

Class 2 Permissive Change

Test Report

CFR47 part 80(E), and RSS-238

Market Label: A02546

9300-9500 MHz

Marine Radar Equipment

FCC ID: IPH-02546

IC: 1792A-02546

For

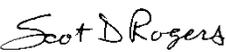
Garmin International, Inc.

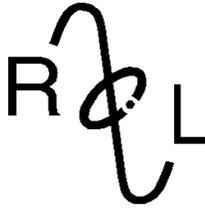
1200 East 151st Street

Olathe, KS 66062

Test Report Number: 161114

IC Test Site Registration: 3041A-1

Authorized Signatory: 
Scot D. Rogers



Rogers Labs, Inc.

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

Engineering Test Report for Class 2 Permissible Change of Certified Equipment For

Garmin International, Inc.

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

Mr. Doug Kealey
Manager, Environmental and Regulatory Affairs

Market Label: A02546
Marine Radar Equipment
Frequency Range: 9300-9500 MHz

FCC ID: IPH-02546
IC: 1792A-02546

Test Date: November 14, 2016

Certifying Engineer: *Scot D Rogers*

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Rogers Labs, Inc.
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Louisburg, KS 66053
Phone/Fax: (913) 837-3214
Revision 1

Garmin International, Inc.
Model: A02546
Test #: 161114
Test to: CFR47 Parts 2, 80, RSS-238
File: A02546 Garmin TstRpt 161114

FCC ID: IPH-02546
IC: 1792A-02546
SN: FF-ENG#2
Date: February 13, 2017
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Revisions

Revision 1, Issued February 13, 2017

Forward

The electromagnetic emissions compatibility testing required for demonstration of continued compliance with 47CFR Part 80 and Industry Canada RSS-238 have been conducted on the A02546 in compliance with class 2 permissible change requirements. This report documents the addition of three new transmitter operational channels contained within the certified frequency band of 9300-9500 MHz. The change required no hardware change as software change provides selection of channels centered at 9335, 9375, 9415, and 9455 MHz. This offers additional user selectable channels providing the end user the ability to select different operational channels in high traffic areas and reducing operational interference. This document and submitted exhibits provide supporting information and demonstration of compliance for use of the channels. The results have been reviewed and determined the equipment remains in compliance with original certification, regulations and requirements.

Name of Applicant: Garmin International, Inc., 1200 East 151st Street, Olathe, KS 66062

Model: A02546

FCC ID: IPH-02546 Industry Canada ID: 1792A-02546

Frequency Range: 9300-9500 MHz

Emissions Designator: 47M4PON (40-dB Occupied Band Width 325M3PON)

Opinion / Interpretation of Results

Tests Performed	Results
Requirements per CFR47 paragraphs 2.2.1031-2.1057	Complies
Requirements per CFR47 paragraphs 80.205 Bandwidths (RSS-238 3.2)	Complies
Requirements per CFR47 paragraphs 80.209 Frequency Tolerances (RSS-238 4.1)	Complies
Requirements per CFR47 paragraphs 80.211 Emission Limitations (RSS-238 4.3)	Complies
Requirements per CFR47 paragraphs 80.213 Modulation	Complies
Requirements per CFR47 paragraphs 80.215 Transmitter Power (RSS-238 4.2)	Complies

Change to Equipment

The transmitter remains electrically identical to the original filing. No change in transmitter hardware design was required. The original hardware was electrically capable to select different frequency channels but intentionally limited to operation on a single channel by firmware. The modified firmware provides enabling the user channel frequency selection. Selection of the RF channel is achieved by changing the frequency of the LO2 signal. The modification in firmware provides the additional operational channels which are contained within the original authorized frequency band. The RF channel center frequencies with the corresponding LO2 frequencies are summarized below in Table 1. The new firmware also provides improved frequency response of BPF1 and BSF1 adjusted to provide a smoother response across the 9.3 – 9.5 GHz band. Testing was performed to verify the change continues to comply with applicable rules and requirements. The modification provided no change to the certified operating power or frequency band of the transmitter.

Channel #	RF Channel Center Frequency (MHz)	LO2 Frequency (MHz)
1	9335	8440
2	9375	8480
3	9415	8520
4	9455	8560

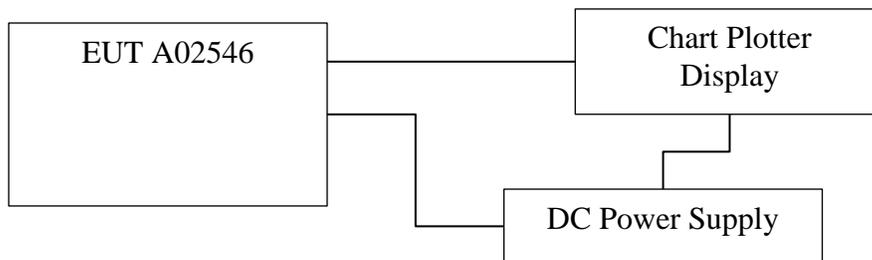
Equipment Tested

<u>Equipment</u>	<u>Serial Number</u>	<u>FCC I.D.#</u>
EUT A02546	FF-ENG#2	IPH-02546
Chart Plotter (GPSMap 8x12)	386112934723	N/A

Equipment Function and Configuration

The A02546 is a ship borne marine radar designed to provide bearing and distance information of above surface ships and land targets located within the radars range. The radar unit must be integrated into a full Marine system installation for operation, including chart plotter for display and control purposes. As the radar sweeps through 360° reflected signals are interpreted and displayed on the chart plotter as indication of potential above surface hazards. The design provides peak out power of 40 watts producing the highest average output power over the range of 4.48 watts delivered into antenna array. The manufacturer provided wave guide antenna port adapter connector allowing testing at the antenna port of the transmitter. Typically the unit is paired with either a 4 or 6 foot directional antenna.

Equipment Configuration



Environmental Conditions

Ambient Temperature	20.6° C
Relative Humidity	40%
Atmospheric Pressure	1015.4 mb

Units of Measurements

AC Line Conducted EMI	Data is in dB μ V; dB referenced to one microvolt.
Radiated EMI	Data is in dB μ V/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 conducted emissions testing performed in a shielded screen room located at Rogers Labs, Inc., 4405 W. 259th Terrace, Louisburg, KS.
Radiated EMI	The radiated emissions tests were performed at the 3 meters, Open Area Test Site (OATS) located at Rogers Labs, Inc., 4405 W. 259th Terrace, Louisburg, KS.
Site Registration	Refer to Annex for FCC Site Registration Letter, # 90910, and Industry Canada Site Registration Letter, IC3041A-1.

List of Test Equipment

A Rohde and Schwarz ESU40 and/or Hewlett Packard 8591EM was used as the measuring device for the emissions testing of frequencies below 1 GHz. A Rohde and 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.

AC Line Conducted Emissions (0.150 -30 MHz)		
RBW	AVG. BW	Detector Function
9 kHz	30 kHz	Peak / Quasi Peak
Emissions (30-1000 MHz)		
RBW	AVG. BW	Detector Function
120 kHz	300 kHz	Peak / Quasi Peak
Emissions (Above 1000 MHz)		
RBW	Video BW	Detector Function
100 kHz	100 kHz	Peak
1 MHz	1 MHz	Peak / Average

<u>Equipment</u>	<u>Manufacturer</u>	<u>Model (SN)</u>	<u>Band</u>	<u>Cal Date</u>	<u>Due</u>
<input type="checkbox"/> LISN	FCC	FCC-LISN-50-2-10(1PA) (160611)	.15-30MHz	5/16	5/17
<input checked="" type="checkbox"/> Cable	Time Microwave	750HF290-750 (L10M)	9kHz-40 GHz	10/16	10/17
<input type="checkbox"/> Cable	Belden	RG-58 (L1-CAT3-11509)	9kHz-30 MHz	10/16	10/17
<input type="checkbox"/> Cable	Belden	RG-58 (L2-CAT3-11509)	9kHz-30 MHz	10/16	10/17
<input type="checkbox"/> Antenna	ARA	BCD-235-B (169)	20-350MHz	10/16	10/17
<input type="checkbox"/> Antenna	EMCO	3147 (40582)	200-1000MHz	10/16	10/17
<input checked="" type="checkbox"/> Antenna	ETS-Lindgren	3117 (200389)	1-18 GHz	5/16	5/18
<input type="checkbox"/> Antenna	Com Power	AH-118 (10110)	1-18 GHz	10/15	10/17
<input checked="" type="checkbox"/> Antenna	Com Power	AH-840 (101046)	18-40 GHz	5/16	5/18
<input checked="" type="checkbox"/> Antenna	Com Power	AL-130 (121055)	.001-30 MHz	10/16	10/17
<input checked="" type="checkbox"/> Antenna	Sunol	JB-6 (A100709)	30-1000 MHz	10/16	10/17
<input type="checkbox"/> Antenna	EMCO	3143 (9607-1277)	20-1200 MHz	5/16	5/17
<input type="checkbox"/> Analyzer	HP	8591EM (3628A00871)	9kHz-1.8GHz	5/16	5/17
<input type="checkbox"/> Analyzer	HP	8562A (3051A05950)	9kHz-110GHz	5/16	5/17
<input type="checkbox"/> Analyzer	HP External Mixers	11571, 11970	25GHz-110GHz	5/16	5/17
<input checked="" type="checkbox"/> Analyzer	Rohde & Schwarz	ESU40 (100108)	20Hz-40GHz	5/16	5/17
<input checked="" type="checkbox"/> Amplifier	Com-Power	PA-010 (171003)	100Hz-30MHz	10/16	10/17
<input checked="" type="checkbox"/> Amplifier	Com-Power	CPA-102 (01254)	1-1000 MHz	10/16	10/17
<input checked="" type="checkbox"/> Amplifier	Com-Power	PAM-118A (551014)	0.5-18 GHz	10/16	10/17

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Applicable Standards & Test Procedures

In accordance with the Federal Communications Commission, Code of Federal Regulations 47CFR, dated October 1, 2016, Part 2, Subpart J, Paragraphs 2.907, 2.911, 2.913, 2.925, 2.926, 2.1031 through 2.1057, applicable parts of paragraph Parts 2, 80(E), and Industry Canada RSS-238 issue 1, the following information is submitted. Test procedures used were the established Methods of Measurement of Radio-Noise Emissions as described in ANSI 63.4-2014 and ANSI/TIA-603-D-2010.

Test Procedures

Radiated Emission Test Procedure

The EUT was placed on a rotating 0.9 x 1.2-meter platform, elevated as required above the ground plane at 3 meters distance from the FSM antenna. EMI energy was maximized by equipment placement, raising and lowering the FSM antenna, changing the antenna polarization, and by rotating the turntable. Each emission was maximized before data was taken using a spectrum analyzer. The frequency spectrum from 9 kHz to 100,000 MHz was searched during preliminary investigation. Refer to diagrams one and two showing typical OATS range configuration and arrangement and test setup exhibits for specific EUT placement during testing.

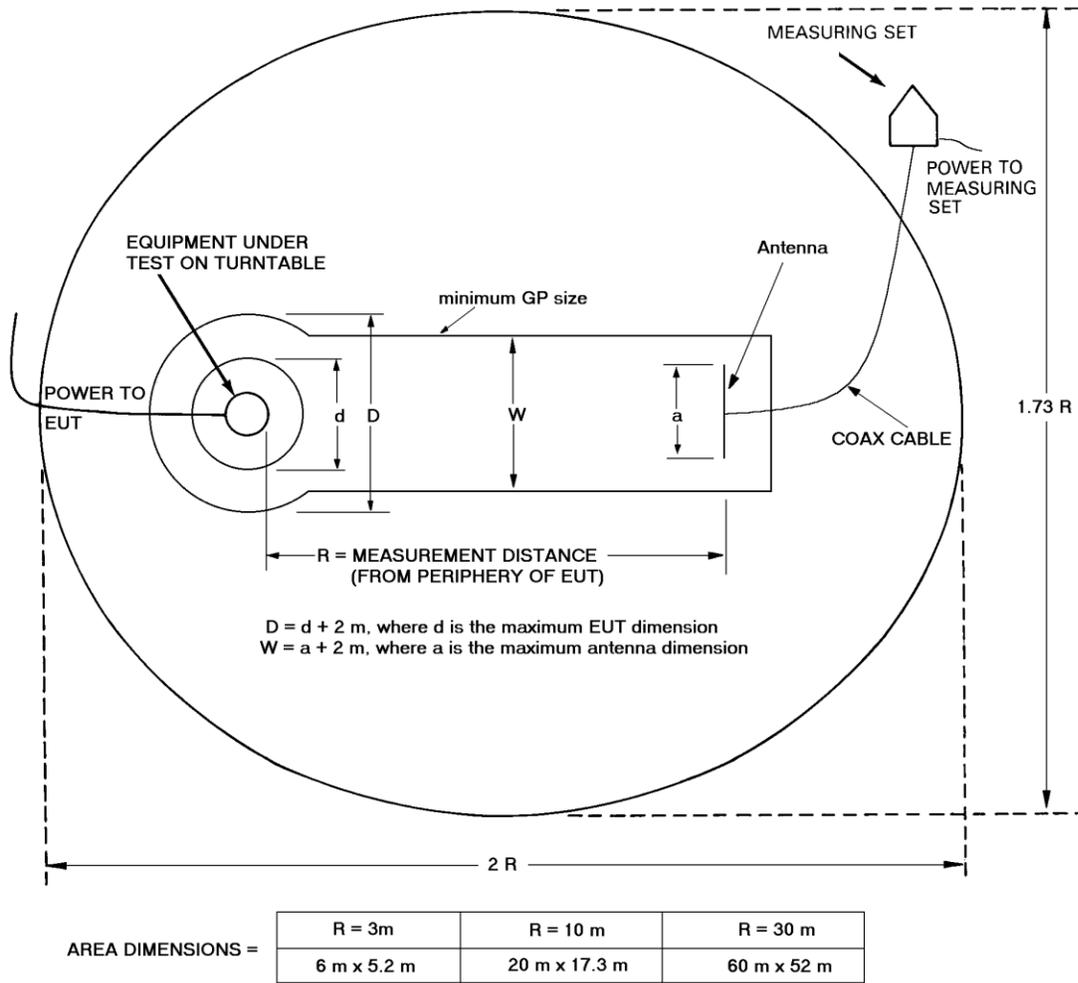
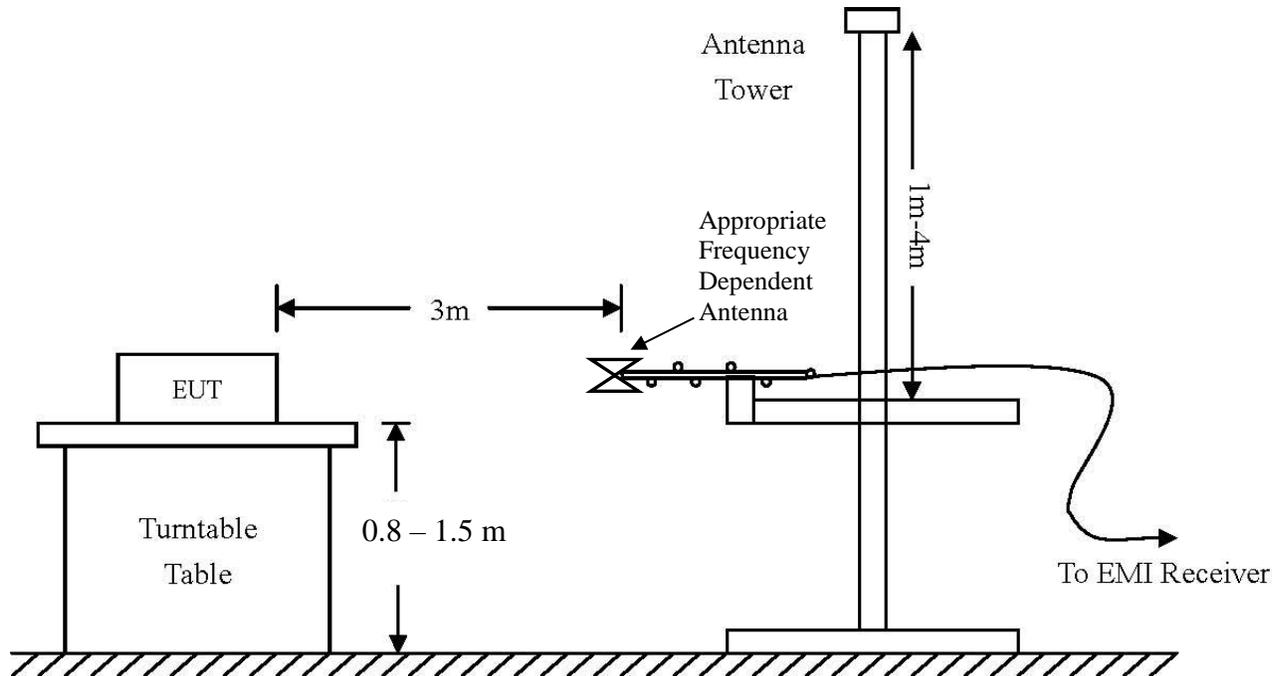


Diagram 1 Test setup for radiated emissions tested on Open Area Test Site (OATS)



Frequency: 9 kHz-30 MHz	Frequency: 30 MHz- 1 GHz	Frequency: Above 1 GHz
Loop Antenna	Broadband Biconilog	Horn
RBW = 9 kHz	RBW = 120 kHz	RBW = 1 MHz
VBW = 30 kHz	VBW = 120 kHz	VBW = 1 MHz
Sweep time = Auto	Sweep time = Auto	Sweep time = Auto
Detector = PK, QP	Detector = PK, QP	Detector = PK, AV
Antenna Height 1m	Antenna Height 1-4m	Antenna Height 1-4m

Diagram 2 Test arrangement for radiated emissions tested on Open Area Test Site (OATS)

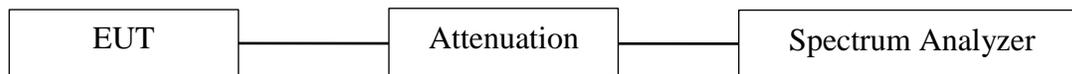
Radio Frequency Power Output

Measurements Required

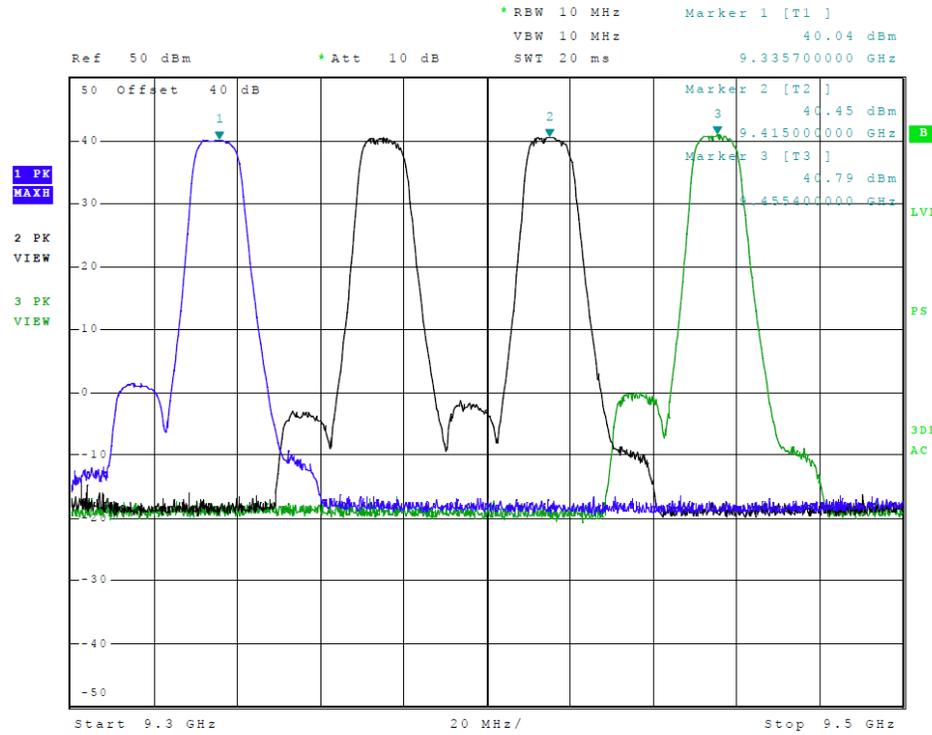
Measurements shall be made to establish the radio frequency power delivered by the transmitter into the standard output termination. The power output shall be monitored and recorded and no adjustment shall be made to the transmitter after the test has begun except as noted below:

If the power output is adjustable, measurements shall be made for the highest and lowest power levels. Note design output power is not adjustable.

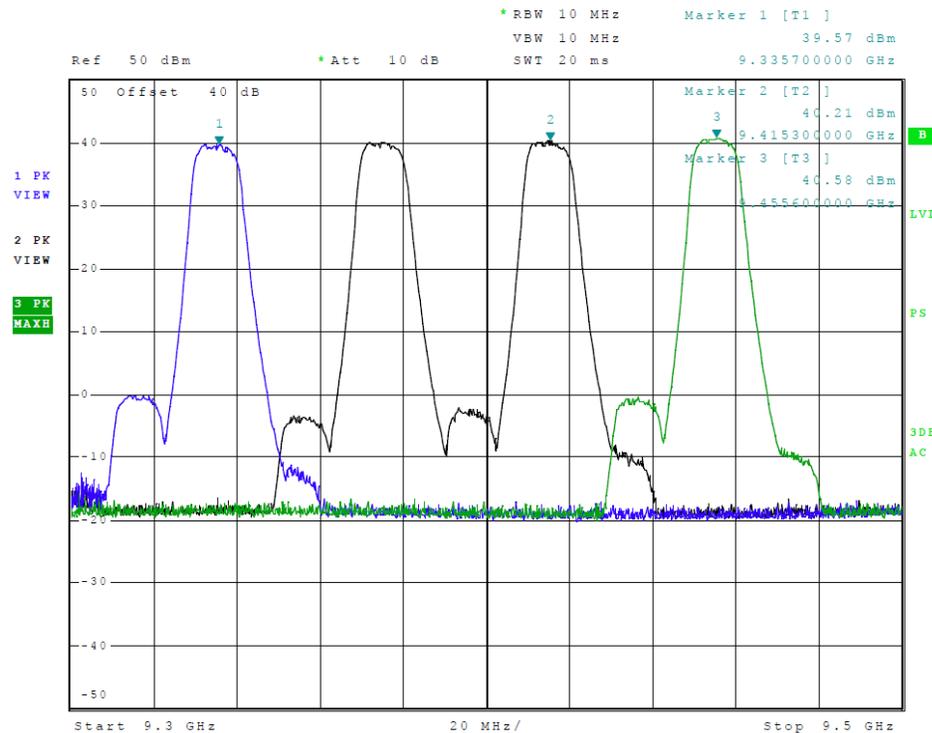
Test Arrangement Radio Frequency Power Output



The peak output power of the design is 40 Watts with average power rated at 4.48 watts. The radio frequency power output was measured at the antenna port connector with 50-ohm load and attenuation. Plots were taken without accounting for 5.3 dB cable loss and require correction with the addition of the cable loss. Emissions testing was also performed at the open area test site with the transmitter operating in testing modes, which simulated normal modes of operation and across all available transmission states. During radiated emissions testing the EUT was separated from the receiving system by a distance of three and ten meters during measurements. The spectrum analyzer had an impedance of 50Ω to match the impedance of the receiving antenna. A Rohde and Schwarz ESU40 and HP 8562A Spectrum Analyzer and appropriate mixers were used to measure the radio frequency power at a three and ten-meter distances. During testing antenna port conducted data was taken in dBm and radiated emissions data take in dBμV/m.



36 nm



72 nm

Figure 1 Maximum Power Output

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Table 1 Radio Frequency Power Output Results

Transmitter Range Setting	Peak Measured emission dBm	Average Measured emission Watts
32 nm (highest Ave power)	46.09	40.64
72 nm (highest Ave power)	45.88	38.73

The average power output calculations are available in original Operational description exhibit.

Table 2 Calculated average power Radio

Range [nm]	Peak Power (Watts)	Calculated Average Power (Watts)	Peak Power (Watts)	Calculated Average Power (Watts)
	24 RPM		48 RPM	
0.0625	40.00	0.03	40.00	0.03
0.125	40.00	0.03	40.00	0.03
0.25	40.00	0.21	40.00	0.21
0.375	40.00	0.21	40.00	0.21
0.5	40.00	0.41	40.00	0.41
0.75	40.00	0.41	40.00	0.41
1	40.00	0.83	40.00	0.83
1.5	40.00	0.83	40.00	0.83
2	40.00	1.65	40.00	1.65
3	40.00	1.65	40.00	1.65
4	40.00	3.31	40.00	3.31
6	40.00	2.67	40.00	2.30
8	40.00	2.83	40.00	2.83
12	40.00	2.66	40.00	2.53
18	40.00	3.75	40.00	3.75
24	40.00	2.97	40.00	2.97
32	40.00	4.48	40.00	4.48
36	40.00	4.06	40.00	4.06
72	40.00	4.06	40.00	4.06

Data was taken per Paragraph 2.1046(a) and applicable parts of Part 80 and RSS-238. The equipment demonstrated compliance with specifications of Paragraph 2.1046(a) and applicable Parts of 80.215 and RSS-238. There were no modifications or deviations to the specifications.

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.

Modulation Characteristics Test Arrangement

The EUT transmits no message and uses no modulation. Therefore, no curves are supplied.

Modulation Characteristics Results

The EUT transmits no message and uses no modulation. Therefore, no curves are supplied. The equipment demonstrated compliance with specifications of Paragraph 2.1046(a) and applicable Parts of 80.215 and RSS-238.

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 each equal to (23-dB or 40-dB down) of the total peak power radiated by a given emission.

Table 3 Occupied Bandwidth Results

f_c (MHz)	Observed 23-dB Bandwidth (MHz)	Observed 40-dB Bandwidth (MHz)
9375	39.9	115.30

A spectrum analyzer was used to observe the radio frequency spectrum with the transmitter operating in a normal mode. The power ratio in dB representing the 23-dB and 40-dB bandwidth was recorded from the spectrum analyzer. Data for the occupied bandwidth was observed at the RLI OATS using appropriate antennas. Refer to figures two through five showing the analyzer display screen with the analyzer connected to the receiving antenna. The equipment demonstrated compliance with specifications of Paragraph 2.1046(a) and applicable Parts of 80.215 and RSS-238.

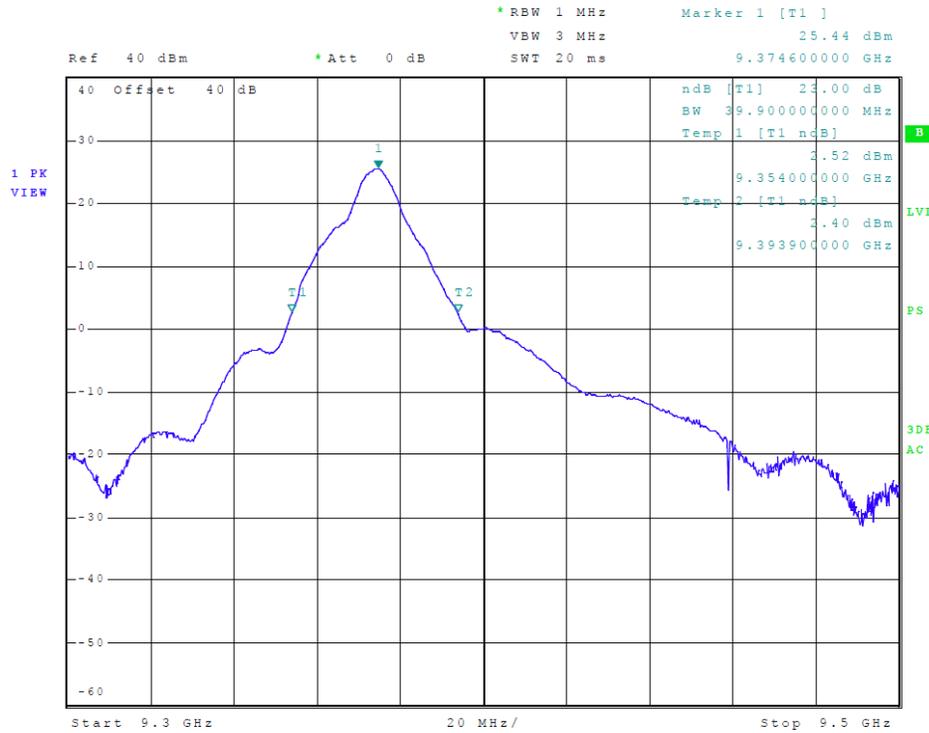


Figure 2 Plot of analyzer screen showing 23-dB occupied bandwidth

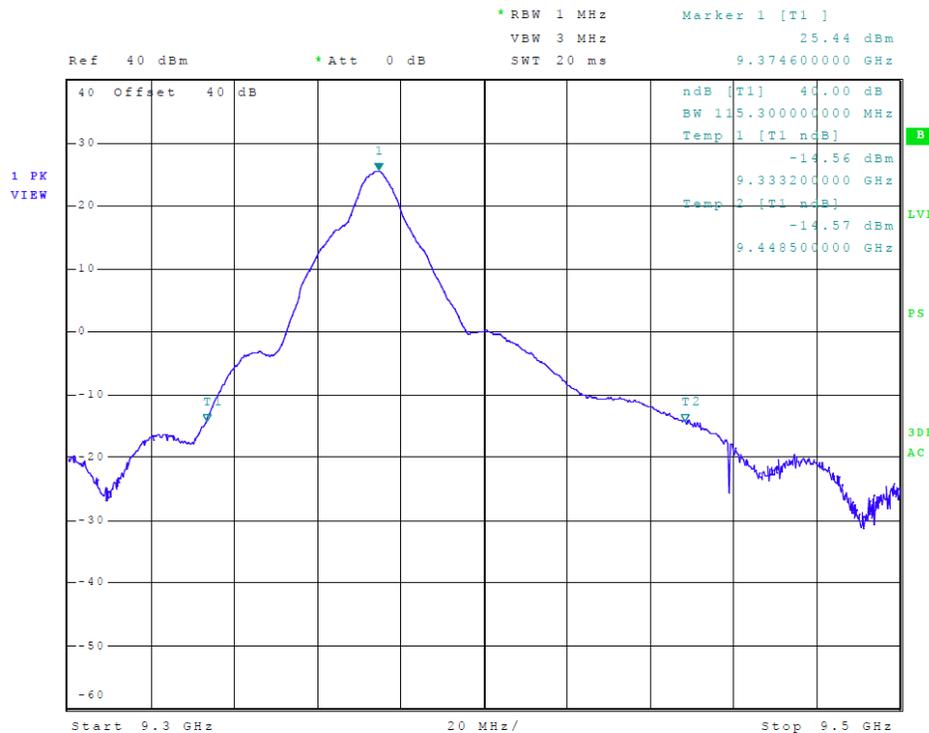


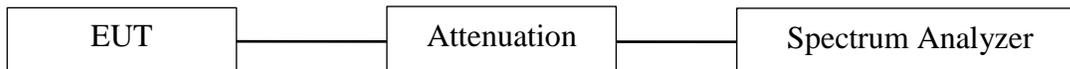
Figure 3 Plot of analyzer screen showing 40-dB occupied bandwidth

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.

Spurious Emission at Antenna Test Arrangement



Spurious Emission at Antenna Results

Spurious emissions data was taken at the provided antenna port. All harmonic and spurious emissions were greater than 20 dB below the requirement. Therefore no additional antenna port conducted emissions data was provided for the transmitter. Radiated emissions data was taken on the OATS supporting antenna port emissions compliance. The equipment demonstrated compliance with specifications of Paragraph 2.1046(a) and applicable Parts of 80.215 and RSS-238.

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.

Field Strength of Spurious Radiation Test Arrangement



The transmitter was placed on a platform at a distance of 3 meters from the FSM antenna. With the EUT radiating into a 50-ohm load attached to the antenna port, the receiving antenna was raised and lowered to obtain the maximum reading of spurious radiation from the EUT on the spectrum analyzer. The platform was rotated through 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 and support circuitry. The transmitter was also placed on a platform at a distance of 10 meters from the FSM antenna for power and spurious emissions testing. The amplitude of each spurious emission was maximized by raising and lowering the FSM antenna, and rotating the EUT before final data was recorded. Data presented below demonstrates the general and harmonic spur emissions from the EUT and support equipment taken at 3 meters.

Field Strength of Spurious Results

The EUT was connected to a load or standard antenna(s) and set to transmit in a normal test mode of operation (with antenna rotation disabled during test). The amplitude of each spurious emission was then maximized and recorded. Measurements were made at a distance of three meters at the RLI OATS. All other measured spurious emissions were 20-dB or more below the specified limit. The equipment demonstrated compliance with specifications of Paragraph 2.1046(a) and applicable Parts of 80.215 and RSS-238. There are no deviations to the specifications.

RSS-238 requires out of band emissions be at least 60 dB below fundamental emission. Using measured fundamental peak emission power of 141.6 dBμV/m at 3-meters, the limit would be 81.6 dBμV/m.

Calculations made are as follows:

CFS = Calculated Field Strength

FSM = Field Strength Measurement

CFS = FSM + Antenna Factor – amplifier gain

Table 4 Harmonic Radiated Emissions

Frequency in MHz	Horizontal Peak (dBµV/m)	Horizontal Quasi-Peak (dBµV/m)	Horizontal Average (dBµV/m)	Vertical Peak (dBµV/m)	Vertical Quasi-Peak (dBµV/m)	Vertical Average (dBµV/m)	General Average Emissions Limit @ 3m (dBµV/m)
4 foot antenna, 9355 MHz Channel							
18710.0	87.1	N/A	62.7	64.2	N/A	59.7	81.6
28065.0	89.1	N/A	62.0	74.0	N/A	60.8	81.6
37420.0	91.9	N/A	68.1	86.2	N/A	57.5	81.6
4 foot antenna, 9415 MHz Channel							
18830.0	81.8	N/A	57.6	70.3	N/A	57.6	81.6
28245.0	87.9	N/A	58.7	61.5	N/A	48.4	81.6
37660.0	87.5	N/A	62.7	70.3	N/A	57.6	81.6
4 foot antenna, 9455 MHz Channel							
18910.0	84.7	N/A	56.4	68.3	N/A	58.3	81.6
28365.0	79.7	N/A	57.9	68.6	N/A	49.6	81.6
37820.0	87.4	N/A	63.7	72.8	N/A	57.7	81.6
6 foot antenna, 9355 MHz Channel							
18710.0	81.3	N/A	54.8	66.5	N/A	58.3	81.6
28065.0	79.0	N/A	61.8	75.7	N/A	50.5	81.6
37420.0	86.2	N/A	63.4	75.3	N/A	57.1	81.6
6 foot antenna, 9415 MHz Channel							
18830.0	76.4	N/A	57.2	70.7	N/A	57.4	81.6
28245.0	75.8	N/A	58.5	71.0	N/A	48.5	81.6
37660.0	83.2	N/A	67.6	70.4	N/A	57.5	81.6
6 foot antenna, 9455 MHz Channel							
18910.0	81.7	N/A	60.0	71.3	N/A	58.4	81.6
28365.0	81.2	N/A	60.5	69.4	N/A	49.5	81.6
37820.0	84.9	N/A	68.5	70.5	N/A	57.6	81.6

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

Quasi-Peak amplitude emissions are recorded above for frequency range of 30-1000 MHz. Average amplitude emissions are recorded above for frequency range above 1000 MHz.

Annex

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

List of Test Equipment	Calibration	<u>Date</u>	<u>Due</u>
Spectrum Analyzer: Rohde & Schwarz ESU40		5/16	5/17
Spectrum Analyzer: HP 8562A, HP Adapters: 11518, 11519, and 11520		5/16	5/17
Mixers: 11517A, 11970A, 11970K, 11970U, 11970V, 11970W			
Spectrum Analyzer: HP 8591EM		5/16	5/17
Antenna: EMCO Biconilog Model: 3143		5/16	5/17
Antenna: Sunol Biconilog Model: JB6		10/16	10/17
Antenna: EMCO Log Periodic Model: 3147		10/16	10/17
Antenna: Com Power Model: AH-118		10/16	10/17
Antenna: Com Power Model: AH-840		5/16	5/18
Antenna: Antenna Research Biconical Model: BCD 235		10/16	10/17
Antenna: Com Power Model: AL-130		10/16	10/17
Antenna: EMCO 6509		10/16	10/17
LISN: Compliance Design Model: FCC-LISN-2.Mod.cd, 50 μ Hy/50 ohm/0.1 μ f		10/16	10/17
R.F. Preamp CPPA-102		10/16	10/17
Attenuator: HP Model: HP11509A		10/16	10/17
Attenuator: Mini Circuits Model: CAT-3		10/16	10/17
Attenuator: Mini Circuits Model: CAT-3		10/16	10/17
Cable: Belden RG-58 (L1)		10/16	10/17
Cable: Belden RG-58 (L2)		10/16	10/17
Cable: Belden 8268 (L3)		10/16	10/17
Cable: Time Microwave: 4M-750HF290-750		10/16	10/17
Cable: Time Microwave: 10M-750HF290-750		10/16	10/17
Frequency Counter: Leader LDC825		2/16	2/17
Oscilloscope Scope: Tektronix 2230		2/16	2/17
Wattmeter: Bird 43 with Load Bird 8085		2/16	2/17
Power Supplies: Sorensen SRL 20-25, SRL 40-25, DCR 150, DCR 140		2/16	2/17
R.F. Generators: HP 606A, HP 8614A, HP 8640B		2/16	2/17
R.F. Power Amp 65W Model: 470-A-1010		2/16	2/17
R.F. Power Amp 50W M185- 10-501		2/16	2/17
R.F. Power Amp A.R. Model: 10W 1010M7		2/16	2/17
R.F. Power Amp EIN Model: A301		2/16	2/17
LISN: Compliance Eng. Model 240/20		2/16	2/17
LISN: Fischer Custom Communications Model: FCC-LISN-50-16-2-08		2/16	2/17
Antenna: EMCO Dipole Set 3121C		2/16	2/17
Antenna: C.D. B-101		2/16	2/17
Antenna: Solar 9229-1 & 9230-1		2/16	2/17
Audio Oscillator: H.P. 201CD		2/16	2/17
ESD Test Set 2010i		2/16	2/17
Fast Transient Burst Generator Model: EFT/B-101		2/16	2/17
Field Intensity Meter: EFM-018		2/16	2/17
KEYTEK Ecat Surge Generator		2/16	2/17
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. Engineering experience includes six years 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.



NVLAP Lab Code 200087-0

Annex D FCC Test Site Registration Letter

FEDERAL COMMUNICATIONS COMMISSION

**Laboratory Division
7435 Oakland Mills Road
Columbia, MD 21046**

April 16, 2015

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: April 16, 2015

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,

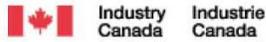
Phyllis Parrish
Industry Analyst

Rogers Labs, Inc.
4405 West 259th Terrace
Louisburg, KS 66053
Phone/Fax: (913) 837-3214
Revision 1

Garmin International, Inc.
Model: A02546
Test #: 161114
Test to: CFR47 Parts 2, 80, RSS-238
File: A02546 Garmin TstRpt 161114

FCC ID: IPH-02546
IC: 1792A-02546
SN: FF-ENG#2
Date: February 13, 2017
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Annex E Industry Canada Test Site Registration Letter



June 08, 2015

OUR FILE: 46405-3041
Authorization No: 010277847-001

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

Attention: Mr. Scot D. Rogers

Dear Sir:

The Bureau has received your application for the renewal of 3m 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 C63.4-2009 or later. A scope of accreditation indicating the accreditation by a recognized accreditation body to ANSI C63.4-2009 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 C63.4-2009 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,

A handwritten signature in black ink that reads "Bill Payn".

Bill Payn
For: Wireless Laboratory Manager
Certification and Engineering Bureau
3701 Carling Ave., Building 94
P.O. Box 11490, Station AH@
Ottawa, Ontario K2H 8S2
Email: certification.bureau@ic.gc.ca

Rogers Labs, Inc.
4405 West 259th Terrace
Louisburg, KS 66053
Phone/Fax: (913) 837-3214
Revision 1

Garmin International, Inc.
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