

Test Report TR3768-165-ETSI-300-328-BLE

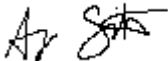
Equipment Under Test:	SONA NX611 M.2 2230, 2 MHF
Requirement(s):	ETSI EN 300 328 AS/NZS 4268
Test Date(s):	04/30/2024-06/04/2024
Prepared for:	Ezurio Attn: Brian Petted W66 N220 Commerce Ct. Cedarburg, WI 53012

Report Issued by: Adam Alger, Manager EMC Laboratory

Signature: 

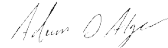
Date: 2/13/2025

Report Reviewed by: Anthony Smith, EMC Engineering Specialist

Signature: 

Date: 02/12/2025

Report Constructed by: Adam Alger, Manager EMC Laboratory

Signature: 

Date: 02/10/2025

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Company: Ezurio	Page 1 of 42	Name:SONA NX611 M.2 2230, 2 MHF
Report: TR3768-165-ETSI-300-328-BLE		Model:SONA NX611M
Job: C-3768		Serial:00047

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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

Company: Ezurio	Page 3 of 42	Name:SONA NX611 M.2 2230, 2 MHF
Report: TR3768-165-ETSI-300-328-BLE		Model:SONA NX611M
Job: C-3768		Serial:00047

1 TEST REPORT SUMMARY

During **04/30/2024-06/04/2024** the Equipment Under Test (EUT), **SONA NX611 M.2 2230, 2 MHF**, as provided by **Ezurio** was tested to the following requirements:

ETSI EN 300 328 | AS/NZS 4268 – DTS - BLE

Requirements	Description	Method	Specification	Compliant
4.3.2.2	RF Output Power	5.4.2.2.1.2	≤20 dBm	Yes
4.3.2.3	Power Spectral Density	5.4.3	10 dBm per MHz	Yes
4.3.2.7	Occupied Channel Bandwidth	5.4.7	2400-2483.5 MHz	Yes
4.3.2.8	Transmitter Unwanted Emissions in the Out-Of-Band Domain	5.4.8	2400 MHz - 2BW – 2483.5 MHz +2BW	Yes
4.3.2.9	Transmitter Unwanted Emissions in the Spurious Domain	5.4.9	30-12750 MHz	Yes
4.3.2.10	Receiver Spurious Emissions	5.4.10	30-12750 MHz	Yes
4.3.2.11	Receiver Blocking (Category 2)	5.4.11	PER ≤ 10%	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	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	Module, SONA NX611 M.2 2230, 2 MHF
Part Number	453-00165
Serial Number	00047
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

Company: Ezurio	Page 5 of 42	Name:SONA NX611 M.2 2230, 2 MHF
Report: TR3768-165-ETSI-300-328-BLE		Model:SONA NX611M
Job: C-3768		Serial:00047

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

2.8 Test Channels

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

2.9 EUT Power Setting

Data Rate	Power Setting
125 kbps	6
500 kbps	6
1 Mbps	6
2 Mbps	6

3 WORST CASE TEST RESULTS SUMMARY

Requirement	Radio	Channel and Data Rate	Frequency (MHz)	Measurement	Limit	Margin
4.3.2.2 RF Output Power	BLE	0 1 Mbps	-	9.4 dBm	20.0 dBm	10.6 dB
4.3.2.3 PSD	BLE	19 1 Mbps	-	9.0 dBm	10.0 dBm	1.0 dB
4.3.2.7 OCBW	BLE	39 2 Mbps	-	2069 kHz	20 MHz	-
4.3.2.8 Tx OOB Emission	BLE	0 1 Mbps	2399.5	-51.2 dBm	-10 dBm	41.2 dB
	BLE	39 1 Mbps	2484.0	-57.2 dBm	-10.0 dBm	47.2 dB
4.3.2.9 Tx Spurious	BLE	0 1 Mbps	2397.0	-59.4	-30.0	29.4
4.3.2.10 Rx Spurious	No emission present					

4 REFERENCES

Publication	Edition	Date
ETSI EN 300 328	2.2.2	2019
AS/NZS 4268	-	2012

5 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

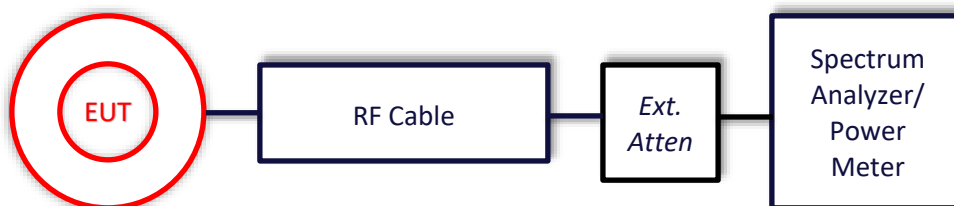
Parameter	ETSI U.C. \pm	U.C. \pm
Radio Frequency, from F0	1×10^{-7}	0.55×10^{-7}
Occupied Channel Bandwidth	5 %	2 %
RF conducted Power (Power Meter)	1.5 dB	1.2 dB
RF conducted emissions (Spectrum Analyzer)	3.0 dB	1.7 dB
All emissions, radiated	6.0 dB	5.3 dB
Temperature	1° C	0.65° C
Humidity	5 %	2.9 %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

6 TEST DATA

6.1 Antenna Port Conducted Emissions

Description of Measurement	<p>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.</p> <p>The cable and attenuator factors are loaded into the analyzer or power meter allowing for direct measurement readings without the need for further corrections.</p>
Example Calculations	<p>Measurement (dBm) + Cable factor (dB) + External Attenuator (dB) = Corrected Reading (dBm)</p> <p>Margin (dB) = Limit (dBm) – Corrected Reading (dBm)</p>

Block Diagram



6.1.1 RF Output Power

Operator	Dylan Rosenfeldt	QA	Adam Hauke
Temperature	21.7°C	R.H. %	48.80%
Test Date	05/13/2024	Location	Conducted RF Bench
Requirement	4.3.2.2	Method	5.4.2.2.1.2

Limits: The RF output power for non-FHSS equipment shall be equal to or less than 20 dBm.

Test Parameters

Frequency	2400-2483.5 MHz	Setup	Antenna Port
Operating Temperature	-40.0°C-85.0°C	Sample Speed	1 MS/s

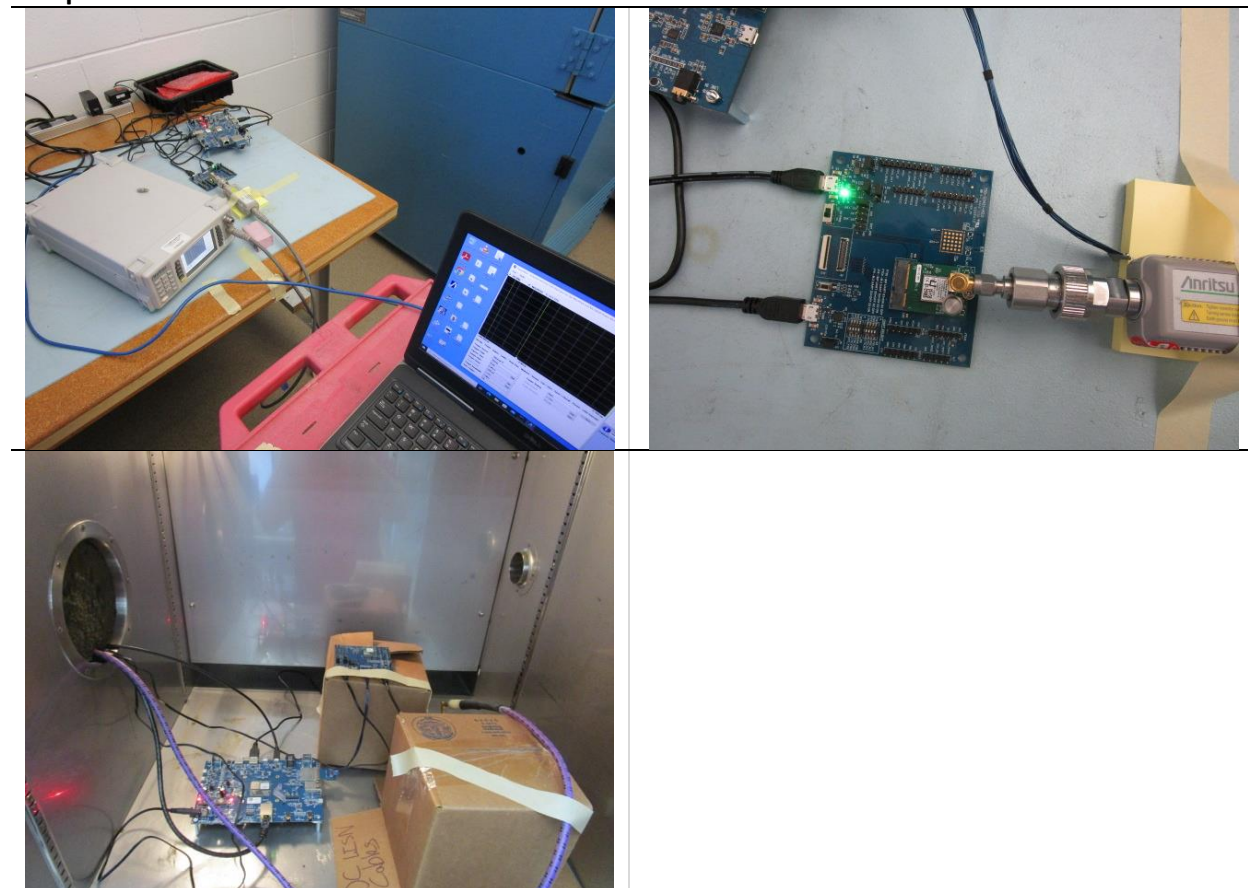
Instrumentation

Asset #	Description	Manufacturer	Model #	Serial #	Date	Due Date	Status
EE 960090	Meter - RF Power	Anritsu	ML2495A	1335006	4/13/2024	4/13/2025	Active Calibration
EE 960091	Sensor - RF Power	Anritsu	MA2491A	1249277	4/13/2024	4/13/2025	Active Calibration

EUT Parameters

Input Power	120 VAC @ 60 Hz	Mode	BLE Tx
Frequency	2400-2483.5 MHz	Channel	See 2.8

Setup Photos



Normal Operating Temperature

Rate	Channel	Avg Output Power (dBm)	EIRP (dbm)	Limit (dBm)	Margin (dB)
1 Mbps	0	6.6	9.1	20.0	10.9
	19	6.4	8.9	20.0	11.1
	39	6.3	8.8	20.0	11.2
2 Mbps	0	6.6	9.1	20.0	10.9
	19	6.4	8.9	20.0	11.1
	39	6.3	8.8	20.0	11.2
500 kbps	0	6.6	9.1	20.0	10.9
	19	6.4	8.9	20.0	11.1
	39	6.3	8.8	20.0	11.2
125 kbps	0	6.6	9.1	20.0	10.9
	19	6.4	8.9	20.0	11.1
	39	6.3	8.8	20.0	11.2

+85°C Temperature

Rate	Channel	Avg Output Power (dBm)	EIRP (dbm)	Limit (dBm)	Margin (dB)
1 Mbps	0	6.2	8.7	20.0	11.3
	19	6.0	8.5	20.0	11.5
	39	5.8	8.3	20.0	11.7
2 Mbps	0	6.2	8.7	20.0	11.3
	19	6.0	8.5	20.0	11.5
	39	5.8	8.3	20.0	11.7
500 kbps	0	6.1	8.6	20.0	11.4
	19	6.0	8.5	20.0	11.5
	39	5.8	8.3	20.0	11.7
125 kbps	0	6.2	8.7	20.0	11.3
	19	6.0	8.5	20.0	11.5
	39	5.8	8.3	20.0	11.7

-40°C Temperature

Rate	Channel	Avg Output Power (dBm)	EIRP (dbm)	Limit (dBm)	Margin (dB)
1 Mbps	0	6.9	9.4	20.0	10.6
	19	6.7	9.2	20.0	10.8
	39	6.4	8.9	20.0	11.1
2 Mbps	0	6.9	9.4	20.0	10.6
	19	6.7	9.2	20.0	10.8
	39	6.4	8.9	20.0	11.1
500 kbps	0	6.9	9.4	20.0	10.6
	19	6.7	9.2	20.0	10.8
	39	6.4	8.9	20.0	11.1
125 kbps	0	6.9	9.4	20.0	10.6
	19	6.7	9.2	20.0	10.8
	39	6.4	8.9	20.0	11.1

6.1.2 Power Spectral Density

Operator	Dylan Rosenfeldt	QA	Adam Hauke
Temperature	22.3°C	R.H. %	58.80%
Test Date	06/04/2024	Location	Conducted RF Bench
Requirement	4.3.2.3	Method	5.4.3.2.1

Limit: The maximum Power Spectral Density for non-FHSS equipment is 10 dBm per MHz

Test Parameters

Frequency	2400-2483.5 MHz	Setup	Antenna Port
RBW	10 kHz	VBW	30 kHz
Detector(s)	RMS	Settings	Max Hold
Sweep Points	10000		

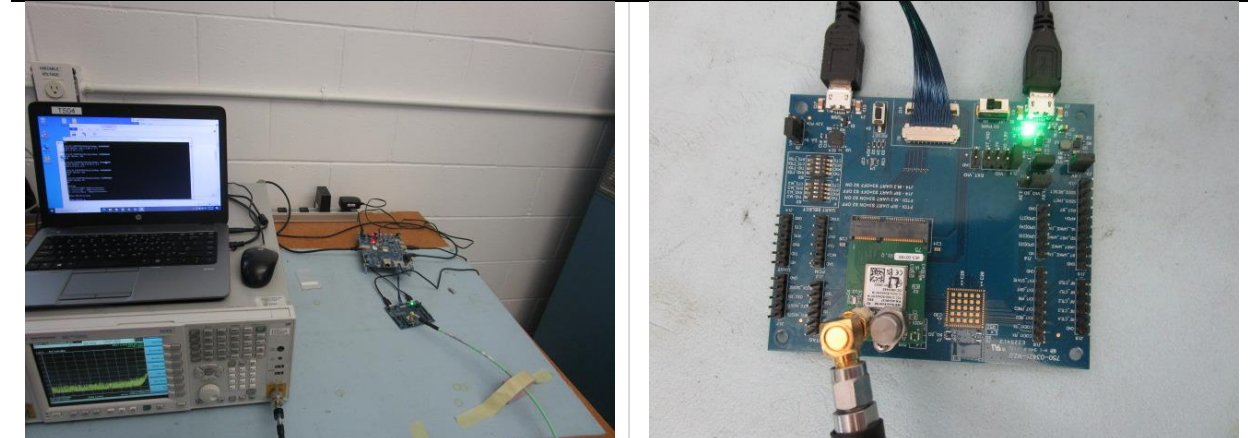
Instrumentation

Asset #	Description	Manufacturer	Model #	Serial #	Date	Due Date	Status
AA 960173	Cable	A.H. Systems, Inc.	SAC-26G-1	388	6/13/2023	6/12/2024	Active Verification
EE 960087	Analyzer - Spectrum	Agilent	N9010A	MY53400296	4/11/2024	4/11/2025	Active Calibration

EUT Parameters

Input Power	120 VAC @ 60 Hz	Mode	BLE Tx
Frequency	2400-2483.5 MHz	Channel	See 2.8

Setup Photos



Measurements

Rate	Channel	PSD (dBm)	Limit (dBm)	Margin (dB)
1 Mbps	0	9.0	10.0	1.0
	19	8.8	10.0	1.2
	39	8.7	10.0	1.3
2 Mbps	0	7.9	10.0	2.1
	19	7.7	10.0	2.3
	39	7.6	10.0	2.4
500 kbps	0	9.0	10.0	1.0
	19	8.8	10.0	1.2
	39	8.7	10.0	1.3
125 kbps	0	9.0	10.0	1.0
	19	8.8	10.0	1.2
	39	8.7	10.0	1.3

6.1.3 Occupied Channel Bandwidth

Operator	Dylan Rosenfeldt	QA	Adam Hauke
Temperature	21.8°C	R.H. %	44.80%
Test Date	05/02/2024	Location	Conducted RF Bench
Requirement	4.3.2.7	Method	5.4.7

Limits: The Occupied Channel Bandwidth shall be within the band 2400 MHz – 2483.5 MHz

In addition, for non-adaptive FHSS equipment with e.i.r.p. greater than 10 dBm, the Occupied Channel Bandwidth shall be equal to or less than 20 MHz.

Test Parameters

Frequency	2400-2483.5 MHz	Detector(s)	Occupied Bandwidth
RBW	43 kHz	VBW	130 kHz

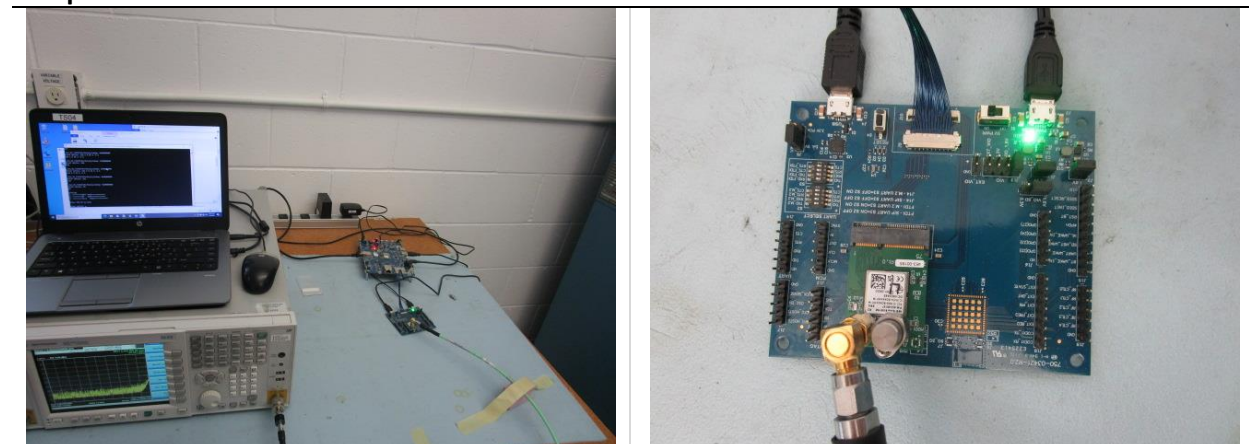
Instrumentation

Asset #	Description	Manufacturer	Model #	Serial #	Date	Due Date	Status
AA 960173	Cable	A.H. Systems, Inc.	SAC-26G-1	388	6/13/2023	6/12/2024	Active Verification
EE 960085	Analyzer - EMI Receiver	Agilent	N9038A	MY51210148	4/27/2024	4/27/2025	Active Calibration

EUT Parameters

Input Power	120 VAC @ 60 Hz	Mode	BLE Tx
Frequency	2400-2483.5 MHz	Channel	See 2.8

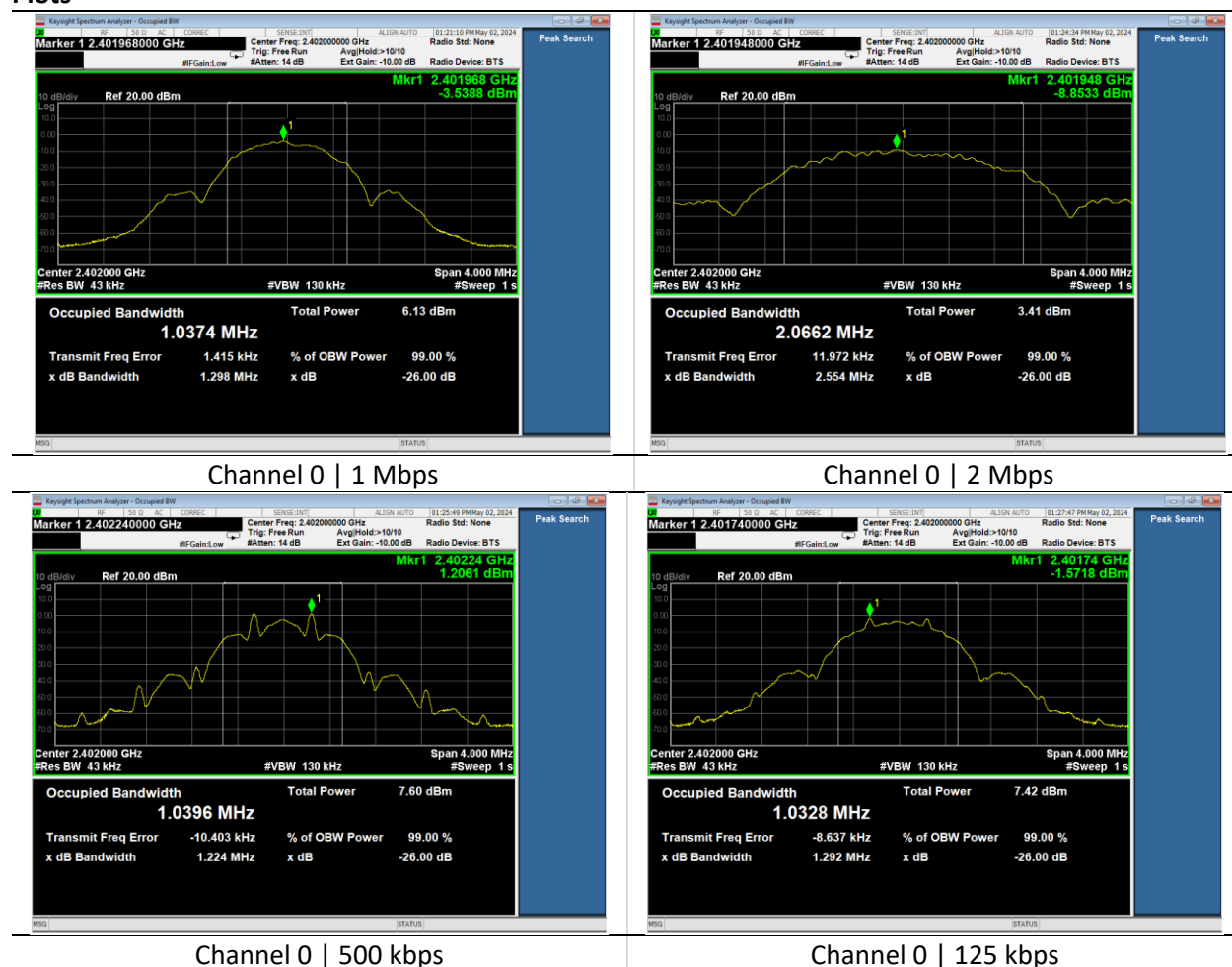
Setup Photos

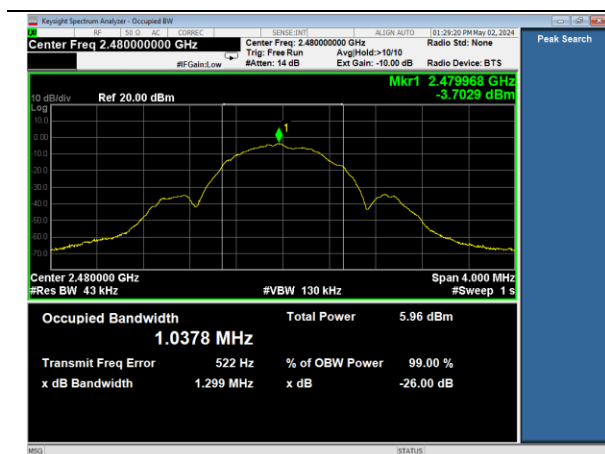


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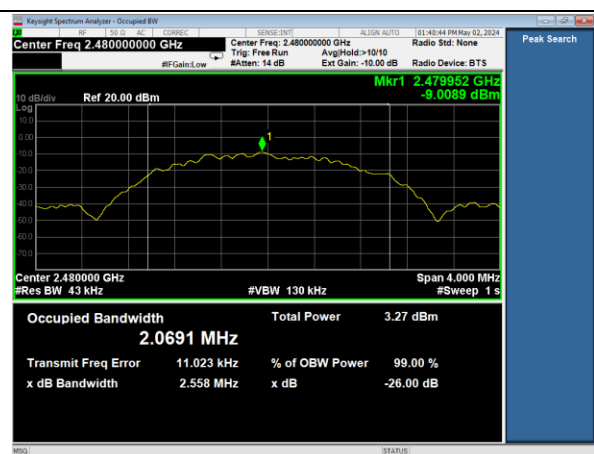
Channel	Rate	Occupied Channel Bandwidth (kHz)
0	1 Mbps	1037
	2 Mbps	2066
	500 kbps	1040
	125 kbps	1032
39	1 Mbps	1038
	2 Mbps	2069
	500 kbps	1039
	125 kbps	1033

Plots





Channel 39 | 1 Mbps



Channel 39 | 2 Mbps



Channel 39 | 500 kbps



Channel 39 | 125 kbps

6.1.4 Transmitter unwanted emissions in the out of band domain

Operator	Dylan Rosenfeldt	QA	Adam Hauke
Temperature	21.8°C	R.H. %	44.80%
Test Date	05/02/2024	Location	Conducted RF Bench
Requirement	4.3.2.8	Method	5.4.8

Limits:

Frequency (MHz)	Limit (dBμV/m)
2400 MHz - 2BW – 2400 MHz - BW	-20 dBm/ MHz e.i.r.p.
2400 MHz - BW – 2400 MHz	-10 dBm/ MHz e.i.r.p.
2400 MHz + BW – 2400 MHz	-10 dBm/ MHz e.i.r.p.
2400 MHz + 2BW – 2400 MHz + BW	-20 dBm/ MHz e.i.r.p.

Test Parameters

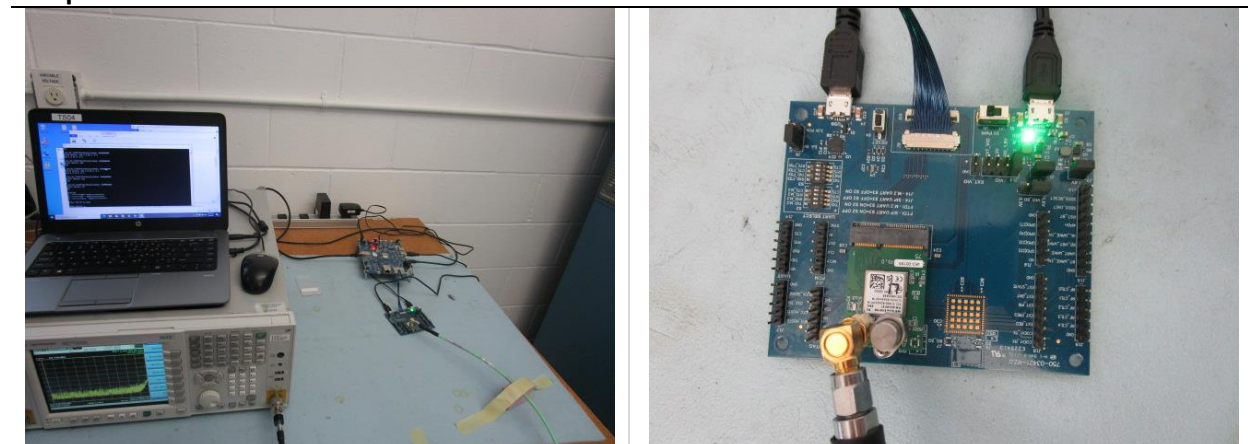
Frequency	2395-2488.5 MHz	Setup	Antenna Port
RBW	1 MHz	VBW	3 MHz
Measurement Mode	Time Domain Power		

Instrumentation

Asset #	Description	Manufacturer	Model #	Serial #	Date	Due Date	Status
AA 960173	Cable	A.H. Systems, Inc.	SAC-26G-1	388	6/13/2023	6/12/2024	Active Verification
EE 960085	Analyzer - EMI Receiver	Agilent	N9038A	MY51210148	4/27/2024	4/27/2025	Active Calibration

Input Power	120 VAC @ 60 Hz	Mode	BLE Tx
Frequency	2400-2483.5 MHz	Channel	See 2.8

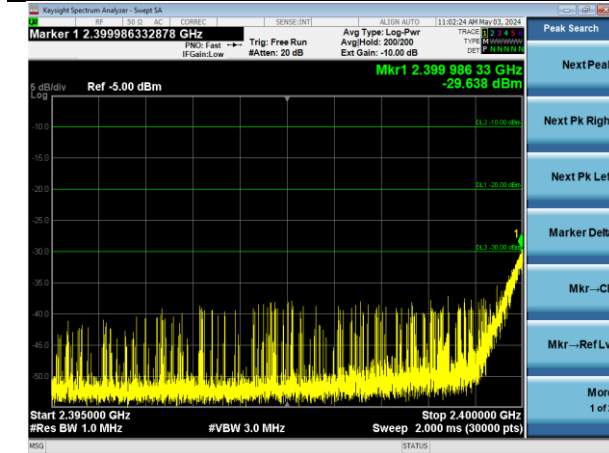
Setup Photos



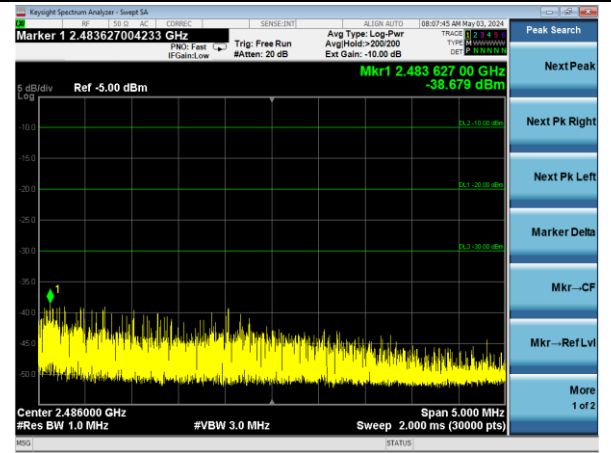
Measurements

Rate	Channel	Frequency (MHz)	TDP EIRP Measurement (dBm)	Limit (dBm)	Margin (dB)
1 Mbps	0	2399.5	-51.2	-10.0	41.2
	39	2484.0	-57.2	-10.0	47.2
500 kbps	0	2399.5	-52.5	-10.0	42.5
	39	2484.0	-58.3	-10.0	48.3
125 kbps	0	2399.5	-52.0	-10.0	42.0
	39	2484.0	-58.1	-10.0	48.1

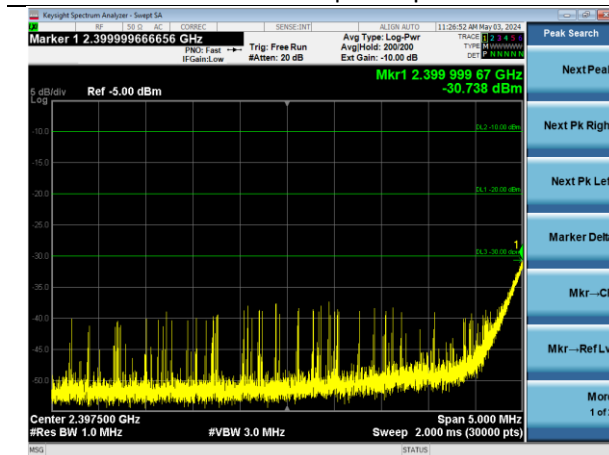
Plots



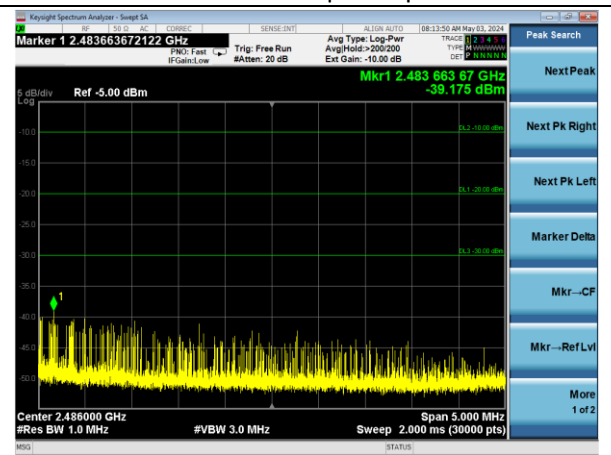
Channel 0 | 1 Mbps



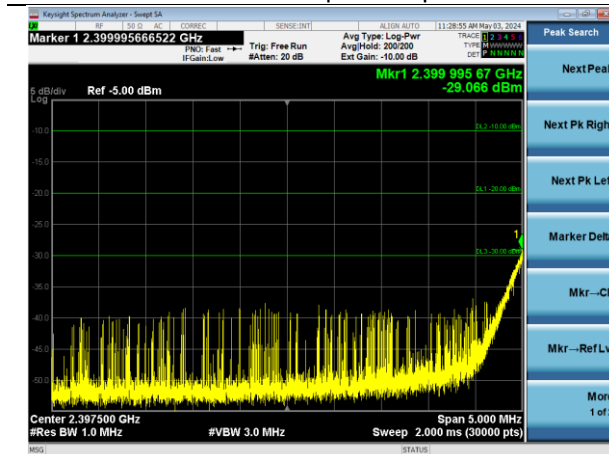
Channel 39 | 1 Mbps



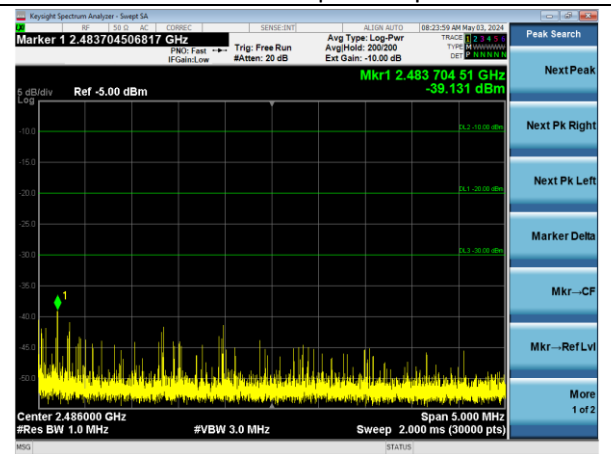
Channel 0 | 500 kbps



Channel 39 | 500 kbps



Channel 0 | 125 kbps



Channel 39 | 125 kbps

6.1.5 Transmitter unwanted emissions in the spurious domain

Operator	Dylan Rosenfeldt	QA	Anthony Smith
Temperature	21.6°C	R.H. %	45.80%
Test Date	05/07/2024	Location	Conducted RF Bench
Requirement	4.3.2.9	Method	5.4.9

Limits:

Frequency (MHz)	Maximum Power	Bandwidth
30-47	-36 dBm	100 kHz
47-74	-54 dBm	100 kHz
74-87.5	-36 dBm	100 kHz
87.5-118	-54 dBm	100 kHz
118-174	-36 dBm	100 kHz
174-230	-54 dBm	100 kHz
230-470	-36 dBm	100 kHz
470-694	-54 dBm	100 kHz
694-1000	-36 dBm	100 kHz
1000-12750	-30 dBm	1 MHz

Test Parameters

Frequency	30-12750 MHz	Setup	Antenna Port
RBW	<1000 MHz – 100 kHz >1000 MHz – 1 MHz	VBW	<1000 MHz – 300 kHz >1000 MHz – 3 MHz
Measurement Mode	Time Domain Power		

Instrumentation

Asset #	Description	Manufacturer	Model #	Serial #	Date	Due Date	Status
AA 960173	Cable	A.H. Systems, Inc.	SAC-26G-1	388	6/13/2023	6/12/2024	Active Verification
EE 960085	Analyzer - EMI Receiver	Agilent	N9038A	MY51210148	4/27/2024	4/27/2025	Active Calibration

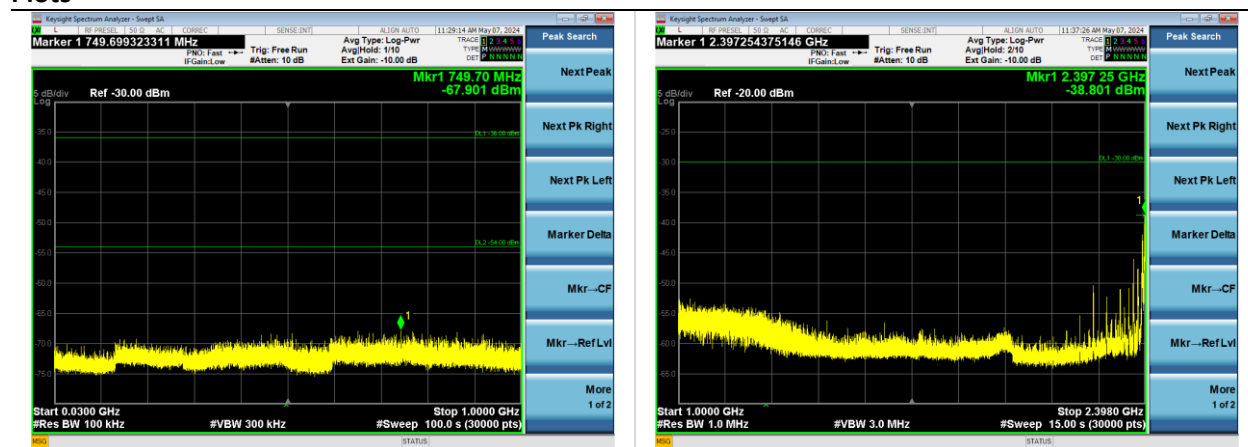
EUT Parameters

Input Power	120 VAC @ 60 Hz	Mode	BLE Tx
Frequency	2402-2480 MHz	Channel	0, 39

Measurements

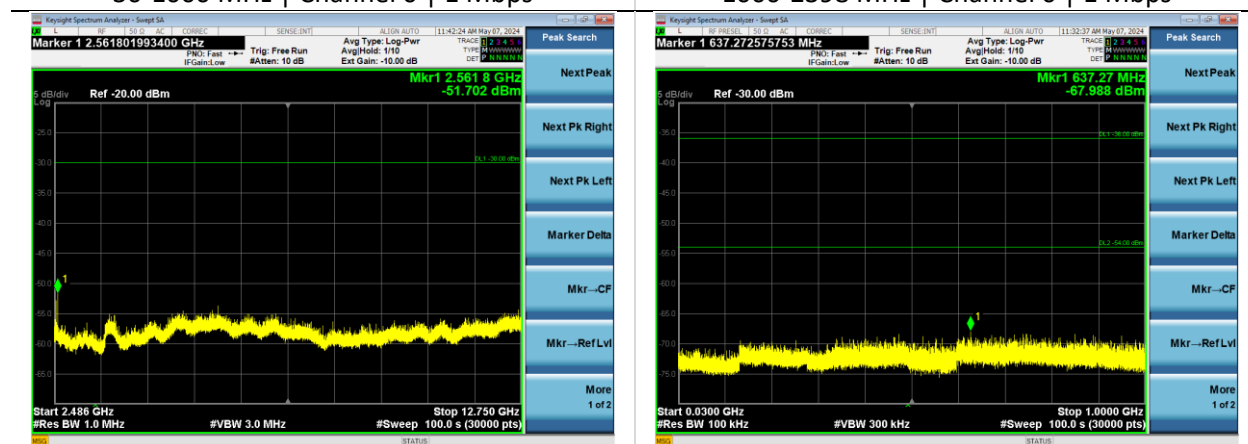
Channel	Rate	Frequency (MHz)	Measurement (dBm)	EIRP (dBm)	Limit (dBm)	Margin (dB)
0	1 Mbps	2397.0	-61.9	-59.4	-30.0	29.4

Plots



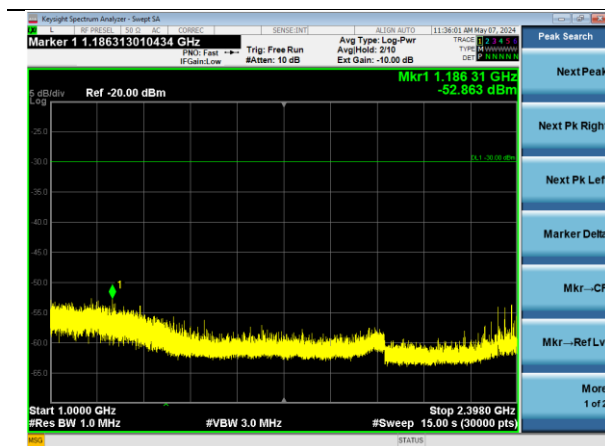
30-1000 MHz | Channel 0 | 1 Mbps

1000-2398 MHz | Channel 0 | 1 Mbps

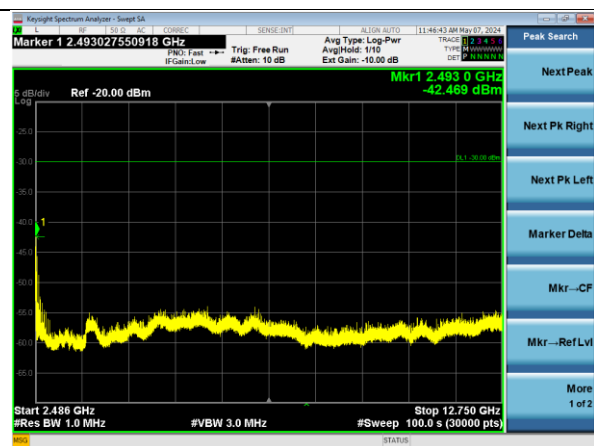


2485.5-12750 MHz | Channel 0 | 1 Mbps

30-1000 MHz | Channel 39 | 1 Mbps



1000-2398 MHz | Channel 39 | 1 Mbps



2485.5-12750 MHz | Channel 39 | 1 Mbps

6.1.6 Receiver Spurious Domain

Operator	Dylan Rosenfeldt	QA	Anthony Smith
Temperature	21.8°C	R.H. %	31.40%
Test Date	04/25/2024	Location	Conducted RF Bench
Requirement	4.3.2.10	Method	5.4.10

Limits:

Frequency (MHz)	Maximum Power	Bandwidth
30-1000	-57 dBm	100 kHz
1000-12750	-47 dBm	1 MHz

Test Parameters

Frequency	30-12750 MHz	Setup	Antenna Port
RBW	<1000 MHz – 100 kHz >1000 MHz – 1 MHz	VBW	<1000 MHz – 300 kHz >1000 MHz – 3 MHz
Measurement Mode	Time Domain Power		

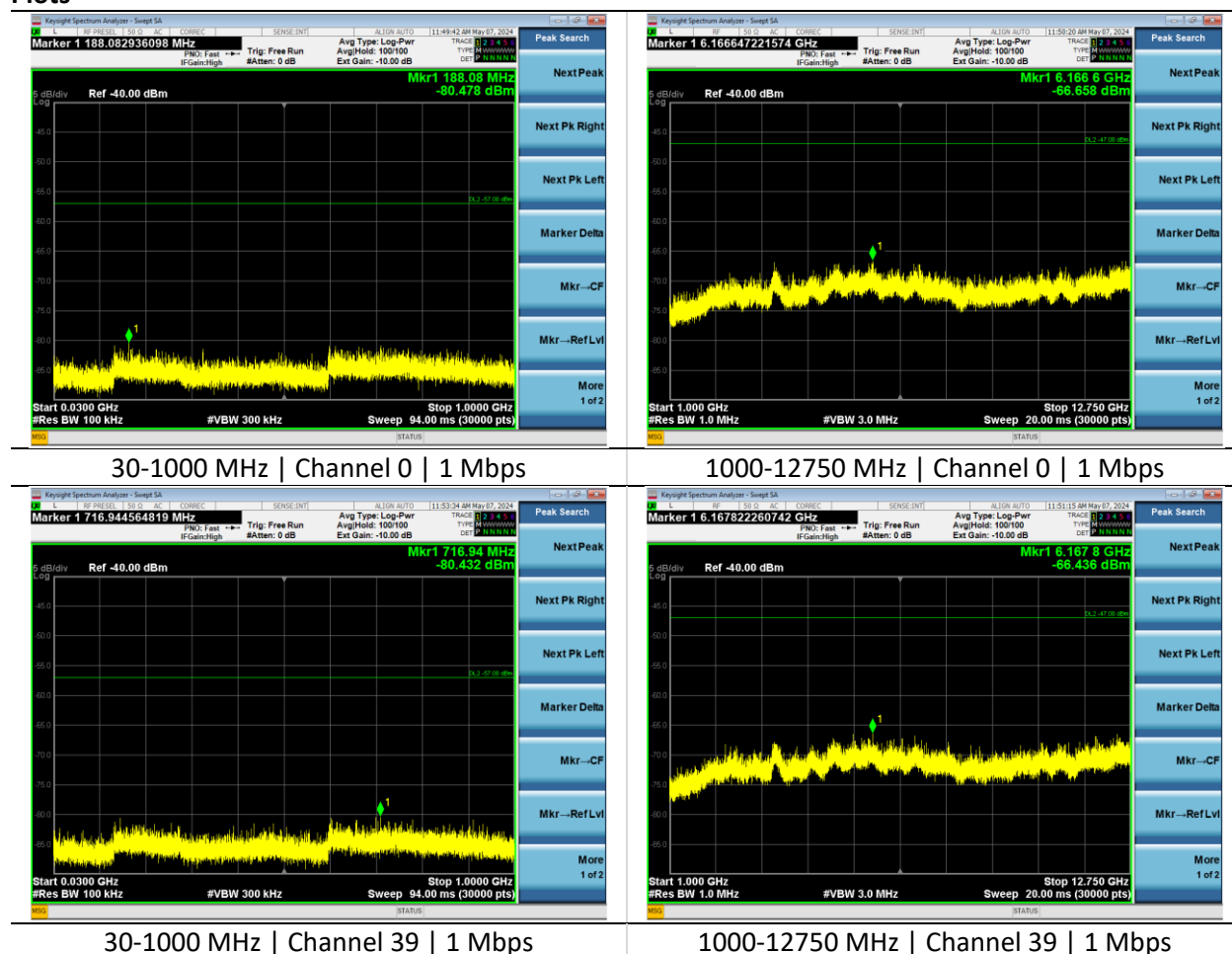
Instrumentation

Asset #	Description	Manufacturer	Model #	Serial #	Date	Due Date	Status
AA 960173	Cable	A.H. Systems, Inc.	SAC-26G-1	388	6/13/2023	6/12/2024	Active Verification
EE 960085	Analyzer - EMI Receiver	Agilent	N9038A	MY51210148	4/27/2024	4/27/2025	Active Calibration

EUT Parameters

Input Power	120 VAC @ 60 Hz	Mode	BLE Rx
Frequency	2402-2480 MHz	Channel	0, 39

Plots



6.1.7 Receiver Blocking

Operator	Anthony Smith	QA	Adam Alger
Temperature	21.8°C	R.H. %	54.0%
Test Date	05/29/2024	Location	Conducted RF Bench
Requirement	4.3.2.11	Method	5.4.11

Table 15: Receiver Blocking parameters receiver Category 2 equipment

Wanted signal mean power from companion device (dBm) (see notes 1 and 3)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 3)	Type of blocking signal
(-139 dBm + $10 \times \log_{10}(\text{OCBW}) + 10 \text{ dB}$) or (-74 dBm + 10 dB) whichever is less (see note 2)	2 380 2 504 2 300 2 584	-34	CW
<p>NOTE 1: OCBW is in Hz.</p> <p>NOTE 2: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to $P_{\min} + 26 \text{ dB}$ where P_{\min} is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.</p> <p>NOTE 3: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2.</p>			

Test Parameters

Receiver Level	2	Performance Criteria	10% PER
Signal Value	-68.9 dBm	Signal Power Companion Device	-71.4 dBm
Blocking Signa Frequencies	2380, 2504, 2300, 2584 MHz		

Instrumentation

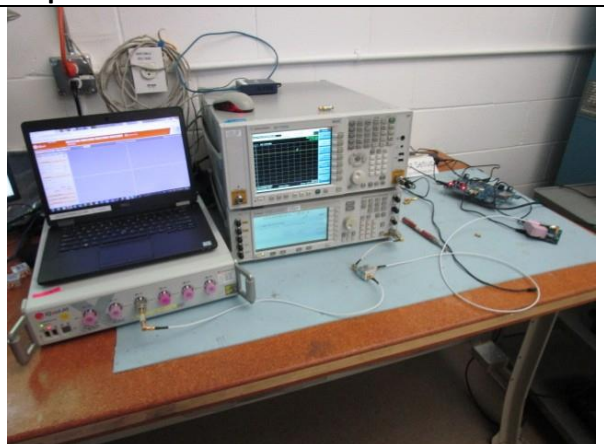
Asset #	Description	Manufacturer	Model #	Serial #	Date	Due Date	Status
EE 960087	Analyzer - Spectrum	Agilent	N9010A	MY53400296	4/11/2024	4/11/2025	Active Calibration
EE 960184	RF Splitter/Combiner	mini-circuits	ZFSC-2-10G +	S F707601702	12/12/2023	12/12/2024	Active Verification
CC 000314C	Vector Signal Generator	Agilent	E4438C	US 41469143	9/21/2022	9/20/2024	Active Calibration

Company: Ezurio	Page 29 of 42	Name:SONA NX611 M.2 2230, 2 MHF
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Job: C-3768		Serial:00047

EUT Parameters

Input Power	120 VAC @ 60 Hz	Mode	BLE Tx
Frequency	2402-2480 MHz	Channel	0, 39

Setup Photos



Channel	Rate	2380 MHz	2504 MHz	2300 MHz	2584 MHz	Packets
		PER %				
0	125 kbps	0.0	-	-	-	1000
39	125 kbps	-	0.0	-	-	1000
0	125 kbps	-	-	0.0	-	1000
39	125 kbps	-	-	-	0.0	1000

6.2 Radiated Emissions

Description of Measurement	<p>The frequency spectrum is investigated for intentional and / or unintentional signals emanating from the EUT by use of a standardized test site and measurement antenna.</p> <p>The antenna, cable, pre-amp, and other necessary measurement system correction factors are loaded onto the EMI receiver / spectrum analyzer when the measurements are performed allowing the data to be gathered and reported as corrected values.</p> <p>The maximum emissions from the EUT are determined by turn-table azimuth rotation (360°) and scanning of the measurement antenna. Maximized levels are noted at degree values of azimuth, measurement antenna height, and measurement antenna polarity.</p>
Example Calculations	<p>Measurement (dBμV) + Cable factor (dB) + Other (dB) + Antenna Factor (dB/m) = Corrected Reading (dBμV/m)</p> <p>Margin (dB) = Limit (dBμV/m) - Corrected Reading (dBμV/m)</p> <p>Example at 4000 MHz: Reading = 40 dBμV + 3.4 dB + 0.9 dB + 6.5 dB/m = 50.8 dBμV/m Average Limit = 20 log (500) = 54 dBμV/m Margin = 54 dBμV/m - 50.8 dBμV/m = 3.2 dB</p>

Block Diagram



6.2.1 Transmitter unwanted emissions in the spurious domain

Operator	Mitchell Freund Nicole Sedmak Jon Dilley Zachary Brown	QA	Anthony Smith Adam Alger Adam Hauke Dylan Rosenfeldt
Temperature	23.3°C-25.5°C	R.H. %	36.10%-42.90%
Test Date	04/30/2024-05/13/2024	Location	Chamber 3 Chamber 5
Requirement	4.3.2.9	Method	5.4.9

Limits:

Frequency (MHz)	Maximum Power	Bandwidth
30-47	-36 dBm	100 kHz
47-74	-54 dBm	100 kHz
74-87.5	-36 dBm	100 kHz
87.5-118	-54 dBm	100 kHz
118-174	-36 dBm	100 kHz
174-230	-54 dBm	100 kHz
230-470	-36 dBm	100 kHz
470-694	-54 dBm	100 kHz
694-1000	-36 dBm	100 kHz
1000-12750	-30 dBm	1 MHz

Test Parameters

Frequency	30-12750 MHz	Distance	3 m
Detector(s)	Peak	Table Height	150 cm
RBW	<1000 MHz – 100 kHz >1000 MHz – 1 MHz	VBW	<1000 MHz – 300 kHz >1000 MHz – 3 MHz
Measurement Mode	Time Domain Power		
Note	No emissions within 6 dB of the limit.		

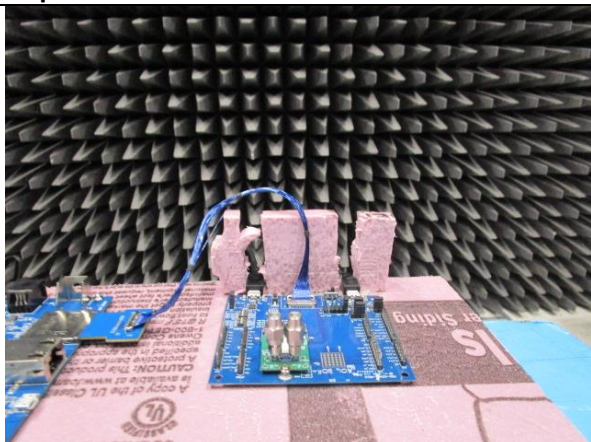
Instrumentation

Asset #	Description	Manufacturer	Model #	Serial #	Date	Due Date	Status
AA 960007	Antenna - Double Ridge Horn	EMCO	3115	9311-4138	8/10/2023	8/10/2024	Active Calibration
AA 960154	Filter - High Pass 2.4 GHz	KWM	HPF-L-14186	7272-02	4/11/2023	4/11/2024	Active Calibration
AA 960163	Antenna - Log Periodic	A.H. Systems, Inc.	SAS-512-2	500	8/10/2023	8/10/2024	Active Calibration
AA 960217	Antenna - Biconical	A.H. Systems, Inc.	SAS-540	852	7/17/2023	7/17/2024	Active Calibration
AA 960221	Cable	A.H. Systems, Inc.	SAC-26G-6	524	6/13/2023	6/13/2024	Active Verification
EE 960085	Analyzer - EMI Receiver	Agilent	N9038A	MY51210148	4/27/2023	4/27/2024	Active Calibration
EE 960203	Analyzer - EMI Receiver	Keysight	N9038A	MY56400072	4/11/2023	4/11/2024	Active Calibration
LSC-300	Cable	Chamber 3 Emissions	-	-	1/5/2024	1/5/2025	Active Verification
LSC-500	Cable	Chamber 5 Emissions	-	-	1/8/2024	1/8/2025	Active Verification

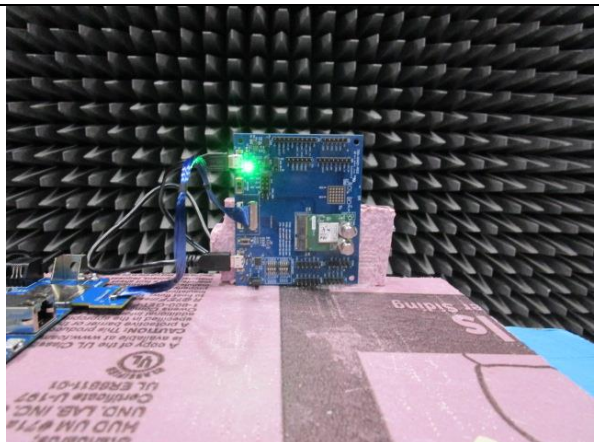
EUT Parameters

Input Power	120 VAC @ 60 Hz	Mode	BLE Tx
EUT	X, Y, Z Plane Orientations Antenna ports terminated with 50 Ω SMA terminators	AE	HP Elitebook 840G1 Ezurio – SOM60 Development Kit
Notes	6000 MHz Emission from auxiliary equipment. Not a function of the EUT.		

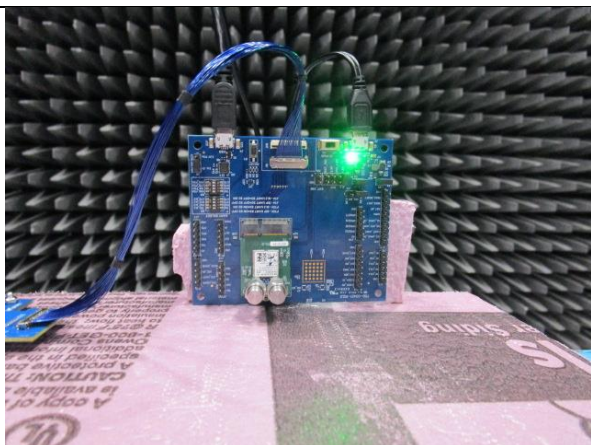
Setup Photos



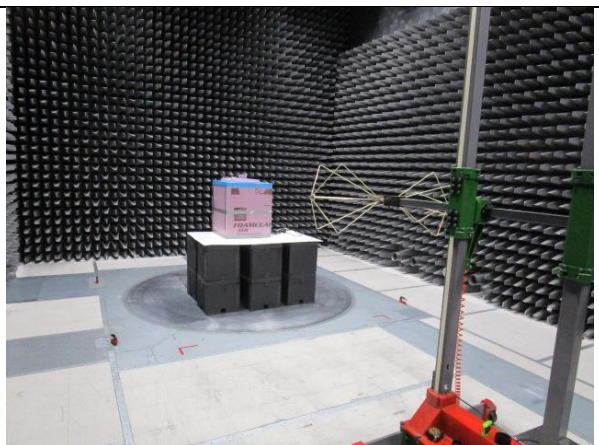
X Plane



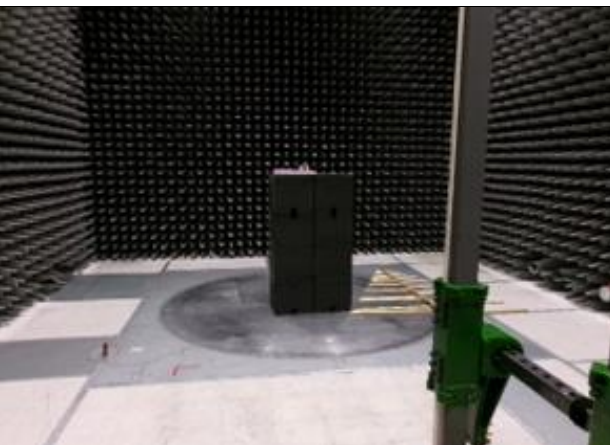
Y Plane



Z Plane



30-200 MHz

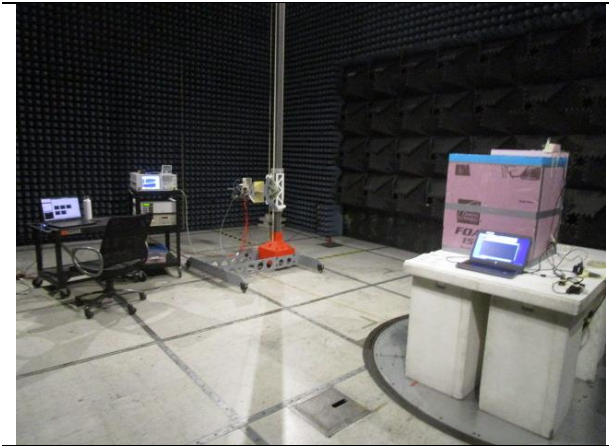


200-1000 MHz



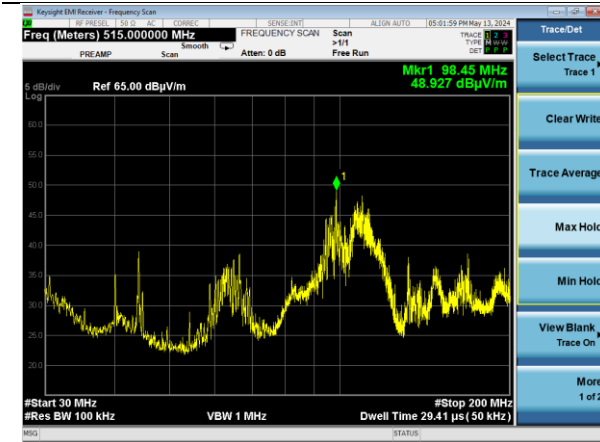
1000-4000 MHz

Company: Ezurio	Page 34 of 42	Name:SONA NX611 M.2 2230, 2 MHF
Report: TR3768-165-ETSI-300-328-BLE		Model:SONA NX611M
Job: C-3768		Serial:00047

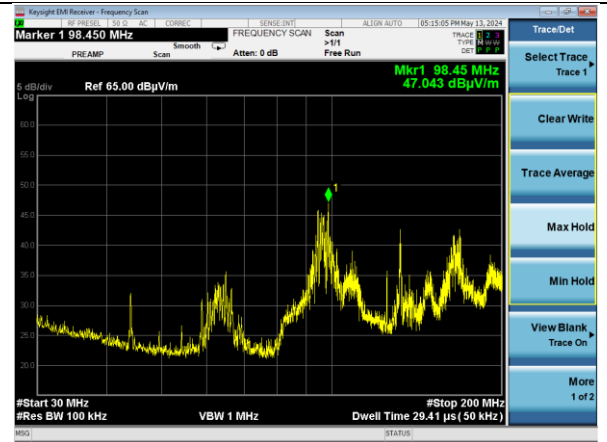


4000-12750 MHz

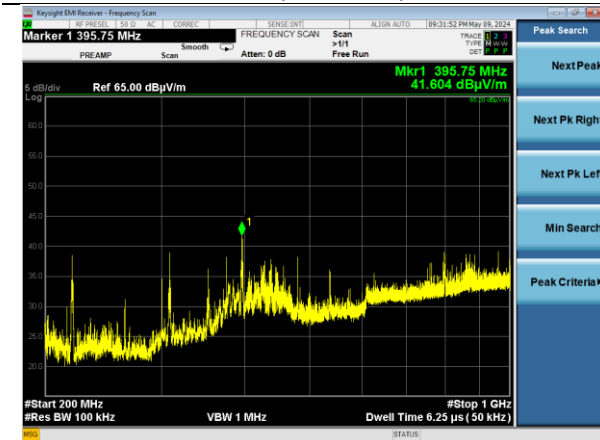
Worst Case Plots



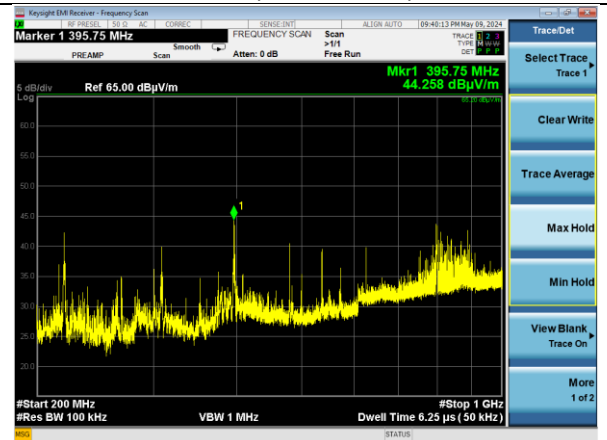
Channel 37 | 1 Mbps
30-200 MHz | Vertical | X Plane



Channel 39 | 1 Mbps
30-200 MHz | Horizontal | X Plane

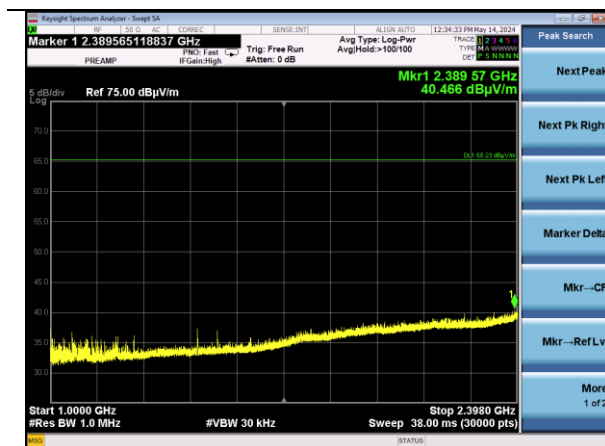


Channel 37 | 1 Mbps
200-1000 MHz | Vertical | Z Plane

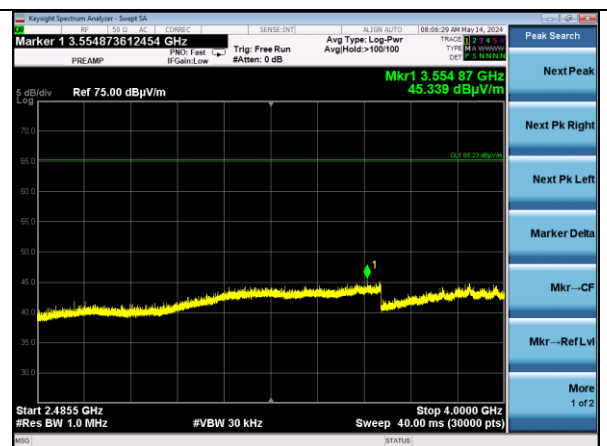


Channel 39 | 1 Mbps |
200-1000 MHz | Horizontal | Z Plane

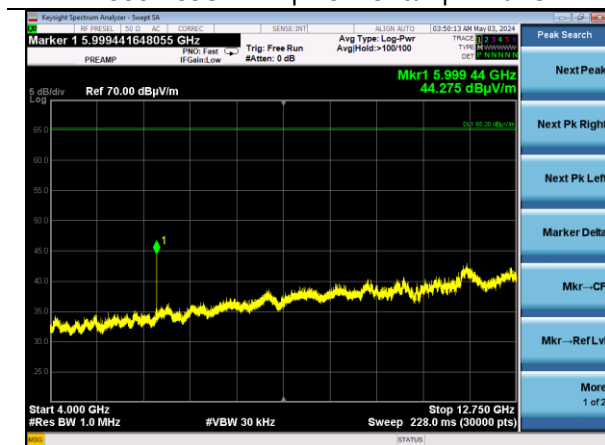
Company: Ezurio	Page 35 of 42	Name:SONA NX611 M.2 2230, 2 MHF
Report: TR3768-165-ETSI-300-328-BLE		Model:SONA NX611M
Job: C-3768		Serial:00047



Channel 37 | 1 Mbps
1000-2398 MHz | Horizontal | X Plane



Channel 39 | 1 Mbps
2485.5-4000 MHz | Vertical | X Plane



Channel 37 | 1 Mbps
4000-12750 MHz | Vertical | X Plane

6.2.2 Receiver spurious

Operator	Mitchell Freund Nicole Sedmak Jon Dilley Zachary Brown	QA	Anthony Smith Adam Alger Adam Hauke Dylan Rosenfeldt
Temperature	23.3°C-25.5°C	R.H. %	36.10%-42.90%
Test Date	04/30/2024-05/10/2024	Location	Chamber 3 Chamber 5
Requirement	4.3.2.9	Method	5.4.9

Limits:

Frequency (MHz)	Maximum Power	Bandwidth
30-1000	-57 dBm	100 kHz
1000-12750	-47 dBm	1 MHz

Test Parameters

Frequency	30-12750 MHz	Distance	3 m
Detector(s)	Peak	Table Height	150 cm
RBW	<1000 MHz – 100 kHz >1000 MHz – 1 MHz	VBW	<1000 MHz – 300 kHz >1000 MHz – 3 MHz
Note	No emissions within 6 dB of the limit.		

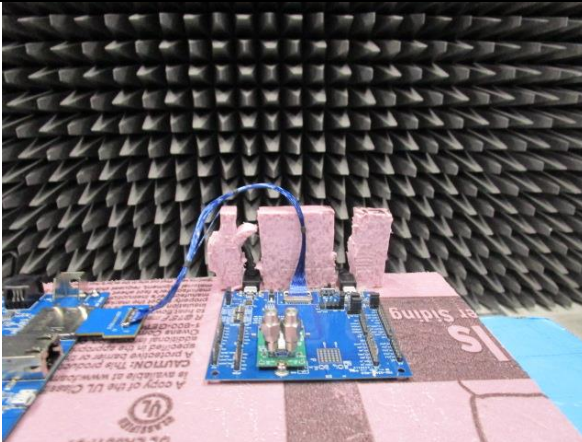
Instrumentation

Asset #	Description	Manufacturer	Model #	Serial #	Date	Due Date	Status
AA 960007	Antenna - Double Ridge Horn	EMCO	3115	9311-4138	8/10/2023	8/10/2024	Active Calibration
AA 960154	Filter - High Pass 2.4 GHz	KWM	HPF-L-14186	7272-02	4/11/2023	4/11/2024	Active Calibration
AA 960163	Antenna - Log Periodic	A.H. Systems, Inc.	SAS-512-2	500	8/10/2023	8/10/2024	Active Calibration
AA 960217	Antenna - Biconical	A.H. Systems, Inc.	SAS-540	852	7/17/2023	7/17/2024	Active Calibration
AA 960221	Cable	A.H. Systems, Inc.	SAC-26G-6	524	6/13/2023	6/13/2024	Active Verification
EE 960085	Analyzer - EMI Receiver	Agilent	N9038A	MY51210148	4/27/2023	4/27/2024	Active Calibration
EE 960203	Analyzer - EMI Receiver	Keysight	N9038A	MY56400072	4/11/2023	4/11/2024	Active Calibration
LSC-300	Cable	Chamber 3 Emissions	-	-	1/5/2024	1/5/2025	Active Verification
LSC-500	Cable	Chamber 5 Emissions	-	-	1/8/2024	1/8/2025	Active Verification

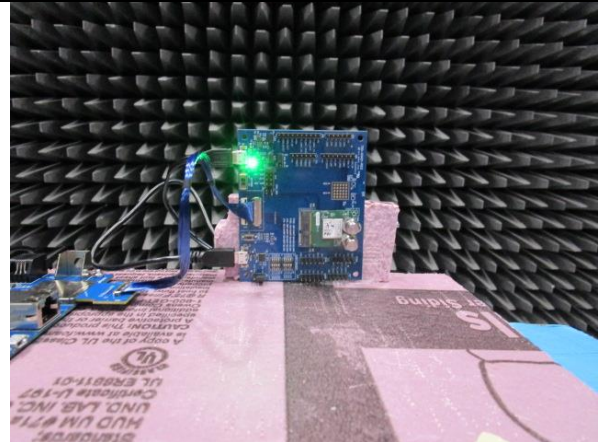
EUT Parameters

Input Power	120 VAC @ 60 Hz	Mode	BLE Rx
EUT	X, Y, Z Plane Orientations Antenna ports terminated with 50 Ω SMA terminators	AE	HP Elitebook 840G1 Ezurio – SOM60 Development Kit
Notes	6000 MHz Emission from auxiliary equipment. Not a function of the EUT.		

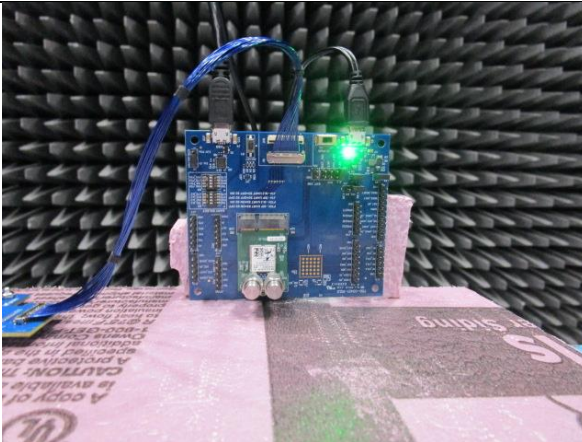
Setup Photos



X Plane



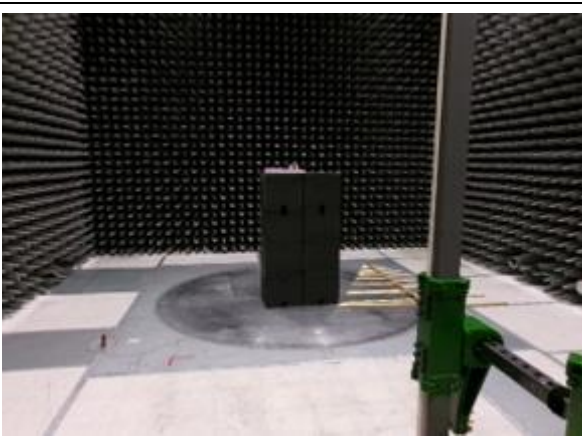
Y Plane



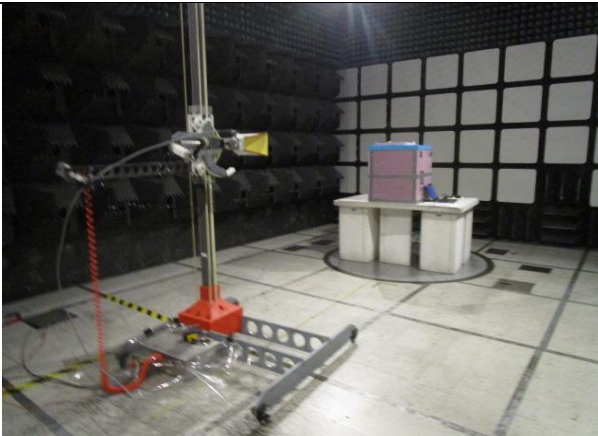
Z Plane



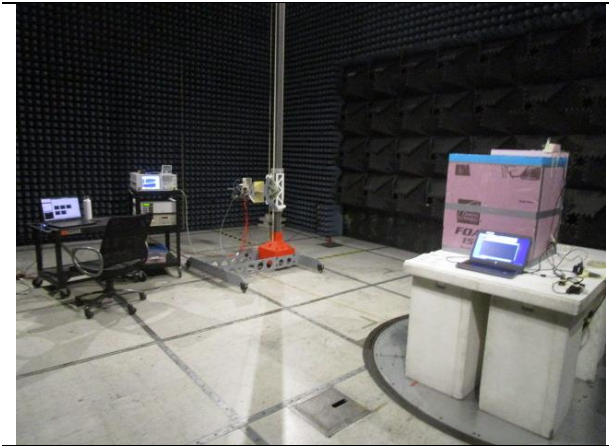
30-200 MHz



200-1000 MHz

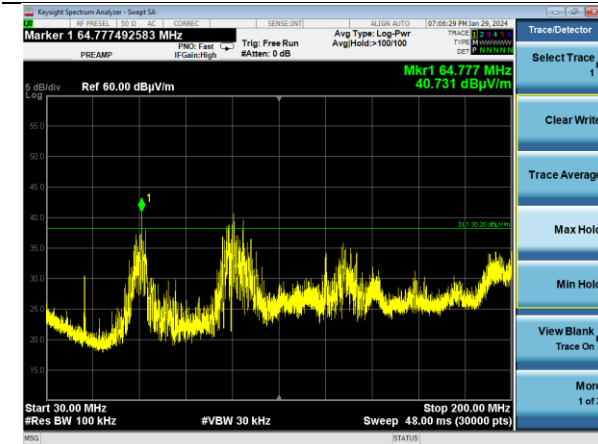


1000-4000 MHz

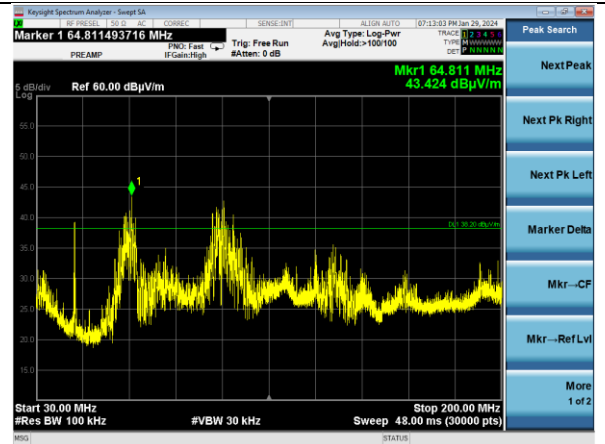


4000-12750 MHz

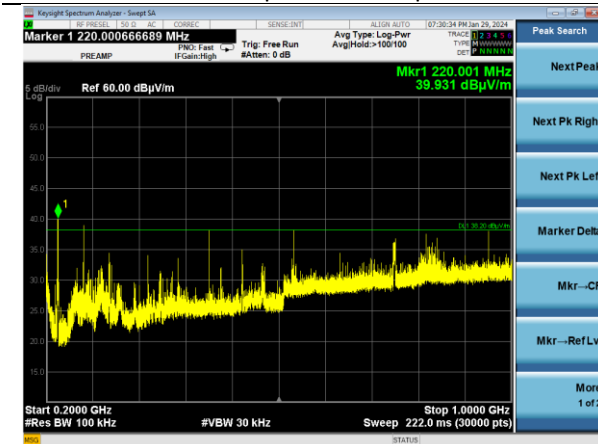
Worst Case Plots



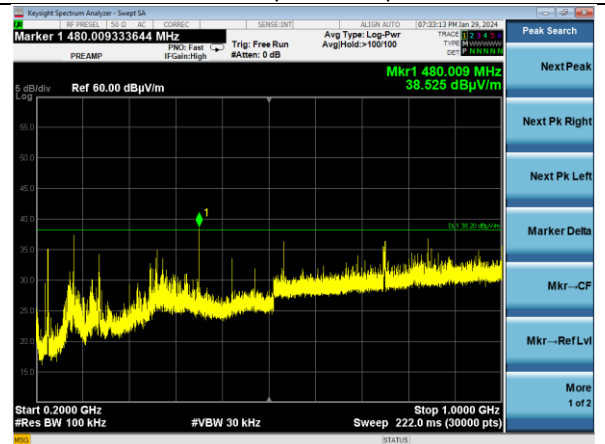
Channel 0 | 1 Mbps
30-200 MHz | Horizontal | X Plane



Channel 0 | 1 Mbps
30-200 MHz | Vertical | X Plane

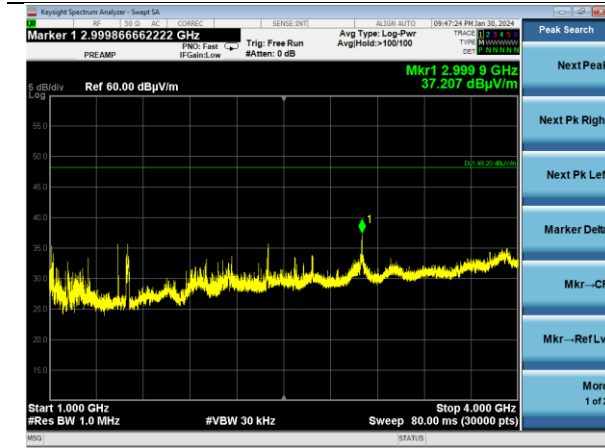


Channel 0 | 1 Mbps
200-1000 MHz | Vertical | X Plane

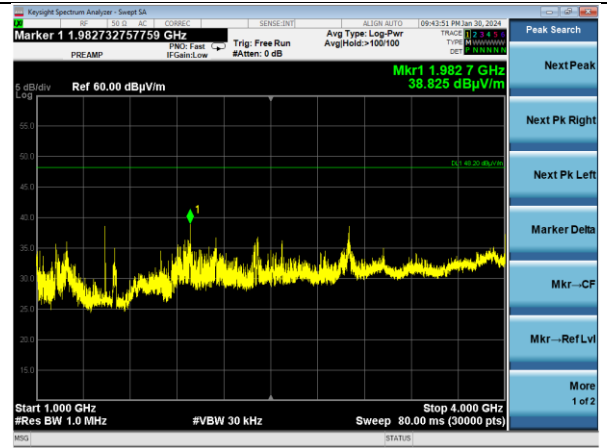


Channel 39 | 1 Mbps |
200-1000 MHz | Horizontal | X Plane

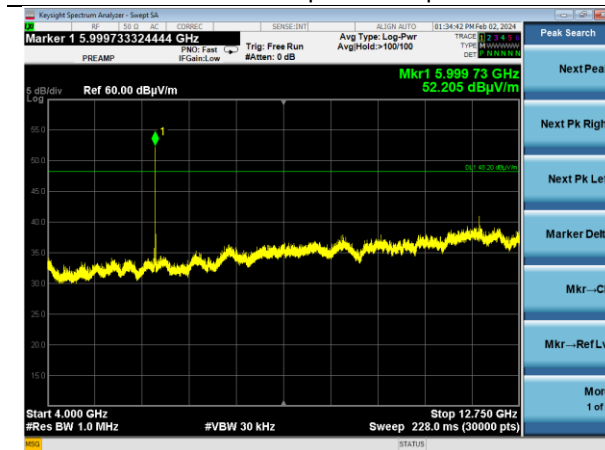
Company: Ezurio	Page 40 of 42	Name:SONA NX611 M.2 2230, 2 MHF
Report: TR3768-165-ETSI-300-328-BLE		Model:SONA NX611M
Job: C-3768		Serial:00047



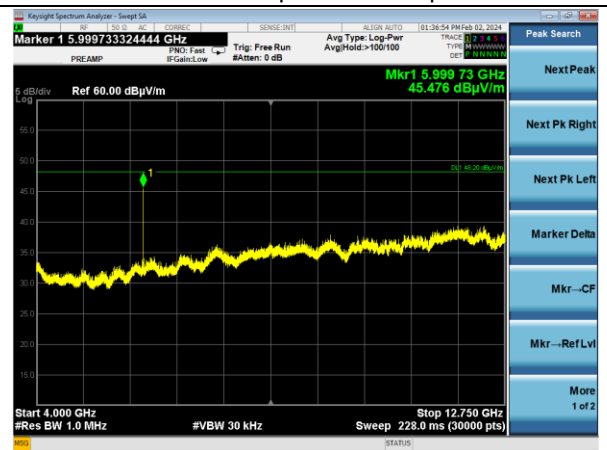
Channel 0 | 1 Mbps
1000-4000 MHz | Vertical | X Plane



Channel 39 | 1 Mbps
1000-4000 MHz | Horizontal | X Plane



Channel 0 | 1 Mbps
4000-12750 MHz | Vertical | Z Plane



Channel 39 | 1 Mbps
4000-12750 MHz | Horizontal | Z Plane

7 REVISION HISTORY

Version	Date	Notes	Person
0.0	08/27/2024	Initial Draft	Adam Hauke
0.1	02/10/2025	Updated Draft	Adam Alger
1	2/13/2025	Final	Adam Alger

END OF REPORT