NVLAP Lab Code 200087-0

Application Submittal Report

For
FCC Grant Of Certification
Per Part 87

Model: TG480
118.00-136.975 MHz
VHF Communications Transceiver

FCC ID: VI9TG480

For

BECKER AVIONICS, INC.

10376 USA Today Way
Miramar, FL 33025

Test Report Number 080924T

Authorized Signatory: Scot D Rogers
Scot D. Rogers

NVLAP Lab Code 200087-0

ROGERS LABS, INC.
4405 West 259th Terrace
Louisburg, KS 66053
Phone / Fax (913) 837-3214

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Test Date: September 24, 2008

Certifying Engineer: Scot D Rogers

Scot D. Rogers
Rogers Labs, Inc.
4405 West 259th Terrace
Louisburg, KS 66053
Phone: (913) 837-3214
Fax: (913) 837-3214

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In accordance with the Federal Communications Commission (FCC) Code of Federal Regulations (CFR47), dated October 1, 2007, Part 2 Subpart J, Paragraphs 2.907, 2.911, 2.913, 2.915, 2.925, 2.926, 2.1031 through 2.1057, and Part 87, Subchapter D, Paragraphs 87.131 through 87.147, and applicable paragraphs of Part 15, the following information is submitted.

Opinion / Interpretation of Results

Tests Performed	Results
AC Line Conducted Emissions as per CFR47 paragraphs 2 and 15.107	Complies
CFR47 paragraphs 2.1033	Complies
Emissions as per CFR47 paragraphs 2.1046 through 2.1055	Complies
Emissions as per CFR47 paragraphs 87.131 through 87.147	Complies

Environmental Conditions

Ambient Temperature	23.3° C
Relative Humidity	44%
Atmospheric Pressure	30.14 in Hg

Applicable Standards & Test Procedures

In accordance with the Federal Communications commission (FCC) Code of Federal Regulations (CFR47), dated October 1, 2007, Part 2 Subpart J, Paragraphs 2.907, 2.911, 2.913, 2.915, 2.925, 2.926, 2.1031 through 2.1057, and Part 87, Subchapter D, Paragraphs 87.131 through 87.147, and applicable paragraphs of Part 15, the following information is submitted.

Test procedures used are the established Methods of Measurement of Radio-Noise Emissions as described in the ANSI 63.4-2003.

Units of Measurements

Conducted EMI Data is in dBµV; dB referenced to one microvolt.

Radiated EMI Data is in dBµV/m; dB/m referenced to one microvolt per meter.

Test Site Locations

Conducted EMI — The AC power line conducted emissions testing performed in a shielded screen room located at Rogers Labs, Inc., 4405 W. 259th Terrace, Louisburg, KS.

Radiated EMI — The radiated emissions tests were performed at the 3 meters, Open Area Test Site (OATS) located at Rogers Labs, Inc., 4405 W. 259th Terrace, Louisburg, KS.

Site Approval — Refer to Annex for FCC Site Registration Letter, # 90910, and Industry Canada Site Registration Letter, IC3041A-1.

List of Test Equipment

A Hewlett Packard 8591EM and or 8562A Spectrum Analyzer was used as the measuring device for the emissions testing. The analyzer settings used are described in the following table. Refer to the Appendix for a complete list of Test Equipment.

HP 8591 EM Analyzer Settings		
Conducted Emissions		
RBW	AVG. BW	Detector Function
9 kHz	30 kHz	Peak / Quasi Peak
Radiated Emissions		
RBW	AVG. BW	Detector Function
120 kHz	300 kHz	Peak / Quasi Peak
HP 8562A Analyzer Settings		
RBW	Video BW	Detector Function
100 kHz	100 kHz	Peak
1 MHz	1 MHz	Peak / Average

Equipment	Manufacturer	Model	Calibration Date	Due
LISN	Comp. Design	FCC-LISN-2-MOD.CD	10/07	10/08
LISN	Comp. Design	1762	2/08	2/09
Antenna	ARA	BCD-235-B	10/07	10/08
Antenna	EMCO	3147	10/07	10/08
Antenna	EMCO	3143	5/08	5/09
Analyzer	HP	8591EM	5/08	5/09
Analyzer	HP	8562A	2/08	2/09

2.1033(c) Application for Certification

(1) Manufacturer: BECKER AVIONICS, INC.
10376 USA Today Way
Miramar, FL 33025

(2) Identification: FCC I.D.: VI9TG480

(3) Instruction Book: Refer to exhibit for Draft Instruction Manual.

(4) Emission Type: Emissions designator 8k10A3E. Double-sideband amplitude modulated single channel, voice transmission.

(5) Frequency Range: 118.00-136.975 MHz

(6) Operating Power Level: 50 Watts (Maximum Power) delivered from the EUT.

(7) Maximum P_o: 50 Watts delivered from the EUT. Maximum power output of 55 Watts allowed in CFR 47, paragraph 87.131.

(8) Power into final amplifying circuitry: Information available in other supplied exhibits.

(9) Tune Up Procedure for Output Power: Refer to Exhibit for Transceiver Alignment Procedure.

(10) Circuit Diagrams; description of circuits, frequency stability, spurious suppression, and power and modulation limiting:
Refer to Exhibits for Circuit Diagrams.
Refer to Exhibits for Theory of Operation.

(11) Photograph or drawing of the Identification Plate:
Refer to Exhibit for Photograph or Drawing.

(12) Drawings of Construction and Layout: Refer to Exhibit for Drawings of Components Layout and Chassis Drawings.

(13) Detail Description of Digital Modulation: Not applicable.

Equipment and Cable Configuration

Test Setup

The EUT was arranged as a standard configuration for testing. This configuration provided test personnel the ability to operate the EUT. The test configuration represented a worst-case configuration. Power to the unit was supplied from the manufacturer supplied power cord. The equipment operates from 120 volt AC. AC line conducted emissions testing was performed with the unit operating through all normal modes during testing. The antenna system of the EUT was attached to a 50-ohm load as required during radiated field emissions testing, and 50-ohm load spectrum analyzer for the antenna conducted emissions testing.

Conducted Emission Test Procedure

Testing of the AC line-conducted emissions testing were performed as defined in clauses 6 through 8 of ANSI C63.4. AC line conducted emissions testing were performed with the equipment operational through all available modes during testing. The test setup, including the EUT, was arranged in a typical equipment configuration and placed on a 1 x 1.5-meter wooden bench, 0.8 meters high located in a screen room. The power lines of the system were isolated from the power source using a LISN with a 50-µHy choke. EMI was coupled to the spectrum analyzer through a 0.1 µF capacitor internal to the LISN. The LISN was positioned on the floor beneath the wooden bench supporting the EUT. The power lines and cables were draped over the back edge of the table during testing.

Radiated Emission Test Procedure

Testing of the radiated emissions was performed as defined in clauses 6 through 8 of ANSI C63.4. The test setup, including the EUT, was placed on top of a rotatable, 1 x 1.5 meter, wooden table, and 0.8 meters above the ground plane. The receiving antenna was located on a variable height antenna mast 3 meters from the table supporting the EUT. The antenna height was varied between 1 and 4 meters above the ground plane. The receive antenna polarization was varied between horizontal and vertical. The measured radiated EMI level was maximized by equipment placement, cable location and table rotation before final data was taken using a spectrum analyzer.

General Emissions Measurement Procedures

AC Power Line Conducted EMI

Testing of the AC line-conducted emissions testing were performed as defined in clauses 6 through 8 of ANSI C63.4. AC line conducted emissions testing were performed with the equipment operational through all available modes during testing. The EUT was arranged in a typical equipment configuration and placed on a 1 x 1.5-meter wooden bench 80 cm above the conducting ground plane, floor of a screen room. The bench was positioned 40 cm away from the wall of the screen room. The LISN was positioned on the floor of the screen room 80-cm from the rear of the EUT. Testing for the line-conducted emissions testing was as follows. The AC power cord for the equipment was connected to the LISN for line-conducted emissions testing. A second LISN was positioned on the floor of the screen room 80-cm from the rear of the supporting equipment of the EUT. All power cords except the EUT were then powered from the second LISN. EMI was coupled to the spectrum analyzer through a 0.1 μF capacitor, internal to the LISN. Power line conducted emissions testing was carried out individually for each current carrying conductor of the EUT. Plots were made of the frequency spectrum from 0.15 MHz to 30 MHz for the preliminary testing. Refer to Figures 1 and 2 for plots of the EUT AC line conducted emissions frequency spectrum taken in the screen room.

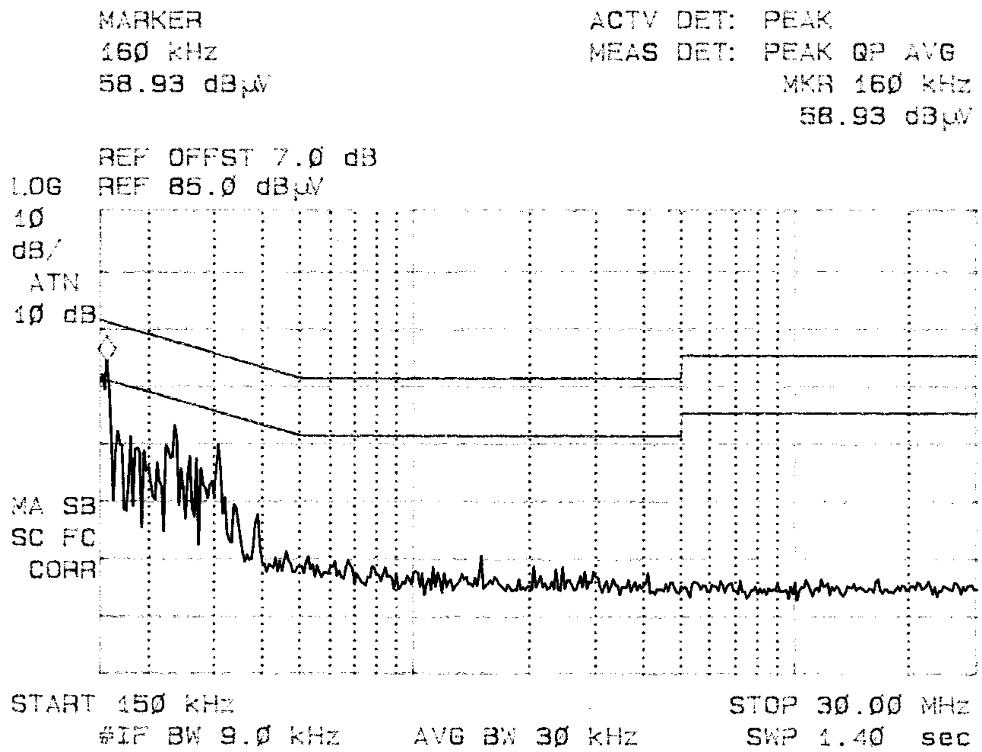


Figure one AC Line Conducted emissions of EUT line 1

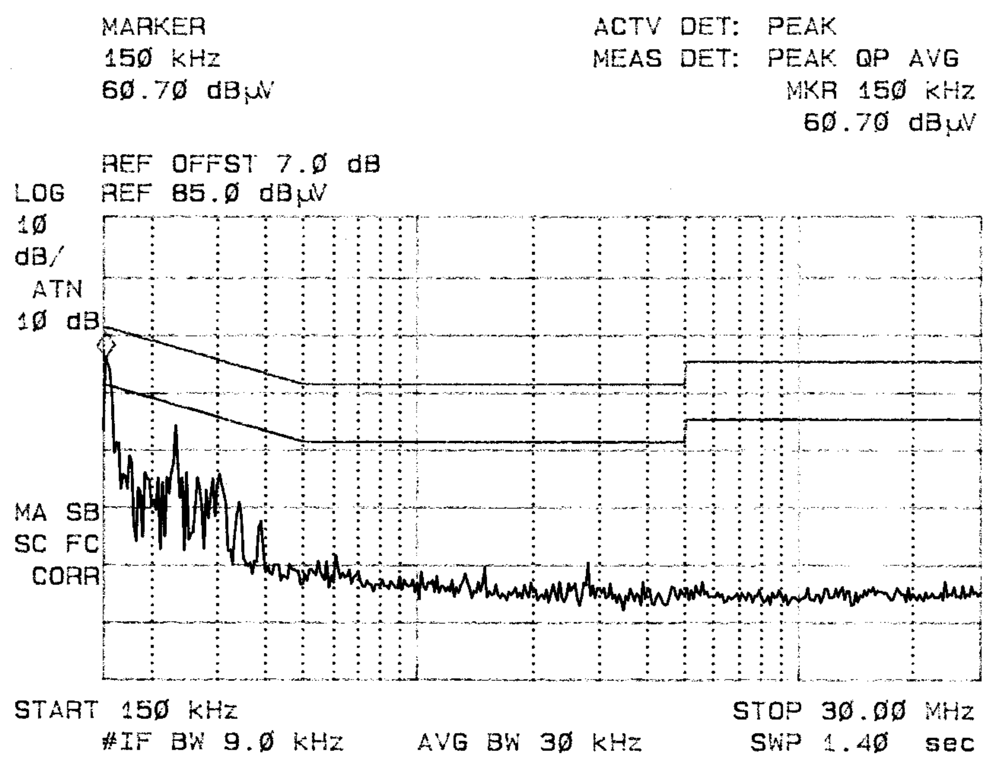


Figure two AC Line Conducted emissions of EUT line 2

Radiated EMI

Testing of the radiated emissions was performed as defined in clauses 6 through 8 of ANSI C63.4. This test configuration represented a typical equipment configuration and the EUT was operated through all of its various modes. Preliminary testing was performed in a screen room with the EUT positioned 1 meter from the FSM. Radiated emissions measurements were performed to identify the frequencies that produced the highest emissions. Plots were made of the frequency spectrum from 30 MHz to 1,200 MHz for the preliminary radiated emissions testing. Refer to figures 3 and 4 showing the radiated emissions spectrum taken in a screen room. The EUT, supporting equipment, and cable locations were noted and reconfigured at the open field test site. The highest radiated emission was then maximized at this location before final radiated emissions measurements were performed. Final data was taken with the EUT located at the open field test site at a distance of 3 meters between the EUT and the receiving antenna. The frequency spectrum from 30 MHz to 6,000 MHz was searched for radiated emissions. Measured emission levels were maximized by EUT placement on the table, changing cable location, rotating the turntable through 360 degrees, varying the antenna height between 1 and 4 meters above the ground plane and changing antenna polarization between horizontal and vertical. Antennas used included Broadband Biconical from 30 MHz to 200 MHz, Log Periodic from 200 MHz to 5 GHz, Biconilog from 30 MHz to 1000 MHz and double ridged horn and/or pyramidal horns from 4-40 GHz.

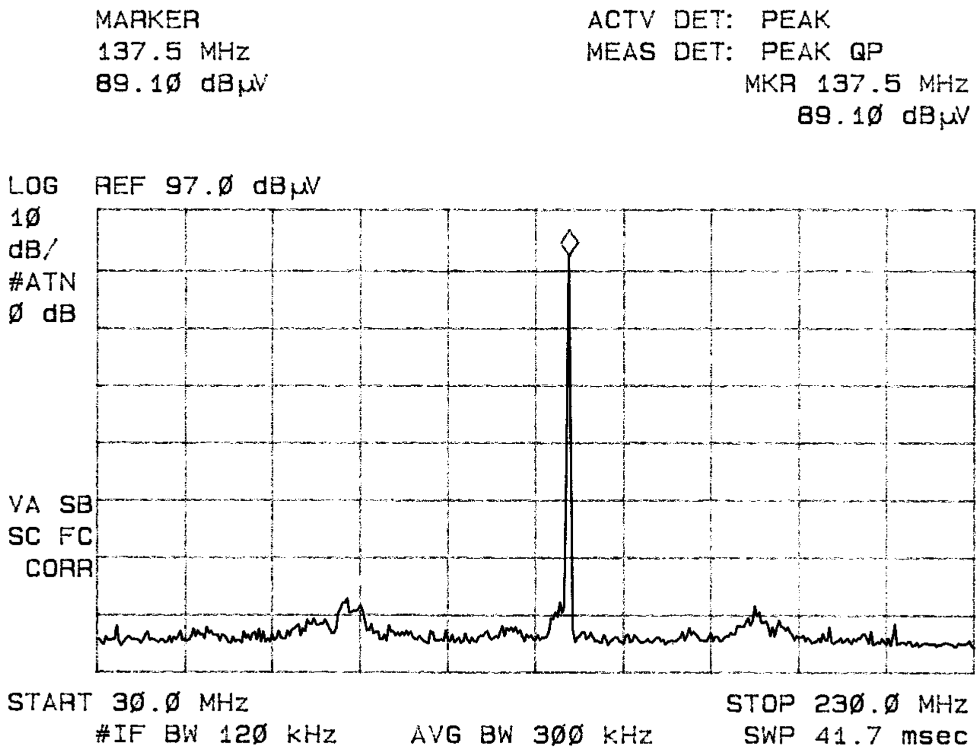


Figure three Radiated Emissions taken in screen room

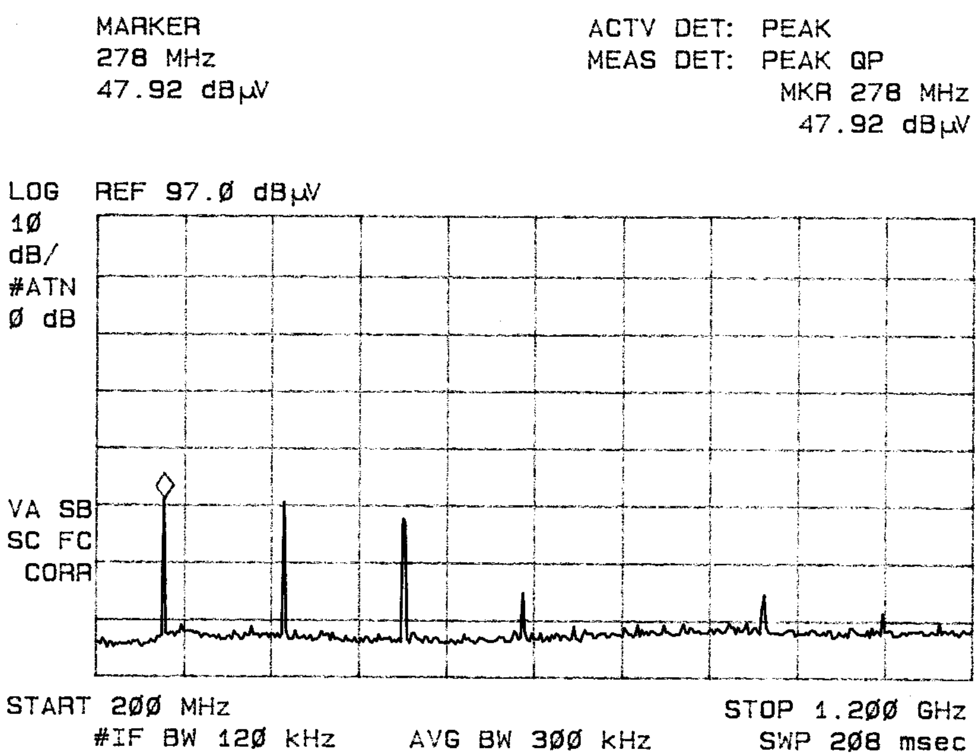


Figure four Radiated Emissions taken in screen room

15.101 Unintentional Radiators - Receiver Verification

Report of measurements for receiver, other than FM or TV, incorporated with a transmitter, which requires a grant of certification. Information for receiver verification is presented in separate report as required.

15.107 Measurements of Line Conducted Emissions

AC Line Conducted Emissions Data

Frequency band (MHz)	L1 Level (dBµV) Peak	Q.P.	AVE	L2 Level (dBµV) Peak	Q.P.	AVE	CISPR 22 Q.P./AVE Limit(dBµV)
0.15 – 0.5	59.0	54.1	43.2	60.7	57.3	52.2	66 / 50
0.5 – 5	30.2	20.9	12.6	26.3	22.6	17.5	56 / 46
5 – 10	20.7	16.2	10.0	20.9	16.6	10.3	60 / 50
10 – 15	20.4	15.9	9.7	20.9	15.9	9.6	60 / 50
15 – 20	21.0	16.0	9.6	22.4	16.0	9.8	60 / 50
20 – 25	21.2	15.8	9.4	20.3	15.8	9.6	60 / 50
25 – 30	20.0	15.7	9.4	20.2	15.7	9.5	60 / 50

Other emissions present had amplitudes at least 20 dB below the limit.

15.109 Measurements of Radiated Emissions

General Radiated Emissions Data

Frequency in MHz	FSM Horz. (dBµV)	FSM Vert. (dBµV)	A.F. (dB/m)	Amp. Gain (dB)	RFS Horz. @ 3m (dBµV/m)	RFS Vert. @ 3m (dBµV/m)	FCC Class B Limit @ 3m (dBµV/m)

All emissions present had amplitudes at least 20 dB below the limit.

General Emissions Summary of Results

AC Line Conducted Emissions Results

The conducted emissions for the EUT comply with the requirements for CISPR 22 and CFR47 Part 15B. The TG480 had an 8.7 dB minimum margin below the CISPR quasi peak limit, and a 3.8 dB minimum margin below the CISPR average limit. Other emissions were present with recorded data representing the worst-case amplitudes.

Radiated Emissions

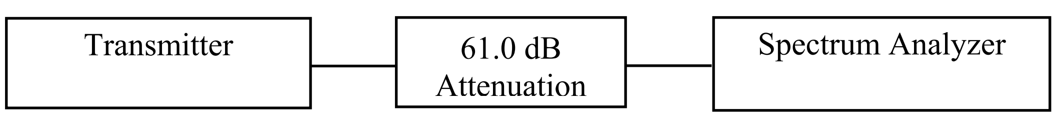
The Radiated emissions for the EUT comply with the requirements for CISPR 22 and CFR47 Part 15B. The radiated emissions for the EUT meet the requirements with a minimum of 20.0 dB margin below the limit. Other emissions were present with amplitudes at least 20 dB below the Class B limits.

2.1046 Radio Frequency Power Output

Measurements Required

Measurements shall be made to establish the radio frequency power delivered by the transmitter into the standard output termination. The power output shall be monitored and recorded and no adjustment shall be made to the transmitter after the test has begun, except as noted below:
If the power output is adjustable, measurements shall be made for the highest and lowest power levels.

Test Arrangement



The radio frequency power output was measured at the antenna terminal by placing of 61.0 dB attenuation in the antenna line and observing the emission with the spectrum analyzer. The spectrum analyzer had an impedance of 50Ω to match the impedance of the standard antenna. A HP 8591EM Spectrum Analyzer was used to measure the radio frequency power at the antenna port. The data was taken in dBm and converted to watts as shown in the following Table. Refer to Figure 5 showing the maximum output power of the transmitter. Data was taken per Paragraph CFR47, 2.1046(a) and applicable paragraphs of Part 87.

P_{dBm} = power in dB above 1 milliwatt.
Milliwatts = $10^{(PdBm/10)}$
Watts = (Milliwatts)(0.001)(W/mW)

Milliwatts = $10^{(42.93/10)}$
= 19,933.6 mW
= 20.0 Watts

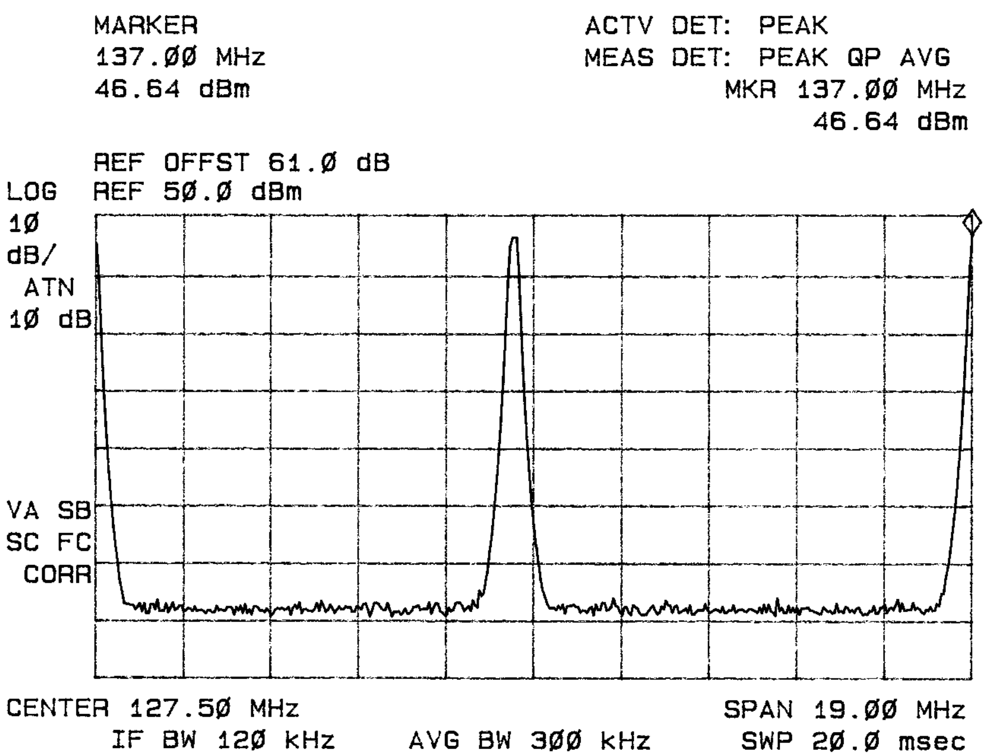


Figure 5 Maximum Power Output

Power Output Data

Frequency	P_{dBm}	P_{mw}	P_w
118.000	46.87	48,640.7	49
127.000	47.01	50,234.3	50
136.975	47.00	50,118.7	50

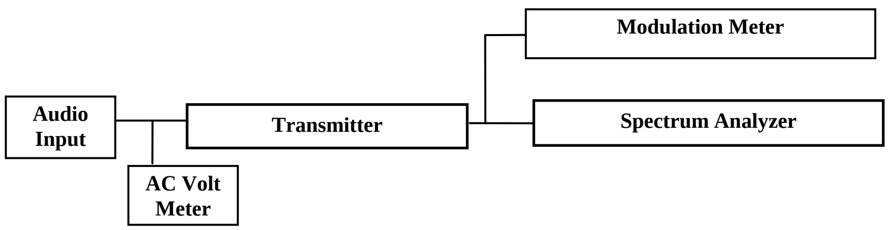
The specifications of Paragraph CFR47 2.1046(a) and applicable Parts of 2 and 87 are met. There are no deviations to the specifications.

2.1047 Modulation Characteristics

Measurements Required

A curve or equivalent data, which shows that the equipment will meet the modulation requirements of the rules, under which the equipment is to be licensed, shall be submitted.

Test Arrangement



The radio frequency output was coupled to a HP Spectrum Analyzer and a modulation meter. The spectrum analyzer was used to observe the radio frequency output spectrum with the transmitter operating through all available modes. The modulation meter was used to measure the percent modulation.

Modulation Characteristics Data

Figure 6 displays the graph made showing the audio frequency response of the modulator. The frequency generator was set to 1 kHz frequency and injected into the audio input port of the EUT. The input voltage amplitude was adjusted to obtain 50% modulation at 1000 Hz. This level was then taken as the 0-dB reference. The frequency of the generator was then varied and the output voltage level was adjusted to maintain the 50% modulation. The output level required for 50% modulation was then recorded. This level was normalized to the level required for 50% modulation at 1000 Hz.

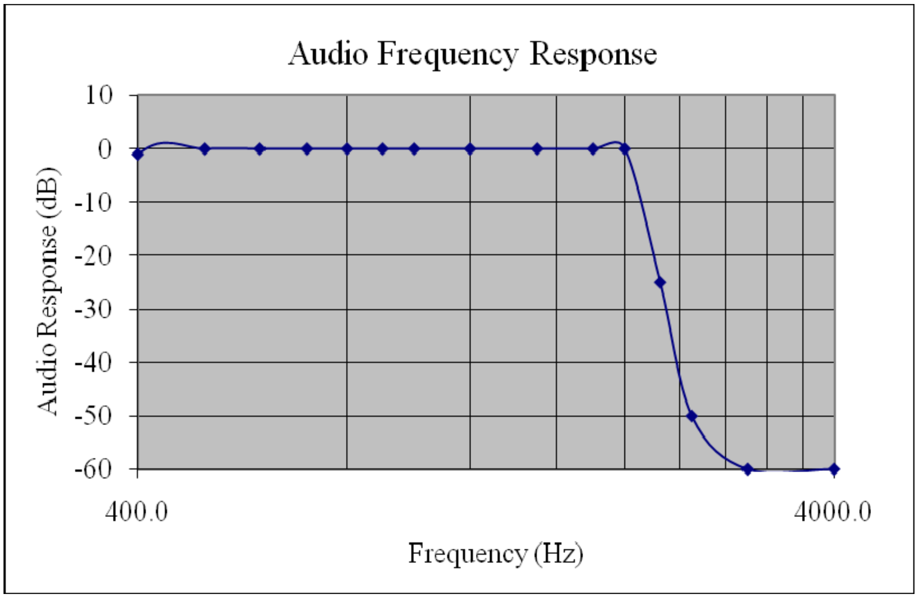


Figure 6 Audio Frequency Response Characteristics

Figure 7 shows the modulation characteristics each of six frequencies while the input voltage was varied. The frequency is held constant and the percent modulation is read from the modulation meter.

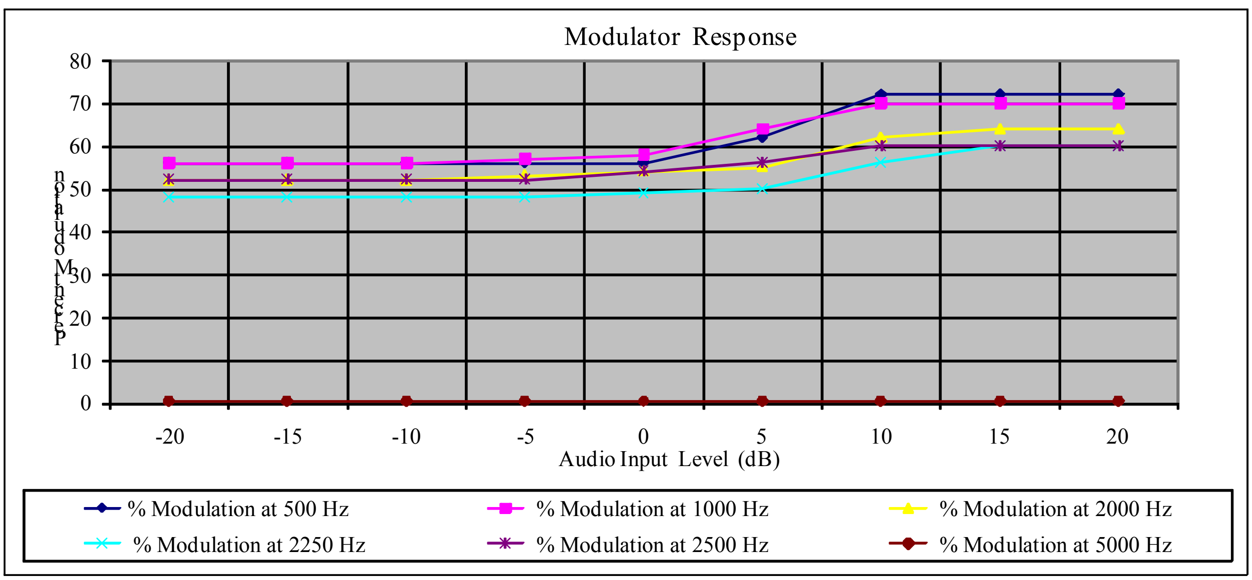


Figure 7 Modulation characteristics

Figure 8 shows the frequency response of the audio lowpass filter. The specifications of Paragraph 47 CFR 2.1047 and applicable parts of paragraph 87 are met.

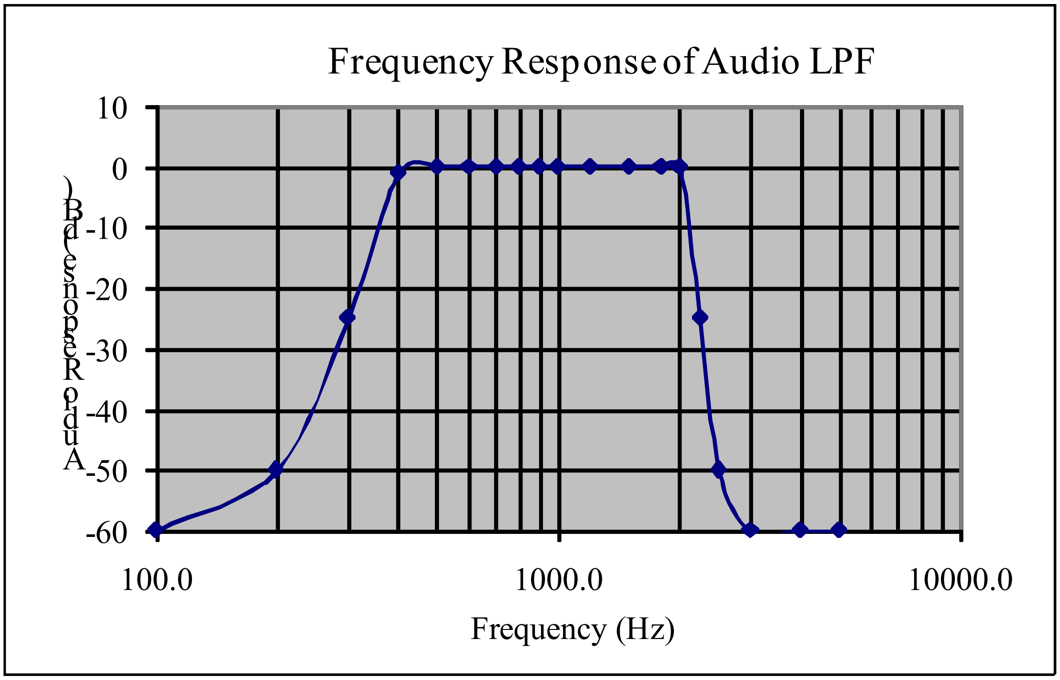


Figure 8 Frequency Response of Audio Low pass Filter

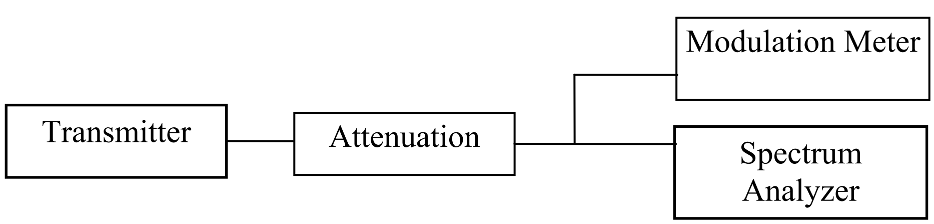
The requirements of CFR47 2.1049(c)(1) and applicable paragraphs of Part 87 are met. There are no deviations to the specifications.

2.1049 Occupied Bandwidth

Measurements Required

The occupied bandwidth, that is the frequency bandwidth such that below its lower and above its upper frequency limits, the mean powers radiated are equal to 0.5 percent of the total mean power radiated by a given emission.

Test Arrangement



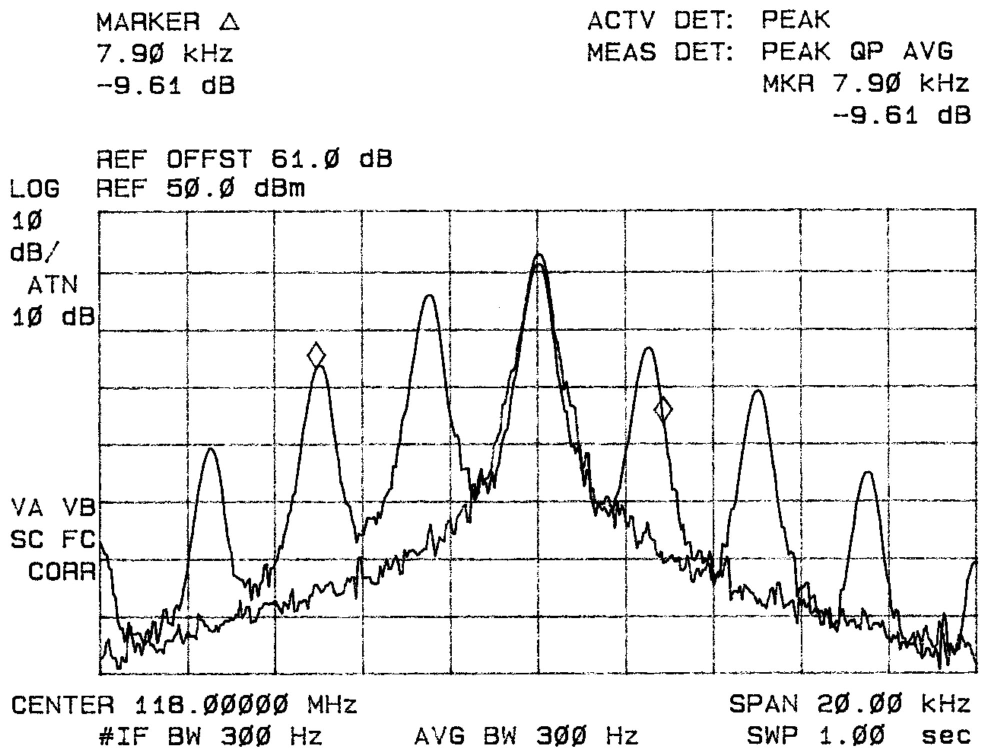


Figure 9 Occupied Band Width, Carrier frequency 118.000 MHz

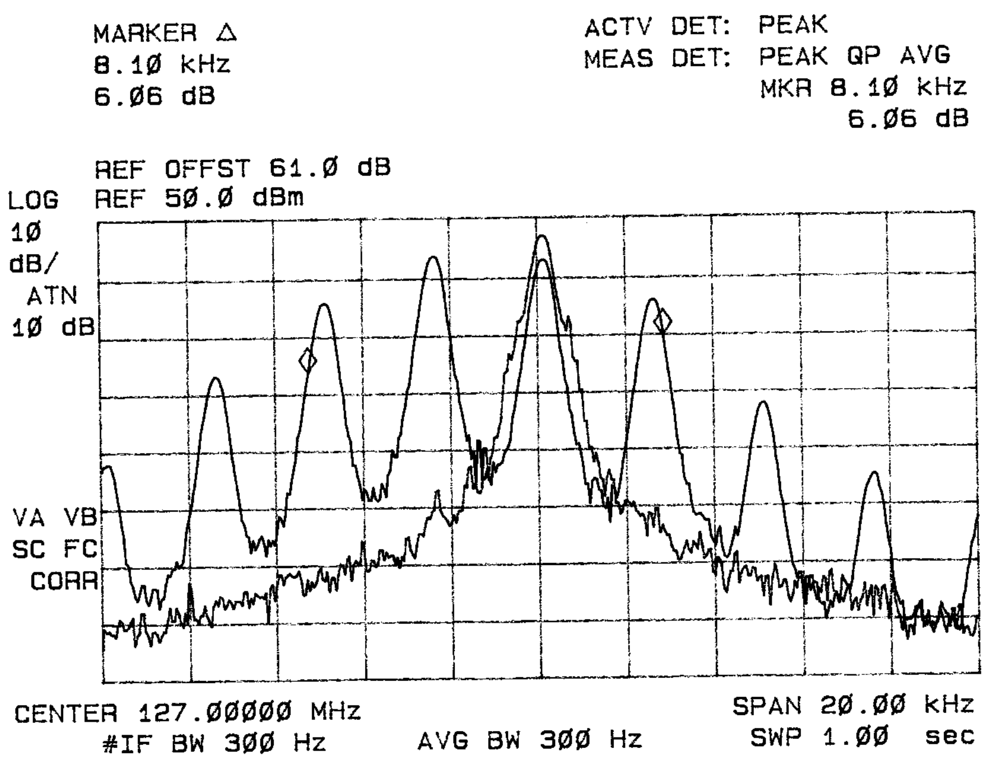


Figure 10 Occupied Band Width, Carrier frequency 127.000 MHz

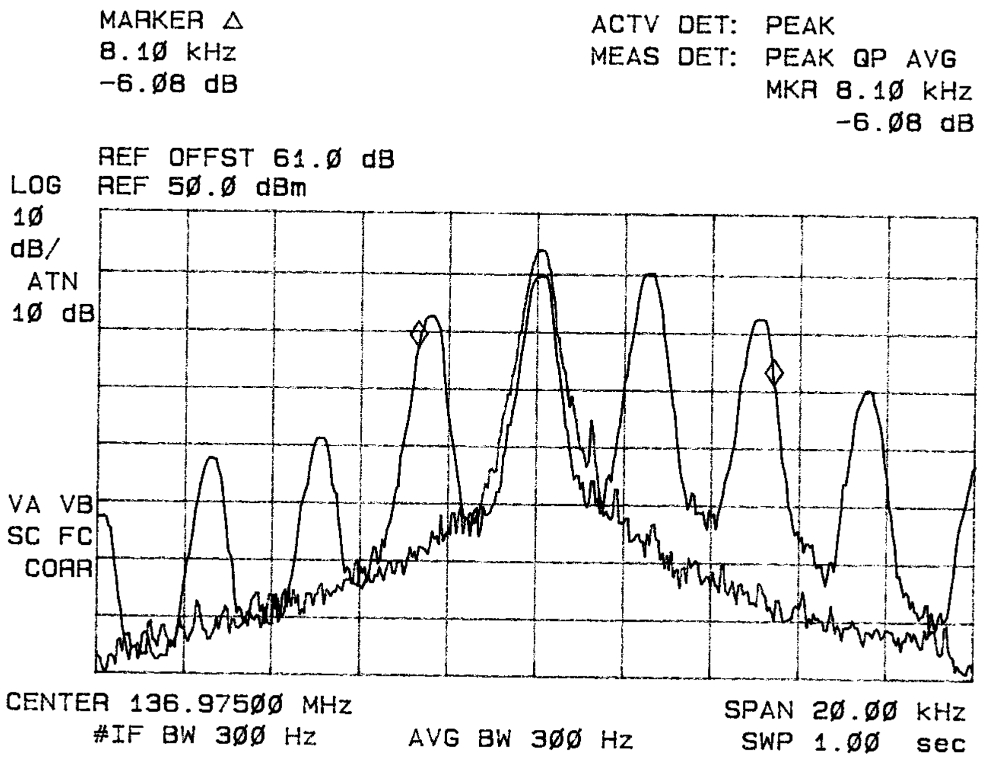


Figure 11 Occupied Band Width, Carrier frequency 136.975 MHz

Occupied Band Width Data

Frequency (MHz)	Occupied bandwidth(kHz)
118.000	7.90
127.000	8.10
136.975	8.10

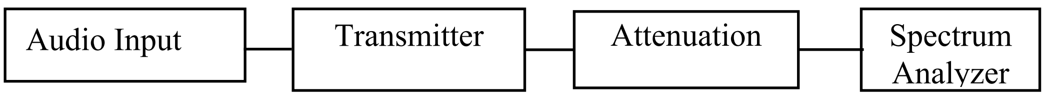
A spectrum analyzer was used to observe the radio frequency spectrum with the transmitter operating in a normal mode, modulated by a signal at a level 16 dB above 50% modulation. The power ratio in dB representing 99.5% of the total mean power was recorded from the spectrum analyzer. Refer to figures 9 through 11 showing plots of the 99.5% power occupied bandwidth. The requirements of CFR47 2.1049(c)(1) and applicable paragraphs of Part 87 are met. There are no deviations to the specifications.

2.1051 Spurious Emissions at Antenna Terminals

Measurements Required

The radio frequency voltage or power generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna.

Test Arrangement



The radio frequency output was coupled to a HP 8591EM Spectrum Analyzer. The spectrum analyzer was used to observe the radio frequency spectrum with the transmitter modulated per section 2.1049 and operated in a normal mode. The frequency spectrum from 10 MHz to 1800 MHz was observed and a plot produced of the frequency spectrum. Figure 12 represents data for the spurious emissions of the TG480. Data was taken per CFR47 2.1051, 2.1057, and applicable paragraphs of Part 87.

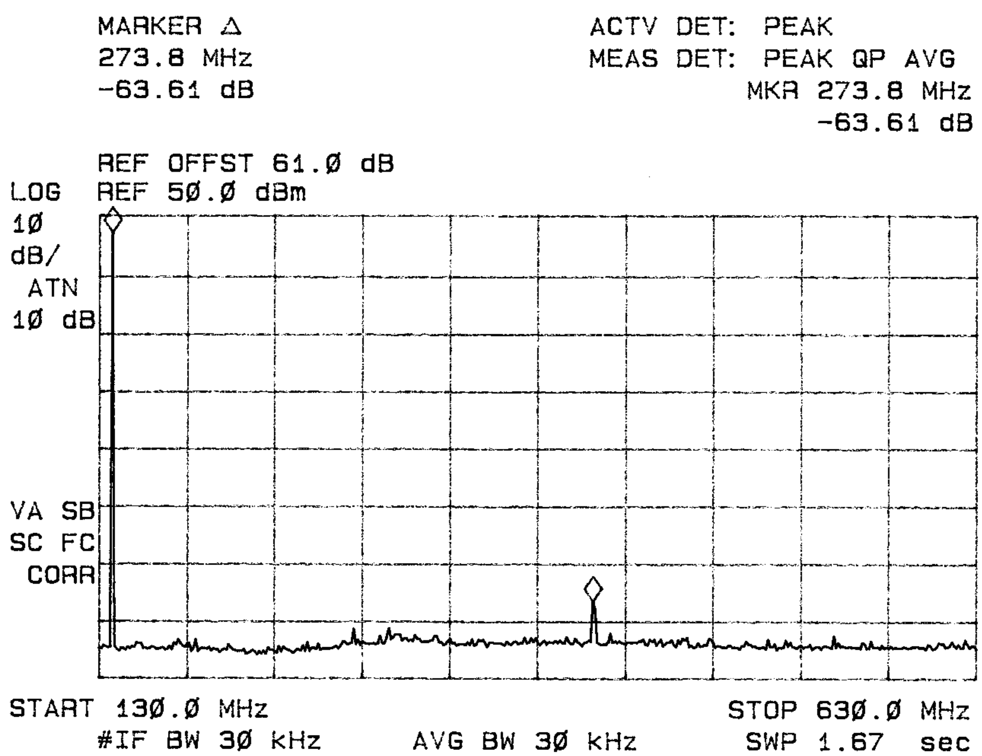


Figure 12 Spurious Emissions at Antenna Terminal

Spurious Emissions at Antenna Terminal Data

The output of the equipment was coupled to a HP Spectrum Analyzer and the frequency emissions were measured. Data was taken as per CFR47 2.1051 and applicable paragraphs of Part 87. Specifications of Paragraphs CFR47 2.1051, 2.1057 and applicable paragraphs of part 87 are met. There are no deviations to the specifications.

FCC Limit: The spurious emissions must be reduced in power by at least 43 + 10 LOG(P_o) below the carrier output power.

50 Watt = 43 + 10 LOG(P_o)
= 43 + 10 LOG(50)
Limit = 59.99 dB below carrier
Limit = 60 - 47 dBm (calculated absolute limit 13dBm)

Channel MHz	Spurious Frequency (MHz)	Measured Level (dBm)	Level Below Carrier (dB)
118.000	236.00	-20.6	-67.5
	354.00	-17.2	-64.1
	472.00	-26.8	-73.7
	590.00	-27.3	-74.2
	708.00	-26.3	-73.2
	826.00	-25.7	-72.6
	944.00	-24.6	-71.5
127.000	254.00	-21.7	-68.7
	381.00	-16.0	-63.0
	508.00	-26.9	-73.9
	635.00	-24.8	-71.8
	762.00	-26.2	-73.2
	889.00	-23.8	-70.8
	1016.00	-25.0	-72.0
136.975	273.95	-19.3	-66.3
	410.93	-15.0	-62.0
	547.90	-22.0	-69.0
	684.88	-25.6	-72.6
	821.85	-24.9	-71.9
	958.83	-23.6	-70.6
	1095.80	-26.0	-73.0

2.1053 Field Strength of Spurious Radiation

Measurements Required

Measurements shall be made to detect spurious emissions that may be radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal conditions of installation and operation. This equipment is offered for typical rack mount or desk top operation. Remote operation of the transmitter was accomplished using a Coaxial cable interfaced to the audio input port. The equipment was set to transmit on each of three frequencies in the band during testing. The antenna port was connected to a 50Ω resistive load during radiated emissions testing.

Test Arrangement

Transmitter — **Load**   **Antenna** — **Spectrum Analyzer**

The transmitter was placed on a wooden turntable 0.8 meters above the ground plane and at a distance of 3 meters from the Field Strength Measuring (FSM) antenna. With the EUT modulated and radiating into a 50Ω load. The receiving antenna was raised and lowered from 1m to 4m to obtain the maximum reading of spurious radiation from the EUT on the spectrum analyzer. The turntable was rotated though 360 degrees to locate the position registering the highest amplitude of emission. The frequency spectrum was then searched for spurious emissions generated from the transmitter. The amplitude of each spurious emission was maximized by raising and lowering the FSM antenna, and rotating the turntable before final data was recorded. A biconilog antenna was used for frequency measurements of 30 to 1000 MHz. A log periodic antenna was used for frequencies of 1000 MHz to 5000 MHz. Emission levels were measured and recorded from the spectrum analyzer in dBμV. The transmitter was then removed and replaced with a substitution antenna powered from a signal generator and amplifier. The output power from the generator was then adjusted such that the amplitude received was the same as that previously recorded for each frequency. This step was repeated for both horizontal and vertical polarizations. The power in dBm required to produce the desired signal level was then recorded from the signal generator. The power in dBm was then calculated by reducing the previous readings by the gain in the substitution antenna. Data was taken at the Rogers Labs, Inc. 3 meters open area test site (OATS). A description of the test facility is on file with the FCC, Reference 90910. The testing procedures used conform to the procedures stated in the TIA/EIA-603 document.

The limits for the spurious radiated emissions are defined by the following equation.

Limit = Amplitude of the spurious emission must be attenuated by this amount below the level of the fundamental. On any frequency removed from the assigned frequency by more than 250% of the authorized bandwidth: at least 43 + 10 Log (P_o) dB.

Spurious limit $= 43 + 10\ Log_{10}(P_w)$
$= 43 + 10\ Log_{10}(50)$
= 60.0 dB below the carrier frequency amplitude

Field Strength of Spurious Radiation Data

The EUT was connected to a resistive load and set to transmit at the desired frequency. The amplitude of each spurious emission was then maximized and recorded. The transmitter produces 50 watts of output power (47 dBm). Then the radiated spurious emission in dB is calculated from the following equation:

Radiated spurious emission (dB) = RSE
Radiated spurious emission (dB) =
$10\ Log_{10}$[Tx power(W)/0.001] – signal level required to reproduce example:
RSE = $10\ Log_{10}$[50/0.001]-(-79.5) = 122.5 dBc

Channel frequency 118.000 MHz

Frequency of Emission	Amplitude of Spurious emission		Signal level to dipole required to reproduce		Emission level below carrier		Limit
	Horizontal	Vertical	Horizontal	Vertical	Horizontal	Vertical	
(MHz)	dBµV	dBµV	dBm	dBm	dBc	dBc	dBc
236.0	45.4	28.2	-38.33	-55.53	85.2	102.4	60
354.0	17.3	23.7	-62.53	-56.13	109.4	103.0	60
472.0	24.1	25.9	-52.73	-50.93	99.6	97.8	60
590.0	13.9	15.2	-62.13	-60.83	109.0	107.7	60
708.0	15.6	13.0	-58.63	-61.23	105.5	108.1	60
826.0	16.6	18.2	-56.53	-54.93	103.4	101.8	60

Channel frequency 127.000 MHz

Frequency of Emission	Amplitude of Spurious emission		Signal level to dipole required to reproduce		Emission level below carrier		Limit
	Horizontal	Vertical	Horizontal	Vertical	Horizontal	Vertical	
(MHz)	dBµV	dBµV	dBm	dBm	dBc	dBc	dBc
254.0	40.7	30.1	-42.03	-52.63	89.0	99.6	60
381.0	26.2	17.9	-53.43	-61.73	100.4	108.7	60
508.0	37.1	30.8	-39.53	-45.83	86.5	92.8	60
635.0	12.9	13.1	-62.13	-61.93	109.1	108.9	60
762.0	20.0	17.1	-53.33	-56.23	100.2	103.1	60
889.0	14.5	14.3	-57.33	-57.53	104.2	104.4	60

Channel frequency 136.975 MHz

Frequency of Emission	Amplitude of Spurious emission		Signal level to dipole required to reproduce		Emission level below carrier		Limit
	Horizontal	Vertical	Horizontal	Vertical	Horizontal	Vertical	
(MHz)	dBµV	dBµV	dBm	dBm	dBc	dBc	dBc
273.95	40.6	26.4	-41.93	-56.13	88.9	103.1	60
410.93	27.1	24.5	-51.53	-54.13	98.5	101.1	60
547.90	29.3	36.8	-46.43	-38.93	93.4	85.9	60
684.88	16.1	16.6	-58.43	-57.93	105.4	104.9	60
821.85	20.8	18.9	-52.43	-54.33	99.3	101.2	60
958.83	18.0	17.1	-53.93	-54.83	100.8	101.7	60

Specifications of CFR47 Paragraph 2.1053, 2.1057, applicable paragraphs of part 87 are met.

There are no deviations or exceptions to the specifications.

2.1055 Frequency Stability

Measurements Required

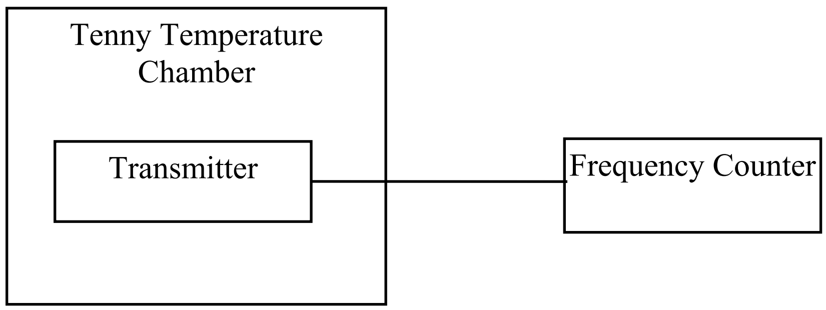
The frequency stability shall be measured with variations of ambient temperature from -30° to +50° centigrade. Measurements shall be made at the extremes of the temperature range and at intervals of not more than 10° centigrade through the range. A period sufficient to stabilize all of the components of the oscillator circuit at each temperature level shall be allowed prior to frequency measurement. In addition to temperature stability, the frequency stability shall be measured with variation of primary supply voltage as follows:

(1) Vary primary supply voltage from 85 to 115 percent of the nominal.

(2) For hand carried, batteries powered equipment, reduce primary supply voltage to the battery-operating end point, which shall be specified by the manufacturer.

(3) The supply voltage shall be measured at the input to the cable normally provided with the equipment, or at the power supply terminals if cables are not normally provided.

Test Arrangement



The measurement procedure outlined below shall be followed.

Step 1: The transmitter shall be installed in an environmental test chamber whose temperature is controllable. Provision shall be made to measure the frequency of the transmitter.

Step 2: With the transmitter inoperative (power switched "OFF"), the temperature of the test chamber shall be adjusted to +25°C. After a temperature stabilization period of one hour at +25°C, the transmitter shall be switched "ON" with standard test voltage applied.

Step 3: The carrier shall be keyed "ON", and the transmitter shall be operated unmodulated at full radio frequency power output at the duty cycle, for which it is rated, for duration of at least 5 minutes. The radio frequency carrier frequency shall be monitored and measurements shall be recorded.

Step 4: The test procedures outlined in Steps 2 and 3, shall be repeated after stabilizing the transmitter at the environmental temperatures specified, -30°C to +50°C in 10-degree increments.

The frequency stability was measured with variations in the power supply voltage from 85 to 115 percent of the nominal value. An AC power supply was used to vary the AC voltage for the power input from 102.0 Vac to 138 Vac. The frequency was measured and the variation in parts per million was calculated. Data was taken per CFR47 Paragraphs 2.1055 and applicable paragraphs of part 87.

Frequency Stability Data

Frequency 127.000 (MHz)	Frequency Stability Vs Temperature In Parts Per Million (PPM)								
Temperature °C	-30	-20	-10	0	10	20	30	40	50
Change (Hz)	-1780.0	-1310.0	-1280.0	-1250.0	-1030.0	0.0	270.0	350.0	1250.0
PPM	-14.016	-10.315	-10.079	-9.843	-8.110	0.00	2.126	2.756	9.843
%	-0.001	-0.001	-0.001	-0.001	-0.001	0.00	0.000	0.000	0.001
Limit (PPM)	20	20	20	20	20	20	20	20	20

Frequency 127.000 MHz	Frequency Stability Vs Voltage Variation 120.0 volts nominal; Results In PPM		
Input Voltage	102.0	120.0	138.0
Change (HZ)	0.0	0.0	0.0

Specifications of CFR47 Paragraphs 2.1055 and applicable paragraphs of part 87 are met. There are no deviations or exceptions to the specifications.

Annex

- Annex A, Measurement Uncertainty Calculations
- Annex B, Test Equipment List.
- Annex C, Rogers Qualifications.
- Annex D, FCC Site Approval Letter.
- Annex E, Industry Canada Approval Letter.

Annex A Measurement Uncertainty Calculations

Radiated Emissions Measurement Uncertainty Calculation

Measurement of vertically polarized radiated field strength over the frequency range 30 MHz to 1 GHz on an open area test site at 3m and 10m includes following uncertainty:

Contribution	Probability Distribution	Uncertainty (dB)
Antenna factor calibration	normal (k = 2)	±0.58
Cable loss calibration	normal (k = 2)	±0.2
Receiver specification	rectangular	±1.0
Antenna directivity	rectangular	±0.1
Antenna factor variation with height	rectangular	±2.0
Antenna factor frequency interpolation	rectangular	±0.1
Measurement distance variation	rectangular	±0.2
Site Imperfections	rectangular	±1.5

Combined standard uncertainty $u_c(y)$ is

$$U_c(y) = \pm \sqrt{\left[\frac{1.0}{2}\right]^2 + \left[\frac{0.2}{2}\right]^2 + \left[\frac{1.0^2 + 0.1^2 + 2.0^2 + 0.1^2 + 0.2^2 + 1.5^2}{3}\right]}$$

$U_c(y) = \pm$ 1.6 dB

It is probable that $u_c(y) / s(q_k) > 3$, where $s(q_k)$ is estimated standard deviation from a sample of n readings unless the repeatability of the EUT is particularly poor, and a coverage factor of k = 2 will ensure that the level of confidence will be approximately 95%, therefore:

$$s(q_k) = \sqrt{\frac{1}{(n-1)} \sum_{k-1}^{n} (q_k - \bar{q})^2}$$

$U = 2\, U_c(y) = 2 \times \pm 1.6$ dB $= \pm$ 3.2 dB

Notes:

1.1 Uncertainties for the antenna and cable were estimated, based on a normal probability distribution with k = 2.

1.2 The receiver uncertainty was obtained from the manufacturer's specification for which a rectangular distribution was assumed.

1.3 The antenna factor uncertainty does not take account of antenna directivity.

1.4 The antenna factor varies with height and since the height was not always the same in use as when the antenna was calibrated an additional uncertainty is added.

1.5 The uncertainty in the measurement distance is relatively small but has some effect on the received signal strength. The increase in measurement distance as the antenna height is increased is an inevitable consequence of the test method and is therefore not considered a contribution to uncertainty.

1.6 Site imperfections are difficult to quantify but may include the following contributions:
-Unwanted reflections from adjacent objects.
-Ground plane imperfections: reflection coefficient, flatness, and edge effects.
-Losses or reflections from "transparent" cabins for the EUT or site coverings.
-Earth currents in antenna cable (mainly effect biconical antennas).

The specified limits for the difference between measured site attenuation and the theoretical value (± 4 dB) were not included in total since the measurement of site attenuation includes uncertainty contributions already allowed for in this budget, such as antenna factor.

Conducted Measurements Uncertainty Calculation

Measurement of conducted emissions over the frequency range 9 kHz to 30 MHz includes following uncertainty:

Contribution	Probability Distribution	Uncertainty (dB)
Receiver specification	rectangular	±1.5
LISN coupling specification	rectangular	±1.5
Cable and input attenuator calibration	normal (k=2)	±0.5

Combined standard uncertainty $u_c(y)$ is

$$U_c(y) = \pm \sqrt{\left[\frac{0.5}{2}\right]^2 + \frac{1.5^2 + 1.5^2}{3}}$$

$U_c(y) = \pm 1.2$ dB

As with radiated field strength uncertainty, it is probable that $u_c(y) / s(q_k) > 3$ and a coverage factor of $k = 2$ will suffice, therefore:

$U = 2\, U_c(y) = 2 \times \pm 1.2$ dB $= \pm 2.4$ dB

Annex B Test Equipment List For Rogers Labs, Inc.

The test equipment used is maintained in calibration and good operating condition. Use of this calibrated equipment ensures measurements are traceable to national standards.

List of Test Equipment	Calibration Date
Oscilloscope Scope: Tektronix 2230	2/08
Wattmeter: Bird 43 with Load Bird 8085	2/08
Power Supplies: Sorensen SRL 20-25, SRL 40-25, DCR 150, DCR 140	2/08
H/V Power Supply: Fluke Model: 408B (SN: 573)	2/08
R.F. Generator: HP 606A	2/08
R.F. Generator: HP 8614A	2/08
R.F. Generator: HP 8640B	2/08
Spectrum Analyzer: HP 8562A,	2/08
Mixers: 11517A, 11970A, 11970K, 11970U, 11970V, 11970W	
HP Adapters: 11518, 11519, 11520	
Spectrum Analyzer: HP 8591EM	5/08
Frequency Counter: Leader LDC825	2/08
Antenna: EMCO Biconilog Model: 3143	5/08
Antenna: EMCO Log Periodic Model: 3147	10/07
Antenna: Antenna Research Biconical Model: BCD 235	10/07
Antenna: EMCO Dipole Set 3121C	2/08
Antenna: C.D. B-101	2/08
Antenna: Solar 9229-1 & 9230-1	2/08
Antenna: EMCO 6509	2/08
Audio Oscillator: H.P. 201CD	2/08
R.F. Power Amp 65W Model: 470-A-1010	2/08
R.F. Power Amp 50W M185- 10-501	2/08
R.F. PreAmp CPPA-102	2/08
LISN 50 µHy/50 ohm/0.1 µf	10/07
LISN Compliance Eng. 240/20	2/08
LISN Fischer Custom Communications FCC-LISN-50-16-2-08	2/08
Peavey Power Amp Model: IPS 801	2/08
Power Amp A.R. Model: 10W 1010M7	2/08
Power Amp EIN Model: A301	2/08
ELGAR Model: 1751	2/08
ELGAR Model: TG 704A-3D	2/08
ESD Test Set 2010i	2/08
Fast Transient Burst Generator Model: EFT/B-101	2/08
Current Probe: Singer CP-105	2/08
Current Probe: Solar 9108-1N	2/08
Field Intensity Meter: EFM-018	2/08
KEYTEK Ecat Surge Generator	2/08

Annex C Qualifications

Scot D. Rogers, Engineer

Rogers Labs, Inc.

Mr. Rogers has approximately 17 years experience in the field of electronics. Six years working in the automated controls industry and 6 years working with the design, development and testing of radio communications and electronic equipment.

Positions Held

Systems Engineer:	A/C Controls Mfg. Co., Inc.	6 Years
Electrical Engineer:	Rogers Consulting Labs, Inc.	5 Years
Electrical Engineer:	Rogers Labs, Inc.	Current

Educational Background

1) Bachelor of Science Degree in Electrical Engineering from Kansas State University.
2) Bachelor of Science Degree in Business Administration Kansas State University.
3) Several Specialized Training courses and seminars pertaining to Microprocessors and Software programming.

Scot D Rogers

Scot D. Rogers

Annex D FCC Site Approval Letter

FEDERAL COMMUNICATIONS COMMISSION
Laboratory Division
7435 Oakland Mills Road
Columbia, MD 21046

June 18, 2008

Registration Number: 90910

Rogers Labs, Inc.
4405 West 259th Terrace,
Louisburg, KS 66053

Attention: Scot Rogers

Re: Measurement facility located at Louisburg
3 & 10 meter site
Date of Renewal: June 18, 2008

Dear Sir or Madam:

Your request for renewal of the registration of the subject measurement facility has been received. The information submitted has been placed in your file and the registration has been renewed. The name of your organization will remain on the list of facilities whose measurement data will be accepted in conjunction with applications for Certification under Parts 15 or 18 of the Commission's Rules. Please note that the file must be updated for any changes made to the facility and the registration must be renewed at least every three years.

Measurement facilities that have indicated that they are available to the public to perform measurement services on a fee basis may be found on the FCC website www.fcc.gov under E-Filing, OET Equipment Authorization Electronic Filing, Test Firms.

Sincerely,

Phyllis Parrish
Industry Analyst

Annex E Industry Canada Site Approval Letter

Industry Canada Industrie Canada

July 29th, 2008

OUR FILE: 46405-3041
Submission No: 127059

Rogers Labs Inc.
4405 West 259th Terrace
Louisburg KY 66053
USA

Attention: Scot D. Rogers

Dear Sir/Madame:

The Bureau has received your application for the registration / renewal of a 3/10m OATS. Be advised that the information received was satisfactory to Industry Canada. The following number(s) is now associated to the site(s) for which registration / renewal was sought **(3040A-1).** Please reference the appropriate site number in the body of test reports containing measurements performed on the site. In addition, please be informed that the Bureau is now utilizing a **new site numbering scheme** in order to simplify the electronic filing process. Our goal is to reduce the number of secondary codes associated to one particular company. The following changes have been made to your records.

Your primary code is: **3041**
The company number associated to the site(s) located at the above address is: **3041A**
The table below is a summary of the changes made to the unique site registration number(s):

New Site Number	Obsolete Site Number	Description of Site	Expiry Date (YYYY-MM-DD)
3041A-1	3041-1	3 / 10m OATS	2010-07-29

Furthermore, to obtain or renew a unique site number, the applicant shall demonstrate that the site has been accredited to ANSI C63.4-2003 or later. A scope of accreditation indicating the accreditation by a recognized accreditation body to ANSI C63.4-2003 shall be accepted. Please indicate in a letter the previous assigned site number if applicable and the type of site (example: 3 meter OATS or 3 meter chamber). If the test facility is not accredited to ANSI C63.4-2003 or later, the test facility shall submit test data demonstrating full compliance with the ANSI standard. The Bureau will evaluate the filing to determine if recognition shall be granted.

The frequency for re-validation of the test site and the information that is required to be filed or retained by the testing party shall comply with the requirements established by the accrediting organization. However, in all cases, test site re-validation shall occur on an interval not to exceed two years. There is no fee or form associated with an OATS filing. OATS submissions are encouraged to be submitted electronically to the Bureau using the following URL;

If you have any questions, you may contact the Bureau by e-mail at certification.bureau@ic.gc.ca
Please reference our file and submission number above for all correspondence.
Yours sincerely,

S. Proulx Wireless Laboratory
Manager Certification and
Engineering Bureau Industry Canada
3701 Carling Ave., Building 94
Ottawa, Ontario K2H 8S2
Canada

Canada