



RADIO TEST REPORT

For

MODEL NO.: 1836

FCC ID: C3K1836

IC ID: 3048A-1836

Test Report No. R-TR484-FCCISED-DFS-2

Issue Date: Jun 04, 2018

FCC CFR47 Part 15 Subpart E
Innovation, Science and Economic Development
Canada RSS-247 Issue 2

Prepared by

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TESTING CERT #3472.01

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Test Report Attestation

Microsoft Corporation**Model:** 1836**FCC ID:** C3K1836**IC ID:** 3048A-1836**Applicable Standards**

Specification	Test Result
FCC 47CFR Rule Parts 15.407 (DFS)	Pass
Innovation, Science and Economic Development Canada RSS-247 Issue 2 (DFS)	Pass

Microsoft EMC Laboratory attests that the product model identified in this report has been tested to and meets the requirements identified in the above standards. The test results in this report solely pertain to the specific sample tested, under the conditions and operating modes as provided by the customer.

This report shall not be used to claim product certification, approval, or endorsement by A2LA or any agency of any Government. Reproduction, duplication or publication of extracts from this test report is prohibited and requires prior written approval of Microsoft EMC Laboratory.

This report replaces the previously issued report #R-TR484-FCCISED-DFS-1 issued by Microsoft EMC Labs on 5/23/2018.



Written By: Andy Shen
Radio Test Engineer



Reviewed/ Issued By: Sajay Jose
EMC/RF Compliance Lab Manager

2 Deviations from Standards

None.

3 Facilities and Accreditations

3.1 Test Facility

All test facilities used to collect the test data are located at
Microsoft EMC Laboratory,
17760 NE 67th Ct,
Redmond WA, 98052, USA

3.2 Accreditations

The lab is established and follows procedures as outlined in IEC/ISO 17025 and A2LA accreditation requirements.

A2LA Accredited Testing Certificate Number: 3472.01

FCC Registration Number: US1141

IC Site Registration Numbers: 3048A-3, 3048A-4

4 Product Description

Company Name:	Microsoft Corporation		
Address:	One Microsoft Way		
City, State, Zip:	Redmond, WA 98052-6399		
Customer Contact:	Pamela Galvan		
Functional Description of the EUT:	Microsoft Wireless Input Device		
Model:	1836		
FCC ID:	C3K1836		
IC ID:	3048A-1836		
Radio under test:	IEEE 802.11a/n supporting 20 MHz Bandwidths 5150- 5250 MHz, 5250-5350 MHz, 5470-5725 MHz and 5725- 5850 MHz.		
Modulation(s):	OFDM – BPSK, QPSK, 16-QAM, 64-QAM, 256-QAM		
EUT Classification:	UNII Client Device without radar detection		
RF Conducted port impedance:	50 Ω in the frequency range of operation		
Antenna Gain Measurement Verification:	N/A – Measurements were performed using conducted test methods		
Transmit Power Control:	The EUT does not implement TPC		
Wireless Bridge or Mesh Capability:	The device does not implement bridge or mesh modes.		
Power – Cycle Time:	N/A. The EUT is a client device without radar detection		
Radar Waveform Information:	The EUT does not detect or store information regarding radar waveforms		
Equipment Design State:	Prototype/Production Equivalent (DV)		
Equipment Condition:	Good		
Test Sample Details:	RF Conducted Test Samples:		
	SN	Internal Lab ID	Design State
	02560002597814	R-484-041818-04	DV
Radio Firmware: 4.5.213.0			

4.1 Test Configurations

The device was setup in normal operation and connected to an 802.11 Xbox Console on 20 MHz bandwidth channels. A DFS monitoring test software provided by the customer was used to program the EUT channel, mode, regulatory domain and for audio streaming.

Aeroflex PXI 3001C DFS test system was used to monitor traffic and generate radar pulses. A spectrum analyzer was used for the 30-minute non-occupancy period test. Measurements were performed on the main antenna, Chain B of the EUT. DFS signals were injected into 5 GHz Tx/Rx port B of the Master device.

4.2 Support Equipment

Product	FCC/IC ID:	Software Version
Microsoft Xbox One S Model:1681 (Master Device)	Contains FCC ID: C3K1817, C3K1683. IC: 3048A-1817, 3048A-1683.	OS Version: 10.0.16299.5101 Driver Version: 1.1.48.0 Firmware Version: 2.35.52428.52428 DFS Version: 1.0.0.0

4.3 Environmental Conditions

Ambient air temperature of the test site was within the range of 10 °C to 40 °C (50 °F to 104 °F) unless the EUT specified testing over a different temperature range. Humidity levels were in the range of 10% to 90% relative humidity. Testing conditions were within tolerance and any deviations required from the EUT are reported.

4.4 Antenna Requirements

The antennas are internal, permanently attached and there are no provisions for connection to an external antenna.

Antenna Gain		
Frequency Band (MHz)	Main Antenna Peak Gain (dBi)	Diversity Antenna Wi-Fi Peak Gain (dBi)
UNII Band 1- 5150 to 5250	6.2	6.7
UNII Band 2a – 5250 to 5350	6.2	6.0
UNII Band 2c – 5470 to 5725	5.9	6.1
UNII Band 3 – 5725 to 5850	5.6	6.4

4.5 Equipment Modifications

No modifications were made during testing.

4.6 Dates of Testing

Testing was performed 5/21/2018- 5/22/2018.

5 Test Results Summary

Test Description	FCC CFR 47/ ISED Rule Part	Limit	Test Result
In-Service Monitoring	15.407(h)(2)(iv) RSS-247 [6.3]	Monitor Co-channel Radar	N/A*
Channel Availability Check	15.407 (h)(2)(ii) RSS-247 [6.3]	60s Detection	N/A*
Channel Move Time	15.407 (h)(2)(iii) RSS-247 [6.3]	10s	Pass
Channel Closing Transmission Time	15.407 (h)(2)(iii) RSS-247 [6.3]	200ms + Aggregate 60ms over remaining 10s period	Pass
Non-Occupancy Period	15.407 (h)(2)(iv) RSS-247 [6.3]	30 minutes	Pass

*Note: The EUT is a Client device without radar detection.

6 Test Equipment List

Manufacturer	Description	Model #	Asset #	FCC ID	Calibration Due
Aeroflex	PXI Chassis	3001C	RF-132	N/A	05/27/2018
Agilent	Spectrum Analyzer	N9020A	EMC-054	N/A	11/27/2018
Murata	RF Cable	MXHQ87WA3000	RF-456	N/A	N/A*
Murata	RF Cable	MXHQ87WA3000	RF-588	N/A	N/A*
Rosenberger	RF Cable	L72-449-915	EMC-154	N/A	N/A*
MegaPhase	RF Cable	L72-450-915	EMC-312	N/A	N/A*
Pasternack	RF-Cable	PE304-16	RF-620	N/A	N/A*
Pasternack	RF-Cable	PE302-48	RF-659	N/A	N/A*
Pasternack	3dB Attenuator	7087-3	RF-438	N/A	N/A*
Pasternack	3dB Attenuator	7087-3	RF-337	N/A	N/A*
Pasternack	30dB Attenuator	7092-30	RF-149	N/A	N/A*
Pasternack	20dB Attenuator	PE7087-20	RF-129	N/A	N/A*
Pasternack	10dB Attenuator	PE7087-10	RF-557	N/A	N/A*
L-Com	RF Combiner	SC5802N	RF-048	N/A	N/A*
L-Com	RF Combiner	SC5802N	RF-049	N/A	N/A*
Madge Tech	THP Monitor	PRHTemp2000	EMC-678	N/A	11/16/2018

Note: Equipment with Calibration Due Date of "N/A*" are functionally verified or characterized before test.

7 Test Method

7.1 Antenna port conducted measurements

Antenna port conducted measurements were performed on a bench-top setup consisting of a spectrum analyzer, splitters/combiners (as necessary), attenuators, and pre-characterized RF cables. The Aeroflex PXI 3001C DFS test system monitored traffic and generated radar bursts.

The correction factors between the EUT, support equipment, radar test generator and the spectrum analyzer are added internally in the Aeroflex test system.

7.2 Test Setup Diagrams

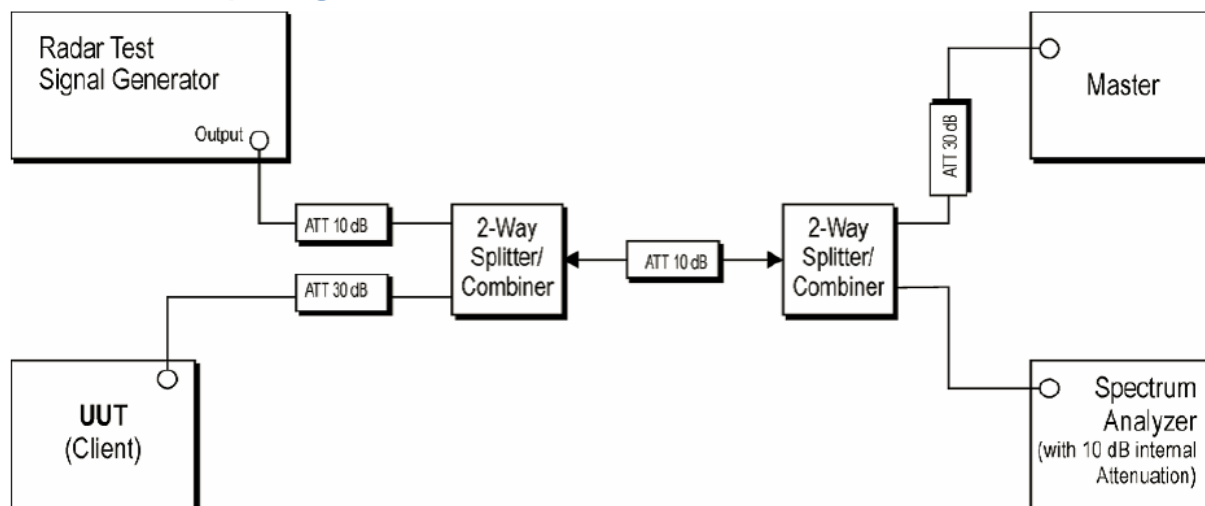


Figure 1. Test Setup for Antenna Port Conducted Measurements

7.3 Radar Waveform Verification

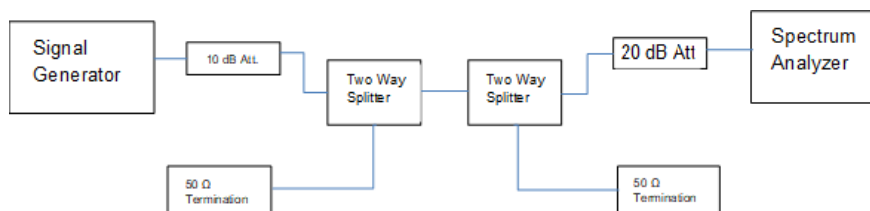


Figure 2. Test Setup for Conducted Measurement Radar Verification

Device Type	Device	Min. Output Power (dBm)	Max Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Required Radar Detection Threshold Level (dBm)
Master	Xbox One S Console Model: 1681	14.04	16.51	2.2	18.71	-63
Client	Microsoft Model 1836	7.81	8.25	6.1	14.35	N/A

DFS Measurement	Radar Type
Channel Move Time	0
Channel Closing Transmission Time	0
Non-Occupancy Period	0

Rader Type	Frequency (MHz)	Level (dBm)	Pulse count	Pulse width (μs)	Pulse Repetition Interval (ms)
0	5320	-63.07	18	1.00	1.428
0	5500	-63.05	18	1.00	1.428

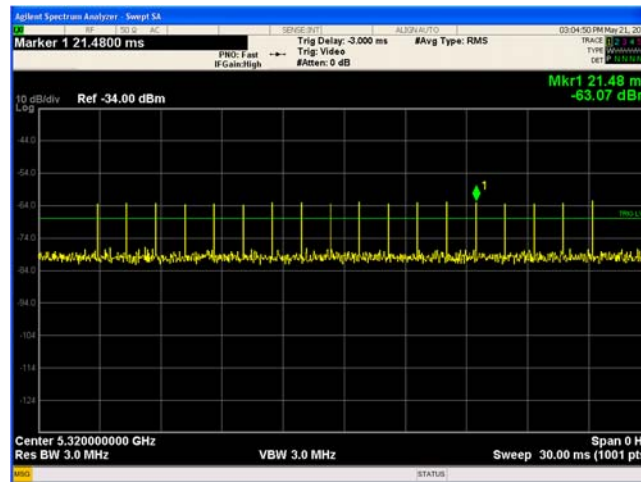


Figure 3. Radar Burst Level at -63dBm: Radar Type 0 (5320 MHz 20 MHz BW)

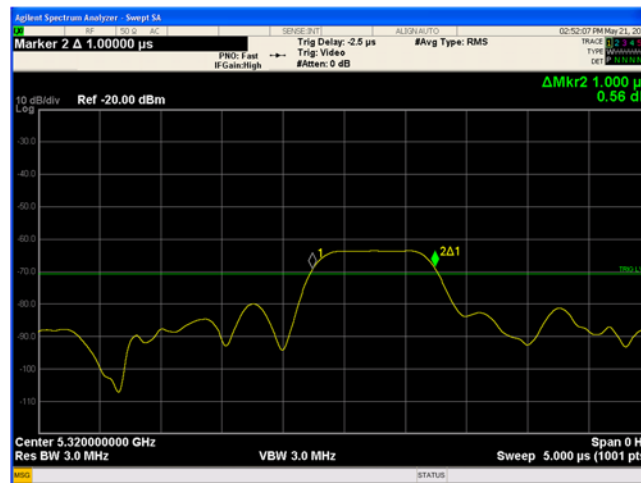


Figure 4. Radar Pulse width: Radar Type 0 (5320 MHz 20 MHz BW)

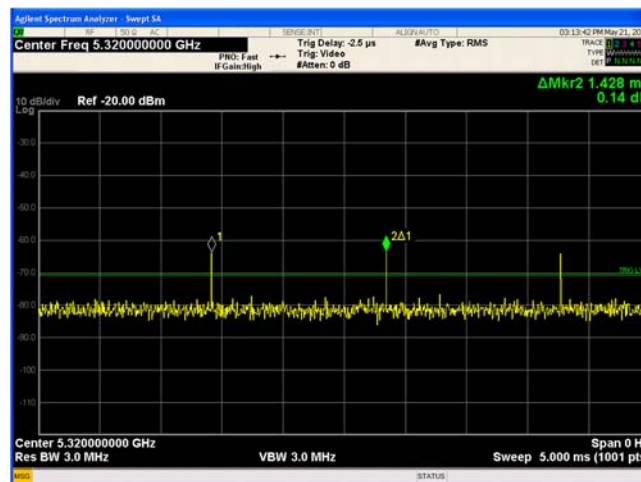


Figure 5. Radar Pulse Repetition Interval: Radar Type 0 (5320 MHz 20 MHz BW)

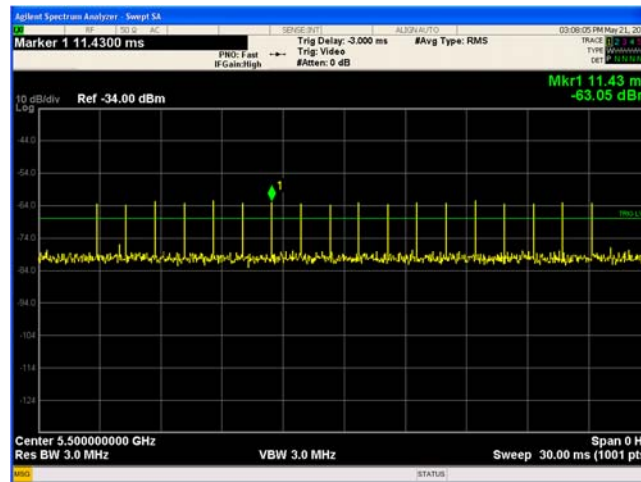


Figure 6. Radar Burst Level at -63dBm: Radar Type 0 (5500 MHz 20 MHz BW)

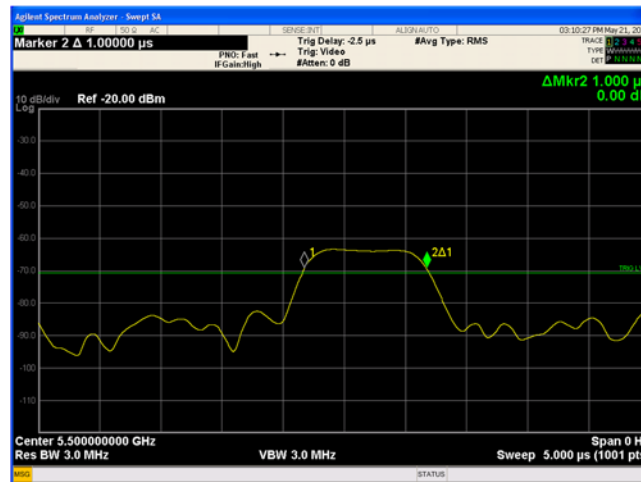


Figure 7. Radar Pulse width: Radar Type 0 (5500 MHz 20 MHz BW)

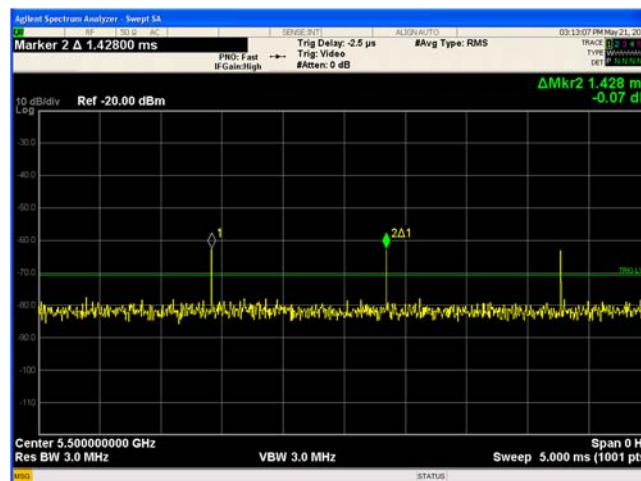


Figure 8. Radar Pulse Repetition Interval: Radar Type 0 (5500 MHz 20 MHz BW)

7.4 Channel Loading

7.4.1 Test Method

Channel Loading measurements were taken with a spectrum analyzer. CSV files were generated, and Channel Loading was calculated using that measured data. Channel Loading was measured to be > 17%.

Channel Loading is calculated using the following formula:

$$\text{Channel Loading (\%)} = \frac{\text{On Time}}{(\text{On Time} + \text{Off Time})} \times 100$$

Frequency (MHz)	Signal Bandwidth (MHz)	Total On Time (ms)	On Time + Off Time (ms)	Channel Loading (%)
5320	20	29.2	100	29.2
5500	20	30.5	100	30.5

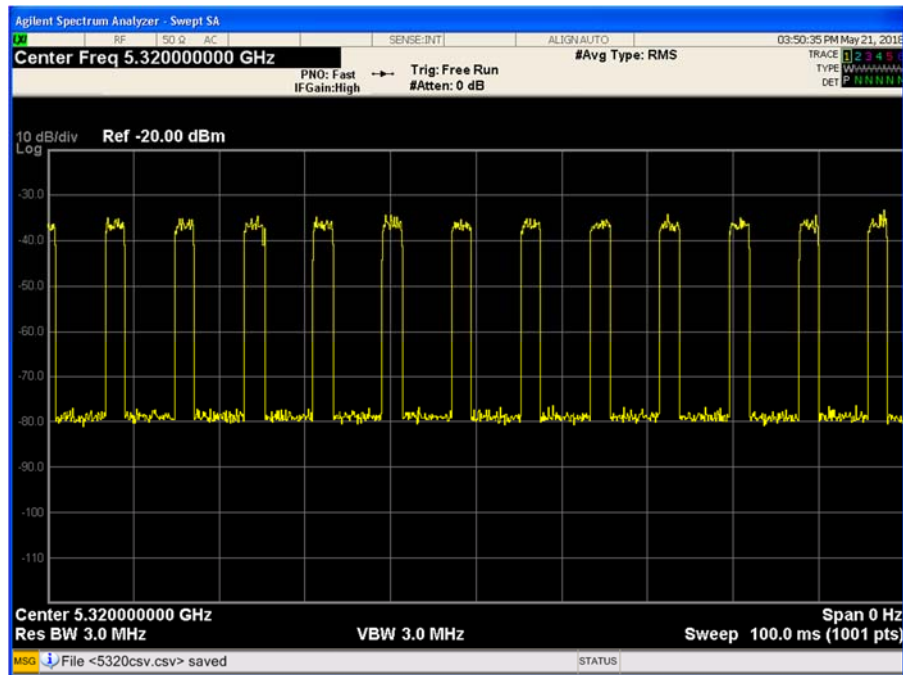


Figure 9. Channel Loading (5320 MHz 20 MHz BW)

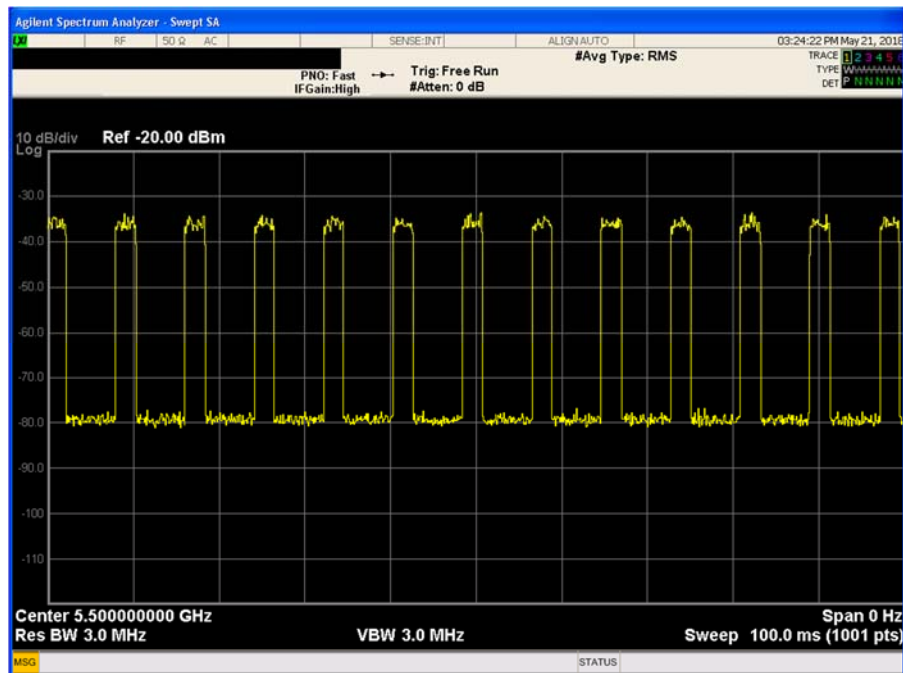


Figure 10. Channel Loading (5500 MHz 20 MHz BW)

8 Test Results

8.1 Channel Move Time

8.1.1 Test Requirement:

FCC CFR 47 Rule Part 15.407 (h)(2)(iv)

ISED Canada RSS-247 [6.3]

8.1.2 Test Method:

Measurements were performed according to the procedures defined in KDB 905462 D02 UNII DFS Compliance Procedures New Rules v02.

8.1.3 Limits:

After a radar signal is detected, the device shall cease all transmissions on the operating channel within 10 seconds.

8.1.4 Test Results:

Pass.

The EUT ceased transmission on the channel within 200 ms and there was less than an aggregate of 60ms transmission time in a 10s period.

8.1.5 Test Data

8.1.5.1 Channel Move Time

Frequency (MHz)	Signal Bandwidth (MHz)	Channel Move Time (s)	Limit (s)	Result
5320	20	0.19	10	Pass
5500	20	0.19	10	Pass

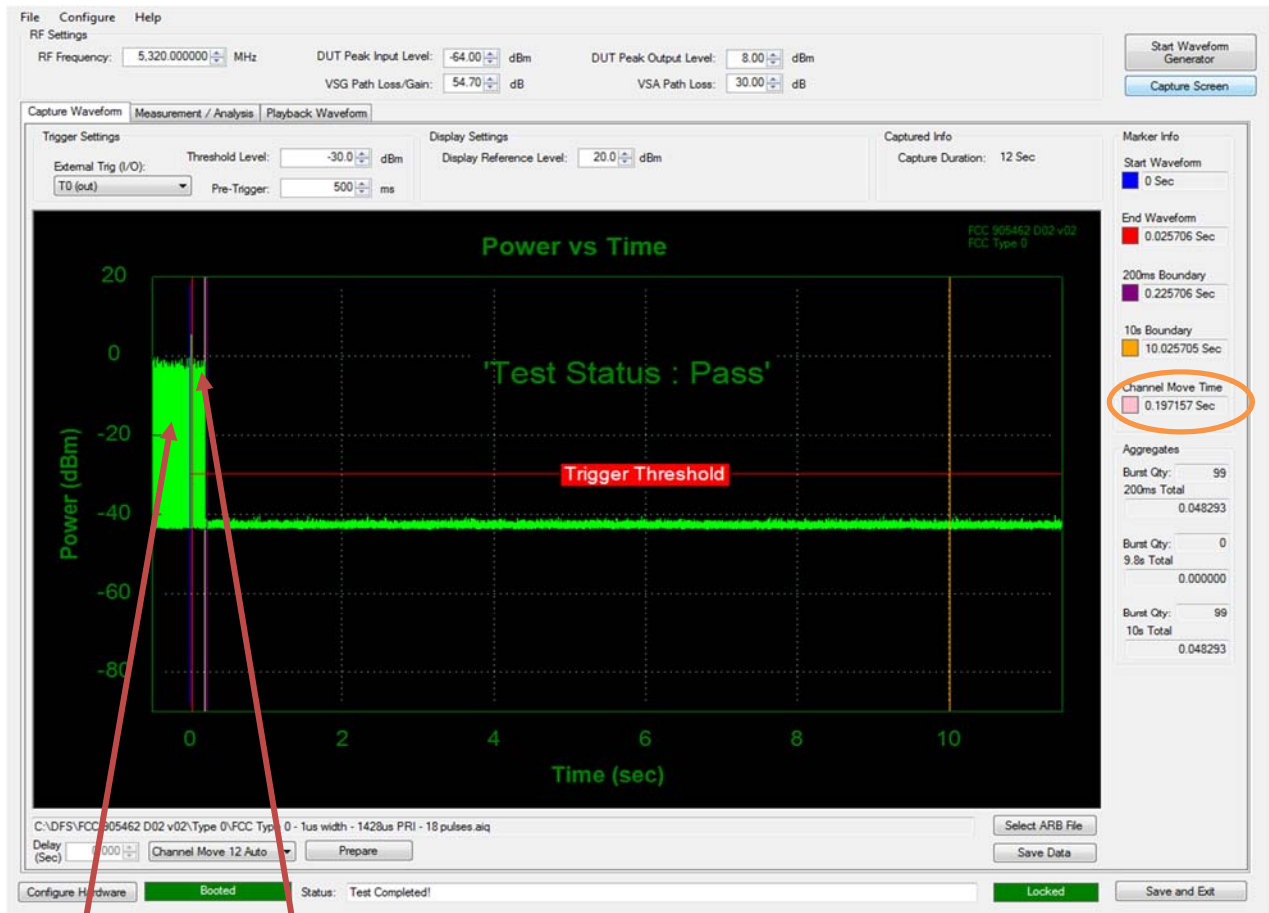


Figure 11. Channel Move Time 5320 MHz

Traffic

Radar



Figure 12. Channel Move Time 5500 MHz

Traffic

Radar

8.2 Channel Closing Transmission Time

8.2.1 Test Requirement:

FCC CFR 47 Rule Part 15.407 (h)(2)(iii)

ISED Canada RSS-247 [6.3]

8.2.2 Test Method:

Measurements were performed according to the procedures defined in KDB 905462 D02 UNII DFS Compliance Procedures New Rules v02.

8.2.3 Limits:

After the radar burst has been applied, the EUT shall cease normal transmission on the channel within 200 ms starting at the beginning of the channel move time. Control signaling required to facilitate a channel move (an aggregate of 60 ms) over the remaining 10-second period of the channel move time is permissible.

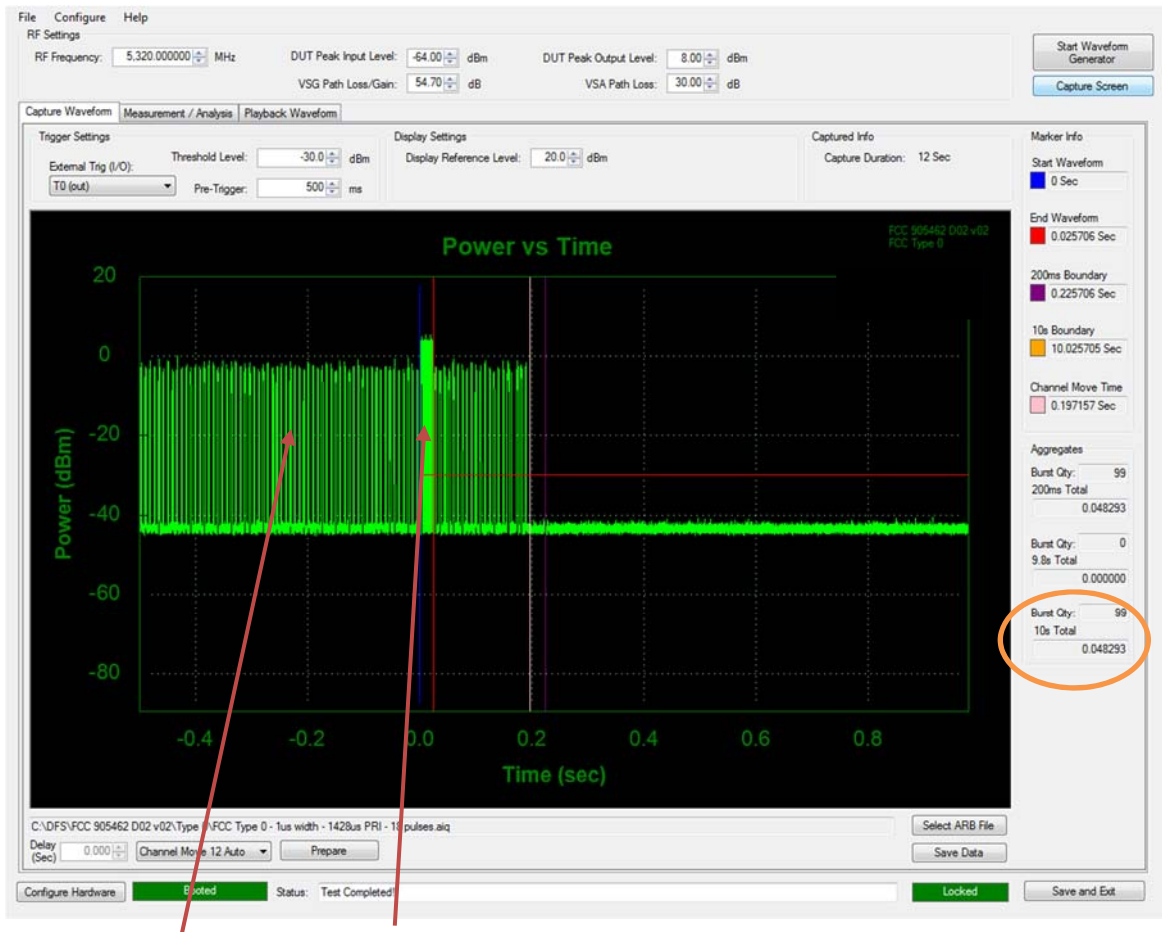
8.2.4 Test Results:

Pass.

The EUT ceased transmission on the channel within the allotted time.

8.2.5 Test Data

Carrier Frequency (MHz)	Channel Bandwidth (MHz)	Channel Closing Transmission Time (ms)	Channel Closing Transmission Time Limit + Aggregate Control Signaling Time Limit (ms)	Result
5320	20	48.29	200 +60	Pass
5500	20	48.02	200 +60	Pass

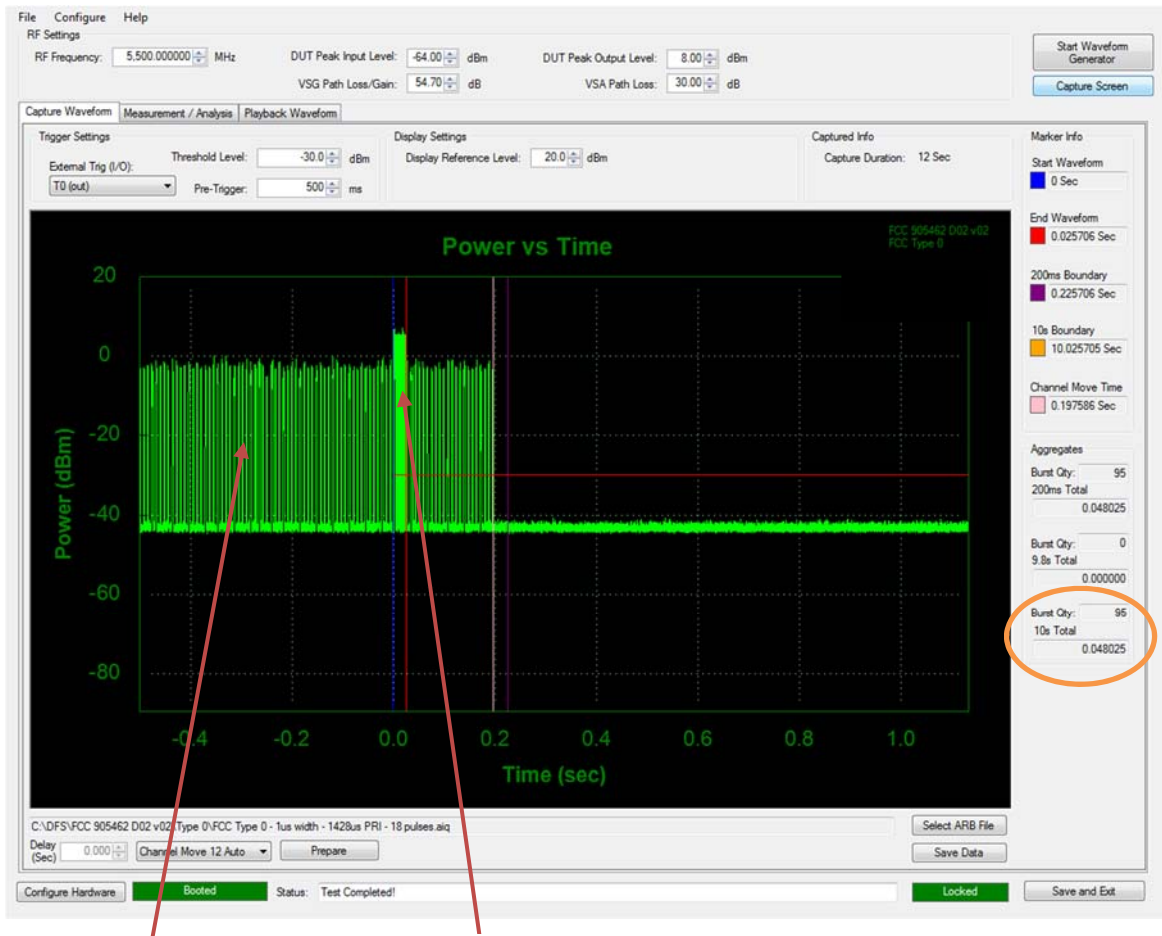


EUT

Radar Burst

Transmission Level

Figure 13. Channel Closing Transmission Time (5320 MHz)



EUT
Transmission Level

Radar Burst

Figure 14. Channel Closing Transmission Time (5500 MHz)

8.3 Non-Occupancy Period

8.3.1 Test Requirement:

FCC CFR 47 Rule Part 15.407 (h)(2)(iv)

ISED Canada RSS-247 [6.3]

8.3.2 Test Method:

Measurements were performed according to the procedures defined in KDB 905462 D02 UNII DFS Compliance Procedures New Rules v02.

8.3.3 Limits:

A channel that has been flagged as containing a radar system, either by a channel availability check or in-service monitoring, is subject to a non-occupancy period of at least 30 minutes. The non-occupancy period starts at the time when the radar system is detected.

8.3.4 Test Results:

Pass.

After radar was detected by the master device, the EUT did not transmit on the tested channel for at least 30 minutes.

8.3.5 Test Data:

Plot shown for 2000 second sweep time.

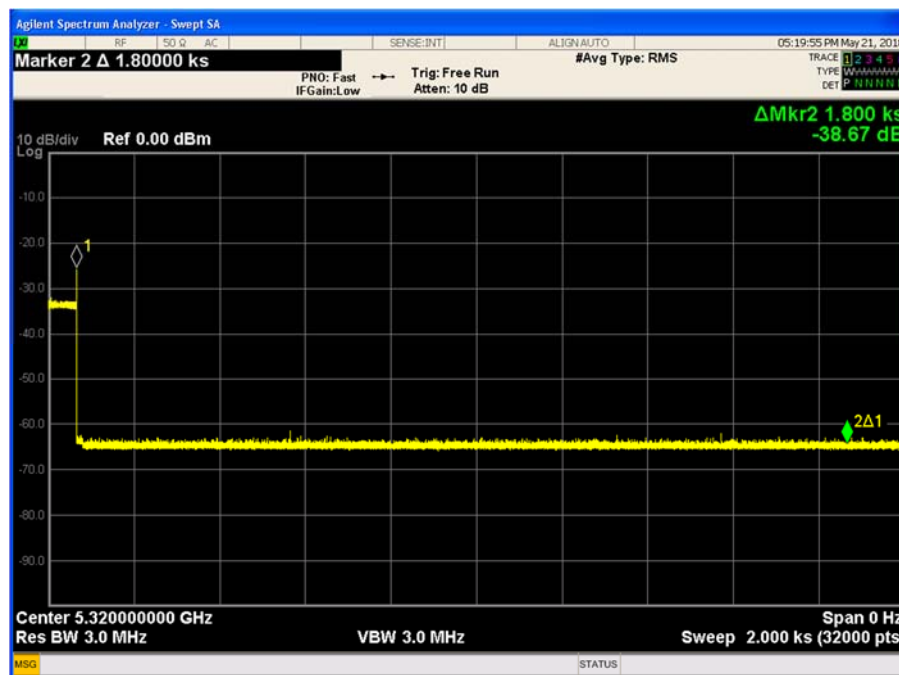


Figure 15. 30 Minute Non-Occupancy Period (5320 MHz)

End of Report