




Test Report 3768-165-166-62311

Equipment Under Test:	SONA NX611 M.2 2230, 1 MHF SONA NX611 M.2 2230, 2 MHF
Requirement(s):	IEC 62311
Test Date(s):	2024
Prepared for:	Ezurio Attn: Brian Petted W66 N220 Commerce Ct. Cedarburg, WI 53012

Report Issued by: Adam Alger, Manager EMC Laboratory	
Signature: 	Date: 02/13/2025
Report Reviewed by: Dylan Rosenfeldt, EMC Engineer	
Signature: 	Date: 02/12/2025
Report Constructed by: Adam Alger, Manager EMC Laboratory	
Signature: 	Date: 02/12/2025

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Report: TR3768-165-166-62311		Model: SONA NX611M
Job: C-3768		Serial: Eng Sample

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Ezurio Test Services in Review

The Ezurio laboratory located at W66 N220 Commerce Court Cedarburg, Wisconsin, 53012 USA is recognized through the following organizations:



A2LA – American Association for Laboratory Accreditation

Accreditation based on ISO/IEC 17025:2017 with Electrical (EMC) Scope

A2LA Certificate Number: 1255.01

Scope of accreditation includes all test methods listed herein unless otherwise noted



Federal Communications Commission (FCC) – USA

Accredited Test Firm Registration Number: 953492

Recognition of two 3 meter Semi-Anechoic Chambers



Innovation, Science and Economic Development Canada

Accredited U.S. Identification Number: US0218

Recognition of two 3 meter Semi-Anechoic Chambers

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1 TEST REPORT SUMMARY

During **2024** the Equipment Under Test (EUT), **SONA NX611M**, as provided by **Ezurio** was tested to the following requirements:

Requirements	Description	Method	Compliant
IEC 62311	Assessment of electronic and electrical equipment related to human exposure restrictions for electromagnetic fields	IEC 62311 Annex A	Yes

Note: IEC 62311 is not on Ezurio Test Services Scope of Accreditation

Notice:

The results relate only to the item tested as configured and described in this report. Any additional configurations, modes of operation, or modifications made to the equipment under test after the specified test date(s) are at the decision of the client and may not apply to the data seen in this test report.

The decision rule for Pass / Fail assessment to the specification or standard listed in this test report has been agreed upon by the client and laboratory to be as follows:

Measurement Type	Rule
Emissions – Amplitude	0.5 dB below specified limit
Emissions – Frequency	1% less than the specification
Immunity	Tested at specified level

2 CLIENT INFORMATION

Company Name	Ezurio
Contact Person	Brian Petted
Address	W66 N220 Commerce Ct. Cedarburg, WI 53012

2.1 Equipment Under Test (EUT) Information

The following information has been supplied by the client

Product Name	SONA NX611 M.2 2230, 1 MHF SONA NX611 M.2 2230, 2 MHF
Part Number	453-00166 453-00165
Serial Number	Eng Sample
FCC ID	SQG-SONANX611M
IC ID	3147A-SONANX611M

2.2 Product Description

The NX611 is based upon NXP IW611 Wi-Fi 6 chipset. Feature-set includes 802.11 a/b/g/n/ac/ax Wi-Fi 6 and Dual-Mode Bluetooth v5.3 (BDR + EDR + BLE).

2.3 Modifications Incorporated for Compliance

None noted at time of test

2.4 Deviations and Exclusions from Test Specifications

None noted at time of test

2.5 EUT Information

Power Supply – INPUT:100-240VAC 50/60 Hz 0.3A

OUTPUT: 5VDC 2A

Firmware - sduart_nw61x_v1.bin.se

Sduart_nw61x_v1_mfg.bin.se

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2.6 Ancillary Equipment

Equipment used for EUT programming (not part of the EUT)

Development Kit, SU60-SOMC 6.0

P/N: 463-00138-K1 Rev 1

Power Supply: INPUT: 100-240 VAC 50/60Hz 0.7A

OUTPUT: 12VDC 2A

HP Elitebook 840G1

Labtool Version: 1.0.0.45.6

2.7 Antenna Information

Manufacturer	Model	Part Number	Dimension	Type	Peak Gain (dBi)	
					2400-2500 MHz	4900-5925 MHz
Laird Connectivity	FlexMIMO 6E	EFD2471A3S-10MH4L	39.5mm X 39.5mm X 4.7mm	PIFA	2.2	3.8
Laird Connectivity	FlexPIFA 6E	EFB2471A3S-10MH4L	16mm X 36mm X 2.5mm	PIFA	2.2	3.9
Laird Connectivity	Mini NanoBlade Flex 6E	EMF2471A3S-10MH4L	36mm X 12mm X 0.3mm	PCB Dipole	2.4	4.4
Joymax Electronics	N/A	TWX-100BRS3B	137mm X 13mm	Dipole	2.0	4.0
Laird Connectivity	FlexPIFA	EFB2455A3S-16MHF1	38.5mm X 12.7 mm X 2.5mm	PIFA	2.5	3.0

3 REFERENCES

Publication	Edition	Date
IEC 62311	2	2019
IEC 62232	2	2017
ICNIRP	-	2020

4 UNCERTAINTY SUMMARY

Using the guidance of the following publications the calculated measurement uncertainty represents an expanded uncertainty expressed at approximately the 95 % confidence level, using a coverage factor of $k = 2$.

References

CISPR 16-4-1

CISPR 16-4-2

CISPR 32

ANSI C63.23

A2LA P103

A2LA P103c

ETSI TR 100-028

Measurement Type	Configuration	Uncertainty \pm
Radiated Emissions	Biconical Antenna	5.0 dB
Radiated Emissions	Log Periodic Antenna	5.3 dB
Radiated Emissions	Horn Antenna	4.7 dB
AC Line Conducted Emissions	Artificial Mains Network	3.4 dB
Telecom Conducted Emissions	Asymmetric Artificial Network	4.9 dB
Disturbance Power Emissions	Absorbing Clamp	4.1 dB
Radiated Immunity	3 Volts/meter	2.2 dB
Conducted Immunity	CDN/EM/BCI	2.4/3.5/3.4 dB
EFT Burst/Surge	Peak pulse voltage	164 volts
ESD Immunity	15 kV level	1377 Volts

Parameter	ETSI U.C. \pm	U.C. \pm
Radio Frequency, from F0	1×10^{-7}	0.55×10^{-7}
Occupied Channel Bandwidth	5 %	2 %
RF conducted Power (Power Meter)	1.5 dB	1.2 dB
RF conducted emissions (Spectrum Analyzer)	3.0 dB	1.7 dB
All emissions, radiated	6.0 dB	5.3 dB
Temperature	1° C	0.65° C
Humidity	5 %	2.9 %
Supply voltages	3 %	1 %

5 TEST DATA

Maximum EIRP

Unit	Protocol	Mode	Frequency (MHz)	EIRP (dBm)
165	BT	DH5	2440	9.3
	BLE	1 Mbps	2402	9.4
	2.4 WLAN	54 Mbps	2442	18.1
	5 GHz WLAN	6 Mbps	5720	19.4
166	BT	DH5	2440	10.1
	BLE	1 Mbps	2440	11.0
	2.4 WLAN	1 Mbps	2442	18.3
	5 GHz WLAN	6 Mbps	5720	19.7

6 RF EXPOSURE EVALUATION

Limits

The device shall comply with the relevant limits for Equivalent plane wave power density for the general public, as stated by ICNIRP in the table below.

ICNIRP Guidelines • ICNIRP

Table 5. Reference levels for exposure, averaged over 30 min and the whole body, to electromagnetic fields from 100 kHz to 300 GHz (unperturbed rms values).^a

Exposure scenario	Frequency range	Incident E-field strength; E_{inc} ($V\ m^{-1}$)	Incident H-field strength; H_{inc} ($A\ m^{-1}$)	Incident power density; S_{inc} ($W\ m^{-2}$)
Occupational	0.1 – 30 MHz	$660/f_M^{0.7}$	$4.9/f_M$	NA
	>30 – 400 MHz	61	0.16	10
	>400 – 2000 MHz	$3f_M^{0.5}$	$0.008f_M^{0.5}$	$f_M/40$
	>2 – 300 GHz	NA	NA	50
General public	0.1 – 30 MHz	$300/f_M^{0.7}$	$2.2/f_M$	NA
	>30 – 400 MHz	27.7	0.073	2
	>400 – 2000 MHz	$1.375f_M^{0.5}$	$0.0037f_M^{0.5}$	$f_M/200$
	>2 – 300 GHz	NA	NA	10

^aNote:

1. "NA" signifies "not applicable" and does not need to be taken into account when determining compliance.
2. f_M is frequency in MHz.
3. S_{inc} , E_{inc} , and H_{inc} are to be averaged over 30 min, over the whole-body space. Temporal and spatial averaging of each of E_{inc} and H_{inc} must be conducted by averaging over the relevant square values (see eqn 8 in Appendix A for details).
4. For frequencies of 100 kHz to 30 MHz, regardless of the far-field/near-field zone distinctions, compliance is demonstrated if neither E_{inc} or H_{inc} exceeds the above reference level values.
5. For frequencies of >30 MHz to 2 GHz: (a) within the far-field zone: compliance is demonstrated if either S_{inc} , E_{inc} , or H_{inc} , does not exceed the above reference level values (only one is required); S_{eq} may be substituted for S_{inc} ; (b) within the radiative near-field zone, compliance is demonstrated if either S_{inc} , or both E_{inc} and H_{inc} , does not exceed the above reference level values; and (c) within the reactive near-field zone: compliance is demonstrated if both E_{inc} and H_{inc} do not exceed the above reference level values; S_{inc} cannot be used to demonstrate compliance, and so basic restrictions must be assessed.
6. For frequencies of >2 GHz to 300 GHz: (a) within the far-field zone: compliance is demonstrated if S_{inc} does not exceed the above reference level values; S_{eq} may be substituted for S_{inc} ; (b) within the radiative near-field zone, compliance is demonstrated if S_{inc} does not exceed the above reference level values; and (c) within the reactive near-field zone, reference levels cannot be used to determine compliance, and so basic restrictions must be assessed.

Figure 1: Radio Frequency exposure reference levels from ICNIRP guidelines

Spherical Evaluation Formula for Far-Field

B.4.2.1.1.2 Applicability of spherical formulas

The far-field spherical formulas can be used to evaluate the spatial-peak and spatially-averaged RF field strengths. The spatially-averaged and spatial-peak equivalent power densities can be evaluated as follows:

$$S = \frac{\overline{P}_{\text{net}} G_{\theta, \phi}}{4\pi r^2} \quad (\text{B.15})$$

Figure 2: Spherical formula to calculate power density from IEC 62232

S = Power density (W/m²)

P = Conducted power output (W)

G = Antenna gain

r = distance to center of radiating antenna (m)

7 CALCULATIONS

Power Calculation 2.4GHz WLAN

Max Power of Channel (EIRP) = 18.3 dBm

Tune-up Tolerance = 1.00 dB

Total Power = 18.3 dBm + Tune-up Tolerance = 19.3 dBm = 0.085 W

Minimum Separation Distance Calculation 2.4GHz WLAN

$$S = \left[\frac{(0.085W)}{4\pi(r)^2} \right] = 10 W/m^2$$

$$r = 0.026m$$

Power Density 2.4GHz WLAN

$$S = \left[\frac{(0.085W)}{4\pi(0.027)^2} \right] = 9.3 W/m^2$$

2.4GHz WLAN Result

2.4GHz WLAN is compliant with IEC 62311 and the ICNIRP guidelines for all separation distances greater than or equal to 27mm.

Power Calculation 5GHz WLAN

Max Power of Channel (EIRP) = 19.7 dBm

Tune-up Tolerance = 1.00 dB

Total Power = 19.7 dBm + Tune-up Tolerance = 20.7 dBm = 0.117 W

Minimum Separation Distance Calculation 2.4GHz WLAN

$$S = \left[\frac{(0.117W)}{4\pi(r)^2} \right] = 10 W/m^2$$

$$r = 0.031m$$

Power Density 5GHz WLAN

$$S = \left[\frac{(0.117W)}{4\pi(0.32)^2} \right] = 9.4 W/m^2$$

5GHz WLAN Result

5GHz WLAN is compliant with IEC 62311 and the ICNIRP guidelines for all separation distances greater than or equal to 32mm.

Power Calculation BLE

Max Power of Channel (EIRP) = 11.0 dBm

Tune-up Tolerance = 1.00 dB

Total Power = 11.0 dBm + Tune-up Tolerance = 12.0 dBm = 0.016 W

Minimum Separation Distance Calculation BLE

$$S = \left[\frac{(0.016W)}{4\pi(r)^2} \right] = 10 \text{ W/m}^2$$

$$r = 0.011m$$

Power Density BLE

$$S = \left[\frac{(0.016W)}{4\pi(0.012)^2} \right] = 8.4 \text{ W/m}^2$$

BLE Result

BLE is compliant with IEC 62311 and the ICNIRP guidelines for all separation distances greater than or equal to 12 mm.

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Power Calculation BT

Max Power of Channel (EIRP) = 10.1 dBm

Tune-up Tolerance = 1.00 dB

Total Power = 10.1 dBm + Tune-up Tolerance = 11.1 dBm = 0.013 W

Minimum Separation Distance Calculation BT

$$S = \left[\frac{(0.013W)}{4\pi(r)^2} \right] = 10 \text{ W/m}^2$$

$$r = 0.010m$$

Power Density BT

$$S = \left[\frac{(0.013W)}{4\pi(0.011)^2} \right] = 8.3 \text{ W/m}^2$$

BT Result

BT is compliant with IEC 62311 and the ICNIRP guidelines for all separation distances greater than or equal to 11 mm.

8 REVISION HISTORY

Version	Date	Notes	Person
0	2/12/2025	Initial Draft	Adam Alger
1	2/13/2025	Final	Adam Alger

END OF REPORT