Flom Test Labs
EMI, EMC, RF Testing Experts Since 1963
toll-free: (866) 311-3268
fax: (480) 926-3598
http://www.flomlabs.com
info@flomlabs.com

**Date:** June 18, 2007

Federal Communications Commission
Via: Electronic Filing

**Attention:** Authorization & Evaluation Division

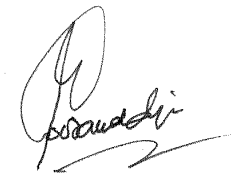
**Applicant:** Kenwood USA Corporation
**Equipment:** TK-3230-K
**FCC ID:** ALH383200
**FCC Rules:** 90, 95a

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.

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,



Hoosamuddin S. Bandukwala, Lab Director

enclosure(s)
cc: Applicant
HSB/hsb

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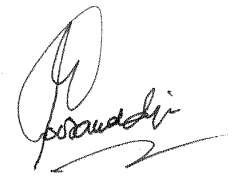
a) Application Form
b) Test Report (if applicable)
c) Filing Fees
d) Copy of Original Grant
e) Expository Statement and/or letter by Applicant
f) Photos (if applicable)
g) Label Drawing (if changes have been made)

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,



Hoosamuddin S. Bandukwala, Lab Director

enclosure(s)
cc: Applicant
HSB/hsb

Flom Test Labs
3356 North San Marcos Place, Suite 107
Chandler, Arizona 85225-7176
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# Transmitter Certification

of

FCC ID: ALH383200
Model: TK-3230-K

to

**Federal Communications Commission**

Rule Part(s) 90, 95a

Date of report: June 18, 2007

| | |
|---|---|
| **On the Behalf of the Applicant**: | Kenwood USA Corporation |
| **At the Request of**: | Kenwood USA Corporation<br>Communications Division<br>3975 Johns Creek Court, Suite 300<br>Suwanee, GA 30024 |
| **Attention of:** | Joel E. Berger, Research & Development<br>JBerger@kenwoodusa.com<br>(678) 474-4722; FAX: -4731 |

Supervised by: Hoosamuddin S. Bandukwala, Lab Director

# List of Exhibits

(FCC **Certification** (Transmitters) - Revised 9/28/98)

Applicant: Kenwood USA Corporation

FCC ID: ALH383200

**By Applicant**:

1. Letter of Authorization

2. Confidentiality Request: 0.457 And 0.459

3. Part 90.203(e) & (g) Attestation

4. Identification Drawings, 2.1033(c)(11)
   - Label
   - Location of Label
   - Compliance Statement
   - Location of Compliance Statement

5. Photographs, 2.1033(c)(12)

6. Documentation: 2.1033(c)
   - (3) User Manual
   - (9) Tune Up Info
   - (10) Schematic Diagram
   - (10) Circuit Description
   - Block Diagram
   - Parts List
   - Active Devices

7. MPE/SAR Report

**By M.F.A. Inc.:**

A. Testimonial & Statement of Certification

## The Applicant has been cautioned as to the following:

15.21 **Information to the 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


| Rule | Description | Page |
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| 2.1046(a) | ERP Carrier Power (Radiated) | 8 |
| 2.1046(a) | RF Power Output (Radiated) | 9 |
| 2.1051 | Unwanted Emissions (Transmitter Conducted) | 10 |
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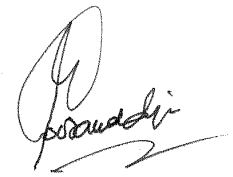
| 2.202(g) | Necessary Bandwidth and Emission Bandwidth | 43 |

*Required information per ISO 17025-2005, paragraph 5.0:*

a) **Test Report**

| | |
|---|---|
| b) Laboratory:<br>(FCC: 31040/SIT)<br>(Canada: IC 2044) | Flom Test Lab.<br>3356 N. San Marcos Place, Suite 107<br>Chandler, AZ 85225 |
| c) Report Number: | d0760019 |
| d) Client: | Kenwood USA Corporation<br>Communications Division<br>3975 Johns Creek Court, Suite 300<br>Suwanee, GA 30024 |
| e) Identification: | TK-3230-K<br>FCC ID: ALH383200 |
| EUT Description: | VHF/UHF FM/AM Handheld/Portable/Mobile Transceiver |
| f) EUT Condition: | Not required unless specified in individual tests. |
| g) Report Date: | June 18, 2007 |
| h, j, k): | As indicated in individual tests. |
| i) Sampling method: | No sampling procedure used. |
| l) Uncertainty: | In accordance with FTL internal quality manual. |
| m) Supervised by: | |



Hoosamuddin S. Bandukwala, Lab Director

| | |
|---|---|
| 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. |

Accessories used during testing:

| Type | Quantity | Manufacturer | Model | Serial No. | FCC ID |
|---|---|---|---|---|---|

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:

| | |
|---|---|
| | 15 – Radio Frequency Devices (unlicensed) |
| | 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 Radio Beacons (EPIRB'S) |
| | 80 Subpart W - Global Maritime Distress and Safety System (GMDSS) |
| | 80 Subpart X - Voluntary Radio Installations |
| | 87 – Aviation Services |
| x | 90 – Private Land Mobile Radio Services |
| | 94 – Private Operational-Fixed Microwave Service |
| x | 95 Subpart A - General Mobile Radio Service (GMRS) |
| | 95 Subpart C - Radio Control (R/C) Radio Service |
| | 95 Subpart D - Citizens Band (CB) Radio Service |
| | 95 Subpart E - Family Radio Service |
| | 95 Subpart F - Interactive Video and Data Service (IVDS) |
| | 97 - Amateur Radio Service |
| | 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 C63.4-2003 Draft, 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.

**A2LA**

"A2LA has accredited Flom Test Labs, Inc. Chandler, AZ for technical competence in the field of Electrical 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 17025:2005 'General Requirements for the Competence of Testing and Calibration Laboratories' and any additional program requirements in the identified field of testing."

Please refer to www.a2la.org for current scope of accreditation.

Certificate number: 2152.01

# List of General Information Required for Certification

In Accordance with FCC Rules and Regulations,
Volume II, Part 2 and to

90, 95aSub-part 2.1033

(c)(1):

| | |
|---|---|
| **Name and Address of Applicant**: | Kenwood USA Corporation<br>Communications Division<br>3975 Johns Creek Court, Suite 300<br>Suwanee, GA 30024 |
| **Manufacturer**: | Kenwood Corporation<br>14-6, Dogenzaka 1-Chome<br>Shibuya-ku, Tokyo 150, Japan<br>OR<br>Kenwood Electronics Technologies PTE Ltd.<br>1 Ang Mo Kio Street 63<br>Singapore 569110 |

(c)(2): **FCC ID**: ALH383200

**Model Number**: TK-3230-K

(c)(3): **Instruction Manual(s):**

Please see attached exhibits

(c)(4): **Type of Emission**: 16K0F3E, 11K0F3E

(c)(5): **Frequency Range, MHz**: 460 to 470

(c)(6): **Power Rating, Watts**: 1.69

____ Switchable x Variable ___ N/A

**FCC Grant Note:**

(c)(7): **Maximum Power Rating, Watts**: 5.0

**DUT Results**: Passes x Fails _____

Subpart 2.1033 (continued)
(c)(8): Voltages & currents in all elements in final RF stage, including final transistor or solid-state device:

| | | |
|---|---|---|
| Collector Current, A | = | 1.4 |
| Collector Voltage, Vdc | = | 3.0 |
| Supply Voltage, Vdc | = | 3.8 |

(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

**Name of Test**: Carrier Output Power (Conducted)

**Specification:** 47 CFR 2.1046(a)

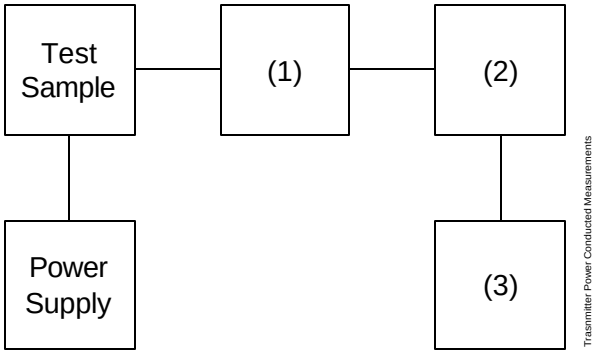
**Guide**: ANSI/TIA/EIA-603-C 2004, Paragraph 2.2.1

**Measurement Procedure**

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

B) Measurement accuracy is ±3%.

**Transmitter Test Set-Up: RF Power Output**



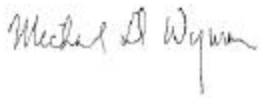

| | Asset | Description | s/n | Cycle | Last Cal |
|---|---|---|---|---|---|
| (1) | **Coaxial Attenuator** | | | | |
| X | i00231/2 | PASTERNACK PE7021-30 (30 dB) | 231 or 232 | N/A | NCR |
| | i00122/3 | NARDA 766 (10 dB) | 7802 or 7802A | N/A | NCR |
| (2) | **Power Meters** | | | | |
| X | i00321 | HP 8901A Power Mode | 2239A02170 | 12 mo. | Sep-06 |
| (3) | **Frequency Counter** | | | | |
| X | i00321 | HP 8901A Frequency Mode | 2239A02170 | 12 mo. | Sep-06 |

**Name of Test**: Carrier Output Power (Conducted)

**Measurement Results**
(Worst case)

| | | |
|---|---|---|
| Power Output | = | High |
| Ambient Temperature | = | 23°C ± 3°C |

| Frequency, MHz | RF Power, dBm | RF Power, Watts |
|---|---|---|
| 460.100000 | 32.23 | 1.69 |
| 465.100000 | 32.07 | 1.61 |
| 469.900000 | 31.84 | 1.52 |



Performed by: Michael Wyman

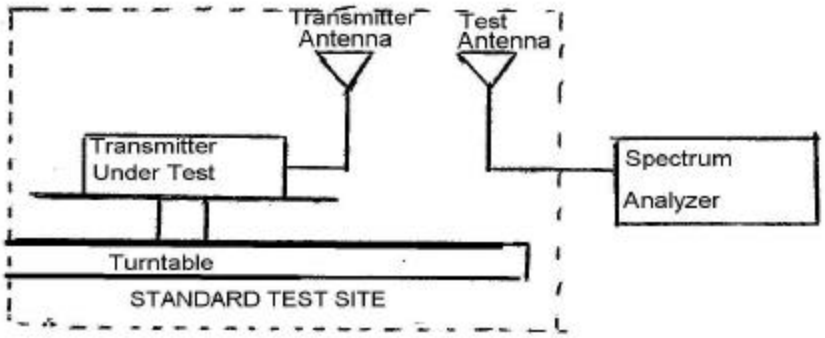
**Name of Test**: ERP Carrier Power (Radiated)

**Specification**: TIA/EIA 603-C-2004 (Substitution Method)

**Measurement Procedure**

**Definition**
The average radiated power of a licensed device is the equivalent power required, when delivered to a half-wave dipole or horn antenna, to produce at a distant point the same average received power as produced by the licensed device.

**Method of Measurement**:
A) Connect the equipment as illustrated. Place the transmitter to be tested on the turntable in the standard test site.




B) Raise and lower the test antenna from 1m to 6 m with the transmitter facing the antenna and record the highest received signal in dB as LVL.

C) Repeat step B) for seven additional readings at 45° interval positions of the turntable.

D) Replace the transmitter under test with a half-wave or horn vertically polarized antenna. The center of the antenna should be at the same location as the transmitter under test. Connect the antenna to a signal generator with a known output power and record the path loss in dB or LOSS.

E) Calculate the average radiated output power from the readings in step C) and D) by the following:

**average radiated power = 10 $\log_{10}$ Ó 10(LVL – LOSS)/10 (dBm)**

**Name of Test**: RF Power Output (Radiated)

**Specification**: 47 CFR 2.1046(a)

**Test Equipment:** As per attached page

**Measurement Procedure (Radiated)**

1. The EUT was placed on an open-field site and its radiated field strength at a known distance was measured by means of a spectrum analyzer. Equivalent loading was calculated from the equation $P_r=((E \times R)^2/49.2)$ watts, where R = 3m.

2. Measurement accuracy is ±1.5 dB.

**Measurement Results**

g0750035: 2007-May-30 Wed 13:59:00
State: 2:High Power Ambient Temperature: 23°C ± 3°C
Amps Mode:

| Frequency Tuned, MHz | Frequency Emission, MHz | Meter, dBuV/m | CF, dB | ERP, dBm | ERP, Watts |
|---|---|---|---|---|---|
| 460.09 | 460.090000 | 109.0 | 21.9 | 33.6 | 2.29 |
| 462.60 | 462.613333 | 109.0 | 22.0 | 33.6 | 2.29 |
| 469.90 | 469.900000 | 108.9 | 22.0 | 33.5 | 2.23 |

**Name of Test**: Unwanted Emissions (Transmitter Conducted)

**Specification**: 47 CFR 2.1051

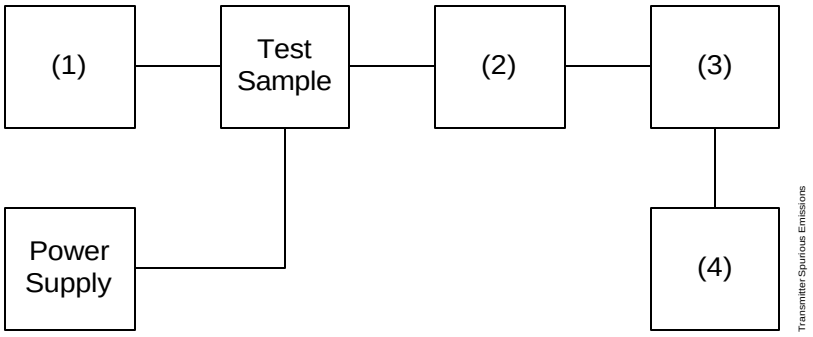
**Guide**: ANSI/TIA/EIA-603-C-2004, Paragraph 2.2.13

**Measurement Procedure**

A) The emissions were measured for the worst case as follows:
   1). within a band of frequencies defined by the carrier frequency plus and minus one channel.
   2). 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.

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

**Transmitter Test Set-Up: Spurious Emission**




| | Asset | Description | s/n | | |
|---|---|---|---|---|---|
| (1) **Audio Oscillator/Generator** | | | | | |
| X | i00324 | HP 8903B Audio Analyzer | 3011A09079 | 12 mo. | Oct-06 |
| | i00002 | HP 3336B Synthesizer / Level Gen. | 1931A01465 | N/A | NCR |
| (2) **Coaxial Attenuator** | | | | | |
| X | i00231/2 | PASTERNACK PE7021-30 (30 dB) | 231 or 232 | N/A | NCR |
| | i0012/3 | NARDA 766 (10 dB) | 7802 or 7802A | N/A | NCR |
| (3) **Filters; Notch, HP, LP, BP** | | | | | |
| | | | | N/A | NCR |
| (4) **Spectrum Analyzer** | | | | | |
| X | i00048 | HP 8566B Spectrum Analyzer | 2511A01467 | 12 mo. | Aug-06 |
| | i00029 | HP 8563E Spectrum Analyzer | 3213A00104 | 12 mo. | Jan-06 |

**Name of Test**: Unwanted Emissions (Transmitter Conducted)

**Measurement Results**
(Worst Case)

Summary:

| | | |
|---|---|---|
| Frequency of carrier, MHz | = | 462..62 |
| Spectrum Searched, GHz | = | 0 to 10 x $F_C$ |
| Maximum Response, Hz | = | 2820 |
| All Other Emissions | = | = 20 dB Below Limit |
| Limit(s), dBc | | 55 |

Graphical Results follow:

**Measurement Results**

State: Ambient Temperature: 23°C ± 3°C

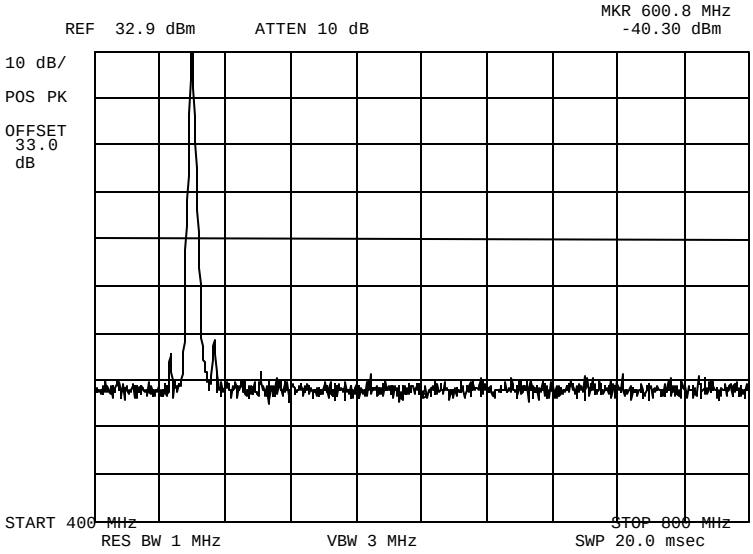
Performed by: Michael Wyman

**Name of Test**: Unwanted Emissions (Transmitter Conducted)

**Measurement Results**

g0740309: 2007-Apr-18 Wed 15:33:00
State: 2:High Power

Ambient Temperature: 23°C ± 3°C




Power: HIGH
Modulation: 25.0 KHZ BW
COND SPURS

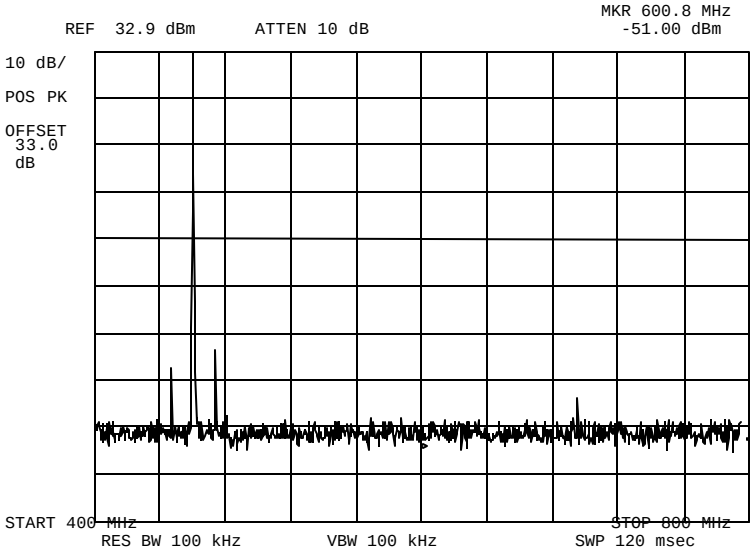
Performed by: Michael Wyman

**Name of Test**: Unwanted Emissions (Transmitter Conducted)

**Measurement Results**

g0740310: 2007-Apr-18 Wed 15:34:00
State: 2:High Power

Ambient Temperature: 23°C ± 3°C




Power: HIGH
Modulation: 25.0KHz BW
COND SPURS

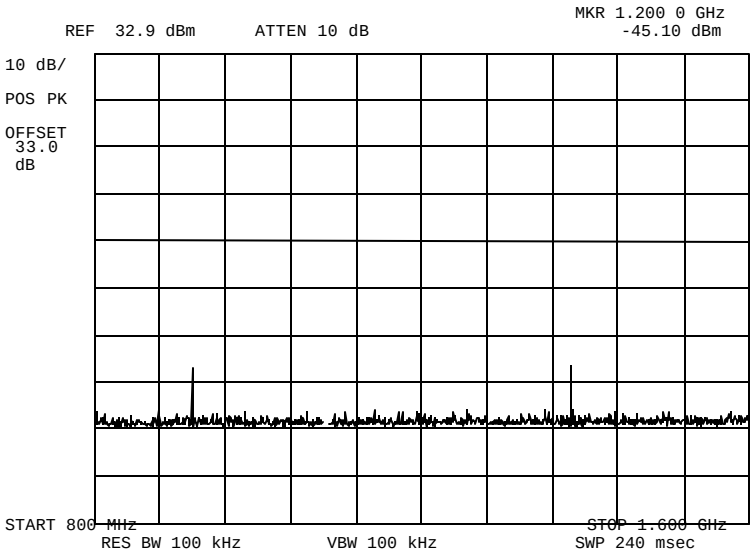
Performed by: Michael Wyman

**Name of Test**: Unwanted Emissions (Transmitter Conducted)

**Measurement Results**

g0740311: 2007-Apr-18 Wed 15:38:00
State: 2:High Power

Ambient Temperature: 23°C ± 3°C




Power: HIGH
Modulation: 25.0 KHZ BW
COND SPURS

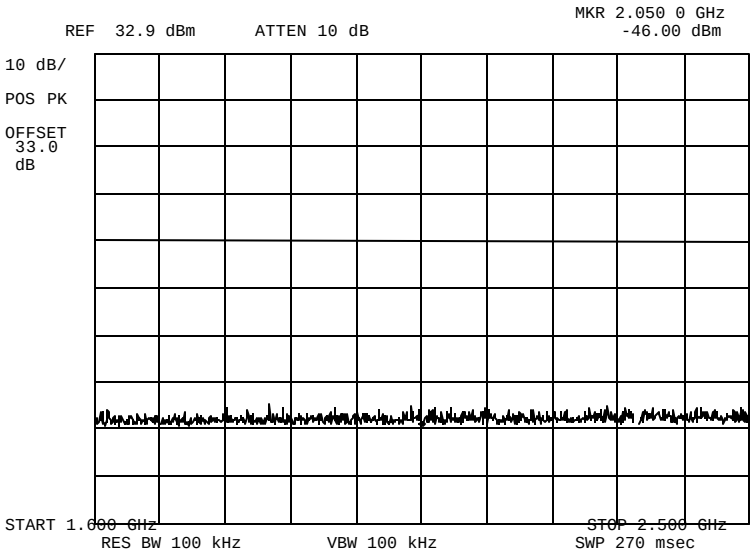
Performed by: Michael Wyman

**Name of Test**: Unwanted Emissions (Transmitter Conducted)

**Measurement Results**

g0740312: 2007-Apr-18 Wed 15:38:00
State: 2:High Power

Ambient Temperature: 23°C ± 3°C




Power: HIGH
Modulation: 25.0 KHZ BW
COND SPURS

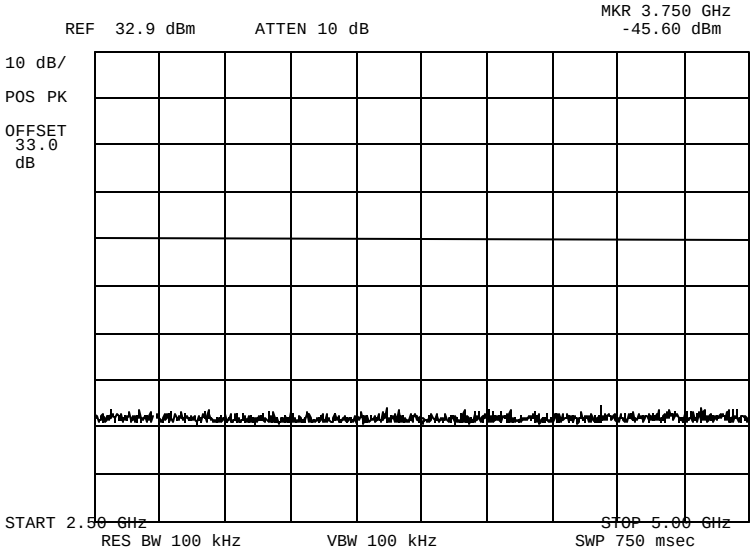
Performed by: Michael Wyman

**Name of Test**: Unwanted Emissions (Transmitter Conducted)

**Measurement Results**

g0740313: 2007-Apr-18 Wed 15:39:00
State: 2:High Power

Ambient Temperature: 23°C ± 3°C




Power: HIGH
Modulation: 25.0 KHZ BW
COND SPURS

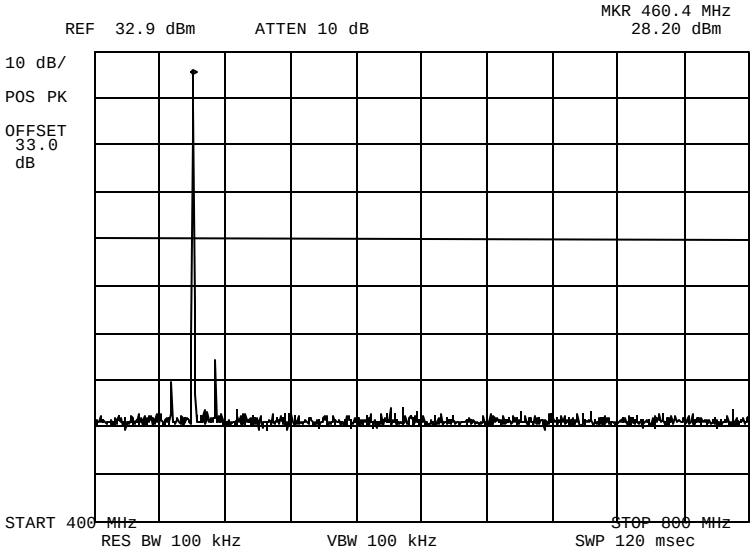
Performed by: Michael Wyman

**Name of Test**: Unwanted Emissions (Transmitter Conducted)

**Measurement Results**

g0740314: 2007-Apr-18 Wed 15:41:00
State: 2:High Power

Ambient Temperature: 23°C ± 3°C




Power: HIGH
Modulation: 12.50 KHZ BW
COND SPURS

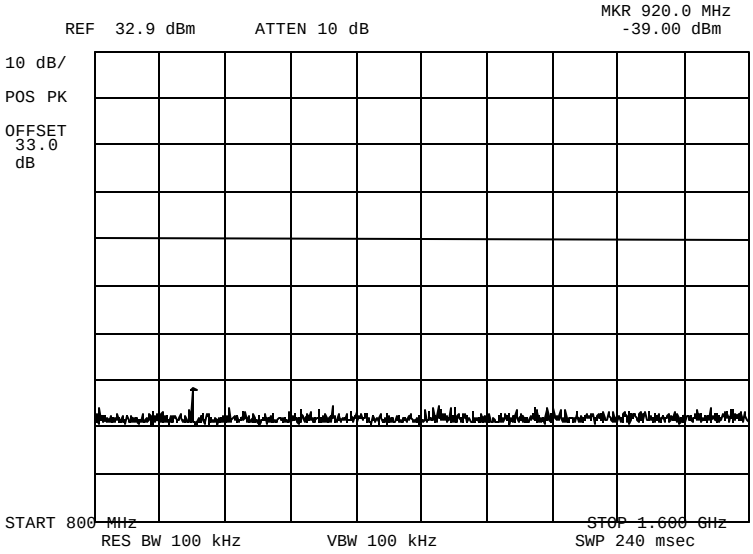
Performed by: Michael Wyman

**Name of Test**: Unwanted Emissions (Transmitter Conducted)

**Measurement Results**

g0740315: 2007-Apr-18 Wed 15:42:00
State: 2:High Power

Ambient Temperature: 23°C ± 3°C




Power: HIGH
Modulation: 12.50 KHZ BW
COND SPURS

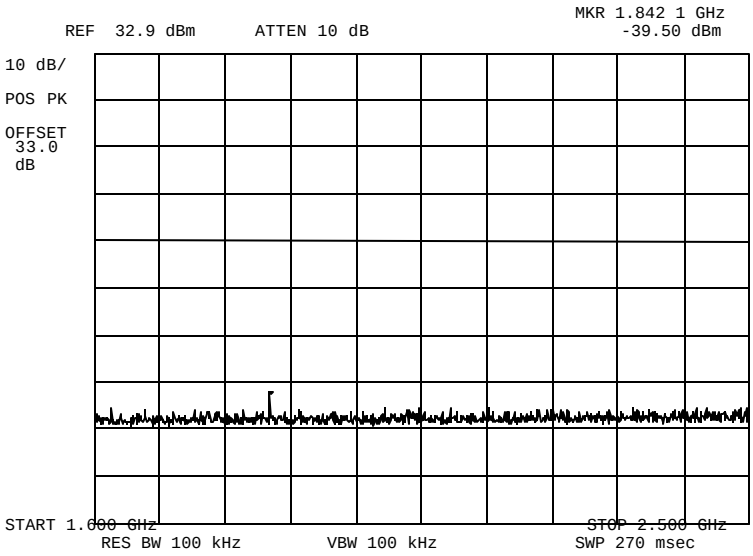
Performed by: Michael Wyman

**Name of Test**: Unwanted Emissions (Transmitter Conducted)

**Measurement Results**

g0740316: 2007-Apr-18 Wed 15:42:00
State: 2:High Power

Ambient Temperature: 23°C ± 3°C




Power: HIGH
Modulation: 12.50 KHZ BW
COND SPURS

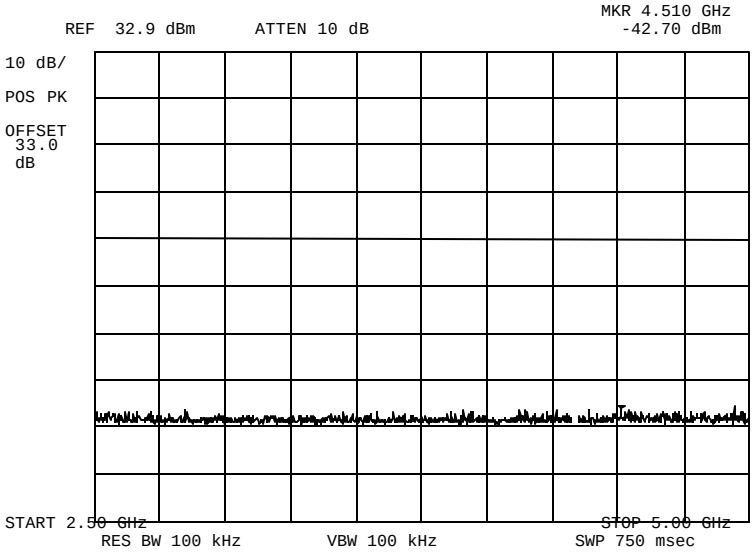
Performed by: Michael Wyman

**Name of Test**: Unwanted Emissions (Transmitter Conducted)

**Measurement Results**

g0740317: 2007-Apr-18 Wed 15:43:00
State: 2:High Power

Ambient Temperature: 23°C ± 3°C




Power: HIGH
Modulation: 12.50 KHZ BW
COND SPURS

Performed by: Michael Wyman

**Name of Test**: Field Strength of Spurious Radiation

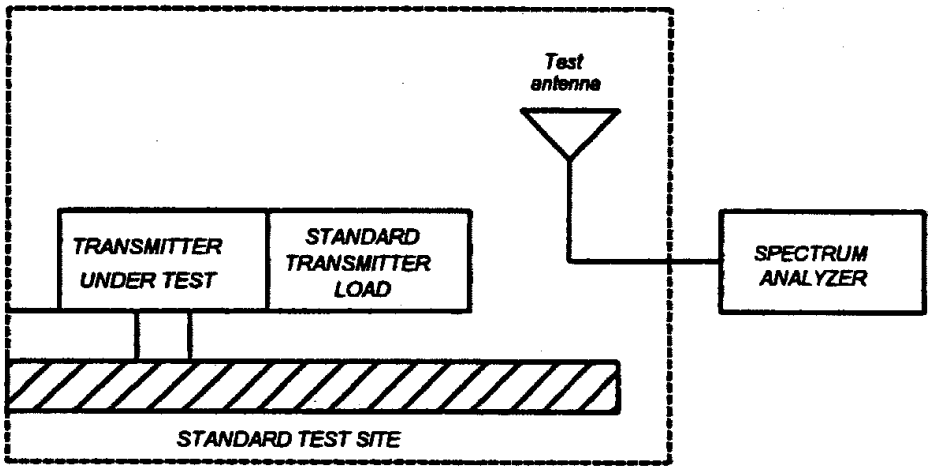
**Specification**: 47 CFR 2.1053(a)

**Guide**: ANSI/TIA/EIA-603-C-2004, Paragraph 1.2.12 and Table 16, 47 CFR 22.917

**Measurement Procedure**

**Definition:**
Radiated spurious emissions are emissions from the equipment when transmitting into a non-radiating load on a frequency or frequencies which are outside an occupied band sufficient to ensure transmission of information of required quality for the class of communications desired.

**Method of Measurement:**
A) Connect the equipment as illustrated
B) Adjust the spectrum analyzer for the following settings:
1) Resolution Bandwidth 100 kHz (<1 GHZ), 1 MHZ (> 1GHz).
2) Video Bandwidth = 3 times Resolution Bandwidth, or 30 kHz (22.917)
3) Sweep Speed ≤2000 Hz/second
4) Detector Mode = Mean or Average Power
C) Place the transmitter to be tested on the turntable in the standard test site. The transmitter is transmitting into a non-radiating load that is placed on the turntable. The RF cable to this load should be of minimum length.

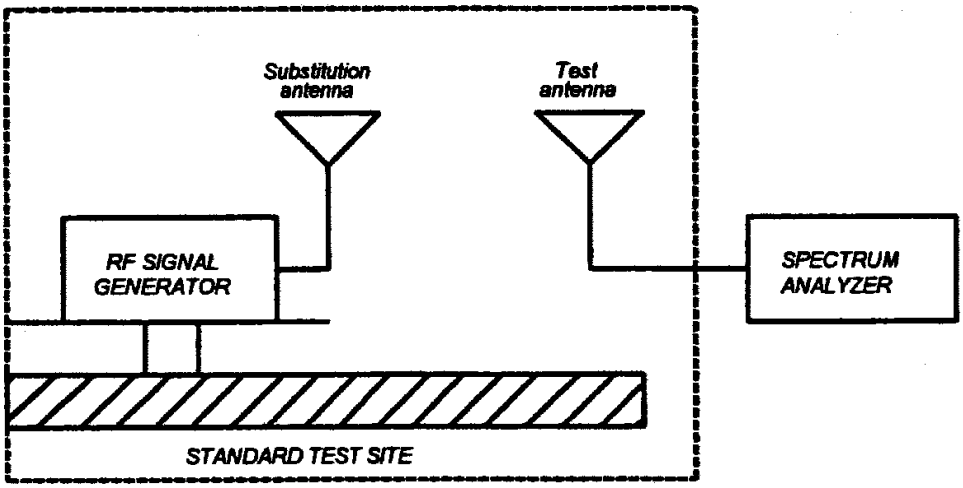


**Name of Test**: Field Strength of Spurious Radiation (Cont.)

D) For each spurious measurement the test antenna should be adjusted to the correct length for the frequency involved. This length may be determined from a calibration ruler supplied with the equipment. Measurements shall be made from the lowest radio frequency generated in the equipment to the tenth harmonic of the carrier, except for the region close to the carrier equal to± the test bandwidth (see section 1.3.4.4).

E) For each spurious frequency, raise and lower the test antenna from 1 m to 4 m to obtain a maximum reading on the spectrum analyzer with the test antenna at horizontal polarity. Repeat this procedure to obtain the highest possible reading. Record this maximum reading.

F) Repeat step E) for each spurious frequency with the test antenna polarized vertically.




G) Reconnect the equipment as illustrated.

H) Keep the spectrum analyzer adjusted as in step B).

I) Remove the transmitter and replace it with a substitution antenna (the antenna should be half-wavelength for each frequency involved). The center of the substitution antenna should be approximately at the same location as the center of the transmitter. At lower frequencies, where the substitution antenna is very long, this will be impossible to achieve when the antenna is polarized vertically. In such case the lower end of the antenna should be 0.3 m above the ground.

**Name of Test**: Field Strength of Spurious Radiation (Cont.)

J) Feed the substitution antenna at the transmitter end with a signal generator connected to the antenna by means of a non-radiating cable. With the antennas at both ends horizontally polarized and with the signal generator tuned to a particular spurious frequency, raise and lower the test antenna to obtain a maximum reading at the spectrum analyzer. Adjust the level of the signal generator output until the previously recorded maximum reading for this set of conditions is obtained. This should be done carefully repeating the adjustment of the test antenna and generator output.

K) Repeat step J) with both antennas vertically polarized for each spurious frequency.

L) Calculate power in dBm into a reference ideal half-wave dipole antenna by reducing the readings obtained in steps J) and K) by the power loss in the cable between the generator and the antenna and further corrected for the gain of the substitution antenna used relative to an ideal half-wave dipole antenna.

M) The levels recorded in step L) are absolute levels of radiated spurious emissions in dBm. The radiated spurious emissions in dB can be calculated by the following:

Radiated spurious emissions dB =

**$10\log_{10}$(TX power in watts/0.001) – the levels in step l)**

*NOTE: It is permissible that other antennas provided can be referenced to a dipole.*

**Test Equipment**

| | Asset | Description | s/n | Cycle | Last Cal |
|---|---|---|---|---|---|
| **Transducer** | | | | | |
| | i00088 | EMCO 3109-B 25MHz-300MHz | 2336 | 12 mo. | Oct-05 |
| X | i00089 | Aprel 2001 200MHz-1GHz | 001500 | 24 mo. | Oct-06 |
| X | i00103 | EMCO 3115 1GHz-18GHz | 9208-3925 | 24 mo. | Sep-06 |
| **Amplifier** | | | | | |
| X | i00028 | HP 8449A | 2749A00121 | 12 mo. | Jun-06 |
| **Spectrum Analyzer** | | | | | |
| X | i00029 | HP 8563E | 3213A00104 | 12 mo. | Jan-06 |
| | i00033 | HP 85462A | 3625A00357 | 12 mo. | Oct-05 |
| **Substitution Generator** | | | | | |
| X | i00067 | HP 8920A Communication TS | 3345U01242 | 12 mo. | Jun-06 |
| | i00207 | HP 8753D Network Analyzer | 3410A08514 | 12 mo. | May-06 |

**Microphone, Antenna Port, and Cabling**

Microphone _____ Cable Length 1.0 Meters

Antenna Port Terminated _____ Load _____ Antenna Gain 2.0

All Ports Terminated by Load _____ Peripheral _____

**Name of Test**: Field Strength of Spurious Radiation

**Measurement Results**

g0750034: 2007-May-30 Wed 14:02:00
STATE: 2:High Power Ambient Temperature: 23°C ± 3°C

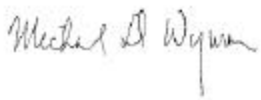
| Frequency Tuned, MHz | Frequency Emission, MHz | ERP, dBm |
|---|---|---|
| 462.627500 | 925.185000 | -27.1 |
| 462.627500 | 1387.810000 | -36.1 |
| 462.627500 | 1850.450000 | -33.4 |
| 462.627500 | 2313.065000 | -37.2 |

**Name of Test**: Field Strength of Spurious Radiation

**Measurement Results**

g0760008: 2007-Jun-01 Fri 08:51:00
STATE: 2:High Power Ambient Temperature: 23°C ± 3°C

| Frequency Tuned, MHz | Frequency Emission, MHz | ERP, dBm |
|---|---|---|
| 460.625000 | 230.969000 | -54.2 |
| 460.625000 | 462.905000 | -49.8 |
| 460.625000 | 611.320000 | -41.9 |
| 460.625000 | 715.370000 | -40.9 |
| 460.625000 | 770.860000 | -39.5 |
| 460.625000 | 917.750000 | -36.7 |



Performed by: Michael Wyman

**Name of Test**: Emission Masks (Occupied Bandwidth) 90.210

**Specification**: 47 CFR 2.1049(c)(1)

**Guide**: ANSI/TIA/EIA-603-C-2004, Paragraph 2.2.11

**Measurement Procedure**

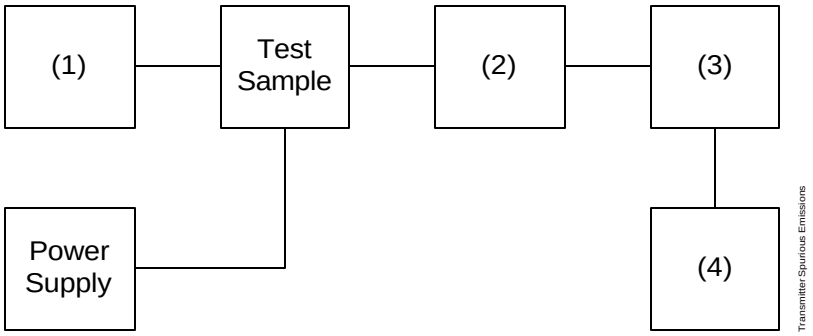
A) The EUT and test equipment were set up as shown below

B) 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/±1.25 kHz deviation (or 50% modulation). With level constant, the signal level was increased 16 dB.

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

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

**Transmitter Test Set-Up: Occupied Bandwidth**



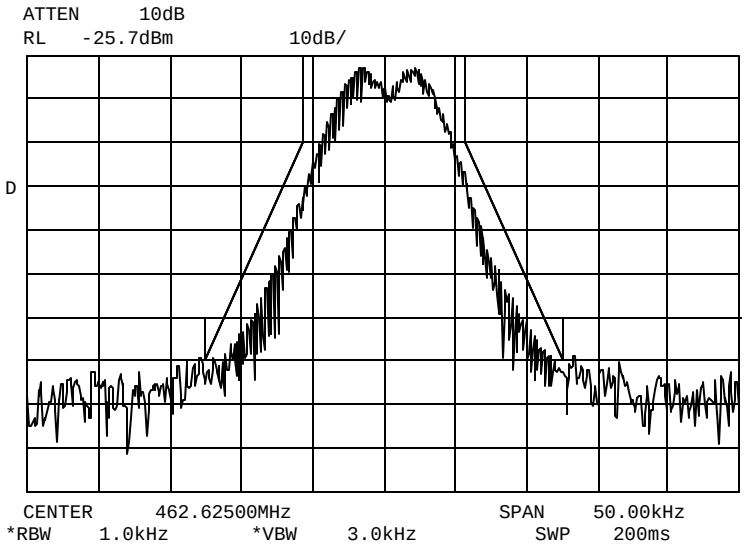

| | Asset | Description | s/n | Cycle | Last Cal |
|---|---|---|---|---|---|
| (1) **Audio Oscillator/Generator** | | | | | |
| X | i00324 | HP 8903B Modulation Meter | 3011A09079 | 12 mo. | Oct-06 |
| (2) **Coaxial Attenuator** | | | | | |
| X | i00231/2 | PASTERNACK PE7021-30 (30 dB) | 231 or 232 | N/A | NCR |
| | i00123 | NARDA 766 (10 dB) | 7802A | N/A | NCR |
| (3) **Interface** | | | | | |
| X | i00021 | HP 8954A Transceiver Interface | 2146A00159 | N/A | NCR |
| (4) **Spectrum Analyzer** | | | | | |
| X | i00048 | HP 8566B Spectrum Analyzer | 2511A01467 | 12 mo. | Aug-06 |
| | i00029 | HP 8563E Spectrum Analyzer | 3213A00104 | 12 mo. | Jan-07 |

**Name of Test**: Emission Masks (Occupied Bandwidth) 90.210

**Measurement Results**

g0760009: 2007-Jun-01 Fri 07:54:00
State: 2:High Power

Ambient Temperature: 23°C ± 3°C




Power: HIGH
Modulation: Ref Gen=12.5 kHz Deviation
MASK: D, VHF/UHF 12.5kHz BW

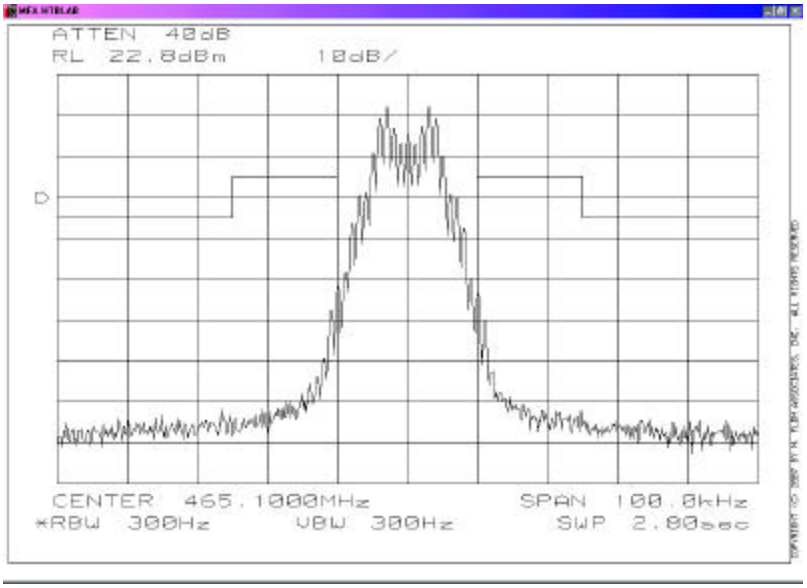
Performed by: Michael Wyman

**Name of Test**: Emission Masks (Occupied Bandwidth) 90.210

**Measurement Results**

g0760011: 2007-Jun-01 Fri 08:05:00
State: 2:High Power

Ambient Temperature: 23°C ± 3°C




| | |
|---|---|
| Power: | HIGH |
| Modulation: | REF GEN=25.0 KHZ DEVIATION<br>MASK: B VHF 25.0 KHZ w/LPF (worst case) |

Performed by: Michael Wyman

**Name of Test**: Transient Frequency Behavior

**Specification**: 47 CFR 90.214

**Guide**: ANSI/TIA/EIA-603-C-2004, Paragraph 2.2.19

**Measurement Procedure**

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

B) The transmitter was turned on.

C) 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.

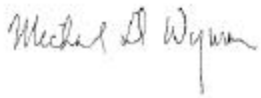
D) The transmitter was turned off.

E) An RF signal generator (1) modulated with a 1 kHz tone at either 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 C) above, measured at the output of the combiner. This level was then fixed for the remainder of the test.

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

G) 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.

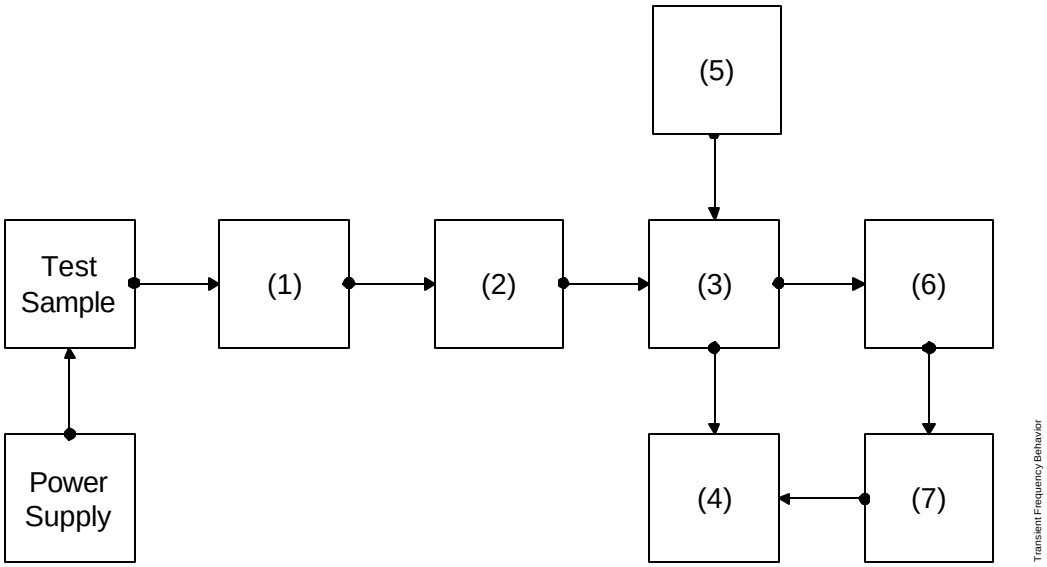
H) The carrier on-time as referenced in TIA/EIA-603 steps m, n, and o was captured and plotted. The carrier off-time as referenced in TIA/EIA-603 steps p, q, r, and s was captured and plotted.



Performed by: Michael Wyman

**Name of Test**: Transient Frequency Behavior

**Transmitter Set-Up**

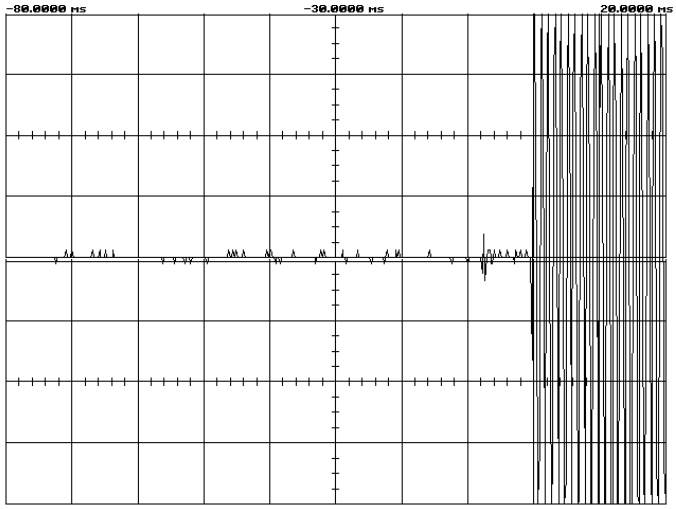



| | Asset | Description | s/n | Cycle | Last Cal |
|---|---|---|---|---|---|
| (1) **Attenuator** (Removed after 1st step) | | | | | |
| X | i00231/2 | PASTERNACK PE7021-30 (30 dB) | 231 or 232 | N/A | NCR |
| (2) **Attenuator** | | | | | |
| X | i00231/2 | PASTERNACK PE7021-30 (30 dB) | 231 or 232 | N/A | NCR |
| | i00122/3 | NARDA 766 (10 dB) | 7802 or 7802A | N/A | NCR |
| (3) **Combiner** | | | | | |
| X | i00154 | 4 x 25 Ω Combiner | 154 | N/A | NCR |
| (4) **Crystal Decoder** | | | | | |
| X | i00159 | HP 8470B Crystal Detector | 1822A10054 | N/A | NCR |
| (5) **RF Signal Generator** | | | | | |
| X | i00067 | HP 8920A Communication TS | 3345U01242 | 12 mo. | Jun-06 |
| (6) **Modulation Analyzer** | | | | | |
| X | i00321 | HP 8901A Modulation Meter | 2239A02170 | 12 mo. | Sep-06 |
| (7) **Oscilloscope** | | | | | |
| X | i00318 | HP 54502A Digital Oscilloscope | 2934A00688 | 12 mo. | Sep-06 |

**Name of Test**: Transient Frequency Behavior

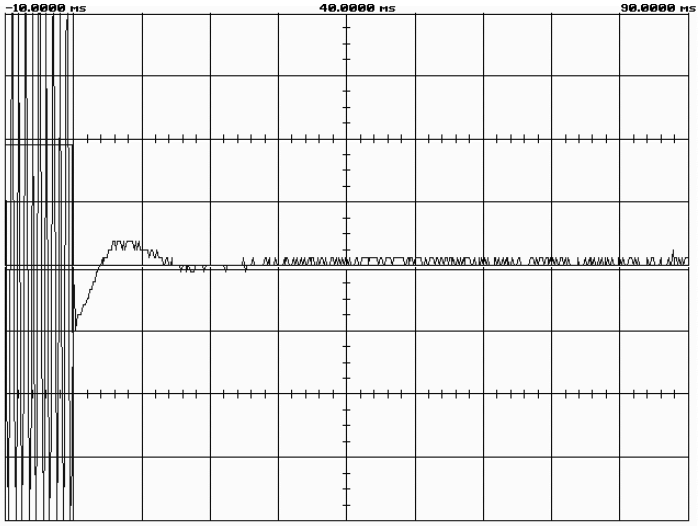
State: Ambient Temperature: 23°C ± 3°C

Vertical axis =
12 KHz Full Scale




Carrier Off

Vertical axis =
12 KHz Full Scale



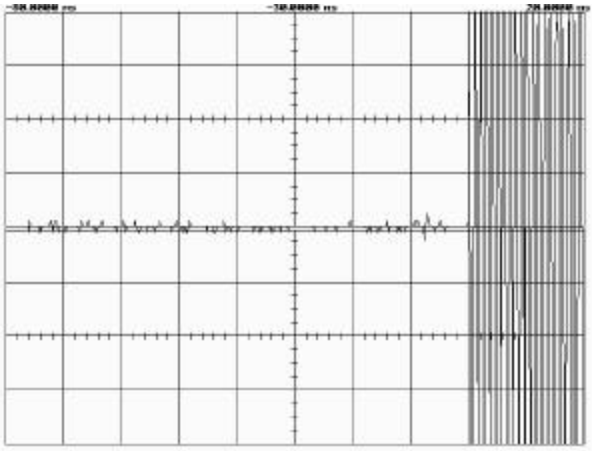

Carrier On

Performed by: Michael Wyman

**Name of Test**: Transient Frequency Behavior

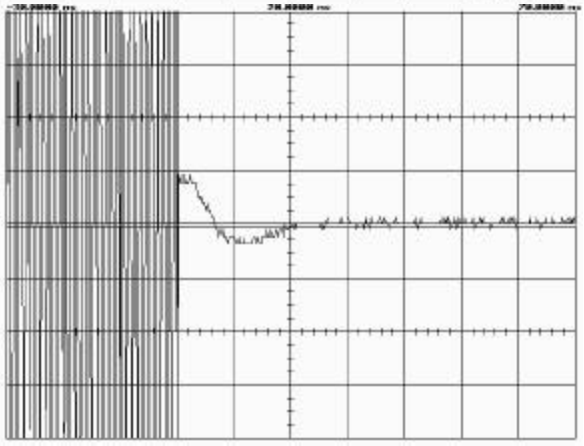
State: Ambient Temperature: 23°C ± 3°C

Vertical axis =
25 KHz Full Scale



Carrier Off

Vertical axis =
25 KHz Full Scale



Carrier On

Performed by: Michael Wyman

Flom Test Labs
3356 North San Marcos Place, Suite 107
Chandler, Arizona 85225-7176
(866) 311-3268 phone, (480) 926-3598 fax

**Name of Test**: Audio Low Pass Filter (Voice Input)

**Specification**: 47 CFR 2.1047(a)

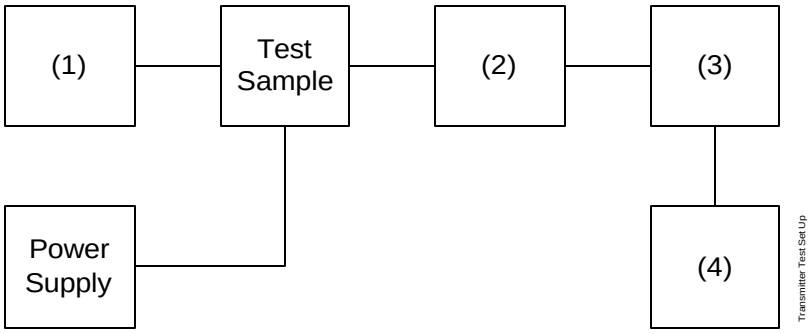
**Guide**: ANSI/TIA/EIA-603-C-2004, Paragraph 2.2.15

**Measurement Procedure**

A) 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.

B) The audio output was connected at the output to the modulated stage.

**Transmitter Test Set-Up: Response of Low Pass Filter**



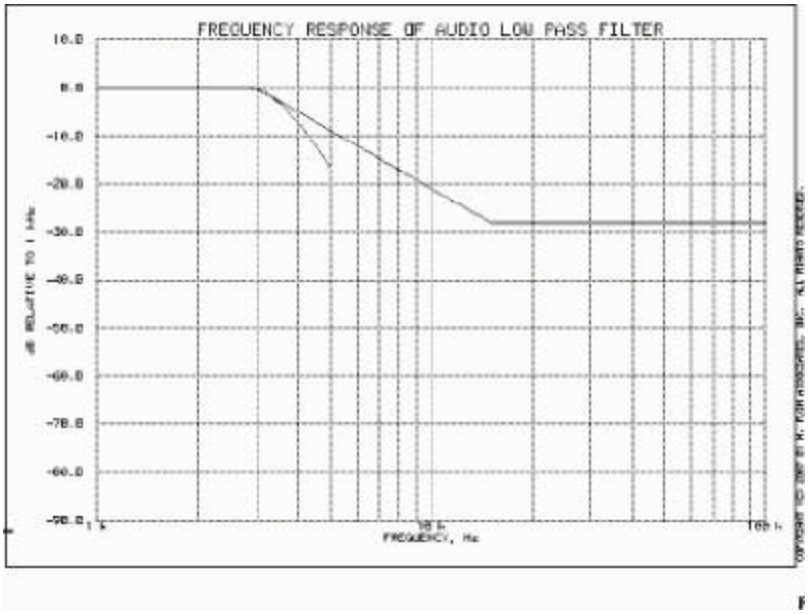

| | Asset | Description | s/n | Cycle | Last Cal |
|---|---|---|---|---|---|
| (1) **Audio Oscillator** | | | | | |
| X | i00002 | HP 3336B Synthesizer / Level Gen. | 1931A01465 | 12 mo | Jun-06 |
| (2) **Coaxial Attenuator** | | | | | |
| | i00122/3 | NARDA 766 (10dB)10 | 7802 or 7802A | N/A | NCR |
| X | i00231/2 | PASTERNACK PE7021-30 (30 dB) | 231 or 232 | N/A | NCR |
| (3) **Modulation Analyzer** | | | | | |
| X | i00321 | HP 8901A Modulation Analyzer | 2239A02170 | 12 mo. | Sep-06 |
| (4) **Audio Analyzer** | | | | | |
| X | I00324 | HP 8903B Audio Analyzer | 3011A09079 | 12 mo. | Oct-06 |

**Name of Test**: Audio Low Pass Filter (Voice Input)

**Measurement Results**

g0750039: 2007-May-31 Thu 15:55:00
State: 0:General

Ambient Temperature: 23°C ± 3°C




Performed by: Michael Wyman

**Name of Test**: Audio Frequency Response

**Specification**: 47 CFR 2.1047(a)

**Guide**: ANSI/TIA/EIA-603-C-2004, Paragraph 2.2.6

**Measurement Procedure**

A) The EUT and test equipment were set up as shown below.

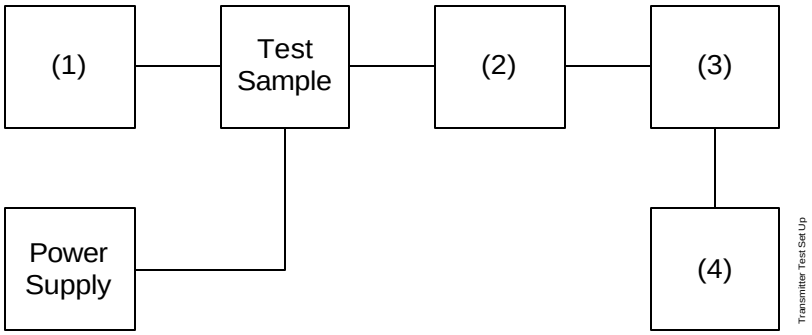
B) The audio signal generator was connected to the audio input circuit/microphone of the EUT.

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

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

E) The response in dB relative to 1 kHz was measured, using the HP 8901A Modulation Meter.

**Transmitter Test Set-Up: Audio Frequency Response**



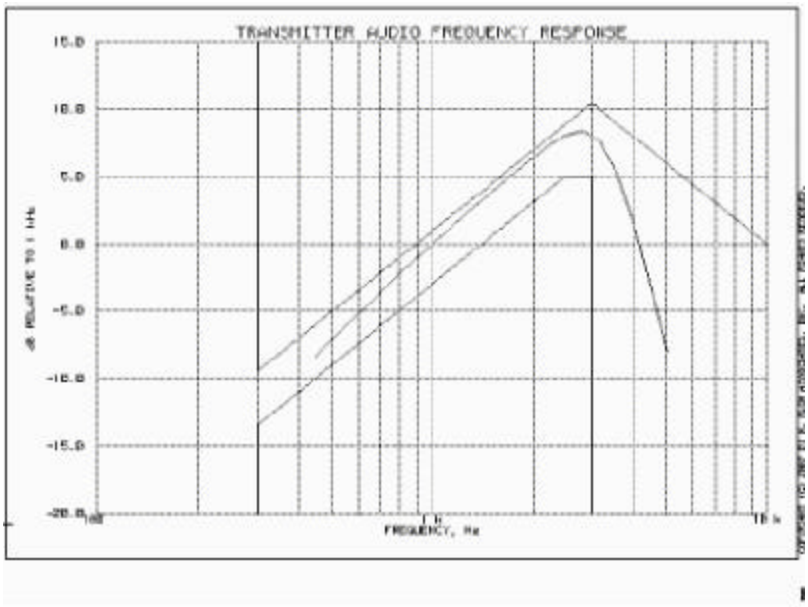

| | Asset | Description | s/n | Cycle | Last Cal |
|---|---|---|---|---|---|
| (1) **Audio Oscillator** | | | | | |
| X | i00324 | HP 8903B Audio Analyzer | 3011A09079 | 12 mo. | Oct-06 |
| (2) **Coaxial Attenuator** | | | | | |
| | i00122/3 | NARDA 766-(10 dB) | 7802 or 7802A | N/A | NCR |
| X | i00231/2 | PASTERNACK PE7021-30 (30 dB) | 231 or 232 | N/A | NCR |
| (3) **Modulation Analyzer** | | | | | |
| X | i00321 | HP 8901A Modulation Analyzer | 2239A02170 | 12 mo. | Sep-06 |
| (4) **Audio Analyzer** | | | | | |
| X | i00324 | HP 8903B Audio Analyzer | 3011A09079 | 12 mo. | Oct-06 |

**Name of Test**: Audio Frequency Response

**Measurement Results**

g0750037: 2007-May-31 Thu 15:17:00
State: 0:General

Ambient Temperature: 23°C ± 3°C




Frequency of Maximum Audio Response, Hz = 2820

Additional points:

| Frequency, Hz | Level, dB |
|---|---|
| 300 | -12.08 |
| 20000 | -17.68 |
| 30000 | -17.60 |
| 50000 | -17.66 |

Performed by: Michael Wyman

**Name of Test**: Modulation Limiting

**Specification**: 47 CFR 2.1047(b)

**Guide**: ANSI/TIA/EIA-603-C-2004, Paragraph 2.2.3

**Measurement Procedure**

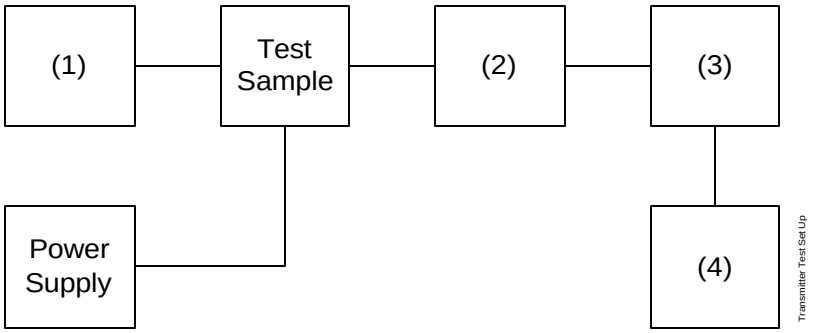
A) The signal generator was connected to the input of the EUT as shown below.

B) 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.

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

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

**Transmitter Test Set-Up: Modulation Limiting**




| | Asset | Description | s/n | | |
|---|---|---|---|---|---|
| (1) **Audio Oscillator** | | | | | |
| X | i00324 | HP 8903B Audio Analyzer | 3011A09079 | 12 mo. | Oct-06 |
| (2) **Coaxial Attenuator** | | | | | |
| | i0012/23 | NARDA 766-(10 dB) | 7802 or 7802A | N/A | NCR |
| X | i00231/2 | PASTERNACK PE7021-30 (30 dB) | 231 or 232 | N/A | NCR |
| (3) **Modulation Analyzer** | | | | | |
| X | i00321 | HP 8901A Modulation Meter | 2239A02170 | 12 mo. | Sep-06 |
| (4) **Audio Analyzer** | | | | | |
| X | i00324 | HP 8903B Audio Analyzer | 3011A09079 | 12 mo. | Oct-06 |

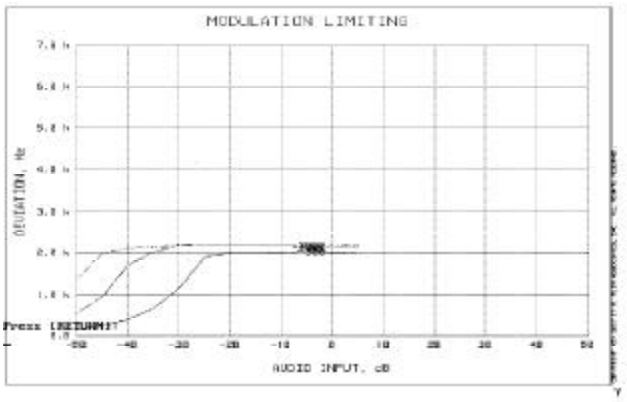
**Name of Test**: Modulation Limiting (12.50 KHz BW)

**Measurement Results**

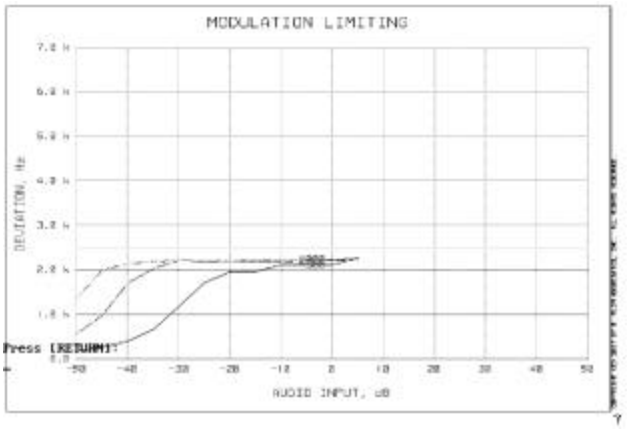
g0750036: 2007-May-31 Thu 15:01:00
State: 0:General

Ambient Temperature: 23°C ± 3°C

Positive Peaks:




Negative Peaks:




Performed by: Michael Wyman

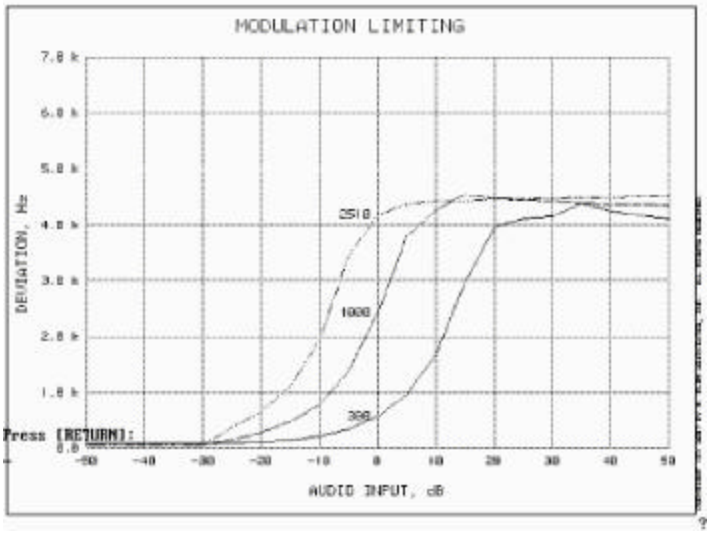
**Name of Test**: Modulation Limiting (25KHz BW)

**Measurement Results**

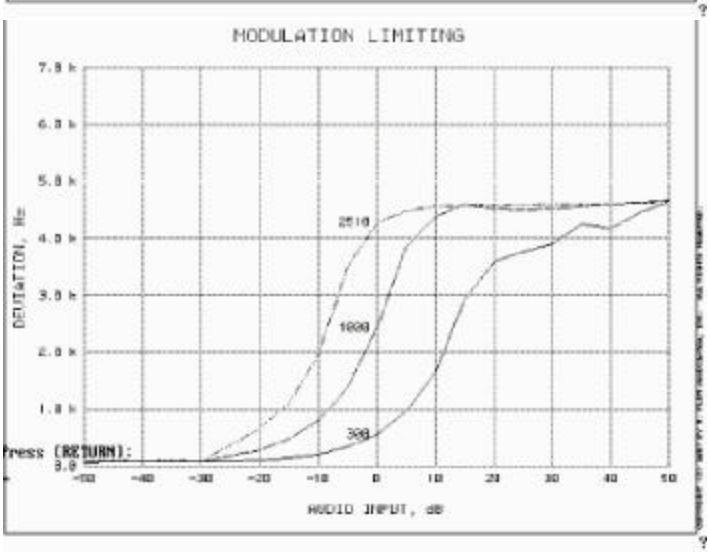
g0750036: 2007-May-31 Thu 15:01:00
State: 0:General

Ambient Temperature: 23°C ± 3°C

Positive Peaks:




Negative Peaks:




Performed by: Michael Wyman

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**Name of Test**: Frequency Stability (Temperature Variation)

**Specification**: 47 CFR 2.1055(a)(1)

**Guide**: ANSI/TIA/EIA-603-C-2004, Paragraph 2.2.2

**Measurement Procedure**

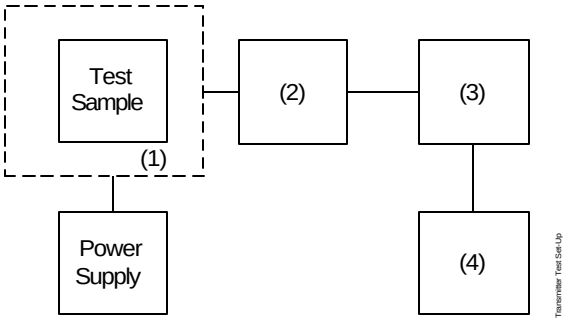
A) The EUT and test equipment were set up as shown on the following page.

B) 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.

C) 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.

D) The temperature tests were performed for the worst case.

**Transmitter Test Set-Up: Temperature Variation**



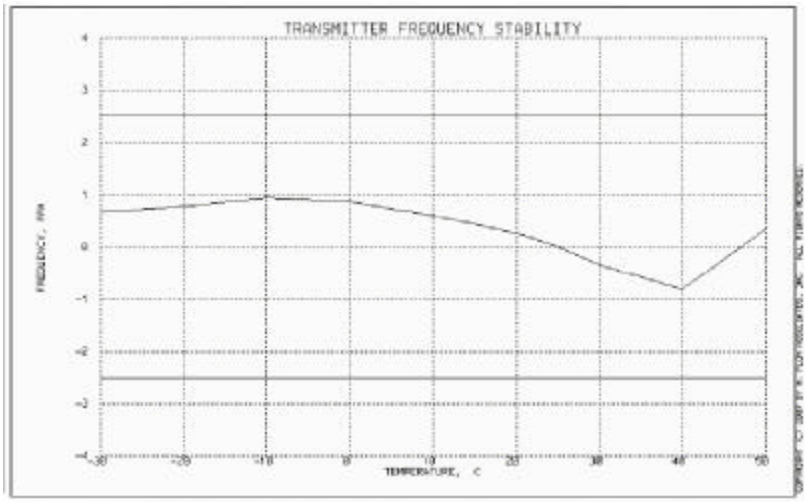

| | Asset | Description | s/n | Cycle | Last Cal |
|---|---|---|---|---|---|
| (1) **Temperature, Humidity, Vibration** | | | | | |
| X | i00027 | Tenney Temp. Chamber | 9083-765-234 | 12 mo. | Sep-06 |
| (2) **Coaxial Attenuator** | | | | | |
| X | i00231/2 | PASTERNACK PE7021-30 (30 dB) | 231 or 232 | N/A | NCR |
| | i00122/3 | NARDA 766 (10 dB) | 7802 or 7802A | N/A | NCR |
| (3) **RF Power** | | | | | |
| X | i00067 | HP 8920A Communications TS | 3345U01242 | 12 mo. | Jun-06 |
| (4) **Frequency Counter** | | | | | |
| X | i00067 | HP 8920A Communications TS | 3345U01242 | 12 mo. | Jun-06 |

**Name of Test**: Frequency Stability (Temperature Variation)

**Measurement Results**

g0740318: 2007-Apr-19 Thu 14:55:00
State: 0:General

Ambient Temperature: 23°C ± 3°C




Performed by: Michael Wyman

**Name of Test**: Frequency Stability (Voltage Variation)

**Specification**: 47 CFR 2.1055(d)(1)

**Guide**: ANSI/TIA/EIA-603-C-2004, Paragraph 2.2.2

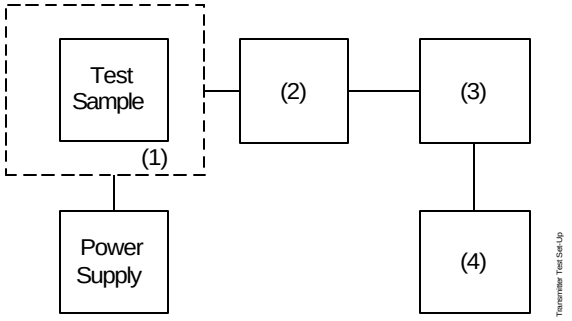
**Measurement Procedure**

A) The EUT was placed in a temperature chamber (if required) at 25±5°C and connected as shown below.

B) The power supply voltage to the EUT was varied from 85% to 115% of the nominal value measured at the input to the EUT.

C) The variation in frequency was measured for the worst case.

**Transmitter Test Set-Up: Voltage Variation**




| | Asset | Description | s/n | Cycle | Last Cal |
|---|---|---|---|---|---|
| (1) **Temperature, Humidity, Vibration** | | | | | |
| | i00027 | Tenney Temp. Chamber | 9083-765-234 | N/A | NCR |
| (2) **Coaxial Attenuator** | | | | | |
| X | i00231/2 | PASTERNACK PE7021-30 (30 dB) | 231 or 232 | N/A | NCR |
| | i00122/3 | NARDA 766 (10 dB) | 7802 or 7802A | N/A | NCR |
| (3) **RF Power** | | | | | |
| X | i00321 | HP 8901A Power Mode | 2239A02170 | 12 mo. | Sep-06 |
| (4) **Frequency Counter** | | | | | |
| X | i00321 | HP 8901A Frequency Mode | 2239A02170 | 12 mo. | Sep-06 |
| (5) **Power Supply** | | | | | |
| X | i00191 | HP 6673A | US36380408 | NA | NCR |

**Results**: Frequency Stability (Voltage Variation)

State: Ambient Temperature: 23°C ± 3°C

| | | |
|---|---|---|
| Limit, ppm | = | + - 2.5 |
| Limit, Hz | = | 1150 |
| Battery End Point (Voltage) | = | 3.00 |

| % of STV | Voltage | Frequency | Change, Hz | Change, ppm |
|---|---|---|---|---|
| 115 | 4.37 | 460.099200 | 0.00 | 0.00 |
| 100 | 3.80 | 460.099200 | 0.00 | 0.00 |
| 85 | 3.33 | 460.099700 | 500 | 1.08 |

Performed by: Michael Wyman

**Name of Test**: Necessary Bandwidth and Emission Bandwidth

**Specification**: 47 CFR 2.202(g)

Modulation = 16K0F3E

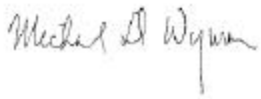
**Necessary Bandwidth Calculation**:

| | | |
|---|---|---|
| Maximum Modulation (M), kHz | = | 3 |
| Maximum Deviation (D), kHz | = | 5 |
| Constant Factor (K) | = | 1 |
| Necessary Bandwidth ($B_N$), kHz | = | (2xM)+(2xDxK) |
| | = | 16.0 |

Modulation = 11K0F3E

**Necessary Bandwidth Calculation**:

| | | |
|---|---|---|
| Maximum Modulation (M), kHz | = | 3 |
| Maximum Deviation (D), kHz | = | 5 |
| Constant Factor (K) | = | 1 |
| Necessary Bandwidth ($B_N$), kHz | = | (2xM)+(2xDxK) |
| | = | 16.0 |



Performed by: Michael Wyman

END OF TEST REPORT

Flom Test Labs
EMI, EMC, RF Testing Experts Since 1983

# Testimonial
# and
# Statement of Certification

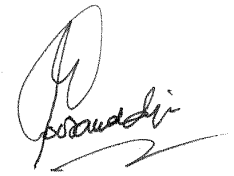
**This is to Certify**:

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

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

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

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



Certifying Engineer: Hoosamuddin S. Bandukwala, Lab Director

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