DFS TEST REPORT

FCC ID	:	Z3WAIR4960
Equipment	:	5400 Mbps 11ax Wi-Fi Mesh Extender 5400 Mbps 11ax Wi-Fi Mesh Access Point AX5400 Wi-Fi 6 Router Home Wi-Fi Solution Kit
Brand Name	:	AirTies
Model Name	:	Air 4960R/Air 4960
Applicant	:	AirTies Wireless Networks Mithat Uluunlu Sokak No. 23 Esentepe, Sisli Istanbul, 34394 Turkey
Manufacturer	:	AirTies Wireless Networks Mithat Uluunlu Sokak No. 23 Esentepe, Sisli Istanbul, 34394 Turkey
Standard	:	47 CFR FCC Part 15.407

The product was received on Dec. 08, 2021, and testing was started from Dec. 21, 2021 and completed on Dec. 28, 2021. We, Sporton International Inc. Hsinchu Laboratory, would like to declare that the tested sample has been evaluated in accordance with the procedures given in FCC KDB 905462 D02 UNII DFS Compliance Procedures New Rules v02 and shown compliance with the applicable technical standards.

The test results in this variant report apply exclusively to the tested model / sample. Without written approval of Sporton International Inc. Hsinchu Laboratory, the test report shall not be reproduced except in full.

Approved by: Sam Chen

Sporton International Inc. Hsinchu Laboratory
No.8, Ln. 724, Bo'ai St., Zhubei City, Hsinchu County 302010, Taiwan (R.O.C.)

Table of Contents

History of this test report

Report No.	Version	Description	Issued Date
FZ982017-14	01	Initial issue of report	Jan. 06, 2021
FZ982017-14	02	Revising issue date to 2022 from 2021.	Jan. 07, 2022

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
3.2.8	FCC KDB 905462 7.8.1	DFS: UNII Detection Bandwidth Measurement	PASS	-
3.3	FCC KDB 905462 7.8.3	DFS: In-Service Monitoring for Channel Move Time (CMT)	PASS	-
3.3	FCC KDB 905462 7.8.3	DFS: In-Service Monitoring for Channel Closing Transmission Time (CCTT)	PASS	-
3.4	FCC KDB 905462 7.8.4	DFS: Statistical Performance Check	PASS	-
3.1.4	FCC KDB 905462 8.1	User Access Restrictions	N/A	Manufacturer attestation NOT accessible to user

Declaration of Conformity:
The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.
Comments and Explanations:
1. The test configuration, test mode and test software were written in this test report are declared by the manufacturer. 2. The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

Reviewed by: Sam Chen
Report Producer: Wendy Pan

1 General Description

1.1 Information

1.1.1 RF General Information

Specification Items	Description	
Frequency Range	5250 MHz – 5350 MHz 5470 MHz – 5725 MHz	
Power Type	From power adapter	
Channel Bandwidth	20/40/80/160 MHz operating channel bandwidth	
Operating Mode	☒ Master (AP, Router)	
	☒ Mesh	
	☐ Client with radar detection	
	☐ Client without radar detection	
Communication Mode	☒ IP Based (Load Based)	☐ Frame Based
TPC Function	☒ With TPC	☐ Without TPC
Weather Band (5600~5650MHz)	☒ With 5600~5650MHz	☐ Without 5600~5650MHz
Firmware Number	2.110.2.0.6_wltest	
◆ 11a, HT20 and HT40 use a combination of OFDM-BPSK, QPSK, 16QAM, 64QAM modulation. ◆ VHT20, VHT40, VHT80 and VHT160 use a combination of OFDM-BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM modulation. ◆ HEW20, HEW40, HEW80 and HEW160 use a combination of OFDMA-BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM modulation. ◆ EUT employ a TPC mechanism and TPC have the capability to operate at least 6 dB below highest RF output power.		

Note: The above information was declared by manufacturer.

TPC Power Result

Mode	Min Power (dBm)	Max Power (dBm)	Min EIRP (dBm)	Max EIRP (dBm)
802.11a_Nss1,(6Mbps)_4TX	-	-	-	-
5.25-5.35GHz	15.93	21.93	17.83	23.83
5.47-5.725GHz	16.46	22.46	17.93	23.93
802.11ax HEW20-BF_Nss1,(MCS0)_4TX	-	-	-	-
5.25-5.35GHz	15.98	21.98	23.90	29.90
5.47-5.725GHz	16.47	22.47	23.96	29.96
802.11ax HEW40-BF_Nss1,(MCS0)_4TX	-	-	-	-
5.25-5.35GHz	15.93	21.93	23.85	29.85
5.47-5.725GHz	16.40	22.40	23.89	29.89
802.11ax HEW80-BF_Nss1,(MCS0)_4TX	-	-	-	-
5.25-5.35GHz	15.66	21.66	23.58	29.58
5.47-5.725GHz	16.33	22.33	23.82	29.82
802.11ax HEW160-BF_Nss1,(MCS0)_4TX	-	-	-	-
5.25-5.35GHz	12.52	18.52	20.44	26.44
5.47-5.725GHz	15.97	21.97	23.46	29.46

Note: The manufacturer declared that TPC is applied to this equipment. The test result of TPC is equal to RF output power minus 6dBm which is recorded as a reference for the manufacturer.

1.1.2 Antenna Information

Ant.	Port		Brand	Model Name	Antenna Type	Connector	Gain (dBi)				
	2.4GHz	5GHz					2.4GHz	5GHz			
								Band 1	Band 2	Band 3	Band 4
1	1	4	Airties	Airties#1	Printed Antenna	N/A	2.86	1.34	1.90	1.47	1.71
2	-	3	Airties	Airties#1	Printed Antenna	N/A	-	1.34	1.90	1.47	1.71
3	-	2	Airties	Airties#1	Printed Antenna	N/A	-	1.34	1.90	1.47	1.71
4	2	1	Airties	Airties#1	Printed Antenna	N/A	2.86	1.34	1.90	1.47	1.71

Note: The above information was declared by manufacturer.

For 2.4GHz function:

For IEEE 802.11b/g/n/VHT/ax (2TX/2RX):

Port 1 and Port 2 can be used as transmitting/receiving antenna.

Port 1 and Port 2 could transmit/receive simultaneously.

For 5GHz function:

For IEEE 802.11a/n/ac/ax (4TX/4RX):

Port 1, Port 2, Pot 3 and Port 4 can be used as transmitting/receiving antenna.

Port 1, Port 2, Pot 3 and Port 4 could transmit/receive simultaneously.

1.1.3 Table for Multiple Listing

The EUT has four equipment names and two model names which are identical to each other in all aspects except for the following table:

EUT	Equipment Name	Model Name	I/O Port Function	I/O Port Color	DDR	WLAN Function
1	5400 Mbps 11ax Wi-Fi Mesh Extender 5400 Mbps 11ax Wi-Fi Mesh Access Point Home Wi-Fi Solution Kit	Air 4960	LAN*2	yellow	Brand: Winbond Model Name: W632GU6NB-12 Capacity: 256MB	Mesh: Only 5GHz 802.11a/an/ac/ax 20/40/80/160MHz AP: 802.11abgn/ac/ax 20/40/80/160MHz
2	AX5400 Wi-Fi 6 Router	Air 4960R	LAN*1 WAN*1	LAN: yellow WAN: Red	Brand: Winbond Model Name: W634GU6NB-11 Capacity: 512MB	Router: 802.11abgn/ac/ax 20/40/80/160MHz Mesh: Only 5GHz 802.11a/an/ac/ax 20/40/80/160MHz

Note 1: From the above models, Air 4960 (EUT 1) was selected as representative model for the test and its data was recorded in this report.
Note 2: The above information was declared by manufacturer.

1.1.4 Table for Permissive Change

This product is an extension of original one reported under Sporton project number: FZ982017-04

Below is the table for the change of the product with respect to the original one.

Modifications	Performance Checking
1. Chaning the EUT Firmware Number to "2.110.2.0.6_wltest" from "Master: 2.76.4.0.45_wltest" and " 802.11ac/ax mesh mode only: 2.88.2.0_wltest".	For AP Mode (5570 MHz): 1. UNII Detection Bandwidth Measurement 2. DFS: In-Service Monitoring for Channel Move Time (CMT) 3. DFS: In-Service Monitoring for Channel Closing Transmission Time (CCTT) For Master Mode and Mesh Mode (5570 MHz): 4. Statistical Performance Check (Type 4 only)
2. Adding Zero wait.	Zero Wait

1.1.5 DFS Band Carrier Frequencies

There are four bandwidth systems.

For 20MHz bandwidth systems, use Channel 52, 56, 60, 64, 100, 104, 108, 112, 116, 120, 124, 128, 132, 136, 140, 144.

For 40MHz bandwidth systems, use Channel 54, 62, 102, 110, 118, 126, 134, 140.

For 80MHz bandwidth systems, use Channel 58, 106, 122, 138.

For 160MHz bandwidth systems, use Channel 50, 114

Frequency Band	Channel No.	Frequency	Channel No.	Frequency
5250~5350 MHz Band 2	50	5250 MHz	58	5290 MHz
	52	5260 MHz	60	5300 MHz
	54	5270 MHz	62	5310 MHz
	56	5280 MHz	64	5320 MHz
5470~5725 MHz Band 3	100	5500 MHz	122	5610 MHz
	102	5510 MHz	124	5620 MHz
	104	5520 MHz	126	5630 MHz
	106	5530 MHz	128	5640 MHz
	108	5540 MHz	132	5660 MHz
	110	5550 MHz	134	5670 MHz
	112	5560 MHz	136	5680 MHz
	114	5570 MHz	138	5690 MHz
	116	5580 MHz	140	5700 MHz
	118	5590 MHz	142	5710 MHz
	120	5600 MHz	144	5720 MHz

1.2 Accessories

Accessories				
No.	**Equipment Name**	**Brand Name**	**Model Name**	**Rating**
1	Adapter	MOSO	MSA-C1000CS12.0-12A-US	Input: 100-240V~50/60Hz 0.5A max. Output: 12.0V, 1A
Other				
RJ-45 cable*1: Non-Shielded, 1.5m				

1.3 Support Equipment

For Master Mode:

Support Equipment				
No.	**Equipment**	**Brand Name**	**Model Name**	**FCC ID**
A	Notebook	DELL	E4300	N/A
B	Notebook	DELL	E4300	N/A
C	WLAN module	Intel	AX210NGW	PD9AX210NG

For Mesh Mode:

Support Equipment				
No.	**Equipment**	**Brand Name**	**Model Name**	**FCC ID**
A	Notebook	DELL	E4300	N/A
B	Notebook	DELL	E4300	N/A
C	DHCP Server	AirTies	Air 5453v2	N/A
D	WLAN AP	AirTies	Air4960	Z3WAIR4960

1.4 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- 47 CFR FCC Part 15.407
- FCC KDB 905462 D02 UNII DFS Compliance Procedures New Rules v02

1.5 Testing Location Information

Testing Location Information	
Test Lab.：Sporton International Inc. Hsinchu Laboratory	
Hsinchu (TAF: 3787)	ADD: No.8, Ln. 724, Bo'ai St., Zhubei City, Hsinchu County 302010, Taiwan (R.O.C.) TEL: 886-3-656-9065 FAX: 886-3-656-9085 Test site Designation No. TW3787 with FCC. Conformity Assessment Body Identifier (CABID) TW3787 with ISED.

Test Condition	Test Site No.	Test Engineer	Test Environment (°C / %)	Test Date
DFS	DF01-CB (Master Mode)	Mason Chen	21.2-21.8 / 62-64	Dec. 21, 2021 ~ Dec. 28, 2021
	DF01-CB (Mesh Mode)	Benson Su	19.5-20.4 / 62-64	Dec. 24, 2021 ~ Dec. 28, 2021

2 Test Configuration of EUT

2.1 Test Channel Frequencies Configuration

Test Channel Frequencies Configuration	
IEEE Std.	**Test Channel Freq. (MHz)**
802.11ax (HEW160)	5570 MHz

2.2 The Worst Case Measurement Configuration

The Worst Case Mode for Following Conformance Tests		
Tests Item	Dynamic Frequency Selection (DFS)	
Test Condition	Radiated measurement The EUT shall be configured to operate at the highest transmitter output power setting. If more than one antenna assembly is intended for this power setting, the gain of the antenna assembly with the lowest gain shall be used. The DFS radar test signals have been aligned to the direction corresponding to the EUT's maximum antenna gain.	
Modulation Mode	802.11ax (HEW160)	
Test Mode	1	AP Mode
	2	Mesh Mode: Statistical Performance Check (Type 4 only)

3 Dynamic Frequency Selection (DFS) Test Result

3.1 General DFS Information

3.1.1 DFS Parameters

Table D.1: DFS requirement values	
Parameter	**Value**
Non-occupancy period	Minimum 30 minutes
Channel Availability Check Time	60 seconds
Channel Move Time	10 seconds (Note 1).
Channel Closing Transmission Time	200 milliseconds + an aggregate of 60 milliseconds over remaining 10 second periods. (Notes 1 and 2).
U-NII Detection Bandwidth	Minimum 100% of the 99% power bandwidth (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 to facilitate Channel changes (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 is used and for each frequency step the minimum percentage of detection is 90%. Measurements are performed with no data traffic.	

Table D.2: Interference threshold values	
Maximum Transmit Power	**Value (see note)**
EIRP ≥ 200 mW	-64 dBm
EIRP < 200 mW and PSD < 10dBm/MHz	-62 dBm
EIRP < 200 mW and PSD >= 10dBm/MHz	-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 662911D01.	

3.1.2 Applicability of DFS Requirements Prior to Use of a Channel

Requirement	DFS 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

3.1.3 Applicability of DFS Requirements during Normal Operation

Requirement	DFS Operational mode		
	Master	Client without radar detection	Client with radar detection
DFS Detection Threshold	Yes	Not required	Yes
Channel Closing Transmission Time	Yes	Yes	Yes
Channel Move Time	Yes	Yes	Yes
U-NII Detection Bandwidth	Yes	Not required	Yes

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.

3.1.4 User Access Restrictions

User Access Restrictions
☒ DFS controls (hardware or software) related to radar detection are NOT accessible to the user. Manufacturer statement confirming that information regarding the parameters of the detected Radar Waveforms is not available to the end user.

3.1.5 Channel Loading/Data Streaming

☐	The data file (MPEG-4) has been transmitting in a streaming mode.
☒	Software to ping the client is permitted to simulate data transfer with random ping intervals.
☒	Minimum channel loading of approximately 17%.
☐	Unicast protocol has been used.

3.2 Radar Test Waveform Calibration

3.2.1 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
1A	1	15 unique PRI in KDB 905462 D02 Table 5a	$Roundup\left\{\left(\frac{1}{360}\right)\times\left(\frac{19\times10^6}{PRI}\right)\right\}$	60%	15
1B	1	15 unique PRI within 518-3066, Excluding 1A PRI		60%	15
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.					

A minimum of 30 unique waveforms are required for each of the short pulse radar types 1 through 4. If more than 30 waveforms are used for short pulse radar types 1 through 4, then each additional waveform must also be unique and not repeated from the previous waveforms. The aggregate is the average of the percentage of successful detections of short pulse radar types 1-4.

3.2.2 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

Each waveform is defined as follows:

- The transmission period for the Long Pulse Radar test signal is 12 seconds.
- 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.
- 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.
- 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.
- Each pulse has a linear FM chirp between 5 and 20 MHz, with the chirp width being randomly chosen. Each pulse within a transmission period will have the same chirp width. 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.

- 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.
- 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 start time for each Burst is chosen independently.

3.2.3 Frequency Hopping Radar Test Waveform

Radar Type	Pulse Width (µsec)	PRI (µsec)	Pulses per Hop	Hopping Rate (kHz)	Hopping Sequence Length (ms)	Minimum Percentage of Successful Detection	Minimum Trials
6	1	333	9	0.333	300	70%	30

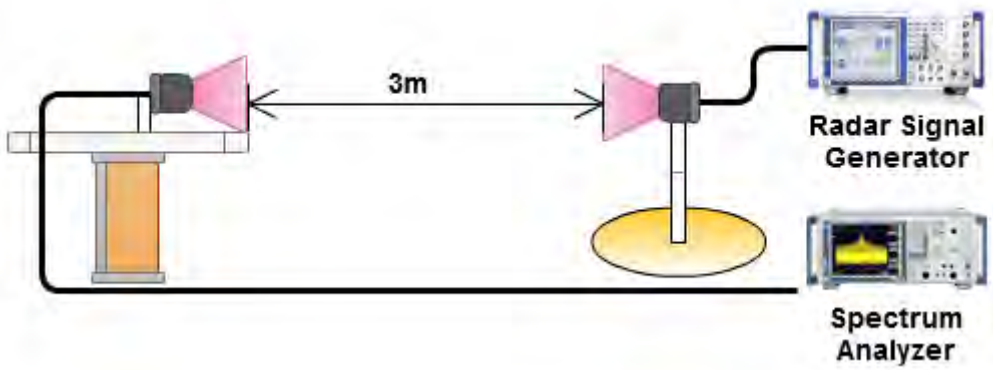
The FCC Type 6 waveform uses a static waveform with 100 bursts in the instruments ARB. In addition, the RF list mode is operated with a list containing 100 frequencies from a randomly generated list and it had be ensured that at least one of the random frequencies falls into the UNII Detection Bandwidth of the DUT. Each burst from the waveform file initiates a trigger pulse at the beginning that switches the RF list from one item to the next one.

3.2.4 DFS Threshold Level

DFS Threshold Level	
DFS Threshold level: -63 dBm	☐ at the antenna connector
	☒ in front of the antenna
The Interference **Radar Detection Threshold Level** is is *-64 dBm + 0 [dBi] + 1 dB* = -63 dBm. That had been been taken into account the output power range and antenna gain.	

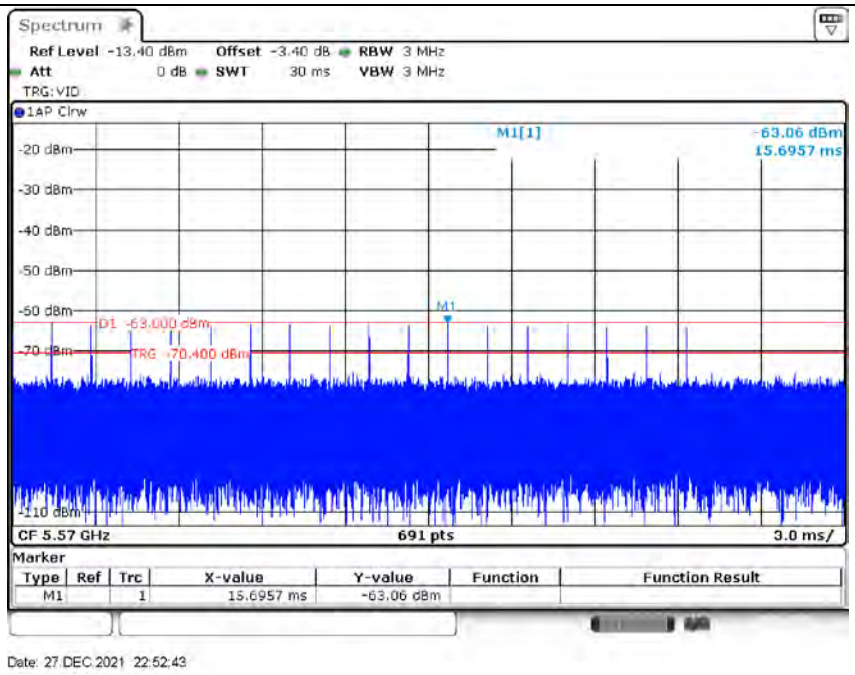
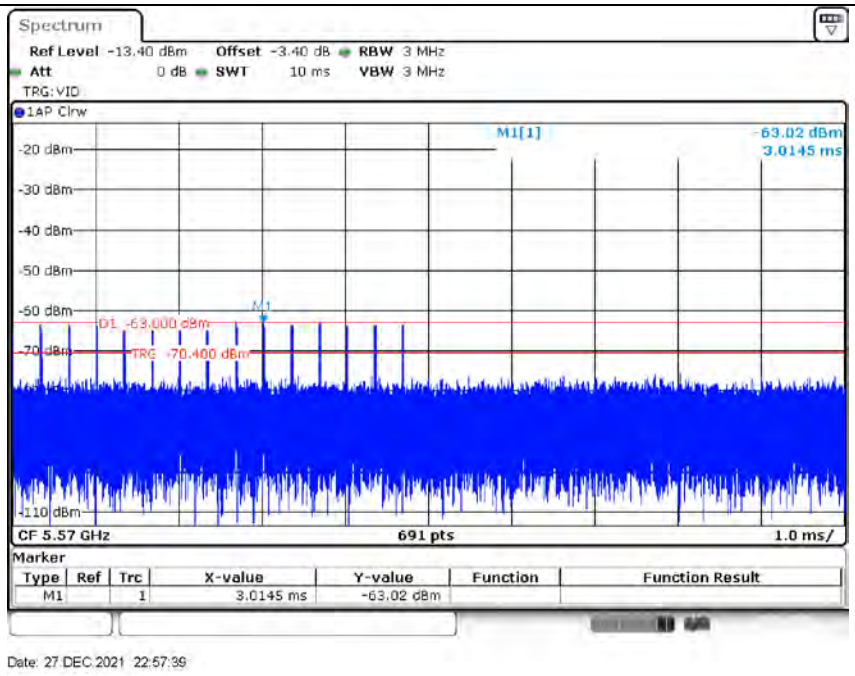
3.2.5 Calibration Setup

Master Radiated Calibration Setup



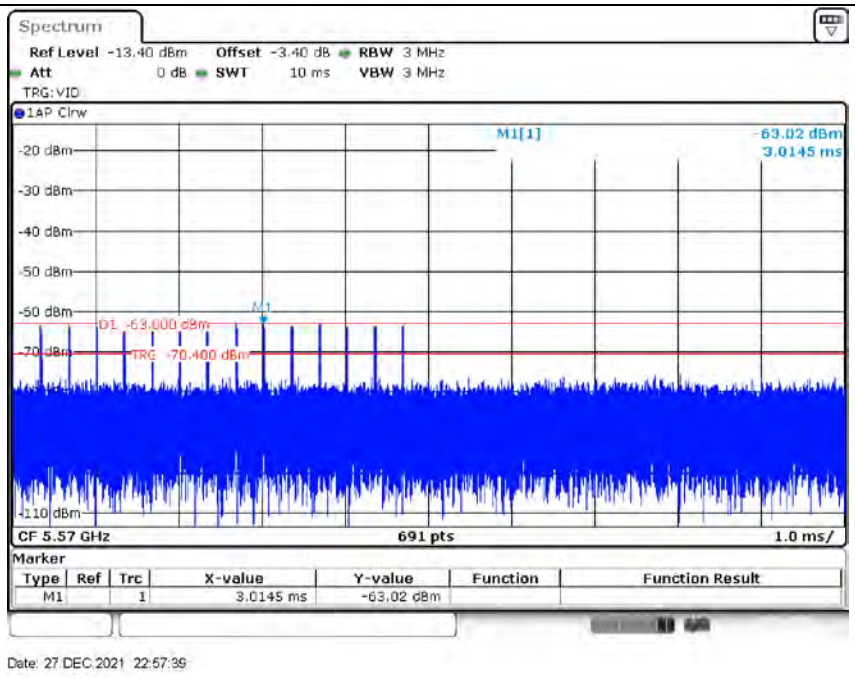
3.2.6 Radar Waveform calibration Plot

For Master Mode:

Test Frequency: 5570 MHz
Radar #0 DFS detection threshold level

Radar #4 DFS detection threshold level


For Mesh Mode:

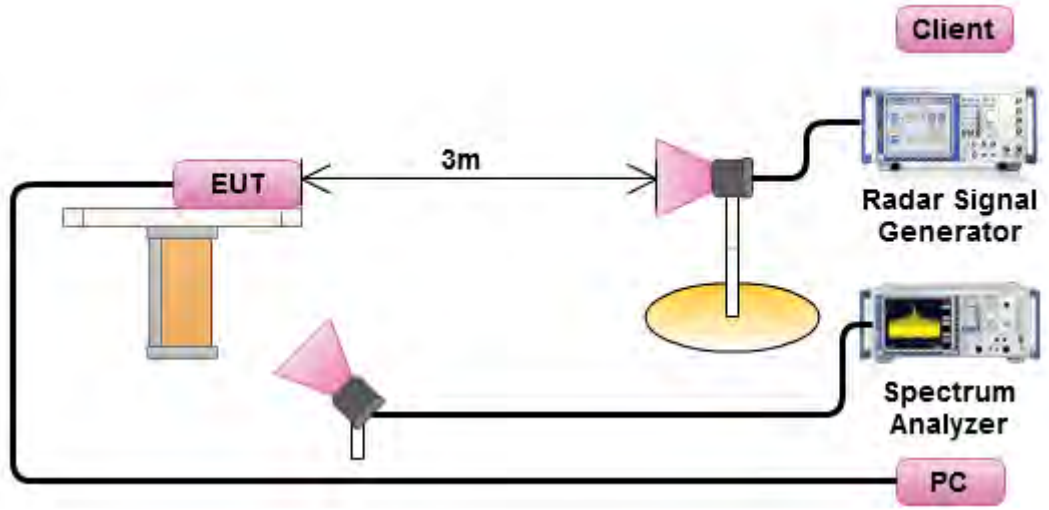
Test Frequency: 5570 MHz
Radar #4 DFS detection threshold level



3.2.7 Test Setup

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.

Master Radiated Measurement



3.2.8 UNII Detection Bandwidth

3.2.9 UNII Detection Bandwidth Limit

Channel Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	UNII Detection Bandwidth Min. Limit (MHz)
160	154.124	155
UNII Detection Bandwidth is minimum 100% of the 99% power bandwidth. A single radar Burst is generated for a minimum of 10 trials, and the response of the UUT is noted. The UUT must detect the Radar Waveform 90% or more of the time.		

3.2.10 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

3.2.11 Test Procedures

Test Method
☒ During the U-NII Detection Bandwidth detection test, radar type 0 is used and for each frequency step the minimum percentage of detection is 90 percent. Measurements are performed with no data traffic. The EUT is set up as a standalone device (no associated Client and no traffic). The radar frequency is increased in 1 MHz steps, repeating the above test sequence, until the detection rate falls below 90%. The highest frequency at which detection is greater than or equal to 90% is denoted as F_H. The radar frequency is decreased in 1 MHz steps, repeating the above test sequence, until the detection rate falls below 90%. The lowest frequency at which detection is greater than or equal to 90% is denoted as F_L. UNII Detection Bandwidth = F_H - F_L.

3.2.12 Test Result of UNII Detection Bandwidth

EUT Frequency=5570 MHz											
Channel Bandwidth (MHz)	160										
Radar Frequency (MHz)	DFS Detection Trials (1=Detection, 0= No Detection)										
	1	2	3	4	5	6	7	8	9	10	Detection Rate (%)
5490	0	0	0	0	0	0	0	0	0	0	0
5491 (FL)	1	1	1	1	0	1	1	1	1	1	90
5492	1	1	1	1	1	1	1	1	1	1	100
5493	1	1	1	1	1	1	1	1	1	1	100
5494	1	1	1	1	1	1	1	1	1	1	100
5495	1	1	1	1	1	1	1	1	1	1	100
5500	1	1	1	1	1	1	1	1	1	1	100
5505	1	1	1	1	1	1	1	1	1	1	100
5510	1	1	1	1	1	1	1	1	1	1	100
5515	1	1	1	1	1	1	1	1	1	1	100
5520	1	1	1	1	1	1	1	1	1	1	100
5525	1	1	1	1	1	1	1	1	1	1	100
5530	1	1	1	1	1	1	1	1	1	1	100
5535	1	1	1	1	1	1	1	1	1	1	100
5540	1	1	1	1	1	1	1	1	1	1	100
5545	1	1	1	1	1	1	1	1	1	1	100
5550	1	1	1	1	1	1	1	1	1	1	100
5555	1	1	1	1	1	1	1	1	1	1	100
5560	1	1	1	1	1	1	1	1	1	1	100
5565	1	1	1	1	1	1	1	1	1	1	100
5570	1	1	1	1	1	1	1	1	1	1	100
5575	1	1	1	1	1	1	1	1	1	1	100
5580	1	1	1	1	1	1	1	1	1	1	100
5585	1	1	1	1	1	1	1	1	1	1	100
5590	1	1	1	1	1	1	1	1	1	1	100
5595	1	1	1	1	1	1	1	1	1	1	100
5600	1	1	1	1	1	1	1	1	1	1	100
5605	1	1	1	1	1	1	1	1	1	1	100
5610	1	1	1	1	1	1	1	1	1	1	100
5615	1	1	1	1	1	1	1	1	1	1	100
5620	1	1	1	1	1	1	1	1	1	1	100
5625	1	1	1	1	1	1	1	1	1	1	100
5630	1	1	1	1	1	1	1	1	1	1	100
5635	1	1	1	1	1	1	1	1	1	1	100
5640	1	1	1	1	1	1	1	1	1	1	100
5645	1	1	1	1	1	1	1	1	1	1	100
5646	1	1	1	1	1	1	1	1	1	1	100
5647	1	1	1	1	1	1	1	1	1	1	100
5648	1	1	1	1	1	1	1	1	1	1	100
5649 (FH)	1	1	1	0	1	1	1	1	1	1	90
5650	0	0	0	0	0	0	0	0	0	0	0
Radar Type 0-Detection Bandwidth (MHz) = (FH-FL) = (5649MHz-5491MHz)=											158
UNII Detection Bandwidth Min. Limit (MHz) =											155
Test Result											**Complied**

3.3 In-service Monitoring

3.3.1 In-service Monitoring Limit

In-service Monitoring Limit	
Channel Move Time	10 sec
Channel Closing Transmission Time	200 ms + an aggregate of 60 ms over remaining 10 sec periods.
Non-occupancy period	Minimum 30 minutes

3.3.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

3.3.3 Test Procedures

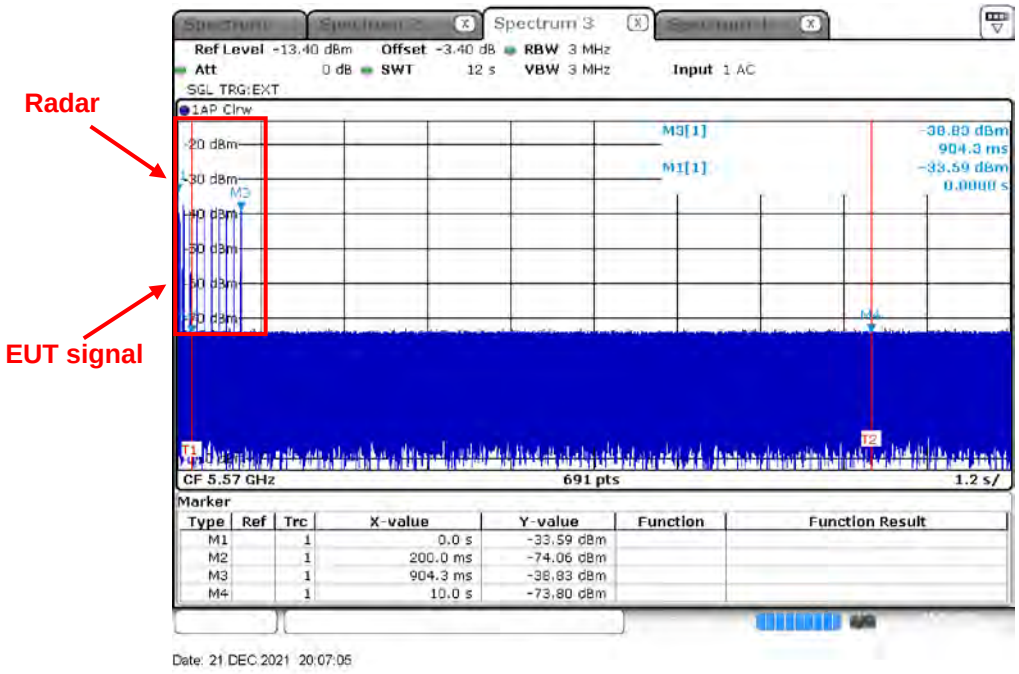
Test Method
☒ Verified during In-Service Monitoring; Channel Closing Transmission Time, Channel Move Time. Client Device will associate with the EUT. Observe the transmissions of the EUT at the end of the radar Burst on the Operating Channel for duration greater than 10 seconds. Measure and record the transmissions from the EUT during the observation time (Channel Move Time). Compare the Channel Move Time and Channel Closing Transmission Time limits.
☒ Verified during In-Service Monitoring; Channel Closing Transmission Time, Channel Move Time. One 12 sec plot needs to be reported for the Short Pulse Radar Types 0. And zoom-in a 60 ms plot verified channel closing time for the aggregate transmission time starting from 200ms after the end of the radar signal to the completion of the channel move.
☒ Verified during In-Service Monitoring; Non-Occupancy Period. Client Device will associate with the EUT. Observe the transmissions of the EUT at the end of the radar Burst on the Operating Channel for duration greater than 10 seconds. Measure and record the transmissions from the EUT during the observation time (Non-Occupancy Period). Compare the Non-Occupancy Period limits.

3.3.4 Test Result of Channel Move Time

Modulation Mode: 802.11ax (HEW160)

Parameter	Test Result	Limit
	Type 0	
Test Channel (MHz)	5570 MHz	-
Channel Move Time (sec.)	0.904	< 10s

Modulation Mode	Freq.	Radar Type
802.11ax (HEW160)	5570 MHz	0



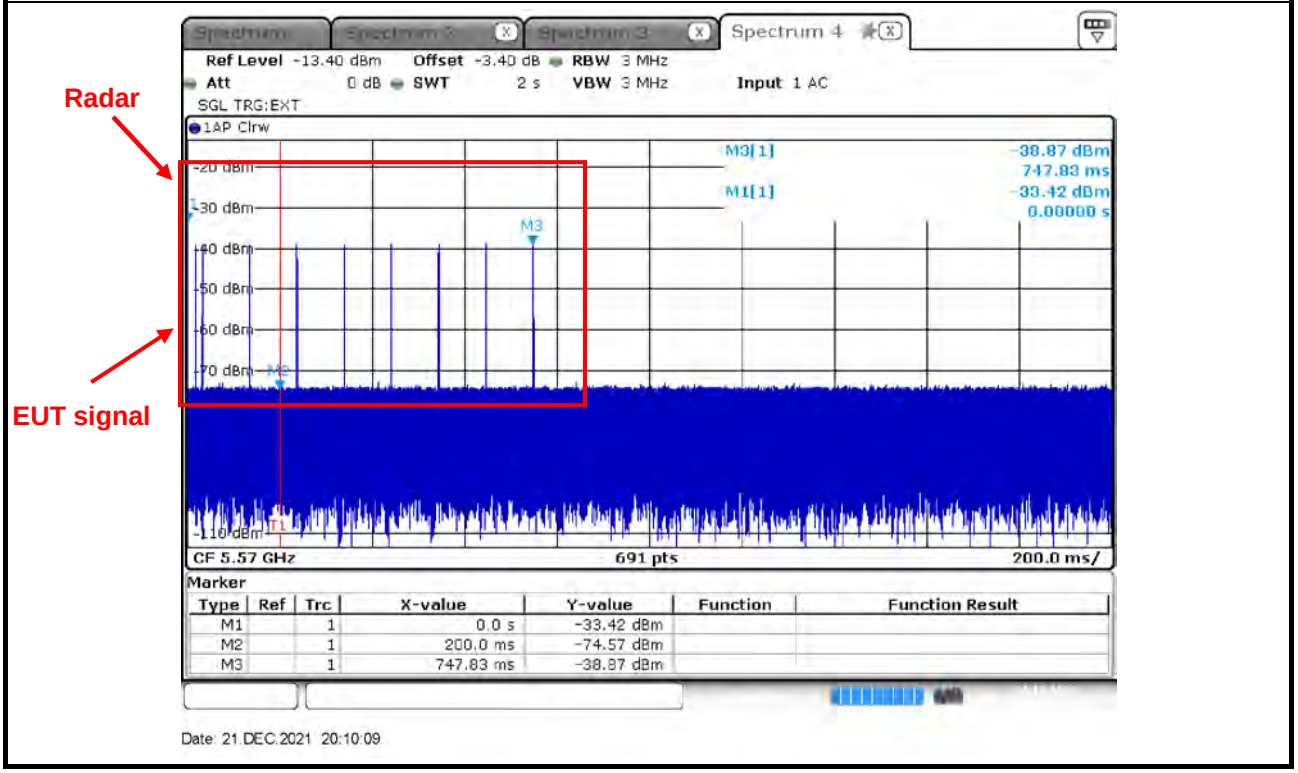
3.3.5 Test Result of Channel Closing Transmission Time

Modulation Mode: 802.11ax (HEW160)

Parameter	Test Result	Limit
	Type 0	
Test Channel (MHz)	5570 MHz	-
Channel Closing Transmission Time (ms) (Note)	23.190	＜ 60ms

Note: 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 seconds period. The aggregate duration of control signals will not count quiet periods in between transmissions.

Modulation Mode	Freq.	Radar Type
802.11ax (HEW160)	5570 MHz	0
Channel Closing Transmission Time is comprised of 200 ms starting at the beginning of the Channel Move Time plus 60ms additional intermittent control signals		



Dwell is the dwell time per spectrum analyzer sampling bin.

S is the sweep time

B is the number of spectrum analyzer sampling bins

C is the intermittent control signals of Channel Closing Transmission Time

N is the number of spectrum analyzer sampling bins (intermittent control signals) showing a U-NII transmission

Dwell (2.899 ms)= S (2000 ms) / B (690)
C (23.190 ms) = N (8) X Dwell (2.899 ms)

3.4 Statistical Performance Check

3.4.1 Statistical Performance Check Limit

Radar Type	Minimum Percentage of Successful Detection (Pd)	Minimum Trials
1	60%	30
2	60%	30
3	60%	30
4	60%	30
Aggregate (Radar Types 1-4)	80%	120
5	80%	30
6	70%	30

The percentage of successful detection is calculated by:

$$\frac{TotalWaveformDetections}{TotalWaveformTrails} \times 100 = \text{Probability of Detection Radar Waveform}$$

In addition an aggregate minimum percentage of successful detection across all Short Pulse Radar Types 1-4 is required and is calculated as follows:

$$\frac{Pd1 + Pd2 + Pd3 + Pd4}{4}$$

3.4.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

3.4.3 Test Procedures

Test Method
☒ For Statistical Performance Check test. Demonstrating a minimum channel loading of approximately 17% or greater of the test. Observe the transmissions of the UUT at the end of the Burst on the Operating Channel for duration greater than 10 seconds for Short Pulse Radar Types 1-4 and 6 to ensure detection occurs. Then Observe the transmissions of the UUT at the end of the Burst on the Operating Channel for duration greater than 22 seconds for Long Pulse Radar Type 5 to ensure detection occurs. The device can utilize a test mode to demonstrate when detection occurs to prevent the need to reset the device between trial runs.

3.4.4 Test Result of Statistical Performance Check

For Master Mode:

Modulation Mode: 802.11ax (HEW160)

Type 4 Radar Statistical Performance

Trial #	*Test Freq. (MHz)*	*Pulse Width (us)*	*PRI (us)*	*Pulses / Burst*	*1=Detection 0=No Detection*
1	5531	18.0	242	15	1
2	5617	19.9	279	12	0
3	5540	12.9	487	14	1
4	5540	15.0	452	13	0
5	5549	16.3	230	12	1
6	5535	19.8	238	13	1
7	5649	18.2	420	16	1
8	5543	16.3	452	15	0
9	5491	14.2	495	12	1
10	5519	17.8	228	16	1
11	5494	19.1	211	16	1
12	5555	18.4	283	15	0
13	5499	11.8	411	12	1
14	5505	14.2	284	13	1
15	5622	13.9	202	12	0
16	5550	17.8	340	14	1
17	5515	15.6	290	16	1
18	5517	14.6	250	16	1
19	5615	14.4	484	15	1
20	5549	18.9	387	13	1
21	5517	11.1	348	15	0
22	5614	13.8	291	16	1
23	5541	14.3	295	12	1
24	5585	12.5	300	12	1
25	5581	12.5	322	14	1
26	5569	12.5	383	13	1
27	5502	15.7	322	16	1
28	5504	19.8	469	13	1
29	5602	18.6	406	15	1
30	5593	15.9	238	14	0
Detection Percentage (%)					76.667
Limit					60%
Test Result					**Complied**

For Mesh Mode:

Modulation Mode: 802.11ax (HEW160)

Type 4 Radar Statistical Performance

Trial #	*Test Freq. (MHz)*	*Pulse Width (us)*	*PRI (us)*	*Pulses / Burst*	*1=Detection 0=No Detection*
1	5531	18.0	242	15	1
2	5617	19.9	279	12	1
3	5540	12.9	487	14	1
4	5540	15.0	452	13	1
5	5549	16.3	230	12	1
6	5535	19.8	238	13	1
7	5649	18.2	420	16	1
8	5543	16.3	452	15	1
9	5491	14.2	495	12	0
10	5519	17.8	228	16	1
11	5494	19.1	211	16	1
12	5555	18.4	283	15	1
13	5499	11.8	411	12	1
14	5505	14.2	284	13	1
15	5622	13.9	202	12	1
16	5550	17.8	340	14	1
17	5515	15.6	290	16	0
18	5517	14.6	250	16	1
19	5615	14.4	484	15	1
20	5549	18.9	387	13	1
21	5517	11.1	348	15	0
22	5614	13.8	291	16	1
23	5541	14.3	295	12	1
24	5585	12.5	300	12	1
25	5581	12.5	322	14	1
26	5569	12.5	383	13	1
27	5502	15.7	322	16	1
28	5504	19.8	469	13	0
29	5602	18.6	406	15	1
30	5593	15.9	238	14	1
Detection Percentage (%)					86.667
Limit					60%
Test Result					**Complied**

4 Test Equipment and Calibration Data

Instrument	Brand	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
Spectrum Analyzer	R&S	FSV40	101026	9kHz~40GHz	Dec. 07, 2021	Dec. 06, 2022	Radiated (DF01-CB)
Vector Signal generator	R&S	SMU200A	102782	100kHz-6GHz	Jun. 24, 2021	Jun. 23, 2022	Radiated (DF01-CB)
Horn Antenna	COM-POWER	AH-118	071187	1GHz – 18GHz	Jul. 29, 2021	Jul. 28, 2022	Radiated (DF01-CB)
Horn Antenna	COM-POWER	AH-118	071028	1GHz ~ 18GHz	Jun. 23, 2021	Jun. 22, 2022	Radiated (DF01-CB)
RF Power Divider	STI	2 Way	DV-2way -05	1GHz ~ 8GHz	Oct. 04, 2021	Oct. 03, 2022	Radiated (DF01-CB)
RF Power Divider	STI	2 Way	DV-2way -06	1GHz ~ 8GHz	Oct. 04, 2021	Oct. 03, 2022	Radiated (DF01-CB)
RF Power Divider	MTJ	4 Way	DFS-01-DV-01	1GHz ~ 6GHz	Oct. 04, 2021	Oct. 03, 2022	Radiated (DF01-CB)
RF Cable-high	Woken	RG402	High Cable-57	1 GHz –18 GHz	Oct. 04, 2021	Oct. 03, 2022	Radiated (DF01-CB)
RF Cable-high	Woken	RG402	High Cable-58	1 GHz –18 GHz	Oct. 04, 2021	Oct. 03, 2022	Radiated (DF01-CB)
RF Cable-high	Woken	RG402	High Cable-59	1 GHz –18 GHz	Oct. 04, 2021	Oct. 03, 2022	Radiated (DF01-CB)

Note: Calibration Interval of instruments listed above is one year.

5 Measurement Uncertainty

Test Items	Uncertainty	Remark
Radiated Emission	3.1 dB	Confidence levels of 95%

1. Dynamic In-Service Monitoring (Zero-Wait CAC)

1.1. Measuring Instruments

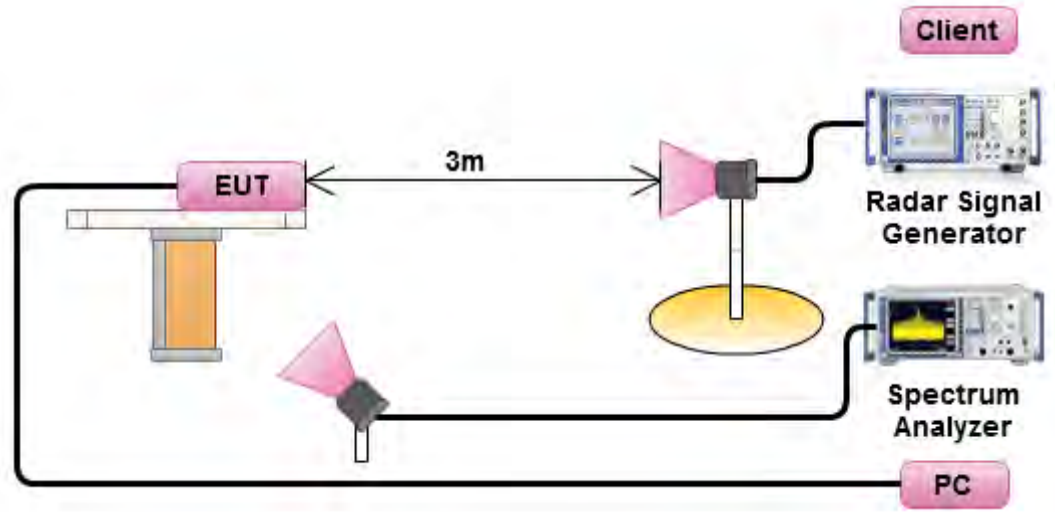
Refer a test equipment and calibration data table in this test report.

1.2. Test Procedure

Pre-clearing a DFS channel for zero time switching from a non-DFS channel
Before the operation channel moves from non-DFS channels to DFS channels for zero time switching, one minute CAC should be performed on the targeted switching channel to make sure no radar presence. When CAC completed with no radar presence, channel move to targeted channel immediately. If radar detected at any time during CAC, EUT stays on the original non-DFS channel.

1.3. Test Setup

Master Radiated Measurement

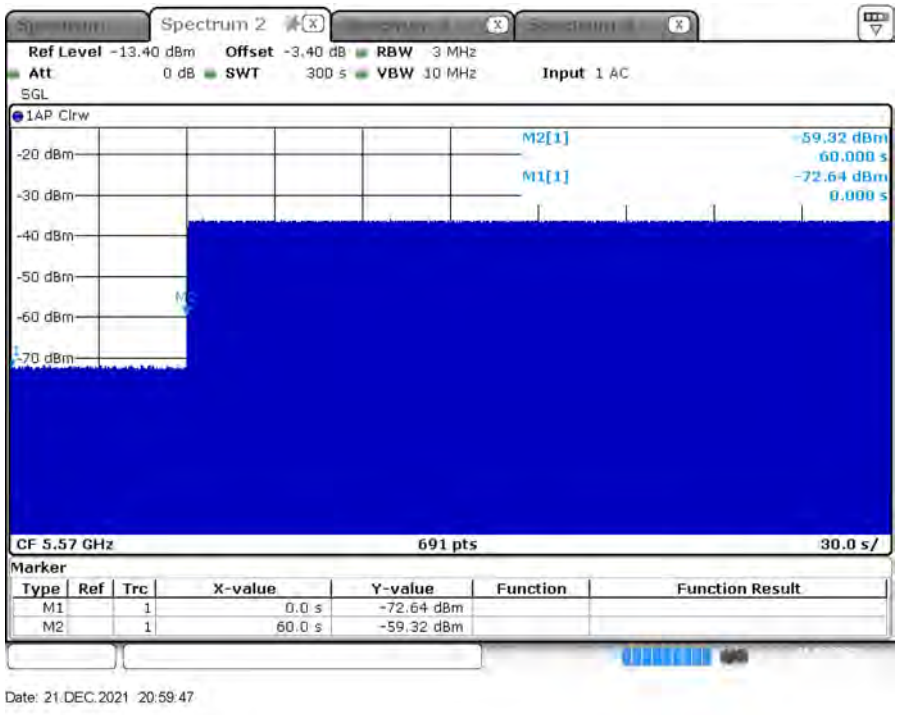


Test Channel Frequencies Configuration	
IEEE Std.	**Test Channel Freq. (MHz)**
802.11ax (HEW160)	5570 MHz

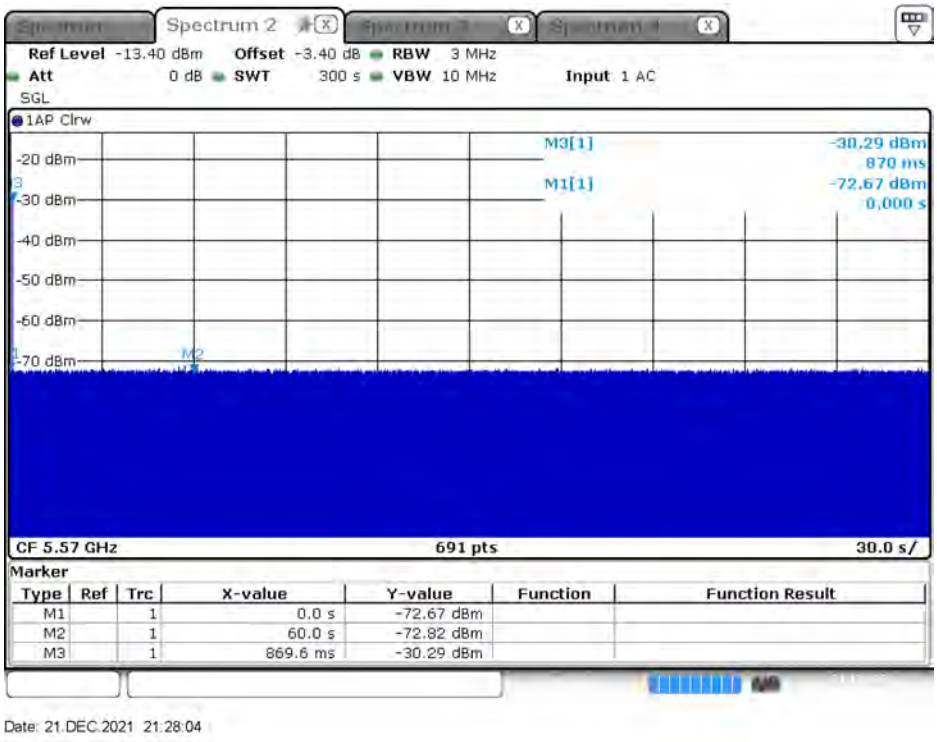
1.4. Test Result of Dynamic In-Service Monitoring

Dynamic In-Service Monitoring Test Result						
Detection Threshold Level (dBm)			-63			
Modulation Mode	Operation Freq.(MHz)	Targeted Channel Freq.(MHz)	Radar Test Signal (#)	Nr of Times Triggered (# out of 20)	Detection Probability (%)	Detection Probability Limit (%)
802.11ax (HEW160)	5250	5570	0	19	95.00	60

Initial CAC – Zero Wait		
Modulation Mode	**Zero-Wait Freq.**	**Radar Type**
802.11ax (HEW160)	5570 MHz	0
The EUT does not transmit any beacon or data transmissions until at least 1 minute after the completion of the power-on cycle (60 sec). The initial CAC time of the EUT is indicated by marker 1 (0.000 sec). Initial beacons/data transmissions are indicated by marker 2 (60.000 sec).		



Begin CAC – Zero Wait		
Modulation Mode	**Zero-Wait Freq.**	**Radar Type**
802.11ax (HEW160)	5570 MHz	0
Visual indication on the EUT of successful detection of the radar Burst will be recorded and reported. Observation of emissions will continue for 299.130 seconds after the radar Burst has been generated. Verify that during the 300 seconds measurement window no EUT transmissions occurred.		



End CAC – Zero Wait		
Modulation Mode	**Zero-Wait Freq.**	**Radar Type**
802.11ax (HEW160)	5570 MHz	0
Visual indication on the EUT of successful detection of the radar Burst will be recorded and reported. Observation of emissions will continue for 240.870 seconds after the radar Burst has been generated. Verify that during the 300 seconds measurement window no EUT transmissions occurred.