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Phone: +1 (949) 393-1123
Web: www.vista-compliance.com
Email: info@vista-compliance.com

FCC RF Test Report

Test Report Number	STA-22021143-LC-FCC-RF_5G
FCC ID	2A8IP-efuseA9X
Applicant	F&S Elektronik Systeme GmbH
Applicant Address	Untere Waldplaetze 23, Stuttgart, Baden-Wuerttemberg, Germany, 70569
Product Name	Computer On Module
Model (s)	efusA9X
Family Model (s)	efusA9Xr2
Date of Receipt	06/07/2022
Date of Test	06/28/2022 - 09/15/2022
Report Issue Date	10/21/2022
Test Standards	47CFR Part 15.407
Test Result	**PASS**

Issued by:

Vista Compliance Laboratories
1261 Puerta Del Sol, San Clemente, CA 92673 USA
www.vista-compliance.com

Devin Tai (Test Engineer)	**David Zhang (Technical Manager)**

REVISION HISTORY

Report Number	Version	Description	Issued Date
STA-22021143-LC-FCC-RF_5G	Original	Initial report	10/21/2022

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1 Test Summary

Test Item	Test Requirement	Test Method	Result
Antenna Requirement	47CFR Part 15.203	N/A	Pass
26 dB Bandwidth	47CFR Part 15.407 (a)	ANSI C63.10 (2013)	Pass
Occupied Bandwidth	47CFR Part 15.407 (a)	ANSI C63.10 (2013)	Pass
Maximum Conducted Output Power	47CFR Part 15.407 (a)	ANSI C63.10 (2013)	Pass
Power Spectral Density	47CFR Part 15.407 (a)	ANSI C63.10 (2013)	Pass
Dynamic Frequency Selection (DFS)	47CFR Part 15.407 (h)	905462 D02 UNII DFS Compliance Procedures New Rules v02	Pass
Radiated Spurious Emission	47CFR Part 15.407 (b)	ANSI C63.10 (2013)	Pass
Radiated Band-Edge into Restricted Frequency Bands	47CFR Part 15.205, 15.209 47CFR Part 15.407 (b)	ANSI C63.10 (2013)	Pass
AC Power Line Conducted Emissions	47CFR Part 15.207	ANSI C63.10 (2013)	Pass

2 General Information

2.1 Applicant

Applicant	F&S Elektronik Systeme GmbH
Applicant Address	Untere Waldplaetze 23 Stuttgart Baden-Wuerttemberg Germany, 70569
Manufacturer	F&S Elektronik Systeme GmbH
Manufacturer Address	Untere Waldplaetze 23 Stuttgart Baden-Wuerttemberg Germany, 70569

2.2 Product information

Product Name	Computer On Module
Model Number	efusA9X
Family Model Number	efusA9Xr2
Serial Number	N/A
Operational Frequency	WLAN 5G: U-NII-1: 5150-5250MHz U-NII-2A: 5250-5350MHz U-NII-2C: 5470-5725MHz U-NII-3: 5725-5850MHz
Channel Bandwidth	20MHz, 40MHz, 80MHz
Type of Modulation	WLAN_5G: 256QAM,64QAM, 16QAM, QPSK, BPSK
Equipment Class	U-NII
Antenna Information	Chip Antenna, 2.4 dBi Peak gain for 5G Band
Clock Frequencies	N/A
Port/Connectors	N/A
Input Power	F&S Efus baseboard input power 5Vdc, efusA9X modules power 3.3Vdc
Power Adapter Manu/Model	N/A
Power Adapter SN	N/A
Hardware version	N/A
Software version	N/A
Simultaneous Transmission	N/A
Additional Info	1. This radio module is based on the certified radio module (FCC ID: N6C-SDPAC) but with different antenna design. 2. Difference between efusA9X and efusA9Xr2. - efusA9X: LAN controller Qualcomm AR8035-AL1 - efusA9Xr2: LAN controller Realtek RTL8211FD No other changes. Both Phys are Gbit Phys and are connected by RGMII interface to CPU. All frequencies are the same.

2.3 Test standard and method

Test standard	47CFR Part 15.407
Test method	ANSI C63.10 (2013) 789033 D02 General UNII Test Procedures New Rules v02r01 905462 D02 UNII DFS Compliance Procedures New Rules v02 905462 D03 UNII Clients Without Radar Detection New Rules v01r02 905462 D04 Operational Modes for DFS Testing New Rules v01

3 Test Site Information

Lab performing tests	Vista Laboratories, Inc.
Lab Address	1261 Puerta Del Sol, San Clemente, CA 92673 USA
Phone Number	+1 (949) 393-1123
Website	www.vista-compliance.com

Test Condition	Temperature	Humidity	Atmospheric Pressure
RF Testing	23.5°C	58.2%	996 mbar

4 Modification of EUT / Deviations from Standards

The EUT is an engineering test sample loaded with RF testing firmware specifically designed to support the RF TX/RX measurement in different aspects.

EUT test sample has u.FL connector for direct RF conducted measurement.

5 Test Configuration and Operation

5.1 EUT Test Configuration

The EUT is an engineering test sample loaded with RF testing firmware specifically designed to support the RF TX/RX measurement in different aspects.

The following software was used for testing and to monitor EUT performance

Software	Description
EMISoft Vasona	EMC/RF Spurious emission test software used during testing
QRCT	Set WiFi of EUT into continuous TX and RX mode under different modulation, data rate and channel, etc. and to also monitor EUT receiver functionality.

5.2 Supporting Equipment

Description	Manufacturer	Model #	Serial #	Remark
Test Laptop	Dell	Latitude E6510	BSD73Q1	Provide by client
F&S Efus baseboard	EMBEDDED	EfUS-SINTF Rev1.50	4820	Provide by client
AC/DC adapter	MEAN WELL	GEM18I05-P1J	N/A	Provide by Lab

6 Uncertainty of Measurement

Test item	Measurement Uncertainty (dB)
RF Output Power (Conducted)	±1.2 dB
Power Spectral Density	±0.9 dB
Unwanted Emission (conducted)	±2.6 dB
Occupied Channel Bandwidth	±5 %
Radiated Emission (9KHz-30MHz)	±3.5 dB
Radiated Emission (30MHz-1GHz)	±4.6 dB
Radiated Emission (1-18GHz)	±4.9 dB
Radiated Emission (18-40GHz)	±3.5 dB

7 Test Results

7.1 Antenna Requirements

7.1.1 Requirement

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

Antenna requirement must meet at least one of the following:

a) Antenna must be permanently attached to the device.

b) The antenna must use a unique type of connector to attach to the device.

c) Device must be professionally installed. The installer shall be responsible for ensuring that the correct antenna is employed by the device.

7.1.2 Conclusion

Analysis:

- EUT has a chip antenna which is soldered onto the main board. The antenna gain is 2.1 dBi for 2.4G band, 2.4dBi for 5G band. This meets the requirement of permanent attachment.

Conclusion:

- EUT complies with antenna requirement in § 15.203.

7.2 26 dB Bandwidth & 6 dB Bandwidth

7.2.1 Requirement

§ 15.407 (a) (2)

26 dB Bandwidth: This section is for reporting purpose only. There are no restriction limits for bandwidth.

§ 15.407 (e)

6 dB Bandwidth: Within the 5.725-5.850 GHz and 5.850-5.895 GHz bands, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

7.2.2 Test Setup

7.2.3 Test Procedure

26 dB Bandwidth:
According to subclause 12.4.1 of ANSI C63.10-2013:
subclause C.1 of 789033 D02 General UNII Test Procedures New Rules v02r01

The automatic bandwidth measurement capability of an instrument may be employed using the X dB bandwidth mode with X set to 26 dB, if the functionality described above (i.e., RBW, VBW ≥ 3 x RBW, peak detector with maximum hold) is implemented by the instrumentation function.

1) Set RBW = approximately 1% of the emission bandwidth.
2) Set the VBW > RBW.
3) Detector = peak.
4) Trace mode = max hold.
5) Measure the maximum width of the emission that is 26 dB down from the peak of the emission. Compare this with the RBW setting of the instrument. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

According to subclause C.2 of 789033 D02 General UNII Test Procedures New Rules v02r01
6 dB Bandwidth:

1) Set RBW = 100 kHz.
2) Set the video bandwidth (VBW) ≥ 3 x RBW.
3) Detector = Peak.
4) Trace mode = max hold.
5) Sweep = auto couple.
6) Allow the trace to stabilize.
7) Use automatic bandwidth measurement capability on instrument to obtain BW result.

7.2.4 Test Result

U-NII-1 Band

Mode	Channel	Frequency (MHz)	Measured Bandwidth (MHz)	Minimum Bandwidth (MHz)	Result
802.11a	36	5180	21.34	N/A	N/A
	40	5200	21.53	N/A	N/A
	48	5240	21.28	N/A	N/A
802.11n	36	5180	21.64	N/A	N/A
	40	5200	20.84	N/A	N/A
	48	5240	20.43	N/A	N/A
802.11n40	38	5190	41.57	N/A	N/A
	46	5230	41.43	N/A	N/A
802.11ac80	42	5210	84.61	N/A	N/A

U-NII-2A Band

Mode	Channel	Frequency (MHz)	Measured Bandwidth (MHz)	Minimum Bandwidth (MHz)	Result
802.11a	52	5260	19.86	N/A	N/A
	56	5280	19.36	N/A	N/A
	64	5320	19.11	N/A	N/A
802.11n	52	5260	19.62	N/A	N/A
	56	5280	19.51	N/A	N/A
	64	5320	19.81	N/A	N/A
802.11n40	54	5270	43.00	N/A	N/A
	62	5310	42.70	N/A	N/A
802.11ac80	58	5290	87.48	N/A	N/A

U-NII-2C Band

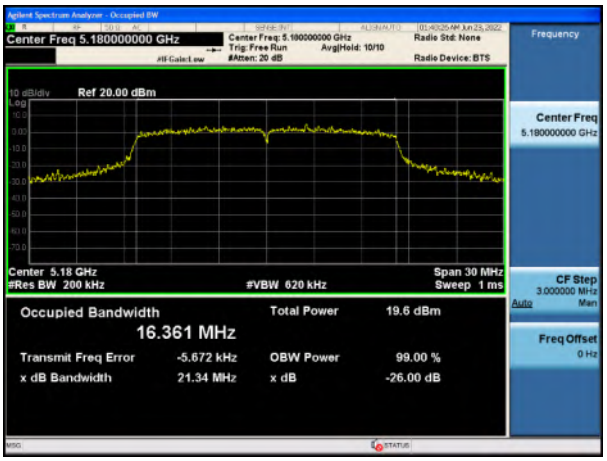
Mode	Channel	Frequency (MHz)	Measured Bandwidth (MHz)	Minimum Bandwidth (MHz)	Result
802.11a	100	5500	19.12	N/A	N/A
	116	5580	18.78	N/A	N/A
	140	5700	18.96	N/A	N/A
802.11n	100	5500	19.83	N/A	N/A
	116	5580	19.62	N/A	N/A
	140	5700	19.58	N/A	N/A
802.11n40	102	5510	42.45	N/A	N/A
	118	5590	42.97	N/A	N/A
	134	5670	43.06	N/A	N/A
802.11ac80	106	5530	97.41	N/A	N/A
	122	5610	96.08	N/A	N/A

U-NII-3 Band

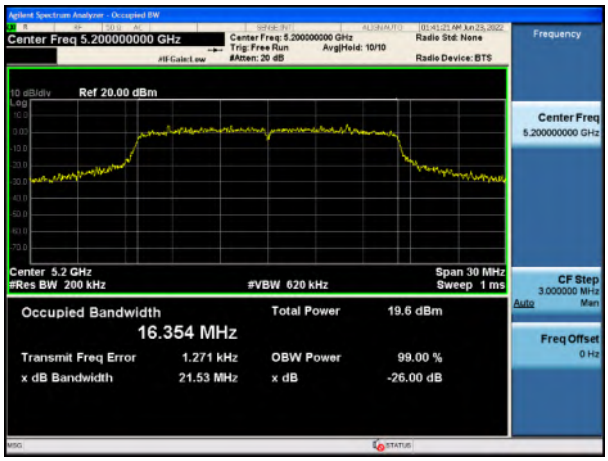
Mode	Channel	Frequency (MHz)	Measured Bandwidth (MHz)	Minimum Bandwidth (MHz)	Result
802.11a	149	5745	15.03	0.5	PASS
	157	5785	15.64	0.5	PASS
	165	5825	15.10	0.5	PASS
802.11n	149	5745	15.01	0.5	PASS
	157	5785	15.04	0.5	PASS
	165	5825	15.00	0.5	PASS
802.11n40	151	5755	34.00	0.5	PASS
	159	5796	35.08	0.5	PASS
802.11ac80	155	5775	72.54	0.5	PASS

7.2.5 Test Plots

26 dB & 99% Bandwidth of U-NII-1 Band



26 dB & 99% BW_U-NII-1_802.11a_5180



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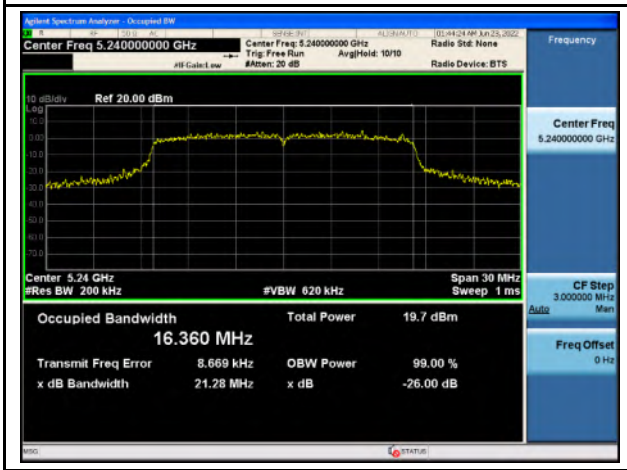

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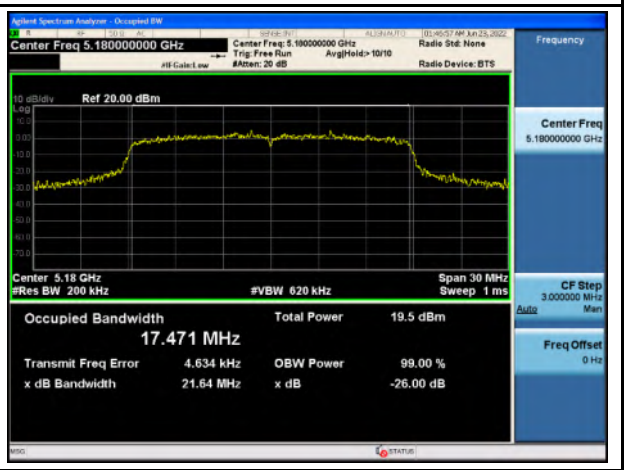

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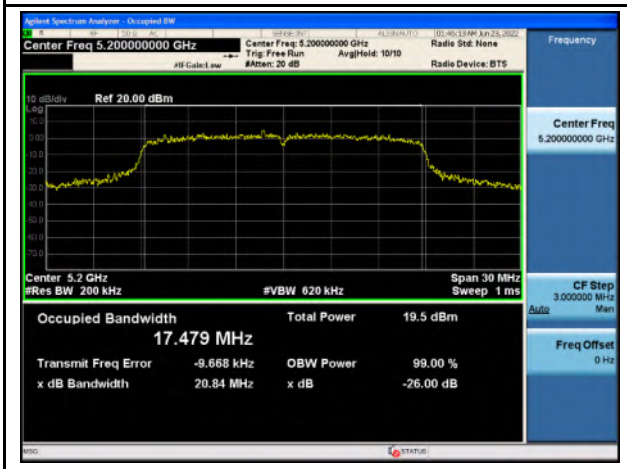
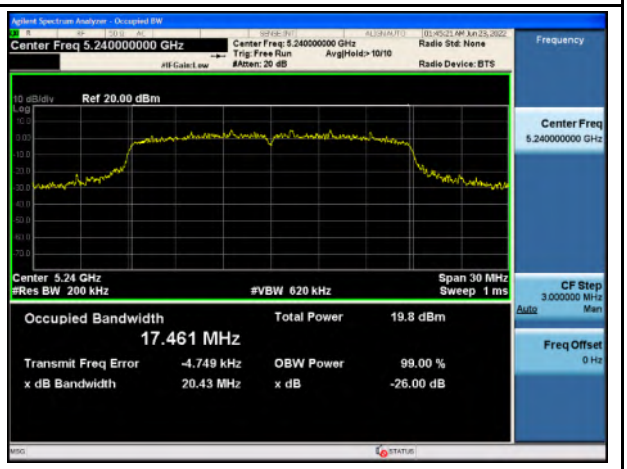


26 dB & 99% BW_U-NII-1_802.11n_5200



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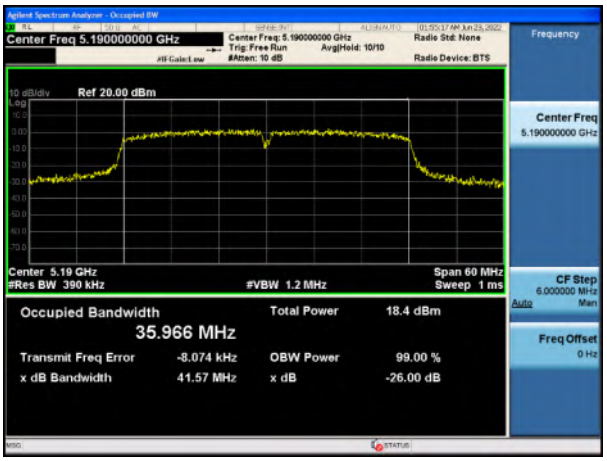
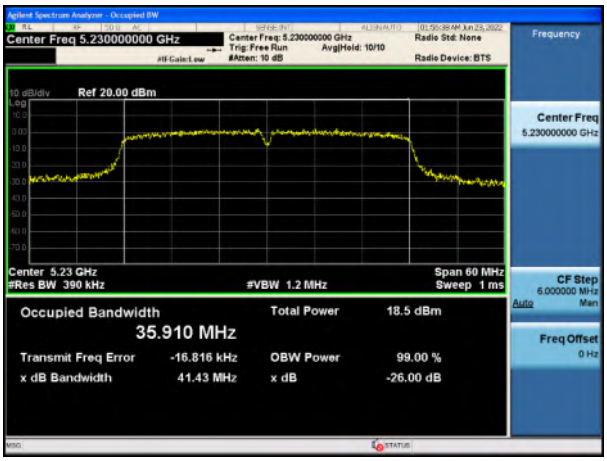
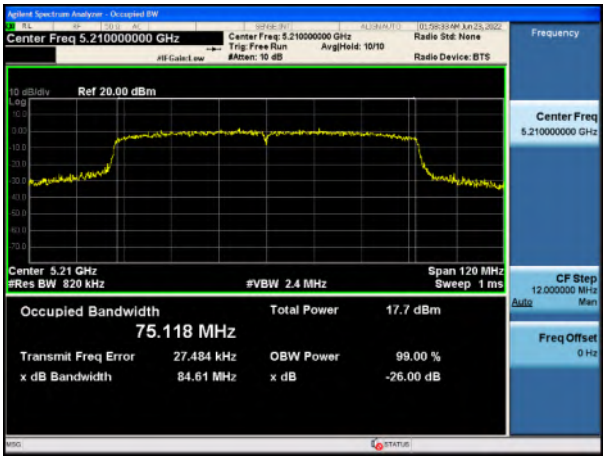


26 dB & 99% BW_U-NII-1_802.11n40_5190

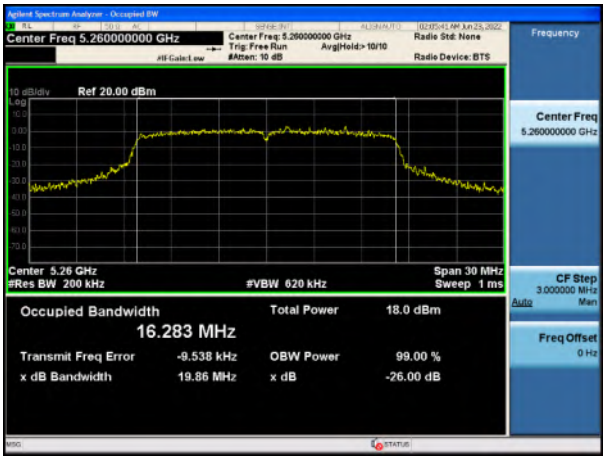


26 dB & 99% BW_U-NII-1_802.11n40_5230



26 dB & 99% BW_U-NII-1_802.11ac_5210

26 dB & 99% Bandwidth of U-NII-2A Band



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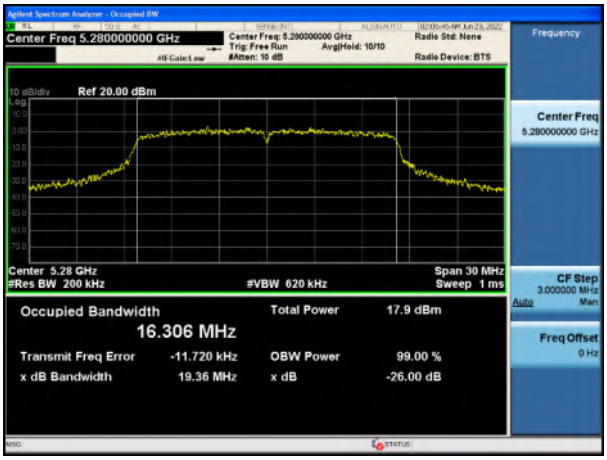
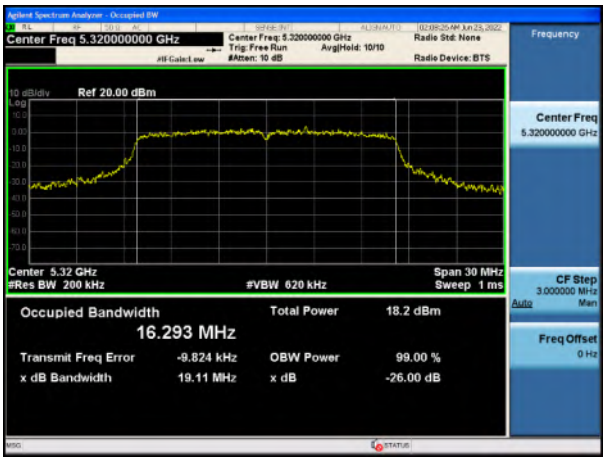


26 dB & 99% BW_U-NII-2A_802.11a_5280



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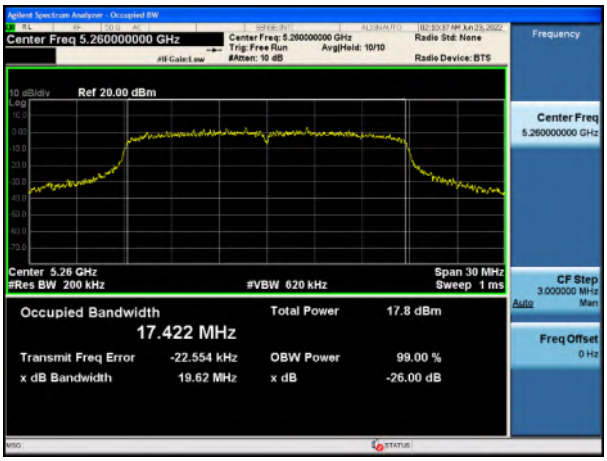
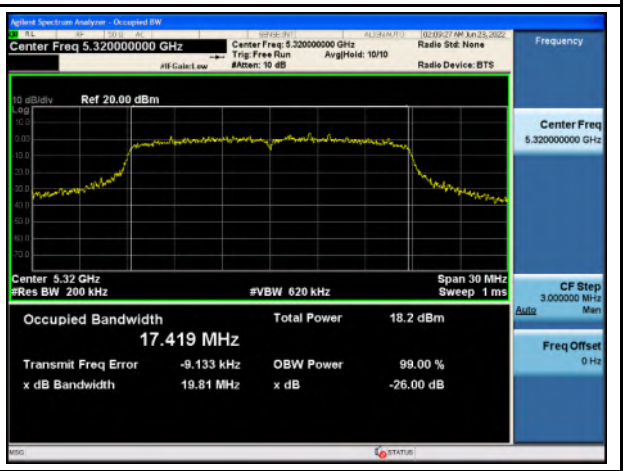


26 dB & 99% BW_U-NII-2A_802.11n_5260

26 dB & 99% BW_U-NII-2A_802.11n_5280



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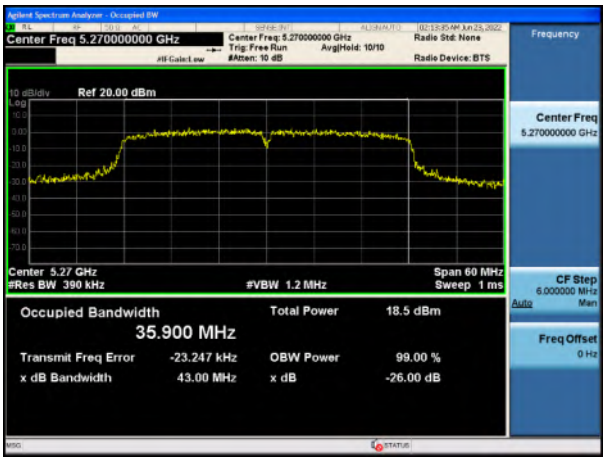	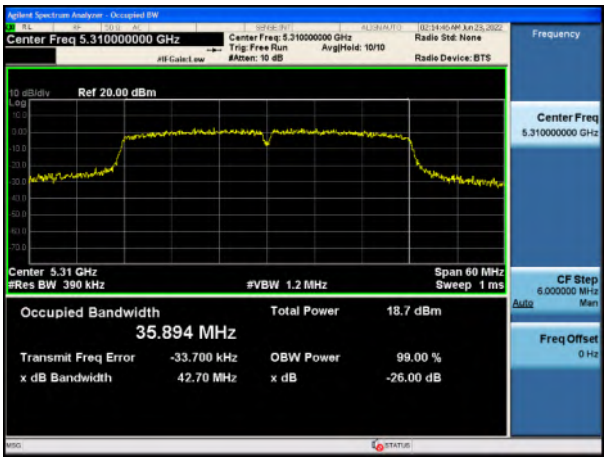
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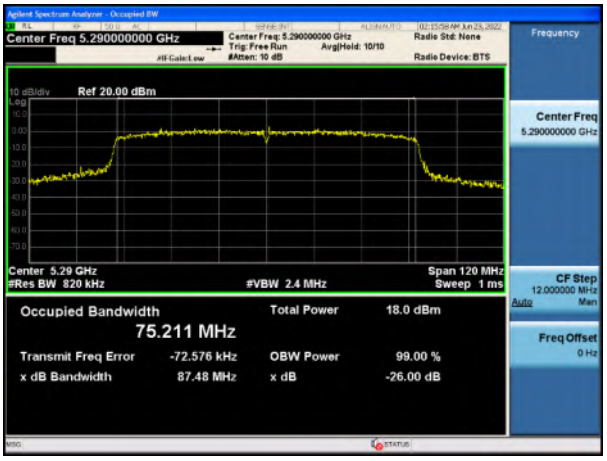	
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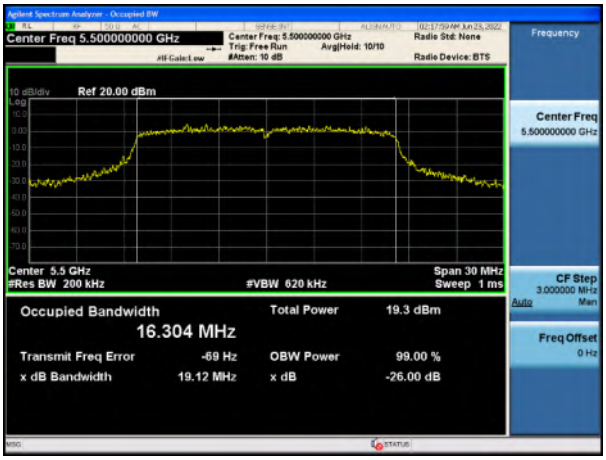
26 dB & 99% Bandwidth of U-NII-2C Band



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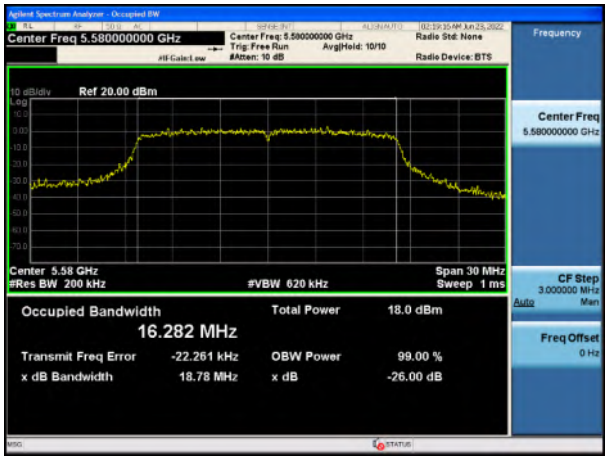

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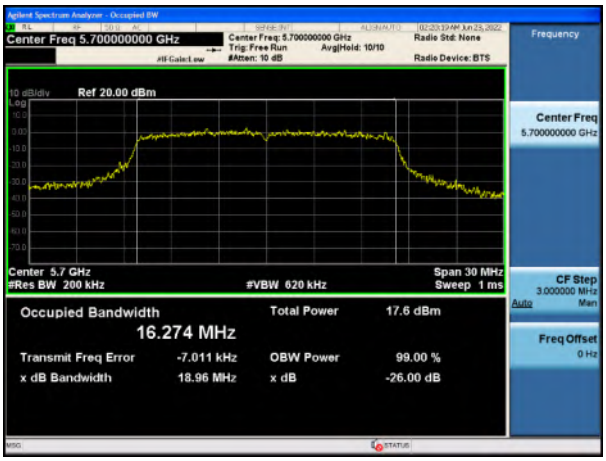

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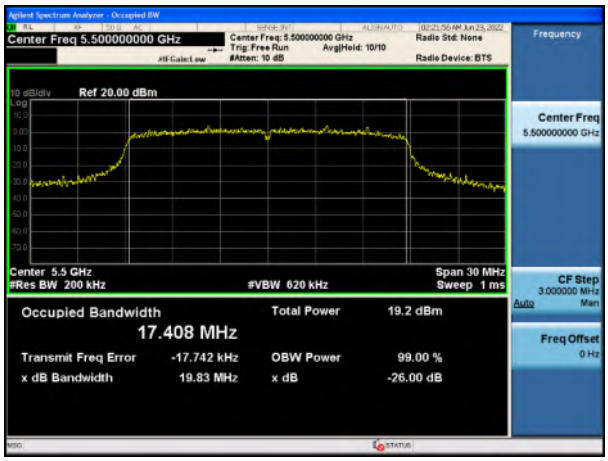
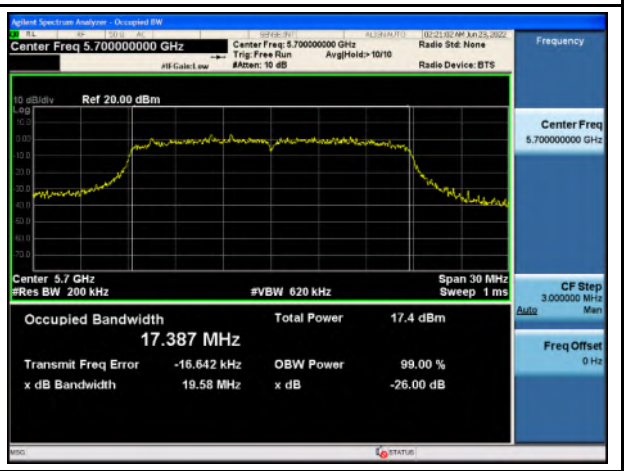


26 dB & 99% BW_U-NII-2C_802.11n_5500

26 dB & 99% BW_U-NII-2C_802.11n_5580



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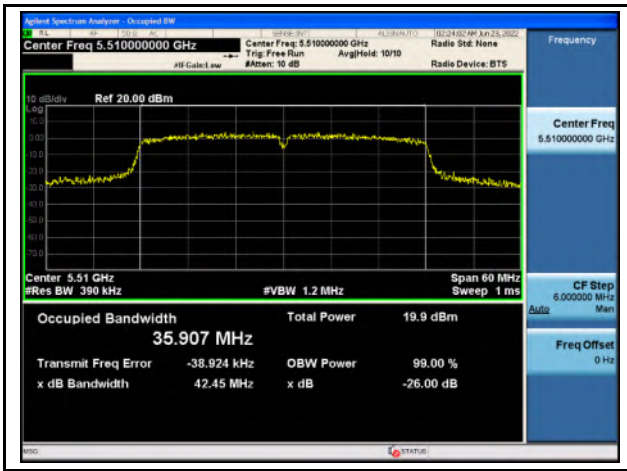

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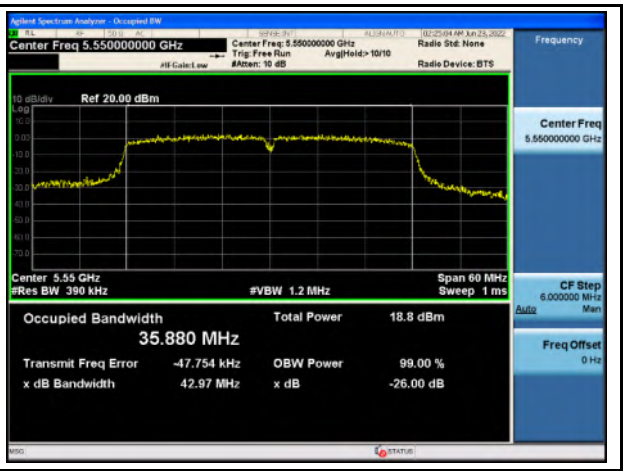

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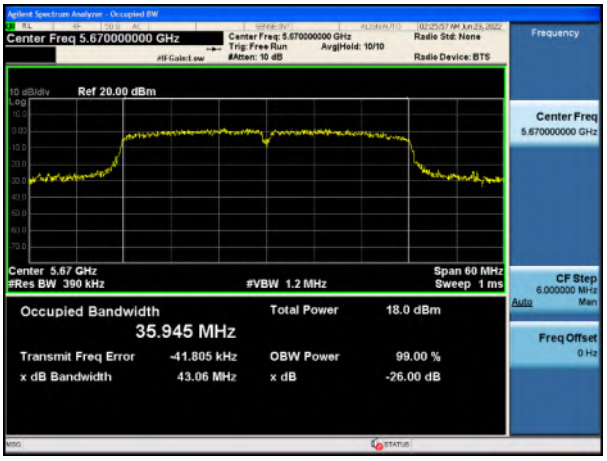

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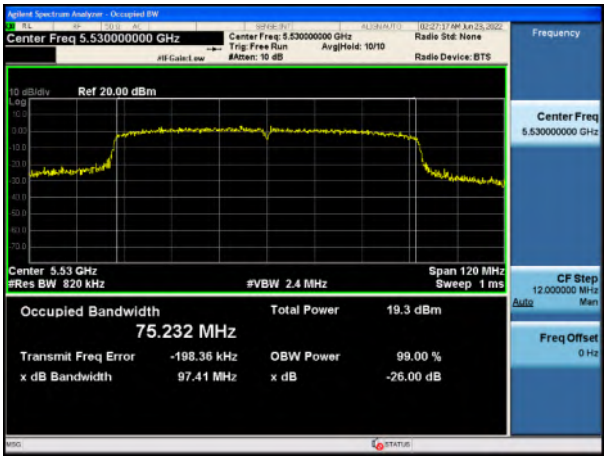

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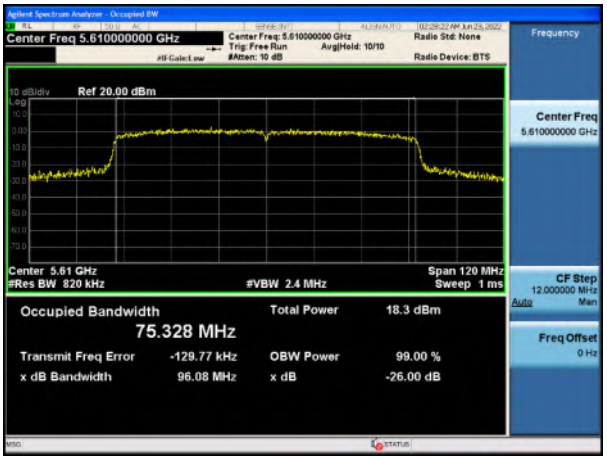
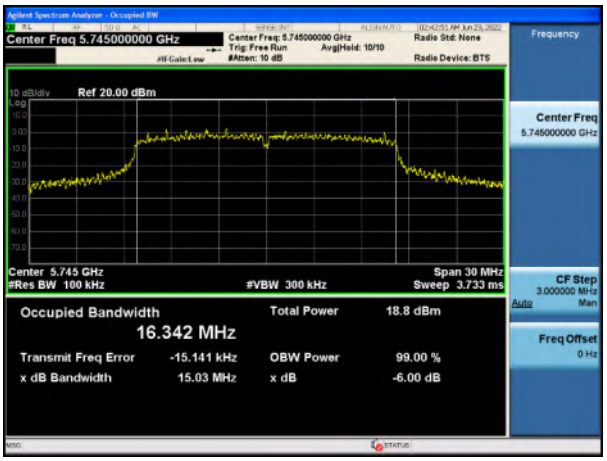


26 dB & 99% BW_U-NII-2C_802.11ac_5610

6 dB & 99% Bandwidth of U-NII-3 Band



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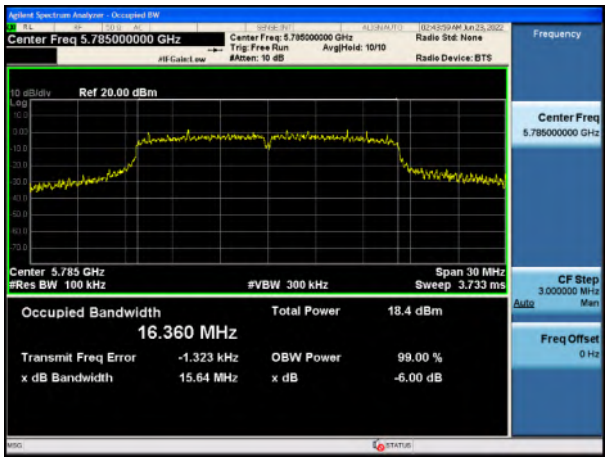

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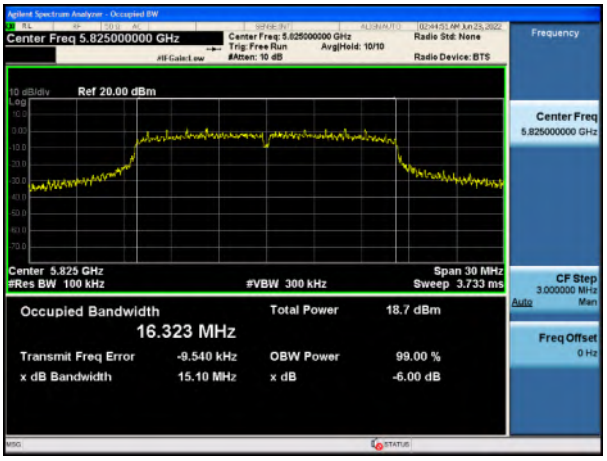
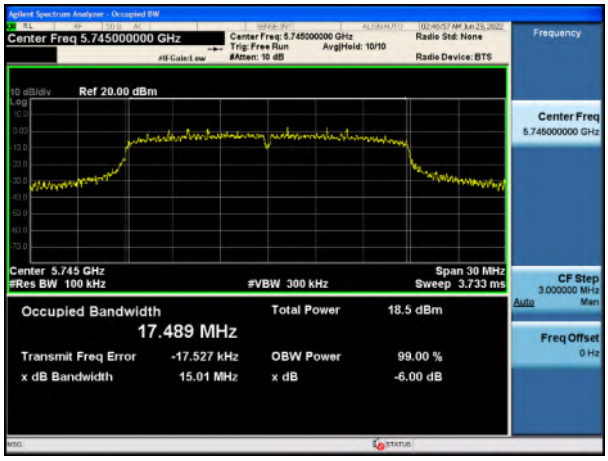
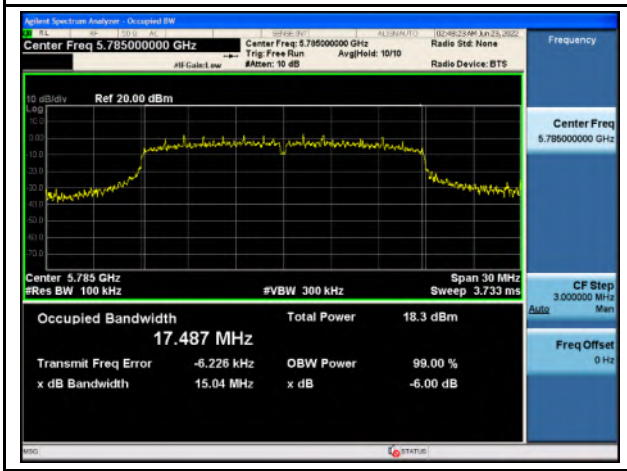


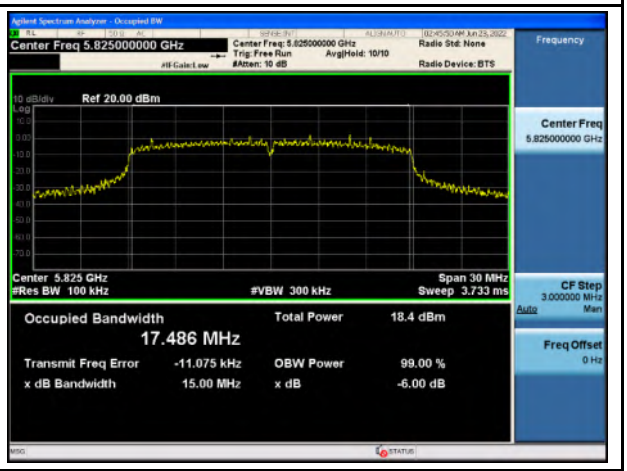
6 dB & 99% BW_U-NII-3_802.11a_5825



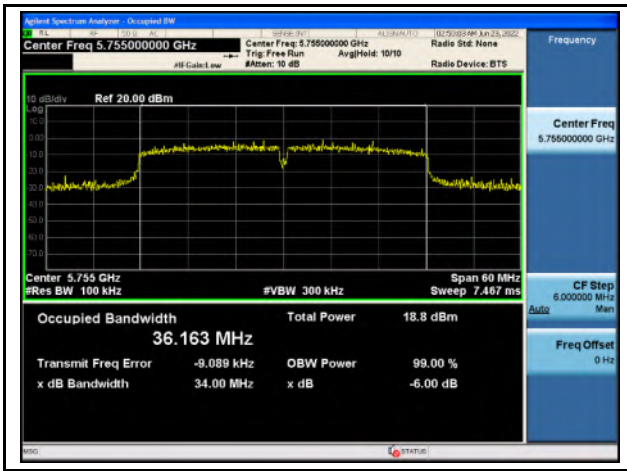
6 dB & 99% BW_U-NII-3_802.11n_5745



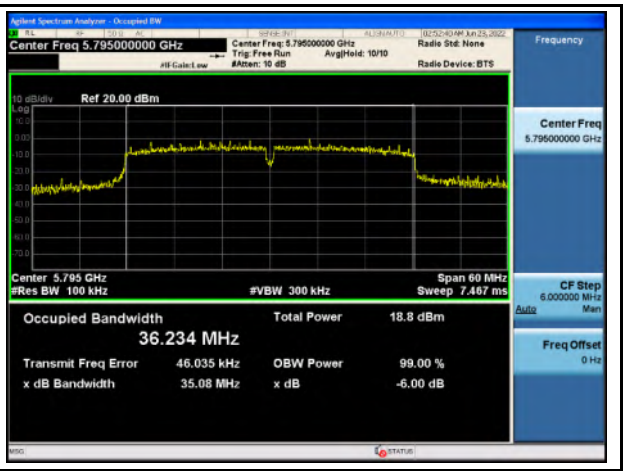
6 dB & 99% BW_U-NII-3_802.11n_5785



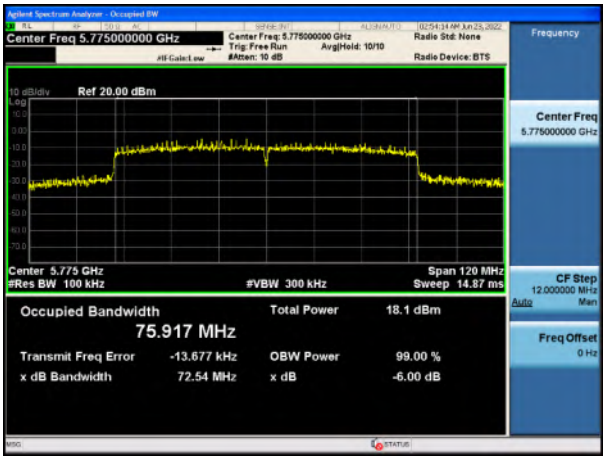
6 dB & 99% BW_U-NII-3_802.11n_5825



6 dB & 99% BW_U-NII-3_802.11n40_5755



6 dB & 99% BW_U-NII-3_802.11n40_5795



6 dB & 99% BW_U-NII-3_802.11ac80_5775

7.3 Occupied Bandwidth (99%)

7.3.1 Requirement

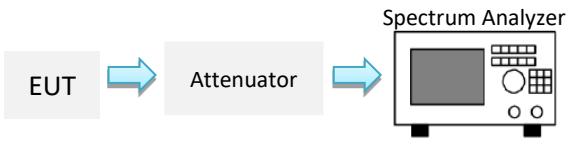
The 99% OBW is for reporting purpose only. The occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5% of the total mean power of the given emission.

7.3.2 Test Procedure

According to subclause 6.9.3 of ANSI C63.10-2013:
subclause D of 789033 D02 General UNII Test Procedures New Rules v02r01

1. Set RBW = 1% to 5% of the actual occupied BW.
2. Set the video bandwidth (VBW) ≥ 3 x RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Span = large enough to capture all products of the modulation process
7. Allow the trace to stabilize.
8. Use automatic bandwidth measurement capability on instrument to obtain BW result.

7.3.3 Test Setup



7.3.4 Test Result

U-NII-1 Band

Mode	Channel	Frequency (MHz)	Measured Bandwidth (MHz)	Minimum Bandwidth (MHz)	Result
802.11a	36	5180	16.36	N/A	N/A
	40	5200	16.35	N/A	N/A
	48	5240	16.36	N/A	N/A
802.11n	36	5180	17.47	N/A	N/A
	40	5200	17.48	N/A	N/A
	48	5240	17.46	N/A	N/A
802.11n40	38	5190	35.97	N/A	N/A
	46	5230	35.91	N/A	N/A
802.11ac80	42	5210	75.12	N/A	N/A

U-NII-2A Band

Mode	Channel	Frequency (MHz)	Measured Bandwidth (MHz)	Minimum Bandwidth (MHz)	Result
802.11a	52	5260	16.28	N/A	N/A
	56	5280	16.31	N/A	N/A
	64	5320	16.29	N/A	N/A
802.11n	52	5260	17.42	N/A	N/A
	56	5280	16.31	N/A	N/A
	64	5320	17.42	N/A	N/A
802.11n40	54	5270	35.90	N/A	N/A
	62	5310	35.89	N/A	N/A
802.11ac80	58	5290	75.21	N/A	N/A

U-NII-2C Band

Mode	Channel	Frequency (MHz)	Measured Bandwidth (MHz)	Minimum Bandwidth (MHz)	Result
802.11a	100	5500	16.30	N/A	N/A
	116	5580	16.28	N/A	N/A
	140	5700	16.27	N/A	N/A
802.11n	100	5500	17.41	N/A	N/A
	116	5580	17.42	N/A	N/A
	140	5700	17.39	N/A	N/A
802.11n40	102	5510	35.91	N/A	N/A
	118	5590	35.88	N/A	N/A
	134	5670	35.95	N/A	N/A
802.11ac80	106	5530	75.23	N/A	N/A
	122	5610	75.33	N/A	N/A

U-NII-3 Band

Mode	Channel	Frequency (MHz)	Measured Bandwidth (MHz)	Minimum Bandwidth (MHz)	Result
802.11a	149	5745	16.34	N/A	N/A
	157	5785	16.36	N/A	N/A
	165	5825	16.32	N/A	N/A
802.11n	149	5745	17.49	N/A	N/A
	157	5785	17.49	N/A	N/A
	165	5825	17.49	N/A	N/A
802.11n40	151	5755	36.16	N/A	N/A
	159	5796	36.23	N/A	N/A
802.11ac80	155	5775	75.92	N/A	N/A

7.3.5 Test Plots

Please refer to section 7.2.5

7.4 Maximum Conducted Output Power

7.4.1 Requirement

§ 15.407 (a)

(iv) For client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi.

(2) For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz.

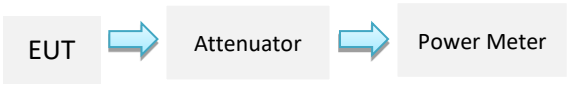
(3) (i) For the band 5.725-5.850 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W.

If transmitting antennas of directional gain greater than 6 dBi are used, the maximum conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Note that U-NII-2 band, devices with a maximum e.i.r.p. greater than 500 mW shall implement TPC in order to have the capability to operate at least 6 dB below the maximum permitted e.i.r.p. of 1 W.

7.4.2 Test Setup

Power Meter



7.4.3 Test Procedure

Spectrum Analyzer method:

According to subclause 12.3.2.2 of ANSI C63.10-2013:

subclause E.2.b of 789033 D02 General UNII Test Procedures New Rules v02r01

1) Set span to encompass the entire 26 dB EBW or 99% OBW of the signal.
2) Set RBW = 1MHz
3) Set VBW ≥ 3 MHz.
4) Number of points in sweep ≥ [2 × span / RBW]. (This gives bin-to-bin spacing ≤ RBW / 2, so that narrow band signals are not lost between frequency bins.)
5) Sweep time = auto
6) Detector = RMS (i.e., power averaging), if available. Otherwise, use sample detector mode.
7) If transmit duty cycle < 98%, use a video trigger with the trigger level set to enable triggering only on full power pulses. The transmitter shall operate at maximum power control level for the entire duration of every sweep. If the EUT transmits continuously (i.e., with no OFF intervals) or at duty cycle ≥ 98%, and if each transmission is entirely at the maximum power control level, then the trigger shall be set to “free run.”
8) Trace average at least 100 traces in power averaging (rms) mode.
9) Compute power by integrating the spectrum across the 26 dB EBW or 99% OBW of the signal using the instrument’s band power measurement function, with band limits set equal to the EBW or OBW band edges. If the instrument does not have a band power function, then sum the spectrum levels (in power units) at 1 MHz intervals extending across the 26 dB EBW or 99% OBW of the spectrum.

Power Meter Method:

According to subclause 12.3.3.2 of ANSI C63.10-2013:

subclause E.3.b of 789033 D02 General UNII Test Procedures New Rules v02r01

Method PM-G is measurement using a gated RF average power meter.
Measurements may be performed using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Because the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.

7.4.4 Test Result

Output power measurement result

U-NII-1 Band

Mode	Channel	Frequency (MHz)	Measured Output Power (dBm)	Output Power Limit (dBm)	Result
802.11a	36	5180	13.81	24	PASS
	40	5200	14.03	24	PASS
	48	5240	13.97	24	PASS
802.11n	36	5180	13.84	24	PASS
	40	5200	13.87	24	PASS
	48	5240	13.96	24	PASS
802.11n40	38	5190	12.73	24	PASS
	46	5230	12.76	24	PASS
802.11ac80	42	5210	12.11	24	PASS

U-NII-2A Band

Mode	Channel	Frequency (MHz)	Measured Output Power (dBm)	Output Power Limit (dBm)	Result
802.11a	52	5260	12.24	24	PASS
	56	5280	12.55	24	PASS
	64	5320	12.76	24	PASS
802.11n	52	5260	12.08	24	PASS
	56	5280	12.35	24	PASS
	64	5320	12.39	24	PASS
802.11n40	54	5270	12.72	24	PASS
	62	5310	13.13	24	PASS
802.11ac80	58	5290	12.44	24	PASS

U-NII-2C Band

Mode	Channel	Frequency (MHz)	Measured Output Power (dBm)	Output Power Limit (dBm)	Result
802.11a	100	5500	13.67	24	PASS
	116	5580	12.51	24	PASS
	140	5700	11.70	24	PASS
802.11n	100	5500	13.59	24	PASS
	116	5580	12.26	24	PASS
	140	5700	11.68	24	PASS
802.11n40	102	5510	14.13	24	PASS
	118	5590	13.22	24	PASS
	134	5670	12.53	24	PASS
802.11ac80	106	5530	13.72	24	PASS
	122	5610	12.69	24	PASS

U-NII-3 Band

Mode	Channel	Frequency (MHz)	Measured Output Power (dBm)	Output Power Limit (dBm)	Result
802.11a	149	5745	13.14	30	PASS
	157	5785	12.87	30	PASS
	165	5825	13.13	30	PASS
802.11n	149	5745	13.13	30	PASS
	157	5785	12.74	30	PASS
	165	5825	13.05	30	PASS
802.11n40	151	5755	13.65	30	PASS
	159	5796	13.75	30	PASS
802.11ac80	155	5775	13.13	30	PASS

7.5 Power Spectral Density

7.5.1 Requirement

§ 15.407 (a)

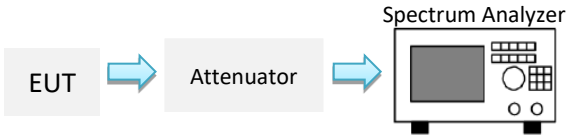
(iv) For client devices in the 5.15-5.25 GHz band, the maximum power spectral density shall not exceed 11 dBm in any 1MHz band.

(2) For the 5.25-5.35 GHz and 5.47-5.725 GHz bands. The maximum power spectral density shall not exceed 11 dBm in any 1MHz band.

(3) (i) For the band 5.725-5.850 GHz, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band.

If transmitting antennas of directional gain greater than 6 dBi are used, the maximum power spectral density from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

7.5.2 Test Setup



7.5.3 Test Procedure

According to subclause 12.5 of ANSI C63.10-2013:
subclause F of 789033 D02 General UNII Test Procedures New Rules v02r01

1) Create an average power spectrum for the EUT operating mode being tested by following the instructions in 12.3.2 for measuring maximum conducted output power using a spectrum analyzer or EMI receiver; that is, select the appropriate test method (SA-1, SA-2, SA-3, or their respective alternatives) and apply it up to, but not including, the step labeled, "Compute power…." (This procedure is required even if the maximum conducted output power measurement was performed using the power meter method PM.)
2) Use the peak search function on the instrument to find the peak of the spectrum.
3) Make the following adjustments to the peak value of the spectrum, if applicable:
    a. If method SA-2 or SA-2A was used, then add [10 log (1 / *D*)], where *D* is the duty cycle, to the peak of the spectrum.
    b. If method SA-3A was used and the linear mode was used in step h) of 12.3.2.7, add 1 dB to the final result to compensate for the difference between linear averaging and power averaging.
4) The result is the PPSD.
5) The procedure in item a) through item c) requires the use of 1 MHz resolution bandwidth to satisfy the 1 MHz measurement bandwidth specified by some regulatory authorities.95 This requirement also permits use of resolution bandwidths less than 1 MHz "provided that the measured power is integrated to show the total power over the measurement bandwidth" (i.e., 1 MHz). If measurements are performed using a reduced resolution bandwidth and integrated over 1 MHz bandwidth, the following adjustments to the procedures apply:
    a. Set RBW ≥ 1 / *T*, where *T* is defined in 12.2 a).
    b. Set VBW ≥ [3 × RBW].
    c. If measurement bandwidth of Maximum PSD is specified in 500 kHz, add 10 log (500 kHz/RBW) to the measured result, whereas RBW (<500 kHz) is the reduced resolution bandwidth of the spectrum analyzer set during measurement.
    d. If measurement bandwidth of Maximum PSD is specified in 1 MHz, add 10 log (1MHz/RBW) to the measured result, whereas RBW (< 1 MHz) is the reduced resolution bandwidth of spectrum analyzer set during measurement.
    e. Care shall be taken such that the measurements are performed during a period of continuous transmission or are corrected upward for duty cycle.

7.5.4 Test Result

U-NII-1 Band

Mode	Channel	Frequency (MHz)	Measured PSD (dBm/MHz)	PSD Limit (dBm/MHz)	Result
802.11a	36	5180	2.34	11	PASS
	40	5200	2.45	11	PASS
	48	5240	2.42	11	PASS
802.11n	36	5180	2.02	11	PASS
	40	5200	2.15	11	PASS
	48	5240	2.13	11	PASS
802.11n40	38	5190	-2.22	11	PASS
	46	5230	-2.00	11	PASS
802.11ac80	42	5210	-6.01	11	PASS

U-NII-2A Band

Mode	Channel	Frequency (MHz)	Measured PSD (dBm/MHz)	PSD Limit (dBm/MHz)	Result
802.11a	52	5260	0.71	11	PASS
	56	5300	0.72	11	PASS
	64	5320	1.05	11	PASS
802.11n	52	5260	0.55	11	PASS
	56	5300	0.86	11	PASS
	64	5320	0.79	11	PASS
802.11n40	54	5270	-2.01	11	PASS
	62	5310	-1.92	11	PASS
802.11ac80	58	5290	-5.89	11	PASS

U-NII-2C Band

Mode	Channel	Frequency (MHz)	Measured PSD (dBm/MHz)	PSD Limit (dBm/MHz)	Result
802.11a	100	5500	2.14	11	PASS
	116	5580	0.93	11	PASS
	140	5700	0.30	11	PASS
802.11n	100	5500	1.82	11	PASS
	116	5580	0.51	11	PASS
	140	5700	-0.12	11	PASS
802.11n40	102	5510	-0.77	11	PASS
	118	5590	-1.51	11	PASS
	134	5670	-2.25	11	PASS
802.11ac80	106	5530	-4.04	11	PASS
	122	5610	-5.16	11	PASS

U-NII-3 Band in 500kHz band

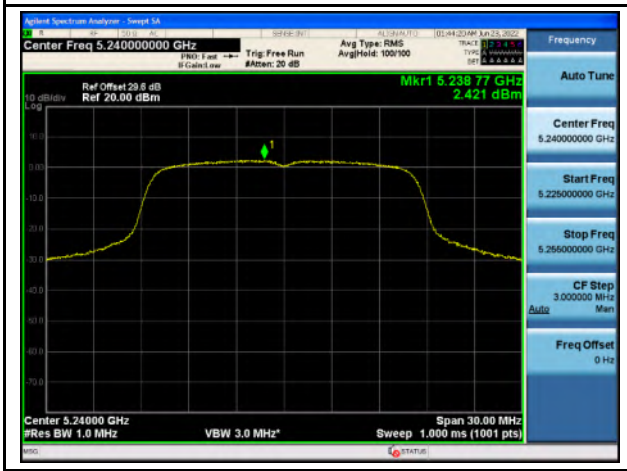
Mode	Channel	Frequency (MHz)	Measured PSD (dBm/100kHz)	Corrected PSD (dBm/500kHz) *	PSD Limit (dBm/500kHz)	Result
802.11a	149	5745	-5.59	1.40	30	PASS
	157	5785	-6.41	0.58	30	PASS
	165	5825	-6.48	0.51	30	PASS
802.11n	149	5745	-6.34	0.65	30	PASS
	157	5785	-6.85	0.14	30	PASS
	165	5825	-6.50	0.49	30	PASS
802.11n40	151	5755	-8.99	-2.00	30	PASS
	159	5796	-9.04	-2.05	30	PASS
802.11ac80	155	5775	-12.14	-5.15	30	PASS

Note: Corrected PSD (dBm/500kHz) * = Measured PSD (dBm/100kHz) + Correction Factor[10*log(500/RBW)]
= Measured PSD (dBm/100kHz) + 10*Log (500/100)
= Measured PSD (dBm/100kHz) + 6.99

7.5.5 Test Plots

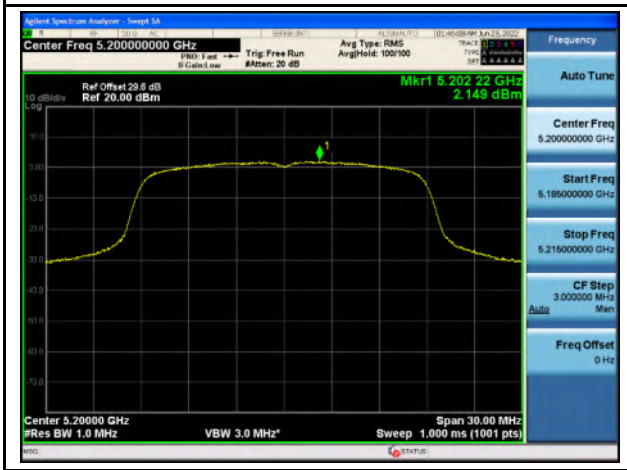
PSD _U-NII-1_802.11a_5180

PSD _U-NII-1_802.11a_5200



PSD _U-NII-1_802.11a_5240

PSD _U-NII-1_802.11n_5180



PSD _U-NII-1_802.11n_5200

PSD _U-NII-1_802.11n_5240

PSD _U-NII-1_802.11n40_5190

PSD _U-NII-1_802.11n40_5230

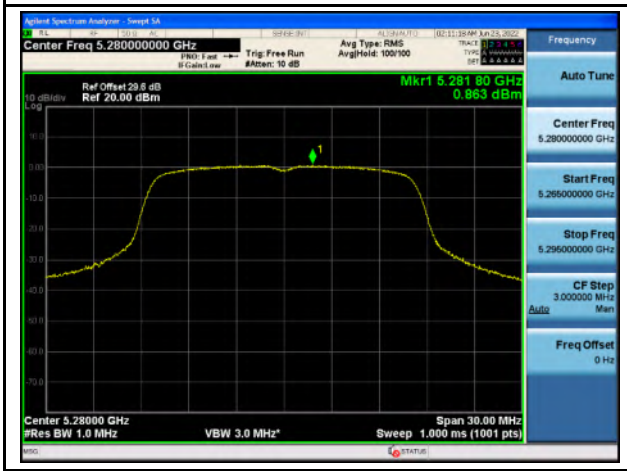
PSD _U-NII-1_802.11ac_5210

PSD _U-NII-2A_802.11a_5260

PSD _U-NII-2A_802.11a_5280

PSD _U-NII-2A_802.11a_5320

PSD _U-NII-2A_802.11n_5260



PSD _U-NII-2A_802.11n_5280

PSD _U-NII-2A_802.11n_5320

PSD _U-NII-2A_802.11n40_5270

PSD _U-NII-2A_802.11n40_5310

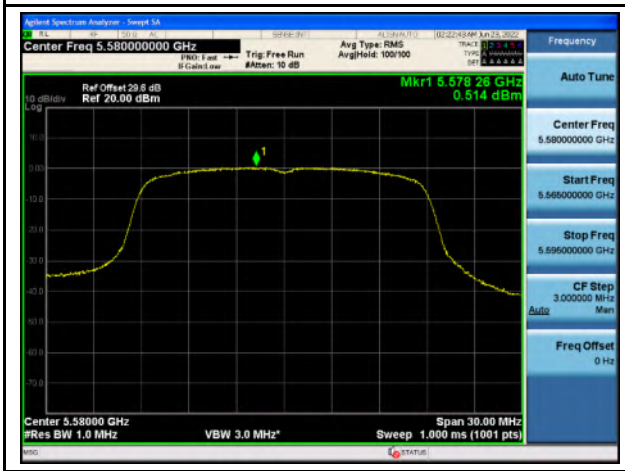
PSD _U-NII-2A_802.11ac_5290

PSD _U-NII-2C_802.11a_5500

PSD _U-NII-2C_802.11a_5580

PSD _U-NII-2C_802.11a_5700

PSD _U-NII-2C_802.11n_5500



PSD _U-NII-2C_802.11n_5580

PSD _U-NII-2C_802.11n_5700

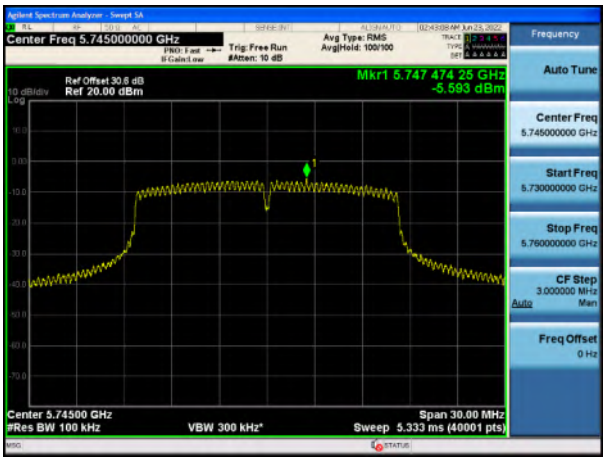
PSD _U-NII-2C_802.11n40_5510

PSD _U-NII-2C_802.11n40_5550

PSD _U-NII-2C_802.11n40_5670

PSD _U-NII-2C_802.11ac80_5530

PSD _U-NII-2C_802.11ac80_5610



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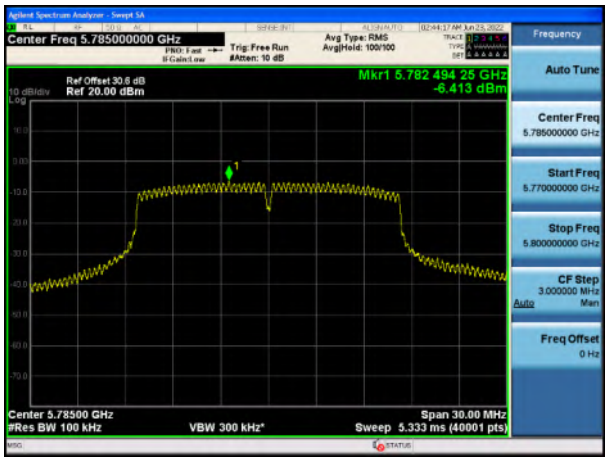
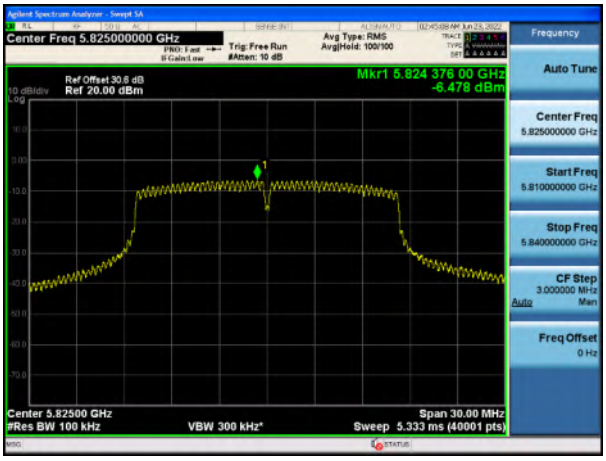
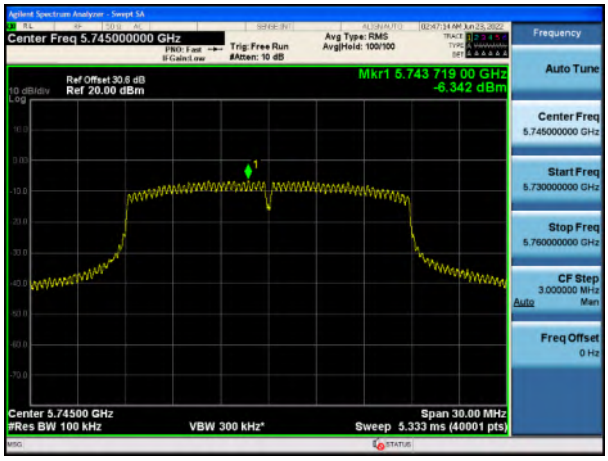


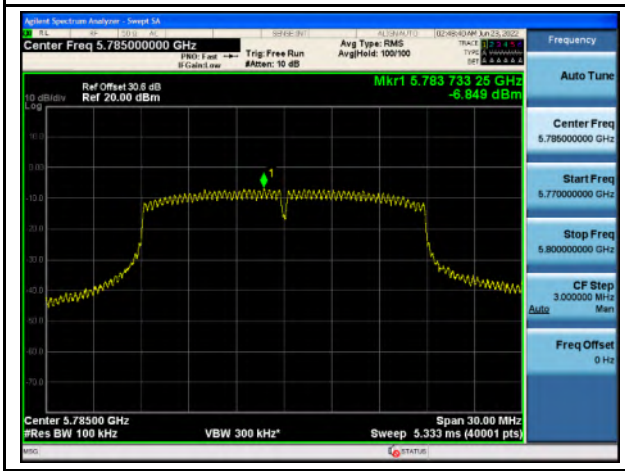
PSD _U-NII-3_802.11a_5785



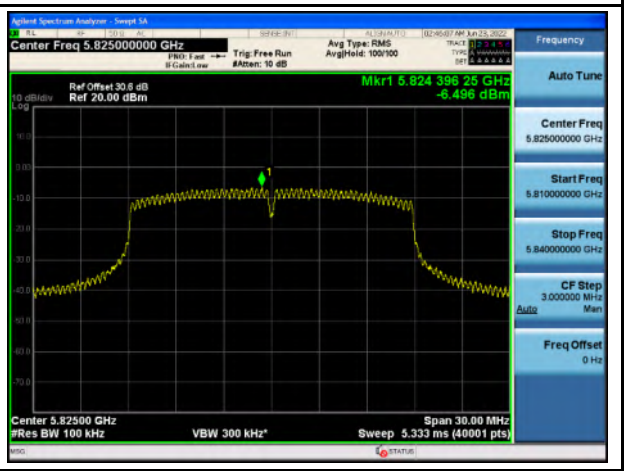
PSD _U-NII-3_802.11a_5825



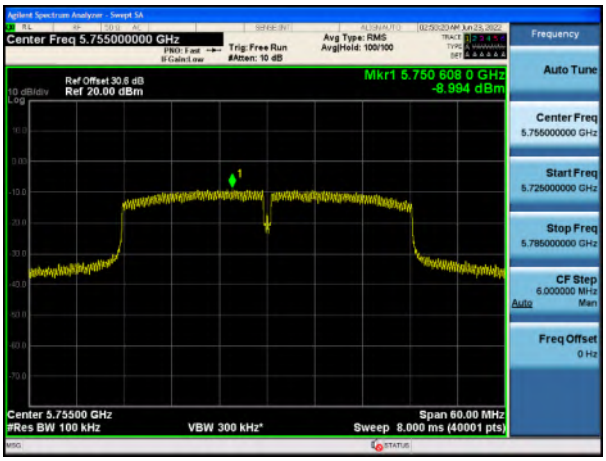
PSD _U-NII-3_802.11n_5745



PSD _U-NII-3_802.11n_5785

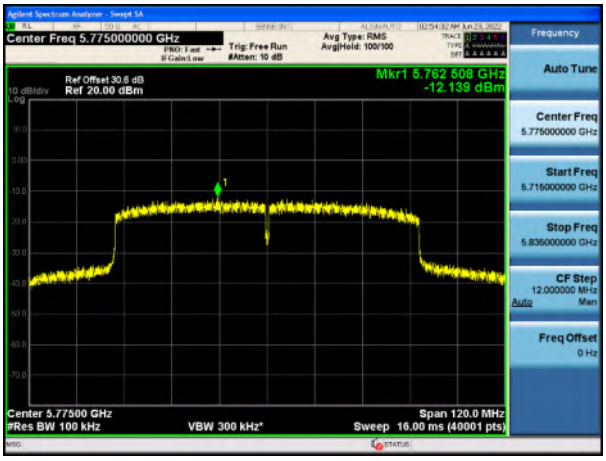


PSD _U-NII-3_802.11n_5825



PSD _U-NII-3_802.11n40_5755

PSD _U-NII-3_802.11n40_5795



PSD _U-NII-3_802.11ac80_5775

7.6 Dynamic Frequency Selection (DFS) Introduction

7.6.1 Requirement

Interference Threshold values, Master or Client incorporating In-Service Monitoring

Maximum Transmit Power	Value (see note)
≥ 200 milliwatt	-64 dBm
EIRP < 200 milliwatt and power spectral density < 10 dBm/MHz	-62 dBm
EIRP < 200 milliwatt that do not meet the power spectra density requirement	-64 dBm
Note 1: This is the level at the input of the receiver assuming a 0 dBi receive antenna. Note 2: Throughout these test procedures an additional 1 dB has been added to the amplitude of the test transmission waveforms to account for variations in measurement equipment. This will ensure that the test signal is at or above the detection threshold level to trigger a DFS response. Note3: EIRP is based on the highest antenna gain. For MIMO devices refer to KDB Publication 662911 D01.	

DFS Response requirement values

Parameter	Value
Non-occupancy period	Minimum 30 minutes
Channel Availability Check Time	60 seconds
Channel Move Time	10 seconds See Note 1.
Channel Closing Transmission Time	200 milliseconds + an aggregate of 60 milliseconds over remaining 10 second period. See Notes 1 and 2.
U-NII Detection Bandwidth	Minimum 100% of the UNII 99% transmission power bandwidth See Note 3.
Note 1: Channel Move Time and the Channel Closing Transmission Time should be performed with Radar Type 0. The measurement timing begins at the end of the Radar Type 0 burst. Note 2: The Channel Closing Transmission Time is comprised of 200 milliseconds starting at the beginning of the Channel Move Time plus any additional intermittent control signals required facilitating a Channel move (an aggregate of 60 milliseconds) during the remainder of the 10 second period. The aggregate duration of control signals will not count quiet periods in between transmissions. Note 3: During the U-NII Detection Bandwidth detection test, radar type 0 should be used. For each frequency step the minimum percentage of detection is 90 percent. Measurements are performed with no data traffic.	

7.6.2 Radar type and test waveforms

This section provides the parameters for required test waveforms, minimum percentage of successful detections, and the minimum number of trials that must be used for determining DFS conformance. Step intervals of 0.1 microsecond for Pulse Width, 1 microsecond for PRI, 1 MHz for chirp width and 1 for the number of pulses will be utilized for the random determination of specific test waveforms

Short Pulse Radar Test Waveforms

Radar Type	Pulse Width (µsec)	PRI (µsec)	Number of Pulses	Minimum Percentage of Successful Detection	Minimum Trials
0	1	1428	18	See Note 1	See Note 1
1	1	Test A: 15 unique PRI values randomly selected from the list of 23 PRI values in Table 5a	Roundup { (1/360) * (19*10^6/ PRI_{usec}	60%	30
		Test B: 15 unique PRI values randomly selected within the range of 518-3066 µsec, with a minimum increment of 1 µsec, excluding PRI values selected in Test A	-		
2	1-5	150-230	23-29	60%	30
3	6-10	200-500	16-18	60%	30
4	11-20	200-500	12-16	60%	30
Aggregate (Radar Types 1-4)				80%	120
Note 1: Short Pulse Radar Type 0 should be used for the detection bandwidth test, channel move time, and channel closing time tests.					

Long Pulse Radar Test Waveform

Radar Type	Pulse Width (µsec)	Chirp Width (MHz)	PRI (µsec)	Number of Pulses per *Burst*	Number of *Bursts*	Minimum Percentage of Successful Detection	Minimum Trials
5	50-100	5-20	1000-2000	1-3	8-20	80%	30

The parameters for this waveform are randomly chosen. Thirty unique waveforms are required for the Long Pulse radar test signal. If more than 30 waveforms are used for the Long Pulse radar test signal, then each additional waveform must also be unique and not repeated from the previous

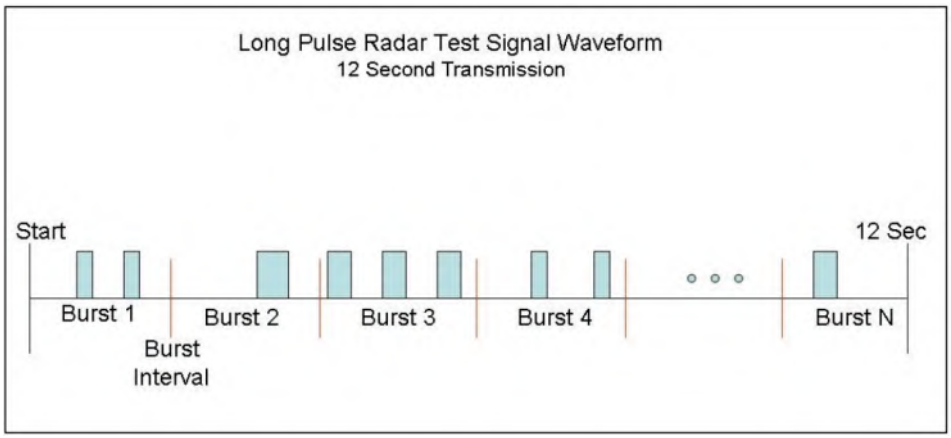
waveforms.

Each waveform is defined as follows:

1) The transmission period for the Long Pulse Radar test signal is 12 seconds.
2) There are a total of 8 to 20 Bursts in the 12 second period, with the number of Bursts being randomly chosen. This number is Burst Count.
3) Each Burst consists of 1 to 3 pulses, with the number of pulses being randomly chosen. Each Burst within the 12 second sequence may have a different number of pulses.
4) The pulse width is between 50 and 100 microseconds, with the pulse width being randomly chosen. Each pulse within a Burst will have the same pulse width. Pulses in different Bursts may have different pulse widths.
5) Each pulse has a linear FM chirp between 5 and 20 MHz, with the chirp width being randomly chosen. Each pulse within a Burst will have the same chirp width. Pulses in different Bursts may have different chirp widths. The chirp is centered on the pulse. For example, with a radar frequency of 5300 MHz and a 20 MHz chirped signal, the chirp starts at 5290 MHz and ends at 5310 MHz
6) If more than one pulse is present in a Burst, the time between the pulses will be between 1000 and 2000 microseconds, with the time being randomly chosen. If three pulses are present in a Burst, the time between the first and second pulses is chosen independently of the time between the second and third pulses.
7) The 12 second transmission period is divided into even intervals. The number of intervals is equal to Burst Count. Each interval is of length (12,000,000 / Burst Count) microseconds. Each interval contains one Burst. The start time for the Burst, relative to the beginning of the interval, is between 1 and [(12,000,000 / Burst Count) – (Total Burst Length) + (One Random PRI Interval)] microseconds, with the start time being randomly chosen. The step interval for the start time is 1 microsecond. The s9tart time for each Burst is chosen independently.

A representative example of a Long Pulse radar test waveform:

1) The total test signal length is 12 seconds.
2) 8 Bursts are randomly generated for the Burst Count.
3) Burst 1 has 2 randomly generated pulses.
4) The pulse width (for both pulses) is randomly selected to be 75 microseconds.
5) The PRI is randomly selected to be at 1213 microseconds.
6) Bursts 2 through 8 are generated using steps 3 – 5.
7) Each Burst is contained in even intervals of 1,500,000 microseconds. The starting location for Pulse 1, Burst 1 is randomly generated (1 to 1,500,000 minus the total Burst 1 length + 1 random PRI interval) at the 325,001 microsecond step. Bursts 2 through 8 randomly fall in successive 1,500,000 microsecond intervals (i.e. Burst 2 falls in the 1,500,001 – 3,000,000 microsecond range).



Frequency Hopping Radar Type

Radar Type	Pulse Width (µsec)	PRI (µsec)	Pulses per Hop	Hopping Rate (kHz)	Hopping Sequence Length (msec)	Minimum Percentage of Successful Detection	Minimum Trials
6	1	333	9	.333	300	70%	30

For the Frequency Hopping Radar Type, the same Burst parameters are used for each waveform. The hopping sequence is different for each waveform and a 100-length segment is selected 1 from the hopping sequence defined by the following algorithm:

The first frequency in a hopping sequence is selected randomly from the group of 475 integer frequencies from 5250 – 5724 MHz. Next, the frequency that was just chosen is removed from the group and a frequency is randomly selected from the remaining 474 frequencies in the group. This process continues until all 475 frequencies are chosen for the set. For selection of a random frequency, the frequencies remaining within the group are always treated as equally likely.

7.7 Dynamic Frequency Selection (DFS) Applicability

7.7.1 Requirement

A U-NII network will employ a DFS function to detect signals from radar systems and to avoid co-channel operation with these systems. This applies to the 5250-5350 MHz and/or 5470-5725 MHz bands.1

Within the context of the operation of the DFS function, a U-NII device will operate in either Master Mode or Client Mode. U-NII devices operating in Client Mode can only operate in a network controlled by a UNII device operating in Master Mode.

Following tables shown below summarize the DFS testing applicability.

Applicability of DFS Requirements Prior to Use of a Channel

Requirement	Operational Mode		
	Master	Client Without Radar Detection	Client With Radar Detection
Non-Occupancy Period	Yes	Not required	Yes
DFS Detection Threshold	Yes	Not required	Yes
Channel Availability Check Time	Yes	Not required	Not required
U-NII Detection Bandwidth	Yes	Not required	Yes

Applicability of DFS requirements during normal operation

Requirement	Operational Mode	
	Master Device or Client with Radar Detection	Client Without Radar Detection
DFS Detection Threshold	Yes	Not required
Channel Closing Transmission Time	Yes	Yes
Channel Move Time	Yes	Yes
U-NII Detection Bandwidth	Yes	Not required

Additional requirements for devices with multiple bandwidth modes	Master Device or Client with Radar Detection	Client Without Radar Detection
U-NII Detection Bandwidth and Statistical Performance Check	All BW modes must be tested	Not required
Channel Move Time and Channel Closing Transmission Time	Test using widest BW mode available	Test using the widest BW mode available for the link
All other tests	Any single BW mode	Not required
Note: Frequencies selected for statistical performance check (Section 7.8.4) should include several frequencies within the radar detection bandwidth and frequencies near the edge of the radar detection bandwidth. For 802.11 devices it is suggested to select frequencies in each of the bonded 20 MHz channels and the channel center frequency.		

7.7.2 Conclusion

EUT is client device without radar detection function. Only the Channel Closing Transmission Time and Channel Move time testing are required.

7.8 Dynamic Frequency Selection (DFS) Testing

7.8.1 Requirement

Channel Closing Transmission Time

The Channel Closing Transmission Time is comprised of 200 milliseconds starting at the beginning of the Channel Move Time plus any additional intermittent control signals required to facilitate a Channel move (an aggregate of 60 milliseconds) during the remainder of the 10 second period. The aggregate duration of control signals will not count quiet periods in between transmissions.

The channel closing transmission time shall be less than (200 milliseconds + an aggregate of 60 milliseconds) over remaining 10 second period

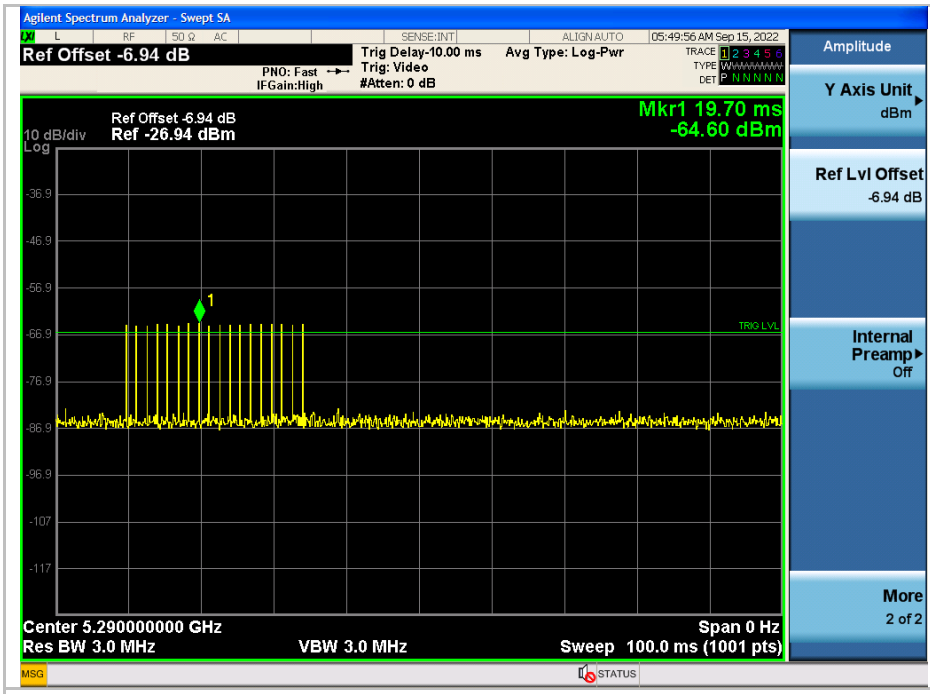
Channel Move Time

After a radar's presence is detected, all transmissions shall cease on the operating channel within 10 seconds. Transmissions during this period shall consist of normal traffic for a maximum of 200 ms after detection of the radar signal. In addition, intermittent management and control signals can be sent during the remaining time to facilitate vacating the operating channel.

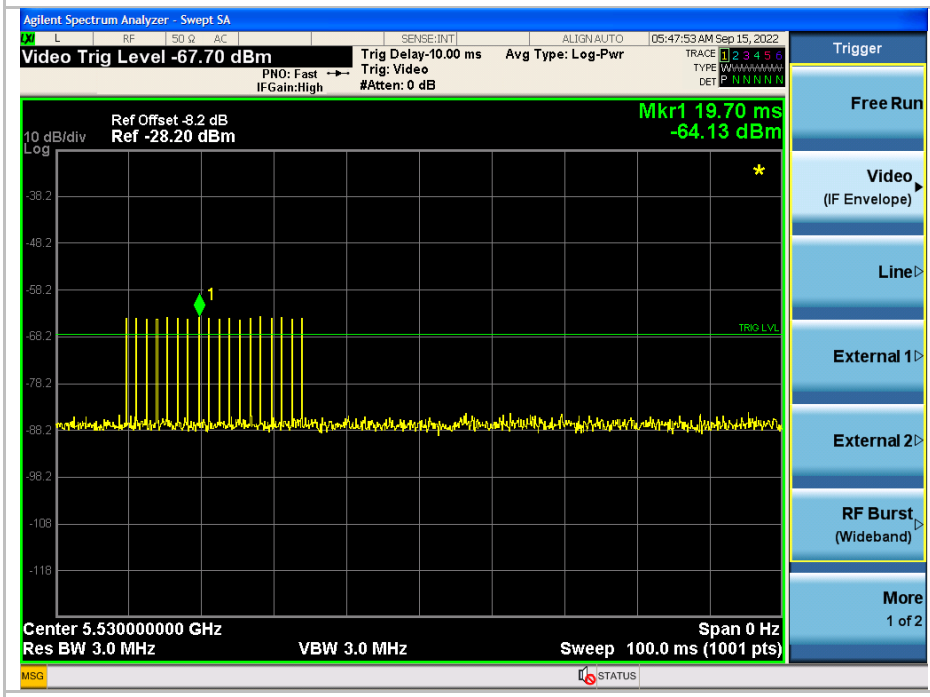
7.8.2 Radar Waveform Calibration

The following equipment setup was used to calibrate the conducted Radar Waveform. A spectrum analyzer was used to establish the test signal level for each radar type. During this process there were no transmissions by either the Master or Client Device. The spectrum analyzer was switched to the zero span (Time Domain) mode at the frequency of the Radar Waveform generator. Peak detection was utilized.

Calibration Test Plots



5250MHz to 5350MHz bands – Radar Type 0 @ 5290MHz



5470MHz to 5725MHz bands – Radar Type 0 @ 5530MHz

7.8.3 DFS Test Procedure

In-Service Monitoring for Channel Move Time, Channel Closing Transmission Time and Non-Occupancy Period

These tests define how the following DFS parameters are verified during In-Service Monitoring; Channel Closing Transmission Time, Channel Move Time, and Non-Occupancy Period.

The steps below define the procedure to determine the above-mentioned parameters when a radar Burst with a level equal to the DFS Detection Threshold + 1dB is generated on the Operating Channel of the U-NII device.

UUT operating as a Client Device will associate with the Master at test Channel. DFS testing was performed while EUT is associated with the HME master device (Remote Transceiver) that it's designed to use with. EUT communicates with master device through the unique frame structure with fixed data rate and duty cycle.

At time T0 the Radar Waveform generator sends a Burst of pulses for each of the radar types.

Observe the transmissions of the UUT at the end of the radar Burst on the Operating Channel for duration greater than 10 seconds. Measure and record the transmissions from the UUT during the observation time (Channel Move Time). Compare the Channel Move Time and Channel Closing Transmission Time results to the limits defined in the DFS Response requirement values table.

Channel Closing Transmission Time- Measurement

A type 1 waveform was introduced to the EUT and the Spectrum Analyzer sweep time was set to 1s for monitoring and capturing the plot. A LabVIEW program was created to collect trace data and capturing the plot. The program will calculate the channel closing time base on the spectrum analyzer result. The result will be calculated based on FCC procedure.

C= N*Dwell

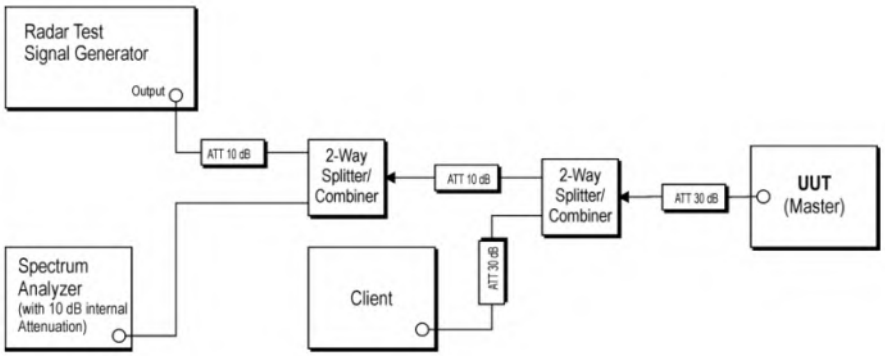
C is the closing time, N is the number of spectrum analyzer sampling bins showing a U-NII transmission and dwell is the dwell time per bin.

Dwell= S/B

Where Dwell is the dwell time per spectrum analyzer sampling bin, S is the sweep time and B is the number 0f spectrum analyzer sampling bins.

7.8.4 DFS Test Setup

Conducted measurement setup was used for full DFS testing.
Test Setup Block Diagram for conducted measurement is as below,



The radio was set at the center channel frequency of tested Channel.
An FCC approved Master device – (FCC ID: Q87-EA8300) AP was used to link with DUT device.

The master device provides, on aggregate, uniform loading of the spectrum across all devices by selecting an operating channel among the available channels using a random algorithm.

The rated output power of the Master unit is > 23 dBm (EIRP). Therefore, the required interference threshold is – 64 dBm. After correction for procedural adjustment, the required radiated threshold at the antenna port is -64 + 1 = -63 dBm.

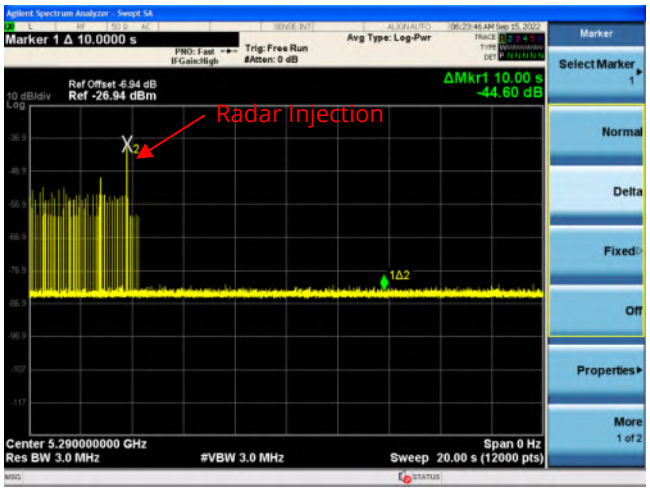
The calibrated radiated DFS detection threshold level is set to -64 dBm. The tested level is lower than the required level hence it provides margining to the limit.

7.8.5 DFS Test Results

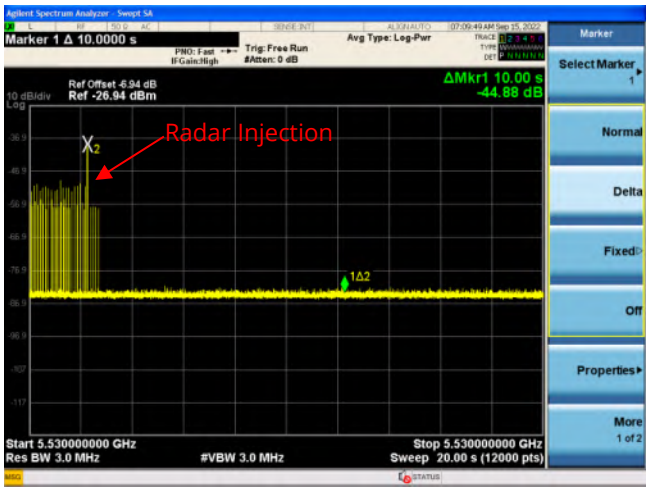
BW / Channel	Test Item	Test Result	Limit	Verdict
ac80-5290MHz	Channel Move Time	< 10s	< 10s	Pass
ac80-5530MHz	Channel Move Time	< 10s	< 10s	Pass
ac80-5290MHz	Channel Closing Transmission Time	4.1ms	< 260ms	Pass
ac80-5530MHz	Channel Closing Transmission Time	4.2ms	< 260ms	Pass
ac80-5290MHz	Non-Occupancy Period	> 30min (1800 s)	≥ 30 min (1800 s)	Pass
ac80-5530MHz	Non-Occupancy Period	> 30min (1800 s)	≥ 30 min (1800 s)	Pass

7.8.6 DFS Test Plots

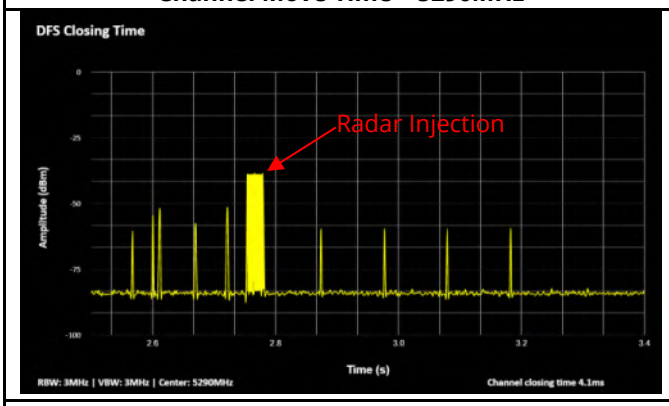
Plots for Channel closing time and Channel Move Time



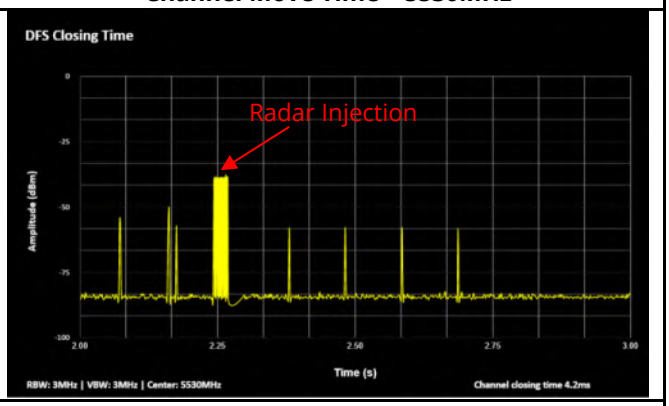
Channel Move Time – 5290MHz



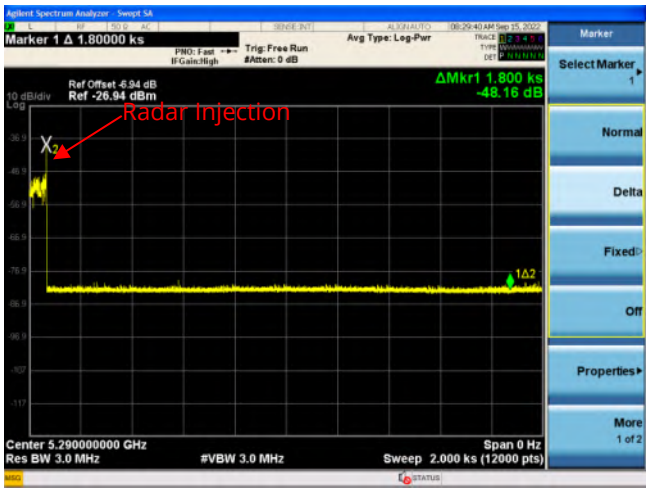
Channel Move Time – 5530MHz



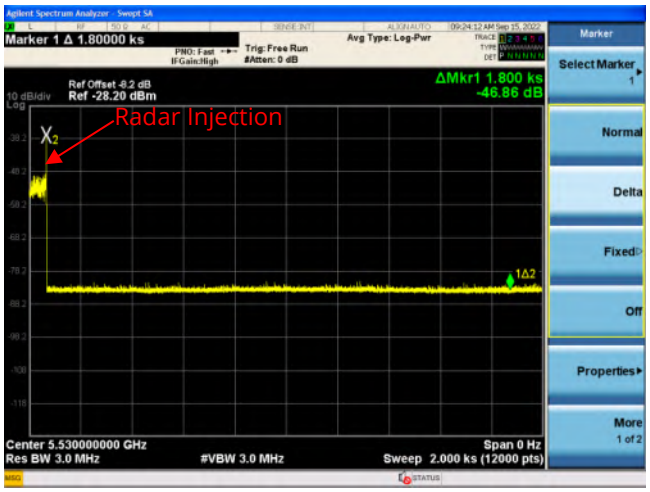
Channel Closing Time – 5290MHz



Channel Closing Time – 5530MHz



Non-occupancy period - 5290MHz (Type0)



Non-occupancy period - 5530MHz (Type0)

7.9 Radiated Spurious Emission

7.9.1 Requirement

§ 15.407 (b)

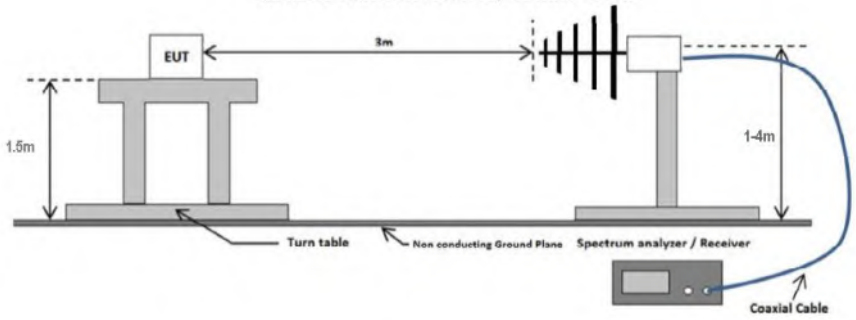
1) For transmitters operating in the 5.15-5.25 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz.
2) For transmitters operating in the 5.25-5.35 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.
3) For transmitters operating in the 5.47-5.725 GHz band: all emissions outside of the 5.47-5.725 GHz band shall not exceed an EIRP of −27 dBm/MHz.
4) For transmitters operating in the 5.725-5.825 GHz band: all emissions shall be limited to a level of −27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.
5) Restricted band, emission must also comply with the radiated emission limits specified in 15.209

Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

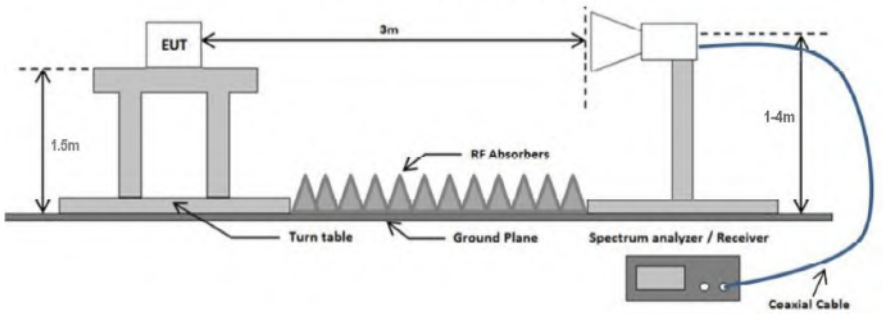
Frequency Range (MHZ)	Field Strength (μV/m)	Measurement Distance (m)
0.009~0.490	2400/F(kHz)	300
0.490~1.705	24000/F(kHz)	30
1.705~30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 960	200	3
Above 960	500	3

7.9.2 Test Setup

Radiated emissions test setup 30 MHz - 1 GHz



Radiated emissions test setup above 1 GHz



7.9.3 Test Procedure

According to subclause 12.7, radiated spurious emission measurements, in ANSI C63.10-2013:

1) The EUT was switched on and allowed to warm up to its normal operating condition.
2) The test was carried out at the selected frequency points obtained from the EUT characterization. Maximization of the emissions, was carried out by rotating the EUT, changing the antenna polarization, and adjusting the antenna height in the following manner:
    a. Vertical or horizontal polarization (whichever gave the higher emission level over a full rotation of the EUT was chosen.
    b. The EUT was then rotated to the direction that gave the maximum emission.
    c. Finally, the antenna height was adjusted to the height that gave the maximum emission.
3) The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 300Hz for frequencies below 150kHz.
4) The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 10kHz for frequency between 150kHz-30MHz.
5) The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for quasi-peak detection at frequency between 30MHz-1GHz.
6) The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz with peak detection for peak and average measurement at frequency above 1GHz.
7) Steps 2 and 3 were repeated for the next frequency point, until all selected frequency points were measured.

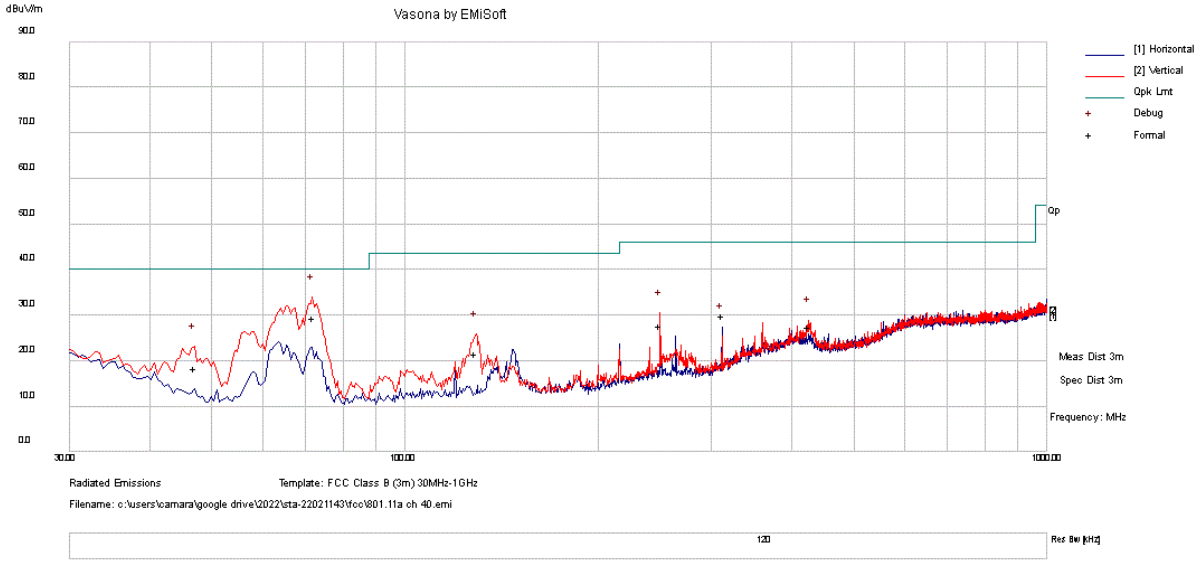
7.9.4 Test Result

Radiated Emission between 9KHz – 30MHz test result

Note: no substantial emission is found other than the noise floor. Different modes have been verified.

RADIATED SPURIOUS EMISSION BELOW 1GHZ

Test Standard:	FCC15.247, 15.209	Mode:	RSE-Below 1GHz_802.11a
Frequency Range:	30 MHz - 1 GHz	Test Date:	07/06/2022
Antenna Type/Polarity:	Bi-Log/Hor & Ver	Test Personnel:	Devin Tai
Remark:	Ch 40	Test Result:	Pass



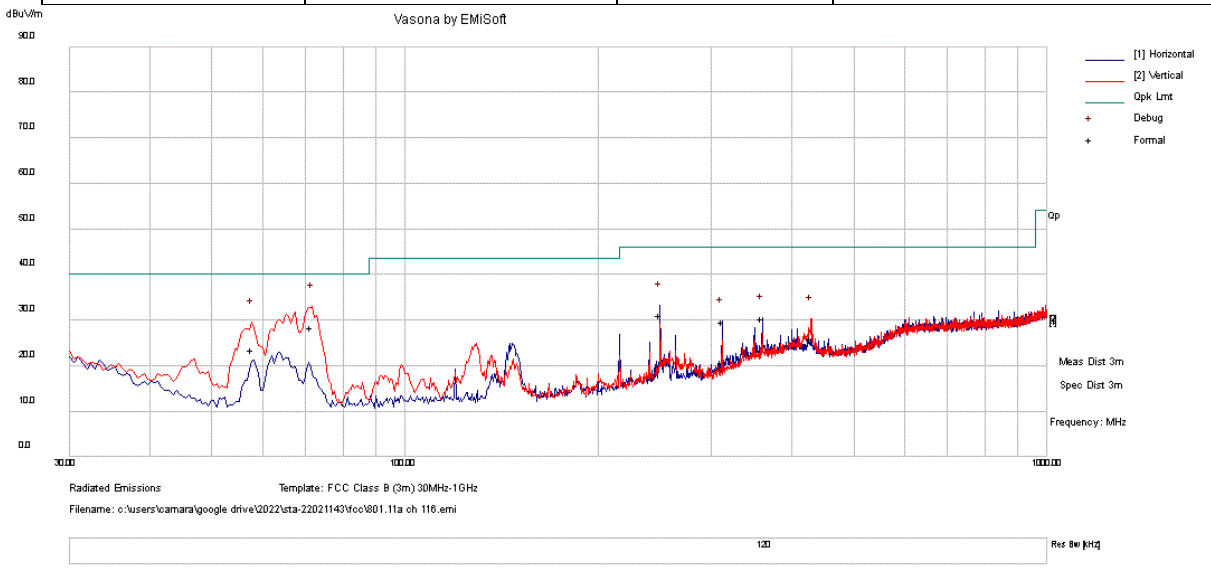
No.	Frequency MHz	Raw dBuV	Cable Loss	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	71.959	46.5	3.2	-20.1	29.6	Quasi Max	V	153	341	40	-10.4	Pass
2	249.947	37.2	5.3	-14.6	27.9	Quasi Max	V	101	203	46	-18.1	Pass
3	47.016	35.6	2.7	-20	18.3	Quasi Max	V	120	307	40	-21.7	Pass
4	425.264	29.9	6.3	-8.6	27.6	Quasi Max	V	200	104	46	-18.4	Pass
5	128.923	35.9	4	-18.3	21.6	Quasi Max	V	159	5	43.5	-21.9	Pass
6	311.987	37.6	5.8	-13.4	30	Quasi Max	H	103	139	46	-16	Pass

Remarks:

1. Level (dBuV/m) = Raw (dBuV) + Cable loss(dB) + AF (dB/m).
2. AF (dB/m) = Antenna Factor (dB) – Preamplifier Gain (dB)
3. Margin = Level (dBuV/m) - Limit value(dBuV/m)

RADIATED SPURIOUS EMISSION BELOW 1GHZ

Test Standard:	FCC15.247, 15.209	Mode:	RSE-Below 1GHz_802.11a
Frequency Range:	30 MHz - 1 GHz	Test Date:	07/06/2022
Antenna Type/Polarity:	Bi-Log/Hor & Ver	Test Personnel:	Devin Tai
Remark:	Ch 116	Test Result:	Pass



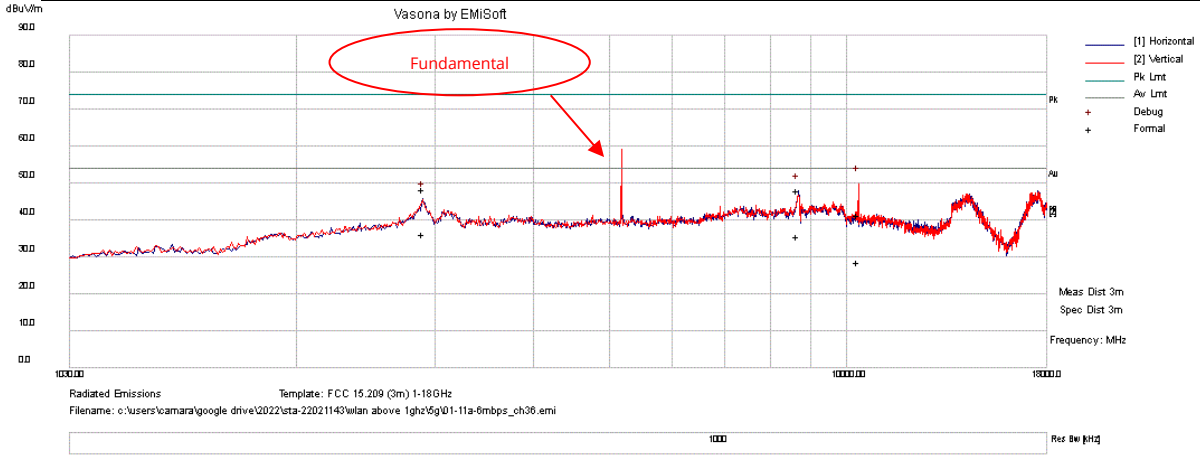
No.	Frequency MHz	Raw dBuV	Cable Loss	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	71.47	45.5	3.2	-20.1	28.6	Quasi Max	V	120	254	40	-11.4	Pass
2	57.864	41.5	3	-20.8	23.7	Quasi Max	V	128	18	40	-16.3	Pass
3	249.953	40.6	5.3	-14.6	31.3	Quasi Max	H	100	92	46	-14.7	Pass
4	360.008	34.6	6.1	-10.4	30.3	Quasi Max	H	100	118	46	-15.7	Pass
5	429.024	28.4	6.3	-8.7	26	Quasi Max	V	344	27	46	-20	Pass
6	312.012	37.4	5.8	-13.4	29.8	Quasi Max	H	108	314	46	-16.2	Pass

Remarks:

1. Level (dBuV/m) = Raw (dBuV) + Cable loss(dB) + AF (dB/m).
2. AF (dB/m) = Antenna Factor (dB) – Preamplifier Gain (dB)
3. Margin = Level (dBuV/m) - Limit value(dBuV/m)

RADIATED SPURIOUS EMISSION ABOVE 1GHZ

Test Standard:	FCC15.247, 15.209	Mode:	RSE-Above 1GHz-802.11a
Frequency Range:	1 GHz - 18 GHz	Test Date:	06/28/2022-06/30/2022
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Devin Tai
Remark:	Ch 36	Test Result:	Pass



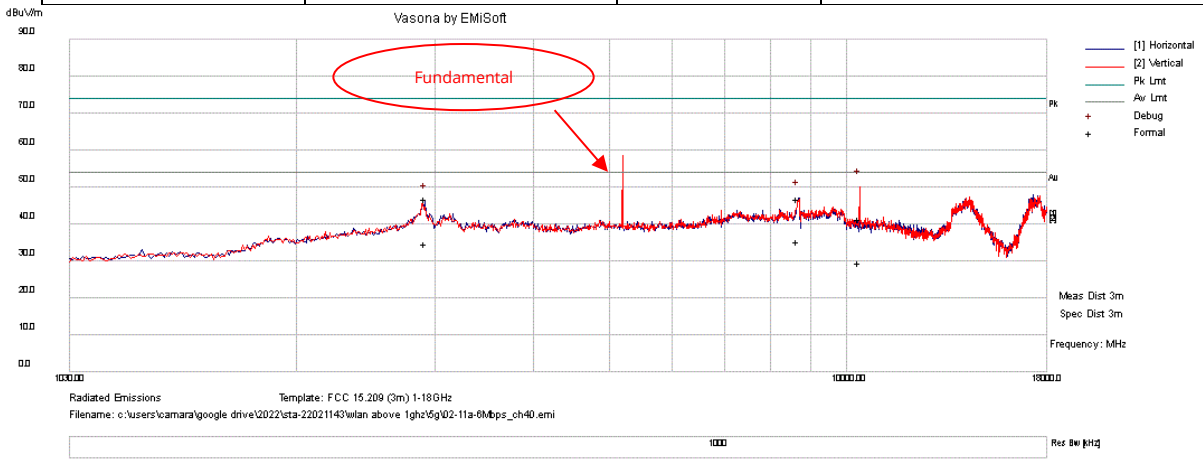
No.	Frequency MHz	Raw dBuV	Cable Loss	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	10364.04	34.1	12.3	-5.1	41.3	Peak Max	V	177	309	74	-32.7	Pass
2	8688.853	36.1	17.4	-5.7	47.8	Peak Max	H	400	170	74	-26.2	Pass
3	2895.788	22.5	21.9	3.8	48.2	Peak Max	H	108	67	74	-25.8	Pass
4	10364.04	21.4	12.3	-5.1	28.6	Average Max	V	177	309	54	-25.4	Pass
5	8688.853	23.7	17.4	-5.7	35.4	Average Max	H	400	170	54	-18.6	Pass
6	2895.788	10.5	21.9	3.8	36.2	Average Max	H	108	67	54	-17.8	Pass

Remarks:

1. Level (dBuV/m) = Raw (dBuV) + Cable loss(dB) + AF (dB/m).
2. AF (dB/m) = Antenna Factor (dB) – Preamplifier Gain (dB)
3. Margin = Level (dBuV/m) - Limit value(dBuV/m)

RADIATED SPURIOUS EMISSION BELOW 1GHZ

Test Standard:	FCC15.247, 15.209	Mode:	RSE-Above 1GHz-802.11a
Frequency Range:	1 GHz - 18 GHz	Test Date:	06/28/2022-06/30/2022
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Devin Tai
Remark:	Ch 40	Test Result:	Pass



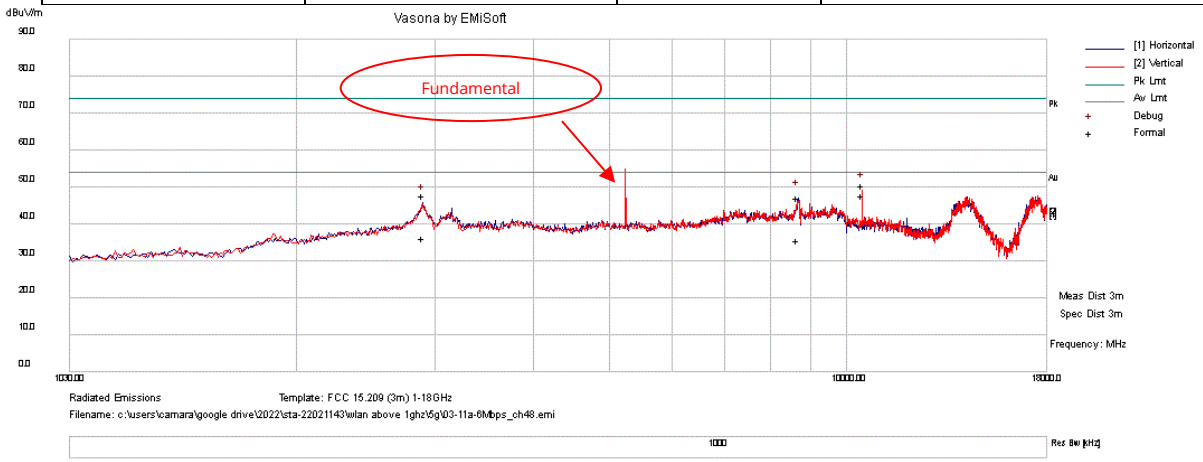
No.	Frequency MHz	Raw dBuV	Cable Loss	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	10394.012	34	12.3	-5.1	41.2	Peak Max	V	364	118	74	-32.8	Pass
2	8689.338	35.1	17.5	-5.7	46.9	Peak Max	H	141	170	74	-27.1	Pass
3	2917.883	23.6	19.2	3.9	46.7	Peak Max	H	108	342	74	-27.3	Pass
4	10394.012	22.3	12.3	-5.1	29.5	Average Max	V	364	118	54	-24.5	Pass
5	8689.338	23.6	17.5	-5.7	35.4	Average Max	H	141	170	54	-18.6	Pass
6	2917.883	11.5	19.2	3.9	34.6	Average Max	H	108	342	54	-19.4	Pass

Remarks:

1. Level (dBuV/m) = Raw (dBuV) + Cable loss(dB) + AF (dB/m).
2. AF (dB/m) = Antenna Factor (dB) – Preamplifier Gain (dB)
3. Margin = Level (dBuV/m) - Limit value(dBuV/m)

RADIATED SPURIOUS EMISSION BELOW 1GHZ

Test Standard:	FCC15.247, 15.209	Mode:	RSE-Above 1GHz-802.11a
Frequency Range:	1 GHz - 18 GHz	Test Date:	06/28/2022-06/30/2022
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Devin Tai
Remark:	Ch 48	Test Result:	Pass



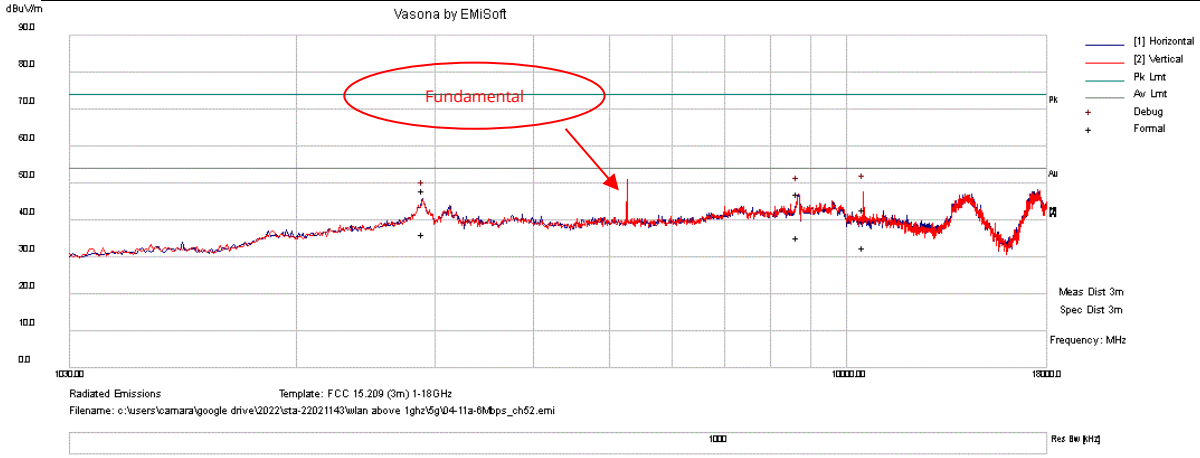
No.	Frequency MHz	Raw dBuV	Cable Loss	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	10480.169	43.3	12.3	-5.2	50.4	Peak Max	V	103	0	74	-23.6	Pass
2	8689.373	35.3	17.5	-5.7	47.1	Peak Max	H	346	145	74	-26.9	Pass
3	2898.388	22	21.9	3.8	47.7	Peak Max	H	111	66	74	-26.3	Pass
4	10480.169	40.7	12.3	-5.2	47.8	Average Max	V	103	0	54	-6.2	Pass
5	8689.373	23.8	17.5	-5.7	35.6	Average Max	H	346	145	54	-18.4	Pass
6	2898.388	10.4	21.9	3.8	36.1	Average Max	H	111	66	54	-17.9	Pass

Remarks:

1. Level (dBuV/m) = Raw (dBuV) + Cable loss(dB) + AF (dB/m).
2. AF (dB/m) = Antenna Factor (dB) – Preamplifier Gain (dB)
3. Margin = Level (dBuV/m) - Limit value(dBuV/m)

RADIATED SPURIOUS EMISSION BELOW 1GHZ

Test Standard:	FCC15.247, 15.209	Mode:	RSE-Above 1GHz-802.11a
Frequency Range:	1 GHz - 18 GHz	Test Date:	06/28/2022-06/30/2022
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Devin Tai
Remark:	Ch 52	Test Result:	Pass



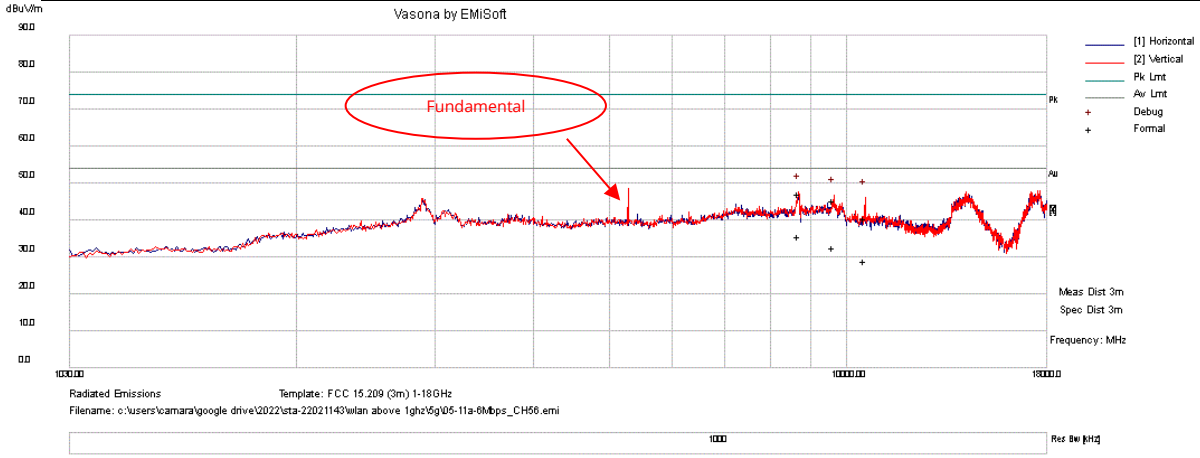
No.	Frequency MHz	Raw dBuV	Cable Loss	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	10520.619	35.8	12.3	-5.2	42.9	Peak Max	V	238	335	74	-31.1	Pass
2	8685.87	35.4	17.3	-5.7	47	Peak Max	V	151	318	74	-27	Pass
3	2896.813	22.2	21.9	3.8	47.9	Peak Max	H	250	118	74	-26.1	Pass
4	10520.619	25.5	12.3	-5.2	32.6	Average Max	V	238	335	54	-21.4	Pass
5	8685.87	23.6	17.3	-5.7	35.2	Average Max	V	151	318	54	-18.8	Pass
6	2896.813	10.5	21.9	3.8	36.2	Average Max	H	250	118	54	-17.8	Pass

Remarks:

1. Level (dBuV/m) = Raw (dBuV) + Cable loss(dB) + AF (dB/m).
2. AF (dB/m) = Antenna Factor (dB) – Preamplifier Gain (dB)
3. Margin = Level (dBuV/m) - Limit value(dBuV/m)

RADIATED SPURIOUS EMISSION BELOW 1GHZ

Test Standard:	FCC15.247, 15.209	Mode:	RSE-Above 1GHz-802.11a
Frequency Range:	1 GHz - 18 GHz	Test Date:	06/28/2022-06/30/2022
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Devin Tai
Remark:	Ch 56	Test Result:	Pass



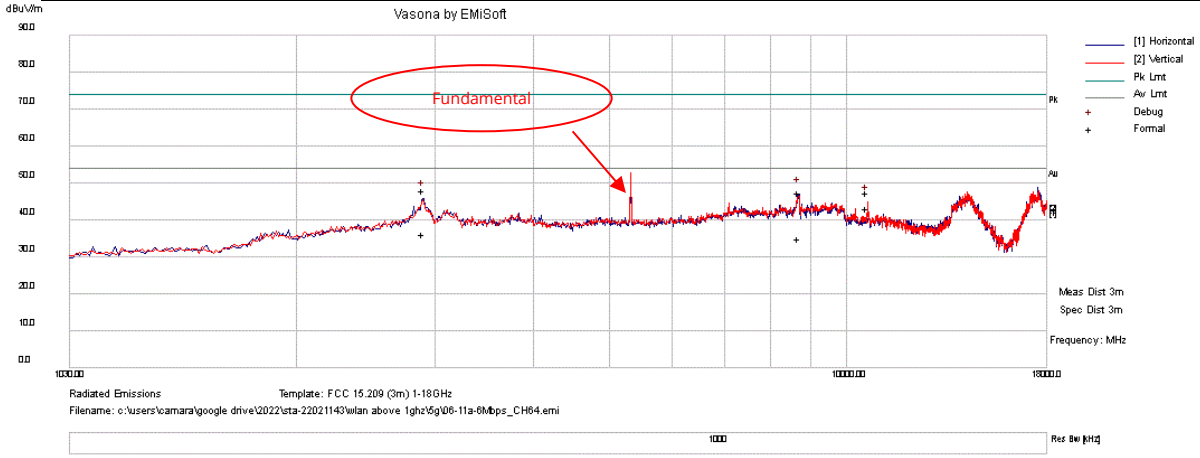
No.	Frequency MHz	Raw dBuV	Cable Loss	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	8697.344	35.1	17.8	-5.7	47.2	Peak Max	V	361	0	74	-26.8	Pass
2	9641.968	36	14.3	-5.2	45.1	Peak Max	V	379	242	74	-28.9	Pass
3	10563.794	33.4	12.3	-5.2	40.5	Peak Max	V	384	356	74	-33.5	Pass
4	8697.344	23.6	17.8	-5.7	35.7	Average Max	V	361	0	54	-18.3	Pass
5	9641.968	23.5	14.3	-5.2	32.6	Average Max	V	379	242	54	-21.4	Pass
6	10563.794	21.8	12.3	-5.2	28.9	Average Max	V	384	356	54	-25.1	Pass

Remarks:

1. Level (dBuV/m) = Raw (dBuV) + Cable loss(dB) + AF (dB/m).
2. AF (dB/m) = Antenna Factor (dB) – Preamplifier Gain (dB)
3. Margin = Level (dBuV/m) - Limit value(dBuV/m)

RADIATED SPURIOUS EMISSION BELOW 1GHZ

Test Standard:	FCC15.247, 15.209	Mode:	RSE-Above 1GHz-802.11a
Frequency Range:	1 GHz - 18 GHz	Test Date:	06/28/2022-06/30/2022
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Devin Tai
Remark:	Ch 64	Test Result:	Pass



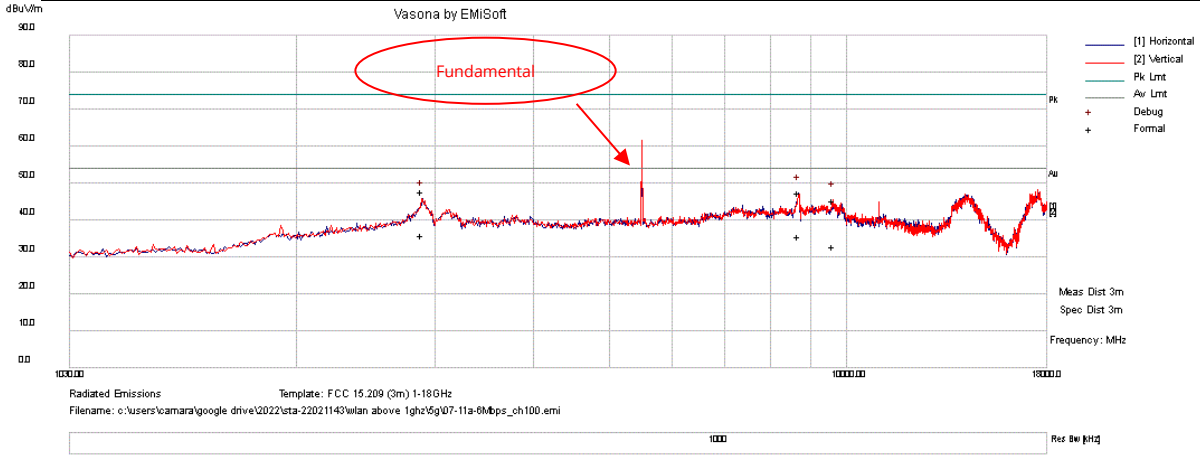
No.	Frequency MHz	Raw dBuV	Cable Loss	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	8709.74	35.5	17.5	-5.7	47.3	Peak Max	H	145	78	74	-26.7	Pass
2	2896.355	22.4	21.9	3.8	48.1	Peak Max	H	400	6	74	-25.9	Pass
3	10640.162	40.3	12.3	-5.3	47.3	Peak Max	V	235	10	74	-26.7	Pass
4	8709.74	23.2	17.5	-5.7	35	Average Max	H	145	78	54	-19	Pass
5	2896.355	10.5	21.9	3.8	36.2	Average Max	H	400	6	54	-17.8	Pass
6	10640.162	36	12.3	-5.3	43	Average Max	V	235	10	54	-11	Pass

Remarks:

1. Level (dBuV/m) = Raw (dBuV) + Cable loss(dB) + AF (dB/m).
2. AF (dB/m) = Antenna Factor (dB) – Preamplifier Gain (dB)
3. Margin = Level (dBuV/m) - Limit value(dBuV/m)

RADIATED SPURIOUS EMISSION BELOW 1GHZ

Test Standard:	FCC15.247, 15.209	Mode:	RSE-Above 1GHz-802.11a
Frequency Range:	1 GHz - 18 GHz	Test Date:	06/28/2022-06/30/2022
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Devin Tai
Remark:	Ch 100	Test Result:	Pass



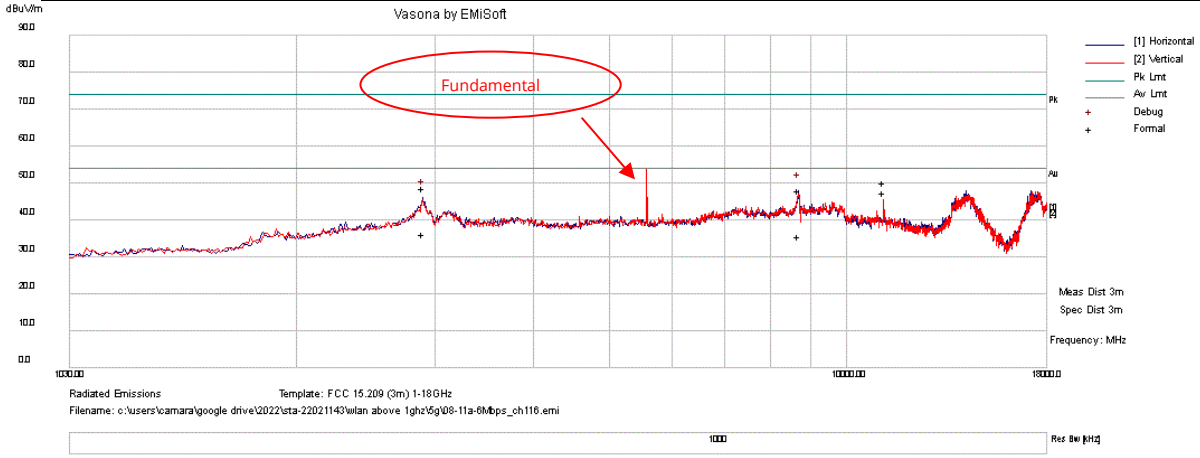
No.	Frequency MHz	Raw dBuV	Cable Loss	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	8698.631	35.1	17.9	-5.7	47.3	Peak Max	H	221	94	74	-26.7	Pass
2	2885.756	22.1	21.9	3.8	47.8	Peak Max	V	193	244	74	-26.2	Pass
3	9632.314	36.3	14.3	-5.2	45.4	Peak Max	V	384	277	74	-28.6	Pass
4	8698.631	23.5	17.9	-5.7	35.7	Average Max	H	221	94	54	-18.3	Pass
5	2885.756	10.2	21.9	3.8	35.9	Average Max	V	193	244	54	-18.1	Pass
6	9632.314	23.6	14.3	-5.2	32.7	Average Max	V	384	277	54	-21.3	Pass

Remarks:

1. Level (dBuV/m) = Raw (dBuV) + Cable loss(dB) + AF (dB/m).
2. AF (dB/m) = Antenna Factor (dB) – Preamplifier Gain (dB)
3. Margin = Level (dBuV/m) - Limit value(dBuV/m)

RADIATED SPURIOUS EMISSION BELOW 1GHZ

Test Standard:	FCC15.247, 15.209	Mode:	RSE-Above 1GHz-802.11a
Frequency Range:	1 GHz - 18 GHz	Test Date:	06/28/2022-06/30/2022
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Devin Tai
Remark:	Ch 116	Test Result:	Pass



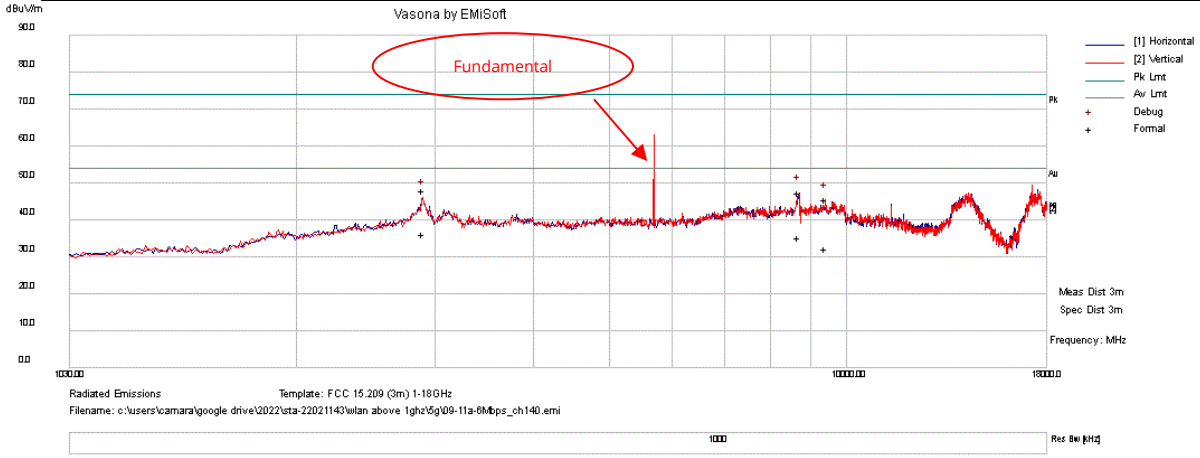
No.	Frequency MHz	Raw dBuV	Cable Loss	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	8699.269	35.7	17.9	-5.7	47.9	Peak Max	H	251	30	74	-26.1	Pass
2	2896.938	22.9	21.9	3.8	48.6	Peak Max	H	150	11	74	-25.4	Pass
3	11160.004	42.6	12.2	-4.6	50.2	Peak Max	V	238	0	74	-23.8	Pass
4	8699.269	23.4	17.9	-5.7	35.6	Average Max	H	251	30	54	-18.4	Pass
5	2896.938	10.5	21.9	3.8	36.2	Average Max	H	150	11	54	-17.8	Pass
6	11160.004	39.7	12.2	-4.6	47.3	Average Max	V	238	0	54	-6.7	Pass

Remarks:

1. Level (dBuV/m) = Raw (dBuV) + Cable loss(dB) + AF (dB/m).
2. AF (dB/m) = Antenna Factor (dB) – Preamplifier Gain (dB)
3. Margin = Level (dBuV/m) - Limit value(dBuV/m)

RADIATED SPURIOUS EMISSION BELOW 1GHZ

Test Standard:	FCC15.247, 15.209	Mode:	RSE-Above 1GHz-802.11a
Frequency Range:	1 GHz - 18 GHz	Test Date:	06/28/2022-06/30/2022
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Devin Tai
Remark:	Ch 140	Test Result:	Pass



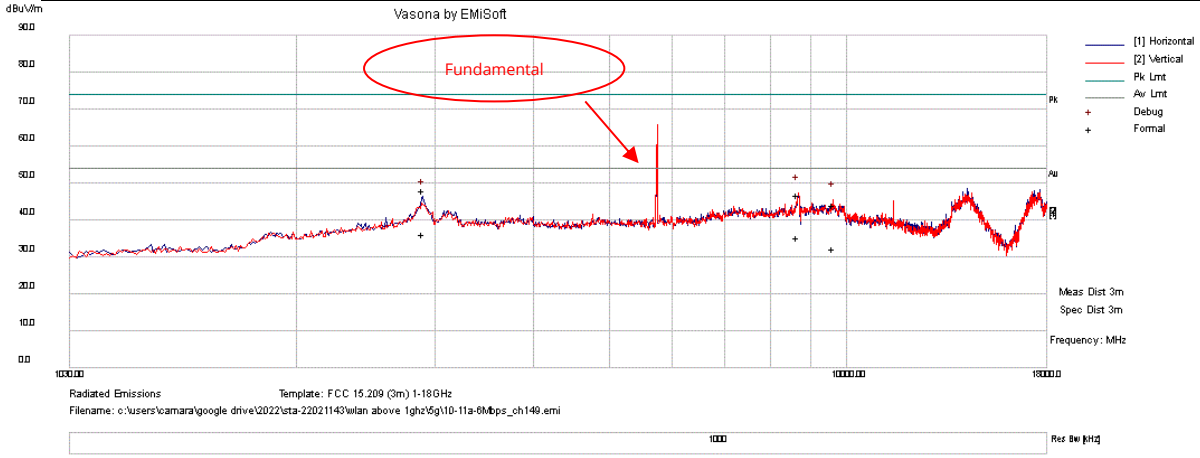
No.	Frequency MHz	Raw dBuV	Cable Loss	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	8708.258	35.4	17.6	-5.7	47.3	Peak Max	H	176	254	74	-26.7	Pass
2	2898.343	22.3	21.9	3.8	48	Peak Max	V	350	252	74	-26	Pass
3	9420.089	36.1	14.5	-5.2	45.4	Peak Max	V	288	291	74	-28.6	Pass
4	8708.258	23.3	17.6	-5.7	35.2	Average Max	H	176	254	54	-18.8	Pass
5	2898.343	10.5	21.9	3.8	36.2	Average Max	V	350	252	54	-17.8	Pass
6	9420.089	22.8	14.5	-5.2	32.1	Average Max	V	288	291	54	-21.9	Pass

Remarks:

1. Level (dBuV/m) = Raw (dBuV) + Cable loss(dB) + AF (dB/m).
2. AF (dB/m) = Antenna Factor (dB) – Preamplifier Gain (dB)
3. Margin = Level (dBuV/m) - Limit value(dBuV/m)

RADIATED SPURIOUS EMISSION BELOW 1GHZ

Test Standard:	FCC15.247, 15.209	Mode:	RSE-Above 1GHz-802.11a
Frequency Range:	1 GHz - 18 GHz	Test Date:	06/28/2022-06/30/2022
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Devin Tai
Remark:	Ch 149	Test Result:	Pass



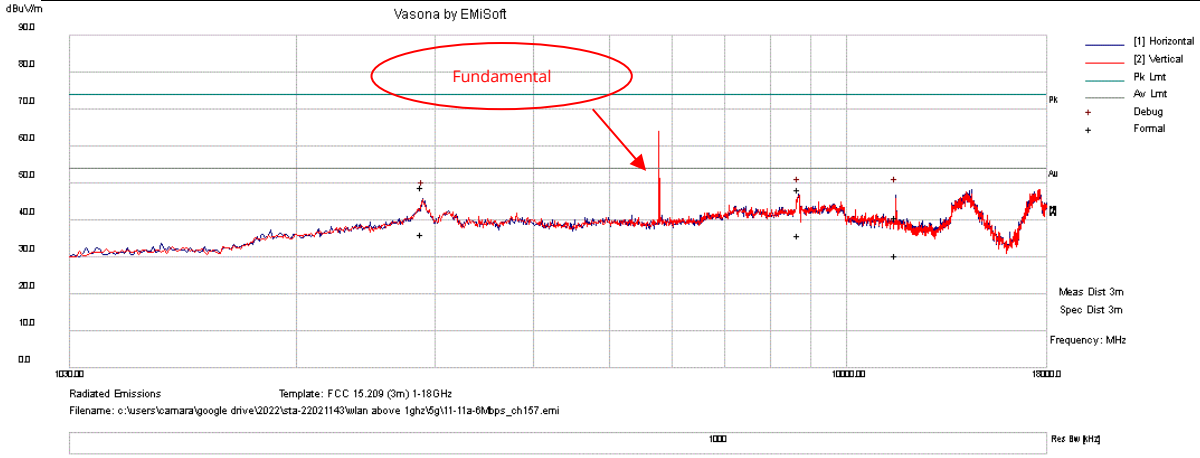
No.	Frequency MHz	Raw dBuV	Cable Loss	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	8688.695	35.2	17.4	-5.7	46.9	Peak Max	V	100	119	74	-27.1	Pass
2	2897.065	22.3	21.9	3.8	48	Peak Max	H	222	108	74	-26	Pass
3	9620.655	35.1	14.2	-5.2	44.1	Peak Max	V	234	124	74	-29.9	Pass
4	8688.695	23.6	17.4	-5.7	35.3	Average Max	V	100	119	54	-18.7	Pass
5	2897.065	10.4	21.9	3.8	36.1	Average Max	H	222	108	54	-17.9	Pass
6	9620.655	23.1	14.2	-5.2	32.1	Average Max	V	234	124	54	-21.9	Pass

Remarks:

1. Level (dBuV/m) = Raw (dBuV) + Cable loss(dB) + AF (dB/m).
2. AF (dB/m) = Antenna Factor (dB) – Preamplifier Gain (dB)
3. Margin = Level (dBuV/m) - Limit value(dBuV/m)

RADIATED SPURIOUS EMISSION BELOW 1GHZ

Test Standard:	FCC15.247, 15.209	Mode:	RSE-Above 1GHz-802.11a
Frequency Range:	1 GHz - 18 GHz	Test Date:	06/28/2022-06/30/2022
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Devin Tai
Remark:	Ch 157	Test Result:	Pass



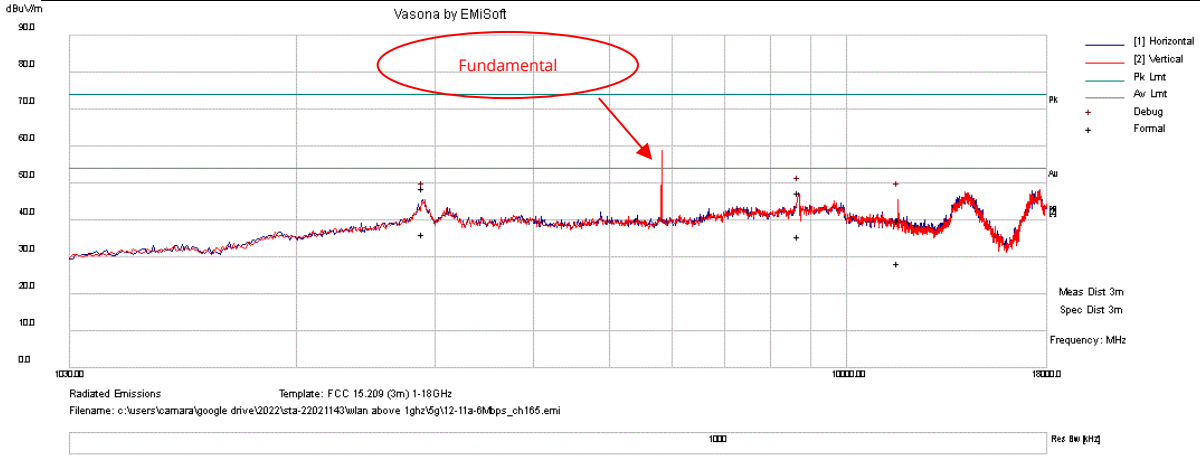
No.	Frequency MHz	Raw dBuV	Cable Loss	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	8700.039	36.1	17.9	-5.7	48.3	Peak Max	H	291	0	74	-25.7	Pass
2	11570.831	33	12	-4.4	40.6	Peak Max	H	247	347	74	-33.4	Pass
3	2894.923	23.3	21.9	3.8	49	Peak Max	H	118	106	74	-25	Pass
4	8700.039	23.5	17.9	-5.7	35.7	Average Max	H	291	0	54	-18.3	Pass
5	11570.831	22.8	12	-4.4	30.4	Average Max	H	247	347	54	-23.6	Pass
6	2894.923	10.6	21.9	3.8	36.3	Average Max	H	118	106	54	-17.7	Pass

Remarks:

1. Level (dBuV/m) = Raw (dBuV) + Cable loss(dB) + AF (dB/m).
2. AF (dB/m) = Antenna Factor (dB) – Preamplifier Gain (dB)
3. Margin = Level (dBuV/m) - Limit value(dBuV/m)

RADIATED SPURIOUS EMISSION BELOW 1GHZ

Test Standard:	FCC15.247, 15.209	Mode:	RSE-Above 1GHz-802.11a
Frequency Range:	1 GHz - 18 GHz	Test Date:	06/28/2022-06/30/2022
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Devin Tai
Remark:	Ch 165	Test Result:	Pass



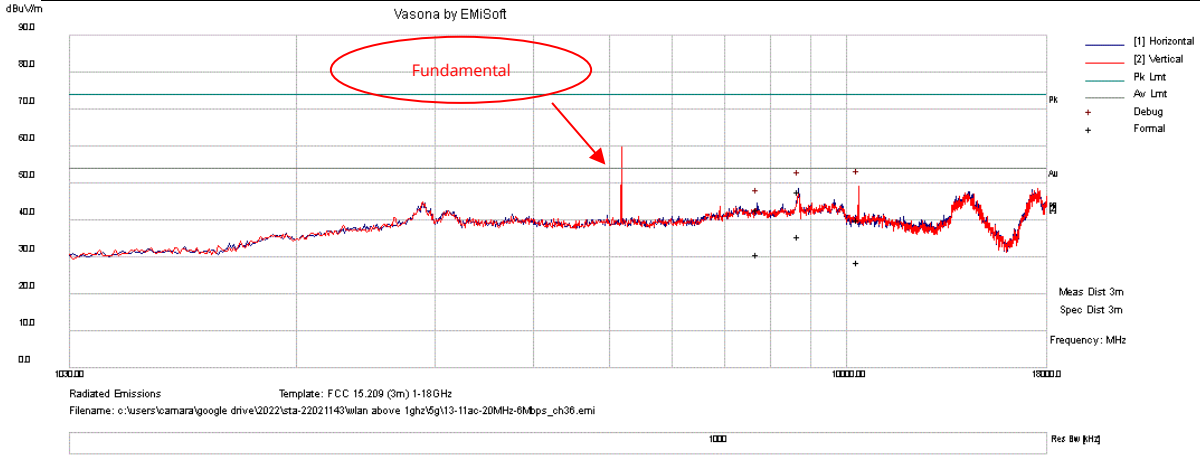
No.	Frequency MHz	Raw dBuV	Cable Loss	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	8697.864	35.4	17.9	-5.7	47.6	Peak Max	H	232	0	74	-26.4	Pass
2	2897.26	22.9	21.9	3.8	48.6	Peak Max	H	199	209	74	-25.4	Pass
3	11647.224	32.3	11.9	-4.3	39.9	Peak Max	V	400	0	74	-34.1	Pass
4	8697.864	23.5	17.9	-5.7	35.7	Average Max	H	232	0	54	-18.3	Pass
5	2897.26	10.4	21.9	3.8	36.1	Average Max	H	199	209	54	-17.9	Pass
6	11647.224	20.8	11.9	-4.3	28.4	Average Max	V	400	0	54	-25.6	Pass

Remarks:

1. Level (dBuV/m) = Raw (dBuV) + Cable loss(dB) + AF (dB/m).
2. AF (dB/m) = Antenna Factor (dB) – Preamplifier Gain (dB)
3. Margin = Level (dBuV/m) - Limit value(dBuV/m)

RADIATED SPURIOUS EMISSION BELOW 1GHZ

Test Standard:	FCC15.247, 15.209	Mode:	RSE-Above 1GHz-802.11ac
Frequency Range:	1 GHz - 18 GHz	Test Date:	06/28/2022-06/30/2022
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Devin Tai
Remark:	Ch 36	Test Result:	Pass



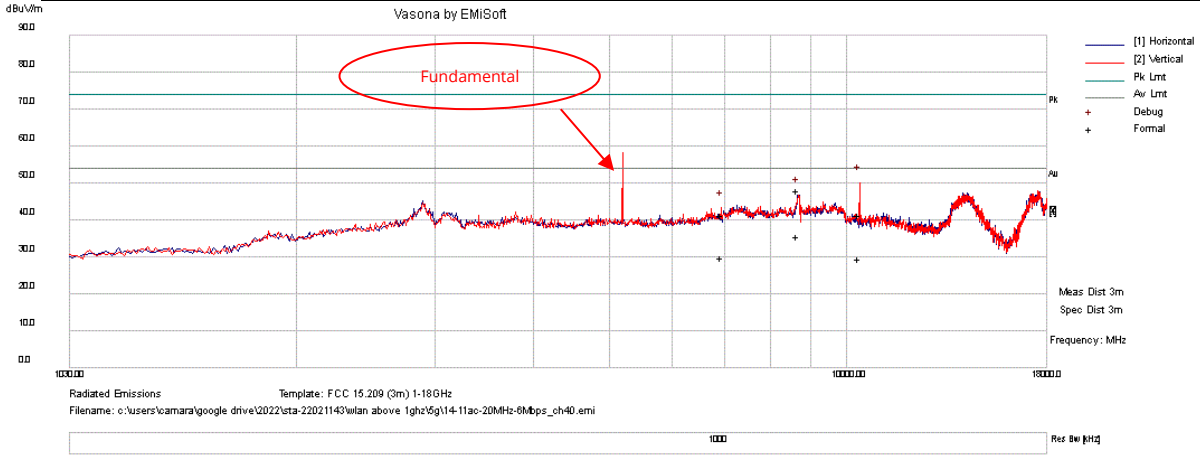
No.	Frequency MHz	Raw dBuV	Cable Loss	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	10365.3	32.9	12.3	-5.1	40.1	Peak Max	V	284	95	74	-33.9	Pass
2	8697.074	35.6	17.8	-5.7	47.7	Peak Max	H	326	258	74	-26.3	Pass
3	7716.948	36	12.4	-5.7	42.7	Peak Max	V	322	192	74	-31.3	Pass
4	10365.3	21.4	12.3	-5.1	28.6	Average Max	V	284	95	54	-25.4	Pass
5	8697.074	23.5	17.8	-5.7	35.6	Average Max	H	326	258	54	-18.4	Pass
6	7716.948	24	12.4	-5.7	30.7	Average Max	V	322	192	54	-23.3	Pass

Remarks:

1. Level (dBuV/m) = Raw (dBuV) + Cable loss(dB) + AF (dB/m).
2. AF (dB/m) = Antenna Factor (dB) – Preamplifier Gain (dB)
3. Margin = Level (dBuV/m) - Limit value(dBuV/m)

RADIATED SPURIOUS EMISSION BELOW 1GHZ

Test Standard:	FCC15.247, 15.209	Mode:	RSE-Above 1GHz-802.11ac
Frequency Range:	1 GHz - 18 GHz	Test Date:	06/28/2022-06/30/2022
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Devin Tai
Remark:	Ch 40	Test Result:	Pass



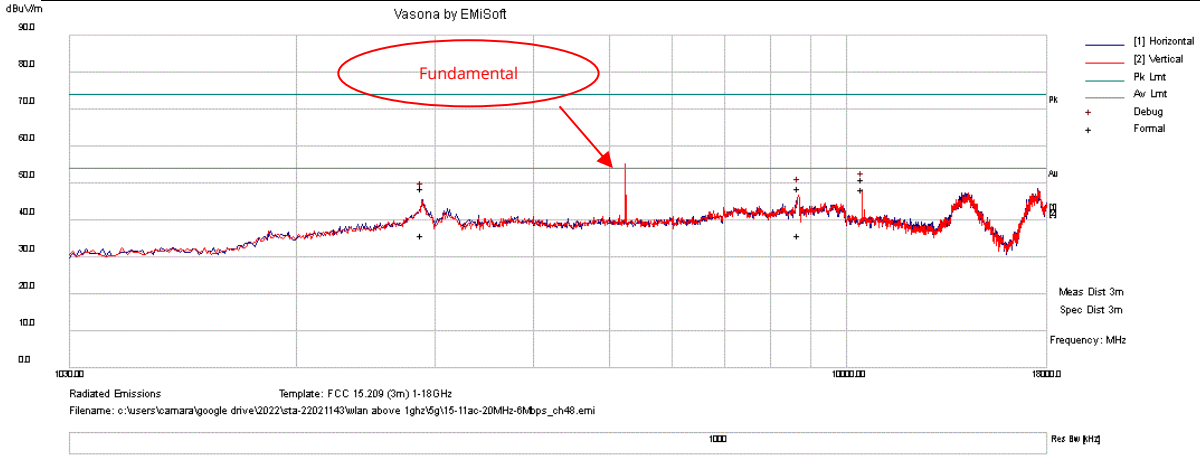
No.	Frequency MHz	Raw dBuV	Cable Loss	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	10397.107	34.2	12.3	-5.1	41.4	Peak Max	V	254	39	74	-32.6	Pass
2	8689.495	36.2	17.5	-5.7	48	Peak Max	H	359	355	74	-26	Pass
3	6938.553	36.2	11.6	-6.5	41.3	Peak Max	V	383	220	74	-32.7	Pass
4	10397.107	22.2	12.3	-5.1	29.4	Average Max	V	254	39	54	-24.6	Pass
5	8689.495	23.8	17.5	-5.7	35.6	Average Max	H	359	355	54	-18.4	Pass
6	6938.553	24.6	11.6	-6.5	29.7	Average Max	V	383	220	54	-24.3	Pass

Remarks:

1. Level (dBuV/m) = Raw (dBuV) + Cable loss(dB) + AF (dB/m).
2. AF (dB/m) = Antenna Factor (dB) – Preamplifier Gain (dB)
3. Margin = Level (dBuV/m) - Limit value(dBuV/m)

RADIATED SPURIOUS EMISSION BELOW 1GHZ

Test Standard:	FCC15.247, 15.209	Mode:	RSE-Above 1GHz-802.11ac
Frequency Range:	1 GHz - 18 GHz	Test Date:	06/28/2022-06/30/2022
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Devin Tai
Remark:	Ch 48	Test Result:	Pass



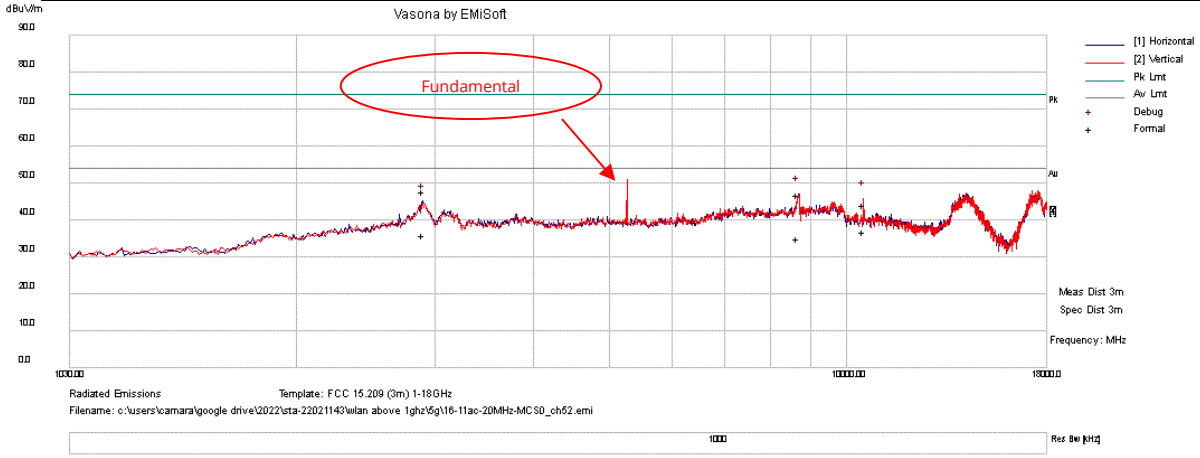
No.	Frequency MHz	Raw dBuV	Cable Loss	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	10480.054	43.8	12.3	-5.2	50.9	Peak Max	V	242	6	74	-23.1	Pass
2	8699.354	36.2	17.9	-5.7	48.4	Peak Max	H	342	222	74	-25.6	Pass
3	2886.044	22.8	21.9	3.8	48.5	Peak Max	V	255	200	74	-25.5	Pass
4	10480.054	41.2	12.3	-5.2	48.3	Average Max	V	242	6	54	-5.7	Pass
5	8699.354	23.5	17.9	-5.7	35.7	Average Max	H	342	222	54	-18.3	Pass
6	2886.044	10.2	21.9	3.8	35.9	Average Max	V	255	200	54	-18.1	Pass

Remarks:

1. Level (dBuV/m) = Raw (dBuV) + Cable loss(dB) + AF (dB/m).
2. AF (dB/m) = Antenna Factor (dB) – Preamplifier Gain (dB)
3. Margin = Level (dBuV/m) - Limit value(dBuV/m)

RADIATED SPURIOUS EMISSION BELOW 1GHZ

Test Standard:	FCC15.247, 15.209	Mode:	RSE-Above 1GHz-802.11ac
Frequency Range:	1 GHz - 18 GHz	Test Date:	06/28/2022-06/30/2022
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Devin Tai
Remark:	Ch 52	Test Result:	Pass



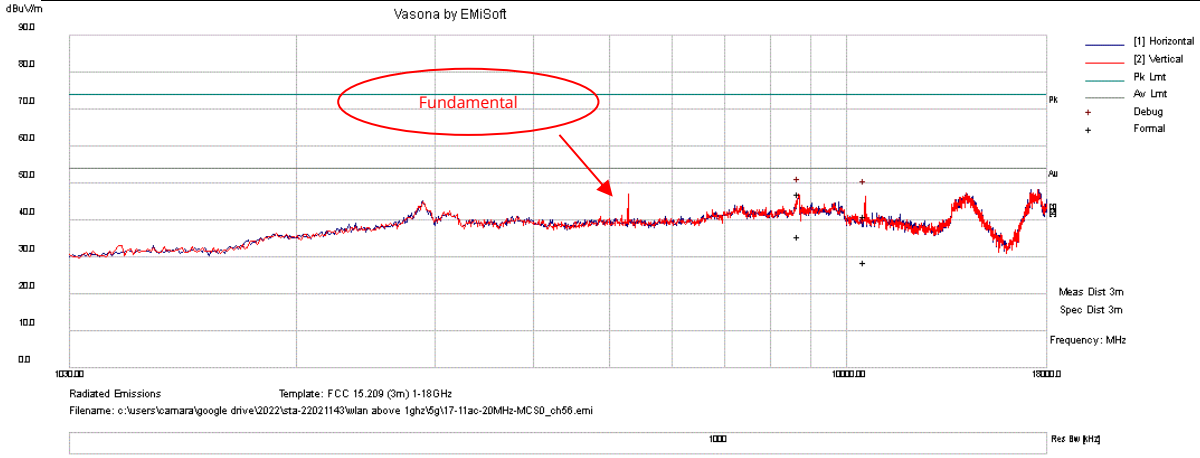
No.	Frequency MHz	Raw dBuV	Cable Loss	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	8686.018	35.1	17.3	-5.7	46.7	Peak Max	H	143	0	74	-27.3	Pass
2	10520.604	37	12.3	-5.2	44.1	Peak Max	V	238	0	74	-29.9	Pass
3	2898.398	22	21.9	3.8	47.7	Peak Max	H	361	0	74	-26.3	Pass
4	8686.018	23.5	17.3	-5.7	35.1	Average Max	H	143	0	54	-18.9	Pass
5	10520.604	29.6	12.3	-5.2	36.7	Average Max	V	238	0	54	-17.3	Pass
6	2898.398	10.3	21.9	3.8	36	Average Max	H	361	0	54	-18	Pass

Remarks:

1. Level (dBuV/m) = Raw (dBuV) + Cable loss(dB) + AF (dB/m).
2. AF (dB/m) = Antenna Factor (dB) – Preamplifier Gain (dB)
3. Margin = Level (dBuV/m) - Limit value(dBuV/m)

RADIATED SPURIOUS EMISSION BELOW 1GHZ

Test Standard:	FCC15.247, 15.209	Mode:	RSE-Above 1GHz-802.11ac
Frequency Range:	1 GHz - 18 GHz	Test Date:	06/28/2022-06/30/2022
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Devin Tai
Remark:	Ch 56	Test Result:	Pass



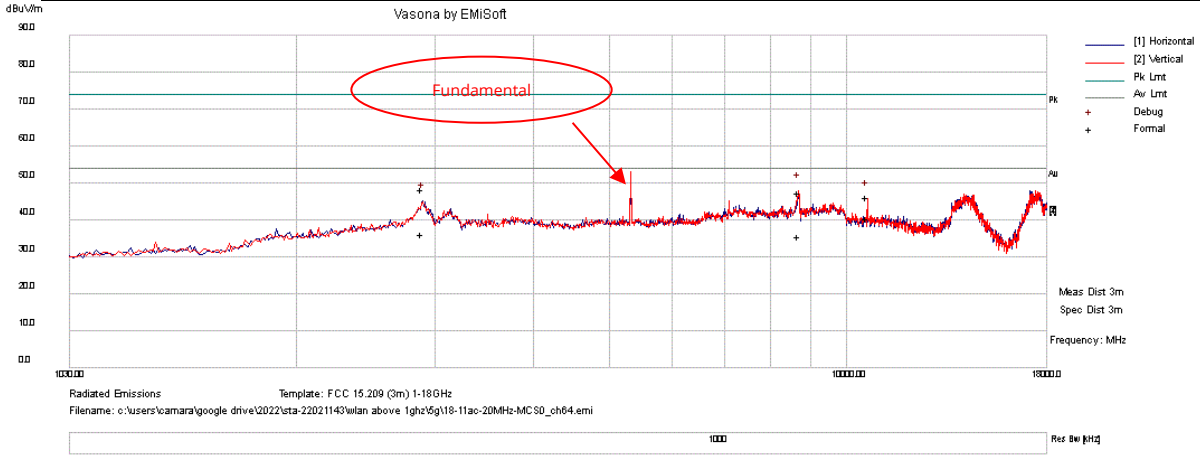
No.	Frequency MHz	Raw dBuV	Cable Loss	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	8697.576	34.9	17.8	-5.7	47	Peak Max	V	116	14	74	-27	Pass
2	10566.847	33.9	12.3	-5.2	41	Peak Max	V	364	206	74	-33	Pass
3	8697.576	23.5	17.8	-5.7	35.6	Average Max	V	116	14	54	-18.4	Pass
4	10566.847	21.6	12.3	-5.2	28.7	Average Max	V	364	206	54	-25.3	Pass

Remarks:

1. Level (dBuV/m) = Raw (dBuV) + Cable loss(dB) + AF (dB/m).
2. AF (dB/m) = Antenna Factor (dB) – Preamplifier Gain (dB)
3. Margin = Level (dBuV/m) - Limit value(dBuV/m)

RADIATED SPURIOUS EMISSION BELOW 1GHZ

Test Standard:	FCC15.247, 15.209	Mode:	RSE-Above 1GHz-802.11ac
Frequency Range:	1 GHz - 18 GHz	Test Date:	06/28/2022-06/30/2022
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Devin Tai
Remark:	Ch 64	Test Result:	Pass



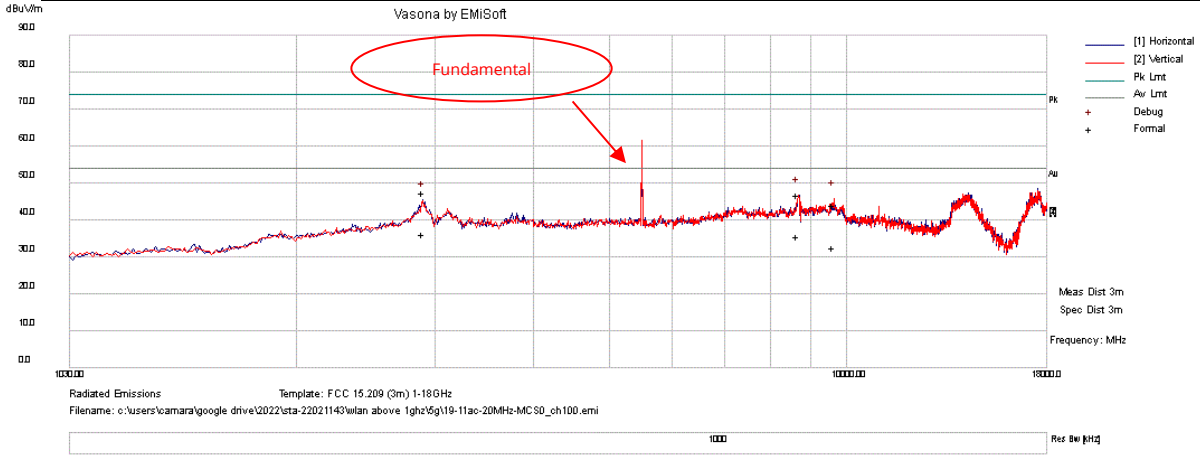
No.	Frequency MHz	Raw dBuV	Cable Loss	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	8699.306	35.1	17.9	-5.7	47.3	Peak Max	V	144	1	74	-26.7	Pass
2	10640.136	39.2	12.3	-5.3	46.2	Peak Max	V	242	114	74	-27.8	Pass
3	2894.933	22.5	21.9	3.8	48.2	Peak Max	H	348	0	74	-25.8	Pass
4	8699.306	23.4	17.9	-5.7	35.6	Average Max	V	144	1	54	-18.4	Pass
5	10640.136	33.3	12.3	-5.3	40.3	Average Max	V	242	114	54	-13.7	Pass
6	2894.933	10.6	21.9	3.8	36.3	Average Max	H	348	0	54	-17.7	Pass

Remarks:

1. Level (dBuV/m) = Raw (dBuV) + Cable loss(dB) + AF (dB/m).
2. AF (dB/m) = Antenna Factor (dB) – Preamplifier Gain (dB)
3. Margin = Level (dBuV/m) - Limit value(dBuV/m)

RADIATED SPURIOUS EMISSION BELOW 1GHZ

Test Standard:	FCC15.247, 15.209	Mode:	RSE-Above 1GHz-802.11ac
Frequency Range:	1 GHz - 18 GHz	Test Date:	06/28/2022-06/30/2022
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Devin Tai
Remark:	Ch 100	Test Result:	Pass



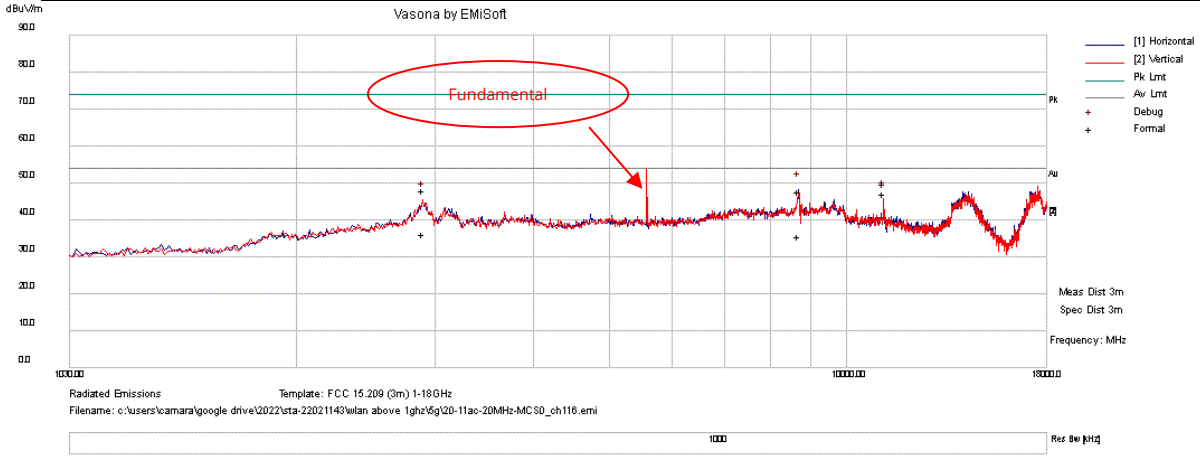
No.	Frequency MHz	Raw dBuV	Cable Loss	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	8688.385	34.9	17.4	-5.7	46.6	Peak Max	V	208	221	74	-27.4	Pass
2	9643.378	35	14.3	-5.2	44.1	Peak Max	V	338	285	74	-29.9	Pass
3	2897.323	21.8	21.9	3.8	47.5	Peak Max	H	167	336	74	-26.5	Pass
4	8688.385	23.8	17.4	-5.7	35.5	Average Max	V	208	221	54	-18.5	Pass
5	9643.378	23.3	14.3	-5.2	32.4	Average Max	V	338	285	54	-21.6	Pass
6	2897.323	10.5	21.9	3.8	36.2	Average Max	H	167	336	54	-17.8	Pass

Remarks:

1. Level (dBuV/m) = Raw (dBuV) + Cable loss(dB) + AF (dB/m).
2. AF (dB/m) = Antenna Factor (dB) – Preamplifier Gain (dB)
3. Margin = Level (dBuV/m) - Limit value(dBuV/m)

RADIATED SPURIOUS EMISSION BELOW 1GHZ

Test Standard:	FCC15.247, 15.209	Mode:	RSE-Above 1GHz-802.11ac
Frequency Range:	1 GHz - 18 GHz	Test Date:	06/28/2022-06/30/2022
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Devin Tai
Remark:	Ch 116	Test Result:	Pass



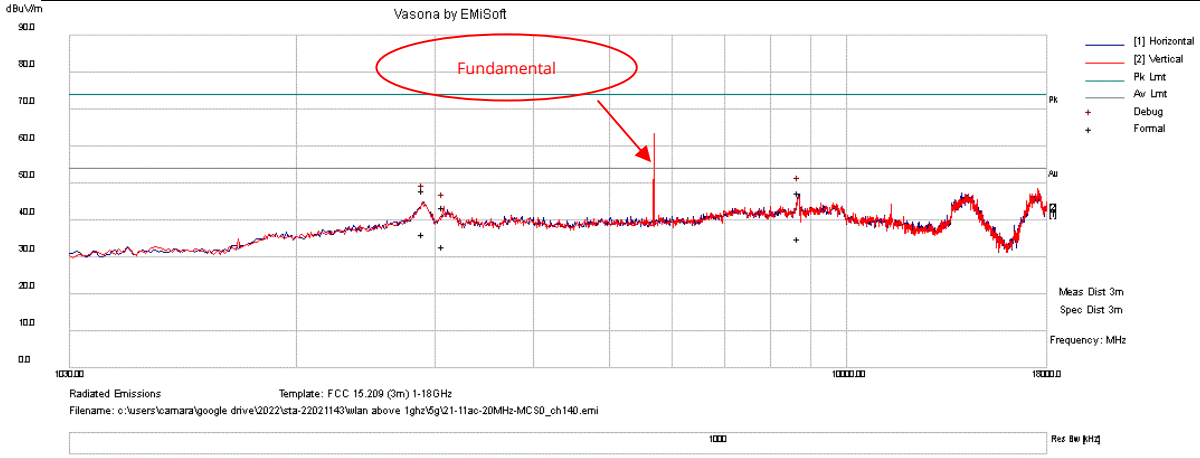
No.	Frequency MHz	Raw dBuV	Cable Loss	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	8699.314	35.4	17.9	-5.7	47.6	Peak Max	H	217	22	74	-26.4	Pass
2	11160.097	42.3	12.2	-4.6	49.9	Peak Max	V	236	5	74	-24.1	Pass
3	2895.105	22.4	21.9	3.8	48.1	Peak Max	V	309	252	74	-25.9	Pass
4	8699.314	23.4	17.9	-5.7	35.6	Average Max	H	217	22	54	-18.4	Pass
5	11160.097	39.6	12.2	-4.6	47.2	Average Max	V	236	5	54	-6.8	Pass
6	2895.105	10.6	21.9	3.8	36.3	Average Max	V	309	252	54	-17.7	Pass

Remarks:

1. Level (dBuV/m) = Raw (dBuV) + Cable loss(dB) + AF (dB/m).
2. AF (dB/m) = Antenna Factor (dB) – Preamplifier Gain (dB)
3. Margin = Level (dBuV/m) - Limit value(dBuV/m)

RADIATED SPURIOUS EMISSION BELOW 1GHZ

Test Standard:	FCC15.247, 15.209	Mode:	RSE-Above 1GHz-802.11ac
Frequency Range:	1 GHz - 18 GHz	Test Date:	06/28/2022-06/30/2022
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Devin Tai
Remark:	Ch 140	Test Result:	Pass



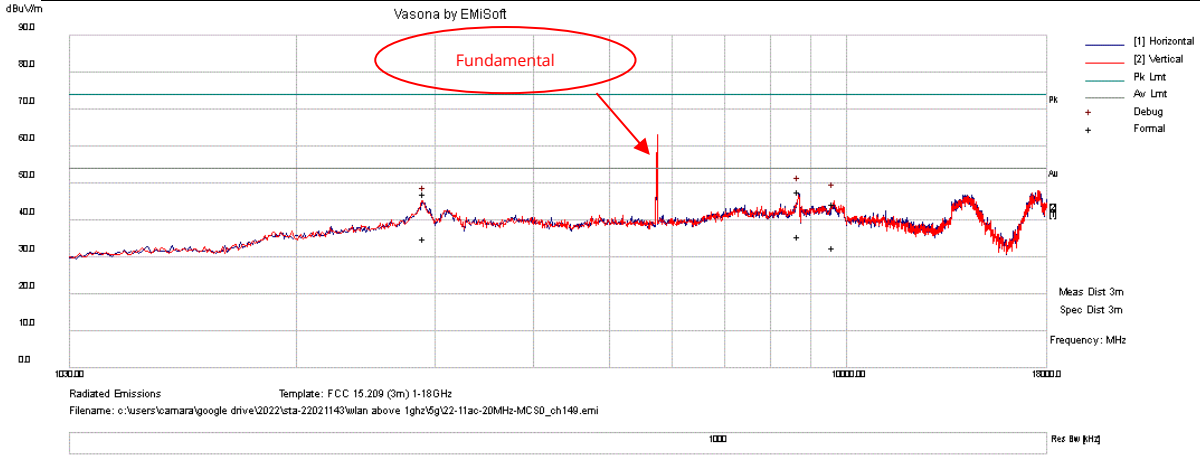
No.	Frequency MHz	Raw dBuV	Cable Loss	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	8709.64	35.5	17.5	-5.7	47.3	Peak Max	H	179	304	74	-26.7	Pass
2	2895.223	22.4	21.9	3.8	48.1	Peak Max	V	400	11	74	-25.9	Pass
3	3071.808	35.6	7	0.7	43.3	Peak Max	V	126	16	74	-30.7	Pass
4	8709.64	23.2	17.5	-5.7	35	Average Max	H	179	304	54	-19	Pass
5	2895.223	10.6	21.9	3.8	36.3	Average Max	V	400	11	54	-17.7	Pass
6	3071.808	25.2	7	0.7	32.9	Average Max	V	126	16	54	-21.1	Pass

Remarks:

1. Level (dBuV/m) = Raw (dBuV) + Cable loss(dB) + AF (dB/m).
2. AF (dB/m) = Antenna Factor (dB) – Preamplifier Gain (dB)
3. Margin = Level (dBuV/m) - Limit value(dBuV/m)

RADIATED SPURIOUS EMISSION BELOW 1GHZ

Test Standard:	FCC15.247, 15.209	Mode:	RSE-Above 1GHz-802.11ac
Frequency Range:	1 GHz - 18 GHz	Test Date:	06/28/2022-06/30/2022
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Devin Tai
Remark:	Ch 149	Test Result:	Pass



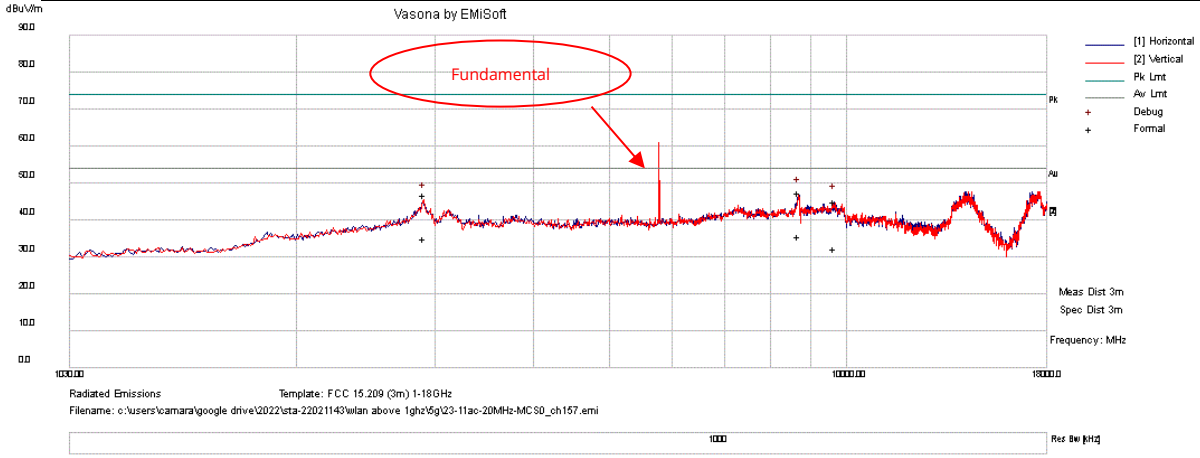
No.	Frequency MHz	Raw dBuV	Cable Loss	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	8696.351	35.6	17.8	-5.7	47.7	Peak Max	H	203	208	74	-26.3	Pass
2	9641.668	35.1	14.3	-5.2	44.2	Peak Max	H	324	335	74	-29.8	Pass
3	2907.194	22.3	20.8	3.9	47	Peak Max	V	146	0	74	-27	Pass
4	8696.351	23.5	17.8	-5.7	35.6	Average Max	H	203	208	54	-18.4	Pass
5	9641.668	23.3	14.3	-5.2	32.4	Average Max	H	324	335	54	-21.6	Pass
6	2907.194	10.3	20.8	3.9	35	Average Max	V	146	0	54	-19	Pass

Remarks:

1. Level (dBuV/m) = Raw (dBuV) + Cable loss(dB) + AF (dB/m).
2. AF (dB/m) = Antenna Factor (dB) – Preamplifier Gain (dB)
3. Margin = Level (dBuV/m) - Limit value(dBuV/m)

RADIATED SPURIOUS EMISSION BELOW 1GHZ

Test Standard:	FCC15.247, 15.209	Mode:	RSE-Above 1GHz-802.11ac
Frequency Range:	1 GHz - 18 GHz	Test Date:	06/28/2022-06/30/2022
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Devin Tai
Remark:	Ch 157	Test Result:	Pass



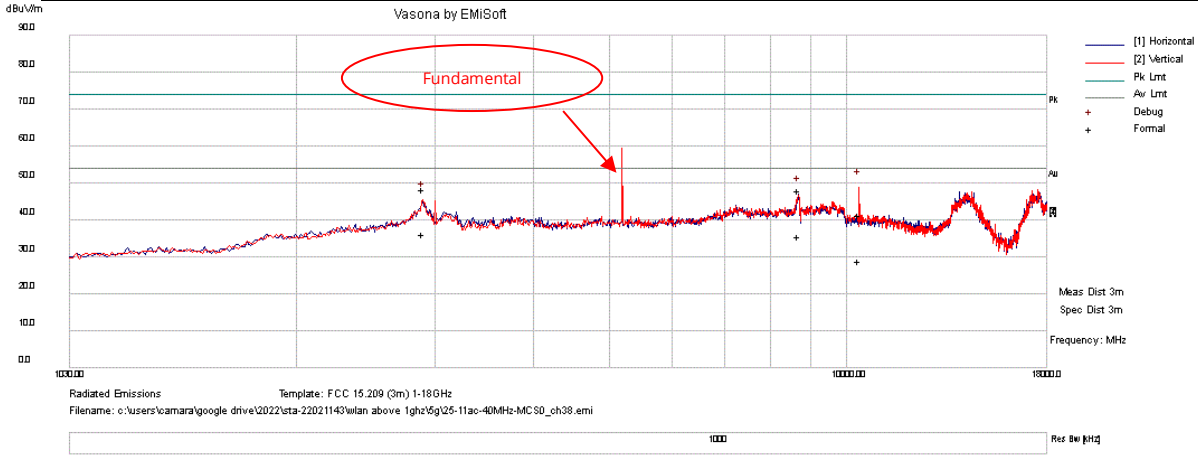
No.	Frequency MHz	Raw dBuV	Cable Loss	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	8699.036	35.1	17.9	-5.7	47.3	Peak Max	V	329	4	74	-26.7	Pass
2	2905.331	21.9	21.1	3.9	46.9	Peak Max	V	198	20	74	-27.1	Pass
3	9662.273	35.6	14.5	-5.2	44.9	Peak Max	H	140	39	74	-29.1	Pass
4	8699.036	23.5	17.9	-5.7	35.7	Average Max	V	329	4	54	-18.3	Pass
5	2905.331	10.2	21.1	3.9	35.2	Average Max	V	198	20	54	-18.8	Pass
6	9662.273	23	14.5	-5.2	32.3	Average Max	H	140	39	54	-21.7	Pass

Remarks:

1. Level (dBuV/m) = Raw (dBuV) + Cable loss(dB) + AF (dB/m).
2. AF (dB/m) = Antenna Factor (dB) – Preamplifier Gain (dB)
3. Margin = Level (dBuV/m) - Limit value(dBuV/m)

RADIATED SPURIOUS EMISSION BELOW 1GHZ

Test Standard:	FCC15.247, 15.209	Mode:	RSE-Above 1GHz-802.11ac40
Frequency Range:	1 GHz - 18 GHz	Test Date:	06/28/2022-06/30/2022
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Devin Tai
Remark:	Ch 38	Test Result:	Pass



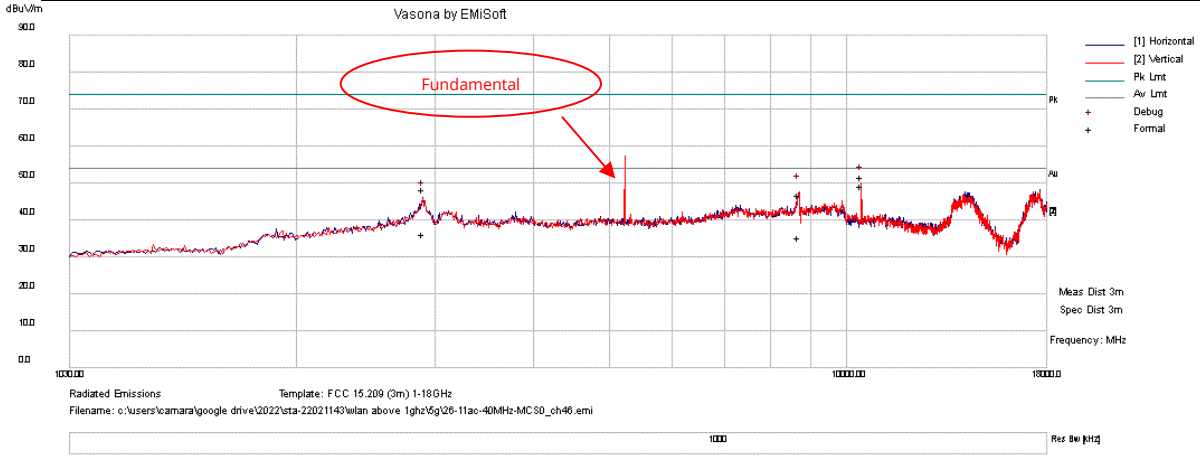
No.	Frequency MHz	Raw dBuV	Cable Loss	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	10385.621	34.2	12.3	-5.1	41.4	Peak Max	V	286	138	74	-32.6	Pass
2	8700.229	35.8	17.9	-5.7	48	Peak Max	H	174	208	74	-26	Pass
3	2896.723	22.6	21.9	3.8	48.3	Peak Max	V	290	176	74	-25.7	Pass
4	10385.621	21.8	12.3	-5.1	29	Average Max	V	286	138	54	-25	Pass
5	8700.229	23.4	17.9	-5.7	35.6	Average Max	H	174	208	54	-18.4	Pass
6	2896.723	10.5	21.9	3.8	36.2	Average Max	V	290	176	54	-17.8	Pass

Remarks:

1. Level (dBuV/m) = Raw (dBuV) + Cable loss(dB) + AF (dB/m).
2. AF (dB/m) = Antenna Factor (dB) – Preamplifier Gain (dB)
3. Margin = Level (dBuV/m) - Limit value(dBuV/m)

RADIATED SPURIOUS EMISSION BELOW 1GHZ

Test Standard:	FCC15.247, 15.209	Mode:	RSE-Above 1GHz-802.11ac40
Frequency Range:	1 GHz - 18 GHz	Test Date:	06/28/2022-06/30/2022
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Devin Tai
Remark:	Ch 46	Test Result:	Pass



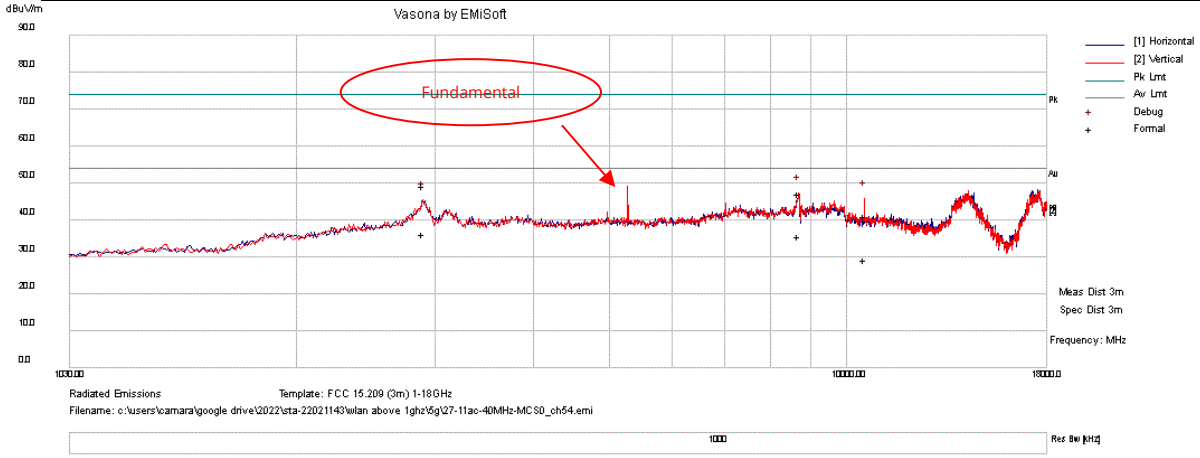
No.	Frequency MHz	Raw dBuV	Cable Loss	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	10460.191	44.6	12.3	-5.1	51.8	Peak Max	V	100	3	74	-22.2	Pass
2	8708.618	35	17.6	-5.7	46.9	Peak Max	V	143	296	74	-27.1	Pass
3	2896.735	22.6	21.9	3.8	48.3	Peak Max	H	316	90	74	-25.7	Pass
4	10460.191	42	12.3	-5.1	49.2	Average Max	V	100	3	54	-4.8	Pass
5	8708.618	23.4	17.6	-5.7	35.3	Average Max	V	143	296	54	-18.7	Pass
6	2896.735	10.4	21.9	3.8	36.1	Average Max	H	316	90	54	-17.9	Pass

Remarks:

1. Level (dBuV/m) = Raw (dBuV) + Cable loss(dB) + AF (dB/m).
2. AF (dB/m) = Antenna Factor (dB) – Preamplifier Gain (dB)
3. Margin = Level (dBuV/m) - Limit value(dBuV/m)

RADIATED SPURIOUS EMISSION BELOW 1GHZ

Test Standard:	FCC15.247, 15.209	Mode:	RSE-Above 1GHz-802.11ac40
Frequency Range:	1 GHz - 18 GHz	Test Date:	06/28/2022-06/30/2022
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Devin Tai
Remark:	Ch 54	Test Result:	Pass



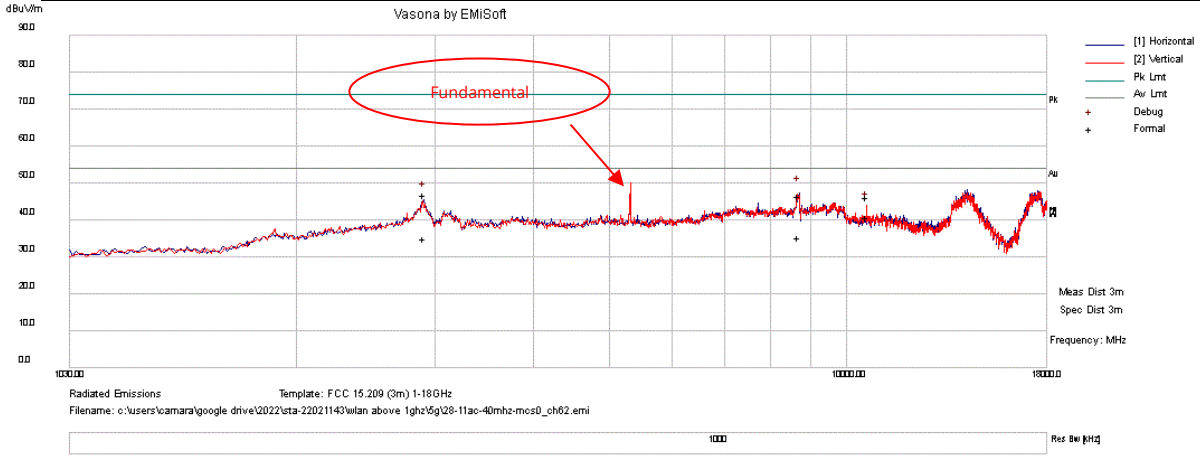
No.	Frequency MHz	Raw dBuV	Cable Loss	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	8697.076	34.9	17.8	-5.7	47	Peak Max	V	186	146	74	-27	Pass
2	10541.834	33.9	12.3	-5.2	41	Peak Max	V	284	355	74	-33	Pass
3	2895.28	23.6	21.9	3.8	49.3	Peak Max	V	368	108	74	-24.7	Pass
4	8697.076	23.5	17.8	-5.7	35.6	Average Max	V	186	146	54	-18.4	Pass
5	10541.834	22	12.3	-5.2	29.1	Average Max	V	284	355	54	-24.9	Pass
6	2895.28	10.4	21.9	3.8	36.1	Average Max	V	368	108	54	-17.9	Pass

Remarks:

1. Level (dBuV/m) = Raw (dBuV) + Cable loss(dB) + AF (dB/m).
2. AF (dB/m) = Antenna Factor (dB) – Preamplifier Gain (dB)
3. Margin = Level (dBuV/m) - Limit value(dBuV/m)

RADIATED SPURIOUS EMISSION BELOW 1GHZ

Test Standard:	FCC15.247, 15.209	Mode:	RSE-Above 1GHz-802.11ac40
Frequency Range:	1 GHz - 18 GHz	Test Date:	06/28/2022-06/30/2022
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Devin Tai
Remark:	Ch 62	Test Result:	Pass



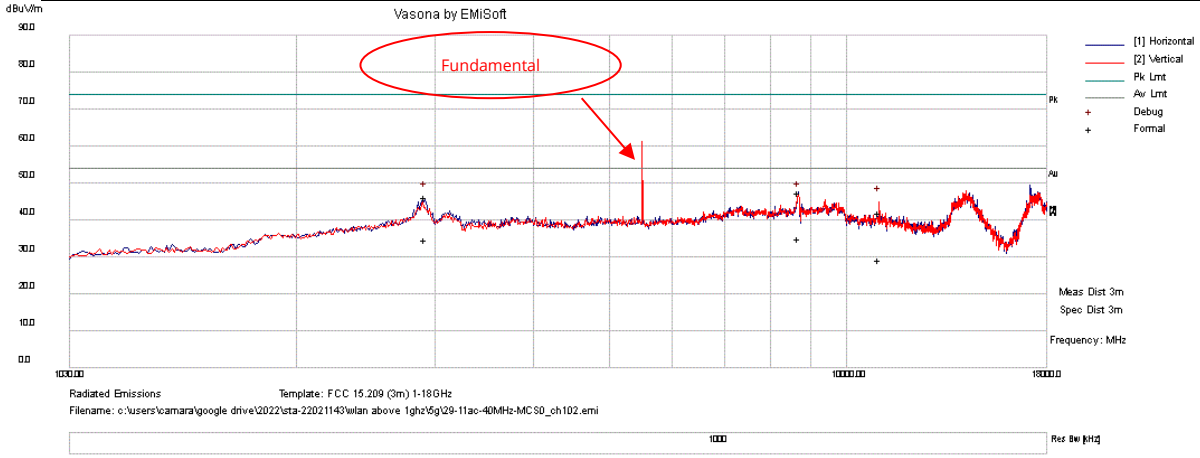
No.	Frequency MHz	Raw dBuV	Cable Loss	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	8709.26	34.8	17.5	-5.7	46.6	Peak Max	H	390	170	74	-27.4	Pass
2	2906.794	22.1	20.8	3.9	46.8	Peak Max	H	288	252	74	-27.2	Pass
3	10620.026	39.1	12.3	-5.3	46.1	Peak Max	V	232	7	74	-27.9	Pass
4	8709.26	23.4	17.5	-5.7	35.2	Average Max	H	390	170	54	-18.8	Pass
5	2906.794	10.3	20.8	3.9	35	Average Max	H	288	252	54	-19	Pass
6	10620.026	33.8	12.3	-5.3	40.8	Average Max	V	232	7	54	-13.2	Pass

Remarks:

1. Level (dBuV/m) = Raw (dBuV) + Cable loss(dB) + AF (dB/m).
2. AF (dB/m) = Antenna Factor (dB) – Preamplifier Gain (dB)
3. Margin = Level (dBuV/m) - Limit value(dBuV/m)

RADIATED SPURIOUS EMISSION BELOW 1GHZ

Test Standard:	FCC15.247, 15.209	Mode:	RSE-Above 1GHz-802.11ac40
Frequency Range:	1 GHz - 18 GHz	Test Date:	06/28/2022-06/30/2022
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Devin Tai
Remark:	Ch 102	Test Result:	Pass



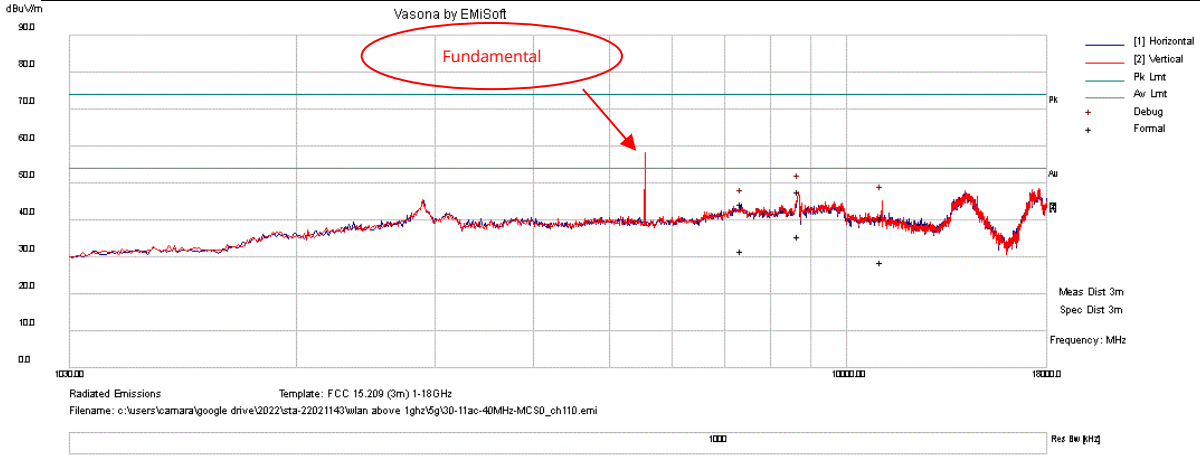
No.	Frequency MHz	Raw dBuV	Cable Loss	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	8712.155	35.5	17.4	-5.7	47.2	Peak Max	V	388	77	74	-26.8	Pass
2	2918.213	23.1	19.1	3.9	46.1	Peak Max	H	263	279	74	-27.9	Pass
3	11023.967	34	12.3	-4.5	41.8	Peak Max	V	151	70	74	-32.2	Pass
4	8712.155	23.2	17.4	-5.7	34.9	Average Max	V	388	77	54	-19.1	Pass
5	2918.213	11.5	19.1	3.9	34.5	Average Max	H	263	279	54	-19.5	Pass
6	11023.967	21.3	12.3	-4.5	29.1	Average Max	V	151	70	54	-24.9	Pass

Remarks:

1. Level (dBuV/m) = Raw (dBuV) + Cable loss(dB) + AF (dB/m).
2. AF (dB/m) = Antenna Factor (dB) – Preamplifier Gain (dB)
3. Margin = Level (dBuV/m) - Limit value(dBuV/m)

RADIATED SPURIOUS EMISSION BELOW 1GHZ

Test Standard:	FCC15.247, 15.209	Mode:	RSE-Above 1GHz-802.11ac40
Frequency Range:	1 GHz - 18 GHz	Test Date:	06/28/2022-06/30/2022
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Devin Tai
Remark:	Ch 110	Test Result:	Pass



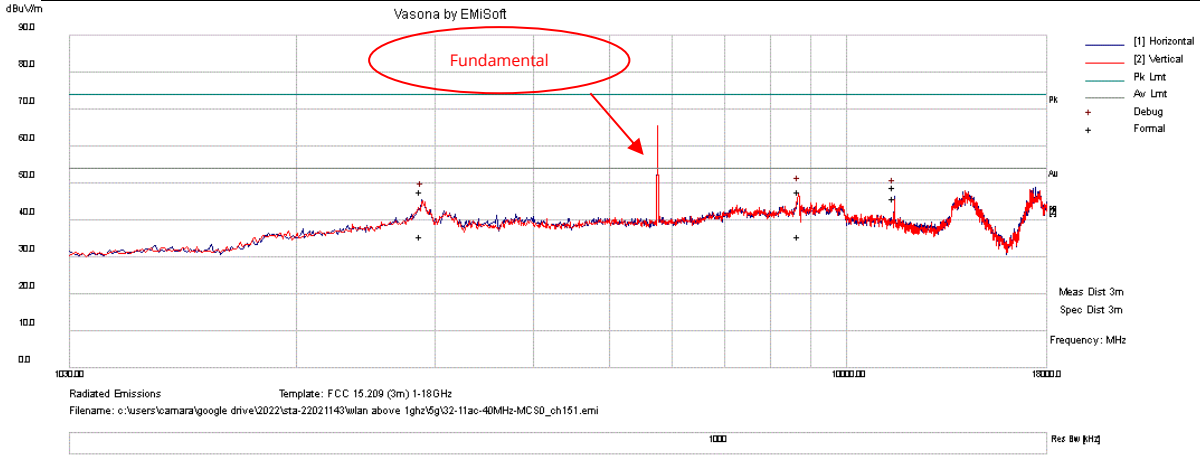
No.	Frequency MHz	Raw dBuV	Cable Loss	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	8698.736	35.4	17.9	-5.7	47.6	Peak Max	H	355	326	74	-26.4	Pass
2	11095.588	32.8	12.3	-4.5	40.6	Peak Max	V	109	337	74	-33.4	Pass
3	7364.025	37.8	11.9	-5.5	44.2	Peak Max	V	224	112	74	-29.8	Pass
4	8698.736	23.5	17.9	-5.7	35.7	Average Max	H	355	326	54	-18.3	Pass
5	11095.588	20.9	12.3	-4.5	28.7	Average Max	V	109	337	54	-25.3	Pass
6	7364.025	25.2	11.9	-5.5	31.6	Average Max	V	224	112	54	-22.4	Pass

Remarks:

1. Level (dBuV/m) = Raw (dBuV) + Cable loss(dB) + AF (dB/m).
2. AF (dB/m) = Antenna Factor (dB) – Preamplifier Gain (dB)
3. Margin = Level (dBuV/m) - Limit value(dBuV/m)

RADIATED SPURIOUS EMISSION BELOW 1GHZ

Test Standard:	FCC15.247, 15.209	Mode:	RSE-Above 1GHz-802.11ac40
Frequency Range:	1 GHz - 18 GHz	Test Date:	06/28/2022-06/30/2022
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Devin Tai
Remark:	Ch 151	Test Result:	Pass



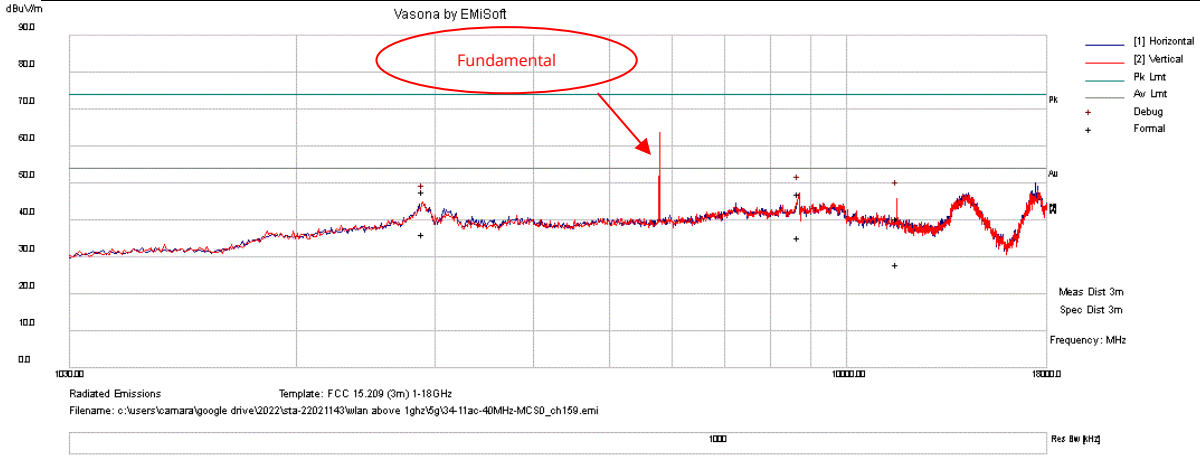
No.	Frequency MHz	Raw dBuV	Cable Loss	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	8696.936	35.5	17.8	-5.7	47.6	Peak Max	V	290	2	74	-26.4	Pass
2	11510.013	41.6	12	-4.6	49	Peak Max	H	225	2	74	-25	Pass
3	2884.329	22.2	21.8	3.8	47.8	Peak Max	H	243	0	74	-26.2	Pass
4	8696.936	23.5	17.8	-5.7	35.6	Average Max	V	290	2	54	-18.4	Pass
5	11510.013	38.5	12	-4.6	45.9	Average Max	H	225	2	54	-8.1	Pass
6	2884.329	10	21.8	3.8	35.6	Average Max	H	243	0	54	-18.4	Pass

Remarks:

1. Level (dBuV/m) = Raw (dBuV) + Cable loss(dB) + AF (dB/m).
2. AF (dB/m) = Antenna Factor (dB) – Preamplifier Gain (dB)
3. Margin = Level (dBuV/m) - Limit value(dBuV/m)

RADIATED SPURIOUS EMISSION BELOW 1GHZ

Test Standard:	FCC15.247, 15.209	Mode:	RSE-Above 1GHz-802.11ac40
Frequency Range:	1 GHz - 18 GHz	Test Date:	06/28/2022-06/30/2022
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Devin Tai
Remark:	Ch 159	Test Result:	Pass



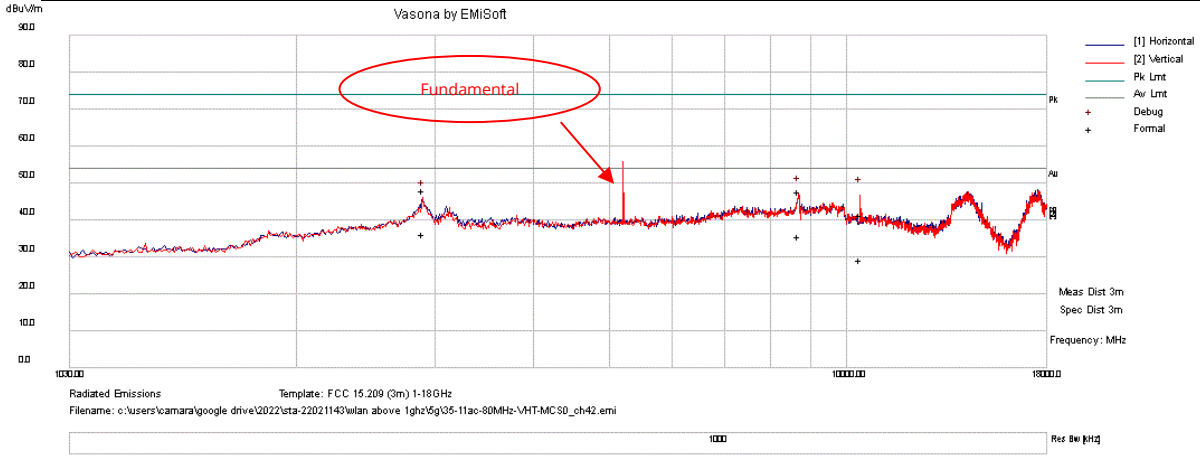
No.	Frequency MHz	Raw dBuV	Cable Loss	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	8708.078	35.3	17.6	-5.7	47.2	Peak Max	H	362	337	74	-26.8	Pass
2	11595.33	32.8	12	-4.4	40.4	Peak Max	V	326	147	74	-33.6	Pass
3	2896.333	22.1	21.9	3.8	47.8	Peak Max	H	228	98	74	-26.2	Pass
4	8708.078	23.5	17.6	-5.7	35.4	Average Max	H	362	337	54	-18.6	Pass
5	11595.33	20.5	12	-4.4	28.1	Average Max	V	326	147	54	-25.9	Pass
6	2896.333	10.5	21.9	3.8	36.2	Average Max	H	228	98	54	-17.8	Pass

Remarks:

1. Level (dBuV/m) = Raw (dBuV) + Cable loss(dB) + AF (dB/m).
2. AF (dB/m) = Antenna Factor (dB) – Preamplifier Gain (dB)
3. Margin = Level (dBuV/m) - Limit value(dBuV/m)

RADIATED SPURIOUS EMISSION BELOW 1GHZ

Test Standard:	FCC15.247, 15.209	Mode:	RSE-Above 1GHz-802.11ac80
Frequency Range:	1 GHz - 18 GHz	Test Date:	06/28/2022-06/30/2022
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Devin Tai
Remark:	Ch 42	Test Result:	Pass



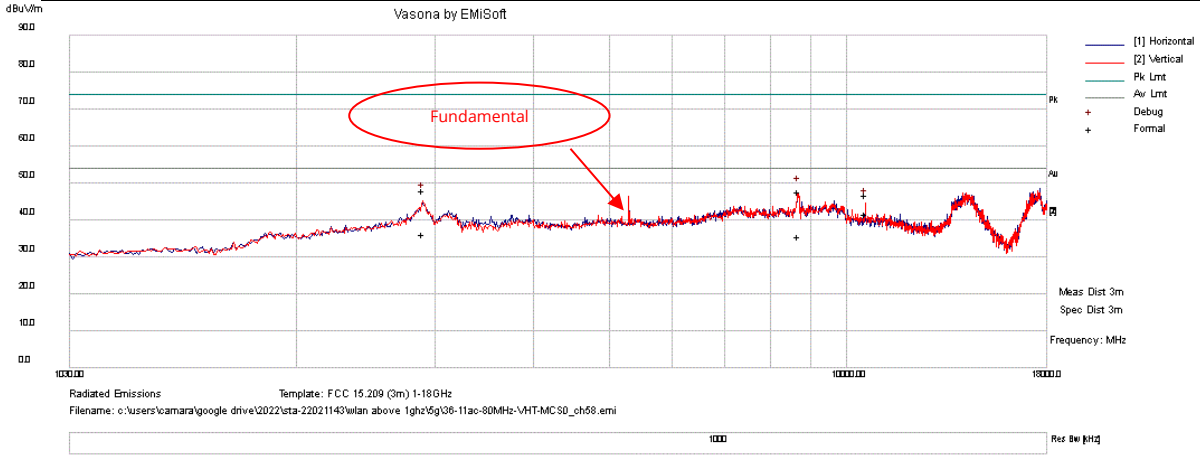
No.	Frequency MHz	Raw dBuV	Cable Loss	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	8698.416	35.4	17.9	-5.7	47.6	Peak Max	H	340	224	74	-26.4	Pass
2	10417.194	34.1	12.3	-5.1	41.3	Peak Max	V	269	0	74	-32.7	Pass
3	2895.133	22.4	21.9	3.8	48.1	Peak Max	V	362	68	74	-25.9	Pass
4	8698.416	23.5	17.9	-5.7	35.7	Average Max	H	340	224	54	-18.3	Pass
5	10417.194	21.9	12.3	-5.1	29.1	Average Max	V	269	0	54	-24.9	Pass
6	2895.133	10.4	21.9	3.8	36.1	Average Max	V	362	68	54	-17.9	Pass

Remarks:

1. Level (dBuV/m) = Raw (dBuV) + Cable loss(dB) + AF (dB/m).
2. AF (dB/m) = Antenna Factor (dB) – Preamplifier Gain (dB)
3. Margin = Level (dBuV/m) - Limit value(dBuV/m)

RADIATED SPURIOUS EMISSION BELOW 1GHZ

Test Standard:	FCC15.247, 15.209	Mode:	RSE-Above 1GHz-802.11ac80
Frequency Range:	1 GHz - 18 GHz	Test Date:	06/28/2022-06/30/2022
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Devin Tai
Remark:	Ch 58	Test Result:	Pass



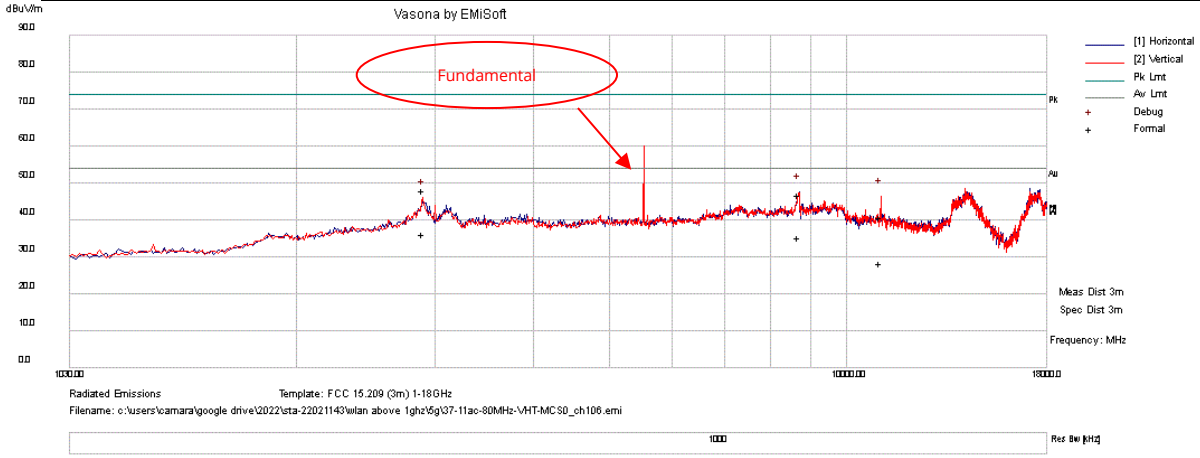
No.	Frequency MHz	Raw dBuV	Cable Loss	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	8699.289	35.5	17.9	-5.7	47.7	Peak Max	V	303	222	74	-26.3	Pass
2	2895.4	22.3	21.9	3.8	48	Peak Max	V	344	220	74	-26	Pass
3	10579.901	39.7	12.3	-5.3	46.7	Peak Max	V	234	0	74	-27.3	Pass
4	8699.289	23.5	17.9	-5.7	35.7	Average Max	V	303	222	54	-18.3	Pass
5	2895.4	10.5	21.9	3.8	36.2	Average Max	V	344	220	54	-17.8	Pass
6	10579.901	34.5	12.3	-5.3	41.5	Average Max	V	234	0	54	-12.5	Pass

Remarks:

1. Level (dBuV/m) = Raw (dBuV) + Cable loss(dB) + AF (dB/m).
2. AF (dB/m) = Antenna Factor (dB) – Preamplifier Gain (dB)
3. Margin = Level (dBuV/m) - Limit value(dBuV/m)

RADIATED SPURIOUS EMISSION BELOW 1GHZ

Test Standard:	FCC15.247, 15.209	Mode:	RSE-Above 1GHz-802.11ac80
Frequency Range:	1 GHz - 18 GHz	Test Date:	06/28/2022-06/30/2022
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Devin Tai
Remark:	Ch 106	Test Result:	Pass



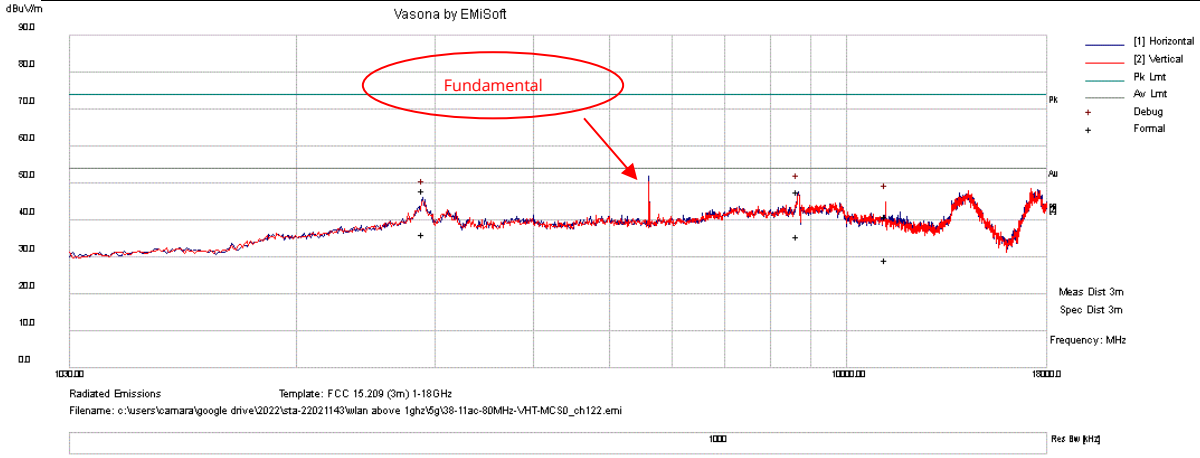
No.	Frequency MHz	Raw dBuV	Cable Loss	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	8710.618	34.8	17.5	-5.7	46.6	Peak Max	H	166	54	74	-27.4	Pass
2	11063.636	32.9	12.3	-4.5	40.7	Peak Max	V	117	242	74	-33.3	Pass
3	2896.035	22.3	21.9	3.8	48	Peak Max	V	141	292	74	-26	Pass
4	8710.618	23.4	17.5	-5.7	35.2	Average Max	H	166	54	54	-18.8	Pass
5	11063.636	20.6	12.3	-4.5	28.4	Average Max	V	117	242	54	-25.6	Pass
6	2896.035	10.4	21.9	3.8	36.1	Average Max	V	141	292	54	-17.9	Pass

Remarks:

1. Level (dBuV/m) = Raw (dBuV) + Cable loss(dB) + AF (dB/m).
2. AF (dB/m) = Antenna Factor (dB) – Preamplifier Gain (dB)
3. Margin = Level (dBuV/m) - Limit value(dBuV/m)

RADIATED SPURIOUS EMISSION BELOW 1GHZ

Test Standard:	FCC15.247, 15.209	Mode:	RSE-Above 1GHz-802.11ac80
Frequency Range:	1 GHz - 18 GHz	Test Date:	06/28/2022-06/30/2022
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Devin Tai
Remark:	Ch 122	Test Result:	Pass



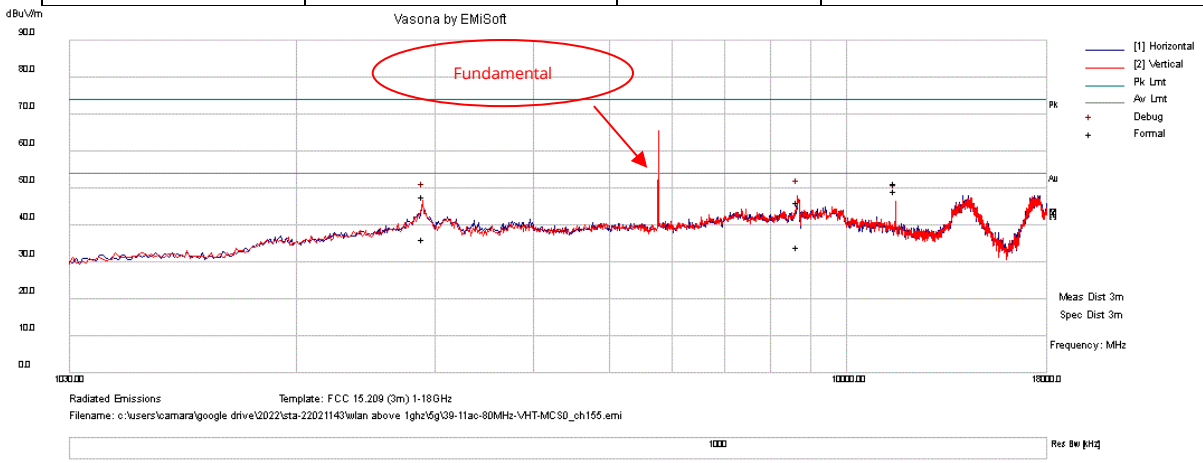
No.	Frequency MHz	Raw dBuV	Cable Loss	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	8687.15	36	17.4	-5.7	47.7	Peak Max	H	260	86	74	-26.3	Pass
2	2895.355	22.3	21.9	3.8	48	Peak Max	H	113	138	74	-26	Pass
3	11222.374	33.6	12.2	-4.7	41.1	Peak Max	V	374	0	74	-32.9	Pass
4	8687.15	23.9	17.4	-5.7	35.6	Average Max	H	260	86	54	-18.4	Pass
5	2895.355	10.5	21.9	3.8	36.2	Average Max	H	113	138	54	-17.8	Pass
6	11222.374	21.6	12.2	-4.7	29.1	Average Max	V	374	0	54	-24.9	Pass

Remarks:

1. Level (dBuV/m) = Raw (dBuV) + Cable loss(dB) + AF (dB/m).
2. AF (dB/m) = Antenna Factor (dB) – Preamplifier Gain (dB)
3. Margin = Level (dBuV/m) - Limit value(dBuV/m)

RADIATED SPURIOUS EMISSION BELOW 1GHZ

Test Standard:	FCC15.247, 15.209	Mode:	RSE-Above 1GHz-802.11ac80
Frequency Range:	1 GHz - 18 GHz	Test Date:	06/28/2022-06/30/2022
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Devin Tai
Remark:	Ch 155	Test Result:	Pass



No.	Frequency MHz	Raw dBuV	Cable Loss	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	8667.94	35.5	16.5	-5.7	46.3	Peak Max	V	258	147	74	-27.7	Pass
2	2895.275	21.9	21.9	3.8	47.6	Peak Max	V	202	82	74	-26.4	Pass
3	11550.065	43.8	12	-4.5	51.3	Peak Max	V	258	64	74	-22.7	Pass
4	8667.94	23.2	16.5	-5.7	34	Average Max	V	258	147	54	-20	Pass
5	2895.275	10.5	21.9	3.8	36.2	Average Max	V	202	82	54	-17.8	Pass
6	11550.065	41.7	12	-4.5	49.2	Average Max	V	258	64	54	-4.8	Pass

Remarks:

1. Level (dBuV/m) = Raw (dBuV) + Cable loss(dB) + AF (dB/m).
2. AF (dB/m) = Antenna Factor (dB) – Preamplifier Gain (dB)
3. Margin = Level (dBuV/m) - Limit value(dBuV/m)

18GHz – 40GHz test result

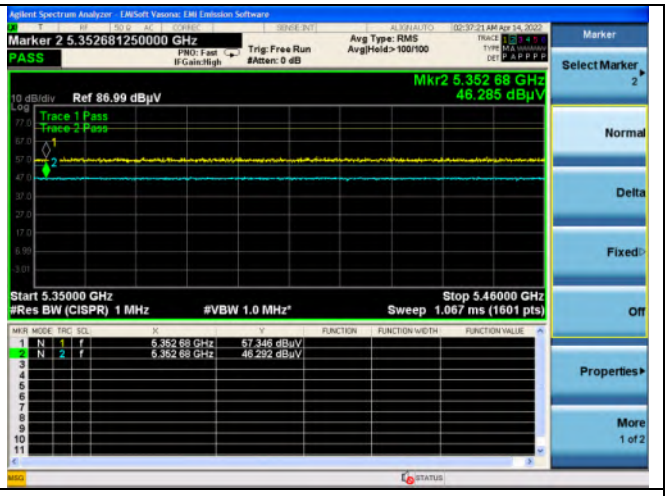
Note: no substantial emission is found other than the noise floor.

Restricted Band measurement result

Mode	Data rate	Channel	Frequency (MHz)	Level (dBuV/m)	Measurement Type	Limit (dBuV/m)	Margin (dB)	Pass/Fail
802.11a	6Mbps	36	5139.0	58.194	Peak Max	74	-15.806	Pass
			5139.0	46.410	Average Max	54	-7.59	Pass
		64	5352.68	57.346	Peak Max	74	-16.654	Pass
			5352.68	46.292	Average Max	54	-7.708	Pass
		100	5458.69	56.117	Peak Max	74	-17.883	Pass
			5458.69	46.800	Average Max	54	-7.2	Pass
802.11n	MCS0	36	5148.0	56.307	Peak Max	74	-17.693	Pass
			5148.0	46.390	Average Max	54	-7.61	Pass
		64	5351.93	55.808	Peak Max	74	-18.192	Pass
			5351.93	46.559	Average Max	54	-7.441	Pass
		100	5458.95	56.913	Peak Max	74	-17.087	Pass
			5458.95	47.108	Average Max	54	-6.892	Pass

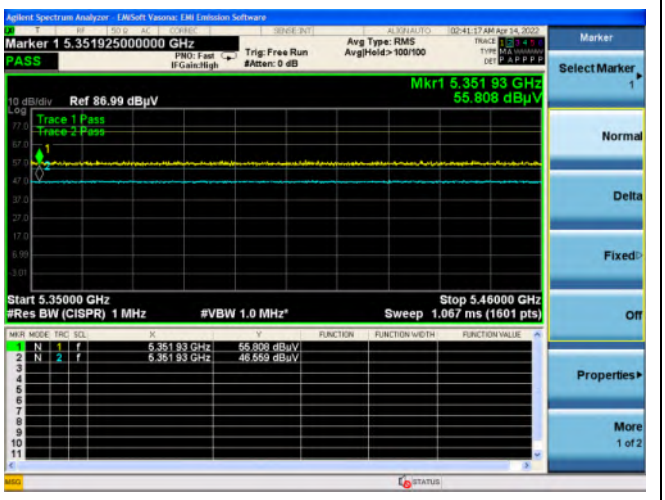
Test plots

Restricted Band -11a-5180MHz

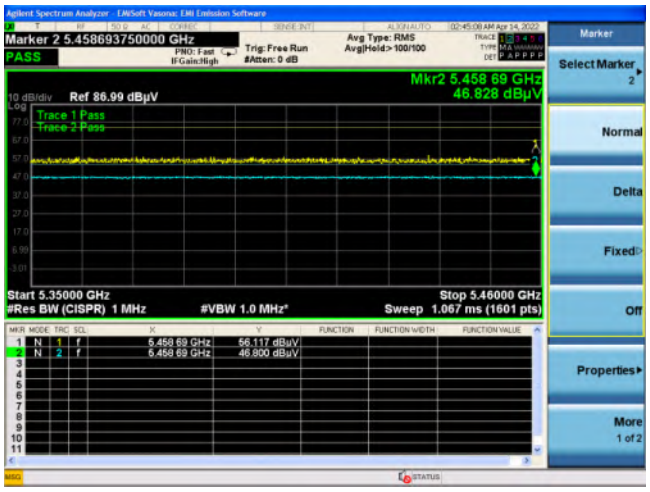


Restricted Band -11a-5320MHz

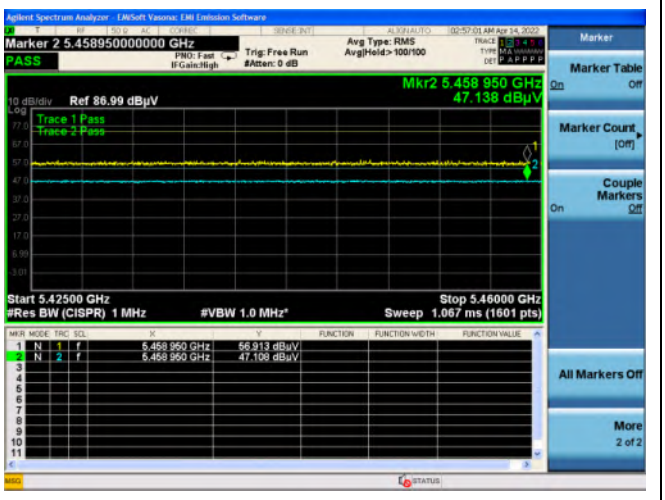
Restricted Band -11n-5180MHz



Restricted Band -11n-5320MHz



Restricted Band -11a-5500MHz



Restricted Band -11n-5500MHz

7.10 Conducted Emissions

7.10.1 Requirement

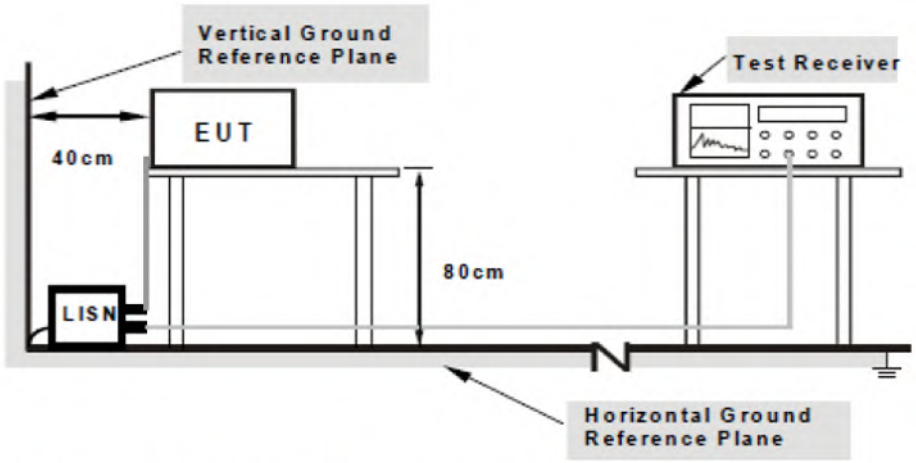
Per § 15.207 (a)

An intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Limits for Conducted Emissions at the Mains Ports

Section	Frequency ranges (MHz)	Limit (dBuV)	
		QP	Average
Class B devices	0.15 – 0.5	66 – 56	56 – 46
	0.5 – 5	56	46
	5 - 30	60	50
NOTE 1 The lower limit shall apply at the transition frequencies.			

7.10.2 Test setup



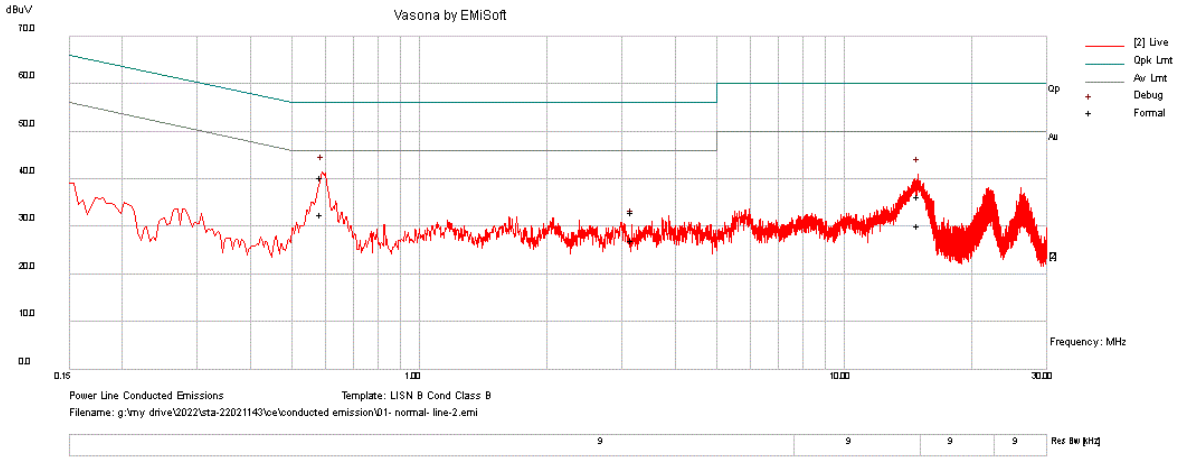
Note: 1.Support units were connected to second LISN.
2.Both of LISNs (AMN) are 80cm from EUT and at least 80cm from other units and other metal planes support units.

7.10.3 Test Procedure

1. The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m x 1m x 0.8m high, non-metallic table.
2. The power supply for the EUT was fed through a 50Ω/50μH EUT LISN, connected to filtered mains.
3. The RF OUT of the EUT LISN was connected to the EMI test receiver via a low-loss coaxial cable. The LISN bonded to the reference ground plane used has a direct current (dc) resistance of less than 2.5 mΩ.
4. All other supporting equipment was powered separately from another main supply.
5. The EUT was switched on and allowed to warm up to its normal operating condition.
6. A scan was made on the NEUTRAL line (for AC mains) or Earth line (for DC power) over the required frequency range using an EMI test receiver.
7. High peaks, relative to the limit line, were then selected.
8. The EMI test receiver was then tuned to the selected frequencies and the necessary measurements made with a receiver bandwidth setting of 10 kHz. For FCC tests, only Quasi-peak measurements were made; while for CISPR/EN tests, both Quasi-peak and Average measurements were made
9. All possible modes of operation were investigated. Only the worst case emissions were measured and reported. All other emissions were relatively insignificant.

7.10.4 Test Result

Test Standard:	Part 15.207	Mode:	TX Mode
Frequency Range:	0.15-30MHz	Test Date:	07/15/2022
Antenna Type/Polarity:	N/A	Test Personnel:	Devin Tai
Remark:	Line 120VAC, 60Hz	Test Result:	Pass

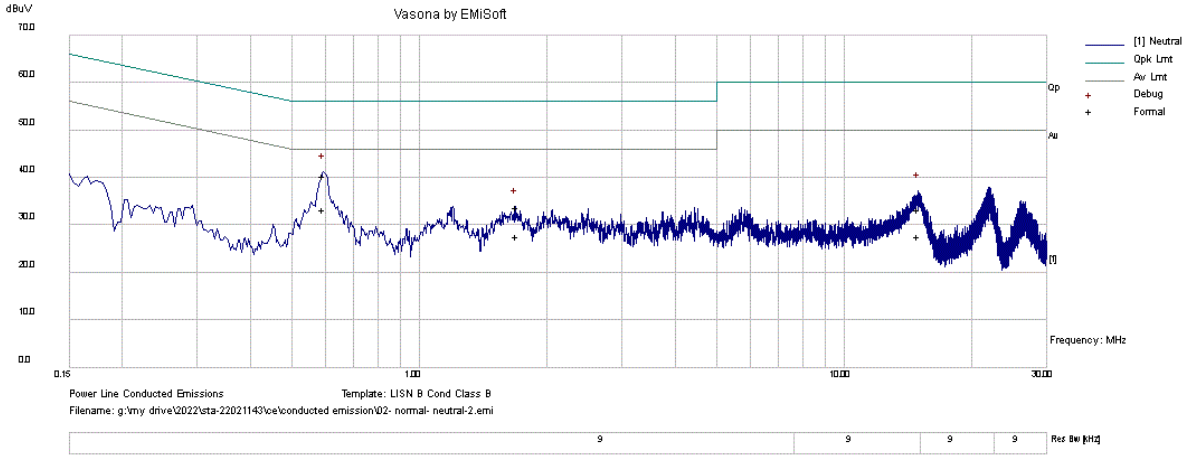


No.	Frequency (MHz)	Raw (dBuV)	Cable Loss (dB)	Factors (dB)	Level (dBuV)	Meas. Type	Line	Limit (dBuV)	Margin (dB)	Pass /Fail
1	0.588	30.1	10.1	0.1	40.3	Quasi Peak	Live	56	-15.7	Pass
2	14.906	25.4	10.6	0.3	36.3	Quasi Peak	Live	60	-23.7	Pass
3	3.177	22.6	10.3	0.1	33	Quasi Peak	Live	56	-23	Pass
4	0.588	22.3	10.1	0.1	32.5	Average	Live	46	-13.5	Pass
5	14.906	19.4	10.6	0.3	30.3	Average	Live	50	-19.7	Pass
6	3.177	16.8	10.3	0.1	27.2	Average	Live	46	-18.8	Pass

REMARKS:

1. The emission levels of other frequencies were very low against the limit.
2. Factor = Inert loss of LISN
3. Margin value = Emission level - Limit value
4. Emission Level = Raw Value + Cable loss + Factors Value.

Test Standard:	Part 15.207	Mode:	TX Mode
Frequency Range:	0.15-30MHz	Test Date:	07/15/2022
Antenna Type/Polarity:	N/A	Test Personnel:	Devin Tai
Remark:	Neutral 120VAC, 60Hz	Test Result:	Pass



No.	Frequency (MHz)	Raw (dBuV)	Cable Loss (dB)	Factors (dB)	Level (dBuV)	Meas. Type	Line	Limit (dBuV)	Margin (dB)	Pass /Fail
1	0.594	30.1	10.1	0.1	40.3	Quasi Peak	Neutral	56	-15.7	Pass
2	1.693	23.5	10.2	0.1	33.8	Quasi Peak	Neutral	56	-22.2	Pass
3	14.897	22.5	10.6	0.3	33.4	Quasi Peak	Neutral	60	-26.6	Pass
4	0.594	23.1	10.1	0.1	33.3	Average	Neutral	46	-12.7	Pass
5	1.693	17.4	10.2	0.1	27.7	Average	Neutral	46	-18.3	Pass
6	14.897	16.7	10.6	0.3	27.6	Average	Neutral	50	-22.4	Pass

REMARKS:

1. The emission levels of other frequencies were very low against the limit.
2. Factor = Inert loss of LISN
3. Margin value = Emission level - Limit value
4. Emission Level = Raw Value + Cable loss + Factors Value.

8 EUT and Test Setup Photos

Refer to FCC filing

9 Test Instrument List

Equipment	Manufacturer	Model	Instrument Number	Cal. Date	Cal. Due
Semi-Anechoic Chamber	ETS-Lindgren	10M	VL001	10/18/2021	10/18/2022
Shielding Control Room	ETS-Lindgren	Series 81	VL006	N/A	N/A
Spectrum Analyzer	Keysight	N9020A	MY50110074	06/09/2022	06/09/2023
EMC Test Receiver	R&S	ESL6	100230	06/07/2022	06/07/2023
LISN (9KHz – 30MHz)	EMCO	3816/2	9705-1066	07/12/2022	07/12/2023
Bi-Log Antenna	ETS-Lindgren	3142E	217921	07/19/2022	07/19/2023
Horn Antenna (1-18GHz)	Electro-Metrics	EM-6961	6292	07/21/2022	07/21/2023
Horn Antenna (18-40GHz)	Com-Power	AH-840	101109	07/21/2022	07/21/2023
Preamplifier	RF Bay, Inc.	LPA-10-20	11180621	07/16/2022	07/16/2023
True RMS Multi-meter	UNI-T	UT181A	C173014829	06/07/2022	06/07/2023
Temp / Humidity / Pressure Meter	PCE Instruments	PCE-THB 40	R062028	06/07/2022	06/07/2023
RF Attenuator	Pasternack	PE7005-3	VL061	07/16/2022	07/16/2023
Preamplifier 100KHz - 40GHz	Aeroflex	33711-392-77150-11	064	07/16/2022	07/16/2023
EM Center Control	ETS-Lindgren	7006-001	160136	N/A	N/A
Turn Table	ETS-Lindgren	2181-3.03	VL002	N/A	N/A
Boresight Antenna Tower	ETS-Lindgren	2171B	VL003	N/A	N/A
Loop Antenna (9k-30MHz)	Com-Power	AL-130	121012	06/10/2022	06/10/2023
RE test cable(below 6GHz)	Vista	RE-6GHz-01	RE-6GHz-01	07/16/2022	07/16/2023
RE test cable (1-18GHz)	PhaseTrack	II-240	RE-18GHz-01	07/16/2022	07/16/2023
RE test cable (>18GHz)	Sucoflex	104	344903/4	07/16/2022	07/16/2023
Pulse limiter	Com-Power	LIT-930A	531727	07/16/2022	07/16/2023
CE test cable #1	FIRST RF	FRF-C-1002-001	CE-6GHz-01	07/16/2022	07/16/2023
CE test cable#2	FIRST RF	FRF-C-1002-001	CE-6GHz-02	07/16/2022	07/16/2023

Note:

1) This equipment is not for measurement purpose and only require functional verification. Calibration is not required.

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