Test Report 3768-180 RFX

Equipment Under Test:	SONA NX611
Requirement(s):	FCC: 1.1307, 1.1310 ISED: RSS-102
Test Date(s):	02/12/2025
Prepared for:	Ezurio Attn: Brian Petted W66 N220 Commerce Ct. Cedarburg, WI 53012

Report Issued by: Dylan Rosenfeldt, EMC Engineer
Signature: Date: 02/14/2025

Report Reviewed by: Adam Alger, Manager EMC Laboratory
Signature: Date: 02/12/2025

Report Constructed by: Dylan Rosenfeldt, EMC Engineer
Signature: Date: 02/12/2025

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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:

Certificate #1255.01

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

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Federal Communications Commission (FCC) – USA

Accredited Test Firm Registration Number: 953492

Recognition of two 3 meter Semi-Anechoic Chambers

Government of Canada

Innovation, Science and Economic Development Canada

Accredited U.S. Identification Number: US0218

Recognition of two 3 meter Semi-Anechoic Chambers

1 TEST REPORT SUMMARY

During **01/27/2025** the Equipment Under Test (EUT), **SONA NX611,** as provided by **Ezurio** was tested to the following requirements:

Requirements	Description	Method	Compliant
FCC Part 1.1310, 2.1093	Radio Frequency Radiation Exposure Evaluation	ANSI C63.10	Yes
ISED RSS-102	Radio Frequency Exposure Compliance of Radiocommunication Apparatus	RSS-102	Yes

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	1 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
Part Number	453-00156, 453-00155
Serial Number	00033 | 00027, 00020 | 00016
FCC ID	SQG-SONANX611C
IC ID	3147A-SONANX611C

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

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)	
					2400-2480 MHz	5150-5850 MHz
TDK	Multilayer Antenna	ANT162442DT-2001A2	1.6mm x 0.8mm x 0.4mm	Chip	3.3	4.2

2.8 Test Channels 2.4 GHz WLAN

Channel	Frequency (MHz)	Bandwidth (MHz)	Data Rates
1	2402	20	802.11b – 1 and 11 Mbps 802.11g – 6 and 54 Mbps 802.11n – MCS0 and MCS7 802.11ax – MCS0 and MCS11
6	2437	20	
11	2462	20	
3	2422	40	
6	2437	40	
9	2452	40	

2.9 Test Channels 5 GHz WLAN

Channel	Frequency (MHz)	Bandwidth (MHz)	Data Rates
36	5180	20	802.11a – 6 and 54 Mbps 802.11n – MCS0 and MCS7 802.11ac – MCS0 and MCS9 802.11ax – MCS0 and MCS11
40	5200	20	
48	5240	20	
38	5190	40	
46	5230	40	
42	5210	80	
52	5260	20	
56	5280	20	
64	5320	20	
54	5270	40	
62	5310	40	
58	5290	80	
100	5500	20	
120	5600	20	
144	5700	20	
102	5510	40	
118	5590	40	
142	5710	40	
106	5530	80	
138	5690	80	
149	5745	20	
157	5785	20	
165	5825	20	
151	5755	40	
159	5795	40	
155	5775	80	

2.10 Test Channels BLE

Channel	Frequency (MHz)	Data Rates
0	2402	125k, 500k, 1M and 2M
19	2440	
39	2480	

2.11 Test Channels BT Classic

Channel	Frequency (MHz)	Data Rates
0	2402	DH5, 2DH5, and 3DH5
39	2441	
78	2480	

3 REFERENCES

Publication	Edition	Date	AMD 1	AMD 2
eCFR	-	2025	-	-
RSS-102	6	2023	-	-
KDB 447498 D01	v06	2015	-	-
IEEE C95.3	-	2021	-	-

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 ±
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

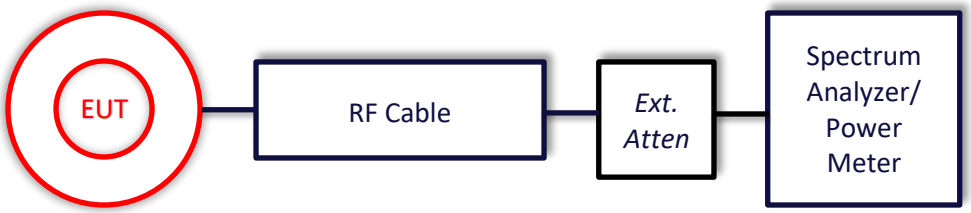
Parameter	ETSI U.C. ±	U.C. ±
Radio Frequency, from F0	$1x10^{-7}$	$0.55x10^{-7}$
Occupied Channel Bandwidth	5 %	2 %
RF conducted Power (Power Meter)	1.5 dB	1.2 dB
RF conducted emissions (Spectrum Analyzer)	3.0 dB	1.7 dB
All emissions, radiated	6.0 dB	5.3 dB
Temperature	1° C	0.65° C
Humidity	5 %	2.9 %
Supply voltages	3 %	1 %

5 TEST DATA

5.1 Antenna Port Conducted Emissions

Description of Measurement	The direct measurement of emissions at the antenna port of the EUT is achieved by use of a RF connection to a spectrum analyzer or power meter. The cable and attenuator factors are loaded into the analyzer or power meter allowing for direct measurement readings without the need for further corrections.
Example Calculations	Measurement (dBm) + Cable factor (dB) + External Attenuator (dB) = Corrected Reading (dBm) Margin (dB) = Limit (dBm) – Corrected Reading (dBm)

Block Diagram



5.1.1 Antenna Port Conducted Emissions – RF Output Power 2.4GHz WLAN

Nominal BW	Channel	Mode	MCS	Average Output Power (dBm)	Duty Cycle Correction (dB)	Corrected Output Value (dBm)	Limit (dBm)	Margin (dB)	PWR Setting
20	1	802.11b	CCK-1	15.8	-	15.8	30.0	14.2	16
	6	802.11b	CCK-1	16.0	-	16.0	30.0	14.0	16
	11	802.11b	CCK-1	16.1	-	16.1	30.0	13.9	16
	1	802.11b	CCK-11	15.7	-	15.7	30.0	14.3	16
	6	802.11b	CCK-11	15.9	-	15.9	30.0	14.1	16
	11	802.11b	CCK-11	16.0	-	16.0	30.0	14.0	16
	1	802.11g	OFDM-6	12.7	-	12.7	30.0	17.3	13
	6	802.11g	OFDM-6	12.9	-	12.9	30.0	17.1	13
	11	802.11g	OFDM-6	12.9	-	12.9	30.0	17.1	13
	1	802.11g	OFDM-54	12.3	0.4	12.7	30.0	17.3	13
	6	802.11g	OFDM-54	12.6	0.4	13.0	30.0	17.0	13
	11	802.11g	OFDM-54	12.5	0.4	12.9	30.0	17.1	13
	1	802.11n	MCS0	12.8	-	12.8	30.0	17.2	13
	6	802.11n	MCS0	12.9	-	12.9	30.0	17.1	13
	11	802.11n	MCS0	12.9	-	12.9	30.0	17.1	13
	1	802.11n	MCS7	12.4	0.4	12.8	30.0	17.2	13
	6	802.11n	MCS7	12.6	0.4	13.0	30.0	17.0	13
	11	802.11n	MCS7	12.6	0.4	13.0	30.0	17.0	13
	1	802.11ax	MCS0	11.1	-	11.1	30.0	18.9	11
	6	802.11ax	MCS0	11.3	-	11.3	30.0	18.7	11
	11	802.11ax	MCS0	11.4	-	11.4	30.0	18.6	11
	1	802.11ax	MCS11	10.6	0.5	11.1	30.0	18.9	11
	6	802.11ax	MCS11	10.7	0.5	11.2	30.0	18.8	11
	11	802.11ax	MCS11	10.9	0.5	11.4	30.0	18.6	11
40	3	802.11n	MCS0	7.8	0.1	7.9	30.0	22.1	8
	6	802.11n	MCS0	8.0	0.1	8.1	30.0	21.9	8
	9	802.11n	MCS0	7.9	0.1	8.0	30.0	22.0	8
	3	802.11n	MCS7	7.4	0.6	8.0	30.0	22.0	8
	6	802.11n	MCS7	7.4	0.6	8.0	30.0	22.0	8
	9	802.11n	MCS7	7.5	0.6	8.1	30.0	21.9	8
	3	802.11ax	MCS0	8.1	0.1	8.2	30.0	21.8	8
	6	802.11ax	MCS0	8.3	0.1	8.4	30.0	21.6	8
	9	802.11ax	MCS0	8.3	0.1	8.4	30.0	21.6	8
	3	802.11ax	MCS11	7.5	0.7	8.2	30.0	21.8	8
	6	802.11ax	MCS11	7.6	0.7	8.3	30.0	21.7	8
	9	802.11ax	MCS11	7.6	0.7	8.3	30.0	21.7	8

Nominal BW	Channel	Mode	MCS	Average Output Power (dBm)	Duty Cycle Correction (dB)	Corrected Output Value (dBm)	Limit (dBm)	Margin (dB)	PWR Setting
20	1	802.11ax	MCS0 RU26	12.9	0.2	13.1	30.0	16.9	12
	6			13.1	0.2	13.3	30.0	16.7	12
	11			13.3	0.2	13.5	30.0	16.5	12
	1		MCS0 RU52	12.5	0.2	12.7	30.0	17.3	12
	6			12.6	0.2	12.8	30.0	17.2	12
	11			12.7	0.2	12.9	30.0	17.1	12
	1		MCS0 RU106	13.1	0.2	13.3	30.0	16.7	13
	6			13.2	0.2	13.4	30.0	16.6	13
	11			13.2	0.2	13.4	30.0	16.6	13
40	3	802.11ax	MCS0 RU26	12.1	0.2	12.3	30.0	17.7	12
	6			12.3	0.2	12.5	30.0	17.5	12
	9			12.3	0.2	12.5	30.0	17.5	12
	3		MCS0 RU52	12.5	0.2	12.7	30.0	17.3	12
	6			12.7	0.2	12.9	30.0	17.1	12
	9			12.6	0.2	12.8	30.0	17.2	12
	3		MCS0 RU106	14.5	0.2	14.7	30.0	15.3	14
	6			14.6	0.2	14.8	30.0	15.2	14
	9			14.6	0.2	14.8	30.0	15.2	14
	3		MCS0 RU242	10.3	0.2	10.5	30.0	19.5	10
	6			10.4	0.2	10.6	30.0	19.4	10
	9			10.5	0.2	10.7	30.0	19.3	10

5.1.2 Antenna Port Conducted Emissions – RF Output Power 5GHz WLAN

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Nominal BW	**Channel**	**Mode**	**MCS**	**Avg Output Power (dBm)**	**Duty Cycle Correction (dB)**	**Corrected Output Value (dBm)**	**Limit (dBm)**	**Margin (dB)**	**Power Setting**
20	36	802.11a	OFDM-6	17.1	-	17.1	24.0	6.9	16
	40			17.2	-	17.2	24.0	6.8	
	48			17.1	-	17.1	24.0	6.9	
	36	802.11a	OFDM-54	16.7	0.4	17.1	24.0	6.9	16
	40			16.9	0.4	17.3	24.0	6.7	
	48			16.8	0.4	17.2	24.0	6.8	
	36	802.11n	MCS0	15.1	-	15.1	24.0	8.9	14
	40			15.2	-	15.2	24.0	8.8	
	48			15.2	-	15.2	24.0	8.8	
	36	802.11n	MCS7	14.8	0.4	15.2	24.0	8.8	14
	40			14.9	0.4	15.3	24.0	8.7	
	48			14.9	0.4	15.3	24.0	8.7	
	36	802.11ac	MCS0	15.1	-	15.1	24.0	8.9	14
	40			15.3	-	15.3	24.0	8.7	
	48			15.2	-	15.2	24.0	8.8	
	36	802.11ac	MCS7	14.8	0.4	15.2	24.0	8.8	14
	40			15.0	0.4	15.4	24.0	8.6	
	48			14.9	0.4	15.3	24.0	8.7	
	36	802.11ac	MCS8	14.7	0.4	15.1	24.0	8.9	14
	40			14.9	0.4	15.3	24.0	8.7	
	48			14.8	0.4	15.2	24.0	8.8	
	36	802.11ax	MCS0	15.3	-	15.3	24.0	8.7	14
	40			15.5	-	15.5	24.0	8.5	
	48			15.4	-	15.4	24.0	8.6	
	36	802.11ax	MCS7	15.0	0.4	15.4	24.0	8.6	14
	40			15.1	0.4	15.5	24.0	8.5	
	48			14.9	0.4	15.3	24.0	8.7	
	36	802.11ax	MCS9	12.8	0.5	13.3	24.0	10.7	12
	40			13.0	0.5	13.5	24.0	10.5	
	48			12.9	0.5	13.4	24.0	10.6	
	36	802.11ax	MCS11	10.6	0.5	11.1	24.0	12.9	10
	40			10.8	0.5	11.3	24.0	12.7	
	48			10.8	0.5	11.3	24.0	12.7	

40	38	802.11n	MCS0	15.0	0.1	15.1	24.0	8.9	14
	46			15.1	0.1	15.2	24.0	8.8	
	38	802.11n	MCS7	14.5	0.6	15.1	24.0	8.9	14
	46			14.6	0.6	15.2	24.0	8.8	
	38	802.11ac	MCS0	13.0	0.1	13.1	24.0	10.9	12
	46			13.1	0.1	13.2	24.0	10.8	
	38	802.11ac	MCS7	12.5	0.6	13.1	24.0	10.9	12
	46			12.6	0.6	13.2	24.0	10.8	
	38	802.11ac	MCS9	12.5	0.7	13.2	24.0	10.8	12
	46			12.6	0.7	13.3	24.0	10.7	
	38	802.11ax	MCS0	13.3	0.1	13.4	24.0	10.6	12
	46			13.4	0.1	13.5	24.0	10.5	
	38	802.11ax	MCS7	12.8	0.6	13.4	24.0	10.6	12
	46			12.9	0.6	13.5	24.0	10.5	
	38	802.11ax	MCS9	12.7	0.6	13.3	24.0	10.7	12
	46			12.9	0.6	13.5	24.0	10.5	
	38	802.11ax	MCS11	10.6	0.7	11.3	24.0	12.7	10
	46			10.8	0.7	11.5	24.0	12.5	
80	42	802.11ac	MCS0	15.4	0.2	15.6	24.0	8.4	14
	42	802.11ac	MCS7	14.8	0.9	15.7	24.0	8.3	14
	42	802.11ac	MCS9	12.7	1.0	13.7	24.0	10.3	12
	42	802.11ax	MCS0	11.5	0.2	11.7	24.0	12.3	10
	42	802.11ax	MCS7	11.1	0.8	11.9	24.0	12.1	10
	42	802.11ax	MCS9	11.1	0.8	11.9	24.0	12.1	10
	42	802.11ax	MCS11	10.9	0.8	11.7	24.0	12.3	10

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Nominal BW	**Channel**	**Mode**	**MCS**	**Avg Output Power (dBm)**	**Duty Cycle Correction (dB)**	**Corrected Output Value (dBm)**	**Limit (dBm)**	**Margin (dB)**	**Power Setting**
20	52	802.11a	OFDM-6	16.5	-	16.5	23.9	7.4	16
	56			16.3	-	16.3	23.9	7.6	
	64			16.0	-	16.0	23.9	7.9	
	52	802.11a	OFDM-54	16.2	0.4	16.6	23.9	7.3	16
	56			16.0	0.4	16.4	23.9	7.5	
	64			15.8	0.4	16.2	23.9	7.7	
	52	802.11n	MCS0	14.5	-	14.5	24.0	9.5	14
	56			14.3	-	14.3	24.0	9.7	
	64			14.1	-	14.1	24.0	9.9	
	52	802.11n	MCS7	14.3	0.4	14.7	24.0	9.3	14
	56			14.1	0.4	14.5	24.0	9.5	
	64			13.8	0.4	14.2	24.0	9.8	
	52	802.11ac	MCS0	14.5	-	14.5	24.0	9.5	14
	56			14.3	-	14.3	24.0	9.7	
	64			14.1	-	14.1	24.0	9.9	
	52	802.11ac	MCS7	14.3	0.4	14.7	24.0	9.3	14
	56			14.1	0.4	14.5	24.0	9.5	
	64			13.8	0.4	14.2	24.0	9.8	
	52	802.11ac	MCS8	14.2	0.4	14.6	24.0	9.4	14
	56			14.0	0.4	14.4	24.0	9.6	
	64			13.7	0.4	14.1	24.0	9.9	
	52	802.11ax	MCS0	14.8	-	14.8	24.0	9.2	14
	56			14.6	-	14.6	24.0	9.4	
	64			14.3	-	14.3	24.0	9.7	
	52	802.11ax	MCS7	14.4	0.4	14.8	24.0	9.2	14
	56			14.3	0.4	14.7	24.0	9.3	
	64			13.9	0.4	14.3	24.0	9.7	
	52	802.11ax	MCS9	12.3	0.5	12.8	24.0	11.2	12
	56			12.2	0.5	12.7	24.0	11.3	
	64			11.9	0.5	12.4	24.0	11.6	
	52	802.11ax	MCS11	10.3	0.5	10.8	24.0	13.2	10
	56			10.1	0.5	10.6	24.0	13.4	
	64			9.9	0.5	10.4	24.0	13.6	

40	54	802.11n	MCS0	14.6	0.1	14.7	24.0	9.3	14
	62			14.3	0.1	14.4	24.0	9.6	
	54	802.11n	MCS7	14.2	0.6	14.8	24.0	9.2	14
	62			13.8	0.6	14.4	24.0	9.6	
	54	802.11ac	MCS0	12.5	0.1	12.6	24.0	11.4	12
	62			12.3	0.1	12.4	24.0	11.6	
	54	802.11ac	MCS7	12.1	0.6	12.7	24.0	11.3	12
	62			11.9	0.6	12.5	24.0	11.5	
	54	802.11ac	MCS9	12.1	0.7	12.8	24.0	11.2	12
	62			12.1	0.7	12.8	24.0	11.2	
	54	802.11ax	MCS0	12.8	0.1	12.9	24.0	11.1	12
	62			12.6	0.1	12.7	24.0	11.3	
	54	802.11ax	MCS7	12.3	0.6	12.9	24.0	11.1	12
	62			12.1	0.6	12.7	24.0	11.3	
	54	802.11ax	MCS9	12.4	0.6	13.0	24.0	11.0	12
	62			12.1	0.6	12.7	24.0	11.3	
	54	802.11ax	MCS11	10.3	0.7	11.0	24.0	13.0	10
	62			10.0	0.7	10.7	24.0	13.3	
80	58	802.11ac	MCS0	14.6	0.2	14.8	24.0	9.2	14
	58	802.11ac	MCS7	14.0	0.9	14.9	24.0	9.1	14
	58	802.11ac	MCS9	12.6	1.0	13.6	24.0	10.4	12
	58	802.11ax	MCS0	10.9	0.2	11.1	24.0	12.9	10
	58	802.11ax	MCS7	10.4	0.8	11.2	24.0	12.8	10
	58	802.11ax	MCS9	10.3	0.8	11.1	24.0	12.9	10
	58	802.11ax	MCS11	10.3	0.8	11.1	24.0	12.9	10

UNII 2C									
Nominal BW	**Channel**	**Mode**	**MCS**	**Avg Output Power (dBm)**	**Duty Cycle Correction (dB)**	**Corrected Output Value (dBm)**	**Limit (dBm)**	**Margin (dB)**	**Power Setting**
20	100	802.11a	OFDM-6	17.5	-	17.5	23.9	6.4	16
	120			17.6	-	17.6	23.9	6.3	
	140			17.3	-	17.3	23.9	6.6	
	100	802.11a	OFDM-54	17.2	0.4	17.6	23.9	6.3	16
	120			17.3	0.4	17.7	23.9	6.2	
	140			16.9	0.4	17.3	23.9	6.6	
	100	802.11n	MCS0	15.7	-	15.7	24.0	8.3	14
	120			15.8	-	15.8	24.0	8.2	
	140			15.4	-	15.4	24.0	8.6	
	100	802.11n	MCS7	15.4	0.4	15.8	24.0	8.2	14
	120			15.5	0.4	15.9	24.0	8.1	
	140			15.1	0.4	15.5	24.0	8.5	
	100	802.11ac	MCS0	15.7	-	15.7	24.0	8.3	14
	120			15.8	-	15.8	24.0	8.2	
	140			15.4	-	15.4	24.0	8.6	
	100	802.11ac	MCS7	15.4	0.4	15.8	24.0	8.2	14
	120			15.5	0.4	15.9	24.0	8.1	
	140			15.1	0.4	15.5	24.0	8.5	
	100	802.11ac	MCS8	15.3	0.4	15.7	24.0	8.3	14
	120			15.4	0.4	15.8	24.0	8.2	
	140			15.1	0.4	15.5	24.0	8.5	
	100	802.11ax	MCS0	15.9	-	15.9	24.0	8.1	14
	120			16.1	-	16.1	24.0	7.9	
	140			15.7	-	15.7	24.0	8.3	
	100	802.11ax	MCS7	15.6	0.4	16.0	24.0	8.0	14
	120			15.7	0.4	16.1	24.0	7.9	
	140			15.3	0.4	15.7	24.0	8.3	
	100	802.11ax	MCS9	13.5	0.5	14.0	24.0	10.0	12
	120			13.6	0.5	14.1	24.0	9.9	
	140			13.1	0.5	13.6	24.0	10.4	
	100	802.11ax	MCS11	11.4	0.5	11.9	24.0	12.1	10
	120			11.5	0.5	12.0	24.0	12.0	
	140			11.0	0.5	11.5	24.0	12.5	

40	102	802.11n	MCS0	15.7	0.1	15.8	24.0	8.2	14
	134			16.2	0.1	16.3	24.0	7.7	
	142			15.6	0.1	15.7	24.0	8.3	
	102	802.11n	MCS7	15.5	0.6	16.1	24.0	7.9	14
	134			15.7	0.6	16.3	24.0	7.7	
	142			15.1	0.6	15.7	24.0	8.3	
	102	802.11ac	MCS0	14.5	0.1	14.6	24.0	9.4	12
	134			14.6	0.1	14.7	24.0	9.3	
	142			14.6	0.1	14.7	24.0	9.3	
	102	802.11ac	MCS7	14.1	0.6	14.7	24.0	9.3	12
	134			14.1	0.6	14.7	24.0	9.3	
	142			14.1	0.6	14.7	24.0	9.3	
	102	802.11ac	MCS9	13.4	0.7	14.1	24.0	9.9	12
	134			13.6	0.7	14.3	24.0	9.7	
	142			13.0	0.7	13.7	24.0	10.3	
	102	802.11ax	MCS0	14.9	0.1	15.0	24.0	9.0	12
	134			14.9	0.1	15.0	24.0	9.0	
	142			14.9	0.1	15.0	24.0	9.0	
	102	802.11ax	MCS7	14.4	0.6	15.0	24.0	9.0	12
	134			14.4	0.6	15.0	24.0	9.0	
	142			14.5	0.6	15.1	24.0	8.9	
	102	802.11ax	MCS9	13.6	0.6	14.2	24.0	9.8	12
	134			13.8	0.6	14.4	24.0	9.6	
	142			13.2	0.6	13.8	24.0	10.2	
	102	802.11ax	MCS11	11.5	0.7	12.2	24.0	11.8	10
	134			11.7	0.7	12.4	24.0	11.6	
	142			11.1	0.7	11.8	24.0	12.2	

80	106	802.11ac	MCS0	16.2	0.2	16.4	24.0	7.6	14
	122			16.4	0.2	16.6	24.0	7.4	14
	138			16.4	0.2	16.6	24.0	7.4	14
	106		MCS7	15.6	0.9	16.5	24.0	7.5	14
	122			15.7	0.9	16.6	24.0	7.4	14
	138			15.7	0.9	16.6	24.0	7.4	14
	106		MCS9	13.8	1.0	14.8	24.0	9.2	12
	122			14.3	1.0	15.3	24.0	8.7	12
	138			14.4	1.0	15.4	24.0	8.6	12
	106	802.11ax	MCS0	12.8	0.2	13.0	24.0	11.0	10
	122			13.4	0.2	13.6	24.0	10.4	10
	138			13.3	0.2	13.5	24.0	10.5	10
	106		MCS7	12.2	0.8	13.0	24.0	11.0	10
	122			12.8	0.8	13.6	24.0	10.4	10
	138			12.8	0.8	13.6	24.0	10.4	10
	106		MCS9	12.2	0.8	13.0	24.0	11.0	10
	122			12.7	0.8	13.5	24.0	10.5	10
	138			12.8	0.8	13.6	24.0	10.4	10
	106		MCS11	11.8	0.8	12.6	24.0	11.4	10
	122			11.9	0.8	12.7	24.0	11.3	10
	138			11.9	0.8	12.7	24.0	11.3	10

UNII 2C (ISED)									
Nominal BW	**Channel**	**Mode**	**MCS**	**Avg Output Power (dBm)**	**Duty Cycle Correction (dB)**	**Corrected Output Value (dBm)**	**Limit (dBm)**	**Margin (dB)**	**Power Setting**
20	116	802.11a	OFDM-6	16.6	0.0	16.6	23.9	7.3	15
			OFDM-54	16.3	0.4	16.7	23.9	7.2	15
		802.11n	MCS0	15.4	0.0	15.4	24	8.6	14
			MCS7	15.1	0.4	15.5	24	8.5	14
		802.11ac	MCS0	15.4	0.0	15.4	24	8.6	14
			MCS7	15.1	0.4	15.5	24	8.5	14
			MCS8	15.0	0.4	15.4	24	8.6	14
		802.11ax	MCS0	10.5	0.0	10.5	24	13.5	9
			MCS7	10.1	0.4	10.5	24	13.5	9
			MCS9	10.0	0.5	10.5	24	13.5	9
			MCS11	9.9	0.5	10.4	24	13.6	9
40	110	802.11n	MCS0	13.3	0.1	13.4	24	10.6	12
			MCS7	12.8	0.6	13.4	24	10.6	12
		802.11ac	MCS0	14.8	0.1	14.9	24	9.1	12
			MCS7	14.3	0.6	14.9	24	9.1	12
			MCS9	11.7	0.7	12.4	24	11.6	11
		802.11ax	MCS0	15.1	0.1	15.2	24	8.8	12
			MCS7	14.6	0.6	15.2	24	8.8	12
			MCS9	11.0	0.6	11.6	24	12.4	10
			MCS11	10.9	0.7	11.6	24	12.4	10

Mid channels used for ISED Canada

UNII 3									
Nominal BW	**Channel**	**Mode**	**MCS**	**Avg Output Power (dBm)**	**Duty Cycle Correction (dB)**	**Corrected Output Value (dBm)**	**Limit (dBm)**	**Margin (dB)**	**Power Setting**
20	149	802.11a	OFDM-6	16.8	-	16.8	30.0	13.2	16
	157			16.8	-	16.8	30.0	13.2	
	165			16.4	-	16.4	30.0	13.6	
	149	802.11a	OFDM-54	16.7	0.4	17.1	30.0	12.9	16
	157			16.4	0.4	16.8	30.0	13.2	
	165			16.1	0.4	16.5	30.0	13.5	
	149	802.11n	MCS0	14.8	-	14.8	30.0	15.2	14
	157			14.8	-	14.8	30.0	15.2	
	165			14.3	-	14.3	30.0	15.7	
	149	802.11n	MCS7	14.4	0.4	14.8	30.0	15.2	14
	157			14.6	0.4	15.0	30.0	15.0	
	165			14.0	0.4	14.4	30.0	15.6	
	149	802.11ac	MCS0	14.8	-	14.8	30.0	15.2	14
	157			14.8	-	14.8	30.0	15.2	
	165			14.4	-	14.4	30.0	15.6	
	149	802.11ac	MCS7	14.5	0.4	14.9	30.0	15.1	14
	157			14.5	0.4	14.9	30.0	15.1	
	165			14.0	0.4	14.4	30.0	15.6	
	149	802.11ac	MCS8	14.5	0.4	14.9	30.0	15.1	14
	157			14.5	0.4	14.9	30.0	15.1	
	165			14.0	0.4	14.4	30.0	15.6	
	149	802.11ax	MCS0	15.1	-	15.1	30.0	14.9	14
	157			15.1	-	15.1	30.0	14.9	
	165			14.6	-	14.6	30.0	15.4	
	149	802.11ax	MCS7	14.7	0.4	15.1	30.0	14.9	14
	157			14.7	0.4	15.1	30.0	14.9	
	165			14.2	0.4	14.6	30.0	15.4	
	149	802.11ax	MCS9	12.5	0.5	13.0	30.0	17.0	12
	157			12.6	0.5	13.1	30.0	16.9	
	165			12.1	0.5	12.6	30.0	17.4	
	149	802.11ax	MCS11	10.4	0.5	10.9	30.0	19.1	10
	157			10.4	0.5	10.9	30.0	19.1	
	165			9.9	0.5	10.4	30.0	19.6	

40	151	802.11n	MCS0	14.9	0.1	15.0	30.0	15.0	14
	159			14.9	0.1	15.0	30.0	15.0	
	151	802.11n	MCS7	14.4	0.6	15.0	30.0	15.0	14
	159			14.3	0.6	14.9	30.0	15.1	
	151	802.11ac	MCS0	14.3	0.1	14.4	30.0	15.6	12
	159			13.2	0.1	13.3	30.0	16.7	
	151	802.11ac	MCS7	13.8	0.6	14.4	30.0	15.6	12
	159			12.7	0.6	13.3	30.0	16.7	
	151	802.11ac	MCS9	12.4	0.7	13.1	30.0	16.9	12
	159			12.2	0.7	12.9	30.0	17.1	
	151	802.11ax	MCS0	14.6	0.1	14.7	30.0	15.3	12
	159			13.5	0.1	13.6	30.0	16.4	
	151	802.11ax	MCS7	14.1	0.6	14.7	30.0	15.3	12
	159			13.0	0.6	13.6	30.0	16.4	
	151	802.11ax	MCS9	12.6	0.6	13.2	30.0	16.8	12
	159			12.5	0.6	13.1	30.0	16.9	
	151	802.11ax	MCS11	10.4	0.7	11.1	30.0	18.9	10
	159			10.3	0.7	11.0	30.0	19.0	
80	155	802.11ac	MCS0	15.3	0.2	15.5	30.0	14.5	14
	155	802.11ac	MCS7	14.7	0.9	15.6	30.0	14.4	14
	155	802.11ac	MCS9	12.5	1.0	13.5	30.0	16.5	12
	155	802.11ax	MCS0	15.5	0.2	15.7	30.0	14.3	14
	155	802.11ax	MCS7	15.0	0.8	15.8	30.0	14.2	14
	155	802.11ax	MCS9	12.9	0.8	13.7	30.0	16.3	12
	155	802.11ax	MCS11	10.8	0.8	11.6	30.0	18.4	10

UNII 1									
Nominal BW	**Channel**	**Mode**	**MCS**	**Avg Output Power (dBm)**	**Duty Cycle Correction (dB)**	**Corrected Output Value (dBm)**	**Limit (dBm)**	**Margin (dB)**	**Power Setting**
20	36	802.11ax	MCS0 RU26	12.4	0.2	12.6	24.0	11.4	10
	40			12.6	0.2	12.8	24.0	11.2	
	48			12.7	0.2	12.9	24.0	11.1	
	36		MCS0 RU52	14.4	0.2	14.6	24.0	9.4	12
	40			14.3	0.2	14.5	24.0	9.5	
	48			14.6	0.2	14.8	24.0	9.2	
	36		MCS0 RU106	15.3	0.2	15.5	24.0	8.5	14
	40			15.2	0.2	15.4	24.0	8.6	
	48			15.3	0.2	15.5	24.0	8.5	
40	38		MCS0 RU26	11.7	0.2	11.9	24.0	12.1	10
	46			12.0	0.2	12.2	24.0	11.8	
	38		MCS0 RU52	12.7	0.2	12.9	24.0	11.1	11
	46			12.3	0.2	12.5	24.0	11.5	
	38		MCS0 RU106	12.7	0.2	12.9	24.0	11.1	11
	46			12.3	0.2	12.5	24.0	11.5	
	38		MCS0 RU242	12.3	0.2	12.5	24.0	11.5	11
	46			12.0	0.2	12.2	24.0	11.8	
80	42		MCS0 RU26	9.5	0.2	9.7	24.0	14.3	8
	42		MCS0 RU52	9.5	0.2	9.7	24.0	14.3	8
	42		MCS0 RU106	9.4	0.2	9.6	24.0	14.4	8
	42		MCS0 RU242	9.3	0.2	9.5	24.0	14.5	8
	42		MCS0 RU484	9.4	0.2	9.6	24.0	14.4	8

UNII 2A									
Nominal BW	Channel	Mode	MCS	Avg Output Power (dBm)	Duty Cycle Correction (dB)	Corrected Output Value (dBm)	Limit (dBm)	Margin (dB)	Power Setting
20	52	802.11ax	MCS0 RU26	11.6	0.2	11.8	23.9	12.1	10
	56			11.5	0.2	11.7	23.9	12.2	
	64			11.5	0.2	11.7	23.9	12.2	
	52		MCS0 RU52	13.2	0.2	13.4	23.9	10.5	12
	56			13.1	0.2	13.3	23.9	10.6	
	64			12.9	0.2	13.1	23.9	10.8	
	52		MCS0 RU106	14.9	0.2	15.1	24.0	8.9	14
	56			14.9	0.2	15.1	24.0	8.9	
	64			14.6	0.2	14.8	24.0	9.2	
40	54	802.11ax	MCS0 RU26	10.9	0.2	11.1	24.0	12.9	10
	62			10.9	0.2	11.1	24.0	12.9	
	54		MCS0 RU52	12.2	0.2	12.4	24.0	11.6	11
	62			12.0	0.2	12.2	24.0	11.8	
	54		MCS0 RU106	12.3	0.2	12.5	24.0	11.5	11
	62			12.2	0.2	12.4	24.0	11.6	
	54		MCS0 RU242	11.8	0.2	12.0	24.0	12.0	11
	62			11.8	0.2	12.0	24.0	12.0	
80	58	802.11ax	MCS0 RU26	9.4	0.2	9.6	24.0	14.4	8
	58		MCS0 RU52	9.2	0.2	9.4	24.0	14.6	8
	58		MCS0 RU106	9.1	0.2	9.3	24.0	14.7	8
	58		MCS0 RU242	9.2	0.2	9.4	24.0	14.6	8
	58		MCS0 RU484	9.1	0.2	9.3	24.0	14.7	8

UNII 2C									
Nominal BW	Channel	Mode	MCS	Avg Output Power (dBm)	Duty Cycle Correction (dB)	Corrected Output Value (dBm)	Limit (dBm)	Margin (dB)	Power Setting
20	100	802.11ax	MCS0 RU26	11.5	0.2	11.7	23.9	12.2	10
	120			12.1	0.2	12.3	23.9	11.6	
	144			11.9	0.2	12.1	23.9	11.8	
	100		MCS0 RU52	13.3	0.2	13.5	23.9	10.4	12
	120			13.7	0.2	13.9	23.9	10.0	
	144			13.5	0.2	13.7	23.9	10.2	
	100		MCS0 RU106	15.4	0.2	15.6	24.0	8.4	14
	120			15.7	0.2	15.9	24.0	8.1	
	144			15.3	0.2	15.5	24.0	8.5	
40	102	802.11ax	MCS0 RU26	11.2	0.2	11.4	23.9	12.5	10
	118			11.0	0.2	11.2	23.9	12.7	
	142			11.3	0.2	11.5	23.9	12.4	
	102		MCS0 RU52	12.8	0.2	13.0	23.9	10.9	11
	118			12.7	0.2	12.9	23.9	11.0	
	142			12.5	0.2	12.7	23.9	11.2	
	102		MCS0 RU106	12.8	0.2	13.0	24.0	11.0	11
	118			12.7	0.2	12.9	24.0	11.1	
	142			12.5	0.2	12.7	24.0	11.3	
	102		MCS0 RU242	12.7	0.2	12.9	24.0	11.1	11
	118			12.5	0.2	12.7	24.0	11.3	
	142			12.4	0.2	12.6	24.0	11.4	
40	106	802.11ax	MCS0 RU26	9.9	0.2	10.1	23.9	13.8	8
	122			10.2	0.2	10.4	23.9	13.5	
	138			10.1	0.2	10.3	23.9	13.6	
	106		MCS0 RU52	9.6	0.2	9.8	23.9	14.1	8
	122			10.0	0.2	10.2	23.9	13.7	
	138			9.8	0.2	10.0	23.9	13.9	
	106		MCS0 RU106	9.7	0.2	9.9	24.0	14.1	8
	122			10.0	0.2	10.2	24.0	13.8	
	138			10.0	0.2	10.2	24.0	13.8	
	106		MCS0 RU242	9.4	0.2	9.6	24.0	14.4	8
	122			9.9	0.2	10.1	24.0	13.9	
	138			9.9	0.2	10.1	24.0	13.9	
	106		MCS0 RU484	9.7	0.2	9.9	24.0	14.1	8
	122			10.2	0.2	10.4	24.0	13.6	
	138			10.1	0.2	10.3	24.0	13.7	

UNII 2C (ISED)									
Nominal BW	**Channel**	**Mode**	**MCS0**	**Avg Output Power (dBm)**	**Duty Cycle Correction (dB)**	**Corrected Output Value (dBm)**	**Limit (dBm)**	**Margin (dB)**	**Power Setting**
20	116	802.11ax	RU26	11.7	0.2	11.9	24	12.1	10
		802.11ax	RU52	13.6	0.2	13.8	24	10.2	12
		802.11ax	RU106	15.5	0.2	15.7	24	8.3	14
40	110	802.11ax	RU26	11.2	0.2	11.4	24	12.6	10
		802.11ax	RU52	13.0	0.2	13.2	24	10.8	11
		802.11ax	RU106	13.0	0.2	13.2	24	10.8	11
		802.11ax	RU242	12.7	0.2	12.9	24	11.1	11

Mid channels used for ISED Canada

UNII 3									
Nominal BW	Channel	Mode	MCS	Avg Output Power (dBm)	Duty Cycle Correction (dB)	Corrected Output Value (dBm)	Limit (dBm)	Margin (dB)	Power Setting
20	149	802.11ax	MCS0 RU26	13.1	0.2	13.3	30.0	16.7	10
	157			11.8	0.2	12.0	30.0	18.0	
	165			12.5	0.2	12.7	30.0	17.3	
	149		MCS0 RU52	14.7	0.2	14.9	30.0	15.1	12
	157			13.4	0.2	13.6	30.0	16.4	
	165			14.2	0.2	14.4	30.0	15.6	
	149		MCS0 RU106	16.2	0.2	16.4	30.0	13.6	14
	157			15.1	0.2	15.3	30.0	14.7	
	165			16.0	0.2	16.2	30.0	13.8	
40	151	802.11ax	MCS0 RU26	12.1	0.2	12.3	30.0	17.7	10
	159			11.1	0.2	11.3	30.0	18.7	
	151		MCS0 RU52	13.4	0.2	13.6	30.0	16.4	11
	159			12.4	0.2	12.6	30.0	17.4	
	151		MCS0 RU106	13.6	0.2	13.8	30.0	16.2	11
	159			12.4	0.2	12.6	30.0	17.4	
	151		MCS0 RU242	12.7	0.2	12.9	30.0	17.1	11
	159			12.2	0.2	12.4	30.0	17.6	
80	155	802.11ax	MCS0 RU26	10.3	0.2	10.5	30.0	19.5	8
	155		MCS0 RU52	10.3	0.2	10.5	30.0	19.5	8
	155		MCS0 RU106	10.4	0.2	10.6	30.0	19.4	8
	155		MCS0 RU242	10.5	0.2	10.7	30.0	19.3	8
	155		MCS0 RU484	9.8	0.2	10.0	30.0	20.0	8

5.1.3 Antenna Port Conducted Emissions – RF Output Power BLE

Channel	Mode	Peak Output Power (dBm)	Limit (dBm)	Margin (dB)
0	1M	7.5	30	22.5
19	1M	7.8	30	22.2
39	1M	7.7	30	22.3
0	2M	7.6	30	22.4
19	2M	7.8	30	22.2
39	2M	7.8	30	22.2
0	500k	7.5	30	22.5
19	500k	7.8	30	22.2
39	500k	7.7	30	22.3
0	125k	7.5	30	22.5
19	125k	7.8	30	22.2
39	125k	7.7	30	22.3

5.1.4 Antenna Port Conducted Emissions – RF Output Power BT Classic

Channel	Mode	Peak Output Power (dBm)	Limit (dBm)	Margin (dB)
0	DH5	7.3	30	22.7
39	DH5	7.7	30	22.3
78	DH5	7.6	30	22.4
0	2DH5	5.8	30	24.2
39	2DH5	5.8	30	24.2
78	2DH5	5.6	30	24.4
0	3DH5	6.1	30	23.9
39	3DH5	6.1	30	23.9
78	3DH5	5.9	30	24.1

6 FCC SAR EXCLUSION – 2.4GHZ WLAN

6.1 SAR Exclusion Limit

For separation distance of 50mm or less

[(max. power of channel, including tune-up tolerance, mW) / (min. test separation distance, mm)] · [√f(GHz)] ≤ 3.0 for 1-g SAR

- F(GHz) is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison
- The value 3.0 is referred to as numeric thresholds

For separation distance of greater than 50 mm

{[Power allowed at numeric threshold for 50 mm)] + [(test separation distance – 50 mm)·10]} mW, for > 1500 MHz and ≤ 6 GHz

KDB 447498 D01

6.2 Distance

≥52 mm

6.3 Power Calculation

Max Power of Channel = 16.1 dBm (802.11b, cck-1, channel 11)

Tune-up Tolerance = 1.00 dB

Antenna Gain = 3.3 dBi

Total Power = 16.1 dBm + Tune-up Tolerance + Gain = 20.4 dBm = 109.6mW

6.4 SAR Test Exclusion Calculation

$$\left[\frac{(XmW)}{(40mm)}\right] \times \sqrt{2.462} = 3.0$$

$$X = 95.6\,mW$$

$$\{[95.6mW + [(52mm - 50mm) \times 10] = 115.6\,mW$$

6.5 Result

The EUT is excluded from SAR testing for WLAN in the 5GHz band at ≥52mm as 109.6 mW is less than the limit of 115.6 mW.

7 FCC SAR EXCLUSION – BLE

7.1 SAR Exclusion Limit

For separation distance of 50mm or less

[(max. power of channel, including tune-up tolerance, mW) / (min. test separation distance, mm)] · [√f(GHz)] ≤ 3.0 for 1-g SAR

- F(GHz) is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison
- The value 3.0 is referred to as numeric thresholds

For separation distance of greater than 50 mm

{[Power allowed at numeric threshold for 50 mm)] + [(test separation distance – 50 mm)·10]} mW, for > 1500 MHz and ≤ 6 GHz

KDB 447498 D01

7.2 Distance

≥9 mm

7.3 Power Calculation

Max Power of Channel = 7.8 dBm (125k, channel 19)

Tune-up Tolerance = 1.00 dB

Antenna Gain = 3.3 dBi

Total Power = 7.8 dBm + Tune-up Tolerance + Gain = 12.1 dBm = 16.2 mW

7.4 SAR Test Exclusion Calculation

$$\left[\frac{(21.9mW)}{(9mm)}\right] \times \sqrt{2.440} = 2.8$$

2.8 ≤ 3.0

7.5 Result

The EUT is excluded from SAR testing at ≥9 mm for BLE in the 2.4GHz band as 2.8 is less than the numeric threshold of 3.0.

8 FCC SAR EXCLUSION – BLUETOOTH CLASSIC

8.1 SAR Exclusion Limit

For separation distance of 50mm or less

[(max. power of channel, including tune-up tolerance, mW) / (min. test separation distance, mm)] · [√f(GHz)] ≤ 3.0 for 1-g SAR

- F(GHz) is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison
- The value 3.0 is referred to as numeric thresholds

For separation distance of greater than 50 mm

{[Power allowed at numeric threshold for 50 mm)] + [(test separation distance – 50 mm)·10]} mW, for > 1500 MHz and ≤ 6 GHz

KDB 447498 D01

8.2 Distance

≥9mm

8.3 Power Calculation

Max Power of Channel = 7.7 dBm (1DH5, channel 39)

Tune-up Tolerance = 1.00 dB

Antenna Gain = 3.3 dBi

Total Power = 7.7 dBm + Tune-up Tolerance + Gain = 12.0 dBm = 15.8 mW

8.4 SAR Test Exclusion Calculation

$$\left[\frac{(15.8mW)}{(9mm)}\right] \times \sqrt{2.441} = 2.7$$

2.7 ≤ 3.0

8.5 Result

The EUT is excluded from SAR testing at ≥9 mm for Bluetooth classic in the 2.4GHz band as 2.7 is less than the numeric threshold of 3.0.

9 FCC SAR EXCLUSION – 5GHZ WLAN

9.1 SAR Exclusion Limit

For separation distance of 50mm or less

[(max. power of channel, including tune-up tolerance, mW) / (min. test separation distance, mm)] · [√f(GHz)] ≤ 3.0 for 1-g SAR

- F(GHz) is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison
- The value 3.0 is referred to as numeric thresholds

For separation distance of greater than 50 mm

{[Power allowed at numeric threshold for 50 mm)] + [(test separation distance – 50 mm)·10]} mW, for > 1500 MHz and ≤ 6 GHz

KDB 447498 D01

9.2 Distance

≥64 mm

9.3 Power Calculation

Max Power of Channel = 17.7 dBm (802.11a, OFDM-54, channel 120)

Tune-up Tolerance = 1.00 dB

Antenna Gain = 4.2 dBi

Total Power = 17.7 dBm + Tune-up Tolerance + Gain = 22.9 dBm = 195.0 mW

9.4 SAR Test Exclusion Calculation

$$\left[\frac{(XmW)}{(50mm)}\right] \times \sqrt{5.600} = 3.0$$

X = 63.4 mW

$$\{[63.4mW + [(64mm - 50mm) \times 10] = 203.4\,mW$$

9.5 Result

The EUT is excluded from SAR testing for WLAN in the 5GHz band at ≥64mm as 195.0 mW is less than the limit of 203.4 mW.

10 ISED SAR EXEMPTION – 2.4GHZ WLAN

10.1 SAR Exemption Limit

Frequency (MHz)	≤ 5 mm (mW)	10 mm (mW)	15 mm (mW)	20 mm (mW)	25 mm (mW)	30 mm (mW)	35 mm (mW)	40 mm (mW)	45 mm (mW)	> 50 mm (mW)
≤ 300	45	116	139	163	189	216	246	280	319	362
450	32	71	87	104	124	147	175	208	248	296
835	21	32	41	54	72	96	129	172	228	298
1900	6	10	18	33	57	92	138	194	257	323
2450	3	7	16	32	56	89	128	170	209	245
3500	2	6	15	29	50	72	94	114	134	158
5800	1	5	13	23	32	41	54	74	102	128

Power Limits for exemption from SAR evaluation RSS-102

10.2 Distance

≥35 mm

10.3 Power Calculation

Max Power of Channel = 16.1 dBm (802.11b, cck-1, channel 11)

Tune-up Tolerance = 1.00 dB

Antenna Gain = 3.3 dBi

Total Power = 16.1 dBm + Tune-up Tolerance + Gain = 20.4 dBm = 109.6mW

10.4 SAR Test Exclusion Calculation

The exemption limit at 35 mm is 128 mW. The total power of the EUT is 109.6 mW.

109.6 mW ≤ 128.0 mW.

10.5 Result

The EUT is exempt from routine SAR testing at ≥35 mm as 109.6 mW is less than 128.0 mW.

11 ISED SAR EXEMPTION – BLE

11.1 SAR Exemption Limit

Frequency (MHz)	≤ 5 mm (mW)	10 mm (mW)	15 mm (mW)	20 mm (mW)	25 mm (mW)	30 mm (mW)	35 mm (mW)	40 mm (mW)	45 mm (mW)	> 50 mm (mW)
≤ 300	45	116	139	163	189	216	246	280	319	362
450	32	71	87	104	124	147	175	208	248	296
835	21	32	41	54	72	96	129	172	228	298
1900	6	10	18	33	57	92	138	194	257	323
2450	3	7	16	32	56	89	128	170	209	245
3500	2	6	15	29	50	72	94	114	134	158
5800	1	5	13	23	32	41	54	74	102	128

Power Limits for exemption from SAR evaluation RSS-102

11.2 Distance

≥20 mm

11.3 Power Calculation

Max Power of Channel = 7.8 dBm (125k, channel 19)

Tune-up Tolerance = 1.00 dB

Antenna Gain = 3.3 dBi

Total Power = 7.8 dBm + Tune-up Tolerance + Gain = 12.1 dBm = 16.2 mW

11.4 SAR Test Exclusion Calculation

The exemption limit at 15 mm is 32 mW. The total power of the EUT is 16.2 mW.

16.2 mW ≤ 32.0 mW.

11.5 Result

The EUT is exempt from routine SAR testing at ≥20 mm as 16.2 mW is less than 32.0 mW.

12 ISED SAR EXEMPTION – BLUETOOTH CLASSIC

12.1 SAR Exemption Limit

Frequency (MHz)	≤ 5 mm (mW)	10 mm (mW)	15 mm (mW)	20 mm (mW)	25 mm (mW)	30 mm (mW)	35 mm (mW)	40 mm (mW)	45 mm (mW)	> 50 mm (mW)
≤ 300	45	116	139	163	189	216	246	280	319	362
450	32	71	87	104	124	147	175	208	248	296
835	21	32	41	54	72	96	129	172	228	298
1900	6	10	18	33	57	92	138	194	257	323
2450	3	7	16	32	56	89	128	170	209	245
3500	2	6	15	29	50	72	94	114	134	158
5800	1	5	13	23	32	41	54	74	102	128

Power Limits for exemption from SAR evaluation RSS-102

12.2 Distance

≥15 mm

12.3 Power Calculation

Max Power of Channel = 7.7 dBm (1DH5, channel 39)

Tune-up Tolerance = 1.00 dB

Antenna Gain = 3.3 dBi

Total Power = 7.7 dBm + Tune-up Tolerance + Gain = 12.0 dBm = 15.8 mW

12.4 SAR Test Exclusion Calculation

The exemption limit at 15 mm is 16 mW. The total power of the EUT is 15.8 mW.

15.8 mW ≤ 16.0 mW.

12.5 Result

The EUT is exempt from routine SAR testing at ≥15 mm as 15.8 mW is less than 16.0 mW.

13 ISED RF EXPOSURE CALCULATION – 5GHZ WLAN

13.1 RF field strength and power density limits for devices used by the general public

Frequency range (MHz)	Electric field (V_{RMS}/m)	Magnetic field (A_{RMS}/m)	Power density (W/m^2)	Reference period (minutes)
10-20	27.46	0.0728	2	6
20-48	$58.07 / f^{0.25}$	$0.1540 / f^{0.25}$	$8.944 / f^{0.5}$	6
48-300	22.06	0.05852	1.291	6
300-6000	$3.142\ f^{0.3417}$	$0.008335\ f^{0.3417}$	$0.02619\ f^{0.6834}$	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	$616000/f^{1.2}$
150000-300000	$0.158\ f^{0.5}$	$4.21 \times 10^{-4}\ f^{0.5}$	$6.67 \times 10^{-5}\ f$	$616000/f^{1.2}$

Note: f is frequency in MHz.

13.2 Determining power density for antenna (simple far-field model)

$$S_{FF} = \frac{G_{i(\theta,\phi)} P_{in}}{4\pi d^2}$$

IEEE Std C95.3-2021

where

S_{FF} is the far-field power density (W/m^2)

$G_i(\theta , \phi)$ is the far-field antenna gain in direction (θ,ϕ) spherical coordinates (power ratio with respect to isotropic).

P_{in} is the power into the antenna (W)

d is the distance to the antenna (m)

13.3 Distance

≥55 mm

13.4 Power Density Limit

The power density limit at 5600 MHz is 9.54 W/m^2.

13.5 Power Density Calculation

Max Power of Channel = 17.7 dBm (802.11a, OFDM-54, channel 120)

Tune-up Tolerance = 1.00 dB

Antenna Gain = 4.2 dBi

Total Power = 17.7 dBm + Tune-up Tolerance + Gain = 22.9 dBm = 195.0 mW

$$S = \frac{0.195W}{4\pi(0.055)^2}$$

$$S = 5.13\ W/m^2$$

13.6 Result

The power density limit is 9.54 W/m^2, and the calculated power density at 55mm is 5.13 W/m^2.

The EUT meet the Power Density Requirement for devices used by the general public at a separation distance of 55 mm.

14 FCC MPE CALCULATION – SIMULTANEOUS TX

14.1 Information

The SONA NX611C is capable of transmitting Bluetooth Classic and Bluetooth Low Energy Simultaneously with 5GHz WLAN.

14.2 MPE Limit

(II) LIMITS FOR GENERAL POPULATION/UNCONTROLLED EXPOSURE

0.3-1.34	614	1.63	*(100)	<30
1.34-30	824/f	2.19/f	*(180/f^2)	<30
30-300	27.5	0.073	0.2	<30
300-1,500			f/1500	<30
1,500-100,000			1.0	<30

*f = frequency in MHz. * = Plane-wave equivalent power density.*

eCFR 1.1310

14.3 Determining power density for antenna (simple far-field model)

$$S_{FF} = \frac{G_{i(\theta,\phi)} P_{in}}{4\pi d^2}$$

IEEE Std C95.3-2021

where

S_{FF} is the far-field power density (W/m^2)

$G_i(\theta , \phi)$ is the far-field antenna gain in direction (θ,ϕ) spherical coordinates (power ratio with respect to isotropic).

P_{in} is the power into the antenna (W)

d is the distance to the antenna (m)

14.4 Distance

≥55 mm

14.5 Power Density Limit

The power density limit from 1,500 – 100,000 MHz is 1mw/cm^2.

14.6 Power Density Calculation 5GHz WLAN

Max Power of Channel = 17.7 dBm (802.11a, OFDM-54, channel 120)

Tune-up Tolerance = 1.00 dB

Antenna Gain = 4.2 dBi

Total Power = 17.7 dBm + Tune-up Tolerance + Gain = 22.9 dBm = 195.0 mW

$$S = \frac{0.195W}{4\pi(0.055)^2}$$

$$S = 5.13\ W/m^2\ = 0.51\ mW/cm^2$$

14.7 Power Density Calculation BLE

Max Power of Channel = 7.8 dBm (125k, channel 19)

Tune-up Tolerance = 1.00 dB

Antenna Gain = 3.3 dBi

Total Power = 7.8 dBm + Tune-up Tolerance + Gain = 12.1 dBm = 16.2 mW

$$S = \frac{0.0162W}{4\pi(0.055)^2}$$

$$S = 0.43\ W/m^2 = 0.04\ mW/cm^2$$

14.8 Power Density Calculation Bluetooth Classic

Max Power of Channel = 7.7 dBm (1DH5, channel 39)

Tune-up Tolerance = 1.00 dB

Antenna Gain = 3.3 dBi

Total Power = 7.7 dBm + Tune-up Tolerance + Gain = 12.0 dBm = 15.8 mW

$$S = \frac{0.0158W}{4\pi(0.055)^2}$$

$$S = 0.42\ W/m^2 = 0.04\ mW/cm^2$$

14.9 MPE Ratio

MPE ratio = (calculated power density) / (power density limit)

5GHz WLAN = 0.51

BLE = 0.04

BT Classic = 0.04

The sum of the power density ratios must be less than 1 to be exempt from SAR testing.

5GHz WLAN + BLE = 0.55
5GHz WLAN + BT Classic = 0.55

14.10 Result

The EUT is exempt from routine SAR testing at ≥55 mm as the MPE ratio is ≤ 1.0

15 ISED MPE CALCULATION – SIMULTANEOUS TX

15.1 Information

The SONA NX611C is capable of transmitting Bluetooth Classic and Bluetooth Low Energy Simultaneously with 5GHz WLAN.

15.2 RF field strength and power density limits for devices used by the general public

Frequency range (MHz)	Electric field (V_{RMS}/m)	Magnetic field (A_{RMS}/m)	Power density (W/m^2)	Reference period (minutes)
10-20	27.46	0.0728	2	6
20-48	$58.07 / f^{0.25}$	$0.1540 / f^{0.25}$	$8.944 / f^{0.5}$	6
48-300	22.06	0.05852	1.291	6
300-6000	$3.142\ f^{0.3417}$	$0.008335\ f^{0.3417}$	$0.02619\ f^{0.6834}$	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	$616000/f^{1.2}$
150000-300000	$0.158\ f^{0.5}$	$4.21 \times 10^{-4}\ f^{0.5}$	$6.67 \times 10^{-5}\ f$	$616000/f^{1.2}$

Note: f is frequency in MHz.

15.3 Determining power density for antenna (simple far-field model)

$$S_{FF} = \frac{G_{i(\theta,\phi)} P_{in}}{4\pi d^2}$$

IEEE Std C95.3-2021

where

S_{FF} is the far-field power density (W/m^2)

$G_i(\theta , \phi)$ is the far-field antenna gain in direction (θ,ϕ) spherical coordinates (power ratio with respect to isotropic).

P_{in} is the power into the antenna (W)

d is the distance to the antenna (m)

15.4 Distance

≥55 mm

15.5 Power Density Limit

The power density limit from 300 – 6000 MHz is $0.02619*f^{0.6834}$ where f is the frequency in MHz.

15.6 Power Density Calculation 5GHz WLAN

Max Power of Channel = 17.7 dBm (802.11a, OFDM-54, channel 120)

Tune-up Tolerance = 1.00 dB

Antenna Gain = 4.2 dBi

Total Power = 17.7 dBm + Tune-up Tolerance + Gain = 22.9 dBm = 195.0 mW

$$S = \frac{0.195W}{4\pi(0.055)^2}$$

$$S = 5.13\ W/m^2$$

$$Limit = 9.54\ W/m^2$$

$$Ratio = \frac{5.13}{9.54} = 0.54$$

15.7 Power Density Calculation BLE

Max Power of Channel = 7.8 dBm (125k, channel 19)

Tune-up Tolerance = 1.00 dB

Antenna Gain = 3.3 dBi

Total Power = 7.8 dBm + Tune-up Tolerance + Gain = 12.1 dBm = 16.2 mW

$$S = \frac{0.0162W}{4\pi(0.055)^2}$$

$$S = 0.43\ W/m^2$$

$$Limit = 5.41\ W/m^2$$

$$Ratio = \frac{0.43}{5.41} = 0.08$$

15.8 Power Density Calculation Bluetooth Classic

Max Power of Channel = 7.7 dBm (1DH5, channel 39)

Tune-up Tolerance = 1.00 dB

Antenna Gain = 3.3 dBi

Total Power = 7.7 dBm + Tune-up Tolerance + Gain = 12.0 dBm = 15.8 mW

$$S = \frac{0.0158W}{4\pi(0.055)^2}$$

$$S = 0.42\ W/m^2$$

$$Limit = 5.41\ W/m^2$$

$$Ratio = \frac{0.42}{5.41} = 0.08$$

15.9 MPE Ratio

MPE ratio = (calculated power density) / (power density limit)

5GHz WLAN = 0.54

BLE = 0.08

BT Classic = 0.08

The sum of the power density ratios must be less than 1 to comply with Power Density Exposure Limits.

5GHz WLAN + BLE = 0.62
5GHz WLAN + BT Classic = 0.62

15.10 Result

The EUT complies with Power Density Exposure Limits at ≥55 mm as the MPE ratio is ≤ 1.0

16 REVISION HISTORY

Version	Date	Notes	Person
0	01/28/2025	Initial Draft	Dylan Rosenfeldt
1	02/11/2025	Revised Draft	Dylan Rosenfeldt
2	02/12/2025	Final Draft	Dylan Rosenfeldt
3	02/14/2025	Updated Antenna and calculations	Dylan Rosenfeldt

END OF REPORT