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DFS MEASUREMENT REPORT

EN 301 893 V2.1.1 WLAN 802.11a/n/ac

- Applicant: Compex Systems Pte Ltd
- Address: No:9 Harrison Road, Harrison Industrial Building, #05-01, Singapore 369651
- Product: 802.11ac Dual Band Module
- Model No.: WLE600VX, WLE600VX-I
- Brand Name: COMPEX
- Standards: EN 301 893 V2.1.1 (2017-05) Clause 4.2.6
- Type of Device: Master Device
- Result: Complies
- **Test Date:** June 10 ~ July 20, 2017

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The test results relate only to the samples tested.

The test results shown in the test report are traceable to the national/international standards through the calibration of the equipment and evaluated measurement uncertainty herein.

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Revision History

Report No.	Version	Description	Issue Date	Note
1706RSU02404	Rev. 01	Initial report	07-21-2017	Valid

Note: This test report was based on MRT report number 1612RSU02404 and updated the standard EN 301 893 version from v1.2.1 to v2.1.1. For DFS testing, there is no any other updated item.



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1. General Information

1.1. Applicant

Compex Systems Pte Ltd No:9 Harrison Road, Harrison Industrial Building, #05-01, Singapore 369651

1.2. Manufacturer

Compex Systems Pte Ltd No:9 Harrison Road, Harrison Industrial Building, #05-01, Singapore 369651

1.3. Testing Facility

Test Site MRT Technology (Suzhou) Co., Ltd

Test Site Location

D8 Building, Youxin Industrial Park, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China

Test Facility / Accreditations

Measurements were performed at MRT Laboratory located in Tian'edang Rd., Suzhou, China.

- MRT facility is a FCC registered (MRT Reg. No. 809388) test facility with the site description report on file and has met all the requirements specified in Section 2.948 of the FCC Rules.
- MRT facility is an IC registered (MRT Reg. No. 11384A-1) test laboratory with the site description on file at Industry Canada.
- MRT facility is a VCCI registered (R-4179, G-814, C-4664, T-2206) test laboratory with the site description on file at VCCI Council.
- MRT Lab is accredited to ISO 17025 by the American Association for Laboratory Accreditation (A2LA) under the American Association for Laboratory Accreditation Program (A2LACert. No.3628.01) in EMC, Telecommunications and Radio testing for FCC, Industry Canada, EU and TELEC Rules.

Accrea	lited Laboratory
	A2LA has accredited
	OGY (SUZHOU) CO., LTD. Isu, People's Republic of China
for tech	nrical competence in the field of
Ele	ectrical Testing
General requirements for the competence of technical competence for a defined scop	ce with the recognized international Standard ISC/IEC 17025/2005 testing and a alitization ibbaratories. This accreditation demonstrates e and the operation of a laboratory quality management system C-UAF Communiqué dated 8 January 2009).
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Product Name	802.11ac Dual Band Module
Model No.	WLE600VX, WLE600VX-I
Brand Name	COMPEX
Wi-Fi Specification	802.11a/b/g/n/ac

1.4. Feature of Equipment under Test

1.5. Product Specification Subjective to this report

Frequency Range	802.11a/n-HT20/ac-VHT20:			
	5260 ~ 5320MHz; 5500 ~ 5700MHz			
	802.11n-HT40/ac-VHT40:			
	5270 ~ 5310MHz; 5510 ~ 5670MHz			
	802.11ac-VHT80:			
	5290MHz, 5530MHz, 5610MHz			
Channel Number	802.11a/n-HT20/ac-VHT20: 15			
	802.11n-HT40/ac-VHT40: 7			
	802.11ac-VHT80: 3			
Type of Modulation	802.11a/n/ac: OFDM			
Data Rate	802.11a: 6/9/12/18/24/36/48/54Mbps			
	802.11n: up to 300Mbps			
	802.11ac: up to 866.6Mbps			
Power-on cycle	Requires 89.99 seconds to complete its power-on cycle			
Uniform Spreading	The Uniform Spreading is a mechanism to be used by the RLAN to provide,			
	on aggregate, a uniform loading of the spectrum across all devices. The			
	Uniform Spreading is limited to the channels being declared as part of the			
	channel plan.			

Note: For other features of this EUT, test report will be issued separately.



1.6. Operation Frequency / Channel List

802.11a/n-HT20/ac-VHT20

Channel	Frequency	Channel	Frequency	Channel	Frequency
52	5260 MHz	56	5280 MHz	60	5300 MHz
64	5320 MHz	100	5500 MHz	104	5520 MHz
108	5540 MHz	112	5560 MHz	116	5580 MHz
132	5660 MHz	136	5680 MHz	140	5700 MHz

802.11n-HT40/ac-VHT40

Channel	Frequency	Channel	Frequency	Channel	Frequency
54	5270 MHz	62	5310 MHz	102	5510 MHz
110	5550 MHz	118	5590 MHz	126	5630 MHz
134	5670 MHz				

802.11ac-VHT80

Channel	Frequency	Channel	Frequency	Channel	Frequency
58	5290 MHz	106	5530 MHz	122	5610 MHz

1.7. Test Channel / Test Mode

Test Mode	Test Channel	Test Frequency	Test Data Rate
	60	5300 MHz	54Mbps
802.11a	100	5500 MHz	54Mbps
	124	5620 MHz	54Mbps
	58	5290 MHz	866.6Mbps
802.11ac-VHT80	106	5530 MHz	866.6Mbps
	122	5610 MHz	866.6Mbps



1.8. Description of Available Antennas

Antenna Type	Manufacturer	Tx Paths	Max Directional Gain (dBi)
Dipole Antenna 1#	Kunshan Wavelink Electronic Co., Ltd.	2	2.4GHz: 2.0, 5GHz: 2.0
Dipole Antenna 2#	Smart Ant Inc	2	2.4GHz: 4.5, 5GHz: 7.0
PCB Antenna 3#	TAOGLAS Inc	2	2.4GHz: 4.5, 5GHz: 6.7
PCB Antenna 4#	Compex Systems Pte Ltd	2	2.4GHz: 5.0, 5GHz: 5.0
PCB Antenna 5#	Compex Systems Pte Ltd	2	2.4GHz: 5.0, 5GHz: 5.0

1.9. Standards Applicable for Testing

The EUT complies with the requirements of ETSI EN 301 893 V2.1.1 Clause 4.2.6.



2. DFS Requirements and Radar Test Waveforms

2.1. Applicability

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

	DFS Operational mode				
Requirement	Master	Slave without radar detection	Slave with radar detection		
Channel Availability Check		Not required	(see note 2)		
Off-Channel CAC (see note 1)		Not required	(see note 2)		
In-Service Monitoring		Not required	\checkmark		
Channel Shutdown			\checkmark		
Non-Occupancy Period		Not required	\checkmark		
Uniform Spreading		Not required	Not required		
Uniform Spreading	N	Not required	Not required		

Table 2-1:	Applicabilit	v of DFS re	equirements
	/	,	

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.

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 5600MHz to 5650MHz, the Channel Availability Check Time shall be 10 minutes.

NOTE 2: For channels whose nominal bandwidth falls completely or partly within the band 5600MHz to 5650MHz, the Maximum Off-Channel CAC Time shall be 24 hours.



2.2. DFS Devices Requirements

Per ETSI EN 301 893 V2.1.1 the following are the requirements for Master Devices:

a) The master device shall use a Radar Interference Detection function in order to detect radar signals. The master device may rely on another device, associated with the master, to implement the Radar Interference Detection function. In such a case, the combination shall comply with the requirements applicable to a master.

b) A master device shall only start operations on Available Channels. At installation (or reinstallation) of the equipment, the RLAN is assumed to have no Available Channels within the band 5250MHz to 5350MHz and/or 5470MHz to 5725MHz. In such a case, before starting operations on one or more of these channels, the master device shall perform either a Channel Availability Check or an Off-Channel CAC to ensure that there are no radars operating on any selected channel. If no radar has been detected, the channel(s) becomes an Available Channel(s) and remains as such until a radar signal is detected during the In-Service Monitoring. The Channel Availability Check or the Off-Channel CAC may be performed over a wider bandwidth such that all channels within the tested bandwidth become Available Channels.

c) Once the RLAN has started operations on an Available Channel, then that channel becomes an Operating Channel. During normal operation, the master device shall monitor all Operating Channels (In-Service Monitoring) to ensure that there is no radar operating within these channel(s). If no radar was detected on an Operating Channel but the RLAN stops operating on that channel, then the channel becomes an Available Channel.

d) If the master device has detected a radar signal on an Operating Channel during In-Service Monitoring, the master device shall instruct all its associated slave devices to stop transmitting on this channel which becomes an Unavailable Channel. For devices operating on multiple (adjacent or non-adjacent) Operating Channels simultaneously, only the Operating Channel containing the frequency on which radar was detected shall become an Unavailable Channel.

e) An Unavailable Channel can become a Usable Channel again after the Non-Occupancy Period. A new Channel Availability Check or an Off-Channel CAC is required to verify there is no radar operating on this channel before it becomes an Available Channel again.

f) In all cases, if radar detection has occurred, then the channel containing the frequency on which radar was detected becomes an Unavailable Channel. Alternatively the channel may be marked as an Unusable Channel.



2.3. DFS Detection Threshold Values

The DFS detection thresholds are defined for Master devices and Client Devices with In-service monitoring. These detection thresholds are listed in the following table.

EIRP 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 a RLAN device with a maximum EIRP density of 10dBm/MHz and assuming a 0dBi receive antenna. For devices employing different EIRP 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 - EIRP Spectral Density (dBm/MHz) + G (dBi), however the DFS threshold level shall not be lower than -64dBm assuming a 0dBi receive antenna gain.

NOTE 2: Slave devices with a maximum EIRP of less than 23dBm do not have to implement radar detection.



2.4. Radar Wave Parameters

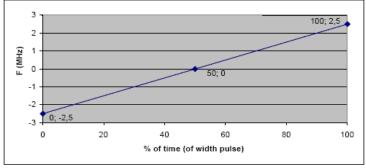
Pulse width W [µs]	Pulse repetition frequency PRF [pps]	Pulses per burst [PPB]				
vv [µS]	[bb2]	נייט				
1	700	18				

Table 2-4: Parameters of the reference DFS test signal

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

Table 2-5: Parameters of radar test signals

NOTE 1: Radar test signals 1 to 4 are constant PRF based signals. See figure 2.1. These radar test signals are intended to simulate also radars using a packet based Staggered PRF. See figure 2.2. NOTE 2: Radar test signal 4 is a modulated radar test signal. The modulation to be used is a chirp modulation with a $\pm 2,5$ MHz frequency deviation which is described below.



NOTE 3: Radar test signals 5 and 6 are single pulse based Staggered PRF radar test signals using 2 or 3 different PRF values. For radar test signal 5, the difference between the PRF values chosen shall be between 20 PPS and 50 PPS. For radar test signal 6, the difference between the PRF values chosen shall be between 80 PPS and 400 PPS. See figure 2.3.

NOTE 4: Apart for the Off-Channel CAC testing, the radar test signals above shall only contain a single burst of pulses. See figures 2.1, 2.3 and 2.4.

For the Off-Channel CAC testing, repetitive bursts shall be used for the total duration of the test. See figures 2.2 and 2.5. See also clauses 4.2.6.2.3, 5.4.8.2.1.4.2 and 5.4.8.2.1.4.3.

NOTE 5: The total number of pulses in a burst is equal to the number of pulses for a single PRF

multiplied by the number of different PRFs used.

NOTE 6: For the CAC and Off-Channel CAC requirement s, the minimum number of pulses (for each PRF) for any of the radar test signals to be detected in the band 5600MHz to 5650MHz shall be 18.

Tablez-6. Detection probability					
	Detection Probability (Pe	d)			
Parameter	Channels whose nominal bandwidth falls partly or completely within the 5600MHz to	Other channels			
	5650MHz band				
CAC, Off-Channel CAC	99,99 %	60 %			
In-Service Monitoring	60 %	60 %			

Table2-6: Detection probability

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

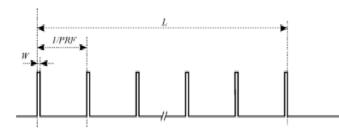
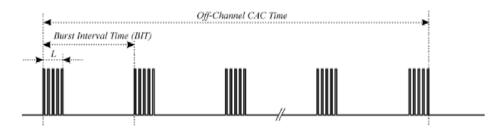
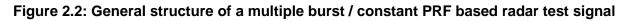
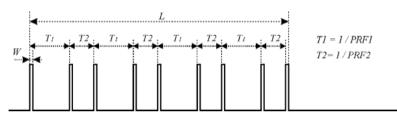
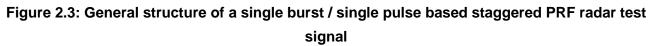


Figure 2.1: General structure of a single burst / constant PRF based radar test signal











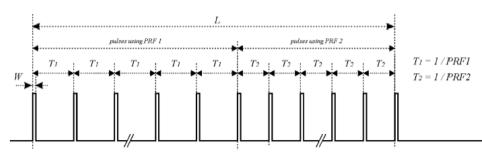


Figure 2.4: General structure of a single burst / packet based staggered PRF radar test signal

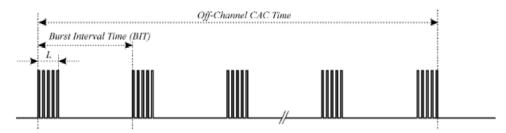


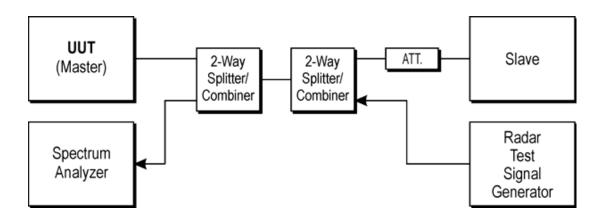
Figure 2.5: General structure of a multiple burst / packet based staggered PRF based radar test Signal



2.5. Conducted Test Setup

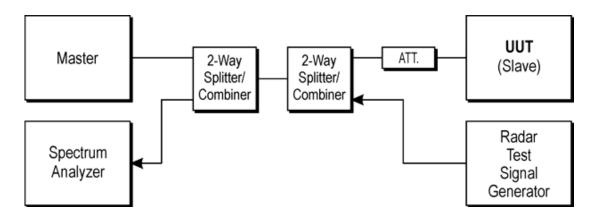
Set-up A

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



Set-up B

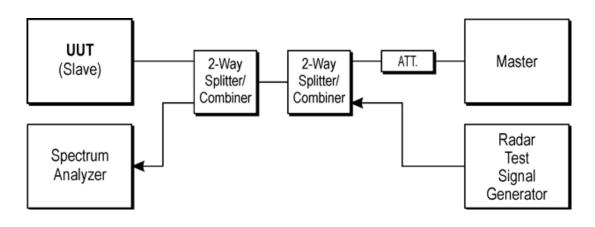
Set-up B is a set-up whereby the UUT is a RLAN device operating in slave mode, with or without Radar Interference Detection function. This set-up also contains a RLAN device operating in master mode. The radar test signals are injected into the master device. The UUT (slave device) is associated with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



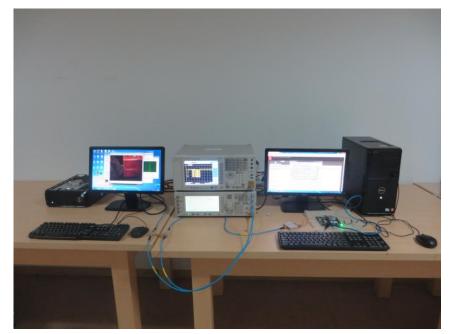


Set-up C

The UUT is a 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 a RLAN device operating in master mode. The UUT (slave device) is associated with the master device.



DFS Test Set-up Photo for Master Device - Set-up A





3. Test Equipment Calibration Date

Dynamic Frequency Selection (DFS) - TR4

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
Spectrum Analyzer	Agilent	N9020A	MRTSUE06106	1 year	2016/04/23
ESG Vector Signal Generator	Agilent	E4438C	MRTSUE06026	1 year	2015/12/09
Notebook	ASUS	PRO45V	MRTSUX02003	N/A	N/A

Note: The notebook has a built-in Intel dual band wireless module (AC 7260).

Software	Version	Manufacturer	Function
Pulse Building	N/A	Agilent	Radar Signal Generation Software
DFS Tool	V 6.9.2	Agilent	DFS Test Software



4. Test Summary

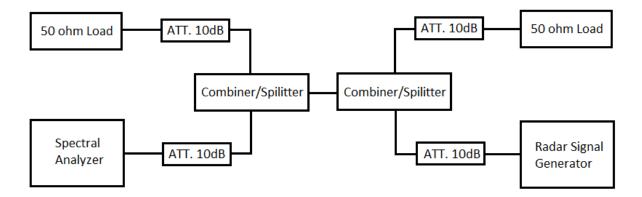
Parameter	Limit	Test Result	Reference
Radar Waveform Calibration	Refer Table 2-4, 2-5, 2-6	Pass	Section 5.1
Test Transmission Sequences	Activity Ratio ≥ 30%	Pass	Section 5.2
Initial Channel Availability Check Time	Refer Table 2-2	Pass	Section 5.3
Radar Burst at the Beginning of the Channel Availability Check Time	Refer Table 2-2	Pass	Section 5.4
Radar Burst at the End of the Channel Availability Check Time	Refer Table 2-2	Pass	Section 5.5
Off-Channel Channel Availability Check	Refer Table 2-2	Pass	Section 5.6
Radar Detection Threshold	Refer Table 2-2	Pass	Section 5.7
In-Service Monitoring	Refer Table 2-2	Pass	Section 5.8
Channel Move Time, Channel Closing Transmission Time and Non-Occupancy Period	Refer Table 2-2	Pass	Section 5.9
Uniform Spreading	≥ 60%	Pass	Section 5.10



5. Test Result

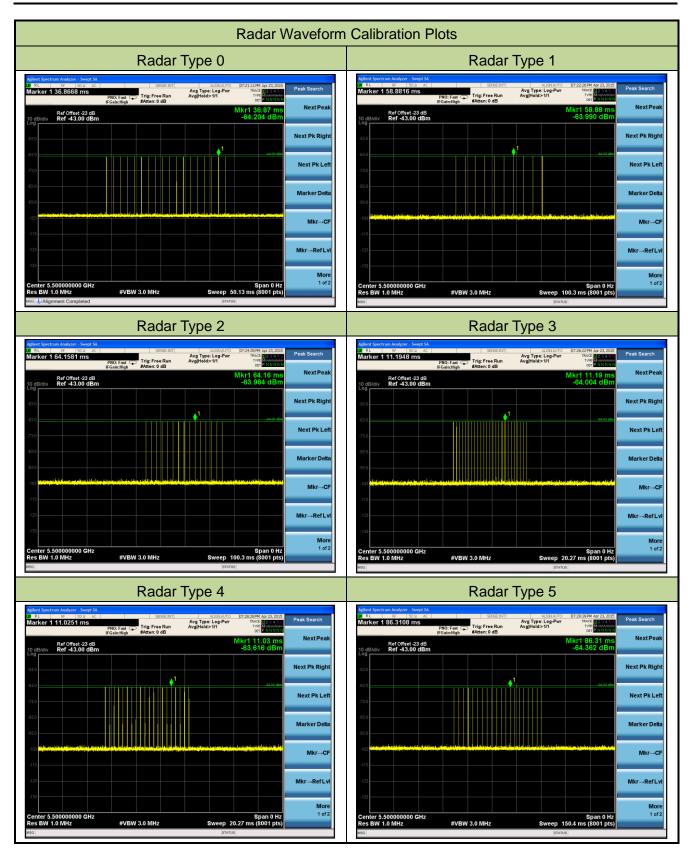
5.1. Radar Waveform Calibration

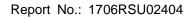
The following equipment setup was used to calibrate the conducted radar waveform. A spectrum analyzer was used to establish the test signal level for each radar type. During this process there were no transmissions by either the master or client device. The spectrum analyzer was switched to the zero spans (time domain) at the frequency of the radar waveform generator. Peak detection was utilized. The spectrum analyzer resolution bandwidth (RBW) and video bandwidth (VBW) were set to 1 MHz and 3 MHz.



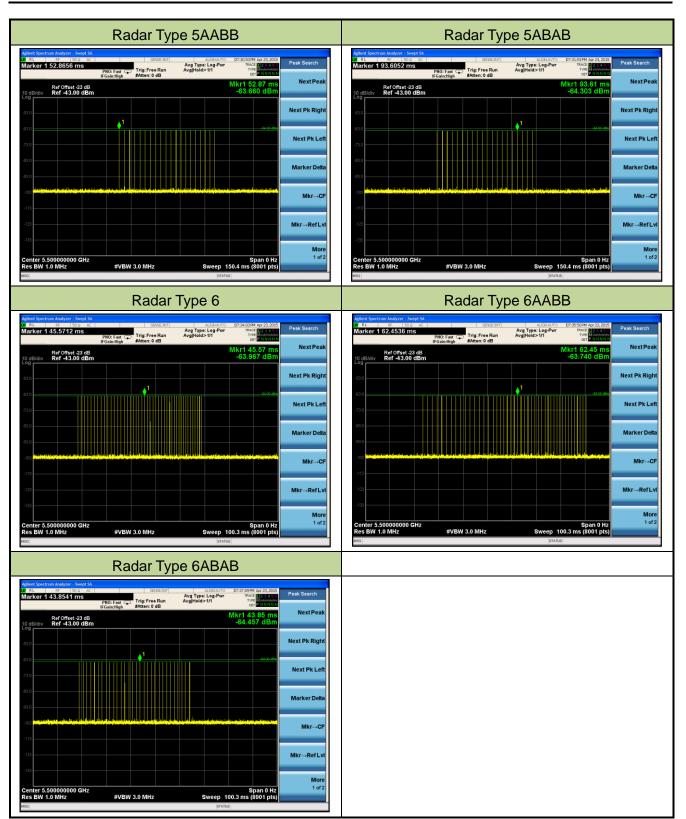
Conducted Calibration Setup













5.2. Test Transmission Sequences

The DFS tests related to the Off-Channel CAC Check and the In-Service Monitoring shall be performed by using a test transmission sequence on the Operating Channel that shall consist of packet transmissions that together exceed the transmitter minimum activity ratio of 30 % measured over an interval of 100ms. The duration of the sequence shall be adequate for the DFS test purposes.

There shall be no transmissions on channels being checked during a Channel Availability Check.



Test Mode	Test Frequency	Activity Ratio	Limit	Test Result
802.11a	5300	38.11%	≥ 30%	Pass
802.11a	5500	39.79%	≥ 30%	Pass
802.11ac-VHT80	5290	36.06%	≥ 30%	Pass
802.11ac-VHT80	5530	35.93%	≥ 30%	Pass



5.3. Initial Channel Availability Check Time Measurement

5.3.1 Test Limit

The Channel Availability Check shall be performed during a continuous period in time (Channel Availability Check Time) which shall not be less than the value defined in table 2-2.

5.3.2 Test Procedure

1. The master devices will be powered on and be instructed to operate on the appropriate channel which falls within the frequency range 5250-5350MHz, 5470-5725MHz. At the same time the EUT is powered on, the spectrum analyzer will be set to zero span mode with a 3MHz RBW and 3MHz VBW on the Channel occupied by the radar (Ch_r) with a 2.5 minute sweep time. The spectrum analyzer's sweep will be started at the same time power is applied to the master device.

2. The EUT should not transmit any beacon or data transmissions until at least 1 minute after the completion of the power-on cycle.

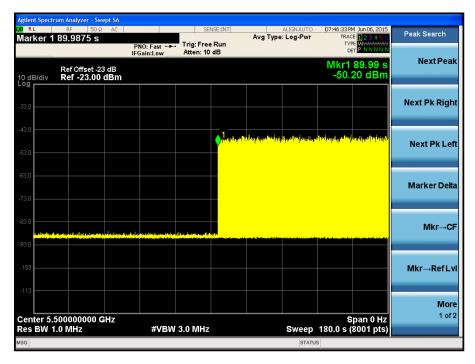
3. Confirm that the EUT initiates transmission on the channel. Measurement system showing its nominal noise floor is marker1.



5.3.3 Test Result

The EUT does not transmit any beacon or data transmissions until at least 1 minute after the completion of the power-on cycle (29.99 sec). Initial beacons/data transmissions are indicated by marker 1 (89.99 sec).

Initial Channel Availability Check Time for 802.11a (5300MHz)





5.4. Radar Burst at the Beginning of the Channel Availability Check Time Measurement

5.4.1 Test Limit

During the Channel Availability Check, the RLAN shall be capable of detecting any of the radar test signals that fall within the ranges given by table 2-4, table 2-5 and table 2-6 with a level above the Radar Detection Threshold defined in table 2-3.

5.4.2 Test Procedure

a) The signal generator and UUT are connected using Set-up A. The power of the UUT is switched off.

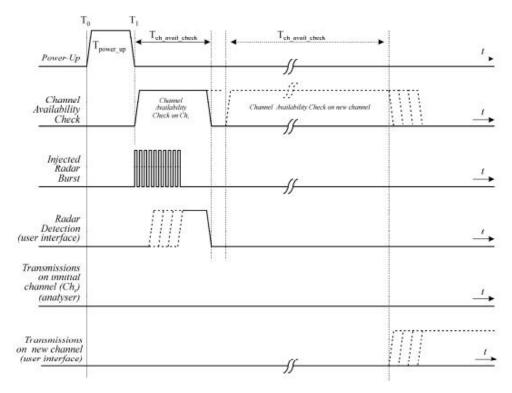
b) The UUT is powered on at T0. T1 denotes the instant when the UUT has completed its power-up sequence (T_{power_up}) and is ready to start the radar detection. The Channel Availability Check is expected to commence on Ch_r at instant T1 and is expected to end no sooner than T1 + $T_{ch_avail_check}$ unless a radar is detected sooner.

Note: Additional verification may be needed to define T1 in case it is not exactly known or indicated by the UUT.

c) A single radar burst is generated on Ch_r using the reference test signal defined in table D.3 at a level of up to 10 dB above the level defined in table 2-3. This single-burst radar test signal shall commence within 2 s after time T1.

d) It shall be recorded if the radar test signal was detected.

e) A timing trace or description of the observed timing and behaviour of the UUT shall be recorded.





5.4.3 Test Result

Refer to report number 1612RSU02404, Clause 5.4.3.



5.5. Radar Burst at the End of the Channel Availability Check Time Measurement

5.5.1 Test Limit

During the Channel Availability Check, the RLAN shall be capable of detecting any of the radar test signals that fall within the ranges given by table 2-4, table 2-5 and table 2-6 with a level above the Radar Detection Threshold defined in table 2-3.

5.5.2 Test Procedure

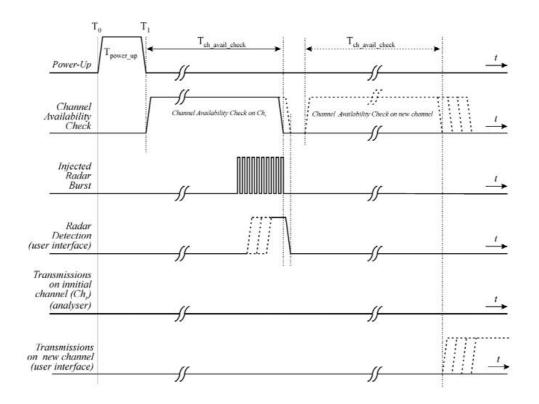
a) The signal generator and UUT are connected using Set-up A. The power of the UUT is switched off.

b) The UUT is powered up at T0. T1 denotes the instant when the UUT has completed its power-up sequence (T_{power_up}) and is ready to start the radar detection. The Channel Availability Check is expected to commence on Ch_r at instant T1 and is expected to end no sooner than T1 + $T_{ch_avail_check}$ unless a radar is detected sooner.

c) A single radar burst is generated on Ch_r using the reference test signal defined in table D.3 at a level of up to 10 dB above the level defined in clause 5.3.8.2.1. This single-burst radar test signal shall commence towards the end of the minimum required Channel Availability Check Time but not before time T1 + T_{ch avail check} - 2 s.

d) It shall be recorded if the radar test signal was detected.

e) A timing trace or description of the observed timing and behaviour of the UUT shall be recorded.





5.5.3 Test Result

Refer to report number 1612RSU02404, Clause 5.5.3.



5.6. Off-Channel Channel Availability Check

5.6.1 Test Limit

Where implemented, the Off-Channel CAC Time shall be declared by the manufacturer. However, the declared Off-Channel CAC Time shall be within the range specified in table 2-2.

During the Off-Channel CAC, the RLAN shall be capable of detecting any of the radar test signals that fall within the ranges given by table 2-4 & table 2-5 with a level above the Radar Detection Threshold defined in table 2-3.

The minimum required detection probability is defined in table 2-6.

5.6.2 Test Procedure

Radar Detection Threshold (during Off-Channel CAC)

The different steps below define the procedure to verify the Radar Detection Threshold during the Off-Channel CAC.

Where the declared channel plan includes channels whose nominal bandwidth falls completely or partly within the 5600MHz to 5650MHz band, the test shall be performed on one of these channels in addition to a channel outside this band.

a) The signal generator, the UUT (master device) and a slave device associated with the UUT, are connected using Set-up A.

b) The UUT shall transmit a test transmission sequence in accordance with clause 5.1.2.2 on (all) the Operating Channel(s).

c) A multi burst radar test signal is generated on Ch_r using any of the radar test signals defined in table D.4 at a level defined at table 2-3. The radar test signal used shall be recorded in the report. This multi burst radar test signal shall commence at T3 and shall continue for the total duration of the Off-Channel CAC Time ($T_{Off-Channel_CAC}$) as declared by the manufacturer in accordance with table 2-2. For channels within the 5600MHz to 5650MHz band test signals #3 and #4 shall not be used and the Burst Interval Time (BIT) during the test shall be varied between 8 minutes and 10 minutes. For channels outside this band, the Burst Interval Time (BIT) during the test shall be varied between 45 s and 60 s.

d) The UUT shall detect the radar test signal before the end of the Off-Channel CAC Time and this shall be recorded.

Detection Probability (P_d)

For channels outside the 5600MHz to 5650MHz band, the test is sufficient to demonstrate that the UUT meets the Detection Probability (Pd) defined in table 2-6.

Where the declared channel plan includes channels whose nominal bandwidth falls completely or partly within the 5600MHz to 5650MHz band, the procedure in the steps below has to be performed on one of these channels.

a) A multi burst radar test signal is generated on Ch_r using any of the radar test signals defined in



table 2-4 and table 2-5 (except signals #3 and #4) at a level of 10 dB above the level defined at table 2-3. The radar test signal used shall be recorded in the report. This multi burst radar test signal shall commence at T3 and shall continue for the total duration of the Off-Channel CAC Time ($T_{Off-Channel_CAC}$) as declared by the manufacturer in accordance with table 2-2. The Burst Interval Time (BIT) during the test shall be varied between 8 minutes and 10 minutes.

b) It shall be recorded how many bursts have been detected by the UUT at the end of the Off-Channel CAC Time.

The minimum number of bursts that the UUT shall detect in order to comply with the detection probability defined for this frequency range in table 2-6 is given by table as below.

Off-Channel CAC Time (Minutes)	Number of Bursts generated assuming a BIT of 10 minutes	Minimum Number of burst detections
60	6	5
90	9	6
160	16	7
320	32	8
1440	144	9

Table: Minimum number of burst detections for channels within the 5600MHz to 5650MHz band

5.6.3 Test Result

Refer to report number 1612RSU02404, Clause 5.6.3.



5.7. Radar Detection Threshold (during the Channel Availability Check)

5.7.1 Test Limit

The minimum required detection probability is defined in table as below.

	Detection Probability (Pd)			
Parameter	Channels whose nominal bandwidth falls partly or completely within the 5600 MHz	Other channels		
	to 5650 MHz band	other onamicis		
CAC, Off-Channel CAC	99.99 %	60 %		
NOTE: Pd gives the probability of detection per simulated radar burst and represents a minimum				
level of detection performance under defined conditions. Therefore Pd does not represent the overall				
detection probability for any particular radar under real life conditions.				

5.7.2 Test Procedure

The different steps below define the procedure to verify the Radar Detection Threshold during the Channel Availability Check Time for channels outside the 5600MHz to 5650MHz band.

a) The signal generator and UUT are connected using Set-up A. The power of the UUT is switched off.

b) The UUT is powered on at T0. T1 denotes the instant when the UUT has completed its power-up sequence (T_{power_up}) and is ready to start the radar detection. The Channel Availability Check on Ch_r is expected to commence at instant T1 and is expected to end no sooner than T1 + $T_{ch_avail_check}$ unless a radar is detected sooner.

c) A single burst radar test signal is generated on Ch_r using any of the radar test signals defined in table 2-4 and table 2-5 at a level defined in table 2-3. This single-burst radar test signal may commence at any time within the applicable Channel Availability Check Time.

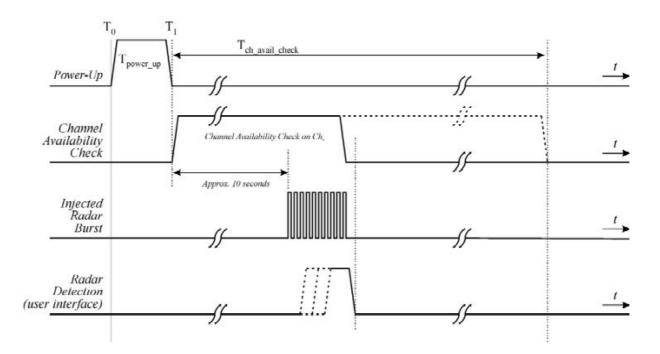
d) It shall be recorded if the radar test signal was detected.

e) The steps c) to d) shall be performed 20 times and each time a different radar test signal shall be generated from options provided in table 2-4, table 2-5 and table 2-6. The radar test signals used shall be recorded in the report. The radar test signal shall be detected at least 12 times out of the 20 trials in order to comply with the detection probability specified for this frequency range in table 2-6 Where the declared channel plan includes channels whose nominal bandwidth falls completely or partly within the 5600 MHz to 5650 MHz band, additional testing as described in the steps below shall be performed on a channel within this band.

f) A single burst radar test signal is generated on Ch_r using any of the radar test signals defined in table 2-4 and table 2-5 (except signals #3 and #4) at a level of 10 dB above the level defined in table 2-3. This single burst radar test signal may commence at any time within the applicable Channel Availability Check Time.



g) Step f) shall be performed 20 times, each time a different radar test signal shall be generated from options provided in table D.4 (except signals #3 and #4). The radar test signals used shall be recorded in the report. The radar test signal shall be detected during each of these trials and this shall be recorded.



5.7.3 Test Result

Refer to report number 1612RSU02404, Clause 5.7.3.



5.8. In-Service Monitoring Measurement

5.8.1 Test Limit

The In-Service Monitoring shall be used to monitor each Operating Channel.

The In-Service-Monitoring shall start immediately after the RLAN has started transmissions on a channel.

During the In-Service Monitoring, the RLAN shall be capable of detecting any of the radar test signals that fall within the ranges 5250-5350MHz, 5470-5725MHz with a level above the Radar Detection Threshold defined in table 2-3.

The minimum required detection probability associated with a given radar test signal is defined in table 2-4 and table 2-5.

5.8.2 Test Procedure Used

a) When the UUT is a master device, a slave device will be used that associates with the UUT. The signal generator and the UUT are connected using Set-up A.

b) The UUT shall transmit a test transmission sequence on the selected channel Ch_r While the testing is performed on Ch_r, the equipment is allowed to have simultaneous transmissions on other adjacent or non-adjacent operating channels.

c) At a certain time T0, a single burst radar test signal is generated on Ch_r using radar test signal #1 defined in table 2-5 and at a level defined in table 2-3. T1 denotes the end of the radar burst.
d) It shall be recorded if the radar test signal was detected.

e) The steps b) to d) shall be performed 20 times. The radar test signal shall be detected at least 12 times out of the 20 trials in order to comply with the detection probability specified in table 2-6.f) The steps b) to e) shall be repeated for each of the radar test signals defined in table 2-5 and as described in table 2-3.

5.8.3 Test Result

Refer to report number 1612RSU02404, Clause 5.8.3.



5.9. Channel Shutdown and Non-Occupancy Period

5.9.1 Test Limit

Parameter	Value
Channel Move Time	< 10 s
Channel Closing Transmission Time	< 1 s

5.9.2 Test Procedure Used

a) When the UUT is a master device, a slave device will be used that associates with the UUT. The signal generator and the UUT shall be connected using Set-up A.

b) The UUT shall transmit a test transmission sequence on the selected channel Ch_r. While the testing is performed on Ch_r, the equipment is allowed to have simultaneous transmissions on other adjacent or non-adjacent operating channels.

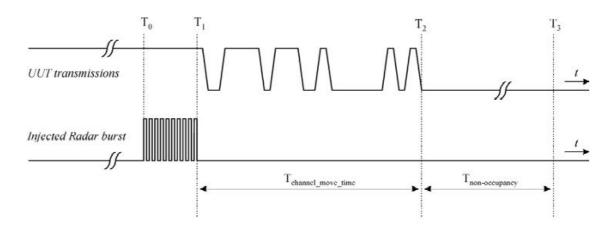
c) At a certain time T0, a single burst test signal is generated on Ch_r using the reference DFS test signal defined in table 2-4 and at a level of up to 10 dB above the level defined in table 2-3 on the selected channel. T1 denotes the end of the radar burst.

d) The transmissions of the UUT following instant T1 on the selected channel Ch_r shall be observed for a period greater than or equal to the Channel Move Time defined in table 2-2. The aggregate duration (Channel Closing Transmission Time) of all transmissions from the UUT on Ch_r during the Channel Move Time shall be compared to the limit defined in table 2-2. For equipment capable of having simultaneous transmissions on multiple (adjacent or non-adjacent) operating channels, the equipment is allowed to continue transmissions on other Operating Channels (different

from Ch_r).

e) T2 denotes the instant when the UUT has ceased all transmissions on the channel Ch_r. The time difference between T1 and T2 shall be measured. This value (Channel Move Time) shall be noted and compared with the limit defined in table 2-2.

f) Following instant T2, the selected channel Ch_r shall be observed for a period equal to the Non-Occupancy Period (T3-T2) to verify that the UUT does not resume any transmissions on this channel.





5.9.3 Test Result

Refer to report number 1612RSU02404, Clause 5.4.3.



5.10. Uniform Spreading

5.10.1 Test Limit

Each of the declared Channel Plans shall make use of at least 60 % of the spectrum available in the applicable sub-band(s).

Each of the Usable Channels shall be used with approximately equal probability. RLAN equipment for which the declared channel plan includes channels whose nominal bandwidth falls completely or partly within the band 5 600 MHz to 5 650 MHz may omit these channels from the list of Usable Channels at initial power up or at initial installation. Channels being used by other RLAN equipment may be omitted from the list of Usable Channels.

5.10.2 Test Result

Refer to report number 1612RSU02404, Clause 5.10.2.

The End





6. Appendix - Original Report



MRT Technology (Suzhou) Co., Ltd Phone: +86-512-66308358 Fax: +86-512-66308368 Web: www.mrt-cert.com Report No.: 1612RSU02404Report Version:V01Issue Date:01-14-2017

DFS MEASUREMENT REPORT

EN 301 893 V1.8.1

- Applicant: Compex Systems Pte Ltd
- Address: No:9 Harrison Road, Harrison Industrial Building, #05-01, Singapore 369651
- Product: 802.11ac Dual Band Module
- Model No.: WLE600VX, WLE600VX-I
- Brand Name: COMPEX
- Standards: EN 301 893 V1.8.1 (2015-03) Clause 4.7
- **Type of Device:** Master Device
 - Client Device without radar detection
 - Client Device with radar detection
- **Result:** Complies
- **Test Date:** Mar. 16 ~ Jun. 15, 2015
- Reviewed By

Approved By





The test results relate only to the samples tested.

The test results shown in the test report are traceable to the national/international standards through the calibration of the equipment and evaluated measurement uncertainty herein.

The test report shall not be reproduced except in full without the written approval of MRT Technology (Suzhou) Co., Ltd.



Revision History

Report No.	Version	Description	Issue Date
1612RSU02404	Rev. 01	Initial report	01-14-2017

Note: This report was based on the original report no. 1503RSU02907. The test rule EN 301 893 version upgrade from v1.7.1 to v1.8.1, there is no change for DFS testing.



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1. General Information

1.1. Applicant

Compex Systems Pte Ltd No:9 Harrison Road, Harrison Industrial Building, #05-01, Singapore 369651

1.2. Manufacturer

Compex Systems Pte Ltd No:9 Harrison Road, Harrison Industrial Building, #05-01, Singapore 369651

1.3. Testing Facility

Test Site MRT Technology (Suzhou) Co., Ltd

Test Site Location

D8 Building, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China

Test Facility / Accreditations

Measurements were performed at MRT Laboratory located in Tian'edang Rd., Suzhou, China
MRT facility is a FCC registered (MRT Reg. No. 809388) test facility with the site description report on file and has met all the requirements specified in Section 2.948 of the FCC Rules.
MRT facility is an IC registered (MRT Reg. No. 11384A-1) test laboratory with the site

description on file at Industry Canada.

• MRT facility is a VCCI registered (R-4179, G-814,

C-4664, T-2206) test laboratory with the site description on file at VCCI Council.

• MRT Lab is accredited to ISO 17025 by the American Association for Laboratory Accreditation (A2LA) under the American Association for Laboratory Accreditation Program (A2LA Cert. No. 3628.01) in EMC, Telecommunications and Radio testing for FCC, Industry Canada, EU and TELEC Rules.

	erican Association for Laboratory Accreditation
	ted Laboratory
	DGY (SUZHOU) CO., LTD. Suzhou, China sical competence in the field of
This faboratory is accredited in accordance with the reo the competence of testing and calibration laboratories. T	lectrical Testing orgaized International Standard ISO/EEC 17025/2005 General requirements for this accreditation demonstrates technical competence for a defined scope and the
operation of a laboratory quality management sy	steen (refer to joint ISO-ILAC-UF Communique duited 8-January 2009). Presented this 17 th days of Jane 2014.
	Life. Alternative CDS Concell Providers & CDS Concell Conflicte Number 5025 (01 Valid to August 31, 2016
For the sense to which this accreditation applie	es, please refer to the laboratory's Electrical Scope of Accreditation.



1.4. Feature of Product

Product Name	802.11ac Dual Band Module
Model No.	WLE600VX, WLE600VX-I
Brand Name	COMPEX
Wi-Fi Specification	802.11a/b/g/n/ac

1.5. Product Specification Subjective to this Report

Frequency Range	802.11a/n-HT20/ac-VHT20:			
	5260 ~ 5320MHz; 5500 ~ 5700MHz			
	802.11n-HT40/ac-VHT40:			
	5270 ~ 5310MHz; 5510 ~ 5670MHz			
	802.11ac-VHT80:			
	5290MHz, 5530MHz, 5610MHz			
Channel Number	802.11a/n-HT20/ac-VHT20: 15			
	802.11n-HT40/ac-VHT40: 7			
	802.11ac-VHT80: 3			
Type of Modulation	802.11a/n/ac: OFDM			
Data Rate	802.11a: 6/9/12/18/24/36/48/54Mbps			
	802.11n: up to 300Mbps			
	802.11ac: up to 866.6Mbps			
Power-on cycle	Requires 89.99 seconds to complete its power-on cycle			
Uniform Spreading	The Uniform Spreading is a mechanism to be used by the RLAN to provide,			
	on aggregate, a uniform loading of the spectrum across all devices. The			
	Uniform Spreading is limited to the channels being declared as part of the			
	channel plan.			

Note: For other features of this EUT, test report will be issued separately.



1.6. Operation Frequency / Channel List

Channel	Frequency	Channel	Frequency	Channel	Frequency
52	5260 MHz	56	5280 MHz	60	5300 MHz
64	5320 MHz	100	5500 MHz	104	5520 MHz
108	5540 MHz	112	5560 MHz	116	5580 MHz
120	5600 MHz	124	5620 MHz	128	5640 MHz
132	5660 MHz	136	5680 MHz	140	5700 MHz

802.11n-HT40/ac-VHT40

Channel	Frequency	Channel	Frequency	Channel	Frequency
54	5270 MHz	62	5310 MHz	102	5510 MHz
110	5550 MHz	118	5590 MHz	126	5630 MHz
134	5670 MHz	N/A	N/A	N/A	N/A

802.11ac-VHT80

Channel	Frequency	Channel	Frequency	Channel	Frequency
58	5290 MHz	106	5530 MHz	122	5610 MHz

1.7. Test Channel / Test Mode

Test Made	5250 ~ 5350MHz		5470 ~ 5725MHz	
Test Mode	Test Channel	Test Frequency	Test Channel	Test Frequency
802.11a	60	5300 MHz	100	5500 MHz
802.11ac-VHT80	58	5290 MHz	106	5530 MHz



1.8. Description of Available Antennas

Antenna Type	Manufacturer	Tx Paths	Max Directional Gain (dBi)
Dipole Antenna 1#	Kunshan Wavelink Electronic Co., Ltd.	2	2.4GHz: 2.0, 5GHz: 2.0
Dipole Antenna 2#	Smart Ant Inc	2	2.4GHz: 4.5, 5GHz: 7.0
PCB Antenna 3#	TAOGLAS Inc	2	2.4GHz: 4.5, 5GHz: 6.7
PCB Antenna 4#	Compex Systems Pte Ltd	2	2.4GHz: 5.0, 5GHz: 5.0
PCB Antenna 5#	Compex Systems Pte Ltd	2	2.4GHz: 5.0, 5GHz: 5.0

1.9. Standards Applicable for Testing

The EUT complies with the requirements of EN 301 893 V1.8.1 clause 4.7.



2. DFS Requirements and Radar Test Waveforms

2.1. Applicability

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

	DFS Operational mode			
Requirement	Master	Slave without radar	Slave with radar	
		detection	detection	
Channel Availability Check	\checkmark	Not required	(see note 2)	
Off-Channel CAC (see note 1)	\checkmark	Not required	(see note 2)	
In-Service Monitoring	\checkmark	Not required	\checkmark	
Channel Shutdown	\checkmark		\checkmark	
Non-Occupancy Period	\checkmark	Not required		
Uniform Spreading	\checkmark	Not required	Not required	
NOTE 1: Where implemented by the				

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.

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	d 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 Maximum Off-Channel CAC Time shall be 24 hours.				



2.2. DFS Devices Requirements

Per ETSI EN 301 893 V1.7.1 the following are the requirements for Master Devices:

a) The master device shall use a Radar Interference Detection function in order to detect radar signals. The master device may rely on another device, associated with the master, to implement the Radar Interference Detection function. In such a case, the combination shall comply with the requirements applicable to a master.

b) A master device shall only start operations on Available Channels. At installation (or reinstallation) of the equipment, the RLAN is assumed to have no Available Channels within the band 5 250 MHz to 5 350 MHz and/or 5 470 MHz to 5 725 MHz. In such a case, before starting operations on one or more of these channels, the master device shall perform either a Channel Availability Check or an Off-Channel CAC to ensure that there are no radars operating on any selected channel. If no radar has been detected, the channel(s) becomes an Available Channel(s) and remains as such until a radar signal is detected during the In-Service Monitoring. The Channel Availability Check or the Off-Channel CAC may be performed over a wider bandwidth such that all channels within the tested bandwidth become Available Channels.

c) Once the RLAN has started operations on an Available Channel, then that channel becomes an Operating Channel. During normal operation, the master device shall monitor all Operating Channels (In-Service Monitoring) to ensure that there is no radar operating within these channel(s). If no radar was detected on an Operating Channel but the RLAN stops operating on that channel, then the channel becomes an Available Channel.

d) If the master device has detected a radar signal on an Operating Channel during In-Service Monitoring, the master device shall instruct all its associated slave devices to stop transmitting on this channel which becomes an Unavailable Channel. For devices operating on multiple (adjacent or non-adjacent) Operating Channels simultaneously, only the Operating Channel containing the frequency on which radar was detected shall become an Unavailable Channel.

e) An Unavailable Channel can become a Usable Channel again after the Non-Occupancy Period. A new Channel Availability Check or an Off-Channel CAC is required to verify there is no radar operating on this channel before it becomes an Available Channel again.

f) In all cases, if radar detection has occurred, then the channel containing the frequency on which radar was detected becomes an Unavailable Channel. Alternatively the channel may be marked as an Unusable Channel.

2.3. DFS Detection Threshold Values

The DFS detection thresholds are defined for Master devices and Client Devices with In-service monitoring. These detection thresholds are listed in the following table.

EIRP Spectral Density dBm/MHz	Value (see notes 1 and 2)		
10	-62 dBm		
NOTE 1: This is the level at the input of the received	r of a RLAN device with a maximum EIRP density		
of 10 dBm/MHz and assuming a 0 dBi receive ante	nna. For devices employing different EIRP		
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 - EIRP			
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 EIRP of less than 23 dBm do not have to implement radar			
detection.			



2.4. Radar Wave Parameters

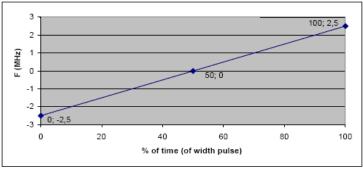
Pulse width	Pulse repetition frequency PRF	Pulses per burst			
W [µs]	[pps]	[PPB]			
1	700	18			

Table 2-4: Parameters of the reference DFS test signal

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

Table 2-5: Parameters of radar test signals

NOTE 1: Radar test signals 1 to 4 are constant PRF based signals. See figure D.1. These radar test signals are intended to simulate also radars using a packet based Staggered PRF. See figure D.2. NOTE 2: Radar test signal 4 is a modulated radar test signal. The modulation to be used is a chirp modulation with a $\pm 2,5$ MHz frequency deviation which is described below.



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

NOTE 4: Apart for the Off-Channel CAC testing, the radar test signals above shall only contain a single burst of pulses. See figures D.1, D.3 and D.4.

For the Off-Channel CAC testing, repetitive bursts shall be used for the total duration of the test. See figures D.2 and D.5. See also clauses 4.7.2.2, 5.3.8.2.1.3.1 and 5.3.8.2.1.3.2.

NOTE 5: The total number of pulses in a burst is equal to the number of pulses for a single PRF



multiplied by the number of different PRFs used.

NOTE 6: For the CAC and Off-Channel CAC requirement s, 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.

Table2-6: Detection probability

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

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

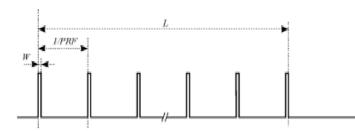
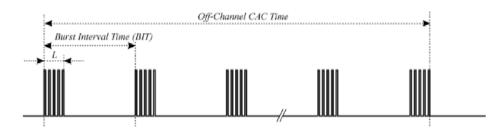
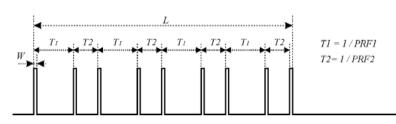
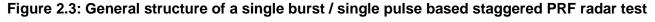


Figure 2.1: General structure of a single burst / constant PRF based radar test signal









signal



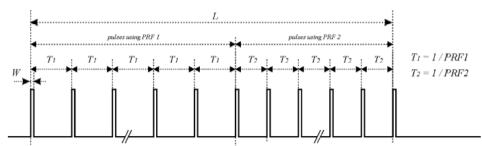


Figure 2.4: General structure of a single burst / packet based staggered PRF radar test signal

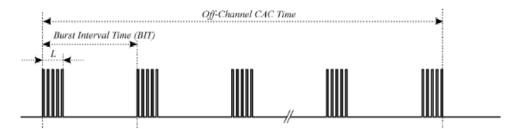


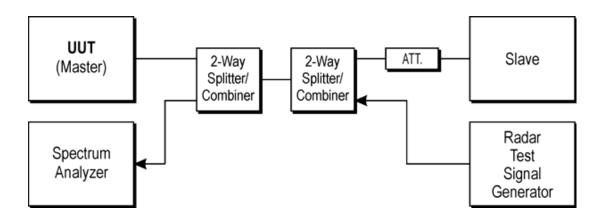
Figure 2.5: General structure of a multiple burst / packet based staggered PRF based radar test Signal



2.5. Conducted Test Setup

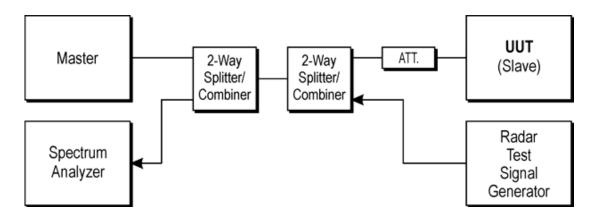
<u>Set-up A</u>

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



Set-up B

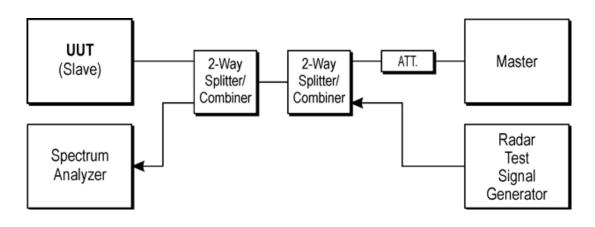
Set-up B is a set-up whereby the UUT is a RLAN device operating in slave mode, with or without Radar Interference Detection function. This set-up also contains a RLAN device operating in master mode. The radar test signals are injected into the master device. The UUT (slave device) is associated with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



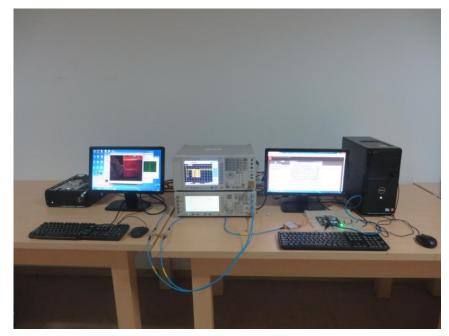


Set-up C

The UUT is a 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 a RLAN device operating in master mode. The UUT (slave device) is associated with the master device.



DFS Test Set-up Photo for Master Device - Set-up A





3. Test Equipment Calibration Date

Dynamic Frequency Selection (DFS)

Instrument	Manufacturer	Туре No.	Cali. Interval	Cali. Due Date
Spectrum Analyzer	Agilent	N9020A	1 year	2016/04/23
ESG Vector Signal Generator	Agilent	E4438C	1 year	2015/12/09

oftware Manufacturer Function		Function
Pulse Building	Agilent	Radar Signal Generation Software
DFS Tool	Agilent	DFS Test Software



4. Test Summary

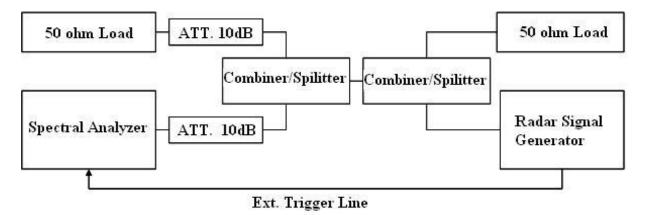
Parameter	Limit	Test Result	Reference
Radar Waveform Calibration	Refer Table 2-4, 2-5, 2-6	Pass	Section 5.1
Test Transmission Sequences	Activity Ratio ≥ 30%	Pass	Section 5.2
Initial Channel Availability Check Time	Refer Tablet 2-2	Pass	Section 5.3
Radar Burst at the Beginning of the Channel Availability Check Time	Refer Tablet 2-2	Pass	Section 5.4
Radar Burst at the End of the Channel Availability Check Time	Refer Tablet 2-2	Pass	Section 5.5
Off-Channel Channel Availability Check	Refer Tablet 2-2	Pass	Section 5.6
Radar Detection Threshold	Refer Tablet 2-2	Pass	Section 5.7
In-Service Monitoring	Refer Tablet 2-2	Pass	Section 5.8
Channel Move Time, Channel Closing Transmission Time and Non-Occupancy Period	Refer Tablet 2-2	Pass	Section 5.9
Uniform Spreading	≥ 60%	Pass	Section 5.10



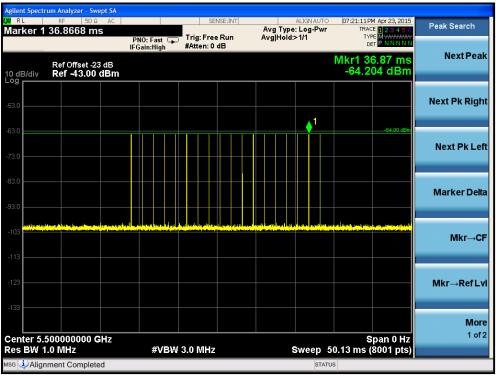
5. Test Result

5.1. Radar Waveform Calibration

The following equipment setup was used to calibrate the conducted radar waveform. A spectrum analyzer was used to establish the test signal level for each radar type. During this process there were no transmissions by either the master or client device. The spectrum analyzer was switched to the zero spans (time domain) at the frequency of the radar waveform generator. Peak detection was utilized. The spectrum analyzer resolution bandwidth (RBW) and video bandwidth (VBW) were set to 1 MHz and 3 MHz.

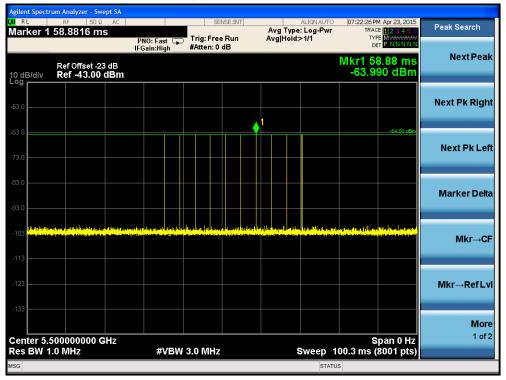


Conducted Calibration Setup

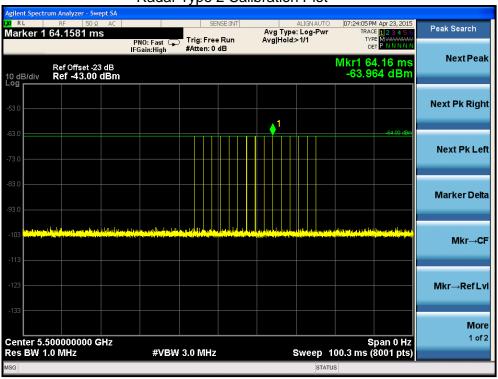


Radar Type 0 Calibration Plot

Radar Type 1 Calibration Plot

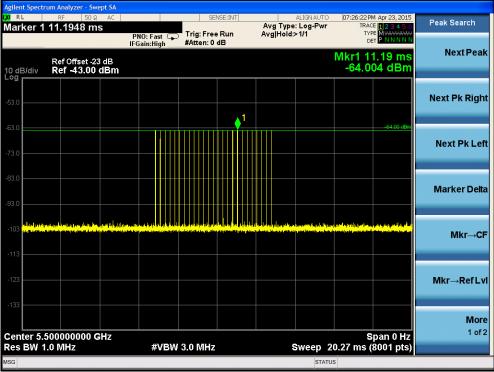






Radar Type 2 Calibration Plot

Radar Type 3 Calibration Plot





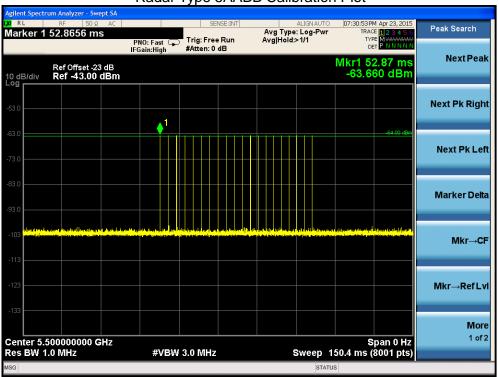
ilent Spectrum Analyzer - Swept SA RI PM Apr 23, 2015 Peak Search Marker 1 11.0251 ms Avg Type: Log-Pwr Avg|Hold:>1/1 TYPE MUNICIPAL P NNNN PNO: Fast IFGain:High #Atten: 0 dB Next Peak Mkr1 11.03 ms -63.616 dBm Ref Offset -23 dB Ref -43.00 dBm 10 dB/div Loa Next Pk Right ø Next Pk Left Marker Delta Mkr→CF Mkr→RefLvl More Center 5.500000000 GHz Res BW 1.0 MHz 1 of 2 Span 0 Hz Sweep 20.27 ms (8001 pts) #VBW 3.0 MHz MSG STATUS

Radar Type 4 Calibration Plot

Radar Type 5 Calibration Plot





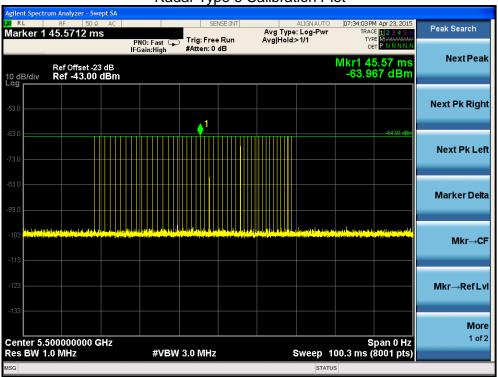


Radar Type 5AABB Calibration Plot

Radar Type 5ABAB Calibration Plot

Agilent Spect	rum Analyzer - Swept SA							
LXI RL	RF 50 Ω AC		SEN	ISE:INT		ALIGN AUTO	07:31:53 PM Apr 23, 2015	
Marker 1	93.6052 ms				Avg Type	: Log-Pwr	TRACE 1 2 3 4 5 6	Peak Search
interited 1	00.0002 m3	PNO: Fast 🗔	Trig: Free	Run	Avg Hold:		TYPE MWAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA	
		IFGain:High	#Atten: 0 d				DET PINNNN	
							Minut 00.04 mm	Next Peak
	Ref Offset -23 dB						Mkr1 93.61 ms	Heatr oun
10 dB/div	Ref -43.00 dBm						-64.303 dBm	
Log	iter teres delin							
								Next Pk Right
-53.0								Next PK Right
					▲1			
-63.0							-64.00 dBm	
								Next Pk Left
-73.0								
-83.0								
								Marker Delta
-93.0								
the lot of	والمراجع والمحد والمتنا والمراجع والمحدولة	and the second secon	Long and the second states of the	ير الد الالمقديين	and the second second	موارية والمراجعة	والمعاود والاليمية ويقاصبوا والاستر	
-103	واللحاد أدادك والذور المارجين المارك السرد وراسيا ألاه	and the second sec	أقداد وأتتبق المرا	ر <u>در ما د است</u> در از ماطله میکرد کار	and the second s		and the standard states in the state of the states of the	Mkr→CF
-113								
-123								Min Defini
-123								Mkr→RefLvl
-133								
- 133								
								More
Center 5.	Center 5.50000000 GHz Span 0 Hz 1 of 2							1 of 2
Res BW 1.0 MHz #VBW 3.0 MHz Sweep 150.4 ms (8001 pts)								
Res Dw		# ¥ D ¥	0.0 191112			aweeb i	0001 pts/	
MSG						STATU	JS	



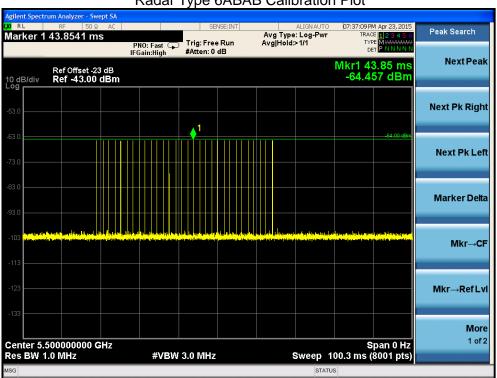


Radar Type 6 Calibration Plot

Radar Type 6AABB Calibration Plot







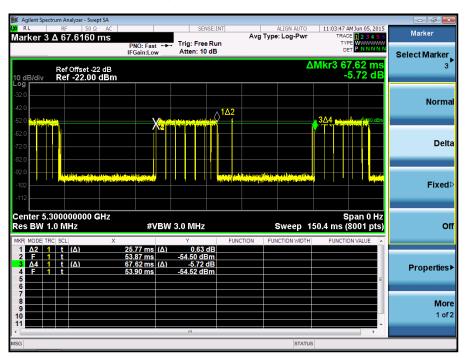
Radar Type 6ABAB Calibration Plot



5.2. Test Transmission Sequences

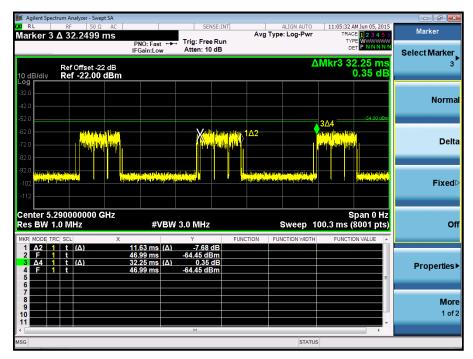
The DFS tests related to the Off-Channel CAC Check and the In-Service Monitoring shall be performed by using a test transmission sequence on the Operating Channel that shall consist of packet transmissions that together exceed the transmitter minimum activity ratio of 30 % measured over an interval of 100ms. The duration of the sequence shall be adequate for the DFS test purposes.

There shall be no transmissions on channels being checked during a Channel Availability Check.



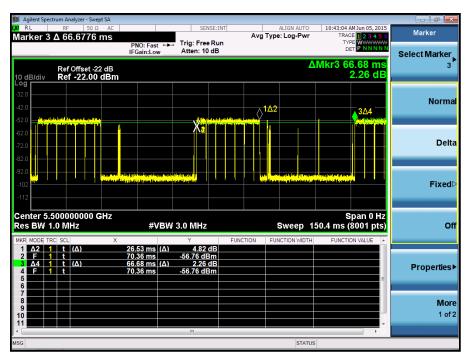
Transmission Sequences Plot - 802.11a-5300MHz



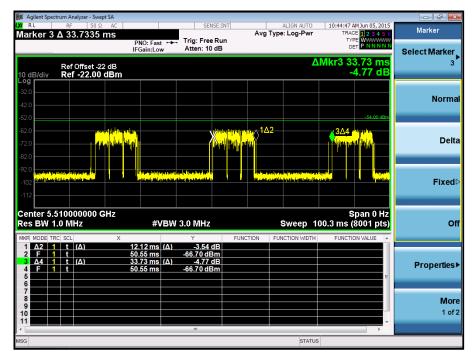


Transmission Sequences Plot - 802.11ac80 5290MHz

Transmission Sequences Plot - 802.11a-5500MHz







Transmission Sequences Plot - 802.11ac80 5530MHz

Test Mode	Test Frequency	Activity Ratio	Test Result
802.11a	5300	38.11%	Pass
802.11a	5500	39.79%	Pass
802.11ac-VHT80	5290	36.06%	Pass
802.11ac-VHT80	5530	35.93%	Pass



5.3. Initial Channel Availability Check Time Measurement

5.3.1 Test Limit

The Channel Availability Check shall be performed during a continuous period in time (Channel Availability Check Time) which shall not be less than the value defined in table 2-2.

5.3.2 Test Procedure

1. The master devices will be powered on and be instructed to operate on the appropriate channel which falls within the frequency range 5250-5350MHz, 5470-5725MHz. At the same time the EUT is powered on, the spectrum analyzer will be set to zero span mode with a 3 MHz RBW and 3 MHz VBW on the Channel occupied by the radar (Ch_r) with a 2.5 minute sweep time. The spectrum analyzer's sweep will be started at the same time power is applied to the master device.

2. The EUT should not transmit any beacon or data transmissions until at least 1 minute after the completion of the power-on cycle.

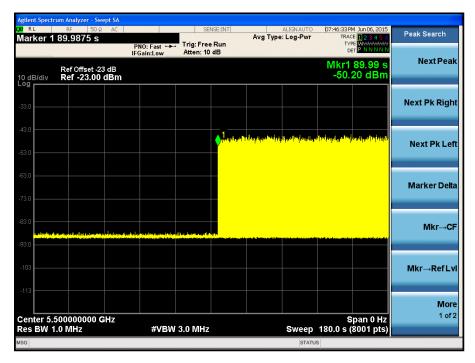
3. Confirm that the EUT initiates transmission on the channel. Measurement system showing its nominal noise floor is marker1.



5.3.3 Test Result

The EUT does not transmit any beacon or data transmissions until at least 1 minute after the completion of the power-on cycle (89.99 sec). Initial beacons/data transmissions are indicated by marker 1 (29.99 sec).

Initial Channel Availability Check Time for 802.11a(5500MHz)





5.4. Radar Burst at the Beginning of the Channel Availability Check Time Measurement

5.4.1 Test Limit

During the Channel Availability Check, the RLAN shall be capable of detecting any of the radar test signals that fall within the ranges given by table 2-4, table 2-5 and table 2-6 with a level above the Radar Detection Threshold defined in table 2-3.

5.4.2 Test Procedure

a) The signal generator and UUT are connected using Set-up A. The power of the UUT is switched off.

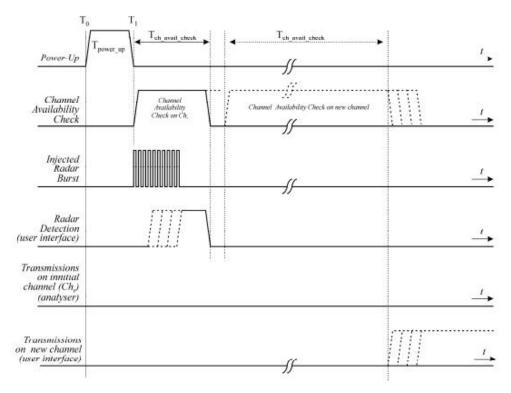
b) The UUT is powered on at T0. T1 denotes the instant when the UUT has completed its power-up sequence (T_{power_up}) and is ready to start the radar detection. The Channel Availability Check is expected to commence on Ch_r at instant T1 and is expected to end no sooner than T1 + $T_{ch_avail_check}$ unless a radar is detected sooner.

Note: Additional verification may be needed to define T1 in case it is not exactly known or indicated by the UUT.

c) A single radar burst is generated on Ch_r using the reference test signal defined in table D.3 at a level of up to 10 dB above the level defined in table 2-3. This single-burst radar test signal shall commence within 2 s after time T1.

d) It shall be recorded if the radar test signal was detected.

e) A timing trace or description of the observed timing and behaviour of the UUT shall be recorded.





5.4.3 Test Result

Radar Burst at the Beginning of the Channel Availability Check Time for 802.11a(5300MHz)

Agilent Spectrum Analyzer - S					
	Ω AC	SENSE:INT	ALIGNAUTO Avg Type: Log-Pwr	07:52:22 PM Jun 06, 2015 TRACE 1 2 3 4 5 6	Peak Search
Marker 1 30.3230 s	PNO: Fast 🔸	Trig: Free Run #Atten: 10 dB	Avg Type: Log-Pwr		
Ref Offset 2 10 dB/div Ref -23.00	23 dB) dBm			Mkr1 30.32 s -53.93 dBm	Next Peak
-32.0					Next Pk Right
-42.0	1			-\$4.00 dBm	Next Pk Left
-62.0					Marker Delta
-82.0	i ku seri ya Majari (ya wiki ya ku seri ya ya ku si ku sa ku si ya ku si y	norma alta filo da la la casa de l Recenter de la casa de l	en algente som at den statelle at av som de skat ståt statelle ståte som at som at som at som at som at som at Henne på som at som a	ng til statut syns sollars för storaget av det statut sollars. I storaget sollars för som av sollar sollars sollars sollars sollars.	Mkr→CF
-102					Mkr→RefLvl
-112 Center 5.300000000 Res BW 1.0 MHz		3.0 MHz	Succes	Span 0 Hz 200.0 s (8001 pts)	More 1 of 2
MSG	#VBW	5.0 WH2	Sweep	200.0 S (800 l pls)	

Radar Burst at the Beginning of the Channel Availability Check Time for 802.11ac-VHT80(5290MHz)

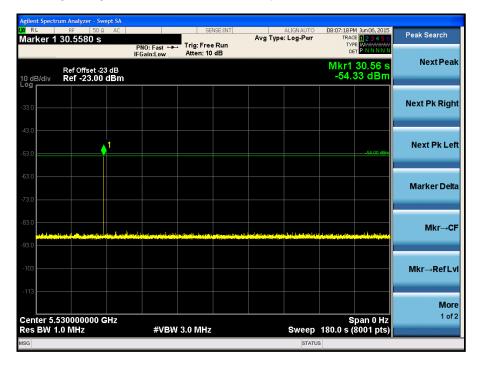




Radar Burst at the Beginning of the Channel Availability Check Time for 802.11a(5500MHz)

Agilent Sp	pectrum Analyzer RF	- <mark>Swept SA</mark> 50 Ω AC								
	er 1 30.7410				NSE:INT	Avg Type	LIGNAUTO	TRAC	M Jun 06, 2015 E 1 2 3 4 5 6	Peak Search
			PNO: Fast +++ IFGain:Low	Trig: Free Atten: 10				DE		
10 dB/d	Ref Offse liv Ref -23.	t -23 dB 00 dBm						Mkr1 -54.1	30.74 s 10 dBm	Next Peak
-33.0										Next Pk Right
-43.0		↓ 1							-54.00 dBm	Next Pk Left
-63.0										Marker Delta
-73.0										Mkr→CF
-93.0	a ta dal contratto por tatono de	and de la la colore	An Anna an Anna an Anna Anna Anna Anna	Andrea yn proteikie			daga des sua del e seratega di	dan di concel		
-103										Mkr→RefLvl
	r 5.50000000 W 1.0 MHz	0 GHz	#VBW	3.0 MHz			Sweep	S 180.0 s (pan 0 Hz 8001 pts)	More 1 of 2
MSG							STATUS			

Radar Burst at the Beginning of the Channel Availability Check Time for 802.11ac-VHT80(5530MHz)

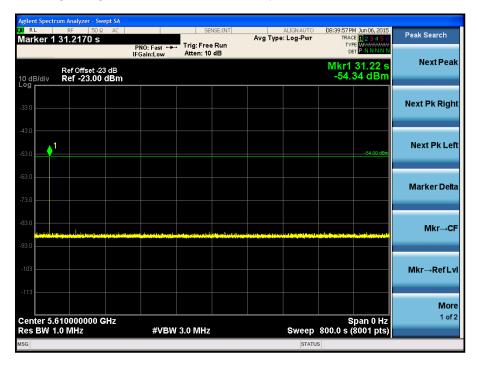




Radar Burst at the Beginning of the Channel Availability Check Time for 802.11a(5620MHz)

Agilent Spectrum Analyzer - Swept SA					
LXIRL RF 50 Q AC		SENSE:INT	ALIGN AUTO	09:29:58 PM Jun 06, 2015	Peak Search
Marker 1 30.2240 s	PNO: Fast ↔→ IFGain:Low	Trig: Free Run Atten: 10 dB	Avg Type: Log-Pwr	TRACE 123456 TYPE WWWWWW DET PNNNNN	
Ref Offset -23 dB 10 dB/div Ref -23.00 dBm				Mkr1 30.22 s -54.44 dBm	Next Peak
-33.0					Next Pk Right
-43.0				-54.00 dBm	Next Pk Left
-63.0					Marker Delta
-83.0	station of website states	stal da moleta de la devica da sulta.	en post e theoretica e d'an en la set any la transmissione	n na hardan (11 katan daraman na haran daraman Manan daraman katan katan katan dara katan dar	Mkr→CF
-103					Mkr→RefLvl
Center 5.620000000 GHz Res BW 1.0 MHz	#VBW :	3.0 MHz	Sweep	Span 0 Hz 800.0 s (8001 pts)	More 1 of 2
MSG			STATUS		

Radar Burst at the Beginning of the Channel Availability Check Time for 802.11ac-VHT80(5610MHz)





5.5. Radar Burst at the End of the Channel Availability Check Time Measurement

5.5.1 Test Limit

During the Channel Availability Check, the RLAN shall be capable of detecting any of the radar test signals that fall within the ranges given by table 2-4, table 2-5 and table 2-6 with a level above the Radar Detection Threshold defined in table 2-3.

5.5.2 Test Procedure

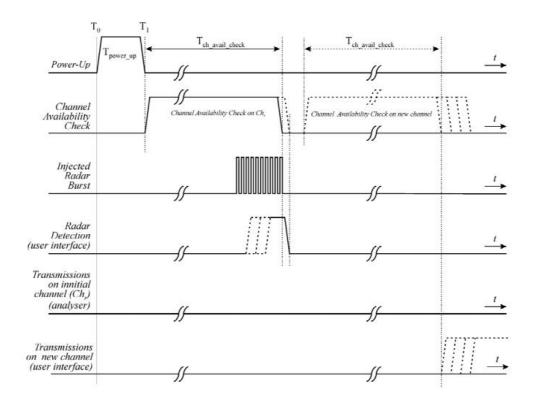
a) The signal generator and UUT are connected using Set-up A. The power of the UUT is switched off.

b) The UUT is powered up at T0. T1 denotes the instant when the UUT has completed its power-up sequence (T_{power_up}) and is ready to start the radar detection. The Channel Availability Check is expected to commence on Ch_r at instant T1 and is expected to end no sooner than T1 + $T_{ch_avail_check}$ unless a radar is detected sooner.

c) A single radar burst is generated on Ch_r using the reference test signal defined in table D.3 at a level of up to 10 dB above the level defined in clause 5.3.8.2.1. This single-burst radar test signal shall commence towards the end of the minimum required Channel Availability Check Time but not before time T1 + T_{ch avail check} - 2 s.

d) It shall be recorded if the radar test signal was detected.

e) A timing trace or description of the observed timing and behaviour of the UUT shall be recorded.



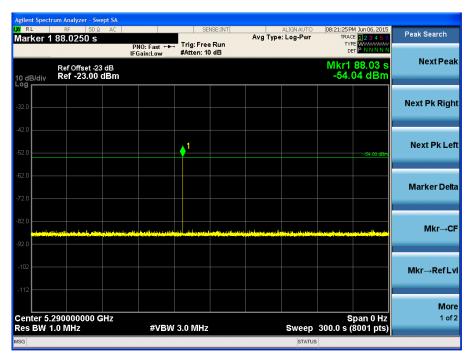


5.5.3 Test Result

Radar Burst at the End of the Channel Availability Check Time for 802.11a(5300MHz)

	ectrum Analyzer - Swept SA								
LX/RL	RF 50 Ω AC		SE	NSE:INT	A 7	ALIGN AUTO		1 Jun 06, 2015	Peak Search
Marker	r 1 88.1400 s	PNO: Fast 🔸	Trig: Free #Atten: 10		Avgiype	: Log-Pwr	TYP	123456 WWWWWWW PNNNNN	
10 dB/div Log	Ref Offset -23 dB Ref -23.00 dBm						Mkr1 -53.9	88.14 s 95 dBm	Next Peak
-32.0									Next Pk Right
-42.0			♦ ¹					-54.00 dBm	Next Pk Left
-62.0 -72.0									Marker Delta
-82.0	gan tan ya da aka shini ta bila ya da ya ay ay ay ay	and a the path in definition is a final in		let met lit get het klinet de se	n den le Ultrein	e al feren y and a line of the e	ak kan da sa kara sa kara	ndia escanta de	Mkr→CF
-102									Mkr→RefLvl
Center	5.300000000 GHz V 1.0 MHz	#VBW	3.0 MHz			Sweep	S 300.0 s (8	pan 0 Hz 3001 pts)	More 1 of 2
MSG						STATUS			

Radar Burst at the End of the Channel Availability Check Time for 802.11ac-VHT80(5290MHz)





Radar Burst at the End of the Channel Availability Check Time for 802.11a(5500MHz)

	um Analyzer - Swept SA							
LXI RL	RF 50Ω AC		SENSE:I		ALIGNAUTO	07:59:27 Pf	4 Jun 06, 2015	Peak Search
Marker 1	88.0510 s	PNO: Fast ↔ IFGain:Low	Trig: Free Ru Atten: 10 dB	Avg Typ n	e: Log-Pwr	TYP	E 123456 E WAMAAAAA P N N N N N	
10 dB/div Log	Ref Offset -23 dB Ref -23.00 dBm					Mkr1 -54.0	88.05 s 08 dBm	Next Peak
-33.0								Next Pk Right
-43.0		^1					-54.00.dBm	Next Pk Left
-63.0								Marker Delta
-73.0						و بادار المحمد ال	s see 14 ke daaren daaren.	Mkr→CF
-93.0								Mkr→RefLvl
-113								MRI→Rei Lvi More
Center 5.5 Res BW 1	500000000 GHz .0 MHz	#VBW	3.0 MHz		Sweep	S 240.0 s (pan 0 Hz 8001 pts)	More 1 of 2
MSG					STATUS			

Radar Burst at the End of the Channel Availability Check Time for 802.11ac-VHT80(5530MHz)





Radar Burst at the End of the Channel Availability Check Time for 802.11a(5620MHz)

	n Analyzer - Swept SA								
Marker 1 6	RF 50Ω AC	PNO: Fast 🔸			OFF / / Avg Type:	Log-Pwr		M Jun 06, 2015 E 123456 E WWWWWWWW T P N N N N N	Peak Search
10 dB/div	Ref Offset -23 dB Ref -23.00 dBm	IFGain:Low	Atten: 10 d				Mkr1	628.3 s 36 dBm	Next Peak
-32.0									Next Pk Right
-42.0						● ¹		-54.00 dBm	Next Pk Left
-62.0 -72.0									Marker Delta
-82.0 -92.0	iter per series and a destruction of the series is a series of the serie	kasatan ja kulajutin kanatikan	teleles in transmitteles	seeded to be a strong	diat, bei impacta	t Han A I Jahnka Fira	den man et distationen	en unteren jantatelan kild	Mkr→CF
-102									Mkr→RefLvl
Center 5.62 Res BW 1.0	20000000 GHz) MHz	#VBW	3.0 MHz			Sweep	S 900.0 s (pan 0 Hz 8001 pts)	More 1 of 2
MSG						STATUS			

Radar Burst at the End of the Channel Availability Check Time for 802.11ac-VHT80(5610MHz)

		um Ana	lyzer - Sw	ept SA										
LXI RL		RF		AC				SENSE	EINT		ALIGN AUTO		M Jun 06, 2015	Peak Search
Mari	ker 1	628.	698 s		PNO IFGai	Fast ↔ n:Low	- Trig: F Atten			Avg T	ype: Log-Pwr	TRAI TY D	CE 123456 PE WWWWWWW ET P NNNNN	
10 dE Log	3/div	Ref (Ref	offset -23 -23.00	3 dB dBm								Mkr1 -54.	628.7 s 28 dBm	Next Peak
-33.0														Next Pk Right
-43.0 -53.0											● ¹		-54.00 dBm	Next Pk Left
-63.0 -73.0														Marker Delta
-83.0	a ik di sa ku	direkt lips I 4	sa ta la la si		اجغان ا طعن	موا الفضاف الم	antaj luk serat	ارد او ذاه	maillenti	ana (de bette		والمترفين ومروقية والمع	uluului due ante ante	Mkr→CF
-93.0 -103														Mkr→RefLvl
-113														More 1 of 2
	BW 1		0000 G Iz	iHZ		#VBW	/ 3.0 M	Hz			Sweep	900.0 s (pan 0 Hz 8001 pts)	
MSG											STATU	S		



5.6. Off-Channel Channel Availability Check

5.6.1 Test Limit

Where implemented, the Off-Channel CAC Time shall be declared by the manufacturer. However, the declared Off-Channel CAC Time shall be within the range specified in table 2-2.

During the Off-Channel CAC, the RLAN shall be capable of detecting any of the radar test signals that fall within the ranges given by table 2-4 & table 2-5 with a level above the Radar Detection Threshold defined in table 2-3.

The minimum required detection probability is defined in table 2-6.

5.6.2 Test Procedure

Radar Detection Threshold (during Off-Channel CAC)

The different steps below define the procedure to verify the Radar Detection Threshold during the Off-Channel CAC.

Where the declared channel plan includes channels whose nominal bandwidth falls completely or partly within the 5 600 MHz to 5 650 MHz band, the test shall be performed on one of these channels in addition to a channel outside this band.

a) The signal generator, the UUT (master device) and a slave device associated with the UUT, are connected using Set-up A.

b) The UUT shall transmit a test transmission sequence in accordance with clause 5.1.2.2 on (all) the Operating Channel(s).

c) A multi burst radar test signal is generated on Ch_r using any of the radar test signals defined in table D.4 at a level defined at table 2-3. The radar test signal used shall be recorded in the report. This multi burst radar test signal shall commence at T3 and shall continue for the total duration of the Off-Channel CAC Time ($T_{Off-Channel_CAC}$) as declared by the manufacturer in accordance with table 2-2. For channels within the 5 600 MHz to 5 650 MHz band test signals #3 and #4 shall not be used and the Burst Interval Time (BIT) during the test shall be varied between 8 minutes and 10 minutes. For channels outside this band, the Burst Interval Time (BIT) during the test shall be varied between 45 s and 60 s.

d) The UUT shall detect the radar test signal before the end of the Off-Channel CAC Time and this shall be recorded.

Detection Probability (P_d)

For channels outside the 5 600 MHz to 5 650 MHz band, the test is sufficient to demonstrate that the UUT meets the Detection Probability (Pd) defined in table 2-6.

Where the declared channel plan includes channels whose nominal bandwidth falls completely or partly within the 5 600 MHz to 5 650 MHz band, the procedure in the steps below has to be performed on one of these channels.

a) A multi burst radar test signal is generated on Ch_r using any of the radar test signals defined in



table 2-4 and table 2-5 (except signals #3 and #4) at a level of 10 dB above the level defined at table 2-3. The radar test signal used shall be recorded in the report. This multi burst radar test signal shall commence at T3 and shall continue for the total duration of the Off-Channel CAC Time ($T_{Off-Channel_CAC}$) as declared by the manufacturer in accordance with table 2-2. The Burst Interval Time (BIT) during the test shall be varied between 8 minutes and 10 minutes.

b) It shall be recorded how many bursts have been detected by the UUT at the end of the Off-Channel CAC Time.

The minimum number of bursts that the UUT shall detect in order to comply with the detection probability defined for this frequency range in table 2-6 is given by table as below.

Off-Channel CAC Time (Minutes)	Number of Bursts generated assuming a BIT of 10 minutes	Minimum Number of burst detections
60	6	5
90	9	6
160	16	7
320	32	8
1440	144	9

Table: Minimum number of burst detections for channels within the 5 600 MHz to 5 650 MHz band

5.6.3 Test Result

This device didn't support Off-Channel CAC mechanism which was declared by the manufacturer, so Radar Detection Threshold and Detection Probability were not performed.



5.7. Radar Detection Threshold (during the Channel Availability Check)

5.7.1 Test Limit

The minimum required detection probability is defined in table as below.

	Detection Probability (Pe	d)					
Parameter	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 %					
NOTE: Pd gives the probabili	ty of detection per simulated radar burst and rep	resents a minimum					
level of detection performanc	level of detection performance under defined conditions. Therefore Pd does not represent the overall						
detection probability for any p	particular radar under real life conditions.						

5.7.2 Test Procedure

The different steps below define the procedure to verify the Radar Detection Threshold during the Channel Availability Check Time for channels outside the 5 600 MHz to 5 650 MHz band.

a) The signal generator and UUT are connected using Set-up A. The power of the UUT is switched off.

b) The UUT is powered on at T0. T1 denotes the instant when the UUT has completed its power-up sequence (T_{power_up}) and is ready to start the radar detection. The Channel Availability Check on Ch_r is expected to commence at instant T1 and is expected to end no sooner than T1 + $T_{ch_avail_check}$ unless a radar is detected sooner.

c) A single burst radar test signal is generated on Ch_r using any of the radar test signals defined in table 2-4 and table 2-5 at a level defined in table 2-3. This single-burst radar test signal may commence at any time within the applicable Channel Availability Check Time.

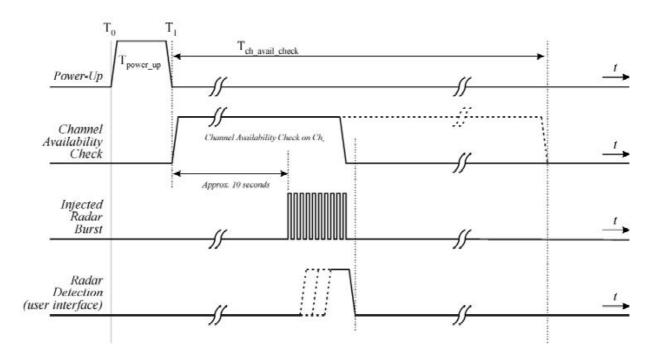
d) It shall be recorded if the radar test signal was detected.

e) The steps c) to d) shall be performed 20 times and each time a different radar test signal shall be generated from options provided in table 2-4, table 2-5 and table 2-6. The radar test signals used shall be recorded in the report. The radar test signal shall be detected at least 12 times out of the 20 trials in order to comply with the detection probability specified for this frequency range in table 2-6. Where the declared channel plan includes channels whose nominal bandwidth falls completely or partly within the 5 600 MHz to 5 650 MHz band, additional testing as described in the steps below shall be performed on a channel within this band.

f) A single burst radar test signal is generated on Ch_r using any of the radar test signals defined in table 2-4 and table 2-5 (except signals #3 and #4) at a level of 10 dB above the level defined in table 2-3. This single burst radar test signal may commence at any time within the applicable Channel Availability Check Time.



g) Step f) shall be performed 20 times, each time a different radar test signal shall be generated from options provided in table D.4 (except signals #3 and #4). The radar test signals used shall be recorded in the report. The radar test signal shall be detected during each of these trials and this shall be recorded.





5.7.3 Test Result

Radar Wave Type	Detection Threshold	Trail Number	Detection Result	Limit	Note	
	THESHOL		Result			
Type 1	-64dBm	20	100%	60%	Pass	
Type 2	-64dBm	20	100%	60%	Pass	
Туре 3	-64dBm	20	100%	60%	Pass	
Type 4	-64dBm	20	95%	60%	Pass	
Туре 5	-64dBm	20	100%	60%	Pass	
Type 5AABB	-64dBm	20	100%	60%	Pass	
Type 5ABAB	-64dBm	20	100%	60%	Pass	
Туре 6	-64dBm	20	100%	60%	Pass	
Type 6AABB	-64dBm	20	100%	60%	Pass	
Type 6ABAB	-64dBm	20	95%	60%	Pass	

802.11a channel 60 - 5300MHz

802.11 ac-VHT80 channel 58 - 5290MHz

Radar Wave Type	Detection Threshold	Trail Number	Detection Result	Limit	Note
Type 1	-64dBm	20	100%	60%	Pass
Туре 2	-64dBm	20	100%	60%	Pass
Туре 3	-64dBm	20	100%	60%	Pass
Type 4	-64dBm	20	100%	60%	Pass
Type 5	-64dBm	20	100%	60%	Pass
Type 5AABB	-64dBm	20	100%	60%	Pass
Type 5ABAB	-64dBm	20	100%	60%	Pass
Туре 6	-64dBm	20	100%	60%	Pass
Type 6AABB	-64dBm	20	100%	60%	Pass
Type 6ABAB	-64dBm	20	100%	60%	Pass



Radar Wave Type	Detection Threshold	Trail Number	Detection Result	Limit	Note
Type 1	-64dBm	20	100%	60%	Pass
Type 2	-64dBm	20	100%	60%	Pass
Туре 3	-64dBm	20	90%	60%	Pass
Type 4	-64dBm	20	100%	60%	Pass
Туре 5	-64dBm	20	100%	60%	Pass
Type 5AABB	-64dBm	20	100%	60%	Pass
Type 5ABAB	-64dBm	20	100%	60%	Pass
Туре 6	-64dBm	20	100%	60%	Pass
Type 6AABB	-64dBm	20	100%	60%	Pass
Type 6ABAB	-64dBm	20	95%	60%	Pass

802.11a channel 100 - 5500MHz

802.11 ac-VHT80 channel 106 - 5530MHz

Radar Wave Type	Detection Threshold	Trail Number	Detection Result	Limit	Note
Type 1	-64dBm	20	100%	60%	Pass
Type 2	-64dBm	20	95%	60%	Pass
Туре 3	-64dBm	20	100%	60%	Pass
Type 4	-64dBm	20	100%	60%	Pass
Type 5	-64dBm	20	100%	60%	Pass
Type 5AABB	-64dBm	20	100%	60%	Pass
Type 5ABAB	-64dBm	20	90%	60%	Pass
Туре 6	-64dBm	20	100%	60%	Pass
Type 6AABB	-64dBm	20	100%	60%	Pass
Type 6ABAB	-64dBm	20	100%	60%	Pass



Radar Wave Type	Detection Threshold	Trail Number	Detection Result	Limit	Note					
Type 1	-54dBm	20	100%	99.99%	Pass					
Type 2	-54dBm	20	100%	99.99%	Pass					
Туре 5	-54dBm	20	100%	99.99%	Pass					
Type 5AABB	-54dBm	20	100%	99.99%	Pass					
Type 5ABAB	-54dBm	20	100%	99.99%	Pass					
Туре 6	-54dBm	20	100%	99.99%	Pass					
Type 6AABB	-54dBm	20	100%	99.99%	Pass					
Type 6ABAB	-54dBm	20	100%	99.99%	Pass					

802.11a channel 124 5620MHz

802.11ac-VHT80 channel 122 5610MHz

Radar Wave Type	Detection Threshold	Trail Number	Detection Result	Limit	Note
Type 1	-54dBm	20	100%	99.99%	Pass
Type 2	-54dBm	20	100%	99.99%	Pass
Type 5	-54dBm	20	100%	99.99%	Pass
Type 5AABB	-54dBm	20	100%	99.99%	Pass
Type 5ABAB	-54dBm	20	100%	99.99%	Pass
Туре 6	-54dBm	20	100%	99.99%	Pass
Type 6AABB	-54dBm	20	100%	99.99%	Pass
Type 6ABAB	-54dBm	20	100%	99.99%	Pass



5.8. In-Service Monitoring Measurement

5.8.1 Test Limit

The In-Service Monitoring shall be used to monitor each Operating Channel.

The In-Service-Monitoring shall start immediately after the RLAN has started transmissions on a channel.

During the In-Service Monitoring, the RLAN shall be capable of detecting any of the radar test signals that fall within the ranges 5250-5350MHz,5470-5725MHz with a level above the Radar Detection Threshold defined in table 2-3.

The minimum required detection probability associated with a given radar test signal is defined in table 2-4 and table 2-5.

5.8.2 Test Procedure Used

a) When the UUT is a master device, a slave device will be used that associates with the UUT. The signal generator and the UUT are connected using Set-up A.

b) The UUT shall transmit a test transmission sequence on the selected channel Ch_r While the testing is performed on Ch_r, the equipment is allowed to have simultaneous transmissions on other adjacent or non-adjacent operating channels.

c) At a certain time T0, a single burst radar test signal is generated on Ch_r using radar test signal #1 defined in table 2-5 and at a level defined in table 2-3. T1 denotes the end of the radar burst.

d) It shall be recorded if the radar test signal was detected.

e) The steps b) to d) shall be performed 20 times. The radar test signal shall be detected at least12 times out of the 20 trials in order to comply with the detection probability specified in table 2-6.

f) The steps b) to e) shall be repeated for each of the radar test signals defined in table 2-5 and as described in table 2-3.



5.8.3 Test Result

In-Service Monitoring 802.11a channel 60 - 5300MHz

Radar Wave Type	Detection Threshold	Trail Number	Detection Result	Limit	Note
Type 1	-64dBm	20	100%	60%	Pass
Type 2	-64dBm	20	95%	60%	Pass
Туре 3	-64dBm	20	100%	60%	Pass
Type 4	-64dBm	20	100%	60%	Pass
Type 5	-64dBm	20	100%	60%	Pass
Type 5AABB	-64dBm	20	100%	60%	Pass
Type 5ABAB	-64dBm	20	100%	60%	Pass
Туре 6	-64dBm	20	100%	60%	Pass
Type 6AABB	-64dBm	20	100%	60%	Pass
Type 6ABAB	-64dBm	20	95%	60%	Pass

In-Service Monitoring 802.11ac-VHT80 channel 58 - 5290MHz

Radar Wave Type	Detection Threshold	Trail Number	Detection Result	Limit	Note
Type 1	-64dBm	20	100%	60%	Pass
Type 2	-64dBm	20	90%	60%	Pass
Туре 3	-64dBm	20	100%	60%	Pass
Type 4	-64dBm	20	100%	60%	Pass
Туре 5	-64dBm	20	100%	60%	Pass
Type 5AABB	-64dBm	20	100%	60%	Pass
Type 5ABAB	-64dBm	20	100%	60%	Pass
Туре 6	-64dBm	20	90	60%	Pass
Type 6AABB	-64dBm	20	100%	60%	Pass
Type 6ABAB	-64dBm	20	100%	60%	Pass



Radar Wave Type	Detection Threshold	Trail Number	Detection Result	Limit	Note
Type 1	-64dBm	20	95%	60%	Pass
Type 2	-64dBm	20	90%	60%	Pass
Туре 3	-64dBm	20	90%	60%	Pass
Type 4	-64dBm	20	100%	60%	Pass
Type 5	-64dBm	20	100%	60%	Pass
Type 5AABB	-64dBm	20	100%	60%	Pass
Type 5ABAB	-64dBm	20	95%	60%	Pass
Туре 6	-64dBm	20	100%	60%	Pass
Type 6AABB	-64dBm	20	100%	60%	Pass
Type 6ABAB	-64dBm	20	100%	60%	Pass

In-Service Monitoring 802.11a channel 100 - 5500MHz

In-Service Monitoring 802.11ac-VHT80 channel 106 - 5530MHz

Radar Wave Type	Detection Threshold	Trail Number	Detection Result	Limit	Note
Type 1	-64dBm	20	100%	60%	Pass
Type 2	-64dBm	20	85%	60%	Pass
Туре 3	-64dBm	20	85%	60%	Pass
Type 4	-64dBm	20	90%	60%	Pass
Type 5	-64dBm	20	90%	60%	Pass
Type 5AABB	-64dBm	20	100%	60%	Pass
Type 5ABAB	-64dBm	20	95%	60%	Pass
Туре 6	-64dBm	20	100%	60%	Pass
Type 6AABB	-64dBm	20	100%	60%	Pass
Type 6ABAB	-64dBm	20	100%	60%	Pass



5.9. Channel Shutdown and Non-Occupancy Period

5.9.1 Test Limit

Parameter	Value
Channel Move Time	< 10 s
Channel Closing Transmission Time	< 1 s

5.9.2 Test Procedure Used

a) When the UUT is a master device, a slave device will be used that associates with the UUT. The signal generator and the UUT shall be connected using Set-up A.

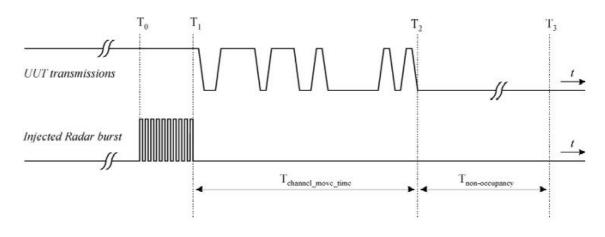
b) The UUT shall transmit a test transmission sequence on the selected channel Ch_r. While the testing is performed on Ch_r, the equipment is allowed to have simultaneous transmissions on other adjacent or non-adjacent operating channels.

c) At a certain time T0, a single burst test signal is generated on Ch_r using the reference DFS test signal defined in table 2-4 and at a level of up to 10 dB above the level defined in table 2-3 on the selected channel. T1 denotes the end of the radar burst.

d) The transmissions of the UUT following instant T1 on the selected channel Ch_r shall be observed for a period greater than or equal to the Channel Move Time defined in table 2-2. The aggregate duration (Channel Closing Transmission Time) of all transmissions from the UUT on Ch_r during the Channel Move Time shall be compared to the limit defined in table 2-2. For equipment capable of having simultaneous transmissions on multiple (adjacent or non-adjacent) operating channels, the equipment is allowed to continue transmissions on other Operating Channels (different from Ch_r).

e) T2 denotes the instant when the UUT has ceased all transmissions on the channel Ch_r . The time difference between T1 and T2 shall be measured. This value (Channel Move Time) shall be noted and compared with the limit defined in table 2-2.

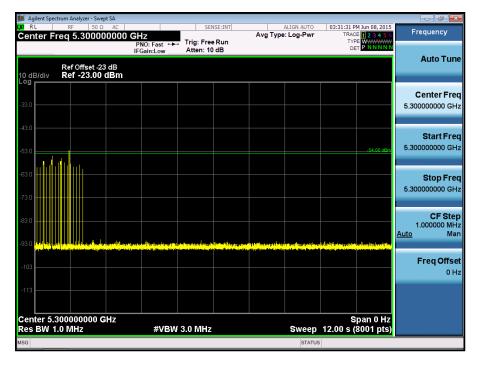
f) Following instant T2, the selected channel Ch_r shall be observed for a period equal to the Non-Occupancy Period (T3-T2) to verify that the UUT does not resume any transmissions on this channel.

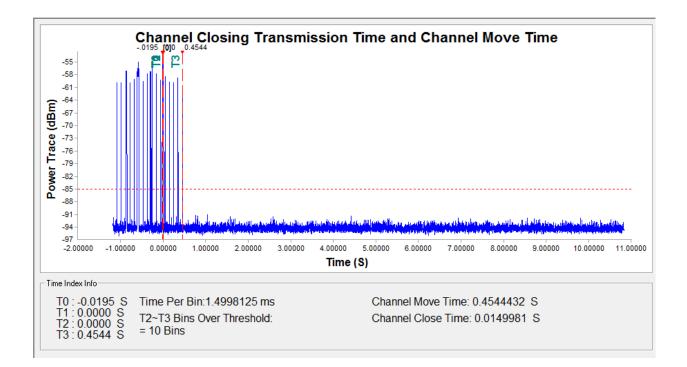




5.9.3 Test Result

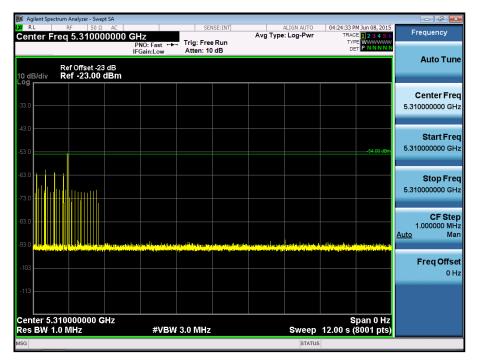
Channel Closing Transmission Time and Channel Move Time for 802.11a 5300MHz

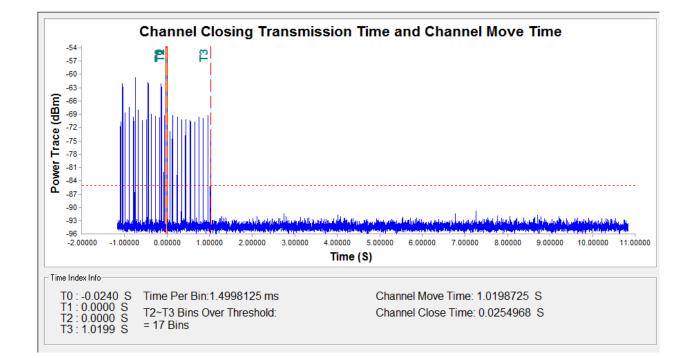






Channel Closing Transmission Time and Channel Move Time for 802.11n-HT40 5310MHz

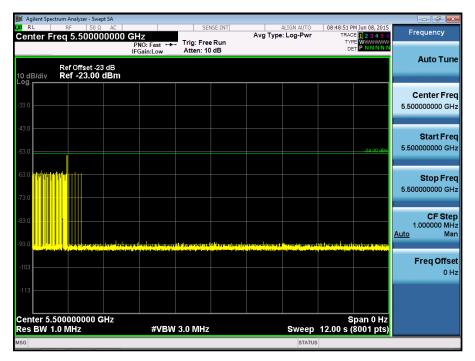


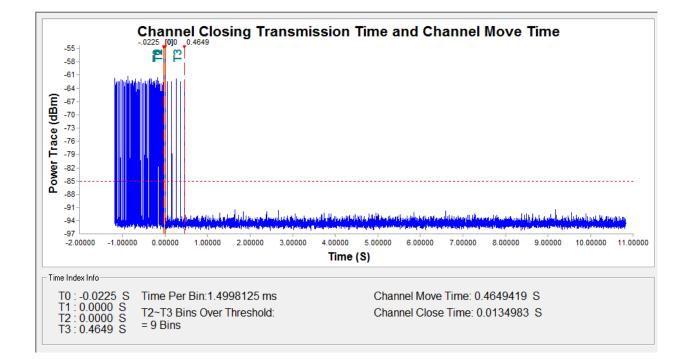


Test Item	Measured Time (s)		Measured Time (s)		Limit	Results
	5300MHz	5310MHz				
Channel Move Time	0.454	1.020	< 10 s	Pass		
Channel Closing Transmission Time	0.015	0.025	< 1 s	Pass		



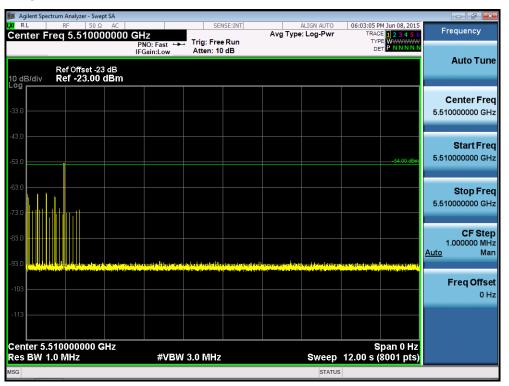
Channel Closing Transmission Time and Channel Move Time for 802.11a 5500MHz

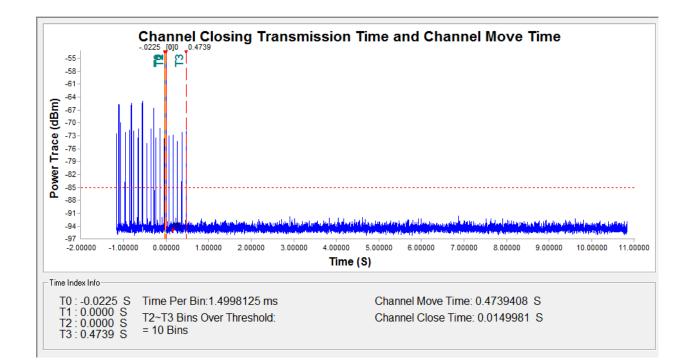






Channel Closing Transmission Time and Channel Move Time for 802.11n-HT40 5510MHz





Test Item	Measured Time (s)		Measured Time (s)		Limit	Results
	5500MHz	5510MHz				
Channel Move Time	0.465	0.474	< 10 s	Pass		
Channel Closing Transmission Time	0.013	0.015	< 1 s	Pass		



Non-Occupancy Period for 802.11a 5300MHz

	trum Analyzer - Sw									
XI RL		Ω AC		SEI	NSE:INT		ALIGN AUTO		M Jun 08, 2015	Marker
Marker 1	Δ 1.80000	lks		Trig: Free	Dun	Avg Type	e: Log-Pwr	TYP	E WWWWWW	marker
			PNO: Fast ++-	Atten: 10				DE	T P N N N N N	Select Marker
								Mket 1	.800 ks	Selectiviarker
	Ref Offset -							-20	8.55 dB	1
10 dB/div Log	Ref -23.00	dBm						-01	5.55 UB	
3										
										Norma
-33.0										
-43.0			_							
										Delta
-53.0 X2									-54.00 dBm	Della
2000 1										
1.0										
-63.0										
										Fixed▷
-73.0										
-83.0										
-03.0									102	Off
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-103										Properties ▶
-113										
-113										
										More
Center 5	300000000	GH7			_				pan 0 Hz	1 of 2
Res BW 1		0112	#VBW	3.0 MHz			Sweep 2	000 ks (8001 nts)	
	10-111112		<i>"</i> • .	GAV 11112					, (or 1 (1 (1 (1 (1 (1 (1 (1 (1 (1 (1 (1 (1 (
ISG							STATUS			

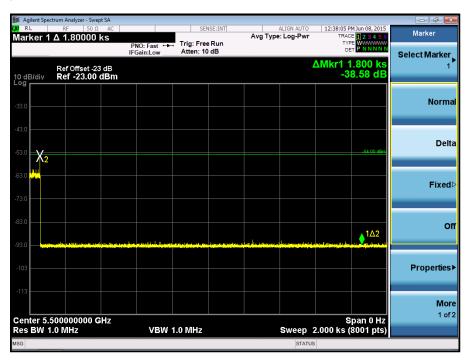
Non-Occupancy Period for 802.11n-HT40 5310MHz

	ctrum Analyzer - Swept SA					- F -
rt RL	RF 50 Ω AC		SENSE:INT	ALIGN AUTO Avg Type: Log-Pwr	05:44:23 PM Jun 08, 2015 TRACE 1 2 3 4 5 6	Marker
narker	A 1.00000 KS	PNO: Fast ↔ IFGain:Low	Trig: Free Run Atten: 10 dB		TYPE WWWWWW DET P NNNNN	Select Marker
0 dB/div	Ref Offset -23 dB Ref -23.00 dBn	n		L	∆Mkr1 1.800 ks -37.97 dB	1
3.0						Norma
13.0						
					-54.00 dBm	Delt
i3.0 X2						
73.0 ***						Fixed
3.0						
3.0	a fan te besteller y Statt Beleinden om en	weedport a the latenet type takes to state	is un fil dall station has summarial in high	in a state and the state of the		0
103						Properties
113						
						Mor 1 of
enter 5. es BW 1	310000000 GHz I.0 MHz	#VBW	3.0 MHz	Sweep 2	Span 0 Hz 000 ks (8001 pts).	
G				STATUS		

Test Item	Measured	Time (Min)	Limit	Results
	5300MHz	5310MHz		
Non-Occupancy Period	> 30 Min	> 30 Min	> 30 Min	Pass



Non-Occupancy Period for 802.11a 5500MHz



Non-Occupancy Period for 802.11n-HT40 5510MHz



Test Item	Measured	Time (Min)	Limit	Results
	5500MHz	5510MHz		
Non-Occupancy Period	> 30 Min	> 30 Min	> 30 Min	Pass



5.10. Uniform Spreading

5.10.1 Test Limit

Each of the declared Channel Plans shall make use of at least 60 % of the spectrum available in the applicable sub-band(s).

Each of the Usable Channels shall be used with approximately equal probability. RLAN equipment for which the declared channel plan includes channels whose nominal bandwidth falls completely or partly within the band 5 600 MHz to 5 650 MHz may omit these channels from the list of Usable Channels at initial power up or at initial installation. Channels being used by other RLAN equipment may be omitted from the list of Usable Channels.

5.10.2 Test Result

Uniform Spreading Mechanism						
Declared Channel Band Applicable sub-band Test Result Limit						
(MHz)	(MHz)	(%)	(%)			
5240 - 5320	5250 - 5350	80	≥60			
5500 - 5700	5470 - 5725	78.4	≥60			

Note: Each of usable channels can be used with approximately equal probability which was declared by the manufacturer.

The End