



Test Report to EN 62311:2008

Assessment of electronic and electrical equipment related to human exposure restrictions for electromagnetic fields (0 Hz - 300 GHz)

Report Number: AT72143353-3R1

Manufacturer: Johnson Outdoors, Inc

Model: SOLIX 12 MSI G2

Test Begin Date: November 27, 2018

Test End Date: November 29, 2018

Report Issue Date: January 11, 2019



FOR THE SCOPE OF ACCREDITATION UNDER Certificate Number: 2955.09

This report must not be used by the client to claim product certification, approval, or endorsement by A2LA, NIST, or any agency of the Federal Government.

Prepared By:

**Jeremy Pickens
Senior Wireless Engineer
TÜV SÜD America Inc.**

Reviewed by:

**Ryan McGann
Team Leader
TÜV SÜD America Inc.**

This test report shall not be reproduced except in full. This report may be reproduced in part with prior written consent of TÜV SÜD America, Inc. The results contained in this report are representative of the sample(s) submitted for evaluation.

This report contains 11 pages

Table of Contents

1	GENERAL.....	3
1.1	PURPOSE	3
1.2	MANUFACTURER INFORMATION.....	3
1.3	PRODUCT DESCRIPTION	3
1.4	TEST METHODOLOGY AND CONSIDERATIONS	5
1.5	MODIFICATIONS OF EUT	5
1.6	REFERENCES	5
2	TEST FACILITIES	6
2.1	LOCATION	6
2.2	LABORATORY ACCREDITATIONS/RECOGNITIONS/CERTIFICATIONS	6
3	CONCLUSIONS, OBSERVATIONS AND COMMENTS.....	7
4	CONFORMITY ASSESSMENT METHODS.....	8
5	VERIFICATION PROCEDURE, LIMITS, AND RESULTS.....	9
5.1	VERIFICATION PROCEDURE	9
5.2	VERIFICATION LIMITS	9
5.3	VERIFICATION RESULTS.....	10
6	PHOTOGRAPHS OF THE EQUIPMENT (UUT)	11

1 GENERAL

1.1 Purpose

To verify compliance of the Equipment Under Test (EUT) with regards to EMF exposure requirements as defined under the test specification EN 62311:2008.

1.2 Manufacturer Information

Johnson Outdoors Marine Electronics, Inc.
678 Humminbird Lane
Eufaula, AL 36027

1.3 Product Description

Product Name: SOLIX 12 MSI G2

The Humminbird SOLIX 12 MSI G2 (411030-1) is a fishfinder/GPS product with Side/Down imaging sonar capability to be used in the marine environment. It is comprised of a keypad, LCD display, Internal GPS, Ethernet, and capable of supporting external GPS, Ethernet, Wi-Fi/Bluetooth module, and both external NMEA 0183 and NMEA2K devices.

The SOLIX 12 MDI G2 CHO is identical to the SOLIX 12 MSI G2 with the exception of the SW settings that limit sonar to traditional 2D and Down imaging.

Model variants include:

411030-1	SOLIX 12 MSI G2
411100-1CHO	SOLIX 12 MDI G2 CHO

Test Sample Serial Number(s): 180907222003

Technical Information (Bluetooth/BLE):

Detail	Description
Transmit Frequency / Alignment Range	2402 MHz – 2480 MHz
Receiver Frequency / Alignment Range	2402 MHz – 2480 MHz
Modulation Format	GFSK, $\pi/4$ -DQPSK, 8-DPSK
Rated RF Output Power	19dBm (Conducted)
Channel Spacing	1 MHz (Bluetooth) 2 MHz (BLE)
Operating Voltage	3.0-3.6 VDC
Adaptive	Yes
Antenna Type / Gain:	PCB Antenna / 0.99 dBi
Type of equipment:	Fixed
Software release:	6.680

Technical Information (Redpine Module WLAN):

Detail	Description
Transmit Frequency / Alignment Range	2412 - 2472 MHz
Receiver Frequency / Alignment Range	2412 - 2472 MHz
Modulation Format	802.11b: DSSS (DBPSK / DQPSK / CCK) 802.11g/n: OFDM (BPSK / QPSK / 16QAM / 64QAM)
Rated RF Output Power	18dBm (Conducted)
Channel Spacing	5 MHz
Operating Voltage	3.0-3.6 VDC
Adaptive	Yes
Antenna Type / Gain:	PCB Antenna / 0.99 dBi
Type of equipment:	Fixed
Software release:	6.680

Test Sample Condition: The test samples were provided in good working order with no visible defects.

1.4 Test Methodology and Considerations

All measurements and/or calculations contained in this report were conducted with EN 62311:2008. Assessment of the compliance of low power electronic and electrical equipment with the basic restrictions related to human exposure to electromagnetic fields (10 MHz to 300 GHz).

1.5 Modifications of EUT

No modification of the EUT were required for compliance.

1.6 References

- EN 62479:2010. Assessment of the compliance of low power electronic and electrical equipment with the basic restrictions related to human exposure to electromagnetic fields (10 MHz to 300 GHz).
- EN 62311:2008. Assessment of electronic and electrical equipment related to human exposure restrictions for electromagnetic fields (0 Hz to 300 GHz).
- ICNIRP Guidelines. For Limiting Exposure to Time-Varying Electric, Magnetic and Electromagnetic Fields (Up to 300 GHz). Published in: Health Physics 74 (4):494-522; 1998.
- Council Recommendation of 12 July 1999 on the limitation of exposure of the general public to electromagnetic fields (0 Hz to 300 GHz)(1999/519/EC).

2 TEST FACILITIES

2.1 Location

The radiated and conducted emissions test sites are located at the following address:

TÜV SÜD America, Inc.
5945 Cabot Pkwy, Suite 100
Alpharetta, GA 30005
Phone: (678) 341-5900
Fax: N/A

2.2 Laboratory Accreditations/Recognitions/Certifications

TÜV SÜD America, Inc. (Alpharetta Facility) is accredited to ISO/IEC 17025 by the American Association for Laboratory Accreditation/A2LA accreditation program and has been issued certificate number 2955.09 in recognition of this accreditation.

Unless otherwise specified, all tests methods described within this report are covered under the ISO/IEC 17025 scopes of accreditation.

The Semi-Anechoic Chamber Test Sites, Open Area Test Sites (OATS) and Conducted Emissions Sites have been fully described, submitted to, and accepted by the FCC, ISED Canada and the Japanese Voluntary Control Council for Interference by information technology equipment.

FCC Registration Number:	967699
ISED Canada Lab Code:	23597
VCCI Member Number:	1831
• VCCI Registration Number	A-0295

3 CONCLUSIONS, OBSERVATIONS AND COMMENTS

The test report will be filed at TÜV SÜD America, Inc. for a period of 10 years following the issue of this report. It may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval from TÜV SÜD America, Inc.

The results of the tests as stated in this report are exclusively applicable to the EUT as identified in this report. TÜV SÜD America, Inc. cannot be held liable for properties of the EUT that have not been observed during these tests.

TÜV SÜD America, Inc. assumes the sample to comply with the requirements of EN 62311 for the respective test sector, if the test results turn out positive.

Comments: The provider was responsible for ensuring the test samples provided were representative of final production units.

4 CONFORMITY ASSESSMENT METHODS

Figure 4-1 summarizes the applicable assessment route for the EUT corresponding with the essential requirements defined in Section 4.0 of EN 62479:2010. Because the device did not meet the low power exclusion level, calculations were performed to show compliance with the ICNIRP Guidelines.

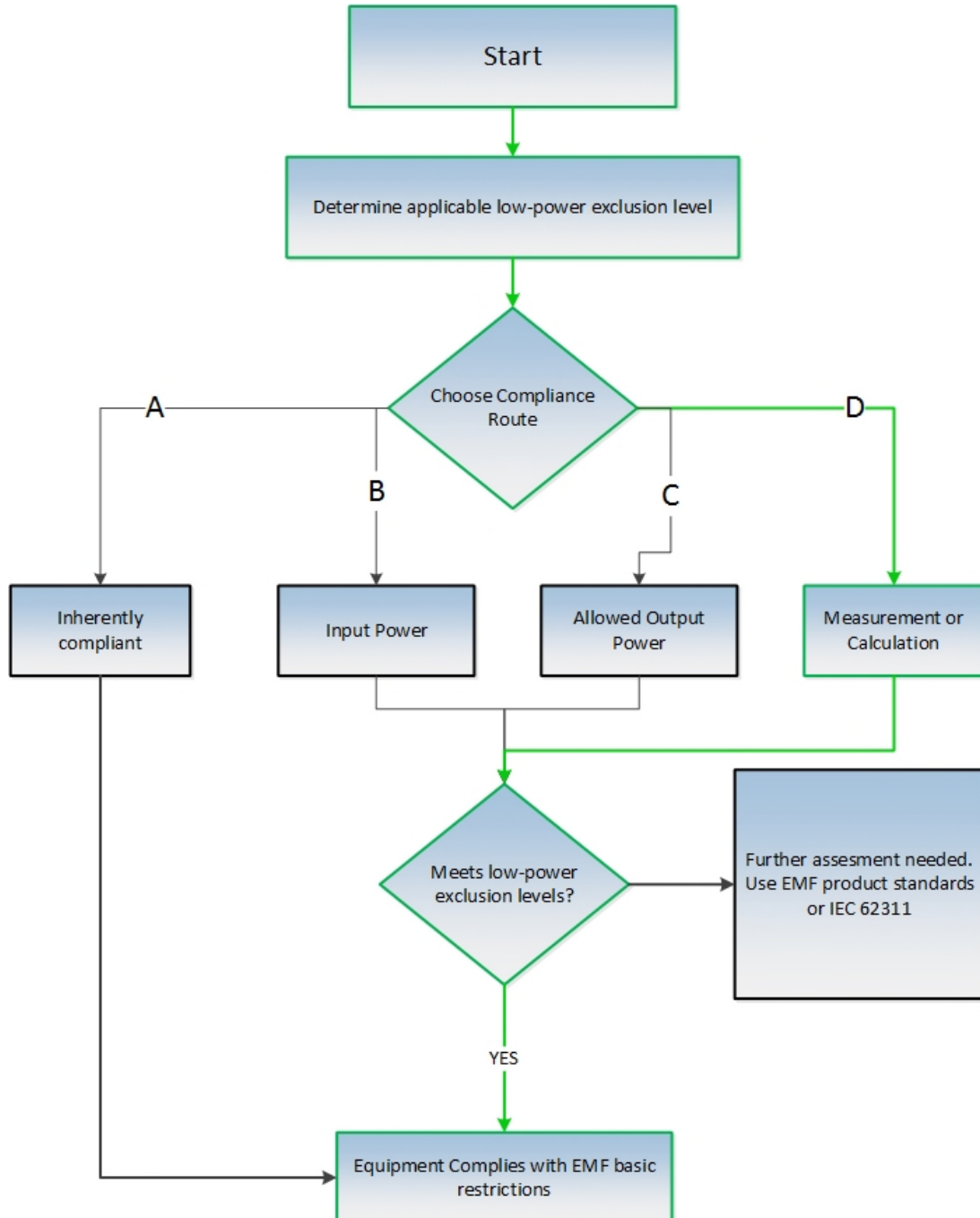


Figure 4-1: Assessment Flowchart

5 VERIFICATION PROCEDURE, LIMITS, AND RESULTS

5.1 Verification Procedure

Verification is based on antenna port conducted measurements taken from the following RF test report(s):

Test Report	Radio Standard	Issued by:
1812CS17	EN 62311	A Test Lab Techno Corp.

EUT test information such as test equipment used, date of actual test, environmental conditions, measurement uncertainty and the person who performed the original tests are referenced in the above test reports.

5.2 Verification Limits

The applicable limits from Table A.1 of EN 62479:2010 are found in Table 5.2-1 below.

Table 5.2-1: EN 62479:2010 limits in Table A.1

Guideline/Standard	SAR limit, SAR_{max} W/kg	Averaging mass, m g	P_{max} mW	Exposure tier	Region of body
ICNIRP	2	10	20	General Public	Head and Trunk

Where P_{max} is the low-power exclusion level. Specified condition on device output power, which may also depend on other variables such as frequency and distance of radiating source from persons, such that the exposure level produced by the source will not exceed a specific basic restriction. If the device output power is less than P_{max} , then the device is deemed to comply with the basic restrictions

Table 5.2-2: ICNIRP Guideline limits in Table 7

Frequency Range	E-Field Strength V/m	H-Field Strength A/m	Power Density W/m^2	Exposure tier
up to 1 Hz	--	$3.2 \cdot 10^4$	--	General Public
1–8 Hz	10,000	$3.2 \cdot 10^4 / f^2$	--	General Public
8–25 Hz	10,000	$4,000/f$	--	General Public
0.025–0.8 kHz	$250/f$	$4/f$	--	General Public
0.8–3 kHz	$250/f$	5	--	General Public
3–150 kHz	87	5	--	General Public
0.15–1 MHz	87	$0.73/f$	--	General Public
1–10 MHz	$87/f^{1/2}$	$0.73/f$	--	General Public
10–400 MHz	28	0.073	2	General Public
400–2,000 MHz	$1.375/f^{1/2}$	$0.0037/f^{1/2}$	$f/200$	General Public
2–300 GHz	61	0.16	10	General Public

5.3 Verification Results

The verification results are summarized in Tables 5.3-1 through 5.3-3 below.

Table 5.3-1: Verification Results (Power Density)

Technology	Frequency Range (MHz)	Duty Cycle (%)	Maximum Conducted Power (dBm)	Antenna Gain (dBi)	Separation Distance (cm)	Power Density (W/m ²)	Limit (W/m ²)	Result
Bluetooth LE	2402 - 2480	100	10.5	0.99	20	0.111	10	Pass
Bluetooth 2.1+EDR	2402 – 2480	100	16.5	0.99	20	0.028	10	Pass
WLAN	2412-2472	100	16.0	0.99	20	0.099	10	Pass

Table 5.3-2: Verification Results (E-Field Strength)

Technology	Frequency Range (MHz)	Duty Cycle (%)	Maximum Conducted Power (dBm)	Antenna Gain (dBi)	Separation Distance (cm)	E-Field Strength (V/m)	Limit (V/m)	Result
Bluetooth LE	2402 - 2480	100	10.5	0.99	20	6.5	61	Pass
Bluetooth 2.1+EDR	2402 – 2480	100	16.5	0.99	20	3.25	61	Pass
WLAN	2412 - 2472	100	16.0	0.99	20	6.11	61	Pass

Table 5.3-2: Verification Results (H-Field Strength)

Technology	Frequency Range (MHz)	Duty Cycle (%)	Maximum Conducted Power (dBm)	Antenna Gain (dBi)	Separation Distance (cm)	H-Field Strength (A/m)	Limit (A/m)	Result
Bluetooth LE	2402 - 2480	100	10.5	0.99	20	0.017	0.16	Pass
Bluetooth 2.1+EDR	2402 – 2480	100	16.5	0.99	20	0.009	0.16	Pass
WLAN	2412-2472	100	16.0	0.99	20	0.016	0.16	Pass

6 PHOTOGRAPHS OF THE EQUIPMENT (UUT)



Figure 6-1: Isotropic View – Equipment Under Test



Figure 6-2: Isotropic View – Equipment Under Test

END REPORT