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

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FCC CFR Part 90/95
Test Report

Prepared for: Communications Specialists, Inc

Model: CSTXR.1

Description: Ankle/Wrist Homing Transmitter

FCC ID: CFXTXR-1

to

Federal Communications Commission

Rule Part 90 and 95

Date of Issue: April 28, 2011

On the behalf of the applicant:	**Communications Specialists, Inc.** **426 W. Taft Ave** **Orange, CA 92865-4296**
Attention of:	**Spence Porter, President** **Ph: (800) 854-0547** **Fax: (714) 974-3420** **E-mail: spence@com-spec.com**

Prepared by

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Project No: p1140015

Greg Corbin

Greg Corbin
Project Test Engineer

Test Report Revision History

Revision	Date	Revised By	Reason for Revision
1.0	April 28, 2011	Greg Corbin	Original Document
2.0	May 3, 2011	Karen Springer	FCC ID correction made on page 1 of 19
3.0	May 16, 2011	Greg Corbin	Revised Radiated Output Power test method per TIA-603-C, section 2.2.17.2

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ILAC / A2LA

Compliance Testing, LLC, has been accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer joint ISO-ILAC-IAF Communiqué dated January 2009)

The tests results contained within this test report all fall within our scope of accreditation, unless noted in the table below

Please refer to http://www.compliancetesting.com/labscope.html for current scope of accreditation.

Testing Certificate Number: **2152.01**

FCC OATS Reg, #933597

IC Reg. #2044A-1

Non-accredited tests contained in this report:
N/A

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 cold 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.

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 and 95.

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**
27.6 deg C	11.5 %

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

Test Result Summary

Specification Part 90	Specification Part 95	Test Name	Pass, Fail, N/A	Comments
90.259(a)(4)	95.639(e)	Radiated Output Power	Pass	
2.1053	95.635(c)(3)	Field Strength of Spurious Radiation	Pass	
90.259(a)(7)	95.635(c)(3)	Emission Masks (Occupied Bandwidth)	Pass	
90.213	95.629(d)(2)	Frequency Stability (Temperature Variation)	Pass	
90.213	95.629(d)(2)	Frequency Stability (Voltage Variation)	Pass	

Accessories used during testing:

Accessories:

Qty	Type	Make, Model	S/N	Description
None				

EUT Description:

The EUT is a wrist or ankle worn transmitter that is used as a homing device to locate persons by Doppler positioning or triangulation under authority or agreement with law enforcement agencies.
The device is programmed at the factory to transmit on any one of 200 individual narrowband channels in the Low Power Radio Service (LPRS).
The EUT transmits CW signals with no modulation.
The EUT is powered by a CR2450 Lithium battery (3.0 vdc) and uses a TCXO oscillator.

Radiated Output Power

Name of Test:	Radiated Output Power	
Specification:	90.259(a)(4), 95.639(e)	**Engineer: Greg Corbin**
Test Equipment Utilized:	i00267, i00379	**Test Date: 5/16/2011**

Measurement Procedure

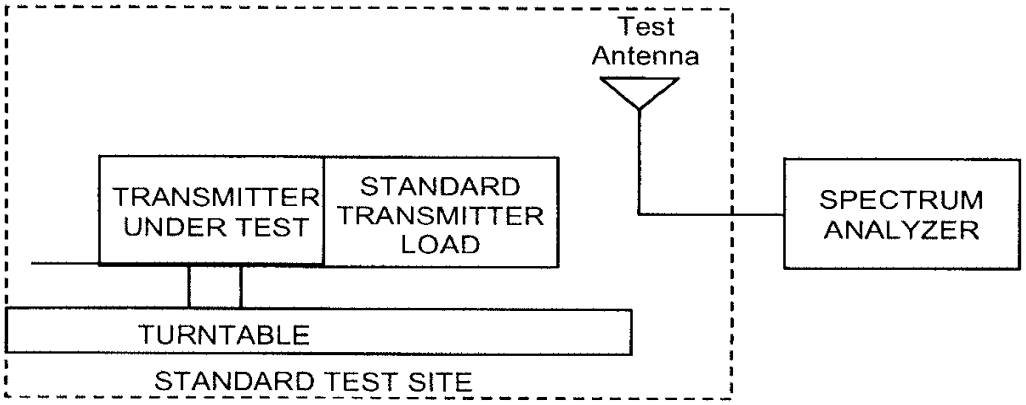
The EUT was tested in an Open Area Test Site (OATS) set 3m from the receiving antenna. A EMI receiver was used to measure the radiated output power per TIA-603-C section 2.2.17.2 Effective Radiated Power (ERP).

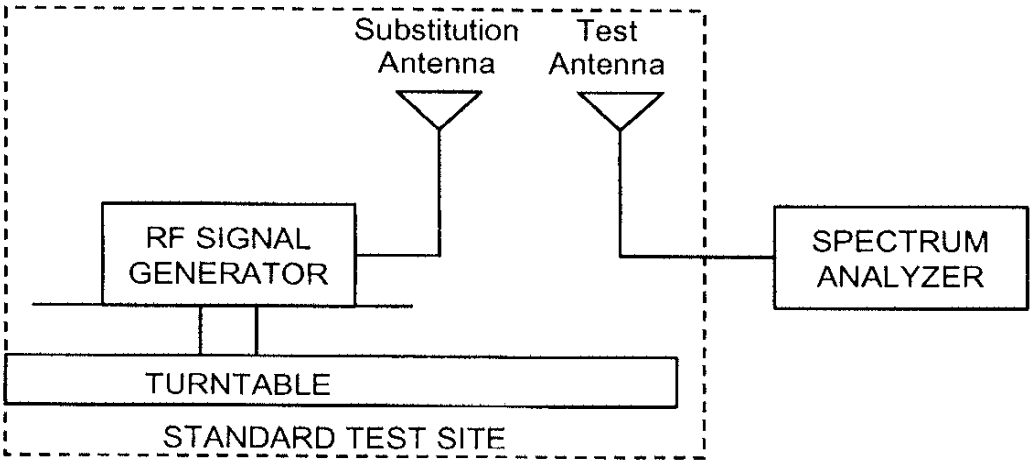
RX Antenna and RX cable correction factors were input to the EMI receiver before recording any measurements.

The measured level was recorded after maximizing the transmitter output power by rotating the turntable 360 deg and varying the antenna height from 1 – 4 meters in both the horizontal and vertical polarization.

The measured loss was recorded by replacing the transmitter with a signal generator set to 0 dBm and a vertically polarized half-wave dipole. The RX antenna height was optimized before recording the measured loss.

Test Setup





RBW = 100 KHz,
VBW = 300 KHz
Detector – Peak

Measured Loss = Generator Output Level – EMI receiver reading
Final Power Level (ERP) = Measured Power Level – Measured Loss

Transmitter Peak Output Power

Tuned Frequency MHz	Measured Power Level dBm	Measured Loss dB	Final Power Level dBm (ERP)	Limit dBm	Result
216.003	-37.8	9.5	-28.3	20	Pass
216.997	-37.7	9.5	-28.2	20	Pass
219.997	-39.5	9.5	-30.0	20	Pass

Field Strength of Spurious Radiation

Name of Test:	Field Strength of Spurious Radiation	
Specification:	2.1053, 95.635(c)(3)	**Engineer: Greg Corbin**
Test Equipment Utilized:	i00142, i00147, i00148, i00266, i00267, i00379	**Test Date:** 4/27/2011

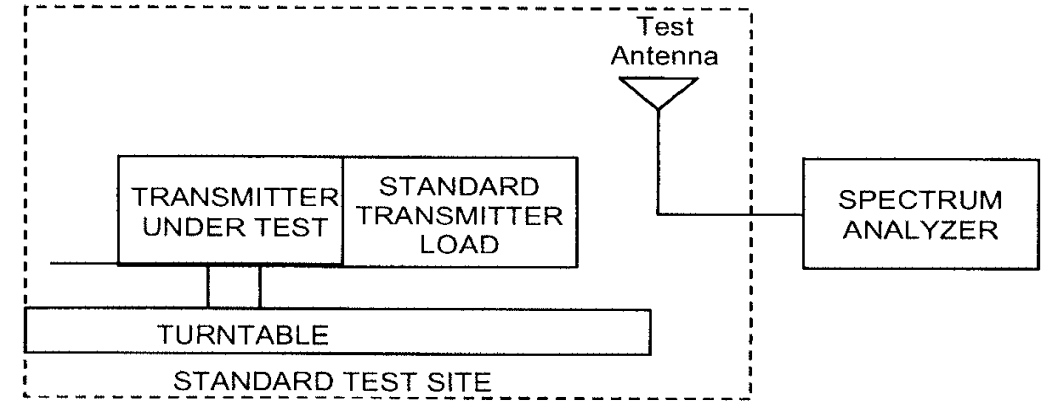
Test Procedure

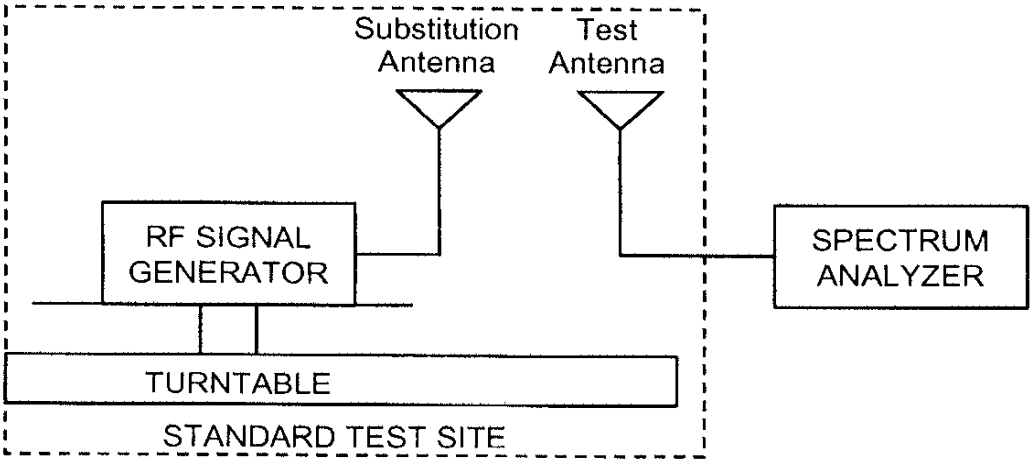
A) Connect the equipment as illustrated
B) Adjust the spectrum analyzer for the following settings:
    1) Resolution Bandwidth 100 kHz (< 1 GHZ), 1 MHZ (> 1GHz)
    2) Video Bandwidth ≥ 3 times Resolution Bandwidth, or 30 kHz
    3) Sweep Speed ≤2000 Hz/second
    4) Detector Mode = Mean or Average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

Radiated Spurious Emissions Test Results

Tuned Frequency (MHz)	Emission Frequency (MHz)	Measured Level (dBm)	Correction Factor (dB)	Corrected Value (dBm)	Limit (dBm)	Margin (dB)
216.003	432.006	-104.7	18.9	-85.8	-25	-60.8
216.003	648.009	-109.4	22.5	-86.9	-25	-61.9
216.003	864.012	-113.6	25.1	-88.5	-25	-63.5
216.997	433.994	-99.5	18.9	-80.6	-25	-55.6
216.997	650.991	-109.4	22.5	-86.9	-25	-61.9
216.997	867.988	-111	25.1	-85.9	-25	-60.9
219.997	439.994	-102.7	18.9	-83.8	-25	-58.8
219.997	650.991	-111.1	22.5	-88.6	-25	-63.6
219.997	867.988	-111.8	25.1	-86.7	-25	-61.7

No other emissions were detected. All emissions were greater than –25 dBm.

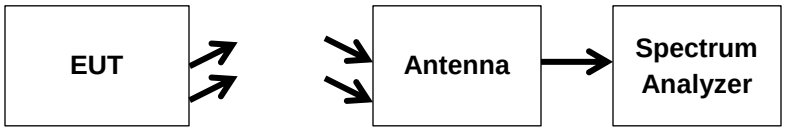
Emission Masks (Occupied Bandwidth)

Name of Test:	Emission Masks (Occupied Bandwidth)	
Specification:	90.259(a)(7) , 95.635(c)(3)	**Engineer: Greg Corbin**
Test Equipment Utilized:	i00267, i00379	**Test Date: 4/27/2011**

Test Procedure

The EUT was tested in an Open Area Test Site (OATS) set 3m from the receiving antenna. A spectrum analyzer was used to measure the bandwidth. The EUT transmits a CW signal with no modulation.
For the Part 90 the -20 dB BW was measured with the RBW set to >1% of the span.
For the Part 95, the emission mask from Part 95.635(c)(3) was used.

Test Setup

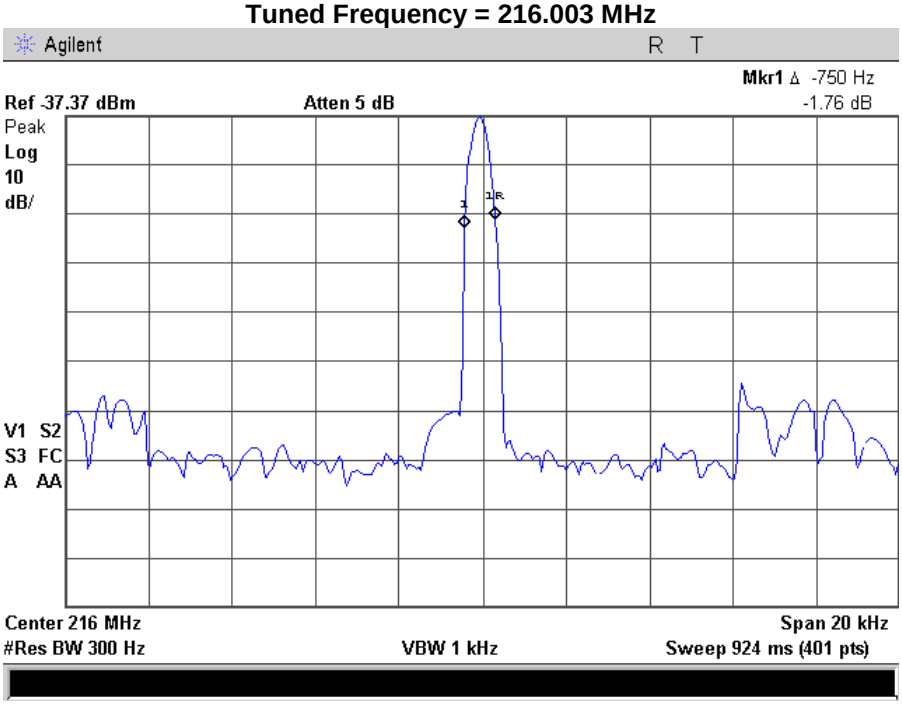


Part 90
-20 dB Bandwidth

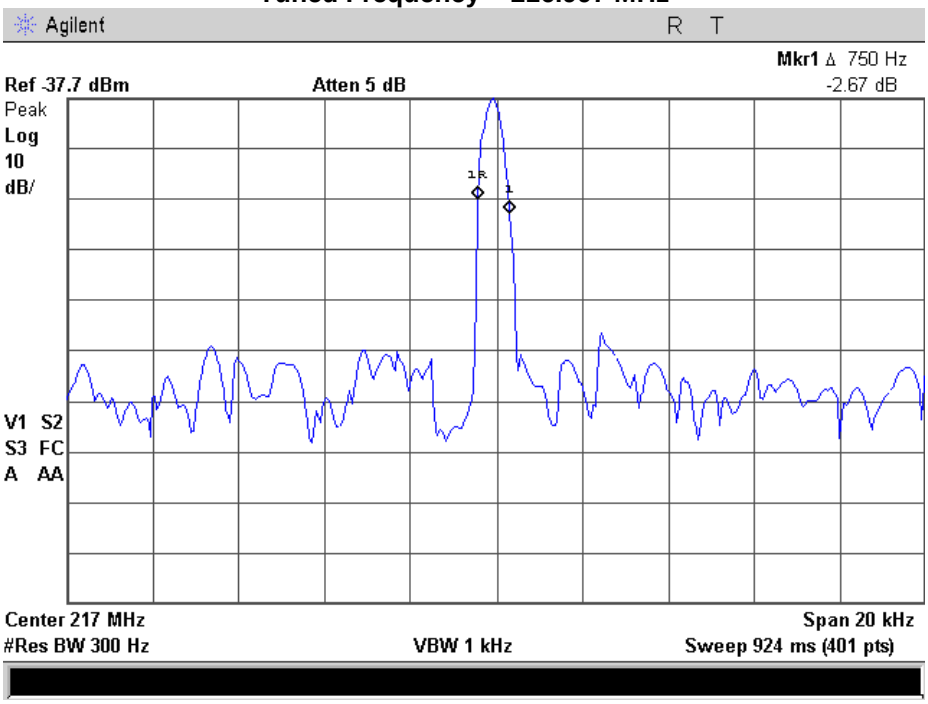
Tuned Frequency - MHz	-20 dB Bandwidth - kHz	Limit - kHz	Results
216.003	0.750	4	Pass
216.997	0.750	4	Pass
219.997	0.750	4	Pass

-20 dB BW Plots – Part 90

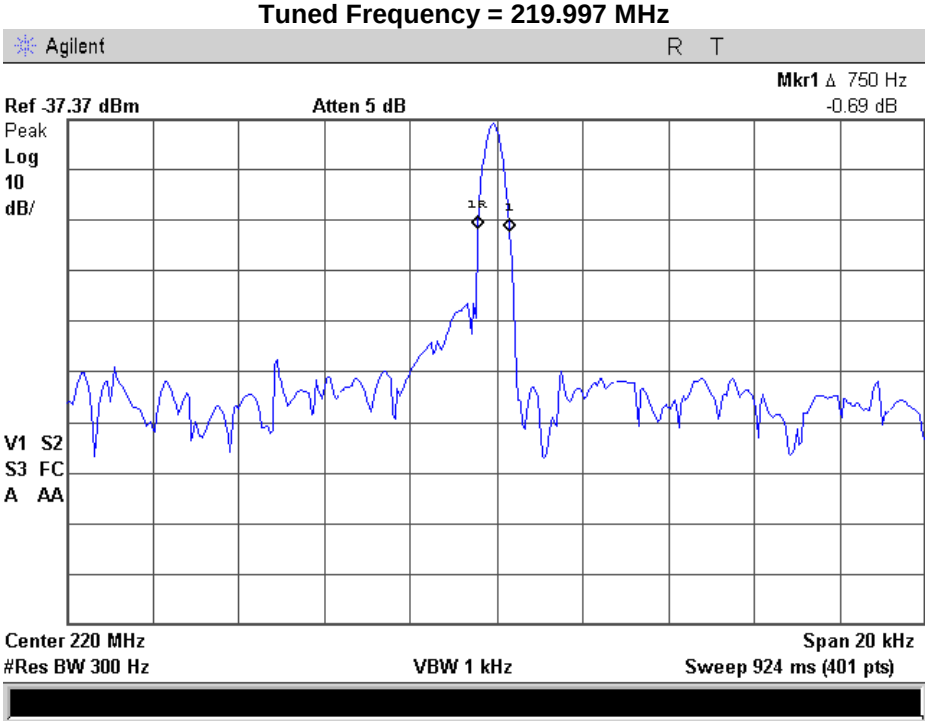
Tuned Frequency = 216.003 MHz



Tuned Frequency = 216.997 MHz

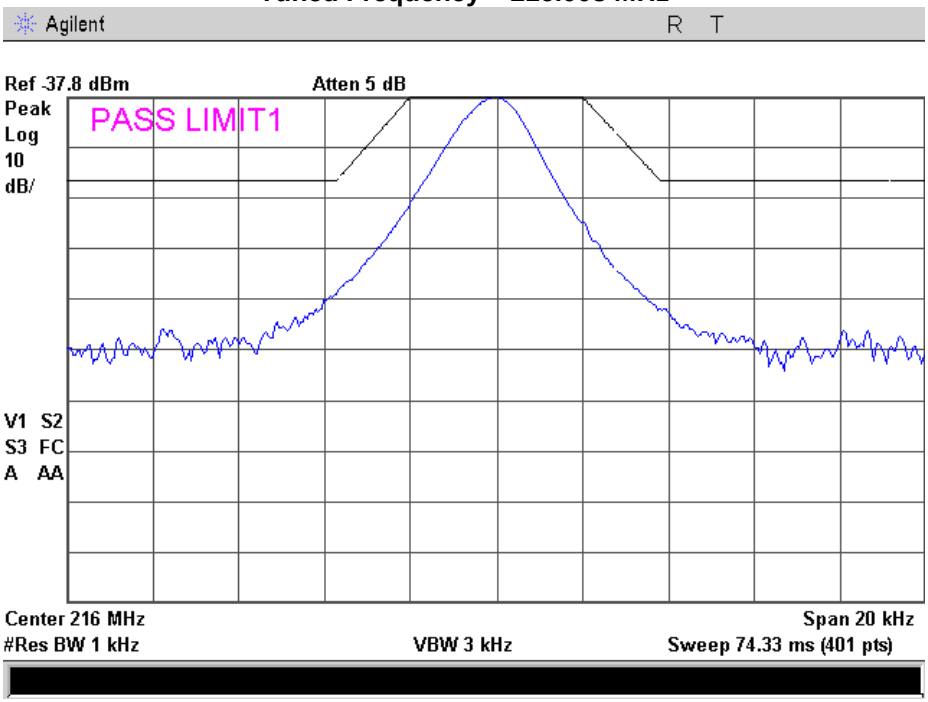


Tuned Frequency = 219.997 MHz

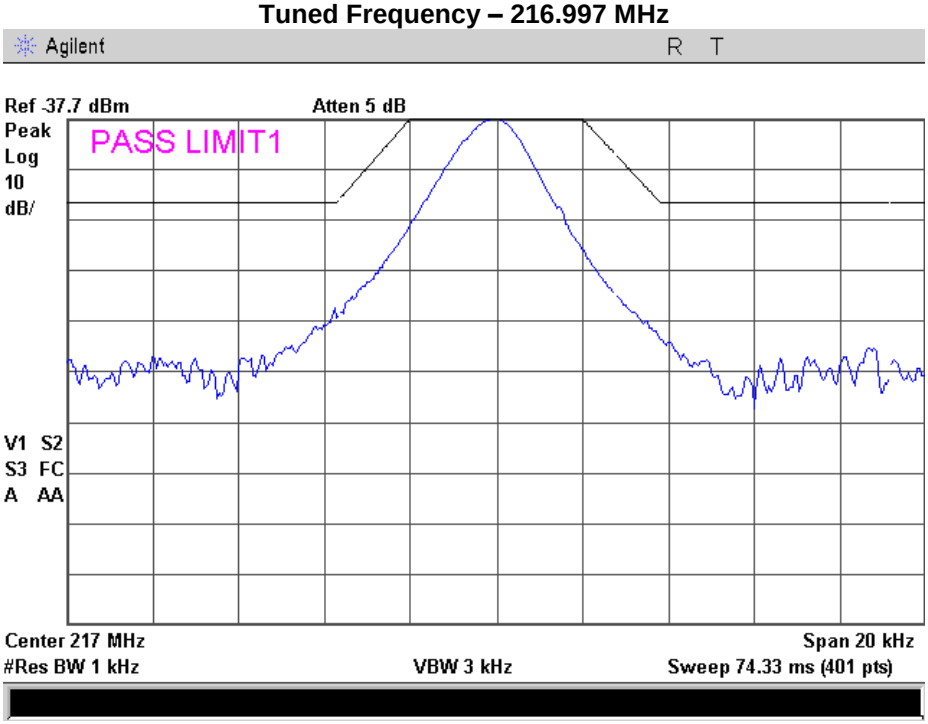


Part 95
Occupied Bandwidth Plots –

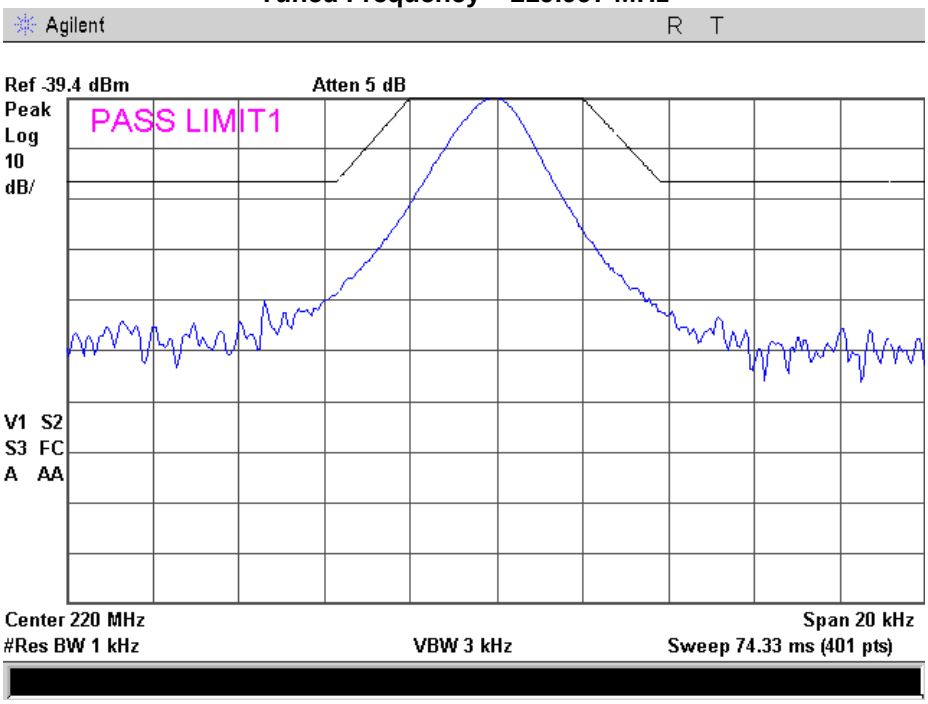
Tuned Frequency – 216.003 MHz



Tuned Frequency – 216.997 MHz



Tuned Frequency – 219.997 MHz



Frequency Stability (Temperature Variation)

Name of Test: Frequency Stability (Temperature Variation)

Specification: 90.213, 95.629(d)(2) **Engineer: Greg Corbin**

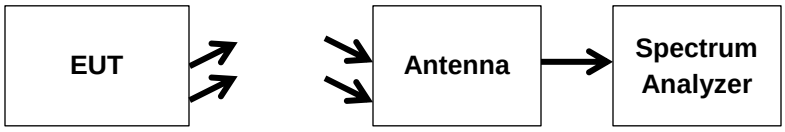
Test Equipment Utilized: i00331 **Test Date: 4/26/2011**

Measurement Procedure

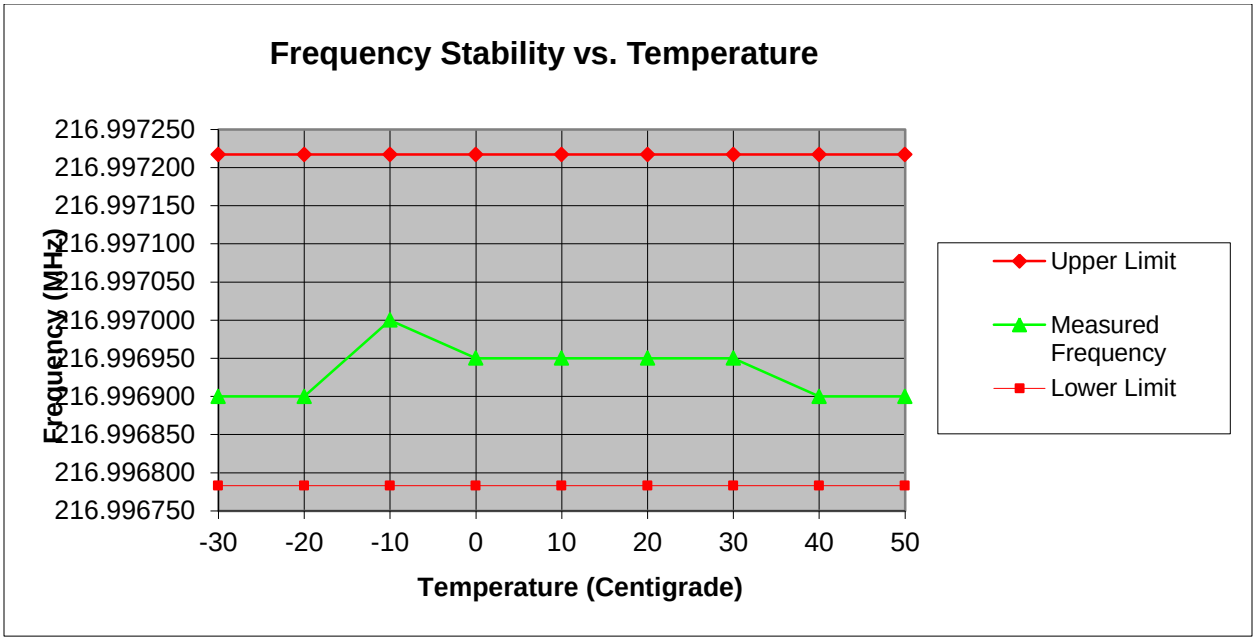
The EUT is enclosed in a hermetically sealed package and transmits a CW signal. Radiated measurements were used to measure frequency stability. The EUT was placed in an environmental test chamber. An antenna was placed inside the chamber and connected to a spectrum analyzer which was used to measure the frequency. The temperature was varied from -30°C to 50°C in 10°C increments. After a sufficient time for temperature stabilization the RF output frequency was measured.

The Part 90 frequency stability limits are 1 ppm.
The Part 95 frequency stability limits are 1.5 ppm
The EUT was tested to the Part 90 limit.

Measurement Setup



Measurement Results



Frequency Stability (Voltage Variation)

Name of Test:	Frequency Stability (Voltage Variation)	
Specification:	90.213, 95.629(d)(2)	**Engineer: Greg Corbin**
Test Equipment Utilized:	i00004, i00319, i00331	**Test Date: 4/26/2011**

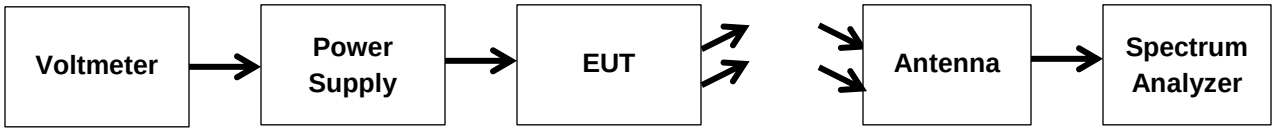
Measurement Procedure

The EUT operates from a 3 v coin cell battery. The manufacturers low voltage limit is 2.5 volts.
The EUT was connected to a power supply and the frequency was measured with the voltage set to 2.5 and 3.0 vdc.
The temperature was set to 20°C.

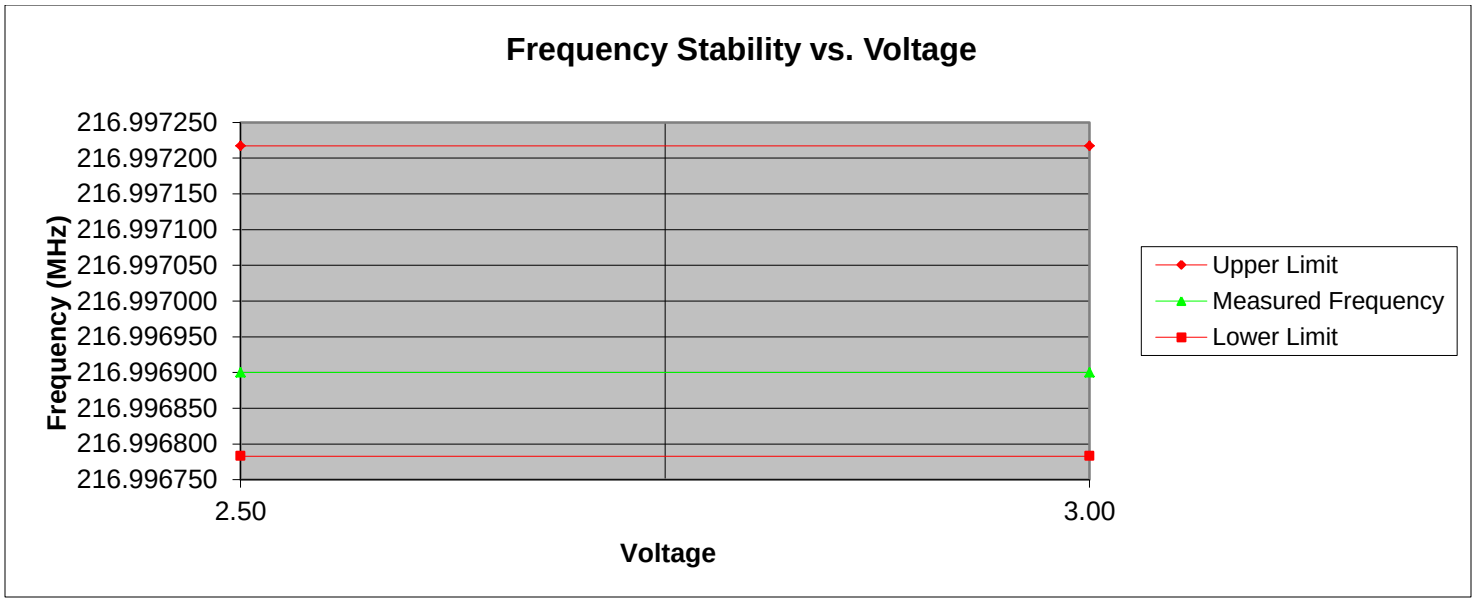
The EUT is enclosed in a hermetically sealed package and transmits a CW signal. Radiated measurements were used to measure frequency. The EUT was placed in an environmental test chamber. An antenna was placed inside the chamber and connected to a spectrum analyzer which was used to measure the frequency.

The Part 90 frequency stability limits are 1 ppm.
The Part 95 frequency stability limits are 1.5 ppm
The EUT was tested to the Part 90 limit.

Measurement Setup



Measurement Results



Test Equipment Utilized

Description	Manufacturer	Model Number	CT Asset No.	Last Cal Date	Cal Due Date
Power Supply	HP	6634A	i00004	Verify When	Use
Temperature Chamber	Tenney	Tenney Jr	i00027	Verify When	Use
Monopole Antenna Set	Ailtech	DM-105A-T1,T2,T3	i00142,147,148	Verify When	Use
Signal Generator	Rohde & Schwarz	SMT-03	i00266	12/7/10	12/7/11
Bi-Log Antenna	Schaffner	CBL611C	i00267	11/21/09	11/21/11
Humidity / Temp Meter	Newport	IBTHX-W-5	i00282	11/11/10	11/11/11
Humidity / Temp Meter	Control Company	4189CC	i00355	1/26/11	1/26/12
Voltmeter	Fluke	87III	i00319	7/1/10	7/1/11
Spectrum Analyzer	Agilent	E4407B	i00331	12/20/10	12/20/11
Data Logger	Fluke	Hydra Data Bucket	i00343	11/18/10	11/18/11
Spectrum Analyzer	Agilent	E7405A	i00379	11/22/10	11/22/11

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