Shenzhen Huatongwei International Inspection Co., Ltd.
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TEST REPORT

For 5 GHz high performance RLAN

Report Reference No. ..... :	**TRE1603019105** R/C…….:14043
Applicant's name ..... :	**Vonino Electronics Limited**
Address.....:	Miramar Tower 10F - no1010, 132 Nathan Road, Tsim Sha Tsui, Kowloon, Hong Kong
Manufacturer.....:	Vonino Electronics Limited
Address.....:	Miramar Tower 10F - no1010, 132 Nathan Road, Tsim Sha Tsui, Kowloon, Hong Kong
Test item description ..... :	**XAVY L8 / Epic M8**
Trade Mark .....:	vonino
Model/Type reference.....:	T8S
Listed Model(s) .....:	-
Standard ..... :	**ETSI EN 301 893 V1.8.1: 2015-03**
Date of receipt of test sample……..:	Mar 29, 2016
Date of testing……:	Mar 30, 2016- Apr 20, 2016
Date of issue……...:	Apr 20, 2016
Result..... ……..:	**PASS**

Compiled by (position+printed name+signature)..:	File administrators Shayne Zhu	Shayne Zhu
Supervised by (position+printed name+signature)..:	Project Engineer Lion Cai	Lion Cai
Approved by (position+printed name+signature)..:	RF Manager Hans Hu	Hans Hu

Testing Laboratory Name ..... :	**Shenzhen Huatongwei International Inspection Co., Ltd**
Address.....:	1/F, Bldg 3, Hongfa Hi-tech Industrial Park, Genyu Road, Tianliao, Gongming, Shenzhen, China

Contents

1. Test standards and Test description

1.1. Test Standards

The tests were performed according to following standards:

ETSI EN 301 893 V1.8.1(2015-03) –Broadband Radio Access Networks (BRAN); 5 GHz high performance RLAN; Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive.

1.2. Test Description

Test item	Standards requirement	Result
Centre frequencies	ETSI EN 301 893 Sub-clause 4.2	Pass
Nominal Channel Bandwidth and Occupied Channel Bandwidth	ETSI EN 301 893 Sub-clause 4.3	Pass
RF output power	ETSI EN 301 893 Sub-clause 4.4	Pass
Transmit Power Control (TPC)	ETSI EN 301 893 Sub-clause 4.4	N/A
Power Density	ETSI EN 301 893 Sub-clause 4.4	Pass
Transmitter unwanted emissions outside the 5 GHz RLAN bands	ETSI EN 301 893 Sub-clause 4.5.1	Pass
Transmitter unwanted emissions within the 5 GHz RLAN bands	ETSI EN 301 893 Sub-clause 4.5.2	Pass
Receiver spurious emissions	ETSI EN 301 893 Sub-clause 4.6	Pass
Dynamic Frequency Selection (DFS)	ETSI EN 301 893 Sub-clause 4.7	N/A
Adaptivity (Channel Access Mechanism)	ETSI EN 301 893 Sub-clause 4.8	Pass
User Access Restrictions	ETSI EN 301 893 Sub-clause 4.9	Pass

Remark: The measurement uncertainty is not included in the test result.
N/A is an abbreviation for Not Applicable and means this test item is not applicable for this device according to the technology characteristic of device.

2. Summary

2.1. Client Information

Applicant:	Vonino Electronics Limited
Address:	Miramar Tower 10F - no1010, 132 Nathan Road, Tsim Sha Tsui, Kowloon, Hong Kong
Manufacturer:	Vonino Electronics Limited
Address:	Miramar Tower 10F - no1010, 132 Nathan Road, Tsim Sha Tsui, Kowloon, Hong Kong

2.2. Product Description

Name of EUT	XAVY L8 / Epic M8
Trade Mark:	vonino
Model/Type reference:	T8S
Listed Model(s):	-
Power supply:	DC 3.7V From internal battery
Adapter information:	Model:FJ-SW728L0502000UE Input:AC 100-240V,50/60Hz 0.4A Max Output: 5Vd.c., 2000mA
Hardware version:	V1.1
Software version:	vonino_v1.1.2
WIFI	
Supported type:	802.11a/n(H20),802.11n(H40)
Modulation:	OFDM
Operation frequency:	5150MHz~5250MHz
Operation bandwidth:	802.11a/n(H20):20MHz , 802.11n(H40):40MHz
Channel number:	802.11a/n(H20):4 , 802.11n(H40):2
Antenna type:	Internal Antenna
Antenna gain:	1.2 dBi

Operation Frequency List:

Operating band	Channel	802.11a/n(H20)	802.11n H(40)
Sub-band 1without DFS (5150MHz-5250MHz)	36	5180	-
	38	-	5190
	40	5200	-
	44	5220	-
	46	-	5230
	48	5240	-

2.3. EUT operation mode

The EUT has been tested under test mode condition. The Applicant provides software to control the EUT for staying in continous transmitting and receiving mode for testing.

2.4. EUT configuration

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

● - supplied by the manufacturer

○ - supplied by the lab

		Length (m) :	/
		Shield :	/
		Detachable :	/
		Manufacturer :	/
		Model No. :	/

2.5. Modifications

No modifications were implemented to meet testing criteria.

3. Test Environment

3.1. Address of the test laboratory

Laboratory:Shenzhen Huatongwei International Inspection Co., Ltd.
Address: 1/F, Bldg 3, Hongfa Hi-tech Industrial Park, Genyu Road, Tianliao, Gongming, Shenzhen, China
Phone: 86-755-26748019 Fax: 86-755-26748089

3.2. Test Facility

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

CNAS-Lab Code: L1225
Shenzhen Huatongwei International Inspection Co., Ltd. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC17025: 2005 General Requirements) for the Competence of Testing and Calibration Laboratories, Date of Registration: February 28, 2015. Valid time is until February 27, 2018.

A2LA-Lab Cert. No. 3902.01
Shenzhen Huatongwei International Inspection Co., Ltd. EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing. Valid time is until December 31, 2016.

FCC-Registration No.: 317478
Shenzhen Huatongwei International Inspection 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 317478, Renewal date Jul. 18, 2014, valid time is until Jul. 18, 2017.

IC-Registration No.: 5377A&5377B
The 3m Alternate Test Site of Shenzhen Huatongwei International Inspection Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Registration No. 5377A on Dec. 31, 2013, valid time is until Dec. 31, 2016.
Two 3m Alternate Test Site of Shenzhen Huatongwei International Inspection Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Registration No. 5377B on Dec.03, 2014, valid time is until Dec.03, 2017.

ACA
Shenzhen Huatongwei International Inspection Co., Ltd. EMC Laboratory can also perform testing for the Australian C-Tick mark as a result of our A2LA accreditation.

VCCI
The 3m Semi-anechoic chamber (12.2m×7.95m×6.7m) of Shenzhen Huatongwei International Inspection Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.:R-2484. Date of Registration: Dec. 20, 2012. Valid time is until Dec. 29, 2015.
Radiated disturbance above 1GHz measurement of Shenzhen Huatongwei International Inspection Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-292. Date of Registration: Dec. 24, 2013. Valid time is until Dec. 23, 2016.
Main Ports Conducted Interference Measurement of Shenzhen Huatongwei International Inspection Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: C-2726. Date of Registration: Dec. 20, 2012. Valid time is until Dec. 19, 2015.
Telecommunication Ports Conducted Interference Measurement of Shenzhen Huatongwei International Inspection Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: T-1837. Date of Registration: May 07, 2013. Valid time is until May 06, 2016.

DNV
Shenzhen Huatongwei International Inspection Co., Ltd. has been found to comply with the requirements of DNV towards subcontractor of EMC and safety testing services in conjunction with the EMC and Low voltage Directives and in the voluntary field. The acceptance is based on a formal quality Audit and follow-ups according to relevant parts of ISO/IEC Guide 17025 (2005), in accordance with the requirements of the DNV Laboratory Quality Manual towards subcontractors. Valid time is until Aug. 24, 2016.

3.3. Environmental conditions

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

Temperature	Normal Temperature:	25°C
	High Temperature:	55°C
	Low Temperature:	-20°C
Voltage	Normal Voltage	DC 3.70V
	High Voltage	DC 4.25V
	Low Voltage	DC 3.50V
Other	lative Humidity	55 %
	Air Pressure	989 hPa

3.4. 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 TR-100028-01" Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics;Part 1" and TR-100028-02 "Electromagnetic compatibilityand Radio spectrum Matters (ERM);Uncertainties in the measurementof mobile radio equipment characteristics;Part 2 " and is documented in the Shenzhen Huatongwei International Inspection Co., Ltd quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

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

Test Items	Measurement Uncertainty	Notes
Frequency range	25 Hz	(1)
Transmitter power conducted	0.57 dB	(1)
Power Spectral Density	2.20 dB	(1)
Radiated spurious emission	2.20 dB	(1)

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

3.5. Equipments Used during the Test

TS8997						
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1	Signal generator	R&S	SMB100A	177956	11/3/2015	11/2/2016
2	Signal and spectrum analyzer	R&S	FSV40	100048	11/3/2015	11/2/2016
3	OSP	R&S	OSP120	101317	11/3/2015	11/2/2016
4	OSP	R&S	OSP-B157	100890	11/3/2015	11/2/2016
5	Climate Chamber	ESPEC	EL-10KA	05107008	11/3/2015	11/2/2016
6	POWER SUPPLY	R&S	NGMO1	1504.8420	11/3/2015	11/2/2016
7	Vector signal generator	R&S	SMBV100A	260790	11/3/2015	11/2/2016

The Cal. Interval was one year

4. Test conditions and Results

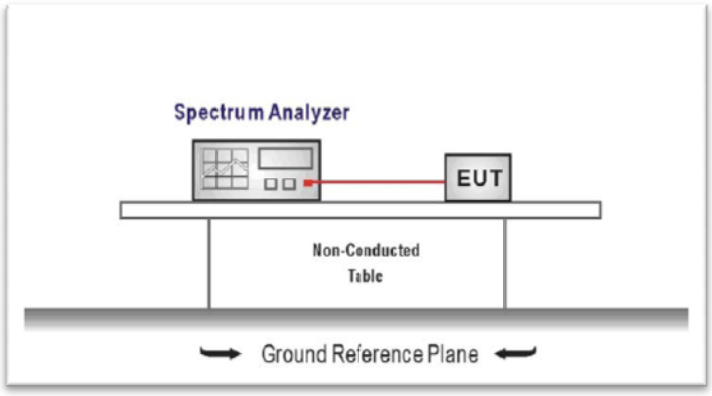
4.1. Centre frequencies

LIMIT

ETSI EN 301 893 Sub-clause 4.2.3

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

TEST CONFIGURATION



TEST PROCEDURE

1. Please refer to ETSI EN 301 893 Sub-clause 5.1 for the test conditions.
2. Please refer to ETSI EN 301 893 Sub-clause 5.3.2.2

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

Centre Frequency: The centre frequency of the channel under test
Resolution BW: 100KHz
Video BW: 3 × RBW
Frequency Span: 2 × Occupied Channel Bandwidth (e.g. 40 MHz for a 20 MHz channel)
Detector Mode: Peak
Trace Mode: Max Hold

TEST RESULTS

802.11a						
Test conditions		Center Frequency (MHz)	Test Result (MHz)	Deviation(ppm)	Limit (ppm)	Result
Temperature (℃)	Voltage (V)					
25	3.70	5180	5180.0045	0.87	± 20	pass
-20	3.50	5180	5180.0063	1.22		
	4.25	5180	5180.0025	0.48		
+55	3.50	5180	5180.0037	0.71		
	4.25	5180	5180.0046	0.89		

802.11n(H20)						
Test conditions		Center Frequency (MHz)	Test Result (MHz)	Deviation(ppm)	Limit (ppm)	Result
Temperature (℃)	Voltage (V)					
25	3.70	5180	5179.9978	-0.42	± 20	pass
-20	3.50	5180	5179.9962	-0.73		
	4.25	5180	5179.9979	-0.41		
+55	3.50	5180	5179.9969	-0.60		
	4.25	5180	5179.9982	-0.35		

802.11n(H40)						
Test conditions		Center Frequency (MHz)	Test Result (MHz)	Deviation(ppm)	Limit (ppm)	Result
Temperature (℃)	Voltage (V)					
25	3.70	5190	5190.0023	0.44	± 20	pass
-20	3.50	5190	5190.0015	0.29		
	4.25	5190	5190.0024	0.46		
+55	3.50	5190	5190.0036	0.69		
	4.25	5190	5190.0047	0.91		

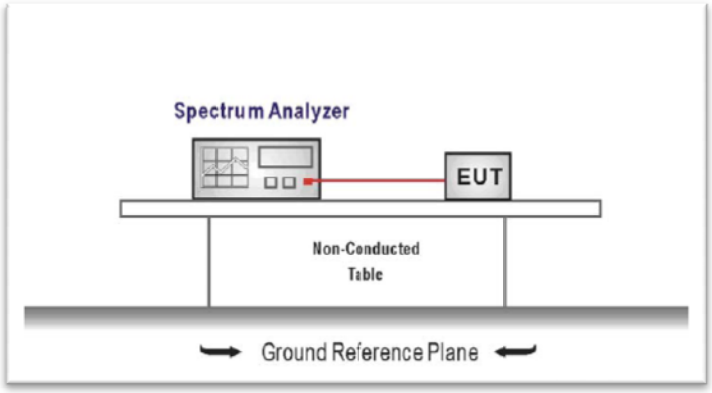
4.2. Nominal Channel Bandwidth and Occupied Channel Bandwidth

LIMIT

ETSI EN 301 893 Sub-clause 4.3.2

The Nominal Channel Bandwidth shall be at least 5 MHz at all times.The Occupied Channel Bandwidth shall be between 80 % and 100 % of the declared Nominal Channel Bandwidth.

TEST CONFIGURATION



TEST PROCEDURE

1. Please refer to ETSI EN 301 893 Sub-clause 5.1 for the test conditions.
2. Please refer to ETSI EN 301 893 Sub-clause 5.3.3 for the measurement method.

Connect the UUT to the spectrum analyser and use the following settings:
Centre Frequency: The centre frequency of the channel under test
- Resolution Bandwidth: 100 kHz
- Video Bandwidth: 300 kHz
- Frequency Span: 2 × Nominal Bandwidth (e.g. 40 MHz for a 20 MHz channel)
- Detector Mode: Peak
- Trace Mode: Max Hold

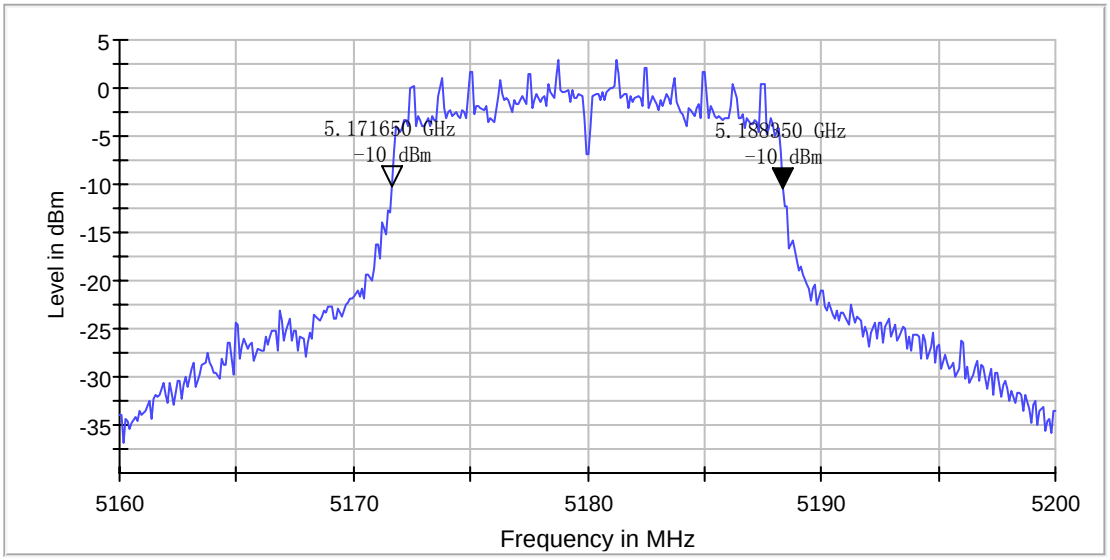
Use the 99 % bandwidth function of the spectrum analyser to measure the Occupied Channel Bandwidth of the UUT.

TEST RESULTS

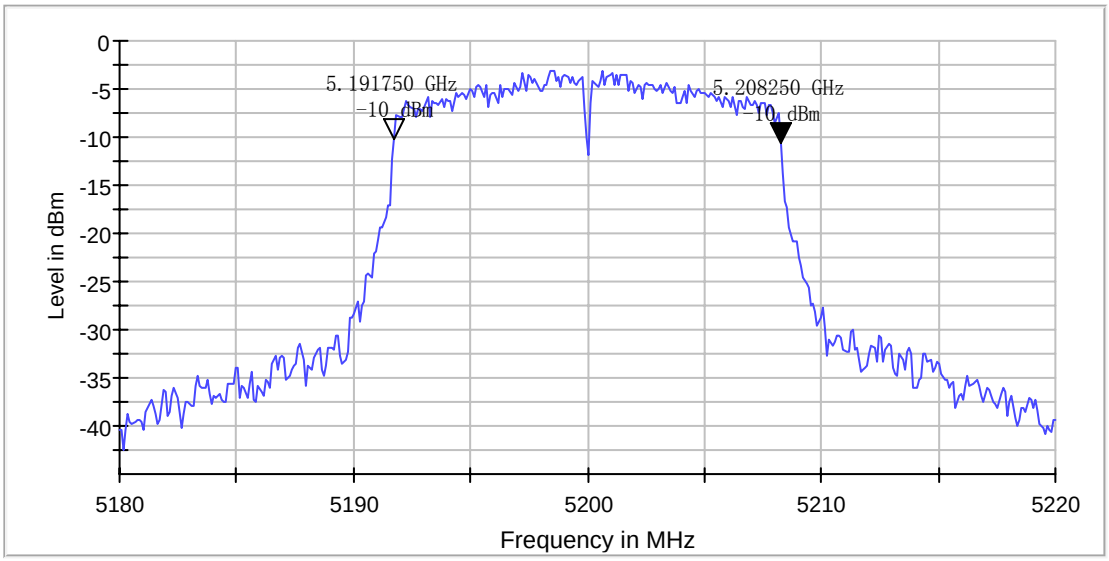
Mode	*Channel*	*99%Occupied Channel Bandwidth(MHz)*	*Limit (MHz)*	*Result*
802.11a	36	16.70	*16~20*	*Pass*
	40	16.50		*Pass*
	44	16.60		*Pass*
	48	16.60		*Pass*
802.11n(H20)	36	17.70	*16~20*	*Pass*
	40	17.70		*Pass*
	44	17.70		*Pass*
	48	17.70		*Pass*
802.11n(H40)	38	36.00	*32~40*	*Pass*
	46	36.00		*Pass*

Test plot as follows:

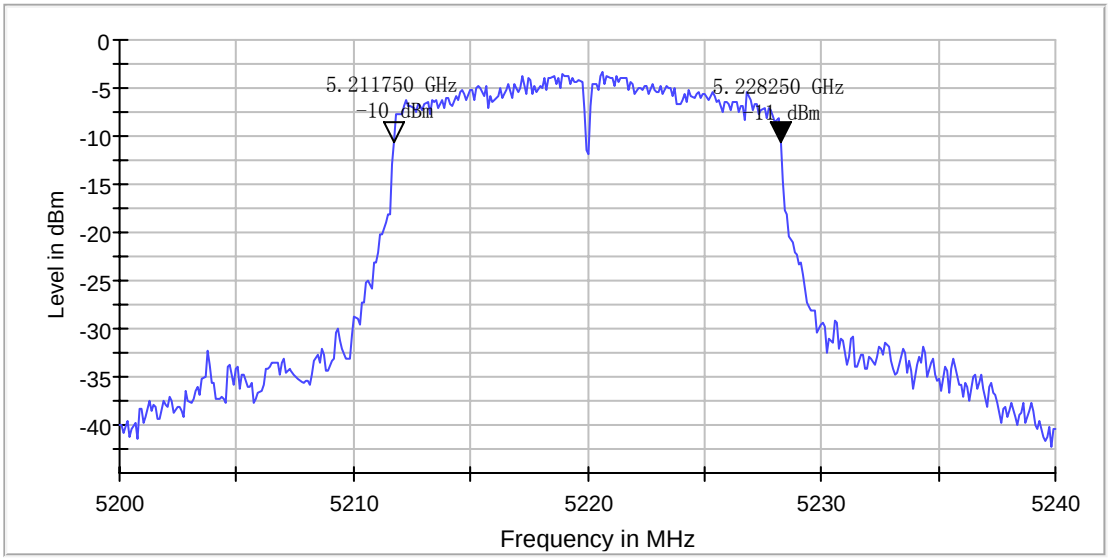
802.11a



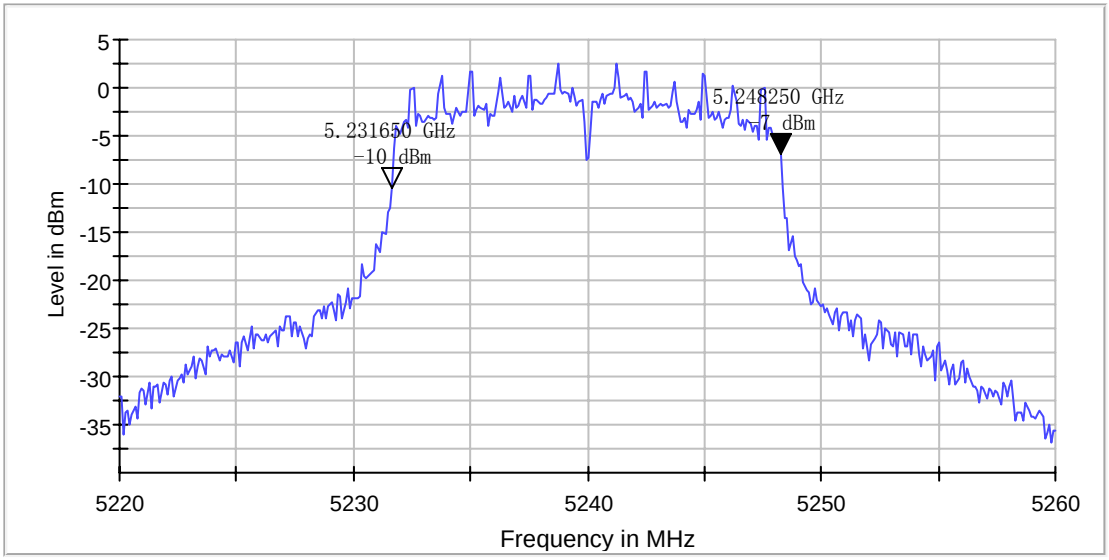
CH36



CH40

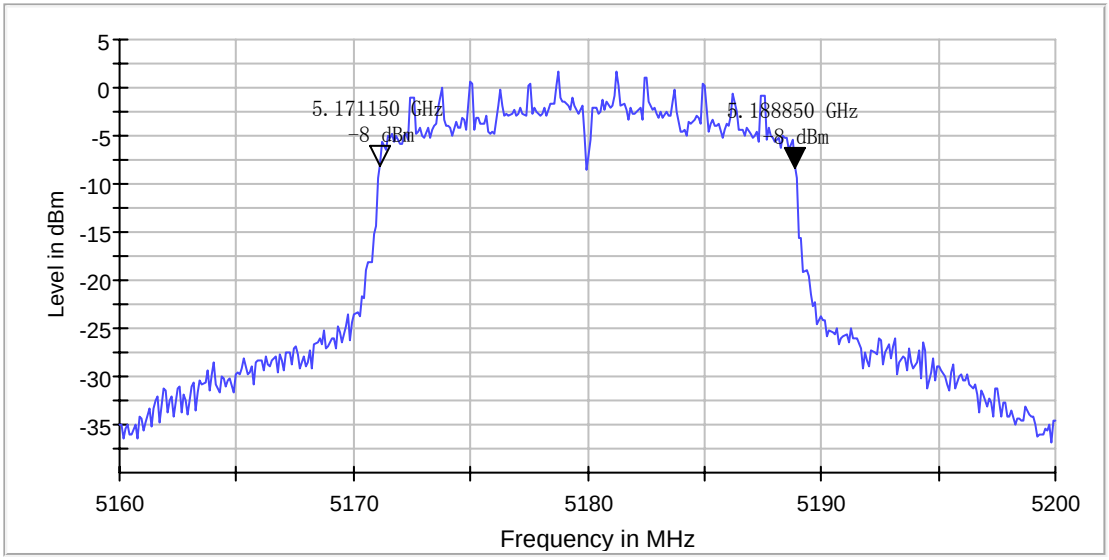


CH44

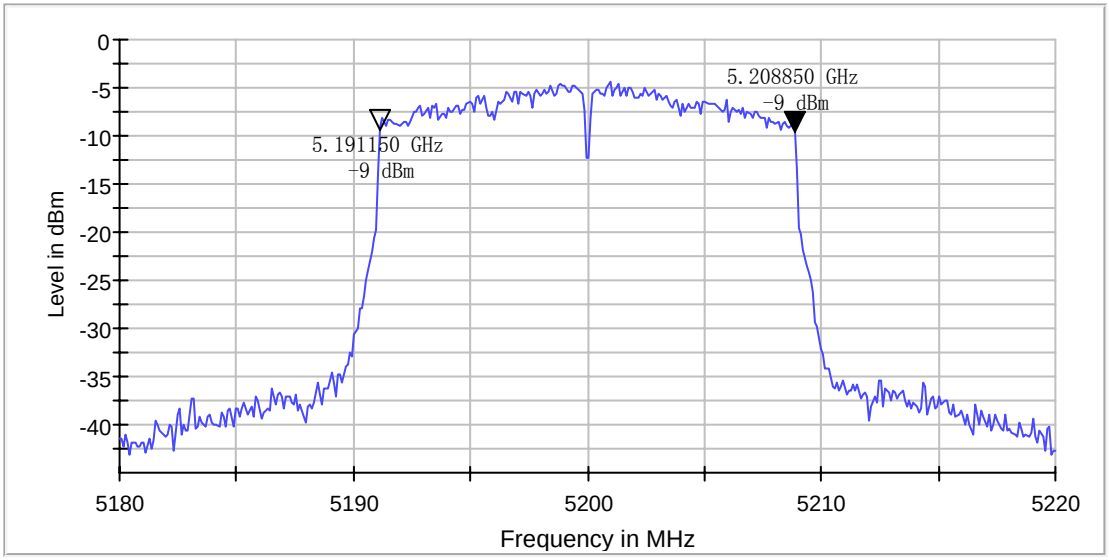


CH48

802.11n(H20)



CH36



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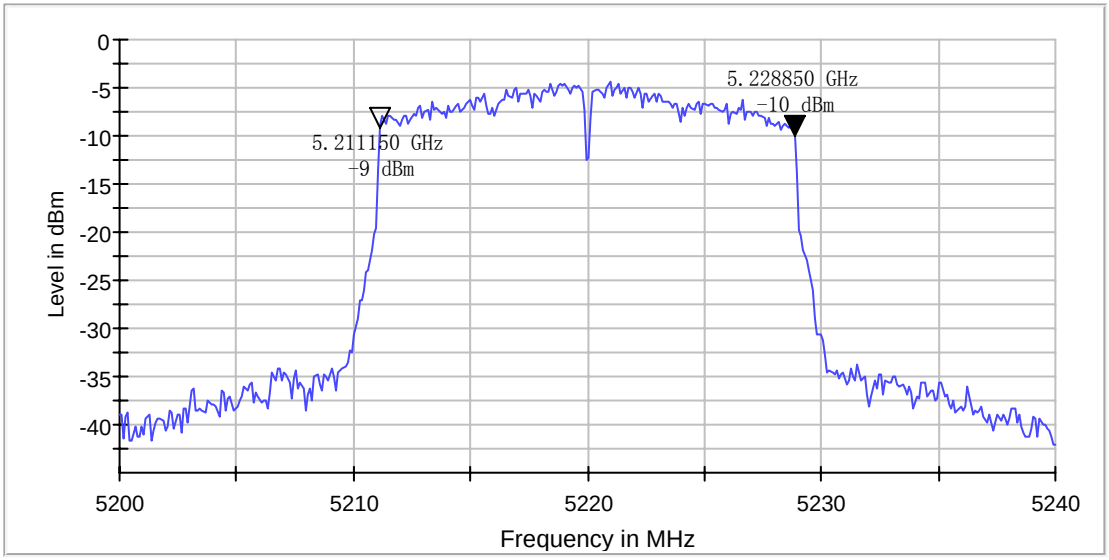

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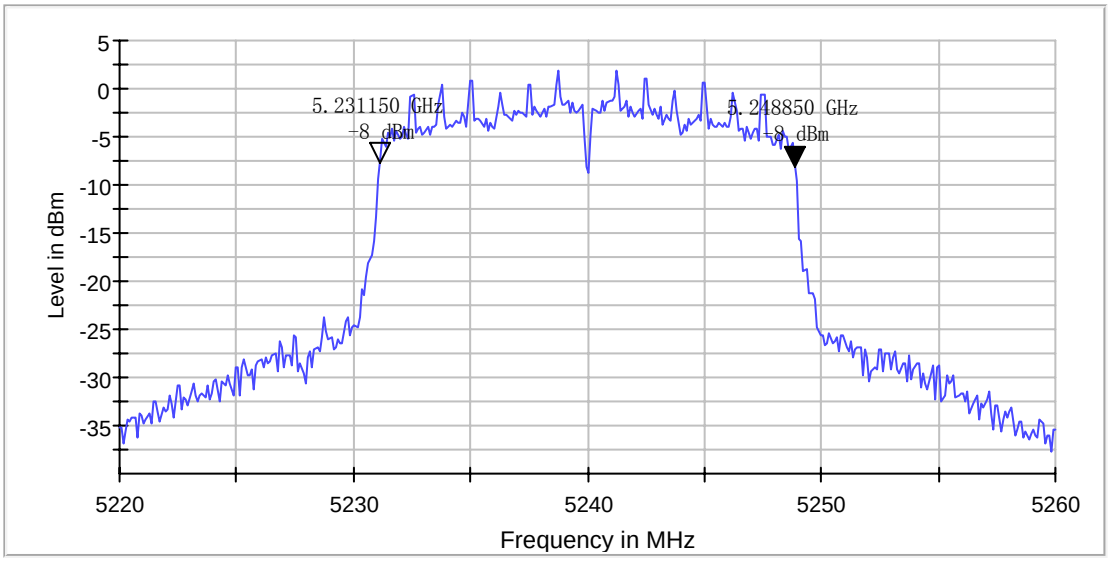
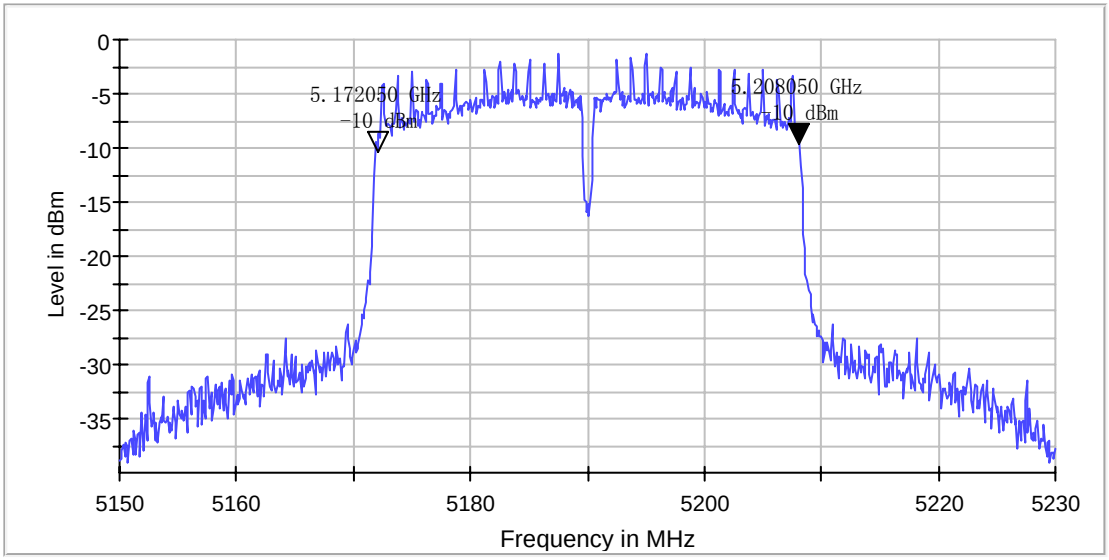
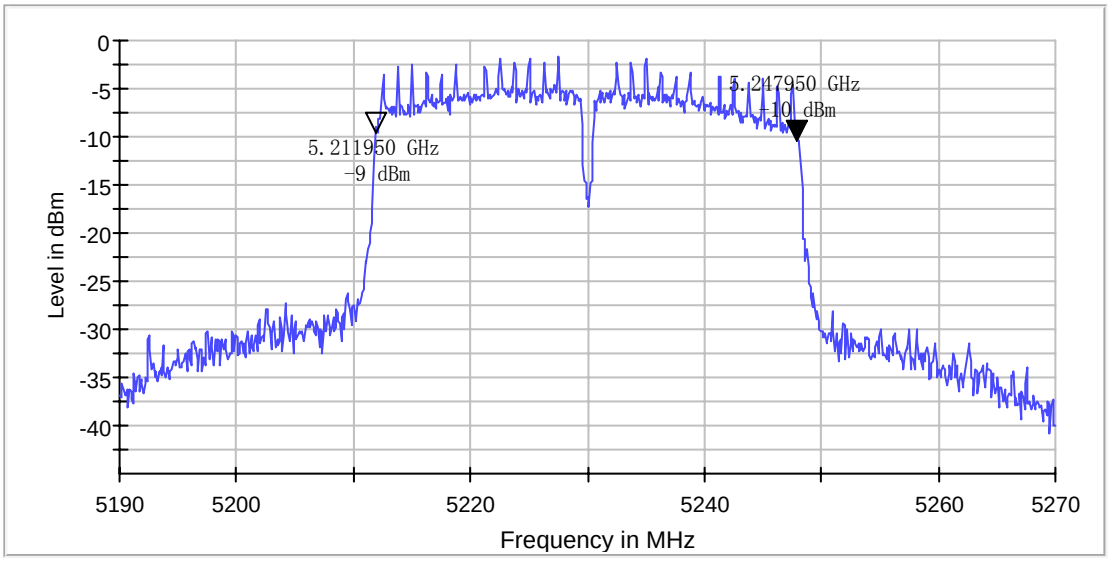


CH48

802.11n(H40)



CH38



CH46

4.3. RF Output Power, Transmit Power Control (TPC)

LIMIT

ETSI EN 301 893 Sub-clause 4.4.2

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

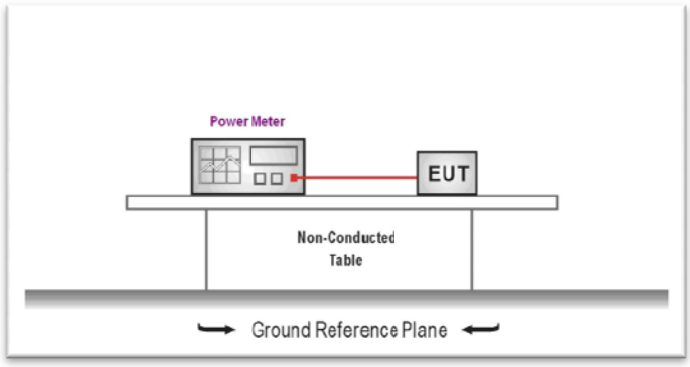
Frequency range [MHz]	Mean e.i.r.p. limit [dBm]		Mean e.i.r.p. density limit [dBm/MHz]	
	with TPC	without TPC	with TPC	without TPC
5 150 to 5 350	23	20/23 (see note 1)	10	7/10 (see note 2)
5 470 to 5 725	30 (see note 3)	27 (see note 3)	17 (see note 3)	14 (see note 3)

NOTE 1: The applicable limit is 20 dBm, except for transmissions whose nominal bandwidth falls completely within the band 5 150 MHz to 5 250 MHz, in which case the applicable limit is 23 dBm.

NOTE 2: The applicable limit is 7 dBm/MHz, except for transmissions whose nominal bandwidth falls completely within the band 5 150 MHz to 5 250 MHz, in which case the applicable limit is 10 dBm/MHz.

NOTE 3: Slave devices without a Radar Interference Detection function shall comply with the limits for the band 5 250 MHz to 5 350 MHz.

TEST CONFIGURATION



TEST PROCEDURE

1. Please refer to ETSI EN 301 893 Sub-clause 5.1 for the test conditions.
2. Please refer to ETSI EN 301 893 Sub-clause 5.3.4.2 for the measurement method.

   Power Meter: sample speed 1MS/s
   Test bursts: 200

TEST RESULTS

802.11a					
Test conditions		Channel	EIRP (dBm)	Limit (dBm)	Result
Temperature (℃)	Voltage (V)				
Tnor=25	3.70	CH36	13.38	23	Pass
Tlow=-20	3.50	CH36	13.45	23	
	4.25	CH36	13.27	23	
Thigh=+55	3.50	CH36	13.14	23	
	4.25	CH36	13.05	23	

802.11n(H20)					
Test conditions		Channel	EIRP (dBm)	Limit (dBm)	Result
Temperature (℃)	Voltage (V)				
Tnor=25	3.70	CH36	12.61	23	Pass
Tlow=-20	3.50	CH36	12.54	23	
	4.25	CH36	12.73	23	
Thigh=+55	3.50	CH36	12.66	23	
	4.25	CH36	12.43	23	

802.11n(H40)					
Test conditions		Channel	EIRP (dBm)	Limit (dBm)	Result
Temperature (℃)	Voltage (V)				
Tnor=25	3.70	CH38	12.17	23	Pass
Tlow=-20	3.50	CH38	12.09	23	
	4.25	CH38	12.32	23	
Thigh=+55	3.50	CH38	12.14	23	
	4.25	CH38	12.08	23	

NOTE:

1.Transmit Power Control (TPC) is not application for the EUT.

2. *Measured value include the cable loss and antenna gain.*

4.4. Power Spectrum Density

LIMIT

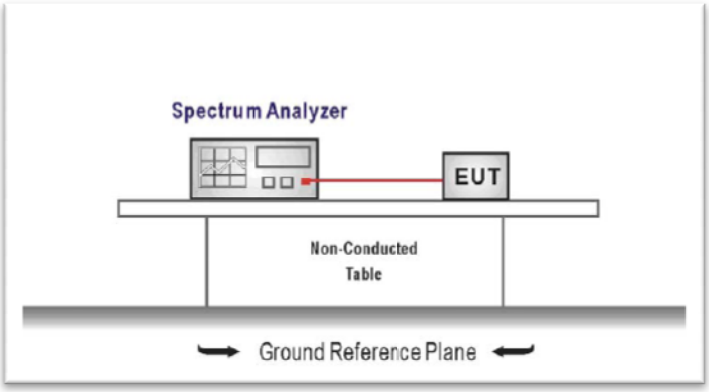
ETSI EN 301 893 Sub-clause 4.4.2

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

Frequency range [MHz]	Mean e.i.r.p. limit [dBm]		Mean e.i.r.p. density limit [dBm/MHz]	
	with TPC	without TPC	with TPC	without TPC
5 150 to 5 350	23	20/23 (see note 1)	10	7/10 (see note 2)
5 470 to 5 725	30 (see note 3)	27 (see note 3)	17 (see note 3)	14 (see note 3)

NOTE 1: The applicable limit is 20 dBm, except for transmissions whose nominal bandwidth falls completely within the band 5 150 MHz to 5 250 MHz, in which case the applicable limit is 23 dBm.
NOTE 2: The applicable limit is 7 dBm/MHz, except for transmissions whose nominal bandwidth falls completely within the band 5 150 MHz to 5 250 MHz, in which case the applicable limit is 10 dBm/MHz.
NOTE 3: Slave devices without a Radar Interference Detection function shall comply with the limits for the band 5 250 MHz to 5 350 MHz.

TEST CONFIGURATION



TEST PROCEDURE

1. Please refer to ETSI EN 301 893 Sub-clause 5.1 for the test conditions.
2. Please refer to ETSI EN 301 893 Sub-clause 5.3.4.2.1.3 for the measurement method.

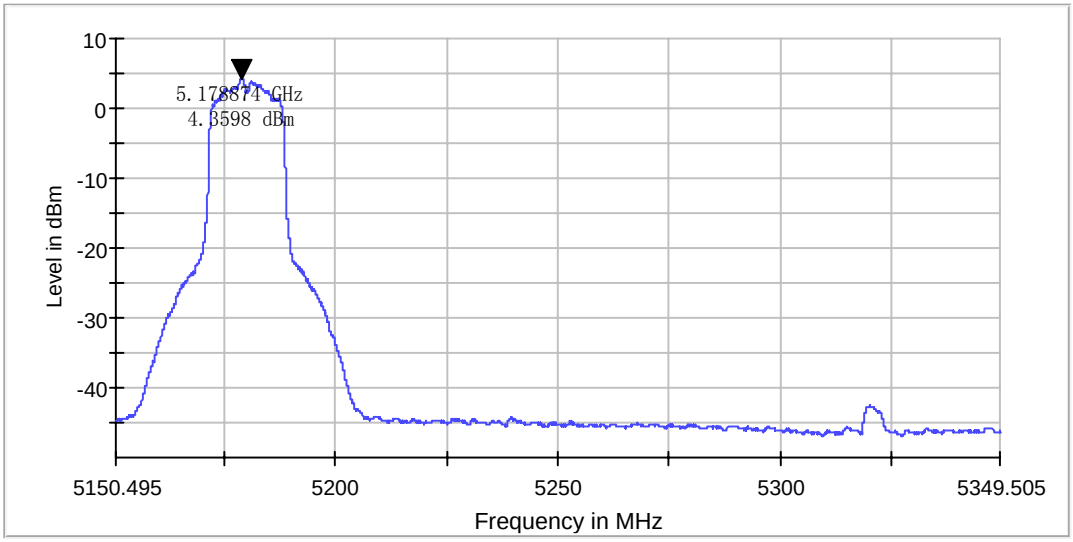
Connect the UUT to the spectrum analyser and use the following settings:
Centre Frequency: The centre frequency of the channel under test
Resolution BW: 1MHz
Video BW: 3 × RBW

TEST RESULTS

Mode	*Channel*	*EIRP Density (dBm/MHz)*	*Limit (dBm/MHz)*	*Result*
802.11a	*CH36*	4.36	*10.00*	*Pass*
802.11n(H20)	*CH36*	3.11	*10.00*	*Pass*
802.11n(H40)	*CH38*	-0.69	*10.00*	*Pass*

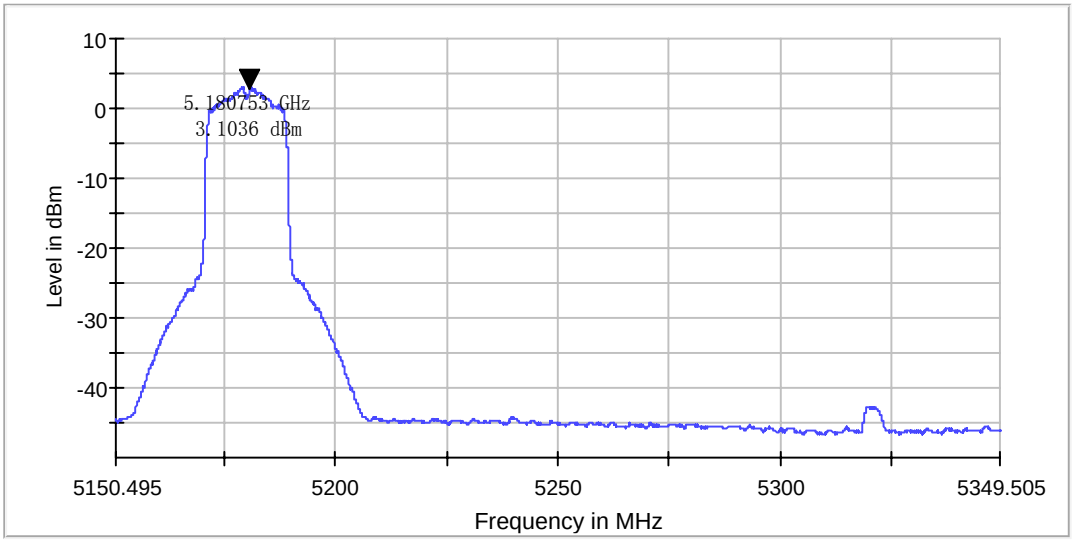
Note: Measured value include the cable loss and antenna gain.

802.11a



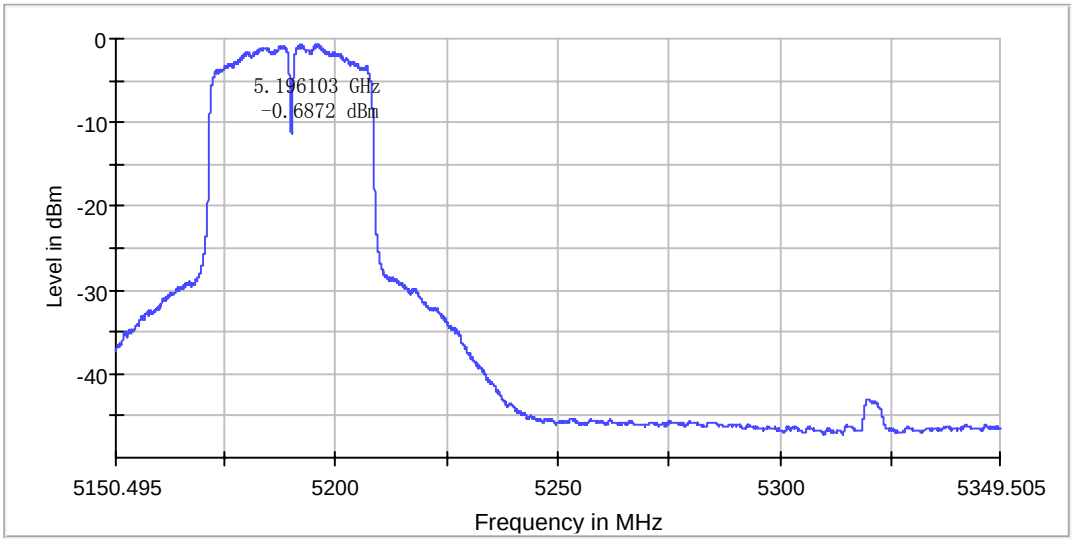
CH36

802.11n(H20)



CH36

802.11n(H40)



CH38

4.5. Transmitter unwanted emissions outside the 5 GHz RLAN bands

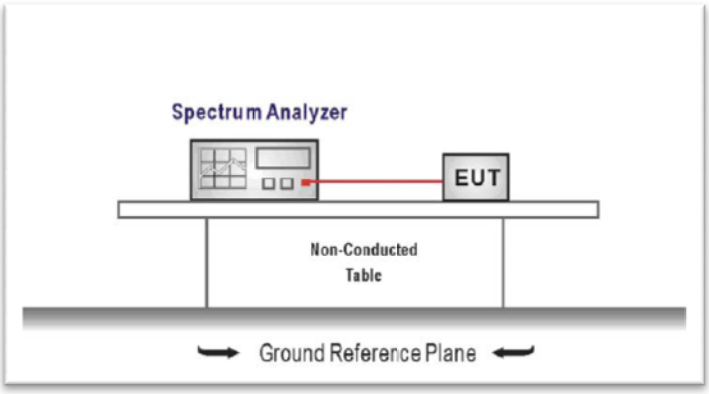
LIMIT

ETSI EN 301 893 Sub-clause 4.5.1.2

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

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

TEST CONFIGURATION



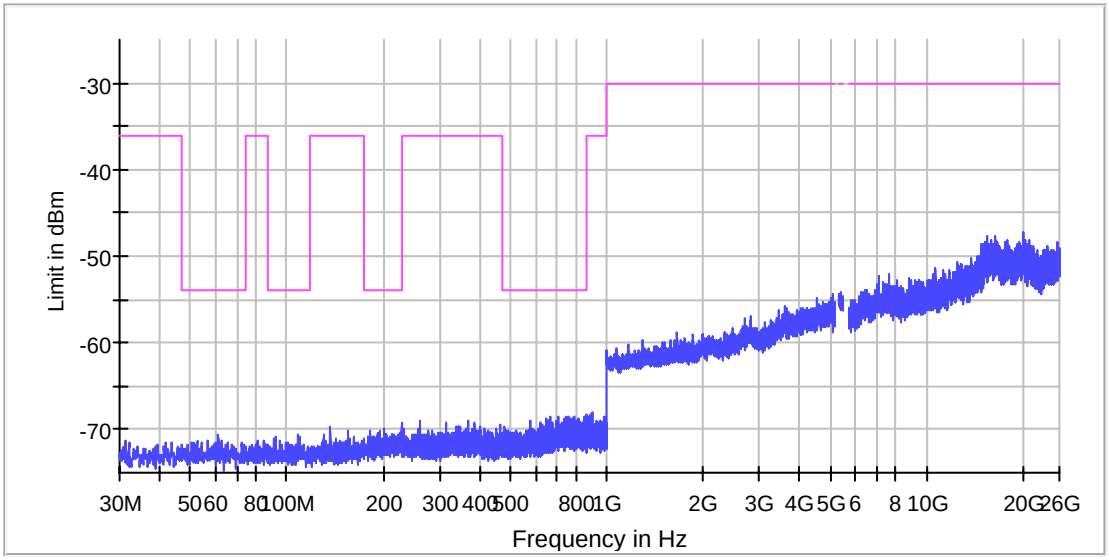
TEST PROCEDURE

1. Please refer to ETSI EN 301 893 Sub-clause 5.1 for the test conditions.
2. Please refer to ETSI EN 301 893 Sub-clause 5.3.5.2.1 for the measurement method.

Resolution Bandwidth: 100 kHz (< 1 GHz) / 1 MHz (> 1 GHz)
Video Bandwidth: 300 kHz (< 1 GHz) / 3 MHz (> 1 GHz)
Detector: Peak for prescan/RMS for emission retest

TEST RESULTS

802.11a



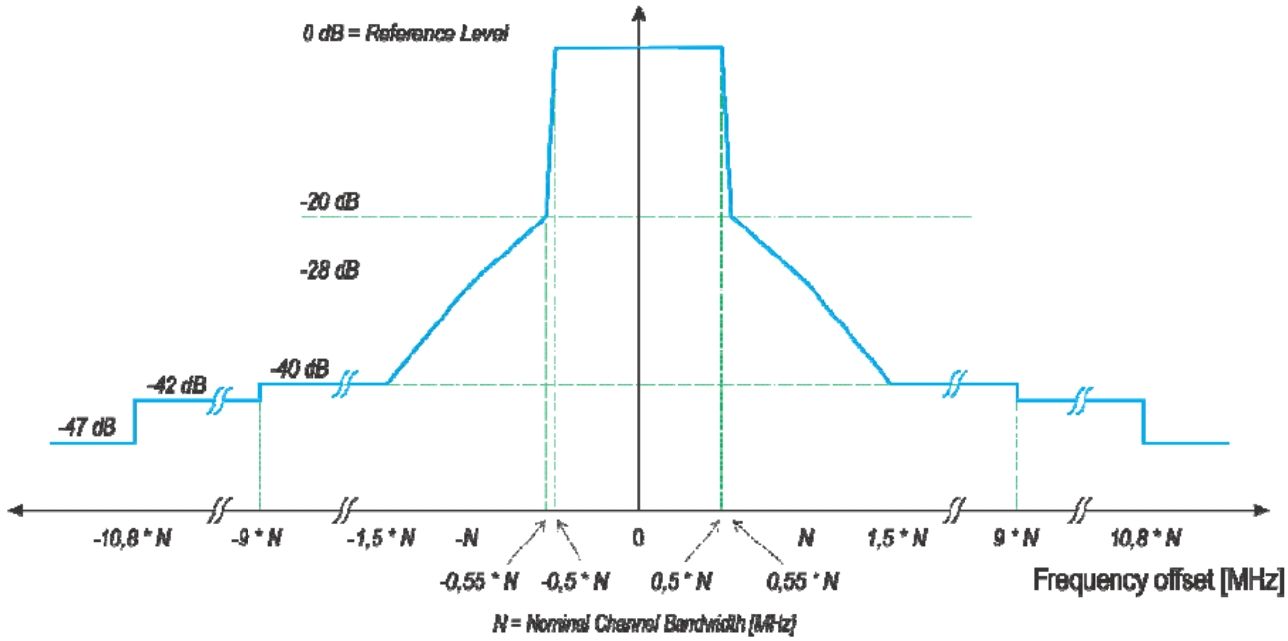
CH36

Note: The Transmitter spurious emission are performed the each mode, the datum recorded is the worst case for all the mode at 802.11a mode.

4.6. Transmitter Unwanted emission Within 5GHz R-LAN Bands

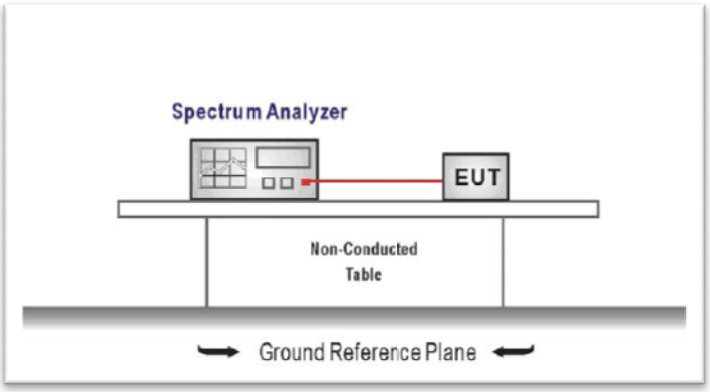
LIMIT

ETSI EN 301 893 Sub-clause 4.5.2.2



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

TEST CONFIGURATION



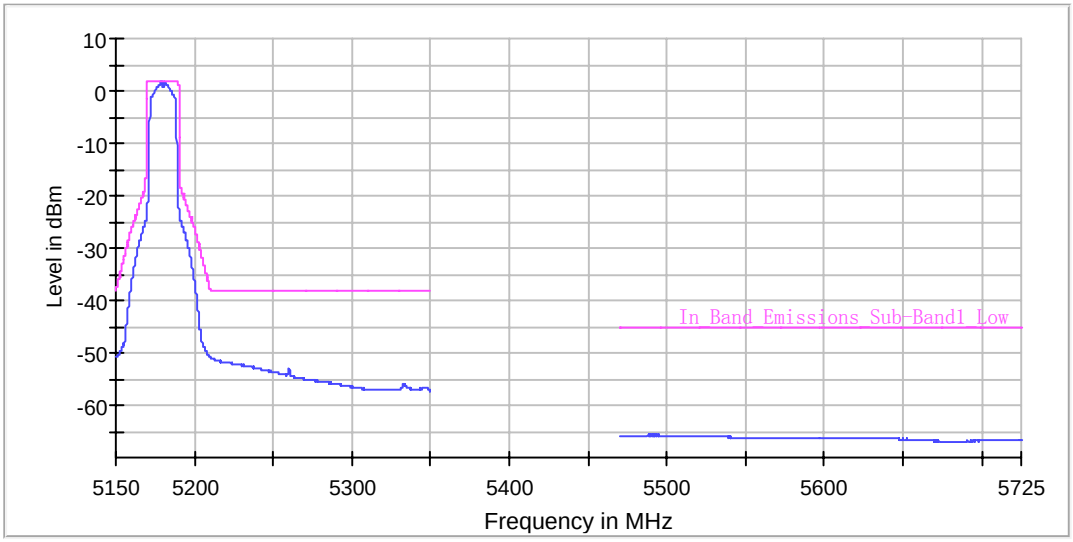
TEST PROCEDURE

1. Please refer to ETSI EN 301 893 Sub-clause 5.1 for the test conditions.
2. Please refer to ETSI EN 301 893 Sub-clause 5.3.6.2 for the measurement method.

Resolution Bandwidth: 1MHz
Video Bandwidth: 30KHz
Detector: RMS

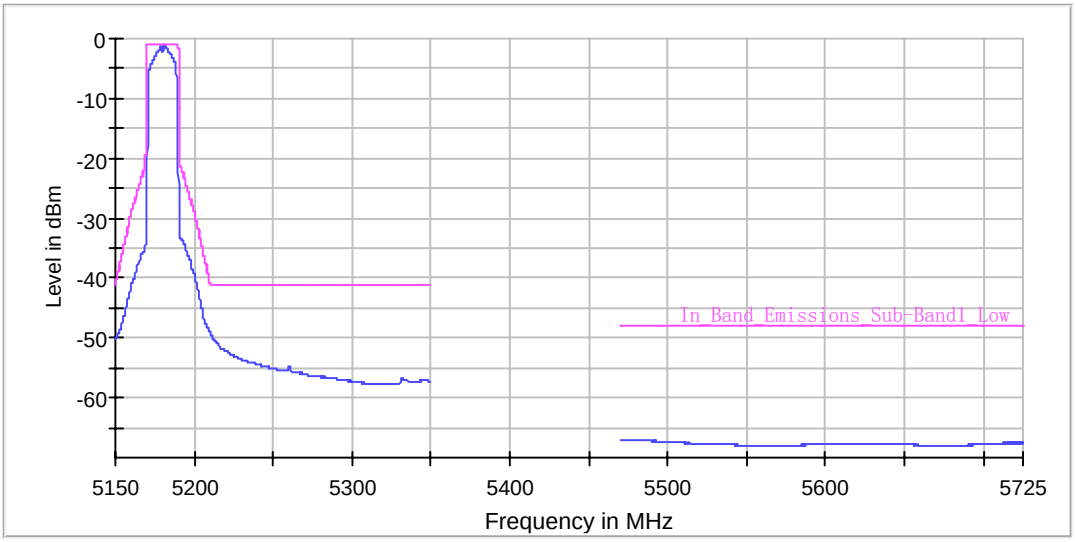
TEST RESULTS

802.11a



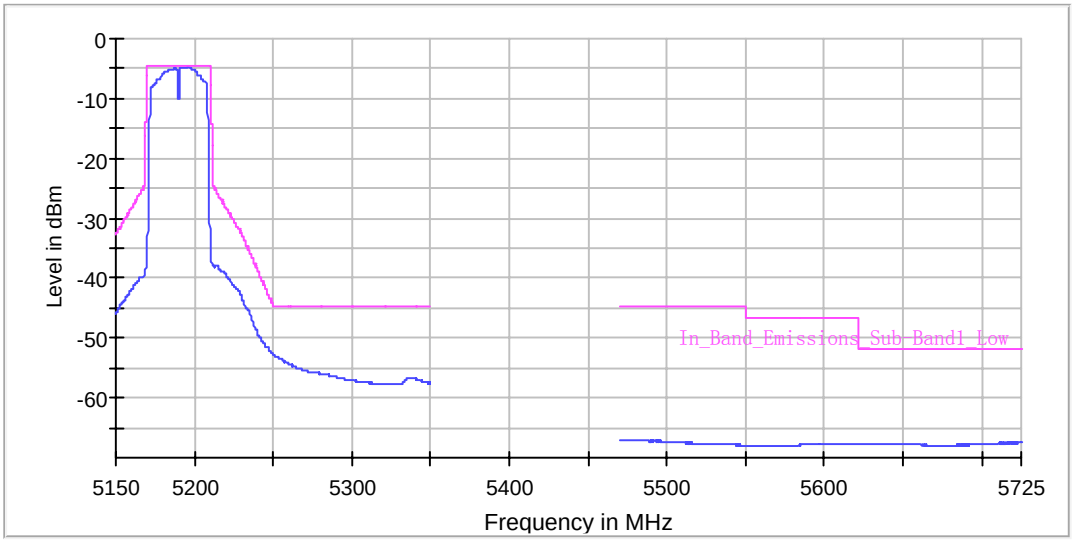
CH36

802.11n(H20)



CH36

802.11n(H40)



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4.7. Receiver spurious emissions

LIMIT

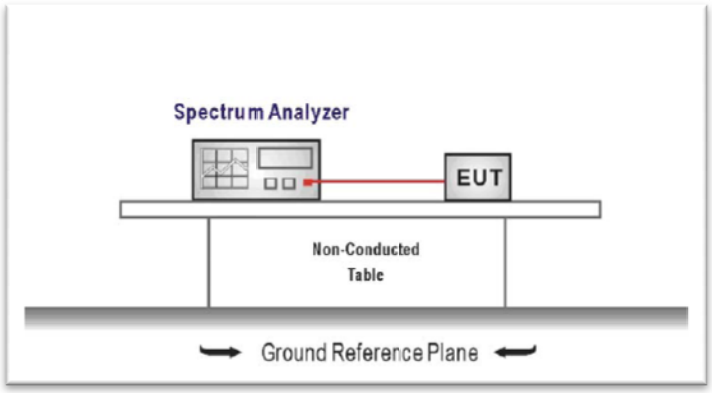
ETSI EN 301 893 Sub-clause 4.6.2

The spurious emissions of the receiver shall not exceed the values given in table 2.

Table 2: spurious emission limits for receivers

Frequency	Maximum power, e.r.p.	Measurement bandwidth
30 MHz to 1 GHz	-57 dBm	100 KHz
1 GHz to 26 GHz	-47 dBm	1 MHz

TEST CONFIGURATION

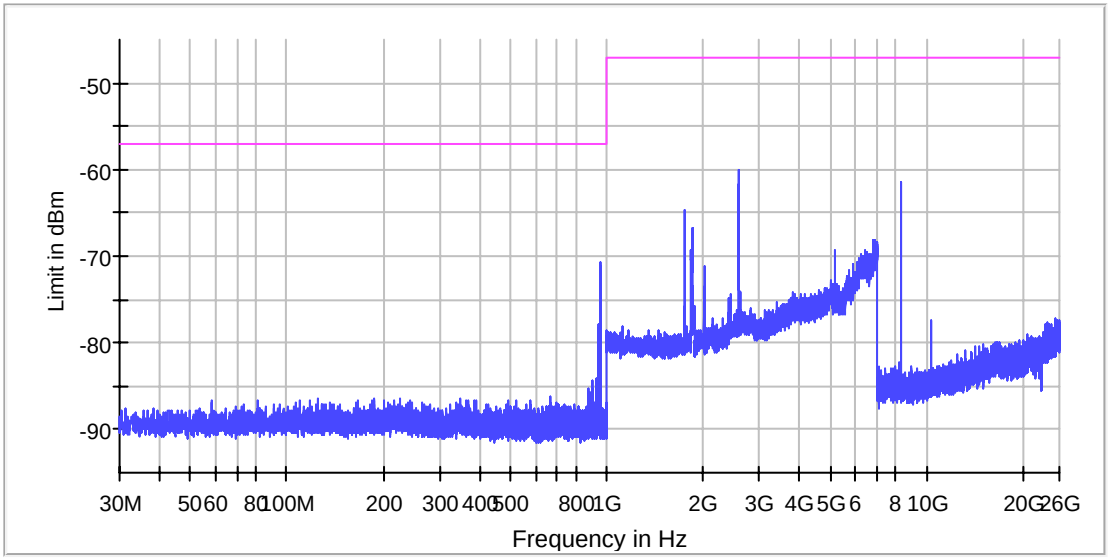


TEST PROCEDURE

1. Please refer to ETSI EN 301 893 Sub-clause 5.1 for the test conditions.
2. Please refer to ETSI EN 301 893 Sub-clause 5.3.7.2 for the measurement method.
   Resolution Bandwidth: 100 kHz (< 1 GHz) / 1 MHz (> 1 GHz)
   Video Bandwidth: 300 kHz (< 1 GHz) / 3 MHz (> 1 GHz)
   Detector: Peak for prescan/RMS for emission retest

TEST RESULTS

802.11a



CH36

Note: The Receiver spurious emission are performed the each mode, the datum recorded is the worst case for all the mode at 802.11a mode.

4.8. Dynamic Frequency Selection (DFS)

DFS parameters

Table D.1: DFS requirement values

Parameter	Value
Channel Availability Check Time	60 s (see note 1)
Minimum Off-Channel CAC Time	6 minutes (see note 2)
Maximum Off-Channel CAC Time	4 hours (see note 2)
Channel Move Time	10 s
Channel Closing Transmission Time	1 s
Non-Occupancy Period	30 minutes
NOTE 1: For channels whose nominal bandwidth falls completely or partly within the band 5 600 MHz to 5 650 MHz, the *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 to 24 hours.	

Table D.2: Interference threshold values

e.i.r.p. Spectral Density dBm/MHz	Value (see notes 1 and 2)
10	-62 dBm
NOTE 1: This is the level at the input of the receiver of an RLAN device with a maximum e.i.r.p. density of 10 dBm/MHz and assuming a 0 dBi receive antenna. For devices employing different e.i.r.p. spectral density and/or a different receive antenna gain G (dBi) the DFS threshold level at the receiver input follows the following relationship: DFS Detection Threshold (dBm) = -62 + 10 - e.i.r.p. Spectral Density (dBm/MHz) + G (dBi), however the DFS threshold level shall not be lower than -64 dBm assuming a 0 dBi receive antenna gain. NOTE 2: Slave devices with a maximum e.i.r.p. of less than 23 dBm do not have to implement radar detection.	

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

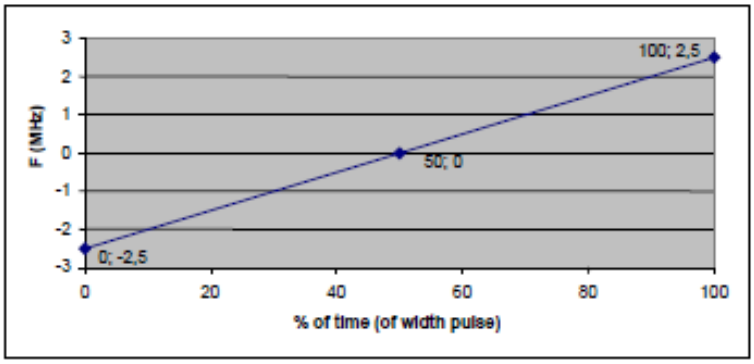
Pulse width W [µs]	Pulse repetition frequency PRF [PPS]	Pulses per burst [PPB]
1	700	18

Table D.4: Parameters of radar test signals

Radar test signal # (see notes 1 to 3)	Pulse width W [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	1 000	1	10 (see note 6)
2	0,5	15	200	1 600	1	15 (see note 6)
3	0,5	15	2 300	4 000	1	25
4	20	30	2 000	4 000	1	20
5	0,5	2	300	400	2/3	10 (see note 6)
6	0,5	2	400	1 200	2/3	15 (see note 6)

NOTE 1: Radar test signals 1 to 4 are constant PRF based signals. See figure D.1. These radar test signals are intended to simulate also radars using a packet based Staggered PRF. See figure D.2.

NOTE 2: Radar test signal 4 is a modulated radar test signal. The modulation to be used is a chirp modulation with a ±2,5 MHz frequency deviation which is described below.



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

NOTE 4: Apart for the Off-Channel CAC testing, the radar test signals above shall only contain a single burst of pulses. See figures D.1, D.3 and D.4.
For the Off-Channel CAC testing, repetitive bursts shall be used for the total duration of the test. See figures D.2 and D.5. See also clauses 4.7.2.2, 5.3.8.2.1.3.1 and 5.3.8.2.1.3.2.

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

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

Table D.5: Detection probability

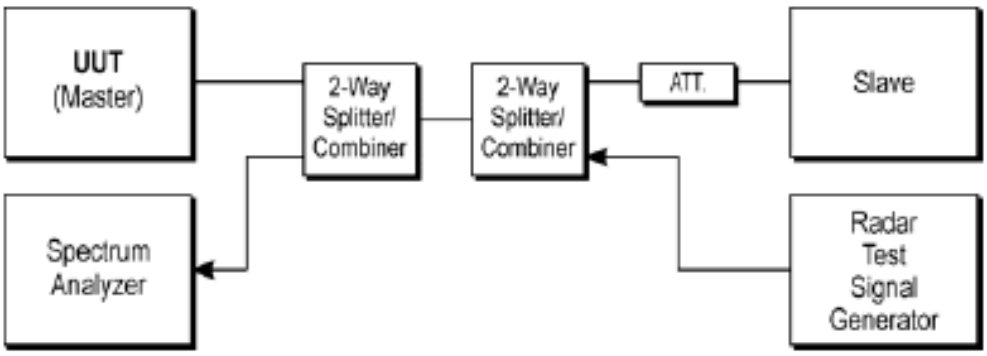
Parameter	Detection Probability (P_d)	
	Channels whose nominal bandwidth falls partly or completely within the 5 600 MHz to 5 650 MHz band	Other channels
CAC, Off-Channel CAC	99,99 %	60 %
In-Service Monitoring	60 %	60 %

NOTE: P_d gives the probability of detection per simulated radar burst and represents a minimum level of detection performance under defined conditions. Therefore P_d does not represent the overall detection probability for any particular radar under real life conditions.

Test set-ups

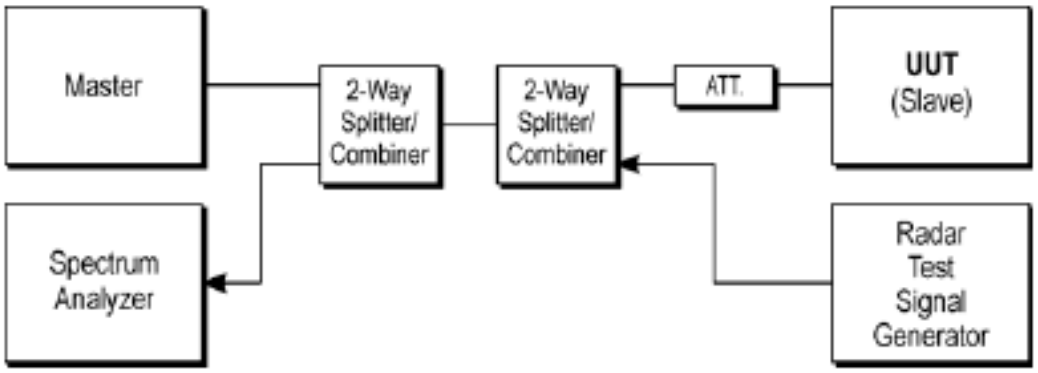
Set-up A

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



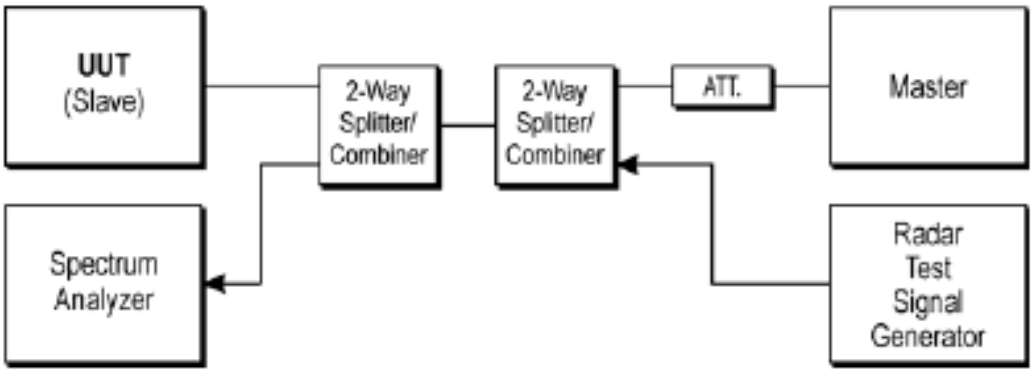
Set-up B

Set-up B is a set-up whereby the UUT is an RLAN device operating in slave mode, with or without Radar Interference Detection function. This set-up also contains an RLAN device operating in master mode. The radar test signals are injected into the master device. The UUT (slave device) is associated with the master device.



Set-up C

The UUT is an RLAN device operating in slave mode with Radar Interference Detection function. Radar test signals are injected into the slave device. This set-up also contains an RLAN device operating in master mode. The UUT (slave device) is associated with the master device.



DFS technical requirements specifications

Table 5 lists the DFS related technical requirements and their applicability for every operational mode. If the RLAN device is capable of operating in more than one operational mode then every operating mode shall be assessed separately.

Table 5: Applicability of DFS requirements

Requirement	DFS Operational mode		
	Master	Slave without radar detection (see table D.2, note 2)	Slave with radar detection (see table D.2, note 2)
Channel Availability Check	✓	Not required	✓ (see note 2)
Off-Channel CAC (see note 1)	✓	Not required	✓ (see note 2)
In-Service Monitoring	✓	Not required	✓
Channel Shutdown	✓	✓	✓
Non-Occupancy Period	✓	Not required	✓
Uniform Spreading	✓	Not required	Not required
NOTE 1: Where implemented by the manufacturer. NOTE 2: A slave with radar detection is not required to perform a CAC or *Off-Channel CAC* at initial use of the channel but only after the slave has detected a radar signal on the *Operating Channel* by *In-Service Monitoring*.			

LIMIT

The results cann't exceed the value defined in table D.1

TEST CONFIGURATION

Please see the test set-up B

TEST PROCEDURE

1. The measurement procedure follows ETSI EN 300 389 (V1.7.1) Sub-clause 5.3.8.2.1.5
2. The measurement shall only be performed at normal test conditions.
3. One channel out of the declared channels for sub-band 5250 MHz to 5350 MHz and 5470 MHz to 5725 MHz . If more than one nominal channel bandwidth has been declared for this sub-band, testing shall be performed using the lowest and highest nominal channel bandwidth.

TEST RESULTS

This test item is not applicable for the EUT.

4.9. Adaptivity (Channel Access Mechanism)

LIMIT

ETSI EN 301 893 Sub-clause 4.9.2

This requirement applies to all equipment within the scope of the present document.

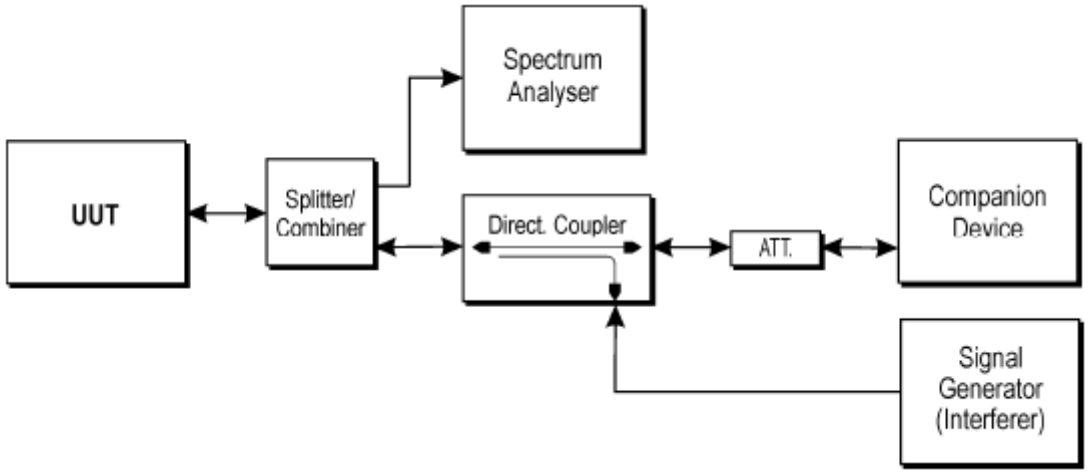
The present document defines 2 types of Adaptive equipment: Frame Based Equipment and Load Based Equipment.

Whilst the mechanisms described in this clause define conditions under which the equipment may transmit,transmissions are only allowed providing they are not prohibited by any of the DFS requirements in clause 4.7.

Short Control Signalling Transmissions

If implemented, Short Control Signalling Transmissions of Adaptive equipment shall have a maximum duty cycle of 5 % within an observation period of 50 ms.

TEST CONFIGURATION



TEST PROCEDURE

1. Please refer to ETSI EN 301 893 Sub-clause 5.1 for the test conditions.
2. Please refer to ETSI EN 301 893 Sub-clause 5.3.9.2 for the measurement method.

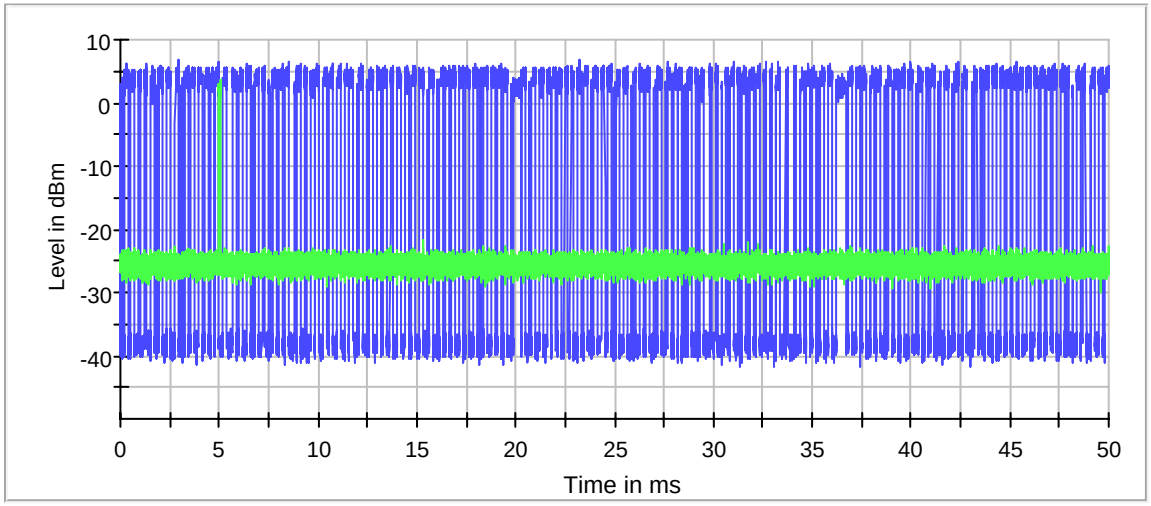
TEST RESULTS

802.11a										
AWGN Interference Level (dBm):-63.45										
Channel	Test Step	No. of Bursts	Max Burst Power(dBm)	COT(ms)	Limit (ms)	CCATime (ms)	Limit (ms)	Short Signaling	Limit (%)	Result
CH36	1	135	13.25	0.485	<13	53.333	>20	---	---	Pass
CH36	2	1	13.14	0.052	---	---	---	0.1	<5	Pass

802.11n H(20)										
AWGN Interference Level (dBm):-62.73										
Channel	Test Step	No. of Bursts	Max Burst Power(dBm)	COT(ms)	Limit (ms)	CCATime (ms)	Limit (ms)	Short Signaling	Limit (%)	Result
CH36	1	106	12.61	0.195	<13	140.000	>20	---	---	Pass
CH36	2	2	12.38	0.055	---	---	---	0.2	<5	Pass

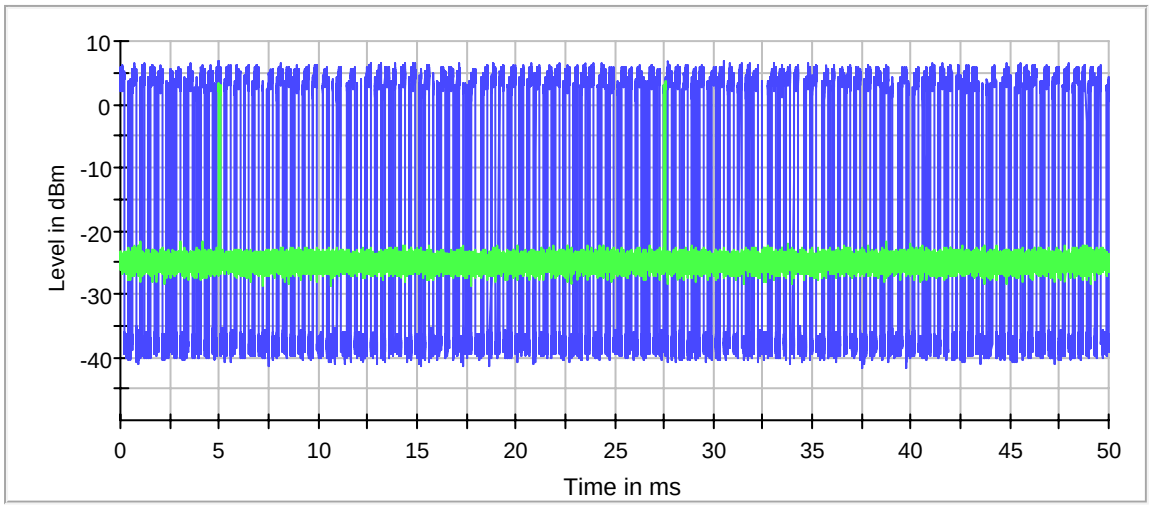
802.11n H(40)										
AWGN Interference Level (dBm):-62.32										
Channel	Test Step	No. of Bursts	Max Burst Power(dBm)	COT(ms)	Limit (ms)	CCATime (ms)	Limit (ms)	Short Signaling	Limit (%)	Result
CH38	1	114	12.14	0.400	<13	128.333	>20	---	---	Pass
CH38	2	4	12.28	0.058	---	---	---	0.5	<5	Pass

802.11a



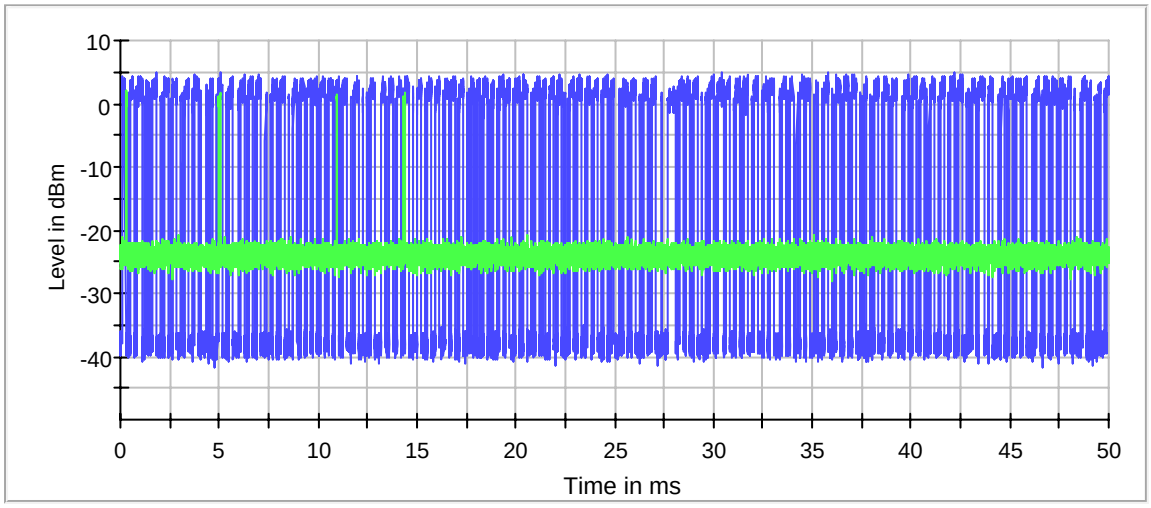
CH36

802.11n(H20)



CH36

802.11n(H40)



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5. Test Setup Photos of the EUT

6. External and Internal Photos of the EUT

Reference to the test report No. TRE1603019101

----------End of Report----------