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: RINO
Family Radio Service (FRS) /
General Mobile Radio Services (GMRS)
Combination UHF TRANSCEIVER
FREQUENCY: 462 MHz and 467 MHz

FCC ID: IPH-00568

Test Date: April 19, 2002

Certifying Engineer: Scot D Rogers
Scot D. Rogers
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FORWARD:

In accordance with the Federal Communications Code of Federal Regulations, dated October 1, 2001, Part 2 Subpart J, Paragraphs 2.907, 2.911, 2.913, 2.915, 2.925, 2.926, 2.1031 through 2.1057, applicable paragraphs of Parts 15, and 95, the following is submitted:

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 8591EM SPECTRUM ANALYZER SETTINGS		
CONDUCTED EMISSIONS:		
RBW	AVG. BW	DETECTOR FUNCTION
9 kHz	30 kHz	Peak/Quasi Peak
RADIATED EMISSIONS (30 – 1000 MHz):		
RBW	AVG. BW	DETECTOR FUNCTION
120 kHz	300 kHz	Peak/Quasi Peak
HP 8562A SPECTRUM ANALYZER SETTINGS		
RADIATED EMISSIONS (1 – 40 GHz):		
RBW	AVG. BW	DETECTOR FUNCTION
1 MHz	1 MHz	Peak/Average
ANTENNA CONDUCTED EMISSIONS:		
RBW	AVG. BW	DETECTOR FUNCTION
120 kHz	300 kHz	Peak

2.1033(c) Application for Certification

(1) Manufacturer: GARMIN INTERNATIONAL, INC.
1200 East 151st Street
Olathe, KS 66062
PHONE: (913) 397-8200A

(2) FCC Identification: Model: RINO
S/N: ENG- 1
FCC I.D.: IPH-00568

(3) Instruction Book:

Refer to exhibit for Draft Instruction Manual.

(4) Emission Types: 6K0F3E and 6K0F2D

(5) Frequency Range: 462 MHz and 467 MHz

(6) Operating Power Level: 1.0 Watts (GMRS channels)
0.5 Watts (FRS channels)

(7) Max Power allowed as defined in 95.639 rule: 50.0 Watts (GMRS) and 0.5 Watts (ERP)(FRS channels)

(8) Power into final amplifier:

1.0 Watt GMRS: 1.6 Watts (4.0V @ 0.4A)
0.5 Watt FRS: 1.2 Watts (4.0V @ 0.3A)

(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 Diagrams.
Refer to Exhibit 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:

Refer to exhibit for description of modulation.

2.1046 RF 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 replacing the antenna with a spectrum analyzer and 3-dB attenuation. The spectrum analyzer had an impedance of 50W to match the impedance of the standard antenna. A HP 8591EM and/or 8562A 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. The unit was also measured for radiated emissions on the three meter OATS with the following data taken. Refer to Figures 1 and two showing the output power of the transmitter at the antenna terminal. Data was taken per Paragraph 2.1046(a) and applicable parts of Part 95.

GMRS and FRS power radiated emission of fundamental.

Frequency	FSM horizontal	FSM vertical	antenna factor	CFS horizontal	CFS vertical
462.5625	89.3	102.7	18.3	107.6	121.0
467.5625	89.3	101.7	18.3	107.6	120.0
462.6000	93.0	108.0	18.3	110.0	125.0

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

29.8 dBm = $10^{(29.8/10)}$
= 954.99 mW
= 1.0 Watts

26.7 dBm = $10^{(26.7/10)}$
= 467.7 mW
= 0.5 Watts

Results:

FREQUENCY	P_{dBm}	P_{mw}	P_{w}
462.5625	26.5	446.7	0.4
467.5625	26.7	467.7	0.5
467.7125	26.5	446.5	0.4
462.6000	29.8	954.9	1.0

The specifications of Paragraph 2.1046(a) and applicable Parts of 95 are met. There are no deviations to the specifications.

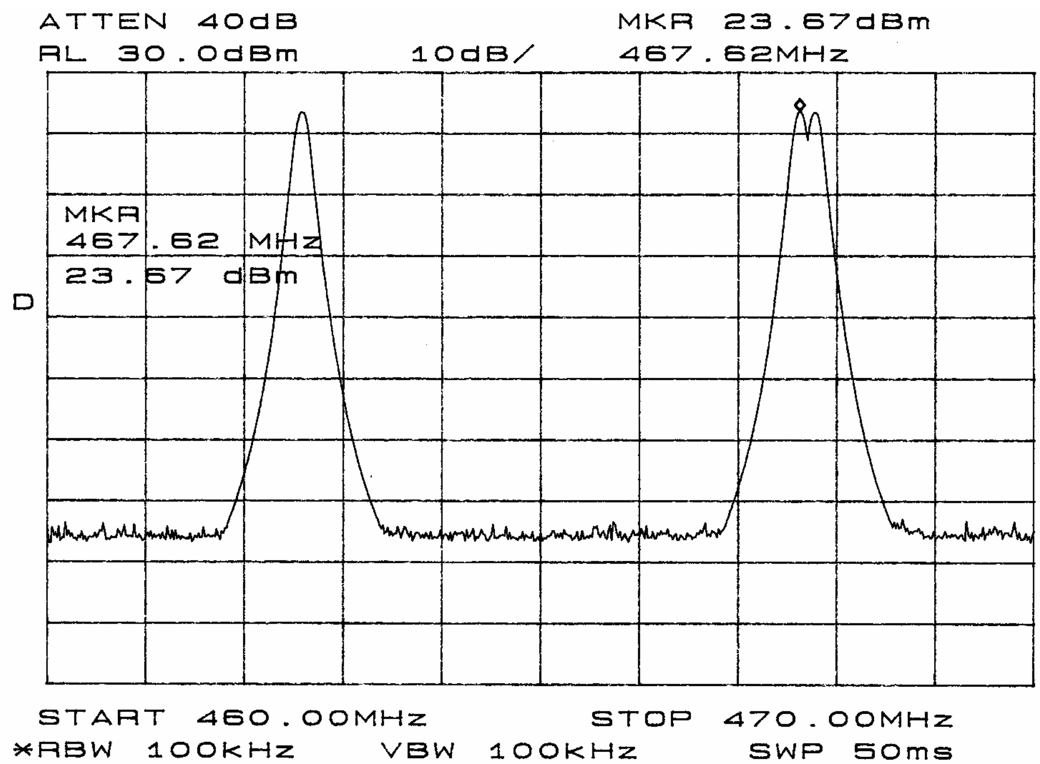


Figure one Power Output at antenna terminal (FRS channels)

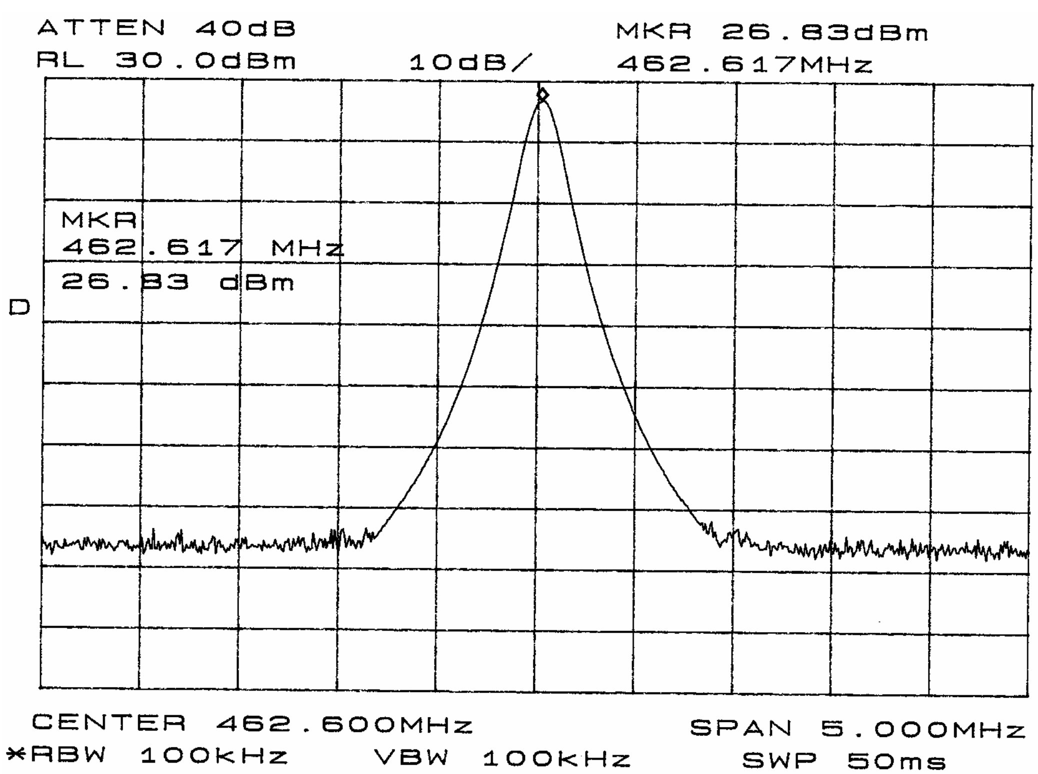


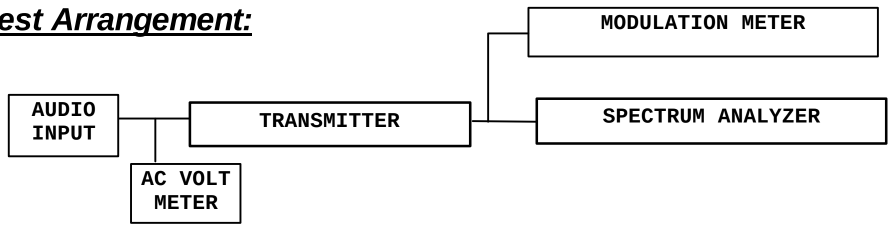
Figure two Power Output at antenna terminal (GMRS channels)

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.

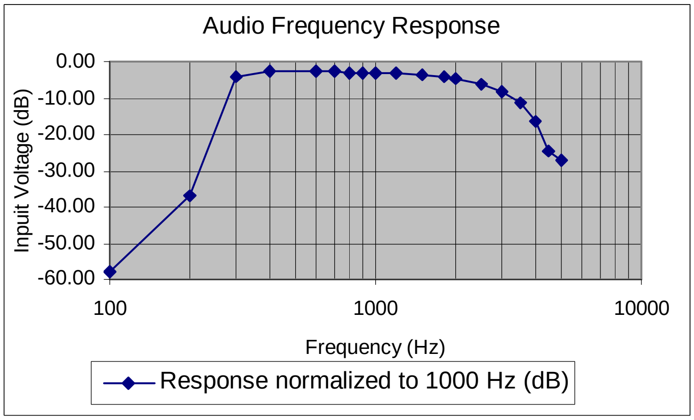
Test Arrangement:



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 spectrum with the transmitter operating in its various modes. The modulation meter was used to measure the percent modulation or frequency deviation.

Results:

Figure 3 displays the graph made showing the audio frequency response of the modulator. The frequency generator was set to 1 kHz 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 voltage input level recorded while holding the output modulation level constant.



Audio Frequency (Hz)	Response normalized to 1000 Hz (dB)
100	-58.00
200	-37.10
300	-4.20
400	-2.60
600	-2.70
700	-2.60
800	-2.90
900	-3.00
1000	-3.05
1200	-3.20
1500	-3.70
1800	-4.00
2000	-4.60
2500	-5.90
3000	-8.00
3500	-11.50
4000	-16.2
4500	-24.50
5000	-27.10

Figure three Audio Frequency Response Characteristics.

Figure 4 shows the deviation response for each of four frequencies while the input voltage was varied. The frequency is held constant and the frequency deviation is read from the deviation meter.

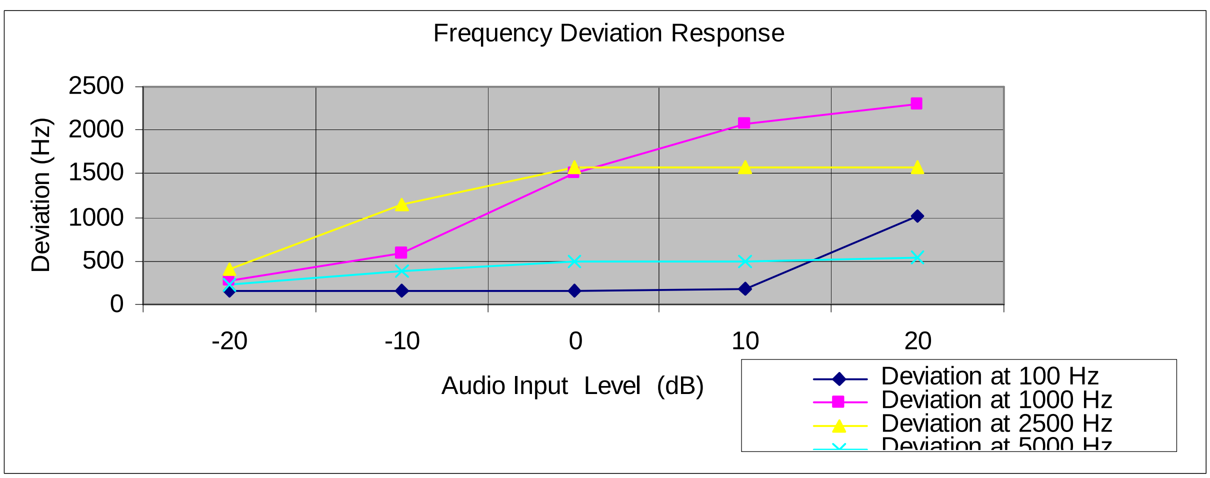


Figure four Deviation Characteristics.

Figure 5 shows the frequency response of the audio low pass filter.

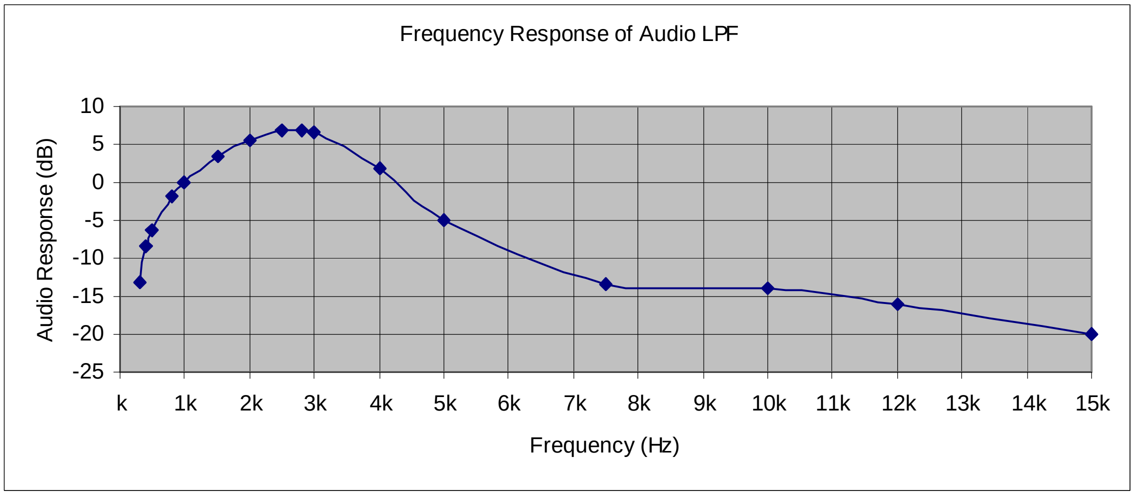


Figure five Frequency Response of Audio low Pass Filter.

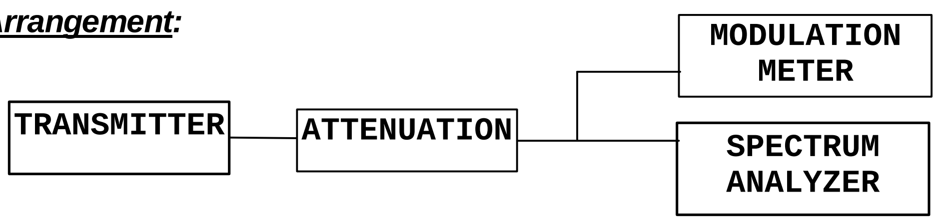
The specifications of Paragraph 2.1047 and applicable parts of 95 are met.

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. Plots were taken with the unit operating in audio and digital data modes.

Test Arrangement:



Results:

Channel	f_c (MHz)	O.B.(kHz)
8 (FRS Audio)	467.5625	5.94
8 (FRS digital 1111)	467.5625	5.75
8 (FRS digital 1010)	467.5625	5.13
17 (GMRS Audio)	462.6000	5.69

A spectrum analyzer was used to observe the radio frequency spectrum with the transmitter operating in a normal modes, modulated by a frequency of 2500 Hz at a level 16 dB above 50% modulation for voice and either a 1010 or 1111 digital code for transmitting GPS data. The power ratio in dB representing 99.5% of the total mean power was recorded from the spectrum analyzer. Refer to figures six through nine for plots showing the occupied bandwidth of 99.5% power.

Requirements of 2.1049(c)(1) and applicable paragraphs of Parts 95 are met. There are no deviations to the specifications.

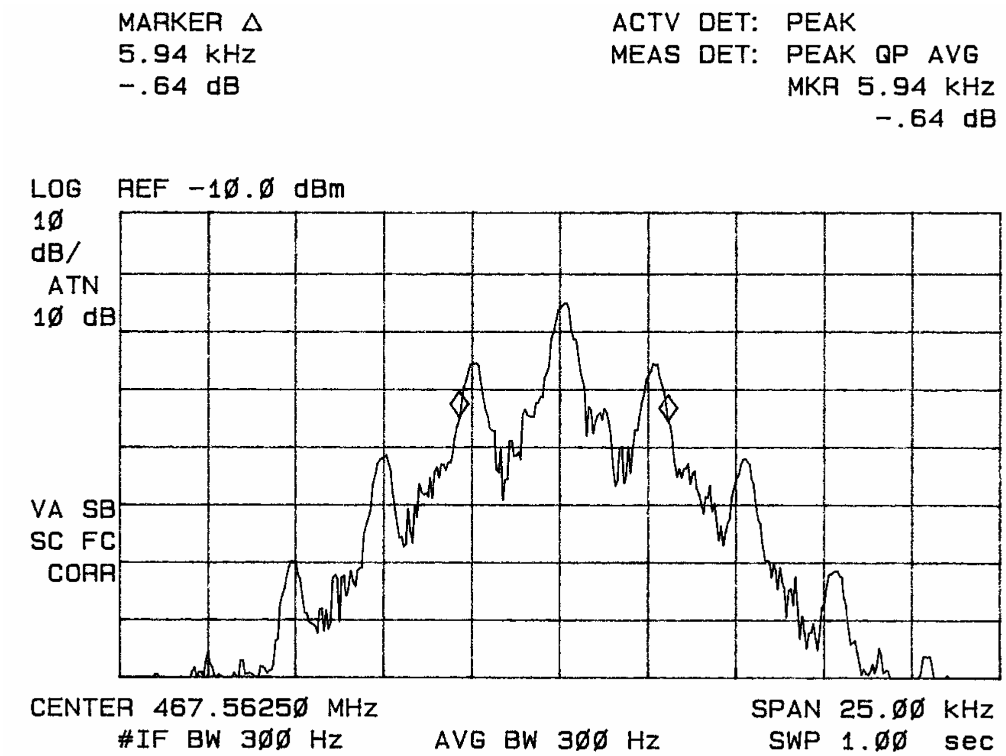


Figure six Occupied Band Width (voice).

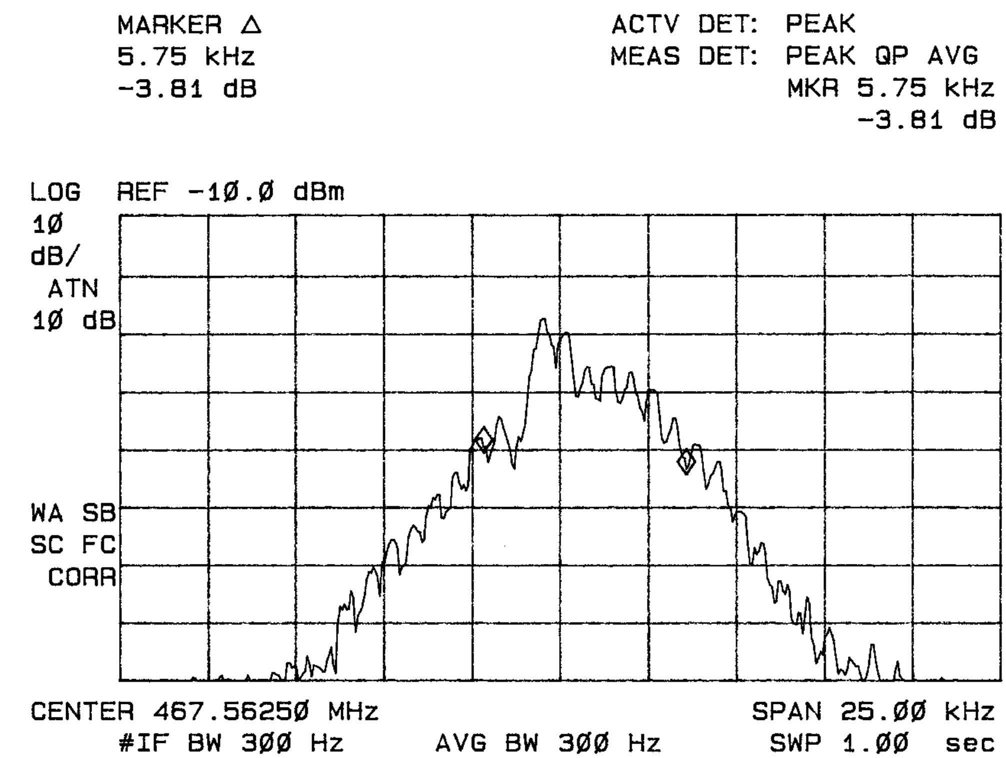


Figure seven Occupied Band Width (Data 1111).

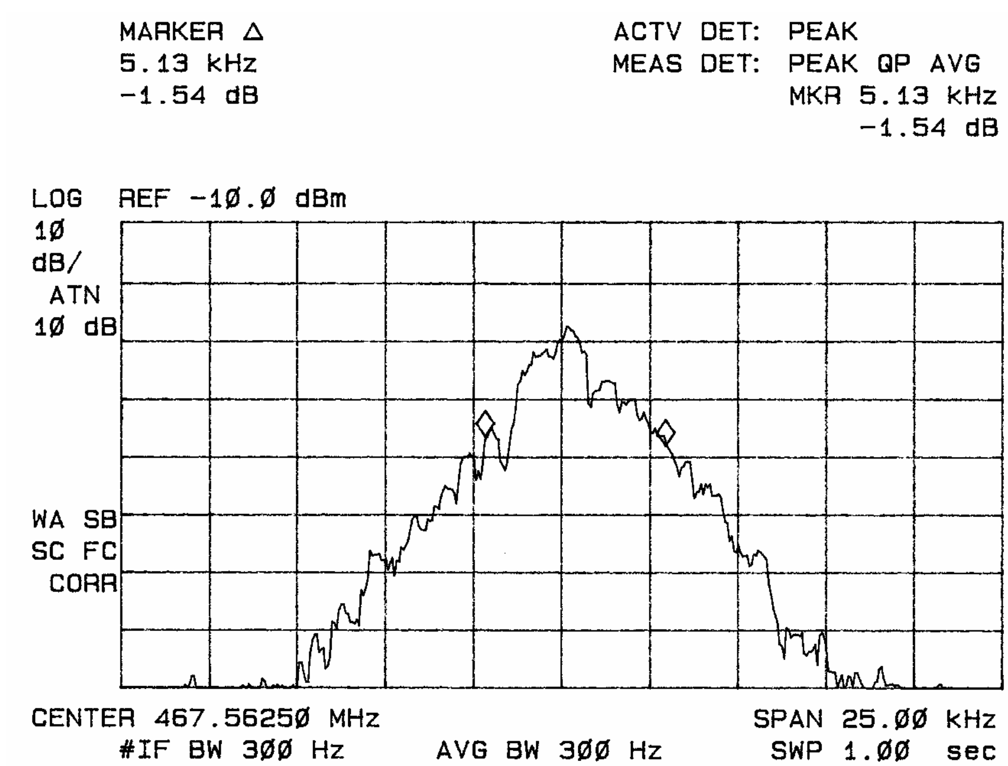


Figure eight Occupied Band Width (Data 1010).

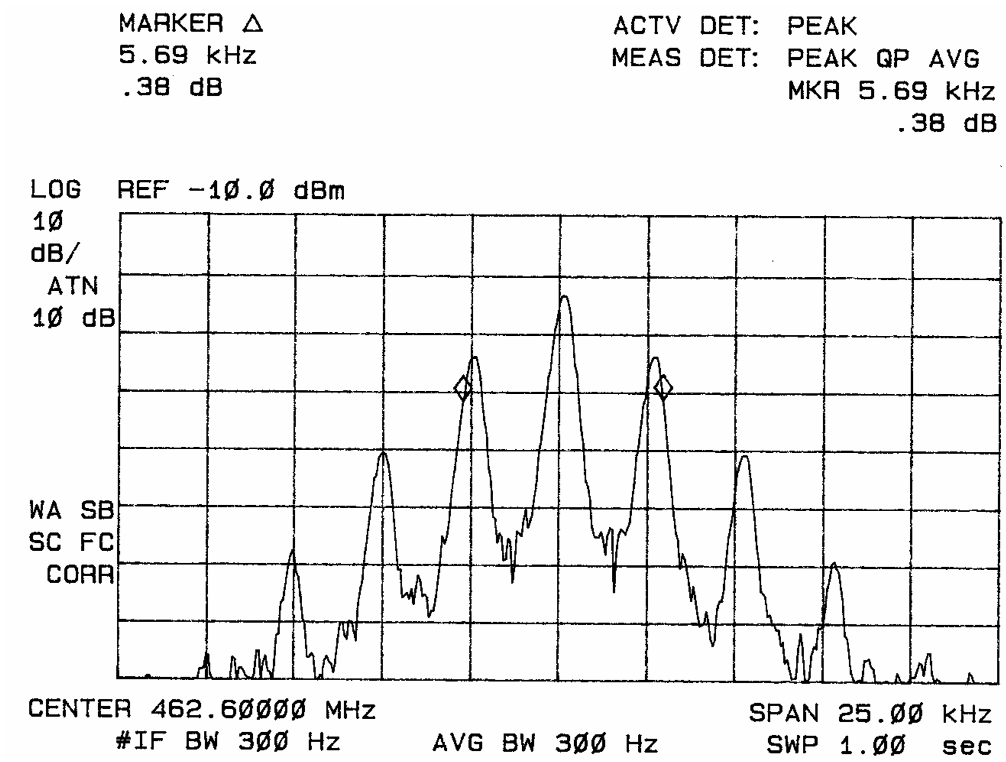


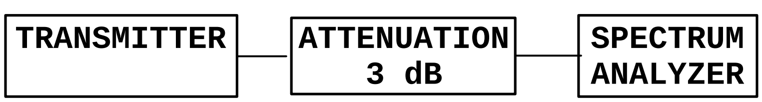
Figure nine Occupied Band Width (voice).

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 8562 Spectrum Analyzer. The spectrum analyzer was used to observe the radio frequency spectrum with the transmitter operated in a normal mode. The frequency spectrum from 30 MHz to 5.0 GHz was observed and plots produced of the frequency spectrum. Figures ten through thirteen represent data for the RINO operating in FRS and GMRS modes. Data was taken per 2.1051, 2.1057, and applicable paragraphs of Part and 95.

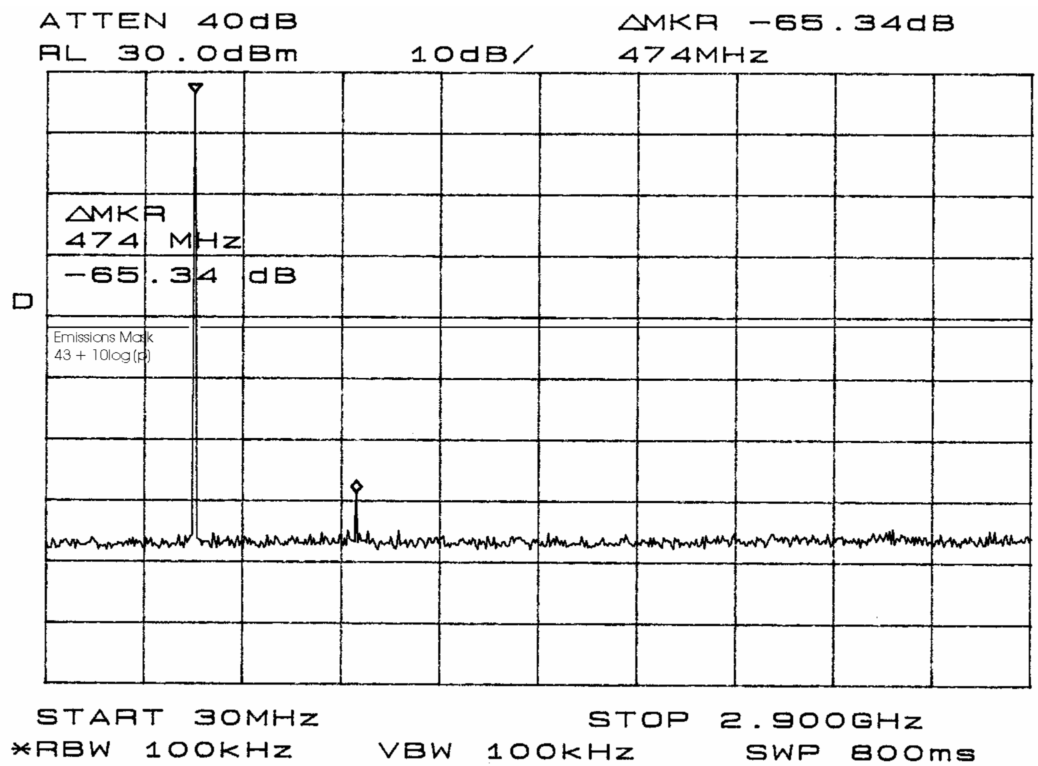


Figure ten Emissions at Antenna Terminal for FRS unit.

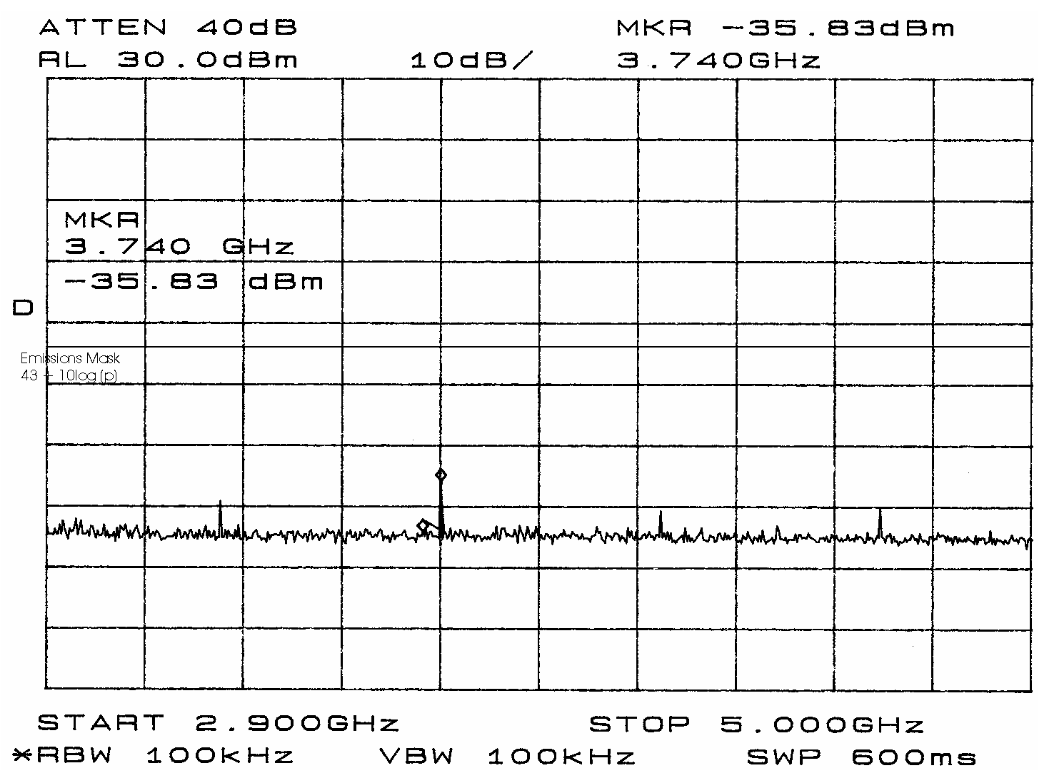


Figure eleven Emissions at Antenna Terminal for FRS unit.

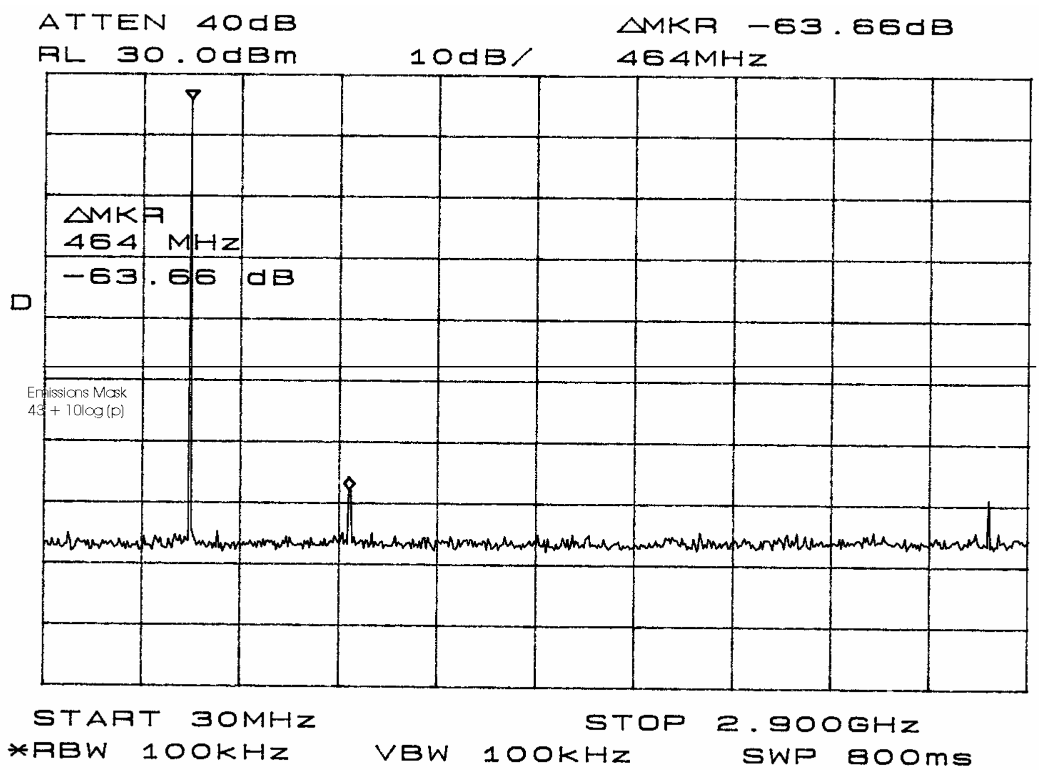


Figure twelve Emissions at Antenna Terminal for GMRS.

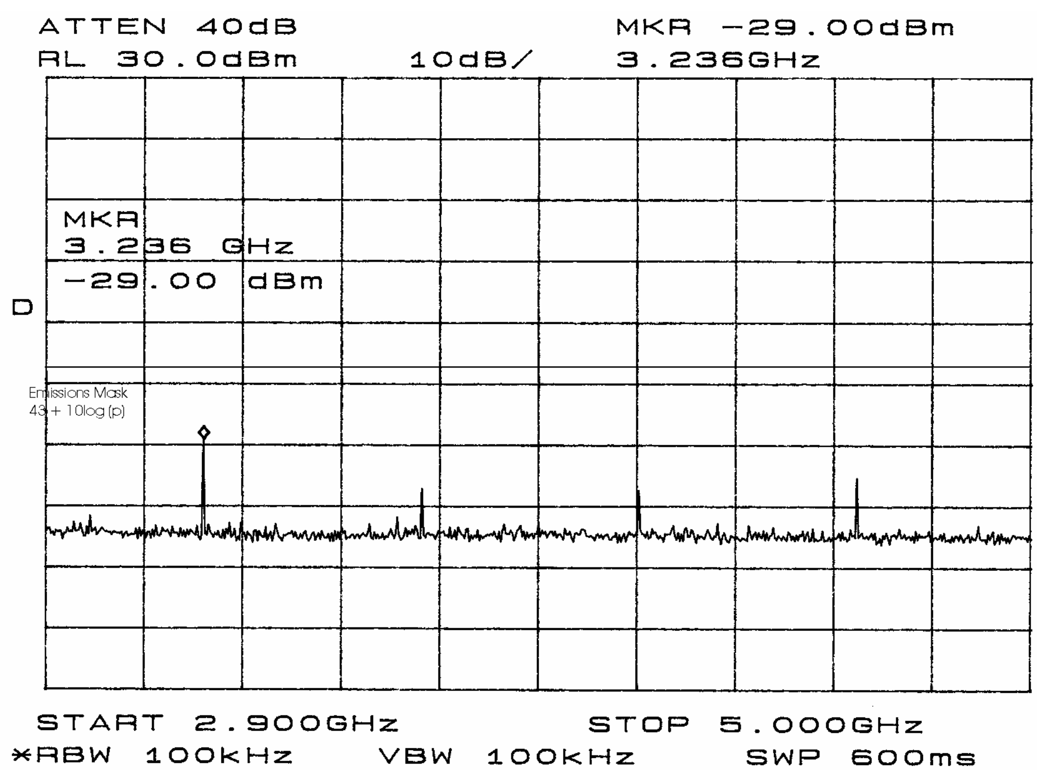


Figure thirteen Emissions at Antenna Terminal for GMRS.

Results:

The output of the unit was coupled to a HP Spectrum Analyzer and the frequency emissions were measured. Data was taken as per 2.1051 and applicable paragraphs of Part 95. Specifications of Paragraphs 2.1051, 2.1057 and applicable paragraphs of part 95 are met. There are no deviations to the specifications.

FCC Limits:

1.0 Watt $= 43 + 10\ \mathrm{LOG}(P_o)$ $= 43 + 10\ \mathrm{LOG}(1)$ $= 43.0$

0.5 Watt $= 43 + 10\ \mathrm{LOG}(P_o)$ $= 43 + 10\ \mathrm{LOG}(0.5)$ $= 40.0$

1.0 Watt GMRS Output

CHANNEL MHz	SPURIOUS FREQ. (MHz)	LEVEL BELOW CARRIER (dB)
462.6000	925.2	-63.6
	1387.8	-78.3
	1850.4	-79.1
	2313.0	-70.4
	2775.6	-74.6
	3238.2	-58.8
	3700.8	-66.8
	4163.4	-66.9
	4626.0	-65.0

0.5 Watt FRS Output

CHANNEL MHz	SPURIOUS FREQ. (MHz)	LEVEL BELOW CARRIER (dB)
467.5625	935.1	-62.7
	1402.7	-70.5
	1870.2	-74.8
	2337.8	-71.7
	2805.4	-71.2
	3272.9	-65.7
	3740.5	-62.5
	4208.1	-67.2
	4675.6	-66.5

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.

Test Arrangement:

The transmitter was placed on a wooden turntable 0.8 meters above the ground plane and at a distance of 3 meters from the FSM antenna. With the EUT radiating into the standard attached antenna, 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 5 GHz and pyramidal horn antennas were used for frequencies of 5 GHz to 40 GHz. Emission levels were measured and recorded from the spectrum analyzer in dBm. The transmitter was then removed and replaced with a substitution antenna 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 power loss in the cable and further corrected for 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, and dated December 8, 2000. 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.

1-watt GMRS transmitter.

$$\text{Attenuation} = 43 + 10\,\text{Log}_{10}(P_w)$$
$$= 43 + 10\,\text{Log}_{10}(1)$$
$$= 43.0\text{ dB}$$

1/2 watt FRS transmitter.
Attenuation $= 43 + 10 \text{ Log}_{10}(P_w)$
$= 43 + 10 \text{ Log}_{10}(0.5)$
$= 40.0$ dB

Results:

The EUT was connected to the standard antenna and set to transmit at the desired frequency. The amplitude of each spurious emission was then maximized and recorded. The transmitter produces 1.0 or 0.5 watts of output power (30 or 27 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}[0.5/0.001]-(-30.1) = 57.1 dBc

Channel frequency 462.5625 MHz (FRS)

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
925.1	48.3	63.0	-30.1	-32.1	57.1	59.1	40

Channel frequency 467.5625 MHz (FRS)

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
935.1	54.5	68.0	-19.8	-28.0	46.8	55.0	40

Channel frequency 467.7125 MHz (FRS)

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
935.4	52.8	65.0	-20.3	-30.2	47.3	57.2	40

Channel frequency 462.6000 MHz (GMRS)

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
925.2	56.5	71.0	-19.3	-26.3	49.3	56.3	43

Radiated Emissions from EUT

Emission Frequency (MHz)	FSM Horz. (dBµV)	FSM Vert. (dBµV)	Ant. Factor (dB)	Amp. Gain (dB)	RFS Horz. @ 3m (dBµV/m)	RFS Vert. @ 3m (dBµV/m)	Limit @ 3m (dBµV/m)
462.5625	89.3	102.7	18.3	0	107.6	121.0	122
925.1	48.3	63.0	23.8	25	47.1	61.8	84
1387.7	43.3	44.6	26.2	25	36.7	42.7	84
1850.2	31.8	37.8	29.9	25	36.7	42.7	84
467.5625	89.3	101.7	18.3	0	107.6	120.0	122
935.1	54.5	68.0	23.8	25	53.3	66.8	84
1402.7	41.5	43.0	26.7	25	43.2	44.7	84
1870.2	39.7	42.0	29.9	25	44.6	46.9	84
467.7125	84.8	99.8	18.3	0	103.1	118.1	122
935.4	52.8	65.0	23.8	25	51.6	63.8	84
1403.1	46.3	44.3	26.7	25	48.0	46.0	84
1870.8	39.3	42.8	29.9	25	44.2	47.7	84
462.6000	93.0	108.0	17.0	0	110.0	125.0	125
925.2	56.5	71.0	23.8	25	55.3	69.8	84
1387.8	39.5	43.5	26.2	25	40.7	44.7	84
1850.4	49.5	45.0	29.9	25	54.4	49.9	84

All other spurious emissions where 20 db or more below the limit. Specifications of Paragraph 2.1053, 2.1057, applicable paragraphs of part 95 are met. There are no deviations to the specifications.

2.1055 Frequency Stability

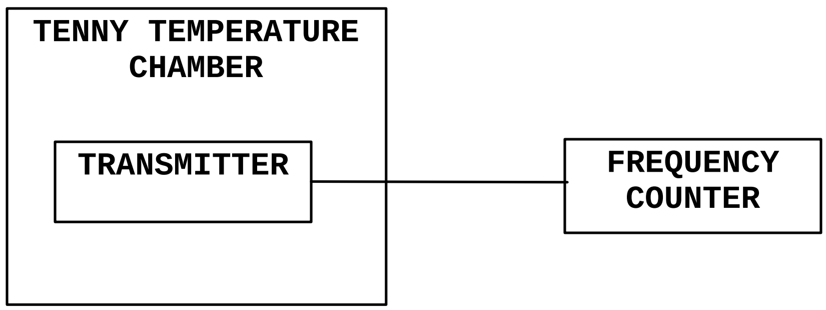
Measurements Required:

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 of time 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 for other than hand carried battery equipment.

(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:

Steps 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. A Topward 6303A DC Power Supply was used to vary the dc voltage for the power input from 3.80 Vdc to 5.18 Vdc. The frequency was measured and the variation in parts per million was calculated. Data was taken per Paragraphs 2.1055 and applicable paragraphs of part 95.

Results:

FREQ. (MHz)	FREQUENCY STABILITY VS TEMPERATURE IN PARTS PER MILLION (PPM)								
	Temperature in °C								
	-30	-20	-10	0	+10	+20	+30	+40	+50
462.6250	-2.0	-0.2	-0.1	-0.08	0.02	-0.2	-0.08	0.02	0.04

FREQUENCY IN MHz	FREQUENCY STABILITY VS VOLTAGE VARIATION 4.0 volts nominal; RESULTS IN PPM INPUT VOLTAGE		
	3.80 V_{dc}	4.50 V_{dc}	5.18 V_{dc}
462.6250	0.0	0.0	0.0

FREQUENCY IN MHz	FREQUENCY STABILITY VS VOLTAGE VARIATION 4.5 volts nominal; RESULTS IN PPM BATTERY ENDPOINT VOLTAGE 3.375 V_{dc}
462.6250	0.0

Specifications of Paragraphs 2.1055 and applicable paragraphs of parts 22, 74, 90 and 95 are met. There are no deviations to the specifications.

APPENDIX

Model: RINO

1. Test Equipment List.
2. Rogers Qualifications.
3. FCC Site Approval Letter.

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:
Scope: Tektronix 2230	2/02
Wattmeter: Bird 43 with Load Bird 8085	2/02
Power Supplies: Sorensen SRL 20-25, SRL 40-25, DCR 150, DCR 140	2/02
H/V Power Supply: Fluke Model: 408B (SN: 573)	2/02
R.F. Generator: HP 606A	2/02
R.F. Generator: HP 8614A	2/02
R.F. Generator: HP 8640B	2/02
Spectrum Analyzer: HP 8562A,	4/01
Mixers: 11517A, 11970A, 11970K, 11970U, 11970V, 11970W	
HP Adapters: 11518, 11519, 11520	
Spectrum Analyzer: HP 8591 EM	7/01
Frequency Counter: Leader LDC 825	2/02
Antenna: EMCO Biconilog Model: 3143	4/01
Antenna: EMCO Log Periodic Model: 3147	10/01
Antenna: Antenna Research Biconical Model: BCD 235	7/01
Antenna: EMCO Dipole Set 3121C	2/02
Antenna: C.D. B-101	2/02
Antenna: Solar 9229-1 & 9230-1	2/02
Antenna: EMCO 6509	2/02
Audio Oscillator: H.P. 201CD	2/02
R.F. Power Amp 65W Model: 470-A-1010	2/02
R.F. Power Amp 50W M185- 10-501	2/02
R.F. PreAmp CPPA-102	2/02
Shielded Room 5 M x 3 M x 3.0 M (101 dB Integrity)	
LISN 50 µHy/50 ohm/0.1 µf	10/01
LISN Compliance Eng. 240/20	2/02
Peavey Power Amp Model: IPS 801	2/02
Power Amp A.R. Model: 10W 1010M7	2/02
Power Amp EIN Model: A301	2/02
ELGAR Model: 1751	2/02
ELGAR Model: TG 704A-3D	2/02
ESD Test Set 2010i	2/02
Fast Transient Burst Generator Model: EFT/B-101	2/02
Current Probe: Singer CP-105	2/02
Current Probe: Solar 9108-1N	2/02
Field Intensity Meter: EFM-018	2/02
KEYTEK Ecat Surge Generator	2/02

02/01/2002

QUALIFICATIONS

Of

SCOT D. ROGERS, ENGINEER

ROGERS LABS, INC.

Mr. Rogers has approximately 13 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

April 19, 2002
Date

1/08/2001

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

December 08, 2000

Registration Number: 90910

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

Attention: Scot D. Rogers

Re: Measurement facility located at Louisburg
3 & 10 meter site
Date of Listing: December 08, 2000

Gentlemen:

Your submission of the description of the subject measurement facility has been reviewed and found to be in compliance with the requirements of Section 2.948 of the FCC Rules. The description has, therefore, been placed on file and the name of your organization added to the Commission's 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 this filing must be updated for any changes made to the facility, and at least every three years from the date of listing the data on file must be certified as current.

If requested, the above mentioned facility has been added to our list of those who perform these measurement services for the public on a fee basis. An up-to-date list of such public test facilities is available on the Internet on the FCC Website at WWW.FCC.GOV, E-Filing, OET Equipment Authorization Electronic Filing.

Sincerely,

Thomas W Phillips

Thomas W Phillips
Electronics Engineer