DFS PORTION of FCC 47 CFR PART 15 SUBPART E
DFS PORTION of INDUSTRY CANADA RSS-247 ISSUE 1

CERTIFICATION TEST REPORT

FOR

PLAYBAR

MODEL NUMBER: PLAYBAR

FCC ID: SBVRM006
IC: 5373A-RM006

REPORT NUMBER: 15U22236-E1V1

ISSUE DATE: JANUARY 29, 2016

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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
V1	01/29/16	Initial Issue	C. Cheung

TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS 4

2. TEST METHODOLOGY 5

3. FACILITIES AND ACCREDITATION 5

4. CALIBRATION AND UNCERTAINTY 5

4.1. MEASURING INSTRUMENT CALIBRATION 5

4.2. SAMPLE CALCULATION 5

4.3. MEASUREMENT UNCERTAINTY 5

5. DYNAMIC FREQUENCY SELECTION 6

5.1. OVERVIEW 6

5.1.1. LIMITS 6
5.1.2. TEST AND MEASUREMENT SYSTEM 10
5.1.3. SETUP OF EUT 13
5.1.4. DESCRIPTION OF EUT 14

5.2. RESULTS FOR 20 MHz BANDWIDTH 15

5.2.1. TEST CHANNEL 15
5.2.2. RADAR WAVEFORMS AND TRAFFIC 15
5.2.1. CHANNEL AVAILABILITY CHECK TIME 24
5.2.2. OVERLAPPING CHANNEL TESTS 29
5.2.3. MOVE AND CLOSING TIME 29
5.2.1. NON-OCCUPANCY PERIOD 34
5.2.2. DETECTION BANDWIDTH 35
5.2.3. IN-SERVICE MONITORING 37

6. BRIDGE MODE RESULTS 44

7. SETUP PHOTOS 45

1. ATTESTATION OF TEST RESULTS

COMPANY NAME: SONOS, INC.
614 CHAPALA STREET
SANTA BARBARA, CA, 93101, U.S.A.

EUT DESCRIPTION: PLAYBAR

MODEL: PLAYBAR

SERIAL NUMBER: 1502 B8-E9-37-7F-DD-A5-7

DATE TESTED: JANUARY 26, 2016

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
DFS Portion of CFR 47 Part 15 Subpart E	Pass
INDUSTRY CANADA RSS-247 Issue 1	Pass

UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Verification Services Inc. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

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EMC ENGINEER
UL Verification Services Inc.

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with the DFS portion of FCC CFR 47 Part 2, FCC CFR 47 Part 15, FCC 06-96, FCC KDB 789033, KDB 905462 D02 and D03, ANSI C63.10-2013, RSS-247 Issue 1.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 Benicia Street, Fremont, California, USA.

UL Verification Services, Inc. is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at http://ts.nist.gov/standards/scopes/2000650.htm.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)

36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	± 3.52 dB
Radiated Disturbance, 30 to 1000 MHz	± 4.94 dB
Radiated Disturbance, 1 to 6 GHz	± 3.86 dB
Radiated Disturbance, 6 to 18 GHz	± 4.23 dB
Radiated Disturbance, 18 to 26 GHz	± 5.30 dB
Radiated Disturbance, 26 to 40 GHz	± 5.23 dB

Uncertainty figures are valid to a confidence level of 95%.

5. DYNAMIC FREQUENCY SELECTION

5.1. OVERVIEW

5.1.1. LIMITS

INDUSTRY CANADA

IC RSS-247 is closely harmonized with FCC Part 15 DFS rules. The deviations are as follows:

RSS-247 Issue 1

Note: For the band 5600–5650 MHz, no operation is permitted.

Until further notice, devices subject to this annex shall not be capable of transmitting in the band 5600–5650 MHz. This restriction is for the protection of Environment Canada weather radars operating in this band.

FCC

§15.407 (h), FCC KDB 905462 D02 “COMPLIANCE MEASUREMENT PROCEDURES FOR UNLICENSED-NATIONAL INFORMATION INFRASTRUCTURE DEVICES OPERATING IN THE 5250-5350 MHz AND 5470-5725 MHz BANDS INCORPORATING DYNAMIC FREQUENCY SELECTION” and KDB 905462 D03 “U-NII CLIENT DEVICES WITHOUT RADAR DETECTION CAPABILITY”.

Table 1: Applicability of DFS requirements prior to use of a channel

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 2: Applicability of DFS requirements during normal operation

Requirement	Operational Mode		
	Master	Client **(without DFS)**	Client **(with DFS)**
DFS Detection Threshold	Yes	Not required	Yes
Channel Closing Transmission Time	Yes	Yes	Yes
Channel Move Time	Yes	Yes	Yes
U-NII Detection Bandwidth	Yes	Not required	Yes

Additional requirements for devices with multiple bandwidth modes	Master Device or Client with Radar DFS	Client (without DFS)
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 all 20 MHz channel blocks and a null frequency between the bonded 20 MHz channel blocks.		

Table 3: Interference Threshold values, Master or Client incorporating In-Service Monitoring

Maximum Transmit Power	Value (see notes)
E.I.R.P. ≥ 200 mill watt	-64 dBm
E.I.R.P. < 200 mill watt and power spectral density < 10 dBm/MHz	-62 dBm
E.I.R.P. < 200 mill watt that do not meet 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: E.I.R.P. is based on the highest antenna gain. For MIMO devices refer to KDB publication 662911 D01.

Table 4: DFS Response requirement values

Parameter	Value
Non-occupancy period	30 minutes
Channel Availability Check Time	60 seconds
Channel Move Time	10 seconds (See Note 1)
Channel Closing Transmission Time	200 milliseconds + approx. 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 5 – Short Pulse Radar Test Waveforms

Radar Type	Pulse Width (usec)	PRI (usec)	Pulses	Minimum Percentage of Successful Detection	Minimum 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: {(1/360) x (19 x 10^6 PRI_{usec})}	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 6 – Long Pulse Radar Test Signal

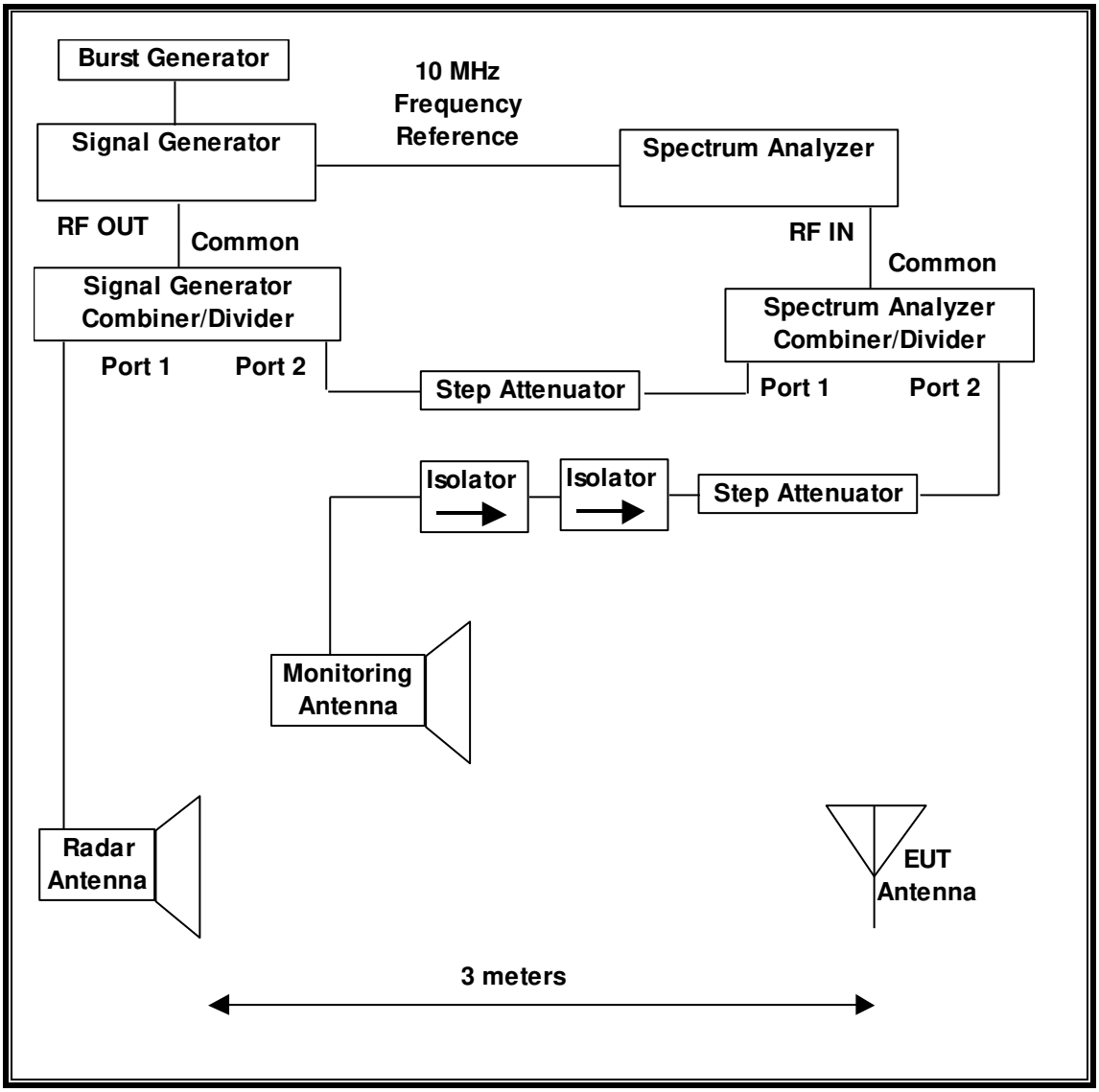
Radar Waveform Type	Pulse Width (µsec)	Chirp Width (MHz)	PRI (µsec)	Pulses per Burst	Number of Bursts	Minimum Percentage of Successful Detection	Minimum Trials
5	50-100	5-20	1000-2000	1-3	8-20	80%	30

Table 7 – Frequency Hopping Radar Test Signal

Radar Waveform 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	0.333	300	70%	30

5.1.2. TEST AND MEASUREMENT SYSTEM

RADIATED METHOD SYSTEM BLOCK DIAGRAM



SYSTEM OVERVIEW

The short pulse and long pulse signal generating system utilizes the NTIA software. The Vector Signal Generator has been validated by the NTIA. The hopping signal generating system utilizes the CCS simulated hopping method and system, which has been validated by the DoD, FCC and NTIA. The software selects waveform parameters from within the bounds of the signal type on a random basis using uniform distribution.

The short pulse types 1, 2, 3 and 4, and the long pulse type 5 parameters are randomized at run-time.

The hopping type 6 pulse parameters are fixed while the hopping sequence is based on the August 2005 NTIA Hopping Frequency List. The initial starting point randomized at run-time and each subsequent starting point is incremented by 475. Each frequency in the 100-length segment is compared to the boundaries of the EUT Detection Bandwidth and the software creates a hopping burst pattern in accordance with Section 7.4.1.3 Method #2 Simulated Frequency Hopping Radar Waveform Generating Subsystem of KDB 905462 D02. The frequency of the signal generator is incremented in 1 MHz steps from F_L to F_H for each successive trial. This incremental sequence is repeated as required to generate a minimum of 30 total trials and to maintain a uniform frequency distribution over the entire Detection Bandwidth.

The signal monitoring equipment consists of a spectrum analyzer. The aggregate ON time is calculated by multiplying the number of bins above a threshold during a particular observation period by the dwell time per bin, with the analyzer set to peak detection and max hold.

SYSTEM CALIBRATION

A 50-ohm load is connected in place of the spectrum analyzer, and the spectrum analyzer is connected to a horn antenna via a coaxial cable, with the reference level offset set to (horn antenna gain – coaxial cable loss). The signal generator is set to CW mode. The amplitude of the signal generator is adjusted to yield a level of –64 dBm as measured on the spectrum analyzer.

Without changing any of the instrument settings, the spectrum analyzer is reconnected to the Common port of the Spectrum Analyzer Combiner/Divider. The Reference Level Offset of the spectrum analyzer is adjusted so that the displayed amplitude of the signal is –64 dBm.

The spectrum analyzer displays the level of the signal generator as received at the antenna ports of the Master Device. The interference detection threshold may be varied from the calibrated value of –64 dBm and the spectrum analyzer will still indicate the level as received by the Master Device.

ADJUSTMENT OF DISPLAYED TRAFFIC LEVEL

A link is established between the Master and Slave and the distance between the units is adjusted as needed to provide a suitable received level at the Master and Slave devices. The video test file is streamed to generate WLAN traffic. The monitoring antenna is adjusted so that the WLAN traffic level, as displayed on the spectrum analyzer, is at lower amplitude than the radar detection threshold.

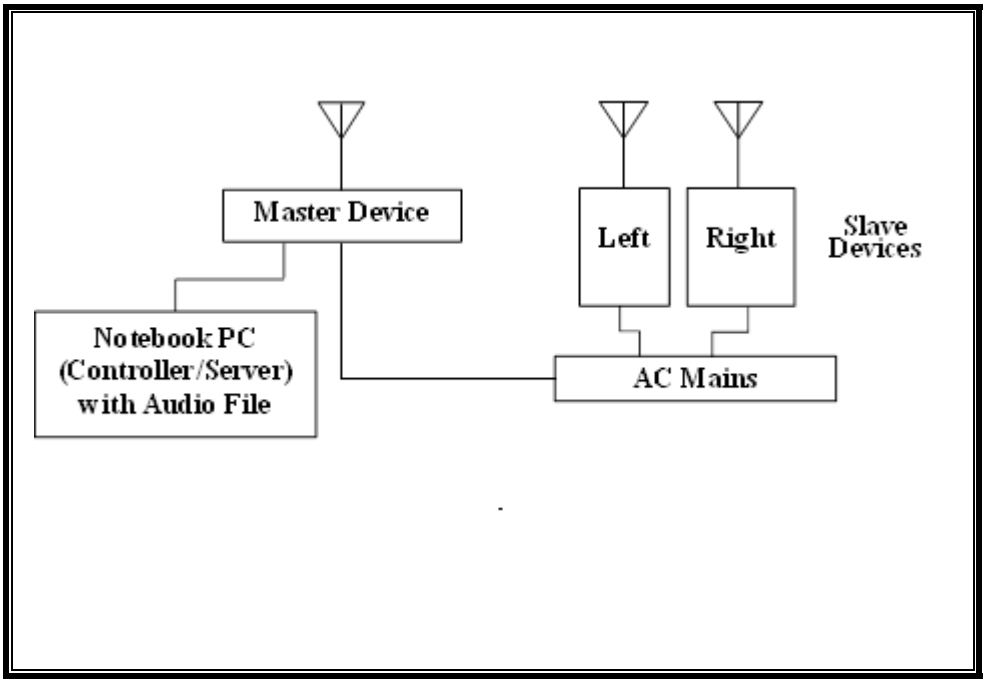
TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the DFS tests documented in this report:

TEST EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	Cal Due
Spectrum Analyzer, PXA, 3Hz to 44GHz	Keysight	N9030A	US51350187	06/01/16
Signal Generator, MXG X-Series RF Vector	Agilent	N5172B	MY51350337	02/17/16
Arbitrary Waveform Generator	Agilent / HP	33220A	MY44037572	04/08/16

5.1.3. SETUP OF EUT

RADIATED METHOD EUT TEST SETUP



SUPPORT EQUIPMENT

The following support equipment was utilized for the DFS tests documented in this report:

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
Notebook PC (Server/Controller)	Lenovo	Type 7454-2GU	R9-0YM4F 09/10	DoC
AC Adapter (Server/Controller PC)	Lenovo	42T4422	11S42T4422Z1ZF3D06K007	DoC
Wireless Speaker (Slave / Left)	Sonos, Inc.	Play: 1	1402 B8-E9-37-5C-04-82-9	SBVRM007
Wireless Speaker (Slave / Right)	Sonos, Inc.	Play: 1	1507 B3-E9-37-E7-87-54-C	SBVRM007
8-Port Gigabit Switch	Netgear	GS108 v3	2162343501F7F	DoC
AC Adapater (Switch)	Netgear	P030WF120B	3113332131020017AL	DoC

5.1.4. DESCRIPTION OF EUT

For FCC and IC the EUT operates over the 5250-5350 MHz and 5470-5725 MHz ranges, excluding the 5600-5650 MHz range.

The EUT is a Master Device.

The highest power level within these bands is 22.78 dBm EIRP in the 5250-5350 MHz band and 23.77 dBm EIRP in the 5470-5725 MHz band.

The highest gain antenna assembly utilized with the EUT has a gain of 5.9 dBi in the 5250-5350 MHz band and 6 dBi in the 5470-5725 MHz band. The lowest gain antenna assembly utilized with the EUT has a gain of 4 dBi in the 5250-5350 MHz band and 4.2 dBi in the 5470-5725 MHz band.

Two identical antennas are utilized to meet the diversity and MIMO operational requirements.

The rated output power of the Master unit is > 23dBm (EIRP). Therefore the required interference threshold level is –64 dBm. After correction for procedural adjustments, the required radiated threshold at the antenna port is –64 + 1 = -63 dBm.

The calibrated radiated DFS Detection Threshold level is set to –64 dBm. The tested level is lower than the required level hence it provides a margin to the limit.

The EUT uses two transmitter/receiver chains, each connected to an antenna to perform radiated tests.

The Slave device associated with the EUT during these tests does not have radar detection capability.

WLAN traffic was generated by streaming the audio file “5_GHz_Audio_Test_file.WAV” from the Master to the Slave using Sonos Controller for Home PC version 6.2 (Build 32225090 Debug Mainline) media player.

TPC is not required since the maximum EIRP is less than 500 mW (27 dBm).

The EUT utilizes the 802.11a/n architecture. One nominal channel bandwidth, 20 MHz, is implemented.

The software installed in the EUT is version 6.2 (Build 32225140SysSW).

UNIFORM CHANNEL SPREADING

This function is not required per KDB 905462.

5.2. RESULTS FOR 20 MHz BANDWIDTH

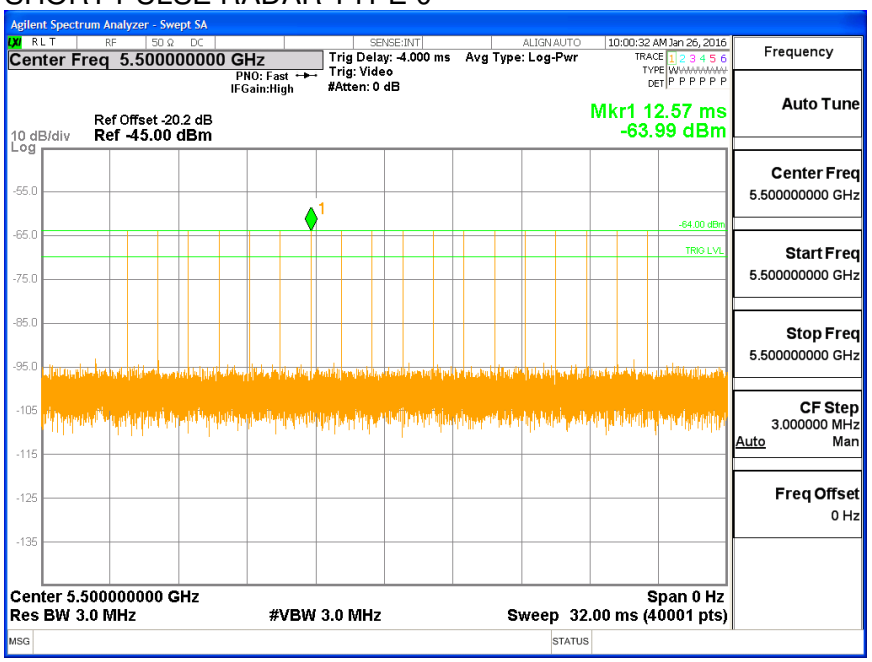
5.2.1. TEST CHANNEL

All tests were performed at a channel center frequency of 5500 MHz.

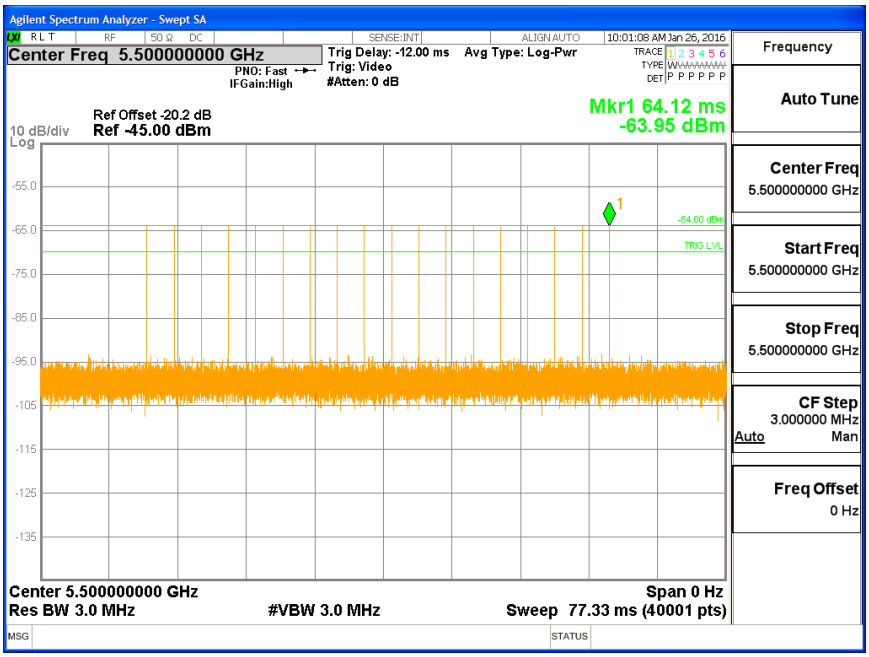
5.2.2. RADAR WAVEFORMS AND TRAFFIC

RADAR WAVEFORMS

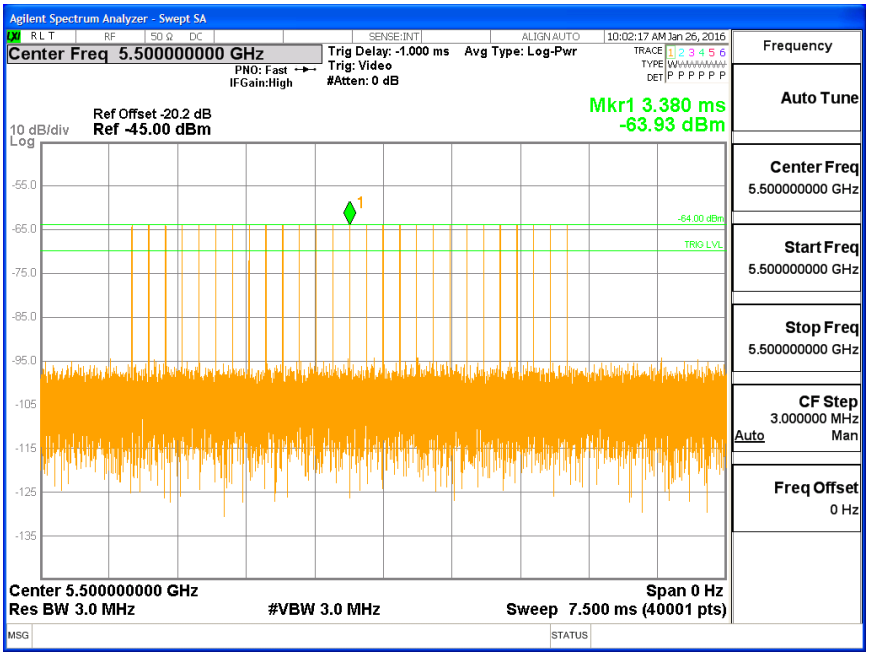
SHORT PULSE RADAR TYPE 0



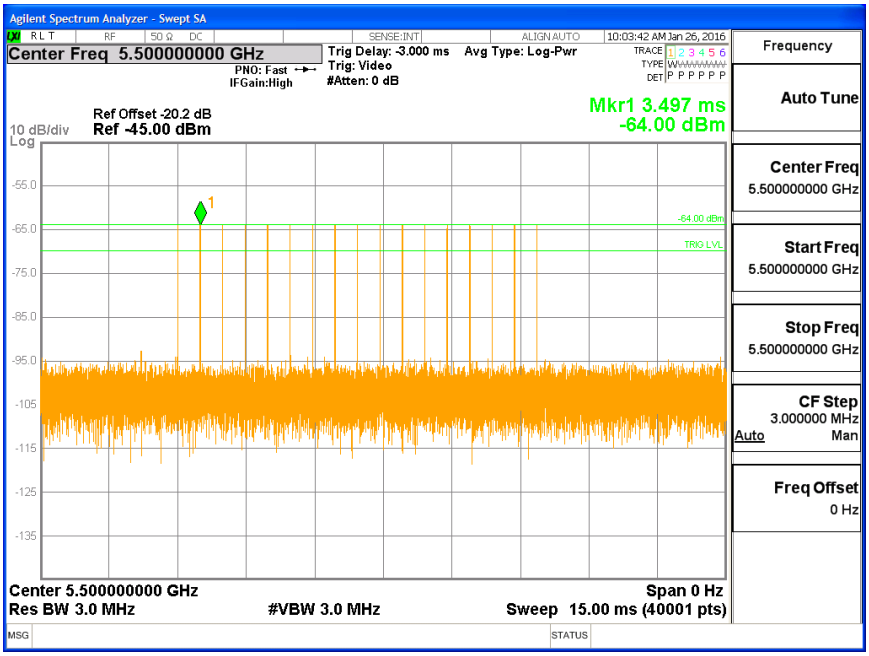
SAMPLE OF RADAR TYPE 1



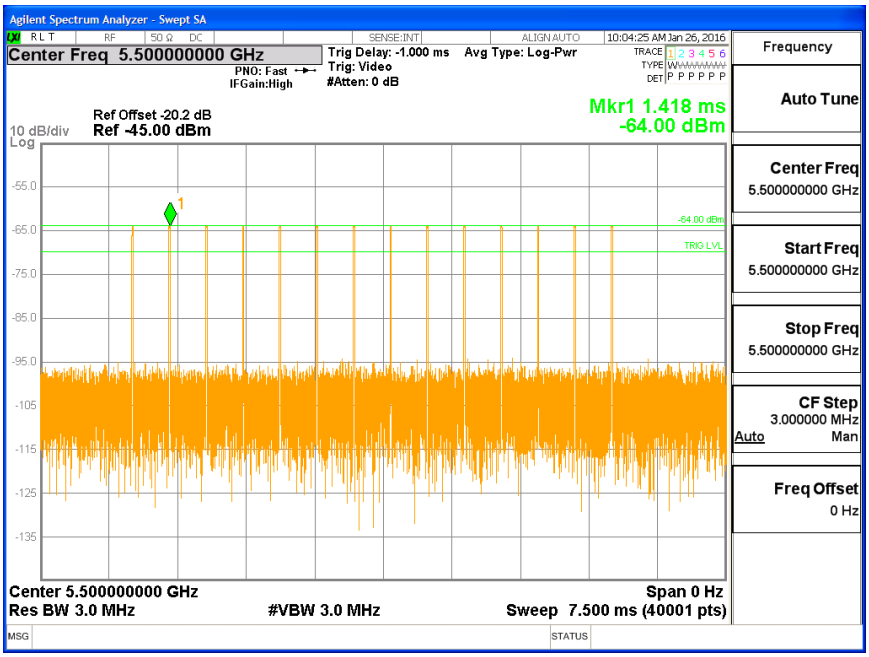
SAMPLE OF RADAR TYPE 2



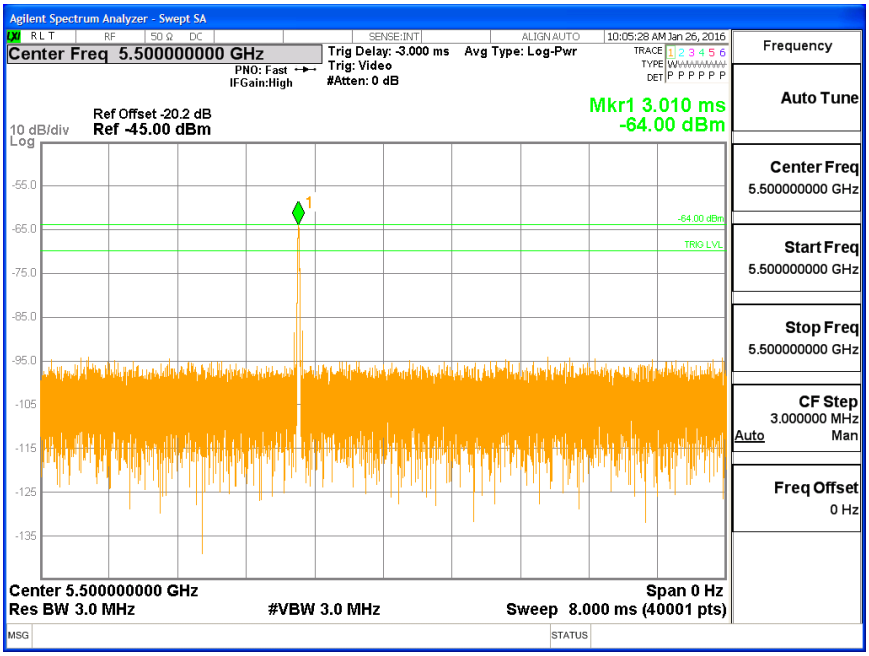
SAMPLE OF RADAR TYPE 3



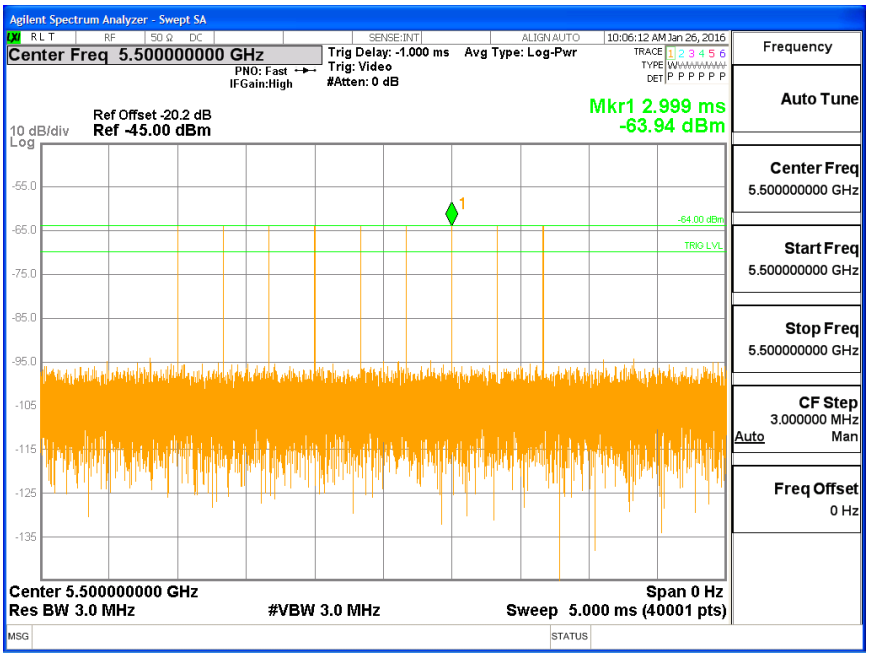
SAMPLE OF RADAR TYPE 4



SAMPLE OF SINGLE BURST OF RADAR TYPE 5

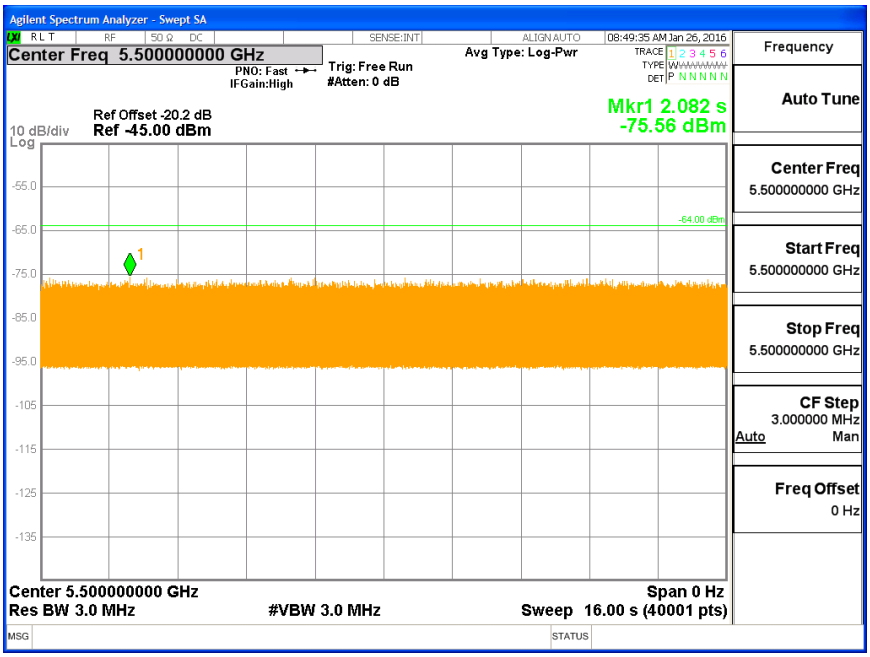


SINGLE BURST OF RADAR TYPE 6

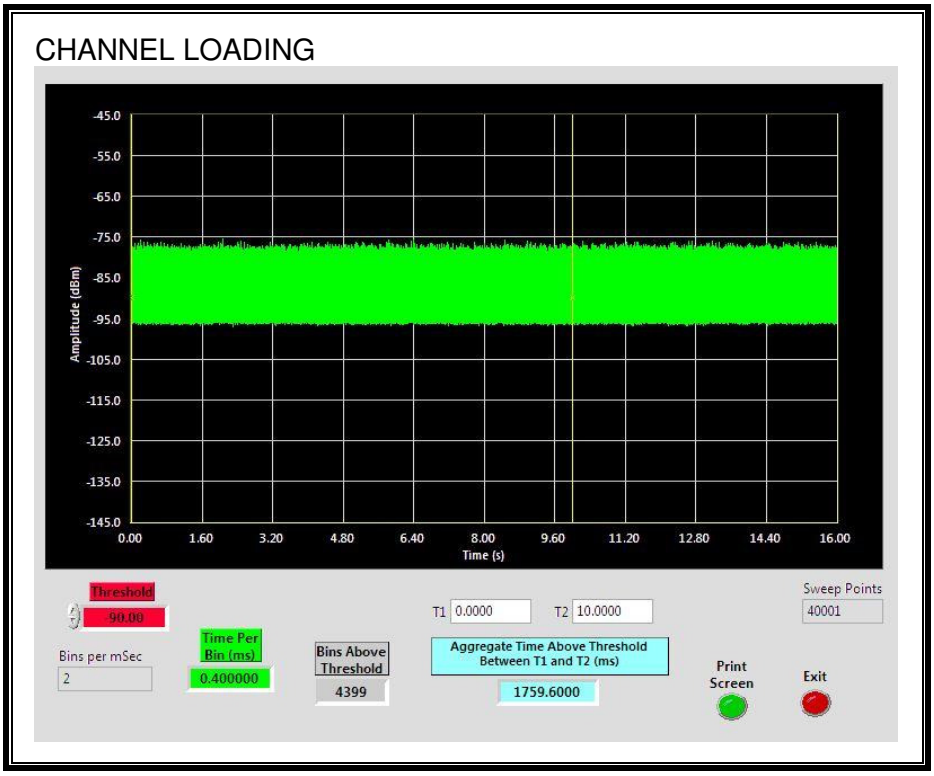


TRAFFIC

TRAFFIC



CHANNEL LOADING



The level of traffic loading on the channel by the EUT is 17.59%

5.2.1. CHANNEL AVAILABILITY CHECK TIME

PROCEDURE TO DETERMINE INITIAL POWER-UP CYCLE TIME

A link was established on channel then the EUT was rebooted. The time from the cessation of traffic to the re-initialization of traffic was measured as the time required for the EUT to complete the total power-up cycle. The time to complete the initial power-up period is 60 seconds less than this total power-up time.

PROCEDURE FOR TIMING OF RADAR BURST

With a link established on channel, the EUT was rebooted. A radar signal was triggered within 0 to 6 seconds after the initial power-up period, and transmissions on the channel were monitored on the spectrum analyzer.

The Non-Occupancy list was cleared. With a link established on channel, the EUT was rebooted. A radar signal was triggered within 54 to 60 seconds after the initial power-up period, and transmissions on the channel were monitored on the spectrum analyzer.

QUANTITATIVE RESULTS

No Radar Triggered

Timing of Reboot (sec)	Timing of Start of Traffic (sec)	Total Power-up Cycle Time (sec)	Initial Power-up Cycle Time (sec)
30.31	127.8	97.5	37.5

Radar Near Beginning of CAC

Timing of Reboot (sec)	Timing of Radar Burst (sec)	Radar Relative to Reboot (sec)	Radar Relative to Start of CAC (sec)
30.95	71.28	40.3	2.8

Radar Near End of CAC

Timing of Reboot (sec)	Timing of Radar Burst (sec)	Radar Relative to Reboot (sec)	Radar Relative to Start of CAC (sec)
30.35	124.7	94.4	56.9

QUALITATIVE RESULTS

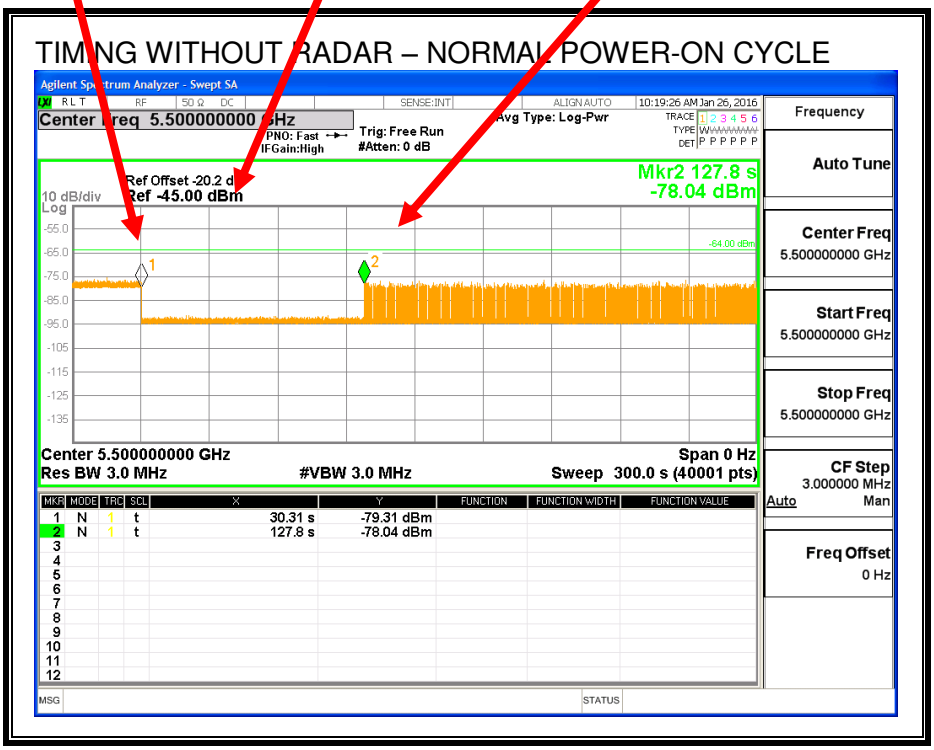
Timing of Radar Burst	Display on Control Computer	Spectrum Analyzer Display
No Radar Triggered	EUT marks Channel as active	Transmissions begin on channel after completion of the initial power-up cycle and the CAC
Within 0 to 6 second window	EUT indicates radar detected	No transmissions on channel
Within 54 to 60 second window	EUT indicates radar detected	No transmissions on channel

TIMING WITHOUT RADAR DURING CAC

AP is rebooted
Traffic ceases
Start of Initial Power-up cycle

End of Initial Power-up cycle
Start of CAC

End of CAC
Traffic is Initiated



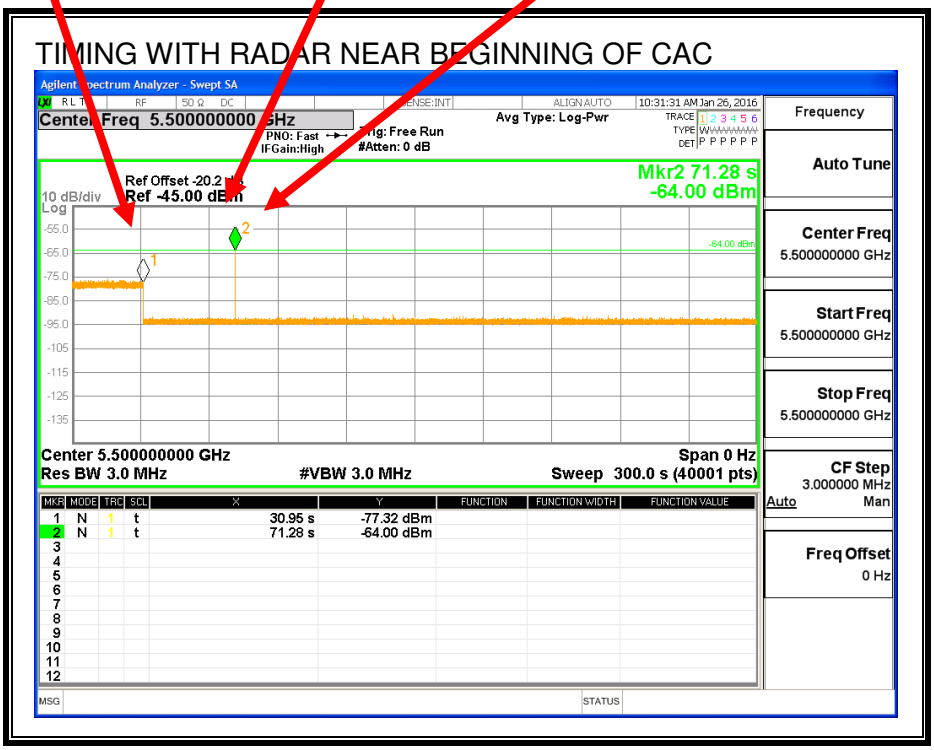
Transmissions begin on channel after completion of the initial power-up cycle and the CAC.

TIMING WITH RADAR NEAR BEGINNING OF CAC

AP is rebooted
Traffic ceases
Start of Initial Power-up cycle

End of Initial Power-up cycle
Start of CAC

Radar Signal Applied



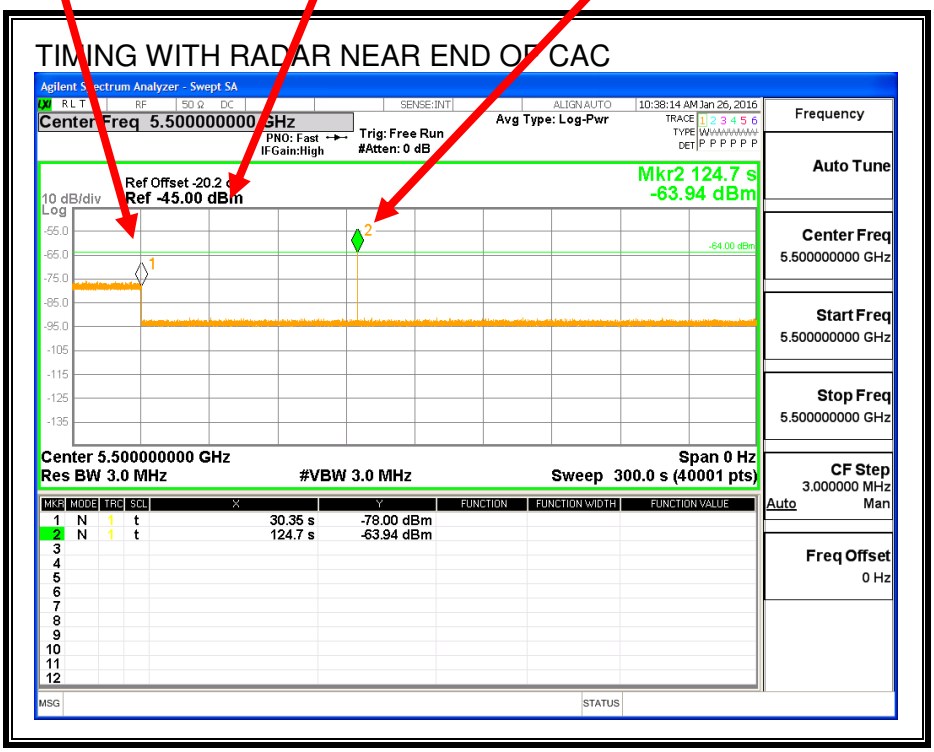
No EUT transmissions were observed after the radar signal.

TIMING WITH RADAR NEAR END OF CAC

AP is rebooted
Traffic ceases
Start of Initial Power-up cycle

End of Initial Power-up cycle
Start of CAC

Radar Signal Applied



No EUT transmissions were observed after the radar signal.

5.2.2. OVERLAPPING CHANNEL TESTS

RESULTS

The channel spacing is not less than the channel bandwidth therefore the EUT does not have an overlapping channel plan.

5.2.3. MOVE AND CLOSING TIME

REPORTING NOTES

The reference marker is set at the end of last radar pulse.

The delta marker is set at the end of the last WLAN transmission following the radar pulse. This delta is the channel move time.

The aggregate channel closing transmission time is calculated as follows:

Aggregate Transmission Time =
(Number of analyzer bins showing transmission) * (dwell time per bin)

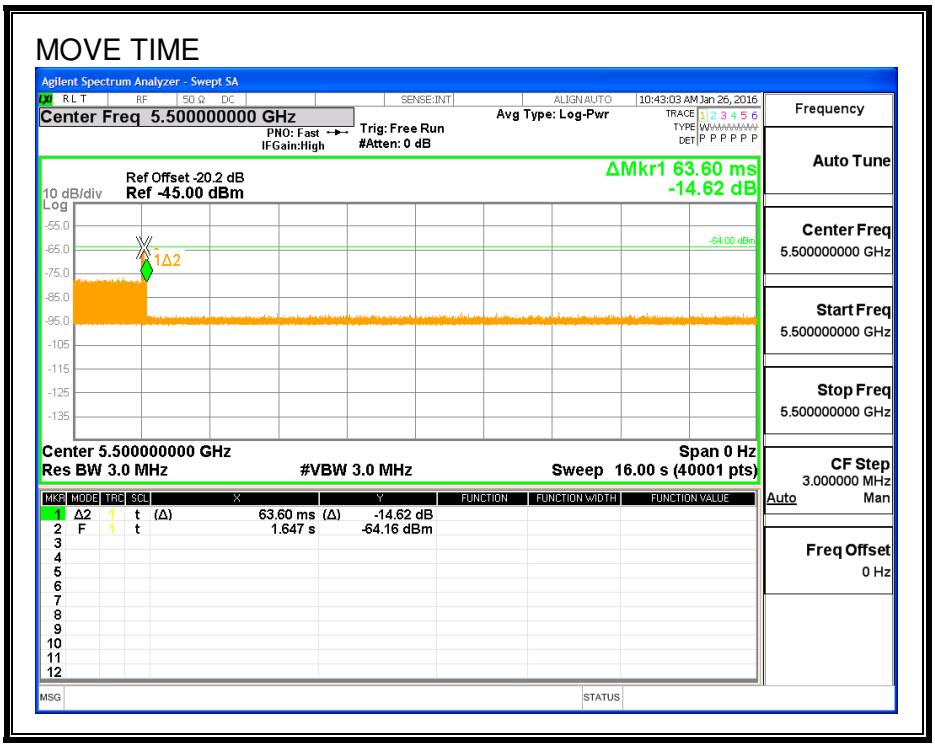
The observation period over which the aggregate time is calculated begins at (Reference Marker + 200 msec) and ends no earlier than (Reference Marker + 10 sec).

RESULTS

Channel Move Time (sec)	Limit (sec)
0.0636	10

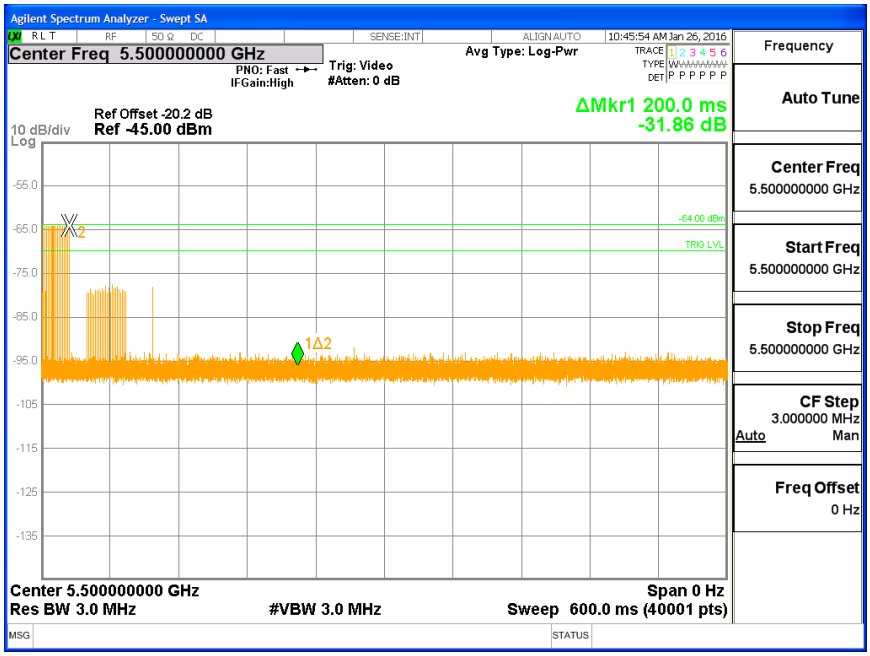
Aggregate Channel Closing Transmission Time (msec)	Limit (msec)
0.0	60

MOVE TIME



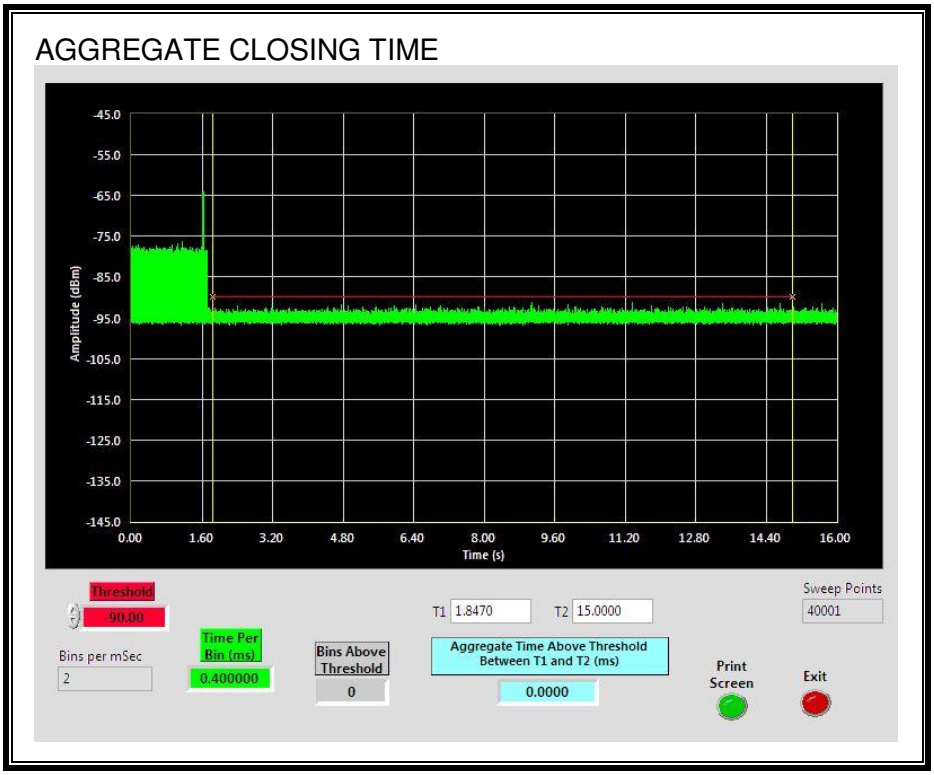
CHANNEL CLOSING TIME

CLOSING TIME



AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

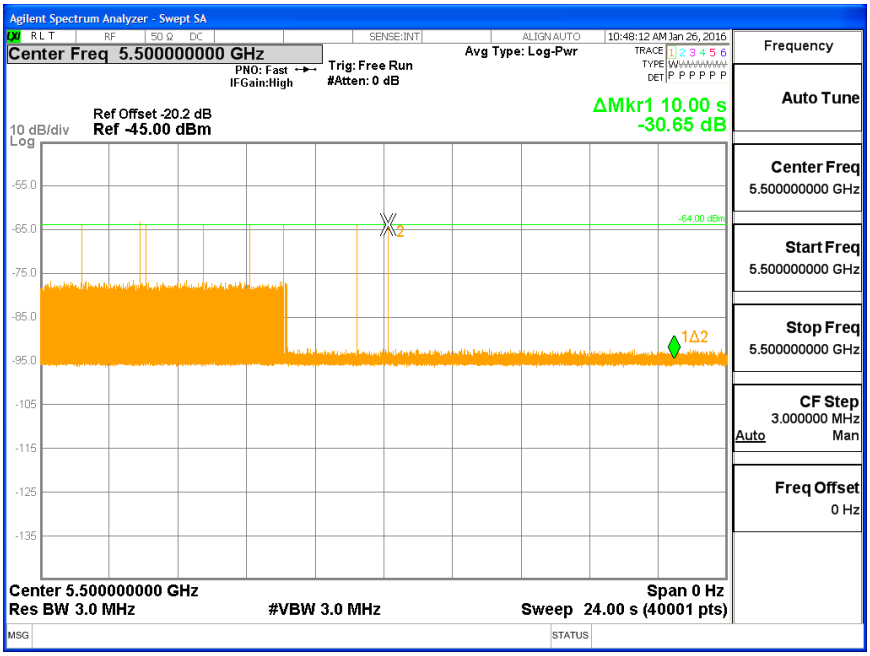
No transmissions are observed during the aggregate monitoring period.



LONG PULSE CHANNEL MOVE TIME

The traffic ceases prior to 10 seconds after the end of the radar waveform.

MOVE TIME FOR LONG PULSE RADAR

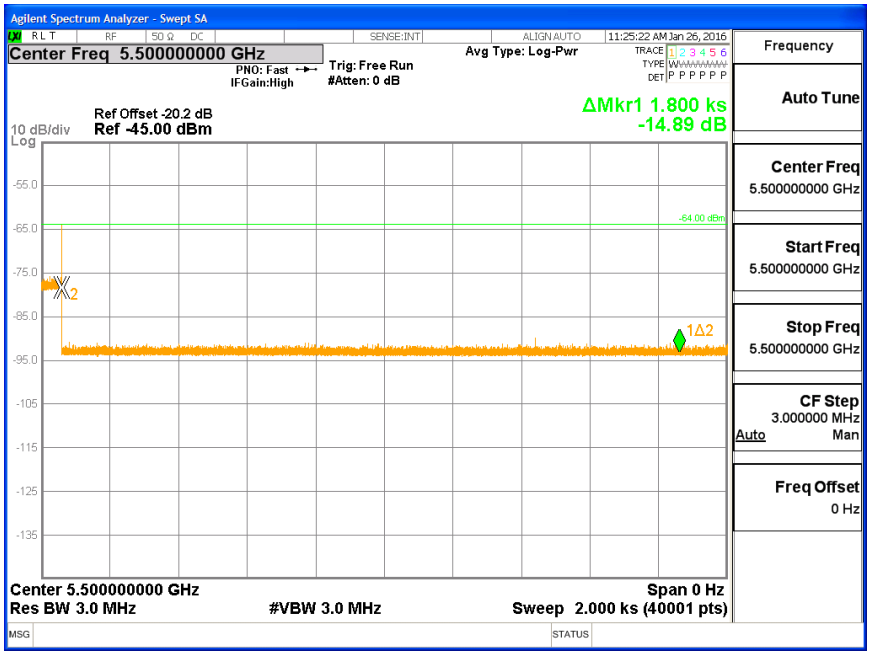


5.2.1. NON-OCCUPANCY PERIOD

RESULTS

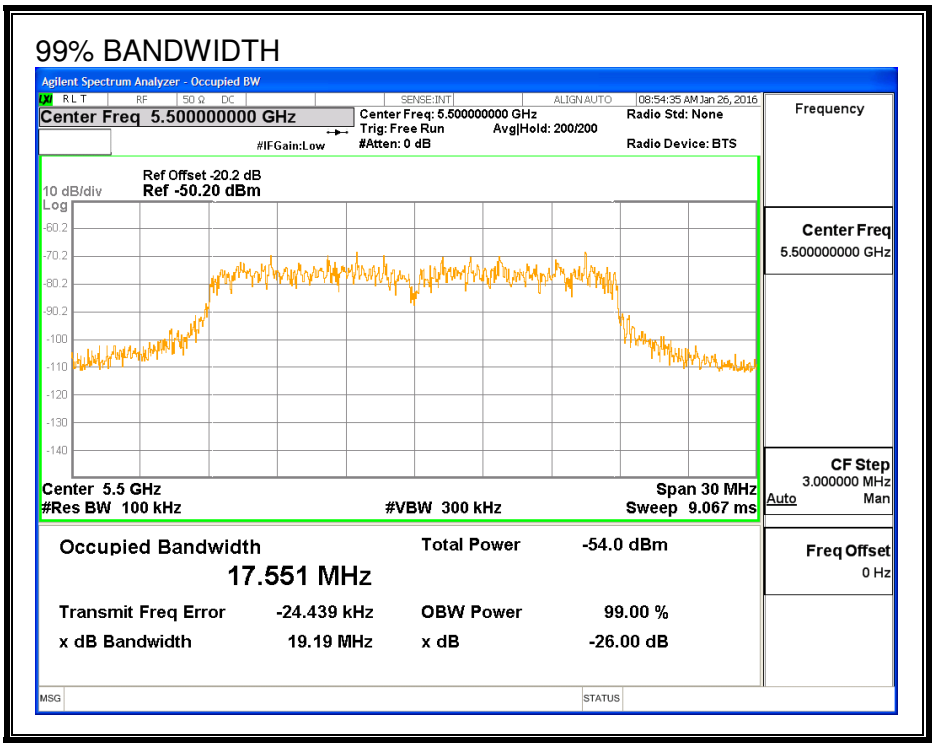
No EUT transmissions were observed on the test channel during the 30-minute observation time.

NON-OCCUPANCY PERIOD



5.2.2. DETECTION BANDWIDTH

REFERENCE PLOT OF 99% POWER BANDWIDTH



RESULTS

FL (MHz)	FH (MHz)	Detection Bandwidth (MHz)	99% Power Bandwidth (MHz)	Ratio of Detection BW to 99% Power BW (%)	Minimum Limit (%)
5491	5510	19	17.551	108.3	100

DETECTION BANDWIDTH PROBABILITY

DETECTION BANDWIDTH PROBABILITY RESULTS

Detection Bandwidth Test Results				
FCC Type 0 Waveform: 1 us Pulse Width, 1428 us PRI, 18 Pulses per Burst				
Frequency (MHz)	Number of Trials	Number Detected	Detection (%)	Mark
5491	10	10	100	FL
5492	10	10	100	
5493	10	10	100	
5494	10	10	100	
5495	10	10	100	
5500	10	10	100	
5505	10	10	100	
5510	10	10	100	FH

5.2.3. IN-SERVICE MONITORING

RESULTS

FCC Radar Test Summary

Signal Type	Number of Trials	Detection (%)	Limit (%)	Pass/Fail	Detection Bandwidth		80% of Det BW	
					FL	FH	FL5	FH5
FCC Short Pulse Type 1	30	100.00	60	Pass	5491	5510		
FCC Short Pulse Type 2	30	93.33	60	Pass	5491	5510		
FCC Short Pulse Type 3	30	100.00	60	Pass	5491	5510		
FCC Short Pulse Type 4	30	100.00	60	Pass	5491	5510		
Aggregate		98.33	80	Pass				
FCC Long Pulse Type 5	30	96.67	80	Pass	5491	5510	5493	5508
FCC Hopping Type 6	40	100.00	70	Pass	5491	5510		

TYPE 1 DETECTION PROBABILITY

Data Sheet for FCC Short Pulse Radar Type 1

Waveform	Pulse Width (us)	PRI (us)	Pulses Per Burst	Test (A/B)	Frequency (MHz)	Successful Detection (Yes/No)
1001	1	3066	18	A	5500	Yes
1002	1	538	99	A	5500	Yes
1003	1	778	68	A	5500	Yes
1004	1	758	70	A	5500	Yes
1005	1	598	89	A	5500	Yes
1006	1	898	59	A	5500	Yes
1007	1	718	74	A	5500	Yes
1008	1	818	65	A	5500	Yes
1009	1	658	81	A	5500	Yes
1010	1	798	67	A	5500	Yes
1011	1	738	72	A	5500	Yes
1012	1	698	76	A	5500	Yes
1013	1	838	63	A	5500	Yes
1014	1	618	86	A	5500	Yes
1015	1	678	78	A	5500	Yes
1016	1	2314	23	B	5500	Yes
1017	1	2881	19	B	5500	Yes
1018	1	1225	44	B	5500	Yes
1019	1	1922	28	B	5500	Yes
1020	1	1749	31	B	5500	Yes
1021	1	2575	21	B	5500	Yes
1022	1	2531	21	B	5500	Yes
1023	1	2293	24	B	5500	Yes
1024	1	1184	45	B	5500	Yes
1025	1	1075	50	B	5500	Yes
1026	1	1290	41	B	5500	Yes
1027	1	2664	20	B	5500	Yes
1028	1	1813	30	B	5500	Yes
1029	1	769	69	B	5500	Yes
1030	1	1401	38	B	5500	Yes

TYPE 2 DETECTION PROBABILITY

Data Sheet for FCC Short Pulse Radar Type 2					
Waveform	Pulse Width (us)	PRI (us)	Pulses Per Burst	Frequency (MHz)	Successful Detection (Yes/No)
2001	2.9	183	27	5500	No
2002	3.5	226	29	5500	No
2003	4.4	220	28	5500	Yes
2004	2.8	229	27	5500	Yes
2005	1.9	227	23	5500	Yes
2006	2.7	159	29	5500	Yes
2007	4	204	29	5500	Yes
2008	3	221	26	5500	Yes
2009	2.6	151	23	5500	Yes
2010	3.8	173	26	5500	Yes
2011	1.7	188	24	5500	Yes
2012	1.1	175	24	5500	Yes
2013	3.3	195	26	5500	Yes
2014	3	187	23	5500	Yes
2015	1.3	172	29	5500	Yes
2016	3.3	168	26	5500	Yes
2017	4	157	25	5500	Yes
2018	2.2	200	27	5500	Yes
2019	3.1	156	23	5500	Yes
2020	1.5	203	25	5500	Yes
2021	4.7	163	28	5500	Yes
2022	1.4	214	27	5500	Yes
2023	4.9	178	24	5500	Yes
2024	1.7	195	23	5500	Yes
2025	1.3	207	27	5500	Yes
2026	4.7	228	24	5500	Yes
2027	4.5	162	25	5500	Yes
2028	3.9	150	29	5500	Yes
2029	2	169	24	5500	Yes
2030	1.7	161	28	5500	Yes

TYPE 3 DETECTION PROBABILITY

Data Sheet for FCC Short Pulse Radar Type 3

Waveform	Pulse Width (us)	PRI (us)	Pulses Per Burst	Frequency (MHz)	Successful Detection (Yes/No)
3001	6.5	491	17	5500	Yes
3002	6.3	478	16	5500	Yes
3003	7.2	446	16	5500	Yes
3004	10	328	18	5500	Yes
3005	6	442	18	5500	Yes
3006	6.7	336	16	5500	Yes
3007	8	463	17	5500	Yes
3008	9	371	17	5500	Yes
3009	8.2	259	18	5500	Yes
3010	9.4	446	18	5500	Yes
3011	8.9	347	17	5500	Yes
3012	8	413	18	5500	Yes
3013	7.7	461	16	5500	Yes
3014	7.1	422	17	5500	Yes
3015	9.8	482	18	5500	Yes
3016	9.4	456	17	5500	Yes
3017	9.9	411	16	5500	Yes
3018	9.8	281	17	5500	Yes
3019	5.5	500	18	5500	Yes
3020	8.4	499	17	5500	Yes
3021	9.5	362	17	5500	Yes
3022	5.1	257	18	5500	Yes
3023	6.4	384	16	5500	Yes
3024	7.4	291	16	5500	Yes
3025	6.6	313	17	5500	Yes
3026	7.8	367	17	5500	Yes
3027	7.3	268	16	5500	Yes
3028	6.4	467	17	5500	Yes
3029	6.1	381	18	5500	Yes
3030	5.4	343	16	5500	Yes

TYPE 4 DETECTION PROBABILITY

Data Sheet for FCC Short Pulse Radar Type 4

Waveform	Pulse Width (us)	PRI (us)	Pulses Per Burst	Frequency (MHz)	Successful Detection (Yes/No)
4001	16.3	403	14	5500	Yes
4002	10.8	259	12	5500	Yes
4003	16.6	332	16	5500	Yes
4004	11.6	452	12	5500	Yes
4005	18	420	16	5500	Yes
4006	13.5	302	12	5500	Yes
4007	15.7	283	12	5500	Yes
4008	17.1	429	16	5500	Yes
4009	19.7	304	16	5500	Yes
4010	11.5	345	15	5500	Yes
4011	10	484	13	5500	Yes
4012	12.4	287	12	5500	Yes
4013	11.4	439	13	5500	Yes
4014	19.7	388	13	5500	Yes
4015	19.1	302	14	5500	Yes
4016	17.8	263	16	5500	Yes
4017	13.1	457	13	5500	Yes
4018	17.7	431	13	5500	Yes
4019	13.4	253	15	5500	Yes
4020	18.5	373	15	5500	Yes
4021	14.8	341	15	5500	Yes
4022	10.3	474	16	5500	Yes
4023	17.9	454	15	5500	Yes
4024	13.9	349	14	5500	Yes
4025	16.5	476	14	5500	Yes
4026	18.4	266	14	5500	Yes
4027	16.9	405	16	5500	Yes
4028	19.3	459	16	5500	Yes
4029	18.3	360	16	5500	Yes
4030	16.5	309	16	5500	Yes

TYPE 5 DETECTION PROBABILITY

Data Sheet for FCC Long Pulse Radar Type 5		
Trial	Frequency (MHz)	Successful Detection (Yes/No)
1	5498	Yes
2	5502	Yes
3	5494	No
4	5497	Yes
5	5504	Yes
6	5503	Yes
7	5504	Yes
8	5496	Yes
9	5494	Yes
10	5505	Yes
11	5506	Yes
12	5508	Yes
13	5507	Yes
14	5500	Yes
15	5498	Yes
16	5503	Yes
17	5498	Yes
18	5493	Yes
19	5506	Yes
20	5498	Yes
21	5495	Yes
22	5494	Yes
23	5502	Yes
24	5506	Yes
25	5499	Yes
26	5497	Yes
27	5495	Yes
28	5506	Yes
29	5494	Yes
30	5503	Yes

Note: The Type 5 randomized parameters tested are shown in a separate document.

TYPE 6 DETECTION PROBABILITY

Data Sheet for FCC Hopping Radar Type 6

1 us Pulse Width, 333 us PRI, 9 Pulses per Burst, 1 Burst per Hop

NTIA August 2005 Hopping Sequence

Trial	Starting Index Within Sequence	Signal Generator Frequency (MHz)	Hops within Detection BW	Successful Detection (Yes/No)
1	151	5491	3	Yes
2	626	5492	6	Yes
3	1101	5493	4	Yes
4	1576	5494	1	Yes
5	2051	5495	3	Yes
6	2526	5496	3	Yes
7	3001	5497	4	Yes
8	3476	5498	4	Yes
9	3951	5499	6	Yes
10	4426	5500	2	Yes
11	4901	5501	6	Yes
12	5376	5502	6	Yes
13	5851	5503	7	Yes
14	6326	5504	3	Yes
15	6801	5505	4	Yes
16	7276	5506	6	Yes
17	7751	5507	5	Yes
18	8226	5508	7	Yes
19	8701	5509	5	Yes
20	9176	5510	5	Yes
21	9651	5491	6	Yes
22	10126	5492	2	Yes
23	10601	5493	3	Yes
24	11076	5494	4	Yes
25	11551	5495	3	Yes
26	12026	5496	5	Yes
27	12501	5497	6	Yes
28	12976	5498	8	Yes
29	13451	5499	5	Yes
30	13926	5500	1	Yes
31	14401	5501	2	Yes
32	14876	5502	3	Yes
33	15351	5503	3	Yes
34	15826	5504	3	Yes
35	16301	5505	2	Yes
36	16776	5506	6	Yes
37	17251	5507	4	Yes
38	17726	5508	6	Yes
39	18201	5509	8	Yes
40	18676	5510	4	Yes

6. BRIDGE MODE RESULTS

Per KDB 905462, Section 5.1 (footnote 1):

Networks Access Points with Bridge and/or MESH modes of operation are permitted to operate in the DFS bands but must employ a DFS function. The functionality of the Bridge mode as specified in §15.403(a) must be validated in the DFS test report. Devices operating as relays must also employ DFS function. The method used to validate the functionality must be documented and validation data must be documented. Bridge mode can be validated by performing a test statistical performance check (Section 7.8.4) on any one of the radar types. This is an abbreviated test to verify DFS functionality. MESH mode operational methodology must be submitted in the application for certification for evaluation by the FCC.

This device does not support Bridge Mode therefore this test was not performed.