Test Report

Product: Android board

Trade Mark: Rcstars

Model Number: RCS-3901

FCC ID: 2BAL6-RCS-3901

Prepared for

Rcstars Industrial (Shenzhen) Co., LTD.

7/F, 2ND Bldg, Senyang High-Tech Park, No.7 Road, Guangming High-Tech Park District, Shenzhen, China

Prepared by

Shenzhen HongBiao Certification& Testing Co., Ltd

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Website: http://www.sz-hongbiao.com

Table of Contents

TEST RESULT CERTIFICATION

Applicant's Name..... :	Rcstars Industrial (Shenzhen) Co., LTD.
Address ..... :	7/F, 2ND Bldg, Senyang High-Tech Park, No.7 Road, Guangming High-Tech Park District, Shenzhen, China
Manufacturer's Name ..... :	Rcstars Industrial (Shenzhen) Co., LTD.
Address ..... :	7/F, 2ND Bldg, Senyang High-Tech Park, No.7 Road, Guangming High-Tech Park District, Shenzhen, China

Product description

Product name ..... :	Android board
Model Number ..... :	RCS-3901
Standards ..... :	FCC Part 15.407
Test procedure ..... :	IEEE/ANSI C63.10-2020 KDB 905462 D06 802.11 Channel Plans New Rules v02 KDB 905462 D02 UNII DFS Compliance Procedures New Rules v02 KDB 905462 D04 Test Mode New Rules v01

This device described above has been tested by Shenzhen HongBiao Certification& Testing Co., Ltd and the test results show that the equipment under test (EUT) is in compliance with the EMC requirements. And it is applicable only to the tested sample identified in the report.

Date of Test

Date (s) of performance of tests .....:	Oct. 12, 2023~Dec. 08, 2023
Test Result.....:	**Pass**

Testing Engineer : Zoe Su

(Z o e S u)

Technical Manager : Gary Lu

(G a r y L u)

Authorized Signatory : Leo Su

(L e o S u)

Revision History

Revised No.	Date of Issue	Description
01	Dec. 08, 2023	Original

1 General Description

1.1 Description of EUT

Product name:	Android board
Model name:	RCS-3901
Series Model:	N/A
Different of series model:	N/A
Frequency range:	U-NII-1: 5180 MHz to 5240 MHz, U-NII-2A: 5260 MHz to 5320 MHz, U-NII-2C: 5500 MHz to 5700 MHz, U-NII-3: 5745 MHz to 5825 MHz
Modulation type:	IEEE 802.11a: OFDM(64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n: OFDM(64QAM, 16QAM, QPSK, BPSK) IEEE 802.11ac: OFDM(256QAM, 64QAM, 16QAM, QPSK, BPSK)
Transfer rate:	IEEE 802.11a: Up to 54 Mbps IEEE 802.11n-HT20: Up to MCS7 IEEE 802.11n-HT40: Up to MCS7 IEEE 802.11ac-VHT20: Up to MCS8 IEEE 802.11ac-VHT40: Up to MCS9 IEEE 802.11ac-VHT80: Up to MCS9
Channel bandwidth:	IEEE 802.11a/n-HT20/ac-VHT20: 20 MHz IEEE 802.11n-HT40/ac-VHT40: 40 MHz IEEE 802.11ac-VHT80: 80 MHz
Antenna type:	Built-in antenna
Antenna gain:	U-NII-1: 3.32dBi U-NII-2A: 1.83dBi U-NII-2C: 3.55dBi U-NII-3: 3.55dBi
Max. output power:	U-NII-1: 12.64dBm U-NII-2A: 11.87dBm U-NII-2C: 11.98dBm U-NII-3: 14.92dBm
Hardware version:	RCS-3901 V2.0
Software version:	Android 11
Battery:	N/A
Power supply:	DC 12V from adapter AC 120V/60Hz

1.2 Operation Channel List

For U-NII-2A:

20 MHz		40 MHz		80 MHz	
Channel Number	Frequency (MHz）	Channel Number	Frequency (MHz）	Channel Number	Frequency (MHz）
52	5260	54	5270	58	5290
56	5280	62	5310	--	--
60	5300	--	--	--	--
64	5320	--	--	--	--
--	--	--	--	--	--

For U-NII-2C:

20 MHz		40 MHz		80 MHz	
Channel Number	Frequency (MHz）	Channel Number	Frequency (MHz）	Channel Number	Frequency (MHz）
100	5500	102	5510	106	5530
104	5520	110	5550	122	5610
108	5540	118	5590	--	--
112	5560	126	5630	--	--
116	5580	134	5670	--	--
120	5600	--	--		
124	5620	--	--	--	--
128	5640	--	--	--	--
132	5660	--	--	--	--
136	5680	--	--	--	--
140	5700	--	--	--	--
--	--	--	--	--	--

1.3 Test Mode

For 802.11a/n(HT20)/ ac(VHT20)

U-NII-2A(5250 - 5350 MHz)			U-NII-2C (5470 - 5725 MHz)		
Channel Number	Channel Number	Channel Number	Channel Number	Channel	Frequency (MHz）
52	Low	5260	100	Low	5500
56	Mid	5280	120	Mid	5600
64	High	5320	140	High	5700

For 802.11n (HT40)/ac (VHT40)

U-NII-2A(5250 - 5350 MHz)			U-NII-2C (5470 - 5725 MHz)		
Channel	Channel	Channel	Channel Number	Channel	Frequency (MHz）
54	Low	5270	102	Low	5510
62	High	5310	110	Mid	5550
			134	High	5670

For 802.11ac (VHT80)

U-NII-2A(5250 - 5350 MHz)	
Channel Number	Channel Number
58	58

U-NII-2C (5470 - 5725 MHz)	
Channel Number	Frequency (MHz）
106	5530
122	5610

During testing, Channel and Power Controlling Software provided by the customer was used to control theoperating channel as well as the output power level. The RF output power selection is for the setting of RFoutput power expected by the customer and is going to be fixed on the firmware of the final end product.Transmitting duty cycle is no less 98%.
The software is TermAssist and SecureCRT tool Use together.

Test Items	Mode	Data Rate	TX/RX
Radiated Emissions	802.11a (HT20)	6 Mbps	TX
	802.11n/ac(HT20/40/80)	MCSO	TX
Duty Cycle	802.11a(HT20)	6 Mbps	TX
	802.11n/ac(HT20/40/80)	MCSO	TX
Band Edge	802.11a (HT20)	6 Mbps	TX
	802.11n/ac(HT20/40/80)	MCSO	TX
6dB Bandwidth	802.11a (HT20)	6 Mbps	TX

	802.11n/ac(HT20/40/80)	MCSO	TX
26dB Bandwidth and 99% Occupied Bandwidth	802.11a (HT20)	6 Mbps	TX
	802.11n/ac(HT20/40/80)	MCSO	TX
Conducted Output Power	802.11a(HT20)	6 Mbps	TX
	802.11n/ac(HT20/40/80)	MCSO	TX
Power Spectral Density	802.11a(HT20)	6 Mbps	TX
	802.11n/ac(HT20/40/80)	MCSO	TX
Frequency Stability	Un-modulation	/	TX

1.4 Test Setup

See photographs of the test setup in the report for the actual setup and connections between EUT and support equipment.

1.5 Ancillary Equipment

Equipment	Model	S/N	Manufacturer
Adapter	GST40A12	EN94C51258	SuZhou MEAN WELL Technology Co., Ltd.
Notebook computer	NbDE-WFH9	XYKPM22A13001799	Huawei Terminal Co., Ltd

2 Summary of Test Result

No.	Standard Section	Test Item	Result	Remark
1	15.407(h)	Non-Occupancy PeriodDFS Detection Threshold	Pass	
2	15.407(h)	Channel Availability Check Time	N/A	
3	15.407(h)	U-NII Detection Bandwidth	N/A	
4	15.407(h)	Channel Closing Transmission Time	N/A	
5	15.407(h)	Channel Move Time	Pass	
6	15.407(h)	Statistical Performance Check	N/A	

3 Test Facilities and Accreditations

3.1 Test Laboratory

Test Site	Shenzhen HongBiao Certification& Testing Co., Ltd
Test Site Location	Room 102, 201, Building 2, Yuanwanggu RFID Industrial Park, Tongguan Road, Tianliao Community, Yutang Street, Guangming District, Shenzhen, China
Telephone:	(86-755) 2998 9321
Fax:	(86-755) 2998 5110
FCC Registration No.:	CN1341
A2LA Certificate No.:	6765.01

3.2 Environmental Conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature:	15ºC~35ºC
Relative Humidity:	20%~75%
Air Pressure:	98kPa~101kPa

3.3 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 %.

Measurement Frequency Range	U，(dB)	Note
RF frequency	2x 10^{-5}	
RF power, conducted	± 0.57 dB	
Conducted emission(150kHz~30MHz)	± 2.5 dB	
Radiated emission(30MHz~1GHz)	± 4.2 dB	
Radiated emission (above 1GHz)	± 4.7 dB	
Temperature	±1 degree	
Humidity	± 5 %	

3.4 Test Software

Software name	Manufacturer	Model	Version
Conducted test system	MWRF-test	MTS 8310	V2.0.0

4 List of Test Equipment

RF							
Item	Equipment No.	Equipment name	Manufacturer	Model	Serial No.	Calibration date	Due date
1	HB-E041	MXG Anaiog Signal Generator	Agilent	N5181A	MY47070421	2023-05-11	2024-05-10
2	HB-E043	MXG Anaiog Signal Generator	Agilent	N5182A	US46240335	2023-05-11	2024-05-10
3	HB-E044	Signal& spectrum Analyzer	R&S	FSV3044	101264	2023-05-11	2024-05-10
4	HB-E045	RF Control Box	Noyetec	NY100-RFCB	N/A	/	/
5	HB-E058	Thermometer Clock Humidity Monitor	N/A	HTC-1	N/A	/	/

Note: the calibration interval of the above test instruments is 12&24 months and the calibrations are traceable to international system unit (SI).

5 Test Item And Results

5.1 Dynamic Frequency Selection

5.1.1 Limits

A U-Nll network will employ a DFS function to detect signals from radar systems and to avoid cochannel operation with these systems. This applies to the 5250-5350 MHz and/or 5470-5725 MHzbands.1
Within the context of the operation of the DFS function, a U-Nll device will operate in either MasterMode or Client Mode. U-Nll devices operating in Client Mode can only operate in a networkcontrolled by a U-Nll device operating in Master Mode.2Tables 1 and 2 shown below summarize the information contained in sections 5.1.1 and 5.1.2.

Table 1: Applicability of DFS Requirements Prior to Use of a Channe

Requirement	Operational Mode		
	Master	ClientWithout RadarDetection	Client With Radar
Non-Occupancy Period	Yes	Not required	Yes
DFS Detection Threshold	Yes	Not required	Yes
Channel AvailabilityCheck Time	Yes	Not required	Not required
U-NII Detection Bandwidth	Yes	Not required	Yes

Table 2: Applicability of DFS requirements during normal operation

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

Additional requirements fordevices with multiplebandwidth modes	Master Device or Client withRadar Detection	Client Without Radar Detection
U-NII Detection Bandwidth andStatistical Performance Check	All BW modes must be tested	Not required
Channel Move Time and ChanneClosing Transmission Time	Test using widest BW mode available	Test using the widest BW modeavailable 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 severalfrequencies within the radar detection bandwidth and frequencies near the edge of the radar detectionbandwidth. For 802.11 devices it is suggested to select frequencies in each of the bonded 20 MHzchannels and the channel center frequency.

Master Devices

a)The Master Device will use DFS in order to detect Radar Waveforms with received signal strengthabove the DFS Detection Threshold in the 52505350 MHz and 54705725 MHz bands, DFS is notrequired in the 5150 5250 MHz or 5725 5825 MHz bands.

b) Before initiating a network on a Channel, the Master Device will perform a Channel Availability Checkfor a specified time duration (Channel Availability Check Time) to ensure that there is no radar systemoperating on the Channel, using DFS described under subsection a) above.

c) The Master Device initiates a U-Nll network by transmitting control signals that will enable other U-Ndevices to Associate with the Master Device.

d) During normal operation, the Master Device will monitor the Channel (n-Service Monitoring) to ensurethat there is no radar svstem operating on the Channel, using DFS described under a).

e) lf the Master Device has detected a Radar Waveform during ln-Service Monitoring as described underd), the Operating Channel of the U-Nll network is no longer an Available Channel. The Master Device wilinstruct all associated Client Device(s) to stop transmitting on this Channel within the Channel Move TimeThe transmissions during the Channel Move Time will be limited to the Channel Closing TransmissionTime.

f) Once the Master Device has detected a Radar Waveform it will not utilize the Channel for the duration ofthe Non-Occupancy Period.3

g) lf the Master Device delegates the ln-Service Monitoring to a Client Device, then the combination will betested to the requirements described under d) through f) above.

Client Devices

a) A Client Device will not transmit before having received appropriate control signals from a MasterDevice.

b) A Client Device will stop all its transmissions whenever instructed by a Master Device to which it isassociated and will meet the Channel Move Time and Channel Closing Transmission Time requirementsThe Client Device will not resume any transmissions until it has again received control signals from aMaster Device.

c) lf a Client Device is performing ln-Service Monitoring and detects a Radar Waveform above the DFSDetection Threshold, it will inform the Master Device. This is equivalent to the Master Device detecting theRadar Waveform and d) through f) of section 5.1.1 apply.

d) lrespective of Client Device or Master Device detection the Channel Move Time and Channel ClosingTransmission Time requirements remain the same.

e) The client test frequency must be monitored to ensure no transmission of any type has occurred for 30minutes. Note: lf the client moves with the master, the device is considered compliant if nothing appears inthe client non-occupancy period test. For devices that shut down (rather than moving channels), nobeacons should appear.

DFS technical requirements specifications

DFS Detection Thresholds

Table 3 below provides the DFS Detection Thresholds for Master Devices as well as Client Devicesincorporating In-Service Monitoring.

NOTE: For devices that support multiple Nominal ChannelBandwidths, the Channel Availability Check

Table 3: DFS Detection Thresholds for Master Devices and Client Devices with Radar Detection

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 powerspectral 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 thetest transmission waveforms to account for variations in measurement equipment. This willensure that the test signal is at or above the detection threshold level to trigger a DFSresponse. Note3: EIRP is based on the highest antenna gain. For MIMO devices refer to KDB Publication662911 D01.	

Table 4: DFS Response Requirement Values

Parameter	Value
Non-occupancy period	Minimum 30 minutcs
Channel Availability Check Time	60 seconds
Channel Move Time	10 seconds Sce Note 1.
Channel Closing Transmission Time	200 milliseconds + anaggregate of 60milliseconds over remaining10 second period.See Notes 1 and 2.
U-NII Detection Bandwidth	Minimum 100% of the U.NII 99% transmissionpower bandwidth. See Note 3.
Note 1: Channel Move Time and the Channel Closing Transmission Time should be performed withRadar 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 thebeginning of the Channel Move Time plus any additional intermittent control signals required tofacilitate a Channel move (an aggregate of 60 milliseconds) during the remainder of the 10 secondperiod. The aggregate duration of control signals will not count quict periods in between transmissions. Note 3: During the U-Nll Detection Bandwidth detection test, radar type 0 should be used. For eachfrequency step the minimum percentage of detection is 90 percent. Measurements are performed withno data traffic.	

5.1.2 Test Procedures

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

These tests define how the following DFS parameters are verified during ln-Service Monitoring

-Channel Closing Transmission Time

-Channel Move Time

- Non-Occupancy Period

The steps below define the procedure to determine the above mentioned parameters when a radar Burstwith a level equal to the DFS Detection Threshold + 1dB is generated on the Operating

Channel of the U.Nll device (In- Service Monitoring).
a) One frequency will be chosen from the Operating Channels of the UUT within the 5250-5350 MHz or5470-5725 MHz bands. For 802.11 devices, the test frequency must contain control signals. This can beverified by disabling channel loading and monitoring the spectrum analyzer. lf no control signals aredetected, another frequency must be selected within the emission bandwidth where control signals aredetected.
b) ln case the UUT is a U-Nll device operating as a Client Device (with or without DFS), a U-Nll deviceoperating as a Master Device will be used to allow the UUT (Client device) to Associate with the MasterDevice. In case the UUT is a Master Device, a U-Nll device operating as a Client Device will be used and itis assumed that the Client will Associate with the UUT (Master). In both cases for conducted tests, theRadar Waveform generator will be connected to the Master Device. For radiated tests. the emissions ofthe Radar Waveform generator wil be directed towards the Master Device. lf the Master Device hasantenna gain, the main beam of the antenna will be directed toward the radar emitter. Vertical polarizationis used for testing.
c) Stream the channel loading test file from the Master Device to the Client Device on the test Channel forthe entire period of the test.
d) At time TO the Radar Waveform generator sends a Burst of pulses for one of the Radar Type 0 in Table5 at levels defined in Table 3, on the Operating Channel. An additional 1 dB is added to the radar testsignal to ensure it is at or above the DFS Detection Threshold, accounting for equipment variations/errorse) Observe the transmissions of the UUT at the end of the radar Burst on the Operating Channel forduration greater than 10 seconds. Measure and record the transmissions from the UUT during theobservation time (Channel Move Time). Measure and record the Channel Move Time and Channel ClosingTransmission Time if radar detection occurs. Figure 17 illustrates Channel Closing Transmission Time.
f) When operating as a Master Device, monitor the UUT for more than 30 minutes following instant T2 toverify that the UUT does not resume any transmissions on this Channel. Perform this test once and recordthe measurement result.
g) In case the UUT is a U-Nll device operating as a Client Device with ln-Service Monitoring, perform steps
a) to f).

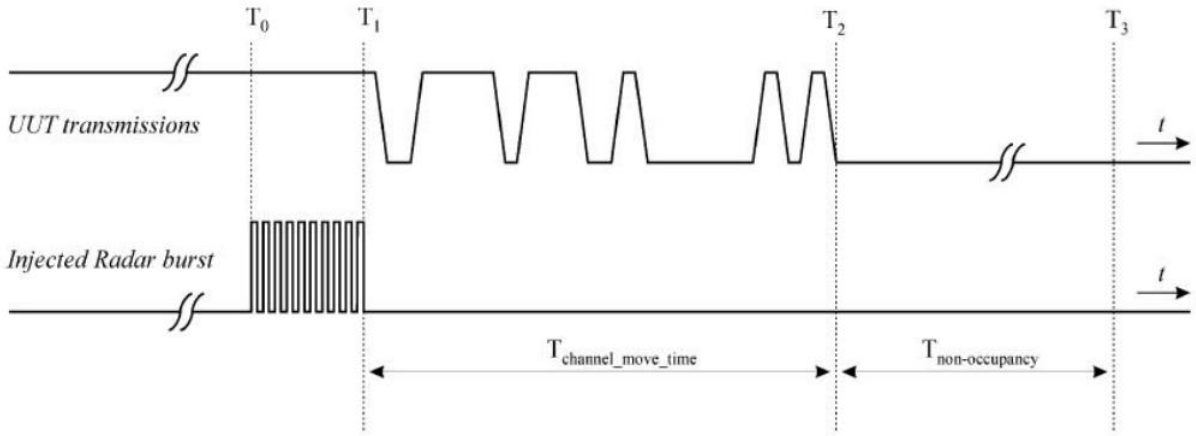


Figure 17: Example of Channel Closing Transmission Time & Channel Closing Time

5.1.3 Test Setup

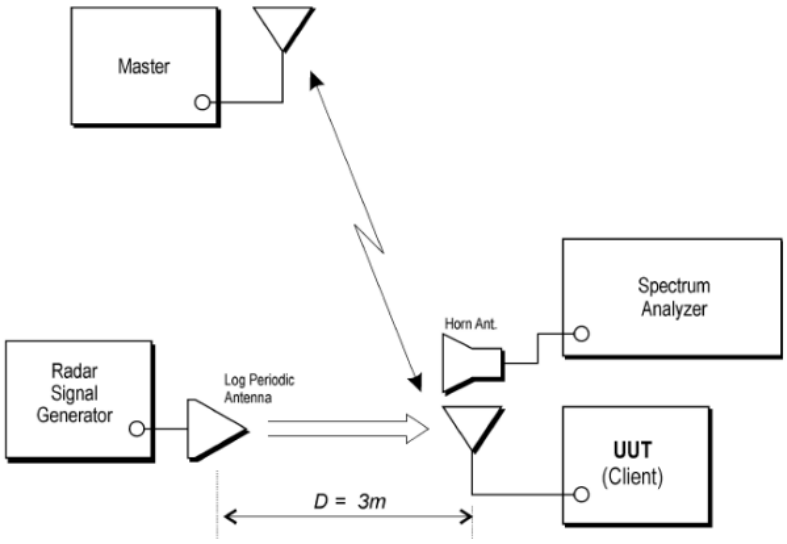


Figure 7: Example Radiated Setup where UUT is a Client and radar Test Waveforms are injected into the Client

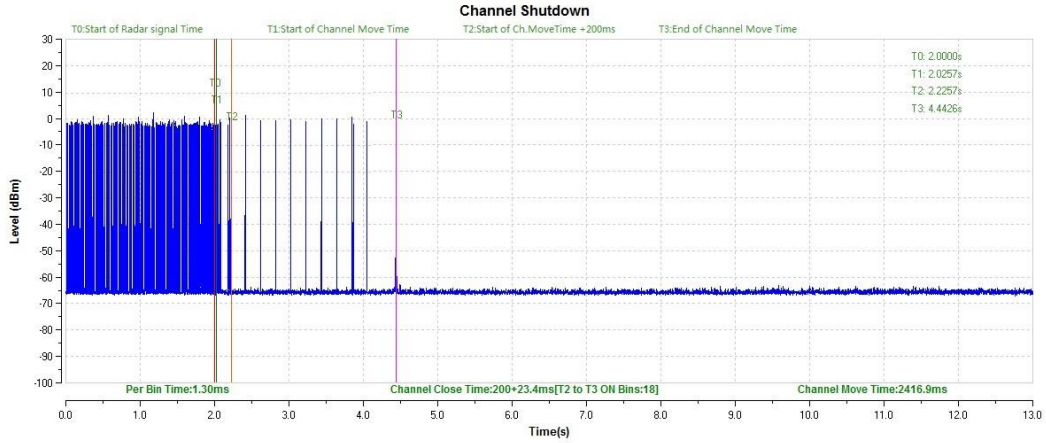
5.1.4 Test Result

Channel Shutdown

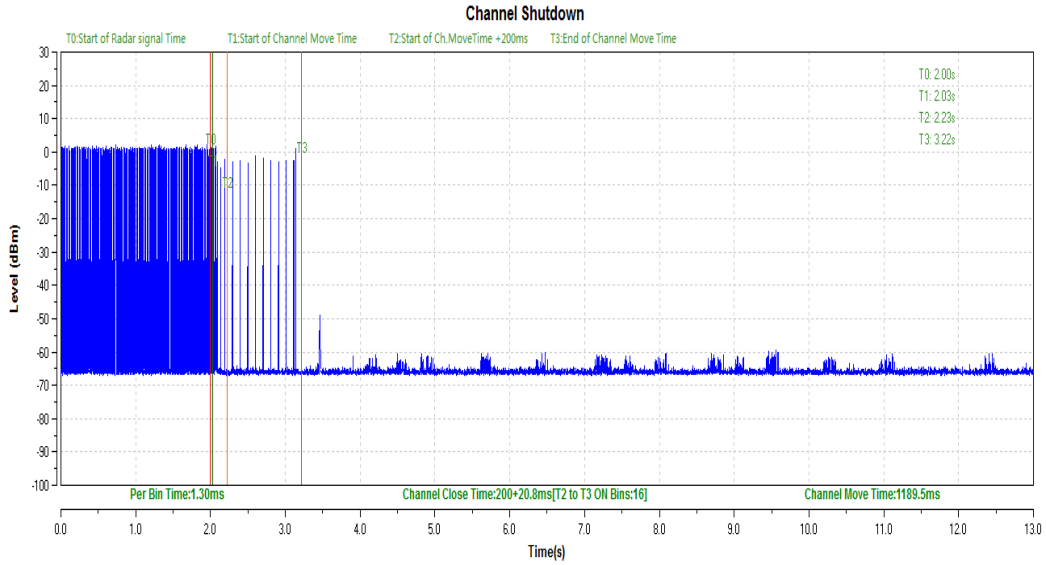
Mode	Channel number	Center frequency	Channel MoveTime (ms)	Limits (ms)	Channel Closing Transmission Time (ms)	Limits(s)	Results
802.11ac (VHT80)	58	5290	2416.9	10000	200+23.4	200 milliseconds+ an aggregate of60 milliseconds over remaining10 second period	Pass
802.11ac (VHT80)	106	5530	1189.5		200+20.8		Pass

Note 1: We test all channels that need to be tested for DFS, including parts of the 5150-5250MHz and5725-5850MHz that fall in the DFS band, reporting only part of the test pattern and data. In this report, wehave identified other parts that are compliant with FCC regulations.

802.11ac80 channel 58 5290MHz



802.11ac80 channel 106 5530MHz

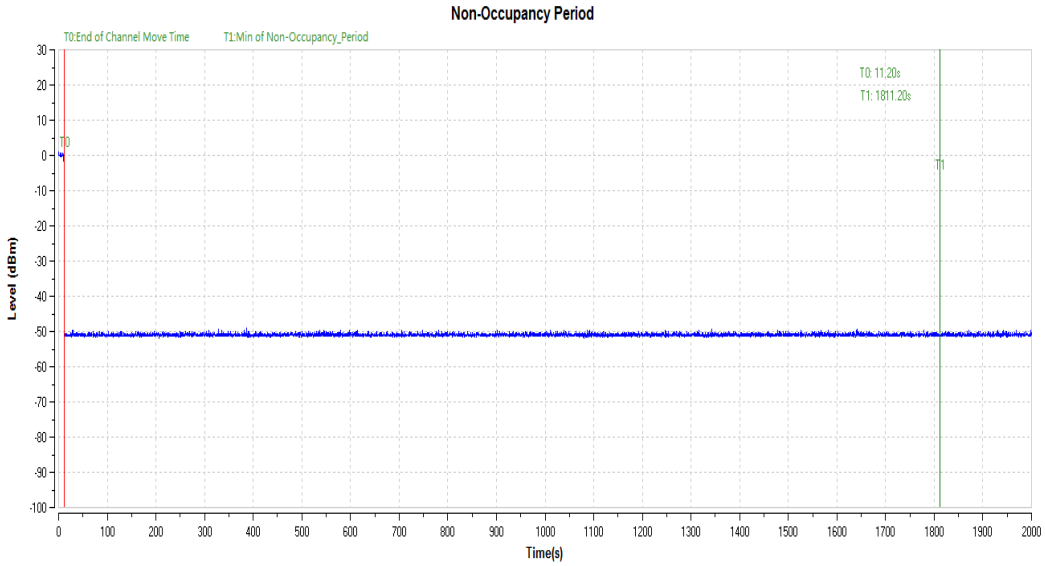


Non-Occupancy Period

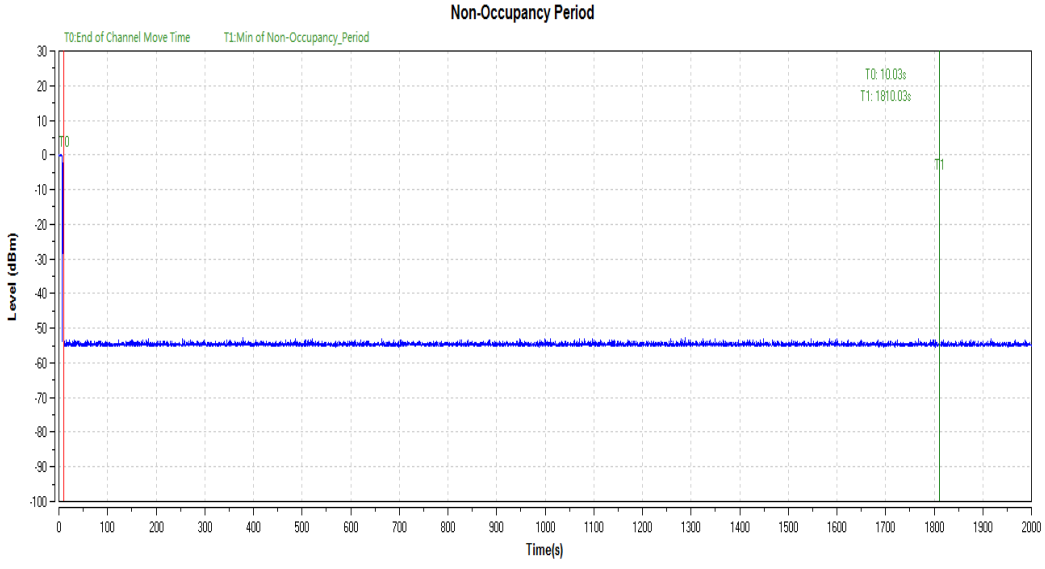
Mode	Frequency	Bandwidth	Measured Value	Limit Requirements	Verdict
802.11ac(VHT80)	5290MHz	80MHz	>30min	30min	Pass
802.11ac(VHT80)	5530MHz	80MHz	>30min	30min	Pass

Note: All the mode have been tested and passed, only showed the worst mode in the report.

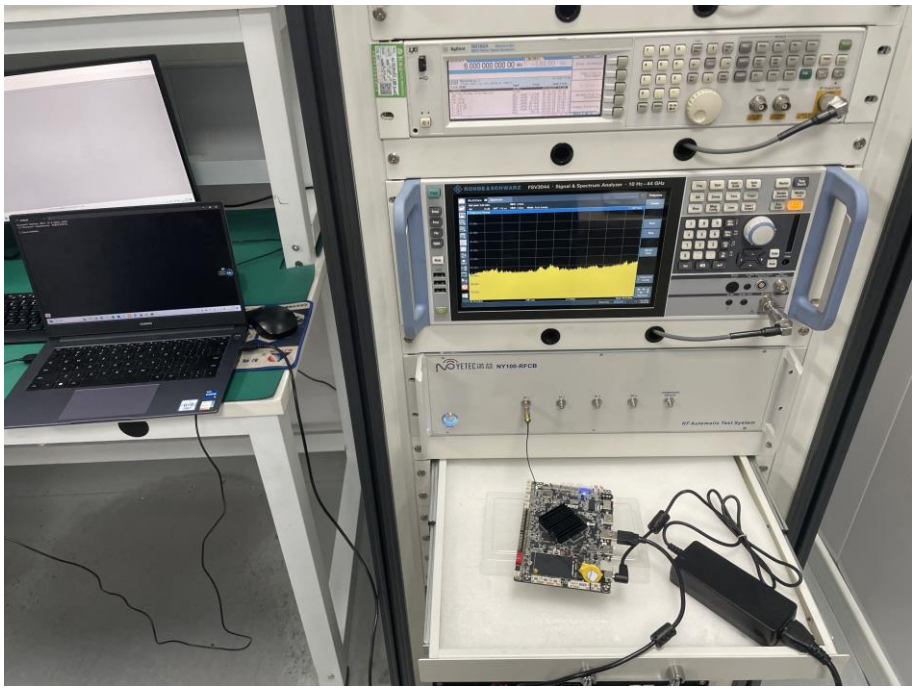
802.11ac80 channel 58 5290MHz



802.11ac80 channel 106 5530MHz



6 Photographs of the Test Setup

DFS


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