



Compliance Testing, LLC

Previously Flom Test Lab

EMI, EMC, RF Testing Experts Since 1963

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Test Report

Prepared for: Garmin International, Inc.

Model: AA2670

Description: Short Range Transceiver

Serial Number: 55C020727

FCC ID: IPH-A2670

IC: 1792A-A2670

To

47 CFR Part 95C

ISED RSS-210 A.2

ANSI C63.26-2015

Date of Issue: December 18, 2018

On the behalf of the applicant:

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Attention of:

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Project No: p1880021

Christian Pawlak

Project Test Engineer

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All results contained herein relate only to the sample tested.



Test Report Revision History

Revision	Date	Revised By	Reason for Revision
1.0	November 7, 2018	Christian Pawlak	Original Document



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ILAC / A2LA

Compliance Testing, LLC, has been accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer joint ISO-ILAC-IAF Communiqué dated January 2009).

The tests results contained within this test report all fall within our scope of accreditation, unless noted below.

Please refer to <http://www.compliancetesting.com/labscope.html> for current scope of accreditation.

Testing Certificate Number: **2152.01**



FCC Site Reg. #349717

IC Site Reg. #2044A-2

Non-accredited tests contained in this report:

N/A

The Applicant has been cautioned as to the following:

15.21: Information to the User

The user's manual or instruction manual for an intentional radiator shall caution the user that changes, or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

15.27(a): Special Accessories

Equipment marketed to a consumer must be capable of complying with the necessary regulations in the configuration in which the equipment is marketed. Where special accessories, such as shielded cables and/or special connectors are required to enable an unintentional or intentional radiator to comply with the emission limits in this part, the equipment must be marketed with, i.e. shipped and sold with, those special accessories. However, in lieu of shipping or packaging the special accessories with the unintentional or intentional radiator, the responsible party may employ other methods of ensuring that the special accessories are provided to the consumer, without an additional charge.

Information detailing any alternative method used to supply the special accessories for a grant of equipment authorization or retained in the verification records, as appropriate. The party responsible for the equipment, as detailed in § 2.909 of this chapter, shall ensure that these special accessories are provided with the equipment. The instruction manual for such devices shall include appropriate instructions on the first page of text concerned with the installation of the device that these special accessories must be used with the device. It is the responsibility of the user to use the needed special accessories supplied with the equipment.

Test and Measurement Data

All tests and measurement data shown were performed in accordance with FCC 47 CFR Parts 2 and 90.

Measurement results, unless otherwise noted, are worst-case measurements.

Standard Test Conditions and Engineering Practices

Except as noted herein, the following conditions and procedures were observed during the testing.

Unless otherwise indicated in the specific measurement results, the ambient temperature of the actual EUT was maintained within the range of 10 to 40C (50 to 104 F) unless the particular equipment requirements specified testing over a different temperature range. Also, unless otherwise indicated, the humidity levels were in the range of 10% to 90% relative humidity.

Environmental Conditions		
Temp (°C)	Humidity (%)	Pressure (mbar)
24.9	48.5	960.2

Accessories: None

Cables: None

Modifications:

Unit #1 - Unmodified

Unit #2 - SMA Connector and battery eliminator installed on unit used for Occupied Bandwidth and Frequency Stability tests.



Test Result Summary

Specification	Test Name	Pass, Fail, N/A	Comments
47 CFR 95.767 47 CFR 2.1046 RSS-210 A.2.1(c)	Transmitter Power	Pass	
47 CFR 95.773 47 CFR 2.1049 RSS-210 A.2.1(e)	Authorized Bandwidth	Pass	
47 CFR 95.779 47 CFR 2.1053 RSS-210 A.2.1(g)	Unwanted Emissions	Pass	
47 CFR 95.765 47 CFR 2.1055 RSS-210 A.2.1(f)	Frequency Accuracy	Pass	

Transmitter Power
Engineer: Christian Pawlak

Test Date: 10/16/2018

Standards: 47 CFR 95.767, RSS-210 A.2.1(c)

Test Procedure

The Method of Measurement was C63.26 5.2.4.3. The EUT was measured in a radiated configuration with the manufacturer's antenna attached. Emissions were maximized per C63.26 5.5.3.2.

ERP was computed as follows:

$$FSPL = 20 \log(F) + 20 \log(D) - 27.5$$

$$ERP (dBm) = P_{meas} - G_R + L_C + FSPL - 2.15$$

$$ERP (W) = 10^{\frac{ERP (dBm) - 30}{10}}$$

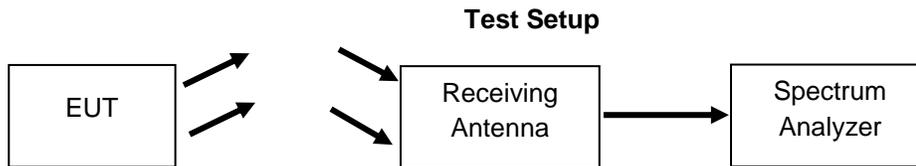
Where:

F = emission frequency in MHz

D = measurement distance in meters

 P_{meas} = power measured at the spectrum analyzer

 G_R = RX antenna gain in dBi

 L_C = RX cable loss in dB

Limits

Operating Frequency (MHz)	Mean Power Limit (W)
27.255	25
26.995	4
27.045	4
27.095	4
27.145	4
27.195	4

Test Results

Frequency (MHz)	Measured Power (dBm)	Cable Loss (dB)	RX Gain (dBi)	FSPL (dB)	ERP (mW)	Limit (W)	Margin (W)
27.045	-36.27	0.40	-17.62	4.66	0.03	4.00	3.99

Authorized Bandwidth

Engineer: Christian Pawlak

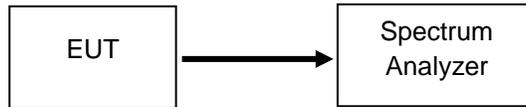
Test Date: 10/16/2018

Standards: 47 CFR 95.773, RSS-210 A.2.1(e)

Test Procedure

The Method of Measurement was C63.26 5.4.4, with no deviations. The EUT was modulated to produce maximum deviation.

Test Setup



Limits

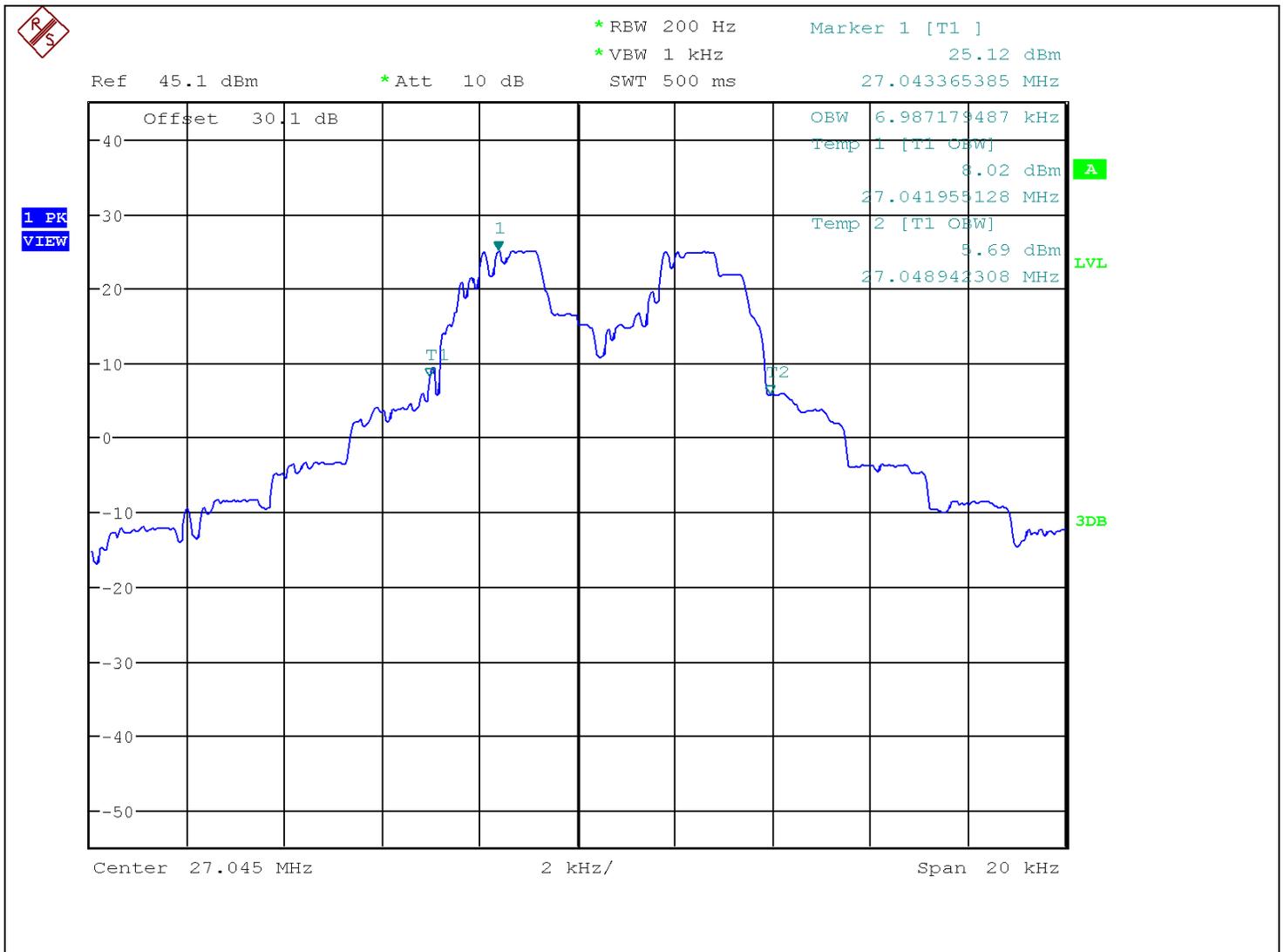
8 kHz for any emission type

Test Results

Frequency (MHz)	99% Bandwidth (kHz)
27.045	6.99



Authorized Bandwidth – 27.045 MHz



Unwanted Emissions – In-Band Mask

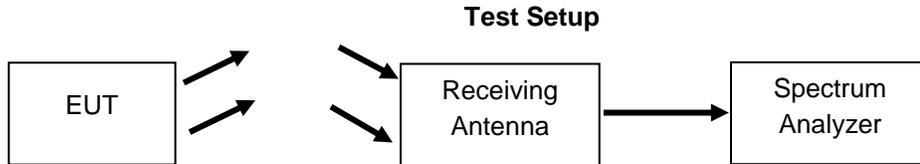
Engineer: Christian Pawlak

Test Date: 10/16/2018

Standards: 47 CFR 95.779, RSS-210 A.2.1(g)

Test Procedure

The Method of Measurement was C63.26 5.5.4, with no deviations. The EUT was modulated to produce maximum deviation. Emission masks were based on Transmitter Output Power data presented previously in this report.



Limits

Band of Operation (MHz)	Limit Reference
26 – 28	47 CFR 95.779(a)(1) 47 CFR 95.779(a)(2)

Test Results

Results meet Requirements.
See plots below.



Unwanted Emissions – In-Band Mask – 27.045 MHz



Unwanted Emissions – Out of Band Spurious

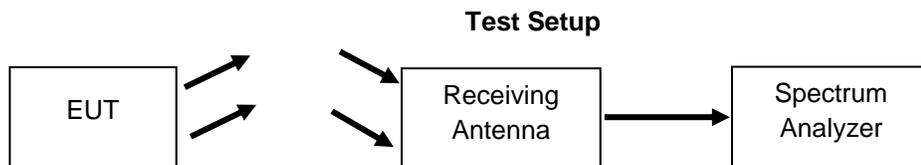
Engineer: Christian Pawlak

Test Date: 10/16/2018

Standards: 47 CFR 95.779, RSS-210 A.2.1(g)

Test Procedure

The Method of Measurement was C63.26 5.5.4, with no deviations. The EUT was modulated to produce maximum deviation. Emission masks were based on Transmitter Output Power data presented previously in this report.



Limits

Unwanted emissions in any frequency band removed from the channel center frequency by more than 20 kHz shall be attenuated below the transmitter output power by 43 dB + 10 log₁₀ (transmitter power in watts)

Test Results

TX Frequency (MHz)	Antenna Polarity	Emission Frequency (MHz)	Emission ERP (dBm)	TX Output Power (mW)	Emission ERP (dBc)	Limit (dBc)	Margin (dB)
27.045	N/A	0.189	-29.74	0.03	14.00	-2.74	16.74
27.045	H	54.100	-42.22	0.03	26.49	-2.74	29.22
27.045	V	54.100	-35.62	0.03	19.89	-2.74	22.62
27.045	H	270.430	-44.87	0.03	29.14	-2.74	31.87
27.045	V	297.460	-44.87	0.03	29.14	-2.74	31.87
27.045	H	297.530	-43.76	0.03	28.03	-2.74	30.76

*Six highest emissions relative to applicable limit are reported. Other emissions were >20 dB from limit.

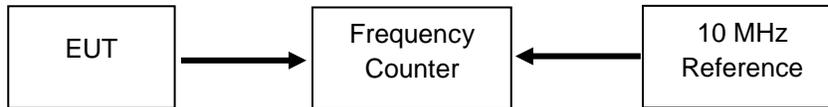
Frequency Accuracy
Engineer: Christian Pawlak

Test Date: 10/16/2018

Standards: 47 CFR 95.765, RSS-210 A.2.1(f)

Test Procedure

The Method of Measurement was C63.26 5.6, with no deviations.

Test Setup

Limits

Band of Operation (MHz)	Transmitter Qualifications	Limit (ppm)
26 – 28	None	±50
26 – 28	Mean transmitter power of 2.5 W or less Used solely by the operator to turn on and/or off a device at a remote location, other than a device used solely to attract attention	±100

Test Results

Temperature (°C)	Voltage (VDC)	Frequency (MHz)	Error (ppm)	Limit (ppm)	Margin (ppm)
+50	3.7	27.0455	0.00	50	50.00
+40	3.7	27.0456	-3.70	50	46.30
+30	3.7	27.0455	0.00	50	50.00
+20	3.7	27.0455	0.00	50	50.00
	3.4	27.0455	0.00	50	50.00
+10	3.7	27.0457	-7.39	50	42.61
0	3.7	27.0456	-3.70	50	46.30
-10	3.7	27.0458	-11.09	50	38.91
-20	3.7	27.0454	3.70	50	46.30
-30	3.7	27.0461	-22.18	50	27.82



Test Equipment Utilized

Description	Manufacturer	Model Number	CT Asset #	Last Cal Date	Cal Due Date
Power Supply	GW	GPX-3030D	i00495	NCR	NCR
Multimeter	Fluke	87 III	i00319	05/01/2018	05/01/2019
Spectrum Analyzer	Rohde & Schwarz	FSU26	i00501	03/27/2018	03/27/2019
Anechoic Chamber	Panashield	3 Meter Semi-Anechoic Chamber	i00428	08/15/2016	08/15/2019
Spectrum Analyzer	Agilent	E7405A	i00379	02/13/2018	02/13/2019
Antenna – Bilog	Chase	CBL6111C	i00267	03/08/2018	03/08/2020
Antenna - Loop	EMCO	6507	I00326	09/25/2017	09/25/2019
Temperature Chamber	Tenney	Tenney Jr	i00027	NCR	NCR
Data Logger	Fluke	Hydra Data Bucket	i00343	05/23/2018	05/23/2019
Frequency Counter	HP	5334B	i00019	NCR	NCR
10 MHz Reference	Fluke	910R	i00541	NCR	NCR
Environmental Gauge	Newport	iBTHX-W/N	i00282	06/29/2018	06/29/2019

In addition to the above listed equipment standard RF connectors and cables were utilized in the testing of the described equipment. Prior to testing these components were tested to verify proper operation.

END OF TEST REPORT