

ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT



Applicant: Arduino S.r.l.
Via Andrea Appiani, 25, 20900 Monza, Italy

Manufacturer: WNC Corporation
20 Park Avenue II Hsinchu Science Park, Hsinchu 300,
Taiwan

EUT Description: Arduino UNO Q

Brand Name: Arduino

Model No./ISED HVIN: ABX00162

ISED PMN: UNO Q

Report Number: TERF2509003010E2

FCC ID 2AN9S-ABX00162

IC: 26792-ABX00162

Date of EUT Received: September 16, 2025

Date of Test: September 18, 2025~October 3, 2025

Issue Date: October 3, 2025

Approved By

Arno Hsieh

Arno Hsieh

We hereby certify that:

The above equipment was tested by SGS Taiwan Ltd. Central RF Lab. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10 and the energy emitted by the sample EUT comply with FCC rule part §15.407, ISSED RSS-247.

The results of this report relate only to the sample identified in this report.

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Revision History

Report Number	Revision	Description	Issue Date	Revised By	Remark
TERF2509003010E2	00	Original	September 30, 2025	Susan Lin	
TERF2509003010E2	01	Update section 2.1 and add IC test data	October 3, 2025	Susan Lin	*

Note:

- 1、The remark "*" indicates modification of the report upon requests from certification body.

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1 GENERAL INFORMATION

1.1 Product Description

EUT Description	Arduino UNO Q
Brand Name	Arduino
Model No. /ISED HVIN	ABX00162
Hardware Version:	N/A
Firmware Version:	N/A
EUT Series No.:	140431490
Power Supply:	5Vdc
Test Software (Name/Version)	Android Debug Bridge version 1.0.41 Version 36.0.1-13811061

1.2 DFS Firmware version:

```
C:\Users\Li-Ying_Chen\Desktop\adb>adb device
Android Debug Bridge version 1.0.39
Revision 3db08f2c6889-android
```

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1.3 Modulation & Data Rate

Wi-Fi	Frequency Range	Channels	Modulation Technology
802.11a/ 802.11n_HT20/ 802.11ac_VHT20	5180~5240	3	OFDM
	5260~5320	3	OFDM
	5500~5720	4	OFDM
	5745~5825	3	OFDM
802.11n_HT40/ 802.11ac_VHT40	5190~5230	2	OFDM
	5270~5310	2	OFDM
	5510~5710	4	OFDM
	5755~5795	2	OFDM
802.11ac_VHT80	5210	1	OFDM
	5290	1	OFDM
	5530~5690	3	OFDM
	5775	1	OFDM

1.4 Antenna Designation

Ant. Type	Brand	Part No.	Freq. (MHz)	Peak Gain(dBi)
PCB	WNC	DMVQ-AD01	5150~5250	0.97
			5250~5350	1.4
			5470~5725	2.05
			5725~5850	2.09

Note:

1. Pre-scanned was done on the above antennas, measurements were demonstrated by using the antenna with the highest gain as the worst case scenarios.
2. The antenna information is provided by the applicant. The laboratory does not verify the accuracy of this information, and all test results related to antenna characteristics are based solely on the data supplied. Responsibility for the authenticity and accuracy of these specifications rests entirely with the party who provided the information.
3. The antenna complies with part 15.203 requirement and no consideration of re-placement. Please see EUT photo for details.

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2 SUMMARY OF TEST RESULT

FCC Rules	ISED Rules	Description Of Test	Result
§15.407(h)	RSS-247 §7.3.6	TPC and DFS Measurement	Compliant

2.1 Test Methodology of Applied Standards

FCC Part 15, Subpart E §15.407

FCC KDB 905462 D02 UNII DFS Compliance Procedures New Rules v02

FCC KDB 905462 D03 UNII Clients Without Radar Detection New Rules v01r02

RSS-247 issue 4 July 2025

ETSI EN 301 893 v 1.8.1 (March 2015)

ANSI C63.10:2020

ANSI C63.10-2020+Cor. 1-2023+C63.10a-2024 + Errata to C63.10a-2024

2.2 Measurement Uncertainty

Test Items	Uncertainty
TPC and DFS Measurement	+/- 1.49 Hz
Temperature	+/- 0.6 °C
Humidity	+/- 3 %
DC / AC Power Source	+/- 1 %

Note:

1. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.
2. The conformity assessment statement in this report is based solely on the test results, measurement uncertainty is excluded.

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2.3 Test Facility

Laboratory	Test Site Address	Test Site Name	FCC Designation Number / Registration Number	IC CAB identifier
SGS Taiwan Ltd. Central RF Lab. (TAF code 3702)	No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan.	SAC 1	TW0027 / 891563	TW3702
		SAC 2		
		SAC 3		
		Conduction 1		
		Conducted 1		
		Conducted 2		
		Conducted 3		
		Conducted 4		
		Conducted 5		
		Conducted 6		
	No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan 333	Conduction C	TW0028 / 200037	
		SAC C		
		SAC D		
		SAC G		
		Conducted A		
		Conducted B		
		Conducted C		
		Conducted D		
		Conducted E		
		Conducted F		
		Conducted G		
Note: The test site name is noted on the equipment list to indicate where the measurements were conducted.				

FCC

Temperature:	25.3	°C	Relative Humidity:	63	%
Test site	Conducted A		Test Start:	09/23/2025	
Test Engineer:	Ari		Test Done:	09/23/2025	

IC

Temperature:	24.1	°C	Relative Humidity:	56	%
Test site	Conducted A		Test Start:	10/03/2025	
Test Engineer:	Ari		Test Done:	10/03/2025	

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3 TEST INSTRUMENT

Conducted Emission Test Site: Conducted A					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL. (mm/dd/yyyy)	CAL DUE. (mm/dd/yyyy)
Attenuator	Woken	WRF53AYM2B7	RF43	11/14/2024	11/13/2025
EMI Test Receiver	Anritsu	N9038A	MY52260216	11/20/2024	11/19/2025
Power Divider	Titan	T0510E4W118Q	RF67	11/14/2024	11/13/2025
Signal Generator	Keysight	N5182B	MY59101143	02/06/2025	02/05/2026
Splitter	Marvelous Microwave	MVE8586	RF49	11/14/2024	11/13/2025
Splitter	Marvelous Microwave	MVE8586	RF50	11/14/2024	11/13/2025
Test Software	SGS Taiwan	Dynamic Frequency Selection Test	Ver. 25.03.05	N.C.R	N.C.R

NOTE: N.C.R refers to Not Calibrated Required.

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4 REGULATORY REQUIREMENTS

4.1 Transmit Power Control (TPC)

U-NII devices operating in the 5.25-5.35 GHz band and the 5.47-5.725 GHz band shall employ a TPC mechanism. The U-NII device is required to have the capability to operate at least 6 dB below the mean EIRP value of 30 dBm. A TPC mechanism is not required for systems with an e.i.r.p. of less than 500 mW.

4.2 Dynamic Frequency Selection (DFS)

4.2.1 FCC

Radar Detection Function of Dynamic Frequency Selection (DFS). U-NII devices operating with any part of its 26 dB emission bandwidth in the 5.25-5.35 GHz and 5.47-5.725 GHz bands shall employ a DFS radar detection mechanism to detect the presence of radar systems and to avoid co-channel operation with radar systems. Operators shall only use equipment with a DFS mechanism that is turned on when operating in these bands.

The minimum DFS detection threshold for devices with a maximum e.i.r.p. of 200 mW to 1 W is -64 dBm. For devices that operate with less than 200 mW e.i.r.p. and a power spectral density of less than 10 dBm in a 1 MHz band, the minimum detection threshold is -62 dBm. The detection threshold is the received power averaged over 1 microsecond referenced to a 0 dBi antenna. For the initial channel setting, the manufacturers shall be permitted to provide for either random channel selection or manual channel selection.

Maximum Transmit Power	Value (See Notes 1, 2, and 3)
EIRP $\geq$ 200 milliwatt	-64 dBm
EIRP < 200 milliwatt and power spectral density < 10 dBm/MHz	-62 dBm
EIRP < 200 milliwatt that do not meet the power spectral density requirement	-64 dBm
Note 1: This is the level at the input of the receiver assuming a 0 dBi receive antenna. Note 2: Throughout these test procedures an additional 1 dB has been added to the amplitude of the test transmission waveforms to account for variations in measurement equipment. This will ensure that the test signal is at or above the detection threshold level to trigger a DFS response. Note 3: EIRP is based on the highest antenna gain. For MIMO devices refer to KDB Publication 662911 D01.	

(i) Operational Modes. The DFS requirement applies to the following operational modes:

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- (a) The requirement for channel availability check time applies in the master operational mode.
- (b) The requirement for channel move time applies in both the master and slave operational modes.
- (ii) Channel Availability Check Time. 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 has to move to a new channel. The U-NII device may start using the channel if no radar signal with a power level greater than the interference threshold values is detected within 60 seconds.
- (iii) Channel Move Time. After a radar's presence 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.
- (iv) Non-occupancy Period. 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.

4.2.2 ISED

Devices operating in the bands 5250-5350 MHz, 5470-5725 MHz shall comply with the following:

(a) DFS radar signal detection threshold

Devices shall employ a DFS radar detection mechanism to detect the presence of radar systems and to avoid co-channel operation with radar systems. The device must detect radar signals within its entire emission bandwidth. The minimum DFS radar signal detection threshold is described below.

Devices	DFS Threshold
Devices with an e.i.r.p. < 200 mW AND a Power Spectral Density < 10 dBm/MHz	-62 dBm
Devices with $200 \text{ mW} \leq \text{e.i.r.p.} \leq 1 \text{ W}$	-64 dBm
Note: The detection threshold power is the received power, averaged over a 1-microsecond reference to a 0 dBi antenna.	

(b) Operational requirements

Devices shall comply with the following requirements, however, the requirement for in-service monitoring does not apply to slave devices without radar detection.

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- (i) In-service monitoring: an LE-LAN device shall be able to monitor the operating channel to check that a co-channel radar has not moved or started operation within range of the LE-LAN device. During in-service monitoring, the LE-LAN radar detection function continuously searches for radar signals between normal LE-LAN transmissions.
- (ii) Channel availability check time: the device shall check whether there is a radar system already operating on the channel before it initiates a transmission on a channel and when it moves to a channel. The device may start using the channel if no radar signal with a power level greater than the interference threshold value is detected within 60 seconds. This requirement only applies in the master operational mode.
- (iii) Channel move time: after a radar signal is detected, the device shall cease all transmissions on the operating channel within 10 seconds.
- (iv) Channel closing transmission time: is comprised of 200 ms starting at the beginning of the channel move time plus any additional intermittent control signals required to facilitate a channel move (an aggregate of 60 ms) over the remaining 10-second period of the channel move time.
- (v) Non-occupancy period: a channel that has been flagged as containing a radar signal, either by a channel availability check or in-service monitoring, is subject to a 30-minute non-occupancy period where the channel cannot be used by the LE-LAN device. The non-occupancy period starts from the time that the radar signal is detected.

4.3 Applicability of DFS requirements during normal operation

Requirement	Operational Mode
	Client Without Radar Detection
DFS Detection Threshold	Not required
Channel Closing Transmission time	Yes
Channel Move time	Yes
U-NII Detection Bandwidth	Not required

Parameter	Value
Non-occupancy period	Minimum 30 minutes
Channel Availability Check Time	60 seconds
Channel Move Time	10 seconds See Note 1.
Channel Closing Transmission Time	200 milliseconds + an aggregate of 60 milliseconds over remaining 10 second period. See Notes 1 and 2.
U-NII Detection Bandwidth	Minimum 100% of the U-NII 99% transmission power bandwidth. See Note 3.

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Note 1: Channel Move Time and the Channel Closing Transmission Time should be performed with Radar Type 0. The measurement timing begins at the end of the Radar Type 0 burst.

Note 2: The Channel Closing Transmission Time is comprised of 200 milliseconds starting at the beginning of the Channel Move Time plus any additional intermittent control signals required to facilitate a Channel move (an aggregate of 60 milliseconds) during the remainder of the 10 second period. The aggregate duration of control signals will not count quiet periods in between transmissions.

Note 3: During the U-NII Detection Bandwidth detection test, radar type 0 should be used. For each frequency step the minimum percentage of detection is 90 percent. Measurements are performed with no data traffic.

Additional requirements for devices with multiple bandwidth mode	Client Without Radar Detection
U-NII Detection Bandwidth and Statistical Performance Check	Not required
Channel Move Time and Channel Closing Transmission Time	Test using the widest BW mode available for the link
All other tests	Not required

Note: Frequencies selected for statistical performance check (Section 7.8.4) should include several frequencies within the radar detection bandwidth and frequencies near the edge of the radar detection bandwidth. For 802.11 devices it is suggested to select frequencies in each of the bonded 20 MHz channels and the channel center frequency.

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4.3.1 Operational requirements for 5600~5650MHz in Canada

Requirement	DFS operational mode
	Secondary device without radar detection (see note 2, note 3)
CAC	Not required
Off-channel CAC (see note 1)	Not required
In-service monitoring	Not required
Channel shutdown	Required
Non-occupancy period	Not required
Uniform spreading	Not required
NOTE 1: If implemented.	
NOTE 2: A secondary device with radar detection is not required to perform a CAC or off-channel CAC at initial use of a channel but only before returning to the use of a channel where it has detected a radar signal by in-service monitoring. Where the secondary device with radar detection is under the control of its primary device and does not start transmissions on the channel until connected to that primary device, then the secondary device with radar detection does not have to perform a CAC or off-channel CAC and may rely on the CAC performed by the primary device to enable in-service monitoring.	
NOTE 3: Secondary devices with a maximum RF output power of less than or equal to 23 dBm EIRP do not have to implement radar detection unless these devices are used in fixed outdoor point-to-point or fixed outdoor point-to-multipoint applications.	

Parameter	Value
Channel Availability Check (CAC) 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	1s
Non-occupancy period	30 minutes

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NOTE 1: For channels whose nominal channel bandwidth falls completely or partly within the band 5 600 MHz to 5 650 MHz, the CAC time shall be 10 minutes.

NOTE 2: For channels whose nominal channel bandwidth falls completely or partly within the band 5 600 MHz to 5 650 MHz, the off-channel CAC time shall be within the range 1 hour to 24 hours.

4.4 Radar Test Waveforms

4.4.1 Short Pulse Radar

Radar Type	Pulse Width (μsec)	PRI (μsec)	Number of Pulses	Minimum Percentage of Successful Detection	Minimum Number of Trials
0	1	1428	18	See Note 1	See Note 1
1	1	Test A: 15 unique PRI values randomly selected from the list of 23 PRI values in Table 5a Test B: 15 unique PRI values randomly selected within the range of 518-3066 μsec, with a minimum increment of 1 μsec, excluding PRI values selected in Test A	Roundup $\left\{ \left(\frac{1}{360} \right) \cdot \left(\frac{19 \cdot 10^6}{\text{PRI}_{\mu\text{sec}}} \right) \right\}$	60%	30
2	1-5	150-230	23-29	60%	30
3	6-10	200-500	16-18	60%	30
4	11-20	200-500	12-16	60%	30
Aggregate (Radar Types 1-4)				80%	120
Note 1: Short Pulse Radar Type 0 should be used for the detection bandwidth test, channel move time, and channel closing time tests.					

4.4.2 Long Pulse Radar

Radar Type	Pulse Width (μsec)	Chirp Width (MHz)	PRI (μsec)	Number of Pulses per Burst	Number of Bursts	Minimum Percentage of Successful Detection	Minimum Number of Trials
5	50-100	5-20	1000-2000	1-3	8-20	80%	30

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4.4.3 Frequency Hopping Radar

Radar Type	Pulse Width (μsec)	PRI (μsec)	Pulses per Hop	Hopping Rate (kHz)	Hopping Sequence Length (msec)	Minimum Percentage of Successful Detection	Minimum Number of Trials
6	1	333	9	0.333	300	70%	30

4.4.4 Reference DFS test signal for 5600~5650MHz in Canada

Pulse width W (μs)	PRF (PPS)	Pulses Per Burst (PPB)
1	700	18

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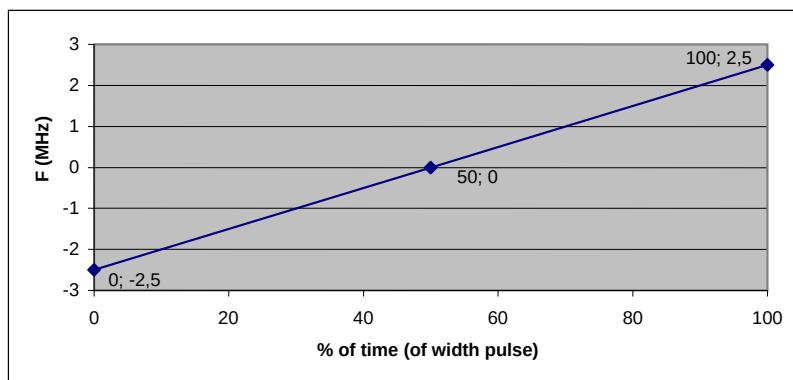
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Radar test signal (see note 1 to note 3)	Pulse width W (μs)		PRF (PPS)		Number of different PRFs	PPB for each PRF (see note 5)
	Min	Max	Min	Max		
1	0,5	5	200	1 000	1	10 (see note 6)
2	0,5	15	200	1 600	1	15 (see note 6)
3	0,5	15	2 300	4 000	1	25
4	20	30	2 000	4 000	1	20
5	0,5	2	300	400	2/3	10 (see note 6)
6	0,5	2	400	1 200	2/3	15 (see note 6)

NOTE 1: Radar test signal 1 to signal 4 are signals with constant PRF (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 is a chirp modulation with a $\pm 2,5$ MHz frequency deviation as shown in the following graph.



NOTE 3: Radar test signal 5 and radar test signal 6 are signals with single pulse-based staggered PRF 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 from off-channel CAC testing, the radar test signals shall only contain a single burst of pulses (see figure D.1, figure D.3 and figure D.4).

For off-channel CAC testing, repetitive bursts shall be used for the total duration of the test (see figure D.2 and figure D.5 (see also clause 4.2.6.2.3, clause 5.4.8.2.1.4.2 and clause 5.4.8.2.1.4.3 of EN 301 893)).

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

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

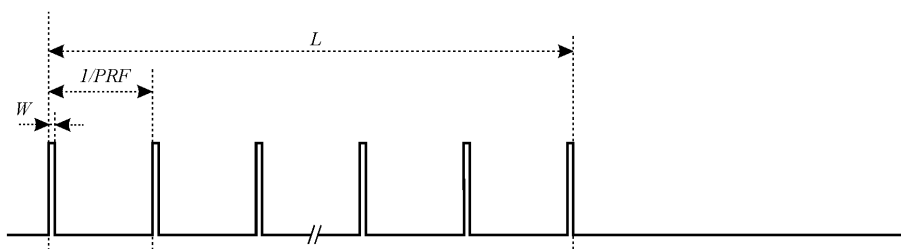


Figure D.1: General structure of a single-burst radar test signal with constant PRF

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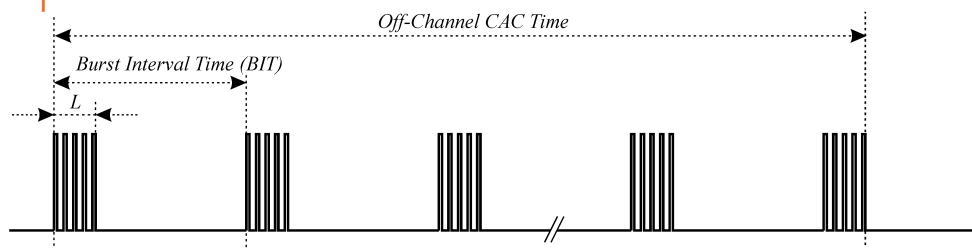


Figure D.2: General structure of a multi-burst radar test signal with constant PRF

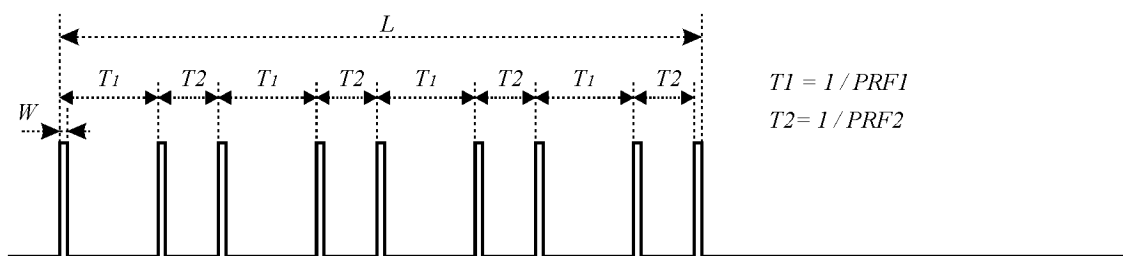


Figure D.3: General structure of a single-burst radar test signal with single pulse-based staggered PRF

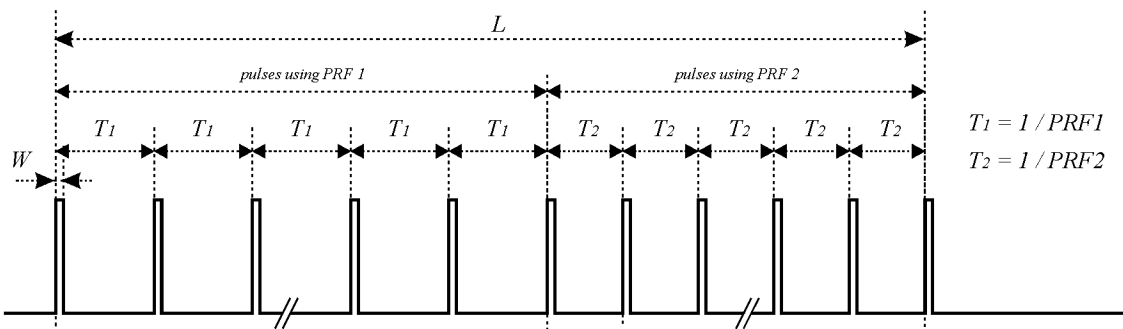


Figure D.4: General structure of a single-burst radar test signal with packet-based staggered PRF

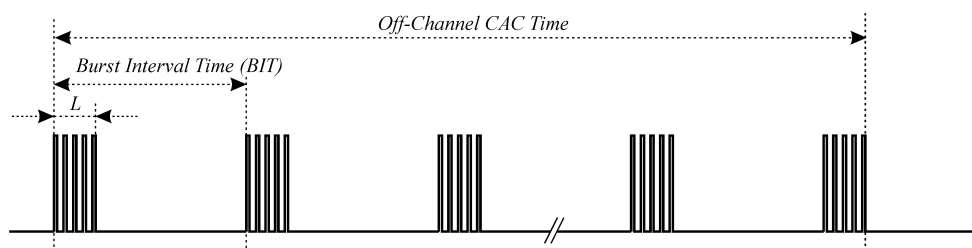


Figure D.5: General structure of a multi-burst radar test signal with packet-based staggered PRF

The applicant of this given application confirms that information regarding the parameters of the detected Radar Waveforms is not available to the end user.

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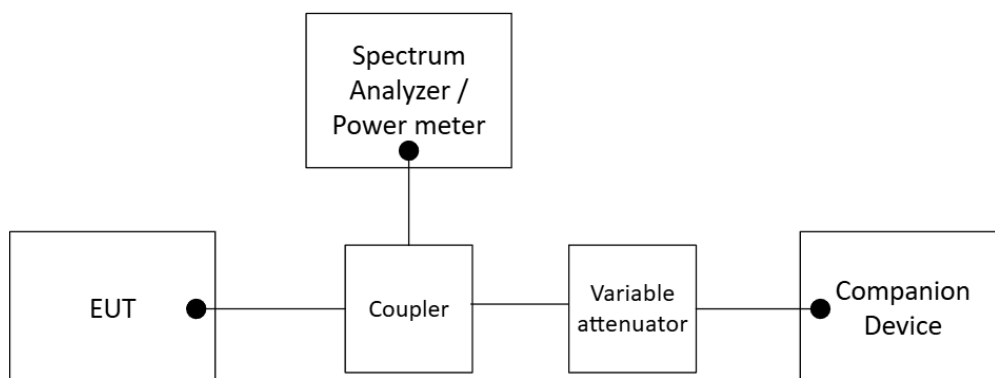
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5 TEST CONFIGURATION

5.1 Transmit Power Control (TPC)



1. Configure EUT and companion device for peer-to-peer communication
2. Set variable attenuator to a high RSSI level to enable TPC function of the device (noise free spectral environment)
3. Establish a link and start communication between EUT and companion device
4. Capture power from spectrum analyzer/power meter
5. Set variable attenuator to a low RSSI level to disable TPC function of the device (noisy spectral environment)
6. Capture power from spectrum analyzer/power meter
7. Compare the highest power from the step 4 to the highest power from the step 6 and determine the delta. For MIMO operations use the sum of the highest power from each individual antenna.

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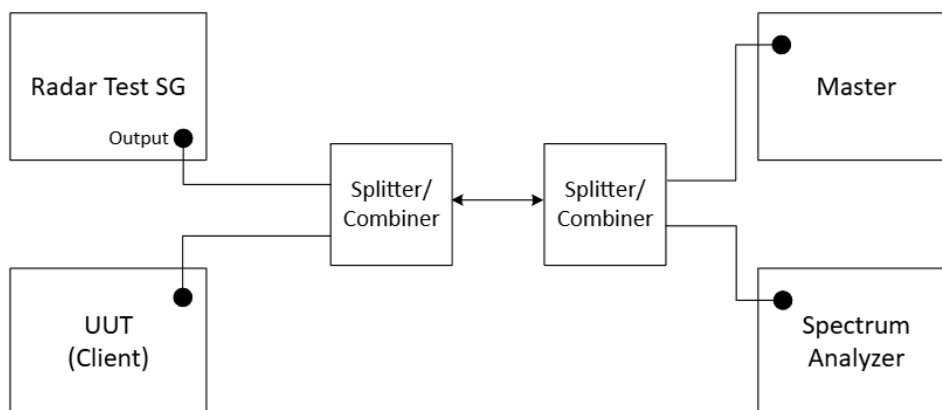
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5.2 Dynamic Frequency Selection (DFS)

Setup for Client with injection at the Master



EUT operates over the 5250-5350MHz and 5470-5725MHz ranges and EUT is a slave device (client equipment) w/o radar detection and DFS capability.

WLAN traffic is generated by streaming the mpeg file from the master to slave in full monitor video mode using the media player or transmit the data with the minimum channel loading of approximately 17%.

For testing of 5600~5650MHz operating in Canada, WLAN traffic is generated by transmitting the data with the minimum channel loading of approximately 30%. (ISED 5600~5650 EN301 893)

While calibrate the path on antenna port of DFS test equipment (master), measurements equipment (spectrum) is ensured to be 50 Ohms, and therefore verification on antenna gain measurement can be ignored.

Message or files that is used for communication between Master and Client:

IP based system:

For the required channel loading, send packets via software to reach the applicable payload via the UE to the slave.

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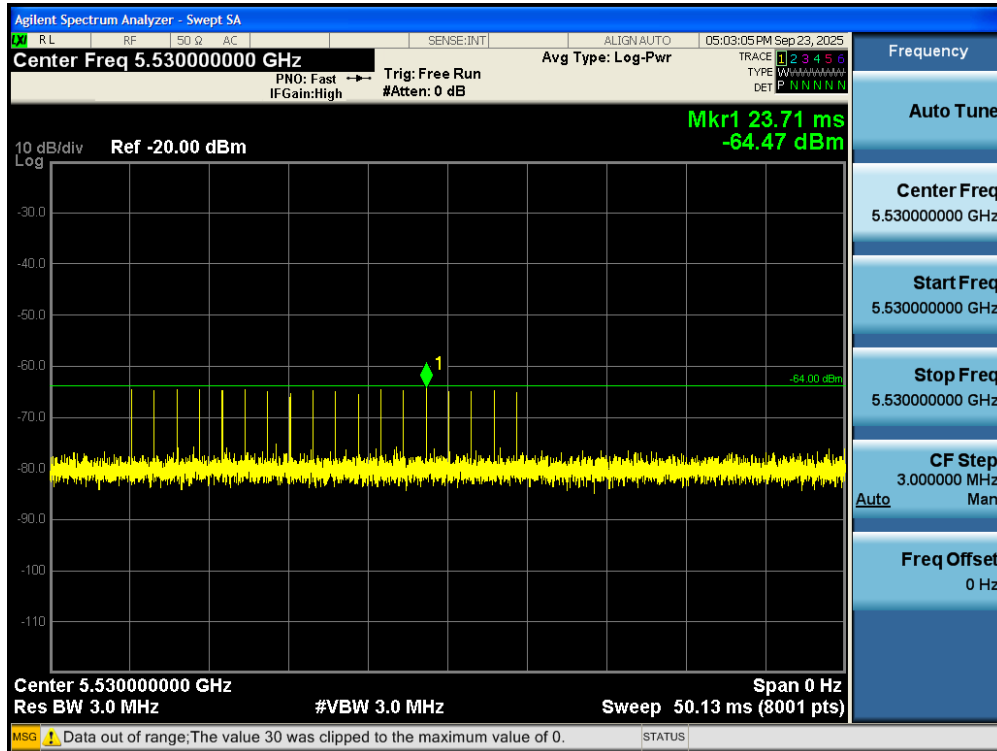
6 TEST RESULTS

6.1 Transmitter Power Control (TPC)

N/A, TPC is not required.

6.2 Radar waveforms

VHT80_5530MHz Radar type 0

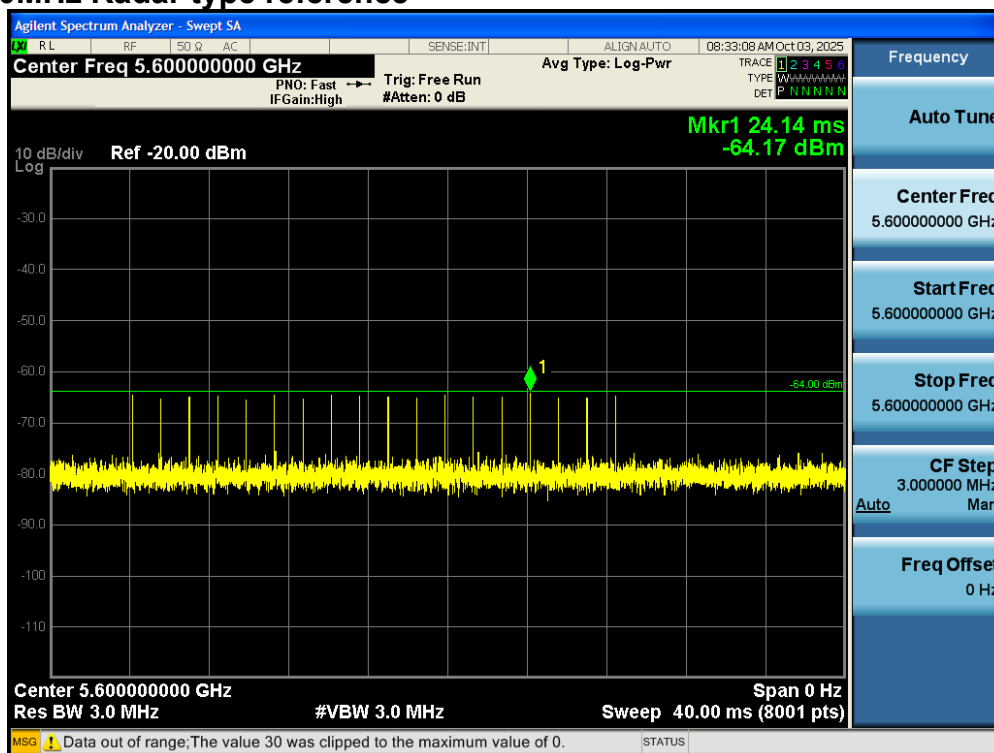


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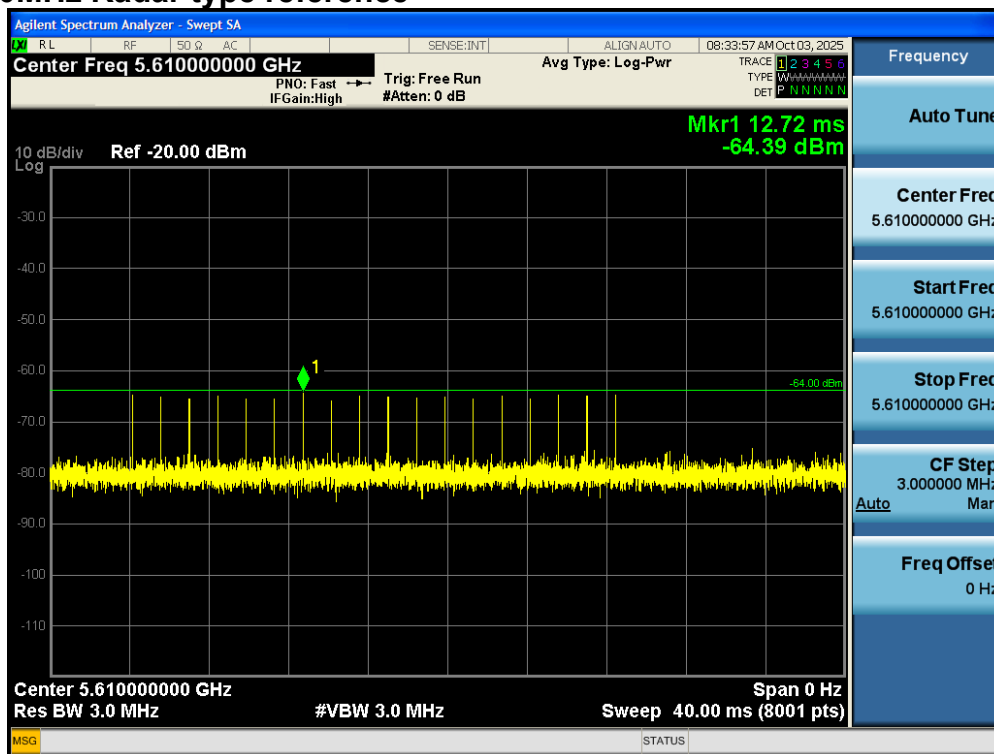
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5600-5650MHz for ISED VHT20_5600MHz Radar type reference



VHT80_5610MHz Radar type reference



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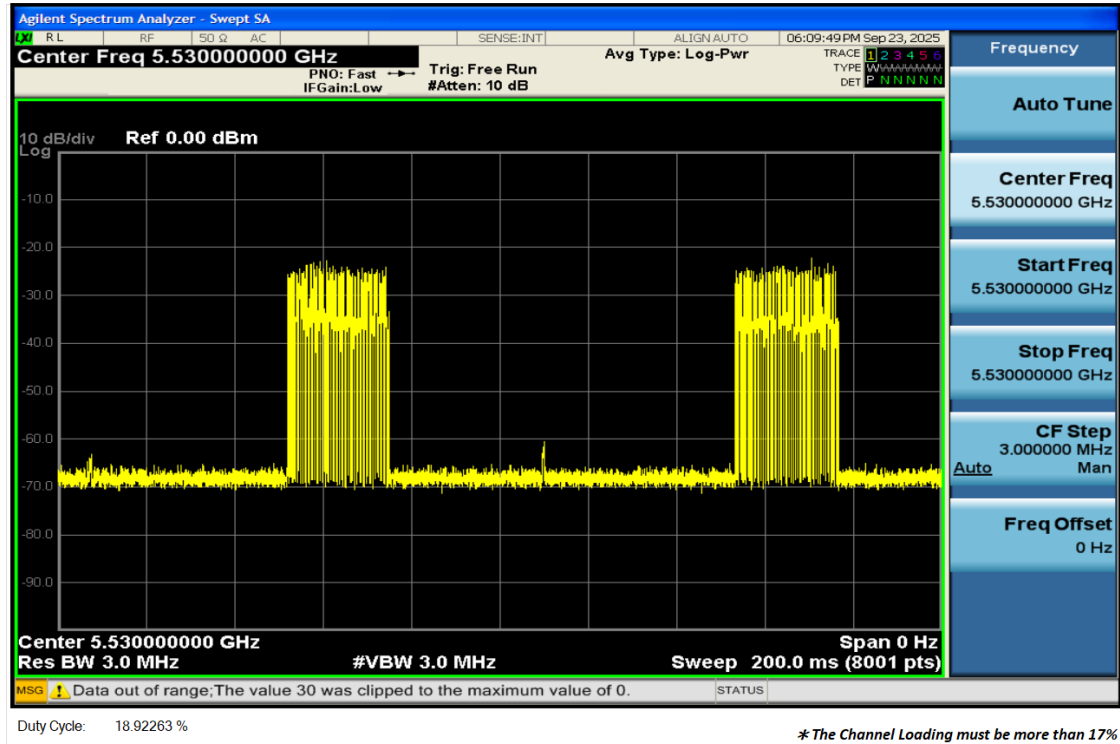
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6.3 WLAN traffic

VHT80_5530MHz

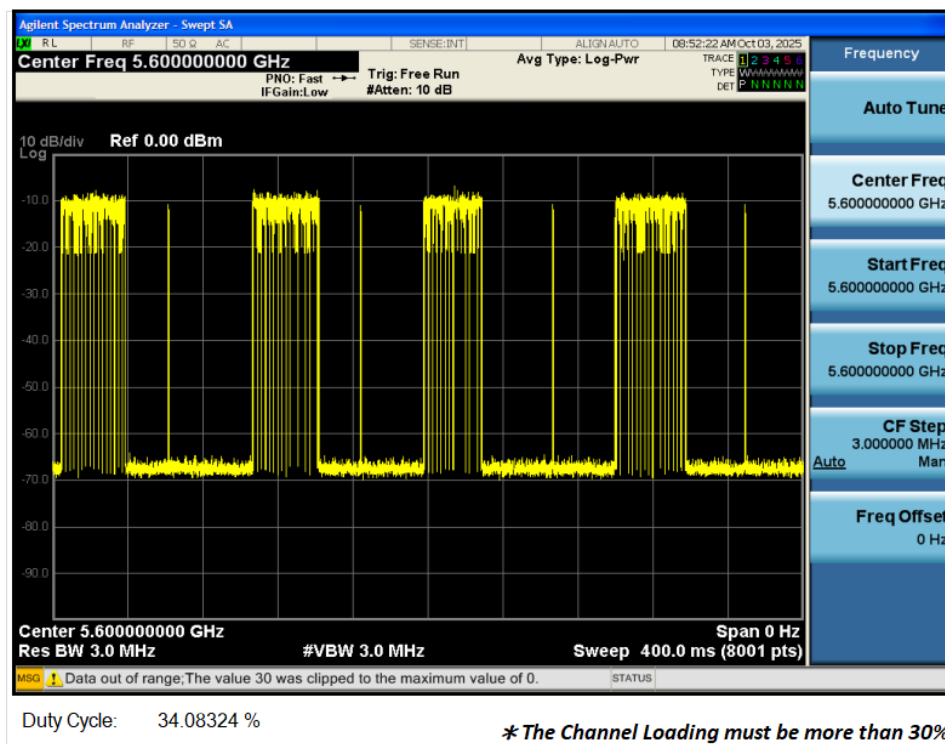


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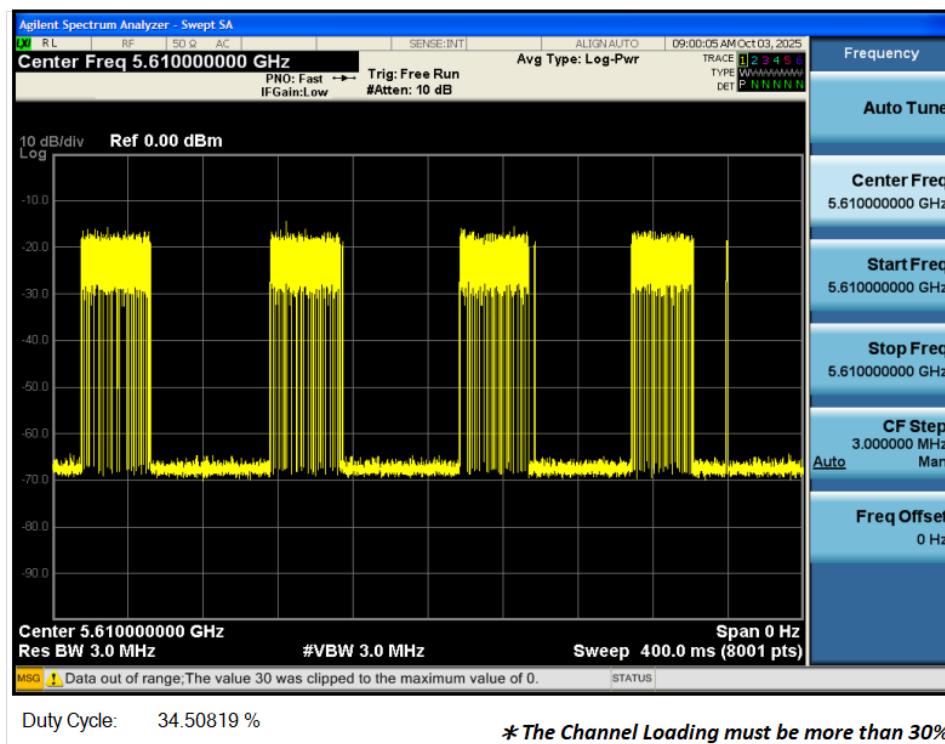
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5600-5650MHz for ISED VHT20_5600MHz



VHT80_5610MHz



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6.4 Channel closing transmission and Move time

Channel Shutdown Result				
Detection Threshold Level (dBm)			-64	
Modulation Mode	Freq. (MHz)	Radar Test Signal	Channel Closing Transmission Time(ms) 200ms~10sec	Channel Move Time(s)
VHT80	5530	Type 0	18	0.798
Limit			60 ms	10 sec
Result			Complied	

5600-5650MHz for ISSED

Channel Shutdown Result				
Detection Threshold Level (dBm)			-64 (DFS Detection Threshold:-62 + 10 - e.i.r.p. Spectral Density+Gain)	
Modulation Mode	Freq. (MHz)	Radar Test Signal	Channel Closing Transmission Time(ms)	Channel Move Time(s)
VHT20	5600	DFS-R-ref	96	0.850
VHT80	5610	DFS-R-ref	106	0.850
Limit			1000 ms	10 sec
Result			Complied	

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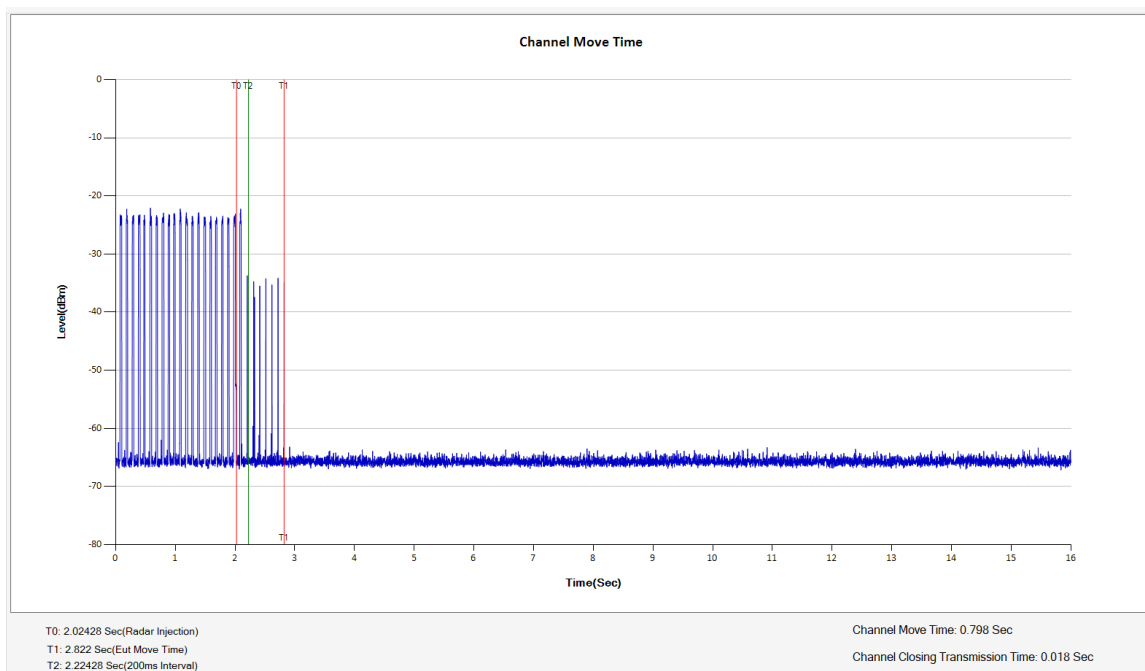
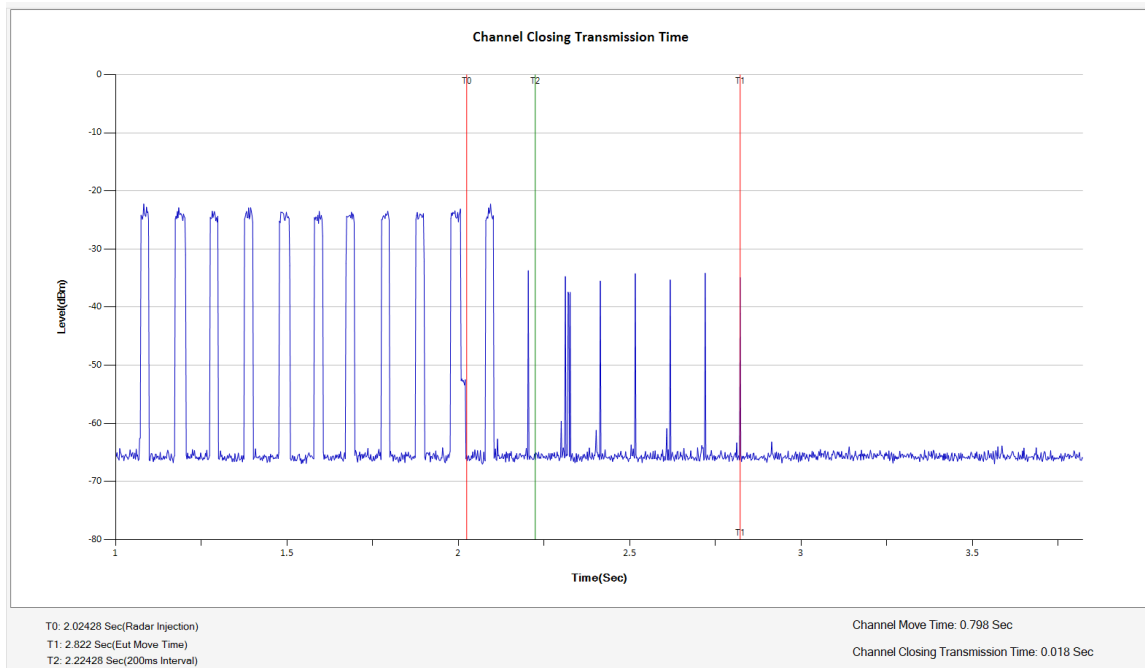
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VHT80_5530MHz

Channel Move and Closing Transmission Time – 1



Verdict: Note: narrowing the sweep time as the good engineering process for the verification of transmission closing in 200ms

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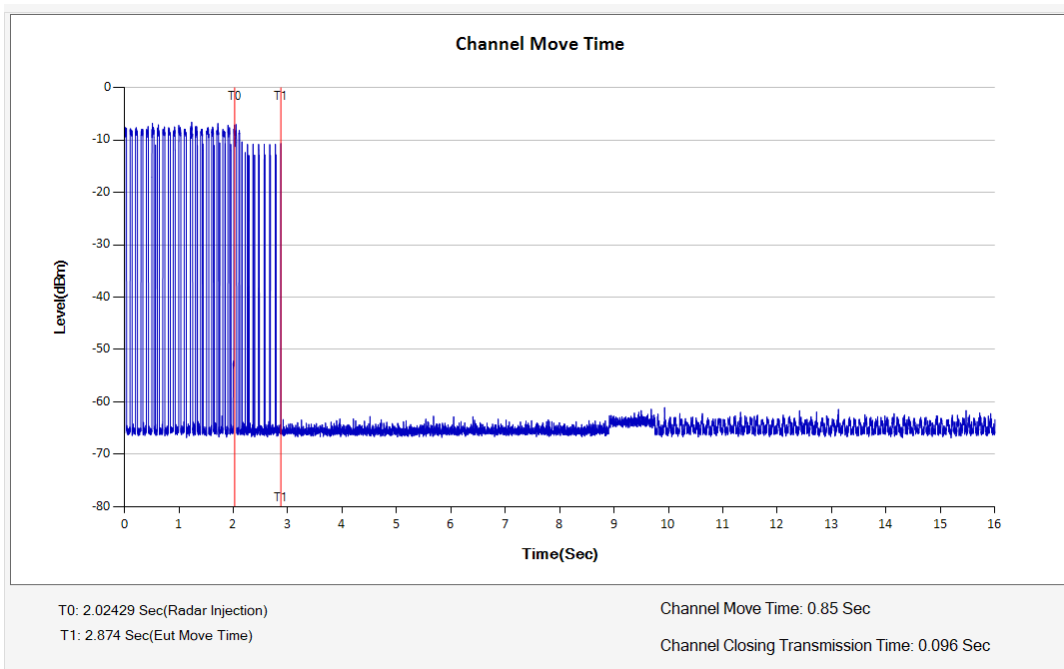
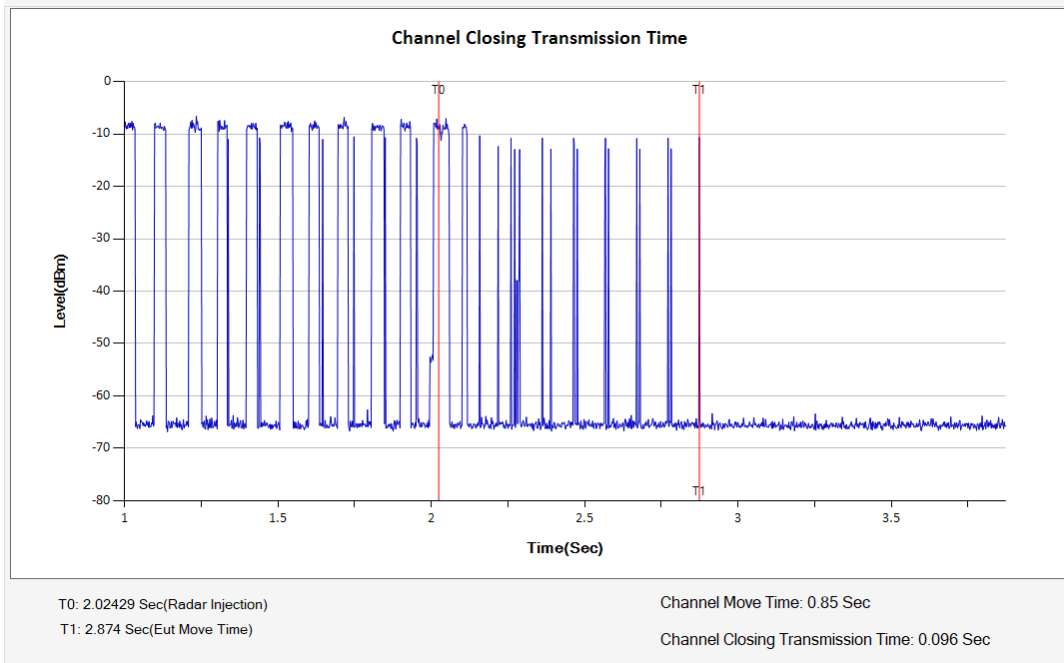
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5600-5650MHz for ISED

VHT20_5600MHz

Channel Move and Closing Transmission Time – 1



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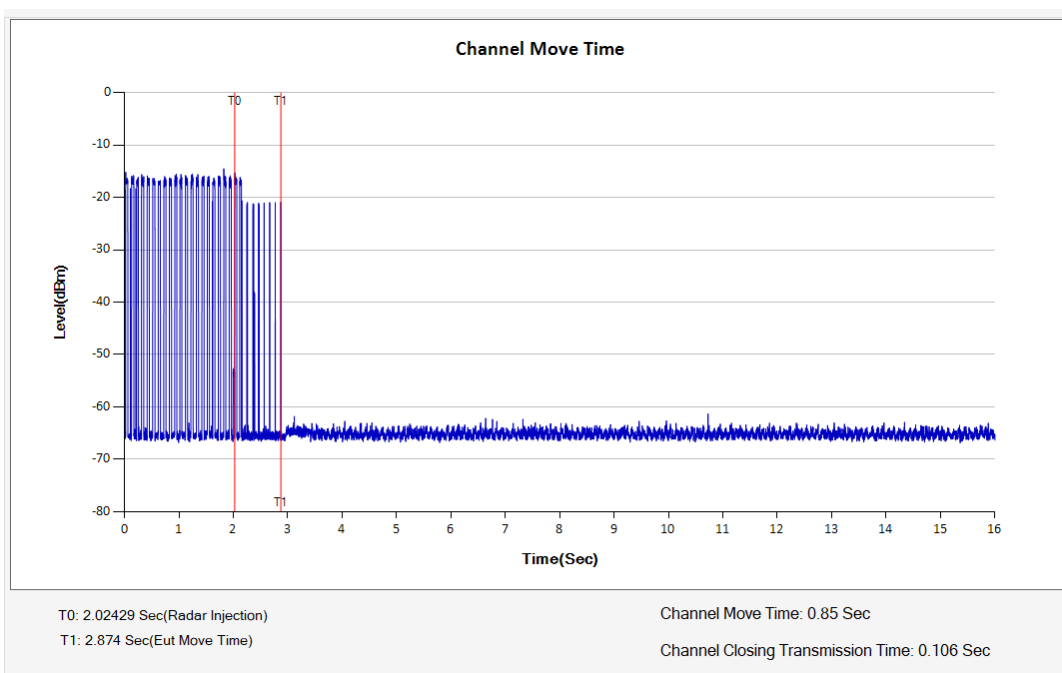
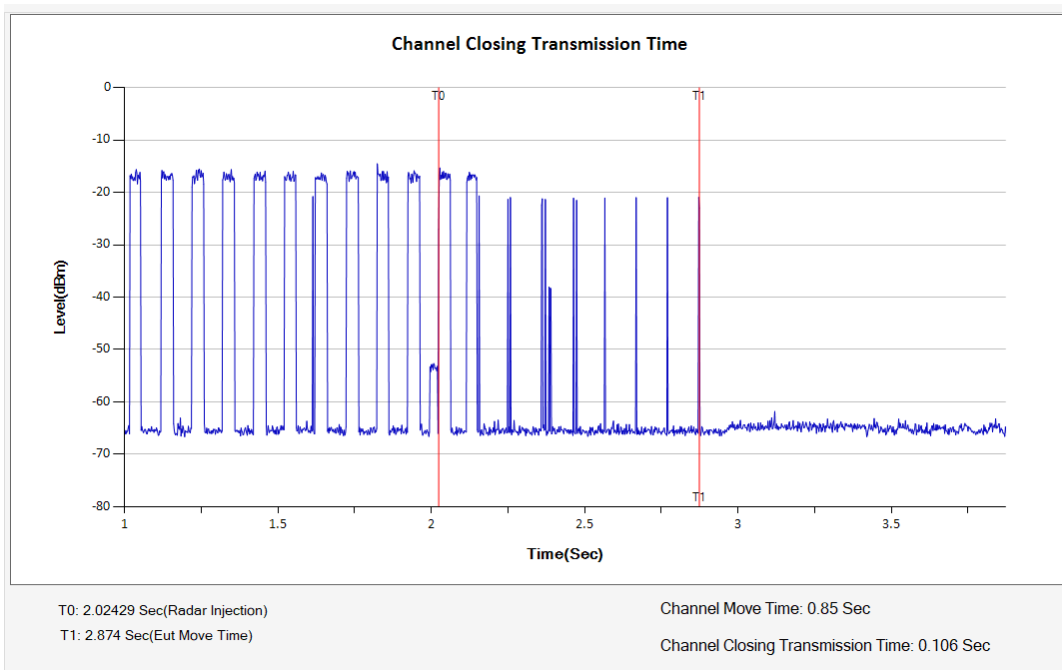
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VHT80_5610MHz

Channel Move and Closing Transmission Time – 1



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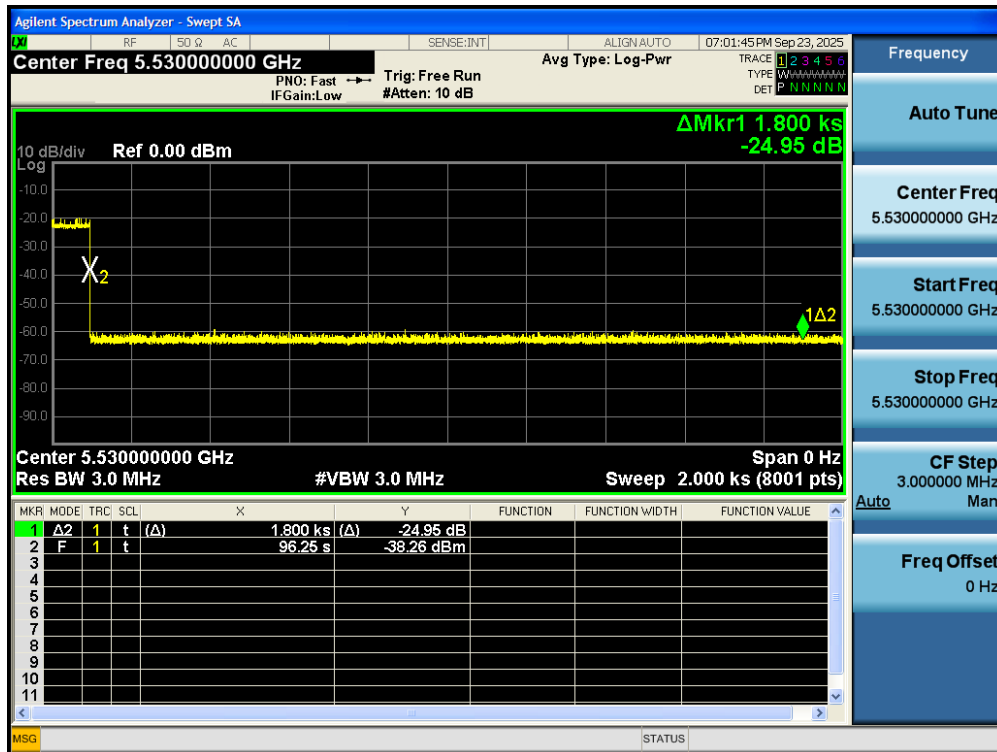
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6.5 Non-occupancy Period (without radar detection)

VHT80_5530MHz



Verdict: To verify whether channel is unavailable to be operated in 30 minutes.

$$1.8ks = 1800s = 1800 \text{ s/min} / 60 = 30\text{minute}$$

~ End of Report ~

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