

TEST REPORT

ETSI EN 301 893 V2.1.1 (2017-05)

Report Reference No. : **GTS20191209006-2-31**

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Date of issue : Dec.23, 2019

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Applicant's name..... : **Shenzhen Bilian Electronic Co.,Ltd.**

Address : Building B1, Zhongxing Industrial Zone, Juling, Jutang Community, Guanlan street, LongHua district, Shenzhen, China

Test specification :

Standard : **ETSI EN 301 893 V2.1.1 (2017-05)**

TRF Originator..... : Shenzhen Global Test Service Co.,Ltd.

Master TRF : Dated 2014-12

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Test item description : **IEEE 802.11a/b/g/n/ac(1T1R)USB WIFI+BT Combo Module**

Trade Mark : N/A

Manufacturer : Shenzhen Bilian Electronic Co.,Ltd.

Model/Type reference : BL-M8821CU1

List Model : N/A

Operation Frequency : From 5180MHz-5240MHz

Hardware version : 1.1

Software version..... : V1.1

Ratings : DC 3.3V

Result : **PASS**

TEST REPORT

Test Report No. : GTS20191209006-2-31	Dec.23, 2019 Date of issue
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Equipment under Test : IEEE 802.11a/b/g/n/ac(1T1R)USB WIFI+BT Combo Module

Model /Type : BL-M8821CU1

Listed Models : N/A

Applicant : **Shenzhen Bilian Electronic Co.,Ltd.**

Address : Building B1, Zhongxing Industrial Zone, Juling, Jutang Community,
Guanlan street, LongHua district, Shenzhen, China

Manufacturer : **Shenzhen Bilian Electronic Co.,Ltd.**

Address : Building B1, Zhongxing Industrial Zone, Juling, Jutang Community,
Guanlan street, LongHua district, Shenzhen, China

Test Result:	PASS
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The test report merely corresponds to the test sample.

It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

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1. TEST STANDARDS

The tests were performed according to following standards:

[ETSI EN 301 893 V2.1.1 \(2017-05\)](#)–5 GHz RLAN; Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU

2. SUMMARY

2.1. General Remarks

Date of receipt of test sample	:	Dec.13, 2019
Testing commenced on	:	Dec.13, 2019
Testing concluded on	:	Dec.23, 2019

2.2. Product Description

Product Name:	IEEE 802.11a/b/g/n/ac(1T1R)USB WIFI+BT Combo Module
Trade Mark:	N/A
Model/Type reference:	BL-M8821CU1
List Model:	N/A
Model Declaration	N/A
Power supply:	DC 3.3V
Hardware Version	1.1
Software Version	V1.1
Bluetooth	
Frequency Range	2402MHz ~ 2480MHz
Channel Number	79 channels for Bluetooth (DSS) 40 channels for Bluetooth (DTS)
Channel Spacing	1MHz for Bluetooth (DSS) 2MHz for Bluetooth (DTS)
Modulation Type	GFSK, $\pi/4$ -DQPSK, 8DPSK for Bluetooth (DSS) GFSK for Bluetooth (DTS)
2.4GWLAN	
WLAN CE Operation frequency	IEEE 802.11b:2412-2472MHz IEEE 802.11g:2412-2472MHz IEEE 802.11n HT20:2412-2472MHz IEEE 802.11n HT40:2422-2462MHz
WLAN CE Modulation Type	IEEE 802.11b: DSSS(CCK,DQPSK,DBPSK) IEEE 802.11g: OFDM(64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n HT20: OFDM (64QAM, 16QAM, QPSK,BPSK) IEEE 802.11n HT40: OFDM (64QAM, 16QAM, QPSK,BPSK)
Channel number:	13 Channel for IEEE 802.11b/g/n(HT20) 9 Channel for IEEE 802.11n(HT40)
Channel separation:	5MHz
WIFI(5G Band)	
WLAN CE Operation frequency	5180-5240MHz
WLAN CE Modulation Type	802.11a/n/ac: OFDM
Channel number:	4 Channels for 20MHz bandwidth(5180-5240MHz) 2 channels for 40MHz bandwidth(5190~5230MHz) 1 channels for 80MHz bandwidth(5210MHz)
SRD(5.8G Band)	
WLAN CE Operation frequency	5745-5825MHz
WLAN CE Modulation Type	802.11a/n/ac: OFDM
Channel Number	5 channels for 20MHz bandwidth(5745-5825MHz) 2 channels for 40MHz bandwidth(5755~5795MHz) 1 channels for 80MHz bandwidth(5775MHz)
Antenna Description	External Antenna, used for Bluetooth & WIFI TX/RX, 2.0dBi(Max.) for 2.4G Band and 2.0dBi(Max.) for 5G Band

2.3. Equipment Under Test

Power supply system utilised

Power supply voltage	:	☐	230V / 50 Hz	☐	120V / 60Hz
		☐	12 V DC	☐	24 V DC
		☒	Other (specified in blank below)		

DC 3.3 V

Channel list:

Channel	Frequency (MHz)
36	5180
38	5190
40	5200
42	5210
44	5220
46	5230
48	5240

2.4. EUT configuration

The following peripheral devices and interface cables were connected during the measurement:

● - supplied by the manufacturer

○ - supplied by the lab

☐	PC	M/N:	Satellite S40Dt-A
		Manufacturer:	TOSHIBA

2.5. Test summary

Test Item	Test Requirement ESTI EN301983	Verdict
Centre frequencies	Section 8.7.1	Pass
Nominal Channel Bandwidth and Occupied Channel Bandwidth	Section 8.7.2	Pass
RF output power, Transmit Power Control (TPC) and power density	Section 8.7.3	Pass
Transmitter unwanted emissions	Section 8.7.4	Pass
Receiver spurious emissions	Section 8.7.5	Pass
Dynamic Frequency Selection (DFS)	Section 8.7.6	N/A
Adaptivity (Channel Access Mechanism) 4.8.1 Applicability	Section 8.7.7	Pass
Receiver Blocking	Section 8.7.8	Pass
User Access Restrictions	Section 8.7.9	Pass
Geo-location capability	Section 8.7.10	N/A
Note:N./A Stands for “Not applicable”		

2.6. Modifications

No modifications were implemented to meet testing criteria.

3. TEST ENVIRONMENT

3.1. Address of the test laboratory

Shenzhen Global Test Service Co.,Ltd.

No.7-101 and 8A-104, Building 7 and 8, DCC Cultural and Creative Garden, No.98, Pingxin North Road, Shangmugu Community, Pinghu Street, Longgang District, Shenzhen, Guangdong

3.2. Test Facility

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

CNAS (No. CNAS L8169)

Shenzhen Global Test Service Co., Ltd. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC 17025: 2019 General Requirements) for the Competence of Testing and Calibration Laboratories.

A2LA (Certificate No. 4758.01)

Shenzhen Global Test Service Co., Ltd. has been assessed by the American Association for Laboratory Accreditation (A2LA). Certificate No. 4758.01.

3.3. Environmental conditions

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

Normal Temperature: 25 °C

High Temperature: 50 °C

Low Temperature: -10 °C

Normal Voltage : DC 3.3V

High Voltage:DC 3.6V

Low Voltage:DC 3.0V

Relative Humidity: 55 %

Air Pressure: 989 hPa

3.4. Test Channels:

Test	Clause	Test channels		
		Lower sub-band (5 150 MHz to 5 350 MHz)		Higher sub-band 5 725 MHz to 5 850 MHz
		5 150 MHz to 5 250 MHz	5 250 MHz to 5 350 MHz	
Centre frequencies	5.3.2	C7 (see note 1)		C8 (see note 1)
Occupied Channel Bandwidth	5.3.3	C7		C8
Power, power density	5.3.4	C1	C2	C3, C4
Transmitter unwanted emissions outside the 5 GHz RLAN bands	5.3.5	C7 (see note 1)		C8 (see note 1)
Transmitter unwanted emissions within the 5 GHz RLAN bands	5.3.6	C1	C2	C3, C4
Receiver spurious emissions	5.3.7	C7 (see note 1)		C8 (see note 1)
Transmit Power Control (TPC)	5.3.4	n.a. (see note 2)	C2 (see note 1)	C3, C4 (see note 1)
Dynamic Frequency Selection (DFS)	5.3.8	n.a. (see note 2)	C5	C6 (see note 3)
Adaptivity	5.3.9	C7		C8
C1, C3:	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, C4:	The highest 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.			
C5, C6:	One channel out of the declared channels for this frequency range. If more than one nominal channel bandwidth has been declared for this sub-band, testing shall be performed using the lowest and highest nominal channel bandwidth.			
C7, C8:	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. For Adaptivity, testing shall be performed using the highest nominal channel bandwidth.			
NOTE 1:	In case of more than one channel plan has been declared, testing of these specific requirements need only be performed using one of the declared channel plans.			
NOTE 2:	Testing is not required for nominal channel bandwidths that fall completely within the frequency range 5 150 MHz to 5 250 MHz.			
NOTE 3:	Where the declared channel plan includes channels whose nominal channel bandwidth falls completely or partly within the 5 600 MHz to 5 650 MHz band, the tests for the <i>Channel Availability Check</i> (and where implemented, for the <i>Off-Channel CAC</i>) shall be performed on one of these channels in addition to a channel within the band 5 470 MHz to 5 600 MHz or within the band 5 650 MHz to 5 725 MHz.			

3.5. Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to TR-100028-01 "Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics;Part 1" and TR-100028-02 "Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics;Part 2 " and is documented in the Shenzhen Global Test Service Co.,Ltd quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for Shenzhen GTS laboratory is reported:

Test Items	Measurement Uncertainty	Notes
Frequency error	25 Hz	(1)
Transmitter power conducted	0.57 dB	(1)
Transmitter power Radiated	2.20 dB	(1)
Conducted spurious emission	1.60 dB	(1)
Radiated spurious emission	2.20 dB	(1)

- (1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

3.6. Equipments Used during the Test

RF output power&PSD&OOB&OBW &Hopping &Duty Cycle, Tx-sequence, Tx-gap&Adaptively&ReceiverBlocking						
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Due Date
1	Spectrum Analyzer	Agilent	N9020A	MY48010425	2019/09/20	2020/09/19
2	Vector Signal generator	Agilent	N5181A	MY49060502	2019/09/20	2020/09/19
3	Signal generator	Agilent	E4421B	3610AO1069	2019/09/20	2020/09/19
4	4 Ch. Simultaneous Sampling 14 Bits 2 MS/s	Agilent	U2531A	TW53323507	2019/09/20	2020/09/19
5	X-series USB Peak and Average Power Sensor	Agilent	U2021XA	MY5365004	2019/09/20	2020/09/19
6	Climate Chamber	ESPEC	EL-10KA	A20120523	2019/09/20	2020/09/19
7	Universal Radio Communication	Rohde&Schwarz	CMU200	114353	2019/09/20	2020/09/19
8	Wireless Communication Tester	Rohde&Schwarz	CMW500	125408	2019/09/20	2020/09/19
9	Test Control Unit	Tonscend	JS0806-1	178060067	2019/06/20	2020/06/19
10	Automated filter bank	Tonscend	JS0806-F	19F8060177	2019/06/20	2020/06/19
11	EMI Test software	Tonscend	JS1120-1	Ver 2.6.8.0518	/	/
12	EMI Test software	Tonscend	JS1120-3	Ver 2.5.77.0418	/	/

Transmitter spurious emissions & Receiver spurious emissions						
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Due Date
1	EMI Test Receiver	ROHDE & SCHWARZ	ESCI 7	101102	2019/09/20	2020/09/19
2	Spectrum Analyzer	Agilent	N9020A	MY48010425	2019/09/20	2020/09/19
3	Spectrum Analyzer	R&S	FSV40	100019	2019/09/20	2020/09/19
4	By-log Antenna	SCHWARZBECK	VULB9163	000976	2019/05/26	2020/05/25
5	Double Ridged Horn Antenna (1~18GHz)	SCHWARZBECK	BBHA 9120D	01622	2019/09/23	2020/09/22
6	Horn Antenna (18GHz~40GHz)	Schwarzbeck	BBHA9170	791	2019/09/20	2020/09/19
7	Amplifier (30MHz~1GHz)	Schwarzbeck	BBV 9743	#202	2019/09/20	2020/09/19
8	Amplifier (1GHz~18GHz)	Taiwan Chengyi	EMC05184 5B	980355	2019/09/20	2020/09/19

9	Amplifier (26.5GHz~40GHz)	Schwarzbeck	BBV9179	9719-025	2019/09/20	2020/09/19
10	High-Pass Filter	K&L	9SH10-2700/X1275 0-O/O	KL142031	2019/09/20	2020/09/19
11	High-Pass Filter	K&L	41H10-1375/U1275 0-O/O	KL142032	2019/09/20	2020/09/19
12	RF Cable	HUBER+SUHNER	RG214	N/A	2019/09/20	2020/09/19
13	EMI Test software	Tonscend	JS32-RE	Ver 2.5.1.8	/	/

The calibration interval is 1 year.

4. TEST CONDITIONS AND RESULTS

4.1. Centre frequencies

Limit

The actual centre frequency for any given channel declared by the manufacturer shall be maintained within the range $f_c \pm 20$ ppm.

Test Procedure

1. For equipment can operating without modulation
 - a Connected The UUT to the spectrum and operated in an unmodulated mode.
 - b Set the centre frequency of spectrum to the frequency which UUT operated.
 - c Max Hold and waiting the trace stabilized.
 - d Search the peak value of the power envelope and noted.
2. For equipment operating with modulation
 - a Connected The UUT to the spectrum.
 - b Set the centre frequency of spectrum to the frequency which UUT operated.
 - c Max Hold and waiting the trace stabilized.
 - d Search the peak value of the power envelope and noted.
 - e Move the marker in a positive frequency increment until the upper, (relative to the centre frequency), - 10 dBc point is reached, note this point as f1.
 - f Move the marker in a negative frequency increment until the lower, (relative to the centre frequency), - 10 dBc point is reached, note this point as f2.
 - g The centre frequency is calculated as $(f1 + f2) / 2$.
3. These measurements shall be performed under both normal and extreme test conditions.
4. One channel out of the declared channels for each sub-band shall be tested.

Test Results

Reference Frequency: 5180 MHz 802.11a				
Test conditions		Test Channel / Frequency	Measured Result (MHz)	Frequency Deviation (ppm)
Voltage (V)	Temperature (°C)			
DC 3.3V	+25	CH36/ 5180MHz	5180.010834	2.09
DC 3.0V	-10		5180.004042	0.78
	+50		5180.022281	4.30
DC 3.6V	-10		5179.992518	-1.44
	+50		5179.979356	-3.99
Limit			±20 ppm	
Result			PASS	

Reference Frequency: 5180 MHz 802.11n(20MHz)				
Test conditions		Test Channel / Frequency	Measured Result (MHz)	Frequency Deviation (ppm)
Voltage (V)	Temperature (°C)			
DC 3.3V	+25	CH36/ 5180MHz	5180.005365	1.04
DC 3.0V	-10		5180.032943	6.36
	+50		5179.989360	-2.05
DC 3.6V	-10		5180.026425	5.10
	+50		5180.003956	0.76
Limit			±20 ppm	
Result			PASS	

Reference Frequency: 5190 MHz 802.11n(40MHz)				
Test conditions		Test Channel / Frequency	Measured Result (MHz)	Frequency Deviation (ppm)
Voltage (V)	Temperature (°C)			
DC 3.3V	+25	CH38/ 5190MHz	5189.990372	-1.86
DC 3.0V	-10		5190.006526	1.26
	+50		5189.971694	-5.45
DC 3.6V	-10		5190.034650	6.68
	+50		5189.982916	-3.29
Limit			±20 ppm	
Result			PASS	

Reference Frequency: 5210 MHz 802.11ac(80MHz)				
Test conditions		Test Channel / Frequency	Measured Result (MHz)	Frequency Deviation (ppm)
Voltage (V)	Temperature (°C)			
DC 3.3V	+25	CH42/ 5210MHz	5210.003645	0.70
DC 3.0V	-10		5209.984203	-3.03
	+50		5210.009772	1.88
DC 3.6V	-10		5209.960697	-7.54
	+50		5209.977656	-4.29
Limit			±20 ppm	
Result			PASS	

4.2. Nominal Channel Bandwidth and Occupied Channel Bandwidth

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 8.7.1 (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

Test Procedure

1. Connect the UUT to the spectrum analyser and use the following settings:

Centre Frequency:	The centre frequency of the channel under test
Resolution Bandwidth:	100 kHz
Video Bandwidth:	300 kHz
Frequency Span:	2 × Nominal Bandwidth (e.g. 40 MHz for a 20 MHz channel)
Detector Mode:	Peak
Trace Mode:	Max Hold

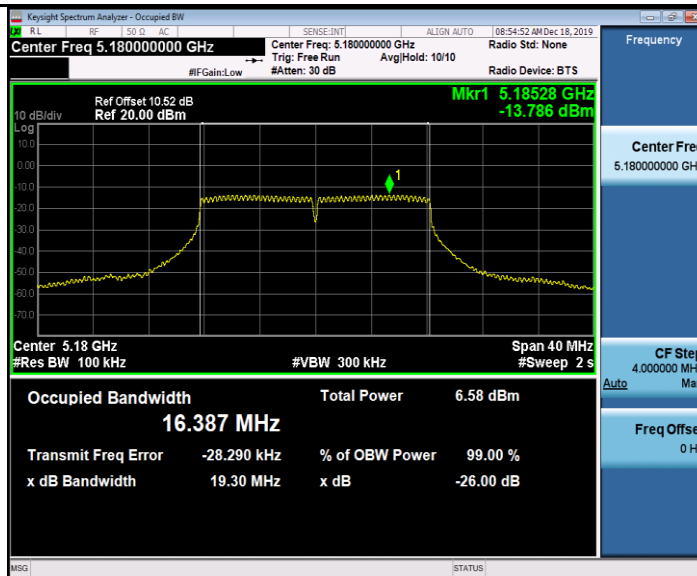
2. When the trace is complete, capture the trace.
3. Find the peak value of the trace and place the analyser marker on this peak.
4. Use the 99 % bandwidth function of the spectrum analyser to measure the Occupied Channel Bandwidth of the UUT. This value shall be recorded.
5. Repeated steps 1 to 3 above in case of simultaneous transmissions in non-adjacent channels.
6. These measurements shall be performed only under normal operating conditions.
7. One channel out of the declared channels for each sub-band shall be tested.

TEST RESULTS

Mode	Channel	Frequency (MHz)	99% bandwidth (MHz)	Result
802.11 a	CH36	5180	16.387	Pass
802.11 n 20	CH36	5180	17.566	Pass
802.11 n 40	CH38	5190	36.159	Pass
802.11 ac20	CH36	5180	17.565	Pass
802.11 ac40	CH38	5190	36.160	Pass
802.11 ac80	CH42	5210	75.251	Pass

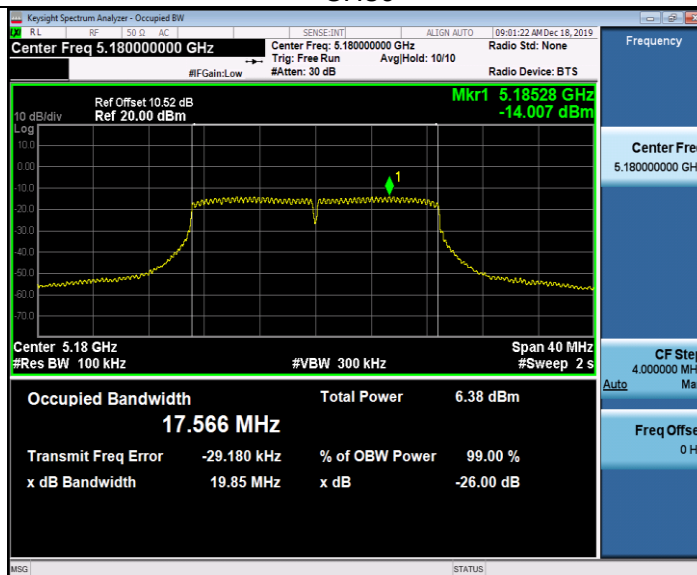
802.11 a

CH36



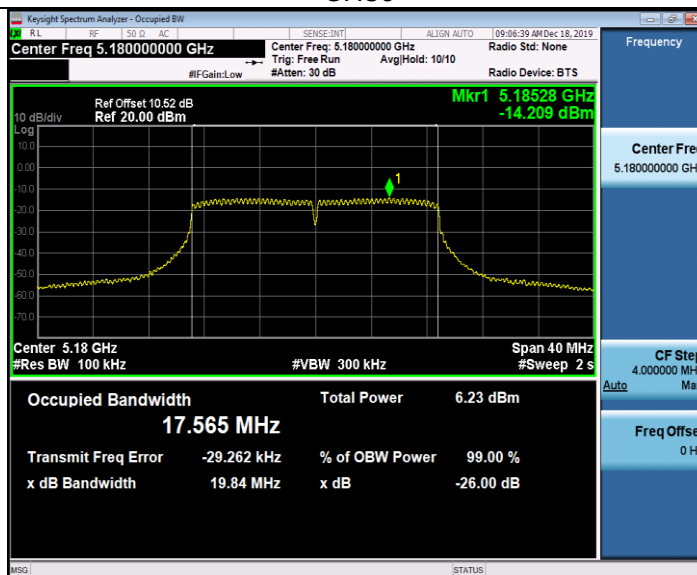
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CH36



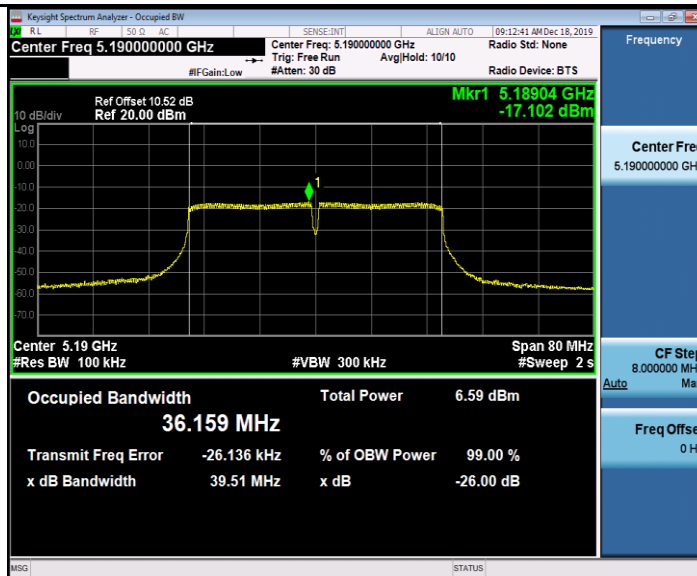
802.11 ac20

CH36



802.11 n40

CH38



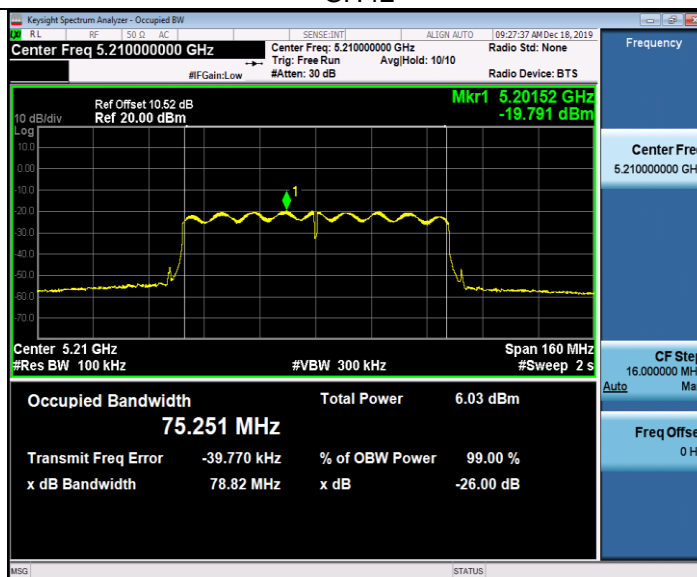
802.11 ac40

CH38



802.11 ac80

CH42



4.3. RF output power, Transmit Power Control (TPC) and power density

LIMIT

The limits below are applicable to the system as a whole and in any possible configuration. Includes smart antenna systems (devices with multiple transmit chains).

In case of multiple (adjacent or non-adjacent) channels within the same sub-band, the total RF output power of all channels in that sub-band shall not exceed the limits defined below.

In case of multiple, non-adjacent channels operating in separate sub-bands, the total RF output power in each of the sub-bands shall not exceed the limits defined below.

TPC is not required for channels whose nominal bandwidth falls completely within the band 5 150 MHz to 5 250 MHz.

For devices with TPC, the RF output power and the power density when configured to operate at the highest stated power level of the TPC range shall not exceed the levels given in table 1.

Devices are allowed to operate without TPC. See table 1 for the applicable limits in this case.

Table 1: Mean e.i.r.p. limits for RF output power and power density at the highest power level

Frequency range [MHz]	Mean e.i.r.p. limit [dBm]		Mean e.i.r.p. density limit [dBm/MHz]	
	with TPC	without TPC	with TPC	without TPC
5 150 to 5 350	23	20/23 (see note 1)	10	7/10 (see note 2)
5 470 to 5 725	30 (see note 3)	27 (see note 3)	17 (see note 3)	14 (see note 3)
NOTE 1: The applicable limit is 20 dBm, except for transmissions whose nominal bandwidth falls completely within the band 5 150 MHz to 5 250 MHz, in which case the applicable limit is 23 dBm.				
NOTE 2: The applicable limit is 7 dBm/MHz, except for transmissions whose nominal bandwidth falls completely within the band 5 150 MHz to 5 250 MHz, in which case the applicable limit is 10 dBm/MHz.				
NOTE 3: Slave devices without a Radar Interference Detection function shall comply with the limits for the band 5 250 MHz to 5 350 MHz.				

For devices using TPC, the RF output power during a transmission burst when configured to operate at the lowest stated power level of the TPC range shall not exceed the levels given in table 2.

For devices without TPC, the limits in table 2 do not apply.

Table 2: Mean e.i.r.p. limits for RF output power at the lowest power level of the TPC range

Frequency range	Mean e.i.r.p. [dBm]
5 250 MHz to 5 350 MHz	17
5 470 MHz to 5 725 MHz	24 (see note)
NOTE: Slave devices without a Radar Interference Detection function shall comply with the limits for the band 5 250 MHz to 5 350 MHz.	

4.3.1. RF output power at the highest power - PH

Test Procedure

- The UUT shall be configured to operate at:
 - The highest stated transmitter output power level of the TPC range; or
 - The maximum transmitter output power level in case the equipment has no TPC feature.
- For equipment with continuous transmission capability or for equipment operating (or with the capability to operate) with a constant duty cycle reference clause 5.4.8.7.1.1.2 ETSI EN 301 893 V2.1.1 (2017-05)
- For equipment without continuous transmission capability and operating (or with the capability to operate) in only one sub-band reference clause 5.4.8.7.1.1.3 ETSI EN 301 893 V2.1.1 (2017-05)
- For equipment without continuous transmission capability and having simultaneous transmissions in both sub-bands reference clause 5.4.8.7.1.1.4 ETSI EN 301 893 V2.1.1 (2017-05)
- These measurements shall be performed under both normal and extreme test conditions.

Test Results

802.11a							
Test conditions		Channel/ Frequency	Measured power (dBm)	Antenna Gain (dBi)	e.i.r.p (dBm)	Limit (dBm)	Result
Temperature (°C)	Voltage (V)						
+25°C	DC 3.3V	36/5180	11.25	2.00	13.25	23	PASS
-10°C	DC 3.0V		11.33	2.00	13.33		
	DC 3.6V		11.81	2.00	13.81		
+50°C	DC 3.0V		11.20	2.00	13.20		
	DC 3.6V		11.29	2.00	13.29		

802.11n HT 20							
Test conditions		Channel/ Frequency	Measured power (dBm)	Antenna Gain (dBi)	e.i.r.p (dBm)	Limit (dBm)	Result
Temperature (°C)	Voltage (V)						
+25°C	DC 3.3V	36/5180	11.59	2.00	13.59	23	PASS
-10°C	DC 3.0V		11.42	2.00	13.42		
	DC 3.6V		11.63	2.00	13.63		
+50°C	DC 3.0V		11.29	2.00	13.29		
	DC 3.6V		11.87	2.00	13.87		

802.11n HT40							
Test conditions		Channel/ Frequency	Measured power (dBm)	Antenna Gain (dBi)	e.i.r.p (dBm)	Limit (dBm)	Result
Temperature (°C)	Voltage (V)						
+25°C	DC 3.3V	38/5190	11.19	2.00	13.19	23	PASS
-10°C	DC 3.0V		11.07	2.00	13.07		
	DC 3.6V		11.53	2.00	13.53		
+50°C	DC 3.0V		11.21	2.00	13.21		
	DC 3.6V		11.95	2.00	13.95		

802.11ac20							
Test conditions		Channel/ Frequency	Measured power (dBm)	Antenna Gain (dBi)	e.i.r.p (dBm)	Limit (dBm)	Result
Temperature (°C)	Voltage (V)						
+25°C	DC 3.3V	36/5180	11.47	2.00	13.47	23	PASS
-10°C	DC 3.0V		11.46	2.00	13.46		
	DC 3.6V		11.61	2.00	13.61		
+50°C	DC 3.0V		11.94	2.00	13.94		
	DC 3.6V		11.86	2.00	13.86		

802.11ac40							
Test conditions		Channel/ Frequency	Measured power (dBm)	Antenna Gain (dBi)	e.i.r.p (dBm)	Limit (dBm)	Result
Temperature (°C)	Voltage (V)						
+25°C	DC 3.3V	38/5190	11.40	2.00	13.40	23	PASS
-10°C	DC 3.0V		11.11	2.00	13.11		
	DC 3.6V		11.40	2.00	13.40		
+50°C	DC 3.0V		12.00	2.00	14.00		
	DC 3.6V		11.54	2.00	13.54		

802.11ac80							
Test conditions		Channel/ Frequency	Measured power (dBm)	Antenna Gain (dBi)	e.i.r.p (dBm)	Limit (dBm)	Result
Temperature (°C)	Voltage (V)						
+25°C	DC 3.3V	42/5210	11.18	2.00	13.18	23	PASS
-10°C	DC 3.0V		11.84	2.00	13.84		
	DC 3.6V		11.38	2.00	13.38		
+50°C	DC 3.0V		12.00	2.00	14.00		
	DC 3.6V		11.56	2.00	13.56		

4.3.2. RF output power at the lowest power level of the TPC range - PL

Test Procedure

1. The UUT shall be configured to operate at the lowest stated transmitter output power level of the TPC range.
2. For equipment with continuous transmission capability or for equipment operating (or with the capability to operate) with a constant duty cycle (e.g. Frame Based equipment) reference clause 5.4.8.7.1.2.2 ETSI EN 301 893 V2.1.1 (2017-05)
3. For equipment without continuous transmission capability and operating (or with the capability to operate) in only one sub-band reference clause 5.4.8.7.1.2.3 ETSI EN 301 893 V2.1.1 (2017-05)
4. For equipment without continuous transmission capability and having simultaneous transmissions in both sub-bands reference clause 5.4.8.7.1.2.4 ETSI EN 301 893 V2.1.1 (2017-05)
5. These measurements shall be performed under both normal and extreme test conditions.
6. This test is only required for equipment with a TPC feature.

Test Results

This test item is not applicable for the EUT without TPC featur.

4.4. Power density

Test Procedure

1. The UUT shall be configured to operate at:
 - The highest stated transmitter output power level of the TPC range; or
 - The maximum transmitter output power level in case the equipment has no TPC feature.
2. For equipment with continuous transmission capability or for equipment operating (or with the capability to operate) with a constant duty cycle (e.g. Frame Based equipment) reference clause 5.4.8.7.1.3.2 ETSI EN 301 893 V2.1.1 (2017-05).
3. For equipment without continuous transmission capability and without the capability to transmit with a constant duty cycle reference clause 5.4.8.7.1.6.5 ETSI EN 301 893 V2.1.1 (2017-05).
4. These measurements shall only be performed at normal test conditions.

Test Results

Mode	Channel/ Frequency (MHz)	Measured value (dBm/MHz)	Antenna Gain (dBi)	PSD (dBm/MHz)	Limit (dBm/MHz)	Result
802.11a	36/5180	-6.865	2.00	-4.865	10	Pass
802.11n20	36/5180	-7.288	2.00	-5.288	10	Pass
802.11n40	38/5190	-10.211	2.00	-8.211	10	Pass
802.11ac20	36/5180	-7.372	2.00	-5.372	10	Pass
802.11ac40	38/5190	-10.302	2.00	-8.302	10	Pass
802.11ac80	42/5210	-12.802	2.00	-10.802	10	Pass

4.5. Transmitter unwanted emissions

4.5.1. Transmitter unwanted emissions outside the 5 GHz RLAN bands

Limit

The level of unwanted emission shall not exceed the limits given in table 3.

Table 3: Transmitter unwanted emission limits outside the 5 GHz RLAN bands

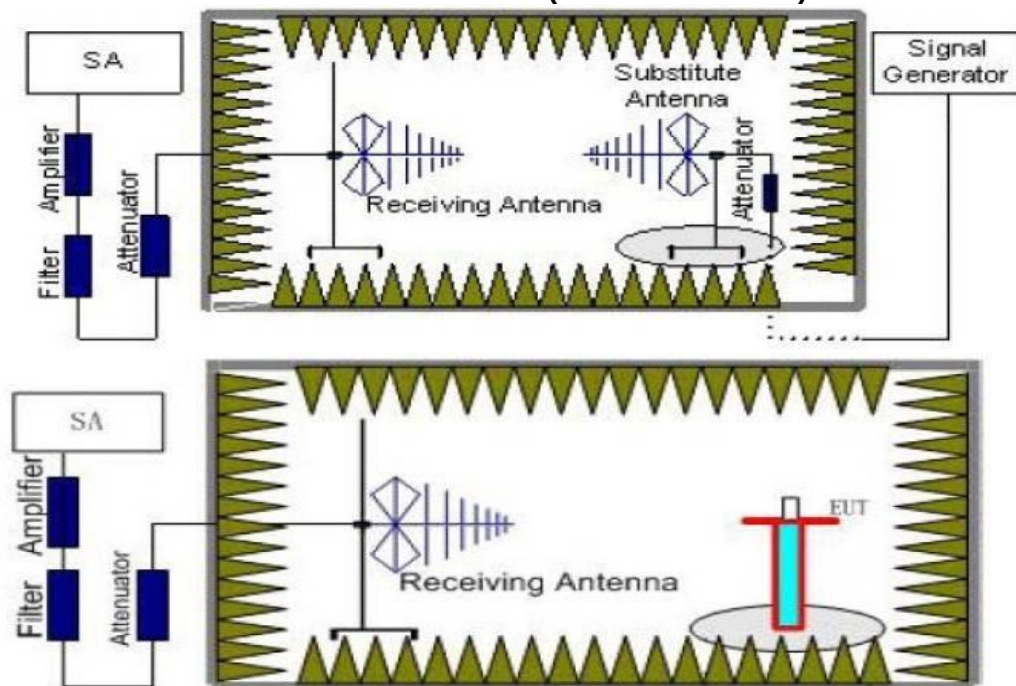
Frequency range	Maximum power	Bandwidth
30 MHz to 47 MHz	-36 dBm	100 kHz
47 MHz to 74 MHz	-54 dBm	100 kHz
74 MHz to 87,5 MHz	-36 dBm	100 kHz
87,5 MHz to 118 MHz	-54 dBm	100 kHz
118 MHz to 174 MHz	-36 dBm	100 kHz
174 MHz to 230 MHz	-54 dBm	100 kHz
230 MHz to 470 MHz	-36 dBm	100 kHz
470 MHz to 862 MHz	-54 dBm	100 kHz
862 MHz to 1 GHz	-36 dBm	100 kHz
1 GHz to 5,15 GHz	-30 dBm	1 MHz
5,35 GHz to 5,47 GHz	-30 dBm	1 MHz
5,725 GHz to 26 GHz	-30 dBm	1 MHz

Test Procedure

1. The measurement procedure follows ETSI EN 301 893 (V2.1.1) Sub-clause 5.4.5.2.2
2. The measurement shall only be performed at normal test conditions.
One channel out of the declared channels for each sub-band shall be tested.

Test Configuration

Effective Radiated Power measurement (30 MHz to 26 GHz)

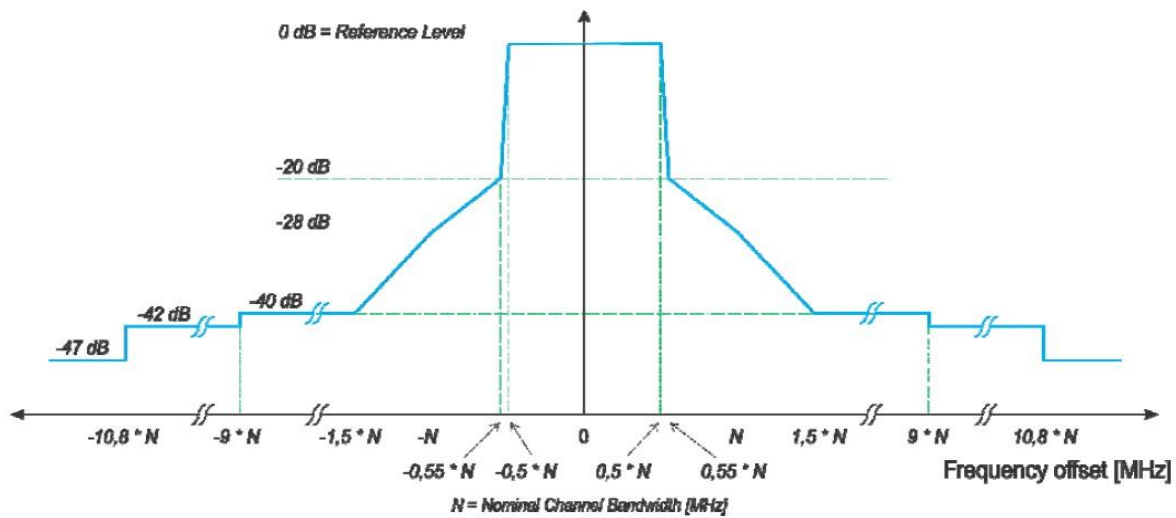


TEST RESULTS

The Worst Test Result For 802.11n(20MHz)					
Frequency (MHz)	Polarization (H/V)	Measure Level (dBm)	Limit (dBm)	Margin (dB)	Detector
Channel 36 (5180MHz)					
420.89	H	-48.15	-36.00	-12.15	PK
863.33	V	-45.65	-36.00	-9.65	PK
867.52	H	-45.07	-36.00	-9.07	PK
901.47	V	-48.13	-36.00	-12.13	PK
1732.94	H	-43.18	-30.00	-13.18	PK
4960.80	V	-41.99	-30.00	-11.99	PK
7439.30	H	-41.28	-30.00	-11.28	PK
7440.84	V	-41.19	-30.00	-11.19	PK

4.5.2. Transmitter unwanted emissions within the 5 GHz RLAN bands

LIMIT



NOTE: dBc is the spectral density relative to the maximum spectral power density of the transmitted signal.

Figure 1: Transmit spectral power mask

Test Procedure

1. The measurement procedure follows ETSI EN 301 893 (V2.1.1) Sub-clause .4.6.2.1.
2. The measurement shall only be performed at normal test conditions.

Test Result

The test plots as follow:

802.11a



802.11n20



802.11ac20



802.11n40



802.11ac40



802.11ac80



4.6. Receiver spurious emissions

The spurious emissions of the receiver shall not exceed the limits given in table 4.

Table 4: Spurious radiated emission limits

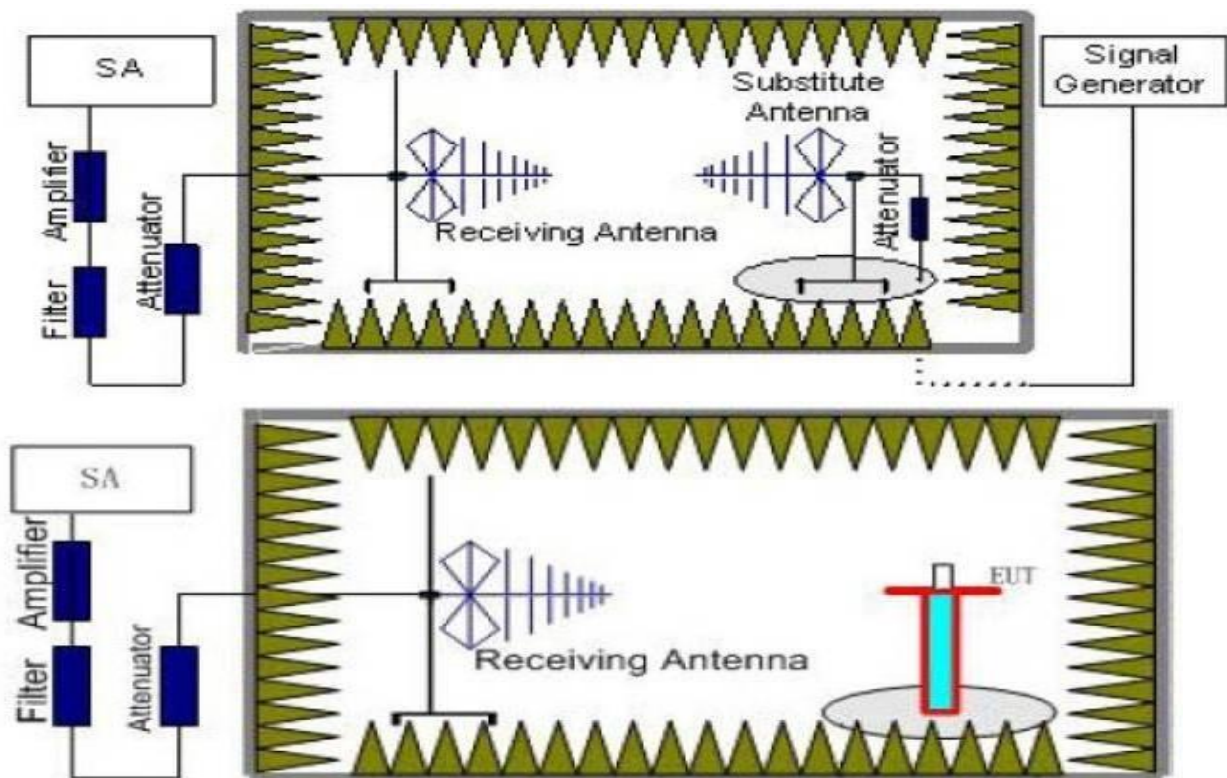
Frequency range	Maximum power	Measurement bandwidth
30 MHz to 1 GHz	-57 dBm	100 kHz
1 GHz to 26 GHz	-47 dBm	1 MHz

Test Procedure

1. The measurement procedure follows ETSI EN 301 893 (V2.1.1) Sub-clause 5.4.7.2.2
2. The measurement shall only be performed at normal test conditions.
3. One channel out of the declared channels for each sub-band shall be tested.

Test Configuration

Effective Radiated Power measurement (30 MHz to 26 GHz)



TEST RESULTS

The Worst Test Result For 802.11n(20MHz)					
Frequency (MHz)	Polarization (H/V)	Measure Level (dBm)	Limit (dBm)	Margin (dB)	Detector
Channel 36 (5180MHz)					
216.64	H	-69.94	-57.00	-12.94	PK
180.01	V	-66.87	-57.00	-9.87	PK
888.86	H	-67.37	-57.00	-10.37	PK
895.37	V	-67.62	-57.00	-10.62	PK
1828.81	H	-58.72	-47.00	-11.72	PK
1300.77	V	-59.13	-47.00	-12.13	PK
2203.66	H	-59.82	-47.00	-12.82	PK
2330.12	V	-56.57	-47.00	-9.57	PK

4.7. Dynamic Frequency Selection (DFS)

DFS parameters

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 to 24 hours.	

Table D.2: Interference threshold values

e.i.r.p. Spectral Density dBm/MHz	Value (see notes 1 and 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 - e.i.r.p. Spectral Density (dBm/MHz) + G (dBi), however the DFS threshold level shall not be lower 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.	

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

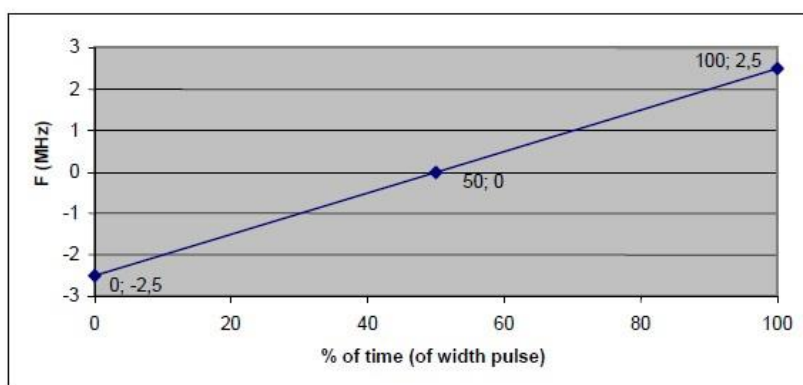
Pulse width W [μs]	Pulse repetition frequency PRF [PPS]	Pulses per burst [PPB]
1	700	18

Table D.4: Parameters of radar test signals

Radar test signal # (see notes 1 to 3)	Pulse width W [μ s]		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 figures D.1, D.3 and D.4. For the Off-Channel CAC testing, repetitive bursts shall be used for the total duration of the test. See figures D.2 and D.5. See also clauses 4.7.2.2, 5.3.8.2.1.3.1 and 5.3.8.2.1.3.2.

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.

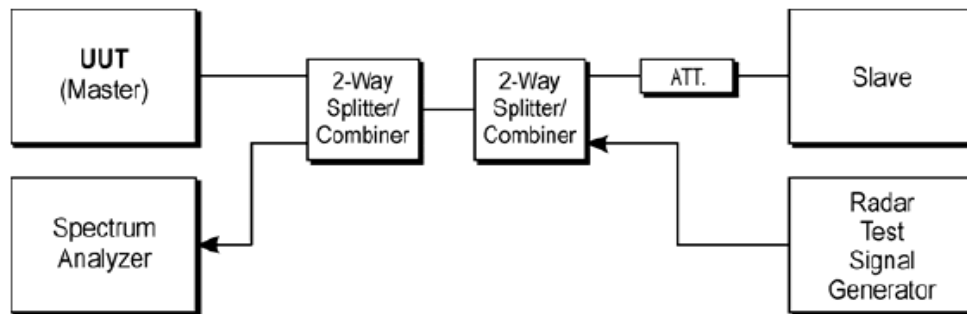
NOTE 6: For the CAC and Off-Channel CAC requirements, the minimum number of pulses (for each PRF) for any of the radar test signals to be detected in the band 5 600 MHz to 5 650 MHz shall be 18.

Table D.5: Detection probability

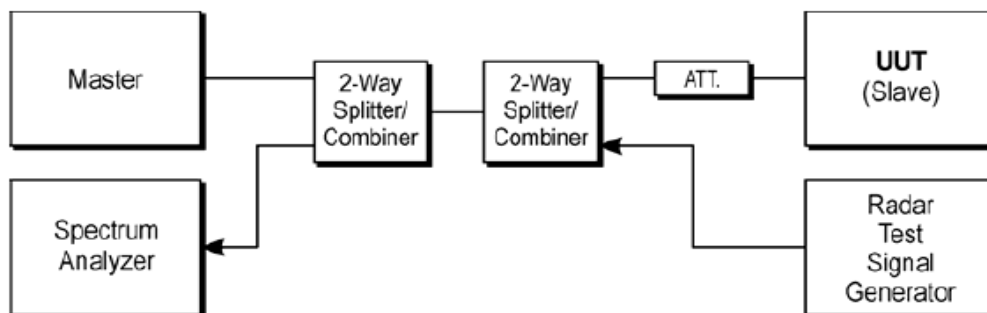
Parameter	Detection Probability (P_d)	
	Channels whose nominal bandwidth falls partly or completely within the 5 600 MHz to 5 650 MHz band	Other channels
CAC, Off-Channel CAC	99,99 %	60 %
In-Service Monitoring	60 %	60 %
NOTE: P_d gives the probability of detection per simulated radar burst and represents 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.		

Test set-ups**Set-up A**

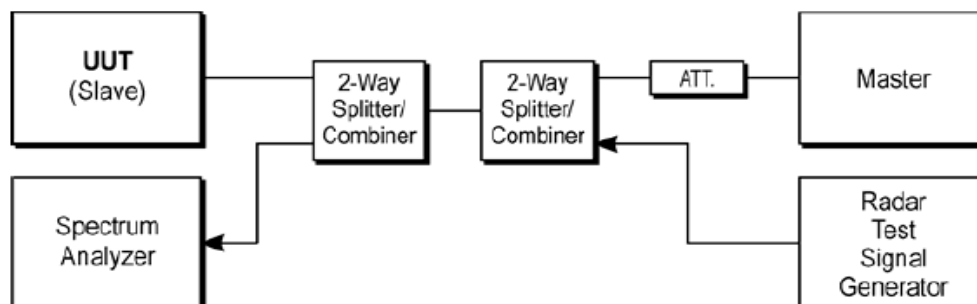
Set-up A is a set-up whereby the UUT is an RLAN device operating in master mode. Radar test signals are injected into the UUT. This set-up also contains an RLAN device operating in slave mode which is associated with the UUT.

**Figure 4: 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 5: 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 6: Set-up C**

DFS technical requirements specifications

Follow table 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.

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	√	Not required	√(see note 2)
Off-Channel CAC (see note 1)	√	Not required	√(see note 2)
In-Service Monitoring	√	Not required	√
Channel Shutdown	√	√	√
Non-Occupancy Period	√	Not required	√
Uniform Spreading	√	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 Off-Channel CAC at initial use of the channel but only after the slave has detected a radar signal on the Operating Channel by In-Service Monitoring.			

TEST RESULTS

Testing is not required for nominal channel bandwidths that fall completely within the frequency range 5 150 MHz to 5 250 MHz. So this test item is not applicable for the EUT.

4.8. Adaptivity

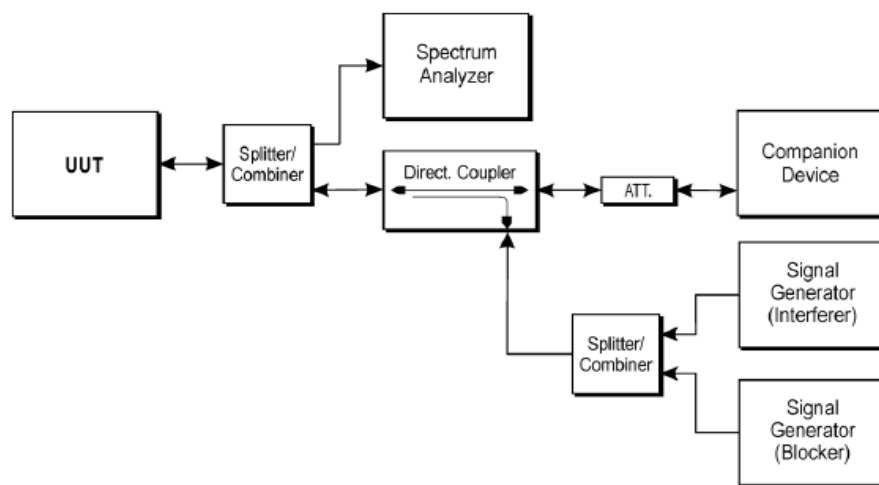
Requirements and limits

When interference signal detected by relevant channel access mechanism UUT used. The UUT should stop transmissions on the current operating channel, apart from Short Control Signaling Transmissions with a maximum duty cycle of 5 % within an observation period of 50 ms,

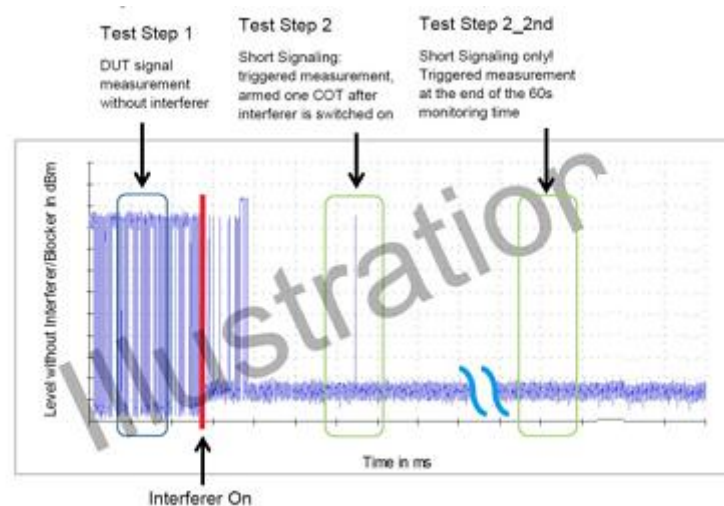
Test Procedure

1. The measurement procedure follows the clause 5.3.9.2.1 of the ETSI EN 301 893 V2.1.1 (2017-05).
2. The inference signal used shall be a band limited noise signal with a 100 % duty cycle.
3. Testing shall be performed at one channel out of the declared channels for each sub-band and the highest nominal channel bandwidth.

Test Configuration



Adaptivity Test schematic graphic



Test Step 2 :We add the Additive white Gaussian noise (AWGN) as interference Signale

Test step 3 and Test step 3_2nd : We Repeat Test Step 2 and Test Step 2_2nd ,but We add the OFDM test signal as interference Signale

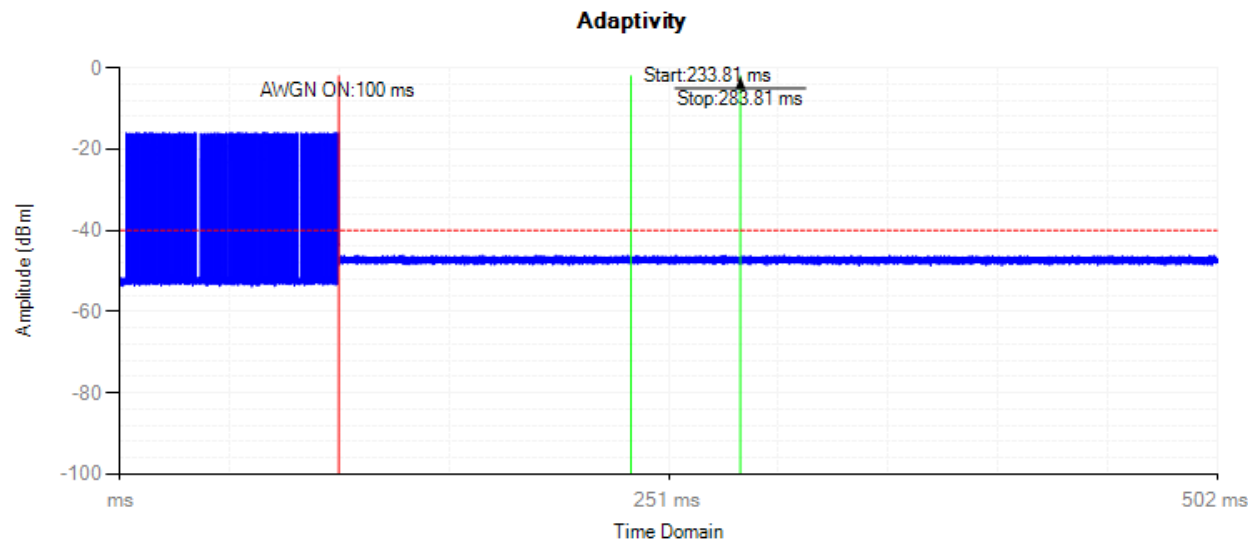
Test step 4 and Test step 4_2nd : We Repeat Test Step 2 and Test Step 2_2nd ,but We add LTE test signal as interference Signale

TEST RESULTS

According to Table 11 in clause 5.3.2 of ETSI EN 301 893 V2.1.1(2017-05), for adaptivity, testing shall be performed using the highest nominal channel bandwidth. So this test item is only performed on 802.11ac(80MHz; Channel 42: 5210MHz)

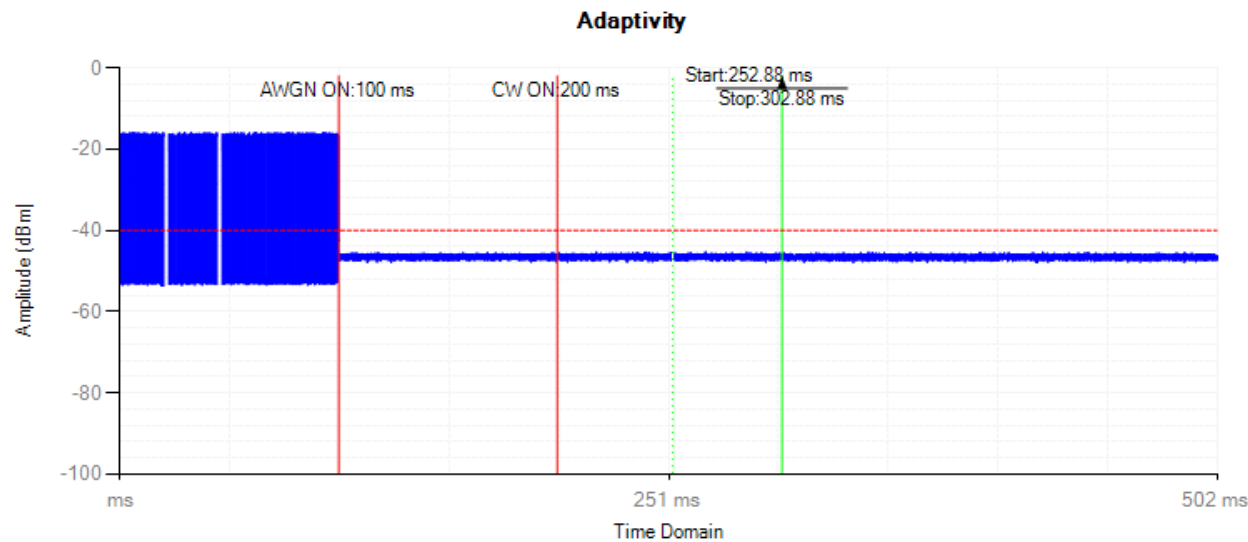
The Worst Test Mode	802.11ac(80MHz; Channel 42: 5210MHz)
AWGN Interference Level (dBm)	-64.25
Interference Start Time (ms)	100
Stop time after interfering signal(ms)	100
Suggest q Level	4
Max. COT (ms)	4.15
Pulse width (ms)	0
Duty Cycle (%)	0

Test plot For 802.11ac(80MHz; Channel 42: 5210MHz):



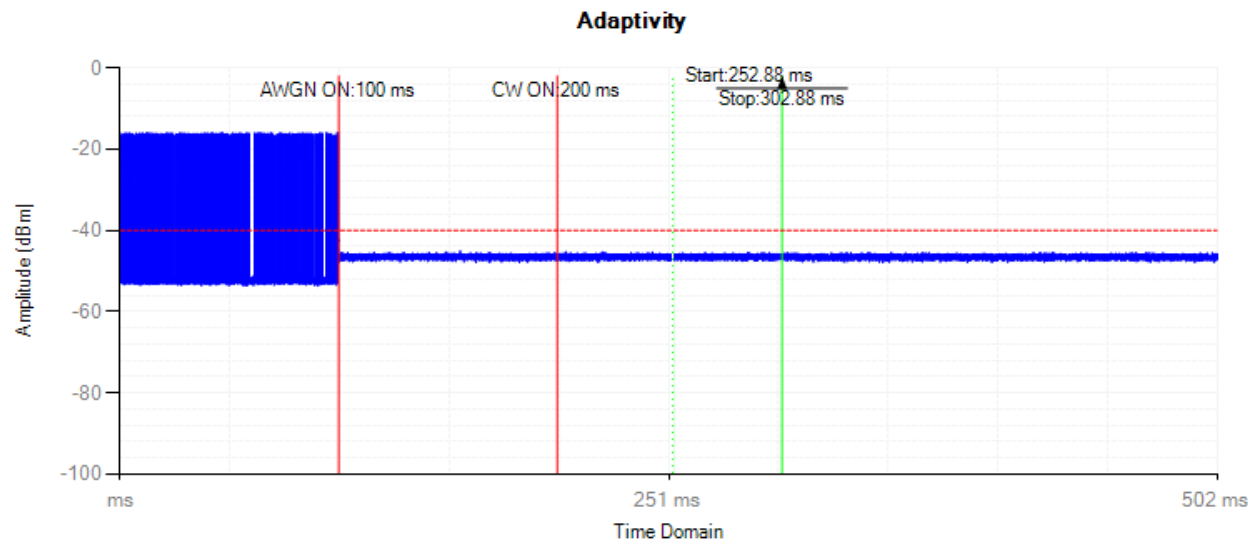
The Worst Test Mode	802.11ac(80MHz; Channel 42: 5210MHz)
OFDM Interference Level (dBm)	-62.73
Interference Start Time (ms)	100
Stop time after interfering signal(ms)	100
Suggest q Level	4
Max. COT (ms)	6.02
Pulse width (ms)	0
Duty Cycle (%)	0

Test plot For 802.11ac(80MHz; Channel 42: 5210MHz):



The Worst Test Mode	802.11ac(80MHz; Channel 42: 5210MHz)
LTE Interference Level (dBm)	-65.88
Interference Start Time (ms)	100
Stop time after interfering signal(ms)	100
Suggest q Level	4
Max. COT (ms)	5.45
Pulse width (ms)	0
Duty Cycle (%)	0

Test plot For 802.11ac(80MHz; Channel 42: 5210MHz):



4.9. Receiver Blocking

Limits

ETSI EN 301 893 Sub-8.7.8.4

While maintaining the minimum performance criteria as defined in clause 8.7.8.3, the blocking levels at specified frequency offsets shall be equal to or greater than the limits defined in table 9.

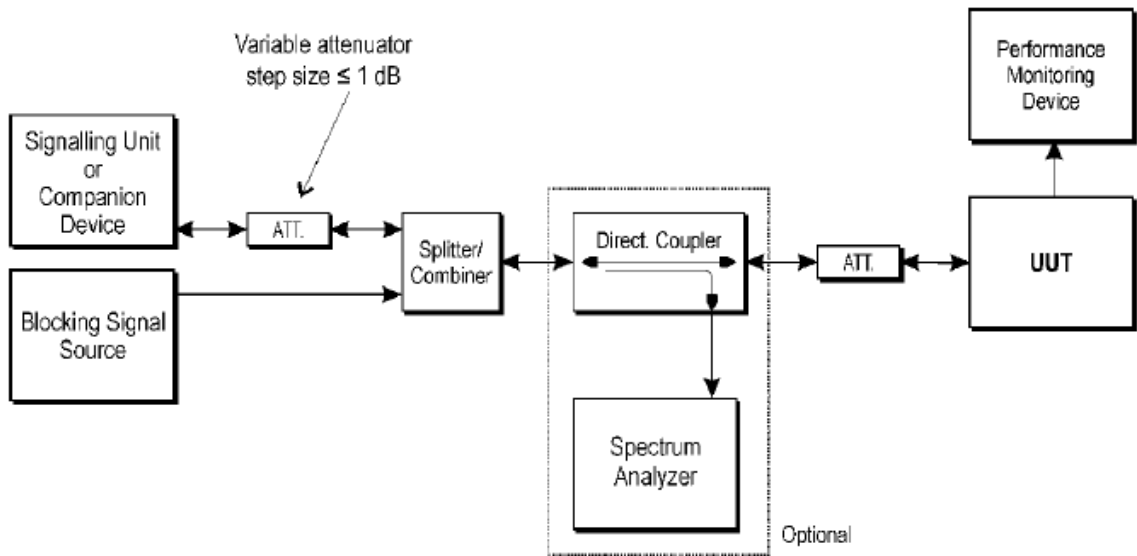
Table 9: Receiver Blocking parameters

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.

TEST CONFIGURATION:



TEST PROCEDURE

Please refer to ETSI EN 301 893 Sub-clause 8.7.8.2 for the measurement method..

TEST RESULTS

The Worst Test Result For 802.11a/CH36					
Wanted signal mean power from companion device (dBm)	Blocking signal frequency (MHz)	Blocking signal power (dBm)	Limit(PER)	test value(PER)	Result
Pmin + 6dB	5100	-53	10%	4%	PASS
	4900	-47	10%	3%	PASS
	5000	-47	10%	4%	PASS
	5975	-47	10%	6%	PASS

4.10. User Access Restrictions

Requirement

The equipment shall be so constructed that settings (hardware and/or software) related to DFS shall not be accessible to the user if changing those settings result in the equipment no longer being compliant with the DFS requirements in EN301893 (clause 4.7) The above requirement includes the prevention of indirect access to any setting that impacts DFS.

Result

The EUT do not use the DFS Band and The customers will not obtain the information to set hardware and/ software related to DFS, if the product is on sales. So The EUT meets this requirement.

4.11. Geo-location capability

Requirement

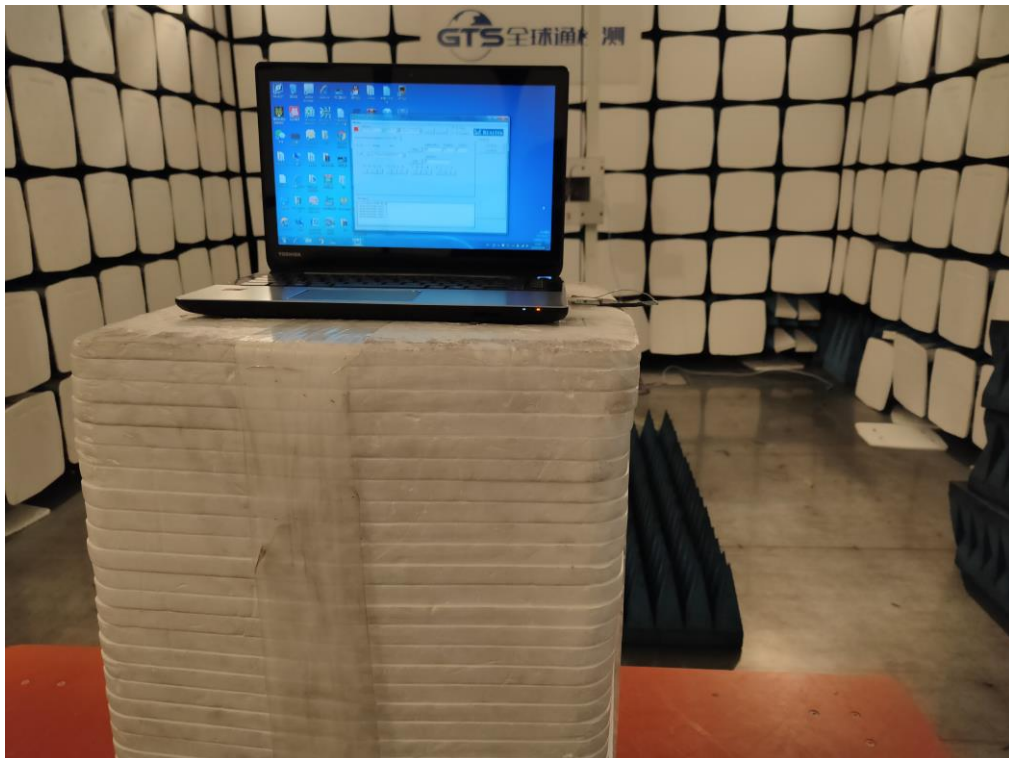
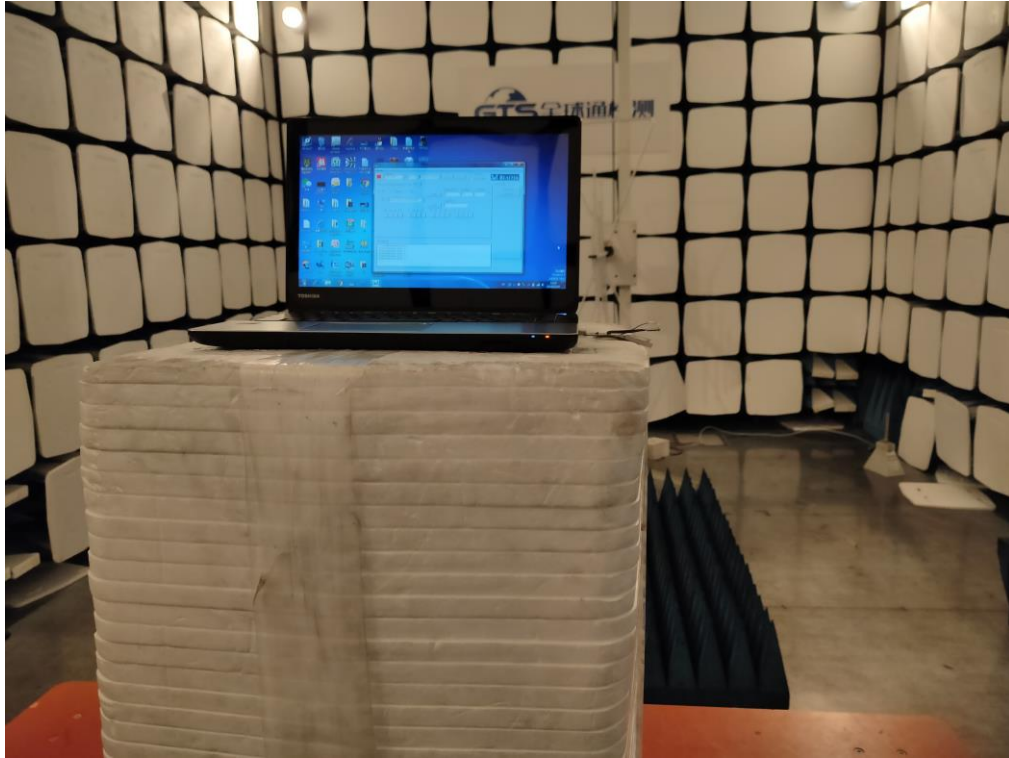
Geo-location capability is a feature of the RLAN device to determine its geographical location with the purpose to configure itself according to the regulatory requirements applicable at the geographical location where it operates. The geo-location capability may be present in the equipment or in an external device (temporary) associated with the equipment operating at the same geographical location during the initial power up of the equipment. The geographical location may also be available in equipment already installed and operating at the same geographical location.

The geographical location determined by the equipment as defined in the above shall not be accessible to the user.

Result

This requirement only applies to equipment with geo-location capability, and the EUT do not support this function. So this requirement is not applicable for the EUT.

5. TEST SETUP PHOTOS OF THE EUT



6. EXTERNAL AND INTERNAL PHOTOS OF THE EUT

Reference to the test report No. GTS20191209006-2-27

.....End of Report.....