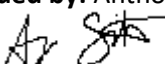




# TR3768-166-5G-300-440

<b>Equipment Under Test:</b>	Module, SONA NX611 M.2 2230, 1 MHF
<b>Requirement(s):</b>	ETSI EN 300 440
<b>Test Date(s):</b>	4/30/2024-12/20/2024
<b>Prepared for:</b>	Ezurio Attn: Brian Petted W66 N220 Commerce Ct. Cedarburg, WI 53012

<b>Report Issued by:</b> Anthony Smith, EMC Engineering Specialist	
Signature: 	Date: 2/12/2025
<b>Report Reviewed by:</b> Adam Alger, Manager EMC Laboratory	
Signature: 	Date: 02/12/2025
<b>Report Constructed by:</b> Anthony Smith, EMC Engineering Specialist	
Signature: 	Date: 2/12/2025

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Company: Ezurio	Page 1 of 36	Name: Module, SONA NX611 M.2 2230, 1 MHF
Report: TR3768-166-ETSI-300-440		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*

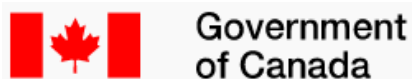
*Scope of accreditation includes all test methods listed herein unless otherwise noted*



### 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 36	Name: Module, SONA NX611 M.2 2230, 1 MHF
Report: TR3768-166-ETSI-300-440		Model: SONA NX611M
Job: C-3768		Serial: 00047

# 1 TEST REPORT SUMMARY

During **April 30<sup>th</sup>, 2024 through December 20<sup>th</sup>, 2024** the Equipment Under Test (EUT), **Module, SONA NX611 M.2 2230, 1 MHF**, as provided by **Ezurio** was tested to the following requirements:

## ETSI EN 300 440 – 5 GHz WLAN

Requirements	Description	Method	Specification	Compliant
4.2.2	Equivalent isotropically radiated power	4.2.2.3	25 mW e.i.r.p	Yes
4.2.3	Permitted range of operating frequencies	4.2.3.3	5725-5875 MHz	Yes
4.2.4	Unwanted emissions in the spurious domain	4.2.4.3	25-40000 MHz	Yes
4.3.3	Adjacent channel selectivity	4.3.3.3	-58.1 and -58.2 dBm	Yes
4.3.4	Blocking or desensitization	4.3.4.3	-57.4 dBm	Yes
4.3.5	Spurious radiations	4.3.5.3	25-40000 MHz	Yes
4.4.2	Spectrum access techniques (LBT)	4.4.2.2.2	-67.5 dBm	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

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

### 2.1 Equipment Under Test (EUT) Information

*The following information has been supplied by the client*

<b>Product Name</b>	Module, SONA NX611 M.2 2230, 1 MHF
<b>Model Number</b>	453-00166
<b>Serial Number</b>	00047
<b>FCC ID</b>	SQG-SONANX611M
<b>IC ID</b>	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 36	Name: Module, SONA NX611 M.2 2230, 1 MHF
Report: TR3768-166-ETSI-300-440		Model: SONA NX611M
Job: C-3768		Serial: 00047

## 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

## 2.6 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

## 2.7 Test Channels

Channel	Frequency (MHz)	Bandwidth (MHz)	Data Rates
149	5745	20	a, n, ac, ax
157	5785	20	a, n, ac, ax
165	5825	20	a, n, ac, ax
151	5755	40	n, ac, ax
159	5795	40	n, ac, ax
155	5775	80	ac, ax

## 2.8 Power Table

Mode	Channel	Power Setting
802.11a	149-165	8
802.11n	149-165	8
802.11ac	149-165	8
802.11ax	149-165	8
802.11ax RU26	149-165	6
802.11ax RU52	149-165	6
802.11ax RU106	149-165	6
802.11ax RU242	149-165	6

### 3 REFERENCES

Publication	Edition	Date	AMD 1	AMD 2
ETSI EN 300 440	2.2.1	2018	-	-



## 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	$1 \times 10^{-7}$	$0.55 \times 10^{-7}$
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 %

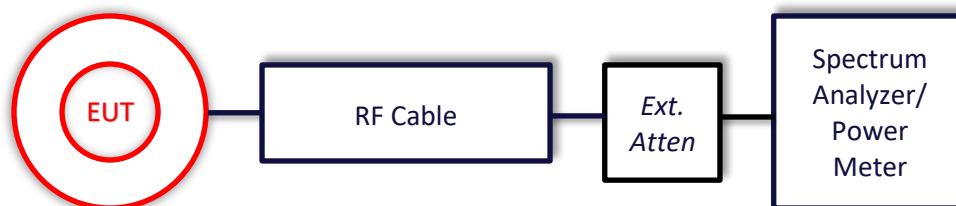
Company: Ezurio	Page 9 of 36	Name: Module, SONA NX611 M.2 2230, 1 MHF
Report: TR3768-166-ETSI-300-440		Model: SONA NX611M
Job: C-3768		Serial: 00047

## 5 TEST DATA

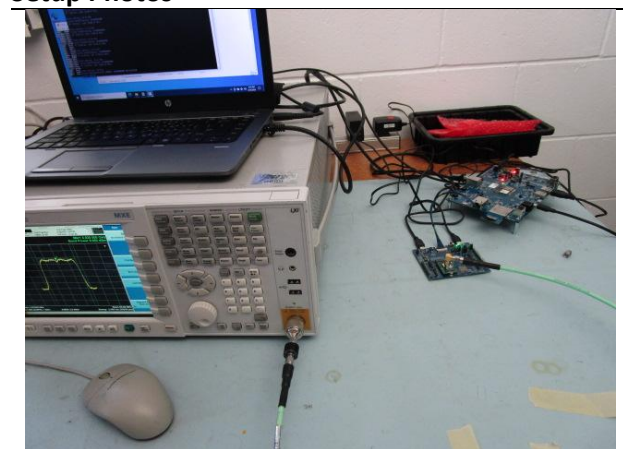
### 5.1 Antenna Port Conducted Emissions

<b>Description of Measurement</b>	<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>
<b>Example Calculations</b>	<p>Measurement (dBm) + Cable factor (dB) + External Attenuator (dB) = Corrected Reading (dBm)</p> <p>Margin (dB) = Limit (dBm) – Corrected Reading (dBm)</p>

#### Block Diagram



#### Setup Photos



### 5.1.1 Equivalent isotropically radiated power (e.i.r.p.)

<b>Operator</b>	Anthony Smith	<b>QA</b>	Dylan Rosenfeldt
<b>Temperature</b>	21.6-23.0°C	<b>R.H. %</b>	31.1-48.6%
<b>Test Date</b>	6/20/2024, 6/21/2024, 6/24/2024, 7/1/2024, 7/2/2024, 8/14/2024, 8/23/2024, 12/4/2024	<b>Location</b>	Thermotron Temp Chamber
<b>Requirement</b>	ETSI 300 440 4.2.2.4	<b>Method</b>	ETSI 300 440 4.2.2.3

Limits: 25 mW

### Test Parameters

<b>Frequency</b>	5725-5850 MHz	<b>Setup</b>	Antenna Port
<b>Operating Temperature</b>	21.5°C	<b>Sample Speed</b>	32 MS/s

### Instrumentation

Asset #	Description	Manufacturer	Model #	Serial #	Date	Due Date	Status
AA 960144	Cable	Gore	EKD01D010720	5800373	1/28/2025	1/28/2026	Active Verification
AA 960172	Cable	A.H. Systems, Inc.	SAC-26G-1	387	1/28/2025	1/28/2026	Active Verification
EE 960087	Analyzer - Spectrum	Agilent	N9010A	MY53400296	4/10/2024	4/10/2025	Active Calibration
EE 960088	Analyzer - EMI Receiver	Agilent	N9038A	MY51210138	12/10/2024	12/10/2025	Active Calibration
EE 960090	Meter - RF Power	Anritsu	ML2495A	1335006	4/11/2024	4/11/2025	Active Calibration
EE 960091	Sensor - RF Power	Anritsu	MA2491A	1249277	4/11/2024	4/11/2025	Active Calibration

### EUT Parameters

<b>Input Power</b>	120 VAC @ 60 Hz	<b>Mode</b>	5GHz WLAN Tx
<b>Frequency</b>	5745-5825 MHz	<b>Channel</b>	See 2.7

## Output Power Measurements

Nominal Bandwidth	Channel	Mode	Data Rate	Measurement (dBm)	Antenna Gain (dBi)	EIRP (dBm/MHz)	Limit (dBm)	Margin (dB)	Power Setting
20	149	802.11a	6	8.8	4.4	13.2	14.0	0.8	8
20	157	802.11a	6	8.7	4.4	13.1	14.0	0.9	8
20	165	802.11a	6	8.5	4.4	12.9	14.0	1.1	8
20	149	802.11n	MCS0	8.8	4.4	13.2	14.0	0.8	8
20	157	802.11n	MCS0	8.6	4.4	13.0	14.0	1.0	8
20	165	802.11n	MCS0	8.4	4.4	12.8	14.0	1.2	8
20	149	802.11ac	MCS0	8.7	4.4	13.1	14.0	0.9	8
20	157	802.11ac	MCS0	8.7	4.4	13.1	14.0	0.9	8
20	165	802.11ac	MCS0	8.5	4.4	12.9	14.0	1.1	8
20	149	802.11ax	MCS0	9.0	4.4	13.4	14.0	0.6	8
20	157	802.11ax	MCS0	8.9	4.4	13.3	14.0	0.7	8
20	165	802.11ax	MCS0	8.7	4.4	13.1	14.0	0.9	8
20	149	802.11ax	MCS11	9.0	4.4	13.4	14.0	0.6	8
20	157	802.11ax	MCS11	8.9	4.4	13.3	14.0	0.7	8
20	165	802.11ax	MCS11	8.7	4.4	13.1	14.0	0.9	8
40	151	802.11n	MCS0	8.8	4.4	13.2	14.0	0.8	8
40	159	802.11n	MCS0	8.5	4.4	12.9	14.0	1.1	8
40	151	802.11ac	MCS0	8.7	4.4	13.1	14.0	0.9	8
40	159	802.11ac	MCS0	8.4	4.4	12.8	14.0	1.2	8
40	151	802.11ac	MCS9	8.7	4.4	13.1	14.0	0.9	8
40	159	802.11ac	MCS9	8.5	4.4	12.9	14.0	1.1	8
40	151	802.11ax	MCS0	9.0	4.4	13.4	14.0	0.6	8
40	159	802.11ax	MCS0	8.8	4.4	13.2	14.0	0.8	8
40	151	802.11ax	MCS11	9.1	4.4	13.5	14.0	0.5	8
40	159	802.11ax	MCS11	8.9	4.4	13.3	14.0	0.7	8
80	155	802.11ac	MCS0	8.8	4.4	13.2	14.0	0.8	8
80	155	802.11ac	MCS9	8.8	4.4	13.2	14.0	0.8	8
80	155	802.11ax	MCS0	9.1	4.4	13.5	14.0	0.5	8
80	155	802.11ax	MCS11	9.0	4.4	13.4	14.0	0.6	8
20	149	802.11ax RU26	MCS0	6.7	4.4	11.1	14.0	2.9	6
20	157	802.11ax RU26	MCS0	6.9	4.4	11.3	14.0	2.7	6
20	165	802.11ax RU26	MCS0	6.8	4.4	11.2	14.0	2.8	6
40	151	802.11ax RU26	MCS0	5.9	4.4	10.3	14.0	3.7	6
40	159	802.11ax RU26	MCS0	6.0	4.4	10.4	14.0	3.6	6
80	155	802.11ax RU26	MCS0	7.2	4.4	11.6	14.0	2.4	6

### 5.1.2 Permitted range of operating frequencies

<b>Operator</b>	Anthony Smith	<b>QA</b>	Dylan Rosenfeldt
<b>Temperature</b>	21.6-23.0°C	<b>R.H. %</b>	31.1-48.6%
<b>Test Date</b>	6/20/2024, 6/21/2024, 6/24/2024, 7/1/2024, 7/2/2024, 8/14/2024, 8/23/2024, 12/4/2024	<b>Location</b>	Thermotron Temp Chamber
<b>Requirement</b>	ETSI 300 440 4.2.3.5	<b>Method</b>	ETSI 300 440 4.2.3.3

**Limits:** The occupied bandwidth of the transmitter shall fall within the assigned frequency band

#### Test Parameters

<b>Frequency</b>	5725-5875 MHz	<b>Setup</b>	Antenna Port
<b>Detector(s)</b>	Peak		
<b>Example Calculation</b>	FH – FL = Frequency Range		

#### Instrumentation

Asset #	Description	Manufacturer	Model #	Serial #	Date	Due Date	Status
AA 960144	Cable	Gore	EKD01D010720	5800373	1/28/2025	1/28/2026	Active Verification
AA 960172	Cable	A.H. Systems, Inc.	SAC-26G-1	387	1/28/2025	1/28/2026	Active Verification
EE 960087	Analyzer - Spectrum	Agilent	N9010A	MY53400296	4/10/2024	4/10/2025	Active Calibration
EE 960088	Analyzer - EMI Receiver	Agilent	N9038A	MY51210138	12/10/2024	12/10/2025	Active Calibration
EE 960090	Meter - RF Power	Anritsu	ML2495A	1335006	4/11/2024	4/11/2025	Active Calibration
EE 960091	Sensor - RF Power	Anritsu	MA2491A	1249277	4/11/2024	4/11/2025	Active Calibration

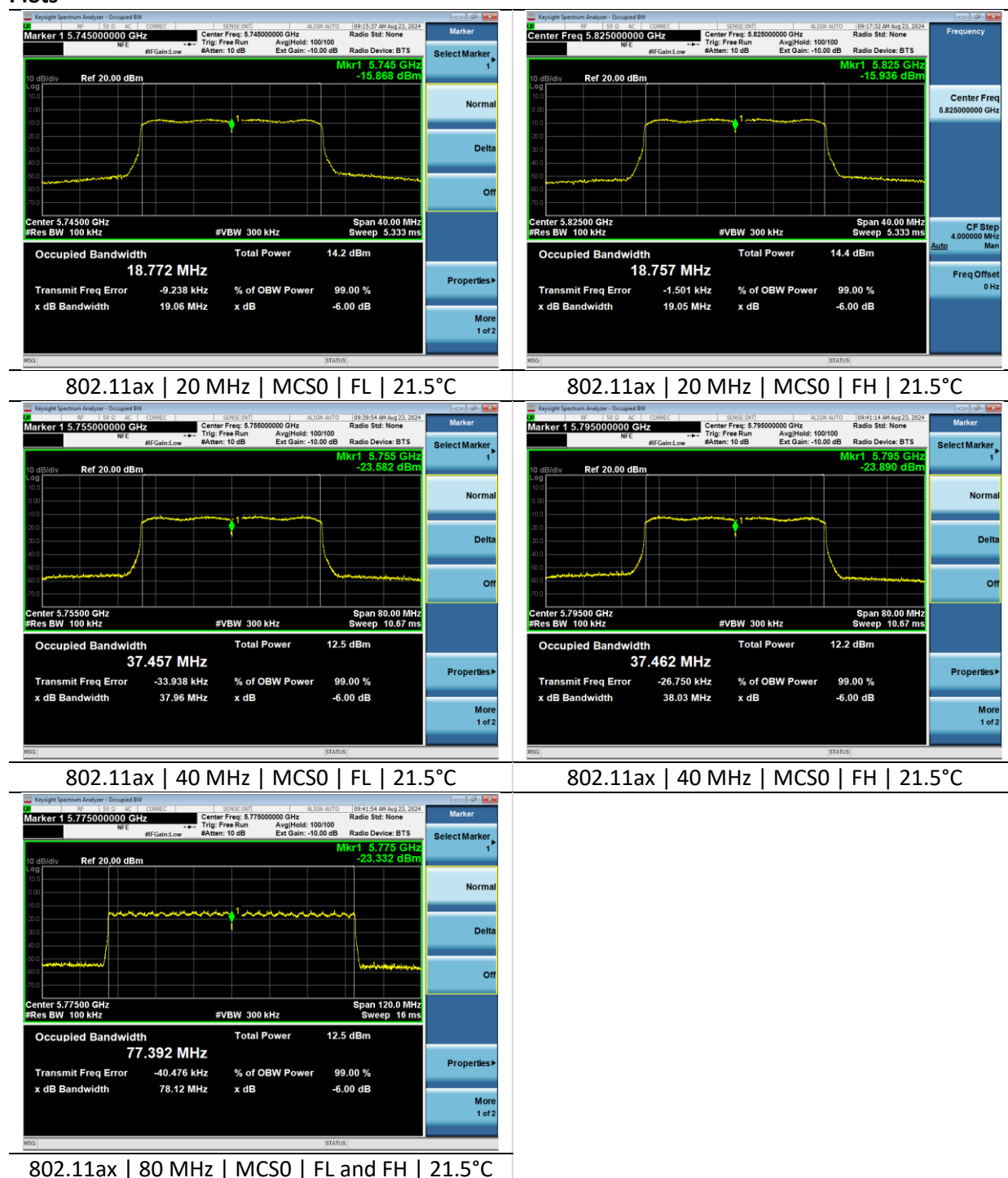
#### EUT Parameters

<b>Input Power</b>	120 VAC @ 60 Hz	<b>Mode</b>	5 GHz WLAN Tx
<b>Frequency</b>	5745, 5825 MHz	<b>Channel</b>	149, 165

## Measurements

Channel	Mode	Temp °C	FL (MHz)	FL Limit (MHz)	FH (MHz)	FH Limit (MHz)	Frequency Range (MHz)
149,165	802.11a (20 MHz)	+21.5	5736.7	5725.0	5833.3	5875.0	96.6
149,165	802.11ax (20 MHz)		5735.4	5725.0	5834.6	5875.0	99.2
151, 159	802.11ax (40 MHz)		5736.0	5725.0	5814.0	5875.0	78.0
155	802.11ax (80 MHz)		5735.9	5725.0	5814.1	5875.0	78.2
149,165	802.11a (20 MHz)	-40	5736.7	5725.0	5833.3	5875.0	96.6
149,165	802.11ax (20 MHz)		5735.5	5725.0	5834.5	5875.0	99.0
151, 159	802.11ax (40 MHz)		5736.1	5725.0	5814.0	5875.0	77.9
155	802.11ax (80 MHz)		5735.9	5725.0	5814.1	5875.0	78.2
149,165	802.11a (20 MHz)	+85	5736.7	5725.0	5833.3	5875.0	96.6
149,165	802.11ax (20 MHz)		5735.5	5725.0	5834.5	5875.0	99.0
151, 159	802.11ax (40 MHz)		5736.0	5725.0	5814.1	5875.0	78.1
155	802.11ax (80 MHz)		5735.9	5725.0	5814.1	5875.0	78.2

## Plots



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Report: TR3768-166-ETSI-300-440		Model: SONA NX611M
Job: C-3768		Serial: 00047

### 5.1.3 Unwanted emissions in the spurious domain

<b>Operator</b>	Anthony Smith	<b>QA</b>	Dylan Rosenfeldt
<b>Temperature</b>	21.6-23.0°C	<b>R.H. %</b>	31.1-48.6%
<b>Test Date</b>	6/20/2024, 6/21/2024, 6/24/2024, 7/1/2024, 7/2/2024, 8/14/2024, 8/23/2024, 12/4/2024	<b>Location</b>	RF Conducted Bench
<b>Requirement</b>	ETSI 300 440 4.2.4	<b>Method</b>	ETSI 300 440 4.2.4

#### Limits:

<b>Frequency ranges</b>	<b>47 MHz to 74 MHz</b> <b>87,5 MHz to 108 MHz</b> <b>174 MHz to 230 MHz</b> <b>470 MHz to 862 MHz</b>	<b>Other frequencies</b> <b>≤ 1 000 MHz</b>	<b>Frequencies</b> <b>&gt; 1 000 MHz</b>
<b>State</b>			
<b>Operating</b>	4 nW	250 nW	1 µW
<b>Standby</b>	2 nW	2 nW	20 nW

#### Test Parameters

<b>Frequency</b>	25-40000 MHz	<b>Setup</b>	Antenna Port
<b>Detector(s)</b>	Peak		

#### Instrumentation

Asset #	Description	Manufacturer	Model #	Serial #	Date	Due Date	Status
AA 960144	Cable	Gore	EKD01D010720	5800373	1/28/2025	1/28/2026	Active Verification
AA 960172	Cable	A.H. Systems, Inc.	SAC-26G-1	387	1/28/2025	1/28/2026	Active Verification
EE 960087	Analyzer - Spectrum	Agilent	N9010A	MY53400296	4/10/2024	4/10/2025	Active Calibration
EE 960088	Analyzer - EMI Receiver	Agilent	N9038A	MY51210138	12/10/2024	12/10/2025	Active Calibration
EE 960090	Meter - RF Power	Anritsu	ML2495A	1335006	4/11/2024	4/11/2025	Active Calibration
EE 960091	Sensor - RF Power	Anritsu	MA2491A	1249277	4/11/2024	4/11/2025	Active Calibration

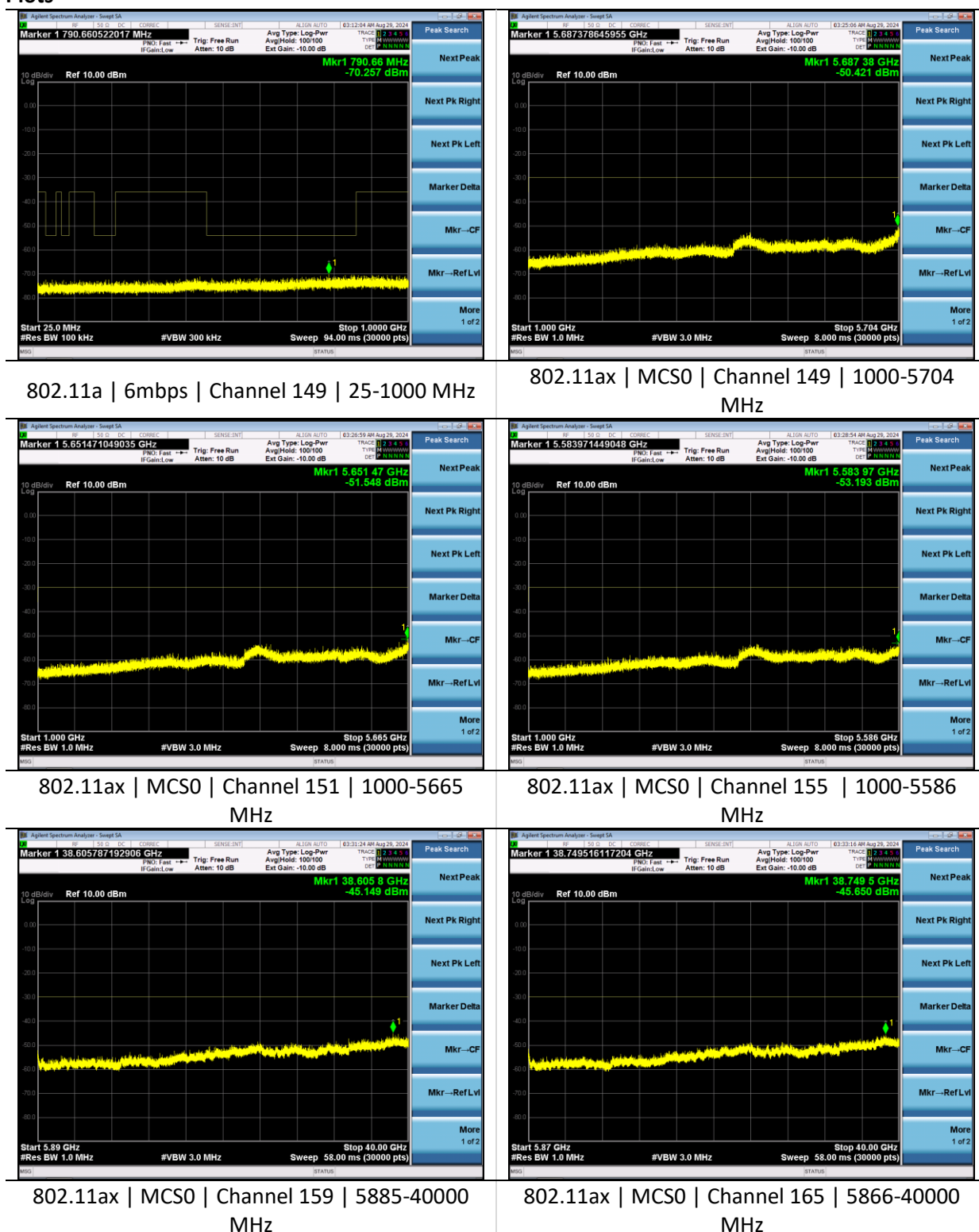
#### EUT Parameters

<b>Input Power</b>	120 VAC @ 60 Hz	<b>Mode</b>	CW Tx
<b>Frequency</b>	5745, 5765, 5785, 5805, 5825 MHz	<b>Channel</b>	149, 153, 157, 161, 165
<b>Notes</b>	No emissions were found to fall within 10dB of the limit		

Company: Ezurio	Page 16 of 36	Name: Module, SONA NX611 M.2 2230, 1 MHF
Report: TR3768-166-ETSI-300-440		Model: SONA NX611M
Job: C-3768		Serial: 00047



# Plots



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Report: TR3768-166-ETSI-300-440		Model: SONA NX611M
Job: C-3768		Serial: 00047

### 5.1.4 Adjacent channel selectivity

<b>Operator</b>	Anthony Smith	<b>QA</b>	Dylan Rosenfeldt
<b>Temperature</b>	19.8°C	<b>R.H. %</b>	29.3%
<b>Test Date</b>	12/20/2024	<b>Location</b>	RF Conducted Bench
<b>Requirement</b>	ETSI 300 440 4.3.3	<b>Method</b>	ETSI 301 440 4.3.3.4

#### Limit:

The adjacent channel selectivity of the equipment under specified conditions shall not be less than  $-30 \text{ dBm} + k$ .

The correction factor,  $k$ , is as follows:

$$k = -20 \log f - 10 \log BW$$

Where:

- $f$  is the frequency in GHz;
- $BW$  is the channel bandwidth in MHz.

The factor  $k$  is limited within the following:

- $-40 \text{ dB} < k < 0 \text{ dB}$ .

#### Test Parameters

<b>Adjacent channel Frequency</b>	5745, 5785, 5825 MHz	<b>Setup</b>	Antenna port
<b>Blocking Signal</b>	CW	<b>Note</b>	Passing level of blocking signals are 1dB above level where under 10% PER is found (e.g. under 10% at -32 dBm, over 10% at -31 dBm)

#### Instrumentation

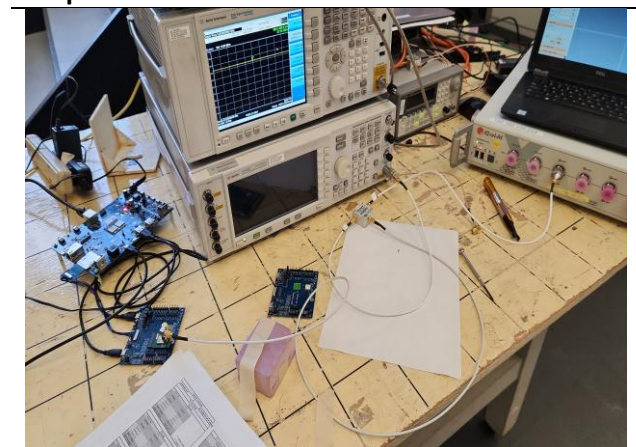
Asset #	Description	Manufacturer	Model #	Serial #	Date	Due Date	Status
AA 960182	RF Splitter/Combiner	Mini-Circuits	ZFSC-2-10G+	F707701704	1/28/2025	1/28/2026	Active Verification
CC 000314C	Vector Signal Generator	Agilent	E4438C	US 41469143	4/10/2024	4/10/2025	Active Calibration
EE 960087	Analyzer - Spectrum	Agilent	N9010A	MY53400296	4/10/2024	4/10/2025	Active Calibration

Company: Ezurio	Page 18 of 36	Name: Module, SONA NX611 M.2 2230, 1 MHF
Report: TR3768-166-ETSI-300-440		Model: SONA NX611M
Job: C-3768		Serial: 00047

## EUT Parameters

<b>Input Power</b>	120VAC 60 Hz	<b>Mode</b>	5GHz WLAN RX
<b>Frequency</b>	5765 and 5805 MHz	<b>Channel</b>	153, 161
<b>AE</b>	Litepoint IQxel-M		

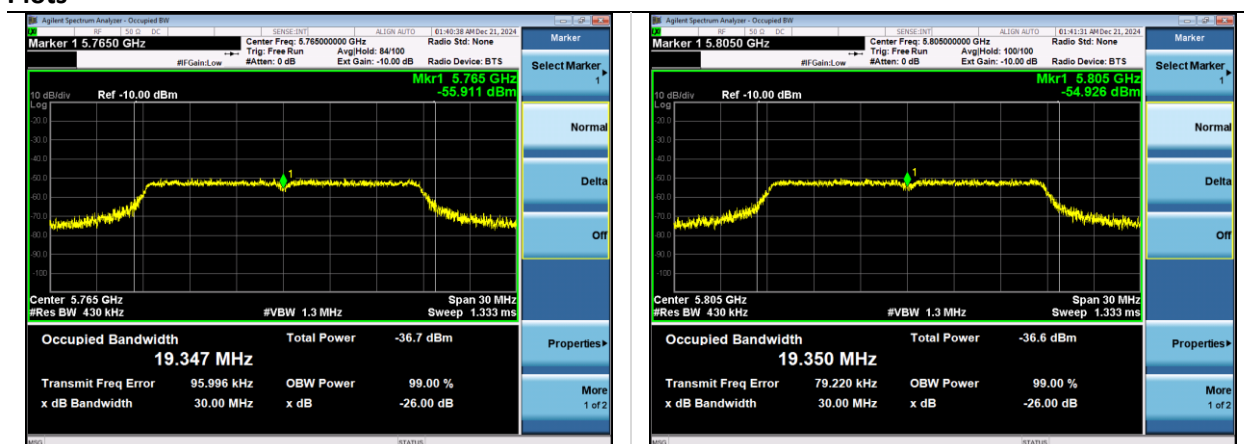
## Setup Photos



## Measurements

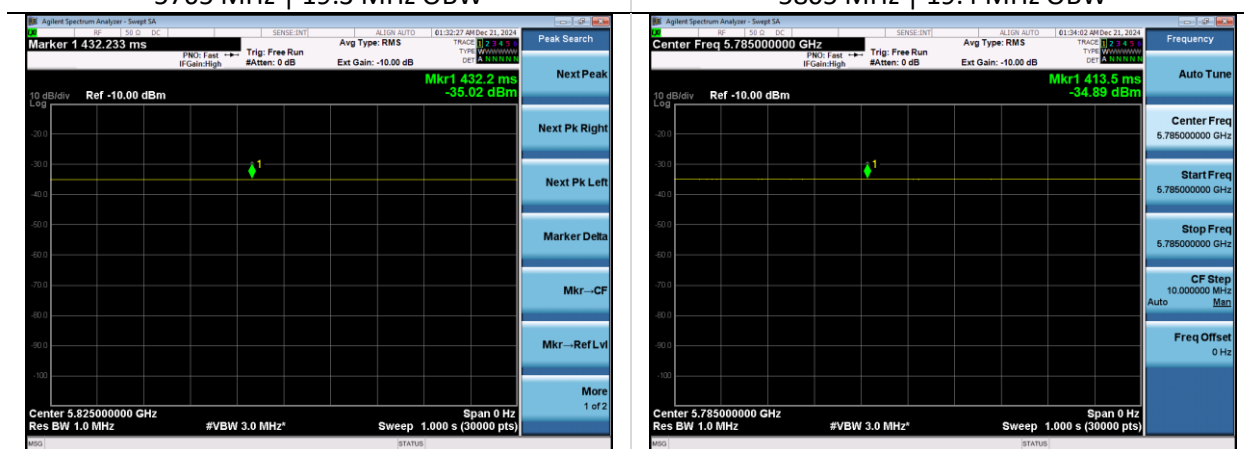
Frequency (MHz)	Pmin (RSSI)	Pmin + 3dB (RSSI)	Blocking Signal Frequency (MHz)	Packet Error Rate (%)	Blocking Power (dBm)	Occupied Bandwidth (MHz)	k Factor (dB)	Limit (dBm)
5765	-82	-79	5745	42.0	-28	19.3	-28.1	-58.1
5765	-82	-79	5785	36.6	-28	19.3	-28.1	-58.1
5805	-82	-79	5785	18.1	-28	19.4	-28.2	-58.2
5805	-82	-79	5825	17.6	-28	19.4	-28.2	-58.2

## Plots



5765 MHz | 19.3 MHz OBW

5805 MHz | 19.4 MHz OBW



5825 MHz Blocking Signal -35.0 dBm

5785 MHz Blocking Signal -34.9 dBm



5745 MHz Blocking Signal -35.1 dBm

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### 5.1.5 Blocking or desensitization

<b>Operator</b>	Anthony Smith	<b>QA</b>	Dylan Rosenfeldt
<b>Temperature</b>	22.5°C	<b>R.H. %</b>	60.9%
<b>Test Date</b>	6/4/2024	<b>Location</b>	RF Conducted Bench
<b>Requirement</b>	ETSI 300 440 4.3.4	<b>Method</b>	ETSI 300 440 4.3.4.3

Limits:

**Table 6: Limits for blocking or desensitization**

Receiver category	Limit
1	-30 dBm + k
2	-45 dBm + k
3	-60 dBm + k

The correction factor,  $k$ , is as follows:

$$k = -20 \log f - 10 \log BW$$

Where:

- $f$  is the frequency in GHz;
- $BW$  is the occupied bandwidth in MHz.

The factor  $k$  is limited within the following:

- $-40 \text{ dB} < k < 0 \text{ dB}$ .

### Test Parameters

<b>Frequency</b>	5785 MHz	<b>Setup</b>	Antenna Port
<b>Blocking Frequencies</b>	5960, 5610, 6125, 5445, 6620, 4950 MHz	<b>Receiver</b>	Category 1
<b>RBW</b>	1 MHz	<b>VBW</b>	3 MHz

## Instrumentation

Asset #	Description	Manufacturer	Model #	Serial #	Date	Due Date	Status
AA 960180	Attenuator - Step Variable 1 dB	RF Lambda	RKT2G6A10	16100801	1/28/2025	1/28/2026	Active Verification
AA 960182	RF Splitter/Combiner	Mini-Circuits	ZFSC-2-10G+	F707701704	1/28/2025	1/28/2026	Active Verification
EE 960088	Analyzer - EMI Receiver	Agilent	N9038A	MY51210138	12/10/2024	12/10/2025	Active Calibration
EE 960184	RF Splitter/Combiner	mini-circuits	ZFSC-2-10G +	S F707601702	1/28/2025	1/28/2026	Active Verification
EE 960210	Vector Signal Generator	Rohde & Schwarz	SMM100A	101827	12/24/2024	12/24/2025	Active Calibration

## EUT Parameters

<b>Input Power</b>	120 VAC @ 60 Hz	<b>Mode</b>	5GHz WLAN Rx
<b>Frequency</b>	5745, 5825 MHz	<b>Channel</b>	149, 165

## Measurements

Operating Frequency (MHz)	Channel Tested	Wanted Signal Power (dBm)	Blocking Signal Frequency (MHz)	Blocking Signal Power (dBm)	k Factor (dB)	Minimum Limit (dBm)	Margin (dB)
5745	149	-94.3	5571	-18.0	-27.4	-57.4	-39.4
5745	149	-94.3	5407	-17.9	-27.4	-57.4	-39.5
5745	149	-94.3	4915	-15.0	-27.4	-57.4	-42.4
5825	165	-94.0	5999	-18.6	-27.4	-57.4	-38.8
5825	165	-94.0	6163	-16.8	-27.4	-57.4	-40.6
5825	165	-94.0	6655	-8.9	-27.4	-57.4	-48.5

## Plots



Blocking Signal 4915 MHz

Blocking Signal 6655 MHz

Blocking Signal 5407 MHz

Blocking Signal 6163 MHz

Blocking Signal 5571 MHz

Blocking Signal 5999 MHz

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### 5.1.6 Receiver spurious emissions

<b>Operator</b>	Anthony Smith	<b>QA</b>	Dylan Rosenfeldt
<b>Temperature</b>	21.6-23.0°C	<b>R.H. %</b>	31.1-48.6%
<b>Test Date</b>	6/20/2024, 6/21/2024, 6/24/2024, 7/1/2024, 7/2/2024, 8/14/2024, 8/23/2024, 12/4/2024	<b>Location</b>	RF Conducted Bench
<b>Requirement</b>	300 440 4.2.4	<b>Method</b>	4.2.4.3

#### Limits:

Frequency (MHz)	Maximum Power	Bandwidth
30-1000	2 nW	100 kHz
1000-40000	20 nW	1 MHz

#### Test Parameters

<b>Frequency</b>	30-40000 MHz	<b>Setup</b>	Antenna Port
<b>RBW</b>	100 kHz 1 MHz	<b>VBW</b>	300 kHz 3 MHz
<b>Detector(s)</b>	Peak – Trace Average (RMS) – Final		

#### Instrumentation

Asset #	Description	Manufacturer	Model #	Serial #	Date	Due Date	Status
AA 960144	Cable	Gore	EKD01D010720	5800373	1/28/2025	1/28/2026	Active Verification
AA 960172	Cable	A.H. Systems, Inc.	SAC-26G-1	387	1/28/2025	1/28/2026	Active Verification
EE 960087	Analyzer - Spectrum	Agilent	N9010A	MY53400296	4/10/2024	4/10/2025	Active Calibration
EE 960088	Analyzer - EMI Receiver	Agilent	N9038A	MY51210138	12/10/2024	12/10/2025	Active Calibration
EE 960090	Meter - RF Power	Anritsu	ML2495A	1335006	4/11/2024	4/11/2025	Active Calibration
EE 960091	Sensor - RF Power	Anritsu	MA2491A	1249277	4/11/2024	4/11/2025	Active Calibration

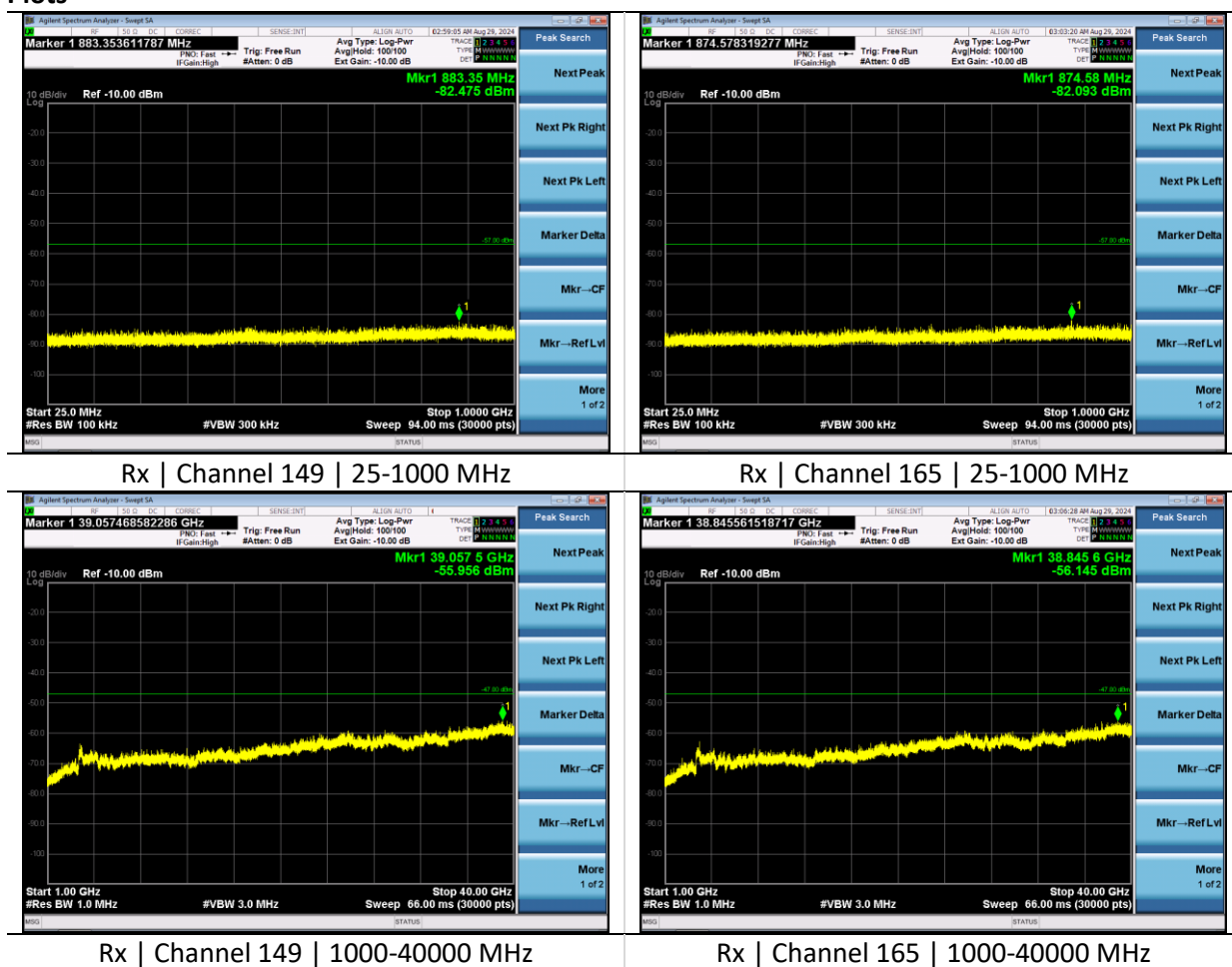
#### EUT Parameters

<b>Input Power</b>	120 VAC @ 60 Hz	<b>Mode</b>	5GHz WLAN Rx
<b>Frequency</b>	5745-5825 MHz	<b>Channel</b>	See 2.7
<b>Note</b>	No emissions within 6dB of limit		

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## Plots



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Job: C-3768		Serial: 00047

### 5.1.7 Spectrum Access Techniques – Listen Before Talk

<b>Operator</b>	Anthony Smith	<b>QA</b>	Dylan Rosenfeldt
<b>Temperature</b>	21.7°C	<b>R.H. %</b>	23.60%
<b>Test Date</b>	12/20/2024	<b>Location</b>	RF Conducted Bench
<b>Requirement</b>	ETSI 300 440 4.4.2	<b>Method</b>	ETSI 301 440 4.4.2.2.2

#### Test Parameters

<b>Frequency</b>	5785 MHz	<b>Setup</b>	Antenna Port
<b>Chosen Threshold Level</b>	-75 dBm/MHz	<b>Interference Signal Level</b>	-75.3 dBm/MHz
<b>Interference Signal Frequency</b>	5785 MHz	<b>Threshold Level Calculation</b>	-80 dBm + c C = 10logBW

#### Instrumentation

Asset #	Description	Manufacturer	Model #	Serial #	Date	Due Date	Status
AA 960180	Attenuator - Step Variable 1 dB	RF Lambda	RKT2G6A10	16100801	1/28/2025	1/28/2026	Active Verification
AA 960182	RF Splitter/Combiner	Mini-Circuits	ZFSC-2-10G+	F707701704	1/28/2025	1/28/2026	Active Verification
AA 960184	Attenuator - Step Variable 10 dB	RF Lambda	RKT2G6A60	17031005	1/28/2025	1/28/2026	Active Verification
CC 000259C	Generator - Function / Arbitrary Waveform	Agilent	33250A	US40000583	4/10/2024	4/10/2026	Active Calibration
CC 000314C	Vector Signal Generator	Agilent	E4438C	US 41469143	4/10/2024	4/10/2025	Active Calibration
CC 000710C	Oscilloscope	Agilent	MSO8104A	MY45001068	4/9/2024	4/9/2025	Active Calibration
EE 960086	Generator - Signal	Rohde & Schwarz	SMB100A	175512	12/27/2024	12/27/2025	Active Calibration
EE 960087	Analyzer - Spectrum	Agilent	N9010A	MY53400296	4/10/2024	4/10/2025	Active Calibration
EE 960166	Coupler - Directional	Narda	3202B-10	11605	1/28/2025	1/28/2026	Active Verification
EE 960184	RF Splitter/Combiner	mini-circuits	ZFSC-2-10G +	S F707601702	1/28/2025	1/28/2026	Active Verification

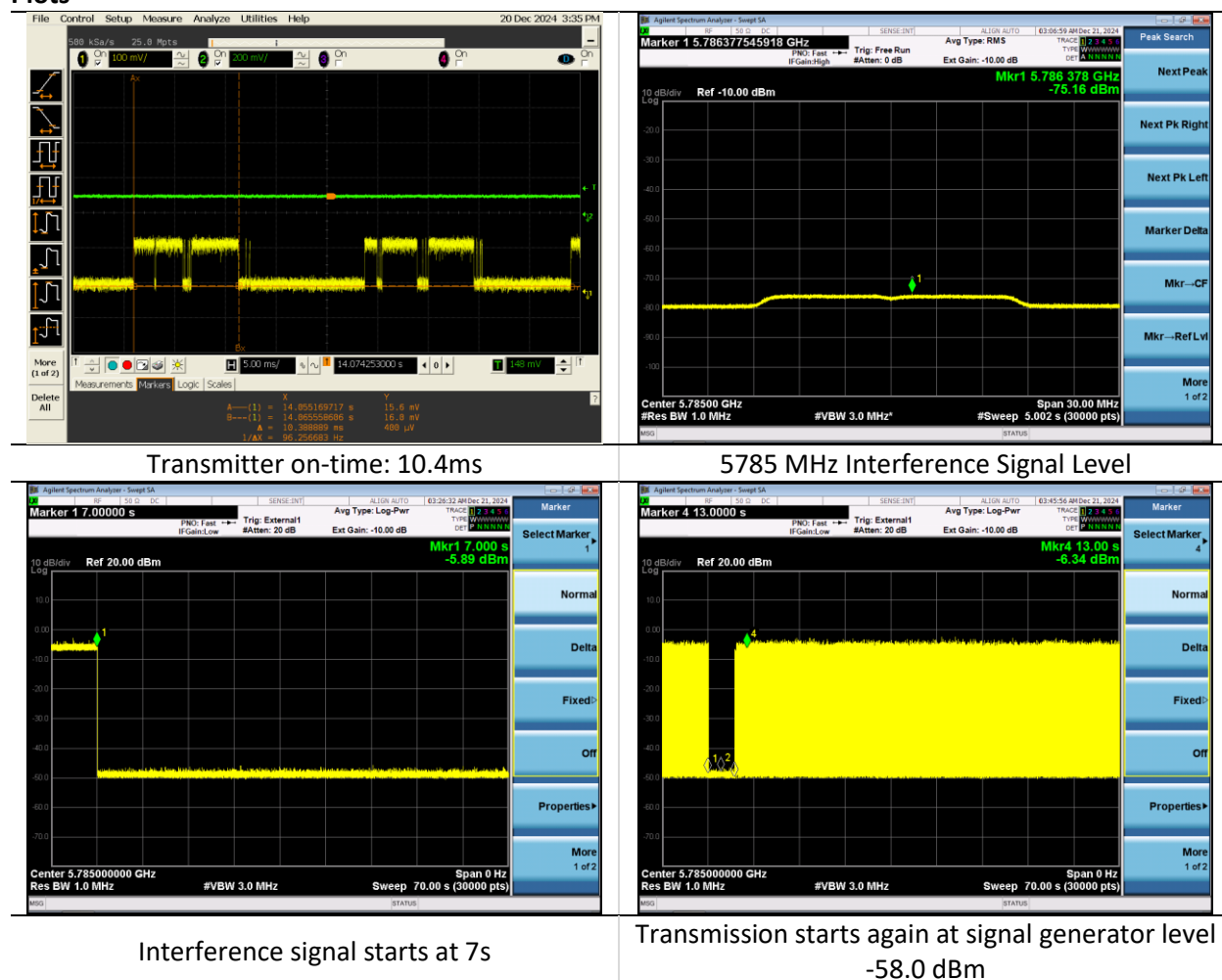
#### EUT Parameters

<b>Input Power</b>	120 VAC @ 60 Hz	<b>Mode</b>	5GHz WLAN
<b>Frequency</b>	5785 MHz	<b>Channel</b>	157

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Interference Signal		
Frequency (MHz)	Threshold Level (dBm)	Sig Gen Setting (dBm)
5785	-75.2	-56.0

## Plots



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## 5.2 Radiated Emissions

<b>Description of Measurement</b>	<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>
<b>Example Calculations</b>	<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



### 5.2.1 Unwanted emissions in the spurious domain

<b>Operator</b>	Dylan Rosenfeldt, Nicole Sedmak, Jon Dilley, Zachary Brown	<b>QA</b>	Jon Dilley, Zachary Brown, Adam Alger, Nicole Sedmak
<b>Temperature</b>	22.7-26.3°C	<b>R.H. %</b>	37.2-51.7%
<b>Test Date</b>	4/30/2024, 5/7/2024, 5/8/2024, 5/15/2024, 5/22/2024, 5/23/2024, 5/28/2024	<b>Location</b>	Chamber 3, Chamber 5
<b>Requirement</b>	ETSI 300 440 4.2.4	<b>Method</b>	ETSI 300 440 4.2.4.3.2

#### Limits:

Frequency ranges	47 MHz to 74 MHz 87,5 MHz to 108 MHz 174 MHz to 230 MHz 470 MHz to 862 MHz	Other frequencies ≤ 1 000 MHz	Frequencies > 1 000 MHz
State			
Operating	4 nW	250 nW	1 µW
Standby	2 nW	2 nW	20 nW

#### Test Parameters

<b>Frequency</b>	25-40000 MHz	<b>Distance</b>	3 m
<b>Detector(s)</b>	Peak Trace Peak and Average Final	<b>Table height</b>	150 cm
<b>RBW</b>	<1000 MHz – 100 kHz >1000 MHz – 1 MHz	<b>VBW</b>	<1000 – 300 kHz >1000 MHz – 3MHz

#### Instrumentation

Asset #	Description	Manufacturer	Model #	Serial #	Date	Due Date	Status
AA 960007	Antenna - Double Ridge Horn	EMCO	3115	9311-4138	11/19/2024	11/19/2025	Active Calibration
AA 960150	Antenna - Biconical	ETS Lindgren	3110B	0003-3346	12/9/2024	12/9/2025	Active Calibration
AA 960161	Filter - Highpass 5 GHz	K&L Microwave	11SH10-8000	2	4/10/2024	4/10/2025	Active Calibration
AA 960162	Cable	MegaPhase	EM2-S1S1-120	51503501 001	1/28/2025	1/28/2026	Active Verification
AA 960163	Antenna - Log Periodic	A.H. Systems, Inc.	SAS-512-2	500	12/11/2024	12/11/2025	Active Calibration
AA 960174	Antenna - Small Horn	ETS Lindgren	3116C-PA	00206880	12/2/2024	12/2/2025	Active Calibration
AA 960209	Antenna - Low Noise Amplifier	Mini-Circuits	ZVA-213X-S+	037101808	11/19/2024	11/19/2025	Active Calibration
AA 960217	Antenna - Biconical	A.H. Systems, Inc.	SAS-540	852	1/15/2025	1/15/2026	Active Calibration
AA 960220	Cable	A.H. Systems, Inc.	SAC-26G-6	552	1/28/2025	1/28/2026	Active Verification
EE 960087	Analyzer - Spectrum	Agilent	N9010A	MY53400296	4/10/2024	4/10/2025	Active Calibration
EE 960203	Analyzer - EMI Receiver	Keysight	N9038A	MY56400072	4/10/2024	4/10/2025	Active Calibration
LSC-300	Cable	Chamber 3 Emissions	-	-	1/24/2025	1/24/2026	Active Verification
LSC-500	Cable	Chamber 5 Emissions	-	-	1/27/2025	1/27/2026	Active Verification

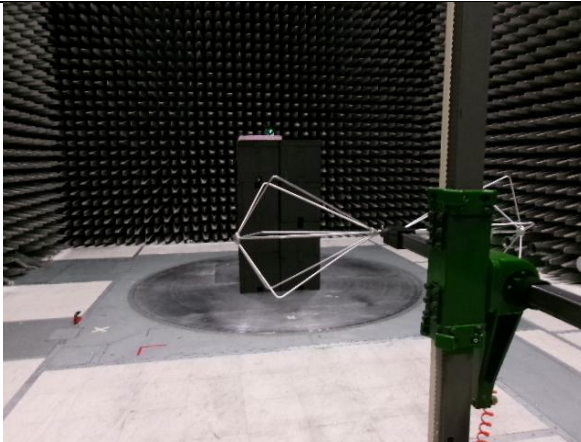
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## EUT Parameters

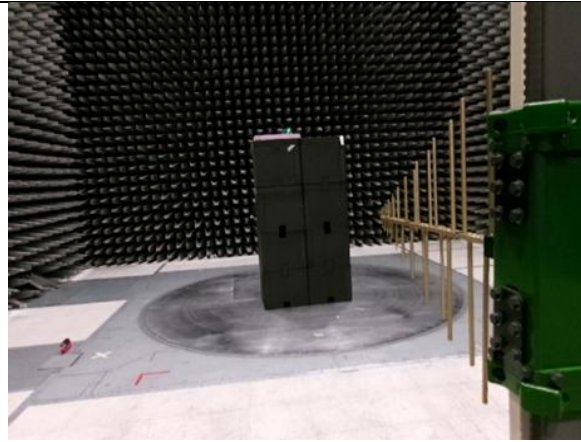
<b>Input Power</b>	120 VAC @ 60 Hz	<b>Mode</b>	5GHz WLAN Tx
<b>EUT</b>	X, Y, Z Plane Orientations	<b>AE</b>	HP Elitebook 840G1 Ezurio – SOM60 Development Kit
<b>Notes</b>	Worst Case plots shown. No radio emissions within 6dB of limit.		



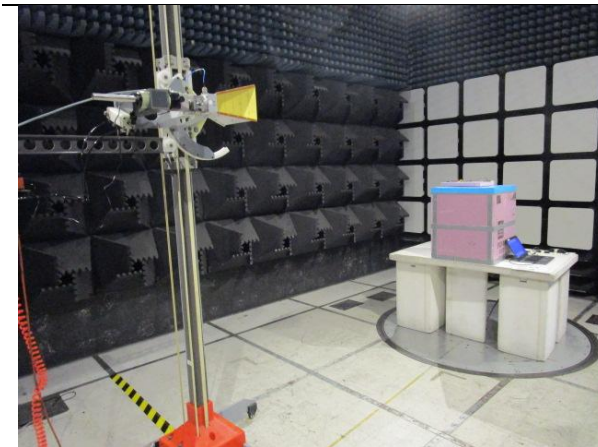
## Setup Photos



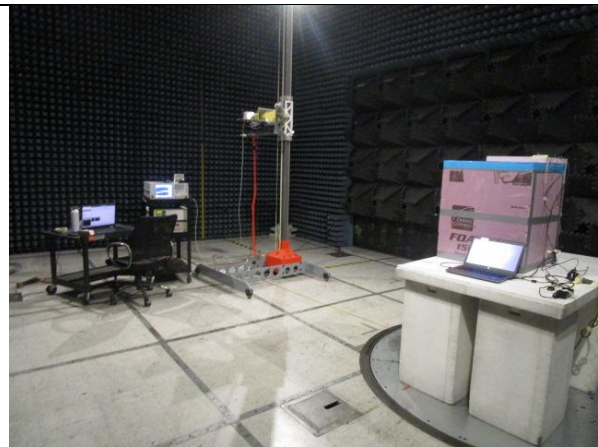
25-200 MHz



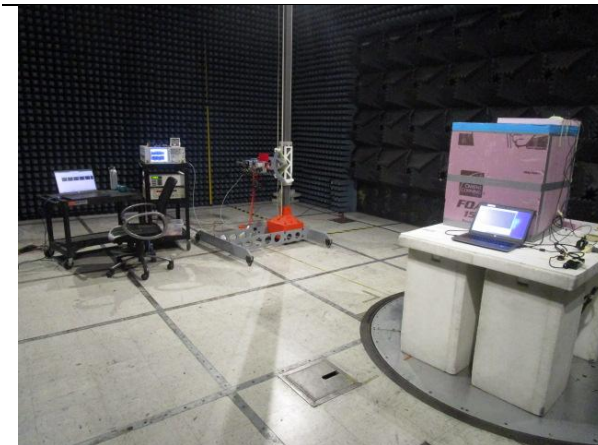
200-1000 MHz



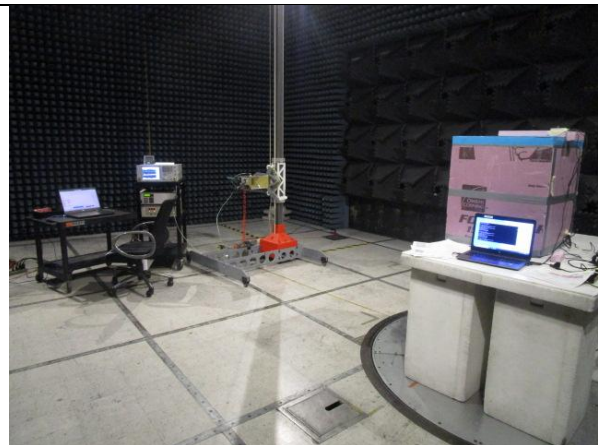
1000-4000 MHz



4000-18000 MHz



18000-26000 MHz

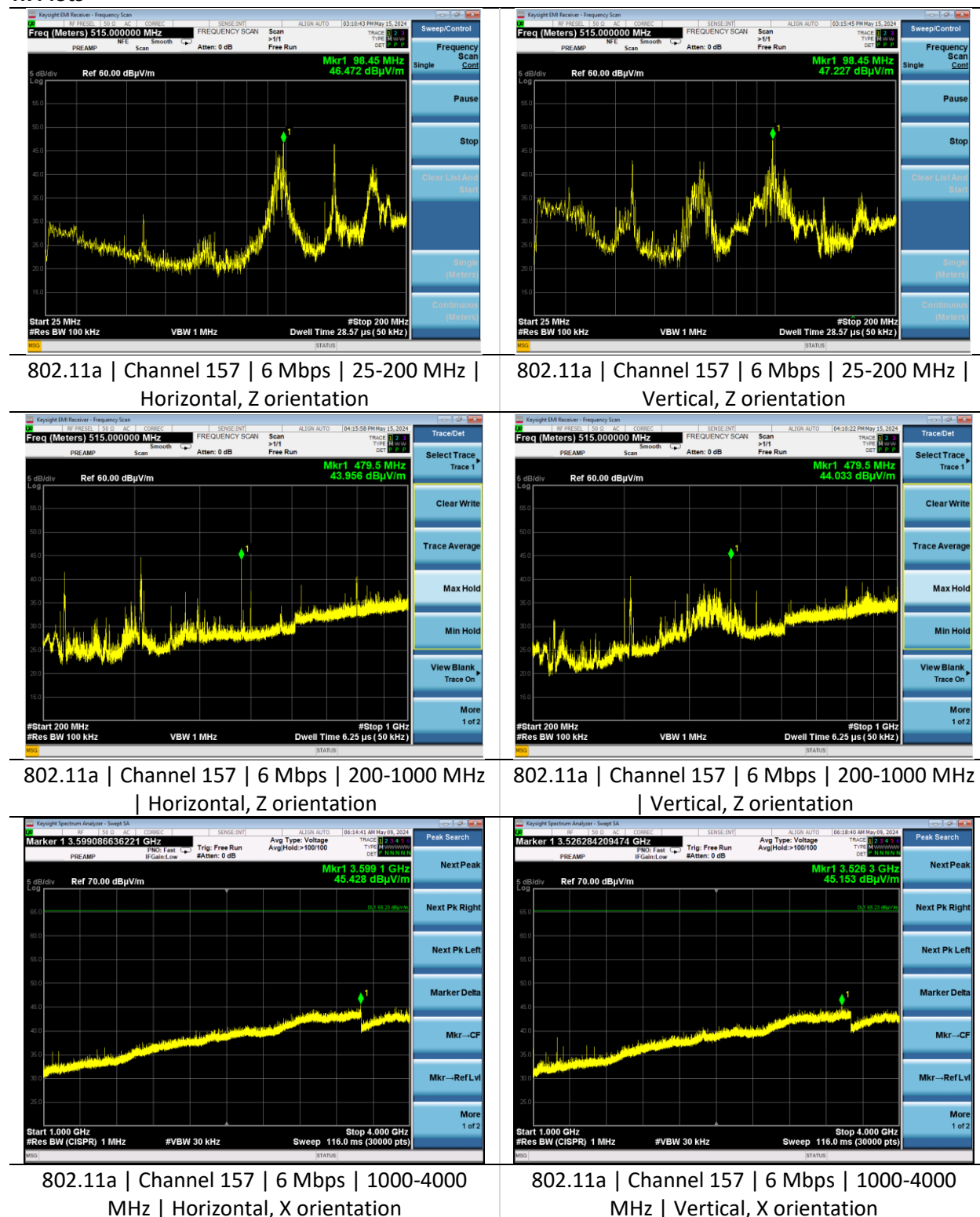


26000-40000 MHz

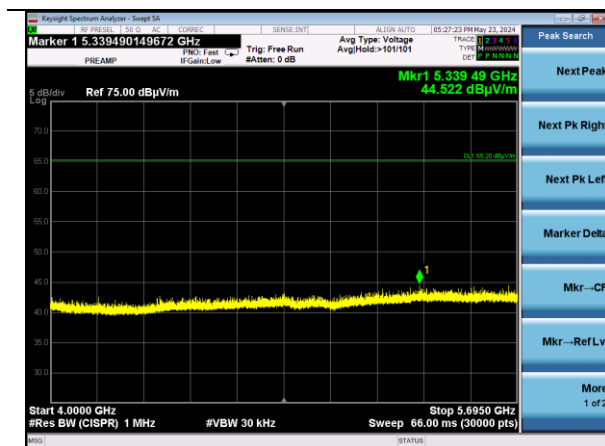
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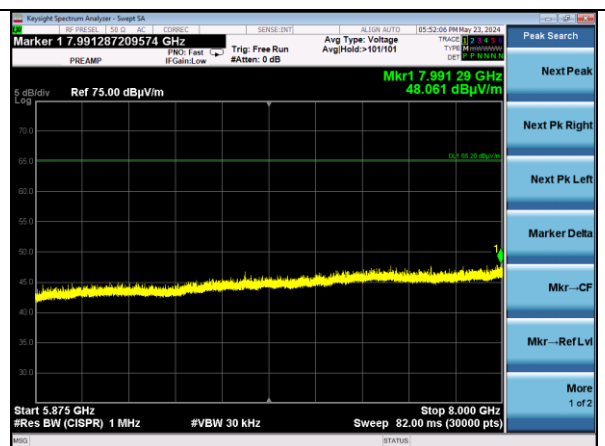
## Tx Plots



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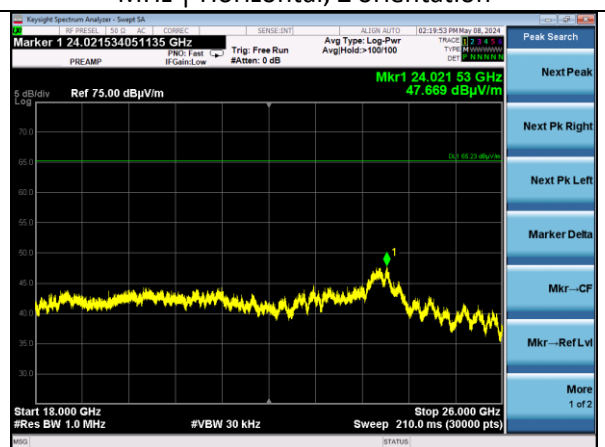
802.11ax | Channel 149 | MCS0 | 4000-5695 MHz  
 | Horizontal, Z orientation



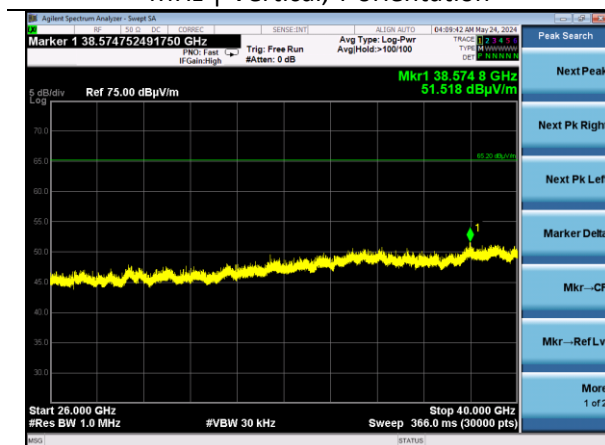
802.11ax | Channel 165 | MCS0 | 5875-8000  
 MHz | Horizontal, Z orientation



802.11a | Channel 157 | 6 Mbps | 8000-18000  
 MHz | Vertical, Y orientation

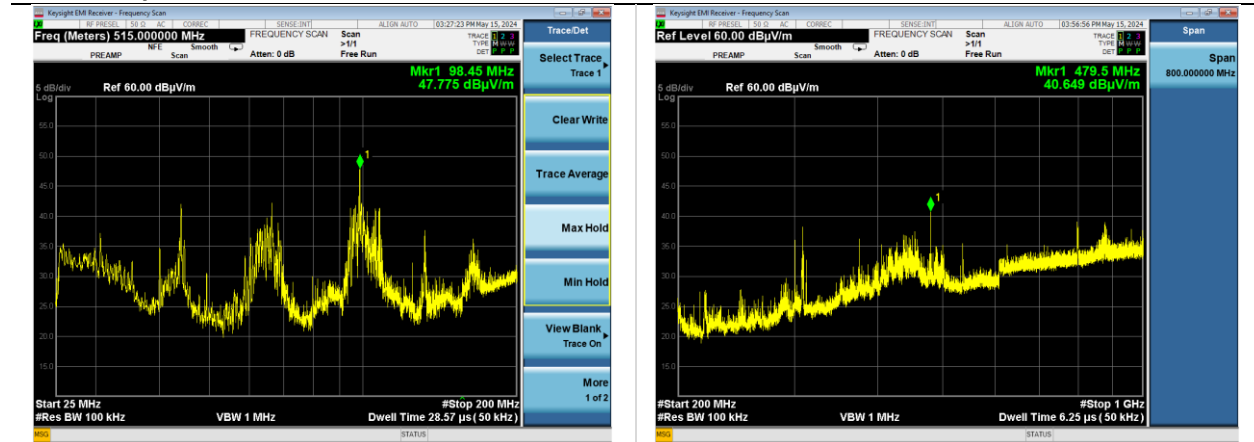


802.11a | Channel 157 | 6 Mbps | 18000-26000  
 MHz | Vertical, X orientation



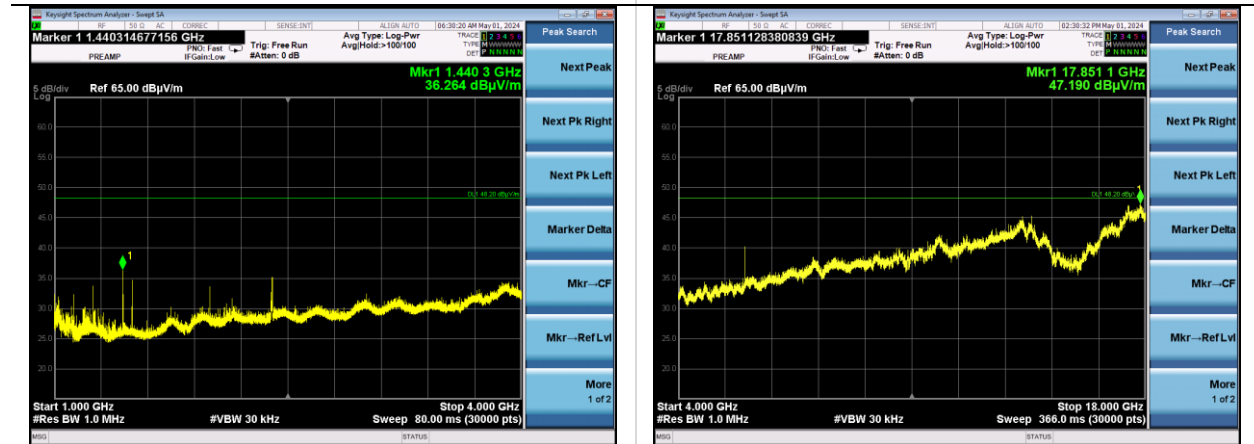
802.11a | Channel 157 | 6 Mbps | 26000-40000  
 MHz | Vertical, X orientation

## Rx/Standby Plots



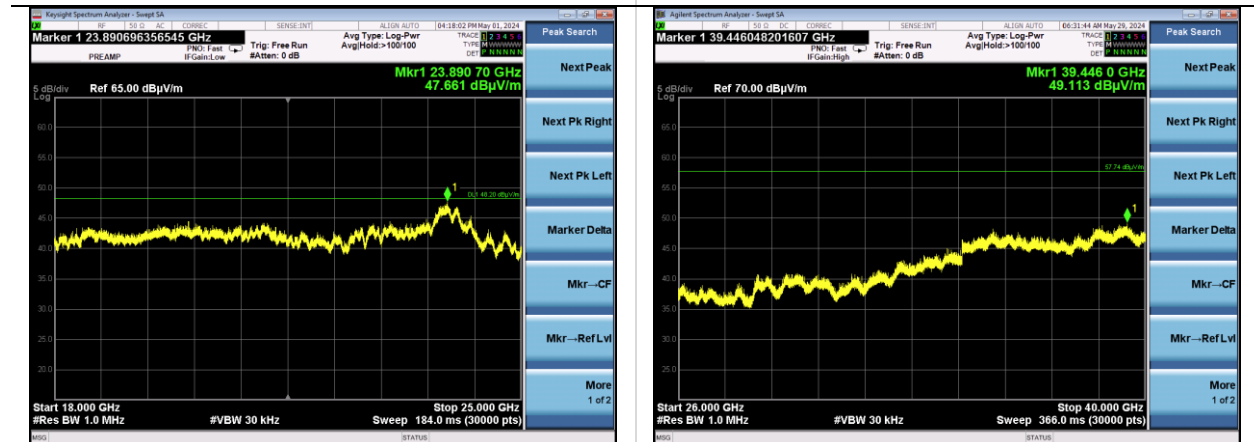
Rx | Channel 157 | 25-200 MHz | Vertical, Y Orientation

Rx | Channel 157 | 200-1000 MHz | Vertical, X Orientation



Rx | Channel 157 | 1000-4000 MHz | Horizontal, X orientation

Rx | Channel 157 | 4000-18000 MHz | Vertical, X orientation



Rx | Channel 157 | 18000-25000 MHz | Horizontal, X orientation

Rx | Channel 157 | 26000-40000 MHz | Vertical, X orientation

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Report: TR3768-166-ETSI-300-440		Model: SONA NX611M
Job: C-3768		Serial: 00047

## 6 REVISION HISTORY

Version	Date	Notes	Person
0	2/11/2025	Initial Draft	Anthony Smith
1	2/12/2025	Final Revisions	Anthony Smith

**END OF REPORT**