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TEST REPORT

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

Report Reference No.: CTL1808275021-WR02

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Product Name.....: ShotKam Action Camera

Model/Type reference: Shotgun ShotKam

List Model(s).....: N/A

Trade Mark.....: ShotKam

Applicant's name: ShotKam LLC

Address of applicant: 2820 NW 45th street, Boca Raton, FL 33434 USA

Test Firm.....: Shenzhen CTL Testing Technology Co., Ltd.

Address of Test Firm.....: Floor 1-A, Baisha Technology Park, No.3011, Shahexi Road, Nanshan District, Shenzhen, China 518055

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

TRF Originator: Shenzhen CTL Testing Technology Co., Ltd.

Master TRF: Dated 2011-01

Date of Receipt.....: Aug. 27, 2018

Date of Test Date.....: Aug. 28, 2018–Sep. 04, 2018

Data of Issue.....: Sep. 05, 2018

Result.....: Pass

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TEST REPORT

Test Report No. :	CTL1808275021-WR02	Sep. 05, 2018
		Date of issue

Equipment under Test : ShotKam Action Camera

Model /Type : Shotgun ShotKam

Listed Models : N/A

Applicant : **ShotKam LLC**

Address : 2820 NW 45th street, Boca Raton, FL 33434 USA

Manufacturer : **ShotKam LLC**

Address : 936 Clint Moore Road, Boca Raton, FL33487, USA

Test result	Pass *
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* In the configuration tested, the EUT complied with the standards specified page 5.

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.

**** Modified History ****

Revision	Description	Issued Data	Report No.	Remark
Version 1.0	Initial Test Report Release	2018-09-05	CTL1808275021-WR02	Tracy Qi



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1 TEST SUMMARY

1.1 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

1.2 Test Description

Technical requirements specifications for transmitter		
Test Item	ETSI EN 301 893 Sub-Clause	Result
Carrier frequencies	Clause 4.2.1	Pass
Nominal Channel Bandwidth and Occupied Channel Bandwidth	Clause 4.2.2	Pass
RF output power, Transmit Power Control (TPC) and power density	Clause 4.2.3	Pass
Transmitter unwanted emissions	Clause 4.2.4.1 Clause 4.2.4.2	Pass
Receiver spurious emissions	Clause 4.2.5	Pass
Dynamic Frequency Selection (DFS)	Clause 4.2.6	Pass
Adaptivity (Channel Access Mechanism)	Clause 4.2.7	Pass
Receiver Blocking	Clause 4.2.8	Pass
User Access Restrictions	Clause 4.2.9	Pass
Geo-location capability	Clause 4.10	N/A

1.3 Test Facility

1.3.1 Address of the test laboratory

Shenzhen CTL Testing Technology Co., Ltd.

Floor 1-A, Baisha Technology Park, No. 3011, Shahexi Road, Nanshan, Shenzhen 518055 China

There is one 3m semi-anechoic chamber and two line conducted labs for final test. The Test Sites meet the requirements in documents ANSI C63.4 and CISPR 22/EN 55022 requirements.

1.3.2 Laboratory accreditation

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

IC Registration No.: 9618B

The 3m alternate test site of Shenzhen CTL Testing Technology Co., Ltd. EMC Laboratory has been registered by Certification and Engineer Bureau of Industry Canada for the performance of with Registration No.: 9618B on November 13, 2013.

FCC-Registration No.: 399832

Shenzhen CTL Testing Technology Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 399832, December 08, 2017.

1.4 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 CISPR 16-4 Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements“ and is documented in the Shenzhen CTL Testing Technology 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 CTL laboratory is reported:

Test Items	Measurement Uncertainty	Notes
Occupied Channel Bandwidth	±2%	(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)
Temperature	±1°C	(1)
Humidity	±3%	(1)
DC and low frequency voltages	±1.5%	(1)
Time	±2%	(1)
Duty cycle	±2%	(1)

Note 1: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=1.96.

2 GENERAL INFORMATION

2.1 Environmental conditions

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

Temperature	Normal Temperature:	25°C
	High Temperature:	80°C
	Low Temperature:	-20°C
Voltage	Normal Voltage	3.70V
	High Voltage	4.26V
	Low Voltage	3.15V
Other	Relative Humidity	55 %
	Air Pressure	101 kPa

2.2 General Description of EUT

Product Name:	ShotKam Action Camera			
Model:	Shotgun ShotKam			
Power supply:	DC 3.7V from battery			
WIFI				
Supported type:	20MHz system	40MHz system	80MHz system	160MHz system
	802.11a 802.11n 802.11ac	802.11n 802.11ac	802.11ac	N/A
Operation frequency:	5180MHz-5240MHz	5190MHz-5230MHz	5210MHz	N/A
Modulation:	OFDM	OFDM	OFDM	N/A
Channel number:	4	2	1	N/A
Channel separation:	20MHz	40MHz	80MHz	N/A
Antenna type:	Ceramic antenna: 4.5dBi on 5GHz			

Note: For more detailed features description, please refer to the manufacturer's specifications or the User's Manual

2.3 Description of Test Modes and Test Frequency

The EUT has been tested under typical operating condition. The Applicant provides communication tools software to control the EUT for staying in continuous transmitting and receiving mode for testing.

Mode	Description
802.11a	IEEE 802.11a with data rate of 6Mbps working in SISO mode
802.11n20	IEEE 802.11n20 with data rate MSC8 and 20MHz bandwidth working in SISO mode
802.11n40	IEEE 802.11n20 with data rate MSC8 and 40MHz bandwidth working in SISO mode
802.11ac20	IEEE 802.11ac20 with data rate MSC0 and 20MHz bandwidth working in SISO mode
802.11ac40	IEEE 802.11ac40 with data rate MSC0 and 40MHz bandwidth working in SISO mode
802.11ac80	IEEE 802.11ac80 with data rate MSC0 and 80MHz bandwidth working in SISO mode

Operation Frequency List WIFI on 5G Band:

Operating band	20MHz		40MHz		80MHz	
	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
W52 (5150MHz-5250MHz)	36	5180	38	5190	42	5210
	40	5200				
	44	5220	46	5230		
	48	5240				

Test Frequency:

Channel selected for test followed the table defined below; refer to ETSI EN 301 893 V2.1.1 clause 5.3.2

Test	Clause	Test channels		
		Lower sub-band (5 150 MHz to 5 350 MHz)		Higher sub-band 5 470 MHz to 5 725 MHz
		5 150 MHz to 5 250 MHz	5 250 MHz to 5 350 MHz	
Centre frequencies	5.4.2	C7 (see note 1)		C8 (see note 1)
Occupied Channel Bandwidth	5.4.3	C7		C8
Power, Power Density	5.4.4	C1	C2	C3, C4
Transmitter unwanted emissions outside the 5 GHz RLAN bands	5.4.5	C7 (see note 1)		C8 (see note 1)
Transmitter unwanted emissions within the 5 GHz RLAN bands	5.4.6	C1	C2	C3, C4
Receiver spurious emissions	5.4.7	C7 (see note 1)		C8 (see note 1)
Transmit Power Control (TPC)	5.4.4	n.a. (see note 2)	C2 (see note 1)	C3, C4 (see note 1)
Dynamic Frequency Selection (DFS)	5.4.8	n.a. (see note 2)	C5	C6 (see note 3)
Adaptivity	5.4.9	C9		
Receiver Blocking	5.4.10	C7		C8
C1, C3:	The lowest declared channel for every declared <i>Nominal Channel Bandwidth</i> within this band. For the Power Density testing, it is sufficient to only perform this test using the lowest <i>Nominal Channel Bandwidth</i> .			
C2, C4:	The highest declared channel for every declared <i>Nominal Channel Bandwidth</i> within this band. For the Power Density testing, it is sufficient to only perform this test using the lowest <i>Nominal Channel Bandwidth</i> .			
C5, C6:	One channel out of the declared channels for this frequency range. If more than one <i>Nominal Channel Bandwidth</i> has been declared for this sub-band, testing shall be performed using the lowest and highest <i>Nominal Channel Bandwidth</i> .			
C7, C8:	One channel out of the declared channels for this sub-band. For <i>Occupied Channel Bandwidth</i> , testing shall be repeated for every declared <i>Nominal Channel Bandwidth</i> within this sub-band.			
C9:	One channel (in case of single-channel testing) or a group of channels (in case of multi-channel testing) out of the declared channels.			
NOTE 1:	In case of more than 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 <i>Nominal Channel Bandwidths</i> that fall completely within the frequency range 5 150 MHz to 5 250 MHz.			
NOTE 3:	Where the declared channel plan includes channels whose <i>Nominal Channel Bandwidth</i> 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.			

2.4 Equipments Used during the Test

Centre frequencies & RF output power & Power density & OCB & TPC & DFS						
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Due Date
1	Spectrum Analyzer	Agilent	N9020	US46220290	2018/01/15	2019/01/14
2	Signal Generator	Agilent	N5182A	MY47420864	2018/05/21	2019/05/20
3	Signal Generator	Agilent	E4421B	US40051744	2018/05/21	2019/05/20
4	Power Sensor	Agilent	U2021XA	MY5365004	2018/05/21	2019/05/20
5	Power Meter	Agilent	U2531A	TW53323507	2018/05/21	2019/05/20
6	Climate Chamber	ESPEC	EL-10KA	A20120523	2018/05/20	2019/05/19

Transmitter spurious emissions & Receiver spurious emissions						
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Due Date
1	ULTRA-ROAD BAND ANTENNA	Sunol Sciences Corp.	JB1	A061713	2018/06/02	2019/06/01
2	Horn Antenna	Sunol Sciences Corp.	DRH-118	A062013	2018/05/19	2019/05/18
3	EMI Test Receiver	R&S	ESCI	103710	2018/06/02	2019/06/01
4	Controller	EM Electronics	Controller EM 1000	N/A	2018/05/21	2019/05/20
5	Amplifier	Agilent	8349B	3008A02306	2018/05/19	2019/05/18
6	Amplifier	Agilent	8447D	2944A10176	2018/05/19	2019/05/18
7	Temperature/Humidity Meter	Gangxing	CTH-608	02	2018/05/20	2019/05/19
8	High-Pass Filter	K&L	9SH10-2700/X12750-O/O	N/A	2018/05/20	2019/05/19
9	High-Pass Filter	K&L	41H10-1375/U12750-O/O	N/A	2018/05/20	2019/05/19
10	RF Cable	HUBER+SUHNER	RG214	N/A	2018/05/20	2019/05/19

The calibration interval is 1 year.

3 TEST ITEM AND RESULTS

3.1 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

Test conditions		Test Channel / Frequency	Measured Result (MHz)	Frequency Deviation (ppm)
Voltage (V)	Temperature (°C)			
3.70	25	CH36/ 5180MHz	5179.925755	-14.3330
4.26	-20		5179.925554	-14.3718
	+55		5179.925262	-14.4282
3.15	-20		5179.925150	-14.4498
	+55		5179.925442	-14.3934
Limit			20 ppm	
Result		PASS		

3.2 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 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.

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 x Nominal Bandwidth (e.g. 40 MHz for a 20 MHz channel)
Sweep time:	> 1 s; for larger Nominal Bandwidths, the sweep time may be increased until a value where the sweep time has no impact on the RMS value of the signal
Detector Mode:	RMS
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
802.11a	CH36	5180	16.344	Pass
802.11n20	CH36	5180	17.554	
802.11n40	CH38	5190	36.026	
802.11ac20	CH36	5180	17.569	
802.11ac40	CH38	5190	36.027	
802.11ac80	CH42	5210	75.166	

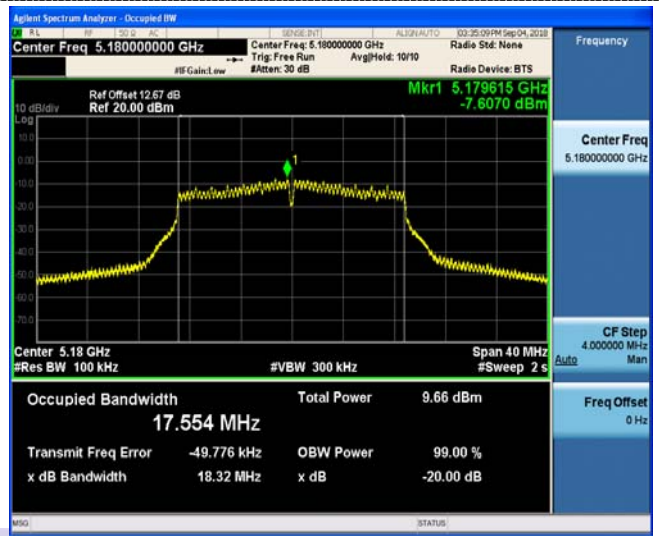
Test plot as follows:

802.11a



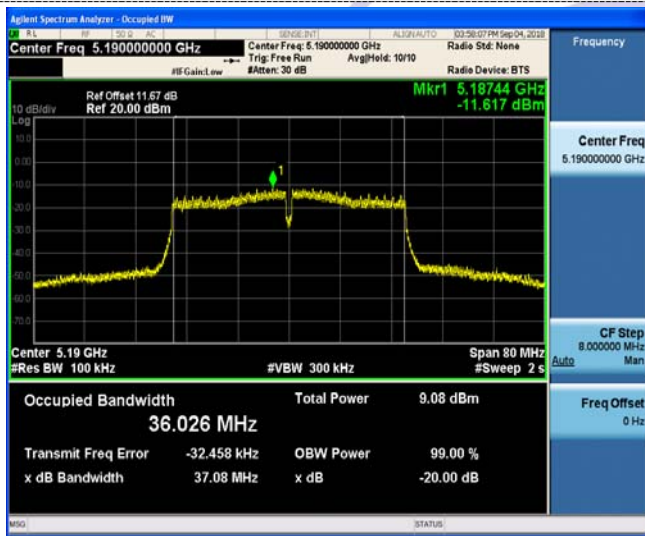
CH36

802.11n20MHz



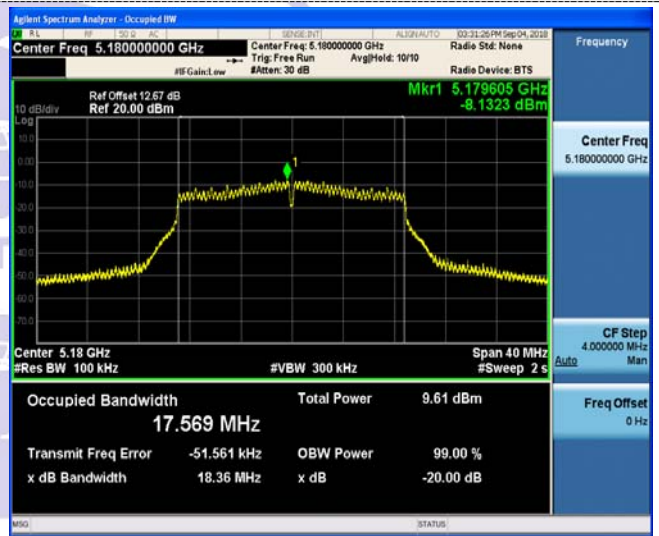
CH36

802.11n40MHz



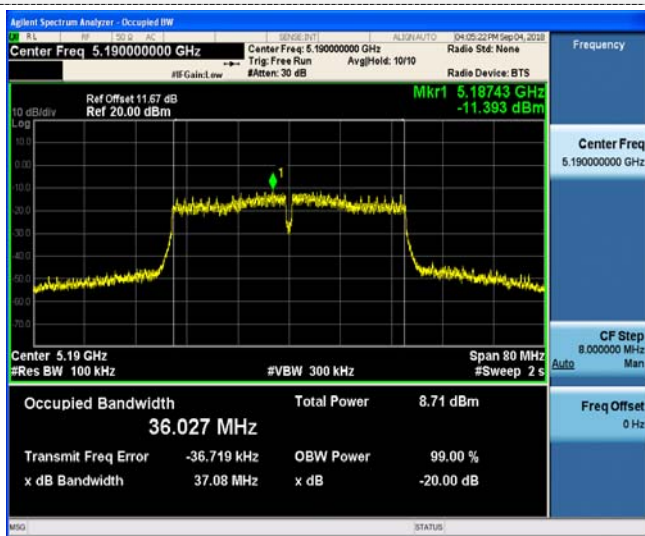
CH38

802.11ac20MHz



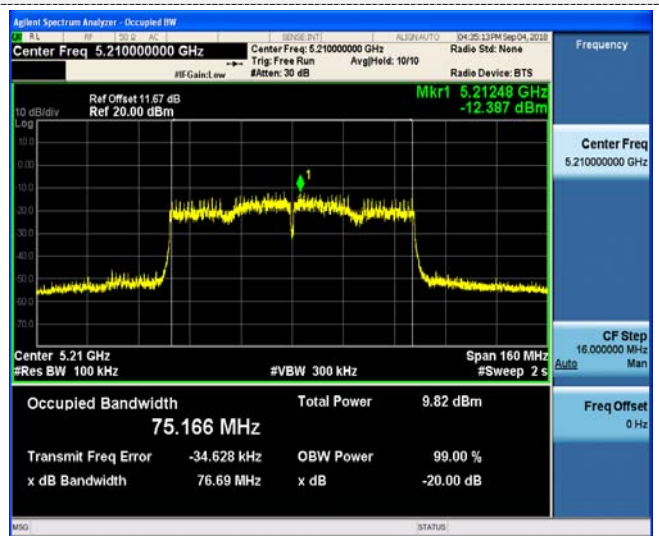
CH36

802.11ac40MHz



CH38

802.11ac80MHz



CH42

3.3 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. This means that the antenna gain of the integral or dedicated antenna has to be taken into account as well as the additional (beamforming) gain in case of 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 in table 2 and table 3.

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 in table 2 and table 3.

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 (P_H) of the TPC range shall not exceed the levels given in table 2.

Devices are allowed to operate without TPC. See table 2 for the applicable limits that shall apply in this case.

Table 2: Mean e.i.r.p. limits for RF output power and Power Density at the highest power level (P_H)

Frequency range (MHz)	Mean e.i.r.p. limit for P_H (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 <i>Radar Interference Detection</i> function shall comply with the limits for the frequency range 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 (P_L) of the TPC range shall not exceed the levels given in table 3. For devices without TPC, the limits in table 3 do not apply.

Table 3: 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) limit for P_L
5 250 MHz to 5 350 MHz	17
5 470 MHz to 5 725 MHz	24 (see note)
NOTE: Slave devices without a <i>Radar Interference Detection</i> function shall comply with the limits for the band 5 250 MHz to 5 350 MHz.	

3.3.1 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 (e.g. Frame Based equipment) reference clause 5.4.4.2.1.1.2 of 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 5.4.4.2.1.1.3 of 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 5.4.4.2.1.1.4 of ETSI EN 301 893 V2.1.1 (2017-05)
- These measurements shall be performed under both normal and extreme test conditions.
- The lowest declared channel for band 5 150 MHz to 5 250 MHz and 5 470 MHz to 5 725 MHz the highest declared channel for band 5 250 MHz to 5 350 MHz and 5 470 MHz to 5 725 MHz shall be tested.

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)						
T _{Nor} (25°C)	3.70	36/5180	7.25	4.50	11.75	23	PASS
T _{min} (-20°C)	4.26		7.44	4.50	11.94		
	3.15		7.25	4.50	11.75		
T _{Max} (+55°C)	4.26		7.59	4.50	12.09		
	3.15		7.44	4.50	11.94		

802.11n20MHz							
Test conditions		Channel/ Frequency	Measured power (dBm)	Antenna Gain (dBi)	e.i.r.p (dBm)	Limit (dBm)	Result
Temperature (°C)	Voltage (V)						
T _{Nor} (25°C)	3.70	36/5180	5.32	4.50	9.82	23	PASS
T _{min} (-20°C)	4.26		5.55	4.50	10.05		
	3.15		5.74	4.50	10.24		
T _{Max} (+55°C)	4.26		5.68	4.50	10.18		
	3.15		5.59	4.50	10.09		

802.11n40MHz							
Test conditions		Channel/ Frequency	Measured power (dBm)	Antenna Gain (dBi)	e.i.r.p (dBm)	Limit (dBm)	Result
Temperature (°C)	Voltage (V)						
T _{Nor} (25°C)	3.70	38/5190	6.87	4.50	11.37	23	PASS
T _{min} (-20°C)	4.26		6.65	4.50	11.15		
	3.15		6.90	4.50	11.40		
T _{Max} (+55°C)	4.26		6.41	4.50	10.91		
	3.15		6.35	4.50	10.85		

802.11ac20MHz							
Test conditions		Channel/ Frequency	Measured power (dBm)	Antenna Gain (dBi)	e.i.r.p (dBm)	Limit (dBm)	Result
Temperature (°C)	Voltage (V)						
T _{Nor} (25°C)	3.70	36/5180	5.65	4.50	10.15	23	PASS
T _{min} (-20°C)	4.26		5.75	4.50	10.25		
	3.15		5.29	4.50	9.79		
T _{Max} (+55°C)	4.26		5.54	4.50	10.04		
	3.15		5.44	4.50	9.94		

802.11ac40MHz							
Test conditions		Channel/ Frequency	Measured power (dBm)	Antenna Gain (dBi)	e.i.r.p (dBm)	Limit (dBm)	Result
Temperature (°C)	Voltage (V)						
T _{Nor} (25°C)	3.70	38/5190	6.36	4.50	10.86	23	PASS
T _{min} (-20°C)	4.26		6.28	4.50	10.78		
	3.15		6.74	4.50	11.24		
T _{Max} (+55°C)	4.26		6.69	4.50	11.19		
	3.15		6.52	4.50	11.02		

802.11ac80MHz							
Test conditions		Channel/ Frequency	Measured power (dBm)	Antenna Gain (dBi)	e.i.r.p (dBm)	Limit (dBm)	Result
Temperature (°C)	Voltage (V)						
T _{Nor} (25°C)	3.70	42/5210	4.88	4.50	9.38	23	PASS
T _{min} (-20°C)	4.26		4.79	4.50	9.29		
	3.15		4.85	4.50	9.35		
T _{Max} (+55°C)	4.26		4.77	4.50	9.27		
	3.15		4.86	4.50	9.36		

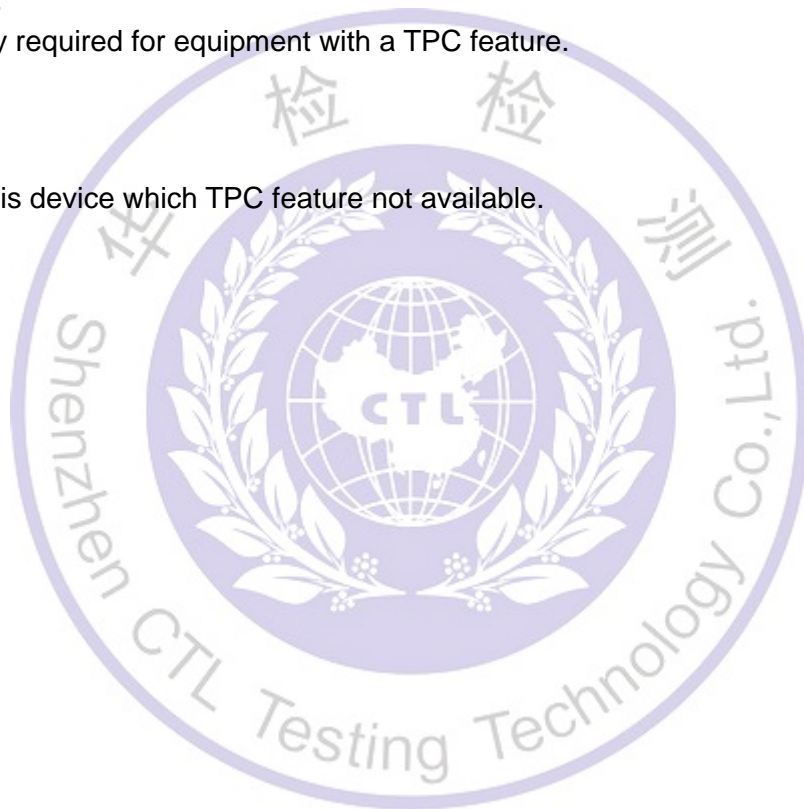
3.3.2 RF output power at the lowest power level of the TPC range - PL

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 5.4.4.2.1.2.2 of 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 5.4.4.2.1.2.3 of 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 5.4.4.2.1.2.4 of ETSI EN 301 893 V2.1.1 (2017-05)
5. These measurements shall be performed under both normal and extreme test conditions.
6. The lowest declared channel for band 5 150 MHz to 5 250 MHz and 5 470 MHz to 5 725 MHz the highest declared channel for band 5 250 MHz to 5 350 MHz and 5 470 MHz to 5 725 MHz shall be tested.
7. This test is only required for equipment with a TPC feature.

Test Results

Not applicable to this device which TPC feature not available.



3.3.3 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 of 5.4.4.2.1.3.2 of 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 5.4.4.2.1.3.3 of ETSI EN 301 893 V2.1.1 (2017-05).
4. These measurements shall only be performed at normal test conditions.
5. The lowest declared channel for band 5 150 MHz to 5 250 MHz and 5 470 MHz to 5 725 MHz the highest declared channel for band 5 250 MHz to 5 350 MHz and 5 470 MHz to 5 725 MHz shall be tested.

Test Results

Mode	Channel/ Frequency (MHz)	Measured value (dBm/MHz)	Antenna Gain (dBi)	PSD (dBm/MHz)	Limit (dBm/MHz)	Result
802.11a	CH36/5180	4.287	4.50	8.787	10	Pass
802.11n20MHz	CH36/5180	2.845	4.50	7.345	10	Pass
802.11n40MHz	CH38/5190	0.255	4.50	4.755	10	Pass
802.11ac20MHz	CH36/5180	2.706	4.50	7.206	10	Pass
802.11ac40MHz	CH38/5190	0.138	4.50	4.638	10	Pass
802.11ac80MHz	CH42/5210	-1.006	4.50	3.494	10	Pass

The test plots as follow:

802.11a



CH36

802.11n20MHz



CH36

802.11n40MHz



CH38

802.11ac20MHz



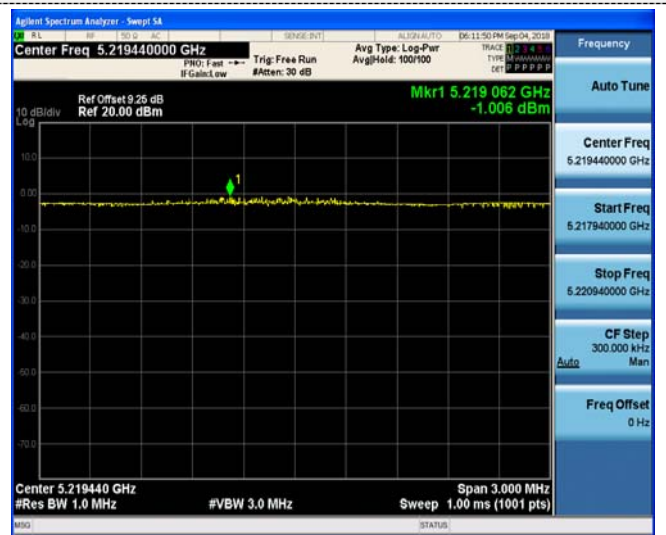
CH36

802.11ac40MHz



CH38

802.11ac80MHz



CH42

3.4 Transmitter unwanted emissions

3.4.1 Transmitter unwanted emissions outside the 5 GHz RLAN bands

Limit

The level of unwanted emission shall not exceed the limits given in table below:

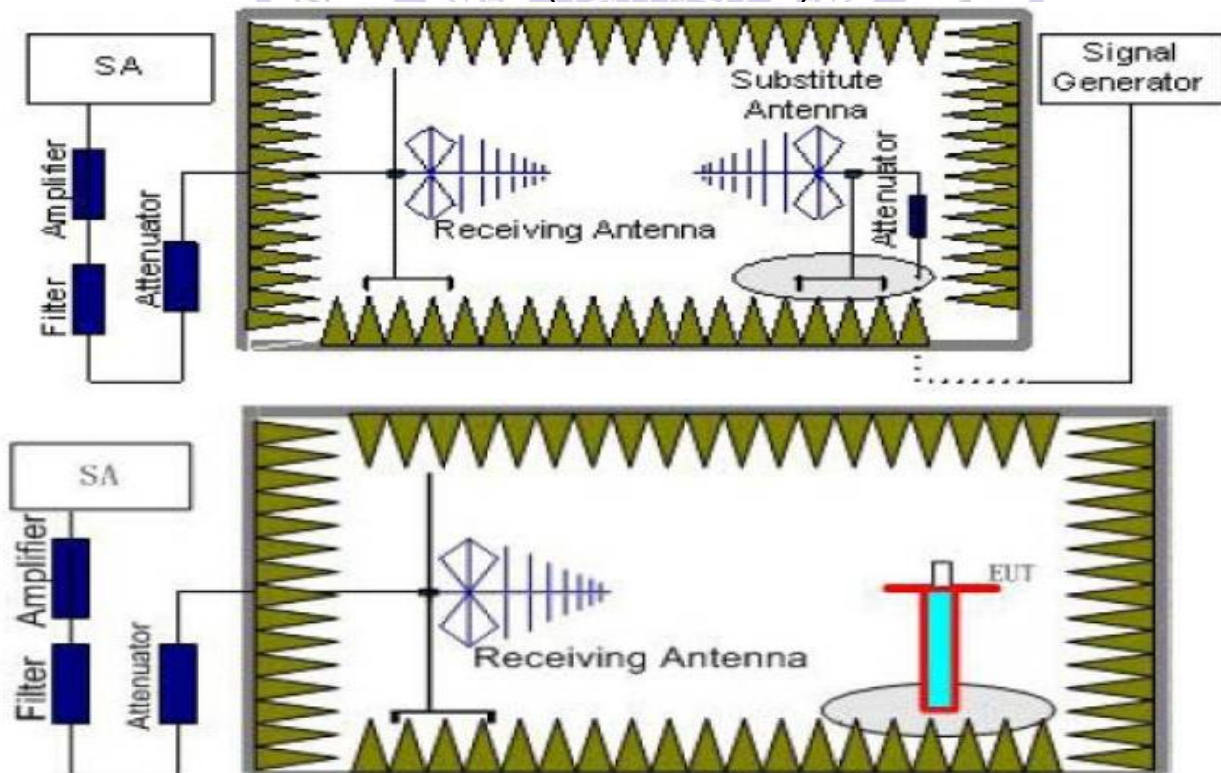
Frequency range	Maximum power	Bandwidth
30 MHz to 47 MHz	-36 dBm	100 kHz
47 MHz to 74 MHz	-54 dBm	100 kHz
74 MHz to 87,5 MHz	-36 dBm	100 kHz
87,5 MHz to 118 MHz	-54 dBm	100 kHz
118 MHz to 174 MHz	-36 dBm	100 kHz
174 MHz to 230 MHz	-54 dBm	100 kHz
230 MHz to 470 MHz	-36 dBm	100 kHz
470 MHz to 862 MHz	-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 (2017-05) Sub-clause 5.4.5
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.

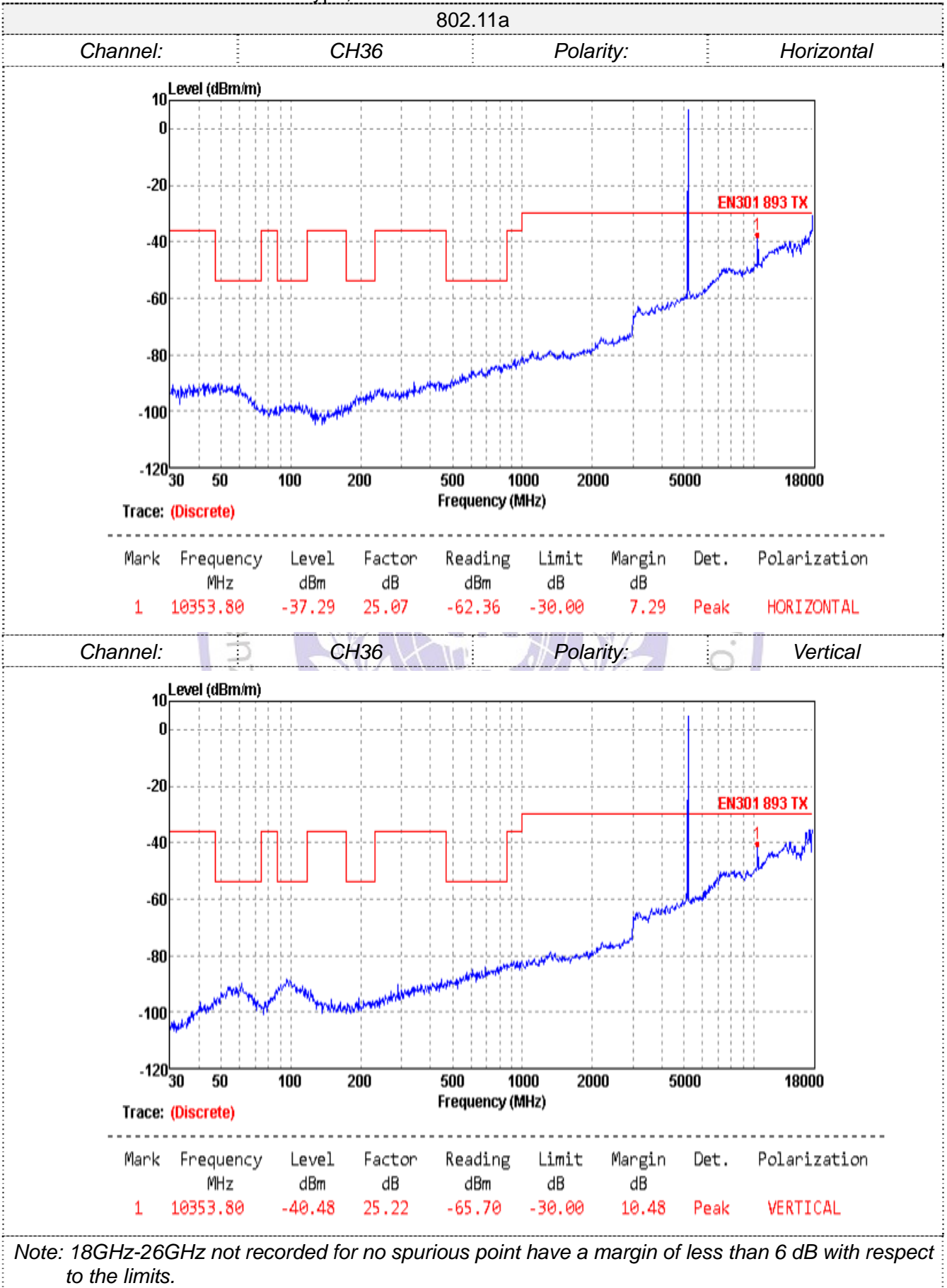
Test Configuration

Effective Radiated Power measurement (30 MHz to 26 GHz)



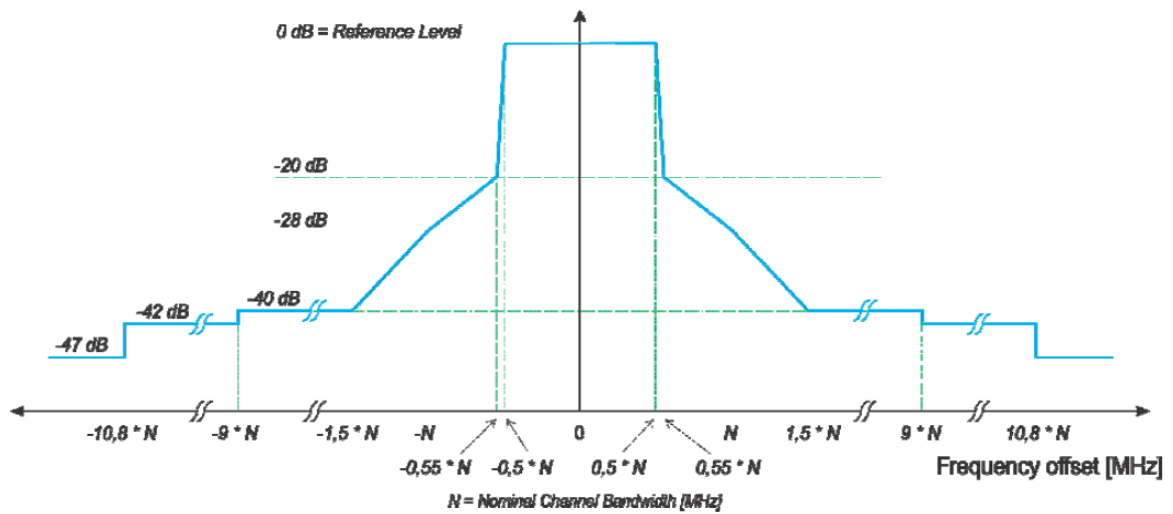
Test Result

Remark: We test all modulation type, and recorded the worst case at 802.11a mode.



3.5 Transmitter unwanted emissions within the 5 GHz RLAN bands

Limit



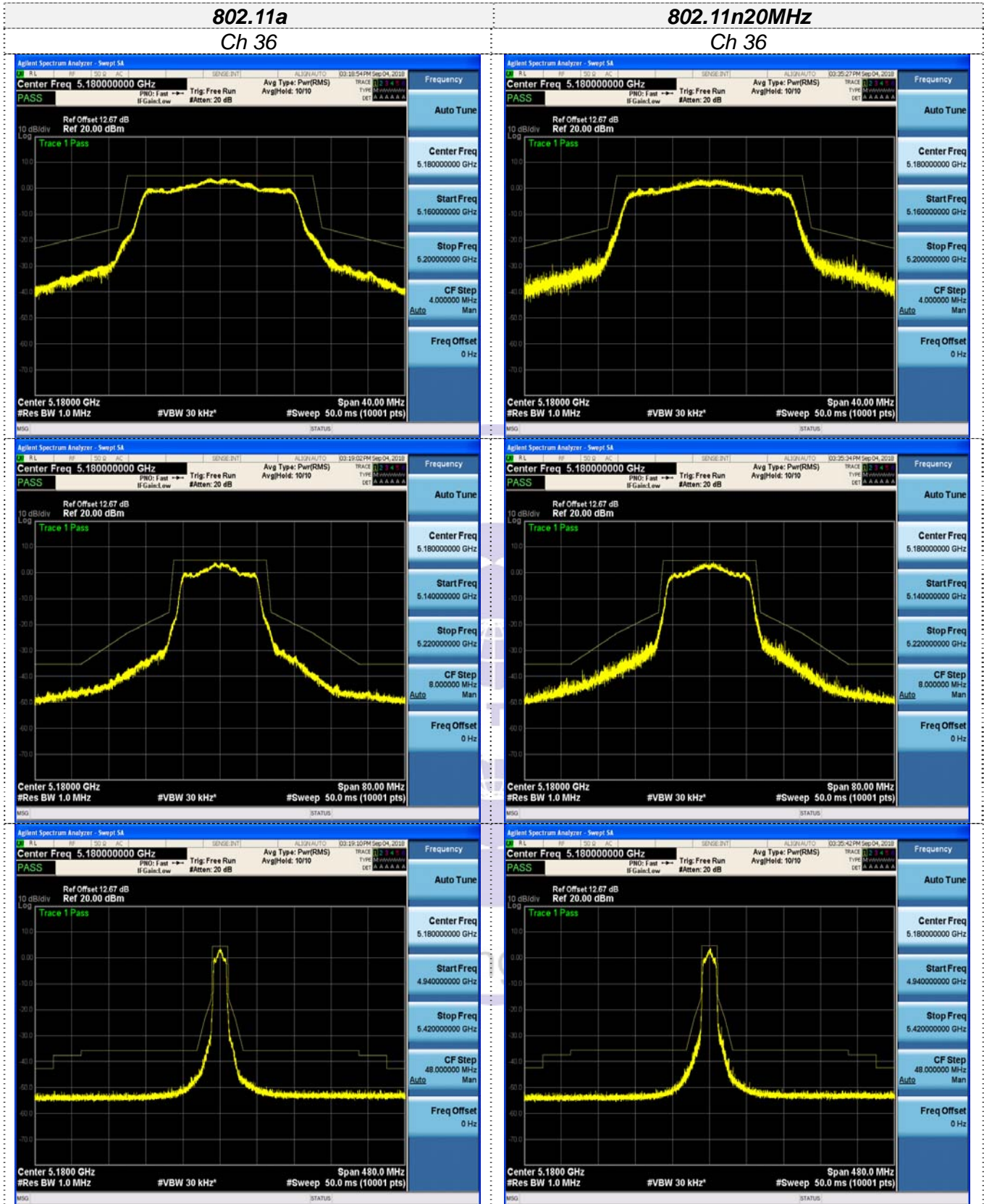
NOTE: dBc is the spectral density relative to the maximum spectral power density of the transmitted signal.

Figure 1: Transmit spectral power mask

Test Procedure

1. The measurement procedure follows ETSI EN 301 893 V2.1.1 Sub-clause 5.4.6
2. The measurement shall only be performed at normal test conditions.
3. The lowest declared channel for band 5 150 MHz to 5 250 MHz and 5 470 MHz to 5 725 MHz the highest declared channel for band 5 250 MHz to 5 350 MHz and 5 470 MHz to 5 725 MHz shall be tested.

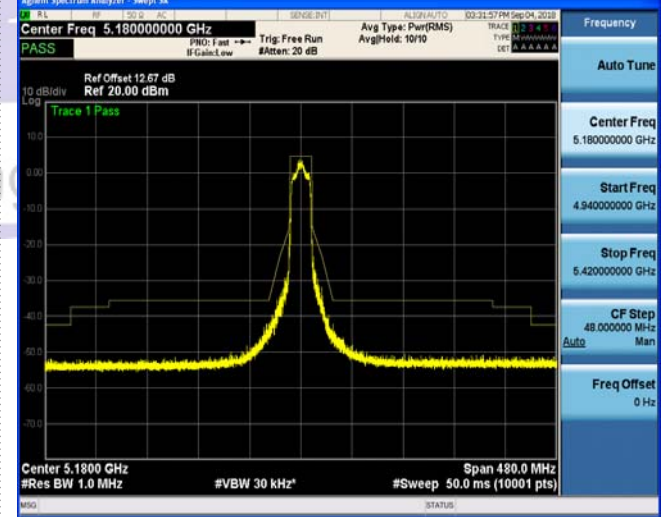
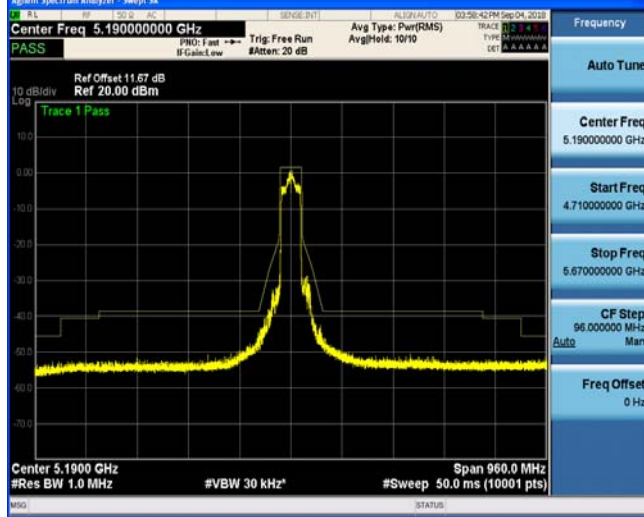
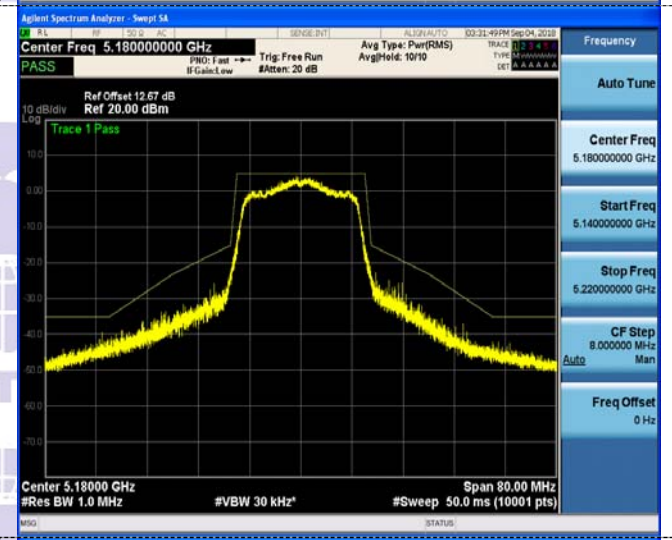
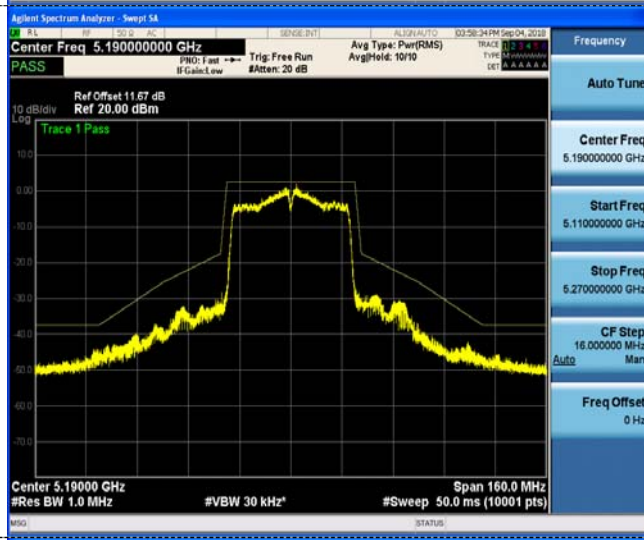
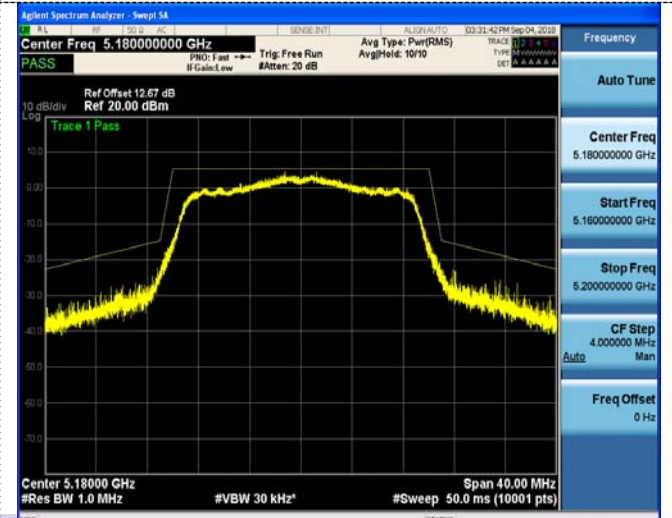
Test Result



802.11n40MHz
Ch 38

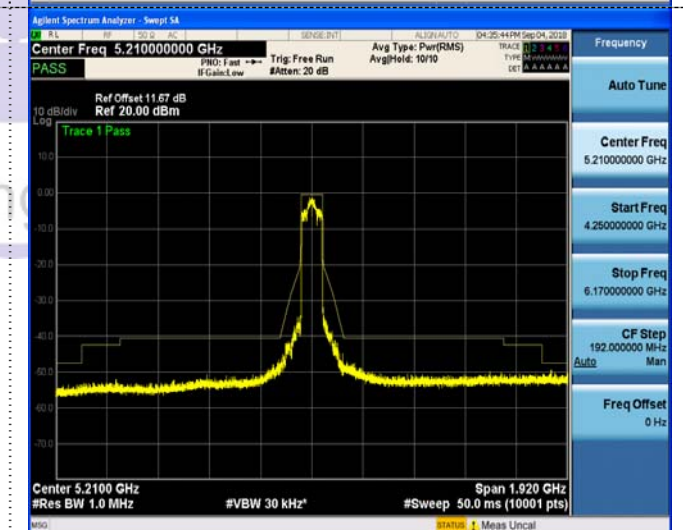
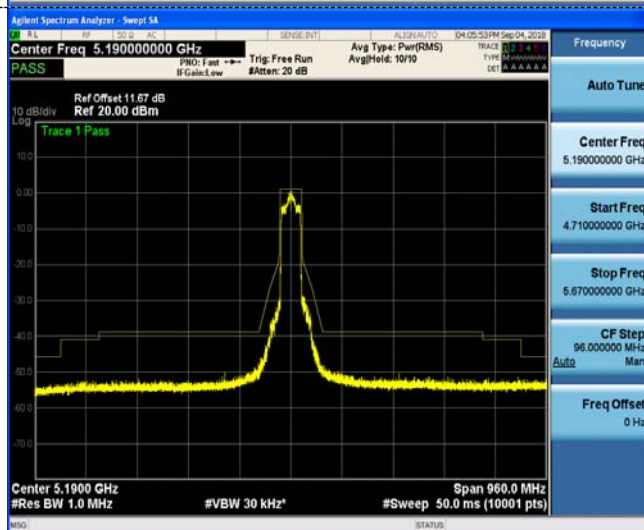
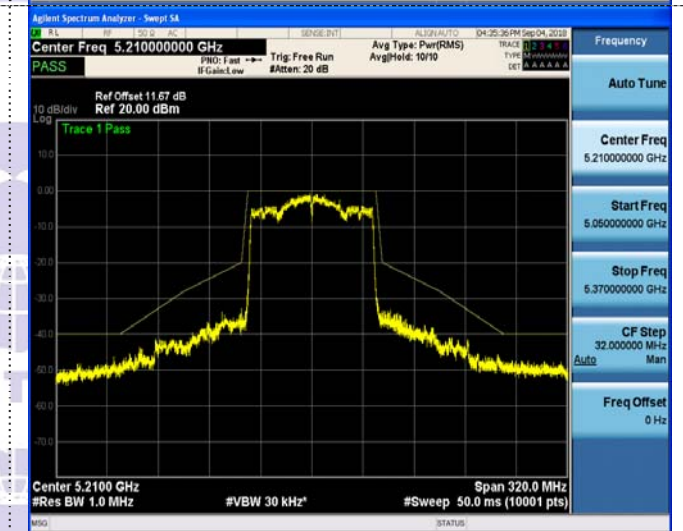
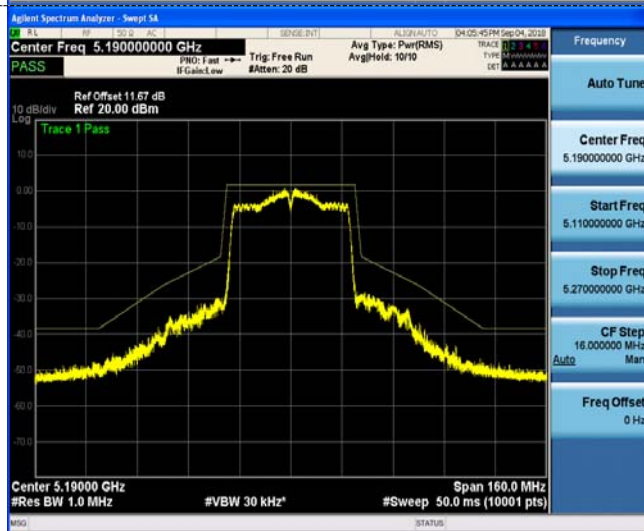
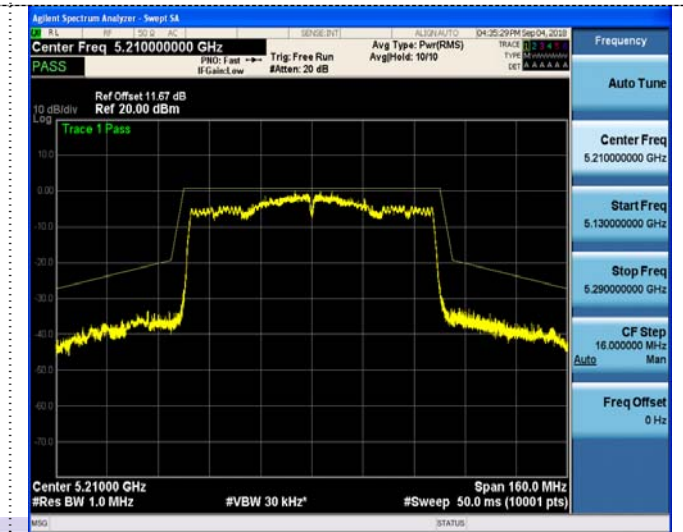
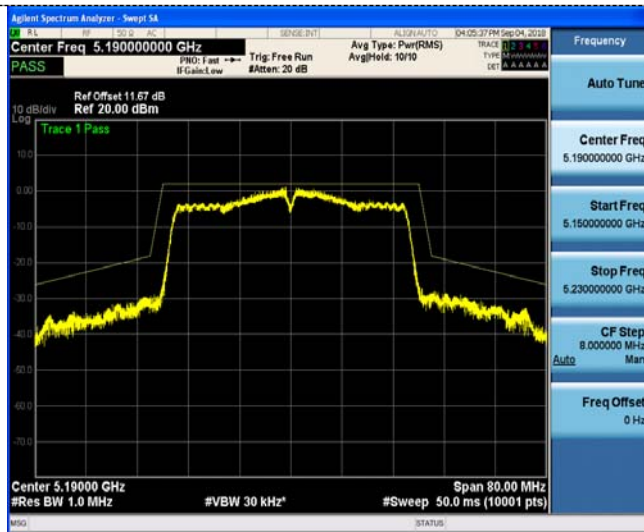


802.11ac20MHz
Ch 36



802.11ac40MHz
Ch 38

802.11ac80MHz
Ch 42



3.6 Receiver spurious emissions

LIMIT

The spurious emissions of the receiver shall not exceed the limits given in table below:

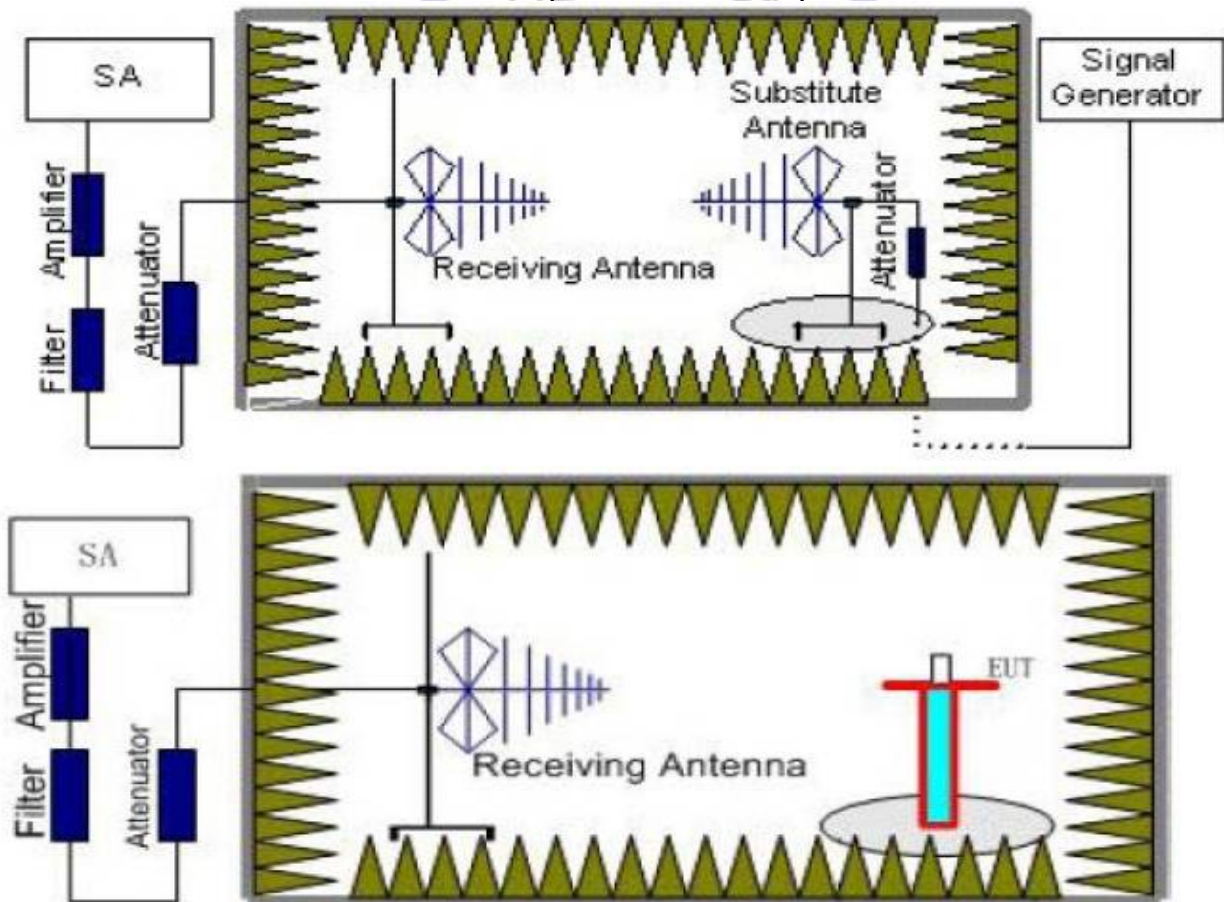
Frequency range	Maximum power	Measurement bandwidth
30 MHz to 1 GHz	-57 dBm	100 kHz
1 GHz to 26 GHz	-47 dBm	1 MHz

Test Procedure

1. The measurement procedure follows ETSI EN 301 893 V2.1.1 Sub-clause 5.4.7
2. 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.

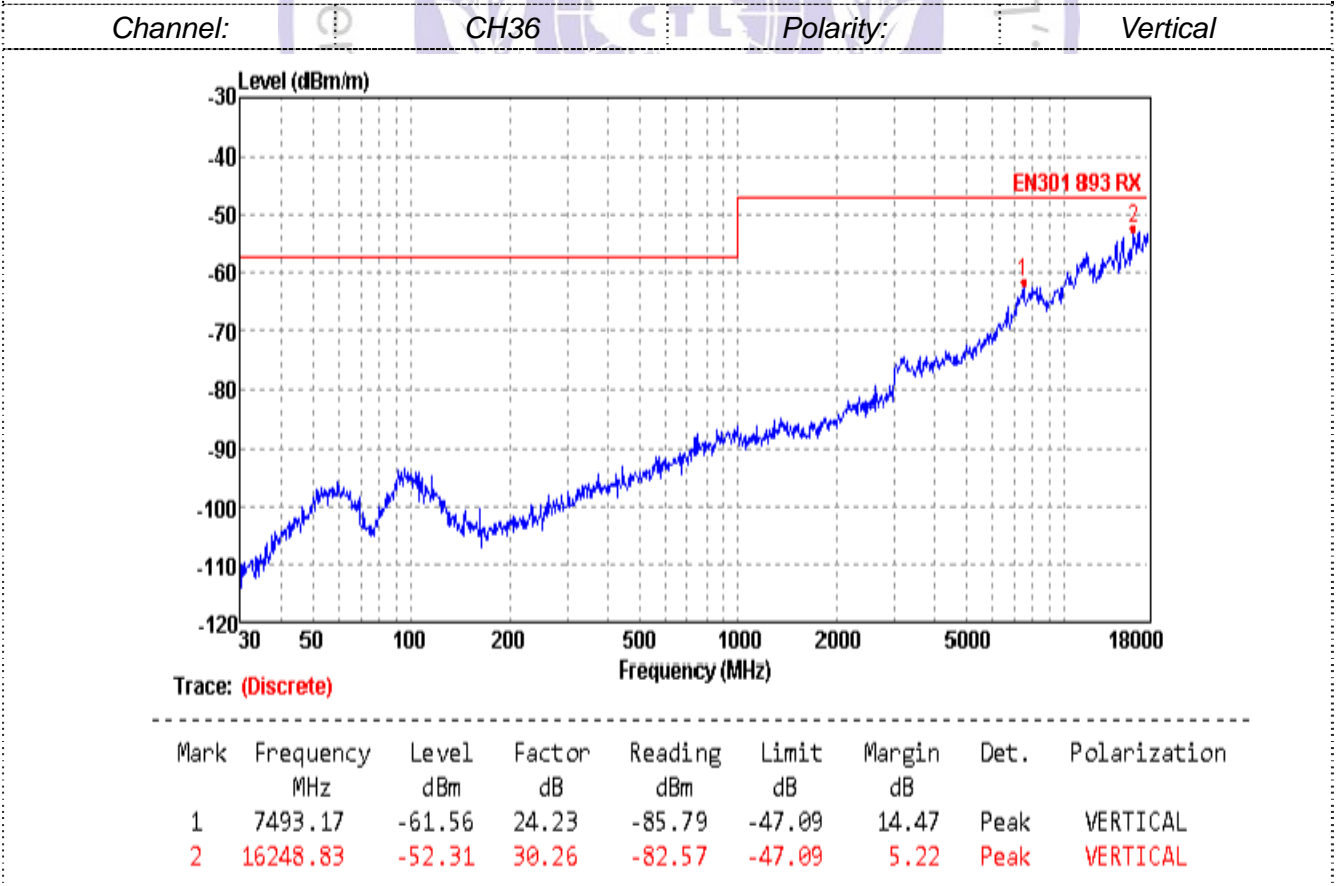
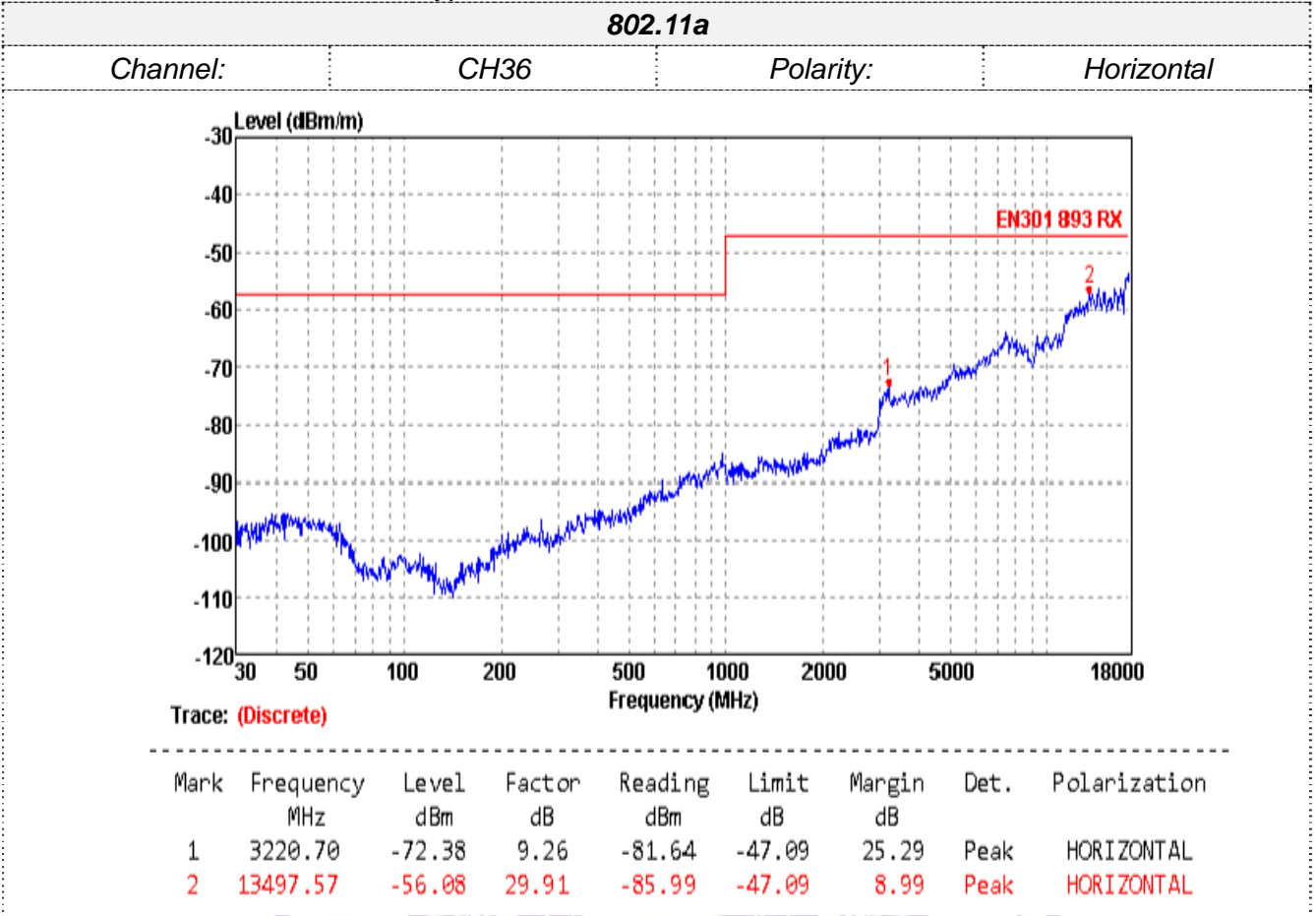
Test Configuration

Effective Radiated Power measurement (30 MHz to 26 GHz)



Test Result

Remark: We test all modulation type, and recorded the worst case at 802.11a mode.



Note: 18GHz-26GHz not recorded for no spurious point have a margin of less than 6 dB with respect to the limits.

3.7 Adaptivity

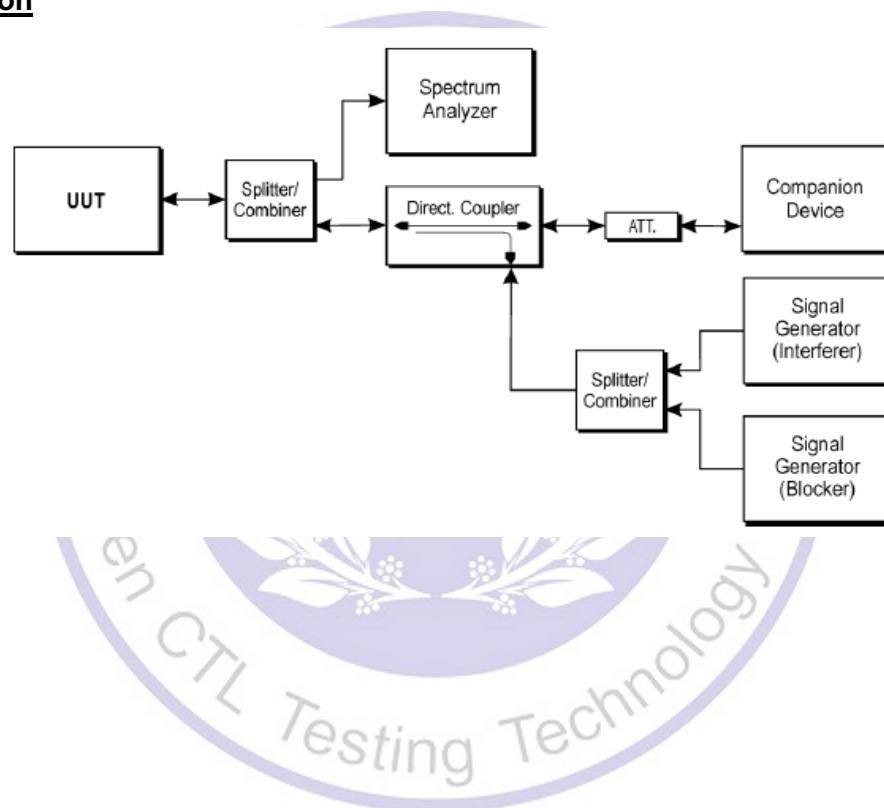
Requirements and limits

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

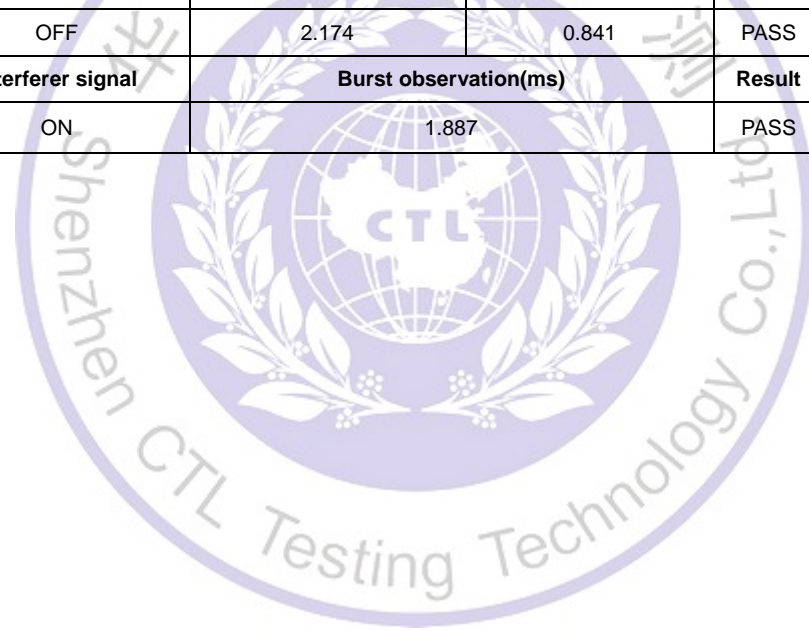
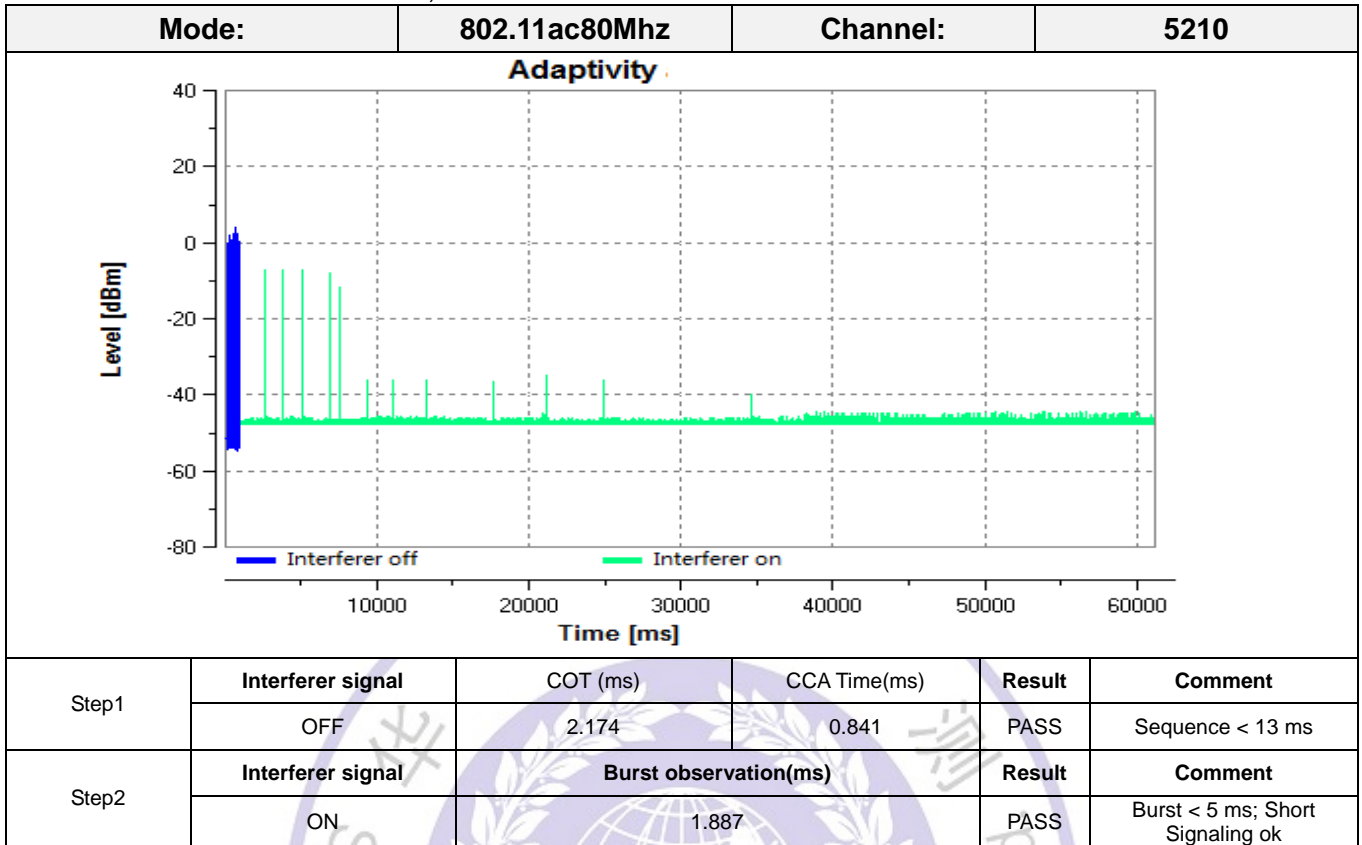
1. The measurement procedure follows the clause 5.3.9.2.1 of the ETSI EN 300 893 V1.8.1 (2015-03).
2. The interference signal used shall be a band limited noise signal with a 100 % duty cycle.
3. Testing shall be performed at one channel out of the declared channels for each sub-band and the highest nominal channel bandwidth.

Test Configuration



Test Results

Remark: We test all test modes, and recorded the worst case at 802.11ac80 mode.



3.8 Receiver Blocking

Limits

The minimum performance criterion shall be a PER of less than or equal to 10 %. The manufacturer may declare alternative performance criteria as long as that is appropriate for the intended use of the equipment

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

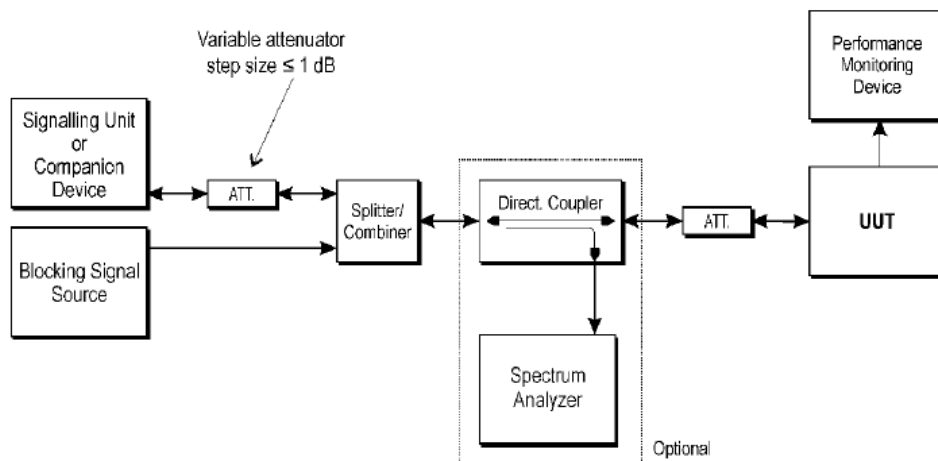
Receiver blocking parameters

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)	
$P_{\min} + 6$ dB	5 100	-53	-59	CW
$P_{\min} + 6$ dB	4 900 5 000 5 975	-47	-53	CW

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

1. For systems using multiple receive chains only one chain need to be tested. All other receiver inputs shall be terminated.
2. The UUT shall be set to the first operating frequency to be tested (see clause 5.3.2)
3. The blocking signal generator is set to the first frequency as defined in table 9.
4. With the blocking signal generator switched off a communication link is set up between the UUT and the associated companion device using the test setup shown in figure 18. The attenuation of the variable attenuator shall be increased in 1 dB steps to a value at which the minimum performance criteria as specified in clause 4.2.8.3 is still met. The resulting level for the wanted

signal at the input of the UUT is P_{\min} .

This signal level (P_{\min}) is increased by 6 dB resulting in a new level ($P_{\min} + 6$ dB) of the wanted signal at the UUT receiver input.

5. The level of the blocking signal at the UUT input is set to the level provided in table 9. It shall be verified and recorded in the test report that the performance criteria as specified in clause 4.2.8.3 are met.

If the performance criteria as specified in clause 4.2.8.3 are met, the level of the blocking signal at the UUT may be further increased (e.g. in steps of 1 dB) until the level whereby the performance criteria as specified in clause 4.2.8.3 are no longer met. The highest level at which the performance criteria are met is recorded in the test report.

6. Repeat step 5 for each remaining combination of frequency and level as specified in table 9.
7. Repeat step 3 to step 6 with the UUT operating at the other operating frequencies at which the blocking test has to be performed. See clause 5.3.2.



Test result*Remark:*

1. The test performed with the combination of the smallest channel bandwidth and the lowest data rate at 802.11a mode according to clause 5.4.10.1 of ETSI EN 301 893 V2.1.1
2. With the blocking signal generator switched off, adjust variable attenuator value by 1dB until to communication once cannot maintains. Then replace EUT by a power sensor, measure the power and recorded as P_{min} .

802.11a

Test Frequency (MHz)	Wanted signal mean power from companion device (dBm)	Blocking signal frequency (MHz)	Blocking signal power (dBm)	PER
5180	$P_{min} + 6\text{dB}$	5100	-59	3%
	$P_{min} + 6\text{dB}$	4900	-53	4%
		5000		4%
		5975		3%

Note: $P_{min} = -68\text{dBm}$ 

3.9 User Access Restrictions

Requirement

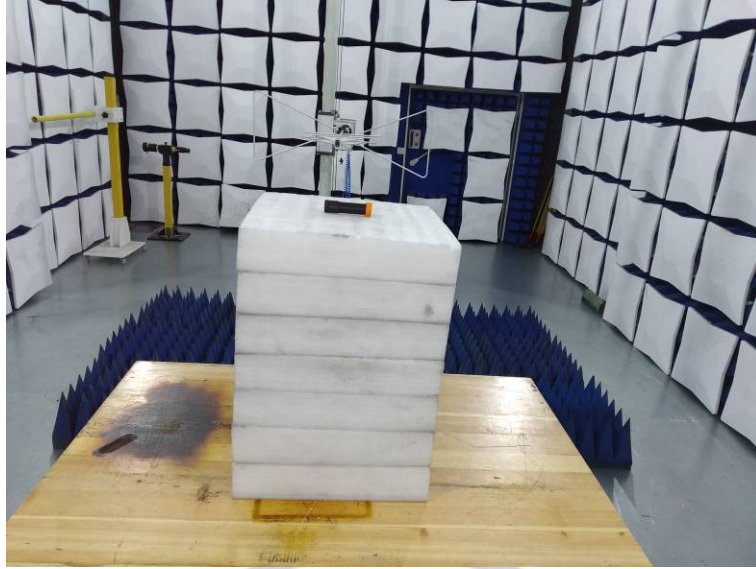
The equipment shall be so constructed that settings (hardware and/or software) related to DFS shall not be accessible to the user if changing those settings result in the equipment no longer being compliant with the DFS requirements.

Method

Default country code is set in the factory and no UI is provided for modification; There is no downloadable software provided by the manufacturer that can modify critical radio transmitter parameters. All critical parameters are programmed in OTP memory at the factory and cannot be modified or overridden by third parties.



4 EUT TEST PHOTOS



Testing Techn

5 PHOTOS OF THE EUT

Please reference to the test report No.: CTL1808275021-WE

*****THE END*****

