UNIFIED COMPLIANCE LABORATORY

427 West 12800 South
Draper, UT 84020

Test Report

Certification

FCC ID	SWX-WAVENANO
ISED ID	6545A-WAVENANO
Equipment Under Test	Wave-Nano
Test Report Serial Number	TR7236_01
Date of Test(s)	1 March; 2 May; 6, 8, 9 and 15 June 2022
Report Issue Date	15 June 2022

Test Specification	Applicant
47 CFR FCC Part 15, Subpart E	Ubiquiti Inc. 685 Third Avenue New York, NY 10017 U.S.A.

NVLAP TESTING ilac-MRA

NVLAP LAB CODE 600241-0

Certification of Engineering Report

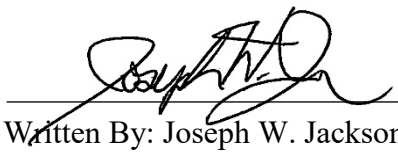
This report has been prepared by Unified Compliance Laboratory (UCL) to document compliance of the device described below with the requirement of Federal Communication Commissions (FCC) Part 15, Subpart E. This report may be reproduced in full. Partial reproduction of this report may only be made with the written consent of the laboratory. The results in this report apply only to the sample tested.

Applicant	Ubiquiti Inc.
Manufacturer	Ubiquiti Inc.
Brand Name	airFiber
Model Number	Wave-Nano
FCC ID	SWX-WAVENANO
ISED ID	6545A-WAVENANO

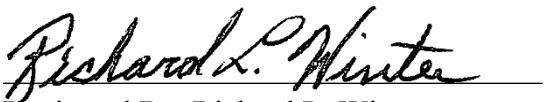
On this 15th day of June 2022, I individually and for Unified Compliance Laboratory certify that the statements made in this engineering report are true, complete and correct to the best of my knowledge and are made in good faith.

Although NVLAP has accredited the Unified Compliance Laboratory testing facilities, this report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST or any agency of the U.S. federal government.

Unified Compliance Laboratory



Written By: Joseph W. Jackson



Reviewed By: Richard L. Winter

Revision History		
Revision	**Description**	**Date**
01	Original Report Release	15 June 2022

Table of Contents

1 Client Information

1.1 Applicant

Company	Ubiquiti Inc. 685 Third Avenue New York, NY 10017 U.S.A.
Contact Name	Mark Feil
Title	Compliance Manager

1.2 Manufacturer

Company	Ubiquiti Inc. 685 Third Avenue New York, NY 10017 U.S.A.
Contact Name	Mark Feil
Title	Compliance Manager

2 Equipment Under Test (EUT)

2.1 Identification of EUT

Brand Name	airFiber
Model Number	Wave-Nano
Serial Number	A2527F
Dimensions (cm)	25.7 x 25.7 x 11.4

2.2 Description of EUT

The 60 GHz Wave Nano (Wave Nano) is a CPE device that connects to a Wave AP functioning as a base station. The Wave Nano has a 1.2+ Gbps throughput rate and can sustain its connection over 5 kilometers. The Wave Nano is also equipped with a 5 GHz WiFi 6 backup radio to sustain connectivity during 60 GHz link disruptions. This easy-to-deploy CPE device can be set up in minutes with the UISP™ application using Bluetooth-powered setup and tracked from anywhere with its built-in GPS antenna.

Band	Modulation Bandwidth	Frequency (MHz)
UNII-2A	20 MHz	5260, 5265, 5270, 5275, 5280, 5285, 5290, 5295, 5300, 5305, 5310, 5315, 5320. 5335
	40 MHz	5270, 5275, 5280, 5285, 5290, 5295, 5300, 5305, 5310, 5325
	80 MHz	5290, 5300, 5305
	160 MHz	5250
UNII-2C	20 MHz	5485, 5500, 5505, 5510, 5515, 5520, 5525, 5530, 5535, 5540, 5545, 5550, 5555, 5560, 5565, 5570, 5575, 5580, 5585, 5590, 5595, 5600, 5605*, 5610*, 5615*, 5620*, 5625*, 5630*, 5635*, 5640*, 5645*, 5650, 5655, 5660, 5665, 5670, 5675, 5680, 5685, 5690, 5695, 5700, 5705, 5710
	40 MHz	5495, 5510, 5515, 5520, 5525, 5530, 5535, 5540, 5545, 5550, 5555, 5560, 5565, 5570, 5575, 5580, 5585, 5590, 5595, 5600, 5605*, 5610*, 5615*, 5620*, 5625*, 5630*, 5635*, 5640*, 5645*, 5650, 5655, 5660, 5665, 5670, 5675, 5680, 5685, 5690, 5695, 5700
	80 MHz	5515, 5530, 5535, 5540, 5545, 5550, 5555, 5560, 5565, 5570, 5575, 5580, 5585, 5590, 5595, 5600, 5605*, 5610*, 5615*, 5620*, 5625*, 5630*, 5635*, 5640*, 5645*, 5650, 5655, 5660, 5665, 5670, 5675, 5680
	160 MHz	5570
* Frequency not applicable in Canada		

Table 1: UNII-2A and UNII-2C Channel Settings

This report covers the circuitry of the device subject to FCC Part 15, Subpart E. The circuitry of the device subject to FCC Part 15 Subpart B was found to be compliant and is covered under a separate Unified Compliance Laboratory test report.

2.3 EUT and Support Equipment

The EUT and support equipment used during the test are listed below.

Brand Name Model Number Serial Number	Description	Name of Interface Ports / Interface Cables
BN: airFiber MN: Wave-Nano SN: A2527F	Wireless Access Point	See Section 2.4
BN: Ubiquiti, Inc. MN: U-POE-at SN: N/A	PoE Injector Power Supply	Shielded or Un-shielded Cat 5e cable (Note 2)
BN: Dell MN: XPS 13 SN: N/A	Laptop Computer	Shielded or Un-shielded Cat 5e cable (Note 2)

Notes: (1) EUT
(2) Interface port connected to EUT (See Section 2.4)

The support equipment listed above was not modified in order to achieve compliance with this standard.

2.4 Interface Ports on EUT

Name of Ports	No. of Ports Fitted to EUT	Cable Description/Length
AC (PoE Injector)	1	3 conductor power cord/80cm
LAN (PoE Injector)	1	Shielded or Un-shielded cat 5e cable/1 meter
Data	1	Shielded or Un-shielded cat 5e cable/1 meter

2.5 Operating Environment

Power Supply	120 Volts AC to 48 Volts PoE
AC Mains Frequency	60 Hz
Temperature	22.3 – 23.1 °C
Humidity	19.5 – 23.7 %
Barometric Pressure	1015 mBar

2.6 Operating Modes

The Wave-Nano was tested using test software in order to enable to constant transmission. The measurements within this report are corrected to reference a 100% duty cycle. All emission modes of 802.11 ax were investigated. All measurements are reported with the worst-case mode (802.11ax) unless otherwise stated.

2.7 EUT Exercise Software

EUT firmware version 1.0 was used to operate the transmitter using a constant transmit mode.

2.8 Block Diagram of Test Configuration

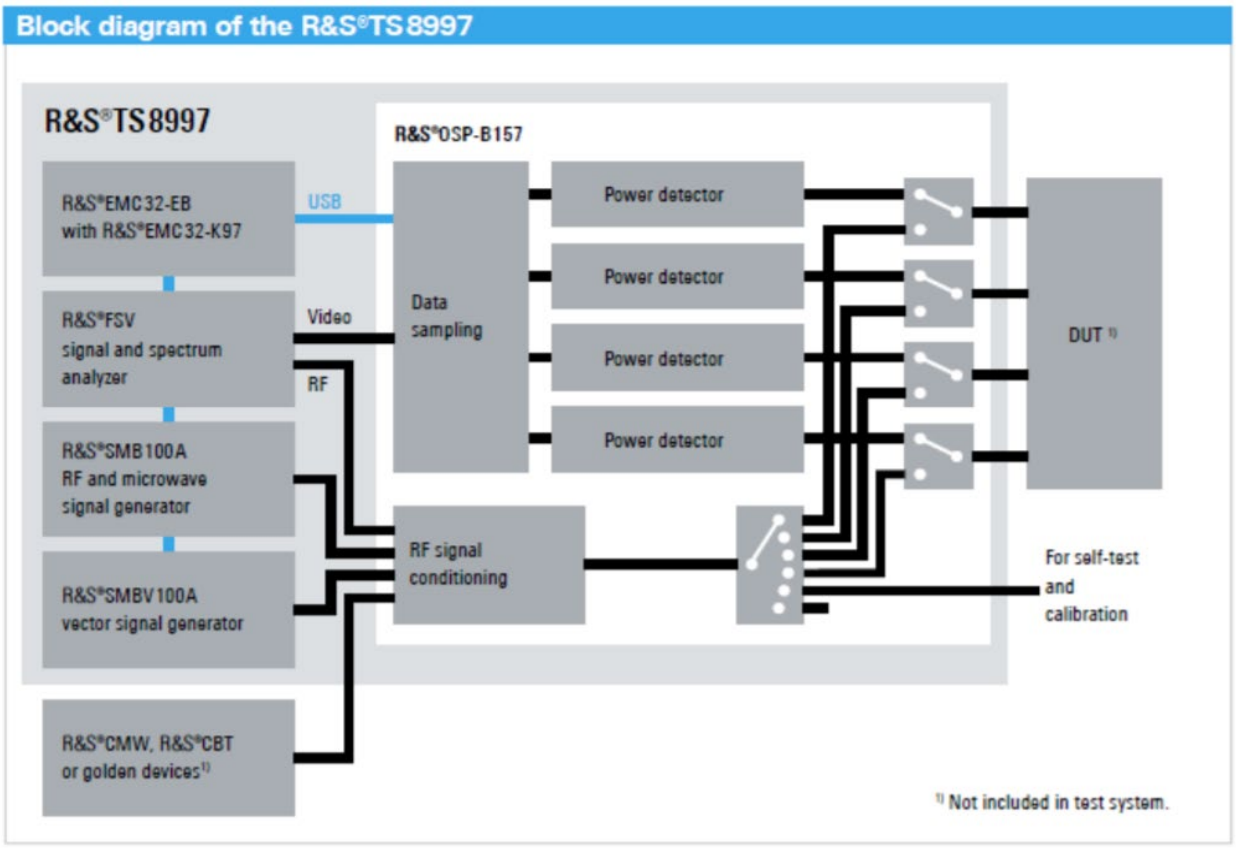


Diagram 1: Test Configuration Block Diagram

2.9 Modification Incorporated/Special Accessories on EUT

There were no modifications made to the EUT during testing to comply with the specification.

2.10 Deviation, Opinions Additional Information or Interpretations from Test Standard

There were no deviations, opinions, additional information or interpretations from the test specification.

3 Test Specification, Method and Procedures

3.1 Test Specification

Title	47 CFR FCC Part 15, Subpart E, Section 15.407 Limits and methods of measurement of radio interference characteristics of Unlicensed National Information Infrastructure Devices
Purpose of Test	The tests were performed to demonstrate initial compliance

3.2 Methods & Procedures

3.2.1 47 CFR FCC Part 15 Section 15.407

See test standard for details.

3.3 FCC Part 15, Subpart E

3.3.1 Summary of Tests

FCC Section	ISED Section	Environmental Phenomena	Frequency Range (MHZ)	Result
15.407(a)	N/A	Antenna requirements	Structural Requirement	Compliant
15.407(b)	RSS-Gen	Conducted Disturbance at Mains Port	0.15 to 30	Compliant
15.407(a)	RSS-247 §6.2.2, §6.2.3	Bandwidth Requirement	5260 to 5570	Compliant
15.407(a)	RSS-247 §6.2.2, §6.2.3	Peak Output Power	5260 to 5570	Compliant
15.407(b)	RSS-247 §6.2.2, §6.2.3	Antenna Conducted Spurious Emissions	0.009 to 40000	Compliant
15.407(b)	RSS-247 §6.2.2, §6.2.3	Radiated Spurious Emissions	0.009 to 40000	Compliant
15.407(a)	RSS-247 §6.2.2, §6.2.3	Peak Power Spectral Density	5260 to 5570	Compliant
15.407(h)	RSS-247 §6.3	DFS Requirements	5260 to 5570	Compliant
The testing was performed according to the procedures in ANSI C63.10-2013, KDB 558074 and 47 CFR Part 15. Where applicable, KDB 662911 was followed to sum required measurements.				

3.4 Results

In the configuration tested, the EUT complied with the requirements of the specification.

3.5 Test Location

Testing was performed at the Unified Compliance Laboratory 3-Meter and 10-Meter chambers located at 427 West 12800 South, Draper, UT 84020. Unified Compliance Laboratory is accredited by National

Voluntary Laboratory Accreditation Program (NVLAP); NVLAP Code 600241-0 which is effective until 30 June 2022. This site has also been registered with Innovations, Science and Economic Development (ISED) department as was accepted under Appendix B, Phase 1 procedures of the APEC Tel MRA for Canadian recognition. ISED No.: 25346, effective until 30 June 2022. Unified Compliance Laboratory has been assigned Conformity Assessment Number US0223 by ISED.

4 Test Equipment

4.1 Conducted Emissions at Mains Ports

Type of Equipment	Manufacturer	Model Number	Asset Number	Date of Last Calibration	Due Date of Calibration
EMI Receiver	AFJ	FFT3010	UCL-6754	12/8/2021	12/8/2022
LISN	AFJ	LS16C/10	UCL-6749	12/6/2021	12/6/2023
Cat6 ISN	Teseq	ISN T8-Cat6	UCL-2971	1/30/2022	1/30/2023
ISN	Teseq	ISN T800	UCL-2974	6/4/2021	6/4/2022
LISN	Com-Power	LIN-120C	UCL-2612	1/6/2022	1/6/2023
AC Power Source	Laplace Instruments	AC1000A	UCL-2857	N/A	N/A
Test Software	UCL	Revision 1	UCL-3107	N/A	N/A

Table 2: List of equipment used for Conducted Emissions Testing at Mains Port

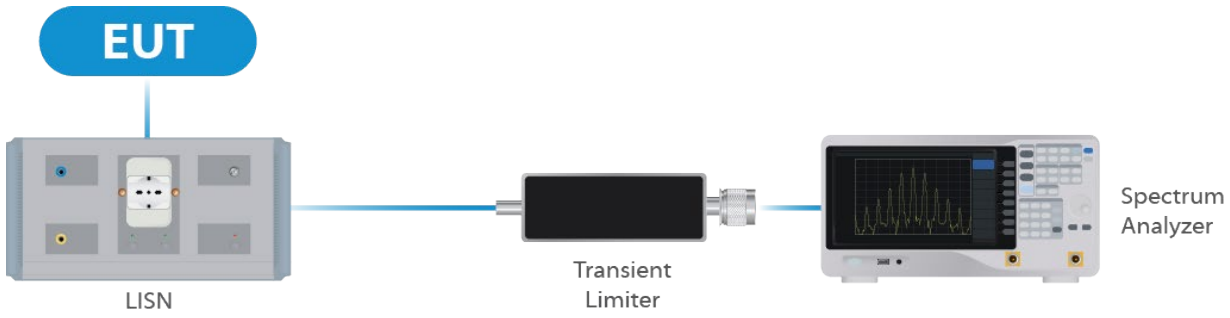


Figure 1: Conducted Emissions Test

4.2 Direct Connect at the Antenna Port Tests

Type of Equipment	Manufacturer	Model Number	Asset Number	Date of Last Calibration	Due Date of Calibration
Spectrum Analyzer	R&S	FSV40	UCL-2861	1/03/2022	1/03/2023
Signal Generator	R&S	SMB100A	UCL-2864	N/A	N/A
Vector Signal Generator	R&S	SMBV100A	UCL-2873	N/A	N/A
Switch Extension	R&S	OSP-B157WX	UCL-2867	1/03/2022	1/03/2023
Switch Extension	R&S	OSP-150W	UCL-2870	1/03/2022	1/03/2023

Table 3: List of equipment used for Direct Connect at the Antenna Port

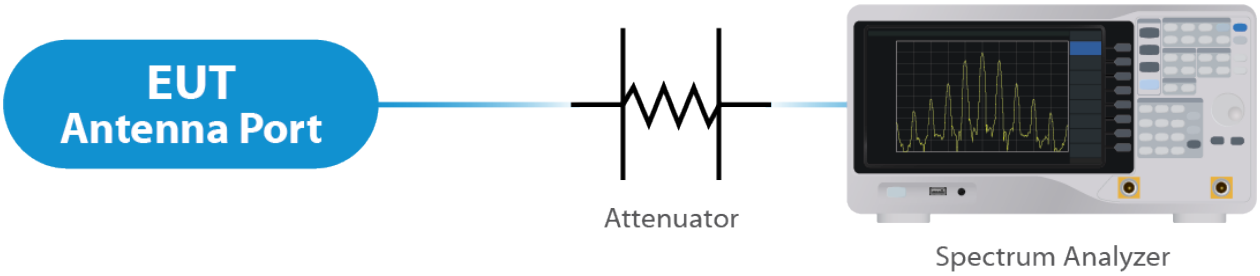


Figure 2: Direct Connect at the Antenna Port Test

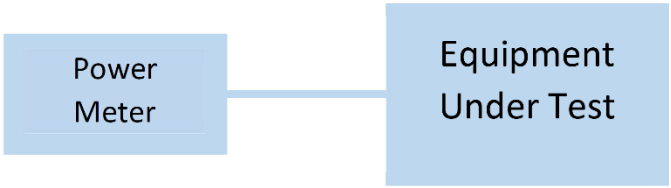


Figure 3: Output Power Measurement

4.3 Radiated Emissions

Type of Equipment	Manufacturer	Model Number	Asset Number	Date of Last Calibration	Due Date of Calibration
EMI Receiver	Keysight	N9038A	UCL-2778	1/04/2022	1/04/2023
Pre-Amplifier 9 kHz – 1 GHz	Sonoma Instruments	310N	UCL-2889	10/7/2021	10/7/2022
Pre-Amplifier 9 kHz – 1 GHz	Sonoma Instruments	310N	UCL-4793	10/7/2021	10/7/2022
Pre-Amplifier 1 – 18 GHz	Com-Power	PAM 118A	UCL-3833	10/7/2021	10/7/2022
Pre-Amplifier 1 – 18 GHz	The EMC Shop	PA18G	UCL-5896	3/11/3022	3/11/2023
Pre-Amplifier 15 – 40 GHz	L3 Harris	LNA-40-18004000-40-15P	UCL-4465	11/3/2021	11/3/2022
Broadband Antenna	Scwarzbeck	VULB 9163	UCL-3062	8/28/2020	8/27/2022
Broadband Antenna	Scwarzbeck	VULB 9163	UCL-3062	8/28/2020	8/28/2022
Double Ridge Horn Antenna	Scwarzbeck	BBHA 9120D	UCL-3065	7/8/2021	7/8/2022
Log Periodic	Scwarzbeck	STLP 9129	UCL-3068	11/16/2020	11/16/2022
15 - 40 GHz Horn Antenna	ETS-Lindgren	3116C	UCL-7209	6/1/2022	6/6/2024
Test Software	UCL	Revision 1	UCL-3108	N/A	N/A

Table 4: List of equipment used for Radiated Emissions

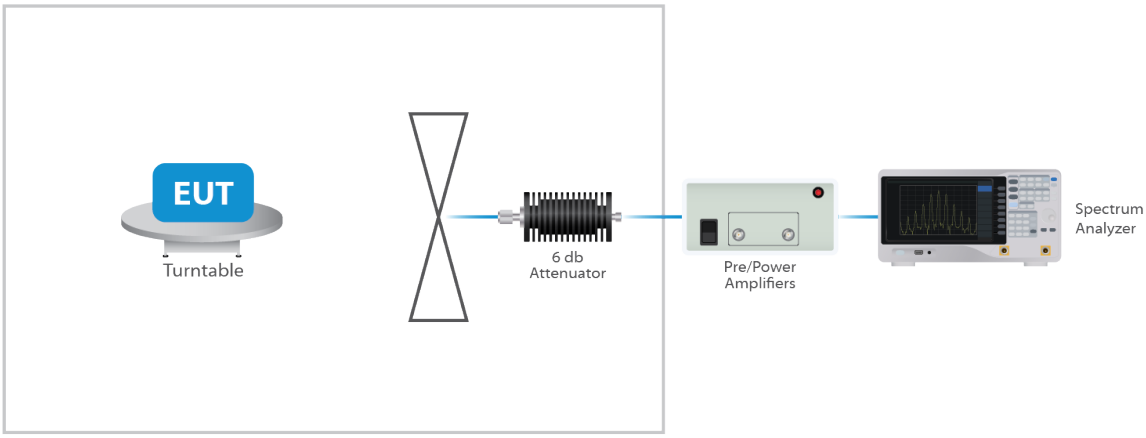


Figure 4: Radiated Emissions Test

4.4 DFS Testing

Type of Equipment	Manufacturer	Model Number	Asset Number	Date of Last Calibration	Due Date of Calibration
Vector Signal Generator	R&S	SMBV100A	UCL-2873	N/A	N/A
Spectrum Analyzer	Keysight	N9010B	UCL-7069	4/25/2022	4/25/2023

4.4.1 Client Test Set Up

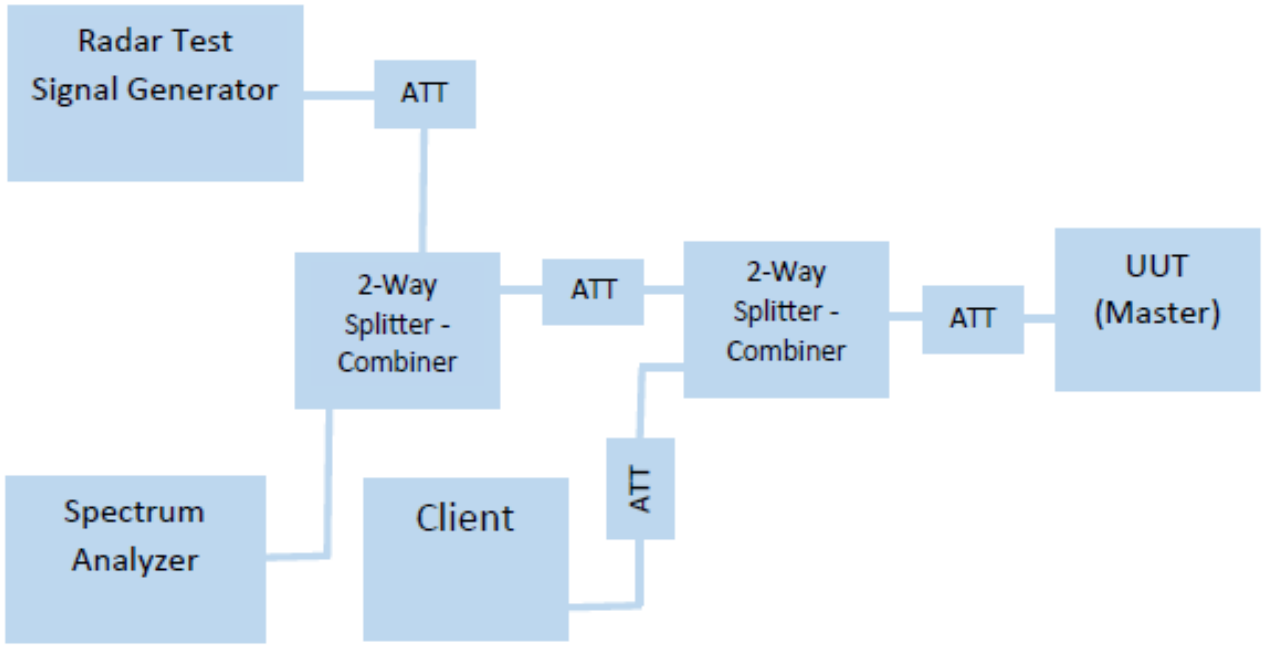


Figure 5: DFS Test Set Up – Client

4.5 Equipment Calibration

All applicable equipment is calibrated using either an independent calibration laboratory or Unified Compliance Laboratory personnel at intervals defined in ANSI C63.4:2014 following outlined calibration procedures. All measurement instrumentation is traceable to the National Institute of Standards and Technology (NIST). Supporting documentation relative to traceability is on file and is available for examination upon request.

4.6 Measurement Uncertainty

Test	Uncertainty (± dB)	Confidence (%)
Conducted Emissions	1.44	95
Radiated Emissions (9 kHz to 30 MHz)	2.50	95
Radiated Emissions (30 MHz to 1 GHz)	4.38	95
Radiated Emissions (1 GHz to 18 GHz)	4.37	95
Radiated Emissions (18 GHz to 40 GHz)	3.93	95
Direct Connect Tests	**K Factor**	**Value**
Emissions Bandwidth	2	2.0%
Output Power	2	1.0 dB
Peak Power Spectral Density	2	1.3 dB
Band Edge	2	0.8 dB
Transmitter Spurious Emissions	2	1.8 dB

5 Test Results

5.1 §15.203 Antenna Requirements

The EUT uses an integral folding antenna structure. The Maximum gain of the antenna is 18.2 dBi. This is an 802.11 device and utilizes CDD as described in KDB 662911 D01. The antenna is not user replaceable.

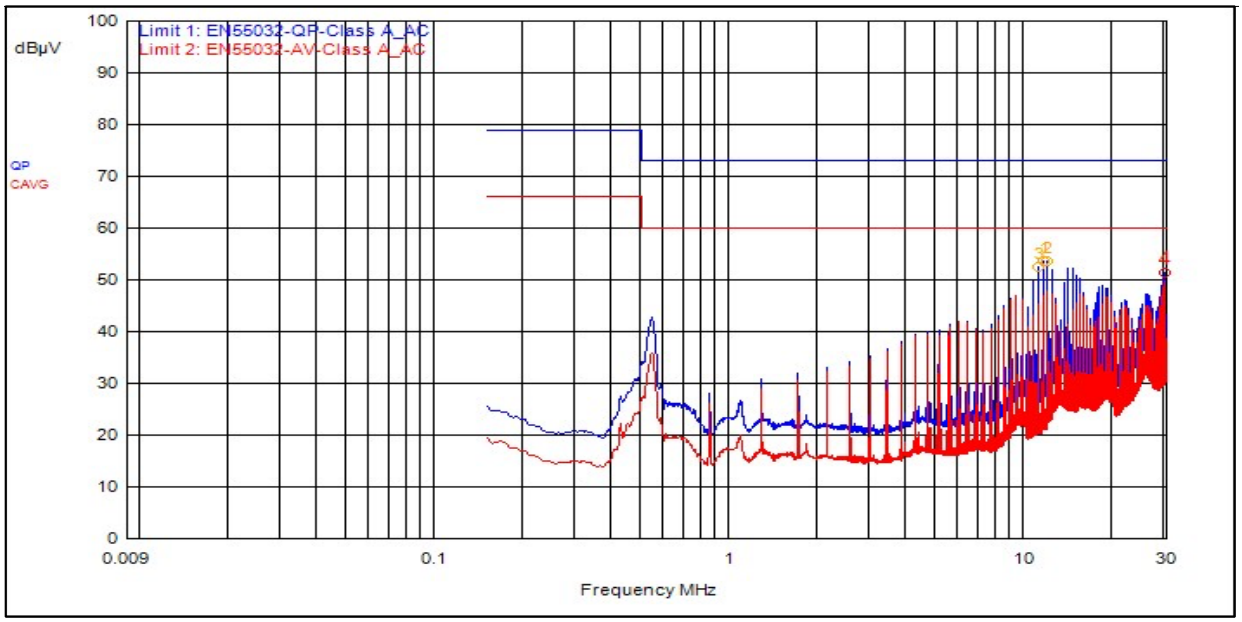
For power measurements on IEEE 802.11 devices, Array Gain = 0 dB for NANT ≤ 4;
For PSD measurements when Nss=1: Array Gain = 10 log(Nant/Nss) dB = 6.02dB

Results

The EUT complied with the specification

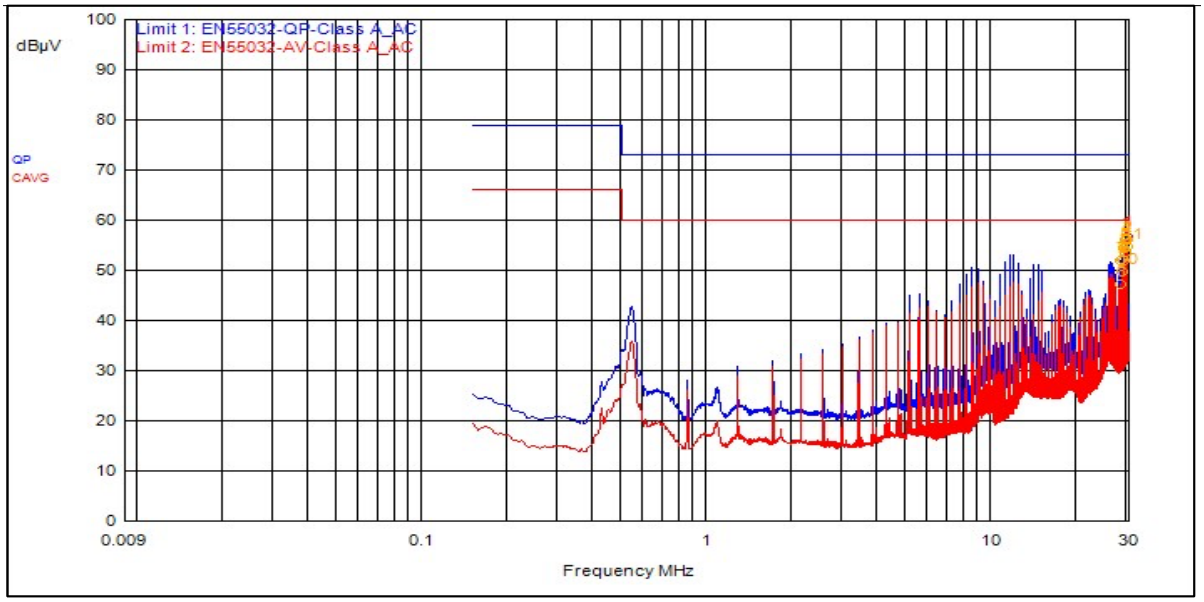
5.2 Conducted Emissions at Mains Ports Data

5.2.1 Line



ID	Frequency	Probe	Cable	Atten.	Detector	Meter Read	Meas Level	Limit 1	Limit 1 Dist.	Limit 2	Limit 2 Dist.
1	11.427MHz	9.6	0.3		QPeak	43.8	53.7	73.0	-19.3		
2	11.850MHz	9.6	0.3		QPeak	43.8	53.7	73.0	-19.3		
3	11.004MHz	9.6	0.3		QPeak	42.6	52.5	73.0	-20.5		
4	29.613MHz	10.1	0.3		QPeak	41.1	51.5	73.0	-21.5		

5.2.2 Neutral



ID	Frequency	Probe	Cable	Atten.	Detector	Meter Read	Meas Level	Limit 1	Limit 1 Dist.	Limit 2	Limit 2 Dist.
1	29.613MHz	9.9	0.3		QPeak	46.6	56.7	73.0	-16.3		
2	29.610MHz	9.9	0.3		QPeak	45.9	56.1	73.0	-16.9		
4	29.190MHz	9.9	0.3		QPeak	45.9	56.0	73.0	-17.0		
5	28.767MHz	9.9	0.3		QPeak	44.3	54.5	73.0	-18.5		
9	28.359MHz	9.8	0.3		QPeak	42.2	52.3	73.0	-20.7		
7	27.933MHz	9.8	0.3		QPeak	41.8	52.0	73.0	-21.0		
3	29.190MHz	9.9	0.3		C_AVG	43.5	53.7			60.0	-6.3
6	28.767MHz	9.9	0.3		C_AVG	41.8	52.0			60.0	-8.0
8	27.921MHz	9.8	0.3		C_AVG	37.2	47.3			60.0	-12.7
10	28.344MHz	9.8	0.3		C_AVG	39.5	49.7			60.0	-10.3
11	29.613MHz	9.9	0.3		C_AVG	44.4	54.6			60.0	-5.4

Result

The EUT complied with the specification limit.

5.3 §15.403(i) 26 dB Emissions Bandwidth

All chains were measured under the guidance of KDB 789033 Section II.C. and KDB 66291 D01. Please see associated annex for details on instrument settings.

5.3.1 UNII-2A

Bandwidth	Frequency (MHz)	99% Bandwidth (MHz)	Emissions 26 dB Bandwidth (MHz)
20	5260	18.9	20.4
20	5300	18.9	20.4
20	5335	18.9	20.3
40	5270	37.8	39.8
40	5300	37.5	39.8
40	5325	37.5	40.1
80	5290	76.5	82.0
80	5300	77.0	82.0
80	5305	76.5	81.5
160	5250	154.0	165.0

5.3.2 UNII-2C

Bandwidth	Frequency (MHz)	99% Bandwidth (MHz)	Emissions 26 dB Bandwidth (MHz)
20	5485	18.8	20.5
20	5600	18.9	20.6
20	5710	18.9	20.6
40	5495	37.8	39.6
40	5600	37.8	39.9
40	5700	37.8	39.9
80	5515	77.0	81.0
80	5600	76.5	82.0

80	5680	76.5	82.5
160	5570	154.0	165.0

Result

The 26 dB bandwidths are reported for information purposes. Please see Annex for all bandwidth measurements.

5.4 §15.407(a)(2) Maximum Average Output Power

All chains were measured and summed under the guidance of KDB 789033 Section II. E.2. and KDB 66291 D01. Please see associated annex for details on instrument settings.

The maximum average RF conducted output power measured for this device was 29.98 dBm or 995.41 mW. The limit is 24 dBm or 250 mW when using antennas with 6 dBi or less gain. The antenna has a maximum gain of 18.2 dBi.

5.4.1 UNII-2A

Modulation (BW)	Frequency (MHz)	Data Rate	TP Setting	Conducted Output Power*	EIRP	Measured PSD
HE 20	5260	Mcs0	21	11.23	29.43	-2.35
HE 20	5300	Mcs0	21	11.52	29.72	-2.26
HE 20	5335	Mcs0	21	11.41	29.61	-2.19
HE 40	5270	Mcs0	21	11.52	29.72	-5.56
HE 40	5300	Mcs0	21	11.78	29.98	-5.11
HE 40	5325	Mcs0	21	11.68	29.88	-4.33
HE 80	5290	Mcs0	21	11.42	29.62	-7.29
HE 80	5300	Mcs0	21	11.58	29.78	-7.05
HE 80	5305	Mcs0	21	11.54	29.74	-7.18
HE 160	5250	Mcs0	20	11.55	29.75	-9.84

5.4.2 UNII-2C

Modulation (BW)	Frequency (MHz)	Data Rate	TP Setting	Conducted Output Power*	EIRP	Measured PSD
HE 20	5485	Mcs0	21	11.35	29.55	-2.43
HE 20	5600	Mcs0	21	11.25	29.45	-2.14
HE 20	5710	Mcs0	21	11.78	29.98	-2.03
HE 40	5495	Mcs0	21	11.63	29.83	-4.45
HE 40	5600	Mcs0	21	11.55	29.75	-4.54
HE 40	5700	Mcs0	20	11.46	29.66	-5.01

HE 80	5515	Mcs0	21	11.37	29.57	-7.27
HE 80	5600	Mcs0	21	11.45	29.65	-6.97
HE 80	5680	Mcs0	21	11.53	29.73	-7.41
HE 160	5570	Mcs0	20	11.24	29.44	-10.11

Result

In the configuration tested, the maximum average RF output power was less than 1 watt; therefore, the EUT complied with the requirements of the specification.

5.5 §15.407(b) Spurious Emissions

5.5.1 Conducted Spurious Emissions

The frequency range from the lowest frequency generated or used in the device to the tenth harmonic of the highest fundamental frequency was investigated to measure any antenna-conducted emissions. The graphs show the measurement data from spurious emissions noted across the frequency range when transmitting at the lowest frequency, middle frequency and upper frequency. Shown below are plots with the EUT turned to the upper and lower channels with the antenna gain of 18.2 dBi accounted for. These demonstrate compliance with the provisions of this section at the band edges.

The emissions must be below -27 dBm EIRP.

Result

Conducted spurious emissions were below -27 dBm; therefore, the EUT complies with the specification. See Annex for results.

5.5.2 Radiated Spurious Emissions in the Restricted Bands of § 15.205

The frequency range from the lowest frequency generated or used in the device to the tenth harmonic of the highest fundamental emissions was investigated to measure any radiated emissions in the restricted bands. For frequencies above 18.0 GHz. The emissions in the restricted bans must meet the limits specified in § 15.209. Conducted measurement results are included in the Annex. Radiated data with the EUT transmitting into a load is included below. All emissions between the required frequencies were investigated, the following plots represent the worst case. The "fail" is the transmitted signal exceeding the spurious limit.

Correction Factor = Antenna Factor + Cable Loss - Pre-Amplifier Gain, and is added to the Receiver reading.

5.5.3 UNII-2A

Frequency	Level (dBµV/m)	Limit (dBµV/m)	Margin	Azimuth (°)	Height	Pol.	Correction (dB)
35.483 MHz	30.648	40	-9.352	255	1.038	Vertical	-14.486
58.092 MHz	23.539	40	-16.461	150	1.985	Vertical	-12.898
287.98 MHz	33.097	47	-13.903	349	0.999	Vertical	-11.568
671.99 MHz	40.174	47	-6.826	98	2.441	Vertical	-4.319
318.82 MHz	30.182	47	-16.818	35	2.459	Horizontal	-11.184
671.98 MHz	43.86	47	-3.14	23	1.201	Horizontal	-4.319

Table 5: Radiated Emissions 30 – 1000 MHz

Peak

Frequency	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	Correction (dB)
4.8 GHz	55.726	74	-18.274	10	1.525	Vertical	1.205
6.3119 GHz	54.936	74	-19.064	18	1.815	Vertical	5.45
15.04 GHz	57.814	74	-16.186	328	1.834	Vertical	15.904
15.783 GHz	69.403	74	-4.597	238	2.034	Vertical	13.699
4.7998 GHz	48.171	74	-25.829	334	3.101	Horizontal	1.205
15.78 GHz	71.712	74	-2.288	286	2.748	Horizontal	13.697
16.818 GHz	58.777	74	-15.223	132	3.794	Horizontal	17.641

Avg

Frequency	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	Correction (dB)
4.8 GHz	51.33	54	-2.67	10	1.525	Vertical	1.205
6.3119 GHz	49.881	54	-4.119	18	1.815	Vertical	5.45
15.04 GHz	44.614	54	-9.386	328	1.834	Vertical	15.904
15.783 GHz	50.65	54	-3.35	238	2.034	Vertical	13.699
4.7998 GHz	40.587	54	-13.413	334	3.101	Horizontal	1.205
15.78 GHz	52.097	54	-1.903	286	2.748	Horizontal	13.697
16.818 GHz	45.55	54	-8.45	132	3.794	Horizontal	17.641

Table 6: Transmitting on the Lowest Frequency 5260 MHz 1 – 17 GHz

Peak

Frequency	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	Correction (dB)
1.6319 GHz	45.167	74	-28.833	286	3.798	Vertical	-20.473
15.025 GHz	52.092	74	-21.908	212	1.834	Vertical	7.212
15.903 GHz	72.349	74	-1.651	230	2.146	Vertical	1.888
10.6 GHz	54.131	74	-19.869	151	1.5	Horizontal	2.033
15.899 GHz	72.103	74	-1.897	260	3.167	Horizontal	1.764
16.797 GHz	51.843	74	-22.157	275	3.784	Horizontal	8.749

Avg

Frequency	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	Correction (dB)
1.6319 GHz	41.744	54	-12.256	286	3.798	Vertical	-20.473
15.025 GHz	38.605	54	-15.395	212	1.834	Vertical	7.212
15.903 GHz	52.371	54	-1.629	230	2.146	Vertical	1.888
10.6 GHz	41.913	54	-12.087	151	1.5	Horizontal	2.033
15.899 GHz	51.224	54	-2.776	260	3.167	Horizontal	1.764
16.797 GHz	39.48	54	-14.52	275	3.784	Horizontal	8.749

Table 7: Transmitting on the Middle Frequency 5300 MHz 1 – 17 GHz

Peak

Frequency	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	Correction (dB)
1.6319 GHz	53.023	74	-20.977	152	1.5	Vertical	-20.473
10.67 GHz	55.165	74	-18.835	276	1.643	Vertical	1.819
16.008 GHz	67.631	74	-6.369	232	2.156	Vertical	1.805
10.67 GHz	57.357	74	-16.643	295	1.5	Horizontal	1.819
16.009 GHz	67.813	74	-6.187	167	1.647	Horizontal	1.826
16.893 GHz	52.642	74	-21.358	106	4	Horizontal	9.254

Avg

Frequency	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	Correction (dB)
1.6319 GHz	50.739	54	-3.261	152	1.5	Vertical	-20.473
10.67 GHz	41.687	54	-12.313	276	1.643	Vertical	1.819
16.008 GHz	47.647	54	-6.353	232	2.156	Vertical	1.805
10.67 GHz	43.182	54	-10.818	295	1.5	Horizontal	1.819
16.009 GHz	47.453	54	-6.547	167	1.647	Horizontal	1.826
16.893 GHz	39.814	54	-14.186	106	4	Horizontal	9.254

Table 8: Transmitting on the Highest Frequency 5335 MHz 1 – 17 GHz

Peak

Frequency	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Pol.	Correction (dB)
16.011 GHz	72.93	74	-1.07	276	Vertical	2.508
30.69 GHz	56.04	74	-17.96	62	Vertical	6.392
33.503 GHz	56.84	74	-17.16	327	Vertical	7.875
36.657 GHz	56.605	74	-17.395	185	Vertical	5.307
39.041 GHz	58.524	74	-15.476	133	Vertical	6.469
16.015 GHz	73.644	74	-0.356	305	Horizontal	2.529
30.991 GHz	55.369	74	-18.631	101	Horizontal	6.583
31.564 GHz	55.927	74	-18.073	298	Horizontal	7.739
33.095 GHz	58.203	74	-15.797	298	Horizontal	8.399
35.082 GHz	56.425	74	-17.575	331	Horizontal	6.58
38.975 GHz	57.596	74	-16.404	68	Horizontal	6.627

Avg

Frequency	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Pol.	Correction (dB)
16.011 GHz	47.117	54	-6.883	276	Vertical	2.508
30.69 GHz	40.378	54	-13.622	62	Vertical	6.392
33.503 GHz	41.513	54	-12.487	327	Vertical	7.875
36.657 GHz	39.499	54	-14.501	185	Vertical	5.307
39.041 GHz	41.022	54	-12.978	133	Vertical	6.469
16.015 GHz	45.72	54	-8.28	305	Horizontal	2.529
30.991 GHz	39.769	54	-14.231	101	Horizontal	6.583
31.564 GHz	40.52	54	-13.48	298	Horizontal	7.739
33.095 GHz	42.046	54	-11.954	298	Horizontal	8.399
35.082 GHz	40.446	54	-13.554	331	Horizontal	6.58
38.975 GHz	41.053	54	-12.947	68	Horizontal	6.627

Table 9: Transmitting on the Highest Frequency 5335 MHz 17 – GHz (worse-case)

5.5.4 UNII-2C

Frequency	Level (dBµV/m)	Limit (dBµV/m)	Margin	Azimuth (°)	Height	Pol.	Correction (dB)
35.483 MHz	30.648	40	-9.352	255	1.038	Vertical	-14.486
58.092 MHz	23.539	40	-16.461	150	1.985	Vertical	-12.898
287.98 MHz	33.097	47	-13.903	349	0.999	Vertical	-11.568
671.99 MHz	40.174	47	-6.826	98	2.441	Vertical	-4.319
318.82 MHz	30.182	47	-16.818	35	2.459	Horizontal	-11.184
671.98 MHz	43.86	47	-3.14	23	1.201	Horizontal	-4.319

Table 10: Radiated Emissions 30 – 1000 MHz

Peak

Frequency	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	Correction (dB)
4.8002 GHz	53.771	74	-20.229	56	1.5	Vertical	-11.775
10.972 GHz	53.798	74	-20.202	63	1.634	Vertical	2.44
16.456 GHz	65.058	74	-8.942	289	4	Vertical	6.856
4.7999 GHz	45.342	74	-28.658	35	3.808	Horizontal	-11.771
10.972 GHz	56.766	74	-17.234	298	1.5	Horizontal	2.44
16.452 GHz	70.241	74	-3.759	349	2.138	Horizontal	6.771

Avg

Frequency	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	Correction (dB)
4.8002 GHz	48.508	54	-5.492	56	1.5	Vertical	-11.775
10.972 GHz	39.152	54	-14.848	63	1.634	Vertical	2.44
16.456 GHz	45.942	54	-8.058	289	4	Vertical	6.856
4.7999 GHz	38.536	54	-15.464	35	3.808	Horizontal	-11.771
10.972 GHz	42.66	54	-11.34	298	1.5	Horizontal	2.44
16.452 GHz	48.402	54	-5.598	349	2.138	Horizontal	6.771

Table 11: Transmitting on the Lowest Frequency 5485 MHz 1 – 17 GHz

Peak

Frequency	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	Correction (dB)
1.632 GHz	52.787	74	-21.213	198	1.5	Vertical	-20.471
11.195 GHz	49.569	74	-24.431	231	1.638	Vertical	1.578
16.794 GHz	66.776	74	-7.224	59	1.634	Vertical	8.796
11.201 GHz	49.202	74	-24.798	322	3.808	Horizontal	1.577
14.64 GHz	50.17	74	-23.83	128	3.804	Horizontal	5.603
16.803 GHz	67.476	74	-6.524	297	3.312	Horizontal	8.655

Avg

Frequency	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	Correction (dB)
1.632 GHz	51.113	54	-2.887	198	1.5	Vertical	-20.471
11.195 GHz	36.073	54	-17.927	231	1.638	Vertical	1.578
16.794 GHz	48.109	54	-5.891	59	1.634	Vertical	8.796
11.201 GHz	35.019	54	-18.981	322	3.808	Horizontal	1.577
14.64 GHz	36.997	54	-17.003	128	3.804	Horizontal	5.603
16.803 GHz	48.554	54	-5.446	297	3.312	Horizontal	8.655

Table 12: Transmitting on the Middle Frequency 5600 MHz 1 – 17 GHz

Peak

Frequency	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	Correction (dB)
1.6319 GHz	52.802	74	-21.198	195	1.5	Vertical	-20.473
11.42 GHz	56.404	74	-17.596	303	4	Vertical	2.11
16.681 GHz	51.832	74	-22.168	81	1.5	Vertical	8.565
11.42 GHz	55.802	74	-18.198	3	1.5	Horizontal	2.11
15.019 GHz	51.057	74	-22.943	347	4	Horizontal	6.975
16.892 GHz	52.879	74	-21.121	212	2.331	Horizontal	9.267

Avg

Frequency	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	Correction (dB)
1.6319 GHz	50.805	54	-3.195	195	1.5	Vertical	-20.473
11.42 GHz	41.773	54	-12.227	303	4	Vertical	2.11
16.681 GHz	38.363	54	-15.637	81	1.5	Vertical	8.565
11.42 GHz	41.405	54	-12.595	3	1.5	Horizontal	2.11
15.019 GHz	38.09	54	-15.91	347	4	Horizontal	6.975
16.892 GHz	39.211	54	-14.789	212	2.331	Horizontal	9.267

Table 13: Transmitting on the Highest Frequency 5710 MHz 1 – 17 GHz

Peak

Frequency	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Pol.	Correction (dB)
17.133 GHz	73.458	74	-0.542	283	Vertical	1.555
22.536 GHz	52.841	74	-21.159	311	Vertical	2.104
26.069 GHz	53.623	74	-20.377	40	Vertical	2.15
26.626 GHz	53.794	74	-20.206	132	Vertical	1.821
31.249 GHz	55.169	74	-18.831	131	Vertical	6.906
32.642 GHz	56.928	74	-17.072	137	Vertical	8.271
39.1 GHz	57.304	74	-16.696	193	Vertical	6.744
17.133 GHz	70.854	74	-3.146	264	Horizontal	1.555
22.85 GHz	55.491	74	-18.509	279	Horizontal	2.242
26.078 GHz	54.404	74	-19.596	81	Horizontal	2.213
28.156 GHz	53.782	74	-20.218	51	Horizontal	1.808
31.009 GHz	55.476	74	-18.524	232	Horizontal	6.487
35.208 GHz	56.633	74	-17.367	127	Horizontal	6.075
35.756 GHz	56.967	74	-17.033	184	Horizontal	5.585

Avg

Frequency	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Pol.	Correction (dB)
17.133 GHz	50.242	54	-3.758	283	Vertical	1.555
22.536 GHz	38.47	54	-15.53	311	Vertical	2.104
26.069 GHz	39.176	54	-14.824	40	Vertical	2.15
26.626 GHz	38.941	54	-15.059	132	Vertical	1.821
31.249 GHz	40.352	54	-13.648	131	Vertical	6.906
32.642 GHz	41.492	54	-12.508	137	Vertical	8.271
39.1 GHz	40.797	54	-13.203	193	Vertical	6.744
17.133 GHz	48.728	54	-5.272	264	Horizontal	1.555
22.85 GHz	39.14	54	-14.86	279	Horizontal	2.242
26.078 GHz	39.298	54	-14.702	81	Horizontal	2.213
28.156 GHz	39.797	54	-14.203	51	Horizontal	1.808
31.009 GHz	39.962	54	-14.038	232	Horizontal	6.487
35.208 GHz	40.59	54	-13.41	127	Horizontal	6.075
35.756 GHz	40.545	54	-13.455	184	Horizontal	5.585

Table 14: Transmitting on the Highest Frequency 5710 MHz 17 – GHz (worse-case)

5.6 §15.407(a) Maximum Power Spectral Density

All chains were measured and summed under the guidance of KDB 789033 Section II. F. and KDB 66291 D01. Please see associated annex for details on instrument settings.

The maximum average power spectral density conducted from the intentional radiator of the antenna shall not be greater than 11 dBm in any 1 MHz band during any time interval of continuous transmission. Results of this testing are summarized. With a 18.2 dBi antenna, the conducted limit for power spectral density is 11 dBm. As per KDB 662911, When the EUT is using spatial-multiplexing in HT to HE modes, there is not additional array gain to accommodate.

Results of this testing are summarized.

5.6.1 UNII-2A

Modulation (BW)	Frequency (MHz)	Data Rate	TP Setting	Conducted Output Power*	Measured PSD
HE 20	5260	Mcs0	21	11.23	-2.35
HE 20	5300	Mcs0	21	11.52	-2.26
HE 20	5335	Mcs0	21	11.41	-2.19
HE 40	5270	Mcs0	21	11.52	-5.56
HE 40	5300	Mcs0	21	11.78	-5.11
HE 40	5325	Mcs0	21	11.68	-4.33
HE 80	5290	Mcs0	21	11.42	-7.29
HE 80	5300	Mcs0	21	11.58	-7.05
HE 80	5305	Mcs0	21	11.54	-7.18
HE 160	5250	Mcs0	20	11.55	-9.84

5.6.2 UNII-2C

Modulation (BW)	Frequency (MHz)	Data Rate	TP Setting	Conducted Output Power*	Measured PSD
HE 20	5485	Mcs0	21	11.35	-2.43
HE 20	5600	Mcs0	21	11.25	-2.14
HE 20	5710	Mcs0	21	11.78	-2.03
HE 40	5495	Mcs0	21	11.63	-4.45
HE 40	5600	Mcs0	21	11.55	-4.54

HE 40	5700	Mcs0	20	11.46	-5.01
HE 80	5515	Mcs0	21	11.37	-7.27
HE 80	5600	Mcs0	21	11.45	-6.97
HE 80	5680	Mcs0	21	11.53	-7.41
HE 160	5570	Mcs0	20	11.24	-10.11

Result

The maximum average power spectral density was less than the limit of 8 dBm; therefore, the EUT complies with the specification.

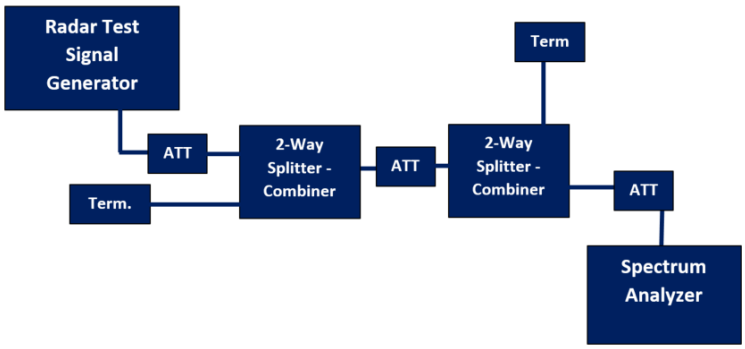
5.7 DFS Requirement

This product is a point-to-point client device. The outcome of the required DFS tests is located in this section. DFS testing was performed following the test procedures as outlined in KDB 905462.

The product passes all required DFS tests for a point-to-point client device.

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

Requirement	Operational Mode	
	Master or Client Client Without 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



Maximum Transmit Power	Value (See Notes 1, 2, and 3)
EIRP ≥ 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 spectral 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.	

5.7.1 Channel Availability Check (CAC)

The EUT shall perform a CAC to ensure that there is no radar operating on the channel. After the power-up sequence, at-east 1 minute shall be monitored on the intended operating frequency. For initial CAC, the EUT does not emit beacon, control, or data signals on the test channel until the power-up sequence has been completed and the UNII device checks for radar waveforms for one minute on the test channel. This test does not use any radar waveforms. The markers in the associated plots indicate initial beacons.

For radar burst at the beginning of the CAC. To verify successful radar detection on the selected channel during a period equal to the beginning of the CAC time, visual indication on the EUT of successful detection of the radar burst will be recorded and reported. Observation of the radar burst is show on the associated plot to be within the beginning of the CAC time. Emissions will continue to be monitored for the remaining 300 seconds.

For radar burst at the end of the CAC. To verify successful radar detection on the selected channel during a period equal to the end of the CAC time, visual indication on the EUT of successful detection of the radar burst will be recorded and reported. Observation of the radar

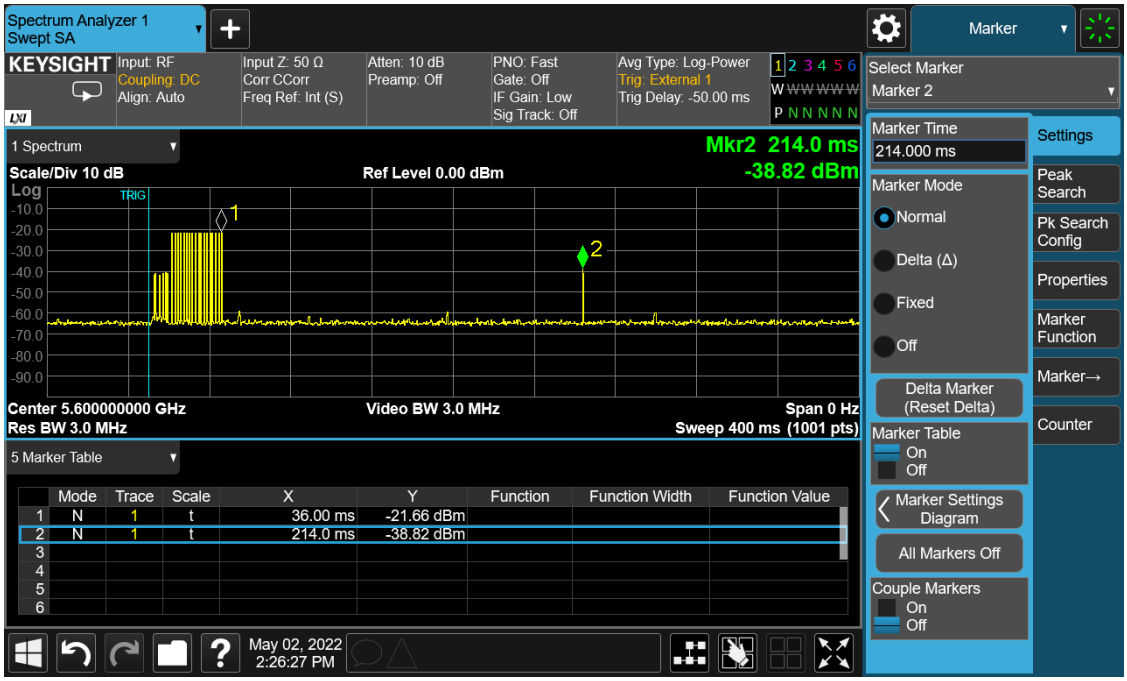
burst is show on the associated plot to be within the end of the CAC time. Emissions will continue to be monitored for the remaining 300 seconds.

A spectrum analyzer is used as a monitor to verify that the EUT has vacated the channel within the channel closing transmission time and channel move time, and does not transmit on a channel during the non-occupancy period after the detection and channel move.

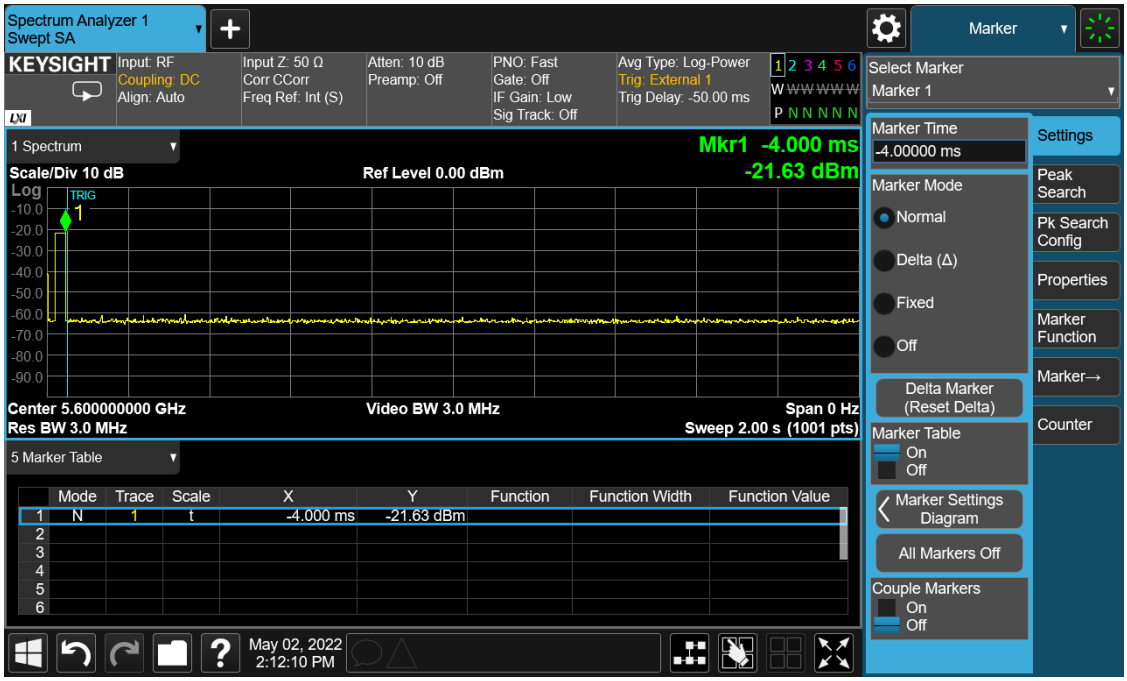
5.7.2 In-service Monitoring

Channel Move Time	10 seconds
Channel Closing Transmission Time	200 ms + aggregate of 60 ms over remaining 10 second period
Non-occupancy period	Minimum 30 minutes

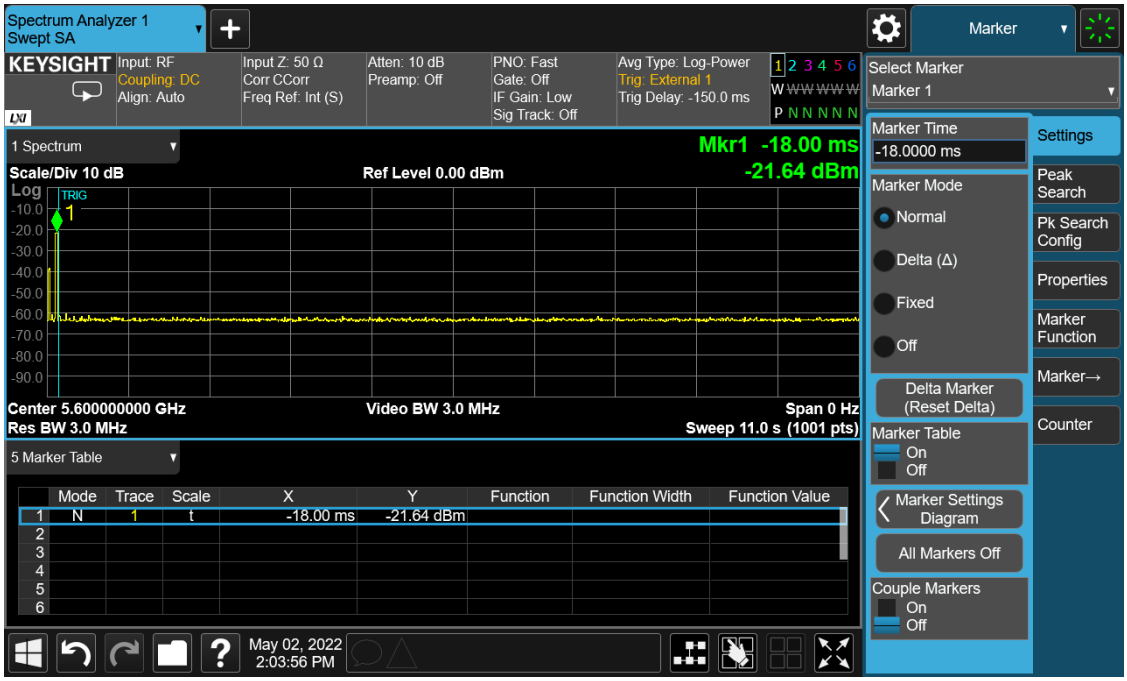
Verified during in-service monitoring: channel closing transmission time and channel move time. The transmissions were observed at the end of the radar burst on the operating channel for a duration of greater than 10 seconds. The transmissions were measured and recorded during the observation time. This was compared to the channel move time and channel closing time limits.
One 12 second plot is reported for the short pulse radar type 0. A 60 ms plot is also provided to verify closing time for the aggregate transmission time starting from 200 ms after the end of the radar signal to the completion of the channel move.
During the 30 minutes observation time, the EUT did not make any transmissions on a channel after a radar signal was detected.
Please see plots below.
A spectrum analyzer is used as a monitor to verify that the EUT has vacated the channel within the channel closing transmission time and channel move time, and does not transmit on a channel during the non-occupancy period after the detection and channel move.



Plot 1: Close (400 ms)



Plot 2: Close (2 s)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Swept SA
KEYSIGHT
Input: RF
Coupling: DC
Align: Auto
Input Z: 50 Ω
Corr CCorr
Freq Ref: Int (S)
Atten: 10 dB
Preamp: Off
PNO: Fast
Gate: Off
IF Gain: Low
Sig Track: Off
Avg Type: Log-Power
Trig: External 1
Trig Delay: -150.0 ms
1 Spectrum
Mkr1 -18.00 ms
-21.64 dBm
Scale/Div 10 dB
Ref Level 0.00 dBm
Log
TRIG
Center 5.600000000 GHz
Res BW 3.0 MHz
Video BW 3.0 MHz
Span 0 Hz
Sweep 11.0 s (1001 pts)
5 Marker Table
Mode Trace Scale X Y Function Function Width Function Value
1 N 1 t -18.00 ms -21.64 dBm
May 02, 2022
2:03:56 PM
Marker
Select Marker
Marker 1
Marker Time
-18.0000 ms
Marker Mode
Normal
Delta (Δ)
Fixed
Off
Delta Marker (Reset Delta)
Marker Table
On
Off
Marker Settings Diagram
All Markers Off
Couple Markers
On
Off
Settings
Peak Search
Pk Search Config
Properties
Marker Function
Marker→
Counter

Plot 3: Move

-- End of Test Report --