ETSI EN 301 893 Test Report

Project No.	:	2207C142
Equipment	:	AX1800 Wi-Fi 6 5G NR Router
Brand Name	:	Tenda
Test Model	:	5G03
Series Model	:	N/A
Applicant	:	SHENZHEN TENDA TECHNOLOGY CO.,LTD.
Address	:	6-8 Floor, Tower E3, No. 1001, Zhongshanyuan Road, Nanshan District, Shenzhen, China. 518052
Manufacturer	:	SHENZHEN TENDA TECHNOLOGY CO.,LTD.
Address	:	6-8 Floor, Tower E3, No. 1001, Zhongshanyuan Road, Nanshan District, Shenzhen, China. 518052
Date of Receipt	:	Jul. 29, 2022
Date of Test	:	Aug. 02, 2022 ~ Sep. 03, 2022
Issued Date	:	Sep. 09, 2022
Report Version	:	R00
Test Sample	:	Engineering Sample No.: DG2022072964 for conducted, DG2022072963 for radiated.
Standard(s)	:	ETSI EN 301 893 V2.1.1 (2017-05)

The above equipment has been tested and found compliance with the requirement of the relative standards by BTL Inc.

Grani Zhou

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TESTING CERT #5123.02

BTL Inc.

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Declaration

BTL represents to the client that testing is done in accordance with standard procedures as applicable and that test instruments used has been calibrated with standards traceable to international standard(s) and/or national standard(s).

BTL's reports apply only to the specific samples tested under conditions. It is manufacture's responsibility to ensure that additional production units of this model are manufactured with the identical electrical and mechanical components. **BTL** shall have no liability for any declarations, inferences or generalizations drawn by the client or others from **BTL** issued reports.

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BTL's laboratory quality assurance procedures are in compliance with the **ISO/IEC 17025** requirements, and accredited by the conformity assessment authorities listed in this test report.

BTL is not responsible for the sampling stage, so the results only apply to the sample as received.

The information, data and test plan are provided by manufacturer which may affect the validity of results, so it is manufacturer's responsibility to ensure that the apparatus meets the essential requirements of applied standards and in all the possible configurations as representative of its intended use.

Limitation

For the use of the authority's logo is limited unless the Test Standard(s)/Scope(s)/Item(s) mentioned in this test report is (are) included in the conformity assessment authorities acceptance respective.
Please note that the measurement uncertainty is provided for informational purpose only and are not use in determining the Pass/Fail results.

Table of Contents Page

Table of Contents Page

Table of Contents Page

Table of Contents Page

REPORT ISSUED HISTORY

Report No.	Version	Description	Issued Date	Note
BTL-ETSP-2-2207C142	R00	Original Report.	Sep. 09, 2022	Valid

1. RF EMISSIONS MEASUREMENT

1.1 TEST FACILITY

The test facilities used to collect the test data in this report is **DG-CB12/TR15/TR17** at the location of No. 3 Jinshagang 1st Rd. Shixia, Dalang Town Dongguan City, Guangdong 523792 People's Republic of China.

1.2 MEASUREMENT UNCERTAINTY

The measurement uncertainty figures shall be calculated according the methods described in the ETSI TR 100 028 and shall correspond to an expansion factor (coverage factor) k=1.96 or k=2(which provide confidence levels of respectively 90% and 95.45% in the case where the distributions characterizing the actual measurement uncertainties are normal (Gaussian)).
Measurement Uncertainty for a Level of Confidence of 95 %, U=2xUc(y).

The BTL measurement uncertainty as below table:

Item	**Uncertainty**
Radio Frequency	±53.46 Hz
RF Power, Conducted	±0.95 dB
RF Power, Radiated	±3.84 dB
Power Density	±0.86 dB
Temperature	±0.08 °C
Humidity	±1.5 %
Time	±0.58 %
Spurious Emissions, Conducted	±2.71 dB
Spurious Emissions, Radiated f ≤ 1GHz	±3.58 dB
Spurious Emissions, Radiated 1GHz < f ≤ 18GHz	±3.78 dB
Spurious Emissions, Radiated 18GHz < f ≤ 26.5GHz	±4.14 dB

1.3 TEST ENVIRONMENT CONDITIONS

Test Item	Temperature	Humidity	Test Voltage	Tested By
Centre frequencies	Normal & Extreme	61~65%	DC 12V	Jaden Kong
Occupied Channel Bandwidth	23.3~24°C	61~65%	DC 12V	Jaden Kong
RF output power	Normal & Extreme	67.3~38.2%	DC 12V	Complex Qin
Power Density	23.3~24°C	61~65%	DC 12V	Jaden Kong
Transmitter unwanted emissions outside the 5 GHz RLAN bands	19~20°C	59~60%	AC 230V/50Hz	Patton Li
Transmitter unwanted emissions within the 5 GHz RLAN bands	23.3~24°C	61~65%	DC 12V	Jaden Kong
Receiver spurious emissions	19°C	59%	AC 230V/50Hz	Patton Li
Adaptivity	22.3~25.3°C	55.3~60.3%	DC 12V	Kirito Li
Receiver Blocking	22.3~25.3°C	55.3~60.3%	DC 12V	Kirito Li

1.4 TEST CHANNEL

IEEE 802.11a / IEEE 802.11n(HT20) / IEEE 802.11ac(VHT20) / IEEE 802.11ax(HE20)		
Test Channel	EUT Channel	Test Frequency
Low	CH36	5180 MHz

IEEE 802.11n(HT40) / IEEE 802.11ac(VHT40) / IEEE 802.11ax(HE40)		
Test Channel	EUT Channel	Test Frequency
Low	CH38	5190 MHz

IEEE 802.11ac(VHT80) / IEEE 802.11ax(HE80)		
Test Channel	EUT Channel	Test Frequency
Low	CH42	5210 MHz

1.5 TEST METHODOLOGY AND RESULTS

Harmonised Standard ETSI EN 301 893					
Requirement			Requirement Conditiona ity		Observations
No	Description	Reference: Clause No	U/C	Condition	
1	Carrier frequencies	4.2.1	U	-	Pass
2	Nominal, and occupied channel bandwidth	4.2.2	U	-	Pass
3	RF output power	4.2.3	U	-	Pass
	Transmit Power Control (TPC)	4.2.3	C	1)Not required for channels whose nominal bandwidth falls completely within the band 5150 MHz to 5250 MHz. 2)Not required for devices that operate at a maximum mean e.i.r.p. of 20 dBm when operating in 5250 MHz to 5350 MHz or 27 dBm when operating in 5470 MHz to 5725 MHz.	N/A
	Power Density	4.2.3	U	-	Pass
4	Transmitter unwanted emissions outside the 5 GHz RLAN bands	4.2.4.1	U	-	Pass
5	Transmitter unwanted emissions within the 5 GHz RLAN bands	4.2.4.2	U	-	Pass
6	Receiver spurious emissions	4.2.5	U	-	Pass
7	Adaptivity	4.2.7	U	-	Pass
8	Receiver Blocking	4.2.8	U	-	Pass
9	User Access Restrictions	4.2.9	U	-	Pass **Note 1**
10	Geo-location capability	4.2.10	C	Where implemented by the manufacturer.	N/A

Note:

1. No related options for DFS functions will be provided in the software interfaces.
   DFS functions can be changed only by telnet command. Before the shipment of the product the telnet will be closed so that it will be inaccessible for the end user.
2. U/C Indicates whether the requirement is unconditionally applicable (U) or is conditional upon the manufacturer's claimed functionality of the equipment (C).
3. “N/A” indicates that it does not apply to this device.

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Equipment	AX1800 Wi-Fi 6 5G NR Router
Brand Name	Tenda
Test Model	5G03
Series Model	N/A
Model Difference(s)	N/A
Power Source	DC Voltage supplied from AC adapter. 1# Model: BN026-A24012E (EU) 2# Model: BN026-A24012B (UK) Only differ in plug.
Power Rating	I/P: 100-240V~ 50/60Hz 0.7A O/P: 12.0V ⎓ 2.0A 24W
Operation Frequency Band(s)	5150 MHz ~ 5250 MHz
Modulation Type	IEEE 802.11a/n/ac: OFDM IEEE 802.11ax: OFDMA
Bit Rate of Transmitter	IEEE 802.11a: 54/48/36/24/18/12/9/6 Mbps IEEE 802.11n: up to 300 Mbps IEEE 802.11ac: up to 866.7 Mbps IEEE 802.11ax: up to 1201 Mbps
Max. e.i.r.p. _Non Beamforming	IEEE 802.11a: 22.59 dBm (181.55 mW) IEEE 802.11n(HT20): 22.88 dBm (194.09 mW) IEEE 802.11n(HT40): 22.74 dBm (187.93 mW) IEEE 802.11ac(VHT20): 22.90 dBm (194.98 mW) IEEE 802.11ac(VHT40): 22.96 dBm (197.70 mW) IEEE 802.11ac(VHT80): 22.69 dBm (185.78 mW) IEEE 802.11ax(HE20): 22.63 dBm (183.23 mW) IEEE 802.11ax(HE40): 22.73 dBm (187.50 mW) IEEE 802.11ax(HE80): 22.81 dBm (190.99 mW)
Max. e.i.r.p. _Beamforming	IEEE 802.11n(HT20): 22.24 dBm (167.49 mW) IEEE 802.11n(HT40): 22.22 dBm (166.72 mW) IEEE 802.11ac(VHT20): 22.35 dBm (171.79 mW) IEEE 802.11ac(VHT40): 22.44 dBm (175.39 mW) IEEE 802.11ac(VHT80): 22.17 dBm (164.82 mW) IEEE 802.11ax(HE20): 22.08 dBm (161.44 mW) IEEE 802.11ax(HE40): 22.38 dBm (172.98mW) IEEE 802.11ax(HE80): 22.37 dBm (172.58 mW)

Note:
1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.

2. Channel List:

IEEE 802.11a IEEE 802.11n(HT20) IEEE 802.11ac(VHT20) IEEE 802.11ax(HE20)		IEEE 802.11n(HT40) IEEE 802.11ac(VHT40) IEEE 802.11ax(HE40)		IEEE 802.11ac(VHT80) IEEE 802.11ax(HE80)	
Band 1		Band 1		Band 1	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
36	5180	38	5190	42	5210
40	5200	46	5230		
44	5220				
48	5240				

3. Table for Filed Antenna:

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	N/A	N/A	PCB	IPEX	3.53
2	N/A	N/A	PCB	IPEX	4.28

Note:
1) The EUT supports MIMO. Physically, the EUT provides two completed transmitters and receivers (2T2R).
2) Beamforming Gain: 3 dB.
3) Only Ant. 1 supports IEEE 802.11a mode.
4) The antenna gain and beamforming gain are provided by the manufacturer.

4. The worst case for 1TX/2TX as follow:
Non Beamforming:

Operating Mode / TX Mode	1TX	2TX
IEEE 802.11a	V (Ant. 1)	-
IEEE 802.11n(HT20)	-	V (Ant. 1+Ant. 2)
IEEE 802.11n(HT40)	-	V (Ant. 1+Ant. 2)
IEEE 802.11ac(VHT20)	-	V (Ant. 1+Ant. 2)
IEEE 802.11ac(VHT40)	-	V (Ant. 1+Ant. 2)
IEEE 802.11ac(VHT80)	-	V (Ant. 1+Ant. 2)
IEEE 802.11ax(HE20)	-	V (Ant. 1+Ant. 2)
IEEE 802.11ax(HE40)	-	V (Ant. 1+Ant. 2)
IEEE 802.11ax(HE80)	-	V (Ant. 1+Ant. 2)

Beamforming:

Operating Mode / TX Mode	2TX
IEEE 802.11n(HT20)	V (Ant. 1+Ant. 2)
IEEE 802.11n(HT40)	V (Ant. 1+Ant. 2)
IEEE 802.11ac(VHT20)	V (Ant. 1+Ant. 2)
IEEE 802.11ac(VHT40)	V (Ant. 1+Ant. 2)
IEEE 802.11ac(VHT80)	V (Ant. 1+Ant. 2)
IEEE 802.11ax(HE20)	V (Ant. 1+Ant. 2)
IEEE 802.11ax(HE40)	V (Ant. 1+Ant. 2)
IEEE 802.11ax(HE80)	V (Ant. 1+Ant. 2)

2.2 DESCRIPTION OF TEST MODES

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Test	Clause	Test channels	
		Lower sub-band (5150 MHz to 5350 MHz)	
		5150 MHz to 5250 MHz	
Centre frequencies	5.4.2	C7(see note 1)	
Occupied Channel Bandwidth	5.4.3	C7	
Power, power density	5.4.4	C1	C2
Transmitter unwanted emissions outside the 5 GHz RLAN bands	5.4.5	C7(see note 1)	
Transmitter unwanted emissions within the 5 GHz RLAN bands	5.4.6	C1	C2
Receiver spurious emissions	5.4.7	C7(see note 1)	
Transmit Power Control (TPC)	5.4.4	N/A(see note 2)	C2(see note 1)
Adaptivity	5.4.9	C9	
Receiver Blocking	5.4.10	C7	

C1	The lowest declared channel for every declared Nominal Channel Bandwidth within this band. For the Power Density testing, it is sufficient to only perform this test using the lowest Nominal Channel Bandwidth.
C2	The highest declared channel for every declared Nominal Channel Bandwidth withinthis band. For the Power Density testing, it is sufficient to only perform this test using the lowest Nominal Channel Bandwidth.
C7	One channel out of the declared channels for this sub-band. For Occupied Channel Bandwidth, testing shall be repeated for every declared Nominal Channel Bandwidth within this sub-band.
C9	One channel (in case of single-channel testing) or a group of channels (in case of multi-channel testing) out of the declared channels.

Note :

(1) In case of more than 1 channel plan has been declared, testing of these specific requirements need only be performed using one of the declared channel plans.

(2) Testing is not required for nominal channel bandwidths that fall completely within the frequency range 5150 MHz to 5250 MHz.

(3) The measurements for RF Output Power are tested, because the modulation of IEEE 802.11n and IEEE 802.11ac are the same, and the power of IEEE 802.11ac(VHT20) mode and IEEE 802.11ac(VHT40) mode is worse than that of IEEE 802.11n(HT20) mode and IEEE 802.11n(HT40) mode, so only the worst cases are documented for other test items.

(4) The measurements for RF Output Power are tested, the Non Beamforming and Beamforming are recorded in the report. The worst case is Non Beamforming and only the worst case is documented for other test items.

(5) For radiated spurious emissions below 1 GHz and receiver spurious emissions above 1 GHz test, the IEEE 802.11ac(VHT40) channel 38 is found to be the worst case and recorded.

(6) IEEE 802.11ax mode only supports full RU, so only the full RU is evaluated and measured inside report.

2.3 TABLE OF PARAMETERS OF TEST SOFTWARE SETTING

During testing channel & power controlling software provided by the customer was used to control the operating channel as well as the output power level.

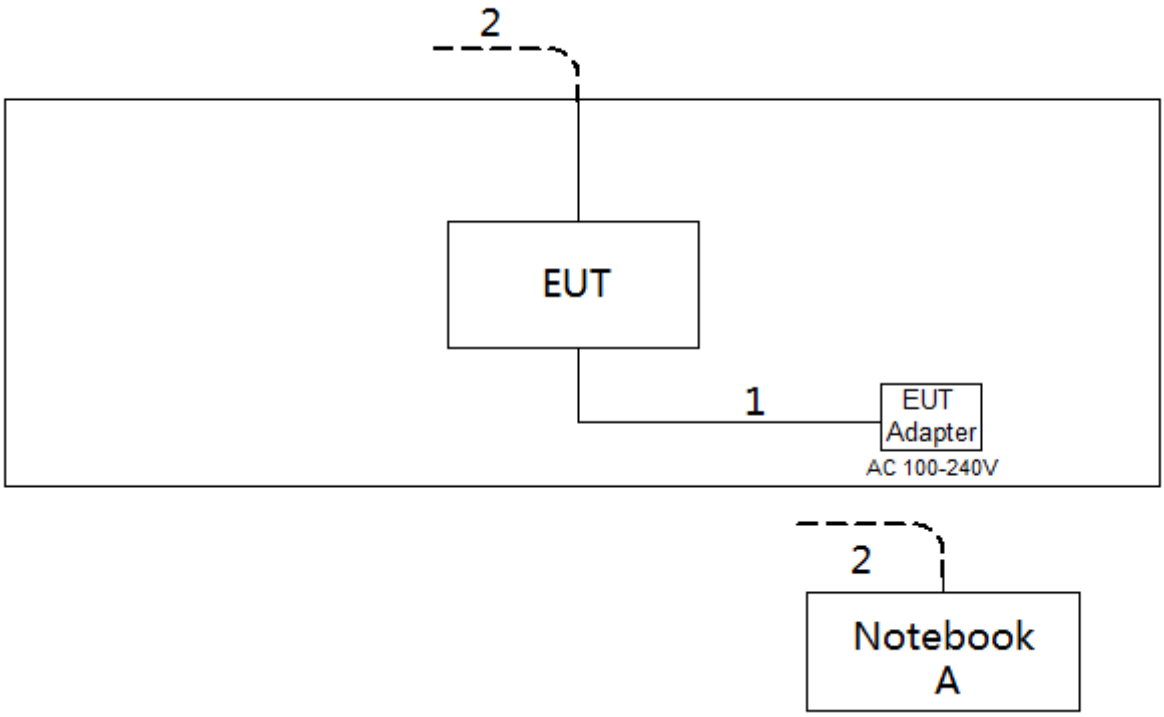
Non Beamforming

Test Software Version	QATool_Dbg 0.0.2.33
Frequency (MHz)	5180
IEEE 802.11a	17
IEEE 802.11n(HT20)	14.5
IEEE 802.11ac(VHT20)	14.5
IEEE 802.11ax(HE20)	15
Frequency (MHz)	5190
IEEE 802.11n(HT40)	14.5
IEEE 802.11ac(VHT40)	15
IEEE 802.11ax(HE40)	15
Frequency (MHz)	5210
IEEE 802.11ac(VHT80)	15
IEEE 802.11ax(HE80)	15.5

Beamforming

Test Software Version	QATool_Dbg 0.0.2.33
Frequency (MHz)	5180
IEEE 802.11n(HT20)	11
IEEE 802.11ac(VHT20)	11
IEEE 802.11ax(HE20)	11.5
Frequency (MHz)	5190
IEEE 802.11n(HT40)	11
IEEE 802.11ac(VHT40)	11.5
IEEE 802.11ax(HE40)	11.5
Frequency (MHz)	5210
IEEE 802.11ac(VHT80)	11.5
IEEE 802.11ax(HE80)	12

2.4 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED



2.5 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Brand	Model No.	Series No.
A	Notebook	Dell	Inspiron 15-7559	N/A

Item	Cable Type	Shielded Type	Ferrite Core	Length
1	DC Cable	NO	NO	1.5m
2	RJ45 Cable	NO	NO	10m

2.6 EUT OPERATING CONDITIONS

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

3. CENTRE FREQUENCIES

3.1 LIMIT

Clause	Test Item	Limit
4.2.1	Centre Frequencies	F(c) ±20ppm

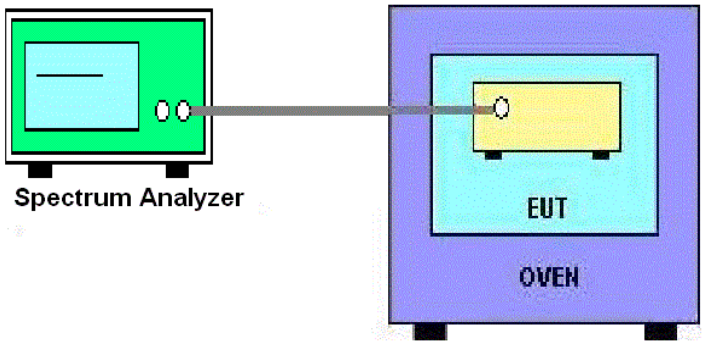
3.2 TEST PROCEDURES

Refer to ETSI EN 301 893, clause 5.4.2.2.1.

3.3 TEST SETUP LAYOUT

Normal Condition

Extreme Condition



3.4 TEST DEVIATION

There is no deviation with the original standard.

3.5 EUT OPERATION DURING TEST

The measurements shall be performed during continuously transmitting.

3.6 TEST RESULTS

Please refer to the Appendix A.

4. NOMINAL / OCCUPIED CHANNEL BANDWIDTH

4.1 LIMIT

The Nominal Channel Bandwidth for a single Operating Channel shall be 20 MHz.

Alternatively, equipment may implement a lower Nominal Channel Bandwidth with a minimum of 5 MHz, providing they still comply with the Nominal Centre Frequencies defined in clause 4.2.1 of EN 301 893 (20 MHz raster).

The Occupied Channel Bandwidth shall be between 80 % and 100 % of the Nominal Channel Bandwidth. In case of smart antenna systems (devices with multiple transmit chains) each of the transmit chains shall meet this requirement. The Occupied Channel Bandwidth might change with time/payload.

During a Channel Occupancy Time (COT), equipment may operate temporarily with an Occupied Channel Bandwidth of less than 80 % of its Nominal Channel Bandwidth with a minimum of 2 MHz.

4.2 TEST PROCEDURES

Refer to ETSI EN 301 893, clause 5.4.3.2.1.

4.3 TEST SETUP LAYOUT

4.4 TEST DEVIATION

There is no deviation with the original standard.

4.5 EUT OPERATION DURING TEST

The measurements shall be performed during continuously transmitting.

4.6 TEST RESULTS

Please refer to the Appendix B.

5. RF OUTPUT POWER

5.1 LIMIT

Mean e.i.r.p. Limits for RF Output Power at the Highest Power Level		
Frequency Range (MHz)	Mean e.i.r.p. Limit for P_H (dBm)	
	With TPC	Without TPC
5150 to 5350	23	20/23 (see note1)

Note:	
(1)	The applicable limit is 20 dBm, except for transmissions whose nominal bandwidth falls completely within the band 5150 MHz to 5250 MHz, in which case the applicable limit is 23 dBm.

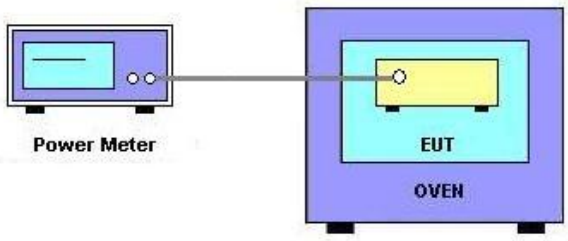
5.2 TEST PROCEDURES

Refer to ETSI EN 301 893, clause 5.4.4.2.1.

5.3 TEST SETUP LAYOUT

Normal Condition

Extreme Condition



5.4 TEST DEVIATION

There is no deviation with the original standard.

5.5 EUT OPERATION DURING TEST

The measurements shall be performed during continuously transmitting.

5.6 TEST RESULTS

Please refer to the Appendix C.

6. POWER DENSITY

6.1 LIMIT

Mean e.i.r.p. Limits for Power Density at the Highest Power Level		
Frequency Range (MHz)	Mean e.i.r.p. Density Limit (dBm/MHz)	
	With TPC	Without TPC
5150 to 5350	10	7/10 (see note1)

Note:	
(1)	The applicable limit is 7 dBm/MHz, except for transmissions whose nominal bandwidth falls completely within the band 5150 MHz to 5250 MHz, in which case the applicable limit is 10 dBm/MHz.

6.2 TEST PROCEDURES

Refer to ETSI EN 301 893, clause 5.4.4.2.1.

6.3 TEST SETUP LAYOUT

6.4 TEST DEVIATION

There is no deviation with the original standard.

6.5 EUT OPERATION DURING TEST

The measurements shall be performed during continuously transmitting.

6.6 TEST RESULTS

Please refer to the Appendix D.

7. TRANSMITTER UNWANTED EMISSIONS (OUTSIDE THE 5 GHZ RLAN BANDS)

7.1 LIMIT

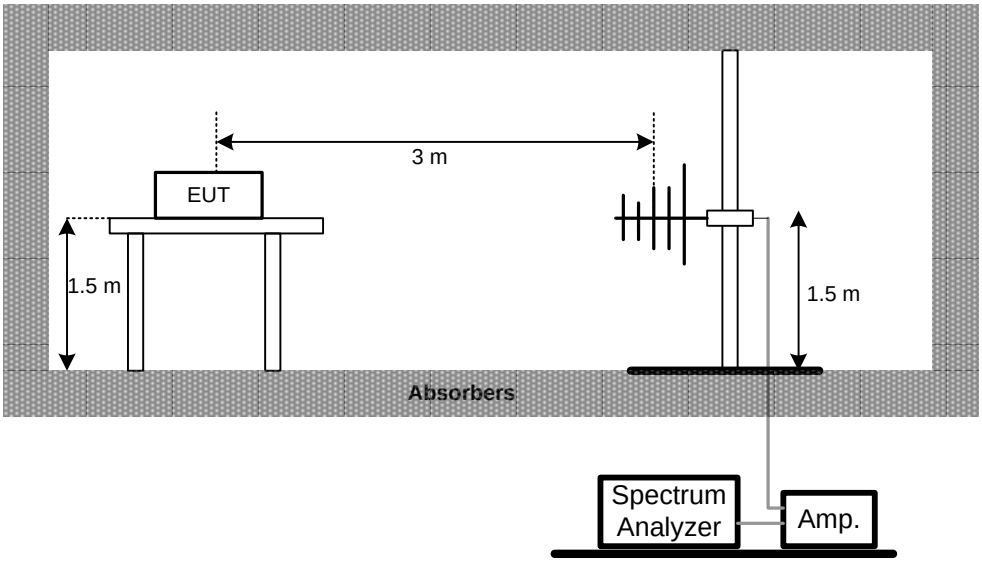
Clause	Test Item	Frequency(MHz)	Limit (dBm)
4.2.4.1	Transmitter Unwanted Emissions (Outside The 5 GHz RLAN Bands)	47 MHz to 74 MHz 87,5 MHz to 118 MHz 174 MHz to 230 MHz 470 MHz to 862 MHz	-54
		Other frequencies Below 1GHz	-36
		1GHz~26.5 GHz (Outside frequency ranges)	-30

7.2 TEST PROCEDURES

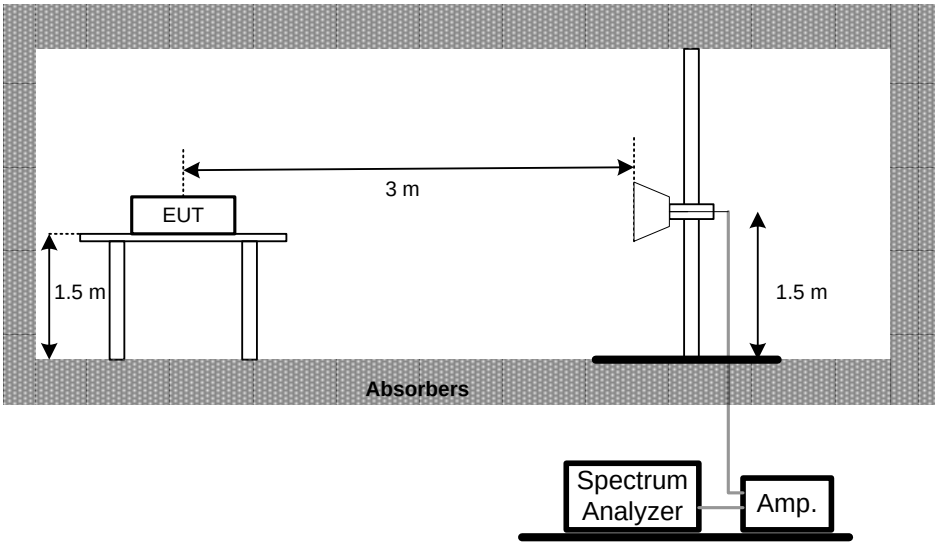
Refer to ETSI EN 301 893, clause 5.4.5.2.2.

7.3 TEST SETUP LAYOUT

Emission Radiated Measurement Test Set-Up Frequency Below 1 GHz



Emission Radiated Measurement Test Set-Up Frequency Above 1 GHz



7.4 TEST DEVIATION
There is no deviation with the original standard.

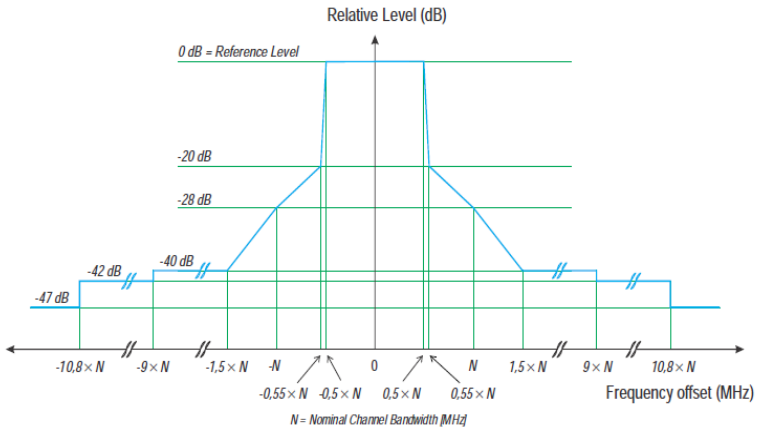
7.5 EUT OPERATION DURING TEST
The measurements shall be performed during continuously transmitting.

7.6 TEST RESULTS (30MHZ TO 1000MHZ)
Please refer to the Appendix E.

7.7 TEST RESULTS (ABOVE 1000MHZ)
Please refer to the Appendix F.

8. TRANSMITTER UNWANTED EMISSIONS(WITHIN THE 5 GHZ RLAN BANDS)

8.1 LIMIT

Clause	Test Item	Limit
4.2.4.2	Transmitter Unwanted Emissions (Within the 5 GHz RLAN bands)	

8.2 TEST PROCEDURES

Refer to ETSI EN 301 893, clause 5.4.6.2.1.

8.3 TEST SETUP LAYOUT

8.4 TEST DEVIATION

There is no deviation with the original standard.

8.5 EUT OPERATION DURING TEST

The measurements shall be performed during continuously transmitting.

8.6 TEST RESULTS

Please refer to the Appendix G.

9. RECEIVER SPURIOUS EMISSIONS

9.1 LIMIT

Clause	Test Item	Frequency(MHz)	Limit
4.2.5	Receiver spurious emissions	30-1000	-57dBm
		1000~26500	-47dBm

9.2 TEST PROCEDURES

Refer to ETSI EN 301 893, clause 5.4.7.2.2.

9.3 TEST SETUP LAYOUT

Please refer to clause 7.3.

9.4 TEST DEVIATION

There is no deviation with the original standard.

9.5 EUT OPERATION DURING TEST

The measurements shall be performed during continuously receiving.

9.6 TEST RESULTS (30 MHZ TO 1000 MHZ)

Please refer to the Appendix H.

9.7 TEST RESULTS (ABOVE 1000 MHZ)

Please refer to the Appendix I.

10. ADAPTIVITY (CHANNEL ACCESS MECHANISM)

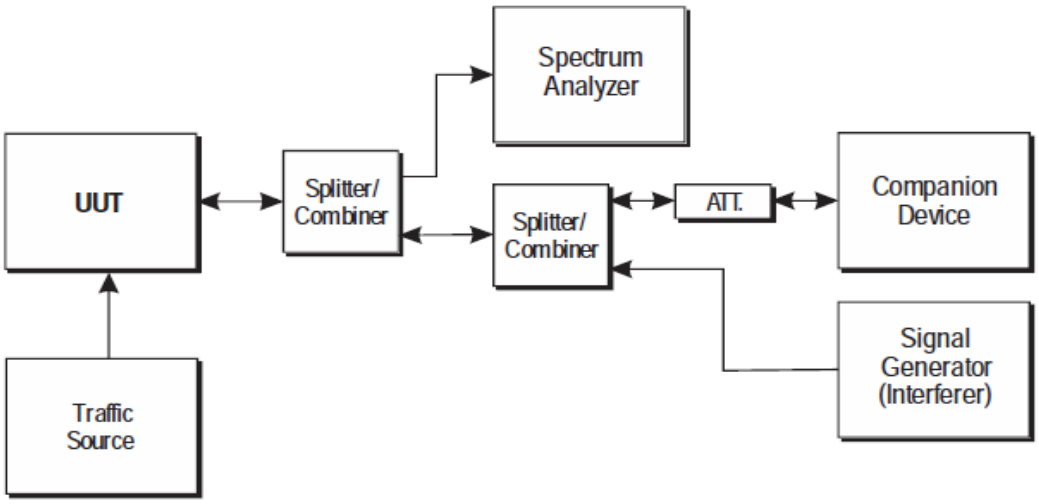
10.1 LIMIT

Refer to ETSI EN 301 893, clause 4.2.7.

10.2 TEST PROCEDURES

Refer to ETSI EN 301 893, clause 5.4.9.3.2.

10.3 TEST SETUP



10.4 TEST DEVIATION

There is no deviation with the original standard.

10.5 EUT OPERATION DURING TEST

The measurements shall be performed during normal operation.

10.6 TEST RESULTS

Please refer to the Appendix J.

11. RECEIVER BLOCKING

11.1 LIMIT

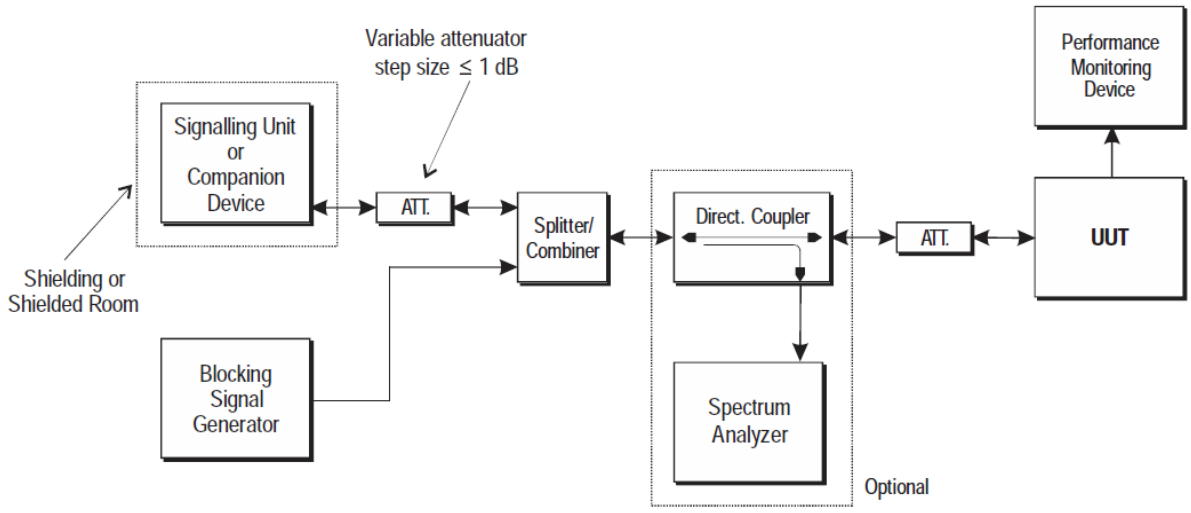
The minimum performance criterion shall be a PER of less than or equal to 10 %.

Wanted signal mean power from companion device (dBm)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 2)		Type of blocking signal
		Master or Slave with radar detection (see table D.2, note 2)	Slave without radar detection (see table D.2, note 2)	
Pmin + 6 dB	5 100	-53	-59	Continuous Wave
Pmin + 6 dB	4 900 5 000 5 975	-47	-53	Continuous Wave
NOTE 1: P_{min} is the minimum level of the wanted signal (in dBm) required to meet the minimum performance criteria as defined clause 4.2.8.3 in the absence of any blocking signal. NOTE 2: The levels specified are levels in front of the UUT antenna. In case of conducted measurements, the same levels should be used at the antenna connector irrespective of antenna gain.				

11.2 TEST PROCEDURES

Refer to ETSI EN 301 893, clause 5.4.10.2.1.

11.3 TEST SETUP



11.4 TEST DEVIATION

There is no deviation with the original standard.

11.5 EUT OPERATION DURING TEST

The measurements shall be performed during normal receiving.

11.6 TEST RESULTS

Please refer to the Appendix K.

12. MEASUREMENT INSTRUMENTS LIST

Centre Frequency					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	EXA Spectrum Analyzer	Agilent	N9010A	MY54200164	Jan. 22, 2023
2	Cable	emci	EMC104-SM-SM-9000(0.01GHz-26.5GHz)	N/A	N/A
3	Const Temp. & Humidity Chamber	CEPREI	CEEC-M64T-40	15-008	Jan. 22, 2023
4	Measurement Software	BTL	EN301893	N/A	N/A

Nominal / Occupied Channel Bandwidth & Power Density & Transmitter Unwanted Emissions Within The 5 GHz RLAN Bands					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	EXA Spectrum Analyzer	Agilent	N9010A	MY54200164	Jan. 22, 2023
2	Cable	emci	EMC104-SM-SM-9000(0.01GHz-26.5GHz)	N/A	N/A
3	Measurement Software	BTL	EN301893	N/A	N/A

RF Output Power					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Cable	emci	EMC104-SM-SM-9000(0.01GHz-26.5GHz)	N/A	N/A
2	Power Sensor	Agilent	U2021XA	MY53320006	Jan. 22, 2023
3	Power Sensor	Agilent	U2021XA	MY53340001	Jan. 22, 2023
4	Power Sensor	Agilent	U2021XA	MY53340005	Jan. 22, 2023
5	Power Sensor	Agilent	U2021XA	MY53340007	Jan. 22, 2023
6	Const Temp. & Humidity Chamber	CEPREI	CEEC-M64T-40	15-008	Jan. 22, 2023
7	Measurement Software	BTL	EN301893	N/A	N/A

Adaptivity					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	EXA Spectrum Analyzer	Agilent	N9010A	MY54200164	Jan. 22, 2023
2	POWER SPLITTER	Mini-Circuits	ZFRSC-183-S+	SF601301339-2	Jan. 22, 2023
3*	POWER SPLITTER	Guangkuo	N/A	SZ201504789	Jul. 10, 2024
4	MXG Vector Signal Generator	Agilent	N5182A	MY49060447	Jan. 22, 2023
5	Data collector	Keysight	AD211	TW54033508	N/A
6	Notebook	Lenovo	XIAOXIN PRO 13 2020	N/A	N/A
7	Measurement Software	BTL	EN301893	N/A	N/A

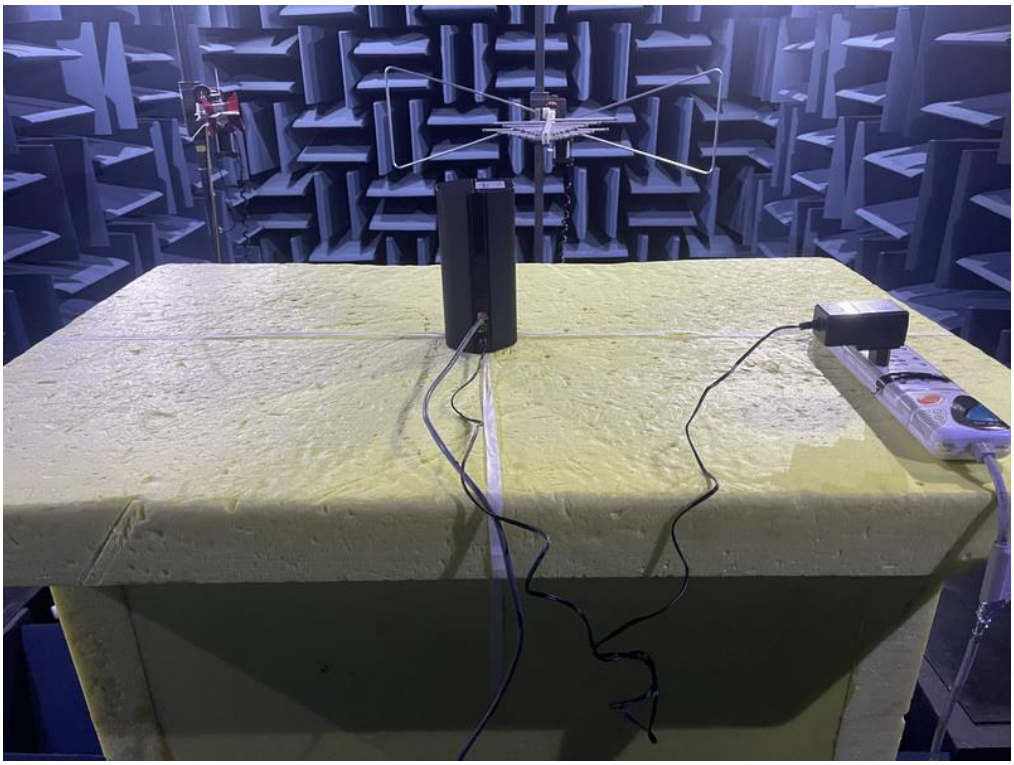
Receiver Blocking					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	wideband radio communication tester	R&S	CMW500	153083	Jan. 22, 2023
2	POWER SPLITTER	Mini-Circuits	ZFRSC-183-S+	SF601301339-2	Jan. 22, 2023
3	MXG Vector Signal Generator	Agilent	N5182A	MY49060447	Jan. 22, 2023

Transmitter and Receiver Spurious Emission (Radiated Measurement)					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Antenna	Schwarzbeck	VULB9160	9160-3231	Apr. 18, 2023
2	Amplifier	HP	8447D	2944A08908	Jan. 22, 2023
3	Controller	ETS-Lindgren	2090	N/A	N/A
4	Double-Ridged Waveguide Horn Antennas	ETS-LINDGREN	3117-PA	00224172	Sep. 18, 2022
5	Preamplifier	ETS-LINDGREN	3117-PA	00224172	Jul. 03, 2023
6	Automatic switching unit of high and low frequency line wave device	Tonscend	JS0806-S	20E8060252	N/A
7	Spectrum Analyzer	R&S	FSV7	101908	Jan. 22, 2023
8	Spectrum Analyzer	R&S	FSV40	101423	Jul. 03, 2023
9	Measurement Software	Tonscend	JS36-RSE 2.5.1.5	N/A	N/A

Remark: “N/A” denotes no model name, serial no. or calibration specified.
“*” calibration period of equipment list is three year.
Except * item, all calibration period of equipment list is one year.

13. EUT TEST PHOTO

Radiated Emissions Test Photos



APPENDIX A - CENTRE FREQUENCIES

Test Mode: IEEE 802.11a Mode		
Test Conditions		Measurement Frequency (MHz)
		5180MHz
T nom(°C)	23.3~24	5179.9580
T min(°C)	0	5179.9532
T max(°C)	40	5179.9538
Max. Deviation Frequency		-0.0468
Max. Frequency Error (ppm)		-9.03
Limit (ppm)		±20.00
Result		Pass

Test Mode: IEEE 802.11ac(VHT40) Mode		
Test Conditions		Measurement Frequency (MHz)
		5190MHz
T nom(°C)	23.3~24	5189.9360
T min(°C)	0	5189.9345
T max(°C)	40	5189.9408
Max. Deviation Frequency		-0.0655
Max. Frequency Error (ppm)		-12.62
Limit (ppm)		±20.00
Result		Pass

Test Mode: IEEE 802.11ax(HE80) Mode		
Test Conditions		Measurement Frequency (MHz)
		5210MHz
T nom(°C)	23.3~24	5210.0880
T min(°C)	0	5210.0836
T max(°C)	40	5210.0858
Max. Deviation Frequency		0.0880
Max. Frequency Error (ppm)		16.89
Limit (ppm)		±20.00
Result		Pass

APPENDIX B - NOMINAL / OCCUPIED CHANNEL BANDWIDTH

Test Mode: IEEE 802.11a Mode		
Test Conditions		Occupied Channel Bandwidth (MHz)
		5180MHz
T nom (°C)	23.3~24	16.37
Limits		16~20
Result		Pass

Test Mode: IEEE 802.11ac(VHT20) Mode		
Test Conditions		Occupied Channel Bandwidth (MHz)
		5180MHz
T nom (°C)	23.3~24	17.56
Limits		16~20
Result		Pass

Test Mode: IEEE 802.11ac(VHT40) Mode		
Test Conditions		Occupied Channel Bandwidth (MHz)
		5190MHz
T nom (°C)	23.3~24	35.76
Limits		32~40
Result		Pass

Test Mode: IEEE 802.11ac(VHT80) Mode		
Test Conditions		Occupied Channel Bandwidth (MHz)
		5210MHz
T nom (°C)	23.3~24	75.07
Limits		64~80
Result		Pass

Test Mode: IEEE 802.11ax(HE20) Mode		
Test Conditions		Occupied Channel Bandwidth (MHz)
		5180MHz
T nom (°C)	23.3~24	18.91
Limits		16~20
Result		Pass

Test Mode: IEEE 802.11ax(HE40) Mode		
Test Conditions		Occupied Channel Bandwidth (MHz)
		5190MHz
T nom (°C)	23.3~24	37.44
Limits		32~40
Result		Pass

Test Mode: IEEE 802.11ax(HE80) Mode		
Test Conditions		Occupied Channel Bandwidth (MHz)
		5210MHz
T nom (°C)	23.3~24	76.63
Limits		64~80
Result		Pass

APPENDIX C - RF OUTPUT POWER

Non Beamforming

Test Mode: IEEE 802.11a Mode at the Highest Power Level		
Test Conditions		e.i.r.p. (dBm)
		5180MHz
T nom (°C)	23.1~24.3	22.42
T min (°C)	0	22.59
T max (°C)	40	22.35
Max. e.i.r.p.		22.59
Limits		23
Result		Pass

Test Mode: IEEE 802.11n(HT20) Mode at the Highest Power Level		
Test Conditions		e.i.r.p. (dBm)
		5180MHz
T nom (°C)	23.1~24.3	22.77
T min (°C)	0	22.88
T max (°C)	40	22.68
Max. e.i.r.p.		22.88
Limits		23
Result		Pass

Test Mode: IEEE 802.11n(HT40) Mode at the Highest Power Level		
Test Conditions		e.i.r.p. (dBm)
		5190MHz
T nom (°C)	23.1~24.3	22.64
T min (°C)	0	22.74
T max (°C)	40	22.53
Max. e.i.r.p.		22.74
Limits		23
Result		Pass

Test Mode: IEEE 802.11ac(VHT20) Mode at the Highest Power Level		
Test Conditions		e.i.r.p. (dBm)
		5180MHz
T nom (°C)	23.1~24.3	22.80
T min (°C)	0	22.90
T max (°C)	40	22.75
Max. e.i.r.p.		22.90
Limits		23
Result		Pass

Test Mode: IEEE 802.11ac(VHT40) Mode at the Highest Power Level		
Test Conditions		e.i.r.p. (dBm)
		5190MHz
T nom (°C)	23.1~24.3	22.86
T min (°C)	0	22.96
T max (°C)	40	22.74
Max. e.i.r.p.		22.96
Limits		23
Result		Pass

Test Mode: IEEE 802.11ac(VHT80) Mode at the Highest Power Level		
Test Conditions		e.i.r.p. (dBm)
		5210MHz
T nom (°C)	23.1~24.3	22.60
T min (°C)	0	22.69
T max (°C)	40	22.50
Max. e.i.r.p.		22.69
Limits		23
Result		Pass

Test Mode: IEEE 802.11ax(HE20) Mode at the Highest Power Level		
Test Conditions		e.i.r.p. (dBm)
		5180MHz
T nom (°C)	23.1~24.3	22.53
T min (°C)	0	22.63
T max (°C)	40	22.43
Max. e.i.r.p.		22.63
Limits		23
Result		Pass

Test Mode: IEEE 802.11ax(HE40) Mode at the Highest Power Level		
Test Conditions		e.i.r.p. (dBm)
		5190MHz
T nom (°C)	23.1~24.3	22.64
T min (°C)	0	22.73
T max (°C)	40	22.54
Max. e.i.r.p.		22.73
Limits		23
Result		Pass

Test Mode: IEEE 802.11ax(HE80) Mode at the Highest Power Level		
Test Conditions		e.i.r.p. (dBm)
		5210MHz
T nom (°C)	23.1~24.3	22.70
T min (°C)	0	22.81
T max (°C)	40	22.57
Max. e.i.r.p.		22.81
Limits		23
Result		Pass

Note: e.i.r.p. = Conducted output power + G (Ant Gain)

Beamforming

Test Mode: IEEE 802.11n(HT20) Mode at the Highest Power Level		
Test Conditions		e.i.r.p. (dBm)
		5180MHz
T nom (°C)	23.1~24.3	22.13
T min (°C)	0	22.24
T max (°C)	40	22.01
Max. e.i.r.p.		22.24
Limits		23
Result		Pass

Test Mode: IEEE 802.11n(HT40) Mode at the Highest Power Level		
Test Conditions		e.i.r.p. (dBm)
		5190MHz
T nom (°C)	23.1~24.3	22.10
T min (°C)	0	22.22
T max (°C)	40	22.01
Max. e.i.r.p.		22.22
Limits		23
Result		Pass

Test Mode: IEEE 802.11ac(VHT20) Mode at the Highest Power Level		
Test Conditions		e.i.r.p. (dBm)
		5180MHz
T nom (°C)	23.1~24.3	22.24
T min (°C)	0	22.35
T max (°C)	40	22.13
Max. e.i.r.p.		22.35
Limits		23
Result		Pass

Test Mode: IEEE 802.11ac(VHT40) Mode at the Highest Power Level		
Test Conditions		e.i.r.p. (dBm)
		5190MHz
T nom (°C)	23.1~24.3	22.35
T min (°C)	0	22.44
T max (°C)	40	22.24
Max. e.i.r.p.		22.44
Limits		23
Result		Pass

Test Mode: IEEE 802.11ac(VHT80) Mode at the Highest Power Level		
Test Conditions		e.i.r.p. (dBm)
		5210MHz
T nom (°C)	23.1~24.3	22.06
T min (°C)	0	22.17
T max (°C)	40	21.96
Max. e.i.r.p.		22.17
Limits		23
Result		Pass

Test Mode: IEEE 802.11ax(HE20) Mode at the Highest Power Level		
Test Conditions		e.i.r.p. (dBm)
		5180MHz
T nom (°C)	23.1~24.3	21.99
T min (°C)	0	22.08
T max (°C)	40	21.88
Max. e.i.r.p.		22.08
Limits		23
Result		Pass

Test Mode: IEEE 802.11ax(HE40) Mode at the Highest Power Level		
Test Conditions		e.i.r.p. (dBm)
		5190MHz
T nom (°C)	23.1~24.3	22.26
T min (°C)	0	22.38
T max (°C)	40	22.17
Max. e.i.r.p.		22.38
Limits		23
Result		Pass

Test Mode: IEEE 802.11ax(HE80) Mode at the Highest Power Level		
Test Conditions		e.i.r.p. (dBm)
		5210MHz
T nom (°C)	23.1~24.3	22.27
T min (°C)	0	22.37
T max (°C)	40	22.19
Max. e.i.r.p.		22.37
Limits		23
Result		Pass

Note: e.i.r.p. = Conducted output power + G (Ant Gain) + Y (Beamforming Gain)

APPENDIX D - POWER DENSITY

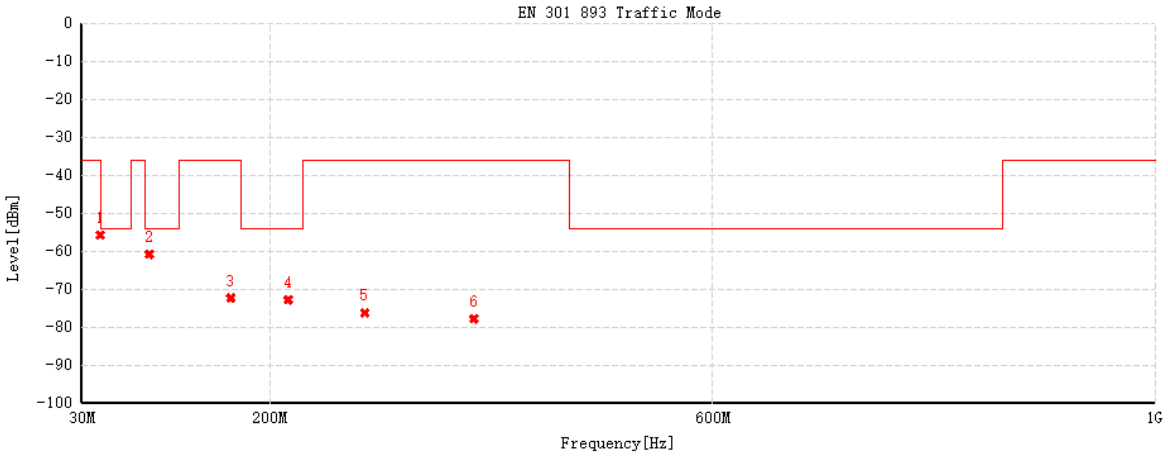
Test Mode: IEEE 802.11a Mode		
Test Conditions		Spectral Power Density e.i.r.p. (dBm / MHz)
		5180MHz
T nom (°C)	23.3~24	9.96
Limits		10
Result		Pass

Test Mode: IEEE 802.11ac(VHT20) Mode		
Test Conditions		Spectral Power Density e.i.r.p. (dBm / MHz)
		5180MHz
T nom (°C)	23.3~24	9.74
Limits		10
Result		Pass

Test Mode: IEEE 802.11ax(HE20) Mode		
Test Conditions		Spectral Power Density e.i.r.p. (dBm / MHz)
		5180MHz
T nom (°C)	23.3~24	9.81
Limits		10
Result		Pass

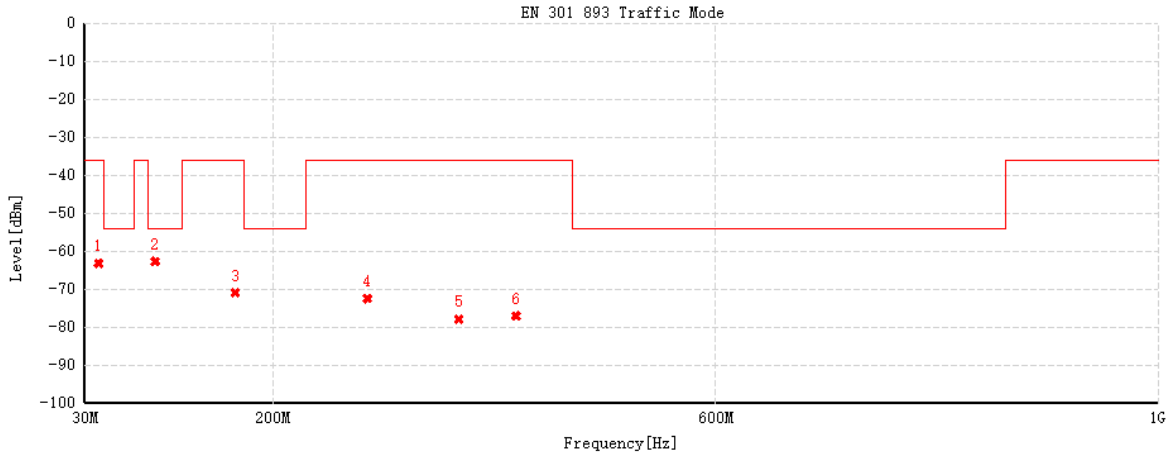
APPENDIX E - TRANSMITTER UNWANTED EMISSIONS OUTSIDE THE 5 GHZ RLAN BANDS (30MHZ TO 1000MHZ)

Test Mode	TX Mode IEEE 802.11ac(VHT40)_5190MHz	Polarization	Vertical



NO.	Freq.[MHz]	Reading[dBm]	Factor[dB]	Level[dBm]	Limit[dBm]	Margin[dB]	Detector	Polarity
1	46.393	-57.06	1.34	-55.72	-36	19.72	RMS	Vertical
2	90.722	-57.83	-2.87	-60.7	-54	6.7	RMS	Vertical
3	164.345	-65.95	-6.28	-72.23	-36	36.23	RMS	Vertical
4	216.434	-67.28	-5.47	-72.75	-54	18.75	RMS	Vertical
5	285.498	-72.51	-3.65	-76.16	-36	40.16	RMS	Vertical
6	384.244	-77.15	-0.62	-77.77	-36	41.77	RMS	Vertical

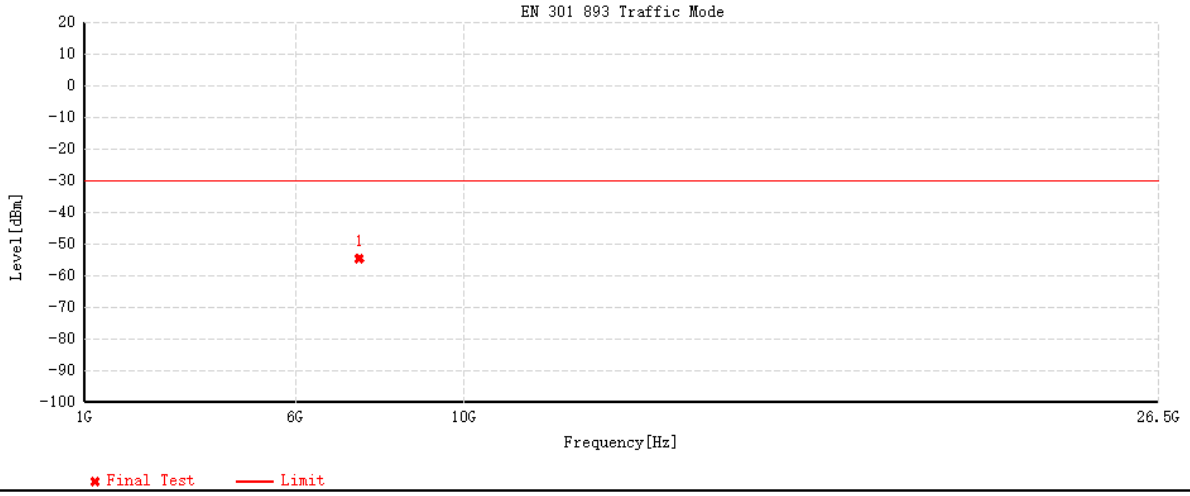
Test Mode	TX Mode IEEE 802.11ac(VHT40)_5190MHz	Polarization	Horizontal



NO.	Freq.[MHz]	Reading[dBm]	Factor[dB]	Level[dBm]	Limit[dBm]	Margin[dB]	Detector	Polarity
1	42.222	-63.28	0.16	-63.12	-36	27.12	RMS	Horizontal
2	93.729	-58.41	-4.21	-62.62	-54	8.62	RMS	Horizontal
3	165.8	-62.93	-7.93	-70.86	-36	34.86	RMS	Horizontal
4	285.498	-68.93	-3.41	-72.34	-36	36.34	RMS	Horizontal
5	368.142	-76.75	-1.07	-77.82	-36	41.82	RMS	Horizontal
6	419.358	-76.72	-0.21	-76.93	-36	40.93	RMS	Horizontal

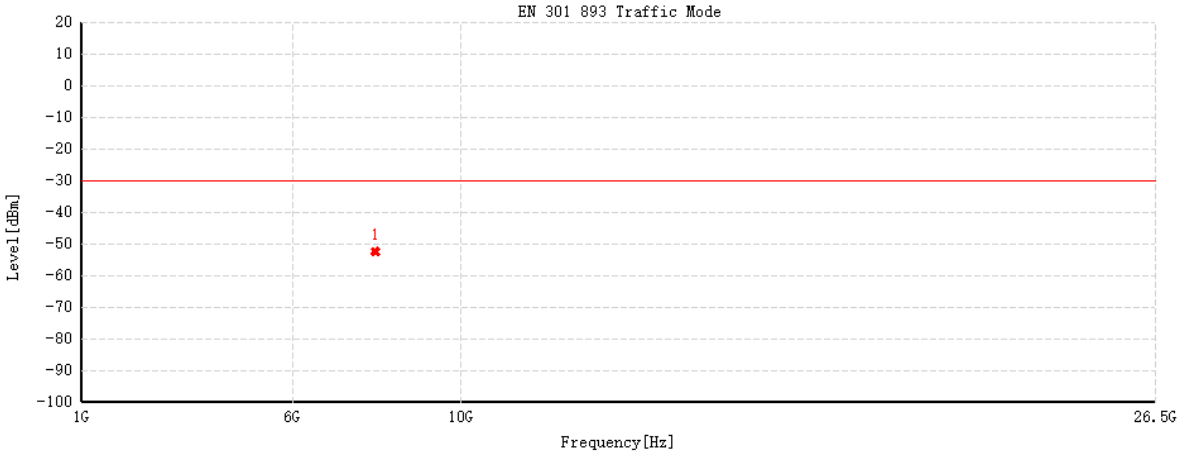
APPENDIX F - TRANSMITTER UNWANTED EMISSIONS OUTSIDE THE 5 GHZ RLAN BANDS (ABOVE 1000MHZ)

Test Mode	TX Mode IEEE 802.11a_5180MHz	Polarization	Vertical



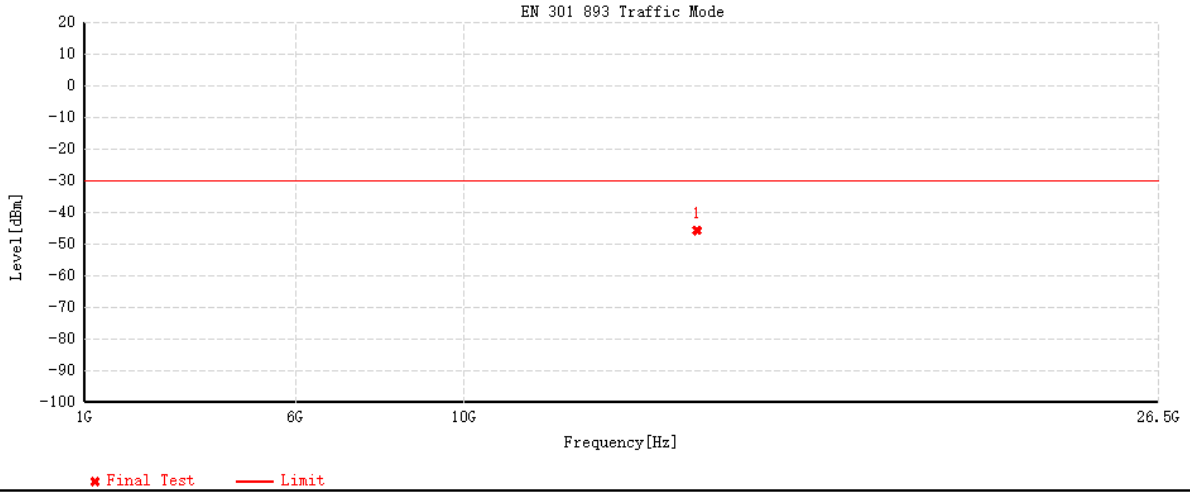
NO.	Freq.[MHz]	Reading[dBm]	Factor[dB]	Level[dBm]	Limit[dBm]	Margin[dB]	Detector	Polarity
1	7516.1	-68.44	13.93	-54.51	-30	24.51	RMS	Vertical

Test Mode	TX Mode IEEE 802.11a_5180MHz	Polarization	Horizontal



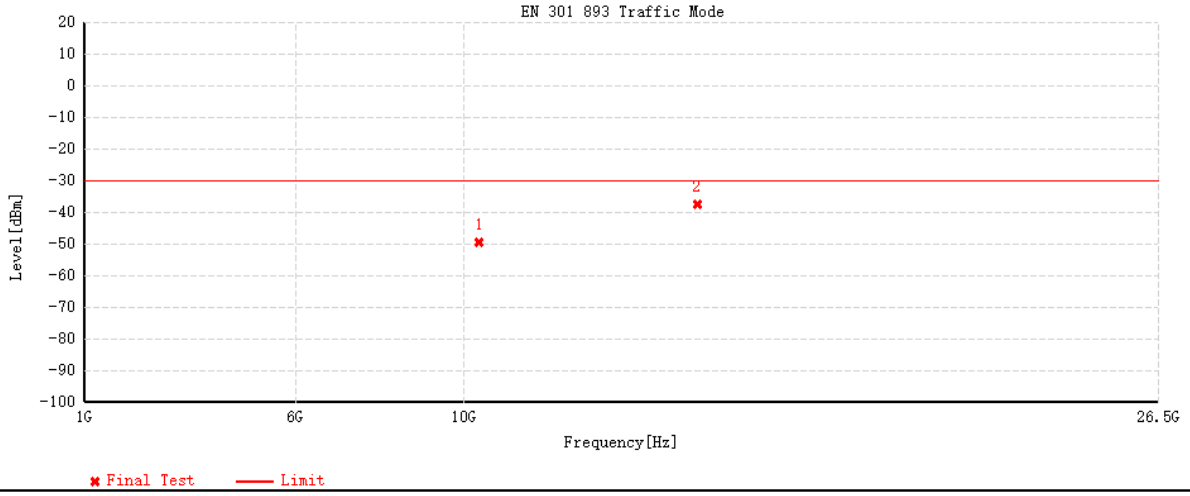
NO.	Freq.[MHz]	Reading[dBm]	Factor[dB]	Level[dBm]	Limit[dBm]	Margin[dB]	Detector	Polarity
1	7968.3	-65.27	12.96	-52.31	-30	22.31	RMS	Horizontal

Test Mode	TX Mode IEEE 802.11ac(VHT20)_5180MHz	Polarization	Vertical



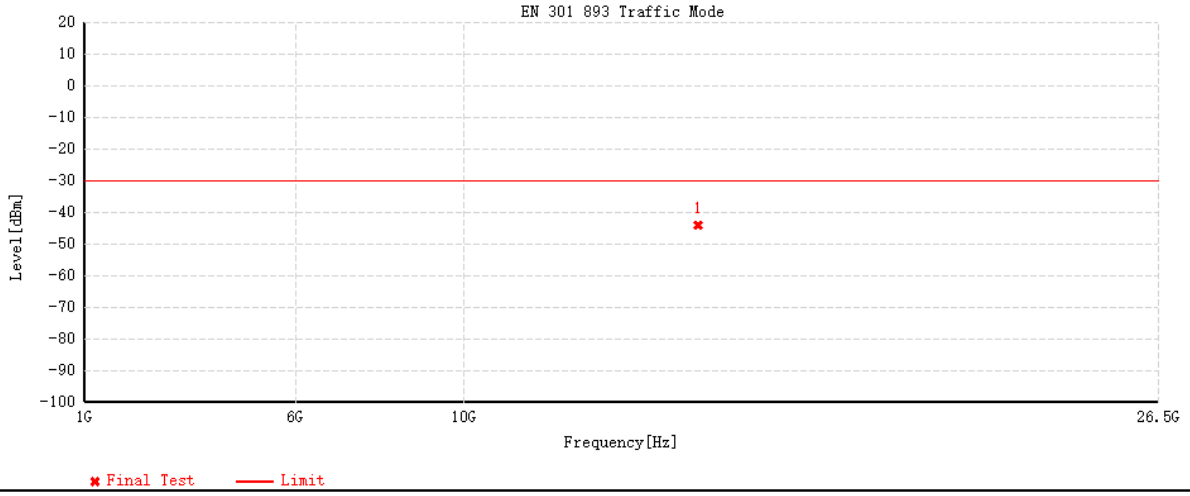
NO.	Freq.[MHz]	Reading[dBm]	Factor[dB]	Level[dBm]	Limit[dBm]	Margin[dB]	Detector	Polarity
1	15541.8	-68.06	22.4	-45.66	-30	15.66	RMS	Vertical

Test Mode	TX Mode IEEE 802.11ac(VHT20)_5180MHz	Polarization	Horizontal



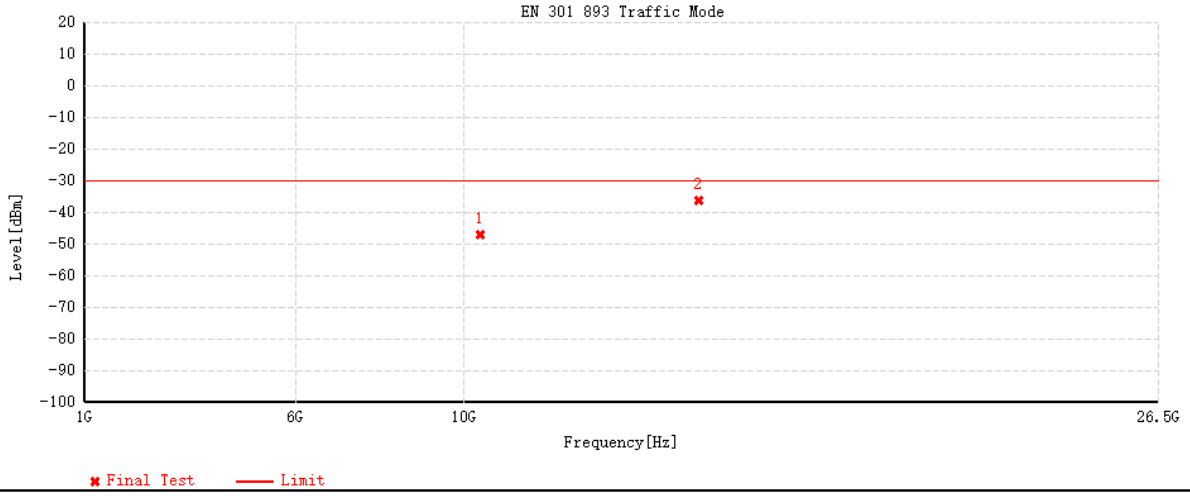
NO.	Freq.[MHz]	Reading[dBm]	Factor[dB]	Level[dBm]	Limit[dBm]	Margin[dB]	Detector	Polarity
1	10363.6	-65.31	15.94	-49.37	-30	19.37	RMS	Horizontal
2	15539.25	-59.63	22.24	-37.39	-30	7.39	RMS	Horizontal

Test Mode	TX Mode IEEE 802.11ac(VHT40)_5190MHz	Polarization	Vertical



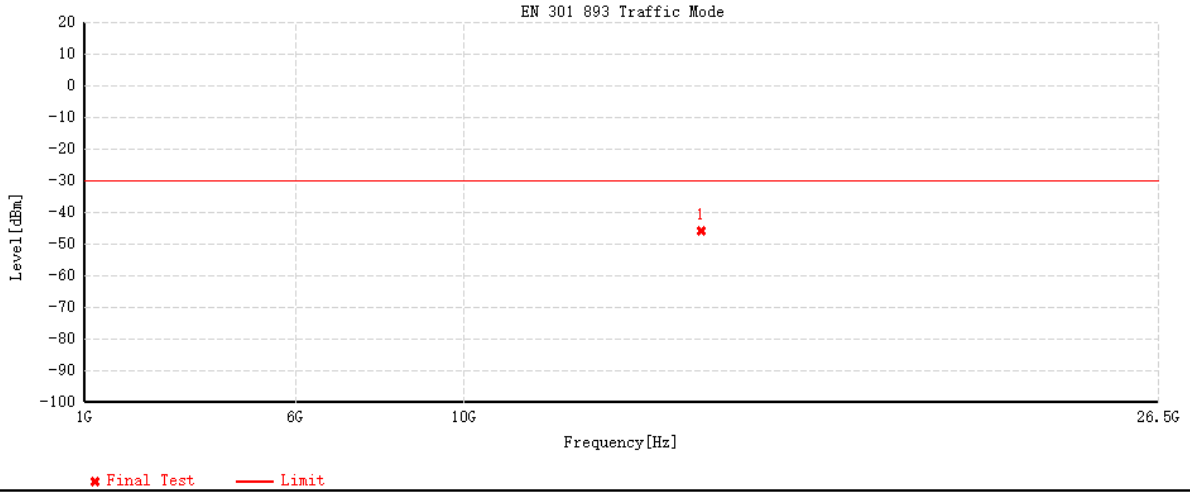
NO.	Freq.[MHz]	Reading[dBm]	Factor[dB]	Level[dBm]	Limit[dBm]	Margin[dB]	Detector	Polarity
1	15565.6	-66.27	22.32	-43.95	-30	13.95	RMS	Vertical

Test Mode	TX Mode IEEE 802.11ac(VHT40)_5190MHz	Polarization	Horizontal



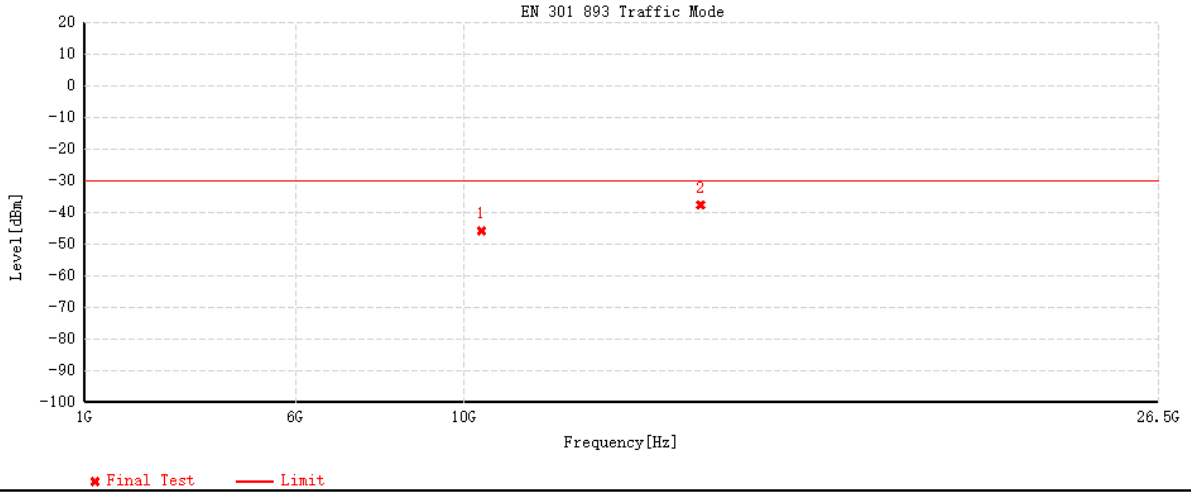
NO.	Freq.[MHz]	Reading[dBm]	Factor[dB]	Level[dBm]	Limit[dBm]	Margin[dB]	Detector	Polarity
1	10378.9	-63.13	16.13	-47	-30	17	RMS	Horizontal
2	15572.4	-58.27	22.05	-36.22	-30	6.22	RMS	Horizontal

Test Mode	TX Mode IEEE 802.11ac(VHT80)_5210MHz	Polarization	Vertical



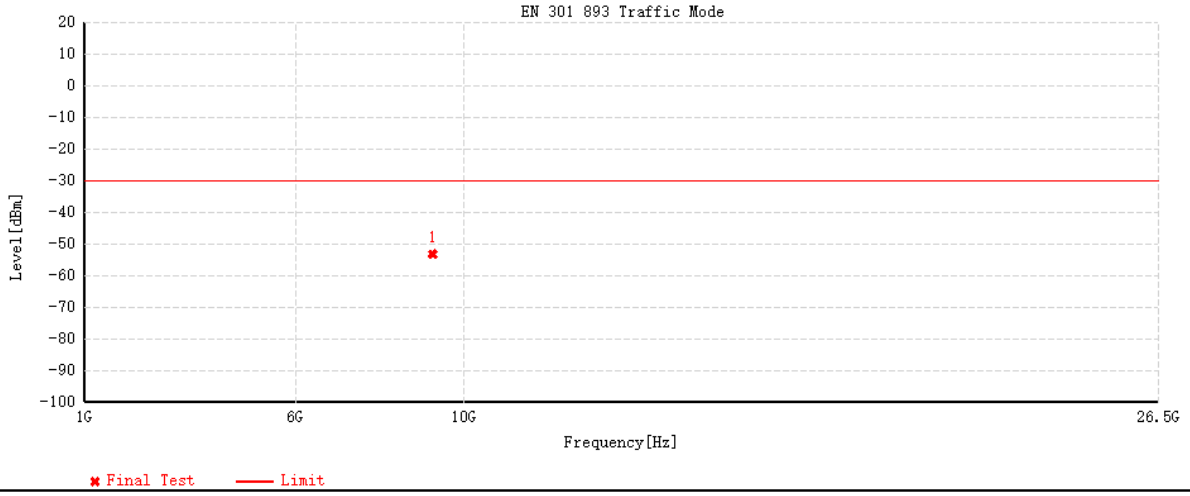
NO.	Freq.[MHz]	Reading[dBm]	Factor[dB]	Level[dBm]	Limit[dBm]	Margin[dB]	Detector	Polarity
1	15636.15	-67.92	22.12	-45.8	-30	15.8	RMS	Vertical

Test Mode	TX Mode IEEE 802.11ac(VHT80)_5210MHz	Polarization	Horizontal



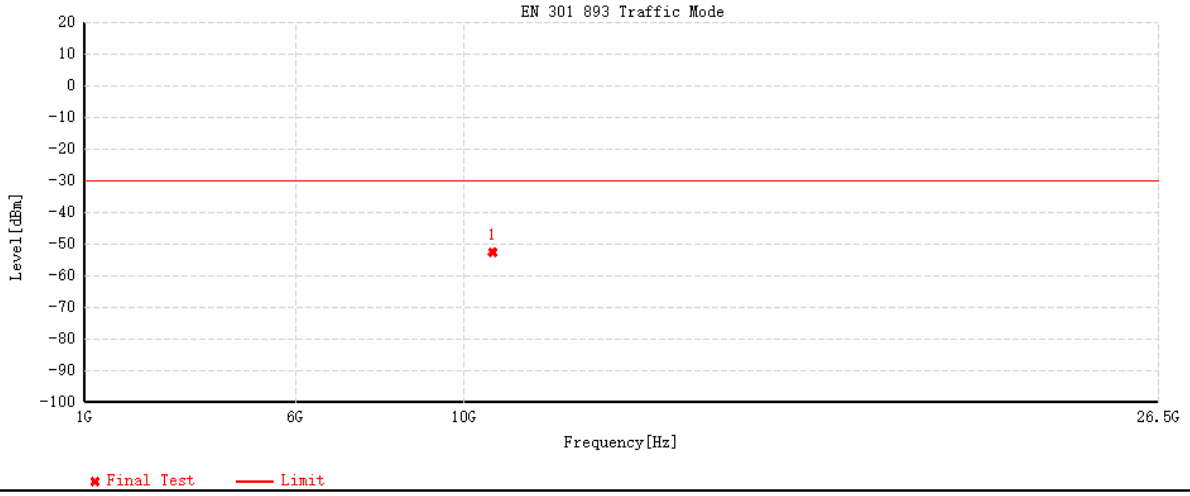
NO.	Freq.[MHz]	Reading[dBm]	Factor[dB]	Level[dBm]	Limit[dBm]	Margin[dB]	Detector	Polarity
1	10418	-62.21	16.48	-45.73	-30	15.73	RMS	Horizontal
2	15626.8	-59.2	21.62	-37.58	-30	7.58	RMS	Horizontal

Test Mode	TX Mode IEEE 802.11ax(HE20)_5180MHz	Polarization	Vertical



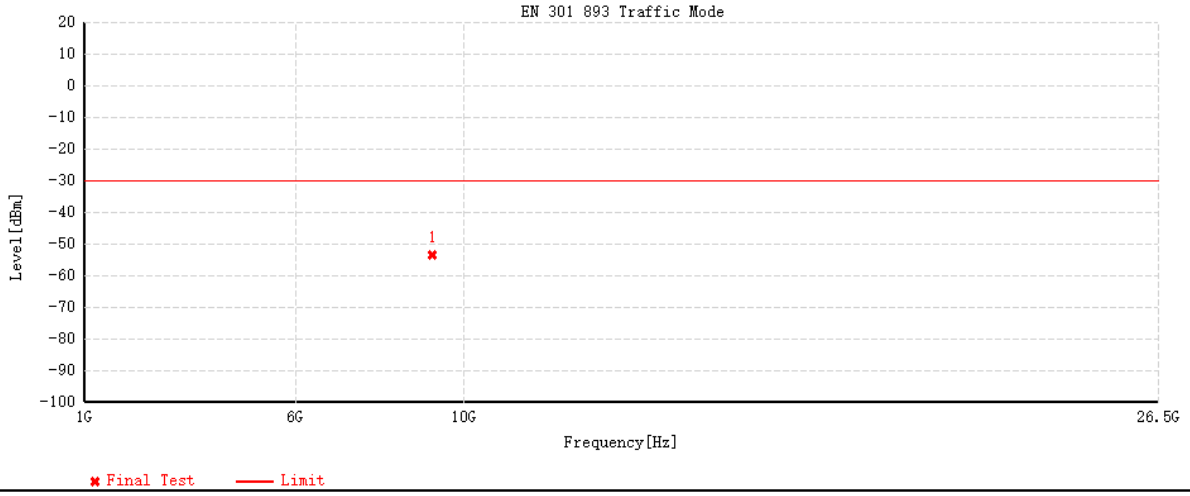
NO.	Freq.[MHz]	Reading[dBm]	Factor[dB]	Level[dBm]	Limit[dBm]	Margin[dB]	Detector	Polarity
1	9262	-67.61	14.54	-53.07	-30	23.07	RMS	Vertical

Test Mode	TX Mode IEEE 802.11ax(HE20)_5180MHz	Polarization	Horizontal



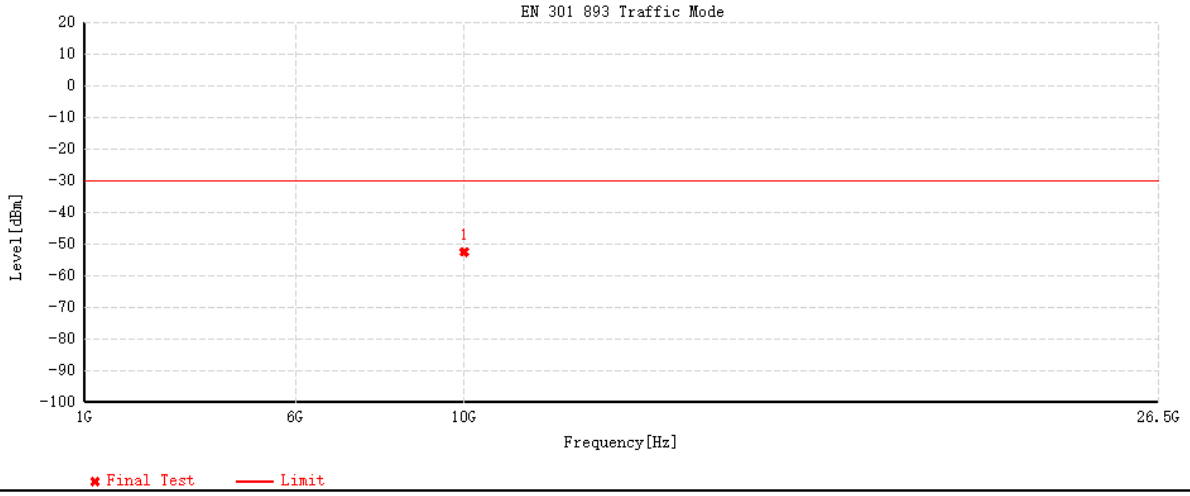
NO.	Freq.[MHz]	Reading[dBm]	Factor[dB]	Level[dBm]	Limit[dBm]	Margin[dB]	Detector	Polarity
1	10682.35	-69.99	17.47	-52.52	-30	22.52	RMS	Horizontal

Test Mode	TX Mode IEEE 802.11ax(HE40)_5190MHz	Polarization	Vertical



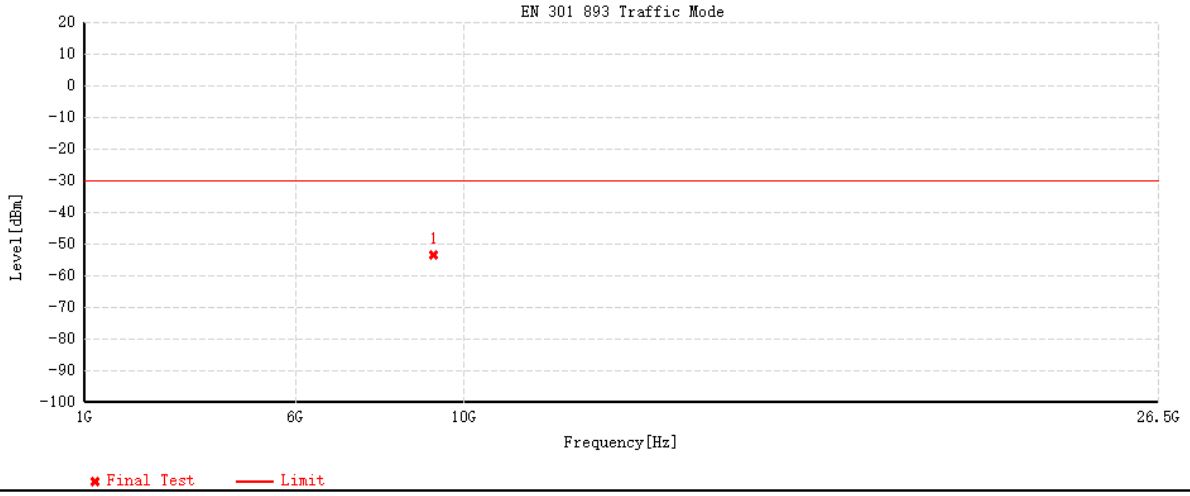
NO.	Freq.[MHz]	Reading[dBm]	Factor[dB]	Level[dBm]	Limit[dBm]	Margin[dB]	Detector	Polarity
1	9249.25	-67.79	14.49	-53.3	-30	23.3	RMS	Vertical

Test Mode	TX Mode IEEE 802.11ax(HE40)_5190MHz	Polarization	Horizontal



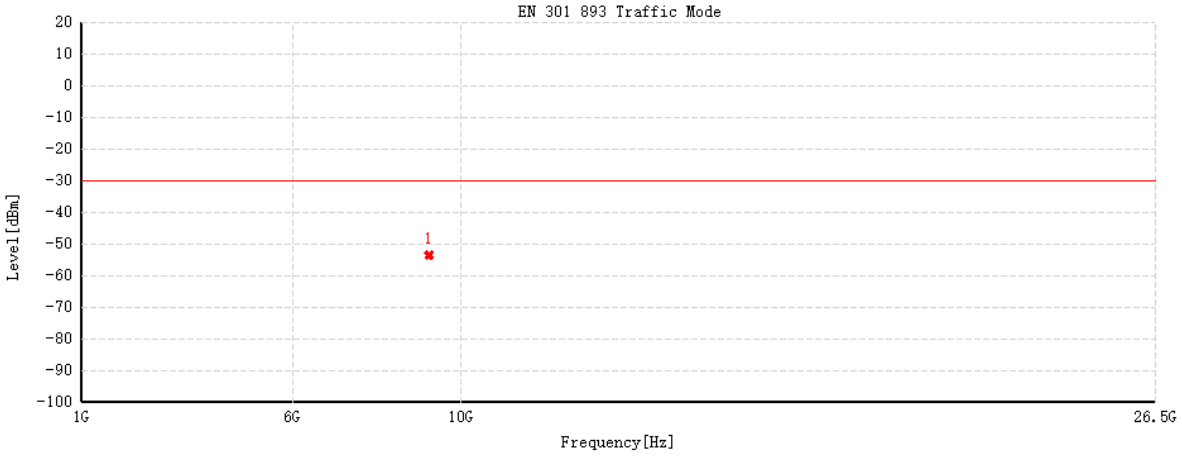
NO.	Freq.[MHz]	Reading[dBm]	Factor[dB]	Level[dBm]	Limit[dBm]	Margin[dB]	Detector	Polarity
1	10013.4	-68.88	16.35	-52.53	-30	22.53	RMS	Horizontal

Test Mode	TX Mode IEEE 802.11ax(HE80)_5210MHz	Polarization	Vertical



NO.	Freq.[MHz]	Reading[dBm]	Factor[dB]	Level[dBm]	Limit[dBm]	Margin[dB]	Detector	Polarity
1	9278.15	-68.04	14.61	-53.43	-30	23.43	RMS	Vertical

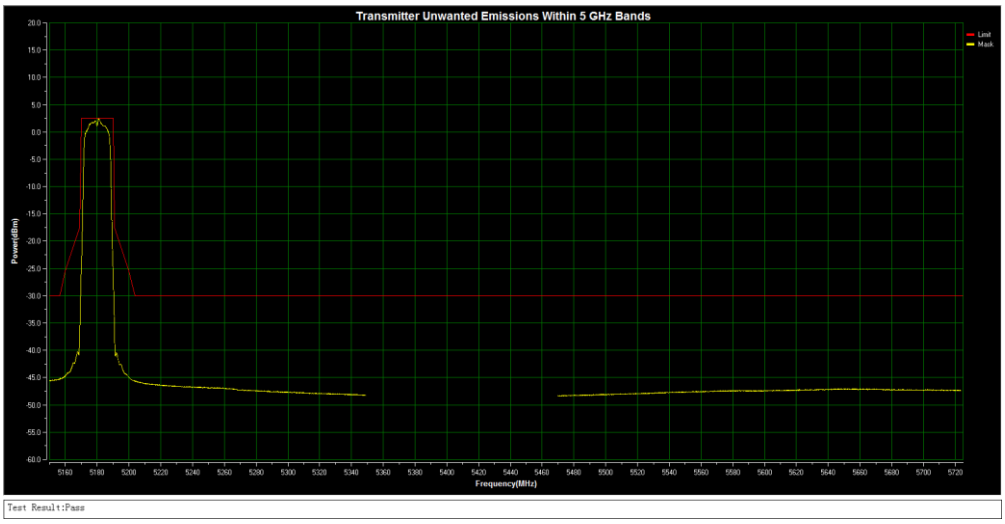
Test Mode	TX Mode IEEE 802.11ax(HE80)_5210MHz	Polarization	Horizontal



NO.	Freq.[MHz]	Reading[dBm]	Factor[dB]	Level[dBm]	Limit[dBm]	Margin[dB]	Detector	Polarity
1	9242.45	-67.94	14.51	-53.43	-30	23.43	RMS	Horizontal

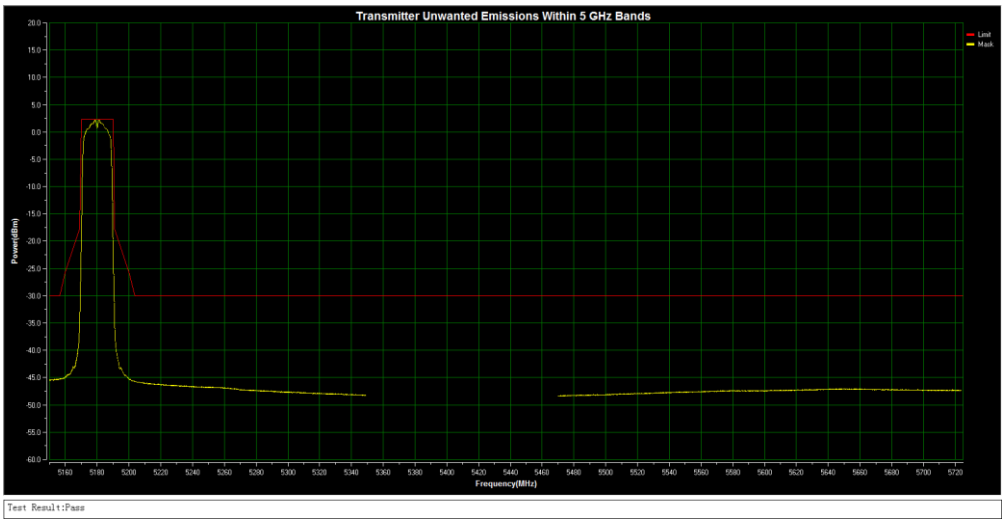
APPENDIX G - TRANSMITTER UNWANTED EMISSIONS WITHIN THE 5 GHZ RLAN BANDS

Test Mode :	IEEE 802.11a_5180MHz



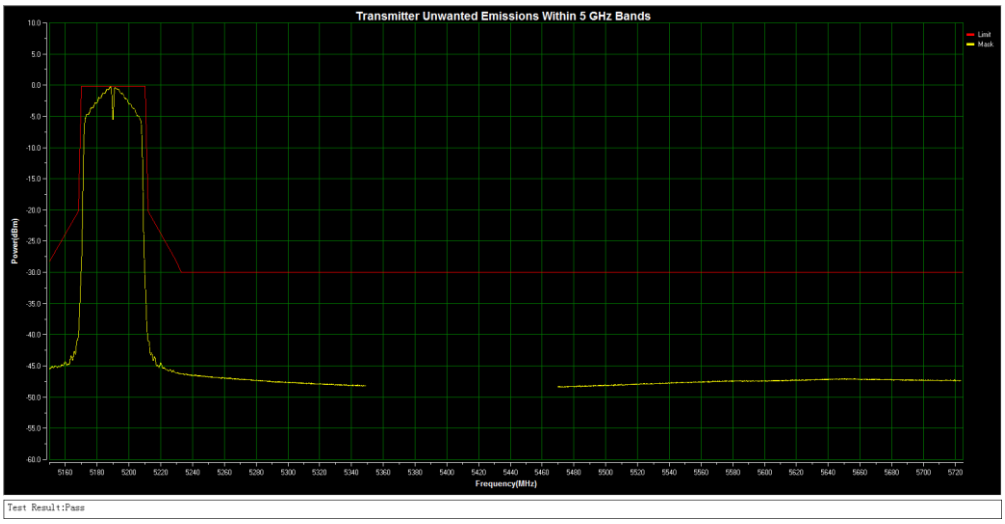
Note:
The MASK is only applicable within the 5150MHz to 5350MHz and 5470MHz to 5725MHz. 5350MHz to 5470MHz is applicable within the Radiation spurious,so the waveform is not displayed in the test data.

Test Mode :	IEEE 802.11ac(VHT20)_5180MHz



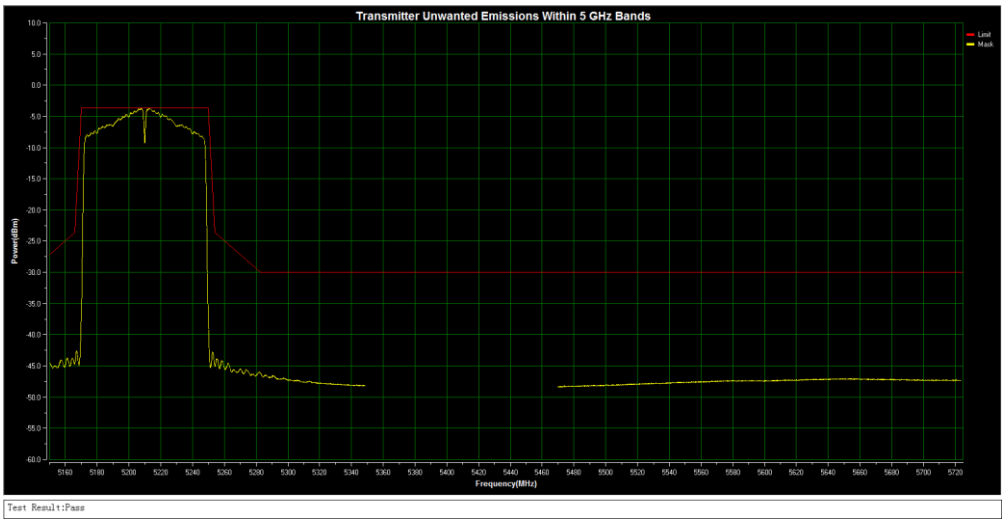
Note:
The MASK is only applicable within the 5150MHz to 5350MHz and 5470MHz to 5725MHz. 5350MHz to 5470MHz is applicable within the Radiation spurious,so the waveform is not displayed in the test data.

Test Mode :	IEEE 802.11ac(VHT40)_5190MHz



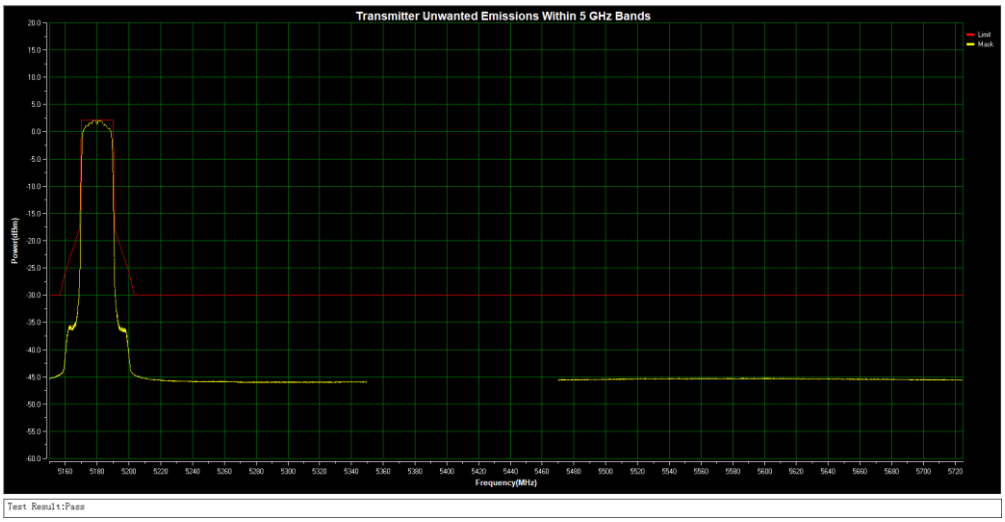
Note:
The MASK is only applicable within the 5150MHz to 5350MHz and 5470MHz to 5725MHz. 5350MHz to 5470MHz is applicable within the Radiation spurious,so the waveform is not displayed in the test data.

Test Mode :	IEEE 802.11ac(VHT80)_5210MHz



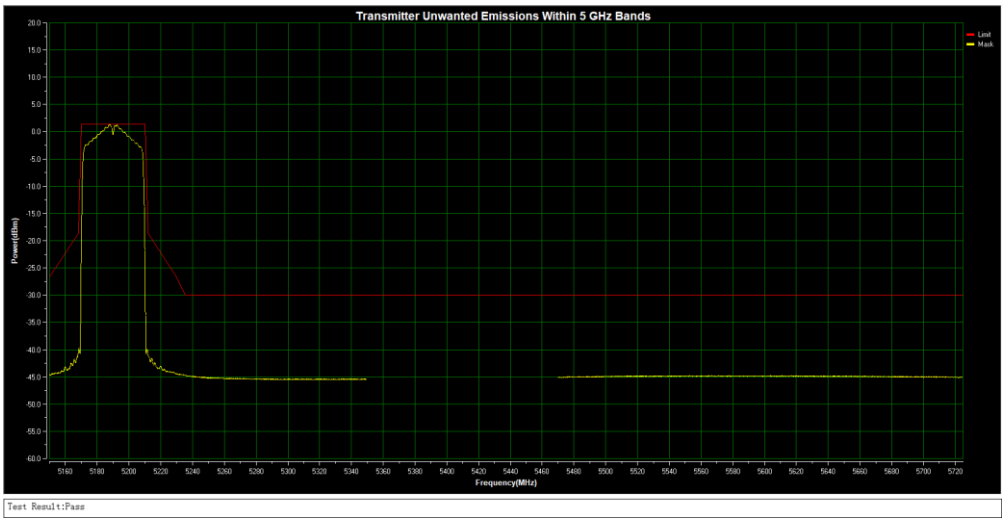
Note:
The MASK is only applicable within the 5150MHz to 5350MHz and 5470MHz to 5725MHz. 5350MHz to 5470MHz is applicable within the Radiation spurious,so the waveform is not displayed in the test data.

Test Mode :	IEEE 802.11ax(HE20)_5180MHz



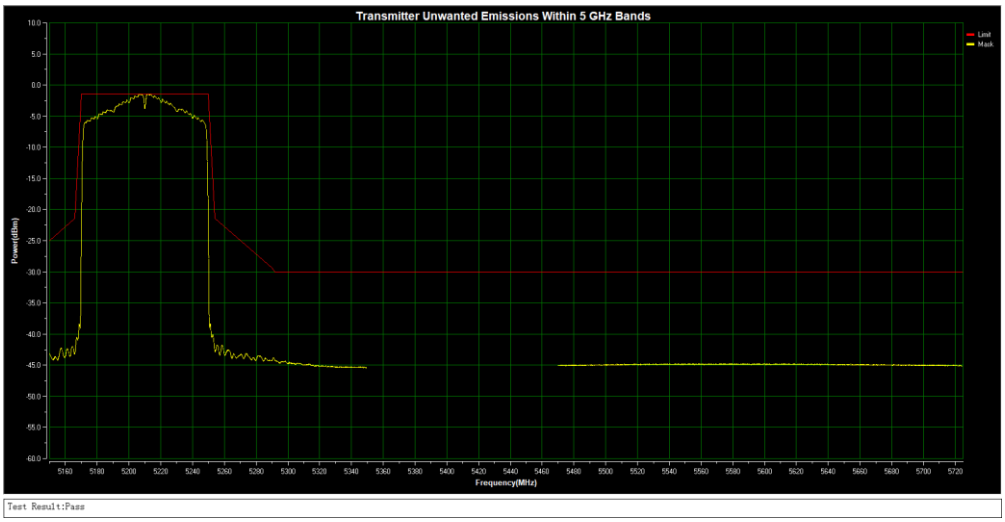
Note:
The MASK is only applicable within the 5150MHz to 5350MHz and 5470MHz to 5725MHz. 5350MHz to 5470MHz is applicable within the Radiation spurious,so the waveform is not displayed in the test data.

Test Mode :	IEEE 802.11ax(HE40)_5190MHz



Note:
The MASK is only applicable within the 5150MHz to 5350MHz and 5470MHz to 5725MHz. 5350MHz to 5470MHz is applicable within the Radiation spurious,so the waveform is not displayed in the test data.

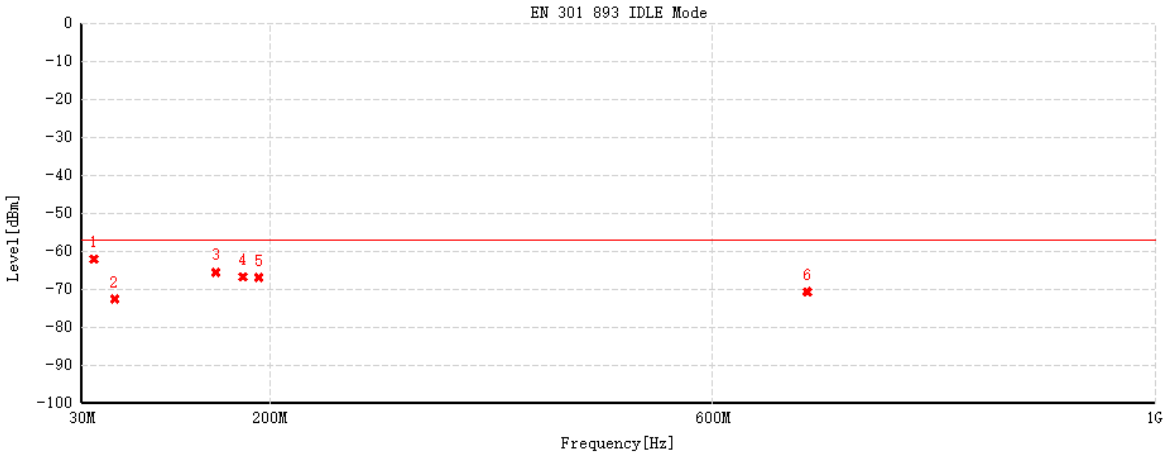
Test Mode :	IEEE 802.11ax(HE80)_5210MHz



Note:
The MASK is only applicable within the 5150MHz to 5350MHz and 5470MHz to 5725MHz. 5350MHz to 5470MHz is applicable within the Radiation spurious,so the waveform is not displayed in the test data.

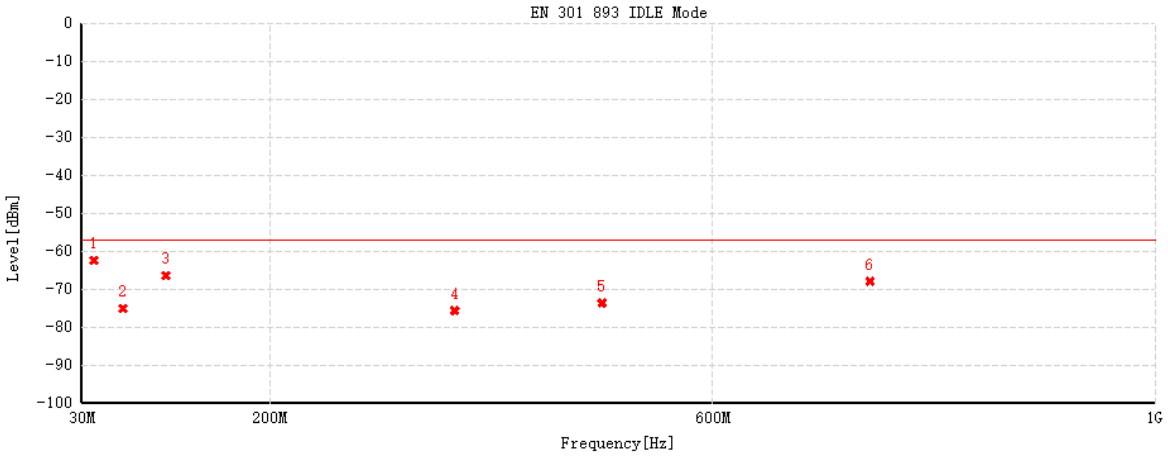
APPENDIX H - RECEIVER SPURIOUS EMISSIONS (30MHZ TO 1000MHZ)

Test Mode	RX Mode IEEE 802.11ac(VHT40)_5190MHz	Polarization	Vertical



NO.	Freq.[MHz]	Reading[dBm]	Factor[dB]	Level[dBm]	Limit[dBm]	Margin[dB]	Detector	Polarity
1	40.573	-62.86	0.83	-62.03	-57	5.03	RMS	Vertical
2	59.294	-72.7	0.2	-72.5	-57	15.5	RMS	Vertical
3	151.056	-58.68	-6.78	-65.46	-57	8.46	RMS	Vertical
4	175.403	-60.57	-6.16	-66.73	-57	9.73	RMS	Vertical
5	190.05	-61.62	-5.24	-66.86	-57	9.86	RMS	Vertical
6	685.526	-75.34	4.8	-70.54	-57	13.54	RMS	Vertical

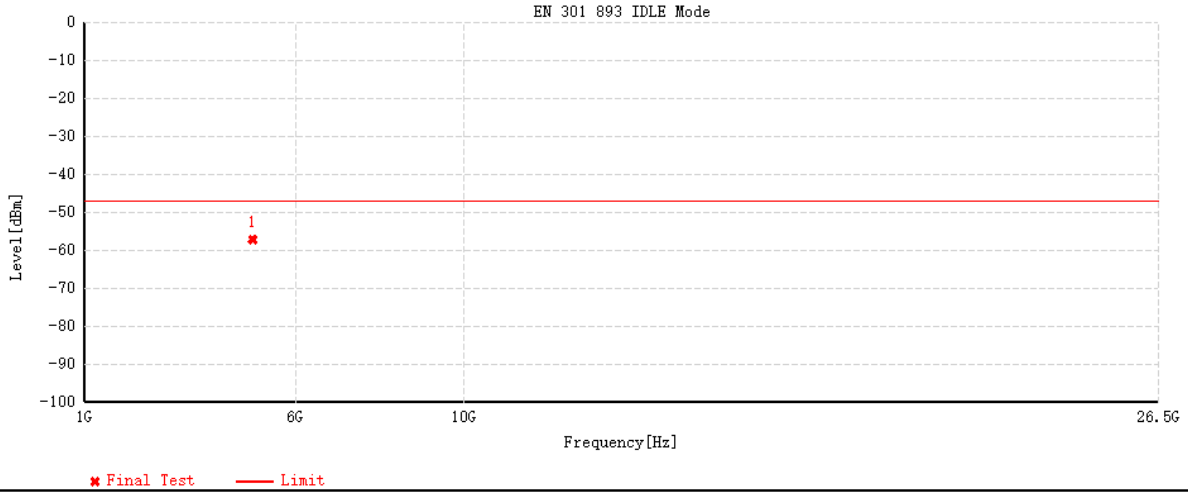
Test Mode	RX Mode IEEE 802.11ac(VHT40)_5190MHz	Polarization	Horizontal



NO.	Freq.[MHz]	Reading[dBm]	Factor[dB]	Level[dBm]	Limit[dBm]	Margin[dB]	Detector	Polarity
1	40.961	-62.49	0.18	-62.31	-57	5.31	RMS	Horizontal
2	67.054	-68.19	-6.77	-74.96	-57	17.96	RMS	Horizontal
3	106.145	-62.68	-3.6	-66.28	-57	9.28	RMS	Horizontal
4	367.075	-74.43	-1.11	-75.54	-57	18.54	RMS	Horizontal
5	500.062	-76.09	2.48	-73.61	-57	16.61	RMS	Horizontal
6	741.98	-75.15	7.24	-67.91	-57	10.91	RMS	Horizontal

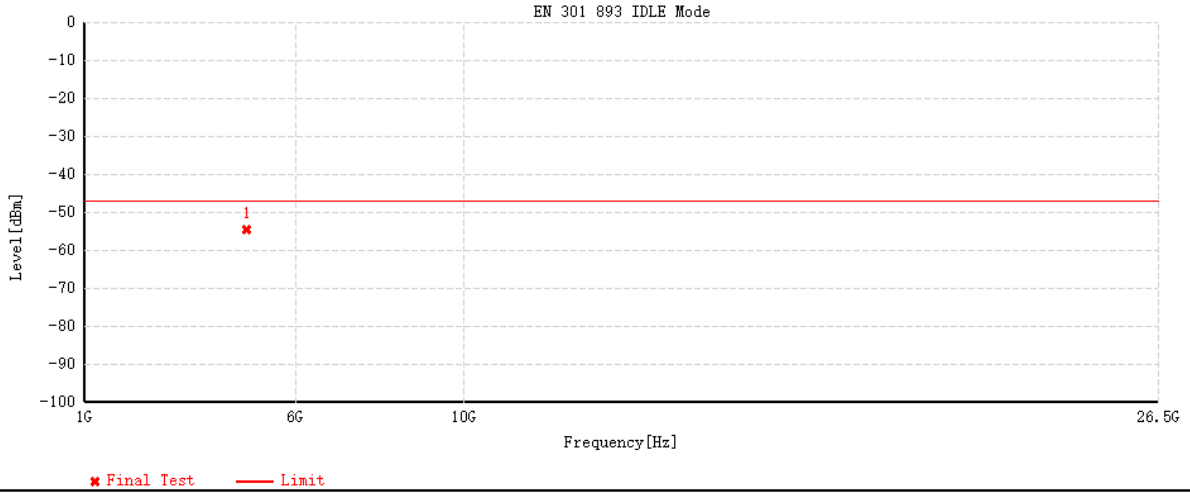
APPENDIX I - RECEIVER SPURIOUS EMISSIONS (ABOVE 1000MHZ)

Test Mode	RX Mode IEEE 802.11ac(VHT40)_5190MHz	Polarization	Vertical



NO.	Freq.[MHz]	Reading[dBm]	Factor[dB]	Level[dBm]	Limit[dBm]	Margin[dB]	Detector	Polarity
1	4987.35	-58.7	1.65	-57.05	-47	10.05	RMS	Vertical

Test Mode	RX Mode IEEE 802.11ac(VHT40)_5190MHz	Polarization	Horizontal



NO.	Freq.[MHz]	Reading[dBm]	Factor[dB]	Level[dBm]	Limit[dBm]	Margin[dB]	Detector	Polarity
1	4843.7	-55.72	1.2	-54.52	-47	7.52	RMS	Horizontal

APPENDIX J - ADAPTIVITY

EUT Operational Mode	Frame Based Equipment	
	Load Based Equipment (CCA using 'energy detect')	√
	Load Based Equipment (CCA not using any of the mechanisms referenced)	

Clause	Test Parameter	Remark	Pass/Fail
4.2.7.3.1	Adaptive (Frame Based Equipment)	Not Applicable	N/A
4.2.7.3.2	Adaptive (Load Based Equipment)	Applicable	Pass
4.2.7.3.3	Short Control Signalling Transmissions	Applicable	Pass

Test Mode:	TX Mode_ IEEE 802.11ac(VHT20)_5180MHz, IEEE 802.11ax(HE40)_5190MHz

Channel Occupancy Time and Priority Class Measured Results		
Freq.(MHz)	Channel Occupancy Time (ms)	Priority Class
5180	5.616	2
5190	5.654	2

Adaptivity Results				
Detection Threshold Level			-71.70 dBm/MHz	
Interference Signal	Freq.(MHz)		Short Control Signalling Transmissions (ms)	Number of Short Control Signalling Transmissions
AWGN	AC20	5180	1.5	3
OFDM		5180	1.5	3
LTE		5180	1.5	2
AWGN	AX40	5180	2.25	4
		5200	2	3
Limit			2.5	≤ 50
Result			Pass	

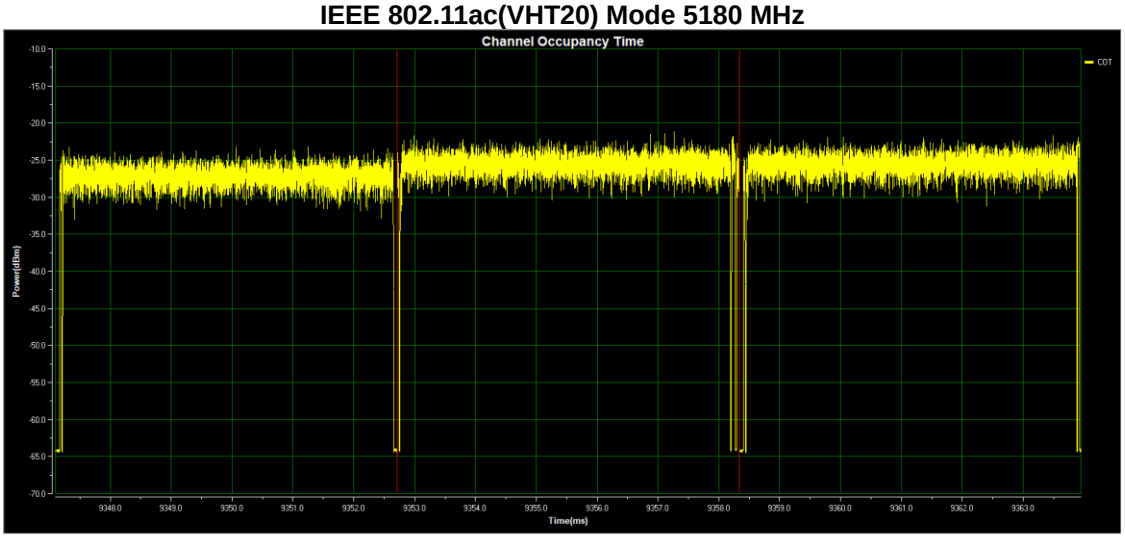
Note:
1. For an EUT with a non-zero dBi antenna gain, the final interference detection threshold level T_L at the port of the radio module in a conducted test setup shall be adjusted by the gain of the bypassed antenna and is calculated using below formulas:

   Threshold Level =-75 dBm/MHz +EUT Antenna Gain.

2. Short Control Signalling Transmissions = 50 (ms) * Duty cycle (%)

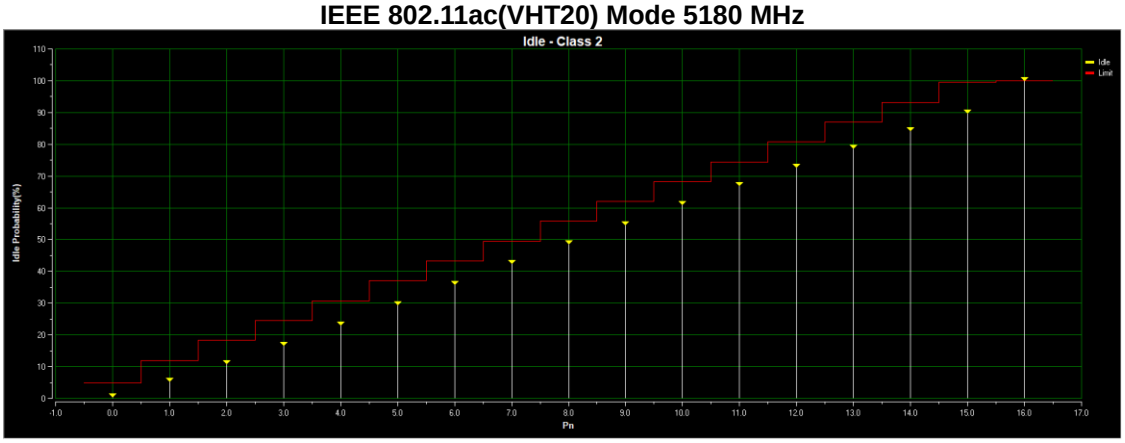
Single Channel device test results

IEEE 802.11ac(VHT20) Mode 5180 MHz



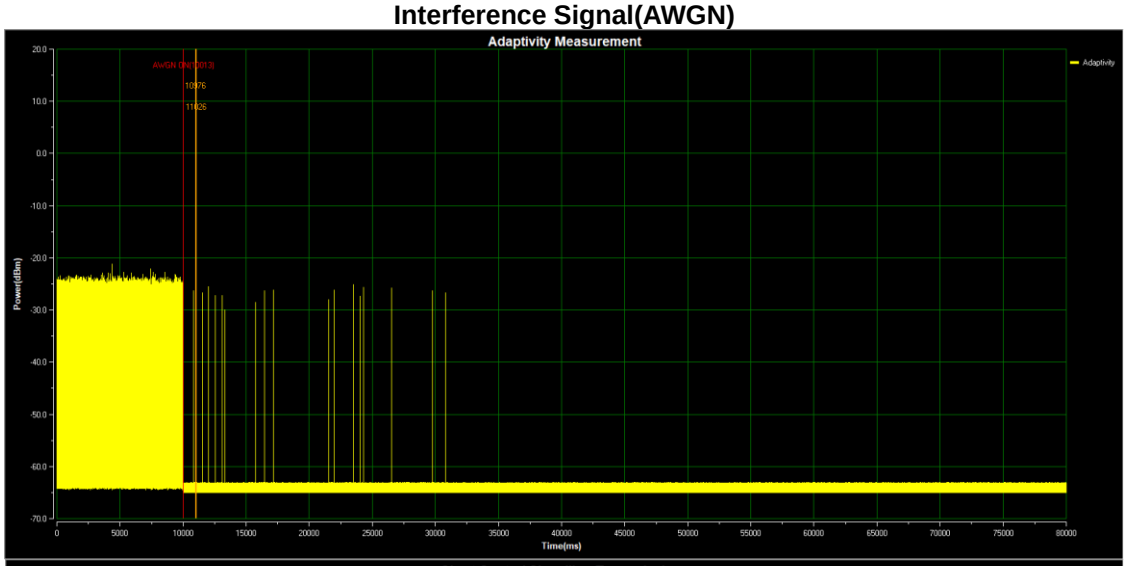
COT Number:10017	Idle Number:9795
Maximum COT(ms):5.616	Minimum Idle Time(us):28

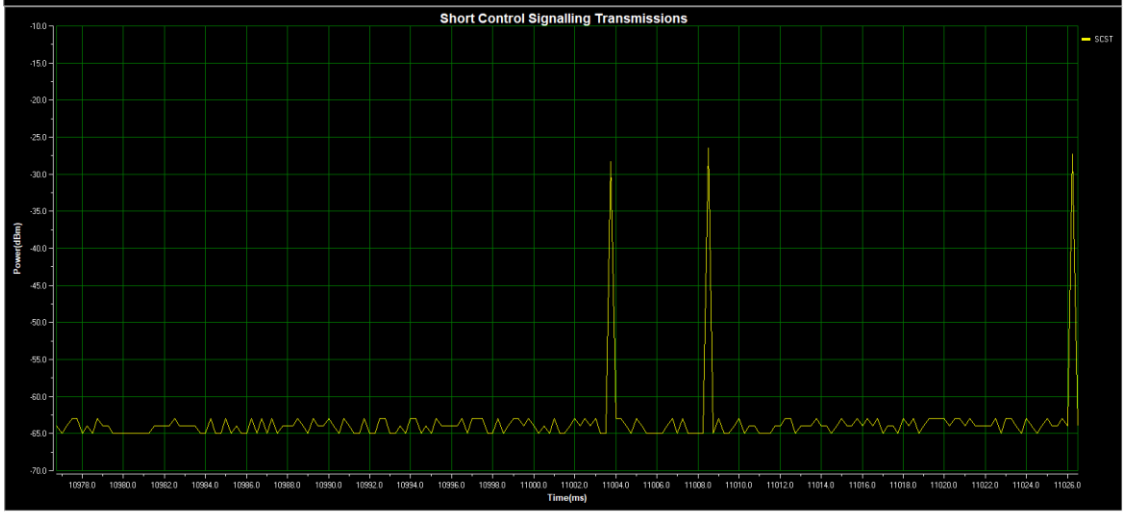
IEEE 802.11ac(VHT20) Mode 5180 MHz



Pn	Idle Num	Result(%)	Limit(%)	Status
0	48	0.49	5	Pass
1	472	5.309	12	Pass
2	541	10.832	18.25	Pass
3	578	16.733	24.5	Pass
4	623	23.093	30.75	Pass
5	615	29.372	37	Pass
6	640	35.906	43.25	Pass
7	634	42.379	49.5	Pass
8	601	48.515	55.75	Pass
9	595	54.589	62	Pass
10	628	61.001	68.25	Pass
11	582	66.942	74.5	Pass
12	558	72.639	80.75	Pass
13	581	78.571	87	Pass
14	547	84.155	93.25	Pass
15	545	89.719	99.5	Pass
16	1007	100	100	Pass

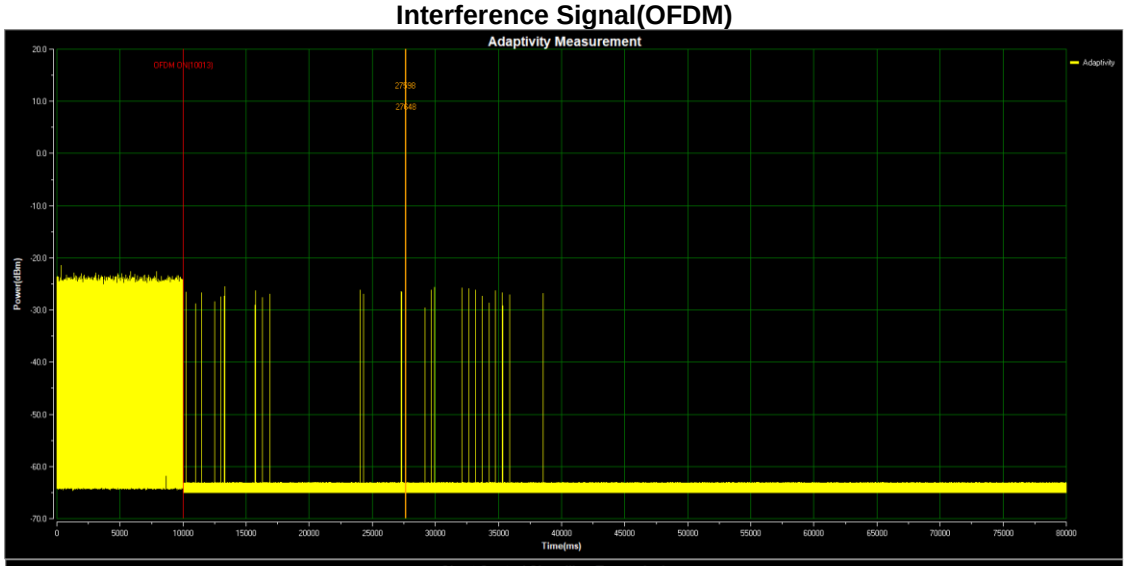
IEEE 802.11ac(VHT20) Mode 5180 MHz
Interference Signal(AWGN)

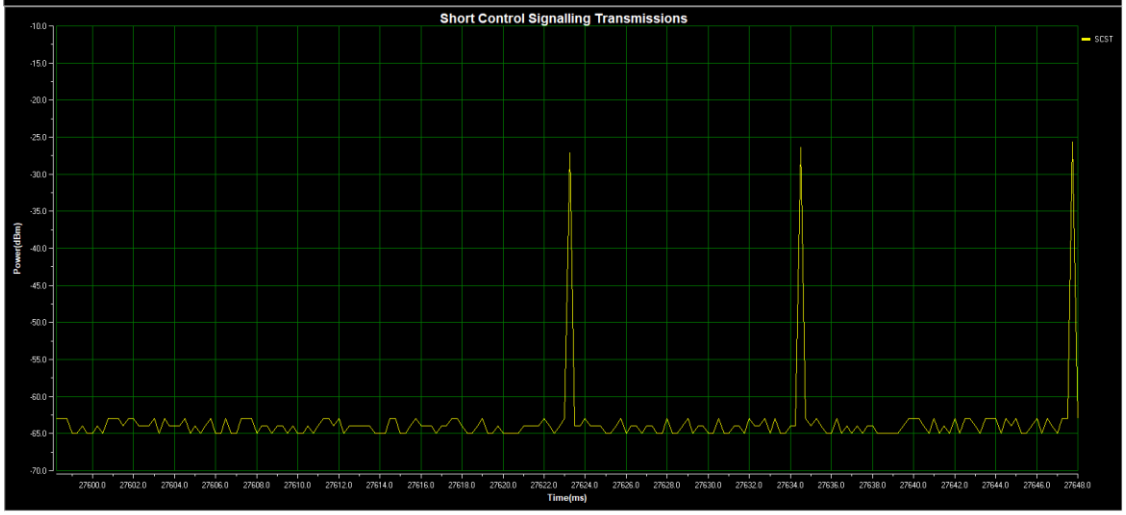




Duty Cycle(%):3.00 Short Control Signalling Transmissions Time(ms):1.50
Test Result:Pass

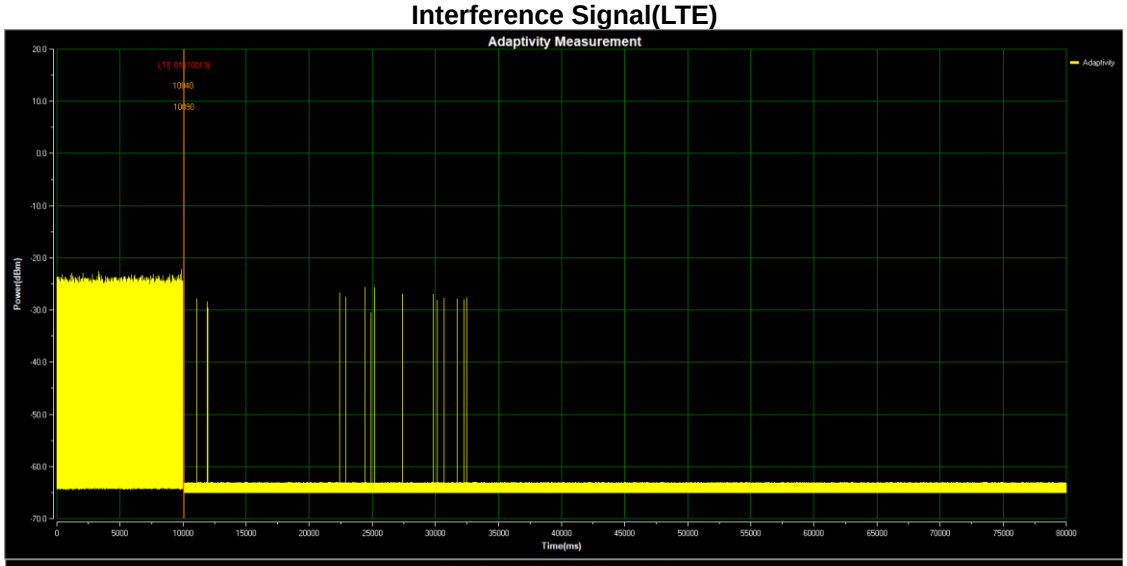
IEEE 802.11ac(VHT20) Mode 5180 MHz
Interference Signal(OFDM)

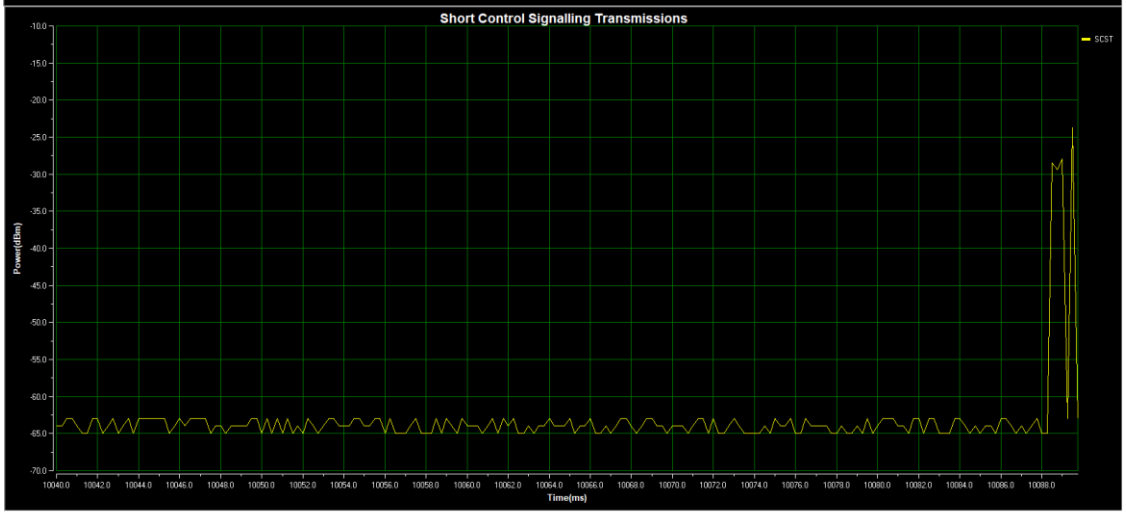




Duty Cycle(%):3.00 Short Control Signalling Transmissions Time(ms):1.50
Test Result:Pass

IEEE 802.11ac(VHT20) Mode 5180 MHz
Interference Signal(LTE)



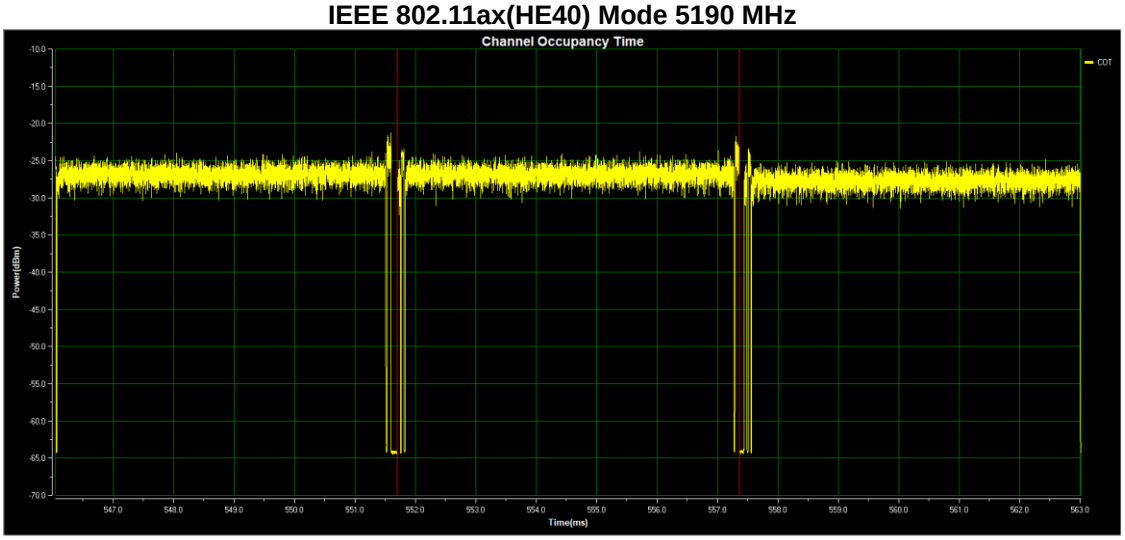


Duty Cycle(%):3.00 Short Control Signalling Transmissions Time(ms):1.50
Test Result:Pass

Multi-Channel device test results

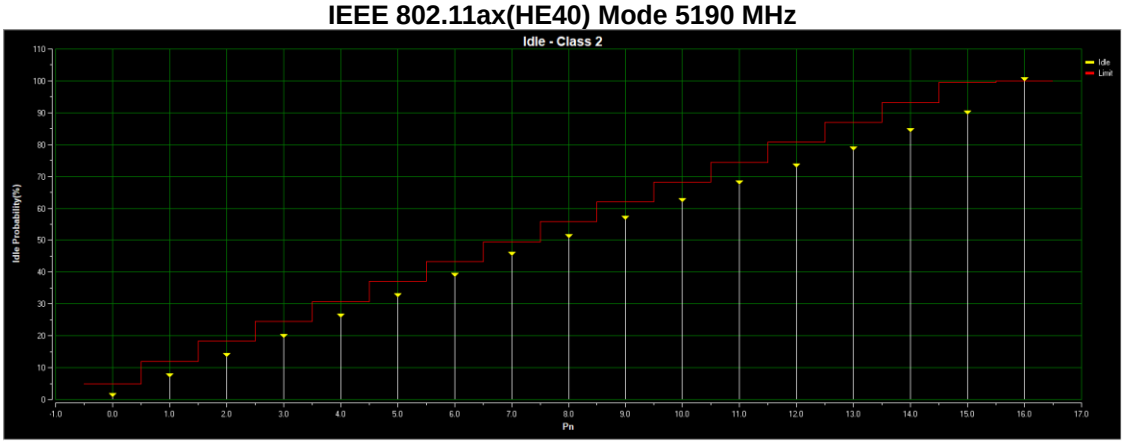
Option 2:
The EUT is set to a channel bandwidth of 40MHz with the primary operating channel 5180MHz. One additional adjacent 20MHz operating channel that constructs the full 40 MHz channel bandwidth is located at 5200 MHz. Data traffic is started and then an interfering signal is injected into the EUT at 5200 MHz.

IEEE 802.11ax(HE40) Mode 5190 MHz



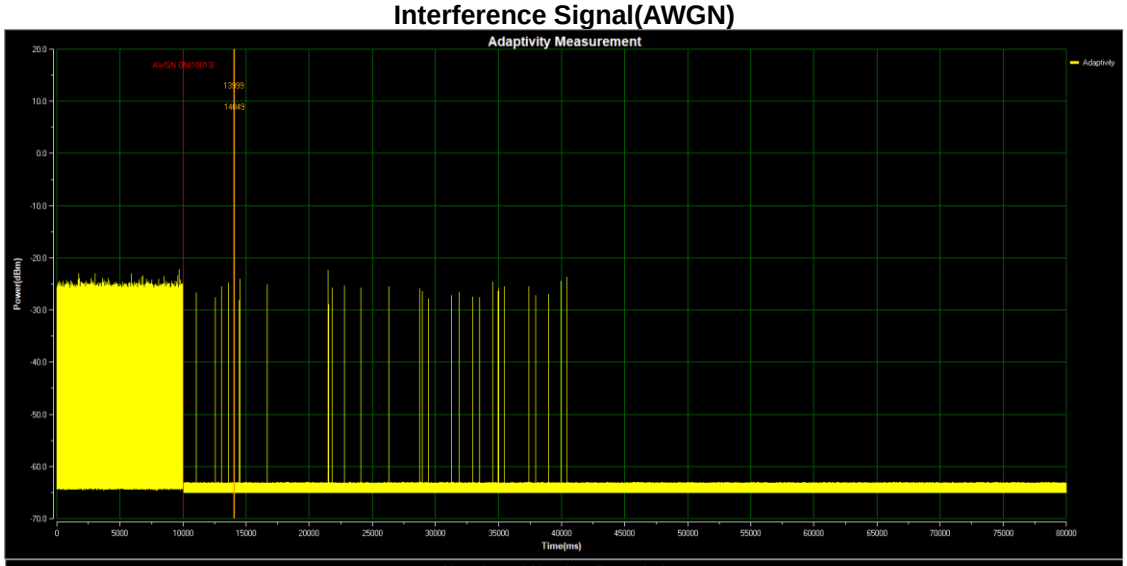
COT Number:10045	Idle Number:9866
Maximum COT(ms):5.654	Minimum Idle Time(us):30

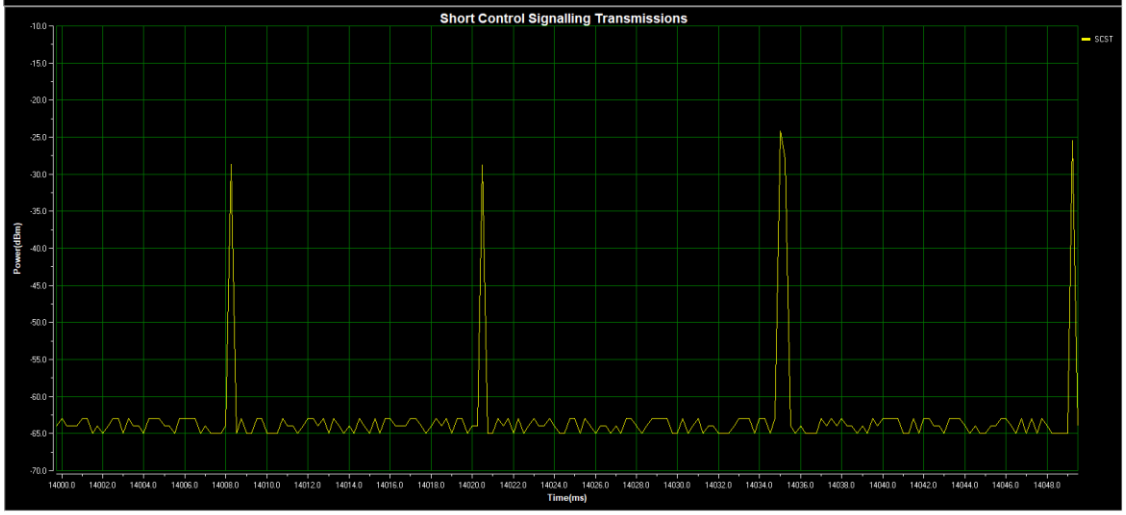
IEEE 802.11ax(HE40) Mode 5190 MHz



Pn	Idle Num	Result(%)	Limit(%)	Status
0	81	0.821	5	Pass
1	613	7.034	12	Pass
2	635	13.471	18.25	Pass
3	583	19.38	24.5	Pass
4	631	25.775	30.75	Pass
5	636	32.222	37	Pass
6	638	38.688	43.25	Pass
7	637	45.145	49.5	Pass
8	562	50.841	55.75	Pass
9	560	56.517	62	Pass
10	548	62.072	68.25	Pass
11	539	67.535	74.5	Pass
12	528	72.887	80.75	Pass
13	533	78.289	87	Pass
14	569	84.056	93.25	Pass
15	537	89.499	99.5	Pass
16	1036	100	100	Pass

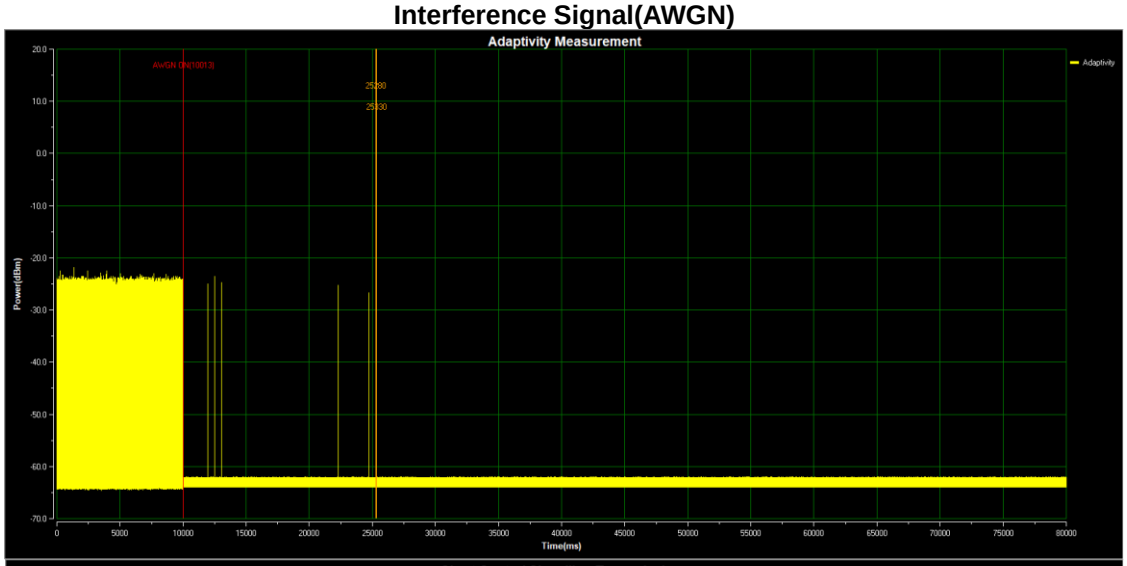
IEEE 802.11ax(HE40) Mode 5180 MHz
Interference Signal(AWGN)

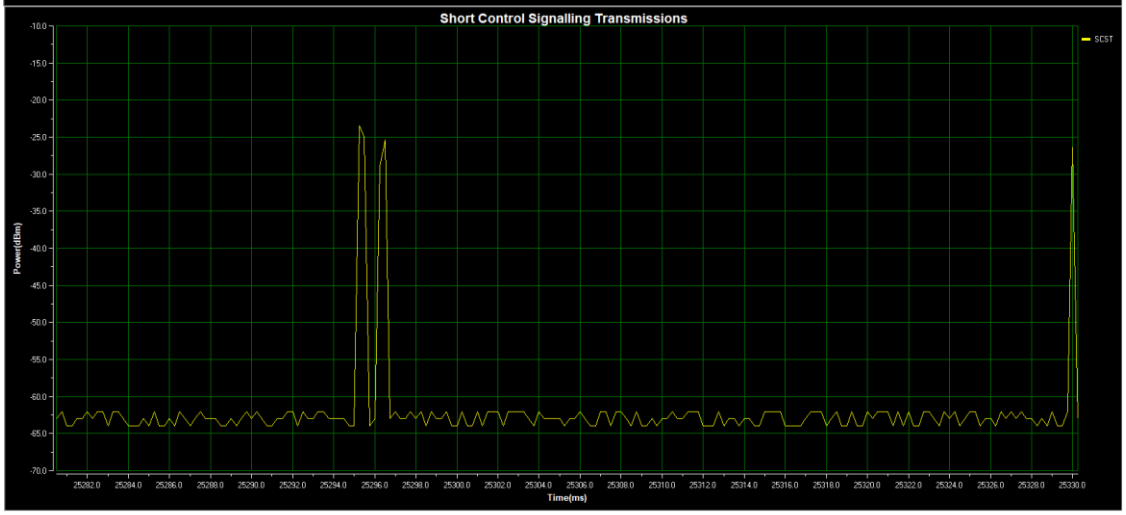




Duty Cycle(%):4.50 Short Control Signalling Transmissions Time(ms):2.25
Test Result:Pass

IEEE 802.11ax(HE40) Mode 5200 MHz
Interference Signal(AWGN)





Duty Cycle(%):4.00 Short Control Signalling Transmissions Time(ms):2.00
Test Result:Pass

APPENDIX K - RECEIVER BLOCKING

Receiver Blocking Result						
P_{min}(dBm)	-93					
Modulation Mode	Operation Freq. (MHz)	Wanted Signal Mean Power from Companion Device (dBm) P_{min} + 6 dB	Blocking Signal Freq. (MHz)	Receiver Blocking Power (dBm)	PER (%)	Blocking Signal Level at which the Performance Criteria is no longer met(dBm) **(See Note)**
IEEE 802.11a 6 Mbps	5180	-87	5100	-53	0.20	-20
			4900	-47	0.00	-15
			5000	-47	1.00	-21
			5975	-47	0.40	-32
Limit	PER(Packet Error Rate) ≦ 10%					N/A
Result	Pass					Record Only

Note:
The performance criteria had been met, the level of the blocking signal at the UUT were further increased in steps of 1 dB until the level whereby the performance criteria were no longer met.

APPENDIX L - INFORMATION AS REQUIRED BY EN 301 893 V2.1.1, CLAUSE 5.4.1

In accordance with ETSI EN 301 893, clause 5.4.1, the following information is provided by the manufacturer.

a) The Nominal Channel Bandwidth(s):

Nominal Channel Bandwidth 1: 20 MHz

Nominal Channel Bandwidth 2: 40 MHz

Nominal Channel Bandwidth 3: 80 MHz

The associated centre frequencies: in clause 1.4 of the test report.

b) For Load Based Equipment that supports multi-channel operation:

☐ The LBE equipment supports Option 1 as described in clause 4.2.7.3.2.3

☒ The LBE equipment supports Option 2 as described in clause 4.2.7.3.2.3

• The (maximum) number of channels used for multi-channel operation: 4

• These channels are adjacent channels: ☒ Yes ☐ No

• In case of non-adjacent channels, whether or not these channels are in different sub-bands:

☐ Yes ☐ No

• for LBE equipment implementing option 1 (see clause 4.2.7.3.2.3), the number of channels used for multi-channel operation when performing the test described in clause 5.4.9.3.2.3.1: N/A

In case of multi-channel operation, further information defining the channels used for these simultaneous transmissions may be required.

c) The different transmit operating modes (see clause 5.3.3.2) (tick all that apply):

☐ **Operating mode 1:** Single Antenna Equipment

- ☐ a) Equipment with only 1 antenna
- ☐ b) Equipment with diversity antennas but only 1 antenna active at any moment in time
- ☐ c) Smart Antenna Systems with 2 or more antennas, but operating in a (legacy) mode where only 1 antenna is used.

☐ **Operating mode 2:** Smart Antenna Systems - Multiple Antennas without beamforming

- ☐ a) Single spatial stream/Standard throughput
- ☐ b) High Throughput (> 1 spatial stream) using Nominal Channel Bandwidth 1
- ☐ c) High Throughput (> 1 spatial stream) using Nominal Channel Bandwidth 2
- ☐ d) High Throughput (> 1 spatial stream) using Nominal Channel Bandwidth 3
- ☐ e) High Throughput (> 1 spatial stream) using Nominal Channel Bandwidth 4

☒ **Operating mode 3:** Smart Antenna Systems - Multiple Antennas with beamforming

- ☒ a) Single spatial stream/Standard throughput
- ☒ b) High Throughput (> 1 spatial stream) using Nominal Channel Bandwidth 1
- ☒ c) High Throughput (> 1 spatial stream) using Nominal Channel Bandwidth 2
- ☒ d) High Throughput (> 1 spatial stream) using Nominal Channel Bandwidth 3
- ☐ e) High Throughput (> 1 spatial stream) using Nominal Channel Bandwidth 4

d) In case of Smart Antenna Systems or multiple antenna systems:

- The number of Receive chains: 2
- The number of Transmit chains: 2
- Equal power distribution among the transmit chains: ☒ Yes ☐ No
- In case of beamforming, the maximum (additional) beamforming gain: 3 dB

NOTE: Beamforming gain does not include the basic gain of a single antenna (assembly).

e) TPC feature available: ☐ Yes ☒ No

h) The DFS related operating mode(s) of the equipment:

☒Master

☐Slave with radar detection

☐Slave without radar detection

i) User access restrictions (please check box below to confirm):

☒the equipment is constructed to comply with the requirements contained in clause 4.2.9 in ETSI EN 301 893 V2.1.1.

j) For equipment with Off-Channel CAC functionality:

The equipment has an *"Off-Channel CAC"* function: ☐Yes ☒No

If yes, specify the *"Off-Channel CAC Time"*

- For channels outside the 5 600 MHz to 5 650 MHz range: ____hours
- If applicable, for channels (partially) within the 5 600 MHz to 5 650 MHz range: ____ hours

k) The equipment can operate in ad-hoc mode:

☒ no ad-hoc operation

☐ ad-hoc operation in the frequency range 5 150 MHz to 5 250 MHz without DFS

☐ ad-hoc operation with DFS

l) Operating Frequency Range(s):

Range 1: ☐5 150 MHz to 5 350 MHz and 5 470 MHz to 5 725 MHz

Range 2: ☐5 470 MHz to 5 725 MHz

Range 3: ☐5 150 MHz to 5 250 MHz (ad-hoc without DFS)

Range 4: ☒other, please specify: 5 150 MHz to 5 250 MHz

If the equipment has more than one Operating Frequency Range, tick all that apply.

m) The extreme operating temperature and supply voltage range that apply to the equipment:

☐-20 °C to +55 °C (Outdoor & Indoor usage)

☐0 °C to +35 °C (Indoor usage only)

☒Other: 0℃ to 40℃.

The supply voltages of the stand-alone radio equipment or the supply voltages of the combined (host) equipment or test jig in case of plug-in devices:

Details provided are for the:

☒stand-alone equipment

☐combined (or host) equipment

☐test jig

Supply Voltage ☒AC mains State AC voltage: Minimum: 100V Nominal: 230V Maximum: 240V

☐DC State DC voltage: Minimum: … Nominal: ... Maximum: ...

In case of DC, indicate the type of power source:

☐Internal Power Supply

☐External Power Supply or AC/DC adapter

☐Battery ☐Nickel Cadmium

☐Alkaline

☐Nickel-Metal Hydride

☐Lithium-Ion

☐Lead acid (Vehicle regulated)

☐Other

☐Other_____

n) The test sequence/test software used (see also ETSI EN 301 893 (V2.1.1), clause 5.3.1.2):

QATool_Dbg 0.0.2.33

o) Type of Equipment:

☒Stand-alone

☐Combined Equipment (Equipment where the radio part is fully integrated within another type of equipment)

☐Plug-in radio device (Equipment intended for a variety of host systems)

☐Other____

p) Adaptivity (Channel Access Mechanism):

☐Frame Based Equipment

☒Load Based Equipment

r) With regards to Adaptivity for Load Based Equipment:

☒ The Load Based Equipment operates as a Supervising Device

☐ The Load Based Equipment operates as a Supervised Device

☐ The Load Based Equipment can operate as a Supervising and as a Supervised Device

☐ The Load Based Equipment makes use of note 1 in table 7 or note 1 in table 8 of ETSI EN 301 893 V2.1.1

The Priority Classes implemented by the Load Based Equipment

- When operating as a Supervising Device

☐ Priority Class 4 (Highest priority)

☐ Priority Class 3

☒ Priority Class 2

☐ Priority Class 1 (Lowest priority)

- When operating as a Supervised Device

☐ Priority Class 4 (Highest priority)

☐ Priority Class 3

☐ Priority Class 2

☐ Priority Class 1 (Lowest priority)

☒ The Load Based Equipment operates as an Initiating Device

☐ The Load Based Equipment operates as an Responding Device

☐ The Load Based Equipment can operate as an Initiating Device and as a Responding Device

With regard to Energy Detection Threshold, the Load Based Equipment has implemented either option 1 of clause 4.2.7.3.2.5 of ETSI EN 301 893 V2.1.1 or option 2 of clause 4.2.7.3.2.5 of ETSI EN 301 893 V2.1.1:

☒ Option 1

☐ Option 2

Specify which protocol has been implemented:

☒ IEEE 802.11™

☐ Other:____

s) The equipment supports a geo-location capability as defined in clause 4.2.10 of ETSI EN 301 893 V2.1.1:

☐ Yes

☒ No

End of Test Report