CE Test Report

Equipment	:	**802.11abgn PCI-E module**
Model No.	:	**SDC-PE15N**
Brand Name	:	**Laird Technologies**
Applicant	:	**Laird Technologies**
Address	:	**W66N220 Commerce Court, Cedarburg, Wisconsin 53012, USA**
Standard	:	**EN 301 893 V2.1.1 (2017-05)**
Received Date	:	**May 02, 2017**
Tested Date	:	**Dec. 23, 2015 ~ Feb. 01, 2016 (for original test)** **Apr. 27, 2017 (for new test)**

We, International Certification Corp., would like to declare that the tested sample has been evaluated and in compliance with the requirement of the above standards. The test results contained in this report refer exclusively to the product. It may be duplicated completely for legal use with the approval of the applicant. It shall not be reproduced except in full without the written approval of our laboratory.

Reviewed by: **Approved by:**

James Fan / Assistant Manager **Gary Chang / Manager**

Testing Laboratory 2732

Table of Contents

1 GENERAL DESCRIPTION 5

1.1 Information 5
1.2 Local Support Equipment List 7
1.3 Test Setup Chart 7
1.4 Test Equipment and Calibration Data 8
1.5 Testing Applied Standards 9
1.6 Measurement Uncertainty 10

2 TEST CONFIGURATION 11

2.1 Testing Condition 11
2.2 The Worst Test Modes and Channel Details 11

3 TRANSMITTER TEST RESULTS 12

3.1 Carrier Frequencies 12
3.2 Occupied Channel Bandwidth 14
3.3 RF Output Power, Transmit Power Control (TPC) and Power Density 15
3.4 Transmitter Unwanted Emissions outside the 5 GHz RLAN Bands 19
3.5 Transmitter Unwanted Emissions within the 5 GHz RLAN Band 29

4 RECEIVER TEST RESULTS 31

4.1 Receiver Spurious Emissions 31

5 ADAPTIVITY TEST RESULTS 41

5.1 Adaptivity 41

6 RECEIVER BLOCKING TEST RESULTS 45

6.1 Receiver Blocking 45

7 PHOTOGRAPHS OF THE TEST CONFIGURATION 48

8 TEST LABORATORY INFORMATION 50

Release Record

Report No.	Version	Description	Issued Date
ER350803-09AN	Rev. 01	Initial issue	Jun. 15, 2017

Summary of Test Result

Ref. Std. Clause	Test Items	Measured	Result
4.2.1	Carrier Frequencies	Meet the requirement of limit.	Pass
4.2.2	Nominal Channel Bandwidth and Occupied Channel Bandwidth	Meet the requirement of limit.	Pass
4.2.3	RF Output Power, Transmit Power Control (TPC)	5.15-5.25GHz: 20.62 dBm 5.25-5.35GHz: 20.39 dBm 5.47-5.725GHz: 18.23 dBm	Pass
4.2.3	Power Density	Meet the requirement of limit.	Pass
4.2.4	Transmitter Unwanted Emissions	Meet the requirement of limit.	Pass
4.2.5	Receiver Spurious Emissions	Meet the requirement of limit.	Pass
4.2.6	Dynamic Frequency Selection (DFS)	Meet the requirement of limit.	Pass
4.2.7	Adaptivity (Channel Access Mechanism)	Meet the requirement of limit.	Pass[Note2]
4.2.8	Receiver Blocking	Meet the requirement of limit.	Pass
4.2.9	User Access Restrictions	Meet the requirement of limit.	Pass
4.2.10	Geo-Location Capability	This test is not required since the device does not support this function	N/A

Note:
1. The DFS measurement was recorded in Report No.: EY350803-09.
2. Channel Access Mechanism and maximum Channel Occupancy Time are declared compliance with requirement by manufacturer. Both items are not evaluated.

1 General Description

1.1 Information

This report is issued as a duplicate report to the original ICC report no. ER350803-07AN. The modification is updating standard from V2.1.0. to V2.1.1. Due to no impact on tests, all data remain unchanged.

1.1.1 Specification of the Equipment under Test (EUT)

RF General Information					
IEEE Std. 802.11	**Frequency Range (MHz)**	**Ch. Freq. (MHz)**	**Channel Number**	**Transmit Chains (N_{TX})**	**Data Rate / MCS**
a	5150-5250 5250-5350 5500-5700	5180-5240 5260-5320 5500-5700	36-48 [4] 52-64 [4] 100-140 [11]	1	6-54 Mbps
Note 1: 802.11a uses a combination of OFDM-BPSK, QPSK, 16QAM, 64QAM modulation.					

1.1.2 Antenna Details

Ant. No.	Model	Type	Connector	Operating Frequencies (MHz) / Antenna Gain (dBi)		
				2400~2483.5	**5150~5350**	**5470~5725**
1	Radiall Larsen R380.500.314	Dipole	UFL	1.6	5	5
2	Cisco AIR-ANT 4941	Dipole	RP-TNC plug	2	---	---

1.1.3 EUT Operational Condition

Power Supply Type	3.3Vdc from host		
SW Version	3.4.12.7		
Operational Voltage	☒ Vnom (230 V)	☒ Vmax (253V)	☒ Vmin (207 V)
Operational Climatic	☒ Tnom (20°C)	☒ Tmax (55°C)	☒ Tmin (-20°C)

1.1.4 Accessories

N/A

1.1.5 Adaptive Equipment

Adaptive Equipment		
☒	Adaptive Equipment without the possibility to switch to a non-adaptive mode:	
	☐	The equipment has implemented an LBT based DAA mechanism:
		☐ The equipment is Frame Based equipment
		☒ The equipment is Load Based equipment
		☐ The equipment can switch dynamically between Frame Based and Load Based equipment
	☐	The equipment has implemented an non-LBT based DAA mechanism
	☐	The equipment can operate in more than one adaptive mode
☐	Adaptive Equipment which can also operate in a non-adaptive mode	

1.1.6 Channel List

Frequency band (MHz)	
Channel	**Frequency(MHz)**
36	5180
40	5200
44	5220
48	5240
52	5260
56	5280
60	5300
64	5320
100	5500
104	5520
108	5540
112	5560
116	5580
120	5600
124	5620
128	5640
132	5660
136	5680
140	5700

1.1.7 Test Tool and Duty Cycle

Test tool	SCU, version: v3.04
Duty Cycle Of Test Signal (%)	92.89% - IEEE 802.11a
Duty Factor	0.32 - IEEE 802.11a

1.1.8 Power Setting

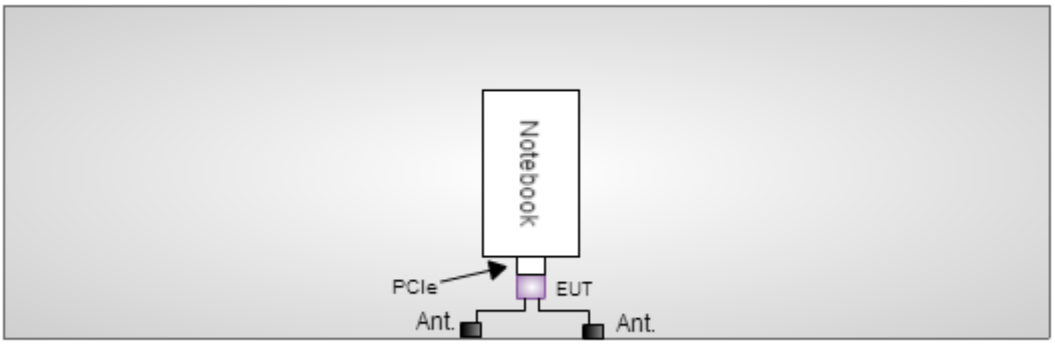
Modulation Mode	**Test Frequency (MHz)**			
	5180	**5320**	**5500**	**5700**
a	100%	100%	100%	100%

1.2 Local Support Equipment List

Support Equipment List						
No.	**Equipment**	**Brand**	**Model**	**S/N**	**FCC ID**	**Signal cable / Length (m)**
1	Notebook	DELL	E6430	G3GB4X1	DoC	---
2	PCIe	ICC	---	---	---	---

1.3 Test Setup Chart

Test Setup Diagram



1.4 Test Equipment and Calibration Data

Test Item	Radiated Emissions				
Test Site	Fully-anechoic chamber 1 / (05CH01-WS)				
Tested Date	Feb. 01, 2016				
Instrument	**Manufacturer**	**Model No.**	**Serial No.**	**Calibration Date**	**Calibration Until**
Spectrum Analyzer	Agilent	N9010A	MY54200247	Aug. 24, 2015	Aug. 23, 2016
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-524	Oct. 03, 2015	Oct. 02, 2016
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1094	Oct. 20, 2015	Oct. 19, 2016
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170517	Nov. 04, 2015	Nov. 03, 2016
Preamplifier	Agilent	83017A	MY39501310	Dec. 11, 2015	Dec. 10, 2016
Preamplifier	EMC	EMC02325	980146	Oct. 14, 2015	Oct. 13, 2016
Preamplifier	EMC	EMC184045B	980192	Sep. 01, 2015	Aug. 31, 2016
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16609/4	Dec. 04, 2015	Dec. 03, 2016
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16608/4	Dec. 04, 2015	Dec. 03, 2016
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16617/4	Dec. 04, 2015	Dec. 03, 2016
LF cable 3M	Woken	CFD400NL-LW	CFD400NL-005	Dec. 04, 2015	Dec. 03, 2016
LF cable 10M	Woken	CFD400NL-LW	CFD400NL-006	Dec. 04, 2015	Dec. 03, 2016
Measurement Software	AUDIX	e3	6.120210g	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

Test Item	RF Conducted				
Test Site	(TH01-WS)				
Tested Date	Jan. 29, 2016				
Instrument	**Manufacturer**	**Model No.**	**Serial No.**	**Calibration Date**	**Calibration Until**
Spectrum Analyzer	ROHDE&SCHWARZ	FSV40	101486	Oct. 14, 2015	Oct. 13, 2016
TEMP&HUMIDITY CHAMBER	GIANT FORCE	GCT-225-40-SP-SD	MAF1212-002	Nov. 27, 2015	Nov. 26, 2016
Power Sensor	Agilent	U2021XA	MY53480019	Feb. 02, 2015	Feb. 01, 2016
Power Sensor	Agilent	U2021XA	MY53510003	Feb. 02, 2015	Feb. 01, 2016
Power Sensor	Agilent	U2021XA	MY54070003	Feb. 16, 2015	Feb. 15, 2016
Power Sensor	Agilent	U2021XA	MY54060013	Feb. 16, 2015	Feb. 15, 2016
Signal Generator	R&S	SMB100A	175727	Oct. 05, 2015	Oct. 04, 2016
MXG-B RF Vector Signal Generator	Agilent	N5182B	MY53050081	Mar. 30, 2015	Mar. 29, 2016
DC POWER SOURCE	GW INSTEK	GPC-3060D	EM884797	Oct. 20, 2015	Oct. 19, 2016
Measurement Software	Sporton	Sporton_1	1.3.30	NA	NA
Measurement Software	Agilent	EN RF test	1.1501125	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

Test Item	Adaptivity				
Test Site	(TH01-WS)				
Tested Date	May 05, 2017				
Instrument	**Manufacturer**	**Model No.**	**Serial No.**	**Calibration Date**	**Calibration Until**
Spectrum	Keysight	N9010A	MY54510374	May 24, 2016	May 23, 2017
Spectrum	R&S	FSV-7	101607	Dec. 07, 2016	Dec. 06, 2017
RF cable-4M	HUBER+SUHNER	SUCOFLEX_104	MY15686/4	Dec. 16, 2016	Dec. 15, 2017
RF cable-0.5M	HUBER+SUHNER	SUCOFLEX_104	296081/4	Dec. 16, 2016	Dec. 15, 2017
RF cable-0.2M	HUBER+SUHNER	SUCOFLEX_104	329023/4	Dec. 16, 2016	Dec. 15, 2017
RF cable-0.2M	HUBER+SUHNER	SUCOFLEX_104	329021/4	Dec. 16, 2016	Dec. 15, 2017
MXG-B RF Vector Signal Generator	Agilent	N5182B	MY53051912	Nov.21, 2016	Nov.20, 2017
Preamplifier	Burgeon	BPA-530	100219	Nov. 02, 2016	Nov. 01, 2017
Oscilloscope	National Instruments	USB-5133	F651FF	Jun. 22, 2016	Jun. 21, 2017
Measurement Software	Sporton	Sporton_3	2.2.0.0	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

Test Item	Receiver Blocking				
Test Site	(05CH01-WS)				
Tested Date	Apr. 27, 2017				
Instrument	**Manufacturer**	**Model No.**	**Serial No.**	**Calibration Date**	**Calibration Until**
Wireless connectivity tester	ROHDE&SCHWARZ	CMW270	100856	Nov. 07, 2016	Nov. 06, 2017
Signal Generator	R&S	SMB100A	175727	Oct. 19, 2016	Oct. 18, 2017
RF Cable	HUBER+SUHNER	SUCOFLEX_104	500202/4	Dec. 16, 2016	Dec. 15, 2017
RF Cable	HUBER+SUHNER	SUCOFLEX_104	296088/4	Dec. 16, 2016	Dec. 15, 2017
RF Cable	HUBER+SUHNER	SUCOFLEX_104	329023/4	Dec. 16, 2016	Dec. 15, 2017
Note: Calibration Interval of instruments listed above is one year.					

1.5 Testing Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

EN 301 893 V2.1.1 (2017-05)

1.6 Measurement Uncertainty

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2)

Measurement Uncertainty		
Parameters	**Uncertainty**	**Limit**
Radio Frequency	±1.4 x 10^{-9}	±1 × 10^{-5}
RF power conducted	±0.808 dB	±1,5 dB
RF power radiated	±3.401 dB	±6 dB
Spurious emission, conducted	±2.994 dB	±3 dB
Spurious emission, radiated	±3.401 dB	±6 dB
Humidity	±0.6 ^{o}C	±5 %
Temperature	±0.29 %	±2 °C
Time	±0.1 %	±10 %

2 Test Configuration

2.1 Testing Condition

Test Item	Test Site	Ambient Condition	Tested By
RF Conducted	TH01-WS	19°C / 68%	Allen Yu
Radiated Emission	05CH01-WS	20°C / 68%	Allen Yu
Adaptivity	TH01-WS	23°C / 67%	Jack Li
Receiver Blocking	05CH01-WS	22.5°C / 64%	Jack Li

2.2 The Worst Test Modes and Channel Details

Test item	Modulation Mode	Test Frequency (MHz)	Data Rate
Carrier Frequencies Occupied Channel Bandwidth RF Output Power Power Spectral Density	11a HT20 HT40	5180 / 5320 / 5500 / 5700 5180 / 5320 / 5500 / 5700 5190 / 5310 / 5510 / 5670	6 Mbps MCS 0 MCS 0
Transmitter Unwanted Emissions outside the 5 GHz RLAN Bands	11a HT20 HT40	5180 / 5700 5180 / 5700 5190 / 5670	6 Mbps MCS 0 MCS 0
Transmitter Unwanted Emissions within the 5 GHz RLAN Band	11a HT20 HT40	5180 / 5320 / 5500 / 5700 5180 / 5320 / 5500 / 5700 5190 / 5310 / 5510 / 5670	6 Mbps MCS 0 MCS 0
Receiver Spurious Emissions	11a HT20 HT40	5180 / 5700 5180 / 5700 5190 / 5670	6 Mbps MCS 0 MCS 0
Adaptivity	11a HT40	5180 / 5500 5190 / 5510	6 Mbps MCS 0
Receiver Blocking	11a	5180	6 Mbps

3 Transmitter Test Results

3.1 Carrier Frequencies

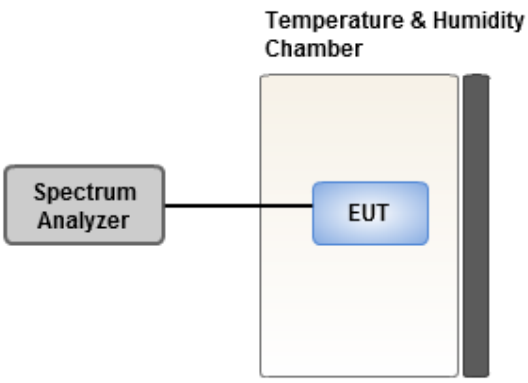
3.1.1 Limit of Carrier Frequencies

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

3.1.2 Test Procedures

Reference to clause 5.4.2.2 of ETSI EN 301 893 V2.1.1 (2017-05).

3.1.3 Test Setup



3.1.4 Test Result of Carrier Frequencies

Condition	Modulation Mode	Freq. (MHz)	Carrier Centre Frequencies (ppm)		Limit (ppm)
			Freqeuncy (MHz)	Carrier Stability	
$T_{nom}V_{nom}$	802.11a	5180	5179.95260	-9.15	20
$T_{min}V_{max}$	802.11a	5180	5179.95910	-7.90	20
$T_{min}V_{min}$	802.11a	5180	5179.95910	-7.90	20
$T_{max}V_{max}$	802.11a	5180	5179.95230	-9.21	20
$T_{max}V_{min}$	802.11a	5180	5179.95230	-9.21	20
$T_{nom}V_{nom}$	802.11a	5320	5319.95290	-8.85	20
$T_{min}V_{max}$	802.11a	5320	5319.95950	-7.61	20
$T_{min}V_{min}$	802.11a	5320	5319.95950	-7.61	20
$T_{max}V_{max}$	802.11a	5320	5319.95280	-8.87	20
$T_{max}V_{min}$	802.11a	5320	5319.95280	-8.87	20
$T_{nom}V_{nom}$	802.11a	5500	5499.95260	-8.62	20
$T_{min}V_{max}$	802.11a	5500	5499.95870	-7.51	20
$T_{min}V_{min}$	802.11a	5500	5499.95870	-7.51	20
$T_{max}V_{max}$	802.11a	5500	5499.95290	-8.56	20
$T_{max}V_{min}$	802.11a	5500	5499.95290	-8.56	20
$T_{nom}V_{nom}$	802.11a	5700	5699.95270	-8.30	20
$T_{min}V_{max}$	802.11a	5700	5699.95960	-7.09	20
$T_{min}V_{min}$	802.11a	5700	5699.95960	-7.09	20
$T_{max}V_{max}$	802.11a	5700	5699.95210	-8.40	20
$T_{max}V_{min}$	802.11a	5700	5699.95210	-8.40	20

3.2 Occupied Channel Bandwidth

3.2.1 Limit of Occupied Channel Bandwidth

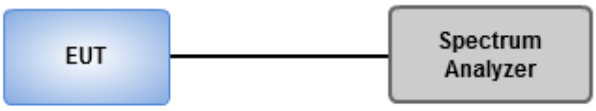
The Nominal Channel Bandwidth for a single Operating Channel shall be 20 MHz

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.

3.2.2 Test Procedures

Reference to clause 5.4.3.2 of ETSI EN 301 893 V2.1.1 (2017-05).

3.2.3 Test Setup



3.2.4 Test Result of Occupied Channel Bandwidth

Modulation Mode	Frequency (MHz)	Occupied Channel Bandwidth (MHz)	Occupied Channel Bandwidth Limit (MHz)
802.11a	5180	16.64	16-20
802.11a	5320	16.64	16-20
802.11a	5500	16.57	16-20
802.11a	5700	16.64	16-20

3.3 RF Output Power, Transmit Power Control (TPC) and Power Density

3.3.1 Limit of RF Output Power, Transmit Power Control (TPC) and Power Density

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 *Radar Interference Detection* function shall comply with the limits for the frequency range 5 250 MHz to 5 350 MHz.

Mean e.i.r.p. limits for RF Output Power at the lowest power level of the TPC range

Frequency range (MHz)	Mean e.i.r.p. (dBm) limit for P_L
5 250 to 5 350	17
5 470 to 5 725	24 (see note)

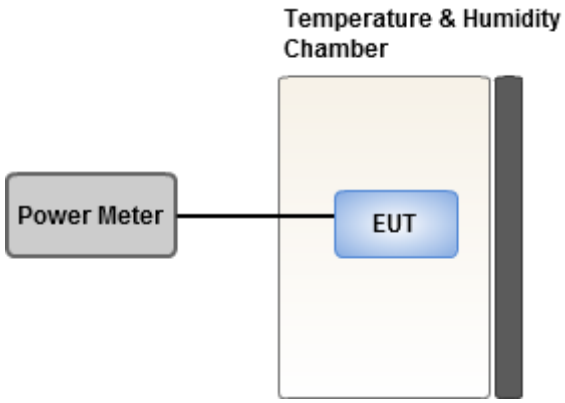
Note: Slave devices without a *Radar Interference Detection* function shall comply with the limits for the band 5 250 MHz to 5 350 MHz.

3.3.2 Test Procedures

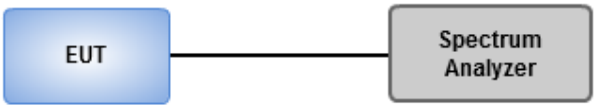
Reference to clause 5.4.4.2 of ETSI EN 301 893 V2.1.1 (2017-05).

3.3.3 Test Setup

For RF Output Power, Transmit Power Control (TPC)



For Power Density



3.3.4 Test Result of RF Output Power at the Highest Power

Maximum Transmit Power (dBm)			
Condition	**Freq. (MHz)**	**802.11a**	**Limit (dBm)**
$T_{nom}V_{nom}$	5180	19.23	23
$T_{min}V_{max}$	5180	20.60	23
$T_{min}V_{min}$	5180	**20.62**	23
$T_{max}V_{max}$	5180	18.80	23
$T_{max}V_{min}$	5180	18.77	23
$T_{nom}V_{nom}$	5320	19.12	23
$T_{min}V_{max}$	5320	20.37	23
$T_{min}V_{min}$	5320	**20.39**	23
$T_{max}V_{max}$	5320	19.01	23
$T_{max}V_{min}$	5320	18.99	23
$T_{nom}V_{nom}$	5500	16.54	23
$T_{min}V_{max}$	5500	17.97	23
$T_{min}V_{min}$	5500	17.99	23
$T_{max}V_{max}$	5500	15.96	23
$T_{max}V_{min}$	5500	15.93	23
$T_{nom}V_{nom}$	5700	17.14	23
$T_{min}V_{max}$	5700	18.20	23
$T_{min}V_{min}$	5700	**18.23**	23
$T_{max}V_{max}$	5700	16.38	23
$T_{max}V_{min}$	5700	16.36	23

3.3.5 Test Result of RF Output Power at the Lowest Power

Maximum Transmit Power (dBm)			
Condition	**Freq. (MHz)**	**802.11a**	**Limit (dBm)**
$T_{nom}V_{nom}$	5320	13.12	17
$T_{min}V_{max}$	5320	14.37	17
$T_{min}V_{min}$	5320	14.39	17
$T_{max}V_{max}$	5320	13.01	17
$T_{max}V_{min}$	5320	12.99	17
$T_{nom}V_{nom}$	5500	10.54	17
$T_{min}V_{max}$	5500	11.97	17
$T_{min}V_{min}$	5500	11.99	17
$T_{max}V_{max}$	5500	9.96	17
$T_{max}V_{min}$	5500	9.93	17
$T_{nom}V_{nom}$	5700	11.14	17
$T_{min}V_{max}$	5700	12.20	17
$T_{min}V_{min}$	5700	12.23	17
$T_{max}V_{max}$	5700	10.38	17
$T_{max}V_{min}$	5700	10.36	17

3.3.6 Test Result of Power Density

Modulation Mode	Freq. (MHz)	Power Density (dBm/1MHz) e.i.r.p.	Limit (dBm/1MHz) e.i.r.p.	Results
802.11a	5180	8.36	10	Pass
802.11a	5320	8.02	10	Pass
802.11a	5500	5.73	10	Pass
802.11a	5700	5.84	10	Pass

3.4 Transmitter Unwanted Emissions outside the 5 GHz RLAN Bands

3.4.1 Limit of Transmitter Unwanted Emissions outside the 5 GHz RLAN Bands

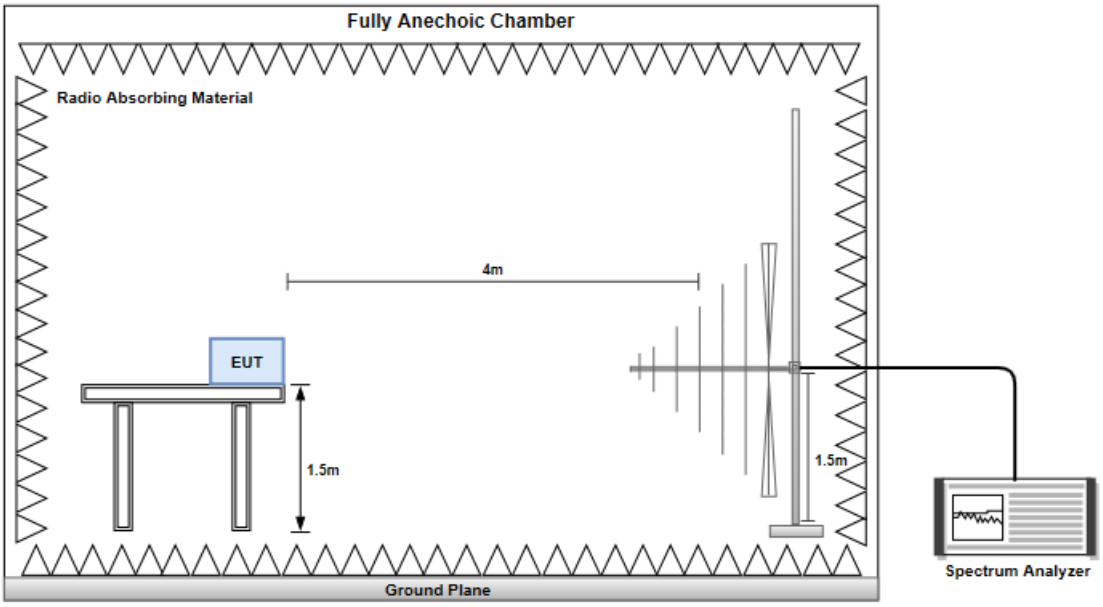
Frequency Range	Maximum Power	Bandwidth
30 MHz to 47 MHz	-36 dBm	100 kHz
47 MHz to 74 MHz	-54 dBm	100 kHz
74 MHz to 87,5 MHz	-36 dBm	100 kHz
87,5 MHz to 118 MHz	-54 dBm	100 kHz
118 MHz to 174 MHz	-36 dBm	100 kHz
174 MHz to 230 MHz	-54 dBm	100 kHz
230 MHz to 470 MHz	-36 dBm	100 kHz
470 MHz to 862 MHz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

3.4.2 Test Procedures

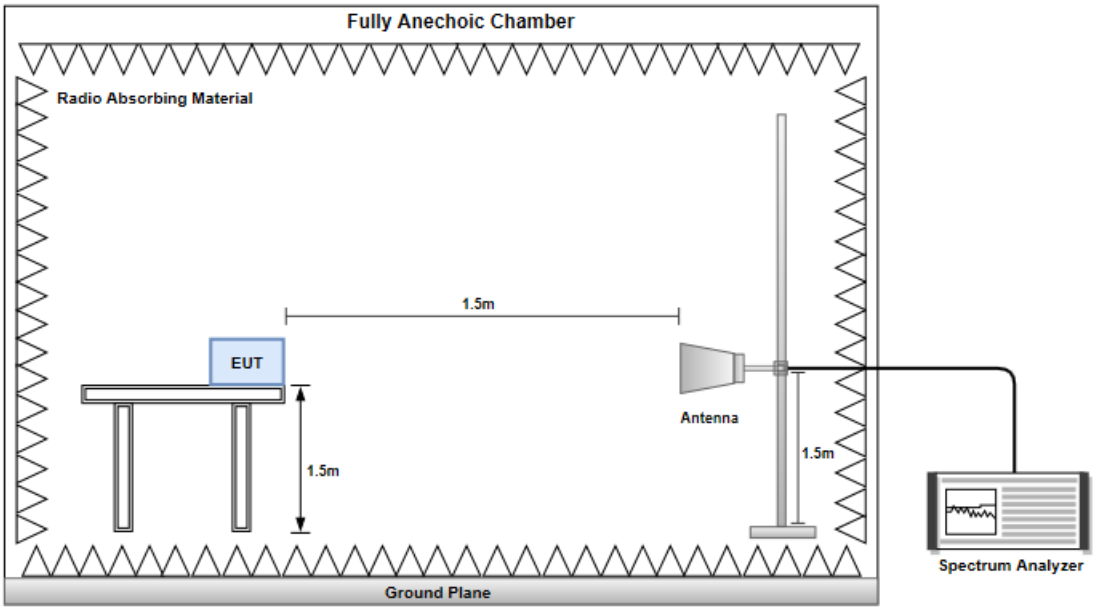
Reference to clause 5.4.5.2 of ETSI EN 301 893 V2.1.1 (2017-05).

3.4.3 Test Setup

Below 1GHz

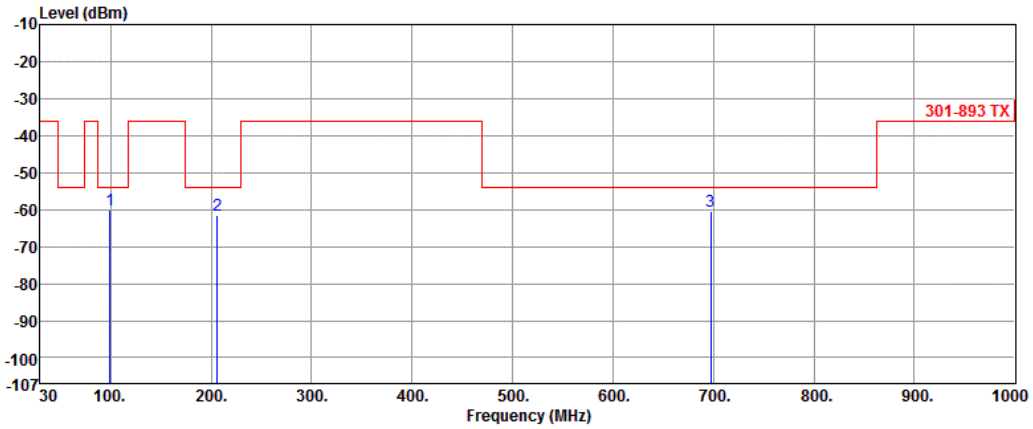


Above 1 GHz



3.4.4 Transmitter Radiated Unwanted Emissions (Below 1GHz)

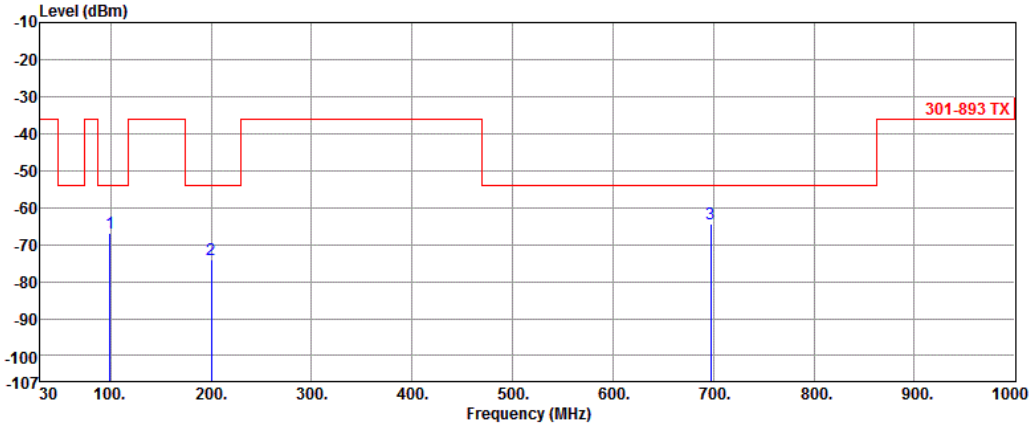
Modulation	11a	**Test Freq. (MHz)**	5180
Polarization	Horizontal		



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	99.45	-60.21	-54.00	-6.21	-7.23	-52.98
2	206.07	-61.62	-54.00	-7.62	-5.55	-56.07
3	697.22	-60.43	-54.00	-6.43	7.49	-67.92

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)
Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

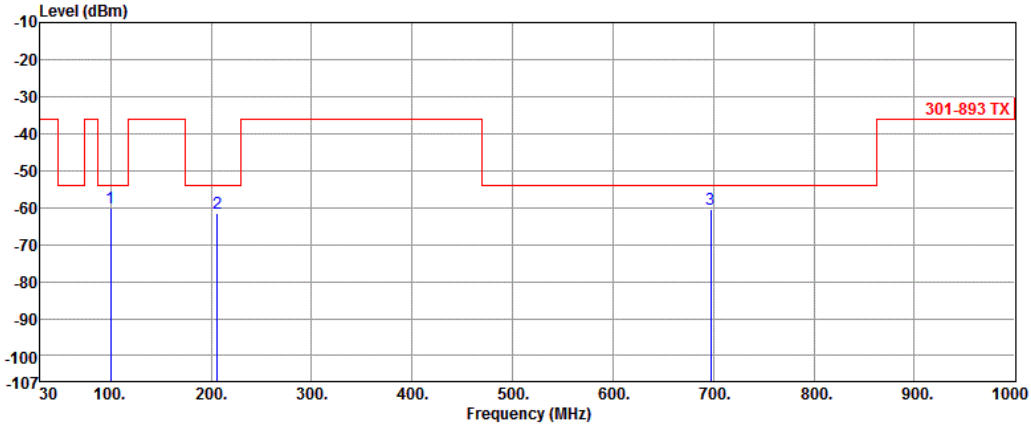
Modulation	11a	Test Freq. (MHz)	5180
Polarization	Vertical		



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	99.36	-66.99	-54.00	-12.99	-4.98	-62.01
2	199.85	-73.94	-54.00	-19.94	-4.70	-69.24
3	697.44	-64.30	-54.00	-10.30	7.12	-71.42

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)
Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

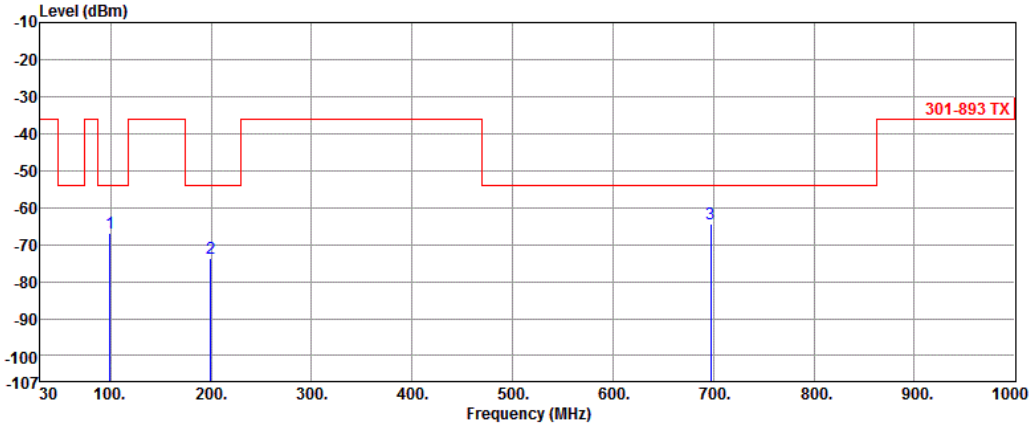
Modulation	11a	Test Freq. (MHz)	5700
Polarization	Horizontal		



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	99.95	-59.99	-54.00	-5.99	-7.19	-52.80
2	206.19	-61.65	-54.00	-7.65	-5.54	-56.11
3	697.10	-60.30	-54.00	-6.30	7.49	-67.79

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)
Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

Modulation	11a	Test Freq. (MHz)	5700
Polarization	Vertical		

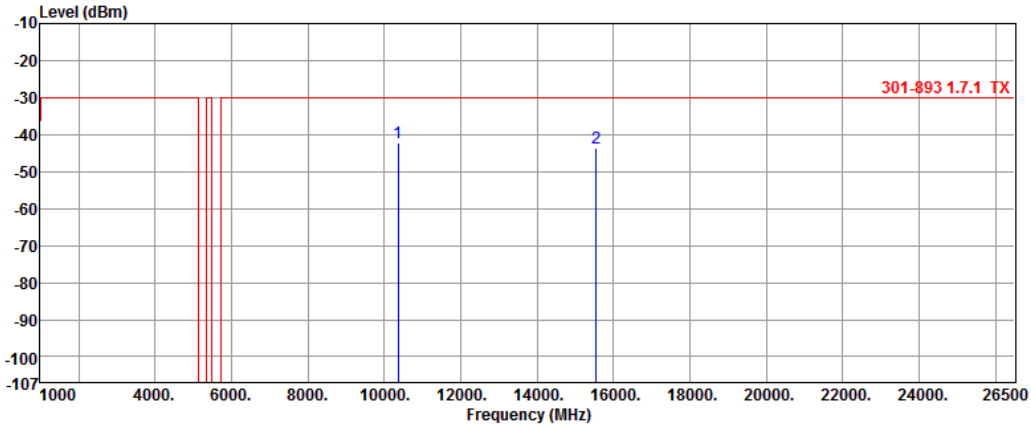


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	99.46	-67.04	-54.00	-13.04	-4.97	-62.07
2	199.59	-73.67	-54.00	-19.67	-4.67	-69.00
3	697.39	-64.40	-54.00	-10.40	7.12	-71.52

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)
Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

3.4.5 Transmitter Radiated Unwanted Emissions (Above 1GHz)

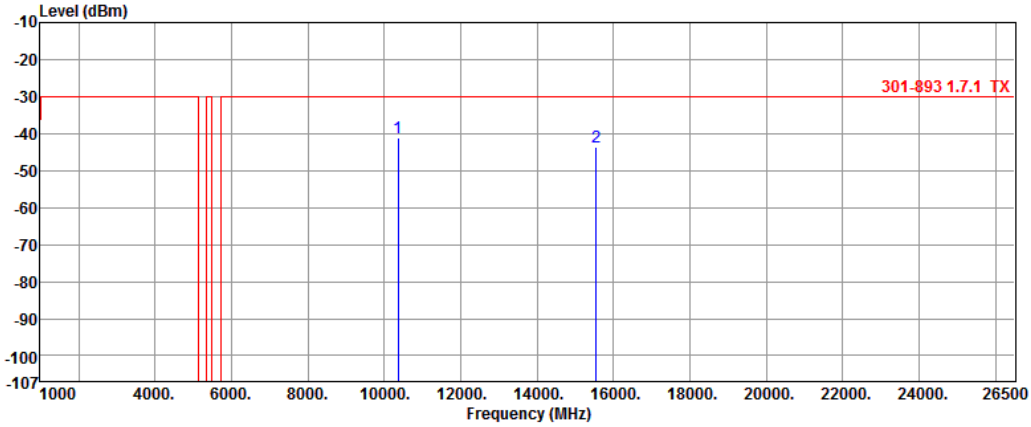
Modulation	11a	**Test Freq. (MHz)**	5180
Polarization	Horizontal		



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	10359.56	-42.05	-30.00	-12.05	18.20	-60.25
2	15538.80	-43.60	-30.00	-13.60	18.09	-61.69

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)
Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

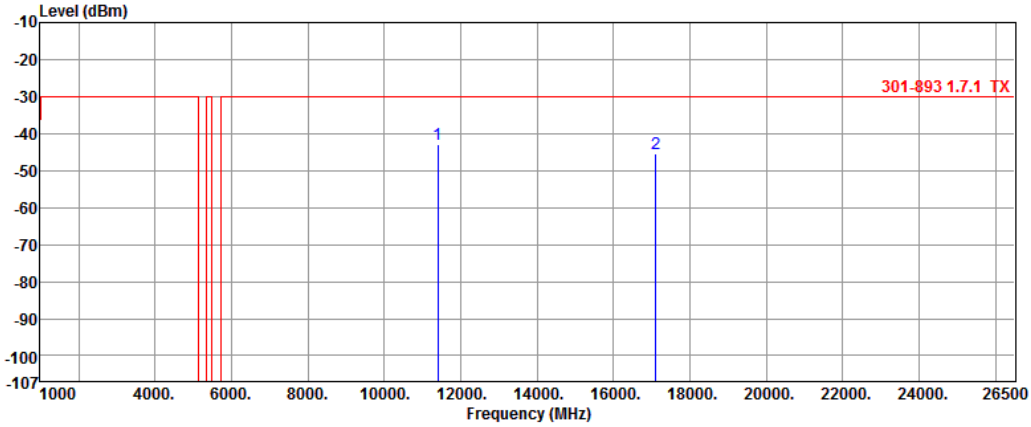
Modulation	11a	Test Freq. (MHz)	5180
Polarization	Vertical		



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	10361.60	-41.21	-30.00	-11.21	17.62	-58.83
2	15538.70	-43.51	-30.00	-13.51	18.44	-61.95

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)
Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

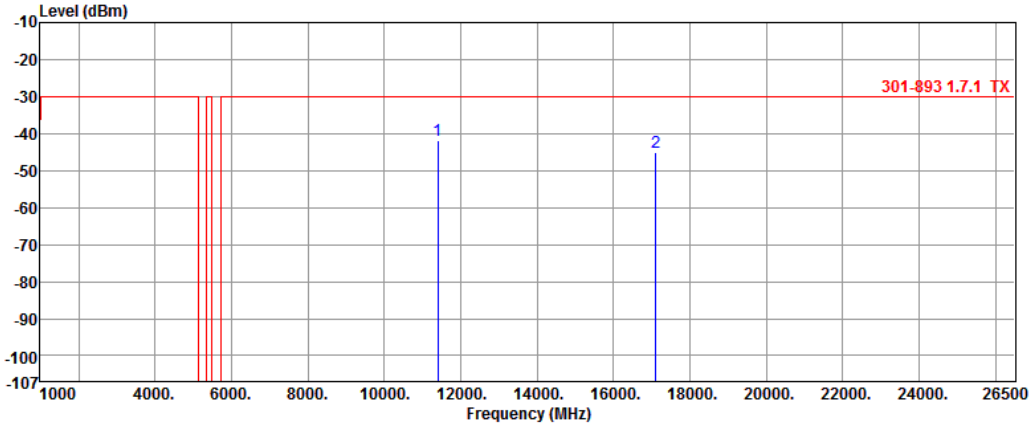
Modulation	11a	Test Freq. (MHz)	5700
Polarization	Horizontal		



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	11401.14	-42.89	-30.00	-12.89	19.38	-62.27
2	17098.78	-45.32	-30.00	-15.32	21.32	-66.64

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)
Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

Modulation	11a	Test Freq. (MHz)	5700
Polarization	Vertical		

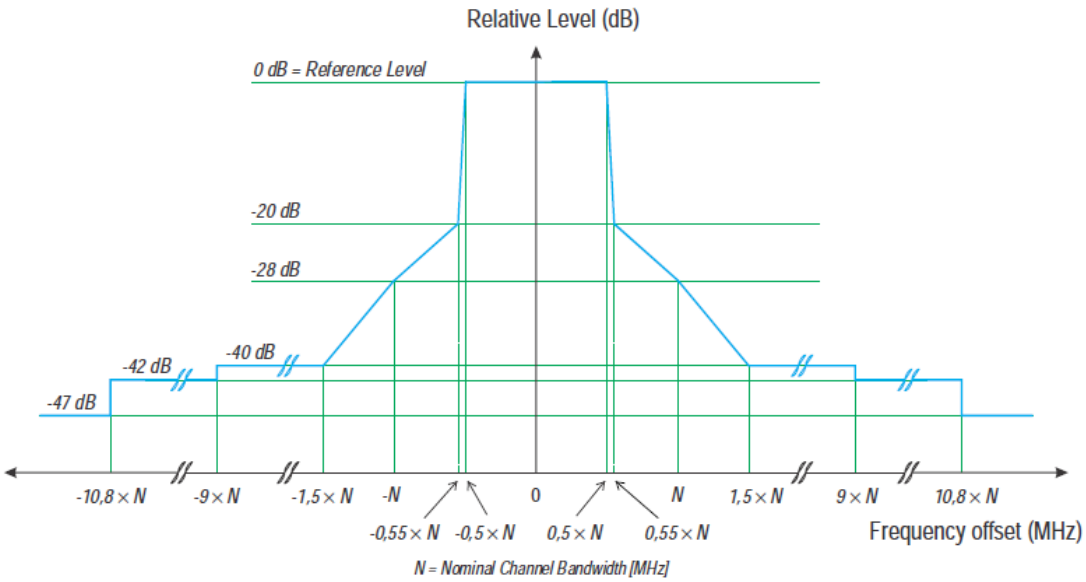


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	11401.44	-42.01	-30.00	-12.01	19.31	-61.32
2	17098.58	-45.06	-30.00	-15.06	20.82	-65.88

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)
Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

3.5 Transmitter Unwanted Emissions within the 5 GHz RLAN Band

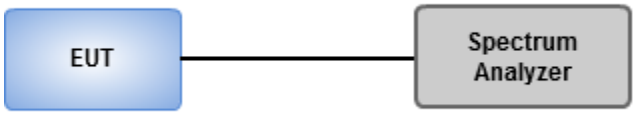
3.5.1 Limit of Transmitter Unwanted Emissions within the 5 GHz RLAN Band



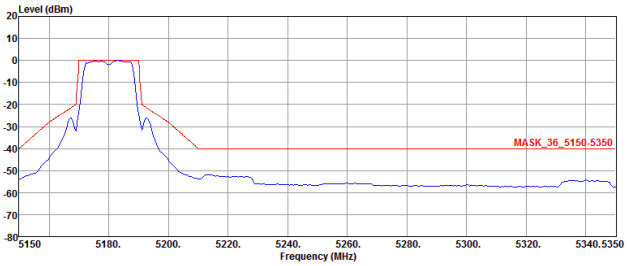
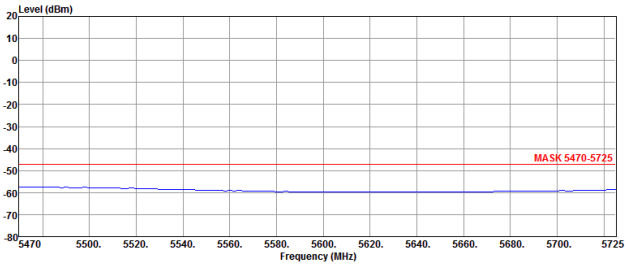
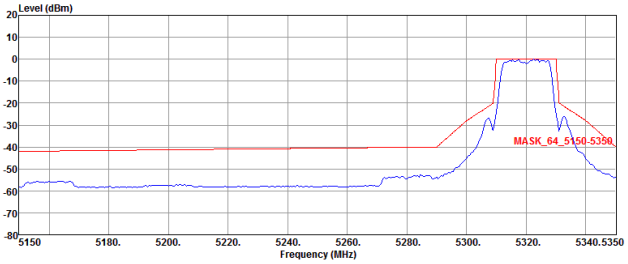
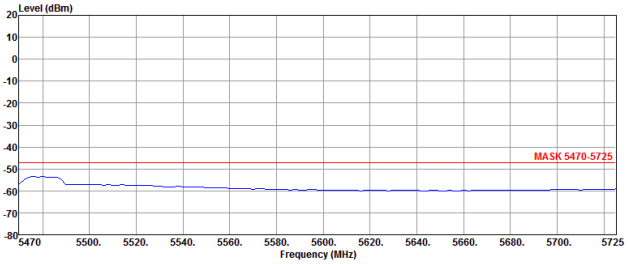
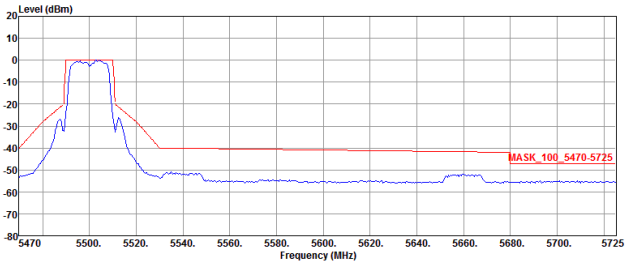
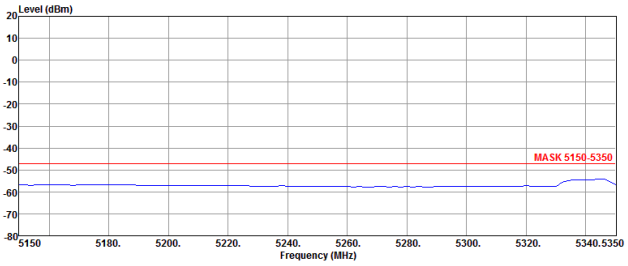
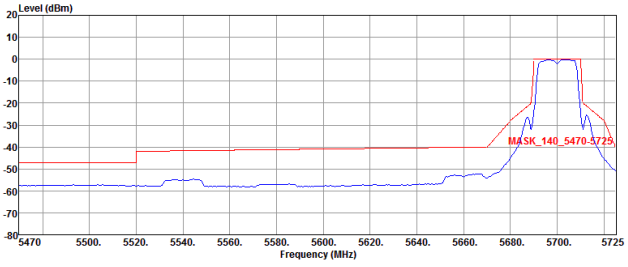
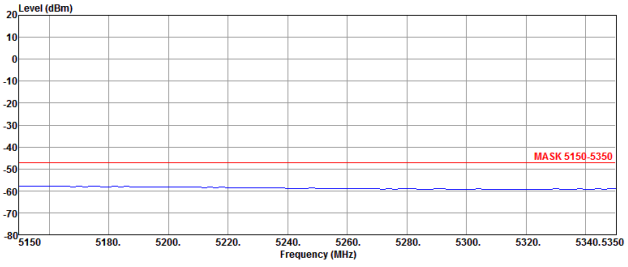
3.5.2 Test Procedures

Reference to clause 5.4.6.2 of ETSI EN 301 893 V2.1.1 (2017-05).

3.5.3 Test Setup



3.5.4 Test Result of Transmitter Unwanted Emissions within the 5 GHz RLAN Band for 802.11a

5180MHz	5180MHz
	
5320MHz	**5320MHz**
	
5500MHz	**5500MHz**
	
5700MHz	**5700MHz**
	

4 Receiver Test Results

4.1 Receiver Spurious Emissions

4.1.1 Limit of Receiver Spurious Emissions

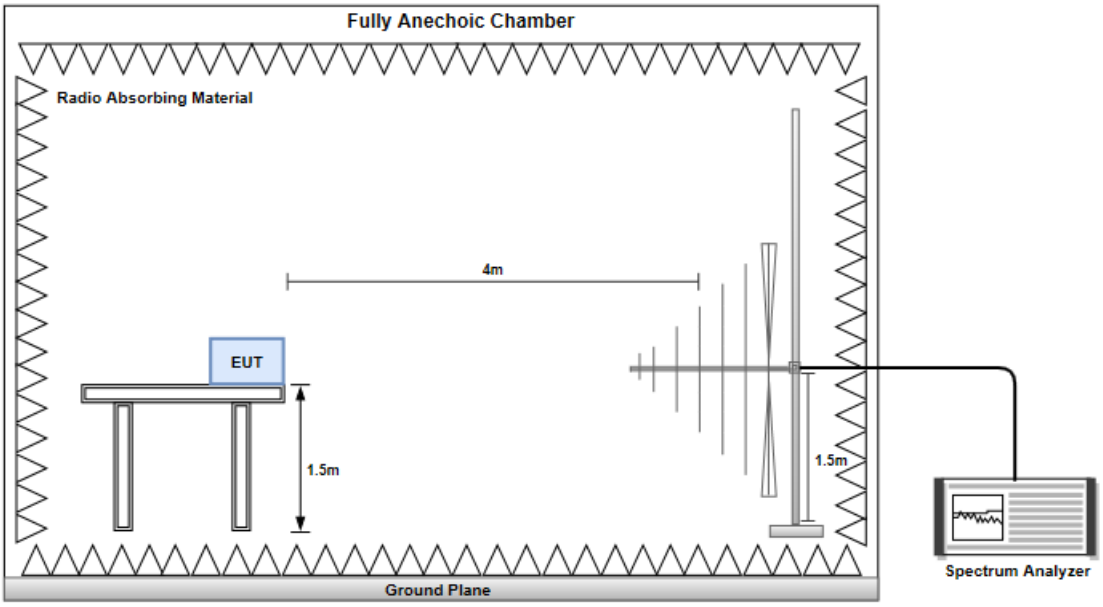
Frequency Range	Maximum Power	Measurement Bandwidth
30 MHz to 1 GHz	-57 dBm	100 kHz
1 GHz to 26 GHz	-47 dBm	1 MHz

4.1.2 Test Procedures

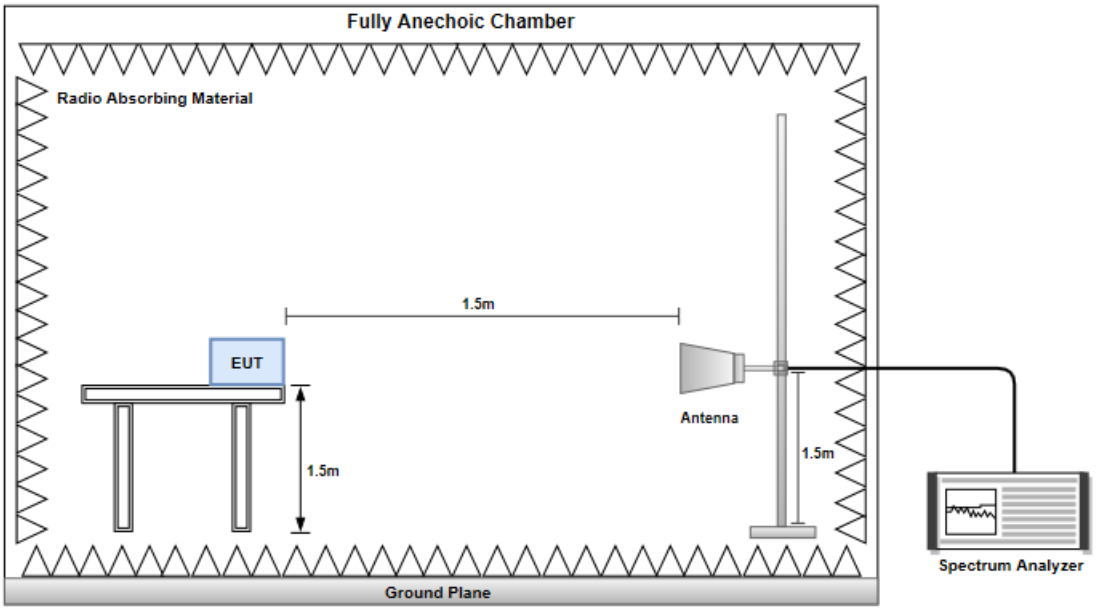
Reference to clause 5.4.7.2 of ETSI EN 301 893 V2.1.1 (2017-05).

4.1.3 Test Setup

Below 1GHz

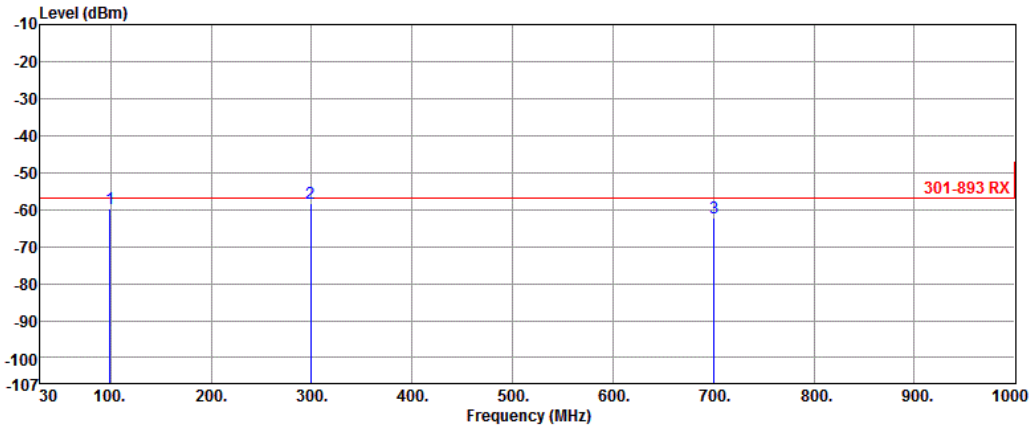


Above 1 GHz



4.1.4 Receiver Spurious Emissions (Below 1GHz)

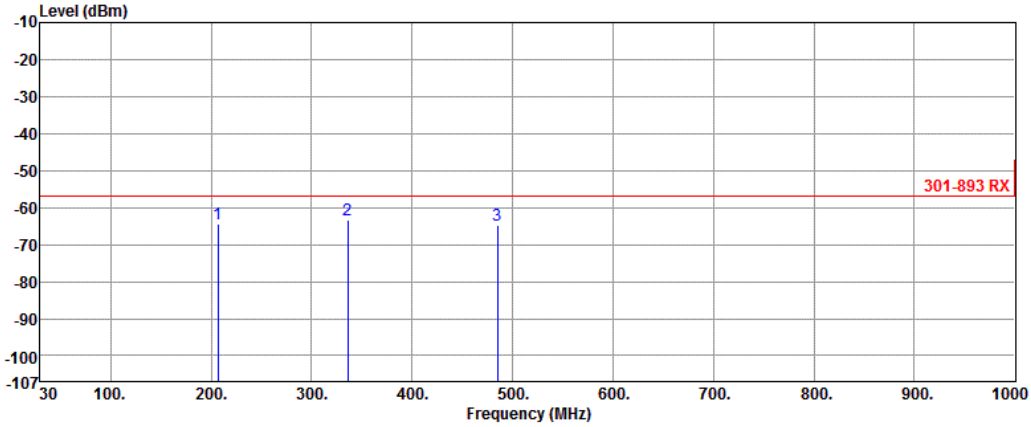
Modulation	11a	**Test Freq. (MHz)**	5180
Polarization	Horizontal		



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	99.14	-59.66	-57.00	-2.66	-7.26	-52.40
2	298.89	-58.40	-57.00	-1.40	-0.15	-58.25
3	700.38	-62.32	-57.00	-5.32	7.46	-69.78

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)
Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

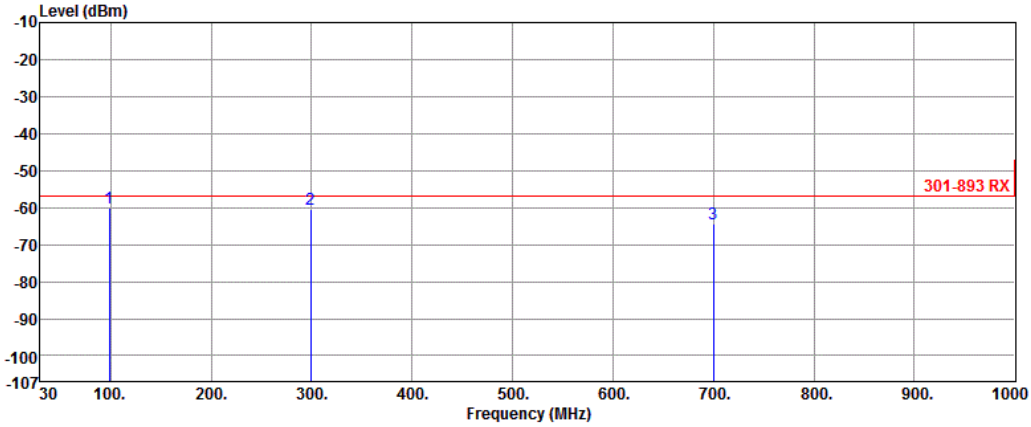
Modulation	11a	Test Freq. (MHz)	5180
Polarization	Vertical		



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	206.87	-64.39	-57.00	-7.39	-5.13	-59.26
2	335.68	-63.16	-57.00	-6.16	-0.31	-62.85
3	484.79	-64.81	-57.00	-7.81	2.53	-67.34

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)
Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

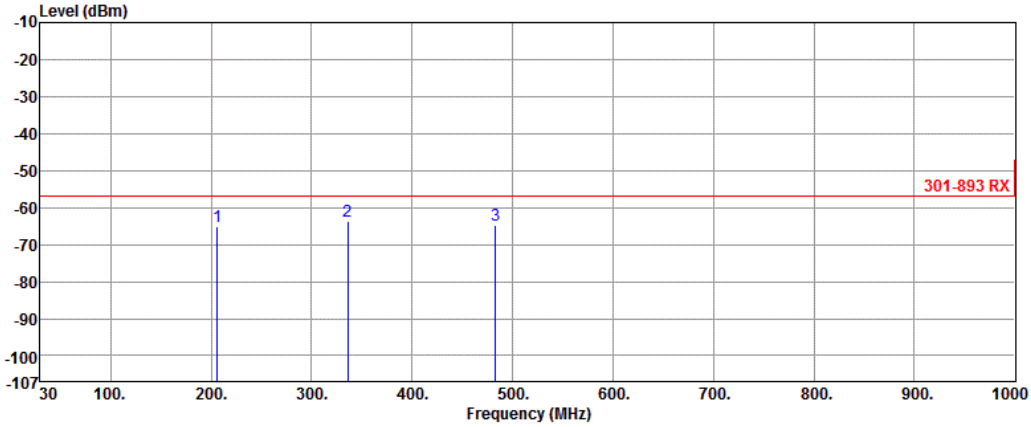
Modulation	11a	Test Freq. (MHz)	5700
Polarization	Horizontal		



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	98.55	-60.11	-57.00	-3.11	-7.31	-52.80
2	298.98	-60.47	-57.00	-3.47	-0.16	-60.31
3	700.08	-64.34	-57.00	-7.34	7.46	-71.80

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)
Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

Modulation	11a	Test Freq. (MHz)	5700
Polarization	Vertical		

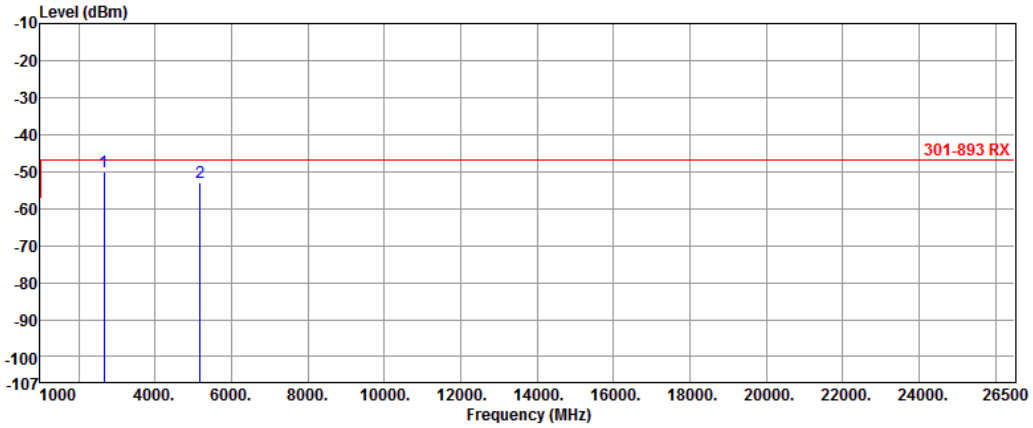


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	206.08	-65.07	-57.00	-8.07	-5.14	-59.93
2	335.67	-63.75	-57.00	-6.75	-0.31	-63.44
3	482.99	-64.85	-57.00	-7.85	2.55	-67.40

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)
Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

4.1.5 Receiver Spurious Emissions (Above 1GHz)

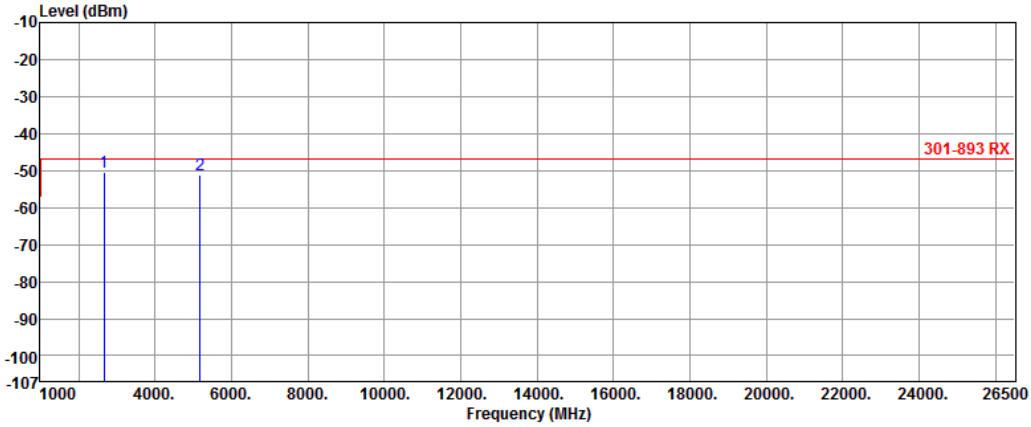
Modulation	11a	Test Freq. (MHz)	5180
Polarization	Horizontal		



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	2658.25	-50.27	-47.00	-3.27	3.63	-53.90
2	5179.76	-53.10	-47.00	-6.10	9.49	-62.59

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)
Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

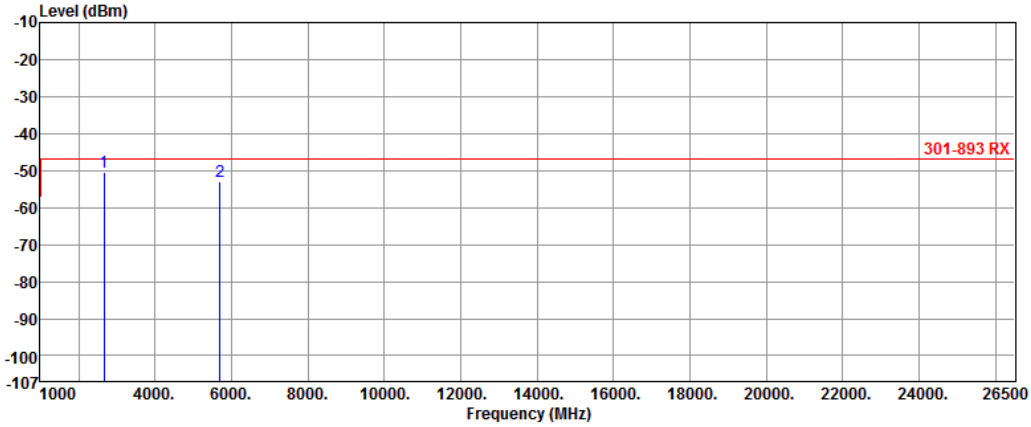
Modulation	11a	Test Freq. (MHz)	5180
Polarization	Vertical		



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	2657.55	-50.35	-47.00	-3.35	3.20	-53.55
2	5179.72	-51.06	-47.00	-4.06	8.85	-59.91

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)
Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

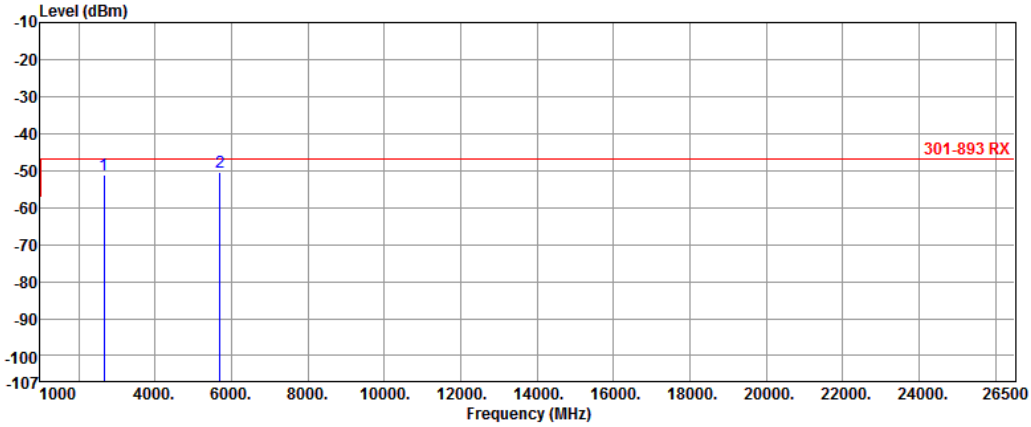
Modulation	11a	Test Freq. (MHz)	5700
Polarization	Horizontal		



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	2657.48	-50.28	-47.00	-3.28	3.63	-53.91
2	5700.15	-52.99	-47.00	-5.99	8.34	-61.33

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)
Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

Modulation	11a	Test Freq. (MHz)	5700
Polarization	Vertical		



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	2657.55	-51.20	-47.00	-4.20	3.20	-54.40
2	5699.85	-50.36	-47.00	-3.36	8.13	-58.49

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)
Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

5 Adaptivity Test Results

5.1 Adaptivity

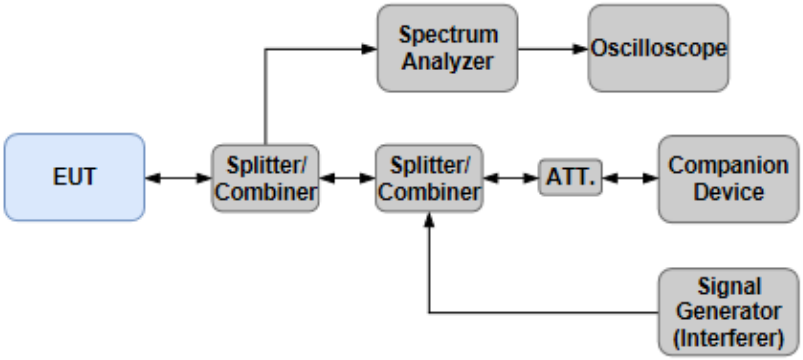
5.1.1 Adaptivity Limit

Adaptivity Limit
☐ Frame Based Equipment 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. For P_H ≤ 13 dBm: TL = -75 dBm/MHz For 13 dBm < P_H < 23 dBm: TL = -85 dBm/MHz + (23 dBm - P_H) For P_H ≥ 23 dBm: TL = -85 dBm/MHz
☒ Load Based Equipment ☒ **Option 1:** For equipment that for its operation in the 5 GHz bands is conforming to IEEE 802.11™-2016 [9], clause 17, clause 19 or clause 21, or any combination of these clauses, the *ED Threshold Level (TL)* is independent of the equipment's maximum transmit power (P_H). Assuming a 0 dBi receive antenna the *ED Threshold Level (TL)* shall be: TL = -75 dBm/MHz
☐ **Option 2:** For equipment conforming to one or more of the clauses listed in Option 1, and to at least one other operating mode, and for equipment conforming to none of the clauses listed in Option 1, the *ED Threshold Level (TL)* shall be proportional to the equipment's maximum transmit power (P_H). Assuming a 0 dBi receive antenna the *ED Threshold Level (TL)* shall be: For P_H ≤ 13 dBm: TL = -75 dBm/MHz For 13 dBm < P_H < 23 dBm: TL = -85 dBm/MHz + (23 dBm - P_H) For P_H ≥ 23 dBm: TL = -85 dBm/MHz
☒ Short Control Signalling Transmissions: ● within an observation period of 50 ms, the number of *Short Control Signalling Transmissions* by the equipment shall be equal to or less than 50; and ● the total duration of the equipment's *Short Control Signalling Transmissions* shall be less than 2 500 µs within said observation period.
☒ Channel Access Mechanism / Maximum Channel Occupancy Time(s) : For Supervising Devices refer to clause 4.2.7.3.2.4 Table 7. For Supervised Devices refer to clause 4.2.7.3.2.4 Table 8. ☐Option A: Measurement for Channel Access Mechanism and Maximum Channel Occupancy Time(s) ☒Option B: Compliance by declaration for the Channel Access Mechanism and Maximum Channel Occupancy Time(s)

5.1.2 Test Procedures

Reference to clause 5.4.9.3 of ETSI EN 301 893 V2.1.1 (2017-05).

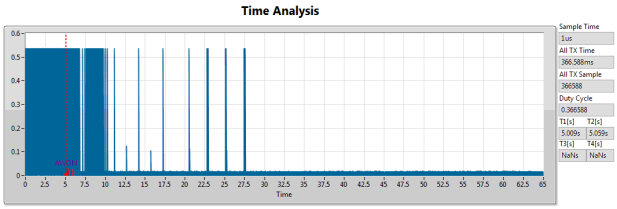
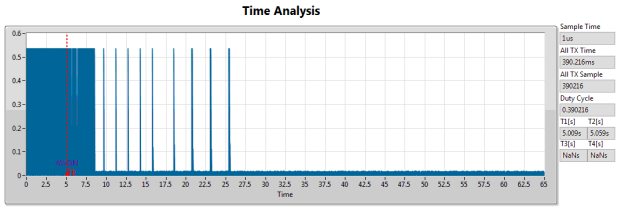
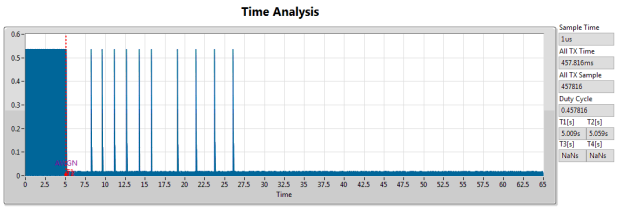
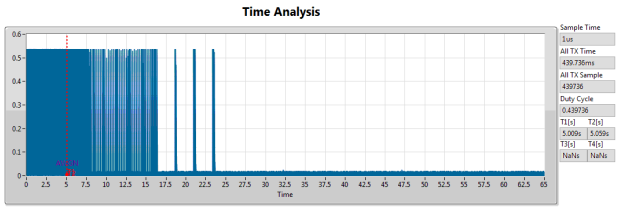
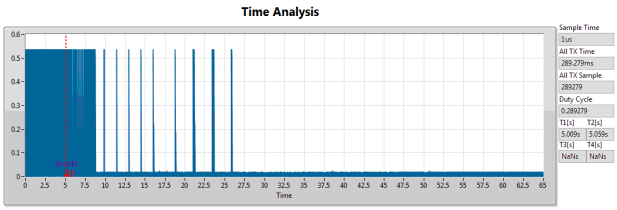
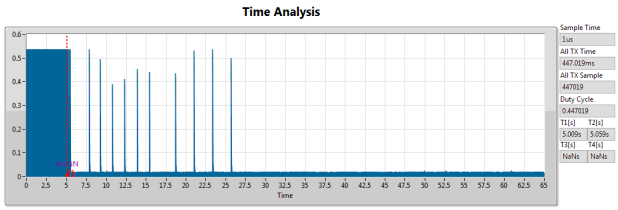
5.1.3 Test Setup



5.1.4 Test Result of Adaptivity and Short Control Signalling Transmissions

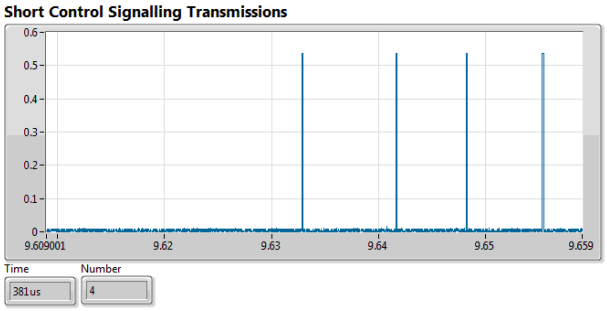
Adaptivity Result						
Equipment / Device type		Load Based Equipment / Supervised Device				
EUT firmware / software version		3.4.12.7				
Energy Detect Threshold Level (dBm)		-75				
Modulation Mode	**Freq. (MHz)**	**Interference Signal Frequency (MHz)**	**Interference Signal Type**	**Short Control Signalling Transmissions (ms)/period Numbers**	**Adaptivity**	
802.11a	5180	5180	AWGN	0.381 / 4	PASS	
802.11a	5180	5180	OFDM	0.545 / 3		
802.11a	5180	5180	LTE	0.362 / 2		
802.11a	5500	5500	AWGN	0.872 / 3	PASS	
802.11a	5500	5500	OFDM	1.314 / 3		
802.11a	5500	5500	LTE	0.344 / 2		
Limit				< 2.5 ms / 50	<6ms	N/A

Adaptivity Result Plots

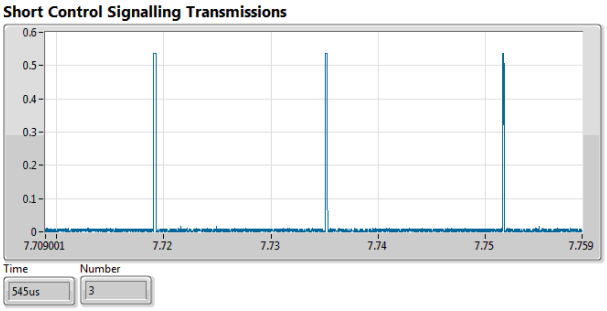
802.11a - 5180MHz (AWGN)	802.11a - 5180MHz (OFDM)
	
802.11a - 5180MHz (LTE)	**802.11a - 5500MHz (AWGN)**
	
802.11a - 5500MHz (OFDM)	**802.11a - 5500MHz (LTE)**
	

Short Control Signalling Transmissions Plots

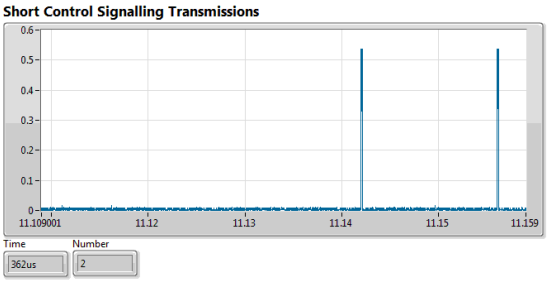
802.11a - 5180MHz (AWGN)



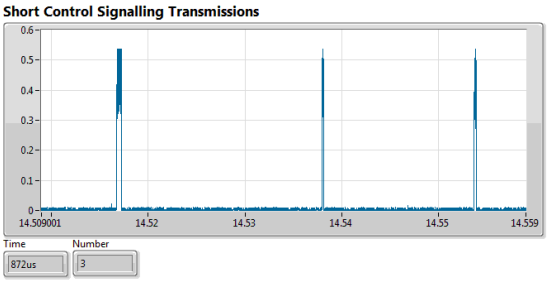
802.11a - 5180MHz (OFDM)



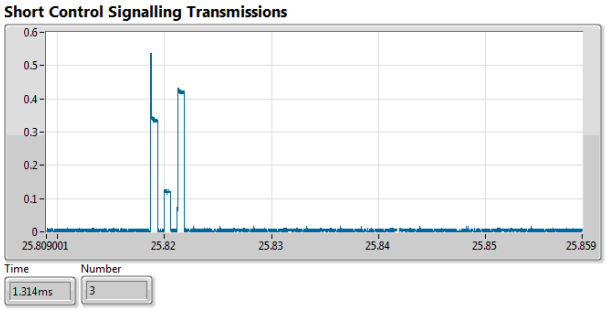
802.11a - 5180MHz (LTE)



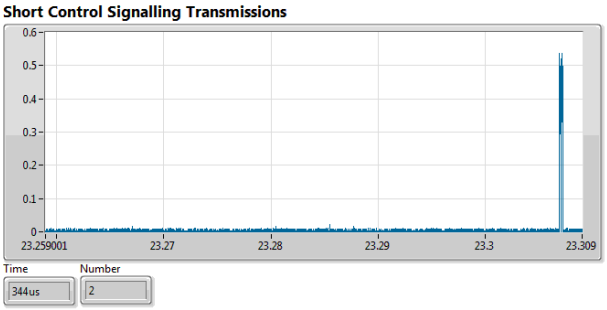
802.11a - 5500MHz (AWGN)



802.11a - 5500MHz (OFDM)



802.11a - 5500MHz (LTE)



6 Receiver Blocking Test Results

6.1 Receiver Blocking

6.1.1 Limit of Receiver Blocking

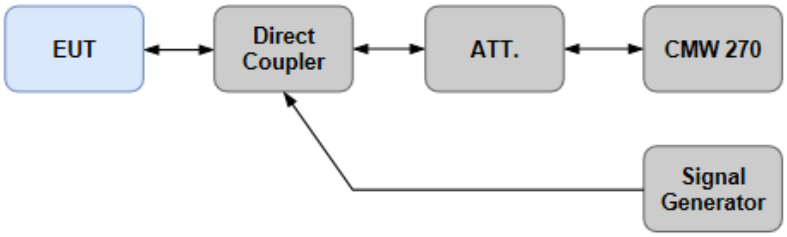
Receiver Blocking Parameters				
Wanted Signal Mean Power from Companion Device (dBm)	Blocking Signal Frequency (MHz)	Blocking Signal Power (dBm) (see note 2)		Type of Blocking Signal
		Master or Slave with radar detection	Slave without radar detection	
P_{min} + 6 dB	5 100	-53	-59	Continuous Wave
P_{min} + 6 dB	4 900 5 000 5 975	-47	-53	Continuous Wave

Note 1: P_{min} is the minimum level of the wanted signal (in dBm) required to meet the minimum performance criteria (The minimum performance criterion shall be a PER of less than or equal to 10 %) 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.

6.1.2 Test Procedures

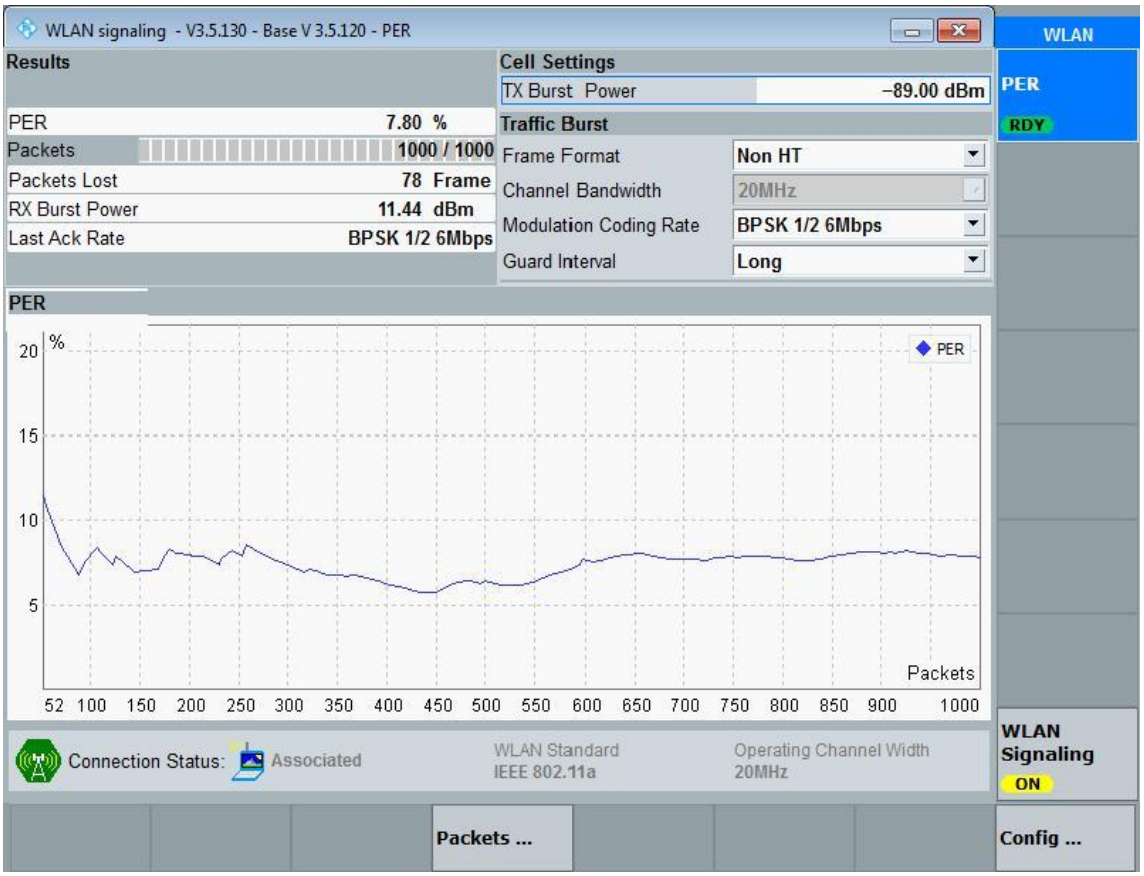
Reference to clause 5.4.10.2 of ETSI EN 301 893 V2.1.1 (2017-05).

6.1.3 Test Setup



6.1.4 Test Result of Receiver Blocking

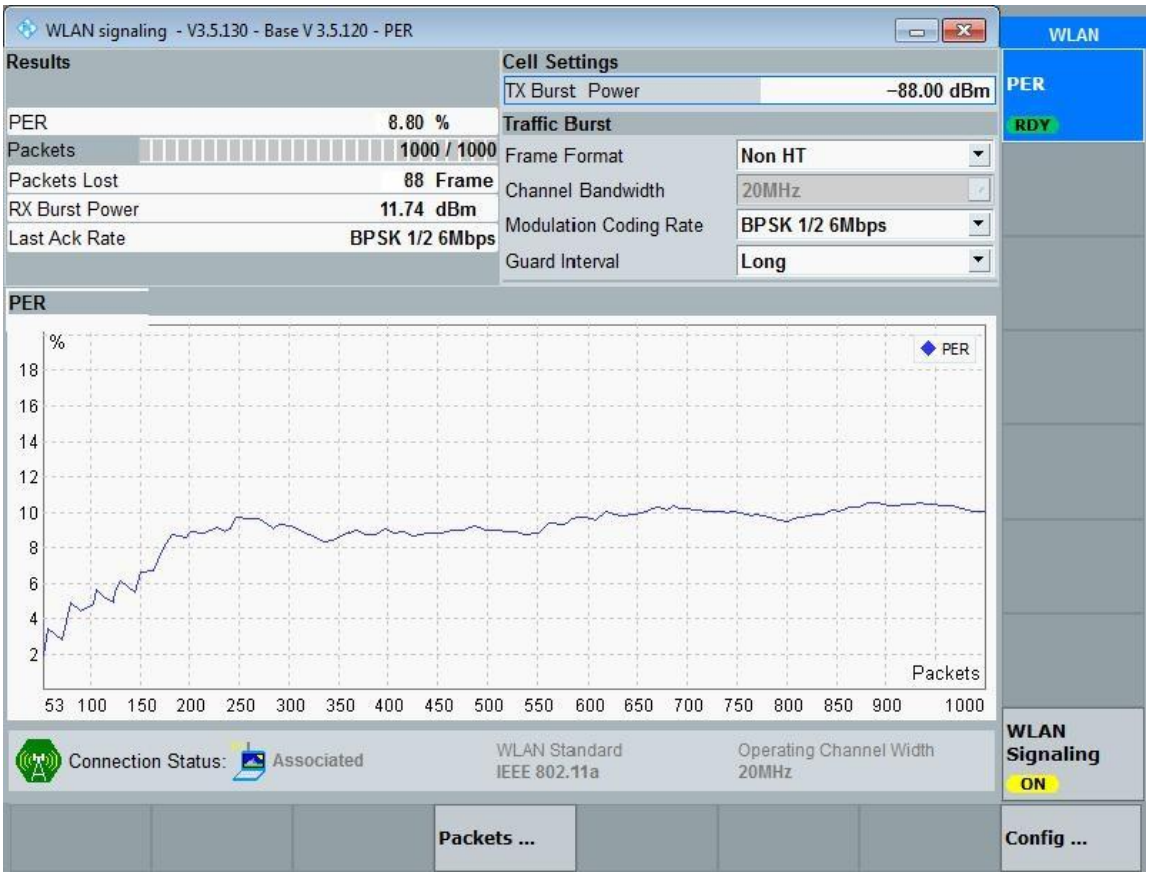
11a / 5180 MHz
Without Interference Signal Sensitivity Level



PER minimum performance criteria	10 %		
Sensitivity Level	-89		**dBm**
Want Signal Mean Power form Companion Device (dBm)	**Blocking Signal Frequency (MHz)**	**Blocking Signal Power (dBm)**	**Test Result**
-83	5100	-54	Pass
-83	4900	-48	Pass
-83	5000		Pass
-83	5975		Pass

11a / 5700 MHz

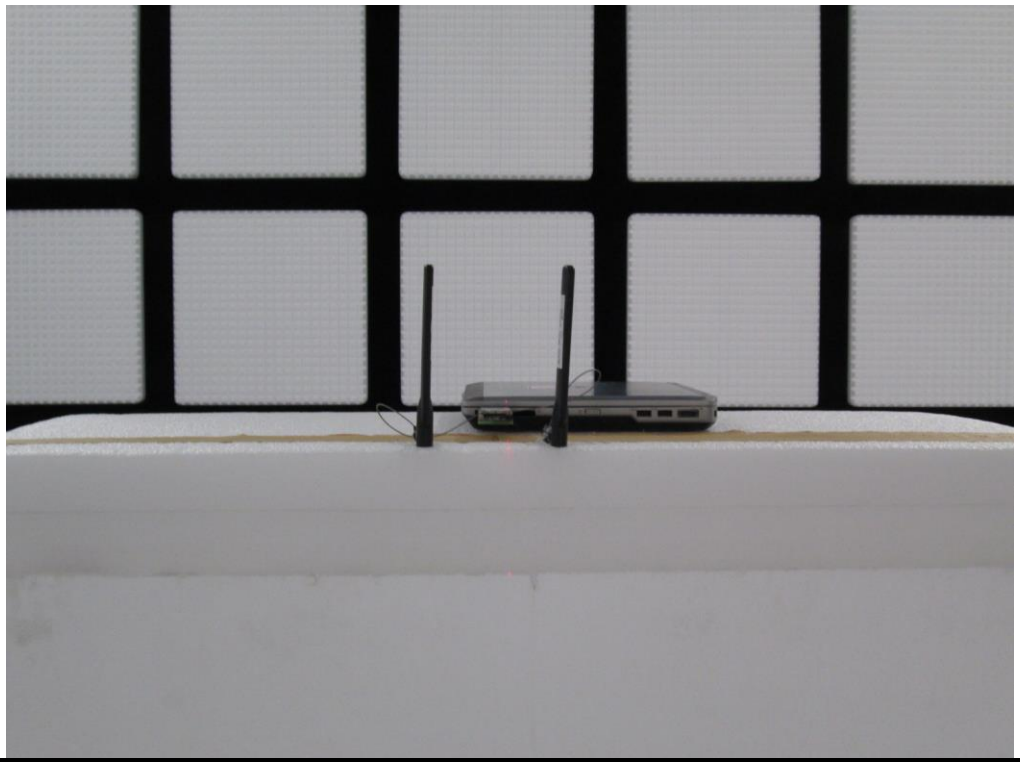
Without Interference Signal Sensitivity Level

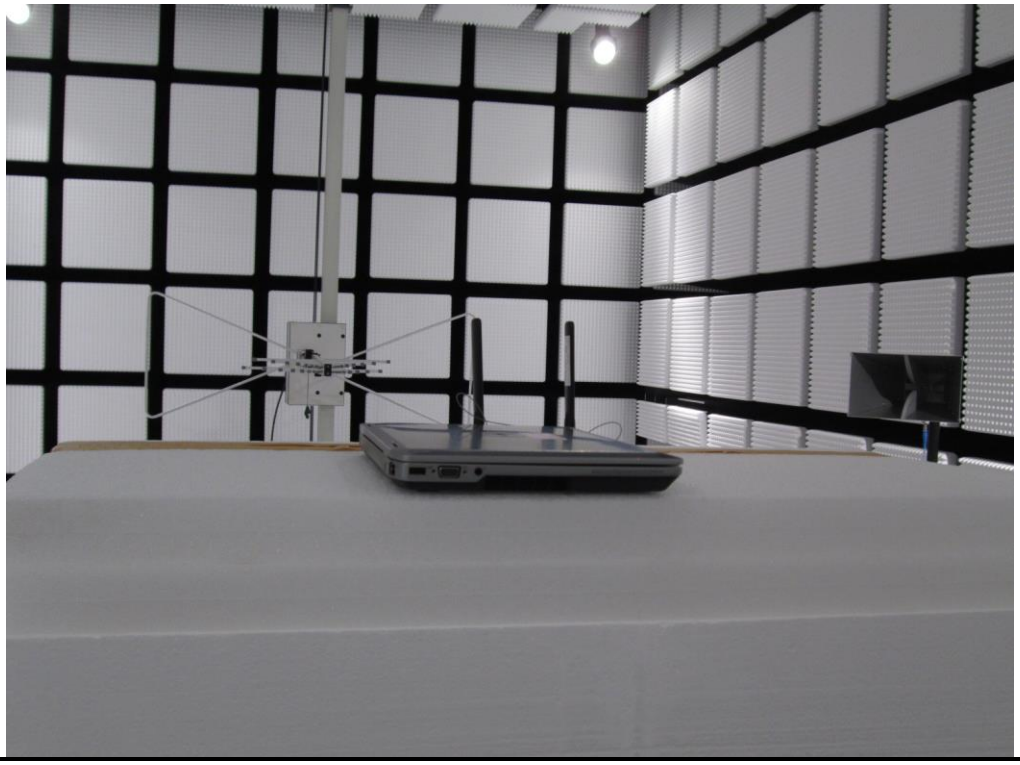


PER minimum performance criteria	10 %		
Sensitivity Level	-88		**dBm**
Want Signal Mean Power form Companion Device (dBm)	**Blocking Signal Frequency (MHz)**	**Blocking Signal Power (dBm)**	**Test Result**
-82	5100	-54	Pass
-82	4900	-48	Pass
-82	5000		Pass
-82	5975		Pass

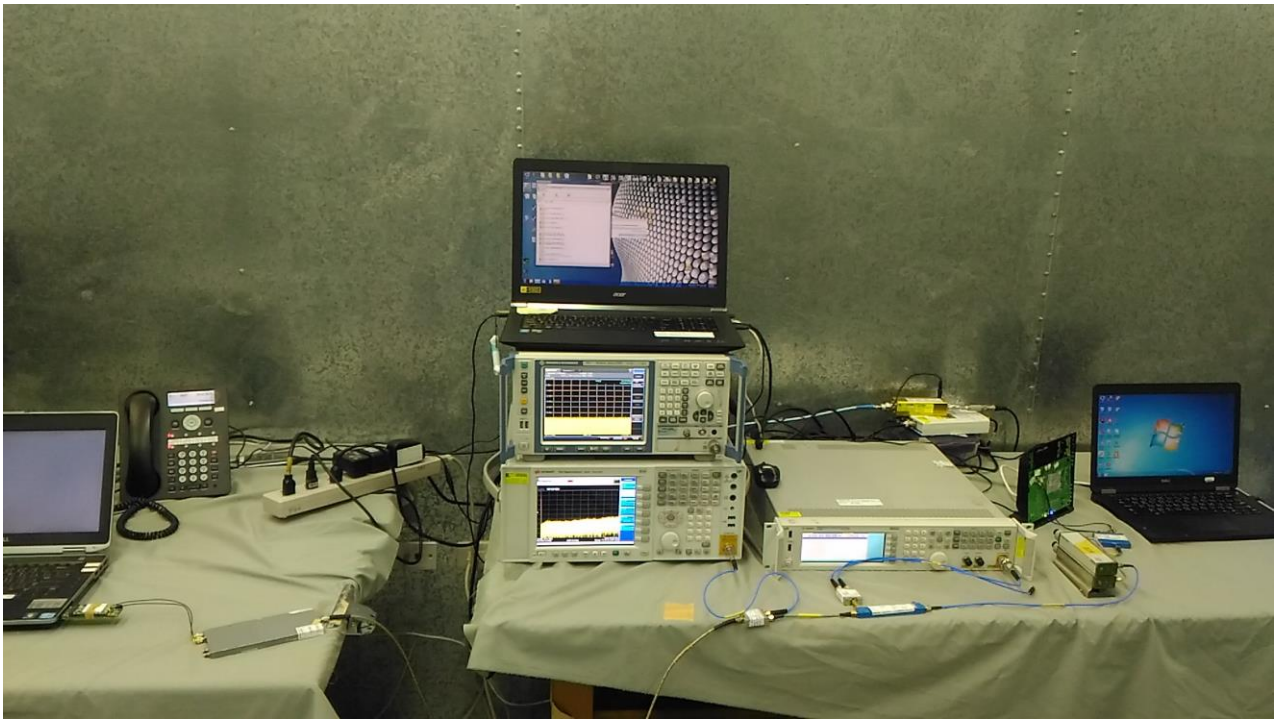
7 Photographs of the Test Configuration

Spurious Emission Test

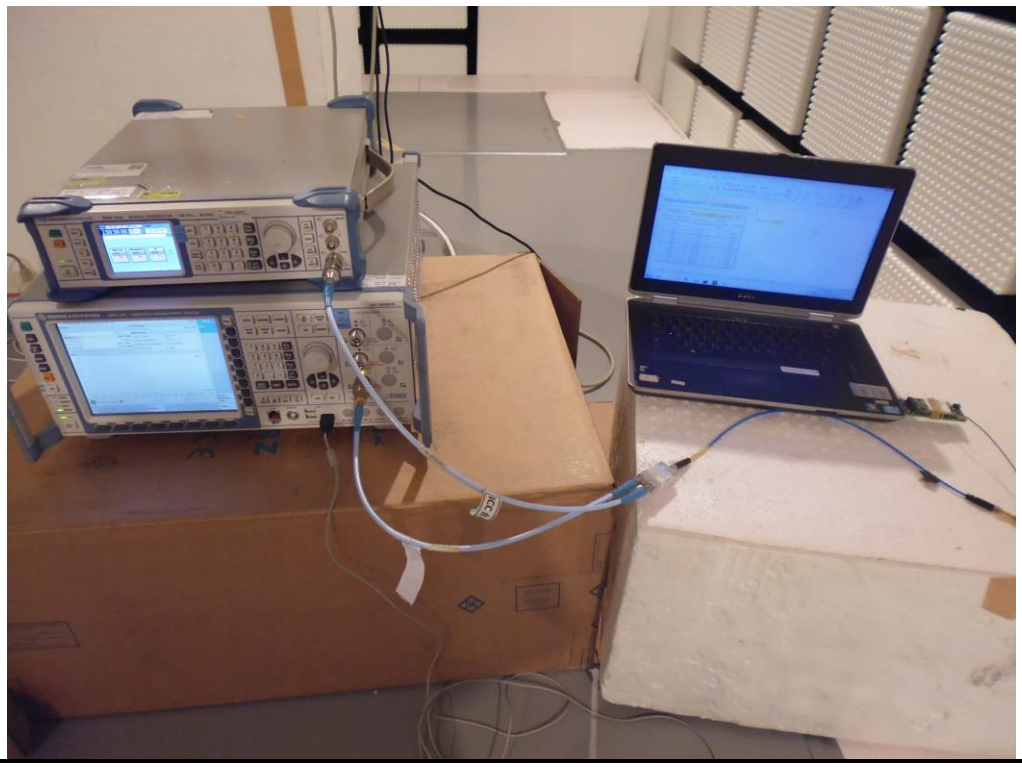




Adaptivity Test



Receiver Blocking Test



8 Test laboratory information

Established in 2012, ICC provides foremost EMC & RF Testing and advisory consultation services by our skilled engineers and technicians. Our services employ a wide variety of advanced edge test equipment and one of the widest certification extents in the business.

International Certification Corp (EMC and Wireless Communication Laboratory), it is our definitive objective is to institute long term, trust-based associations with our clients. The expectation we set up with our clients is based on outstanding service, practical expertise and devotion to a certified value structure. Our passion is to grant our clients with best EMC / RF services by oriented knowledgeable and accommodating staff.

Our Test sites are located at Linkou District and Kwei Shan District. Location map can be found on our website http://www.icertifi.com.tw.

Linkou	**Kwei Shan**	**Kwei Shan Site II**
Tel: 886-2-2601-1640	Tel: 886-3-271-8666	Tel: 886-3-271-8640
No. 30-2, Ding Fwu Tsuen, Lin Kou District, New Taipei City, Taiwan, R.O.C.	No. 3-1, Lane 6, Wen San 3rd St., Kwei Shan District, Tao Yuan City 333, Taiwan, R.O.C.	No. 14-1, Lane 19, Wen San 3rd St., Kwei Shan District, Tao Yuan City 333, Taiwan, R.O.C..

If you have any suggestion, please feel free to contact us as below information

Tel: 886-3-271-8666
Fax: 886-3-318-0155
Email: ICC_Service@icertifi.com.tw

═END═