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

Test Report

Prepared for: Becker Avionics, Inc

Model: TG660-50

Description: Aeronautical basestation radio used for emergencies

Serial Number: 10001, 10002

FCC ID: 2AHX9TG660

To

FCC Part 87

Date of Issue: August 18, 2016

On the behalf of the applicant:	**Becker Avionics, Inc** **10376 USA Today Way** **Miramar, FL 33025**
Attention of:	**Arturo Garcia** **(954)450-3137** **arturo@beckerusa.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: p1640035

Greg Corbin

Greg Corbin
Project Test Engineer

Test Report Revision History

Revision	Date	Revised By	Reason for Revision
1.0	June 30, 2016	Greg Corbin	Original Document
2.0	August 18, 2016	Greg Corbin	Updated emission designators and added Occupied Bandwidth test data

Table of Contents

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**

ACCREDITED
TESTING CERT
#2152.01

FCC Site Reg. #349717

IC Site Reg. #2044A-2

Non-accredited tests contained in this report:

N/A

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)**
28.1 – 34.6	16 – 26.2	960.5 – 972.5

EUT Description
Model: TG660-50
Description: Aeronautical basestation radio used for emergencies
Software: TG 660 M
Software Revision: V1.0130.10.13
Serial Number: 10001, 10002
Additional Information:
The TG660 is a 50 watt, fixed basestation for voice communications in the VHF frequency range of 118.000 MHz to 136.990 MHz with 25 kHz / 8.33 kHz channel spacing.

Modulation utilized is AM, 6K80A3E and 5K00A3E

The EUT is powered by 120 vac 60 Hz.

EUT Operation during Tests
The EUT was operated under normal operating conditions at maximum output power.

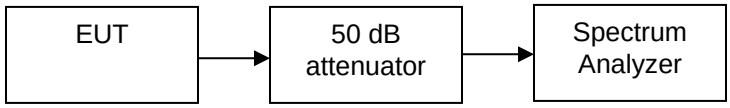
Test Results Summary

Specification	Test Name	Pass, Fail, N/A	Comments
2.1046, 87.131	Carrier Output Power (Conducted)	Pass	
2.1051, 87.139(a)(3)	Unwanted Emissions (Transmitter Conducted)	Pass	
2.1053	Field Strength of Spurious Radiation	Pass	
2.1049, 87.139(a)	Emission Masks (Occupied Bandwidth)	Pass	
2.1047	Audio Low Pass Filter Frequency Response	Pass	
2.1047	Modulation Limiting	Pass	
2.1049, 87.135	Occupied Bandwidth	Pass	
2.1055, 87.133(a)	Frequency Stability (Temperature Variation)	Pass	
2.1055, 87.133(a)	Frequency Stability (Voltage Variation)	Pass	

Carrier Output Power (Conducted)
Engineer: Greg Corbin
Test Date: 6/30/2016

Test Procedure

The Equipment Under Test (EUT) was connected directly to a spectrum analyzer with the RBW set to 100 kHz and the VBW set to 3 X RBW.
The EUT was connected to the spectrum analyzer thru a 50 dB high power attenuator.
The CW signal was measured using an RMS power averaging detector.



Average Output Power

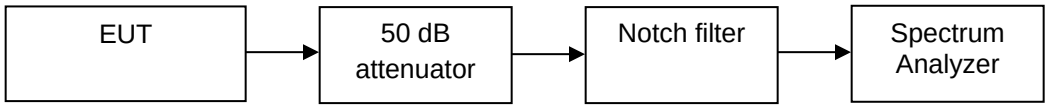
Tuned Frequency (MHz)	Measured Power (dBm)	Measured Power (W)	Limit (W)	Result
118.5	46.88	48.752	50	Pass
127.5	46.40	43.651	50	Pass
136.975	46.90	48.978	50	pass

Conducted Spurious Emissions
Engineer: Greg Corbin
Test Date: 5/24/2016

Test Procedure

The EUT was connected as shown in the test setup.
The RBW was set to 100 kHz, and a peak detector with max hold was used to measure the spurious signals.
The frequency of investigation was 9 kHz to 2 GHz.

Test Setup



Refer to Annex A for the Conducted Spurious Emission plots

Field Strength of Spurious Radiation
Engineer: Greg Corbin
Test Date: 7/5/2016

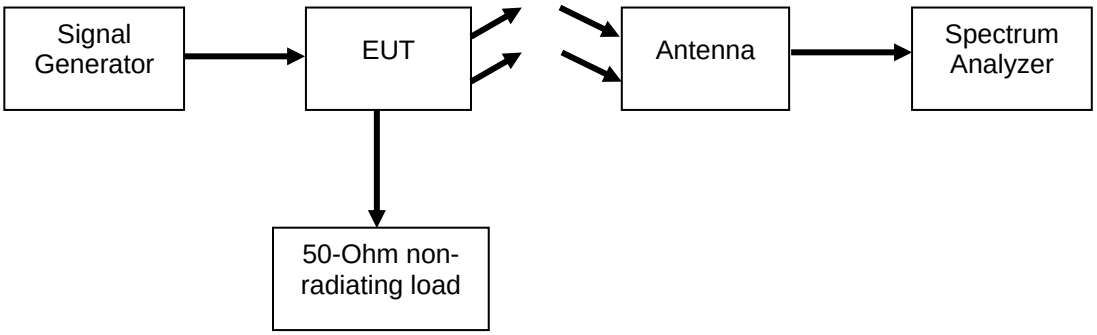
Test Procedure

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 antenna in both the vertical and horizontal orientation while raised from 1 to 4 meters to ensure that the signal levels were maximized. All cable and antenna correction factors were input into the spectrum analyzer ensuring an accurate measurement in ERP/EIRP with the resultant power in dBm. The EUT output was terminated into a 50 Ohm non-radiating load.
The frequency of investigation was from the lowest frequency generated by the EUT up to the 10th harmonic.

The following formula was used for calculating the limits:

Radiated Spurious Emissions Limit = P1 – (43+ 10Log(P2)) = -13dBm
P1 = power in dBm
P2 = power in Watts

Test Setup



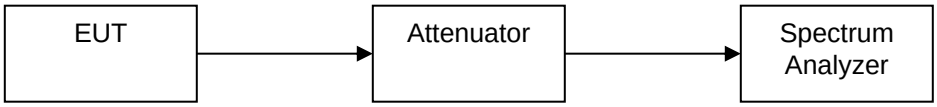
Refer to Annex B for radiated Spurious Emission plots

Emission Mask
Engineer: Greg Corbin
Test Date: 5/24/2016

Test Procedure

The EUT was connected directly to a spectrum analyzer to verify that the EUT meets the required emissions mask per FCC §87.139(a).
A reference level plot is provided to verify that the peak power was established prior to testing the mask. The transmitter was modulated with a 1 kHz sinewave set to 80%.
RBW = 100 Hz

Test Setup



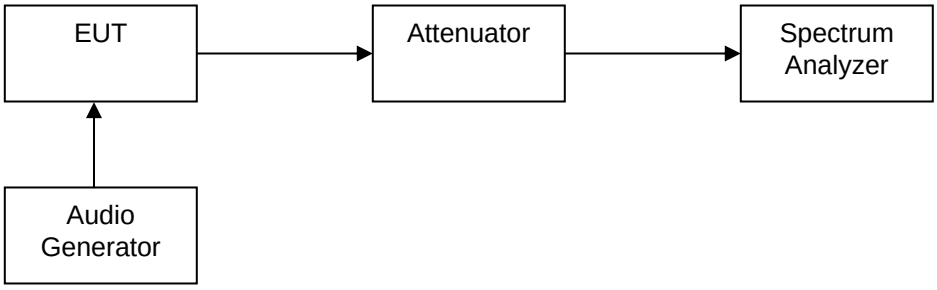
Refer to Annex C for Emission Mask plots.

Audio Low Pass Filter Frequency Response
Engineer: Greg Corbin
Test Date: 5/25/2016

Test Procedure

The equipment was set up as shown. The audio frequency was input into the EUT AF Input at the rear panel 25 pin auxiliary connector.
The demodulated audio frequency was measured using the spectrum analyzer audio analysis tool.
The audio frequency was swept from 100 Hz to 5 kHz and the demodulated output was recorded.

Test Setup



Audio Low Pass Filter Frequency Response test data

Frequency (kHz)	Attenuation (dB)	Attenuation – referenced to 1 kHz (dB)
0.1	-57.6	-53.8
0.2	-18.5	-14.7
0.3	-12.2	-8.4
0.4	-9.4	-5.6
0.5	-6.8	-3
0.6	-5.4	-1.6
0.7	-4.5	-0.7
0.8	-4	-0.2
0.9	-3.8	0
1	-3.8	0
1.1	-3.8	0
1.2	-3.8	0
1.3	-3.9	-0.1
1.4	-3.9	-0.1
1.5	-4	-0.2
1.6	-4	-0.2
1.7	-4	-0.2
1.8	-4.1	-0.3
1.9	-4.1	-0.3
2	-4.1	-0.3
2.2	-4.3	-0.5
2.4	-4.5	-0.7
2.6	-4.6	-0.8
2.8	-5.2	-1.4
3	-5.6	-1.8
3.2	-6	-2.2
3.4	-7.2	-3.4
3.6	-10.5	-6.7
3.8	-17.3	-13.5
4	-32.9	-29.1
4.2	-73.1	-69.3
4.4	-100	-96.2
4.6	-99.1	-95.3
4.8	-105	-101.2
5	-103	-99.2

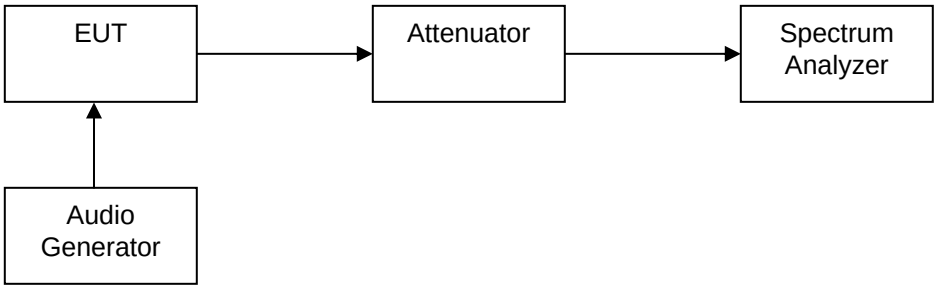
Modulation Limiting
Engineer: Greg Corbin
Test Date: 5/25/2016

Test Procedure

The equipment was set up as shown. The audio frequency was input into the EUT AF Input at the rear panel 25 pin auxiliary connector.

The audio signal was varied from 1 mV to 2.5 v and the modulation limiting was recorded across the frequency range of 0.1 – 5 kHz.
The modulation limiting was measured using the audio summary tool on the spectrum analyzer.

Test Setup



Modulation Limiting test results

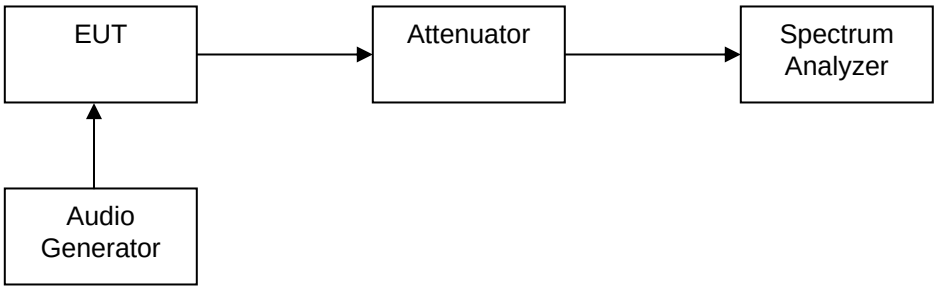
	Frequency (kHz)				
Input Voltage	**0.1**	**0.5**	**1**	**3**	**5**
(mVpeak)	**Modulation Limiting (%)**				
1	8.7	9	8.5	8.8	4.4
10	9.3	8.8	7.9	8.2	10
20	7.6	4.4	10.7	5.9	7
50	5.6	9.8	6	11.1	5.5
100	9.4	10.1	10.3	9.6	11.8
200	9.2	13.6	18.9	14.9	6.9
500	10.4	30.3	43	33.9	5.2
1000	7.2	57.6	78.8	63.7	7.9
1500	9.7	79.9	84.2	77.2	7.8
2000	6.7	83.9	83.3	74.9	5.1
2500	11.1	84.2	82.9	76.6	4.7

Occupied Bandwidth
Engineer: Greg Corbin
Test Date: 5/12/2016

Test Procedure

The equipment was set up as shown. The audio frequency was input into the EUT AF Input at the rear panel 25 pin auxiliary connector.
The 99% bandwidth was recorded.
Modulation Frequency = 1000 Hz
Modulation Depth = 85%

Test Setup



Frequency (MHz)	OBW (kHz)	Result
118	4.00	Pass
127.5	3.94	Pass
136.975	3.09	Pass

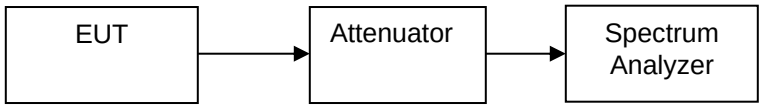
Refer to Annex D for Occupied Bandwidth plots

Frequency Stability (Temperature Variation)
Engineer: Greg Corbin
Test Date: 5/24/2016

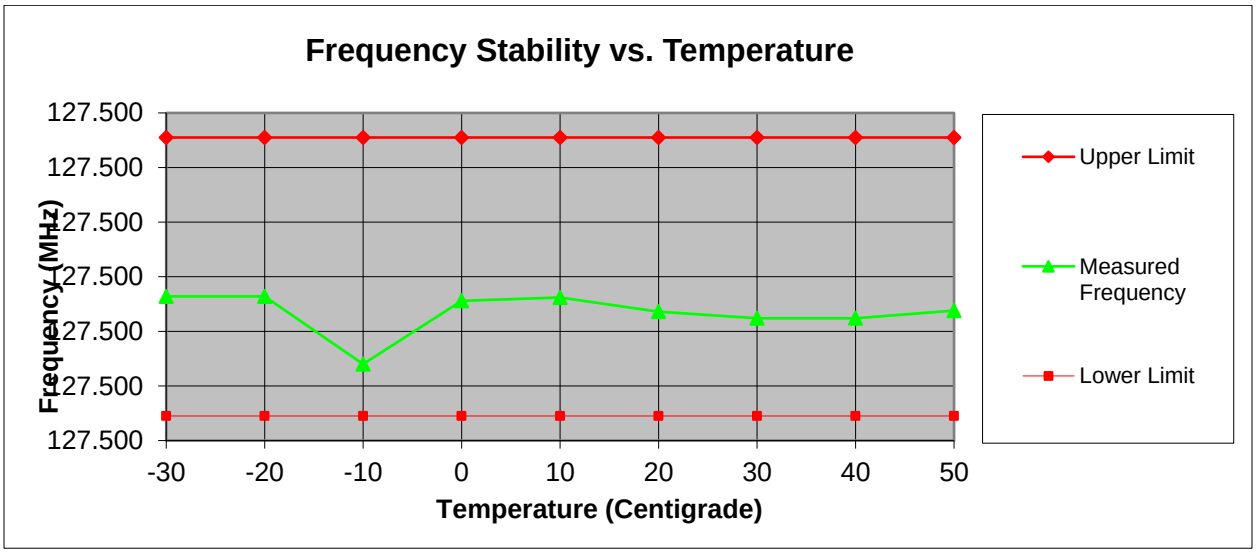
Test Procedure

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.

Test Setup



Measurement Results



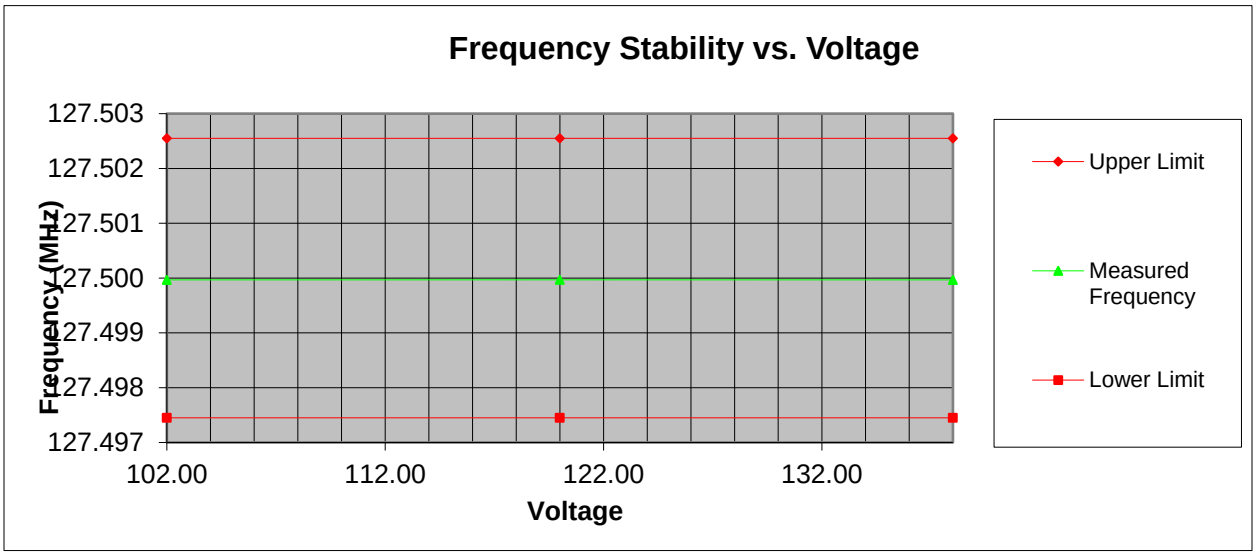
Frequency Stability (Temperature Variation)
Engineer: Greg Corbin
Test Date: 5/24/2016

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% (102 – 138 vac) of the nominal value and the RF output was measured.

Test Setup

Test Results



Test Equipment Utilized

Description	Manufacturer	Model #	CT Asset #	Last Cal Date	Cal Due Date
Horn Antenna	EMCO	3115	i00103	1/20/15	1/20/17
Humidity / Temp Meter	Newport	IBTHX-W-5	i00282	5/26/16	5/26/17
Temperature Chamber	Tenney	Tenney II Benchmaster	i00287	Verified on: 5/24/16	
Data Logger	Fluke	Hydra Data Bucket	i00343	4/5/16	4/5/17
Bi-Log Antenna	Schaffner	CBL 6111D	i00349	10/19/15	10/19/17
EMI Analyzer	Agilent	E7405A	i00379	2/11/16	2/11/17
Signal Generator	Rohde & Schwarz	SMU200A	i00405	1/22/16	1/22/17
Spectrum Analyzer	Textronix	RSA5126A	i00424	3/28/16	3/28/17
3 Meter Semi-Anechoic Chamber	Panashield	3 Meter Semi-Anechoic Chamber	i00428	7/27/14	7/27/16

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