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

CERTIFICATION TEST REPORT

FOR

SONOS MODEL NUMBER S11

MODEL NUMBER: S11

FCC ID: SBVRM011
IC: 5373A-RM011

REPORT NUMBER: 11361969-E3V2

ISSUE DATE: DECEMBER 06, 2016

Prepared for
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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
V1	08/29/16	Initial Issue	Conan Cheung
V2	12/16/16	Correct Typo in EUT Description Section	Conan Cheung

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1. ATTESTATION OF TEST RESULTS

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

EUT DESCRIPTION: SONOS MODEL NUMBER S11

MODEL: S11

SERIAL NUMBER: B8-E9-37-40-12-E5:9

DATE TESTED: AUGUST 23, 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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UL Verification Services Inc. By:

CONAN CHEUNG
PROJECT LEAD
UL Verification Services Inc.

Tested By:

DOUG ANDERSON
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

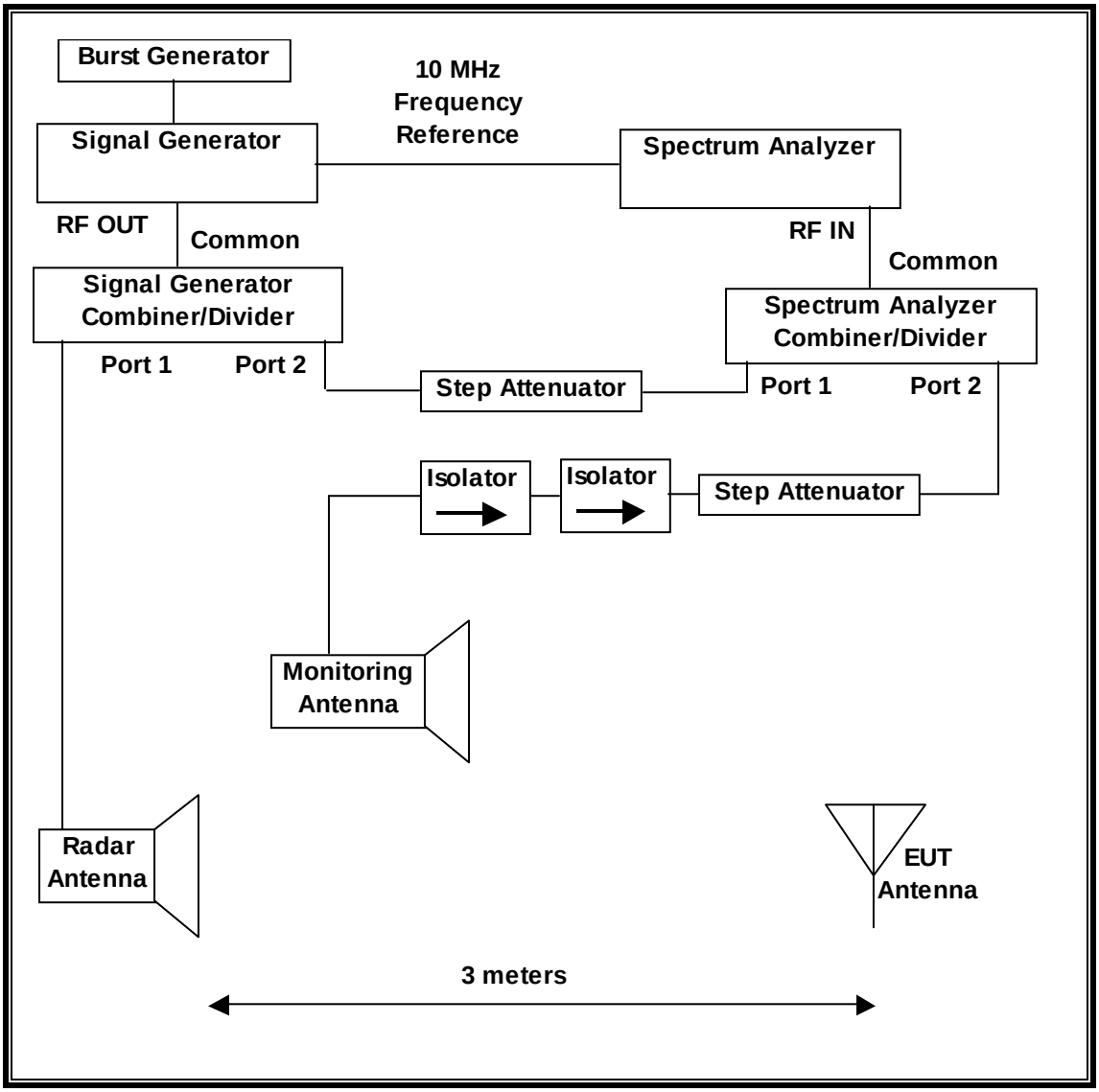
Radar Waveform Type	Pulse Width (µsec)	Chirp Width (MHz)	PRI (µsec)	Pulses per Burst	Number of Bursts	Minimum Percentage of Successful Detection	Minimum Trials
5	50-100	5-20	1000-2000	1-3	8-20	80%	30

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	06/13/17
Signal Generator, MXG X-Series RF Vector	Agilent	N5182B	MY51350337	03/11/17
Arbitrary Waveform Generator	Agilent / HP	33220A	MY44037572	04/11/17

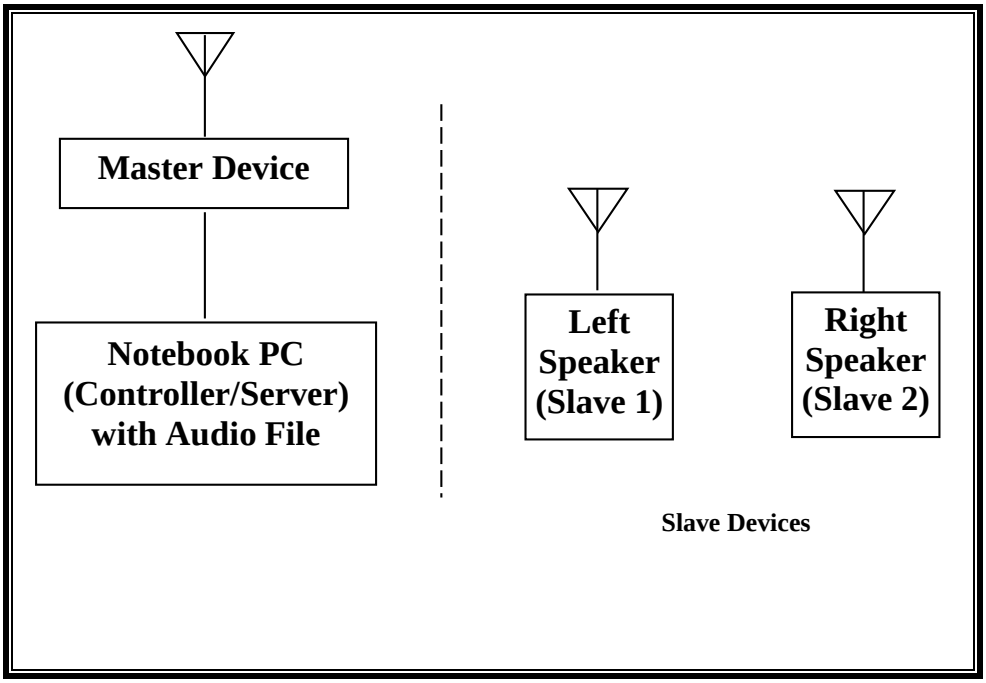
5.1.3. TEST AND MEASUREMENT SOFTWARE

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

TEST SOFTWARE LIST		
Name	**Version**	**Test / Function**
Aggregate Time-PXA	3.0	Channel Loading and Aggregate Closing Time
FCC 2014 Detection	3.0	Detection Bandwidth in 5 MHz Steps
In Service Monitoring-PXA	3.0	In-Service Monitoring (Probability of Detection)
PXA Read	3.0.0.9	Signal Generator Screen Capture
SGXProject.exe	2	Radar Waveform Generation and Download

5.1.4. 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 (EUT Controller/Server)	Dell	P05G	9NGRWN1	DoC
AC Adapter (Controller/Server PC)	Dell	L65NS2-01	CN-0928G4-72438-07F-16ED-400	DoC
Left Wireless Speaker (Slave 1)	Sonos	Play:1	5C-AA-FD-4D-F7-F6-7	SBVRM009
Rightt Wireless Speaker (Slave 2)	Sonos	Play:1	B8-E9-37-57-00-1E-2	SBVRM009

5.1.5. 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 26.16 dBm EIRP in the 5250-5350 MHz band and 27.61 dBm EIRP in the 5470-5725 MHz band.

For horizontal orientation, the EUT antenna assembly has peak gain of 5.7 dBi in 5250-5350 MHz band and 6.2 dBi in the 5470-5725 MHz band. For vertical orientation, the EUT antenna assembly has peak gain of 4.5 dBi in 5250-5350 MHz band and 4.6 dBi in the 5470-5725 MHz band.

Two 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 that meets or exceeds the minimum requirement was generated by streaming the audio file “5_GHz_Audio_Test_file.WAV” from the Master to the Slave using Sonos Desktop Controller for PC version 6.5 software.

TPC is required since the maximum EIRP is greater 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 revision 6.5.

UNIFORM CHANNEL SPREADING

This function is not required per KDB 905462.

OVERVIEW OF MASTER DEVICE WITH RESPECT TO §15.407 (h) REQUIREMENTS

The Master Device is a Sonos wireless smart speaker, FCC ID: SBVRM011. The minimum antenna gain for the Master Device is 4.5 dBi.

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.

5.2. RESULTS FOR 20 MHz BANDWIDTH

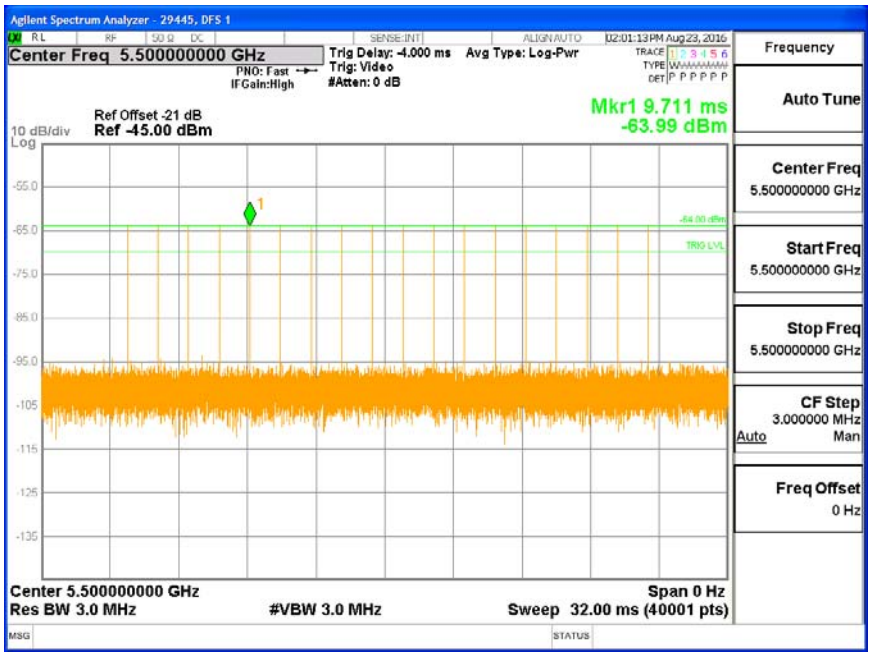
5.2.1. TEST CHANNEL

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

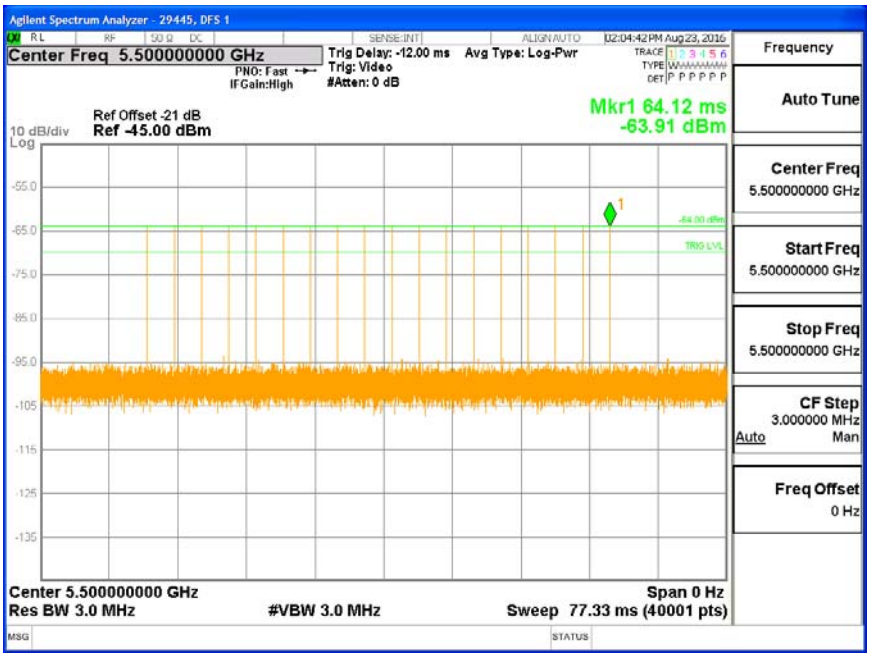
5.2.2. RADAR WAVEFORMS AND TRAFFIC

RADAR WAVEFORMS

SHORT PULSE RADAR TYPE 0

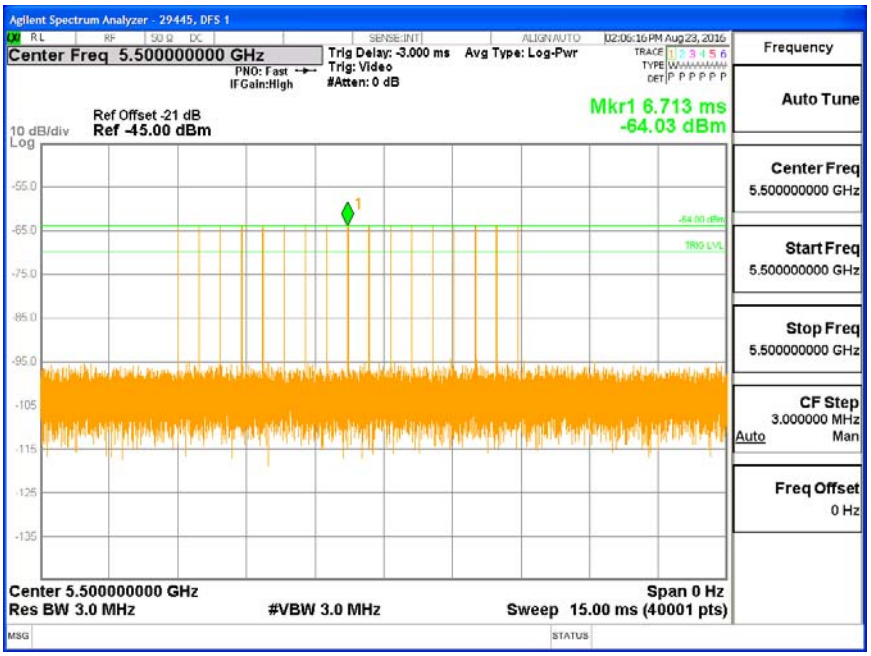


SAMPLE OF RADAR TYPE 1

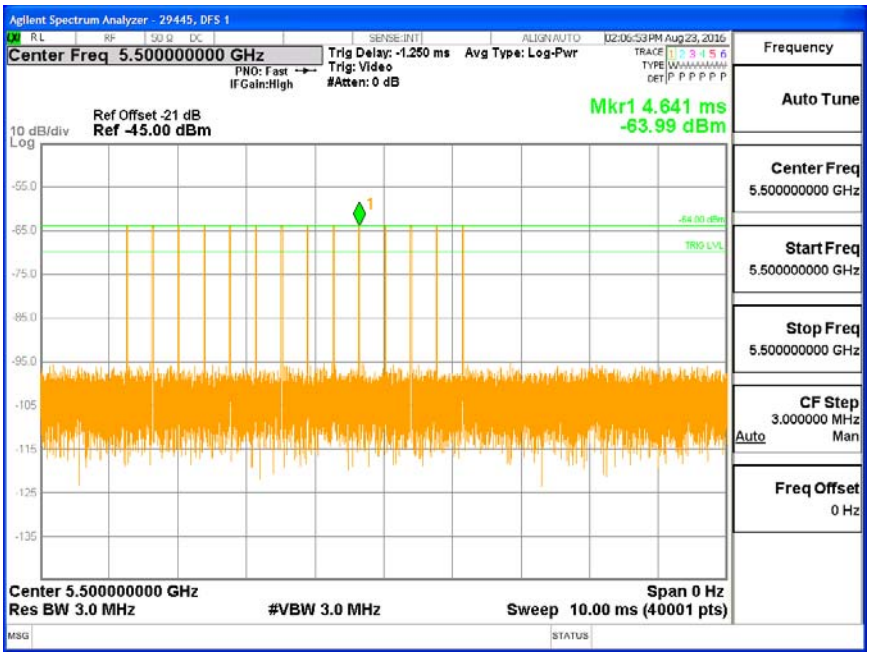


SAMPLE OF RADAR TYPE 2

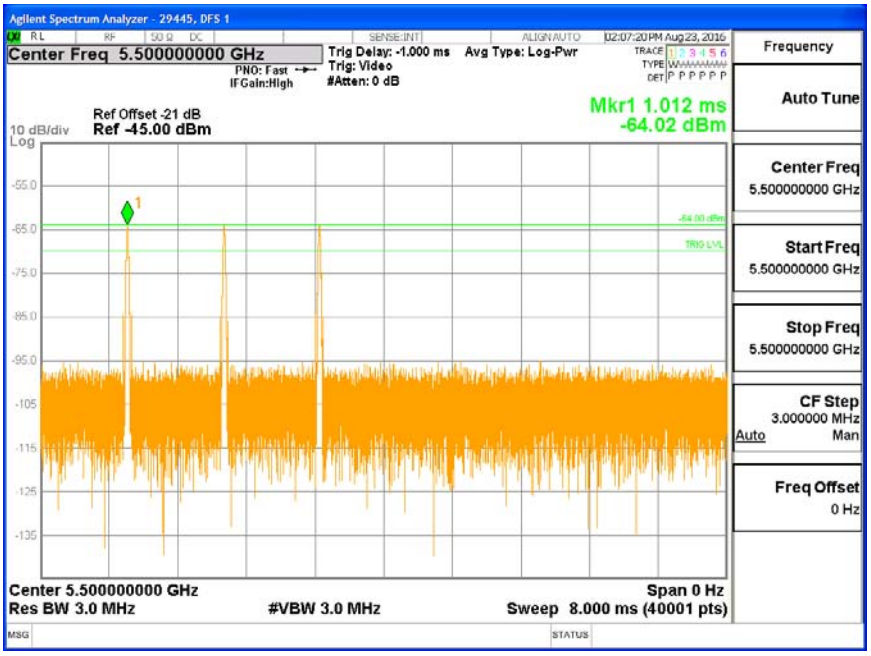
SAMPLE OF RADAR TYPE 3



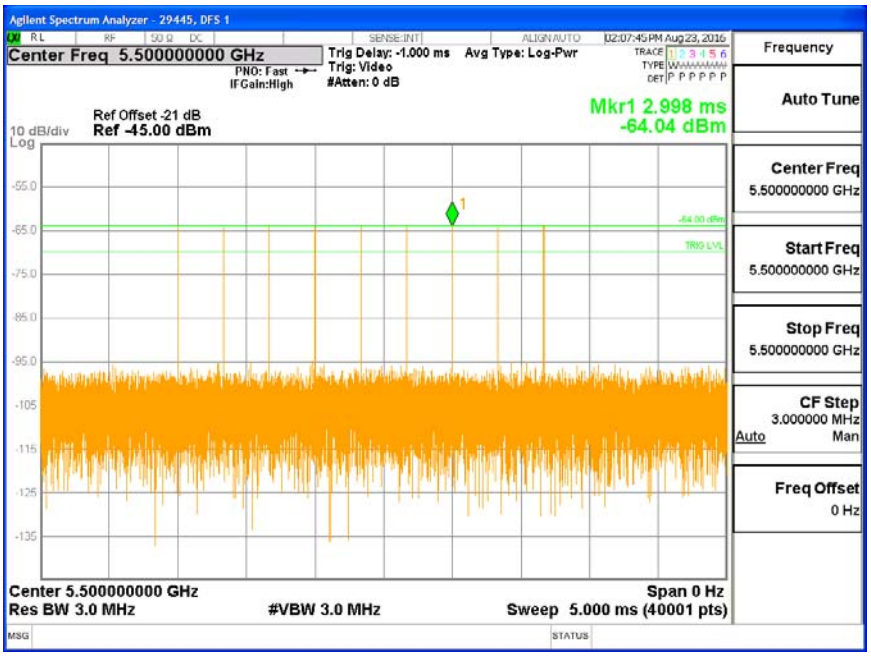
SAMPLE OF RADAR TYPE 4



SAMPLE OF SINGLE BURST OF RADAR TYPE 5

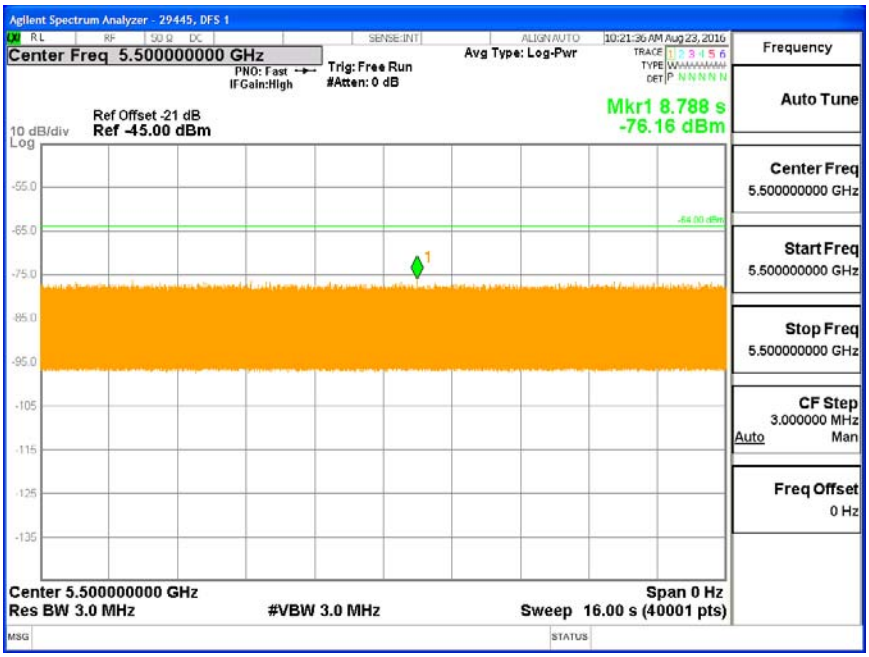


SINGLE BURST OF RADAR TYPE 6

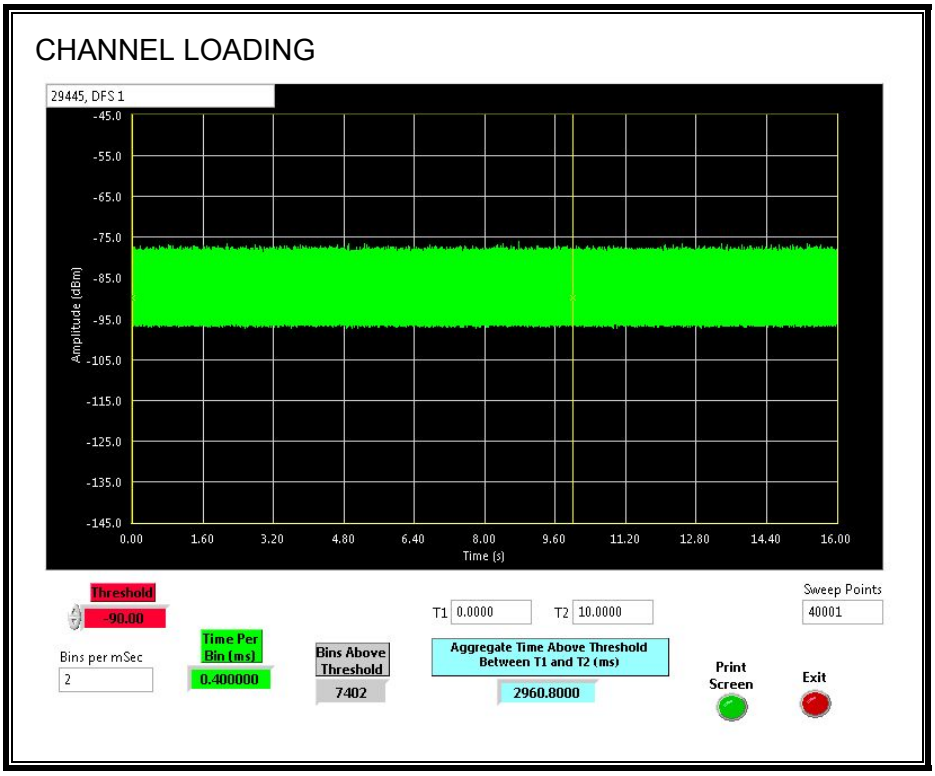


TRAFFIC

TRAFFIC



CHANNEL LOADING



The level of traffic loading on the channel by the EUT is 29.6%

5.2.3. CHANNEL AVAILABILITY CHECK TIME

PROCEDURE TO DETERMINE CAC PERIOD TIME

A link was established on a non-DFS channel then a software command was issued to the EUT. to change to the test channel. The time from the software command to the re-initialization of traffic was measured as the time required for the EUT to complete the CAC period.

PROCEDURE FOR TIMING OF RADAR BURST

A link was established on a non-DFS channel then a software command was issued to the EUT. to change to the test channel. A radar signal was triggered within 0 to 6 seconds after the beginning of the CAC period. Transmissions on the channel were monitored on the spectrum analyzer and a plot was captured

The Non-Occupancy list was cleared. A link was established on a non-DFS channel then a software command was issued to the EUT. to change to the test channel. A radar signal was triggered within 54 to 60 seconds after the beginning of the CAC period. Transmissions on the channel were monitored on the spectrum analyzer and a plot was captured
.

QUANTITATIVE RESULTS

No Radar Triggered

Timing of Software Command (sec)	Timing of Start of Traffic (sec)	Total CAC Period (sec)
0	61.25	61.3

Radar Near Beginning of CAC

Timing of Software Command (sec)	Timing of Radar Burst (sec)	Radar Relative to Beginning of CAC (sec)
0	1.19	1.2

Radar Near End of CAC

Timing of Software Command (sec)	Timing of Radar Burst (sec)	Radar Relative to Beginning of CAC (sec)
0	59.37	59.4

QUALITATIVE RESULTS

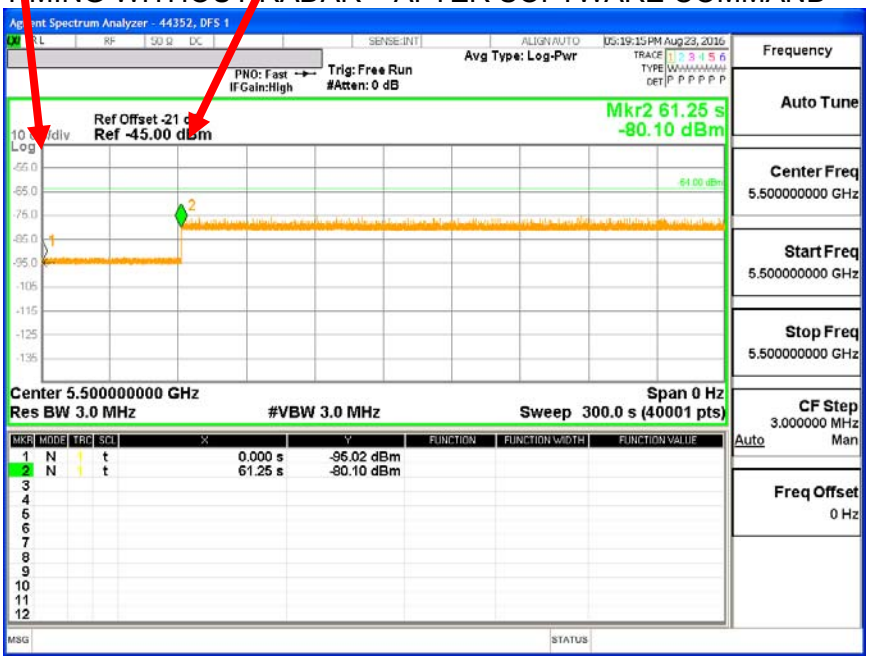
Timing of Radar Burst	Display on Control Computer	Spectrum Analyzer Display
No Radar Triggered	EUT marks Channel as active	Transmissions begin on channel after completion of the initial power-up cycle and the CAC
Within 0 to 6 second window	EUT indicates radar detected	No transmissions on channel
Within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

TIMING WITHOUT RADAR DURING CAC

Software Command Issued
Start of CAC Period

End of CAC Period

TIMING WITHOUT RADAR – AFTER SOFTWARE COMMAND

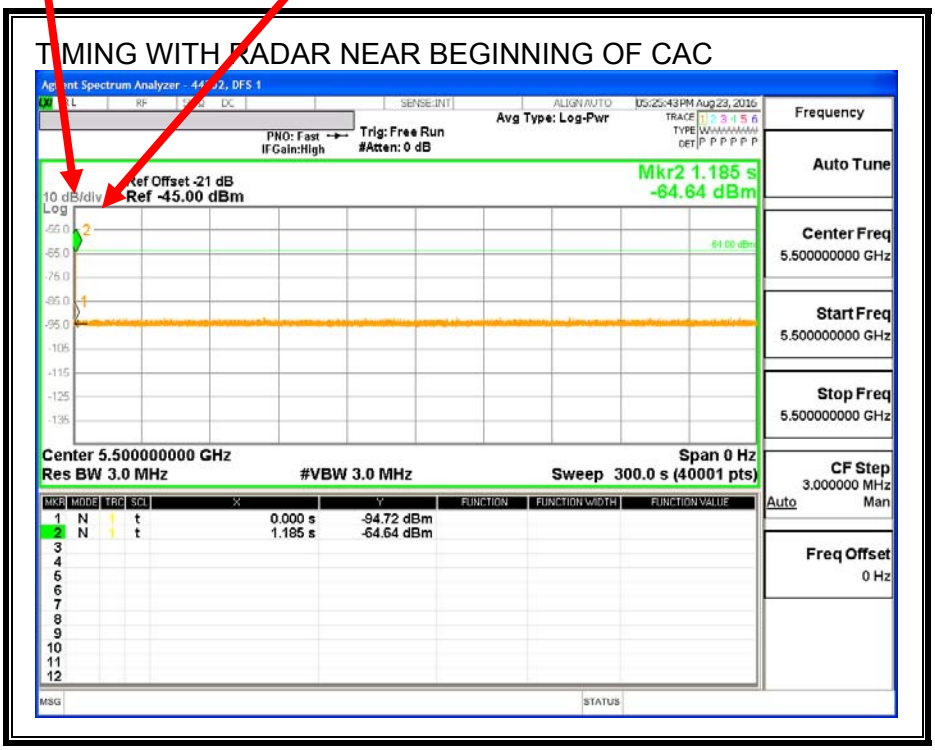


Transmissions begin on channel after completion of the initial power-up cycle and the CAC.

TIMING WITH RADAR NEAR BEGINNING OF CAC

Software Command Issued
Start of CAC Period

Radar Signal Applied

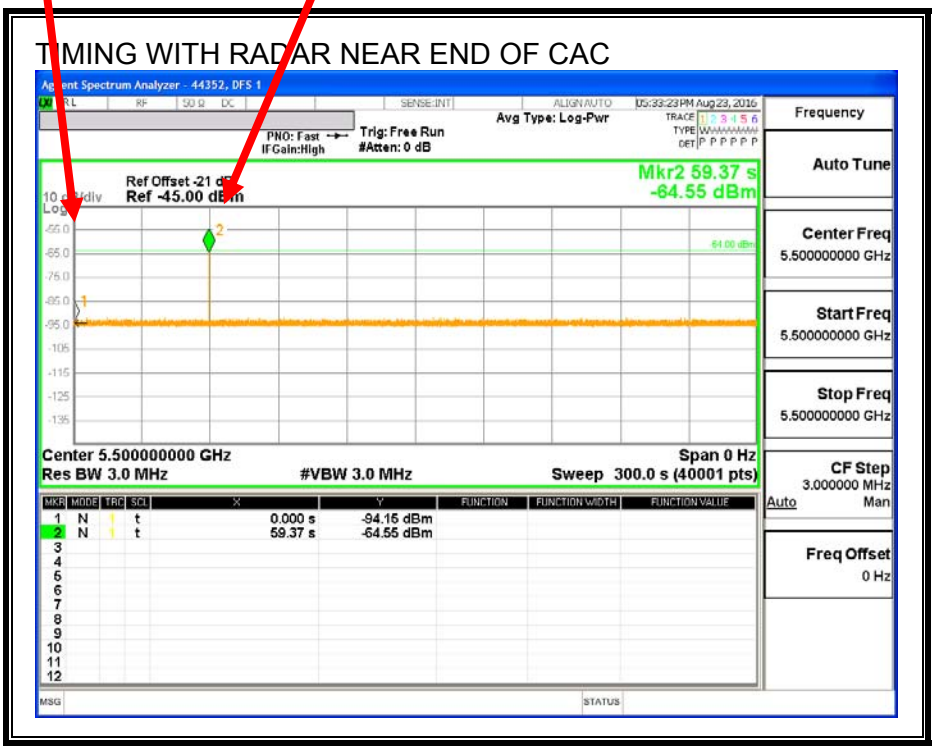


No EUT transmissions were observed after the radar signal.

TIMING WITH RADAR NEAR END OF CAC

Software Command Issued
Start of CAC Period

Radar Signal Applied



No EUT transmissions were observed after the radar signal.

5.2.4. OVERLAPPING CHANNEL TESTS

RESULTS

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

5.2.5. 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).

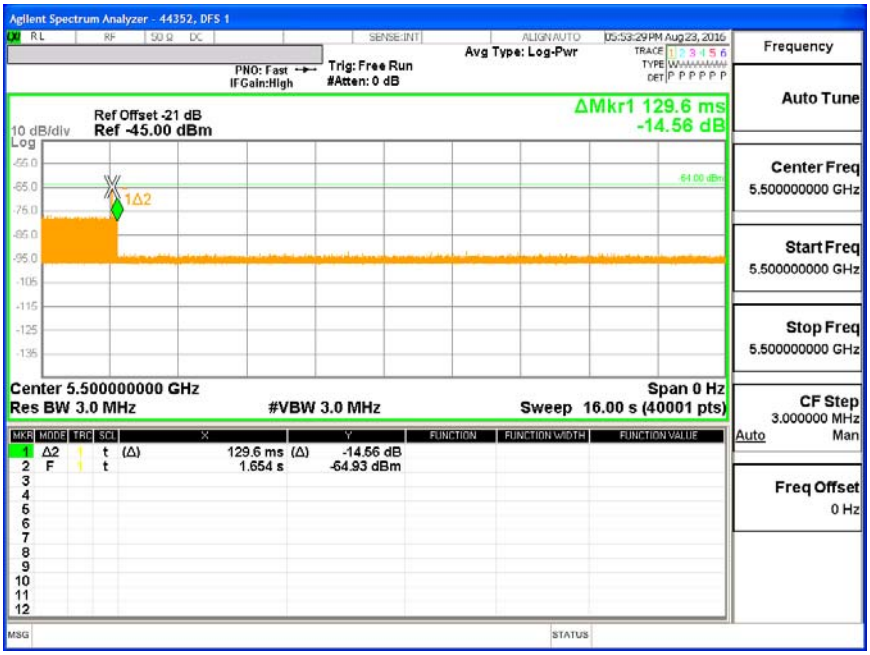
RESULTS

Channel Move Time (sec)	Limit (sec)
0.130	10

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

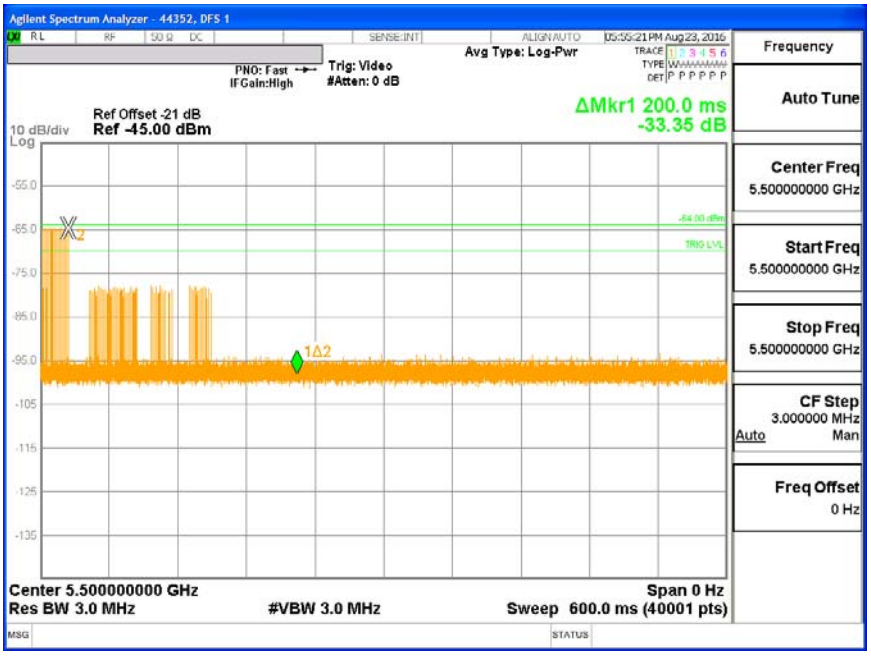
MOVE TIME

MOVE TIME



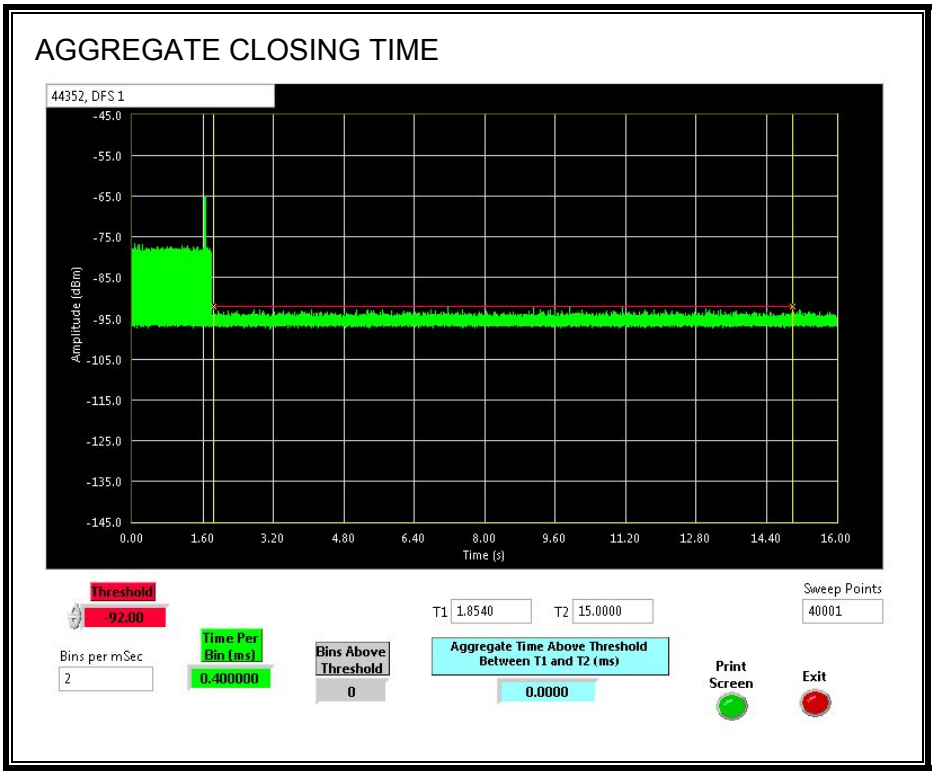
CHANNEL CLOSING TIME

CLOSING TIME



AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

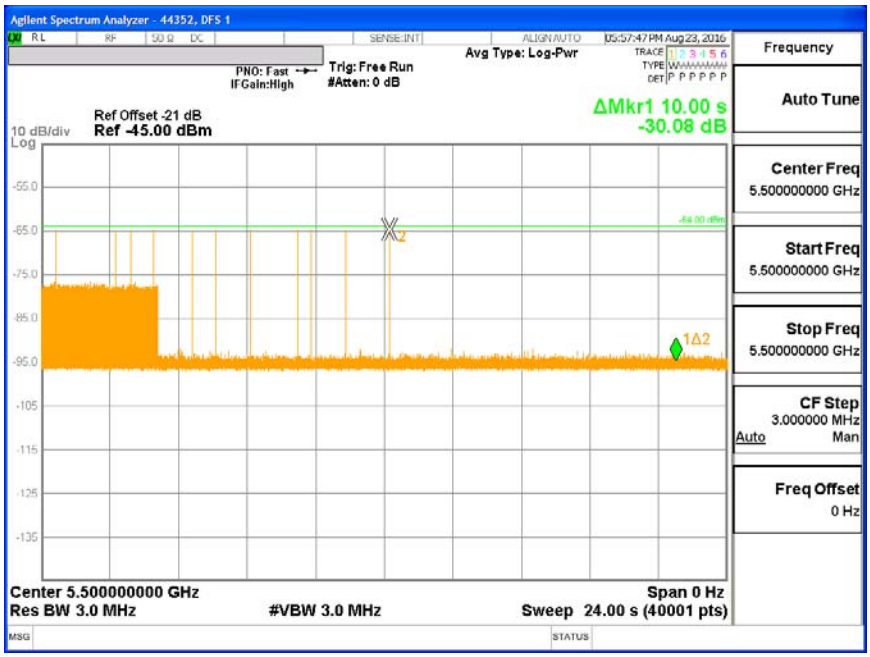
No transmissions are observed during the aggregate monitoring period.



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

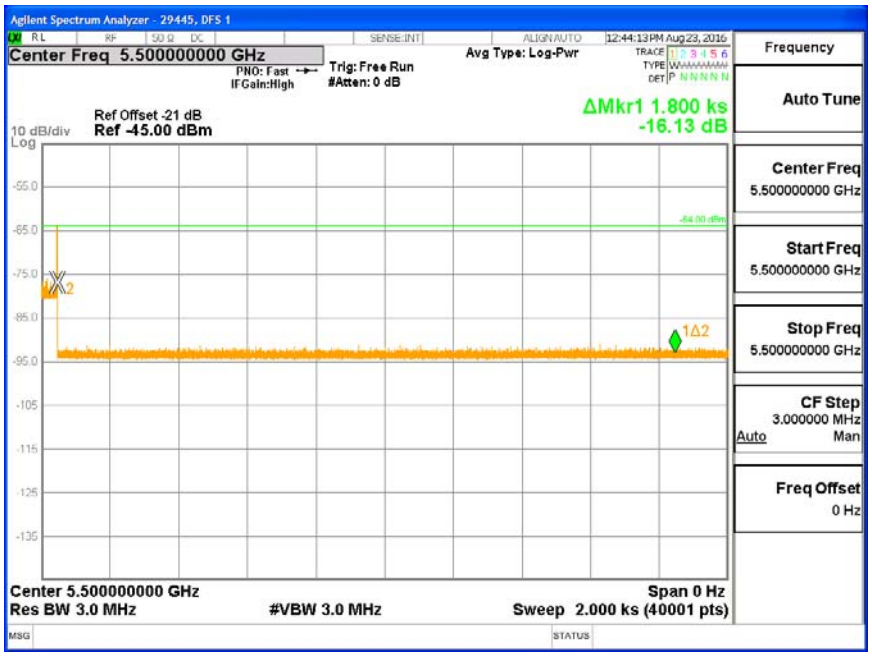


5.2.1. NON-OCCUPANCY PERIOD

RESULTS

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

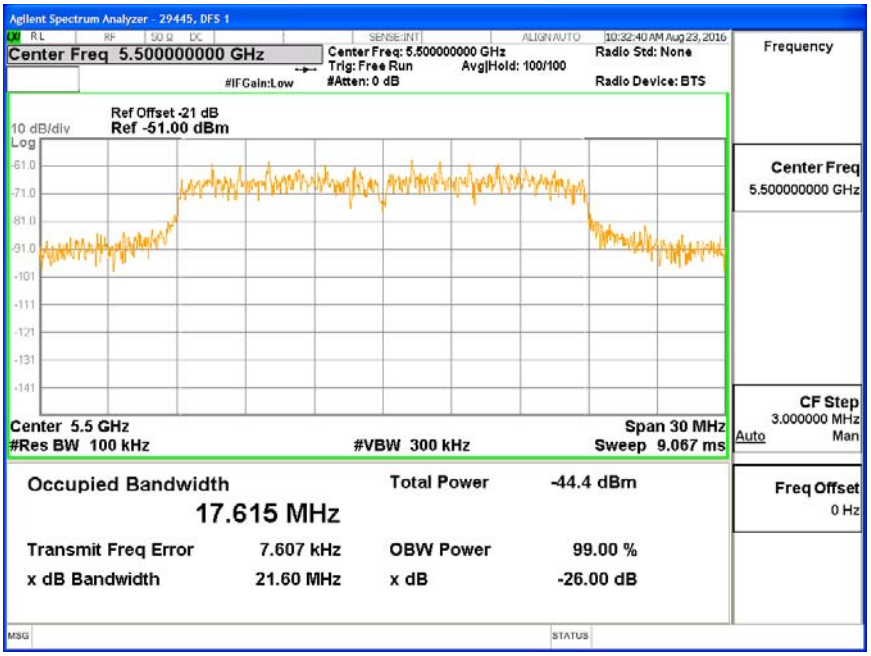
NON-OCCUPANCY PERIOD



5.2.2. DETECTION BANDWIDTH

REFERENCE PLOT OF 99% POWER BANDWIDTH

99% BANDWIDTH



RESULTS

FL (MHz)	FH (MHz)	Detection Bandwidth (MHz)	99% Power Bandwidth (MHz)	Ratio of Detection BW to 99% Power BW (%)	Minimum Limit (%)
5490	5510	20	17.615	113.5	100

DETECTION BANDWIDTH PROBABILITY

DETECTION BANDWIDTH PROBABILITY RESULTS

Detection Bandwidth Test Results		29445	DFS 1	
FCC Type 0 Waveform: 1 us Pulse Width, 1428 us PRI, 18 Pulses per Burst				
Frequency (MHz)	Number of Trials	Number Detected	Detection (%)	Mark
5490	10	10	100	FL
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 Bandwidt FL	Detection Bandwidt FH	80% of Det BW FL5	80% of Det BW FH5	OBW	Test Location	Employee Number	In-Service Monitoring Version
FCC Short Pulse Type 1	30	96.67	60	Pass	5490	5510	5492	5508	17.61	DFS 1	29445	Version 3.0
FCC Short Pulse Type 2	30	100.00	60	Pass	5490	5510	5492	5508	17.61	DFS 1	29445	Version 3.0
FCC Short Pulse Type 3	30	83.33	60	Pass	5490	5510	5492	5508	17.61	DFS 1	29445	Version 3.0
FCC Short Pulse Type 4	30	96.67	60	Pass	5490	5510	5492	5508	17.61	DFS 1	29445	Version 3.0
Aggregate		94.17	80	Pass								
FCC Long Pulse Type 5	30	93.33	80	Pass	5490	5510	5492	5508	17.61	DFS 1	29445	Version 3.0
FCC Hopping Type 6	42	100.00	70	Pass	5490	5510				DFS 1	29445	Version 3.0

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	838	63	A	5500	Yes
1003	1	558	95	A	5500	Yes
1004	1	578	92	A	5500	Yes
1005	1	818	65	A	5500	Yes
1006	1	618	86	A	5500	Yes
1007	1	918	58	A	5500	Yes
1008	1	738	72	A	5500	Yes
1009	1	698	76	A	5500	Yes
1010	1	678	78	A	5500	Yes
1011	1	638	83	A	5500	Yes
1012	1	518	102	A	5500	Yes
1013	1	938	57	A	5500	No
1014	1	858	62	A	5500	Yes
1015	1	758	70	A	5500	Yes
1016	1	2611	21	B	5500	Yes
1017	1	1696	32	B	5500	Yes
1018	1	2458	22	B	5500	Yes
1019	1	1672	32	B	5500	Yes
1020	1	1369	39	B	5500	Yes
1021	1	2066	26	B	5500	Yes
1022	1	1893	28	B	5500	Yes
1023	1	2720	20	B	5500	Yes
1024	1	2676	20	B	5500	Yes
1025	1	2437	22	B	5500	Yes
1026	1	2523	21	B	5500	Yes
1027	1	2414	22	B	5500	Yes
1028	1	1434	37	B	5500	Yes
1029	1	1455	37	B	5500	Yes
1030	1	1958	27	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	4.9	174	27	5500	Yes
2002	3.1	217	28	5500	Yes
2003	3.9	211	28	5500	Yes
2004	2.3	220	26	5500	Yes
2005	1.5	218	23	5500	Yes
2006	2.3	150	29	5500	Yes
2007	3.5	195	29	5500	Yes
2008	2.6	213	25	5500	Yes
2009	2.2	224	29	5500	Yes
2010	3.4	164	25	5500	Yes
2011	1.2	179	23	5500	Yes
2012	4.8	167	24	5500	Yes
2013	2.9	186	25	5500	Yes
2014	2.6	178	29	5500	Yes
2015	4.9	163	28	5500	Yes
2016	2.9	159	25	5500	Yes
2017	3.6	230	24	5500	Yes
2018	1.8	192	26	5500	Yes
2019	2.6	229	29	5500	Yes
2020	1	195	24	5500	Yes
2021	4.3	154	27	5500	Yes
2022	1	206	27	5500	Yes
2023	4.4	170	23	5500	Yes
2024	1.3	187	23	5500	Yes
2025	5	198	27	5500	Yes
2026	4.2	219	23	5500	Yes
2027	4	154	24	5500	Yes
2028	3.5	222	28	5500	Yes
2029	1.6	161	23	5500	Yes
2030	1.3	152	27	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	5.9	464	17	5500	Yes
3002	5.8	451	16	5500	Yes
3003	6.6	419	18	5500	Yes
3004	9.4	301	18	5500	No
3005	5.4	415	17	5500	Yes
3006	6.1	310	18	5500	Yes
3007	7.5	436	17	5500	Yes
3008	8.4	344	16	5500	Yes
3009	7.7	483	18	5500	No
3010	8.9	419	18	5500	Yes
3011	8.4	320	16	5500	Yes
3012	7.4	387	18	5500	Yes
3013	7.2	434	18	5500	Yes
3014	6.5	396	17	5500	No
3015	9.2	456	18	5500	Yes
3016	8.8	430	17	5500	No
3017	9.4	385	16	5500	No
3018	9.3	254	16	5500	Yes
3019	5	473	17	5500	Yes
3020	7.8	473	17	5500	Yes
3021	8.9	336	16	5500	Yes
3022	9.6	481	17	5500	Yes
3023	5.9	357	16	5500	Yes
3024	6.8	265	18	5500	Yes
3025	6	286	17	5500	Yes
3026	7.3	340	17	5500	Yes
3027	6.7	492	18	5500	Yes
3028	5.8	441	17	5500	Yes
3029	5.6	355	17	5500	Yes
3030	10	316	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	15.2	376	14	5500	Yes
4002	19.8	484	12	5500	Yes
4003	15.6	305	16	5500	Yes
4004	10.6	426	12	5500	Yes
4005	16.9	394	16	5500	Yes
4006	12.5	276	12	5500	Yes
4007	14.6	256	16	5500	Yes
4008	16	402	16	5500	Yes
4009	18.7	278	15	5500	Yes
4010	10.5	318	15	5500	Yes
4011	19	458	12	5500	Yes
4012	11.3	260	12	5500	Yes
4013	10.3	413	12	5500	Yes
4014	18.6	361	12	5500	Yes
4015	18.1	275	13	5500	Yes
4016	16.8	488	16	5500	Yes
4017	12	430	12	5500	Yes
4018	16.6	404	13	5500	Yes
4019	12.4	477	14	5500	Yes
4020	17.5	346	15	5500	Yes
4021	13.8	314	14	5500	Yes
4022	19.4	447	15	5500	Yes
4023	16.8	428	15	5500	Yes
4024	12.8	323	14	5500	Yes
4025	15.5	449	14	5500	Yes
4026	17.4	490	13	5500	No
4027	15.8	378	16	5500	Yes
4028	18.2	432	15	5500	Yes
4029	17.2	333	16	5500	Yes
4030	15.4	282	16	5500	Yes

TYPE 5 DETECTION PROBABILITY

Data Sheet for FCC Long Pulse Radar Type 5		
Trial	Frequency (MHz)	Successful Detection (Yes/No)
1	5500	Yes
2	5500	Yes
3	5500	Yes
4	5500	Yes
5	5500	Yes
6	5500	Yes
7	5500	Yes
8	5500	Yes
9	5500	Yes
10	5500	Yes
11	5494	Yes
12	5495	Yes
13	5495	Yes
14	5498	Yes
15	5494	Yes
16	5496	No
17	5494	Yes
18	5496	Yes
19	5499	Yes
20	5497	No
21	5504	Yes
22	5501	Yes
23	5502	Yes
24	5500	Yes
25	5506	Yes
26	5506	Yes
27	5501	Yes
28	5502	Yes
29	5503	Yes
30	5501	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	374	5490	2	Yes
2	849	5491	3	Yes
3	1324	5492	8	Yes
4	1799	5493	5	Yes
5	2274	5494	6	Yes
6	2749	5495	2	Yes
7	3699	5496	4	Yes
8	4174	5497	3	Yes
9	4649	5498	3	Yes
10	5124	5499	2	Yes
11	5599	5500	2	Yes
12	6074	5501	5	Yes
13	6549	5502	3	Yes
14	7024	5503	4	Yes
15	7499	5504	4	Yes
16	7974	5505	2	Yes
17	8449	5506	4	Yes
18	8924	5507	7	Yes
19	9399	5508	6	Yes
20	9874	5509	3	Yes
21	10349	5510	5	Yes
22	10824	5490	7	Yes
23	11299	5491	6	Yes
24	11774	5492	5	Yes
25	12249	5493	2	Yes
26	12724	5494	5	Yes
27	13199	5495	2	Yes
28	13674	5496	3	Yes
29	14149	5497	9	Yes
30	14624	5498	4	Yes
31	15099	5499	6	Yes
32	15574	5500	2	Yes
33	16049	5501	3	Yes
34	16524	5502	10	Yes
35	16999	5503	5	Yes
36	17474	5504	5	Yes
37	17949	5505	3	Yes
38	18424	5506	1	Yes
39	18899	5507	4	Yes
40	19374	5508	5	Yes
41	19849	5509	6	Yes
42	20324	5510	2	Yes

5.3. 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.