CE RF TEST REPORT

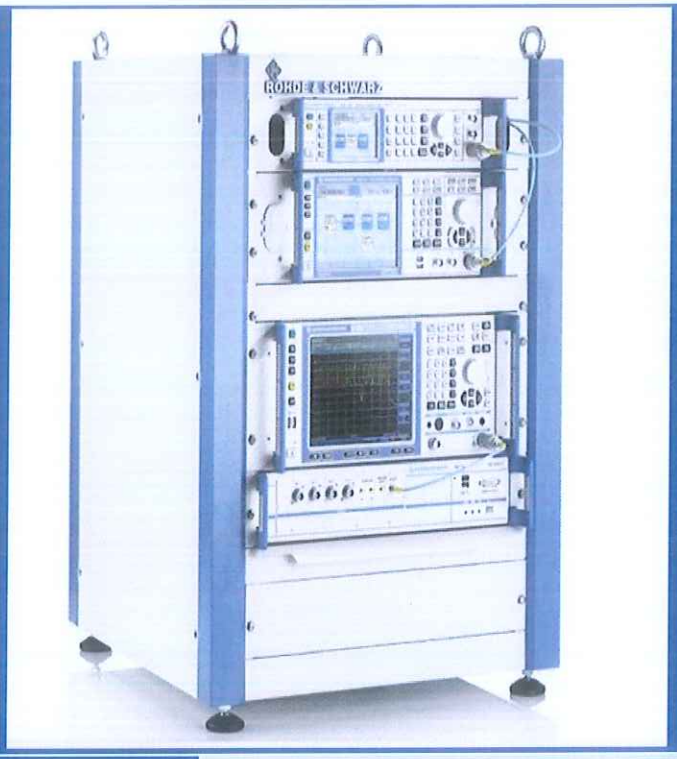
ISSUED BY
Shenzhen BALUN Technology Co., Ltd.

FOR

AC1200 Wireless Dual Band Router

ISSUED TO
TP-Link Technologies Co., Ltd.

Building 24 (floors 1,3,4,5) and 28 (floors1-4) Central Science and Technology Park, Shennan Rd, Nanshan, Shenzhen, China



Tested by: Zheng Muyi
(Engineer)
Date: Aug. 11. 2017

Approved by: Wei Yanquan
(Chief Engineer)
Date: Aug. 11. 2017

Report No:	BL-SZ1760077-602
EUT Name:	AC1200 Wireless Dual Band Router
Model Name:	Archer C50
Brand Name:	tp-link
Test Standard:	ETSI EN 301 893 V2.1.1 (2017-05)
Test conclusion:	Pass
Test Date:	Jul. 10, 2017 ~ Jul. 17, 2017
Date of Issue:	Aug. 11, 2017

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Revision History

Version	Issue Date	Revisions Content
Rev. 01	Jul. 20, 2017	Initial Issue
Rev. 02	Aug. 02, 2017	Update the test method in section 5.2.3 and other changes
Rev. 03	Aug. 07, 2017	Update the test result of adaptivity on page 62.
Rev. 04	Aug. 10, 2017	Add the information of software in section 3.2.

TABLE OF CONTENTS

1 ADMINISTRATIVE DATA (GENERAL INFORMATION)

1.1 Identification of the Testing Laboratory

Company Name	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1st FL, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Phone Number	+86 755 6685 0100

1.2 Identification of the Responsible Testing Location

Test Location	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1st FL, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Accreditation Certificate	The laboratory has been listed by Industry Canada to perform electromagnetic emission measurements. The recognition numbers of test site are 11524A-1. The laboratory has been listed by US Federal Communications Commission to perform electromagnetic emission measurements. The recognition numbers of test site are 832625. The laboratory is a testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L6791.
Description	All measurement facilities used to collect the measurement data are located at Block B, FL 1, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China 518055

1.3 Laboratory Condition

Ambient Temperature	20 to 25℃
Ambient Relative Humidity	45% - 55%
Ambient Pressure	100 kPa - 102 kPa

1.4 Announce

(1) The test report reference to the report template version v1.1.

(2) The test report is invalid if not marked with the signatures of the persons responsible for preparing and approving the test report.

(3) The test report is invalid if there is any evidence and/or falsification.

(4) The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein.

(5) This document may not be altered or revised in any way unless done so by BALUN and all revisions are duly noted in the revisions section.

(6) Content of the test report, in part or in full, cannot be used for publicity and/or promotional purposes without prior written approval from the laboratory.

2 PRODUCT INFORMATION

2.1 Applicant Information

Applicant	TP-Link Technologies Co., Ltd.
Address	Building 24 (floors 1,3,4,5) and 28 (floors1-4) Central Science and Technology Park, Shennan Rd, Nanshan, Shenzhen, China

2.2 Manufacturer Information

Manufacturer	TP-Link Technologies Co., Ltd.
Address	Building 24 (floors 1,3,4,5) and 28 (floors1-4) Central Science and Technology Park, Shennan Rd, Nanshan, Shenzhen, China

2.3 Factory Information

Factory	N/A
Address	N/A

2.4 General Description for Equipment under Test (EUT)

EUT Type	AC1200 Wireless Dual Band Router
Model Name Under Test	Archer C50
Series Model Name	N/A
Description of Model name differentiation	N/A
Hardware Version	N/A
Software Version	N/A
Network and Wireless connectivity	WIFI 802.11a, 802.11b, 802.11g, 802.11n(HT20/40) and 802.11ac

2.5 Ancillary Equipment

Ancillary Equipment 1	Adapter 1	
	Brand Name	TP-Link
	Model No.	T090085-2C1 (EU) Note
	Serial No.	N/A
	Rated Input	100-240 V~, 300 mA, 50/60 Hz
	Rated Output	9 V⎓, 850 mA
Ancillary Equipment 2	Adapter 2	
	Brand Name	TP-Link
	Model No.	T090085-2D1(UK) Note
	Serial No.	N/A
	Rated Input	100-240 V~, 300 mA, 50/60 Hz
	Rated Output	9 V⎓, 850 mA
Ancillary Equipment 3	Adapter 3	
	Brand Name	TP-Link
	Model No.	T090085-2E1(AU) Note
	Serial No.	N/A
	Rated Input	100-240 V~, 300 mA, 50/60 Hz
	Rated Output	9 V⎓, 850 mA
Note: The adapter are same with electrical parameters and internal circuit structure, only differ in model name and adapter plug, T090085-2C1 (EU Plug) as the main for tested in this report.		

2.6 Description of Support Units

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Mobile phone	Nubia	NX531J	SRD-008	--	--

2.7 Technical Information

Frequency Range		Low Sub-band: 5.15 GHz – 5.35 GHz
Modulation technology		OFDM
Modulation Type		802.11a/ n: 64QAM, 16QAM, BPSK, QPSK 802.11ac:256QAM, 64QAM, 16QAM, BPSK, QPSK
Transfer Rate (Mbps) (Single RF path)		802.11a: 54/ 48/ 36 / 24 / 18 /12/ 9/ 6 Mbps 802.11ac: up to VHT-MCS9
Equipment Type (LBT / non- LBT)		Adaptive equipment LBT based Detect and Avoid
Antenna Type		Dipole Antenna
Antenna Gain	ANT0	2.74 dBi
	ANT1	2.99 dBi
Adaptive Adaptive or non-adaptive		Adaptive
The Max RF Output power		22.6 dBm
Receiver Category		Master without radar detection

Low Sub-band: 5.15 GHz – 5.35 GHz

8 channels are provided for 802.11a, 802.11ac (20MHz):

Channel	Center Frequency(MHz)
36	5180
40	5200
44	5220
48	5240

4 channels are provided for 802.11ac (40MHz):

Channel	Center Frequency(MHz)
38	5190
46	5230

2 channels are provided for 802.11ac (80MHz):

Channel	Center Frequency(MHz)
42	5210

Note: Preliminary tests were performed in different data rate in above table to find the worst radiated emission. The data rate shown in the table below is the worst-case rate with respect to the specific test item. Investigation has been done on all the possible configurations for searching the worst cases. The following table is a list of the test modes shown in this test report.

Test Items	Mode	Data Rate	Modulation Technology	Modulation Type	Low Sub-band Channel
Center frequencies	11a	6	OFDM	BPSK	48/36
	11ac(20 MHz)	6.5	OFDM	BPSK	48/36
	11ac(40 MHz)	13.5	OFDM	BPSK	46/38
	11ac(80 MHz)	V0	OFDM	BPSK	42
Nominal Channel Bandwidth and Occupied Channel Bandwidth	11a	6	OFDM	BPSK	48/36
	11ac(20 MHz)	6.5	OFDM	BPSK	48/36
	11ac(40 MHz)	13.5	OFDM	BPSK	46/38
	11ac(80 MHz)	V0	OFDM	BPSK	42
RF output power	11a	6	OFDM	BPSK	48/36
	11ac(20 MHz)	6.5	OFDM	BPSK	48/36
	11ac(40 MHz)	13.5	OFDM	BPSK	46/38
	11ac(80 MHz)	V0	OFDM	BPSK	42
Power density	11a	6	OFDM	BPSK	48/36
	11ac(20 MHz)	6.5	OFDM	BPSK	48/36
	11ac(40 MHz)	13.5	OFDM	BPSK	46/38
	11ac(80 MHz)	V0	OFDM	BPSK	42
Transmitter unwanted emissions outside the 5 GHz RLAN bands	11a	6	OFDM	BPSK	48/36
	11ac(20 MHz)	6.5	OFDM	BPSK	48/36
	11ac(40 MHz)	13.5	OFDM	BPSK	46/38
	11ac(80 MHz)	V0	OFDM	BPSK	42
Transmitter unwanted emissions within the 5 GHz RLAN bands	11a	6	OFDM	BPSK	48/36
	11ac(20 MHz)	6.5	OFDM	BPSK	48/36
	11ac(40 MHz)	13.5	OFDM	BPSK	46/38
	11ac(80 MHz)	V0	OFDM	BPSK	42
Receiver spurious emissions	11a	6	OFDM	BPSK	48/36
	11ac(20 MHz)	6.5	OFDM	BPSK	48/36
	11ac(40 MHz)	13.5	OFDM	BPSK	46/38
	11ac(80 MHz)	V0	OFDM	BPSK	42
Dynamic Frequency Selection (DFS)	11a	6	OFDM	BPSK	48
	11ac(80 MHz)	V0	OFDM	BPSK	46

Adaptivity (Channel Access Mechanism)	11a	6	OFDM	BPSK	36
	11ac(80 MHz)	V0	OFDM	BPSK	42
Receiver Blocking	11a	6	OFDM	BPSK	36
User Access Restrictions	/	/	/	/	/
Geo-location capability	/	/	/	/	/
Note: The modulation of 11ac (20 MHz), 11ac (40 MHz) backward compatible with 11n (HT20), 11n (HT40), and the test results are basically the same with them, thus only the modulation of 11ac (20 MHz), 11ac (40 MHz) was evaluated in the report.					

Mode	Low Sub-band		
	Channel	Channel Number	Frequency (MHz)
11a	LOW(H/ L)	48/36	5240/5180
11ac20	LOW(H/ L)	48/36	5240/5180
11ac40	LOW(H/ L)	46/38	5230/5190
11ac80	LOW(H/ L)	42	5210
Note: The above EUT information in section 2.3 and 2.4 was declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or user's manual.			

2.8 Additional Instructions

EUT Software Settings:

Mode	☒ Special software is used. The software provided by client to enable the EUT under transmission condition continuously at specific channel frequencies individually. And EUT is transmitting pseudo random data by itself.

During testing. Channel and Power Controlling Software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product.

Power level setup in software		
Test Software Version	ADB	
Mode	Channel	Soft Set
11a	Low	18
	Middle	1A
	High	19
11n20	Low	18
	Middle	1A
	High	19
11n40	Low	1D
	High	1E
11ac80	All	1E

3 UMMARY OF TEST RESULTS

The EUT has been tested according to ETSI EN 301 893 V2.1.1 (2017-05).

No.	Identity	Document Title
1	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

Test items and the results are as follows:

Report Section	Standard Rule	Description		Test Result	Verdict	Remark
5.1.1	4.2.1	Center frequencies		ANNEX A.1	Pass	--
5.1.2	4.2.2	Nominal Channel Bandwidth and Occupied Channel Bandwidth		ANNEX A.2	Pass	--
5.1.3	4.2.3	RF output power		ANNEX A.3	Pass	--
5.1.4		Power density		ANNEX A.4	Pass	
5.1.5	4.2.4	Transmitter unwanted emissions	Transmitter unwanted emissions outside the 5 GHz RLAN bands	ANNEX A.5	Pass	--
5.1.6			Transmitter unwanted emissions within the 5 GHz RLAN bands	ANNEX A.6	Pass	--
5.2.1	4.2.5	Receiver spurious emissions		ANNEX A.7	Pass	--
5.2.2	4.2.6	Dynamic Frequency Selection (DFS)		ANNEX A.8	N/A	--
5.2.3	4.2.7	Adaptivity (Channel Access Mechanism)		ANNEX A.9	Pass	--
5.2.4	4.2.8	Receiver Blocking		ANNEX A.10	Pass	--
5.2.5	4.2.9	User Access Restrictions		--	Note 1	--
5.2.6	4.2.10	Geo-location capability		--	Note 1	--
Note[1]: The function of User Access Restrictions and Geo-location capability is declared by manufacture, for more detailed description, please refer to the user manual.						

4 GENERAL TEST CONFIGURATIONS

4.1 Test Environments

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

Relative Humidity	45% - 55%	
Atmospheric Pressure	100 kPa - 102 kPa	
Temperature	NT (Normal Temperature)	+22℃ to +25℃
	LT (Low Temperature)	-10℃
	HT (High Temperature)	+40℃
Working Voltage of the EUT	NV (Normal Voltage)	230 V
	LV (Low Voltage)	207 V
	HV (High Voltage)	240 V

4.2 Test Equipment List

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Spectrum Analyzer	ROHDE&SCHWARZ	FSV-30	103118	2017.06.22	2018.06.21
Vector Signal Generator	ROHDE&SCHWARZ	SMBV100A	260592	2017.06.22	2018.06.21
Signal Generator	ROHDE&SCHWARZ	SMB100A	177746	2017.06.22	2018.06.21
Switch Unit with OSP-B157	ROHDE&SCHWARZ	OSP120	101270	2017.06.22	2018.06.21
Spectrum Analyzer	AGILENT	E4440A	MY45304434	2016.11.08	2017.11.07
EMI Receiver	ROHDE&SCHWARZ	ESRP	101036	2017.06.22	2018.06.21
Power Splitter	KMW	DCPD-LDC	1305003215	--	--
Power Sensor	ROHDE&SCHWARZ	NRP-Z21	103971	2017.06.22	2018.06.21
Attenuator (20 dB)	KMW	ZA-S1-201	110617091	--	--
Attenuator (6 dB)	KMW	ZA-S1-61	1305003189	--	--
DC Power Supply	ROHDE&SCHWARZ	HMP2020	018141664	2017.06.22	2018.06.21
Temperature Chamber	ANGELANTIONI SCIENCE	NTH64-40A	1310	2017.06.22	2018.06.21
Test Antenna-Loop(9 kHz-30 MHz)	SCHWARZBECK	FMZB 1519	1519-037	2017.06.22	2018.06.21
Test Antenna-Bi-Log(30 MHz-3 GHz)	SCHWARZBECK	VULB 9163	9163-624	2017.06.22	2018.06.21
Test Antenna-Horn(1-18 GHz)	SCHWARZBECK	BBHA 9120D	9120D-1148	2017.06.22	2018.06.21
Test Antenna-Horn(15-40 GHz)	SCHWARZBECK	BBHA 9170	9170-305	2017.06.22	2018.06.21
Anechoic Chamber	RAINFORD	9m*6m*6m	N/A	2017.02.24	2019.02.23
Shielded Enclosure	ChangNing	CN-130701	130703	--	--
Wireless Communications Test	ROHDE&SCHWARZ	CMW500	142028	2017.06.12	2018.06.11

4.3 Test Software List

Description	Manufacturer	Software Version	Serial No.
TS8997 EMC32	ROHDE&SCHWARZ	V10.00.00	N/A
COT Test	BALUN	V1.0	N/A

4.4 MEASUREMENT UNCERTAINTY

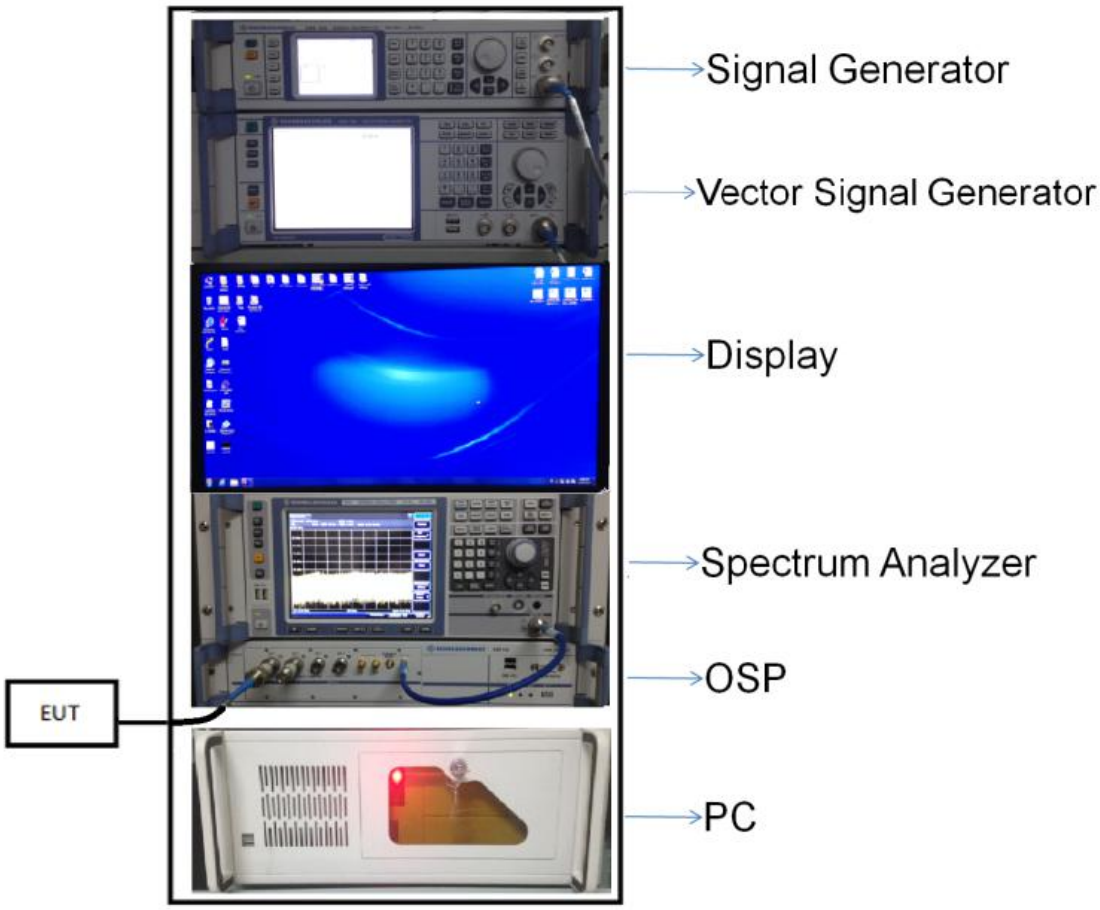
The following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2.

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

Measurement	Value
RF frequency	$\pm 1*10^{-5}$
RF power conducted	±1.5 dB
RF power, radiated	±6 dB
Spurious emissions, conducted	±3 dB
Spurious emissions, radiated	±6 dB
Temperature	±1°C
Humidity	±5 %
Time	±10 %

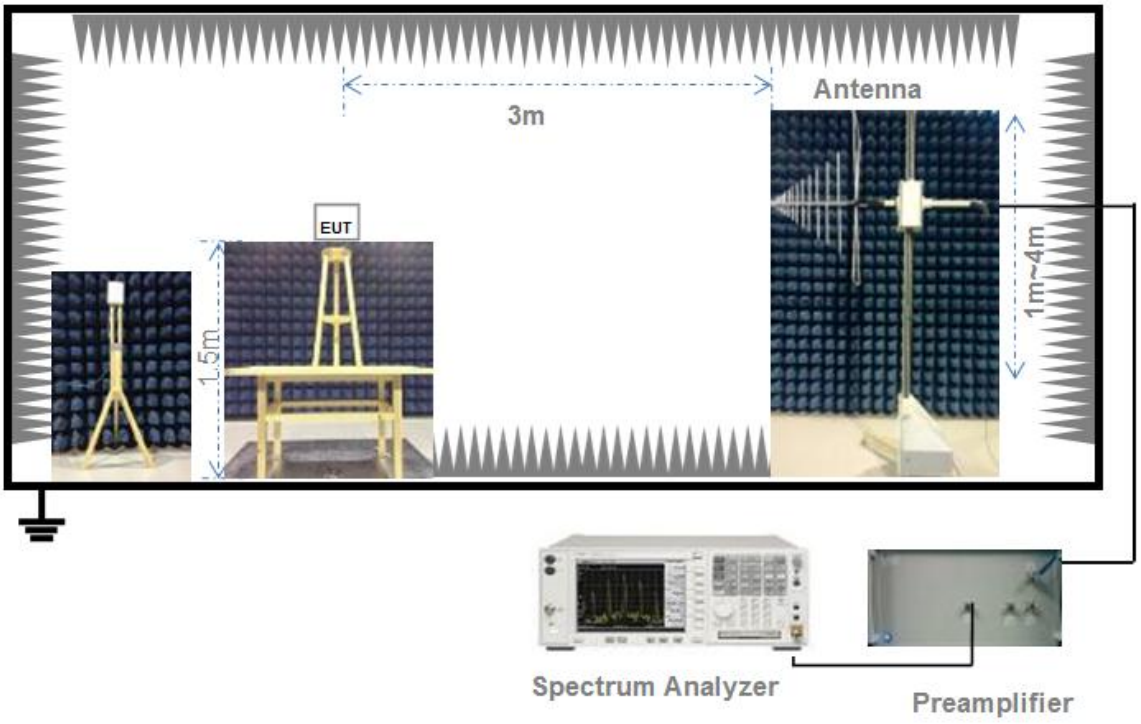
4.5 Description of Test Setup

4.5.1 For Conducted Test

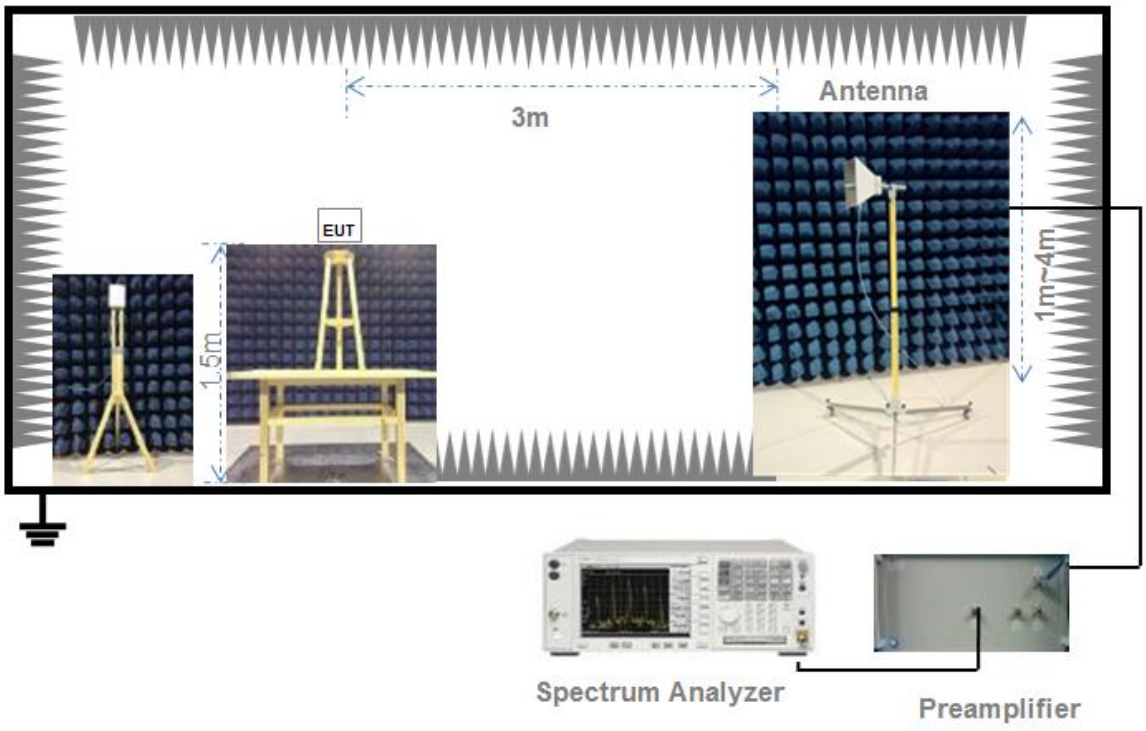


(Diagram 1)

4.5.2 For Radiated Test

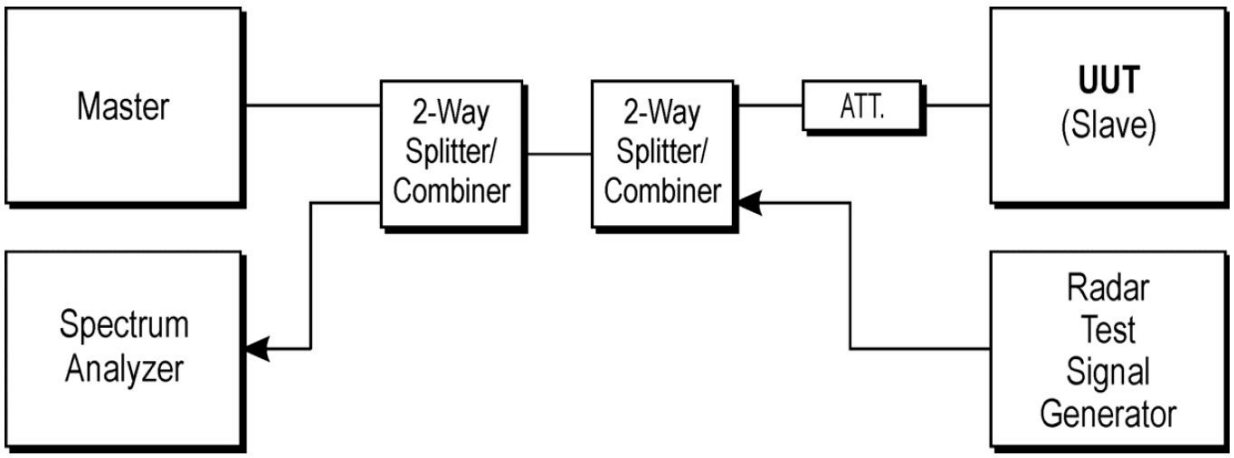


(Diagram 2)



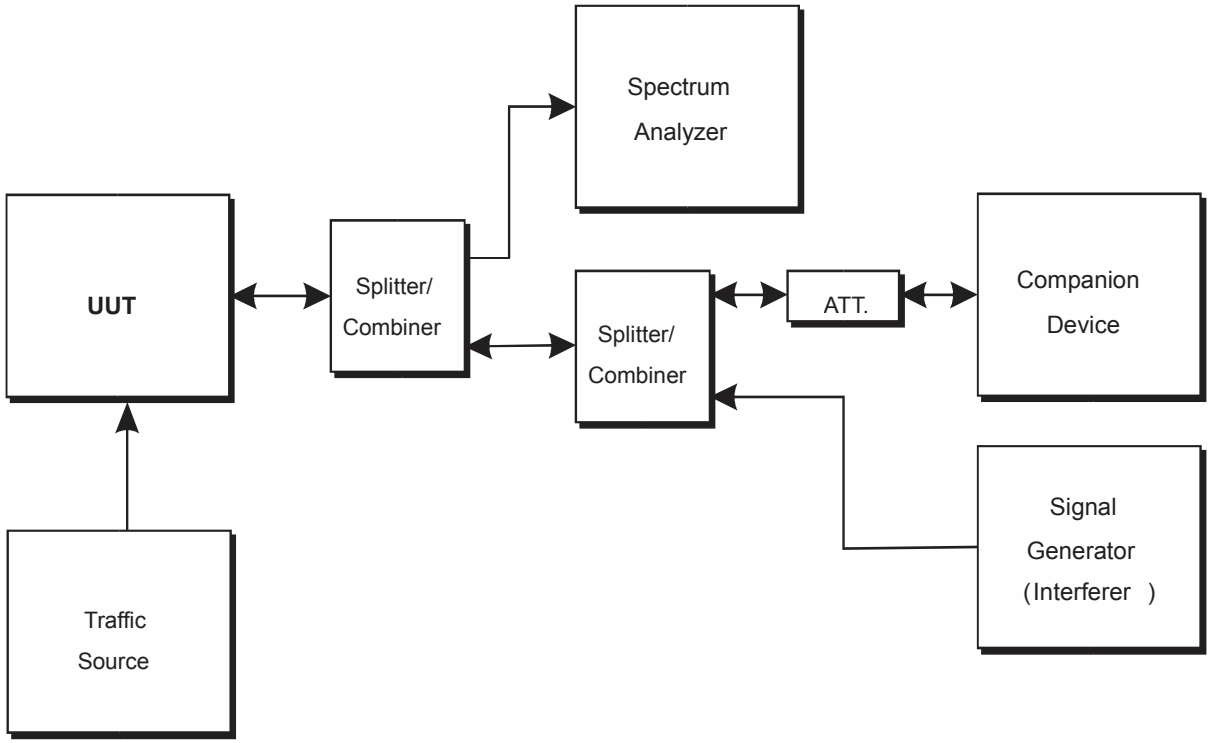
(Diagram 3)

4.5.3 For Dynamic Frequency Selection (DFS) Test

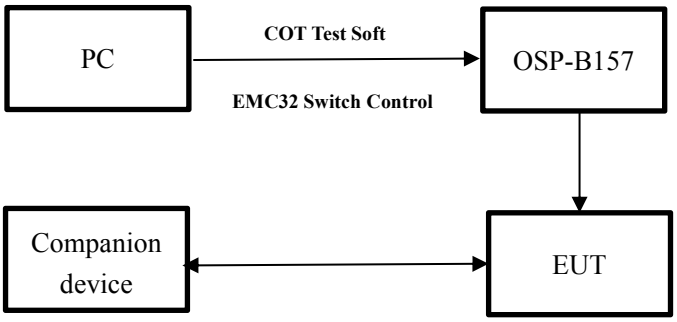


(Diagram 4)

4.5.4 For Adaptivity Test

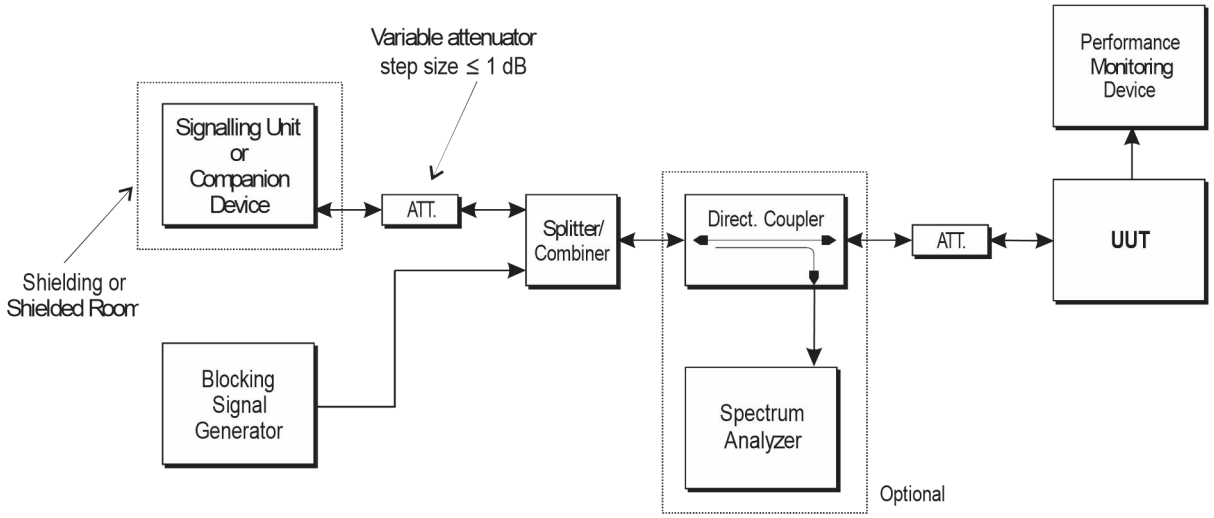


(Diagram 5)



(Diagram 6)

4.5.5 For Receiver Blocking Test



(Diagram 7)

5 Test Type and Test Results

5.1 Transmitter Parameters

5.1.1 Centre frequencies

5.1.1.1 Limit

The Nominal Centre Frequencies (fc) for a Nominal Channel Bandwidth of 20 MHz are defined by equation (1).

$$f_{cn} = 5\ 160 + (g \times 20)\ \text{MHz, where } 0 \le g \le 9 \text{ or } 16 \le g \le 27 \qquad (1)$$

A maximum offset of the Nominal Centre Frequency of ± 200 kHz is permitted. Where the manufacturer decides to make use of this frequency offset, the manufacturer shall declare the actual centre frequencies used by the equipment. (See clause 5.4.1, item a).

The actual centre frequency for any given channel shall be maintained within the range fc ± 20 ppm.

Equipment may have simultaneous transmissions on more than one Operating Channel with a Nominal Channel Bandwidth of 20 MHz.

5.1.1.2 Test Setup

The section 4.4.1 (Diagram 1) test setup description was used for this test.

5.1.1.3 Test Procedure

Reference to ETSI EN 301 893 V2.1.1 clause 5.4.2.2

5.1.1.4 Test Result

Please refer to ANNEX A.1.

5.1.2 Nominal Channel Bandwidth and Occupied Channel Bandwidth

5.1.2.1 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 (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.

5.1.2.2 Test Setup

The section 4.4.1 (Diagram 1) test setup description was used for this test.

5.1.2.3 Test Procedure

Reference to ETSI EN 301 893 V2.1.1 clause 5.4.3.2

5.1.2.4 Test Result

Please refer to ANNEX A.2.

5.1.3 RF output power

5.1.3.1 Limit

The RF Output Power is the mean equivalent isotropically radiated power (e.i.r.p.) during a transmission burst.

Transmit Power Control (TPC) is a mechanism to be used by the RLAN device to ensure a mitigation factor of at least 3 dB on the aggregate power from a large number of devices. This requires the RLAN device to have a TPC range from which the lowest value is at least 6 dB below the values for mean e.i.r.p. given in table 1 for devices with TPC.

Limits for RF output power at the highest power level

Frequency range (MHz)	Mean e.i.r.p. limit (dBm)	
	With TPC	Without TPC
5150 to 5350	23	20/23(see note 1)
5470 to 5725	30(see note 2)	27(see note 2)

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]: Slave devices without a Radar Interference Detection function shall comply with the limits for the band 5 250 MHz to 5 350 MHz.

Limit for RF output power at the lowest power level of the TPC range

Frequency range (MHz)	Mean e.i.r.p. limit (dBm)
5250 to 5350	17
5470 to 5725	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.

5.1.3.2 Test Setup

The section 4.4.1 (Diagram 1) test setup description was used for this test.

5.1.3.3 Test Procedure

Reference to ETSI EN 301 893 V2.1.1 clause 5.4.4.2.1.1 and clause 5.4.4.2.1.2.

5.1.3.4 Test Result

Please refer to ANNEX A.3.

5.1.4 Power density

5.1.4.1 Limit

The Power Density is the mean equivalent isotropically radiated power (e.i.r.p.) density during a transmission burst.

Transmit Power Control (TPC) is a mechanism to be used by the RLAN device to ensure a mitigation factor of at least 3 dB on the aggregate power from a large number of devices. This requires the RLAN device to have a TPC range from which the lowest value is at least 6 dB below the values for mean e.i.r.p. given in table 1 for devices with TPC.

Frequency range (MHz)	Mean e.i.r.p. density limit (dBm/MHz)	
	With TPC	Without TPC
5150 to 5350	10	7/10(see Note [1])
5470 to 5725	17(see Note [2])	14(see Note [2])

Note [1]: 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 [2]: Slave devices without a Radar Interference Detection function shall comply with the limits for the band 5 250 MHz to 5 350 MHz.

5.1.4.2 Test Setup

The section 4.4.1 (Diagram 1) test setup description was used for this test.

5.1.4.3 Test Procedure

Reference to ETSI EN 301 893 V2.1.1 clause 5.4.4.2.1.3

5.1.4.4 Test Result

Please refer to ANNEX A.4.

5.1.5 Transmitter unwanted emissions outside the 5 GHz RLAN bands

5.1.5.1 Limit

The level of transmitter unwanted emissions outside the 5 GHz RLAN bands shall not exceed the limits given in next table.

In case of equipment with antenna connectors, these limits apply to emissions at the antenna port (conducted) and to the emissions radiated by the cabinet. In case of integral antenna equipment (without temporary antenna connectors), these limits apply to emissions radiated by the equipment.

Frequency range	Maximum power (dBm)	Bandwidth
30 MHz to 47 MHz	-36	100 kHz
47 MHz to 74 MHz	-54	100 kHz
74 MHz to 87.5 MHz	-36	100 kHz
87.5 MHz to 118 MHz	-54	100 kHz
118 MHz to 174 MHz	-36	100 kHz
174 MHz to 230 MHz	-54	100 kHz
230 MHz to 470 MHz	-36	100 kHz
470 MHz to 862 MHz	-54	100 kHz
862 MHz to 1 GHz	-36	100 kHz
1 GHz to 26 GHz	-30	1 MHz

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

5.1.5.2 Test Setup

See the section 4.4.1 and 4.4.2 (Diagram 1, 2, 3) for test setup description..

5.1.5.3 Test Procedure

Reference to ETSI EN 301 893 V2.1.1 clause 5.4.5.2

5.1.5.4 Test Result

Please refer to ANNEX A.5.

5.1.6 Transmitter unwanted emissions within the 5 GHz RLAN bands

5.1.6.1 Limit

The average level of the transmitted spectrum shall not exceed the limits given in the following figure:

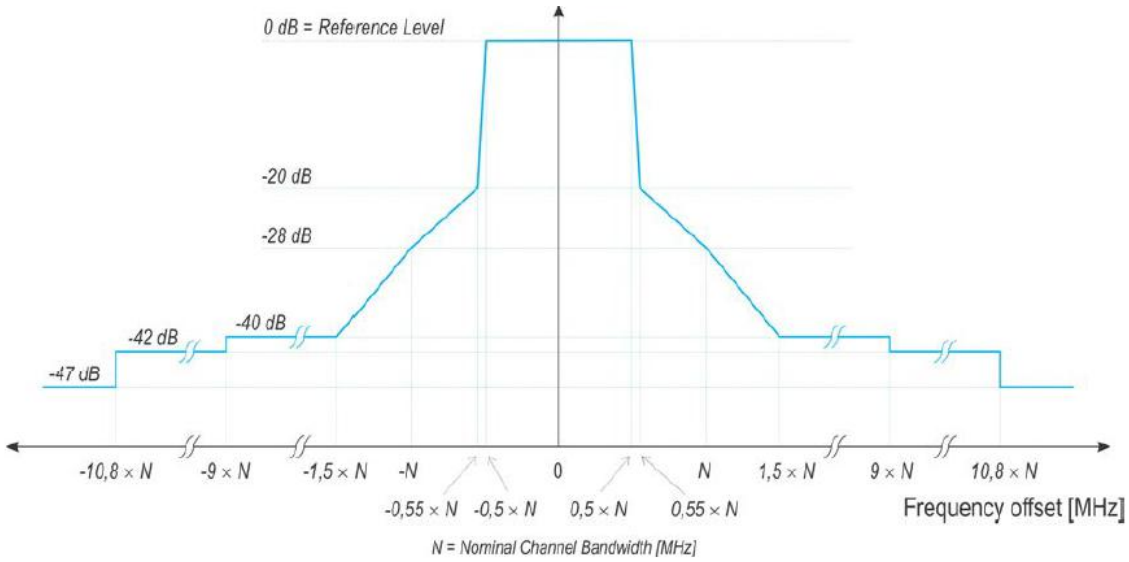


Figure 1: Transmit mask

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

5.1.6.2 Test Setup

The section 4.4.1 (Diagram 1) test setup description was used for this test.

5.1.6.3 Test Procedure

Reference to ETSI EN 301 893 V2.1.1 clause 5.4.6.2

5.1.6.4 Test Result

Please refer to ANNEX A.6.

5.2 Receiver Parameters

5.2.1 Receiver Spurious Emissions

5.2.1.1 Limit

Receiver spurious emissions are emissions at any frequency when the equipment is in receive mode.

The spurious emissions of the transmitter shall not exceed the values in following tables for the EUT in this report.

Frequency range	Maximum power (dBm)	Bandwidth
30 MHz to 1 GHz	-57	100 KHz
1 GHz to 12.75 GHz	-47	1 MHz

5.2.1.2 Test Setup

See the section 4.4.1 (Diagram 1) for test setup description.

5.2.1.3 Test Procedure

Reference to ETSI EN 301 893 V2.1.1 clause 5.4.7.2

5.2.1.4 Test Result

Please refer to ANNEX A.7.

5.2.2 Dynamic Frequency Selection (DFS)

5.2.2.1 Limit

The manufacturer shall state whether the UUT is capable of operating as a Master and/or a Slave. If the UUT is capable of operating in more than one operating mode then each operating mode shall be tested separately. See tables A for the applicability of DFS requirements for each of the operational modes.

Requirement	Operational Mode		
	Master	Slave (without radar detection)	Slave (with radar detection)
Channel Availability Check	Required	Not required	Required (see Note 2)
Off-Channel CAC (see note 1)	Required	Not required	Required (see Note 2)
In-Service Monitoring	Required	Not required	Required
Channel Shutdown	Required	Required	Required
Non-Occupancy Period	Required	Not required	Required
Uniform Spreading	Required	Not required	Not required
Note [1]: Where implemented by the manufacturer. Note [2]: A slave with radar detection is not required to perform a CAC or 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 and the Non-Occupancy Period resulting from this detection has elapsed.			

The radar detection requirements specified in clauses 4.2.6.2.2 to 4.2.6.2.4 assume that the centre frequencies of the radar signals fall within the central 80 % of the Occupied Channel Bandwidth of the RLAN channel.

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 Channel Availability Check Time 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 Off-Channel CAC Time shall be within the range 1 hour to 24 hours.	

Interference threshold values

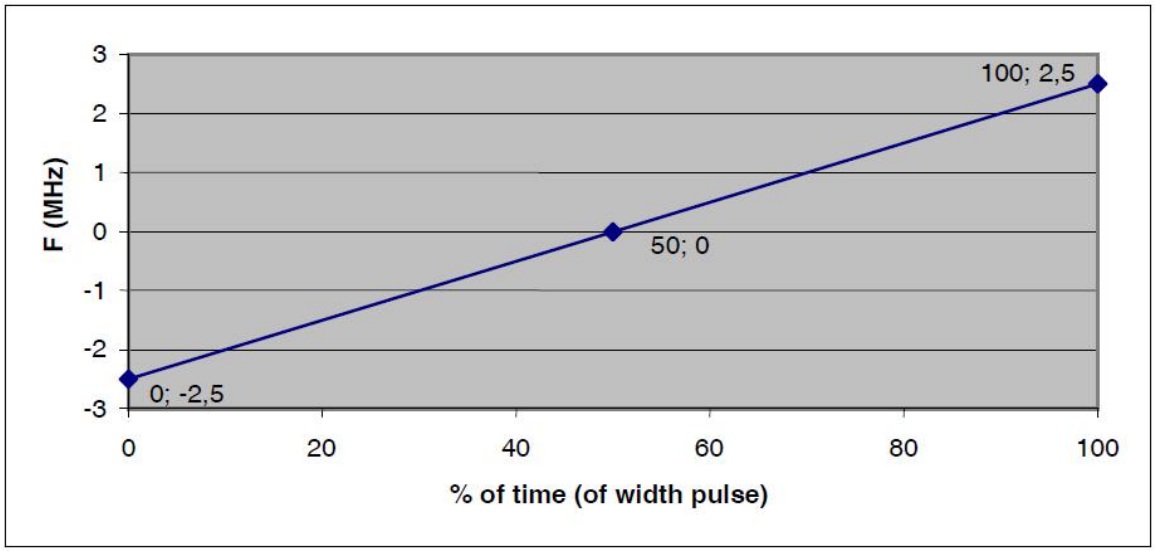
e.i.r.p. Spectral Density (dBm/MHz)	Value (see Note 1&2)
10	-62 dBm
Note 1: This is the level at the input of the receiver of an RLAN device with a maximum e.i.r.p. density of 10 dBm/MHz and assuming a 0 dBi receive antenna. For devices employing different e.i.r.p. spectral density and/or a different 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 less than -64 dBm assuming a 0 dBi receive antenna gain. Note 2: Slave devices with a maximum e.i.r.p. of less than 23 dBm do not have to implement radar detection unless these devices are used in fixed outdoor point to point or fixed outdoor point to multipoint applications (see clause 4.2.6.1.3).	

Parameters of the reference DFS test signal

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

Parameters of radar test signals

Radar test signal # (see Note 1 to Note 3)	Pulse width W [μs]		Pulse repetition frequency PRF (PPS)		Number of different PRFs	Pulses per burst for each PRF (PPB) (see Note 5)
	Min	Max	Min	Max		
1	0.5	5	200	1000	1	10 (see Note 6)
2	0.5	15	200	1600	1	15 (see Note 6)
3	0.5	15	2300	4000	1	25
4	20	30	2000	4000	1	20
5	0.5	2	300	400	2/3	10 (see Note 6)
6	0.5	2	400	1200	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 ±2,5 MHz frequency deviation which is described below.						



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

Note [4]: Apart for the Off-Channel CAC testing, the radar test signals above shall only contain a single burst of pulses. See figure D.1, figure D.3 and figure D.4. For the Off-Channel CAC testing, repetitive bursts shall be used for the total duration of the test.

See figure D.2 and figure D.5. See also clause 4.2.6.2.3, clause 5.4.8.2.1.4.2 and clause 5.4.8.2.1.4.3.

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

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

Detection probability

Parameter	Detection Probability (Pd)	
	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: Pd gives the probability of detection per simulated radar burst and represents a minimum level of detection performance under defined conditions. Therefore Pd does not represent the overall detection probability for any particular radar under real life conditions.		

5.2.2.2 Test Setup

See the section 4.4.3 (Diagram 4) for test setup description.

5.2.2.3 Test Procedure

The measured channel shall test with the lowest and highest bandwidth. The radar signal was the same as transmitted channels, and injected into the antenna port of AP (master) with radar signal, measured the channel shutdown. The slave transmitted the test data to master.

Specific test procedure please reference to ETSI EN 301 893 V2.1.1 clause 5.4.8.2

5.2.2.4 Test Result

Please refer to ANNEX A.8.

5.2.3 Adaptivity (Channel Access Mechanism)

5.2.3.1 Priority Classes

Table 8 each contain four different sets of Channel Access parameters for Supervised Devices respectively, resulting in different Priority Classes and different maximum Channel Occupancy Times.

If a Channel Occupancy consists of more than one transmission the transmissions may be separated by gaps. The
Channel Occupancy Time is the total duration of all transmissions and all gaps of 25 μs duration or less within a Channel Occupancy and shall not exceed the maximum Channel Occupancy Time in table 8. The duration from the start of the first transmission within a Channel Occupancy until the end of the last transmission in that same Channel Occupancy shall not exceed 20 ms.

Table 8: Priority Class dependent Channel Access parameters for Supervised Devices

Class #	P_0	CW_{min}	CW_{max}	Maximum Channel Occupancy Time (COT)
4	2	3	7	2 ms
3	2	7	15	4 ms
2	3	15	1 023	6 ms (see note 1)
1	7	15	1 023	6 ms (see note 1)

NOTE 1: The maximum Channel Occupancy Time (COT) of 6 ms may be increased to 8 ms by inserting one or more pauses. The minimum duration of a pause shall be 100 μs. The maximum duration (Channel Occupancy) before including any such pause shall be 6 ms. Pause duration is not included in the channel occupancy time.
NOTE 2: The values for p0, CWmin, CWmax are minimum values. Greater values are allowed.

5.2.3.2 Limit

This requirement applies to equipment, testing shall be performed using the combination/grouping of 20 MHz operating channels. The manufacturer shall state whether the UUT is capable of operating as a Frame Based Equipment or Load Based Equipment. See tables for the applicability of adaptive requirements and limit for each of the operational modes.

Applicability of adaptive requirements and limit

Requirement	Initiating Device Channel Access Mechanism	
	Frame Based Equipment	Load Based Equipment
Periods	1ms ~ 10ms (see note 1)	1ms ~ 10ms (see note 1)
Maximum Channel Occupancy Time (COT)	(see note 2)	See Table 8
Minimum Idle Period	5 % COT and within 100 μs	5 % COT and within 100 μs
Clear Channel Assessment (CCA)	16 μs	9μs<; <16μs
Short Control Signaling	Note 3	Note 3
Note 1: Declared by the manufacturer. Note 2: Different Priority Classes has different limit, please reference to table 8. Note 3: Within an observation period of 50 ms, the number of Short Control Signaling Transmissions by the equipment shall be equal to or less than 50ms, the total duration of the equipment's Short Control Signaling Transmissions shall be less than 2 500 μs within said observation period.		

Interference Signals used for Adaptivity Tests

Interference Signals Type	Bandwidth (MHz)	Descriptions
AWGN	20	Note 1
OFDM	20	
LTE	20	
Note 1: All of interference signals shall be a continuous (100 % duty cycle), the OFDM signal as defined in IEEE 802.11™-2016 [9], clause 17 and the LTE-type signal as described in ETSI TS 136 141 [8], clause 6.1.1.1.		

Interference threshold level

	The maximum transmit power (P_H)	Threshold level (TL) (see notes 1)
Option1	--	-75 dBm / MHz
Option2	$P_H \leq$ 13 dBm	-75 dBm / MHz
	13 dBm < P_H < 23 dBm	-85 dBm/MHz + (23 dBm - PH)
	$P_H \geq$ 23 dBm	-85 dBm/MHz
Note 1: The ED Threshold Level (TL), at the input of the receiver, shall be proportional to the maximum transmit power (PH) according to the formula which assumes a 0 dBi receive antenna and PH to be specified in dBm e.i.r.p.		

Test Setup

See the section 4.5.4 (Diagram 5) for test setup description.

For Maximum Channel Occupancy Time (COT) and minimum idle time

Please the section 4.5.4 (Diagram 6) for test setup description.

5.2.3.3 Test Procedure

Reference to ETSI EN 301 893 V2.1.1 clause 5.4.9.2

For Maximum Channel Occupancy Time (COT) and minimum idle time

Step 1: Connect to EUT according to diagram 6

Step 2: Make sure the EUT have traffic with a companion device

Step 3: EMC32 software was only used for controlling the test path (OSP-B157) to power sensor

Step 4: Running the COT Test soft by setting suitable time to monitor and record the COT and Idle time

Step 5: Record the test data

5.2.3.4 Test Result

Please refer to ANNEX A.9.

5.2.4 Receiver Blocking

5.2.4.1 Limit

While maintaining the minimum performance criteria as defined in clause 4.2.8.3, the blocking levels at specified frequency offsets shall be equal to or greater than the limits defined in table 9.

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	5100	-53	-59	Continuous Wave
Pmin + 6 dB	4900 5000 5975	-47	-53	Continuous Wave
NOTE 1: Pmin 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.				

5.2.4.2 Test Setup

See the section 4.4.5 (Diagram 7) for test setup description.

5.2.4.3 Test Procedure

Reference to ETSI EN 301 893 V2.1.1 clause 5.4.10.2

5.2.4.4 Test Result

Please refer to ANNEX A.10.

5.2.5 User Access Restrictions

5.2.5.1 Definition

User Access Restrictions are restraints implemented in the RLAN to restrict access for the user to certain hardware and/or software settings of the equipment.

5.2.5.2 Requirement

DFS controls (hardware or software) related to radar detection shall not be accessible to the user so that the DFS requirements described in clauses 4.2.6.2.1 to 4.2.6.2.4 can neither be disabled nor altered.

5.2.5.3 Test Result

Please refer to section 3 note[1].

5.2.6 Geo-location capability

5.2.6.1 Definition

This requirement only applies to equipment with geo-location capability

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.

5.2.6.2 Requirement

The geographical location determined by the equipment as defined in clause 4.2.10.3 shall not be accessible to the user.

5.2.6.3 Test Result

Please refer to section 3 note[1].

ANNEX A TEST RESULT

A.1 Centre frequencies

Measuring Parameter

Centre Frequency	The centre frequency of the channel under test
RBW (MHz)	100 kHz
VBW (MHz)	300 kHz
Span (MHz)	20 MHz (for 20 MHz channel), 40 MHz (for 40 MHz channel) 80MHz（For 80MHz channel）
Detector mode	RMS
Sweep Point	30000
Trace mode	Max Hold
Sweep time	1s
Test Method	☐ Radiated ☒ Conducted

Test Data

Modulation Mode		802.11a			
Sub-band		Low band			
Limit		±20 ppm			
Test Result					
Test Conditions		Carrier Centre Frequencies f_c (MHz)			
Temperature	Voltage	Low Channel		High Channel	
		Frequency (MHz)	ppm	Frequency (MHz)	ppm
NT	NV	5179.946810	10.27	5239.944291	10.63
LT	LV	5179.946815	10.27	5239.944299	10.63
	HV	5179.946821	10.28	5239.944308	10.64
HT	LV	5179.946821	10.28	5239.944317	10.65
	HV	5179.946829	10.29	5239.944326	10.65
Test Verdict		Pass			

Modulation Mode		802.11ac(20 MHz)			
Sub-band		Low band			
Limit		±20 ppm			
Test Result					
Test Conditions		Carrier Centre Frequencies f_c (MHz)			
Temperature	Voltage	Low Channel		High Channel	
		Frequency (MHz)	ppm	Frequency (MHz)	ppm
NT	NV	5179.946541	10.32	5239.948790	9.77
LT	LV	5179.946546	10.33	5239.948792	9.78
	HV	5179.946550	10.33	5239.948794	9.78
HT	LV	5179.946556	10.34	5239.948803	9.79
	HV	5179.946561	10.34	5239.948806	9.79
Test Verdict		Pass			

Modulation Mode		802.11ac(40 MHz)			
Sub-band		Low band			
Limit		±20 ppm			
Test Result					
Test Conditions		Carrier Centre Frequencies f_c (MHz)			
Temperature	Voltage	Low Channel		High Channel	
		Frequency (MHz)	ppm	Frequency (MHz)	ppm
NT	NV	5239.948790	9.77	5229.948790	9.79
LT	LV	5239.948790	9.78	5229.948799	9.79
	HV	5239.948797	9.79	5229.948805	9.80
HT	LV	5239.948797	9.80	5229.948807	9.80
	HV	5239.948802	9.81	5229.948810	9.81
Test Verdict		Pass			

Modulation Mode		802.11ac(80 MHz)	
Sub-band		Low band	
Limit		±20 ppm	
Test Result			
Test Conditions		Carrier Centre Frequencies f_c (MHz)	
Temperature	Voltage	Low Channel	
		Frequency (MHz)	ppm
NT	NV	5209.952750	9.07
LT	LV	5209.952758	9.07
	HV	5209.952759	9.08
HT	LV	5209.952764	9.09
	HV	5209.952769	9.09
Test Verdict		Pass	

A.2 Nominal Channel Bandwidth and Occupied Channel Bandwidth

Measuring Parameter

Centre Frequency	The centre frequency of the channel under test
RBW (MHz)	100 kHz
VBW (MHz)	300 kHz
Span (MHz)	40 MHz (for 20 MHz channel), 80 MHz (for 40 MHz channel) 160MHz（For 80MHz channel）
Detector mode	RMS
Trace mode	Max Hold
Sweep time	2s
Test Method	☐ Radiated ☒ Conducted

Test Data

Modulation Mode		802.11a			
Limit		16~20 MHz			
Test Result					
Test Conditions		Occupied Bandwidth (MHz)			
Temperature	Voltage	Low Sub-band		/	
		Low Channel	High Channel	/	/
NT	NV	16.4	16.4	/	/
Test Verdict		Pass			

Modulation Mode		802.11ac(20MHz)			
Limit		16~20 MHz			
Test Result					
Test Conditions		Occupied Bandwidth (MHz)			
Temperature	Voltage	Low Sub-band		/	
		Low Channel	High Channel	/	/
NT	NV	17.6	17.6	/	/
Test Verdict		Pass			

Modulation Mode		802.11ac(40MHz)			
Limit		32~40 MHz			
Test Result					
Test Conditions		Occupied Bandwidth (MHz)			
Temperature	Voltage	Low Sub-band		/	
		Low Channel	High Channel	/	/
NT	NV	36.2	36.2	/	/
Test Verdict		Pass			

Modulation Mode		802.11ac(80MHz)			
Limit		64~80 MHz			
Test Result					
Test Conditions		Occupied Bandwidth (MHz)			
Temperature	Voltage	Low Sub-band		/	
		Low Channel	/	/	/
NT	NV	75.6	/	/	/
Test Verdict		Pass			

A.3 RF output power

Test Data

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]: This product does not support TPC function.

Modulation Mode			802.11a			
Limit	Low Sub-band		20/23(see note 1) dBm			
	High Sub-band		27 dBm			
Test Result						
Test Method	Test Conditions		EIRP (dBm)			
	Temperature	Voltage	Low Sub-band		/	
			Low Channel	High Channel	/	/
☐ Radiated	NT	NV	20.5	20.7	/	/
☒ Conducted	LT	LV	20.5	20.6	/	/
		HV	20.4	20.7	/	/
	HT	LV	20.5	20.5	/	/
		HV	20.3	20.7	/	/
Test Verdict			Pass			

Modulation Mode			802.11ac(20 MHz)			
Limit	Low Sub-band		20/23(see note 1) dBm			
	High Sub-band		27 dBm			
Test Result						
Test Method	Test Conditions		EIRP (dBm)			
	Temperature	Voltage	Low Sub-band		/	
			Low Channel	High Channel	/	/
☐ Radiated	NT	NV	20.6	20.7	/	/
☒ Conducted	LT	LV	20.5	20.6	/	/
		HV	20.6	20.7	/	/
	HT	LV	20.4	20.5	/	/
		HV	20.6	20.7	/	/
Test Verdict			Pass			

Modulation Mode			802.11ac(40 MHz)			
Limit	Low Sub-band		20/23(see note 1) dBm			
	High Sub-band		27 dBm			
Test Result						
Test Method	Test Conditions		EIRP (dBm)			
	Temperature	Voltage	Low Sub-band		/	
			Low Channel	High Channel	/	/
☐ Radiated	NT	NV	22.6	22.6	/	/
☒ Conducted	LT	LV	22.5	22.6	/	/
		HV	22.6	22.5	/	/
	HT	LV	22.4	22.6	/	/
		HV	22.6	22.4	/	/
Test Verdict			Pass			

Modulation Mode			802.11ac(80 MHz)			
Limit	Low Sub-band		20/23(see note 1) dBm			
	High Sub-band		27 dBm			
Test Result						
Test Method	Test Conditions		EIRP (dBm)			
	Temperature	Voltage	Low Sub-band		/	
			Low Channel	/	/	/
☐ Radiated	NT	NV	22.6	/	/	/
☒ Conducted	LT	LV	22.6	/	/	/
		HV	22.5	/	/	/
	HT	LV	22.6	/	/	/
		HV	22.4	/	/	/
Test Verdict			Pass			

A.4 Power density

Measuring Parameter

RBW (MHz)	1 MHz
VBW (MHz)	3 MHz
Sweep points	26000
Detector mode	RMS
Span	40 MHz (for 20 MHz channel), 80 MHz (for 40 MHz channel), 160 MHz (for 80 MHz channel)
Trace mode	Max Hold
Sweep time	Auto
Test Method	☐ Radiated ☒ Conducted

Test Data

Modulation Mode		802.11a			
Limit	Low Sub-band	7 dBm/MHz			
	High Sub-band	10 dBm/MHz			
Test Result					
Test Conditions		Power density (dBm/MHz)			
Temperature	Voltage	Low Sub-band		/	
		Low Channel	High Channel	/	/
NT	NV	9.7	9.8	/	/
Test Verdict		Pass			

Modulation Mode		802.11ac(20 MHz)			
Limit	Low Sub-band	7 dBm/MHz			
	High Sub-band	10 dBm/MHz			
Test Result					
Test Conditions		Power density (dBm/MHz)			
Temperature	Voltage	Low Sub-band		/	
		Low Channel	High Channel	/	/
NT	NV	9.6	9.6	/	/
Test Verdict		Pass			

Modulation Mode		802.11ac(40 MHz)			
Limit	Low Sub-band	7 dBm/MHz			
	High Sub-band	10 dBm/MHz			
Test Result					
Test Conditions		Power density (dBm/MHz)			
Temperature	Voltage	Low Sub-band		/	
		Low Channel	High Channel	/	/
NT	NV	8.4	8.0	/	/
Test Verdict		Pass			

Modulation Mode		802.11ac(80 MHz)			
Limit	Low Sub-band	7 dBm/MHz			
	High Sub-band	10 dBm/MHz			
Test Result					
Test Conditions		Power density (dBm/MHz)			
Temperature	Voltage	Low Sub-band		/	
		Low Channel	/	/	/
NT	NV	5.3	/	/	/
Test Verdict		Pass			

A.5 Transmitter unwanted emissions outside the 5 GHz RLAN bands

Note: The Frequency band was pre-scanned, the harmonic and other spurious which worst frequency are recorded in the report.

Measuring Parameter

Frequency Range		
30 MHz to 1 000 MHz	RBW	100 kHz
	VBW	300 kHz
	Sweep points	9700
	Detector mode	Peak
	Trace mode	Max Hold
1 GHz to 26 GHz	RBW	1 MHz
	VBW	3 MHz
	Sweep points	25000
	Detector mode	Peak
	Trace mode	Max Hold

Conducted Test Data

Modulation Mode	802.11a			
Test Condition	Temperature NT, Voltage NV			
No.	Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)
Transmitter Operating Mode				
Tx:Low Sub-band, Low Channel				
1	63.00	-79.77	-54	25.77
2	175.64	-79.68	-54	25.68
3	741.62	-78.99	-54	24.99
4	4801.42	-60.43	-30	30.43
5	7203.91	-58.38	-30	28.38
6	9605.26	-59.38	-30	29.38
7	12008.32	-57.90	-30	27.90
8	12499.00	-58.17	-30	28.17
Tx: Low Sub-band, High Channel				
1	60.88	-78.85	-54	24.85
2	159.60	-78.53	-36	42.53
3	583.95	-73.05	-54	19.05
4	4802.39	-60.41	-30	30.41
5	7200.84	-58.10	-30	28.10
6	9600.19	-59.23	-30	29.23
7	12004.22	-58.25	-30	28.25
8	12492.00	-57.92	-30	27.92

Modulation Mode	802.11ac(20 MHz)

Test Condition	Temperature NT, Voltage NV			
No.	Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)
Transmitter Operating Mode				
Tx:Low Sub-band, Low Channel				
1	71.41	-78.85	-54	24.85
2	466.47	-78.59	-36	42.59
3	621.71	-77.85	-54	23.85
4	4797.67	-60.91	-30	30.91
5	7202.38	-58.01	-30	28.01
6	9600.81	-59.05	-30	29.05
7	12001.35	-57.76	-30	27.76
8	12498.00	-57.69	-30	27.69
Tx: Low Sub-band, High Channel				
1	53.55	-76.64	-54	22.64
2	403.10	-76.34	-36	40.34
3	535.04	-72.91	-54	18.91
4	4802.65	-61.08	-30	31.08
5	7201.64	-58.49	-30	28.49
6	9601.69	-58.64	-30	28.64
7	12004.80	-58.39	-30	28.39
8	12496.00	-58.22	-30	28.22

Modulation Mode	802.11ac(40 MHz)			
Test Condition	Temperature NT, Voltage NV			
No.	Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)
Transmitter Operating Mode				
Tx:Low Sub-band, Low Channel				
1	30.36	-76.98	-36	40.98
2	325.58	-76.25	-36	40.25
3	709.50	-71.82	-54	17.82
4	4799.69	-60.23	-30	30.23
5	7198.60	-57.65	-30	27.65
6	9602.07	-59.42	-30	29.42
7	12001.83	-58.01	-30	28.01
8	12492.00	-57.93	-30	27.93
Tx: Low Sub-band, High Channel				
1	51.61	-79.83	-54	25.83
2	196.47	-79.80	-54	25.80
3	507.77	-79.35	-54	25.35
4	4801.31	-61.19	-30	31.19
5	7202.21	-58.43	-30	28.43
6	9603.72	-58.60	-30	28.60
7	12006.99	-58.02	-30	28.02
8	12498.00	-57.56	-30	27.56

Modulation Mode	802.11ac(80 MHz)			
Test Condition	Temperature NT, Voltage NV			
No.	Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)
Transmitter Operating Mode				
Tx:Low Sub-band, Low Channel				
1	64.39	-80.43	-54	26.43
2	457.83	-79.68	-36	43.68
3	703.19	-76.50	-54	22.50
4	4802.24	-61.05	-30	31.05
5	7197.69	-58.36	-30	28.36
6	9603.90	-59.02	-30	29.02
7	12007.82	-58.43	-30	28.43
8	12497.00	-58.22	-30	28.22

Cabinet Radiated spurious emission test data

Note: The device was evaluated/tested in XYZ orientation for radiated spurious emissions. And only the worst orientation of EUT was reported, which is the horizontal orientation.

Modulation Mode	802.11a			
Test Condition	Temperature NT, Voltage NV			
No.	Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)
Transmitter Operating Mode				
Tx:Low Sub-band, Low Channel Antenna Polarization: Vertical				
1	37.25	-69.04	-36	33.04
2	237.13	-68.73	-36	32.73
3	471.74	-67.42	-54	13.42
4	4796.17	-41.12	-30	11.12
5	7197.58	-42.28	-30	12.28
6	9602.80	-40.61	-30	10.61
7	12008.86	-38.60	-30	8.60
8	12492.00	-39.24	-30	9.24
Tx:Low Sub-band, Low Channel Antenna Polarization: Horizontal				
1	83.46	-68.31	-36	32.31
2	272.02	-67.71	-36	31.71
3	711.87	-61.64	-54	7.64
4	4802.81	-40.87	-30	10.87
5	7200.94	-42.07	-30	12.07
6	9605.32	-41.33	-30	11.33
7	12004.00	-39.46	-30	9.46
8	12495.00	-39.14	-30	9.14
Tx:Low Sub-band, High Channel Antenna Polarization: Vertical				
1	57.17	-70.84	-54	16.84
2	444.73	-70.24	-36	34.24
3	666.56	-66.42	-54	12.42
4	4802.37	-40.20	-30	10.20
5	7197.97	-41.96	-30	11.96
6	9607.15	-41.24	-30	11.24
7	12003.07	-38.65	-30	8.65
8	12493.00	-38.57	-30	8.57
Tx:Low Sub-band, High Channel Antenna Polarization: Horizontal				
1	57.53	-69.13	-54	15.13
2	215.17	-68.60	-54	14.60
3	682.58	-65.67	-54	11.67
4	4795.42	-40.69	-30	10.69
5	7205.01	-42.34	-30	12.34
6	9605.68	-40.96	-30	10.96
7	12009.02	-39.01	-30	9.01
8	12498.00	-39.32	-30	9.32
Modulation Mode	802.11ac(20 MHz)			

Test Condition	Temperature NT, Voltage NV			
No.	Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)
Transmitter Operating Mode				
Tx:Low Sub-band, Low Channel Antenna Polarization: Vertical				
1	66.03	-67.66	-54	13.66
2	237.6	-67.57	-36	31.57
3	832.22	-65.26	-54	11.26
4	4801.13	-40.50	-30	10.50
5	7202.70	-41.78	-30	11.78
6	9606.79	-40.91	-30	10.91
7	12005.93	-39.20	-30	9.20
8	12491.00	-39.08	-30	9.08
Tx:Low Sub-band, Low Channel Antenna Polarization: Horizontal				
1	98.87	-70.35	-54	16.35
2	217.82	-70.25	-54	16.25
3	516.36	-68.41	-54	14.41
4	4802.94	-41.01	-30	11.01
5	7204.73	-42.06	-30	12.06
6	9606.89	-41.45	-30	11.45
7	12004.88	-38.72	-30	8.72
8	12494.00	-38.74	-30	8.74
Tx:Low Sub-band, High Channel Antenna Polarization: Vertical				
1	80.87	-68.73	-36	32.73
2	152.3	-68.78	-36	32.78
3	835.79	-65.96	-54	11.96
4	4795.32	-41.09	-30	11.09
5	7202.57	-41.54	-30	11.54
6	9602.33	-40.52	-30	10.52
7	12006.02	-39.38	-30	9.38
8	12495.00	-39.18	-30	9.18
Tx:Low Sub-band, High Channel Antenna Polarization: Horizontal				
1	80.34	-67.95	-36	31.95
2	252.37	-67.64	-36	31.64
3	814.59	-62.33	-54	8.33
4	4799.26	-40.73	-30	10.73
5	7198.23	-41.93	-30	11.93
6	9605.24	-40.94	-30	10.94
7	12006.12	-38.94	-30	8.94
8	12500.00	-38.83	-30	8.83

Modulation Mode	802.11ac(40 MHz)			
Test Condition	Temperature NT, Voltage NV			
No.	Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)
Transmitter Operating Mode				
Tx:Low Sub-band, Low Channel Antenna Polarization: Vertical				
1	68.81	-70.40	-54	16.40
2	314.31	-70.41	-36	34.41
3	587.19	-63.90	-54	9.90
4	4799.43	-40.65	-30	10.65
5	7197.81	-42.33	-30	12.33
6	9604.36	-41.39	-30	11.39
7	12008.88	-39.13	-30	9.13
8	12498.00	-38.97	-30	8.97
Tx:Low Sub-band, Low Channel Antenna Polarization: Horizontal				
1	59.74	-69.00	-54	15.00
2	466.95	-68.67	-36	32.67
3	749.39	-68.07	-54	14.07
4	4801.86	-40.37	-30	10.37
5	7198.55	-41.67	-30	11.67
6	9604.26	-40.63	-30	10.63
7	12003.72	-39.36	-30	9.36
8	12496.00	-38.83	-30	8.83
Tx:Low Sub-band, High Channel Antenna Polarization: Vertical				
1	70.74	-67.64	-54	13.64
2	336.97	-67.66	-36	31.66
3	850.01	-61.79	-54	7.79
4	4798.28	-40.44	-30	10.44
5	7201.35	-42.23	-30	12.23
6	9601.41	-41.48	-30	11.48
7	12004.94	-39.14	-30	9.14
8	12499.00	-39.13	-30	9.13
Tx:Low Sub-band, High Channel Antenna Polarization: Horizontal				
1	88.49	-70.27	-54	16.27
2	329.61	-70.33	-36	34.33
3	831.6	-68.92	-54	14.92
4	4798.84	-40.45	-30	10.45
5	7198.49	-41.61	-30	11.61
6	9606.54	-40.94	-30	10.94
7	12007.05	-38.70	-30	8.70
8	12493.00	-38.63	-30	8.63

Modulation Mode	802.11ac(80 MHz)			
Test Condition	Temperature NT, Voltage NV			
No.	Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)
Transmitter Operating Mode				
Tx:Low Sub-band, Low Channel Antenna Polarization: Vertical				
1	44.58	-68.81	-36	32.81
2	438.24	-68.73	-36	32.73
3	510.45	-66.73	-54	12.73
4	4800.10	-40.56	-30	10.56
5	7205.34	-41.70	-30	11.70
6	9599.95	-40.53	-30	10.53
7	12003.48	-38.71	-30	8.71
8	12495.00	-38.74	-30	8.74
Tx:Low Sub-band, Low Channel Antenna Polarization: Horizontal				
1	35.07	-67.80	-36	31.80
2	127.97	-67.73	-36	31.73
3	492.65	-60.64	-54	6.64
4	4799.73	-40.65	-30	10.65
5	7197.26	-42.34	-30	12.34
6	9604.72	-40.53	-30	10.53
7	12008.45	-38.61	-30	8.61
8	12495.00	-39.06	-30	9.06

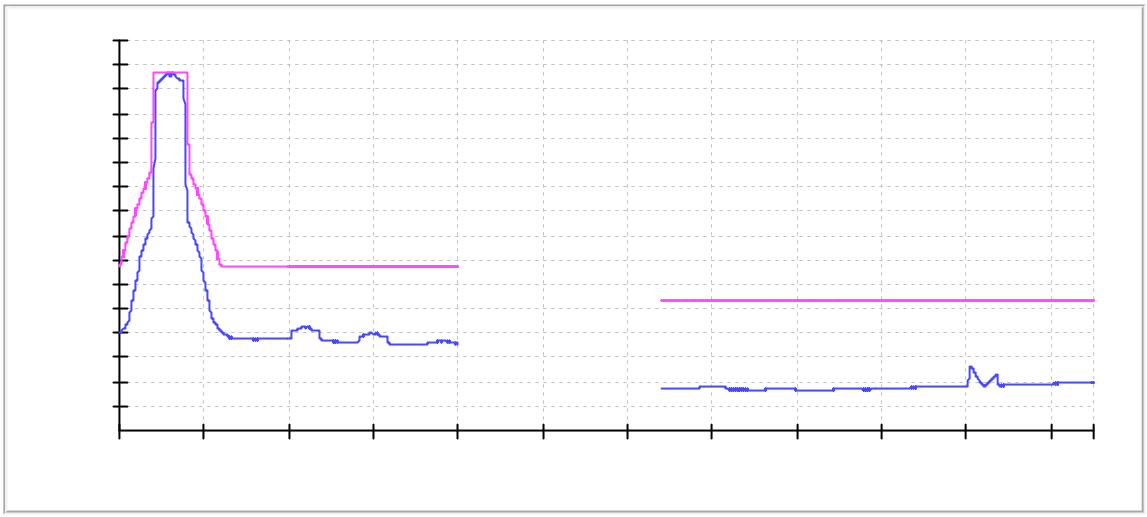
A.6 Transmitter unwanted emissions within the 5 GHz RLAN bands

Measuring Parameter(For equipment with continuous transmission capability)

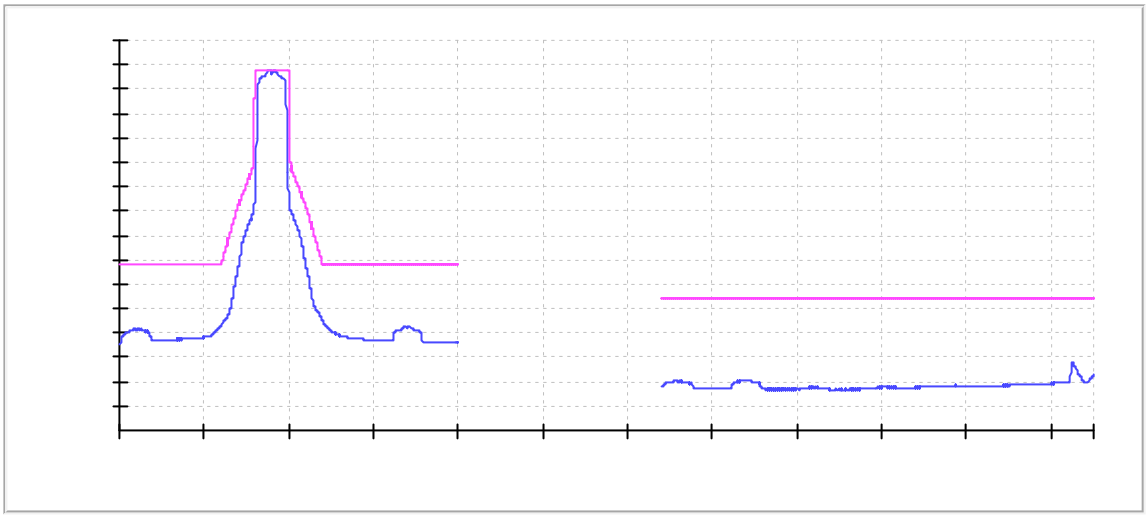
RBW (MHz)	1 MHz
VBW (MHz)	30 kHz
Detector mode	Peak
Trace mode	Video Average
Sweep time	Coupled
Test Method	☐ Radiated ☒ Conducted

Test Plots

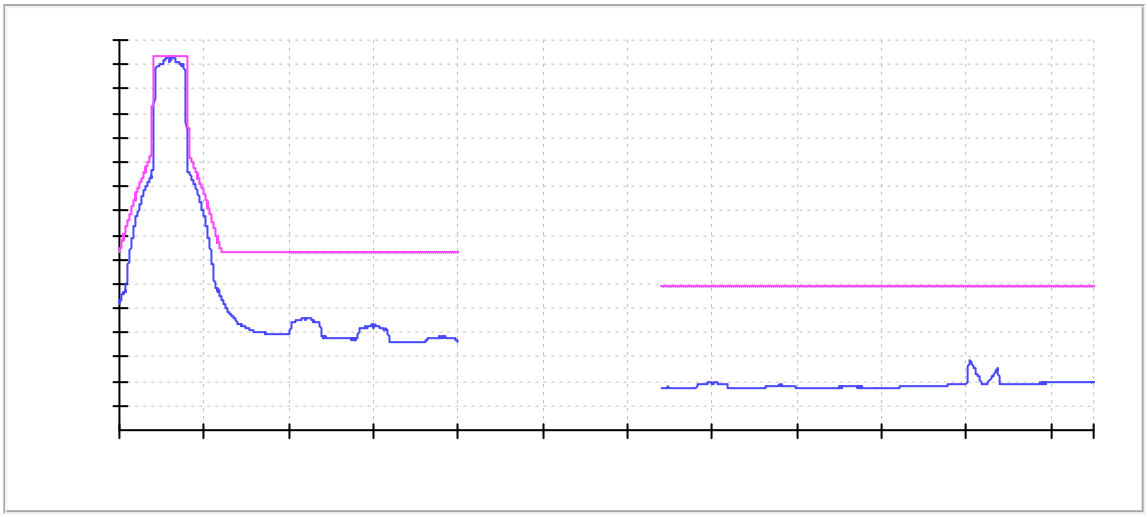
802.11a –Low Sub-band, Low channel



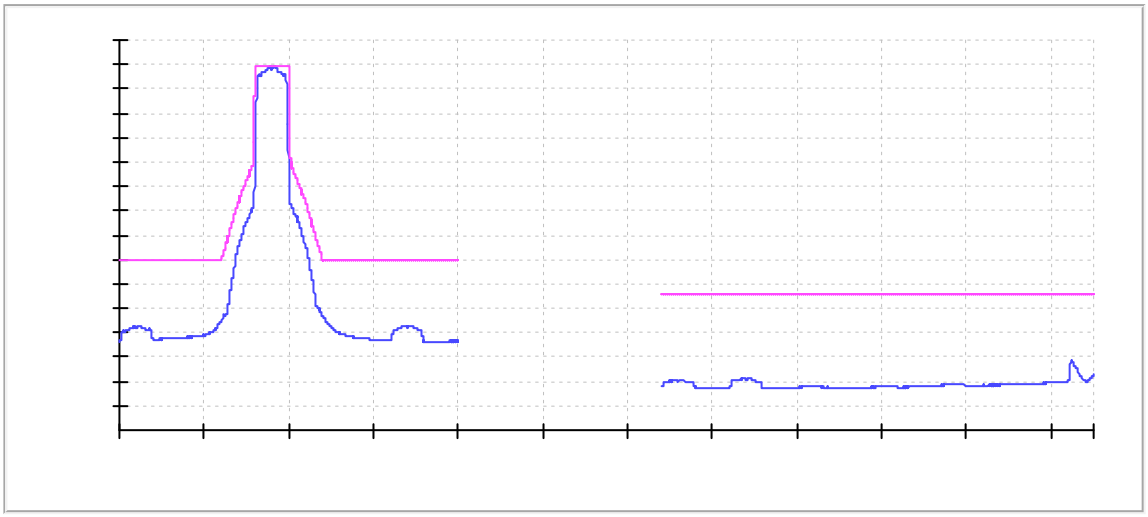
802.11a –Low Sub-band, High channel



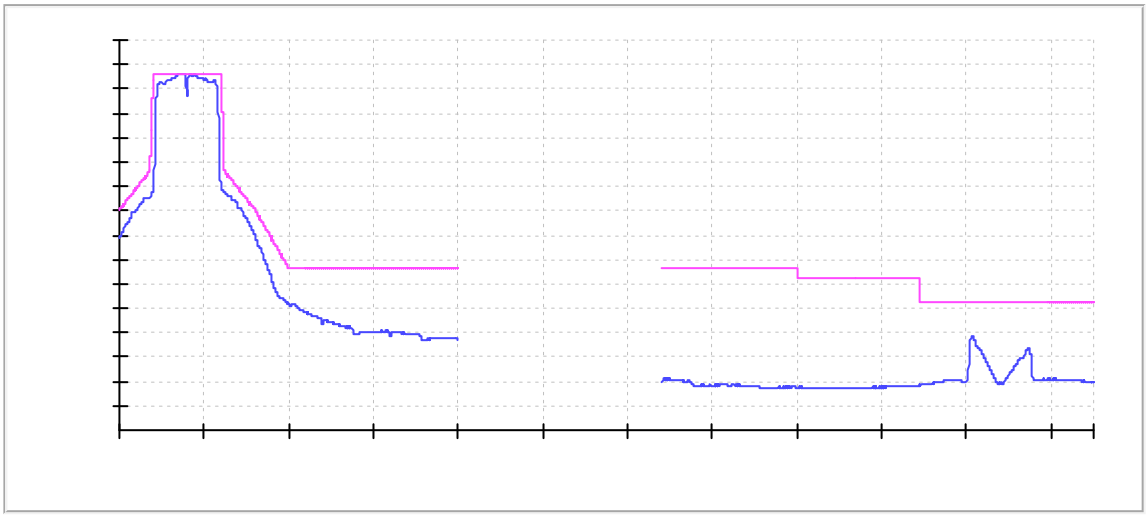
802.11ac(20 MHz) – Low Sub-band, Low channel



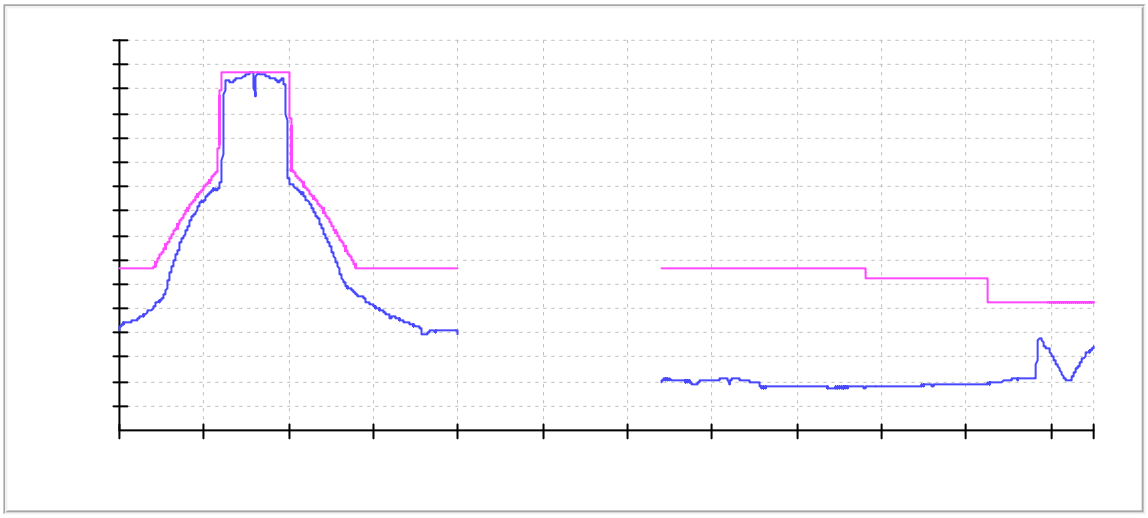
802.11ac(20 MHz) –Low Sub-band, High channel



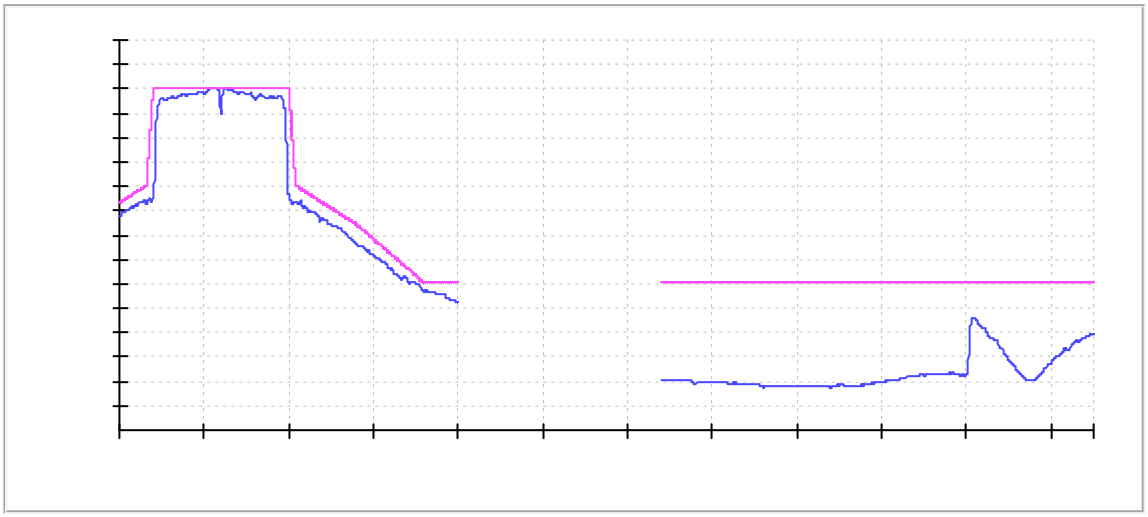
802.11ac(40 MHz) –Low Sub-band, Low channel



802.11ac(40 MHz) –Low Sub-band, High channel



802.11ac(80 MHz) –Low Sub-band, Low channel



A.7 Receiver Spurious Emissions

Note [1]: The test method choose the conducted method. Which power in a specified load (conducted spurious emissions) and their effective radiated power when radiated by the cabinet or structure of the equipment (cabinet radiation).

Note [2]: The Frequency band was pre-scanned, the harmonic and other spurious which worst frequency are recorded in the report.

Measuring Parameter

Frequency Range		
30 MHz to 1 000 MHz	RBW (MHz)	100 kHz
	VBW (MHz)	300 kHz
	Sweep points	9700
	Detector mode	Peak
	Trace mode	Max Hold
1 GHz to 26 GHz	RBW (MHz)	1 MHz
	VBW (MHz)	3 MHz
	Sweep points	25000
	Detector mode	Peak
	Trace mode	Max Hold

Conducted Test Data

Modulation Mode	802.11a			
Test Condition	Temperature NT, Voltage NV			
No.	Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)
Receiver Operating Mode				
Rx:Low Sub-band, Low Channel				
1	75.22	-76.89	-57	19.89
2	311.71	-76.26	-57	19.26
3	776.76	-69.89	-57	12.89
4	4797.48	-70.90	-47	23.90
5	7205.07	-69.49	-47	22.49
6	9607.88	-76.64	-47	29.64
7	12007.38	-71.06	-47	24.06
8	12400.81	-70.96	-47	23.96
Rx:Low Sub-band, High Channel				
1	104.48	-79.24	-57	22.24
2	340.90	-78.64	-57	21.64
3	666.58	-71.39	-57	14.39
4	4797.05	-70.88	-47	23.88
5	7199.93	-68.85	-47	21.85
6	9601.37	-76.45	-47	29.45
7	12009.60	-70.56	-47	23.56
8	12397.19	-71.40	-47	24.40
Modulation Mode	802.11ac(20 MHz)			

Test Condition	Temperature NT, Voltage NV			
No.	Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)
Receiver Operating Mode				
Rx:Low Sub-band, Low Channel				
1	109.51	-80.34	-57	23.34
2	127.52	-79.67	-57	22.67
3	642.94	-73.67	-57	16.67
4	4795.95	-70.59	-47	23.59
5	7200.64	-68.63	-47	21.63
6	9607.02	-76.62	-47	29.62
7	12001.25	-71.10	-47	24.10
8	12399.92	-70.76	-47	23.76
Rx:Low Sub-band, High Channel				
1	82.06	-76.97	-57	19.97
2	123.92	-76.30	-57	19.30
3	503.16	-71.73	-57	14.73
4	4798.35	-71.26	-47	24.26
5	7199.47	-69.23	-47	22.23
6	9603.77	-76.03	-47	29.03
7	12005.10	-70.99	-47	23.99
8	12404.89	-71.34	-47	24.34

Modulation Mode	802.11ac(40 MHz)			
Test Condition	Temperature NT, Voltage NV			
No.	Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)
Receiver Operating Mode				
Rx:Low Sub-band, Low Channel				
1	97.75	-78.56	-57	21.56
2	379.99	-78.46	-57	21.46
3	582.95	-72.75	-57	15.75
4	4796.84	-71.15	-47	24.15
5	7198.08	-69.35	-47	22.35
6	9606.10	-75.82	-47	28.82
7	12004.06	-70.84	-47	23.84
8	12400.7	-70.96	-47	23.96
Rx:Low Sub-band, High Channel				
1	69.92	-80.2	-57	23.2
2	162.65	-79.63	-57	22.63
3	782.47	-77.68	-57	20.68
4	4801.99	-71.41	-47	24.41
5	7203.59	-69.14	-47	22.14
6	9604.44	-76.39	-47	29.39
7	12002.03	-70.68	-47	23.68
8	12402.48	-70.64	-47	23.64

Modulation Mode	802.11ac			
Test Condition	Temperature NT, Voltage NV			
No.	Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)
Receiver Operating Mode				
Rx:Low Sub-band, Low Channel				
1	47.01	-76.45	-57	19.45
2	201.11	-76.29	-57	19.29
3	827.35	-75.28	-57	18.28
4	4802.82	-70.56	-47	23.56
5	7202.51	-69.60	-47	22.60
6	9605.11	-76.17	-47	29.17
7	12006.90	-71.05	-47	24.05
8	12403.63	-71.10	-47	24.10

Cabinet Radiation Test Data

Note [1]: All the configuration were tested, but only the worst data (802.11ac80) were reported in this report.

Note [2]: The device was evaluated/tested in XYZ orientation for radiated spurious emissions. And only the worst orientation of EUT was reported, which is the horizontal orientation.

Test Condition	Temperature NT, Voltage NV			
No.	Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)
Receiver Operating Mode				
Antenna Polarization: Vertical				
1	48.61	-68.65	-57	11.65
2	211.97	-69.49	-57	12.49
3	674.71	-72.48	-57	15.48
4	4801.45	-63.29	-47	16.29
5	7203.53	-59.03	-47	12.03
6	9599.62	-54.89	-47	7.89
7	12001.69	-55.25	-47	8.25
8	12399.19	-55.09	-47	8.09
Antenna Polarization: Horizontal				
1	109.44	-70.28	-57	13.28
2	510.23	-68.81	-57	11.81
3	698.27	-64.52	-57	7.52
4	4799.66	-62.88	-47	15.88
5	7197.17	-59.54	-47	12.54
6	9604.39	-55.33	-47	8.33
7	12001.88	-55.29	-47	8.29
8	12402.5	-54.91	-47	7.91

A.8 Dynamic Frequency Selection (DFS)

Note: Not applicable.

A.9 Adaptivity (Channel Access Mechanism)

List of Measurements

UUT Operational Mode		
Pulse width W [μs]	Pulse repetition frequency PRF [PPS]	Pulses per burst [PPB]
--	√	--

Test Method	Clause	Test Parameter	Remarks	Pass/Fail
☐ Radiated ☒ Conducted	4.8.3.1	Adaptive (Frame Based Equipment)	Not Applicable	N/A
	4.8.3.2	Adaptive (Load Based Equipment)	Applicable	Pass
	4.8.3.3	Short Control Signaling Transmissions	Applicable	Pass

Interference Signals used for Adaptively Tests

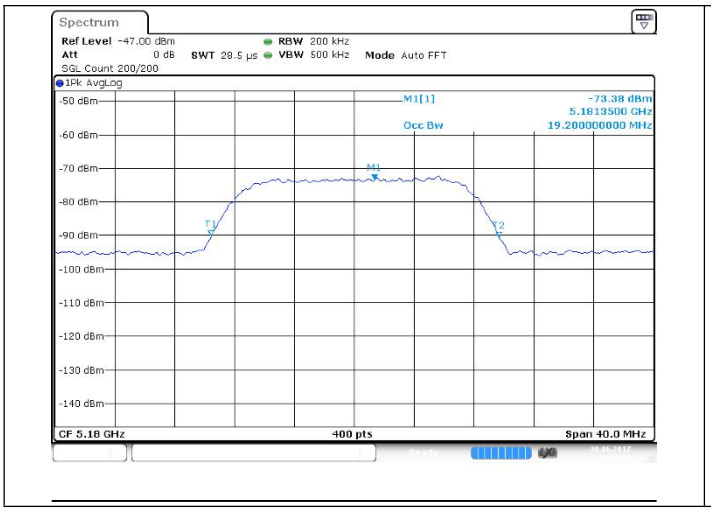
Interference Signals Type	Bandwidth (MHz)	Descriptions
AWGN	20	Note 1
OFDM	20	
LTE	20	
Note 1: The three interference signals was tested, only the worst result of interference signal (AWGN) was shown in the test report.		

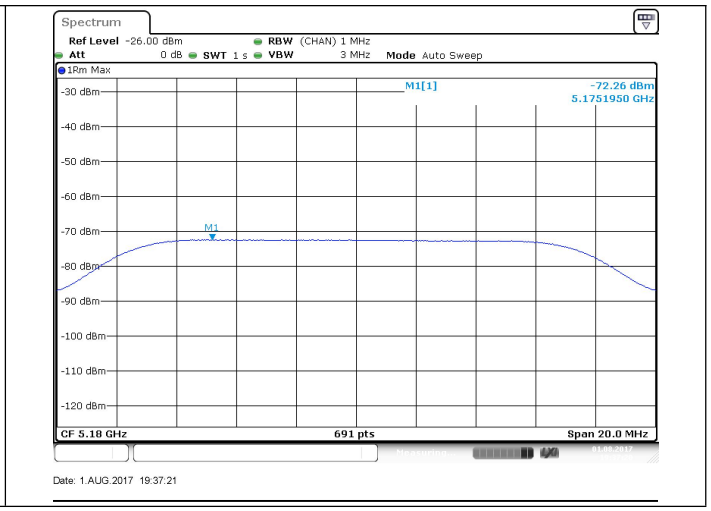
Energy Detection Threshold Level (TL)

Type of equipment	Interference threshold level
☒ Option 1 ☐ Option 2	The ED Threshold level (TL) = -75 dBm/MHz (assumes a 0 dBi receive antenna) and antenna gain is 1.8 dBi. The ED Threshold level (TL) = -75 dBm/MHz + G (1.8 dBi) = -73.2 dBm/MHz

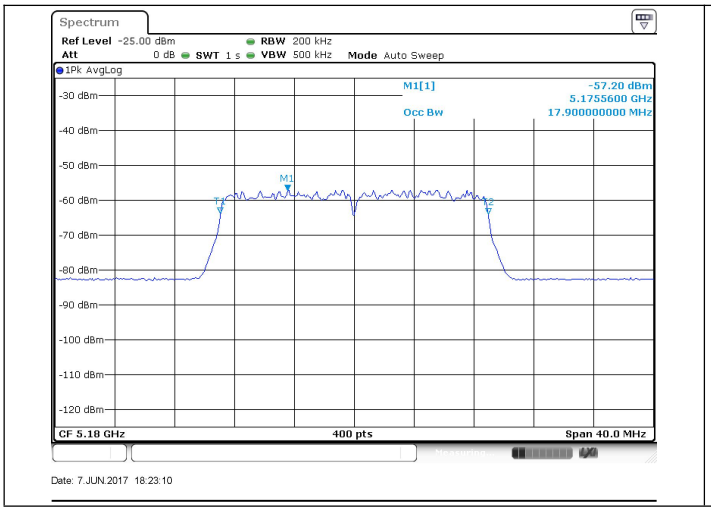
Test plots

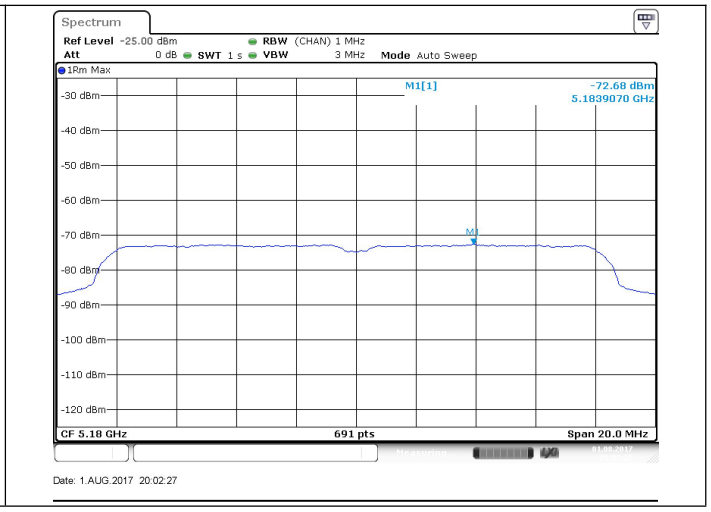
AWGN Signal



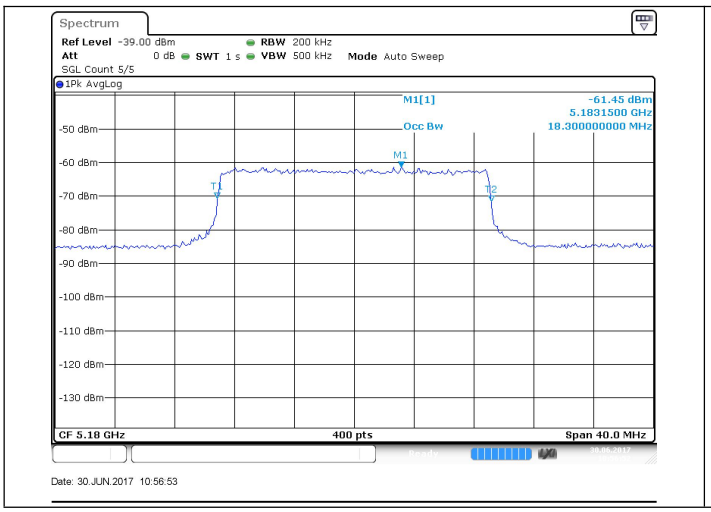


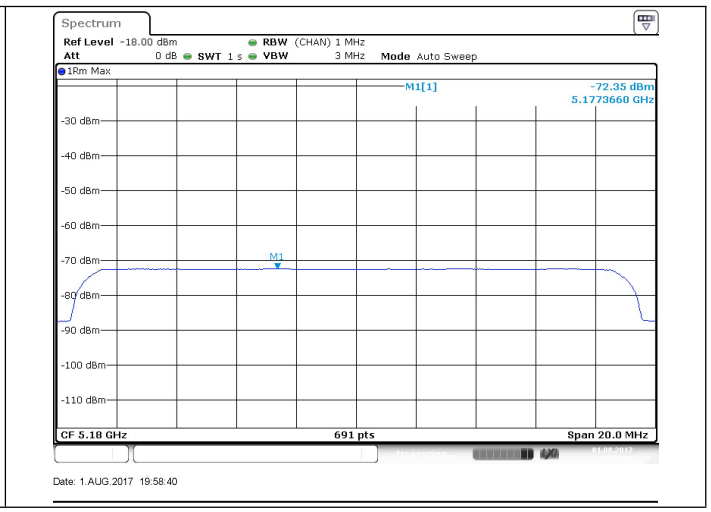
OFDM Signal





LTE Signal





Result of Measurements (For Priority Class 1)

The Maximum Channel Occupancy Time (COT) and Minimum Idle period time

For Supervising Device

Modulation	Frequency (MHz)	Maximum Channel Occupancy Time (ms)	Limit (ms)	Verdict
11a(20MHz)	5180	4.462	6	Pass
11ac(80MHz)	5210	1.822	6	Pass

Modulation	Frequency (MHz)	Minimum Idle Period (us)	Limit (us)	Verdict
11a(20MHz)	5180	35	27	Pass
11ac(80MHz)	5210	43	27	Pass

The COT Times List:

Note: The COT was monitored at least 10000 times, but only the nearly maximum channel occupancy and minimum idle period was list here.

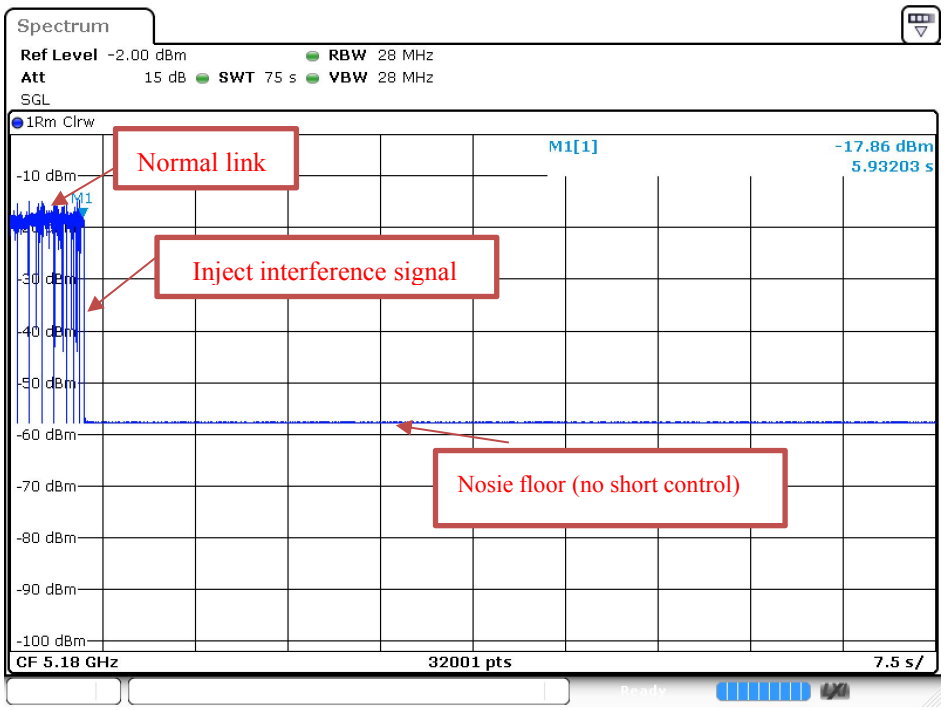
802.11a (20 MHz) Channel 36

NO. of COT	Burst RMS Power (dBm)	Start Time (ms)	Stop Time (ms)	Channel Occupancy Time (ms)	Idle Period (us)
50	18.3	60.416	64.878	**4.462**	161
268	18.9	359.929	359.963	0.034	**35**

802.11ac (80 MHz) Channel 42

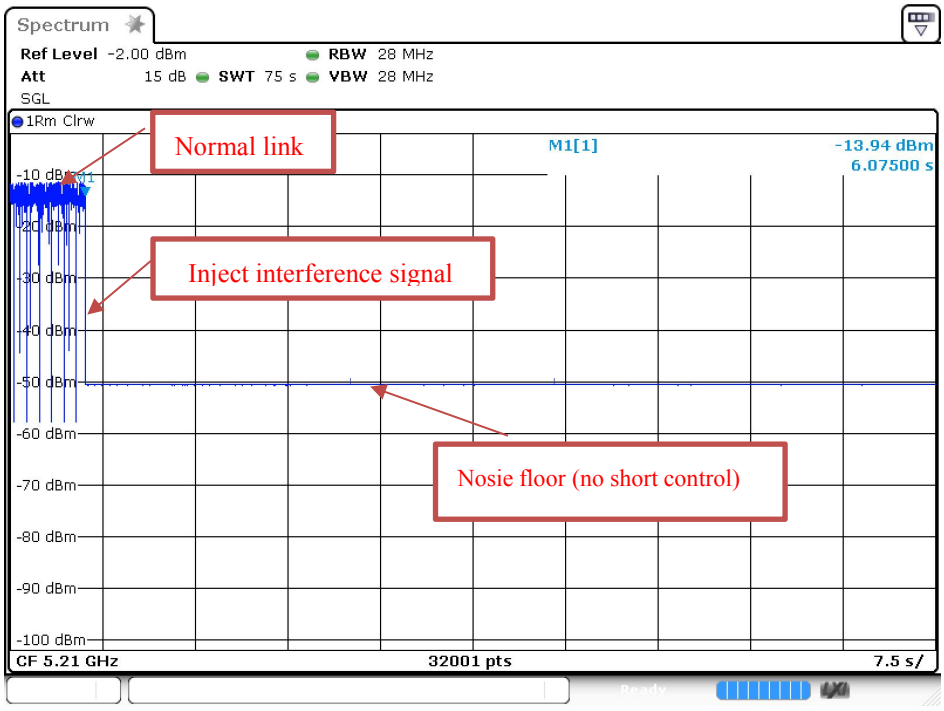
NO. of COT	Burst RMS Power (dBm)	Start Time (ms)	Stop Time (ms)	Channel Occupancy Time (ms)	Idle Period (us)
901	18.10	231.215	231.249	0.034	**43**
3096	15.04	827.164	828.986	**1.822**	268

802.11a(20 MHz) Channel 36



Date: 25.JUL.2017 21:08:13

802.11ac(80 MHz) Channel 42



Date: 25.JUL.2017 21:11:39

A.10 Receiver Blocking

Test Data

Note 1: The combination of the smallest channel bandwidth and the lowest data rate was reported.

Note 2: Pmin = TX Level – cable loss (7 dBm)

Note 3：For conducted measurements, the levels of blocking signal have to be corrected by the actual antenna assembly gain. The actual maximum antenna gain is 2.99 dBi.

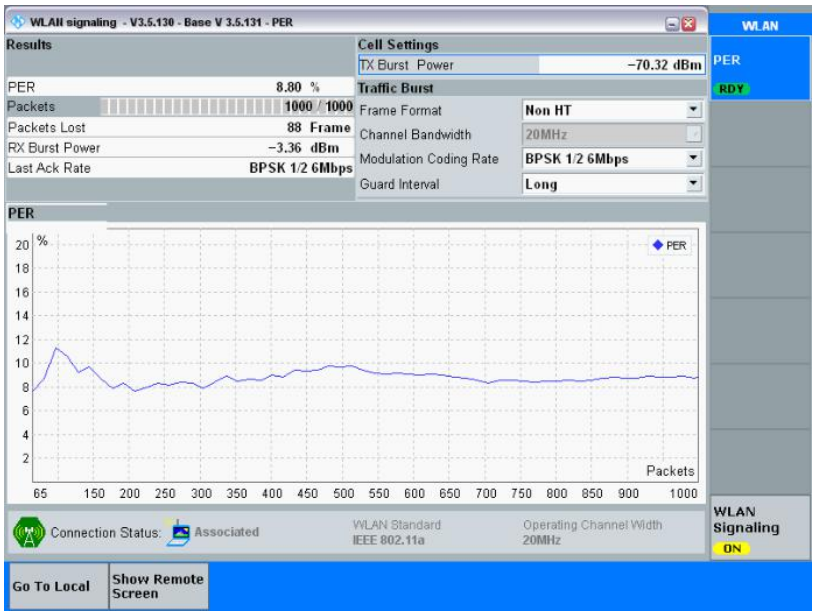
802.11a:

Operational channel (MHz)	Pmin	PER	Limit
5180	-70.32 dBm	8.8 %	≦10 %

Blocking signal frequency(MHz)	Blocking signal power (dBm) (see note 2)	Type of blocking signal	PER Result		Limit	Verdict
			Low channel	High channel		
5100	-56.01	CW	0.00%	0.00%	The minimum performance criterion shall be a PER less than or equal to 10 %.	Pass
4900	-50.01	CW	0.00%	0.00%		Pass
5000	-50.01	CW	0.00%	0.00%		Pass
5975	-50.01	CW	0.00%	0.00%		Pass

Test Plot (P_{min})

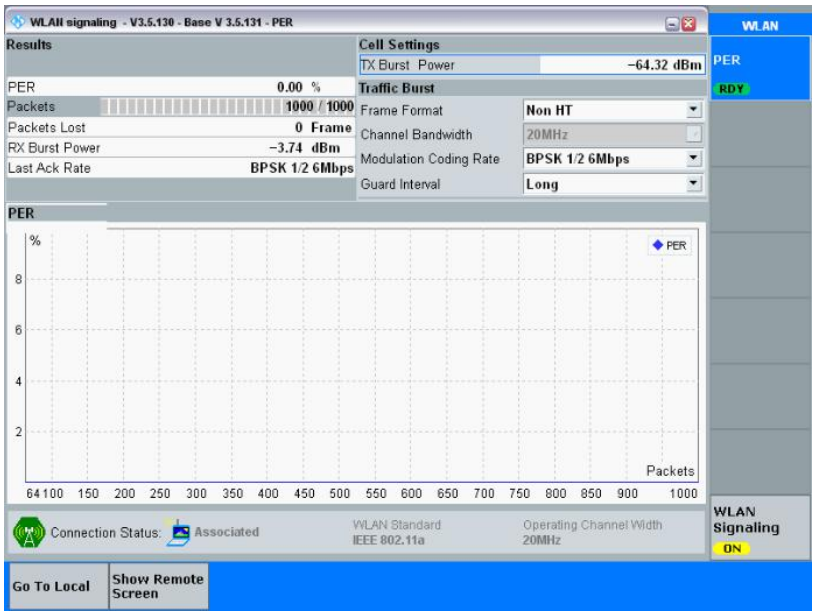
802.11a Low channel



Test Plot (PER)

Note: All the configuration were tested, but only the worst PER Plot were reported in this report.

802.11a Low channel



ANNEX B TEST SETUP PHOTOS

Please refer the document “BL-SZ1760077-AR.PDF”.

ANNEX C EUT EXTERNAL PHOTOS

Please refer the document “BL- SZ1760077-AW.PDF”.

ANNEX D EUT INTERNAL PHOTOS

Please refer the document “BL- SZ1760077-AI.PDF”.

--END OF REPORT--