Dynamic Frequency Selection (DFS) Measurements on an Inflight Entertainment System, Part No. E71-319-01 Rev B

For	Astronics CSC 804 S Northpoint Blvd Waukegan, IL 60087
P.O. Number	42995
Date Tested	March 31, 2020 through April 2, 2020
Test Personnel	Mark E. Longinotti
Test Specification	FCC "Code of Federal Regulations" Title 47 Part15, Subpart E, Section 15.407 KDB 905462 D02 v02

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REVISION HISTORY

Revision	Date	Description
—	16 APR 2020	Initial release

Dynamic Frequency Selection (DFS) measurement on an Inflight Entertainment System, Part No. E71-319-01 Rev B

1. INTRODUCTION

1.1. Scope of Tests

This report presents the results of a series of Dynamic Frequency Selection (DSF) tests that were performed on an Astronics CSC Sierra™ Portable IFE, Inflight Entertainment System, Part No. E71-319-01 Rev B, Serial No. 000008, (hereinafter referred to as the Equipment Under Test (EUT)). The EUT was manufactured and submitted for testing by Astronics CSC located in Waukegan, IL.

1.2. Purpose

The test series was performed to determine if the Aruba Access Point, M/N: APIN0303, FCC ID: Q9DAPIN0303, continues to meet the Dynamic Frequency Selection Requirements of the FCC “Code of Federal Regulations” Title 47, Section 15.407 and KDB 905462 D02 v02 when placed in the EUT.

1.3. Deviations, Additions and Exclusions

There were no deviations from the test specification during this test series. A limited number of tests were performed because the purpose of these tests was to verify that the Aruba Access Point, M/N: APIN0303, FCC ID: Q9DAPIN0303, continues to meet the Dynamic Frequency Selection Requirements of the FCC “Code of Federal Regulations” Title 47, Section 15.407 and KDB 905462 D02 v02.

1.4. EMC Laboratory Identification

This series of tests was performed by Elite Electronic Engineering Incorporated of Downers Grove, Illinois. The laboratory is accredited by the American Association for Laboratory Accreditation (A2LA), A2LA Lab Code: 1786-01.

1.5. Laboratory Conditions

The temperature at the time of the test was 21°C and the relative humidity was 19%.

2. APPLICABLE DOCUMENTS

The following documents of the exact issue designated form part of this document to the extent specified herein:

- Federal Communications Commission "Code of Federal Regulations", Title 47, Part 15, Subpart E
- KDB 905462 D02 – “Federal Communications Commission Office of Engineering Technology Laboratory Division, Compliance Measurement Procedures for Unlicensed-National Information Infrastructure Devices Operating in the 5250-535MHz and 5470-5725MHz Bands Incorporating Dynamic Frequency Selection”

3. EUT SETUP AND OPERATION

3.1. General Description

The EUT is an Astronics CSC, Inflight Entertainment System, Part No. E71-319-01 Rev B. Photographs of the EUT are shown as Figure 1.

3.1.1.Power Input

The EUT was powered by an AC/DC Switching Power Supply, Part No. 10009600.

3.1.2. Grounding

The EUT was not grounded.

3.2. Software

For all tests, the EUT had Aruba OS Software Version 8.3.0.7 loaded onto the device to provide correct load characteristics.

3.3. Operational Mode

For Dynamic Frequency Selection (DSF) tests, the EUT was programmed to operate in one of the following modes:

WiFi: Transmit at 5300MHz (Channel 60), 802.11ac, 20MHz bandwidth
WiFi: Transmit at 5290MHz (Channel 58), 802.11ac, 80MHz bandwidth

3.4. EUT Modifications

No modifications were required for compliance.

4. TEST INSTRUMENTATION

4.1. Test Instrumentation

The test instrumentation and auxiliary equipment used during the tests are listed in Table 9-1.

4.2. Calibration Traceability

Test equipment is maintained and calibrated on a regular basis with a calibration interval not greater than two years. All calibrations are traceable to the National Institute of Standards and Technology (NIST).

4.3. Measurement Uncertainty

For the test methods, the measurement uncertainty figures shall be calculated in accordance with TR 100 028-1 and shall correspond to an expansion factor (coverage factor) k = 1.96 or k = 2 (which provide confidence levels of respectively 95 % and 95,45 % in the case where the distributions characterizing the actual measurement uncertainties are normal (Gaussian)).

The expanded measurement uncertainty factors for ETSI EN 300 328 are as follows:

Parameter	Uncertainty
Occupied Channel Bandwidth	+/- 224kHz
Power Spectral Density	+/- 0.372Hz
RF Output Power, Conducted	+/- 0.349 dB
Unwanted Emissions, Conducted	+/- 1.39 dB
All Emissions Radiated Below 1GHz	+/- 2.629 dB
All Emissions Radiated Above 1GHz	+/- 2.710 dB
Temperature	+/- 0.165 ˚C
Humidity	+/- 1.7% RH
DC and Low Frequency Voltages	+/- 0.115 Volts
Time	+/- 0.05%

5. TEST PROCEDURES

5.1. UNII Detection Bandwidth Measurement

5.1.1.Requirements

The minimum U-NII detection bandwidth in which it detects 100% of the radar waveforms shall be at least as wide as the 99% transmission power bandwidth.

5.1.2.Procedures

The vector signal generator was set up to produce the short pulse radar Type 0 at the appropriate power level. The EUT was set up as a stand-alone device. The frequency of the vector signal generator was set to the center frequency of the EUT. A single short radar pulse is generated and the response of the EUT is noted. This is repeated for a minimum of 10 times.

The center frequency of the vector signal generator was increased in 5MHz steps, and the single short radar pulse was generated 10 times until the detection rate of the EUT falls below 90%. Then the sequence was repeated in 1MHz steps at frequencies 5MHz below where the detection rate began to fail. The highest frequency (FH) at which detection was greater than 90% was recorded.

Starting at the center frequency of the EUT, the center frequency of the vector signal generator was decreased in 5MHz steps, and the single short radar pulse was generated 10 times until the detection rate of the EUT falls below 90%. Then the sequence was repeated in 1MHz steps at frequencies 5MHz above where the detection rate began to fail. The lowest frequency (FL) at which detection was greater than 90% was recorded.

The U-NII detection bandwidth is calculated as:

U-NII Detection Bandwidth = FH-FL

5.1.3.Results

The UNII detection bandwidth measurement results are presented on page 12. As can be seen from the data, the UNII detection bandwidth was at least as wide as the 99% transmission power bandwidth.

5.2. Initial Channel Availability Check Time

5.2.1.Requirements

A U-NII device shall check if there is a radar system already operating on the channel before it can initiate a transmission on a channel and when it must move to a new channel. The U-NII device may start using the channel if no radar is detected within 60 seconds.

5.2.2.Procedures

The EUT was powered on and was instructed to operate on the appropriate channel that incorporates DFS functions. At the same time the EUT was powered on, the spectrum analyzer was set to zero span mode with a 3MHz RBW and 3MHz VBW on the channel occupied by the radar with a 2.5-minute sweep time. The spectrum analyzer's sweep will be started at the same time power applied to the EUT.

5.2.3.Results

The Initial Channel Availability Check Time results are shown on page 13. As can be seen from the data, the Initial Channel Availability Check Time was greater than 60 seconds.

5.3. Radar Burst at the Beginning of the Channel Availability Check Time

5.3.1.Requirements

At the beginning of the Channel Availability Check (CAC) Time, when a radar burst is detected on the test

channel, the EUT must avoid operating on that channel.

5.3.2.Procedures

The EUT was powered on at time T_0. T_1, this was the instant when the EUT had completed its power-up sequence. The Channel Availability Check (CAC) Time began at time T_1 and ended at time T_1 + 60 seconds.

A single burst of one of the Short Pulse Radar Types 0-4 began within a 6 second window starting at T_1. An additional 1dB was added to the radar test signal to ensure it was at or above the DFS detection threshold.

Visual indication or measured results on the EUT of successful detection of the radar burst was recorded. Observation of the EUT emissions continued for 2.5 minutes after the radar burst had been generated.

5.3.3.Results

The Radar Burst at the Beginning of the Channel Availability Check Time measurement results are presented on pages 14 through 19. As can be seen from the data, the EUT successfully detected the radar burst that occurred at the beginning of the Channel Availability Check Time and no EUT transmissions occurred on the channel 2.5 minutes after the radar burst was generated.

5.4. Radar Burst at the End of the Channel Availability Check Time

5.4.1.Requirements

At the end of the Channel Availability Check (CAC) Time, when a radar burst is detected on the test channel, the EUT must avoid operating on that channel.

5.4.2.Procedures

The EUT was powered on at time T_0. T_1, this was the instant when the EUT had completed its power-up sequence. The Channel Availability Check (CAC) Time began at time T_1 and ended at time T_1 + 60 seconds.

A single burst of one of the Short Pulse Radar Types 0-4 began within a 6 second window starting at T_1 + 54 seconds. An additional 1dB was added to the radar test signal to ensure it was at or above the DFS detection threshold.

Visual indication or measured results on the EUT of successful detection of the radar burst was recorded. Observation of the EUT emissions continued for 2.5 minutes after the radar burst had been generated.

5.4.3.Results

The Radar Burst at the Beginning of the Channel Availability Check Time measurement results are presented on pages 20 through 25. As can be seen from the data, the EUT successfully detected the radar burst that occurred at the beginning of the Channel Availability Check Time and no EUT transmissions occurred on the channel 2.5 minutes after the radar burst was generated.

5.5. In-Service Monitoring for Channel Move Time, Channel Closing Transmission Time and Non-Occupancy Period

5.5.1.Requirements

After a radar pulse is detected, all transmissions shall cease on the operating channel within 10 seconds. Transmissions during this period shall consist of normal traffic for a maximum of 200 ms after detection of the radar signal. In addition, intermittent management and control signals can be sent during the remaining time to facilitate vacating the operating channel. A channel that has been flagged as containing a radar system, either by a channel availability check or in-service monitoring, is subject to a non-occupancy period of at least 30 minutes. The non-occupancy period starts at the time when the radar system is detected.

5.5.2.Procedures

At time T_0, the vector signal generator sends a burst of pulses for one of the Radar Type 0 on the operational channel. An additional 1dB was added to the radar test signal.

The transmissions of the EUT were observed at the end of the radar burst on the operating channel for a duration greater than 10 seconds. The transmissions from the EUT during the observation time (channel move time) were measured and recorded. The Channel Move Time and Channel Closing Time were measured and recorded.

In addition, the ETU was monitored for more than 30 minutes following instant T_2 to verify that that UUT does not resume any transmissions on this channel.

5.5.3.Results

The Channel Move Time, Channel Closing Transmission Time and Non-Occupancy Period measurement results are presented on pages 26 through 28. As can be seen from the data, transmissions stopped on the operating channel within 10 seconds of detection of the radar pulse. Transmissions during this period consisted of normal traffic for no more than 200 ms after detection of the radar signal. The non-occupancy period of the EUT was at least 30 minutes after detection of the radar pulse.

6. OTHER TEST CONDITIONS

6.1. Test Personnel and Witnesses

All tests were performed by qualified personnel from Elite Electronic Engineering Incorporated. The test series was witnessed by Astronics CSC personnel.

6.2. Disposition of the EUT

The EUT and all associated equipment were returned to Astronics CSC upon completion of the tests.

7. CONCLUSIONS

It was determined, with spot testing, that the Aruba Access Point, M/N: APIN0303, FCC ID: Q9DAPIN0303, continues to meet the Dynamic Frequency Selection Requirements of the FCC “Code of Federal Regulations” Title 47, Section 15.407 and KDB 905462 D02 v02 when placed in the Astronics CSC Inflight Entertainment System, Part No. E71-319-01 Rev B, Serial No. 000008 .

8. CERTIFICATION

Elite Electronic Engineering Incorporated certifies that the information contained in this report was obtained under conditions which meet or exceed those specified in the test specifications.

The data presented in this test report pertains to the EUT at the test date as operated by Astronics CSC personnel. Any electrical or mechanical modification made to the EUT subsequent to the specified test date will serve to invalidate the data and void this certification.

This report must not be used to claim product certification, approval, or endorsement by A2LA, NIST or any agency of the Federal Government.

9. EQUIPMENT LIST

Table 9-1 Equipment List

Eq ID	Equipment Description	Manufacturer	Model No.	Serial No.	Frequency Range	Cal Date	Due Date
GSF0	VECTOR SIGNAL GENERATOR	ROHDE & SCHWARZ	SMBV100A	260452	9kHz to 6GHz	8/27/2019	8/27/2020
GSFB	OSP120 BASE UNIT	ROHDE & SCHWARZ	OSP120	101246	---	4/1/2019	4/1/2021
GSFE	OSP120	ROHDE & SCWARZ	OSP120	101288	.01-40GHZ	5/2/2019	5/2/2020
RBG2	EMI ANALYZER	ROHDE & SCHWARZ	ESW44	101591	2HZ-44GHZ	3/23/2020	3/23/2021

I/O: Initial Only
N/A: Not Applicable
Note 1: For the purpose of this test, the equipment was calibrated over the specified frequency range, pulse rate, or modulation prior to the test or monitored by a calibrated instrument.

Figure 1

Photograph of the EUT

Photograph of the EUT

DFS U-NII Detection Bandwidth
(5300 MHz, Channel 60,802.11ac, 20MHz BW)

Radar level verification

Description	Value	Unit
IF(({DFS Mode(0/1/2)}=0)or({DFS Mode(0/1/2)}=1) , IF((dBm2W({Nominal Power[dBm]})>0.2) , -64 , IF(({Configured PSD[dBm]}<10) , -62 , -64))+ {Attenuation Vector Generator to DUT[dB]} , -50+ {Attenuation Vector Generator to COMP[dB]})+ {Radar Signal Level Offset[dB]}	Given setting / formula to calculate Vector Generator level	--
Configured DUT EIRP:	47.75	mW
Configured DUT PSD:	5.30	dBm/MHz
Requirement of the Detection threshold value for this given values acc. to FCC clause 5.2 / Table 3	-62	dBm
Vector Generator level setting	-4.02	dBm
Configured overall path loss from Vector Generator RF out to DUT connector of 'DUT to OSP'-cable	56.98	dB
Given additional level added to the amplitude of the waveform to account for variations in measurement equipment acc. to FCC clause 5.2 / Table 3 / Note 2	1.00	dB
This results in the following radar signal level at the DUT	-61.00	dBm

Detection Bandwidth Detailed Results

Check Frequency (MHz)	Detection count	Percentage of Detection	Minimum Limit	Single Measurement Result	Single Measurement Comment
5285.000000	0 of 10	0 %	90%	FAIL	
5289.000000	0 of 10	0 %	90%	FAIL	
5290.000000	10 of 10	100 %	90%	PASS	Lower Limit
5295.000000	10 of 10	100 %	90%	PASS	
5300.000000	10 of 10	100 %	90%	PASS	
5305.000000	10 of 10	100 %	90%	PASS	
5310.000000	10 of 10	100 %	90%	PASS	Upper Limit
5311.000000	0 of 10	0 %	90%	FAIL	
5315.000000	0 of 10	0 %	90%	FAIL	

Therefore U-NII Detection Bandwidth = FH-FL = 5310MHz – 5290MHz = 20MHz

Initial Channel Availability Check Time
(5300 MHz, Channel 60,802.11ac, 20MHz BW)

Measurement Detailed Results

DUT Frequency (MHz)	Radar Type No.	CAC Type	Measured Startup time (s)	Minimum Initial Channel Availability Check Time (s)	Results
5300.000000	4	Begin of CAC Phase	174.350	60	PASS

Radar Burst at the Beginning of the Channel Availability Check Time

(5300 MHz, Channel 60,802.11ac, 20MHz BW)

Measurement Detailed Results

DUT Frequency (MHz)	Radar Type No.	CAC Type	Measured Startup time (s)	Configured Startup time (s)	Kind of Measurement
5300.000000	0	Begin of CAC Phase	174.350	---	Before Radar Injection
5300.000000	0	Begin of CAC Phase	174.350	---	After Radar Injection

(continuation of the "Measurement Detailed Results" table from column 6 ...)

DUT Frequency (MHz)	Time of Tx Start (s)	Limit (s)	Result	Comment
5300.000000	0.000	0.00	PASS	No emissions detected; OK
5300.000000	>150.0	>150.0	PASS	See Note 1.

Note 1: Sweep of Analyzer and Radar Pulse waveform are triggered at the same time. Therefore, the radar pulses maybe can be seen at the trigger point of the trace. Analysis of the sweeps excludes the covered time for the radar pulses.

Radar Pulse verification Summary

Radar Type No.	No. of Pulses	Required No. of Pulses	Min. Pulse width (µs)	Max. Pulse width (µs)	Required Pulse width (us)	Measured Min. PRI (µs)
0	18	18	0.900	1.000	1.0	1427.900

(continuation of the "Radar Pulse verification Summary" table from column 7 ...)

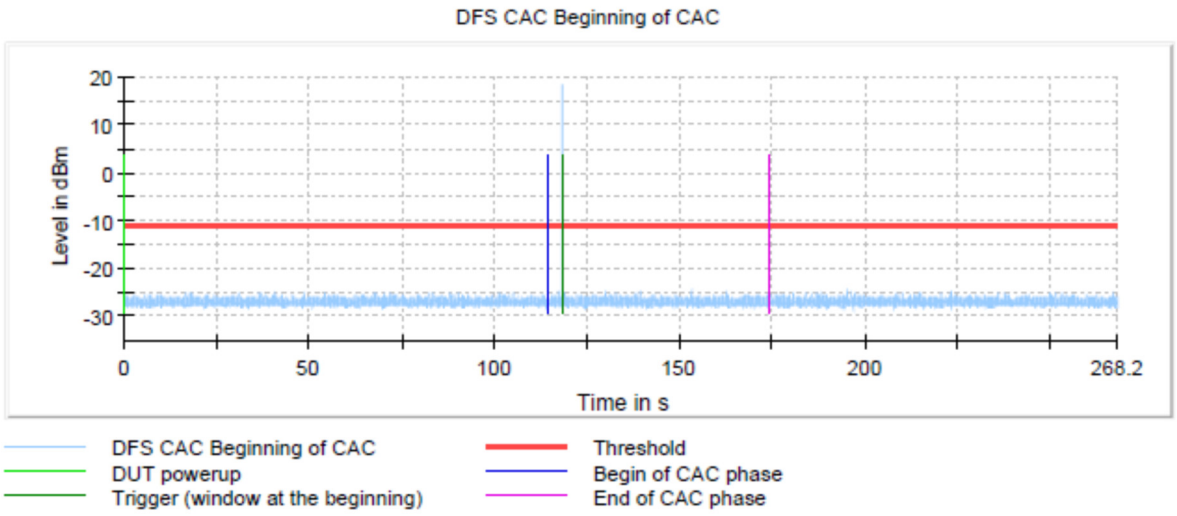
Radar Type No.	Measured Max. PRI (µs)	Required PRI (us)	Result
0	1428.000	1428	PASS

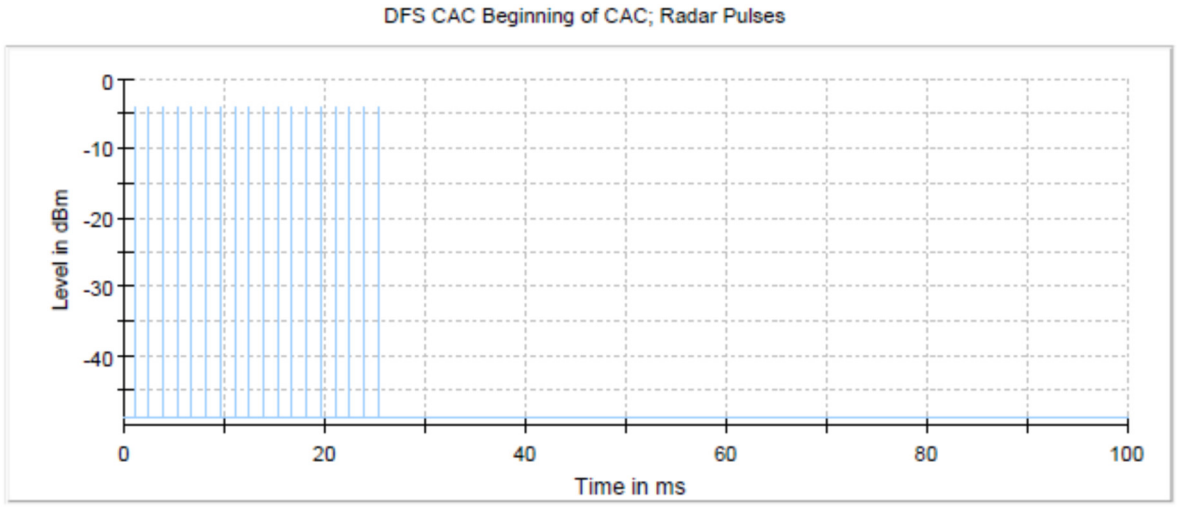
Radar Pulse verification detail (Begin of CAC Phase)

Radar Type No.	Pulse No.	Pulse width (µs)	Required Pulse width (µs)
0	1	1.000	1.000
0	2	0.900	1.000
0	3	0.900	1.000
0	4	0.900	1.000
0	5	0.900	1.000
0	6	1.000	1.000
0	7	1.000	1.000
0	8	0.900	1.000
0	9	0.900	1.000
0	10	0.900	1.000
0	11	0.900	1.000
0	12	0.900	1.000
0	13	1.000	1.000
0	14	1.000	1.000
0	15	0.900	1.000
0	16	0.900	1.000
0	17	0.900	1.000
0	18	1.000	1.000

Radar level verification

Description	Value	Unit
IF(({DFS Mode(0/1/2)}=0)or({DFS Mode(0/1/2)}=1) , IF((dBm2W({Nominal Power[dBm]})>0.2) , -64 , IF(({Configured PSD[dBm]}<10) , -62 , -64))+ {Attenuation Vector Generator to DUT[dB]} , -50+ {Attenuation Vector Generator to COMP[dB]})+ {Radar Signal Level Offset[dB]}	Given setting / formula to calculate Vector Generator level	--
Configured DUT EIRP:	47.75	mW
Configured DUT PSD:	6.99	dBm/MHz
Requirement of the Detection threshold value for this given values acc. to FCC clause 5.2 / Table 3	-62	dBm
Vector Generator level setting	-4.02	dBm
Configured overall path loss from Vector Generator RF out to DUT connector of 'DUT to OSP'-cable	56.98	dB
Given additional level added to the amplitude of the waveform to account for variations in measurement equipment acc. to FCC clause 5.2 / Table 3 / Note 2	1.00	dB
This results in the following radar signal level at the DUT	-61.00	dBm


DFS CAC Beginning of CAC
Level in dBm
20
10
0
-10
-20
-30
0
50
100
150
200
268.2
Time in s
DFS CAC Beginning of CAC
DUT powerup
Trigger (window at the beginning)
Threshold
Begin of CAC phase
End of CAC phase


DFS CAC Beginning of CAC; Radar Pulses
Level in dBm
0
-10
-20
-30
-40
0
20
40
60
80
100
Time in ms

Radar Burst at the Beginning of the Channel Availability Check Time

(5300 MHz, Channel 60, 802.11ac, 20MHz BW)

Measurement Detailed Results

DUT Frequency (MHz)	Radar Type No.	CAC Type	Measured Startup time (s)	Configured Startup time (s)	Kind of Measurement
5300.000000	4	Begin of CAC Phase	174.350	---	Before Radar Injection
5300.000000	4	Begin of CAC Phase	174.350	---	After Radar Injection

(continuation of the "Measurement Detailed Results" table from column 6 ...)

DUT Frequency (MHz)	Time of Tx Start (s)	Limit (s)	Result	Comment
5300.000000	0.000	0.00	PASS	No emissions detected; OK
5300.000000	>150.0	>150.0	PASS	See Note 1.

Note 1: Sweep of Analyzer and Radar Pulse waveform are triggered at the same time. Therefore, the radar pulses maybe can be seen at the trigger point of the trace. Analysis of the sweeps excludes the covered time for the radar pulses.

Radar Pulse verification Summary

Radar Type No.	No. of Pulses	Required No. of Pulses	Min. Pulse width (µs)	Max. Pulse width (µs)	Required Pulse width (us)	Measured Min. PRI (µs)
4	13	13	15.800	15.800	15.9	410.000

(continuation of the "Radar Pulse verification Summary" table from column 7 ...)

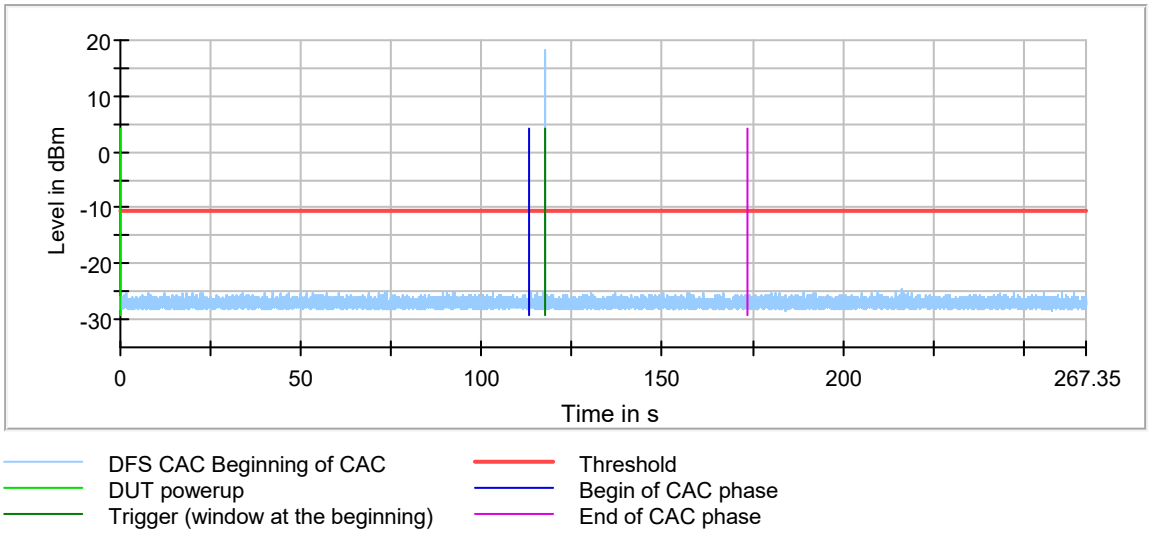
Radar Type No.	Measured Max. PRI (µs)	Required PRI (us)	Result
4	410.000	410	PASS

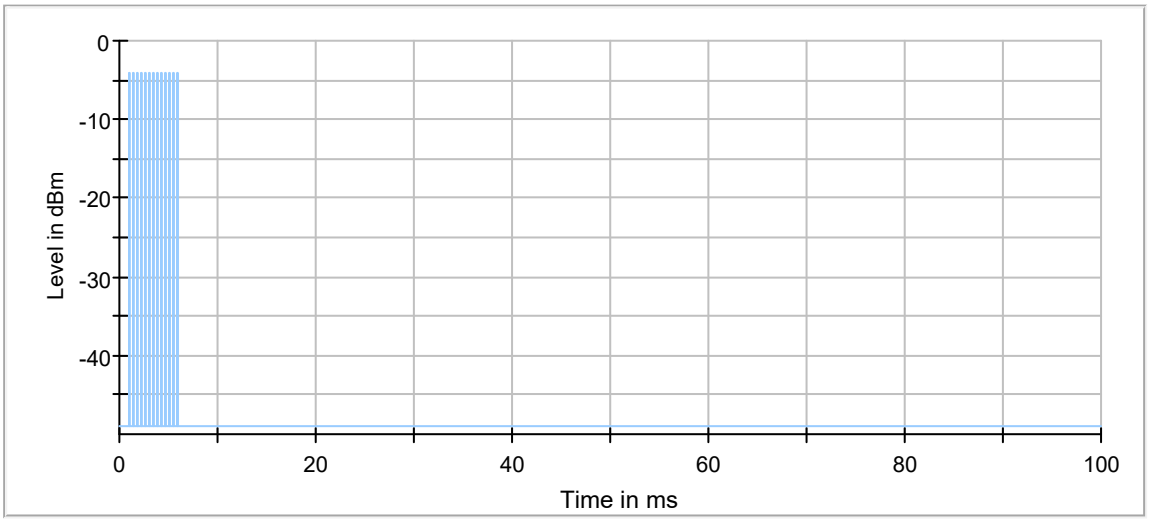
Radar Pulse verification detail (Begin of CAC Phase)

Radar Type No.	Pulse No.	Pulse width (µs)	Required Pulse width (µs)
4	1	15.800	15.900
4	2	15.800	15.900
4	3	15.800	15.900
4	4	15.800	15.900
4	5	15.800	15.900
4	6	15.800	15.900
4	7	15.800	15.900
4	8	15.800	15.900
4	9	15.800	15.900
4	10	15.800	15.900
4	11	15.800	15.900
4	12	15.800	15.900
4	13	15.800	15.900

Radar level verification

Description	Value	Unit
IF(({DFS Mode(0/1/2)}=0)or({DFS Mode(0/1/2)}=1) , IF((dBm2W({Nominal Power[dBm]})>0.2) , -64 , IF(({Configured PSD[dBm]}<10) , -62 , -64))+ {Attenuation Vector Generator to DUT[dB]} , -50+ {Attenuation Vector Generator to COMP[dB]})+ {Radar Signal Level Offset[dB]}	Given setting / formula to calculate Vector Generator level	--
Configured DUT EIRP:	47.75	mW
Configured DUT PSD:	6.99	dBm/MHz
Requirement of the Detection threshold value for this given values acc. to FCC clause 5.2 / Table 3	-62	dBm
Vector Generator level setting	-4.02	dBm
Configured overall path loss from Vector Generator RF out to DUT connector of 'DUT to OSP'-cable	56.98	dB
Given additional level added to the amplitude of the waveform to account for variations in measurement equipment acc. to FCC clause 5.2 / Table 3 / Note 2	1.00	dB
This results in the following radar signal level at the DUT	-61.00	dBm




0
-10
-20
-30
-40
Level in dBm
0
20
40
60
80
100
Time in ms

Radar Burst at the End of the Channel Availability Check Time

(5300 MHz, Channel 60,802.11ac, 20MHz BW)

Measurement Detailed Results

DUT Frequency (MHz)	Radar Type No.	CAC Type	Measured Startup time (s)	Configured Startup time (s)	Kind of Measurement
5300.000000	0	End of CAC Phase	174.350	---	Before Radar Injection
5300.000000	0	End of CAC Phase	174.350	---	After Radar Injection

(continuation of the "Measurement Detailed Results" table from column 6 ...)

DUT Frequency (MHz)	Time of Tx Start (s)	Limit (s)	Result	Comment
5300.000000	0.000	0.00	PASS	No emissions detected; OK
5300.000000	>150.0	>150.0	PASS	See Note 1.

Note 1: Sweep of Analyzer and Radar Pulse waveform are triggered at the same time. Therefore, the radar pulses maybe can be seen at the trigger point of the trace. Analysis of the sweeps excludes the covered time for the radar pulses.

Radar Pulse verification Summary

Radar Type No.	No. of Pulses	Required No. of Pulses	Min. Pulse width (µs)	Max. Pulse width (µs)	Required Pulse width (us)	Measured Min. PRI (µs)
0	18	18	0.900	1.000	1.0	1427.900

(continuation of the "Radar Pulse verification Summary" table from column 7 ...)

Radar Type No.	Measured Max. PRI (µs)	Required PRI (us)	Result
0	1428.000	1428	PASS

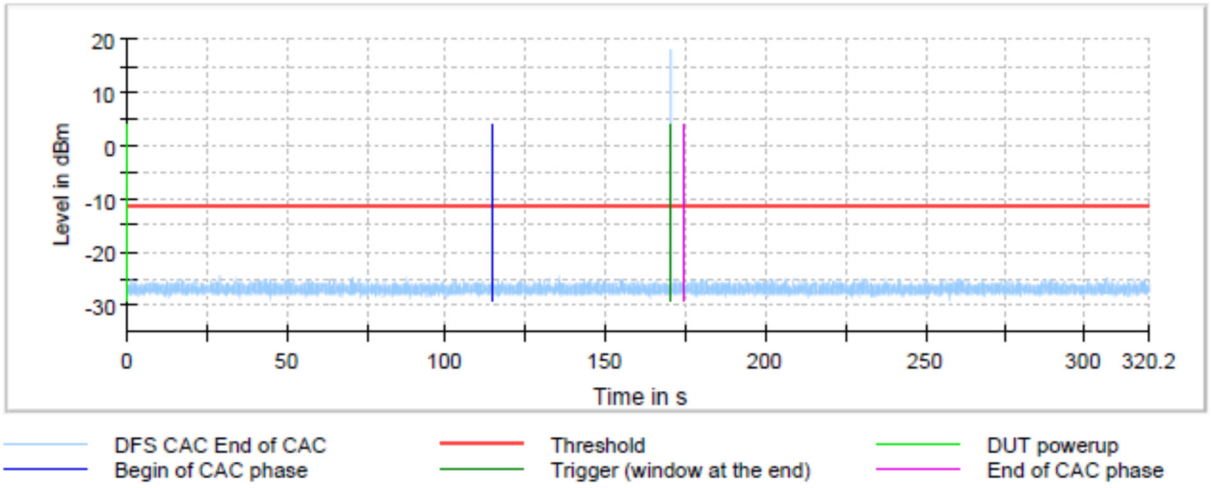
Radar Pulse verification detail (Begin of CAC Phase)

Radar Type No.	Pulse No.	Pulse width (µs)	Required Pulse width (µs)
0	1	1.000	1.000
0	2	0.900	1.000
0	3	0.900	1.000
0	4	0.900	1.000
0	5	1.000	1.000
0	6	1.000	1.000
0	7	1.000	1.000
0	8	0.900	1.000
0	9	0.900	1.000
0	10	0.900	1.000
0	11	0.900	1.000
0	12	0.900	1.000
0	13	1.000	1.000
0	14	0.900	1.000
0	15	0.900	1.000
0	16	0.900	1.000
0	17	0.900	1.000
0	18	1.000	1.000

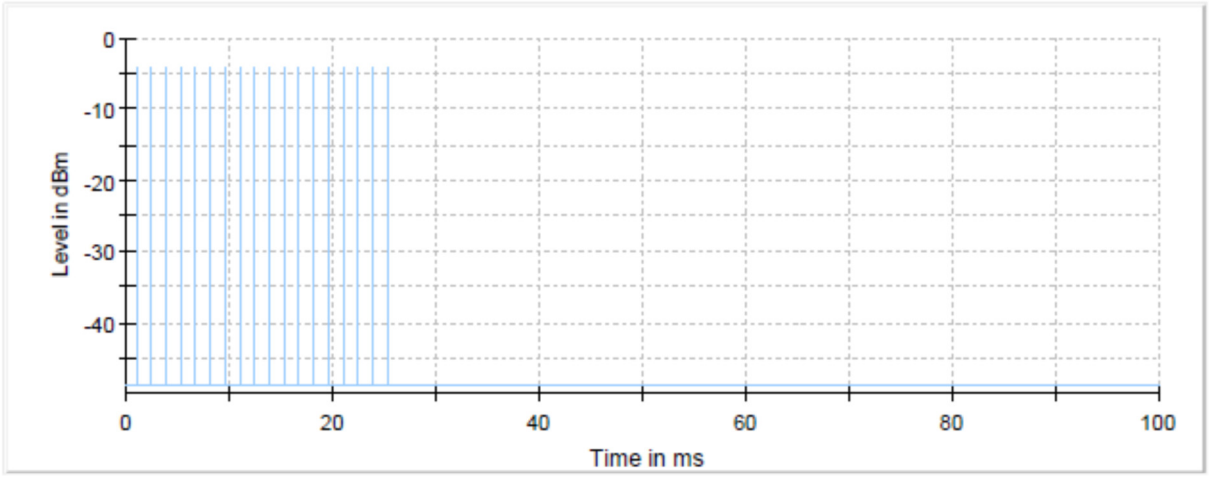
Radar level verification

Description	Value	Unit
IF(({DFS Mode(0/1/2)}=0)or({DFS Mode(0/1/2)}=1) , IF((dBm2W({Nominal Power[dBm]})>0.2) , -64 , IF(({Configured PSD[dBm]}<10) , -62 , -64))+ {Attenuation Vector Generator to DUT[dB]} , -50+ {Attenuation Vector Generator to COMP[dB]})+ {Radar Signal Level Offset[dB]}	Given setting / formula to calculate Vector Generator level	--
Configured DUT EIRP:	47.75	mW
Configured DUT PSD:	6.99	dBm/MHz
Requirement of the Detection threshold value for this given values acc. to FCC clause 5.2 / Table 3	-62	dBm
Vector Generator level setting	-4.02	dBm
Configured overall path loss from Vector Generator RF out to DUT connector of 'DUT to OSP'-cable	56.98	dB
Given additional level added to the amplitude of the waveform to account for variations in measurement equipment acc. to FCC clause 5.2 / Table 3 / Note 2	1.00	dB
This results in the following radar signal level at the DUT	-61.00	dBm

DFS CAC End of CAC



DFS CAC End of CAC; Radar Pulses



Radar Burst at the End of the Channel Availability Check Time

(5300 MHz, Channel 60,802.11ac, 20MHz BW)

Measurement Detailed Results

DUT Frequency (MHz)	Radar Type No.	CAC Type	Measured Startup time (s)	Configured Startup time (s)	Kind of Measurement
5300.000000	4	End of CAC Phase	174.350	---	Before Radar Injection
5300.000000	4	End of CAC Phase	174.350	---	After Radar Injection

(continuation of the "Measurement Detailed Results" table from column 6 ...)

DUT Frequency (MHz)	Time of Tx Start (s)	Limit (s)	Result	Comment
5300.000000	0.000	0.00	PASS	No emissions detected; OK
5300.000000	>150.0	>150.0	PASS	See Note 1.

Note 1: Sweep of Analyzer and Radar Pulse waveform are triggered at the same time. Therefore, the radar pulses maybe can be seen at the trigger point of the trace. Analysis of the sweeps excludes the covered time for the radar pulses.

Radar Pulse verification Summary

Radar Type No.	No. of Pulses	Required No. of Pulses	Min. Pulse width (µs)	Max. Pulse width (µs)	Required Pulse width (us)	Measured Min. PRI (µs)
4	13	13	15.800	15.900	15.9	410.000

(continuation of the "Radar Pulse verification Summary" table from column 7 ...)

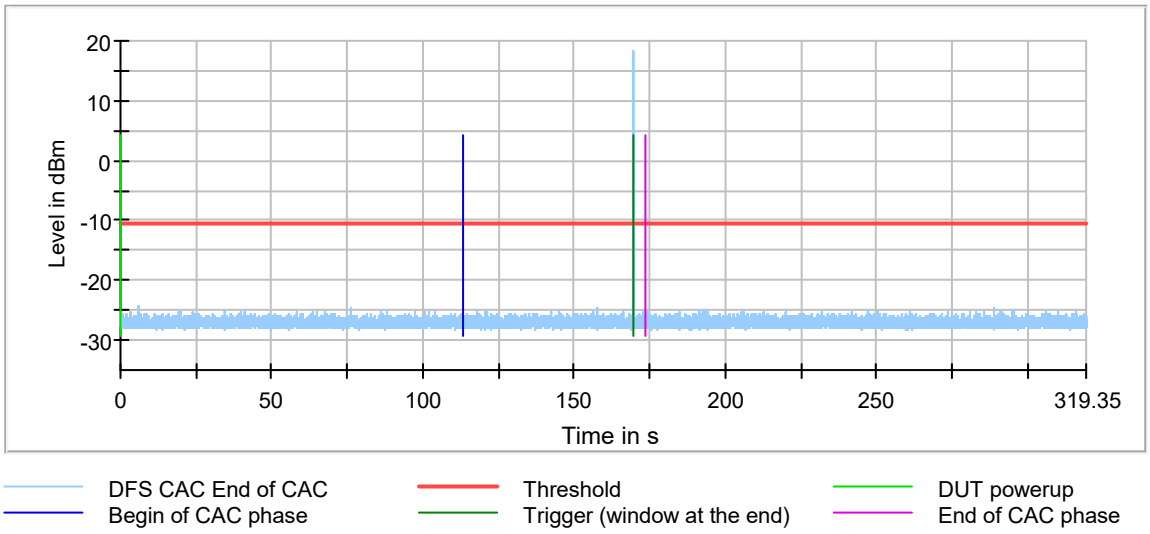
Radar Type No.	Measured Max. PRI (µs)	Required PRI (us)	Result
4	410.000	410	PASS

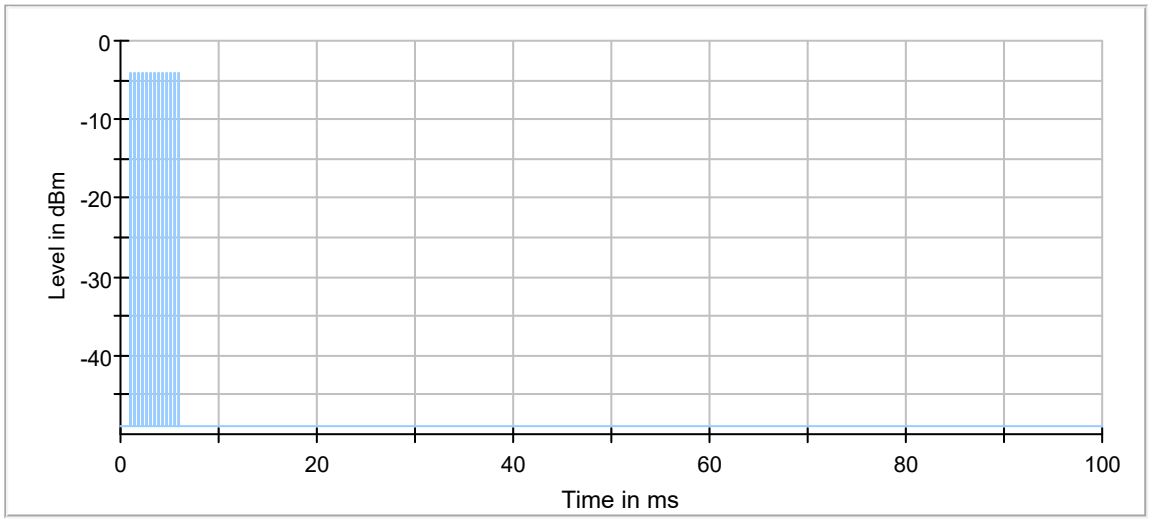
Radar Pulse verification detail (Begin of CAC Phase)

Radar Type No.	Pulse No.	Pulse width (µs)	Required Pulse width (µs)
4	1	15.900	15.900
4	2	15.900	15.900
4	3	15.800	15.900
4	4	15.800	15.900
4	5	15.800	15.900
4	6	15.800	15.900
4	7	15.800	15.900
4	8	15.800	15.900
4	9	15.800	15.900
4	10	15.800	15.900
4	11	15.800	15.900
4	12	15.800	15.900
4	13	15.800	15.900

Radar level verification

Description	Value	Unit
IF(({DFS Mode(0/1/2)}=0)or({DFS Mode(0/1/2)}=1) , IF((dBm2W({Nominal Power[dBm]})>0.2) , -64 , IF(({Configured PSD[dBm]}<10) , -62 , -64))+ {Attenuation Vector Generator to DUT[dB]} , -50+ {Attenuation Vector Generator to COMP[dB]})+ {Radar Signal Level Offset[dB]}	Given setting / formula to calculate Vector Generator level	--
Configured DUT EIRP:	47.75	mW
Configured DUT PSD:	6.99	dBm/MHz
Requirement of the Detection threshold value for this given values acc. to FCC clause 5.2 / Table 3	-62	dBm
Vector Generator level setting	-4.02	dBm
Configured overall path loss from Vector Generator RF out to DUT connector of 'DUT to OSP'-cable	56.98	dB
Given additional level added to the amplitude of the waveform to account for variations in measurement equipment acc. to FCC clause 5.2 / Table 3 / Note 2	1.00	dB
This results in the following radar signal level at the DUT	-61.00	dBm




0
-10
-20
-30
-40
Level in dBm
0
20
40
60
80
100
Time in ms

DFS In-Service Monitoring (5290MHz, Ch. 58, 802.11ac, 80MHz BW)

Channel Move Time Detailed Results

DUT Frequency (MHz)	Radar Type No.	CMT Tx Time (s)	CMT Limit (s)	CMT Result	CMT Comment
5290.000000	0	0.000	10.000	PASS	Tx Time value is last trailing edge found within sweep. See Note 1.

Note 1: Because of the radar pulse event at the beginning, the investigation of the trace begins with an offset of 26.7 ms conforming to the end of the Radar burst.

Channel Closing Transmission Time Detailed Results

DUT Frequency (MHz)	Radar Type No.	CCTT Type of Value	CCTT No. of Pulses Found	CCTT Tx Time (msec)
5290.000000	0	First 200 ms	0	0.000
5290.000000	0	Remaining 10.0 second period	0	0.000

(continuation of the "Channel Closing Transmission Time Detailed Results table from column 5…)

DUT Frequency (MHz)	CCTT Tx Time Left (ms)	CCTT Result	CCTT Comment
5290.000000	200.000	PASS	See Note 1.
5290.000000	60.000	PASS	See note 1.

Note 1: Because of the radar pulse event at the beginning, the investigation of the trace begins with an offset of 26.7 ms conforming to the end of the Radar burst.

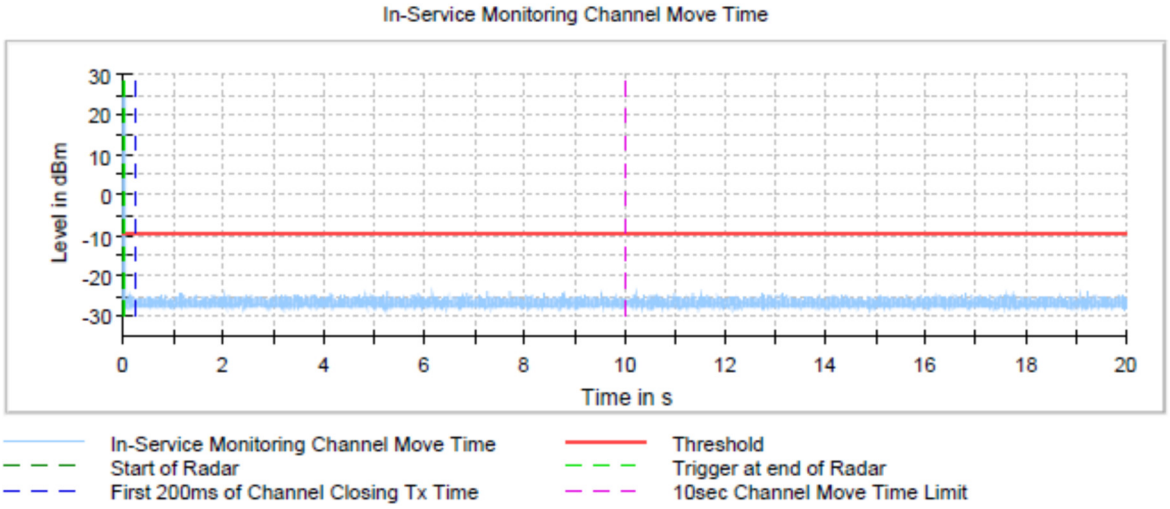
Non-occupancy period Detailed Results

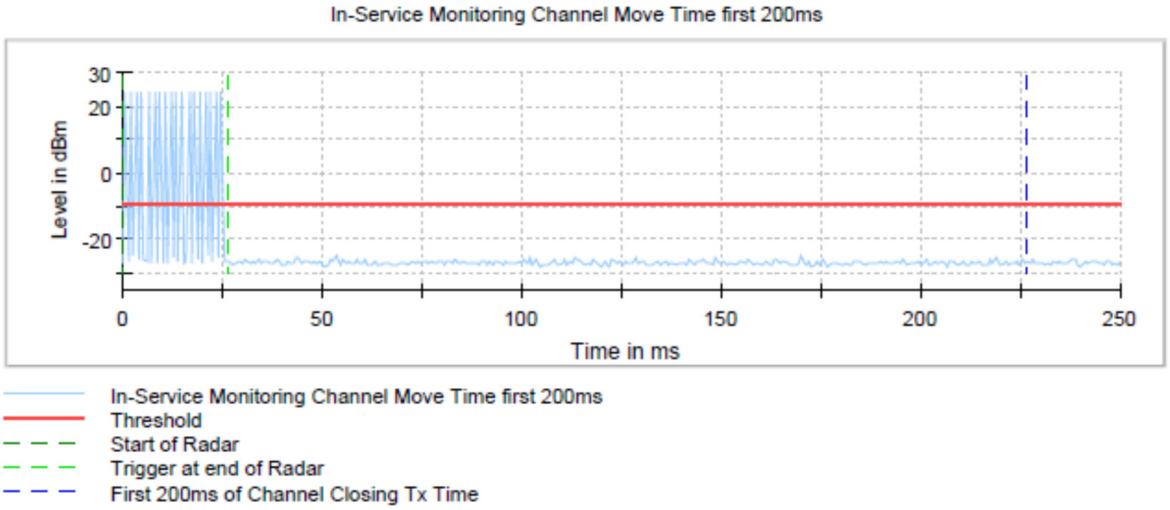
DUT Frequency (MHz)	Radar Type No.	NOP No. of Pulses found	NOP No. of Pulses limit	NOP Tx Time (s)	NOP Tx Time Limit (s)	NOP Result
5290.000000	0	0	0	0.000	0.000	PASS

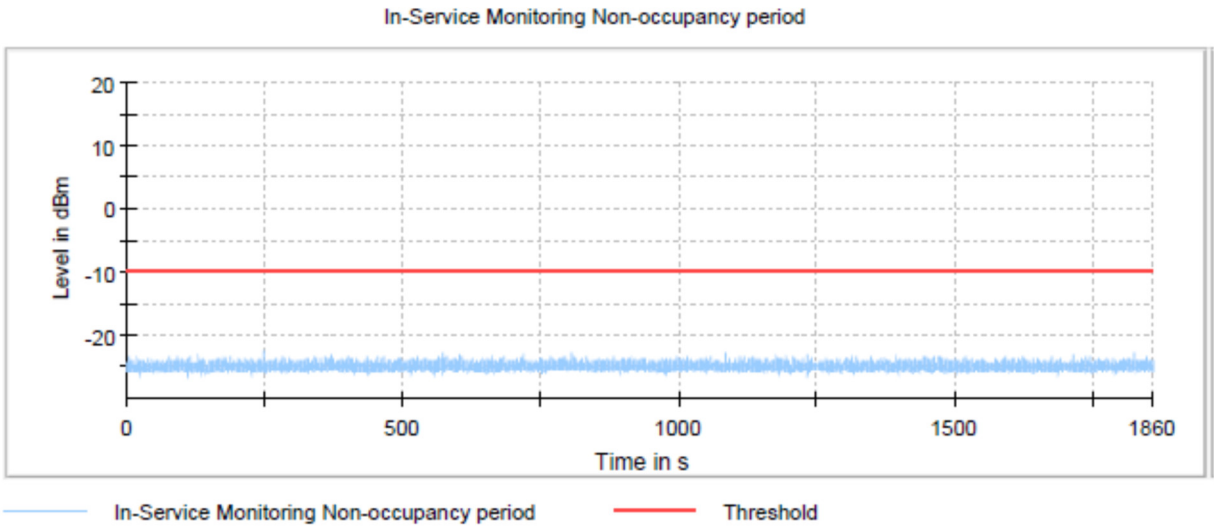
Radar level verification

Description	Value	Unit
IF(({DFS Mode(0/1/2)}=0)or({DFS Mode(0/1/2)}=1) , IF((dBm2W({Nominal Power[dBm]})>0.2) , -64 , IF(({Configured PSD[dBm]}<10) , -62 , -64))+ {Attenuation Vector Generator to DUT[dB]} , -50+ {Attenuation Vector Generator to COMP[dB]})+ {Radar Signal Level Offset[dB]}	Given setting / formula to calculate Vector Generator level	--
Configured DUT EIRP:	55.21	mW
Configured DUT PSD:	-2.29	dBm/MHz
Requirement of the Detection threshold value for this given values acc. to FCC clause 5.2 / Table 3	-62	dBm
Vector Generator level setting	-3.99	dBm
Configured overall path loss from Vector Generator RF out to DUT connector of 'DUT to OSP'-cable	57.01	dB

Given additional level added to the amplitude of the waveform to account for variations in measurement equipment acc. to FCC clause 5.2 / Table 3 / Note 2	**1.00**	**dB**
This results in the following radar signal level at the DUT	**-61.00**	**dBm**







Note 2: Channel move time (CMT) / channel closing transmission time (CCTT) measurement was made with hi resolution video sweep using OSP DAQ channel

Note 3: Because of the substantially higher sampling rate of the video signal the results for CCTT and CMT are more accurate than in the graphics visible. Reached timing accuracy of the video trace: approx 4 µs

Note 4: The Non-Occupancy Period trace starts at the end of the Channel move time trace (20.000 secs.)
Labeling of the x-axis (time) is relative to its beginning (0 secs.)