

**M. Flom Associates, Inc. - Global Compliance Center**

3356 North San Marcos Place, Suite 107, Chandler, Arizona 85225-7176

www.mflom.com general@mflom.com (480) 926-3100, FAX: 926-3598

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Date: October 14, 1999

Federal Communications Commission  
EQUIPMENT APPROVAL SERVICES  
P.O. Box 358315  
Pittsburgh, PA 15251-5315

Attention: Authorization &amp; Evaluation Division

Applicant: Icom Incorporated  
Equipment: IC-M1V  
FCC ID: AFJIC-M1V  
FCC Rules: 80

Gentlemen:

On behalf of the Applicant, enclosed please find Application Form 731, Engineering Test Report and all pertinent documentation, the whole for approval of the referenced equipment as shown.

Filing fees are attached.

We trust the same is in order. Should you need any further information, kindly contact the writer who is authorized to act as agent.

Sincerely yours,

A handwritten signature in black ink, appearing to read "William H. Graff", is written over a horizontal line.

William H. Graff, Director  
of Engineering

enclosure(s)  
ELECTRONIC FILING

cc: Applicant  
WHG/cvr

LIST OF EXHIBITS  
(FCC **CERTIFICATION** ~~(TRANSMITTERS)~~ - REVISED 9/28/98)

APPLICANT: Icom Incorporated

FCC ID: AFJIC-M1V

BY APPLICANT:

1. LETTER OF AUTHORIZATION
2. IDENTIFICATION DRAWINGS, 2.1033(c)(11)
  - \_\_\_ LABEL
  - \_\_\_ LOCATION OF LABEL
  - \_\_\_ COMPLIANCE STATEMENT
  - \_\_\_ LOCATION OF COMPLIANCE STATEMENT
3. PHOTOGRAPHS, 2.1033(c)(12)
4. DOCUMENTATION: 2.1033(c)
  - (3) USER MANUAL
  - (9) TUNE-UP/ALIGNMENT PROCEDURE
  - (10) SCHEMATIC DIAGRAM
  - (10) OPERATIONAL DESCRIPTION
5. PART 80 ATTESTATION

BY M.F.A. INC.

- A. TESTIMONIAL & STATEMENT OF CERTIFICATION
- B. STATEMENT OF QUALIFICATIONS



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Sub-part  
2.1033(c):

EQUIPMENT IDENTIFICATION

FCC ID: AFJIC-M1V

NAMEPLATE DRAWING

ATTACHED, EXHIBIT 1.

LOCATION

AS PER LABEL DRAWING(S)

DATE OF REPORT

October 14, 1999

SUPERVISED BY:

A handwritten signature in black ink, appearing to read 'William H. Graff', is positioned above the printed name.

William H. Graff, Director  
of Engineering

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.

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

a) TEST REPORT

b) Laboratory: M. Flom Associates, Inc.  
(FCC: 31040/SIT) 3356 N. San Marcos Place, Suite 107  
(Canada: IC 2044) Chandler, AZ 85225

c) Report Number: d99a0066

d) Client: Icom America, Inc.  
2380 - 116th Ave. N. E.  
P.O. C-90029  
Bellevue, Washington 98009-9029

e) Identification: IC-M1V  
FCC ID: AFJIC-M1V  
Description: VHF Marine Transceiver

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

g) Report Date: October 14, 1999  
EUT Received: October 6, 1999

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:



William H. Graff, Director  
of Engineering

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 39.

LIST OF GENERAL INFORMATION REQUIRED FOR CERTIFICATION

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

80

Sub-part 2.1033

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

Icom Incorporated  
1-6-19 Kamikurazukuri  
Hirano-ku  
Osaka, Japan 547

MANUFACTURER:

Applicant

(c)(2): FCC ID: AFJIC-M1V

MODEL NO: IC-M1V

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

PLEASE SEE ATTACHED EXHIBITS

(c)(4): TYPE OF EMISSION: 16K0G3E

(c)(5): FREQUENCY RANGE, MHz: 156 to 157.5

(c)(6): POWER RATING, Watts: 0.5 to 1 to 5  
x Switchable      Variable      N/A

(c)(7): MAXIMUM POWER RATING, Watts: 25 25

PAGE NO. 3 of 39.

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, Vdc = 7.4

(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 39.

M. Flom Associates, Inc. is accredited by the American Association for Laboratory Accreditation (A2LA) as shown in the scope below.



**THE AMERICAN  
ASSOCIATION  
FOR LABORATORY  
ACCREDITATION**

**ACCREDITED LABORATORY**

A2LA has accredited

**M. FLOM ASSOCIATES, INC.**  
**Chandler, AZ**

for technical competence in the field of

**Electrical (EMC) Testing**

The accreditation covers the specific tests and types of tests listed on the agreed scope of accreditation. This laboratory meets the requirements of ISO/IEC Guide 25-1990 "General Requirements for the Competence of Calibration and Testing Laboratories" (equivalent to relevant requirements of the ISO 9000 series of standards) and any additional program requirements in the identified field of testing.

Presented this 24<sup>th</sup> day of November, 1998.



*Peter Maye*  
President  
For the Accreditation Council  
Certificate Number 1008.01  
Valid to December 31, 2000

For tests or types of tests to which this accreditation applies, please refer to the laboratory's Electrical (EMC) Scope of Accreditation



**American Association for Laboratory Accreditation**

**SCOPE OF ACCREDITATION TO ISO/IEC GUIDE 25-1990 AND EN 45001**

**M. FLOM ASSOCIATES, INC.**  
Electronic Testing Laboratory  
3356 North San Marcos Place, Suite 107  
Chandler, AZ 85224-1571  
Morris Flom Phone: 602 926 3100

**ELECTRICAL (EMC)**

Valid to: December 31, 2000 Certificate Number: 1008.01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following electromagnetic compatibility tests:

| Tests                   | Standard(s)                                                                                                                                                                                                                               |
|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| RF Emissions            | FCC Part 15 (Subparts B and C) using ANSI C63.4-1992; CISPR 11; CISPR 13; CISPR 14; CISPR 22; EN 55011; EN 55013; EN 55014; EN 55022; EN 55081-1; EN 55081-2; FCC Part 18; ICES-003; AS/NZS 1044; AS/NZS 1053; AS/NZS 3548; AS/NZS 4251.1 |
| RF Immunity             | EN 50082-1; EN 50082-2; AS/NZS 4251.1                                                                                                                                                                                                     |
| Radiated Susceptibility | EN 61000-4-3; ENV 50140; ENV 50204; IEC 1000-4-3; IEC 801-3                                                                                                                                                                               |
| ESD                     | EN 61000-4-2; IEC 1000-4-2; IEC 801-2                                                                                                                                                                                                     |
| EFT                     | EN 61000-4-4; IEC 1000-4-4; IEC 801-4                                                                                                                                                                                                     |
| Surge                   | EN 61000-4-5; ENV 50142; IEC 1000-4-5; IEC 801-5                                                                                                                                                                                          |
| 47 CFR (FCC)            | 2, 21, 22, 23, 24, 74, 80, 87, 90, 95, 97                                                                                                                                                                                                 |

*Peter Maye*

5301 Buckeystown Pike, Suite 350 • Frederick, MD 21704-8307 • Phone: 301 644 3200 • Fax: 301 662 2974

"This laboratory is accredited by the American Association for Laboratory Accreditation (A2LA) and the results shown in this report have been determined in accordance with the laboratory's terms of accreditation unless stated otherwise in the report."

Should this report contain any data for tests for which we are not accredited, or which have been undertaken by a subcontractor that is not A2LA accredited, such data would not covered by this laboratory's A2LA accreditation.

PAGE NO.

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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
- x \_\_\_\_\_ 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
- \_\_\_\_\_ 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)
- \_\_\_\_\_ 97 - Amateur Radio Service
- \_\_\_\_\_ 101 - Fixed Microwave Services

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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. 7 of 39.  
NAME OF TEST: R.F. Power Output  
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  $\pm 3\%$ .

### MEASUREMENT RESULTS

| NOMINAL, MHz | CHANNEL         | R. F. POWER, WATTS |     |    |
|--------------|-----------------|--------------------|-----|----|
|              |                 | LO                 | MID | HI |
| 156.300      | 06              | 0.5                | 1   | 5  |
| 156.550      | 11              | 0.5                | 1   | 5  |
| 156.600      | 12              | 0.5                | 1   | 5  |
| 156.650      | 13* Mobile Only | 0.5                | 1   | 5  |
| 156.700      | 14              | 0.5                | 1   | 5  |
| 156.750      | 15              | 0.5                | 1   | 5  |
| 156.800      | 16              | 0.5                | 1   | 5  |
| 156.850      | 17* Mobile Only | 0.5                | 1   | 5  |
| 156.875      | 67* Mobile Only | 0.5                | 1   | 5  |

\*Automatic switching to low power.

\*\*High power with manual over-ride, see attached manual.

SUPERVISED BY:

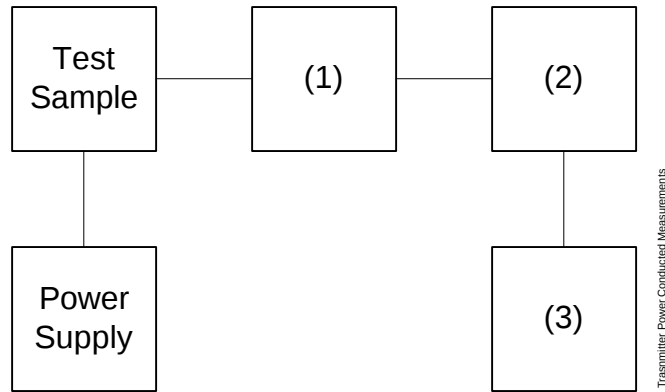
  
 William H. Graff, Director  
 of Engineering

PAGE NO.

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TRANSMITTER POWER CONDUCTED MEASUREMENTS

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



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

PAGE NO. 9 of 39.  
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 attached page

MEASUREMENT PROCEDURE

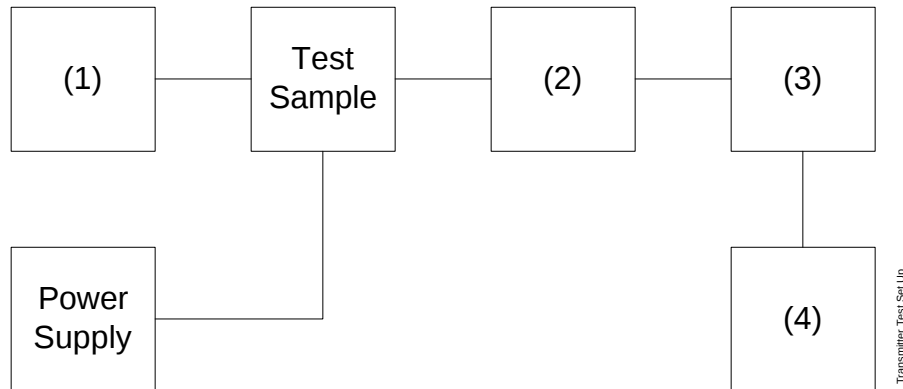
1. The EUT and test equipment were set up as shown on the following page.
2. The audio signal generator was connected to the audio input circuit/microphone of the EUT.
3. The audio signal input was adjusted to obtain 50% modulation at 1 kHz, and this point was taken as the 0 dB reference level.
4. With 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

PAGE NO.

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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<br>(as applicable) | s/n        |
|--------------------------------------|------------|
| (1) <u>AUDIO GENERATOR</u>           |            |
| i00010 HP 204D                       | 1105A04683 |
| i00017 HP 8903A                      | 2216A01753 |
| i00118 HP 33120A                     | US36002064 |
| (2) <u>COAXIAL ATTENUATOR</u>        |            |
| i00122 NARDA 766-10                  | 7802       |
| i00123 NARDA 766-10                  | 7802A      |
| i00113 SIERRA 661A-3D                | 1059       |
| i00069 BIRD 8329 (30 dB)             | 10066      |
| (3) <u>MODULATION ANALYZER</u>       |            |
| i00020 HP 8901A                      | 2105A01087 |
| (4) <u>AUDIO ANALYZER</u>            |            |
| i00017 HP 8903A                      | 2216A01753 |

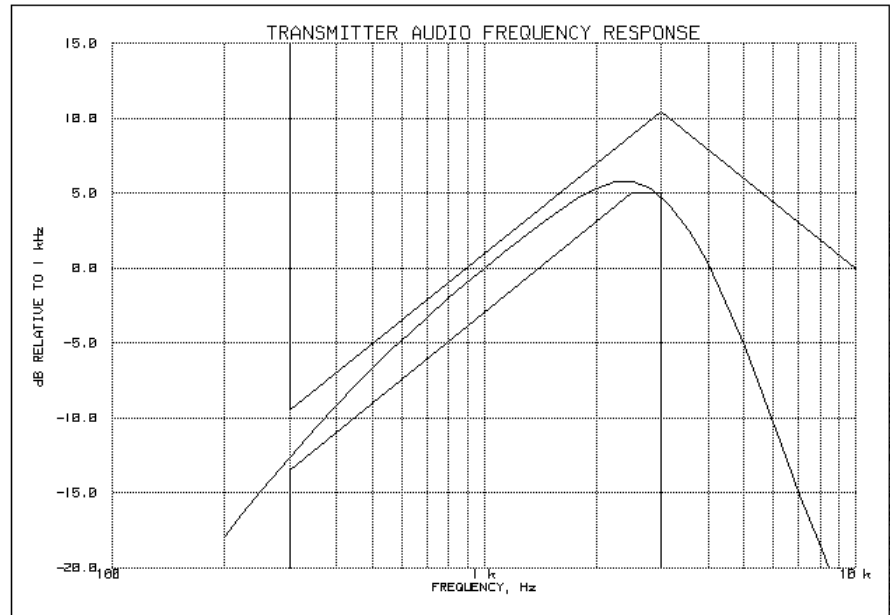
PAGE NO.

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NAME OF TEST: Audio Frequency Response

g99a0132: 1999-Oct-12 Tue 08:23:00

STATE: 0:General



Additional points:

| FREQUENCY, Hz | LEVEL, dB |
|---------------|-----------|
| 300           | -12.68    |
| 20000         | -29.58    |
| 30000         | -34.86    |
| 50000         | -38.28    |

SUPERVISED BY:

William H. Graff, Director  
of Engineering

PAGE NO. 12 of 39.  
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 previous page

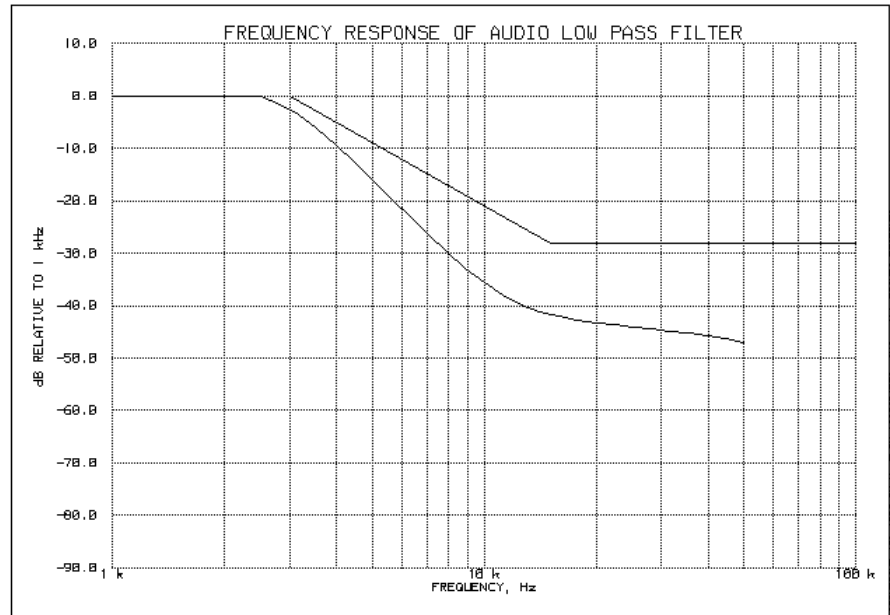
MEASUREMENT PROCEDURE

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.

13 of 39.

NAME OF TEST: Audio Low Pass Filter (Voice Input)  
g99a0133: 1999-Oct-12 Tue 08:31:00  
STATE: 0:General



SUPERVISED BY:

  
William H. Graff, Director  
of Engineering

PAGE NO. 14 of 39.  
NAME OF TEST: Modulation Limiting  
SPECIFICATION: 47 CFR 2.1047(b), 80.211, 80.213  
GUIDE: ANSI/TIA/EIA-603-1992, Paragraph 2.2.3  
TEST EQUIPMENT: As per previous page

MEASUREMENT PROCEDURE

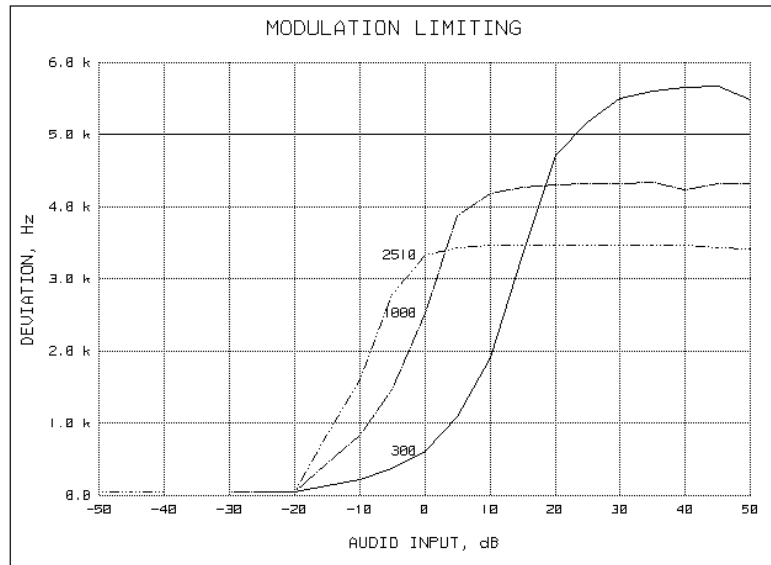
1. The signal generator was connected to the input of the EUT as for "Frequency Response of the Modulating Circuit."
2. The modulation response was measured for each of three frequencies (one of which was the frequency of maximum response), and the input voltage was varied and was observed on an HP 8901A Modulation Analyzer.
3. The input level was varied from 30% modulation ( $\pm 1.5$  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

PAGE NO.

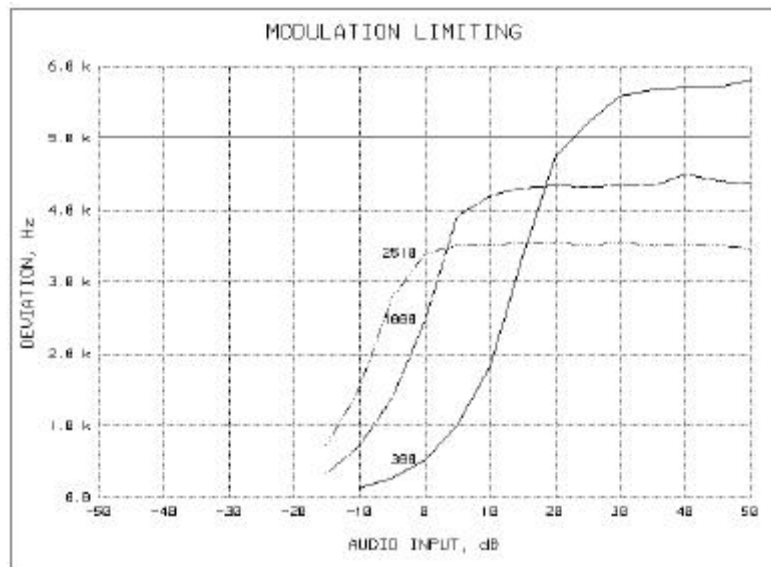
15 of 39.

NAME OF TEST: Modulation Limiting  
 g99a0134: 1999-Oct-12 Tue 08:34:00  
 STATE: 0:General

Positive  
 Peaks:



Negative  
 Peaks:



SUPERVISED BY:

William H. Graff, Director  
 of Engineering

PAGE NO. 16 of 39.

NAME OF TEST: Emission Masks (Occupied Bandwidth)

SPECIFICATION: 47 CFR 2.1049(c)(1)

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

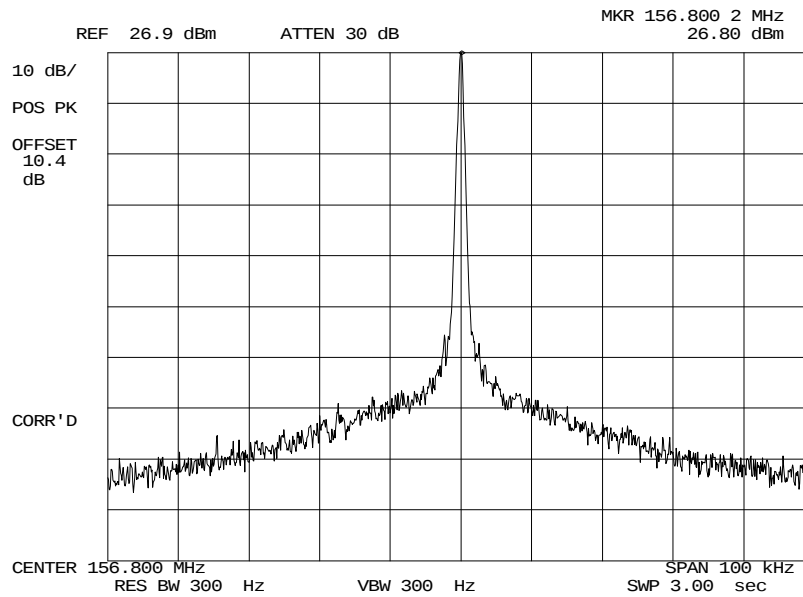
TEST EQUIPMENT: As per previous page

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  $\pm 2.5$  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. 17 of 39.

NAME OF TEST: Emission Masks (Occupied Bandwidth)  
g99a0152: 1999-Oct-12 Tue 14:24:00  
STATE: 1:Low Power



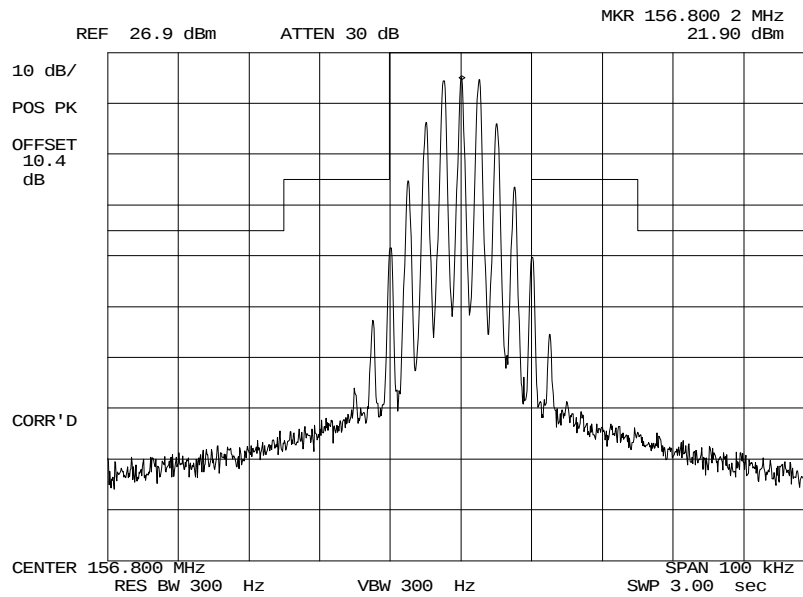
POWER: LOW  
MODULATION: NONE

SUPERVISED BY:

  
William H. Graff, Director  
of Engineering

PAGE NO. 18 of 39.

NAME OF TEST: Emission Masks (Occupied Bandwidth)  
g99a0154: 1999-Oct-12 Tue 14:28:00  
STATE: 1:Low Power



POWER:  
MODULATION:

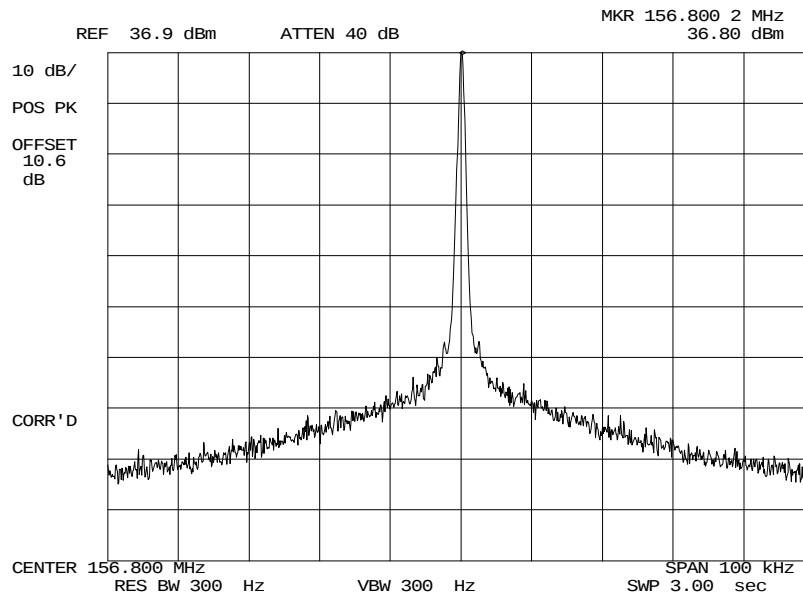
LOW  
VOICE: 2500 Hz SINE WAVE  
MASK: B, VHF/UHF 25kHz,  
w/LPF

SUPERVISED BY:

  
William H. Graff, Director  
of Engineering

PAGE NO. 19 of 39.

NAME OF TEST: Emission Masks (Occupied Bandwidth)  
g99a0151: 1999-Oct-12 Tue 14:22:00  
STATE: 2:High Power



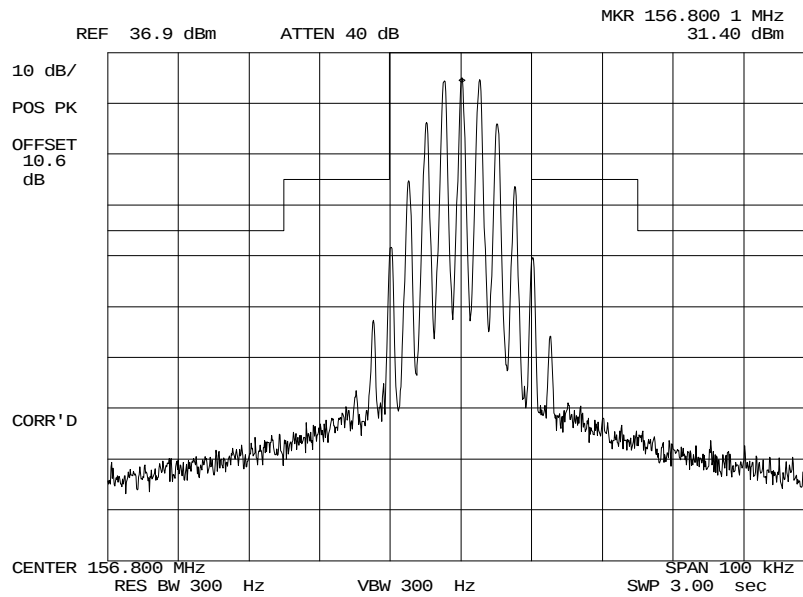
POWER: HIGH  
MODULATION: NONE

SUPERVISED BY:

  
William H. Graff, Director  
of Engineering

PAGE NO. 20 of 39.

NAME OF TEST: Emission Masks (Occupied Bandwidth)  
g99a0153: 1999-Oct-12 Tue 14:27:00  
STATE: 2:High Power



POWER:  
MODULATION:

HIGH  
VOICE: 2500 Hz SINE WAVE  
MASK: B, VHF/UHF 25kHz,  
w/LPF

SUPERVISED BY:

  
William H. Graff, Director  
of Engineering

PAGE NO. 21 of 39.

NAME OF TEST: Spurious Emissions at Antenna Terminals

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 = 156.8

SPECTRUM SEARCHED, GHz = 0 to 10 x F<sub>c</sub>

MAXIMUM RESPONSE, Hz = 2510

ALL OTHER EMISSIONS = 20 dB BELOW LIMIT

LIMIT(S), dBc

- (43+10xLOG P) = -33 (0.5 Watts)
- (43+10xLOG P) = -43 (1 Watts)
- (43+10xLOG P) = -50 (5 Watts)

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NAME OF TEST: Spurious Emissions at Antenna Terminals  
 g99a0157: 1999-Oct-12 Tue 15:09:00  
 STATE: 2:Low Power

| FREQUENCY TUNED,<br>MHz | FREQUENCY<br>EMISSION, MHz | LEVEL, dBm | LEVEL, dBc | MARGIN, dB |
|-------------------------|----------------------------|------------|------------|------------|
| 156.800000              | 313.780000                 | -40.4      | -67.3      | -27.4      |
| 156.800000              | 470.387000                 | -50.3      | -77.2      | -37.3      |
| 156.800000              | 627.193000                 | -53.8      | -80.7      | -40.8      |
| 156.800000              | 783.924000                 | -54.8      | -81.7      | -41.8      |
| 156.800000              | 940.671000                 | -53.4      | -80.3      | -40.4      |
| 156.800000              | 1097.239000                | -53.1      | -80        | -40.1      |
| 156.800000              | 1254.388000                | -53.2      | -80.1      | -40.2      |
| 156.800000              | 1410.948000                | -54.3      | -81.2      | -41.3      |
| 156.800000              | 1568.192000                | -51.5      | -78.4      | -38.5      |
| 156.800000              | 1724.588000                | -54        | -80.9      | -41        |
| 156.800000              | 1881.607000                | -53.3      | -80.2      | -40.3      |
| 156.800000              | 2038.304000                | -53.3      | -80.2      | -40.3      |
| 156.800000              | 2195.173000                | -52.8      | -79.7      | -39.8      |
| 156.800000              | 2352.044000                | -52.2      | -79.1      | -39.2      |

NAME OF TEST: Spurious Emissions at Antenna Terminals  
 g99a0155: 1999-Oct-12 Tue 14:35:00  
 STATE: 2:High Power

| FREQUENCY TUNED,<br>MHz | FREQUENCY<br>EMISSION, MHz | LEVEL, dBm | LEVEL, dBc | MARGIN, dB |
|-------------------------|----------------------------|------------|------------|------------|
| 156.800000              | 313.598000                 | -39.6      | -76.5      | -26.6      |
| 156.800000              | 470.413000                 | -38.8      | -75.7      | -25.8      |
| 156.800000              | 626.753000                 | -44.5      | -81.4      | -31.5      |
| 156.800000              | 784.015000                 | -43.9      | -80.8      | -30.9      |
| 156.800000              | 940.646000                 | -44.1      | -81        | -31.1      |
| 156.800000              | 1097.272000                | -43.9      | -80.8      | -30.9      |
| 156.800000              | 1254.434000                | -43.1      | -80        | -30.1      |
| 156.800000              | 1410.748000                | -43.8      | -80.7      | -30.8      |
| 156.800000              | 1567.573000                | -44.5      | -81.4      | -31.5      |
| 156.800000              | 1724.757000                | -43.4      | -80.3      | -30.4      |
| 156.800000              | 1881.378000                | -42.3      | -79.2      | -29.3      |
| 156.800000              | 2038.448000                | -42.8      | -79.7      | -29.8      |
| 156.800000              | 2195.357000                | -43.3      | -80.2      | -30.3      |
| 156.800000              | 2352.006000                | -41.2      | -78.1      | -28.2      |

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

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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 (CONT.)

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

$$\text{SPURIOUS LEVEL, dB} = 10 \text{ LOG } \left( \frac{\text{Calculated Spurious Power}}{\text{TX Power (Wattmeter)}} \right) \quad \text{[From Para. 7].}$$

9. The worst case for all channels is shown.

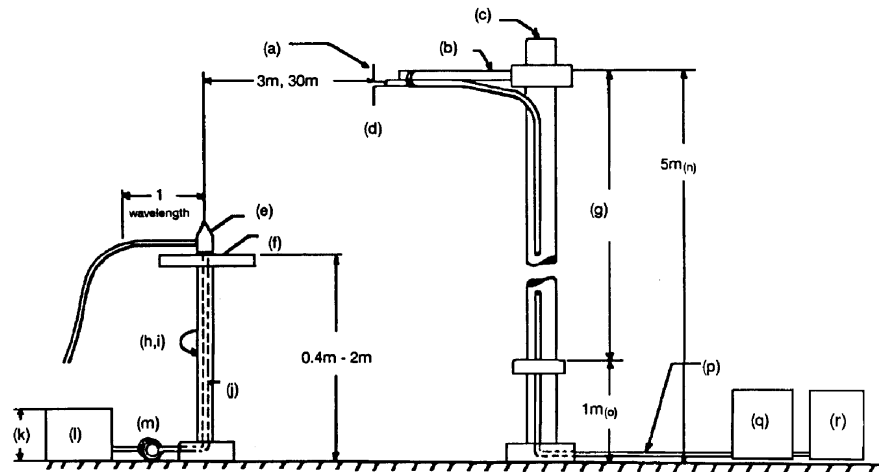
10. Measurement summary:

|                           |   |                          |
|---------------------------|---|--------------------------|
| FREQUENCY OF CARRIER, MHz | = | 156.8                    |
| SPECTRUM SEARCHED, GHz    | = | 0 to 10 x F <sub>c</sub> |
| ALL OTHER EMISSIONS       | = | 20 dB BELOW LIMIT        |
| LIMIT, dBc                | = | -50                      |

11. Measurement results: ATTACHED

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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 | Last Cal |
|-----------------|-------------|-----|-------|----------|
| (as applicable) |             |     |       |          |

Per ANSI C63.4-1992, 10.1.4

TRANSDUCER

|        |                            |           |        |        |
|--------|----------------------------|-----------|--------|--------|
| i00103 | EMCO 3115 1GHz-18GHz       | 9208-3925 | 12 mo. | Sep-99 |
| i00033 | Singer 94593-1 10kHz-32MHz | 0219      | 12 mo. |        |
| i00088 | EMCO 3109-B 25MHz-300MHz   | 2336      | 12 mo. | Oct-99 |
| i00089 | Apral 2001 200MHz-1GHz     | 001500    | 12 mo. | Oct-99 |
| i00103 | EMCO 3115 1GHz-18GHz       | 9208-3925 | 12 mo. | Oct-99 |
| i00085 | EMCO 3116 10GHz-40GHz      | 2076      | 12 mo. |        |

AMPLIFIER

|        |          |            |        |        |
|--------|----------|------------|--------|--------|
| i00028 | HP 8449A | 2749A00121 | 12 mo. | Mar-99 |
|--------|----------|------------|--------|--------|

SPECTRUM ANALYZER

|        |           |            |        |        |
|--------|-----------|------------|--------|--------|
| i00029 | HP 8563E  | 3213A00104 | 12 mo. | Aug-99 |
| i00033 | HP 85462A | 3625A00357 | 12 mo. | May-99 |
| i00048 | HP 8566B  | 2511AD1467 | 6 mo.  | May-99 |

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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            | <-65                | <-75 |

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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

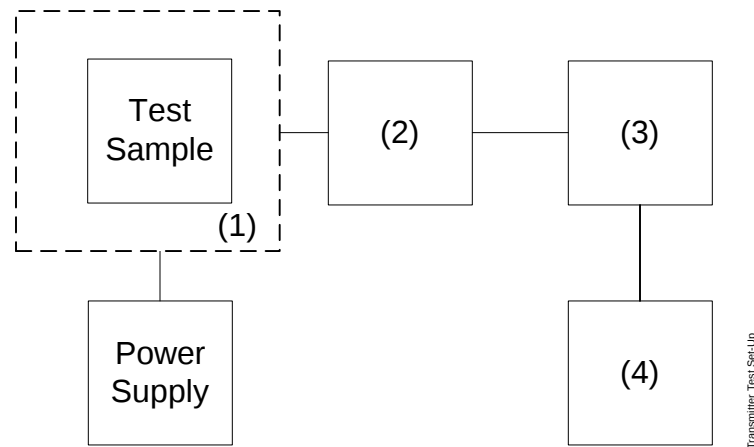
1. The EUT and test equipment were set up as shown on the following page.
2. With all power removed, the temperature was decreased to -30°C and permitted to stabilize for three hours. Power was applied and the maximum change in frequency was noted within one minute.
3. With power OFF, the temperature 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

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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

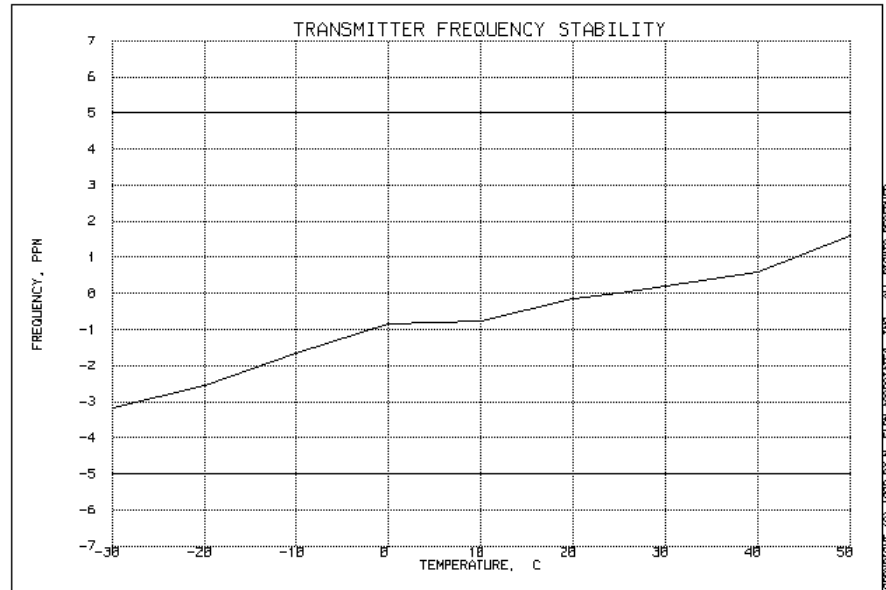


| Asset  | Description<br>(as applicable)          | s/n          |
|--------|-----------------------------------------|--------------|
| (1)    | <u>TEMPERATURE, HUMIDITY, VIBRATION</u> |              |
| i00027 | Tenny Temp. Chamber                     | 9083-765-234 |
| i00    | Weber Humidity Chamber                  |              |
| i00    | L.A.B. RVH 18-100                       |              |
| (2)    | <u>COAXIAL ATTENUATOR</u>               |              |
| i00122 | NARDA 766-10                            | 7802         |
| i00123 | NARDA 766-10                            | 7802A        |
| i00113 | SIERRA 661A-3D                          | 1059         |
| i00069 | BIRD 8329 (30 dB)                       | 10066        |
| (3)    | <u>R.F. POWER</u>                       |              |
| i00014 | HP 435A POWER METER                     | 1733A05839   |
| i00039 | HP 436A POWER METER                     | 2709A26776   |
| i00020 | HP 8901A POWER MODE                     | 2105A01087   |
| (4)    | <u>FREQUENCY COUNTER</u>                |              |
| i00042 | HP 5383A                                | 1628A00959   |
| i00019 | HP 5334B                                | 2704A00347   |
| i00020 | HP 8901A                                | 2105A01087   |

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NAME OF TEST: Frequency Stability (Temperature Variation)  
g99a0137: 1999-Oct-12 Tue 16:45:00  
STATE: 0:General



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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)  
 g99a0138: 1999-Oct-12 Tue 08:49:21  
 STATE: 0:General

LIMIT, ppm = 5  
 LIMIT, Hz = 784  
 BATTERY END POINT (Voltage) = 5.9

| % of STV | Voltage | Frequency, MHz | Change, Hz | Change, ppm |
|----------|---------|----------------|------------|-------------|
| 85       | 6.29    | 156.800000     | 0          | 0.00        |
| 100      | 7.4     | 156.800000     | 0          | 0.00        |
| 115      | 8.51    | 156.800050     | 50         | 0.32        |
| 80       | 5.9     | 156.800010     | 10         | 0.06        |

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PAGE NO. 31 of 39.  
NAME OF TEST: User Controls  
SPECIFICATION: 47 CFR 80.203(b)  
GUIDE: ANSI/TIA/EIA-603-1992, Paragraph

STATEMENT

The external controls of the maritime station transmitter capable of operation in the 156-162 MHz band only provides for selection of maritime channels for which the maritime station is authorized. This transmitter is not capable of being programmed by station operators using external controls to transmit on channels other than those programmed by the manufacturer, service or maintenance personal.

The EUT fully complies with the requirements of 47 CFR 80.203 (b).

PAGE NO. 32 of 39.  
NAME OF TEST: Automatic Deactivation (Time-Out Timer)  
SPECIFICATION: 47 CFR 80.203(c)  
TEST EQUIPMENT: As per previous page

(c) All VHF ship station transmitters that are either manufactured in or imported into the United States, on or after August 1, 1993, or are installed on or after August 1, 1994, must be equipped with an automatic timing device that deactivates the transmitter and reverts the transmitter to the receive mode after an uninterrupted transmission period of five minutes, plus or minus 10 per cent. Additionally, such transmitters must have a device that indicates when the automatic timer has deactivated the transmitter. VHF ship station transmitters initially installed before August 1, 1994, are authorized for use indefinitely at the same maritime station. VHF handheld, portable transmitters are not required to comply with the requirements in paragraph © of this section except when used as described in 80.141.

THE TRANSMITTER MEETS THESE REQUIREMENTS

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PAGE NO. 33 of 39.  
NAME OF TEST: Power Output Over Time  
SPECIFICATION: 47 CFR 80.959(c)(1)(2)&(3)  
TEST EQUIPMENT: As per previous 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  $\pm 3\%$ .
3. The transmitter was operated continuously.
4. Measurements summary:

| TIME, Min. | SUPPLY VOLTAGE, vdc | R.F. Power Output, Watts |
|------------|---------------------|--------------------------|
| 0          | 13.8                | 5.1                      |
| 10         | 13.8                | 4.7                      |

Measurement Results: Attached

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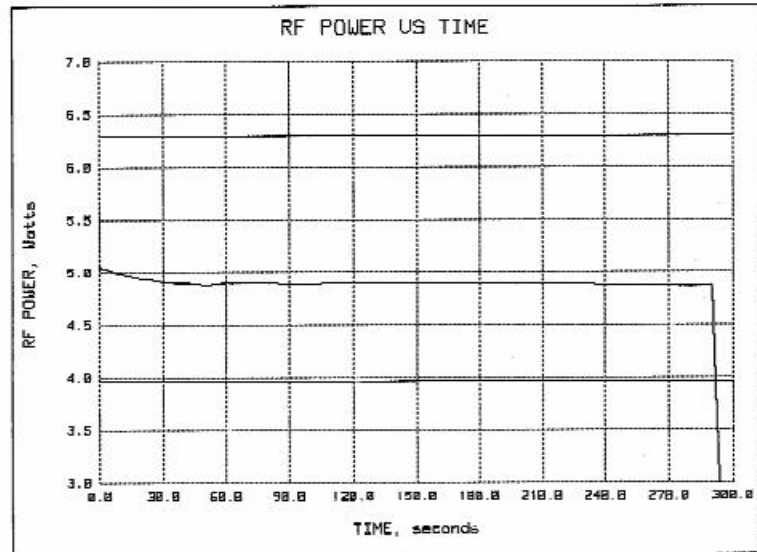
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NAME OF TEST:

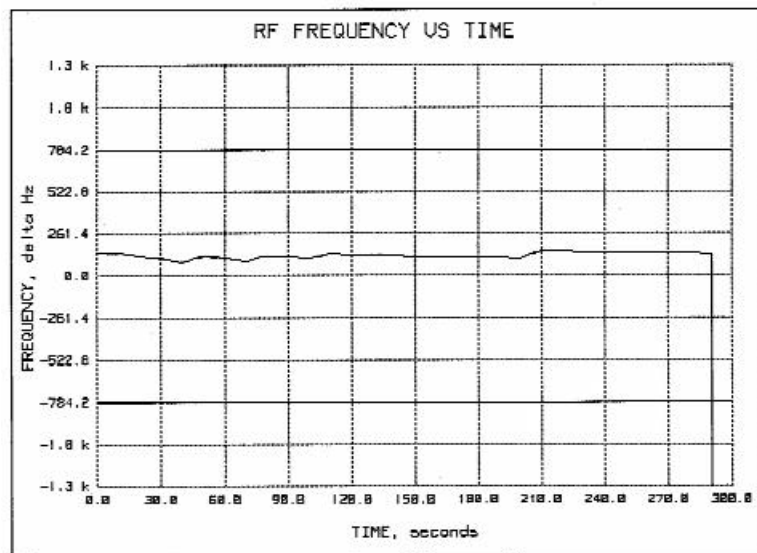
Power Output Over Time

RF POWER VS TIME  
 ICOM, IC-M1V  
 1999-OCT-12, 15:51



|                    |        |
|--------------------|--------|
| NOMINAL, Watts     | = 5    |
| UPPER LIMIT, dB    | = 1.0  |
| UPPER LIMIT, Watts | = 6.29 |
| LOWER LIMIT, dB    | = 1.0  |
| LOWER LIMIT, Watts | = 3.97 |

RF FREQUENCY VS TIME  
 ICOM, IC-M1V  
 1999-OCT-12, 15:51



|              |              |
|--------------|--------------|
| NOMINAL, MHz | = 156.800000 |
| LIMIT, ppm   | = 5.0        |
| LIMIT, Hz    | = 784        |

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NAME OF TEST: Subpart T - G3E Emissions

SPECIFICATION: 47 CFR 80.956(a) & (b)

TEST EQUIPMENT: As per previous page

### MEASUREMENT PROCEDURE

1. Each VHF R/T installation must be capable of transmitting and receiving G3E emissions.

### MEASUREMENT RESULTS

| NOMINAL, MHZ | CHANNEL         | R. F. POWER, WATTS |     |    |
|--------------|-----------------|--------------------|-----|----|
|              |                 | LO                 | MID | HI |
| 156.300      | 06              | 0.5                | 1   | 5  |
| 156.550      | 11              | 0.5                | 1   | 5  |
| 156.600      | 12              | 0.5                | 1   | 5  |
| 156.650      | 13* Mobile Only | 0.5                | 1   | 5  |
| 156.700      | 14              | 0.5                | 1   | 5  |
| 156.750      | 15              | 0.5                | 1   | 5  |
| 156.800      | 16              | 0.5                | 1   | 5  |
| 156.850      | 17* Mobile Only | 0.5                | 1   | 5  |
| 156.875      | 67* Mobile Only | 0.5                | 1   | 5  |

\*Automatic switching to low power.

\*\*High power with manual over-ride, see attached manual.

THE TRANSMITTER AND RECEIVER MEET THESE REQUIREMENTS.

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PAGE NO. 36 of 39.  
NAME OF TEST: Subpart T - G3E Emissions  
SPECIFICATION: 47 CFR 80.956(a) & (b)  
TEST EQUIPMENT: As per previous page

- (a) The transmitter must be capable of transmission of G3E emissions on the required frequencies.

The transmitter must be capable of readily reducing the power to 1 watt or less

THE TRANSMITTER MEETS THESE REQUIREMENTS

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PAGE NO. 37 of 39.  
NAME OF TEST: Subpart T - G3E Emissions  
SPECIFICATION: 47 CFR 80.961(a) & (b)  
TEST EQUIPMENT: As per previous page

MEASUREMENT RESULTS

- (a) The receiver is capable of reception of G3E emissions on the required frequencies.
- (b) The sensitivity of the receiver at 20 dB SINAD is better than:

SENSITIVITY, dBm = -121.8  
SENSITIVITY,  $\mu$ V = 0.182

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PAGE NO. 38 of 39.  
NAME OF TEST: Subpart U - Bridge-to-Bridge Act  
SPECIFICATION: 47 CFR 80.1011, 80.1013  
TEST EQUIPMENT: As per previous page

### RESULTS

#### 80.1011 Transmitter.

The transmitter is capable of G3E emissions on the navigational frequency 156.650 MHz (Channel 13) and the Coast Guard liaison frequency 157.100 MHz (Channel 22). Additionally the transmitter is capable of transmission of G3E emissions on the navigational frequency of 156.375 MHz (Channel 67) while transmitting in any of the applicable waters.

#### 80.1013 Receiver.

The receiver is capable of reception of G3E emissions on the navigational frequency 156.650 MHz (Channel 13) and the Coast Guard liaison frequency 157.100 MHz (Channel 22A). Additionally the receiver is capable of reception of G3E emissions on the navigational frequency of 156.375 MHz (Channel 67) while receiving in any of the applicable waters.

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NAME OF TEST: Necessary Bandwidth and Emission Bandwidth

SPECIFICATION: 47 CFR 2.202(g)

MODULATION = 16K0G3E

NECESSARY BANDWIDTH CALCULATION:

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

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William H. Graff, Director  
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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:



William H. Graff, Director  
of Engineering