| Additional requirements for devices with multiple bandwidth modes | Master Device or Client with Radar Detection | Client Without Radar Detection |
|---|---|---|
| *U-NII Detection Bandwidth and Statistical Performance Check* | All BW modes must be tested | Not required |
| *Channel Move Time and Channel Closing Transmission Time* | Test using widest BW mode available | Test using the widest BW mode available for the link |
| *All other tests* | Any single BW mode | Not required |
| **Note:** Frequencies selected for statistical performance check (Section 7.8.4) should include several frequencies within the radar detection bandwidth and frequencies near the edge of the radar detection bandwidth. For 802.11 devices it is suggested to select frequencies in each of the bonded 20 MHz channels and the channel center frequency. | | |



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## Test Limited

According to KDB 905462 D02 Table 3 DFS Detection Thresholds for Master Devices and Client Devices with Radar Detection

| **Maximum Transmit Power** | **Value (See Notes 1, 2, and 3)** |
|---|---|
| EIRP ≥ 200 milliwatt | -64 dBm |
| EIRP < 200 milliwatt and power spectral density < 10 dBm/MHz | -62 dBm |
| EIRP < 200 milliwatt that do not meet the power spectral density requirement | -64 dBm |
| **Note 1:** This is the level at the input of the receiver assuming a 0 dBi receive antenna.<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. | |

According to KDB 905462 D02 Table 4 DFS Response Requirement Values

| **Parameter** | **Value** |
|---|---|
| *Non-occupancy period* | Minimum 30 minutes |
| *Channel Availability Check Time* | 60 seconds |
| *Channel Move Time* | 10 seconds<br>See Note 1. |
| *Channel Closing Transmission Time* | 200 milliseconds + an aggregate of 60 milliseconds over remaining 10 second period.<br>See Notes 1 and 2. |
| *U-NII Detection Bandwidth* | Minimum 100% of the U-NII 99% transmission power bandwidth. See Note 3. |
| **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.<br>**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.<br>**Note 3:** During the *U-NII Detection Bandwidth* detection test, radar type 0 should be used. For each frequency step the minimum percentage of detection is 90 percent. Measurements are performed with no data traffic. | |



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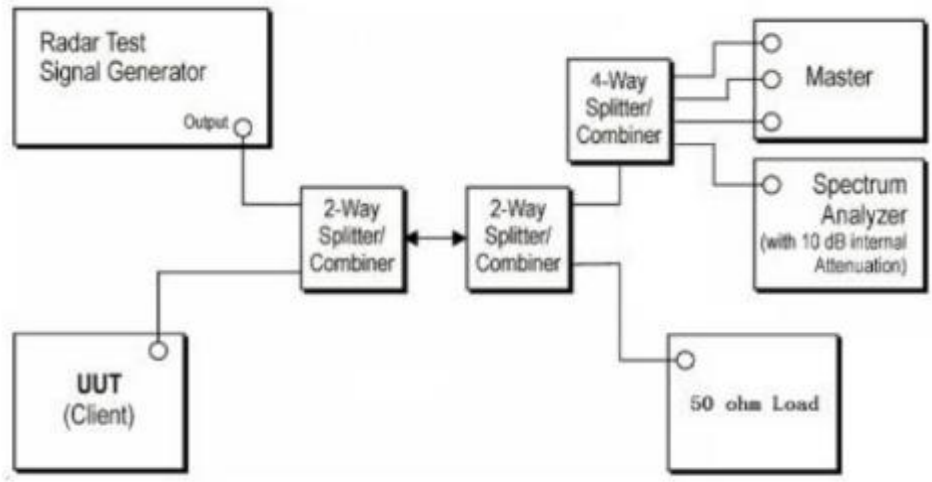
## Calibration of Radar Waveform

(1) A 50ohm load is connected in place of the spectrum analyzer, and the spectrum analyzer is connected to place of the master.
(2) The interference Radar Detection Threshold Level is -62dBm+3.7dB+1.5dB=-55.8dBm that had been taken into account the output power range and antenna gain.
(3) The following equipment setup was used to calibrate the conducted radar waveform. A vector signal generator was utilized to establish the test signal level for radar type 0. During this process there were no transmissions by either the master or client device. The spectrum analyzer was switched to the zero spans (time domain) at the frequency of the radar waveform generator. Peak detection was used. The spectrum analyzer resolution bandwidth (RBW) and video bandwidth (VBW) were set to 3MHz. The spectrum analyzer had offset -1.5dB to compensate RF cable loss 1.5dB.
(4) The vector signal generator amplitude was set so that the power level measured at the spectrum analyzer was -62dBm+3.7dB+1.5dB=-55.8dBm. Capture the spectrum analyzer plots on short pulse radar waveform.

Conducted Calibration Setup:




### 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 | $\text{Roundup}\left\{\left(\frac{1}{360}\right)\cdot\left(\frac{19\cdot 10^6}{\text{PRI}_{\mu sec}}\right)\right\}$ | 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 |
| **Note 1:** Short Pulse Radar Type 0 should be used for the detection bandwidth test, channel move time, and channel closing time tests. | | | | | |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A minimum of 30 unique waveforms are required for each of the short pulse radar types 1 through 4. If more than 30 waveforms are used for short pulse radar types 1 through 4, then each additional waveform must also be unique and not repeated from the previous waveforms. The aggregate is the average of the percentage of successful detections of short pulse radar types 1-4.

**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 Trials |
|---|---|---|---|---|---|---|---|
| 5 | 50-100 | 5-20 | 1000-2000 | 1-3 | 8-20 | 80% | 30 |

Each waveform is defined as follows:

The transmission period for the Long Pulse Radar test signal is 12 seconds.

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.

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.

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.

Each pulse has a linear FM 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.

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 time between the first and second pulses is chosen independently of the time between the second and third pulses.

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 / 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 / Burst Count) – (Total Burst Length) + (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 independently.

**Frequency Hopping Radar Test Waveform**

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

The FCC Type 6 waveform uses a static waveform with 100 bursts in the instruments ARB. In addition, the RF list mode is operated with a list containing 100 frequencies from a randomly generated list and it had be ensured that at least one of the random frequencies falls into the UNII Detection Bandwidth of the DUT. Each burst from the waveform file initiates a trigger pulse at the beginning that switches the RF list from one item to the next one.



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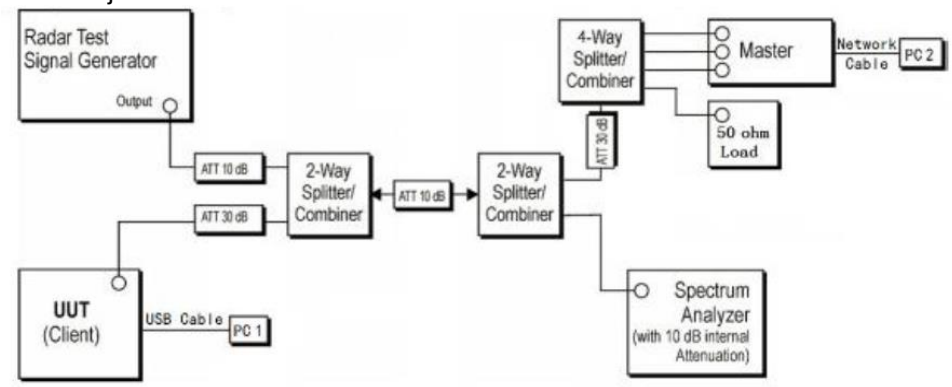
Test Setup:
Setup for client with injection at the master.




## Test Result

| Ref Std. Clause | Test Items | Result (PASS/FAIL) |
|---|---|---|
| FCC KDB 905462 7.8.1 | DFS: UNII Detection Bandwidth Measurement | PASS |
| FCC KDB 905462 7.8.2.1 | DFS: Initial Channel Availability Check Time | PASS |
| FCC KDB 905462 7.8.2.2 | DFS: Radar Burst at the Beginning of the Channel Availability Check Time | PASS |
| FCC KDB 905462 7.8.2.3 | DFS: Radar Burst at the End of the Channel Availability Check Time | PASS |
| FCC KDB 905462 7.8.3 | DFS: In-Service Monitoring for Channel Move Time (CMT) | PASS |
| FCC KDB 905462 7.8.3 | DFS: In-Service Monitoring for Channel Closing Transmission Time (CCTT) | PASS |
| FCC KDB 905462 7.8.3 | DFS: In-Service Monitoring for Non-Occupancy Period (NOP) | PASS |
| FCC KDB 905462 7.8.4 | DFS: Statistical Performance Check | PASS |



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## DFS Threshold Level

| TestMode | Channel | Radar Type | Result | Limit[dbm] | Verdict |
|---|---|---|---|---|---|
| 20MHz | 5280 | Type0 | -62.39 | -61.00 | PASS |
| | | Type1 | -61.47 | -61.00 | PASS |
| | | Type2 | -61.06 | -61.00 | PASS |
| | | Type3 | -61.27 | -61.00 | PASS |
| | | Type4 | -61.14 | -61.00 | PASS |
| | | Type5 | -61.46 | -61.00 | PASS |
| | | Type6 | -61.70 | -61.00 | PASS |
| | 5500 | Type0 | -61.97 | -61.00 | PASS |
| | | Type1 | -61.63 | -61.00 | PASS |
| | | Type2 | -61.89 | -61.00 | PASS |
| | | Type3 | -61.42 | -61.00 | PASS |
| | | Type4 | -61.70 | -61.00 | PASS |
| | | Type5 | -62.01 | -61.00 | PASS |
| | | Type6 | -62.21 | -61.00 | PASS |
| 40MHz | 5270 | Type0 | -63.54 | -61.00 | PASS |
| | | Type1 | -61.83 | -61.00 | PASS |
| | | Type2 | -61.37 | -61.00 | PASS |
| | | Type3 | -61.20 | -61.00 | PASS |
| | | Type4 | -61.20 | -61.00 | PASS |
| | | Type5 | -61.73 | -61.00 | PASS |
| | | Type6 | -62.22 | -61.00 | PASS |
| | 5510 | Type0 | -62.65 | -61.00 | PASS |
| | | Type1 | -61.70 | -61.00 | PASS |
| | | Type2 | -61.13 | -61.00 | PASS |
| | | Type3 | -61.22 | -61.00 | PASS |
| | | Type4 | -61.07 | -61.00 | PASS |
| | | Type5 | -61.44 | -61.00 | PASS |
| | | Type6 | -61.70 | -61.00 | PASS |
| 80MHz | 5290 | Type0 | -62.83 | -61.00 | PASS |
| | | Type1 | -61.71 | -61.00 | PASS |
| | | Type2 | -61.57 | -61.00 | PASS |
| | | Type3 | -61.48 | -61.00 | PASS |
| | | Type4 | -61.56 | -61.00 | PASS |
| | | Type5 | -62.17 | -61.00 | PASS |
| | | Type6 | -61.79 | -61.00 | PASS |
| | 5530 | Type0 | -61.66 | -61.00 | PASS |
| | | Type1 | -61.68 | -61.00 | PASS |
| | | Type2 | -61.83 | -61.00 | PASS |
| | | Type3 | -61.23 | -61.00 | PASS |
| | | Type4 | -61.31 | -61.00 | PASS |
| | | Type5 | -61.90 | -61.00 | PASS |
| | | Type6 | -61.42 | -61.00 | PASS |



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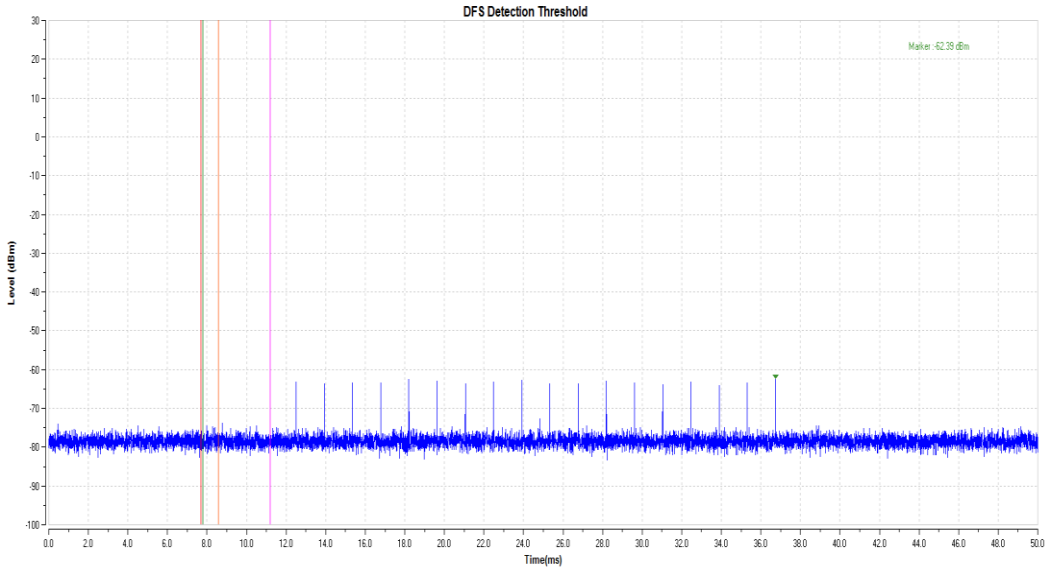


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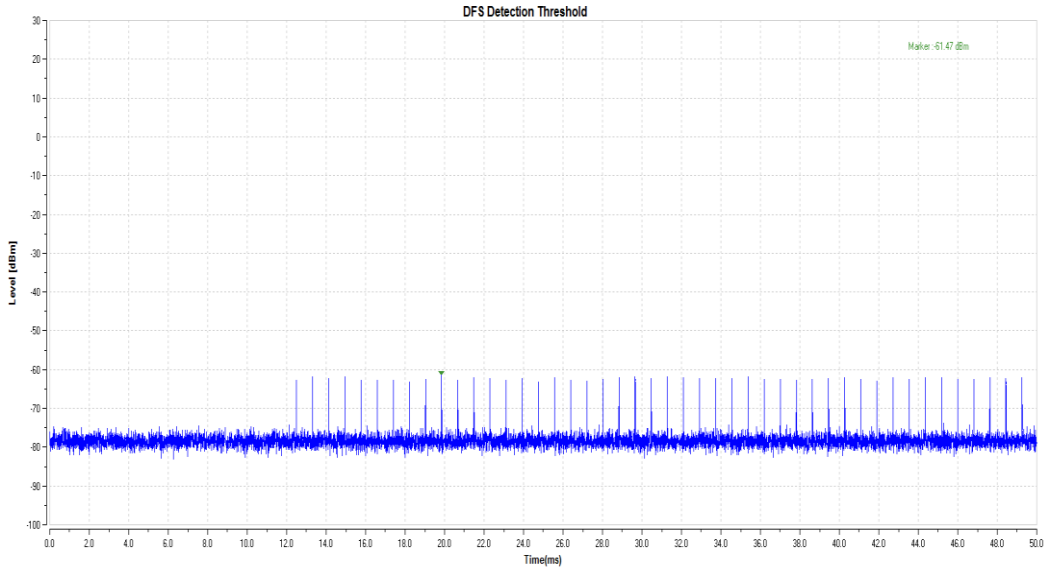
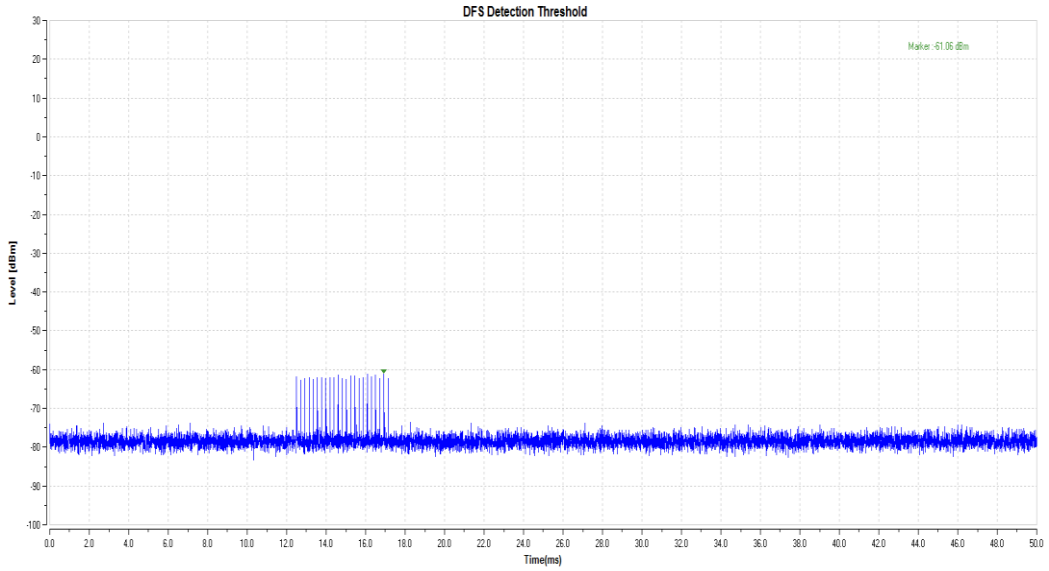



20MHz_5280_Type2



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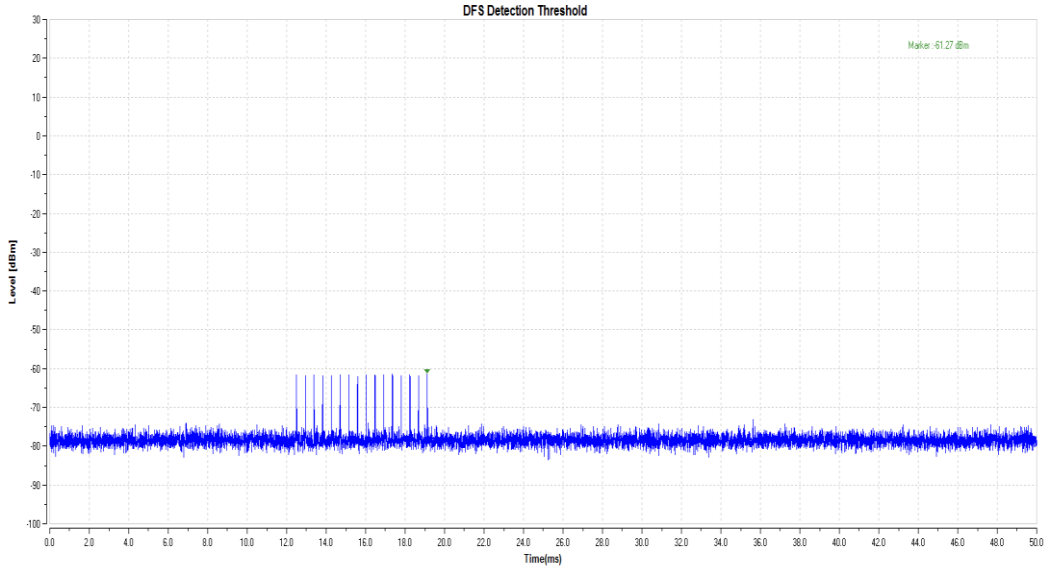
20MHz_5280_Type3

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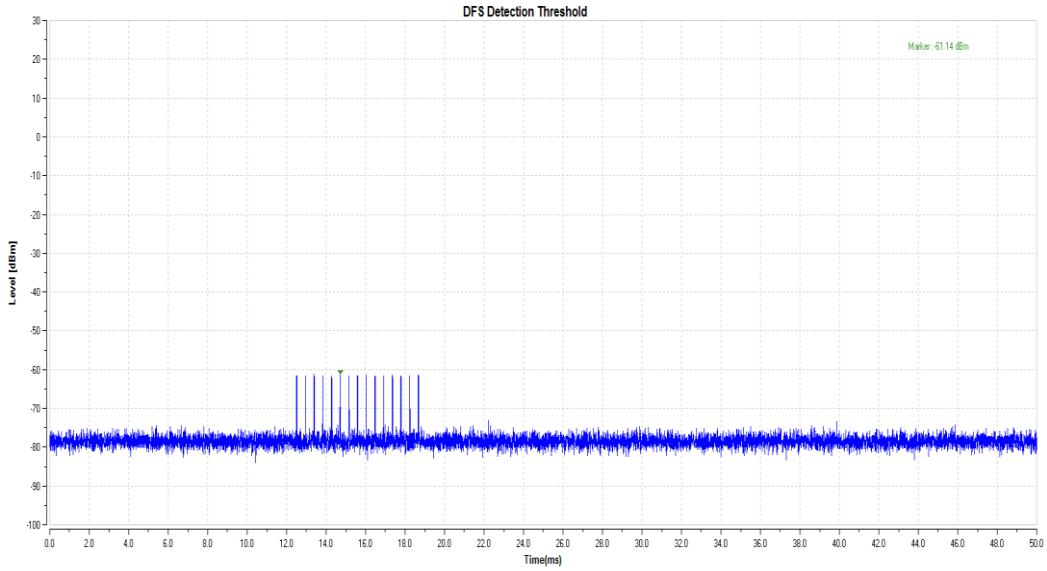


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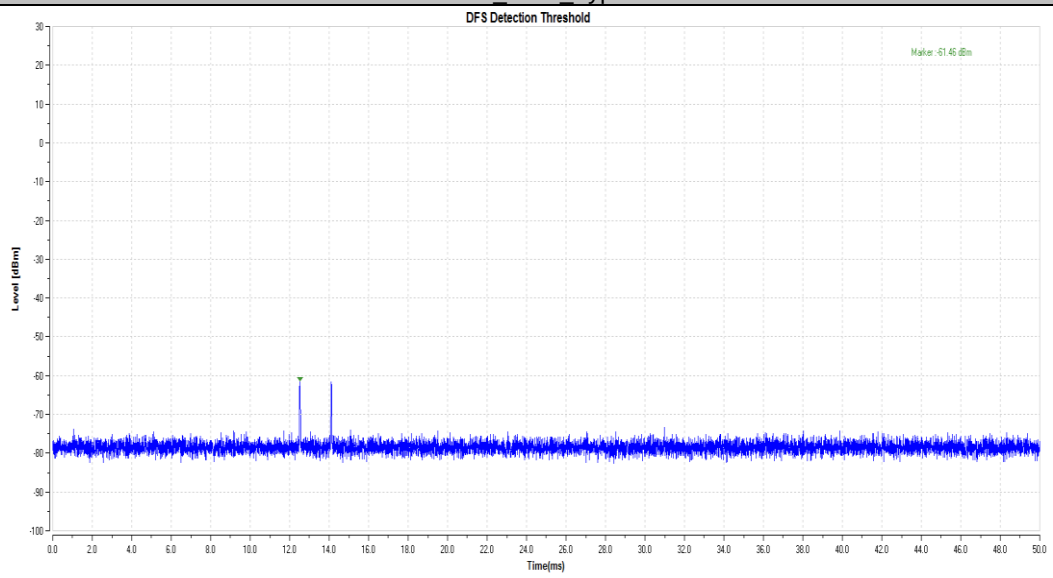


20MHz_5280_Type6



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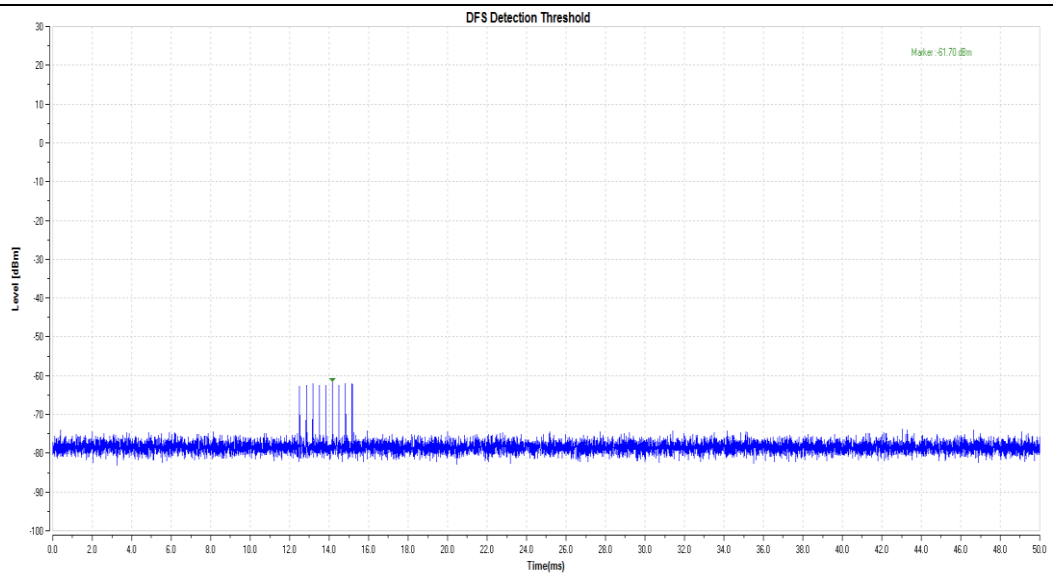
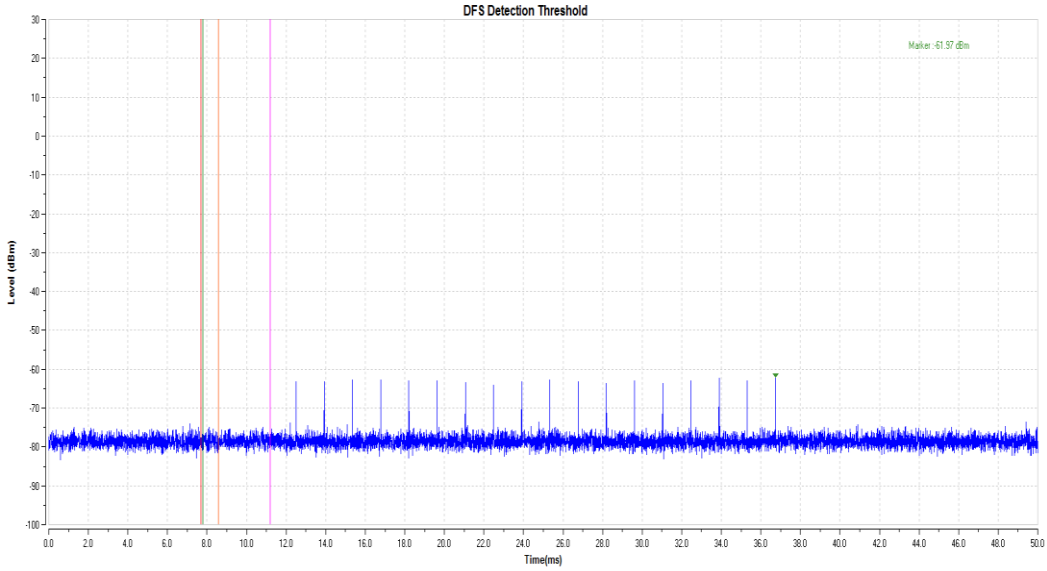



20MHz_5500_Type0

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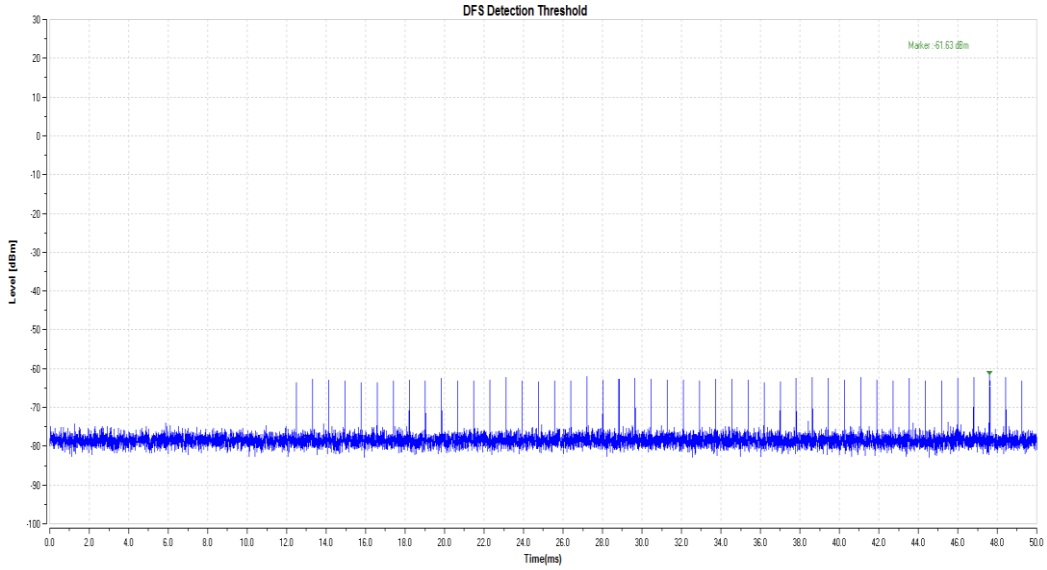


20MHz_5500_Type2



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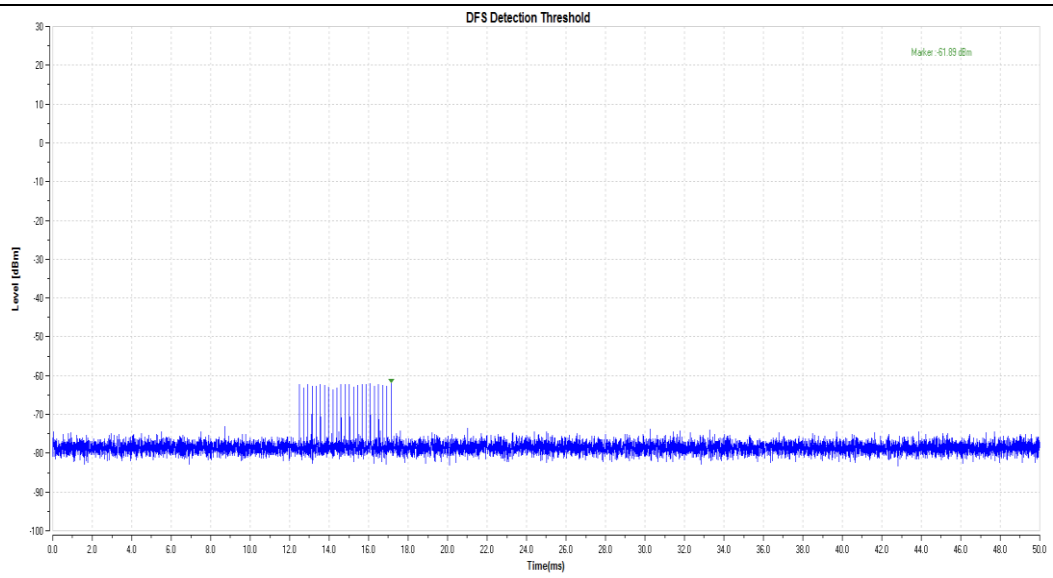


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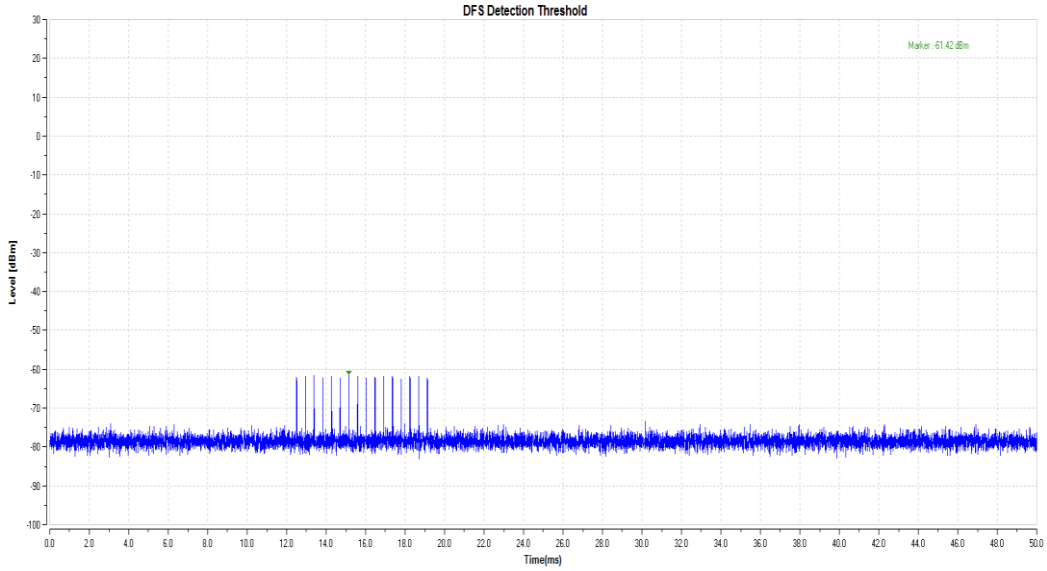


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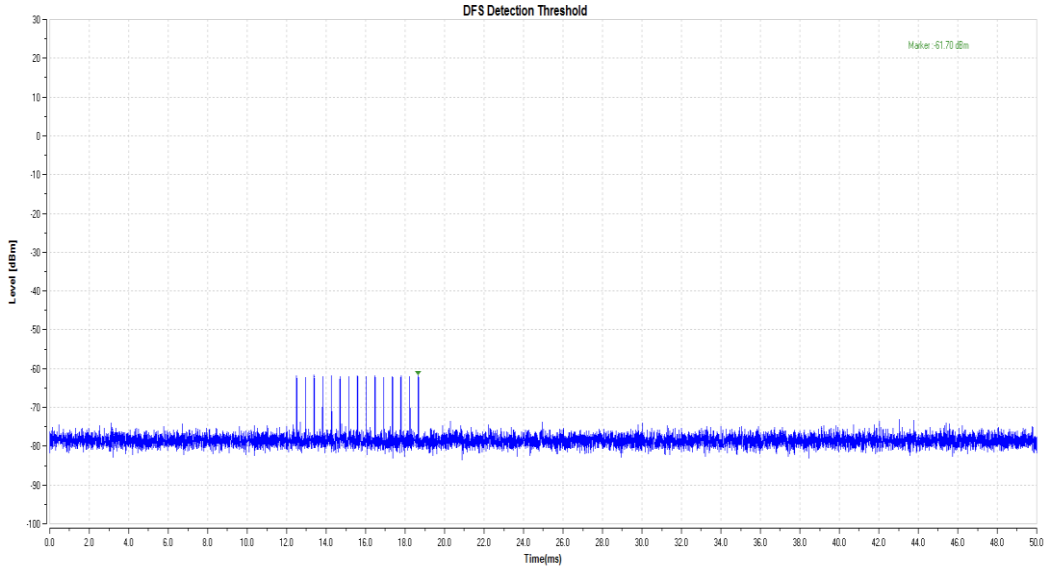


20MHz_5500_Type5



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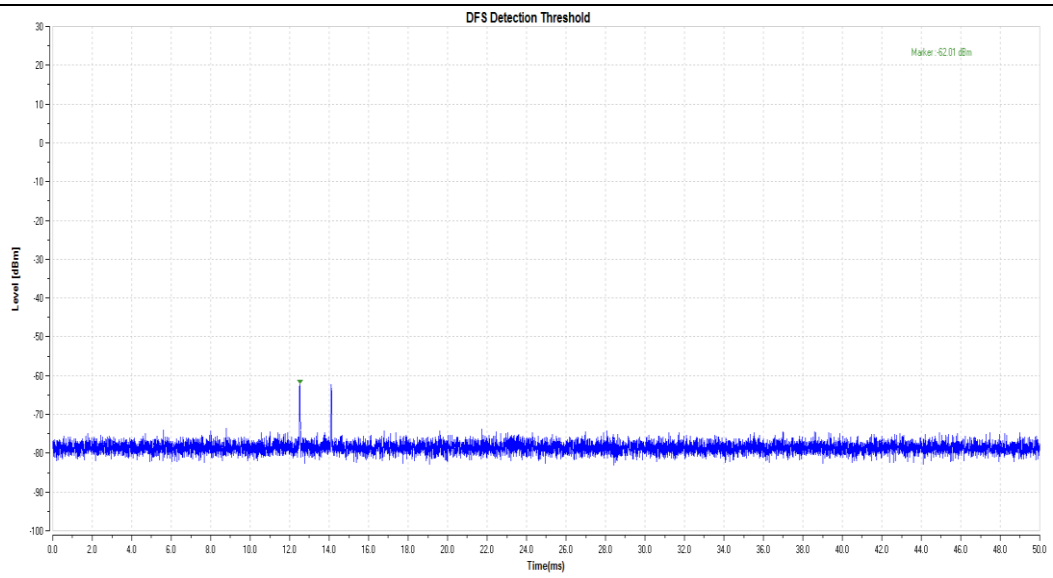


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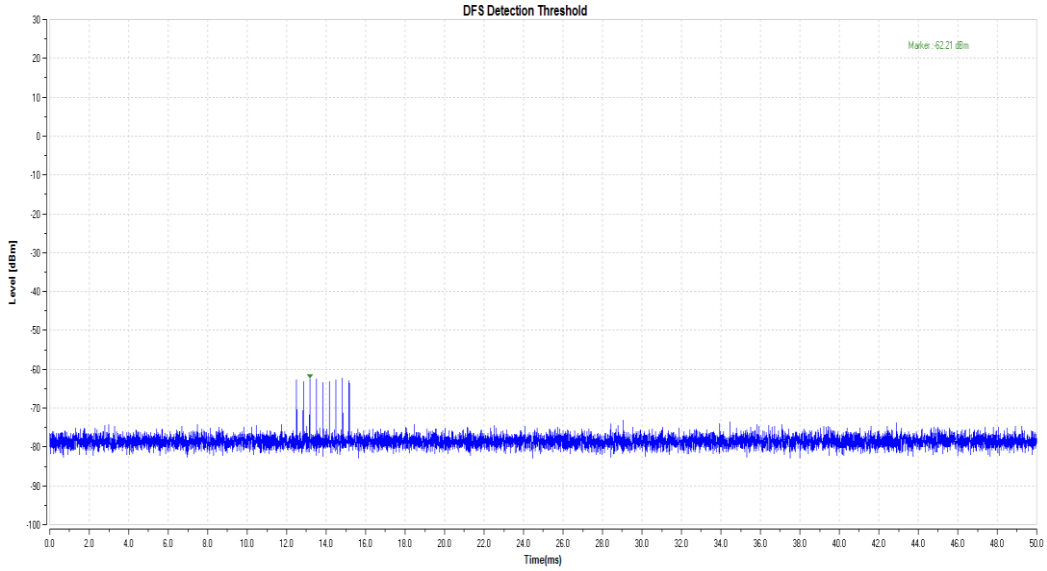
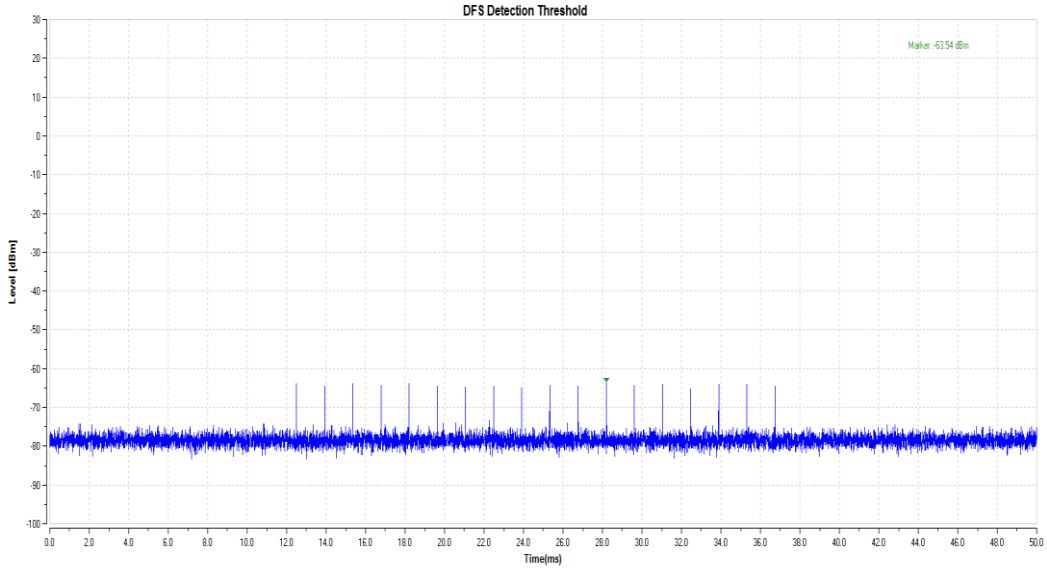



40MHz_5270_Type0




40MHz_5270_Type1



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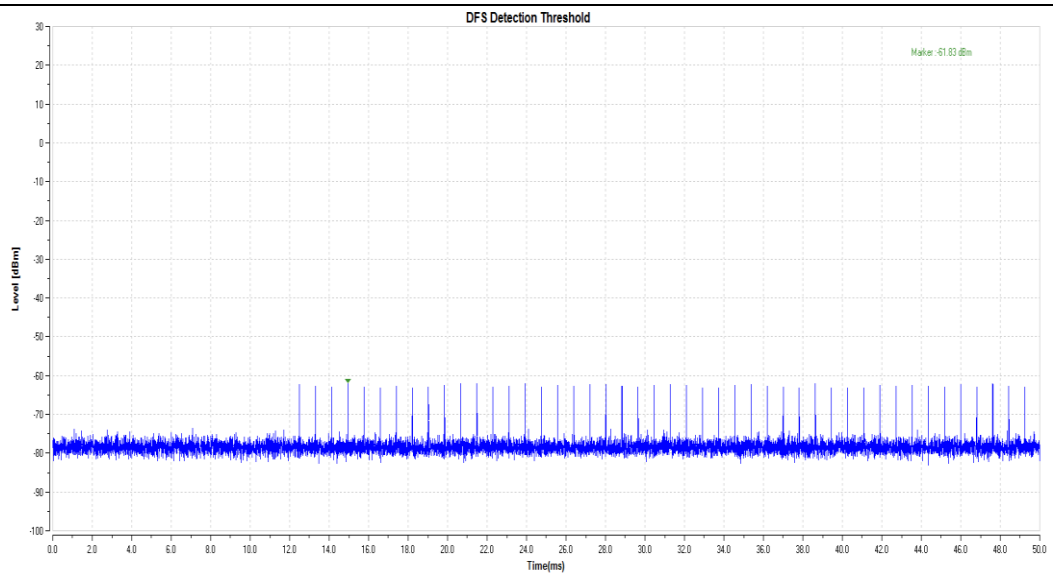


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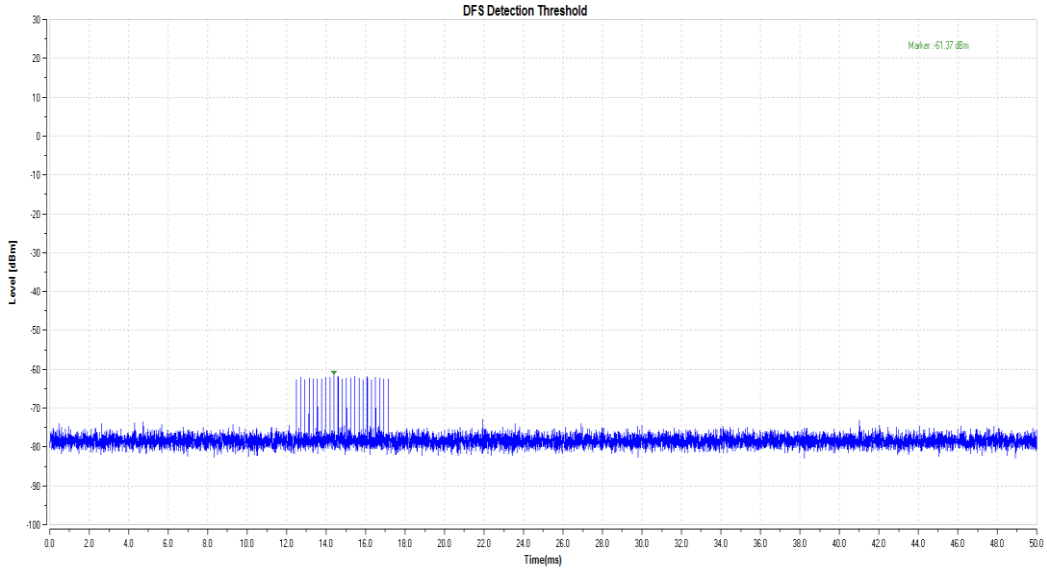


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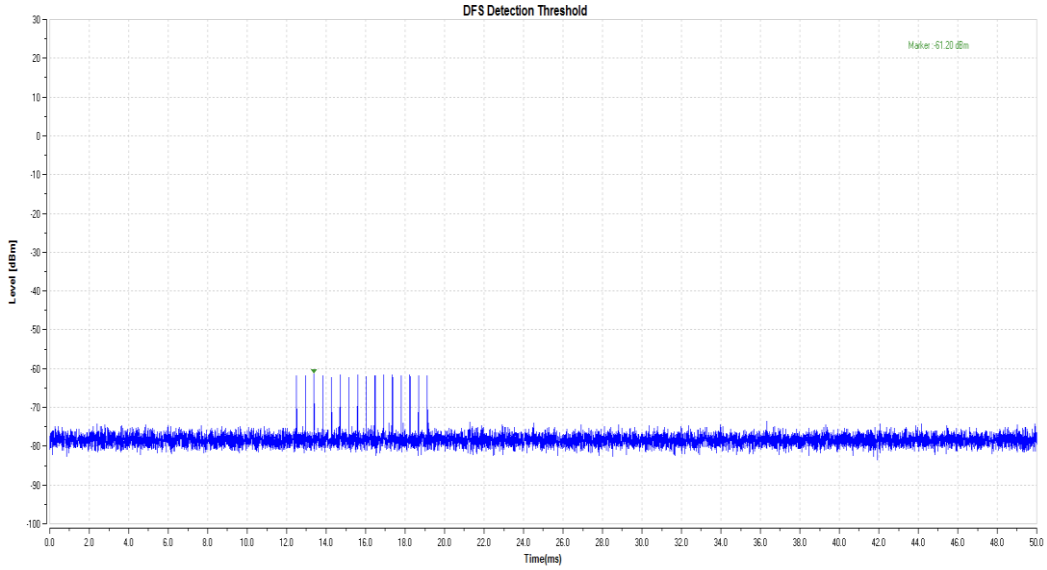


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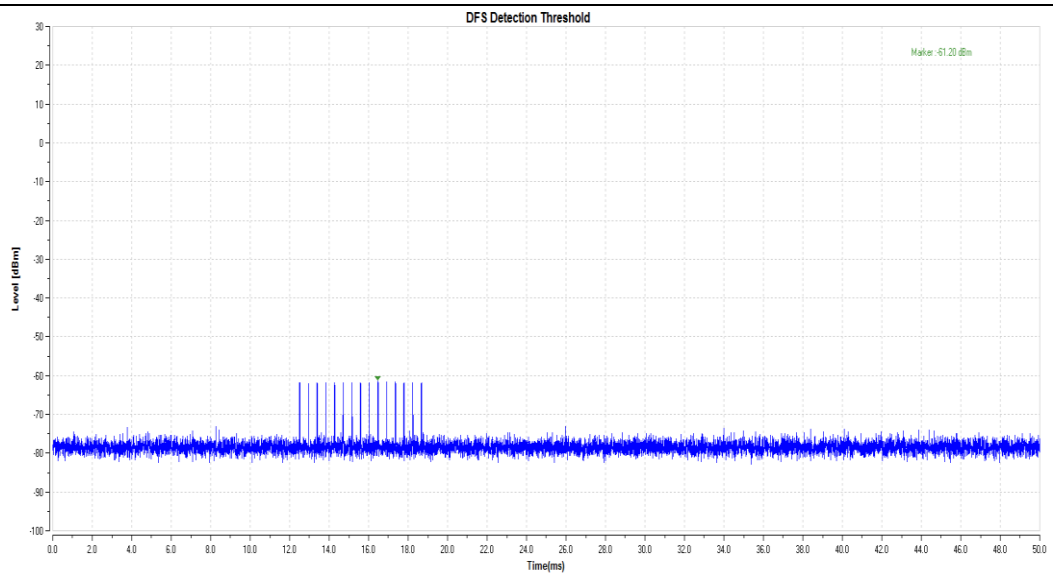


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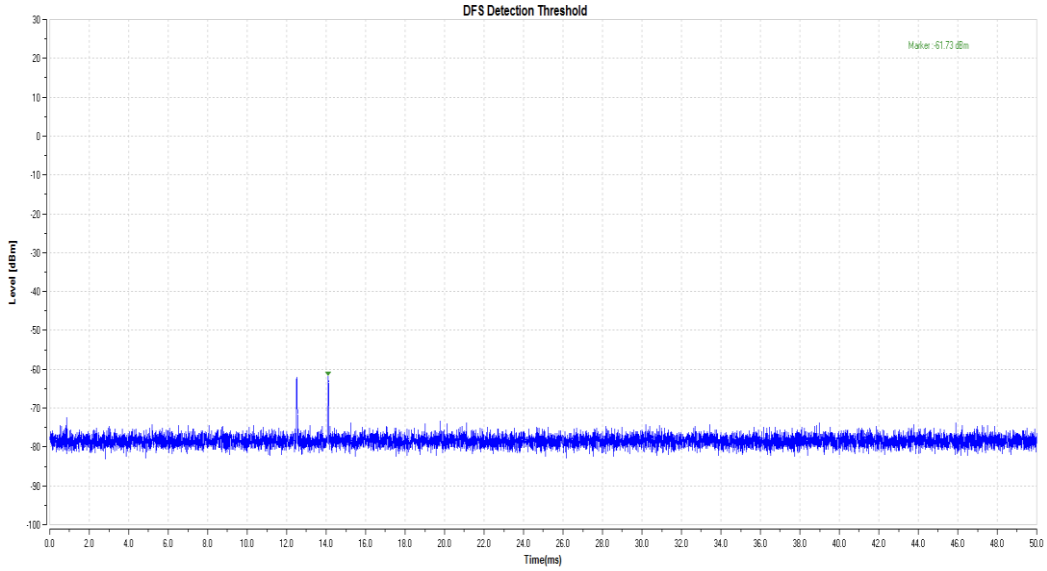
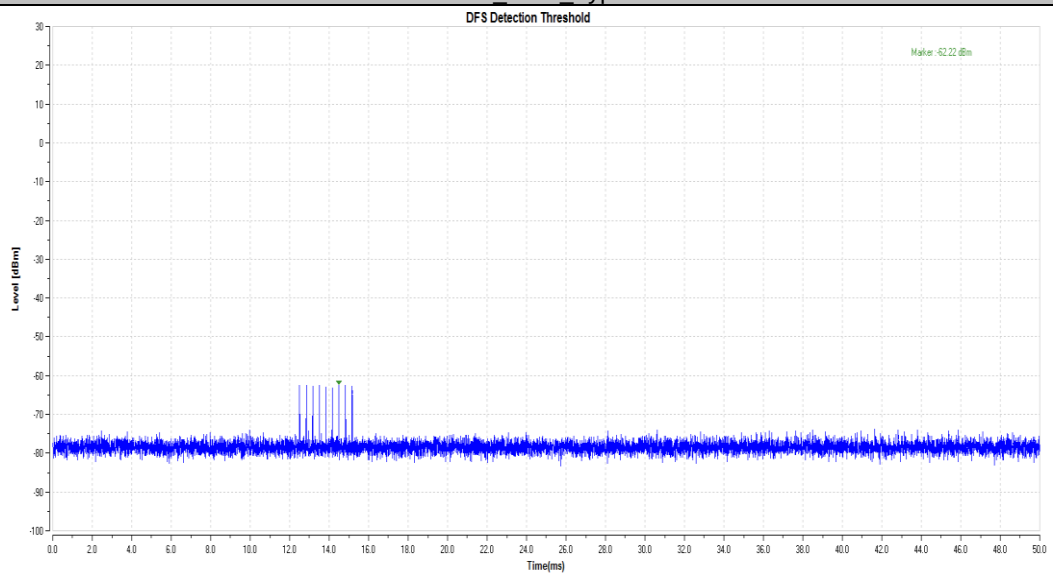



40MHz_5270_Type6




40MHz_5510_Type0



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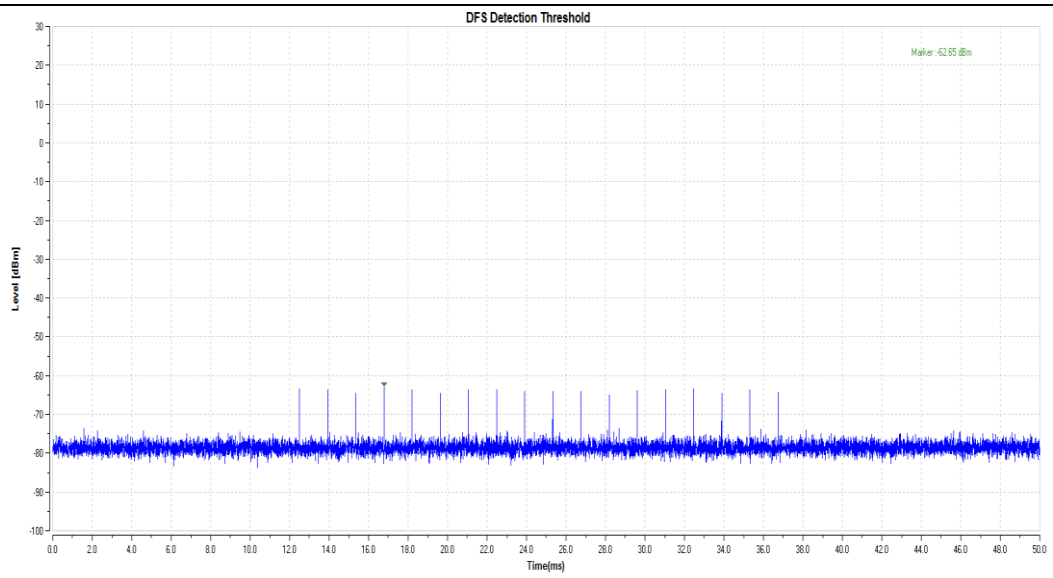
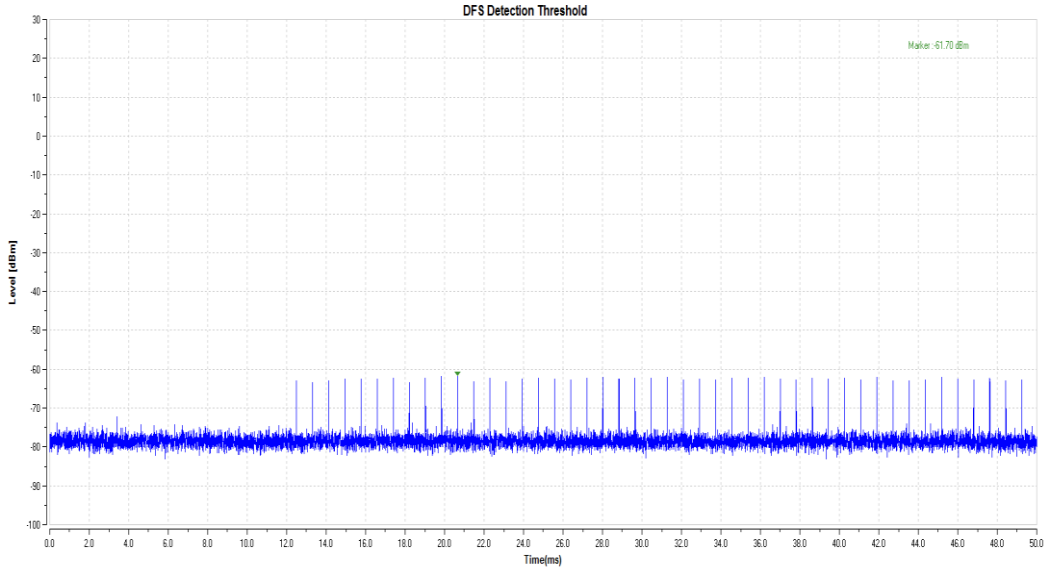
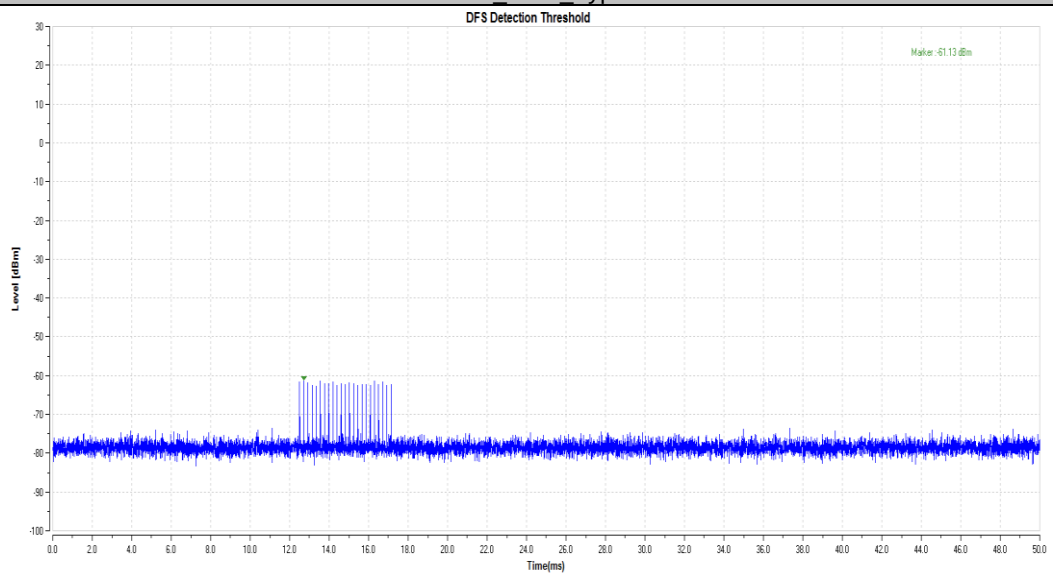


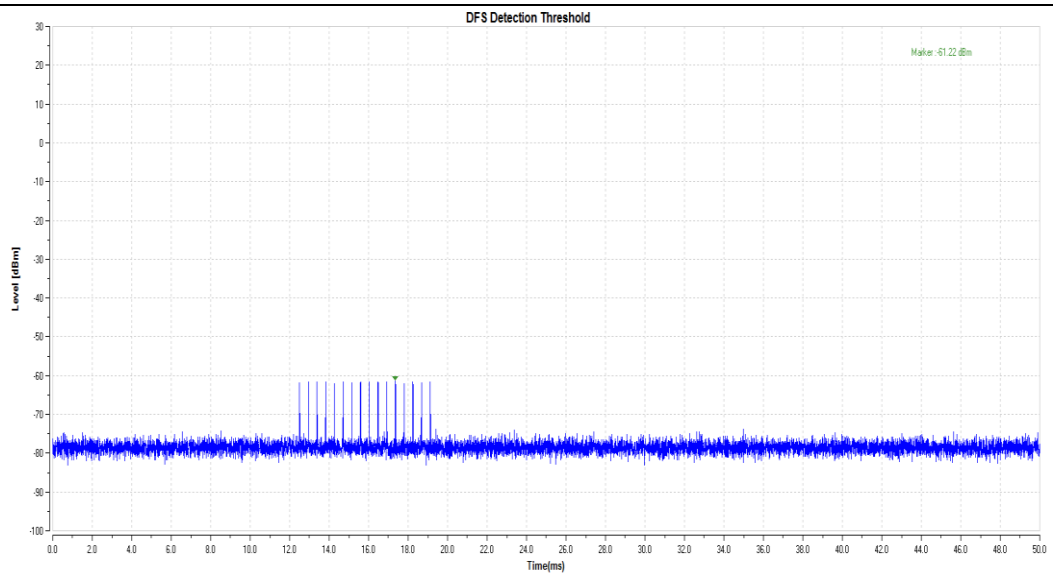

40MHz_5510_Type1



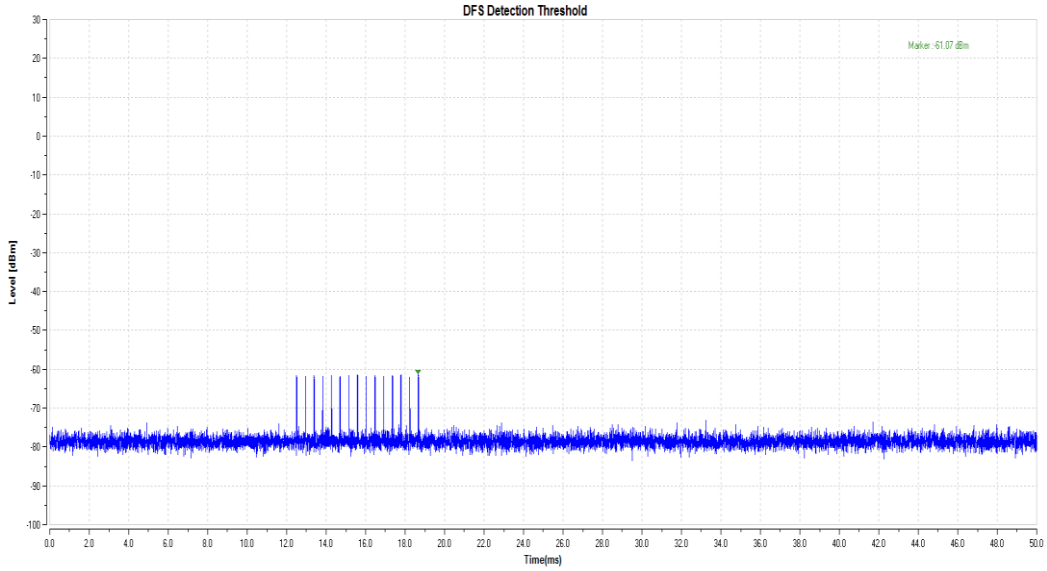

40MHz_5510_Type2



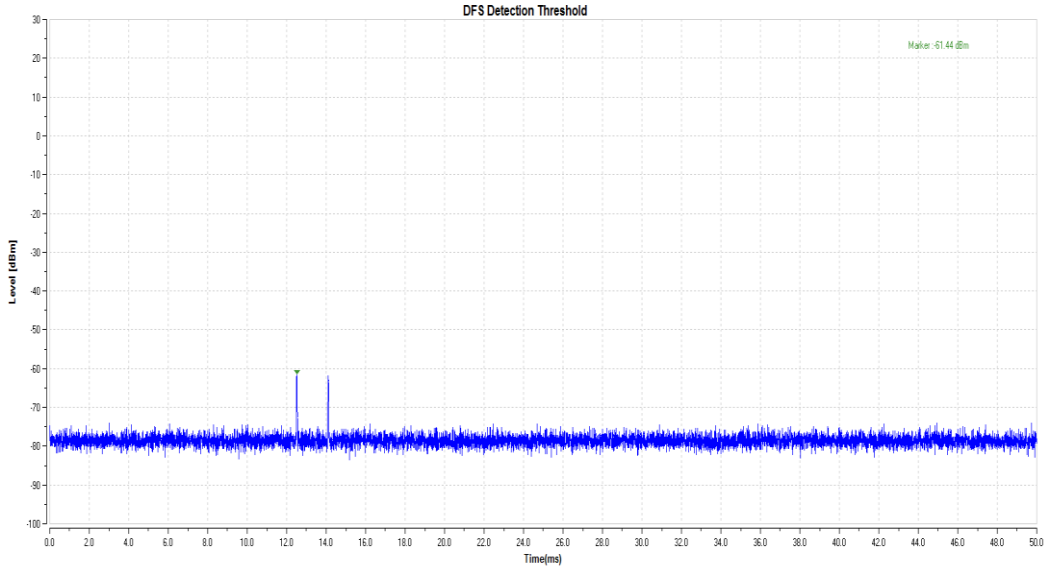

40MHz_5510_Type3




40MHz_5510_Type4




40MHz_5510_Type5




40MHz_5510_Type6



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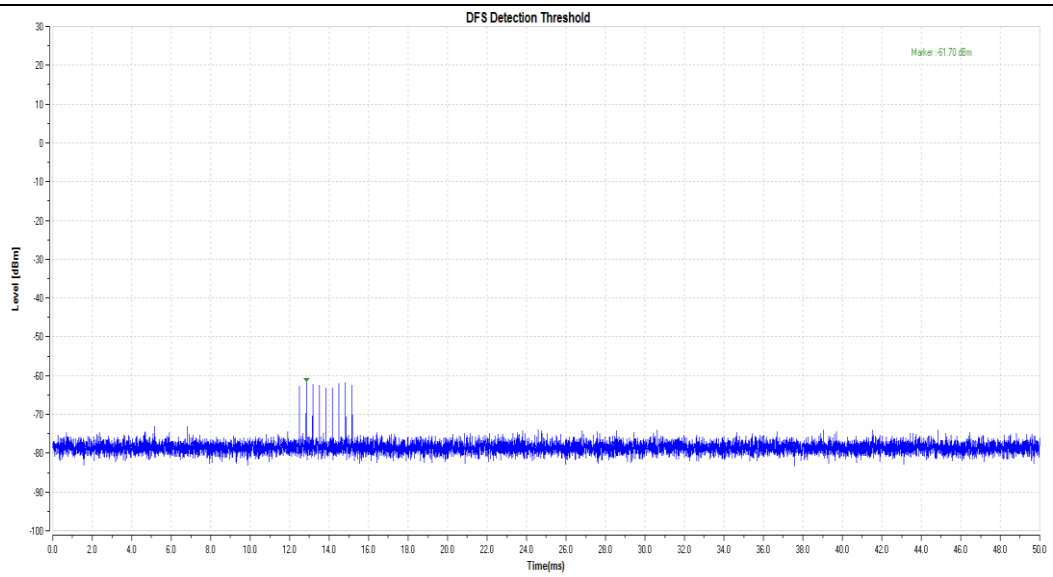
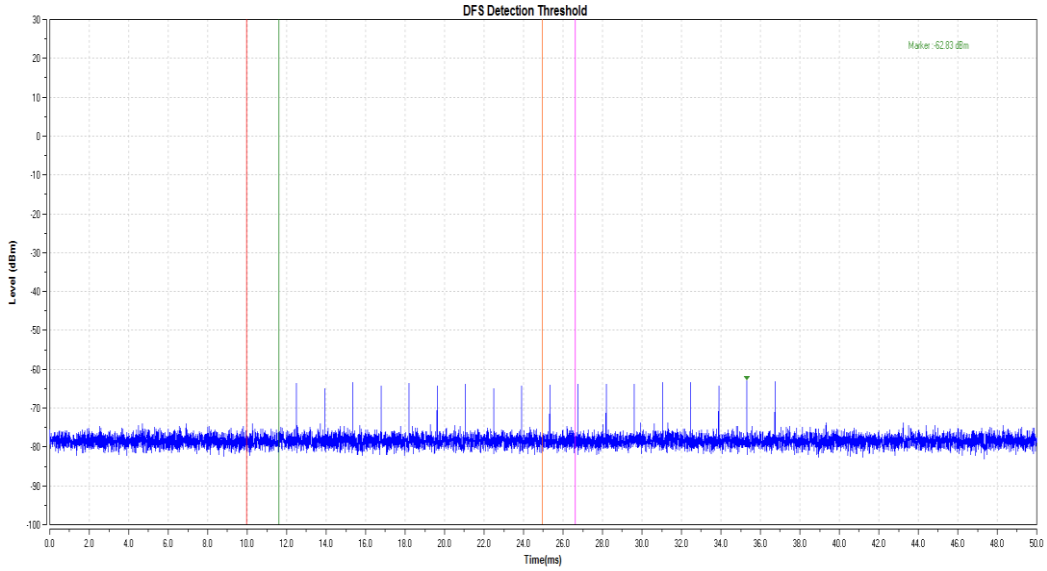
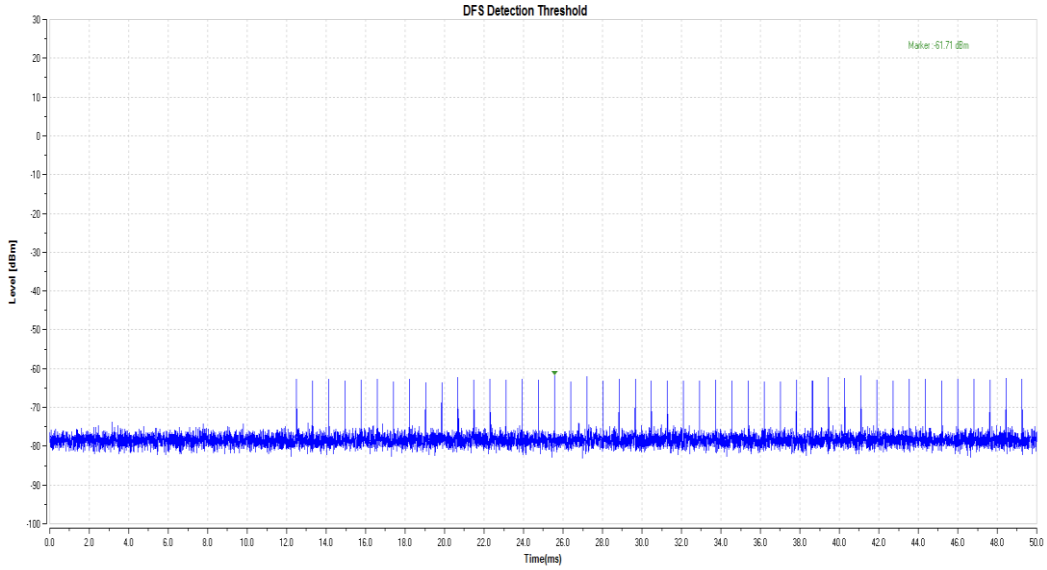



80MHz_5290_Type0




80MHz_5290_Type1




80MHz_5290_Type2



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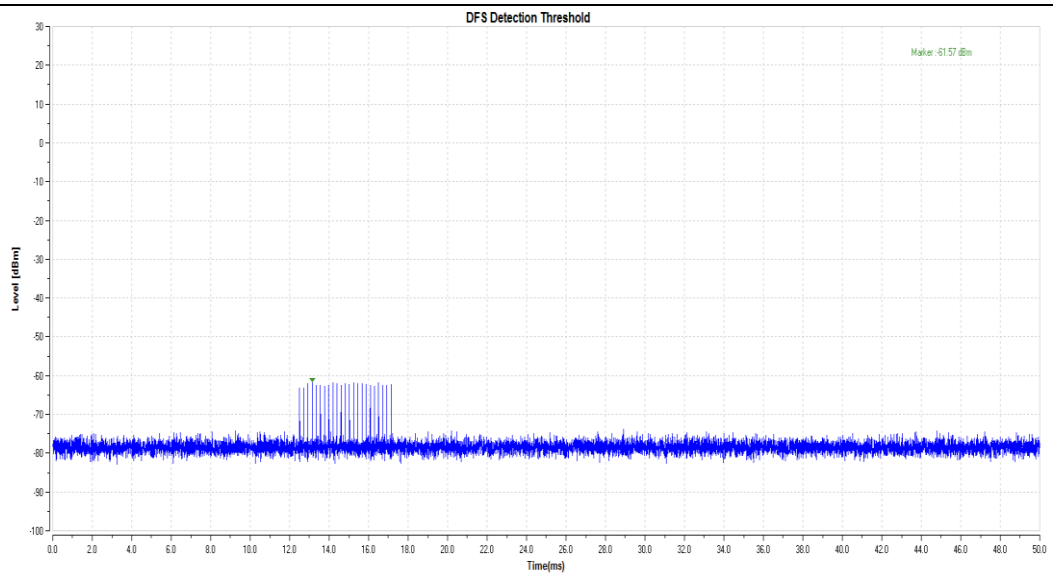
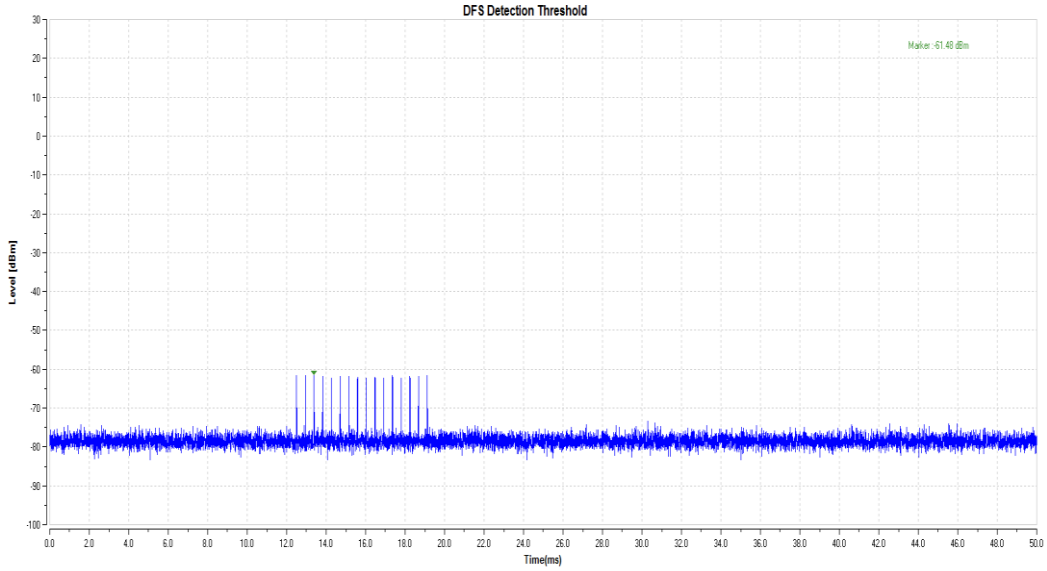
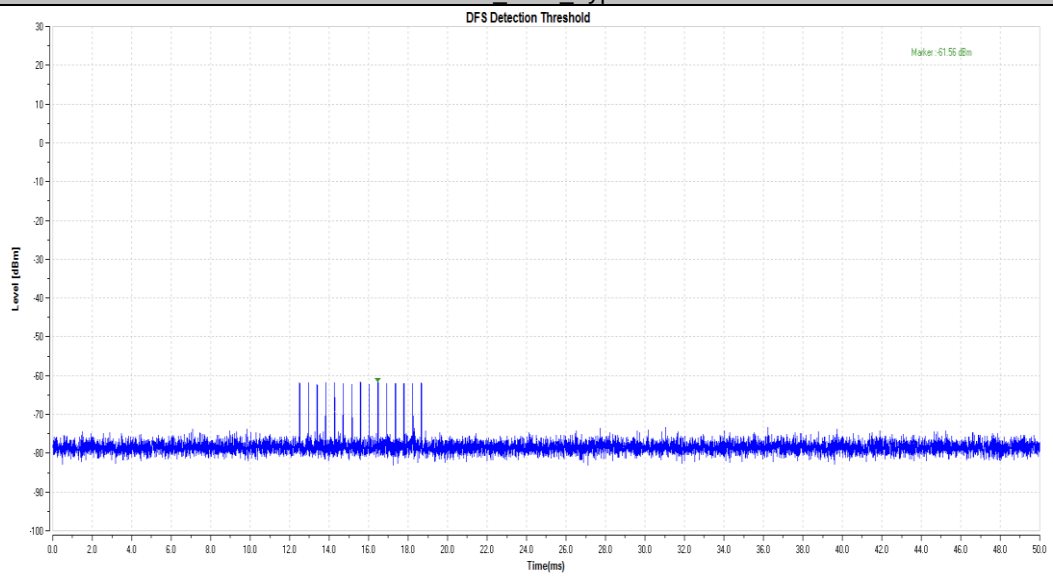



80MHz_5290_Type3




80MHz_5290_Type4




80MHz_5290_Type5



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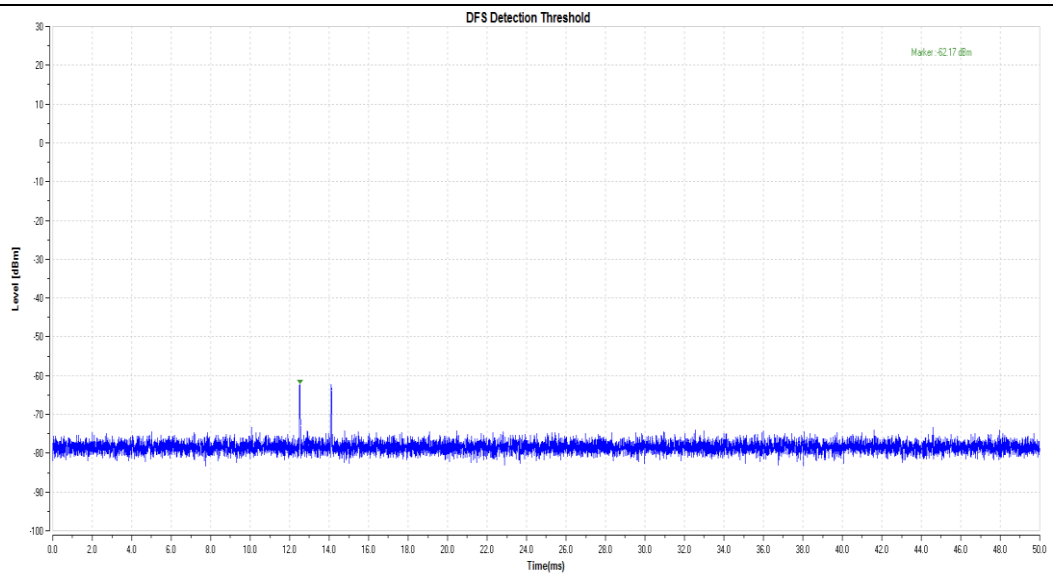
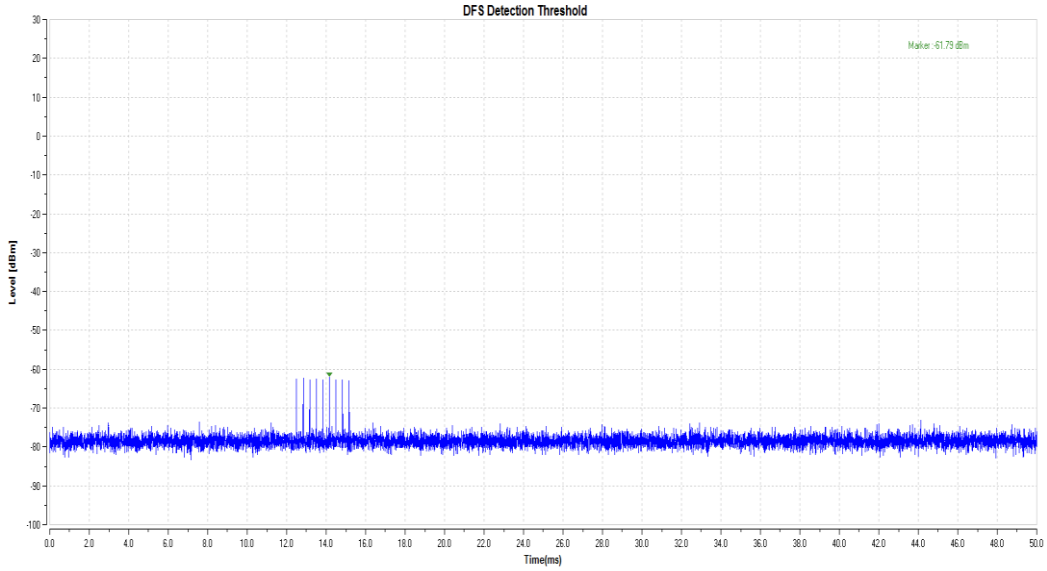
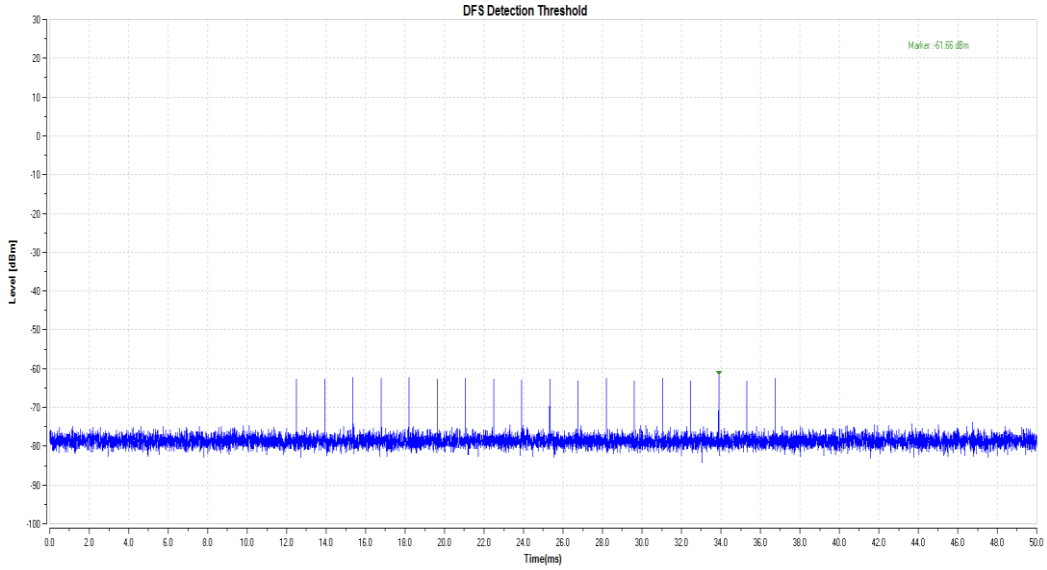



80MHz_5290_Type6




80MHz_5530_Type0




80MHz_5530_Type1



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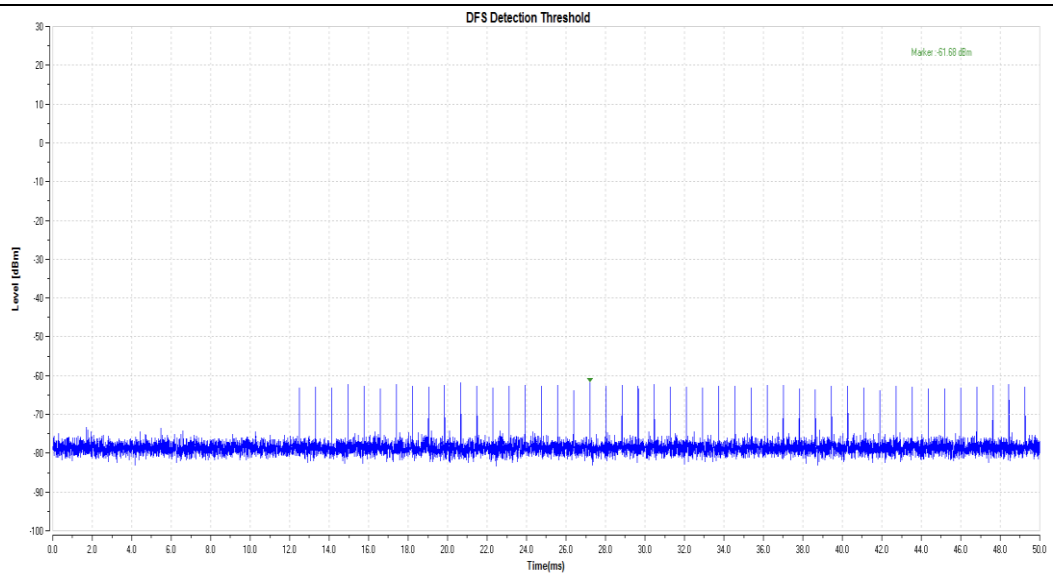
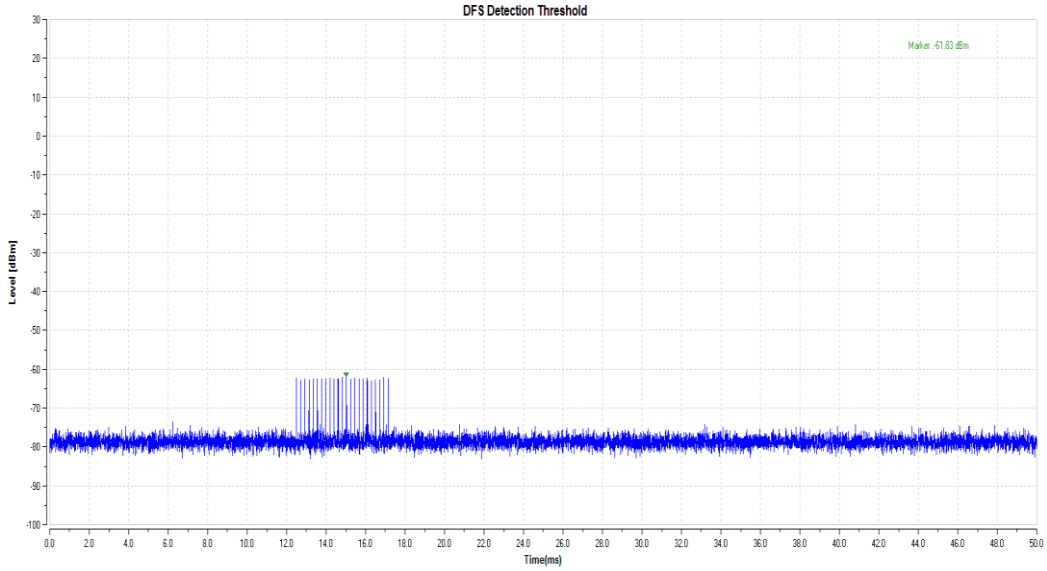
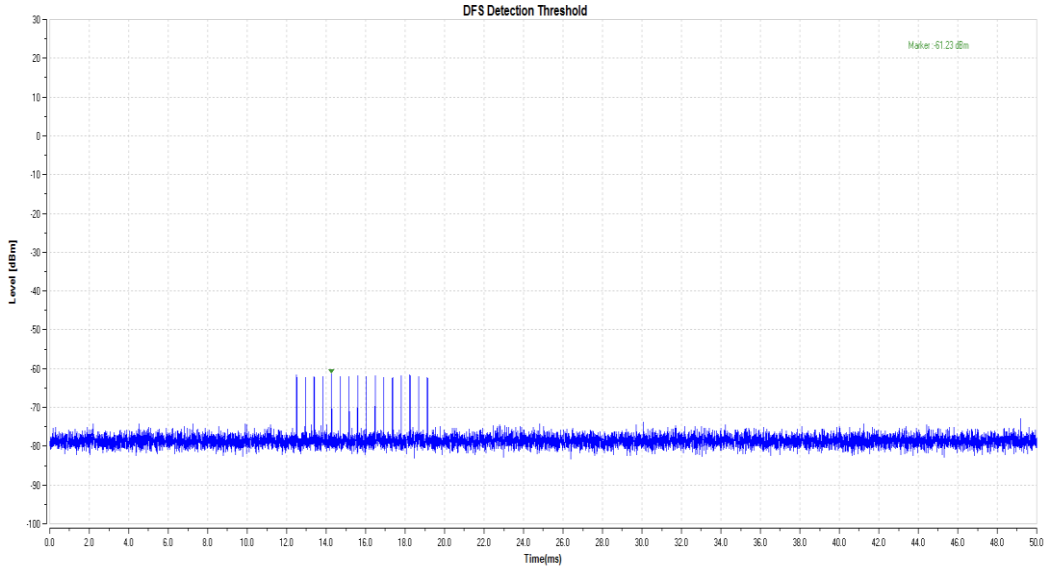



80MHz_5530_Type2




80MHz_5530_Type3




80MHz_5530_Type4



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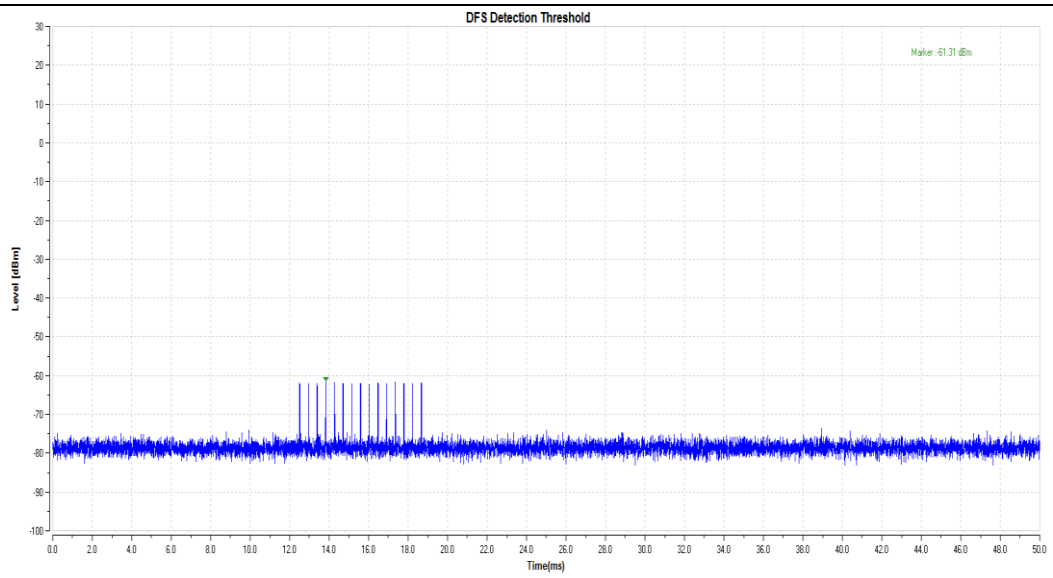
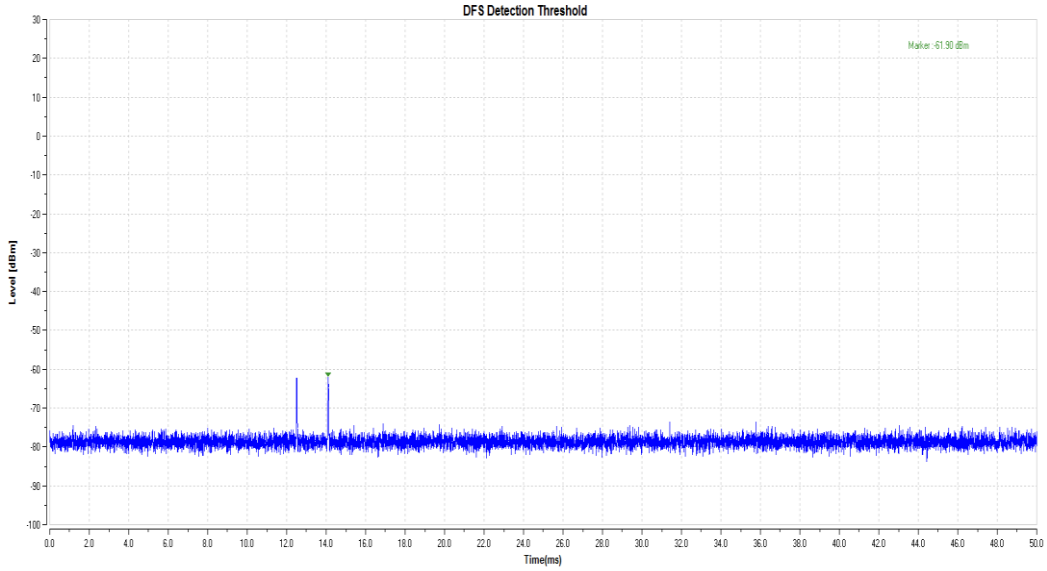
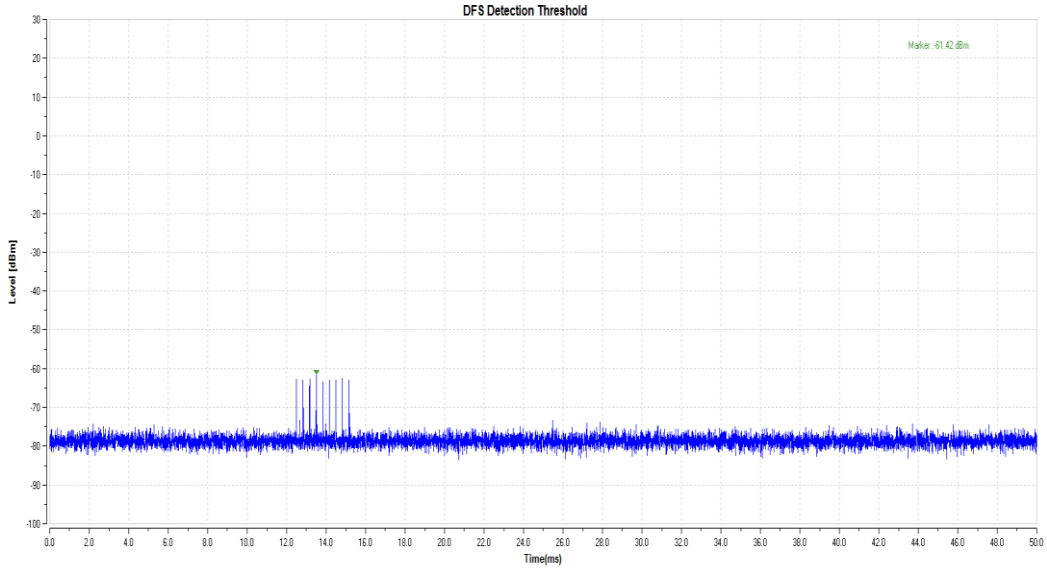



80MHz_5530_Type5




80MHz_5530_Type6



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## UNII Detection Bandwidth

### UNII Detection Bandwidth Limit

| Channel Bandwidth (MHz) | Channel (MHz) | 99% Occupied Bandwidth (MHz) | UNII Detection Bandwidth Min. Limit (MHz) | Result |
|---|---|---|---|---|
| 20 | 5280 | 17.504 | 20 | PASS |
| | 5500 | 17.988 | 20 | PASS |
| 40 | 5270 | 36.685 | 40 | PASS |
| | 5510 | 36.98 | 40 | PASS |
| 80 | 5290 | 74.97 | 78 | PASS |
| | 5530 | 75.726 | 80 | PASS |
| UNII Detection Bandwidth is minimum 100% of the 99% power bandwidth. A single radar Burst is generated for a minimum of 10 trials, and the response of the UUT is noted. The UUT must detect the Radar Waveform 90% or more of the time. | | | | |

### Test Procedures

During the U-NII Detection Bandwidth detection test, radar type 0 is used and for each frequency step the minimum percentage of detection is 90 percent. Measurements are performed with no data traffic. The EUT is set up as a standalone device (no associated Client and no traffic). The radar frequency is increased in 1 MHz steps, repeating the above test sequence, until the detection rate falls below 90%. The highest frequency at which detection is greater than or equal to 90% is denoted as FH. The radar frequency is decreased in 1 MHz steps, repeating the above test sequence, until the detection rate falls below 90%. The lowest frequency at which detection is greater than or equal to 90% is denoted as FL. UNII Detection Bandwidth = FH - FL.



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## Test Result of UNII Detection Bandwidth

Remark: 1=Detection, 0= No Detection

| Test Mode | Channel | Radar Freq. | Trial 1 | Trial 2 | Trial 3 | Trial 4 | Trial 5 | Trial 6 | Trial 7 | Trial 8 | Trial 9 | Trial 10 | Ratio (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20MHz | 5280 | 5269 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 20 |
| | | 5270 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5271 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 90 |
| | | 5272 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 90 |
| | | 5273 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 90 |
| | | 5274 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 90 |
| | | 5275 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 90 |
| | | 5280 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5285 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5290 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5291 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Detection Bandwidth (MHz) = (FH-FL) = (5290MHz-5720MHz )= | | | | | | | | | | | 20MHz |
| | 5500 | 5489 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | 5490 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5495 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5500 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5505 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5510 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5511 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Detection Bandwidth (MHz) = (FH-FL) = (5510MHz-5490MHz )= | | | | | | | | | | | 20MHz |
| 40MHz | 5270 | 5249 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | 5250 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5255 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5260 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5265 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5270 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5275 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5280 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5285 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 90 |
| | | 5286 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5287 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5288 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5289 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5290 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5291 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10 |
| | | Detection Bandwidth (MHz) = (FH-FL) = (5290MHz-5250MHz )= | | | | | | | | | | | 40MHz |
| | 5510 | 5489 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 30 |
| | | 5490 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 90 |
| | | 5495 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5500 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5505 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5510 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5515 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 90 |
| | | 5516 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5517 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5518 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5519 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5520 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5521 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5522 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5523 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5524 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5525 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5526 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5527 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |



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| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 5528 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5529 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5530 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5531 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 20 |
| | | Detection Bandwidth (MHz) = (FH-FL) = (5530MHz-5490MHz )= | | | | | | | | | | | 40MHz |
| 80MHz | 5290 | 5250 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | 5251 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5252 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5253 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5254 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 90 |
| | | 5255 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5260 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5265 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5270 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5275 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5280 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5285 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5290 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5295 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5300 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5305 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5310 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5315 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5320 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5325 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 90 |
| | | 5326 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5327 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5328 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5329 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5330 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Detection Bandwidth (MHz) = (FH-FL) = (5329MHz-5251MHz )= | | | | | | | | | | | 78MHz |
| | 5530 | 5489 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | 5490 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5495 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5500 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5505 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5510 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5515 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5520 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5525 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5530 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5535 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5540 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5545 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5550 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5555 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5560 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5565 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5570 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| | | 5571 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Detection Bandwidth (MHz) = (FH-FL) = (5570MHz-5490MHz )= | | | | | | | | | | | 80MHz |



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## Channel Availability Check (CAC)

### Channel Availability Check Limit

The EUT shall perform a Channel Availability Check to ensure that there is no radar operating on the channel. After power-up sequence, receive at least 1 minute (60 sec) on the intended operating frequency.

### Test Procedures

| | Test Method |
|---|---|
| ☒ | For Initial Channel Availability Check Time. The EUT does not emit beacon, control, or data signals on the test Channel until the power-up sequence has been completed and the UNII device checks for Radar Waveforms for one minute on the test Channel. This test does not use any Radar Waveforms. |
| ☒ | For Radar Burst at the Beginning of the Channel Availability Check Time. To verify successful radar detection on the selected Channel during a period equal to the Beginning of the Channel Availability Check Time. |
| ☒ | For Radar Burst at the End of the Channel Availability Check Time. To verify successful radar detection on the selected Channel during a period equal to the End of the Channel Availability Check Time. |



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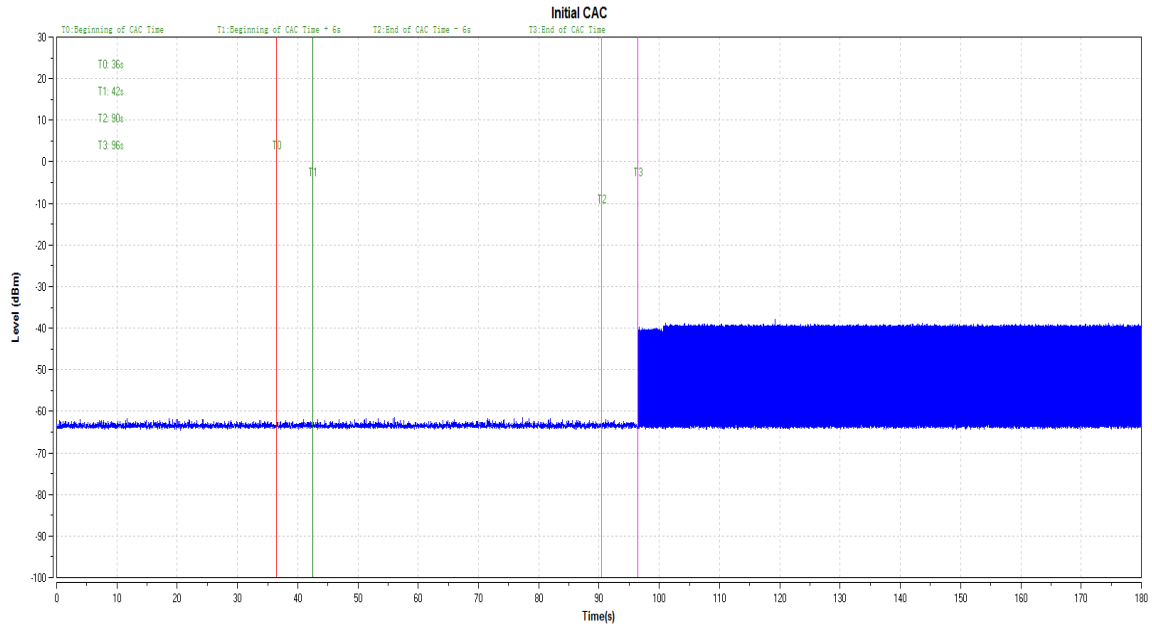
## Test Result of Initial Channel Availability Check Time

| Modulation Mode | Freq. | Radar Test Signal |
|---|---|---|
| 802.11ac80 | 5290MHz | N/A |

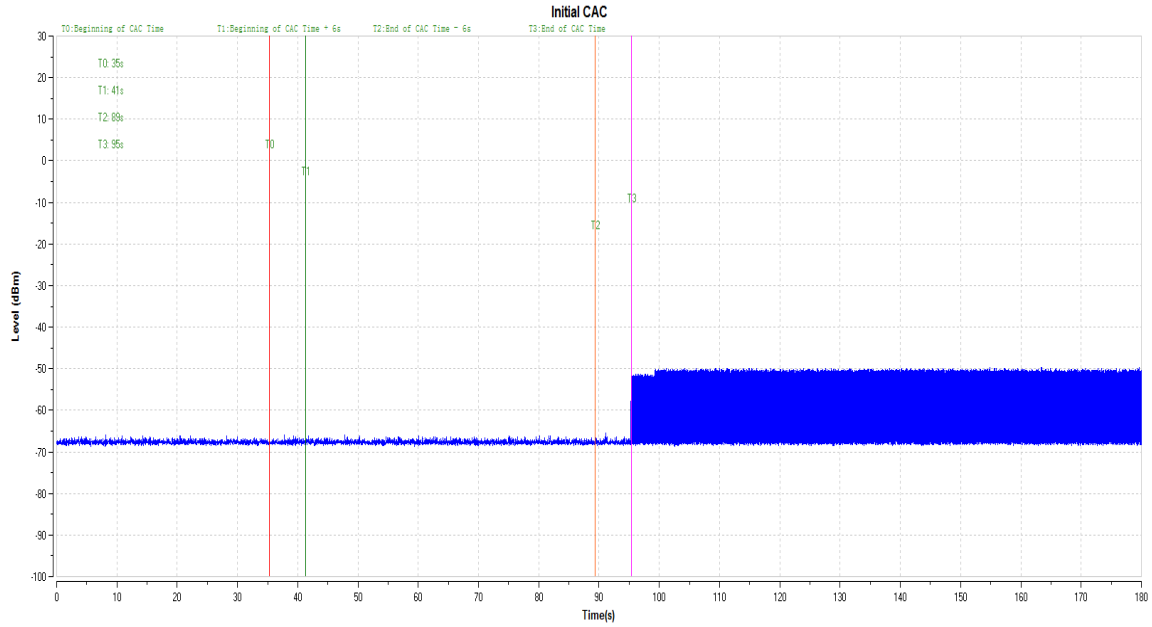
The EUT does not transmit any beacon or data transmissions until at least 1 minute after the completion of the power-on cycle.




| Test Result | Complied |
|---|---|

| Modulation Mode | Freq. | Radar Test Signal |
|---|---|---|
| 802.11ac80 | 5530MHz | N/A |

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




| Test Result | Complied |
|---|---|



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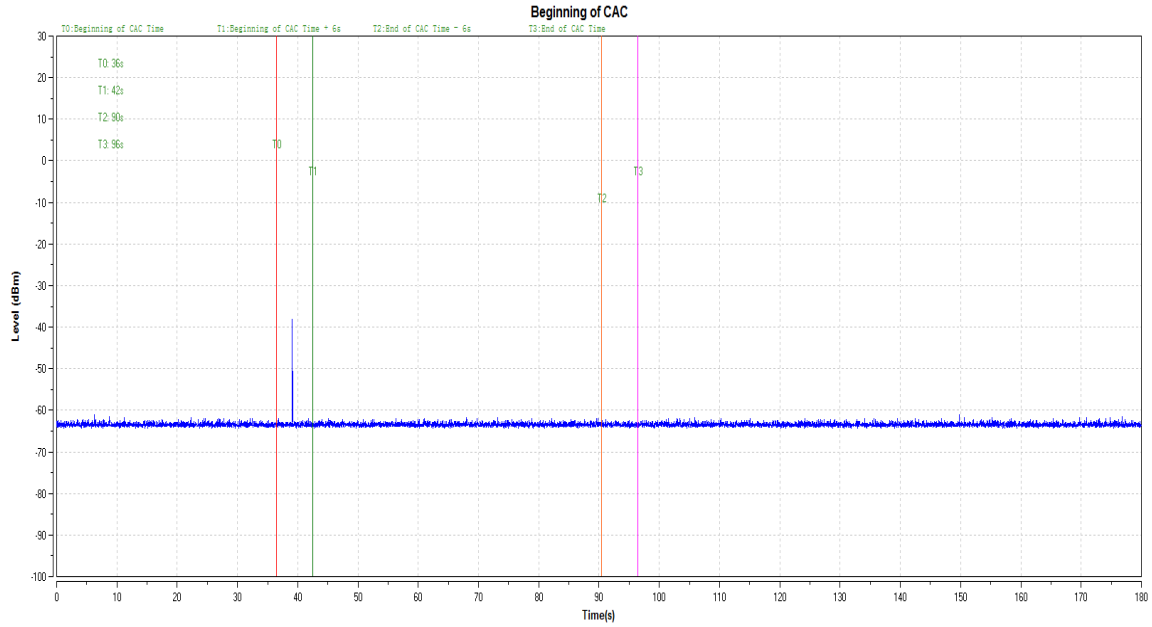
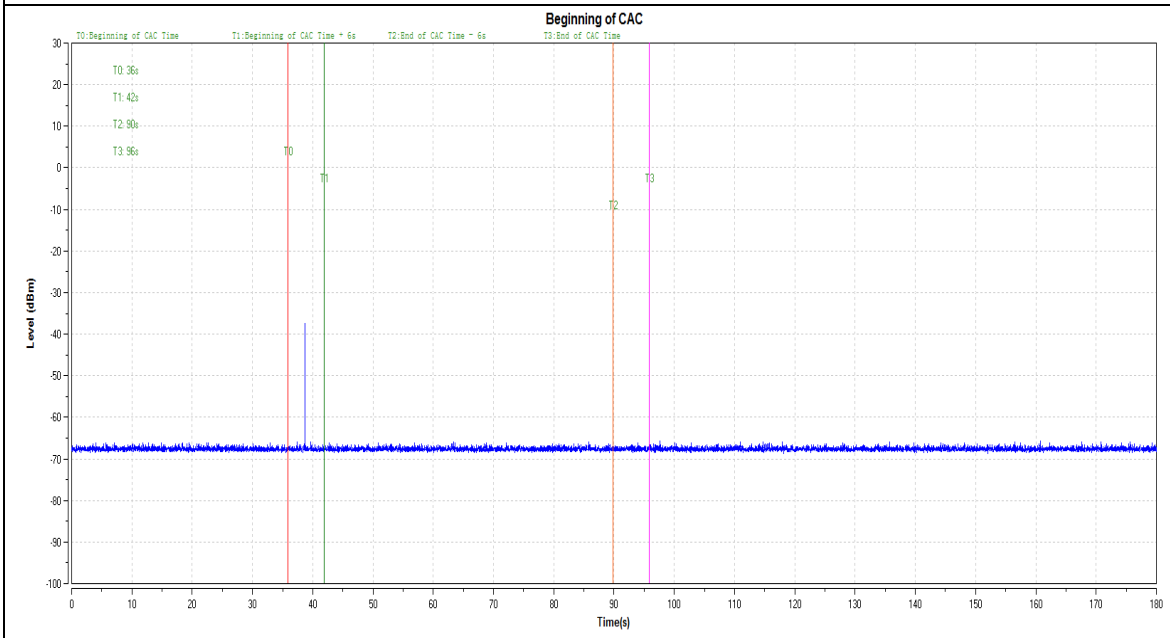
## Test Result of Radar Burst at the Beginning of the Channel Availability Check Time

| Modulation Mode | Freq. | Radar Test Signal |
|---|---|---|
| 802.11ac80 | 5290MHz | N/A |
| Verify that during the measurement window no EUT transmissions occurred. | | |




| Test Result | Complied |
|---|---|

| Modulation Mode | Freq. | Radar Test Signal |
|---|---|---|
| 802.11ac80 | 5530MHz | N/A |
| Verify that during the measurement window no EUT transmissions occurred. | | |




| Test Result | Complied |
|---|---|



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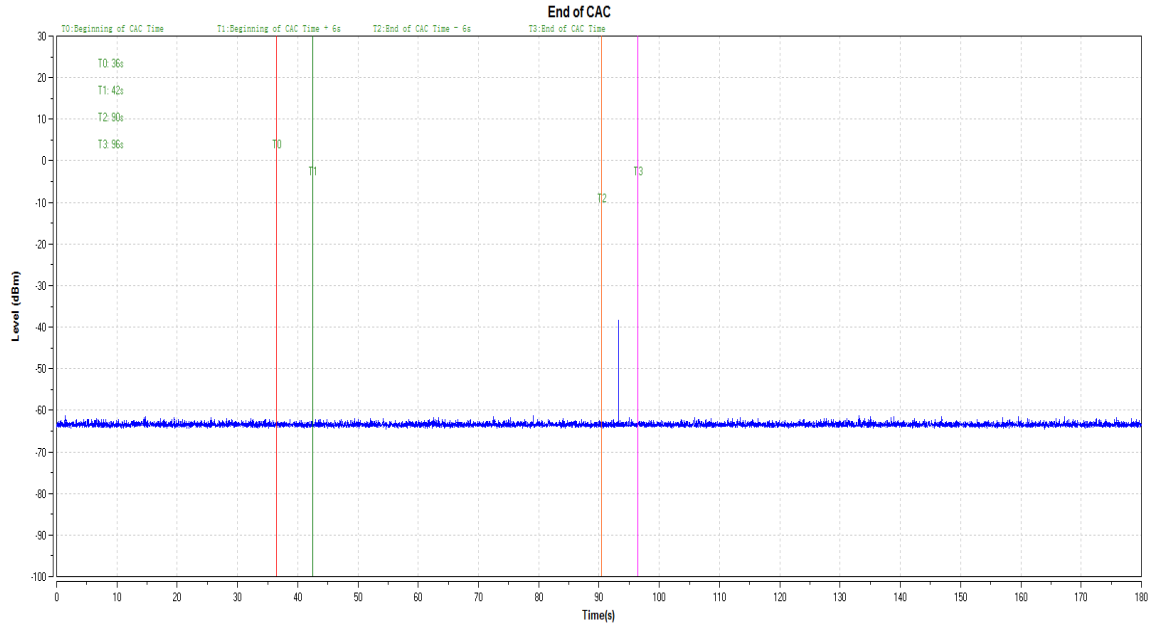
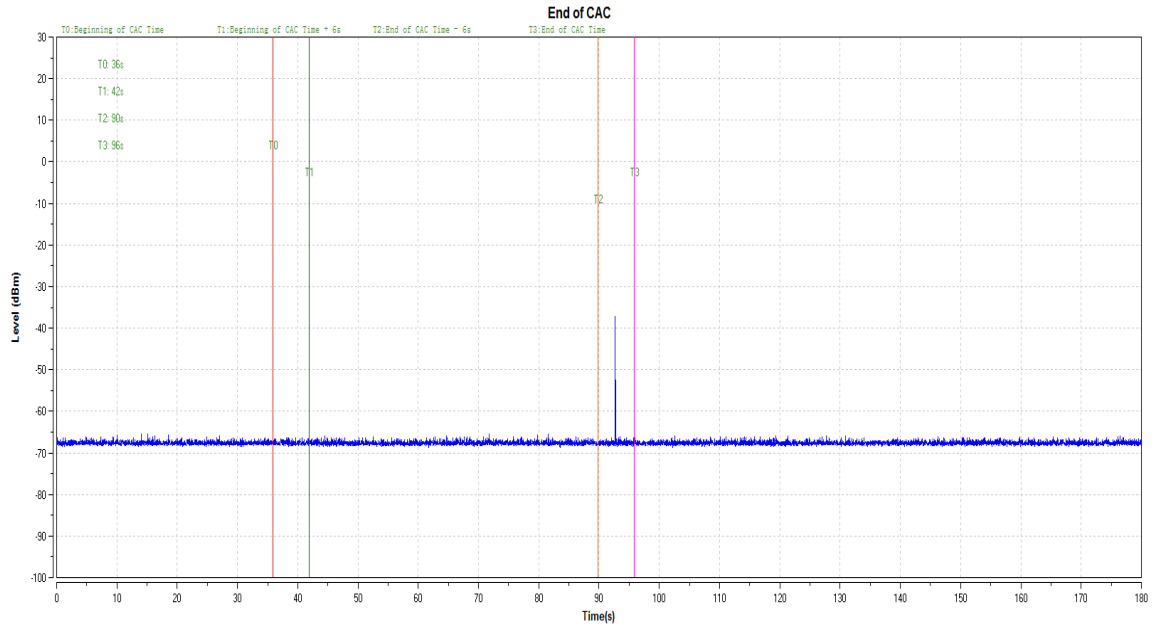
## Test Result of Radar Burst at the End of the Channel Availability Check Time

| Modulation Mode | Freq. | Radar Test Signal |
|---|---|---|
| 802.11ac80 | 5290MHz | N/A |
| Verify that during the measurement window no EUT transmissions occurred. | | |




| Test Result | Complied |
|---|---|

| Modulation Mode | Freq. | Radar Test Signal |
|---|---|---|
| 802.11ac80 | 5530MHz | N/A |
| Verify that during the measurement window no EUT transmissions occurred.. | | |




| Test Result | Complied |
|---|---|



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## In-service Monitoring

### In-service Monitoring Limit

| In-service Monitoring Limit | |
|---|---|
| Channel Move Time | 10 sec |
| Channel Closing Transmission Time | 200 ms + an aggregate of 60 ms over remaining 10 sec periods. |
| Non-occupancy period | Minimum 30 minutes |

### Test Procedures

| Test Method |
|---|
| Verified during In-Service Monitoring; Channel Closing Transmission Time, Channel Move Time. Client Device will associate with the EUT. Observe the transmissions of the EUT at the end of the radar Burst on the Operating Channel for duration greater than 10 seconds. Measure and record the transmissions from the EUT during the observation time (Channel Move Time). Compare the Channel Move Time and Channel Closing Transmission Time limits. |
| Verified during In-Service Monitoring; Channel Closing Transmission Time, Channel Move Time. One 12 sec plot needs to be reported for the Short Pulse Radar Types 0. And zoom-in a 60 ms plot verified channel closing time for the aggregate transmission time starting from 200ms after the end of the radar signal to the completion of the channel move. |
| Verified during In-Service Monitoring; Non-Occupancy Period. Client Device will associate with the EUT. Observe the transmissions of the EUT at the end of the radar Burst on the Operating Channel for duration greater than 10 seconds. Measure and record the transmissions from the EUT during the observation time (Non-Occupancy Period). Compare the Non-Occupancy Period limits. |



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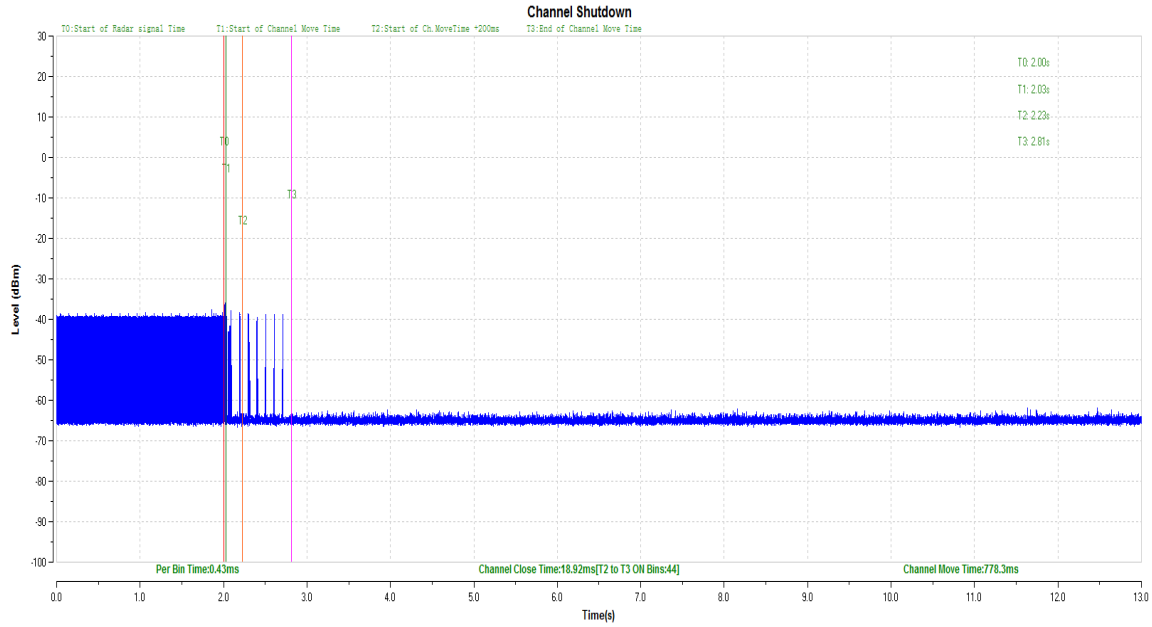
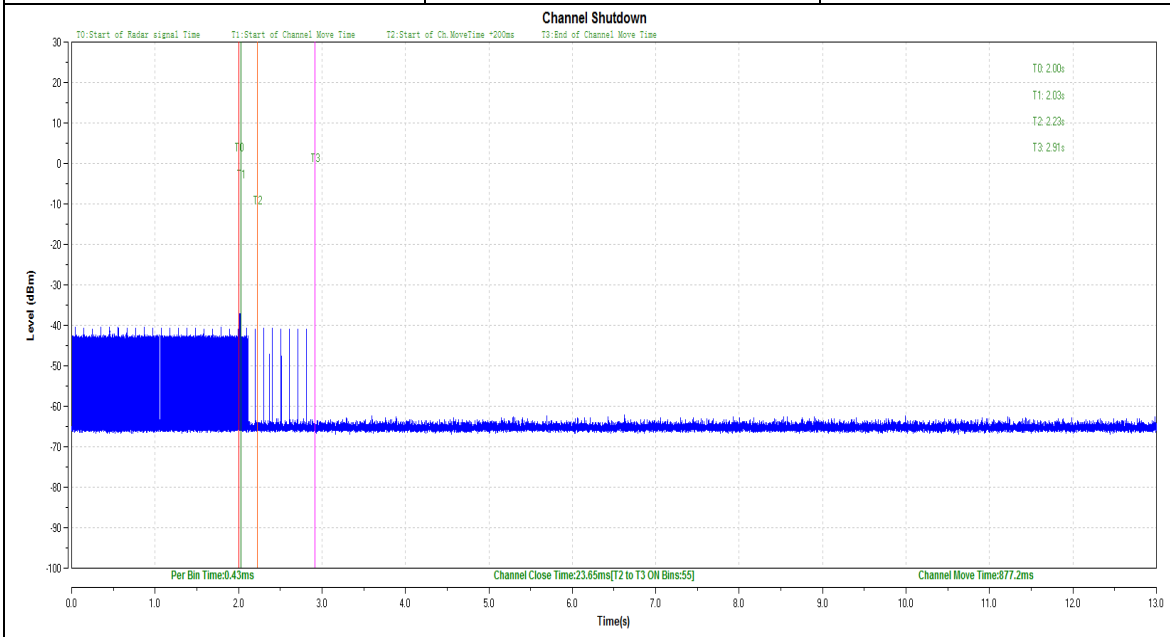
## Test Result of Channel Move Time and Channel Closing Transmission Time

| Modulation Mode | Freq. | Radar Test Signal |
|---|---|---|
| 802.11ac80 | 5290MHz | 0 |




| CCT [ms] | CCT [ms] | CMT [ms] | CMT Limit [ms] | Verdict |
|---|---|---|---|---|
| 17.63 | 60 | 772.71 | 10000 | PASS |

| Modulation Mode | Freq. | Radar Test Signal |
|---|---|---|
| 802.11ac80 | 5530MHz | 0 |




| CCT [ms] | CCT [ms] | CMT [ms] | CMT Limit [ms] | Verdict |
|---|---|---|---|---|
| 23.65 | 60 | 877.2 | 10000 | 23.65 |



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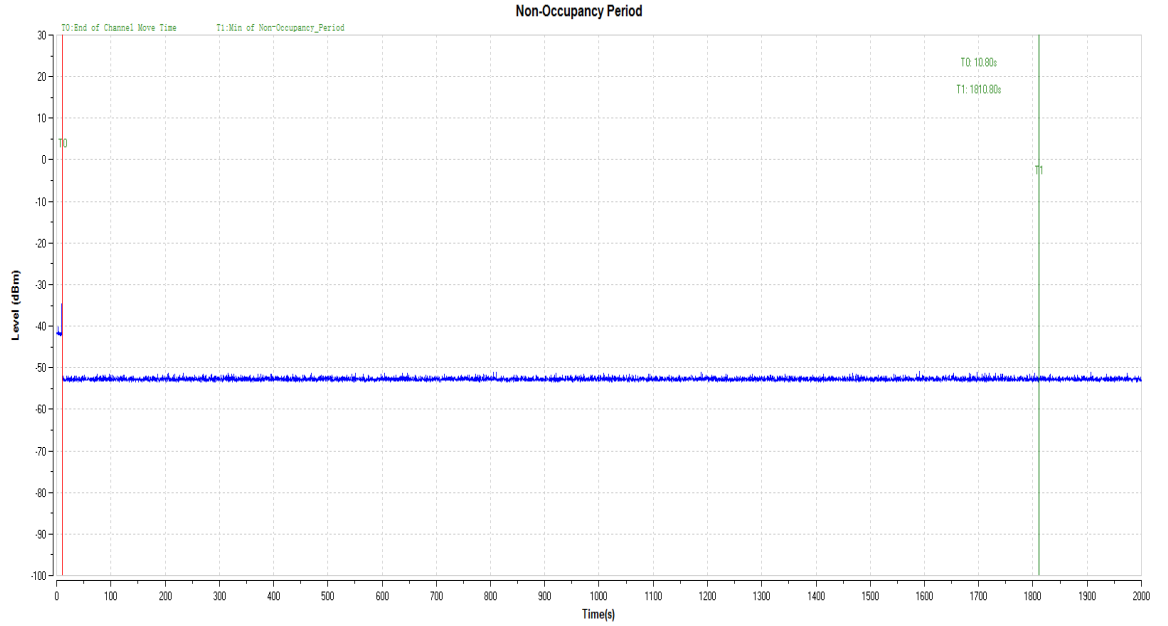
## Test Result of Non-Occupancy Period

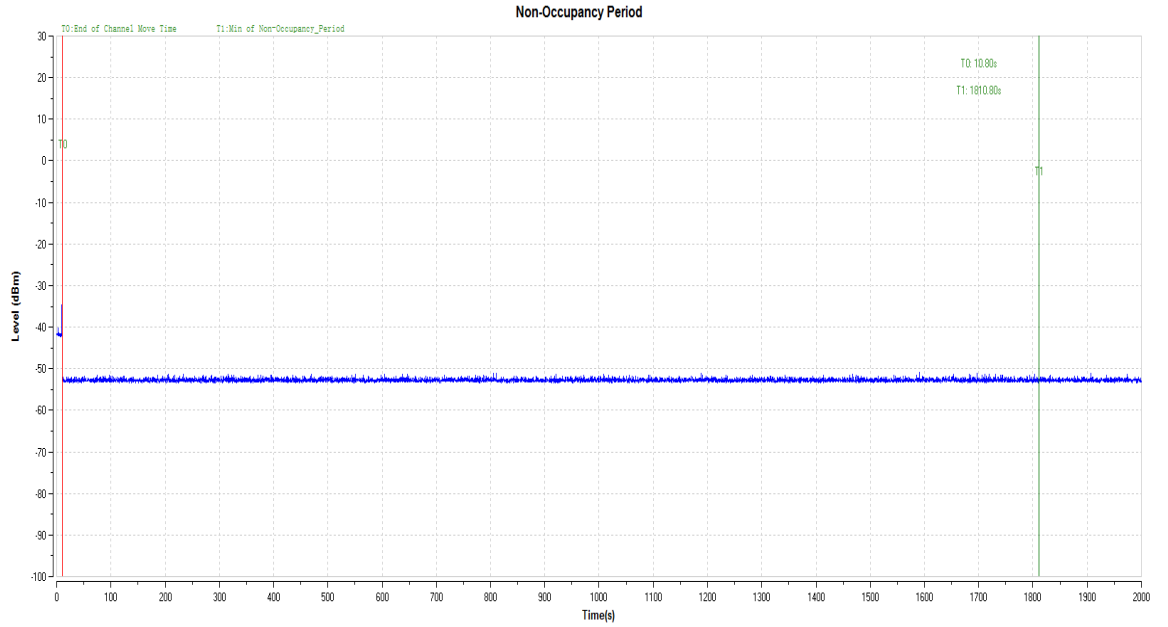
| Modulation Mode | Freq. | Radar Test Signal |
|---|---|---|
| 802.11ac80 | 5290MHz | 0 |

During the 30 minutes observation time, UUT did not make any transmissions on a channel after a radar signal was detected on that channel by either the Channel Availability Check or the In-Service Monitoring.




| Test Result | Complied |
|---|---|

| Modulation Mode | Freq. | Radar Test Signal |
|---|---|---|
| 802.11ac80 | 5530MHz | 0 |




| Test Result | Complied |
|---|---|



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## Statistical Performance Check

### Statistical Performance Check Limit

| Radar Type | Minimum Percentage of Successful Detection (Pd) | Minimum Trials |
|---|---|---|
| 1 | 60% | 30 |
| 2 | 60% | 30 |
| 3 | 60% | 30 |
| 4 | 60% | 30 |
| Aggregate (Radar Types 1-4) | 80% | 120 |
| 5 | 80% | 30 |
| 6 | 70% | 30 |

The percentage of successful detection is calculated by:

$$\frac{TotalWaveformDetections}{TotalWaveformTrails} \times 100 = \text{Probability of Detection Radar Waveform}$$

In addition an aggregate minimum percentage of successful detection across all Short Pulse Radar Types 1-4 is required and is calculated as follows:

$$\frac{Pd1 + Pd2 + Pd3 + Pd4}{4}$$

### Test Procedures

| Test Method |
|---|
| For Statistical Performance Check test. Demonstrating a minimum channel loading of approximately 17% or greater of the test. Observe the transmissions of the UUT at the end of the Burst on the Operating Channel for duration greater than 10 seconds for Short Pulse Radar Types 1-4 and 6 to ensure detection occurs. Then Observe the transmissions of the UUT 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. The device can utilize a test mode to demonstrate when detection occurs to prevent the need to reset the device between trial runs. |



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## Test Result of Statistical Performance Check

| Test Mode | Channel | Radar Type | Pass Times | Fail Times | Probability (%) | Limit (%) | Verdict |
|---|---|---|---|---|---|---|---|
| 11A | 5280 | Type1 | 28 | 2 | 93.33 | 60 | PASS |
| | | Type2 | 26 | 4 | 86.67 | 60 | PASS |
| | | Type3 | 26 | 4 | 86.67 | 60 | PASS |
| | | Type4 | 25 | 5 | 83.33 | 60 | PASS |
| | | Aggregate (Radar Types 1-4) | -- | -- | 87.50 | 80 | PASS |
| | | Type5 | 25 | 5 | 83.33 | 60 | PASS |
| | | Type6 | 30 | 30 | 100.00 | 60 | PASS |
| | 5500 | Type1 | 30 | 0 | 100.00 | 60 | PASS |
| | | Type2 | 26 | 4 | 86.67 | 60 | PASS |
| | | Type3 | 25 | 5 | 83.33 | 60 | PASS |
| | | Type4 | 30 | 0 | 100.00 | 60 | PASS |
| | | Aggregate (Radar Types 1-4) | -- | -- | 92.50 | 80 | PASS |
| | | Type5 | 26 | 4 | 86.67 | 60 | PASS |
| | | Type6 | 24 | 6 | 80.00 | 60 | PASS |
| 11N40 | 5270 | Type1 | 28 | 2 | 93.33 | 60 | PASS |
| | | Type2 | 25 | 5 | 83.33 | 60 | PASS |
| | | Type3 | 25 | 5 | 83.33 | 60 | PASS |
| | | Type4 | 26 | 4 | 86.67 | 60 | PASS |
| | | Aggregate (Radar Types 1-4) | -- | -- | 86.67 | 80 | PASS |
| | | Type5 | 24 | 6 | 80.00 | 60 | PASS |
| | | Type6 | 30 | 30 | 100.00 | 60 | PASS |
| | 5510 | Type1 | 30 | 0 | 100.00 | 60 | PASS |
| | | Type2 | 24 | 6 | 80.00 | 60 | PASS |
| | | Type3 | 26 | 4 | 86.67 | 60 | PASS |
| | | Type4 | 26 | 4 | 86.67 | 60 | PASS |
| | | Aggregate (Radar Types 1-4) | -- | -- | 88.34 | 80 | PASS |
| | | Type5 | 25 | 5 | 83.33 | 60 | PASS |
| | | Type6 | 25 | 5 | 83.33 | 60 | PASS |
| 11AC80 | 5290 | Type1 | 26 | 4 | 86.67 | 60 | PASS |
| | | Type2 | 25 | 5 | 83.33 | 60 | PASS |
| | | Type3 | 29 | 1 | 96.67 | 60 | PASS |
| | | Type4 | 25 | 5 | 83.33 | 60 | PASS |
| | | Aggregate (Radar Types 1-4) | -- | -- | 87.50 | 80 | PASS |
| | | Type5 | 25 | 5 | 83.33 | 60 | PASS |
| | | Type6 | 25 | 5 | 83.33 | 60 | PASS |
| | 5530 | Type1 | 29 | 1 | 96.67 | 60 | PASS |
| | | Type2 | 26 | 4 | 86.67 | 60 | PASS |
| | | Type3 | 29 | 1 | 96.67 | 60 | PASS |
| | | Type4 | 25 | 5 | 83.33 | 60 | PASS |
| | | Aggregate (Radar Types 1-4) | -- | -- | 90.84 | 80 | PASS |
| | | Type5 | 26 | 4 | 86.67 | 60 | PASS |
| | | Type6 | 25 | 5 | 83.33 | 60 | PASS |



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# 10 Test Equipment List

Conducted Emission Test

| Description | Manufacturer | Model no. | Equipment ID | Serial no. | cal interval (year) | cal. due date |
|---|---|---|---|---|---|---|
| EMI Test Receiver | Rohde & Schwarz | ESR 3 | 68-4-74-19-002 | 102590 | 1 | 2022-6-4 |
| LISN | Rohde & Schwarz | ENV216 | 68-4-87-19-001 | 102472 | 1 | 2022-6-5 |
| Attenuator | Shanghai Huaxiang | TS2-26-3 | 68-4-81-16-003 | 080928189 | 1 | 2022-6-3 |
| Test software | Rohde & Schwarz | EMC32 | 68-4-90-19-005-A01 | Version10.35.02 | N/A | N/A |
| Shielding Room | TDK | CSR #2 | 68-4-90-19-005 | ---- | 1 | 2022-11-07 |

Radiated Emission Test

| DESCRIPTION | MANUFACTURER | MODEL NO. | EQUIPMENT ID | SERIAL NO. | CAL INTERVAL (YEAR) | CAL. DUE DATE |
|---|---|---|---|---|---|---|
| Signal Analyzer | Rohde & Schwarz | FSV40 | 68-4-74-14-003 | 101031 | 1 | 2022-6-3 |
| Trilog Super Broadband Test Antenna | Schwarzbeck | VULB 9163 | 68-4-80-14-003 | 708 | 1 | 2022-6-27 |
| Horn Antenna | Rohde & Schwarz | HF907 | 68-4-80-14-004 | 102295 | 1 | 2022-7-21 |
| Wideband Horn Antenna | Q-PAR | QWH-SL-18-40-K-SG | 68-4-80-14-008 | 12827 | 1 | 2022-7-21 |
| Loop Antenna | Rohde & Schwarz | HFH2-Z2 | 68-4-80-14-006 | 100398 | 1 | 2022-8-25 |
| Pre-amplifier | Rohde & Schwarz | SCU 18 | 68-4-29-14-001 | 102230 | 1 | 2022-6-6 |
| Pre-amplifier | Rohde & Schwarz | SCU 40A | 68-4-29-14-002 | 100432 | 1 | 2022-7-27 |
| Fully Anechoic Chamber | TDK | 8X4X4 | 68-4-90-14-002 | -- | 2 | 2023-9-2 |
| Test software | Rohde & Schwarz | EMC32 | 68-4-90-14-002-A10 | Version 9.15.00 | N/A | N/A |

RF Conducted Test

| DESCRIPTION | MANUFACTURER | MODEL NO. | EQUIPMENT ID | SERIAL NO. | CAL INTERVAL (YEAR) | CAL. DUE DATE |
|---|---|---|---|---|---|---|
| Signal Generator | Rohde & Schwarz | SMB100A | 68-4-48-14-001 | 108272 | 1 | 2022-6-3 |
| Vector Signal Generator | Rohde & Schwarz | SMBV100A | 68-4-48-18-001 | 262825 | 1 | 2022-6-3 |
| Communication Synthetical Test Instrument | Rohde & Schwarz | CMW 270 | 68-4-48-18-003 | 101251 | 1 | 2022-6-3 |
| Signal Analyzer | Rohde & Schwarz | FSV40 | 68-4-74-14-004 | 101030 | 1 | 2022-6-3 |
| Vector Signal Generator | Rohde & Schwarz | SMU 200A | 68-4-48-14-003 | 105324 | 1 | 2022-6-3 |
| RF Switch Module | Rohde & Schwarz | OSP120/OSP-B157 | 68-4-93-14-003 | 101226/100851 | 1 | 2022-6-3 |
| Power Splitter | Weinschel | 1580 | 68-4-85-14-001 | SC319 | 1 | 2022-6-3 |
| 10dB Attenuator | Weinschel | 4M-10 | 68-4-81-14-003 | 43152 | 1 | 2022-6-3 |
| 10dB Attenuator | R&S | DNF | 68-4-81-14-004 | DNF-001 | 1 | 2022-6-3 |
| 10dB Attenuator | R&S | DNF | 68-4-81-14-005 | DNF-002 | 1 | 2022-6-3 |
| 10dB Attenuator | R&S | DNF | 68-4-81-14-006 | DNF-003 | 1 | 2022-6-3 |
| 10dB Attenuator | R&S | DNF | 68-4-81-14-007 | DNF-004 | 1 | 2022-6-3 |
| Test software | Rohde & Schwarz | EMC32 | 68-4-48-14-003-A10 | Version 10.60.10 | N/A | N/A |
| Test software | Tonscend | System for BT/WIFI | 68-4-74-14-006-A13 | Version 2.6.77.0518 | N/A | N/A |
| Shielding Room | TDK | TS8997 | 68-4-90-19-003 | ---- | 3 | 2022-11-07 |



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# 11 System Measurement Uncertainly

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:

| System Measurement Uncertainty | |
|---|---|
| Test Items | Extended Uncertainty |
| Uncertainty for Conducted Emission 150kHz-30MHz (for test using AMN ENV432 or ENV4200) | 3.62dB |
| Uncertainty for Radiated Spurious Emission 25MHz-3000MHz | Horizontal: 4.81dB;<br>Vertical: 4.89dB; |
| Uncertainty for Radiated Spurious Emission 3000MHz-18000MHz | Horizontal: 4.69dB;<br>Vertical: 4.68dB; |
| Uncertainty for Radiated Spurious Emission 18000MHz-40000MHz | Horizontal: 4.89dB;<br>Vertical: 4.87dB; |
| Uncertainty for Conducted RF test | RF Power Conducted: 1.16dB<br>Frequency test involved: $0.6\times10^{-7}$ or 1% |

---THE END OF REPORT---



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