

# PCTEL, Inc.

## REVISED TEST REPORT FOR 103235-41

**Industrial IoT Radio Module  
Model: RM-WIFI-AC-2X2-HP-US**

**Tested to The Following Standards:**

**FCC Part 15 Subpart E Section(s)**

**15.407 (h)(2)**

**Radar Detection Function of Dynamic Frequency Selection (DFS)**

**Report No.: 103235-41A**

**Date of issue: July 12, 2022**



This test report bears the accreditation symbol indicating that the testing performed herein meets the test and reporting requirements of ISO/IEC 17025 under the applicable scope of testing for CKC Laboratories, Inc.

We strive to create long-term, trust based relationships by providing sound, adaptive, customer first testing services. We embrace each of our customers' unique EMC challenges, not as an interruption to set processes, but rather as the reason we are in business.

**Test Certificate # 803.01**

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## ADMINISTRATIVE INFORMATION

### Test Report Information

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Customer Reference Number: 5406

Project Number: 103235

**DATE OF EQUIPMENT RECEIPT:**  
**DATE(S) OF TESTING:**

August 21, 2021  
August 23 – November 15, 2021

### Report Authorization

The test data contained in this report documents the observed testing parameters pertaining to and are relevant for only the equipment provided by the client, tested in the agreed upon operational mode(s) and configuration(s) as identified herein. Compliance assessment remains the client's responsibility. This report may not be used to claim product endorsement by A2LA or any government agencies. This test report has been authorized for release under quality control from CKC Laboratories, Inc.

A handwritten signature in black ink that reads 'Steve Behm'.

*Steve Behm*  
*Director of Quality Assurance & Engineering Services*  
*CKC Laboratories, Inc.*

## Test Facility Information



Our laboratories are configured to effectively test a wide variety of product types. CKC utilizes first class test equipment, anechoic chambers, data acquisition and information services to create accurate, repeatable and affordable test results.

TEST LOCATION(S):  
CKC Laboratories, Inc.  
110 Olinda Place  
Brea, CA 92823

## Software Versions

| CKC Laboratories Proprietary Software | Version |
|---------------------------------------|---------|
| EMITest Emissions                     | 5.03.20 |

## Site Registration & Accreditation Information

| Location                 | *NIST CB # | FCC    | Canada | Japan  |
|--------------------------|------------|--------|--------|--------|
| Canyon Park, Bothell, WA | US0103     | US1024 | 3082C  | A-0136 |
| Brea, CA                 | US0103     | US1024 | 3082D  | A-0136 |
| Fremont, CA              | US0103     | US1024 | 3082B  | A-0136 |
| Mariposa, CA             | US0103     | US1024 | 3082A  | A-0136 |

\*CKC's list of NIST designated countries can be found at: <https://standards.gov/cabs/designations.html>

## SUMMARY OF RESULTS

**Standard: FCC Part 15 Subpart E - 15.407(h)(2) (UNII) 5.25-5.35 GHz and 5.47-5.725 GHz bands**

| Requirement        | Test Procedure Clause         | Description   | Mods | Results |
|--------------------|-------------------------------|---|------|---------|
| 15.407(h)(2)       | 7.5                           | DFS Detection Threshold (master & client with DFS)          | NA   | Pass    |
| 15.407(h)(2)       | 7.8.1                         | UNII Detection Bandwidth (master & client with DFS)         | NA   | Pass    |
| 15.407(h)(2)(i)(A) | 7.8.2.1<br>7.8.2.2<br>7.8.2.3 | Channel Availability Check Time. (master & client with DFS) | NA   | Pass    |
| 15.407(h)(2)(ii)   |                               |   |      |         |
| 15.407(h)(2)(i)(B) | 7.8.3                         | Channel Move Time, Channel Closing Time                     | NA   | Pass    |
| 15.407(h)(2)(iii)  |                               | (master, client with DFS, client)                           |      |         |
| 15.407(h)(2)(iv)   | 7.8.3                         | Non-Occupancy Period (master & client with DFS, client)     | NA   | Pass    |
| 5.1 Table 2*       | 7.8.4                         | Statistical Performance Check (master & client with DFS)    | NA   | Pass    |
| 7.7*               | 7.7                           | Channel Loading (master and client with radar detection)    | NA   | Pass    |

NA = Not Applicable

\* KDB requirement.

### ISO/IEC 17025 Decision Rule

The declaration of pass or fail herein is based upon assessment to the specification(s) listed above, including where applicable, assessment of measurement uncertainties. For performance related tests, equipment was monitored for specified criteria identified in that section of testing.

## Modifications During Testing

This list is a summary of the modifications made to the equipment during testing.

### Modifications During Testing

No modifications were made during testing.

**Modifications listed above must be incorporated into all production units.**

## Conditions During Testing

This list is a summary of the conditions noted to the equipment during testing.

### Summary of Conditions

The EUT, a Limited modular approved radio device operating as a DFS Master and client without radar detection is placed on the test bench. Antenna 1, Antenna 2 ports are connected to several power dividers to enable communication with a Client/Master as applicable, received injected Radar signal from a signal generator and provide timing feedback to a spectrum analyzer for evaluation of DFS parameter.

The EUT is placed on a carrier board connected to a Host Access point via ribbon cable for data communication and DC power

See Appendix A and B for Test Setup Block Diagrams

## Test Procedure

The DFS testing presented in this report is perform in accordance with the following test procedure to meet the requirement

905462 D02 UNII DFS Compliance Procedures New Rules v02. April 8, 2016.

Each clause of the test procedure is identified in specific section of this report.

## EQUIPMENT UNDER TEST (EUT)

During testing numerous configurations may have been utilized. The configurations listed below support compliance to the standard(s) listed in the Summary of Results section.

### Configuration 1

**Equipment Tested:**

| Device                      | Manufacturer | Model #              | S/N |
|-----------------------------|--------------|----------------------|-----|
| Industrial IoT Radio Module | PCTEL, Inc.  | RM-WIFI-AC-2X2-HP-US | NA  |

**Support Equipment:**

| Device            | Manufacturer | Model #     | S/N          |
|-------------------|--------------|-------------|--------------|
| Laptop            | HP           | 17-by3613dx | PCTEL2772    |
| Laptop            | Lenovo       | R61         | L3-B7192     |
| Laptop            | Lenovo       | E530        | AN03319      |
| Dual Speed Hub    | Netgear      | DS309       | DS39A0800012 |
| AP Host           | Qualcomm     | N10P5TG1J   | PCTEL2765    |
| USB Wi-Fi Adaptor | Netgear      | AC1200      | NA           |

### Configuration 5

**Equipment Tested:**

| Device                      | Manufacturer | Model #              | S/N |
|-----------------------------|--------------|----------------------|-----|
| Industrial IoT Radio Module | PCTEL, Inc   | RM-WIFI-AC-2X2-HP-US | NA  |

**Support Equipment:**

| Device          | Manufacturer | Model #       | S/N           |
|-----------------|--------------|---------------|---------------|
| Laptop          | Dell         | Latitude 5490 | PCTEL2620     |
| AP Host         | Qualcomm     | N10P5TG1J     | PCTEL2765     |
| Laptop          | Lenovo       | T400          | 2764CT0       |
| Wireless Router | Netgear      | R7800         | 4H487A5U02B6F |

## General Product Information:

| Product Information               |  | Manufacturer-Provided Details   |
|-----------------------------------|--|---|
| Equipment Type:                   |  | Radio Module  |
| Operational Mode(s):              |  | <input checked="" type="checkbox"/> Master<br><input type="checkbox"/> Client with Radar Detection<br><input checked="" type="checkbox"/> Client without Radar Detection  |
| FCCID of Master Used for Testing: |  | Client mode was tested with<br>FCCID: PY315100319   |
| Network Type:                     |  | <input checked="" type="checkbox"/> Bridge<br><input type="checkbox"/> ...Mesh<br><input checked="" type="checkbox"/> Access Point  |
| System Architecture:              |  | 802.11a, 802.11VHT20, 802.11 VHT40, 802.11 VHT80<br><br>*Non-H20T protocol is intended for beacon and NOT for data transfer.  |
| Operating Frequency Range(s):     |  | <input checked="" type="checkbox"/> 5150-5250 MHz<br><input checked="" type="checkbox"/> 5250-5350 MHz<br><input checked="" type="checkbox"/> 5470-5725 MHz<br><input checked="" type="checkbox"/> 5725-5850 MHz                            |
| Modulation Type(s):               |  | OFDM , BPSK,QPSK, 16QAM, 64QAM, 256QAM  |
| Channel bandwidth(s):             |  | <input checked="" type="checkbox"/> 20 MHz<br><input checked="" type="checkbox"/> 40 MHz<br><input checked="" type="checkbox"/> 80 MHz<br><input type="checkbox"/> 160MHz contiguous<br><input type="checkbox"/> 80 MHz+80MHz noncontiguous |
| Measured 99% BW:                  |  | 5470-5725 MHz<br>802.11a : 16.1MHz<br>802.11VHT20 : 17.9 MHz<br>802.11VHT40 : 37.4 MHz<br>802.11VHT80 : 76.2 MHz  |
| Maximum Duty Cycle:               |  | 98%   |
| Highest Power (EIRP, dBm/Watt):   |  | 29.4dBm   |
| Lowest Power (EIRP, dBm/Watt):    |  | 21.6dBm   |
| Number of TX/RX Chains:           |  | 2   |
| Antenna Type(s) and Gain:         |  | Omnidirectional<br>Max: 7 dBi<br>Min: 3.1 dBi   |
| Antenna cable loss                |  | Max cable loss: 2dB   |
| Beamforming Capable:              |  | Yes   |
| Antenna Connection Type:          |  | External Connector  |
| Antenna Impedance (ohm):          |  | 50  |
| Nominal Input Voltage:            |  | 3.3V DC from host   |
| Boot up time from power cycle:    |  | 50 Seconds  |
| Manufacturer Statement:           | The manufacturer has confirmed that information regarding the parameters of the detected Radar Waveforms is not available to the end user. |   |

| Product Information                |  | Manufacturer-Provided Details  |  |
|------------------------------------|--|--|--|
| Firmware / Software used for Test: |  | Linux version 3.14.77 (user@ubuntu-16)<br>(gcc version 4.8.3 (OpenWrt/Linaro GCC 4.8-2014.04 8574ee4+r49254) |  |

| Part Number        | Description  | 2.4 GHz Gain | 5 GHz Gain |
|--------------------|--|--------------|------------|
| MPAMB24495804      | 2.4-2.5/4.9-5.925 GHz Dual Band Omni Antennas w/RPTNC connector  | 4 dBi        | 4 dBi      |
|                    | RPTNC-to-SMA adapters  |              |            |
|                    | SMA-to-U.FL Adapters   |              |            |
|                    | U.FL cables (7.874")   |              |            |
| BOA51004NM         | 5.1-5.9 GHz 4 dBi Omni Antenna   | NA           | 4 dBi      |
| MHODB24490507NM-IP | 2.4-2.5/4.94 - 5.925 GHz Omni Antenna, 5/7 dBi Gain<br>Cable Assembly, AMC (U.FL) - to- N Female, RG-178, 5.905" | 5 dBi        | 7 dBi      |
| AED2451PT155UFL    | Circuit board-based dual-band dipole with 155 mm U.FL pigtail cable  | 2 dBi        | 3.1 dBi    |
| AEMH51PT155UFL     | Circuit-board-based 5 GHz horizontally polarized monopole with 155 mm U.FL pigtail cable                         | NA           | 4.3 dBi    |
| AEMV2451PT155UFL   | Bent-metal dual-band monopole with 155 mm U.FL pigtail cable   | 2.6 dBi      | 3.6 dBi    |
| AEPV2451PT155UFL   | Bent metal dual-band PIFA with 155 mm U.FL pigtail cable   | 4.5 dBi      | 4.8 dBi    |

**EUT and Support Equipment Photo(s)**



EUT, View 1



EUT, View 1



Laptop, Master Mode 1



Laptop, Master Mode 2



Laptop, Client Mode 1



Laptop, Client Mode 1

| Test Equipment |                         |                |                          |           |           |
|----------------|-------------------------|----------------|--------------------------|-----------|-----------|
| Asset#         | Description             | Manufacturer   | Model                    | Cal Date  | Cal Due   |
| 02672          | Spectrum Analyzer       | Agilent        | E4446A                   | 4/29/2020 | 4/29/2022 |
| 07657          | cable                   | Astrolab, Inc. | 32022-29094K-29094K-24TC | 7/30/2020 | 7/30/2022 |
| 03592          | Vector Signal Generator | Keysight       | N5182B                   | 1/18/2020 | 1/18/2022 |
| P07134         | Attenuator              | Weinschel      | 3M10                     | NCR       | NCR       |
| P07135         | Attenuator              | Weinschel      | 3M10                     | NCR       | NCR       |
| P07181         | Attenuator              | Weinschel      | 3M30                     | NCR       | NCR       |
| P07182         | Attenuator              | Weinschel      | 3M30                     | NCR       | NCR       |
| P06794         | Splitter/Combiner       | Anaren         | 41130                    | 4/6/2021  | 4/6/2023  |
| P07137         | Power Divider           | Anaren         | 41130                    | 8/5/2021  | 8/5/2023  |
| P07209         | Power Divider           | Anaren         | 40297                    | 4/6/2021  | 4/6/2023  |
| P07655         | Cable                   | Astrolab, Inc. | 32022-29094K-29094K-24TC | 7/30/2020 | 7/30/2022 |
| P07660         | Cable                   | Astrolab, Inc. | 32022-29094K-29094K-24TC | 7/30/2020 | 7/30/2022 |

NCR = No Calibration Required

| Environmental Conditions |    |                        |    |
|--------------------------|----|------------------------|----|
| Temperature (°C)         | 26 | Relative Humidity (%): | 52 |

Unless otherwise noted, all test performed under the listed environmental condition.

| Waveform information.   |
|---|
| The waveforms used are commercially available pre-defined DFS waveform per Agilent N7607B Signal Studio for DFS radar profile. The waveforms meeting the following requirement. |
| USA : FCC15.407, FCC-13-22  |

## FCC Part 15 Subpart E

### Requirements

**Table 1: Applicability of DFS Requirements Prior to Use of a Channel**

| Requirement                            | Operational Mode |                                |                             |
|--|------------------|--------------------------------|-----------------------------|
|  | Master           | Client Without Radar Detection | Client With Radar Detection |
| <i>Non-Occupancy Period</i>            | Yes              | Not required                   | Yes                         |
| <i>DFS Detection Threshold</i>         | Yes              | Not required                   | Yes                         |
| <i>Channel Availability Check Time</i> | Yes              | Not required                   | Not required                |
| <i>U-NII Detection Bandwidth</i>       | Yes              | Not required                   | Yes                         |

**Table 2: Applicability of DFS requirements during normal operation**

| Requirement                              | Operational Mode                             |                                |
|--|--|--------------------------------|
|  | Master Device or Client with Radar Detection | Client Without Radar Detection |
| <i>DFS Detection Threshold</i>           | Yes  | Not required                   |
| <i>Channel Closing Transmission Time</i> | Yes  | Yes                            |
| <i>Channel Move Time</i>                 | Yes  | Yes                            |
| <i>U-NII Detection Bandwidth</i>         | Yes  | Not required                   |

| Additional requirements for devices with multiple bandwidth modes  | Master Device or Client with Radar Detection | Client Without Radar Detection                       |
|--|--|--|
| <i>U-NII Detection Bandwidth and Statistical Performance Check</i>   | All BW modes must be tested                  | Not required   |
| <i>Channel Move Time and Channel Closing Transmission Time</i>   | Test using widest BW mode available          | Test using the widest BW mode available for the link |
| <i>All other tests</i>   | Any single BW mode                           | Not required   |
| <b>Note:</b> 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. |  |  |

**Table 3: DFS Detection Thresholds for Master Devices and Client Devices with Radar Detection**

| Maximum Transmit Power   | Value<br>(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                          |
| <p><b>Note 1:</b> This is the level at the input of the receiver assuming a 0 dBi receive antenna.</p> <p><b>Note 2:</b> 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.</p> <p><b>Note 3:</b> EIRP is based on the highest antenna gain. For MIMO devices refer to KDB Publication 662911 D01.</p> |                                  |

**Table 4: DFS Response Requirement Values**

| Parameter  | Value   |
|--|---|
| <i>Non-occupancy period</i>  | Minimum 30 minutes  |
| <i>Channel Availability Check Time</i>   | 60 seconds  |
| <i>Channel Move Time</i>   | 10 seconds<br>See Note 1.   |
| <i>Channel Closing Transmission Time</i>   | 200 milliseconds + an aggregate of 60 milliseconds over remaining 10 second period.<br>See Notes 1 and 2. |
| <i>U-NII Detection Bandwidth</i>   | Minimum 100% of the U-NII 99% transmission power bandwidth. See Note 3.                                   |
| <p><b>Note 1:</b> <i>Channel Move Time</i> and the <i>Channel Closing Transmission Time</i> should be performed with Radar Type 0. The measurement timing begins at the end of the Radar Type 0 burst.</p> <p><b>Note 2:</b> The <i>Channel Closing Transmission Time</i> is comprised of 200 milliseconds starting at the beginning of the <i>Channel Move Time</i> plus any additional intermittent control signals required to facilitate a <i>Channel</i> 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.</p> <p><b>Note 3:</b> During the <i>U-NII Detection Bandwidth</i> 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.</p> |   |

## 15.407(h)(2) DFS Detection Threshold

| Test Setup/Conditions |  |                |           |
|-----------------------|--|----------------|-----------|
| Test Location:        | Brea Lab Bench   | Test Engineer: | E. Wong   |
| Test Method:          | 7.5  | Test Date(s):  | 8/23/2021 |
| Configuration:        | 1  |                |           |
| Test Setup:           | <p>Conducted</p> <p>Detection threshold is adjusted with test method as illustrated in test setup diagram.</p> <p>A spectrum analyzer with Peak detector activated, set at zero span and RBW and VBW &gt;3 MHz was used for measurement of DFS detection threshold. Measurement made at Antenna port.</p> <p>Each Radar waveform is loaded into the Vector Signal Generator and triggered. The RF output level of the Signal generator with each waveform is adjust test until the measured signal level at measuring point to be injected to the antenna port of the master device reaches the required equivalent DFS detection threshold.</p> <p>All other ports of test system are terminated to 50-ohm load.</p> <p>The signal output level of the vector signal generator is recorded and used for regeneration of test level.</p> <p>Waveform 13-22</p> |                |           |

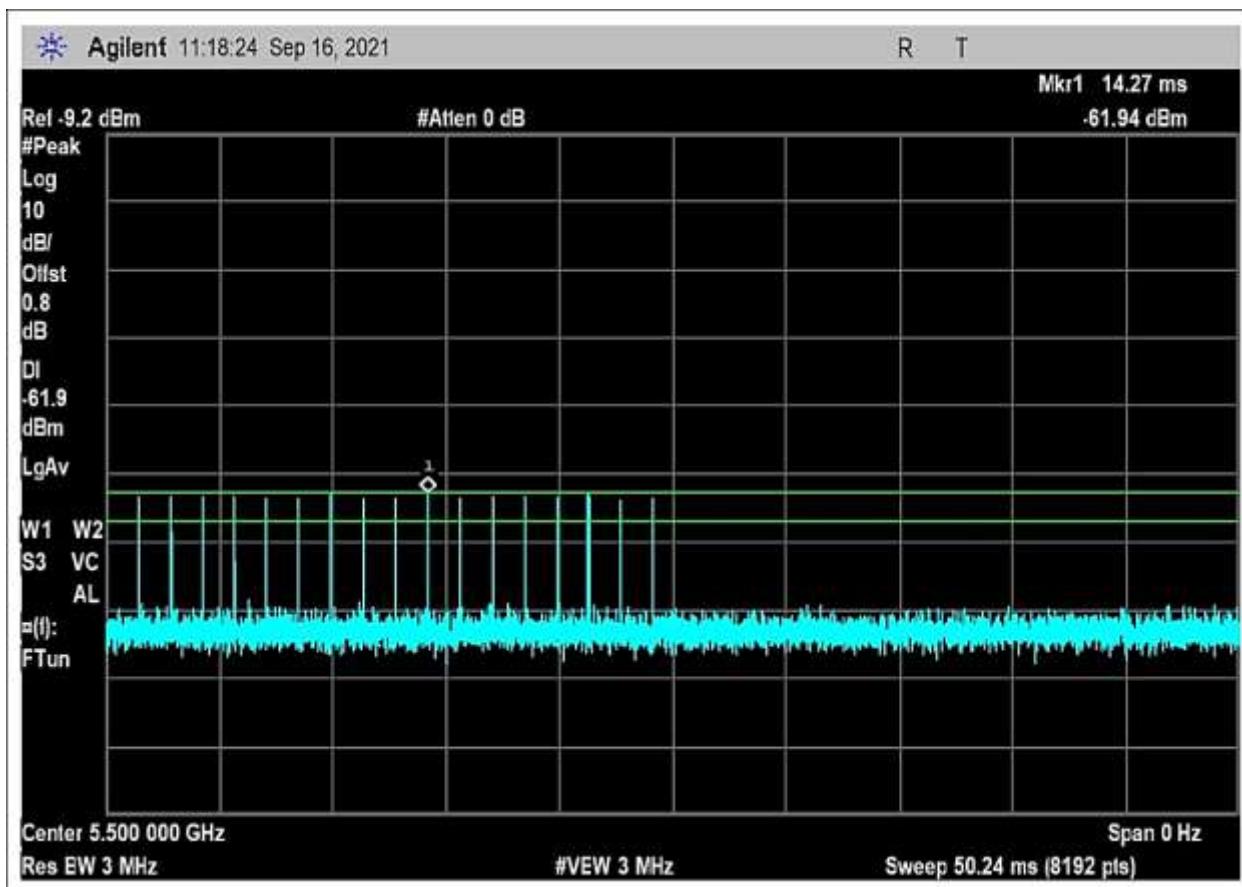
| Calibration Data Summary |               |  |                        |                     |                                    |                                     |                      |                     |
|--------------------------|---------------|--|------------------------|---------------------|------------------------------------|-------------------------------------|----------------------|---------------------|
| Antenna Port: 1 and 2    |               |  |                        |                     |                                    |                                     |                      |                     |
| Frequency (MHz)          | Waveform Type | Detection Threshold<br>See note1 (dBm) | Min antenna Gain (dBi) | Max cable Loss (dB) | Additional level<br>See note2 (dB) | Required Equivalent Threshold (dBm) | Measured Level (dBm) | Sig Gen Level (dBm) |
| 5500                     | 0             | -64                                    | 3.1                    | 2                   | 1                                  | -61.9                               | -61.9                | 5.5                 |
| 5500                     | 1             | -64                                    | 3.1                    | 2                   | 1                                  | -61.9                               | -61.9                | 5.5                 |
| 5500                     | 2             | -64                                    | 3.1                    | 2                   | 1                                  | -61.9                               | -61.9                | 5.5                 |
| 5500                     | 3             | -64                                    | 3.1                    | 2                   | 1                                  | -61.9                               | -61.9                | 5.5                 |
| 5500                     | 4             | -64                                    | 3.1                    | 2                   | 1                                  | -61.9                               | -61.9                | 5.5                 |
| 5500                     | 5             | -64                                    | 3.1                    | 2                   | 1                                  | -61.9                               | -61.9                | 5.5                 |
| 5500                     | 6             | -64                                    | 3.1                    | 2                   | 1                                  | -61.9                               | -61.9                | 11.5                |

Req threshold at input of the receiver = Detection threshold + min antenna gain – max cable loss + additional level.

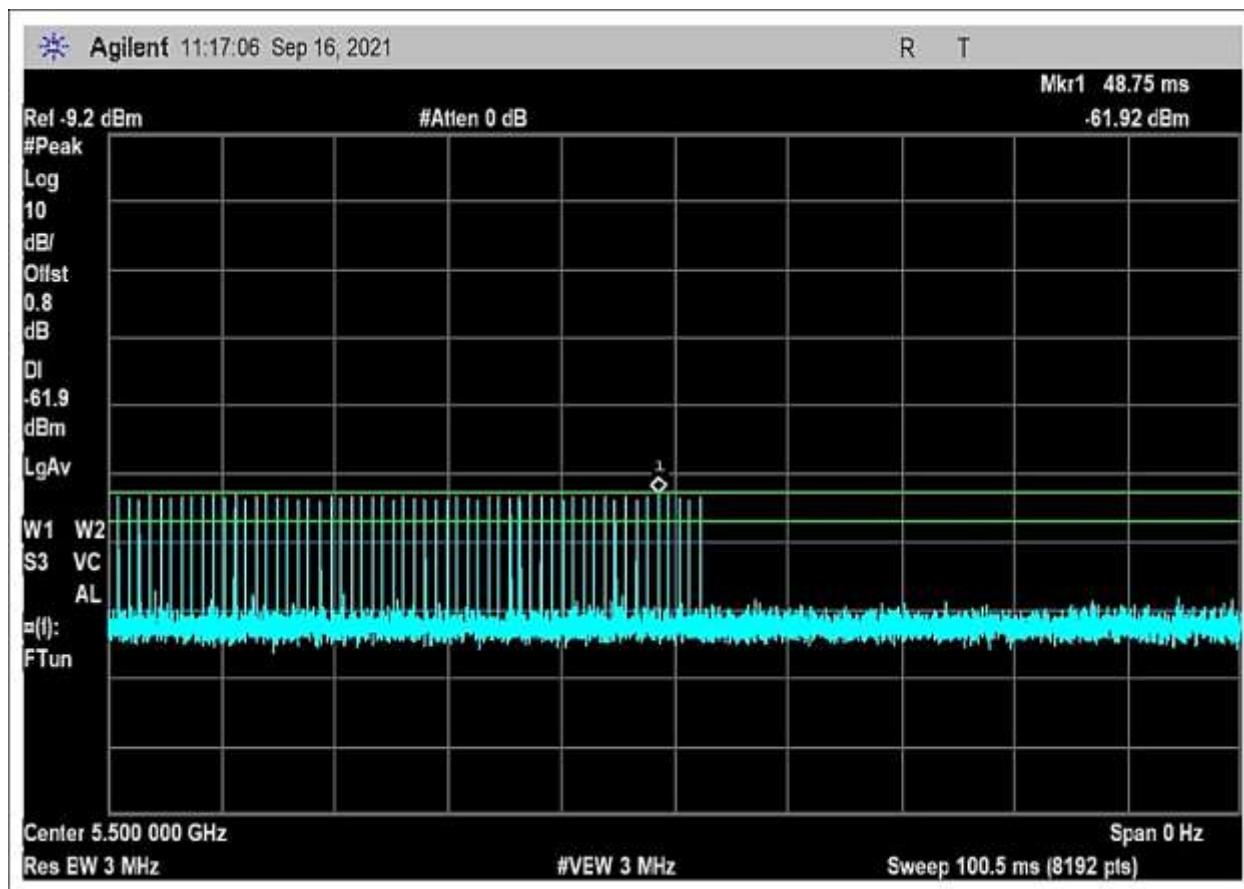
### DFS Detection Thresholds

| Maximum Transmit Power  | Value<br>(See Notes 1, 2, and 3) |
|---|----------------------------------|
| EIRP $\geq$ 200 milliwatt   | -64 dBm                          |
| EIRP $<$ 200 milliwatt and<br>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.<br>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.<br>Note3: EIRP is based on the highest antenna gain. For MIMO devices refer to KDB Publication 662911 D01. |                                  |

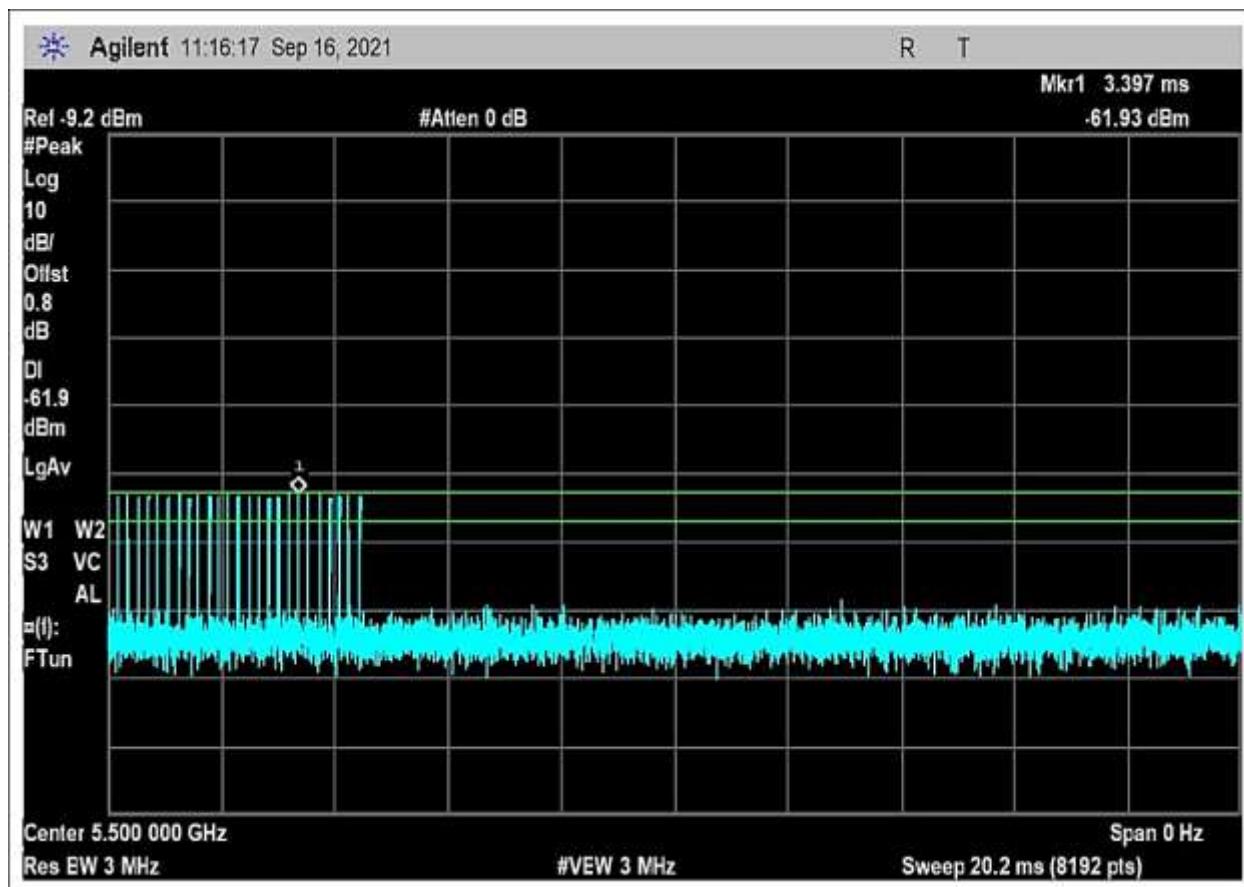
### Plot(s)



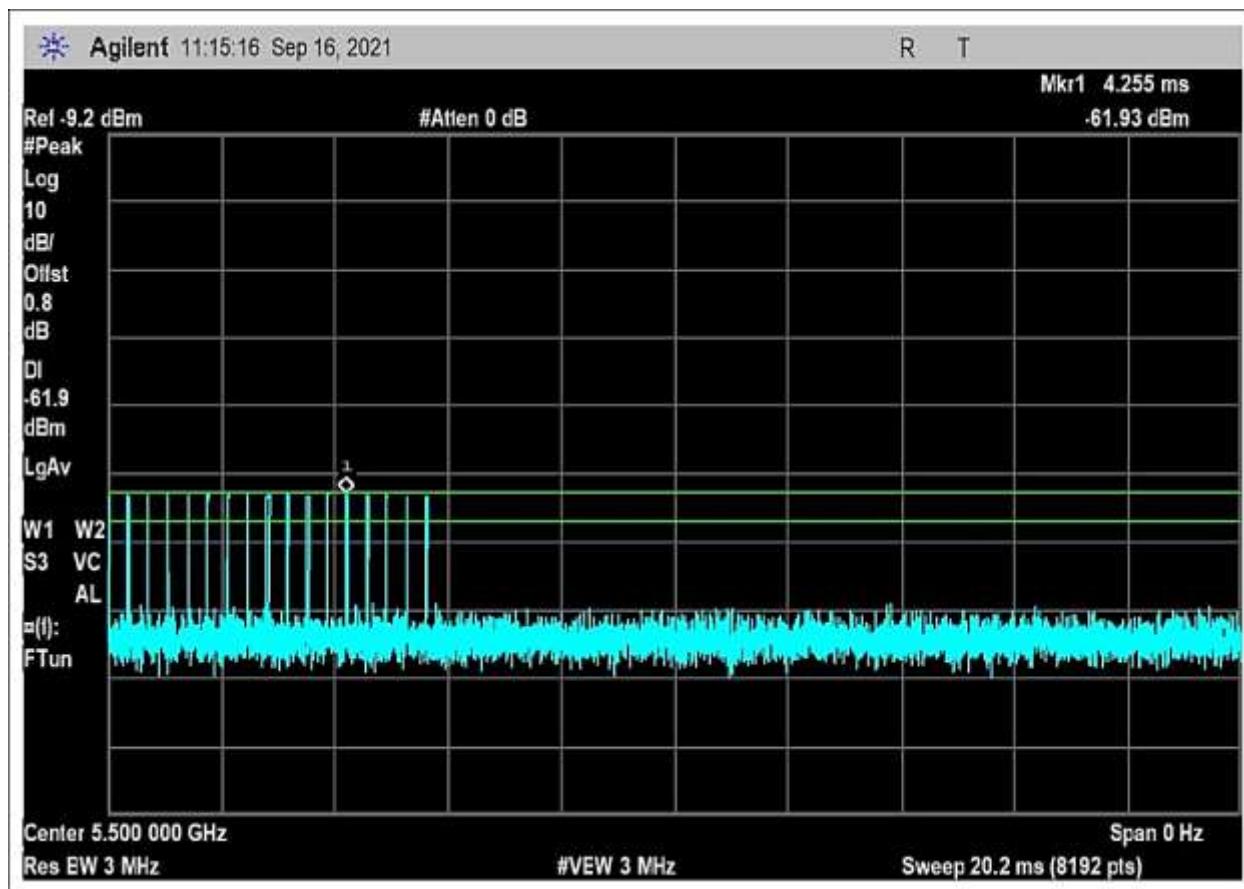
Type 0: Short Pulse Radar Type



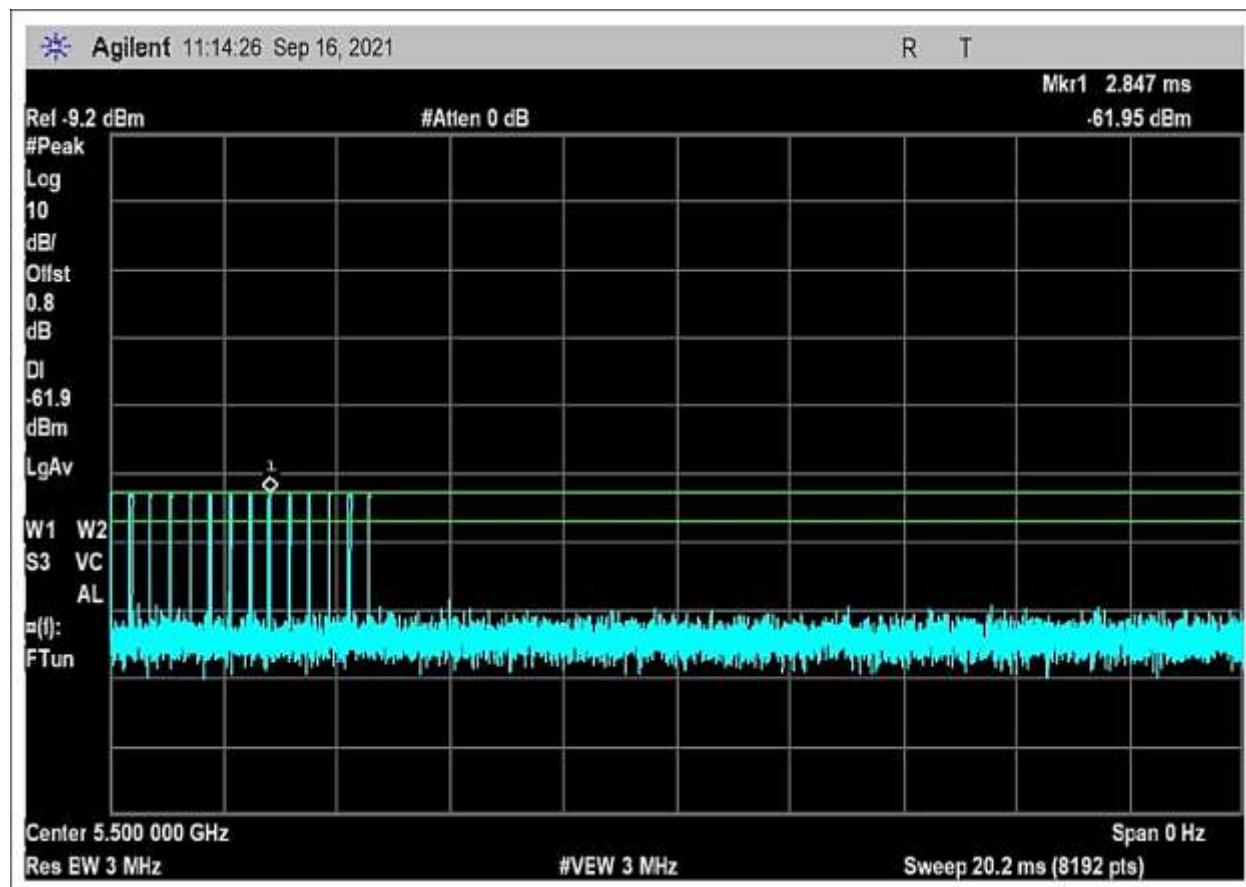
Type 1: Short Pulse Radar Type



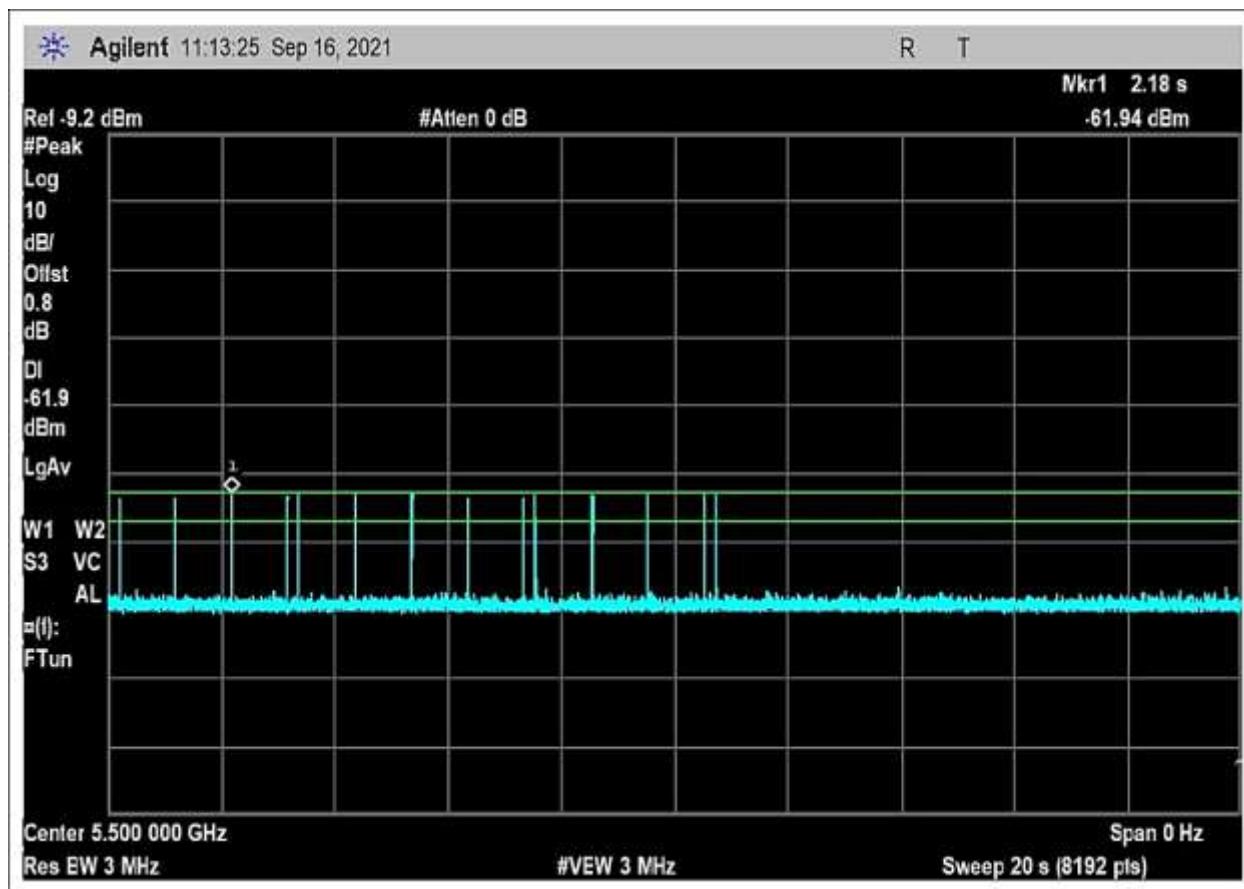
Type 2: Short Pulse Radar Types



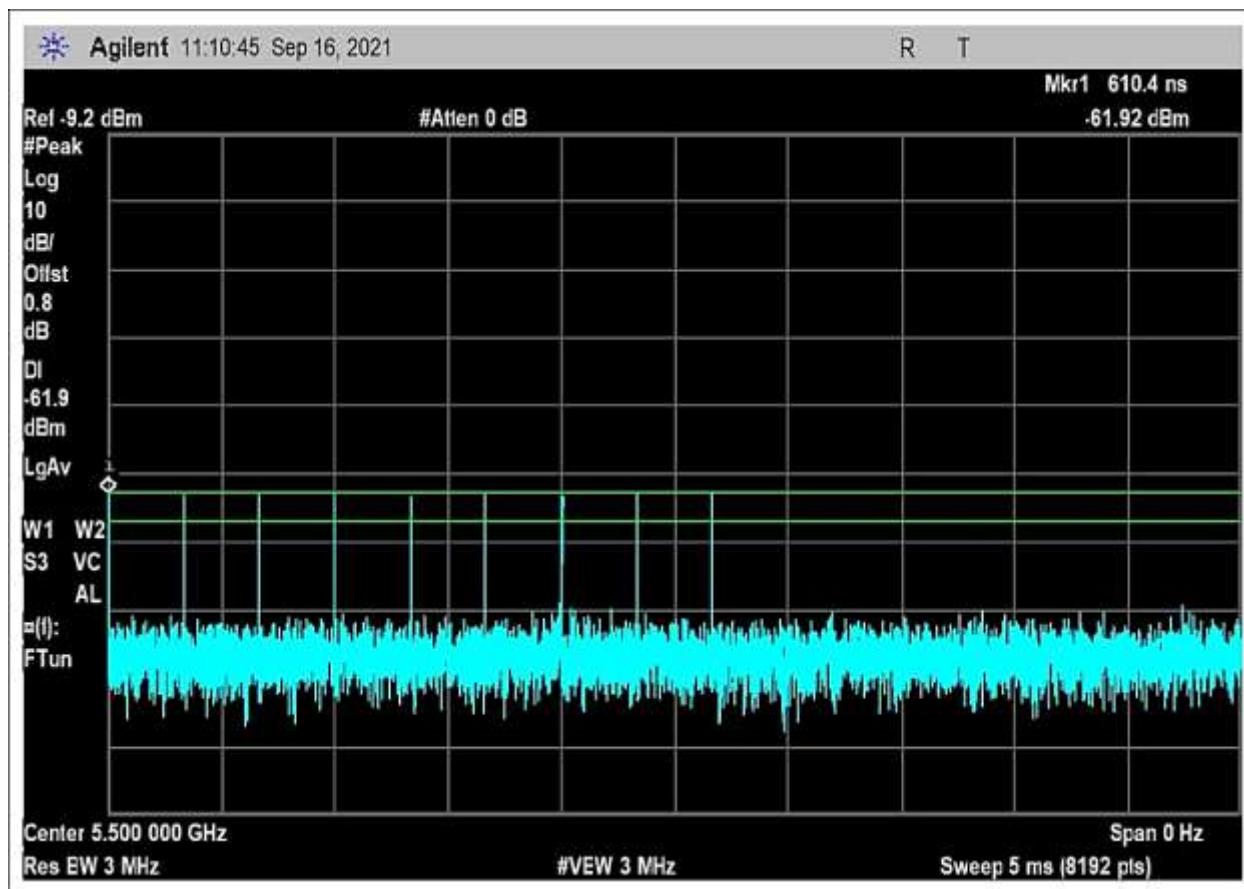
Type 3: Short Pulse Radar Type



Type 4: Short Pulse Radar Types



Type 5: Long Pulse Radar Type, plot of a single burst (1-3 pulses) on the  
 Channel frequency should be provided.



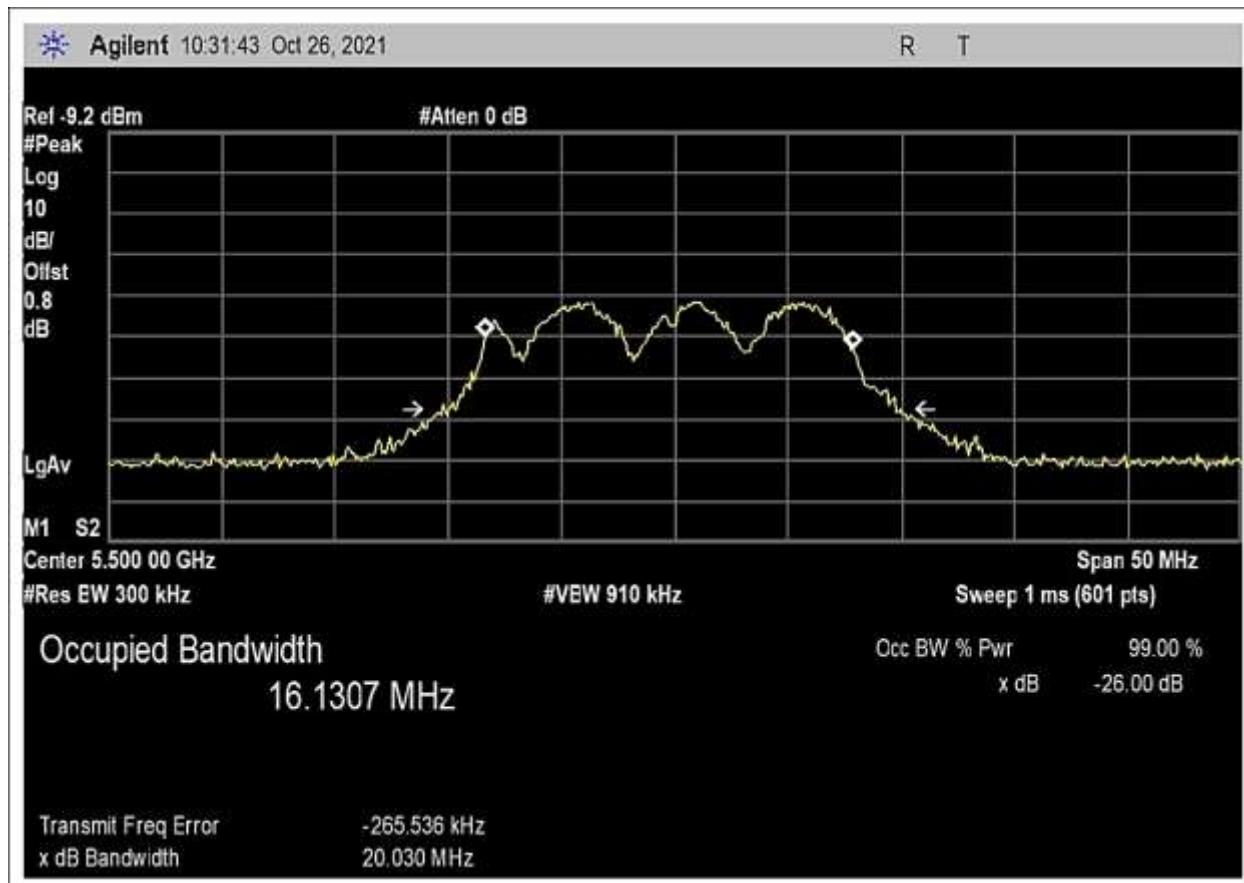
Type 6: Frequency Hopping waveform, a plot showing 9 pulses on one frequency within the UNII Detection Bandwidth should be provided.

## 15.407(h)(2) UNII Detection Bandwidth

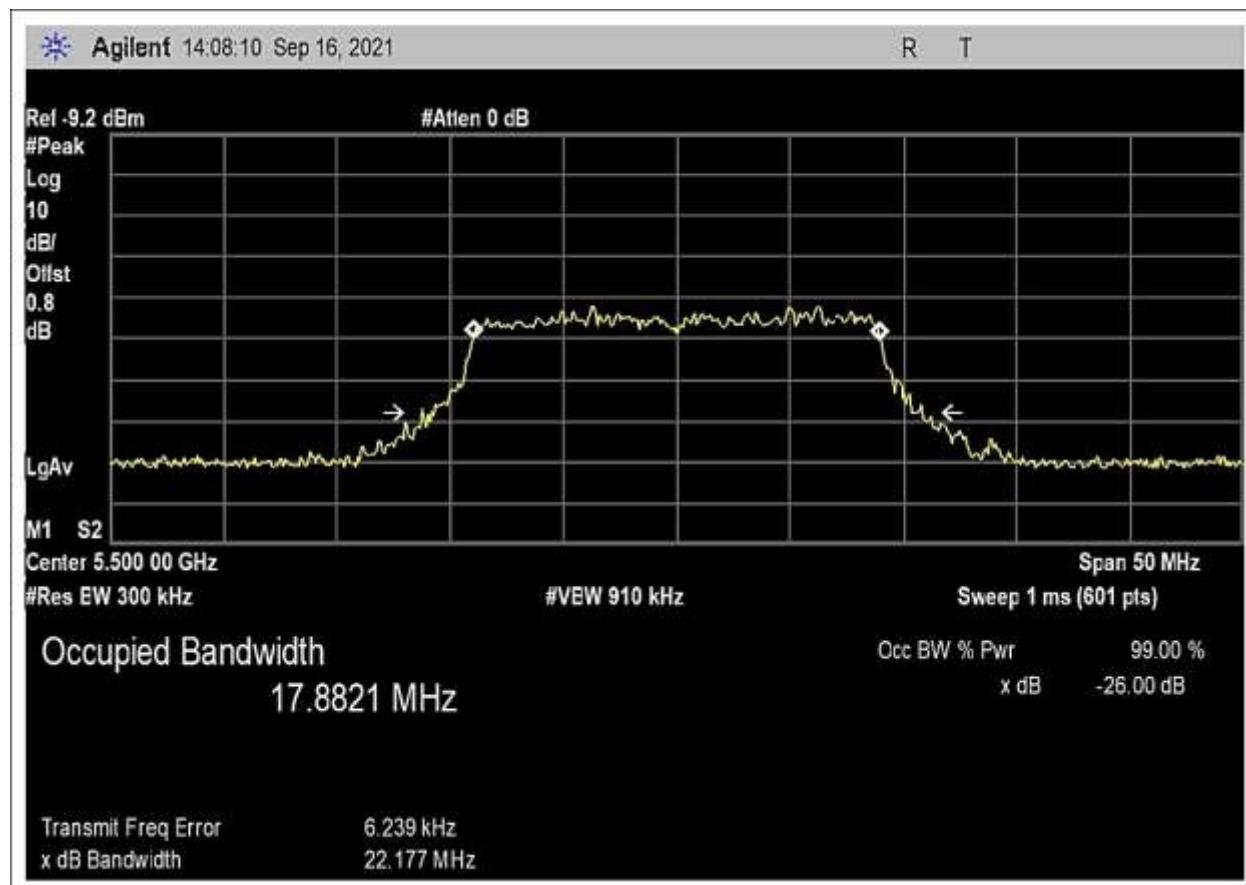
| Test Setup/Conditions |  |                |            |
|-----------------------|--|----------------|------------|
| Test Location:        | Brea Lab Bench   | Test Engineer: | E. Wong    |
| Test Method:          | 7.8.1  | Test Date(s):  | 10/26/2021 |
| Configuration:        | 1  |                |            |
| Test Setup:           | Conducted<br>UNII detection was measured as illustrated in setup diagram.<br>The EUT is set up as a standalone device (no associated Client or Master, as appropriate) and no traffic.<br><br>Frame based systems is set to a talk/listen ratio reflecting the worst case (maximum) that is user configurable during this test as applicable.<br><br>UNII detection bandwidth of each protocol was evaluated.<br><br>Response of the EUT is monitored by Laptop #3 which is connected to the Master via Comm port. The response of the EUT to radar detection is monitored Terminal emulator program TeraTerm installed.<br><br>Test performed for all available BW modes. |                |            |

| Test Data Summary      |          |             |                    |              |              |           |         |
|------------------------|----------|-------------|--------------------|--------------|--------------|-----------|---------|
| Radar Waveform Type: 0 |          |             |                    |              |              |           |         |
| Fl (MHz)               | Fh (MHz) | Protocol    | Detection BW (MHz) | 99% BW (MHz) | Ratio BW (%) | Limit (%) | Results |
| 5490                   | 5510     | 802.11a     | 20                 | 16.1         | 124.2        | >100      | Pass    |
| 5490                   | 5510     | 802.11VHT20 | 20                 | 17.9         | 111.7        | >100      | Pass    |
| 5490                   | 5530     | 802.11VHT40 | 40                 | 37.4         | 107.0        | >100      | Pass    |
| 5490                   | 5570     | 802.11VHT80 | 80                 | 76.2         | 105.0        | >100      | Pass    |
| 5490                   | 5510     | 802.11a     | 20                 | 16.1         | 124.2        | >100      | Pass    |

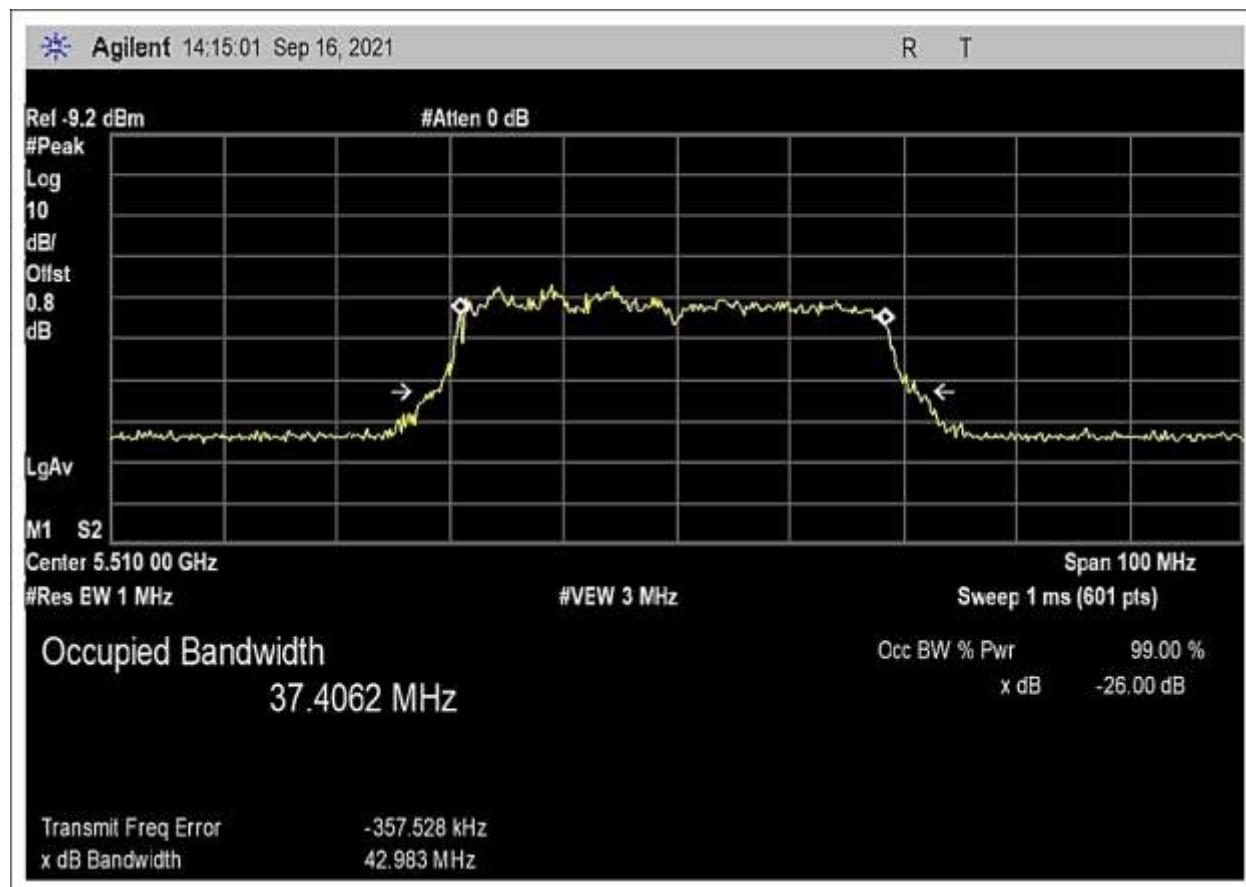
Plot(s)



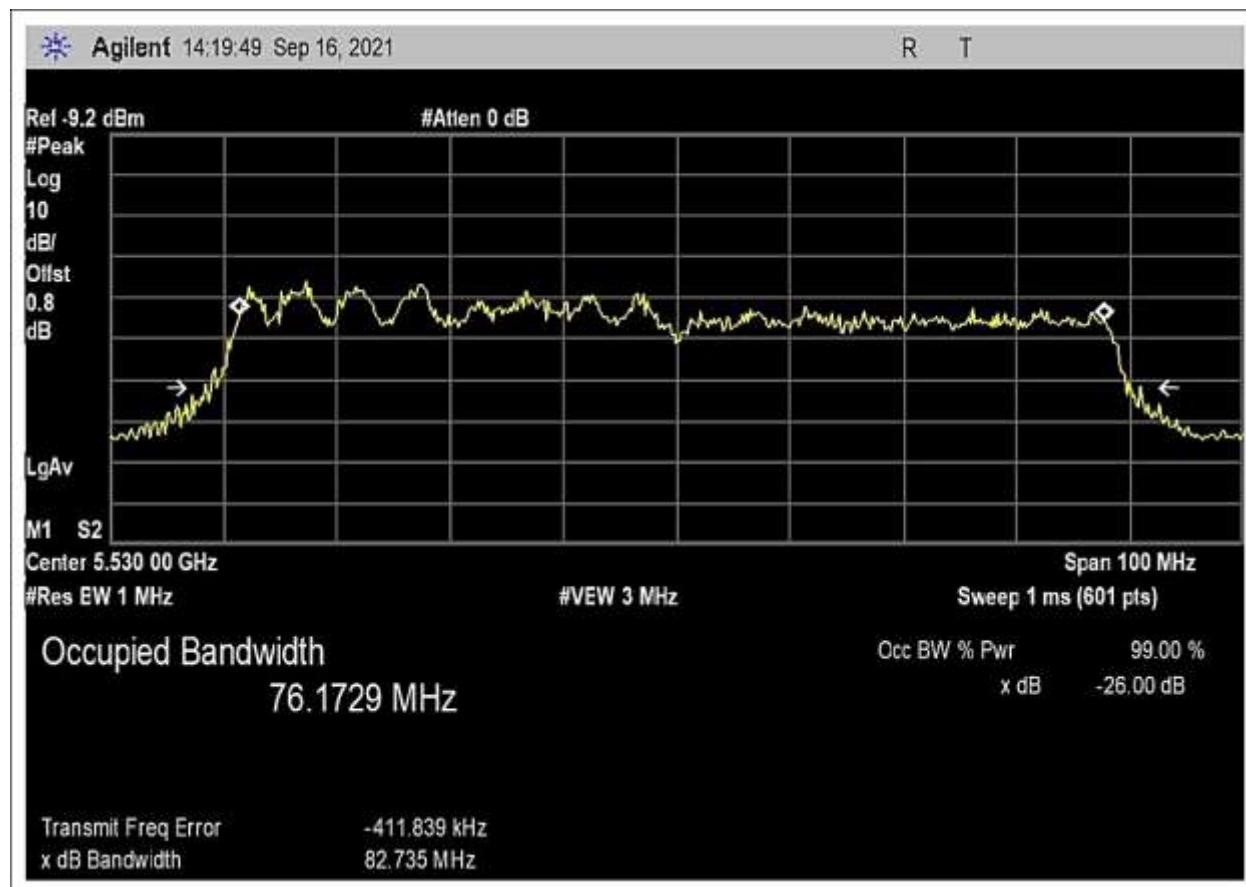
99% BW 802.11a



99%BW 802.11VHT20



99%BW 802.11VHT40



99%BW 802.11VHT80

## Test Results

| <b>Result: 802.11a</b>                |      |       |     |
|---------------------------------------|------|-------|-----|
| Fl (90% success rate)                 |      | 5490  | MHz |
| Fh (90% success rate)                 |      | 5510  | MHz |
| Measured 99% Bandwidth                | =    | 16.1  | MHz |
| Detection Bandwidth (Fh -Fl)          |      | 20    | MHz |
| (Detection BW / 99% BW) %             |      | 124.2 | %   |
| Requirement: % of detection BW > 100% | Pass |       |     |

| <b>Result: 802.11 VHT20</b>           |      |       |     |
|---------------------------------------|------|-------|-----|
| Fl (90% success rate)                 |      | 5490  | MHz |
| Fh (90% success rate)                 |      | 5510  | MHz |
| Measured 99% Bandwidth                | =    | 17.9  | MHz |
| Detection Bandwidth (Fh -Fl)          |      | 20    | MHz |
| (Detection BW / 99% BW) %             |      | 111.7 | %   |
| Requirement: % of detection BW > 100% | Pass |       |     |

| <b>Result: 802.11V HT40</b>           |      |       |     |
|---------------------------------------|------|-------|-----|
| Fl (90% success rate)                 |      | 5490  | MHz |
| Fh (90% success rate)                 |      | 5530  | MHz |
| Measured 99% Bandwidth                | =    | 37.4  | MHz |
| Detection Bandwidth (Fh -Fl)          |      | 40    | MHz |
| (Detection BW / 99% BW) %             |      | 107.0 | %   |
| Requirement: % of detection BW > 100% | Pass |       |     |

| <b>Result: 802.11 VHT80</b>           |      |       |     |
|---------------------------------------|------|-------|-----|
| Fl (90% success rate)                 |      | 5490  | MHz |
| Fh (90% success rate)                 |      | 5570  | MHz |
| Measured 99% Bandwidth                | =    | 76.2  | MHz |
| Detection Bandwidth (Fh -Fl)          |      | 80    | MHz |
| (Detection BW / 99% BW) %             |      | 105.0 | %   |
| Requirement: % of detection BW > 100% | Pass |       |     |

| 802.11a                  |   |   |   |   |   |   |   |   |   |     |
|--------------------------|---|---|---|---|---|---|---|---|---|-----|
| EUT Operating Freq(MHz)= | 5500  |   |   |   |   |   |   |   |   |     |
| Radar Waveform Type      | 0   |   |   |   |   |   |   |   |   |     |
|                          | DFS Detection Trial (1 = detection , 0= no detection) |   |   |   |   |   |   |   |   |     |
| Radar Freq (MHz)         | 1   | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10  |
| 5450                     |   |   |   |   |   |   |   |   |   | 0   |
| 5485                     | 0   | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0   |
| 5486                     | 0   | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0   |
| 5487                     | 0   | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0   |
| 5488                     | 0   | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0   |
| 5489                     | 0   | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0   |
| 5490                     | 1   | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| 5491                     |   |   |   |   |   |   |   |   |   | 0   |
| 5492                     |   |   |   |   |   |   |   |   |   | 0   |
| 5493                     |   |   |   |   |   |   |   |   |   | 0   |
| 5494                     |   |   |   |   |   |   |   |   |   | 0   |
| 5495                     | 1   | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| 5496                     |   |   |   |   |   |   |   |   |   | 0   |
| 5497                     |   |   |   |   |   |   |   |   |   | 0   |
| 5498                     |   |   |   |   |   |   |   |   |   | 0   |
| 5499                     |   |   |   |   |   |   |   |   |   | 0   |
| <b>5500</b>              | 1   | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| 5501                     |   |   |   |   |   |   |   |   |   | 0   |
| 5502                     |   |   |   |   |   |   |   |   |   | 0   |
| 5503                     |   |   |   |   |   |   |   |   |   | 0   |
| 5504                     |   |   |   |   |   |   |   |   |   | 0   |
| 5505                     | 1   | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| 5506                     |   |   |   |   |   |   |   |   |   | 0   |
| 5507                     |   |   |   |   |   |   |   |   |   | 0   |
| 5508                     |   |   |   |   |   |   |   |   |   | 0   |
| 5509                     |   |   |   |   |   |   |   |   |   | 0   |
| 5510                     | 1   | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| 5511                     | 0   | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0   |
| 5512                     | 0   | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0   |
| 5513                     | 0   | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0   |
| 5514                     | 0   | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0   |
| 5515                     | 0   | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0   |
| 5550                     |   |   |   |   |   |   |   |   |   | 0   |

| 802.11VHT20              |   |   |   |   |   |   |   |   |   |     |
|--------------------------|---|---|---|---|---|---|---|---|---|-----|
| EUT Operating Freq(MHz)= | 5500  |   |   |   |   |   |   |   |   |     |
| Radar Waveform Type      | 0   |   |   |   |   |   |   |   |   |     |
|                          | DFS Detection Trial (1 = detection , 0= no detection) |   |   |   |   |   |   |   |   |     |
| Radar Freq (MHz)         | 1   | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10  |
| 5450                     |   |   |   |   |   |   |   |   |   | 0   |
| 5485                     | 0   | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0   |
| 5486                     | 0   | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0   |
| 5487                     | 0   | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0   |
| 5488                     | 0   | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0   |
| 5489                     | 0   | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0   |
| 5490                     | 1   | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| 5491                     |   |   |   |   |   |   |   |   |   | 0   |
| 5492                     |   |   |   |   |   |   |   |   |   | 0   |
| 5493                     |   |   |   |   |   |   |   |   |   | 0   |
| 5494                     |   |   |   |   |   |   |   |   |   | 0   |
| 5495                     | 1   | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| 5496                     |   |   |   |   |   |   |   |   |   | 0   |
| 5497                     |   |   |   |   |   |   |   |   |   | 0   |
| 5498                     |   |   |   |   |   |   |   |   |   | 0   |
| 5499                     |   |   |   |   |   |   |   |   |   | 0   |
| <b>5500</b>              | 1   | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| 5501                     |   |   |   |   |   |   |   |   |   | 0   |
| 5502                     |   |   |   |   |   |   |   |   |   | 0   |
| 5503                     |   |   |   |   |   |   |   |   |   | 0   |
| 5504                     |   |   |   |   |   |   |   |   |   | 0   |
| 5505                     | 1   | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| 5506                     |   |   |   |   |   |   |   |   |   | 0   |
| 5507                     |   |   |   |   |   |   |   |   |   | 0   |
| 5508                     |   |   |   |   |   |   |   |   |   | 0   |
| 5509                     |   |   |   |   |   |   |   |   |   | 0   |
| 5510                     | 1   | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| 5511                     | 0   | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0   |
| 5512                     | 0   | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0   |
| 5513                     | 0   | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0   |
| 5514                     | 0   | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0   |
| 5515                     | 0   | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0   |
| 5550                     |   |   |   |   |   |   |   |   |   | 0   |

| 802.11VHT40              |   |   |   |   |   |   |   |   |   |     |
|--------------------------|---|---|---|---|---|---|---|---|---|-----|
| EUT Operating Freq(MHz)= | 5510  |   |   |   |   |   |   |   |   |     |
| Radar Waveform Type      | 0   |   |   |   |   |   |   |   |   |     |
|                          | DFS Detection Trial (1 = detection , 0= no detection) |   |   |   |   |   |   |   |   |     |
| Radar Freq (MHz)         | 1   | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10  |
| 5460                     |   |   |   |   |   |   |   |   |   | 0   |
| 5485                     | 0   | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0   |
| 5486                     | 0   | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0   |
| 5487                     | 0   | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0   |
| 5488                     | 0   | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0   |
| 5489                     | 0   | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0   |
| 5490                     | 1   | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| 5491                     |   |   |   |   |   |   |   |   |   | 0   |
| 5492                     |   |   |   |   |   |   |   |   |   | 0   |
| 5493                     |   |   |   |   |   |   |   |   |   | 0   |
| 5494                     |   |   |   |   |   |   |   |   |   | 0   |
| 5495                     | 1   | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| 5496                     |   |   |   |   |   |   |   |   |   | 0   |
| 5497                     |   |   |   |   |   |   |   |   |   | 0   |
| 5498                     |   |   |   |   |   |   |   |   |   | 0   |
| 5499                     |   |   |   |   |   |   |   |   |   | 0   |
| 5500                     | 1   | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| 5501                     |   |   |   |   |   |   |   |   |   | 0   |
| 5502                     |   |   |   |   |   |   |   |   |   | 0   |
| 5503                     |   |   |   |   |   |   |   |   |   | 0   |
| 5504                     |   |   |   |   |   |   |   |   |   | 0   |
| 5505                     | 1   | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| 5506                     |   |   |   |   |   |   |   |   |   | 0   |
| 5507                     |   |   |   |   |   |   |   |   |   | 0   |
| 5508                     |   |   |   |   |   |   |   |   |   | 0   |
| 5509                     |   |   |   |   |   |   |   |   |   | 0   |
| 5510                     | 1   | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| 5511                     |   |   |   |   |   |   |   |   |   | 0   |
| 5512                     |   |   |   |   |   |   |   |   |   | 0   |
| 5513                     |   |   |   |   |   |   |   |   |   | 0   |
| 5514                     |   |   |   |   |   |   |   |   |   | 0   |
| 5515                     | 1   | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| 5516                     |   |   |   |   |   |   |   |   |   | 0   |
| 5517                     |   |   |   |   |   |   |   |   |   | 0   |
| 5518                     |   |   |   |   |   |   |   |   |   | 0   |
| 5519                     |   |   |   |   |   |   |   |   |   | 0   |
| 5520                     | 1   | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| 5521                     |   |   |   |   |   |   |   |   |   | 0   |
| 5522                     |   |   |   |   |   |   |   |   |   | 0   |
| 5523                     |   |   |   |   |   |   |   |   |   | 0   |
| 5524                     |   |   |   |   |   |   |   |   |   | 0   |
| 5525                     | 1   | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| 5526                     |   |   |   |   |   |   |   |   |   | 0   |
| 5527                     |   |   |   |   |   |   |   |   |   | 0   |
| 5528                     |   |   |   |   |   |   |   |   |   | 0   |
| 5529                     |   |   |   |   |   |   |   |   |   | 0   |
| 5530                     | 1   | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| 5531                     | 0   | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0   |
| 5532                     | 0   | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0   |
| 5533                     | 0   | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0   |
| 5534                     | 0   | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0   |
| 5535                     | 0   | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0   |
| 5560                     |   |   |   |   |   |   |   |   |   | 0   |

| 802.11VHT80              |   |   |   |   |   |   |   |   |   |    |     |
|--------------------------|---|---|---|---|---|---|---|---|---|----|-----|
| EUT Operating Freq(MHz)= |   | 5530  |   |   |   |   |   |   |   |    |     |
| Radar Waveform Type =    |   | 0   |   |   |   |   |   |   |   |    |     |
|                          |   | DFS Detection Trial (1 = detection , 0= no detection) |   |   |   |   |   |   |   |    |     |
| Radar Freq (MHz)         | 1 | 2   | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | %   |
| 5480                     |   |   |   |   |   |   |   |   |   |    | 0   |
| 5485                     | 0 | 0   | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0  | 0   |
| 5486                     | 0 | 0   | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0  | 0   |
| 5487                     | 0 | 0   | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0  | 0   |
| 5488                     | 0 | 0   | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0  | 0   |
| 5489                     | 0 | 0   | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0  | 0   |
| 5490                     | 1 | 1   | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1  | 100 |
| 5491                     |   |   |   |   |   |   |   |   |   |    | 0   |
| 5492                     |   |   |   |   |   |   |   |   |   |    | 0   |
| 5493                     |   |   |   |   |   |   |   |   |   |    | 0   |
| 5494                     |   |   |   |   |   |   |   |   |   |    | 0   |
| 5495                     | 1 | 1   | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1  | 100 |
| 5496                     |   |   |   |   |   |   |   |   |   |    | 0   |
| 5497                     |   |   |   |   |   |   |   |   |   |    | 0   |
| 5498                     |   |   |   |   |   |   |   |   |   |    | 0   |
| 5499                     |   |   |   |   |   |   |   |   |   |    | 0   |
| 5500                     | 1 | 1   | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1  | 100 |
| 5501                     |   |   |   |   |   |   |   |   |   |    | 0   |
| 5502                     |   |   |   |   |   |   |   |   |   |    | 0   |
| 5503                     |   |   |   |   |   |   |   |   |   |    | 0   |
| 5504                     |   |   |   |   |   |   |   |   |   |    | 0   |
| 5505                     | 1 | 1   | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1  | 100 |
| 5506                     |   |   |   |   |   |   |   |   |   |    | 0   |
| 5507                     |   |   |   |   |   |   |   |   |   |    | 0   |
| 5508                     |   |   |   |   |   |   |   |   |   |    | 0   |
| 5509                     |   |   |   |   |   |   |   |   |   |    | 0   |
| 5510                     | 1 | 1   | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1  | 100 |
| 5511                     |   |   |   |   |   |   |   |   |   |    | 0   |
| 5512                     |   |   |   |   |   |   |   |   |   |    | 0   |
| 5513                     |   |   |   |   |   |   |   |   |   |    | 0   |
| 5514                     |   |   |   |   |   |   |   |   |   |    | 0   |
| 5515                     | 1 | 1   | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1  | 100 |
| 5516                     |   |   |   |   |   |   |   |   |   |    | 0   |
| 5517                     |   |   |   |   |   |   |   |   |   |    | 0   |
| 5518                     |   |   |   |   |   |   |   |   |   |    | 0   |
| 5519                     |   |   |   |   |   |   |   |   |   |    | 0   |
| 5520                     | 1 | 1   | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1  | 100 |
| 5521                     |   |   |   |   |   |   |   |   |   |    | 0   |
| 5522                     |   |   |   |   |   |   |   |   |   |    | 0   |
| 5523                     |   |   |   |   |   |   |   |   |   |    | 0   |
| 5524                     |   |   |   |   |   |   |   |   |   |    | 0   |
| 5525                     | 1 | 1   | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1  | 100 |
| 5526                     |   |   |   |   |   |   |   |   |   |    | 0   |
| 5527                     |   |   |   |   |   |   |   |   |   |    | 0   |
| 5528                     |   |   |   |   |   |   |   |   |   |    | 0   |
| 5529                     |   |   |   |   |   |   |   |   |   |    | 0   |
| ▲ 5530                   | 1 | 1   | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1  | 100 |

|      |   |   |   |   |   |   |   |   |   |   |     |
|------|---|---|---|---|---|---|---|---|---|---|-----|
| 5531 |   |   |   |   |   |   |   |   |   |   | 0   |
| 5532 |   |   |   |   |   |   |   |   |   |   | 0   |
| 5533 |   |   |   |   |   |   |   |   |   |   | 0   |
| 5534 |   |   |   |   |   |   |   |   |   |   | 0   |
| 5535 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| 5536 |   |   |   |   |   |   |   |   |   |   | 0   |
| 5537 |   |   |   |   |   |   |   |   |   |   | 0   |
| 5538 |   |   |   |   |   |   |   |   |   |   | 0   |
| 5539 |   |   |   |   |   |   |   |   |   |   | 0   |
| 5540 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| 5541 |   |   |   |   |   |   |   |   |   |   | 0   |
| 5542 |   |   |   |   |   |   |   |   |   |   | 0   |
| 5543 |   |   |   |   |   |   |   |   |   |   | 0   |
| 5544 |   |   |   |   |   |   |   |   |   |   | 0   |
| 5545 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| 5546 |   |   |   |   |   |   |   |   |   |   | 0   |
| 5547 |   |   |   |   |   |   |   |   |   |   | 0   |
| 5548 |   |   |   |   |   |   |   |   |   |   | 0   |
| 5549 |   |   |   |   |   |   |   |   |   |   | 0   |
| 5550 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| 5551 |   |   |   |   |   |   |   |   |   |   | 0   |
| 5552 |   |   |   |   |   |   |   |   |   |   | 0   |
| 5553 |   |   |   |   |   |   |   |   |   |   | 0   |
| 5554 |   |   |   |   |   |   |   |   |   |   | 0   |
| 5555 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| 5556 |   |   |   |   |   |   |   |   |   |   | 0   |
| 5557 |   |   |   |   |   |   |   |   |   |   | 0   |
| 5558 |   |   |   |   |   |   |   |   |   |   | 0   |
| 5559 |   |   |   |   |   |   |   |   |   |   | 0   |
| 5560 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| 5561 |   |   |   |   |   |   |   |   |   |   | 0   |
| 5562 |   |   |   |   |   |   |   |   |   |   | 0   |
| 5563 |   |   |   |   |   |   |   |   |   |   | 0   |
| 5564 |   |   |   |   |   |   |   |   |   |   | 0   |
| 5565 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| 5566 |   |   |   |   |   |   |   |   |   |   | 0   |
| 5567 |   |   |   |   |   |   |   |   |   |   | 0   |
| 5568 |   |   |   |   |   |   |   |   |   |   | 0   |
| 5569 |   |   |   |   |   |   |   |   |   |   | 0   |
| 5570 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| 5571 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0   |
| 5572 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0   |
| 5573 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0   |
| 5574 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0   |
| 5575 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0   |
| 5580 |   |   |   |   |   |   |   |   |   |   | 0   |

## 15.407(h)(2)(i)(A) Channel Availability Check Time

### Nominal Noise Floor - Master/ Client with Radar Detection

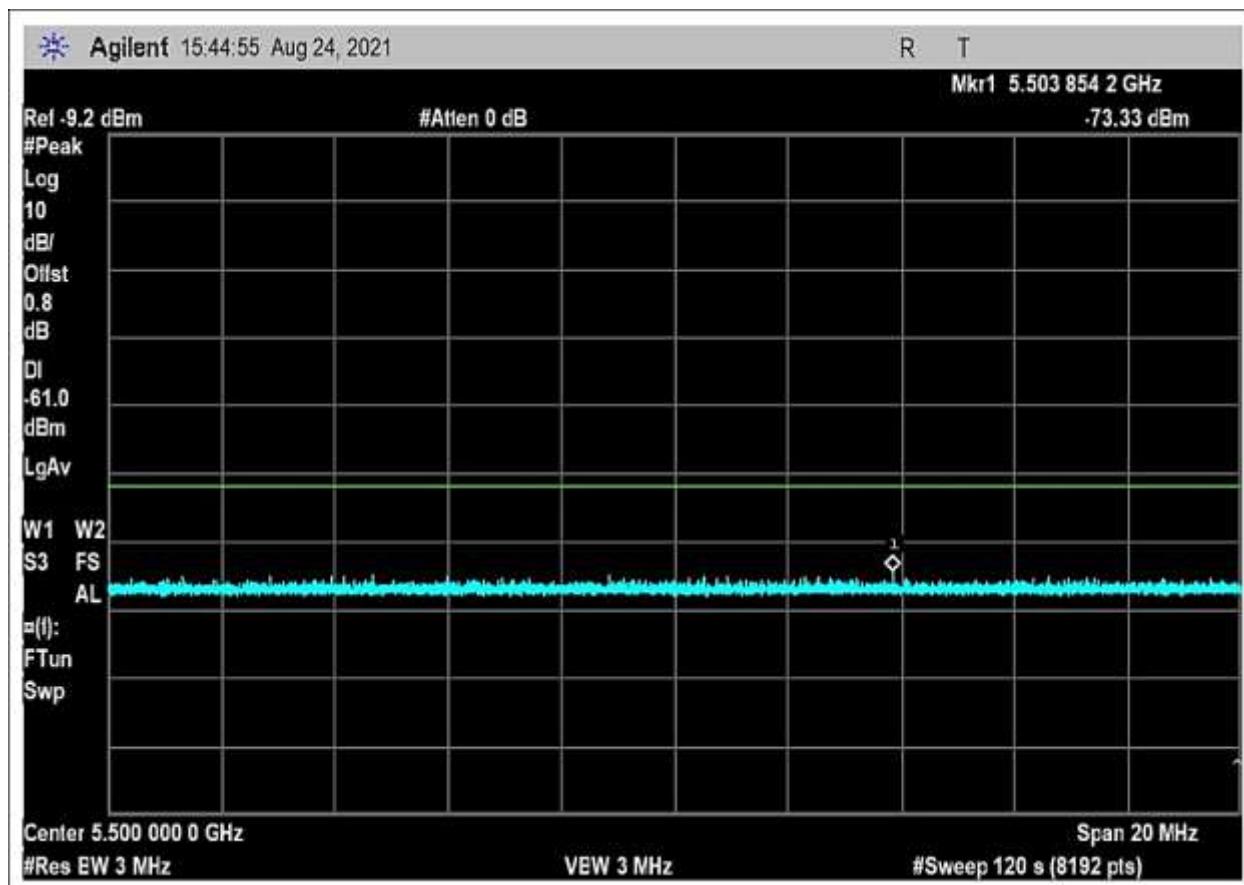
Applies to Channel availability check, Initial radar bursts, in-service monitoring and 30-minute non-occupancy period tests.

| Test Setup/Conditions |  |                |           |
|-----------------------|--|----------------|-----------|
| Test Location:        | Brea Lab A   | Test Engineer: | E. Wong   |
| Test Method:          | 7.8.2.1, 7.8.2.2, 7.8.2.3  | Test Date(s):  | 8/23/2021 |
| Configuration:        | 1  |                |           |
| Test Setup:           | Conducted<br><br>Nominal Noise floor measurement of the system was measured with test method as illustrated in test setup diagram. A spectrum analyzer with Peak detector activated and RBW and VBW >3 MHz was used for measurement of DFS detection threshold.<br><br>The span is set to the bandwidth of the signal protocol to be used for Channel availability measurement IAW plot requirement of clause 8.3, d) 3) the Master and Client are not transmitting, the Radar signal is turned off. |                |           |

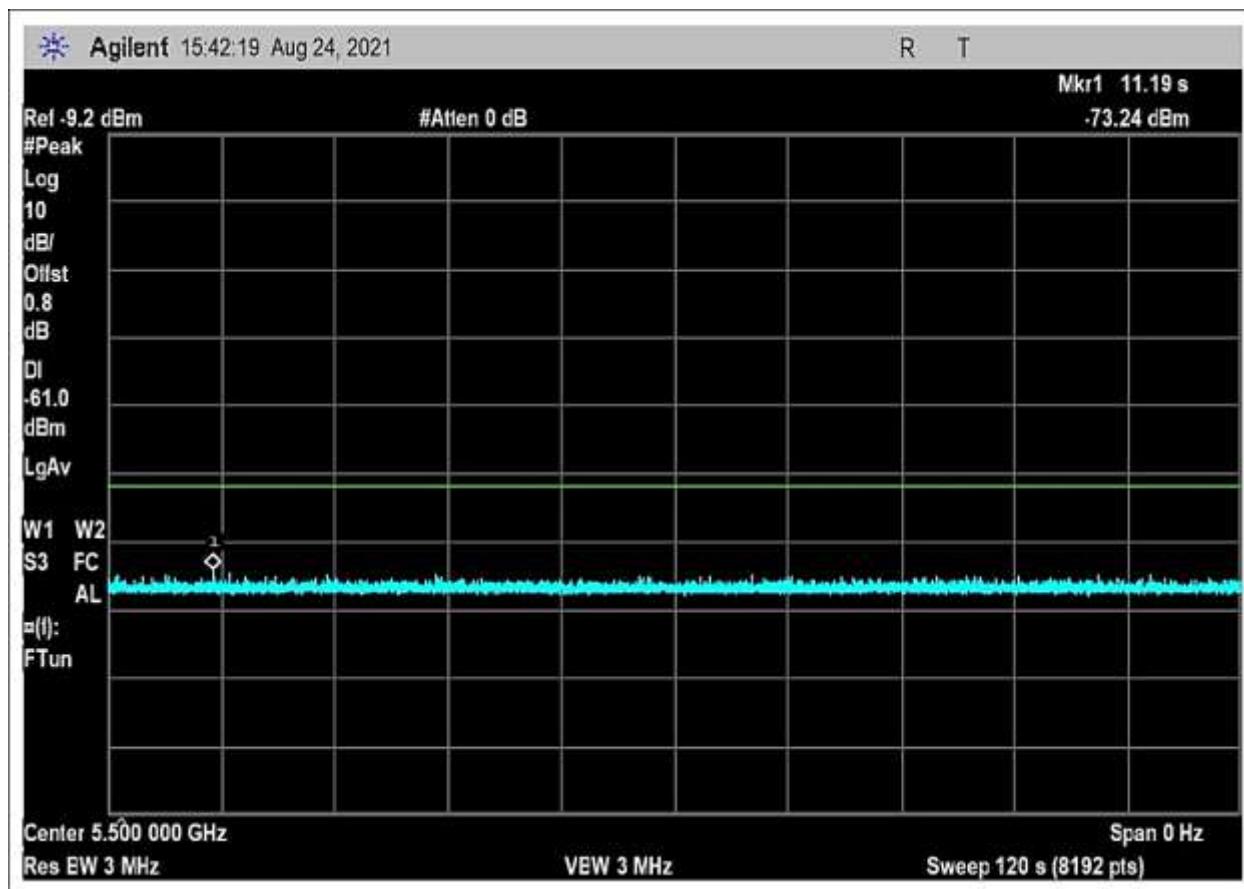
| Test Data Summary |                         |                           |
|-------------------|-------------------------|---------------------------|
| Frequency (MHz)   | Channel bandwidth (MHz) | Nominal Noise Floor (dBm) |
| 5500              | 20                      | -72.28                    |

\* No limit, however, must be below the Radar signal

Plot(s)



Noise Floor Plot



Noise Floor Plot

## Initial Channel Availability Check Time -- Master

### Test Setup/Conditions

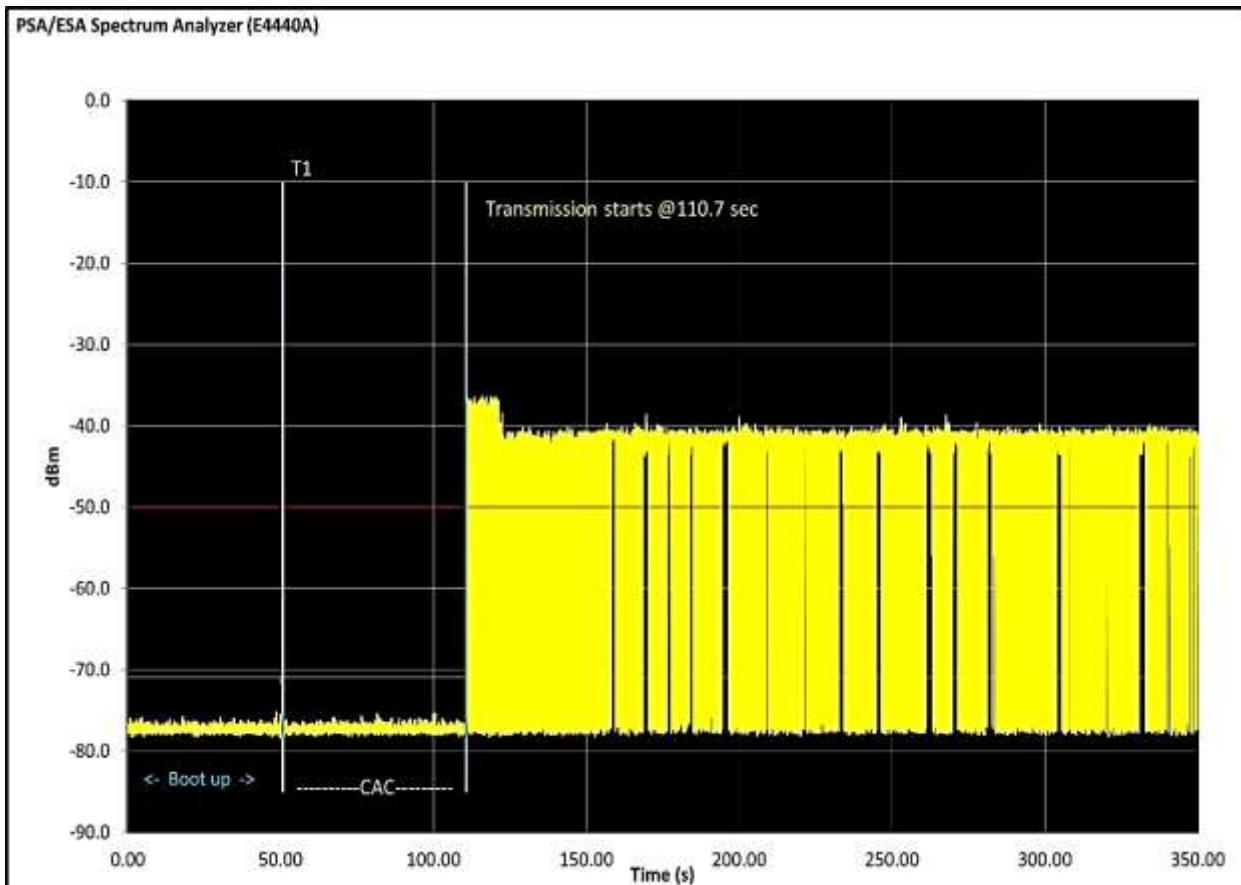
|                |  |                |           |  |
|----------------|--|----------------|-----------|--|
| Test Location: | Brea Lab Bench   | Test Engineer: | E. Wong   |  |
| Test Method:   | 7.8.2.1  | Test Date(s):  | 9/17/2021 |  |
| Configuration: | 1  |                |           |  |
| Test Setup:    | <p>Conducted</p> <p>Initial Channel Availability Check time was measured as illustrated in test setup diagram. A spectrum analyzer with Peak detector activated, set at zero span and RBW and VBW &gt;3 MHz.</p> <p>The spectrum analyzer is tuned to Channel occupied by the radar with minimum sweep time of 2.5 minute.</p> <p>Test performed using one representative BW mode.</p> |                |           |  |

### Test Data Summary

| Frequency (MHz) | Protocol    | CAC Time (sec) | Limit (sec) | Results |
|-----------------|-------------|----------------|-------------|---------|
| 5500            | 802.11VHT20 | 60.7           | > 60        | Pass    |

Note: CAC was measured with radar injected at various time interval to determine boot up time , 50 sec was determined to be the end of bootup and CAC starts .Radar was injected at 45, 46,47, 48, 49, 50, 52, 523, 52, 53 sec after power reset, 50 s is the radar timing that the radar was detected, prior to 50 s, radar was ignored by the system since it as has not completed boot up. Then the device was reset and sweep with no radar, the time when transmission started was noted, in this case 110.7 second after power up. 110.7 (transmission start time) – 50 sec (finish booth up and start CAC) = 60.7sec.

## Plot(s)



Initial Channel Availability Check time

## Radar Burst Near Channel Availability Check Time -- Master

### Test Setup/Conditions

|                |   |                |           |
|----------------|---|----------------|-----------|
| Test Location: | Brea Lab A  | Test Engineer: | E. Wong   |
| Test Method:   | 7.8.2.2, 7.8.2.3  | Test Date (s): | 9/17/2021 |
| Configuration: | 1   |                |           |
| Test Setup:    | <p>Conducted</p> <p>Initial Channel Availability Check time was measured as illustrated in test setup diagram. A spectrum analyzer with Peak detector activated, set at zero span and RBW and VBW &gt;3 MHz.</p> <p>Radar Burst at the Beginning of the Channel Availability Check Time was evaluated with one representative BW mode.</p> <p>The spectrum analyzer is tuned to Channel occupied by the radar with minimum sweep time of 2.5 minute. Observation of EUT emission continues 2.5 minutes /150sec after radar burst has been generated.</p> <p>For test at Start of CAC, Radar burst Triggered within 6 second window starting at T1. For test at End of CAC, Radar burst triggered within 6 second window starting at T1 +54 seconds.</p> |                |           |

### Timing Summary

| Test                    | Reboot time (s) | Start of Traffic (s) | Radar Timing T1 (s) | Radar Timing (Rel to Reboot 0 – 6 sec<br>T1+54 sec) | Radar Timing (Rel to CAC) |
|-------------------------|-----------------|----------------------|---------------------|---|---------------------------|
| No Radar Triggered      | 50              | 100.7                |                     |   |                           |
| Radar Near Start of CAC | 50              |                      | 50.7                | 50.7 – 56.7   | 53.0                      |
| Radar Near End of CAC   | 50              |                      | 50.7                | 104.7 – 110.7                                       | 107.0                     |

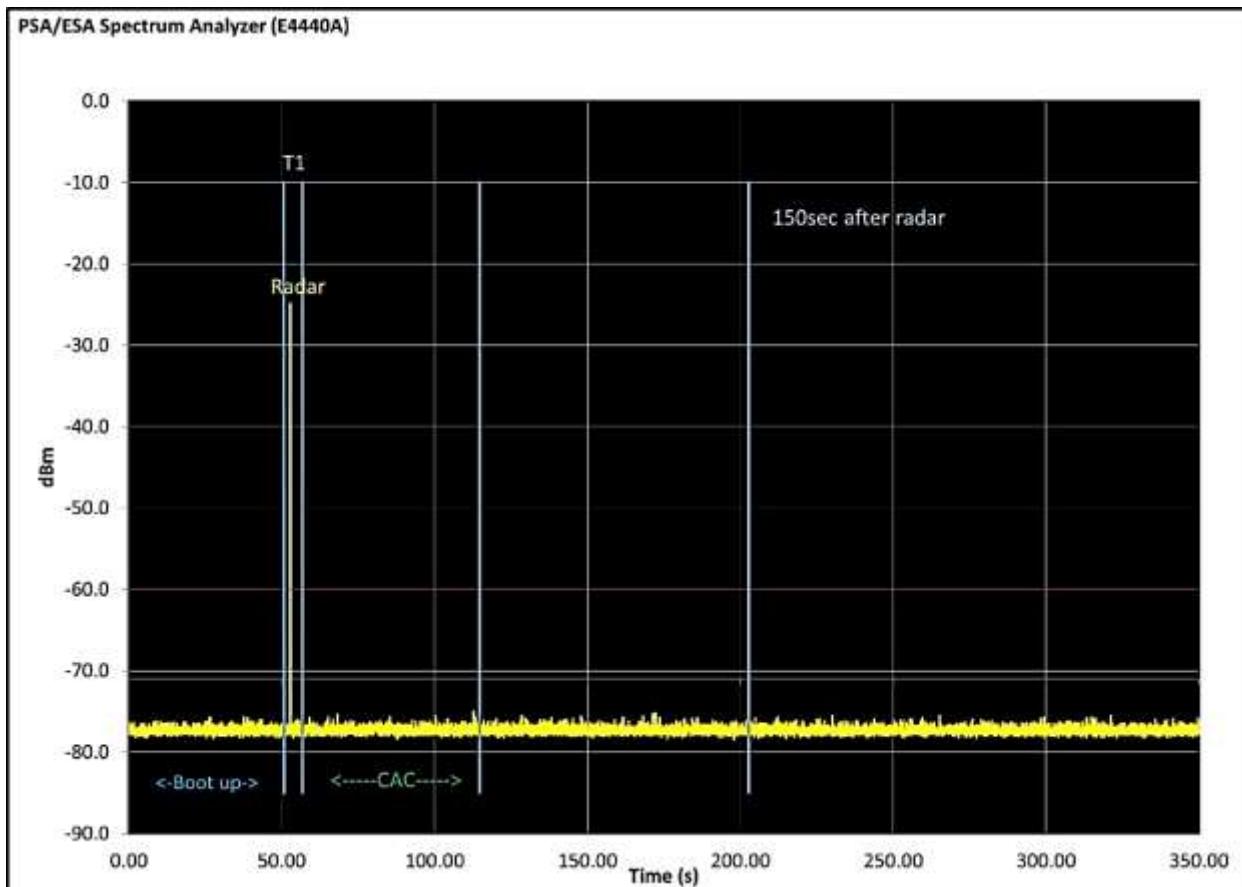
### Test Data Summary

| Frequency (MHz) | Protocol / Modulation | Waveform Type | Timing | Limit   | Results |
|-----------------|-----------------------|---------------|--------|---|---------|
| 5500            | 802.11HT20            | 0             | Start  | No transmission within 2.5 minute /150 sec after radar burst. | Pass    |
| 5500            | 802.11HT20            | 0             | End    |   | Pass    |

**Fail:** Transmission detected by the spectrum analyzer within observation period and the Master device indicates Radar was detected

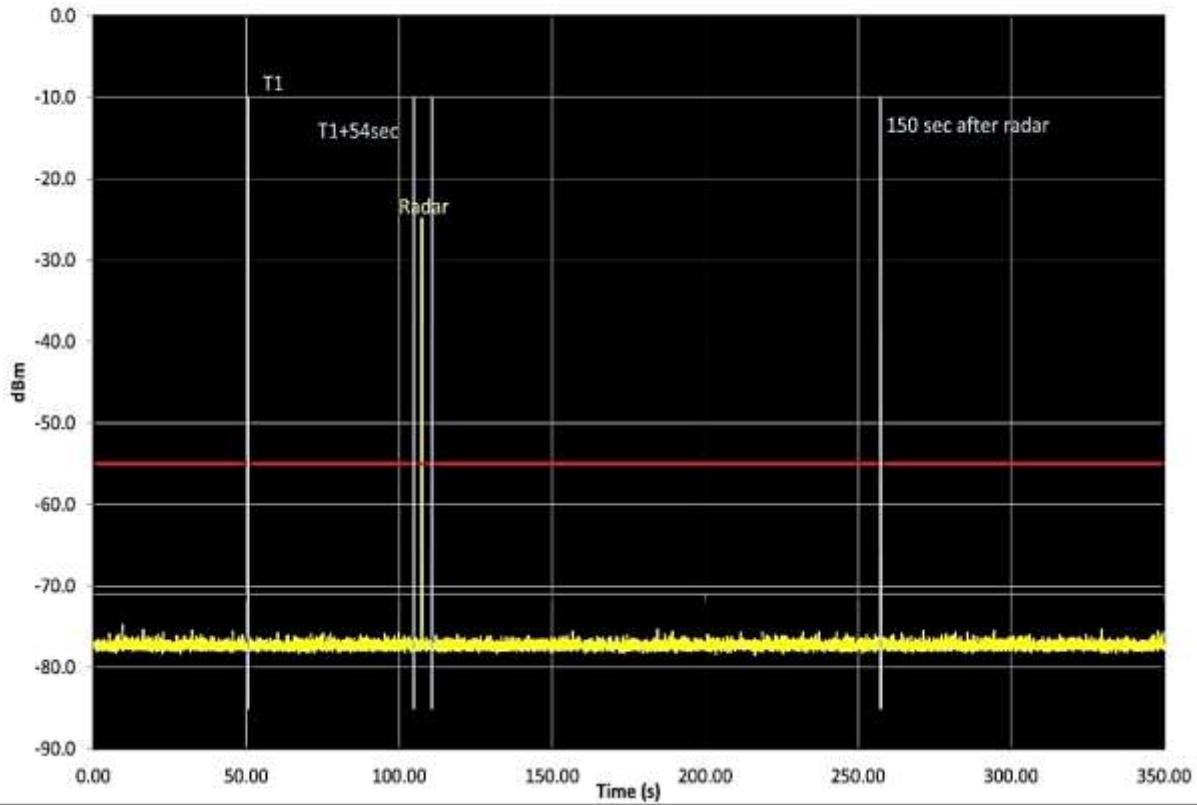
**Pass:** No Transmission detected by the spectrum analyzer within observation period, nor the Master device indicates Radar was detected.

**Plot(s)**



Radar Burst at the beginning of the Channel Availability Check time

PSA/ESA Spectrum Analyzer (E4440A)



Radar Burst at the end of the Channel Availability Check time

**15.407(h)(2)(i)(B) Channel Move Time, Channel Closing Time**  
**15.407(h)(2)(iv) Non-Occupancy Period**

**Channel Move / Closing Time and Non-Occupancy Period**  
**Master**

| <b>Test Setup/Conditions</b> |   |                |            |
|------------------------------|---|----------------|------------|
| Test Location:               | Brea Lab A  | Test Engineer: | E. Wong    |
| Test Method:                 | 7.8.3   | Test Date(s):  | 10/27/2021 |
| Configuration:               | 1   |                |            |
| Test Setup:                  | <p>Service Monitoring was evaluated as illustrated in test setup diagram. The Test frequency contains control signals. A spectrum analyzer with Peak detector activated, set at zero span and RBW and VBW &gt;3 MHz.</p> <p>Except for Non-Occupancy time, In-Service monitoring was evaluated with the Widest bandwidth mode.</p> <p>Radar burst at required test level was triggered and the time to vacate the channel and remained unoccupied was evaluated.</p> <p>Plot and Spectrum analyzer trace data was captured with maximum available BIN, the trace data is imported to Analysis application to detect channel move time and channel closing time.</p> <p>Time above Threshold (T1 to T1+200ms) and (T1+200ms to Ts+10s) meet required maximum timing requirements.</p> <p>Test performed with widest BW mode available. (see table a2) 802.11HT80, radar inject and monitored at 5500MHz, the service channel of 802.11HT80 is at 5500MHz.</p> <p>For Channel move and Channel closing time<br/>           Sweep at 11sec, there was no transmission detected after 1 second, second acquisition performed at 2 second sweep time.<br/>           Time analyses perform with 2 sec sweep.</p> |                |            |

### Test Data Summary

| Frequency (MHz) | Protocol    | Waveform Type | Channel Test                | Measured Time | Limit      | Results* |
|-----------------|-------------|---------------|-----------------------------|---------------|------------|----------|
| 5500            | 802.11VHT80 | 0             | Move <sup>1</sup>           | 0.3956 s      | <10 s      | Pass     |
| 5500            | 802.11VHT80 | 0             | T1 - Closing <sup>1,2</sup> | 1.7ms         | <200ms     | Pass     |
| 5500            | 802.11VHT80 | 0             | CS - Closing <sup>1,2</sup> | 2.2ms         | <60 ms/10s | Pass     |
| 5500            | 802.11VHT20 | 0             | Non-Occupancy <sup>3</sup>  | NA            | >30min     | Pass     |

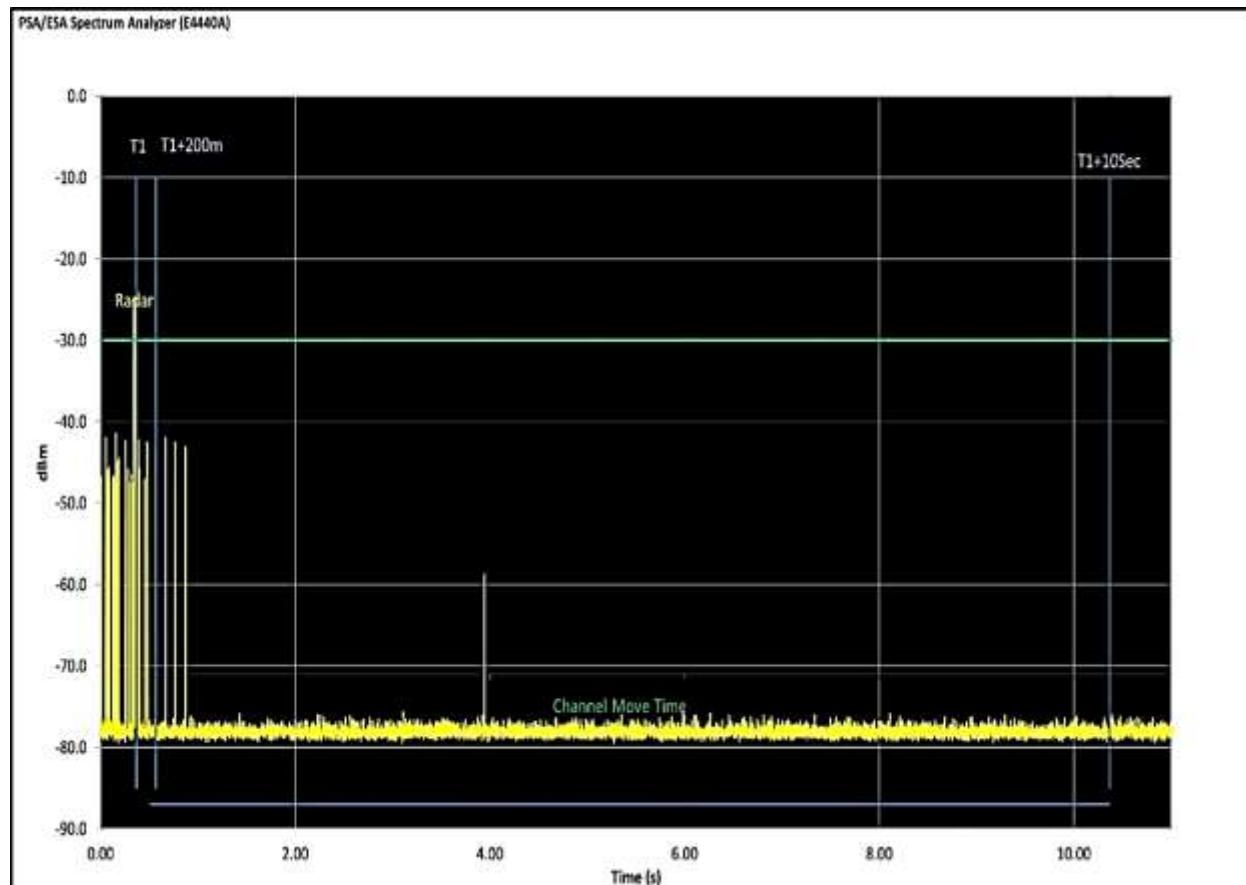
Note 1: Channel Move Time and the Channel Closing Transmission Time should be performed with Radar Type 0. The measurement timing begins at the end of the Radar Type 0 burst.

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.

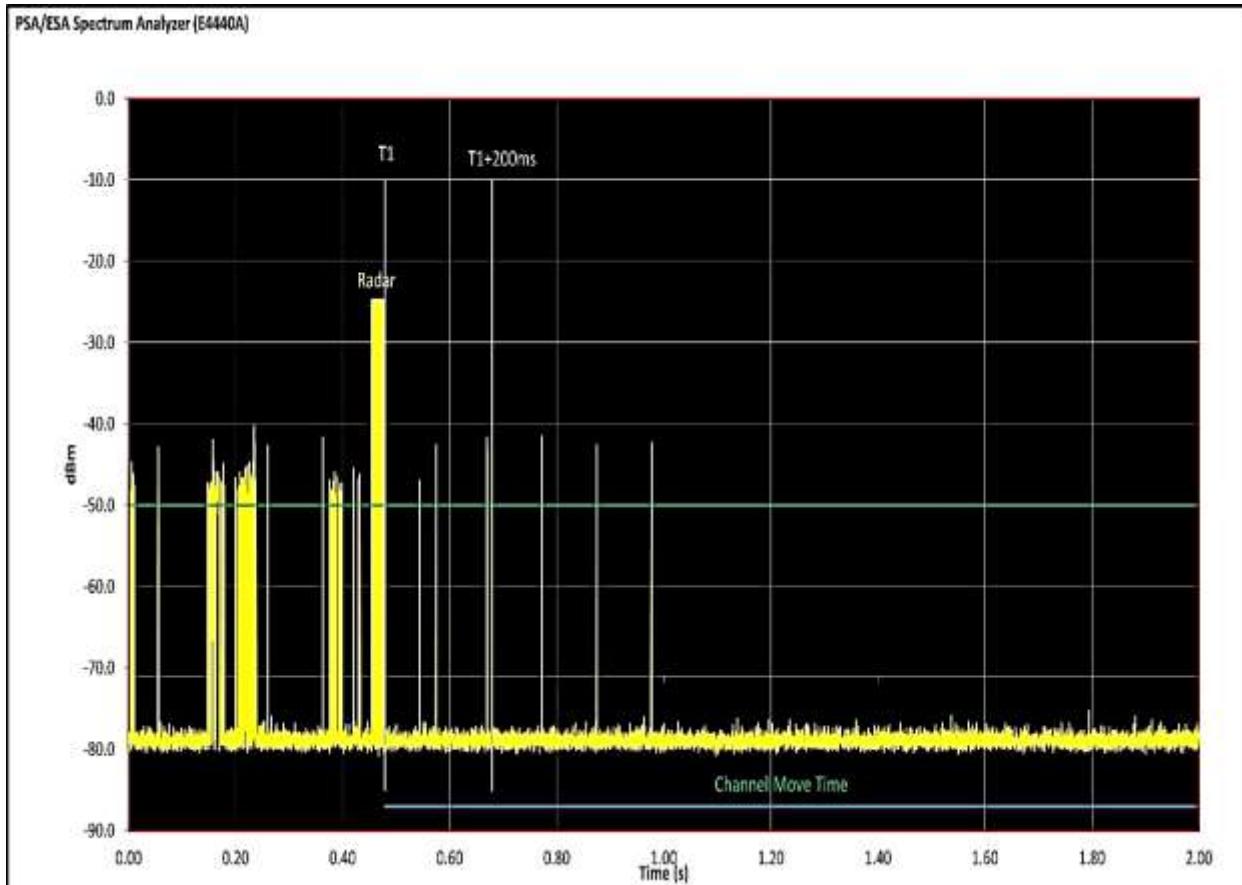
Note 3. This test is required for Master and Client with Radar Detection.

\*Pass: No transmission within 30 minutes after Radar burst.

### Plot(s)



Transmission with radar pulse at T1, 366ms, 11 sec sweep

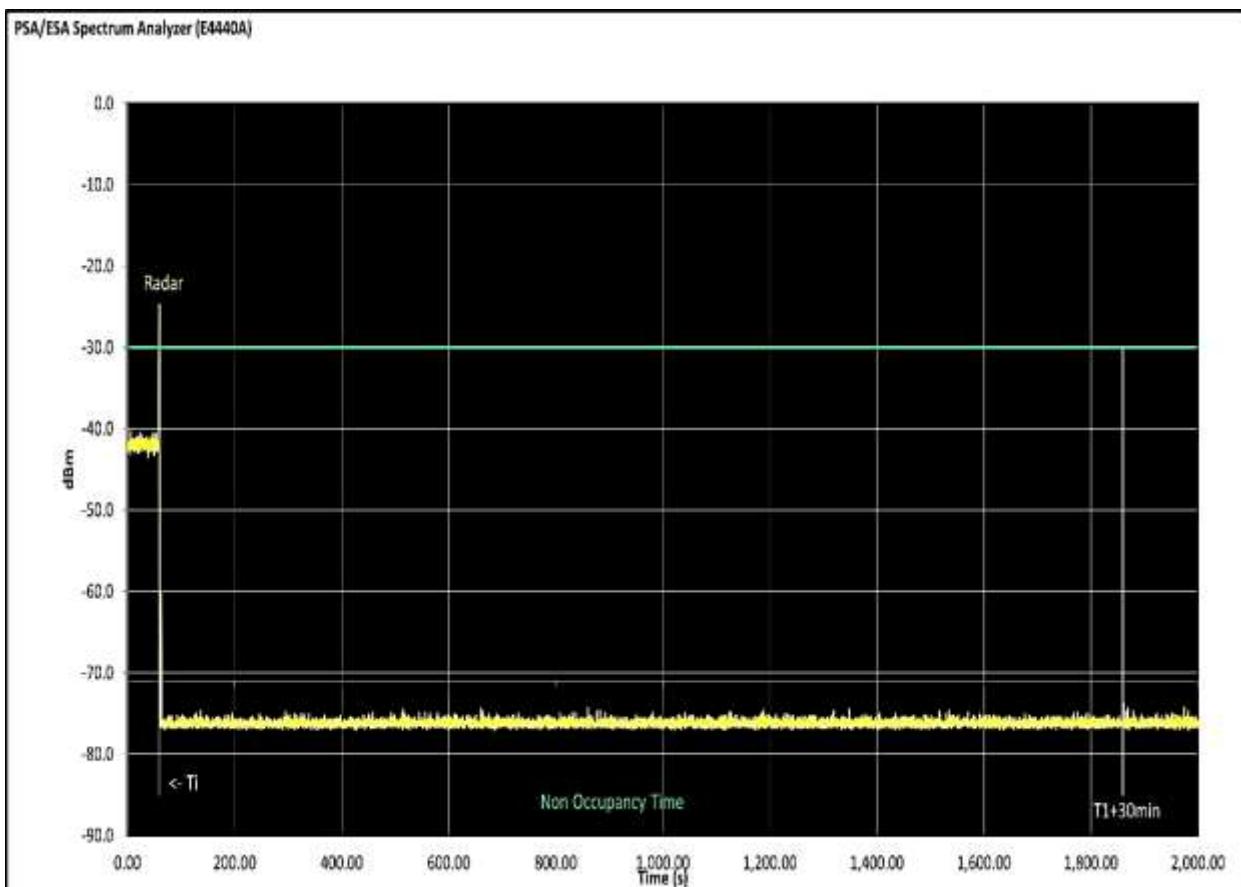


Transmission with radar pulse at 366ms 2 sec sweep

|                  |     |
|------------------|-----|
| BIN T1+200ms     | 7   |
| Time T1+200ms ms | 1.7 |

|   |     |
|---|-----|
| BIN after T1+200ms to 10sec             | 9   |
| Aggregate time (T1+200ms, to 10 sec) ms | 2.2 |

PSA/ESA Spectrum Analyzer (E4440A)



Non-Occupancy time 2000sec sweep

## 15.407(h)(2)(i)(B) Channel Move Time, Channel Closing Time

### Channel Move / Closing Time and Non Occupancy Period

#### Client without Radar Detection

| Test Setup/Conditions |   |                |            |
|-----------------------|---|----------------|------------|
| Test Location:        | Brea Lab A  | Test Engineer: | E. Wong    |
| Test Method:          | 7.8.3   | Test Date(s):  | 11/15/2021 |
| Configuration:        | 5   |                |            |
| Test Setup:           | <p>Conducted</p> <p>In-Service Monitoring was evaluated as illustrated in test setup diagram. The Test frequency contains control signals. A spectrum analyzer with Peak detector activated, set at zero span and RBW and VBW &gt;3 MHz.</p> <p>In-Service monitoring was evaluated with the Widest bandwidth mode.</p> <p>Radar burst at required test level was triggered and the time to vacate the channel and remained unoccupied was evaluated.</p> <p>Plot and Spectrum analyzer trace data was captured with maximum available BIN, the trace data is imported to Analysis application to detect channel move time and channel closing time.</p> <p>Time above Threshold (T1 to T1+200ms) and (T1+200ms to Ts+10s) meet required maximum timing requirements.</p> <p>Test performed with widest BW mode available. (see table a2) 802.11HT80, radar inject and monitored at 5500MHz, the service channel of 802.11HT80 is at 5500MHz.</p> <p>For Channel move and Channel closing time<br/>Sweep at 1sec, there was no transmission detected after 1 second, second acquisition performed at 2 second sweep time.<br/>Time analyses perform with 2 sec sweep.</p> |                |            |

### Test Data Summary

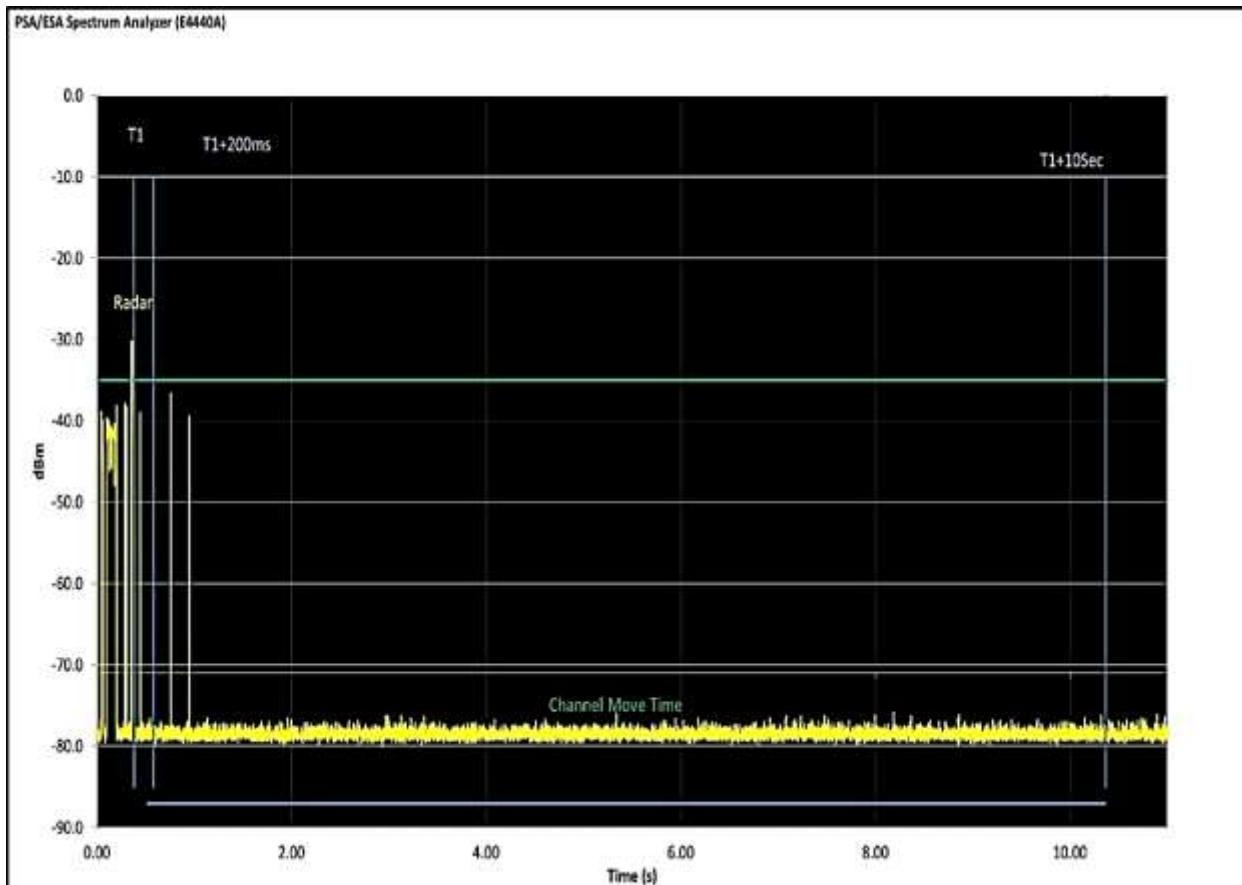
| Frequency (MHz) | Protocol    | Waveform Type | Channel Test                | Measured Time | Limit      | Results |
|-----------------|-------------|---------------|-----------------------------|---------------|------------|---------|
| 5500            | 802.11VHT80 | 0             | Move <sup>1</sup>           | 0.4946s       | <10 s      | Pass    |
| 5500            | 802.11VHT80 | 0             | T1 - Closing <sup>1,2</sup> | 3.2ms         | <200ms     | Pass    |
| 5500            | 802.11VHT80 | 0             | CS - Closing <sup>1,2</sup> | 2.2ms         | <60 ms/10s | Pass    |
| 5500            | 802.11VHT20 | 0             | Non-Occupancy <sup>3</sup>  | NA            | >30 min    | Pass    |

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.

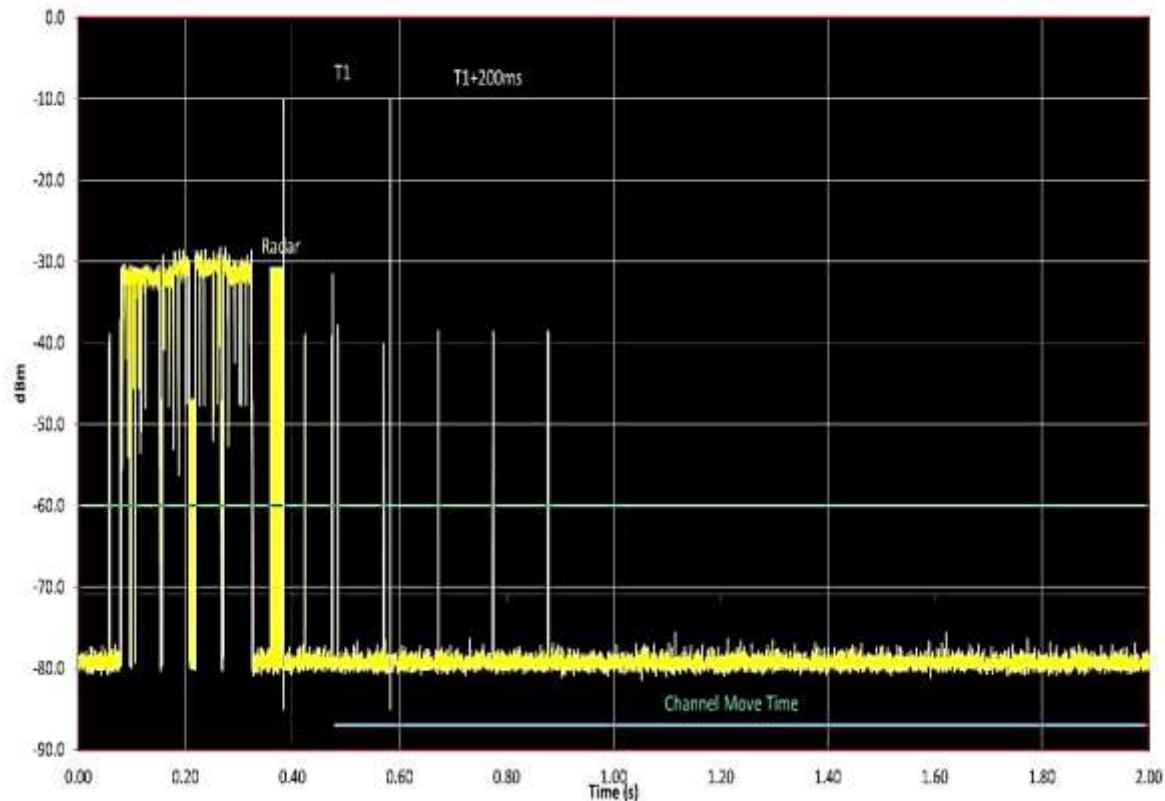
Note 2: The Channel Closing Transmission Time is comprised of 200 milliseconds starting at the beginning of the Channel Move Time plus any additional intermittent control signals required to facilitate a Channel move (an aggregate of 60 milliseconds) during the remainder of the 10 second period. The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

Note 3. This test is required for Master and Client with Radar Detection.

### Plot(s)



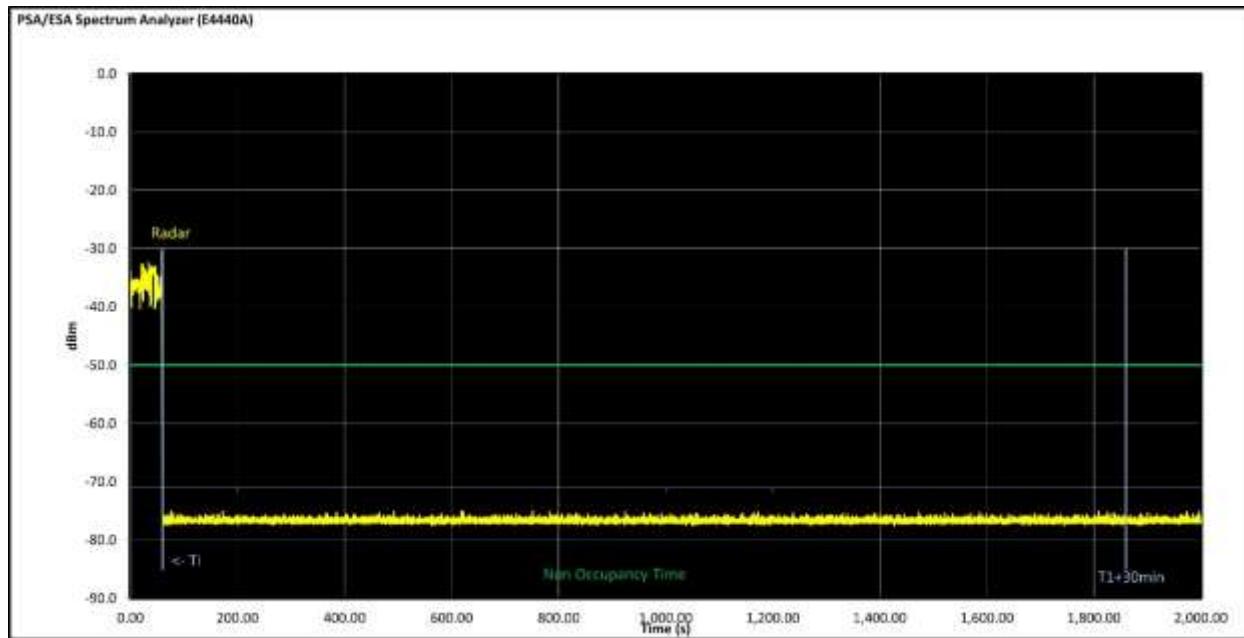
Transmission with radar pulse at T1, 381ms, 11 sec sweep

**PSA/ESA Spectrum Analyzer (E4440A)**


Transmission with radar pulse at 383ms 2 sec sweep

|                  |     |
|------------------|-----|
| BIN T1+200ms     | 13  |
| Time T1+200ms ms | 3.2 |

|   |     |
|---|-----|
| BIN after T1+200ms to 10sec             | 9   |
| Aggregate time (T1+200ms, to 10 sec) ms | 2.2 |



Non-Occupancy time 2000sec sweep

## 5.1 Table 2 – Statistical Performance Check

| Test Setup/Conditions |  |                |            |
|-----------------------|--|----------------|------------|
| Test Location:        | Brea Lab Bench   | Test Engineer: | E. Wong    |
| Test Method:          | 7.8.4  | Test Date(s):  | 10/26/2021 |
| Configuration:        | 1  |                |            |
| Test Setup:           | <p>Conducted</p> <p>Statistical Performance Check was evaluated as illustrated in test setup diagram.</p> <p>Initial check:<br/>Radar burst at required test level was triggered.</p> <p>Transmissions of the EUT was observed at the end of the Burst on the Operating Channel for duration greater than 10 seconds for Radar Type 0 to ensure detection occurs.</p> <p>Transmissions of the EUT was observed at the end of the Burst on the Operating Channel for duration greater than 22 seconds for Long Pulse Radar Type 5 to ensure detection occurs.</p> <p>Statistical Performance of each protocol was evaluated with Radar burst triggered at required test level.</p> <p>Frequencies selected for statistical performance check 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.</p> <p>Video file of various channel loading meeting channel loading of at least 17 % were used</p> |                |            |

## Test Data Summary

| 802.11a            |                 |           |       |           |
|--------------------|-----------------|-----------|-------|-----------|
|                    |                 | Detection | Limit | Pass/Fail |
| Waveform           | Number of trial | %         | %     |           |
| <b>Short Pulse</b> |                 |           |       |           |
| Waveform 1         | 30              | 90.0      | 60    | Pass      |
| Waveform 2         | 30              | 73.3      | 60    | Pass      |
| Waveform 3         | 30              | 86.7      | 60    | Pass      |
| Waveform 4         | 30              | 86.7      | 60    | Pass      |
| Aggregate          | 120             | 84.2      | 80    | Pass      |
| <b>Long Pulse</b>  |                 |           |       |           |
| Waveform 5         | 30              | 100.0     | 80    | Pass      |
| Waveform 6         | 30              | 100.0     | 70    | Pass      |

| 802.11VHT20        |                 |           |       |           |
|--------------------|-----------------|-----------|-------|-----------|
|                    |                 | Detection | Limit | Pass/Fail |
| Waveform           | Number of trial | %         | %     |           |
| <b>Short Pulse</b> |                 |           |       |           |
| Waveform 1         | 30              | 93.3      | 60    | Pass      |
| Waveform 2         | 30              | 76.7      | 60    | Pass      |
| Waveform 3         | 30              | 80.0      | 60    | Pass      |
| Waveform 4         | 30              | 86.7      | 60    | Pass      |
| Aggregate          | 120             | 84.2      | 80    | Pass      |
| <b>Long Pulse</b>  |                 |           |       |           |
| Waveform 5         | 30              | 96.7      | 80    | Pass      |
| Waveform 6         | 30              | 96.7      | 70    | Pass      |

| <b>802.11VHT40</b> |                        |                  |              |                  |
|--------------------|------------------------|------------------|--------------|------------------|
|                    |                        | <b>Detection</b> | <b>Limit</b> | <b>Pass/Fail</b> |
| <b>Waveform</b>    | <b>Number of trial</b> | <b>%</b>         | <b>%</b>     |                  |
| <b>Short Pulse</b> |                        |                  |              |                  |
| Waveform 1         | 30                     | 96.7             | 60           | Pass             |
| Waveform 2         | 30                     | 86.7             | 60           | Pass             |
| Waveform 3         | 30                     | 76.7             | 60           | Pass             |
| Waveform 4         | 30                     | 83.3             | 60           | Pass             |
| Aggregate          | 120                    | 85.8             | 80           | Pass             |
| <b>Long Pulse</b>  |                        |                  |              |                  |
| Waveform 5         | 30                     | 100.0            | 80           | Pass             |
| Waveform 6         | 30                     | 100.0            | 70           | Pass             |

| <b>802.1VHT80</b>  |                        |                  |              |                  |
|--------------------|------------------------|------------------|--------------|------------------|
|                    |                        | <b>Detection</b> | <b>Limit</b> | <b>Pass/Fail</b> |
| <b>Waveform</b>    | <b>Number of trial</b> | <b>%</b>         | <b>%</b>     |                  |
| <b>Short Pulse</b> |                        |                  |              |                  |
| Waveform 1         | 30                     | 93.3             | 60           | Pass             |
| Waveform 2         | 30                     | 96.7             | 60           | Pass             |
| Waveform 3         | 30                     | 100.0            | 60           | Pass             |
| Waveform 4         | 30                     | 90.0             | 60           | Pass             |
| Aggregate          | 120                    | 95.0             | 80           | Pass             |
| <b>Long Pulse</b>  |                        |                  |              |                  |
| Waveform 5         | 30                     | 96.7             | 80           | Pass             |
| Waveform 6         | 30                     | 100.0            | 70           | Pass             |

### Test Data

| Waveform Type 1<br>For 20MHz, 40 MHz, 80MHz<br>See appendix D for Waveform detail |             |             |      | 5Mbps                   | 5Mbps               | 7Mbps       | 9Mbps        |
|---|-------------|-------------|------|-------------------------|---------------------|-------------|--------------|
|   |             |             |      | 5500MHz                 | 5500MHz             | 5510MHz     | 5530MHz      |
|   |             |             |      | 802.11a                 | 802.11VHT20         | 802.11VHT40 | 802.11 VHT80 |
| Trial   | Pulse/burst | Pulse width | PRI  | Detection<br>1=Yes,0=No | Trial<br>1=Yes,0=No | Pulse/burst | Pulse width  |
|   |             | us          | (us) |                         |                     | 1=Yes,0=No  | us           |
| 0   | 57          | 1           | 938  | 1                       | 0                   | 1           | 1            |
| 1   | 76          | 1           | 698  | 1                       | 1                   | 1           | 1            |
| 2   | 86          | 1           | 618  | 1                       | 1                   | 1           | 1            |
| 3   | 99          | 1           | 538  | 1                       | 1                   | 1           | 1            |
| 4   | 61          | 1           | 878  | 1                       | 0                   | 1           | 1            |
| 5   | 18          | 1           | 3066 | 1                       | 1                   | 1           | 1            |
| 6   | 83          | 1           | 638  | 1                       | 1                   | 1           | 1            |
| 7   | 58          | 1           | 918  | 1                       | 1                   | 1           | 1            |
| 8   | 63          | 1           | 838  | 1                       | 0                   | 1           | 1            |
| 9   | 62          | 1           | 858  | 1                       | 0                   | 1           | 1            |
| 10  | 67          | 1           | 798  | 1                       | 1                   | 1           | 1            |
| 11  | 74          | 1           | 718  | 1                       | 0                   | 0           | 0            |
| 12  | 92          | 1           | 578  | 1                       | 1                   | 1           | 1            |
| 13  | 89          | 1           | 598  | 1                       | 1                   | 1           | 1            |
| 14  | 95          | 1           | 558  | 1                       | 1                   | 1           | 1            |
| 15  | 21          | 1           | 2536 | 0                       | 1                   | 1           | 1            |
| 16  | 55          | 1           | 966  | 1                       | 1                   | 1           | 1            |
| 17  | 64          | 1           | 827  | 1                       | 1                   | 1           | 1            |
| 18  | 22          | 1           | 2501 | 0                       | 1                   | 1           | 1            |
| 19  | 21          | 1           | 2595 | 1                       | 1                   | 1           | 1            |
| 20  | 48          | 1           | 1114 | 1                       | 1                   | 1           | 1            |
| 21  | 41          | 1           | 1302 | 1                       | 0                   | 1           | 1            |
| 22  | 18          | 1           | 3045 | 1                       | 1                   | 1           | 1            |
| 23  | 33          | 1           | 1624 | 1                       | 1                   | 1           | 1            |
| 24  | 19          | 1           | 2878 | 1                       | 1                   | 1           | 1            |
| 25  | 52          | 1           | 1027 | 1                       | 1                   | 1           | 1            |
| 26  | 22          | 1           | 2485 | 1                       | 1                   | 1           | 1            |
| 27  | 33          | 1           | 1600 | 1                       | 1                   | 1           | 1            |
| 28  | 46          | 1           | 1172 | 0                       | 1                   | 1           | 1            |
| 29  | 45          | 1           | 1177 | 1                       | 1                   | 1           | 1            |
| Statistic Performance (%)   |             |             |      | 90.0                    | 93.3                | 96.7        | 93.3         |

| Waveform Type 2<br>For 20MHz, 40 MHz, 80MHz<br>See appendix D for Waveform detail |             |             |      | 5Mbps      | 5Mbps       | 7Mbps       | 9Mbps       |
|---|-------------|-------------|------|------------|-------------|-------------|-------------|
|   |             |             |      | 5500MHz    | 5500MHz     | 5510MHz     | 5530MHz     |
|   |             |             |      | 802.11a    | 802.11VHT20 | 802.11VHT40 | 802.11VHT80 |
| Trial   | Pulse/burst | Pulse width | PRI  | Detection  | Trial       | Pulse/burst | Pulse width |
|   |             | us          | (us) | 1=Yes,0=No | 1=Yes,0=No  | 1=Yes,0=No  | us          |
| 0   | 26          | 3.2         | 179  | 1          | 1           | 1           | 1           |
| 1   | 23          | 1.1         | 207  | 1          | 1           | 1           | 1           |
| 2   | 24          | 2.1         | 230  | 1          | 1           | 1           | 1           |
| 3   | 29          | 4.8         | 200  | 1          | 1           | 1           | 1           |
| 4   | 28          | 3.9         | 214  | 1          | 1           | 1           | 1           |
| 5   | 26          | 2.9         | 222  | 1          | 1           | 1           | 1           |
| 6   | 26          | 3.2         | 204  | 1          | 0           | 1           | 1           |
| 7   | 25          | 2.5         | 192  | 1          | 1           | 1           | 0           |
| 8   | 26          | 3.1         | 164  | 1          | 1           | 1           | 1           |
| 9   | 23          | 1.2         | 156  | 1          | 1           | 1           | 1           |
| 10  | 27          | 3.9         | 210  | 1          | 1           | 1           | 1           |
| 11  | 29          | 4.6         | 201  | 1          | 1           | 0           | 1           |
| 12  | 26          | 3.2         | 162  | 1          | 1           | 0           | 1           |
| 13  | 25          | 2.2         | 197  | 0          | 0           | 1           | 1           |
| 14  | 29          | 4.5         | 163  | 1          | 1           | 0           | 1           |
| 15  | 26          | 3           | 203  | 1          | 1           | 0           | 1           |
| 16  | 29          | 5           | 168  | 1          | 0           | 1           | 1           |
| 17  | 25          | 2.4         | 217  | 1          | 0           | 1           | 1           |
| 18  | 26          | 2.9         | 191  | 1          | 1           | 1           | 1           |
| 19  | 25          | 2.3         | 166  | 0          | 1           | 1           | 1           |
| 20  | 27          | 3.7         | 150  | 0          | 1           | 1           | 1           |
| 21  | 25          | 2.2         | 176  | 1          | 1           | 1           | 1           |
| 22  | 29          | 4.9         | 195  | 1          | 1           | 1           | 1           |
| 23  | 26          | 2.9         | 202  | 0          | 0           | 1           | 1           |
| 24  | 25          | 2.5         | 178  | 1          | 1           | 1           | 1           |
| 25  | 23          | 1.1         | 206  | 1          | 1           | 1           | 1           |
| 26  | 27          | 3.8         | 155  | 0          | 0           | 1           | 1           |
| 27  | 29          | 4.7         | 157  | 0          | 1           | 1           | 1           |
| 28  | 25          | 2.4         | 224  | 0          | 1           | 1           | 1           |
| 29  | 28          | 4.2         | 159  | 0          | 0           | 1           | 1           |
| Statistic Performance (%)   |             |             |      | 73.3       | 76.7        | 86.7        | 96.7        |

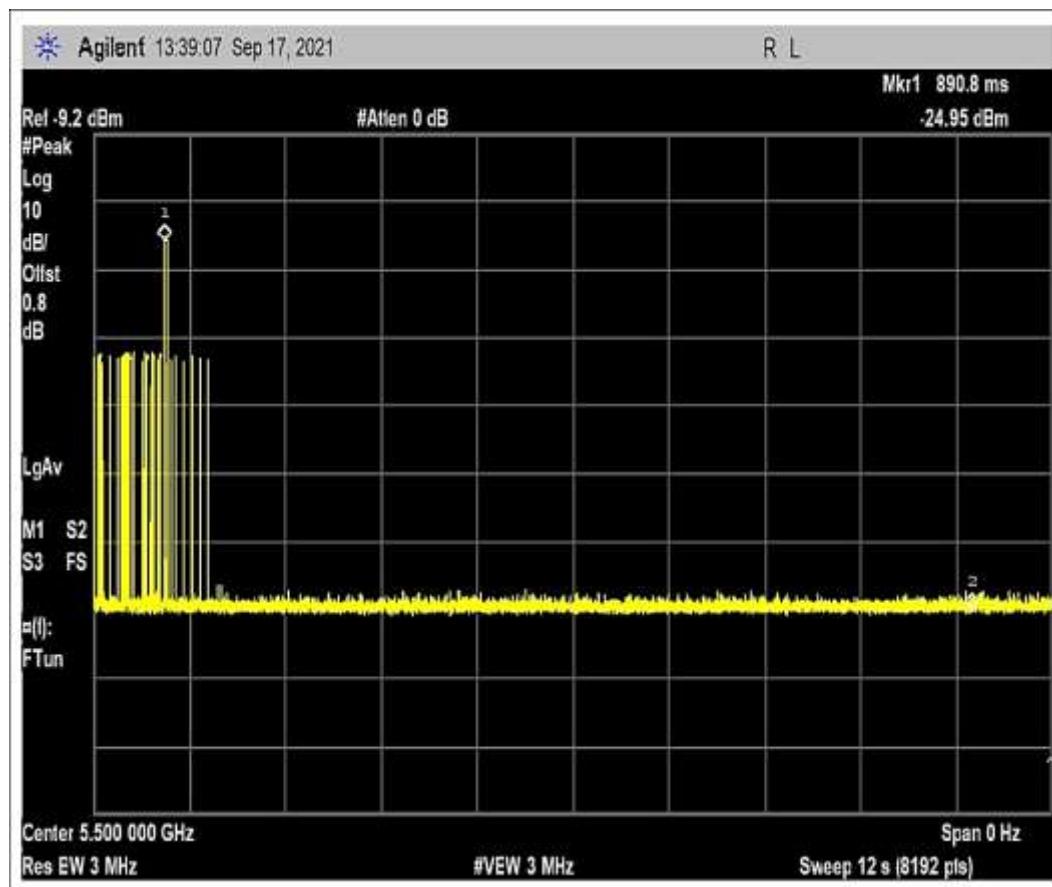
| <b>Waveform Type 3</b><br><b>For 20MHz, 40 MHz, 80MHz</b><br><b>See appendix D for Waveform detail</b> |                    |                    |            | <b>5Mbps</b>     | <b>5Mbps</b> | <b>7Mbps</b>       | <b>9Mbps</b>       |
|--|--------------------|--------------------|------------|------------------|--------------|--------------------|--------------------|
|  |                    |                    |            | 5500MHz          | 5500MHz      | 5510MHz            | 5530MHz            |
|  |                    |                    |            | 802.11a          | 802.11VHT20  | 802.11VHT40        | 802.11VHT80        |
| <b>Trial</b>   | <b>Pulse/burst</b> | <b>Pulse width</b> | <b>PRI</b> | <b>Detection</b> | <b>Trial</b> | <b>Pulse/burst</b> | <b>Pulse width</b> |
|  |                    | us                 | (us)       | 1=Yes,0=No       | 1=Yes,0=No   | 1=Yes,0=No         | us                 |
| 0  | 17                 | 8.2                | 355        | 1                | 1            | 1                  | 1                  |
| 1  | 16                 | 6.1                | 487        | 1                | 1            | 0                  | 1                  |
| 2  | 16                 | 7.1                | 344        | 1                | 1            | 1                  | 1                  |
| 3  | 18                 | 9.8                | 288        | 1                | 1            | 1                  | 1                  |
| 4  | 18                 | 8.9                | 230        | 1                | 0            | 0                  | 1                  |
| 5  | 17                 | 7.9                | 432        | 1                | 0            | 1                  | 1                  |
| 6  | 17                 | 8.2                | 207        | 1                | 1            | 1                  | 1                  |
| 7  | 17                 | 7.5                | 443        | 1                | 0            | 0                  | 1                  |
| 8  | 17                 | 8.1                | 439        | 0                | 1            | 1                  | 1                  |
| 9  | 16                 | 6.2                | 223        | 1                | 0            | 1                  | 1                  |
| 10   | 18                 | 8.9                | 208        | 1                | 1            | 1                  | 1                  |
| 11   | 18                 | 9.6                | 463        | 1                | 1            | 1                  | 1                  |
| 12   | 17                 | 8.2                | 441        | 1                | 1            | 1                  | 1                  |
| 13   | 16                 | 7.2                | 323        | 1                | 1            | 1                  | 1                  |
| 14   | 18                 | 9.5                | 297        | 1                | 1            | 0                  | 1                  |
| 15   | 17                 | 8                  | 412        | 1                | 1            | 1                  | 1                  |
| 16   | 18                 | 10                 | 324        | 1                | 1            | 1                  | 1                  |
| 17   | 17                 | 7.4                | 271        | 0                | 1            | 1                  | 1                  |
| 18   | 17                 | 7.9                | 349        | 1                | 1            | 1                  | 1                  |
| 19   | 16                 | 7.3                | 409        | 1                | 0            | 1                  | 1                  |
| 20   | 18                 | 8.7                | 373        | 1                | 1            | 1                  | 1                  |
| 21   | 16                 | 7.2                | 254        | 0                | 1            | 0                  | 1                  |
| 22   | 18                 | 9.9                | 274        | 1                | 1            | 0                  | 1                  |
| 23   | 17                 | 7.9                | 278        | 1                | 1            | 1                  | 1                  |
| 24   | 17                 | 7.5                | 317        | 1                | 1            | 1                  | 1                  |
| 25   | 16                 | 6.1                | 260        | 0                | 1            | 1                  | 1                  |
| 26   | 18                 | 8.8                | 211        | 1                | 1            | 1                  | 1                  |
| 27   | 18                 | 9.7                | 272        | 1                | 0            | 0                  | 1                  |
| 28   | 17                 | 7.4                | 264        | 1                | 1            | 1                  | 1                  |
| 29   | 18                 | 9.2                | 284        | 1                | 1            | 1                  | 1                  |
| <b>Statistic Performance (%)</b>   |                    |                    |            | 86.7             | 80.0         | 76.7               | 100.0              |

| <b>Waveform Type 4</b><br><b>For 20MHz, 40 MHz, 80MHz</b><br><b>See appendix D for Waveform detail</b> |                    |                    |            | <b>5Mbps</b>     | <b>5Mbps</b> | <b>7Mbps</b>       | <b>9Mbps</b>       |
|--|--------------------|--------------------|------------|------------------|--------------|--------------------|--------------------|
|  |                    |                    |            | 5500MHz          | 5500MHz      | 5510MHz            | 5530MHz            |
|  |                    |                    |            | 802.11a          | 802.11VHT20  | 802.11VHT40        | 802.11 VHT80       |
| <b>Trial</b>   | <b>Pulse/burst</b> | <b>Pulse width</b> | <b>PRI</b> | <b>Detection</b> | <b>Trial</b> | <b>Pulse/burst</b> | <b>Pulse width</b> |
|  |                    | us                 | (us)       | 1=Yes,0=No       | 1=Yes,0=No   | 1=Yes,0=No         | us                 |
| 0  | 14                 | 16                 | 355        | 1                | 1            | 1                  | 1                  |
| 1  | 12                 | 11.3               | 487        | 1                | 1            | 0                  | 1                  |
| 2  | 13                 | 13.5               | 344        | 1                | 1            | 1                  | 1                  |
| 3  | 16                 | 19.4               | 288        | 1                | 1            | 1                  | 1                  |
| 4  | 15                 | 17.5               | 230        | 0                | 1            | 1                  | 1                  |
| 5  | 14                 | 15.3               | 432        | 0                | 1            | 1                  | 1                  |
| 6  | 14                 | 15.9               | 207        | 0                | 1            | 1                  | 0                  |
| 7  | 13                 | 14.3               | 443        | 1                | 1            | 1                  | 1                  |
| 8  | 14                 | 15.8               | 439        | 1                | 1            | 1                  | 1                  |
| 9  | 12                 | 11.5               | 223        | 1                | 1            | 1                  | 1                  |
| 10   | 15                 | 17.4               | 208        | 1                | 1            | 0                  | 1                  |
| 11   | 16                 | 19                 | 463        | 1                | 1            | 1                  | 1                  |
| 12   | 14                 | 16                 | 441        | 1                | 1            | 1                  | 1                  |
| 13   | 13                 | 13.8               | 323        | 1                | 1            | 0                  | 1                  |
| 14   | 16                 | 18.9               | 297        | 0                | 1            | 1                  | 1                  |
| 15   | 14                 | 15.5               | 412        | 1                | 1            | 1                  | 0                  |
| 16   | 16                 | 19.9               | 324        | 1                | 1            | 1                  | 1                  |
| 17   | 13                 | 14.1               | 271        | 1                | 1            | 1                  | 1                  |
| 18   | 14                 | 15.2               | 349        | 1                | 1            | 1                  | 1                  |
| 19   | 13                 | 13.8               | 409        | 1                | 1            | 0                  | 1                  |
| 20   | 15                 | 17.1               | 373        | 1                | 1            | 1                  | 1                  |
| 21   | 13                 | 13.8               | 254        | 1                | 1            | 1                  | 1                  |
| 22   | 16                 | 19.8               | 274        | 1                | 0            | 0                  | 1                  |
| 23   | 14                 | 15.3               | 278        | 1                | 0            | 1                  | 1                  |
| 24   | 13                 | 14.5               | 317        | 1                | 0            | 1                  | 0                  |
| 25   | 12                 | 11.3               | 260        | 1                | 1            | 1                  | 1                  |
| 26   | 15                 | 17.3               | 211        | 1                | 1            | 1                  | 1                  |
| 27   | 16                 | 19.2               | 272        | 1                | 0            | 1                  | 1                  |
| 28   | 13                 | 14.2               | 264        | 1                | 1            | 1                  | 1                  |
| 29   | 15                 | 18.2               | 284        | 1                | 1            | 1                  | 1                  |
| <b>Statistic Performance (%)</b>   |                    |                    |            | 86.7             | 86.7         | 83.3               | 90.0               |

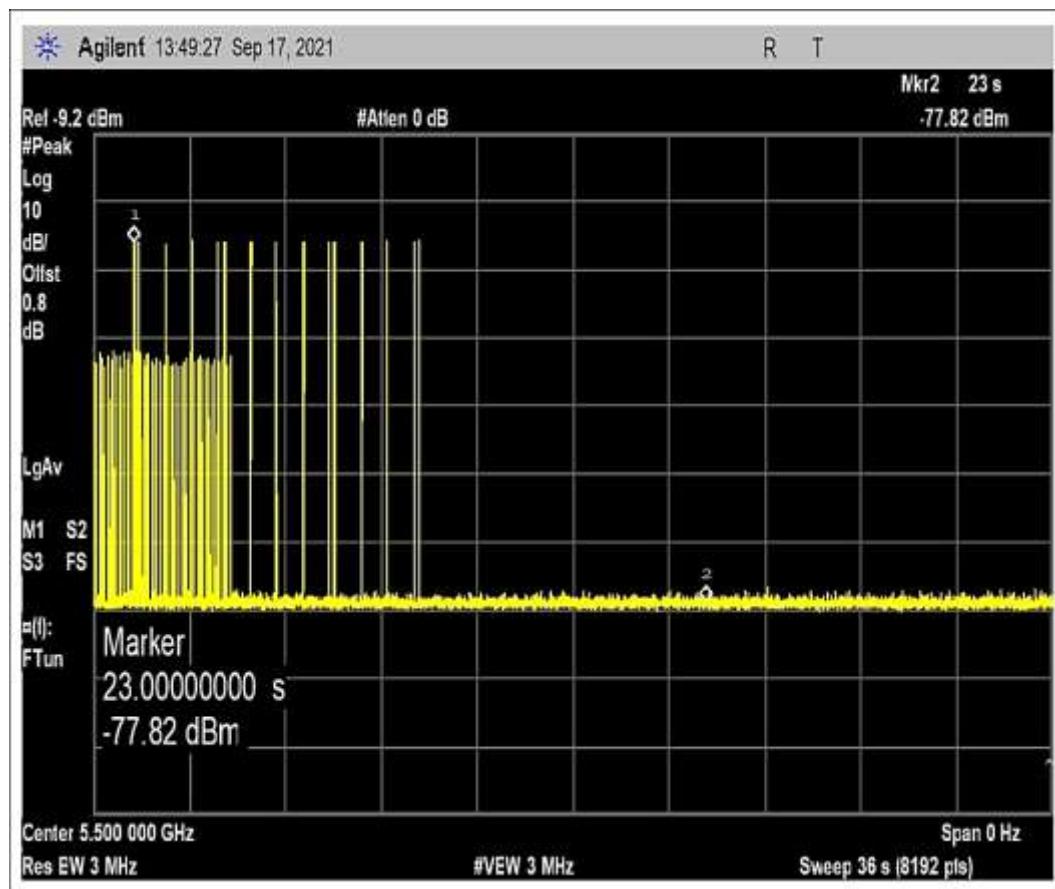
| <b>Waveform Type 5</b><br><b>For 20MHz, 40 MHz, 80MHz</b><br><b>See appendix D for Waveform detail</b> |                        | <b>5Mbps</b>      | <b>5Mbps</b>      | <b>7Mbps</b>      | <b>9Mbps</b>      |
|--|------------------------|-------------------|-------------------|-------------------|-------------------|
|  |                        | 5500MHz           | 5500MHz           | 5510MHz           | 5530MHz           |
|  |                        | 802.11a           | 802.11VHT20       | 802.11VHT40       | 802.11 VHT80      |
| <b>Trial</b>   |                        | <b>Detection</b>  | <b>Detection</b>  | <b>Detection</b>  | <b>Trial</b>      |
|  |                        | <b>1=Yes,0=No</b> | <b>1=Yes,0=No</b> | <b>1=Yes,0=No</b> | <b>1=Yes,0=No</b> |
| 0  | FCC Waveform 5 Test 0  | 1                 | 1                 | 1                 | 1                 |
| 1  | FCC Waveform 5 Test 1  | 1                 | 1                 | 1                 | 1                 |
| 2  | FCC Waveform 5 Test 2  | 1                 | 0                 | 1                 | 1                 |
| 3  | FCC Waveform 5 Test 3  | 1                 | 1                 | 1                 | 1                 |
| 4  | FCC Waveform 5 Test 4  | 1                 | 1                 | 1                 | 1                 |
| 5  | FCC Waveform 5 Test 5  | 1                 | 1                 | 1                 | 1                 |
| 6  | FCC Waveform 5 Test 6  | 1                 | 1                 | 1                 | 1                 |
| 7  | FCC Waveform 5 Test 7  | 1                 | 1                 | 1                 | 1                 |
| 8  | FCC Waveform 5 Test 8  | 1                 | 1                 | 1                 | 1                 |
| 9  | FCC Waveform 5 Test 9  | 1                 | 1                 | 1                 | 1                 |
| 10   | FCC Waveform 5 Test 10 | 1                 | 1                 | 1                 | 1                 |
| 11   | FCC Waveform 5 Test 11 | 1                 | 1                 | 1                 | 1                 |
| 12   | FCC Waveform 5 Test 12 | 1                 | 1                 | 1                 | 1                 |
| 13   | FCC Waveform 5 Test 13 | 1                 | 1                 | 1                 | 1                 |
| 14   | FCC Waveform 5 Test 14 | 1                 | 1                 | 1                 | 0                 |
| 15   | FCC Waveform 5 Test 15 | 1                 | 1                 | 1                 | 1                 |
| 16   | FCC Waveform 5 Test 16 | 1                 | 1                 | 1                 | 1                 |
| 17   | FCC Waveform 5 Test 17 | 1                 | 1                 | 1                 | 1                 |
| 18   | FCC Waveform 5 Test 18 | 1                 | 1                 | 1                 | 1                 |
| 19   | FCC Waveform 5 Test 19 | 1                 | 1                 | 1                 | 1                 |
| 20   | FCC Waveform 5 Test 20 | 1                 | 1                 | 1                 | 1                 |
| 21   | FCC Waveform 5 Test 21 | 1                 | 1                 | 1                 | 1                 |
| 22   | FCC Waveform 5 Test 22 | 1                 | 1                 | 1                 | 1                 |
| 23   | FCC Waveform 5 Test 23 | 1                 | 1                 | 1                 | 1                 |
| 24   | FCC Waveform 5 Test 24 | 1                 | 1                 | 1                 | 1                 |
| 25   | FCC Waveform 5 Test 25 | 1                 | 1                 | 1                 | 1                 |
| 26   | FCC Waveform 5 Test 26 | 1                 | 1                 | 1                 | 1                 |
| 27   | FCC Waveform 5 Test 27 | 1                 | 1                 | 1                 | 1                 |
| 28   | FCC Waveform 5 Test 28 | 1                 | 1                 | 1                 | 1                 |
| 29   | FCC Waveform 5 Test 29 | 1                 | 1                 | 1                 | 1                 |
| <b>Statistic Performance (%)</b>   |                        | 100.0             | 96.7              | 100.0             | 96.7              |

| <b>Waveform Type 6</b><br><b>For 20MHz, 40 MHz, 80MHz</b><br><b>See appendix D for Waveform detail</b> |                        | <b>5Mbps</b>      | <b>5Mbps</b>      | <b>7Mbps</b>      | <b>9Mbps</b>      |
|--|------------------------|-------------------|-------------------|-------------------|-------------------|
|  |                        | 5500MHz           | 5500MHz           | 5510MHz           | 5530MHz           |
|  |                        | 802.11a           | 802.11VHT20       | 802.11VHT40       | 802.11VHT80       |
| <b>Trial</b>   |                        | <b>Detection</b>  | <b>Detection</b>  | <b>Detection</b>  | <b>Trial</b>      |
|  |                        | <b>1=Yes,0=No</b> | <b>1=Yes,0=No</b> | <b>1=Yes,0=No</b> | <b>1=Yes,0=No</b> |
| 0  | FCC Waveform 6 Test 0  | 1                 | 1                 | 1                 | 1                 |
| 1  | FCC Waveform 6 Test 1  | 1                 | 1                 | 1                 | 1                 |
| 2  | FCC Waveform 6 Test 2  | 1                 | 1                 | 1                 | 1                 |
| 3  | FCC Waveform 6 Test 3  | 1                 | 1                 | 1                 | 1                 |
| 4  | FCC Waveform 6 Test 4  | 1                 | 1                 | 1                 | 1                 |
| 5  | FCC Waveform 6 Test 5  | 1                 | 0                 | 1                 | 1                 |
| 6  | FCC Waveform 6 Test 6  | 1                 | 1                 | 1                 | 1                 |
| 7  | FCC Waveform 6 Test 7  | 1                 | 1                 | 1                 | 1                 |
| 8  | FCC Waveform 6 Test 8  | 1                 | 1                 | 1                 | 1                 |
| 9  | FCC Waveform 6 Test 9  | 1                 | 1                 | 1                 | 1                 |
| 10   | FCC Waveform 6 Test 10 | 1                 | 1                 | 1                 | 1                 |
| 11   | FCC Waveform 6 Test 11 | 1                 | 1                 | 1                 | 1                 |
| 12   | FCC Waveform 6 Test 12 | 1                 | 1                 | 1                 | 1                 |
| 13   | FCC Waveform 6 Test 13 | 1                 | 1                 | 1                 | 1                 |
| 14   | FCC Waveform 6 Test 14 | 1                 | 1                 | 1                 | 1                 |
| 15   | FCC Waveform 6 Test 15 | 1                 | 1                 | 1                 | 1                 |
| 16   | FCC Waveform 6 Test 16 | 1                 | 1                 | 1                 | 1                 |
| 17   | FCC Waveform 6 Test 17 | 1                 | 1                 | 1                 | 1                 |
| 18   | FCC Waveform 6 Test 18 | 1                 | 1                 | 1                 | 1                 |
| 19   | FCC Waveform 6 Test 19 | 1                 | 1                 | 1                 | 1                 |
| 20   | FCC Waveform 6 Test 20 | 1                 | 1                 | 1                 | 1                 |
| 21   | FCC Waveform 6 Test 21 | 1                 | 1                 | 1                 | 1                 |
| 22   | FCC Waveform 6 Test 22 | 1                 | 1                 | 1                 | 1                 |
| 23   | FCC Waveform 6 Test 23 | 1                 | 1                 | 1                 | 1                 |
| 24   | FCC Waveform 6 Test 24 | 1                 | 1                 | 1                 | 1                 |
| 25   | FCC Waveform 6 Test 25 | 1                 | 1                 | 1                 | 1                 |
| 26   | FCC Waveform 6 Test 26 | 1                 | 1                 | 1                 | 1                 |
| 27   | FCC Waveform 6 Test 27 | 1                 | 1                 | 1                 | 1                 |
| 28   | FCC Waveform 6 Test 28 | 1                 | 1                 | 1                 | 1                 |
| 29   | FCC Waveform 6 Test 29 | 1                 | 1                 | 1                 | 1                 |
| <b>Statistic Performance (%)</b>   |                        | 100.0             | 96.7              | 100.0             | 100.0             |

**Plot(s)**



12 second plot Radar Type 0 response in at least 10 sec



36 second plot Radar Type 5 response in at least 20 sec

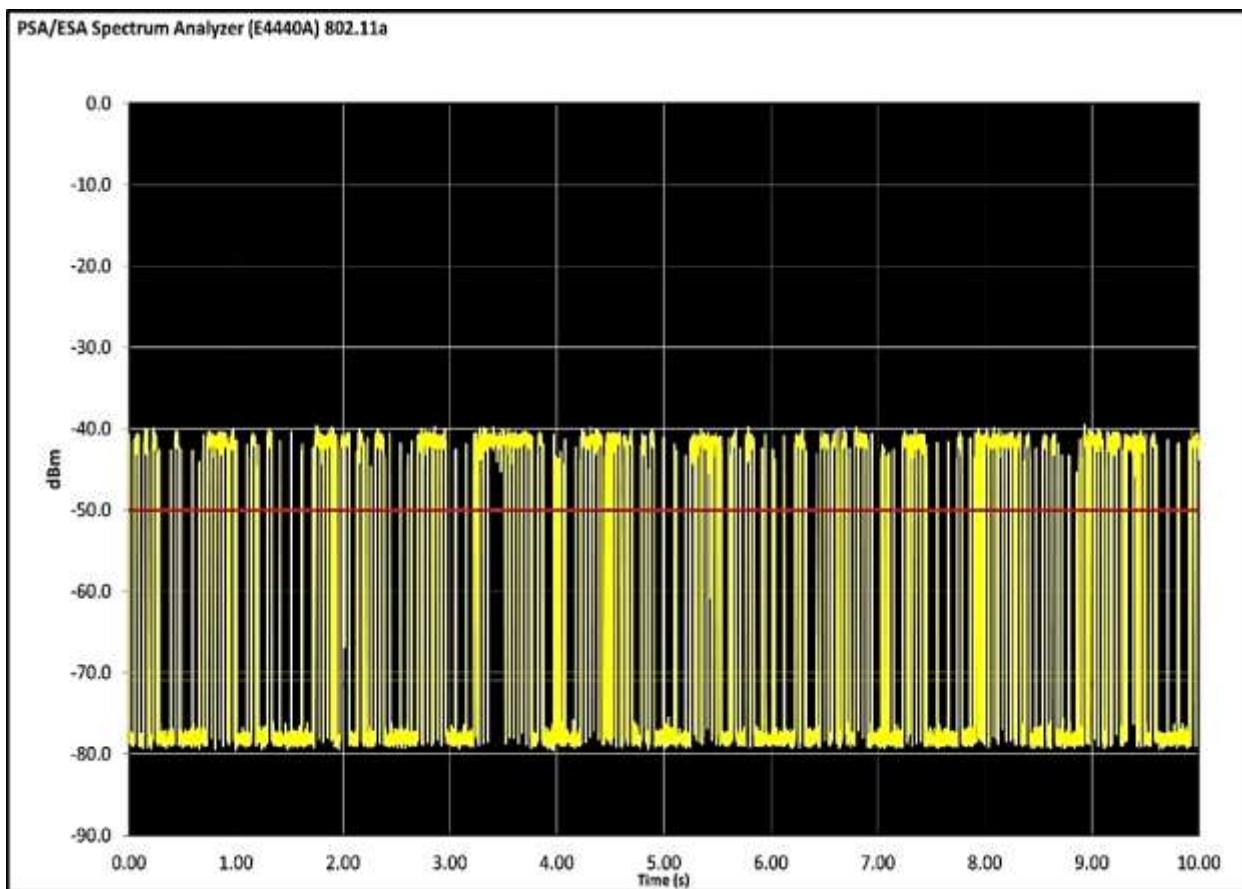
## Channel Loading

| Test Setup/Conditions |  |                |           |
|-----------------------|--|----------------|-----------|
| Test Location:        | Brea Lab Bench   | Test Engineer: | E. Wong   |
| Test Method:          | 7.7  | Test Date(s):  | 9/15/2021 |
| Configuration:        | 1  |                |           |
| Test Setup:           | <p>Conducted</p> <p>Channel loading was measured as illustrated in test setup diagram. A spectrum analyzer with Peak detector activated, set at zero span and RBW and VBW &gt;3 MHz. Channel loading of each protocol is evaluated.</p> <p>Data transfer: MPEG file is loaded on Laptop1 which is connected to the Ethernet port of a host with the Master device installed. Laptop 2 is connected to the client device via Ethernet port.</p> <p>Communication established between the master and client, Window Media Player with V2.61 Codec package installed in Laptop2 (client device) plays the MPEG file stored in laptop1 (Master device) via steaming mode.</p> <p>Filename: DFS Video 5 Mbps, 7 Mbps, 9Mbps,</p> <p>Trace captured and analyzed with excel spread sheet.</p> <p>Channel loading is measured by Time On/ (Time On + Time Off), equivalently (BIN above Threshold/ total BIN)</p> |                |           |

| Test Data Summary |                      |             |           |         |
|-------------------|----------------------|-------------|-----------|---------|
| Frequency (MHz)   | Protocol             | Loading (%) | Limit (%) | Results |
| 5500              | 802.11a, 5Mbps       | 42.4        | > 17      | Pass    |
| 5500              | 802.11VHT20, 5Mbps   | 27.6        | > 17      | Pass    |
| 5510              | 802.11VHT40, 7Mbps   | 17.6        | > 17      | Pass    |
| 5530              | 802.11VHT80, 9Mbps   | 18.6        | > 17      | Pass    |
| 5530              | 802.11VHT80, 30Mbps* | 29.1        | >17       | Pass    |

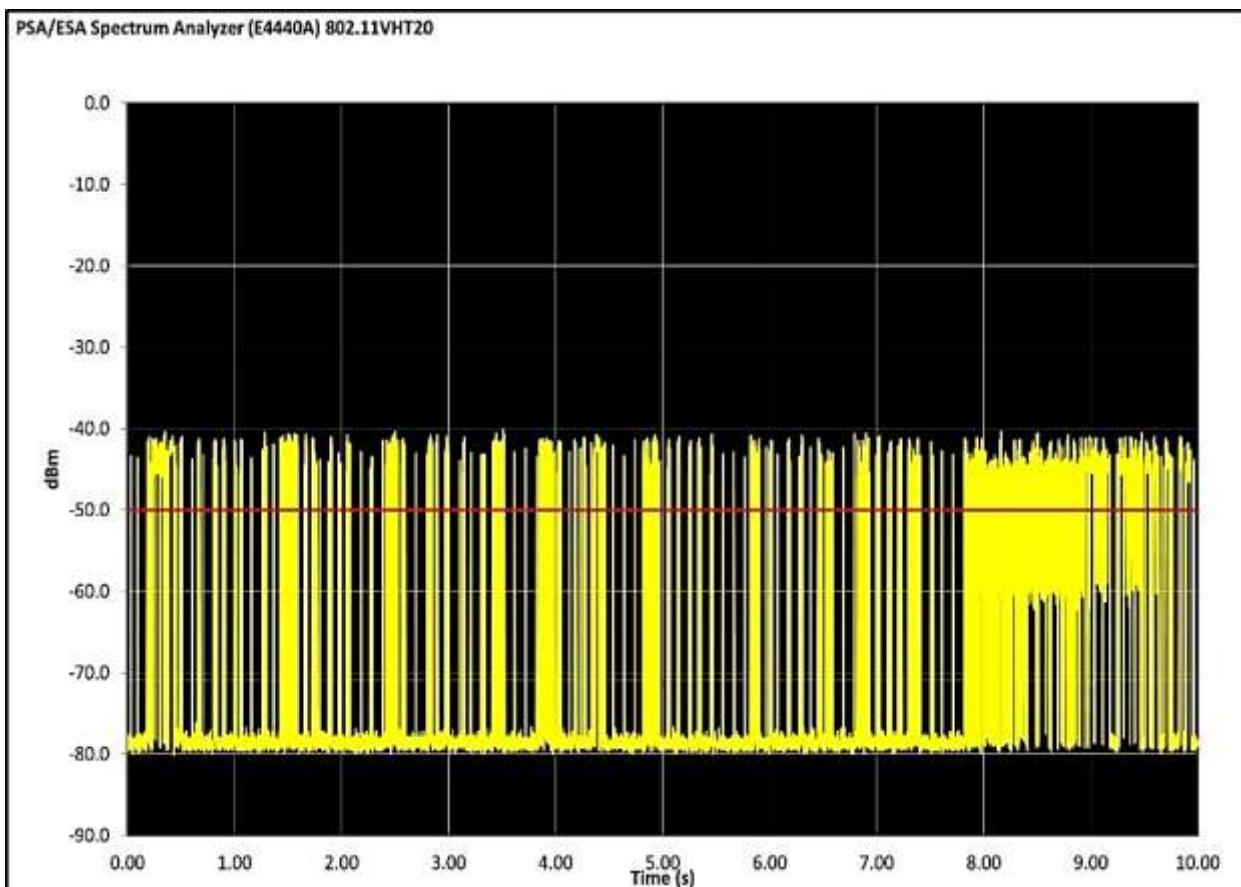
\*Client

**Plot(s)**



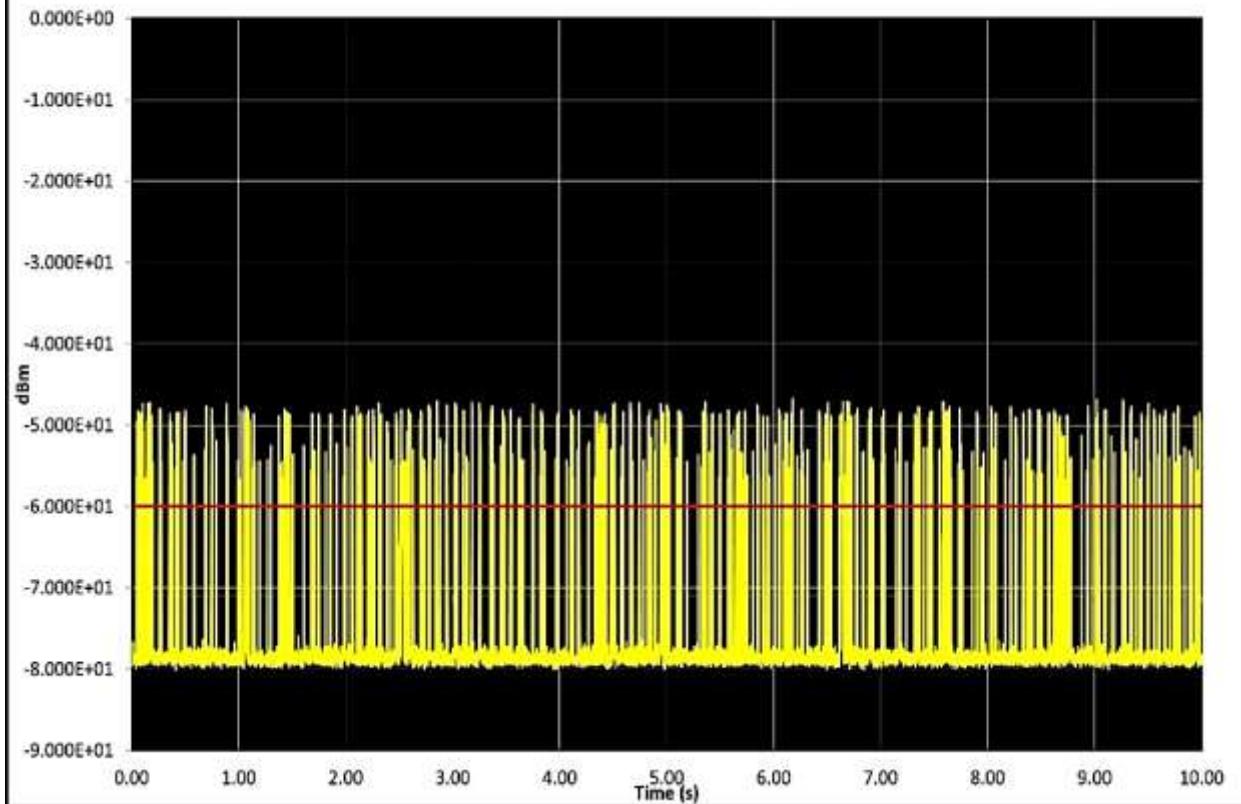
7.7 Channel Loading\_802.11a\_8192pt\_5Mbps

PSA/ESA Spectrum Analyzer (E4440A) 802.11VHT20



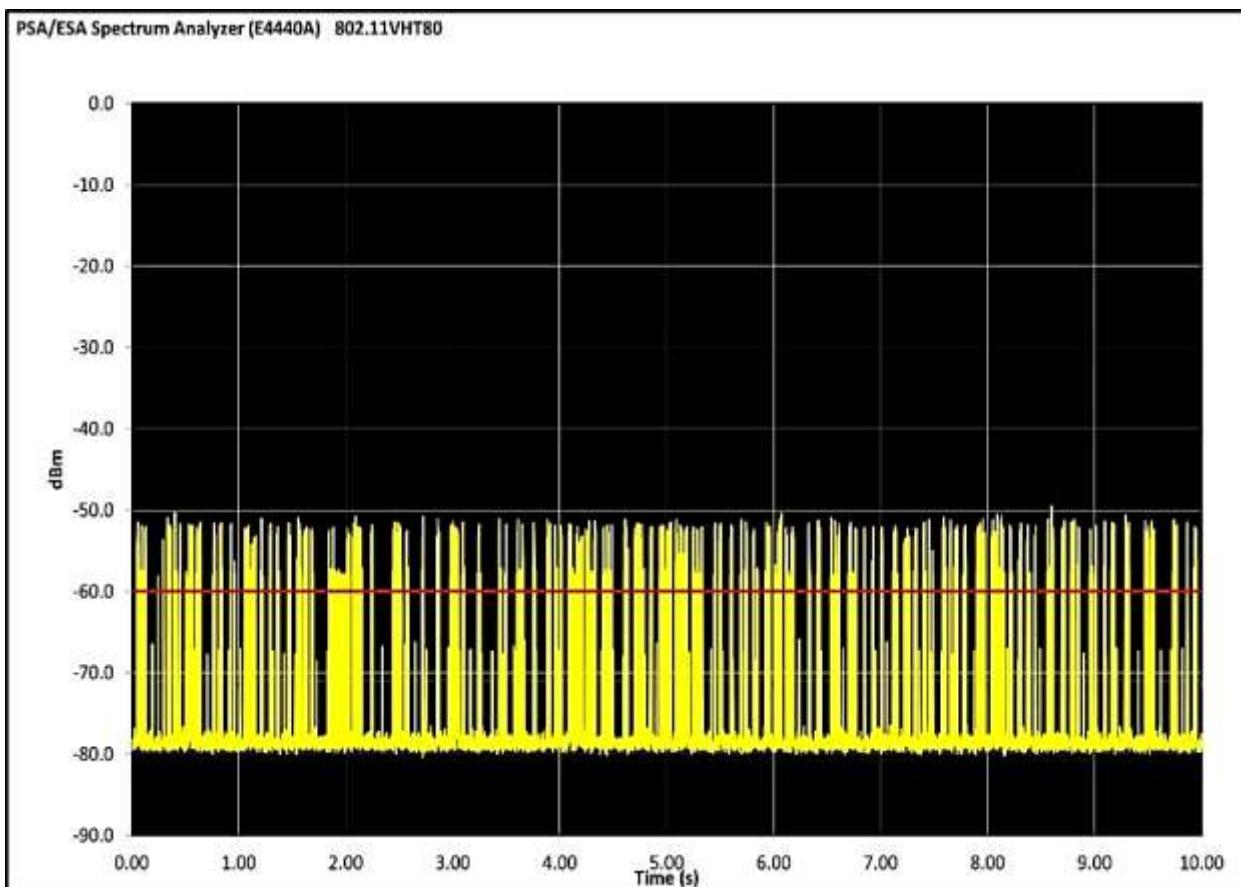
7.7 Channel Loading\_801.11VHT20\_8192pt\_5Mbps

PSA/ESA Spectrum Analyzer (E4440A) 802.11VHT40



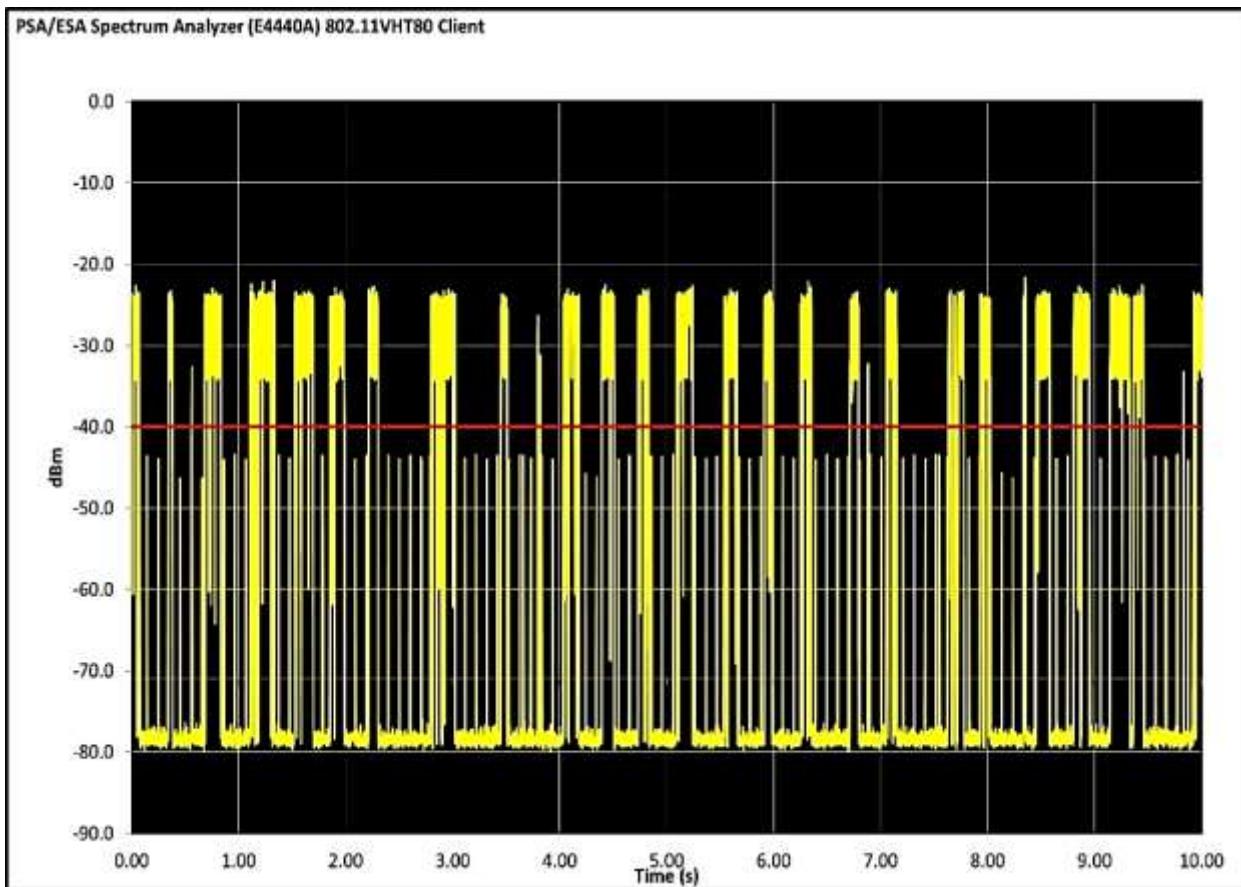
7.7 Channel Loading\_801.11VHT40\_8192pt\_7Mbps

PSA/ESA Spectrum Analyzer (E4440A) 802.11VHT80



7.7 Channel Loading\_801.11VHT80\_8192pt\_9Mbps

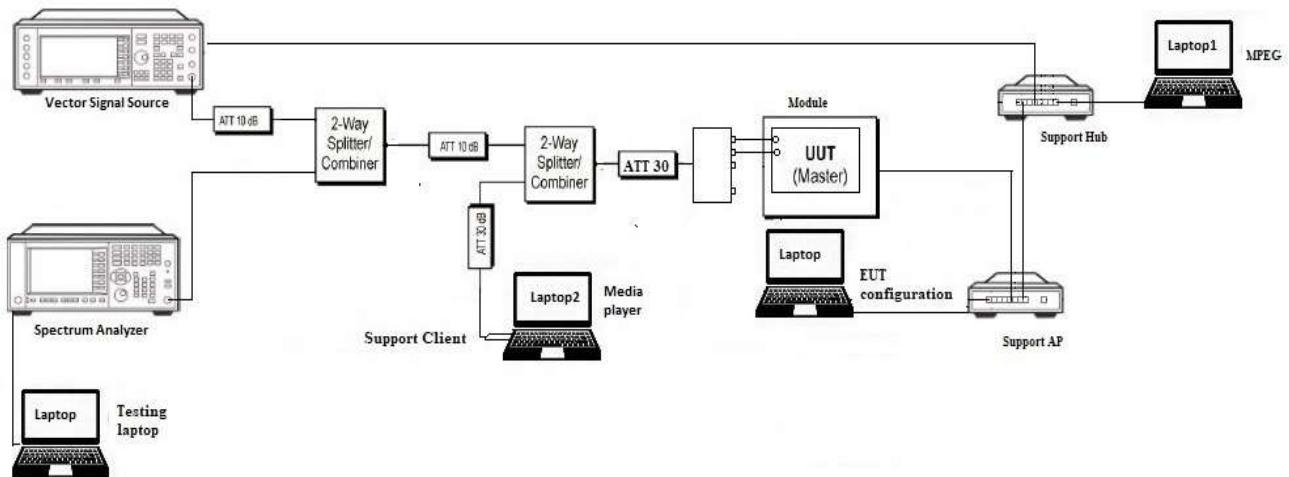
PSA/ESA Spectrum Analyzer (E4440A) 802.11VHT80 Client



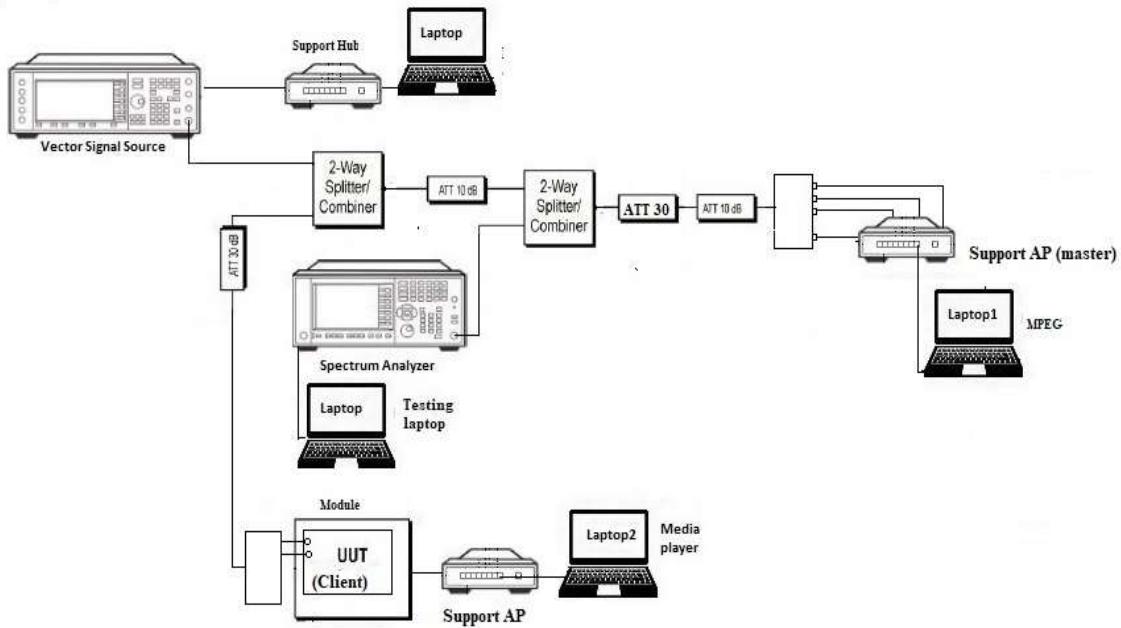
7.7 Channel Loading\_801.11VHT80\_8192pt\_30Mbps (client)

## Appendix A: Test Equipment Setup Block Diagram

Setup for Master with injection at the Master

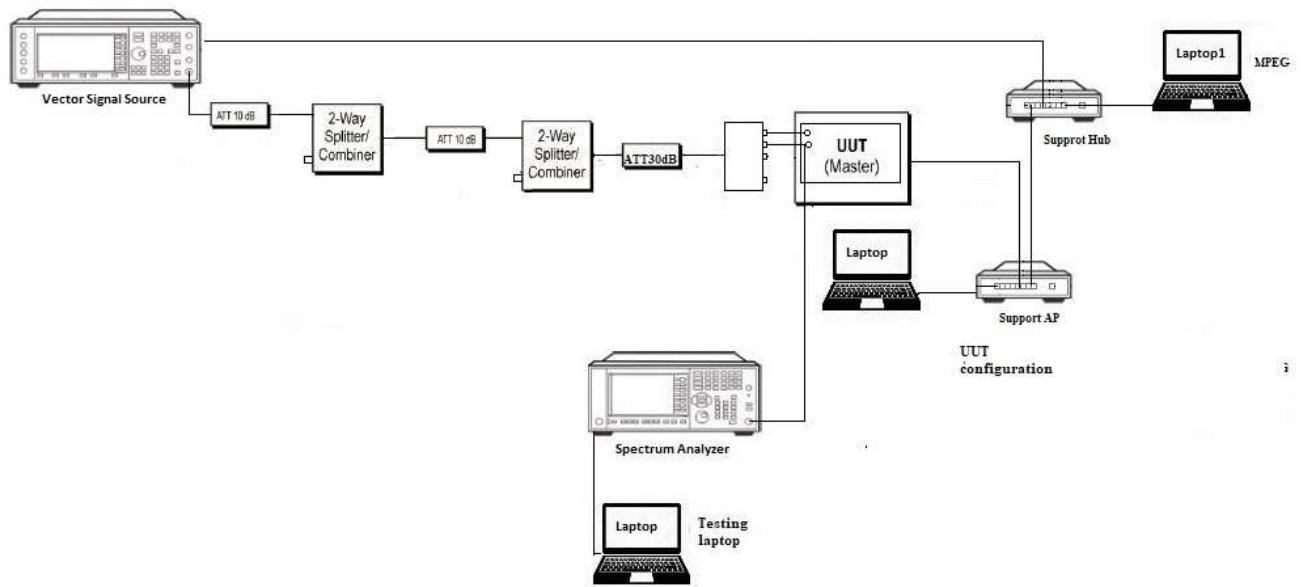


Setup for Client with injection at the master

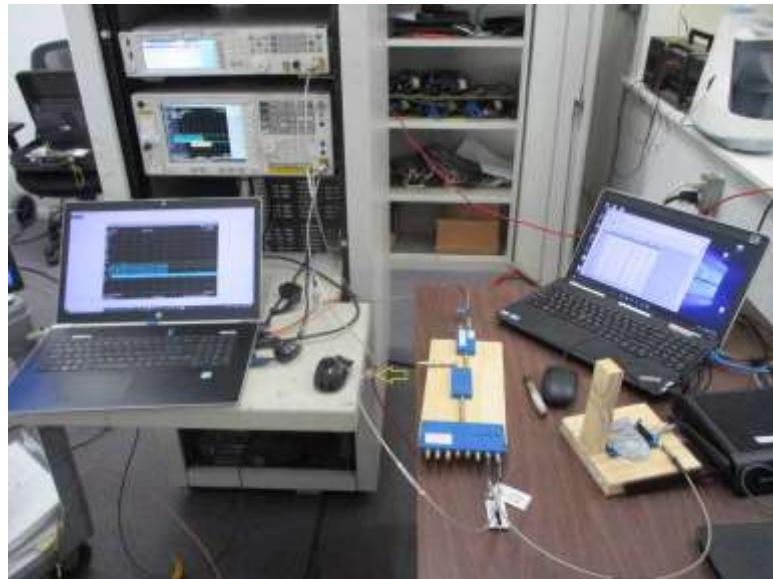


## Appendix B: Detection Threshold Diagram

Setup for Master with injection at the Master



## Appendix C: Test Setup Photos



Radar Signal Calibration



Test Setup, Master 1



Test Setup, Master 2



Test Setup, Client 1



Test Setup, Client 2



Test Setup, Client 5

## Appendix D: Statistical Performance Test Waveform Radar Type 1-6 for 20MHz, 40 MHz and 80MHz

| Short Pulse Radar: Waveform Type 1 |             |      |                  |                 |
|------------------------------------|-------------|------|------------------|-----------------|
| Trial                              | Pulse width | PRI  | Number of Pulses | Waveform Length |
|                                    | (μs)        | (μs) |                  | (μs)            |
| 0                                  | 1           | 938  | 57               | 53466.0         |
| 1                                  | 1           | 698  | 76               | 53048.0         |
| 2                                  | 1           | 618  | 86               | 53148.0         |
| 3                                  | 1           | 538  | 99               | 53262.0         |
| 4                                  | 1           | 878  | 61               | 53558.0         |
| 5                                  | 1           | 3066 | 18               | 55188.0         |
| 6                                  | 1           | 638  | 83               | 52954.0         |
| 7                                  | 1           | 918  | 58               | 53244.0         |
| 8                                  | 1           | 838  | 63               | 52794.0         |
| 9                                  | 1           | 858  | 62               | 53196.0         |
| 10                                 | 1           | 798  | 67               | 53466.0         |
| 11                                 | 1           | 718  | 74               | 53132.0         |
| 12                                 | 1           | 578  | 92               | 53176.0         |
| 13                                 | 1           | 598  | 89               | 53222.0         |
| 14                                 | 1           | 558  | 95               | 53010.0         |
| 15                                 | 1           | 2536 | 21               | 53256.0         |
| 16                                 | 1           | 966  | 55               | 53130.0         |
| 17                                 | 1           | 827  | 64               | 52928.0         |
| 18                                 | 1           | 2501 | 22               | 55022.0         |
| 19                                 | 1           | 2595 | 21               | 54495.0         |
| 20                                 | 1           | 1114 | 48               | 53472.0         |
| 21                                 | 1           | 1302 | 41               | 53382.0         |
| 22                                 | 1           | 3045 | 18               | 54810.0         |
| 23                                 | 1           | 1624 | 33               | 53592.0         |
| 24                                 | 1           | 2878 | 19               | 54682.0         |
| 25                                 | 1           | 1027 | 52               | 53404.0         |
| 26                                 | 1           | 2485 | 22               | 54670.0         |
| 27                                 | 1           | 1600 | 33               | 52800.0         |
| 28                                 | 1           | 1172 | 46               | 53912.0         |
| 29                                 | 1           | 1177 | 45               | 52965.0         |

**Short Pulse Radar: Waveform Type 2**

| Trial | Pulse width | PRI  | Number of Pulses | Waveform Length |
|-------|-------------|------|------------------|-----------------|
|       | (μs)        | (μs) |                  | (μs)            |
| 0     | 3.2         | 179  | 26               | 4654.0          |
| 1     | 1.1         | 207  | 23               | 4761.0          |
| 2     | 2.1         | 230  | 24               | 5520.0          |
| 3     | 4.8         | 200  | 29               | 5800.0          |
| 4     | 3.9         | 214  | 28               | 5992.0          |
| 5     | 2.9         | 222  | 26               | 5772.0          |
| 6     | 3.2         | 204  | 26               | 5304.0          |
| 7     | 2.5         | 192  | 25               | 4800.0          |
| 8     | 3.1         | 164  | 26               | 4264.0          |
| 9     | 1.2         | 156  | 23               | 3588.0          |
| 10    | 3.9         | 210  | 27               | 5670.0          |
| 11    | 4.6         | 201  | 29               | 5829.0          |
| 12    | 3.2         | 162  | 26               | 4212.0          |
| 13    | 2.2         | 197  | 25               | 4925.0          |
| 14    | 4.5         | 163  | 29               | 4727.0          |
| 15    | 3.0         | 203  | 26               | 5278.0          |
| 16    | 5.0         | 168  | 29               | 4872.0          |
| 17    | 2.4         | 217  | 25               | 5425.0          |
| 18    | 2.9         | 191  | 26               | 4966.0          |
| 19    | 2.3         | 166  | 25               | 4150.0          |
| 20    | 3.7         | 150  | 27               | 4050.0          |
| 21    | 2.2         | 176  | 25               | 4400.0          |
| 22    | 4.9         | 195  | 29               | 5655.0          |
| 23    | 2.9         | 202  | 26               | 5252.0          |
| 24    | 2.5         | 178  | 25               | 4450.0          |
| 25    | 1.1         | 206  | 23               | 4738.0          |
| 26    | 3.8         | 155  | 27               | 4185.0          |
| 27    | 4.7         | 157  | 29               | 4553.0          |
| 28    | 2.4         | 224  | 25               | 5600.0          |
| 29    | 4.2         | 159  | 28               | 4452.0          |

**Short Pulse Radar: Waveform Type 3**

| Trial | Pulse width | PRI  | Number of Pulses | Waveform Length |
|-------|-------------|------|------------------|-----------------|
|       | (μs)        | (μs) |                  | (μs)            |
| 0     | 8.2         | 355  | 17               | 6035.0          |
| 1     | 6.1         | 487  | 16               | 7792.0          |
| 2     | 7.1         | 344  | 16               | 5504.0          |
| 3     | 9.8         | 288  | 18               | 5184.0          |
| 4     | 8.9         | 230  | 18               | 4140.0          |
| 5     | 7.9         | 432  | 17               | 7344.0          |
| 6     | 8.2         | 207  | 17               | 3519.0          |
| 7     | 7.5         | 443  | 17               | 7531.0          |
| 8     | 8.1         | 439  | 17               | 7463.0          |
| 9     | 6.2         | 223  | 16               | 3568.0          |
| 10    | 8.9         | 208  | 18               | 3744.0          |
| 11    | 9.6         | 463  | 18               | 8334.0          |
| 12    | 8.2         | 441  | 17               | 7497.0          |
| 13    | 7.2         | 323  | 16               | 5168.0          |
| 14    | 9.5         | 297  | 18               | 5346.0          |
| 15    | 8.0         | 412  | 17               | 7004.0          |
| 16    | 10.0        | 324  | 18               | 5832.0          |
| 17    | 7.4         | 271  | 17               | 4607.0          |
| 18    | 7.9         | 349  | 17               | 5933.0          |
| 19    | 7.3         | 409  | 16               | 6544.0          |
| 20    | 8.7         | 373  | 18               | 6714.0          |
| 21    | 7.2         | 254  | 16               | 4064.0          |
| 22    | 9.9         | 274  | 18               | 4932.0          |
| 23    | 7.9         | 278  | 17               | 4726.0          |
| 24    | 7.5         | 317  | 17               | 5389.0          |
| 25    | 6.1         | 260  | 16               | 4160.0          |
| 26    | 8.8         | 211  | 18               | 3798.0          |
| 27    | 9.7         | 272  | 18               | 4896.0          |
| 28    | 7.4         | 264  | 17               | 4488.0          |
| 29    | 9.2         | 284  | 18               | 5112.0          |

**Short Pulse Radar: Waveform Type 4**

| Trial | Pulse width | PRI  | Number of Pulses | Waveform Length |
|-------|-------------|------|------------------|-----------------|
|       | (μs)        | (μs) |                  | (μs)            |
| 0     | 16          | 355  | 14               | 4970.0          |
| 1     | 11.3        | 487  | 12               | 5844.0          |
| 2     | 13.5        | 344  | 13               | 4472.0          |
| 3     | 19.4        | 288  | 16               | 4608.0          |
| 4     | 17.5        | 230  | 15               | 3450.0          |
| 5     | 15.3        | 432  | 14               | 6048.0          |
| 6     | 15.9        | 207  | 14               | 2898.0          |
| 7     | 14.3        | 443  | 13               | 5759.0          |
| 8     | 15.8        | 439  | 14               | 6146.0          |
| 9     | 11.5        | 223  | 12               | 2676.0          |
| 10    | 17.4        | 208  | 15               | 3120.0          |
| 11    | 19.0        | 463  | 16               | 7408.0          |
| 12    | 16.0        | 441  | 14               | 6174.0          |
| 13    | 13.8        | 323  | 13               | 4199.0          |
| 14    | 18.9        | 297  | 16               | 4752.0          |
| 15    | 15.5        | 412  | 14               | 5768.0          |
| 16    | 19.9        | 324  | 16               | 5184.0          |
| 17    | 14.1        | 271  | 13               | 3523.0          |
| 18    | 15.2        | 349  | 14               | 4886.0          |
| 19    | 13.8        | 409  | 13               | 5317.0          |
| 20    | 17.1        | 373  | 15               | 5595.0          |
| 21    | 13.8        | 254  | 13               | 3302.0          |
| 22    | 19.8        | 274  | 16               | 4384.0          |
| 23    | 15.3        | 278  | 14               | 3892.0          |
| 24    | 14.5        | 317  | 13               | 4121.0          |
| 25    | 11.3        | 260  | 12               | 3120.0          |
| 26    | 17.3        | 211  | 15               | 3165.0          |
| 27    | 19.2        | 272  | 16               | 4352.0          |
| 28    | 14.2        | 264  | 13               | 3432.0          |
| 29    | 18.2        | 284  | 15               | 4260.0          |

| Long Pulse Radar: Waveform Type 5 |                  |                 |                 |
|-----------------------------------|------------------|-----------------|-----------------|
| Trial ID                          | Number of Bursts | Burst Period(s) | Wave Length (s) |
| 0                                 | 15               | 0.8000000       | 12              |
| 1                                 | 8                | 1.5000000       | 12              |
| 2                                 | 11               | 1.0909091       | 12              |
| 3                                 | 20               | 0.6000000       | 12              |
| 4                                 | 17               | 0.7058824       | 12              |
| 5                                 | 14               | 0.8571429       | 12              |
| 6                                 | 15               | 0.8000000       | 12              |
| 7                                 | 12               | 1.0000000       | 12              |
| 8                                 | 14               | 0.8571429       | 12              |
| 9                                 | 8                | 1.5000000       | 12              |
| 10                                | 17               | 0.7058824       | 12              |
| 11                                | 19               | 0.6315789       | 12              |
| 12                                | 15               | 0.8000000       | 12              |
| 13                                | 12               | 1.0000000       | 12              |
| 14                                | 19               | 0.6315789       | 12              |
| 15                                | 14               | 0.8571429       | 12              |
| 16                                | 20               | 0.6000000       | 12              |
| 17                                | 12               | 1.0000000       | 12              |
| 18                                | 14               | 0.8571429       | 12              |
| 19                                | 12               | 1.0000000       | 12              |
| 20                                | 16               | 0.7500000       | 12              |
| 21                                | 12               | 1.0000000       | 12              |
| 22                                | 20               | 0.6000000       | 12              |
| 23                                | 14               | 0.8571429       | 12              |
| 24                                | 13               | 0.9230769       | 12              |
| 25                                | 8                | 1.5000000       | 12              |
| 26                                | 17               | 0.7058824       | 12              |
| 27                                | 19               | 0.6315789       | 12              |
| 28                                | 12               | 1.0000000       | 12              |
| 29                                | 18               | 0.6666667       | 12              |

| Long Pulse Radar: Waveform Type 6 |                  |          |               |                   |                    |                          |
|-----------------------------------|------------------|----------|---------------|-------------------|--------------------|--------------------------|
| Trial ID                          | Pulse Width (μs) | PRI (μs) | Pulse Per Hop | Hopping Rate(kHz) | Hopping Length(ms) | Visible Frequency Number |
| 0                                 | 1.0              | 333.3    | 9             | 0.3333            | 300.000000         | 5                        |
| 1                                 | 1.0              | 333.3    | 9             | 0.3333            | 300.000000         | 1                        |
| 2                                 | 1.0              | 333.3    | 9             | 0.3333            | 300.000000         | 4                        |
| 3                                 | 1.0              | 333.3    | 9             | 0.3333            | 300.000000         | 6                        |
| 4                                 | 1.0              | 333.3    | 9             | 0.3333            | 300.000000         | 2                        |
| 5                                 | 1.0              | 333.3    | 9             | 0.3333            | 300.000000         | 1                        |
| 6                                 | 1.0              | 333.3    | 9             | 0.3333            | 300.000000         | 4                        |
| 7                                 | 1.0              | 333.3    | 9             | 0.3333            | 300.000000         | 6                        |
| 8                                 | 1.0              | 333.3    | 9             | 0.3333            | 300.000000         | 5                        |
| 9                                 | 1.0              | 333.3    | 9             | 0.3333            | 300.000000         | 1                        |
| 10                                | 1.0              | 333.3    | 9             | 0.3333            | 300.000000         | 4                        |
| 11                                | 1.0              | 333.3    | 9             | 0.3333            | 300.000000         | 8                        |
| 12                                | 1.0              | 333.3    | 9             | 0.3333            | 300.000000         | 5                        |
| 13                                | 1.0              | 333.3    | 9             | 0.3333            | 300.000000         | 5                        |
| 14                                | 1.0              | 333.3    | 9             | 0.3333            | 300.000000         | 4                        |
| 15                                | 1.0              | 333.3    | 9             | 0.3333            | 300.000000         | 6                        |
| 16                                | 1.0              | 333.3    | 9             | 0.3333            | 300.000000         | 2                        |
| 17                                | 1.0              | 333.3    | 9             | 0.3333            | 300.000000         | 5                        |
| 18                                | 1.0              | 333.3    | 9             | 0.3333            | 300.000000         | 4                        |
| 19                                | 1.0              | 333.3    | 9             | 0.3333            | 300.000000         | 5                        |
| 20                                | 1.0              | 333.3    | 9             | 0.3333            | 300.000000         | 5                        |
| 21                                | 1.0              | 333.3    | 9             | 0.3333            | 300.000000         | 8                        |
| 22                                | 1.0              | 333.3    | 9             | 0.3333            | 300.000000         | 5                        |
| 23                                | 1.0              | 333.3    | 9             | 0.3333            | 300.000000         | 2                        |
| 24                                | 1.0              | 333.3    | 9             | 0.3333            | 300.000000         | 3                        |
| 25                                | 1.0              | 333.3    | 9             | 0.3333            | 300.000000         | 3                        |
| 26                                | 1.0              | 333.3    | 9             | 0.3333            | 300.000000         | 4                        |
| 27                                | 1.0              | 333.3    | 9             | 0.3333            | 300.000000         | 5                        |
| 28                                | 1.0              | 333.3    | 9             | 0.3333            | 300.000000         | 7                        |
| 29                                | 1.0              | 333.3    | 9             | 0.3333            | 300.000000         | 3                        |

## Appendix E: Radar Waveform Requirement

The Waveform used for testing meets FCC requirement in accordance with section 6 of 905462 D02 UNII DFS Compliance Procedures New Rules v02

### RADAR TEST WAVEFORMS

This section provides the parameters for required test waveforms, minimum percentage of successful detections, and the minimum number of trials that must be used for determining DFS conformance. Step intervals of 0.1 microsecond for Pulse Width, 1 microsecond for PRI, 1 MHz for chirp width and 1 for the number of pulses will be utilized for the random determination of specific test waveforms.

#### 6.1 Short Pulse Radar Test Waveforms

**Table 5 – Short Pulse Radar Test Waveforms**

| 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   | $\text{Roundup} \left\{ \left( \frac{1}{360} \right) \cdot \left( \frac{19 \cdot 10^6}{\text{PRI}_{\mu\text{sec}}} \right) \right\}$ | 60%  | 30                       |
|   |                    | 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 |  |  |                          |
| 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                      |
| <b>Note 1:</b> Short Pulse Radar Type 0 should be used for the detection bandwidth test, channel move time, and channel closing time tests. |                    |   |  |  |                          |

A minimum of 30 unique waveforms are required for each of the Short Pulse Radar Types 2 through 4. If more than 30 waveforms are used for Short Pulse Radar Types 2 through 4, then each additional waveform must also be unique and not repeated from the previous waveforms. If more than 30 waveforms are used for Short Pulse Radar Type 1, then each additional waveform is generated with Test B and must also be unique and not repeated from the previous waveforms in Tests A or B.

For example, if in Short Pulse Radar Type 1 Test B a PRI of 3066  $\mu$ sec is selected, the number of pulses would be =

$$\left\{ \left( \frac{1}{360} \right) \cdot \left( \frac{19 \cdot 10^6}{3066} \right) \right\} = \text{Round up } \{17.2\} = 18.$$

**Table 5a - Pulse Repetition Intervals Values for Test A**

| Pulse Repetition Frequency Number | Pulse Repetition Frequency (Pulses Per Second) | Pulse Repetition Interval (Microseconds) |
|-----------------------------------|--|--|
| 1                                 | 1930.5   | 518                                      |
| 2                                 | 1858.7   | 538                                      |
| 3                                 | 1792.1   | 558                                      |
| 4                                 | 1730.1   | 578                                      |
| 5                                 | 1672.2   | 598                                      |
| 6                                 | 1618.1   | 618                                      |
| 7                                 | 1567.4   | 638                                      |
| 8                                 | 1519.8   | 658                                      |
| 9                                 | 1474.9   | 678                                      |
| 10                                | 1432.7   | 698                                      |
| 11                                | 1392.8   | 718                                      |
| 12                                | 1355   | 738                                      |
| 13                                | 1319.3   | 758                                      |
| 14                                | 1285.3   | 778                                      |
| 15                                | 1253.1   | 798                                      |
| 16                                | 1222.5   | 818                                      |
| 17                                | 1193.3   | 838                                      |
| 18                                | 1165.6   | 858                                      |
| 19                                | 1139   | 878                                      |
| 20                                | 1113.6   | 898                                      |
| 21                                | 1089.3   | 918                                      |
| 22                                | 1066.1   | 938                                      |
| 23                                | 326.2  | 3066                                     |

The aggregate is the average of the percentage of successful detections of Short Pulse Radar Types 1-4.

For example, the following table indicates how to compute the aggregate of percentage of successful detections.

| Radar Type   | Number of Trials | Number of Successful Detections | Minimum Percentage of Successful Detection |
|--|------------------|---------------------------------|--|
| 1  | 35               | 29                              | 82.9%                                      |
| 2  | 30               | 18                              | 60%  |
| 3  | 30               | 27                              | 90%  |
| 4  | 50               | 44                              | 88%  |
| Aggregate $(82.9\% + 60\% + 90\% + 88\%) / 4 = 80.2\%$ |                  |                                 |  |

## 6.2 Long Pulse Radar Test Waveform

**Table 6 – Long Pulse Radar Test Waveform**

| 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                       |

The parameters for this waveform are randomly chosen. Thirty unique waveforms are required for the Long Pulse Radar Type waveforms. If more than 30 waveforms are used for the Long Pulse Radar Type waveforms, then each additional waveform must also be unique and not repeated from the previous waveforms.

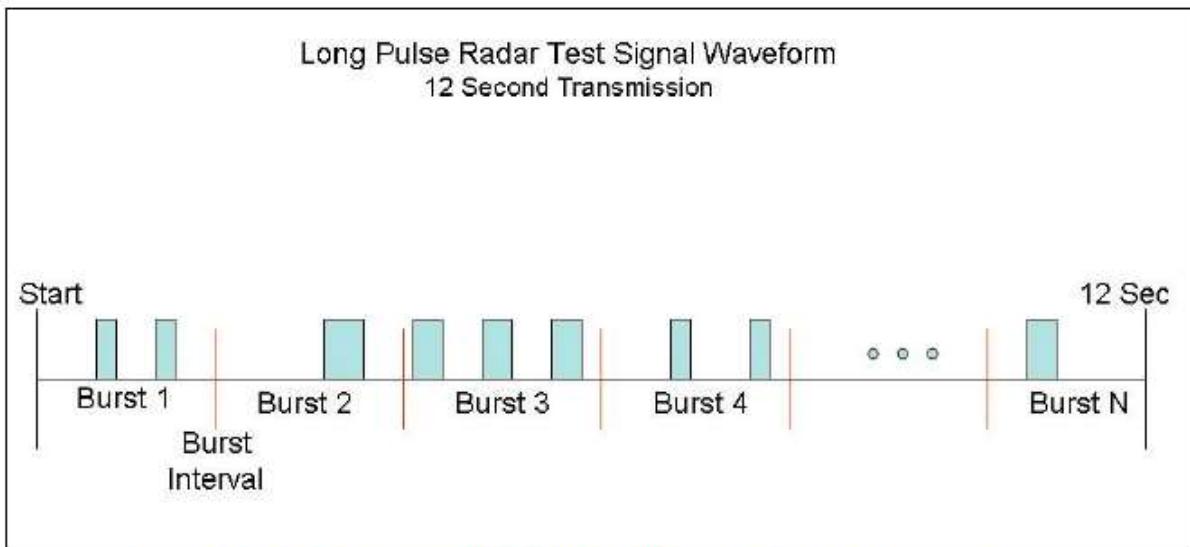
Each waveform is defined as follows:

- 1) The transmission period for the Long Pulse Radar test signal is 12 seconds.
- 2) There are a total of 8 to 20 *Bursts* in the 12 second period, with the number of *Bursts* being randomly chosen. This number is *Burst Count*.
- 3) Each *Burst* consists of 1 to 3 pulses, with the number of pulses being randomly chosen. Each *Burst* within the 12 second sequence may have a different number of pulses.
- 4) The pulse width is between 50 and 100 microseconds, with the pulse width being randomly chosen. Each pulse within a *Burst* will have the same pulse width. Pulses in different *Bursts* may have different pulse widths.
- 5) Each pulse has a linear frequency modulated chirp between 5 and 20 MHz, with the chirp width being randomly chosen. Each pulse within a *transmission period* will have the same chirp width. The chirp is centered on the pulse. For example, with a radar frequency of 5300 MHz and a 20 MHz chirped signal, the chirp starts at 5290 MHz and ends at 5310 MHz.
- 6) If more than one pulse is present in a *Burst*, the time between the pulses will be between 1000 and 2000 microseconds, with the time being randomly chosen. If three pulses are present in a *Burst*, the random time interval between the first and second pulses is chosen independently of the random time interval between the second and third pulses.
- 7) The 12 second transmission period is divided into even intervals. The number of intervals is equal to *Burst Count*. Each interval is of length  $(12,000,000 / \text{Burst Count})$  microseconds. Each interval contains one *Burst*. The start time for the *Burst*, relative to the beginning of the interval, is between 1 and  $[(12,000,000 / \text{Burst Count}) - (\text{Total Burst Length}) + (\text{One Random PRI Interval})]$  microseconds, with the start time being randomly chosen. The step interval for the start time is 1 microsecond. The start time for each *Burst* is chosen randomly.

**A representative example of a Long Pulse Radar Type waveform:**

- 1) The total test waveform length is 12 seconds.
- 2) Eight (8) *Bursts* are randomly generated for the *Burst Count*.
- 3) *Burst 1* has 2 randomly generated pulses.
- 4) The pulse width (for both pulses) is randomly selected to be 75 microseconds.
- 5) The PRI is randomly selected to be at 1213 microseconds.
- 6) *Bursts 2* through 8 are generated using steps 3 – 5.
- 7) Each *Burst* is contained in even intervals of 1,500,000 microseconds. The starting location for Pulse 1, *Burst 1* is randomly generated (1 to 1,500,000 minus the total *Burst 1* length + 1 random PRI interval) at the 325,001 microsecond step. *Bursts 2* through 8 randomly fall in successive 1,500,000 microsecond intervals (i.e. *Burst 2* falls in the 1,500,001 – 3,000,000 microsecond range).

**Figure 1** provides a graphical representation of the Long Pulse Radar Test Waveform.



*Figure 1: Graphical Representation of a Long Pulse Radar Type Waveform*

### 6.3 Frequency Hopping Radar Test Waveform

**Table 7 – Frequency Hopping Radar Test Waveform**

| 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                       |

For the Frequency Hopping Radar Type, the same *Burst* parameters are used for each waveform. The hopping sequence is different for each waveform and a 100-length segment is selected from the hopping sequence defined by the following algorithm: <sup>4</sup>

The first frequency in a hopping sequence is selected randomly from the group of 475 integer frequencies from 5250 – 5724 MHz. Next, the frequency that was just chosen is removed from the group and a frequency is randomly selected from the remaining 474 frequencies in the group. This process continues until all 475 frequencies are chosen for the set. For selection of a random frequency, the frequencies remaining within the group are always treated as equally likely.

<sup>4</sup> If a segment does not contain at least 1 frequency within the *UNII Detection Bandwidth* of the UUT, then that segment is not used.

## Appendix F: Measurement Uncertainty

| Uncertainty Value | Parameter                 |
|-------------------|---------------------------|
| 4.73 dB           | Radiated Emissions        |
| 3.34 dB           | Mains Conducted Emissions |
| 3.30 dB           | Disturbance Power         |

Uncertainties reported are worst case for all CKC Laboratories' sites and represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k=2.