NVLAP Lab Code 200087-0

Test Report

FCC CFR47 Part 87 and Industry Canada RSS-141

Application for Grant of Certification

For

Model: GTR 200
IC M/N: GTR 200-1
GPN: 011-02979-00

118-136.975 MHz

Aviation Communications Transceiver

FCC ID: IPH-0211501

IC: 1792A-0211501

For

Garmin International, Inc.

1200 East 151st Street

Olathe, KS 66062

Test Report Number 130520

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

Test Report For Application of Certification

For

Garmin International, Inc.

1200 East 151st Street
Olathe, KS 66062
Phone: (913) 397-8200

Mr. Van Ruggles
Director of Quality Assurance

Model: GTR 200
IC M/N: GTR 200-1
GPN: 011-02979-00

Aviation Communications Transceiver

FCC ID: IPH-0211501
IC: 1792A-0211501
Frequency Range: 118-136.975 MHz

Test Date: May 20, 2013

Certifying Engineer: Scot D Rogers

Scot D. Rogers
Rogers Labs, Inc.
4405 West 259th Terrace
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Revision History

Revision 1 issued June 1, 2013

Forward

In accordance with the Federal Communications, Code of Federal Regulations dated October 1, 2012, 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 Industry Canada RSS-141 Issue 2, June 2010 the following information is submitted for consideration on obtaining Grant of Certification.

Opinion / Interpretation of Results

Tests Performed	Results
Emissions Tests	
Requirements per CFR47 paragraphs 2.1031-2.1057 and RSS-141, Issue 2	Complies
Requirements per CFR47 paragraphs 87.131 and RSS-141 paragraph 5.1	Complies
Requirements per CFR47 paragraphs 87.133 and RSS-141 paragraph 5.1	Complies
Requirements per CFR47 paragraphs 87.135 and RSS-141 paragraph 5.1	Complies
Requirements per CFR47 paragraphs 87.139 and RSS-141 paragraph 5.2.2	Complies
Requirements per CFR47 paragraphs 87.141 and RSS-141 paragraph 5.1	Complies

Applicable Standards & Test Procedures

In accordance with the Federal Communications Code of Federal Regulations Part 2, Subpart J, Paragraphs 2.907, 2.911, 2.913, 2.925, 2.926, 2.1031 through 2.1057, and applicable paragraphs of Part 87, and RSS-141, Issue 2 the following is submitted for consideration in obtaining Grant of Certification. Test procedures used are the established Methods of Measurement of Radio-Noise Emissions as described in ANSI C63.4-2009 and TIA/EIA 603.

Environmental Conditions

Ambient Temperature	22.4° C
Relative Humidity	41%
Atmospheric Pressure	1015.8 mb

Application for Certification

1) Manufacturer: Garmin International, Inc. 1200 East 151st Street Olathe, KS 66062

2) Identification: FCC I.D.: IPH-0211501 IC: 1792A-0211501

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

4) Emission Type: Emissions designator 6k00A3E (25 kHz)

5) Frequency Range: 118-136.975 MHz (25 kHz channel operation)

6) Operating Power Level: 12 W nominal, 41 dBm

7) Maximum P_o: Maximum allowable power output of 55 Watts as defined per CFR47 paragraph 87.131 and RSS-141 paragraph 5.1.

8) Power into final amplifying circuitry: Power delivered into final amplifier 27.5 volts @ 1.53 amps (42.1 watts)

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 Exhibit for Circuit information and 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

14) Data required by CFR47 paragraphs 2.1046 through 2.1057 are contained in this application.

15) External power amplifier requirements do not apply to this device or application.

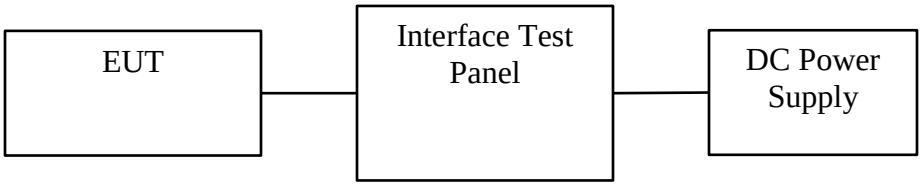
16) AM broadcast requirements do not apply to this device or application.

17) Requirements of CFR47 paragraph 25.129 do not apply to this device or application.

18) The device is not a software-defined radio and requirements of 2.944 do not apply to this application.

System Description

The GTR 200 is an aeronautical navigational/communications transceiver. The transmitter operational frequency band is 118.000 to 136.975 MHz (25 kHz mode). The device is marketed as Aircraft, Panel or Remote Mounted Integrated Avionics Unit. The design includes an Aviation-Band VHF Transceiver with 25 kHz Channel Spacing.



Units of Measurements

AC Line 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

Antenna Conducted — Data is in dBm, dB referenced to one milliwatt

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 testing performed at the 3 meters, Open Area Test Site (OATS) located at Rogers Labs, Inc., 4405 W. 259th Terrace, Louisburg, KS.

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

List of Test Equipment

A Rohde & Schwarz ESU40 and/or Hewlett Packard 8591EM Spectrum Analyzer was used as the measuring device for the emissions testing of frequencies below 1 GHz. A Rohde & Schwarz ESU40 and/or Hewlett Packard 8562A Spectrum Analyzer was used as the measuring device for testing the emissions at frequencies above 1 GHz. The analyzer settings used are described in the following table. Refer to the appendix for a complete list of test equipment.

Analyzer Settings		
AC Line Conducted Emissions:		
RBW	AVG. BW	Detector Function
9 kHz	30 kHz	Peak/Quasi Peak
Radiated Emissions 30-1000 MHz		
RBW	AVG. BW	Detector Function
100 kHz	100 kHz	Peak
120 kHz	300 kHz	Peak/Quasi Peak
Radiated Emissions Above 1000 MHz		
RBW	Video BW	Detector Function
1 MHz	1 MHz	Peak / Average

Equipment	Manufacturer	Model	Band	Cal Date	Due
☐ LISN	Comp. Design	FCC-LISN-2-MOD.CD	.15-30MHz	10/12	10/13
☐ Antenna	ARA	BCD-235-B	20-350MHz	10/12	10/13
☐ Antenna	EMCO	3147	200-1000MHz	10/12	10/13
☒ Antenna	Com Power	AH-118	1-18 GHz	10/12	10/13
☒ Antenna	Sunol	JB-6	30-1000 MHz	10/12	10/13
☒ Antenna	EMCO	6509	.001-30 MHz	10/12	10/13
☒ Amplifier	Com-Power	PA-010	100Hz-30MHz	10/12	10/13
☒ Amplifier	Com-Power	CPPA-102	1-1000 MHz	10/12	10/13
☒ Amplifier	Com-Power	PA-22	0.5-22 GHz	10/12	10/13
☒ Antenna	Com Power	AH-840	18-40 GHz	5/13	5/14
☒ Antenna	Standard	FXRY638A	10-18 GHz	5/13	5/14
☐ Antenna	EMCO	3143	20-1200 MHz	5/13	5/14
☐ Analyzer	HP	8591EM	9kHz-1.8GHz	5/13	5/14
☐ Analyzer	HP	8562A	9kHz-110GHz	5/13	5/14
☒ Analyzer	Rohde & Schwarz	ESU40	20Hz-40GHz	5/13	5/14

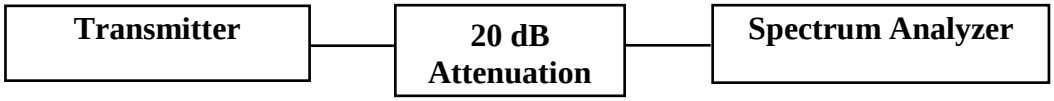
Transmitter Power Output

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. Output transmitter power is not user selectable.

Test Arrangement



The radio frequency power output was measured at the antenna terminal by placing 20-dB attenuation in the antenna line and observing the emission with the spectrum analyzer. The spectrum analyzer offered an impedance of 50Ω to match the impedance of the standard antenna. A Rohde & Schwarz ESU40 Spectrum Analyzer was used to measure the radio frequency power at the antenna port. Data was taken in dBm and converted to watts as shown in the following Table. Refer to Figure 1 showing maximum output power of the transmitter. Data was taken per CFR47 Paragraph 2.1046(a) and applicable paragraphs of Part 87 and RSS-141.

P_{dBm} = power in dB above 1 milliwatt

Milliwatts $= 10^{(PdBm/10)}$

Watts = (Milliwatts)(0.001)(W/mW)

Milliwatts $= 10^{(40.73/10)}$

= 11,830 mW

= 11.9 Watts Peak power

Table 1 Transmitter Power Results

Frequency	Input Power	P_{dBm}	P_{mw}	P_{w}
118.000	14 Vdc	40.73	11,830	11.9
127.000	14 Vdc	41.06	12,764	12.8
136.975	14 Vdc	40.75	11,885	11.9
118.000	28 Vdc	40.46	11,117	11.1
127.000	28 Vdc	40.78	11,967	12.0
136.975	28 Vdc	40.46	11,117	11.1

The EUT demonstrated compliance with specifications of CFR47 Paragraph 2.1046(a) and applicable Parts of 2 and 87.131 and RSS-141 paragraph 5.1. There are no deviations to the specifications.

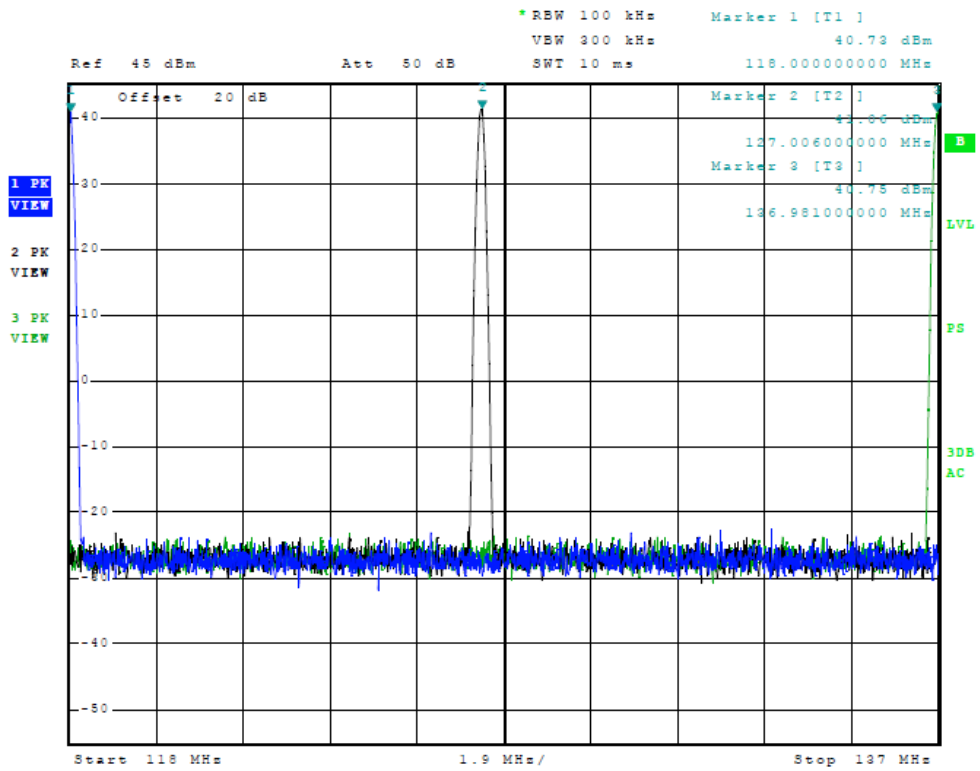


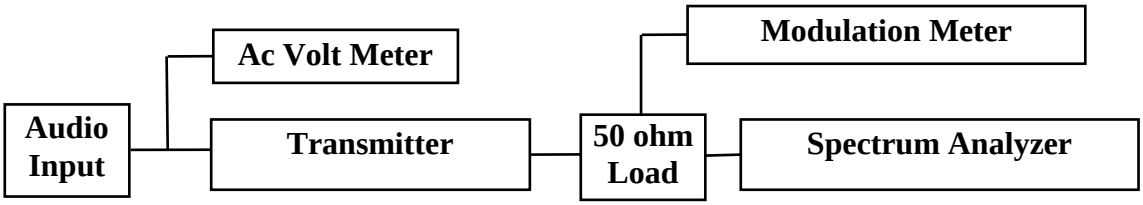
Figure 1 Maximum Power Output Across Frequency Band

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 licensed, shall be submitted. The radio frequency output was coupled to a Spectrum Analyzer and a modulation meter. The spectrum analyzer was used to observe the radio frequency spectrum with the transmitter operating in its various modes. The modulation meter was used to measure the percent modulation.

Test Arrangement



Modulation Characteristic Results

Figure 2 shows the modulation characteristics of six frequencies while the input voltage was varied. The frequency is held constant and the percent modulation is read from the modulation meter.

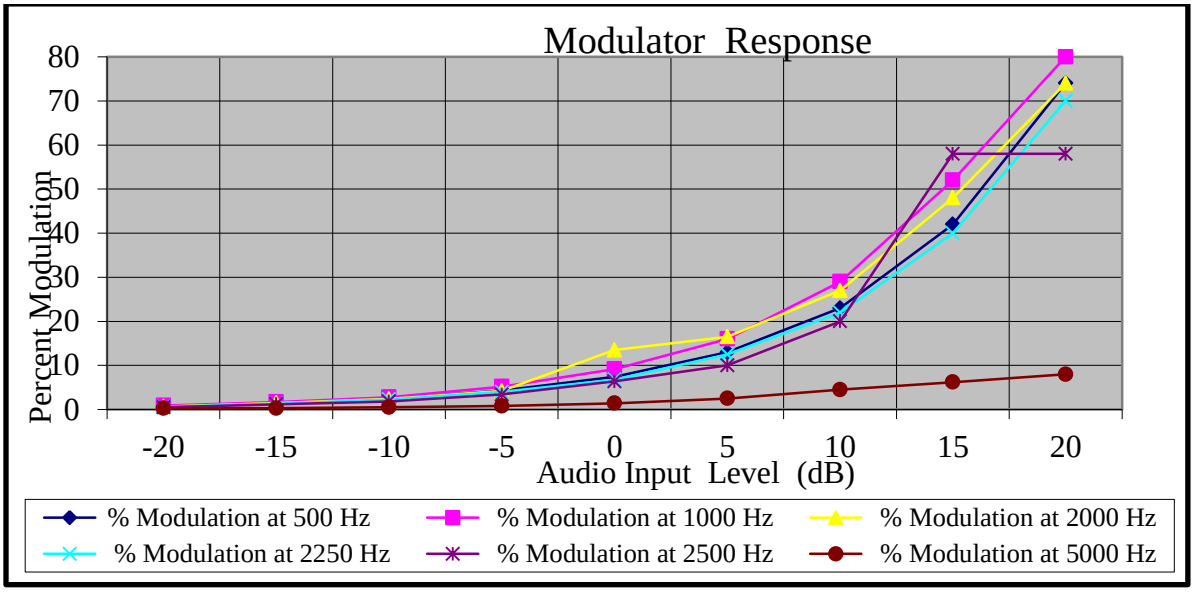


Figure 2 Modulation Characteristics

Figure 3 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 then recorded. This level was normalized to the level required for 50% modulation at 1000 Hz.

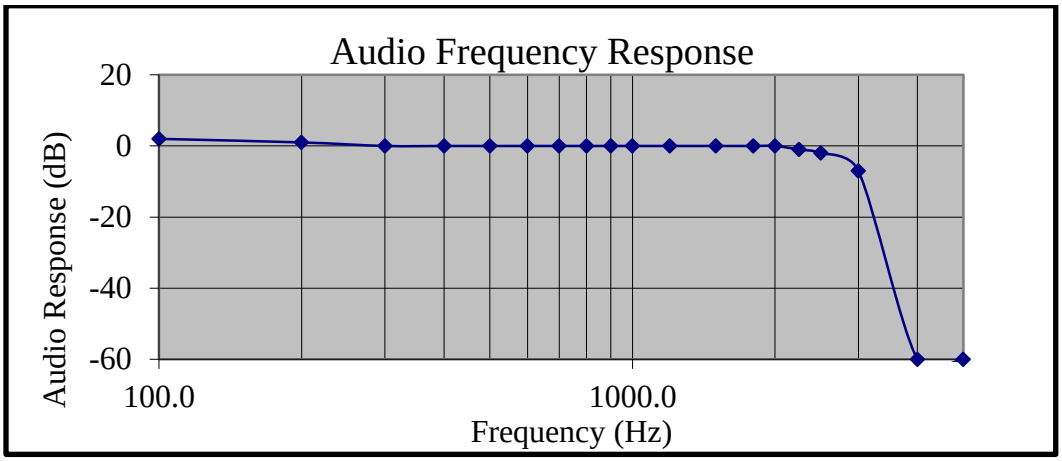


Figure 3 Audio Frequency Response / Modulation Characteristics

Figure 4 shows the frequency response of the audio low pass filter.

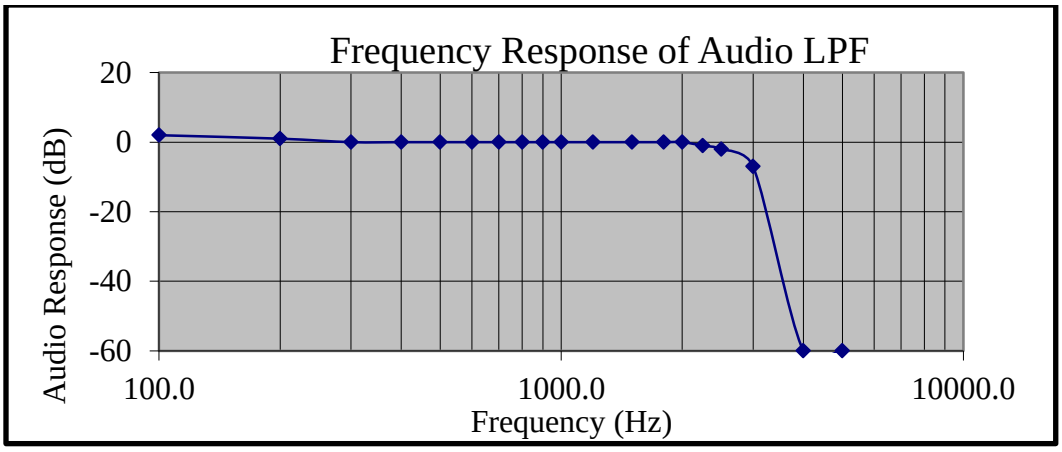


Figure 4 Frequency Response of Audio Low pass Filter

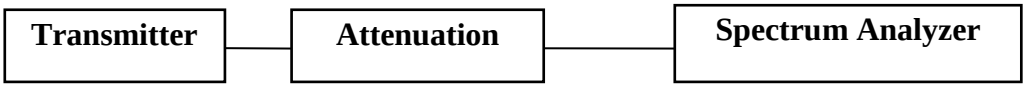
The EUT demonstrated compliance with specifications of CFR47 Paragraph 2.1046(a) and applicable Parts of 2 and 87.141 and RSS-141. There are no deviations to the specifications.

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



A Rohde & Schwarz ESU 40 spectrum analyzer was used to observe the radio frequency spectrum with the transmitter operating in normal modes. Characteristics for audio communications were obtained with the EUT modulated by a frequency of 2500 Hz at a level 16 dB above 50% modulation. Other modulation schemes were measured using appropriate input signals as defined by other standards. The power ratio in dB representing 99% of the total mean power was recorded from the spectrum analyzer measurements. Refer to figures 5 through 7 displaying plots of 99% power occupied bandwidth measurements.

Table 2 Occupied Bandwidth Results

Frequency (MHz)	Occupied bandwidth (kHz)
118.000	5.300
127.000	5.280
136.975	5.300

The EUT demonstrated compliance with specifications of CFR47 Paragraph 2.1046(a) and applicable Parts of 2 and 87.135 and RSS-141 paragraph 5.1. There are no deviations to the specifications.

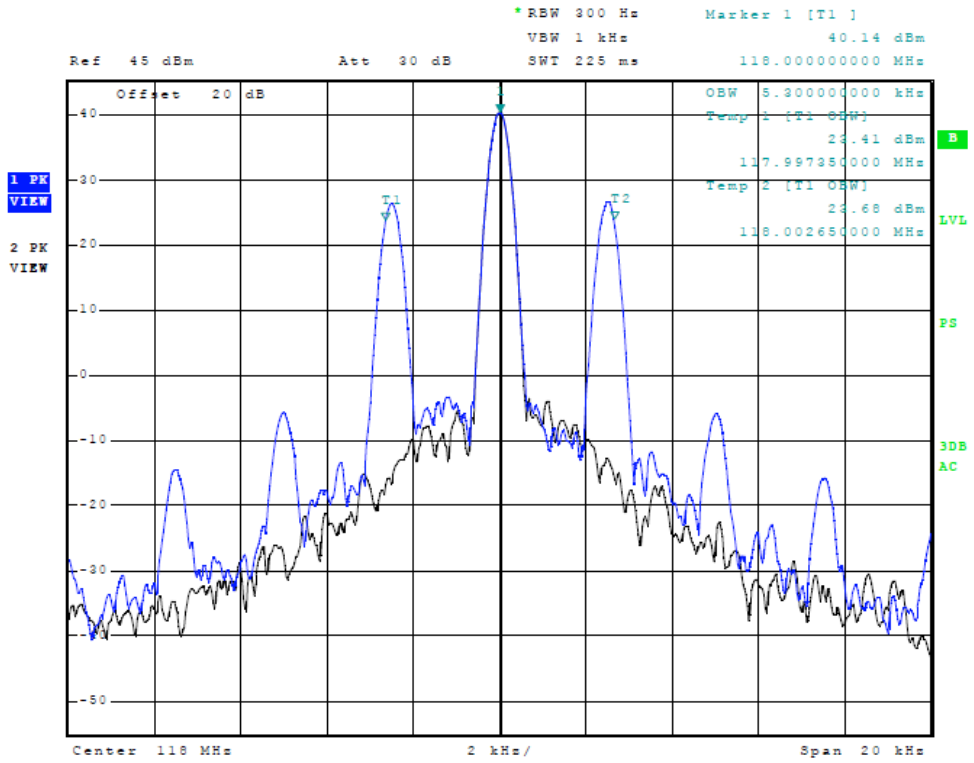


Figure 5 Occupied Band Width Carrier frequency 118.000 MHz

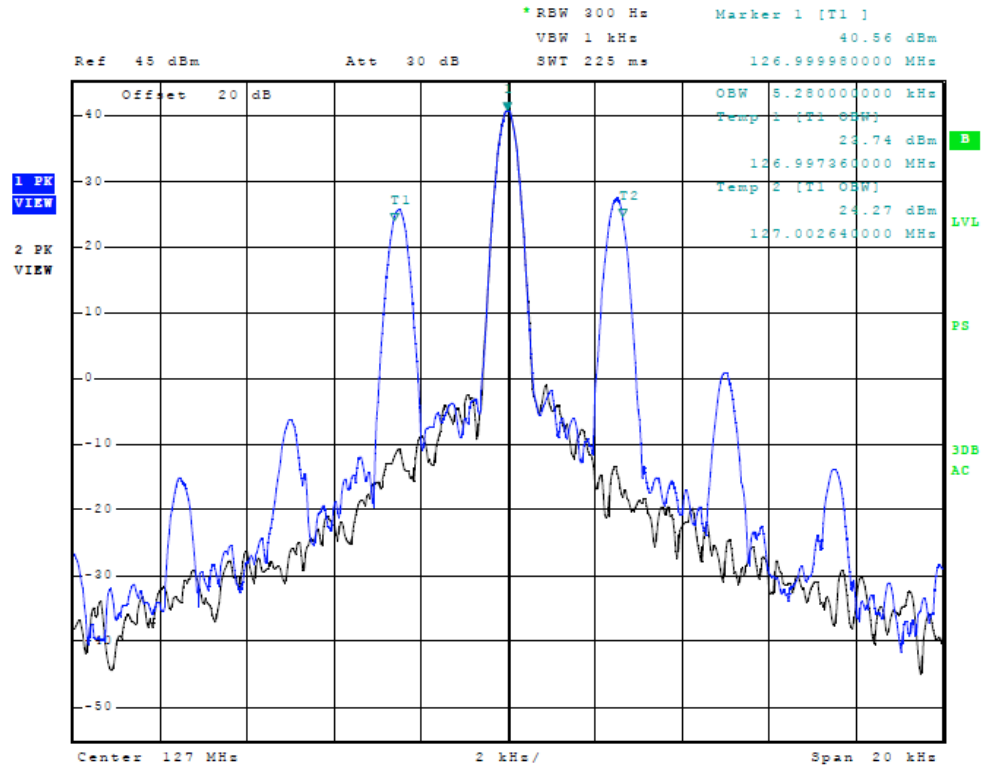


Figure 6 Occupied Band Width Carrier frequency 127.000 MHz

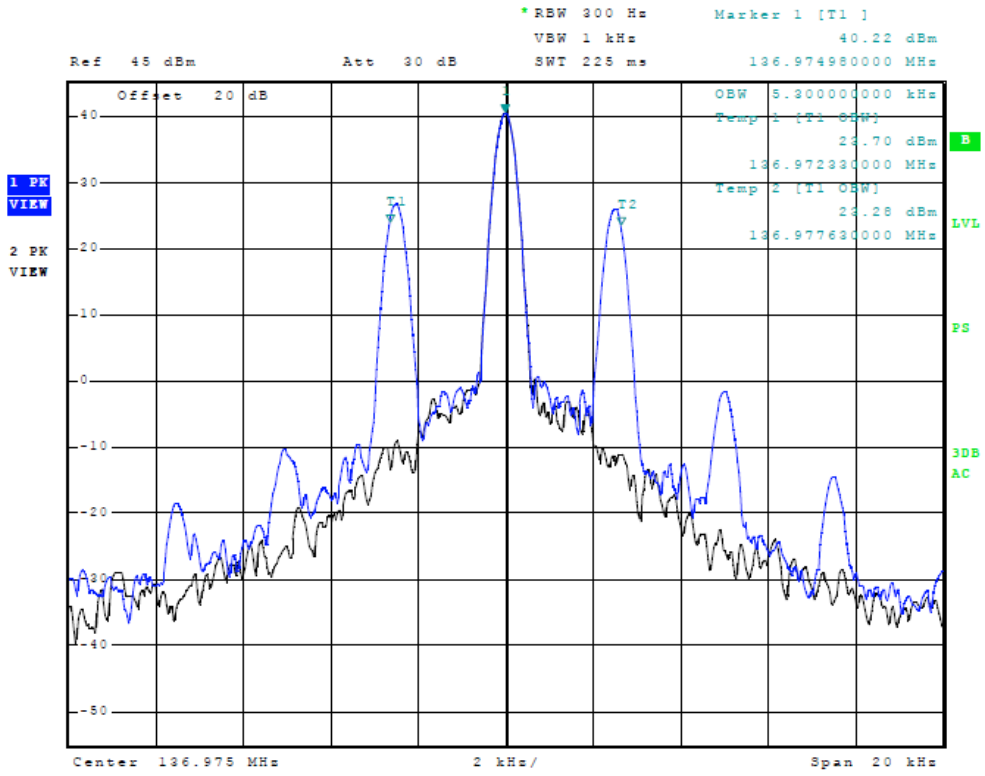


Figure 7 Occupied Band Width Carrier frequency 136.975 MHz

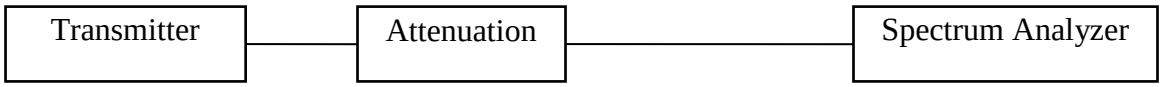
Spurious Emissions at Antenna Terminals

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. Refer to figure 8 for plot of spurious emissions at antenna port and figure 9 for plot of emission mask. All spurious emissions must be attenuated at least 43 +10log (Po) below the fundamental emission power level. The following equations represent the calculated attenuation offset level for the equipment.

Limit 12.7 Watts = 43 + 10 Log (Po)
= 43 + 10 Log (12.7)
= 54.0 dBc

Test Arrangement



The radio frequency output was coupled to a Rohde & Schwarz ESU40 Spectrum Analyzer during antenna port conducted emissions measurements. The spectrum analyzer was used to observe the radio frequency spectrum with the transmitter modulated per section 2.1049 and operated in all normal modes. The frequency spectrum from 30 MHz to 1,500 MHz was observed and plot produced of the frequency spectrum displayed on the test equipment. Refer to figures 8 and 9 representing compliance of the antenna spurious emissions of the GTR 200. Data was taken per CFR47 2.1051, 2.1057, and applicable paragraphs of Part 87.139, and RSS-141. There are no deviations to the specifications.

Table 3 Spurious Emissions at Antenna Terminal Results

Channel MHz	Spurious Freq. (MHz)	Measured Level (dBm)	Level Below Carrier (dBc)
118.000	236.0	-31.45	72.2
	354.0	-45.00	85.7
	472.0	-44.95	85.7
	590.0	-45.64	86.4
	708.0	-44.61	85.3
	826.0	-44.20	84.9
127.000	254.0	-33.70	74.8
	381.0	-42.26	83.3
	508.0	-45.75	86.8
	635.0	-44.44	85.5
	762.0	-44.41	85.5
	889.0	-44.44	85.5
136.975	274.0	-36.07	76.8
	410.9	-46.11	86.9
	547.9	-45.83	86.6
	684.9	-44.44	85.2
	821.9	-45.16	85.9
	958.8	-43.86	84.6

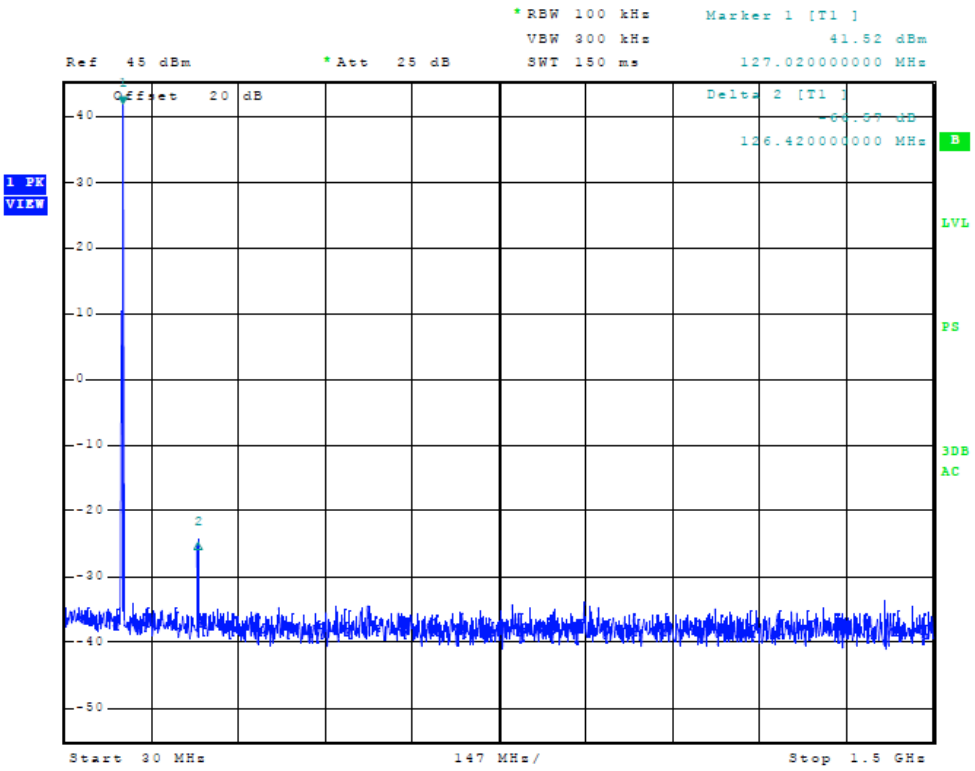


Figure 8 Spurious Emissions at Antenna Terminal

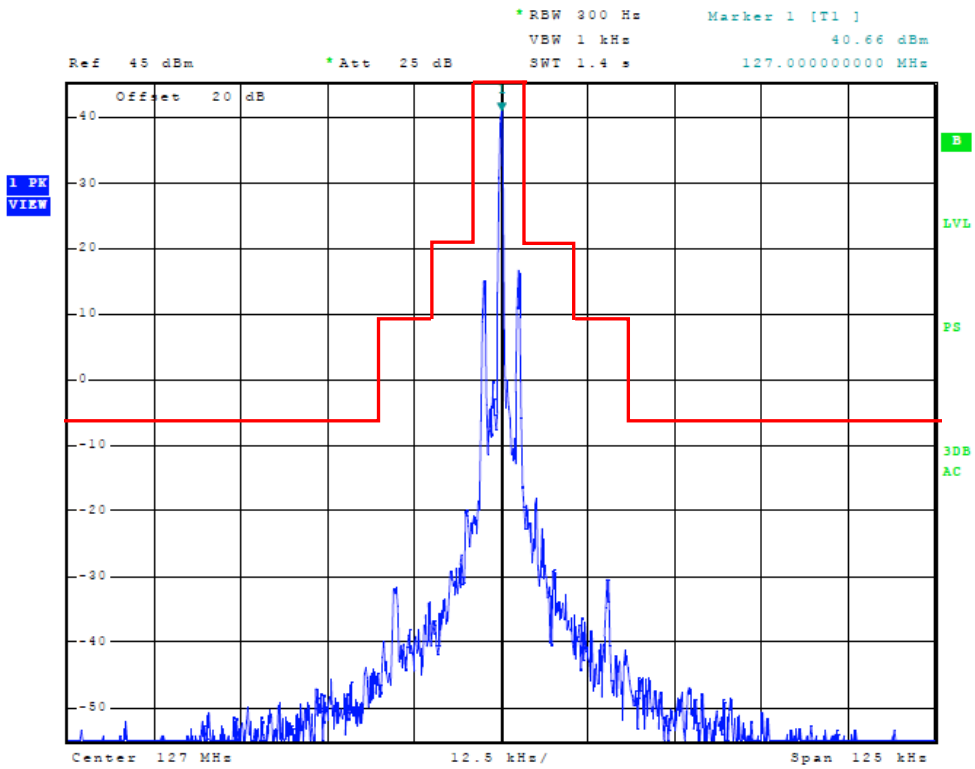


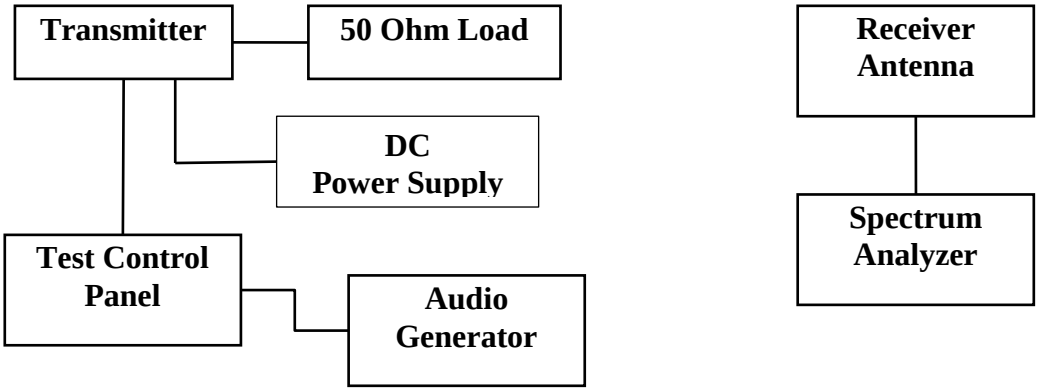
Figure 9 Emission Mask

Field Strength of Spurious Radiation (Unwanted Emissions)

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 typically remote mounted with interface cabling connecting the display control unit to the cabinet. The test sample offered for testing required interfacing with additional test control panels offering operation and communications with all functions of transmitter.

Test Arrangement



The test setup was assembled in a screen room for preliminary screening. The transmitter was placed on a wooden turntable 0.8 meters above the ground plane and at a distance of 1 meter from the receive antenna, plots were taken of the radiated emissions. A final radiated emission testing was performed with the transmitter 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. The EUT was operational and radiating into a 50Ω load. The receiving antenna was raised and lowered from 1m to 4m in height to obtain the maximum reading of spurious radiation from the EUT, cabinet, and interface cabling. 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, interface cabling, and test setup. The amplitude of each spurious emission was maximized by raising and lowering the FSM

antenna, and rotating the turntable before final data was recorded. The frequency spectrum from 30 MHz to 1,500 MHz was investigated during radiated emissions testing. A Biconilog antenna was used for frequency measurements of 30 to 1000 MHz. A double-ridge horn antenna was used for frequencies of 1000 MHz to 2,000 MHz. Emission levels were measured and recorded from the spectrum analyzer in dBµV. Data was taken at the Rogers Labs, Inc. 3 meters open area test site (OATS). The transmitter was then removed and replaced with a substitution antenna, amplification as required, and signal generator. The signal 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. A description of the test facility is on file with the FCC and Industry Canada (refer to annex for site registration letters). The testing procedures used conform to the procedures stated in the TIA/EIA-603 document.

All spurious emissions must be attenuated at least 43 +10log (Po) below the fundamental emission power level. The following equations represent the calculated attenuation levels for the equipment.

Limit 12.7 Watts = 43 + 10 Log (Po)
= 43 + 10 Log (12.7)
= 54.0 dBc

Requirement 41 dB less the limit 54 dBc equates to an absolute level of -13 dBm

Table 4 General Spurious Radiated Emission Results

Frequency	Amplitude of Emission (dBµV)		Signal Level to dipole required to Reproduce(dBm)		Emission level below carrier (dBc)		Limit (dBm)
MHz	Horizontal	Vertical	Horizontal	Vertical	Horizontal	Vertical	
228.9	28.5	26.0	-66.73	-69.23	107.7	110.2	-13
221.2	25.4	24.2	-69.83	-71.03	110.8	112.0	-13
223.8	25.6	24.3	-69.63	-70.93	110.6	111.9	-13
226.4	21.0	24.5	-74.23	-70.73	115.2	111.7	-13
252.0	11.6	14.2	-83.63	-81.03	124.6	122.0	-13

Other emissions present had amplitudes at least 20 dB below the limit. Peak and Quasi-Peak amplitude emissions are recorded above for frequencies below 1000 MHz. Peak and Average amplitude emissions are recorded above for frequencies above 1000 MHz.

The EUT demonstrated compliance with specifications of CFR47 Paragraph 2.1046(a) and applicable Parts of 2 and 87.139, and RSS-141 paragraph 5. There are no deviations to the specifications. There are no deviations or exceptions to the specifications.

Table 5 Spurious Radiated Emission Results for 118.000 MHz Operation

Frequency	Amplitude of Emission (dBµV)		Signal Level to dipole required to Reproduce(dBm)		Emission level below carrier (dBc)		Limit (dBm)
MHz	Horizontal	Vertical	Horizontal	Vertical	Horizontal	Vertical	
236.00	37.8	31.1	-57.43	-64.13	98.4	105.1	-13
354.00	40.5	33.8	-54.73	-61.43	95.7	102.4	-13
472.00	25.6	20.4	-69.63	-74.83	110.6	115.8	-13
590.00	43.6	46.3	-51.63	-48.93	92.6	89.9	-13
708.00	23.3	27.8	-71.93	-67.43	112.9	108.4	-13
826.00	46.0	44.0	-49.23	-51.23	90.2	92.2	-13

Table 6 Spurious Radiated Emission Results for 127.000 MHz Operation

Frequency	Amplitude of Emission (dBµV)		Signal Level to dipole required to Reproduce(dBm)		Emission level below carrier (dBc)		Limit (dBm)
MHz	Horizontal	Vertical	Horizontal	Vertical	Horizontal	Vertical	
254.00	34.5	32.2	-60.73	-63.03	101.7	104.0	-13
381.00	39.9	39.9	-55.33	-55.33	96.3	96.3	-13
508.00	22.6	24.8	-72.63	-70.43	113.6	111.4	-13
635.00	29.0	31.3	-66.23	-63.93	107.2	104.9	-13
762.00	35.0	33.7	-60.23	-61.53	101.2	102.5	-13
889.00	44.5	43.7	-50.73	-51.53	91.7	92.5	-13

Table 7 Spurious Radiated Emission Results for 136.975 MHz Operation

Frequency	Amplitude of Emission (dBµV)		Signal Level to dipole required to Reproduce(dBm)		Emission level below carrier (dBc)		Limit (dBm)
MHz	Horizontal	Vertical	Horizontal	Vertical	Horizontal	Vertical	
273.95	38.4	30.5	-56.83	-64.73	97.8	105.7	-13
410.93	47.7	35.6	-47.53	-59.63	88.5	100.6	-13
547.90	29.7	28.1	-65.53	-67.13	106.5	108.1	-13
684.88	27.9	21.8	-67.33	-73.43	108.3	114.4	-13
821.85	45.9	41.8	-49.33	-53.43	90.3	94.4	-13
958.83	42.2	42.4	-53.03	-52.83	94.0	93.8	-13

Frequency Stability

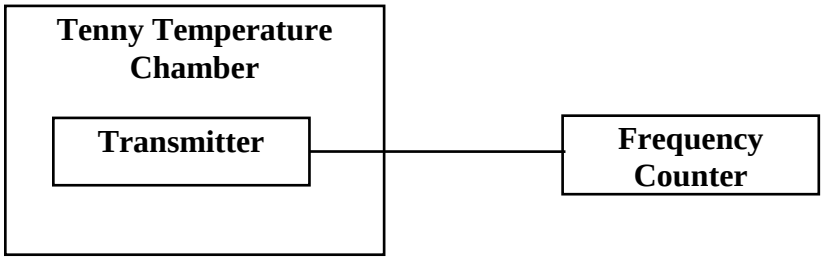
Measurements Required

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 value.

(2) 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 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. The frequency was measured and the variation in parts per million calculated. Data was taken per CFR47 Paragraphs 2.1055 and applicable paragraphs of part 87.133 and RSS-141.

Table 8 Frequency Stability vs. Temperature Results

Frequency 127.000 MHz)	Frequency Stability Vs. Temperature Ambient Frequency (127.000000)								
Temperature °C	-30	-20	-10	0	+10	+20	+30	+40	+50
Change (Hz)	-10.0	0.0	1.0	16.0	17.0	2.0	-8.0	-6.0	-11.0
PPM	-0.1	0.0	0.0	0.1	0.1	0.0	-0.1	0.0	-0.1
%	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Limit (PPM)	20	20	20	20	20	20	20	20	20

Table 9 Frequency Stability vs. Input Power Supply Voltage Results

Frequency (127.000 MHz)	Frequency Stability Vs. Voltage Variation 14 or 28.0 volts nominal; Results In Hz change		
Voltage V_{dc}	11.69 / 23.38	13.8 / 27.5	15.8 / 31.7
Change (Hz)	-18 / -16	-17 / -15	-16 / -15

The EUT demonstrated compliance with specifications of CFR47 Paragraph 2.1046(a) and applicable Parts of 87.133(d) and RSS-141 paragraph 5.1. There are no deviations or exceptions to the specifications.

Annex

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

Annex A Measurement Uncertainty Calculations

Measurement uncertainty calculations were made for the laboratory. Result of measurement uncertainty calculations are recorded below for AC line conducted and radiated emission measurements.

Measurement Uncertainty	$U_{(E)}$	$U_{(lab)}$
3 Meter Horizontal 30-200 MHz Measurements	2.08	4.16
3 Meter Vertical 30-200 MHz Measurements	2.16	4.33
3 Meter Vertical Measurements 200-1000 MHz	2.99	5.97
10 Meter Horizontal Measurements 30-200 MHz	2.07	4.15
10 Meter Vertical Measurements 30-200 MHz	2.06	4.13
10 Meter Horizontal Measurements 200-1000 MHz	2.32	4.64
10 Meter Vertical Measurements 200-1000 MHz	2.33	4.66
3 Meter Measurements 1-6 GHz	2.57	5.14
3 Meter Measurements 6-18 GHz	2.58	5.16
AC Line Conducted	1.72	3.43

Annex B Rogers Labs Test Equipment

Equipment	Calibration Date
Spectrum Analyzer: Rohde & Schwarz ESU40	5/13
Spectrum Analyzer: HP 8562A, HP Adapters: 11518, 11519, and 11520 Mixers: 11517A, 11970A, 11970K, 11970U, 11970V, 11970W	5/13
Spectrum Analyzer: HP 8591EM	5/13
Antenna: EMCO Biconilog Model: 3143	5/13
Antenna: Schwarzbeck Biconilog Model: BBA 9106 (VHBB 9124)	5/13
Antenna: Schwarzbeck Log Periodic Model: VULP 9118 A	5/13
Antenna: Sunol Biconilog Model: JB6	10/12
Antenna: EMCO Log Periodic Model: 3147	10/12
Antenna: Antenna Research Biconical Model: BCD 235	10/12
Antenna: EMCO 6509	10/12
LISN: Compliance Design Model: FCC-LISN-2.Mod.cd, 50 µHy/50 ohm/0.1 µf	10/12
R.F. Preamp PA-010	10/12
R.F. Preamp CPPA-102	10/12
R.F. Preamp PA-122	10/12
Cable assembly: (L1) consisting of Belden RG-58, HP11509A, CAT-3	10/12
Cable assembly: (L2) consisting of Belden RG-58, HP11509A, CAT-3	10/12
Cable: (L3) Belden 8268	10/12
Cable: Time Microwave: 4M-750HF290-750	10/12
Cable: Time Microwave: 10M-750HF290-750	10/12
Frequency Counter: Leader LDC825	2/13
Oscilloscope Scope: Tektronix 2230	2/13
Wattmeter: Bird 43 with 50 Ohm Load 8085	2/13
Power Supplies: Sorensen SRL 20-25, SRL 40-25, DCR 150, DCR 140	2/13
R.F. Generators: HP 606A, HP 8614A, HP 8640B	2/13
R.F. Power Amp 65W Model: 470-A-1010	2/13
R.F. Power Amp 50W M185- 10-501	2/13
R.F. Power Amp A.R. Model: 10W 1010M7	2/13
R.F. Power Amp EIN Model: A301	2/13
LISN: Compliance Eng. Model 240/20	2/13
LISN: Fischer Custom Communications Model: FCC-LISN-50-16-2-08	2/13
Antenna: EMCO Dipole Set 3121C	2/13
Antenna: Compliance Design B-101	2/13
Antenna: Solar 9229-1 & 9230-1	2/13
Audio Oscillator: HP 201CD	2/13
Peavey Power Amp Model: IPS 801	2/13
ELGAR Model: 1751	2/13
ELGAR Model: TG 704A-3D	2/13
ESD Test Set 2010i	2/13
Fast Transient Burst Generator Model: EFT/B-101	2/13
Field Intensity Meter: EFM-018	2/13
KEYTEK Ecat Surge Generator	2/13
Shielded Room 5 M x 3 M x 3.0 M	

Annex C Rogers Qualifications

Scot D. Rogers, Engineer

Rogers Labs, Inc.

Mr. Rogers has approximately 17 years' experience in the field of electronics. Work experience includes six years working in the automated controls industry and remaining 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.

Annex D FCC Test Site Registration Letter

FEDERAL COMMUNICATIONS COMMISSION

Laboratory Division
7435 Oakland Mills Road
Columbia, MD 21046

November 01, 2011

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: November 01, 2011

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

NVLAP Lab Code 200087-0

Annex E Industry Canada Test Site Registration Letter

Industry Canada Industrie Canada

December 28, 2011

OUR FILE: 46405-3041
Submission No: 152685

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

Attention: Mr. Scot D. Rogers

Dear Sir/Madame:

The Bureau has received your application for the renewal of 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 **(Site# 3041A-1).** Please reference the appropriate site number in the body of test reports containing measurements performed on the site. In addition, please keep for your records the following information;

- The company address code associated to the site(s) located at the above address is: **3041A**

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 or later shall be accepted. Please indicate in a letter the previous assigned site number if applicable and the type of site (example: 3 metre OATS or 3 metre 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 three 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;
http://strategis.ic.gc.ca/epic/internet/inceb-bhst.nsf/en/h_tt00052e.html.

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,

Dalwinder Gill

Dalwinder Gill
For: Wireless Laboratory Manager
Certification and Engineering Bureau
3701 Carling Ave., Building 94
P.O. Box 11490, Station "H"
Ottawa, Ontario K2H 8S2
Email: dalwinder.gill@ic.gc.ca
Tel. No. (613) 998-8363
Fax. No. (613) 990-4752