Test Report

Prepared for: Honeywell International Inc.

Model: RTA-50E

Description: VHF Aviation Communications Transceiver

Serial Number: RTA50E-00010

FCC ID: AOIRTA-50E

To

FCC Part 87

Date of Issue: November 7, 2022

On the behalf of the applicant:	**Honeywell International Inc.** **PO Box 981162** **EL Paso, Texas 79998-1195**
Attention of:	**Tom Heidemann** **Senior Technical Manager** **Ph: (612) 951-6527** **Tom.w.heidemann@honeywell.com**

Prepared by
Compliance Testing, LLC
1724 S. Nevada Way
Mesa, AZ 85204
(480) 926-3100 phone / (480) 926-3598 fax
www.compliancetesting.com

Project No: p22a0004

Greg Corbin

Project Test Engineer

Test Report Revision History

Revision	Date	Revised By	Reason for Revision
1.0	November 7, 2022	Greg Corbin	Original Document
2.0	February 15, 2024	Greg Corbin	Updated emission designator table on page 5.

Table of Contents

ANAB

Compliance Testing, LLC, has been accredited in accordance with the recognized International Standard ISO/IEC 17025:2017. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to the 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 below.

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

FCC Site Reg. #349717

IC Site Reg. #2044A-2

Standard Test Conditions Engineering Practices

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

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, 2.1051, 2.1053, 2.1055, 2.1057 and the following individual Parts: FCC Part 87.

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

Environmental Conditions		
Temperature (ºC)	**Humidity (%)**	**Pressure (mbar)**
24.0 – 27.5	31.3 – 38.3	965.1 – 972.8

EUT Description
Model: RTA-50E
Description: VHF Aviation Communication Transceiver
Hardware / Equipment: 965-1796-0F1, Rev B
Software: SWM69001496-502
Firmware: CHM69001490-901 / CHM69005814-901
Serial Number: RTA50E-00010

Additional Information:

The RTA-50E VDR system is an airborne VHF communications transceiver that operates in 118 MHz to 136.975 MHz airborne frequency band located inside the fuselage. It provides voice and data communication between on-board aircraft systems, other aircraft systems, and ground-based systems. It can operate in analog DSB-AM analog voice mode, VHF ACARS data modes (Mode A), and VDL Mode 2 data mode.

Mode of Operation	Modulation	Emission Designator
Voice	DSB-AM	6K00A3E
Data Mode A	2400 bps MSK	13K0A9W
Data Mode 2	31.5 kbps D8PSK	14K0G1D

EUT Operation during Tests

The EUT is powered by 28 VDC.
The manufacturer provided an Interface Breakout box to control the EUT manually.
The interface box was used to inject the voice and data modulation for voice and data mode A.
The interface box provided a switch to turn on the D8PSK modulation for data mode 2.
The modulation was asset per the manufacturer's instructions,
For voice modulation a 1 kHz sinewave @ 0.25 Vrms was applied to the interface box audio input (MPA1 / MPB1).
For data mode A modulation, a 2.4 kHz squarewave @ 0.25 Vrms was applied to the interface box Mode 0 Data Input (MPA5 / MPB5).
For data mode 2, the D8PSK switch (MPC5) was used to turn on the D8PSK modulation.

Accessories:				
Qty	**Description**	**Manufacturer**	**Model**	**S/N**
1	RTA-50E Breakout Box (Nexcom RTA-50D)	Honeywell	747-0453-001	06
1	RTA-50E LRU Cable	Honeywell	749-0357-001	N/A
1	RTA-50E External Cooling Fans	Honeywell	N/A	N/A
1	Frequency Control Panel	Aeroflex	Datatrac 400H	1000448681

Modifications: None

Test Results Summary

Specification	Test Name	Pass, Fail, N/A	Comments
2.1046 87.131	Carrier Output Power (Conducted)	Pass	
2.1051 87.139(a) 87.139(k)	Unwanted Emissions (Transmitter Conducted)	Pass	
2.1053 87.139(a) 87.139(k)	Field Strength of Spurious Radiation	Pass	
2.1049, 87.139(a) 87.139(k)	Emission Masks (Occupied Bandwidth)	Pass	
87-139(k)(3)	Adjacent Channel Power	Pass	
2.1047	Audio Low Pass Filter (Voice Input)	Pass	
2.1047	Audio Frequency Response	Pass	
2.1047	Modulation Limiting	Pass	
2.1055 87.133(a)(6)	Frequency Stability (Temperature Variation)	Pass	
2.1055 87.133(a)(6)	Frequency Stability (Voltage Variation)	Pass	

Statements of conformity are reported as:

- Pass - the measured value is below the acceptance limit, *acceptance limit = test limit*.
- Fail - the measured value is above the acceptance limit, *acceptance limit = test limit*.

Carrier Output Power (Conducted)

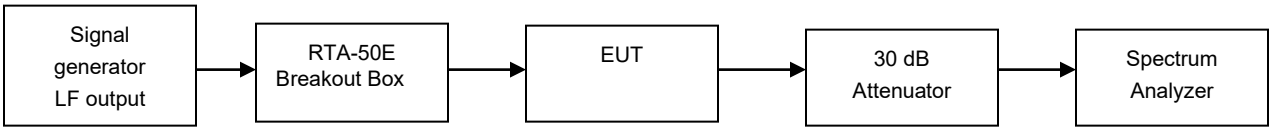
Engineer: Greg Corbin

Test Date: 11/1/2022

Test Procedure

The Equipment Under Test (EUT) was connected directly to a spectrum analyzer with the RBW > the OCC BW. Test cable and attenuation correction factors where input to the spectrum analyzer before recording final output power. Trace max hold was used and the peak envelope readings were taken for each modulation type and the result was then compared to the limit.

Test Setup



Output Power Test Results

Voice Mode

Tuned Frequency (MHz)	Measured Power (dBm)	Measured Power (W)	Limit (W)	Result
118	45.81	38.107	55	Pass
127.5	45.97	39.537	55	Pass
136.975	45.89	38.815	55	Pass

Data Mode A

Tuned Frequency (MHz)	Measured Power (dBm)	Measured Power (W)	Limit (W)	Result
118	44.82	30.339	55	Pass
127.5	45.25	33.497	55	Pass
136.975	44.94	31.189	55	Pass

Data Mode 2

Tuned Frequency (MHz)	Measured Power (dBm)	Measured Power (W)	Limit (W)	Result
118	45.77	37.757	55	Pass
127.5	46.32	42.855	55	Pass
136.975	46.19	41.591	55	Pass

Refer to Annex A for Output Power plots

Conducted Spurious Emissions

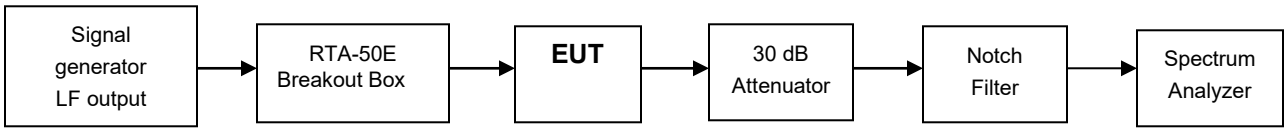
Engineer: Greg Corbin

Test Date: 11/3/2022

Test Procedure

The EUT was connected directly to a spectrum analyzer to verify that the UUT met the requirements for spurious emissions.
Test cable and attenuation correction factors where input to the spectrum analyzer before recording final output power.
A notch filter was used to suppress the fundamental signal to prevent the spectrum analyzer from being overdriven.
A peak detector with the trace max hold function was used to record the maximum signal level.
Spurious emissions were recorded from 30 – 1500 MHz.
No spurious signals were observed above the noise floor of the spectrum analyzer.
The highest noise floor reading was recorded for each measurement.

Test Setup



Conducted Spurious Emissions Test Results

Test mode	Tuned Frequency (MHz)	Spurious Measurement		Limit	Margin	Pass / Fail
		Frequency (MHz)	Power Level (dBm)	dBm	dB	
Voice	118	49.364	-23.9	-13	-10.9	Pass
Voice	127.5	48.799	-24.7	-13	-11.7	Pass
Voice	136.975	71.697	-24.5	-13	-11.5	Pass
Mode A	118	48.223	-23.2	-13	-10.2	Pass
Mode A	127.5	48.516	-24.4	-13	-11.4	Pass
Mode A	136.975	34.099	-24.6	-13	-11.6	Pass
Mode 2	118	60.672	-24.3	-13	-11.3	Pass
Mode 2	127.5	48.233	-23.3	-13	-10.3	Pass
Mode 2	136.975	49.081	-24.2	-13	-11.2	Pass

Refer to Annex B for Conducted Spurious Emission Plots

Field Strength of Spurious Radiation

Engineer: Greg Corbin

Test Date: 11/6/2022

Test Procedure

The EUT was tested in a semi-anechoic chamber with the turntable set 3m from the receiving antenna. A spectrum analyzer was used to verify that the EUT met the requirements for Radiated Emissions. The EUT was tested by rotating it 360 degrees with the antennas in both the vertical and horizontal orientation while raised from 1 to 4 meters to ensure the signal levels were maximized.
All emissions from 30 MHz to 1.5 GHz were examined.
Correction factors for test cables, pre-amplifier, and antennas were input to the spectrum analyzer before recording final measurements.
The EUT output was terminated into a 50 ohm load.
Due to the emissions coming from the support equipment, an ambient plot was recorded with the EUT support equipment powered on and the EUT powered off.
The EUT was powered on and the emissions from the EUT were recorded.
Any spurious emission not associated with the support equipment within 20 dB of the limit were evaluated.
No spurious emissions were observed within 20 dB of the limit were observed.
No spurious signals were observed above the noise floor of the spectrum analyzer.
The highest noise floor reading was recorded for each measurement.

A peak detector with Trace Max hold was used to record the test data.

From 30 – 1000 MHz:
RBW = 100 kHz
VBW = 300 kHz

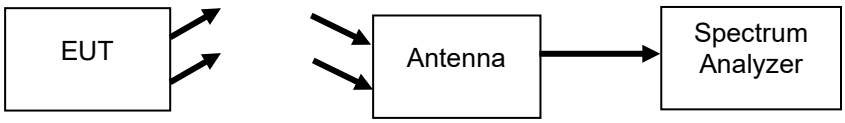
From 1000 – 1500 MHz:
RBW = 1 MHz
VBW = 3 MHz

Sample Calculations

Corrected Value = Measured Value + Correction factor

Correction factor = ACF + cable loss – preamplifier gain

Test Setup



Refer to Annex C for Radiated Spurious Emission Plots

Emission Masks (Occupied Bandwidth)

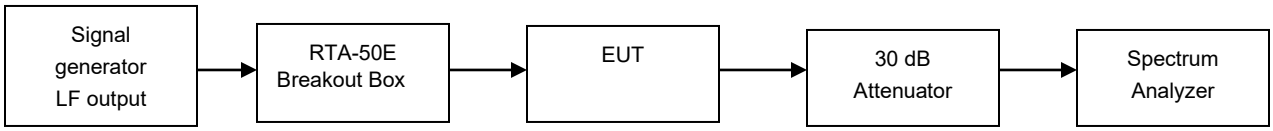
Engineer: Greg Corbin

Test Date: 11/3/2022

Test Procedure

The EUT was connected directly to a spectrum analyzer to verify that the EUT meets the required emissions mask.
Test cable and attenuation correction factors where input to the spectrum analyzer before recording emission mask test data.
A peak detector with Trace Max hold was used to record the test data.
For the A3E and A9W test mode, the emissions were compared to the emission limits for FCC Part 87.139(a).
For the G1D test mode, the emissions were compared to the emission limits for FCC Part 87.139(k).

Test Setup



Refer to Annex D for Emission Mask Plots

Adjacent Channel Power

Engineer: Greg Corbin

Test Date: 11/3/2022

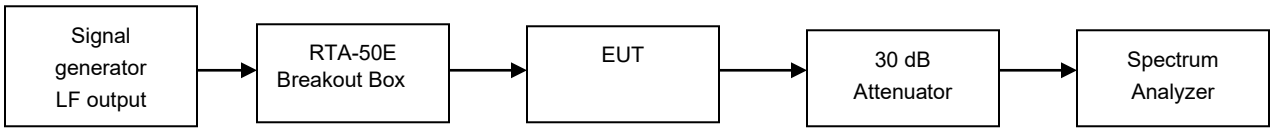
Test Procedure

For the G1D test mode, there is a adjacent channel Power test requirement.

Per FCC Part 97.139(k)(3):
The amount of power measured over a 16 kHz channel bandwidth centered on the first adjacent 25 kHz channel shall not exceed −18 dBm.

The EUT was connected directly to a spectrum analyzer to verify that the EUT meets the required adjacent channel power requirement.
Test cable and attenuation correction factors where input to the spectrum analyzer before recording the adjacent Channel Power.
The spectrum analyzer was tuned to the 1st lower adjacent channel with the span was set to 16 kHz.
A average detector with 50 Trace averages was used to record the test data.
The power in the 1st lower and upper adjacent channel was recorded for the G1D emission at all 3 test frequencies.

Test Setup



Tuned Frequency (MHz)	Adjacent Channel Power		Limit (dBm)	Margin (dB)	Pass / Fail
	Low side	High side			
118	-26.82	-27.19	-18	-9.19	Pass
127.5	-26.39	-26.48	-18	-8.48	Pass
136.975	-26.29	-25.99	-18	-7.99	Pass

Refer to Annex E for Adjacent Channel Power Plots

Audio Low Pass Filter (Voice Input)

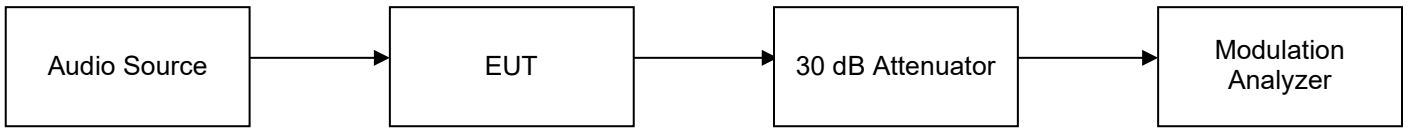
Engineer: Greg Corbin

Test Date: 11/2/2022

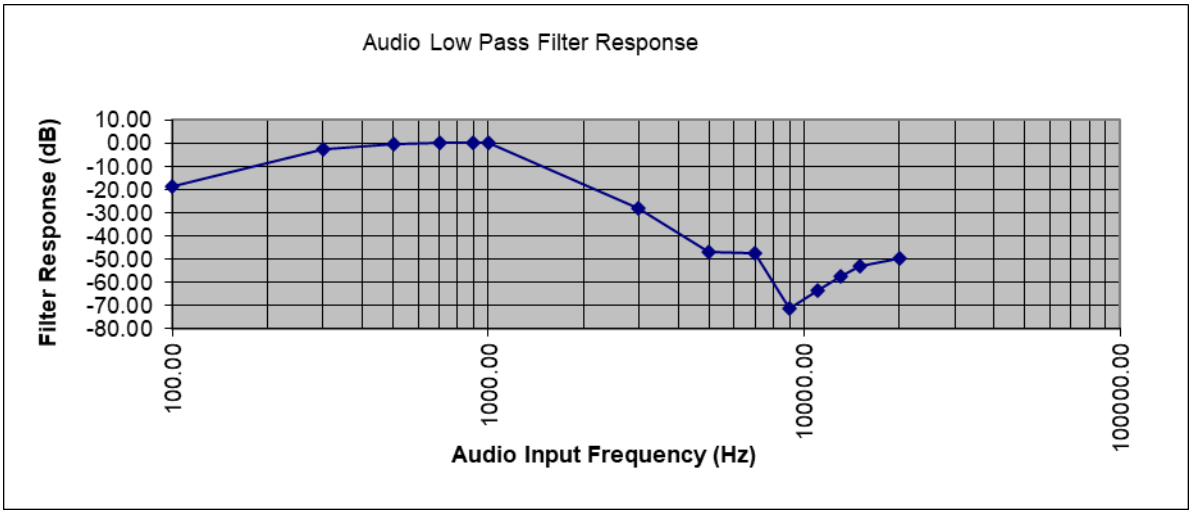
Measurement Procedure

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 Setup



Audio Low Pass Filter Test Results



Audio Frequency Response

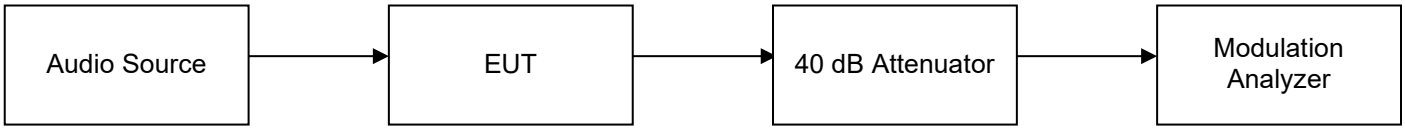
Engineer: Greg Corbin

Test Date: 11/2/2022

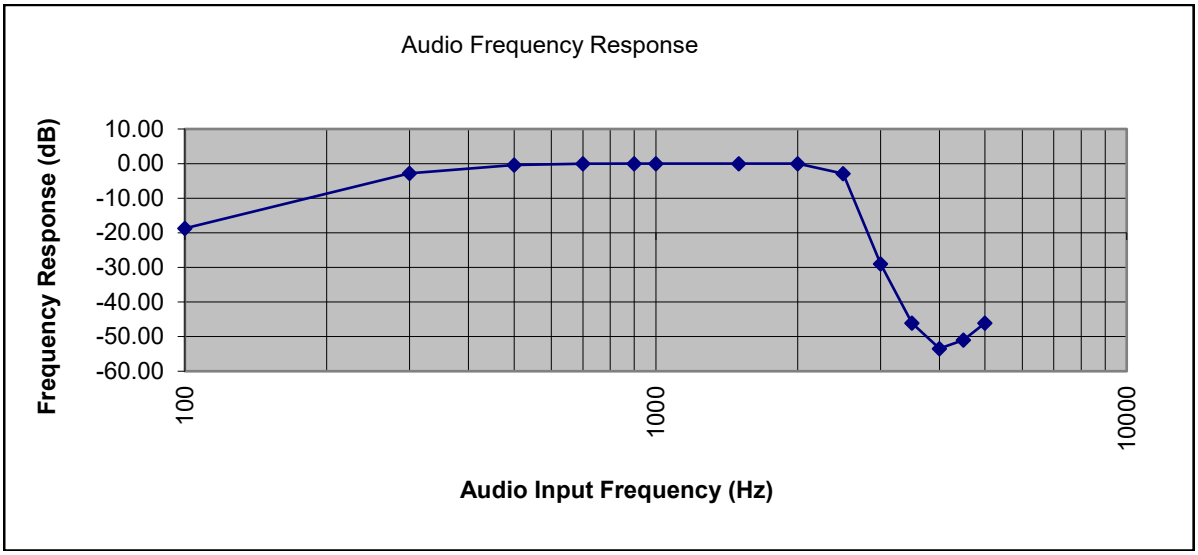
Measurement Procedure

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 Setup



Audio Frequency Response Test Results



Modulation Limiting

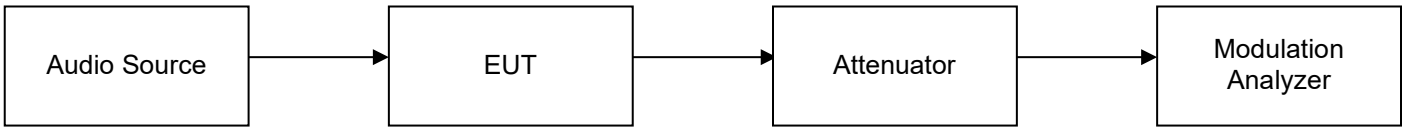
Engineer: Greg Corbin

Test Date: 11/2/2022

Measurement Procedure

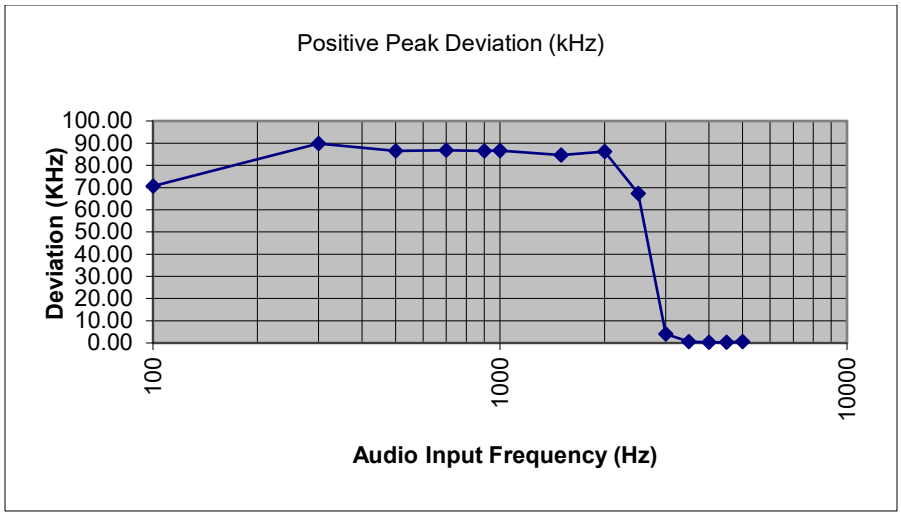
The EUT was connected directly to a modulation analyzer through an attenuator. The audio source was tuned across the required audio frequency range and the modulation limiting response was measured and plotted. The modulation analyzer is a real time spectrum analyzer with integrated demodulation, audio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

Test Setup

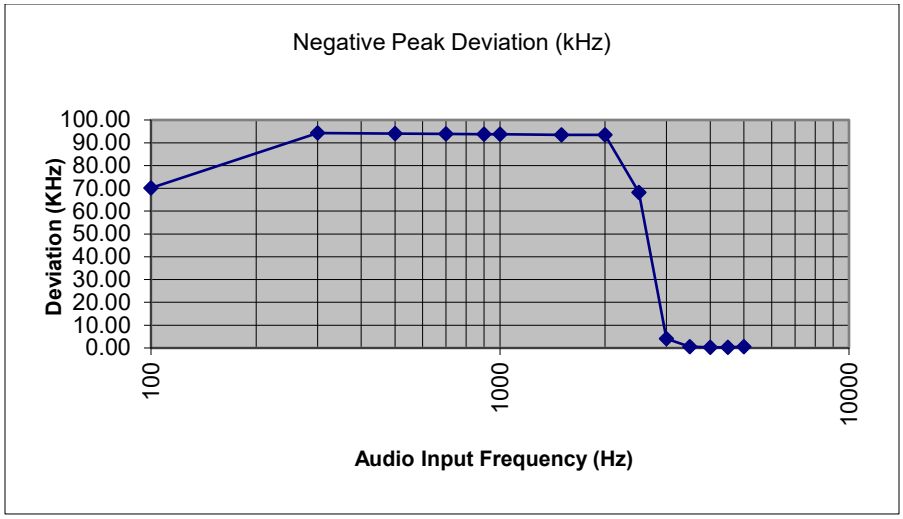


Modulation Limiting Test Results

Positive Peak Deviation



Negative Peak Deviation



Frequency Stability (Temperature Variation)

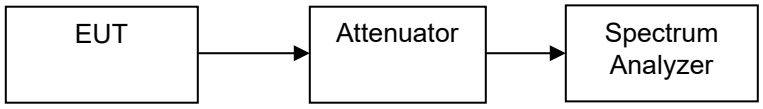
Engineer: Greg Corbin

Test Date: 11/3/2022

Test Procedure

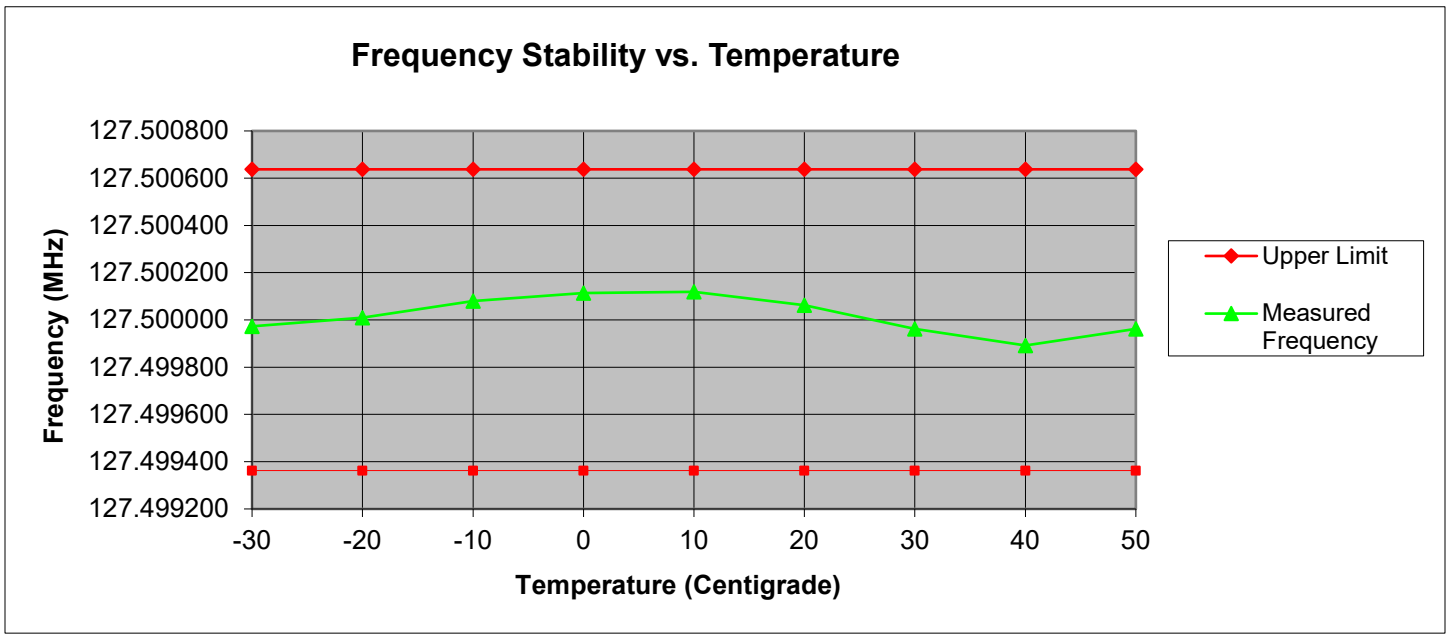
The EUT was placed in an environmental test chamber and the RF output was connected directly to a spectrum analyzer. Te The temperature was varied from -30ºC to 50ºC in 10ºC increments. After a sufficient time for temperature stabilization the RF output frequency was measured.

Test Setup



Measurement Results

Tuned Frequency (MHz)	Frequency Tolerance PPM	Upper Limit (MHz)	Lower Limit (MHz)	Temperature centigrade	Measured Frequency (MHz)	Upper Margin (MHz)	Lower Margin (MHz)
127.500	5.0	127.500638	127.499363	-30	127.499973	-0.000664	0.000610
		127.500638	127.499363	-20	127.500009	-0.000628	0.000647
		127.500638	127.499363	-10	127.500080	-0.000557	0.000717
		127.500638	127.499363	0	127.500114	-0.000523	0.000751
		127.500638	127.499363	10	127.500119	-0.000518	0.000756
		127.500638	127.499363	20	127.500062	-0.000575	0.000699
		127.500638	127.499363	30	127.499962	-0.000675	0.000599
		127.500638	127.499363	40	127.499892	-0.000745	0.000529
		127.500638	127.499363	50	127.499962	-0.000675	0.000599



Frequency Stability (Voltage Variation)

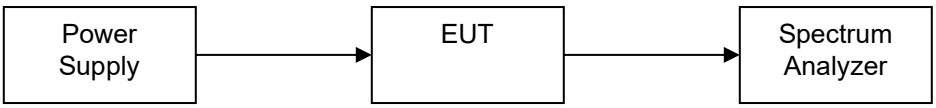
Engineer: Greg Corbin

Test Date: 11/3/2022

Test Procedure

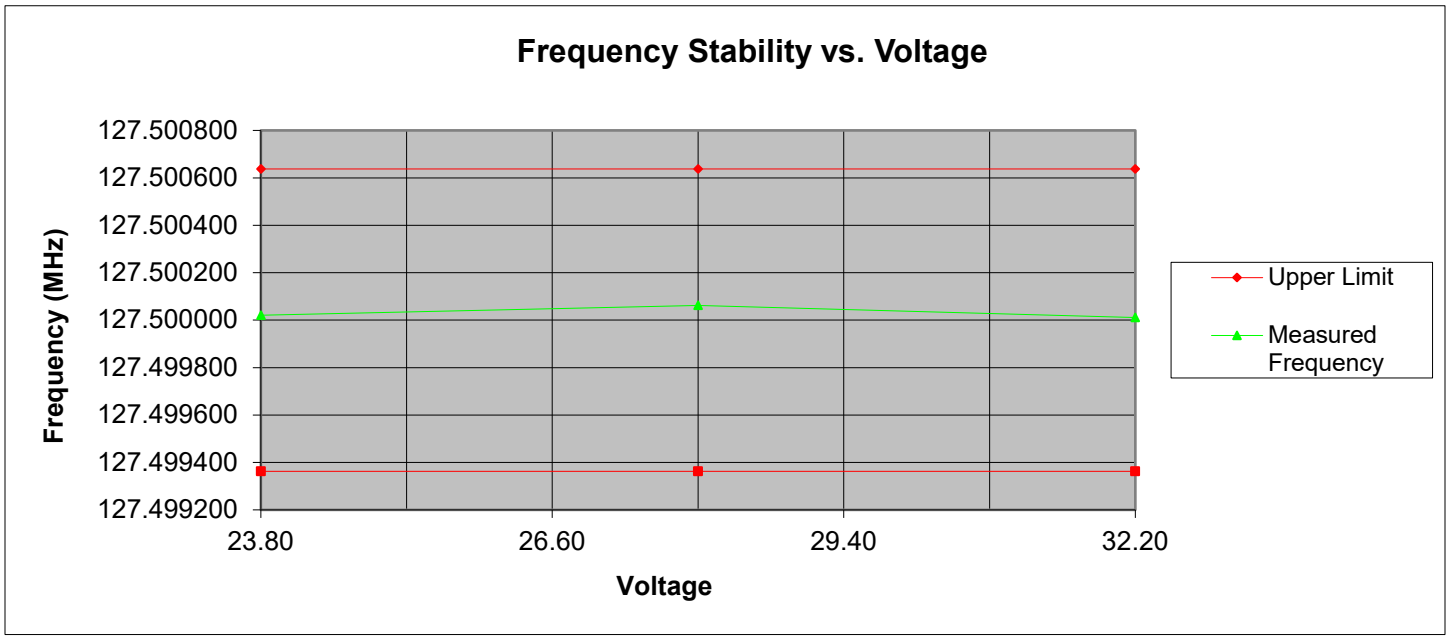
The EUT was placed in a temperature chamber at 20±5°C and connected directly to a spectrum analyzer. The power supply voltage to the EUT was varied from 85% to 115% of the nominal value and the RF output was measured.

Test Setup



Test Results

Tuned Frequency (MHz)	Frequency Tolerance PPM	Upper Limit (MHz)	Lower Limit (MHz)	Nominal Voltage	Voltage	Measured Frequency (MHz)	Upper Margin (MHz)	Lower Margin (MHz)
127.500	5.0	127.500638	127.499363	28.00	23.80	127.500021	-0.000616	0.000659
		127.500638	127.499363		28.00	127.500062	-0.000575	0.000699
		127.500638	127.499363		32.20	127.500011	-0.000626	0.000648



Measurement Uncertainty

Measurement Uncertainty for Compliance Testing is listed in the table below.

The reported expanded uncertainty has been estimated at a 95% confidence level (k=2)

Measurement Type	Expanded Uncertainty
Conducted Emissions, AC Powerline	± 3.28 dB
Radiated Emissions_30 – 1000 MHz	± 4.82 dB
Radiated Emissions_1 – 18 GHz	± 5.73 dB
Frequency Error	± 22 Hz
Conducted RF Power	± 0.98 dB
Conducted Spurious Emission	± 2.49 dB
AC Voltage	± 2.3 %
DC Voltage	± 0.12 %
Temperature	± 1.0 deg C
Humidity	± 4.32 %

Test Equipment Utilized

Description	Manufacturer	Model #	CT Asset #	Last Cal Date	Cal Due Date
Tunable Notch Filter	Eagle	TNF-1-(100-200MHz)	i00126	Verified on: 11/3/22	
Horn Antenna	ARA	DRG-118/A	i00271	8/11/22	8/11/24
Temperature Chamber	Thermotron	THER SE 1000-3-3	i00557	N/A	N/A
Data Logger	Fluke	Hydra Data Bucket	i00343	6/23/22	6/23/23
Vector Signal Generator	Agilent	E4438C	i00348	6/14/22	6/14/23
Bi-Log Antenna	Schaffner	CBL 6111D	i00349	1/20/21	1/20/23
Spectrum Analyzer	Textronix	RSA5126A	i00424	10/11/22	10/11/23
3 Meter Semi-Anechoic Chamber	Panashield	3 Meter Semi-Anechoic Chamber	i00428	7/17/20	7/17/23
Voltmeter	Fluke	179	i00488	6/8/22	6/8/23
MXE EMI receiver	Keysight	N9038A	i00552	2/24/22	2/24/23
Preamplifier	Eravant	SBB-0115034018-2F2F-E3	i00650	N/A	N/A

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