

TEST REPORT

Verified Code: 187137

Report No.:	E20201010106801-6	Application No.:	E20201010106801
Client:	Shen Zhen MTC Co., LTD		
Address:	MTC Industry Park, 1st Lilang Road, Xialilang community, Nanwan street, Longgang district, Shenzhen, China		
Sample Description:	Google Android TV BOX		
Model:	UI-7060A		
Test Specification:	FCC Part 15 Subpart E 15.407		
Receipt Date:	2020-10-16		
Test Date:	2020-11-07 to 2020-11-07		
Issue Date:	2020-12-08		
Test Result:	Pass		
Prepared By: Test Engineer Xie Jang	Reviewed By: Technical Manager Wu Haoting	Approved By: Manager Wu Chegong 	
Other Aspects:			
Note: Note			
Abbreviations: ok / P = passed; fail / F = failed; n.a. / N = not applicable;			
The test result in this test report refers exclusively to the presented test sample. This report shall not be reproduced except in full, without the written approval of GRGT.			



DIRECTIONS OF TEST

- 1. This station carries out test task according to the national regulation of verifications which can be traced to National Primary Standards and BIPM.**
- 2. The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test result without the written permission of the test laboratory.**
- 3. If there is any objection concerning the test, the client should inform the laboratory within 15 days from the date of receiving the test report.**

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1. TEST RESULT SUMMARY

FCC Part 15 Subpart E 15.407			
Item	Test Mode	FCC Standard Section	Result
Channel Closing Transmission Time	IEEE 802.11ac VHT80 5530MHz	15.407(h)	PASS
Channel Move Time	IEEE 802.11ac VHT80 5530MHz	15.407(h)	PASS
Non-Occupancy Period	IEEE 802.11ac VHT80 5530MHz	15.407(h)	PASS

Note: Recorded the worst case results in this report

2. GENERAL DESCRIPTION OF EUT

2.1. APPLICANT

Name: Shen Zhen MTC Co., LTD
Address: MTC Industry Park, 1st Lilang Road, Xialilang community, Nanwan street, Longgang district, Shenzhen, China

2.2. MANUFACTURER

Name: DIGITAL MULTIMEDIA TECHNOLOGY CO., LTD
Address: 14th Floor, 726, Eonju-ro, Gangnam-gu, Seoul, Republic of Korea

2.3. FACTORY

Name: PT. PAMPAS ELECTRIC
Address: JL. KRUIING 2 BLOK L9 NO.9 KAWASAN INDUSTRI DELTA SILICON, LIPPO CIKARANG, KEL SUKARESMI, KEC. CIKARANG SELATAN KAB. BEKASI JAWA BARAT 17530

2.4. BASIC DESCRIPTION OF EQUIPMENT UNDER TEST

Equipment: Google Android TV BOX
Model No.: UI-7060A
Adding Model: UI-7060
Model Differences: UI-7060, UI-7060A board, schematic, hardware version, software version, structure are same, the difference as below:

model name	EMMC	DDR	S/PDIF	Remote Control
UI-7060	4G EMMC	1GB DDR3-2133, 16bits(4Gb*2)	/	Infrared Remote Control
UI-7060A	8G EMMC	2GB DDR3-2133, 16bits(4Gb*4)	1	Bluetooth Control

Trade Name: DMT, TIVO, EVOLUTION DIGITAL, NELSON CABLE, LINGVO TV, SFN, ODK, ODV, Homecast, Mid air Connect

FCC ID: 2AHVH-UI7060

Power supply: DC12V power supplied by adapter
Adapter Specification: CHENZHOU FRECOM ELECTRONICS CO., LTD
Model: F12L46-120100SPAU

Input: 100-240V~50/60Hz 0.3A

Output: 12.0V --- 1.0A 12.0W

Operation Frequency: U-NII-2A: 5250 MHz~5350 MHz
U-NII-2C: 5470 MHz~5725 MHz

Modulation type: OFDM

Number Of Channel: U-NII-2A:
IEEE 802.11a / n HT20 / ac VHT20: 4 Channels
IEEE 802.11n HT40 / ac VHT40: 2 Channels

	IEEE 802.11ac VHT80: 1 Channel
	U-NII-2C:
	IEEE 802.11a / n HT20 / ac VHT20: 11 Channels
	IEEE 802.11n HT40 / ac VHT40: 5 Channels
	IEEE 802.11ac VHT80: 2 Channel
Channels	IEEE 802.11a: 20MHz
Spacing:	IEEE 802.11n HT20: 20MHz
	IEEE 802.11n HT40: 40MHz
	IEEE 802.11ac VHT20: 20MHz
	IEEE 802.11ac VHT40: 40MHz
	IEEE 802.11ac VHT80: 80MHz
Antenna	Internal antenna 1 with 5.57dBi gain (Max.)
Specification:	Internal antenna 2 with 5.65dBi gain (Max.)
Temperature	-10 ℃ ~ +40 ℃
Range:	
Hardware	IP1510-ZC01-01
Version:	
Software	
Version:	
Sample No:	0001
Note:	/

2.5. TEST OPERATION MODE

Mode No.	Description of the modes
1	5G wifi work normally

3. LABORATORY AND ACCREDITATIONS

3.1. LABORATORY

The tests & measurements refer to this report were performed by Shenzhen EMC Laboratory of Guangzhou GRG Metrology & Test Co., Ltd.

Add : No.1301 Guanguang Road Xinlan Community, Guanlan Street, Longhua District Shenzhen, 518110, People's Republic of China

P.C. : 518000

Tel : 0755-61180008

Fax : 0755-61180008

3.2. ACCREDITATIONS

A2LA	Certificate Number 2861.01
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3.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement		Frequency	Uncertainty
Radiated Emission	Horizontal	30MHz~1000MHz	4.3dB
		1GHz~18GHz	5.6dB
	Vertical	30MHz~1000MHz	4.3dB
		1GHz~18GHz	5.6dB
Conduction Emission		9 kHz ~ 150 kHz	2.8 dB
		150 kHz ~ 10 MHz	2.8 dB
		10 MHz ~ 30 MHz	2.2 dB

This uncertainty represents an expanded uncertainty factor of $k=2$.

4. LIST OF USED TEST EQUIPMENT AT GRGT

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	N9010A	MY52221469	2021/05/16
Vector signal generator	Agilent	N5182A	MY50142870	2020/11/28

5. EIRP POWER

Band	Test Mode	Maximum Conducted Power (dBm)		Antenna Gain (dBi)		Total EIRP Power (mW)
		Ant 1	Ant 2	Ant 1	Ant2	
UNII-2A (5250 MHz~5350 MHz)	IEEE 802.11 a	14.04	/	5.57	5.65	19.61
	IEEE 802.11n HT20	11.89	12.19			20.66
	IEEE 802.11ac VHT20	11.93	11.60			20.39
	IEEE 802.11n HT40	12.43	12.09			20.88
	IEEE 802.11ac VHT40	12.09	11.83			20.58
	IEEE 802.11ac VHT80	7.13	7.59			15.99
UNII-2C (5470 MHz~5725 MHz)	IEEE 802.11 a	/	14.21	5.57	5.65	19.86
	IEEE 802.11n HT20	12.62	11.97			20.92
	IEEE 802.11ac VHT20	12.29	11.95			20.74
	IEEE 802.11n HT40	13.07	12.47			21.40
	IEEE 802.11ac VHT40	12.17	12.29			20.85
	IEEE 802.11ac VHT80	9.55	10.33			18.58

6. DYNAMIC FREQUENCY SELECTION REQUIREMENTS

6.1. DFS OVERVIEW

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 Device or Client with Radar Detection	Client Without Radar Detection
DFS Detection Threshold	Yes	Not required
Channel Closing Transmission Time	Yes	Not required
Channel Move Time	Yes	Not required
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 (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 each of the bonded 20 MHz channels and the channel center frequency.		

6.2. DFS DETECTION THRESHOLDS

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

Maximum Transmit Power	Value (See Notes 1, 2, and 3)
EIRP $\geq$ 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. Note 3: EIRP is based on the highest antenna gain. For MIMO devices refer to KDB Publication 662911 D01.	

6.3. RESPONSE REQUIREMENTS

Table 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 100% of the U-NII 99% transmission power bandwidth. See Note 3.
Note 1: <i>Channel Move Time</i> and the <i>Channel Closing Transmission Time</i> should be performed with Radar Type 0. The measurement timing begins at the end of the Radar Type 0 burst. Note 2: The <i>Channel Closing Transmission Time</i> is comprised of 200 milliseconds starting at the beginning of the <i>Channel Move Time</i> plus any additional intermittent control signals required to facilitate a <i>Channel move</i> (an aggregate of 60 milliseconds) during the remainder of the 10 second period. The aggregate duration of control signals will not count quiet periods in between transmissions. Note 3: During the <i>U-NII Detection Bandwidth</i> detection test, radar type 0 should be used. For each frequency step the minimum percentage of detection is 90 percent. Measurements are performed with no data traffic	

6.4. RADAR TEST WAVEFORMS

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.

6.4.1 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 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.					

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.

- For example if in Short Pulse Radar Type 1 Test B a PRI of 3066 μsec is selected, the number of pulses would be $\text{Roundup} \left\{ \left(\frac{1}{360} \right) (19 \times 10^6 / 3066) \right\} = \text{Round up } \{17.2\} = 18$.

Table 5a - Pulse Repetition Intervals Values for Test A

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 $(82.9\% + 60\% + 90\% + 88\%)/4 = 80.2\%$			

6.4.2 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 *transmission period* will have the same chirp width. 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 $(12,000,000 / \text{Burst Count})$ microseconds. Each interval contains one *Burst*. The start time for the *Burst*, relative to the beginning of the interval, is between 1 and $[(12,000,000 / \text{Burst Count}) - (\text{Total Burst Length}) + (\text{One Random PRI Interval})]$ 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).

6.4.3 FREQUENCY HOPPING RADAR TEST WAVEFORM

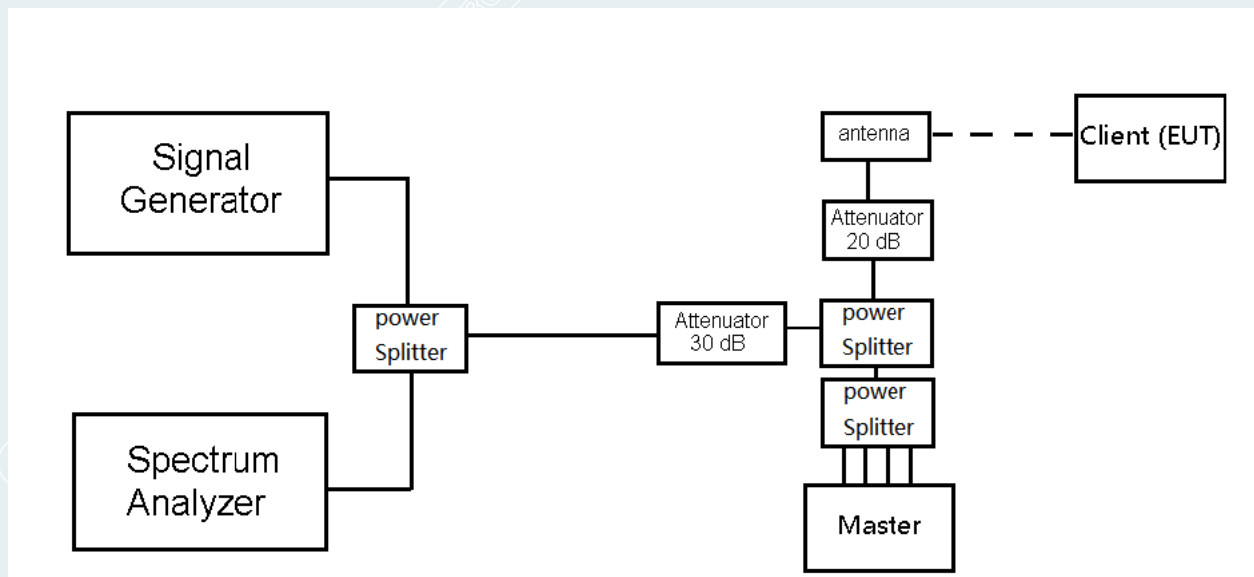
Table 7 – Frequency Hopping Radar Test Waveform

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:

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.

6.5. TEST SETUP



6.6. RADAR WAVEFORM CALIBRATION RESULT

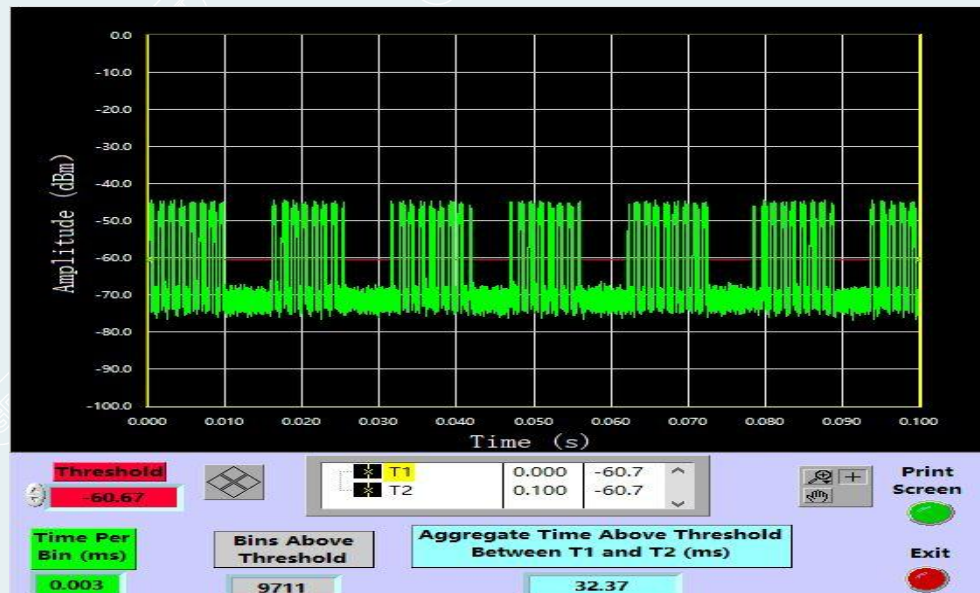
Radar Waveform Type 0

Description	Value	Unit
Configured DUT EIRP:	138	mW
Configured DUT PSD:	8.23	dBm/MHz
Requirement of the Detection threshold value for this given values acc. to FCC clause 5.2 / Table 3	-62	dBm
This results in the following radar signal level at the DUT	-61.53	dBm

6.7. CHANEL LOADING

DUT Frequency (MHz)	Tx-Test Duty Cycle (%)	Tx-Test Duty Cycle Limit	Tx-Test Result
5530.000000	32.37	$\geq 17\%$	PASS

802.11ac VHT80 5530MHz



7. IN-SERVICE MONITORING FOR CHANNEL MOVE TIME, CHANNEL CLOSING TRANSMISSION TIME AND NON-OCCUPANCY PERIOD

7.1 TEST PROCEDURE

The steps below define the procedure to determine the above mentioned parameters when a radar Burst with a level equal to the DFS Detection Threshold + 1dB is generated on the Operating Channel of the U-NII device (In- Service Monitoring).

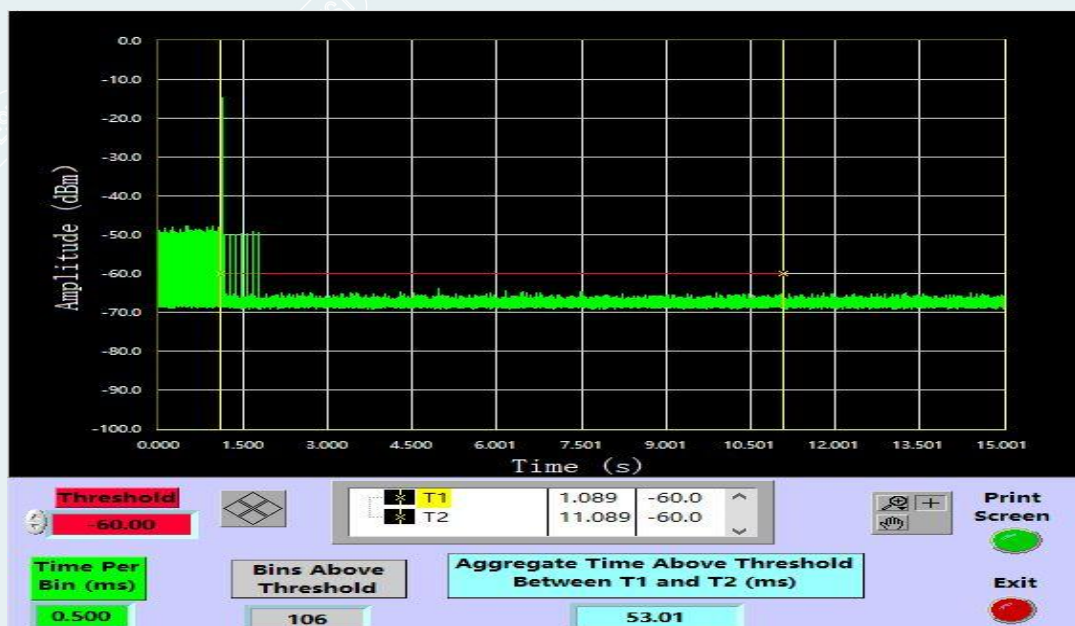
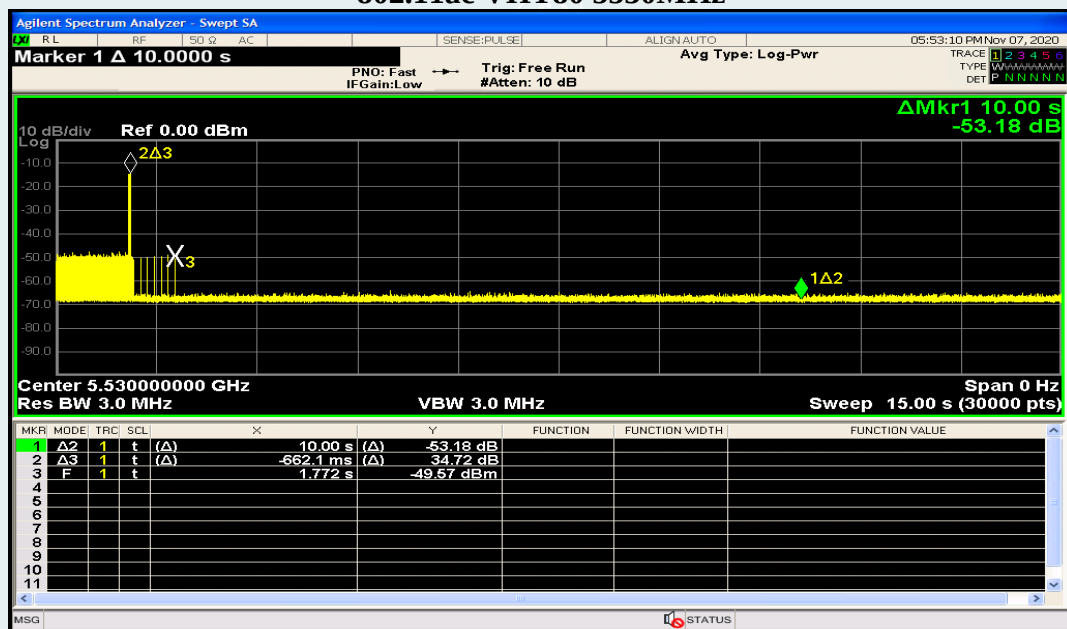
- a) One frequency will be chosen from the Operating Channels of the UUT within the 5250-5350 MHz or 5470-5725 MHz bands. For 802.11 devices, the test frequency must contain control signals. This can be verified by disabling channel loading and monitoring the spectrum analyzer. If no control signals are detected, another frequency must be selected within the emission bandwidth where control signals are detected.
- b) In case the UUT is a U-NII device operating as a Client Device (with or without DFS), a U-NII device operating as a Master Device will be used to allow the UUT (Client device) to Associate with the Master Device. In case the UUT is a Master Device, a U-NII device operating as a Client Device will be used and it is assumed that the Client will Associate with the UUT (Master). In both cases for conducted tests, the Radar Waveform generator will be connected to the Master Device. For radiated tests, the emissions of the Radar Waveform generator will be directed towards the Master Device. If the Master Device has antenna gain, the main beam of the antenna will be directed toward the radar emitter. Vertical polarization is used for testing.
- c) Stream the channel loading test file from the Master Device to the Client Device on the test Channel for the entire period of the test.
- d) At time T₀ the Radar Waveform generator sends a Burst of pulses for one of the Radar Type 0 in **Table 5** at levels defined in **Table 3**, on the Operating Channel. An additional 1 dB is added to the radar test signal to ensure it is at or above the DFS Detection Threshold, accounting for equipment variations/errors.
- e) Observe the transmissions of the UUT at the end of the radar Burst on the Operating Channel for duration greater than 10 seconds. Measure and record the transmissions from the UUT during the observation time (Channel Move Time). Measure and record the Channel Move Time and Channel Closing Transmission Time if radar detection occurs. f) When operating as a Master Device, monitor the UUT for more than 30 minutes following instant T₂ to verify that the UUT does not resume any transmissions on this Channel. Perform this test once and record the measurement result.
- g) In case the UUT is a U-NII device operating as a Client Device with In-Service Monitoring, perform steps a) to f).

7.2 CHANNEL MOVE TIME&CHANNEL CLOSE TRANSMISSION TIME TEST RESULT

Frequency (MHz)	Radar Type No.	CMT Tx Time (s)	CMT Limit (s)	Result
5530.000000	0	0.6621	10.000	PASS

Frequency (MHz)	Radar Type No.	CCTT Type of Value	CCTT No. of Pulses found	CCTT Tx Time (ms)	Limit (ms)	Result
5530.000000	0	remaining 10.0 second(s) period	106	53.01	60	PASS

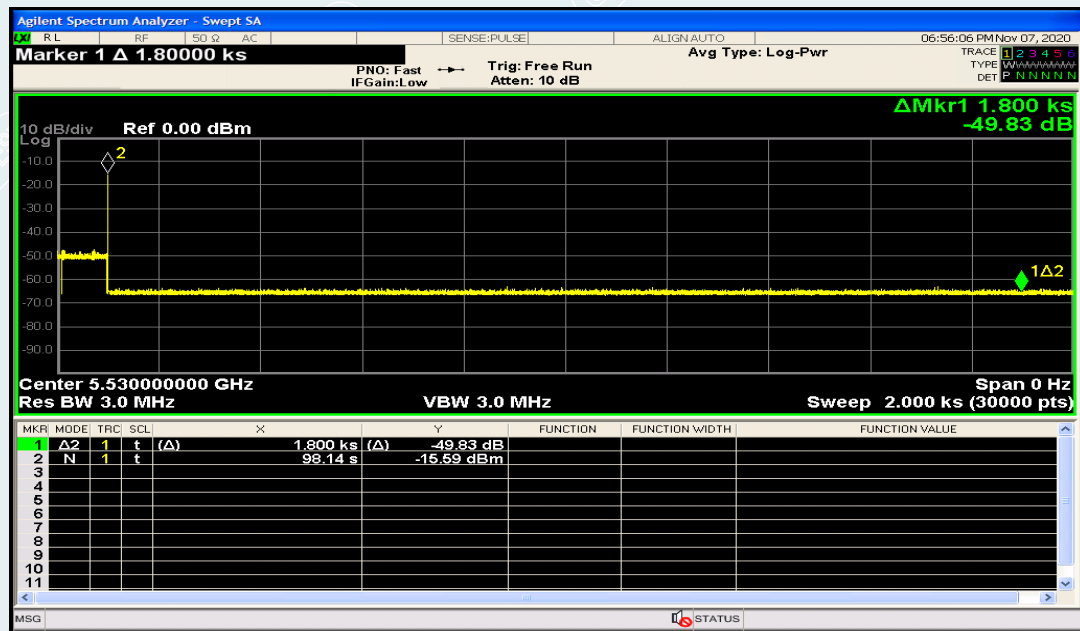
802.11ac VHT80 5530MHz



7.3 NON-OCCUPANCY PERIOD TEST RESULT

Frequency (MHz)	Radar Type No.	NOP No. of Pulses found	NOP No. of Pulses Limit	NOP Tx Time (s)	NOP Tx Time Limit (s)	Result
5530.000000	0	0	0	0.000	30.000	PASS

802.11ac VHT80 5530MHz



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