# TEST REPORT

| | | |
|---|---|---|
| **Reference No.** | : | WTX21X05051655W-2 |
| **FCC ID** | : | 2AABK-SKYV3 |
| **Applicant** | : | Shenzhen Chuangwei Electronic Appliance Tech Co., Ltd. |
| **Address** | : | 4F & 6F, Overseas plant south, Skyworth Industrial Park, Shiyan Street, Bao'an District, Shenzhen, China |
| **Product Name** | : | 10 inch WIFI Digital Photo Frame |
| **Test Model** | : | SKYV3 |
| **Standards** | : | FCC Part 15E |
| **Date of Receipt sample** | : | May. 28, 2021 |
| **Date of Test** | : | May. 28, 2021 to Jun. 11, 2021 |
| **Date of Issue** | : | Jun. 11, 2021 |
| **Test Result** | : | **Pass** |

Remarks:

The results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.


**Prepared By:**

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| Tested by: | Reviewed By: | Approved & Authorized By: |
|---|---|---|
| Mike Shi / Project Engineer | Lion Cai / RF Manager | Silin Chen / Manager |

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## Report version

| Version No. | Date of issue | Description |
|---|---|---|
| Rev.00 | Jun. 11, 2021 | Original |
| / | / | / |

# 1. GENERAL INFORMATION

## 1.1 Product Description for Equipment Under Test (EUT)

**Client Information**

| | |
|---|---|
| Applicant: | Shenzhen Chuangwei Electronic Appliance Tech Co., Ltd. |
| Address of applicant: | 4F & 6F, Overseas plant south, Skyworth Industrial Park, Shiyan Street, Bao'an District, Shenzhen, China |
| Manufacturer: | Shenzhen Chuangwei Electronic Appliance Tech Co., Ltd. |
| Address of manufacturer: | 4F & 6F, Overseas plant south, Skyworth Industrial Park, Shiyan Street, Bao'an District, Shenzhen, China |

| **General Description of EUT** | |
|---|---|
| Product Name: | 10 inch WIFI Digital Photo Frame |
| Trade Name: | Skylight |
| Model No.: | SKYV3 |
| Adding Model: | / |
| Rated Voltage: | DC 5V |
| Battery Capacity: | / |
| Power Adapter: | MODEL: S85A02<br>INPUT: AC100-240V, 50/60Hz, 0.5A<br>OUTPUT: DC5V, 2.0A |
| Software Version: | / |
| Hardware Version: | / |
| The EUT is only support slave without radar Detection function. | |
| *Note: The test data is gathered from a production sample provided by the manufacturer.* | |

| **Technical Characteristics of EUT** | |
|---|---|
| Support Standards: | 802.11a, 802.11n(HT20), 802.11n(HT40), |
| Frequency Range: | 5150-5250MHz, 5250-5350MHz,<br>5470-5725MHz, 5725-5850MHz |
| RF Output Power: | 9.63dBm (Conducted) |
| Type of Modulation: | BPSK, QPSK,16QAM,64QAM |
| Type of Antenna: | Integral Antenna |
| Antenna Gain: | 3.58dBi |

## 1.2 Test Standards

The tests were performed according to following standards:

**FCC Rules Part 15.407:** General technical requirements.
**ANSI C63.10-2013:** American National Standard for Testing Unlicensed Wireless Devices.
**KDB905462 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.
**KDB905462 D03:**U-NII CLIENT DEVICES WITHOUT RADAR DETECTION CAPABILITY.

**Maintenance of compliance** is the responsibility of the manufacturer. Any modification of the product, which result in lowering the emission, should be checked to ensure compliance has been maintained.

**Maintenance of compliance** is the responsibility of the manufacturer. Any modification of the product, which result in lowering the emission, should be checked to ensure compliance has been maintained.

## 1.3 Test Methodology

All measurements contained in this report were conducted with KDB 905462 D02 UNII DFS Compliance Procedures New Rules v02.

## 1.4 EUT Operating during test

EUT was programmed to be in continuously transmitting mode. During the test, EUT operation to normal function and programs under WIN XP were executed.

## 1.5 Test Facility

**Address of the test laboratory**
Laboratory: Waltek Testing Group (Shenzhen) Co., Ltd.
Address: 1/F., Room 101, Building 1, Hongwei Industrial Park, Liuxian 2nd Road, Block 70 Bao'an District, Shenzhen, Guangdong, China

**FCC – Registration No.: 125990**
Waltek Testing Group (Shenzhen) Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintain ed in our files. The Designation Number is CN5010, and Test Firm Registration Number is 125990.

**Industry Canada (IC) Registration No.: 11464A**
The 3m Semi-anechoic chamber of Waltek Testing Group (Shenzhen) Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 11464A.

## 1.6 EUT Setup and Test Mode

The EUT in this application is a client device without radar detection capability and indicate the FCC identifier for the Master U-NII Device .During the test, the product works on the designated test channel and transmits normal data to the master.

Messages for communication between Master and Client Devices: 0101010101……..( Continuous cycle.)

The type of system architecture for the device in this application is IP based.,

more detailed description as follows:

| **Test Mode List** | | |
|---|---|---|
| Test Mode | Description | Remark |
| TM1 | 802.11N-HT(40) | 5270MHz,5550MHz, |

| **EUT Cable List and Details** | | | |
|---|---|---|---|
| Cable Description | Length (m) | Shielded/Unshielded | With / Without Core |
| DC Cable | 1.8 | Unshielded | Without Ferrite |

| **Special Cable List and Details** | | | |
|---|---|---|---|
| Cable Description | Length (m) | Shielded/Unshielded | With / Without Ferrite |
| USB Cable | 0.8 | Shielded | Without Ferrite |

| **Auxiliary Equipment List and Details** | | | |
|---|---|---|---|
| Description | Manufacturer | Model | Serial Number |
| Computer | Lenovo | TianYi310-14ISK | / |
| WIFI AP/Router | LINKSYS | WRT32X | FCCID: Q87-WRT3200ACM |

## 1.7 Test Equipment List and Details

| No. | Description | Manufacturer | Model | Serial No. | Cal Date | Due. Date |
|---|---|---|---|---|---|---|
| SEMT-1075 | Communication Tester | Rohde & Schwarz | CMW500 | 148650 | 2021-03-27 | 2022-03-26 |
| SEMT-1063 | GSM Tester | Rohde & Schwarz | CMU200 | 114403 | 2021-03-27 | 2022-03-26 |
| SEMT-1072 | Spectrum Analyzer | Agilent | E4407B | MY41440400 | 2021-03-27 | 2022-03-26 |
| SEMT-1079 | Spectrum Analyzer | Agilent | N9020A | US47140102 | 2021-03-27 | 2022-03-26 |
| SEMT-1080 | Signal Generator | Agilent | 83752A | 3610A01453 | 2021-03-27 | 2022-03-26 |
| SEMT-1081 | Vector Signal Generator | Agilent | N5182A | MY47070202 | 2021-03-27 | 2022-03-26 |
| SEMT-1028 | Power Divider | Weinschel | 1506A | PM204 | 2021-03-27 | 2022-03-26 |
| SEMT-1082 | Power Divider | RF-Lambda | RFLT4W5M18G | 14110400027 | 2021-03-27 | 2022-03-26 |
| SEMT-1031 | Spectrum Analyzer | Rohde & Schwarz | FSP30 | 836079/035 | 2021-03-27 | 2022-03-26 |
| SEMT-1007 | EMI Test Receiver | Rohde & Schwarz | ESVB | 825471/005 | 2021-03-27 | 2022-03-26 |
| SEMT-1008 | Amplifier | Agilent | 8447F | 3113A06717 | 2021-04-12 | 2022-04-11 |
| SEMT-1043 | Amplifier | C&D | PAP-1G18 | 2002 | 2021-04-12 | 2022-04-11 |
| SEMT-1069 | Loop Antenna | Schwarz beck | FMZB 1516 | 9773 | 2021-03-19 | 2023-03-18 |
| SEMT-1068 | Broadband Antenna | Schwarz beck | VULB9163 | 9163-333 | 2021-03-19 | 2023-03-18 |
| SEMT-1042 | Horn Antenna | ETS | 3117 | 00086197 | 2021-03-19 | 2023-03-18 |
| SEMT-1121 | Horn Antenna | Schwarzbeck | BBHA 9170 | BBHA9170582 | 2021-04-27 | 2023-04-26 |
| SEMT-1169 | Pre-amplifier | Direction Systems Inc. | PAP-2640 | 14145-14153 | 2021-04-27 | 2022-04-26 |
| SEMT-1163 | Spectrum Analyzer | Rohde & Schwarz | FSP40 | 100612 | 2021-03-27 | 2022-03-26 |
| SEMT-1166 | Power Limiter | Agilent | N9356B | MY45450376 | 2021-03-27 | 2022-03-26 |
| SEMT-1076 | RF Switcher | Top Precision | RCS03-A2 | / | 2021-03-19 | 2023-03-18 |
| SEMT-C001 | Cable | Zheng DI | LL142-07-07-10M(A) | / | / | / |
| SEMT-C002 | Cable | Zheng DI | ZT40-2.92J-2.92J-6M | / | / | / |
| SEMT-C003 | Cable | Zheng DI | ZT40-2.92J-2.92J-2.5M | / | / | / |
| SEMT-C004 | Cable | Zheng DI | 2M0RFC | / | / | / |
| SEMT-C005 | Cable | Zheng DI | 1M0RFC | / | / | / |
| SEMT-C006 | Cable | Zheng DI | 1M0RFC | / | / | / |

| Software List | | | |
|---|---|---|---|
| Description | Manufacturer | Model | Version |
| EMI Test Software (Radiated Emission)* | Farad | EZ-EMC | RA-03A1 |

*Remark: indicates software version used in the compliance certification testing

# 2. SUMMARY OF TEST RESULTS

| FCC Rules | Description of Test Item | Result |
|---|---|---|
| §15.407(h) | Dynamic Frequency Selection (DFS) | Pass |

N/A: Not applicable

# 3.Dynamic Frequency Selection (DFS)

## 3.1 Requirement

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 | Yes |
| Channel Move Time | Yes | Yes |
| U-NII Detection Bandwidth | Yes | Not required |

| Additional requirements for devices with multiple bandwidth | 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. | | |

**LIMIT**

1. 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 ≥ 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.

2. DFS Response Requirements

Table 4: DFS Response Requirement Values

| Paramenter | 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: 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 facilitating 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.

## 3.2 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.

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 | $\text{Roundup}\left\{\left(\frac{1}{360}\right)\cdot\left(\frac{19\cdot10^6}{\text{PRI}_{\mu\text{sec}}}\right)\right\}$ | 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

$$\left\{\left(\frac{1}{360}\right)\cdot\left(\frac{19\cdot10^6}{3066}\right)\right\}$$

would be Round up = Round up {17.2} = 18.

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 |

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 waveforms 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 wave

forms, then each additional waveform must also be unique and not repeated from the previous waveforms.

Table 7 – Frequency Hopping Radar Test Waveform

| Radar Type | Pulse Width (μsec) | PRI (μsec) | Pulses per Hop | Hopping Rate (kHz) | Hopping Sequence Length | Minimum Percentage of Successful | 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 wave form. The hopping sequence is different for each wave form and a 100-length segment is selected from the hopping sequence defined by the following algorithm:

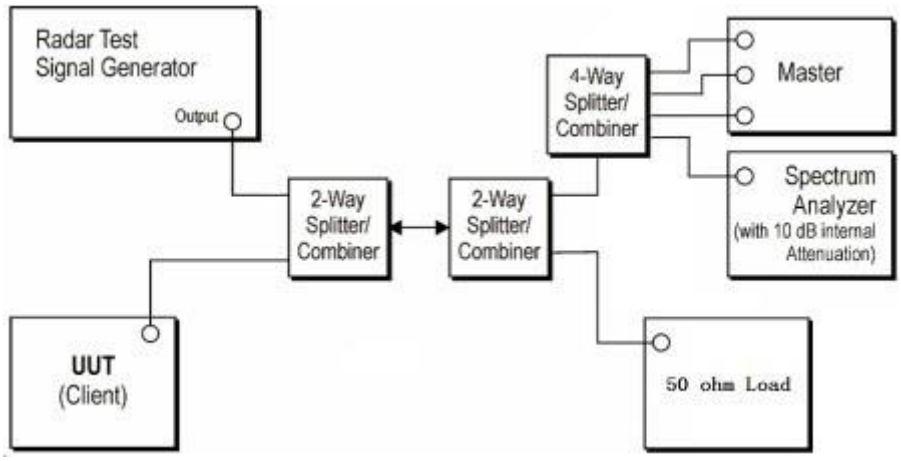
The first frequency in a hopping sequence is selected randomly from the group of 475 integer frequencies from 5250–5724MHz.Next,the frequency that was just chosen is removed from the group and a frequency is randomly selected from the remaining 474 frequencies in the group. This process continues until 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.

## 3.3 Calibration of Radar Waveform

Radar Waveform Calibration Procedure

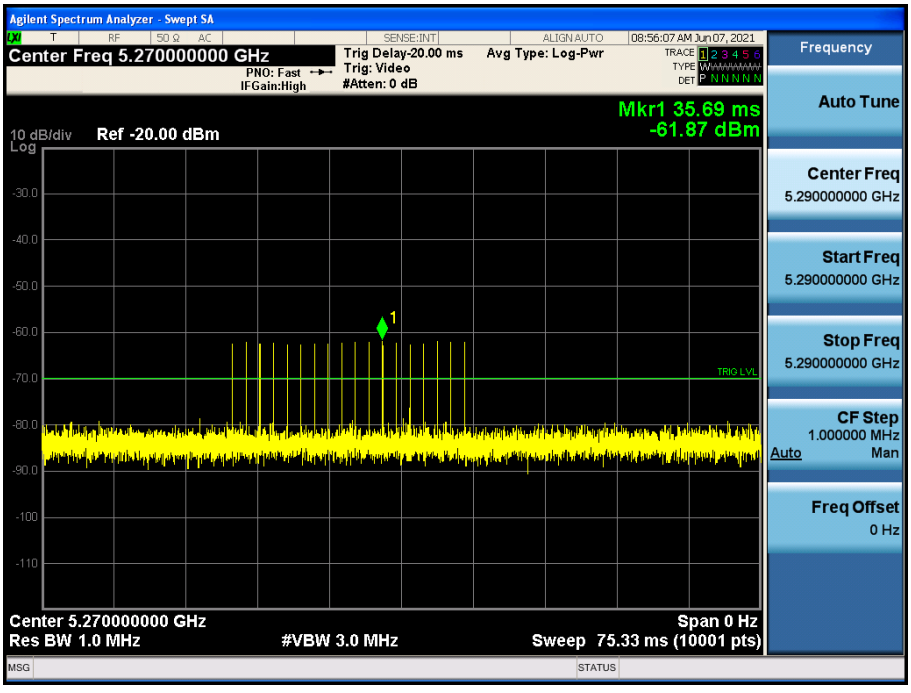
1) A 50 ohm load is connected in place of the spectrum analyzer, and the spectrum analyzer is connected to place of the master
2) The interference Radar Detection Threshold Level is -62dBm + 0dBi +1dB = -61dBm that had been taken into account the output power range and antenna gain.
3) The following equipment setup was used to calibrate the conducted radar waveform. A vector signal generator was utilized to establish the test signal level for radar type 0. 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 used. The spectrum analyzer resolution bandwidth (RBW) and video bandwidth (VBW) were set to 3 MHz. The spectrum analyzer had offset -1.0dB to compensate RF cable loss 1.0dB.
4) The vector signal generator amplitude was set so that the power level measured at the spectrum analyzer was - -62dBm + 0dBi +1dB = -61dBm. Capture the spectrum analyzer plots on short pulse radar waveform.

## Conducted Calibration Setup



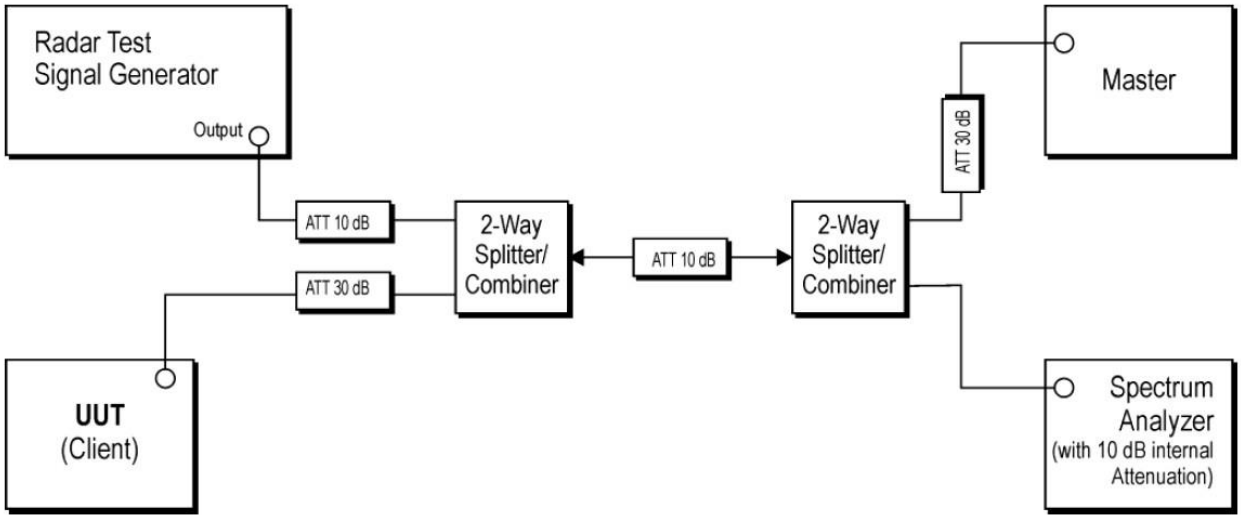

## Radar Waveform Calibration Result

Radar Type 0 (40MHz / 5270Hz)



**TEST CONFIGURATION**

Setup for Client with injection at the Master




## 3.4 TEST PROCEDURE

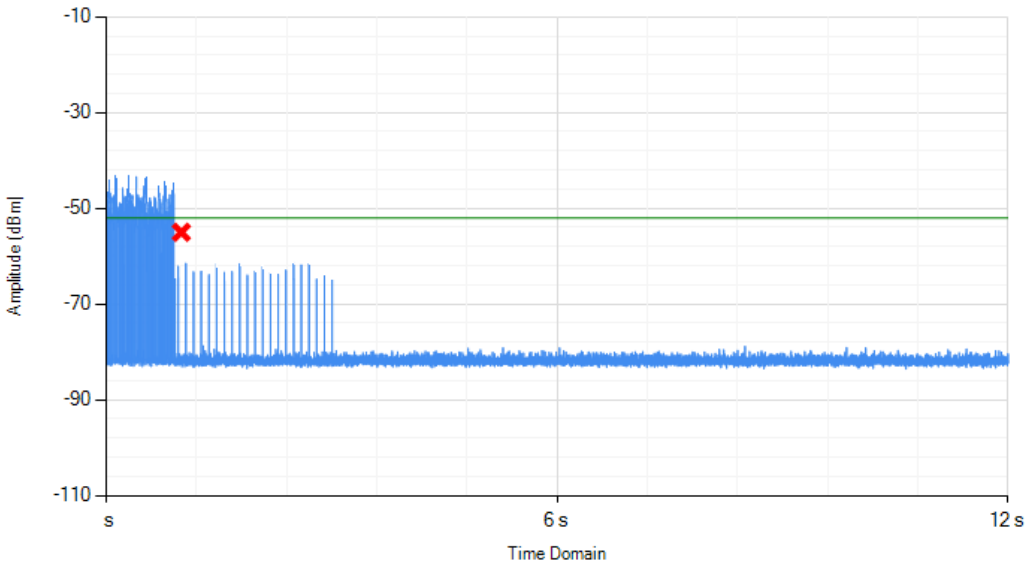
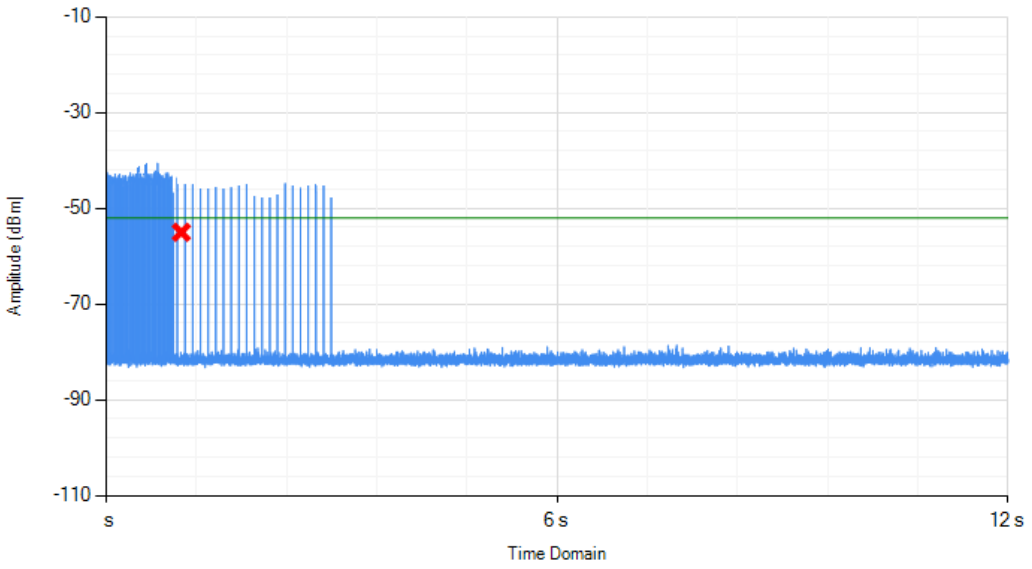
1. The radar pulse generator is setup to provide a pulse at frequency that the master and client are operating. A type 0 radar pulse with a 1us pulse width and a 1428us PRI is used for the testing.
2. The vector signal generator is adjusted to provide the radar burst (18 pulses) at the level of approximately -61dBm at the antenna port of the master device
3. A trigger is provided from the pulse generator to the DFS monitoring system in order to capture the traffic and the occurrence of the radar pulse.
4. EUT will associate with the master at channel. The file “iperf.exe” specified by the FCC is streamed from the PC 2 through the master and the client device to the PC 1 and played in full motion video using Media Player Classic Ver. 6.4.8.6 in order to properly load the network for the entire period of the test.
5. When radar burst with a level equal to the DFS Detection Threshold +1dB is generated on the operating channel of the U-NII device. At time T0 the radar waveform generator sends a burst of pulse of the radar waveform at Detection Threshold +1dB.
6. Observe the transmissions of the EUT at the end of the radar Burst on the Operating Channel Measure and record the transmissions from the UUT during the observation time (Channel Move Time). One 15 seconds plot is reported for the Short Pulse Radar Type 0. The plot for the Short Pulse Radar Types start at the end

of the radar burst. The Channel Move Time will be calculated based on the zoom in 600ms plot of the Short Pulse Radar Type

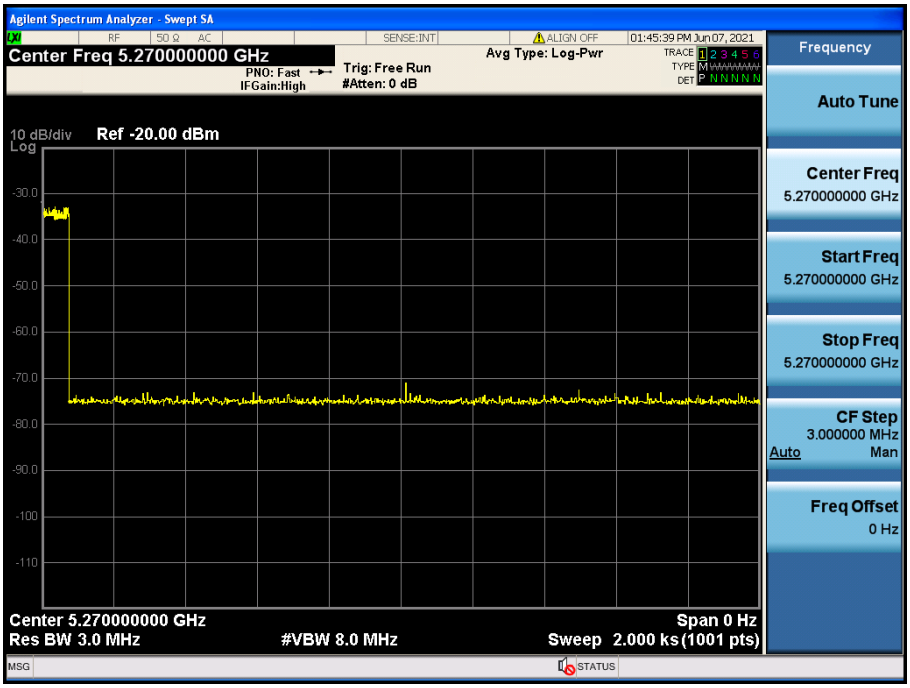
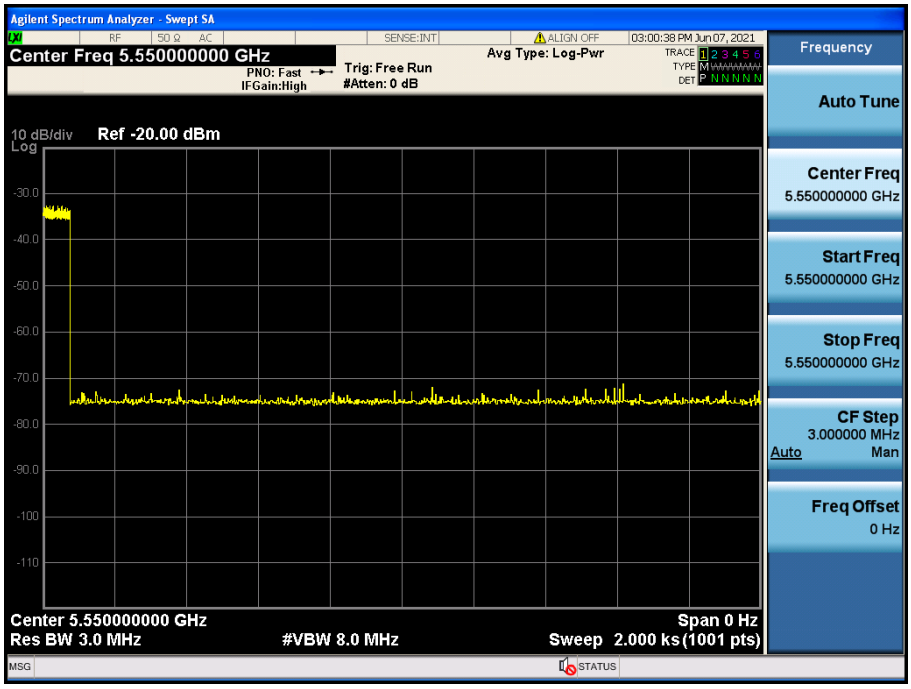
7. Measurement of the aggregate duration of the Channel Closed Transmission Time method. With the spectrum analyzer set to zero span tuned to the center frequency of the EUT operating channel at the radar simulated frequency, peak detection, and max hold, the dwell time per bin is given by: Dwell (0.3ms) =S (12000ms) / B (4000); where Dwell is the dwell time per spectrum analyzer sampling bin, S is sweep time and B is the number of spectrum analyzer sampling bins. An upper bound of the aggregate duration of the intermittent control signals of Channel Closing Transmission Time is calculated by: C (ms)= N X Dwell (0.3ms); where C is the Closing Time, N is the number of spectrum analyzer sampling bins (intermittent control signals) showing a U-NII transmission and Dwell is the dwell time per bin.
8. Measurement the EUT for more than 30 minutes following the channel move time to verify that no transmission or beacons occur on this channel.

## 3.5 TEST RESULTS

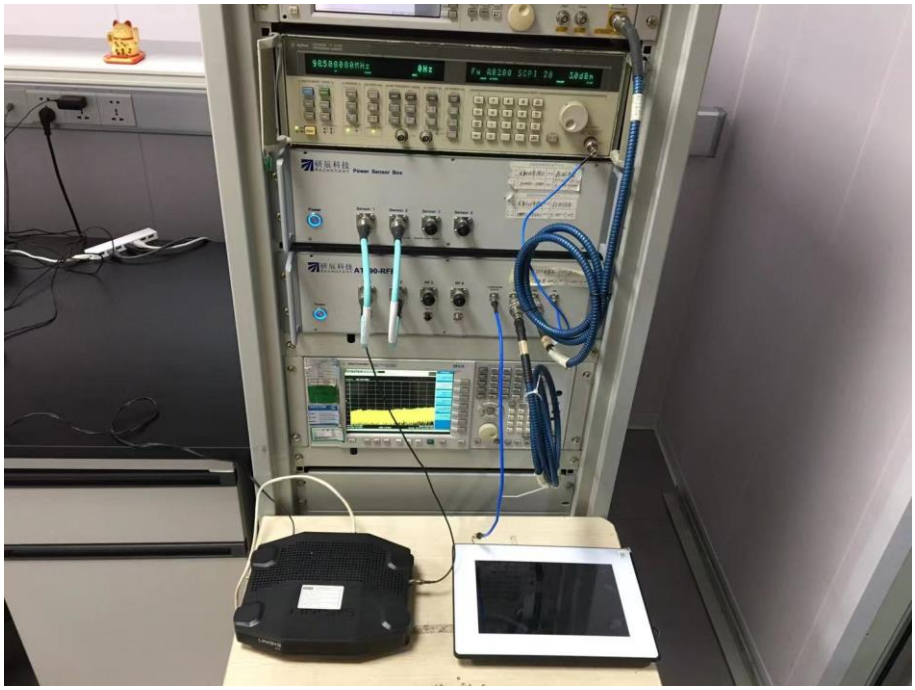
| BW/Channel | Test Item | Test Result(s) | Limit | Result |
|---|---|---|---|---|
| 80MHz/5290MHz | Channel Move Time | 1.997 | ＜10s | Pass |
| | Channel Closing Transmission Time | 0.0111 | ＜0.26s | Pass |
| 80MHz/5610MHz | Channel Move Time | 1.995 | ＜10s | Pass |
| | Channel Closing Transmission Time | 0.0313 | ＜0.26s | Pass |

| Channel Move Time& Channel Closing Transmission Time |
| --- |
|  |
| 40MHz/5270MHz |
|  |
| 40MHz/5550MHz |

Non-occupancy Observer

| Non-occupancy period |
| --- |
|  |
| 40MHz/5270MHz |
|  |
| 40MHz/5550MHz |

# EXHIBIT 1 - TEST SETUP PHOTOGRAPHS

| | |
|---|---|
| **DFS Test Setup** |  |

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