TEST REPORT

Report No.:	BCTC2410128129-4E
Applicant:	REOLINK INNOVATION LIMITED
Product Name:	WiFi module
Test Model:	WL1NM1001
Tested Date:	2024-10-31 to 2024-11-15
Issued Date:	2024-11-15

Shenzhen BCTC Testing Co., Ltd.

FCC ID: 2AYHE-2402A

Product Name:	WiFi module
Trademark:	Reolink
Model/Type reference:	WL1NM1001
Prepared For:	REOLINK INNOVATION LIMITED
Address:	FLAT/RM 705 7/F FA YUEN COMMERCIAL BUILDING 75-77 FA YUEN STREET MONG KOK KL HONG KONG
Manufacturer:	REOLINK INNOVATION LIMITED
Address:	FLAT/RM 705 7/F FA YUEN COMMERCIAL BUILDING 75-77 FA YUEN STREET MONG KOK KL HONG KONG
Factory:	HUIZHOU GAOSHENGDA TECHNOLOGY CO., LTD
Address:	No.2,Jin-da Road,Huinan High-tech Industrial Park,llui-a Avenue, Huizhou City, Guangdong Province, China
Prepared By:	Shenzhen BCTC Testing Co., Ltd.
Address:	1-2/F., Building B, Pengzhou Industrial Park, No.158, Fuyuan 1st Road, Zhancheng, Fuhai Subdistrict, Bao'an District, Shenzhen, Guangdong, China
Sample Received Date:	2024-10-31
Sample tested Date:	2024-10-31 to 2024-11-15
Issue Date:	2024-11-15
Report No.:	BCTC2410128129-4E
Test Standards:	47 CFR FCC Part 15.407 KDB 905462 D02 UNII DFS Compliance Procedures New Rules v02 KDB 905462 D03 UNII Clients Without Radar Detection New Rules v01r02
Test Results:	PASS
Remark:	This is WIFI-5GHz band radio test report.

Tested by:

Brave Zeng/ Project Handler

Approved by:

Zero Zhou/Reviewer

The test report is effective only with both signature and specialized stamp. This result(s) shown in this report refer only to the sample(s) tested. Without written approval of Shenzhen BCTC Testing Co., Ltd, this report can't be reproduced except in full. The tested sample(s) and the sample information are provided by the client.

Table Of Content

Test Report Declaration Page
1. Version 4
2. Test Summary 5
3. Measurement Uncertainty 6
4. Product Information And Test Setup 7
4.1 Product Information 7
4.2 Test Setup Configuration 8
4.3 Test Setup Configuration 8
5. Test Facility And Test Instrument Used 9
5.1 Test Facility 9
5.2 Test Instrument Used 9
6. Dynamic Frequency Selection (DFS) Test Result 10
6.1 DFS Parameters 10
6.2 Applicability of DFS Requirements Prior to Use of a Channel 11
6.3 Applicability of DFS Requirements during Normal Operation 11
6.4 Uniform Spreading 12
6.5 User Access Restrictions 12
6.6 Channel Loading/Data Streaming 12
6.7 Radar Test Waveform Calibration 13
6.8 UNII Detection Bandwidth 21
6.9 In-service Monitoring 22
7. EUT Photographs 31
8. EUT Test Setup Photographs 32

(Note: N/A Means Not Applicable)

1. Version

Report No.	Issue Date	Description	Approved
BCTC2410128129-4E	2024-11-15	Original	Valid

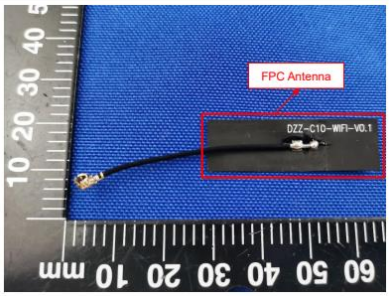
2. Test Summary

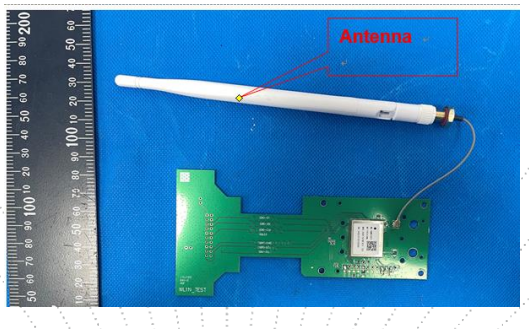
The Product has been tested according to the following specifications:

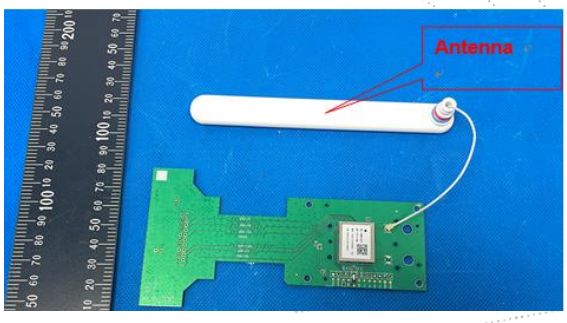
Items	Description of Test	Result
Performance Requirements Check	Initial Channel Availability Check Time (CAC)	Not Applicable
	Radar Burst at the Beginning of the CAC	Not Applicable
	Radar Burst at the End of the CAC	Not Applicable
In-Service Monitoring	Channel Move Time	Compliance
	Channel Closing Transmission Time	Compliance
	Non-Occupancy Period	Compliance
Radar Detection	Statistical Performance Check	Not Applicable
Note: EUT is client device without radar detection.		

Note: According to the following changes in the product, change the antenna,
Therefore, conducted emission and radiation emission, radiation stray and radiation sideband tests were only carried out in this report on the original report (BL-SZ2471080-604)

Product reports two different antennas

Original: 

New(ANT 1) 

New(ANT 2) 

Note: According to the following changes in the original test report (BL-SZ2471080-604), no changes have been made to the product.
Only updated test instruments, conducted emission, radiation emission, radiation sideband, radiation spurious, EUT photos, etc.

3. Measurement Uncertainty

The reported uncertainty of measurement y ± U, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95 %.

No.	Item	Uncertainty
1	In-service Monitoring	± 0.1 ms

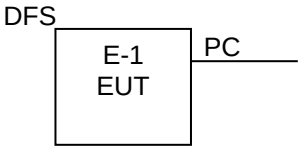
4. Product Information And Test Setup

4.1 Product Information

Model/Type reference:	WL1NM1001
Model differences:	N/A
Hardware Version:	N/A
Software Version:	N/A
Operation Frequency:	Band 2A: 5260MHz~5320MHz Band 2C: 5500MHz~5700MHz
Channel Separation:	802.11a: 20MHz 802.11n: 20MHz 802.11ac: 20MHz 802.11ax: 20MHz
Type of Modulation:	OFDM/OFDMA
Antenna Type:	External antenna
Antenna Gain:	Antenna 1: 2.55 dBi, Antenna 2: 3.21 dBi Remark: ☒ The antenna gain of the product comes from the antenna report provided by the customer, and the test data is affected by the customer information. ☐ The antenna gain of the product is provided by the customer, and the test data is affected by the customer information.
Ratings:	DC 3.3V

4.2 Test Setup Configuration

See test photographs attached in *EUT TEST SETUP PHOTOGRAPHS* for the actual connections between Product and support equipment.



4.3 Test Setup Configuration

No.	Device Type	Brand	Model	Series No.	Note
E-1	WiFi module	Reolink	WL1NM1001	N/A	EUT
E-2	Router	N/A	N/A	N/A	Auxiliary
E-3	laptop	N/A	N/A	N/A	Auxiliary

Router: FCC ID:MSQ-RTAXJ300 IC:3568A-RTAXJ300

Item	Shielded Type	Ferrite Core	Length	Note
C-1	N/A	N/A	0M	DC cable unshielded

Notes:
1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.
3.The product is a client device without radar detection function and is a passive device.

5. Test Facility And Test Instrument Used

5.1 Test Facility

All measurement facilities used to collect the measurement data are located at Shenzhen BCTC Testing Co., Ltd. Address: 1-2/F., Building B, Pengzhou Industrial Park, No.158, Fuyuan 1st Road, Zhancheng, Fuhai Subdistrict, Bao'an District, Shenzhen, Guangdong, China. The site and apparatus are constructed in conformance with the requirements of ANSI C63.4 and CISPR 16-1-1 other equivalent standards.
FCC Test Firm Registration Number: 712850
A2LA certificate registration number is: CN1212
ISED Registered No.: 23583
ISED CAB identifier: CN0017

5.2 Test Instrument Used

Equipment	Manufacturer	Model#	Serial#	Last Cal.	Next Cal.
Signal Analyzer20kHz-26.5GHz	Keysight	N9020A	MY49100060	May 16, 2024	May 15, 2025
Signal Generator	Keysight	N5182B	MY56200519	May 16, 2024	May 15, 2025
WIFI6 router	Asus	RT-AX82U	/	/	/

6. Dynamic Frequency Selection (DFS) Test Result

6.1 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 See Note 1.
Channel Closing Transmission Time	200 milliseconds + an aggregate of 60 milliseconds over remaining 10 second periods. See Notes 1 and 2.
U-NII Detection Bandwidth	Minimum 100% of the 99% power bandwidth See Note 3.
Note 1: The instant that the *Channel Move Time* and the *Channel Closing Transmission Time* begins is as follows: 1)For the Short pulse radar Test Signals this instant is the end of the *Burst*. 2)For the Frequency Hopping radar Test Signal, this instant is the end of the last radar *Burst* generated. 3)For the Long Pulse radar Test Signal this instant is the end of the 12 second period defining the radar transmission. 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 1 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)**
≥ 200 milliwatt	-64 dBm
< 200 milliwatt	-62 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.	
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.	

6.2 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
Uniform Spreading	Yes	Not required	Not required
U-NII Detection Bandwidth	Yes	Not required	Yes

6.3 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

6.4 Uniform Spreading

Manufacturer Declare the Uniform Spreading:
☒For the 5250-5350 MHz and 5470-5725 MHz bands, 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 Gaussian random algorithm.

6.5 User Access Restrictions

User Access Restrictions
☒DFS controls (hardware or software) related to radar d etection 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.

6.6 Channel Loading/Data Streaming

☒IP Based (Load Based) - stream the test file from the Master to the Client
The client device is link with the master device and plays the WAV audio file from master device to client device. Test file download in NTIA website (http://ntiacsd.ntia.doc.gov/dfs/)
The client device is link with the master device and plays the MPEG file (6 1/2 Magic Hours) from master device to client device. Test file download in NTIA website (http://ntiacsd.ntia.doc.gov/dfs/)
Alternative streaming e.g., FTP with about 17 to 20% loading and submit proposal to FCC.
☒Frame Based - stream the test file from the Master to the Client.
fixed talk/listen ratio, set the ratio to 45%/55%

6.7 Radar Test Waveform Calibration

Short Pulse Radar Test Waveforms:

Table 5 – Short Pulse Radar Test Waveforms

Radar Type	Pulse Width (µsec)	PRI (µsec)	Number of Pulses	Minimum Percentage of Successful Detection	Minimum Number of 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	$\text{Roundup}\left\{\left(\frac{1}{360}\right)\cdot\left(\frac{19\cdot 10^6}{\text{PRI}_{\mu sec}}\right)\right\}$	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.

A minimum of 30 unique waveforms are required for each of the short pulse radar types 2 through 4. For short pulse radar type 1, the same waveform is used a minimum of 30 times. If more than 30 waveforms are used for short pulse radar types 2 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.

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:

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 start time for each Burst is chosen independently.

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.

DFS Threshold Level:
Antenna 2

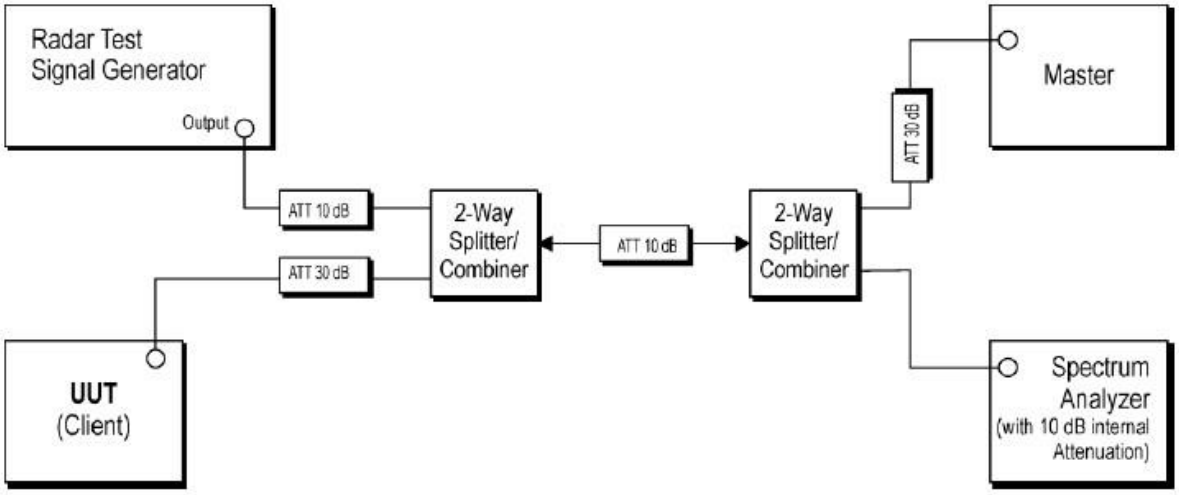
DFS Threshold Level	
DFS Threshold level: -58.79 dBm	☒at the antenna connector
	☐ in front of the antenna
The Interference **Radar Detection Threshold Level** is -58.79 dBm. That had been taken into account the output power range and antenna gain.	

Antenna 1

DFS Threshold Level	
DFS Threshold level: -59.45 dBm	☒at the antenna connector
	☐ in front of the antenna
The Interference **Radar Detection Threshold Level** is -59.45 dBm. That had been taken into account the output power range and antenna gain.	

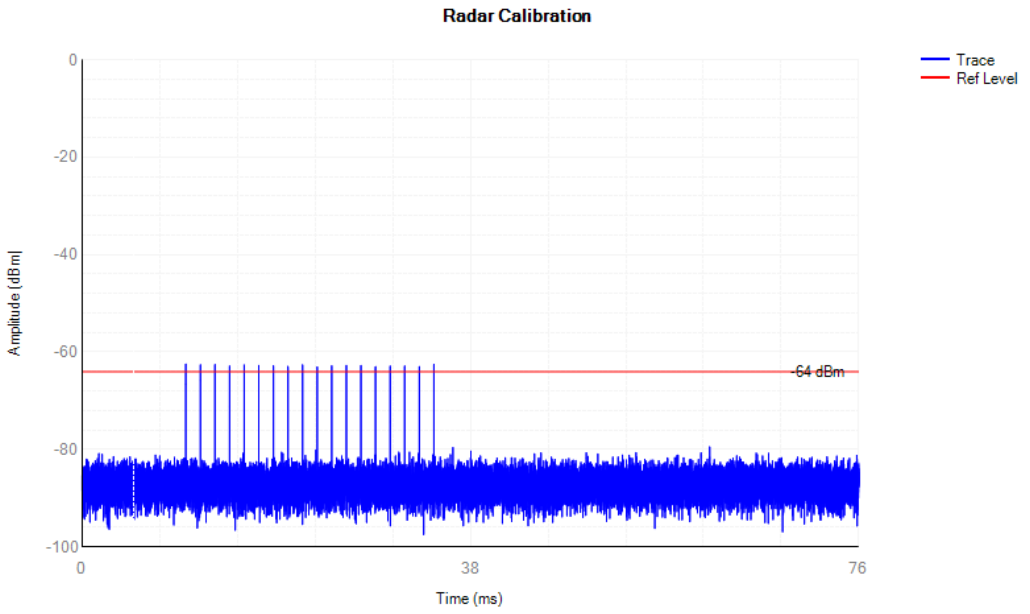
Test Set up:

Setup for Client with injection at the Master

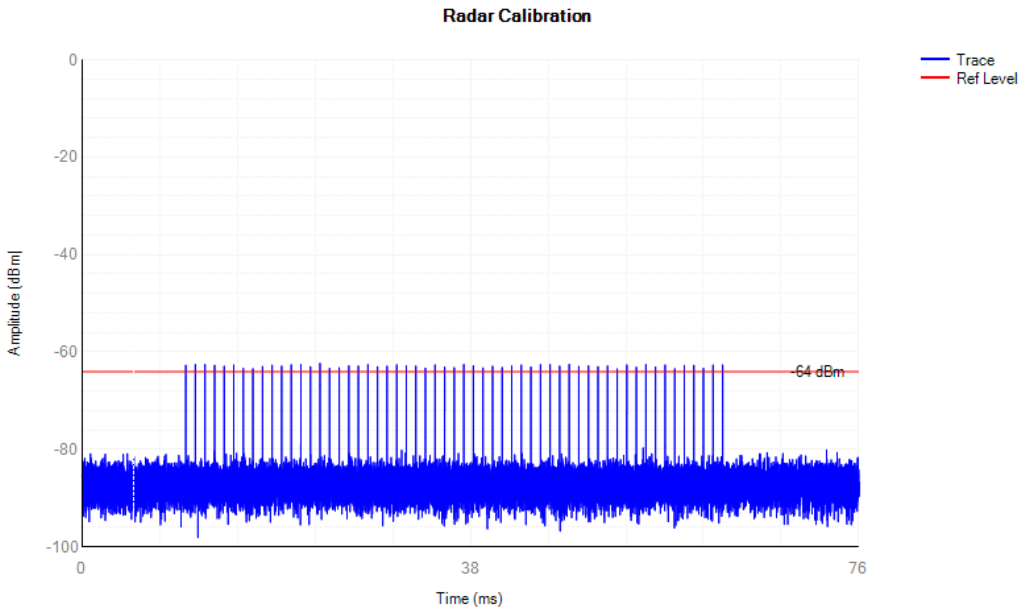


Calibrate the radar chart

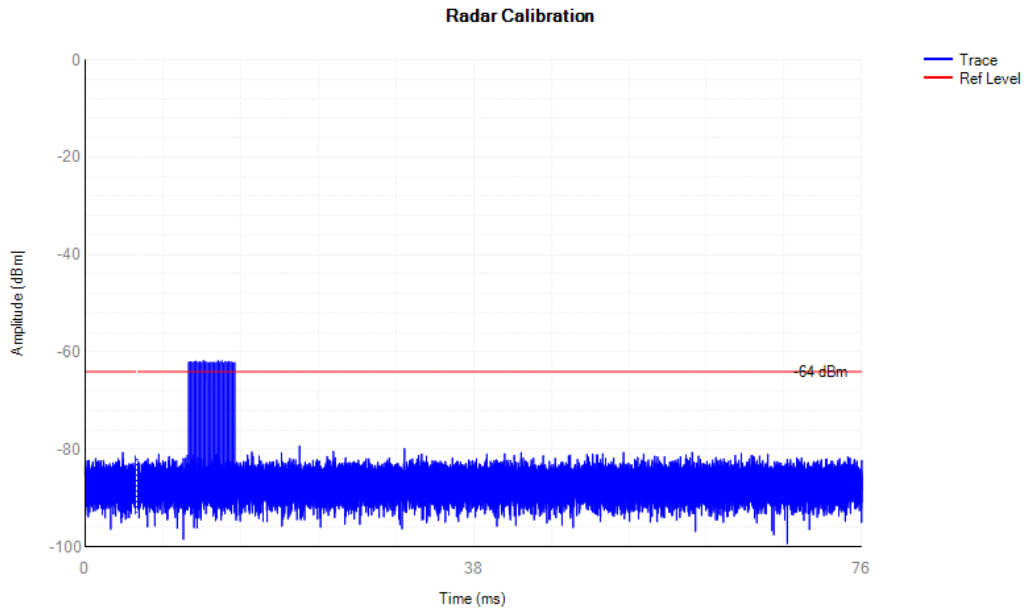
Test Graphs
DFS_FCC _Ref 0



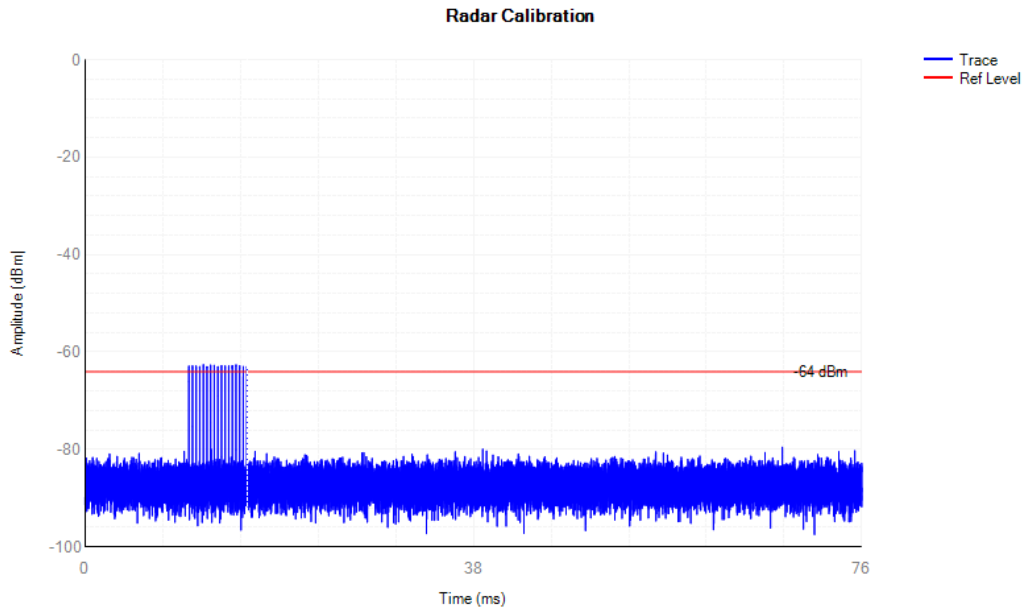
Test Graphs
DFS_FCC_Ref 1



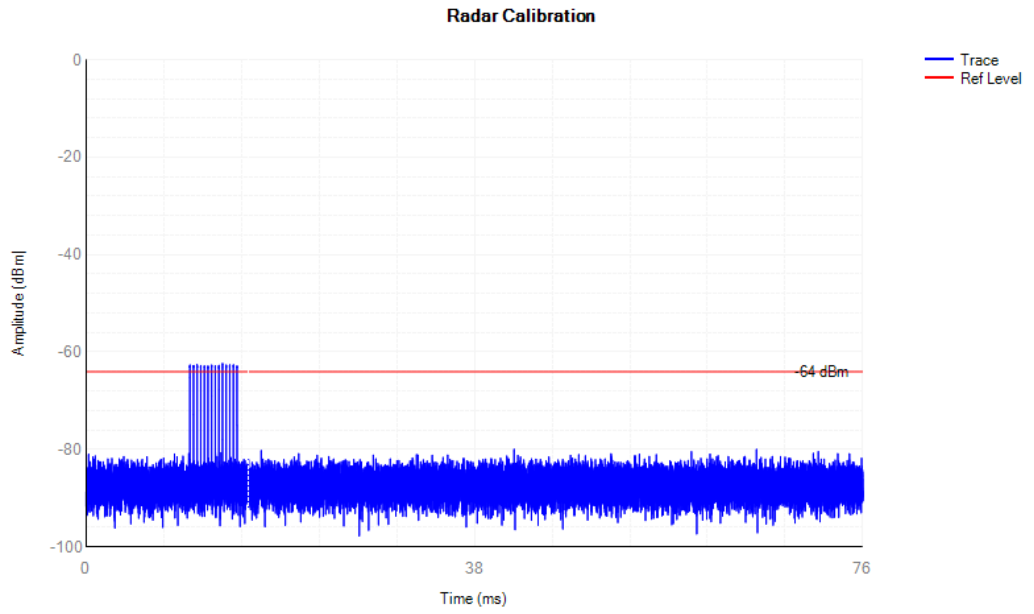
Test Graphs
DFS_FCC_Ref 2



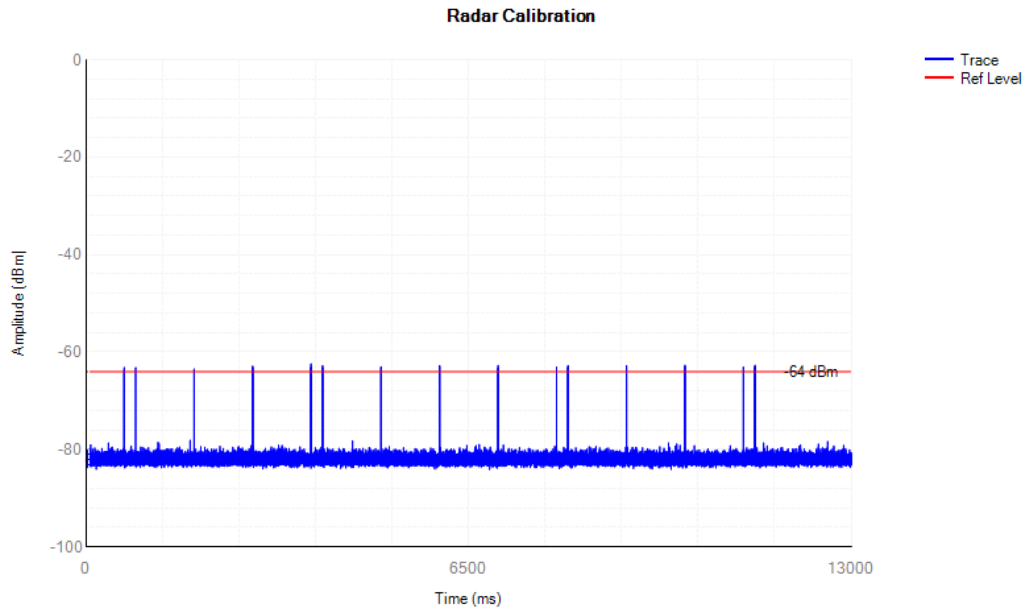
Test Graphs
DFS_FCC_Ref 3



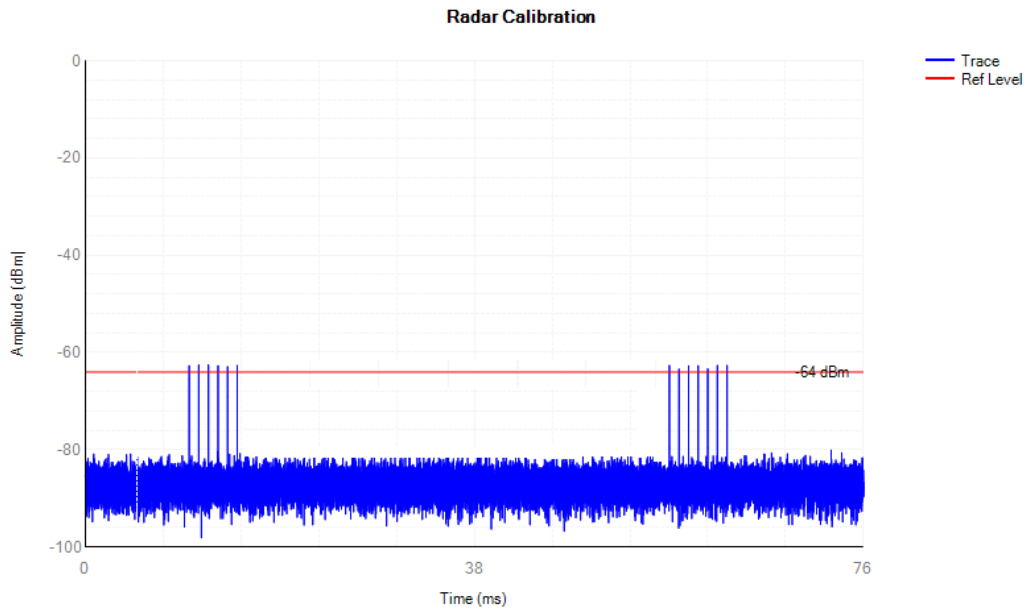
Test Graphs
DFS_FCC_Ref 4



Test Graphs
DFS_FCC_Ref 5



Test Graphs
DFS_FCC_Ref 6



6.8 UNII Detection Bandwidth

UNII Detection Bandwidth Limit:

Channel Bandwidth (MHz)	99% Power Bandwidth (MHz)	UNII Detection Bandwidth (MHz)
20	N/A	N/A
40	N/A	N/A
80	N/A	N/A
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.		

Measuring Instruments:

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

Test Procedures:

Test Method
Refer as KDB905462 D02 UNII DFS Compliance Procedures New Rules v02, clause 7.8.1 for UNII Detection Bandwidth test. During the U-NII Detection Bandwidth detection test, radar type 1 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 FH. 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 FL. UNII Detection Bandwidth = FH -FL

Test result: Not required

6.9 In-service Monitoring

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

Measuring Instruments:

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

Test Procedures:

Test Method
☒Refer as KDB905462 D02 UNII DFS Compliance Procedures New Rules v02, clause 7.8.3 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.
☒Refer as KDB905462 D02 UNII DFS Compliance Procedures New Rules v02, clause 8.3 verified during In-Service Monitoring; Channel Closing Transmission Time, Channel Move Time. One 10 sec plot needs to be reported for the Short Pulse Radar Types 1-4 and one for the Long Pulse Radar Type in a 22 sec plot. And zoom-in a 600 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.
☒Refer as KDB905462 D02 UNII DFS Compliance Procedures New Rules v02, clause 7.8.3 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.

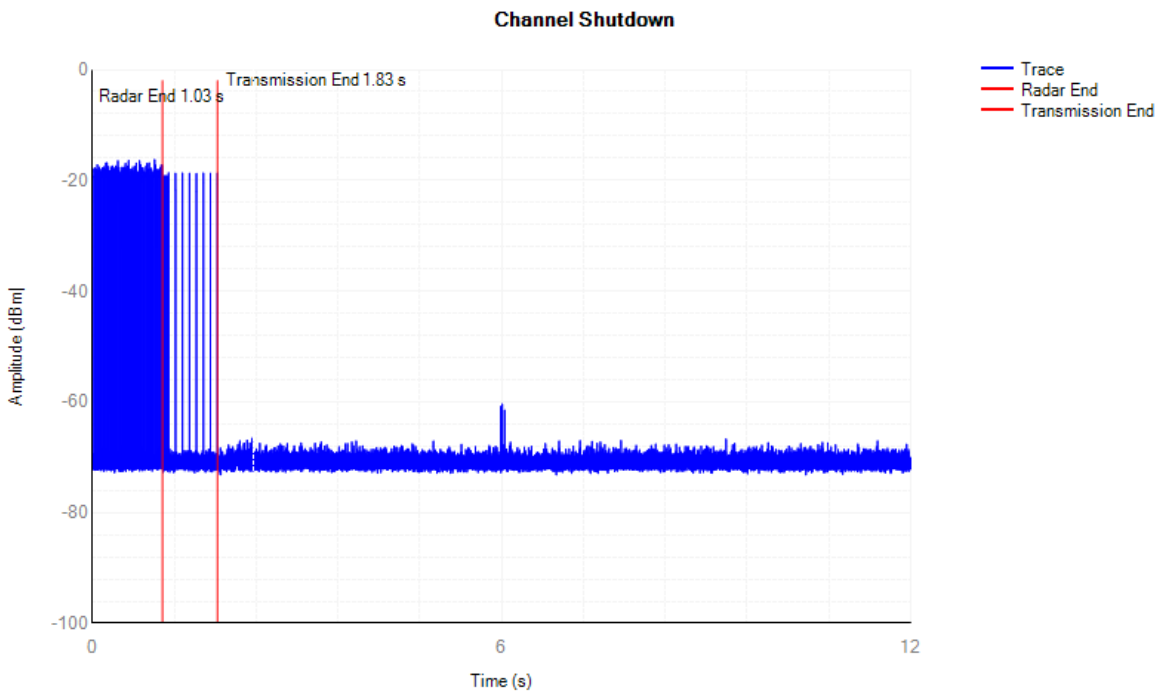
Note：The test data shows only the worst mode and maximum bandwidth.

Test Result of In-service Monitoring:
Antenna 1

Channel Closing Transmission Time and Channel Move Time Result						
Mode	**Frequency (MHz)**	**Channel Move Time (s)**	**Limit Channel Move Time (s)**	**Close Transmission Time (s)**	**Limit Close Transmission Time (s)**	**Verdict**
ax20	5320	0.805	10	0.0124	0.26	Pass

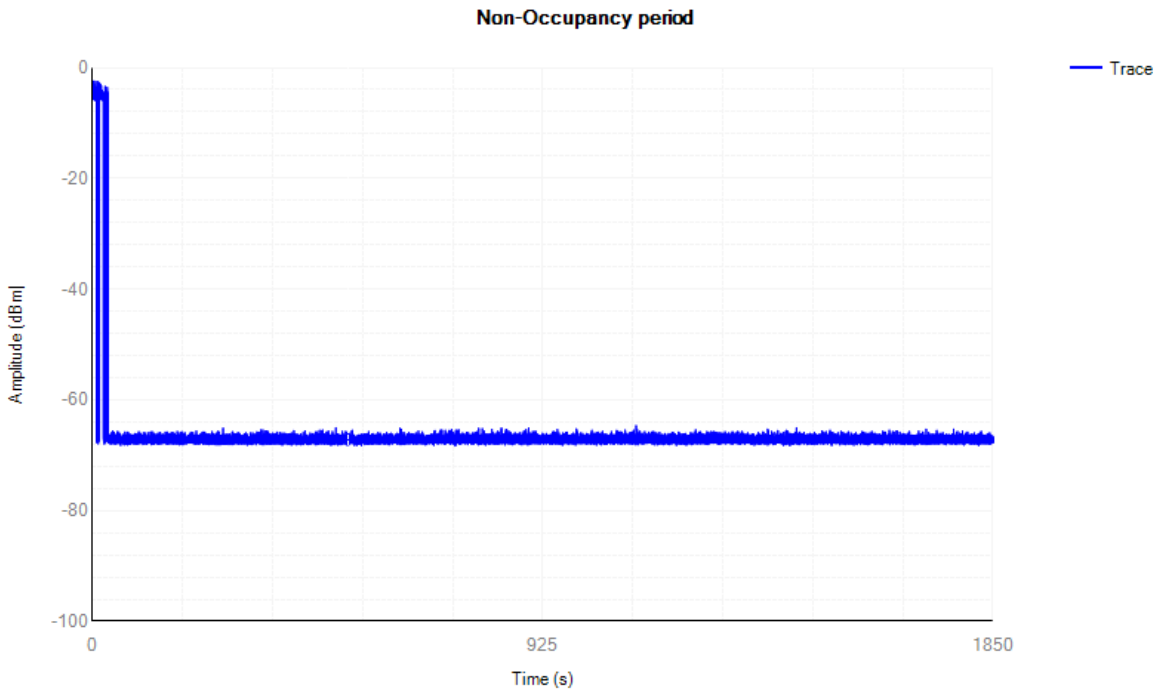
Test Graphs

5320MHz Shutdown



Non-Occupancy Period Result				
Modulation Mode	Freq. (MHz)	Non-Occupancy Period		
		Measured	Limit	Verdict
ax20	5320	>30min	30min	PASS
1850 sec Timing Plot				

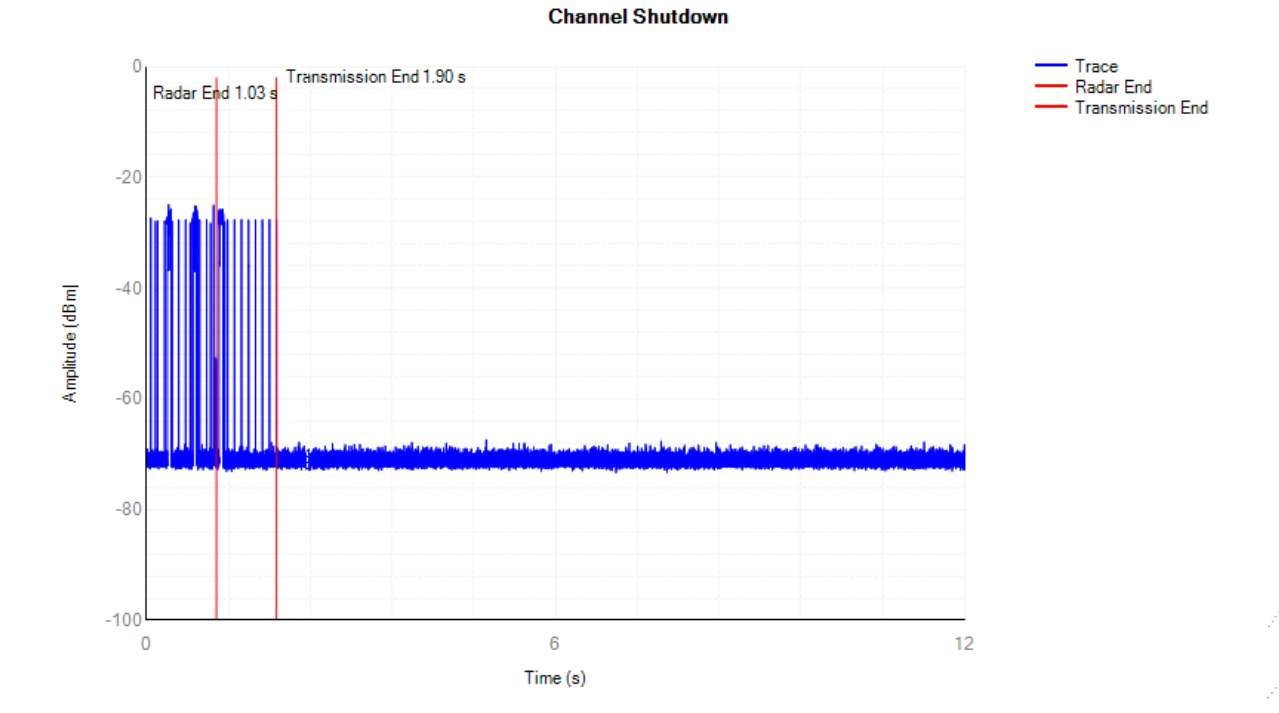
Test Graphs
5320MHz Non-Occupancy



Antenna 1

Channel Closing Transmission Time and Channel Move Time Result						
Mode	**Frequency (MHz)**	**Channel Move Time (s)**	**Limit Channel Move Time (s)**	**Close Transmission Time (s)**	**Limit Close Transmission Time (s)**	**Verdict**
ax20	5700	0.8786	10	0.068	0.26	Pass

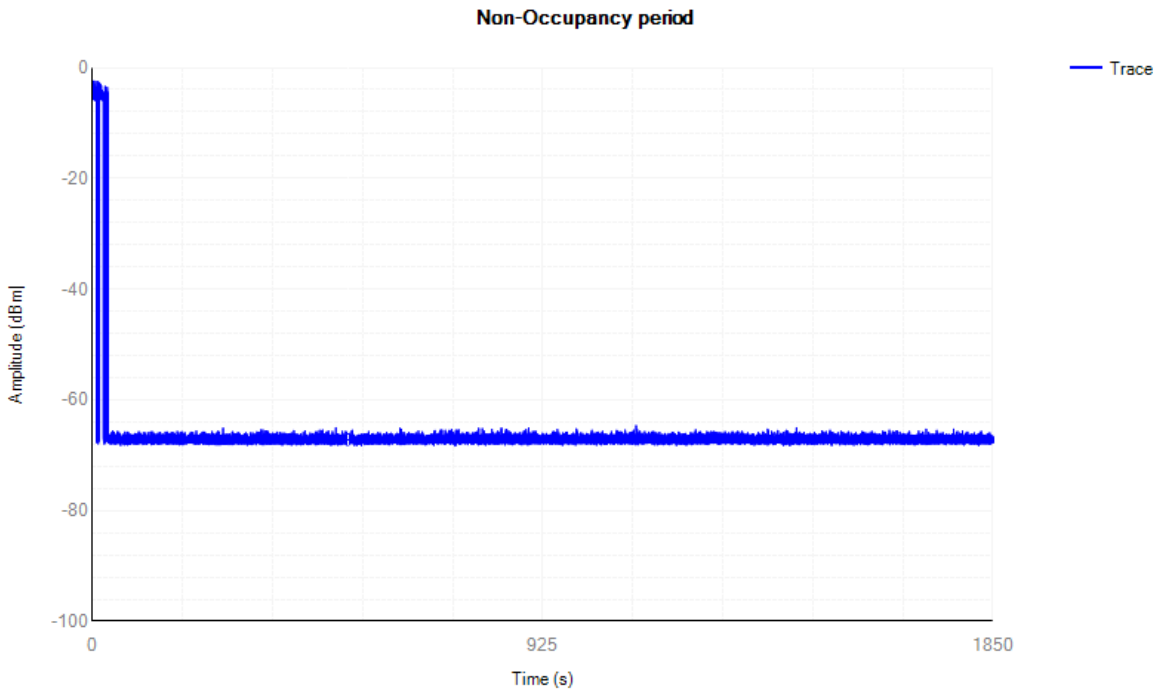
5700MHz Shutdown



Non-Occupancy Period Result				
Modulation Mode	Freq. (MHz)	Non-Occupancy Period		
		Measured	Limit	Verdict
ax20	5700	>30min	30min	PASS
1850 sec Timing Plot				

Test Graphs

5700MHz Non-Occupancy

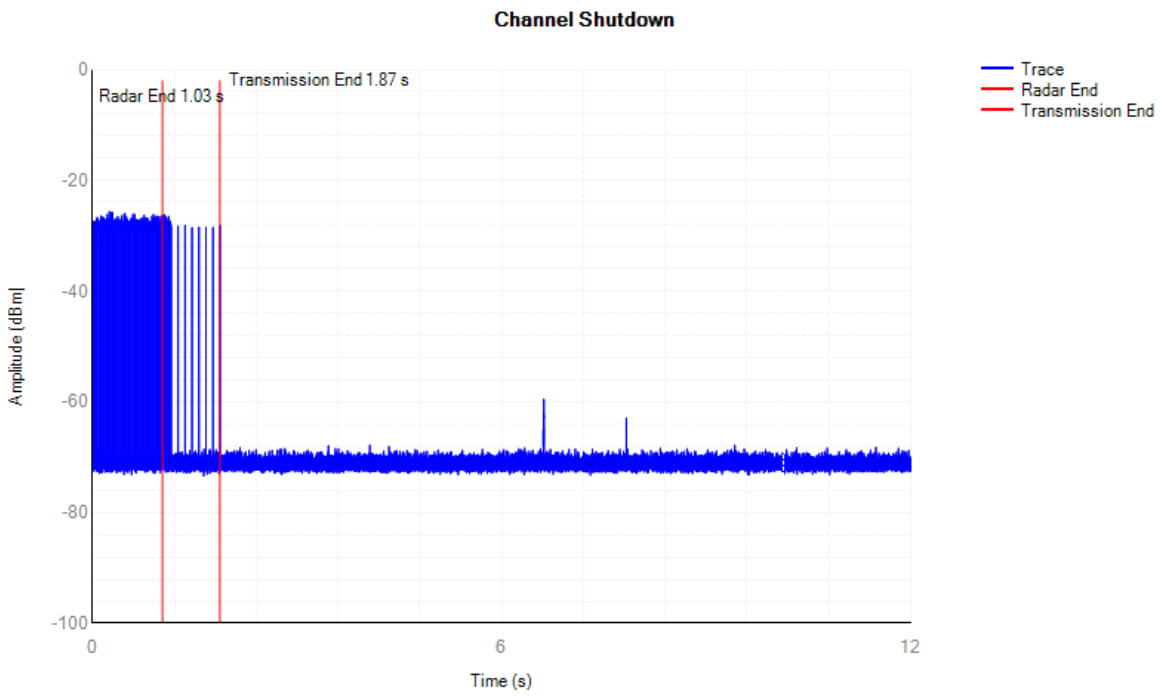


Test Result of In-service Monitoring:
Antenna 2

Channel Closing Transmission Time and Channel Move Time Result						
Mode	**Frequency (MHz)**	**Channel Move Time (s)**	**Limit Channel Move Time (s)**	**Close Transmission Time (s)**	**Limit Close Transmission Time (s)**	**Verdict**
ax20	5320	0.8422	10	0.0344	0.26	Pass

Test Graphs

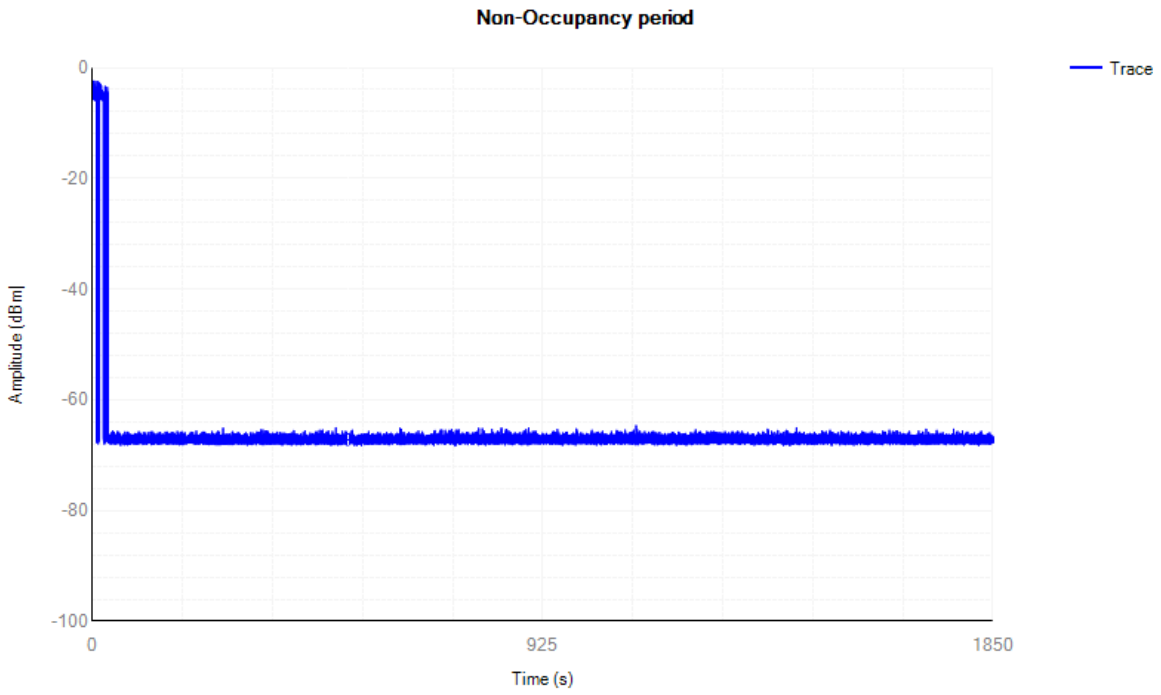
5320MHz Shutdown



Non-Occupancy Period Result				
Modulation Mode	Freq. (MHz)	Non-Occupancy Period		
		Measured	Limit	Verdict
ax20	5320	>30min	30min	PASS
1850 sec Timing Plot				

Test Graphs

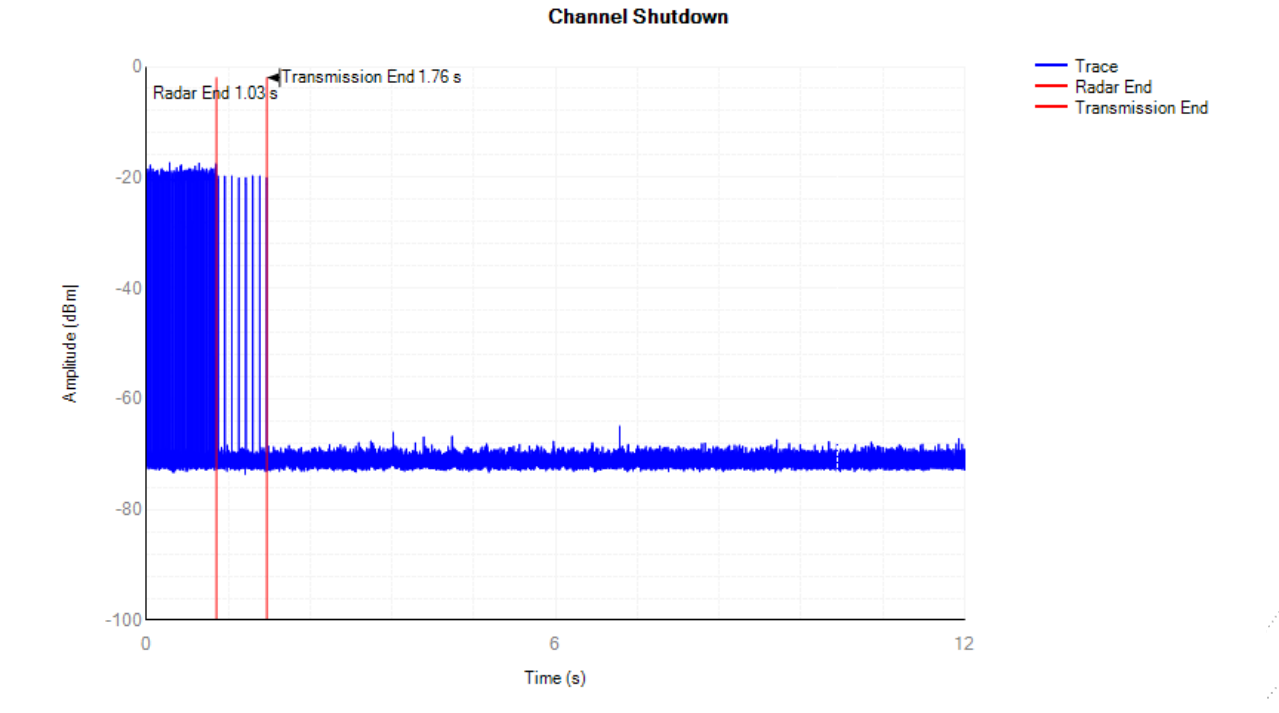
5320MHz Non-Occupancy



Antenna 1

Channel Closing Transmission Time and Channel Move TimeResult						
Mode	**Frequency (MHz)**	**Channel Move Time (s)**	**Limit Channel Move Time (s)**	**Close Transmission Time (s)**	**Limit Close Transmission Time (s)**	**Verdict**
ax20	5700	0.7366	10	0.008	0.26	Pass

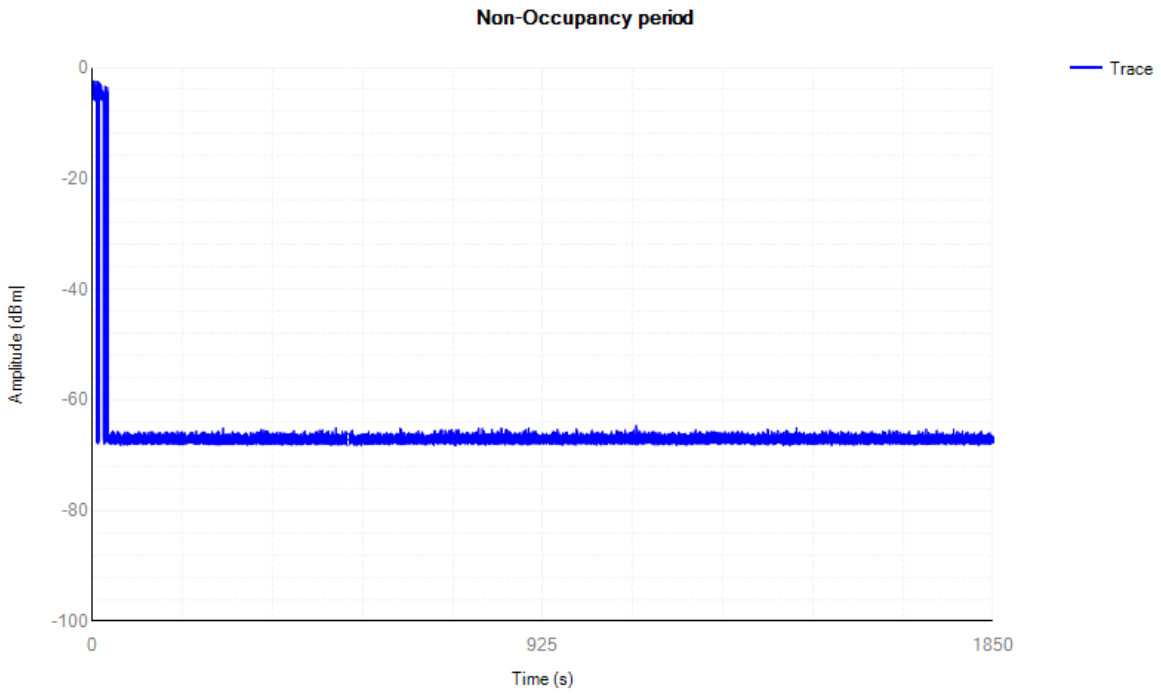
5700MHz Shutdown



Non-Occupancy Period Result				
Modulation Mode	Freq. (MHz)	Non-Occupancy Period		
		Measured	Limit	Verdict
ax20	5700	>30min	30min	PASS
1850 sec Timing Plot				

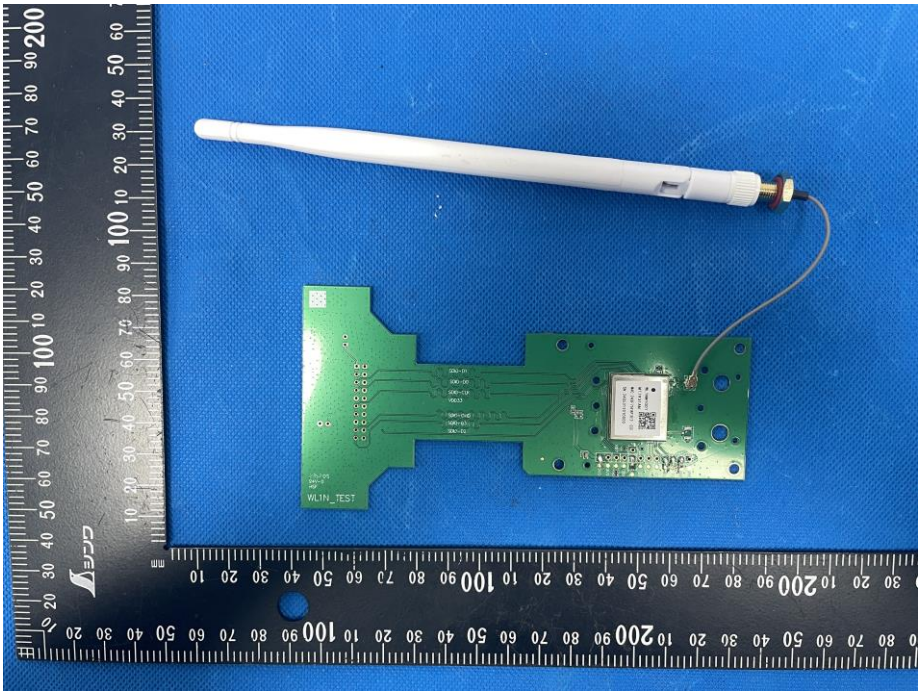
Test Graphs

5700MHz Non-Occupancy

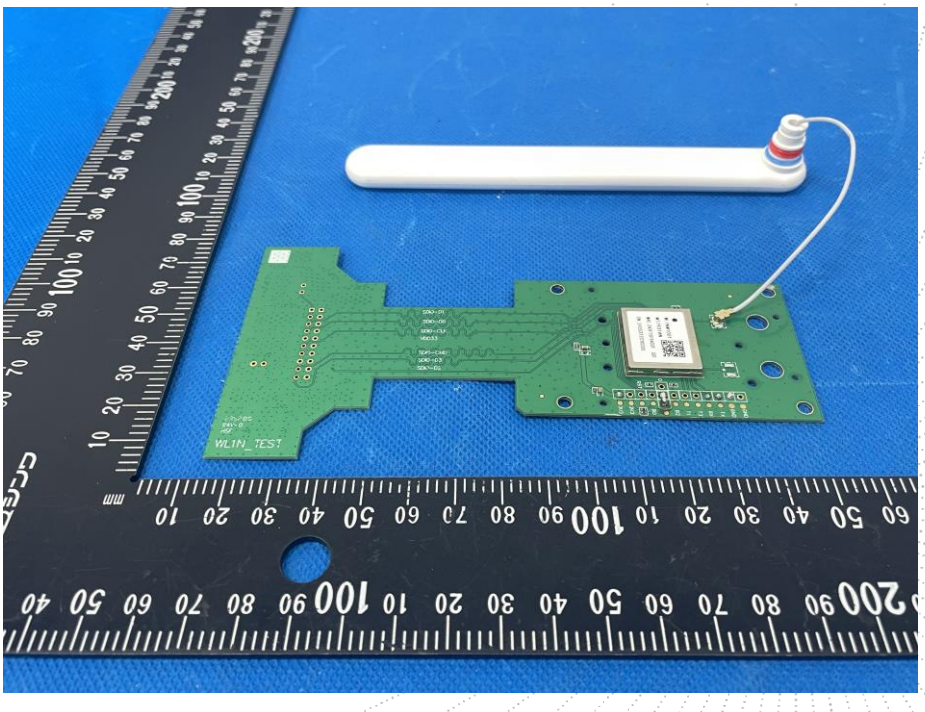


7. EUT Photographs

EUT Photo 1



EUT Photo 2



NOTE: Appendix-Photographs Of EUT Constructional Details

8. EUT Test Setup Photographs

DFS

STATEMENT

1. The equipment lists are traceable to the national reference standards.

2. The test report can not be partially copied unless prior written approval is issued from our lab.

3. The test report is invalid without the "special seal for inspection and testing".

4. The test report is invalid without the signature of the approver.

5. The test process and test result is only related to the Unit Under Test.

6. Sample information is provided by the client and the laboratory is not responsible for its authenticity.

7. The quality system of our laboratory is in accordance with ISO/IEC17025.

8. If there is any objection to this test report, the client should inform issuing laboratory within 15 days from the date of receiving test report.

Address:
1-2/F., Building B, Pengzhou Industrial Park, No.158, Fuyuan 1st Road, Zhancheng, Fuhai Subdistrict, Bao'an District, Shenzhen, Guangdong, China

TEL: 400-788-9558

P.C.: 518103

FAX: 0755-33229357

Website: http://www.chnbctc.com

Consultation E-mail: bctc@bctc-lab.com.cn

Complaint/Advice E-mail: advice@bctc-lab.com.cn

※※※※※ END ※※※※※