



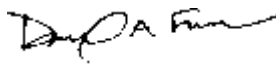
Engineering Solutions & Electromagnetic Compatibility Services

**Class 2 & Class 3 Permissive Change Report  
FCC Part 15.247 & Industry Canada RSS-247**

<b>Test Lab:</b>  Rhein Tech Laboratories, Inc.      Tel: 703-689-0368 360 Herndon Parkway              Fax: 703-689-2056 Suite 1400                              www.rheintech.com Herndon, VA 20170 E-Mail: atcbinfo@rheintech.com		<b>Applicant:</b>  Garmin International Inc. Tel: (913) 440-5471 1200 E. 151 <sup>st</sup> Street Olathe, Kansas 66062	
<b>FCC ID IC</b>	IPH-A3119-00 1792A-A311900	<b>Test Report Date</b>	December 6, 2017
<b>Platform</b>	N/A	<b>RTL Work Order #</b>	2017209
<b>Model/HVIN</b>	AA3119-00	<b>RTL Quote #</b>	QRTL17-209B
<b>American National Standard Institute</b>	ANSI C63.10-2013: American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices		
<b>FCC Classification</b>	DTS – Digital Transmission System		
<b>FCC Rule Part(s)/Guidance</b>	FCC Rules Part 15.247: Operation within the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz Direct Sequence System (10/01/2016)		
<b>ISED</b>	RSS-247 Issue 2 Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices		
<b>Digital Interface Information</b>	Digital Interface was found to be compliant		
<b>Frequency Range (MHz)</b>	<b>Output Power (W)*</b>	<b>Frequency Tolerance</b>	<b>Emission Designator</b>
2412 – 2462	0.224	N/A	18M8G1D

\* power is maximum conducted as stated on original grant

I, the undersigned, hereby declare that the equipment tested and referenced in this report conforms to the identified standard(s) as described in this test report. No modifications were made to the equipment during testing in order to achieve compliance with these standards. Furthermore, there was no deviation from, additions to, or exclusions from, the applicable parts of FCC Part 2, FCC Part 15, ISED RSS-247, RSS-Gen, and ANSI C63.10.

Signature: 

Date: December 6, 2017

Typed/Printed Name: Desmond A. Fraser

Position: President

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*These test(s) are accredited under Rhein Tech Laboratories, Inc. ISO/IEC 17025 accreditation issued by ANAB. Refer to certificate and scope of accreditation AT-1445.*

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## **1 General Information**

### **1.1 Scope**

This is an FCC Class 2 permissive change and ISED Class 3 permissive change report.

### **1.2 Description of EUT**

<b>Equipment Under Test</b>	Watch
<b>Model/HVIN</b>	AA3119-00
<b>Power Supply</b>	Internal rechargeable battery
<b>Modulation Type</b>	BPSK
<b>Frequency Range</b>	2412-2462 MHz
<b>Antenna Type</b>	Sheet metal inverted F

### **1.3 Test Facility**

The open area test site and conducted measurement facility used to collect the radiated data is located at 360 Herndon Parkway, Suite 1400, Herndon, Virginia 20170. This site has been fully described in a report and approved by the Federal Communications Commission to perform AC line conducted and radiated emissions testing.

### **1.4 Related Submittal(s)/Grant(s)**

This is a Class 2/Class 3 permissive change application for Garmin International Inc. Model/HVIN: AA3119-00, FCC ID: IPH-A3119-00, IC: 1792A-A311900 to add a new antenna.

### **1.5 Modifications**

No modifications were made to the equipment during testing.

## 2 Test Information

### 2.1 Description of Test Modes

In accordance with FCC 15.31(m), and because the EUT utilizes an operating band greater than 10 MHz, the following frequencies were tested.

**Table 2-1: Channels Tested**

Channel	Frequency
Low	2412
Middle	2436
High	2462

### 2.2 Exercising the EUT

The EUT was supplied with a switch to change channels to a high, mid, and low channel for testing, and to switch between all modulations. All modulations were investigated and the worst-case data is presented in this report. The EUT was tested in all three orthogonal planes in order to determine worst-case emissions. The EUT was provided with ability to continuously transmit during testing. The carrier was also checked to verify that information was being transmitted. There were no deviations from the test standard(s) and/or methods. The test results reported relate only to the item tested.

### 2.3 Test Result Summary

**Table 2-2: Test Result Summary – FCC Part 15 Subpart C (Section 15.247) & IC**

Test	FCC Reference	ISED Reference	Result
Radiated Emissions	FCC 15.209	RSS-247 5.5; RSS-Gen 6.13/7.1	Pass
Maximum Peak Power Output	FCC 15.247(b)(3)	RSS-247 5.4 RSS-Gen 6.12	Pass
Band Edge Measurement	FCC 15.247(d)	RSS-247 5.5	Pass

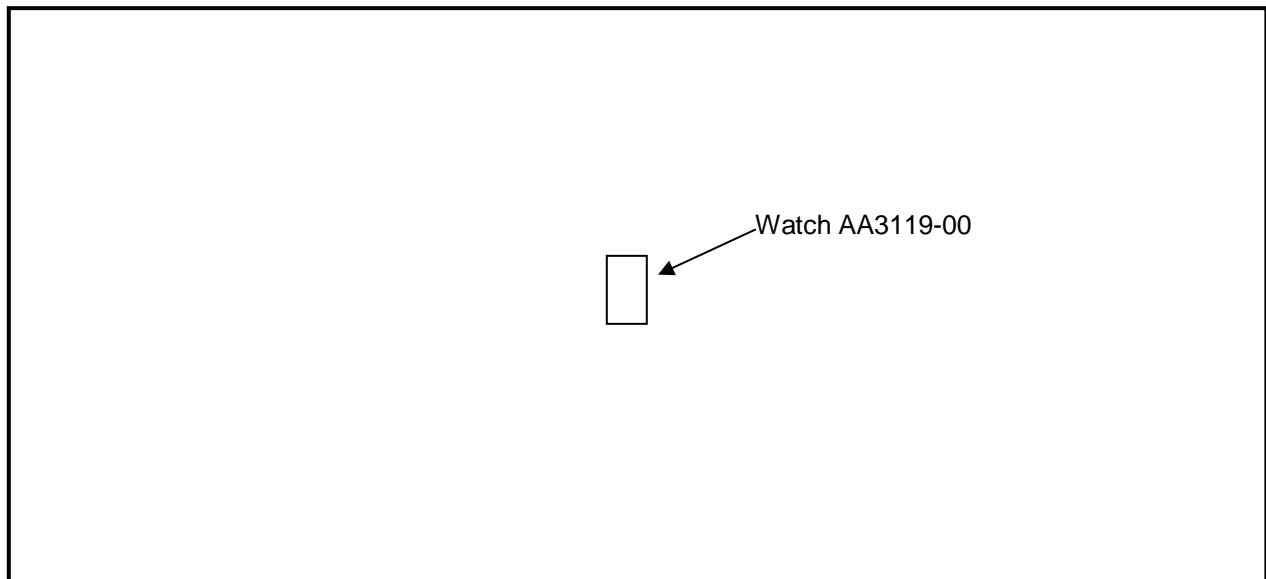
## 2.4 Test System Details

The test samples were received on November 1, 2017. The FCC identifiers for all applicable equipment, plus descriptions of all cables used in the tested system, are identified in the following table.

**Table 2-3: Equipment Under Test**

Part	Manufacturer	Model/ HVIN	Serial Number	FCC ID	Cable Description	RTL Bar Code
Transceiver (conducted emissions)	Garmin International Inc.	AA3119-00	3953653078u	IPH-A3119-00	N/A	22526
Transceiver (radiated emissions)	Garmin International Inc.	AA3119-00	3953653087u	IPH-A3119-00	N/A	22527

## 2.5 Configuration of Tested System



**Figure 2-1: Configuration of System Under Test**

### 3 Peak Output Power - 15.247(b)(3); IC RSS-247 5.4(4), RSS-Gen 6.12

#### 3.1 Power Output Test Procedure

A radiated measurement was made with the spectrum analyzer, for the low, mid, and high channels since no antenna port was available and a conversion to dBm and W determined from dBuV/m-104.7\* 20Log(3m). The resolution bandwidth used was 3 MHz, and video bandwidth was 10 MHz.

**Table 3-1: Peak Power Output Test Equipment**

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901581	Rohde & Schwarz	FSU	Spectrum Analyzer	1166.1660.50	3/22/18

#### 3.2 Peak Output Power Test Data

**Table 3-2: Peak Output Power Test Data - 802.11b (11 Mbps)**

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV)	Site Correction Factor (dB/m)	Peak Emission Level (dBuV/m)	Peak Emission Level (dBm)	Peak Emission Level (W)
2412.0	69.1	25.4	94.5	-0.7	0.001
2437.0	69.1	25.5	94.6	-0.6	0.001
2484.0	71.4	25.7	97.1	1.9	0.002

**Table 3-3: Peak Output Power Test Data - 802.11g (9 Mbps)**

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV)	Site Correction Factor (dB/m)	Peak Emission Level (dBuV/m)	Peak Emission Level (dBm)	Peak Emission Level (W)
2412.0	69.0	25.4	94.4	-0.8	0.001
2437.0	69.0	25.5	94.5	-0.7	0.001
2462.0	70.5	25.7	96.2	1.0	0.001

**Table 3-4: Peak Output Power Test Data - 802.11n (MCS7)**


Emission Frequency (MHz)	Peak Analyzer Reading (dBuV)	Site Correction Factor (dB/m)	Peak Emission Level (dBuV/m)	Peak Emission Level (dBm)	Peak Emission Level (W)
2412.0	68.8	25.4	94.2	-1.0	0.001
2437.0	69.1	25.5	94.6	-0.6	0.001
2484.0	70.0	25.7	95.7	0.5	0.001

Rhein Tech Laboratories, Inc.  
360 Herndon Parkway  
Suite 1400  
Herndon, VA 20170  
<http://www.rheintech.com>

Client: Garmin Int'l Inc.  
Model/HVIN: AA3119-00  
Standards: FCC 15.247/ISED RSS-247  
ID's: IPH-A3119-00/1792A-A311900  
Report #: 2017209DTS

Measurement uncertainties shown for these tests are expanded Gaussian uncertainties expressed at 95% confidence level using a coverage factor  $k = 1.96$ . Measurement uncertainty =  $\pm 4.6$  dB.

**Test Personnel:**

Dan Baltzell		November 7, 2017
Test Engineer	Signature	Date of Test



#### 4 Compliance with the Band Edge – FCC 15.247(d); ISED RSS-247 5.5

##### 4.1 Band Edge Test Procedure

Conducted measurements were taken. The span was set wide enough to capture the peak level of the emission operating on the channel closest to the band edge, as well as any modulation products which fall outside of the authorized band of operation. The spectrum analyzer was set to the following:

RBW > = 1 MHz

VBW > = 3 x RBW

Detector function = peak and average

Trace = max hold

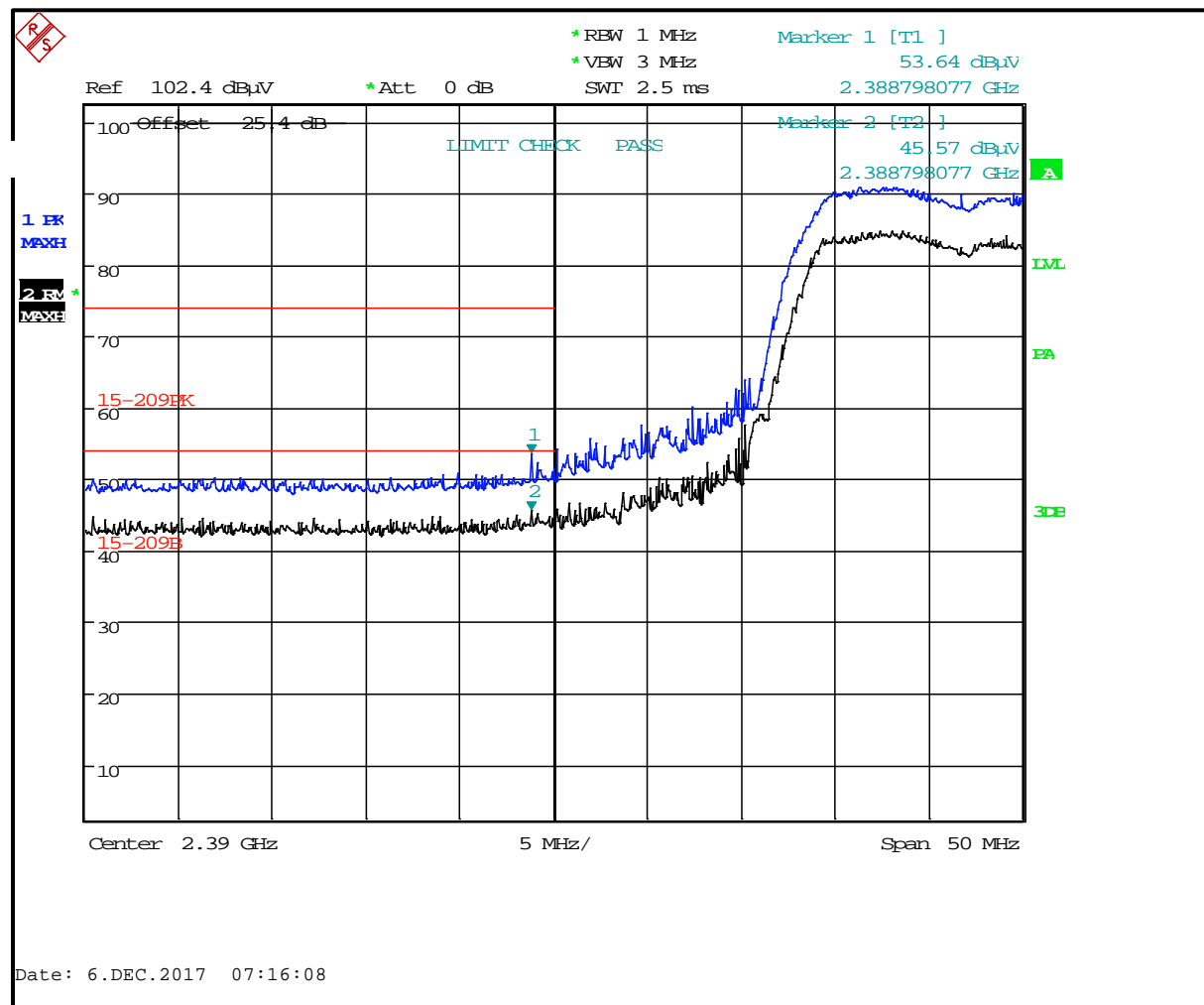
The trace was allowed to stabilize. The marker was set on the emission at the band edge. The maximum restricted-band emission was measured, and was compared to the 20 dBc requirement of 15.247(d) (when using peak emissions) or restricted band.

**Table 4-1: Band Edge Test Equipment**

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901581	Rohde & Schwarz	FSU	Spectrum Analyzer	1166.1660.50	3/22/18



**Plot 4-2: Lower Band Edge – Peak-Average Detector - 802.11g (9 Mbps)**





Ref 102.7 dBμV \*Att 0 dB SWT 2.5 ms

Marker 2 [T2] 44.05 dBμV 2.484381410 GHz

Offset 25.7 dB

LIMIT CHECK PASS

Marker 1 [T1] 50.01 dBμV 2.48558333 GHz

1 RB VIEW

2 RB VIEW

UBE\_PEAK

UBE\_AVG

IML

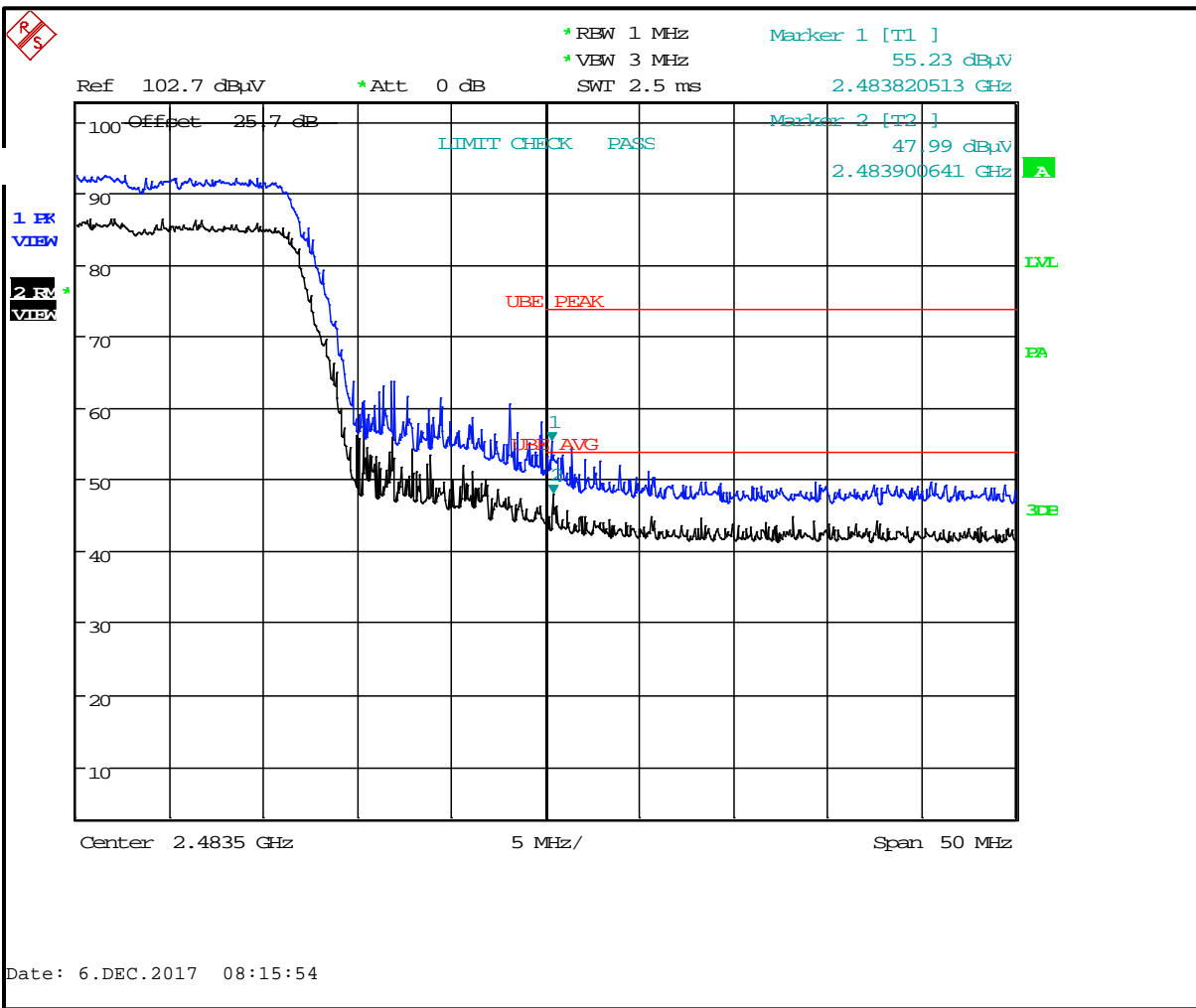
PA

3DB

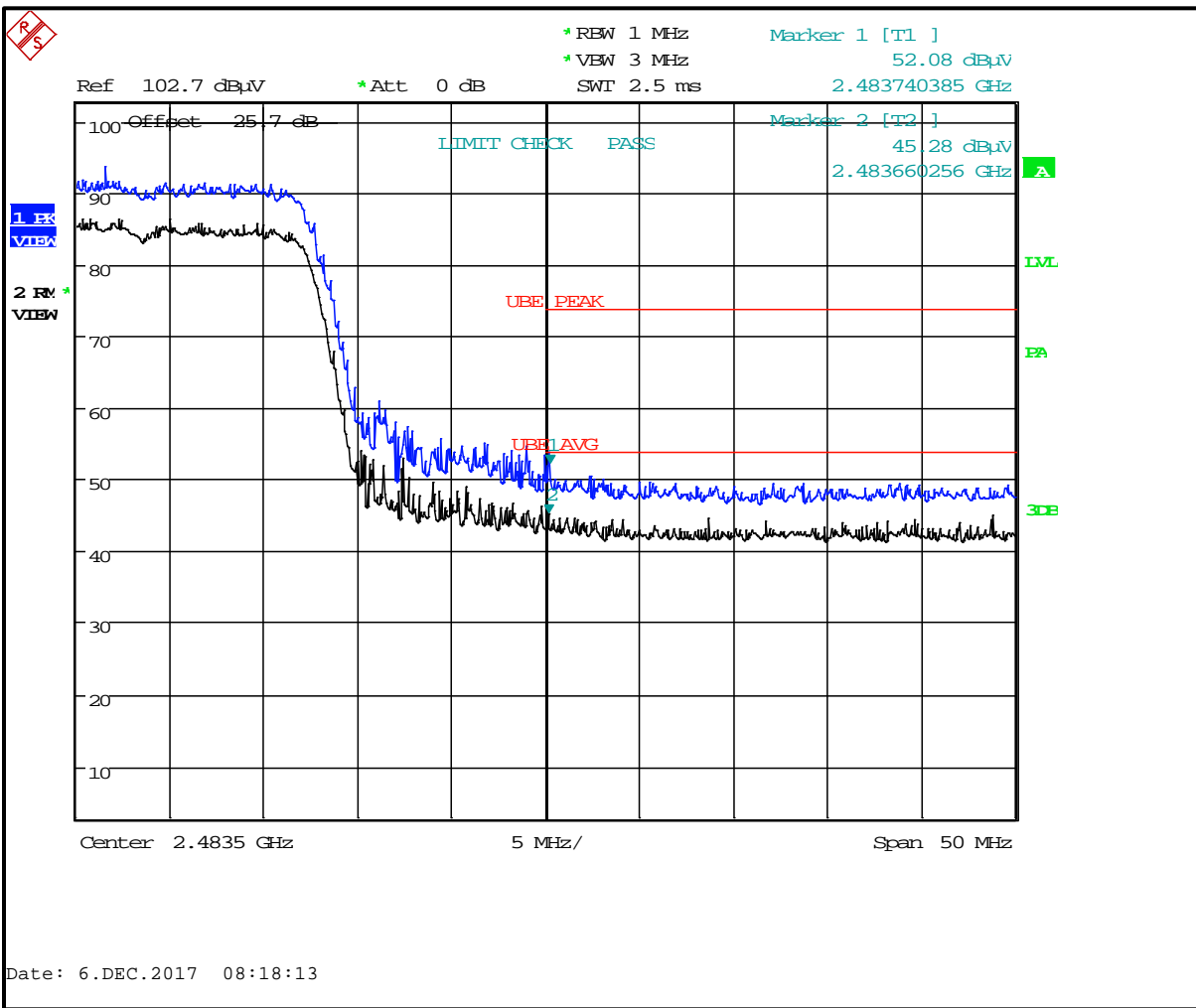
Center 2.4835 GHz 5 MHz/ Span 50 MHz

Date: 6.DEC.2017 08:13:40

**Plot 4-5: Upper Band Edge – Peak-Average Detector - 802.11g (9 Mbps)**



**Plot 4-6: Upper Band Edge – Peak-Average Detector - 802.11n (MCS7)**



Measurement uncertainties shown for these tests are expanded Gaussian uncertainties expressed at 95% confidence level using a coverage factor  $k = 1.96$ . Measurement uncertainty = 4.5 dB.

**Test Personnel:**

Dan Baltzell  
Test Engineer

*Daniel W. Baltzell*

Signature

December 6, 2017  
Date of Test

## 5 Radiated Emissions - 15.209; RSS-247 2.2; RSS-Gen 6.13/7.1

### 5.1 Limits of Radiated Emissions Measurement

Frequency (MHz)	Field Strength (uV/m)	Measurement Distance (m)
0.009-0.490	2400/f (kHz)	300
0.490-1.705	2400/f (kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

As shown in 15.35(b), for frequencies above 1000 MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20 dB under any circumstances of modulation.

### 5.2 Radiated Emissions Measurement Test Procedure

Before final measurements of radiated emissions were made on the open-field three/ten meter range, the EUT was scanned indoors at one and three meter distances. This was done in order to determine its emissions spectrum signature. The physical arrangement of the test system and associated cabling was varied in order to determine the effect on the EUT's emissions in amplitude, direction and frequency. This process was repeated during final radiated emissions measurements on the open-field range, at each frequency, in order to ensure that maximum emission amplitudes were attained. Final radiated emissions measurements were made on the three/ten-meter, open-field test site. The EUT was placed on a nonconductive turntable 1.5 meters above the ground plane. The spectrum was examined from 9 kHz to the 10<sup>th</sup> harmonic of the highest fundamental transmitter frequency (10 GHz). At each frequency, the EUT was rotated 360°, and the antenna was raised and lowered from 1 to 4 meters in order to determine the emission's maximum level. Measurements were taken using both horizontal and vertical antenna polarizations. For frequencies between 30 and 1000 MHz, the spectrum analyzer's 6 dB bandwidth was set to 120 kHz, and the analyzer was operated in the CISPR quasi-peak detection mode. For emissions above 1000 MHz, emissions are measured using a VBW of 10 Hz, with a minimum resolution bandwidth of 1 MHz. No video filter less than 10 times the resolution bandwidth was used. The highest emission amplitudes relative to the appropriate limit were measured and recorded in this report.

**Table 5-1: Radiated Emissions Test Equipment**

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900791	Chase	CBL6112	Antenna (.03 – 2 GHz)	2099	6/11/18
900772	EMCO	3161-02	Horn Antenna (2 - 4 GHz)	9804-1044	4/9/18
900321	EMCO	3161-03	Horn Antenna (4 - 8.2 GHz)	9528-1020	4/9/18
900323	EMCO	3160-07	Horn Antenna (8.2 - 12.4 GHz)	9605-1024	4/9/18
901581	Rohde & Schwarz	FSU	Spectrum Analyzer	1166.1660.50	3/22/18
901592	Insulated Wire Inc.	KPS-1503-3600-KPR	SMK RF Cables 20'	NA	8/18/18



### 5.3 Radiated Emissions Test Results

#### 5.3.1 Spurious/Harmonics Radiated Emissions Test Data

**Table 5-2: Radiated Emissions Spurious/Harmonics – 2412 MHz – Peak - 802.11g (11 Mbps)**

Emission Frequency (MHz)	Analyzer Reading (dBuV)	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4824.0	14.7	28.5	43.2	74.0	-30.8
12060.0	11.5	36.9	48.4	74.0	-25.6
14472.0	11.5	40.5	52.0	74.0	-22.0
19296.0	-1.3	45.1	43.8	74.0	-30.2

**Table 5-3: Radiated Emissions Spurious/Harmonics – 2412 MHz – Average - 802.11g (11 Mbps)**

Emission Frequency (MHz)	Analyzer Reading (dBuV)	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4824.0	8.9	28.5	37.4	54.0	-16.6
12060.0	1.9	36.9	38.8	54.0	-15.2
14472.0	1.5	40.5	42.0	54.0	-12.0
19296.0	-8.5	45.1	36.6	54.0	-17.4

**Table 5-4: Radiated Emissions Spurious/Harmonics – 2437 MHz – Peak - 802.11g (11 Mbps)**

Emission Frequency (MHz)	Analyzer Reading (dBuV)	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4874.0	15.0	28.5	43.5	74.0	-30.5
7311.0	17.3	29.8	47.1	74.0	-26.9
12185.0	11.7	36.9	48.6	74.0	-25.4
19496.0	-2.0	45.2	43.1	74.0	-30.9

**Table 5-5: Radiated Emissions Spurious/Harmonics – 2437 MHz – Average - 802.11g (11 Mbps)**

Emission Frequency (MHz)	Analyzer Reading (dBuV)	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4874.0	10.1	28.5	38.6	54.0	-15.4
7311.0	10.9	29.8	40.7	54.0	-13.3
12185.0	2.2	36.9	39.1	54.0	-14.9
19496.0	-8.9	45.2	36.2	54.0	-17.8

**Table 5-6: Radiated Emissions Spurious/Harmonics – 2462 MHz – Peak - 802.11g (11 Mbps)**

Emission Frequency (MHz)	Analyzer Reading (dBuV)	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4924.0	15.9	28.6	44.5	74.0	-29.5
7386.0	18.2	29.8	48.0	74.0	-26.0
12310.0	10.9	36.9	47.8	74.0	-26.2
19696.0	-1.9	45.2	43.3	74.0	-30.7
22158.0	-3.6	46.1	42.4	74.0	-31.6

**Table 5-7: Radiated Emissions Spurious/Harmonics – 2462 MHz – Average - 802.11g (11 Mbps)**

Emission Frequency (MHz)	Analyzer Reading (dBuV)	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4924.0	11.1	28.6	39.7	54.0	-14.3
7386.0	12.9	29.8	42.7	54.0	-11.3
12310.0	1.7	36.9	38.6	54.0	-15.4
19696.0	-10.2	45.2	35.0	54.0	-19.0
22158.0	-13.7	46.1	32.3	54.0	-21.7

Measurement uncertainty: Measurement uncertainties shown for these tests are expanded uncertainties expressed at 95% confidence level using a coverage factor  $k = 2$ .  $\pm 4.6$  dB

**Test Personnel:**

Dan Baltzell Test Engineer	 Signature	December 6, 2017 Date of Test
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**6 Conclusion**

The data in this measurement report shows that the EUT as tested, Garmin International Inc. Model/HVIN: AA3119-00, FCC ID: IPH-A3119-00, IC: 1792A-A311900, complies with the applicable requirements of Parts 2 and 15 of the FCC Rules and Regulations and Industry Canada RSS-247 and RSS-Gen.