	VERITAS
	DFS Test Report
Report No.:	RFBCIB-WTW-P21060785-2
FCC ID:	2AA3N-PT012
Test Model:	PT01
Received Date:	Jun. 22, 2021
Test Date:	Aug. 6, 2021
Issued Date:	Oct. 12, 2021
Applicant:	Peloton Interactive Inc.
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FCC Registration / Designation Number:	198487 / T\\/2021
	TAF Tac-MRA Testing Laboratory 2021
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Release Control Record

Issue No.	Description	Date Issued
RFBCIB-WTW-P21060785-2	Original release.	Oct. 12, 2021

1 Certificate of Conformity

Product:	Peloton Guide (Set Top Box)
Brand:	Peloton
Test Model:	PT01
Sample Status:	Engineering sample
Applicant:	Peloton Interactive Inc.
Test Date:	Aug. 6, 2021
Standards:	FCC Part 15, Subpart E (Section 15.407)
References Test Guidance:	KDB 905462 D02 UNII DFS Compliance Procedures New Rules v02
	KDB 905462 D03 UNII Clients Without Radar Detection New Rules v01r02

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's RF characteristics under the conditions specified in this report.

Prepared by :

Jessica Cheng / Senior Specialist

Date: Oct. 12, 2021

Approved by :

Rex. Lai

Date: Oct. 12, 2021

Rex Lai / Associate Technical Manager



2 EUT Information

2.1 Operating Frequency Bands and Mode of EUT

TABLE 1: OPERATING FREQUENCY BANDS AND MODE OF EUT

Operational Made	Operating Frequency Range	
Operational Mode	5250~5350MHz	5470~5725MHz
Client without radar detection and ad hoc function	✓	✓

2.2 EUT Software and Firmware Version

Table 2: The Eut Software/Firmware Version

No	Product	Model No.	Software/Firmware Version
1	Peloton Guide (Set Top Box)	PT01	Kernel Version : 4.9.226-perf+

2.3 Description Of Available Antennas to The EUT

Table 3: Antenna List

Ant. No.	Туре	Operation Frequency Range	Max. Gain(dBi)
1	PIFA	5250-5350MHz	2.88
1	PIFA	5470-5725MHz	2.88
2	PIFA	5250-5350MHz	3.18
2	PIFA	5470-5725MHz	3.18

The above Antenna information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications, the laboratory shall not be held responsible.



2.4 EUT Maximum Conducted Power

Table 4: The Measured Conducted Output Power

802.11a

Frequency Band (MHz)	MAX. Power	
	Output Power(dBm)	Output Power(mW)
5250~5350	16.89	48.917
5470~5725	16.81	47.975

802.11ac (VHT20)

Frequency Band (MHz)	MAX. Power	
	Output Power(dBm)	Output Power(mW)
5250~5350	18.08	64.287
5470~5725	18.20	66.127

802.11ac (VHT40)

Frequency Band (MHz)	MAX. Power	
	Output Power(dBm)	Output Power(mW)
5250~5350	15.94	39.259
5470~5725	16.20	41.693

802.11ac (VHT80)

Frequency Band (MHz)	MAX. Power		
	Output Power(dBm)	Output Power(mW)	
5250~5350	15.78	37.848	
5470~5725	15.47	35.20	



2.5 EUT Maximum E.I.R.P. Power

Table 5: The Eirp Output Power List

802.11a

Frequency Band (MHz)	MAX. Power	
	Output Power(dBm)	Output Power(mW)
5250~5350	20.07	101.625
5470~5725	19.99	99.77

802.11ac (VHT20)

Frequency Band (MHz)	MAX. Power		
	Output Power(dBm)	Output Power(mW)	
5250~5350	21.26	133.66	
5470~5725	21.38	137.404	

802.11ac (VHT40)

Frequency Band (MHz)	MAX. Power		
···· / ····· / ····· / ····· / ·········	Output Power(dBm)	Output Power(mW)	
5250~5350	19.12	81.658	
5470~5725	19.38	86.696	

802.11ac (VHT80)

Frequency Band (MHz)	MAX. Power		
	Output Power(dBm)	Output Power(mW)	
5250~5350	18.96	78.705	
5470~5725	18.65	73.282	



2.6 Transmit Power Control (TPC)

U-NII devices operating in the 5.25-5.35 GHz band and the 5.47-5.725 GHz band shall employ a TPC mechanism. The U-NII device is required to have the capability to operate at least 6 dB below the mean EIRP value of 30 dBm. A TPC mechanism is not required for systems with an e.i.r.p. of less than 500 mW.

Maximum EIRP of this device is **137.404 mW** which less than 500mW, therefore it's require TPC function.

TPC	E.I.R.P	FCC 15.407(h)(1)
	> 500mW	The TPC mechanism is required for system with an E.I.R.P. of above 500mW
\checkmark	< 500mW	The TPC mechanism is not required for system with an E.I.R.P. of less 500mW

2.7 Statement of Manufacturer

Manufacturer statement confirming that information regarding the parameters of the detected Radar Waveforms is not available to the end user. And the device doesn't have Ad Hoc mode on DFS frequency band.



3. U-NII DFS Rule Requirements

3.1 Working Modes and Required Test Items

The manufacturer shall state whether the UUT is capable of operating as a Master and/or a Client. If the UUT is capable of operating in more than one operating mode then each operating mode shall be tested separately. See tables 6 and 7 for the applicability of DFS requirements for each of the operational modes.

	Operational Mode			
Requirement	Master	Client without radar detection	Client with radar detection	
Non-Occupancy Period	✓	✓ note	✓	
DFS Detection Threshold	✓	Not required	✓	
Channel Availability Check Time	✓	Not required	Not required	
U-NII Detection Bandwidth	\checkmark	Not required	\checkmark	

Table 6: Applicability of DFS Requirements Prior To Use a Channel

Note: Per KDB 905462 D03 UNII Clients Without Radar Detection New Rules v01r02 section (b)(5/6),

If the client moves with the master, the device is considered compliant if nothing appears in the client non-occupancy period test. For devices that shut down (rather than moving channels), no beacons should appear. An analyzer plot that contains a single 30-minute sweep on the original channel.

Table 7: Applicability of DFS Requirements During Normal Operation.

	Operational Mode			
Requirement	Master or Client with radar detection	Client without radar detection		
DFS Detection Threshold	✓	Not required		
Channel Closing Transmission Time	✓	\checkmark		
Channel Move Time	~	\checkmark		
U-NII Detection Bandwidth	✓	Not required		

Additional requirements for devices with multiple bandwidth modes	Master 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.

3.2 Test Limits And Radar Signal Parameters

Detection Threshold Values

Table 8: DFS Detection Thresholds For Master Devices And Client Devices With Radar Detection

Maximum Transmit Power	Value (See Notes 1, 2, and 3)		
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.

Table 9: 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	

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.



Parameters of DFS Test Signals

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.

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 Test B: 15 unique PRI values randomly selected within the range of 518-3066 μ sec, with a minimum increment of 1 μ sec, excluding PRI values selected in Test A	$\operatorname{Roundup}\left\{ \begin{array}{c} \left(\frac{1}{360}\right) \\ \left(\frac{19 \cdot 10^{6}}{\operatorname{PRI}_{\mu \operatorname{sec}}}\right) \end{array} \right\}$	60%	30				
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				
	Aggreg	gate (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 10: Short Pulse Radar Test Waveforms



Table 11: 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

Three subsets of trials will be performed with a minimum of ten trials per subset. The subset of trials differ in where the Long Pulse Type 5 Signal is tuned in frequency.

a) the Channel center frequency

b) tuned frequencies such that 90% of the Long Pulse Type 5 frequency modulation is within the low edge of the UUT Occupied Bandwidth

c) tuned frequencies such that 90% of the Long Pulse Type 5 frequency modulation is within the high edge of the UUT Occupied Bandwidth

It include 10 trails for every subset, the formula as below,

For subset case 1: the center frequency of the signal generator will remain fixed at the center of the UUT Channel.

For subset case 2: to retain 90% frequency overlap between the radar signal and the UUT Occupied Bandwidth, the center frequency of the signal generator will vary for each of the ten trials in subset case 2. The center frequency of the signal generator for each trial is calculated by:

FL+(0.4*Chirp Width [in MHz])

For subset case 3: to retain 90% frequency overlap between the radar signal and the UUT Occupied Bandwidth, the center frequency of the signal generator will vary for each of the ten trials in subset case 3. The center frequency of the signal generator for each trial is calculated by:

FH-(0.4*Chirp Width [in MHz])

Table 12: 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



4. Test & Support Equipment List

4.1 Test Instruments

Table 13: Test Instru	iments List
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Description & Manufacturer	Model No.	Brand	Date Of Calibration	Due Date Of Calibration
Spectrum analyzer	FSV	R&S	May 24, 2021	May 23, 2022
Signal generator	MXG	KEYSIGHT	May 19, 2021	May 18,2022
Horn antenna	BBHA 9120 D1	Schwarzbeck	Nov 22, 2020	Nov. 21, 2021
RF coaxial cable	SUCOFLEX 104	HUBER SUHNER	NA	NA

Note: Calibrate the RF coaxial cable before each test and use the radiation or conducted method to calibrate the reference FCC KDB 412172 standard.

4.2 Description of Support Units

No.	Product	Brand	Model No.	Fcc ld	Gain
1	Wireless Router	Access Point	Netgear R6800	PY316200344	5G Ant gain : 1.28dBi Maximum EIRP :28.4dBm

NOTE: This device was functioned as a Master Slave device during the DFS test.

Table 15: Software/Firmware Inform	ation.
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No.	Product	Model No.	Software/Firmware Version	
1.	Wireless Router	Netgear R6800	V1.1.034_1.0.1_0418_usdfs	

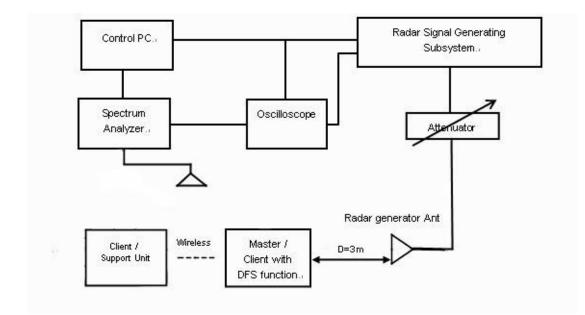


5. Test Procedure

5.1 DFS Measurement System

A complete DFS Measurement System consists of two subsystems: (1) the Radar Signal Generating Subsystem and (2) the Traffic Monitoring Subsystem. The control PC is necessary for generating the Radar waveforms in Table 10, 11 and 12. The traffic monitoring subsystem is specified to the type of unit under test (UUT).

Radiated Setup Configuration of DFS Measurement System

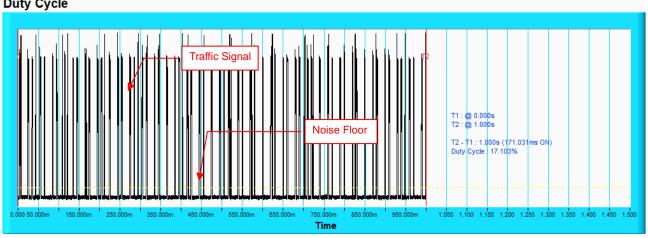


System testing will be performed with channel-loading using means appropriate to the data types that are used by the unlicensed device. The following requirements apply:

	a) The data file must be of a type that is typical for the device (i.e., MPEG-2, MPEG-4, WAV, MP3, MP4 AVI, etc.) and must generally be transmitting in a streaming mode.		
	b) Software to ping the client is permitted to simulate data transfer but must have random ping intervals.		
V	c) Timing plots are required with calculations demonstrating a minimum channel loading of approximately 17% or greater.		
	d) Unicast or Multicast protocols are preferable but other protocols may be used. The appropriate protocol used must be described in the test procedures.		



Wireless Traffic Loading Duty Cycle



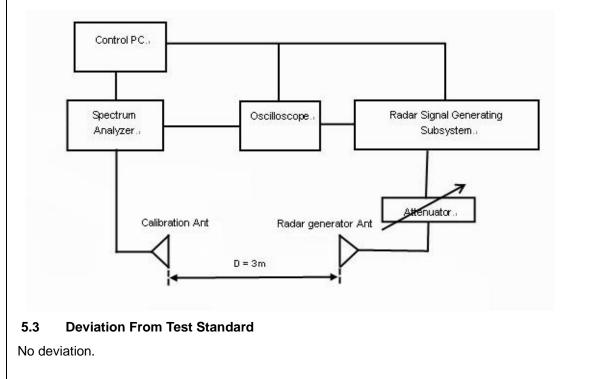
5.2 Calibration of DFS Detection Threshold Level

The measured channel is 5500MHz, 5510MHz, 5530MHz. The radar signal was the same as transmitted channels, and injected into the antenna of AP (master) or Client Device with Radar Detection, measured the channel closing transmission time and channel move time. The calibrated conducted detection threshold level is set to -64dBm. The tested level is lower than required level hence it provides margin to the limit.

Radiated setup configuration of Calibration of DFS Detection Threshold Level

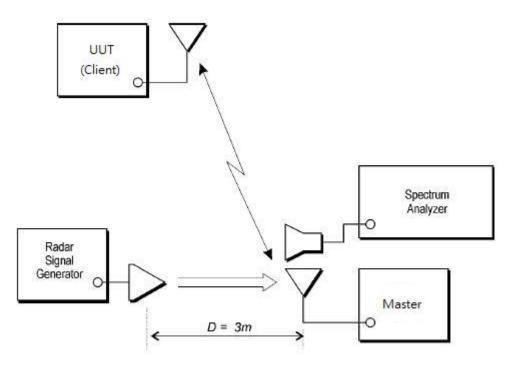
The radar signal generate system is gererating waveform pattern of radar types. The amplitude of the radar signal generator system is adjusted to yield a level of – 64 dBm as measured on the spectrum analyzer.

The interference detection threshold level is lower than – 64dBm hence it provides margin to the limit.



5.4 Radiated Test Setup Configuration

5.4.1 Client Without Radar Detection Mode



6. Test Results

6.1 Summary of Test Results

Clause	Test Parameter	Remarks	Pass/Fail
15.407	DFS Detection Threshold	Not Applicable	NA
15.407	Channel Availability Check Time	Not Applicable	NA
15.407	Channel Move Time	Applicable	Pass
15.407	Channel Closing Transmission Time	Applicable	Pass
15.407	Non- Occupancy Period	Applicable	Pass
15.407	Uniform Spreading	Not Applicable	NA
15.407	U-NII Detection Bandwidth	Not Applicable	NA
15.407	Non-associated test	Applicable	Pass
15.407	Non-Co-Channel test	Applicable	Pass

Note: Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

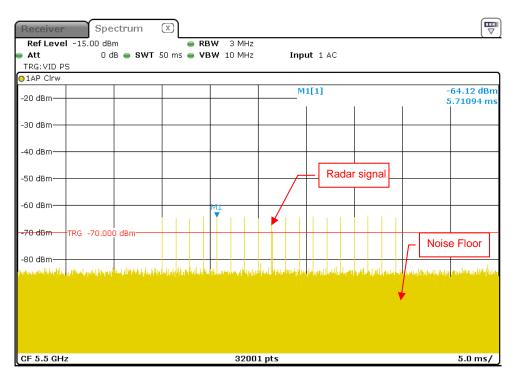


6.2.1 Test Mode: Device Operating In Client Without Radar Detection Mode.

Client with injection at the Master. (The radar test signals are injected into the Master Device)

DFS Detection Threshold

For detection threshold level of -64dBm, the required signal strength at AP antenna location is -64 dBm.



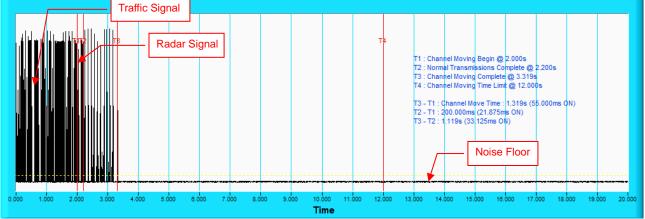
Radar Signal 0



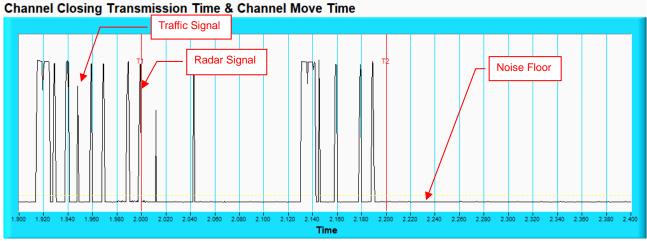
Radar Signal 0

802.11ac VHT20

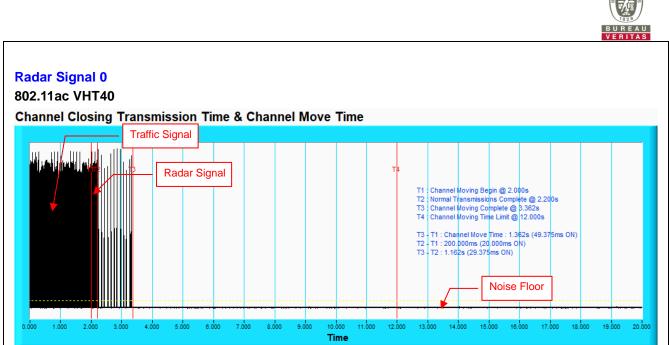




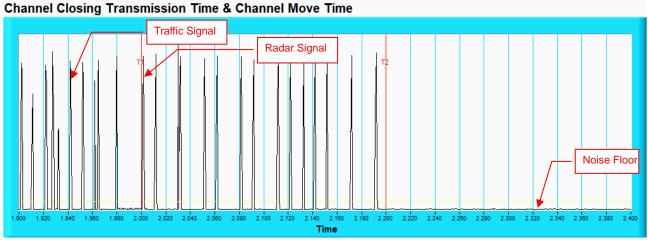
NOTE: T1 denotes the start of Channel Move Time upon the end of the last Radar burst. T2 denotes the data transmission time of 200ms from T1. T3 denotes the end of Channel Move Time.T4 denotes the 10 second from T1 to observe the aggregate duration of transmissions.



NOTE: An expanded plot for the device vacates the channel in the required 500ms.



NOTE: T1 denotes the start of Channel Move Time upon the end of the last Radar burst. T2 denotes the data transmission time of 200ms from T1. T3 denotes the end of Channel Move Time.T4 denotes the 10 second from T1 to observe the aggregate duration of transmissions.



NOTE: An expanded plot for the device vacates the channel in the required 500ms.

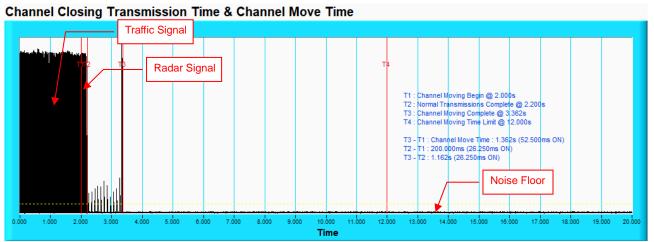


Noise Floor

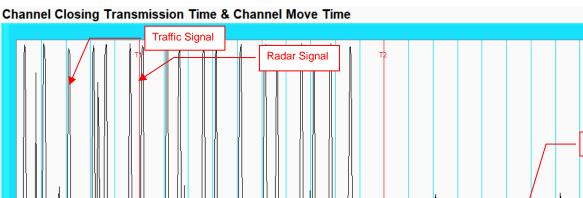
2.400

Radar Signal 0

802.11ac VHT80



NOTE: T1 denotes the start of Channel Move Time upon the end of the last Radar burst. T2 denotes the data transmission time of 200ms from T1. T3 denotes the end of Channel Move Time.T4 denotes the 10 second from T1 to observe the aggregate duration of transmissions.



2.160 2.180

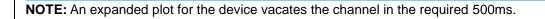
Time

2.200 2.220 2.240

2.260 2.280 2.300 2.320

2.340 2.380 2.380





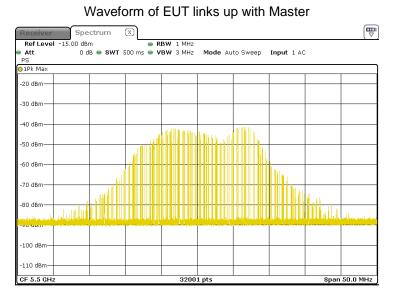
2.080 2.080 2.100 2.120

6.2.3 Non-Occupancy Period

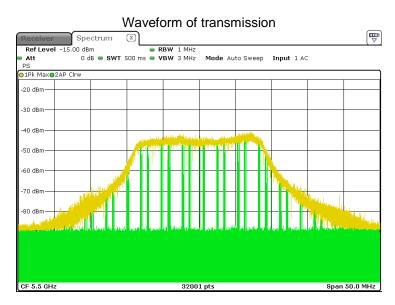
Associate test:

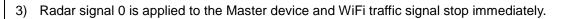
During the 30 minutes observation time, UUT did not make any transmissions on a channel after a radar signal was detected on that channel by either the Channel Availability Check or the In-Service Monitoring.

1) EUT (Client) links with master on 5500MHz.



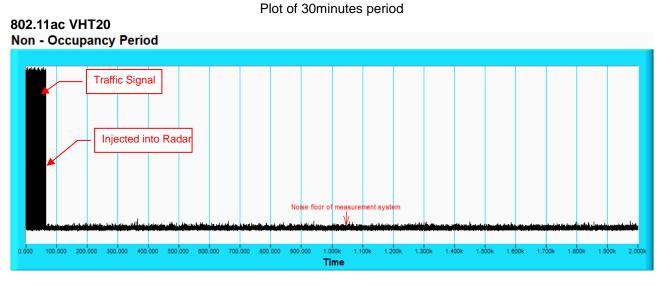
2) Client plays specified files via master.





Radar signal applied to the master and traffic stopped as described in section 6.2.2.

4) 5500MHz has been monitored in 30 minutes period. In this period, no any transmission occurs.

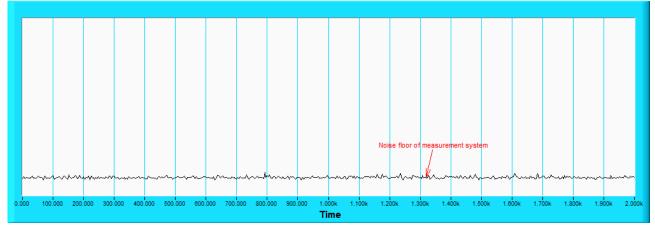


NOTE: Test setup are shown on Test set up photo.pdf

6.2.4 Non-Associated Test

Master was off.

During the 30 minutes observation time, The UUT did not make any transmissions in the DFS band after UUT power up.



6.2.5 Non- Co-Channel Test

The UUT was investigated after radar was detected and confirmed that no co-channel operation with radars.



7. Appendix – Information of the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are FCC recognized accredited test firms and accredited according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

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The address and road map of all our labs can be found in our web site also.

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