Compliance Testing, LLC
Previously Flom Test Lab
EMI, EMC, RF Testing Experts Since 1963

toll-free: (866) 311-3268
fax: (480) 926-3598
http://www.ComplianceTesting.com
info@ComplianceTesting.com

Date:	October 21, 2010
Applicant:	Kenwood USA Corporation Communications Division 3970 Johns Creek Court, Suite 100 Suwanee, GA 30024
Attention of:	Joel E. Berger, Research & Development Ph: (678) 474-4722 Fax: (687) 474 -4731 E-mail: JBerger@kenwoodusa.com
Equipment:	TK-3000-1
FCC ID:	ALH437300
FCC Rules:	Part 90

Enclosed please find your copy of the Engineering Test Report for which you are subject to the restrictions as listed on the attached summary.
This report may not be reproduced, except in full, without written permission from Compliance Testing, LLC.
Please retain a copy of this report for your archival purposes.

Once a Telecommunication Certification Body (TCB) issues a Grant the Federal Communication Commission (FCC) has 30 days to review the application and request added information. It is your decision whether or not to market the equipment subject to a possible recall before the end of the 30 days.

If your equipment is still retained by us, it will be returned to you 30 days after approval is achieved. Our invoice for services has been directed to your Accounts Payable Department.

For any additional information please contact us.

Sincerely,

Compliance Testing

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Test Report

for

FCC ID: ALH437300

Model: TK-3000-1

Description: UHF FM TRANSCEIVER

to

Federal Communications Commission

Rule Part(s) 90

Date of Report: October 21, 2010

On the Behalf of the Applicant:	Kenwood USA Corporation
At the Request of:	Kenwood USA Corporation Communications Division 3970 Johns Creek Court, Suite 100 Suwanee, GA 30024
Attention of:	Joel E. Berger, Research & Development Ph: (678) 474-4722 Fax: (687) 474 -4731 E-mail: JBerger@kenwoodusa.com

By
Compliance Testing, LLC
3356 N. San Marcos Place, Suite 107
Chandler, Arizona 85225-7176
(866) 311-3268 phone, (480) 926-3598 fax

Test Report Revision History

Revision	Date	Revised By	Reason for revision
1.0	October 21, 2010	Greg C	Original Document

The Applicant has been cautioned as to the following:

15.21 **Information to the User**

The user's 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.

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

Greg Corbin

Certifying Engineer: Greg Corbin

Table of Contents

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: 90.

Standard Test Conditions and Engineering Practices

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

In accordance with ANSI/C63.4-2009, 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.

Environmental Conditions		
Temperature	**Humidity**	**Pressure**
29.9 deg C	29%	30 in

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

A2LA

"A2LA has accredited Compliance Testing, LLC, in 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

ACCREDITED
TESTING CERT# 2152.01

FCC OATS Reg. #933597

IC Reg. # 2044A-1

List of General Information Required for Certification

In Accordance with FCC Rules and Regulations,
Volume II, Part 2 and to Part 90

Sub-part 2.1033
(c)(1):

Name and Address of Applicant: Kenwood USA Corporation
Communications Division
3970 Johns Creek Court, Suite 100
Suwanee, GA 30024

Manufacturer: Kenwood Corporation
2967-3, Ishikawa-machi
Hachioji-shi, Tokyo 192-8525
Japan

(c)(2):**FCC ID**: ALH437300

Model Number: TK-3000-1

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

Please see attached exhibits

(c)(4): **Type of Emission**: FM

(c)(5): **Frequency Range, MHz**: 440 – 480 MHz

(c)(6): **Power Rating, Watts:** 4

____ Switchable **X** Variable ____ N/A

FCC Grant Note:

(c)(7): **Maximum Allowable Power, Watts:** 5

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	=	0.72
Collector Voltage, Vdc	=	7.5
Supply Voltage, Vdc	=	7.5

(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

Test Results Summary

Specification	Test Name	Pass, Fail, N/A	Comments
2.1046	Carrier Output Power (Conducted)	Pass	
2.1051	Unwanted Emissions (Transmitter Conducted)	Pass	
2.1053	Field Strength of Spurious Radiation	Pass	
90.210	Emission Masks (Occupied Bandwidth)	Pass	
2.1047	Audio Low Pass Filter (Voice Input)	Pass	
2.1047	Audio Frequency Response	Pass	
2.1047	Modulation Limiting	Pass	
90.213	Frequency Stability (Temperature Variation)	Pass	
90.213	Frequency Stability (Voltage Variation)	Pass	

Accessories used during testing:

Type	Quantity	Manufacturer	Model	Serial No.	FCC ID
Antenna	1	Kenwood	T90-0196-05	0350	N/A
Audio Test Jig	1	Kenwood	N/A	0050	N/A
Rapid Charger	1	Kenwood	KSC-35S	0326	N/A
AC Adapter	1	Kenwood	W08-1247	0050	N/A

Name of Test: Carrier Output Power (Conducted)
Specification: 2.1046
Test Equipment Utilized: i00228, i00344

Engineer: G. Corbin
Test Date: 10/15/2010

Measurement Procedure

The Equipment Under Test (EUT) was connected directly to a power meter input. The peak readings were taken and the result was then compared to the limit.

Test Setup

High Power Transmitter Peak Output Power

Tuned Frequency MHz	Recorded Measurement dBm	Result
440.05	36.02	Pass
460.05	36.05	Pass
479.95	36.04	Pass

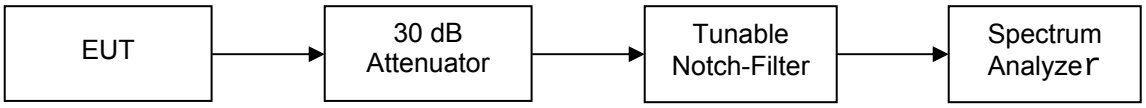
Name of Test: Conducted Spurious Emissions
Specification: 2.1051
Test Equipment Utilized: i00124, i00331

Engineer: G. Corbin
Test Date: 10/19/2010

Test Procedure

The EUT was connected directly to a spectrum analyzer to verify that the UUT met the requirements for spurious emissions. A tunable notch filter was utilized to ensure the fundamental did not put the spectrum analyzer into compression. The resolution bandwidth set for 100 kHz and the reference level was adjusted to ensure the system had sufficient dynamic range to measure spurious emissions. The frequency range from 30 MHz to the 10th harmonic of the fundamental transmitter was observed and plotted.

Test Setup

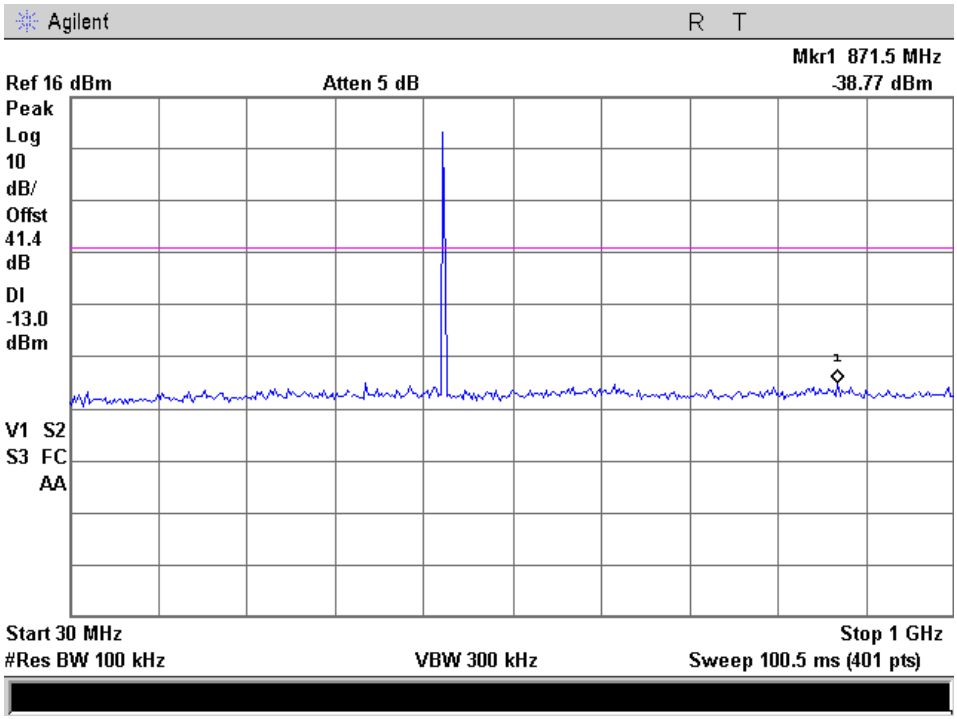


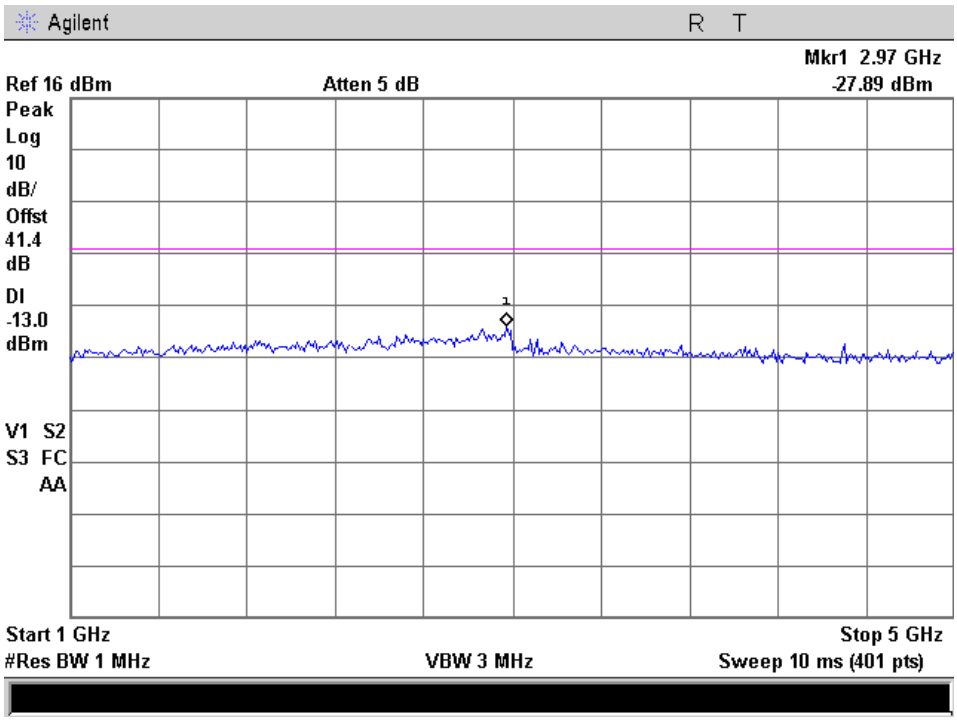
High Power Conducted Spurious Emissions Summary Test Table

Tuned Frequency (MHz)	Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Specification Limit (dBm)	Result
440.05	2970	-29.9	-13	Pass
460.05	2970	-28.6	-13	Pass
479.95	2960	-28.1	-13	Pass

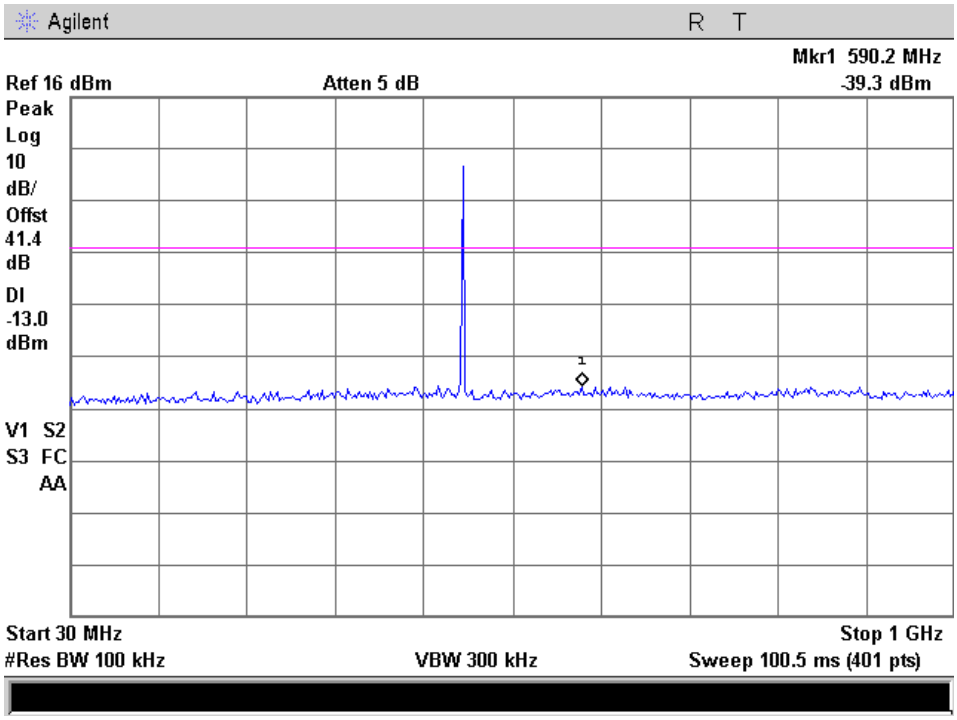
Conducted Spurious Emissions Test Plots

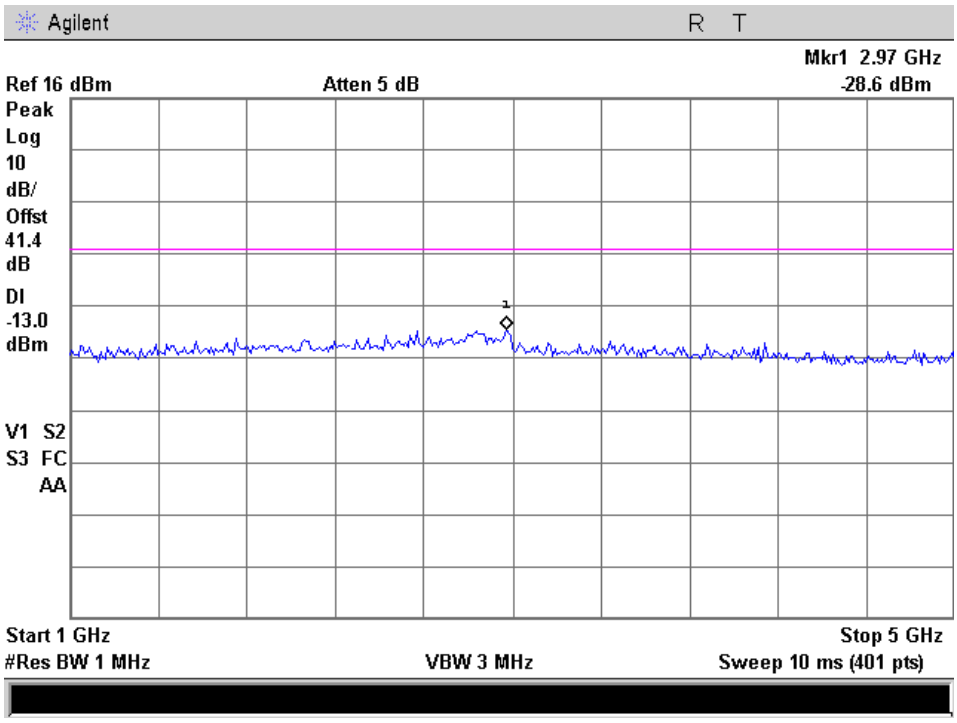
Tuned Freq = 440.05 MHz



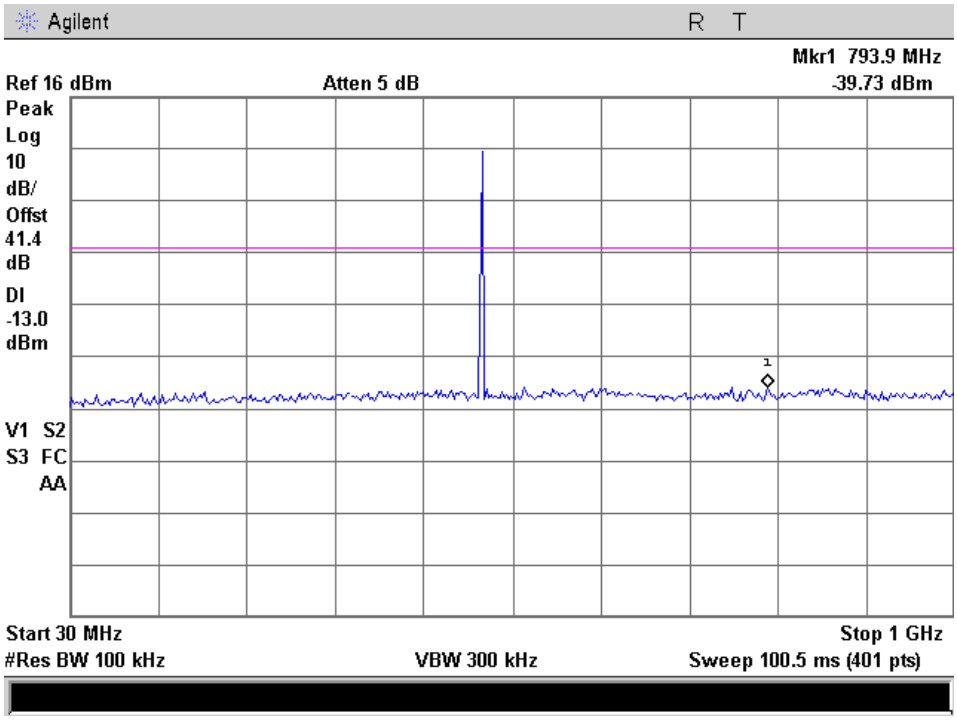


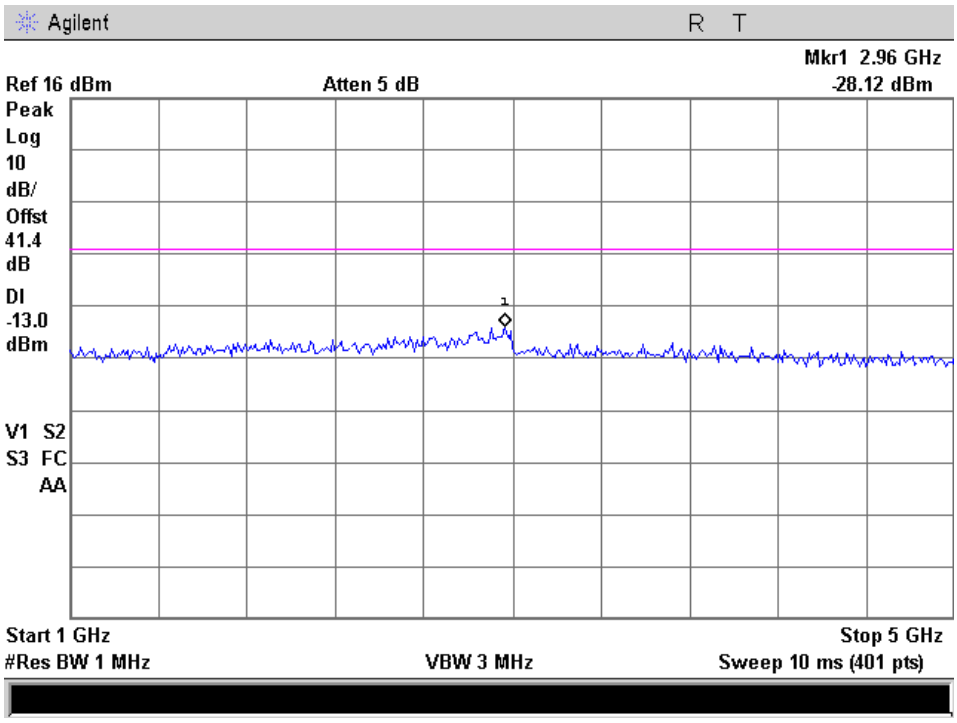
Tuned Frequency = 460.05 MHz





Tuned Frequency = 479.95 MHz





Name of Test: Field Strength of Spurious Radiation
Specification: 2.1053 **Engineer**: G. Corbin
Test Equipment Utilized: i00033, i00103, i00124, i00267 **Test Date**: 10/19/2010

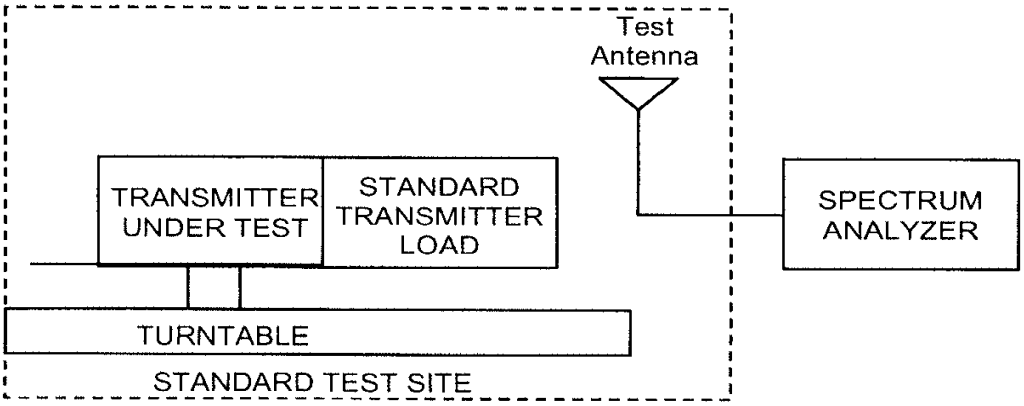
Test Procedure

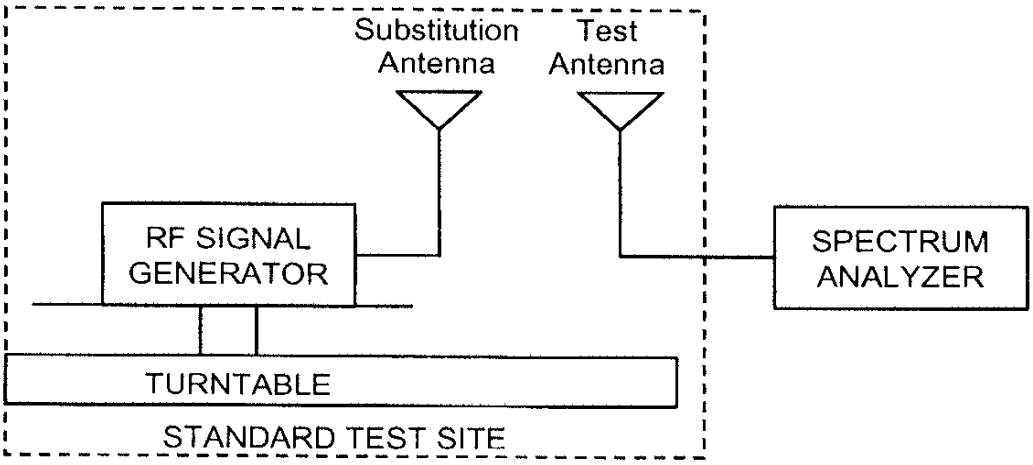
A) Connect the equipment as illustrated
B) Adjust the spectrum analyzer for the following settings:
1) Resolution Bandwidth 100 kHz (<1 GHZ), 1 MHZ (> 1GHz).
2) Video Bandwidth ≥ 3 times Resolution Bandwidth, or 30 kHz
3) Sweep Speed ≤2000 Hz/second
4) Detector Mode = Mean or Average Power
C) Place the 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.
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.
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 I)

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

Test Setup


Test
Antenna
TRANSMITTER
UNDER TEST
STANDARD
TRANSMITTER
LOAD
SPECTRUM
ANALYZER
TURNTABLE
STANDARD TEST SITE


Substitution
Antenna
Test
Antenna
RF SIGNAL
GENERATOR
SPECTRUM
ANALYZER
TURNTABLE
STANDARD TEST SITE

440.05 Radiated Spurious Emissions Test Results
Tuned Freq = 440.05 MHz

Emission Frequency (MHz)	Measured Level (dBm)	Correction Factor (dB)	Corrected Value (dBm)	Limit (dBm) ERP/EIRP	Result
880.10	-71.2	25.3	-45.9	-13	Pass
1320.15	-75.0	28.4	-46.6	-13	Pass
1760.20	-75.5	30.5	-45.0	-13	Pass
2200.25	-77.3	32.5	-44.8	-13	Pass

Radiated Spurious Emissions Test Results
Tuned Freq = 460.05 MHz

Emission Frequency (MHz)	Measured Level (dBm)	Correction Factor (dB)	Corrected Value (dBm)	Limit (dBm) ERP/EIRP	Result
920.10	-78.5	26.2	52.3	-13	Pass
1380.15	-79.3	28.6	50.7	-13	Pass
1840.2	-81.7	30.9	50.8	-13	Pass
2300.25	-84.7	32.8	51.9	-13	Pass

Radiated Spurious Emissions Test Results
Tuned Freq = 479.95 MHz

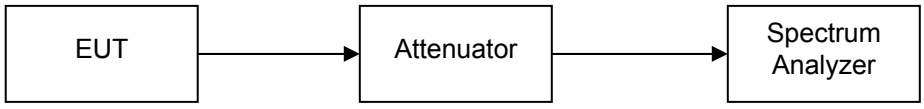
Emission Frequency (MHz)	Measured Level (dBm)	Correction Factor (dB)	Corrected Value (dBm)	Limit (dBm) ERP/EIRP	Result
959.90	-72.3	26.6	-45.7	-13	Pass
1439.85	-73.6	28.8	-44.8	-13	Pass
1919.80	-77.8	31.3	-46.5	-13	Pass
2399.75	-78.1	33.1	-45.0	-13	Pass

No other emissions were detected. All emissions were less than –13 dBm.

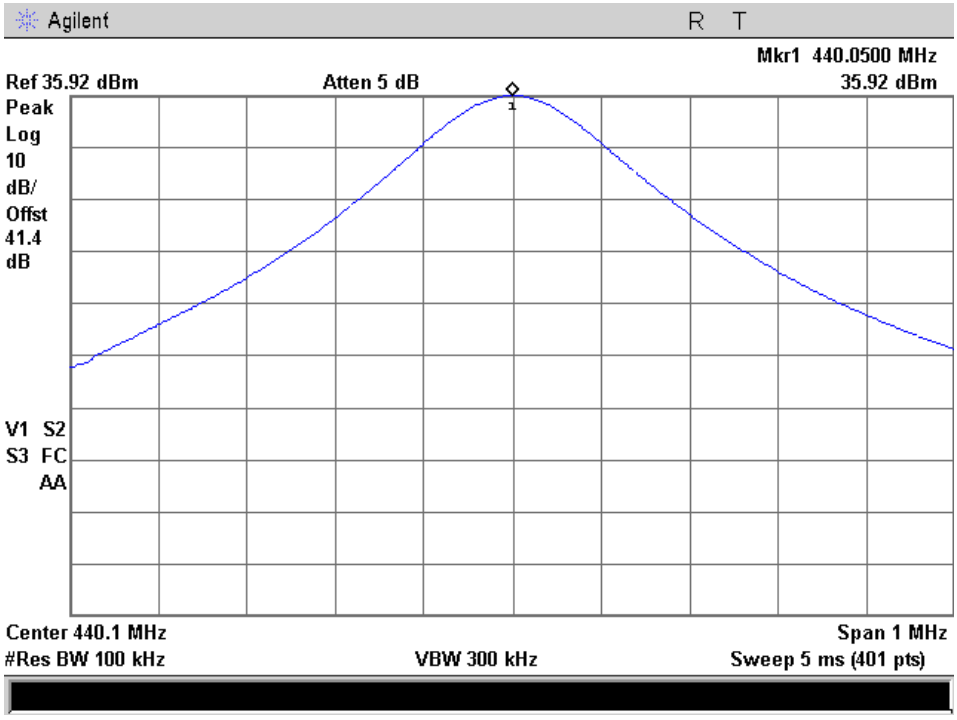
Name of Test: Emission Masks (Occupied Bandwidth)
Specification: 90.210 **Engineer**: G. Corbin
Test Equipment Utilized: i00118, i00331 **Test Date**: 10/19/2010

The EUT was connected directly to a spectrum analyzer to verify that the EUT meets the required emissions mask. A reference level plot is provided to verify that the peak power was established prior to testing the mask. A modulation frequency of 2.5 kHz at a level of 500 mVPP was input into the EUT for the analog tests and an internal test pattern was utilized for the digital input.

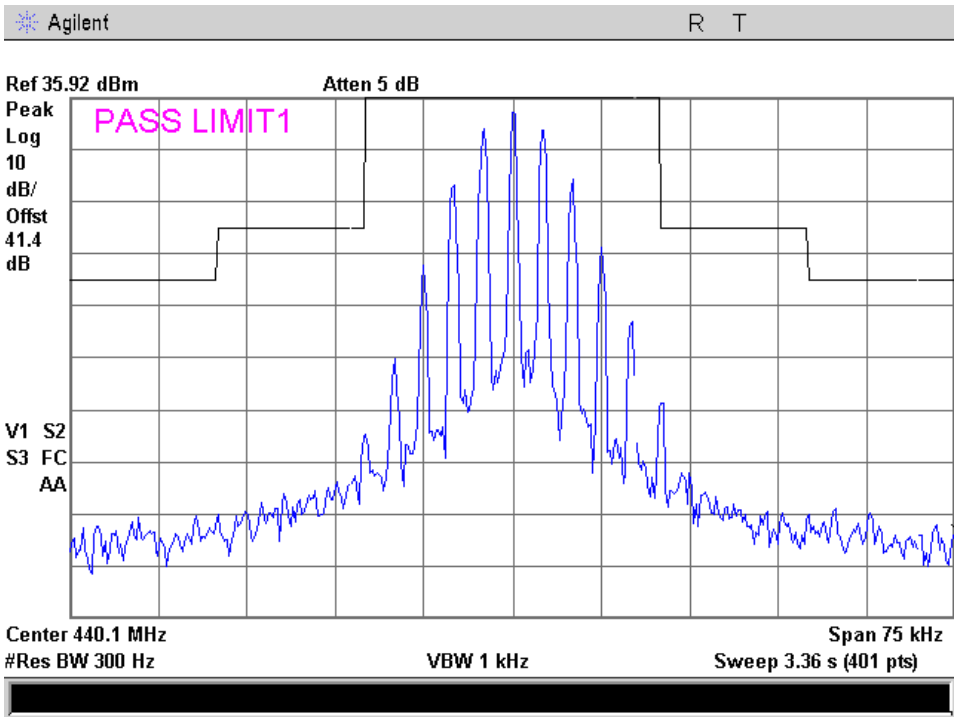
Test Setup



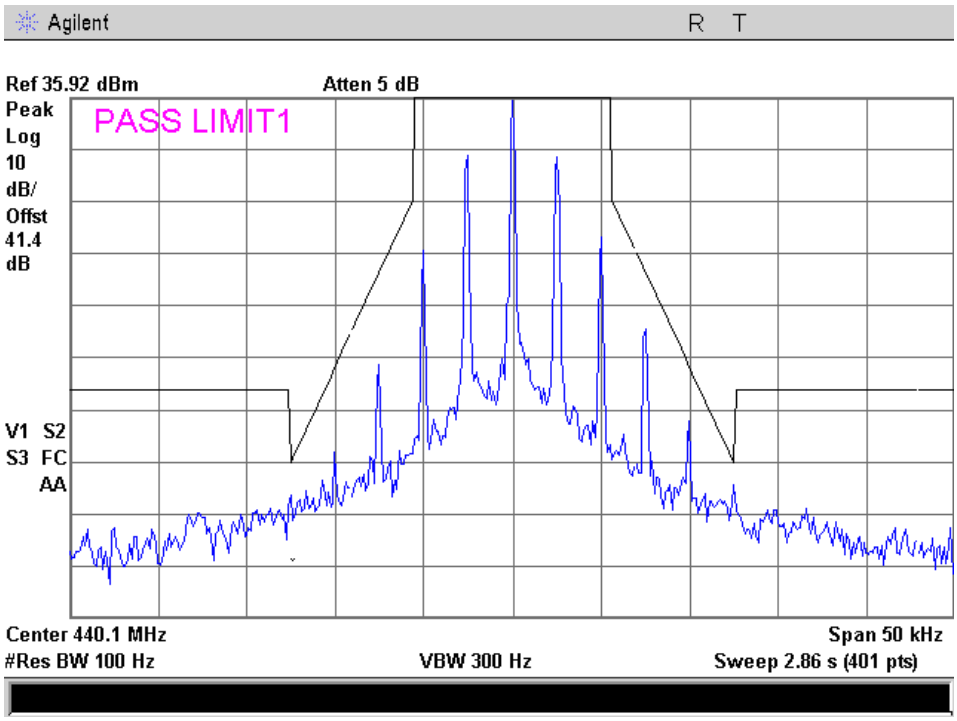
440.05 MHz Reference



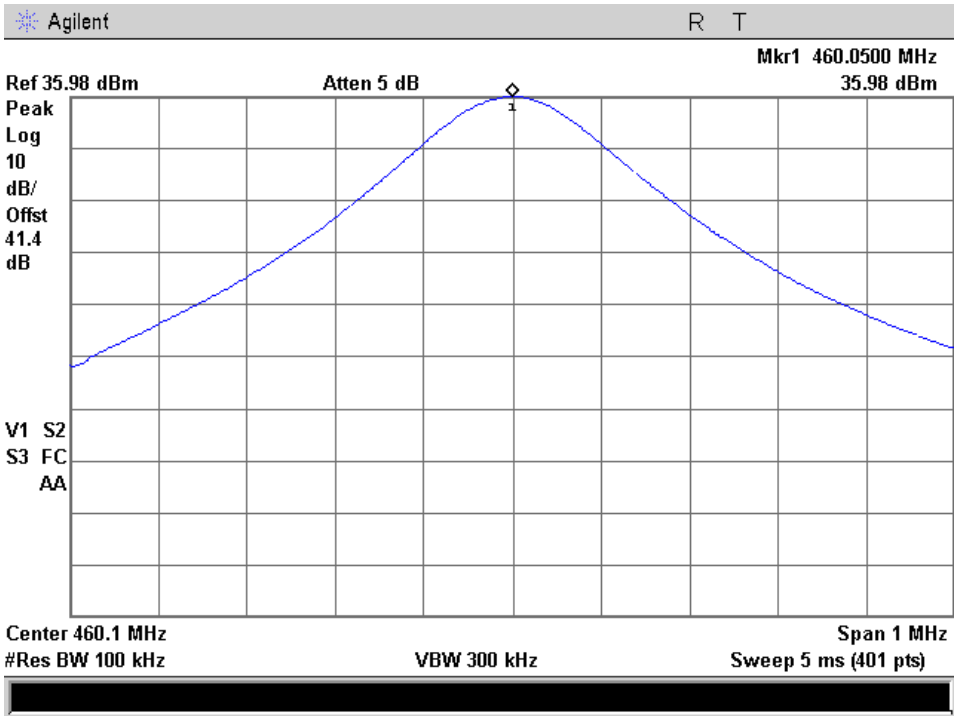
440.05 MHz Mask, 25 kHz BW



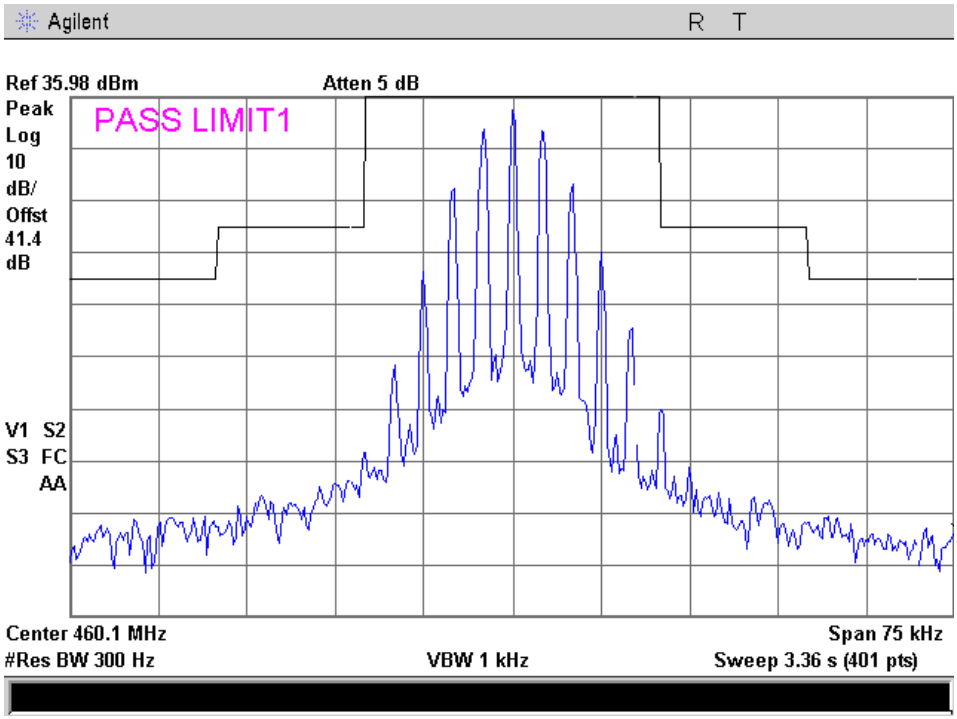
440.05 MHz Mask,12.5 kHz BW



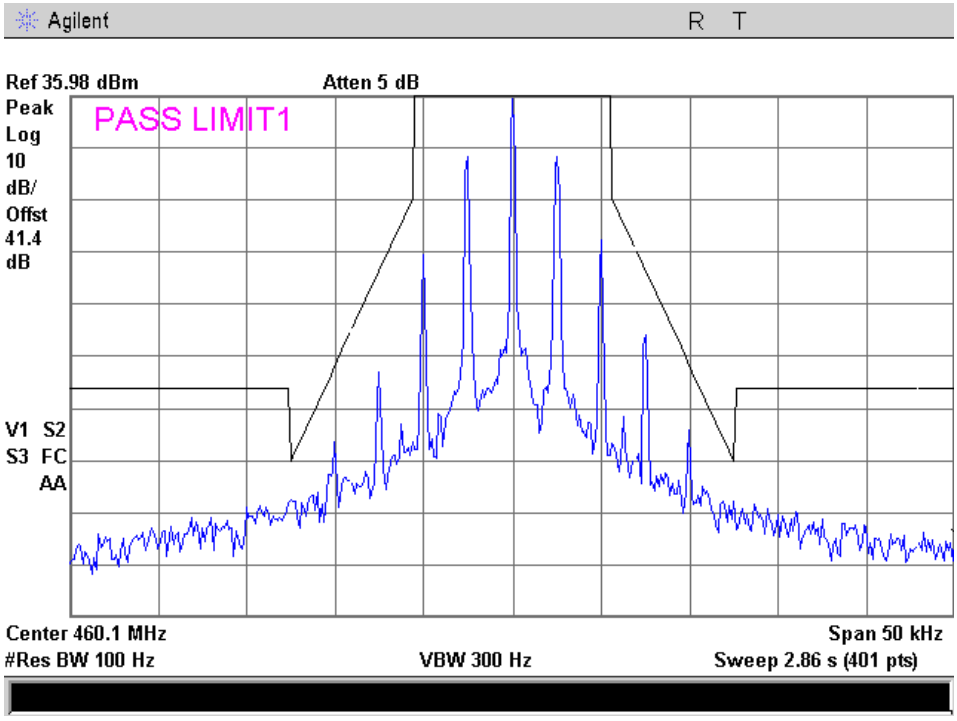
460.05 MHz Reference



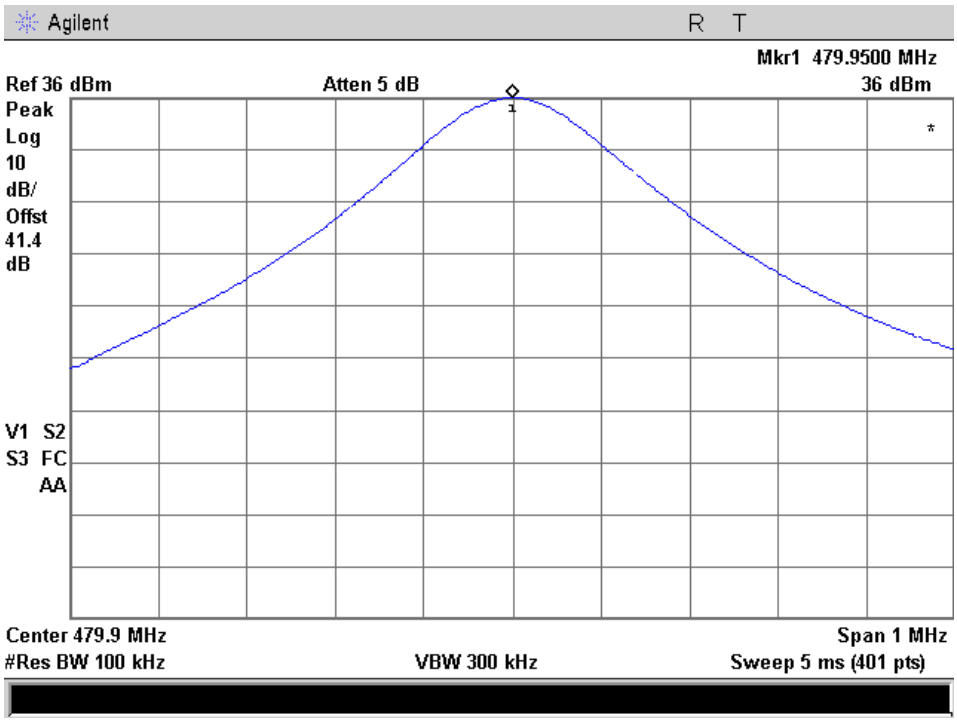
460.05 MHz Mask, 25 kHz BW



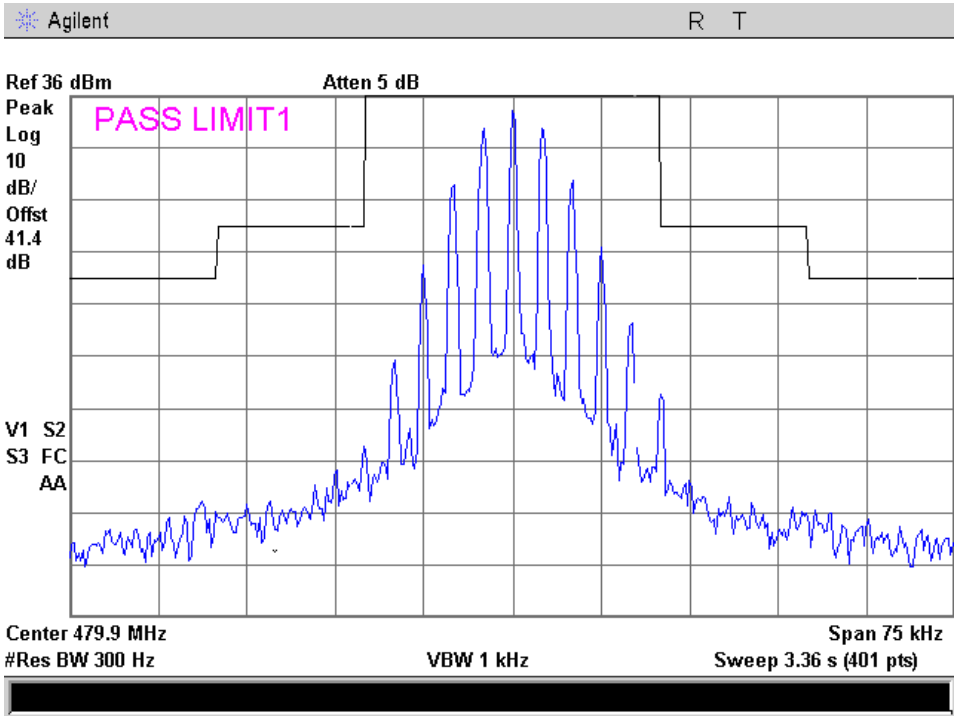
460.05 MHz Mask,12.5 kHz BW



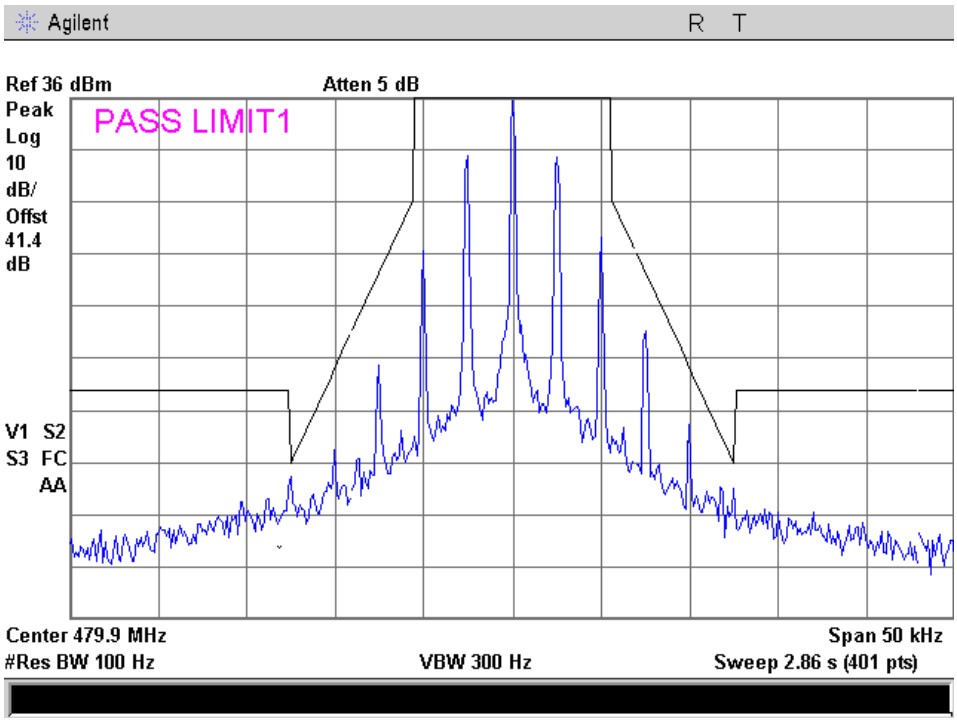
479.95 MHz Reference



479.95 MHz Mask, 25 kHz BW



479.95 MHz Mask,12.5 kHz BW



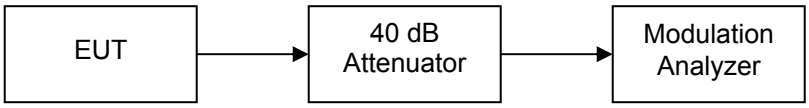
Name of Test: Transient Frequency Behavior
Specification: 90.214
Test Equipment Utilized: i00345

Engineer: G. Corbin
Test Date: 10/15/2010

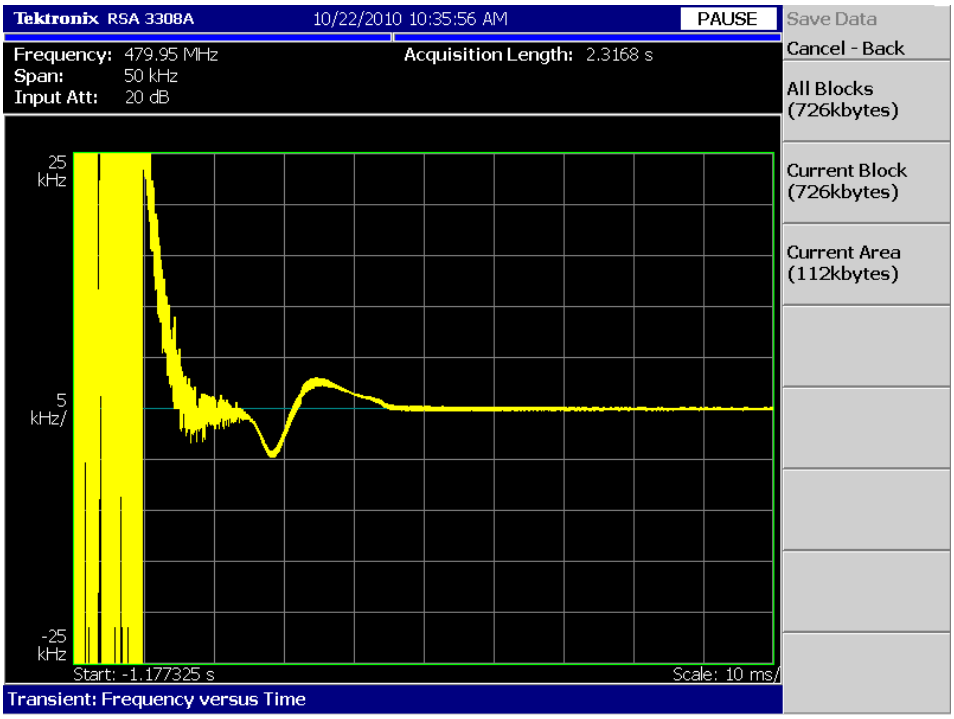
Measurement Procedure

The EUT was connected directly to a Modulation Analyzer through an attenuator to verify that the EUT meets the required Transient Frequency Behavior response per the specification. The modulation analyzer is a real time spectrum analyzer with integrated demodulation, audio measurement capabilities, and timing analysis. The turn on and turn off transient timing was measured and recorded.

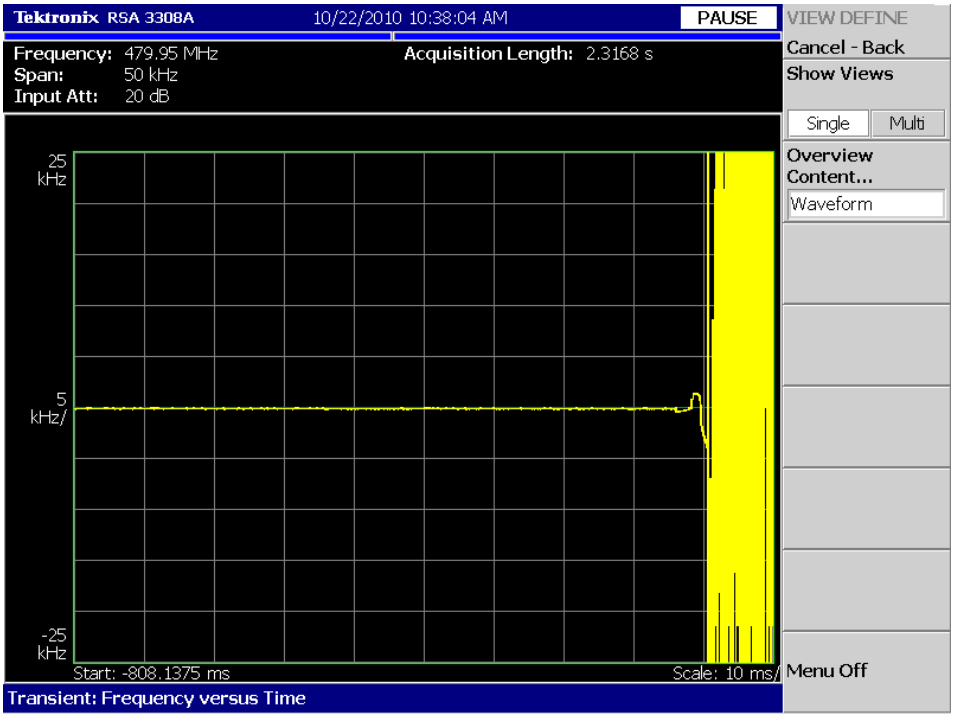
Test Setup



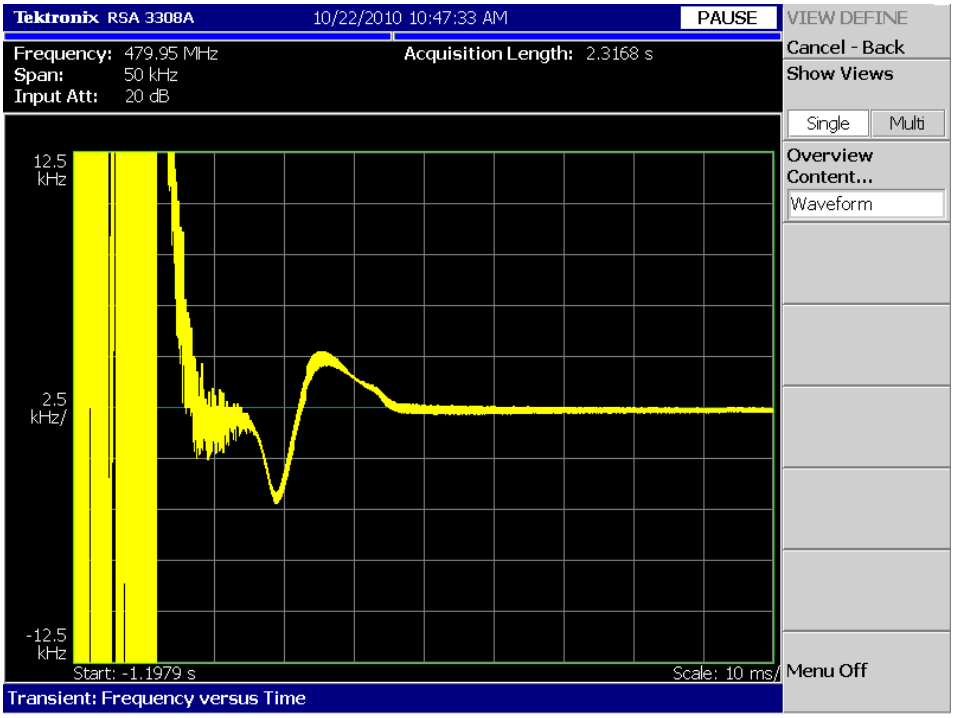
ON Time, 25 kHz CH. BW



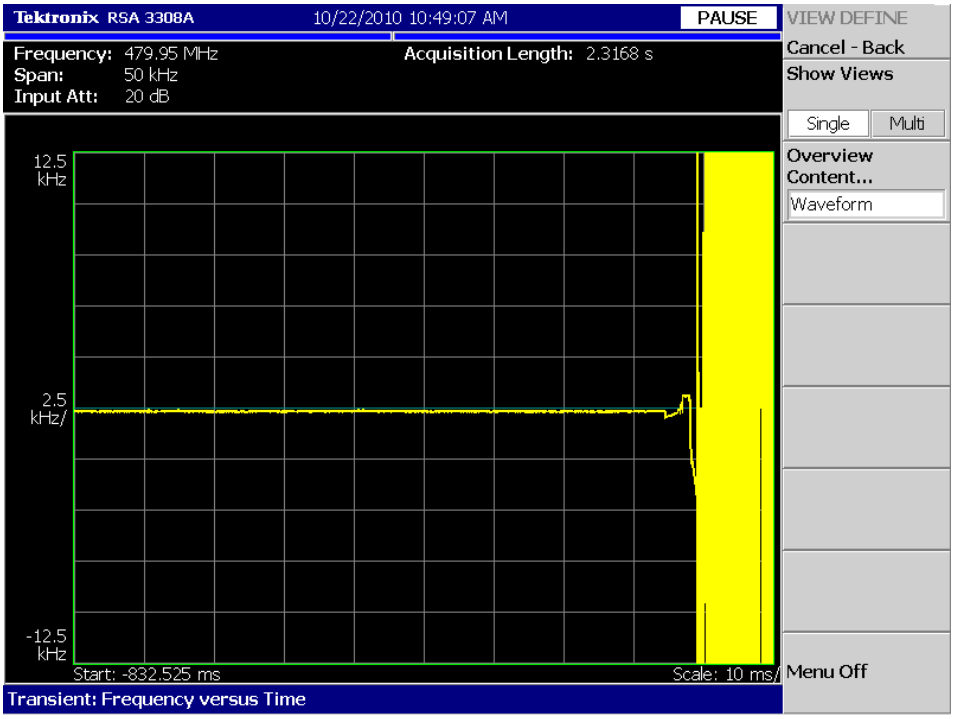
Off Time, 25 kHz CH. BW



ON Time, 12.5 kHz CH. BW



Off Time, 12.5 kHz CH. BW



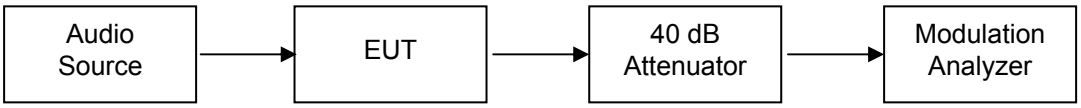
Name of Test: Audio Low Pass Filter (Voice Input)
Specification: 2.1047
Test Equipment Utilized: i00118, i00345

Engineer: G. Corbin
Test Date: 10/15/2010

Measurement Procedure

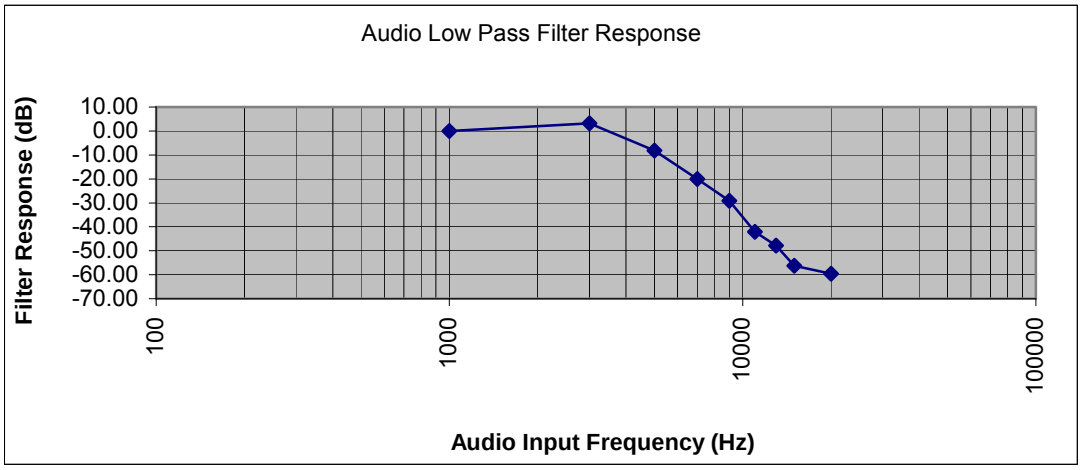
The EUT was connected directly to a Modulation Analyzer through an attenuator. The audio source was tuned across the required audio frequency range and the audio low pass filter response was measured and plotted.
The modulation analyzer is a real time spectrum analyzer with integrated demodulation, audio measurement capabilities, and timing analysis.

Test Set-Up

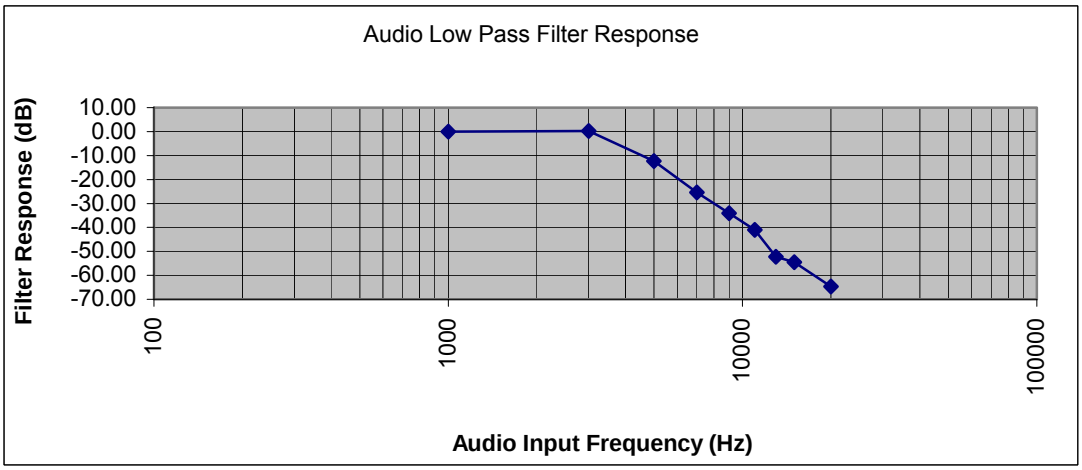


Measurement Results

25 kHz CH. BW



12.5 kHz CH. BW



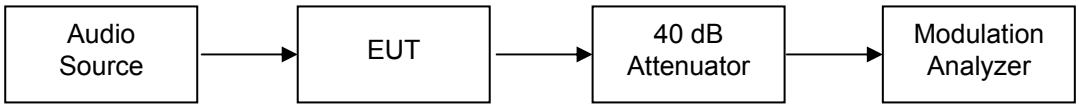
Name of Test: Audio Frequency Response
Specification: 2.1047
Test Equipment Utilized: i00118, i00345

Engineer: G. Corbin
Test Date: 10/15/2010

Measurement Procedure

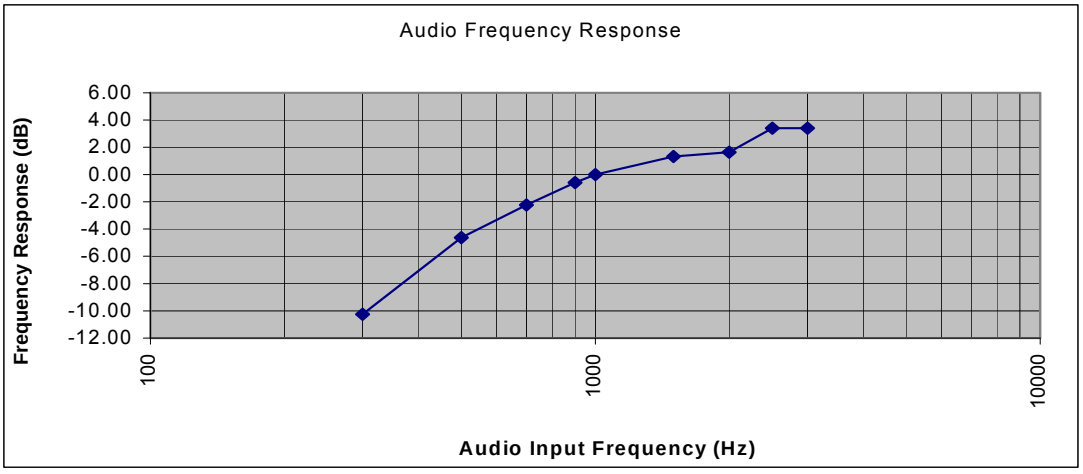
The EUT was connected directly to a Modulation Analyzer through an attenuator. The audio source was tuned across the required audio frequency range and the audio frequency response was measured and plotted.
The modulation analyzer is a real time spectrum analyzer with integrated demodulation, audio measurement capabilities, and timing analysis.

Test Set-Up

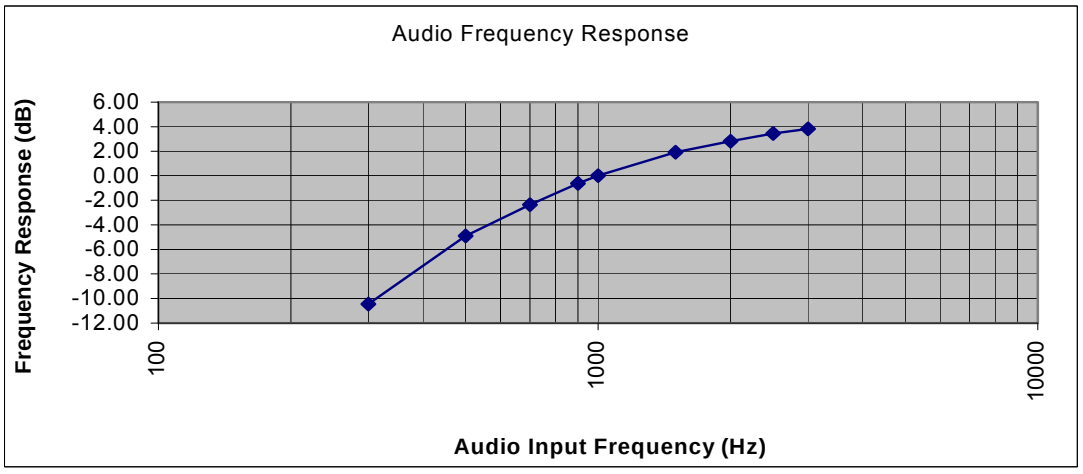


Measurement Results

25 kHz CH. BW



12.5 kHz CH. BW



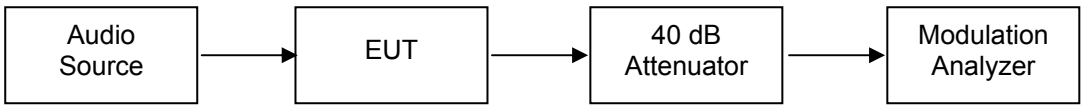
Name of Test: Modulation Limiting
Specification: 2.1047(a)
Test Equipment Utilized: i00118, i00345

Engineer: G. Corbin
Test Date: 10/15/2010

Measurement Procedure

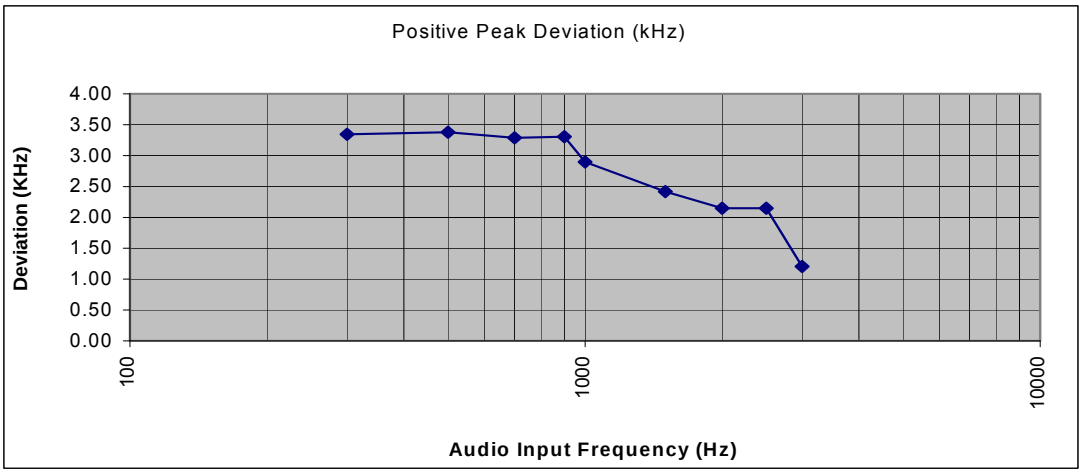
The EUT was connected directly to a Modulation Analyzer through an attenuator. The audio source was tuned across the required audio frequency range and the modulation limiting response was measured and plotted.
The modulation analyzer is a real time spectrum analyzer with integrated demodulation, audio measurement capabilities, and timing analysis.

Test Set-Up

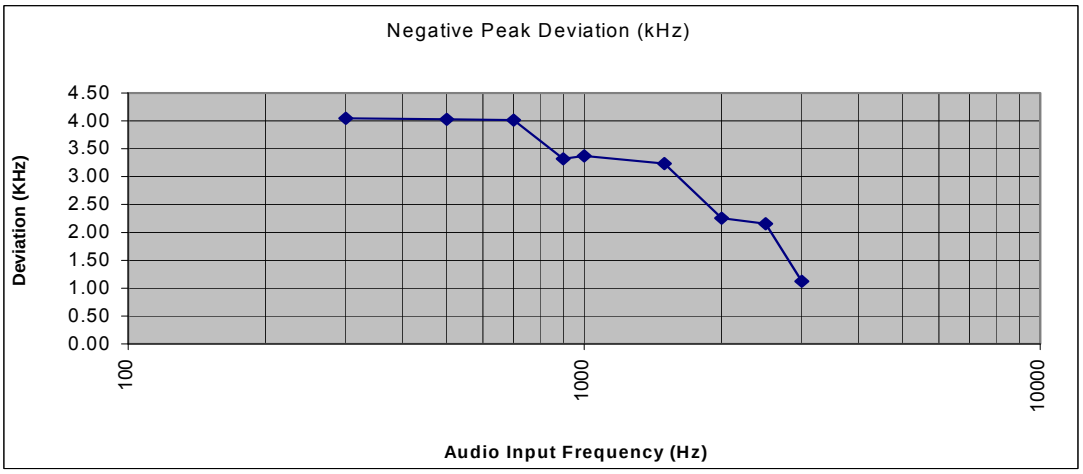


Swept Frequency – 25 kHz CH BW

Measurement Results - Positive Peaks

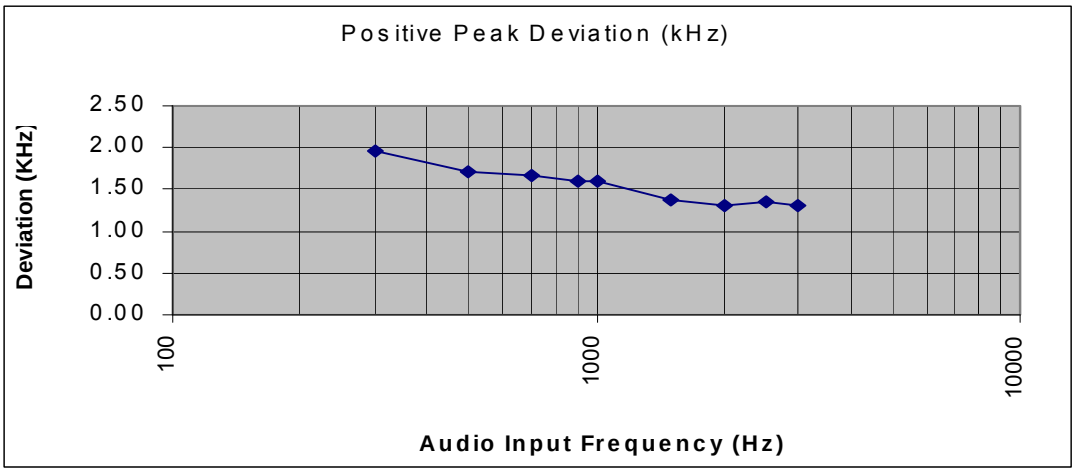


Measurement Results - Negative Peaks

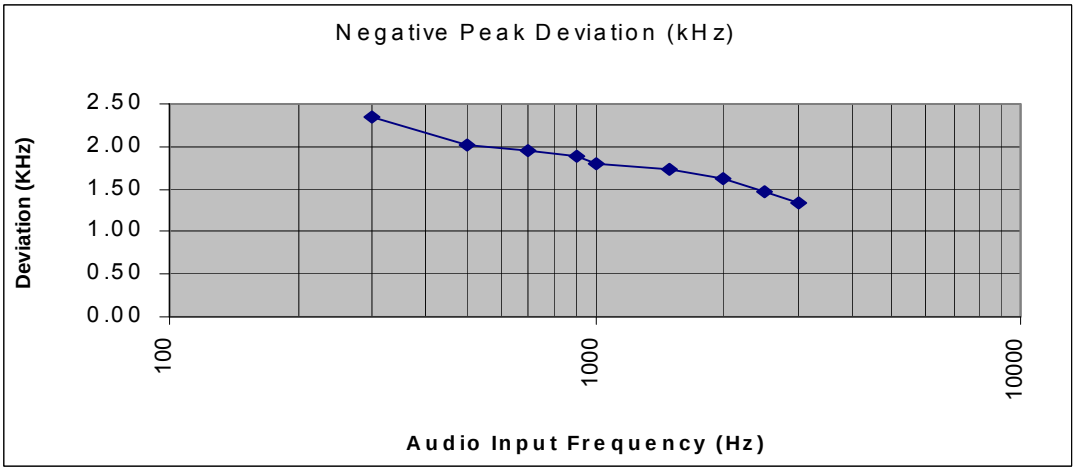


Swept Frequency – 12.5 kHz CH BW

Measurement Results - Positive Peaks



Measurement Results - Negative Peaks

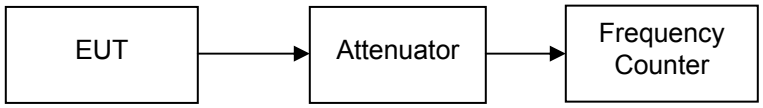


Name of Test: Frequency Stability (Temperature Variation)
Specification: 90.213 **Engineer**: G. Corbin
Test Equipment Utilized: i00019, i00027, i00350 **Test Date**: 10/14/2010

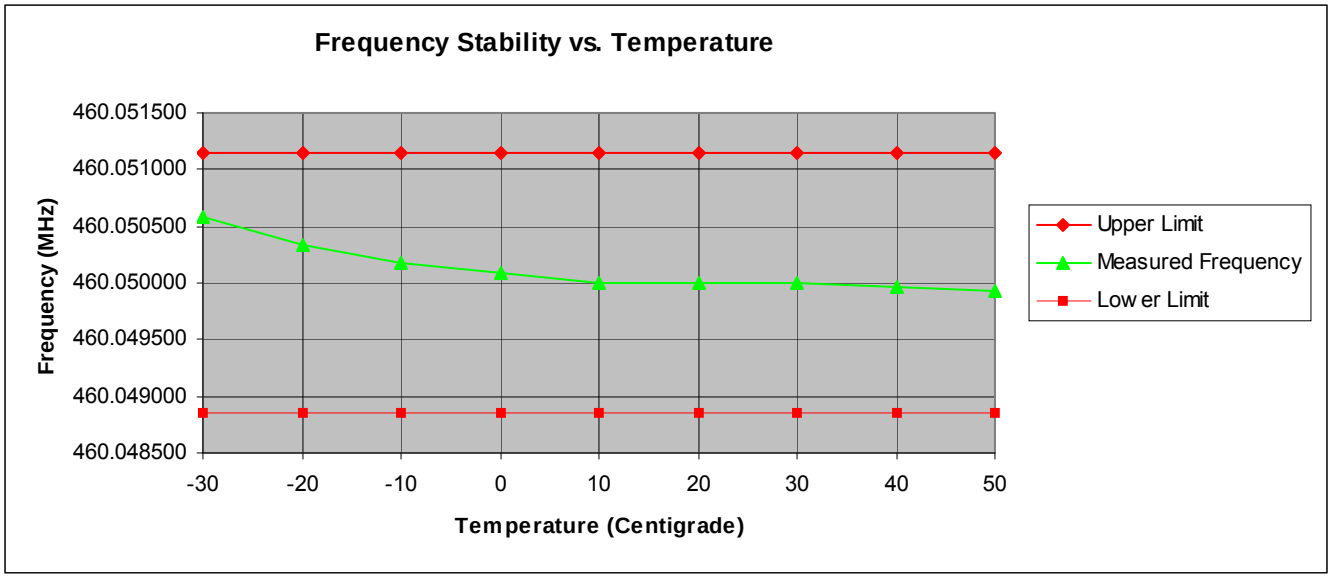
Measurement Procedure

The EUT was placed in an environmental test chamber and the RF output was connected directly to a frequency counter. The temperature was varied from -30ºC to 50ºC in 10ºC increments. After a sufficient time for temperature stabilization the RF output frequency was measured.

Measurement Setup



Measurement Results

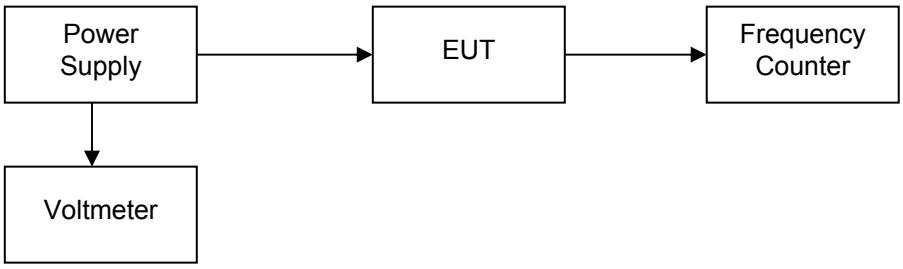


Name of Test: Frequency Stability (Voltage Variation)
Specification: 90.213 **Engineer**: G. Corbin
Test Equipment Utilized: i00019, i00027, i00320, i00350 **Test Date:** 10/14/2010

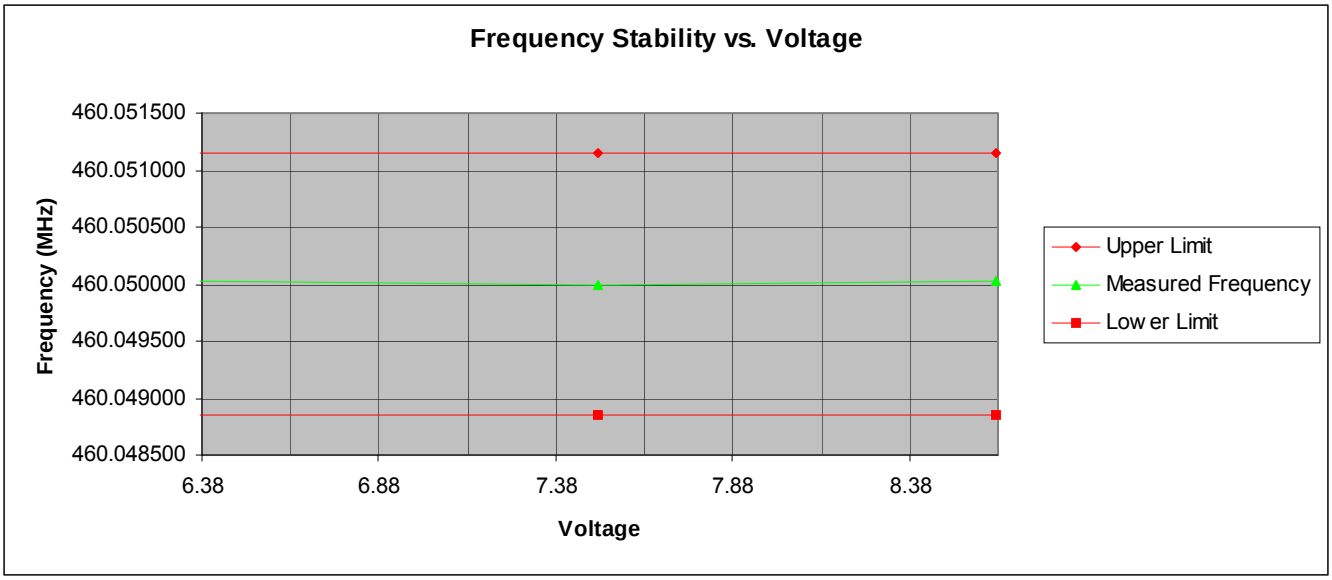
Measurement Procedure

The EUT was placed in a temperature chamber at 25±5°C and connected directly to a frequency counter and variable power supply. The power supply voltage to the EUT was varied from 85% to 115% of the nominal value and the RF output was measured.

Measurement Setup



Measurement Results



Test Equipment Utilized

Description	MFG	Model Number	CT Asset Number	Last Cal Date	Cal Due Date
Power Supply	Kenwood	PR18-3A	i00008	Verify	When used
Frequency Counter	HP	5334B	i00019	2/15/2010	2/15/2011
Temperature Chamber	Tenney	Tenney Jr.	i00027	12/8/2009	12/8/2010
EMI Receiver	HP	8546A	i00033	11/04/2009	11/04/2010
Horn Antenna	EMCO	3115	i00103	11/25/2008	11/25/2010
Function Generator	HP	33120A	i00118	Verify	When used
Tunable Notch Filter	Eagle	TNF-1	i00124	Verify	When used
Dipole Antenna	Ailtech	DM-105A-T3	i00142	Verify	When used
Power Meter	HP	E4418B	i00228	9/17/2010	9/17/2011
Bi-Log Antenna	Schaffner	CBL611C	i00267	11/21/2009	11/21/2011
Voltmeter	Fluke	87III	i00320	2/16/2010	2/16/2011
Spectrum Analyzer	Agilent	E4407B	i00331	11/03/2009	11/03/2010
Power sensor	HP	8485A	i00344	9/15/2010	9/15/2011
Spectrum analyzer	Textronix	RSA3308A	i00345	9/21/2010	9/21/2011
Power Supply	HP	6654A	i00350	Verify	When used
Humidity / Temp Meter	Control Co.	4189CC	I00335	3/27/2009	3/27/2011

In addition to the above listed equipment standard RF connectors and cables were utilized in the testing of the described equipment. Prior to testing these components were tested to verify proper operation.

END OF TEST REPORT