

ROGERS

Consulting Labs, Inc.

11701 CRAIG • OVERLAND PARK, KS 66210 • PHONE & FAX: (913) 339-6072

RECEIVER NOTIFICATION REPORT

for

GARMIN INTERNATIONAL, INC.

1200 East 151st Street

Olathe, KS 66062

Van Ruggles, Director of Quality Assurance

MODEL: GNS 430

012-00195-()

Frequency Range: 108-117.95 MHz

FCC ID#: IPH-0019500

Test Date: June 16, 1998

Certification Date: June 19, 1998

Certifying Engineer:

Scot D. Rogers

ROGERS CONSULTING LABS, INC.

11701 Craig

Overland Park, KS 66210

PHONE: (913) 339-6072

FAX: (913) 339-6072

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RECEIVER NOTIFICATION

In accordance with the Code of Federal Regulations, Telecommunications Title 47 dated October 1, 1997, Part 2, Paragraph 2.904, 2.925, 2.926, 2.947, 2.948, 2.971 through 2.977, and Part 15B, Paragraphs 15.19, 15.21, 15.31, 15.33, 15.35, 15.101, 15.105, 15.109 and 15.111 the following is submitted:

2.947 Measurement Procedures

Applicable Parts of the Following Documents:

- 1) Code of Federal Regulations, Title 47
- 2) ANSI 63.4-1992

List of Test Equipment

A Hewlett Packard 8591 EM 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
30-1000 MHz RADIATED EMISSIONS:		
RBW	AVG. BW	DETECTOR FUNCTION
120 kHz	300 kHz	Peak / Quasi Peak

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11701 Craig
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HP 8562A ANALYZER SETTINGS		
30-1000 MHz RADIATED EMISSIONS:		
RBW	VIDEO	DETECTOR FUNCTION
100 kHz	100	Peak
ABOVE 1000 MHz RADIATED EMISSIONS:		
1 MHz	1 MHz	Peak/Average

2.948 Measurement Facilities

Description of Measurement Facilities for ROGERS CONSULTING LABS, INC. is on file with the FCC: Reference: 31040/SIT 1300F2, Dated October 15, 1996.

2.975 Application for Notification

1) Name of Applicant:

GARMIN INTERNATIONAL, INC.
1200 East 151st Street
Olathe, KS 66062

GARMIN INTERNATIONAL, INC. is the manufacturer of the equipment.

2) Technical Information:

- (i) Type of Emission: N/A.
- (ii) Frequency Range: 108-117.95 MHz.
- (iii) Frequency Tolerance: 20 PPM.
- (iv) RF power Output: N/A.

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(v) Modulation: N/A.

3) Device Description and Use:

The unit is a multi-channel receiver used in the aviation navigation of airborne personnel. The EUT utilizes a 20.4 MHz I.F. low side injection, superhetrodyne receiver.

4) FCC Identifier:

Identification Label: IPH-0019500. Refer to Appendix for label.

5) Photos:

Attached.

6) Signed Statement:

See Appendix of this Report.

7) Equipment Tested:

In accordance with the Standards of Part 15B, Paragraph 15.109 and 15.111, the transition provisions of 15.37 are not being utilized.

8) N/A:

15.31 Measurement Standards

Description of the measurement facilities for ROGERS CONSULTING LABS, INC. is on file with the FCC:

Reference 31040/SIT 1300F2, October 15, 1996;

Measurement Procedures: Applicable parts of ANSI 63.4-1992.

15.101 Unintentional Radiators

Report of Measurements: Receiver subject to Part 15, Notification.

15.109 Measurements of Radiated Energy

The EUT was arranged in a typical equipment configuration and operated through all of its various modes. The inter-connecting cables of the EUT and supporting equipment were manipulated such as to obtain maximum levels of radiated emissions within the range of likely configurations. 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 which produced the highest emissions. Plots were made of the frequency spectrum from 30 MHz to 1000 MHz for the

preliminary testing. The EUT, supporting equipment and cable locations were noted and reconfigured at the final test site. The EUT was placed on a wooden turntable 0.8 meters above the ground plane and a distance of 3 meters from the FSM antenna. The highest radiated emission was then remaximized at this site location before final radiated emissions measurements were performed. The frequency spectrum from 30 MHz to 10,000 MHz was searched for radiated emissions. Emissions were maximized by EUT placement on the table, changing cable location, rotating the turntable and varying the antenna height and polarization. Antennas used were Broadband Biconical from 30 to 200 MHz, Log Periodic from 200 to 5000 MHz, Biconilog from 30 to 1000 MHz and/or Pyramidal Horns from 4-40 GHz. The field strength was recorded from the FSM in dB μ V then converted to dB μ V/m at 3 m by using the following formula:

$$\begin{aligned}\text{Calculations: } \text{dB}\mu\text{V/m @ 3m} &= \text{dB}\mu\text{V} + \text{A.F.} - \text{Amp. Gain} \\ &= 40.6 + 16.3 - 35 \\ &= 21.9\end{aligned}$$

Data:

Radiated (8 Highest Emissions) 15.109(a)

Emission Freq. (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)
36.0	40.6	48.5	16.3	35.0	21.9	29.8	40.0
46.0	45.2	52.6	11.7	35.0	21.9	29.3	40.0
63.0	38.4	57.0	8.2	35.0	11.6	30.2	40.0
85.0	60.1	58.7	8.6	35.0	33.7	32.3	40.0
129.0	43.4	52.7	9.7	35.0	18.1	27.4	43.5
131.5	44.1	49.7	9.7	35.0	18.8	24.4	43.5
140.0	41.7	52.9	10.2	35.0	16.9	28.1	43.5
200.0	60.6	53.0	10.6	35.0	36.2	28.6	43.5

Other emissions were present with amplitudes at least 10 dB below limits.

Radiated Emissions Channel Frequencies 15.109(a)

Channel	Emission Frequency in MHz	FSM in dBµV HORZ.	FSM in dBµV VERT.	Ant. Factor	Amp. Gain	CFS @ 3m HORZ.	CFS @ 3m VERT.	FCC Limit in dBµV/m @ 3m
108.0	87.6	41.2	42.8	8.6	25.0	24.8	26.4	40.0
	438.0	36.0	36.8	16.5	25.0	27.5	28.3	43.5
112.5	92.1	45.6	46.0	8.8	25.0	29.4	29.8	40.0
	184.2	42.6	38.1	9.9	25.0	27.5	23.0	43.5
	368.4	34.8	36.0	15.2	25.0	25.0	26.2	43.5
117.95	97.6	39.1	38.9	8.8	25.0	22.9	22.7	40.0
	195.1	44.9	40.8	10.2	25.0	30.1	26.0	43.5
	292.6	37.2	37.0	15.3	25.0	27.5	27.3	43.5
	585.3	37.3	37.8	19.1	25.0	31.4	31.9	43.5

Other emissions were present with amplitudes at least 10 dB below limits.

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15.111 Antenna Power Conduction Limits for Receivers**Data:**

Emissions at Antenna Terminal Per 15.111

Channel Frequency in MHz	Conducted Emissions Frequency	Level in dB μ V dBm	FCC Limit in dB μ V
108.0	87.6	-71.8	-57.0
	175.2	-90.0	-57.0
	262.8	-92.3	-57.0
	438.	-91.6	-57.0
112.5	92.1	-77.4	-57.0
	184.2	-92.3	-57.0
	368.4	-94.8	-57.0
117.95	97.6	-86.3	-57.0
	195.1	-90.7	-57.0
	292.6	-91.5	-57.0
	585.3	-92.4	-57.0

Other emissions were present with amplitudes at least 20 dB below the limits.

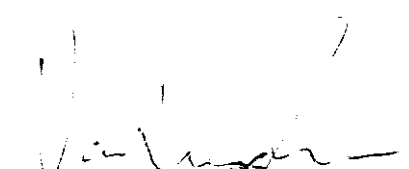
APPENDIX

1. Photos Radiated Test Set Up.
2. Photo Showing Front Panel.
3. Statement of Compliance per 2.975(6).
4. Test Equipment List.
5. Rogers Qualifications.
6. FCC Site Approval Letter.
7. Schematic.
8. Identification Label per 2.925 and 2.926.

STATEMENT OF COMPLIANCE PER 2.975(6)

This equipment has been tested in accordance with the requirements contained in the appropriate Commission Regulations. To the best of my knowledge, these tests were performed using measurement procedures consistent with industry or Commission standards and demonstrate that the equipment complies with the appropriate standards. Each unit manufactured, imported or marketed, as defined in the Commission's Regulations, will conform to the sample(s) tested within the variations that can be expected due to quantity production and testing on a statistical basis. I further certify that the necessary measurements were made by ROGERS CONSULTING LABS, INC., 11701 Craig, Overland Park, Kansas 66210, (913) 339-6072.

Signed:



Van Ruggles,
Director of Quality Assurance
GARMIN INTERNATIONAL, INC.
1200 East 151st Street
Olathe, KS 66062

June 19, 1998

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TEST EQUIPMENT LIST FOR ROGERS CONSULTING LABS, INC.

The equipment is used daily and kept in good calibration and operating condition. Calibration of critical items are checked for accuracy each time used.

List of Test Equipment:Calibration Date:

Scope: Tektronix 2230	2/98
Wattmeter: Bird 43 with Load Bird 8085	2/98
Power Supplies: Sorensen SRL 20-25, DCR 150, DCR 140	2/98
H/V Power Supply: Fluke Model: 408B (SN:573)	2/98
R.F. Generator: Boonton 102F	2/98
R.F. Generator: HP 606A	2/98
R.F. Generator: HP 8614A	2/98
R.F. Generator: HP 8640B	2/98
Spectrum Analyzer: HP 8562A,	2/98
Mixers: 11517A, 11980A & 11980K	
HP Adapters: 11518, 11519, 11520	
Spectrum Analyzer: HP 8591 EM	6/97
Frequency Counter: Weston 1255	2/98
Frequency Counter: Leader LDC 825	2/98
Antenna: EMCO Log Periodic	9/97
Antenna: BCD 235/BNC Antenna Research	9/97
Antenna: EMCO Dipole Set 3121C	2/98
Antenna: C.D. B-100	2/98
Antenna: Solar 9229-1 & 9230-1	2/98
Antenna: EMCO 6509	2/98
Microline Freq. Meter: Model 27B	2/98
Dana Modulation Meter: Model 9008	2/98
Audio Oscillator: H.P. 200CD	2/98
R.F. Power Amp 65W Model: 470-A-1000	9/97
R.F. Power Amp 50W M185- 10-500	9/97
R.F. PreAmp CPPA-102	9/97
Shielded Room 5 M x 3 M x 2.5 M (100 dB Integrity)	
LISN 50 μ Hy/50 ohm/0.1 μ f	9/97
LISN Compliance Eng. 240/20	2/98
SCS Power Amp Model: 2350A	2/98
Power Amp A.R. Model: 10W 1000M7	2/98
Linear Amp Mini Circuits: ZHL-1A (2 Units)	2/98
Combiner Unit Mini Circuits: ZSC-2-1 (2 Units)	2/98
ELGAR Model: 1751	2/98
ELGAR Model: TG 704A-3D	2/98
ELGAR Model: 400SD (PB)	2/98
ESD Test Set 2000i	10/95
Fast Transient Burst Generator Model: EFT/B-100	10/95
Current Probe: Singer CP-105	8/97
Current Probe: Solar 9108-1N	8/97
Field Intensity Meter: EFM-018	10/95

12-11-98

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QUALIFICATIONS

of

SCOT D. ROGERS, ENGINEER

ROGERS CONSULTING LABS, INC.

Mr. Rogers has approximately 10 years experience in the field of electronics. Six years working in the automated controls industry and 4 years working with the design, development and testing of radio communications and electronic equipment.

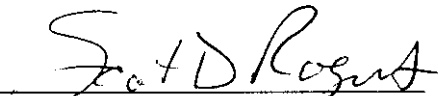
POSITIONS HELD:

Systems Engineer: A/C Controls Mfg. Co., Inc.
6 Years

Electrical Engineer: Rogers Consulting Labs, Inc.
4 Years

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

6/24/98
Date

11/98

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FEDERAL COMMUNICATIONS COMMISSION

7435 Oakland Mills Road
Columbia, MD 21046
Telephone: 301-725-1585 (ext-218)
Facsimile: 301-344-2050

October 15, 1996

IN REPLY REFER TO
31040/SIT
1300F2

Rogers Consulting Labs, Inc.
11701 Craig
Overland Park, KS 66210

Attention: Scot D. Rogers

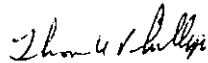
Re: Measurement facility located at Paola
(3 meter site)

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 or notification under Parts 15 or 18 of the Commission's Rules. Our list will also indicate that the facility complies with the radiated and AC line conducted test site criteria in ANSI C63.4-1992. Please note that this filing must be updated for any changes made to the facility, and at least every three years the data on file must be certified as current.

Per your request, the above mentioned facility has been also added to our list of those who perform these measurement services for the public on a fee basis. This list is published periodically and is also available on the Laboratory's Public Access Link as described in the enclosed Public Notice.

Sincerely,



Thomas W. Phillips
Electronics Engineer
Customer Service Branch

Enclosure:
PAL PN

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