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FCC RF Test Report

Test Report Number	HID-21050342-LC-FCC-IC-RF-WLAN5G
FCC ID	JQ6-SECONNECT
IC	2236B-SECONNECT
Applicant	HID Global Corporation
Applicant Address	611 Center Ridge Drive, Austin, TX, 78753, USA
Product Name	HID® iCLASS SE® Connectivity Module
Model (s)	BT/WIFIE
Date of Receipt	11/23/2021
Date of Test	11/29/2021- 04/14/2022
Report Issue Date	06/07/2022
Test Standards	47CFR Part 15.407 RSS 247 Issue 2: February 2017 RSS-Gen Issue 5, Mar 2019
Test Result	**PASS**

Issued by:

Vista Compliance Laboratories
1261 Puerta Del Sol, San Clemente, CA 92673 USA
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Devin Tai (Test Engineer)

David Zhang (Technical Manager)

REVISION HISTORY

Report Number	Version	Description	Issued Date
HID-21050342-LC-FCC-IC-RF-WLAN5G	Original	Initial report	06/07/2022

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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) RSS-247 Issue 2, Feb 2017	ANSI C63.10 (2013)	Pass
Occupied Bandwidth	47CFR Part 15.407 (a) RSS-Gen Issue 5, Mar 2019	ANSI C63.10 (2013) RSS-Gen Issue 5, Mar 2019	Pass
Maximum Conducted Output Power	47CFR Part 15.407 (a) RSS-247 Issue 2, Feb 2017	ANSI C63.10 (2013)	Pass
Power Spectral Density	47CFR Part 15.407 (a) RSS-247 Issue 2, Feb 2017	ANSI C63.10 (2013)	Pass
Radiated Spurious Emission	47CFR Part 15.407 (b) RSS-247 Issue 2, Feb 2017	ANSI C63.10 (2013)	Pass
Radiated Band-Edge into Restricted Frequency Bands	47CFR Part 15.205, 15.209 47CFR Part 15.407 (b) RSS-247 Issue 2, Feb 2017	ANSI C63.10 (2013)	Pass
AC Power Line Conducted Emissions	47CFR Part 15.207 RSS-Gen Issue 5, Mar 2019	ANSI C63.10 (2013) RSS-Gen Issue 5, Mar 2019	Pass

2 General Information

2.1 Applicant

Applicant	HID Global Corporation
Applicant address	611 Center Ridge Drive, Austin, TX, 78753, USA
Manufacturer	HID Global Corporation
Manufacturer Address	611 Center Ridge Drive, Austin, TX, 78753, USA

2.2 Product information

Product Name	HID® iCLASS SE® Connectivity Module
Model Number	BT/WIFIE
Family Models	N/A
Serial Number	210119 0028
Frequency Band	BLE: 2402-2480MHz 2.4G: 2412-2462MHz 5G: U-NII-1: 5150-5250MHz U-NII-2A: 5250-5350MHz U-NII-2C: 5470-5725MHz U-NII-3: 5725-5850MHz
Type of modulation	BT_LE: GFSK 2.4G: CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM 5G: 256QAM,64QAM, 16QAM, QPSK, BPSK
Equipment Class	DTS, U-NII
Antenna Information	Chip Antenna Antenna Gain: BLE:0.5dBi 2.4G: 1.0dBi 5G: 2.6dBi
Clock Frequencies	N/A
Input Power	DC 3.0V (EUT obtains power from the reader it works with)
Power Adapter Manufacturer/Model	N/A
Power Adapter SN	N/A
Hardware version	N/A
Software version	N/A
Additional Info	Test sample has u.FL connector for direct RF conducted measurement

2.3 Test standard and method

Test standard	47CFR Part 15.407 RSS-247 Issue 2, Feb 2017 RSS-Gen Issue 5, Mar 2019
Test method	ANSI C63.10 (2013) 789033 D02 General UNII Test Procedures New Rules v02r01

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.
It also has a soldered 3.5mm TRS jack connector to connect to laptop with USB to UART cable for programming purpose, to set EUT into test mode.

5 Test Configuration and Operation

5.1 EUT Test Configuration

The EUT is mounted onto an iCLASS SE® Readers to support testing. EUT is set to different transmission modes in terms of radio mode bandwidth, power level, test channel, etc.

For Radiated Emission testing, a 12VDC battery is used as power source to minimize the ambient noise; for other testing, a 12VDC power supply provided by manufacturer is used as a power source representative for the reader that supplier power to EUT.

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
RadioToolGUI.exe	Set the module into different WLAN test mode, to change channel, modulation, power level, bandwidth, etc.

5.2 Supporting Equipment

Description	Manufacturer	Model #	Serial #	Remark
Laptop	Dell	Inspiron 15 3000 series	72YPMJ2	Provided by client
iCLASS SE® Readers	HID Global Corporation	RK40	N/A	Provided by client
DC Power supply	WERKER	WK12V1000	MRG05	Provided by client
USB to UART cable	FTDI Chip	TTL-232R-3V3-AJ	N/A	Provided by client

Description	Qty	Length (m)	Shielding (Y/N)	Core(s)	Remark
/	/	/	/	/	/

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 1.0 dBi for 2.4GHz band, 2.6dBi for 5GHz 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); RSS-247 §6.2.1.2

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

§ 15.407 (e); RSS-247 §6.2.4.1

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)	Data rate	Measured 26dB Bandwidth (MHz)	Minimum Bandwidth (MHz)	Result
802.11a	36	5180	6Mbps	31.25	N/A	N/A
	40	5200	6Mbps	35.14	N/A	N/A
	48	5240	6Mbps	34.36	N/A	N/A
802.11n	36	5180	MCS0	31.43	N/A	N/A
	40	5200	MCS0	34.99	N/A	N/A
	48	5240	MCS0	35.18	N/A	N/A

U-NII-2A Band

Mode	Channel	Frequency (MHz)	Data rate	Measured 26dB Bandwidth (MHz)	Minimum Bandwidth (MHz)	Result
802.11a	52	5260	6Mbps	34.63	N/A	N/A
	56	5280	6Mbps	35.48	N/A	N/A
	64	5320	6Mbps	29.04	N/A	N/A
802.11n	52	5260	MCS0	35.54	N/A	N/A
	56	5280	MCS0	34.79	N/A	N/A
	64	5320	MCS0	28.22	N/A	N/A

U-NII-2C Band

Mode	Channel	Frequency (MHz)	Data rate	Measured 26dB Bandwidth (MHz)	Minimum Bandwidth (MHz)	Result
802.11a	100	5500	6Mbps	24.90	N/A	N/A
	116	5580	6Mbps	32.94	N/A	N/A
	140	5700	6Mbps	23.35	N/A	N/A
802.11n	100	5500	MCS0	24.25	N/A	N/A
	116	5580	MCS0	33.73	N/A	N/A
	140	5700	MCS0	22.90	N/A	N/A

U-NII-3 Band

Mode	Channel	Frequency (MHz)	Data rate	Measured 6dB Bandwidth (MHz)	Minimum Bandwidth (MHz)	Result
802.11a	149	5745	6Mbps	15.13	0.5	PASS
	157	5785	6Mbps	15.09	0.5	PASS
	165	5825	6Mbps	15.14	0.5	PASS
802.11n	149	5745	MCS0	15.13	0.5	PASS
	157	5785	MCS0	15.12	0.5	PASS
	165	5825	MCS0	15.10	0.5	PASS

Cross Band

Mode	Channel	Frequency (MHz)	Data rate	Measured 26dB Bandwidth (MHz)	Measured 6dB Bandwidth (MHz)	Minimum Bandwidth (MHz)	Result
802.11a	144	5720	6Mbps	34.55	15.09	0.5	PASS
802.11n	144	5720	MCS0	35.13	15.09	0.5	PASS

7.2.5 Test Plots

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

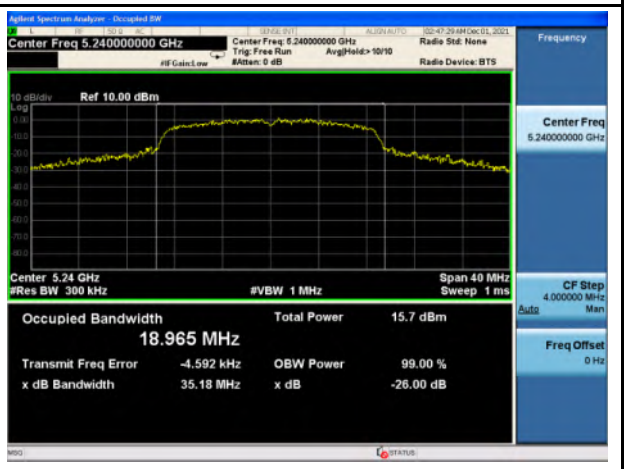
26 dB & 99% BW_U-NII-1_802.11a_5180

26 dB & 99% BW_U-NII-1_802.11a_5200

26 dB & 99% BW_U-NII-1_802.11a_5240

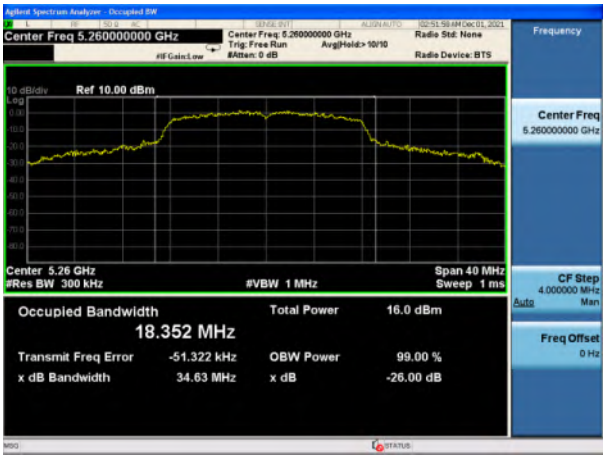
26 dB & 99% BW_U-NII-1_802.11n_5180

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



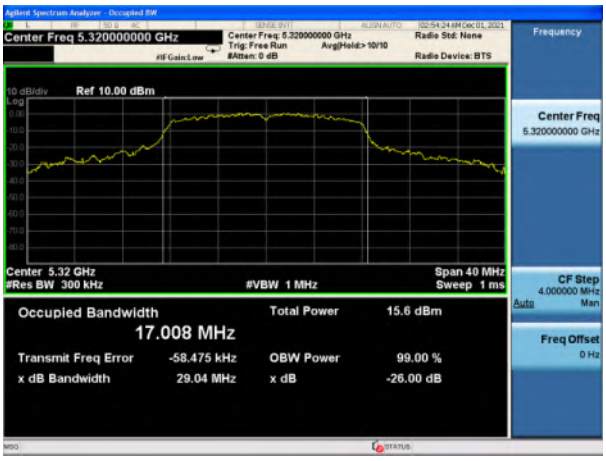
26 dB & 99% BW_U-NII-1_802.11n_5240

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

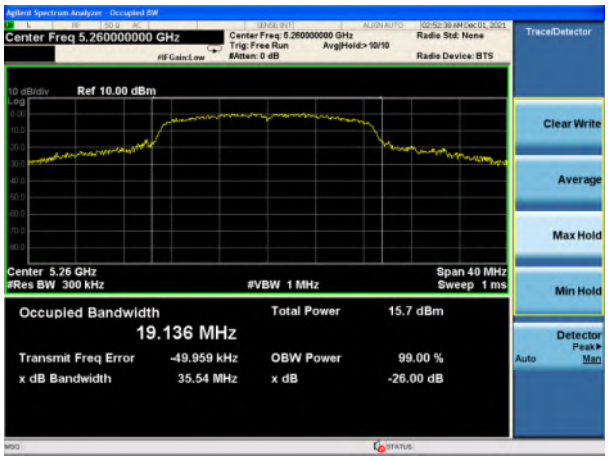


26 dB & 99% BW_U-NII-2A_802.11a_5260

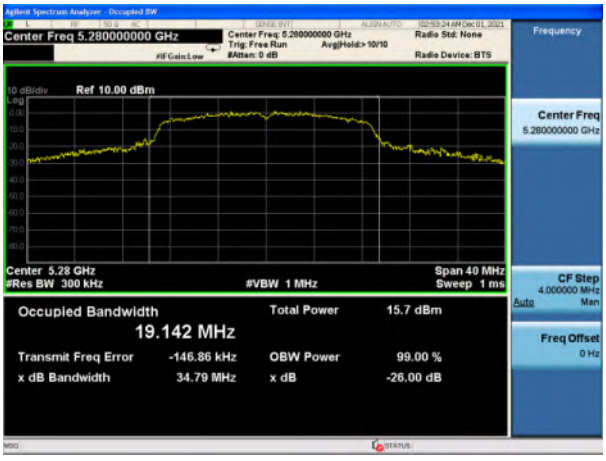
26 dB & 99% BW_U-NII-2A_802.11a_5280



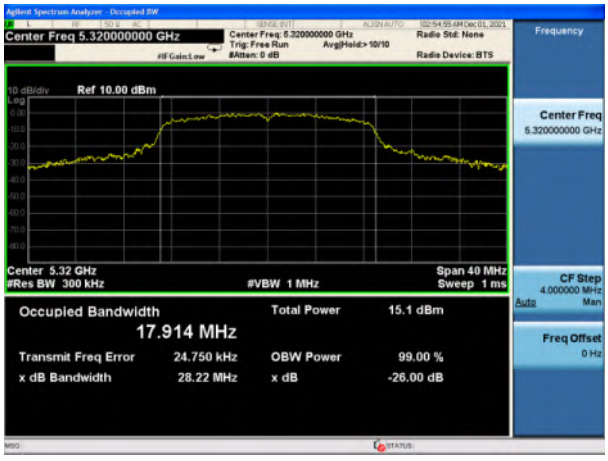
26 dB & 99% BW_U-NII-2A_802.11a_5320



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



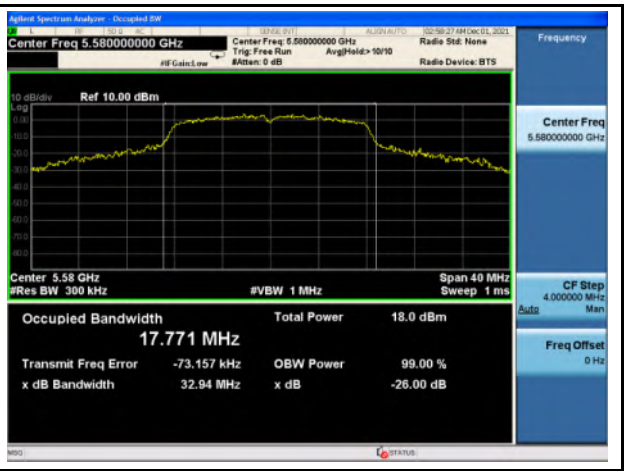
26 dB & 99% BW_U-NII-2A_802.11n_5280



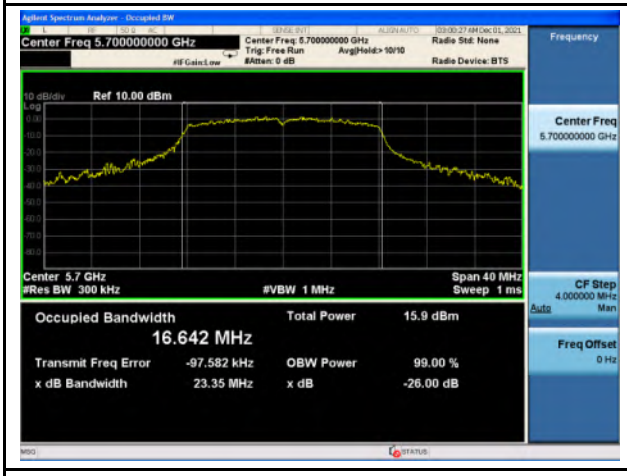
26 dB & 99% BW_U-NII-2A_802.11n_5320

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

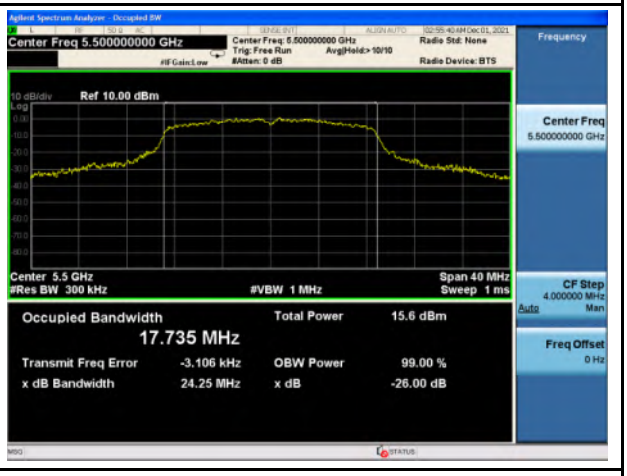
26 dB & 99% BW_U-NII-2C_802.11a_5500



26 dB & 99% BW_U-NII-2C_802.11a_5580

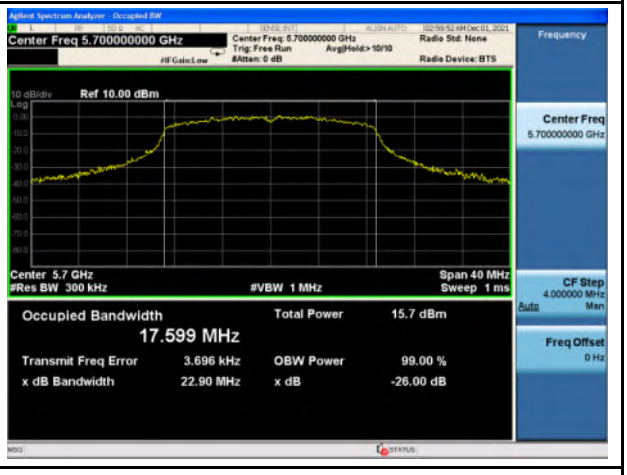


26 dB & 99% BW_U-NII-2C_802.11a_5700



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

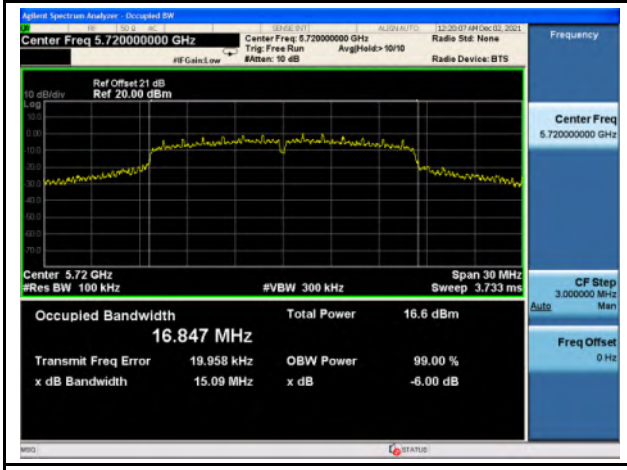
26 dB & 99% BW_U-NII-2C_802.11n_5580



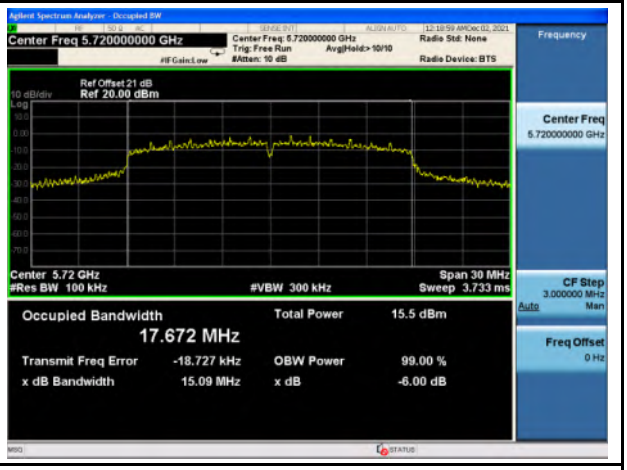
26 dB & 99% BW_U-NII-2C_802.11n_5700

	
26 dB & 99% BW_U-NII-2C_802.11a_5720	26 dB & 99% BW_U-NII-2C_802.11n_5720

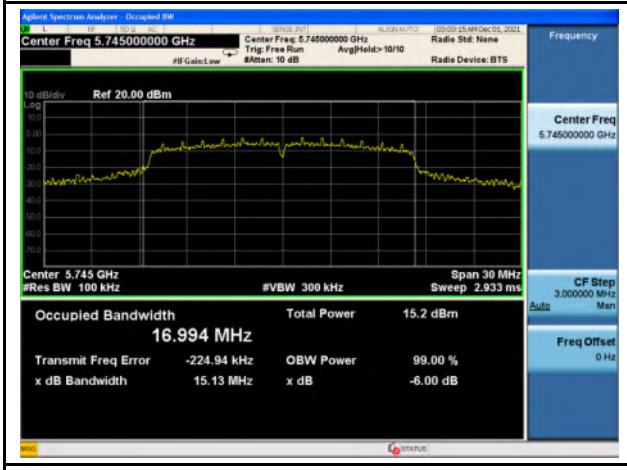
6 dB & 99% Bandwidth of U-NII-3 Band



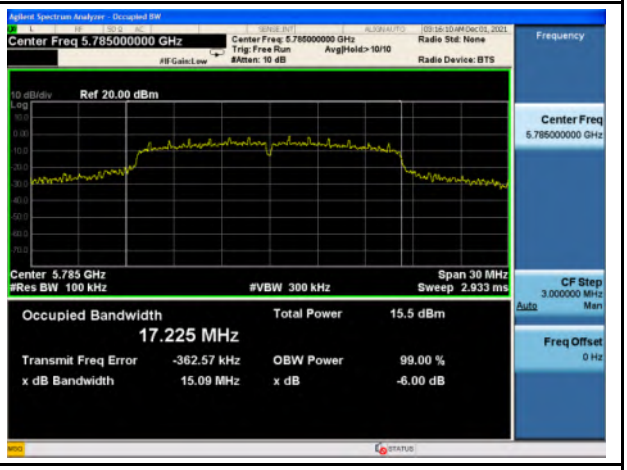
6 dB & 99% BW_U-NII-3_802.11a_5720



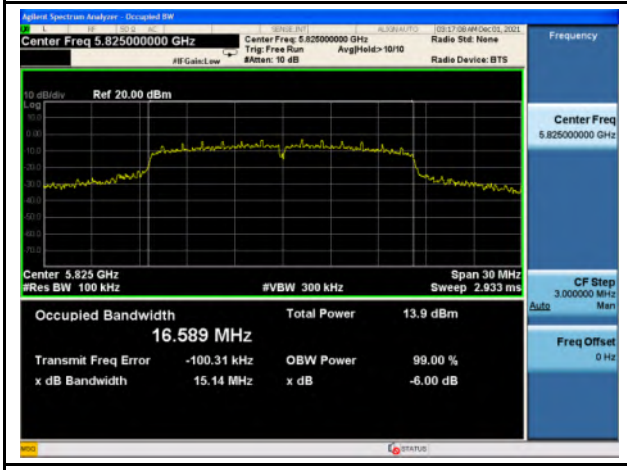
6 dB & 99% BW_U-NII-3_802.11a_5720



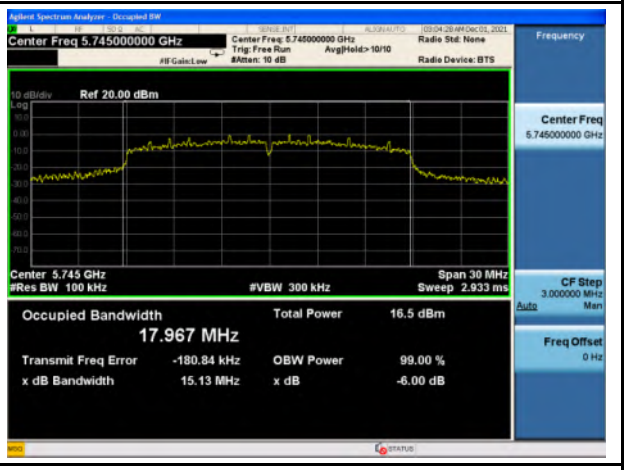
6 dB & 99% BW_U-NII-3_802.11a_5745



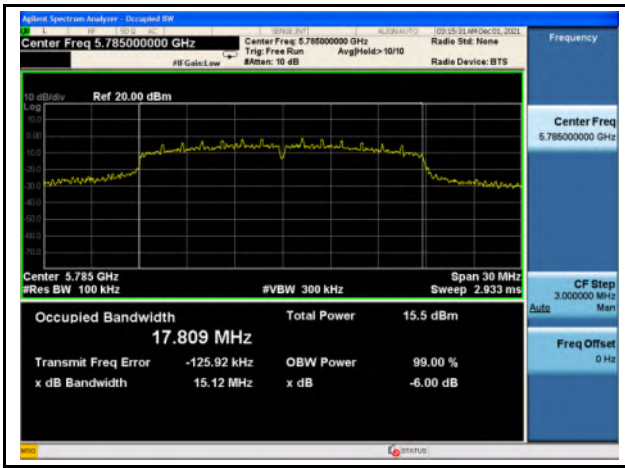
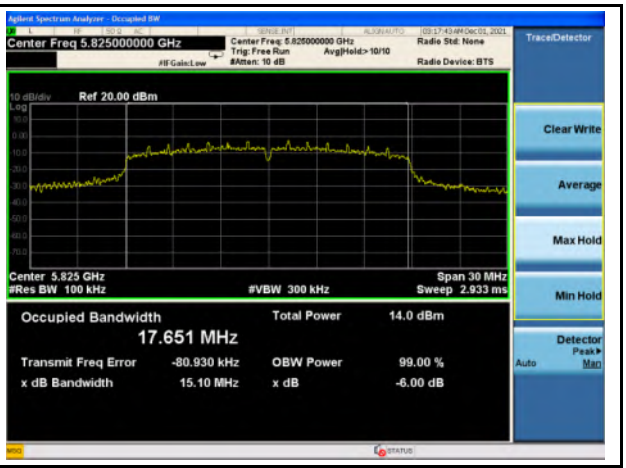
6 dB & 99% BW_U-NII-3_802.11a_5785



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

7.3 Occupied Bandwidth (99%)

7.3.1 Requirement

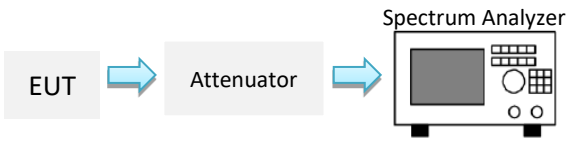
The 99% OBW is for reporting purpose only. The occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5% of the total mean power of the given emission.

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)	Data rate	Measured Bandwidth (MHz)	Minimum Bandwidth (MHz)	Result
802.11a	36	5180	6Mbps	17.011	N/A	N/A
	40	5200	6Mbps	18.308	N/A	N/A
	48	5240	6Mbps	18.681	N/A	N/A
802.11n	36	5180	MCS0	18.267	N/A	N/A
	40	5200	MCS0	18.645	N/A	N/A
	48	5240	MCS0	18.965	N/A	N/A

U-NII-2A Band

Mode	Channel	Frequency (MHz)	Data rate	Measured Bandwidth (MHz)	Minimum Bandwidth (MHz)	Result
802.11a	52	5260	6Mbps	18.352	N/A	N/A
	56	5280	6Mbps	18.694	N/A	N/A
	64	5320	6Mbps	17.008	N/A	N/A
802.11n	52	5260	MCS0	19.136	N/A	N/A
	56	5280	MCS0	19.142	N/A	N/A
	64	5320	MCS0	17.914	N/A	N/A

U-NII-2C Band

Mode	Channel	Frequency (MHz)	Data rate	Measured Bandwidth (MHz)	Minimum Bandwidth (MHz)	Result
802.11a	100	5500	6Mbps	16.613	N/A	N/A
	116	5580	6Mbps	17.771	N/A	N/A
	140	5700	6Mbps	16.462	N/A	N/A
802.11n	100	5500	MCS0	17.735	N/A	N/A
	116	5580	MCS0	18.710	N/A	N/A
	140	5700	MCS0	17.599	N/A	N/A

U-NII-3 Band

Mode	Channel	Frequency (MHz)	Data rate	Measured Bandwidth (MHz)	Minimum Bandwidth (MHz)	Result
802.11a	149	5745	6Mbps	16.994	N/A	N/A
	157	5785	6Mbps	17.225	N/A	N/A
	165	5825	6Mbps	16.589	N/A	N/A
802.11n	149	5745	MCS0	17.967	N/A	N/A
	157	5785	MCS0	17.809	N/A	N/A
	165	5825	MCS0	17.651	N/A	N/A

Cross Band

Mode	Channel	Frequency (MHz)	Data rate	Measured Bandwidth (MHz)	Minimum Bandwidth (MHz)	Result
802.11a	144	5720	6Mbps	18.040	N/A	PASS
802.11n	144	5720	MCS0	18.618	N/A	PASS

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.

RSS-247

6.2.1 Frequency band 5150-5250 MHz:

For other than devices installed in vehicles, the maximum e.i.r.p. shall not exceed 200 mW or 10 + 10 log10B, dBm, whichever power is less. B is the 99% emission bandwidth in MHz.

6.2.2 Frequency band 5250-5350 MHz:

For other than devices installed in vehicles, shall comply with the following:

a) The maximum conducted output power shall not exceed 250 mW or 11 + 10 log10B, dBm, whichever is less.

b) The maximum e.i.r.p. shall not exceed 1.0 W or 17 + 10 log10B, dBm, whichever is less. B is the 99% emission bandwidth in MHz.

6.2.3 Frequency bands 5470-5600 MHz and 5650-5725 MHz

The maximum conducted output power shall not exceed 250 mW or 11 + 10 log10B, dBm, whichever is less.

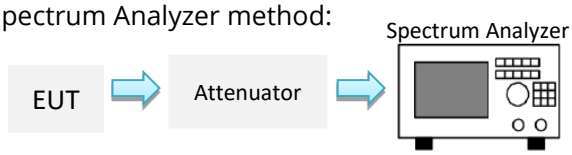
The maximum e.i.r.p. shall not exceed 1.0 W or 17 + 10 log10B, dBm, whichever is less. B is the 99% emission bandwidth in mMHz.

6.2.4 Frequency band 5725-5850 MHz

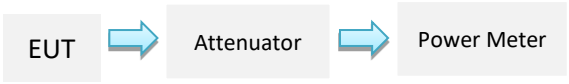
The maximum conducted output power shall not exceed 1 W.

7.4.2 Test Setup

Spectrum Analyzer method:



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)	Data rate	Measured Output Power (dBm)	Output Power Limit (dBm)	Result
802.11a	36	5180	6Mbps	10.50	24	PASS
	40	5200	6Mbps	10.79	24	PASS
	48	5240	6Mbps	10.90	24	PASS
802.11n	36	5180	MCS0	10.34	24	PASS
	40	5200	MCS0	10.48	24	PASS
	48	5240	MCS0	10.58	24	PASS

U-NII-2A Band

Mode	Channel	Frequency (MHz)	Data rate	Measured Output Power (dBm)	Output Power Limit (dBm)	Result
802.11a	52	5260	6Mbps	11.02	24	PASS
	56	5280	6Mbps	11.29	24	PASS
	64	5320	6Mbps	12.10	24	PASS
802.11n	52	5260	MCS0	10.78	24	PASS
	56	5280	MCS0	10.92	24	PASS
	64	5320	MCS0	11.91	24	PASS

U-NII-2C Band

Mode	Channel	Frequency (MHz)	Data rate	Measured Output Power (dBm)	Output Power Limit (dBm)	Result
802.11a	100	5500	6Mbps	11.76	24	PASS
	116	5580	6Mbps	13.20	24	PASS
	140	5700	6Mbps	10.96	24	PASS
802.11n	100	5500	MCS0	11.53	24	PASS
	116	5580	MCS0	13.01	24	PASS
	140	5700	MCS0	10.74	24	PASS

U-NII-3 Band

Mode	Channel	Frequency (MHz)	Data rate	Measured Output Power (dBm)	Output Power Limit (dBm)	Result
802.11a	149	5745	6Mbps	13.75	30	PASS
	157	5785	6Mbps	12.12	30	PASS
	165	5825	6Mbps	10.51	30	PASS
802.11n	149	5745	MCS0	13.23	30	PASS
	157	5785	MCS0	11.88	30	PASS
	165	5825	MCS0	10.87	30	PASS

Cross Band

Mode	Channel	Frequency (MHz)	Data rate	Measured Output Power (dBm)	Output Power Limit (dBm)	Result
802.11a	144	5720	6Mbps	11.79	24	PASS
802.11n	144	5720	MCS0	11.37	24	PASS

EIRP measurement result

U-NII-1 Band

Mode	Channel	Frequency (MHz)	Data rate	Measured Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Result
802.11a	36	5180	6Mbps	10.50	2.6	13.10	22.31	PASS
	40	5200	6Mbps	10.79	2.6	13.39	22.63	PASS
	48	5240	6Mbps	10.90	2.6	13.50	22.71	PASS
802.11n	36	5180	MCS0	10.34	2.6	12.94	22.62	PASS
	40	5200	MCS0	10.48	2.6	13.08	22.71	PASS
	48	5240	MCS0	10.58	2.6	13.18	22.78	PASS

Note:
EIRP Limit: 200 mW (23dBm) or 10 + 10 log10B, dBm, whichever power is less. B is the 99% emission bandwidth.
Where:
1. 10 dBm + 10log (17.011) = 22.31 dBm < 23 dBm.
2. 10 dBm + 10log (18.308) = 22.63 dBm < 23 dBm.
3. 10 dBm + 10log (18.681) = 22.71 dBm < 23 dBm.
4. 10 dBm + 10log (18.267) = 22.62 dBm < 23 dBm.
5. 10 dBm + 10log (18.645) = 22.71 dBm < 23 dBm.
6. 10 dBm + 10log (18.965) = 22.78 dBm < 23 dBm.

U-NII-2A Band

Mode	Channel	Frequency (MHz)	Data rate	Measured Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Result
802.11a	52	5260	6Mbps	11.02	2.6	13.62	29.64	PASS
	60	5300	6Mbps	11.29	2.6	13.89	29.72	PASS
	64	5320	6Mbps	12.10	2.6	14.70	29.31	PASS
802.11n	52	5260	MCS0	10.78	2.6	13.38	29.82	PASS
	60	5300	MCS0	10.92	2.6	13.52	29.82	PASS
	64	5320	MCS0	11.91	2.6	14.51	29.53	PASS

Note:
EIRP Limit: 1W (30dBm) or 17 + 10 log10B, dBm, whichever power is less. B is the 99% emission bandwidth.
Where:
1. 17 dBm + 10log (18.352) = 29.64 dBm < 30 dBm.
2. 17 dBm + 10log (18.694) = 29.72 dBm < 30 dBm.
3. 17 dBm + 10log (17.008) = 29.31 dBm < 30 dBm.
4. 17 dBm + 10log (19.136) = 29.82 dBm < 30 dBm.
5. 17 dBm + 10log (19.142) = 29.82 dBm < 30 dBm.
6. 17 dBm + 10log (17.914) = 29.53 dBm < 30 dBm.

U-NII-2C Band

Mode	Channel	Frequency (MHz)	Data rate	Measured Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Result
802.11a	100	5500	6Mbps	11.76	2.6	14.36	29.20	PASS
	116	5580	6Mbps	13.20	2.6	15.80	29.50	PASS
	140	5700	6Mbps	10.96	2.6	13.56	29.16	PASS
802.11n	100	5500	MCS0	11.53	2.6	14.13	29.49	PASS
	116	5580	MCS0	13.01	2.6	15.61	29.72	PASS
	140	5700	MCS0	10.74	2.6	13.34	29.45	PASS

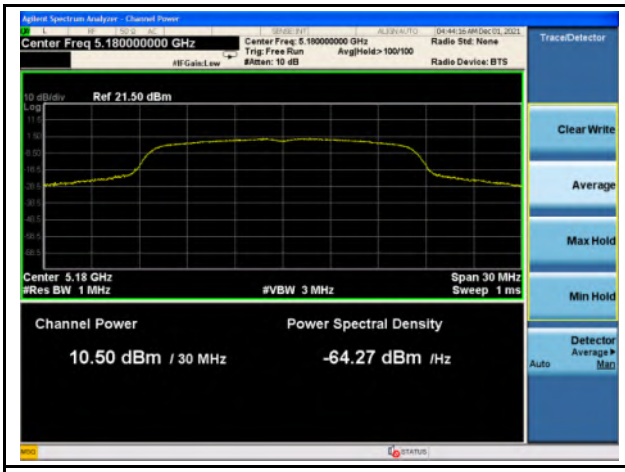
Note:
EIRP Limit: 1W (30dBm) or 17 + 10 log10B, dBm, whichever power is less. B is the 99% emission bandwidth.
Where:
1. 17 dBm + 10log (16.613) = 29.20 dBm < 30 dBm.
2. 17 dBm + 10log (17.771) = 29.50 dBm < 30 dBm.
3. 17 dBm + 10log (16.462) = 29.16 dBm < 30 dBm.
4. 17 dBm + 10log (17.735) = 29.49 dBm < 30 dBm.
5. 17 dBm + 10log (18.710) = 29.72 dBm < 30 dBm.
6. 17 dBm + 10log (17.599) = 29.45 dBm < 30 dBm.

Cross Band

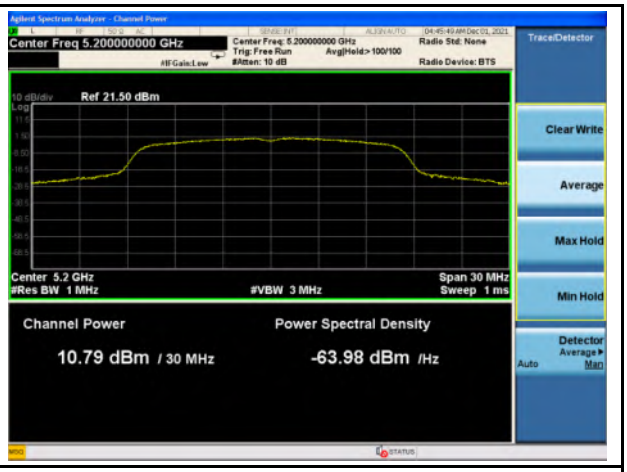
Mode	Channel	Frequency (MHz)	Data rate	Measured Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Result
802.11a	144	5720	6Mbps	11.79	2.6	14.39	29.56	PASS
	144	5720	MCS0	11.37	2.6	13.97	29.70	PASS

Note:
EIRP Limit: 1W (30dBm) or 17 + 10 log10B, dBm, whichever power is less. B is the 99% emission bandwidth.
Where:
1. 17 dBm + 10log (18.040) = 29.56 dBm < 30 dBm.
2. 17 dBm + 10log (18.618) = 29.70 dBm < 30 dBm.

7.4.5 Test Plots



Output Power_U-NII-1_802.11a_5180

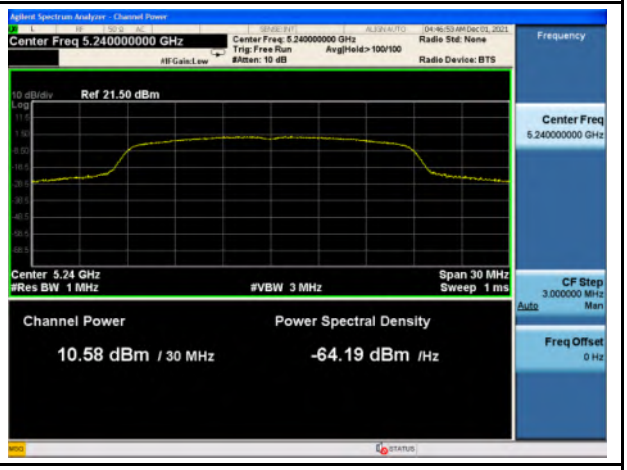


Output Power _U-NII-1_802.11a_5200

Output Power _U-NII-1_802.11a_5240

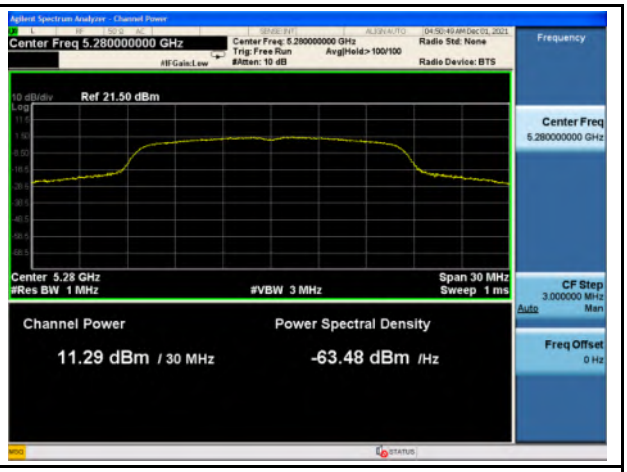
Output Power _U-NII-1_802.11n_5180

Output Power _U-NII-1_802.11n_5200



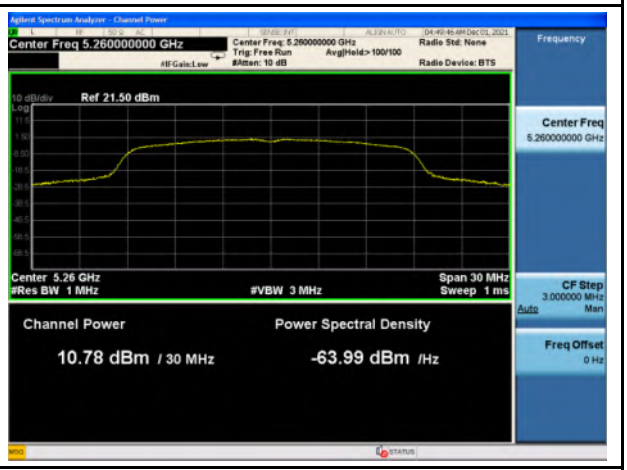
Output Power _U-NII-1_802.11n_5240

Output Power _U-NII-2A_802.11a_5260



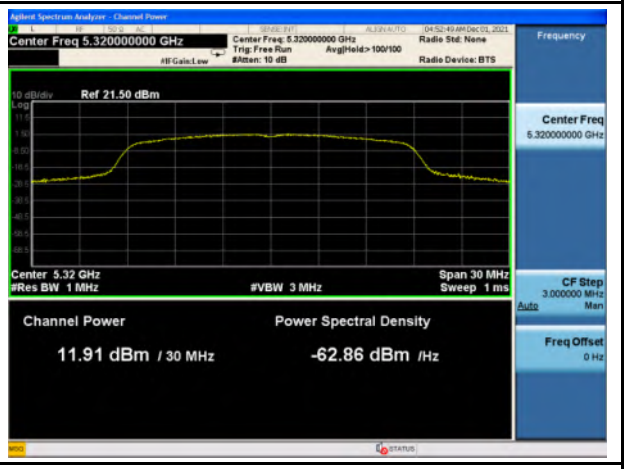
Output Power _U-NII-2A_802.11a_5280

Output Power _U-NII-2A_802.11a_5320

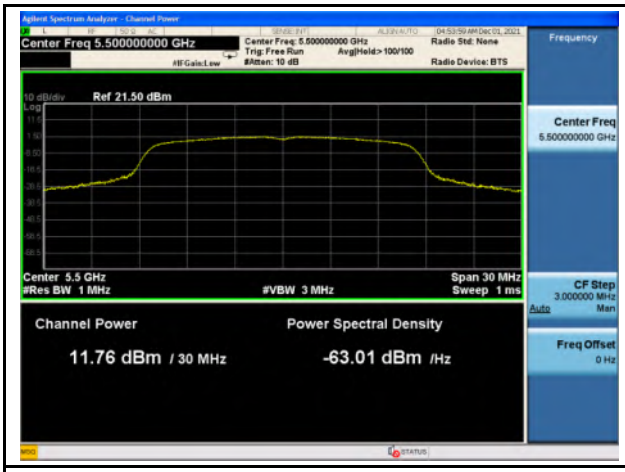


Output Power _U-NII-2A_802.11n_5260

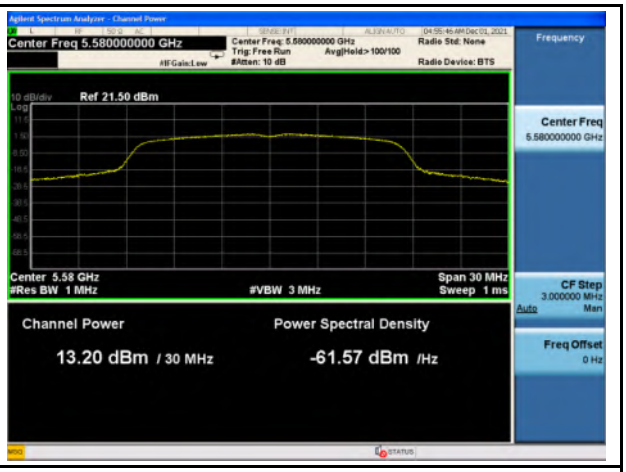
Output Power _U-NII-2A_802.11n_5280



Output Power _U-NII-2A_802.11n_5320

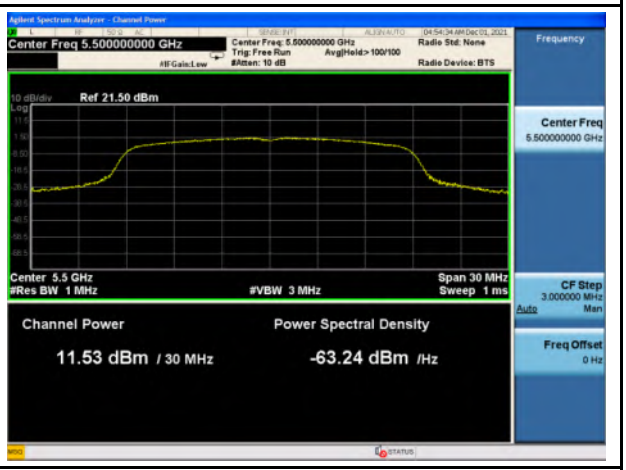


Output Power _U-NII-2C_802.11a_5500



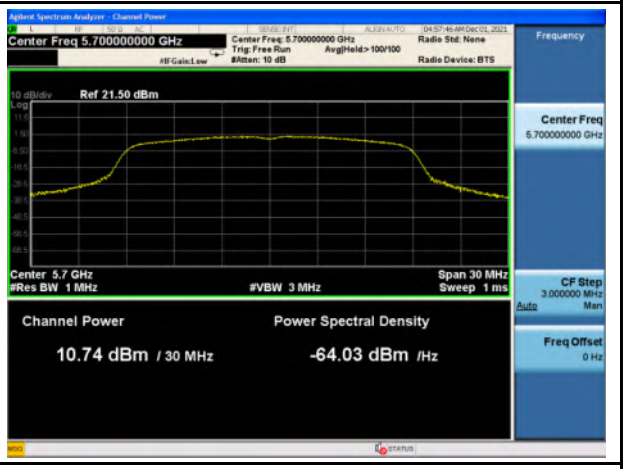
Output Power _U-NII-2C_802.11a_5580

Output Power _U-NII-2C_802.11a_5700



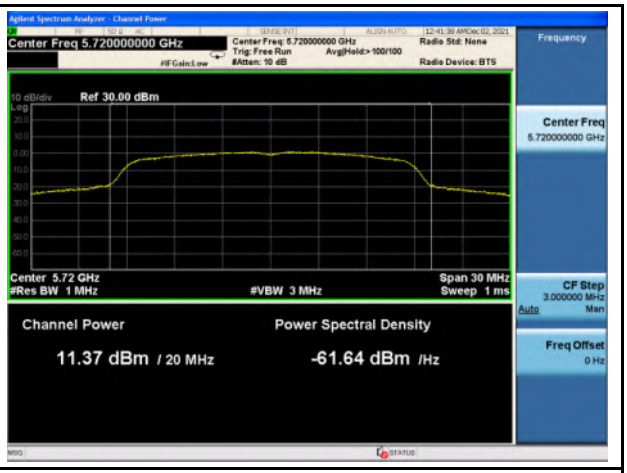
Output Power _U-NII-2C_802.11n_5500

Output Power _U-NII-2C_802.11n_5580



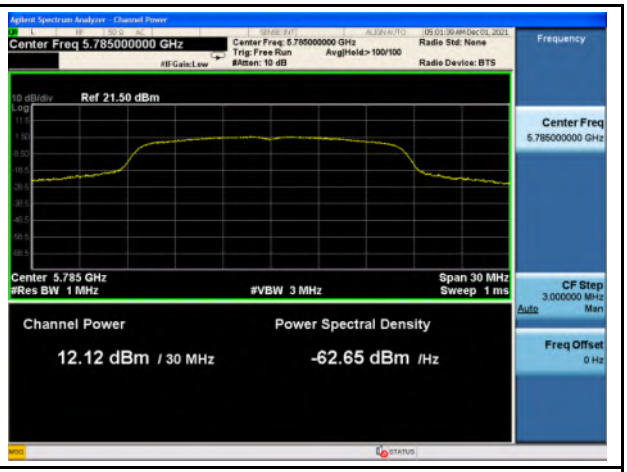
Output Power _U-NII-2C_802.11n_5700

Output Power _U-NII-2C_802.11a_5720

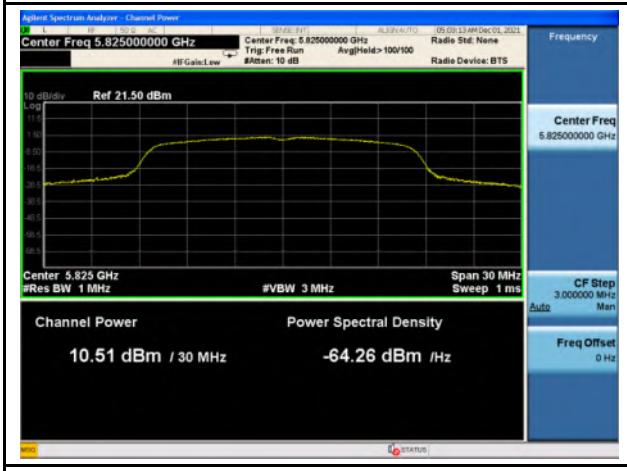


Output Power _U-NII-2C_802.11n_5720

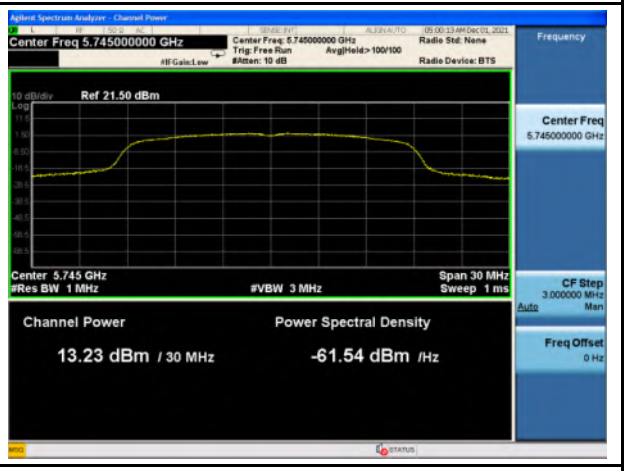
Output Power _U-NII-3_802.11a_5745



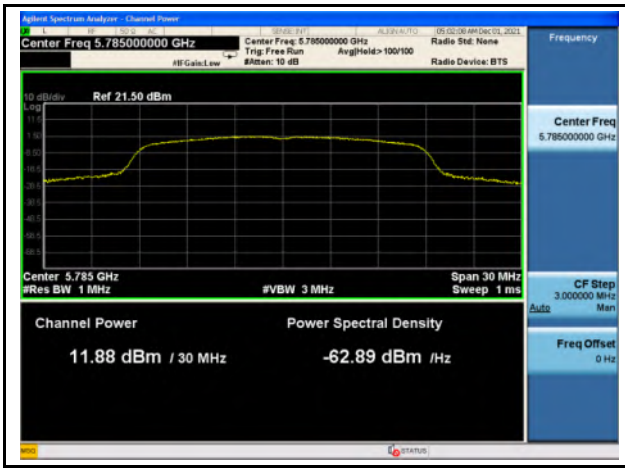
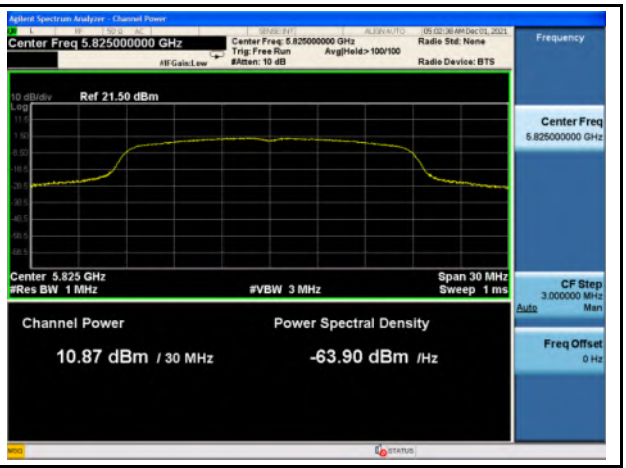
Output Power _U-NII-3_802.11a_5785



Output Power _U-NII-3_802.11a_5825



Output Power _U-NII-3_802.11n_5745

	
Output Power _U-NII-3_802.11n_5785	Output Power _U-NII-3_802.11n_5825

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.

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6.2.1 Frequency band 5150-5250 MHz:

The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band.

6.2.2 Frequency band 5250-5350 MHz:

The power spectral density shall not exceed 11 dBm in any 1.0 MHz band

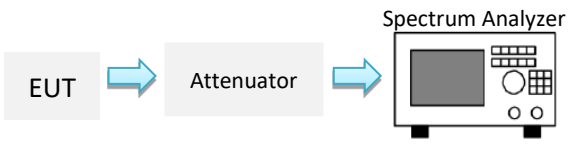
6.2.3 Frequency bands 5470-5600 MHz and 5650-5725 MHz

The power spectral density shall not exceed 11 dBm in any 1.0 MHz band.

6.2.4 Frequency band 5725-5850 MHz

The output power spectral density shall not exceed 30 dBm in any 500 kHz band.

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)	Data rate	Measured PSD (dBm/MHz)	PSD Limit (dBm/MHz)	Result
802.11a	36	5180	6Mbps	1.326	11	PASS
	40	5200	6Mbps	1.227	11	PASS
	48	5240	6Mbps	0.283	11	PASS
802.11n	36	5180	MCS0	-0.385	11	PASS
	40	5200	MCS0	1.064	11	PASS
	48	5240	MCS0	-0.182	11	PASS

U-NII-1 Band (EIRP PSD)

Mode	Channel	Frequency (MHz)	Data rate	Measured PSD (dBm/MHz)	Antenna Gain (dBi)	EIRP PSD (dBi)	ERIP PSD Limit (dBm/MHz)	Result
802.11a	36	5180	6Mbps	1.326	2.6	3.926	10	PASS
	40	5200	6Mbps	1.227	2.6	3.827	10	PASS
	48	5240	6Mbps	0.283	2.6	2.883	10	PASS
802.11n	36	5180	MCS0	-0.385	2.6	2.215	10	PASS
	40	5200	MCS0	1.064	2.6	3.664	10	PASS
	48	5240	MCS0	-0.182	2.6	2.418	10	PASS

U-NII-2A Band

Mode	Channel	Frequency (MHz)	Data rate	Measured PSD (dBm/MHz)	PSD Limit (dBm/MHz)	Result
802.11a	52	5260	6Mbps	0.327	11	PASS
	56	5300	6Mbps	0.443	11	PASS
	64	5320	6Mbps	0.786	11	PASS
802.11n	52	5260	MCS0	0.177	11	PASS
	56	5300	MCS0	-0.233	11	PASS
	64	5320	MCS0	0.424	11	PASS

U-NII-2C Band

Mode	Channel	Frequency (MHz)	Data rate	Measured PSD (dBm/MHz)	PSD Limit (dBm/MHz)	Result
802.11a	100	5500	6Mbps	2.209	11	PASS
	116	5580	6Mbps	3.357	11	PASS
	140	5700	6Mbps	-0.196	11	PASS
802.11n	100	5500	MCS0	1.737	11	PASS
	116	5580	MCS0	2.736	11	PASS
	140	5700	MCS0	-0.657	11	PASS

Cross Band (in band 5470-5725MHz)

Mode	Channel	Frequency (MHz)	Data rate	Measured PSD (dBm/MHz)	Duty Factor (dB)	Corrected PSD (dBm/MHz)	PSD Limit (dBm/MHz)	Result
802.11a	144	5720	6Mbps	3.666	0.39	4.056	11	PASS
802.11n	144	5720	MCS0	3.111	0.44	3.551	11	PASS

Cross Band (in band 5725-5850MHz)

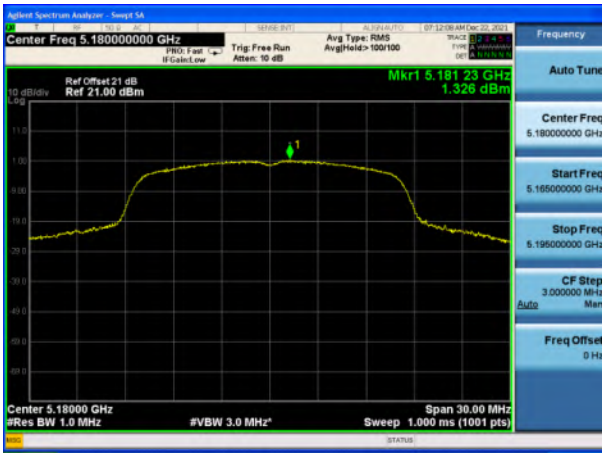
Mode	Channel	Frequency (MHz)	Data rate	Measured PSD (dBm/300kHz)	Corrected PSD (dBm/500kHz) *	PSD Limit (dBm/500kHz)	Result
802.11a	144	5720	6Mbps	0.812	3.032	30	PASS
	144	5720	MCS0	0.459	2.679	30	PASS

U-NII-3 Band in 500kHz band

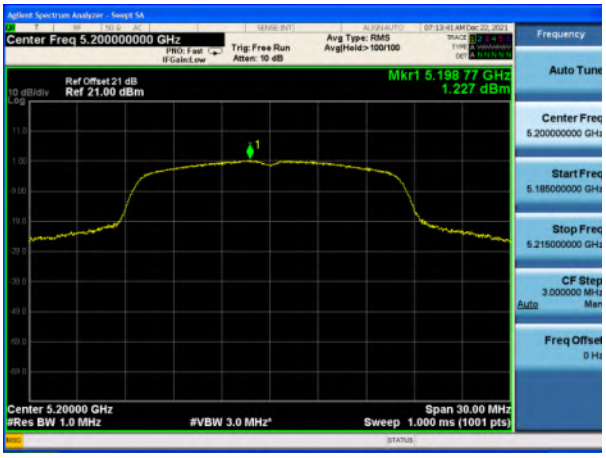
Mode	Channel	Frequency (MHz)	Data rate	Measured PSD (dBm/300kHz)	Corrected PSD (dBm/500kHz) *	PSD Limit (dBm/500kHz)	Result
802.11a	149	5745	6Mbps	-2.700	-0.48	30	PASS
	157	5785	6Mbps	-2.964	-0.744	30	PASS
	165	5825	6Mbps	-4.106	-1.886	30	PASS
802.11n	149	5745	MCS0	-2.860	-0.64	30	PASS
	157	5785	MCS0	-3.657	-1.437	30	PASS
	165	5825	MCS0	-4.960	-2.74	30	PASS

Note: Corrected PSD (dBm/500kHz) * = Measured PSD (dBm/300kHz) + Correction Factor[10*log(500/RBW)]
= Measured PSD (dBm/300kHz) + 10*Log (500/300)
= Measured PSD (dBm/300kHz) + 2.22

7.5.5 Test Plots



PSD _U-NII-1_802.11a_5180



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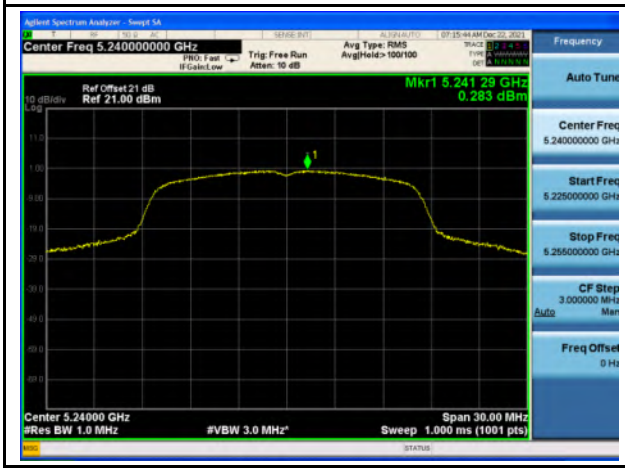
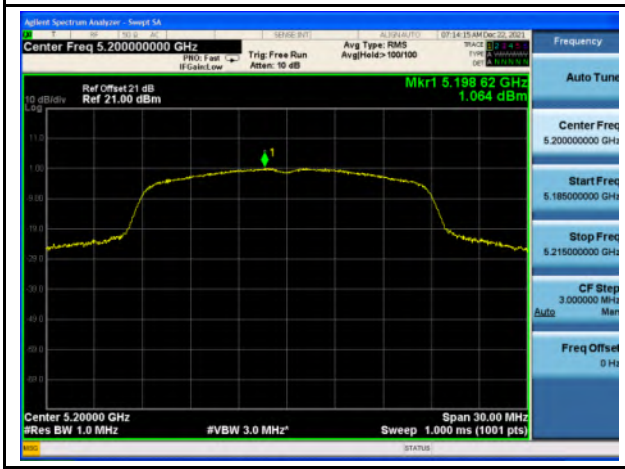


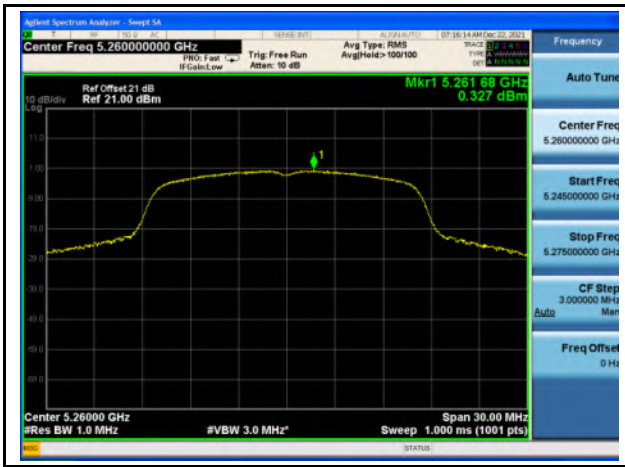
PSD _U-NII-1_802.11a_5240

PSD _U-NII-1_802.11n_5180



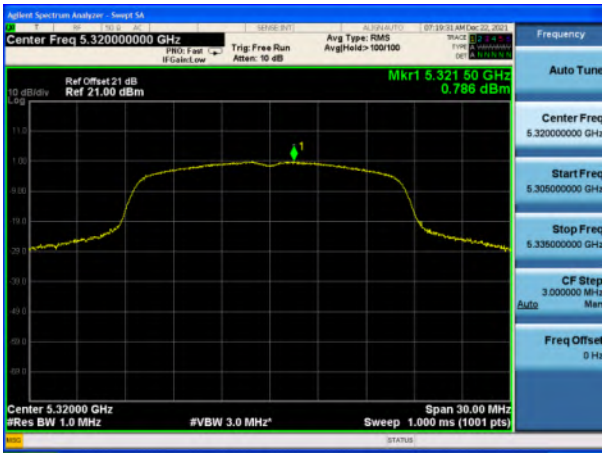
PSD _U-NII-1_802.11n_5200

PSD _U-NII-1_802.11n_5240

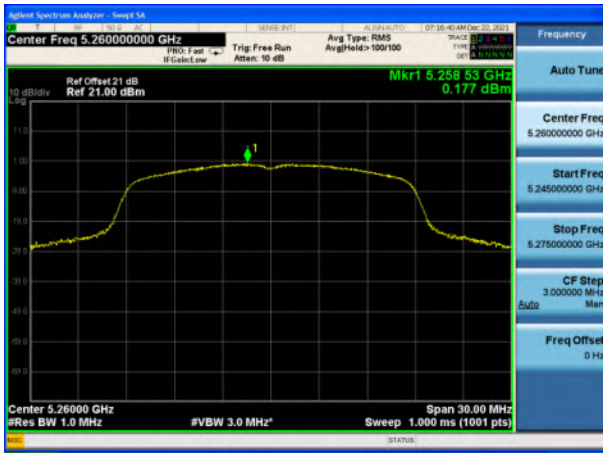


PSD _U-NII-2A_802.11a_5260

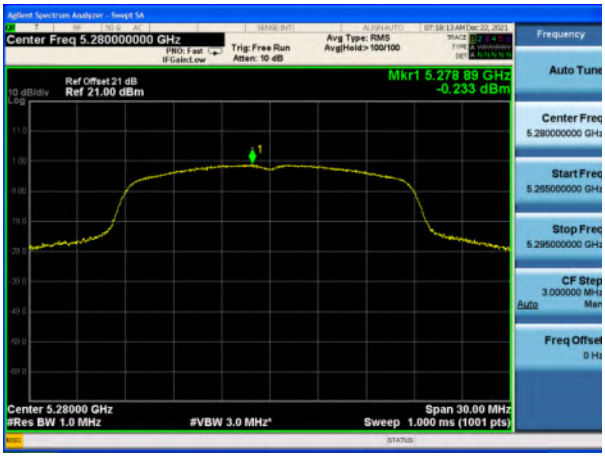
PSD _U-NII-2A_802.11a_5280



PSD _U-NII-2A_802.11a_5320



PSD _U-NII-2A_802.11n_5260



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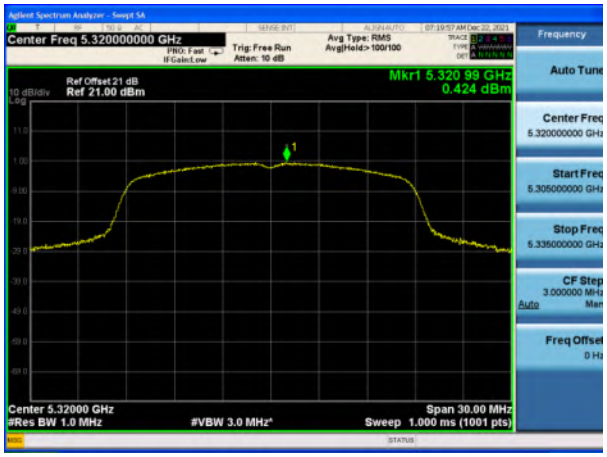
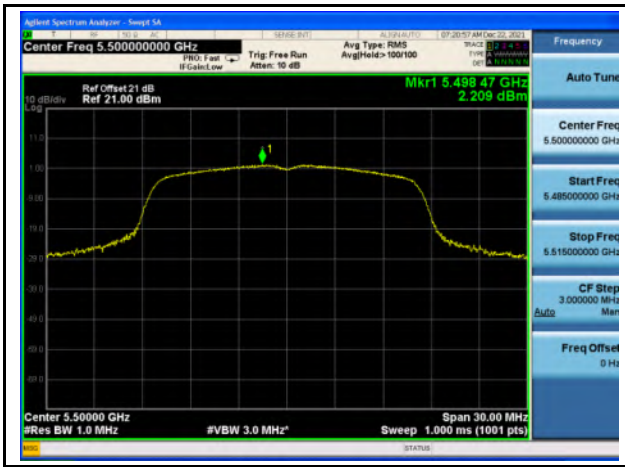


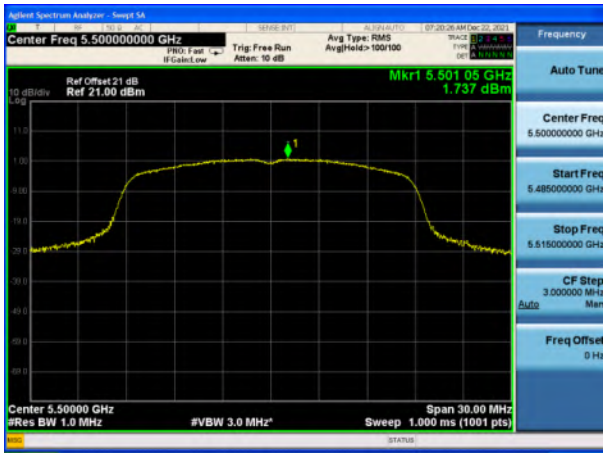
PSD _U-NII-2A_802.11n_5320



PSD _U-NII-2C_802.11a_5500

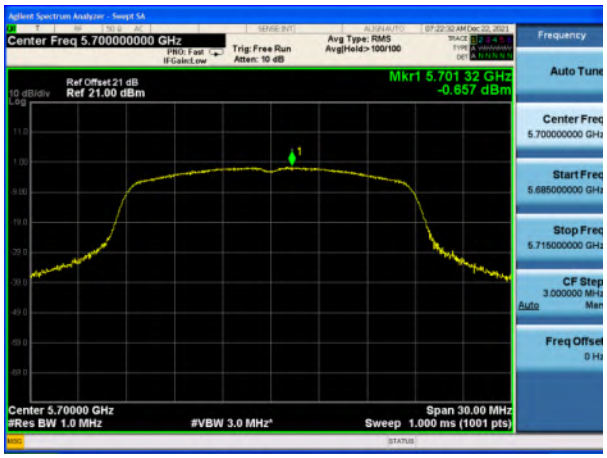
PSD _U-NII-2C_802.11a_5580

PSD _U-NII-2C_802.11a_5700



PSD _U-NII-2C_802.11n_5500

PSD _U-NII-2C_802.11n_5580



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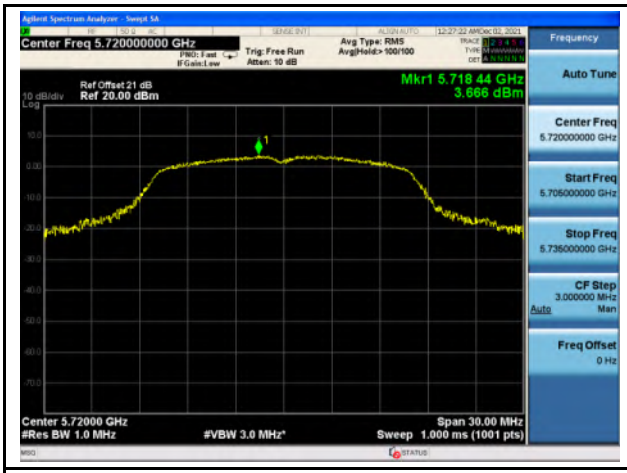
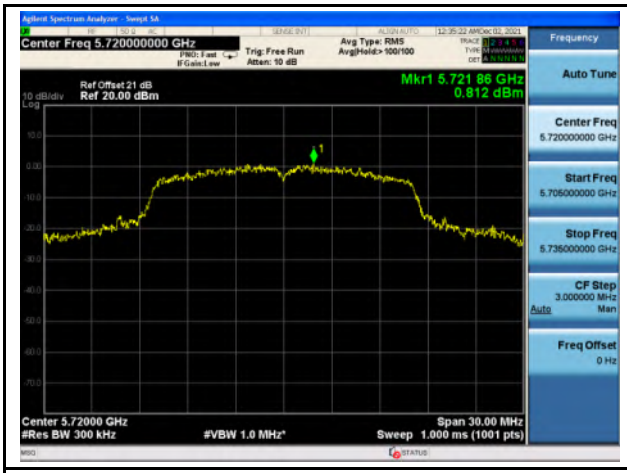
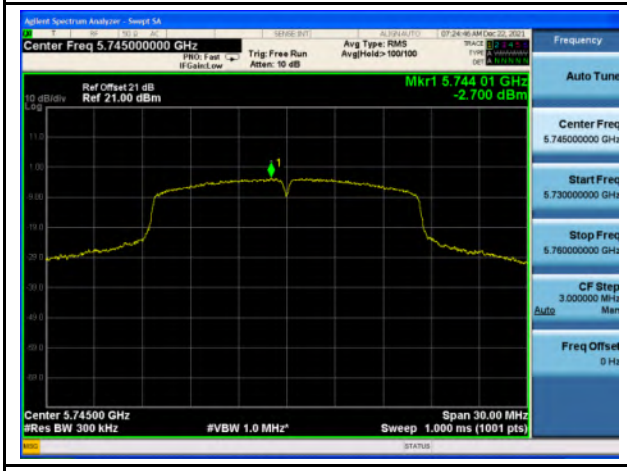
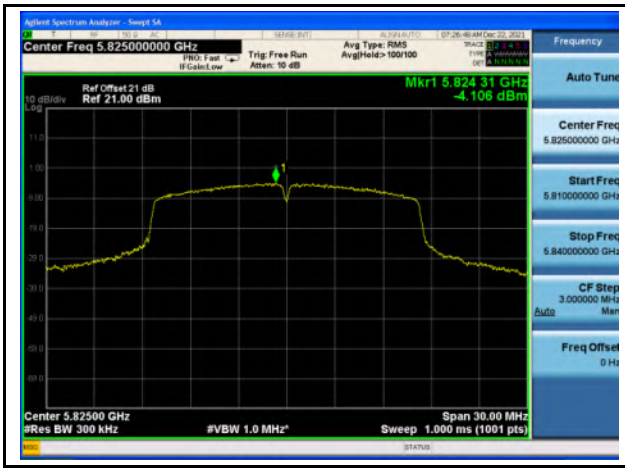
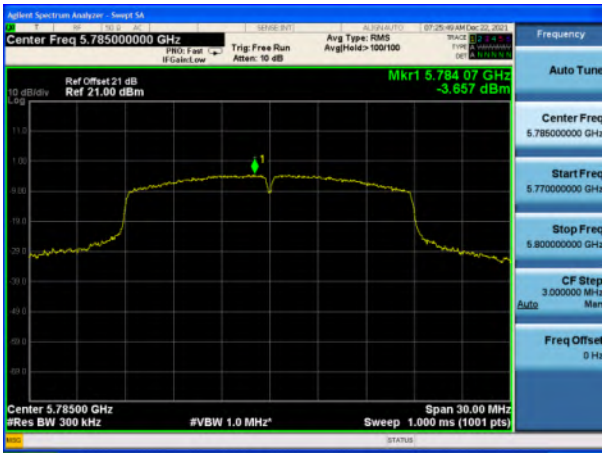
	
PSD _Cross channel_802.11n_5720 (In U-NII-2C Band)	PSD _ Cross channel _802.11n_5720 (In U-NII-2C Band)
	
PSD _Cross channel_802.11n_5720 (In U-NII-3 Band)	PSD _ Cross channel _802.11n_5720 (In U-NII-3 Band)
	
PSD _U-NII-3_802.11a_5745	PSD _U-NII-3_802.11a_5785

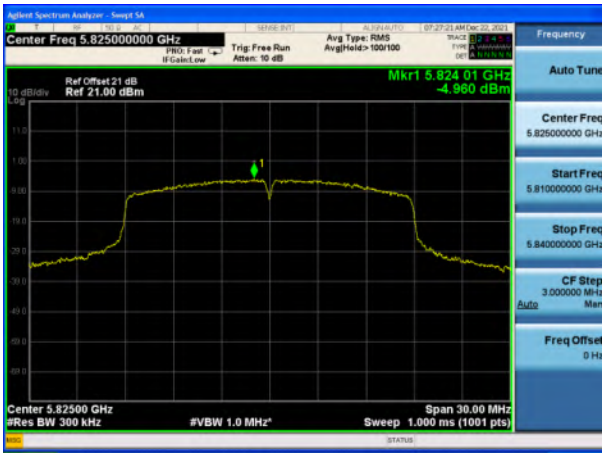


PSD _U-NII-3_802.11a_5825

PSD _U-NII-3_802.11n_5745



PSD _U-NII-3_802.11n_5785



PSD _U-NII-3_802.11n_5825

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

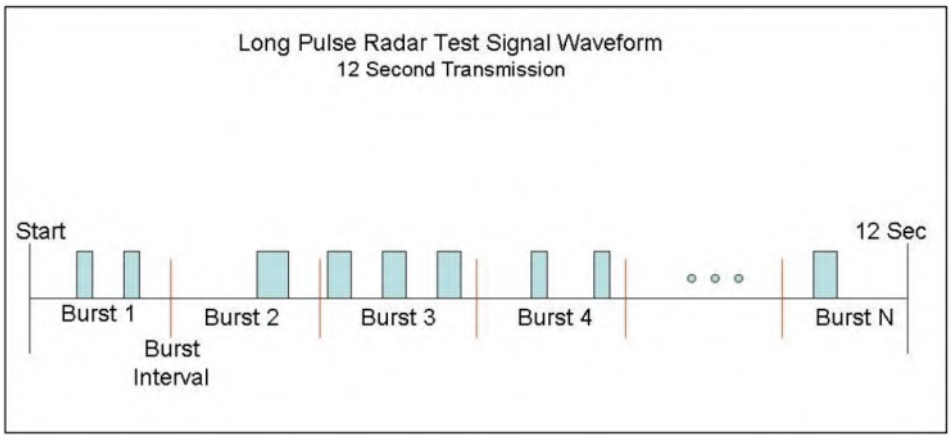
waveforms.

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. EUT only support 20MHz bandwidth.

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

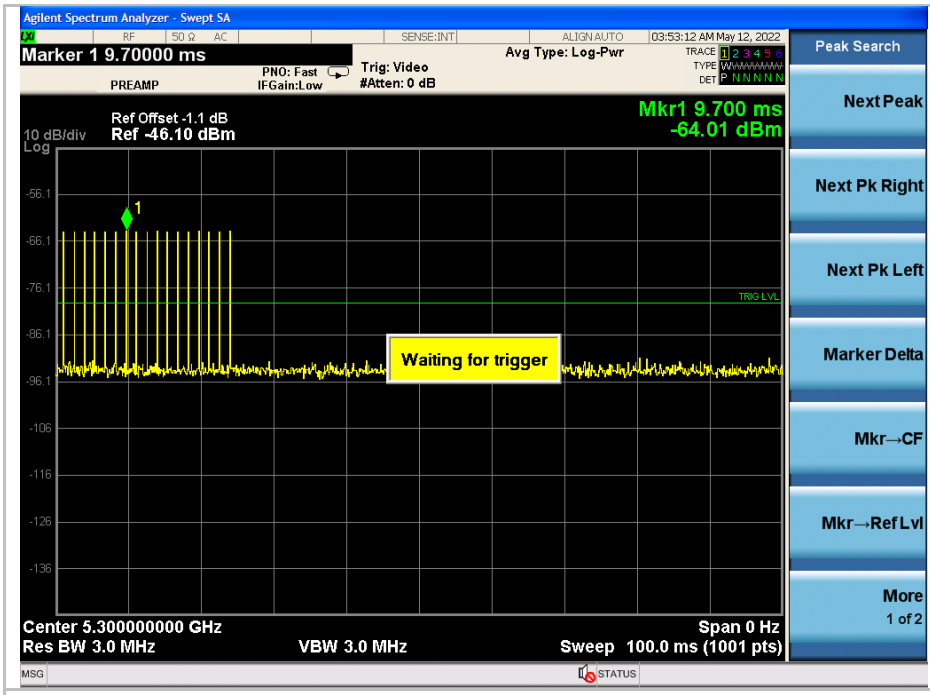
Channel Move Time

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.

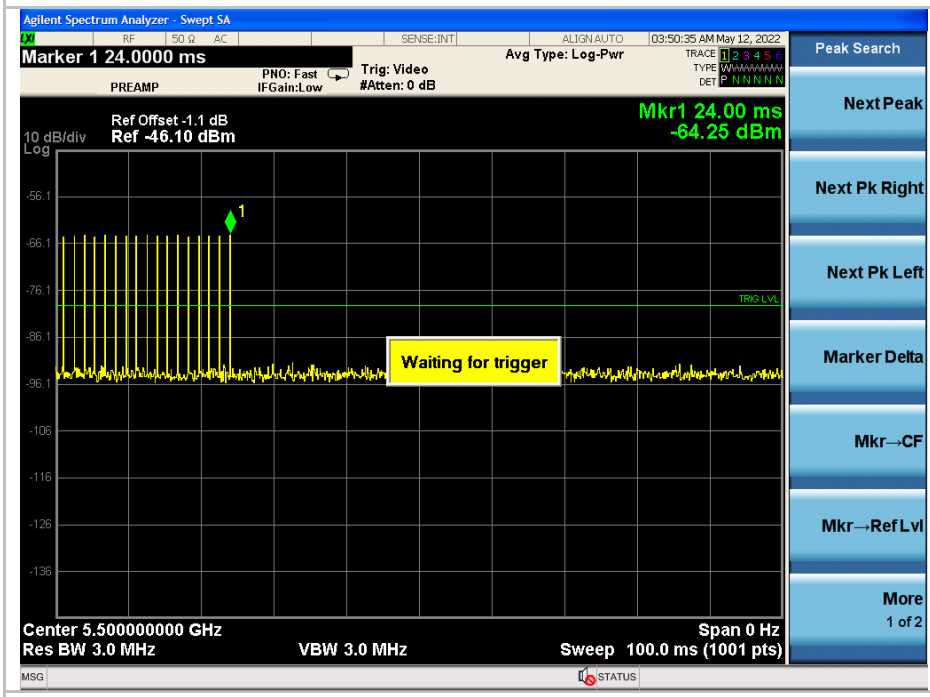
7.8.2 Radar Waveform Calibration

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 1 @ 5300MHz



5470MHz to 5725MHz bands – Radar Type 0 @ 5500MHz

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

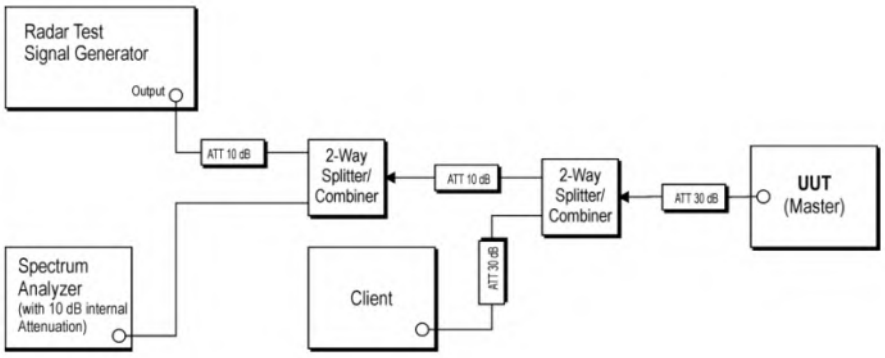
C is the closing time, N is the number of spectrum analyzer sampling bins showing a U-NII transmission and dwell is the dwell time per bin.

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.

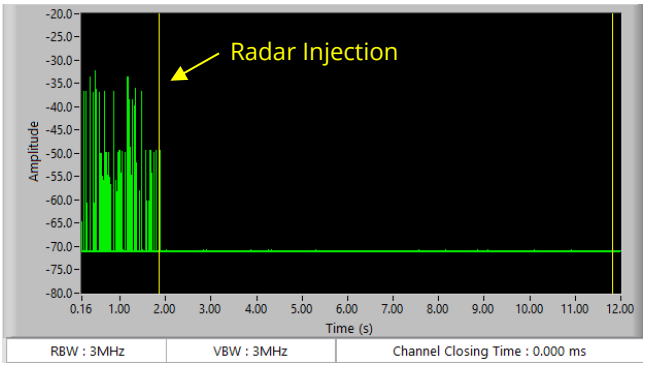
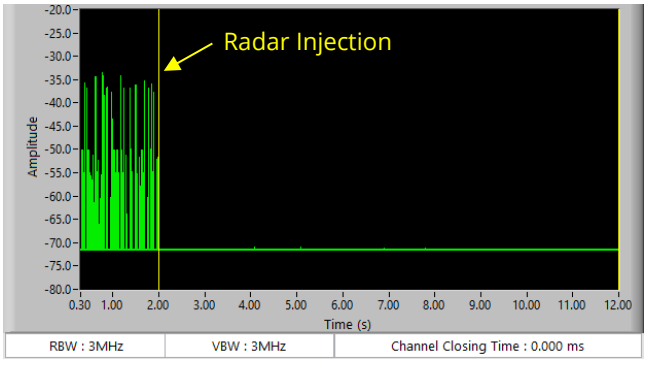
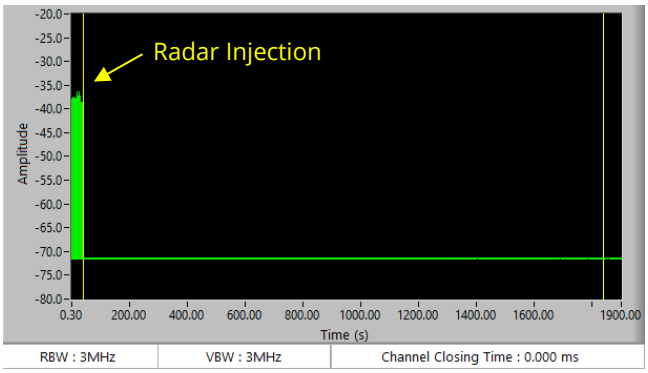
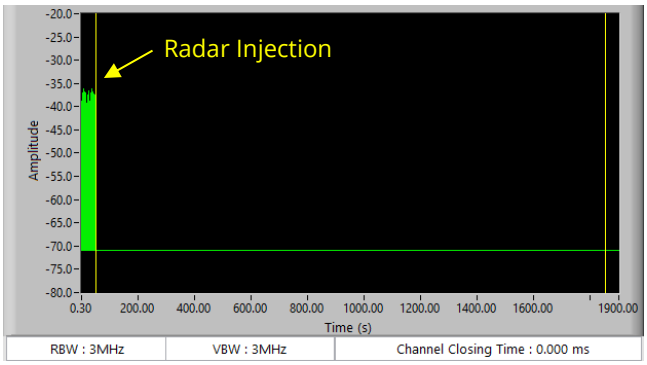
The calibrated radiated DFS detection threshold level is set to -64 dBm. The tested level is lower than the required level hence it provides margining to the limit.

7.8.5 DFS Test Results

BW / Channel	Test Item	Test Result	Limit	Verdict
11n-5300MHz	Channel Move Time	< 10s	< 10s	Pass
11n-5500MHz	Channel Move Time	< 10s	< 10s	Pass
11n-5300MHz	Channel Closing Transmission Time	0ms	< 260ms	Pass
11n-5500MHz	Channel Closing Transmission Time	0ms	< 260ms	Pass
11n-5300MHz	Non-Occupancy Period	> 30min (1800 s)	≥ 30 min (1800 s)	Pass
11n-5500MHz	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

<table>
<tr><td> 
</td><td> 
</td></tr>
<tr><td>Channel Move Time & Closing Time – 5300MHz</td><td>Channel Move Time & Closing Time – 5500MHz</td></tr>
<tr><td> 
</td><td> 
</td></tr>
<tr><td>Non-occupancy period - 5300MHz (Type0)</td><td>Non-occupancy period - 5500MHz (Type0)</td></tr>
</table>

7.9 Radiated Spurious Emission

7.9.1 Requirement

§ 15.407 (b) RSS-247 6.2

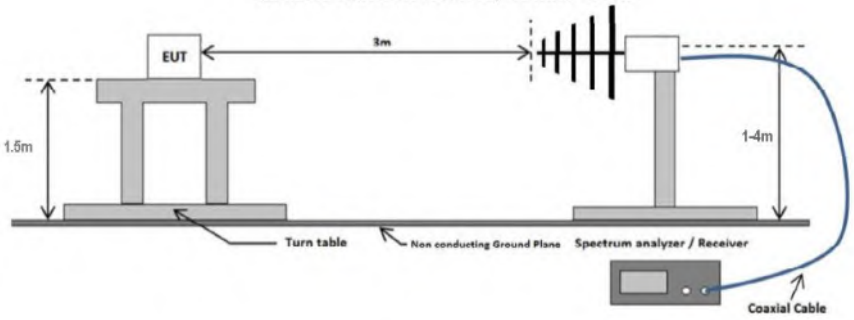
1) For transmitters operating in the 5.15-5.25 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz.
2) For transmitters operating in the 5.25-5.35 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.
3) For 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) and RSS-Gen 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)).

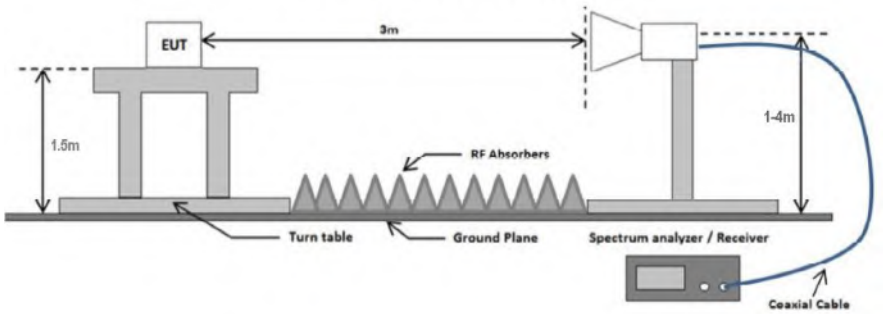
Frequency Range (MHZ)	Field Strength (μV/m)	Measurement Distance (m)
0.009~0.490	2400/F(kHz)	300
0.490~1.705	24000/F(kHz)	30
1.705~30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 960	200	3
Above 960	500	3

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

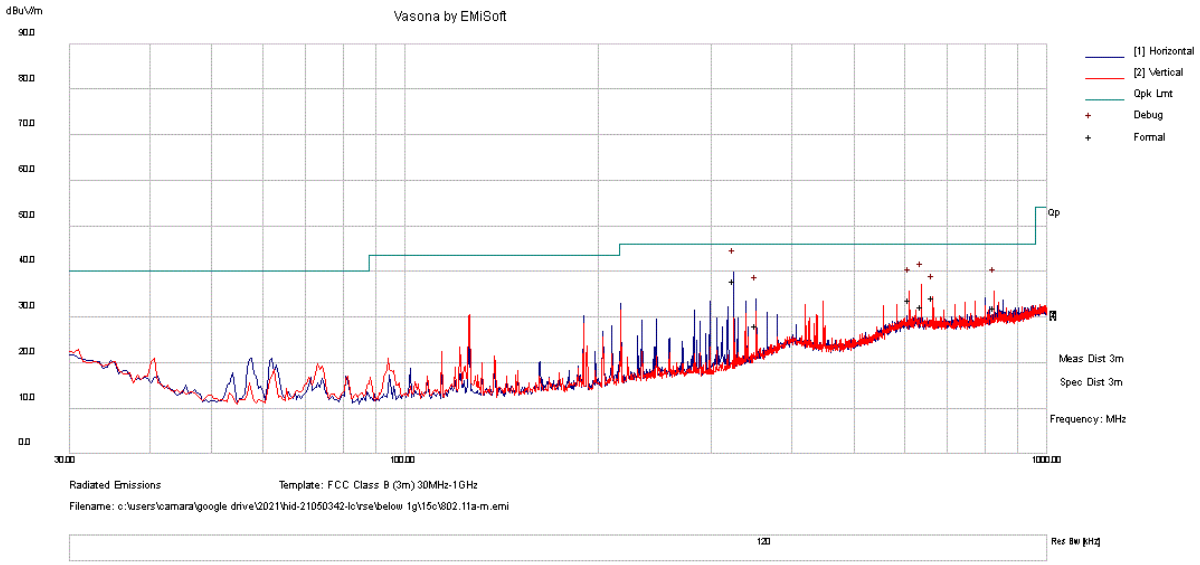
Radiated Emission between 9KHz – 30MHz test result

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, RSS-247	Mode:	RSE-Below 1GHz_802.11a
Frequency Range:	30 MHz - 1 GHz	Test Date:	04/14/2022
Antenna Type/Polarity:	Bi-Log/Hor & Ver	Test Personnel:	Devin Tai
Remark:	Ch 149	Test Result:	Pass

Radiated Spurious Emission-Below 1GHz-11a-20MHz BW-5300MHz



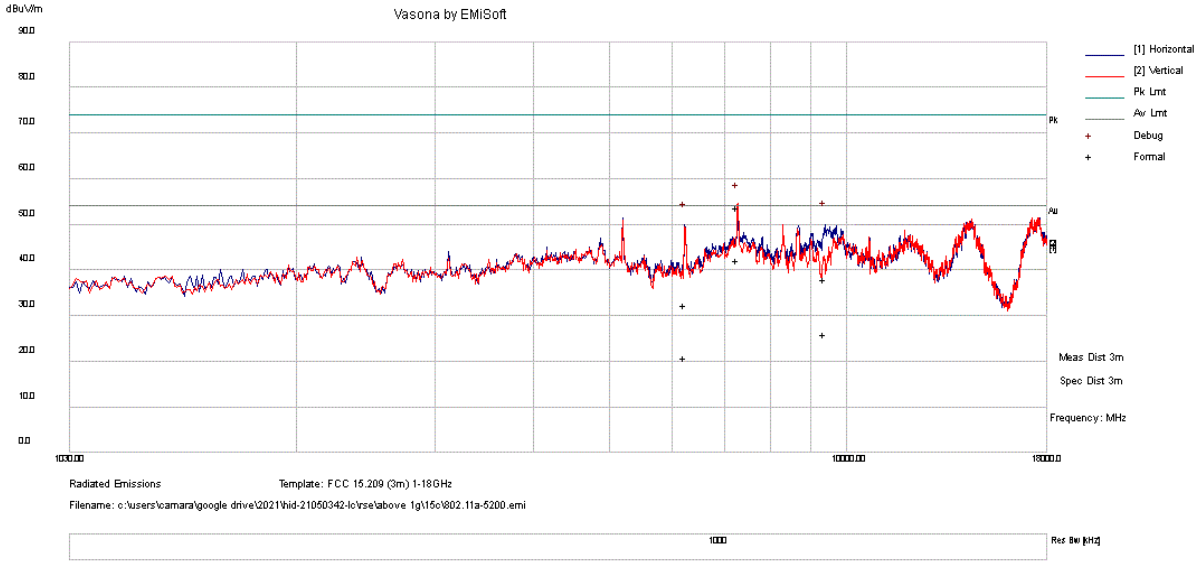
No.	Frequency MHz	Raw dBuV	Cable Loss dB	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	325.466	44.8	5.9	-12.5	38.2	QP Max	H	117	106	46	-7.8	Pass
2	637.383	30.4	7.2	-5.1	32.5	QP Max	V	136	287	46	-13.5	Pass
3	827.244	28.9	7.3	-4.1	32.1	QP Max	V	308	0	46	-13.9	Pass
4	610.258	31.8	7.2	-5	34	QP Max	V	165	237	46	-12	Pass
5	664.485	32.4	7.3	-5.2	34.5	QP Max	V	264	0	46	-11.5	Pass
6	352.59	33	6.1	-10.9	28.2	QP Max	H	323	3	46	-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 ABOVE 1GHZ

Test Standard:	FCC15.247, 15.209, RSS-247	Mode:	RSE-Above 1GHz-802.11a
Frequency Range:	1 GHz - 18 GHz	Test Date:	04/11/2022-04/12/2022
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Devin Tai
Remark:	Ch 36	Test Result:	Pass

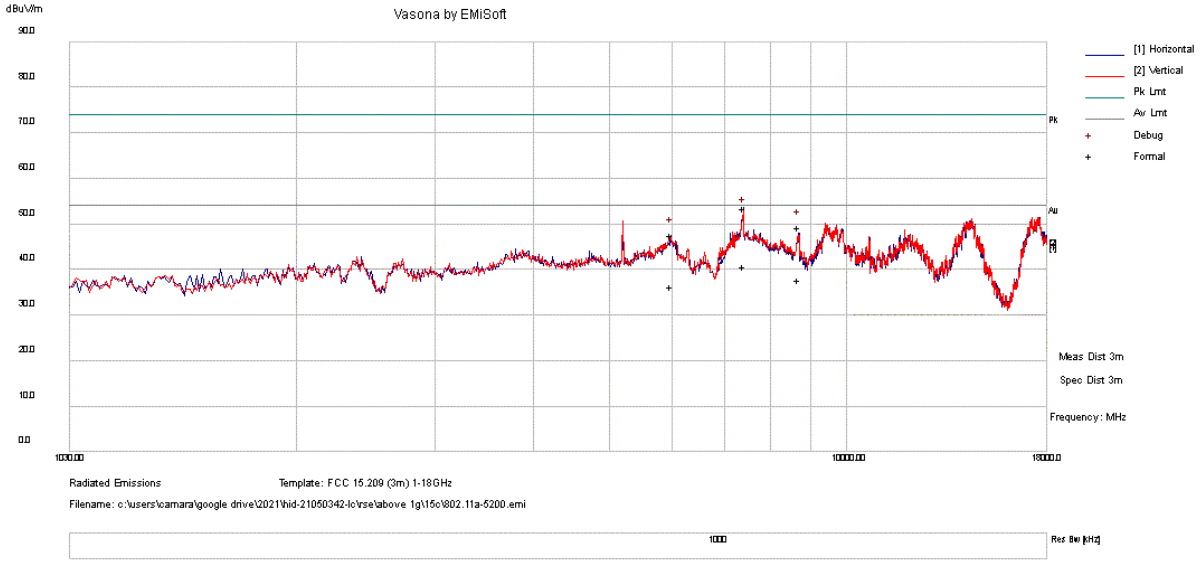


No.	Frequency MHz	Raw dBuV	Cable Loss dB	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	7276.954	36.9	11.8	5.1	53.8	Peak Max	V	341	294	74	-20.2	Pass
2	9397.549	16.4	14.7	7.1	38.2	Peak Max	H	278	348	74	-35.8	Pass
3	6242.168	16.9	10.7	4.9	32.5	Peak Max	V	324	282	74	-41.5	Pass
4	7276.954	25.4	11.8	5.1	42.3	Average Max	V	341	294	54	-11.7	Pass
5	9397.549	4.3	14.7	7.1	26.1	Average Max	H	278	348	54	-27.9	Pass
6	6242.168	5.2	10.7	4.9	20.8	Average Max	V	324	282	54	-33.2	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)

Test Standard:	FCC15.247, 15.209, RSS-247	Mode:	RSE-Above 1GHz-802.11a
Frequency Range:	1 GHz - 18 GHz	Test Date:	04/11/2022-04/12/2022
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Devin Tai
Remark:	Ch 40	Test Result:	Pass

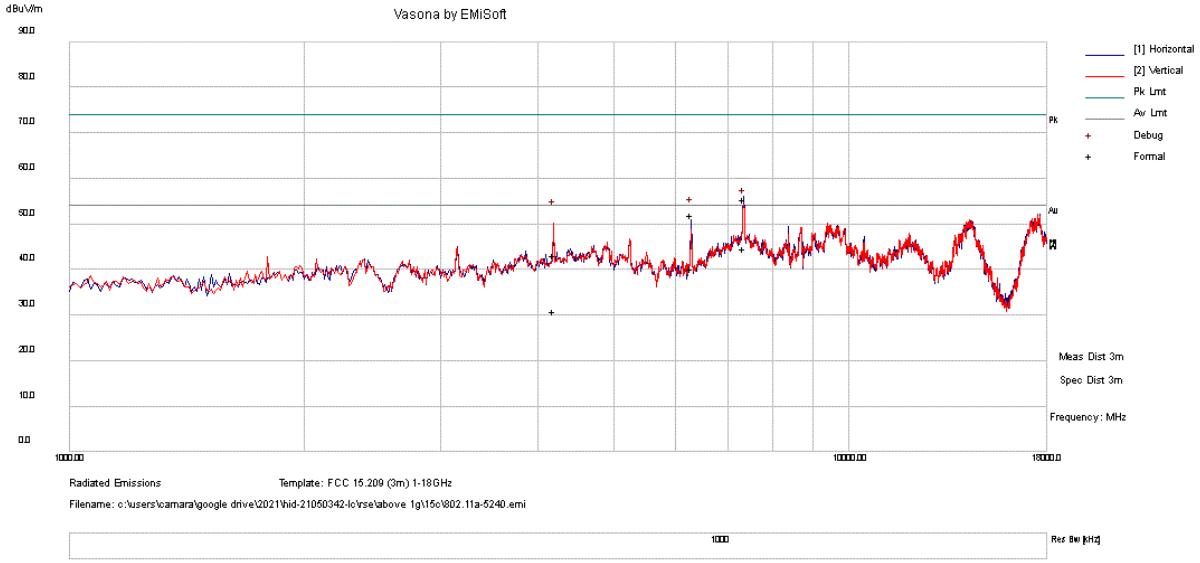


No.	Frequency MHz	Raw dBuV	Cable Loss dB	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	7414.258	23.3	19	11.2	53.5	Peak Max	V	112	97	74	-20.5	Pass
2	8708.163	18.8	23.1	7.6	49.5	Peak Max	H	249	360	74	-24.5	Pass
3	5991.507	21.7	18.4	7.6	47.7	Peak Max	V	152	0	74	-26.3	Pass
4	7414.258	10.6	19	11.2	40.8	Average Max	V	112	97	54	-13.2	Pass
5	8708.163	7.2	23.1	7.6	37.9	Average Max	H	249	360	54	-16.1	Pass
6	5991.507	10.4	18.4	7.6	36.4	Average Max	V	152	0	54	-17.6	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)

Test Standard:	FCC15.247, 15.209, RSS-247	Mode:	RSE-Above 1GHz-802.11a
Frequency Range:	1 GHz - 18 GHz	Test Date:	04/11/2022-04/12/2022
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Devin Tai
Remark:	Ch 48	Test Result:	Pass

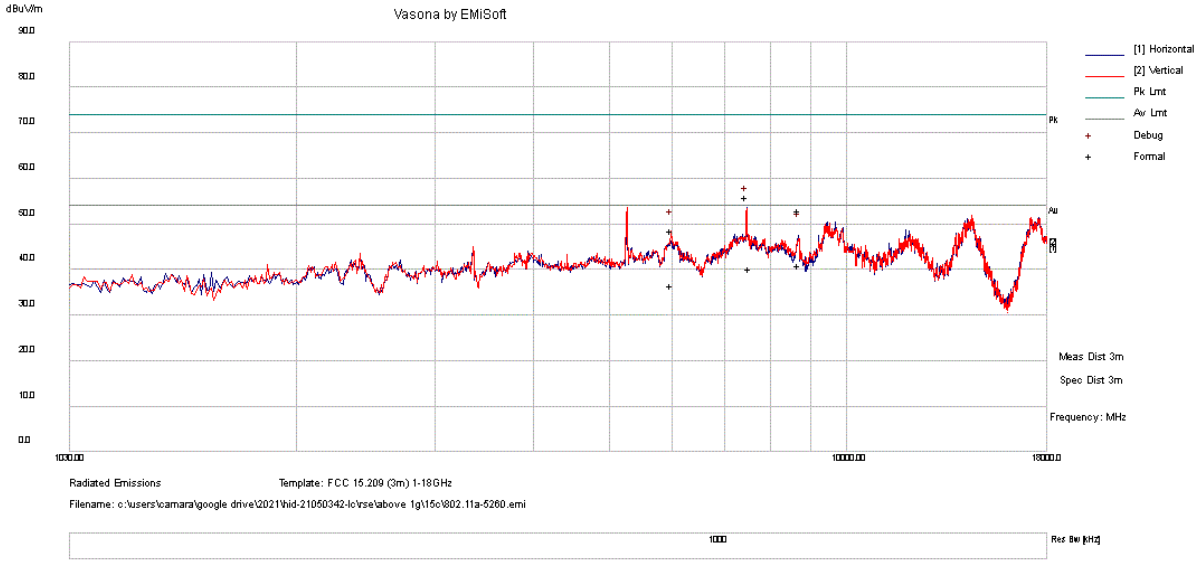


No.	Frequency MHz	Raw dBuV	Cable Loss dB	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	7343.355	34.4	11.9	5.4	51.7	Peak Max	H	205	97	74	-22.3	Pass
2	6291.478	37	10.5	4.5	52	Peak Max	H	102	201	74	-22	Pass
3	4188.358	34	8.1	1	43.1	Peak Max	V	268	208	74	-30.9	Pass
4	7343.355	27.5	11.9	5.4	44.8	Average Max	H	205	97	54	-9.2	Pass
5	6291.478	25.3	10.5	4.5	40.3	Average Max	H	102	201	54	-13.7	Pass
6	4188.358	21.7	8.1	1	30.8	Average Max	V	268	208	54	-23.2	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)

Test Standard:	FCC15.247, 15.209, RSS-247	Mode:	RSE-Above 1GHz-802.11a
Frequency Range:	1 GHz - 18 GHz	Test Date:	04/11/2022-04/12/2022
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Devin Tai
Remark:	Ch 52	Test Result:	Pass

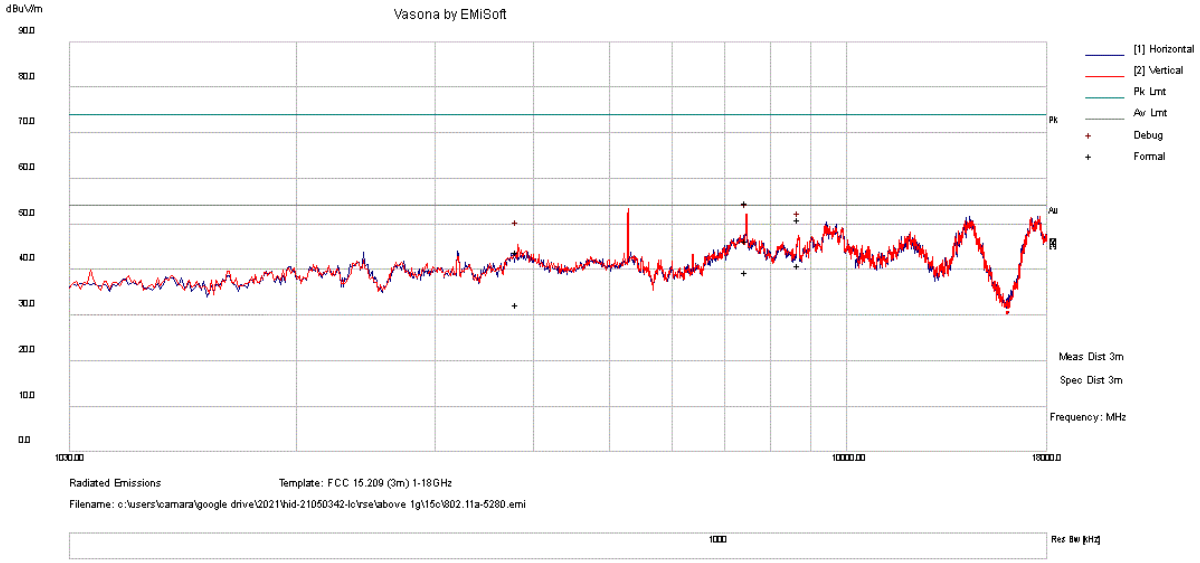


No.	Frequency MHz	Raw dBuV	Cable Loss dB	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	7531.726	22.5	18.8	11.6	52.9	Peak Max	V	378	98	74	-21.1	Pass
2	5994.948	22.4	18.5	7.7	48.6	Peak Max	V	126	0	74	-25.4	Pass
3	8700.136	22	23.5	7.6	53.1	Peak Max	H	348	28	74	-20.9	Pass
4	7531.726	9.9	18.8	11.6	40.3	Average Max	V	378	98	54	-13.7	Pass
5	5994.948	10.4	18.5	7.7	36.6	Average Max	V	126	0	54	-17.4	Pass
6	8700.136	9.9	23.5	7.6	41	Average Max	H	348	28	54	-13	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)

Test Standard:	FCC15.247, 15.209, RSS-247	Mode:	RSE-Above 1GHz-802.11a
Frequency Range:	1 GHz - 18 GHz	Test Date:	04/11/2022-04/12/2022
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Devin Tai
Remark:	Ch 56	Test Result:	Pass

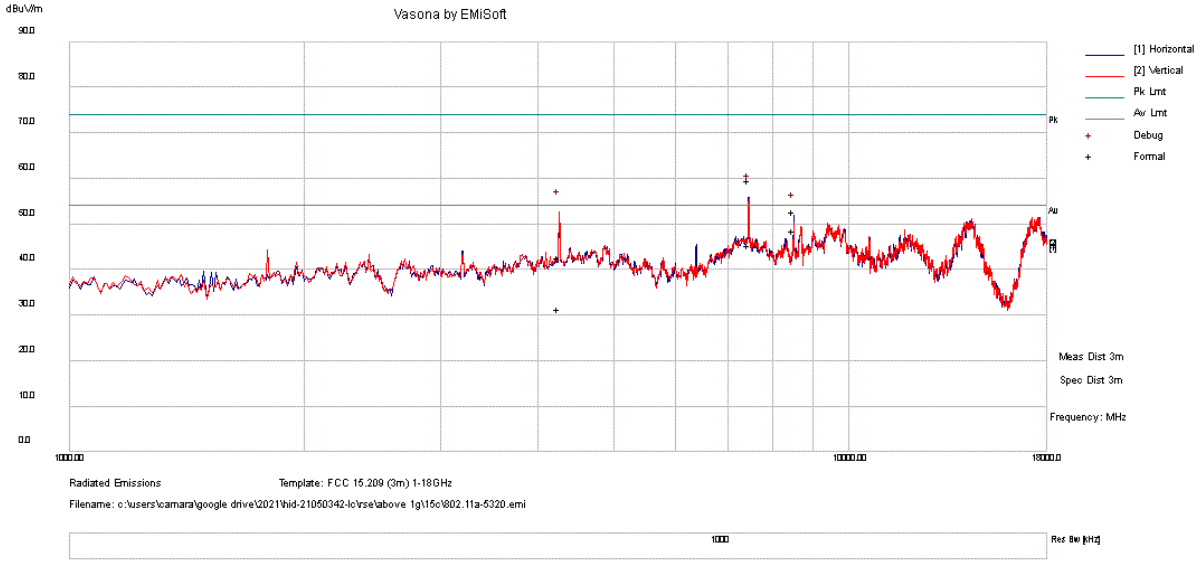


No.	Frequency MHz	Raw dBuV	Cable Loss dB	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	7456.74	24.1	19	11.5	54.6	Peak Max	H	324	203	74	-19.4	Pass
2	8698.759	20.2	23.4	7.6	51.2	Peak Max	V	349	116	74	-22.8	Pass
3	3817.781	25.8	16.2	1.8	43.8	Peak Max	V	166	311	74	-30.2	Pass
4	7456.74	9.2	19	11.5	39.7	Average Max	H	324	203	54	-14.3	Pass
5	8698.759	10	23.4	7.6	41	Average Max	V	349	116	54	-13	Pass
6	3817.781	14.3	16.2	1.8	32.3	Average Max	V	166	311	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)

Test Standard:	FCC15.247, 15.209, RSS-247	Mode:	RSE-Above 1GHz-802.11a
Frequency Range:	1 GHz - 18 GHz	Test Date:	04/11/2022-04/12/2022
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Devin Tai
Remark:	Ch 60	Test Result:	Pass

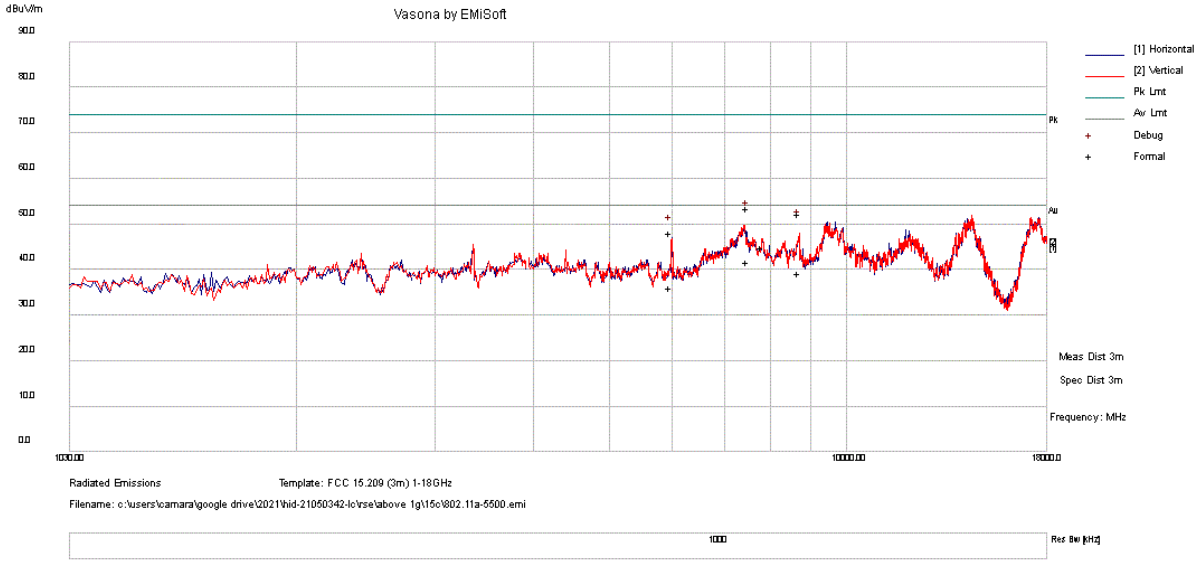


No.	Frequency MHz	Raw dBuV	Cable Loss dB	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	7447.55	42.6	11.9	5.1	59.6	Peak Max	H	206	64	74	-14.4	Pass
2	4251.673	33.4	8.3	1.2	42.9	Peak Max	V	239	101	74	-31.1	Pass
3	8512	34.5	12.9	5.3	52.7	Peak Max	H	174	30	74	-21.3	Pass
4	7447.55	28.5	11.9	5.1	45.5	Average Max	H	206	64	54	-8.5	Pass
5	4251.673	21.9	8.3	1.2	31.4	Average Max	V	239	101	54	-22.6	Pass
6	8512	30.3	12.9	5.3	48.5	Average Max	H	174	30	54	-5.5	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)

Test Standard:	FCC15.247, 15.209, RSS-247	Mode:	RSE-Above 1GHz-802.11a
Frequency Range:	1 GHz - 18 GHz	Test Date:	04/11/2022-04/12/2022
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Devin Tai
Remark:	Ch 100	Test Result:	Pass

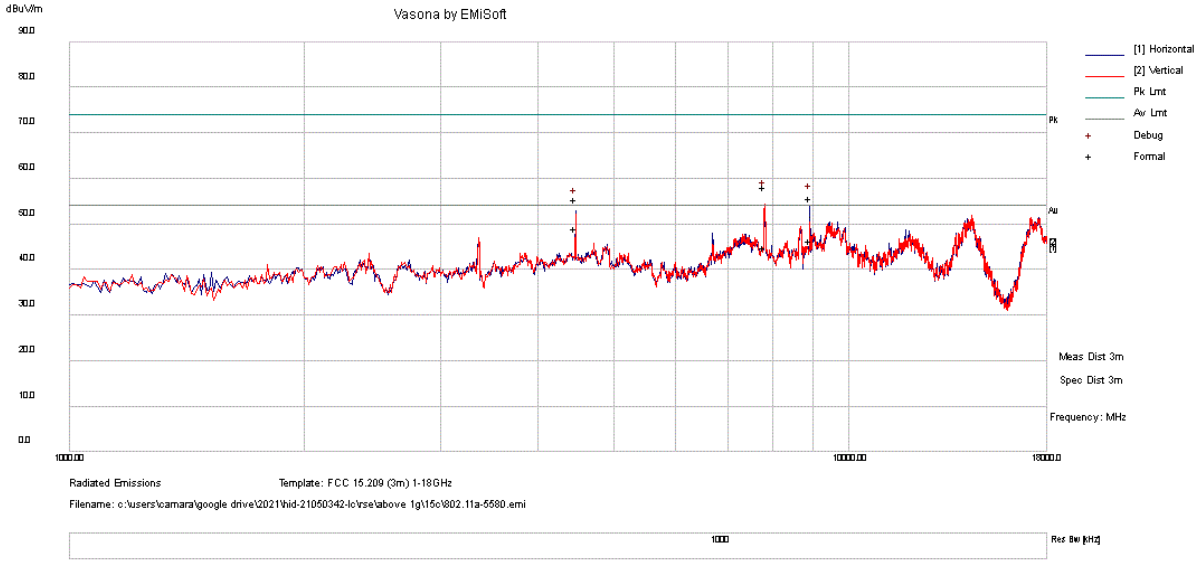


No.	Frequency MHz	Raw dBuV	Cable Loss dB	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	7500.715	22.8	19	11.8	53.6	Peak Max	V	162	0	74	-20.4	Pass
2	8707.955	21.8	23.1	7.6	52.5	Peak Max	V	182	179	74	-21.5	Pass
3	5973.714	22.4	18.3	7.4	48.1	Peak Max	H	160	325	74	-25.9	Pass
4	7500.715	10.9	19	11.8	41.7	Average Max	V	162	0	54	-12.3	Pass
5	8707.955	8.6	23.1	7.6	39.3	Average Max	V	182	179	54	-14.7	Pass
6	5973.714	10.4	18.3	7.4	36.1	Average Max	H	160	325	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)

Test Standard:	FCC15.247, 15.209, RSS-247	Mode:	RSE-Above 1GHz-802.11a
Frequency Range:	1 GHz - 18 GHz	Test Date:	04/11/2022-04/12/2022
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Devin Tai
Remark:	Ch 116	Test Result:	Pass

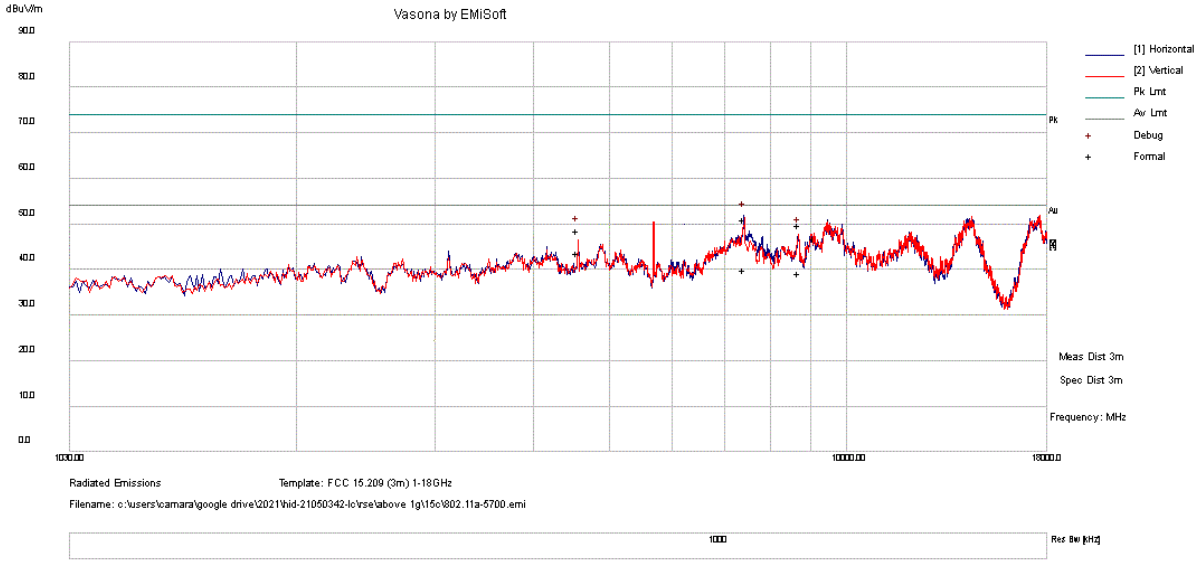


No.	Frequency MHz	Raw dBuV	Cable Loss dB	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	7811.283	41.1	12.5	4.7	58.3	Peak Max	V	108	229	74	-15.7	Pass
2	8928.038	36	13.5	6.4	55.9	Peak Max	H	174	0	74	-18.1	Pass
3	4463.97	45	8.6	1.9	55.5	Peak Max	H	167	134	74	-18.5	Pass
4	7811.283	27.7	12.5	4.7	44.9	Average Max	V	108	229	54	-9.1	Pass
5	8928.038	26	13.5	6.4	45.9	Average Max	H	174	0	54	-8.1	Pass
6	4463.97	37.8	8.6	1.9	48.3	Average Max	H	167	134	54	-5.7	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)

Test Standard:	FCC15.247, 15.209, RSS-247	Mode:	RSE-Above 1GHz-802.11a
Frequency Range:	1 GHz - 18 GHz	Test Date:	04/11/2022-04/12/2022
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Devin Tai
Remark:	Ch 140	Test Result:	Pass

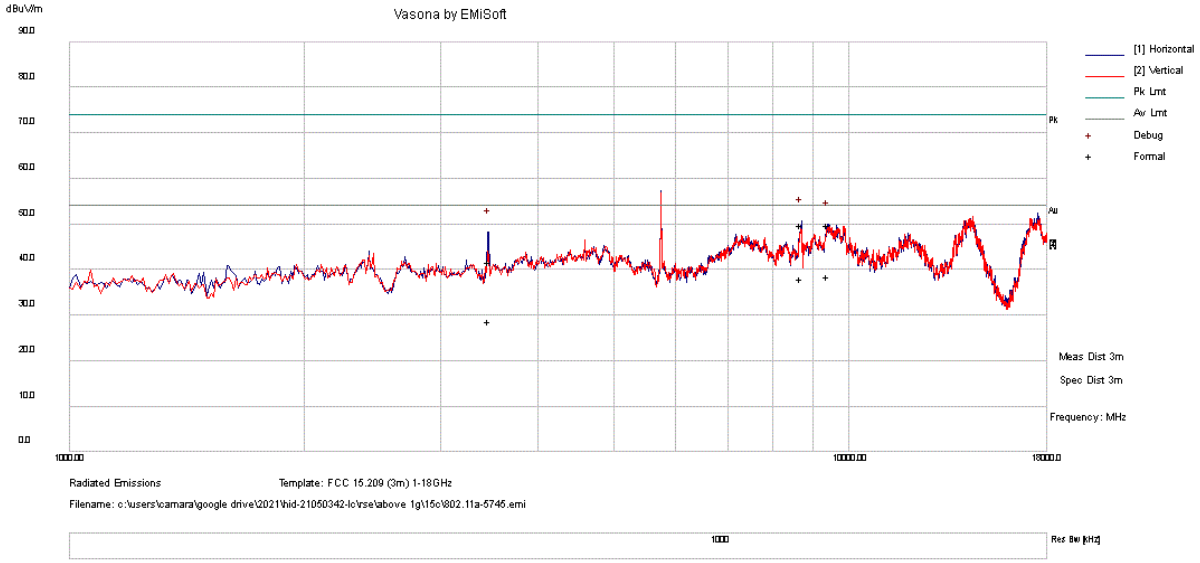


No.	Frequency MHz	Raw dBuV	Cable Loss dB	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	7405.851	21	18.9	11.1	51	Peak Max	V	100	41	74	-23	Pass
2	4560.049	31.5	16.9	0.3	48.7	Peak Max	V	100	144	74	-25.3	Pass
3	8696.329	19.1	23.3	7.6	50	Peak Max	V	378	192	74	-24	Pass
4	7405.851	10	18.9	11.1	40	Average Max	V	100	41	54	-14	Pass
5	4560.049	26.4	16.9	0.3	43.6	Average Max	V	100	144	54	-10.4	Pass
6	8696.329	8.5	23.3	7.6	39.4	Average Max	V	378	192	54	-14.6	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)

Test Standard:	FCC15.247, 15.209, RSS-247	Mode:	RSE-Above 1GHz-802.11a
Frequency Range:	1 GHz - 18 GHz	Test Date:	04/11/2022-04/12/2022
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Devin Tai
Remark:	Ch 149	Test Result:	Pass

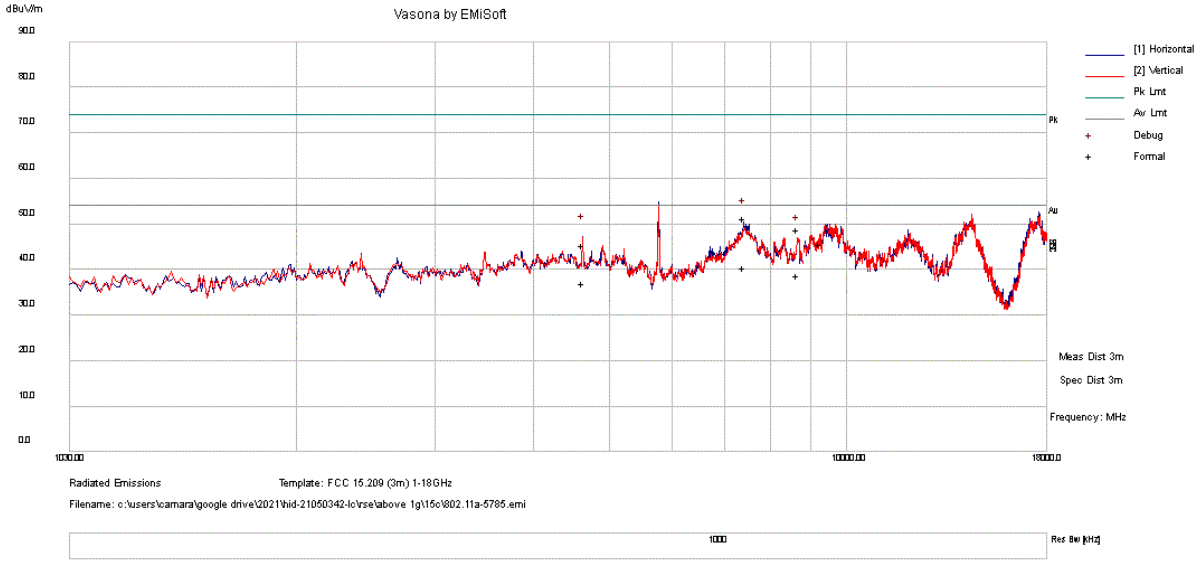


No.	Frequency MHz	Raw dBuV	Cable Loss dB	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	8701.725	26.8	17.9	5	49.7	Peak Max	H	315	5	74	-24.3	Pass
2	9403.645	28.1	14.7	7.1	49.9	Peak Max	H	100	265	74	-24.1	Pass
3	3454.88	34.6	7.6	-0.5	41.7	Peak Max	H	365	222	74	-32.3	Pass
4	8701.725	15.3	17.9	5	38.2	Average Max	H	315	5	54	-15.8	Pass
5	9403.645	16.7	14.7	7.1	38.5	Average Max	H	100	265	54	-15.5	Pass
6	3454.88	21.6	7.6	-0.5	28.7	Average Max	H	365	222	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)

Test Standard:	FCC15.247, 15.209, RSS-247	Mode:	RSE-Above 1GHz-802.11a
Frequency Range:	1 GHz - 18 GHz	Test Date:	04/11/2022-04/12/2022
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Devin Tai
Remark:	Ch 157	Test Result:	Pass

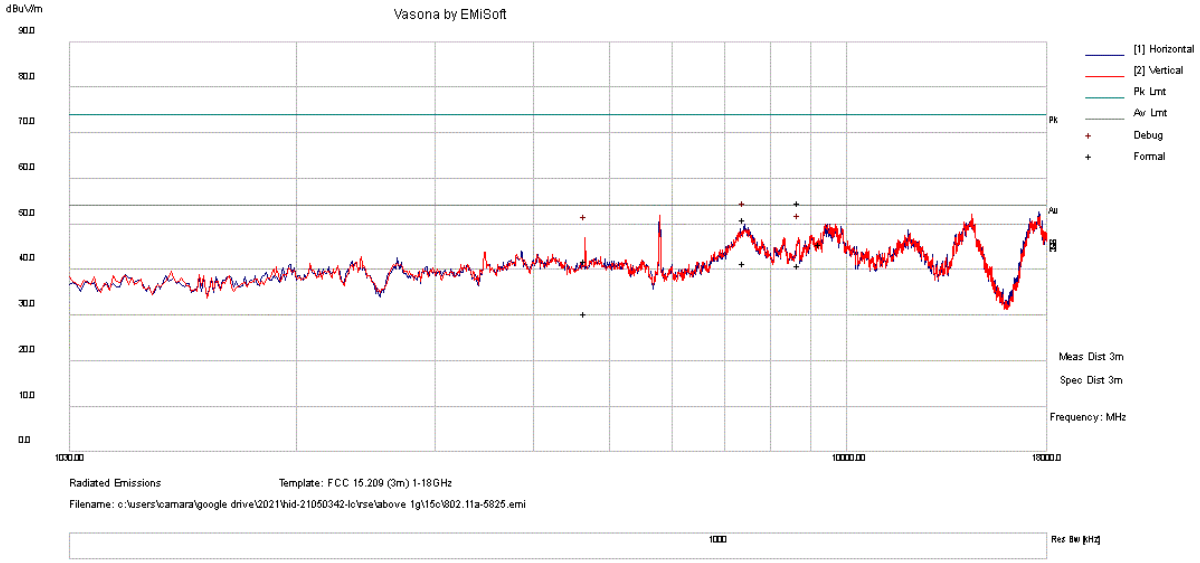


No.	Frequency MHz	Raw dBuV	Cable Loss dB	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	7413.118	21.2	19	11.2	51.4	Peak Max	H	100	18	74	-22.6	Pass
2	4627.476	27.9	16.9	0.6	45.4	Peak Max	H	185	265	74	-28.6	Pass
3	8678.556	18.8	22.5	7.6	48.9	Peak Max	V	258	107	74	-25.1	Pass
4	7413.118	10.3	19	11.2	40.5	Average Max	H	100	18	54	-13.5	Pass
5	4627.476	19.5	16.9	0.6	37	Average Max	H	185	265	54	-17	Pass
6	8678.556	8.5	22.5	7.6	38.6	Average Max	V	258	107	54	-15.4	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)

Test Standard:	FCC15.247, 15.209, RSS-247	Mode:	RSE-Above 1GHz-802.11a
Frequency Range:	1 GHz - 18 GHz	Test Date:	04/11/2022-04/12/2022
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Devin Tai
Remark:	Ch 165	Test Result:	Pass

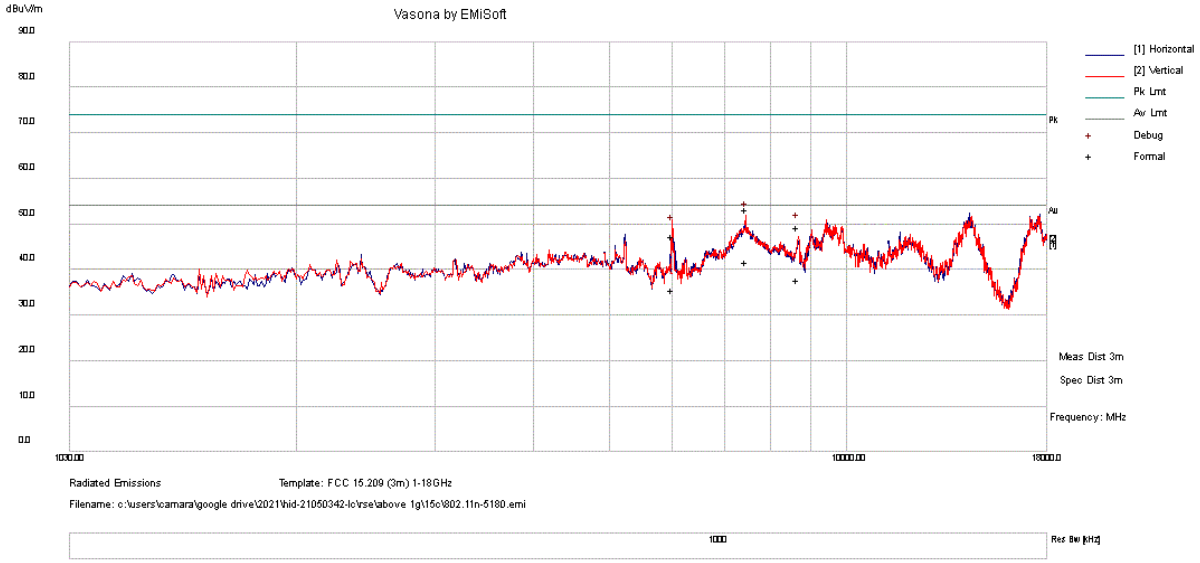


No.	Frequency MHz	Raw dBuV	Cable Loss dB	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	7424.504	21	19	11.2	51.2	Peak Max	H	346	69	74	-22.8	Pass
2	8697.771	23.9	23.4	7.6	54.9	Peak Max	V	180	11	74	-19.1	Pass
3	4656.518	24.3	17	0.6	41.9	Peak Max	V	103	24	74	-32.1	Pass
4	7424.504	11.3	19	11.2	41.5	Average Max	H	346	69	54	-12.5	Pass
5	8697.771	9.9	23.4	7.6	40.9	Average Max	V	180	11	54	-13.1	Pass
6	4656.518	12.8	17	0.6	30.4	Average Max	V	103	24	54	-23.6	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)

Test Standard:	FCC15.247, 15.209, RSS-247	Mode:	RSE-Above 1GHz-802.11n
Frequency Range:	1 GHz - 18 GHz	Test Date:	04/11/2022-04/12/2022
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Devin Tai
Remark:	Ch 36	Test Result:	Pass

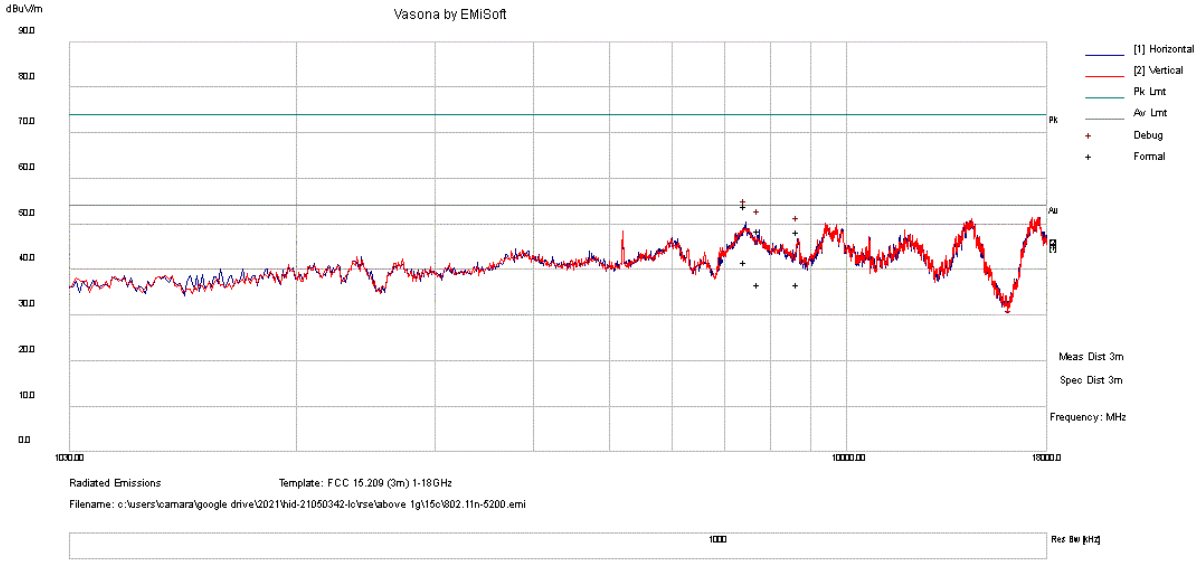


No.	Frequency MHz	Raw dBuV	Cable Loss dB	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	7458.503	22.8	19	11.5	53.3	Peak Max	V	184	351	74	-20.7	Pass
2	8688.783	18.8	23	7.6	49.4	Peak Max	V	248	2	74	-24.6	Pass
3	6005.913	21.2	18.4	7.7	47.3	Peak Max	V	229	0	74	-26.7	Pass
4	7458.503	11.2	19	11.5	41.7	Average Max	V	184	351	54	-12.3	Pass
5	8688.783	7.2	23	7.6	37.8	Average Max	V	248	2	54	-16.2	Pass
6	6005.913	9.4	18.4	7.7	35.5	Average Max	V	229	0	54	-18.5	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)

Test Standard:	FCC15.247, 15.209, RSS-247	Mode:	RSE-Above 1GHz-802.11n
Frequency Range:	1 GHz - 18 GHz	Test Date:	04/11/2022-04/12/2022
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Devin Tai
Remark:	Ch 40	Test Result:	Pass

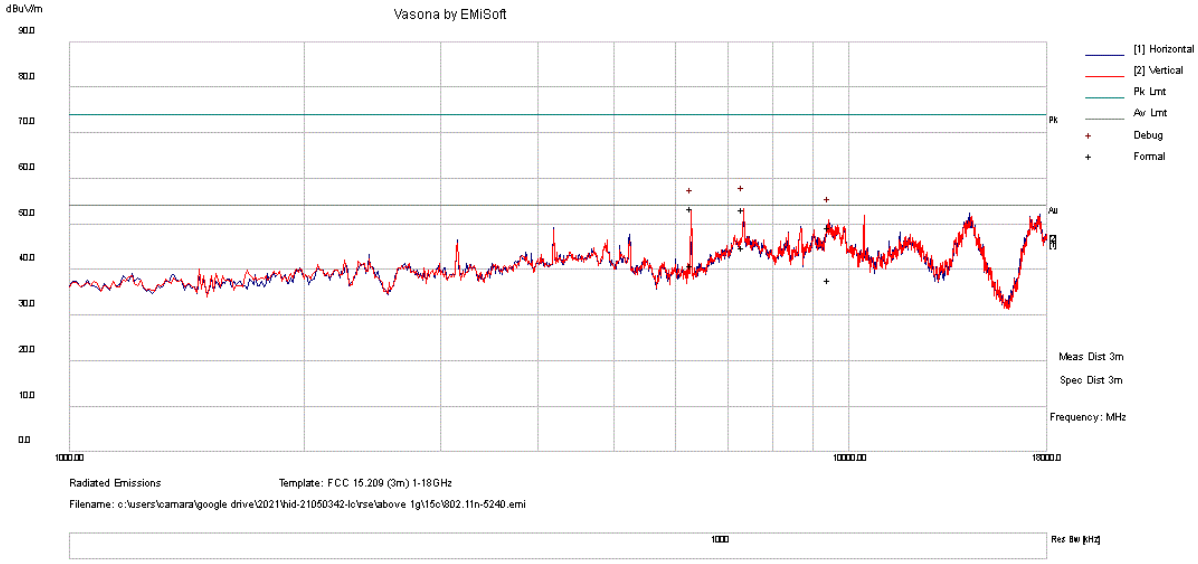


No.	Frequency MHz	Raw dBuV	Cable Loss dB	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	7446.971	23.5	19	11.4	53.9	Peak Max	H	302	0	74	-20.1	Pass
2	7744.712	19.7	18.7	10.2	48.6	Peak Max	H	209	327	74	-25.4	Pass
3	8678.854	18.3	22.5	7.6	48.4	Peak Max	H	370	336	74	-25.6	Pass
4	7446.971	11.2	19	11.4	41.6	Average Max	H	302	0	54	-12.4	Pass
5	7744.712	7.9	18.7	10.2	36.8	Average Max	H	209	327	54	-17.2	Pass
6	8678.854	6.6	22.5	7.6	36.7	Average Max	H	370	336	54	-17.3	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)

Test Standard:	FCC15.247, 15.209, RSS-247	Mode:	RSE-Above 1GHz-802.11n
Frequency Range:	1 GHz - 18 GHz	Test Date:	04/11/2022-04/12/2022
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Devin Tai
Remark:	Ch 48	Test Result:	Pass

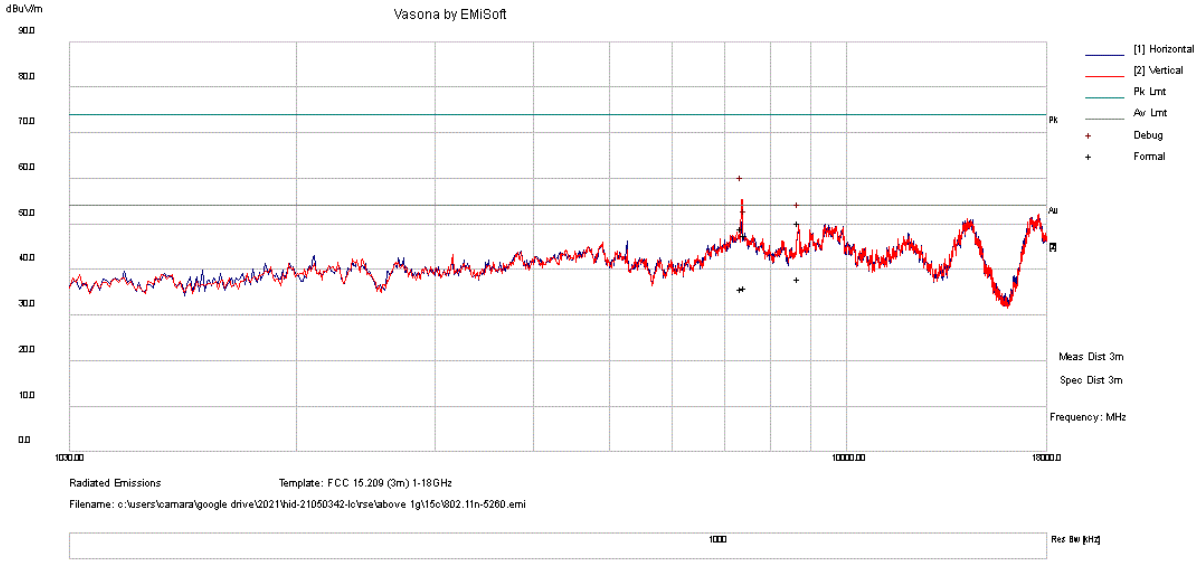


No.	Frequency MHz	Raw dBuV	Cable Loss dB	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	7331.07	36.4	11.9	5.3	53.6	Peak Max	V	249	188	74	-20.4	Pass
2	6290.15	38.4	10.5	4.5	53.4	Peak Max	V	210	224	74	-20.6	Pass
3	9436.655	27.6	14.4	7.4	49.4	Peak Max	V	309	14	74	-24.6	Pass
4	7331.07	23.6	11.9	5.3	40.8	Average Max	V	249	188	54	-13.2	Pass
5	6290.15	26	10.5	4.5	41	Average Max	V	210	224	54	-13	Pass
6	9436.655	16	14.4	7.4	37.8	Average Max	V	309	14	54	-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)

Test Standard:	FCC15.247, 15.209, RSS-247	Mode:	RSE-Above 1GHz-802.11n
Frequency Range:	1 GHz - 18 GHz	Test Date:	04/11/2022-04/12/2022
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Devin Tai
Remark:	Ch 52	Test Result:	Pass

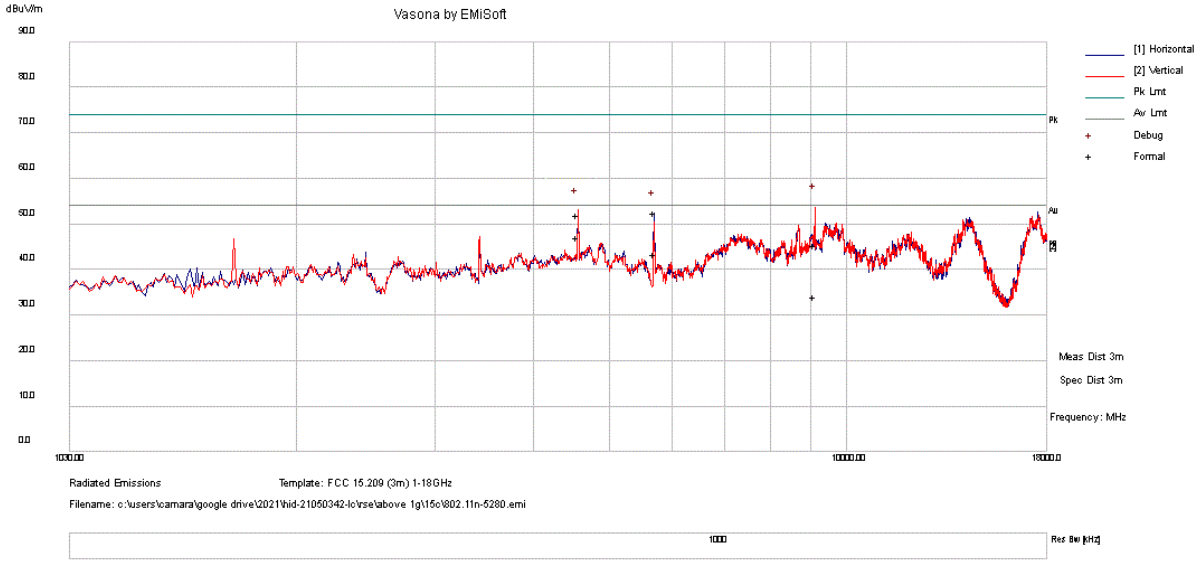


No.	Frequency MHz	Raw dBuV	Cable Loss dB	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	7363.336	31.6	11.9	5.5	49	Peak Max	V	172	249	74	-25	Pass
2	8697.421	27.6	17.8	5	50.4	Peak Max	V	250	0	74	-23.6	Pass
3	7436.59	30.4	11.9	5.3	47.6	Peak Max	H	100	297	74	-26.4	Pass
4	7363.336	18.3	11.9	5.5	35.7	Average Max	V	172	249	54	-18.3	Pass
5	8697.421	15.3	17.8	5	38.1	Average Max	V	250	0	54	-15.9	Pass
6	7436.59	19	11.9	5.3	36.2	Average Max	H	100	297	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)

Test Standard:	FCC15.247, 15.209, RSS-247	Mode:	RSE-Above 1GHz-802.11n
Frequency Range:	1 GHz - 18 GHz	Test Date:	04/11/2022-04/12/2022
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Devin Tai
Remark:	Ch 56	Test Result:	Pass

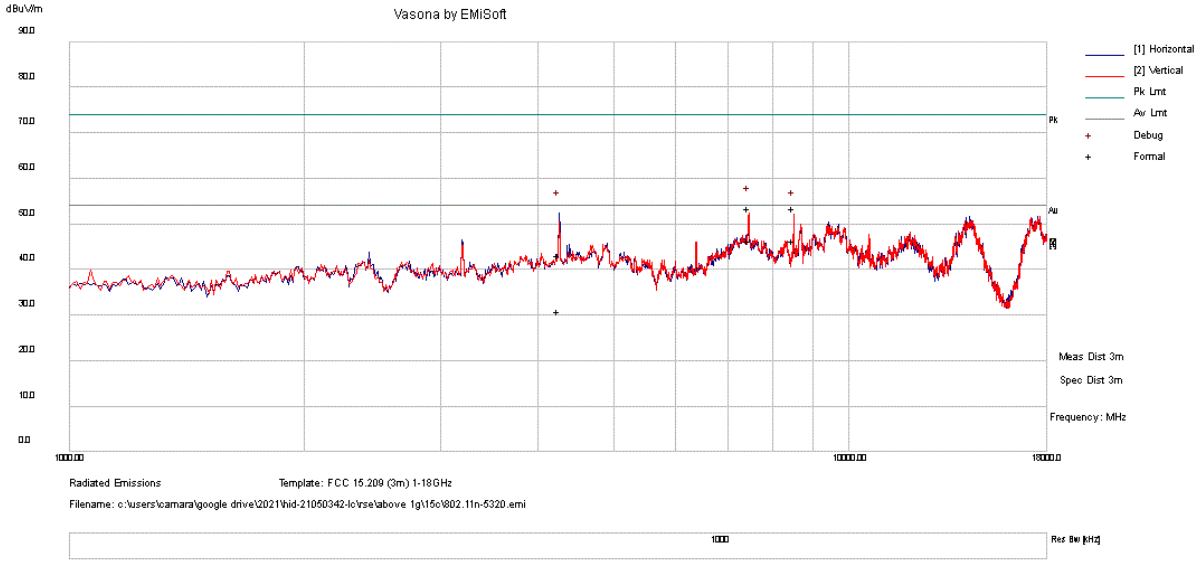


No.	Frequency MHz	Raw dBuV	Cable Loss dB	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	4560.089	41.7	8.8	1.7	52.2	Peak Max	H	109	239	74	-21.8	Pass
2	9122.014	26.7	13.8	5	45.5	Peak Max	V	348	238	74	-28.5	Pass
3	5698.64	38.8	10	3.9	52.7	Peak Max	H	102	226	74	-21.3	Pass
4	4560.089	36.3	8.8	1.7	46.8	Average Max	H	109	239	54	-7.2	Pass
5	9122.014	15.2	13.8	5	34	Average Max	V	348	238	54	-20	Pass
6	5698.64	29.7	10	3.9	43.6	Average Max	H	102	226	54	-10.4	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)

Test Standard:	FCC15.247, 15.209, RSS-247	Mode:	RSE-Above 1GHz-802.11n
Frequency Range:	1 GHz - 18 GHz	Test Date:	04/11/2022-04/12/2022
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Devin Tai
Remark:	Ch 64	Test Result:	Pass

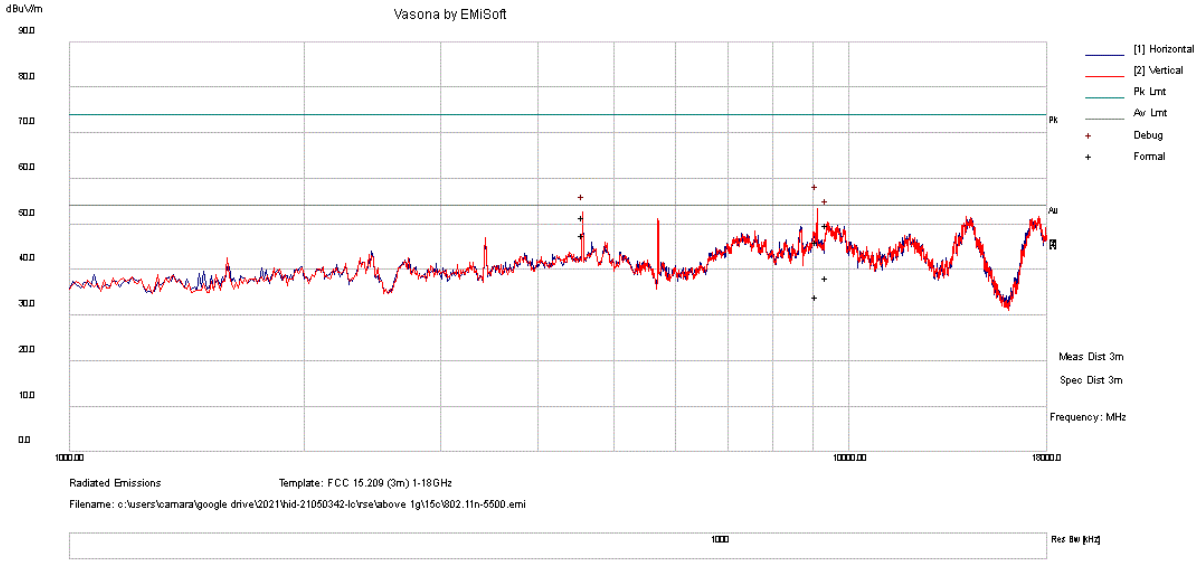


No.	Frequency MHz	Raw dBuV	Cable Loss dB	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	7449.338	36.6	11.9	5.1	53.6	Peak Max	V	137	0	74	-20.4	Pass
2	4250.428	33.7	8.3	1.2	43.2	Peak Max	H	140	180	74	-30.8	Pass
3	8512.05	35.3	12.9	5.3	53.5	Peak Max	V	117	7	74	-20.5	Pass
4	7449.338	29.4	11.9	5.1	46.4	Average Max	V	137	0	54	-7.6	Pass
5	4250.428	21.5	8.3	1.2	31	Average Max	H	140	180	54	-23	Pass
6	8512.05	28.3	12.9	5.3	46.5	Average Max	V	117	7	54	-7.5	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)

Test Standard:	FCC15.247, 15.209, RSS-247	Mode:	RSE-Above 1GHz-802.11n
Frequency Range:	1 GHz - 18 GHz	Test Date:	04/11/2022-04/12/2022
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Devin Tai
Remark:	Ch 100	Test Result:	Pass

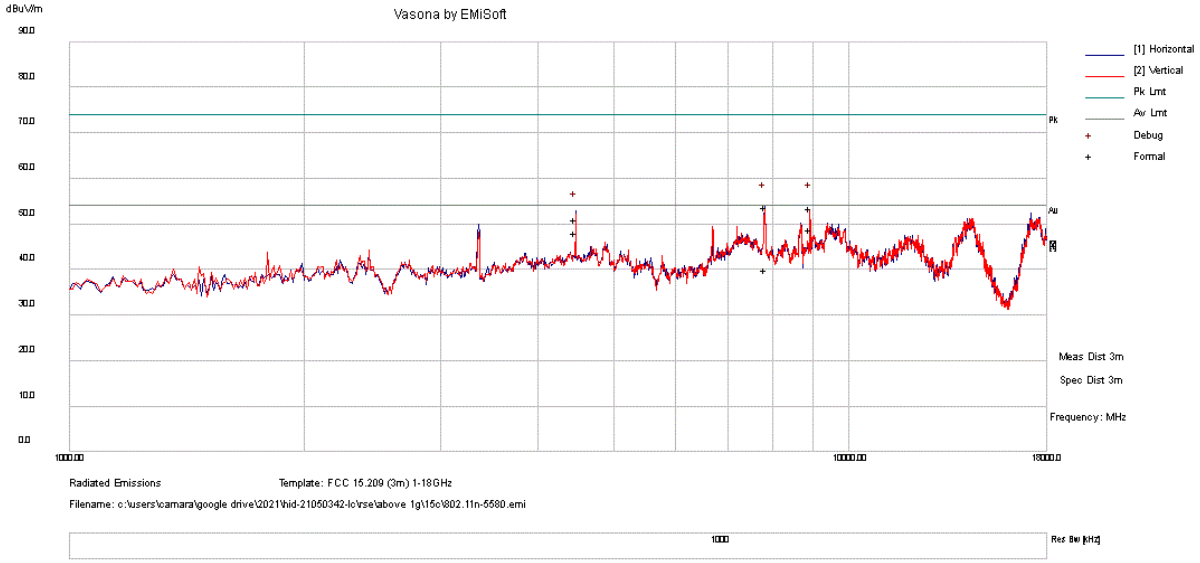


No.	Frequency MHz	Raw dBuV	Cable Loss dB	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	4559.98	41.3	8.8	1.7	51.8	Peak Max	H	106	240	74	-22.2	Pass
2	9117.3	27.3	13.8	5	46.1	Peak Max	V	132	243	74	-27.9	Pass
3	9393.273	28.1	14.6	7	49.7	Peak Max	V	100	36	74	-24.3	Pass
4	4559.98	36.4	8.8	1.7	46.9	Average Max	H	106	240	54	-7.1	Pass
5	9117.3	15.2	13.8	5	34	Average Max	V	132	243	54	-20	Pass
6	9393.273	16.7	14.6	7	38.3	Average Max	V	100	36	54	-15.7	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)

Test Standard:	FCC15.247, 15.209, RSS-247	Mode:	RSE-Above 1GHz-802.11n
Frequency Range:	1 GHz - 18 GHz	Test Date:	04/11/2022-04/12/2022
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Devin Tai
Remark:	Ch 116	Test Result:	Pass

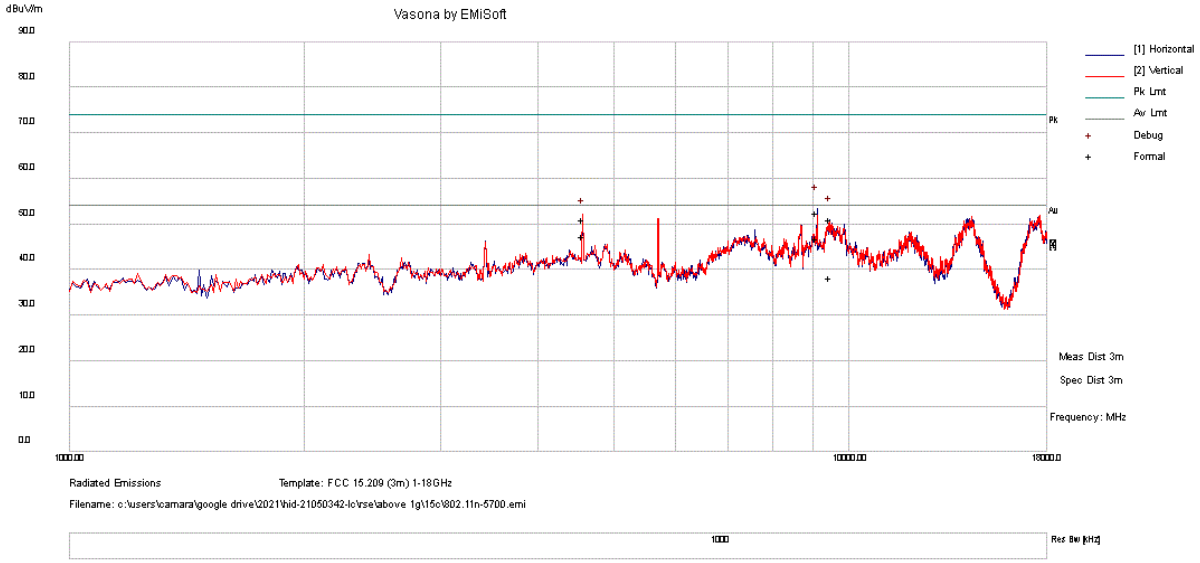


No.	Frequency MHz	Raw dBuV	Cable Loss dB	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	4463.875	39.7	8.6	1.9	50.2	Peak Max	H	160	120	74	-23.8	Pass
2	8927.95	34.5	13.5	6.4	54.4	Peak Max	V	114	10	74	-19.6	Pass
3	7812.108	36.7	12.5	4.7	53.9	Peak Max	H	128	184	74	-20.1	Pass
4	4463.875	36.8	8.6	1.9	47.3	Average Max	H	160	120	54	-6.7	Pass
5	8927.95	27.7	13.5	6.4	47.6	Average Max	V	114	10	54	-6.4	Pass
6	7812.108	22.9	12.5	4.7	40.1	Average Max	H	128	184	54	-13.9	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)

Test Standard:	FCC15.247, 15.209, RSS-247	Mode:	RSE-Above 1GHz-802.11n
Frequency Range:	1 GHz - 18 GHz	Test Date:	04/11/2022-04/12/2022
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Devin Tai
Remark:	Ch 140	Test Result:	Pass

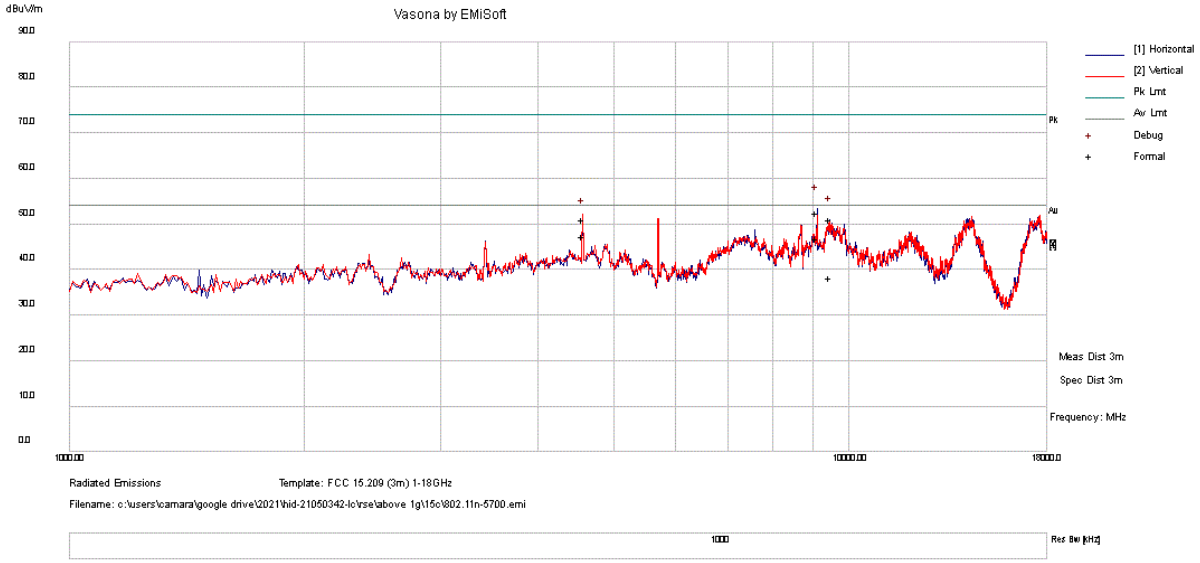


No.	Frequency MHz	Raw dBuV	Cable Loss dB	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	4560.005	39.8	8.8	1.7	50.3	Peak Max	V	166	230	74	-23.7	Pass
2	9119.493	33.7	13.8	5	52.5	Peak Max	H	147	313	74	-21.5	Pass
3	9469.515	29.4	14.1	7.6	51.1	Peak Max	H	213	26	74	-22.9	Pass
4	4560.005	36	8.8	1.7	46.5	Average Max	V	166	230	54	-7.5	Pass
5	9119.493	28	13.8	5	46.8	Average Max	H	147	313	54	-7.2	Pass
6	9469.515	16.7	14.1	7.6	38.4	Average Max	H	213	26	54	-15.6	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)

Test Standard:	FCC15.247, 15.209, RSS-247	Mode:	RSE-Above 1GHz-802.11n
Frequency Range:	1 GHz - 18 GHz	Test Date:	04/11/2022-04/12/2022
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Devin Tai
Remark:	Ch 149	Test Result:	Pass

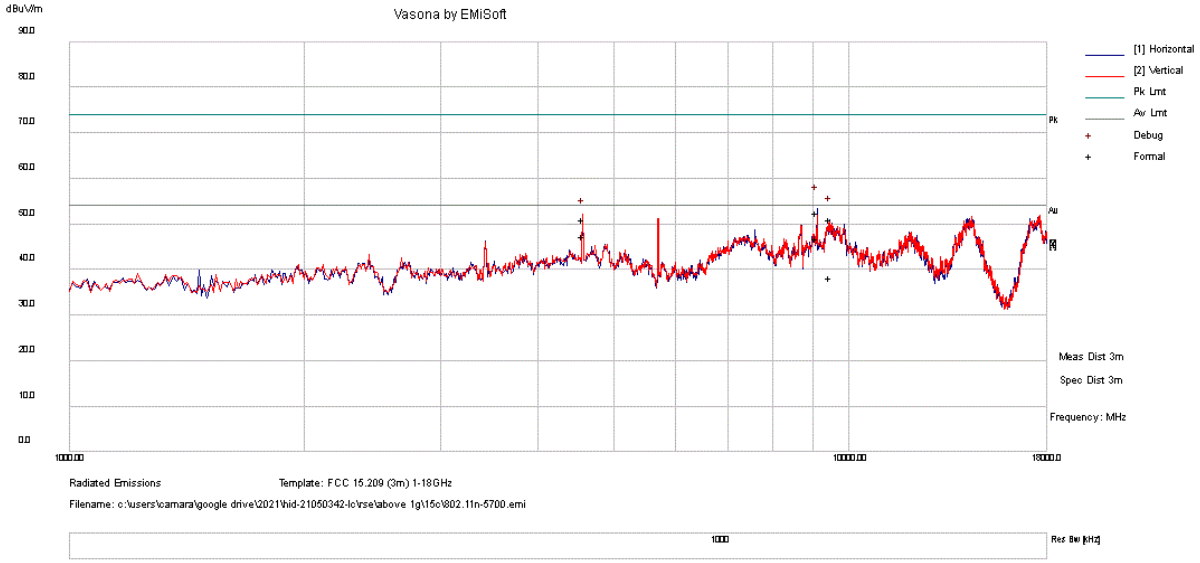


No.	Frequency MHz	Raw dBuV	Cable Loss dB	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	4596.07	41.8	8.8	1.7	52.3	Peak Max	H	100	110	74	-21.7	Pass
2	9191.805	33.3	14	4.8	52.1	Peak Max	V	165	10	74	-21.9	Pass
3	3445.268	45.9	7.5	-0.5	52.9	Peak Max	H	109	124	74	-21.1	Pass
4	4596.07	36.8	8.8	1.7	47.3	Average Max	H	100	110	54	-6.7	Pass
5	9191.805	27.3	14	4.8	46.1	Average Max	V	165	10	54	-7.9	Pass
6	3445.268	29.3	7.5	-0.5	36.3	Average Max	H	109	124	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)

Test Standard:	FCC15.247, 15.209, RSS-247	Mode:	RSE-Above 1GHz-802.11n
Frequency Range:	1 GHz - 18 GHz	Test Date:	04/11/2022-04/12/2022
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Devin Tai
Remark:	Ch 157	Test Result:	Pass

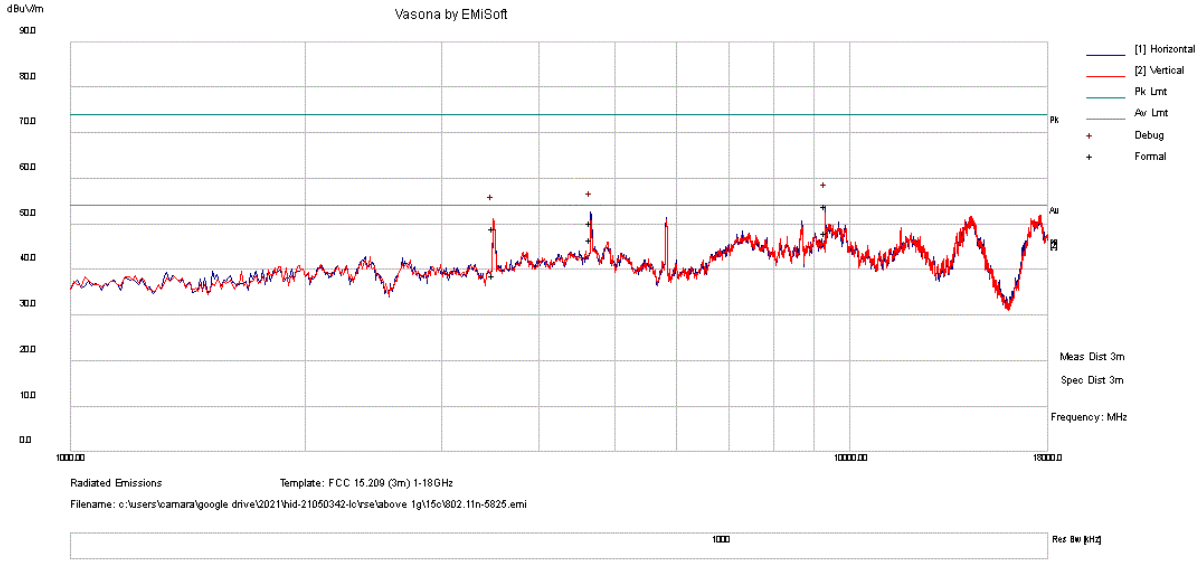


No.	Frequency MHz	Raw dBuV	Cable Loss dB	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	4628.793	39	8.8	1.9	49.7	Peak Max	H	275	300	74	-24.3	Pass
2	9257.495	27.1	13.9	4.8	45.8	Peak Max	H	104	96	74	-28.2	Pass
3	6941.328	28.6	11.6	5.3	45.5	Peak Max	V	147	160	74	-28.5	Pass
4	4628.793	36.5	8.8	1.9	47.2	Average Max	H	275	300	54	-6.8	Pass
5	9257.495	15.3	13.9	4.8	34	Average Max	H	104	96	54	-20	Pass
6	6941.328	16.9	11.6	5.3	33.8	Average Max	V	147	160	54	-20.2	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)

Test Standard:	FCC15.247, 15.209, RSS-247	Mode:	RSE-Above 1GHz-802.11n
Frequency Range:	1 GHz - 18 GHz	Test Date:	04/11/2022-04/12/2022
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Devin Tai
Remark:	Ch 165	Test Result:	Pass



No.	Frequency MHz	Raw dBuV	Cable Loss dB	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	4656.568	39.2	8.8	2	50	Peak Max	H	113	238	74	-24	Pass
2	9320.06	34.8	13.9	5.4	54.1	Peak Max	H	136	323	74	-19.9	Pass
3	3487.488	41.6	7.8	-0.3	49.1	Peak Max	V	130	176	74	-24.9	Pass
4	4656.568	35.7	8.8	2	46.5	Average Max	H	113	238	54	-7.5	Pass
5	9320.06	27.9	13.9	5.4	47.2	Average Max	H	136	323	54	-6.8	Pass
6	3487.488	31.2	7.8	-0.3	38.7	Average Max	V	130	176	54	-15.3	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)

18GHz – 40GHz test result

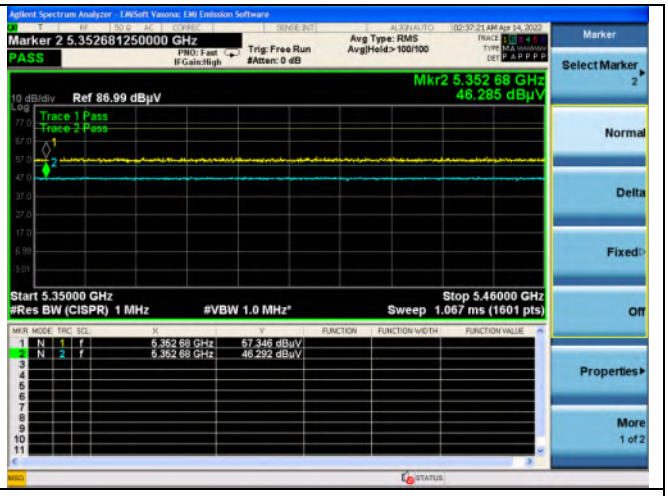
Note: no substantial emission is found other than the noise floor.

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

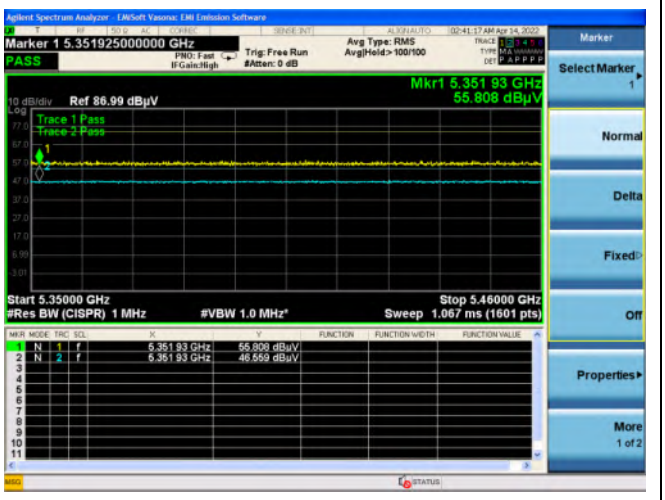
Test plots

Restricted Band -11a-5180MHz

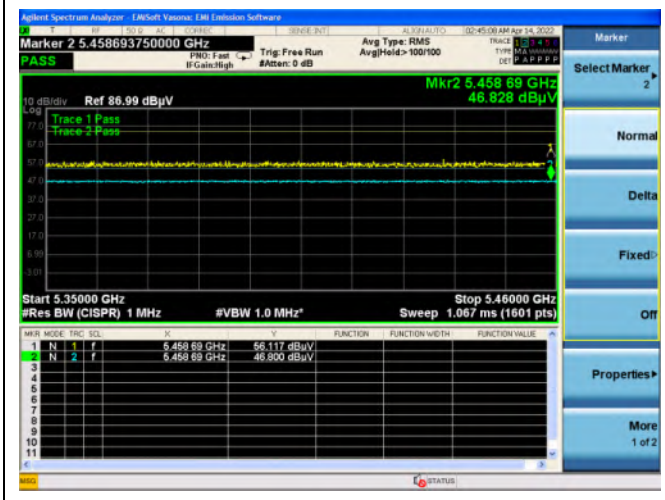


Restricted Band -11a-5320MHz

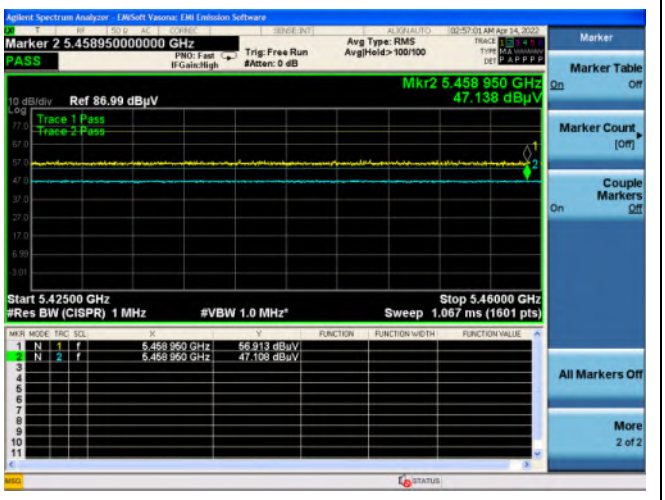
Restricted Band -11n-5180MHz



Restricted Band -11n-5320MHz



Restricted Band -11a-5500MHz



Restricted Band -11n-5500MHz

7.10 Conducted Emissions

7.10.1 Requirement

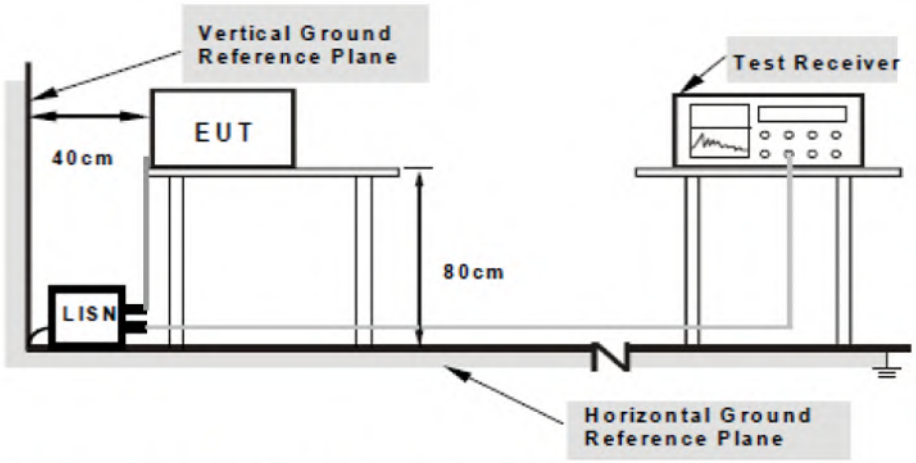
Per § 15.207 (a), RSS Gen 8.8

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



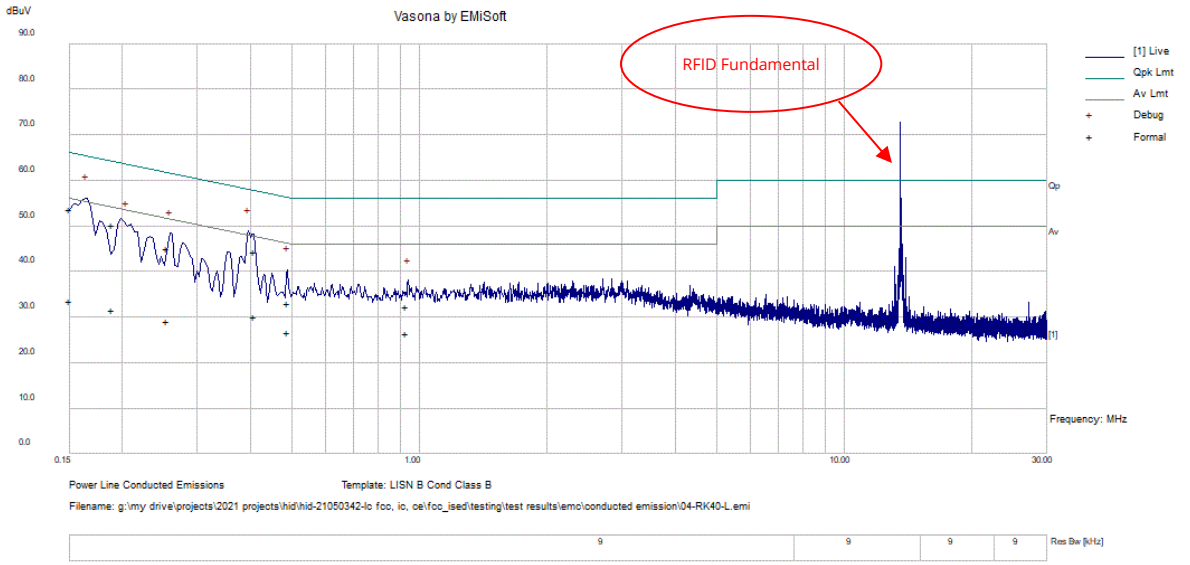
Note: 1.Support units were connected to second LISN.
2.Both of LISNs (AMN) are 80cm from EUT and at least 80cm from other units and other metal planes support units.

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 Live / 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 RSS Gen 8.8	Mode:	TX Mode
Frequency Range:	0.15-30MHz	Test Date:	03/14/2022
Antenna Type/Polarity:	N/A	Test Personnel:	Devin Tai
Remark:	Line 120VAC, 60Hz	Test Result:	Pass

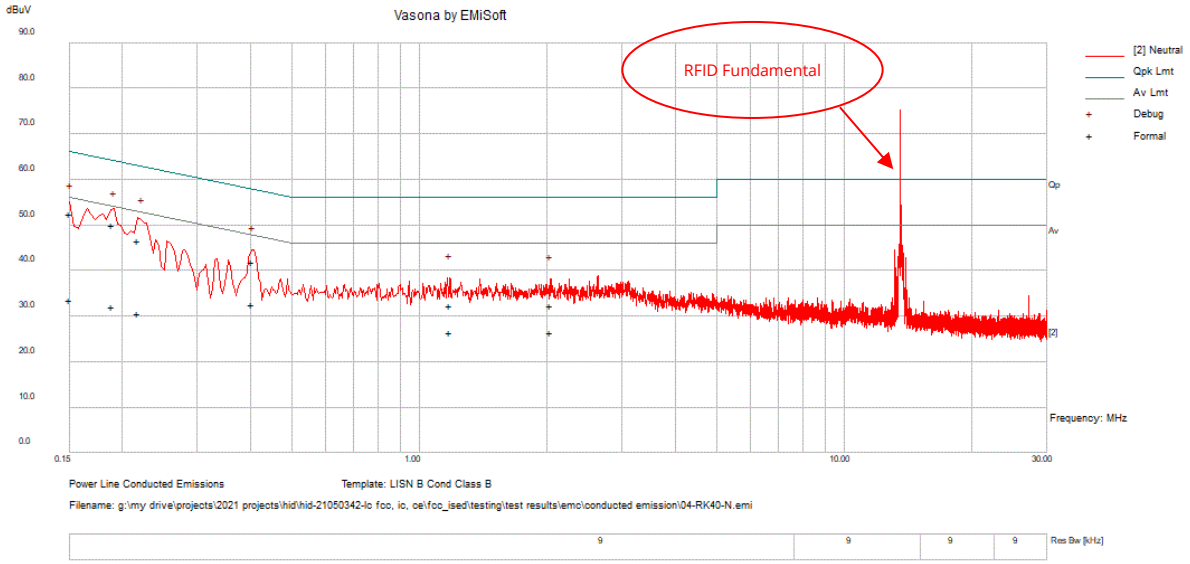


No.	Frequency (MHz)	Raw (dBuV)	Cable Loss (dB)	Factors (dB)	Level (dBuV)	Meas. Type	Line	Limit (dBuV)	Margin (dB)	Pass /Fail
1	0.409	34.3	10.1	0.1	44.5	Quasi Peak	Live	57.7	-13.2	Pass
2	0.15	43.5	10.1	0.2	53.8	Quasi Peak	Live	66	-12.2	Pass
3	0.254	35	10.1	0.2	45.3	Quasi Peak	Live	61.6	-16.3	Pass
4	0.19	40.1	10.1	0.2	50.4	Quasi Peak	Live	64	-13.6	Pass
5	0.489	23	10.1	0.1	33.2	Quasi Peak	Live	56.2	-23	Pass
6	0.933	22.2	10.1	0.1	32.4	Quasi Peak	Live	56	-23.6	Pass
7	0.409	20	10.1	0.1	30.2	Average	Live	47.7	-17.5	Pass
8	0.15	23.4	10.1	0.2	33.7	Average	Live	56	-22.3	Pass
9	0.254	19	10.1	0.2	29.3	Average	Live	51.6	-22.3	Pass
10	0.19	21.5	10.1	0.2	31.8	Average	Live	54	-22.2	Pass
11	0.489	16.5	10.1	0.1	26.7	Average	Live	46.2	-19.5	Pass
12	0.933	16.2	10.1	0.1	26.4	Average	Live	46	-19.6	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.
5. RFID fundamental signal comes from the integrated 13.56MHz RFID in the support equipment iCLASS SE® Readers that this module obtains power from.

Test Standard:	Part 15.207 RSS Gen 8.8	Mode:	TX Mode
Frequency Range:	0.15-30MHz	Test Date:	03/14/2022
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	0.189	39.9	10.1	0.2	50.2	Quasi Peak	Neutral	64.1	-13.9	Pass
2	0.15	42.2	10.1	0.2	52.5	Quasi Peak	Neutral	66	-13.5	Pass
3	0.218	36.3	10.1	0.2	46.6	Quasi Peak	Neutral	62.9	-16.3	Pass
4	0.403	31.9	10.1	0.1	42.1	Quasi Peak	Neutral	57.8	-15.7	Pass
5	1.182	22.2	10.2	0.1	32.5	Quasi Peak	Neutral	56	-23.5	Pass
6	2.03	22.1	10.2	0.1	32.4	Quasi Peak	Neutral	56	-23.6	Pass
7	0.189	22	10.1	0.2	32.3	Average	Neutral	54.1	-21.8	Pass
8	0.15	23.3	10.1	0.2	33.6	Average	Neutral	56	-22.4	Pass
9	0.218	20.4	10.1	0.2	30.7	Average	Neutral	52.9	-22.2	Pass
10	0.403	22.5	10.1	0.1	32.7	Average	Neutral	47.8	-15.1	Pass
11	1.182	16.3	10.2	0.1	26.6	Average	Neutral	46	-19.4	Pass
12	2.03	16.2	10.2	0.1	26.5	Average	Neutral	46	-19.5	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.
5. RFID fundamental signal comes from the integrated 13.56MHz RFID in the support equipment iCLASS SE® Readers that this module obtains power from.

8 EUT and Test Setup Photos

Refer to FCC/ISED exhibits

9 Test Instrument List

Equipment	Manufacturer	Model	Instrument Number	Cal. Date	Cal. Due
Semi-Anechoic Chamber	ETS-Lindgren	10M	VL001	10/18/2020	10/18/2022
Shielding Control Room	ETS-Lindgren	Series 81	VL006	N/A1)	N/A1)
Spectrum Analyzer	Keysight	N9020A	MY50110074	06/17/2021	06/17/2022
EMC Test Receiver	R&S	ESL6	100230	06/14/2021	06/14/2022
LISN (9KHz – 30MHz)	EMCO	3816/2	9705-1066	05/04/2021	05/04/2022
Bi-Log Antenna	ETS-Lindgren	3142E	217921	11/15/2021	11/15/2022
Horn Antenna (1-18GHz)	Electro-Metrics	EM-6961	6292	05/14/2021	05/14/2022
Horn Antenna (18-40GHz)	Com-Power	AH-840	101109	06/24/2021	06/24/2022
Preamplifier	RF Bay, Inc.	LPA-10-20	11180621	07/16/2021	07/16/2022
Temp / Humidity / Pressure Meter	PCE Instruments	PCE-THB 40	R062028	05/15/2021	05/15/2022
RF Attenuator	Pasternack	PE7005-3	VL061	07/16/2021	07/16/2022
Preamplifier 100KHz - 40GHz	Aeroflex	33711-392-77150-11	064	07/16/2021	07/16/2022
EM Center Control	ETS-Lindgren	7006-001	160136	N/A1)	N/A1)
Turn Table	ETS-Lindgren	2181-3.03	VL002	N/A1)	N/A1)
Boresight Antenna Tower	ETS-Lindgren	2171B	VL003	N/A1)	N/A1)
Loop Antenna (9k-30MHz)	Com-Power	AL-130	121012	05/16/2021	05/16/2022
RE test cable (below 6GHz)	Vista	RE-6GHz-01	RE-6GHz-01	07/16/2021	07/16/2022
RE test cable (1-18GHz)	PhaseTrack	II-240	RE-18GHz-01	07/16/2021	07/16/2022
RE test cable (>18GHz)	Sucoflex	104	344903/4	07/16/2021	07/16/2022
Pulse limiter	Com-Power	LIT-930A	531727	07/16/2021	07/16/2022
CE test cable #1	FIRST RF	FRF-C-1002-001	CE-6GHz-01	07/16/2021	07/16/2022
CE test cable#2	FIRST RF	FRF-C-1002-001	CE-6GHz-02	07/16/2021	07/16/2022
Agilent Signal Generator	MXG N5182A	N5182A	US47080548	6/17/2021	6/17/2022
Power Splitter/Combiner	Mini-Circuits	ZFSC-2-9G+	VL052	N/A1)	N/A1)
Power Splitter/Combiner	Mini-Circuits	ZFSC-2-9G+	VL053	N/A1)	N/A1)
Power Splitter/Combiner	Mini-Circuits	ZFSC-2-9G+	VL054	N/A1)	N/A1)
Power Splitter/Combiner	Mini-Circuits	ZFSC-2-9G+	VL055	N/A1)	N/A1)

Note:

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

---END---