




TR3818-5G-300-440

Equipment Under Test:	SONA TI351
Requirement(s):	ETSI EN 300 440
Test Date(s):	09/24/2024 – 12/20/2024
Prepared for:	Ezurio Attn: Brian Petted W66 N220 Commerce Ct. Cedarburg, WI 53012

Report Issued by: Dylan Rosenfeldt, EMC Engineer	
Signature: 	Date: 01/14/2025
Report Reviewed by: Adam Alger, Manager EMC Laboratory	
Signature: 	Date: 01/13/2025
Report Constructed by: Dylan Rosenfeldt, EMC Engineer	
Signature: 	Date: 01/14/2025

This test report may not be reproduced, except in full, without approval of Ezurio

Company: Ezurio	Page 1 of 44	Name: SONA TI351
Report: TR3818-5G-300-440		Model: SONA TI351
Job: C-3818		Serial: 00013 00008

CONTENTS

Contents.....	2
Ezurio Test Services in Review	3
1 Test Report Summary	4
2 Client Information.....	5
2.1 Equipment Under Test (EUT) Information.....	5
2.2 Product Description.....	5
2.3 Modifications Incorporated for Compliance	5
2.4 Deviations and Exclusions from Test Specifications.....	5
2.5 EUT Information	5
2.6 Antenna Information	6
2.7 Test Channels.....	6
2.8 Power Table	7
3 References	8
4 Uncertainty Summary	9
5 Test Data	10
5.1 Antenna Port Conducted Emissions	10
5.2 Radiated Emissions	36
6 Revision History	44

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 44	Name: SONA TI351
Report: TR3818-5G-300-440		Model: SONA TI351
Job: C-3818		Serial: 00013 00008

1 TEST REPORT SUMMARY

During **09/24/2024-12/20/2024** the Equipment Under Test (EUT), **SONA TI351**, 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 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	-67.2 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	1.5 dB below specified limit
Emissions – Frequency	1% less than the specification
Immunity	Tested at specified level

2 CLIENT INFORMATION

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

2.1 Equipment Under Test (EUT) Information

The following information has been supplied by the client

Product Name	SONA TI351
Model Number	SONA TI351
Serial Number	00013 00008
FCC ID	SQG-SONATI351
IC ID	3147A-SONATI351

2.2 Product Description

The TI351 is based upon TI CC3351 Wi-Fi 6 chipset. Feature-set includes 802.11 a/b/g/n/ac/ax Wi-Fi 6 and Bluetooth Low Energy v5.4.

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 - image-imx8mp-evk-rdvk 1.0.0.5

Ancillary Equipment

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

Development Kit, NXP 8MPLUS-BB

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

OUTPUT: USB Type C 45W, 5V/3A; 9V/3A; 15V/3 A; 20V/2.25 A

HP Elitebook 840G1

TeraTerm Version: 5.1

2.6 Antenna Information

Manufacturer	Model	Part Number	Dimension	Type	Peak Gain (dBi)	
					2400-2500 MHz	4900-5925 MHz
Ezurio	FlexPIFA 6E	EFB2471A3S-10MH4L	16mm X 36mm X 2.5mm	PIFA	2.2	3.9
Ezurio	Mini NanoBlade Flex 6E	EMF2471A3S-10MH4L	36mm X 12mm X 0.3mm	PCB Dipole	2.4	4.4
Ezurio	FlexPIFA	001-0021	38.5mm X 12.7mm X 2.5mm	PIFA	2.5	3.0
Joymax Electronics	N/A	TWX-100BRS3B	137mm X 13mm	Dipole	2.0	4.0
Ezurio	FlexPIFA	EFB2455A3S-15MH4L	2.5mm X 38.6mm X 12.7mm	PIFA	2.5	3.0
Ezurio	Mini NanoBlade Flex	EMF2449A1-10MH4L	36mm x 12mm x 0.1mm	PIFA	2.8	3.4
Ezurio	NanoBlade	ENB2449A1-10MH4L	50.8mm x 16.5mm	PCB Dipole	3.2	4.1

2.7 Test Channels

Channel	Frequency (MHz)	Bandwidth (MHz)	Data Rates
149	5745	20	802.11a – 6 and 54 Mbps 802.11n – MCS0 and MCS7 802.11ac – MCS0 and MCS7 802.11ax – MCS0 and MCS7
153	5765	20	
157	5785	20	
161	5805	20	
165	5825	20	

2.8 Power Table

Mode	Channel	Power Setting
802.11a	149-165	21
802.11n	149-165	21
802.11ac	149-165	21
802.11ax	149-165	21
802.11ax RU26	149-165	21
802.11ax RU52	149-165	21
802.11ax RU106	149-165	21
802.11ax RU242	149-165	20

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

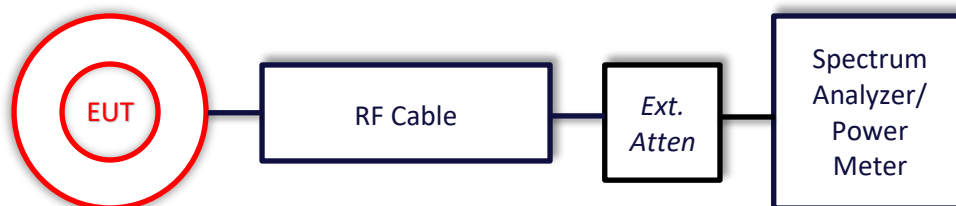
Parameter	ETSI U.C. \pm	U.C. \pm
Radio Frequency, from F0	1×10^{-7}	0.55×10^{-7}
Occupied Channel Bandwidth	5 %	2 %
RF conducted Power (Power Meter)	1.5 dB	1.2 dB
RF conducted emissions (Spectrum Analyzer)	3.0 dB	1.7 dB
All emissions, radiated	6.0 dB	5.3 dB
Temperature	1° C	0.65° C
Humidity	5 %	2.9 %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

5 TEST DATA

5.1 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



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

Operator	Dylan Rosenfeldt	QA	Adam Alger
Temperature	21.1°C	R.H. %	45.7%
Test Date	10/28/2024	Location	Thermotron Temp Chamber
Requirement	ETSI 300 440 4.2.2.4	Method	ETSI 300 440 4.2.2.3

Limits: The transmitter maximum e.i.r.p. under normal and extreme test conditions is 25 mW

Test Parameters

Frequency	5725-5850 MHz	Setup	Antenna Port
Operating Temperature	-40.0°C to +85.0°C	Sample Speed	32 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
AA 960144	Cable	Gore	EKD01D010720	5800373	6/13/2024	6/13/2025	Active Verification

EUT Parameters

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

Setup Photos



Company: Ezurio	Page 12 of 44	Name: SONA TI351
Report: TR3818-5G-300-440		Model: SONA TI351
Job: C-3818		Serial: 00013 00008

Output Power Measurements +21.1°C

Channel	Mode	Data Rate	Avg Output Power (dBm)	Antenna Gain (dBi)	Corrected Measurement (dBm) e.i.r.p	Limit (dBm)	Margin (dB)	Power Setting
149	802.11a	6M	5.4	4.4	9.8	14.0	4.2	21
	802.11n	MCS0	5.6	4.4	10.0	14.0	4.0	21
	802.11ac	MCS0	5.8	4.4	10.2	14.0	3.8	21
	802.11ax	MCS0	5.5	4.4	9.9	14.0	4.1	21
	802.11ax	MCS0 RU26	6.0	4.4	10.4	14.0	3.6	21
	802.11ax	MCS0 RU52	6.1	4.4	10.5	14.0	3.5	21
	802.11ax	MCS0 RU106	6.0	4.4	10.4	14.0	3.6	21
	802.11ax	MCS0 RU242	5.2	4.4	9.6	14.0	4.4	20
157	802.11a	6M	5.5	4.4	9.9	14.0	4.1	21
	802.11n	MCS0	5.5	4.4	9.9	14.0	4.1	21
	802.11ac	MCS0	5.6	4.4	10.0	14.0	4.0	21
	802.11ax	MCS0	5.5	4.4	9.9	14.0	4.1	21
	802.11ax	MCS0 RU26	5.7	4.4	10.1	14.0	3.9	21
	802.11ax	MCS0 RU52	6.1	4.4	10.5	14.0	3.5	21
	802.11ax	MCS0 RU106	6.1	4.4	10.5	14.0	3.5	21
	802.11ax	MCS0 RU242	4.8	4.4	9.2	14.0	4.8	20
165	802.11a	6M	5.5	4.4	9.9	14.0	4.1	21
	802.11n	MCS0	5.7	4.4	10.1	14.0	3.9	21
	802.11ac	MCS0	5.6	4.4	10.0	14.0	4.0	21
	802.11ax	MCS0	5.7	4.4	10.1	14.0	3.9	21
	802.11ax	MCS0 RU26	6.0	4.4	10.4	14.0	3.6	21
	802.11ax	MCS0 RU52	6.3	4.4	10.7	14.0	3.3	21
	802.11ax	MCS0 RU106	6.1	4.4	10.5	14.0	3.5	21
	802.11ax	MCS0 RU242	4.9	4.4	9.3	14.0	4.7	20

Output Power Measurements +85.0°C

Channel	Mode	Data Rate	Avg Output Power (dBm)	Antenna Gain (dBi)	Corrected Measurement (dBm) e.i.r.p	Limit (dBm)	Margin (dB)	Power Setting
149	802.11a	6M	3.6	4.4	8.0	14.0	6.0	21
	802.11n	MCS0	3.6	4.4	8.0	14.0	6.0	21
	802.11ac	MCS0	3.7	4.4	8.1	14.0	5.9	21
	802.11ax	MCS0	3.5	4.4	7.9	14.0	6.1	21
	802.11ax	MCS0 RU26	3.7	4.4	8.1	14.0	5.9	21
	802.11ax	MCS0 RU52	4.2	4.4	8.6	14.0	5.4	21
	802.11ax	MCS0 RU106	4.2	4.4	8.6	14.0	5.4	21
	802.11ax	MCS0 RU242	2.8	4.4	7.2	14.0	6.8	20
157	802.11a	6M	3.5	4.4	7.9	14.0	6.1	21
	802.11n	MCS0	3.5	4.4	7.9	14.0	6.1	21
	802.11ac	MCS0	3.5	4.4	7.9	14.0	6.1	21
	802.11ax	MCS0	3.4	4.4	7.8	14.0	6.2	21
	802.11ax	MCS0 RU26	3.7	4.4	8.1	14.0	5.9	21
	802.11ax	MCS0 RU52	4.0	4.4	8.4	14.0	5.6	21
	802.11ax	MCS0 RU106	4.0	4.4	8.4	14.0	5.6	21
	802.11ax	MCS0 RU242	2.5	4.4	6.9	14.0	7.1	20
165	802.11a	6M	3.6	4.4	8.0	14.0	6.0	21
	802.11n	MCS0	3.6	4.4	8.0	14.0	6.0	21
	802.11ac	MCS0	3.8	4.4	8.2	14.0	5.8	21
	802.11ax	MCS0	3.6	4.4	8.0	14.0	6.0	21
	802.11ax	MCS0 RU26	3.9	4.4	8.3	14.0	5.7	21
	802.11ax	MCS0 RU52	4.2	4.4	8.6	14.0	5.4	21
	802.11ax	MCS0 RU106	4.1	4.4	8.5	14.0	5.5	21
	802.11ax	MCS0 RU242	2.6	4.4	7.0	14.0	7.0	20

Output Power Measurements -40.0°C

Channel	Mode	Data Rate	Avg Output Power (dBm)	Antenna Gain (dBi)	Corrected Measurement (dBm) e.i.r.p	Limit (dBm)	Margin (dB)	Power Setting
149	802.11a	6M	7.7	4.4	12.1	14.0	1.9	21
	802.11n	MCS0	7.6	4.4	12.0	14.0	2.0	21
	802.11ac	MCS0	7.7	4.4	12.1	14.0	1.9	21
	802.11ax	MCS0	7.6	4.4	12.0	14.0	2.0	21
	802.11ax	MCS0 RU26	7.8	4.4	12.2	14.0	1.8	21
	802.11ax	MCS0 RU52	8.1	4.4	12.5	14.0	1.5	21
	802.11ax	MCS0 RU106	8.0	4.4	12.4	14.0	1.6	21
	802.11ax	MCS0 RU242	7.4	4.4	11.8	14.0	2.2	20
157	802.11a	6M	7.4	4.4	11.8	14.0	2.2	21
	802.11n	MCS0	7.4	4.4	11.8	14.0	2.2	21
	802.11ac	MCS0	7.6	4.4	12.0	14.0	2.0	21
	802.11ax	MCS0	7.3	4.4	11.7	14.0	2.3	21
	802.11ax	MCS0 RU26	7.7	4.4	12.1	14.0	1.9	21
	802.11ax	MCS0 RU52	8.0	4.4	12.4	14.0	1.6	21
	802.11ax	MCS0 RU106	8.0	4.4	12.4	14.0	1.6	21
	802.11ax	MCS0 RU242	7.1	4.4	11.5	14.0	2.5	20
165	802.11a	6M	7.4	4.4	11.8	14.0	2.2	21
	802.11n	MCS0	7.5	4.4	11.9	14.0	2.1	21
	802.11ac	MCS0	7.6	4.4	12.0	14.0	2.0	21
	802.11ax	MCS0	7.4	4.4	11.8	14.0	2.2	21
	802.11ax	MCS0 RU26	7.4	4.4	11.8	14.0	2.2	21
	802.11ax	MCS0 RU52	8.1	4.4	12.5	14.0	1.5	21
	802.11ax	MCS0 RU106	7.9	4.4	12.3	14.0	1.7	21
	802.11ax	MCS0 RU242	7.2	4.4	11.6	14.0	2.4	20

5.1.2 Permitted range of operating frequencies

Operator	Dylan Rosenfeldt	QA	Anthony Smith
Temperature	21.5°C	R.H. %	30.90%
Test Date	10/28/2024	Location	Thermotron Temp Chamber
Requirement	ETSI 300 440 4.2.3.5	Method	ETSI 300 440 4.2.3.3

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

Test Parameters

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

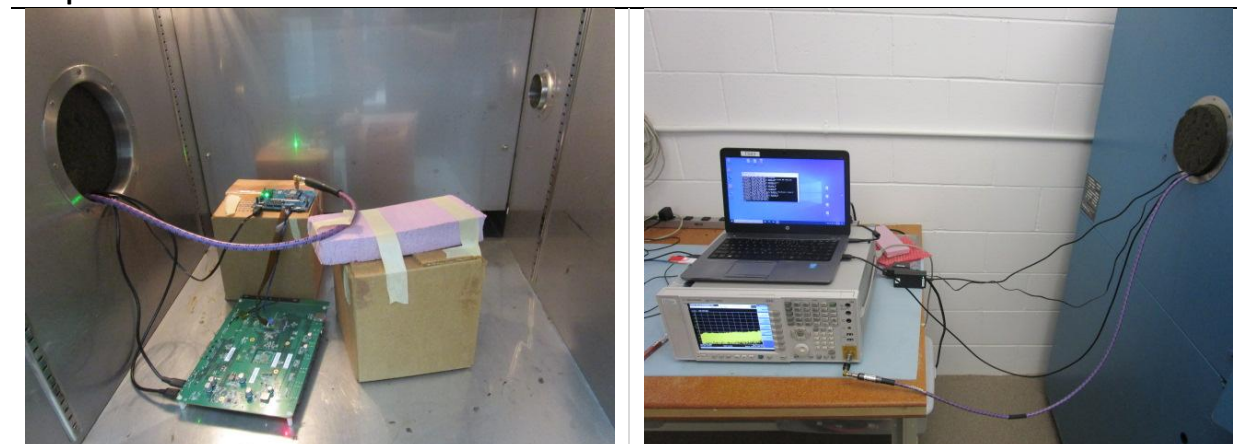
Instrumentation

Asset #	Description	Manufacturer	Model #	Serial #	Date	Due Date	Status
EE 960087	Analyzer - Spectrum	Agilent	N9010A	MY53400296	4/10/2024	4/10/2025	Active Calibration
AA 960144	Cable	Gore	EKD01D010720	5800373	6/13/2024	6/13/2025	Active Verification

EUT Parameters

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

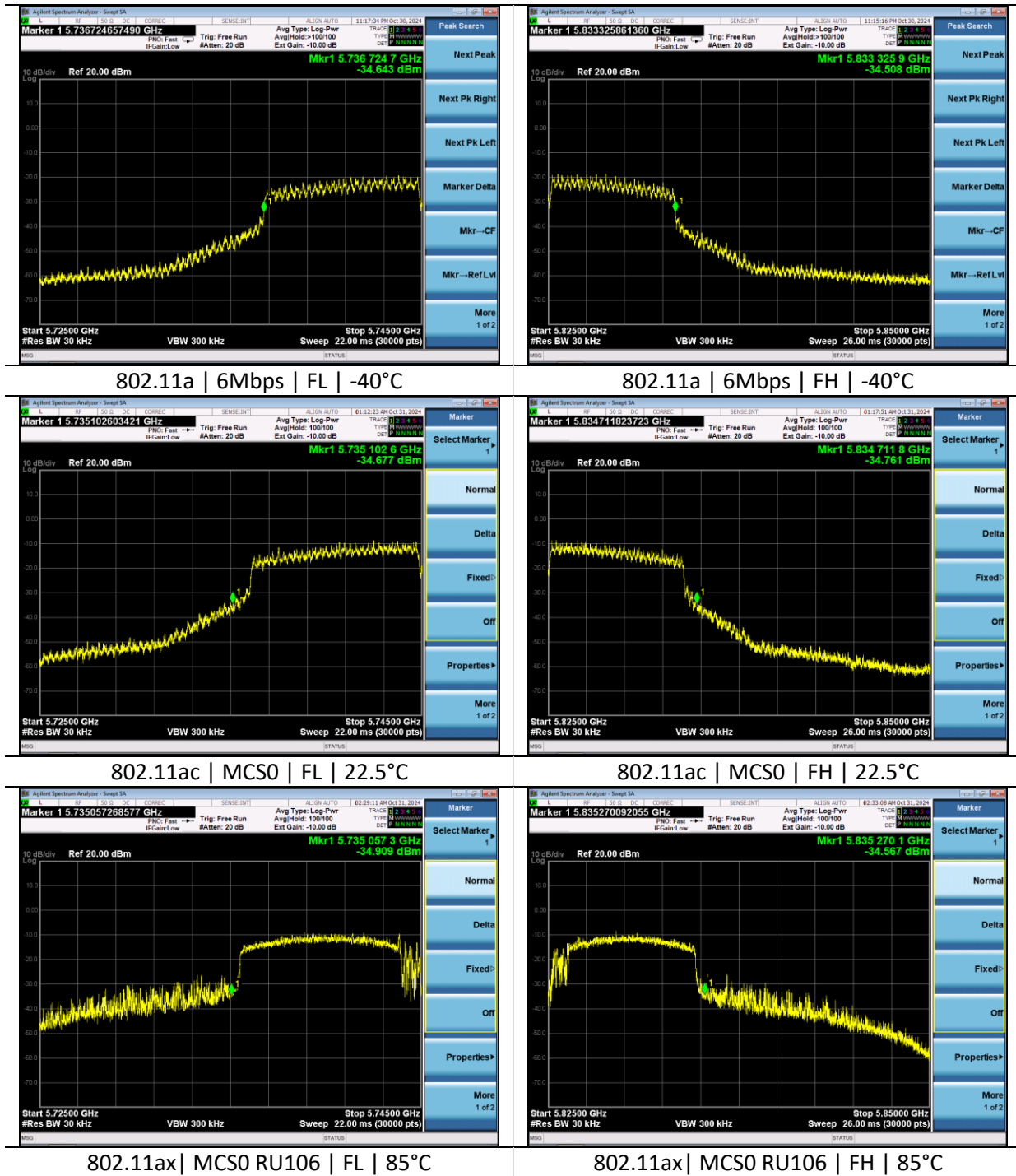
Setup Photos



Measurements

Channel	Mode	Temp	FL (MHz)	FL Limit (MHz)	FH (MHz)	FH Limit (MHz)	Frequency Range (MHz)
149,165	802.11a	-40°C	5736.7	5725.0	5833.3	5875.0	96.6
149,165	802.11n	-40°C	5736.1	5725.0	5834.0	5875.0	97.9
149,165	802.11ac	-40°C	5736.1	5725.0	5834.0	5875.0	97.9
149,165	802.11ax	-40°C	5735.4	5725.0	5834.6	5875.0	99.2
149,165	802.11ax RU26	-40°C	5735.2	5725.0	5834.8	5875.0	99.6
149,165	802.11ax RU52	-40°C	5735.4	5725.0	5834.7	5875.0	99.3
149,165	802.11ax RU106	-40°C	5735.4	5725.0	5834.7	5875.0	99.3
149,165	802.11ax RU242	-40°C	5735.4	5725.0	5834.6	5875.0	99.2
149,165	802.11a	22.5°C	5734.7	5725.0	5834.5	5875.0	99.8
149,165	802.11n	22.5°C	5735.2	5725.0	5834.7	5875.0	99.5
149,165	802.11ac	22.5°C	5735.1	5725.0	5834.7	5875.0	99.6
149,165	802.11ax	22.5°C	5734.9	5725.0	5835.0	5875.0	100.1
149,165	802.11ax RU26	22.5°C	5734.5	5725.0	5836.0	5875.0	101.5
149,165	802.11ax RU52	22.5°C	5734.5	5725.0	5835.9	5875.0	101.4
149,165	802.11ax RU106	22.5°C	5734.4	5725.0	5835.5	5875.0	101.1
149,165	802.11ax RU242	22.5°C	5734.8	5725.0	5835.3	5875.0	100.5
149,165	802.11a	85°C	5736.5	5725.0	5833.7	5875.0	97.2
149,165	802.11n	85°C	5735.9	5725.0	5834.3	5875.0	98.4
149,165	802.11ac	85°C	5735.9	5725.0	5834.3	5875.0	98.4
149,165	802.11ax	85°C	5735.4	5725.0	5834.8	5875.0	99.4
149,165	802.11ax RU26	85°C	5734.9	5725.0	5835.4	5875.0	100.5
149,165	802.11ax RU52	85°C	5735.1	5725.0	5835.1	5875.0	100
149,165	802.11ax RU106	85°C	5735.1	5725.0	5835.3	5875.0	100.2
149,165	802.11ax RU242	85°C	5735.3	5725.0	5834.8	5875.0	99.5

Plots



5.1.3 Unwanted emissions in the spurious domain

Operator	Dylan Rosenfeldt	QA	Jon Dilley
Temperature	21.3°C	R.H. %	50.80%
Test Date	11/5/2024	Location	RF Conducted Bench
Requirement	ETSI 300 440 4.2.4	Method	ETSI 300 440 4.2.4

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

Frequency	25-40000 MHz	Setup	Antenna Port
Detector(s)	Peak		

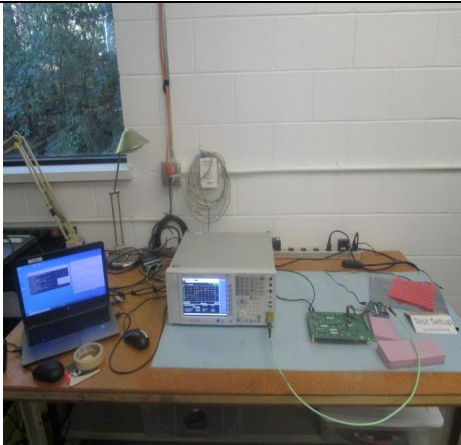
Instrumentation

Asset #	Description	Manufacturer	Model #	Serial #	Date	Due Date	Status
AA 960144	Cable	Gore	EKD01D010720	5800373	6/13/2024	6/13/2025	Active Verification
EE 960087	Analyzer - Spectrum	Agilent	N9010A	MY53400296	4/10/2024	4/10/2025	Active Calibration

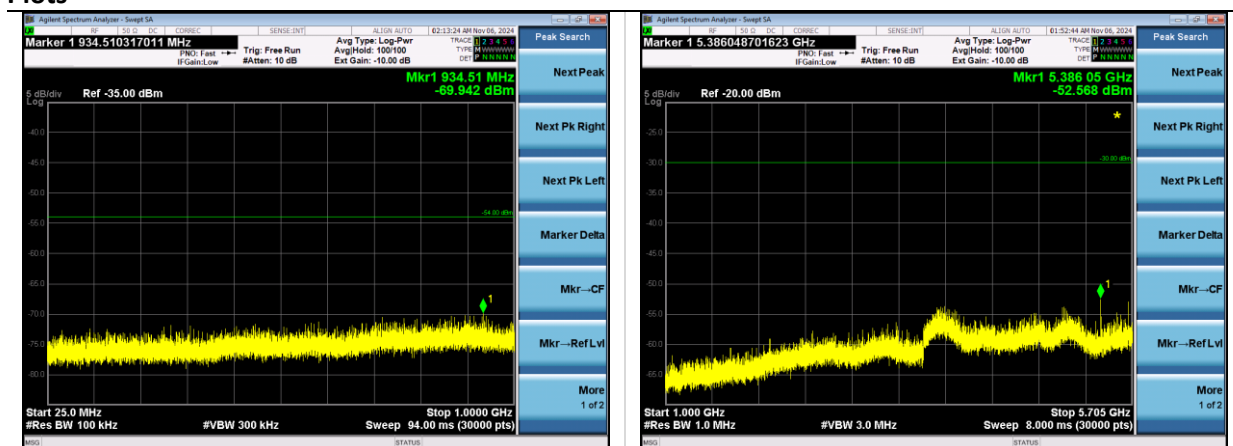
EUT Parameters

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

Setup Photos

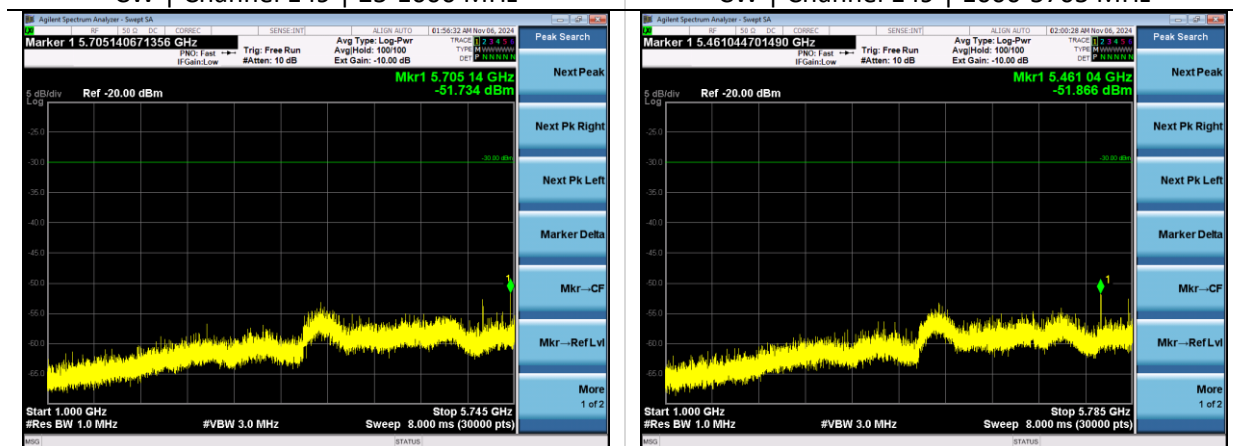


Plots



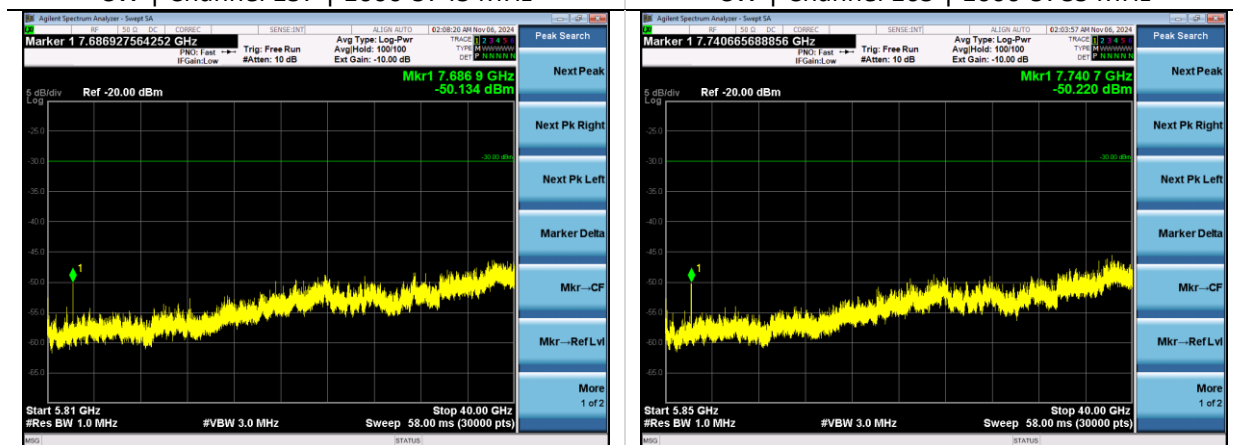
CW | Channel 149 | 25-1000 MHz

CW | Channel 149 | 1000-5705 MHz



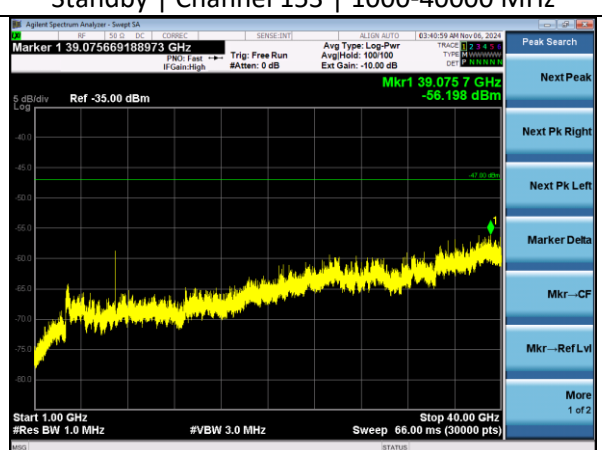
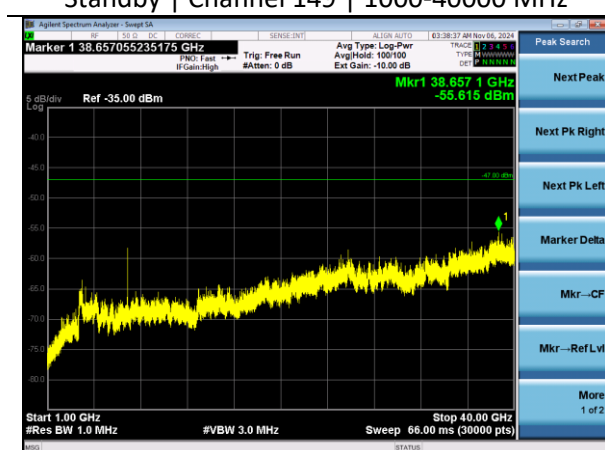
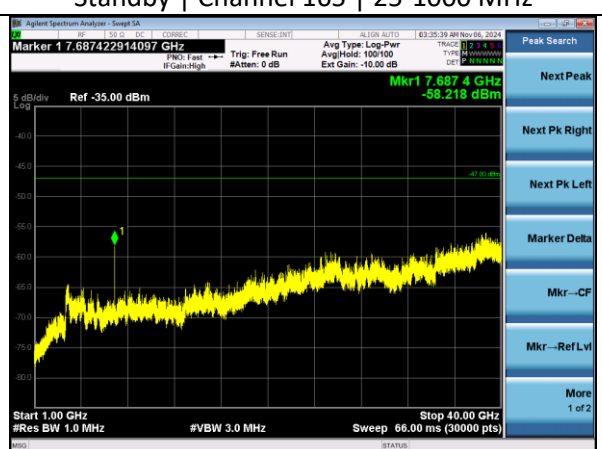
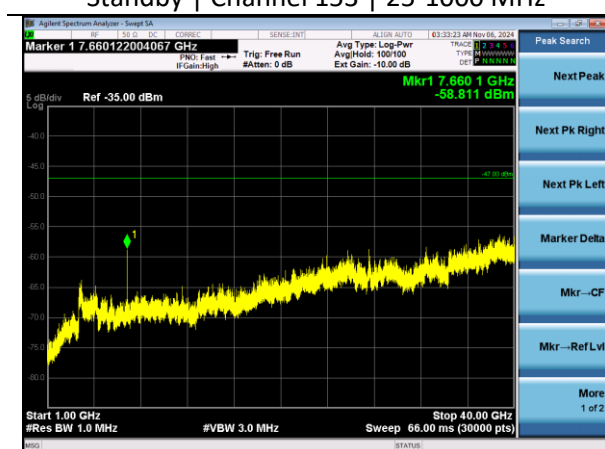
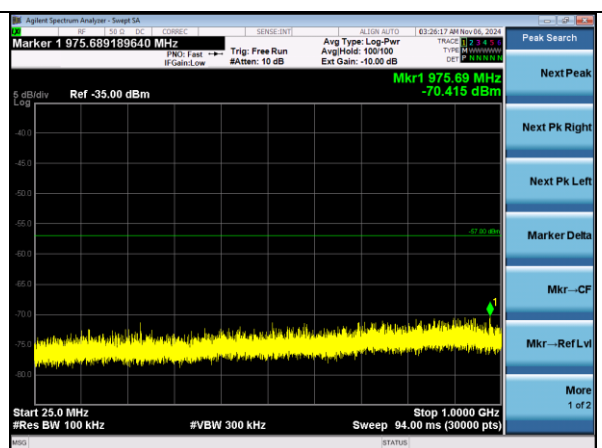
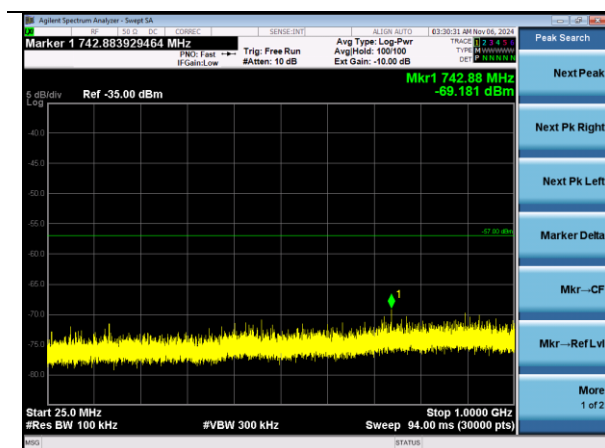
CW | Channel 157 | 1000-5745 MHz

CW | Channel 157 | 1000-5785 MHz



CW | Channel 153 | 5805-40000 MHz

CW | Channel 153 | 5845-40000 MHz



5.1.4 Adjacent channel selectivity

Operator	Dylan Rosenfeldt	QA	Anthony Smith
Temperature	21.7°C	R.H. %	23.60%
Test Date	12/20/2024	Location	RF Conducted Bench
Requirement	ETSI 300 440 4.3.3	Method	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

Adjacent channel Frequency	5765, 5805 MHz	Setup	Antenna port
Blocking Signal	CW		

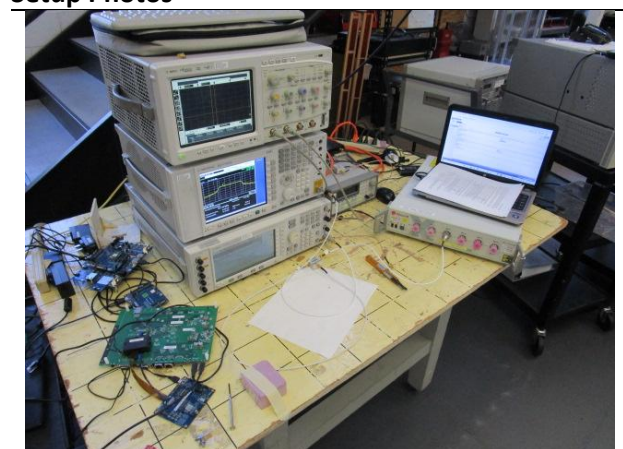
Instrumentation

Asset #	Description	Manufacturer	Model #	Serial #	Date	Due Date	Status
AA 960182	RF Splitter/Combiner	Mini-Circuits	ZFSC-2-10G+	F707701704	12/12/2023	12/12/2025	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

EUT Parameters

Input Power	120VAC 60 Hz	Mode	5GHz WLAN RX
Frequency	5785 MHz	Channel	157
AE	Litepoint IQxel-M		

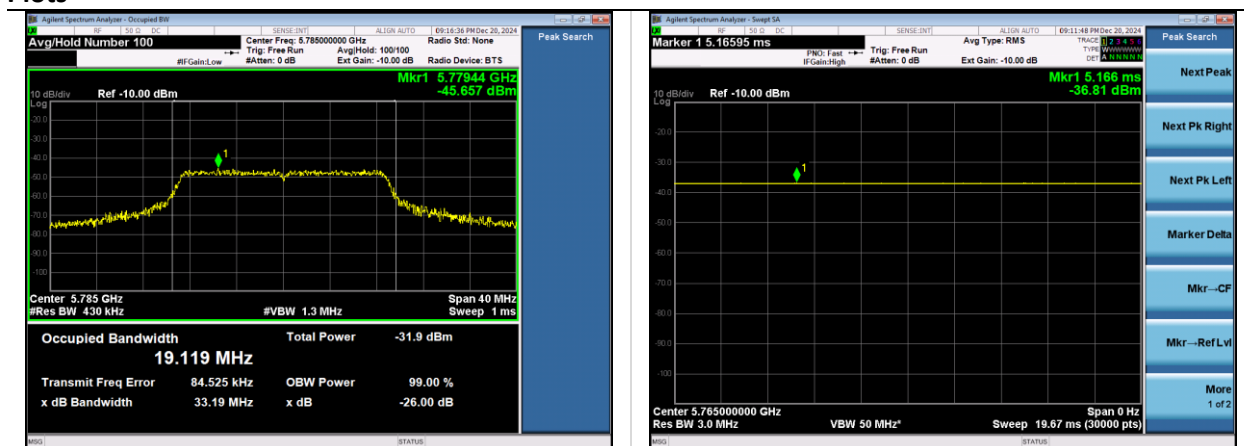
Setup Photos



Measurements

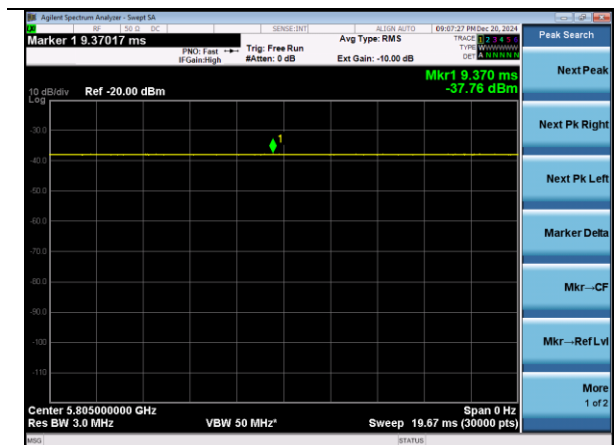
Frequency (MHz)	Pmin (RSSI)	Pmin + 3dB (RSSI)	Blocking Signal Frequency (MHz)	Packets Received of 1000	Blocking Power (dBm)	Occupied Bandwidth (MHz)	k Factor (dB)	Limit (dBm)
5785	-82	-79	5765	1000	-36.8	19.1	-28.1	-58.1
			5805	1000	-37.8			

Plots



Wanted Signal Bandwidth

Blocking Signal at adjacent channel below wanted signal



Blocking Signal at adjacent channel above wanted signal

5.1.5 Blocking or desensitization

Operator	Anthony Smith	QA	Dylan Rosenfeldt
Temperature	21.4°C-21.5°C	R.H. %	36.9%-41.2%
Test Date	11/11/2024-11/12/2024	Location	RF Conducted Bench
Requirement	ETSI 300 440 4.3.4	Method	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

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

Instrumentation

Asset #	Description	Manufacturer	Model #	Serial #	Date	Due Date	Status
EE 960086	Generator - Signal	Rohde & Schwarz	SMB100A	1406.600K03	4/13/2024	4/13/2025	Active Calibration
EE 960087	Analyzer - Spectrum	Agilent	N9010A	MY53400296	4/10/2024	4/10/2025	Active Calibration
AA 960180	Attenuator - Step Variable 1 dB	RF Lambda	RKT2G6A10	16100801	12/12/2023	12/12/20245	Active Verification
AA 960182	RF Splitter/Combiner	Mini-Circuits	ZFSC-2-10G+	F707701704	12/12/2023	12/12/202	Active Verification
AA 960184	Attenuator - Step Variable 10 dB	RF Lambda	RKT2G6A60	17031005	12/12/2023	12/12/2025	Active Verification

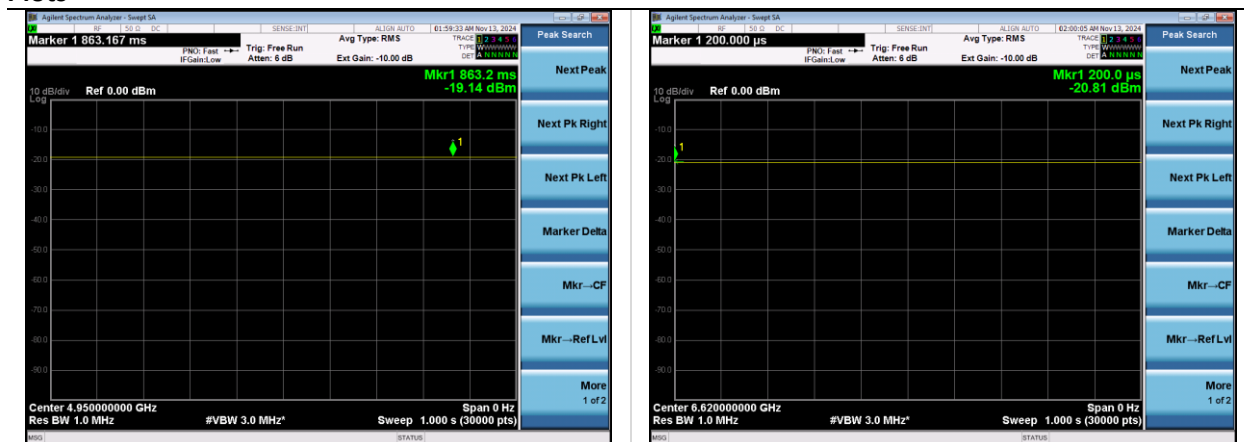
EUT Parameters

Input Power	120 VAC @ 60 Hz	Mode	5GHz WLAN Rx
Frequency	5785 MHz	Channel	157

Measurements

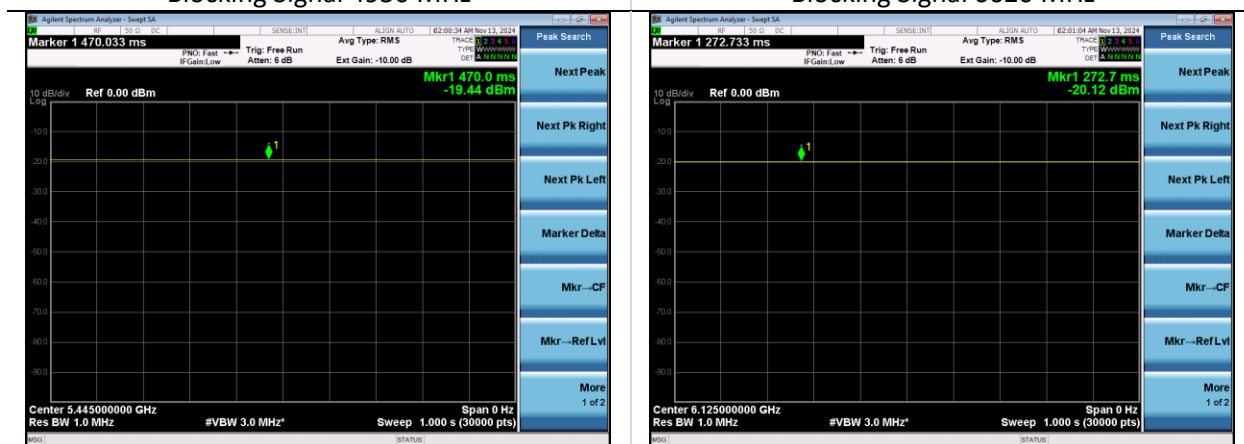
Frequency (MHz)	Pmin (RSSI)	Pmin + 3dB (RSSI)	Blocking Signal Frequency (MHz)	Blocking Power (dBm)	Occupied Bandwidth (MHz)	k Factor (dB)	Limit (dBm)
5785	-93	-90	5960.0	-21.6	16.5	-27.4	-57.4
			5610.0	-19.4			
			6125.0	-20.1			
			5445.0	-19.4			
			6620.0	-20.8			
			4950.0	-19.1			

Plots



Blocking Signal 4950 MHz

Blocking Signal 6620 MHz



Blocking Signal 5445 MHz

Blocking Signal 6125 MHz



Blocking Signal 5610 MHz

Blocking Signal 5960 MHz

Pmin found at litepoint setting -80, levels taken at -60 to be above noise floor of analyzer

Company: Ezurio		Name: SONA TI351
Report: TR3818-5G-300-440	Page 28 of 44	Model: SONA TI351
Job: C-3818		Serial: 00013 00008

5.1.6 Receiver spurious emissions

Operator	Dylan Rosenfeldt	QA	Jon Dilley
Temperature	21.3°C	R.H. %	50.80%
Test Date	11/5/2024	Location	RF Conducted Bench
Requirement	300 440 4.2.4	Method	4.2.4.3

Limits:

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

Test Parameters

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

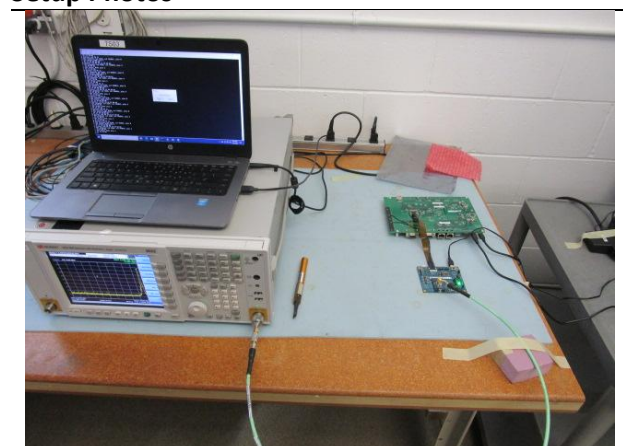
Instrumentation

Asset #	Description	Manufacturer	Model #	Serial #	Date	Due Date	Status
AA 960144	Cable	Gore	EKD01D010720	5800373	6/13/2024	6/13/2025	Active Verification
EE 960087	Analyzer - Spectrum	Agilent	N9010A	MY53400296	4/10/2024	4/10/2025	Active Calibration

EUT Parameters

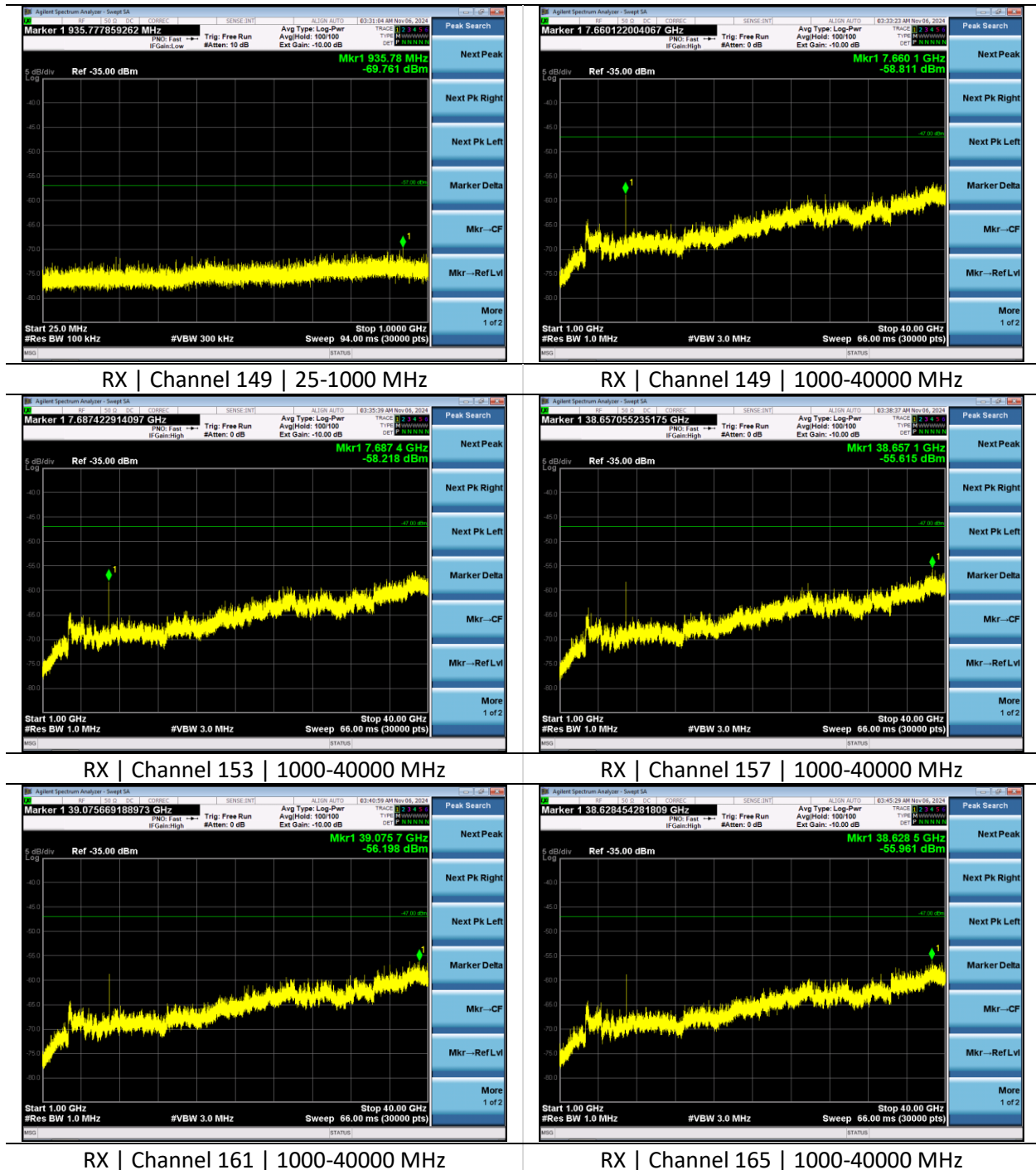
Input Power	120 VAC @ 60 Hz	Mode	5GHz WLAN Rx
Frequency	5745-5825 MHz	Channel	See 2.7

Setup Photos



Channel	Mode	Data Rate	Frequency (MHz)	Measurement (dBm)	Antenna Gain (dBi)	Corrected Measurement (dBm) e.i.r.p	Limit (dBm)	Margin (dB)
153	RX	RX	7686.5	-57.9	4.4	-53.5	-47.0	6.5
157	RX	RX	38661.8	-57.1	4.4	-52.7	-47.0	5.7

Plots



5.1.7 Spectrum Access Techniques – Listen Before Talk

Operator	Dylan Rosenfeldt	QA	Anthony Smith
Temperature	21.7°C	R.H. %	23.60%
Test Date	12/19/2024	Location	RF Conducted Bench
Requirement	ETSI 300 440 4.4.2	Method	ETSI 301 440 4.4.2.2.2

Test Parameters

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

Instrumentation

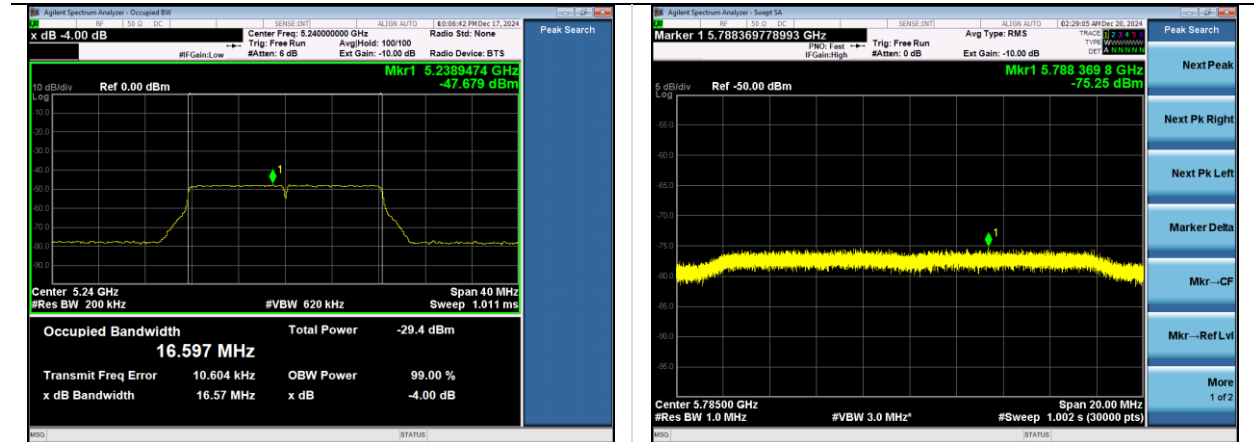
Asset #	Description	Manufacturer	Model #	Serial #	Date	Due Date	Status
AA 960180	Attenuator - Step Variable 1 dB	RF Lambda	RKT2G6A10	16100801	12/12/2023	12/12/2025	Active Verification
AA 960182	RF Splitter/Combiner	Mini-Circuits	ZFSC-2-10G+	F707701704	12/12/2023	12/12/2025	Active Verification
AA 960184	Attenuator - Step Variable 10 dB	RF Lambda	RKT2G6A60	17031005	12/12/2023	12/12/2025	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	1406.600K03	4/13/2024	4/13/2025	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	1/8/2024	1/8/2025	Active Verification
EE 960184	RF Splitter/Combiner	mini-circuits	ZFSC-2-10G +	S F707601702	12/12/2023	12/12/2025	Active Verification

EUT Parameters

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

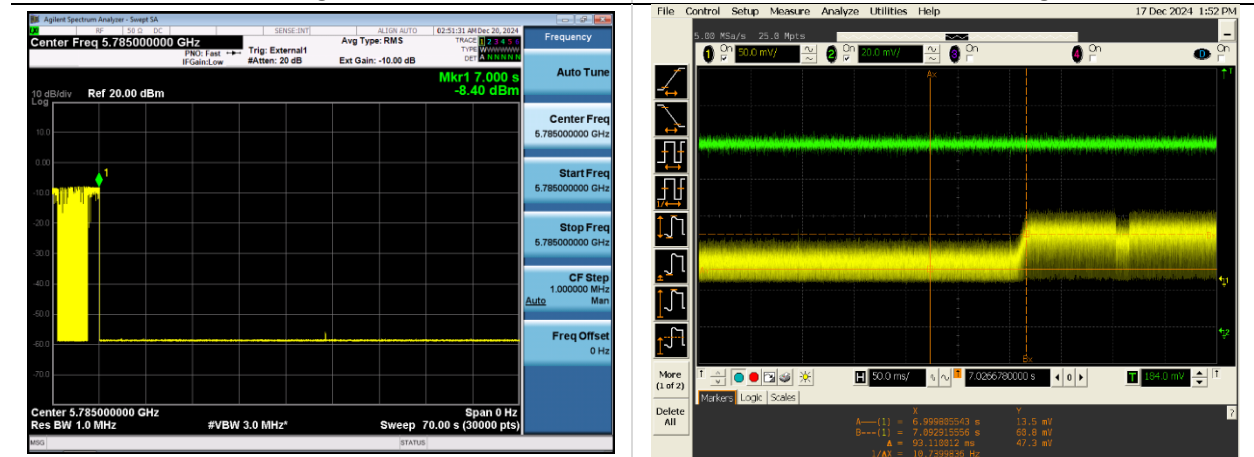
Interference Signal		
Frequency (MHz)	Threshold Level (dBm)	Sig Gen Setting (dBm)
5785	-75.3	-59.0

Plots



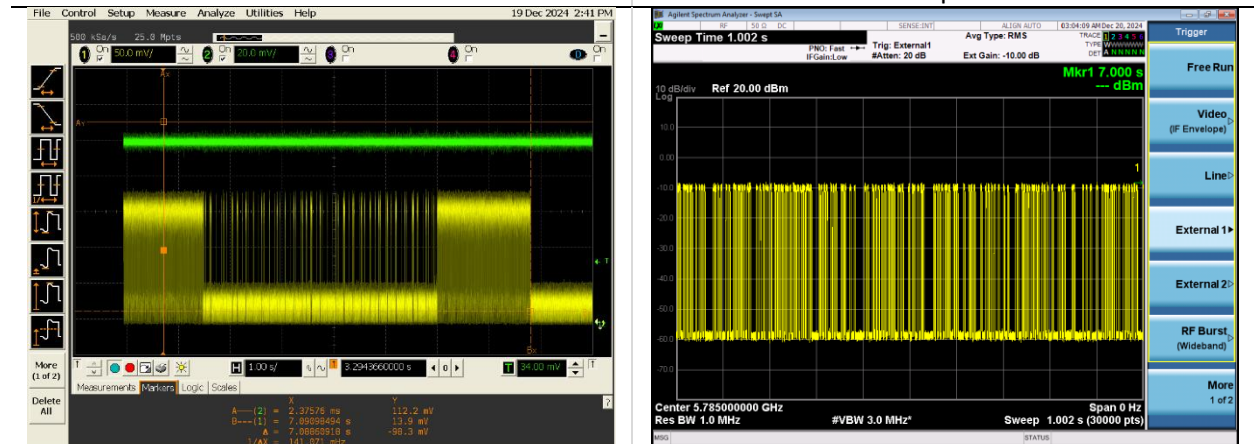
Interference signal Bandwidth

5785 MHz Interference Signal Level



Interference signal starts at 7s

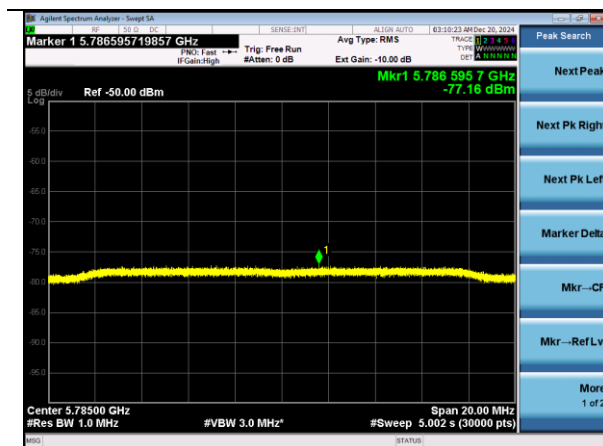
90ms after interference signal starts to reach correct TX power level



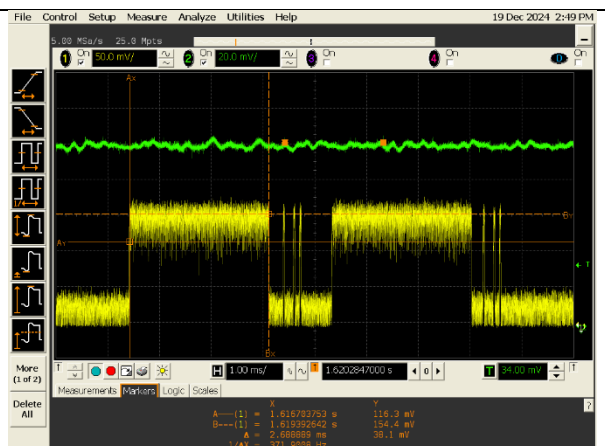
Transmission stops at 7.088 seconds

Transmission starts again at signal generator level -62.0 dBm

Company: Ezurio		Name: SONA TI351
Report: TR3818-5G-300-440	Page 34 of 44	Model: SONA TI351
Job: C-3818		Serial: 00013 00008



Interference Signal Level at signal generator level
-62.0



Transmitter on-time 2.69ms

Company: Ezurio	Page 35 of 44	Name: SONA TI351
Report: TR3818-5G-300-440		Model: SONA TI351
Job: C-3818		Serial: 00013 00008

5.2 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



5.2.1 Unwanted emissions in the spurious domain

Operator	Mitchell Freund Jon Dilley Dylan Rosenfeldt	QA	Jon Dilley Mitchell Freund Adam Alger Anthony Smith
Temperature	20.7°C-21.9°C	R.H. %	36.1%-51.6%
Test Date	09/24/2024-9/26/2024, 10/14/2024, 10/23/2024-10/25/2024, 11/4/2024	Location	Chamber 3
Requirement	ETSI 300 440 4.2.4	Method	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

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

Instrumentation

Asset #	Description	Manufacturer	Model #	Serial #	Date	Due Date	Status
EE 960203	Analyzer - EMI Receiver	Keysight	N9038A	MY56400072	4/11/2024	4/11/2025	Active Calibration
LSC-300	Cable	Chamber 3 Emissions	-	-	1/5/2024	1/5/2025	Active Verification
AA 960218	Antenna - Biconical	A.H. Systems, Inc.	SAS-540	853	7/17/2024	7/17/2025	Active Calibration
AA 960150	Antenna - Biconical	ETS Lindgren	3110B	0003-3346	12/9/2024	12/9/2025	Active Calibration
AA 960158	Antenna - Double Ridge Horn	ETS Lindgren	3117	109300	2/7/2024	2/7/2025	Active Calibration
AA 960174	Antenna - Small Horn	ETS Lindgren	3116C-PA	00206880	8/30/2023	8/30/2024	Active Calibration
AA 960211	Antenna - Low Noise Amplifier	Mini-Circuits	ZVA-213X-S+	977711030	2/7/2024	2/7/2025	Active Calibration
LSC-546	Cable	A.H. Systems, Inc.	SAC-26G-6	546	7/17/2024	7/18/2025	Active Verification
AA 960161	Filter - Highpass 5 GHz	K&L Microwave	11SH10-8000	2	4/10/2024	4/10/2025	Active Calibration
EE 960087	Analyzer - Spectrum	Agilent	N9010A	MY53400296	4/10/2024	4/10/2025	Active Calibration

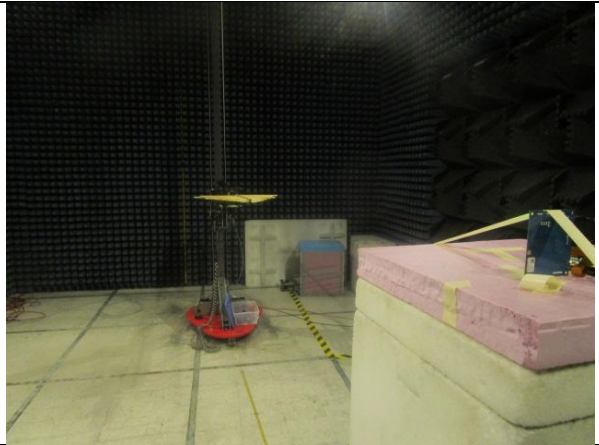
EUT Parameters

Input Power	120 VAC @ 60 Hz	Mode	5GHz WLAN Tx
EUT	X, Y, Z Plane Orientations	AE	HP Elitebook 840G1 Development Kit, NXP 8MPLUS-BB
Notes	<1000 MHz Emissions from auxiliary equipment. Not a function of the EUT. Emissions at 4 and 6 GHz are from the AE.		

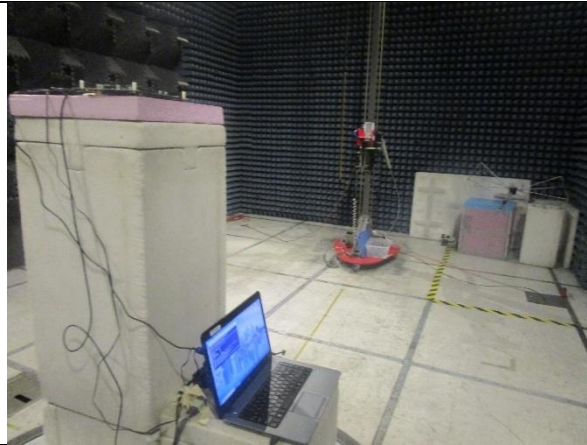
Setup Photos



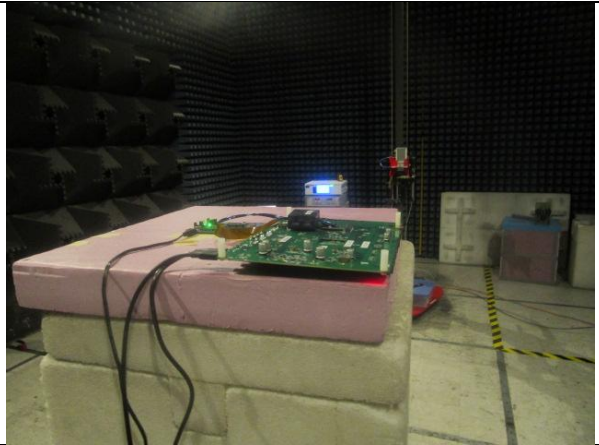
25-200 MHz



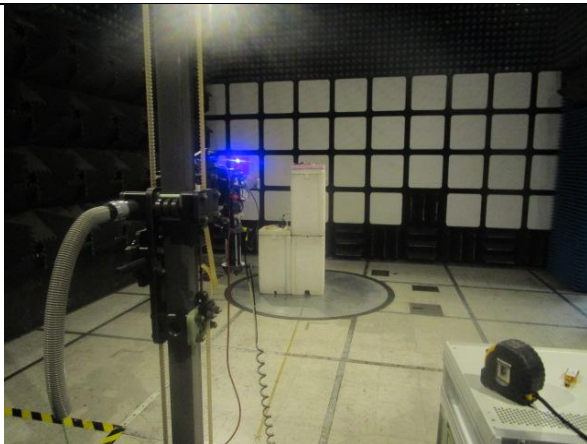
200-1000 MHz



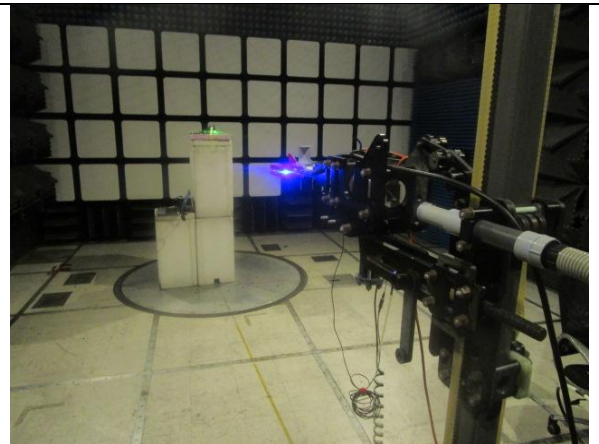
1000-4000 MHz



4000-18000 MHz

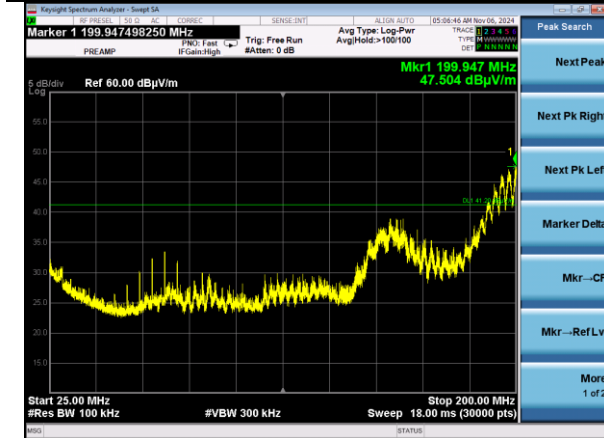


18000-26000 MHz

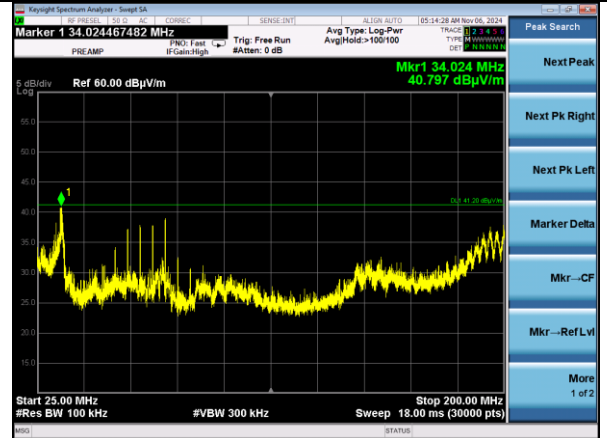


26000-40000 MHz

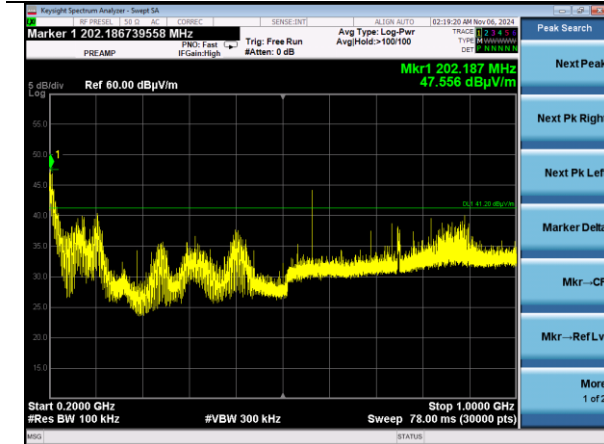
Tx Plots



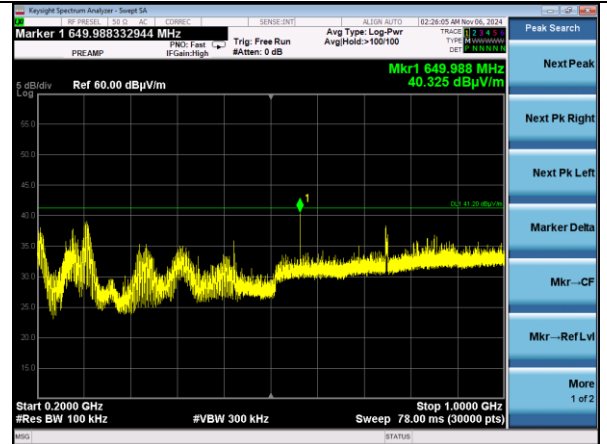
Baseline | EUT off | 25-200 MHz | Horizontal



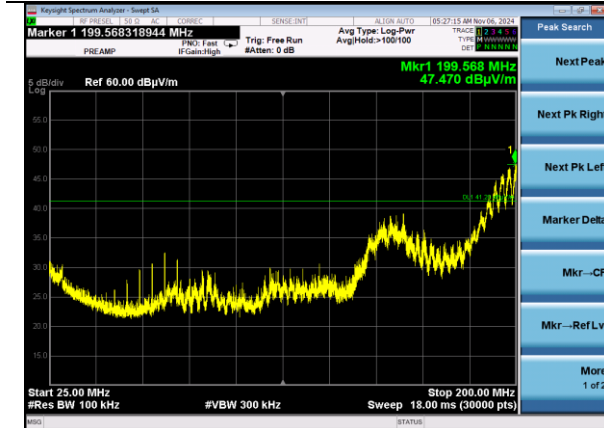
Baseline | EUT off | 25-200 MHz | Vertical



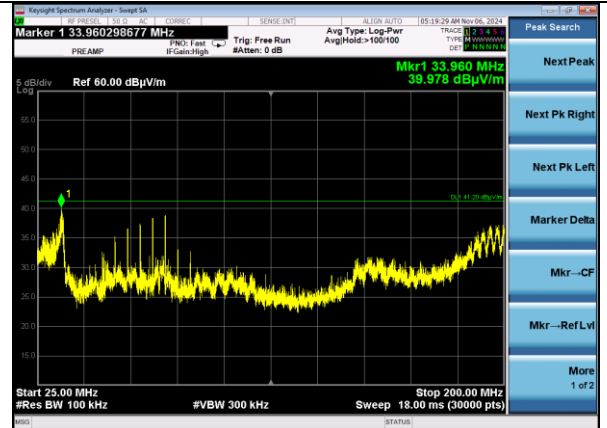
Baseline | EUT off | 200-1000 MHz | Horizontal



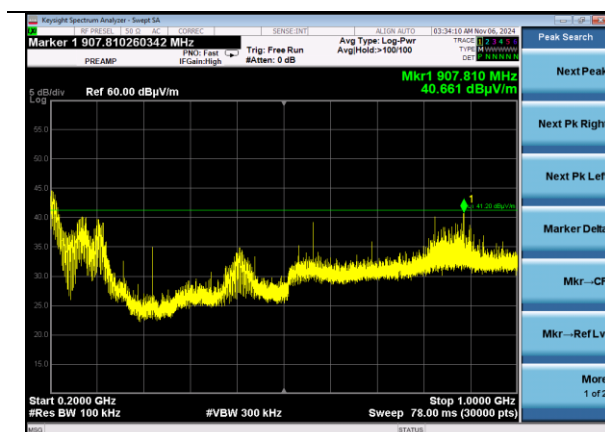
Baseline | EUT off | 200-1000 MHz | Vertical



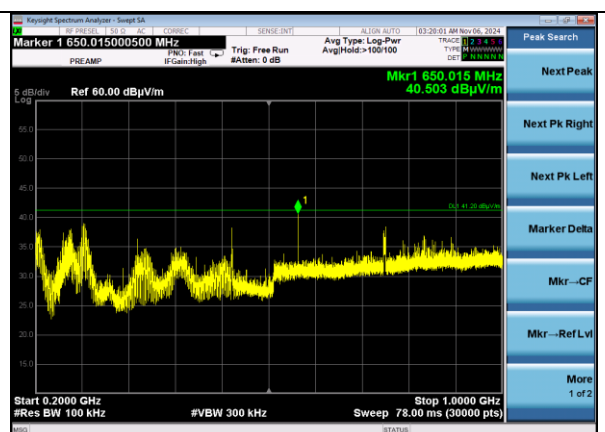
802.11a | Channel 157 | 6 Mbps | 25-200 MHz | Horizontal



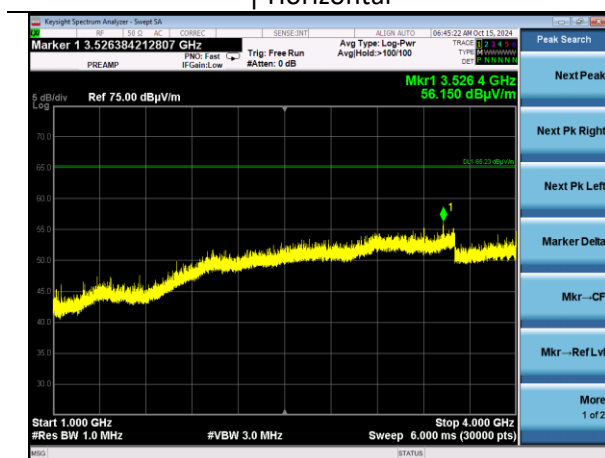
802.11a | Channel 157 | 6 Mbps | 25-200 MHz | Vertical



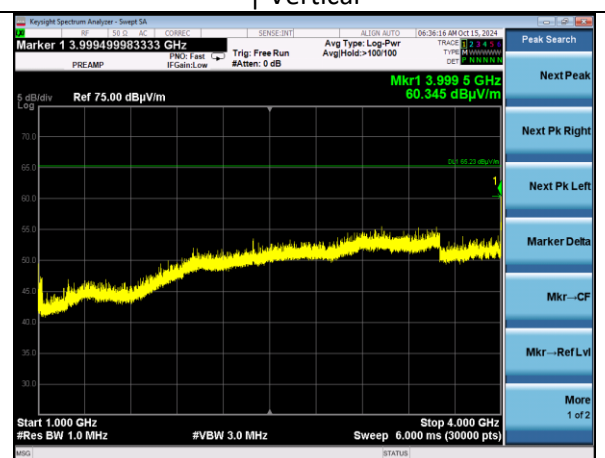
802.11a | Channel 157 | 6 Mbps | 200-1000 MHz
| Horizontal



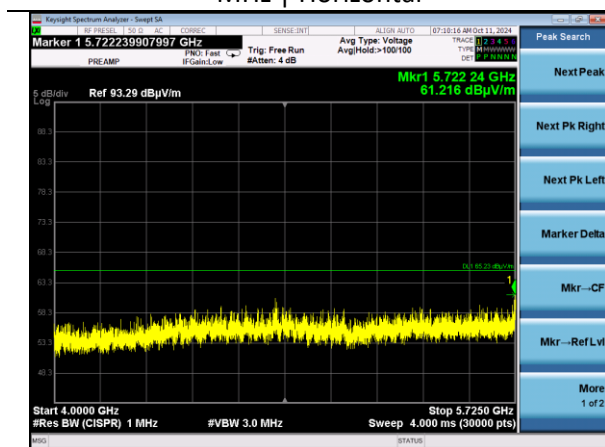
802.11a | Channel 157 | 6 Mbps | 200-1000 MHz
| Vertical



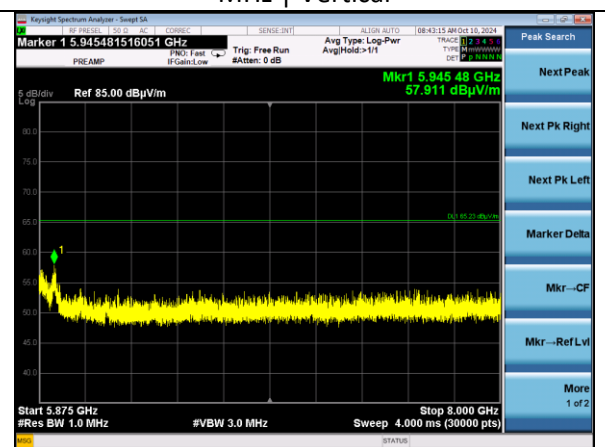
802.11a | Channel 157 | 6 Mbps | 1000-4000
MHz | Horizontal



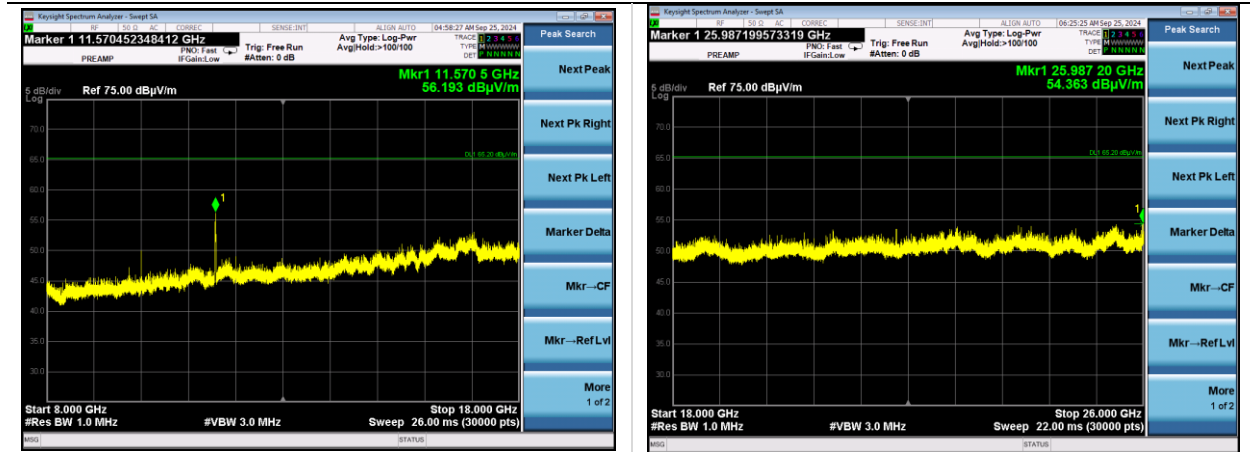
802.11a | Channel 157 | 6 Mbps | 1000-4000
MHz | Vertical



802.11ax | Channel 149 | MCS0 | 4000-5725 MHz
| Horizontal

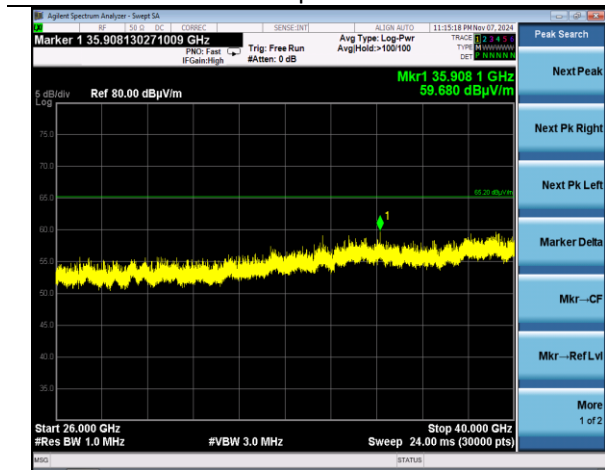


802.11ac | Channel 165 | MCS0 | 5875-8000
MHz | Horizontal



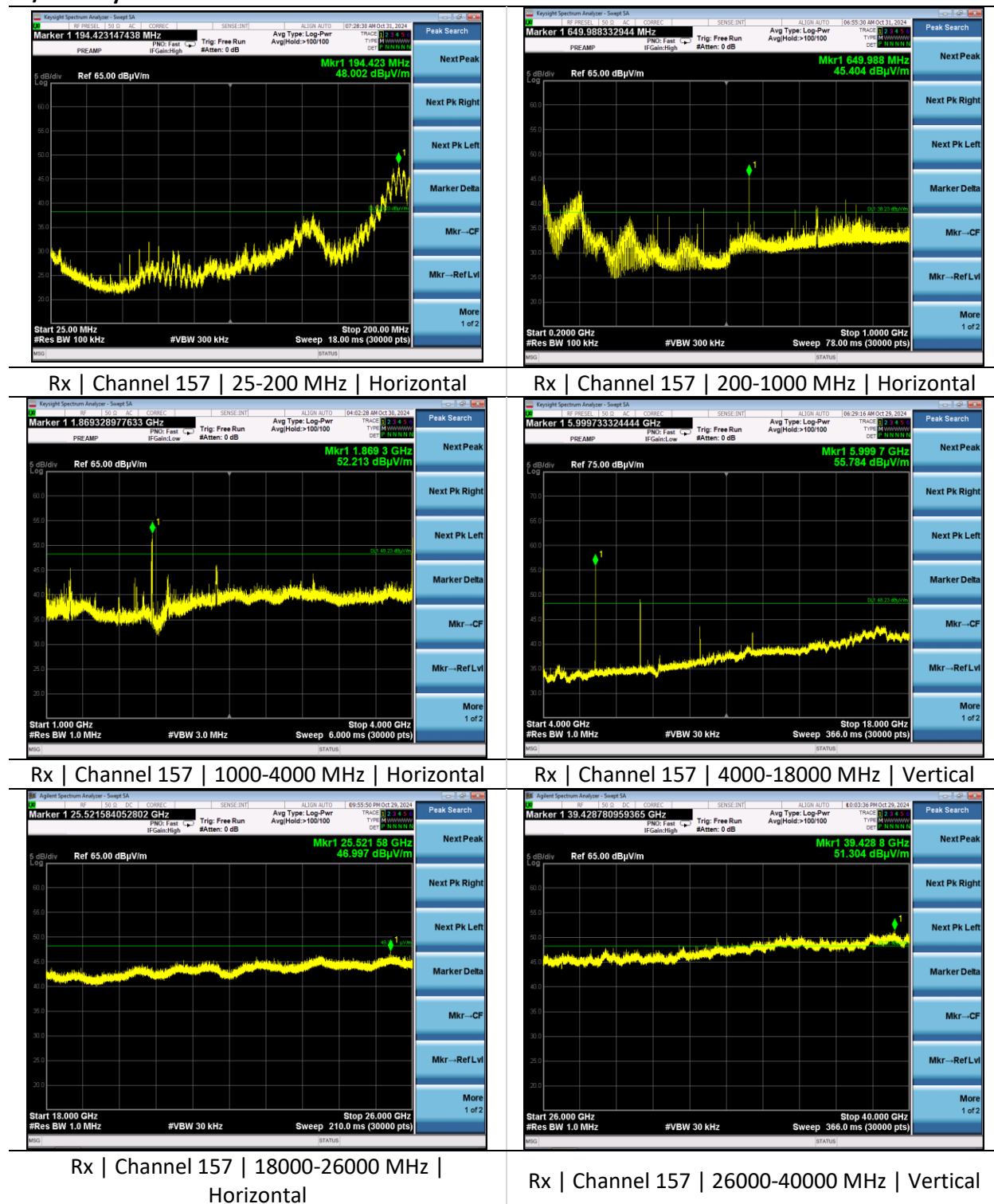
802.11a | Channel 157 | 6 Mbps | 8000-18000 MHz | Vertical

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



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

Rx/Standby Plots



6 REVISION HISTORY

Version	Date	Notes	Person
0	12/16/2024	Initial Draft	Dylan Rosenfeldt
1	01/13/2025	Updated Reference and Units	Dylan Rosenfeldt
2	01/14/2025	Final Draft	Dylan Rosenfeldt

END OF REPORT