

DFS TEST REPORT

Product Name : Set-Top Box
Trade mark : Infomir
Model No. : MAG500A
Extension Model : MAG520w3, MAG522w3, MAG524w3
FCC ID : 2AUIR-IM010CXXX1
Report Number : BLA-EMC-202105-A0708
Date of sample receipt : 2022/1/4
Date of Test : 2022/1/4 to 2022/1/26
Date of Issue : 2022/1/26
Test standard : 47 CFR Part 15, Subpart E 15.407
Test result : PASS

Prepared for:

TELECOMMUNICATION TECHNOLOGIES, LLC
1, Mytna Sq., Odesa, 65026, Ukraine

Prepared by:

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Date:

2022/1/26



2 Version

Version No.	Date	Description
00	2022/1/26	Original

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4 Test Summary

Test Items	Limit	Result
Channel Move Time	< 10 seconds	Pass
Channel Closing Transmission Time	< 1 seconds	Pass
Note: "Pass" means meet the requirements, "N/A" means not applicable		

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5 General Information

5.1 Client Information

Applicant	TELECOMMUNICATION TECHNOLOGIES, LLC
Address	1, Mytna Sq., Odesa, 65026, Ukraine
Manufacturer	TELECOMMUNICATION TECHNOLOGIES, LLC
Address	1, Mytna Sq., Odesa, 65026, Ukraine
Factory	TELECOMMUNICATION TECHNOLOGIES, LLC
Address	1, Mytna Sq., Odesa, 65026, Ukraine
Product Name	Set-Top Box
Test Model No.	MAG500A

5.2 General Description of E.U.T.

Product Name:	Set-Top Box
Model No.:	MAG500A
Transmitter frequency range:	5250MHz~5350MHz 5470MHz~5725MHz, 5725MHz~5825MHz
Modulation type:	BPSK, QPSK, 16-QAM, 64-QAM, 256-QAM
WLAN Function:	802.11a/802.11n/802.11ac
Bandwidth:	20MHz/40MHz/80MHz
Antenna Type:	Patch Antenna
Antenna Gain:	3.11 dBi (Provided by the customer)
DFS Operation Type:	☐ Master Device ☐ Slaver Device with Radar detection function ☒ Slaver Device without Radar detection function
Power supply:	DC 5V

5.3 Description of Support Units

Manufacturer	Description	Model	Serial Number
PC	HASEE	K610D	N/A
I-O DATA	WiFi Router	WHG-AC1750AL	BBL00076992M

5.4 Laboratory Facility

The test facility is recognized, certified, or accredited by the following organizations:

- FCC — Designation No.: CN1252

BlueAsia of Technical Services(Shenzhen) Co., Ltd. has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in files. Designation CN1252.

- ISED — CAB identifier No.: CN0028

BlueAsia of Technical Services(Shenzhen) Co., Ltd. has been registered by Certification and Engineering Bureau of ISED for radio equipment testing with CAB identifier CN0028.

- CNAS - Registration No.: CNAS L9788

BlueAsia of Technical Services(Shenzhen) Co., Ltd. is accredited to ISO/IEC 17025:2017 General Requirements for the Competence of Testing and Calibration laboratories for the competence of testing. The Registration No. is CNAS L9788

5.5 Laboratory Location

All tests were performed at:

BlueAsia of Technical Services(Shenzhen) Co., Ltd.

Building C, No. 107, Shihuan Road, Shiyuan Sub-District, Baoan District, Shenzhen, Guangdong Province, China

Telephone: TEL: +86-755-28682673 FAX: +86-755-28682673

No tests were sub-contracted.

5.6 Test Instruments list

Conducted method:					
Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Date (mm-dd-yy)	Cal. Due date (mm-dd-yy)
Spectrum Analyzer	Agilent	N9020A	MY49100060	05-24-2021	05-23-2022
Universal Radio Communication Tester	Rohde & Schwarz	CMW500	1201-002K50	08-21-2021	08-20-2022
Vector Signal Generator	Agilent	E4438C	MY45092582	05-24-2021	05-23-2022
Signal Generator	Agilent	E8257D	MY44320250	05-24-2021	05-23-2022
Power Sensor	D.A.R.E	RPR3006W	17I00015SNO27	05-24-2021	05-23-2022
Power Sensor	D.A.R.E	RPR3006W	17I00015SNO28	05-24-2021	05-23-2022
DC Power Supply	LODESTAR	LP305DE	N/A	07-14-2021	07-13-2022
Temperature Humidity Chamber	Mingle	TH101B	N/A	07-14-2021	07-13-2022
DFS Test Software	Tonscend	N/A	N/A	N/A	N/A

5.7 Test Environment

Temperature:	20 ~ 25 °C
Humidity:	60% ~ 65%
Atmospheric pressure:	1012 kPa

6 DFS Technical Requirements

6.1 DFS Parameters

Table 6 lists the DFS related technical requirements and their applicability for every operational mode. If the RLAN device is capable of operating in more than one operational mode then every operating mode shall be assessed separately.

Table 6: Applicability of DFS requirements

Requirement	DFS Operational mode		
	Master	Slave without radar detection (see table D.2, note 2)	Slave with radar detection (see table D.2, note 2)
Channel Availability Check	Required	Not required	Required (see note 2)
Off-Channel CAC (see note 1)	Required	Not required	Required (see note 2)
In-Service Monitoring	Required	Not required	Required
Channel Shutdown	Required	Required	Required
Non-Occupancy Period	Required	Not required	Required
Uniform Spreading	Required	Not required	Not required
NOTE 1: Where implemented by the manufacturer.			
NOTE 2: A slave with radar detection is not required to perform a CAC or <i>Off-Channel CAC</i> at initial use of the channel but only after the slave has detected a radar signal on the <i>Operating Channel</i> by <i>In-Service Monitoring</i> and the <i>Non-Occupancy Period</i> resulting from this detection has elapsed.			

Table D.1: DFS requirement values

Parameter	Value
Channel Availability Check Time	60 s (see note 1)
Minimum Off-Channel CAC Time	6 minutes (see note 2)
Maximum Off-Channel CAC Time	4 hours (see note 2)
Channel Move Time	10 s
Channel Closing Transmission Time	1 s
Non-Occupancy Period	30 minutes
NOTE 1: For channels whose nominal bandwidth falls completely or partly within the band 5 600 MHz to 5 650 MHz, the <i>Channel Availability Check Time</i> shall be 10 minutes.	
NOTE 2: For channels whose nominal bandwidth falls completely or partly within the band 5 600 MHz to 5 650 MHz, the <i>Off-Channel CAC Time</i> shall be within the range 1 hour to 24 hours.	

Table D.2: Interference threshold values

e.i.r.p. Spectral Density (dBm/MHz)	Value (see note 1 and note 2)
10	-62 dBm
NOTE 1: This is the level at the input of the receiver of an RLAN device with a maximum e.i.r.p. density of 10 dBm/MHz and assuming a 0 dBi receive antenna. For devices employing different e.i.r.p. spectral density and/or a different receive antenna gain G (dBi) the DFS threshold level at the receiver input follows the following relationship: DFS Detection Threshold (dBm) = $-62 + 10 \cdot \text{e.i.r.p. Spectral Density (dBm/MHz)} + G \text{ (dBi)}$; however the DFS threshold level shall not be less than -64 dBm assuming a 0 dBi receive antenna gain. NOTE 2: Slave devices with a maximum e.i.r.p. of less than 23 dBm do not have to implement radar detection unless these devices are used in fixed outdoor point to point or fixed outdoor point to multipoint applications (see clause 4.2.6.1.3).	

Table D.3: Parameters of the reference DFS test signal

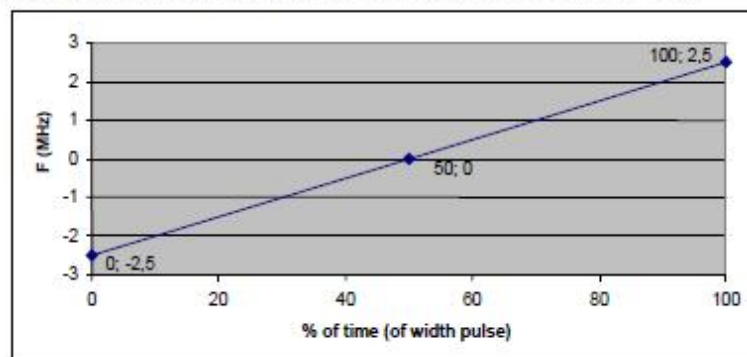
Pulse width W (μs)	Pulse repetition frequency PRF (PPS)	Pulses per burst (PPB)
1	700	18

Table D.4: Parameters of radar test signals

Radar test signal # (see note 1 to note 3)	Pulse width W (μs)		Pulse repetition frequency PRF (PPS)		Number of different PRFs	Pulses per burst for each PRF (PPB) (see note 5)
	Min	Max	Min	Max		
1	0,5	5	200	1 000	1	10 (see note 6)
2	0,5	15	200	1 600	1	15 (see note 6)
3	0,5	15	2 300	4 000	1	25
4	20	30	2 000	4 000	1	20
5	0,5	2	300	400	2/3	10 (see note 6)
6	0,5	2	400	1 200	2/3	15 (see note 6)

NOTE 1: Radar test signals #1 to #4 are constant PRF based signals. See figure D.1. These radar test signals are intended to simulate also radars using a packet based Staggered PRF. See figure D.2.

NOTE 2: Radar test signal #4 is a modulated radar test signal. The modulation to be used is a chirp modulation with a $\pm 2,5$ MHz frequency deviation which is described below.



NOTE 3: Radar test signals #5 and #6 are single pulse based Staggered PRF radar test signals using 2 or 3 different PRF values. For radar test signal #5, the difference between the PRF values chosen shall be between 20 PPS and 50 PPS. For radar test signal #6, the difference between the PRF values chosen shall be between 80 PPS and 400 PPS. See figure D.3.

NOTE 4: Apart for the Off-Channel CAC testing, the radar test signals above shall only contain a single burst of pulses. See figure D.1, figure D.3 and figure D.4. For the Off-Channel CAC testing, repetitive bursts shall be used for the total duration of the test. See figure D.2 and figure D.5. See also clause 4.2.6.2.3, clause 5.4.8.2.1.4.2 and clause 5.4.8.2.1.4.3.

NOTE 5: The total number of pulses in a burst is equal to the number of pulses for a single PRF multiplied by the number of different PRFs used.

NOTE 6: For the CAC and Off-Channel CAC requirements, the minimum number of pulses (for each PRF) for any of the radar test signals to be detected in the band 5 600 MHz to 5 650 MHz shall be 18.

Table D.5: Detection probability

Parameter	Detection Probability (P_d)	
	Channels whose nominal bandwidth falls partly or completely within the 5 600 MHz to 5 650 MHz band	Other channels
CAC, Off-Channel CAC	99,99 %	60 %
In-Service Monitoring	60 %	60 %

NOTE: P_d gives the probability of detection per simulated radar burst and represents a minimum level of detection performance under defined conditions. Therefore P_d does not represent the overall detection probability for any particular radar under real life conditions.

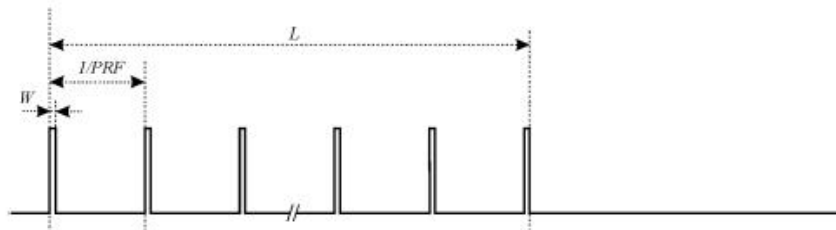


Figure D.1: General structure of a single burst/constant PRF based radar test signal

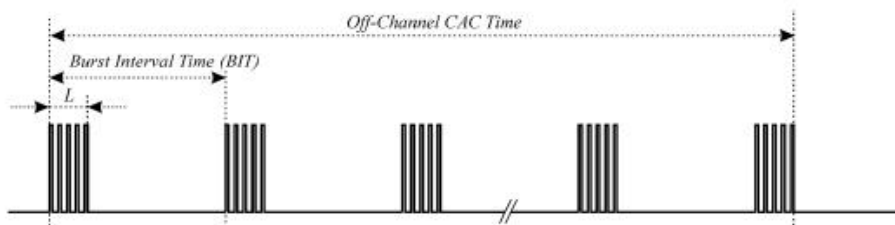


Figure D.2: General structure of a multiple burst/constant PRF based radar test signal

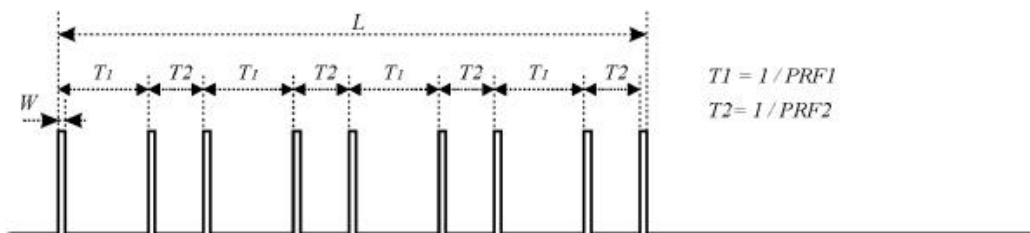


Figure D.3: General structure of a single burst/single pulse based staggered PRF radar test signal

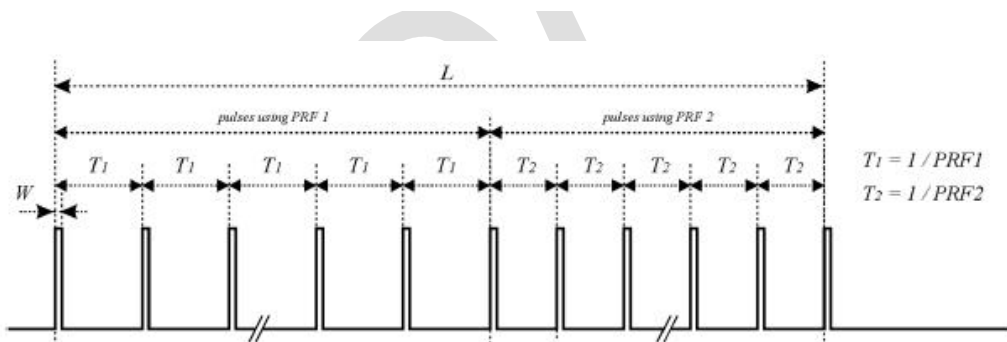


Figure D.4: General structure of a single burst/packet based staggered PRF radar test signal

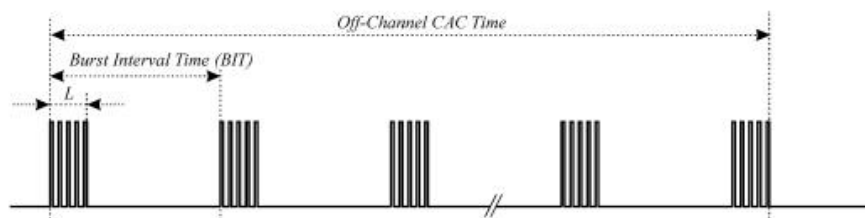


Figure D.5: General structure of a multiple burst/packet based staggered PRF based radar test signal

6.2 DFS Technical Requirements

Requirement	DFS Operational mode		
	☐ Master	☒ Slave without Radar Detection	☐ Slave with Radar Detection
Channel Availability Check	√	Not Required	Not Required
Off-Channel CAC (see note 1)	√	Not Required	√
In-Service Monitoring	√	Not Required	√
Channel Move Time	√	√	√
Channel Closing Transmission Time	√	√	√
Non-Occupancy Period	√	√	√
Uniform Spreading	√	Not Required	√

6.3 DFS Threshold Level

DFS Threshold Level	
5250MHz ~ 5350MHz	-62dBm @ antenna connector
5470MHz~5725MHz	-62dBm @ antenna connector
Note: The worst case level was selected to perform the test.	

6.4 Test Setup

Set-up A:

Set-up A is a set-up whereby the UUT is an RLAN device operating in master mode. Radar test signals are injected into the UUT. This set-up also contains an RLAN device operating in slave mode which is associated with the UUT.

Figure 5 shows an example for *Set-up A*. The set-up used shall be documented in the test report.

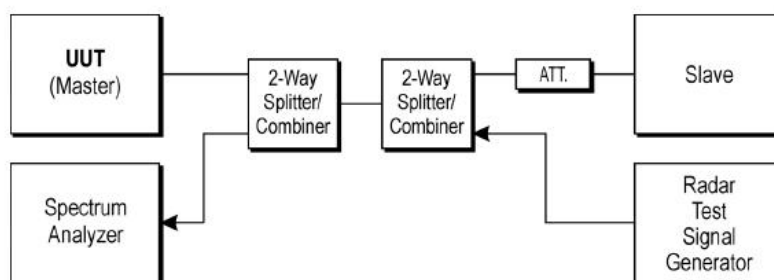


Figure 5: Set-up A

Set-up B:

Set-up B is a set-up whereby the UUT is an RLAN device operating in slave mode, with or without Radar Interference Detection function. This set-up also contains an RLAN device operating in master mode. The radar test signals are injected into the master device. The UUT (slave device) is associated with the master device.

Figure 6 shows an example for *Set-up B*. The set-up used shall be documented in the test report.

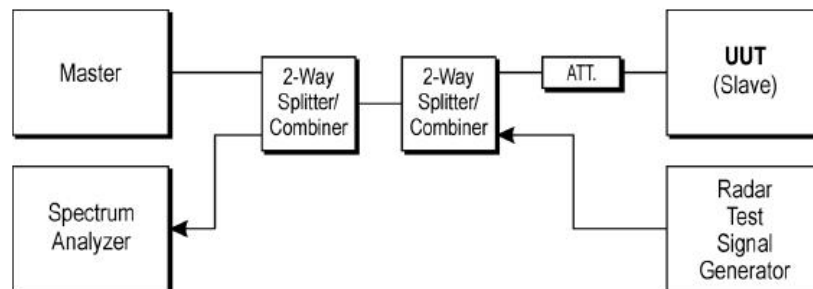


Figure 6: Set-up B

Set-up C:

The UUT is an RLAN device operating in slave mode with Radar Interference Detection function. Radar test signals are injected into the slave device. This set-up also contains an RLAN device operating in master mode. The UUT (slave device) is associated with the master device.

Figure 7 shows an example for *Set-up C*. The set-up used shall be documented in the test report.

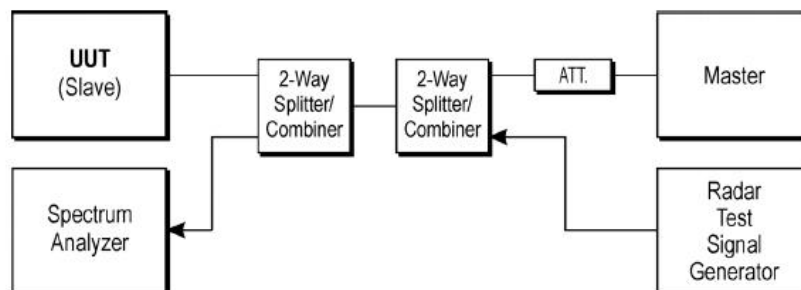


Figure 7: Set-up C

6.5 EUT Configuration for DFS Test

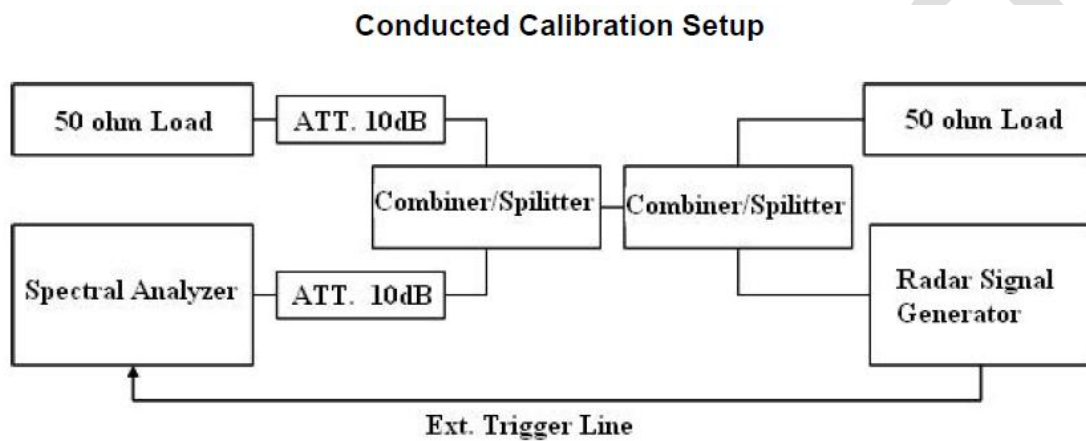
Test Items	Channel Frequency
Channel Move Time	5290MHz 5610MHz
Channel Closing Transmission Time	5290MHz 5610MHz
Non-Occupancy Period	5290MHz 5610MHz

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7 Test Result

7.1 Verification of Radar Type and Level

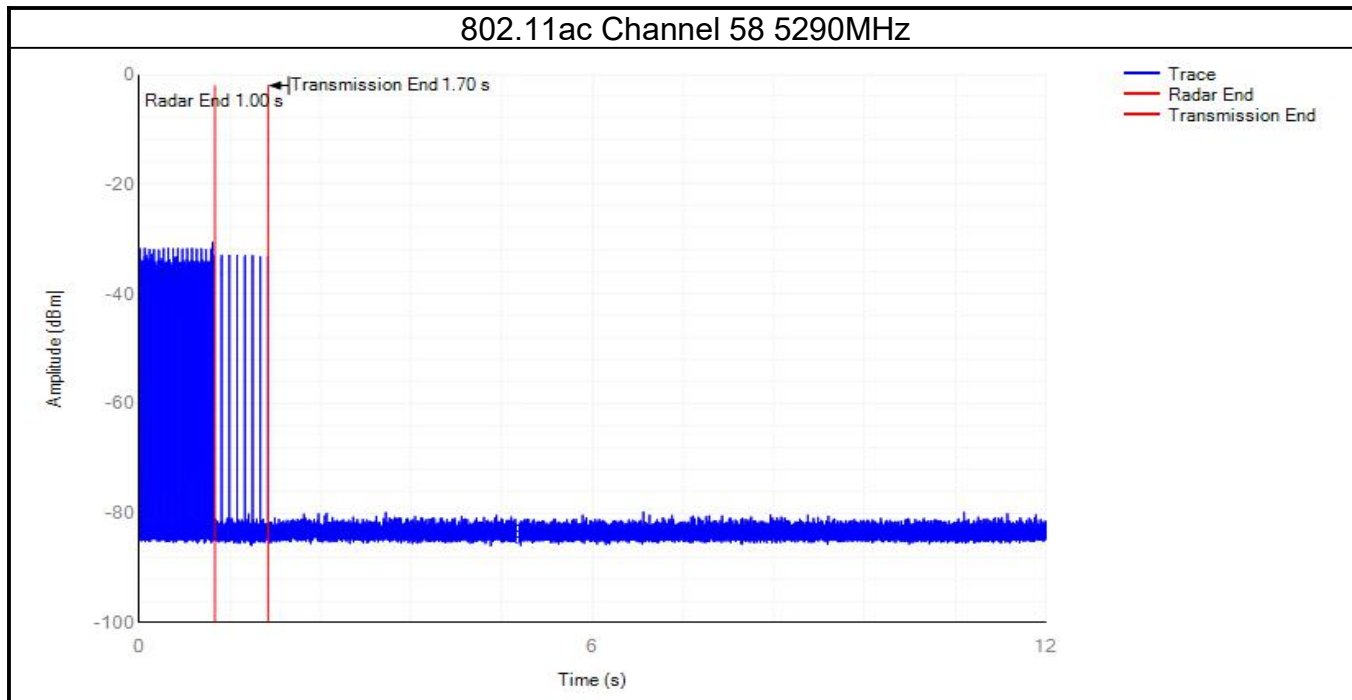
The following equipment setup was used to calibrate the conducted radar waveform. A spectrum analyzer was used to establish the test signal level for each radar type. During this process there were no transmissions by either the master or client device. The spectrum analyzer was switched to the zero spans (time domain) at the frequency of the radar waveform generator. Peak detection was utilized. The spectrum analyzer resolution bandwidth (RBW) and video bandwidth (VBW) were set to 1 MHz and 3 MHz.



7.2 Channel Move Time and Channel Closing Transmission Time

5250MHz-5350MHz

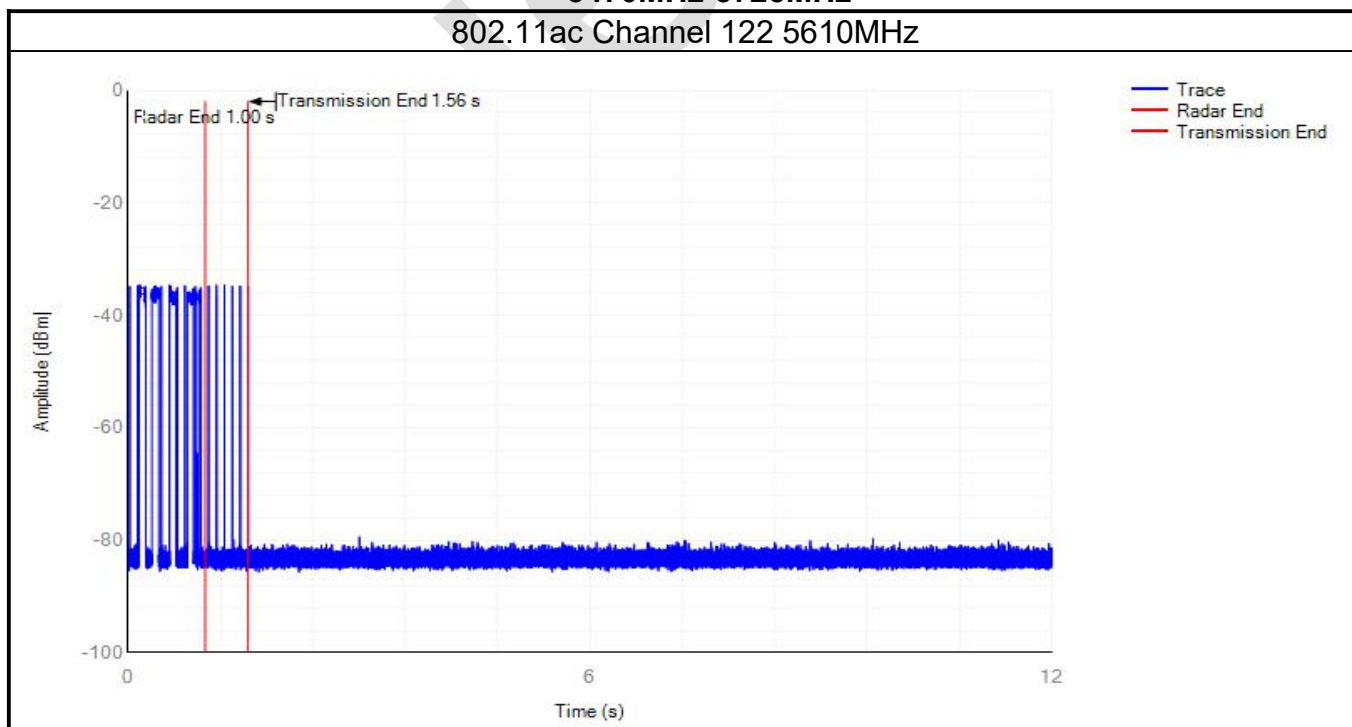
802.11ac Channel 58 5290MHz



Test Items	Value	Limit	Result
Channel Closing Transmission Time	0.0055s	1s	Pass
Channel Move Time	0.7032s	10 s	Pass

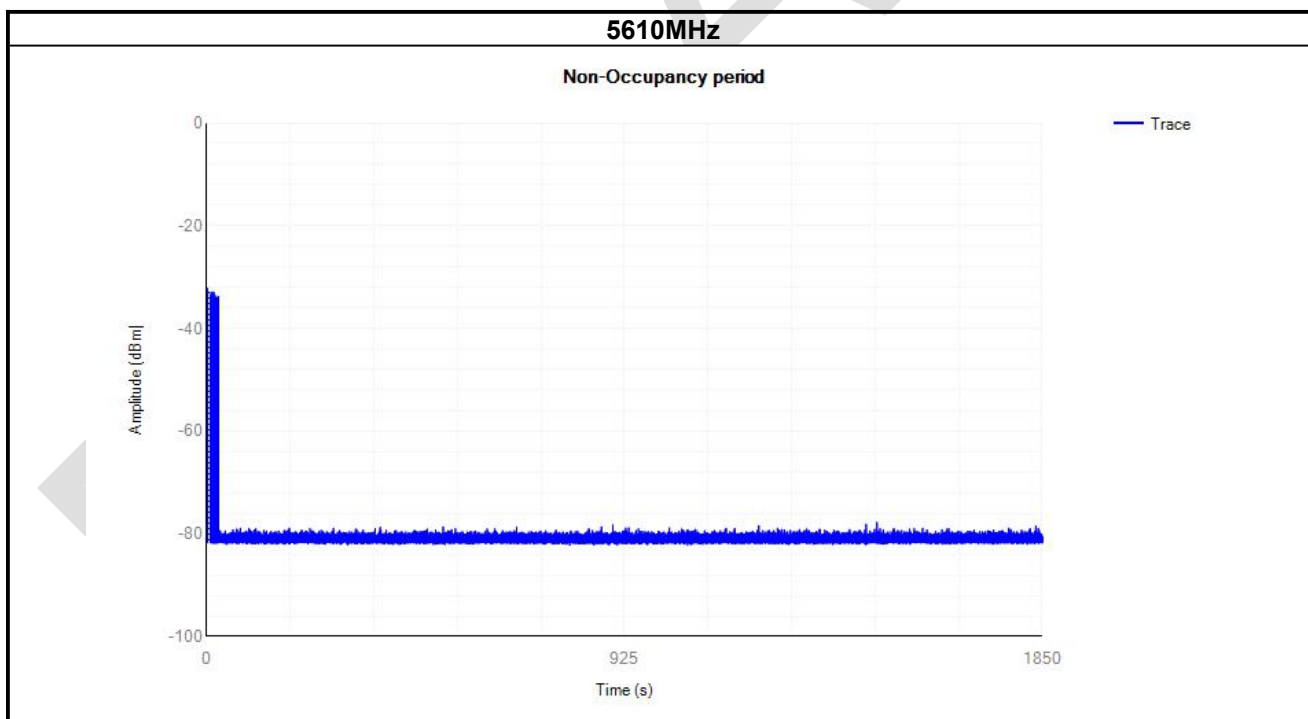
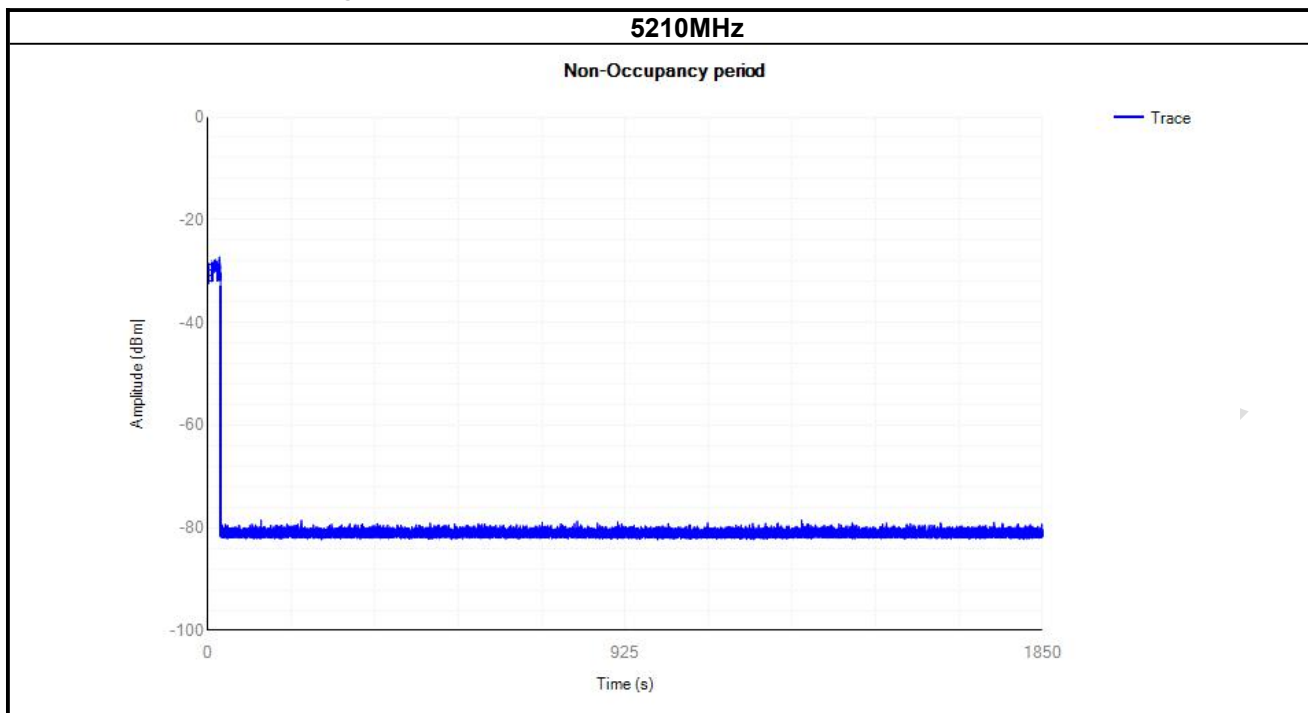
5470MHz-5725MHz

802.11ac Channel 122 5610MHz



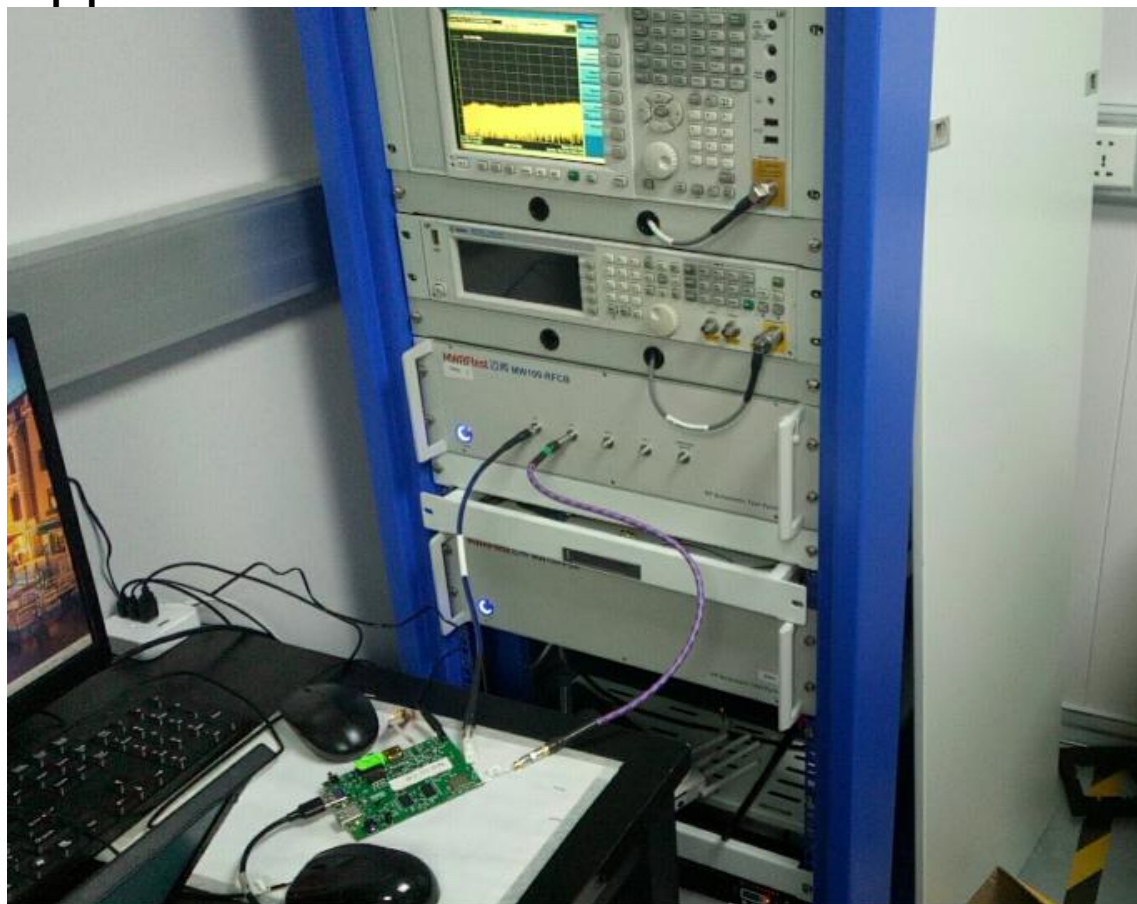
Test Items	Value	Limit	Result
Channel Closing Transmission Time	0.0058s	1s	Pass
Channel Move Time	0.5576s	10 s	Pass

7.3 Non-Occupancy Period



Test Items	Value	Limit	Result
Non-Occupancy Period	> 30 minutes	Minimum 30 minutes	Pass

8 Setup photos



9 EUT Constructional Details

Reference to the test report No. BLA-EMC-202105-A0701

----- End of report -----