



DFS PORTION of NCC LP0002
CERTIFICATION TEST REPORT
FOR
802.11a/b/g/n/ac 3x3 ACCESS POINT
MODEL NUMBER: AP-7562
FCC ID: QXO-AP7562
REPORT NUMBER: 12289715-E2V3

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Revision History

Rev.	Issue Date	Revisions	Revised By
V1	07/26/18	Initial Issue	Conan Cheung
V2	08/14/18	Added FCC ID: QXO-AP7562	Sol Kuwatani
V3	08/17/18	Page 17 FCC ID corrected	Sol Kuwatani

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: EXTREME NETWORKS, INC.
6480 VIA DEL ORO DR.
SAN JOSE, CA 95119, U.S.A.

EUT DESCRIPTION: 802.11a/b/g/n/ac 3x3 MIMO ACCESS POINT

MODEL: AP-7562

SERIAL NUMBER: 15015522201567

DATE TESTED: MAY 16, 2018 – JUNE 13, 2018

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
DFS Portion of NCC LP0002	Complies

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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PROJECT LEAD
UL Verification Services Inc.



HENRY LAU
TEST ENGINEER
UL Verification Services Inc.

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with the DFS portion of NCC LP0002, ANSI C63.4-2003, FCC CFR 47 Part 2, FCC CFR 47 Part 15, FCC 06-96, FCC KDB 789033, KDB 905462 D02 and D03.

3. REFERENCE DOCUMENTS

Measurements of transmitter parameters as referenced in this report are documented in Sporton report number FR4D0488-10AC.

4. 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.

5. CALIBRATION AND UNCERTAINTY

5.1. 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.

5.2. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty level has been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Time	$\pm 0.02 \%$

The Uncertainty figure is valid to a confidence level of 95%.

6. DYNAMIC FREQUENCY SELECTION

6.1. OVERVIEW

6.1.1. LIMITS

NCC

NCC LP002 is harmonized with FCC Part 15 DFS rules.

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)
<i>U-NII Detection Bandwidth and Statistical Performance Check</i>	All BW modes must be tested	Not required
<i>Channel Move Time and Channel Closing Transmission Time</i>	Test using widest BW mode available	Test using the widest BW mode available for the link
<i>All other tests</i>	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. $\geq$ 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
<i>Non-occupancy period</i>	30 minutes
<i>Channel Availability Check Time</i>	60 seconds
<i>Channel Move Time</i>	10 seconds (See Note 1)
<i>Channel Closing Transmission Time</i>	200 milliseconds + approx. 60 milliseconds over remaining 10 second period. (See Notes 1 and 2)
<i>U-NII Detection Bandwidth</i>	Minimum 100% of the U- NII 99% transmission power bandwidth. (See Note 3)
Note 1: <i>Channel Move Time</i> and the <i>Channel Closing Transmission Time</i> should be performed with Radar Type 0. The measurement timing begins at the end of the Radar Type 0 burst. Note 2: The <i>Channel Closing Transmission Time</i> is comprised of 200 milliseconds starting at the beginning of the <i>Channel Move Time</i> plus any additional intermittent control signals required to facilitate a <i>Channel</i> 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 <i>U-NII Detection Bandwidth</i> 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: $\{(1/360) \times (19 \times 10^6 \text{ PRI}_{\text{usec}})\}$	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 <i>Detection Bandwidth</i> test, <i>Channel Move Time</i> , and <i>Channel Closing Time</i> 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

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. WLAN Traffic is generated from the EUT to the Slave device using iPerf version 2.0.5. 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	T No.	Cal Due
Spectrum Analyzer, PXA, 3Hz to 44GHz	Keysight	N9030A	T459	06/22/18
Signal Generator, MXG X-Series RF Vector	Agilent	N5182B	T1134	04/23/19
Arbitrary Waveform Generator	Agilent / HP	33220A	T190	04/23/19

6.1.3. 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	3.1	Channel Loading and Aggregate Closing Time
FCC 2014 Detection Bandwidth-PXA	3.1.1	Detection Bandwidth in 5 MHz Steps
In Service Monitoring-PXA	3.3.4	In-Service Monitoring (Probability of Detection)
PXA Read	3.1	Signal Generator Screen Capture
SGXProject.exe	1.7	Radar Waveform Generation and Download

6.1.4. TEST ROOM ENVIRONMENT

The test room temperature and humidity shall be maintained within normal temperature of 15~35 °C and normal humidity 20~75% (relative humidity).

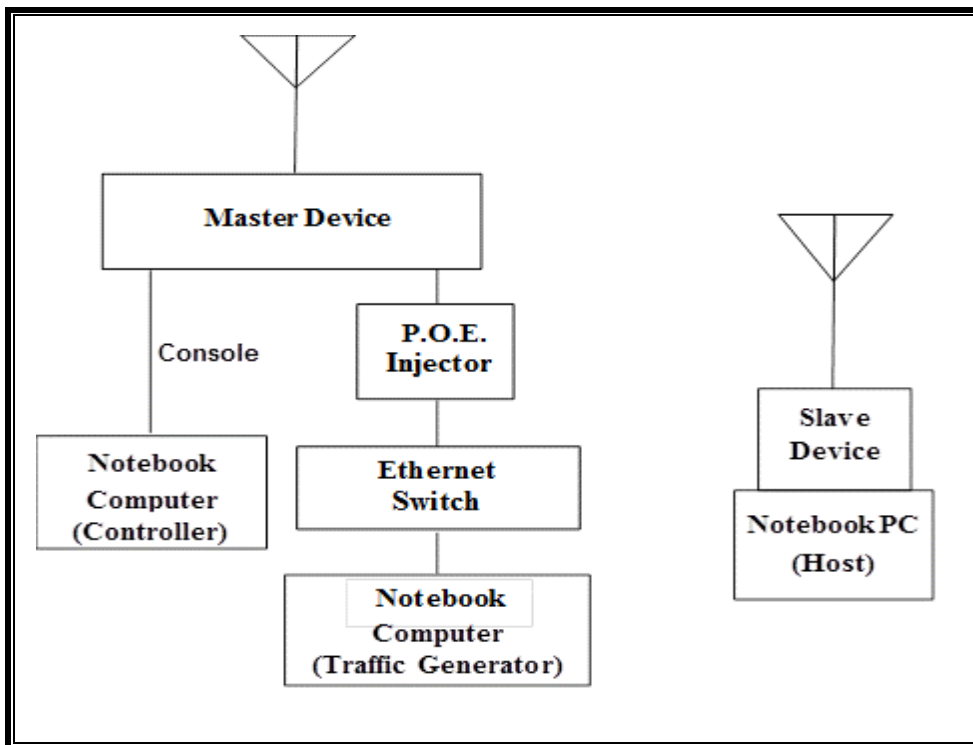
ENVIRONMENT CONDITION

Parameter	Value
Temperature	26.1 & 26.6 °C
Humidity	31 & 35 %

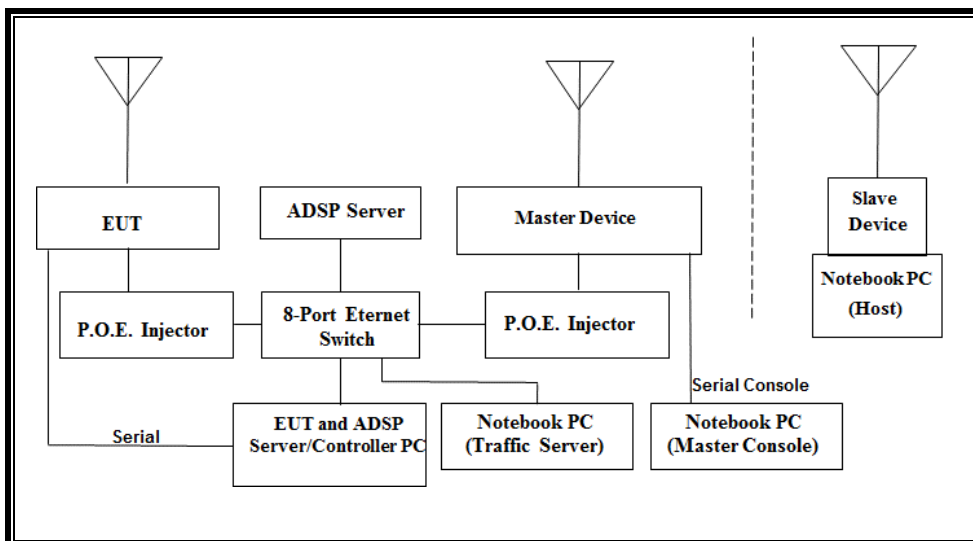
6.1.5. SETUP OF EUT

RADIATED METHOD EUT TEST SETUP

Master Mode



Sensor Mode



SUPPORT EQUIPMENT

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

Master Mode

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	FCC ID
Gigabit P.O.E. Injector (EUT)	Motorola	AP-PSBIAS	D083164410003ADA01	DoC
Notebook PC (Traffic Generator)	HP	Elitebook 8470p	CNU251B4RR	DoC
AC Adapter (Traffic PC)	HP	PA-1900-18HN	WACMB0GBMXFCUE	DoC
Notebook PC (EUT Controller)	HP	Elitebook 8460p	CNU2032CKJ	DoC
AC Adapter (Controller PC)	Lite On Technology	PA-1900-32HT	WBGTK0A1RZALCM	DoC
Notebook PC (Slave Host)	HP	Elitebook 8470p	CNU25193C2	DoC
AC Adapter (Host PC)	Lite On Technology	PA-1650-32HT	WBGST0A4LZDL3A	DoC
802.11ac USB Converter (Slave Radio)	Zyxel Communications Corp.	NWD6505	S130F25008252	I88NWD6505
8-Port Ethernet Switch	D-Link	DGS-1008G	QB201AA003459	DoC
AC Adapter (Switch)	Jentec Technology Co., Ltd.	CF0605-B	LF4R00103624217	DoC

Sensor Mode

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	FCC ID
Gigabit P.O.E. Injector (Master Device)	Motorola	AP-PSBIAS	D083164410003ADA01	DoC
802.11ac Access Point (Master Device)	Zebra	AP-7532I	15198522203616	QXO-AP7532I
Gigabit P.O.E. Injector (EUT)	Motorola	AP-PSBIAS	D0831644100038BA01	DoC
ADSP Server	Motorola AirDefense Solutions	SV-4250-P-1	425A1012459	DoC
Notebook PC (EUT & ADSP Controller)	Dell	Precision 5510	EN005218	DoC
Notebook PC (Master Controller)	HP	Elitebook 8460p	CNU2032CKJ	DoC
AC Adapter (Master Controller PC)	Lite On Technology	PA-1900-32ht	WBGTK0A1RZALCM	DoC
Notebook PC (Slave Host)	HP	Elitebook 8470p	CNU25193C2	DoC
AC Adapter (Host PC)	Lite On Technology	PA-1650-32HT	WBGST0A4LZDL3A	DoC
802.11ac USB Converter (Slave Radio)	Zyxel Communications Corp.	NWD6505	S130F25008252	I88NWD6505
8-Port Ethernet Switch	D-Link	DGS-1008G	QB201AA003459	DoC
AC Adapter (Switch)	Jentec Technology Co., Ltd.	CF0605-B	LF4R00103624217	DoC

6.1.6. DESCRIPTION OF EUT

For FCC the EUT operates over the 5250-5350 MHz and 5470-5725 MHz ranges.

For 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 EUT supports both Master and Client DFS modes of operation.

The highest power level within these bands is 29.97 dBm EIRP in the 5250-5350 MHz band and 29.97 dBm EIRP in the 5470-5725 MHz band.

The highest gain antenna assembly (Model Number: ML-2452-PNL3M3-1) utilized with the EUT has a peak gain of 9.2 dBi in the 5250-5350 MHz band and the 5470-5725 MHz band. The lowest gain antenna assembly (Model Number: ML-5299-HPA5-01) utilized with the EUT has a peak gain of 5.6 dBi (typical gain of 4.4 dBi) in the 5250-5350 MHz band and 5.6 dBi (typical gain of 4.4 dBi) in the 5470-5725 MHz band.

Three identical dipole antennas (Model Number: ML-5299-HPA5-01) 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 -63 dBm.

The EUT uses three 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.

For Master Mode, WLAN traffic that meets or exceeds the minimum required loading was generated by transferring a data stream from the Master Device to the Slave Device using iPerf version 2.0.5 software package.

For Sensor Mode, the EUT transmits de-authentication packets only in the control channel at a channel bandwidth of 20 MHz.

TPC is required since the maximum EIRP is greater than 500 mW (27 dBm).

For Master Mode, the EUT utilizes the 802.11ac architecture. Three nominal channel bandwidths are implemented: 20 MHz, 40 MHz and 80 MHz.

For Sensor Mode, the EUT utilizes the 802.11n architecture. One nominal channel bandwidth is implemented: 20 MHz..

The software installed in the EUT is AP7562 version 5.9.2.0-9b9a60cX.

UNIFORM CHANNEL SPREADING

This function is not required per KDB 905462.

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

The Master Device is a Extreme Technologies Access Point, FCC ID: QXO-AP7562. The minimum antenna gain for the Master Device is 4.4 dBi.

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

The calibrated radiated DFS Detection Threshold level is set to -63 dBm .

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

The Master Device is a Extreme Technologies Access Point, FCC ID: QXO-AP7532i. The minimum antenna gain for the Master Device is 5.92 dBi.

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

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.

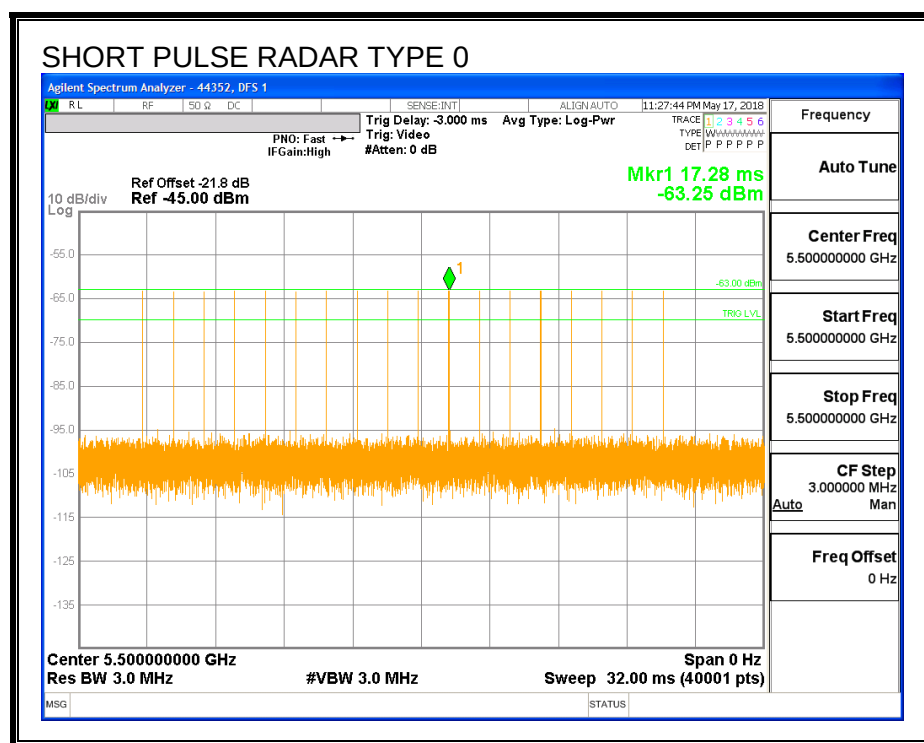
6.2. RESULTS FOR 20 MHz BANDWIDTH

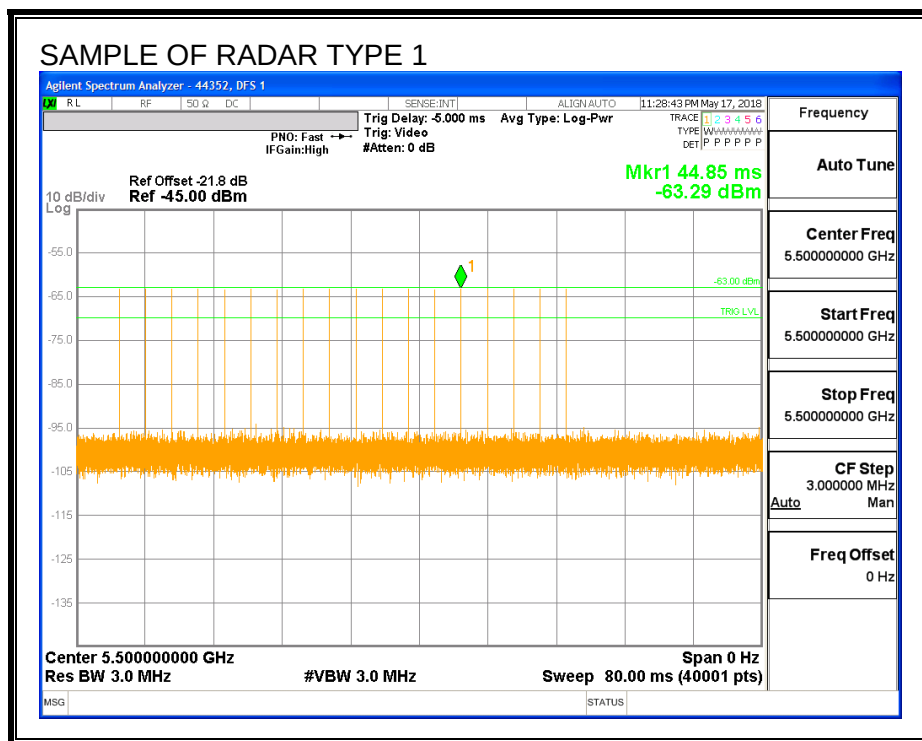
6.2.1. TEST CHANNEL

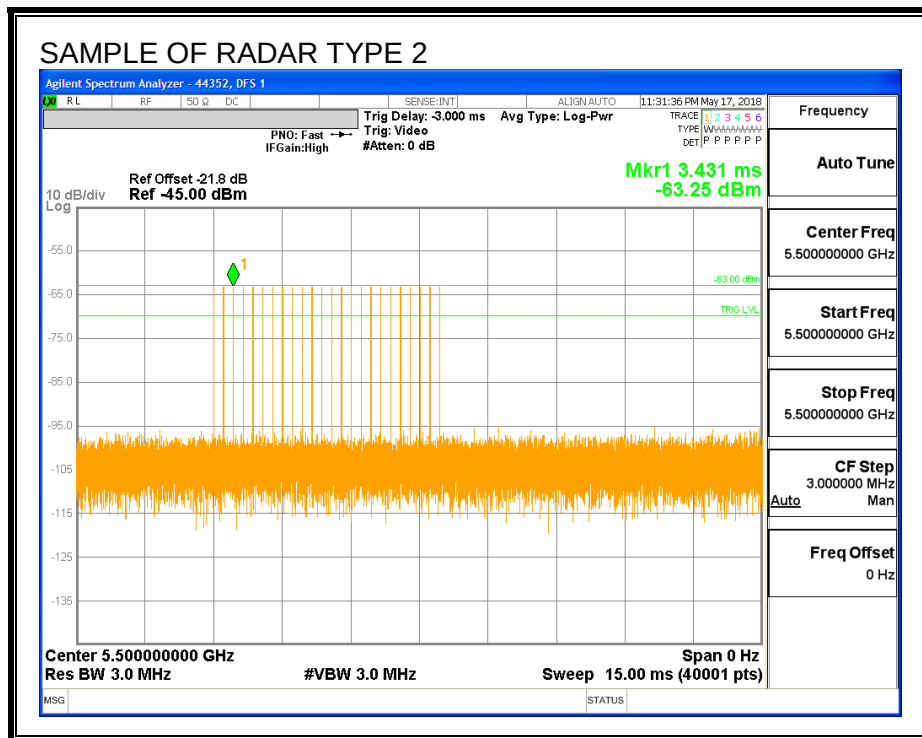
All tests were performed at a channel center frequency of 5500 MHz.

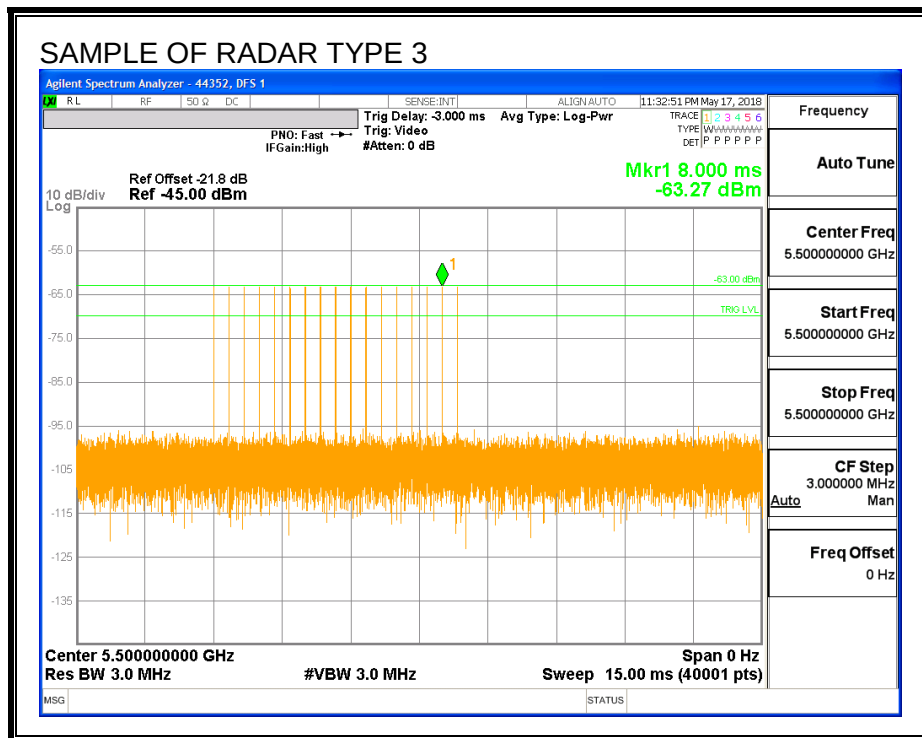
6.2.2. RADAR WAVEFORMS AND TRAFFIC

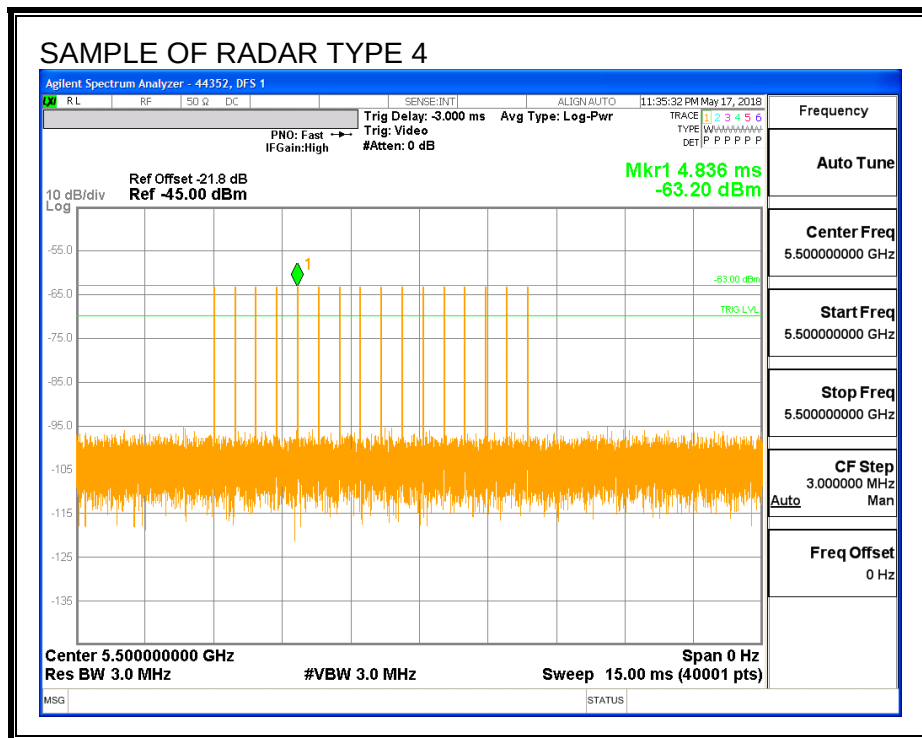
RADAR WAVEFORMS

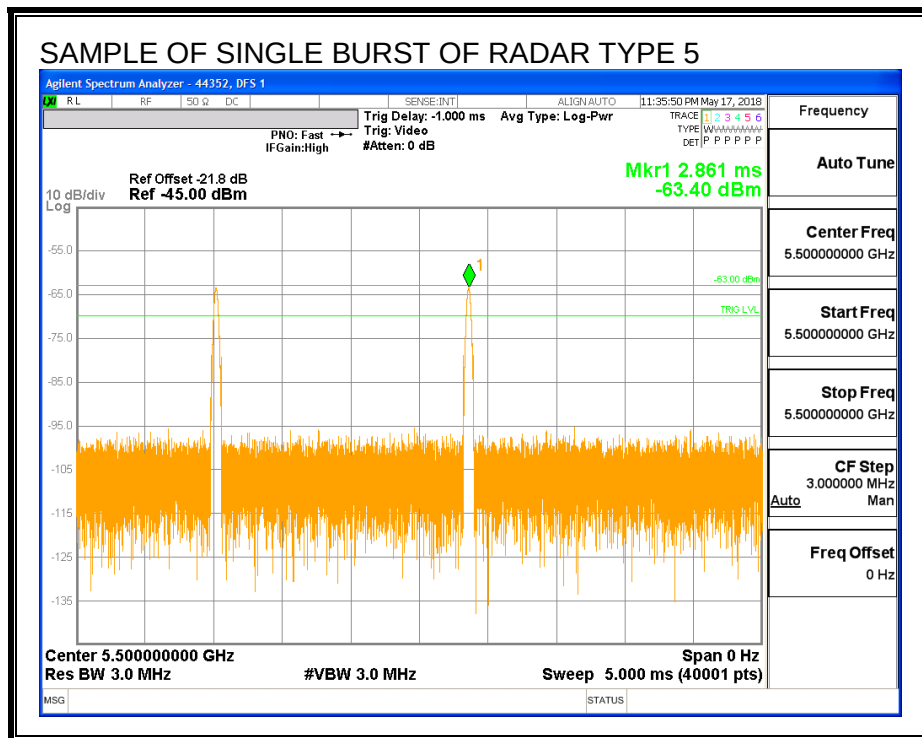


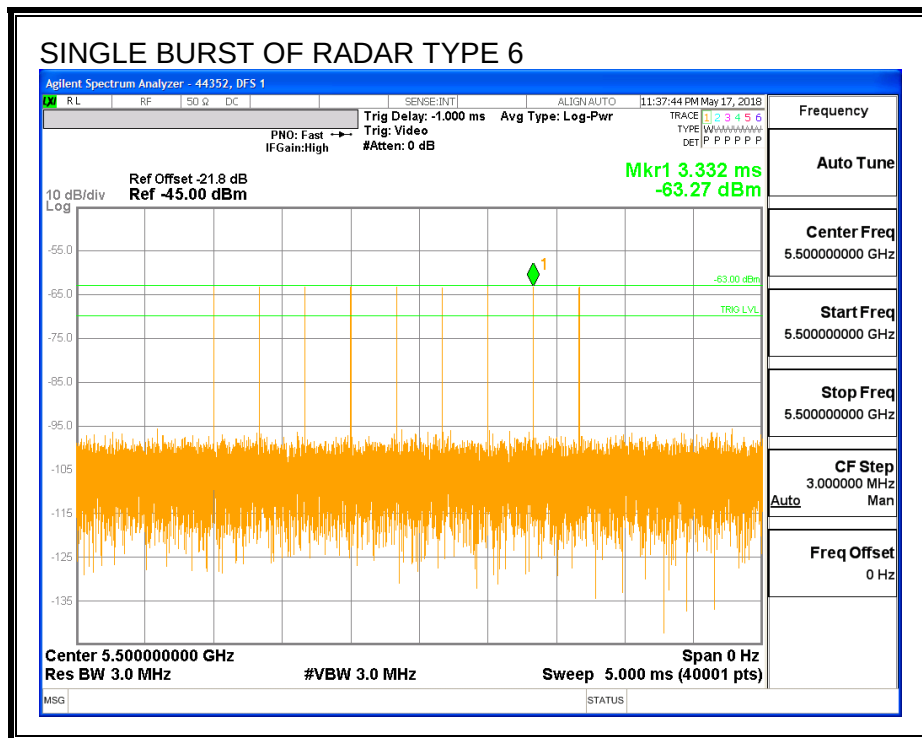




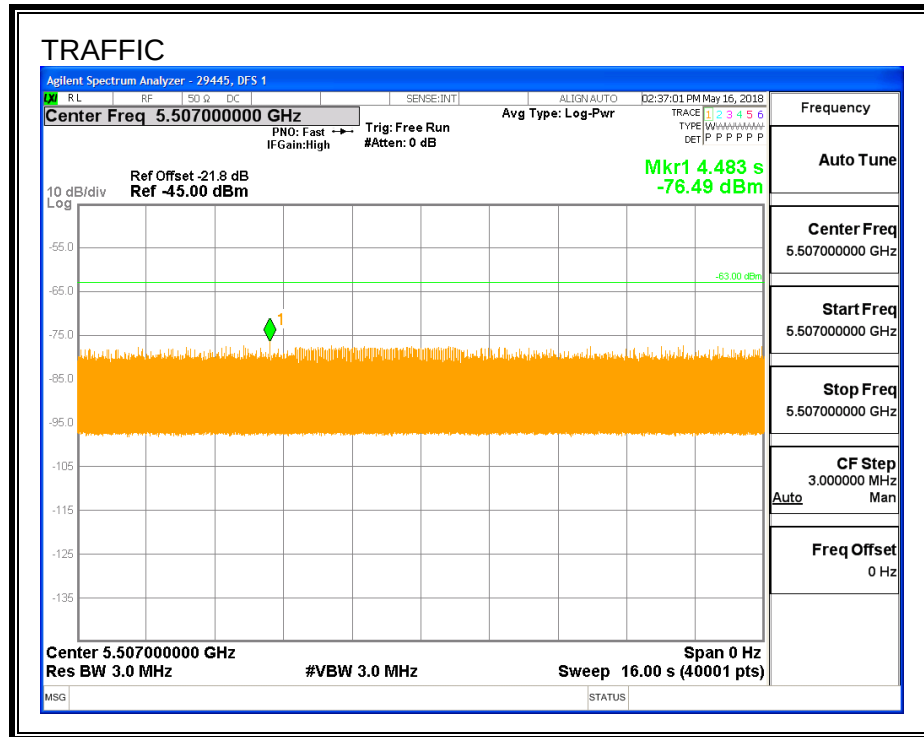




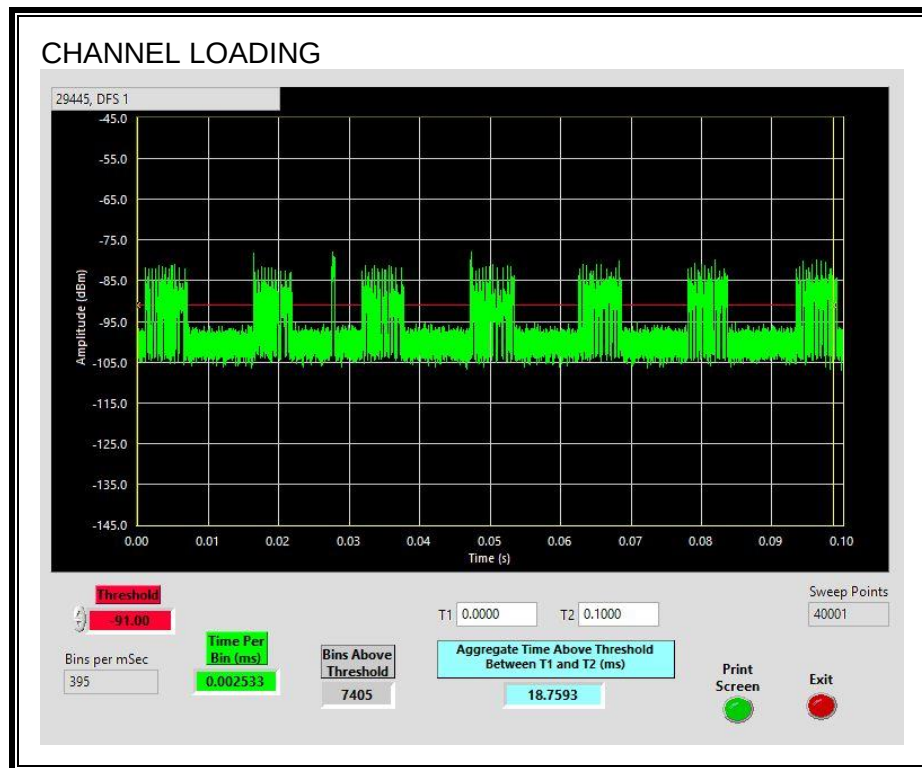




TRAFFIC



CHANNEL LOADING



The level of traffic loading on the channel by the EUT is 18.75%

6.2.3. CHANNEL AVAILABILITY CHECK TIME

PROCEDURE TO DETERMINE INITIAL POWER-UP CYCLE TIME

A sweep was started on the spectrum analyzer when a software command was issued to the EUT to commence a CAC period on 5500 MHz. The time 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 sweep was started on the spectrum analyzer when a software command was issued to the EUT to commence a CAC period on 5500 MHz. A radar signal was triggered within 0 to 6 seconds after the beginning of the CAC period and transmissions on the channel were monitored on the spectrum analyzer.

The Non-Occupancy list was cleared. A sweep was started on the spectrum analyzer when a software command was issued to the EUT to commence a CAC period on 5500 MHz. A radar signal was triggered within 54 to 60 seconds after the beginning of the CAC period and transmissions on the channel were monitored on the spectrum analyzer.

QUANTITATIVE RESULTS

No Radar Triggered

Beginning of CAC (sec)	Timing of Start of Traffic (sec)	Total Power-up Cycle Time (sec)
0	64.3	64.3

Radar Near Beginning of CAC

Beginning of CAC (sec)	Timing of Radar Burst (sec)	Radar Relative to Start of CAC (sec)
0	0.7	0.7

Radar Near End of CAC

Beginning of CAC (sec)	Timing of Radar Burst (sec)	Radar Relative to Start of CAC (sec)
0	58.5	58.5

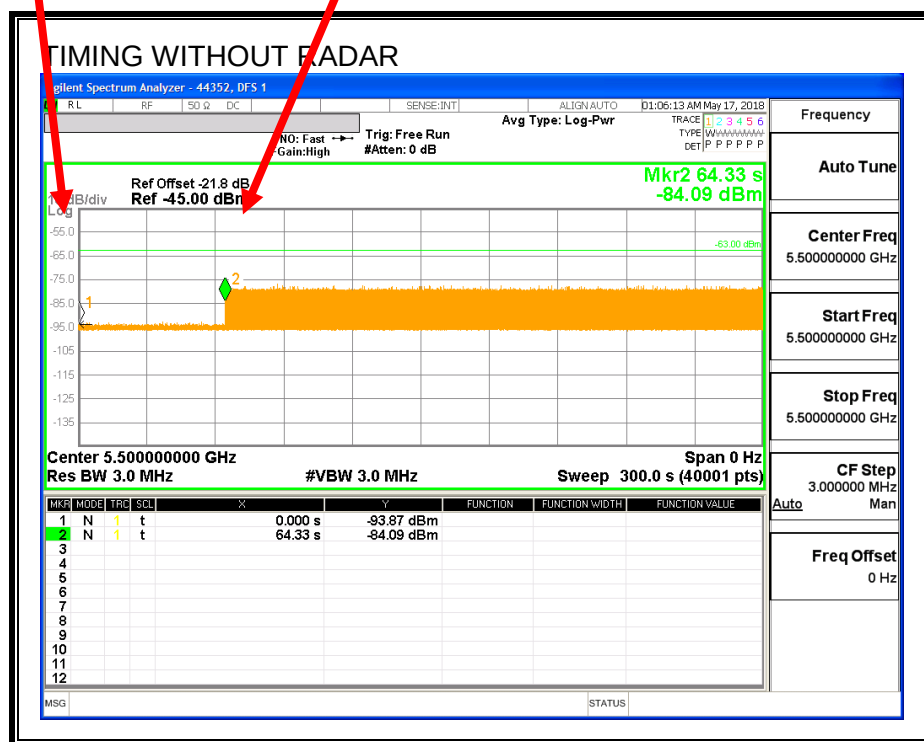
QUALITATIVE RESULTS

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

Command to
Switch Channels
Start of CAC

End of CAC

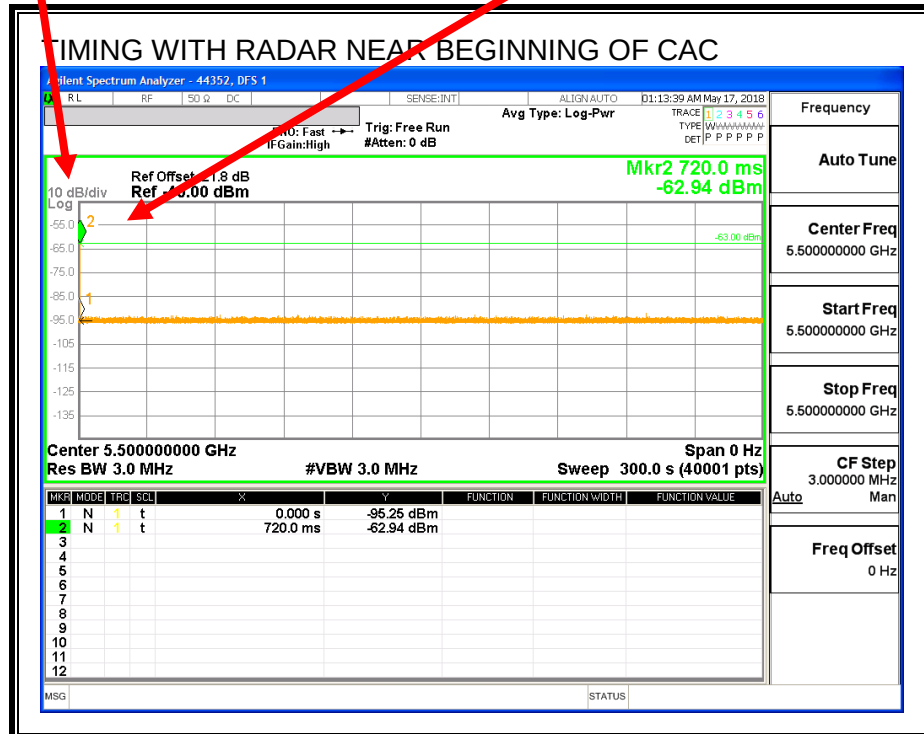


Transmissions begin on channel after completion of the CAC period.

TIMING WITH RADAR NEAR BEGINNING OF CAC

Command to
Switch Channels
Start of CAC

Radar Signal Applied

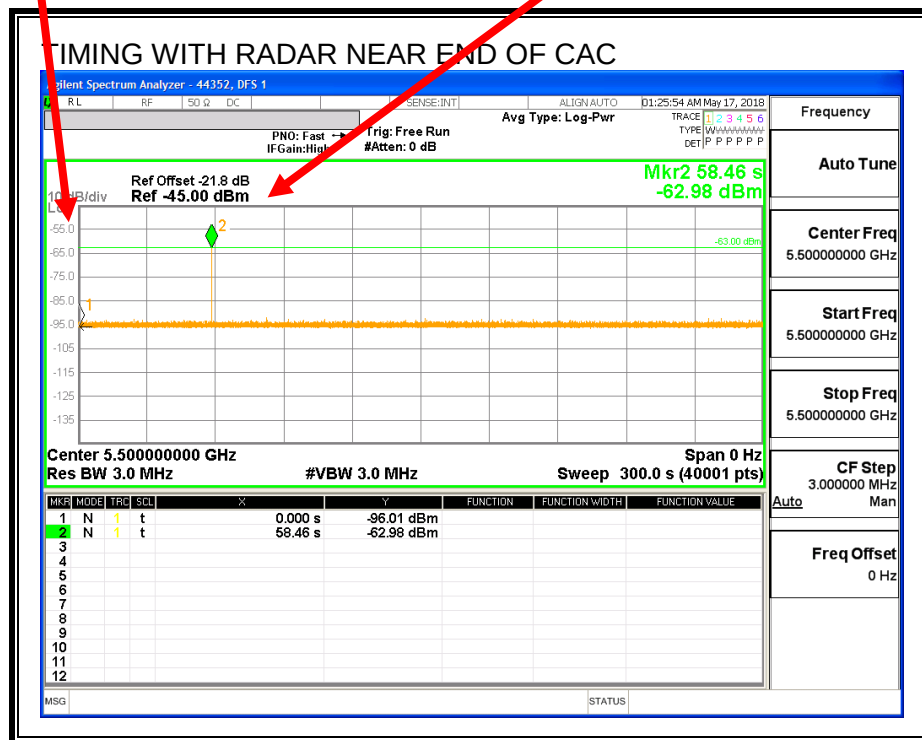


No EUT transmissions were observed after the radar signal.

TIMING WITH RADAR NEAR END OF CAC

Command to
Switch Channels
Start of CAC

Radar Signal Applied



No EUT transmissions were observed after the radar signal.

6.2.4. OVERLAPPING CHANNEL TESTS

RESULTS

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

These tests are not applicable.

6.2.5. 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)

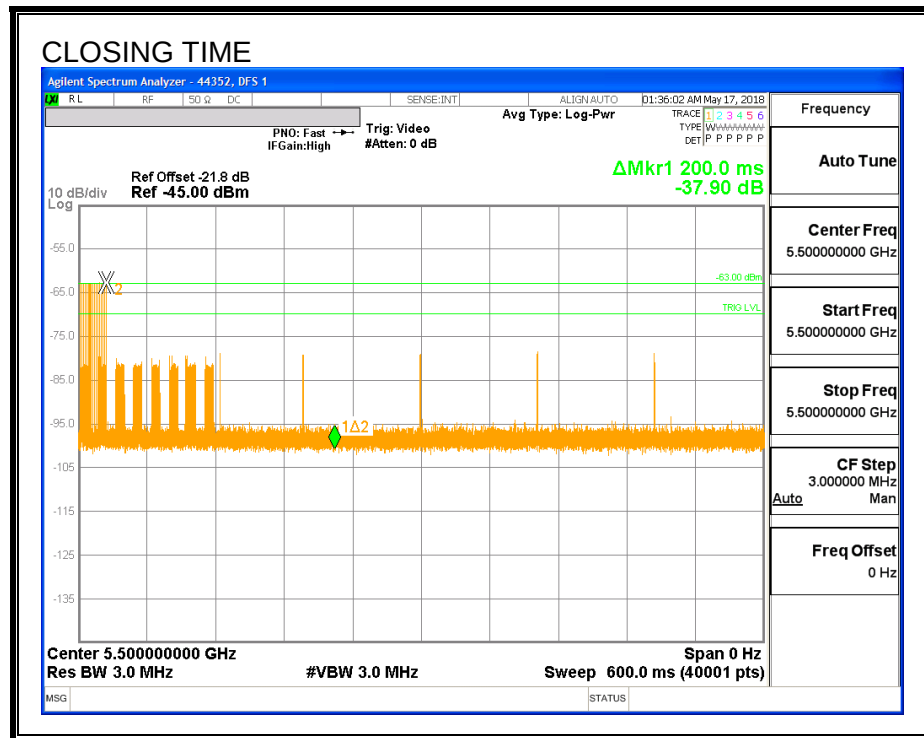
The observation period over which the aggregate time is calculated begins at (Reference Marker + 200 msec) and ends no earlier than (Reference Marker + 10 sec).

RESULTS

Channel Move Time (sec)	Limit (sec)
0.610	10

Aggregate Channel Closing Transmission Time (msec)	Limit (msec)
4.4	60

CHANNEL CLOSING TIME



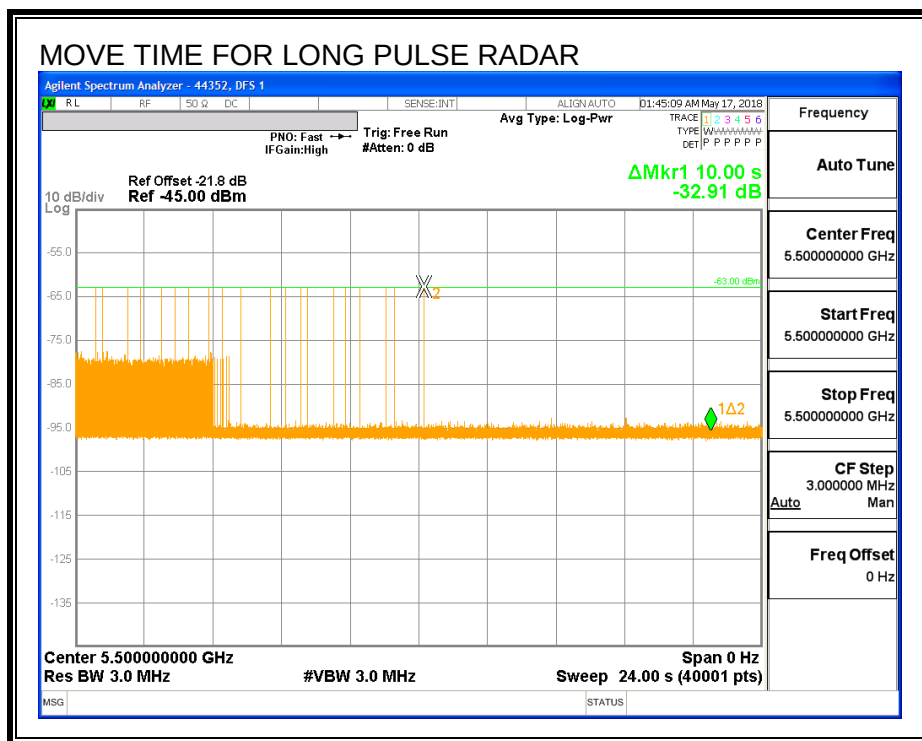
AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

Only intermittent transmissions are observed during the aggregate monitoring period.



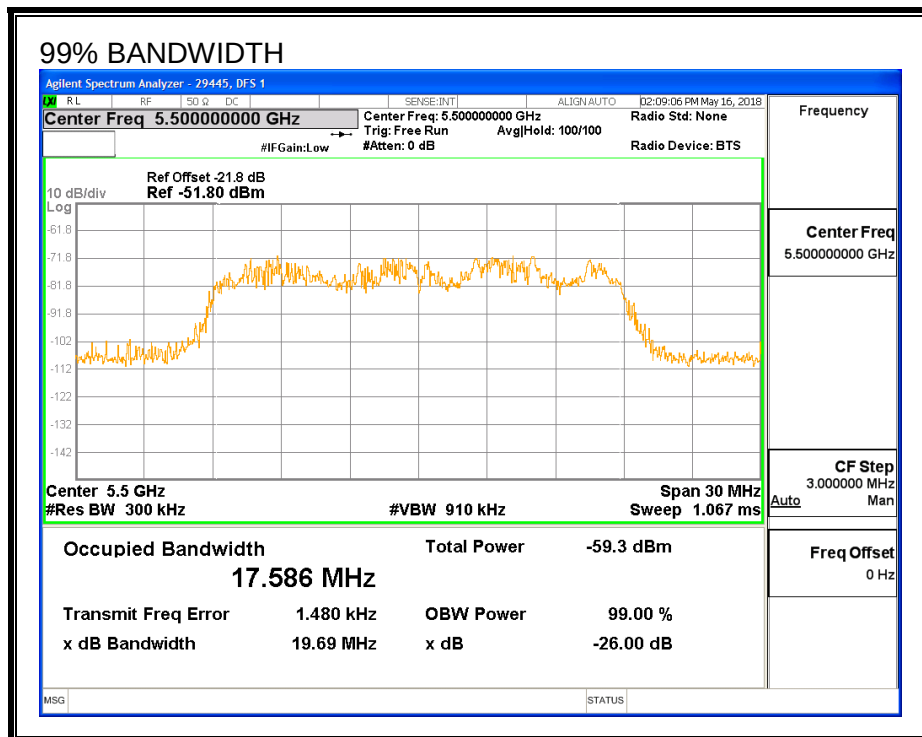
LONG PULSE CHANNEL MOVE TIME

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



6.2.6. DETECTION BANDWIDTH

REFERENCE PLOT OF 99% POWER BANDWIDTH



RESULTS

FL	FH	Detection Bandwidth	99% Power Bandwidth	Ratio of Detection BW to 99% Power BW	Minimum Limit
(MHz)	(MHz)	(MHz)	(MHz)	(%)	(%)
5491	5509	18	17.586	102.4	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	0	0	
5491	10	10	100	FL
5492	10	10	100	
5493	10	9	90	
5494	10	10	100	
5495	10	10	100	
5500	10	10	100	
5505	10	10	100	
5506	10	10	100	
5507	10	10	100	
5508	10	10	100	
5509	10	10	100	FH
5510	10	1	10	

6.2.7. IN-SERVICE MONITORING

RESULTS

FCC Radar Test Summary										
Signal Type	Number of Trials	Detection (%)	Limit (%)	Pass/Fail	Detection Bandwidth		OBW	Test Location	Employee Number	In-Service Monitoring Version
					FL	FH				
FCC Short Pulse Type 1	30	93.33	60	Pass	5491	5509	17.59	DFS 1	29445	Version 3.3.4
FCC Short Pulse Type 2	30	90.00	60	Pass	5491	5509	17.59	DFS 1	29445	Version 3.3.4
FCC Short Pulse Type 3	30	80.00	60	Pass	5491	5509	17.59	DFS 1	29445	Version 3.3.4
FCC Short Pulse Type 4	30	73.33	60	Pass	5491	5509	17.59	DFS 1	29445	Version 3.3.4
Aggregate		84.17	80	Pass						
FCC Long Pulse Type 5	30	90.00	80	Pass	5491	5509	17.59	DFS 1	29445	Version 3.3.4
FCC Hopping Type 6	38	100.00	70	Pass	5491	5509		DFS 1	29445	Version 3.3.4

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	5497	No
1002	1	618	86	A	5492	Yes
1003	1	718	74	A	5507	Yes
1004	1	738	72	A	5505	Yes
1005	1	838	63	A	5502	Yes
1006	1	678	78	A	5493	Yes
1007	1	818	65	A	5499	Yes
1008	1	918	58	A	5499	Yes
1009	1	638	83	A	5496	Yes
1010	1	758	70	A	5500	Yes
1011	1	858	62	A	5506	Yes
1012	1	878	61	A	5495	Yes
1013	1	558	95	A	5502	Yes
1014	1	938	57	A	5507	Yes
1015	1	658	81	A	5497	Yes
1016	1	2058	26	B	5499	Yes
1017	1	1885	28	B	5506	Yes
1018	1	2711	20	B	5509	Yes
1019	1	1472	36	B	5504	Yes
1020	1	2429	22	B	5503	Yes
1021	1	1320	40	B	5498	No
1022	1	1211	44	B	5503	Yes
1023	1	2779	19	B	5493	Yes
1024	1	2799	19	B	5498	Yes
1025	1	1949	28	B	5491	Yes
1026	1	905	59	B	5498	Yes
1027	1	1537	35	B	5501	Yes
1028	1	622	85	B	5508	Yes
1029	1	1384	39	B	5499	Yes
1030	1	599	89	B	5495	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	3.2	215	24	5492	Yes
2002	1.2	154	29	5492	Yes
2003	5	226	26	5505	Yes
2004	3.3	212	28	5504	Yes
2005	1.3	208	23	5500	Yes
2006	1.9	197	29	5509	Yes
2007	4.2	159	23	5507	Yes
2008	1	153	29	5509	Yes
2009	3.5	162	28	5492	Yes
2010	2.6	160	25	5506	Yes
2011	3.4	173	24	5507	Yes
2012	4.7	218	24	5500	Yes
2013	3.8	154	27	5492	Yes
2014	3.3	165	24	5508	Yes
2015	4.5	187	27	5508	No
2016	2.4	202	25	5493	Yes
2017	1.9	190	25	5500	Yes
2018	4.8	224	28	5504	Yes
2019	4.5	216	26	5504	Yes
2020	2.8	201	24	5505	Yes
2021	4.8	197	29	5495	Yes
2022	1.4	187	28	5507	Yes
2023	3.7	230	29	5501	Yes
2024	4.6	185	25	5508	No
2025	2.9	151	27	5507	Yes
2026	2.1	192	24	5497	Yes
2027	2.9	162	23	5498	Yes
2028	2.2	207	26	5498	Yes
2029	3.2	225	26	5507	No
2030	2.8	155	23	5494	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	7.1	333	17	5503	No
3002	6.9	380	18	5494	Yes
3003	6.3	341	16	5505	Yes
3004	8.5	401	17	5508	No
3005	8.2	375	16	5507	Yes
3006	8.6	330	18	5507	Yes
3007	8.5	317	17	5503	Yes
3008	9.2	285	17	5502	Yes
3009	7.4	418	16	5509	Yes
3010	8.3	281	16	5492	Yes
3011	8.8	427	17	5496	Yes
3012	9.9	303	18	5503	Yes
3013	6.6	461	18	5504	Yes
3014	10	350	16	5509	No
3015	6.9	286	16	5493	Yes
3016	6.5	438	18	5492	Yes
3017	9.9	253	16	5504	Yes
3018	9.7	300	17	5497	Yes
3019	9.1	262	18	5500	Yes
3020	7.2	322	16	5500	No
3021	6.9	296	18	5501	Yes
3022	7.3	251	17	5499	Yes
3023	7.2	371	18	5497	No
3024	7.9	339	16	5507	No
3025	6.1	339	18	5496	Yes
3026	7	453	18	5506	Yes
3027	7.5	348	16	5492	Yes
3028	8.6	474	17	5506	Yes
3029	9.4	382	17	5492	Yes
3030	8.7	404	18	5502	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	19.3	457	16	5498	No
4002	18.4	358	14	5492	Yes
4003	16.8	307	16	5503	Yes
4004	16.3	472	12	5509	No
4005	15.1	433	15	5504	Yes
4006	19.9	493	16	5495	Yes
4007	15	350	14	5509	No
4008	11.2	423	13	5503	No
4009	15.8	292	14	5496	Yes
4010	12.4	260	13	5492	Yes
4011	17.5	393	14	5501	Yes
4012	19.4	373	14	5495	No
4013	11.6	268	13	5503	No
4014	14	395	13	5502	Yes
4015	15.7	436	12	5499	Yes
4016	14.3	324	15	5493	Yes
4017	16.5	378	14	5494	No
4018	15.5	279	15	5503	Yes
4019	13.9	479	15	5503	Yes
4020	13.4	393	15	5509	No
4021	12.2	354	13	5503	Yes
4022	17.1	296	14	5492	Yes
4023	12.1	271	15	5499	Yes
4024	17.4	343	16	5508	Yes
4025	12.9	464	12	5492	Yes
4026	18.6	431	16	5508	Yes
4027	14.6	313	13	5501	Yes
4028	12.3	294	12	5493	Yes
4029	17.8	440	16	5503	Yes
4030	11.1	315	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	No
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	5495	Yes
12	5497	Yes
13	5495	Yes
14	5497	Yes
15	5495	Yes
16	5497	Yes
17	5495	Yes
18	5497	Yes
19	5495	Yes
20	5497	Yes
21	5505	Yes
22	5503	Yes
23	5505	Yes
24	5503	No
25	5505	Yes
26	5503	No
27	5505	Yes
28	5503	Yes
29	5505	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	60	5491	4	Yes
2	535	5492	4	Yes
3	1010	5493	4	Yes
4	1485	5494	5	Yes
5	1960	5495	4	Yes
6	2435	5496	6	Yes
7	2910	5497	6	Yes
8	3385	5498	2	Yes
9	3860	5499	4	Yes
10	4335	5500	4	Yes
11	4810	5501	6	Yes
12	5285	5502	4	Yes
13	5760	5503	3	Yes
14	6235	5504	6	Yes
15	6710	5505	3	Yes
16	7185	5506	4	Yes
17	7660	5507	4	Yes
18	8135	5508	2	Yes
19	8610	5509	4	Yes
20	9085	5491	4	Yes
21	9560	5492	5	Yes
22	10035	5493	5	Yes
23	10510	5494	1	Yes
24	10985	5495	4	Yes
25	11460	5496	5	Yes
26	11935	5497	8	Yes
27	12410	5498	3	Yes
28	12885	5499	3	Yes
29	13360	5500	5	Yes
30	13835	5501	2	Yes
31	14310	5502	6	Yes
32	14785	5503	2	Yes
33	15260	5504	5	Yes
34	15735	5505	4	Yes
35	16210	5506	3	Yes
36	16685	5507	2	Yes
37	17160	5508	3	Yes
38	17635	5509	5	Yes

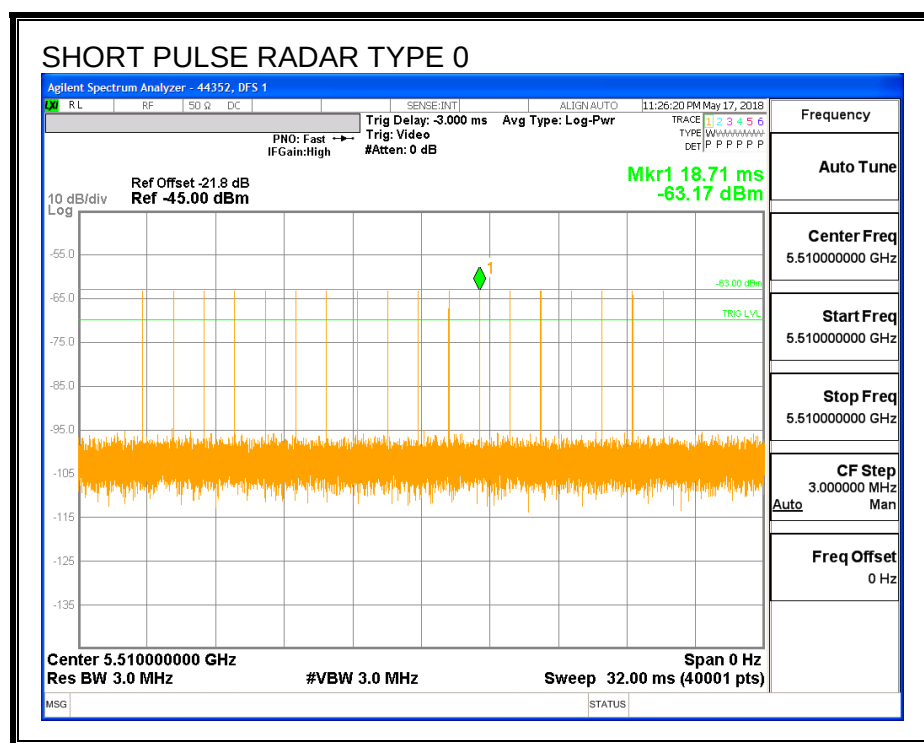
6.3. RESULTS FOR 40 MHz BANDWIDTH

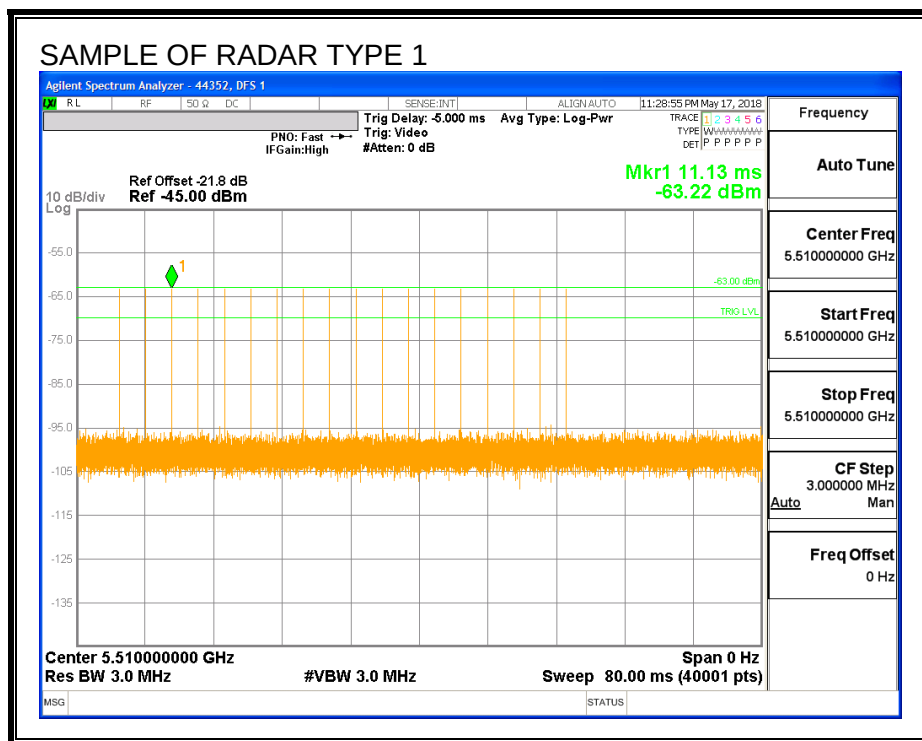
6.3.1. TEST CHANNEL

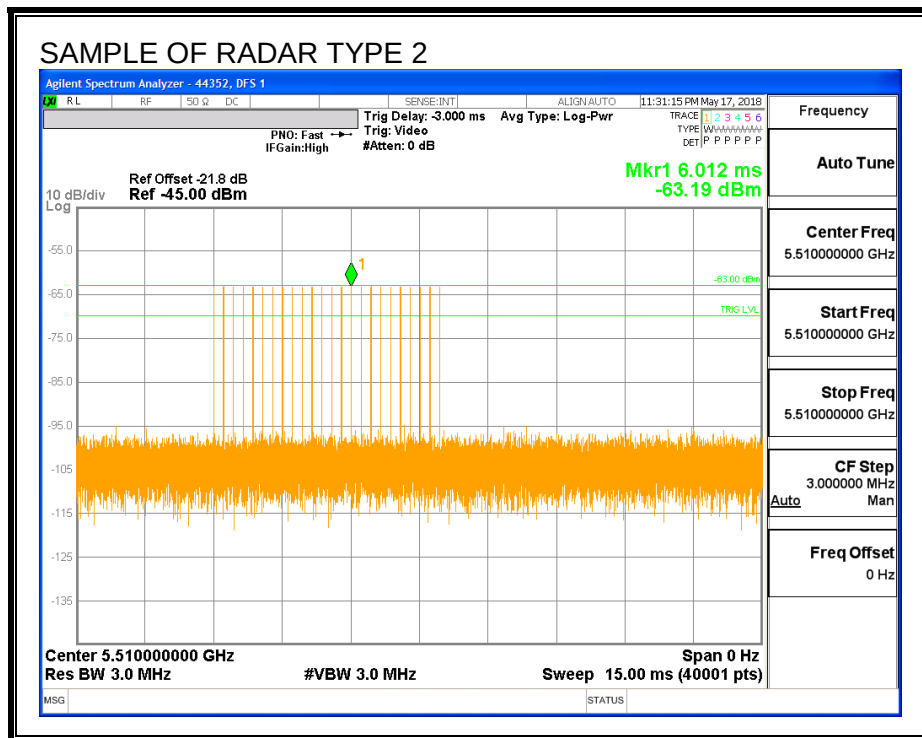
All tests were performed at a channel center frequency of 5510 MHz.

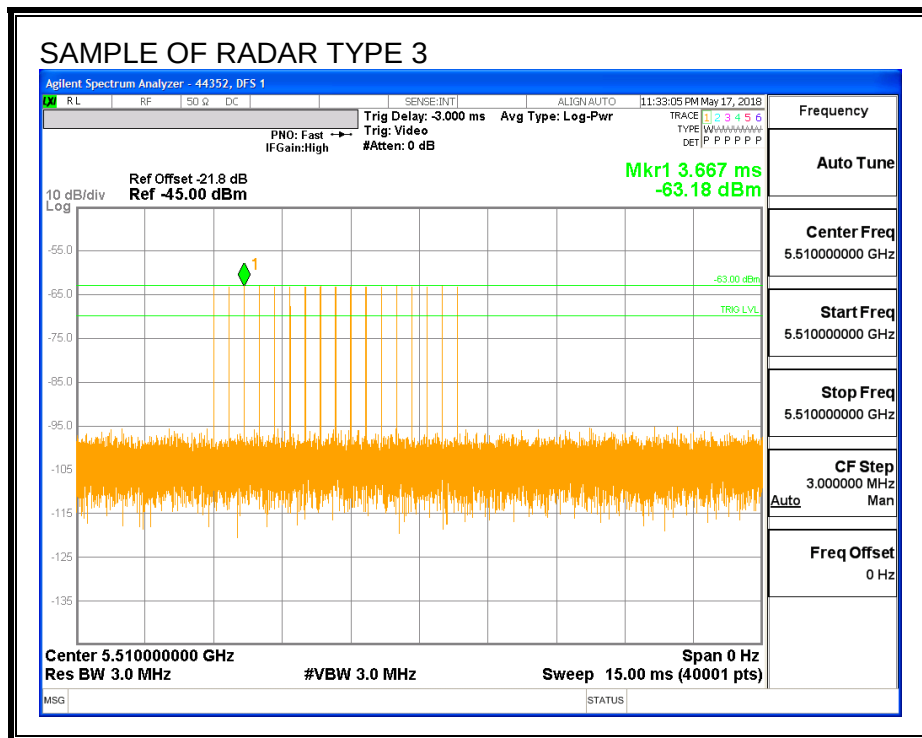
6.3.2. RADAR WAVEFORMS AND TRAFFIC

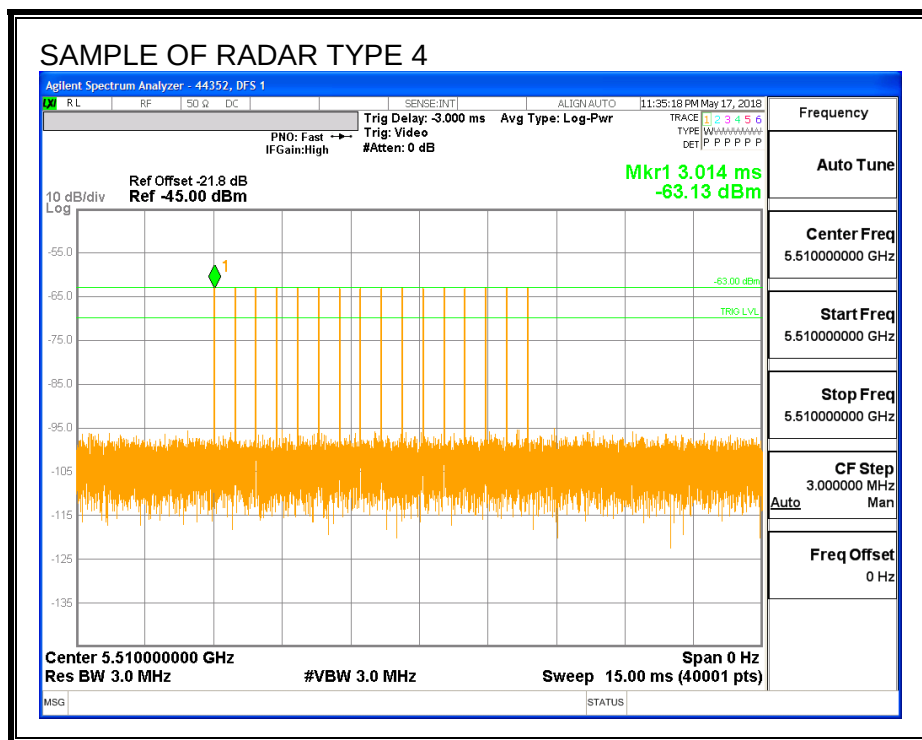
RADAR WAVEFORMS

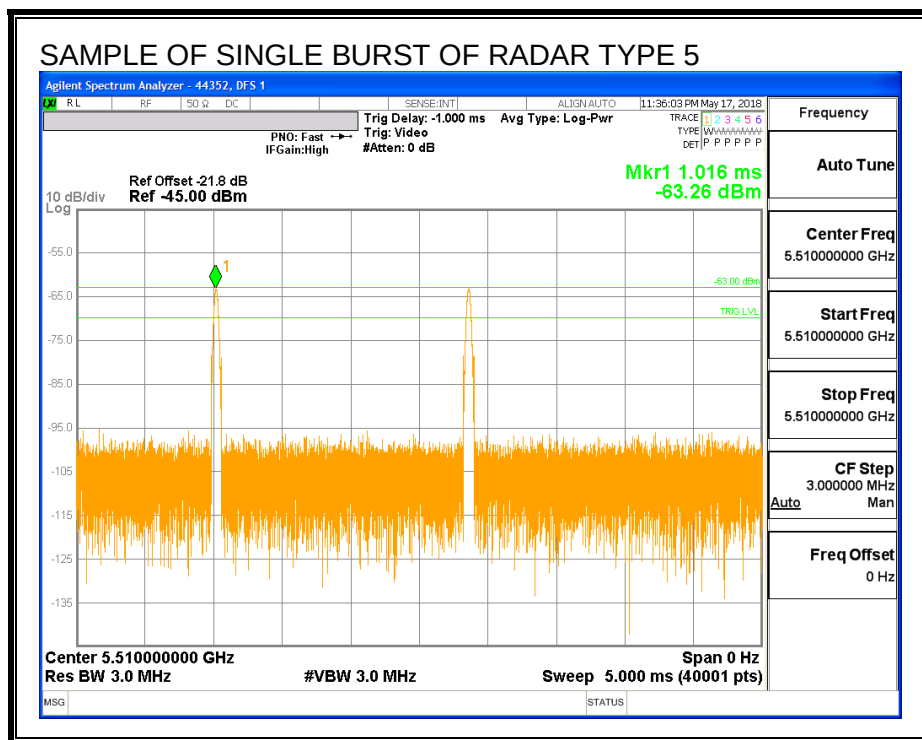


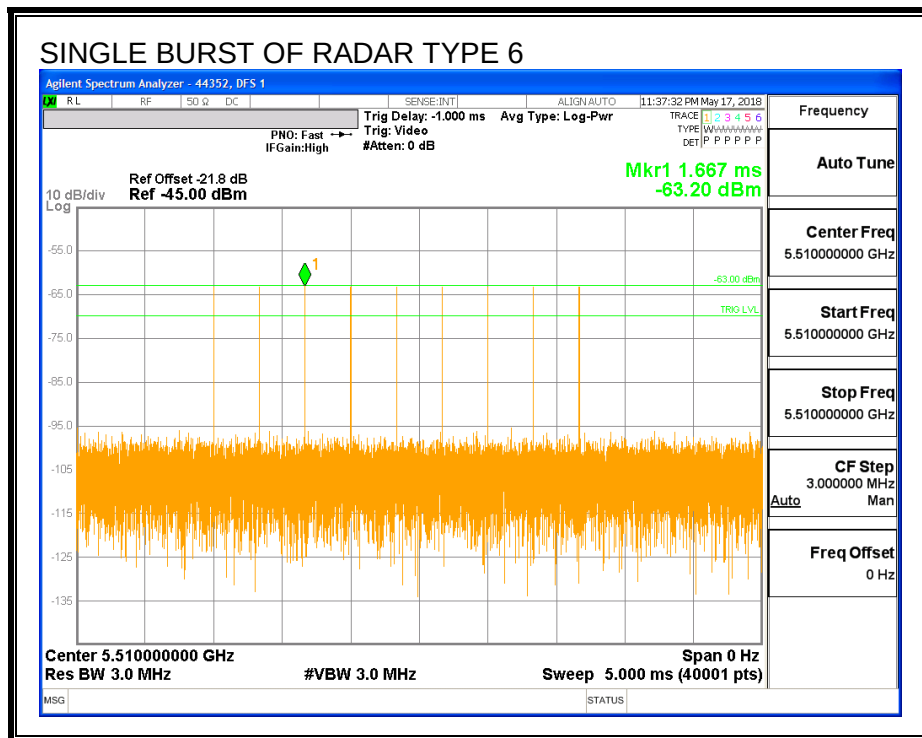




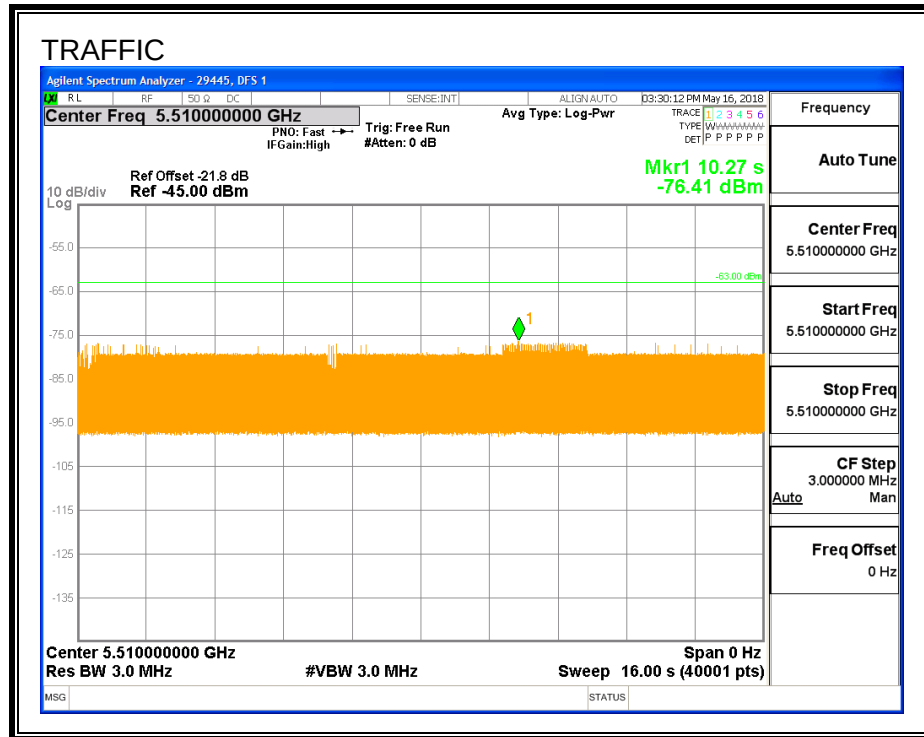




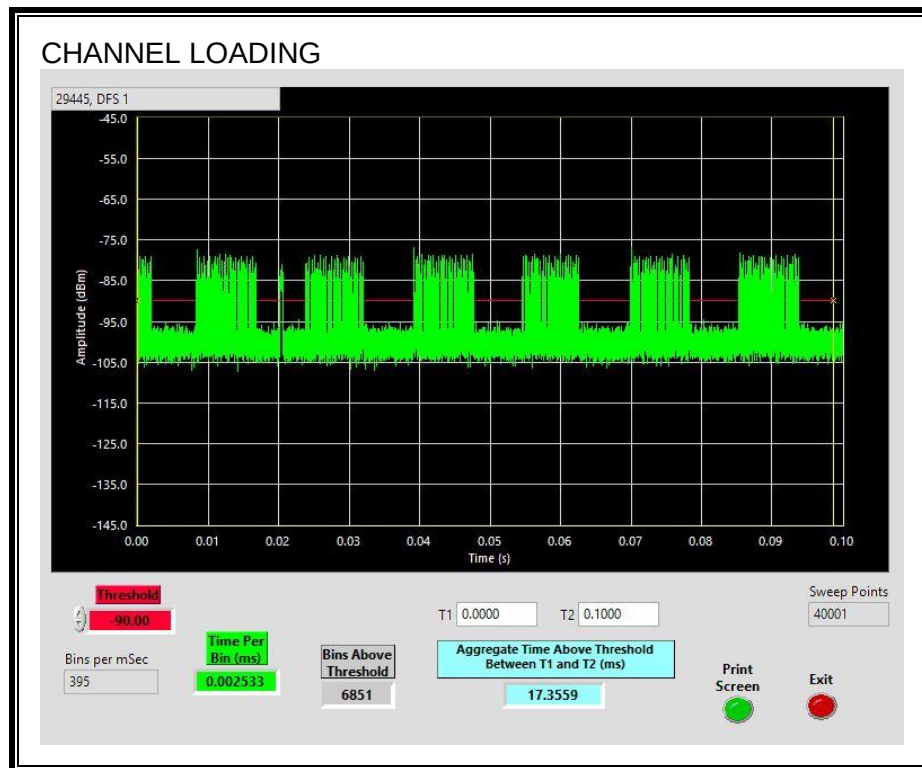




TRAFFIC



CHANNEL LOADING



The level of traffic loading on the channel by the EUT is 17.35%.

6.3.3. CHANNEL AVAILABILITY CHECK TIME

PROCEDURE TO DETERMINE INITIAL POWER-UP CYCLE TIME

A sweep was started on the spectrum analyzer when a software command was issued to the EUT to commence a CAC period on 5510 MHz. The time 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 sweep was started on the spectrum analyzer when a software command was issued to the EUT to commence a CAC period on 5510 MHz. A radar signal was triggered within 0 to 6 seconds after the beginning of the CAC period and transmissions on the channel were monitored on the spectrum analyzer.

The Non-Occupancy list was cleared. A sweep was started on the spectrum analyzer when a software command was issued to the EUT to commence a CAC period on 5510 MHz. A radar signal was triggered within 54 to 60 seconds after the beginning of the CAC period and transmissions on the channel were monitored on the spectrum analyzer.

QUANTITATIVE RESULTS

No Radar Triggered

Beginning of CAC (sec)	Timing of Start of Traffic (sec)	Total Power-up Cycle Time (sec)
0	64.5	64.5

Radar Near Beginning of CAC

Beginning of CAC (sec)	Timing of Radar Burst (sec)	Radar Relative to Start of CAC (sec)
0	0.8	0.8

Radar Near End of CAC

Beginning of CAC (sec)	Timing of Radar Burst (sec)	Radar Relative to Start of CAC (sec)
0	58.4	58.4

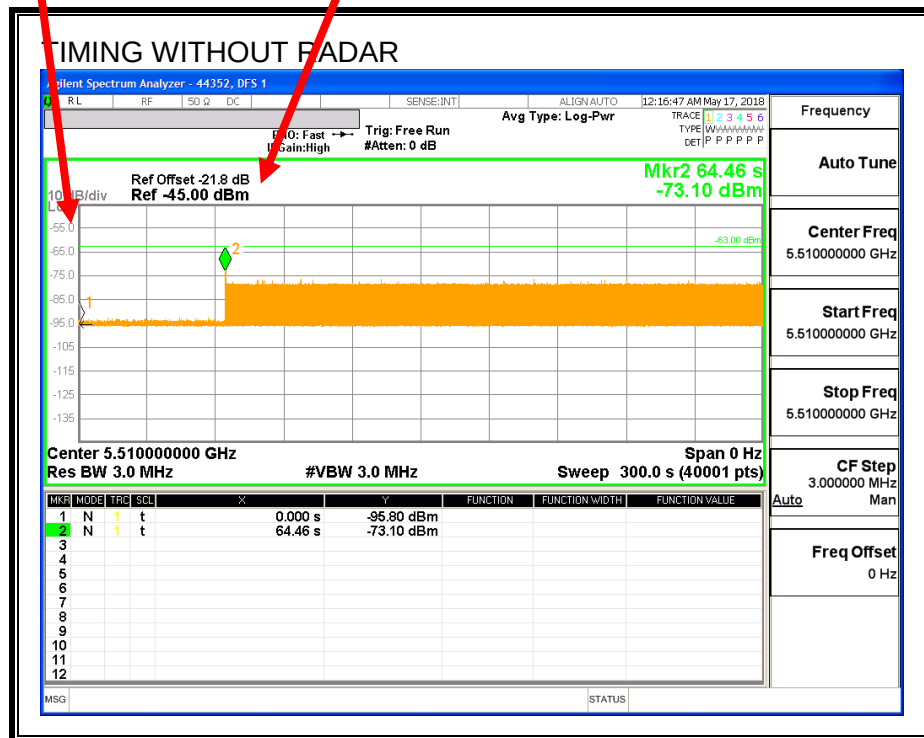
QUALITATIVE RESULTS

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

Command to
Switch Channels
Start of CAC

End of CAC

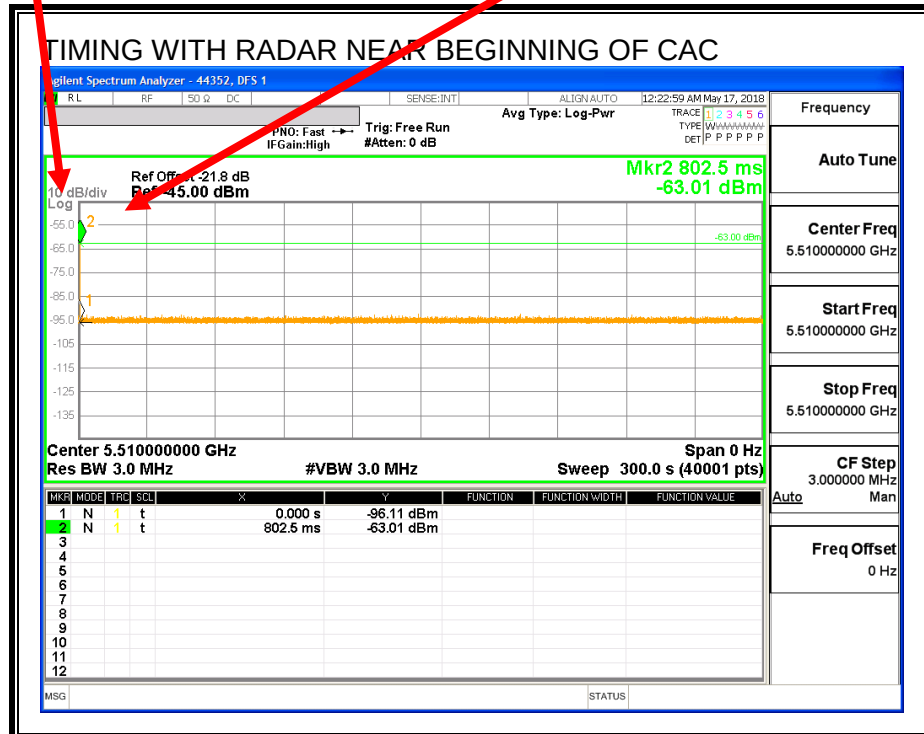


Transmissions begin on channel after completion of the CAC period.

TIMING WITH RADAR NEAR BEGINNING OF CAC

Command to
Switch Channels
Start of CAC

Radar Signal Applied

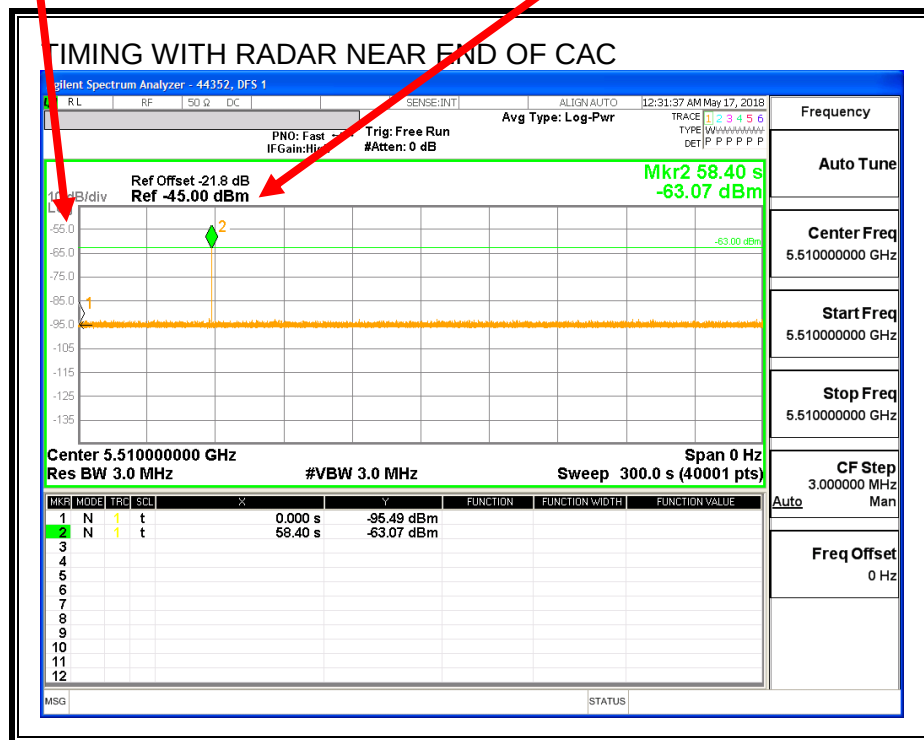


No EUT transmissions were observed after the radar signal.

TIMING WITH RADAR NEAR END OF CAC

Command to
Switch Channels
Start of CAC

Radar Signal Applied



No EUT transmissions were observed after the radar signal.

6.3.4. OVERLAPPING CHANNEL TESTS

RESULTS

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

These tests are not applicable.

6.3.5. 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:

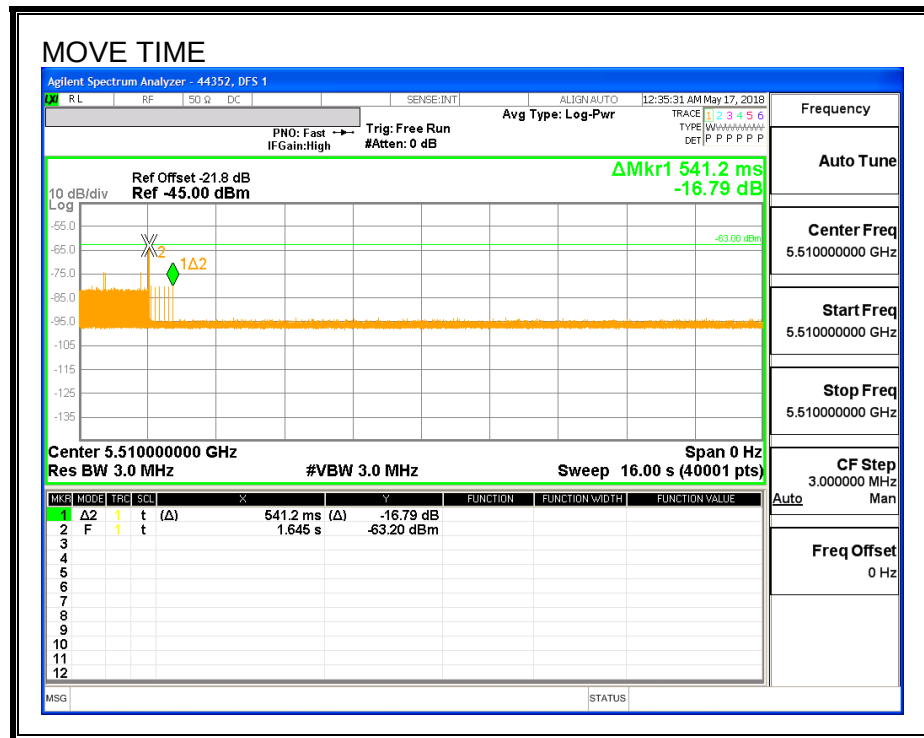
Aggregate Transmission Time =
(Number of analyzer bins showing transmission) * (dwell time per bin)

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)
0.541	10

Aggregate Channel Closing Transmission Time (msec)	Limit (msec)
3.6	60



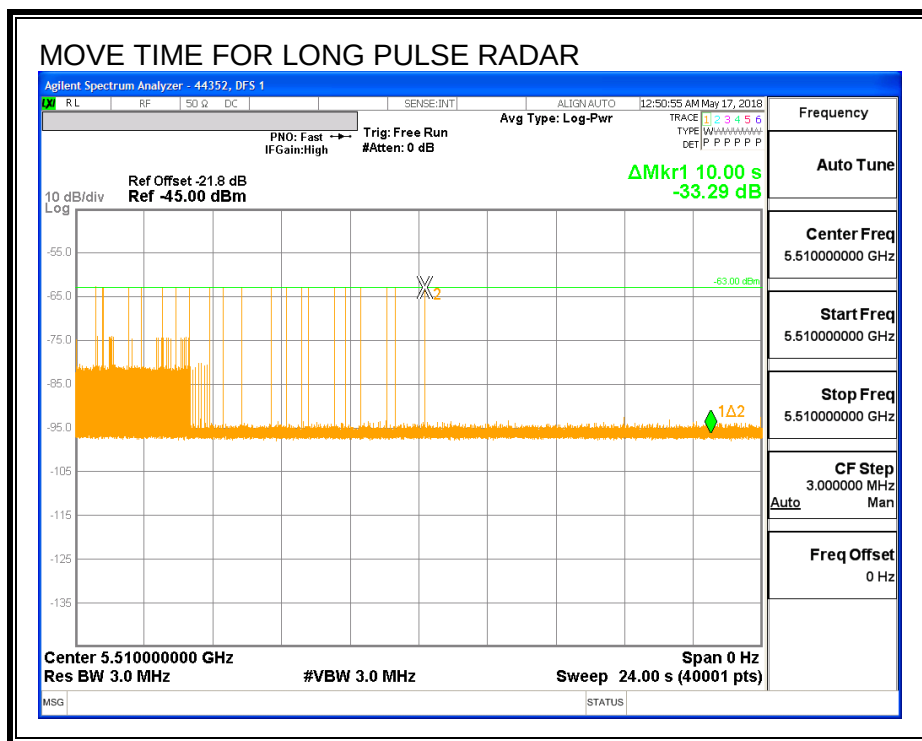
AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

Only intermittent transmissions are observed during the aggregate monitoring period.



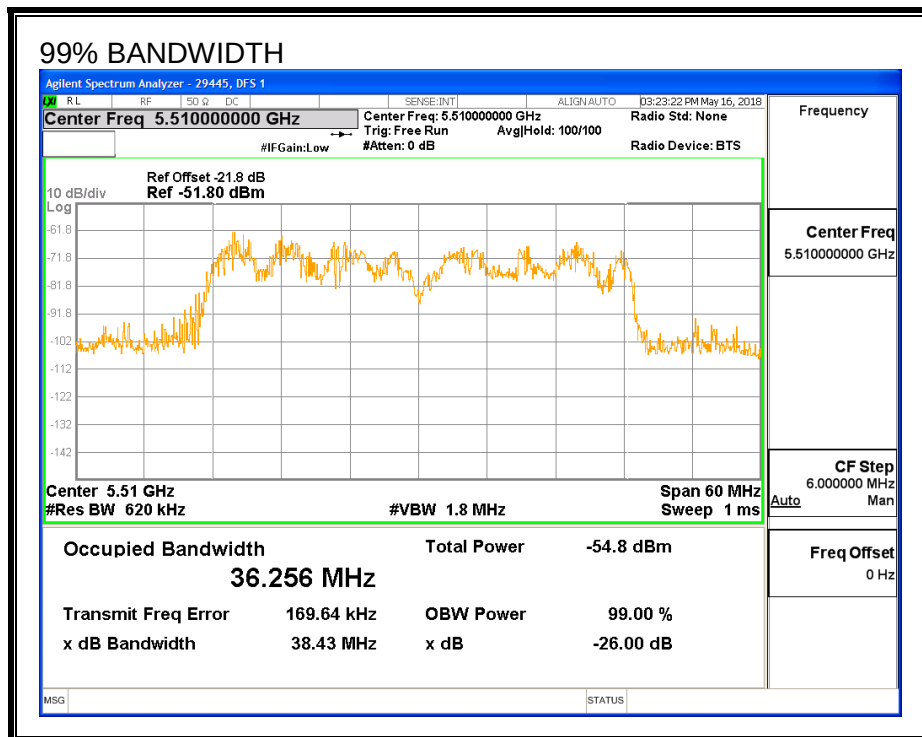
LONG PULSE CHANNEL MOVE TIME

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



6.3.6. DETECTION BANDWIDTH

REFERENCE PLOT OF 99% POWER BANDWIDTH



RESULTS

FL	FH	Detection Bandwidth	99% Power Bandwidth	Ratio of Detection BW to 99% Power BW	Minimum Limit
(MHz)	(MHz)	(MHz)	(MHz)	(%)	(%)
5491	5529	38	36.256	104.8	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	0	0	
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	
5515	10	10	100	
5520	10	10	100	
5525	10	10	100	
5526	10	10	100	
5527	10	10	100	
5528	10	10	100	
5529	10	10	100	FH
5530	10	0	0	

6.3.7. IN-SERVICE MONITORING

RESULTS

FCC Radar Test Summary										
Signal Type	Number of Trials	Detection (%)	Limit (%)	Pass/Fail	Detection Bandwidth		OBW	Test Location	Employee Number	In-Service Monitoring Version
					FL	FH				
FCC Short Pulse Type 1	30	100.00	60	Pass	5491	5529	36.26	DFS 1	44352	Version 3.3.4
FCC Short Pulse Type 2	30	76.67	60	Pass	5491	5529	36.26	DFS 1	44352	Version 3.3.4
FCC Short Pulse Type 3	30	76.67	60	Pass	5491	5529	36.26	DFS 1	44352	Version 3.3.4
FCC Short Pulse Type 4	30	70.00	60	Pass	5491	5529	36.26	DFS 1	44352	Version 3.3.4
Aggregate		80.83	80	Pass						
FCC Long Pulse Type 5	30	83.33	80	Pass	5491	5529	36.26	DFS 1	44352	Version 3.3.4
FCC Hopping Type 6	39	100.00	70	Pass	5491	5529		DFS 1	44352	Version 3.3.4

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	5517	Yes
1002	1	618	86	A	5518	Yes
1003	1	718	74	A	5524	Yes
1004	1	738	72	A	5506	Yes
1005	1	838	63	A	5510	Yes
1006	1	678	78	A	5509	Yes
1007	1	818	65	A	5523	Yes
1008	1	918	58	A	5504	Yes
1009	1	638	83	A	5513	Yes
1010	1	758	70	A	5521	Yes
1011	1	858	62	A	5508	Yes
1012	1	878	61	A	5523	Yes
1013	1	558	95	A	5520	Yes
1014	1	938	57	A	5494	Yes
1015	1	658	81	A	5505	Yes
1016	1	2058	26	B	5499	Yes
1017	1	1885	28	B	5515	Yes
1018	1	2711	20	B	5508	Yes
1019	1	1472	36	B	5525	Yes
1020	1	2429	22	B	5523	Yes
1021	1	1320	40	B	5514	Yes
1022	1	1211	44	B	5493	Yes
1023	1	2779	19	B	5523	Yes
1024	1	2799	19	B	5524	Yes
1025	1	1949	28	B	5498	Yes
1026	1	905	59	B	5504	Yes
1027	1	1537	35	B	5503	Yes
1028	1	622	85	B	5499	Yes
1029	1	1384	39	B	5506	Yes
1030	1	599	89	B	5504	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	3.2	215	24	5511	Yes
2002	1.2	154	29	5497	Yes
2003	5	226	26	5524	No
2004	3.3	212	28	5528	Yes
2005	1.3	208	23	5511	Yes
2006	1.9	197	29	5518	No
2007	4.2	159	23	5498	Yes
2008	1	153	29	5527	No
2009	3.5	162	28	5521	Yes
2010	2.6	160	25	5513	Yes
2011	3.4	173	24	5505	No
2012	4.7	218	24	5494	Yes
2013	3.8	154	27	5515	Yes
2014	3.3	165	24	5498	Yes
2015	4.5	187	27	5498	Yes
2016	2.4	202	25	5526	No
2017	1.9	190	25	5499	Yes
2018	4.8	224	28	5498	Yes
2019	4.5	216	26	5515	Yes
2020	2.8	201	24	5510	Yes
2021	4.8	197	29	5506	No
2022	1.4	187	28	5519	No
2023	3.7	230	29	5509	Yes
2024	4.6	185	25	5499	Yes
2025	2.9	151	27	5502	Yes
2026	2.1	192	24	5506	Yes
2027	2.9	162	23	5525	Yes
2028	2.2	207	26	5492	Yes
2029	3.2	225	26	5512	Yes
2030	2.8	155	23	5494	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	7.1	333	17	5515	No
3002	6.9	380	18	5518	Yes
3003	6.3	341	16	5506	Yes
3004	8.5	401	17	5514	Yes
3005	8.2	375	16	5529	Yes
3006	8.6	330	18	5492	Yes
3007	8.5	317	17	5526	Yes
3008	9.2	285	17	5506	Yes
3009	7.4	418	16	5504	Yes
3010	8.3	281	16	5496	Yes
3011	8.8	427	17	5508	Yes
3012	9.9	303	18	5493	No
3013	6.6	461	18	5506	Yes
3014	10	350	16	5517	No
3015	6.9	286	16	5506	No
3016	6.5	438	18	5527	Yes
3017	9.9	253	16	5522	Yes
3018	9.7	300	17	5522	Yes
3019	9.1	262	18	5524	Yes
3020	7.2	322	16	5513	Yes
3021	6.9	296	18	5520	No
3022	7.3	251	17	5517	Yes
3023	7.2	371	18	5493	Yes
3024	7.9	339	16	5529	Yes
3025	6.1	339	18	5497	No
3026	7	453	18	5497	Yes
3027	7.5	348	16	5493	Yes
3028	8.6	474	17	5513	Yes
3029	9.4	382	17	5498	No
3030	8.7	404	18	5496	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	19.3	457	16	5524	Yes
4002	18.4	358	14	5500	Yes
4003	16.8	307	16	5504	No
4004	16.3	472	12	5507	Yes
4005	15.1	433	15	5508	Yes
4006	19.9	493	16	5491	Yes
4007	15	350	14	5514	No
4008	11.2	423	13	5511	Yes
4009	15.8	292	14	5497	No
4010	12.4	260	13	5523	Yes
4011	17.5	393	14	5511	Yes
4012	19.4	373	14	5493	No
4013	11.6	268	13	5523	Yes
4014	14	395	13	5501	Yes
4015	15.7	436	12	5527	No
4016	14.3	324	15	5507	Yes
4017	16.5	378	14	5527	Yes
4018	15.5	279	15	5513	Yes
4019	13.9	479	15	5513	Yes
4020	13.4	393	15	5520	Yes
4021	12.2	354	13	5527	Yes
4022	17.1	296	14	5508	Yes
4023	12.1	271	15	5496	No
4024	17.4	343	16	5499	No
4025	12.9	464	12	5503	No
4026	18.6	431	16	5529	No
4027	14.6	313	13	5519	Yes
4028	12.3	294	12	5503	Yes
4029	17.8	440	16	5508	Yes
4030	11.1	315	16	5525	Yes

TYPE 5 DETECTION PROBABILITY

Data Sheet for FCC Long Pulse Radar Type 5		
Trial	Frequency (MHz)	Successful Detection (Yes/No)
1	5510	Yes
2	5510	Yes
3	5510	Yes
4	5510	Yes
5	5510	Yes
6	5510	Yes
7	5510	Yes
8	5510	Yes
9	5510	Yes
10	5510	Yes
11	5496	Yes
12	5497	No
13	5496	Yes
14	5497	No
15	5496	Yes
16	5497	No
17	5496	Yes
18	5497	Yes
19	5496	Yes
20	5497	Yes
21	5524	Yes
22	5523	Yes
23	5524	Yes
24	5523	No
25	5524	Yes
26	5523	Yes
27	5524	Yes
28	5523	Yes
29	5524	No
30	5523	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	30	5491	12	Yes
2	505	5492	7	Yes
3	980	5493	8	Yes
4	1455	5494	10	Yes
5	1930	5495	17	Yes
6	2405	5496	10	Yes
7	2880	5497	7	Yes
8	3355	5498	8	Yes
9	3830	5499	10	Yes
10	4305	5500	8	Yes
11	4780	5501	8	Yes
12	5255	5502	8	Yes
13	5730	5503	7	Yes
14	6205	5504	12	Yes
15	6680	5505	8	Yes
16	7155	5506	9	Yes
17	7630	5507	13	Yes
18	8105	5508	3	Yes
19	8580	5509	5	Yes
20	9055	5510	9	Yes
21	9530	5511	9	Yes
22	10005	5512	7	Yes
23	10480	5513	5	Yes
24	10955	5514	10	Yes
25	11430	5515	7	Yes
26	11905	5516	8	Yes
27	12380	5517	7	Yes
28	12855	5518	8	Yes
29	13330	5519	12	Yes
30	13805	5520	6	Yes
31	14280	5521	8	Yes
32	14755	5522	6	Yes
33	15230	5523	8	Yes
34	15705	5524	9	Yes
35	16180	5525	9	Yes
36	16655	5526	5	Yes
37	17130	5527	11	Yes
38	17605	5528	12	Yes
39	18080	5529	9	Yes

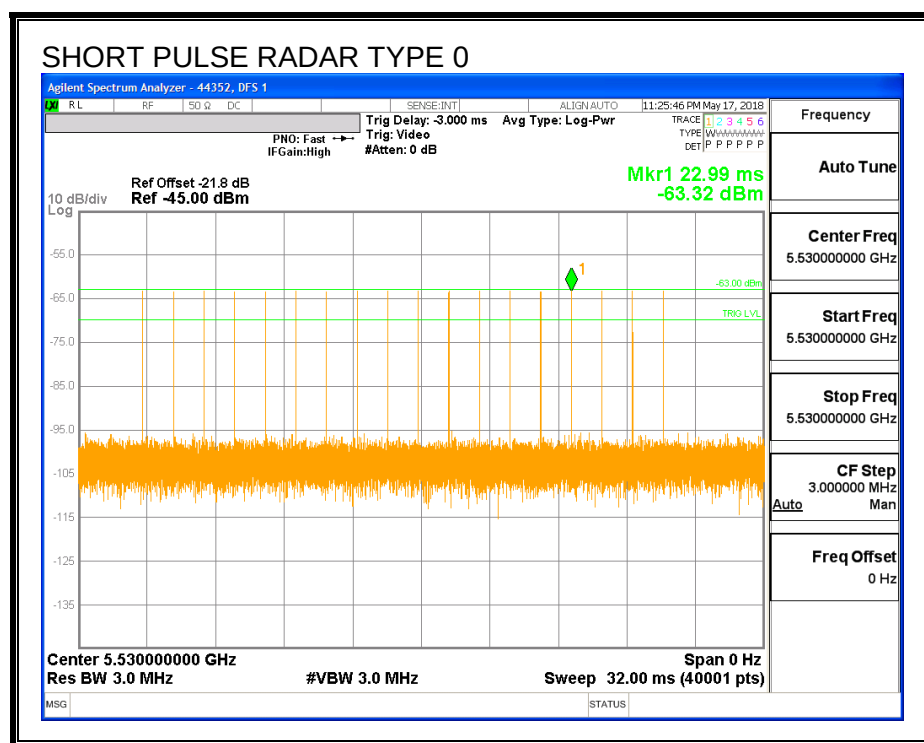
6.4. RESULTS FOR 80 MHz BANDWIDTH

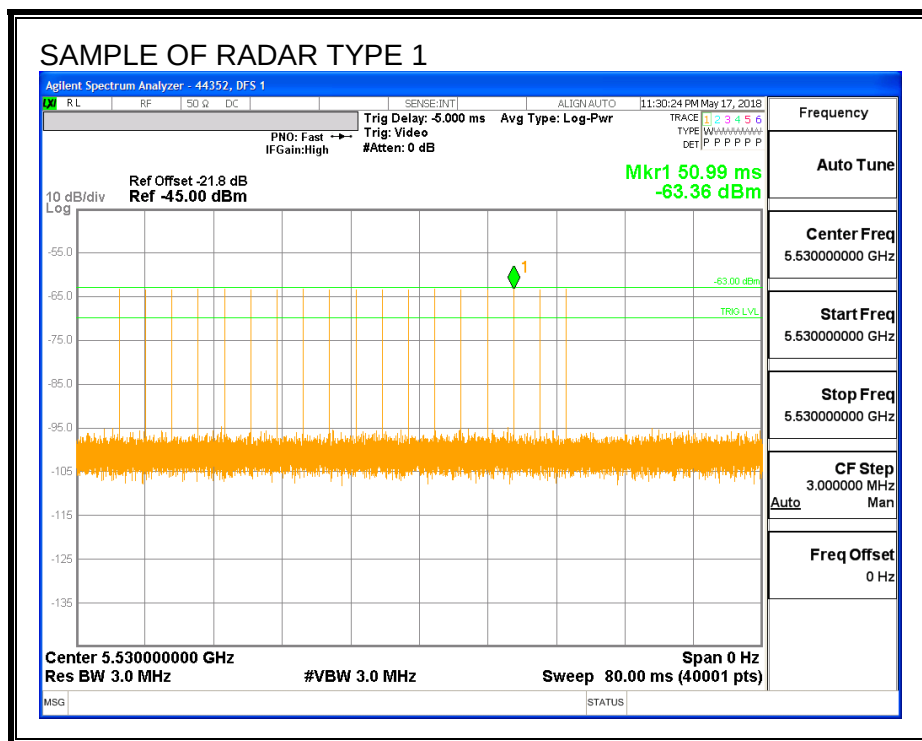
6.4.1. TEST CHANNEL

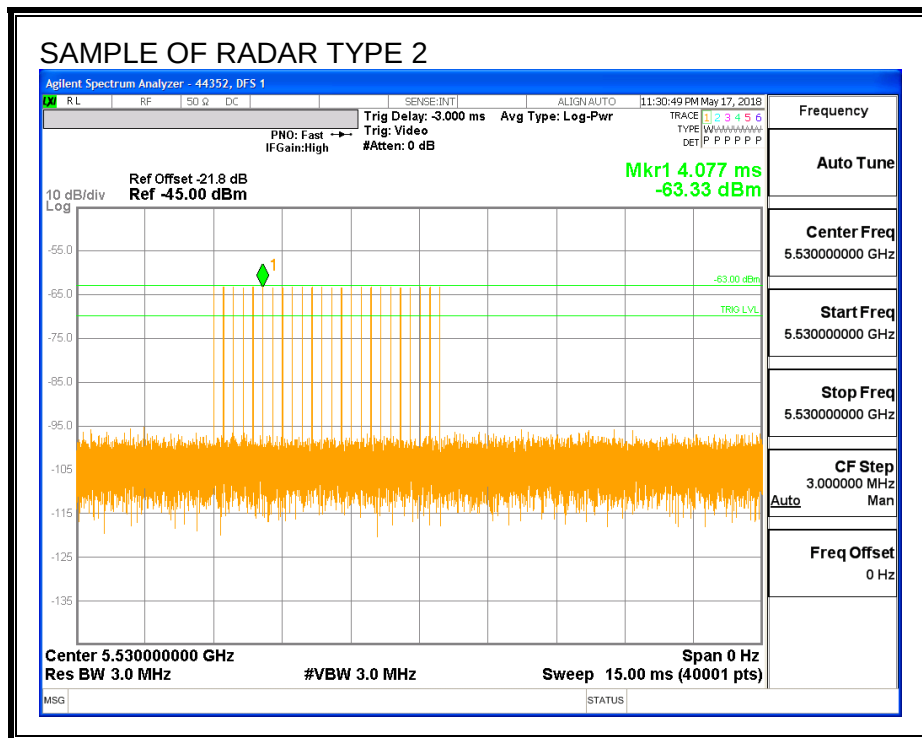
All tests were performed at a channel center frequency of 5530 MHz.

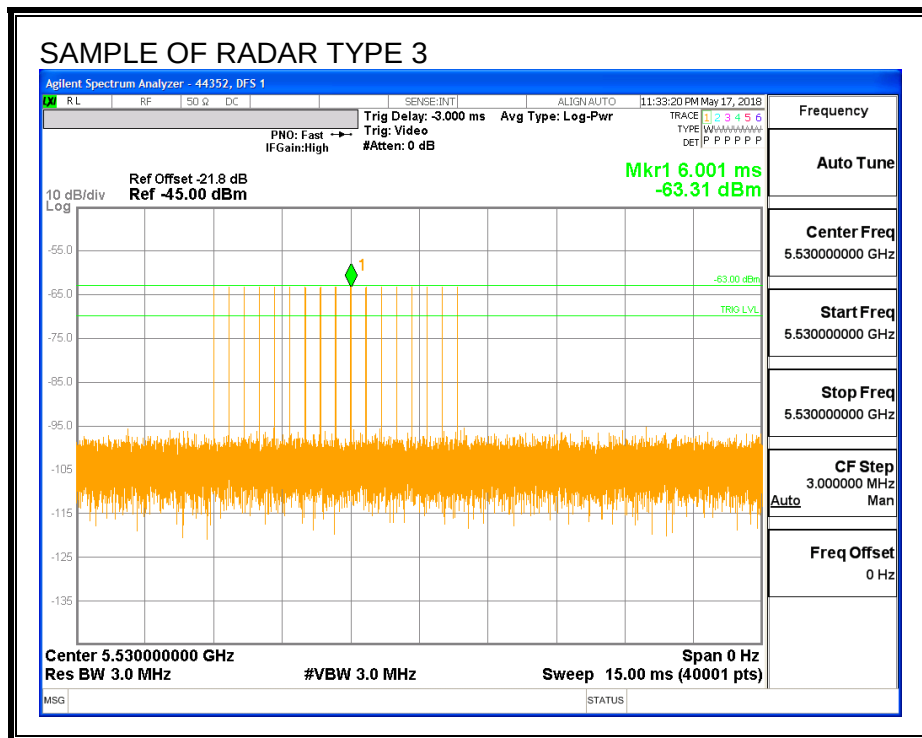
6.4.2. RADAR WAVEFORMS AND TRAFFIC

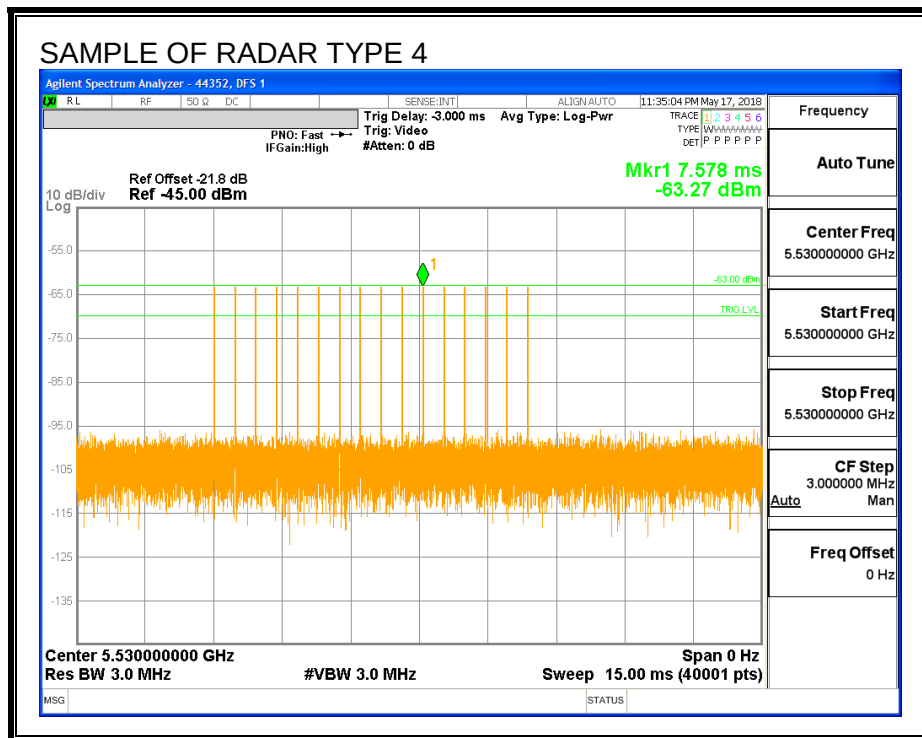
RADAR WAVEFORMS

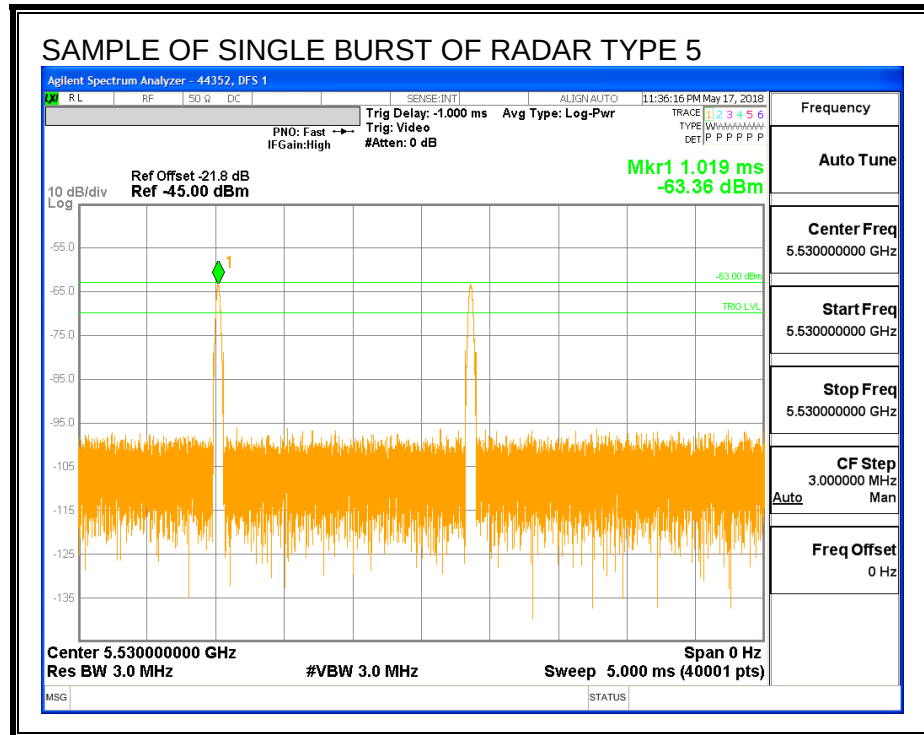


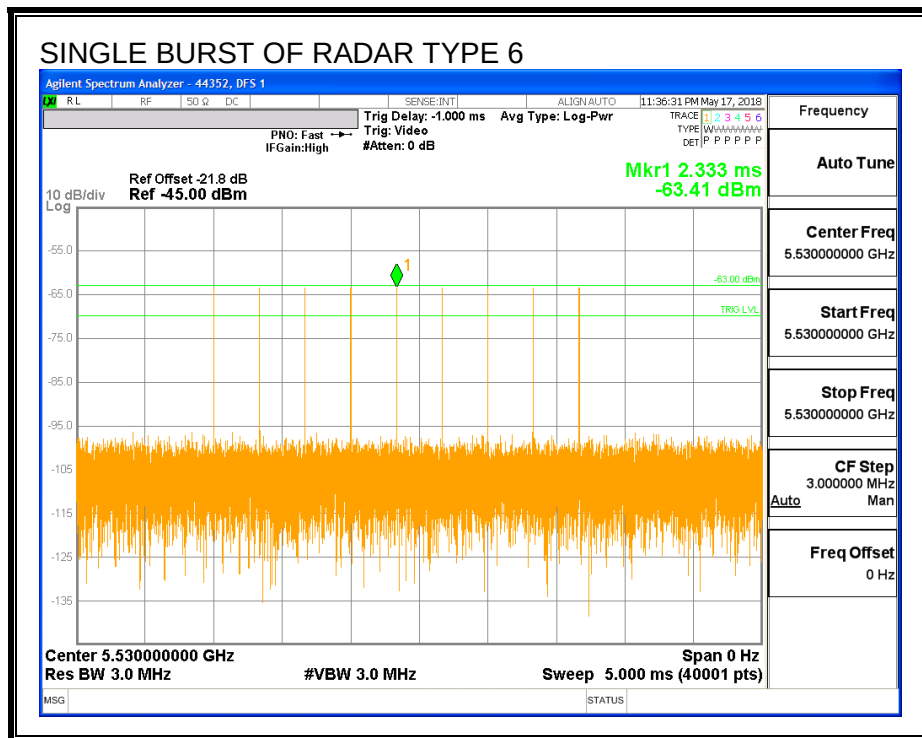




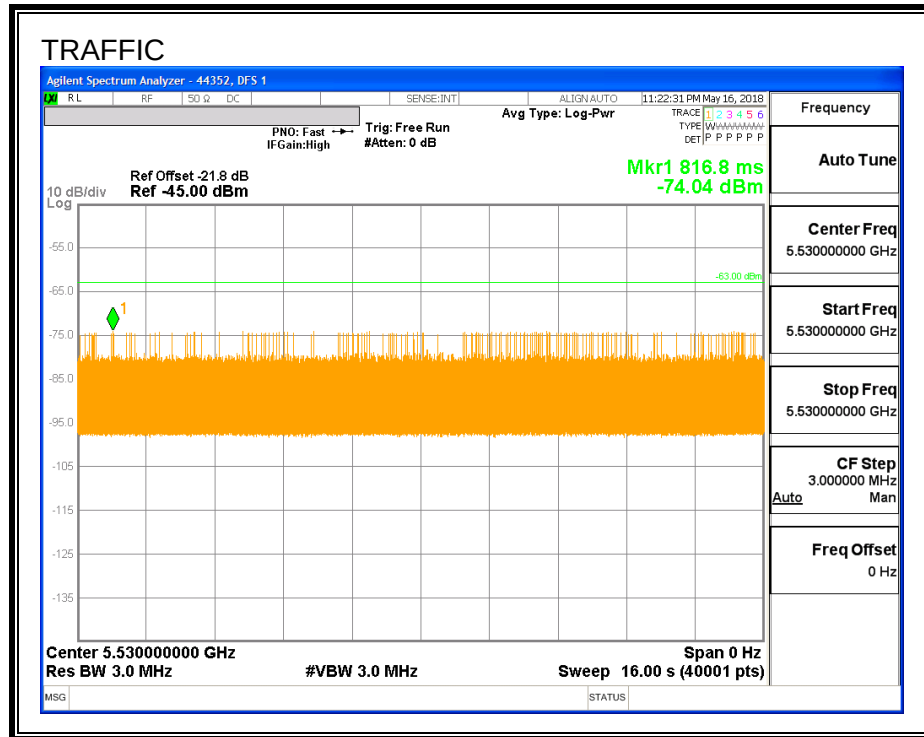




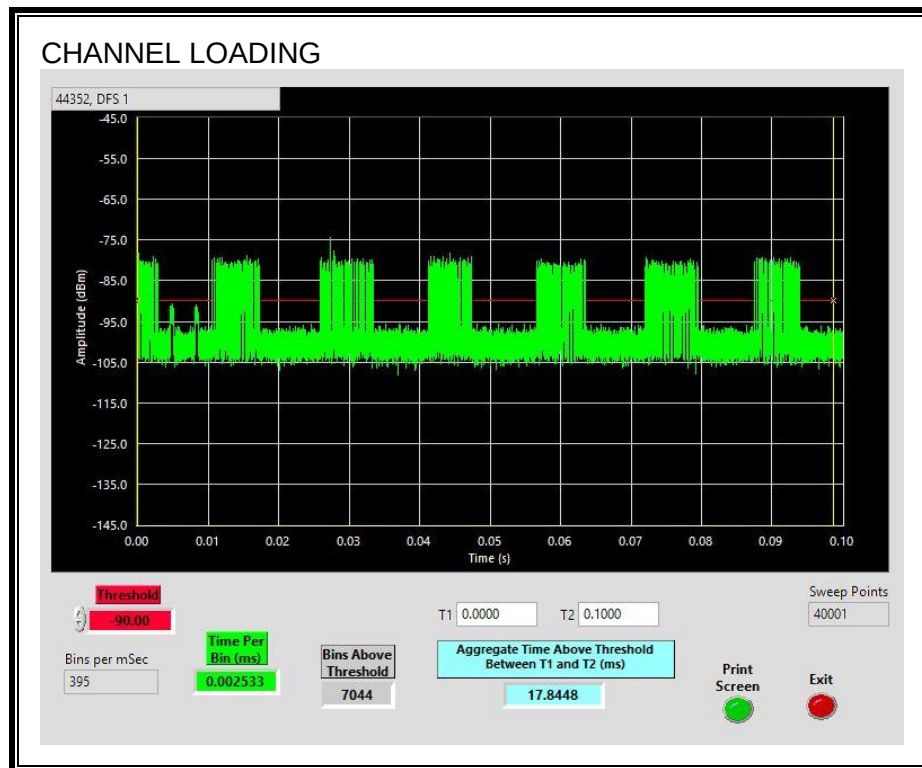




TRAFFIC



CHANNEL LOADING



The level of traffic loading on the channel by the EUT is 17.8448%.

6.4.3. CHANNEL AVAILABILITY CHECK TIME

PROCEDURE TO DETERMINE INITIAL POWER-UP CYCLE TIME

A sweep was started on the spectrum analyzer when a software command was issued to the EUT to commence a CAC period on 5530 MHz. The time 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 sweep was started on the spectrum analyzer when a software command was issued to the EUT to commence a CAC period on 5530 MHz. A radar signal was triggered within 0 to 6 seconds after the beginning of the CAC period and transmissions on the channel were monitored on the spectrum analyzer.

The Non-Occupancy list was cleared. A sweep was started on the spectrum analyzer when a software command was issued to the EUT to commence a CAC period on 5530 MHz. A radar signal was triggered within 54 to 60 seconds after the beginning of the CAC period and transmissions on the channel were monitored on the spectrum analyzer.

QUANTITATIVE RESULTS

No Radar Triggered

Beginning of CAC (sec)	Timing of Start of Traffic (sec)	Total Power-up Cycle Time (sec)
0	64.3	64.3

Radar Near Beginning of CAC

Beginning of CAC (sec)	Timing of Radar Burst (sec)	Radar Relative to Start of CAC (sec)
0	0.8	0.8

Radar Near End of CAC

Beginning of CAC (sec)	Timing of Radar Burst (sec)	Radar Relative to Start of CAC (sec)
0	58.4	58.4

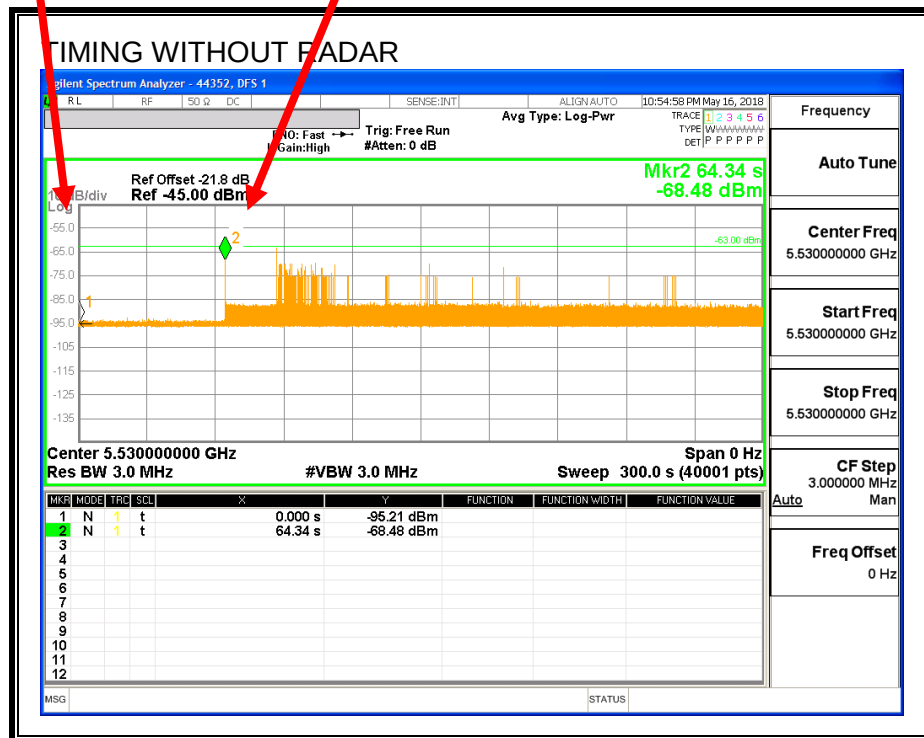
QUALITATIVE RESULTS

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

Command to
Switch Channels
Start of CAC

End of CAC

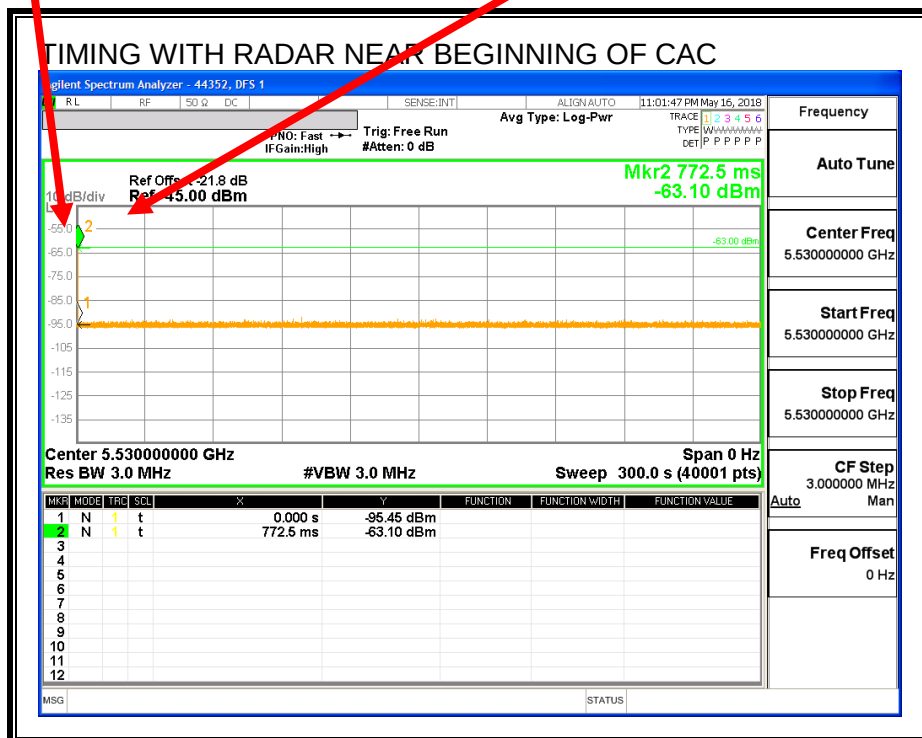


Transmissions begin on channel after completion of the CAC period.

TIMING WITH RADAR NEAR BEGINNING OF CAC

Command to
Switch Channels
Start of CAC

Radar Signal Applied

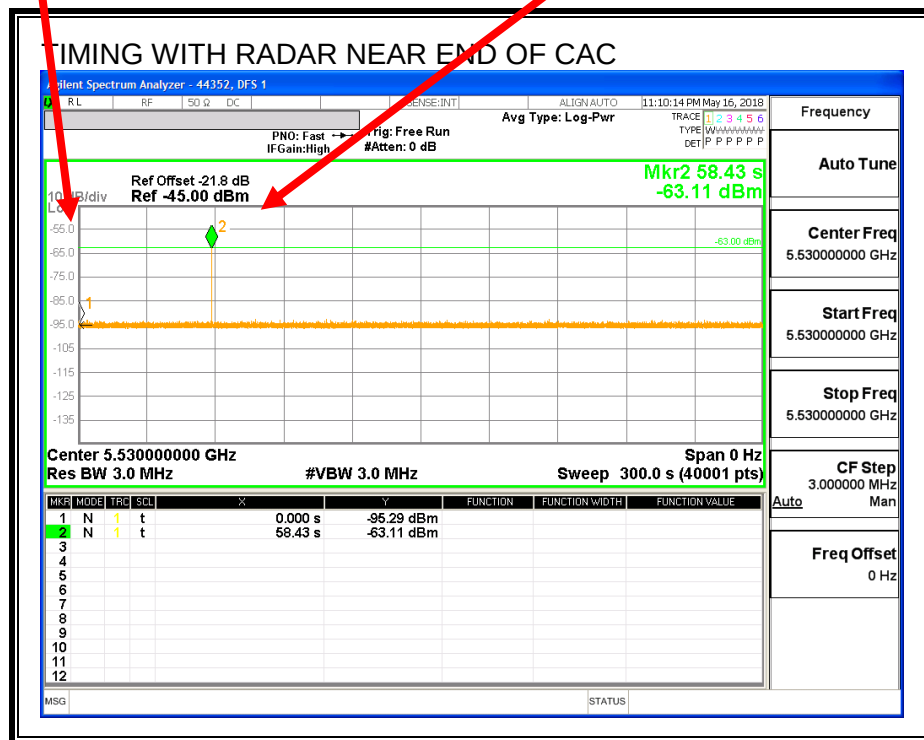


No EUT transmissions were observed after the radar signal.

TIMING WITH RADAR NEAR END OF CAC

Command to
Switch Channels
Start of CAC

Radar Signal Applied



No EUT transmissions were observed after the radar signal.

6.4.4. OVERLAPPING CHANNEL TESTS

RESULTS

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

These tests are not applicable.

6.4.5. 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)

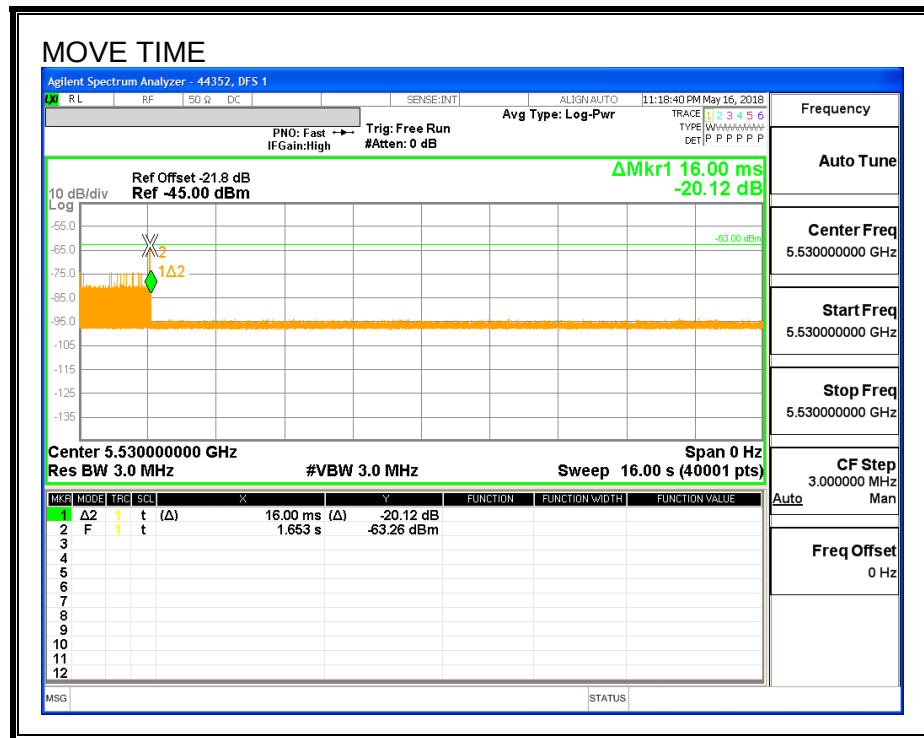
The observation period over which the aggregate time is calculated begins at (Reference Marker + 200 msec) and ends no earlier than (Reference Marker + 10 sec).

RESULTS

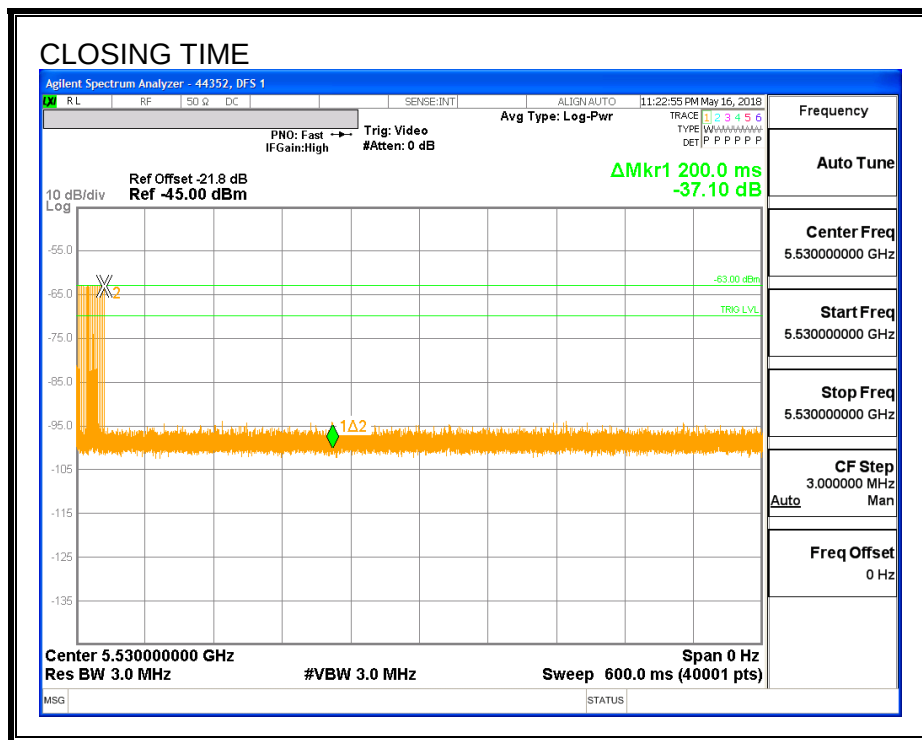
Channel Move Time (sec)	Limit (sec)
0.016	10

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

MOVE TIME



CHANNEL CLOSING TIME



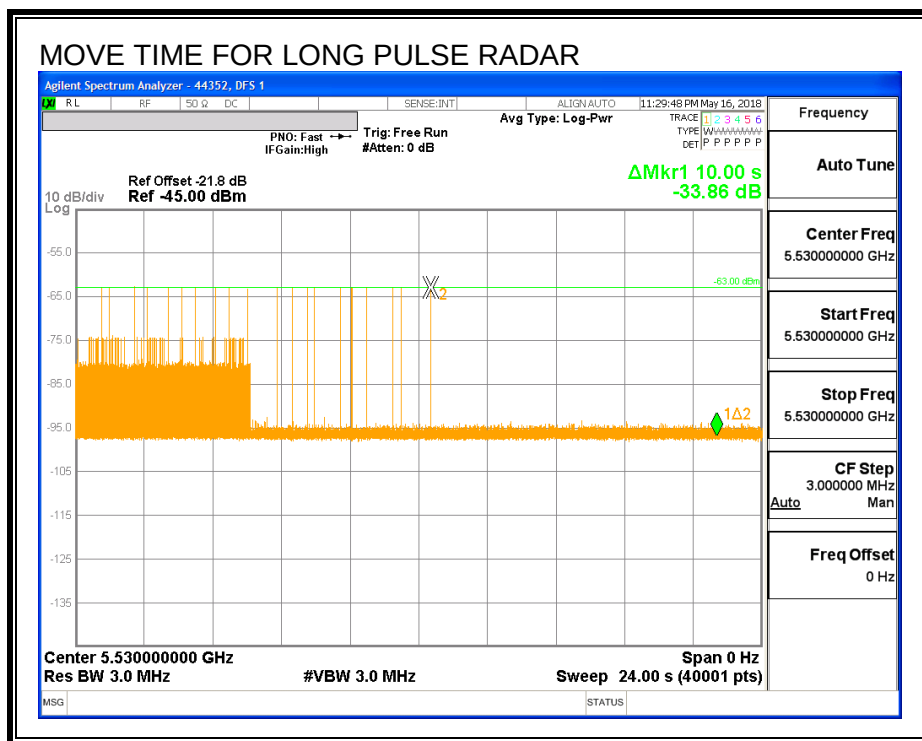
AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

No transmissions are observed during the aggregate monitoring period.



LONG PULSE CHANNEL MOVE TIME

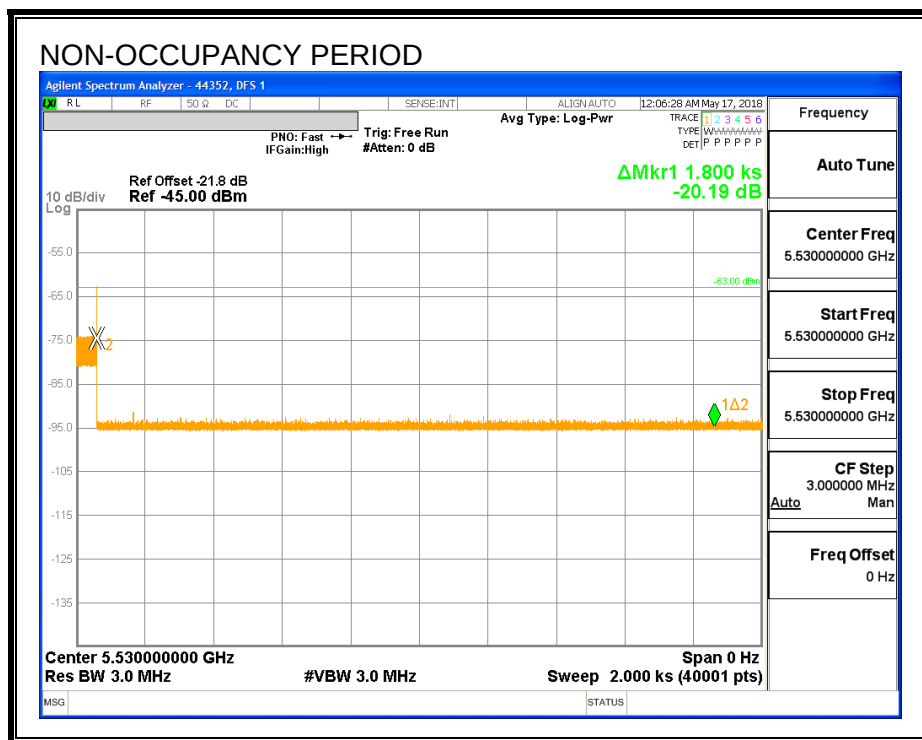
The traffic ceases prior to 10 seconds after the end of the radar waveform.



6.4.6. NON-OCCUPANCY PERIOD

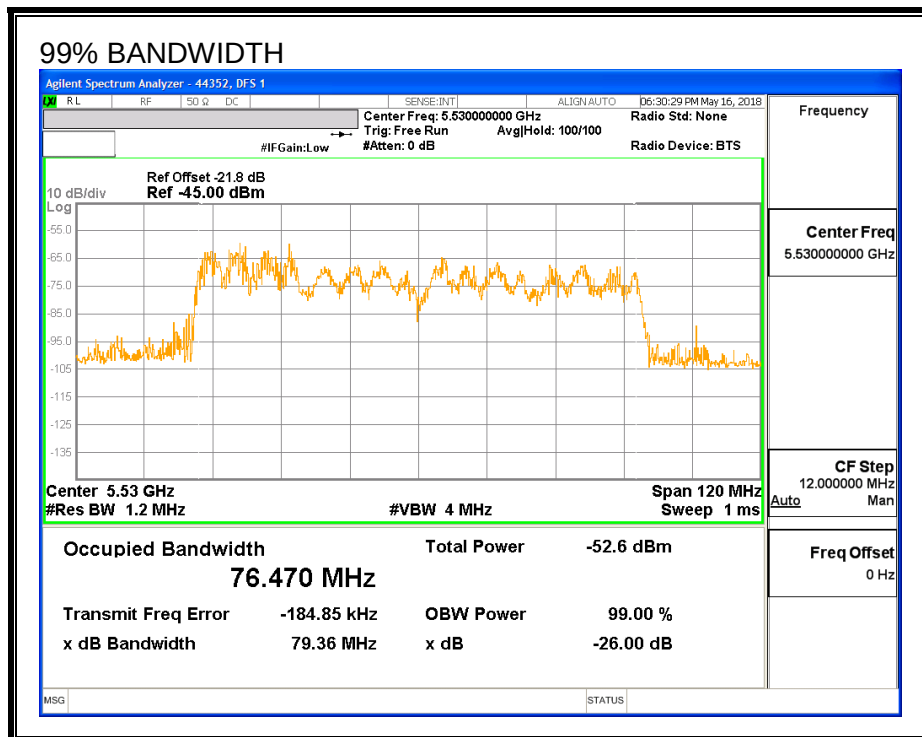
RESULTS

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



6.4.7. DETECTION BANDWIDTH

REFERENCE PLOT OF 99% POWER BANDWIDTH



RESULTS

FL	FH	Detection Bandwidth	99% Power Bandwidth	Ratio of Detection BW to 99% Power BW	Minimum Limit
(MHz)	(MHz)	(MHz)	(MHz)	(%)	(%)
5491	5569	78	76.470	102.0	100

DETECTION BANDWIDTH PROBABILITY

DETECTION BANDWIDTH PROBABILITY RESULTS				
Detection Bandwidth Test Results		44352	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	0	0	
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	
5515	10	10	100	
5520	10	10	100	
5525	10	10	100	
5530	10	10	100	
5535	10	10	100	
5540	10	10	100	
5545	10	10	100	
5550	10	10	100	
5555	10	10	100	
5560	10	10	100	
5565	10	10	100	
5566	10	10	100	
5567	10	10	100	
5568	10	10	100	
5569	10	10	100	FH
5570	10	0	0	

6.4.8. IN-SERVICE MONITORING

RESULTS

FCC Radar Test Summary										
Signal Type	Number of Trials	Detection (%)	Limit (%)	Pass/Fail	Detection Bandwidth		OBW	Test Location	Employee Number	In-Service Monitoring Version
					FL	FH				
FCC Short Pulse Type 1	30	100.00	60	Pass	5491	5569	76.47	DFS 1	44352	Version 3.3.4
FCC Short Pulse Type 2	30	90.00	60	Pass	5491	5569	76.47	DFS 1	44352	Version 3.3.4
FCC Short Pulse Type 3	30	70.00	60	Pass	5491	5569	76.47	DFS 1	44352	Version 3.3.4
FCC Short Pulse Type 4	30	66.67	60	Pass	5491	5569	76.47	DFS 1	44352	Version 3.3.4
Aggregate		81.67	80	Pass						
FCC Long Pulse Type 5	30	100.00	80	Pass	5491	5569	76.47	DFS 1	44352	Version 3.3.4
FCC Hopping Type 6	79	100.00	70	Pass	5491	5569		DFS 1	44352	Version 3.3.4

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	5530	Yes
1002	1	618	86	A	5542	Yes
1003	1	718	74	A	5554	Yes
1004	1	738	72	A	5522	Yes
1005	1	838	63	A	5510	Yes
1006	1	678	78	A	5521	Yes
1007	1	818	65	A	5503	Yes
1008	1	918	58	A	5506	Yes
1009	1	638	83	A	5491	Yes
1010	1	758	70	A	5512	Yes
1011	1	858	62	A	5514	Yes
1012	1	878	61	A	5566	Yes
1013	1	558	95	A	5550	Yes
1014	1	938	57	A	5504	Yes
1015	1	658	81	A	5522	Yes
1016	1	2058	26	B	5558	Yes
1017	1	1885	28	B	5500	Yes
1018	1	2711	20	B	5569	Yes
1019	1	1472	36	B	5537	Yes
1020	1	2429	22	B	5529	Yes
1021	1	1320	40	B	5536	Yes
1022	1	1211	44	B	5495	Yes
1023	1	2779	19	B	5523	Yes
1024	1	2799	19	B	5560	Yes
1025	1	1949	28	B	5567	Yes
1026	1	905	59	B	5569	Yes
1027	1	1537	35	B	5537	Yes
1028	1	622	85	B	5564	Yes
1029	1	1384	39	B	5560	Yes
1030	1	599	89	B	5502	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	3.2	215	24	5491	Yes
2002	1.2	154	29	5510	No
2003	5	226	26	5542	Yes
2004	3.3	212	28	5566	Yes
2005	1.3	208	23	5550	Yes
2006	1.9	197	29	5562	Yes
2007	4.2	159	23	5534	Yes
2008	1	153	29	5527	Yes
2009	3.5	162	28	5532	Yes
2010	2.6	160	25	5504	Yes
2011	3.4	173	24	5549	No
2012	4.7	218	24	5495	Yes
2013	3.8	154	27	5509	Yes
2014	3.3	165	24	5559	Yes
2015	4.5	187	27	5554	Yes
2016	2.4	202	25	5568	Yes
2017	1.9	190	25	5551	Yes
2018	4.8	224	28	5524	Yes
2019	4.5	216	26	5517	Yes
2020	2.8	201	24	5554	Yes
2021	4.8	197	29	5546	Yes
2022	1.4	187	28	5542	Yes
2023	3.7	230	29	5562	Yes
2024	4.6	185	25	5559	Yes
2025	2.9	151	27	5535	Yes
2026	2.1	192	24	5544	Yes
2027	2.9	162	23	5515	Yes
2028	2.2	207	26	5519	Yes
2029	3.2	225	26	5517	No
2030	2.8	155	23	5537	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	7.1	333	17	5524	No
3002	6.9	380	18	5568	Yes
3003	6.3	341	16	5523	No
3004	8.5	401	17	5534	No
3005	8.2	375	16	5537	Yes
3006	8.6	330	18	5565	No
3007	8.5	317	17	5537	Yes
3008	9.2	285	17	5546	Yes
3009	7.4	418	16	5550	Yes
3010	8.3	281	16	5500	Yes
3011	8.8	427	17	5507	Yes
3012	9.9	303	18	5555	Yes
3013	6.6	461	18	5562	Yes
3014	10	350	16	5548	Yes
3015	6.9	286	16	5535	Yes
3016	6.5	438	18	5531	No
3017	9.9	253	16	5542	Yes
3018	9.7	300	17	5495	No
3019	9.1	262	18	5546	Yes
3020	7.2	322	16	5560	Yes
3021	6.9	296	18	5549	Yes
3022	7.3	251	17	5529	Yes
3023	7.2	371	18	5517	No
3024	7.9	339	16	5568	No
3025	6.1	339	18	5541	Yes
3026	7	453	18	5560	Yes
3027	7.5	348	16	5545	Yes
3028	8.6	474	17	5526	Yes
3029	9.4	382	17	5510	Yes
3030	8.7	404	18	5507	No

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	19.3	457	16	5553	No
4002	18.4	358	14	5539	No
4003	16.8	307	16	5535	No
4004	16.3	472	12	5536	Yes
4005	15.1	433	15	5568	Yes
4006	19.9	493	16	5550	Yes
4007	15	350	14	5559	Yes
4008	11.2	423	13	5513	Yes
4009	15.8	292	14	5491	No
4010	12.4	260	13	5497	Yes
4011	17.5	393	14	5517	Yes
4012	19.4	373	14	5503	No
4013	11.6	268	13	5497	No
4014	14	395	13	5519	No
4015	15.7	436	12	5498	Yes
4016	14.3	324	15	5565	Yes
4017	16.5	378	14	5495	No
4018	15.5	279	15	5543	Yes
4019	13.9	479	15	5546	Yes
4020	13.4	393	15	5557	Yes
4021	12.2	354	13	5556	Yes
4022	17.1	296	14	5566	Yes
4023	12.1	271	15	5513	Yes
4024	17.4	343	16	5566	Yes
4025	12.9	464	12	5502	Yes
4026	18.6	431	16	5544	Yes
4027	14.6	313	13	5500	Yes
4028	12.3	294	12	5494	No
4029	17.8	440	16	5525	Yes
4030	11.1	315	16	5539	No

TYPE 5 DETECTION PROBABILITY

Data Sheet for FCC Long Pulse Radar Type 5		
Trial	Frequency (MHz)	Successful Detection (Yes/No)
1	5530	Yes
2	5530	Yes
3	5530	Yes
4	5530	Yes
5	5530	Yes
6	5530	Yes
7	5530	Yes
8	5530	Yes
9	5530	Yes
10	5530	Yes
11	5496	Yes
12	5497	Yes
13	5496	Yes
14	5497	Yes
15	5496	Yes
16	5497	Yes
17	5496	Yes
18	5497	Yes
19	5496	Yes
20	5497	Yes
21	5564	Yes
22	5563	Yes
23	5564	Yes
24	5563	Yes
25	5564	Yes
26	5563	Yes
27	5564	Yes
28	5563	Yes
29	5564	Yes
30	5563	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	57	5491	17	Yes
2	532	5492	16	Yes
3	1007	5493	17	Yes
4	1482	5494	19	Yes
5	1957	5495	20	Yes
6	2432	5496	19	Yes
7	2907	5497	16	Yes
8	3382	5498	19	Yes
9	3857	5499	21	Yes
10	4332	5500	14	Yes
11	4807	5501	16	Yes
12	5282	5502	17	Yes
13	5757	5503	21	Yes
14	6232	5504	19	Yes
15	6707	5505	12	Yes
16	7182	5506	16	Yes
17	7657	5507	12	Yes
18	8132	5508	19	Yes
19	8607	5509	12	Yes
20	9082	5510	14	Yes
21	9557	5511	19	Yes
22	10032	5512	19	Yes
23	10507	5513	14	Yes
24	10982	5514	17	Yes
25	11457	5515	16	Yes
26	11932	5516	16	Yes
27	12407	5517	15	Yes
28	12882	5518	18	Yes
29	13357	5519	23	Yes
30	13832	5520	17	Yes
31	14307	5521	14	Yes
32	14782	5522	15	Yes
33	15257	5523	19	Yes
34	15732	5524	16	Yes
35	16207	5525	15	Yes

TYPE 6 DETECTION PROBABILITY (CONTINUED)

36	16682	5526	15	Yes
37	17157	5527	16	Yes
38	17632	5528	17	Yes
39	18107	5529	18	Yes
40	18582	5530	16	Yes
41	19057	5531	15	Yes
42	19532	5532	19	Yes
43	20007	5533	13	Yes
44	20482	5534	21	Yes
45	20957	5535	19	Yes
46	21432	5536	18	Yes
47	21907	5537	22	Yes
48	22382	5538	11	Yes
49	22857	5539	16	Yes
50	23332	5540	18	Yes
51	23807	5541	21	Yes
52	24282	5542	24	Yes
53	24757	5543	17	Yes
54	25232	5544	14	Yes
55	25707	5545	15	Yes
56	26182	5546	15	Yes
57	26657	5547	15	Yes
58	27132	5548	16	Yes
59	27607	5549	16	Yes
60	28082	5550	15	Yes
61	28557	5551	14	Yes
62	29032	5552	12	Yes
63	29507	5553	17	Yes
64	29982	5554	15	Yes
65	30457	5555	12	Yes
66	30932	5556	14	Yes
67	31407	5557	23	Yes
68	31882	5558	15	Yes
69	32357	5559	13	Yes
70	32832	5560	12	Yes
71	33307	5561	17	Yes
72	33782	5562	19	Yes
73	34257	5563	18	Yes
74	34732	5564	8	Yes
75	35207	5565	16	Yes
76	35682	5566	11	Yes
77	36157	5567	17	Yes
78	36632	5568	17	Yes
79	37107	5569	19	Yes

6.5. 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.

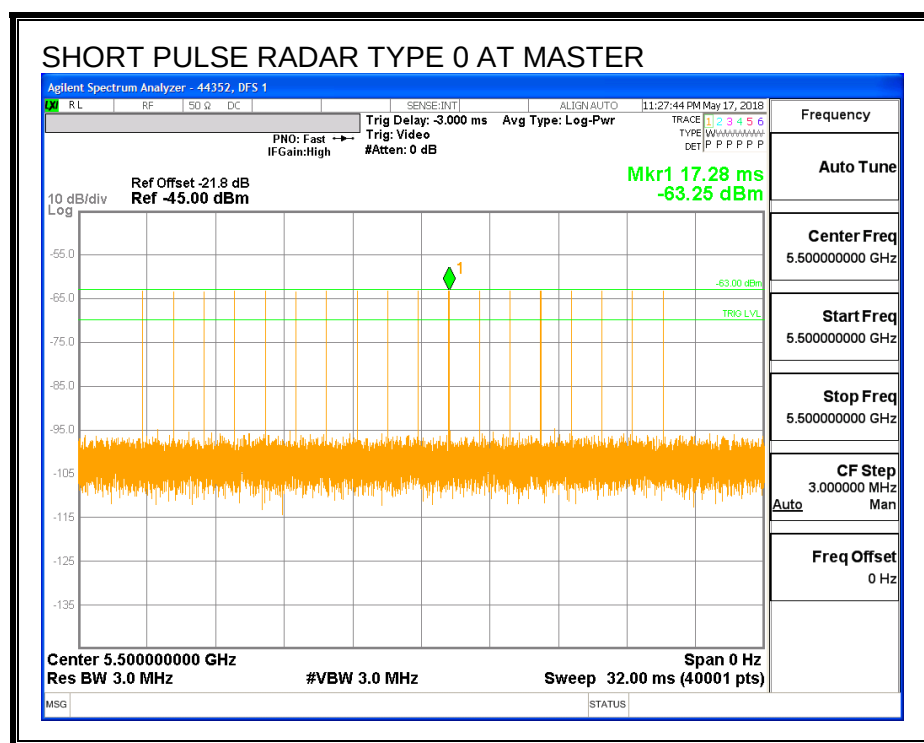
6.6. RESULTS FOR 20 MHz BANDWIDTH

6.6.1. TEST CHANNEL

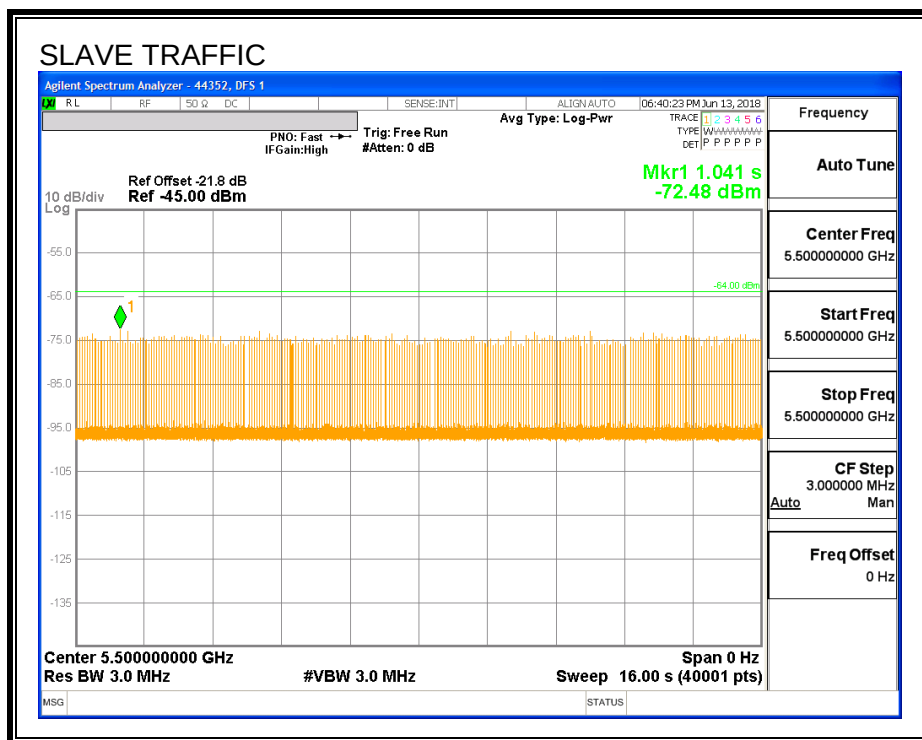
All tests were performed at a channel center frequency of 5500 MHz.

6.6.2. RADAR WAVEFORM AND TRAFFIC

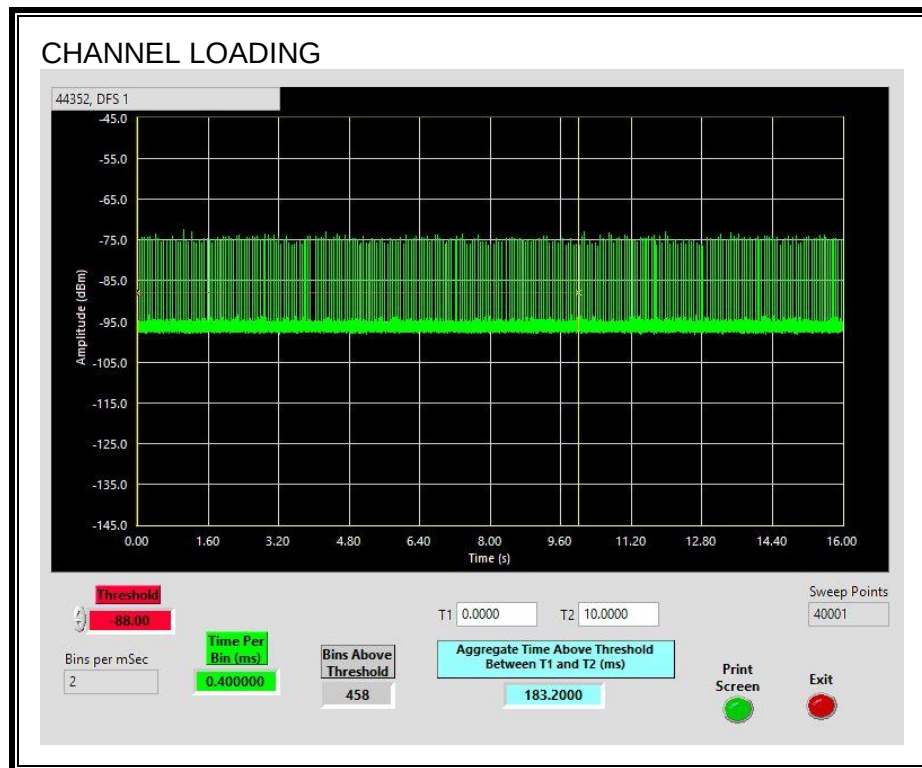
RADAR WAVEFORM



TRAFFIC



CHANNEL LOADING



The level of traffic loading on the channel by the EUT is 1.832%.

6.6.3. OVERLAPPING CHANNEL TESTS

RESULTS

These tests are not applicable.

6.6.4. 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)

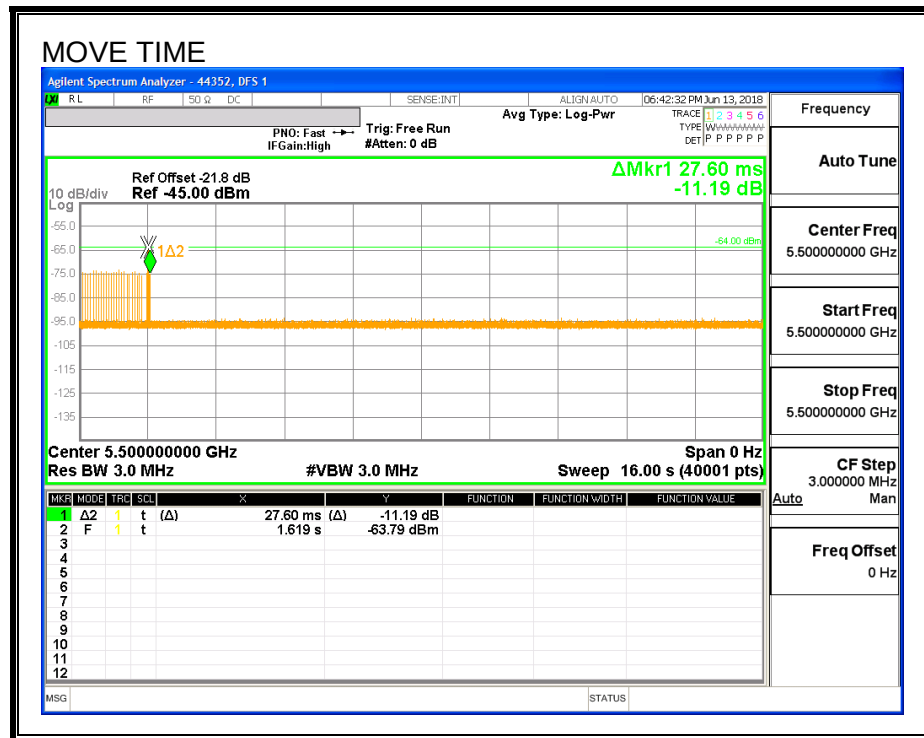
The observation period over which the aggregate time is calculated begins at (Reference Marker + 200 msec) and ends no earlier than (Reference Marker + 10 sec).

RESULTS

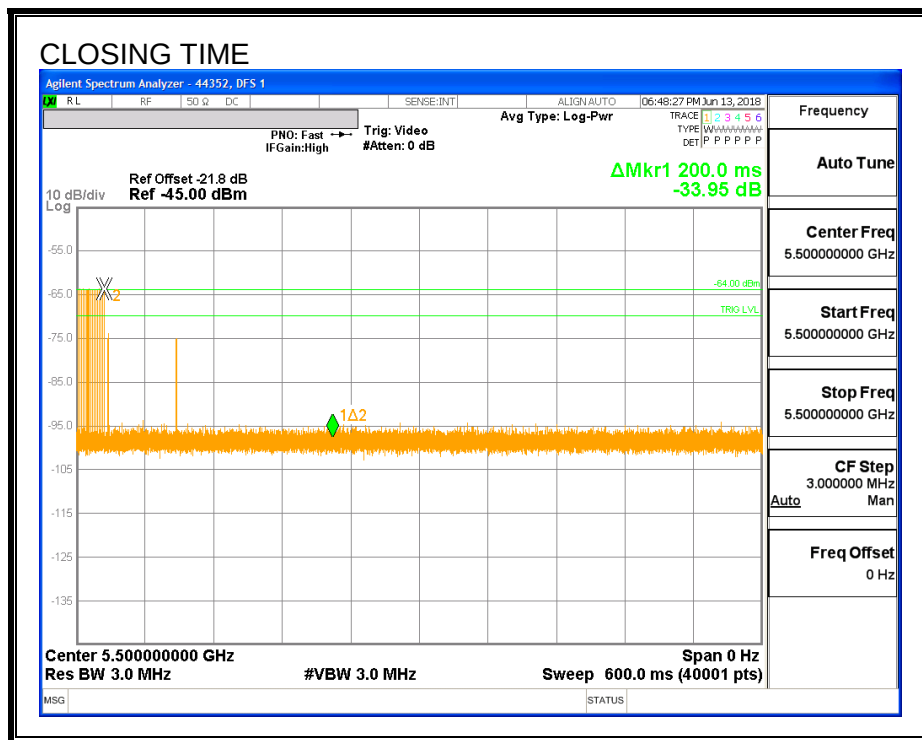
Channel Move Time (sec)	Limit (sec)
0.028	10

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

MOVE TIME



CHANNEL CLOSING TIME



AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

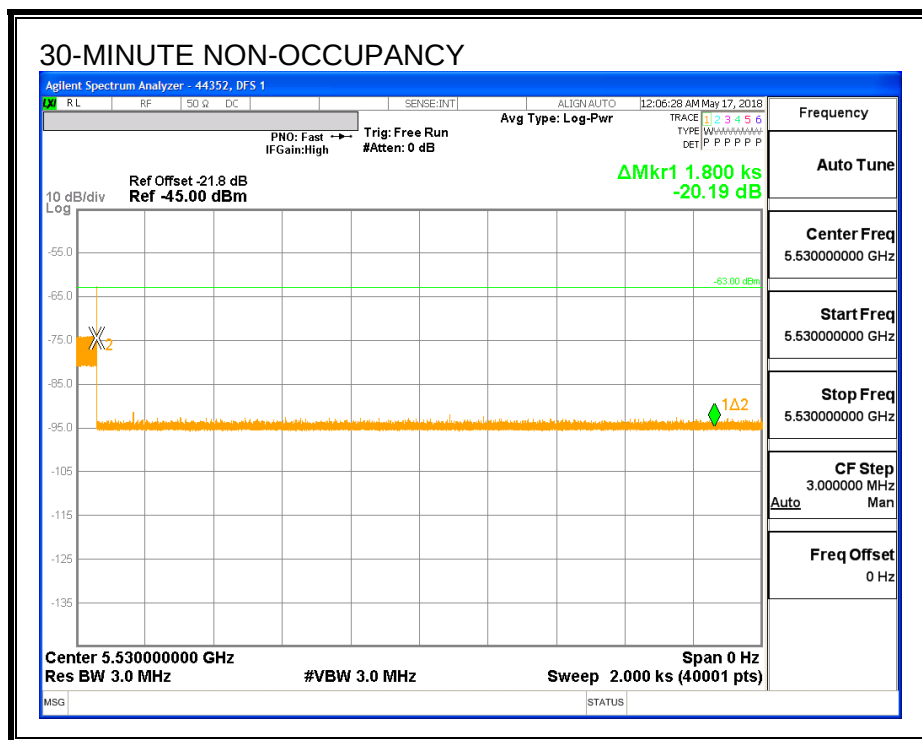
No transmissions are observed during the aggregate monitoring period.



6.6.5. 30-MINUTE NON-OCCUPANCY PERIOD

RESULTS

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



7. SETUP PHOTOS

DYNAMIC FREQUENCY SELECTION MEASUREMENT SETUP

DFS FRONT PHOTO



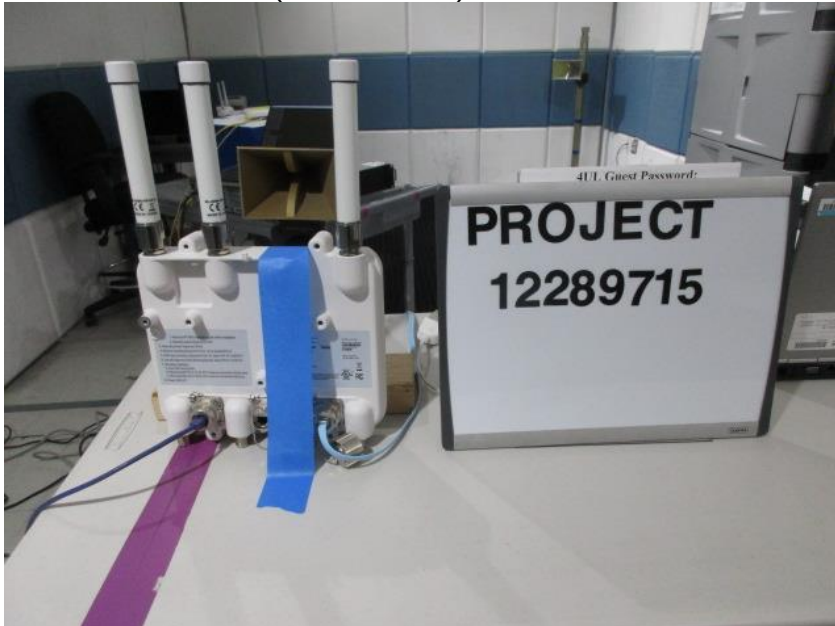
DFS BACK PHOTO



DFS FRONT PHOTO (Sensor Mode)



DFS BACK PHOTO (Sensor mode)



END OF REPORT