HEADQUARTERS: 914 WEST PATAPSCO AVENUE • BALTIMORE, MARYLAND 21230 • PHONE (410) 354-3300 • FAX (410) 354-3313

February 19, 2021

Arris International Plc
3871 Lakefield Drive, Suite 300
Suwanee, GA 30024

Dear Tony Figueiredo,

Enclosed is the EMC Wireless test report for compliance testing of the Arris International Plc, DG3450 P2 as tested to the requirements of Title 47 of the CFR, Ch. 1 (10-1-06 ed.), Title 47 of the CFR, Part 15.407, Subpart E (UNII 2).

Thank you for using the services of Eurofins E&E North America. If you have any questions regarding these results or if we can be of further service to you, please feel free to contact me.

Sincerely yours,
EUROFINS E&E NORTH AMERICA

Michelle Tawmging
Documentation Department

Reference: (\Arris International Plc\WIR106885-FCC407 UNII 2 DFS Rev. 2)

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Electromagnetic Compatibility Criteria
Test Report

for the

Arris International Plc
Model DG3450

Tested under
The FCC Certification Rules
contained in
Title 47 of the CFR
15.407 Subpart E

Report: WIR106885-FCC407 UNII 2 DFS Rev. 2

February 19, 2021

Prepared For:

Arris International Plc
3871 Lakefield Drive, Suite 300
Suwanee, GA 30024

Prepared By:
Eurofins E&E North America
914 W. Patapsco Avenue
Baltimore, MD 21230

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15.407 Subpart E

Deepak Giri, Project Engineer
Electromagnetic Compatibility Lab

Michelle Tawmging
Documentation Department

Engineering Statement: The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of 15.407 of the FCC Rules under normal use and maintenance.

Donald Salguero,
Manager, Wireless Lab

Report Status Sheet

Revision	Report Date	Reason for Revision
∅	March 3, 2020	Initial Issue.
1	February 18, 2021	Updated EUT name on page i and page ii; Updated EUT name in header throughout; Updated EUT name in Figure 2; Added FCC/IC IDs to Figure 2.
2	February 19, 2021	Updated FCC/IC IDs in Figure 2.

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List of Terms and Abbreviations

AC	**A**lternating **C**urrent
ACF	**A**ntenna **C**orrection **F**actor
Cal	**Cal**ibration
d	**M**easurement **D**istance
dB	**D**eci**b**els
dBµA	**D**eci**b**els above one **micro**amp
dBµV	**D**eci**b**els above one **micro**volt
dBµA/m	**D**eci**b**els above one **micro**amp **per m**eter
dBµV/m	**D**eci**b**els above one **micro**volt **per m**eter
DC	**D**irect **C**urrent
E	**E**lectric Field
DSL	**D**igital **S**ubscriber **L**ine
ESD	**E**lectro**s**tatic **D**ischarge
EUT	**E**quipment **U**nder **T**est
f	**F**requency
FCC	**F**ederal **C**ommunications **C**ommission
GRP	**G**round **R**eference **P**lane
H	Magnetic Field
HCP	**H**orizontal **C**oupling **P**lane
Hz	**H**ert**z**
IEC	**I**nternational **E**lectrotechnical **C**ommission
kHz	**k**ilo**h**ert**z**
kPa	**k**ilo**pa**scal
kV	**k**ilo**v**olt
LISN	**L**ine **I**mpedance **S**tabilization **N**etwork
MHz	**M**ega**h**ertz
µH	**microh**enry
µ	**microf**arad
µs	**micros**econds
PRF	**P**ulse **R**epetition **F**requency
RF	**R**adio **F**requency
RMS	**R**oot-**M**ean-**S**quare
TWT	**T**raveling **W**ave **T**ube
V/m	**V**olts **per m**eter
VCP	**V**ertical **C**oupling **P**lane

Executive Summary

A. Purpose of Test

An EMC evaluation was performed to determine compliance of the Arris International Plc DG3450 P2, with the requirements of Part 15, §15.407. All references are to the most current version of Title 47 of the Code of Federal Regulations in effect. In accordance with §2.1033, the following data is presented in support of the Certification of the DG3450 P2. Arris International Plc should retain a copy of this document which should be kept on file for at least two years after the manufacturing of the DG3450 P2, has been **permanently** discontinued.

B. Executive Summary

The following tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15, §15.407, in accordance with Arris International Plc, purchase order number PURUS1004-04783. All tests were conducted using measurement procedure FCC KDB 905462 D02 v02.

FCC Reference	Description	Results
15.407 (h)(2)	U-NII Detection Bandwidth	Compliant
15.407(h)(2)(ii)	Channel Availability Check Time	Compliant
15.407(h)(2)(ii-iii)	In-Service Monitoring	Compliant
15.407(h)(2)	Statistical Performance Check	Compliant

Figure 1: Executive Summary of EMC Part 15.407 ComplianceTesting

Eurofins MET Laboratories Inc. (Eurofins E&E North America) is part of the Eurofins Electrical & Electronics (E&E) global compliance network.

Equipment Configuration

A. Overview

Eurofins MET Laboratories, Inc. was contracted by Arris International Plc to perform testing on the DG3450 P2, under Arris International Plc's purchase order number PURUS1004-04783.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the Arris International Plc DG3450 P2.

The results obtained relate only to the item(s) tested.

Model(s) Tested:	DG3450	
Model(s) Covered:	DG3450	
EUT Specifications:	Primary Power: 12 VDC	
	FCC ID: UIDDG3450P2 IC ID: 6670A-DG3450P2	
	Type of Modulations:	256-QAM, 64-QAM, 16-QAM, QPSK, BPSK, DSSS/CCK
	Equipment Code:	NII
	EIRP:	28.62 dBm
	EUT DFS Mode:	Master
	EUT Frequency Ranges:	5.25-5.35, 5.47-5.725 GHz
Analysis:	The results obtained relate only to the item(s) tested.	
Environmental Test Conditions:	Temperature: 15-35° C	
	Relative Humidity: 30-60%	
	Barometric Pressure: 860-1060 mbar	
Type of Filing:	Original	
Evaluated by:	Deepak Giri	
Report Date:	February 19, 2021	

Figure 2: EUT Summary

B. References

CFR 47, Part 15, Subpart E	Unlicensed National Information Infrastructure Devices (UNII)
ANSI C63.4:2014	Methods and Measurements of Radio-Noise Emissions from Low-Voltage Electrical And Electronic Equipment in the Range of 9 kHz to 40 GHz
ISO/IEC 17025:2017	General Requirements for the Competence of Testing and Calibration Laboratories
ANSI C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices
789033 D02 General UNII Test Procedures New Rules v02r01	Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices Part 15, Subpart E
905462 DO2 UNII DFS Compliance Procedures New Rules v02	Compliance Measurement Procedures for Unlicensed-National Information Infrastructure Devices Operating in the 5250-5350 MHz and 5470-5725 MHz Bands Incorporating Dynamic Frequency Selection

Figure 3: References

C. Test Site

All testing was performed at Eurofins MET Laboratories, Inc., 914 W. Patapsco Avenue, Baltimore, MD 21230. All equipment used in making physical determinations is accurate and bears recent traceability to the National Institute of Standards and Technology.

Radiated Emissions measurements were performed in a 3 meter semi-anechoic chamber (equivalent to an Open Area Test Site). In accordance with §2.948(a)(3), a complete site description is contained at MET Laboratories.

Eurofins MET Laboratories Inc. (Eurofins E&E North America) is part of the Eurofins Electrical & Electronics (E&E) global compliance network.

D. Measurement Uncertainty

Test Method	Typical Expanded Uncertainty	K	Confidence Level
RF Frequencies	±4.52 Hz	2	95%
RF Power Conducted Emissions	±2.32 dB	2	95%
RF Power Conducted Spurious Emissions	±2.25 dB	2	95%
RF Power Radiated Emissions	±3.01 dB	2	95%

Figure 4: Uncertainty Calculations Summary

E. Description of Test Sample

The Arris International Plc DG3450 P2, Equipment Under Test (EUT), is a data gateway.

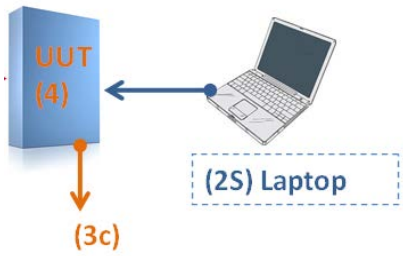


Figure 5: Block Diagram of Test Configuration

F. Equipment Configuration

The EUT was set up as outlined in Figure 5. All cards, racks, etc., incorporated as part of the EUT is included in the following list.

Ref. ID	Slot #	Name / Description	Model Number	Part Number	Serial Number	Rev. #
4	n/a	UUT	DG3450	xxxxx	xxxxxxxx	

Figure 6: Equipment Configuration

The firmware installed in the EUT during testing was AR01.02.056.08.01

G. Support Equipment

Support equipment necessary for the operation and testing of the EUT is included in the following list.

Ref. ID	Name / Description	Manufacturer	Model Number	*Customer Supplied Calibration Data
2s	Laptop	Assorted	N/A	N/A

Figure 7: Support Equipment

H. Ports and Cabling Information

Ref. ID	Port name on EUT	Cable Description or reason for no cable	Qty	Length as tested (m)	Max Length (m)	Shielded? (Y/N)	Termination Box ID & Port Name
2C	Ethernet	5e Modular 8 pin	1	1	1	No	

Figure 8: Ports and Cabling Information

I. Mode of Operation

The provided instructions and software will configure the unit for operation at each required test mode. See Configuration.

The test software used during testing was Internal to EUT.

J. Method of Monitoring EUT Operation

Indicator LED on, both Wi-Fi 2.4G and 5 G passing traffic.

K. Modifications

a) Modifications to EUT

No modifications were made to the EUT.

b) Modifications to Test Standard

No modifications were made to the test standard.

L. Disposition of EUT

The test sample including all support equipment submitted to the Electro-Magnetic Compatibility Lab for testing was returned to Arris International Plc upon completion of testing.

DFS Requirements and Radar Waveform Description & Calibration

A. DFS Requirements

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

Figure 9: Applicability of DFS Requirements Prior to Use of a Channel

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

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.		

Figure 10: Applicability of DFS Requirements During Normal Operation

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. **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. **Note3:** EIRP is based on the highest antenna gain. For MIMO devices refer to KDB Publication 662911 D01.	

Figure 11: DFS Detection Thresholds for Master or Client Devices Incorporating DFS

Parameter	Value
Non-occupancy period	Minimum 30 minutes
Channel Availability Check Time	60 seconds
Channel Move Time	10 seconds See Note 1.
Channel Closing Transmission Time	200 milliseconds + an aggregate of 60 milliseconds over remaining 10 second period. See Notes 1 and 2.
U-NII Detection Bandwidth	Minimum 100% of the U-NII 99% transmission power bandwidth. See Note 3.
Note 1: *Channel Move Time* and the *Channel Closing Transmission Time* should be performed with Radar Type 0. The measurement timing begins at the end of the Radar Type 0 burst. **Note 2:** The *Channel Closing Transmission Time* is comprised of 200 milliseconds starting at the beginning of the *Channel Move Time* plus any additional intermittent control signals required to facilitate a *Channel* move (an aggregate of 60 milliseconds) during the remainder of the 10 second period. The aggregate duration of control signals will not count quiet periods in between transmissions. **Note 3:** During the *U-NII Detection Bandwidth* detection test, radar type 0 should be used. For each frequency step the minimum percentage of detection is 90 percent. Measurements are performed with no data traffic.	

Figure 12: DFS Response Requirement Values

B. 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.

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	Roundup $\left\{\left(\frac{1}{360}\right)\cdot\left(\frac{19\cdot10^6}{PRI_{\mu sec}}\right)\right\}$	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.					

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 Type1, 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.

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

Figure 13: Pulse Repetition Intervals Values for Test A

Long Pulse Radar Test Waveform

Radar Type	Pulse Width (µsec)	Chirp Width (MHz)	PRI (µsec)	Number of Pulses per Bursts	Number of Bursts	Minimum Percentage of Successful Detection	Minimum 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 test signal. If more than 30 waveforms are used for the Long Pulse radar test signal, 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 FM chirp between 5 and 20 MHz, with the chirp width being randomly chosen. Each pulse within a Burst will have the same chirp width. Pulses in different Bursts may have different chirp widths. The chirp is centered on the pulse. For example, with 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 time between the first and second pulses is chosen independently of the time 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 / 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.

A representative example of a Long Pulse radar test waveform:

1) The total test signal length is 12 seconds.
2) 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).

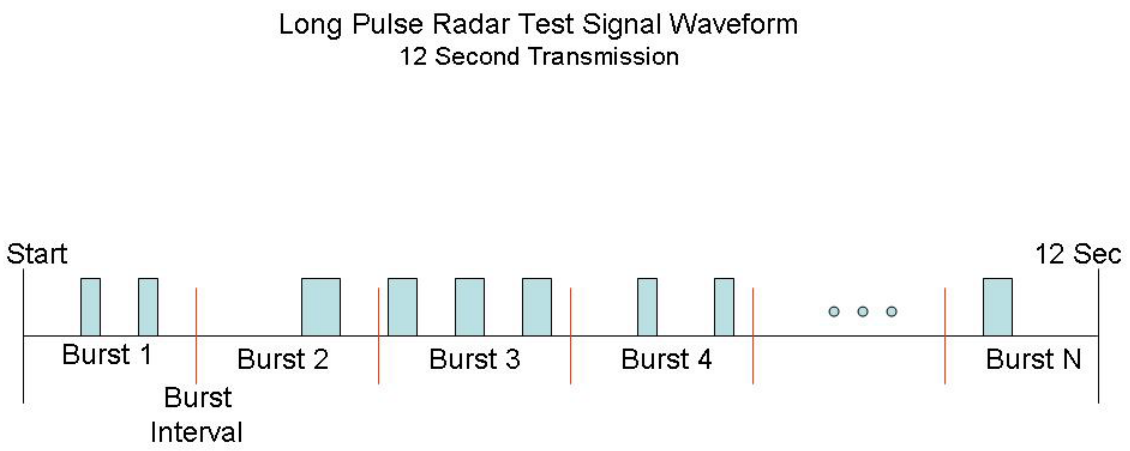


Figure 14: Long Pulse Radar Test Signal Waveform

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 Trials
6	1	333	9	.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 selected1 from the hopping sequence defined by the following algorithm:

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.

C. Radar Waveform Calibration

Calibration of the DFS test was done using a radiated method. A signal generator capable of producing all radar pulse types (0-6) was connected to a transmitting antenna. A receive antenna, through an external pre-amp was connected to a spectrum analyzer. The spectrum analyzer was set to a zero span with a peak detector and an RBW and VBW of 3 MHz. The transmit and receive antennas were vertically polarized during this calibration.

With the signal generator and spectrum analyzer tuned to the test frequency, each radar pulse was triggered and observed on the spectrum analyzer. The DFS Detection Threshold was verified for each radar pulse type (0-6) which is -64 dBm. -64 dBm is determined based on 28.62 dBm EIRP obtained from 4.66 dBi peak antenna gain.

During this process there were no transmissions by either the Master or Client Device.

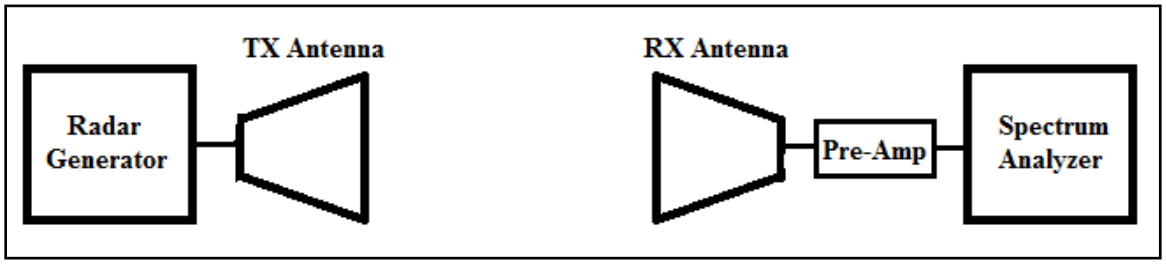


Figure 15: Radiated DFS Calibration Block Diagram

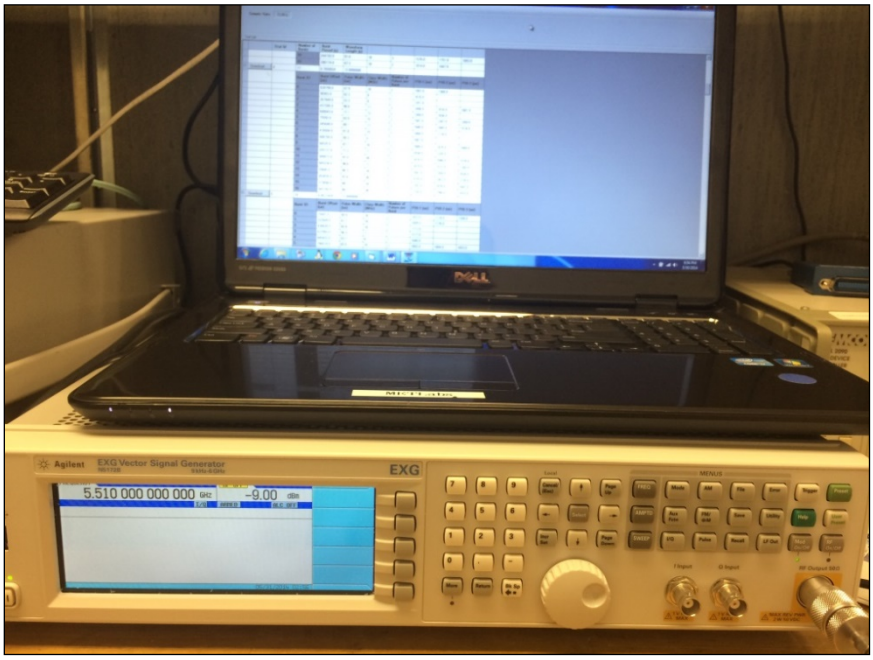


Figure 16: DFS Radar Test Signal Generator

Radar Waveform Calibration

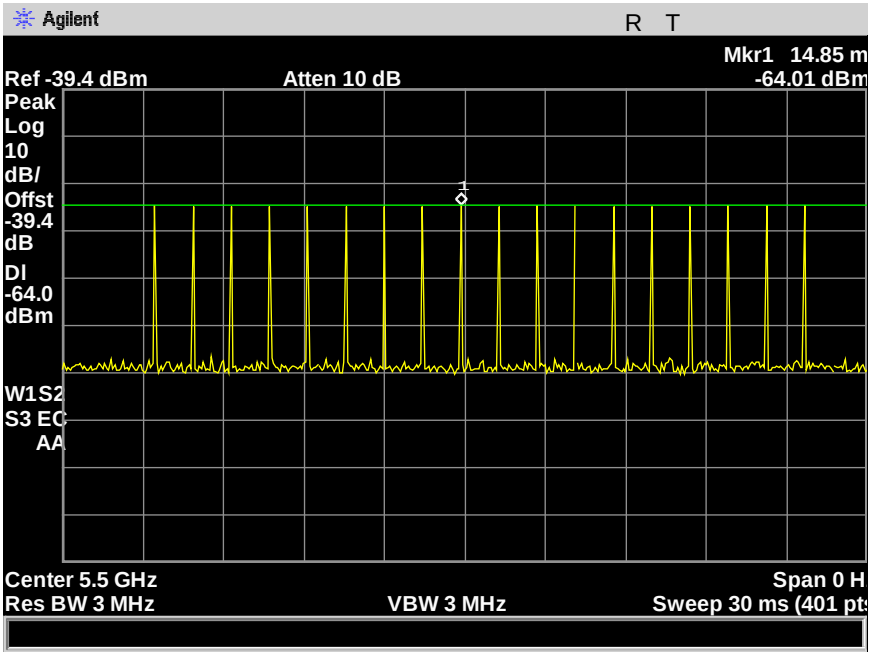


Figure 17: Radar Waveform Calibration, 5500 MHz calibration Type -0

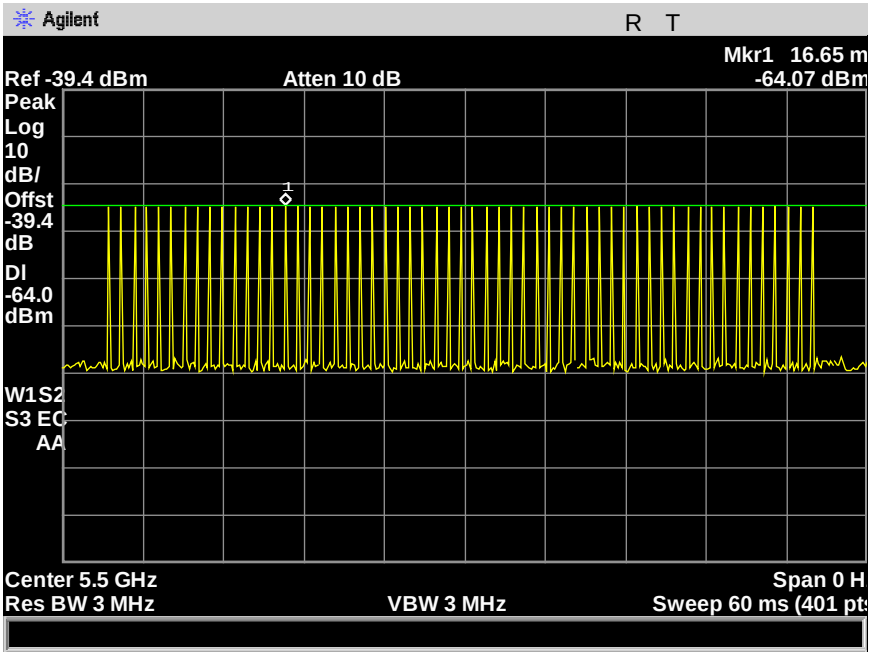


Figure 18: Radar Waveform Calibration, 5500 MHz calibration Type -1

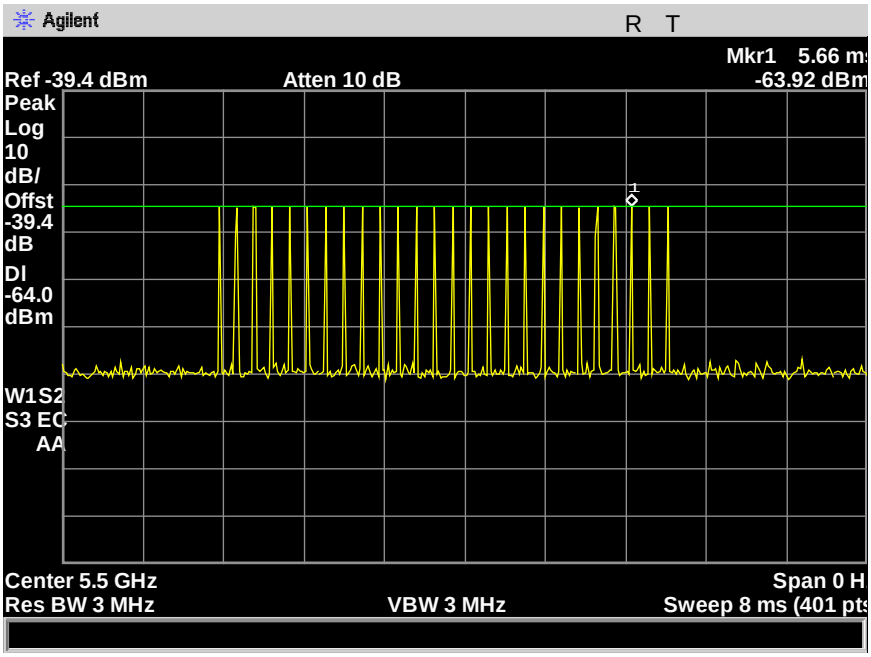


Figure 19: Radar Waveform Calibration, 5500 MHz calibration Type -2

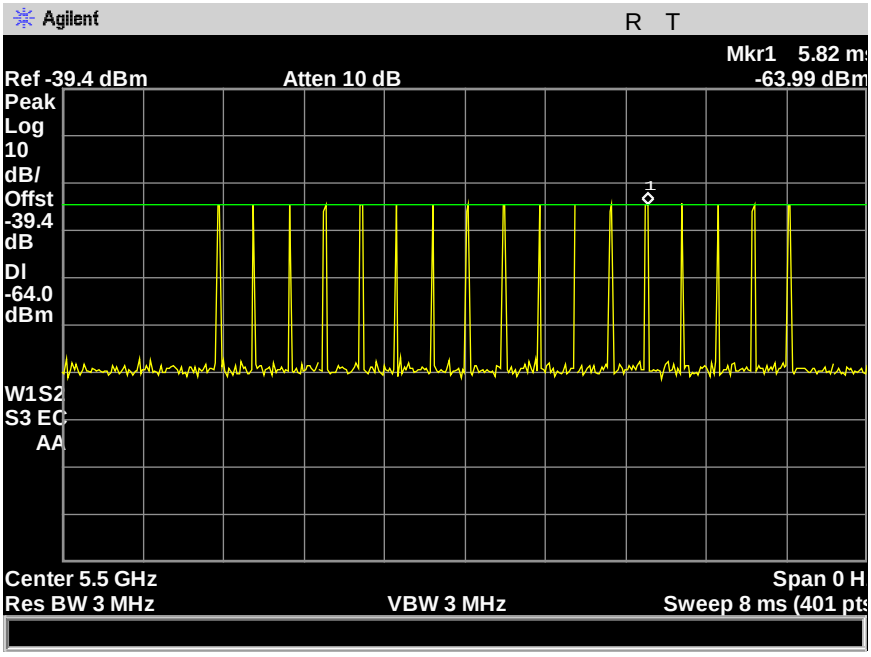


Figure 20: Radar Waveform Calibration, 5500 MHz calibration Type -3

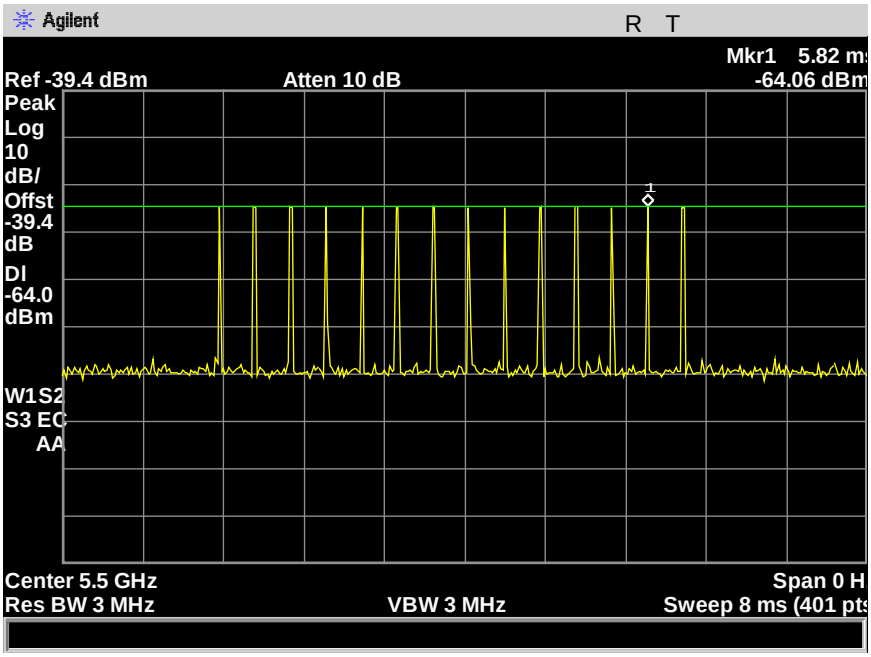


Figure 21: Radar Waveform Calibration, 5500 MHz calibration Type -4

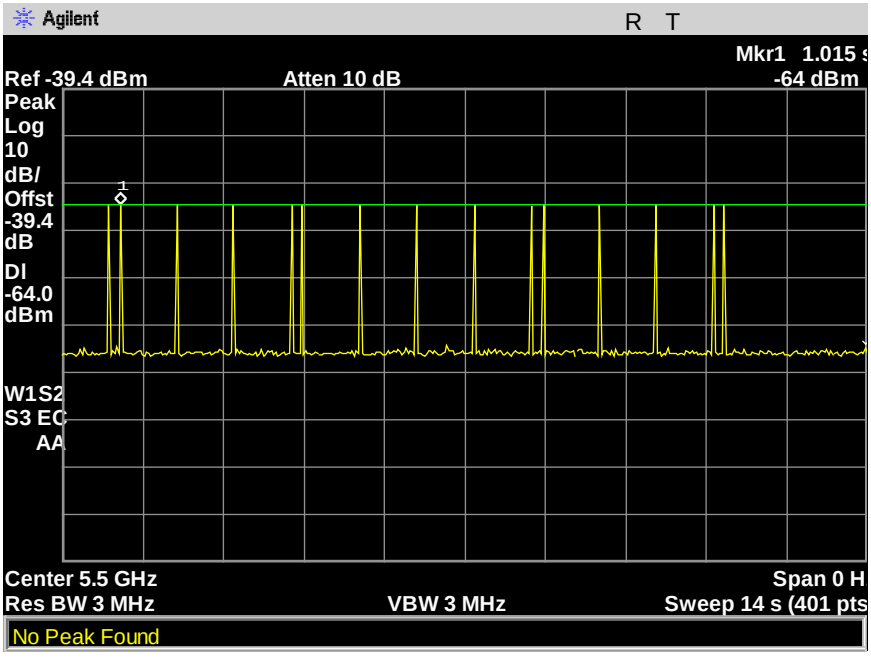


Figure 22: Radar Waveform Calibration, 5500 MHz calibration Type -5

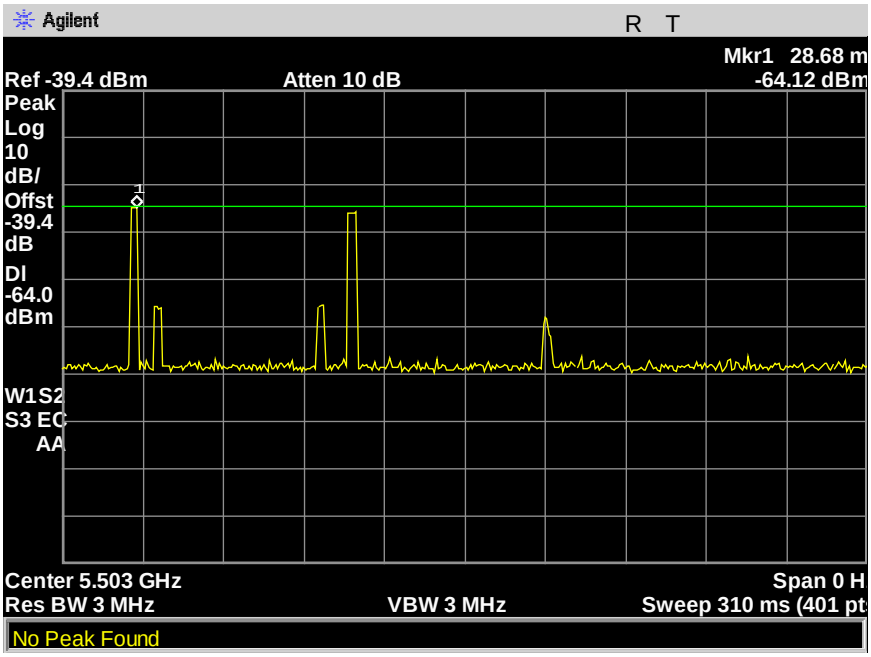


Figure 23: Radar Waveform Calibration, 5500 MHz calibration Type -6 hop at 5503 MHz

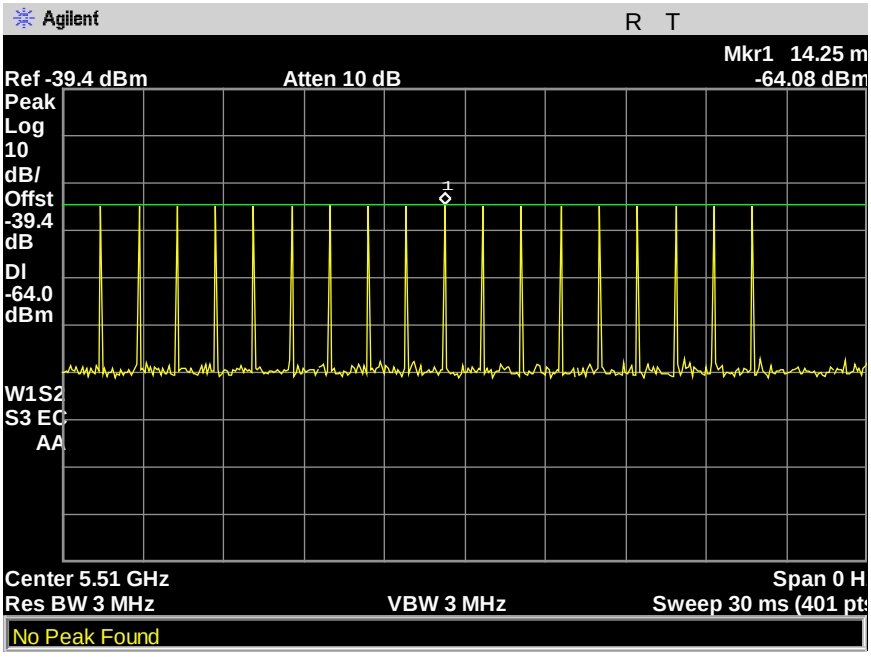


Figure 24: Radar Waveform Calibration, 5510 MHz calibration Type -0

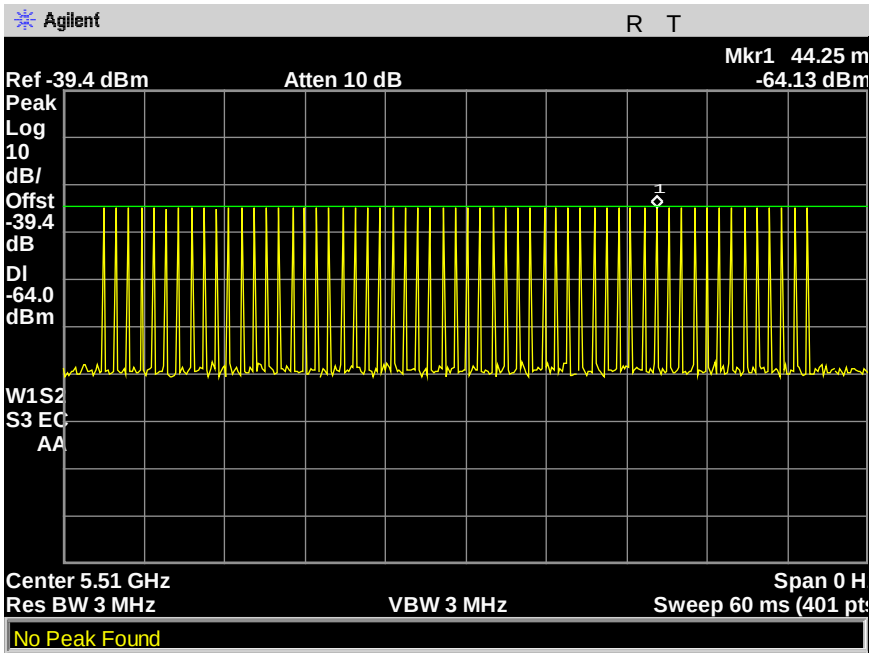


Figure 25: Radar Waveform Calibration, 5510 MHz calibration Type -1

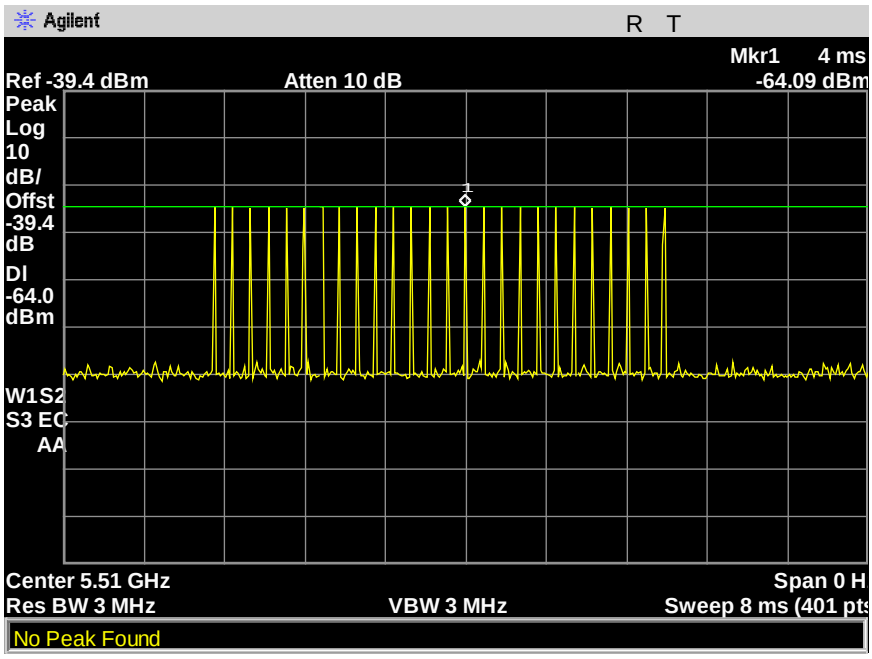


Figure 26: Radar Waveform Calibration, 5510 MHz calibration Type -2

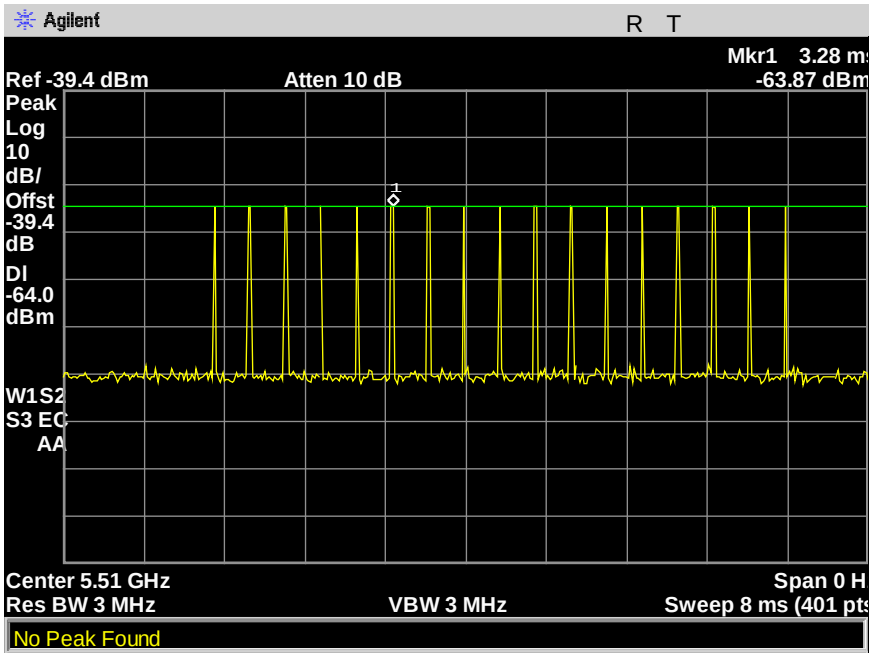


Figure 27: Radar Waveform Calibration, 5510 MHz calibration Type -3

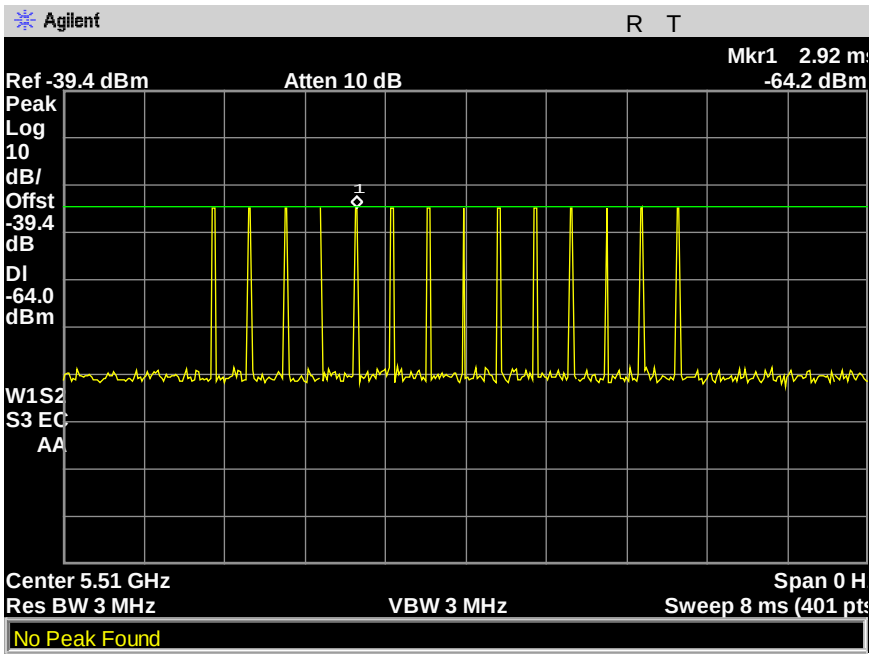


Figure 28: Radar Waveform Calibration, 5510 MHz calibration Type -4

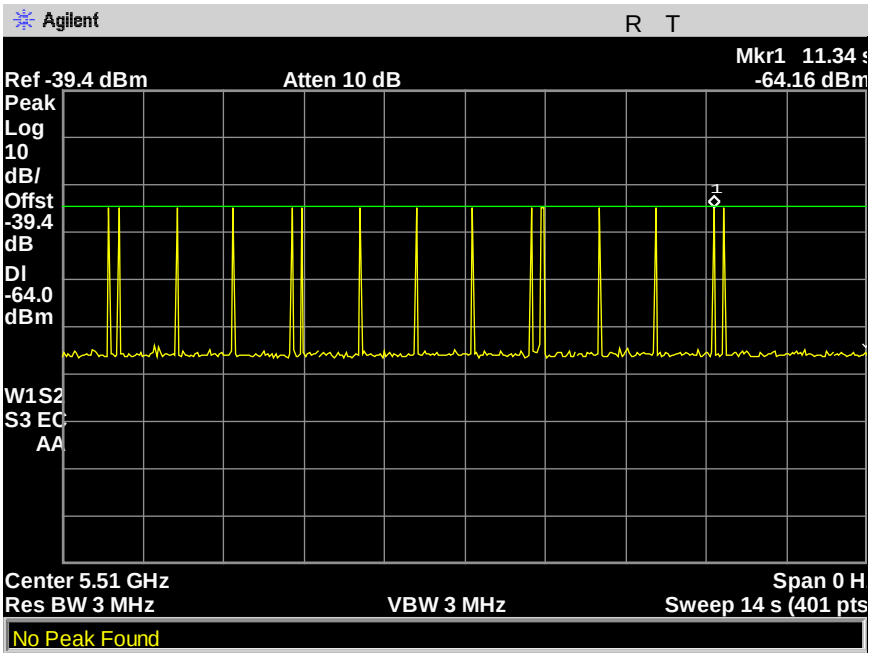


Figure 29: Radar Waveform Calibration, 5510 MHz calibration Type -5

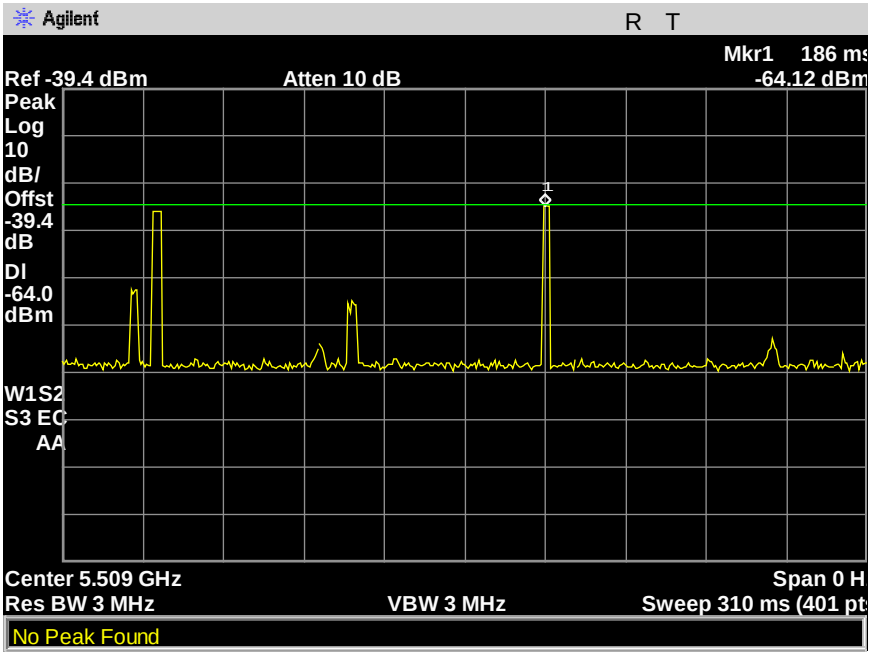


Figure 30: Radar Waveform Calibration, 5510 MHz calibration Type -6 hop at 5509 MHz

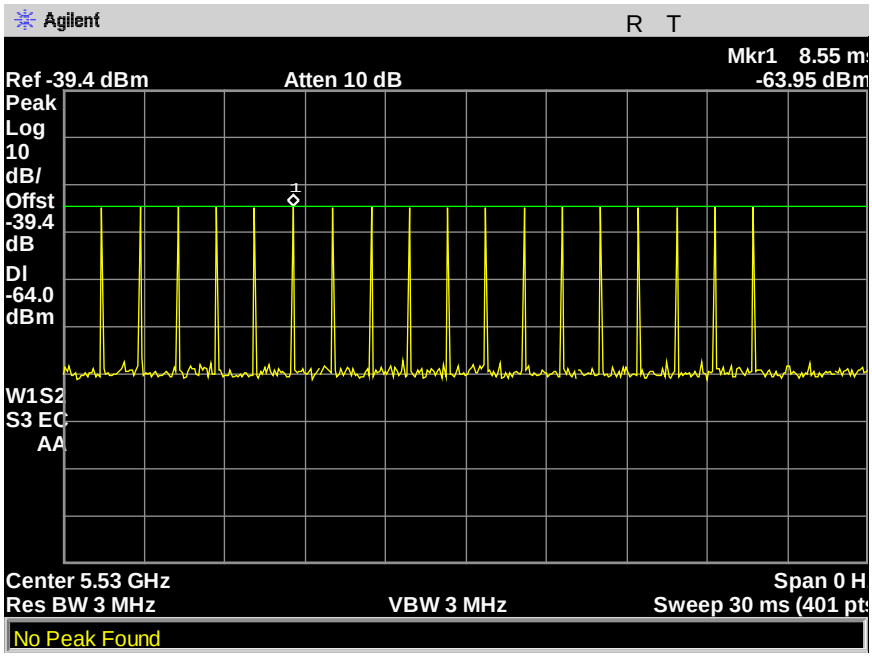


Figure 31: Radar Waveform Calibration, 5530 MHz calibration Type -0

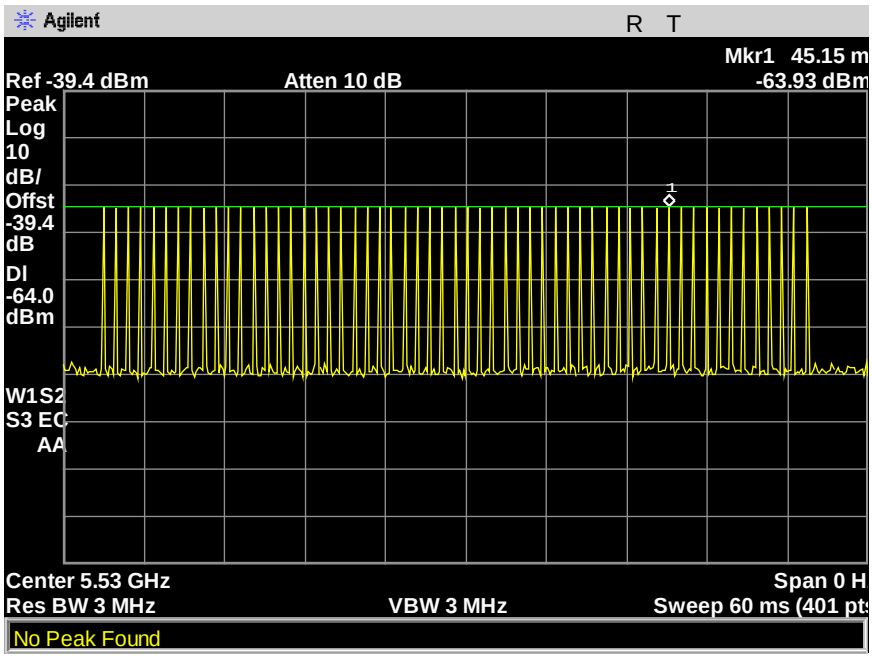


Figure 32: Radar Waveform Calibration, 5530 MHz calibration Type -1

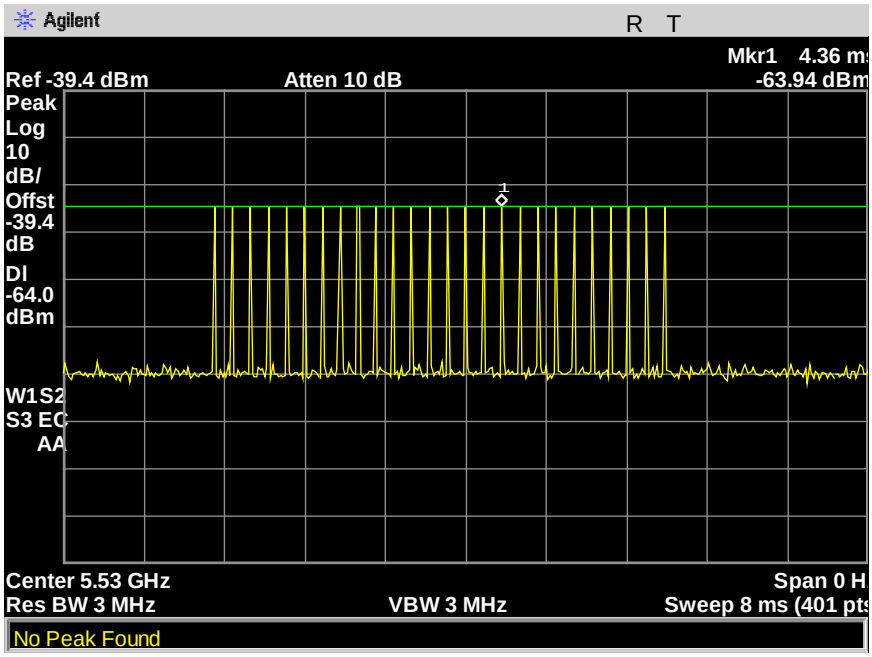


Figure 33: Radar Waveform Calibration, 5530 MHz calibration Type -2

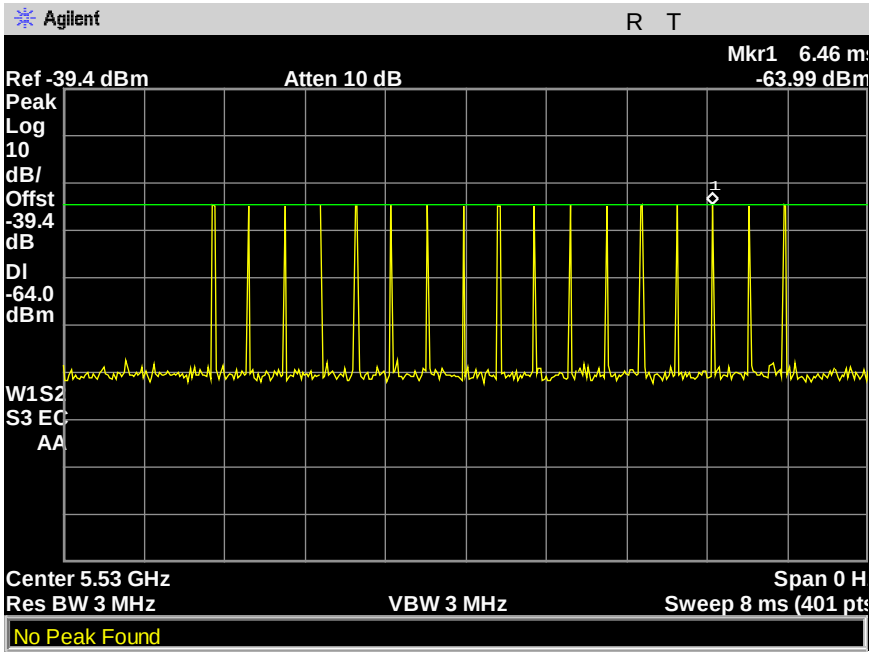


Figure 34: Radar Waveform Calibration, 5530 MHz calibration Type -3

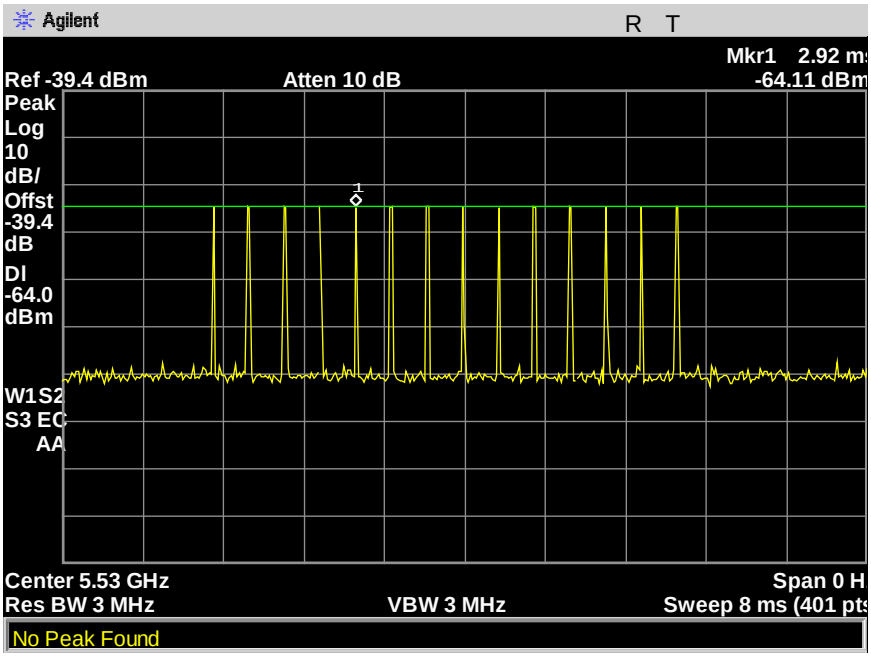


Figure 35: Radar Waveform Calibration, 5530 MHz calibration Type -4

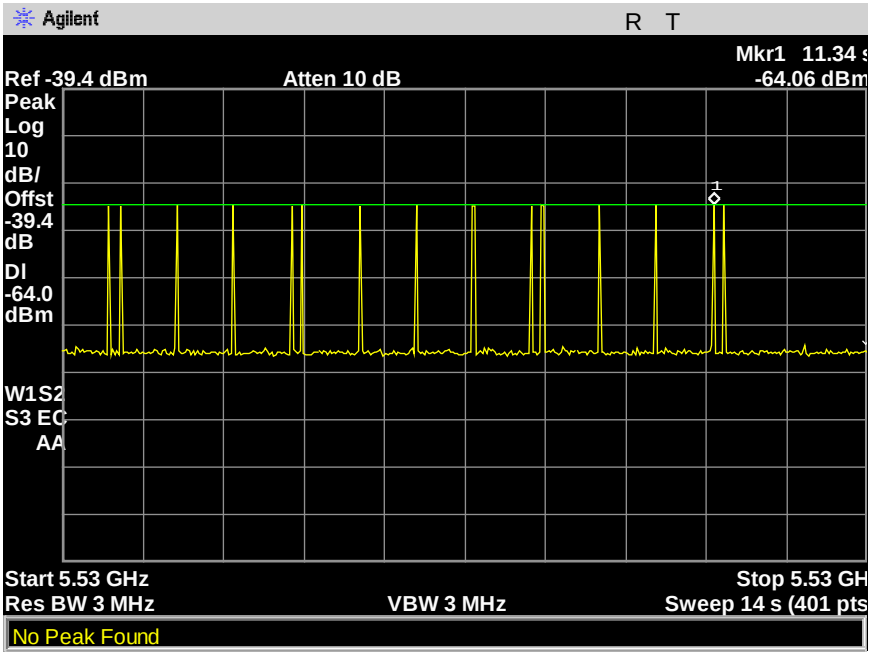


Figure 36: Radar Waveform Calibration, 5530 MHz calibration Type -5

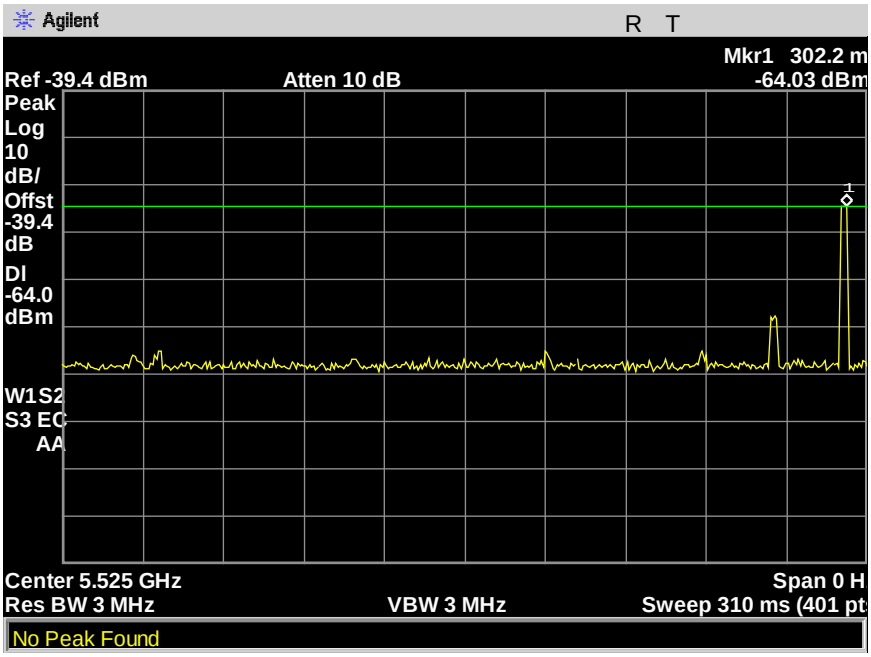


Figure 37: Radar Waveform Calibration, 5530 MHz calibration Type -6 hop at 5525 MHz

DFS Test Procedure and Test Results

D. DFS Test Setup

1. A spectrum analyzer is used as a monitor to verify that the Unit Under Test (EUT) has vacated the Channel within the Channel Closing Transmission Time and Channel Move Time, and does not transmit on a Channel during the Non-Occupancy Period after the detection and subsequent Channel move. It is also used to monitor EUT transmissions during the Channel Availability Check Time. It was also used to measure the duty cycle of the channel loaded which is required for statistical analysis and In service monitoring.
2. The test setup, which consists of test equipment and equipment under test (EUT), is diagrammed in Figure 38.

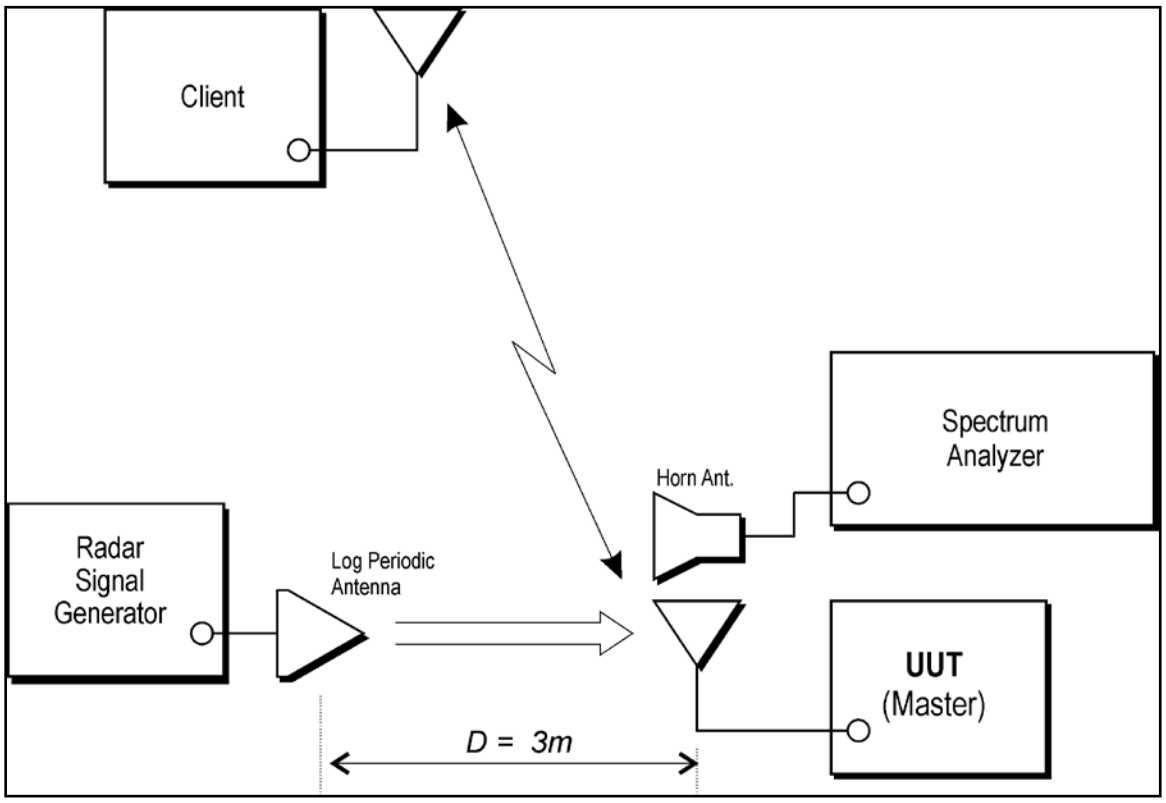


Figure 38: Test Setup Diagram

EUT DFS Mode:	Master
Client 1 FCC ID:	PD93165NG
Client 2 FCC ID:	PD97265D2
Data Streaming method:	iPerf

DFS Test Set up Information

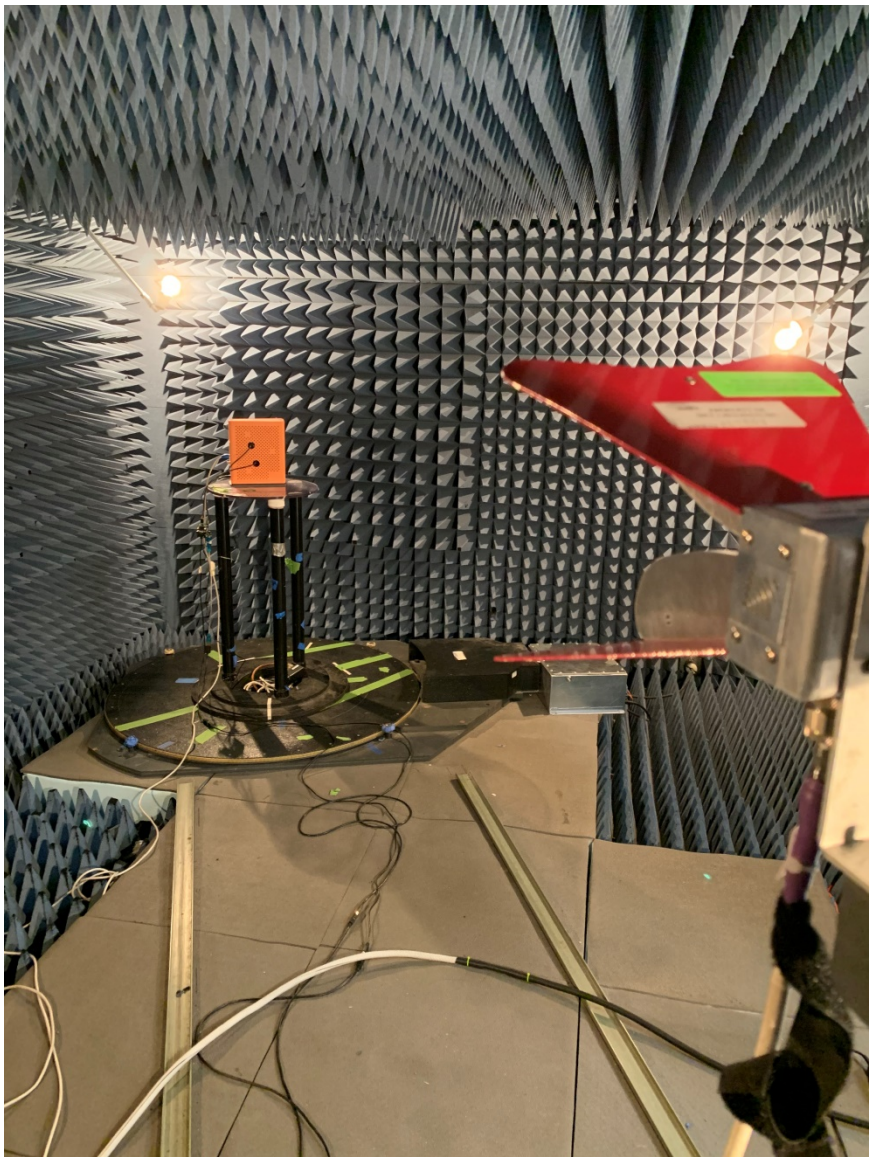


Figure 39: DFS Test Setup Photograph

E. UNII Detection Bandwidth

Test Requirement(s): **KDB 905462 §5.1** All BW modes must be tested.

§5.3 A minimum 100% detection rate is required across a EUT's 99% bandwidth.

Test Procedure: The EUT was set up as a standalone device (no associated Client or Master, as appropriate) and no traffic. Test was performed as per section 7.8.1 of FCC KDB 905462 D02 v02.

A single radar burst of type 4 and the center frequency was generated and the response of the EUT was noted. This was repeated for a minimum of 10 trials. The minimum percentage of detection for each frequency was 90%, as per the KDB 905462.

Starting at the center frequency of the EUT operating Channel, the radar frequency was increased in 5 MHz steps, repeating the minimum of 10 trials, until the detection rate fell below the U-NII Detection Bandwidth criterion (90%). The measurement was repeated in 1MHz steps at frequencies 5 MHz below where the detection rate began to fall. The highest frequency (denoted as F_H) at which detection was greater or equal than the U-NII Detection Bandwidth criterion (90%) was recorded.

Starting at the center frequency of the EUT operating Channel, the radar frequency was decreased in 5 MHz steps, repeating the minimum of 10 trials, until the detection rate fell below the U-NII Detection Bandwidth criterion (90%). The measurement was repeated in 1MHz steps at frequencies 5 MHz below where the detection rate began to fall. The lowest frequency (denoted as F_L) at which detection was greater or equal than the U-NII Detection Bandwidth criterion (90%) was recorded.

The U-NII Detection Bandwidth was calculated as follow:

U-NII Detection Bandwidth = FH – FL

Test Results: The EUT was **compliant** with the requirements of this section.

Test Engineer: Deepak Giri

Test Date: January 28, 2020 – February 3, 2020

EUT Configuration - 5500MHz 20MHz BW											
	DFS Detection Trials (1=Detection, 0= No Detection)										
Radar Frequency (MHz)	1	2	3	4	5	6	7	8	9	10	Detection Rate (%)
5490	0	0	0	0	0	0	0	0	0	0	0
5491.3	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
5508.9	1	1	1	1	1	1	1	1	1	1	100
5510	0	0	0	0	0	0	0	0	0	0	0
Detection Bandwidth = f_h - f_l = 5509 – 5491 = 18MHz											
EUT 99% Bandwidth = 17.7MHz											
FCC Radar pulse type #4 was used for testing.											

Figure 40: UNII Detection Bandwidth, Detection BW_5500M_20MHz BW

EUT Configuration – 5510MHz 40MHz BW											
	DFS Detection Trials (1=Detection, 0= No Detection)										
Radar Frequency (MHz)	1	2	3	4	5	6	7	8	9	10	Detection Rate (%)
5490	0	0	0	0	0	0	0	0	0	0	0
5491.4	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
Center 5510	**1**	**1**	**1**	**1**	**1**	**0**	**1**	**1**	**1**	**1**	**90**
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
5528.8	1	1	1	1	1	1	1	0	1	1	90
5530	0	0	0	0	0	0	0	0	0	0	0
Detection Bandwidth = f_h - f_l = 5529 MHz – 5492MHz = 37MHz											
EUT 99% Bandwidth = 36.2MHz											
FCC Radar pulse type #4 was used for testing.											

Figure 41: UNII Detection Bandwidth, Detection BW_5510M_40MHz BW

EUT Configuration - 5530MHz 80MHz BW											
	DFS Detection Trials (1=Detection, 0= No Detection)										
Radar Frequency (MHz)	1	2	3	4	5	6	7	8	9	10	Detection Rate (%)
5492.2	1	1	1	1	1	1	1	1	1	1	100
5494	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**	**0**	**1**	**1**	**90**
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	0	1	1	1	1	1	1	1	1	90
5555	1	1	1	1	1	1	1	1	1	1	100
5560	1	1	1	0	1	1	1	1	1	1	90
5565	1	1	1	1	1	1	1	1	1	1	100
5567.8	1	1	1	1	1	1	1	1	1	1	100
5570	0	0	0	0	0	0	0	0	0	0	0
Detection Bandwidth = f_h - f_l = 5568 MHz-5492MHz = 76MHz											
EUT 99% Bandwidth = 75.8MHz											
FCC Radar pulse type #4 was used for testing.											

Figure 42: UNII Detection Bandwidth, Detection BW_5530M_80MHz BW

F. Channel Availability Check Time

Test Requirements: **§15.407(h)(2)(ii)** A U-NII device shall check if there is a radar system already operating on the channel before it can initiate a transmission on a channel and when it has to move to a new channel. The U-NII device may start using the channel if no radar signal with a power level greater than the interference threshold values listed in paragraph (h)(2) of this section, is detected within 60 seconds.

Test Procedure: The spectrum analyzer was set to a zero span mode with a 3 MHz RBW and 3 MHz VBW on the test channel with a 2.5 minute sweep time. The spectrum analyzer's sweep was started at the same time power was applied to the U-NII device. Test was performed as per section 7.8.2.1, 7.8.2.2 and 7.8.2.3 of FCC KDB 905462 D02 v02.

For the initial Channel Availability Check Time no radar burst was generated and the EUT was monitored for how long after startup transmission started.

For radar burst at the beginning of the Channel Availability Check Time a short pulse radar type (0-4) with a level equal to the DFS Detection Threshold + 1 dB was generated within the first 6 seconds of the EUT's channel availability check. The EUT was monitored to ensure that it did not start transmitting on the channel.

For radar burst at the end of the Channel Availability Check Time a short pulse radar type (0-4) with a level equal to the DFS Detection Threshold + 1 dB was generated within the last 6 seconds of the EUT's channel availability check. The EUT was monitored to ensure that it did not start transmitting on the channel.

Test Results: The EUT was **compliant** with the requirements of this section. As per table 2 of FCC KDB 905462 D02 v02, any single bandwidth mode (40 MHZ) bandwidth was used for testing.

Test Engineer: Deepak Giri

Test Date: January 29, 2020

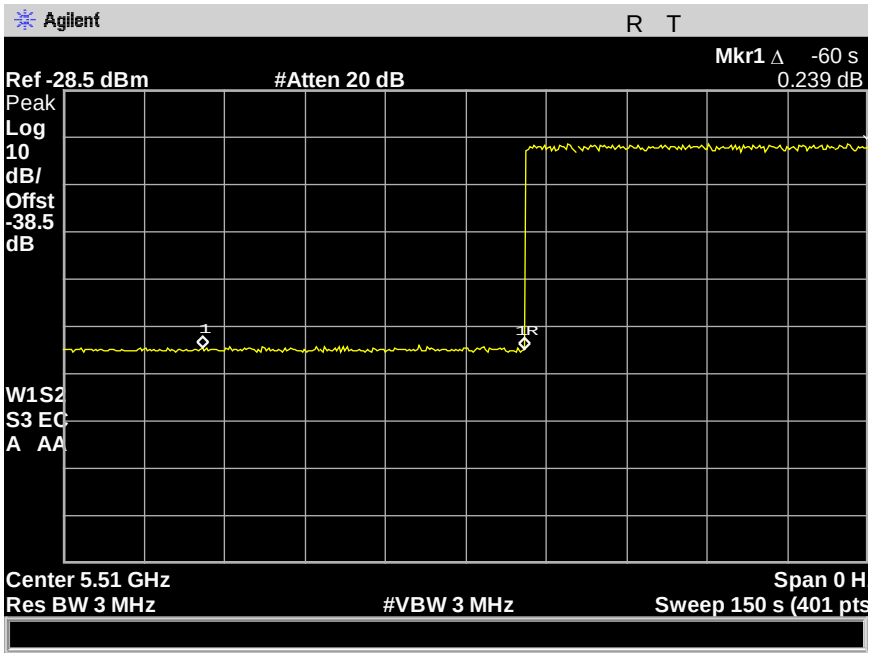


Figure 43: Initial Channel Availability Check Time (CACT), Channel Availability Check Time

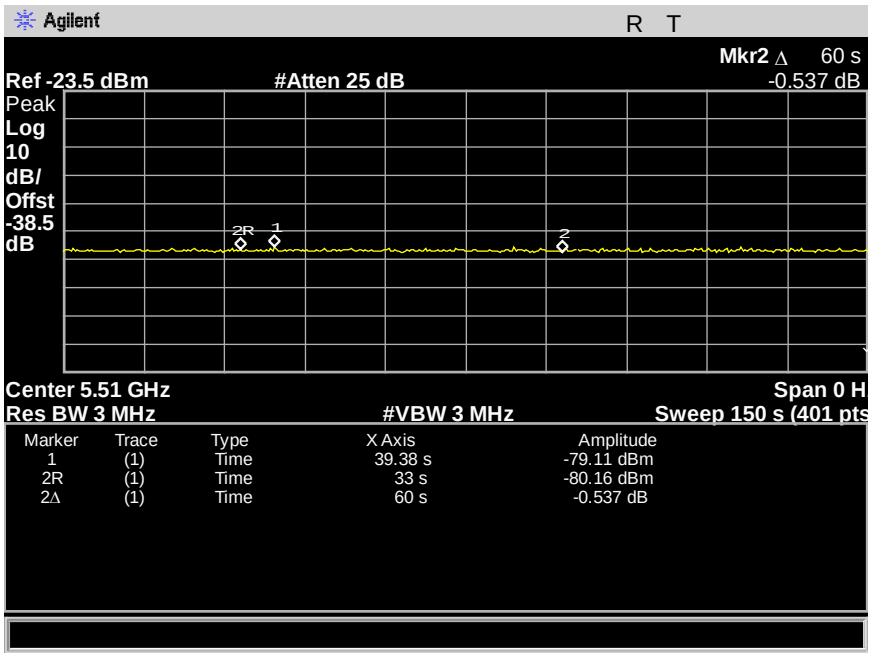


Figure 44: Radar Burst at the Beginning of CACT

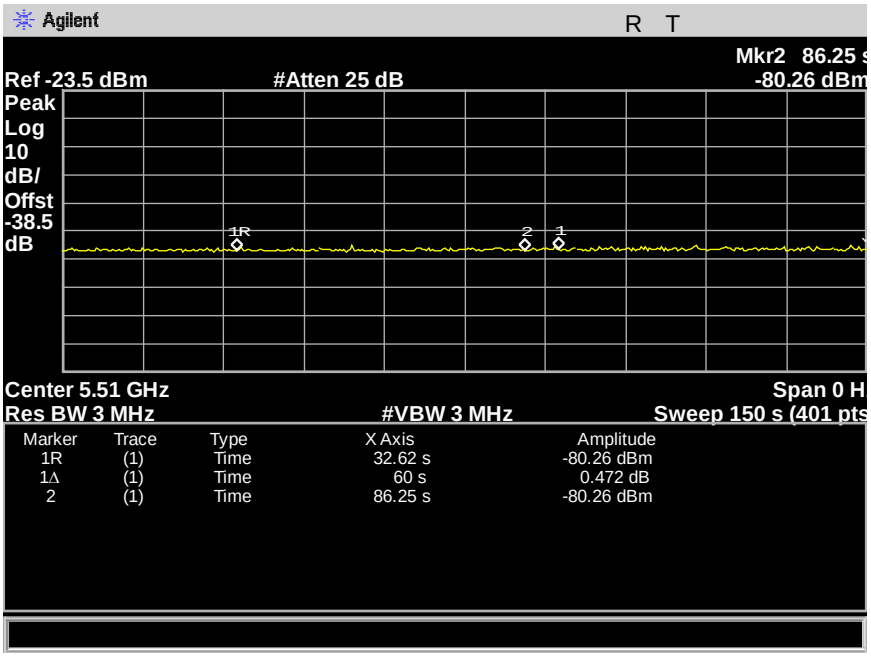


Figure 45: Radar Burst at the End of CACT

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

Test Requirements: **§15.407(h)(2)(iii)** Channel Move Time. After a radar's presence is detected, all transmissions shall cease on the operating channel within 10 seconds. Transmissions during this period shall consist of normal traffic for a maximum of 200 ms after detection of the radar signal. In addition, intermittent management and control signals can be sent during the remaining time to facilitate vacating the operating channel.

§15.407(h)(2)(iv) Non-occupancy Period. A channel that has been flagged as containing a radar system, either by a channel availability check or in-service monitoring, is subject to a non-occupancy period of at least 30 minutes. The non-occupancy period starts at the time when the radar system is detected.

KDB 905462 §5.1 Test using widest BW mode available.

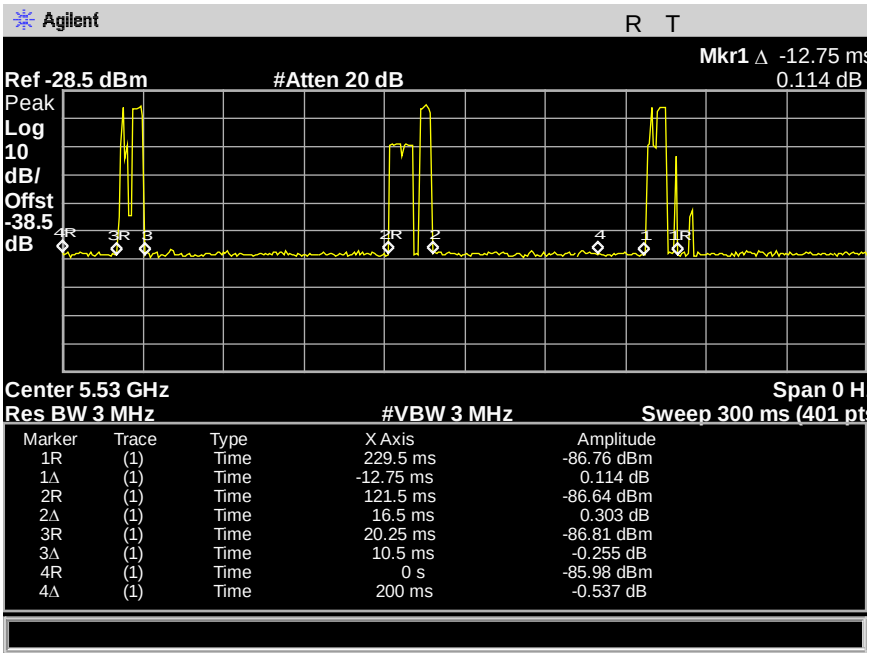
Test Procedure: The EUT was setup as a client device and associated with a master device. iPerf was used to stream data from the Master device to the Client device for the entire period of the test. Data rate was adjusted to maintain at least 17% channel load. A Radar Burst of type 0 with a level equal to the DFS Detection Threshold + 1 dB was used.

A radar pulse was generated while the EUT was transmitting. A spectrum analyzer set to a zero span was used to observe the transmission of the EUT at the end of the burst. Test was performed as per section 7.8.3 of FCC KDB 905462 D02 v02.

Test Results: The EUT was **compliant** with the requirements of this section. Total ON time in channel close session was 39.75ms out of 250ms.

Test Engineer: Deepak Giri

Test Date: January 29, 2020



Transmissions ON Time	T1(ms)	T2(ms)	T3(ms)	Total(ms)
	12.75	16.5	10.5	39.75

Figure 46: In-Service Monitoring for Channel Close Time, 5530 MHz BW_80MHz

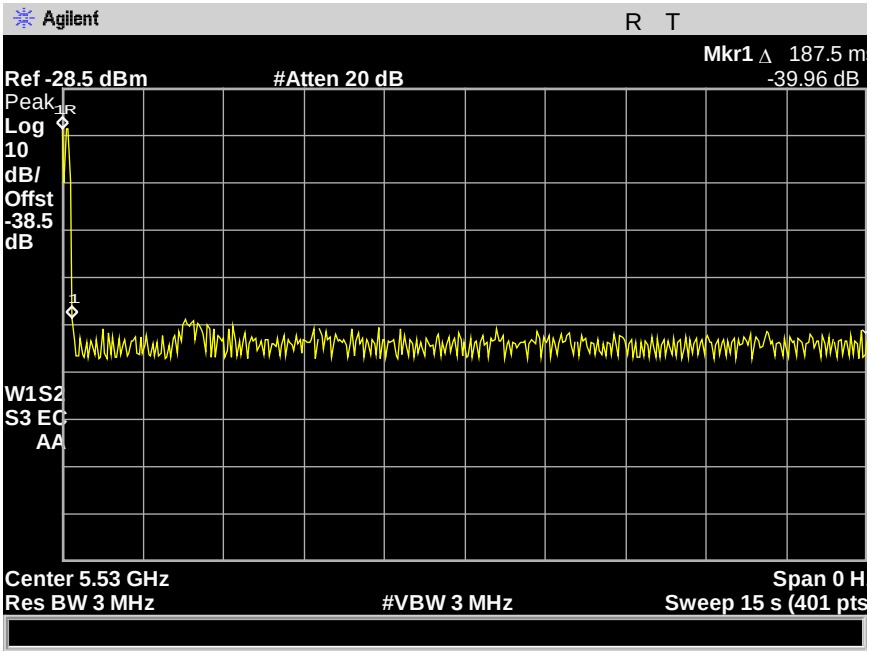


Figure 47: In-Service Monitoring for Channel Move Time, 5530 MHz BW_80MHz

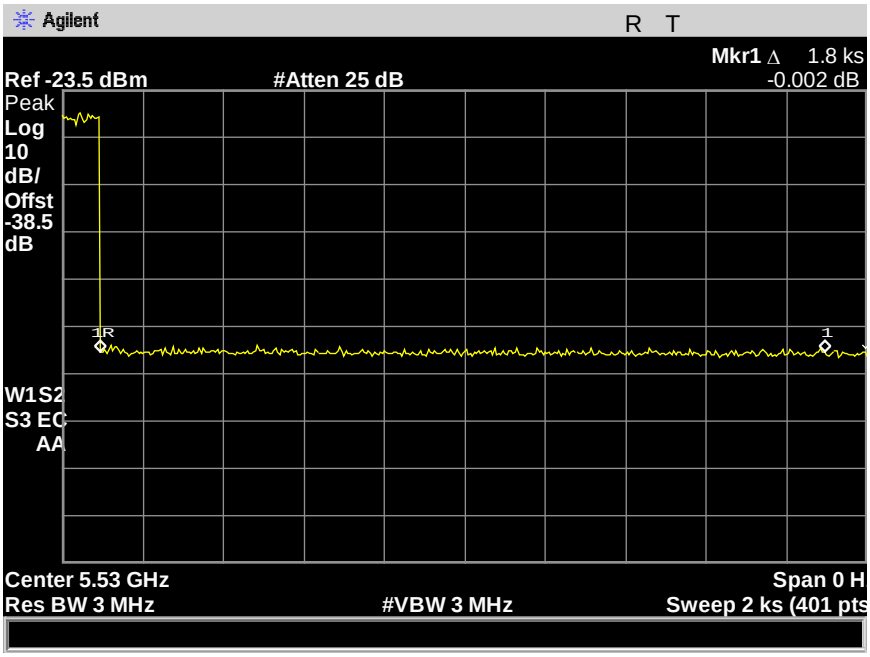


Figure 48: In-Service Monitoring for Non Occupancy Period on 80 MHz Channel centered at 5530 MHz

H. Statistical Performance Check

Test Requirements: **§15.407(h)(2) & KDB 905462 §5.1 table 2** All BW modes must be tested.

KDB 905462: Each of the Radar Pulse types requires a minimum percentage of detections while the EUT is transmitting and listening for potential radar systems operating within the DFS Detection Bandwidth.
For Short Pulse Radar types the aggregate minimum percentage of detections is 80 percent.
Fort the Long Pulse Radar types the minimum percentage of detections is 80 percent.
For the Frequency Hopping Radar type the minimum percentage of detections is 70 percent.

Test Procedure: The EUT was setup as a Master device and associated with a Client device. iPerf was used to stream data from the Master device to the Client device for the entire period of the test. Data rate was adjusted to maintain at least 17% channel load. The EUT was also set to a test mode as to demonstrate when the detection occurred without resetting the device between trials.

A Radar Burst of each type (1-6) with a level equal to the DFS Detection Threshold + 1 dB was used. The frequencies selected for the radar burst included several frequencies within the DFS Detection Bandwidth and frequencies near the edge of the bandwidth.

For Pulse Radar types, an observation of the EUT's transmission was made for duration greater than 10 to 22 seconds after the burst to ensure detection occurred. Test was performed as per section 7.8.4, 7.8.4.1, 7.8.4.2 and 7.8.4.3 of FCC KDB 905462 D02 v02.

Test Results: The EUT was **compliant** with the requirements of this section.

Test Engineer: Deepak Giri

Test Date: February 5, 2020

Statistical Performance Check, 5500M_20MHz

Radar Type	Trial #	Pulses Repetition Frequency Number (1-23)	Pulse Repetition Interval (µsec)	Number of Pulses	Detection 1 = Yes, 0 = No
1	1	22	938.0	57	1
	2	10	698.0	76	1
	3	6	618.0	86	1
	4	2	538.0	99	1
	5	19	878.0	61	1
	6	23	3066.0	18	1
	7	7	638.0	83	0
	8	21	918.0	58	1
	9	17	838.0	63	0
	10	18	858.0	62	1
	11	15	798.0	67	1
	12	11	718.0	74	1
	13	4	578.0	92	1
	14	5	598.0	89	1
	15	3	558.0	95	1
	16	n/a	2536.0	21	1
	17	n/a	966.0	55	1
	18	n/a	827.0	64	1
	19	n/a	2501.0	22	0
	20	n/a	2595.0	21	1
	21	n/a	1114.0	48	1
	22	n/a	1302.0	41	1
	23	n/a	3045.0	18	1
	24	n/a	1624.0	33	1
	25	n/a	2878.0	19	1
	26	n/a	1027.0	52	1
	27	n/a	2485.0	22	1
	28	n/a	1600.0	33	1
	29	n/a	1172.0	46	1
	30	n/a	1177.0	45	1
Detection Percentage					**90% (> 60%)**
EUT Frequency					**5500 MHz**

Figure 49: Statistical Performance Check, 5500M_20MHz, Radar Type 1

Radar Type	Trial #	Pulse Width 1- 5 µsec	PRI 150-230 µsec	Number of Pulses 23-29	Detection 1 = Yes, 0 = No
2	1	3.2	179.0	26	1
	2	1.1	207.0	23	0
	3	2.1	230.0	24	0
	4	4.8	200.0	29	1
	5	3.9	214.0	28	1
	6	2.9	222.0	26	1
	7	3.2	204.0	26	1
	8	2.5	192.0	25	1
	9	3.1	164.0	26	1
	10	1.2	156.0	23	1
	11	3.9	210.0	27	1
	12	4.6	201.0	29	1
	13	3.2	162.0	26	1
	14	2.2	197.0	25	0
	15	4.5	163.0	29	1
	16	3.0	203.0	26	1
	17	5.0	168.0	29	1
	18	2.4	217.0	25	1
	19	2.9	191.0	26	1
	20	2.3	166.0	25	1
	21	3.7	150.0	27	1
	22	2.2	176.0	25	1
	23	4.9	195.0	29	1
	24	2.9	202.0	26	1
	25	2.5	178.0	25	1
	26	1.1	206.0	23	1
	27	3.8	155.0	27	1
	28	4.7	157.0	29	1
	29	2.4	224.0	25	1
	30	4.2	159.0	28	1
	Detection Percentage				90% (>60%)
	EUT Frequency				5500 MHz

Figure 50: Statistical Performance Check, 5500M_20MHz, Radar Type 2

Radar Type	Trial #	Pulse Width 6-10 µsec	PRI 200-500 µsec	Number of Pulses 16-18	Detection 1 = Yes, 0 = No
3	1	8.2	355.0	17	1
	2	6.1	487.0	16	1
	3	7.1	344.0	16	1
	4	9.8	288.0	18	1
	5	8.9	230.0	18	1
	6	7.9	432.0	17	1
	7	8.2	207.0	17	1
	8	7.5	443.0	17	0
	9	8.1	439.0	17	1
	10	6.2	223.0	16	1
	11	8.9	208.0	18	1
	12	9.6	463.0	18	1
	13	8.2	441.0	17	1
	14	7.2	323.0	16	1
	15	9.5	297.0	18	1
	16	8.0	412.0	17	1
	17	10.0	324.0	18	1
	18	7.4	271.0	17	0
	19	7.9	349.0	17	1
	20	7.3	409.0	16	1
	21	8.7	373.0	18	1
	22	7.2	254.0	16	1
	23	9.9	274.0	18	1
	24	7.9	278.0	17	1
	25	7.5	317.0	17	1
	26	6.1	260.0	16	1
	27	8.8	211.0	18	1
	28	9.7	272.0	18	1
	29	7.4	264.0	17	1
	30	9.2	284.0	18	1
	Detection Percentage				**93% (>60%)**
	EUT Frequency				**5500 MHz**

Figure 51: Statistical Performance Check, 5500M_20MHz, Radar Type 3

Radar Type	Trial #	Pulse Width 11-20 µsec	PRI 200-500 µsec	Number of Pulses 12-16	Detection 1 = Yes, 0 = No
4	1	16.0	355.0	14	1
	2	11.3	487.0	12	1
	3	13.5	344.0	13	1
	4	19.4	288.0	16	1
	5	17.5	230.0	15	0
	6	15.3	432.0	14	1
	7	15.9	207.0	14	0
	8	14.3	443.0	13	1
	9	15.8	439.0	14	1
	10	11.5	223.0	12	1
	11	17.4	208.0	15	0
	12	19.0	463.0	16	1
	13	16.0	441.0	14	1
	14	13.8	323.0	13	1
	15	18.9	297.0	16	1
	16	15.5	412.0	14	1
	17	19.9	324.0	16	1
	18	14.1	271.0	13	1
	19	15.2	349.0	14	1
	20	13.8	409.0	13	1
	21	17.1	373.0	15	1
	22	13.8	254.0	13	1
	23	19.8	274.0	16	1
	24	15.3	278.0	14	1
	25	14.5	317.0	13	0
	26	11.3	260.0	12	1
	27	17.3	211.0	15	1
	28	19.2	272.0	16	1
	29	14.2	264.0	13	1
	30	18.2	284.0	15	1
	Detection Percentage				**86.6% (> 60%)**
	EUT Frequency				**5500 MHz**

Figure 52: Statistical Performance Check, 5500M_20MHz, Radar Type 4

Radar Type	Number of Trials	Number of Successful Detections	Minimum Percentage of Successful Detections
1	30	30	90%
2	30	30	90%
3	30	30	93%
4	30	30	86.6%
Aggregate = (90% + 90% + 93% + 86.6%)/4 = 89.9%			

Figure 53: Statistical Performance Check, 5500M_20MHz, Aggregate

Radar Type	Trial #	Number of Bursts 8-20	Burst Period (s)	Chirp Width (MHz) 5 -20	Radar Center Frequency (MHz)	Detection 1 = Yes, 0 = No
5	1	15	0.8000000	13	5.500000000	1
	2	8	1.5000000	5	5.500000000	1
	3	11	1.0909091	9	5.500000000	1
	4	20	0.6000000	19	5.500000000	0
	5	17	0.7058824	16	5.500000000	1
	6	14	0.8571429	12	5.500000000	1
	7	15	0.8000000	13	5.500000000	1
	8	12	1.0000000	10	5.500000000	1
	9	14	0.8571429	13	5.500000000	1
	10	8	1.5000000	6	5.500000000	1
	11	17	0.7058824	16	5.497600000	1
	12	19	0.6315789	19	5.498800000	1
	13	15	0.8000000	13	5.496400000	1
	14	12	1.0000000	10	5.495200000	1
	15	19	0.6315789	18	5.498400000	1
	16	14	0.8571429	12	5.496000000	1
	17	20	0.6000000	20	5.499200000	1
	18	12	1.0000000	10	5.495200000	1
	19	14	0.8571429	12	5.496000000	1
	20	12	1.0000000	10	5.495200000	1
	21	16	0.7500000	15	5.502800000	0
	22	12	1.0000000	9	5.505200000	1
	23	20	0.6000000	20	5.500800000	1
	24	14	0.8571429	12	5.504000000	1
	25	13	0.9230769	11	5.504400000	1
	26	8	1.5000000	5	5.506800000	1
	27	17	0.7058824	16	5.502400000	1
	28	19	0.6315789	19	5.501200000	1
	29	12	1.0000000	10	5.504800000	1
	30	18	0.6666667	17	5.502000000	1
	Detection Percentage					**93% (> 80%)**
Radar Frequency						**5493.2 – 5506.8 MHz**

Figure 54: Statistical Performance Check, 5500M_20MHz, Radar Type 5

Radar Type	Trial #	Visible Frequency Number	Pulses per Hop	Pulse Width (µsec)	PRI (µsec)	Detection 1 = Yes, 0 = No
6	1	5	9	1	333.3	1
	2	1	9	1	333.3	1
	3	4	9	1	333.3	1
	4	6	9	1	333.3	1
	5	2	9	1	333.3	1
	6	1	9	1	333.3	1
	7	4	9	1	333.3	1
	8	6	9	1	333.3	1
	9	5	9	1	333.3	1
	10	1	9	1	333.3	1
	11	4	9	1	333.3	1
	12	8	9	1	333.3	0
	13	5	9	1	333.3	1
	14	5	9	1	333.3	1
	15	4	9	1	333.3	1
	16	6	9	1	333.3	1
	17	2	9	1	333.3	1
	18	5	9	1	333.3	1
	19	4	9	1	333.3	0
	20	5	9	1	333.3	1
	21	5	9	1	333.3	1
	22	8	9	1	333.3	1
	23	5	9	1	333.3	1
	24	2	9	1	333.3	1
	25	3	9	1	333.3	1
	26	3	9	1	333.3	1
	27	4	9	1	333.3	1
	28	5	9	1	333.3	1
	29	7	9	1	333.3	1
	30	3	9	1	333.3	1
	Detection Percentage					**93% (> 70%)**
	EUT Frequency					**5500 MHz**

Figure 55: Statistical Performance Check, 5500M_20MHz, Radar Type 6

Radar Type	Trial #	Pulses Repetition Frequency Number (1-23)	Pulse Repetition Interval (µsec)	Number of Pulses	Detection 1 = Yes, 0 = No
1	1	22	938.0	57	1
	2	10	698.0	76	1
	3	6	618.0	86	1
	4	2	538.0	99	1
	5	19	878.0	61	1
	6	23	3066.0	18	1
	7	7	638.0	83	1
	8	21	918.0	58	0
	9	17	838.0	63	1
	10	18	858.0	62	1
	11	15	798.0	67	1
	12	11	718.0	74	1
	13	4	578.0	92	0
	14	5	598.0	89	1
	15	3	558.0	95	1
	16	n/a	2536.0	21	1
	17	n/a	966.0	55	1
	18	n/a	827.0	64	1
	19	n/a	2501.0	22	1
	20	n/a	2595.0	21	1
	21	n/a	1114.0	48	1
	22	n/a	1302.0	41	1
	23	n/a	3045.0	18	1
	24	n/a	1624.0	33	1
	25	n/a	2878.0	19	0
	26	n/a	1027.0	52	1
	27	n/a	2485.0	22	0
	28	n/a	1600.0	33	1
	29	n/a	1172.0	46	1
	30	n/a	1177.0	45	1
Detection Percentage					**86% (> 60%)**
EUT Test Frequency					**5510 MHz**

Figure 56: Statistical Performance Check, 5510M_40MHz, Radar Type 1

Radar Type	Trial #	Pulse Width 1- 5 µsec	PRI 150-230 µsec	Number of Pulses 23-29	Detection 1 = Yes, 0 = No
2	1	3.2	179.0	26	1
	2	1.1	207.0	23	1
	3	2.1	230.0	24	0
	4	4.8	200.0	29	0
	5	3.9	214.0	28	1
	6	2.9	222.0	26	1
	7	3.2	204.0	26	1
	8	2.5	192.0	25	1
	9	3.1	164.0	26	1
	10	1.2	156.0	23	1
	11	3.9	210.0	27	1
	12	4.6	201.0	29	1
	13	3.2	162.0	26	1
	14	2.2	197.0	25	1
	15	4.5	163.0	29	1
	16	3.0	203.0	26	1
	17	5.0	168.0	29	1
	18	2.4	217.0	25	1
	19	2.9	191.0	26	1
	20	2.3	166.0	25	0
	21	3.7	150.0	27	1
	22	2.2	176.0	25	1
	23	4.9	195.0	29	1
	24	2.9	202.0	26	1
	25	2.5	178.0	25	1
	26	1.1	206.0	23	1
	27	3.8	155.0	27	1
	28	4.7	157.0	29	1
	29	2.4	224.0	25	1
	30	4.2	159.0	28	1
	Detection Percentage				**90% (>60%)**
	EUT Test Frequency				**5510 MHz**

Figure 57: Statistical Performance Check, 5510M_40MHz, Radar Type 2

Radar Type	Trial #	Pulse Width 6-10 µsec	PRI 200-500 µsec	Number of Pulses 16-18	Detection 1 = Yes, 0 = No
3	1	8.2	355.0	17	1
	2	6.1	487.0	16	1
	3	7.1	344.0	16	1
	4	9.8	288.0	18	1
	5	8.9	230.0	18	1
	6	7.9	432.0	17	1
	7	8.2	207.0	17	1
	8	7.5	443.0	17	1
	9	8.1	439.0	17	1
	10	6.2	223.0	16	1
	11	8.9	208.0	18	1
	12	9.6	463.0	18	1
	13	8.2	441.0	17	1
	14	7.2	323.0	16	1
	15	9.5	297.0	18	1
	16	8.0	412.0	17	1
	17	10.0	324.0	18	1
	18	7.4	271.0	17	1
	19	7.9	349.0	17	1
	20	7.3	409.0	16	1
	21	8.7	373.0	18	1
	22	7.2	254.0	16	1
	23	9.9	274.0	18	1
	24	7.9	278.0	17	1
	25	7.5	317.0	17	1
	26	6.1	260.0	16	1
	27	8.8	211.0	18	1
	28	9.7	272.0	18	1
	29	7.4	264.0	17	1
	30	9.2	284.0	18	1
	Detection Percentage				100% (>60%)
	EUT Test Frequency				5510 MHz

Figure 58: Statistical Performance Check, 5510M_40MHz, Radar Type 3

Radar Type	Trial #	Pulse Width 11-20 µsec	PRI 200-500 µsec	Number of Pulses 12-16	Detection 1 = Yes, 0 = No
4	1	16.0	355.0	14	1
	2	11.3	487.0	12	1
	3	13.5	344.0	13	1
	4	19.4	288.0	16	1
	5	17.5	230.0	15	1
	6	15.3	432.0	14	1
	7	15.9	207.0	14	1
	8	14.3	443.0	13	1
	9	15.8	439.0	14	1
	10	11.5	223.0	12	1
	11	17.4	208.0	15	1
	12	19.0	463.0	16	1
	13	16.0	441.0	14	1
	14	13.8	323.0	13	1
	15	18.9	297.0	16	1
	16	15.5	412.0	14	1
	17	19.9	324.0	16	1
	18	14.1	271.0	13	1
	19	15.2	349.0	14	1
	20	13.8	409.0	13	1
	21	17.1	373.0	15	1
	22	13.8	254.0	13	1
	23	19.8	274.0	16	1
	24	15.3	278.0	14	1
	25	14.5	317.0	13	1
	26	11.3	260.0	12	1
	27	17.3	211.0	15	0
	28	19.2	272.0	16	1
	29	14.2	264.0	13	1
	30	18.2	284.0	15	1
	Detection Percentage				96% (> 60%)
	EUT Test Frequency				5510 MHz

Figure 59: Statistical Performance Check, 5510M_40MHz, Radar Type 4

Radar Type	Number of Trials	Number of Successful Detections	Minimum Percentage of Successful Detections
1	30	30	86%
2	30	30	90%
3	30	30	100%
4	30	30	96%
Aggregate = (100% + 100% + 100% + 100%)/4 = 93%			

Figure 60: Statistical Performance Check, 5510M_40MHz, Aggregate

Radar Type	Trial #	Number of Bursts 8-20	Burst Period (s)	Chirp Width (MHz) 5 -20	Frequency (MHz)	Detection 1 = Yes, 0 = No
5	1	15	0.8000000	13	5.510000000	1
	2	8	1.5000000	5	5.510000000	1
	3	11	1.0909091	9	5.510000000	1
	4	20	0.6000000	19	5.510000000	1
	5	17	0.7058824	16	5.510000000	1
	6	14	0.8571429	12	5.510000000	1
	7	15	0.8000000	13	5.510000000	1
	8	12	1.0000000	10	5.510000000	1
	9	14	0.8571429	13	5.510000000	1
	10	8	1.5000000	6	5.510000000	1
	11	17	0.7058824	16	5.497700000	0
	12	19	0.6315789	19	5.498900000	1
	13	15	0.8000000	13	5.496500000	1
	14	12	1.0000000	10	5.495300000	1
	15	19	0.6315789	18	5.498500000	1
	16	14	0.8571429	12	5.496100000	1
	17	20	0.6000000	20	5.499300000	1
	18	12	1.0000000	10	5.495300000	1
	19	14	0.8571429	12	5.496100000	1
	20	12	1.0000000	10	5.495300000	1
	21	16	0.7500000	15	5.522700000	1
	22	12	1.0000000	9	5.525100000	1
	23	20	0.6000000	20	5.520700000	1
	24	14	0.8571429	12	5.523900000	1
	25	13	0.9230769	11	5.524300000	1
	26	8	1.5000000	5	5.526700000	1
	27	17	0.7058824	16	5.522300000	0
	28	19	0.6315789	19	5.521100000	1
	29	12	1.0000000	10	5.524700000	1
	30	18	0.6666667	17	5.521900000	1
	Detection Percentage					**93% (> 80%)**
	Radar Frequency					**5493.3 – 5526.7 MHz**

Figure 61: Statistical Performance Check, 5510M_40MHz, Radar Type 5

Radar Type	Trial #	Visible Frequency Number	Pulses per Hop	Pulse Width (µsec)	PRI (µsec)	Detection 1 = Yes, 0 = No
6	1	7	9	1	333.3	1
	2	3	9	1	333.3	1
	3	9	9	1	333.3	0
	4	11	9	1	333.3	1
	5	5	9	1	333.3	1
	6	7	9	1	333.3	1
	7	7	9	1	333.3	1
	8	10	9	1	333.3	1
	9	9	9	1	333.3	1
	10	5	9	1	333.3	1
	11	8	9	1	333.3	1
	12	15	9	1	333.3	1
	13	9	9	1	333.3	1
	14	10	9	1	333.3	1
	15	7	9	1	333.3	1
	16	10	9	1	333.3	1
	17	6	9	1	333.3	1
	18	10	9	1	333.3	1
	19	8	9	1	333.3	1
	20	12	9	1	333.3	1
	21	13	9	1	333.3	1
	22	10	9	1	333.3	1
	23	13	9	1	333.3	1
	24	7	9	1	333.3	1
	25	7	9	1	333.3	1
	26	7	9	1	333.3	1
	27	7	9	1	333.3	1
	28	11	9	1	333.3	1
	29	9	9	1	333.3	1
	30	9	9	1	333.3	1
	Detection Percentage					**96% (> 70%)**
	EUT Test Frequency					**5510 MHz**

Figure 62: Statistical Performance Check, 5510M_40MHz, Radar Type 6

Radar Type	Trial #	Pulses Repetition Frequency Number (1-23)	Pulse Repetition Interval (µsec)	Number of Pulses	Detection 1 = Yes, 0 = No
1	1	22	938.0	57	1
	2	10	698.0	76	1
	3	6	618.0	86	1
	4	2	538.0	99	1
	5	19	878.0	61	1
	6	23	3066.0	18	0
	7	7	638.0	83	1
	8	21	918.0	58	1
	9	17	838.0	63	1
	10	18	858.0	62	1
	11	15	798.0	67	1
	12	11	718.0	74	1
	13	4	578.0	92	1
	14	5	598.0	89	1
	15	3	558.0	95	1
	16	n/a	2536.0	21	1
	17	n/a	966.0	55	1
	18	n/a	827.0	64	1
	19	n/a	2501.0	22	0
	20	n/a	2595.0	21	1
	21	n/a	1114.0	48	1
	22	n/a	1302.0	41	1
	23	n/a	3045.0	18	0
	24	n/a	1624.0	33	1
	25	n/a	2878.0	19	1
	26	n/a	1027.0	52	1
	27	n/a	2485.0	22	1
	28	n/a	1600.0	33	1
	29	n/a	1172.0	46	1
	30	n/a	1177.0	45	1
Detection Percentage					**90% (> 60%)**
EUT Test Frequency					**5530 MHz**

Figure 63: Statistical Performance Check, 5530M_80MHz, Radar Type 1

Radar Type	Trial #	Pulse Width 1- 5 µsec	PRI 150-230 µsec	Number of Pulses 23-29	Detection 1 = Yes, 0 = No
2	1	3.2	179.0	26	1
	2	1.1	207.0	23	1
	3	2.1	230.0	24	1
	4	4.8	200.0	29	1
	5	3.9	214.0	28	1
	6	2.9	222.0	26	1
	7	3.2	204.0	26	1
	8	2.5	192.0	25	1
	9	3.1	164.0	26	1
	10	1.2	156.0	23	1
	11	3.9	210.0	27	1
	12	4.6	201.0	29	1
	13	3.2	162.0	26	1
	14	2.2	197.0	25	1
	15	4.5	163.0	29	1
	16	3.0	203.0	26	1
	17	5.0	168.0	29	1
	18	2.4	217.0	25	1
	19	2.9	191.0	26	1
	20	2.3	166.0	25	1
	21	3.7	150.0	27	1
	22	2.2	176.0	25	1
	23	4.9	195.0	29	1
	24	2.9	202.0	26	1
	25	2.5	178.0	25	1
	26	1.1	206.0	23	1
	27	3.8	155.0	27	1
	28	4.7	157.0	29	1
	29	2.4	224.0	25	1
	30	4.2	159.0	28	1
	Detection Percentage				**100% (>60%)**
	EUT Test Frequency				**5530 MHz**

Figure 64: Statistical Performance Check, 5530M_80MHz, Radar Type 2

Radar Type	Trial #	Pulse Width 6-10 µsec	PRI 200-500 µsec	Number of Pulses 16-18	Detection 1 = Yes, 0 = No
3	1	8.2	355.0	17	1
	2	6.1	487.0	16	1
	3	7.1	344.0	16	1
	4	9.8	288.0	18	1
	5	8.9	230.0	18	1
	6	7.9	432.0	17	1
	7	8.2	207.0	17	1
	8	7.5	443.0	17	1
	9	8.1	439.0	17	1
	10	6.2	223.0	16	1
	11	8.9	208.0	18	1
	12	9.6	463.0	18	1
	13	8.2	441.0	17	1
	14	7.2	323.0	16	1
	15	9.5	297.0	18	1
	16	8.0	412.0	17	1
	17	10.0	324.0	18	1
	18	7.4	271.0	17	1
	19	7.9	349.0	17	1
	20	7.3	409.0	16	1
	21	8.7	373.0	18	1
	22	7.2	254.0	16	1
	23	9.9	274.0	18	1
	24	7.9	278.0	17	1
	25	7.5	317.0	17	1
	26	6.1	260.0	16	1
	27	8.8	211.0	18	1
	28	9.7	272.0	18	1
	29	7.4	264.0	17	1
	30	9.2	284.0	18	1
	Detection Percentage				100% (>60%)
	EUT Test Frequency				5530 MHz

Figure 65: Statistical Performance Check, 5530M_80MHz, Radar Type 3

Radar Type	Trial #	Pulse Width 11-20 µsec	PRI 200-500 µsec	Number of Pulses 12-16	Detection 1 = Yes, 0 = No
4	1	16.0	355.0	14	1
	2	11.3	487.0	12	1
	3	13.5	344.0	13	1
	4	19.4	288.0	16	1
	5	17.5	230.0	15	1
	6	15.3	432.0	14	1
	7	15.9	207.0	14	1
	8	14.3	443.0	13	1
	9	15.8	439.0	14	1
	10	11.5	223.0	12	1
	11	17.4	208.0	15	1
	12	19.0	463.0	16	1
	13	16.0	441.0	14	1
	14	13.8	323.0	13	1
	15	18.9	297.0	16	1
	16	15.5	412.0	14	1
	17	19.9	324.0	16	1
	18	14.1	271.0	13	1
	19	15.2	349.0	14	1
	20	13.8	409.0	13	1
	21	17.1	373.0	15	1
	22	13.8	254.0	13	1
	23	19.8	274.0	16	1
	24	15.3	278.0	14	1
	25	14.5	317.0	13	1
	26	11.3	260.0	12	1
	27	17.3	211.0	15	1
	28	19.2	272.0	16	1
	29	14.2	264.0	13	1
	30	18.2	284.0	15	1
	Detection Percentage				100% (> 60%)
	EUT Test Frequency				5530 MHz

Figure 66: Statistical Performance Check, 5530M_80MHz, Radar Type 4

Radar Type	Number of Trials	Number of Successful Detections	Minimum Percentage of Successful Detections
1	30	30	90%
2	30	30	100%
3	30	30	100%
4	30	30	100%
Aggregate = (90% + 100% + 100% + 100%)/4 = 97.5%			

Figure 67: Statistical Performance Check, 5530M_80MHz, Aggregate

Radar Type	Trial #	Number of Bursts 8-20	Burst Period (s)	Chirp Width (MHz) 5 -20	Radar Center Frequency (MHz)	Detection 1 = Yes, 0 = No
5	1	15	0.8000000	13	5.530000000	1
	2	8	1.5000000	5	5.530000000	1
	3	11	1.0909091	9	5.530000000	1
	4	20	0.6000000	19	5.530000000	1
	5	17	0.7058824	16	5.530000000	1
	6	14	0.8571429	12	5.530000000	1
	7	15	0.8000000	13	5.530000000	0
	8	12	1.0000000	10	5.530000000	1
	9	14	0.8571429	13	5.530000000	1
	10	8	1.5000000	6	5.530000000	1
	11	17	0.7058824	16	5.498600000	1
	12	19	0.6315789	19	5.499800000	1
	13	15	0.8000000	13	5.497400000	1
	14	12	1.0000000	10	5.496200000	1
	15	19	0.6315789	18	5.499400000	1
	16	14	0.8571429	12	5.497000000	1
	17	20	0.6000000	20	5.500200000	1
	18	12	1.0000000	10	5.496200000	0
	19	14	0.8571429	12	5.497000000	1
	20	12	1.0000000	10	5.496200000	1
	21	16	0.7500000	15	5.561800000	1
	22	12	1.0000000	9	5.564200000	1
	23	20	0.6000000	20	5.559800000	1
	24	14	0.8571429	12	5.563000000	1
	25	13	0.9230769	11	5.563400000	1
	26	8	1.5000000	5	5.565800000	1
	27	17	0.7058824	16	5.561400000	1
	28	19	0.6315789	19	5.560200000	0
	29	12	1.0000000	10	5.563800000	1
	30	18	0.6666667	17	5.561000000	1
	Detection Percentage					**90% (> 80%)**
Radar Frequency						**5494.2 – 5565.8 MHz**

Figure 68: Statistical Performance Check, 5530M_80MHz, Radar Type 5

Radar Type	Trial #	Visible Frequency Number	Pulses/Hop	Pulse Width (µsec)	PRI (µsec)	Detection 1 = Yes, 0 = No
6	1	17	9	1	333.3	1
	2	14	9	1	333.3	1
	3	16	9	1	333.3	1
	4	19	9	1	333.3	1
	5	11	9	1	333.3	1
	6	13	9	1	333.3	1
	7	15	9	1	333.3	1
	8	17	9	1	333.3	1
	9	15	9	1	333.3	1
	10	17	9	1	333.3	1
	11	16	9	1	333.3	1
	12	23	9	1	333.3	1
	13	22	9	1	333.3	1
	14	17	9	1	333.3	1
	15	15	9	1	333.3	1
	16	22	9	1	333.3	1
	17	14	9	1	333.3	1
	18	22	9	1	333.3	1
	19	13	9	1	333.3	1
	20	17	9	1	333.3	1
	21	21	9	1	333.3	1
	22	18	9	1	333.3	1
	23	24	9	1	333.3	1
	24	14	9	1	333.3	1
	25	13	9	1	333.3	1
	26	16	9	1	333.3	1
	27	15	9	1	333.3	1
	28	20	9	1	333.3	1
	29	19	9	1	333.3	1
	30	16	9	1	333.3	1
	Detection Percentage					**100% (> 70%)**
	EUT Test Frequency					**5530 MHz**

Figure 69: Statistical Performance Check, 5530M_80MHz, Radar Type 6

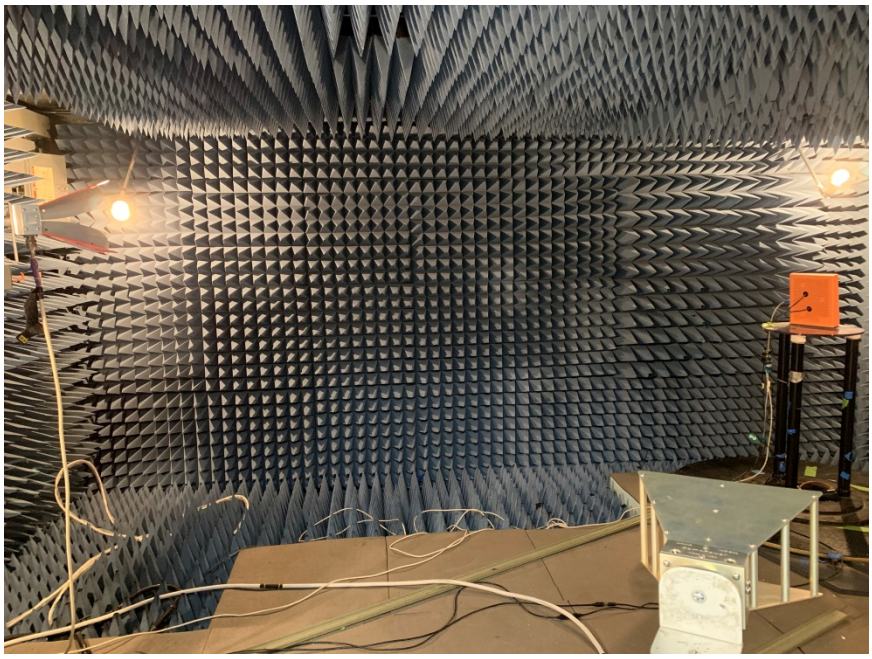


Figure 70: Statistical Analysis Test Setup Photograph

Test Equipment

Test Equipment

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ISO/IEC 17025:2017.

ASSET #	EQUIPMENT	MANUFACTURER	MODEL	LAST CAL	CAL DUE
1T4149A	HF WIRELESS CHAMBER - NSA			06/30/2019	06/30/2020
1T4905	HORN ANTENNA	COM-POWER	AH-118	05/07/2019	11/07/2020
1T4871	VECTOR SIGNAL GENERATOR	AGILENT TECHNOLOGIES	N5172B	FUNC VERIFY	
1T4414	MICROWAVE PRE-AMPLIFIER	A.H. SYSTEMS, INC.	PAM-0118	FUNC VERIFY	

Figure 71: Test Equipment List

Note: Functionally tested equipment is verified using calibrated instrumentation at the time of testing.

Certification & User's Manual Information

Certification & User's Manual Information

M. Certification Information

The following is extracted from Title 47 of the Code of Federal Regulations, Part 2, Subpart I — Marketing of Radio frequency devices:

§ 2.801 Radio-frequency device defined.

As used in this part, a radio-frequency device is any device which in its operation is capable of Emitting radio-frequency energy by radiation, conduction, or other means. Radio- frequency devices include, but are not limited to:

(a) The various types of radio communication transmitting devices described throughout this chapter.

(b) The incidental, unintentional and intentional radiators defined in Part 15 of this chapter.

(c) The industrial, scientific, and medical equipment described in Part 18 of this chapter.

(d) Any part or component thereof which in use emits radio-frequency energy by radiation, conduction, or other means.

§ 2.803 Marketing of radio frequency devices prior to equipment authorization.

(a) Except as provided elsewhere in this chapter, no person shall sell or lease, or offer for sale or lease (including advertising for sale or lease), or import, ship or distribute for the purpose of selling or leasing or offering for sale or lease, any radio frequency device unless:

(1) In the case of a device subject to certification, such device has been authorized by the Commission in accordance with the rules in this chapter and is properly identified and labeled as required by §2.925 and other relevant sections in this chapter; or

(2) In the case of a device that is not required to have a grant of equipment authorization issued by the Commission, but which must comply with the specified technical standards prior to use, such device also complies with all applicable administrative (including verification of the equipment or authorization under a Declaration of Conformity, where required), technical, labeling and identification requirements specified in this chapter.

(d) Notwithstanding the provisions of paragraph (a) of this section, the offer for sale solely to business, commercial, industrial, scientific or medical users (but not an offer for sale to other parties or to end users located in a residential environment) of a radio frequency device that is in the conceptual, developmental, design or pre-production stage is permitted prior to equipment authorization or, for devices not subject to the equipment authorization requirements, prior to a determination of compliance with the applicable technical requirements *provided* that the prospective buyer is advised in writing at the time of the offer for sale that the equipment is subject to the FCC rules and that the equipment will comply with the appropriate rules before delivery to the buyer or to centers of distribution.

(e)(1) Notwithstanding the provisions of paragraph (a) of this section, prior to equipment authorization or determination of compliance with the applicable technical requirements any radio frequency device may be operated, but not marketed, for the following purposes and under the following conditions:

(i) Compliance testing;

(ii) Demonstrations at a trade show provided the notice contained in paragraph (c) of this section is displayed in a conspicuous location on, or immediately adjacent to, the device;

(iii) Demonstrations at an exhibition conducted at a business, commercial, industrial, scientific or medical location, but excluding locations in a residential environment, provided the notice contained in paragraphs (c) or (d) of this section, as appropriate, is displayed in a conspicuous location on, or immediately adjacent to, the device;

(iv) Evaluation of product performance and determination of customer acceptability, provided such operation takes place at the manufacturer's facilities during developmental, design or pre-production states; or

(v) Evaluation of product performance and determination of customer acceptability where customer acceptability of a radio frequency device cannot be determined at the manufacturer's facilities because of size or unique capability of the device, provided the device is operated at a business, commercial, industrial, scientific or medical user's site, but not at a residential site, during the development, design or pre-production stages.

(e)(2) For the purpose of paragraphs (e)(1)(iv) and (e)(1)(v) of this section, the term *manufacturer's facilities* includes the facilities of the party responsible for compliance with the regulations and the manufacturer's premises, as well as the facilities of other entities working under the authorization of the responsible party in connection with the development and manufacture, but not the marketing, of the equipment.

(f) For radio frequency devices subject to verification and sold solely to business, commercial, industrial, scientific and medical users (excluding products sold to other parties or for operation in a residential environment), parties responsible for verification of the devices shall have the option of ensuring compliance with the applicable technical specifications of this chapter at each end user's location after installation, provided that the purchase or lease agreement includes a proviso that such a determination of compliance be made and is the responsibility of the party responsible for verification of the equipment.

Certification & User's Manual Information

The following is extracted from Title 47 of the Code of Federal Regulations, Part 2, Subpart J — Equipment Authorization Procedures:

§ 2.901 Basis and Purpose

(a) In order to carry out its responsibilities under the Communications Act and the various treaties and international regulations, and in order to promote efficient use of the radio spectrum, the Commission has developed technical standards for radio frequency equipment and parts or components thereof. The technical standards applicable to individual types of equipment are found in that part of the rules governing the service wherein the equipment is to be operated.[1] *In addition to the technical standards provided, the rules governing the service may require that such equipment be verified by the manufacturer or importer*, be authorized under a Declaration of Conformity, or receive an equipment authorization from the Commission by one of the following procedures: certification or registration.

(b) The following sections describe the verification procedure, the procedure for a Declaration of Conformity, and the procedures to be followed in obtaining certification from the Commission and the conditions attendant to such a grant.

§ 2.907 Certification.

(a) Certification is an equipment authorization issued by the Commission, based on representation and test data submitted by the applicant.

(b) Certification attaches to all units subsequently marketed by the grantee which are identical (see Section 2.908) to the sample tested except for permissive changes or other variations authorized by the Commission pursuant to Section 2.1043.

[1] In this case, the equipment is subject to the rules of Part 15. More specifically, the equipment falls under Subpart B (of Part 15), which deals with unintentional radiators.

Certification & User's Manual Information

§ 2.948 Description of measurement facilities.

(a) Each party making measurements of equipment that is subject to an equipment authorization under Part 15 or Part 18 of this chapter, regardless of whether the measurements are filed with the Commission or kept on file by the party responsible for compliance of equipment marketed within the U.S. or its possessions, shall compile a description of the measurement facilities employed.

(1) If the measured equipment is subject to the verification procedure, the description of the measurement facilities shall be retained by the party responsible for verification of the equipment.

(i) If the equipment is verified through measurements performed by an independent laboratory, it is acceptable for the party responsible for verification of the equipment to rely upon the description of the measurement facilities retained by or placed on file with the Commission by that laboratory. In this situation, the party responsible for the verification of the equipment is not required to retain a duplicate copy of the description of the measurement facilities.

(ii) If the equipment is verified based on measurements performed at the installation site of the equipment, no specific site calibration data is required. It is acceptable to retain the description of the measurement facilities at the site at which the measurements were performed.

(2) If the equipment is to be authorized by the Commission under the certification procedure, the description of the measurement facilities shall be filed with the Commission's Laboratory in Columbia, Maryland. The data describing the measurement facilities need only be filed once but must be updated as changes are made to the measurement facilities or as otherwise described in this section. At least every three years, the organization responsible for filing the data with the Commission shall certify that the data on file is current.

Certification & User's Manual Information

Label and User's Manual Information

The following is extracted from Title 47 of the Code of Federal Regulations, Part 15, Subpart A — General:

§ 15.19 Labeling requirements.

(a) In addition to the requirements in Part 2 of this chapter, a device subject to certification or verification shall be labeled as follows:

(1) Receivers associated with the operation of a licensed radio service, e.g., FM broadcast under Part 73 of this chapter, land mobile operation under Part 90, etc., shall bear the following statement in a conspicuous location on the device:

This device complies with Part 15 of the FCC Rules. Operation is subject to the condition that this device does not cause harmful interference.

(2) A stand-alone cable input selector switch, shall bear the following statement in a conspicuous location on the device:

This device is verified to comply with Part 15 of the FCC Rules for use with cable television service.

(3) All other devices shall bear the following statement in a conspicuous location on the device:

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

(4) Where a device is constructed in two or more sections connected by wires and marketed together, the statement specified under paragraph (a) of this section is required to be affixed only to the main control unit.

(5) When the device is so small or for such use that it is not practicable to place the statement specified under paragraph (a) of this section on it, the information required by this paragraph shall be placed in a prominent location in the instruction manual or pamphlet supplied to the user or, alternatively, shall be placed on the container in which the device is marketed. However, the FCC identifier or the unique identifier, as appropriate, must be displayed on the device.

§ 15.21 Information to user.

The user's manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Verification & User's Manual Information

The following is extracted from Title 47 of the Code of Federal Regulations, Part 15, Subpart B — Unintentional Radiators:

§ 15.105 Information to the user.

(a) For a Class A digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at own expense.

(b) For a Class B digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

– Reorient or relocate the receiving antenna.

– Increase the separation between the equipment and receiver.

– Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

– Consult the dealer or an experienced radio/TV technician for help.106885