APPLICATION

FOR

GRANT of CERTIFICATION REPORT

FOR

MODELS: Rino 520 and Rino 530
P/Ns 011-01123-00 and 011-01123-01

FOR

GARMIN INTERNATIONAL, INC.

1200 East 151st Street
Olathe, KS 66062

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. Doug Kealey
Compliance Engineer

MODELS: RINO 520 and Rino 530
Family Radio Service (FRS) /
General Mobile Radio Services (GMRS)
Combination UHF TRANSCEIVER
FREQUENCY: 462 MHz and 467 MHz

FCC ID: IPH-00861

Test Date: January 31, 2005

Certifying Engineer: Scot D Rogers

Scot D. Rogers
ROGERS LABS, INC.
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FORWARD:

In accordance with the Federal Communications Code of Federal Regulations, dated October 1, 2003, 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 report 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) 397-8200

(2) FCC Identification: Models: RINO 520 AND RINO 530
FCC ID: IPH-00861 IC: 1792A-00861 S/N: Unit #7

(3) Copy of the installation and operating manual:
Refer to exhibit for Draft Instruction Manual.

(4) Emission Types: FRS: 6K0F3E and 6K20F2D
GMRS:10k8F3E and 6k25F2D

(5) Frequency Range: 462 MHz and 467 MHz

(6) Operating Power Level: 0.5 Watts (FRS channels)
2.0 Watts (US/IC GMRS channels only)
5.0 Watts (US GMRS channels only)

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

(8) Power into final amplifier:
0.5 Watt FRS: 3.0 Watts (7.5V @ 0.400A)
2.0 Watt GMRS: 6.0 Watts (7.5V @ 0.600A)
5.0 Watt GMRS: 12.0 Watts (7.5V @ 1.600A)

(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 Information of Components Layout and Chassis Drawings.

(13) Detail Description of Digital Modulation:
Refer to exhibit for description of modulation.

(14) Data required by 2.1046 through 2.1057 is reported in this document.

(15) Application for certification of an external radio power amplifier operating under part 97 of this chapter.
This specification is not applicable to this device.

(16) Application for certification of AM broadcast transmitter.
This specification is not applicable to this device.

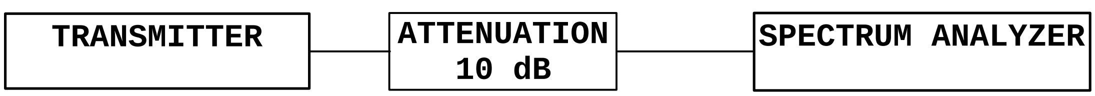
(17) A single application may be filed for a composite system that incorporates devices subject to certification under multiple rule parts; however, the appropriate fee must be included for each device.
The device is governed by CFR rule Part 95 subpart A (GMRS) and 95 subpart B (FRS).

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. The units are produced with a permanently mounted antenna; a unit was supplied for testing with the external antenna replaced with a SMA connection for antenna conducted emissions testing. The spectrum analyzer had an impedance of 50 Ohms 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. Refer to Figure one 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.

36.58 dBm $= 10^{(36.58/10)}$
= 4,549.88 mW
= 4.6 Watts

27.0 dBm $= 10^{(27.0/10)}$
= 501.1mW
= 0.5 Watts

Results:

FREQUENCY	P_{dBm}	P_{mw}	P_{w}
462.5625	36.58	4,549.88	4.6
467.5625	27.0	501.1	0.5
467.7125	27.0	50.1	0.5
462.6000	36.95	4,954.5	5.0

Using the substitution method the following data was taken per TIA/EIA-603. Utilizing the permanently attached one-quarter wave antenna system the radio frequency output power was measured at a three-meter distance on an approved Open Area Test Site (OATS) using the substitution method. A HP 8591EM Spectrum Analyzer was used to measure the radio frequency power produced by the EUT at a distance of three-meters. The level was recorded and the EUT was removed from the table and replaced by a substitution antenna driven by a frequency generator and amplification stages. The generator output level was then increased until the amplitude level produced by the substitution system measured the same as previously recorded from the EUT. The antenna was removed and replaced by a spectrum analyzer to accurately record the generator-amplifier power output. This power output level was then recorded as the power required to reproduce the measured level. This procedure was repeated for all frequencies of interest with the data taken reported below. The testing procedures used conform to the procedures stated in the TIA/EIA-603 document.

High and low power radiated emission of fundamental.

Frequency of Emission	Amplitude of emission		Signal level to dipole required to reproduce	
	Horizontal	Vertical	Horizontal	Vertical
(MHz)	dBm	dBm	dBm	dBm
462.5625	5.5	5.9	33.9	36.1
467.5625	-1.5	-1.2	23.0	25.8
467.7125	-1.8	-1.2	22.9	25.8
462.6000	5.3	6.2	33.8	36.6

P_{dBm} = power in dB above 1 milliwatt.

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

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

Table for conversion from dBm to watts

dBm	22.9	23.0	25.8	33.8	33.9	36.1	36.6
Watts	0.195	0.200	0.380	2.399	2.455	4.074	4.571

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

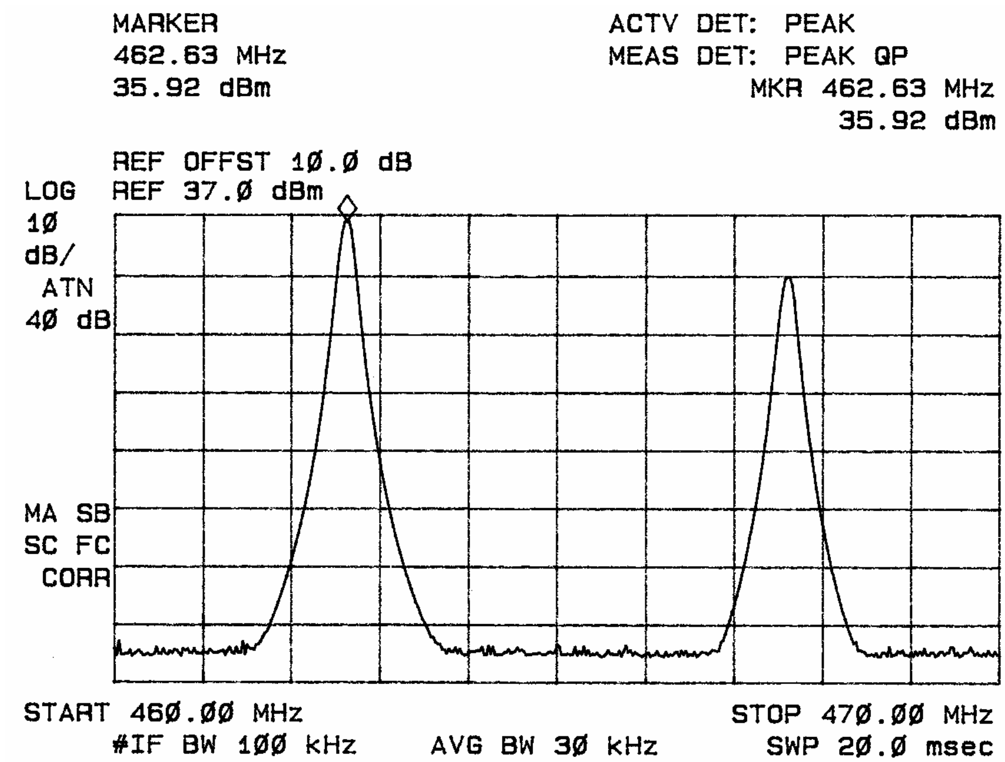


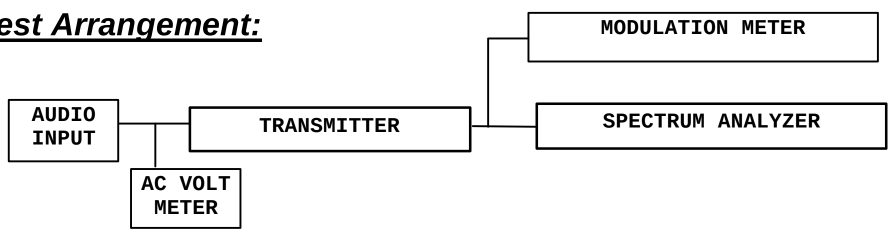
Figure 1 Power Output at antenna terminal

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.

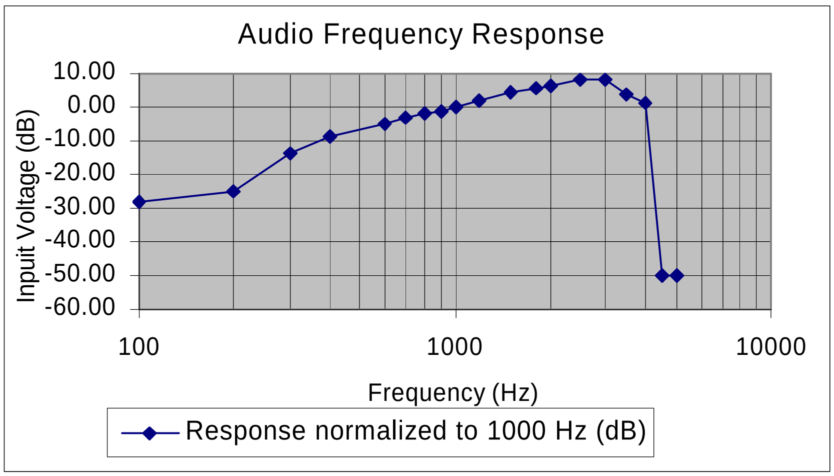
Test Arrangement:



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 2 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	-28.00
200	-25.00
300	-14.00
400	-8.50
600	-5.00
700	-3.00
800	-2.00
900	-1.00
1000	0.00
1200	2.00
1500	4.50
1800	5.50
2000	6.00
2500	8.20
3000	8.00
3500	4.00
4000	1.00
4500	-50.00
5000	-50.00
10000	-50.00
15000	-50.00
20000	-50.00

Figure 2 Audio Frequency Response Characteristics.

Figure 3 shows the deviation response for FRS channels. This figure 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.

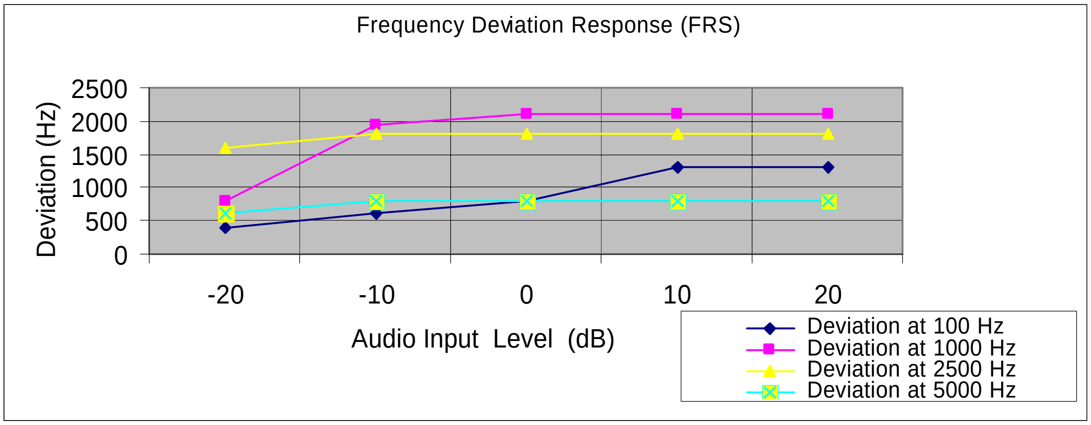


Figure 3 Frequency Deviation Characteristics (FRS).

Figure 4 shows the deviation response for GMRS channels. This figure 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.

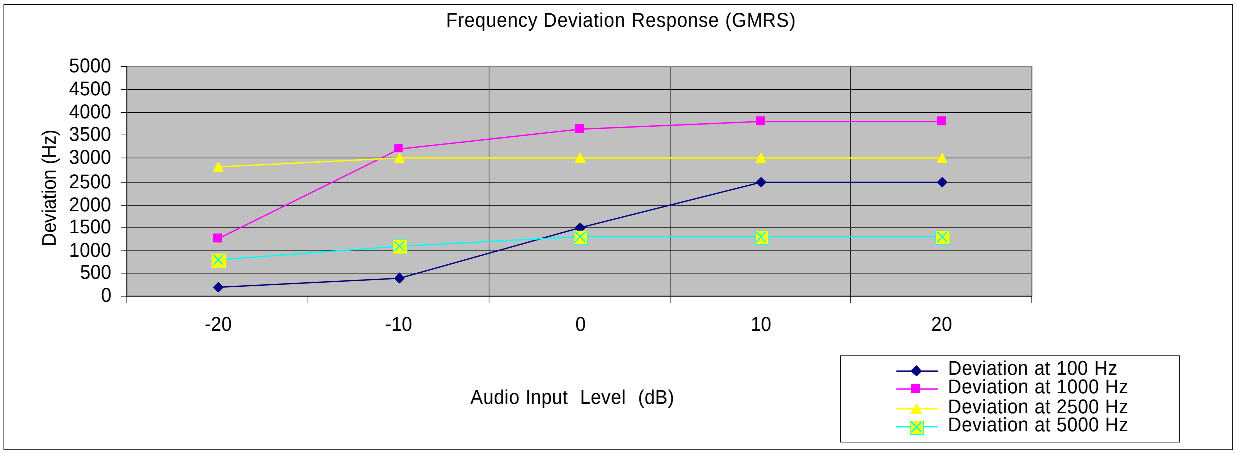


Figure 4 Frequency Deviation Characteristics (GMRS).

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

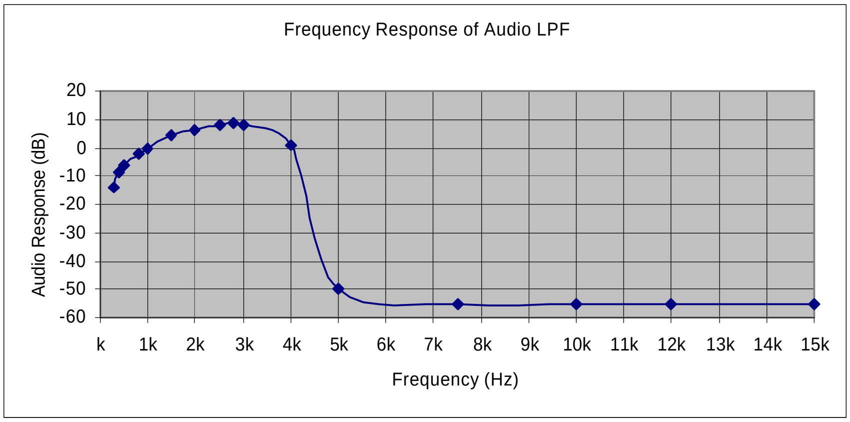


Figure 5 Frequency Response of Audio low Pass Filter.

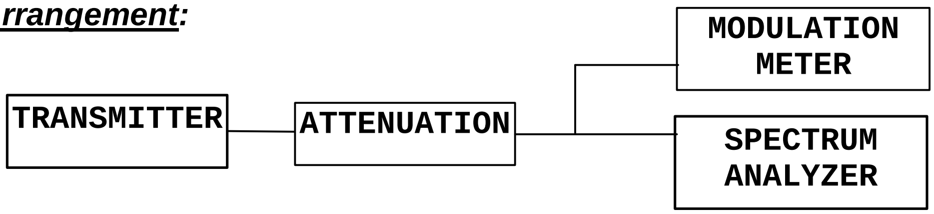
The specifications of Paragraph 2.1047 and applicable parts of 95 are met.

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	5.56
8 (FRS CTCSS)	467.5625	6.00
8 (FRS digital 1111)	467.5625	5.25
8 (FRS digital 1010)	467.5625	6.19
17 (GMRS Audio)	462.6000	10.25
17 (GMRS CTCSS)	462.6000	10.75
17 (GMRS digital 1111)	462.6000	5.25
17 (GMRS digital 1010)	462.6000	6.25

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 thirteen for plots showing the occupied bandwidth of 99.5% power and emission mask.

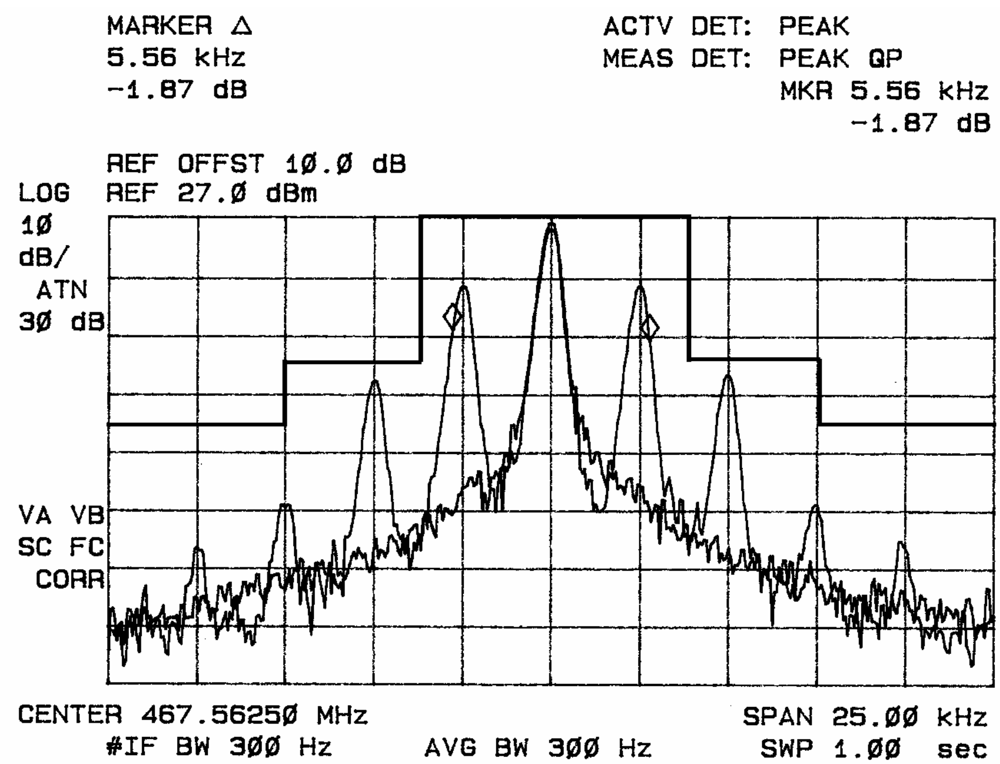


Figure 6 Occupied Band Width (FRS voice).

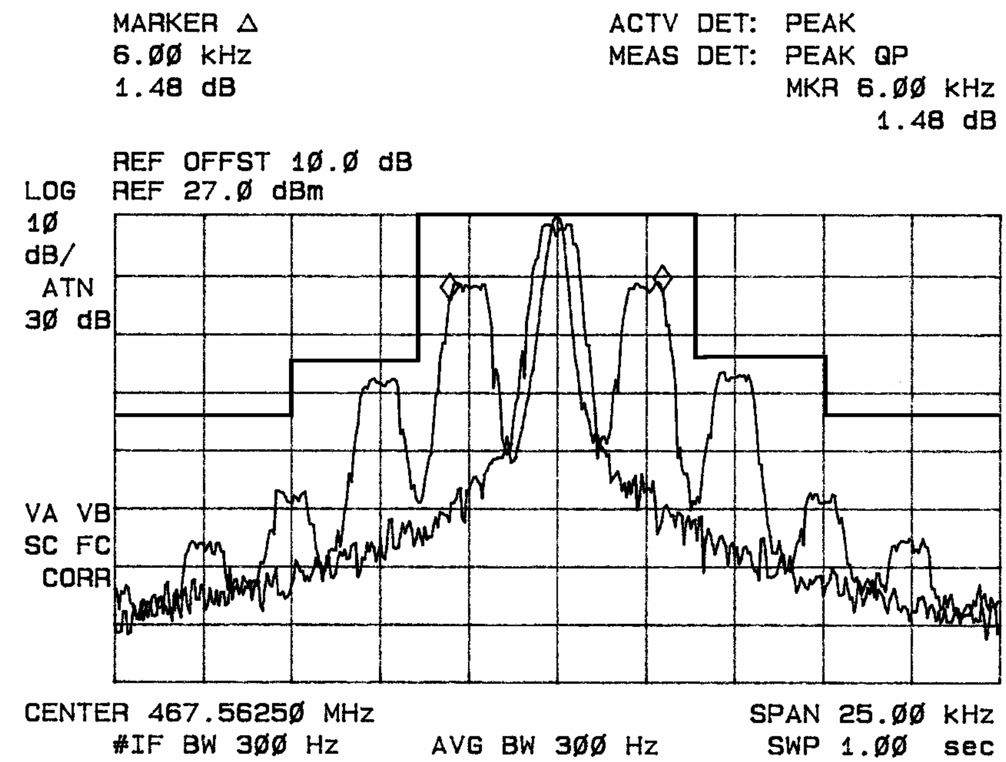


Figure 7 Occupied Band Width (FRS voice with CTCSS).

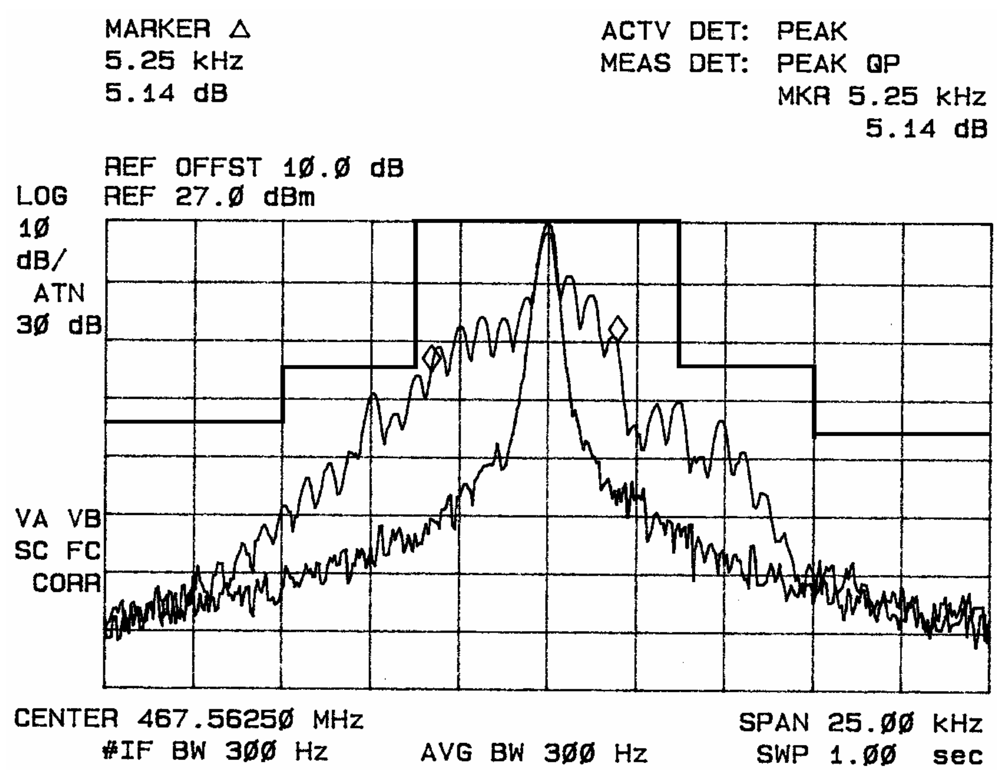


Figure 8 Occupied Band Width (FRS Data 1111).

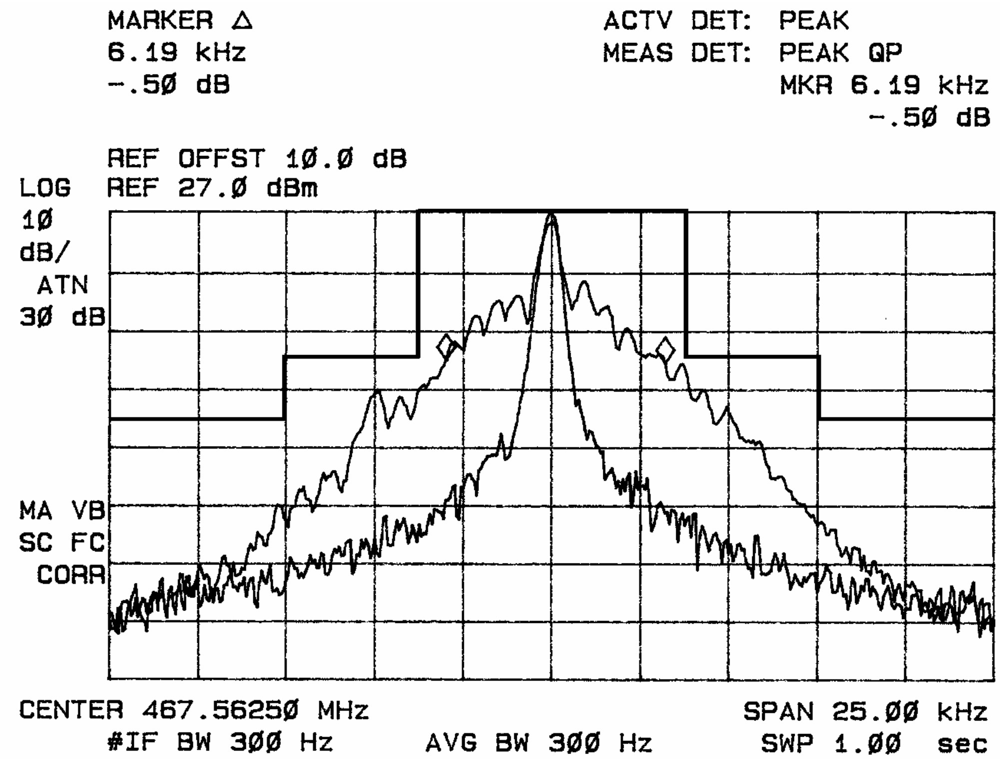


Figure 9 Occupied Band Width (FRS Data 1010).

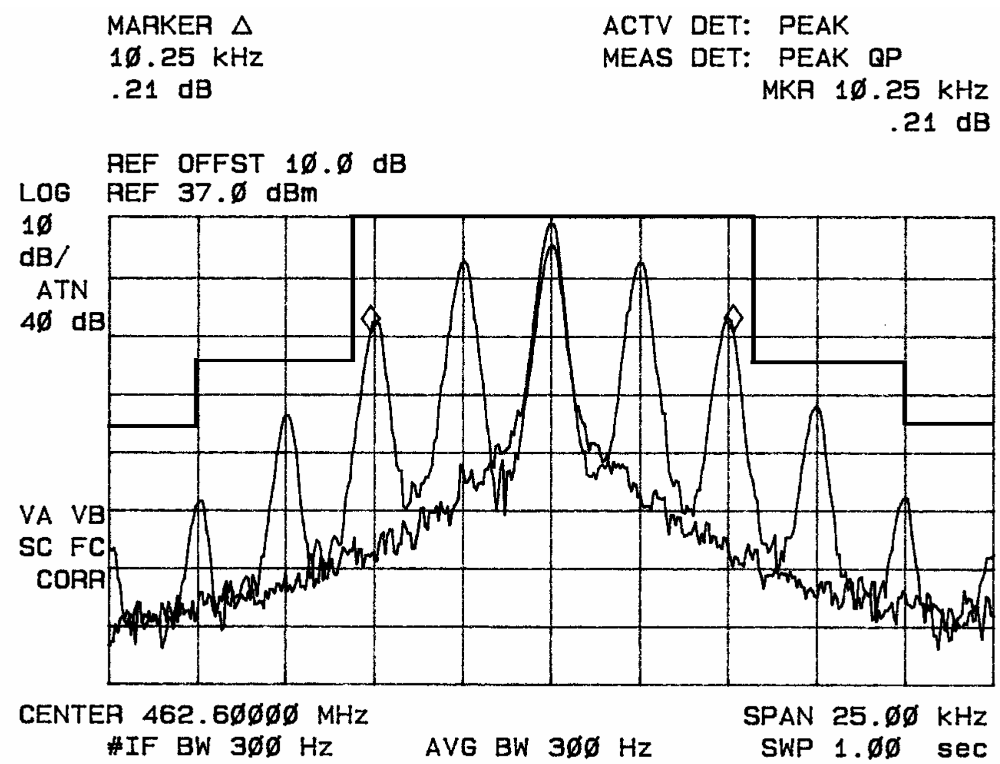


Figure 10 Occupied Band Width (GMRS voice).

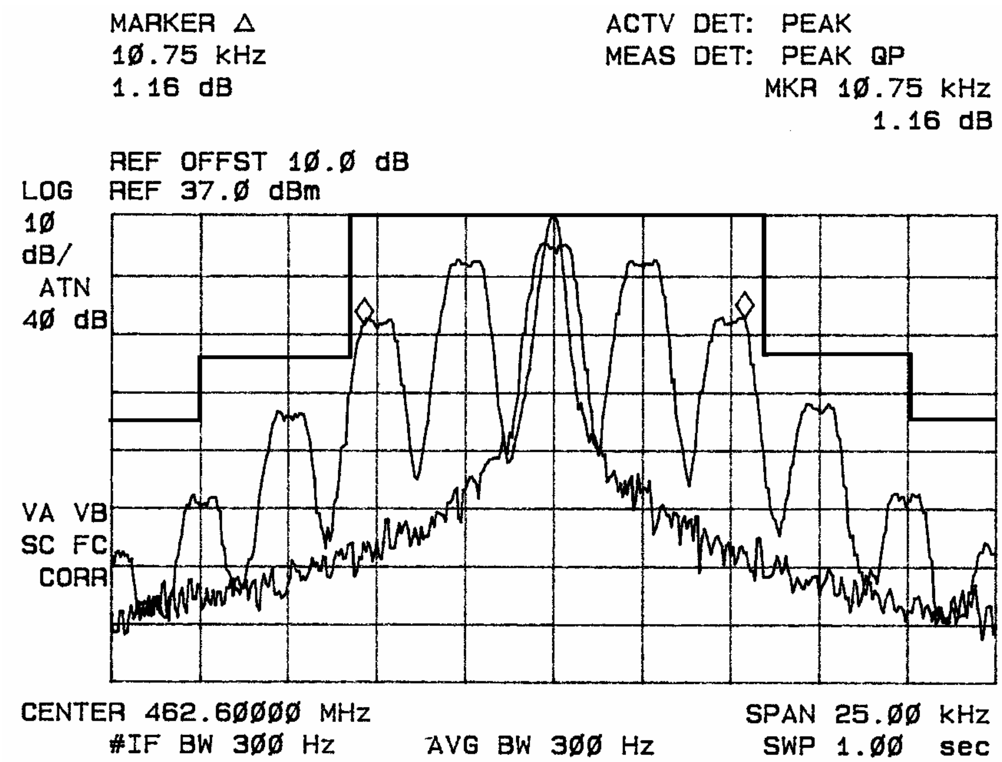


Figure 11 Occupied Band Width (GMRS voice with CTCSS).

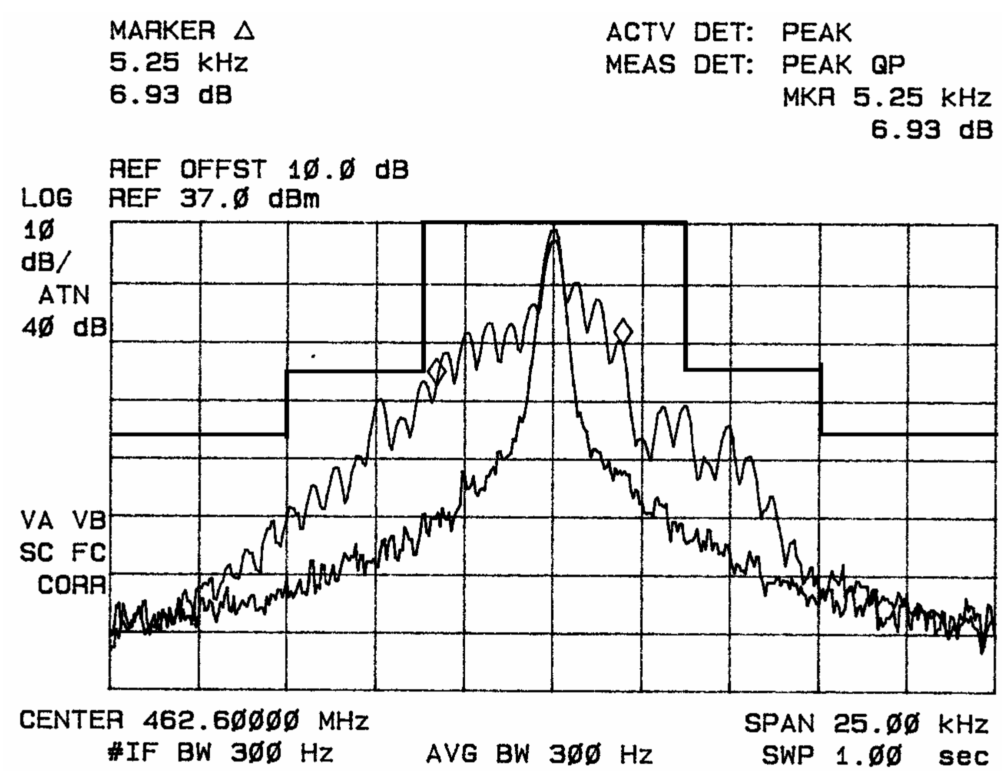


Figure 12 Occupied Band Width (GMRS Data 1111).

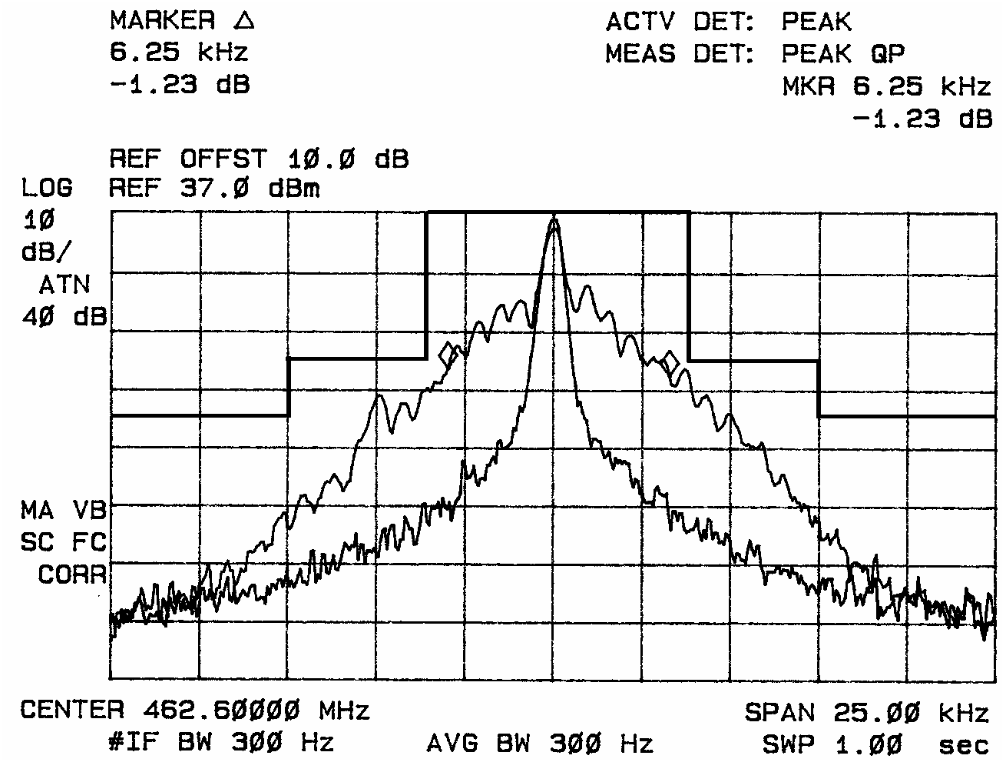


Figure 13 Occupied Band Width (GMRS Data 1010).

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:

TRANSMITTER — **ATTENUATION 10 dB** — **SPECTRUM ANALYZER**

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 fourteen through seventeen represent data for the Rino 520 and Rino 530 operating in FRS and GMRS modes. Data was taken per 2.1051, 2.1057, and applicable paragraphs of Part and 95.

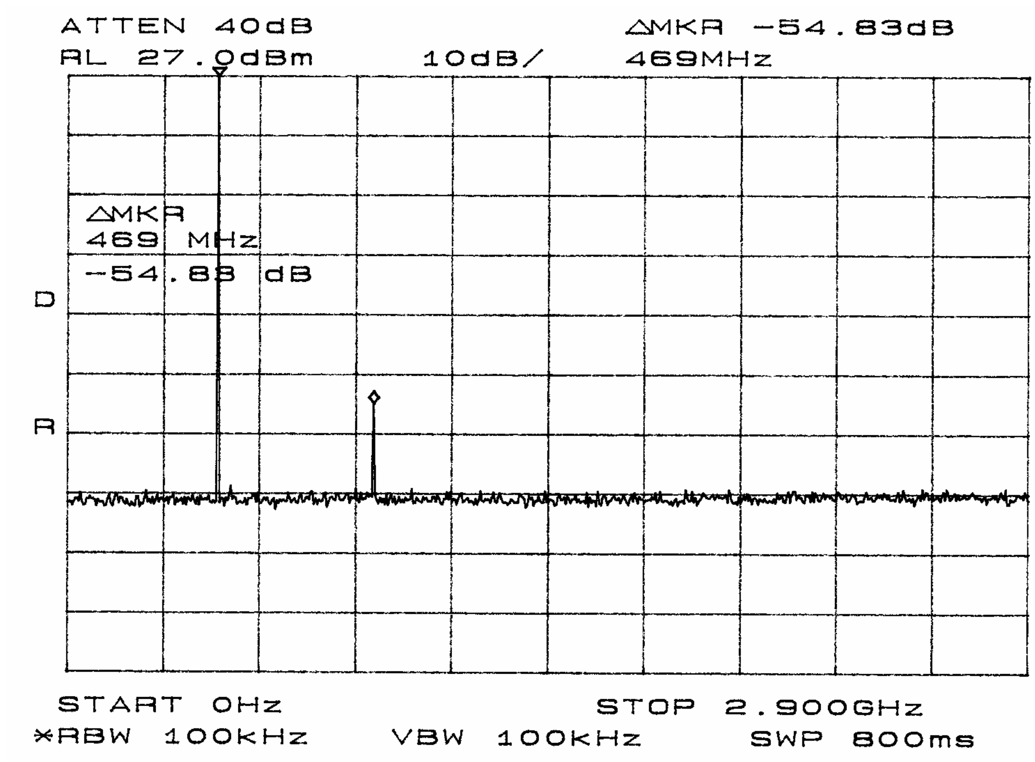


Figure 14 Emissions at Antenna Terminal for FRS.

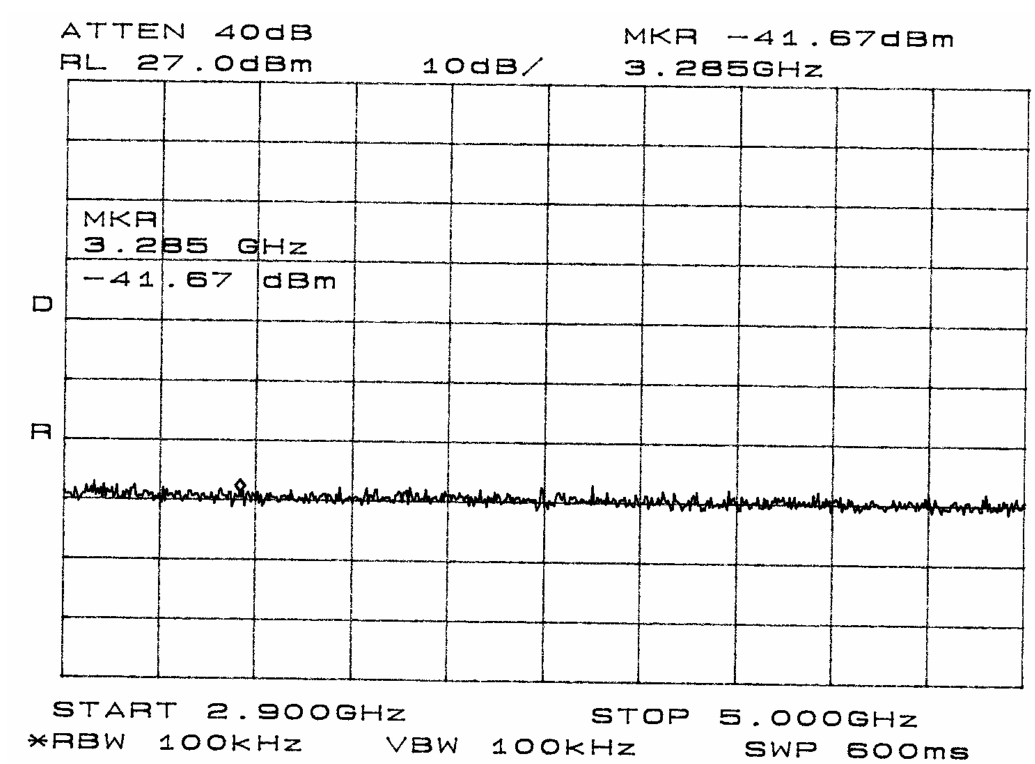


Figure 15 Emissions at Antenna Terminal for FRS.

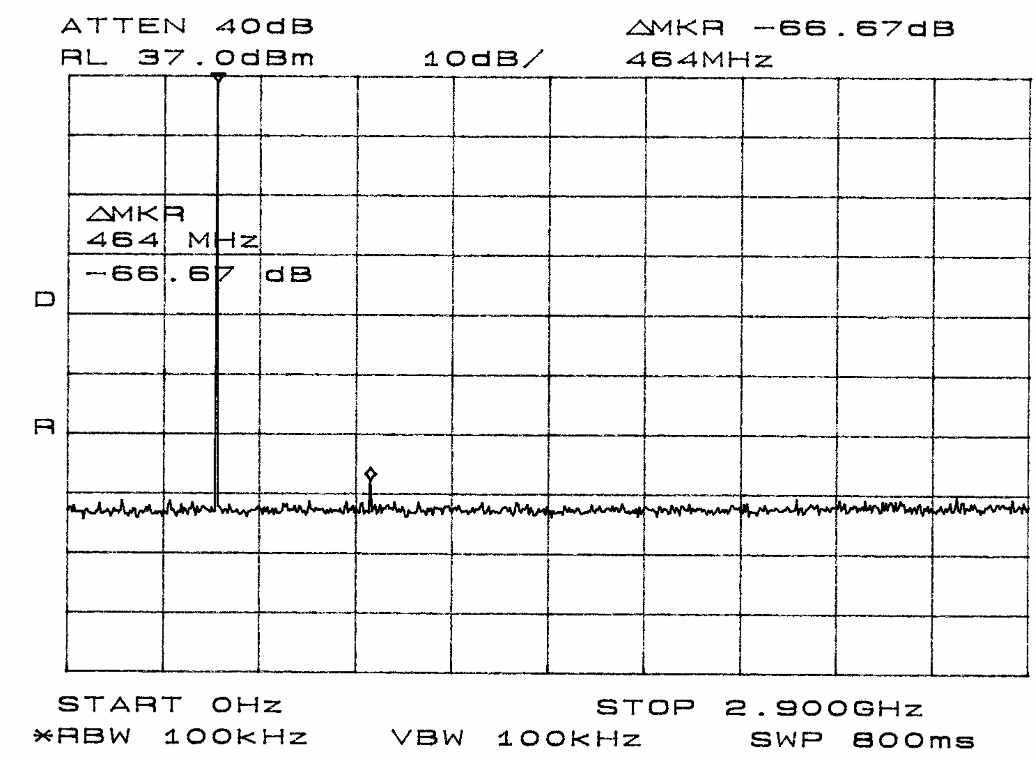


Figure 16 Emissions at Antenna Terminal for GMRS.

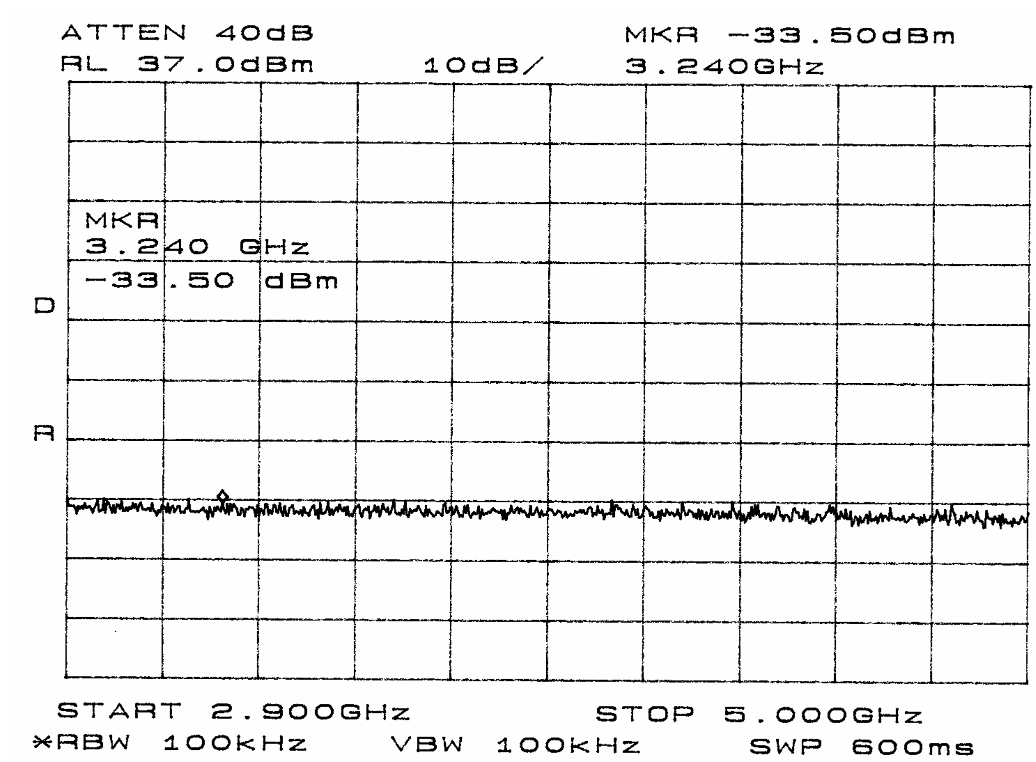


Figure 17 Emissions at Antenna Terminal for GMRS.

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:

5.0 Watt $= 43 + 10\ LOG(P_o)$
$= 43 + 10\ LOG(5)$
$= 50.0$

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

5.0 Watt GMRS Output

CHANNEL MHz	SPURIOUS FREQ. (MHz)	LEVEL BELOW CARRIER (dB)
462.6000	925.2	-66.7
	1387.8	-73.7
	1850.4	-81.2
	2313.0	-79.9
	2775.6	-77.7
	3238.2	-80.8
	3700.8	-80.3
	4163.4	-76.2
	4626.0	-81.7

0.5 Watt FRS Output

CHANNEL MHz	SPURIOUS FREQ. (MHz)	LEVEL BELOW CARRIER (dB)
467.5625	935.13	-54.5
	1402.69	-76.7
	1870.25	-77.0
	2337.81	-78.7
	2805.38	-77.2
	3272.94	-76.3
	3740.50	-75.0
	4208.06	-75.8
	4675.63	-75.2

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 August 15, 2003. 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.

5-watt GMRS transmitter.
Attenuation $= 43 + 10 \text{ Log}_{10}(P_w)$
$= 43 + 10 \text{ Log}_{10}(5)$
$= 50.0$ 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 5.0 (GMRS, US only), 2.0 (Canada GMRS) or 0.5 watts (FRS) of output power (37, 33 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]-(-36.3) = 59.3 dBc

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)	dBm	dBm	dBm	dBm	dBc	dBc	dBc
935.10	-76.2	-64.5	-36.3	-30.2	59.3	56.0	40
1402.70	-87.7	-81.4	-56.5	-58.8	79.5	84.6	40
1870.20	-87.9	-85.5	-60.8	-63.5	83.8	89.3	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)	dBm	dBm	dBm	dBm	dBc	dBc	dBc
935.40	-73.1	-68.5	-34.8	-34.5	57.7	60.3	40
1403.10	-84.9	-84.5	-54.3	-60.5	77.2	86.3	40
1870.80	-85.9	-86.0	-58.7	-63.8	81.6	89.6	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)	dBm	dBm	dBm	dBm	dBc	dBc	dBc
925.20	-63.6	-60.0	-25.5	-28.8	59.3	65.4	50.0
1387.80	-87.4	-86.9	-56.3	-62.8	90.1	99.4	50.0
1850.40	-85.5	-86.5	-58.3	-64.1	92.1	100.7	50.0

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	112.5	112.9	17.7	0	130.2	130.6	132.2
925.10	44.5	46.3	23.8	25	43.3	45.1	82.0
1387.70	19.3	20.3	26.6	25	20.9	21.9	82.0
1850.20	21.3	20.8	29.6	25	25.9	25.4	82.0
2312.80	20.0	21.8	31.6	25	26.6	28.4	82.0
2775.40	19.3	20.3	35.3	25	29.6	30.6	82.0
3237.90	22.1	21.6	38.2	25	35.3	34.8	82.0
3700.50	21.5	22.0	39.8	25	36.3	36.8	82.0
467.5625	105.6	105.8	17.9	0	123.5	123.7	124.4
935.10	30.8	42.5	24.1	25	29.9	41.6	82.0
1402.70	19.3	25.6	26.9	25	21.2	27.5	82.0
1870.20	19.1	21.5	29.9	25	24.0	26.4	82.0
2337.80	20.5	20.2	32.4	25	27.9	27.6	82.0
2805.40	19.3	20.0	35.7	25	30.0	30.7	82.0
3272.90	21.8	21.8	38.4	25	35.2	35.2	82.0
3740.50	22.1	21.0	39.9	25	37.0	35.9	82.0
467.7125	105.2	105.8	17.9	0	123.1	123.7	124.4
935.40	33.9	38.5	24.1	25	33.0	37.6	82.0
1403.10	22.1	22.5	26.9	25	24.0	24.4	82.0
1870.80	21.1	21.0	29.9	25	26.0	25.9	82.0
2338.60	20.8	19.5	32.4	25	28.2	26.9	82.0
2806.30	20.3	19.8	35.7	25	31.0	30.5	82.0
3274.00	20.6	22.6	38.4	25	34.0	36.0	82.0
3741.70	21.0	21.8	39.9	25	35.9	36.7	82.0
462.6000	112.3	113.2	17.7	0	130.0	130.9	132.2
925.22	43.4	47.0	23.8	25	42.2	45.8	82.0
1387.80	19.6	20.1	26.6	25	21.2	21.7	82.0
1850.40	21.5	20.5	29.6	25	26.1	25.1	82.0
2313.00	21.0	20.7	31.6	25	27.6	27.3	82.0
2775.60	20.1	21.3	35.3	25	30.4	31.6	82.0
3238.20	23.0	21.6	38.2	25	36.2	34.8	82.0
3700.80	20.5	21.3	39.8	25	35.3	36.1	82.0

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

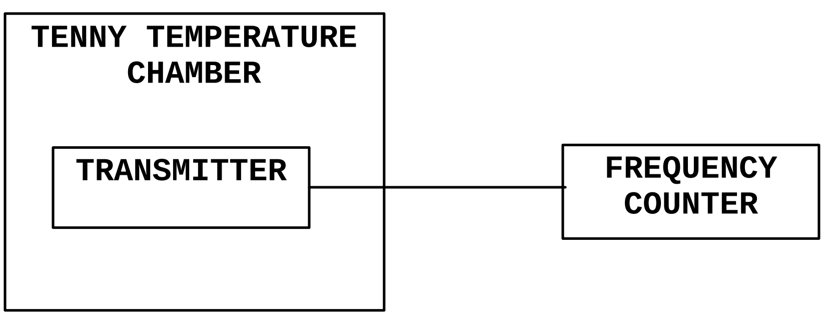
2.1055 Frequency Stability

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 6.37 Vdc to 8.63 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) 467.5625	FREQUENCY STABILITY VS TEMPERATURE IN PARTS PER MILLION (PPM) Temperature in °C								
	-30	-20	-10	0	+10	+20	+30	+40	+50
D (Hz)	410.00	430.0	420.0	400.0	340.0	110.0	80.0	10.0	0.0
Ppm	0.877	0.920	0.898	0.856	0.727	0.235	0.171	0.021	0.000
%	0.0001	0.0001	0.0001	0.0001	0.0001	0.0000	0.0000	0.0000	0.0000

FREQUENCY IN MHz	FREQUENCY STABILITY VS VOLTAGE VARIATION 7.5 volts nominal; RESULTS IN PPM INPUT VOLTAGE		
	6.37 V_{dc}	7.50 V_{dc}	8.63 V_{dc}
467.5625	0.0	0.0	0.0

FREQUENCY IN MHz	FREQUENCY STABILITY VS VOLTAGE VARIATION 7.5 volts nominal; RESULTS IN PPM BATTERY ENDPOINT VOLTAGE 5.625 V_{dc}
467.5625	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 520 / Rino 530

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	2/04
Wattmeter: Bird 43 with Load Bird 8085	2/04
Power Supplies: Sorensen SRL 20-25, SRL 40-25, DCR 150, DCR 140	2/04
H/V Power Supply: Fluke Model: 408B (SN: 573)	2/04
R.F. Generator: HP 606A	2/04
R.F. Generator: HP 8614A	2/04
R.F. Generator: HP 8640B	2/04
Spectrum Analyzer: HP 8562A,	2/04
Mixers: 11517A, 11970A, 11970K, 11970U, 11970V, 11970W	
HP Adapters: 11518, 11519, 11520	
Spectrum Analyzer: HP 8591 EM	5/04
Frequency Counter: Leader LDC 825	2/04
Antenna: EMCO Biconilog Model: 3143	5/04
Antenna: EMCO Log Periodic Model: 3147	10/04
Antenna: Antenna Research Biconical Model: BCD 235	10/04
Antenna: EMCO Dipole Set 3121C	2/04
Antenna: C.D. B-101	2/04
Antenna: Solar 9229-1 & 9230-1	2/04
Antenna: EMCO 6509	2/04
Audio Oscillator: H.P. 201CD	2/04
R.F. Power Amp 65W Model: 470-A-1010	2/04
R.F. Power Amp 50W M185- 10-501	2/04
R.F. PreAmp CPPA-102	2/04
LISN 50 μHy/50 ohm/0.1 μf	10/04
LISN Compliance Eng. 240/20	2/04
Peavey Power Amp Model: IPS 801	2/04
Power Amp A.R. Model: 10W 1010M7	2/04
Power Amp EIN Model: A301	2/04
ELGAR Model: 1751	2/04
ELGAR Model: TG 704A-3D	2/04
ESD Test Set 2010i	2/04
Fast Transient Burst Generator Model: EFT/B-101	2/04
Current Probe: Singer CP-105	2/04
Current Probe: Solar 9108-1N	2/04
Field Intensity Meter: EFM-018	2/04
KEYTEK Ecat Surge Generator	2/04
Shielded Room 5 M x 3 M x 3.0 M (101 dB Integrity)	

10/1/2004

QUALIFICATIONS

Of

SCOT D. ROGERS, ENGINEER

ROGERS LABS, INC.

Mr. Rogers has approximately 16 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

January 31, 2005
Date

1/08/2003

FEDERAL COMMUNICATIONS COMMISSION

Laboratory Division
7435 Oakland Mills Road
Columbia, MD 21046

August 15, 2003

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: August 15, 2003

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,

Ms. Phyllis Parrish
Information Technician