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MEASUREMENT REPORT
FCC PART 15.407 DFS (Master Device)

Company Name:
Samsung Electronics Co., Ltd.
129, Samsung-ro,
Yeongtong-gu, Suwon-si
Gyeonggi-do, 16677, Korea

Date of Testing:
3/21-6/5/2017
Test Site/Location:
PCTEST Lab. Columbia, MD, USA
Test Report Serial No.:
1M1703270127-02.A3L

FCC ID:	**A3LETWV520**
COMPANY:	**Samsung Electronics Co., Ltd.**

Application Type:	Class II Permissive Change
Model:	ET-WV520
EUT Type:	Indoor Access Point
Type of Device:	Master Device
Frequency Range:	5260 – 5320 MHz (UNII-2A Band)
	5500 – 5720 MHz (UNII-2C Band)
FCC Rule Part(s):	Part 15.407(UNII)
Test Procedure(s):	KDB 905462 D02 v02
Class II Permissive Change:	Please see FCC change document
Original Grant Date:	3/6/2017

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in KDB 905462 D02 v02 *Compliance Measurement Procedures for Unlicensed-National Information Infrastructure Devices Operating in the 5.25 – 5.35 GHz and 5.47 – 5.725 GHz Bands Incorporating Dynamic Frequency Selection*. Test results reported herein relate only to the item(s) tested.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

Randy Ortanez
President

ACCREDITED
TESTING CERT#2041.01

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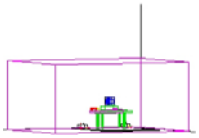


DFS MEASUREMENT REPORT
FCC Part 15.407

§ 2.1033 General Information

APPLICANT:	Samsung Electronics Co., Ltd.
APPLICANT ADDRESS:	129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea
TEST SITE:	PCTEST ENGINEERING LABORATORY, INC.
TEST SITE ADDRESS:	7185 Oakland Mills Road, Columbia, MD 21046 USA
FCC RULE PART(S):	Part 15.407(h)
BASE MODEL:	ET-WV520
FCC ID:	A3LETWV520
DEVICE CLASSIFICATION:	Master Device
DATE(S) OF TEST:	3/21-6/5/2017
TEST REPORT S/N:	1M1703270127-02.A3L

Test Facility / Accreditations

Measurements were performed at PCTEST Engineering Lab located in Columbia, MD 21045, U.S.A.

- PCTEST facility is an FCC registered (PCTEST Reg. No. 159966) test facility with the site description report on file and has met all the requirements specified in Section 2.948 of the FCC Rules and Industry Canada (2451B-1).
- PCTEST Lab is accredited to ISO 17025 by U.S. National Institute of Standards and Technology (NIST) under the National Voluntary Laboratory Accreditation Program (NVLAP Lab code: 100431-0) in EMC, FCC and Telecommunications.
- PCTEST Lab is accredited to ISO 17025-2005 by the American Association for Laboratory Accreditation (A2LA) in Specific Absorption Rate (SAR) testing, Hearing Aid Compatibility (HAC) testing, CTIA Test Plans, and wireless testing for FCC and Industry Canada Rules.

- PCTEST Lab is a recognized U.S. Conformity Assessment Body (CAB) in EMC and R&TTE (n.b. 0982) under the U.S.-EU Mutual Recognition Agreement (MRA).
- PCTEST TCB is a Telecommunication Certification Body (TCB) accredited to ISO/IEC Guide 65 by the American National Standards Institute (ANSI) in all scopes of FCC Rules and Industry Canada Standards (RSS).
- PCTEST facility is an IC registered (2451B-1) test laboratory with the site description on file at Industry Canada.
- PCTEST is a CTIA Authorized Test Laboratory (CATL) for AMPS, CDMA, and EvDO wireless devices and for Over-the-Air (OTA) Antenna Performance testing for AMPS, CDMA, GSM, GPRS, EGPRS, UMTS (W-CDMA), CDMA 1xEVDO, and CDMA 1xRTT.

1.0 INTRODUCTION

1.1 Scope

This report has been prepared to demonstrate compliance with the requirements for Dynamic Frequency Selection (DFS) as stated in KDB 905462. Testing was performed on the **Samsung Indoor Access Point FCC ID: A3LETWV520**. As of July 20, 2007 all devices operating in the 5250 – 5350 MHz and/or the 5470 – 5725 MHz bands must comply with the DFS requirements. All test results reported herein are applicable to the sample selected for testing. The unit used for testing was supplied by Samsung Electronics Co., Ltd..

1.2 Evaluation Procedure

Per KDB 905462, conducted test methodology was used for the DFS evaluation procedure of the **Samsung Indoor Access Point FCC ID: A3LETWV520**.

1.3 Summary of Test Results

The **Samsung Indoor Access Point FCC ID: A3LETWV520** was found to be compliant with the requirements for DFS as required for a Master Device per Part 15.407(h) and KDB 905462 D02 v02.

Tests	Verdict
Non-Occupancy Period	Pass
DFS Detection Threshold	Pass
U-NII Detection Bandwidth	Pass
Channel Availability Check(CAC) Time	Pass
Channel Closing Transmission Time	Pass
Channel Move Time	Pass
Statistical Performance Check	Pass

Table 1-1. DFS Test Results Summary

2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung Indoor Access Point FCC ID: A3LETWV520**.

Mode of Operation:

Master Device	☒
Client Device (No radar detection)	☐
Client Device with Radar Detection	☐

Description of EUT:	
Operating Frequency Range:	5260 – 5320, 5500 – 5720 MHz
Output Power Range:	13.20 – 20.99 dBm
Antenna Port Used for Conducted Tests:	5G Antenna #1
Minimum Peak Antenna Gain used for Conducted Tests :	2.06 dBi (5G Antenna #1)
Antenna Assembly and Directional Gain (dBi):	6.31 (U-NII 2A) and 6.08 (U-NII 2C) with antenna connector impedance of 50Ohm.
Conducted Power U-NII 2A (dBm):	Ant1: 20.97, Ant2: 20.80, MIMO: 20.48
Conducted Power U-NII 2C (dBm):	Ant1: 20.98, Ant2: 20.99, MIMO: 20.77
Highest EIRP:	20.77 dBm + 6.08 dBi = 26.85 dBm
Lowest EIRP:	13.20 dBm + 2.06 dBi= 15.26 dBm
System Architecture:	IP based (802.11a/n/ac)
Supported Channel Bandwidths:	20, 40, 80 MHz
Time required for Master to complete power-on cycle:	1 second

Antenna Assemblies of EUT:	**Minimum Peak Antenna Gain @ ~5.5 GHz [dBi]**
5GHz Antenna 1:	2.06
5GHz Antenna 2:	2.52

2.2 EUT Capabilities

This device contains the following capabilities:

802.11b/g/n/ac WLAN, 802.11a/n/ac UNII, Bluetooth (LE), Zigbee, Zwave

2.3 Modifications

No modifications to the EUT were required in order to comply with the DFS specifications.

3.0 DESCRIPTION OF DYNAMIC FREQUENCY SELECTION TEST

3.1 Applicability

The following table from KDB 905462 lists the applicable requirements for the DFS testing. The device evaluated in this report is considered a client device without radar detection capability.

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

Table 3-1. DFS Applicability Prior to Use of a Channel

Requirement	Operational Mode	
	Master 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

Table 3-2. DFS Applicability During Normal Operation

Additional Requirement	Operational Mode	
	Master	Client Without Radar Detection
UNII Detection BW 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 should include several frequencies within the radar detection BW and frequencies near the edge of the radar detection BW. For 802.11 devices, it is suggested to select frequencies in each of the bonded 20MHz channels and the channel center frequency		

Table 3-3. Additional Requirements During Normal Operations for devices with multiple BW's

3.2 Master Device Overview

Per KDB 905462 the following are the requirements for Master Devices:

a) The *Master Device* will use DFS in order to detect *Radar Waveforms* with received signal strength above the *DFS Detection Threshold* in the 5250 - 5350 MHz and 5470 - 5725 MHz bands. DFS is not required in the 5150 - 5250 MHz or 5725 - 5825 MHz bands.

b) Before initiating a network on a *Channel*, the *Master Device* will perform a C*hannel Availability Check* for a specified time duration (*Channel Availability Check Time*) to ensure that there is no radar system operating on the *Channel*, using DFS described under subsection a) above.

c) The *Master Device* initiates a U-NII network by transmitting control signals that will enable other U-NII devices to *Associate* with the *Master Device*.

d) During normal operation, the *Master Device* will monitor the *Channel (In-Service Monitoring)* to ensure that there is no radar system operating on the *Channel*, using DFS described under a).

e) If the *Master Device* has detected a *Radar Waveform* during *In-Service Monitoring* as described under d), the *Operating Channel* of the U-NII network is no longer an *Available Channel*. The *Master Device* will instruct all associated *Client Device(s)* to stop transmitting on this *Channel* within the *Channel Move Time*. The transmissions during the *Channel Move Time* will be limited to the *Channel Closing Transmission Time*.

f) Once the *Master Device* has detected a *Radar Waveform* it will not utilize the *Channel* for the duration of the *Non-Occupancy Period*.

g) If the *Master Device* delegates the *In-Service Monitoring* to a *Client Device*, then the combination will be tested to the requirements described under d) through f) above.

3.3 DFS Detection Threshold Values

The DFS detection thresholds are defined for Master devices and Client Devices with In-service monitoring. These detection thresholds are listed in the following table.

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

Table 3-4: Detection Thresholds for Master Devices and Client Devices with Radar Detection

3.4 Response Requirements

Requirements for both Master and Client device are listed in the following table.

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.	

Table 3-5: DFS Response Requirements

3.5 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.

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 from Table 5a of KDB 905462	See KDB 905462	60%	30
		Test B: 15 unique PRI values randomly selected within the range of 518-3066 usec, with a minimum increment of 1 usec, 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.					

Table 3-6: Short Pulse Radar Waveforms

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

Table 3-7. Long Pulse Radar Waveforms

Note:

For Radar Type 5: Three subsets of trials were performed with a minimum of ten trials per subset. The subset of trials differ in where the Long Pulse Type 5 Signal is tuned in frequency:

a) Subset#1: the Channel center frequency;
b) Subset#2: tuned frequencies such that 90% of the Long Pulse Type 5 frequency modulation is within the low edge of the UUT Occupied Bandwidth;
and
c) Subset#3: tuned frequencies such that 90% of the Long Pulse Type 5 frequency modulation is within the high edge of the UUT Occupied Bandwidth.

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

Table 3-8. Frequency Hopping Radar Waveforms

3.6 Procedure and Test Setup

KDB 905462 describes a radiated test setup and a conducted test setup. The conducted test setup was used for testing reported herein. Figure 3-1 below shows the typical test setup.

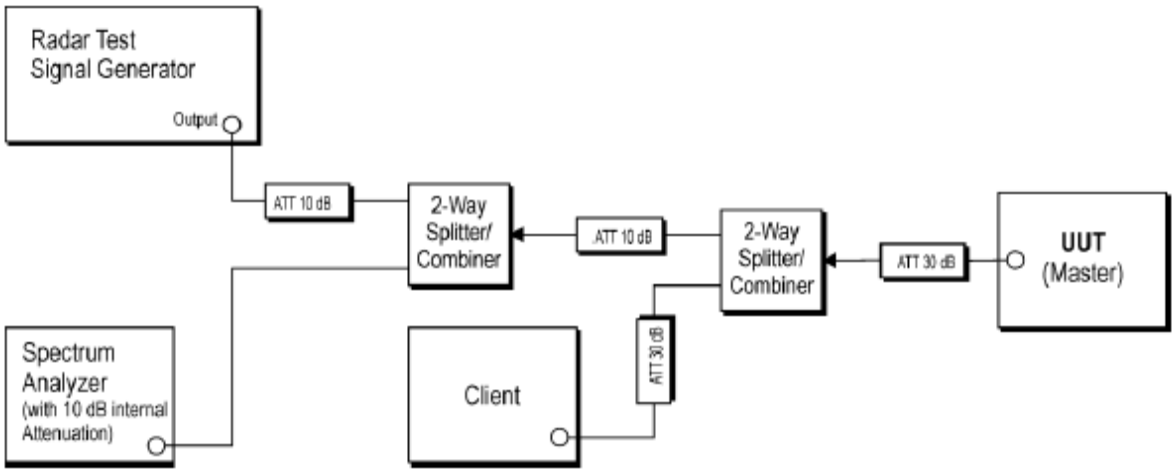


Figure 3-1. Example of Conducted Test Setup for DFS Master Device

1. The "Aeroflex PXI DFS Radar Simulator and Analyzer Test Suite" is setup to provide a simulated radar pulse at the frequency that the Master and Client are operating.
2. Testing is set up per the diagram in Figure 3-1 and communications between the Master device and the Client is established.
3. Once WIFI connection is established between Master and Client, the program "iperf.exe" is used to streamed data from the Master to the Client to properly load the network (17%).
4. The "Aeroflex PXI DFS Radar Simulator and Analyzer Test Suite" is set to generate radars type 0 – 6 as specified in KDB 905462.

4.0 TEST EQUIPMENT

Test Equipment Calibration is traceable to the National Institute of Standards and Technology (NIST).

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Aeroflex	PXI 82531	PXI RF Synthesizer	9/22/2016	Biennial	9/22/2018	1082329
Aeroflex	PXI 82531	PXI DFS Radar Simulator & Analyzer	9/22/2016	Biennial	9/22/2018	1082329
Agilent	N9030A	PXA Signal Analyzer (26.5GHz)	7/20/2016	Annual	7/20/2017	MY49432391
Agilent	N9038A	MXE EMI Receiver	4/26/2017	Annual	4/26/2018	MY51210133
Seekonk	NC-100	Torque Wrench 5/16", 8" lbs	3/2/2016	Biennial	3/2/2018	N/A

Table 4-1. Annual Test Equipment Calibration Schedule

4.1 Additional Equipment

The following equipment was used in support of the DFS testing.

Device	Manufacturer	Model/Description	Description	S/N:
Client	Apple	A1465	802.11 Laptop	C02RGF2JGFWM

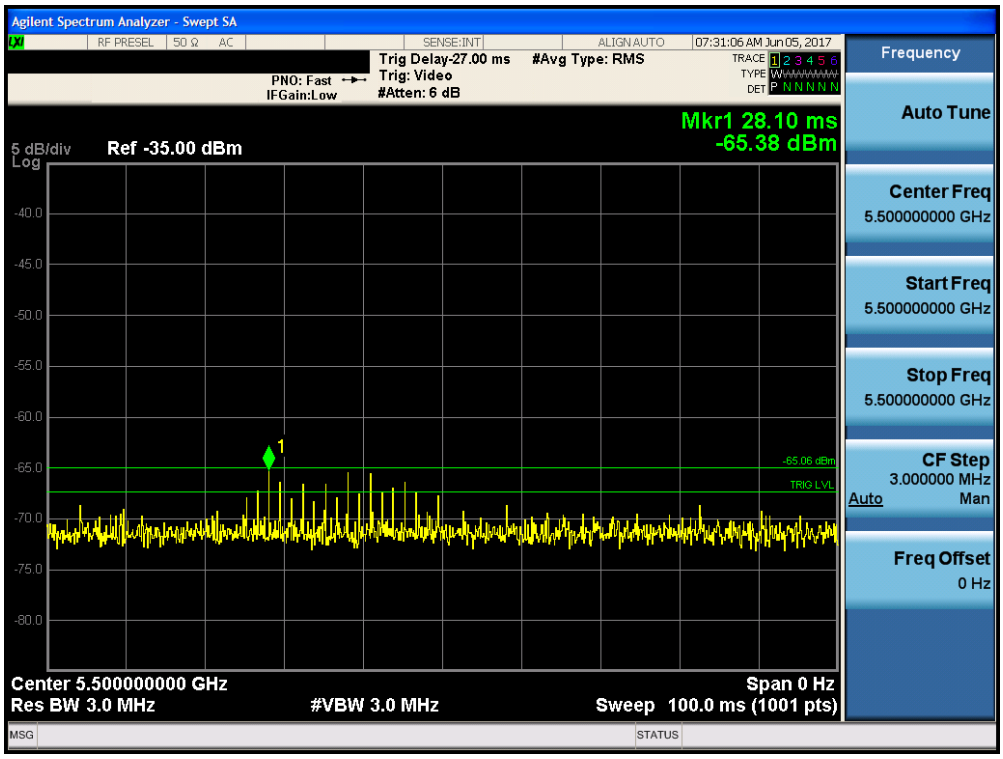
Table 4-2. Support Equipment

5.0 TEST RESULTS

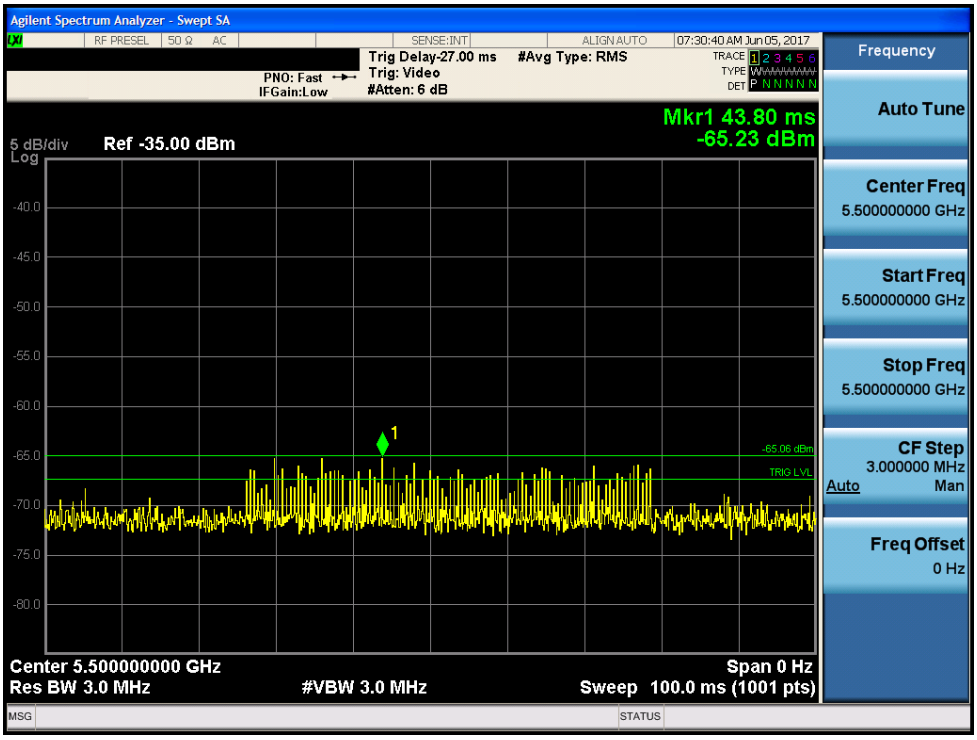
5.1 Radar Waveform Calibration

Radar waveforms signal levels were calibrated to ensure that the detection threshold of -64 dBm is achieved, since the EIRP > 200mW. The RF cable, which during normal testing would be connected to the master EUT device, is connected to a spectrum analyzer with zero span, peak detector, and 3MHz RBW and VBW. The level measured by the spectrum analyzer is the level to which the master device would receive the radar waveform.

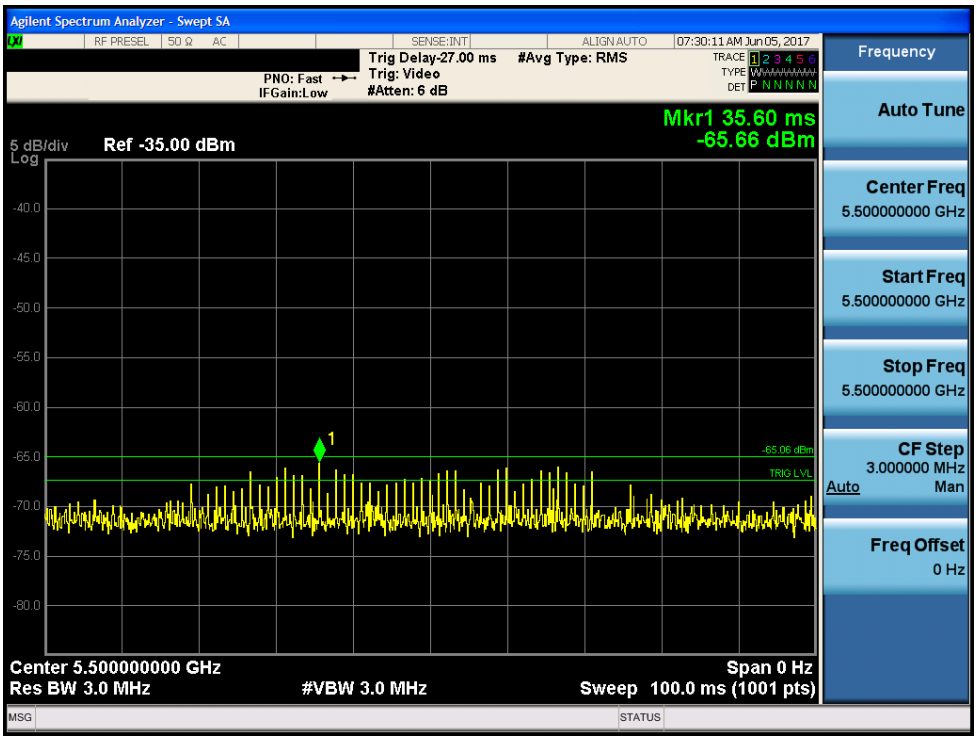
Note: The minimum peak antenna gain of 2.06 dBi (please see Section 2.1) was factored into the detection threshold level during testing. Since the detection threshold values in Table 3 of KDB 905462 are based on 0dBi receive antenna gain, the detection threshold was adjusted to account for the 2.06 dBi antenna gain. Additionally, 1dB was added per Note 2 of Table 3 in KDB 905462.
Detection threshold = -64 dBm – (2.06 dBi) + 1 dB = -65.06 dBm



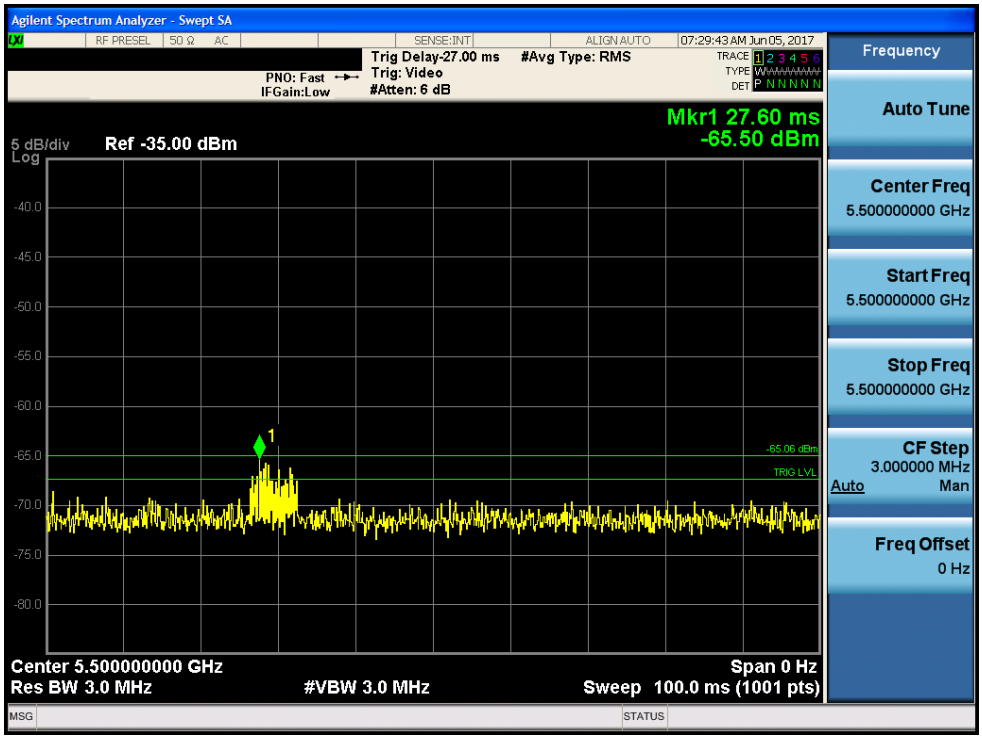
Plot 5-1. Radar Type 0 Calibration



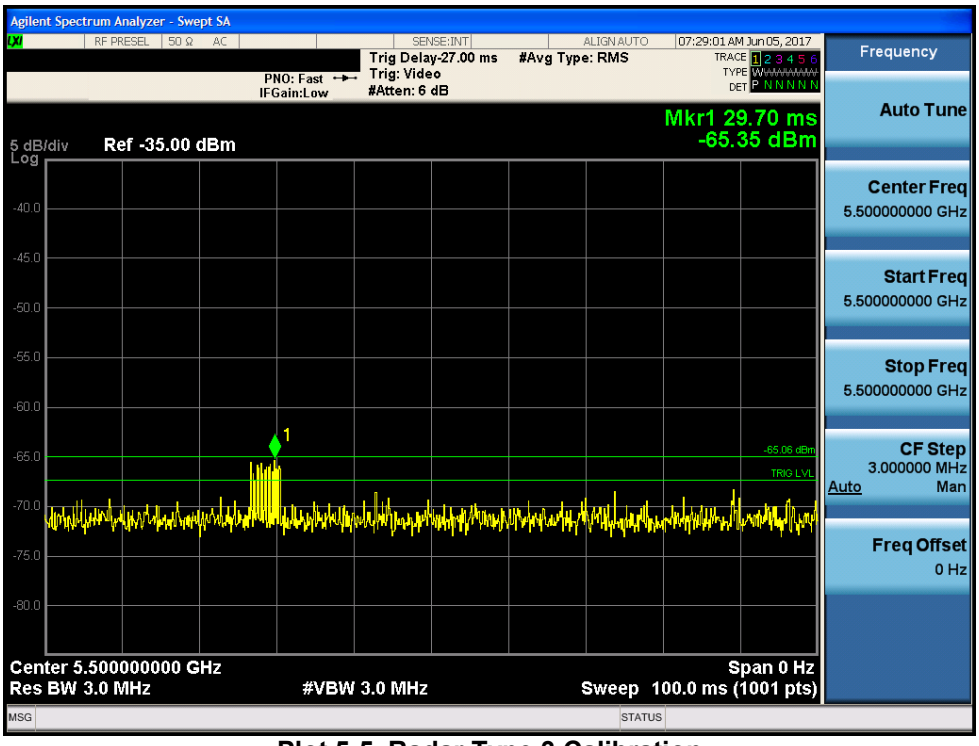
Plot 5-2. Radar Type 1A Calibration



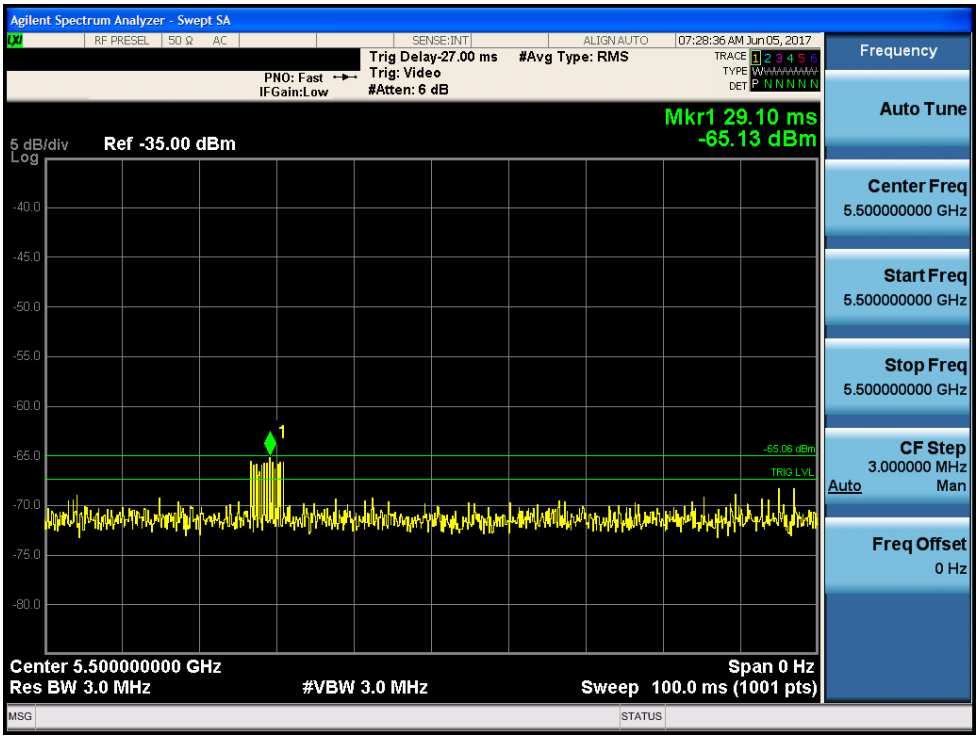
Plot 5-3. Radar Type 1B Calibration



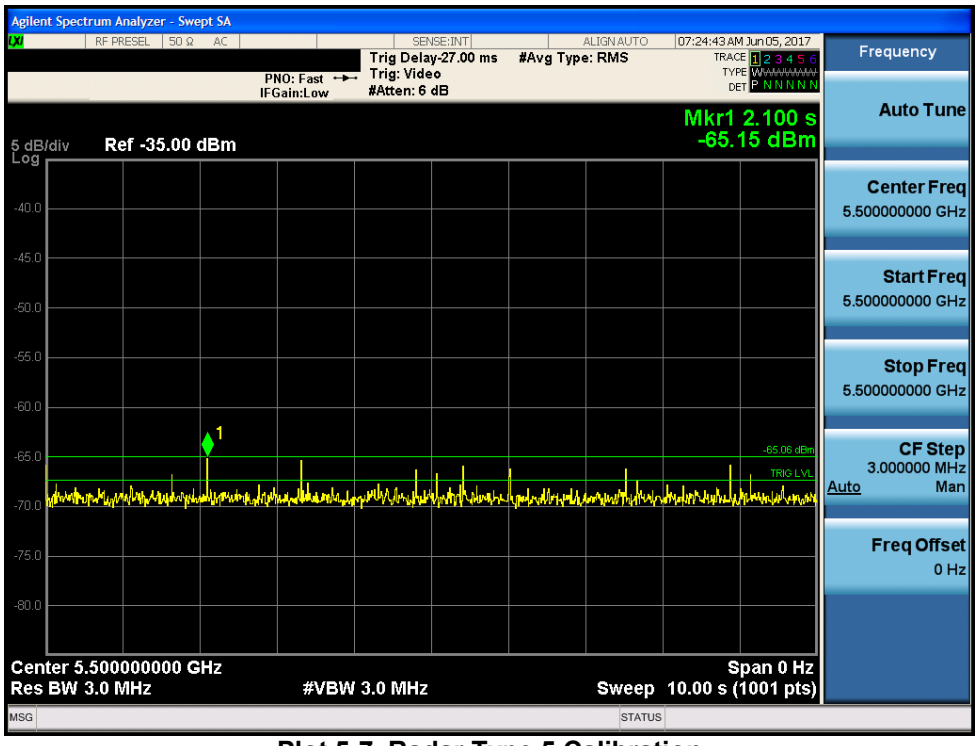
Plot 5-4. Radar Type 2 Calibration



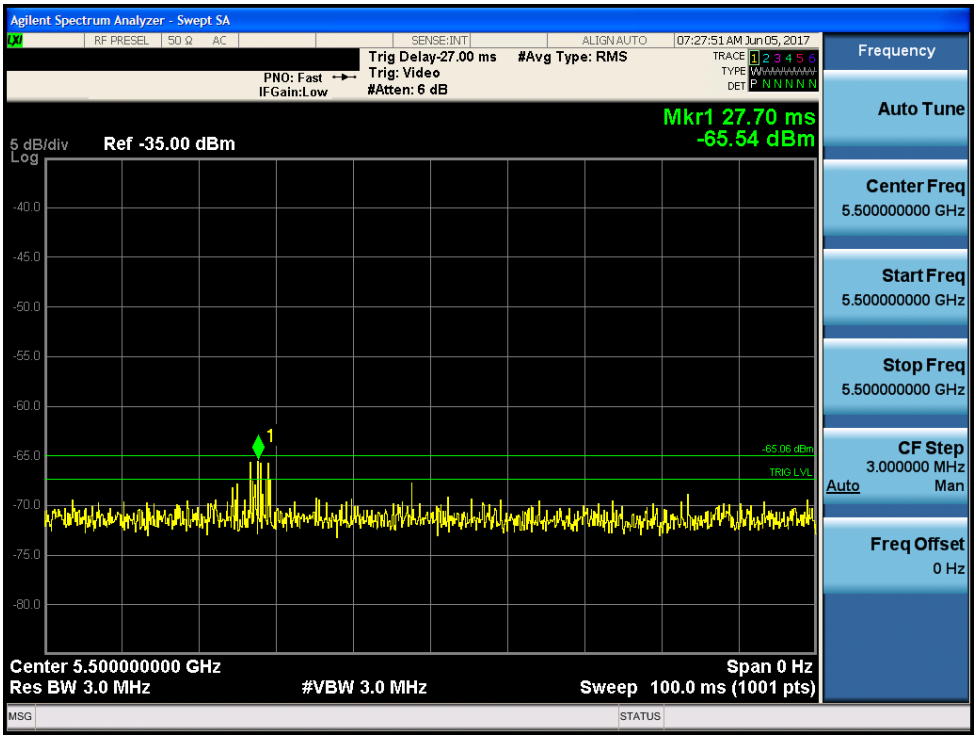
Plot 5-5. Radar Type 3 Calibration



Plot 5-6. Radar Type 4 Calibration



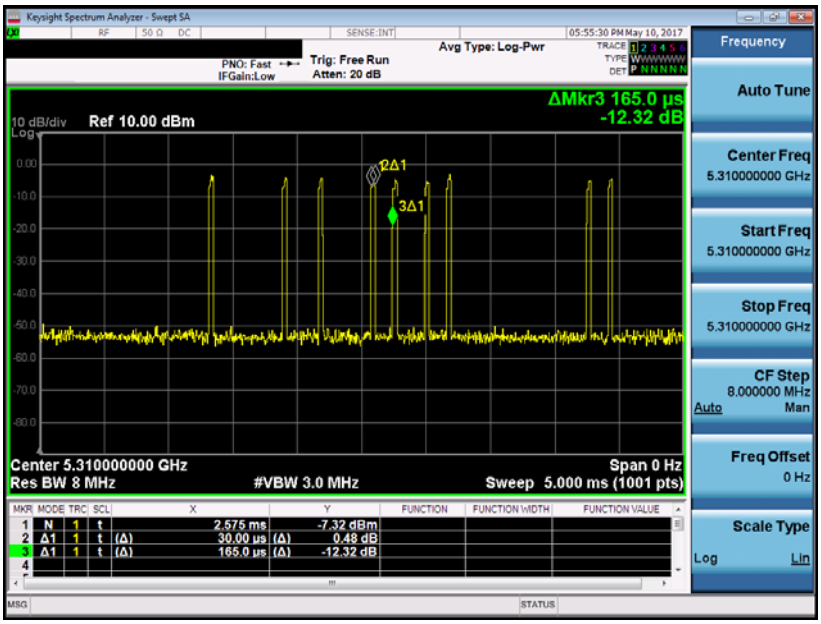
Plot 5-7. Radar Type 5 Calibration



Plot 5-8. Radar Type 6 Calibration

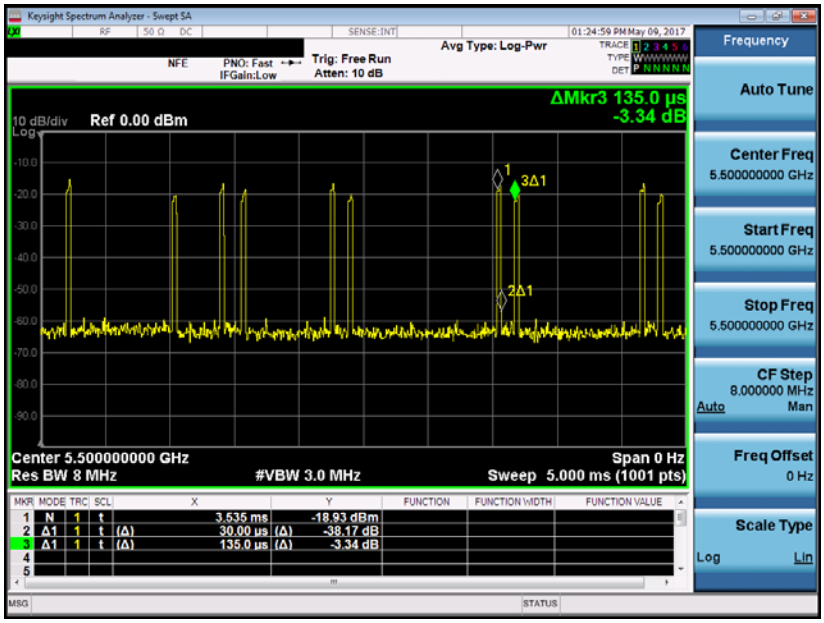
5.2 Channel Loading

Per KDB 905462, timing plots with calculations are required to demonstrate a minimum channel loading of approximately 17% or greater. A zero span spectrum analyzer plot is used to approximate the channel loading time.



Plot 5-9. Band 2A Pulse Width / Period

Band 2A Channel Loading = Pulse Width / Period = 30 µs / 165 µs = 18.2 %



Plot 5-10. Band 2C Pulse Width / Period

Band 2C Channel Loading = Pulse Width / Period = 30 µs / 135 µs = 22.2 %

5.3 UNII Detection Bandwidth

All UNII 20MHz channels for this device have identical channel bandwidths, all 40MHz channels have identical channel bandwidths, and all 80MHz channels have identical channel bandwidths. All UNII detection bandwidth tests were done at 5500MHz. Please see UNII report for 26dB Bandwidth plot which also includes the 99% power bandwidth.

Per KDB 905462, Radar Type 0 was used for all UNII detection bandwidth tests. The master EUT device was setup as standalone device with no associated Client and no traffic. The EUT must detect the radar waveform at least 90% of the time. Test procedure used is KDB 905462. UNII detection bandwidth is calculated as follows:

UNII Detection BW = FH – FL.

UNII Detection BW must be 100% of the 99% power bandwidth.

Summary to UNII Detection Bandwidth results:

802.11 Bandwidth [MHz]	99% power Bandwidth [MHz]	UNII Detection Bandwidth [MHz]	Verdict
20	18.0	20	PASS
40	37.0	40	PASS
80	76.1	80	PASS

Table 5-1. UNII Detection BW Summary Table

DFS Detection Trials (1 = Detection, Blank = No Detection)													
Radar Frequency	1	2	3	4	5	6	7	8	9	10	Detection Rate (%)	Detection Bandwidth (MHz)	Limit (MHz)
5490	1	1	1	1	1	1	1	1	1	1	100		
5491	1	1	1	1	1	1	1	1	1	1	100		
5492	1	1	1	1	1	1	1	1	1	1	100		
5493	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		
5496	1	1	1	1	1	1	1	1	1	1	100		
5497	1	1	1	1	1	1	1	1	1	1	100		
5498	1	1	1	1	1	1	1	1	1	1	100		
5499	1	1	1	1	1	1	1	1	1	1	100		
5500	1	1	1	1	1	1	1	1	1	1	100	20	18.0
5501	1	1	1	1	1	1	1	1	1	1	100		
5502	1	1	1	1	1	1	1	1	1	1	100		
5503	1	1	1	1	1	1	1	1	1	1	100		
5504	1	1	1	1	1	1	1	1	1	1	100		
5505	1	1	1	1	1	1	1	1	1	1	100		
5506	1	1	1	1	1	1	1	1	1	1	100		
5507	1	1	1	1	1	1	1	1	1	1	100		
5508	1	1	1	1	1	1	1	1	1	1	100		
5509	1	1	1	1	1	1	1	1	1	1	100		
5510	1	1	1	1	1	1	1	1	1	1	100		

Table 5-11. 20MHz UNII Detection Bandwidth Data

DFS Detection Trials (1 = Detection, Blank = No Detection)													
Radar Frequency	1	2	3	4	5	6	7	8	9	10	Detection Rate (%)	Detection Bandwidth (MHz)	Limit (MHz)
5490	1	1	1	1		1	1	1	1	1	90		
5491	1	1	1	1	1	1	1	1	1	1	100		
5492	1	1	1	1	1	1	1	1	1	1	100		
5493	1		1	1	1	1	1	1	1	1	90		
5494	1	1	1	1	1	1	1	1	1	1	100		
5495	1	1	1	1	1	1	1	1	1	1	100		
5496	1	1	1	1	1	1	1	1	1	1	100		
5497	1	1	1	1	1	1	1	1	1	1	100		
5498	1	1	1	1	1	1	1	1	1	1	100		
5499	1	1	1	1	1	1	1	1	1	1	100		
5500	1	1	1	1	1	1	1	1	1	1	100		
5501	1	1	1	1	1	1	1	1	1	1	100		
5502	1	1	1	1	1	1	1	1	1	1	100		
5503	1	1	1	1	1	1	1		1	1	90		
5504	1	1	1	1	1	1	1	1	1	1	100		
5505	1	1	1	1	1		1	1	1	1	90		
5506	1	1	1	1	1	1	1	1	1	1	100		
5507	1	1	1	1	1	1	1	1	1	1	100		
5508	1	1	1	1	1	1	1	1	1	1	100		
5509	1	1	1	1	1	1	1	1	1	1	100		
5510	1	1	1	1	1	1	1	1	1	1	100	40	37.0
5511	1	1	1	1	1	1	1	1	1	1	100		
5512	1	1	1	1	1	1	1	1	1	1	100		
5513	1	1	1	1	1	1	1	1	1	1	100		
5514	1	1	1	1		1	1	1	1	1	90		
5515	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	90		
5522	1	1	1	1	1	1	1		1	1	90		
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		90		
5527	1	1	1	1	1	1	1	1	1	1	100		
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		

Table 5-12. 40MHz UNII Detection Bandwidth Data

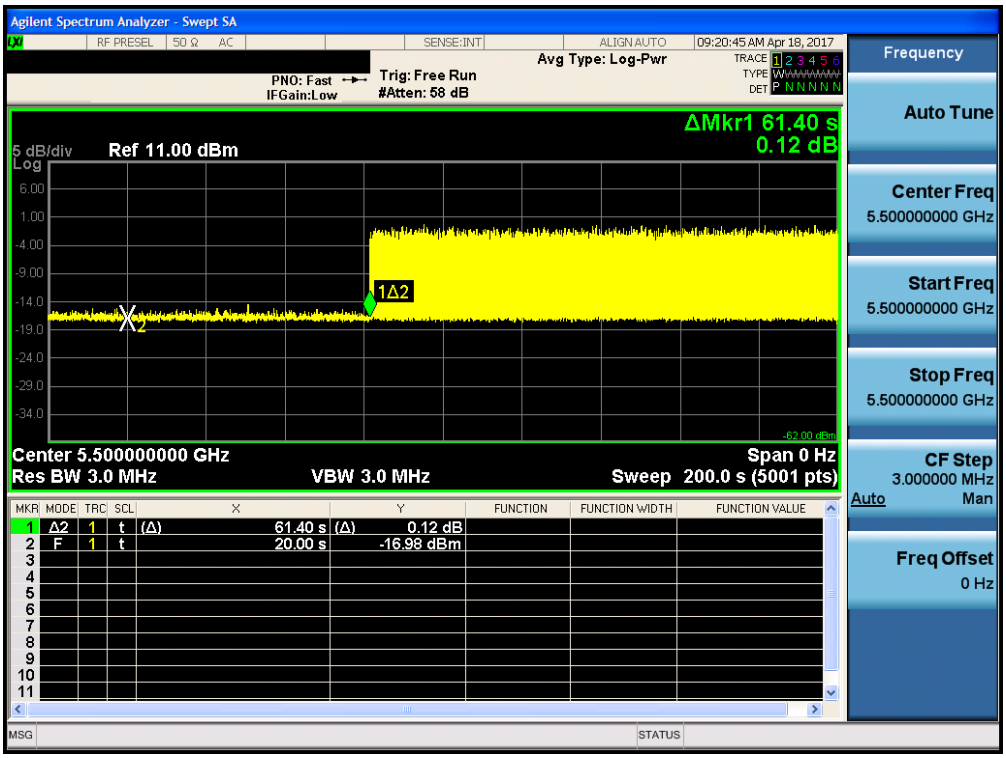
DFS Detection Trials (1 = Detection, Blank = No Detection)													
Radar Frequency	1	2	3	4	5	6	7	8	9	10	Detection Rate (%)	Detection Bandwidth (MHz)	Limit (MHz)
5490	1	1	1	1	1	1	1	1	1	1	100		
5491	1	1	1	1	1	1	1	1	1	1	100		
5492		1	1	1	1	1		1	1	1	90		
5493	1	1	1	1	1	1	1	1	1	1	100		
5494	1	1	1	1	1	1		1	1	1	90		
5495	1		1	1	1	1	1	1	1	1	90		
5496	1	1	1		1	1	1	1	1	1	90		
5497	1	1	1	1	1	1		1	1	1	90		
5498	1	1	1	1	1	1	1	1		1	90		
5499	1	1	1	1	1	1	1	1	1	1	100		
5500	1	1	1	1	1	1	1	1		1	90		
5501	1	1	1	1	1	1	1	1	1	1	100		
5502	1	1	1	1	1	1	1		1	1	90		
5503	1	1	1	1	1	1	1	1	1	1	100		
5504	1	1	1	1	1	1	1	1	1	1	100		
5505	1	1	1	1	1	1	1	1	1	1	100		
5506	1	1	1	1	1	1	1	1	1	1	100		
5507	1	1	1	1	1	1	1	1	1	1	100		
5508	1	1	1	1	1	1	1	1	1	1	100		
5509	1	1	1	1	1	1	1	1	1	1	100		
5510	1	1	1		1	1	1	1	1	1	90		
5511	1	1	1	1	1	1	1	1	1	1	100		
5512	1	1	1	1	1	1	1	1	1	1	100		
5513	1		1	1	1	1	1	1	1	1	90		
5514	1	1	1		1	1	1	1	1	1	90		
5515	1	1		1	1	1	1	1	1	1	90		
5516	1	1	1		1	1	1	1	1	1	90		
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		90		
5521	1	1	1	1	1	1	1	1		1	90		
5522	1	1	1	1	1	1	1	1	1	1	100		
5523	1	1	1	1	1	1	1	1		1	90		
5524	1	1	1	1	1	1	1	1	1		90		
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		
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	80	76.1
5531	1	1	1	1	1	1		1	1	1	90		
5532	1	1	1	1	1	1	1	1	1	1	100		
5533	1	1	1	1	1	1	1	1	1	1	100		
5534	1	1	1	1	1	1	1	1	1	1	100		
5535	1	1	1	1		1	1	1	1	1	90		
5536	1	1	1	1	1	1	1	1		1	90		
5537	1	1	1	1	1	1	1	1	1	1	100		
5538	1	1	1	1	1	1	1	1	1	1	100		
5539	1	1	1	1	1	1	1	1	1		90		
5540	1	1	1	1	1	1	1	1	1	1	100		
5541	1	1	1		1	1	1	1	1	1	90		
5542	1	1	1	1	1	1	1	1		1	90		
5543	1	1	1	1	1	1	1	1	1	1	100		
5544	1	1	1	1	1	1	1	1	1	1	100		
5545	1	1	1	1	1	1	1	1	1	1	100		
5546	1	1	1	1	1	1	1	1	1	1	100		
5547		1	1	1	1	1	1	1	1	1	90		
5548	1	1	1	1	1	1	1	1	1	1	100		
5549	1	1	1	1	1	1	1	1		1	90		
5550	1	1	1	1	1	1	1	1	1	1	100		
5551	1	1	1	1	1	1	1	1	1	1	100		
5552	1	1	1	1	1	1	1	1	1		90		
5553	1	1	1	1	1	1	1	1	1	1	100		
5554	1	1	1	1	1	1	1	1	1	1	100		
5555	1	1	1	1	1	1	1	1	1	1	100		
5556	1	1	1	1	1	1	1	1	1	1	100		
5557	1		1	1	1	1	1	1	1	1	90		
5558	1	1	1	1	1	1	1	1	1	1	100		
5559	1	1	1		1	1	1	1	1	1	90		
5560	1	1	1	1	1	1	1	1	1	1	100		
5561	1	1	1	1	1	1	1	1	1	1	100		
5562	1	1	1		1	1	1	1	1	1	90		
5563	1	1	1	1	1		1	1	1	1	90		
5564	1	1	1	1	1	1	1	1	1	1	100		
5565	1	1	1	1	1	1	1	1	1	1	100		
5566	1	1		1	1	1	1	1	1	1	90		
5567	1	1	1		1	1	1	1	1	1	90		
5568	1		1	1	1	1	1	1	1	1	90		
5569	1	1	1	1	1	1	1	1	1	1	100		
5570	1	1	1	1	1	1	1	1	1	1	100		

Table 5-13. 80MHz UNII Detection Bandwidth Data

5.4 Channel Availability Check Time

5.4.1 Initial Channel Availability Check Time

The Initial *Channel Availability Check Time* tests that the UUT does not emit beacon, control, or data signals on the test *Channel* until the power-up sequence has been completed and the U-NII device checks for *Radar Waveforms* for one minute on the test *Channel*. This test does not use any *Radar Waveforms* and only needs to be performed one time.

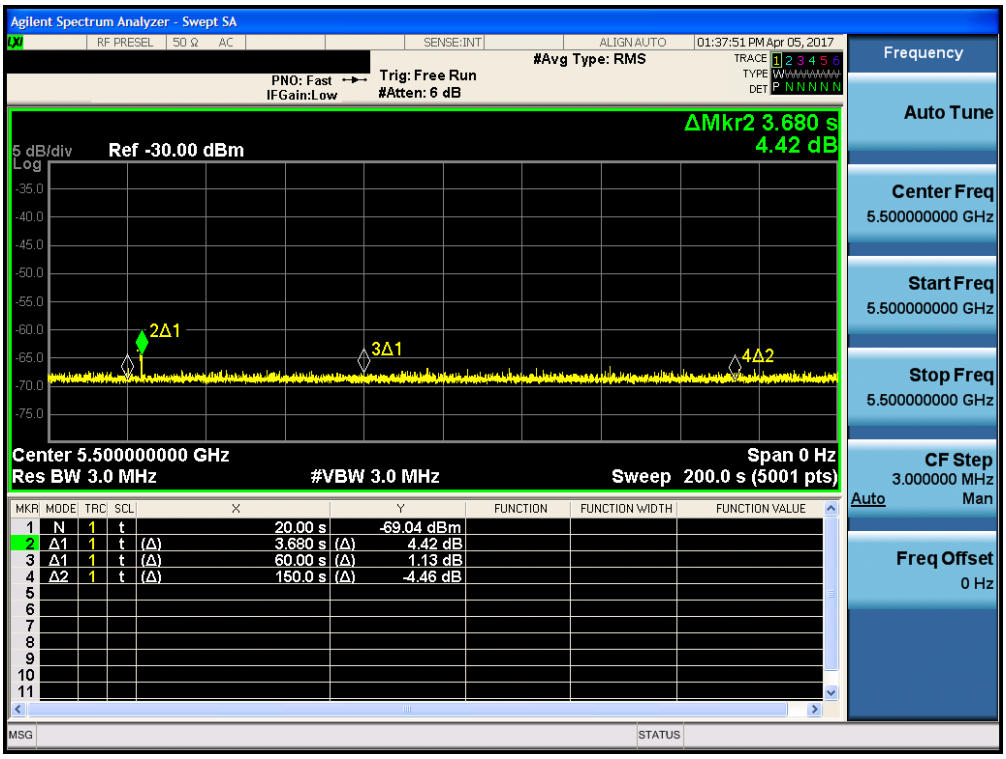


Plot 5-14. Initial CAC Time

Note: Marker 1 is set at the end of the power-up sequence. Marker 2 is set at the beginning of the data transmissions.

5.4.2 Radar Burst at the Beginning of the Channel Availability Check Time

The plot below verifies successful radar detection on the test *Channel* during a period equal to the *Channel Availability Check Time* and avoidance of operation on that *Channel* when a radar *Burst* with a level equal to the *DFS Detection Threshold* + 1 dB occurs at the beginning of the *Channel Availability Check Time*.



Plot 5-15. Radar Burst at Beginning CAC Time

Note:

1. Marker 1 is set at the end of the power-up sequence. Marker 2 is set at the radar burst. Marker 3 is set 60 sec after power-up (CAC period). Marker 4 is set 2.5 min after radar burst.

2. Radar Type 0 was used for this test.

5.4.3 Radar Bust at the End of the Channel Availability Check Time

The plot below verifies successful radar detection on the test *Channel* during a period equal to the *Channel Availability Check Time* and avoidance of operation on that *Channel* when a radar *Burst* with a level equal to the *DFS Detection Threshold* + 1dB occurs at the end of the *Channel Availability Check Time*.

Plot 5-16. Radar Burst at End of CAC Time

Note:

1. Marker 1 is set at the end of the power-up sequence. Marker 2 is set at the radar burst. Marker 3 is set 60 sec after power-up (CAC period). Marker 4 is set 2.5 min after radar burst.

2. Radar Type 0 was used for this test.

5.5 In-Service Monitoring

5.5.1 Channel Move Time and Channel Closing Transmission Time

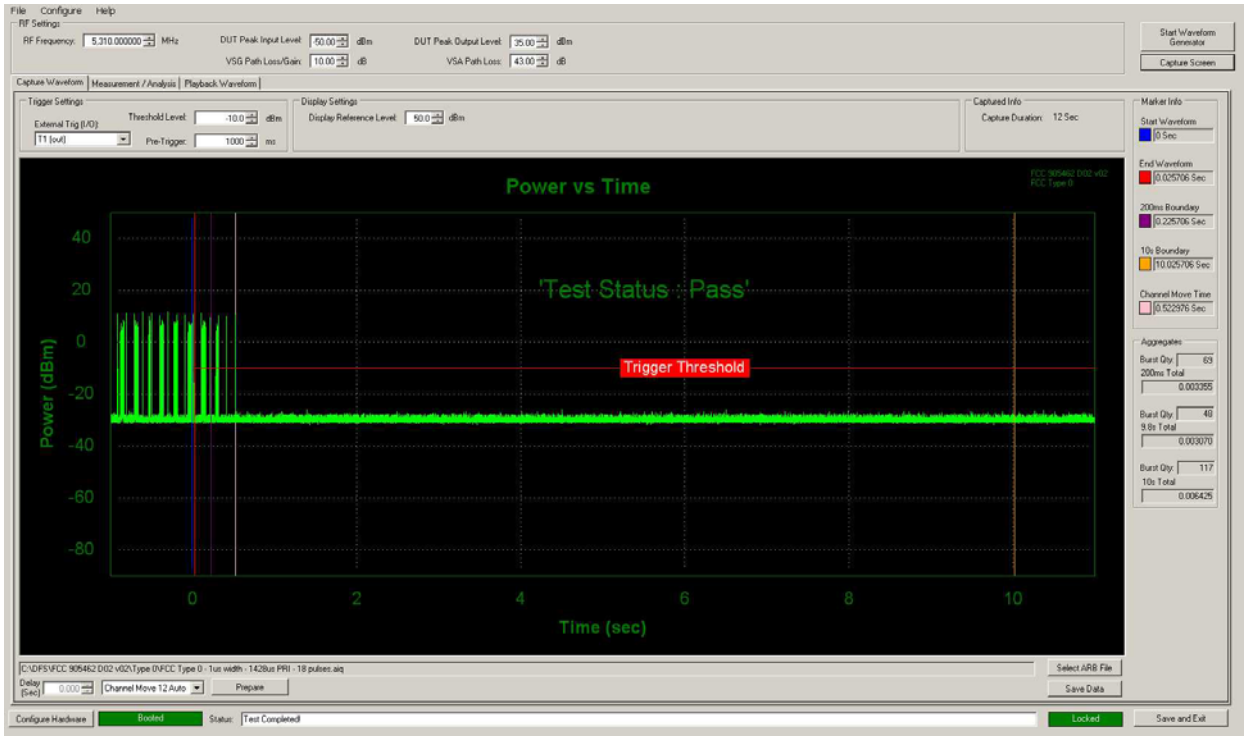
While the master is associated with a client and actively streaming a video file to the client, channel move time and channel closing transmission time ensures that the master EUT device detects the radar and changes channels within the required amount of time. Per KDB 905462, radar type 0 was used for this test. Please see the following definitions and summary table.

Channel Move Time: The time to cease all transmissions on the current *Channel* upon detection of a *Radar Waveform* above the *DFS Detection Threshold*.

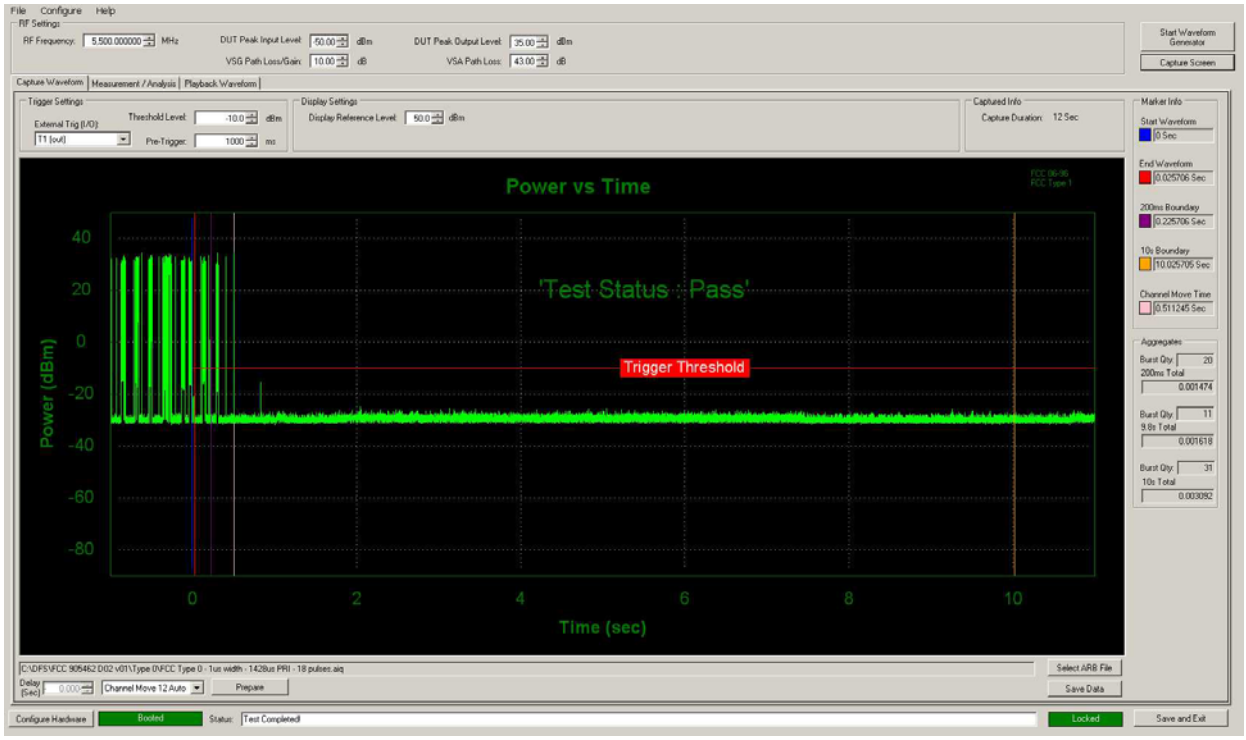
Channel Closing Transmission Time: The total duration of transmissions, consisting of data signals and the aggregate of control signals, by a U-NII device during the *Channel Move Time.* This is also called "Aggregate Time."

	Parameter	Measured	Limit	Result
5260 – 5320 MHz UNII – 2A Band	Channel Move Time	0.52 s	10 seconds	Pass
	Channel Closing Transmission Time	< 200ms + 3.07 ms (aggregate)	200ms + aggregate of 60ms over remaining 10 second period	Pass
	Client beacon test	Monitored for 30 minutes with no client transmission	No client transmission occurred	Pass
5470 – 5725 MHz UNII – 2C Band	Channel Move Time	0.51 s	10 seconds	Pass
	Channel Closing Transmission Time	< 200ms + 1.62 ms (aggregate)	200ms + aggregate of 60ms over remaining 10 second period	Pass
	Client beacon test	Monitored for 30 minutes with no client transmission	No client transmission occurred	Pass

Table 5-2. In-Service Monitoring Summary Table



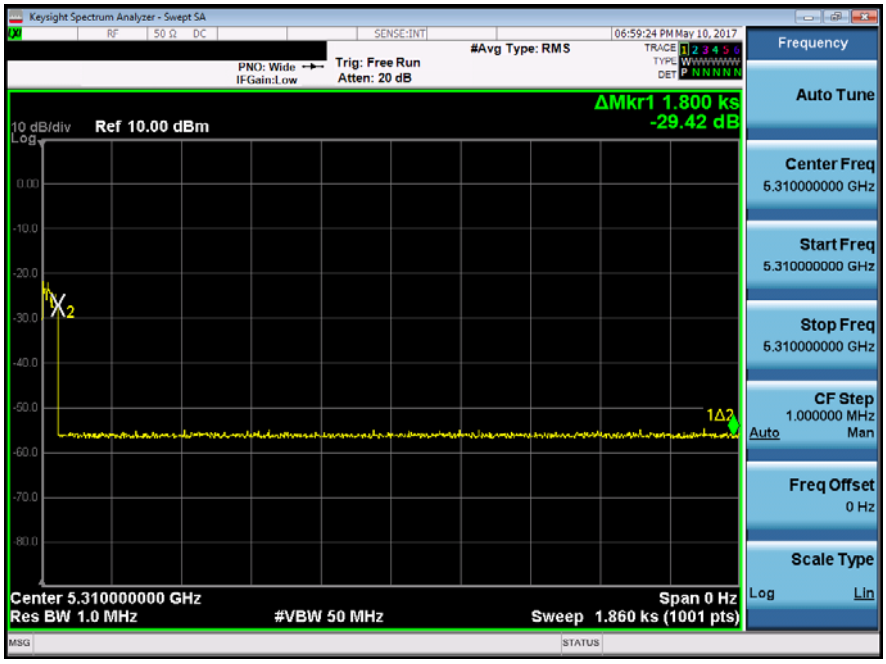
Plot 5-17. Band 2A Channel Move Time and Aggregate Time



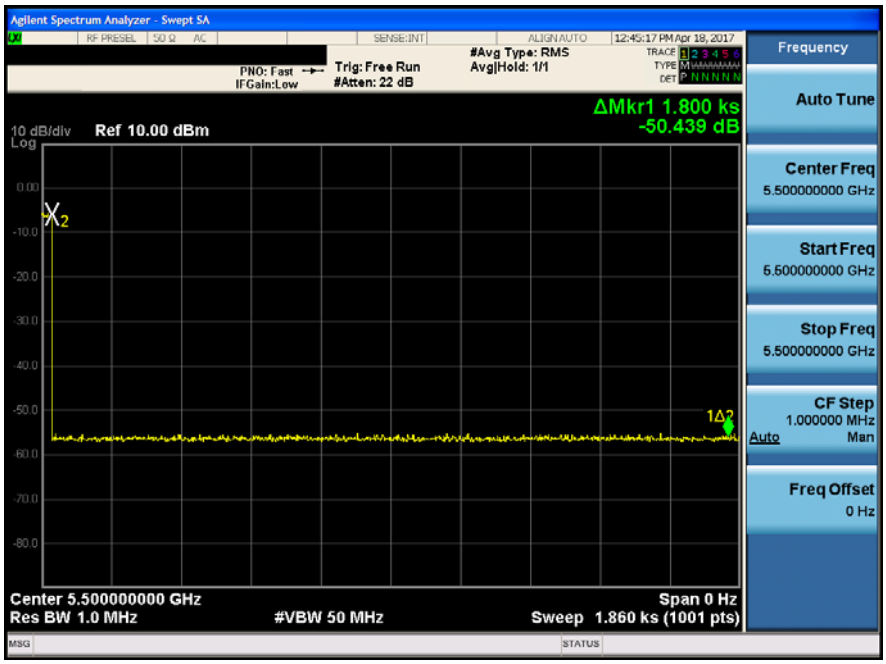
Plot 5-18. Band 2C Channel Move Time and Aggregate Time

5.5.2 Non-Occupancy Period

After the 10 seconds monitored in Channel Move Time, the EUT is monitored for an additional 30 minutes to verify that the EUT does not resume any transmissions on the channel.



Plot 5-19. Band 2A Non-Occupancy Period - Monitoring Live Spectrum Elapsed time - 30 minutes



Plot 5-20. Band 2C Non-Occupancy Period - Monitoring Live Spectrum Elapsed time - 30 minutes

5.6 Statistical Performance Check

The statistical performance check is performed to determine the minimum percentage of successful detection requirements found in KDB 905462 when a radar burst with a level equal to the *DFS Detection Threshold* + 1dB is generated on the *Operating Channel* of the U-NII device *(In- Service Monitoring).* For each trial, while the master device (EUT) is associated and streaming data to the client device, a radar waveform is transmitted to the master and the EUT's ability to detect the radar waveform is recorded. Test results reported in this section were performed on channel 100 (5.5 GHz). Each radar type used in the measurement trials reported herein conforms with the Radar Test Waveform definitions of Section 6 of KDB 905462.

Trial #	Pulses	PW (Microseconds)	PRI (Microseconds)	Detection ?	Detection Percentage	Limit
1	102	1	518	1	87%	60%
2	99	1	538	1		
3	95	1	558	1		
4	92	1	578	1		
5	89	1	598	1		
6	86	1	618	0		
7	83	1	638	1		
8	81	1	658	1		
9	78	1	678	1		
10	76	1	698	1		
11	74	1	718	1		
12	72	1	738	1		
13	70	1	758	1		
14	67	1	798	1		
15	65	1	818	1		
16	58	1	919	1		
17	50	1	1057	0		
18	42	1	1258	1		
19	41	1	1302	0		
20	40	1	1347	1		
21	39	1	1358	0		
22	38	1	1395	1		
23	38	1	1423	1		
24	35	1	1509	1		
25	35	1	1528	1		
26	27	1	1964	1		
27	26	1	2102	1		
28	24	1	2206	1		
29	20	1	2777	1		
30	18	1	2950	1		

Table 5-21. Radar Type 1A/1B Statistical Performance (Ch. 100)

Trial #	Pulses	PW (Microseconds)	PRI (Microseconds)	Detection ?	Detection Percentage	Limit
1	27	4.1	151	1	97%	60%
2	23	4.1	165	1		
3	25	4.2	191	1		
4	23	4.3	195	1		
5	28	4.3	206	1		
6	26	4.8	208	1		
7	28	4.8	222	1		
8	23	3.1	168	1		
9	26	3.2	224	1		
10	24	3.4	187	1		
11	26	3.4	211	1		
12	24	3.4	225	1		
13	24	3.5	180	1		
14	24	3.7	191	1		
15	24	3.8	201	1		
16	23	2.1	208	1		
17	27	2.1	229	1		
18	26	2.2	164	1		
19	28	2.3	181	0		
20	25	2.4	152	1		
21	27	2.6	217	1		
22	23	2.8	177	1		
23	24	2.9	183	1		
24	29	1	192	1		
25	23	1.1	221	1		
26	25	1.5	204	1		
27	26	1.6	191	1		
28	27	1.7	168	1		
29	23	1.7	208	1		
30	25	1.8	197	1		

Table 5-22. Radar Type 2 Statistical Performance (Ch. 100)

Trial #	Pulses	PW (Microseconds)	PRI (Microseconds)	Detection ?	Detection Percentage	Limit
1	18	10	347	1	97%	60%
2	18	6	378	1		
3	16	6.3	379	1		
4	18	6.3	419	1		
5	18	6.6	257	0		
6	16	6.6	335	1		
7	18	6.8	306	1		
8	18	6.9	394	1		
9	18	7	296	1		
10	16	7	343	1		
11	17	7.1	225	1		
12	16	7.3	210	1		
13	17	7.3	387	1		
14	17	7.5	279	1		
15	18	7.5	310	1		
16	17	7.7	380	1		
17	17	7.8	436	1		
18	17	7.9	304	1		
19	17	8	396	1		
20	18	8.2	326	1		
21	16	8.2	379	1		
22	17	8.3	264	1		
23	17	8.7	400	1		
24	16	9	217	1		
25	16	9	450	1		
26	18	9.1	256	1		
27	18	9.1	396	1		
28	16	9.2	466	1		
29	16	9.3	483	1		
30	18	9.4	329	1		

Table 5-23. Radar Type 3 Statistical Performance (Ch. 100)

Trial #	Pulses	PW (Microseconds)	PRI (Microseconds)	Detection ?	Detection Percentage	Limit
1	13	11.3	459	1		
2	15	11.6	415	1		
3	13	12	223	1		
4	14	1.6	200	1		
5	15	12.6	323	1		
6	16	13.3	412	1		
7	12	13.5	270	1		
8	15	13.7	469	1		
9	14	14.1	226	1		
10	16	14.3	377	1		
11	15	15	249	1		
12	13	15.1	393	1		
13	15	15.3	496	1		
14	12	15.4	373	1		
15	15	15.5	224	1	97%	60%
16	16	15.9	373	1		
17	16	15.9	426	1		
18	12	16.1	423	1		
19	12	16.8	434	1		
20	16	17.6	433	0		
21	15	17.8	438	1		
22	15	18.1	263	1		
23	15	18.3	330	1		
24	12	18.4	327	1		
25	12	18.6	480	1		
26	15	18.7	270	1		
27	13	19.5	280	1		
28	12	19.8	324	1		
29	14	19.9	248	1		
30	15	20	304	1		

Table 5-24. Radar Type 4 Statistical Performance (Ch. 100)

Radar Type	Number of Trials	Number of Successful Detections	Percentage of Successful Detection
1	30	26	87%
2	30	29	97%
3	30	29	97%
4	30	29	97%
Aggregate (87 + 97 + 97 + 97)/4 = 94.5%; Minimum = 80%			

Table 5-25.Aggregate (Radar Types 1-4)

	Trial #	Chirp Width [MHz]	Center Frequency [MHz]	Detection ?	Detection Percentage	Limit
Subset 1 (100% Overlap)	1	10	5500	1	100%	80%
	2	15	5500	1		
	3	20	5500	1		
	4	19	5500	1		
	5	16	5500	1		
	6	12	5500	1		
	7	8	5500	1		
	8	8	5500	1		
	9	8	5500	1		
	10	14	5500	1		
Subset 2 (90% Overlap at Low Edge of Band)	11	9	5495.2	1		
	12	10	5495.6	1		
	13	15	5497.6	1		
	14	6	5494	1		
	15	13	5496.8	1		
	16	18	5498.8	1		
	17	18	5498.8	1		
	18	20	5499.6	1		
	19	17	5498.4	1		
	20	8	5494.8	1		
Subset 3 (90% Overlap at Upper Edge of Band)	21	18	5501.3	1		
	22	15	5502.5	1		
	23	20	5500.5	1		
	24	14	5502.9	1		
	25	16	5502.1	1		
	26	12	5503.7	1		
	27	16	5502.1	1		
	28	14	5502.9	1		
	29	11	5504.1	1		
	30	18	5501.3	1		

Table 5-26. Radar Type 5 Statistical Performance (Ch. 100)

Trial #	USA Bin 6 Radar	Detection ?	Detection Percentage	Limit
1	001	1	100%	80%
2	002	1		
3	003	1		
4	004	1		
5	005	1		
6	006	1		
7	007	1		
8	008	1		
9	009	1		
10	010	1		
11	011	1		
12	012	1		
13	013	1		
14	014	1		
15	015	1		
16	016	1		
17	017	1		
18	018	1		
19	019	1		
20	020	1		
21	021	1		
22	022	1		
23	023	1		
24	024	1		
25	025	1		
26	026	1		
27	027	1		
28	028	1		
29	029	1		
30	030	1		

Table 5-27. Radar Type 6 Statistical Performance (Ch. 100)

6.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Samsung Indoor Access Point FCC ID: A3LETWV520** is in compliance with the DFS requirements for a Master Device in accordance with Part 15.407 of the FCC Rules.