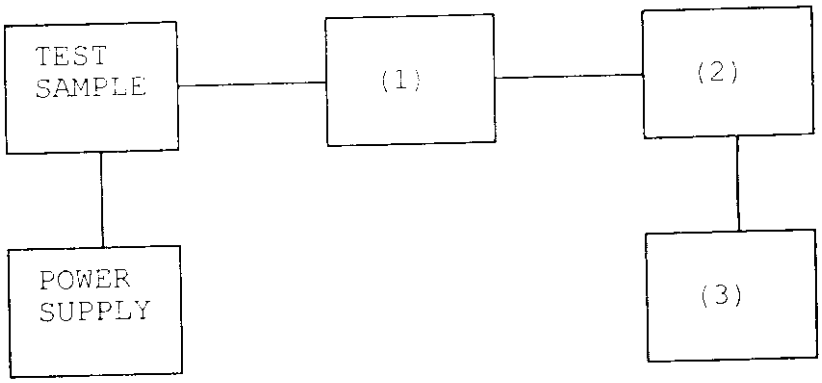
| POWER SETTING | R. F. POWER, WATTS |
|---|---|
| Low | 2 |
| High | 25 |

SUPERVISED BY: Morton Flom, P. Eng.

PAGE NO. 7 of 36.

## TRANSMITTER POWER CONDUCTED MEASUREMENTS

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




| | Asset | Description | s/n |
|---|---|---|---|
| (1) | | COAXIAL ATTENUATOR | |
| ___ | i00122 | Narda 766-10 | 7802 |
| ___ | i00123 | Narda 766-10 | 7802A |
| ___ | i00069 | Bird 8329 (30 dB) | 1006 |
| x | i00113 | Sierra 661A-3D | 1059 |
| (2) | | POWER METERS | |
| ___ | i00014 | HP 435A | 1733A05836 |
| x | i00039 | HP 436A | 2709A26776 |
| x | i00020 | HP 8901A POWER MODE | 2105A01087 |
| (3) | | FREQUENCY COUNTER | |
| ___ | i00042 | HP 5383A | 1628A00959 |
| x | i00019 | HP 5334B | 2704A00347 |
| x | i00020 | HP 8901A FREQUENCY MODE | 2105A01087 |

PAGE NO. 8 of 36.

NAME OF TEST: Unwanted Emissions (Transmitter Conducted)

SPECIFICATION: 47 CFR 2.1051

GUIDE: ANSI/TIA/EIA-603-1992, Paragraph 2.2.13

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 that are attenuated more than 20 dB below the permissible value need not be specified.

3. MEASUREMENT RESULTS: ATTACHED FOR WORST CASE

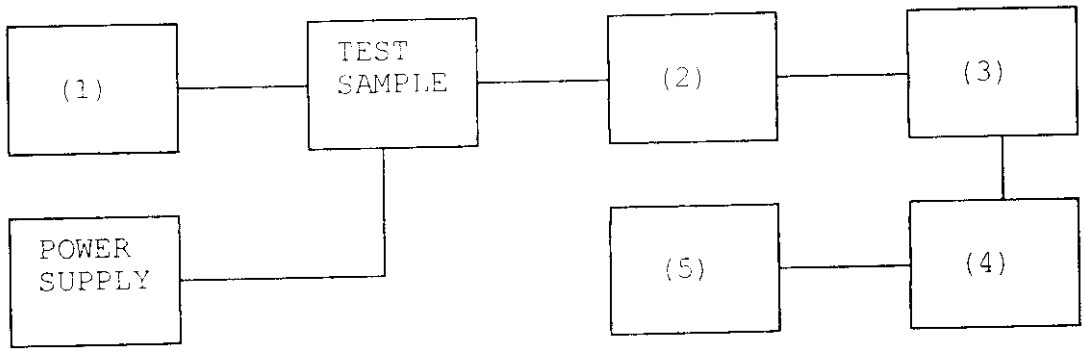
| | | |
|---|---|---|
| FREQUENCY OF CARRIER, MHz | = | 415.05 |
| SPECTRUM SEARCHED, GHz | = | 0 to 10 x $F_c$ |
| MAXIMUM RESPONSE, Hz | = | 2820 |
| ALL OTHER EMISSIONS | = | ≥ 20 dB BELOW LIMIT |
| LIMIT(S), dBc | | |
| -(43+10xLOG P) | = | -46 (2 Watts) |
| -(43+10xLOG P) | = | -57 (25 Watts) |

SUPERVISED BY: Morton Flom, P. Eng.

PAGE NO. 9 of 36.

## TRANSMITTER SPURIOUS EMISSION

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




| | Asset | Description | s/n |
|---|---|---|---|
| | | (1) AUDIO OSCILLATOR/GENERATOR | |
| | i00010 | HP 204D | 1105A04683 |
| | i00017 | HP 8903A | 2216A01753 |
| x | i00012 | HP 3312A | 1432A11250 |
| | | (2) COAXIAL ATTENUATOR | |
| | i00122 | Narda 766-10 | 7802 |
| | i00123 | Narda 766-10 | 7802A |
| x | i00069 | Bird 8329 (30 dB) | 1006 |
| x | i00113 | Sierra 661A-3D | 1059 |
| | | (3) FILTERS; NOTCH, HP, LP, BP | |
| x | i00126 | Eagle TNF-1 | 100-250 |
| x | i00125 | Eagle TNF-1 | 50-60 |
| x | i00124 | Eagle TNF-1 | 250-850 |
| | | (4) SPECTRUM ANALYZER | |
| x | i00048 | HP 8566B | 2511A01467 |
| | i00029 | HP 8563E | 3213A00104 |
| | | (5) SCOPE | |
| | i00058 | HP 1741A | 2251A09356 |
| | i00030 | HP 54502A | 2927A00209 |
| | i00071 | Tektronix 935 | 1935-B011343 |

PAGE NO. 10 of 36.

NAME OF TEST: Unwanted Emissions (Transmitter Conducted)
g98a0023: 1998-Oct-14 Wed 06:14:00
STATE: 1:Low Power

| FREQUENCY TUNED, MHz | FREQUENCY EMISSION, MHz | LEVEL, dBm | LEVEL, dBc | MARGIN, dB |
|---|---|---|---|---|
| 415.050000 | 829.829000 | -43.5 | -76.5 | -30.5 |
| 415.050000 | 1245.539000 | -42.8 | -75.8 | -29.8 |
| 415.050000 | 1660.056000 | -42.7 | -75.7 | -29.7 |
| 415.050000 | 2074.848000 | -42.1 | -75.1 | -29.1 |
| 415.050000 | 2490.589000 | -41.1 | -74.1 | -28.1 |
| 415.050000 | 2905.825000 | -44.4 | -77.4 | -31.4 |
| 415.050000 | 3319.989000 | -44.6 | -77.6 | -31.6 |
| 415.050000 | 3735.242000 | -43.8 | -76.8 | -30.8 |
| 415.050000 | 4150.601000 | -44.6 | -77.6 | -31.6 |
| 415.050000 | 4565.381000 | -44.6 | -77.6 | -31.6 |
| 415.050000 | 4980.509000 | -43.4 | -76.4 | -30.4 |
| 415.050000 | 5395.496000 | -44.6 | -77.6 | -31.6 |
| 415.050000 | 5810.504000 | -38.4 | -71.4 | -25.4 |
| 415.050000 | 6225.996000 | -37.2 | -70.2 | -24.2 |

PAGE NO. 11 of 36.

NAME OF TEST: Unwanted Emissions (Transmitter Conducted)
g98a0022: 1998-Oct-14 Wed 08:12:00
STATE: 2:High Power

| FREQUENCY TUNED, MHz | FREQUENCY EMISSION, MHz | LEVEL, dBm | LEVEL, dBc | MARGIN, dB |
|---|---|---|---|---|
| 415.050000 | 829.954000 | -32.6 | -76.5 | -19.6 |
| 415.050000 | 1245.076000 | -32.5 | -76.4 | -19.5 |
| 415.050000 | 1660.103000 | -23.9 | -67.8 | -10.9 |
| 415.050000 | 2075.133000 | -30 | -73.9 | -17 |
| 415.050000 | 2490.141000 | -22.5 | -66.4 | -9.5 |
| 415.050000 | 2905.174000 | -30.4 | -74.3 | -17.4 |
| 415.050000 | 3320.208000 | -32.3 | -76.2 | -19.3 |
| 415.050000 | 3735.206000 | -30.6 | -74.5 | -17.6 |
| 415.050000 | 4150.138000 | -33.6 | -77.5 | -20.6 |
| 415.050000 | 4565.099000 | -33.7 | -77.6 | -20.7 |
| 415.050000 | 4980.492000 | -33.6 | -77.5 | -20.6 |
| 415.050000 | 5395.895000 | -32.8 | -76.7 | -19.8 |
| 415.050000 | 5810.682000 | -27.6 | -71.5 | -14.6 |
| 415.050000 | 6225.797000 | -28.4 | -72.3 | -15.4 |

PAGE NO. 12 of 36.

NAME OF TEST: Field Strength of Spurious Radiation

SPECIFICATION: 47 CFR 2.1053(a)

GUIDE: ANSI/TIA/EIA-603-1992, Paragraph 2.2.12

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. Excess power leads were coiled near the power supply.

   The cables were oriented in order to obtain the maximum response. At each emission frequency, the turntable was rotated and the search antennas were raised and lowered vertically.

4. The emission was observed with both a vertically polarized and a horizontally polarized search antenna and the worst case was used.

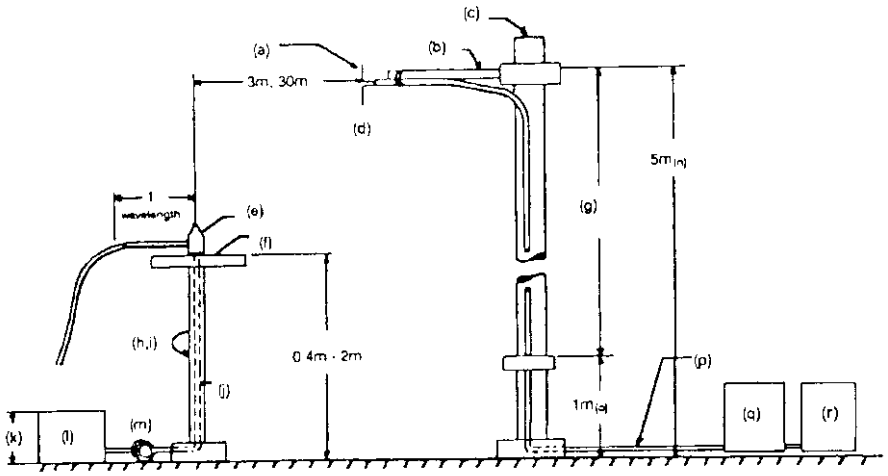
6. The field strength of each emission within 20 dB of the limit was recorded and corrected with the appropriate cable and transducer factors.

7. The worst case for all channels is shown.

8. Measurement results: ATTACHED FOR WORST CASE

PAGE NO. 13 of 36.

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', 1m normally
(p) Calibrated Cable at least 10m in length
(q) Amplifier (optional)
(r) Spectrum Analyzer

| | Asset | Description | s/n | Cycle (Per ANSI C63.4 1992, 10.1.4) | Last Cal |
|---|---|---|---|---|---|
| **TRANSDUCER** | | | | | |
| ___ | i00065 | EMCO 3109B 100Hz-50MHz | 2336 | 12 mo. | |
| ___ | i00033 | Singer 94593-1 10kHz-32MHz | 0219 | 12 mo. | |
| x | i00088 | EMCO 3109-B 25MHz-300MHz | 2336 | 12 mo. | Oct-98 |
| x | i00089 | Aprel 2001 200MHz-1GHz | 001500 | 12 mo. | Oct-98 |
| x | i00103 | EMCO 3115 1GHz-18GHz | 9208-3925 | 12 mo. | Oct-98 |
| ___ | i00085 | EMCO 3116 10GHz-40GHz | 2076 | 12 mo. | |
| **AMPLIFIER** | | | | | |
| ___ | i00028 | HP 8449A | 2749A00121 | 12 mo. | Mar-98 |
| **SPECTRUM ANALYZER** | | | | | |
| ___ | i00029 | HP 8563E | 3213A00104 | 12 mo. | |
| x | i00033 | HP 85462A | 3625A00357 | 12 mo. | Dec-97 |
| ___ | i00048 | HP 8566B | 2511AD1467 | 6 mo. | Mar-98 |

PAGE NO. 14 of 36.

NAME OF TEST: Field Strength of Spurious Radiation

ALL OTHER EMISSIONS = ≥ 20 dB BELOW LIMIT

| EMISSION, MHz/HARMONIC | SPURIOUS LEVEL, dBc | |
|---|---|---|
| | Low | High |
| 2nd to 10th | <-70 | <-65 |

SUPERVISED BY:

Morton Flom, P. Eng.

PAGE NO. 15 of 36.

NAME OF TEST: Emission Masks (Occupied Bandwidth)

SPECIFICATION: 47 CFR 2.1049(c)(1)

GUIDE: ANSI/TIA/EIA-603-1992, Paragraph 2.2.11

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.

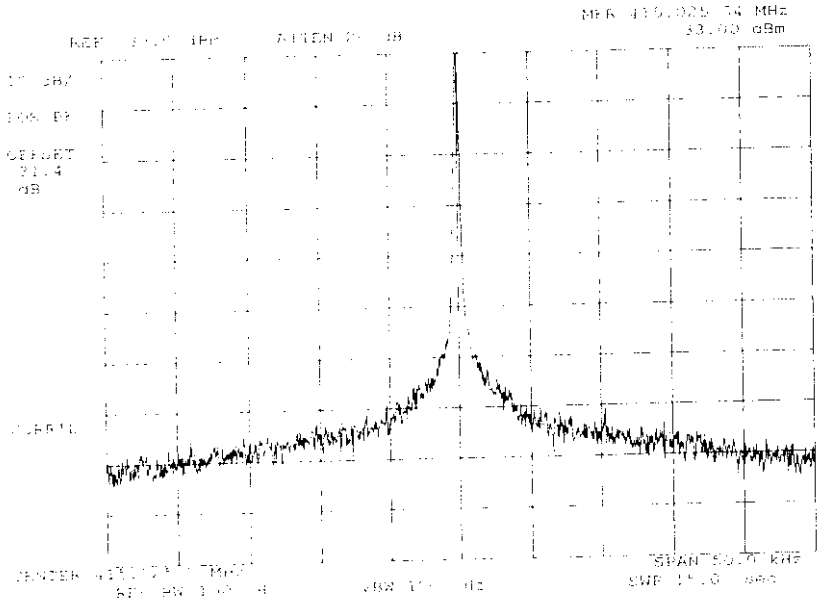
3. For EUTs supporting digital modulation, the digital modulation mode was operated to its maximum extent.

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

5. MEASUREMENT RESULTS: ATTACHED

PAGE NO. 16 of 36.

NAME OF TEST: Emission Masks (Occupied Bandwidth)
g98a0017: 1998-Oct-14 Wed 07:55:00
STATE: 1:Low Power



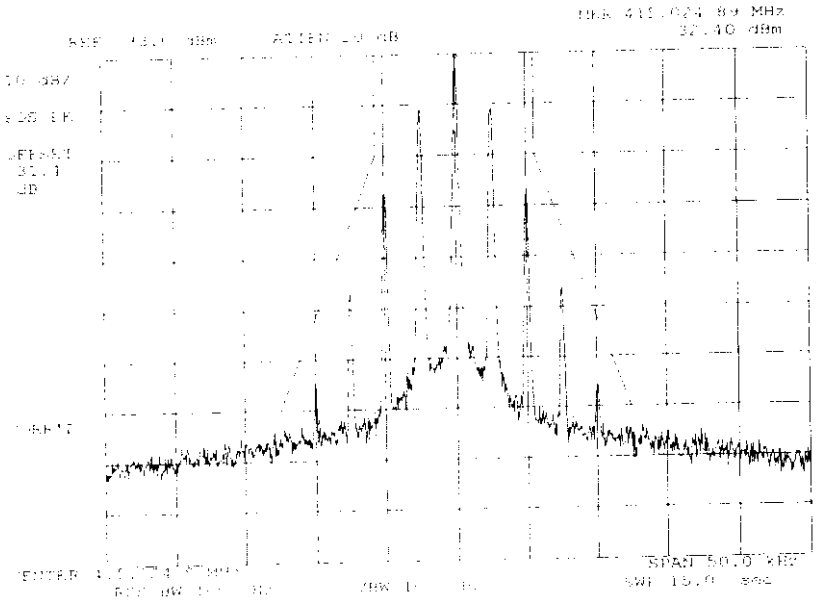
POWER: LOW
MODULATION: NONE

SUPERVISED BY:

Morton Flom, P. Eng.

PAGE NO. 17 of 36.

NAME OF TEST: Emission Masks (Occupied Bandwidth)
g98a0020: 1998-Oct-14 Wed 08:03:00
STATE: 1:Low Power

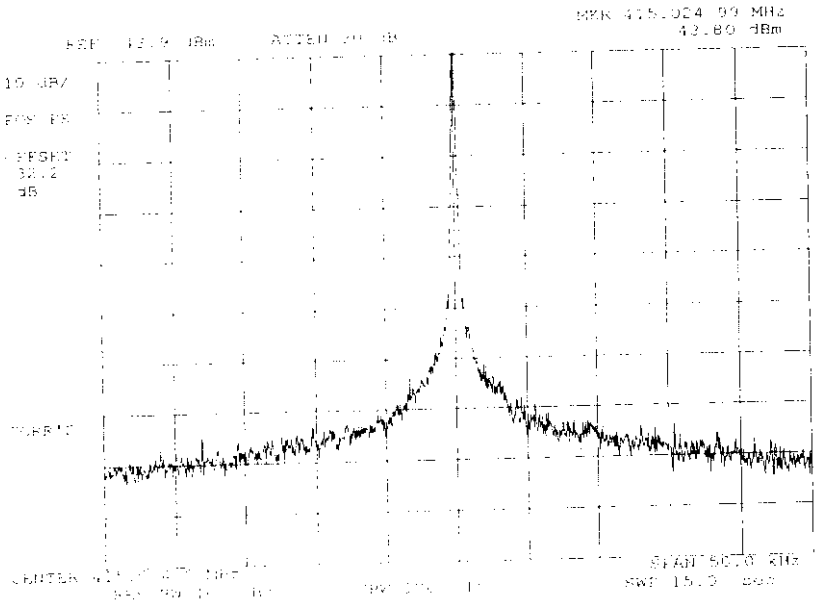



POWER: LOW
MODULATION: VOICE: 2500 Hz SINE WAVE
MASK: D, VHF/UHF 12.5kHz BW

SUPERVISED BY: Morton Flom, P. Eng.

PAGE NO. 18 of 36.

NAME OF TEST: Emission Masks (Occupied Bandwidth)
g98a0018: 1998-Oct-14 Wed 07:58:00
STATE: 2:High Power

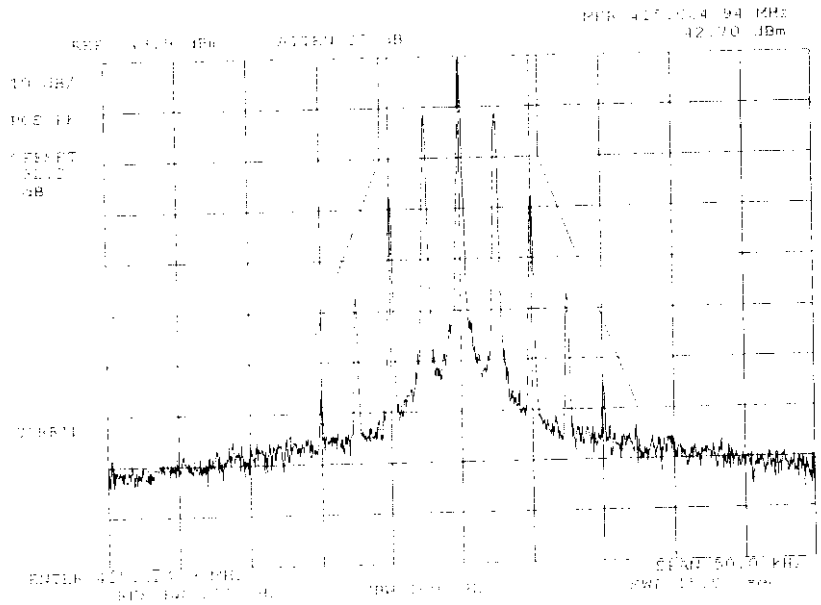



POWER: HIGH
MODULATION: NONE

SUPERVISED BY: Morton Flom, P. Eng.

PAGE NO. 19 of 36.

NAME OF TEST: Emission Masks (Occupied Bandwidth)
g98a0019: 1998-Oct-14 Wed 08:01:00
STATE: 2:High Power



POWER: HIGH
MODULATION: VOICE: 2500 Hz SINE WAVE
MASK: D, VHF/UHF 12.5kHz BW

SUPERVISED BY: Morton Flom, P. Eng.

PAGE NO. 20 of 36.

NAME OF TEST: Transient Frequency Behavior

SPECIFICATION: 47 CFR 90.214

GUIDE: ANSI/TIA/EIA-603-1992, Paragraph 2.2.19

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:

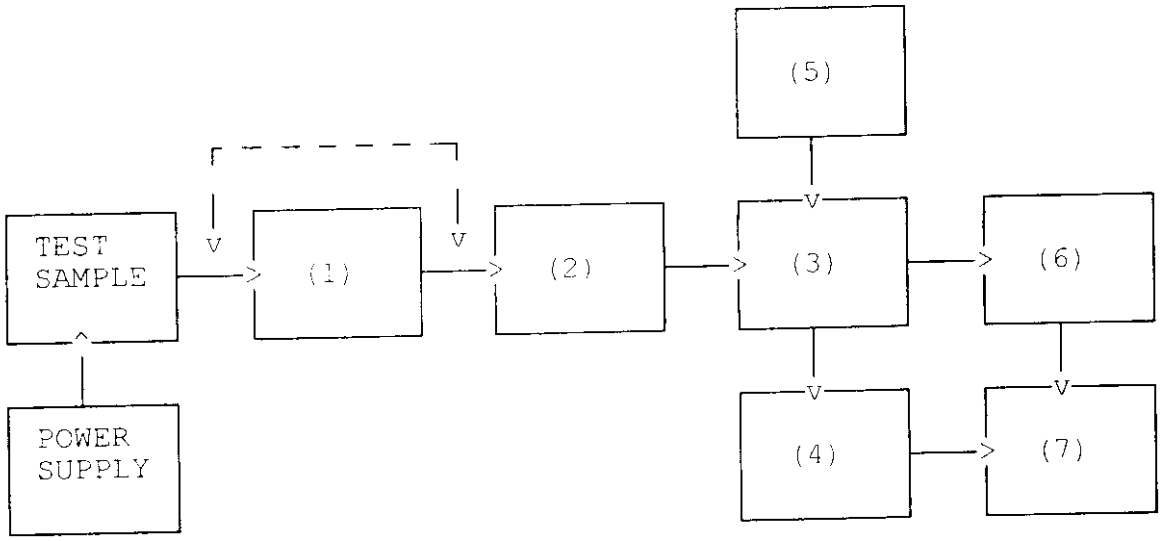
| | |
|---|---|
| step f, dBm | = -17.9 |
| step h, dBm | = -38.1 |
| step l, dBm | = 12.7 |

Morton Flom, P. Eng.

SUPERVISED BY:

PAGE NO. 21 of 36.

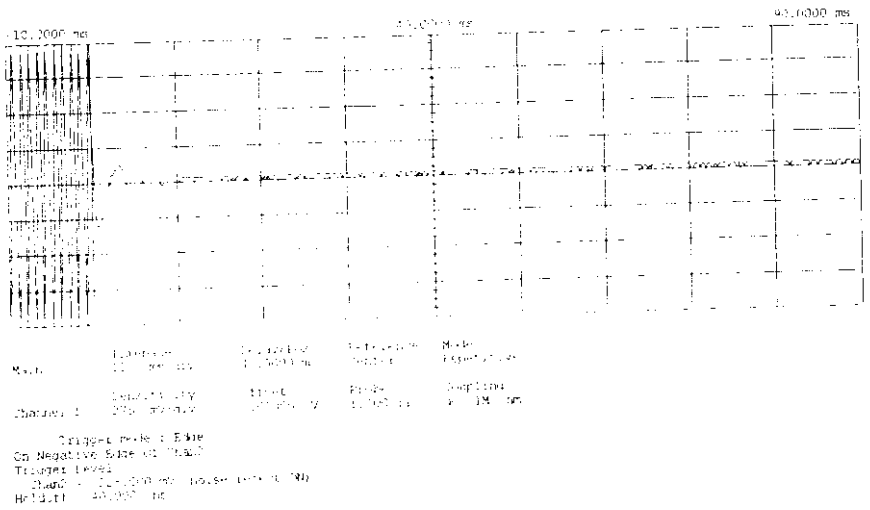
TRANSIENT FREQUENCY BEHAVIOR




| | Asset | Description | s/n |
|---|---|---|---|
| | (1) ATTENUATOR (Removed after 1st step) | | |
| x | i00112 | Philco 30 dB | 989 |
| | (2) ATTENUATOR | | |
| | i00112 | Philco 30 dB | 989 |
| | i00172 | Bird 30 dB | 989 |
| x | i00122 | Narda 10 dB | 7802 |
| | i00123 | Narda 10 dB | 7802A |
| | i00110 | Kay Variable | 145-387 |
| | (3) COMBINER | | |
| x | i00154 | 4 x 25 Ω COMBINER | 154 |
| | (4) CRYSTAL DETECTOR | | |
| x | i00159 | HP 8470B | 1822A10054 |
| | (5) RF SIGNAL GENERATOR | | |
| | i00018 | HP 8656A | 2228A03472 |
| | i00031 | HP 8656A | 2402A06180 |
| x | i00067 | HP 8920A | 3345U01242 |
| | (6) MODULATION ANALYZER | | |
| x | i00020 | HP 8901A | 2105A01087 |
| | (7) SCOPE | | |
| x | i00030 | HP 54502A | 2927A00209 |

PAGE NO. 22 of 36.

NAME OF TEST: Transient Frequency Behavior
g98a0025: 1998-Oct-14 Wed 08:45:00
STATE: 0:General



+12.5kHz

-12.5kHz

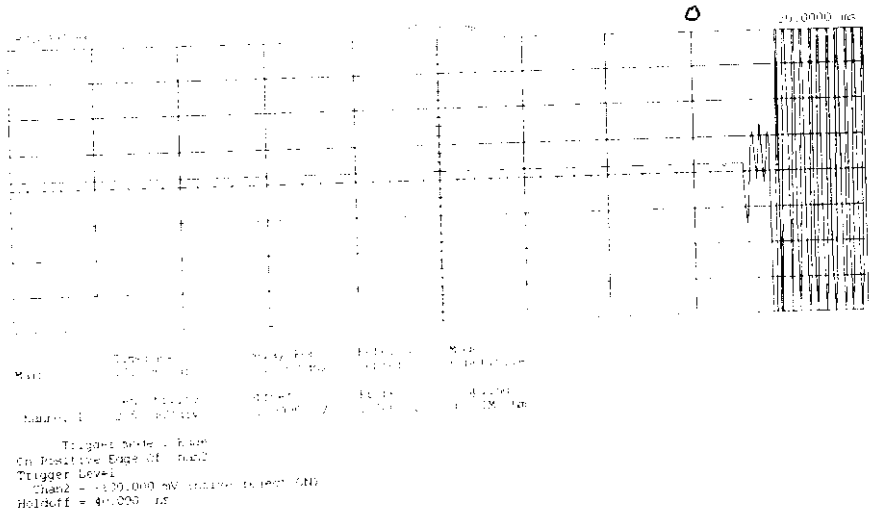
POWER: n/a
MODULATION: Ref Gen=12.5 kHz Deviation
DESCRIPTION: CARRIER ON TIME

SUPERVISED BY:

Morton Flom, P. Eng.

PAGE NO. 23 of 36.

NAME OF TEST: Transient Frequency Behavior
g98a0026: 1998-Oct-14 Wed 09:00:00
STATE: 0:General




POWER: n/a
MODULATION: Ref Gen=12.5 kHz Deviation
DESCRIPTION: CARRIER OFF TIME

SUPERVISED BY:

Morton Flom, P. Eng.

PAGE NO. 24 of 36.

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

SPECIFICATION: 47 CFR 2.1047(a)

GUIDE: ANSI/TIA/EIA-603-1992, Paragraph 2.2.15

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.

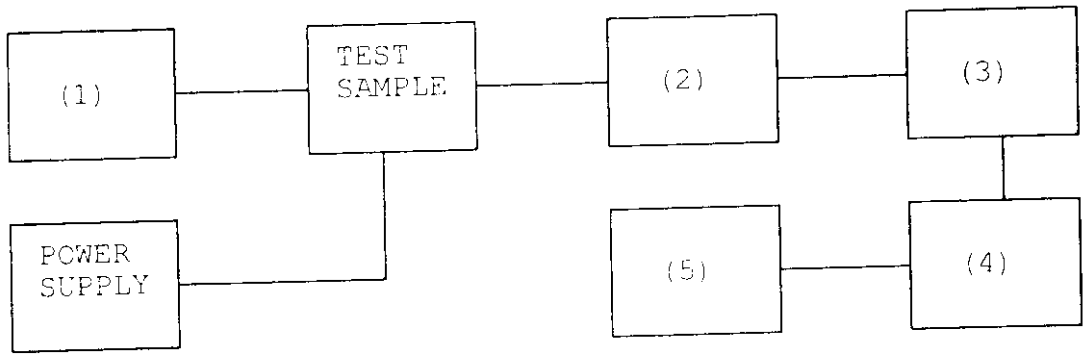
2. The audio output was connected at the output to the modulated stage.

3. MEASUREMENT RESULTS: ATTACHED

PAGE NO. 25 of 36.

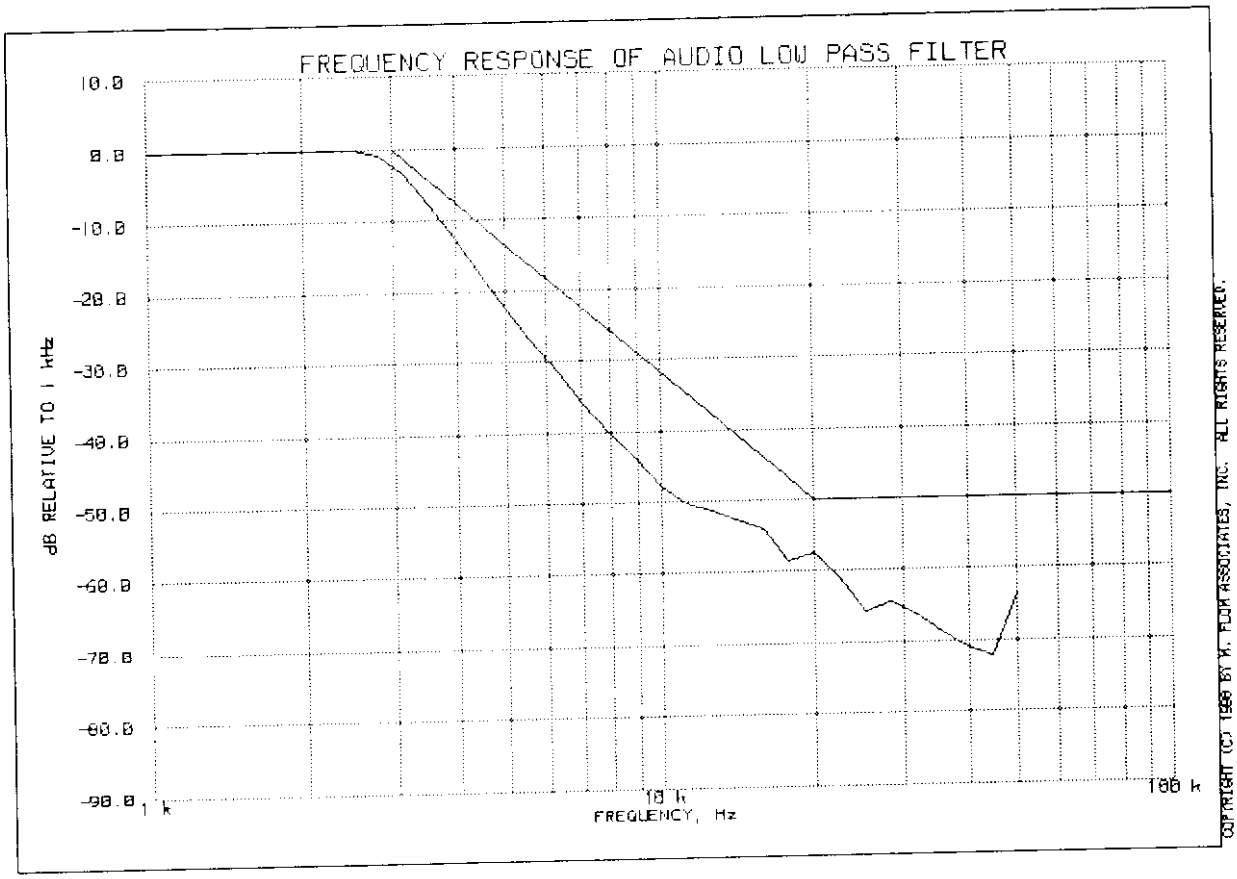
## TRANSMITTER TEST SET-UP

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




| | Asset | Description | s/n |
|---|---|---|---|
| (1) | | LINE IMPEDANCE STABILIZATION NETWORK | |
| ___ | i00010 | HP 204D | 1105A04683 |
| x | i00017 | HP 8903A | 2216A01753 |
| x | i00118 | HP 33120A | US36002064 |
| (2) | | COAXIAL ATTENUATOR | |
| ___ | i00122 | NARDA 766-10 | 7802 |
| ___ | i00123 | NARDA 766-10 | 7802A |
| x | i00113 | SIERRA 661A-3D | 1059 |
| ___ | i00069 | BIRD 8329 (30 dB) | 10066 |
| (3) | | MODULATION ANALYZER | |
| x | i00020 | HP 8901A | 2105A01087 |
| (4) | | AUDIO ANALYZER | |
| x | i00017 | HP 8903A | 2216A01753 |
| (5) | | SCOPE | |
| ___ | i00058 | HP 1741A | 2215A09356 |
| ___ | i00071 | Tektronix 935 | 1935-B011343 |

FREQUENCY RESPONSE OF AUDIO LOW PASS FILTER
KENWOOD, TKR-820(N)
13 OCT 1998, 12:09




PEAK AUDIO FREQUENCY, Hz: 2500

PAGE NO. 27 of 36.

NAME OF TEST: Audio Frequency Response

SPECIFICATION: 47 CFR 2.1047(a)

GUIDE: ANSI/TIA/EIA-603-1992, Paragraph 2.2.6

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.

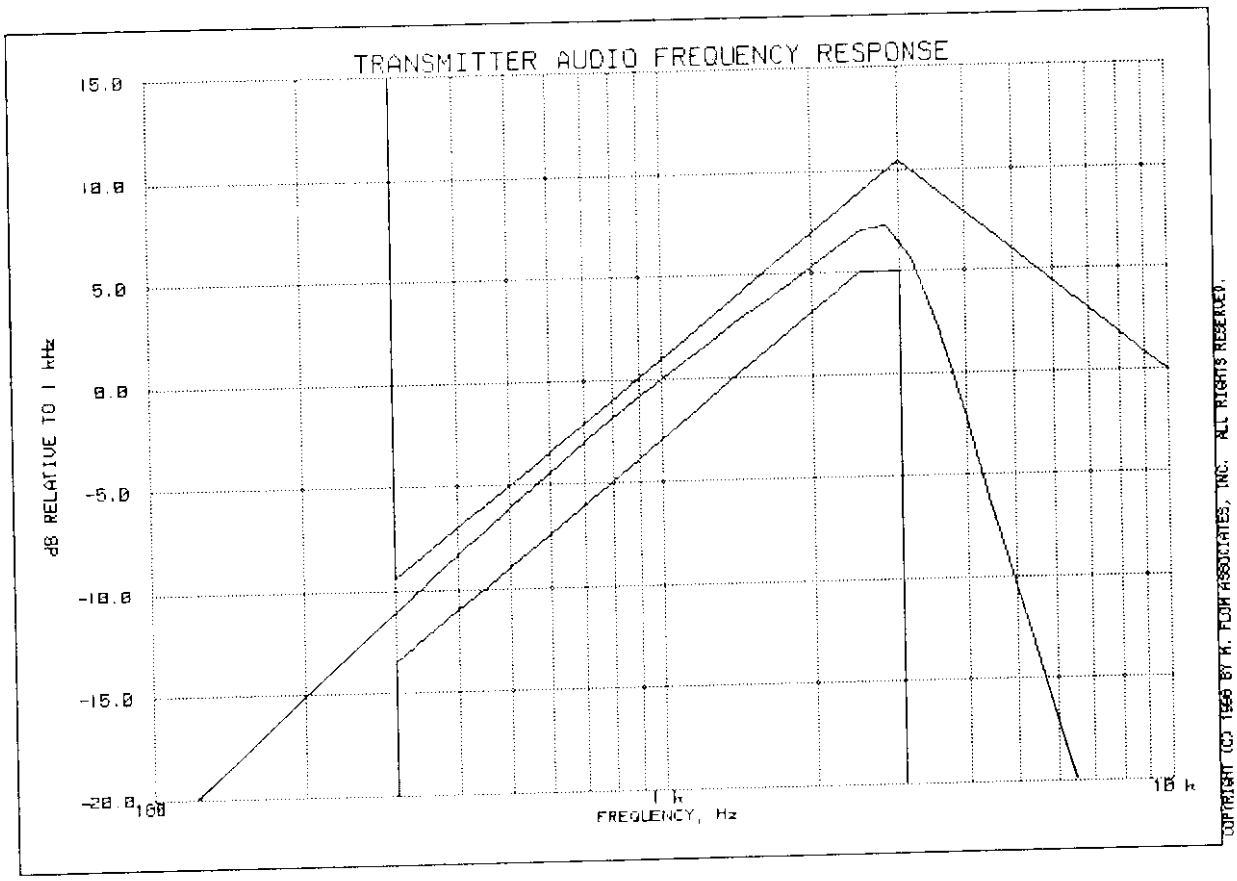
3. The audio signal input was adjusted to obtain 20% modulation at 1 kHz, and this point was taken as the 0 dB reference level.

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

TRANSMITTER AUDIO FREQUENCY RESPONSE
KENWOOD, TKR-820(N)
13 OCT 1998, 12:13




PEAK AUDIO FREQUENCY, Hz: 2820

TABLE VALUES:

| FREQUENCY, Hz | LEVEL, dB | FREQUENCY, Hz | LEVEL, dB | FREQUENCY, Hz | LEVEL, dB |
|---|---|---|---|---|---|
| 300 | -11.1 | 30000 | -22.3 | | |
| 20000 | -22.3 | 50000 | -22.3 | | |

PAGE NO. 29 of 36.

NAME OF TEST: Modulation Limiting

SPECIFICATION: 47 CFR 2.1047(b)

GUIDE: ANSI/TIA/EIA-603-1992, Paragraph 2.2.3

TEST EQUIPMENT: As per previous page

MEASUREMENT PROCEDURE

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

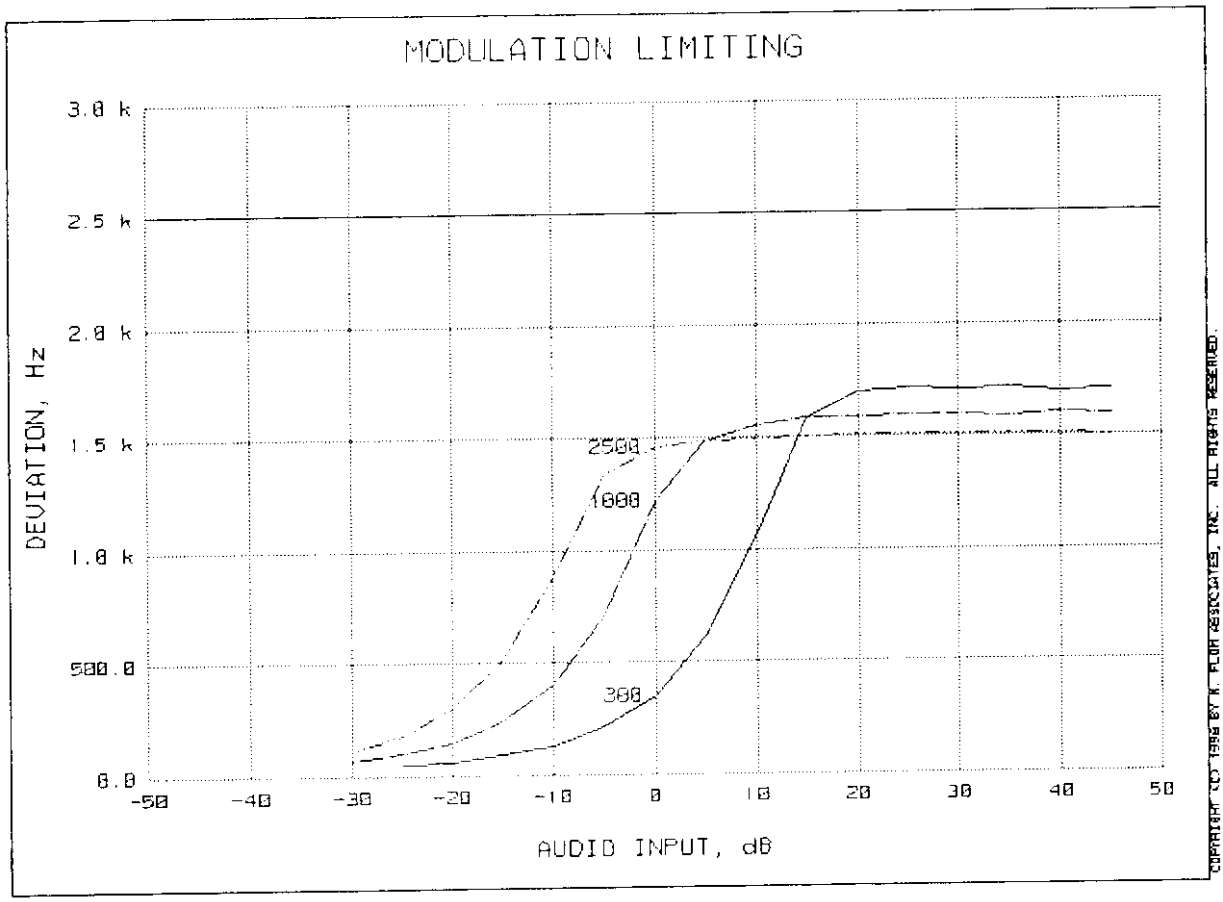
2. The modulation response was measured for each of three frequencies (one of which was the frequency of maximum response), and the input voltage was varied and was observed on an HP 8901A Modulation Analyzer.

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.

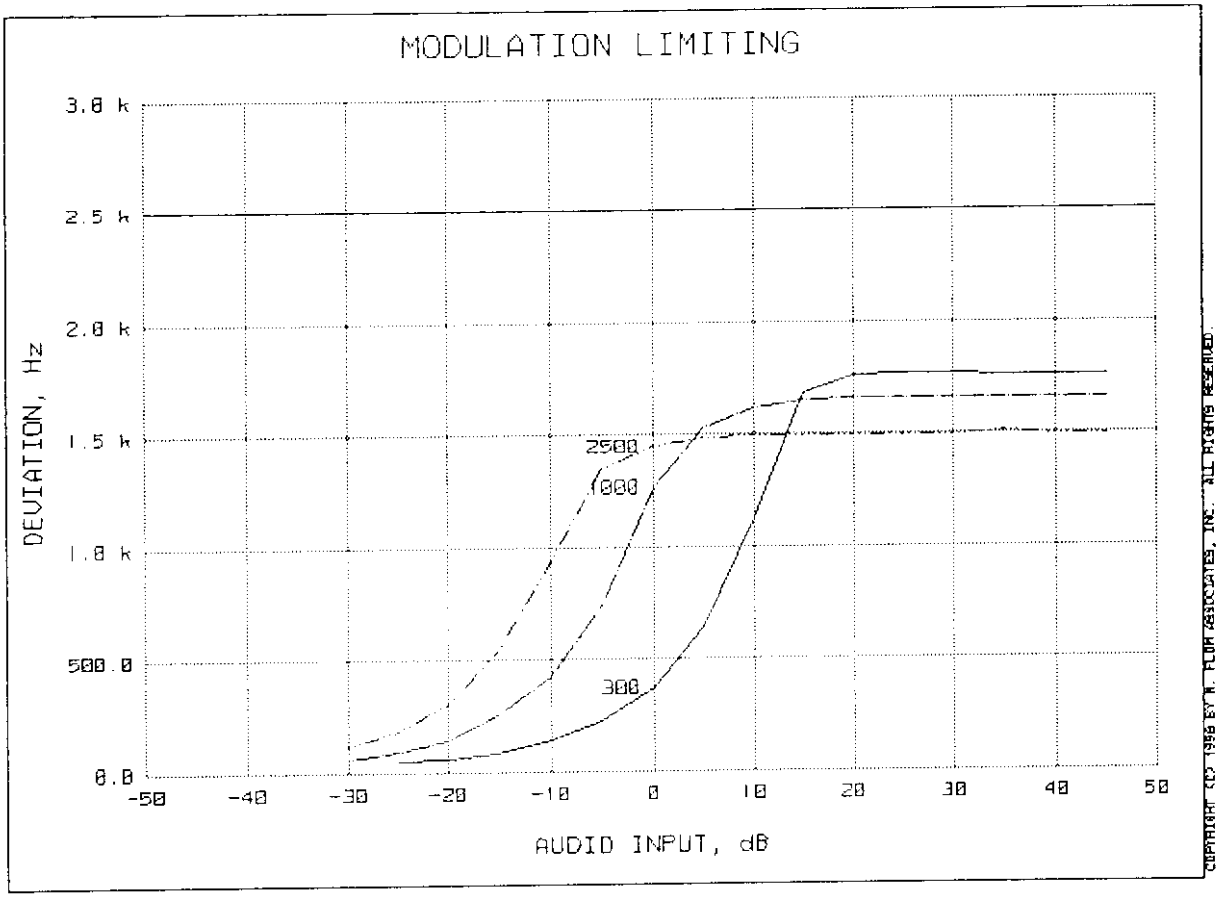
5. MEASUREMENT RESULTS: ATTACHED

MODULATION LIMITING
KENWOOD, TKR-820(N)
1998-OCT-13, 16:26




| | |
|---|---|
| REFERENCE DEVIATION, kHz | = 1.25 |
| REFERENCE MODULATION, Hz | = 1000 |
| PEAKS | = POSITIVE |
| AUDIO AMPLITUDE, mV | = 23.94 |

MODULATION LIMITING
KENWOOD, TKR-820(N)
1998-OCT-13, 16:26




| | |
|---|---|
| REFERENCE DEVIATION, kHz | = 1.25 |
| REFERENCE MODULATION, Hz | = 1000 |
| PEAKS | = NEGATIVE |
| AUDIO AMPLITUDE, mV | = 25.65 |

| | |
|---|---|
| PAGE NO. | 32 of 36. |
| NAME OF TEST: | Frequency Stability (Temperature Variation) |
| SPECIFICATION: | 47 CFR 2.1055(a)(1) |
| GUIDE: | ANSI/TIA/EIA-603-1992, Paragraph 2.2.2 |
| TEST CONDITIONS: | As Indicated |
| TEST EQUIPMENT: | As per previous 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.

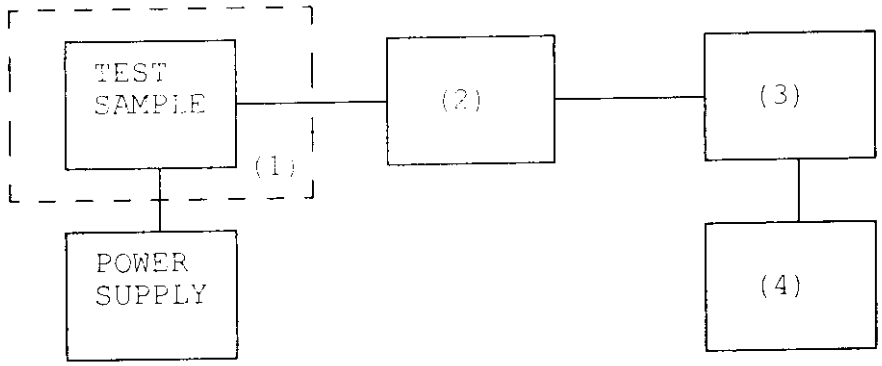
4. The temperature tests were performed for the worst case.

5. MEASUREMENT RESULTS: ATTACHED

PAGE NO. 33 of 36.

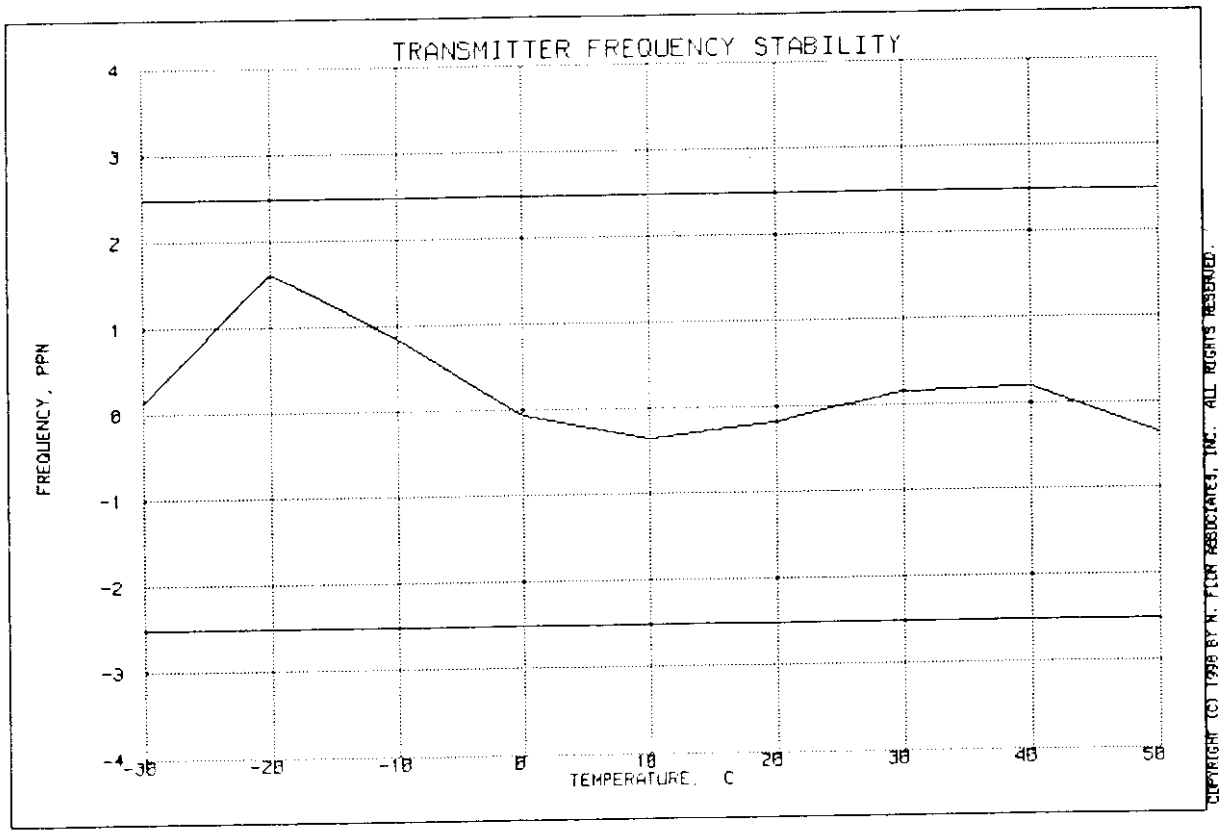
## TRANSMITTER TEST SET-UP

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




| | Asset | Description | s/n |
|---|---|---|---|
| (1) | | TEMPERATURE, HUMIDITY, VIBRATION | |
| X | i00027 | Tenny Temp. Chamber | 9083-765-234 |
| | i00 | Weber Humidity Chamber | |
| | i00 | L.A.B. RVH 16-100 | |
| (2) | | COAXIAL ATTENUATOR | |
| | i00122 | NARDA 766-10 | 7802 |
| | i00123 | NARDA 766-10 | 7802A |
| X | i00113 | SIERRA 661A-3D | 1059 |
| | i00069 | BIRD 8329 (30 dB) | 10066 |
| (3) | | R.F. POWER | |
| | i00014 | HP 435A POWER METER | 1733A05839 |
| X | i00039 | HP 436A POWER METER | 2709A26776 |
| X | i00020 | HP 8901A POWER MODE | 2105A01087 |
| (4) | | FREQUENCY COUNTER | |
| | i00042 | HP 5383A | 1628A00959 |
| X | i00019 | HP 5334B | 2704A00347 |
| X | i00020 | HP 8901A | 2105A01087 |

TRANSMITTER FREQUENCY STABILITY
KENWOOD, TKR-820(N)
11 SEP 1998, 15:34




FREQUENCY OF CARRIER, MHz = 415.025

LIMIT, ppm = 2.5

LIMIT, Hz = 1038

PAGE NO. 35 of 36.

NAME OF TEST: Frequency Stability (Voltage Variation)

SPECIFICATION: 47 CFR 2.1055(b)(1)

GUIDE: ANSI/TIA/EIA-603-1992, Paragraph 2.2.2

TEST EQUIPMENT: As per previous 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.

RESULTS: Frequency Stability (Voltage Variation)

STATE:

LIMIT, ppm = 2.5
LIMIT, Hz = 1038
BATTERY END POINT (Voltage) = 120

| % of STV | Voltage | Frequency, MHz | Change, Hz | Change, ppm |
|---|---|---|---|---|
| 80 | 96 | 415025080 | -15 | -0.04 |
| 85 | 102 | 415025080 | +20 | 0.05 |
| 100 | 120 | 415025000 | 0 | 0.00 |
| 115 | 138 | 415999990 | -10 | -0.02 |

SUPERVISED BY: Morton Flom, P. Eng.

PAGE NO. 36 of 36.

NAME OF TEST: Necessary Bandwidth and Emission Bandwidth

SPECIFICATION: 47 CFR 2.202(g)

MODULATION = 11K0F3E

NECESSARY BANDWIDTH CALCULATION:

| | | |
|---|---|---|
| MAXIMUM MODULATION (M), kHz | = | 3 |
| MAXIMUM DEVIATION (D), kHz | = | 2.5 |
| CONSTANT FACTOR (K) | = | 1 |
| NECESSARY BANDWIDTH ($B_n$), kHz | = | (2 x M) + (2 x D x K) |
| | = | 11.0 |

SUPERVISED BY: Morton Flom, P. Eng.

# TESTIMONIAL AND STATEMENT OF CERTIFICATION

THIS IS TO CERTIFY THAT:

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.