FCC/IC TEST REPORT

According to

CFR47 §15.407 & RSS-247 Issue 2

Applicant	:	**Mitac Digital Technology Corporation**
Address	:	**No. 200, Wen Hwa 2nd Rd., Kuei Shan Dist. 33383 Taoyuan City,TAIWAN**
Manufacturer	:	**Mitac Computer (Kunshan) Co., Ltd.**
Address	:	**No. 269, 2nd Avenue, District A, Comprehensive Free Trade Zone, 215300 Kunshan, Jiangsu, PEOPLES REPUBLIC OF CHINA**
Equipment	:	**Tablet**
Model No.	:	**N642**
FCC ID	:	**P4Q-N642-M1000**
IC	:	**2420C-N642-M1000**
Test Period	:	**July 25, 2019~ October 11, 2019**
Type of Device	:	☐ **Master device**
	:	☐ **Slaver device with radar detection function**
	:	☒ **Slaver device without radar detection function**

■ The test result refers exclusively to the test presented test model / sample.

■ Without written approval of **Cerpass Technology (Suzhou) Co., Ltd.**, the test report shall not be reproduced exc- ept in full.

■ The test report must not be used by the clients to claim product certification approval by any agency of the Government.

I **HEREBY** CERTIFY THAT :

The measurements shown in this test report were made in accordance with the procedures given in **ANSI C63.10 – 2013& FCC Part15.407& RSS-247 Issue 2** and the energy emitted by this equipment was ***passed.***

Approved by:

Miro Chueh
EMC/RF Manager

Laboratory Accreditation:
Cerpass Technology Corporation Test Laboratory

☐ **TAF LAB Code: 1439**

Cerpass Technology (SuZhou) Co., Ltd.

☒ **A2LA LAB Code: 4981.01**

Contents

History of this test report

Report No.	Version	Issue Date	Description
SEFE1907033	Rev 01	Oct. 12, 2019	Original

1. Test Configuration of Equipment under Test

1.1. Feature of Equipment under Test

EUT Type		Tablet
Model Name		N642
Wireless Module		Qualcomm WCN3660B
TX Frequency Range		5GHz: 5150MHz~5350MHz, 5470MHz~5725MHz, 5725MHz~5850MHz
Number of Channel		5GHz: 802.11a, 802.11n-HT20: 25 802.11n-HT40: 12
Type of Modulation		BPSK, QPSK, 16-QAM, 64-QAM for OFDM in 802.11a/g/n mode
Data Rate		802.11b: up to 11Mbps, 802.11a/g: up to 54Mbps, 802.11n: up to MCS7
Antenna Type		IFA
Antenna Peak Gain		5.15~5.35GHz: 2.91dBi,5.47~5.725GHz: 4.33dBi, 5.725~5.85GHz: 5.41dBi
Device Category		Mobile
RF Exposure Environment		General Population/ Uncontrolled
Power supply1	**Model:**	CVW120200
	Input:	100-240V~1.2A 50-60Hz 0.75A
	Output:	DC 12V --2.0A
Power supply2	**Model:**	POE-GTI-3556ND4
	Input:	100-240V
	Output:	DC 56V--0.625A

1.2. Working Frequencies of DFS Channel

802.11a/n(20MHz) Working Frequency of Each Channel:							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
52	5260 MHz	56	5280 MHz	60	5300 MHz	64	5320 MHz
100	5500 MHz	104	5520 MHz	108	5540 MHz	112	5560 MHz
116	5580 MHz	120	5600 MHz	124	5620 MHz	128	5640 MHz
132	5660 MHz	136	5680 MHz	140	5700 MHz	144	5720 MHz
802.11n (40MHz) Working Frequency of Each Channel:							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
54	5270 MHz	62	5310 MHz	102	5510 MHz	110	5550 MHz
118	5590 MHz	126	5630 MHz	134	5670 MHz	142	5710 MHz

1.3. The test mode

Test Mode	Normal Operation

1.4. Description of Antenna

Manufacturer	Model	Specification
MiTAC	MIC-N642 Locking WIFI	IFA Antenna for WIFI 802.11a/b/g application

1.5. General Information of Test

☐	Test Site	**Cerpass Technology Corporation Test Laboratory** Address: No.10, Ln. 2, Lianfu St., Luzhu Dist., Taoyuan City 33848, Taiwan (R.O.C.) Tel:+886-3-3226-888 Fax:+886-3-3226-881 Address: No.68-1, Shihbachongsi, Shihding Township, New Taipei City 223, Taiwan, R.O.C. Tel: +886-2-2663-8582
	TAF	1439
	FCC	TW1079, TW1061
	IC	4934E-1, 4934E-2
	VCCI	T-2205 for Telecommunication Test C-4663 for Conducted emission test R-4399, R-4218 for Radiated emission test G-812, G-813 for radiated disturbance above 1GHz
☒	Test Site	Cerpass Technology (Suzhou) Co.,Ltd Address: No.66,Tangzhuang Road, Suzhou Industrial Park, Jiangsu 215006, China Tel: +86-512-6917-5888 Fax: +86-512-6917-5666
	CNAS	L5515
	FCC	CN1243
	A2LA	4981.01
	IC	7290A-1, 7290A-2
	VCCI	T-1945 for Telecommunication Test C-12919 for Conducted emission test R-12670 for Radiated emission test G-227 for radiated disturbance above 1GHz

2. Test Equipment

Instrument	Manufacturer	Type No.	Serial No	Cali. Due Date
Spectrum Analyzer	Agilent	N9010A	MY45118947	2020.10.09
Vector Signal Generator	Agilent	N5182B	MY51350515	2019.12.18
Power Splitter	Mini-Circuits	ZN2PD-9G	F078500430	2019.11.03
Power Splitter	Mini-Circuits	ZFRSC-183-S+	C645401336	2019.11.03
Power Splitter	Mini-Circuits	ZFRSC-183-S+	F601301339	2019.11.03
Power Splitter	Mini-Circuits	ZN4PD-642W-S+	N120701440	2019.11.03
Coupler	Mini-Circuits	ZADC-10-63-S+	F631801334	2019.11.03
10dB Attenuators	Mini-Circuits	VAT-10+	N/A	2019.11.03
10dB Attenuators	Mini-Circuits	VAT-10+	N/A	2019.11.03
30dB Attenuators	Mini-Circuits	VAT-30+	N/A	2019.11.03
30dB Attenuators	Mini-Circuits	VAT-30+	N/A	2019.11.03
Laptop PC	Dell	RP1F7A00DPC	9S7JD32	N/A
RF Cable (Qty: 6)	Mini-Circuits	N/A	N/A	2019.11.03

Software	Manufacturer	Function
Pulse Building	Agilent	DFS Radar Profiles
DFS Tool	Agilent	ISMonitor10.exe

3. DFS Overview

A U-NII network will employ a DFS function to detect signals from radar systems and to avoid co-channel operation with these systems. This applies to the 5250-5350 MHz and/or 5470-5725 MHz bands.

Within the context of the operation of the DFS function, a U-NII device will operate in either Master Mode or Client Mode. U-NII devices operating in Client Mode can only operate in a network controlled by a U-NII device operating in Master Mode.

Tablet 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
Uniform Spreading	Yes	Not required	Not required
U-NII Detection Bandwidth	Yes	Not required	Yes

Note: Deviations YES ☐ NO ☒

Tablet 2: Applicability of DFS requirements during normal operation

Requirement	Operational Mode	
	Master Device or Client With Radar Detection	Client Without Radar Detection
DFS Detection Threshold	Yes	Not required
Channel Closing Transmission Time	Yes	Yes
Channel Move Time	Yes	Yes
U-NII Detection Bandwidth	Yes	Not required

Additional requirements for devices with multiple bandwidth modes	Master Device or Client with Radar Detection	Client Without Radar Detection
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 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 each of the bonded 20 MHz channels and the channel center frequency.		

Table 3: DFS Detection Thresholds for Master Devices and Client Devices with Radar Detection

Maximum Transmit Power	Value (see note)
EIRP≥ 200 milliwatt	-64 dBm
EIRP < 200 milliwatt and power spectral density < 10 dBm/MHz	-62 dBm
EIRP < 200 milliwatt that do not meet the 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. Note3: EIRP is based on the highest antenna gain. For MIMO devices refer to KDB Publication 662911 D01.	

Tablet 4: DFS Response requirement values

Parameter	Value
Non-occupancy period	Minimum 30 minutes
Channel Availability Check Time	60 seconds
Channel Move Time	10 seconds (See Note 1)
Channel Closing Transmission Time	200 milliseconds + an aggregate of 60 milliseconds over remaining 10 second period. (See Notes 1 and 2)
U-NII Detection Bandwidth	Minimum 80% of the 99% power bandwidth (See Note 3)

Note 1: The instant that the Channel Move Time and the Channel Closing Transmission Time begins is as follows:

• For the Short pulse radar Test Signals this instant is the end of the Burst.

• For the Frequency Hopping radar Test Signal, this instant is the end of the last radar Burst generated.

• For the Long Pulse radar Test Signal this instant is the end of the 12 second period defining the radar transmission.

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 Channel changes (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 1 is used and for each frequency step the minimum percentage of detection is 90%. Measurements are performed with no data traffic.

4. Radar Wave Parameters

This section provides the parameters for required test waveforms, minimum percentage of successful detections, and the minimum number of trials that must be used for determining DFS conformance. Step intervals of 0.1 microsecond for Pulse Width, 1 microsecond for PRI, 1 MHz for chirp width and 1 for the number of pulses will be utilized for the random determination of specific test waveforms.

Short Pulse Radar Test Waveforms

Table 5 – Short Pulse Radar Test Waveforms

Radar Type	Pulse Width (μsec)	PRI (μsec)	Number of Pulses	Minimum Percentage of Successful Detection	Minimum Number of 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	$\text{Roundup}\left\{\left(\frac{1}{360}\right)\cdot\left(\frac{19\cdot 10^6}{\text{PRI}_{\mu\text{sec}}}\right)\right\}$	60%	30
		Test B: 15 unique PRI values randomly selected within the range of 518-3066 μsec, with a minimum increment of 1 μsec, 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 Type 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.					

A minimum of 30 unique waveforms are required for each of the Short Pulse Radar Types 2 through 4. If more than 30 waveforms are used for Short Pulse Radar Types 2 through 4, then each additional waveform must also be unique and not repeated from the previous waveforms. If more than 30 waveforms are used for Short Pulse Radar Type 1, then each additional waveform is generated with Test B and must also be unique and not repeated from the previous waveforms in Tests A or B.

Table 5a - Pulse Repetition Intervals Values for Test A

Pulse Repetition Frequency Number	Pulse Repetition Frequency (Pulses Per Second)	Pulse Repetition Interval (Microseconds)
1	1930.5	518
2	1858.7	538
3	1792.1	558
4	1730.1	578
5	1672.2	598
6	1618.1	618
7	1567.4	638
8	1519.8	658
9	1474.9	678
10	1432.7	698
11	1392.8	718
12	1355	738
13	1319.3	758
14	1285.3	778
15	1253.1	798
16	1222.5	818
17	1193.3	838
18	1165.6	858
19	1139	878
20	1113.6	898
21	1089.3	918
22	1066.1	938
23	326.2	3066

The aggregate is the average of the percentage of successful detections of Short Pulse Radar Types 1-4. For example, the following table indicates how to compute the aggregate of percentage of successful detections.

Radar Type	Number of Trials	Number of Successful Detections	Minimum Percentage of Successful Detection
1	35	29	82.9%
2	30	18	60%
3	30	27	90%
4	50	44	88%
Aggregate (82.9% + 60% + 90% + 88%)/4 = 80.2%			

Long Pulse Radar Test Waveform

Table 6 – Long Pulse Radar Test Waveform

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

The parameters for this waveform are randomly chosen. Thirty unique waveforms are required for the Long Pulse Radar Type waveforms. If more than 30 waveforms are used for the Long Pulse Radar Type waveforms, then each additional waveform must also be unique and not repeated from the previous waveforms.

Each waveform is defined as follows:

1) The transmission period for the Long Pulse Radar test signal is 12 seconds.

2) There are a total of 8 to 20 Bursts in the 12 second period, with the number of Bursts being randomly chosen. This number is Burst_Count.

3) Each Burst consists of 1 to 3 pulses, with the number of pulses being randomly chosen. Each Burst within the 12 second sequence may have a different number of pulses.

4) The pulse width is between 50 and 100 microseconds, with the pulse width being randomly chosen. Each pulse within a Burst will have the same pulse width. Pulses in different Bursts may have different pulse widths.

5) Each pulse has a linear frequency modulated chirp between 5 and 20 MHz, with the chirp width being randomly chosen. Each pulse within a Burst will have the same chirp width. Pulses in different Bursts may have different chirp widths. The chirp is centered on the pulse. For example, with a radar frequency of 5300 MHz and a 20 MHz chirped signal, the chirp starts at 5290 MHz and ends at 5310 MHz.

6) If more than one pulse is present in a Burst, the time between the pulses will be between 1000 and 2000 microseconds, with the time being randomly chosen. If three pulses are present in a Burst, the random time interval between the first and second pulses is chosen independently of the random time interval between the second and third pulses.

7) The 12 second transmission period is divided into even intervals. The number of intervals is equal to Burst_Count. Each interval is of length (12,000,000 / Burst_Count) microseconds. Each interval contains one Burst. The start time for the Burst, relative to the beginning of the interval, is between 1 and [(12,000,000 / Burst_Count) – (Total Burst Length) + (One Random PRI Interval)] microseconds, with the start time being randomly chosen. The step interval for the start time is 1 microsecond. The start time for each Burst is chosen randomly.

A representative example of a Long Pulse Radar Type waveform:

1) The total test waveform length is 12 seconds.

2) Eight (8) Bursts are randomly generated for the Burst_Count.

3) Burst 1 has 2 randomly generated pulses.

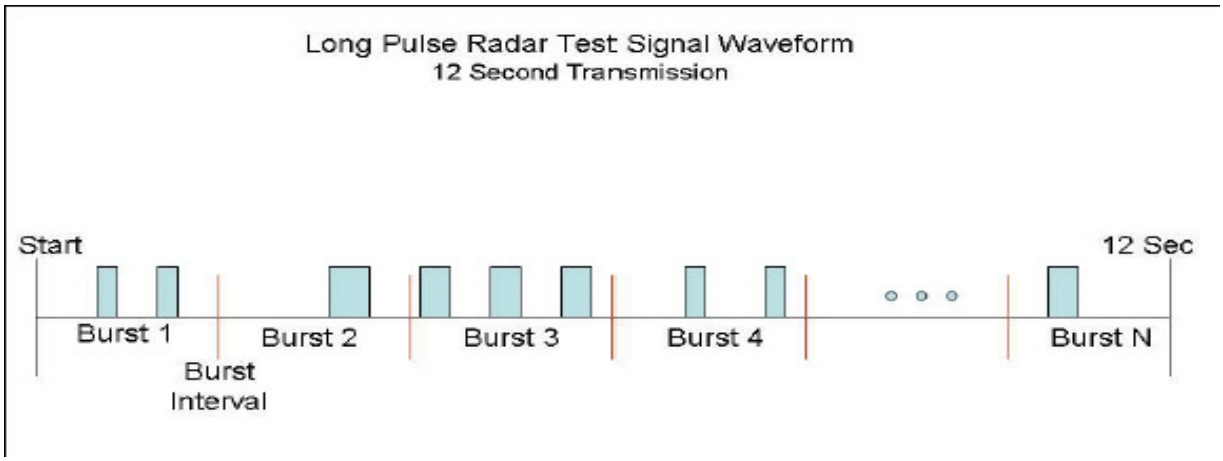
4) The pulse width (for both pulses) is randomly selected to be 75 microseconds.

5) The PRI is randomly selected to be at 1213 microseconds.

6) Bursts 2 through 8 are generated using steps 3 – 5.

7) Each Burst is contained in even intervals of 1,500,000 microseconds. The starting location for Pulse 1, Burst 1 is randomly generated (1 to 1,500,000 minus the total Burst 1 length + 1 random PRI interval) at the

325,001 microsecond step. Bursts 2 through 8 randomly fall in successive 1,500,000 microsecond intervals (i.e. Burst 2 falls in the 1,500,001 – 3,000,000 microsecond range).



Frequency Hopping Radar Test Waveform

Table 7 – Frequency Hopping Radar Test Waveform

Radar Type	Pulse Width (µsec)	PRI (µsec)	Pulses per Hop	Hopping Rate (kHz)	Hopping Sequence Length (msec)	Minimum Percentage of Successful Detection	Minimum Number of Trials
6	1	333	9	0.333	300	70%	30

For the Frequency Hopping Radar Type, the same Burst parameters are used for each waveform. The hopping sequence is different for each waveform and a 100-length segment is selected from the hopping sequence defined by the following algorithm: 3

The first frequency in a hopping sequence is selected randomly from the group of 475 integer frequencies from 5250 – 5724 MHz. Next, the frequency that was just chosen is removed from the group and a frequency is randomly selected from the remaining 474 frequencies in the group. This process continues until all 475 frequencies are chosen for the set. For selection of a random frequency, the frequencies remaining within the group are always treated as equally likely.

5. Test Setup

Conducted Test Setup

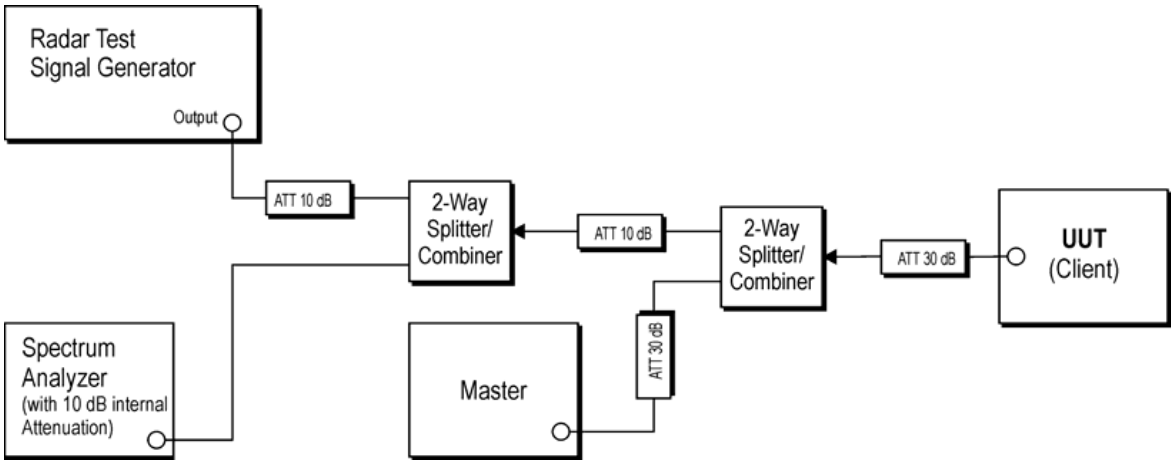
The sections below contain block diagrams that focus on the Radar Waveform injection path for each of the different conducted setups to be used. Each setup consists of a signal generator, analyzer (spectrum analyzer or vector signal analyzer), Master Device, Client Device, plus power combiner/splitters and attenuators. The Client Device is set up to Associate with the Master Device. The designation of the UUT (Master Device or Client Device) and the device into which the Radar Waveform is injected varies among the setups.

Other topologies may be used provided that: (1) the radar and UUT signals can be discriminated from each other on the analyzer and (2) the radar DFS Detection Threshold level at the UUT is stable.

To address point (1), for typical UUT power levels and typical minimum antenna gains, the topologies shown will result in the following relative amplitudes of each signal as displayed on the analyzer: the Radar Waveform level is the highest, the signal from the UUT is the next highest, while the signal from the device that is associated with the UUT is the lowest. Attenuator values may need to be adjusted for particular configurations.

To address point (2), the isolation characteristic between ports 1 and 2 of a power combiner/splitter are extremely sensitive to the impedance presented to the common port, while the insertion loss characteristic between the common port and (port 1, for example) are relatively insensitive to the impedance presented to (port 2, in this example). Thus, the isolation between ports 1 and 2 should never be part of the path that establishes the radar DFS Detection Threshold. The 10 dB attenuator after the signal generator is specified as a precaution; since many of the radar test waveforms will require typical signal generators to operate with their ALC turned off, the source match will generally be degraded from the closed loop specifications.

Figure 4: Setup for Client with injection at the Client

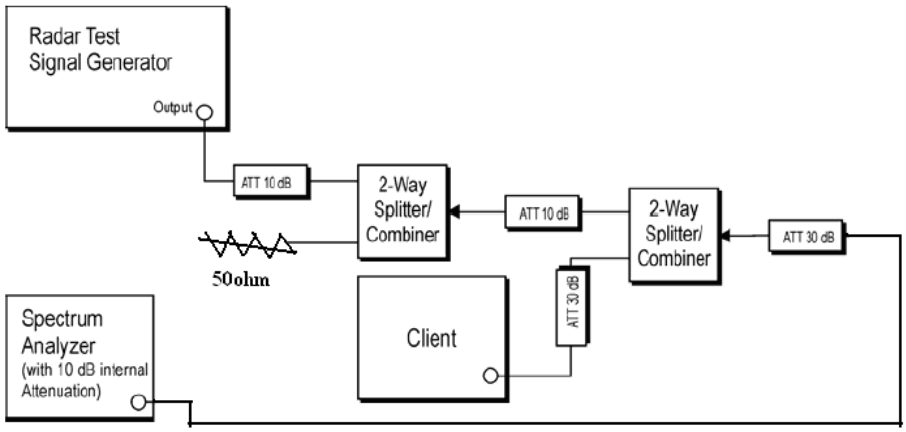


6. Radar Waveform Calibration

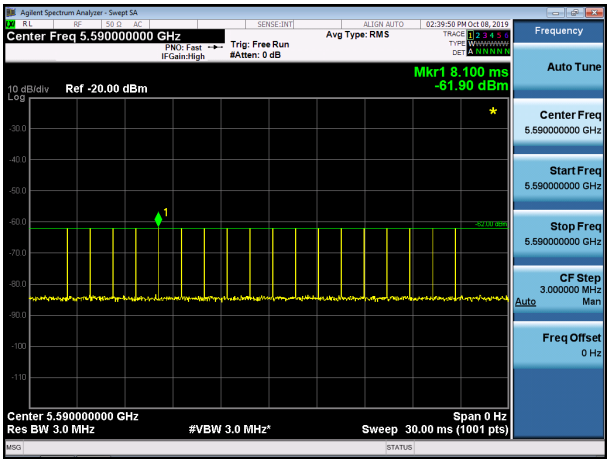
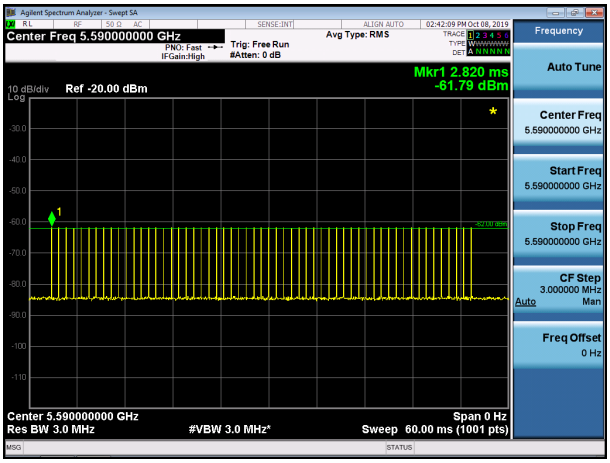
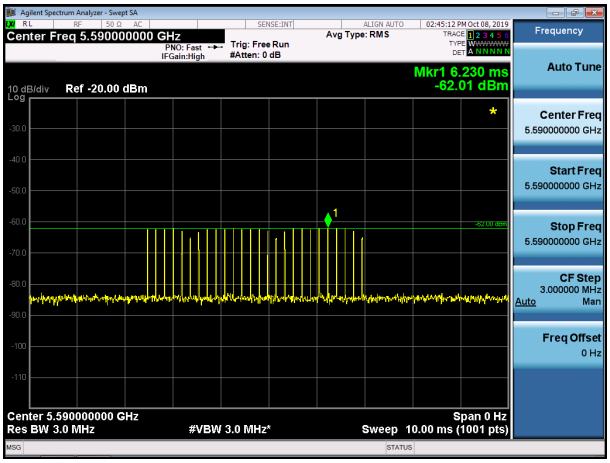
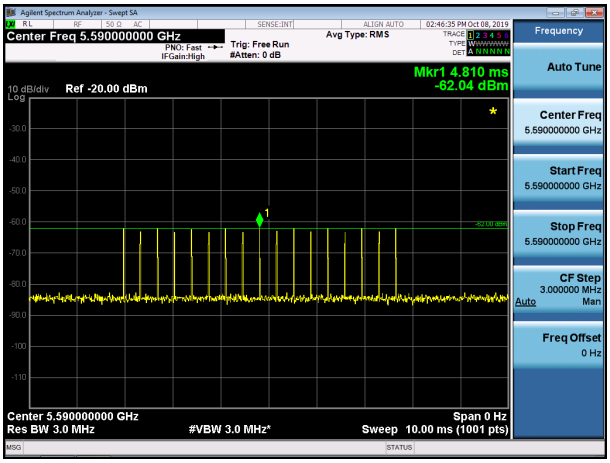
The following equipment setup was used to calibrate the conducted radar waveform. A spectrum analyzer was used to establish the test signal level for each radar type. During this process there were no transmissions by either the master or client device. The spectrum analyzer was switched to the zero spans (time domain) at the frequency of the radar waveform generator. Peak detection was utilized. The spectrum analyzer resolution bandwidth (RBW) and video bandwidth (VBW) were set to 3 MHz and 3 MHz.

The signal generator amplitude was set so that the power level measured at the spectrum analyzer was -62dBm due to the interference threshold level.

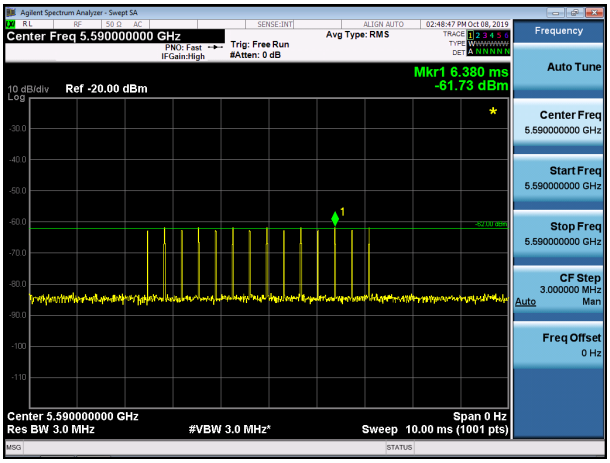
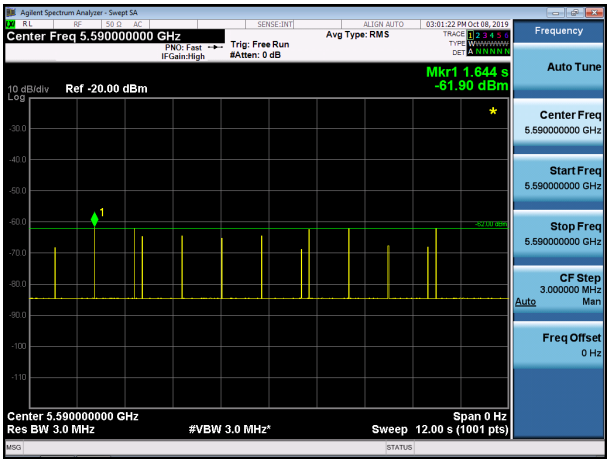
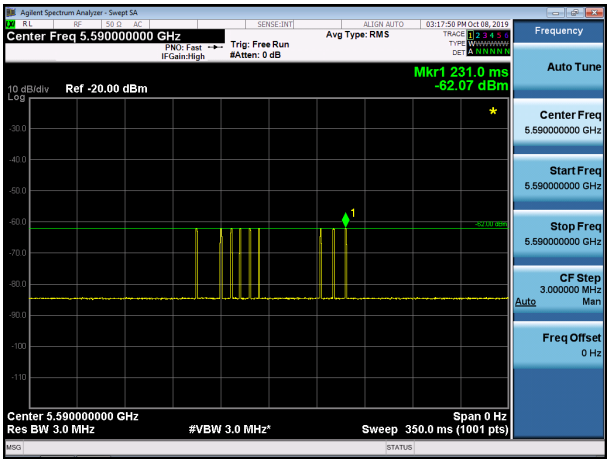
Figure 2: Conducted Calibration Setup



6.1 The Cablibration Result

Radar Type 0 Calibration Plot	Radar Type 1 Calibration Plot
	
Radar Type 2 Calibration Plot	**Radar Type 3 Calibration Plot**
	

7.

Radar Type 4 Calibration Plot	Radar Type 5 Calibration Plot
	
Radar Type 6 Calibration Plot	**N/A**
	**N/A**

8. Non-Occupancy Period

The Channel Shutdown is defined as the process initiated by the RLAN device immediately after a radar signal has been detected on an Operating Channel.

The master device shall instruct all associated slave devices to stop transmitting on this channel, which they shall do within the Channel Move Time.

Slave devices with a Radar Interference Detection function, shall stop their own transmissions within the Channel Move Time.

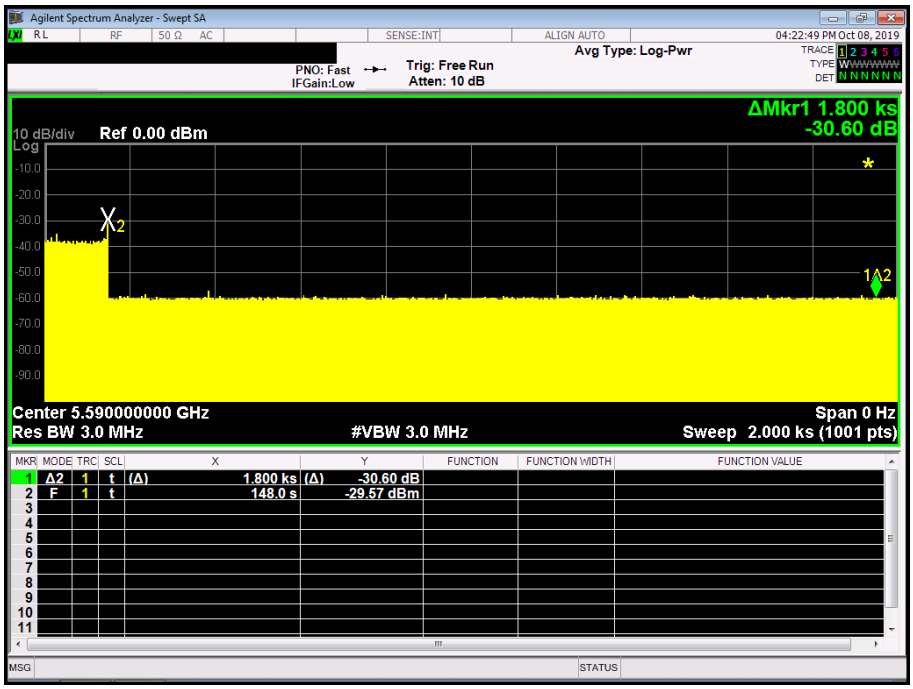
The aggregate duration of all transmissions of the RLAN device on this channel during the Channel Move Time shall be limited to the Channel Closing Transmission Time. The aggregate duration of all transmissions shall not include quiet periods in between transmissions.

8.1.1 Test Limit

Radar Test Signal	Master (min)	Client (min)
0	> 30	> 30

8.1.2 Test Result of Non-Occupancy Period

Signal 0 at 5590MHz, HT40



9. DFS Detection Threshold

This is a client without radar detection device, this test item is not applicable.

10. Channel Availability Check

This is a client without radar detection device, this test item is not applicable.

11. U-NII Detection Bandwidth

This is a client without radar detection device, this test item is not applicable.

12. Uniform Spreading

This is a client without radar detection device, this test item is not applicable.

13. In-Service Monitoring

The In-Service Monitoring is defined as the process by which an RLAN monitors the Operating Channel for the presence of radar signals.

13.1.1 Test Limit

Parameter	Value
Channel Move Time	< 10 s (See Note 1)
Channel Closing Transmission Time	< 200 ms+ an aggregate of 60 milliseconds over remaining 10 second period. (See Notes 1 and Notes 2.)

Note 1: The instant that the Channel Move Time and the Channel Closing Transmission Time begins is as follows:
- For the Short Pulse Radar Test Signals this instant is the end of the Burst.
- For the Frequency Hopping radar Test Signal, this instant is the end of the last radar Burst generated.
- For the Long Pulse Radar Test Signal this instant is the end of the 12 second period defining the Radar Waveform.

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.

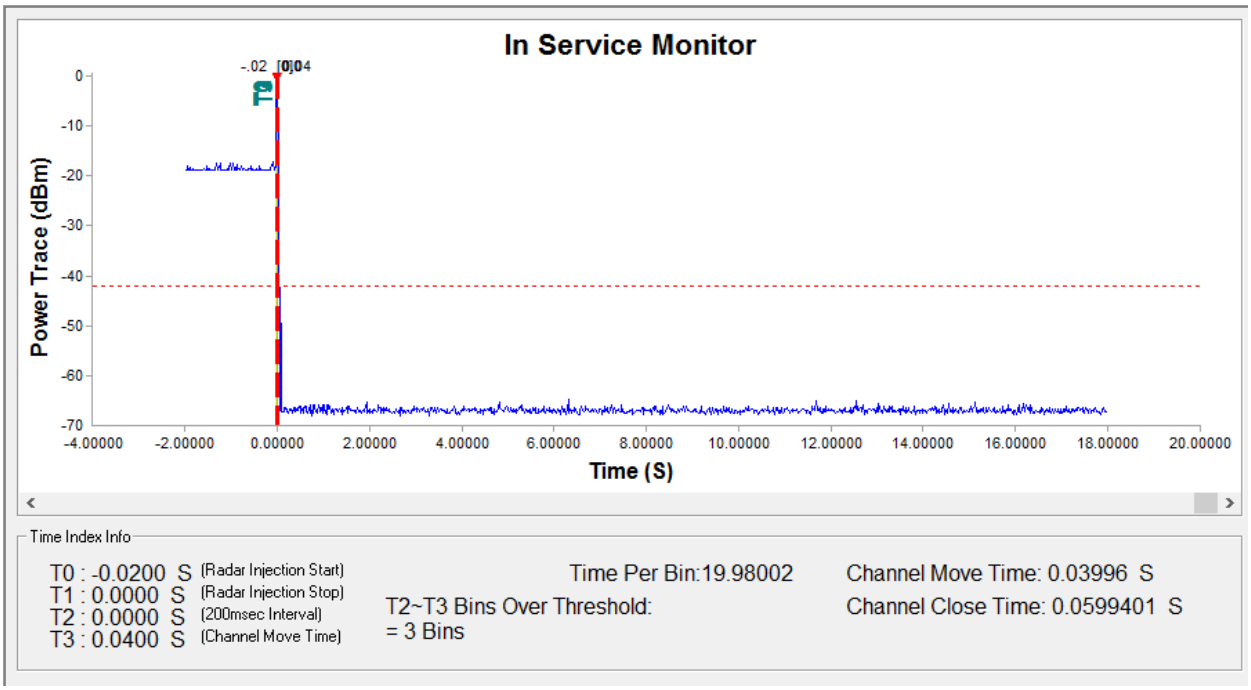
Limits Clause 4.7.2.2.2

The In-Service Monitoring shall be used to continuously monitor an Operating Channel.

The In-Service-Monitoring shall start immediately after the RLAN has started transmissions on an Operating Channel.

13.1.2 Test Result

Signal 0 at 5590MHz, HT40



	Value(S)	Result
Channel Move Time	0.03996	Pass
Channel Closing Transmission Time	0.0599401	pass

***** END OF REPORT *****