

# KENWOOD

LSB-0219 REV. A

## SERVICE BULLETIN

Land Mobile Division

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SUBJECT: UHF TRANSCEIVERS CAPABLE OF 406-406.1 MHz TX      DATE: 09/04/98

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The United States Coast Guard and NOAA have reported to the FCC an occurrence of unauthorized transmissions in the 406-406.1 MHz band. This band is reserved for use by distress beacons.

The purpose of this Service Bulletin is to remind all Kenwood Authorized Dealers and Servicicers not to program the 406-406.1 MHz frequency range into any Kenwood transceiver capable of transmitting in this frequency range.

**NOTE:**

This bulletin has been revised to correct the frequency range.

Printed in U.S.A.

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Kenwood Service Corporation 2201 E. Dominguez St. Long Beach, Ca. 90810

(310) 761-8275

(310) 761-8290 FAX

(310) 605-5045 BBS


(310) 761-4498 Direct FAX

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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 85224
- c) Report Number: d9970061
- d) Client: Kenwood Communications Corporation  
P.O. Box 22745  
Long Beach, CA 90801-5745
- e) Identification: TK-880H-3  
FCC ID: ALH24593230  
Description: UHF FM Mobile Transceiver
- f) EUT Condition: Not required unless specified in individual tests.
- g) Report Date: July 23, 1999  
EUT Received: July 12, 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.

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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

MANUFACTURER:


Kenwood electronics Technologies PTE Ltd.  
1 Ang Mo Kio Street 63  
Singapore 569110

(c) (2): FCC ID: ALH24593230MODEL NO: TK-880H-3(c) (3): INSTRUCTION MANUAL(S):

PLEASE SEE ATTACHED EXHIBITS

(c) (4): TYPE OF EMISSION: 16K0F3E, 11K0F3E(c) (5): FREQUENCY RANGE, MHz: 400 to 430(c) (6): POWER RATING, Watts: 10 to 40  
x Switchable      Variable      N/A(c) (7): MAXIMUM POWER RATING, Watts: 300

M. Flom Associates, Inc. is accredited by the American Association for Laboratory Association (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 Almy*  
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  
3136 North Elm Avenue, Suite 107  
Chandler, AZ 85226-1577  
Master Files Phone: 480 926 2100

**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 Metrological capabilities test:

Test	Standards
RF Immunity	FCC Part 15 (Subparts B and C) using ANSI C63.4-1992; CISPR 11; CISPR 13; CISPR 14; CISPR 22; EN 55011; EN 55015; EN 55022; EN 55022; EN 55031-1; EN 50061-2; FCC Part 18; ICES-889; AS/NZS 1044; AS/NZS 1423; AS/NZS 2548; AS/NZS 4021.1
RF Emission	EN 50062-1; EN 50062-2; AS/NZS 4021.1
Reduced Susceptibility	EN 61000-4-3; EN 50149; EN 50204; IEC 10004-3; IEC 101-3
ESD	EN 61000-4-2; IEC 1000-4-2; IEC 101-2
RF7	EN 61000-4-4; IEC 1000-4-4; IEC 101-4
Surge	EN 61000-4-5; EN 50142; IEC 1000-4-5; IEC 101-5
RF CE (PC)	2, 21, 22, 23, 24, 74, 86, 87, 98, 95, 97

*Peter Almy*

3301 Rockwaytown Pike, Suite 300 • Frederick, MD 21704-8307 • Phone: 301 464 3280 • Fax: 301 683 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.

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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 = 13.6

(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

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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
- \_\_\_\_\_ 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

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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 41.  
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  $\pm 3\%$ .

MEASUREMENT RESULTS  
(Worst case)

FREQUENCY OF CARRIER, MHz = 418.1, 400.1, 429.9

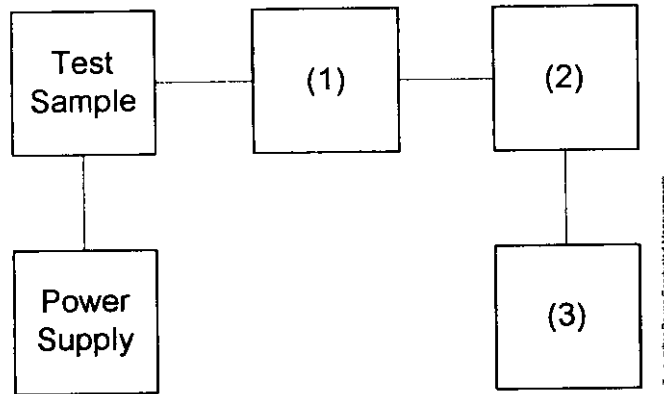
<u>POWER SETTING</u>	<u>R. F. POWER, WATTS</u>
Low	10
High	40

SUPERVISED BY:

  
William H. Graff,  
Director of Engineering

TRANSMITTER POWER CONDUCTED MEASUREMENTS

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



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

SUPERVISED BY:

William H. Graff,  
Director of Engineering



FREQUENCY OF CARRIER, MHZ = 418.1, 400.1, 429.9  
 SPECTRUM SEARCHED, GHZ = 0 to 10 x Fc  
 MAXIMUM RESPONSE, HZ = 3160  
 ALL OTHER EMISSIONS = ≥ 20 dB BELOW LIMIT  
 LIMIT(S), dBC = -66 (40 watts) = -50+10xLOG P  
 = -60 (10 watts) = -50+10xLOG P

ATTACHED FOR WORST CASE

MEASUREMENT RESULTS:

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

MEASUREMENT PROCEDURE

PAGE NO. 9 of 41.

NAME OF TEST: Unwanted Emissions (Transmitter Conducted)

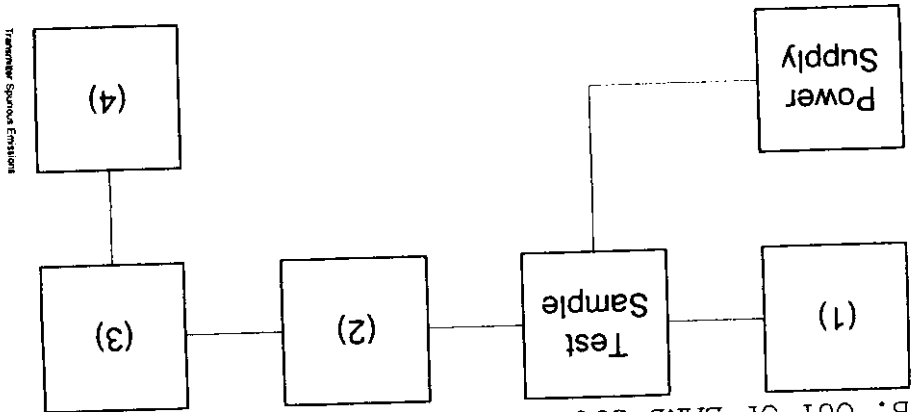
SPECIFICATION: 47 CFR 2.1051

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

TEST EQUIPMENT: As per attached page

TRANSMITTER SPURIOUS EMISSION

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



Asset Description s/n

(1) AUDIO OSCILLATOR/GENERATOR  
 100010 HP 204D  
 100017 HP 8903A  
 100012 HP 3312A

1105A04683  
 2216A01753  
 1432A11250

(2) COAXIAL ATTENUATOR  
 100122 Narda 766-10  
 100123 Narda 766-10  
 100069 Bird 8329 (30 dB)  
 100113 Sierra 661A-3D

7802  
 7802A  
 1006  
 1059

(3) FILTERS; NOTCH, HP, LP, BP  
 100126 Eagle TNF-1  
 100125 Eagle TNF-1  
 100124 Eagle TNF-1

100-250  
 50-60  
 250-850

(4) SPECTRUM ANALYZER  
 100048 HP 8566B  
 100029 HP 8563E

2511A01467  
 3213A00104

NAME OF TEST: Unwanted Emissions (Transmitter Conducted)

g9970148: 1999-Jul-13 Tue 08:43:00

STATE: 1:Low Power

FREQUENCY TUNED, MHZ	FREQUENCY LEVEL, dbm	EMISSION, MHZ	LEVEL, dbc	MARGIN, db
-------------------------	----------------------	---------------	------------	------------

400.100000	800.377000	-31.8	-77.8	-11.8
418.100000	836.422000	-33	-79	-13
429.900000	859.506000	-32.6	-78.6	-12.6
400.100000	1200.308000	-30.5	-76.5	-10.5
418.100000	1253.858000	-32.3	-78.3	-12.3
429.900000	1289.353000	-32.2	-78.2	-12.2
400.100000	1600.024000	-31.8	-77.8	-11.8
418.100000	1672.515000	-32.3	-78.3	-12.3
429.900000	1719.639000	-32	-78	-12
400.100000	2000.740000	-31.7	-77.7	-11.7
418.100000	2090.470000	-30.8	-76.8	-10.8
429.900000	2149.506000	-26.2	-72.2	-6.2
400.100000	2400.759000	-30.5	-76.5	-10.5
418.100000	2508.432000	-31.3	-77.3	-11.3
429.900000	2579.015000	-33	-79	-13
400.100000	2800.769000	-32.4	-78.4	-12.4
418.100000	2927.134000	-33.9	-79.9	-13.9
429.900000	3009.674000	-32.8	-78.8	-12.8
400.100000	3201.067000	-32.8	-78.8	-12.8
418.100000	3345.210000	-33.2	-79.2	-13.2
429.900000	3439.182000	-33.7	-79.7	-13.7
400.100000	3600.761000	-33.4	-79.4	-13.4
418.100000	3763.169000	-34.4	-80.4	-14.4
429.900000	3868.782000	-34.1	-80.1	-14.1
400.100000	4000.729000	-33.6	-79.6	-13.6
418.100000	4181.310000	-33.1	-79.1	-13.1
429.900000	4299.390000	-33.4	-79.4	-13.4
400.100000	4401.484000	-33.9	-79.9	-13.9
418.100000	4598.832000	-33.3	-79.3	-13.3
429.900000	4728.644000	-33.4	-79.4	-13.4
400.100000	4801.068000	-33.3	-79.3	-13.3
418.100000	5016.960000	-32.3	-78.3	-12.3
429.900000	5158.431000	-33	-79	-13
400.100000	5201.501000	-31.9	-77.9	-11.9
418.100000	5434.962000	-33.2	-79.2	-13.2
429.900000	5588.200000	-33.4	-79.4	-13.4
400.100000	5601.196000	-33	-79	-13
418.100000	5852.928000	-27.1	-73.1	-7.1
400.100000	6001.859000	-28.1	-74.1	-8.1
429.900000	6018.956000	-25.5	-71.5	-5.5
418.100000	6271.623000	-29	-75	-9
429.900000	6448.626000	-28.2	-74.2	-8.2

NAME OF TEST: Unwanted Emissions (Transmitter Conducted)  
 g9970346: 1999-Jul-23 Fri 09:22:00  
 STATE: 2: High Power

FREQUENCY TUNED, MHZ	FREQUENCY LEVEL, dbm	EMMISSION, MHZ	dbc	MARGIN, db
400.100000	800.200000	-37.5	-77.5	-17.5
418.100000	836.198000	-39.8	-79.8	-19.8
429.900000	859.911000	-41.7	-81.7	-21.7
400.100000	1200.302000	-36.5	-76.5	-16.5
418.100000	1254.245000	-43.3	-83.3	-23.3
429.900000	1289.711000	-41.5	-81.5	-21.5
400.100000	1600.432000	-42.9	-82.9	-22.9
418.100000	1672.398000	-42.4	-82.4	-22.4
429.900000	1719.570000	-43.4	-83.4	-23.4
400.100000	2000.054000	-42.9	-82.9	-22.9
418.100000	2090.496000	-38	-78	-18
429.900000	2149.490000	-34.3	-74.3	-14.3
400.100000	2400.217000	-40.7	-80.7	-20.7
418.100000	2508.146000	-44.5	-84.5	-24.5
429.900000	2579.172000	-42.6	-82.6	-22.6
400.100000	2800.872000	-43.6	-83.6	-23.6
418.100000	2926.417000	-44.7	-84.7	-24.7
429.900000	3009.397000	-44.3	-84.3	-24.3
400.100000	3201.116000	-44.8	-84.8	-24.8
418.100000	3344.310000	-44.5	-84.5	-24.5
429.900000	3439.354000	-44.8	-84.8	-24.8
400.100000	3600.650000	-44.7	-84.7	-24.7
418.100000	3762.497000	-44.9	-84.9	-24.9
429.900000	3868.943000	-44.7	-84.7	-24.7
400.100000	4001.427000	-44.7	-84.7	-24.7
418.100000	4181.223000	-44.9	-84.9	-24.9
429.900000	4298.927000	-43.9	-83.9	-23.9
400.100000	4401.291000	-44.3	-84.3	-24.3
418.100000	4599.404000	-44.7	-84.7	-24.7
429.900000	4729.279000	-44.7	-84.7	-24.7
400.100000	4801.366000	-44.5	-84.5	-24.5
418.100000	5017.673000	-44.4	-84.4	-24.4
429.900000	5159.072000	-43.5	-83.5	-23.5
400.100000	5201.786000	-43.8	-83.8	-23.8
418.100000	5434.992000	-44.4	-84.4	-24.4
429.900000	5588.674000	-44.8	-84.8	-24.8
400.100000	5601.688000	-44.4	-84.4	-24.4
418.100000	5853.835000	-36.9	-76.9	-16.9
400.100000	6001.333000	-39.2	-79.2	-19.2
429.900000	6019.071000	-39.5	-79.5	-19.5
418.100000	6271.714000	-38.3	-78.3	-18.3
429.900000	6448.601000	-37.9	-77.9	-17.9

1. A description of the measurement facilities was filed with the FCC and was found to be in compliance with the requirements of Section 2.948, 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.
4. 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.
5. 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

MEASUREMENT PROCEDURE

PAGE NO. 13 of 41.

NAME OF TEST: Field Strength of Spurious Radiation

SPECIFICATION: 47 CFR 2.1053(a)

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

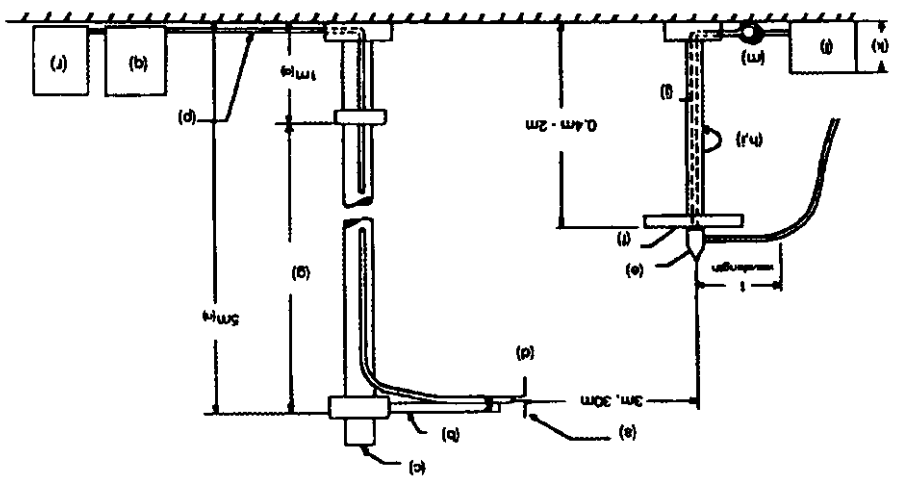
TEST EQUIPMENT: As per attached page

Asset	Description	s/n	Cycle	Last Cal
100065	EMCO 3109B 100Hz-50MHz	2336	12 mo.	12 mo.
100033	Singer 94593-1 10kHz-32MHz	0219	12 mo.	12 mo.
100088	EMCO 3109-B 25MHz-300MHz	2336	12 mo.	12 mo.
100089	Apriel 2001 200MHz-1GHz	001500	12 mo.	12 mo.
100103	EMCO 3115 1GHz-18GHz	9208-3925	12 mo.	12 mo.
100085	EMCO 3116 10GHz-40GHz	2076	12 mo.	12 mo.
100028	HP 8449A	2749A00121	12 mo.	12 mo.
100029	HP 8563E	3213A00104	12 mo.	12 mo.
100033	HP 85462A	3625A00357	12 mo.	12 mo.
100048	HP 8566B	2511AD1467	6 mo.	6 mo.

Asset	Description	s/n	Cycle	Last Cal
100065	EMCO 3109B 100Hz-50MHz	2336	12 mo.	12 mo.
100033	Singer 94593-1 10kHz-32MHz	0219	12 mo.	12 mo.
100088	EMCO 3109-B 25MHz-300MHz	2336	12 mo.	12 mo.
100089	Apriel 2001 200MHz-1GHz	001500	12 mo.	12 mo.
100103	EMCO 3115 1GHz-18GHz	9208-3925	12 mo.	12 mo.
100085	EMCO 3116 10GHz-40GHz	2076	12 mo.	12 mo.
100028	HP 8449A	2749A00121	12 mo.	12 mo.
100029	HP 8563E	3213A00104	12 mo.	12 mo.
100033	HP 85462A	3625A00357	12 mo.	12 mo.
100048	HP 8566B	2511AD1467	6 mo.	6 mo.

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



RADIATED TEST SETUP



SUPERVISED BY:

William H. Graff,  
Director of Engineering



2nd to 10th

<-70

<-75

EMISSION, MHZ/HARMONIC

SPURIOUS LEVEL, dbc  
Low  
High

ALL OTHER EMISSIONS =  $\geq$  20 DB BELOW LIMIT

NAME OF TEST: Field Strength of Spurious Radiation

PAGE NO. 15 of 41.

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

MEASUREMENT PROCEDURE

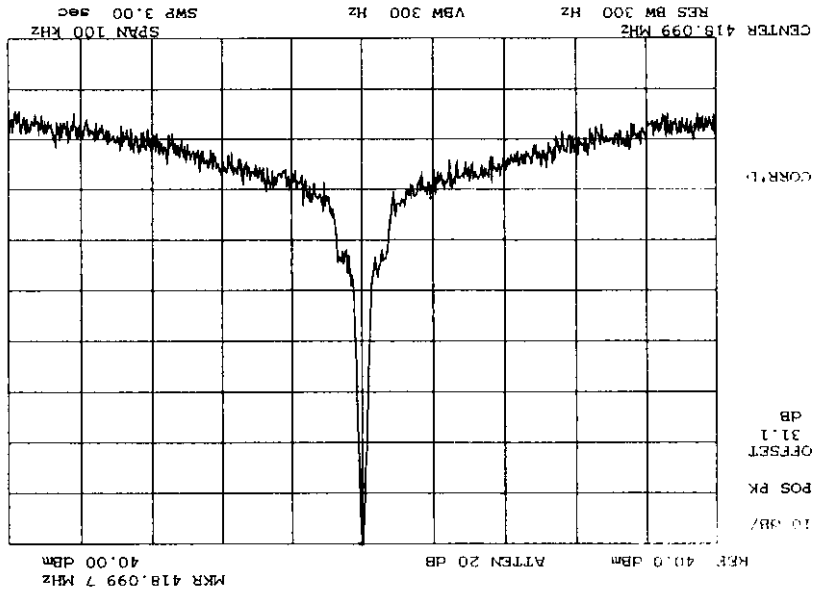
PAGE NO.	16 of 41.
<u>NAME OF TEST:</u>	Emission Masks (Occupied Bandwidth)
<u>SPECIFICATION:</u>	47 CFR 2.1049(c) (1)
<u>GUIDE:</u>	ANSI/TIA/EIA-603-1992, Paragraph 2.2.11
<u>TEST EQUIPMENT:</u>	As per previous page

SUPERVISED BY:

William H. Graff,  
Director of Engineering



POWER: LOW  
MODULATION: NONE



NAME OF TEST: Emission Masks (Occupied Bandwidth)  
STATE: 1: Low Power  
9970343: 1999-Jul-23 Fri 09:07:00

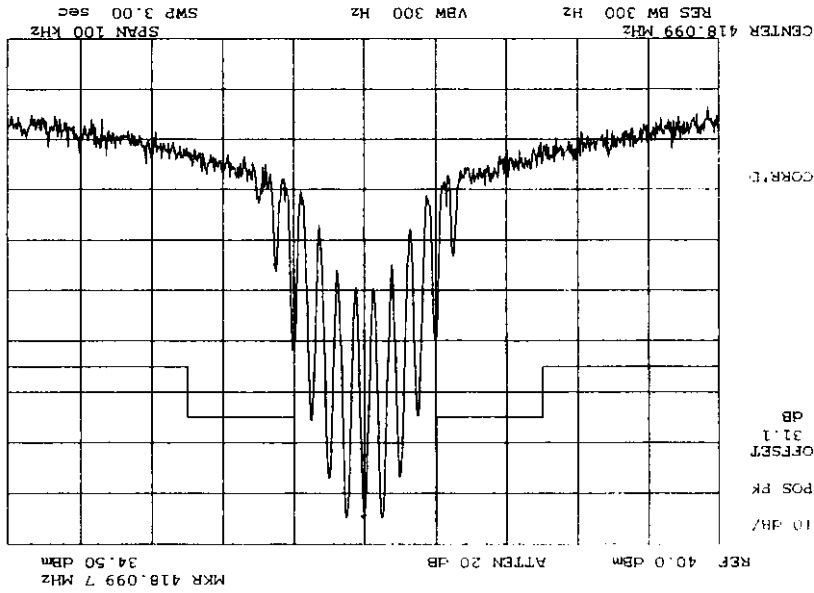
SUPERVISED BY:

Director of Engineering  
William H. Graff,



LOW  
VOICE: 2500 HZ SINE WAVE  
MASK: B, VHF/UHF 25KHZ,  
w/LPF

POWER:  
MODULATION:

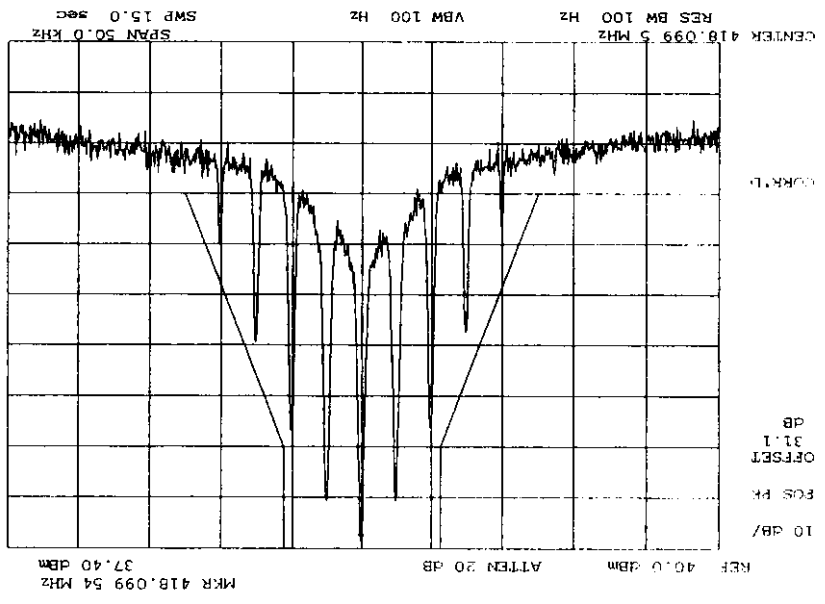


NAME OF TEST: Emission Masks (Occupied Bandwidth)  
g9970344: 1999-Jul-23 Fri 09:10:00  
STATE: 1: Low Power

SUPERVISED BY:

William H. Graf,  
Director of Engineering

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



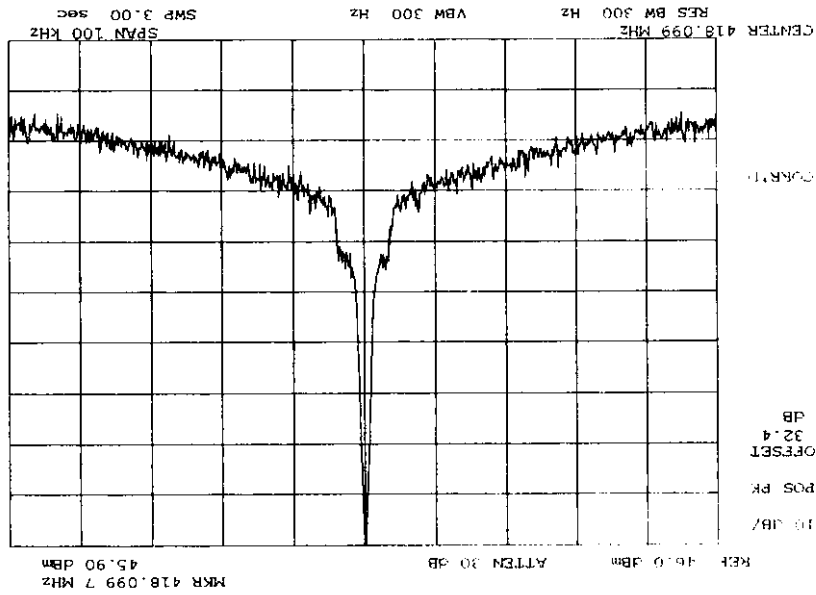
NAME OF TEST: Emission Masks (Occupied Bandwidth)  
STATE: 1: Low Power  
g9970345: 1999-Jul-23 Fri 09:13:00

SUPERVISED BY:

Director of Engineering  
William H. Graff,



POWER: HIGH  
MODULATION: NONE



NAME OF TEST: Emission Masks (Occupied Bandwidth)  
STATE: 2: High Power  
g9970145: 1999-Jul-13 Tue 08:33:00

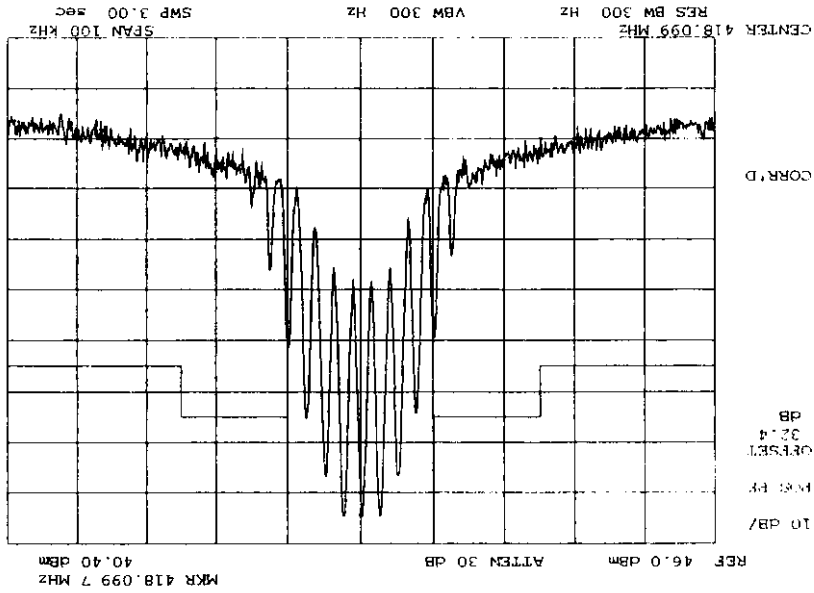
PAGE NO. 20 of 41.

SUPERVISED BY:

Director of Engineering  
William H. Graff,



POWER: HIGH  
MODULATION: HIGH  
VOICE: 2500 HZ SINE WAVE  
MASK: B, VHF/UHF 25KHZ,  
w/LPF



NAME OF TEST: Emission Masks (Occupied Bandwidth)  
STATE: 2: High Power  
g9970146: 1999-Jul-13 Tue 08:35:00

PAGE NO.

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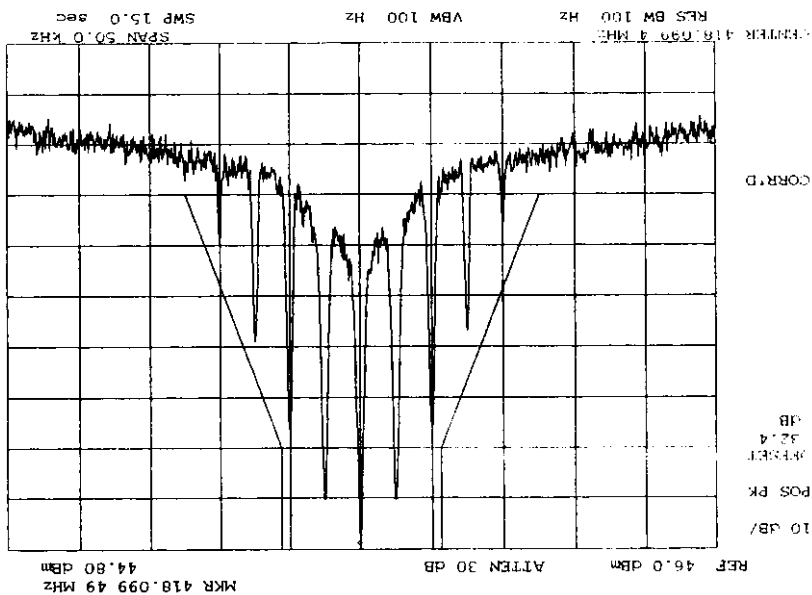
SUPERVISED BY:

Director of Engineering  
William H. Graf,



HIGH  
VOICE: 2500 HZ SINE WAVE  
MASK: D, VHF/UHF 12.5kHz BW

POWER:  
MODULATION:



NAME OF TEST: Emission Masks (Occupied Bandwidth)  
g9970147: 1999-Jul-13 Tue 08:37:00  
STATE: 2: High Power



Director of Engineering  
William H. Graf,  
Director of Engineering



SUPERVISED BY:

=	step f, dbm	=	-15.5
=	step h, dbm	=	-47.2
=	step l, dbm	=	3.3

LEVELS MEASURED:

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.
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.
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).
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.
4. The transmitter was turned off.
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.
2. The transmitter was turned on.
1. The EUT was setup as shown on the attached page, following TIA/EIA-603 steps a, b, and c as a guide.

MEASUREMENT PROCEDURE

PAGE NO. 23 of 41.

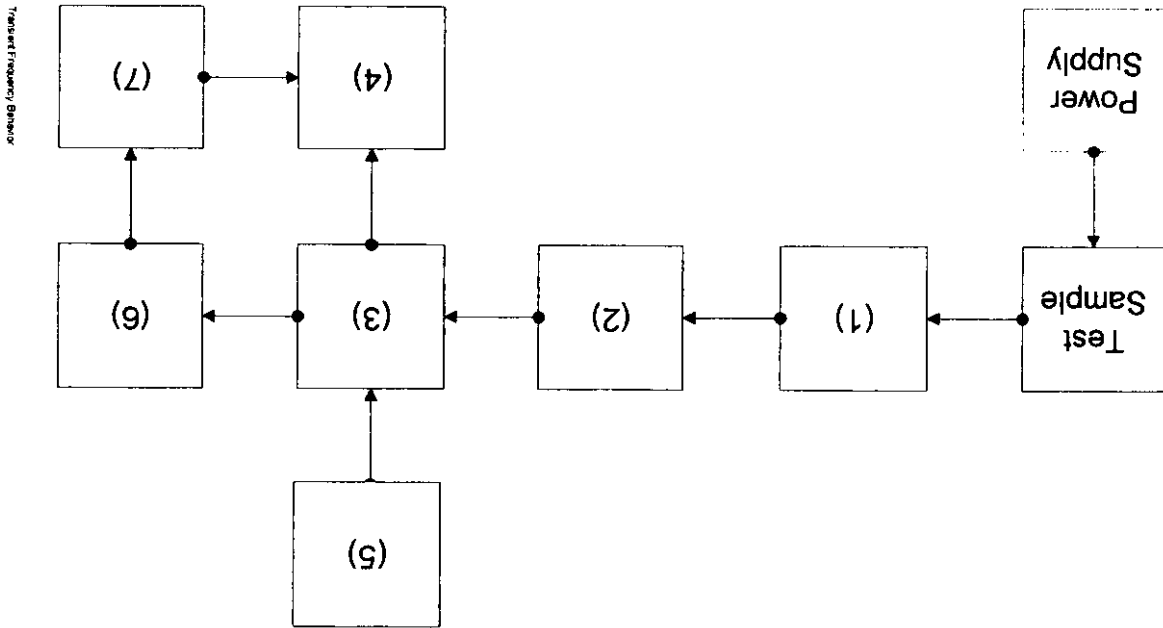
NAME OF TEST: Transient Frequency Behavior

SPECIFICATION: 47 CFR 90.214

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

TEST EQUIPMENT: As per attached page

Asset	Description	s/n
(1)	ATTENUATOR (Removed after 1st step)	989
x	100112 Philco 30 dB	989
(2)	ATTENUATOR	989
	100112 Philco 30 dB	989
x	100122 Narda 10 dB	7802
	100123 Narda 10 dB	7802A
	100110 Kay Variable	145-387
(3)	COMBINER	154
x	100154 4 x 25 $\Omega$ COMBINER	
(4)	CRYSTAL DETECTOR	
x	100159 HP 8470B	1822A10054
(5)	RF SIGNAL GENERATOR	
	100018 HP 8656A	2228A03472
	100031 HP 8656A	2402A06180
x	100067 HP 8920A	3345U01242
(6)	MODULATION ANALYZER	
x	100020 HP 8901A	2105A01087
(7)	SCOPE	
x	100030 HP 54502A	2927A00209



TRANSIENT FREQUENCY BEHAVIOR

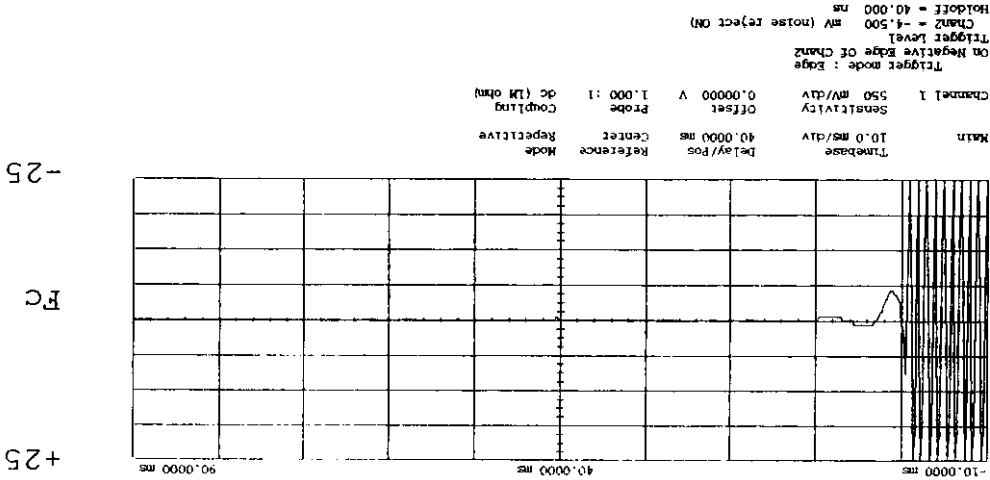
SUPERVISED BY:

Director of Engineering

William H. Graf,

POWER:  
MODULATION:  
DESCRIPTION:

HIGH  
Ref Gen=25 KHZ Deviation  
CARRIER ON TIME



NAME OF TEST: Transient Frequency Behavior  
STATE: 2:High Power  
g9970352: 1999-Jul-26 Mon 07:39:00

PAGE NO.

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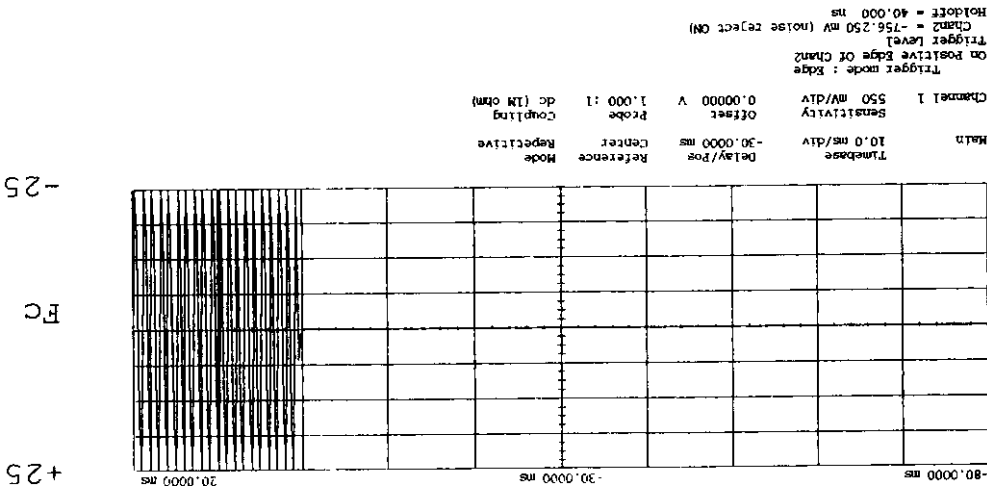
SUPERVISED BY:

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William H. Graf,



HIGH  
Ref Gen=25 KHz Deviation  
CARRIER OFF TIME

POWER:  
MODULATION:  
DESCRIPTION:



NAME OF TEST: Transient Frequency Behavior  
STATE: 2: High Power  
g9970353: 1999-Jul-26 Mon 07:43:00

0

PAGE NO.

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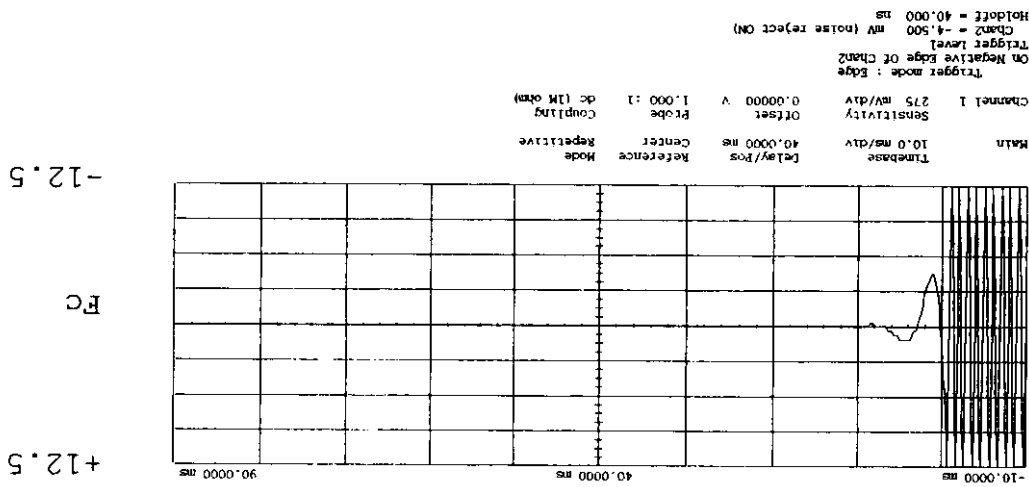
SUPERVISED BY:

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William H. Graf,



POWER:  
MODULATION:  
DESCRIPTION:

HIGH  
Ref Gen=12.5 KHz Deviation  
CARRIER ON TIME



NAME OF TEST: Transient Frequency Behavior  
STATE: 2: High Power  
1999-Jul-26 Mon 07:58:00  
g9970354



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

MEASUREMENT PROCEDURE

PAGE NO. 29 of 41.

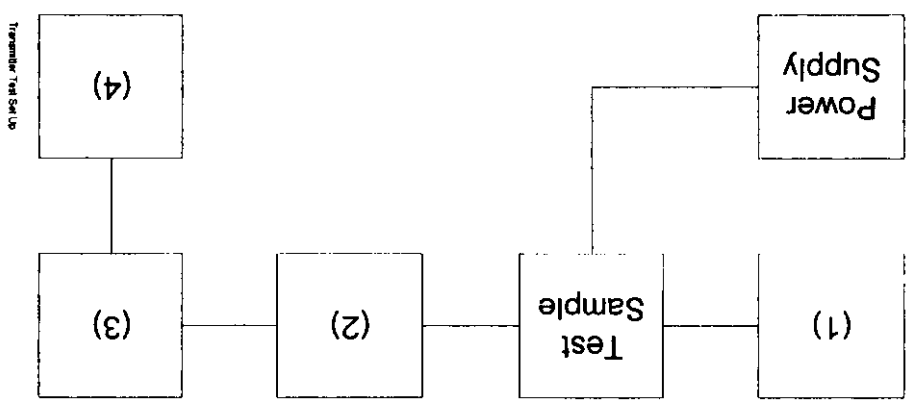
NAME OF TEST: Audio Low Pass Filter (Voice Input)

SPECIFICATION: 47 CFR 2.1047(a)

GUIDE: ANS1/TIA/EIA-603-1992, Paragraph 2.2.15

TEST EQUIPMENT: As per attached page

Asset	Description	s/n
(1)	Audio Oscillator	
x	100010 HP 204D	1105A04683
x	100017 HP 8903A	2216A01753
x	100118 HP 33120A	US36002064
(2)	COAXIAL ATTENUATOR	
	100122 NARDA 766-10	7802
	100123 NARDA 766-10	7802A
x	100113 SIERRA 661A-3D	1059
	100069 BIRD 8329 (30 dB)	10066
(3)	MODULATION ANALYZER	
x	100020 HP 8901A	2105A01087
(4)	AUDIO ANALYZER	
x	100017 HP 8903A	2216A01753



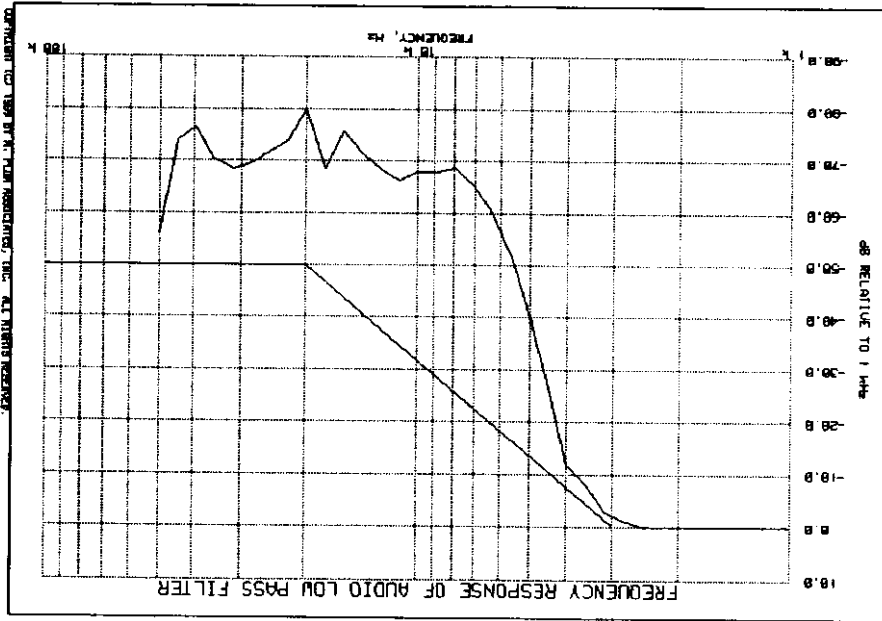
TEST A. MODULATION CAPABILITY/DISTORTION  
 TEST B. AUDIO FREQUENCY RESPONSE  
 TEST C. HUM AND NOISE LEVEL  
 TEST D. RESPONSE OF LOW PASS FILTER  
 TEST E. MODULATION LIMITING

TRANSMITTER TEST SET-UP



SUPERVISED BY:

Director of Engineering  
William H. Graff,  
*[Signature]*



NAME OF TEST: Audio Low Pass Filter (Voice Input)  
STATE: 0:General  
g9970063: 1999-Jul-12 Mon 14:21:00

PAGE NO.

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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

MEASUREMENT PROCEDURE

<p>PAGE NO. 32 of 41.</p> <p>NAME OF TEST: Audio Frequency Response</p> <p>SPECIFICATION: 47 CFR 2.1047(a)</p> <p>GUIDE: ANSI/TIA/EIA-603-1992, Paragraph 2.2.6</p> <p>TEST EQUIPMENT: As per previous page</p>	<p>MEASUREMENT PROCEDURE</p>
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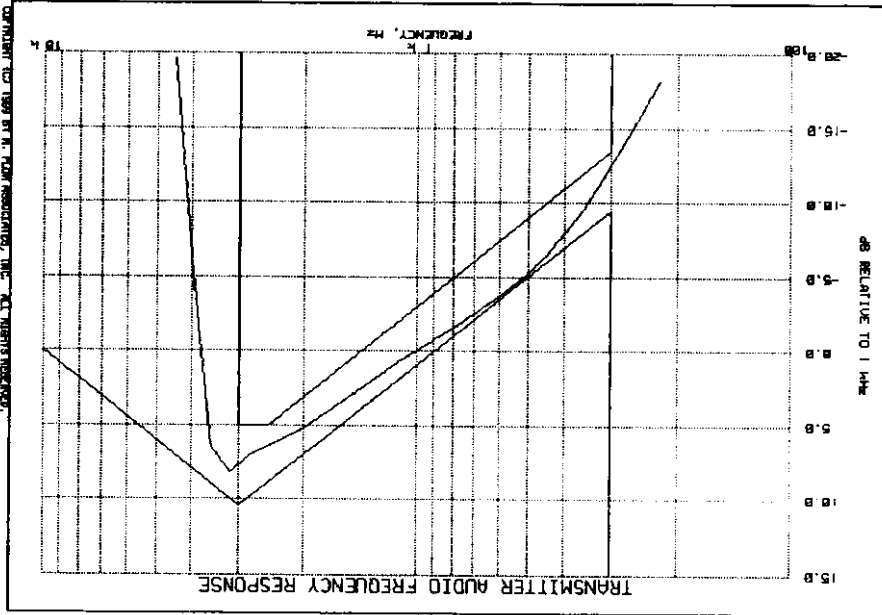
SUPERVISED BY:

William H. Graf,  
Director of Engineering



Additional points:

FREQUENCY, Hz	LEVEL, dB
300	-12.69
20000	-27.56
30000	-27.75
50000	-27.79



NAME OF TEST: Audio Frequency Response  
 g9970064: 1999-Jul-12 Mon 14:25:00  
 STATE: 0:General

PAGE NO. 33 of 41.

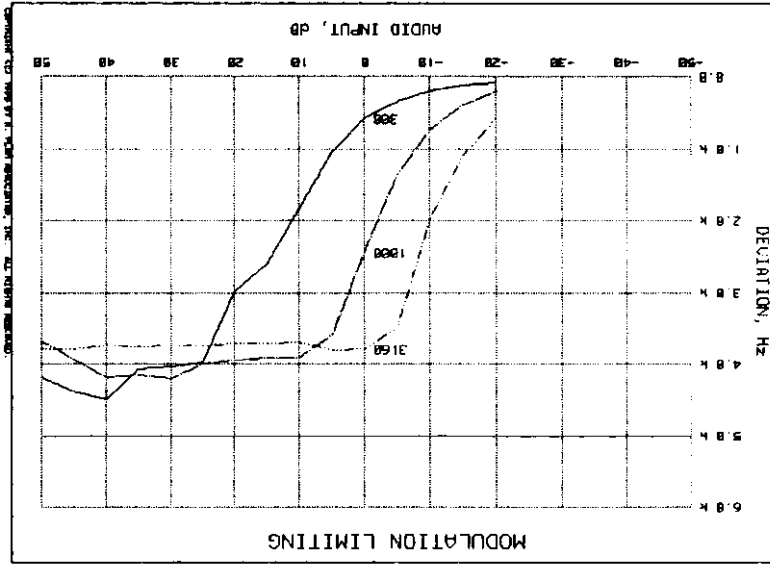
1. The signal generator was connected to the input of the EUT as for "Frequency Response of the Modulating Circuit."
2. The modulation response was measured for each of three frequencies (one of which was the frequency of maximum response), and the input voltage was varied and was observed on an HP 8901A 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

MEASUREMENT PROCEDURE

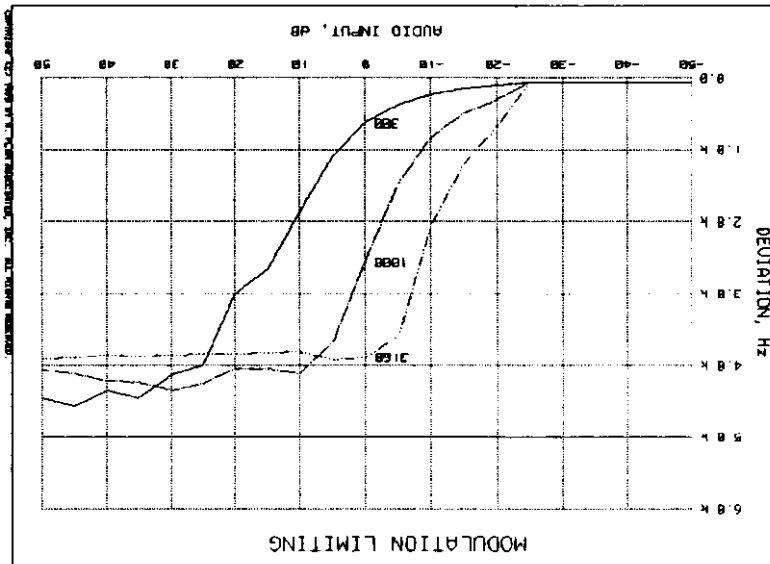
PAGE NO.	34 of 41.
<u>NAME OF TEST:</u>	Modulation Limiting
<u>SPECIFICATION:</u>	47 CFR 2.1047(b)
<u>GUIDE:</u>	ANSI/TIA/EIA-603-1992, Paragraph 2.2.3
<u>TEST EQUIPMENT:</u>	As per previous page

Director of Engineering  
William H. Graft,

SUPERVISED BY:



Negative  
Peaks:

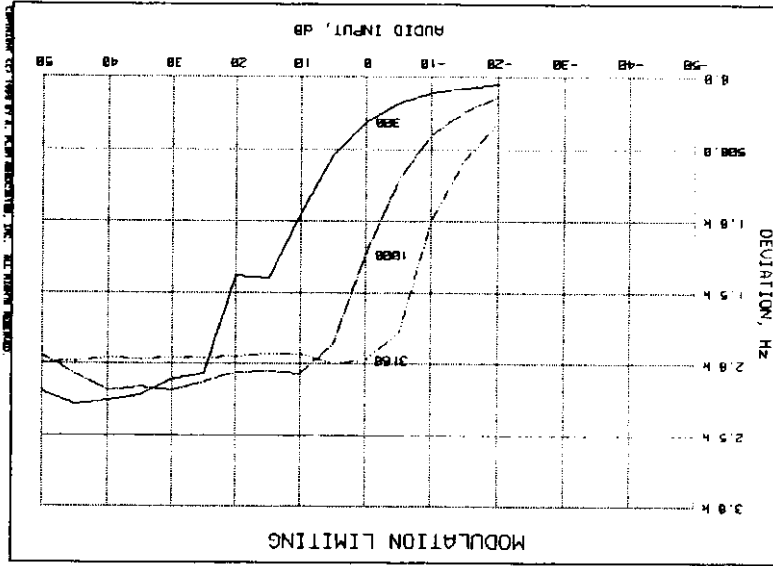


Positive  
Peaks:

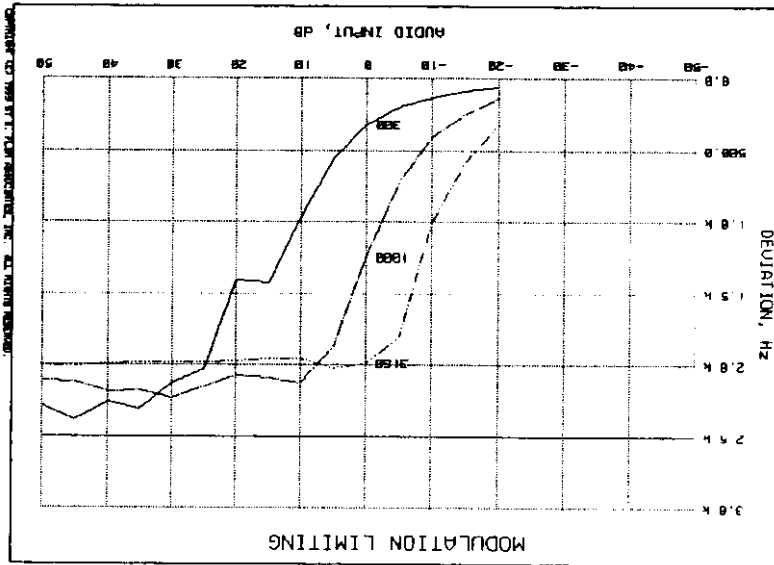
NAME OF TEST: Modulation Limiting  
STATE: 0:General  
99970065: 1999-Jul-12 Mon 14:28:00

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*[Signature]*

SUPERVISED BY:



Negative  
Peaks:



Positive  
Peaks:

NAME OF TEST: Modulation Limiting  
g9970066: 1999-Jul-12 Mon 15:00:00  
STATE: 0:General

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

MEASUREMENT PROCEDURE

NAME OF TEST: Frequency Stability (Temperature Variation)

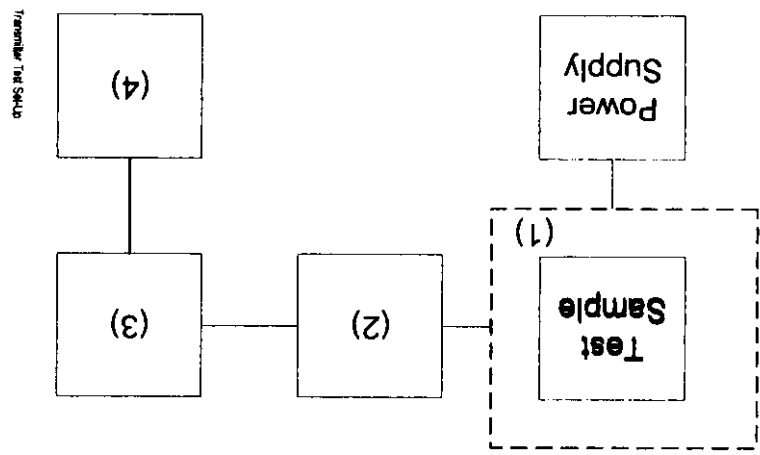
SPECIFICATION: 47 CFR 2.1055(a) (1)

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

TEST CONDITIONS: As Indicated

TEST EQUIPMENT: As per previous page

Asset	Description	s/n
(1)	TEMPERATURE, HUMIDITY, VIBRATION	
x	100027 Tenny Temp. Chamber	9083-765-234
	100 Weber Humidity Chamber	
	100 L.A.B. RVH 18-100	
(2)	COAXIAL ATTENUATOR	
	100122 NARDA 766-10	7802
	100123 NARDA 766-10	7802A
x	100113 SIERRA 661A-3D	1059
	100069 BIRD 8329 (30 dB)	10066
(3)	R.F. POWER	
x	100014 HP 435A POWER METER	1733A05839
x	100039 HP 436A POWER METER	2709A26776
x	100020 HP 8901A POWER MODE	2105A01087
(4)	FREQUENCY COUNTER	
	100042 HP 5383A	1628A00959
x	100019 HP 5334B	2704A00347
x	100020 HP 8901A	2105A01087



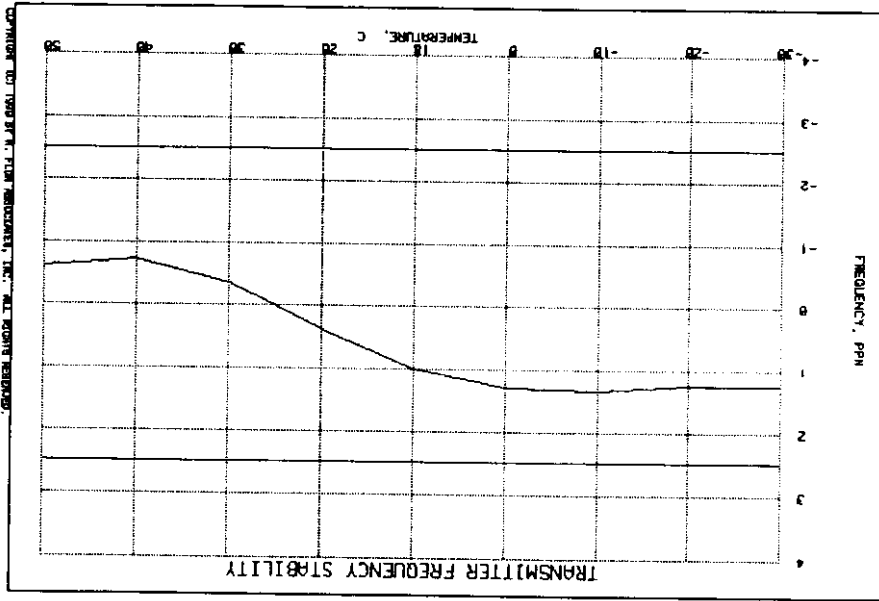
- TEST A. OPERATIONAL STABILITY
- TEST B. CARRIER FREQUENCY STABILITY
- TEST C. OPERATIONAL PERFORMANCE STABILITY
- TEST D. HUMIDITY
- TEST E. VIBRATION
- TEST F. ENVIRONMENTAL TEMPERATURE
- TEST G. FREQUENCY STABILITY: TEMPERATURE VARIATION
- TEST H. FREQUENCY STABILITY: VOLTAGE VARIATION

TRANSMITTER TEST SET-UP



SUPERVISED BY:

Director of Engineering  
William H. Graff,



NAME OF TEST: Frequency Stability (Temperature Variation)  
 STATE: 0:General  
 99970139: 1999-Jul-14 Wed 16:51:00

PAGE NO.

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SUPERVISED BY:

Director of Engineering  
 William H. Graff,



% of STV	Voltage	Frequency, MHz	Change, Hz	Change, ppm
73	10.1	418.100010	10	0.02
115	15.87	418.099990	-10	-0.02
100	13.8	418.100000	0	0.00
85	11.73	418.099980	-20	-0.05

LIMIT, ppm = 2.5  
 LIMIT, Hz = 1045  
 BATTERY END POINT (Voltage) = 10.1

RESULTS: g9970140: 1999-Jul-12 Mon 15:28:01  
 STATE: 0:General

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 PROCEDURE

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

SUPERVISED BY:

William H. Graff,  
Director of Engineering

NECESSARY BANDWIDTH CALCULATION:  
 MAXIMUM MODULATION (M), KHZ = 3  
 MAXIMUM DEVIATION (D), KHZ = 2.5  
 CONSTANT FACTOR (K) = 1  
 NECESSARY BANDWIDTH (B<sub>N</sub>), KHZ = (2 x M) + (2 x D x K) = 11.0

MODULATION = 11K0F3E

NECESSARY BANDWIDTH CALCULATION:  
 MAXIMUM MODULATION (M), KHZ = 3  
 MAXIMUM DEVIATION (D), KHZ = 5  
 CONSTANT FACTOR (K) = 1  
 NECESSARY BANDWIDTH (B<sub>N</sub>), KHZ = (2 x M) + (2 x D x K) = 16.0

MODULATION = 16K0F3E

NAME OF TEST: Necessary Bandwidth and Emission Bandwidth  
 SPECIFICATION: 47 CFR 2.202(g)

PAGE NO. 41 of 41.

CERTIFYING ENGINEER:

William H. Graff,  
Director of Engineering



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.

THIS IS TO CERTIFY THAT:

<p>TESTIMONIAL AND STATEMENT OF CERTIFICATION</p>
---