10. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

Frequency of Emission (MHz)	Conducted Limit (dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

TEST PROCEDURE

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.10.

The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

Line conducted data is recorded for both NEUTRAL and HOT lines.

RESULTS

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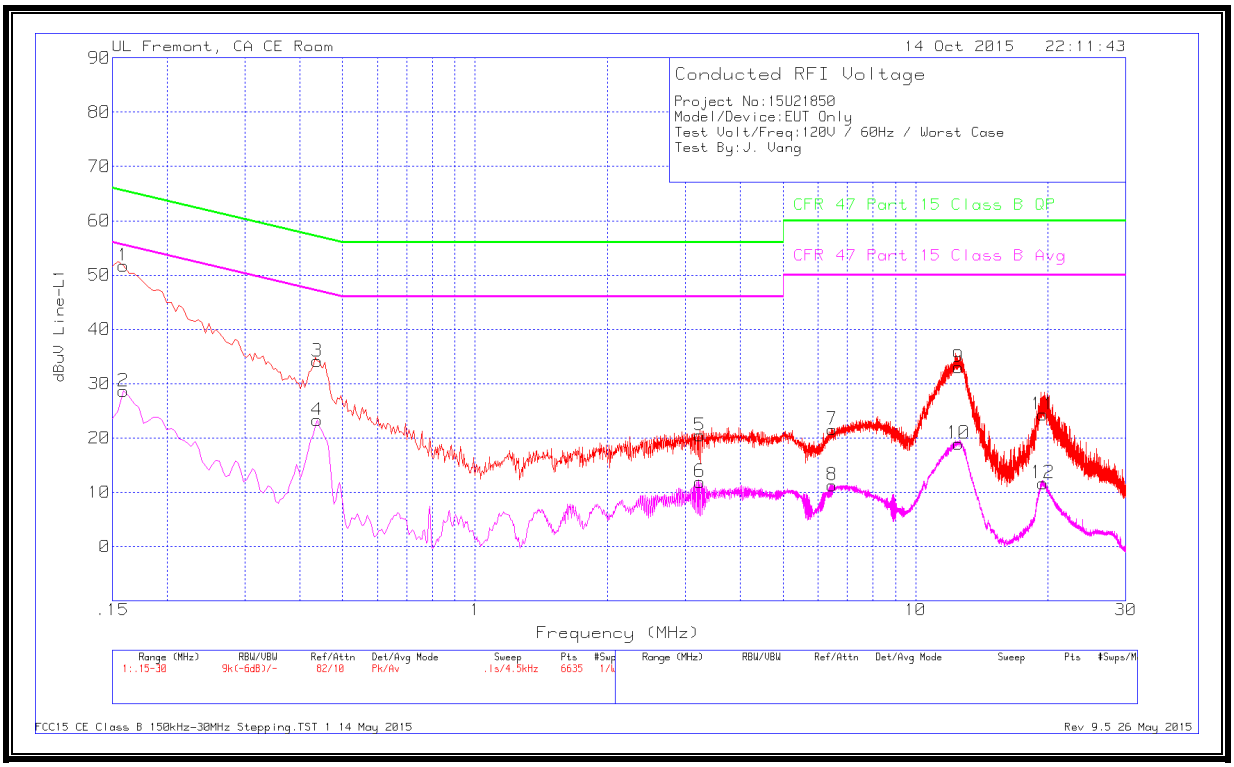
10.1. EUT POWERED BY AC ADAPTER

LINE 1 RESULTS



WORST EMISSIONS

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L1	LC Cables 1&3	Corrected Reading dBuV	CFR 47 Part 15 Class B QP	Margin (dB)	CFR 47 Part 15 Class B Avg	Margin (dB)
1	.159	50.42	Pk	1.3	0	51.72	65.52	-13.8	-	-
2	.159	27.35	Av	1.3	0	28.65	-	-	55.52	-26.87
3	.438	33.76	Pk	.4	0	34.16	57.1	-22.94	-	-
4	.438	22.88	Av	.4	0	23.28	-	-	47.1	-23.82
5	3.237	20.17	Pk	.2	.1	20.47	56	-35.53	-	-
6	3.237	11.65	Av	.2	.1	11.95	-	-	46	-34.05
7	6.468	21.28	Pk	.2	.1	21.58	60	-38.42	-	-
8	6.468	11	Av	.2	.1	11.3	-	-	50	-38.7
9	12.516	32.62	Pk	.2	.2	33.02	60	-26.98	-	-
10	12.516	18.59	Av	.2	.2	18.99	-	-	50	-31.01
11	19.464	23.84	Pk	.3	.2	24.34	60	-35.66	-	-
12	19.464	11.19	Av	.3	.2	11.69	-	-	50	-38.31

Pk - Peak detector

Av - Average detection

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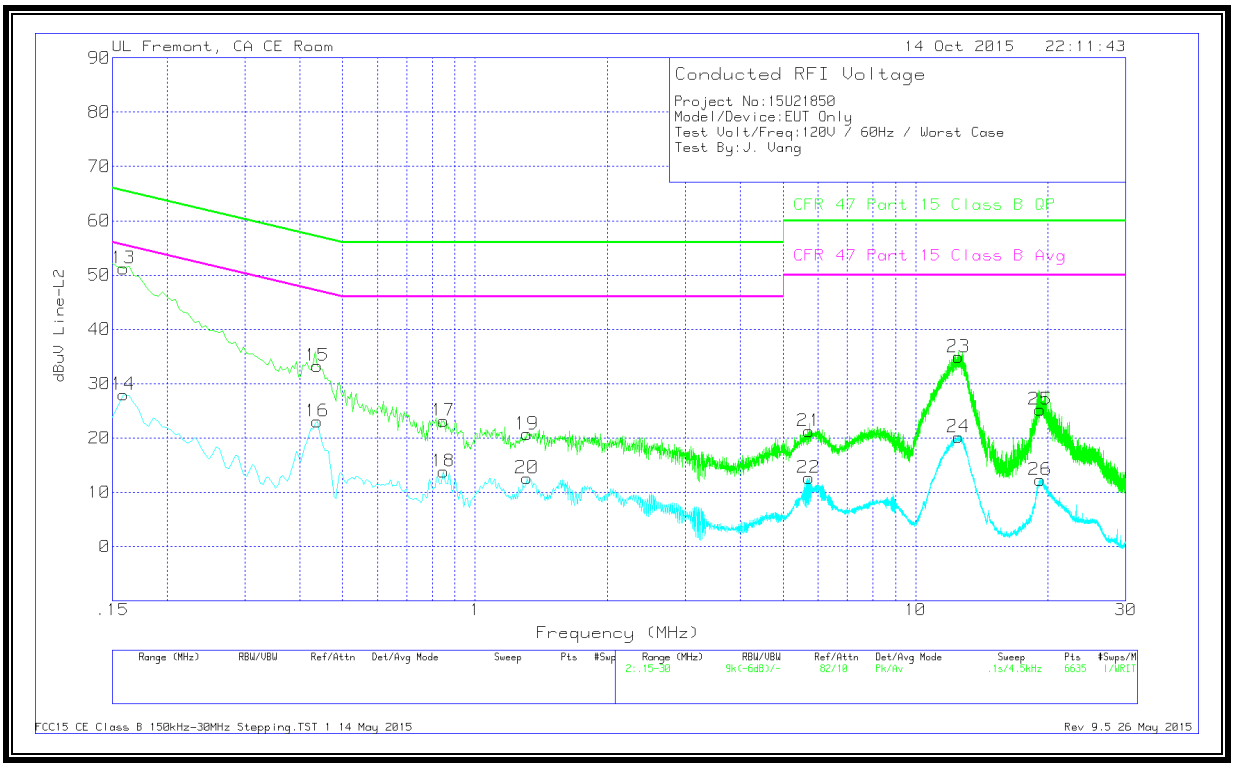
LINE 2 RESULTS



WORST EMISSIONS

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L2	LC Cables 2&3	Corrected Reading dBuV	CFR 47 Part 15 Class B QP	Margin (dB)	CFR 47 Part 15 Class B Avg	Margin (dB)
13	.159	49.85	Pk	1.4	0	51.25	65.52	-14.27	-	-
14	.159	26.57	Av	1.4	0	27.97	-	-	55.52	-27.55
15	.438	32.9	Pk	.4	0	33.3	57.1	-23.8	-	-
16	.438	22.66	Av	.4	0	23.06	-	-	47.1	-24.04
17	.8475	22.87	Pk	.3	0	23.17	56	-32.83	-	-
18	.8475	13.55	Av	.3	0	13.85	-	-	46	-32.15
19	1.311	20.4	Pk	.2	.1	20.7	56	-35.3	-	-
20	1.311	12.32	Av	.2	.1	12.62	-	-	46	-33.38
21	5.721	20.97	Pk	.2	.1	21.27	60	-38.73	-	-
22	5.721	12.36	Av	.2	.1	12.66	-	-	50	-37.34
23	12.516	34.51	Pk	.2	.2	34.91	60	-25.09	-	-
24	12.516	19.78	Av	.2	.2	20.18	-	-	50	-29.82
25	19.1805	24.71	Pk	.3	.2	25.21	60	-34.79	-	-
26	19.1805	11.78	Av	.3	.2	12.28	-	-	50	-37.72

Pk - Peak detector

Av - Average detection

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11. DYNAMIC FREQUENCY SELECTION

11.1. OVERVIEW

11.1.1. LIMITS

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”.

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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.		

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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.

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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

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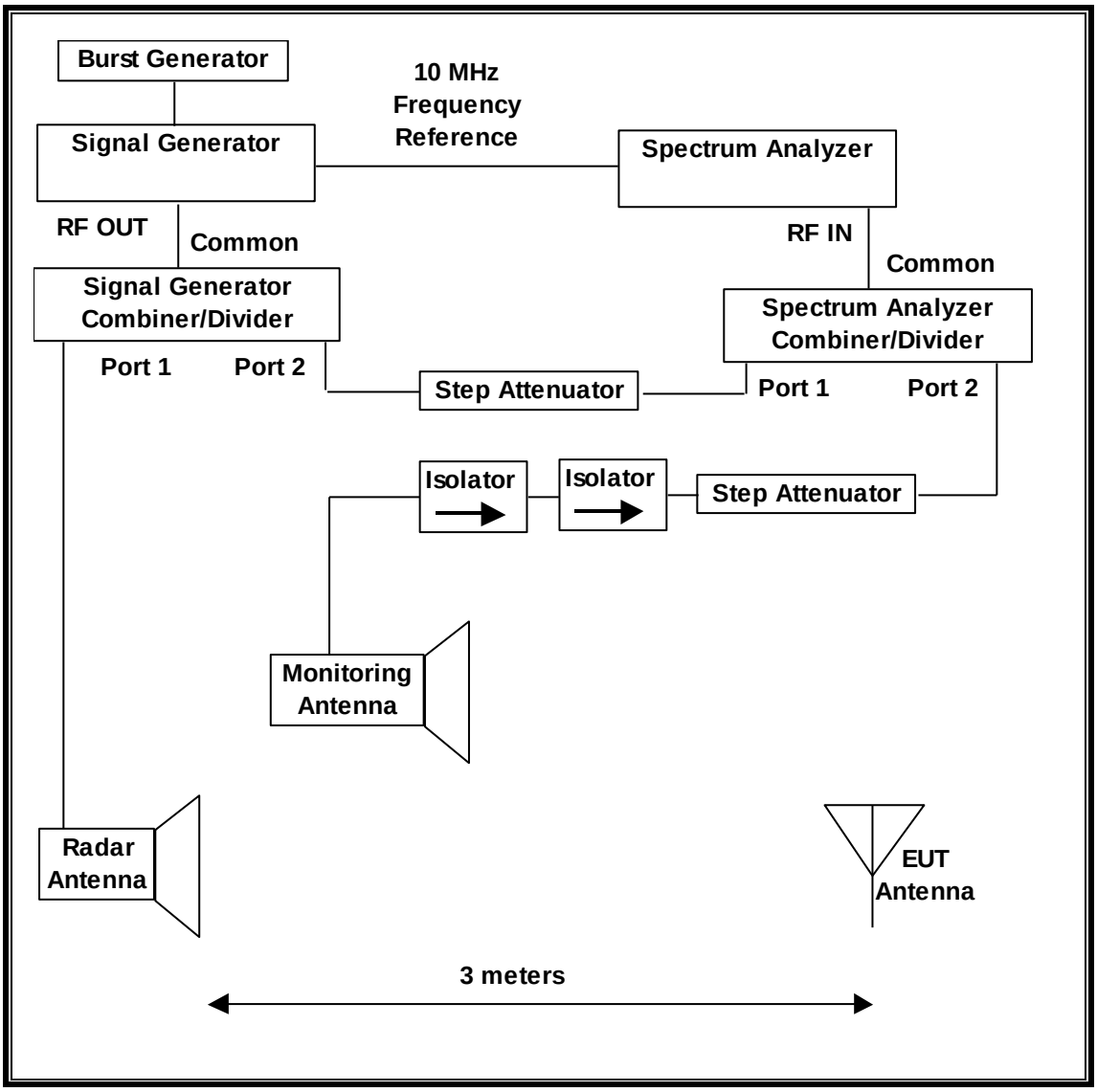
11.1.2. TEST AND MEASUREMENT SYSTEM

RADIATED METHOD SYSTEM BLOCK DIAGRAM



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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.

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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:

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
Notebook PC (Controller)	Apple	A1278	C02HJ0A7DTY4	DoC
AC Adapter (ControllerPC)	Apple	A1172	MV7211FJAX4XA	DoC
iPhone 6S(Slave Device)	Apple	A1633	C7JPH035GL2T	BCG-E2946A
Notebook PC (Host)	Apple	A1502	C02LRLKYFH00	DoC
AC Adapter (Host PC)	Apple	A1435	D39346606VMF2YAJ	DoC

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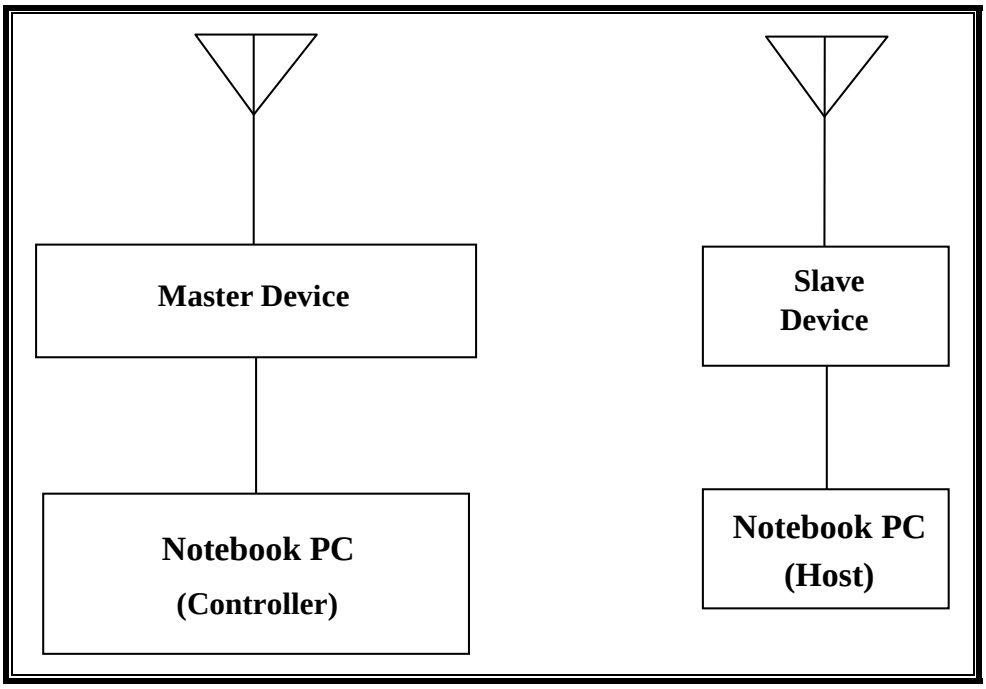
11.1.3. SETUP OF EUT

RADIATED METHOD EUT TEST SETUP



SUPPORT EQUIPMENT

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

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
Notebook PC (Controller)	Apple	A1278	C02HJ0A7DTY4	DoC
AC Adapter (ControllerPC)	Apple	A1172	MV7211FJAX4XA	DoC
iPhone 6S(Slave Device)	Apple	A1633	C7JPH035GL2T	BCG-E2946A
Notebook PC (Host)	Apple	A1502	C02LRLKYFH00	DoC
AC Adapter (Host PC)	Apple	A1435	D39346606VMF2YAJ	DoC

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11.1.4. 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 highest power level within these bands is 28.15 dBm EIRP in the 5250-5350 MHz band and 28.81 dBm EIRP in the 5470-5725 MHz band.

The only antenna assembly consists of 3 antennas with individual gains of 3.4 dBi, 1.6 dBi and 2.3 dBi in the 5250-5350 MHz band and 3.0 dBi, 1.7 dBi and 3.8 dBi in the 5470-5725 MHz band.

Three 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 margin to the limit.

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.

WLAN traffic that meets or exceeds the minimum required loading was generated by transferring a data stream from the controller/server PC to the EUT using iPerf version 2.0.5 software package.

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

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

The software installed in the access point is revision 7.7 D2.

UNIFORM CHANNEL SPREADING

This function is not required per KDB 905462.

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11.2. RESULTS FOR 20 MHz BANDWIDTH

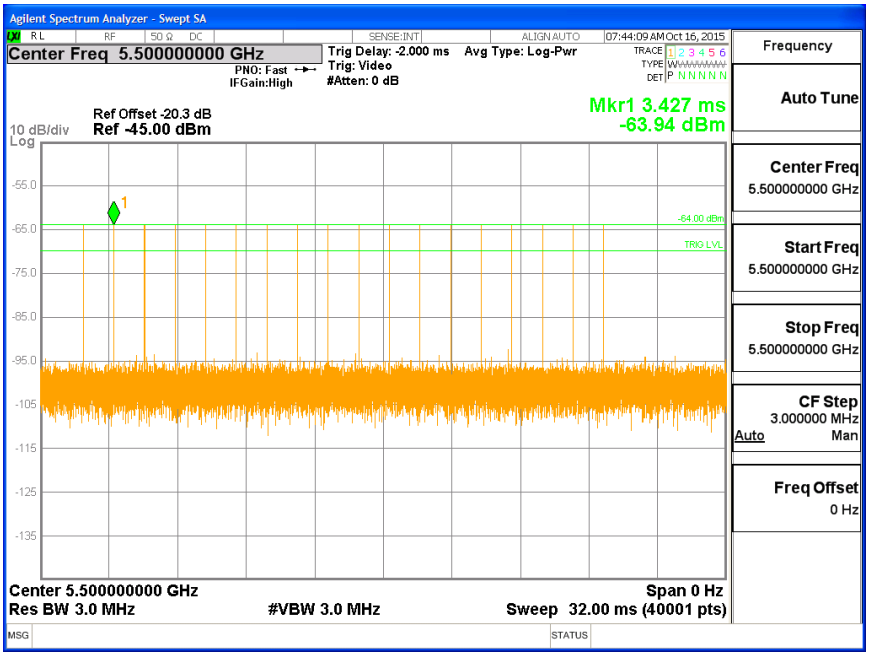
11.2.1. TEST CHANNEL

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

11.2.2. RADAR WAVEFORMS AND TRAFFIC

RADAR WAVEFORMS

SHORT PULSE RADAR TYPE 0



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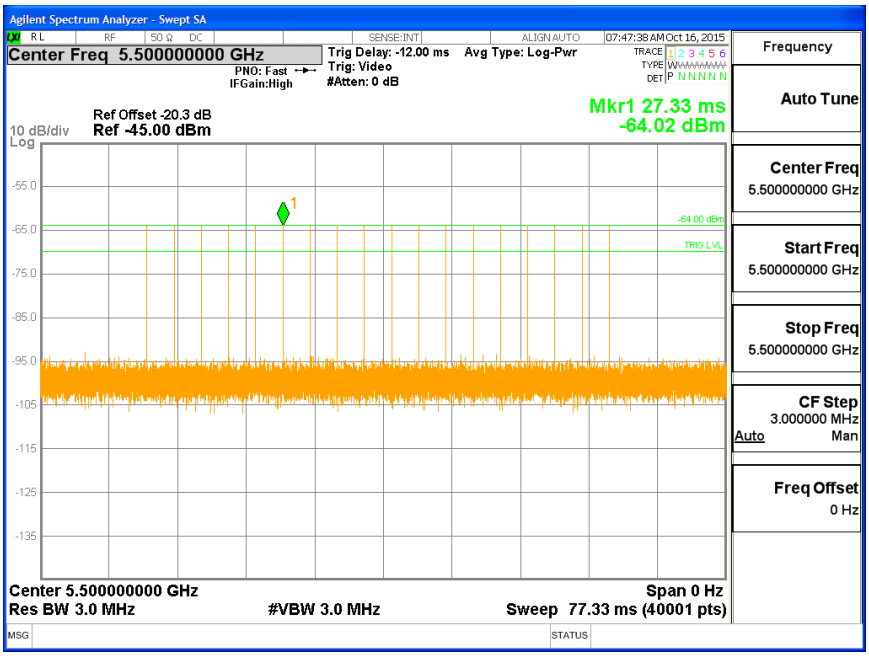
SAMPLE OF RADAR TYPE 1



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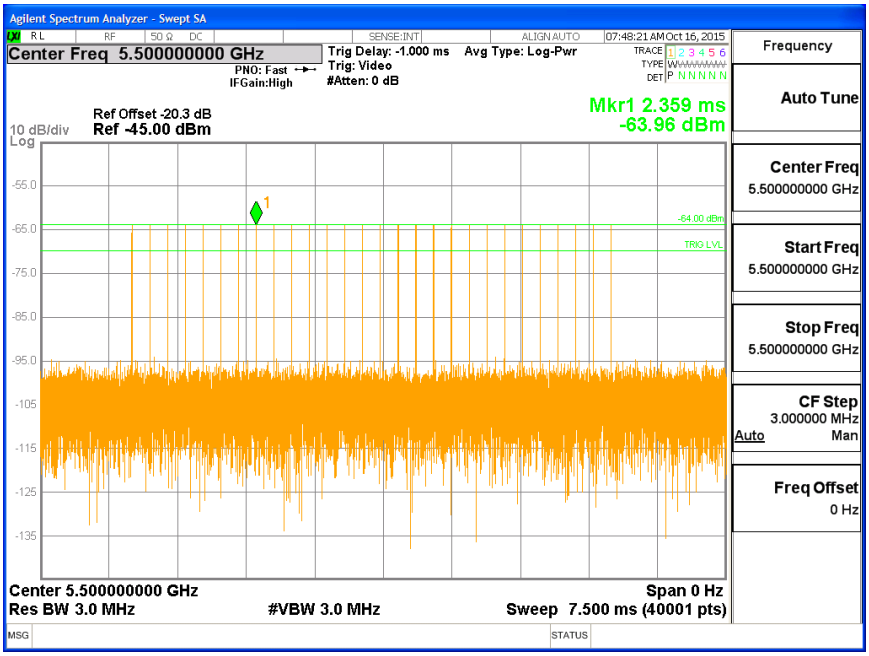
SAMPLE OF RADAR TYPE 2



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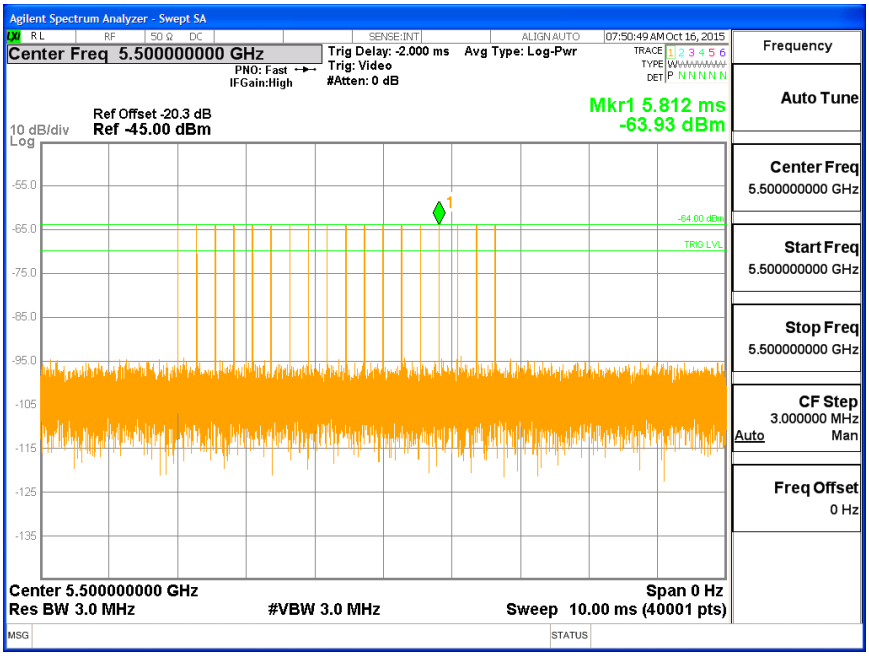
SAMPLE OF RADAR TYPE 3



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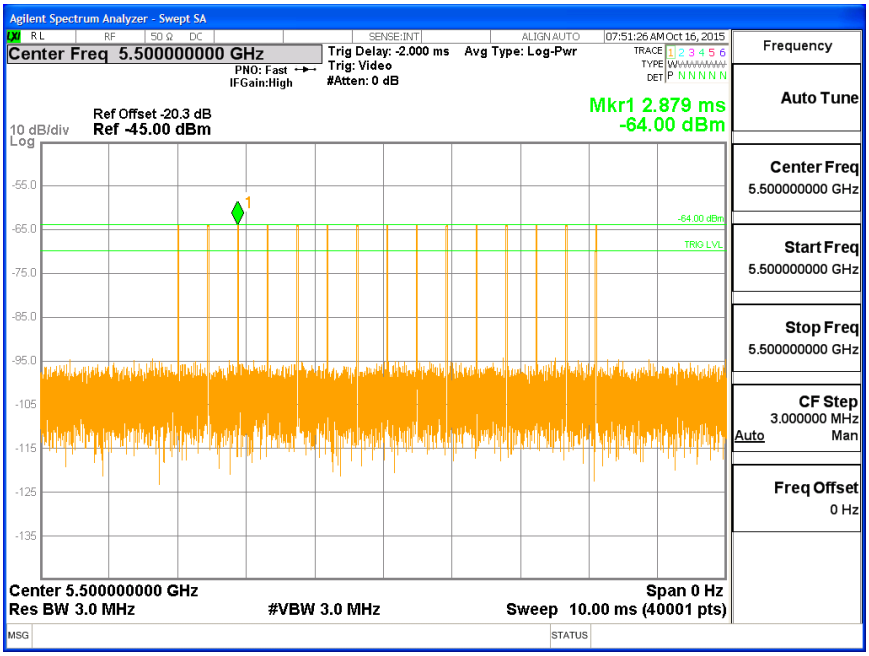
SAMPLE OF RADAR TYPE 4



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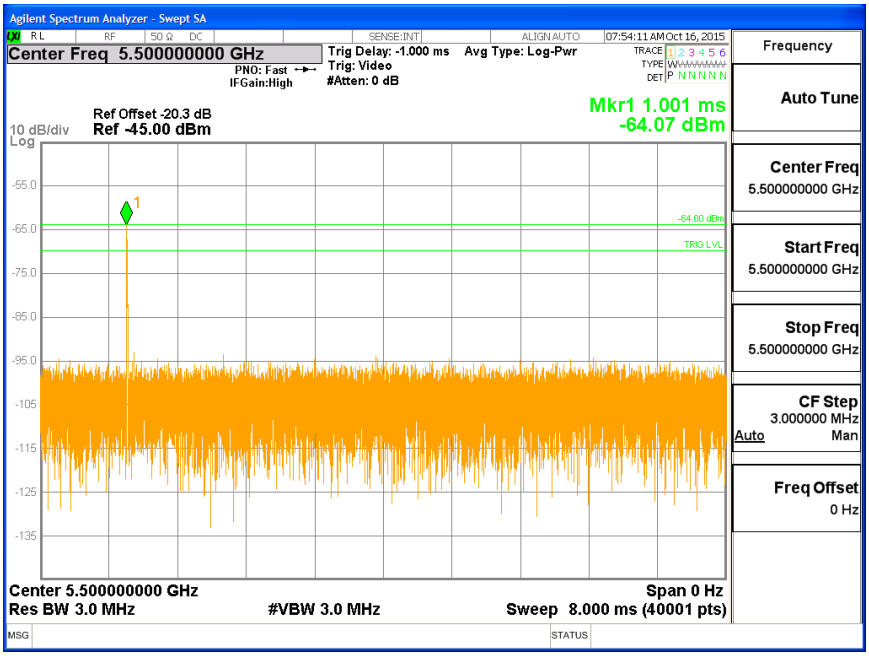
SAMPLE OF SINGLE BURST OF RADAR TYPE 5



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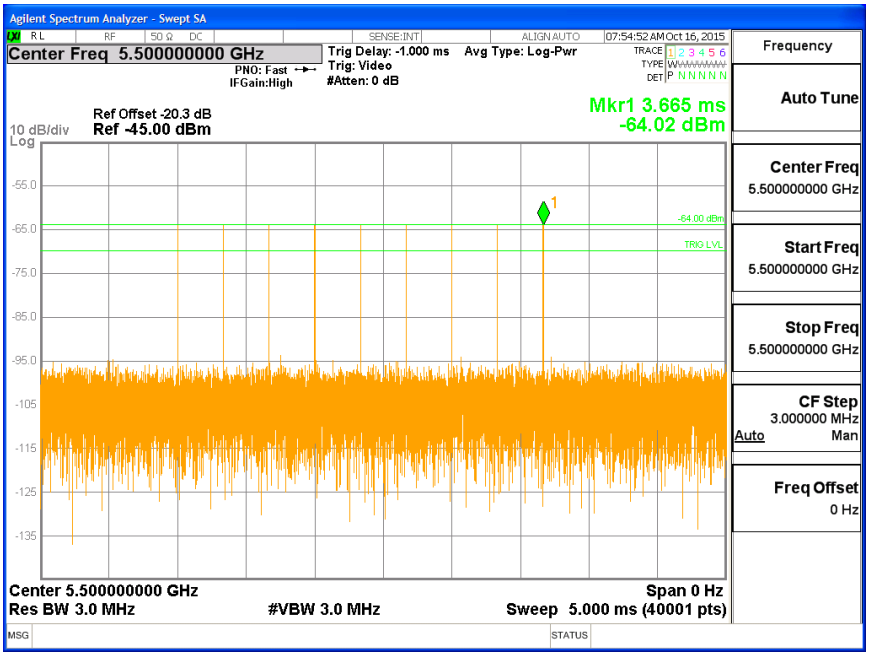
SINGLE BURST OF RADAR TYPE 6



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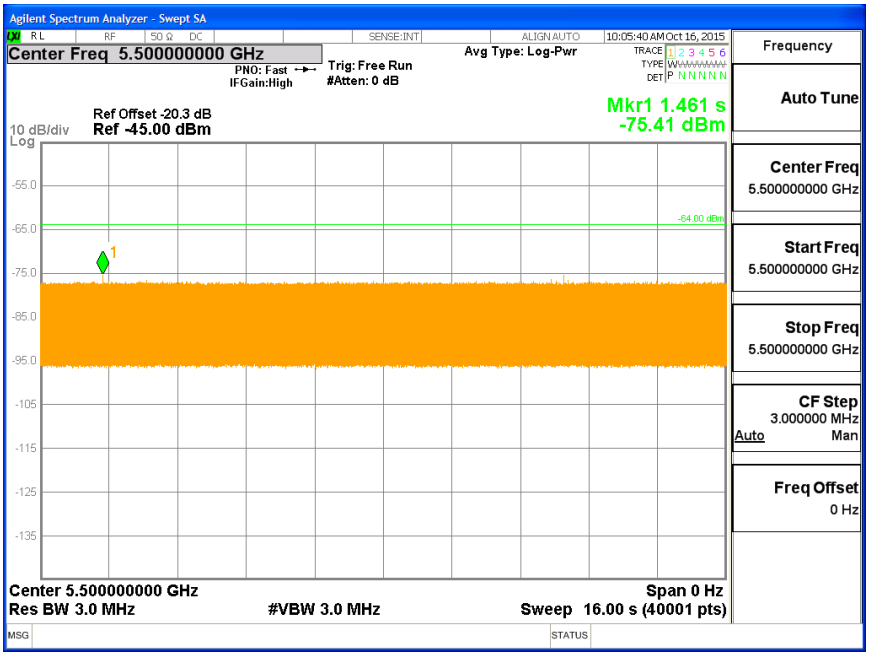
TRAFFIC

TRAFFIC



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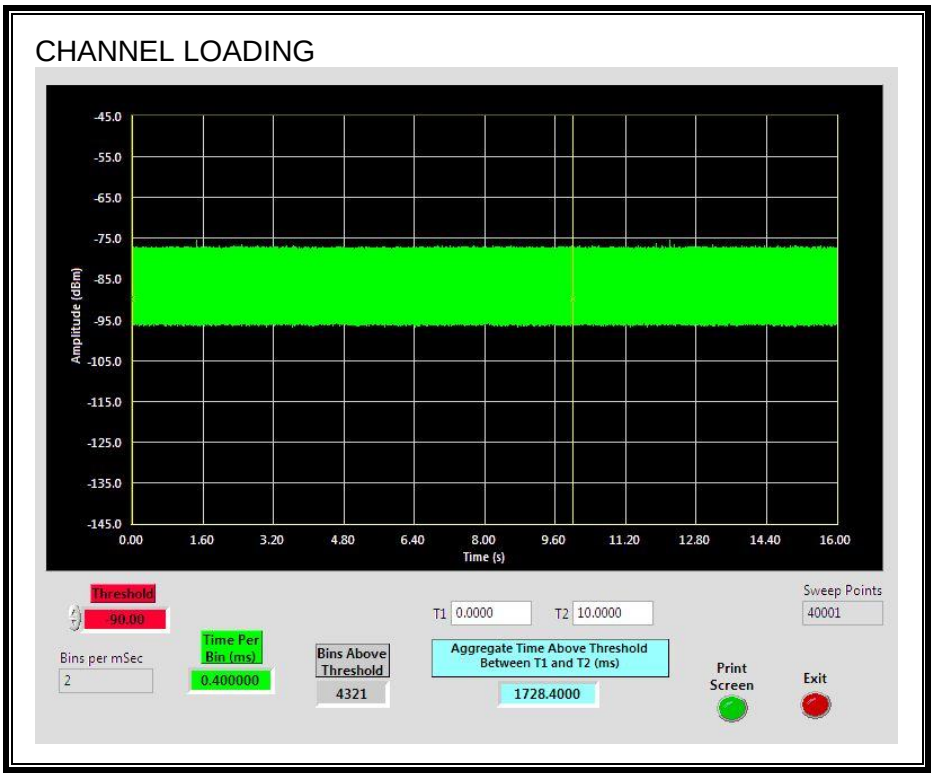
CHANNEL LOADING



The level of traffic loading on the channel by the EUT is 17.28%

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11.2.1. CHANNEL AVAILABILITY CHECK TIME

PROCEDURE TO DETERMINE INITIAL POWER-UP CYCLE TIME

A link was established on channel then a software reboot command was issued to the EUT. The period of time between reboot and the initialization of traffic was measured as the time required for the EUT to complete the total power-up cycle. The time to complete the initial power-up period is 60 seconds less than this total power-up time.

PROCEDURE FOR TIMING OF RADAR BURST

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

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

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QUANTITATIVE RESULTS

No Radar Triggered

Timing of Reboot (sec)	Timing of Start of Traffic (sec)	Total Power-up Cycle Time (sec)	Initial Power-up Cycle Time (sec)
5.963	127.3	121.3	61.3

Radar Near Beginning of CAC

Timing of Reboot (sec)	Timing of Radar Burst (sec)	Radar Relative to Reboot (sec)	Radar Relative to Start of CAC (sec)
5.24	67.55	62.3	1.0

Radar Near End of CAC

Timing of Reboot (sec)	Timing of Radar Burst (sec)	Radar Relative to Reboot (sec)	Radar Relative to Start of CAC (sec)
5.53	125.3	119.8	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

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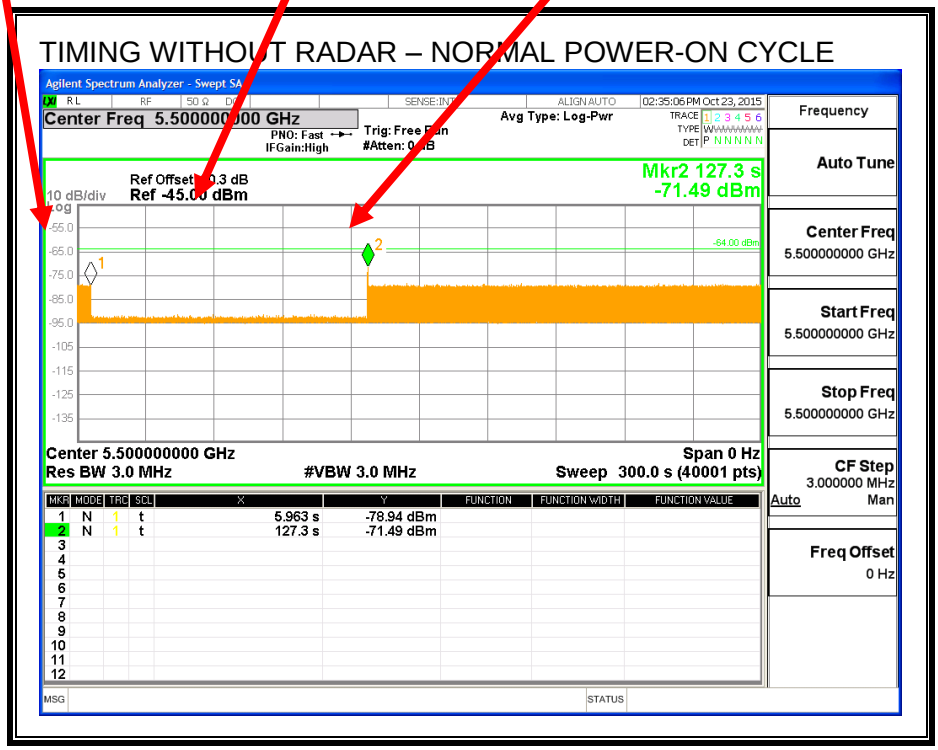
TIMING WITHOUT RADAR DURING CAC

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

End of Initial Power-up cycle
Start of CAC

End of CAC
Traffic is Initiated



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

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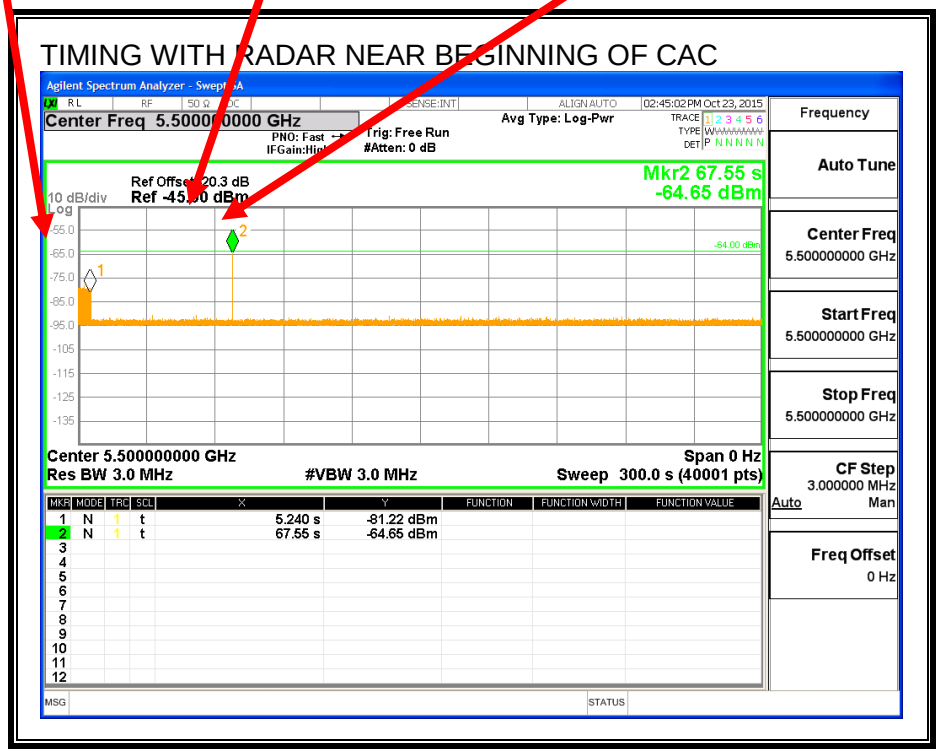
TIMING WITH RADAR NEAR BEGINNING OF CAC

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

End of Initial Power-up cycle
Start of CAC

Radar Signal Applied



No EUT transmissions were observed after the radar signal.

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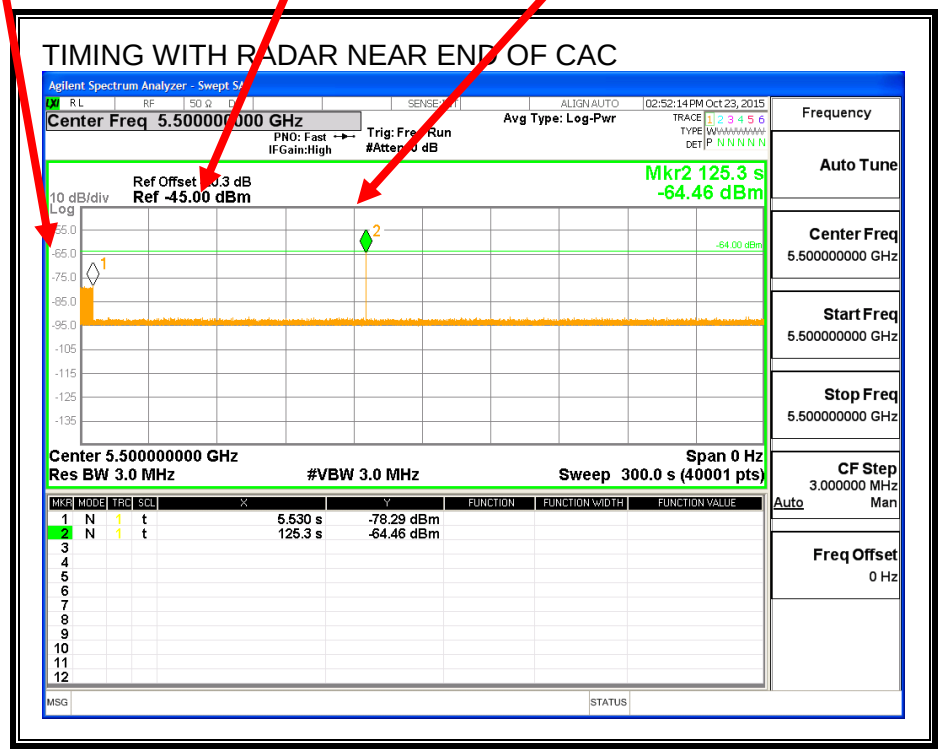
TIMING WITH RADAR NEAR END OF CAC

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

End of Initial Power-up cycle
Start of CAC

Radar Signal Applied



No EUT transmissions were observed after the radar signal.

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11.2.2. OVERLAPPING CHANNEL TESTS

RESULTS

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

11.2.3. MOVE AND CLOSING TIME

REPORTING NOTES

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

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

The aggregate channel closing transmission time is calculated as follows:

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

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

RESULTS

Channel Move Time (sec)	Limit (sec)
4.200	10

Aggregate Channel Closing Transmission Time (msec)	Limit (msec)
35.2	60

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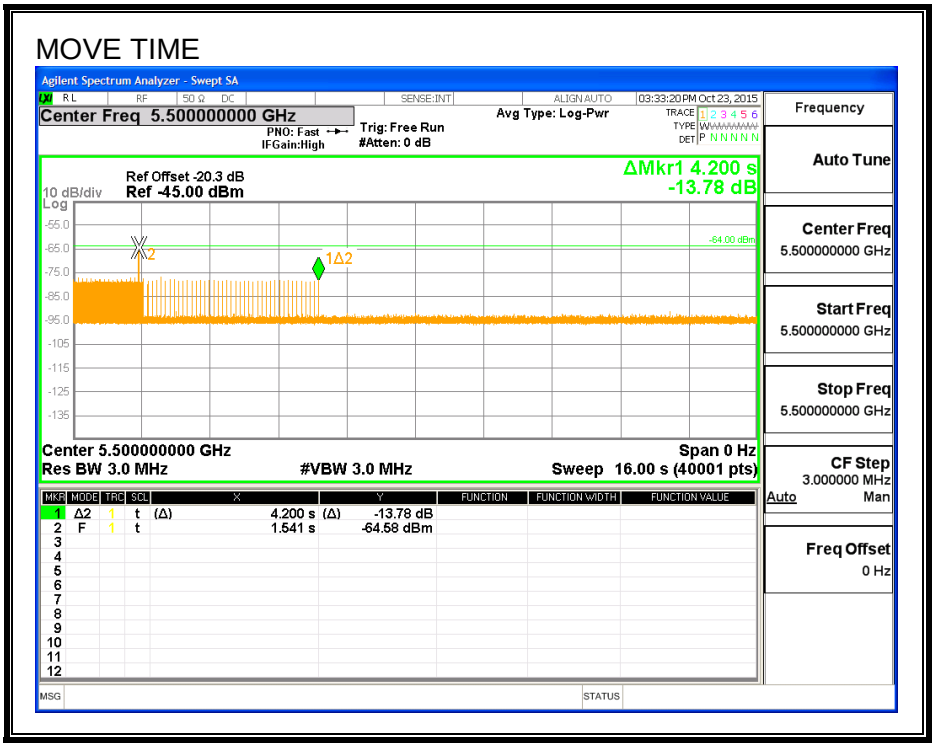
MOVE TIME



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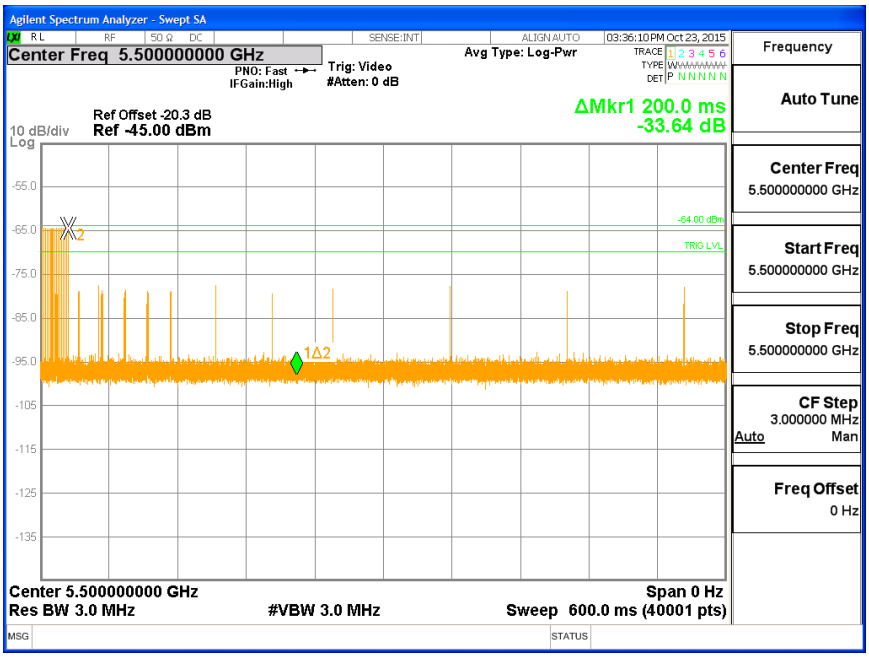
CHANNEL CLOSING TIME

CLOSING TIME



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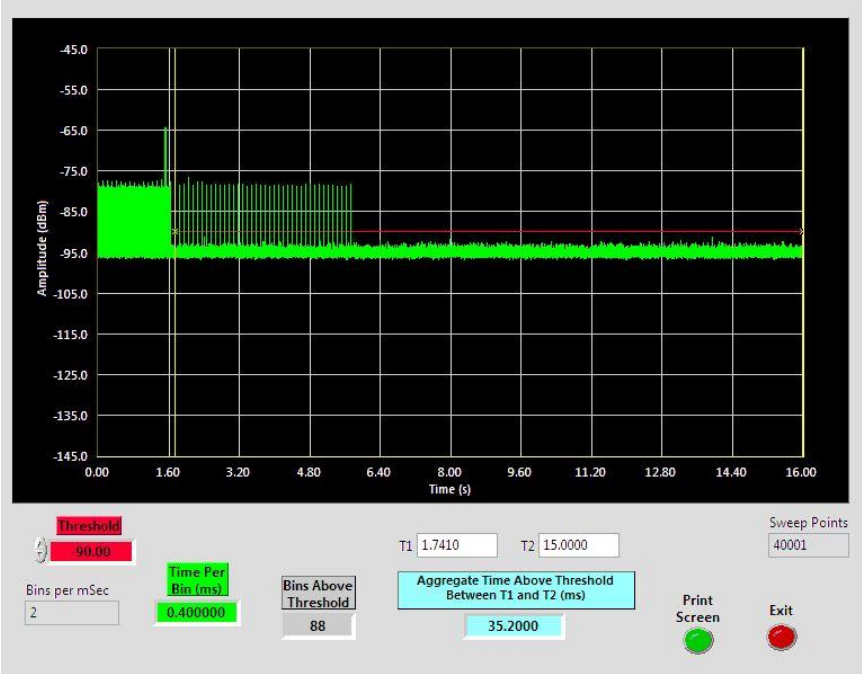
AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

Only intermittent transmissions are observed during the aggregate monitoring period.

AGGREGATE CLOSING TIME



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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

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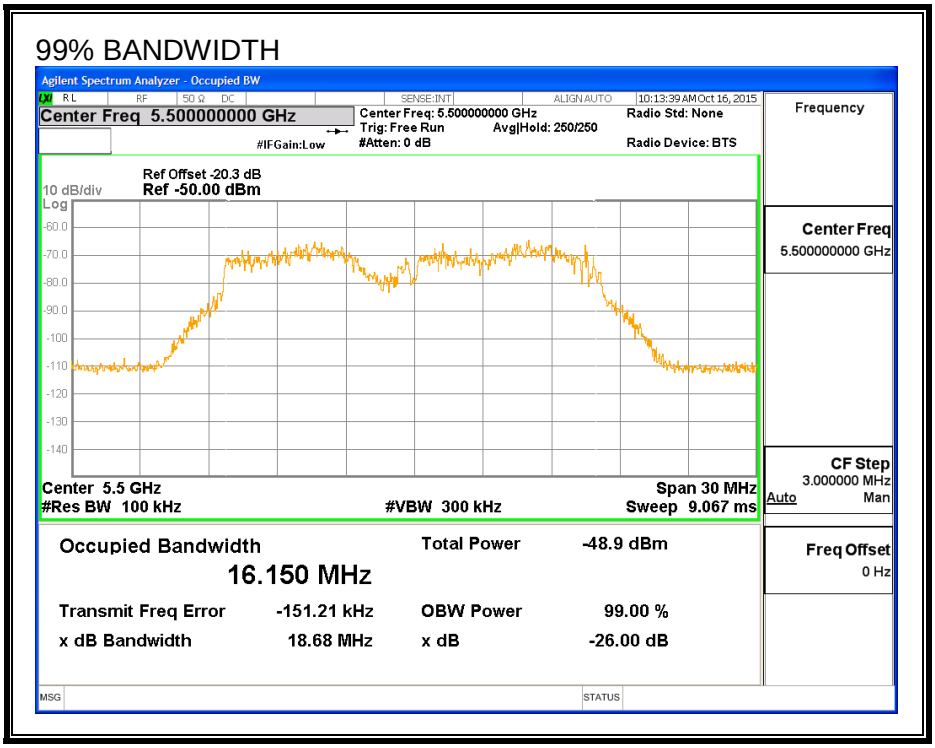
11.2.4. DETECTION BANDWIDTH

REFERENCE PLOT OF 99% POWER BANDWIDTH



RESULTS

FL (MHz)	FH (MHz)	Detection Bandwidth (MHz)	99% Power Bandwidth (MHz)	Ratio of Detection BW to 99% Power BW (%)	Minimum Limit (%)
5491	5509	18	16.150	111.5	100

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DETECTION BANDWIDTH PROBABILITY

DETECTION BANDWIDTH PROBABILITY RESULTS

Detection Bandwidth Test Results				
FCC Type 0 Waveform: 1 us Pulse Width, 1428 us PRI, 18 Pulses per Burst				
Frequency (MHz)	Number of Trials	Number Detected	Detection (%)	Mark
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	
5506	10	10	100	
5507	10	10	100	
5508	10	10	100	
5509	10	10	100	FH
5510	10	0	0	

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11.2.5. IN-SERVICE MONITORING

RESULTS

FCC Radar Test Summary

Signal Type	Number of Trials	Detection (%)	Limit (%)	Pass/Fail	Detection Bandwidth		80% of Det BW	
					FL	FH	FL5	FH5
FCC Short Pulse Type 1	30	96.67	60	Pass	5491	5509		
FCC Short Pulse Type 2	30	100.00	60	Pass	5491	5509		
FCC Short Pulse Type 3	30	100.00	60	Pass	5491	5509		
FCC Short Pulse Type 4	30	100.00	60	Pass	5491	5509		
Aggregate		99.17	80	Pass				
FCC Long Pulse Type 5	30	100.00	80	Pass	5491	5509	5493	5507
FCC Hopping Type 6	38	97.37	70	Pass	5491	5509		

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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	No
1002	1	518	102	A	5500	Yes
1003	1	618	86	A	5500	Yes
1004	1	778	68	A	5500	Yes
1005	1	898	59	A	5500	Yes
1006	1	858	62	A	5500	Yes
1007	1	558	95	A	5500	Yes
1008	1	538	99	A	5500	Yes
1009	1	578	92	A	5500	Yes
1010	1	878	61	A	5500	Yes
1011	1	698	76	A	5500	Yes
1012	1	838	63	A	5500	Yes
1013	1	638	83	A	5500	Yes
1014	1	798	67	A	5500	Yes
1015	1	918	58	A	5500	Yes
1016	1	2683	20	B	5500	Yes
1017	1	962	55	B	5500	Yes
1018	1	2271	24	B	5500	Yes
1019	1	680	78	B	5500	Yes
1020	1	2118	25	B	5500	Yes
1021	1	2009	27	B	5500	Yes
1022	1	1030	52	B	5500	Yes
1023	1	1050	51	B	5500	Yes
1024	1	2748	20	B	5500	Yes
1025	1	1703	31	B	5500	Yes
1026	1	2336	23	B	5500	Yes
1027	1	1421	38	B	5500	Yes
1028	1	2183	25	B	5500	Yes
1029	1	1397	38	B	5500	Yes
1030	1	1094	49	B	5500	Yes

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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	1.7	194	28	5500	Yes
2002	4	155	23	5500	Yes
2003	4.9	230	29	5500	Yes
2004	3.3	158	28	5500	Yes
2005	2.4	156	24	5500	Yes
2006	3.2	169	23	5500	Yes
2007	4.5	214	23	5500	Yes
2008	3.6	151	27	5500	Yes
2009	3.1	162	24	5500	Yes
2010	4.3	183	27	5500	Yes
2011	2.2	198	25	5500	Yes
2012	1.7	186	25	5500	Yes
2013	3.8	205	27	5500	Yes
2014	3.5	197	24	5500	Yes
2015	1.8	183	29	5500	Yes
2016	3.9	178	27	5500	Yes
2017	4.5	168	26	5500	Yes
2018	2.7	211	28	5500	Yes
2019	3.6	167	24	5500	Yes
2020	2	214	26	5500	Yes
2021	1.1	174	29	5500	Yes
2022	1.9	225	28	5500	Yes
2023	1.3	189	25	5500	Yes
2024	2.3	206	24	5500	Yes
2025	1.8	217	28	5500	Yes
2026	1.1	158	25	5500	Yes
2027	5	173	26	5500	Yes
2028	4.5	160	23	5500	Yes
2029	2.6	180	24	5500	Yes
2030	2.2	171	29	5500	Yes

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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	272	18	5500	Yes
3002	7	259	17	5500	Yes
3003	7.8	478	16	5500	Yes
3004	5.5	360	18	5500	Yes
3005	6.6	474	18	5500	Yes
3006	7.3	369	16	5500	Yes
3007	8.7	496	17	5500	Yes
3008	9.6	403	17	5500	Yes
3009	8.9	292	16	5500	Yes
3010	5	478	18	5500	Yes
3011	9.6	380	17	5500	Yes
3012	8.6	446	16	5500	Yes
3013	8.4	493	16	5500	Yes
3014	7.7	455	18	5500	Yes
3015	5.3	264	18	5500	Yes
3016	10	489	17	5500	Yes
3017	5.5	444	17	5500	Yes
3018	5.4	313	17	5500	Yes
3019	6.2	281	18	5500	Yes
3020	9	281	17	5500	Yes
3021	5	395	17	5500	Yes
3022	5.7	289	18	5500	Yes
3023	7.1	416	16	5500	Yes
3024	8	324	16	5500	Yes
3025	7.2	345	18	5500	Yes
3026	8.5	399	17	5500	Yes
3027	7.9	300	16	5500	Yes
3028	7	500	18	5500	Yes
3029	6.8	414	18	5500	Yes
3030	6.1	375	17	5500	Yes

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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	17.6	435	15	5500	Yes
4002	12.1	292	13	5500	Yes
4003	18	365	12	5500	Yes
4004	12.9	485	13	5500	Yes
4005	19.3	453	12	5500	Yes
4006	14.8	335	13	5500	Yes
4007	17	315	13	5500	Yes
4008	18.4	461	12	5500	Yes
4009	11	337	16	5500	Yes
4010	12.9	378	16	5500	Yes
4011	11.3	266	13	5500	Yes
4012	13.7	320	13	5500	Yes
4013	12.7	472	14	5500	Yes
4014	10.9	420	13	5500	Yes
4015	10.3	334	14	5500	Yes
4016	19.2	296	12	5500	Yes
4017	14.4	489	13	5500	Yes
4018	19	463	14	5500	Yes
4019	14.8	285	15	5500	Yes
4020	19.9	405	16	5500	Yes
4021	16.1	373	15	5500	Yes
4022	11.6	255	12	5500	Yes
4023	19.2	487	16	5500	Yes
4024	15.2	382	15	5500	Yes
4025	17.9	257	15	5500	Yes
4026	19.8	298	14	5500	Yes
4027	18.2	438	12	5500	Yes
4028	10.5	491	16	5500	Yes
4029	19.6	392	12	5500	Yes
4030	17.8	341	12	5500	Yes

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TYPE 5 DETECTION PROBABILITY

Data Sheet for FCC Long Pulse Radar Type 5

Trial	Frequency (MHz)	Successful Detection (Yes/No)
1	5496	Yes
2	5503	Yes
3	5503	Yes
4	5504	Yes
5	5495	Yes
6	5499	Yes
7	5505	Yes
8	5499	Yes
9	5496	Yes
10	5493	Yes
11	5504	Yes
12	5493	Yes
13	5496	Yes
14	5496	Yes
15	5503	Yes
16	5503	Yes
17	5494	Yes
18	5506	Yes
19	5503	Yes
20	5498	Yes
21	5497	Yes
22	5501	Yes
23	5497	Yes
24	5499	Yes
25	5501	Yes
26	5504	Yes
27	5495	Yes
28	5500	Yes
29	5505	Yes
30	5499	Yes

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

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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	123	5491	1	No
2	598	5492	6	Yes
3	1073	5493	3	Yes
4	1548	5494	2	Yes
5	2023	5495	1	Yes
6	2498	5496	4	Yes
7	2973	5497	5	Yes
8	3448	5498	2	Yes
9	3923	5499	1	Yes
10	4398	5500	3	Yes
11	4873	5501	6	Yes
12	5348	5502	5	Yes
13	5823	5503	4	Yes
14	6298	5504	5	Yes
15	6773	5505	5	Yes
16	7248	5506	1	Yes
17	7723	5507	5	Yes
18	8198	5508	6	Yes
19	8673	5509	3	Yes
20	9148	5491	4	Yes
21	9623	5492	6	Yes
22	10098	5493	4	Yes
23	10573	5494	2	Yes
24	11048	5495	2	Yes
25	11523	5496	5	Yes
26	11998	5497	7	Yes
27	12473	5498	6	Yes
28	12948	5499	7	Yes
29	13423	5500	6	Yes
30	13898	5501	2	Yes
31	14373	5502	3	Yes
32	14848	5503	2	Yes
33	15323	5504	3	Yes
34	15798	5505	3	Yes
35	16273	5506	2	Yes
36	16748	5507	5	Yes
37	17223	5508	4	Yes
38	17698	5509	4	Yes

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11.3. RESULTS FOR 40 MHz BANDWIDTH

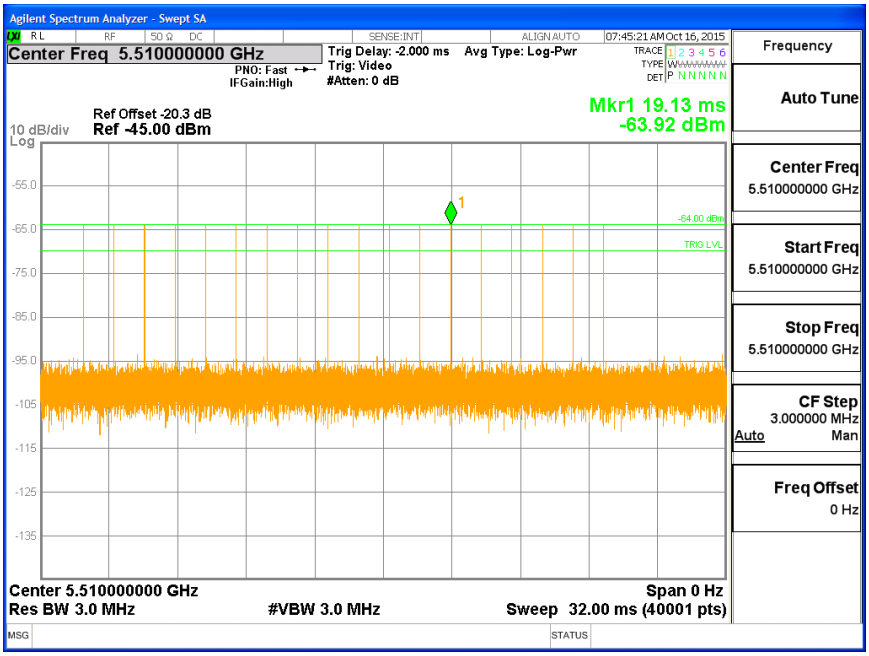
11.3.1. TEST CHANNEL

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

11.3.2. RADAR WAVEFORMS AND TRAFFIC

RADAR WAVEFORMS

SHORT PULSE RADAR TYPE 0



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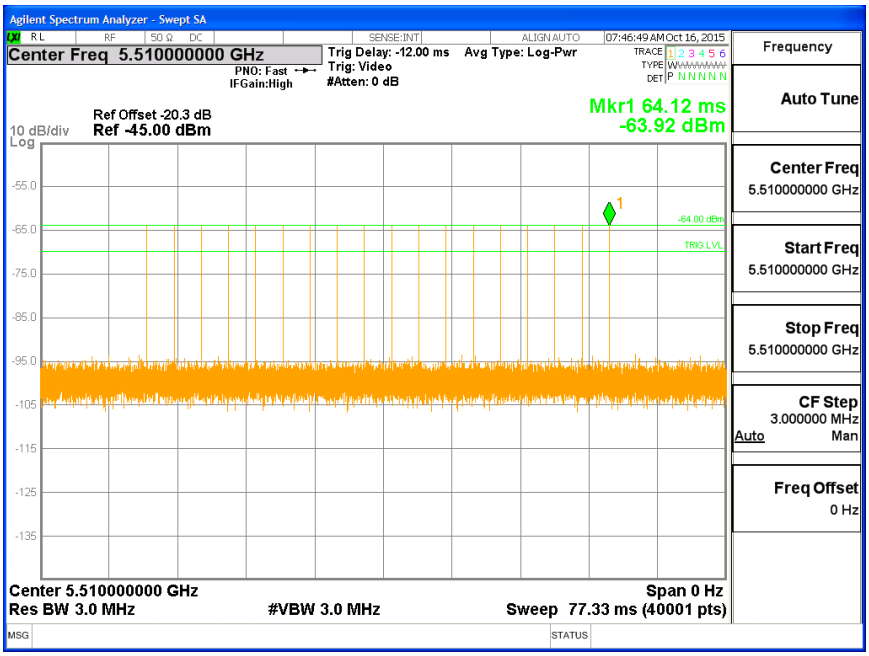
SAMPLE OF RADAR TYPE 1



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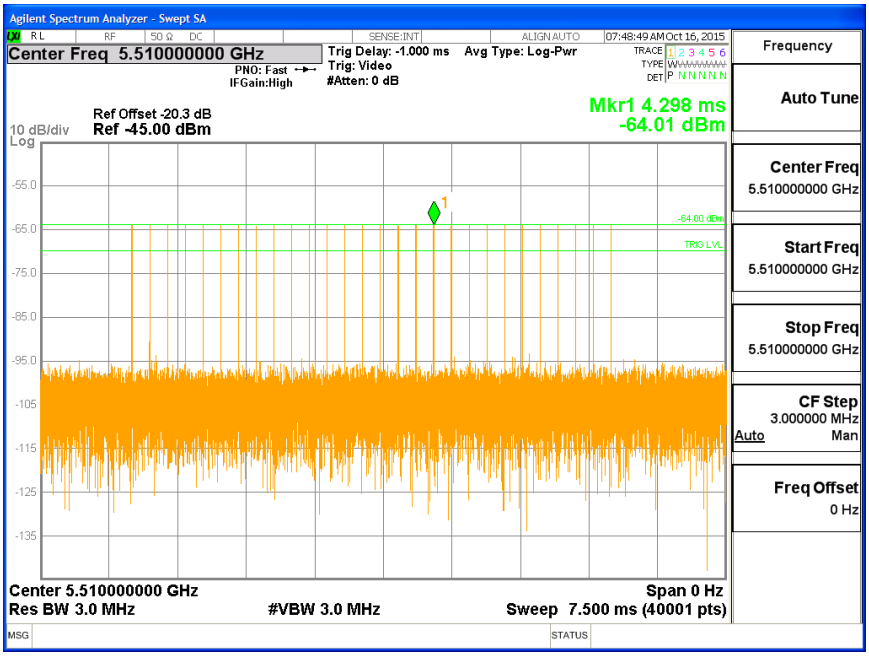
SAMPLE OF RADAR TYPE 2



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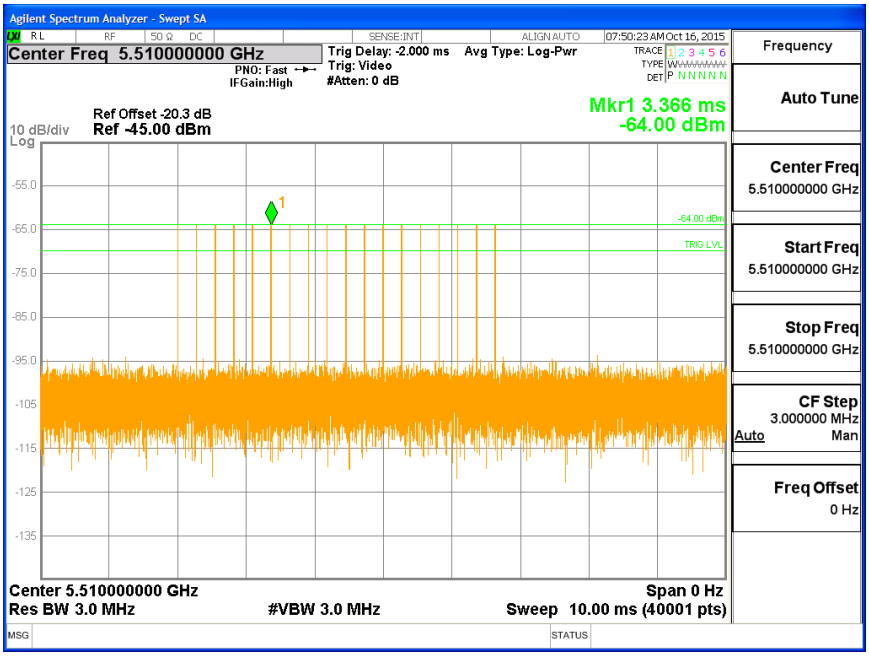
SAMPLE OF RADAR TYPE 3



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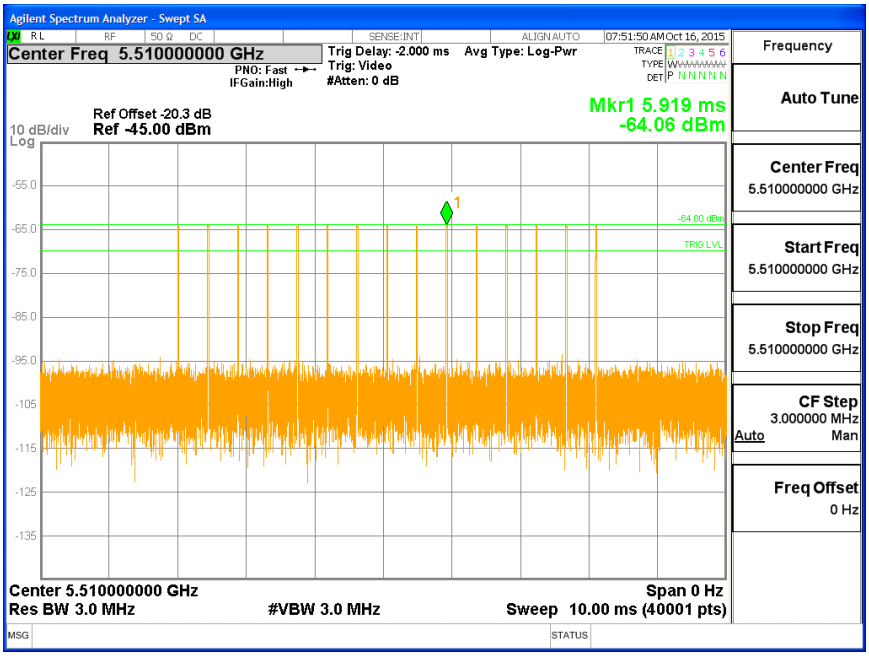
SAMPLE OF RADAR TYPE 4



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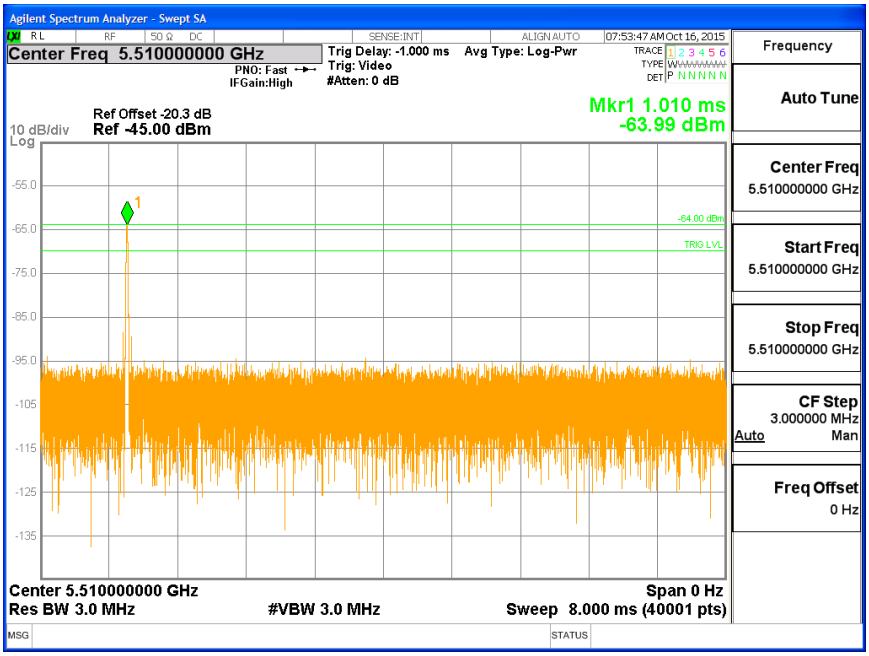
SAMPLE OF SINGLE BURST OF RADAR TYPE 5



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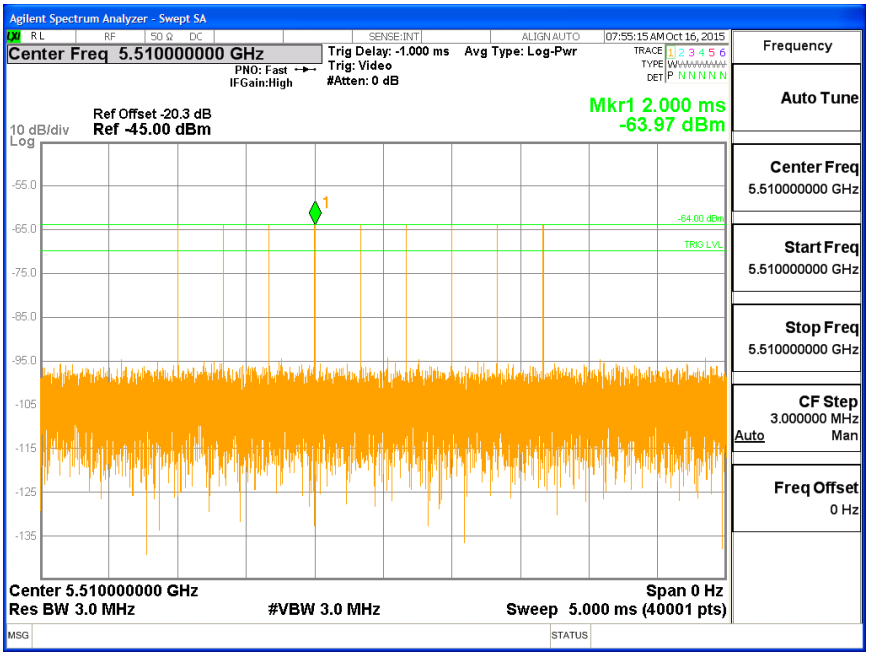
SINGLE BURST OF RADAR TYPE 6



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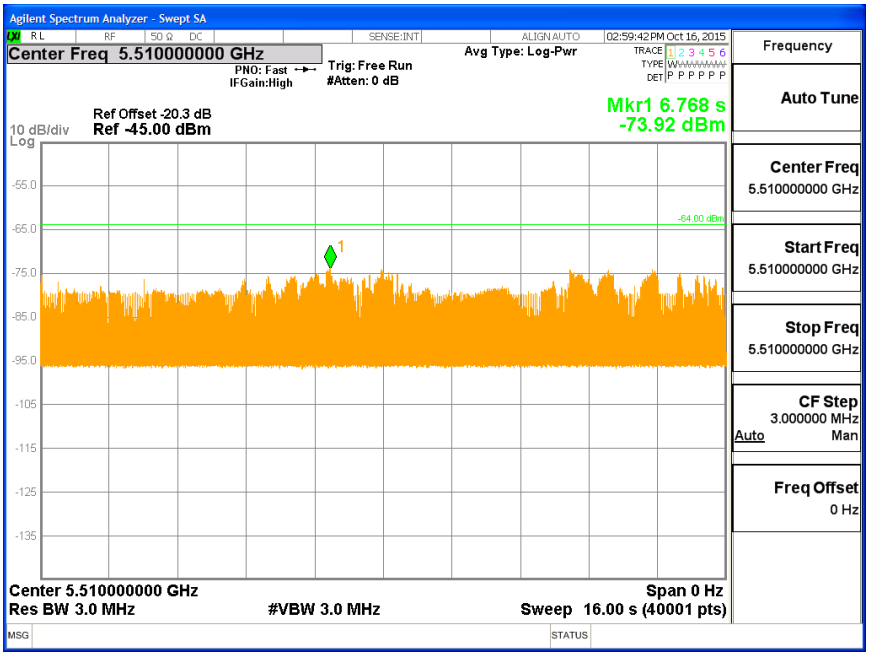
TRAFFIC

TRAFFIC



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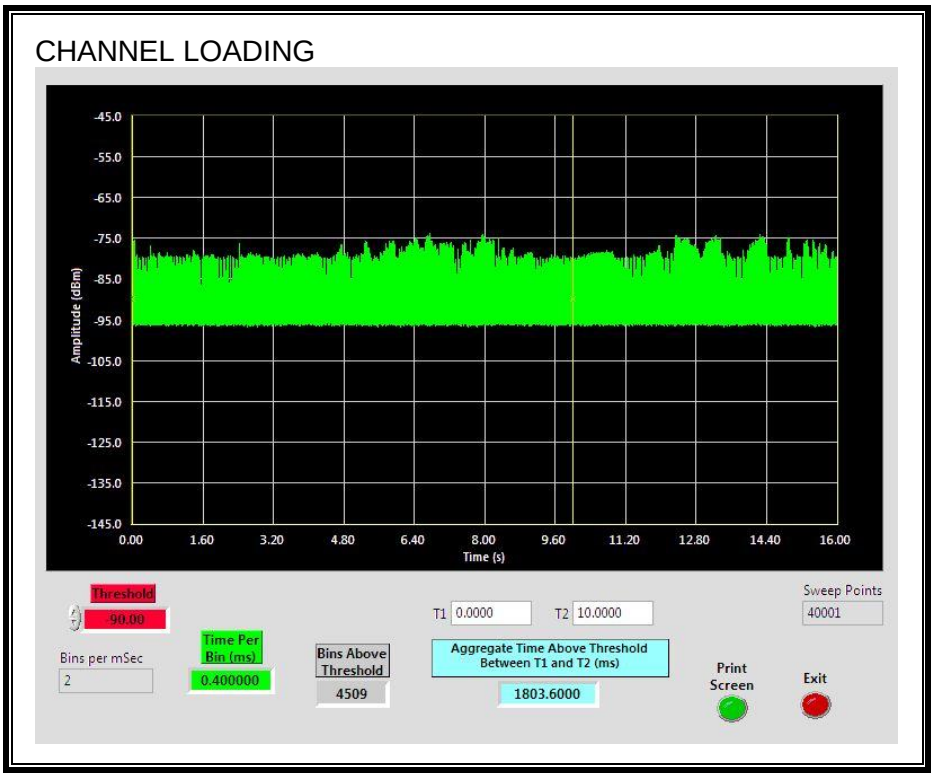
CHANNEL LOADING



The level of traffic loading on the channel by the EUT is 18.03%

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11.3.3. CHANNEL AVAILABILITY CHECK TIME

PROCEDURE TO DETERMINE INITIAL POWER-UP CYCLE TIME

A link was established on channel then a software reboot command was issued to the EUT. The period of time between reboot and the initialization of traffic was measured as the time required for the EUT to complete the total power-up cycle. The time to complete the initial power-up period is 60 seconds less than this total power-up time.

PROCEDURE FOR TIMING OF RADAR BURST

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

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

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QUANTITATIVE RESULTS

No Radar Triggered

Timing of Reboot (sec)	Timing of Start of Traffic (sec)	Total Power-up Cycle Time (sec)	Initial Power-up Cycle Time (sec)
0.0	60.10	60.1	0.1

Radar Near Beginning of CAC

Timing of Reboot (sec)	Timing of Radar Burst (sec)	Radar Relative to Reboot (sec)	Radar Relative to Start of CAC (sec)
0.0	2.0	2.0	1.9

Radar Near End of CAC

Timing of Reboot (sec)	Timing of Radar Burst (sec)	Radar Relative to Reboot (sec)	Radar Relative to Start of CAC (sec)
0.0	58.5	58.5	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

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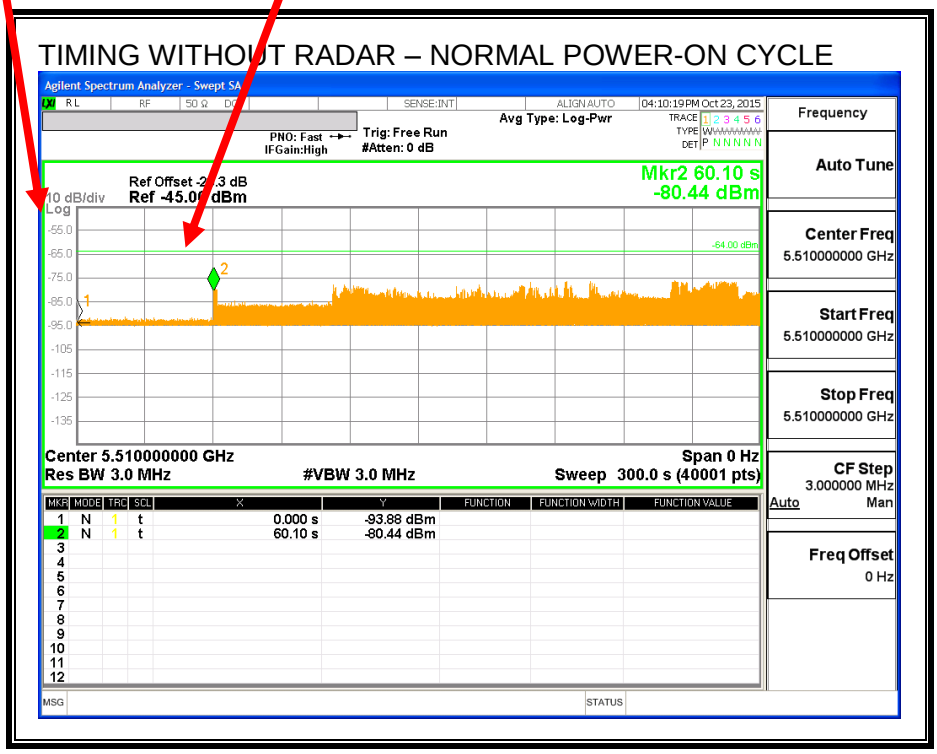
TIMING WITHOUT RADAR DURING CAC

AP is rebooted
Start CAC

End of CAC
Traffic is Initiated



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

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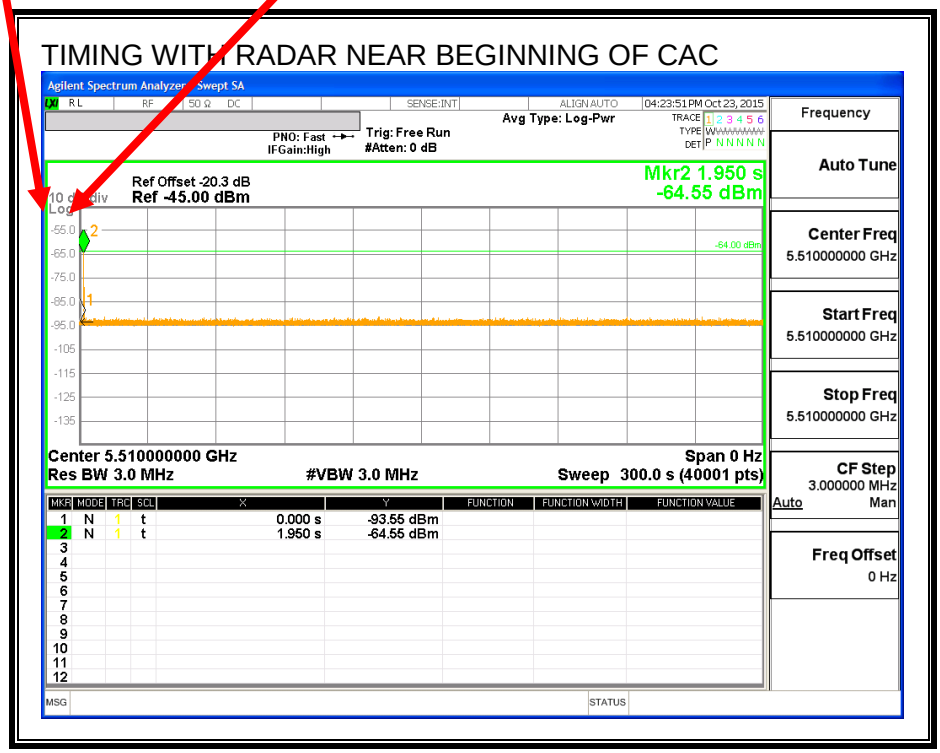
TIMING WITH RADAR NEAR BEGINNING OF CAC

AP is rebooted
Start of CAC

Radar Signal Applied



No EUT transmissions were observed after the radar signal.

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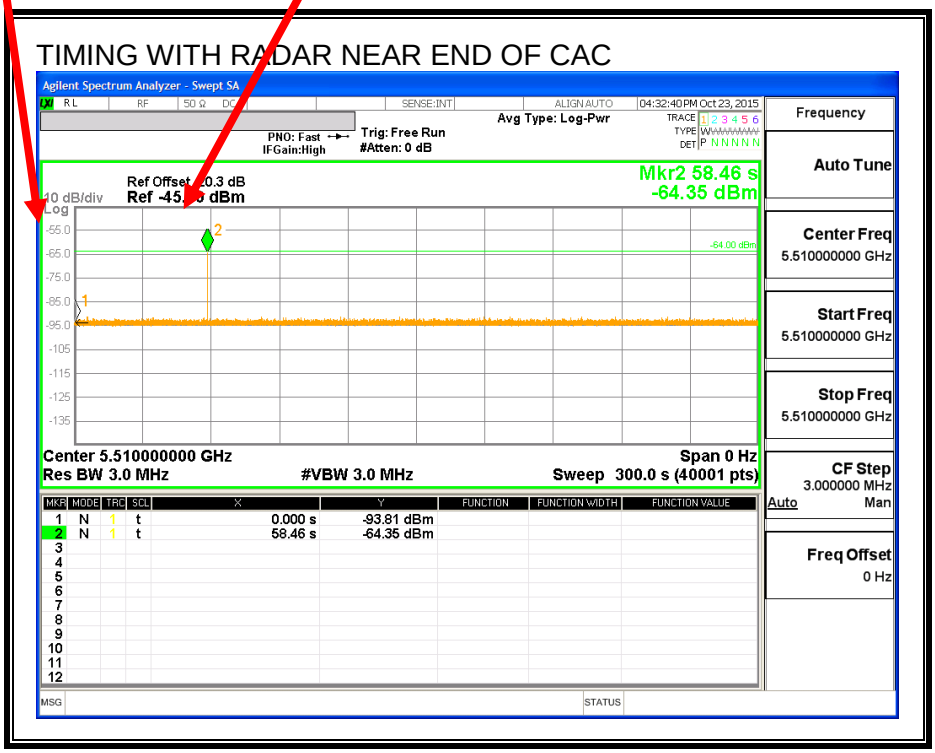
TIMING WITH RADAR NEAR END OF CAC

AP is rebooted
Start of CAC

Radar Signal Applied



No EUT transmissions were observed after the radar signal.

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11.3.4. OVERLAPPING CHANNEL TESTS

RESULTS

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

11.3.5. 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)
4.132	10

Aggregate Channel Closing Transmission Time (msec)	Limit (msec)
31.2	60

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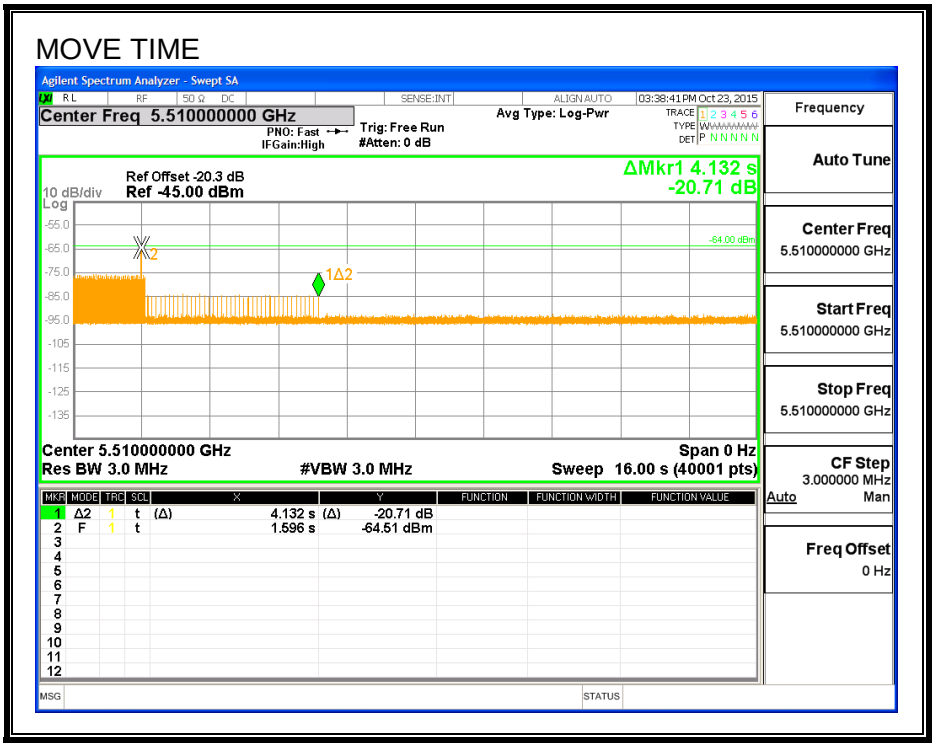
MOVE TIME



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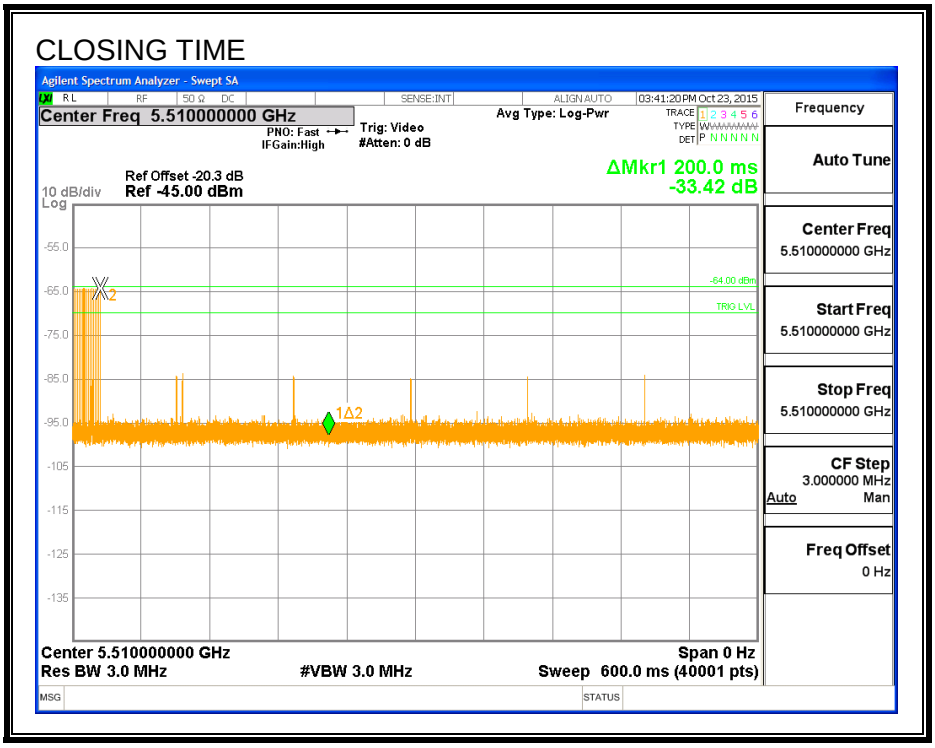
CHANNEL CLOSING TIME



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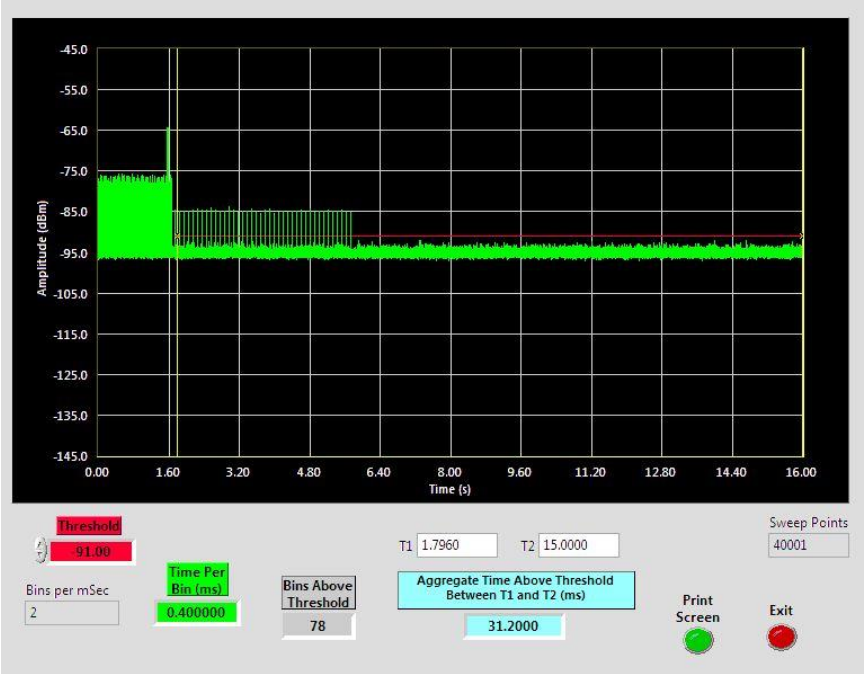
AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

Only intermittent transmissions are observed during the aggregate monitoring period.

AGGREGATE CLOSING TIME



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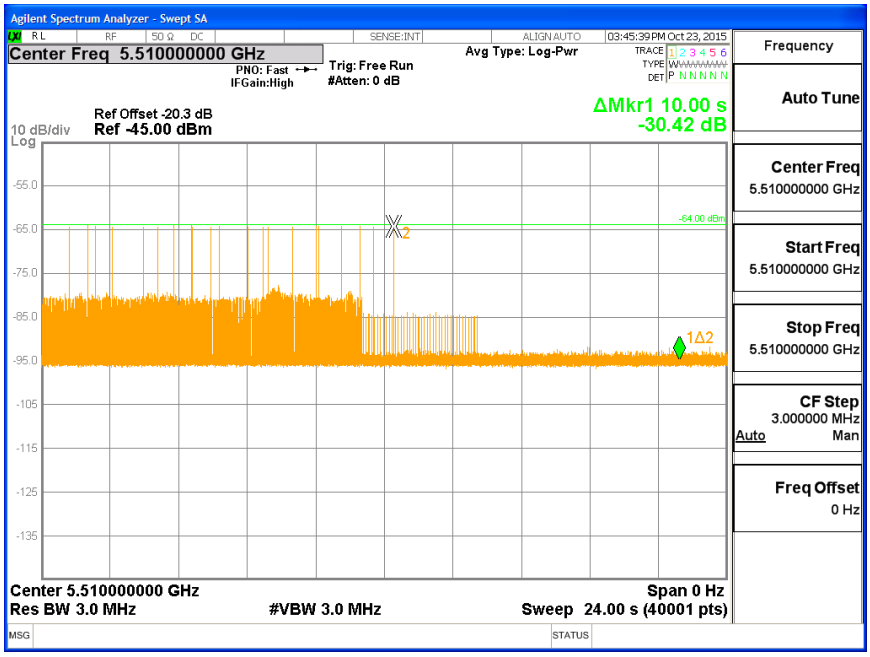
LONG PULSE CHANNEL MOVE TIME

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

MOVE TIME FOR LONG PULSE RADAR



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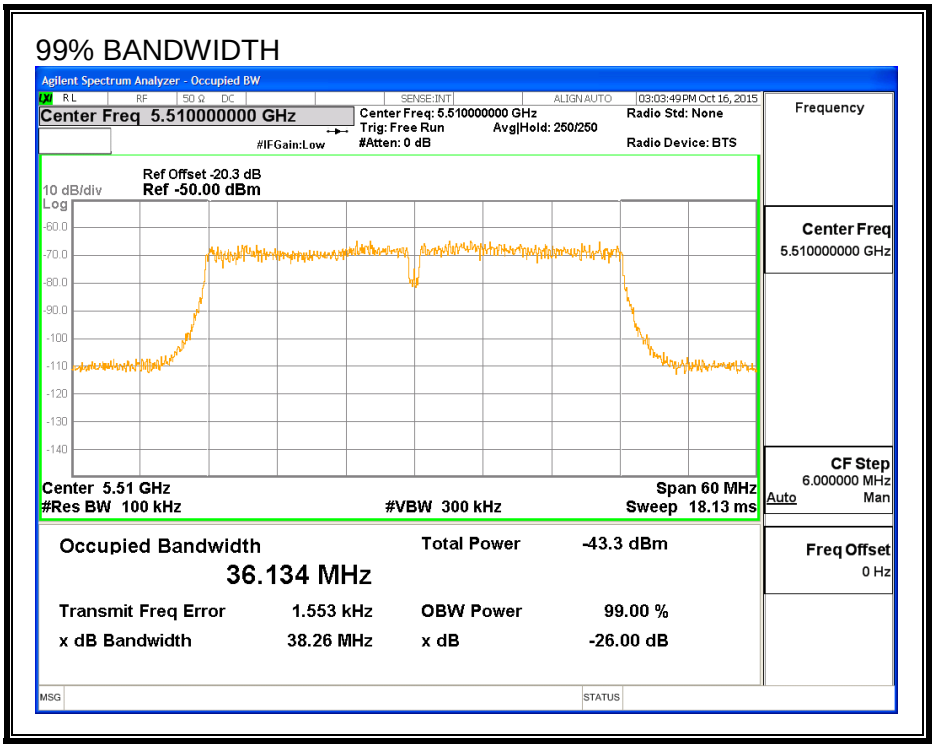
11.3.6. DETECTION BANDWIDTH

REFERENCE PLOT OF 99% POWER BANDWIDTH



RESULTS

FL (MHz)	FH (MHz)	Detection Bandwidth (MHz)	99% Power Bandwidth (MHz)	Ratio of Detection BW to 99% Power BW (%)	Minimum Limit (%)
5491	5529	38	36.134	105.2	100

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DETECTION BANDWIDTH PROBABILITY

DETECTION BANDWIDTH PROBABILITY RESULTS

Detection Bandwidth Test Results				
FCC Type 0 Waveform: 1 us Pulse Width, 1428 us PRI, 18 Pulses per Burst				
Frequency (MHz)	Number of Trials	Number Detected	Detection (%)	Mark
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	9	90	
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	

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11.3.7. IN-SERVICE MONITORING

RESULTS

FCC Radar Test Summary

Signal Type	Number of Trials	Detection (%)	Limit (%)	Pass/Fail	Detection Bandwidth		80% of Det BW	
					FL	FH	FL5	FH5
FCC Short Pulse Type 1	30	96.67	60	Pass	5491	5529		
FCC Short Pulse Type 2	30	100.00	60	Pass	5491	5529		
FCC Short Pulse Type 3	30	100.00	60	Pass	5491	5529		
FCC Short Pulse Type 4	30	86.67	60	Pass	5491	5529		
Aggregate		95.83	80	Pass				
FCC Long Pulse Type 5	30	100.00	80	Pass	5491	5529	5495	5525
FCC Hopping Type 6	39	100.00	70	Pass	5491	5529		

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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	5510	No
1002	1	518	102	A	5510	Yes
1003	1	618	86	A	5510	Yes
1004	1	778	68	A	5510	Yes
1005	1	898	59	A	5510	Yes
1006	1	858	62	A	5510	Yes
1007	1	558	95	A	5510	Yes
1008	1	538	99	A	5510	Yes
1009	1	578	92	A	5510	Yes
1010	1	878	61	A	5510	Yes
1011	1	698	76	A	5510	Yes
1012	1	838	63	A	5510	Yes
1013	1	638	83	A	5510	Yes
1014	1	798	67	A	5510	Yes
1015	1	918	58	A	5510	Yes
1016	1	2683	20	B	5510	Yes
1017	1	962	55	B	5510	Yes
1018	1	2271	24	B	5510	Yes
1019	1	680	78	B	5510	Yes
1020	1	2118	25	B	5510	Yes
1021	1	2009	27	B	5510	Yes
1022	1	1030	52	B	5510	Yes
1023	1	1050	51	B	5510	Yes
1024	1	2748	20	B	5510	Yes
1025	1	1703	31	B	5510	Yes
1026	1	2336	23	B	5510	Yes
1027	1	1421	38	B	5510	Yes
1028	1	2183	25	B	5510	Yes
1029	1	1397	38	B	5510	Yes
1030	1	1094	49	B	5510	Yes

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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	1.7	194	28	5510	Yes
2002	4	155	23	5510	Yes
2003	4.9	230	29	5510	Yes
2004	3.3	158	28	5510	Yes
2005	2.4	156	24	5510	Yes
2006	3.2	169	23	5510	Yes
2007	4.5	214	23	5510	Yes
2008	3.6	151	27	5510	Yes
2009	3.1	162	24	5510	Yes
2010	4.3	183	27	5510	Yes
2011	2.2	198	25	5510	Yes
2012	1.7	186	25	5510	Yes
2013	3.8	205	27	5510	Yes
2014	3.5	197	24	5510	Yes
2015	1.8	183	29	5510	Yes
2016	3.9	178	27	5510	Yes
2017	4.5	168	26	5510	Yes
2018	2.7	211	28	5510	Yes
2019	3.6	167	24	5510	Yes
2020	2	214	26	5510	Yes
2021	1.1	174	29	5510	Yes
2022	1.9	225	28	5510	Yes
2023	1.3	189	25	5510	Yes
2024	2.3	206	24	5510	Yes
2025	1.8	217	28	5510	Yes
2026	1.1	158	25	5510	Yes
2027	5	173	26	5510	Yes
2028	4.5	160	23	5510	Yes
2029	2.6	180	24	5510	Yes
2030	2.2	171	29	5510	Yes

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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	272	18	5510	Yes
3002	7	259	17	5510	Yes
3003	7.8	478	16	5510	Yes
3004	5.5	360	18	5510	Yes
3005	6.6	474	18	5510	Yes
3006	7.3	369	16	5510	Yes
3007	8.7	496	17	5510	Yes
3008	9.6	403	17	5510	Yes
3009	8.9	292	16	5510	Yes
3010	5	478	18	5510	Yes
3011	9.6	380	17	5510	Yes
3012	8.6	446	16	5510	Yes
3013	8.4	493	16	5510	Yes
3014	7.7	455	18	5510	Yes
3015	5.3	264	18	5510	Yes
3016	10	489	17	5510	Yes
3017	5.5	444	17	5510	Yes
3018	5.4	313	17	5510	Yes
3019	6.2	281	18	5510	Yes
3020	9	281	17	5510	Yes
3021	5	395	17	5510	Yes
3022	5.7	289	18	5510	Yes
3023	7.1	416	16	5510	Yes
3024	8	324	16	5510	Yes
3025	7.2	345	18	5510	Yes
3026	8.5	399	17	5510	Yes
3027	7.9	300	16	5510	Yes
3028	7	500	18	5510	Yes
3029	6.8	414	18	5510	Yes
3030	6.1	375	17	5510	Yes

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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	17.6	435	15	5510	Yes
4002	12.1	292	13	5510	Yes
4003	18	365	12	5510	Yes
4004	12.9	485	13	5510	Yes
4005	19.3	453	12	5510	Yes
4006	14.8	335	13	5510	Yes
4007	17	315	13	5510	Yes
4008	18.4	461	12	5510	Yes
4009	11	337	16	5510	Yes
4010	12.9	378	16	5510	Yes
4011	11.3	266	13	5510	Yes
4012	13.7	320	13	5510	Yes
4013	12.7	472	14	5510	Yes
4014	10.9	420	13	5510	Yes
4015	10.3	334	14	5510	Yes
4016	19.2	296	12	5510	Yes
4017	14.4	489	13	5510	Yes
4018	19	463	14	5510	No
4019	14.8	285	15	5510	Yes
4020	19.9	405	16	5510	Yes
4021	16.1	373	15	5510	Yes
4022	11.6	255	12	5510	Yes
4023	19.2	487	16	5510	Yes
4024	15.2	382	15	5510	No
4025	17.9	257	15	5510	No
4026	19.8	298	14	5510	No
4027	18.2	438	12	5510	Yes
4028	10.5	491	16	5510	Yes
4029	19.6	392	12	5510	Yes
4030	17.8	341	12	5510	Yes

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TYPE 5 DETECTION PROBABILITY

Data Sheet for FCC Long Pulse Radar Type 5

Trial	Frequency (MHz)	Successful Detection (Yes/No)
1	5503	Yes
2	5503	Yes
3	5502	Yes
4	5497	Yes
5	5512	Yes
6	5505	Yes
7	5521	Yes
8	5510	Yes
9	5503	Yes
10	5506	Yes
11	5505	Yes
12	5515	Yes
13	5516	Yes
14	5496	Yes
15	5496	Yes
16	5504	Yes
17	5522	Yes
18	5513	Yes
19	5507	Yes
20	5520	Yes
21	5505	Yes
22	5519	Yes
23	5502	Yes
24	5510	Yes
25	5504	Yes
26	5514	Yes
27	5495	Yes
28	5498	Yes
29	5501	Yes
30	5514	Yes

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

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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	289	5491	8	Yes
2	764	5492	9	Yes
3	1239	5493	12	Yes
4	1714	5494	6	Yes
5	2189	5495	5	Yes
6	2664	5496	11	Yes
7	3139	5497	9	Yes
8	3614	5498	9	Yes
9	4089	5499	7	Yes
10	4564	5500	4	Yes
11	5039	5501	5	Yes
12	5514	5502	10	Yes
13	5989	5503	7	Yes
14	6464	5504	7	Yes
15	6939	5505	10	Yes
16	7414	5506	7	Yes
17	7889	5507	8	Yes
18	8364	5508	7	Yes
19	8839	5509	11	Yes
20	9314	5510	10	Yes
21	9789	5511	9	Yes
22	10264	5512	10	Yes
23	10739	5513	7	Yes
24	11214	5514	12	Yes
25	11689	5515	5	Yes
26	12164	5516	9	Yes
27	12639	5517	7	Yes
28	13114	5518	7	Yes
29	13589	5519	7	Yes
30	14064	5520	11	Yes
31	14539	5521	7	Yes
32	15014	5522	6	Yes
33	15489	5523	7	Yes
34	15964	5524	10	Yes
35	16439	5525	9	Yes
36	16914	5526	7	Yes
37	17389	5527	7	Yes
38	17864	5528	10	Yes
39	18339	5529	6	Yes

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11.4. RESULTS FOR 80 MHz BANDWIDTH

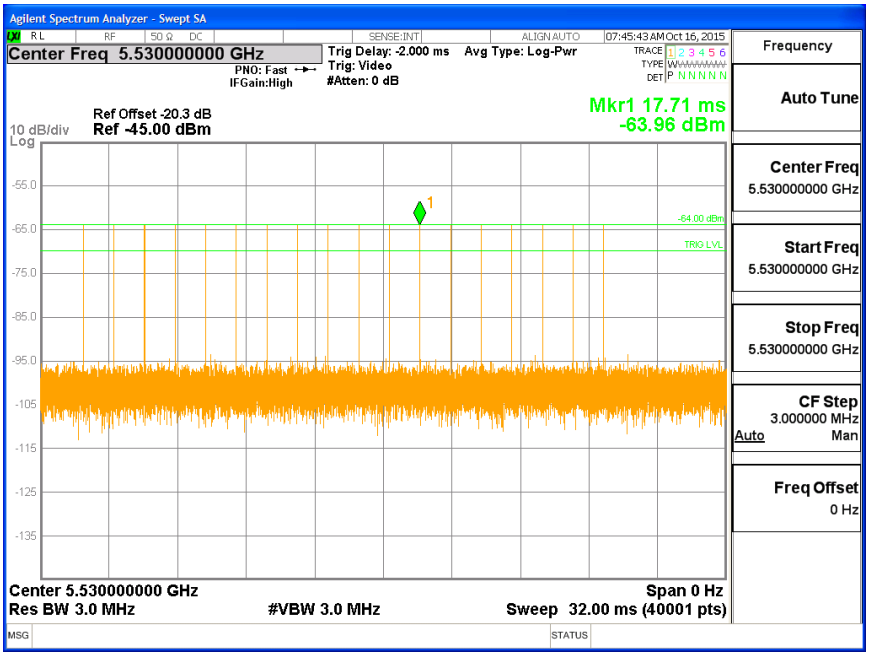
11.4.1. TEST CHANNEL

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

11.4.2. RADAR WAVEFORMS AND TRAFFIC

RADAR WAVEFORMS

SHORT PULSE RADAR TYPE 0



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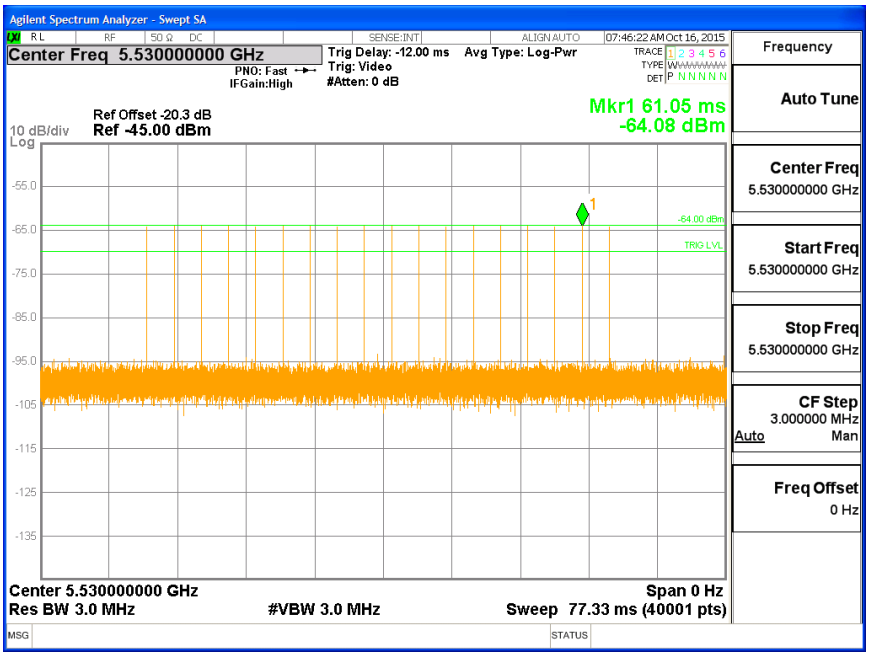
SAMPLE OF RADAR TYPE 1



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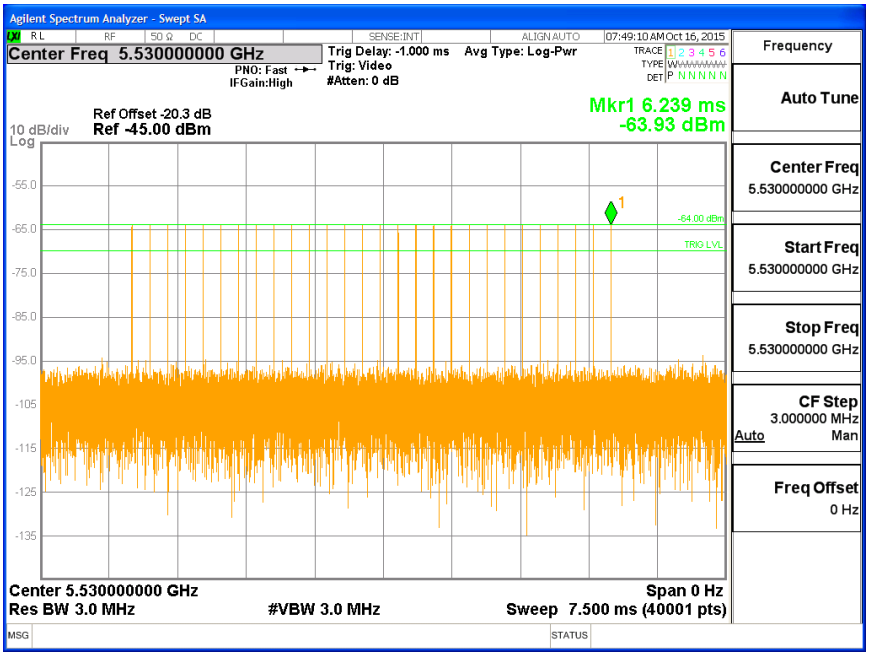
SAMPLE OF RADAR TYPE 2



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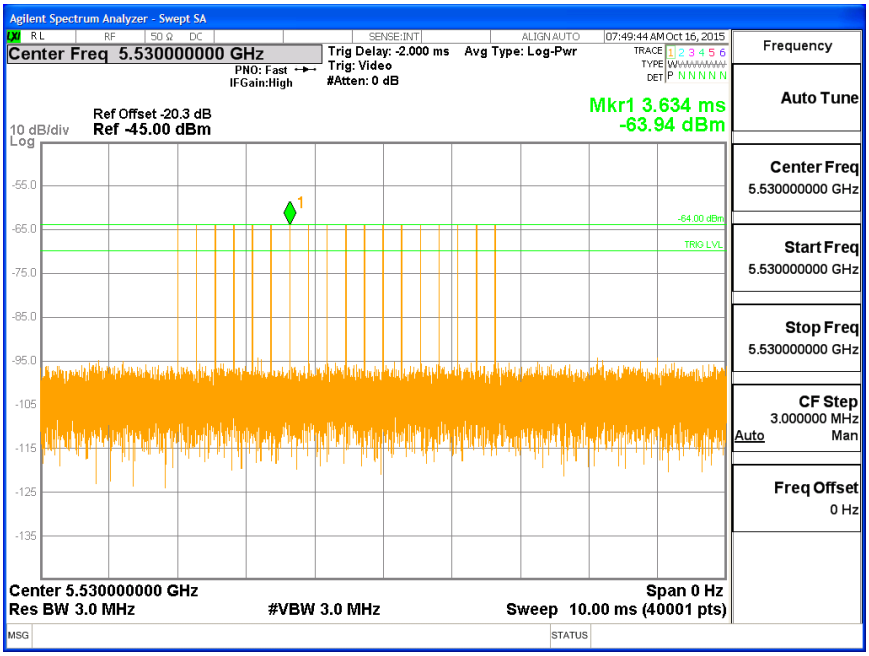
SAMPLE OF RADAR TYPE 3



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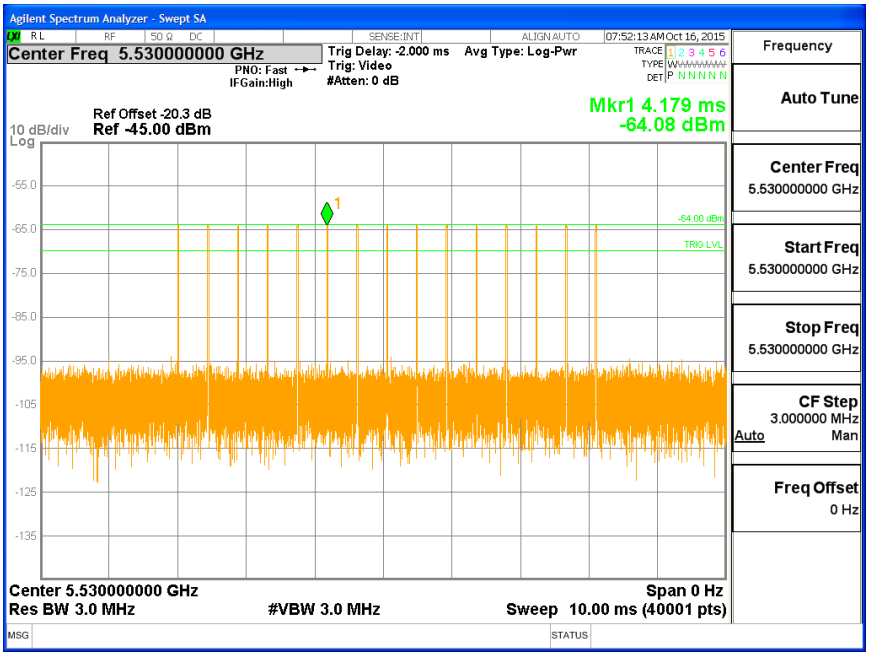
SAMPLE OF RADAR TYPE 4



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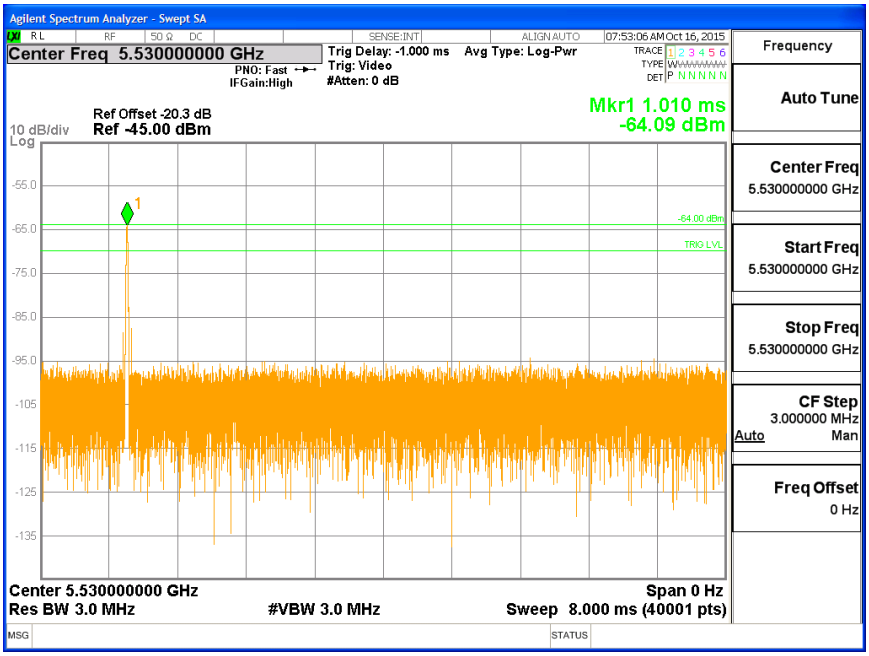
SAMPLE OF SINGLE BURST OF RADAR TYPE 5



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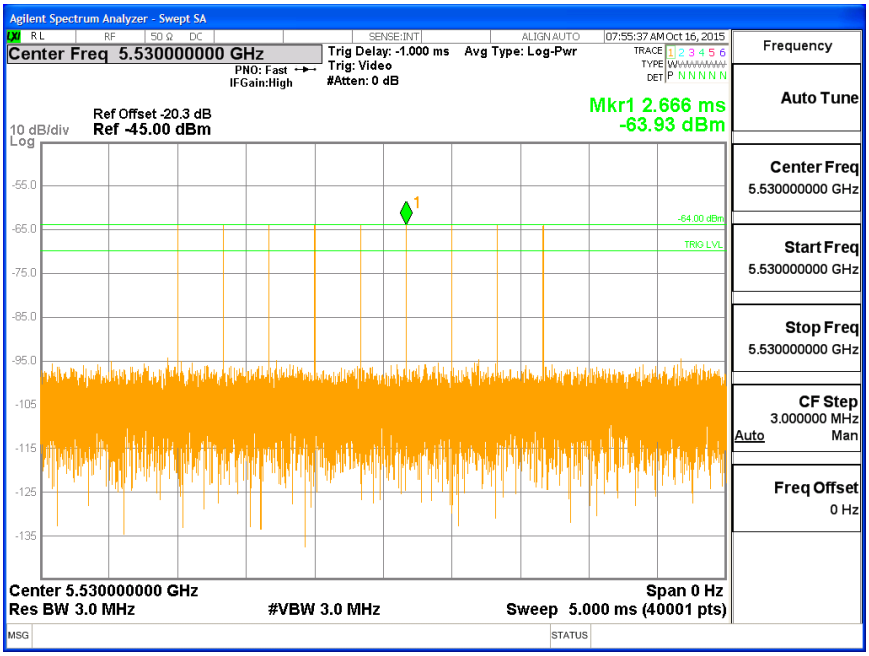
SINGLE BURST OF RADAR TYPE 6



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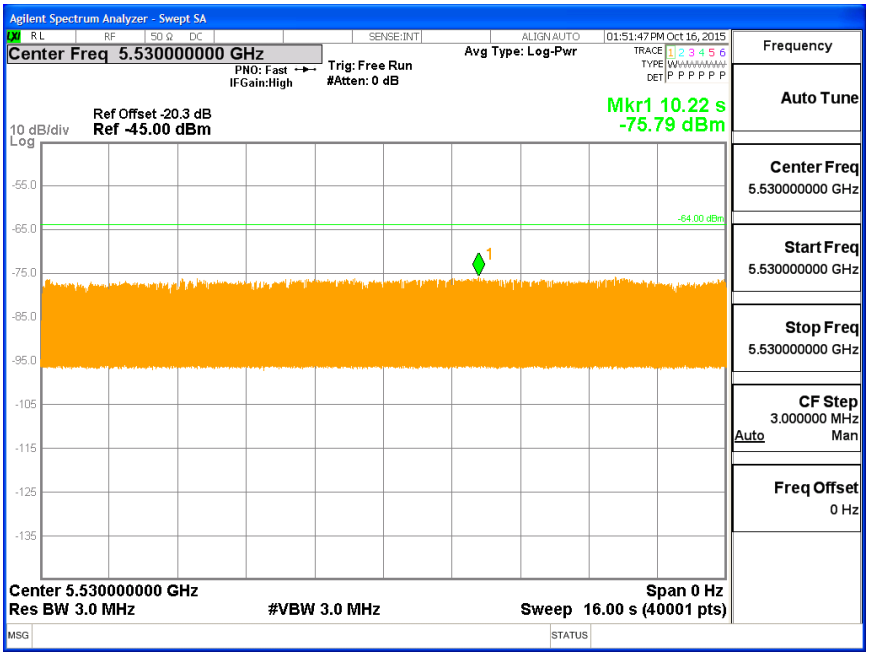
TRAFFIC

TRAFFIC



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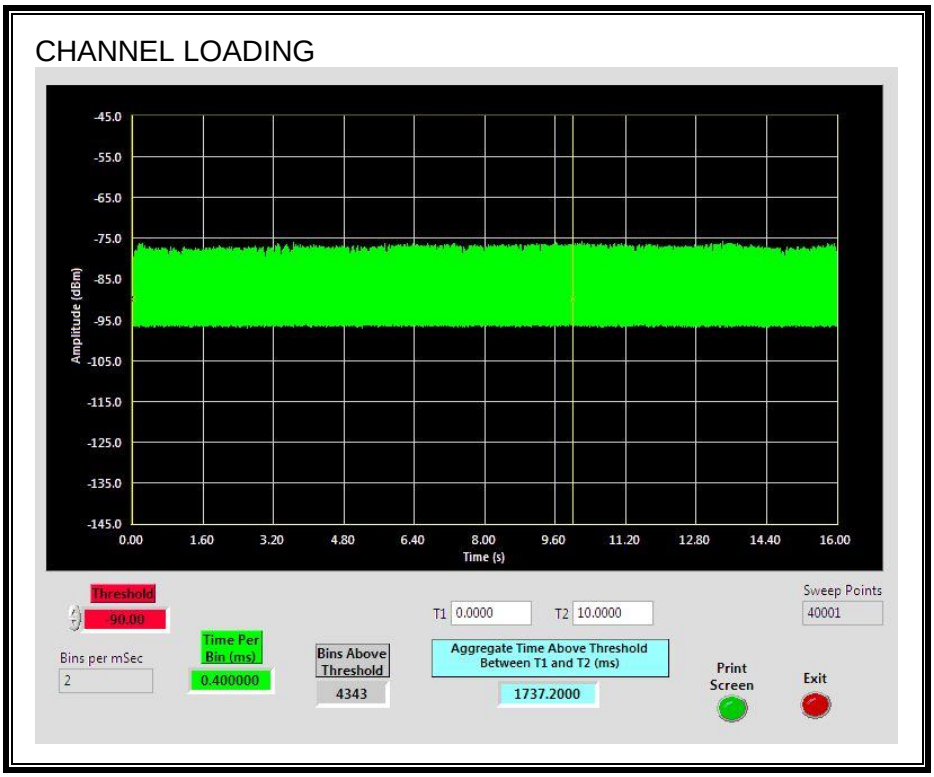
CHANNEL LOADING



The level of traffic loading on the channel by the EUT is 17.37%

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11.4.3. CHANNEL AVAILABILITY CHECK TIME

PROCEDURE TO DETERMINE INITIAL POWER-UP CYCLE TIME

A link was established on channel then a software reboot command was issued to the EUT. The period of time between reboot and the initialization of traffic was measured as the time required for the EUT to complete the total power-up cycle. The time to complete the initial power-up period is 60 seconds less than this total power-up time.

PROCEDURE FOR TIMING OF RADAR BURST

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

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

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QUANTITATIVE RESULTS

No Radar Triggered

Timing of Reboot (sec)	Timing of Start of Traffic (sec)	Total Power-up Cycle Time (sec)	Initial Power-up Cycle Time (sec)
4.815	126.5	121.7	61.7

Radar Near Beginning of CAC

Timing of Reboot (sec)	Timing of Radar Burst (sec)	Radar Relative to Reboot (sec)	Radar Relative to Start of CAC (sec)
5.56	68.1	62.6	0.9

Radar Near End of CAC

Timing of Reboot (sec)	Timing of Radar Burst (sec)	Radar Relative to Reboot (sec)	Radar Relative to Start of CAC (sec)
4.675	125.1	120.4	58.7

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

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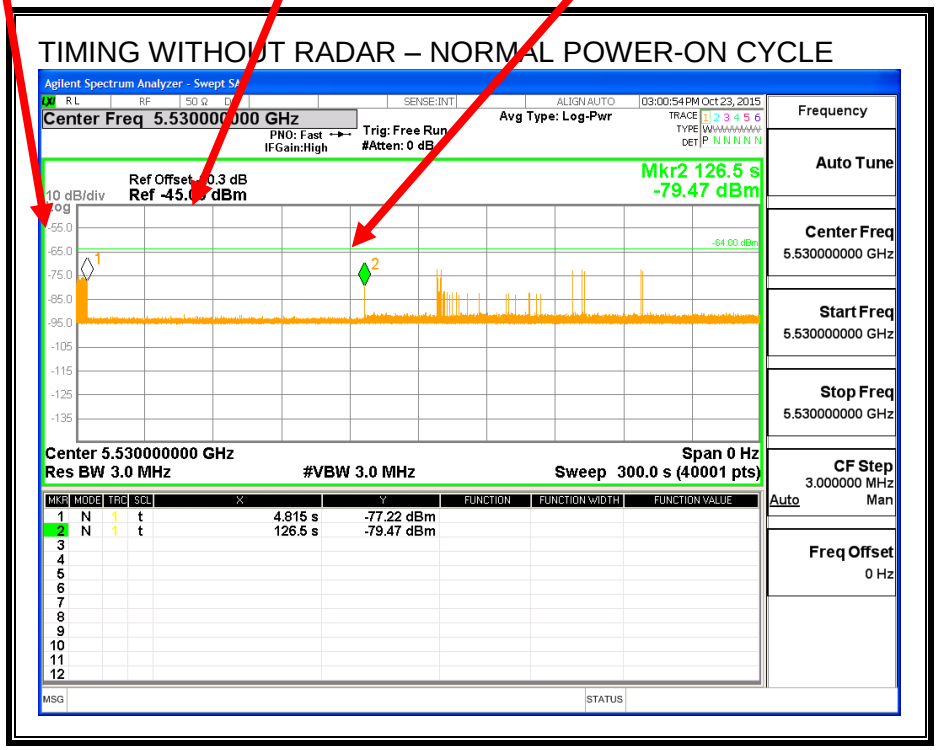
TIMING WITHOUT RADAR DURING CAC

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

End of Initial Power-up cycle
Start of CAC

End of CAC
Traffic is Initiated



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

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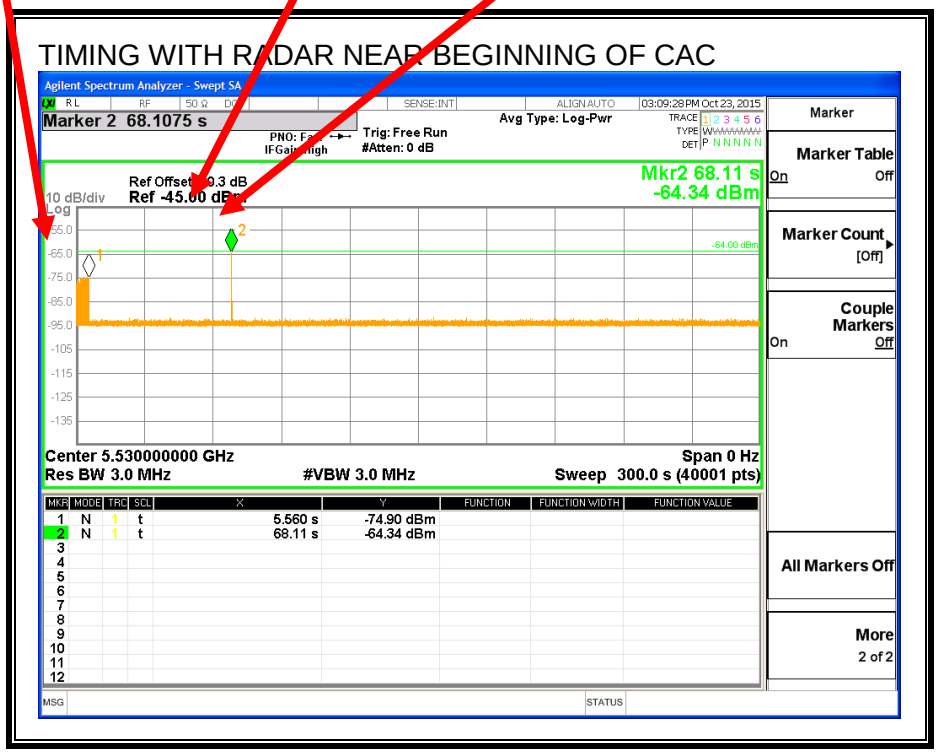
TIMING WITH RADAR NEAR BEGINNING OF CAC

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

End of Initial Power-up cycle
Start of CAC

Radar Signal Applied



No EUT transmissions were observed after the radar signal.

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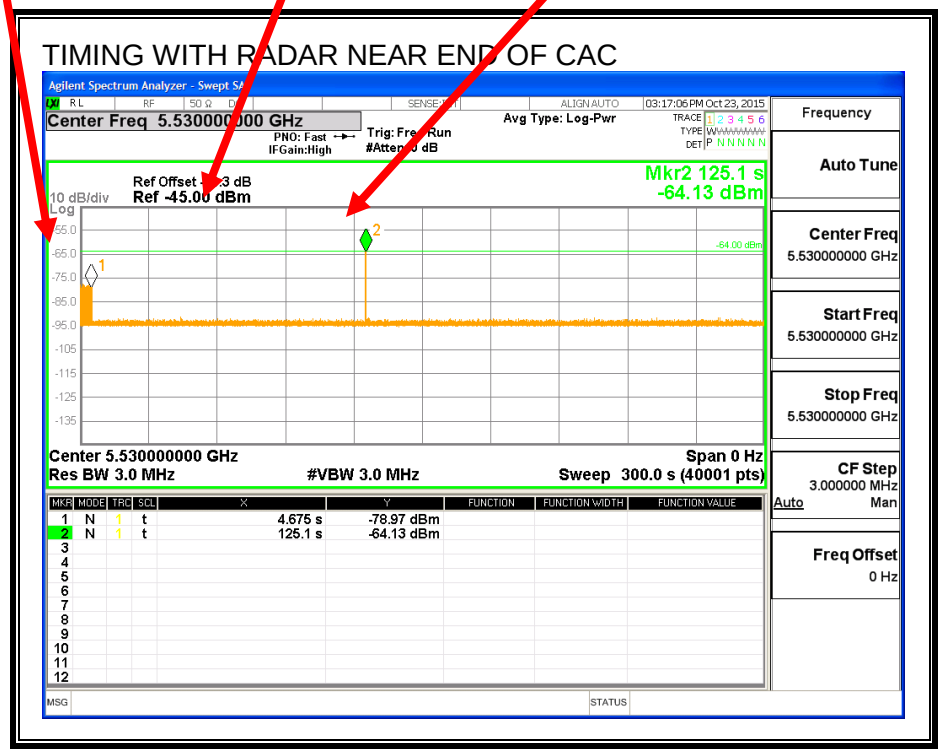
TIMING WITH RADAR NEAR END OF CAC

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

End of Initial Power-up cycle
Start of CAC

Radar Signal Applied



No EUT transmissions were observed after the radar signal.

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11.4.4. OVERLAPPING CHANNEL TESTS

RESULTS

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

11.4.5. 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)
0.080	10

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

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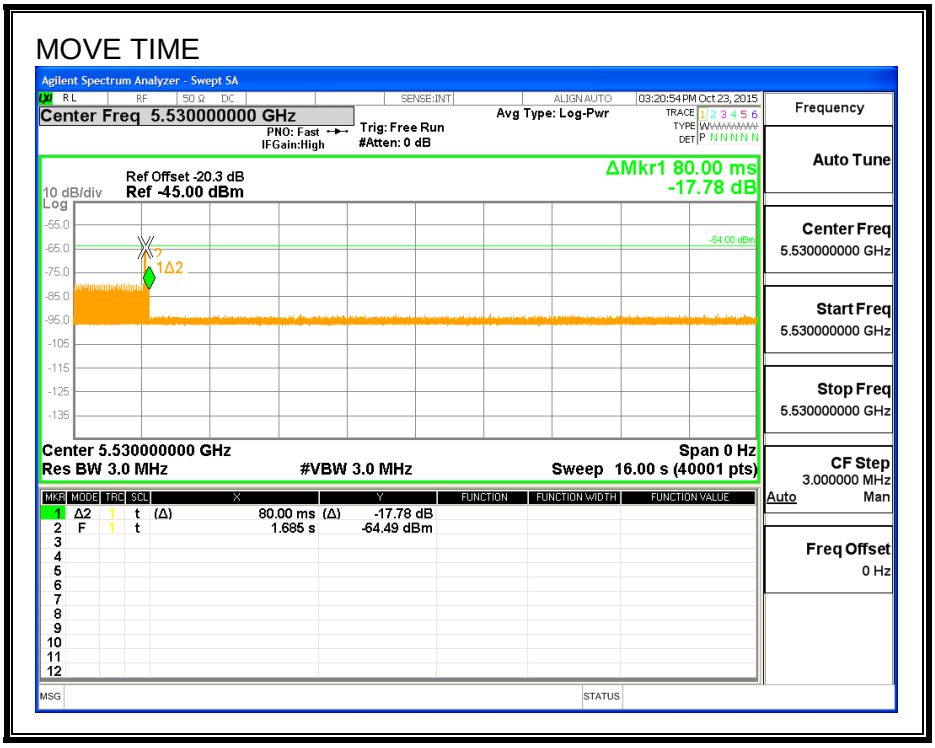
MOVE TIME



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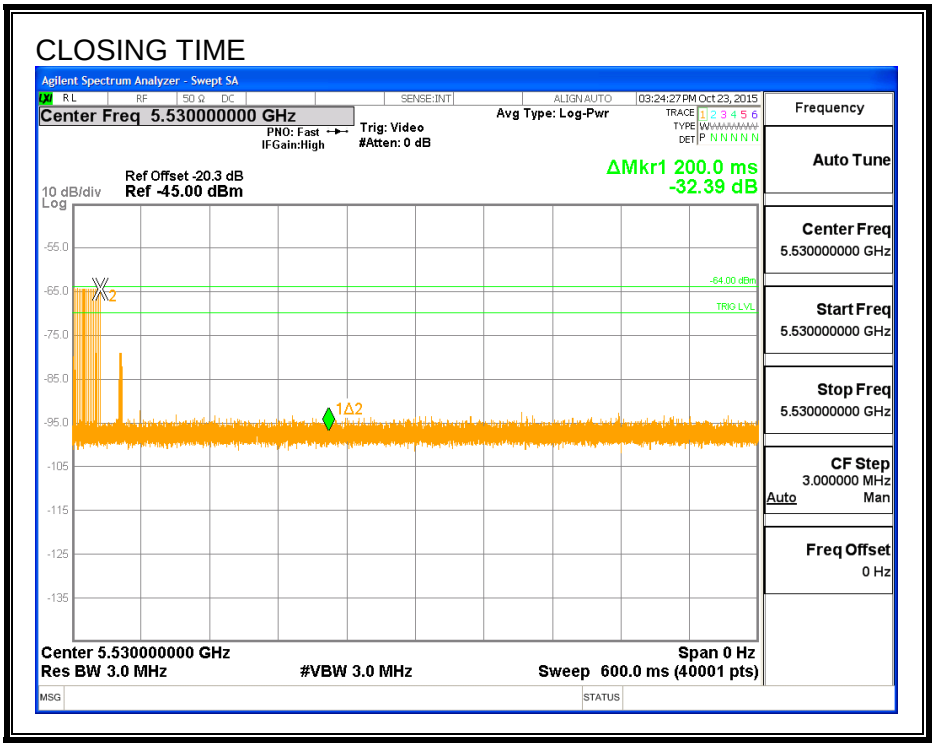
CHANNEL CLOSING TIME



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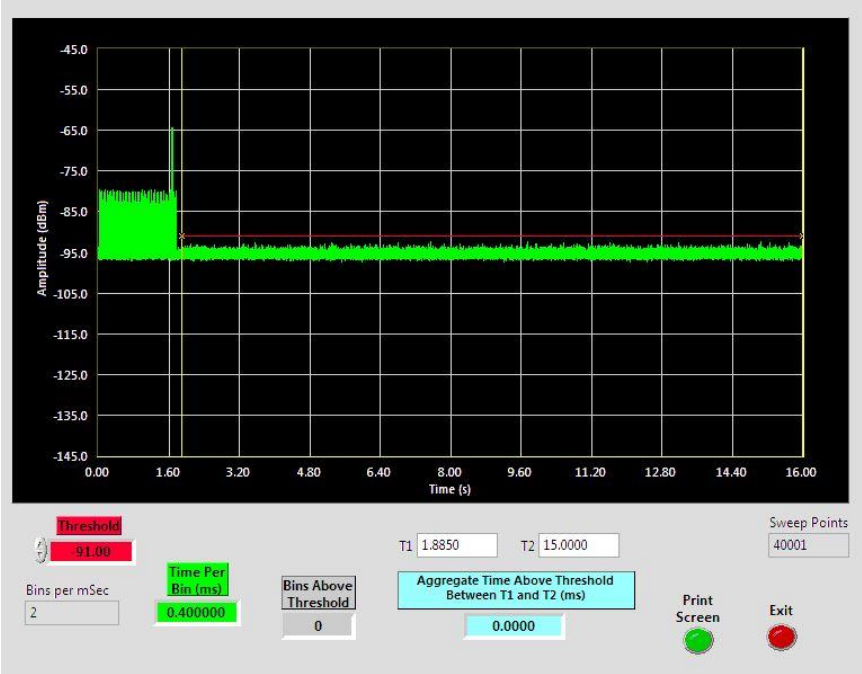
AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

No transmissions are observed during the aggregate monitoring period.

AGGREGATE CLOSING TIME



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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

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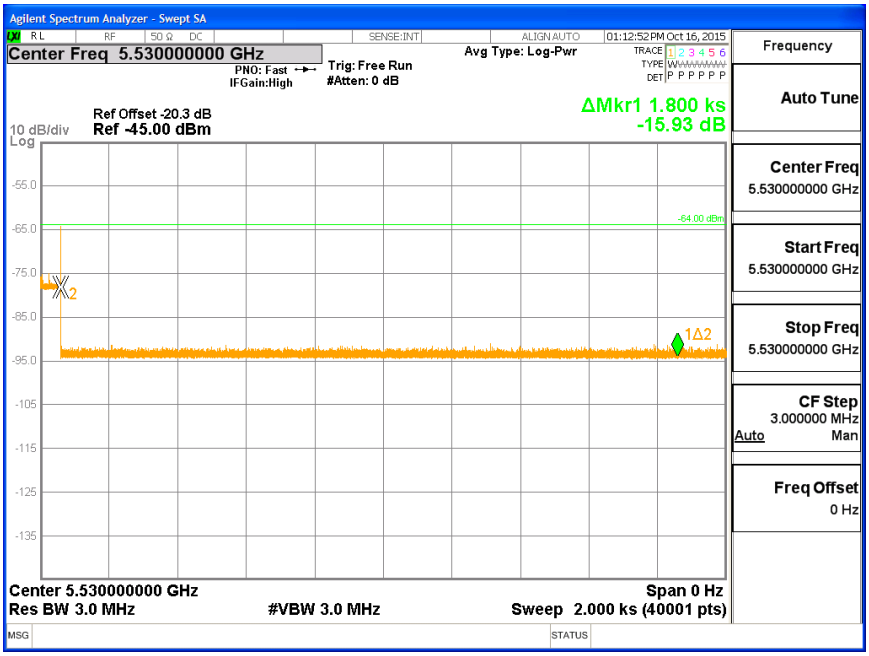
11.4.6. NON-OCCUPANCY PERIOD

RESULTS

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

NON-OCCUPANCY PERIOD



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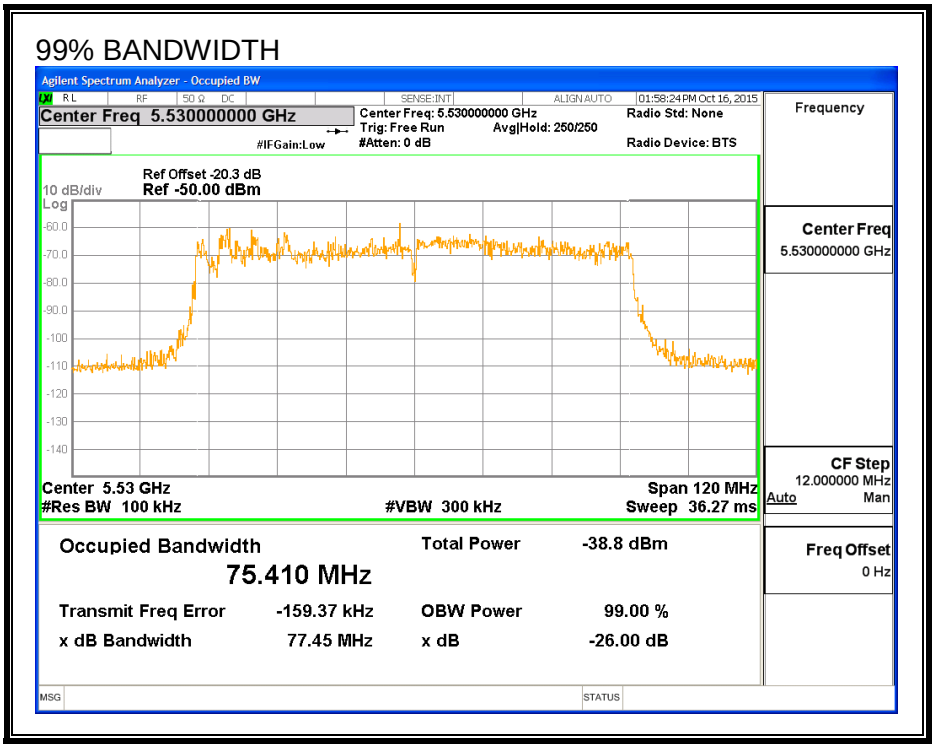
11.4.7. DETECTION BANDWIDTH

REFERENCE PLOT OF 99% POWER BANDWIDTH



RESULTS

FL (MHz)	FH (MHz)	Detection Bandwidth (MHz)	99% Power Bandwidth (MHz)	Ratio of Detection BW to 99% Power BW (%)	Minimum Limit (%)
5490	5570	80	75.410	106.1	100

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DETECTION BANDWIDTH PROBABILITY

DETECTION BANDWIDTH PROBABILITY RESULTS

Detection Bandwidth Test Results

FCC Type 0 Waveform: 1 us Pulse Width, 1428 us PRI, 18 Pulses per Burst

Frequency (MHz)	Number of Trials	Number Detected	Detection (%)	Mark
5489	10	0	0	
5490	10	10	100	FL
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	9	90	
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	
5570	10	10	100	FH
5571	10	0	0	

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11.4.8. IN-SERVICE MONITORING

RESULTS

FCC Radar Test Summary

Signal Type	Number of Trials	Detection (%)	Limit (%)	Pass/Fail	Detection Bandwidth		80% of Det BW	
					FL	FH	FL5	FH5
FCC Short Pulse Type 1	30	100.00	60	Pass	5490	5570		
FCC Short Pulse Type 2	30	96.67	60	Pass	5490	5570		
FCC Short Pulse Type 3	30	96.67	60	Pass	5490	5570		
FCC Short Pulse Type 4	30	90.00	60	Pass	5490	5570		
Aggregate		95.83	80	Pass				
FCC Long Pulse Type 5	30	100.00	80	Pass	5490	5570	5498	5562
FCC Hopping Type 6	81	100.00	70	Pass	5490	5570		

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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	518	102	A	5530	Yes
1003	1	618	86	A	5530	Yes
1004	1	778	68	A	5530	Yes
1005	1	898	59	A	5530	Yes
1006	1	858	62	A	5530	Yes
1007	1	558	95	A	5530	Yes
1008	1	538	99	A	5530	Yes
1009	1	578	92	A	5530	Yes
1010	1	878	61	A	5530	Yes
1011	1	698	76	A	5530	Yes
1012	1	838	63	A	5530	Yes
1013	1	638	83	A	5530	Yes
1014	1	798	67	A	5530	Yes
1015	1	918	58	A	5530	Yes
1016	1	2683	20	B	5530	Yes
1017	1	962	55	B	5530	Yes
1018	1	2271	24	B	5530	Yes
1019	1	680	78	B	5530	Yes
1020	1	2118	25	B	5530	Yes
1021	1	2009	27	B	5530	Yes
1022	1	1030	52	B	5530	Yes
1023	1	1050	51	B	5530	Yes
1024	1	2748	20	B	5530	Yes
1025	1	1703	31	B	5530	Yes
1026	1	2336	23	B	5530	Yes
1027	1	1421	38	B	5530	Yes
1028	1	2183	25	B	5530	Yes
1029	1	1397	38	B	5530	Yes
1030	1	1094	49	B	5530	Yes

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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	1.7	194	28	5530	Yes
2002	4	155	23	5530	Yes
2003	4.9	230	29	5530	Yes
2004	3.3	158	28	5530	Yes
2005	2.4	156	24	5530	Yes
2006	3.2	169	23	5530	Yes
2007	4.5	214	23	5530	Yes
2008	3.6	151	27	5530	Yes
2009	3.1	162	24	5530	Yes
2010	4.3	183	27	5530	Yes
2011	2.2	198	25	5530	Yes
2012	1.7	186	25	5530	Yes
2013	3.8	205	27	5530	Yes
2014	3.5	197	24	5530	Yes
2015	1.8	183	29	5530	Yes
2016	3.9	178	27	5530	Yes
2017	4.5	168	26	5530	Yes
2018	2.7	211	28	5530	Yes
2019	3.6	167	24	5530	Yes
2020	2	214	26	5530	Yes
2021	1.1	174	29	5530	Yes
2022	1.9	225	28	5530	Yes
2023	1.3	189	25	5530	Yes
2024	2.3	206	24	5530	Yes
2025	1.8	217	28	5530	Yes
2026	1.1	158	25	5530	Yes
2027	5	173	26	5530	Yes
2028	4.5	160	23	5530	Yes
2029	2.6	180	24	5530	No
2030	2.2	171	29	5530	Yes

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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	272	18	5530	Yes
3002	7	259	17	5530	Yes
3003	7.8	478	16	5530	Yes
3004	5.5	360	18	5530	Yes
3005	6.6	474	18	5530	Yes
3006	7.3	369	16	5530	No
3007	8.7	496	17	5530	Yes
3008	9.6	403	17	5530	Yes
3009	8.9	292	16	5530	Yes
3010	5	478	18	5530	Yes
3011	9.6	380	17	5530	Yes
3012	8.6	446	16	5530	Yes
3013	8.4	493	16	5530	Yes
3014	7.7	455	18	5530	Yes
3015	5.3	264	18	5530	Yes
3016	10	489	17	5530	Yes
3017	5.5	444	17	5530	Yes
3018	5.4	313	17	5530	Yes
3019	6.2	281	18	5530	Yes
3020	9	281	17	5530	Yes
3021	5	395	17	5530	Yes
3022	5.7	289	18	5530	Yes
3023	7.1	416	16	5530	Yes
3024	8	324	16	5530	Yes
3025	7.2	345	18	5530	Yes
3026	8.5	399	17	5530	Yes
3027	7.9	300	16	5530	Yes
3028	7	500	18	5530	Yes
3029	6.8	414	18	5530	Yes
3030	6.1	375	17	5530	Yes

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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	17.6	435	15	5530	Yes
4002	12.1	292	13	5530	No
4003	18	365	12	5530	Yes
4004	12.9	485	13	5530	Yes
4005	19.3	453	12	5530	No
4006	14.8	335	13	5530	Yes
4007	17	315	13	5530	Yes
4008	18.4	461	12	5530	Yes
4009	11	337	16	5530	No
4010	12.9	378	16	5530	Yes
4011	11.3	266	13	5530	Yes
4012	13.7	320	13	5530	Yes
4013	12.7	472	14	5530	Yes
4014	10.9	420	13	5530	Yes
4015	10.3	334	14	5530	Yes
4016	19.2	296	12	5530	Yes
4017	14.4	489	13	5530	Yes
4018	19	463	14	5530	Yes
4019	14.8	285	15	5530	Yes
4020	19.9	405	16	5530	Yes
4021	16.1	373	15	5530	Yes
4022	11.6	255	12	5530	Yes
4023	19.2	487	16	5530	Yes
4024	15.2	382	15	5530	Yes
4025	17.9	257	15	5530	Yes
4026	19.8	298	14	5530	Yes
4027	18.2	438	12	5530	Yes
4028	10.5	491	16	5530	Yes
4029	19.6	392	12	5530	Yes
4030	17.8	341	12	5530	Yes

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TYPE 5 DETECTION PROBABILITY

Data Sheet for FCC Long Pulse Radar Type 5

Trial	Frequency (MHz)	Successful Detection (Yes/No)
1	5517	Yes
2	5503	Yes
3	5519	Yes
4	5507	Yes
5	5554	Yes
6	5536	Yes
7	5523	Yes
8	5546	Yes
9	5541	Yes
10	5507	Yes
11	5559	Yes
12	5562	Yes
13	5505	Yes
14	5547	Yes
15	5541	Yes
16	5533	Yes
17	5550	Yes
18	5535	Yes
19	5555	Yes
20	5547	Yes
21	5524	Yes
22	5534	Yes
23	5519	Yes
24	5530	Yes
25	5529	Yes
26	5524	Yes
27	5533	Yes
28	5544	Yes
29	5528	Yes
30	5525	Yes

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

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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	241	5490	16	Yes
2	716	5491	14	Yes
3	1191	5492	20	Yes
4	1666	5493	14	Yes
5	2141	5494	11	Yes
6	2616	5495	14	Yes
7	3091	5496	20	Yes
8	3566	5497	14	Yes
9	4041	5498	13	Yes
10	4516	5499	16	Yes
11	4991	5500	16	Yes
12	5466	5501	24	Yes
13	5941	5502	19	Yes
14	6416	5503	14	Yes
15	6891	5504	21	Yes
16	7366	5505	18	Yes
17	7841	5506	27	Yes
18	8316	5507	14	Yes
19	8791	5508	15	Yes
20	9266	5509	13	Yes
21	9741	5510	24	Yes
22	10216	5511	16	Yes
23	10691	5512	13	Yes
24	11166	5513	19	Yes
25	11641	5514	19	Yes
26	12116	5515	16	Yes
27	12591	5516	14	Yes
28	13066	5517	15	Yes
29	13541	5518	16	Yes
30	14016	5519	20	Yes
31	14491	5520	21	Yes
32	14966	5521	14	Yes
33	15441	5522	18	Yes
34	15916	5523	17	Yes
35	16391	5524	21	Yes
36	16866	5525	20	Yes
37	17341	5526	14	Yes
38	17816	5527	21	Yes
39	18291	5528	14	Yes

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TYPE 6 DETECTION PROBABILITY (CONTINUED)

40	18766	5529	11	Yes
41	19241	5530	15	Yes
42	19716	5531	25	Yes
43	20191	5532	21	Yes
44	20666	5533	25	Yes
45	21141	5534	15	Yes
46	21616	5535	20	Yes
47	22091	5536	20	Yes
48	22566	5537	21	Yes
49	23041	5538	20	Yes
50	23516	5539	23	Yes
51	23991	5540	14	Yes
52	24466	5541	9	Yes
53	24941	5542	16	Yes
54	25416	5543	16	Yes
55	25891	5544	14	Yes
56	26366	5545	13	Yes
57	26841	5546	18	Yes
58	27316	5547	19	Yes
59	27791	5548	13	Yes
60	28266	5549	19	Yes
61	28741	5550	16	Yes
62	29216	5551	16	Yes
63	29691	5552	21	Yes
64	30166	5553	20	Yes
65	30641	5554	20	Yes
66	31116	5555	19	Yes
67	31591	5556	13	Yes
68	32066	5557	19	Yes
69	32541	5558	16	Yes
70	33016	5559	14	Yes
71	33491	5560	18	Yes
72	33966	5561	16	Yes
73	34441	5562	14	Yes
74	34916	5563	14	Yes
75	35391	5564	15	Yes
76	35866	5565	20	Yes
77	36341	5566	15	Yes
78	36816	5567	20	Yes
79	37291	5568	14	Yes
80	37766	5569	18	Yes
81	38241	5570	19	Yes

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12. 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.

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