

ATC

TEST REPORT

Applicant Name : Hearth Display Inc.
Address : FCC: 364 Lincoln Pl, #E7, Brooklyn, NY, NY 11238 United States
IC: 364 Lincoln Pl, #E7, Brooklyn NY 11238 United States Of America
Report Number : SZNS221021-48560E-RFC
FCC ID: 2A896-E0027
IC 29706-E0027

Test Standard (s)

FCC PART 15.407; RSS-247, ISSUE 2, FEBRUARY 2017

Sample Description

Product Type: Hearth Display
Model No.: Hearth Display Matte White 27"(HD-SALE-HDP-DSP-MW-27)
Multiple Model(s) No.: Hearth Display Matte Black 27" (HD-SALE-HDP-DSP-MB-27)
Hearth Display Light Wood 27"(HD-SALE-HDP-DSP-LW-27)
Trade Mark: N/A
Date Received: 2022/10/21
Report Date: 2022/11/25

| | |
|--------------|-------|
| Test Result: | Pass* |
|--------------|-------|

* In the configuration tested, the EUT complied with the standards above.

Prepared and Checked By:

Roger Ling
EMC Engineer

Approved By:

Candy Li
EMC Engineer

Note: This report may contain data that are not covered by the A2LA accreditation and are marked with an asterisk “*”.

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TABLE OF CONTENTS

| | |
|---|-----------|
| GENERAL INFORMATION..... | 3 |
| PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT)..... | 3 |
| OBJECTIVE | 3 |
| TEST METHODOLOGY | 3 |
| TEST FACILITY | 4 |
| SYSTEM TEST CONFIGURATION..... | 5 |
| DESCRIPTION OF TEST CONFIGURATION | 5 |
| EUT EXERCISE SOFTWARE | 5 |
| EQUIPMENT MODIFICATIONS | 5 |
| SUPPORT EQUIPMENT LIST AND DETAILS | 5 |
| EXTERNAL I/O CABLE..... | 5 |
| SUMMARY OF TEST RESULTS | 6 |
| TEST EQUIPMENT LIST | 7 |
| APPLICABLE STANDARDS..... | 8 |
| DFS REQUIREMENT | 8 |
| DFS MEASUREMENT SYSTEM..... | 12 |
| SYSTEM BLOCK DIAGRAM | 12 |
| CONDUCTED METHOD | 13 |
| RADIATED METHOD..... | 14 |
| TEST PROCEDURE | 14 |
| TEST RESULTS..... | 15 |
| DESCRIPTION OF EUT | 15 |
| RADAR WAVEFORM CALIBRATION | 15 |
| TEST DATA | 15 |
| CHANNEL MOVE TIME AND CHANNEL CLOSING TRANSMISSION TIME | 16 |
| TEST PROCEDURE | 16 |
| TEST DATA | 16 |
| NON-OCCUPANCY PERIOD..... | 17 |
| TEST PROCEDURE | 17 |
| TEST DATA | 17 |
| APPENDIX | 18 |
| APPENDIX A: DFS DETECTION THRESHOLDS | 18 |
| APPENDIX B: CHANNEL MOVE TIME AND CHANNEL CLOSING TRANSMISSION TIME | 21 |
| APPENDIX C: NON-OCCUPANCY PERIOD | 23 |

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

| | |
|---------------------------------------|---|
| Product | Hearth Display |
| Tested Model | Hearth Display Matte White 27"(HD-SALE-HDP-DSP-MW-27) |
| Multiple Models | Hearth Display Matte Black 27" (HD-SALE-HDP-DSP-MB-27) Hearth Display Light Wood 27"(HD-SALE-HDP-DSP-LW-27) (model difference see product declaration letter of similarity) |
| HVIN | R102 V1.0A |
| FVIN | ZX-WF2708T-R102V1.0A-27-G1.1-GG-R1-20220505 |
| Frequency Range | 5GHz Wi-Fi: 5250-5350 MHz; 5470-5725MHz Note: frequency range 5600-5650MHz can't be use in Canada |
| Mode | 802.11a/n20/n40/ac20/ac40/ac80 |
| Maximum Conducted Average Ouput Power | 5250-5350MHz: 15.17dBm 5470-5725MHz: 11.24dBm |
| Modulation Technique | OFDM |
| Antenna Specification* | 2.48dBi (It is provided by the applicant) |
| Voltage Range | DC 12V from adapter |
| Sample serial number | 1N84-1 (Assigned by ATC) |
| Sample/EUT Status | Good condition |
| Adapter information | Model: FJ-SW729C1205000U Input: AC 100-240V, 50/60Hz, 1.5A Max Output: DC 12.0V, 5.0A ,60.0W |

Objective

This test report is in accordance with Part 2-Subpart J, Part 15-Subparts E of the Federal Communications Commission's rules, and RSS-247, Issue 2, February 2017 of the Innovation, Science and Economic Development Canada..

The objective is to determine compliance with FCC Part 15, Subpart E, section 15.407 Dynamic Frequency Selection (DFS) for devices operating in the bands 5250-5350 MHz, 5470-5725 MHz.

The objective is to determine compliance with Dynamic Frequency Selection (DFS) of the RSS-247, Issue 2, February 2017 of the Innovation, Science and Economic Development Canada for devices operating in the bands 5250-5350 MHz, 5470-5600MHz and 5650-5725 MHz.

Test Methodology

FCC KDB 905462 D02 UNII DFS Compliance Procedures New Rules v02.
Each test item follows test standards and with no deviation.

Test Facility

The test site used by Shenzhen Accurate Technology Co., Ltd. to collect test data is located on the 1/F., Building A, Changyuan New Material Port, Science & Industry Park, Nanshan District, Shenzhen, Guangdong, P.R. China.

The test site has been approved by the FCC under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No.: 708358, the FCC Designation No.: CN1189. Accredited by American Association for Laboratory Accreditation (A2LA) The Certificate Number is 429 7.01.

Listed by Innovation, Science and Economic Development Canada (ISED), the Registration Number is 5077A.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The EUT was configured for testing in an engineering mode which was provided by the manufacturer.

EUT Exercise Software

“Authentic Tool” software was used.

Equipment Modifications

N/A

Support Equipment List and Details

| Manufacturer | Description | Model | Serial Number |
|--------------|-------------|-------------------------------------|------------------|
| Gospower | POE | G0720-480-050 | 212701319 |
| Grandstream | Router | GWN7664LR (FCC ID: YZZGWN7664LR) | 259LAT9M123E666D |
| DELL | NoteBook | 67CTQ12 | 1350545499398 |

External I/O Cable

| Cable Description | Shielding Type | Ferrite Core | Length (m) | From Port | To |
|-------------------|----------------|--------------|------------|-----------------|--------|
| RJ45 Cable | No | No | 1.5 | POE | Router |
| RF Cable | Yes | No | 1.0 | RF Contorl unit | Router |
| RF Cable | Yes | No | 1.0 | RF Contorl unit | EUT |

SUMMARY OF TEST RESULTS

The following result table represents the list of measurements required under the CFR §47 Part 15.407(h), RSS-247 Issue 2 §6.3 and KDB: 905462 D02 UNII DFS Compliance Procedures New Rules v02

| Items | Description of Test | Result |
|--------------------------------|---|----------------|
| Detection Bandwidth | UNII Detection Bandwidth | Not Applicable |
| Performance Requirements Check | Initial Channel Availability Check Time (CAC) | Not Applicable |
| | Radar Burst at the Beginning of the CAC | Not Applicable |
| | Radar Burst at the End of the CAC | Not Applicable |
| In-Service Monitoring | Channel Move Time | Compliant |
| | Channel Closing Transmission Time | Compliant |
| | Non-Occupancy Period | Compliant |
| Radar Detection | Statistical Performance Check | Not Applicable |

Note: EUT is client without radar detection

TEST EQUIPMENT LIST

| Manufacturer | Description | Model | Serial Number | Calibration Date | Calibration Due Date |
|---------------|-------------------------|----------|---------------|------------------|----------------------|
| Rohde&Schwarz | Spectrum Analyzer | FSV-40 | 101590 | 2022/01/19 | 2023/01/18 |
| Tonscend | RF Control Unit | JS0806-2 | 19G8060182 | 2022/07/06 | 2023/07/05 |
| AGILENT | Vector Signal Generator | N5182A | MY50143401 | 2021/12/13 | 2022/12/12 |
| Unknown | RF Coaxial Cable | No.31 | RF-01 | Each time | |

*** Statement of Traceability:** Shenzhen Accurate Technology Co., Ltd. attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

APPLICABLE STANDARDS

DFS Requirement

CFR §47 Part 15.407(h) & RSS-247, Issue 2, February 2017 section 6.3

FCC KDB 905462 D02 UNII DFS Compliance Procedures New Rules v02

Table 1: Applicability of DFS Requirements Prior to Use of a Channel

| Requirement | Operational Mode | | |
|--|------------------|--------------------------------|-----------------------------|
| | Master | Client Without Radar Detection | Client With Radar Detection |
| <i>Non-Occupancy Period</i> | Yes | Not required | Yes |
| <i>DFS Detection Threshold</i> | Yes | Not required | Yes |
| <i>Channel Availability Check Time</i> | Yes | Not required | Not required |
| <i>U-NII Detection Bandwidth</i> | 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 |
| <i>DFS Detection Threshold</i> | Yes | Not required |
| <i>Channel Closing Transmission Time</i> | Yes | Yes |
| <i>Channel Move Time</i> | Yes | Yes |
| <i>U-NII Detection Bandwidth</i> | Yes | Not required |

| Additional requirements for devices with multiple bandwidth modes | Master Device or Client with Radar Detection | Client Without Radar Detection |
|--|--|--|
| <i>U-NII Detection Bandwidth and Statistical Performance Check</i> | All BW modes must be tested | Not required |
| <i>Channel Move Time and Channel Closing Transmission Time</i> | Test using widest BW mode available | Test using the widest BW mode available for the link |
| <i>All other tests</i> | 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.

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 |
| <p>Note 1: This is the level at the input of the receiver assuming a 0 dBi receive antenna.</p> <p>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.</p> <p>Note 3: EIRP is based on the highest antenna gain. For MIMO devices refer to KDB Publication 662911 D01.</p> | |

Table 4: DFS Response Requirement Values

| Parameter | Value |
|--|---|
| <i>Non-occupancy period</i> | Minimum 30 minutes |
| <i>Channel Availability Check Time</i> | 60 seconds |
| <i>Channel Move Time</i> | 10 seconds See Note 1. |
| <i>Channel Closing Transmission Time</i> | 200 milliseconds + an aggregate of 60 milliseconds over remaining 10 second period. See Notes 1 and 2. |
| <i>U-NII Detection Bandwidth</i> | Minimum 100% of the U-NII 99% transmission power bandwidth. See Note 3. |
| <p>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.</p> <p>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.</p> <p>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.</p> | |

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 | Roundup $\left\lceil \left(\frac{1}{360} \right) \cdot \left(\frac{19 \cdot 10^6}{\text{PRI}_{\mu\text{sec}}} \right) \right\rceil$ | 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 usec is selected, the number of pulses would be Roundup $\left\lceil \left(\frac{1}{360} \right) \cdot \left(\frac{19 \cdot 10^6}{3066} \right) \right\rceil = \text{Roundup}\{17.2\} = 18$.

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 |

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% |
| $\text{Aggregate } (82.9\% + 60\% + 90\% + 88\%) / 4 = 80.2\%$ | | | |

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 |

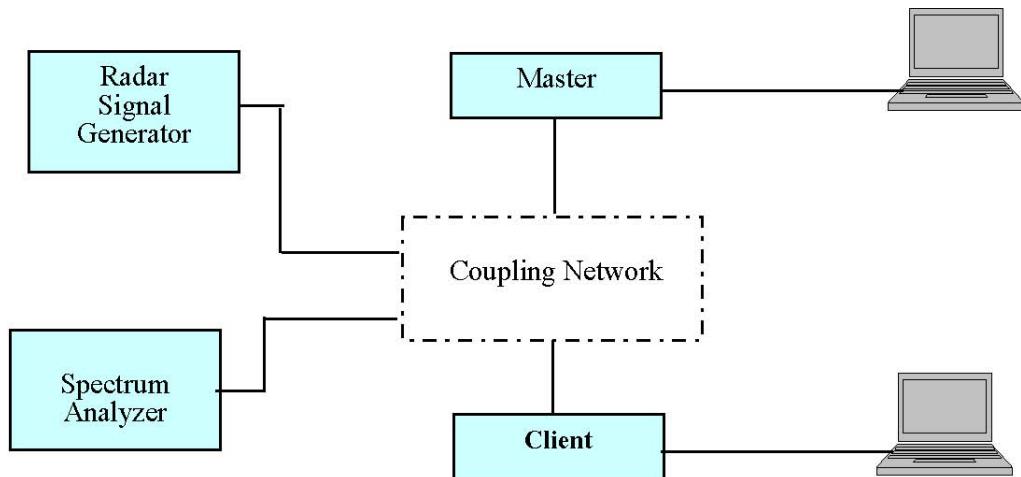
Table 7 – Frequency Hopping Radar Test Waveform

| 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 |

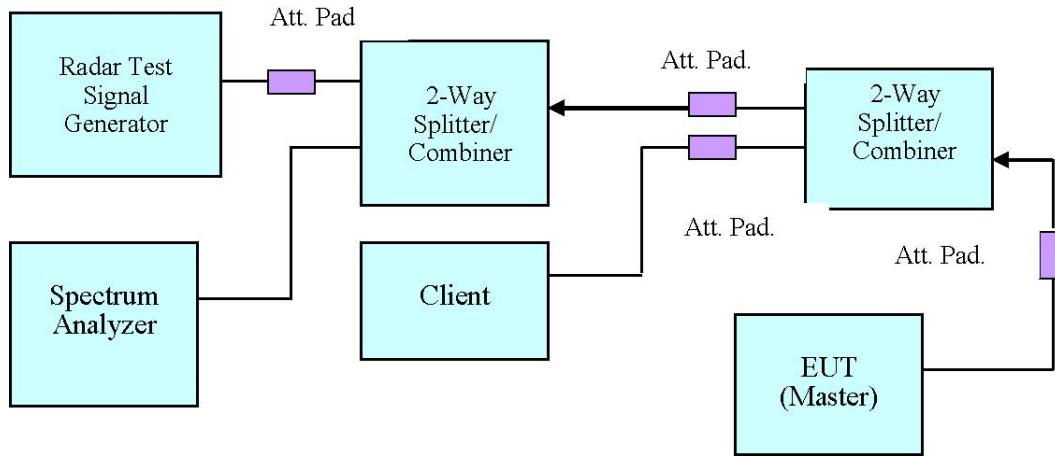
DFS Measurement System

DFS measurement system consists of two subsystems: (1) The radar signal generating subsystem and (2) the traffic monitoring subsystem.

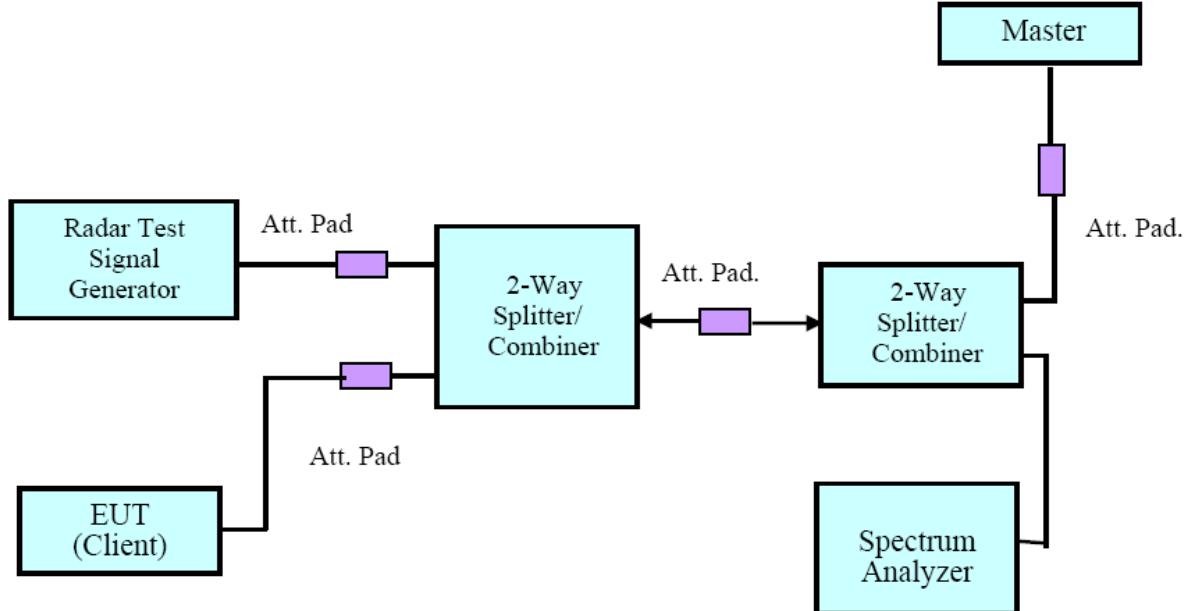
System Block Diagram



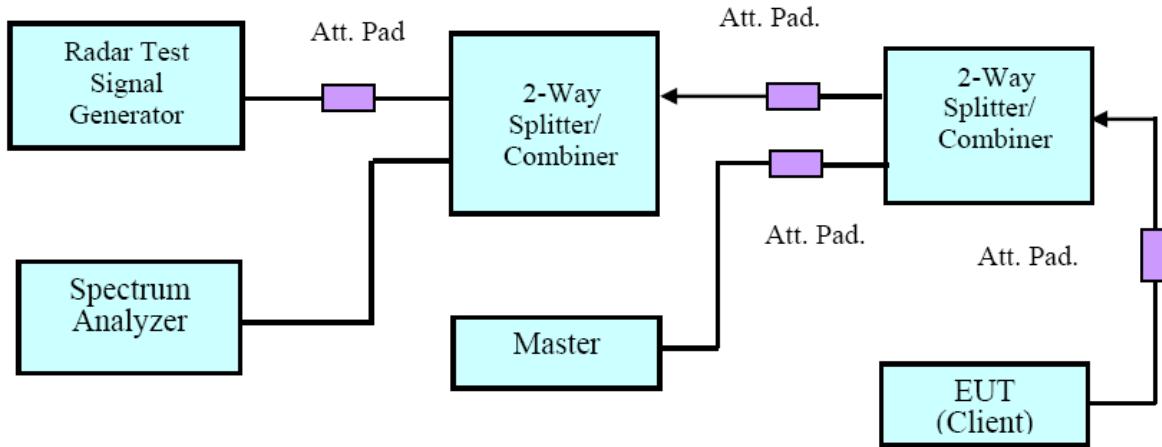
Conducted Method



Setup for Master with injection at the Master

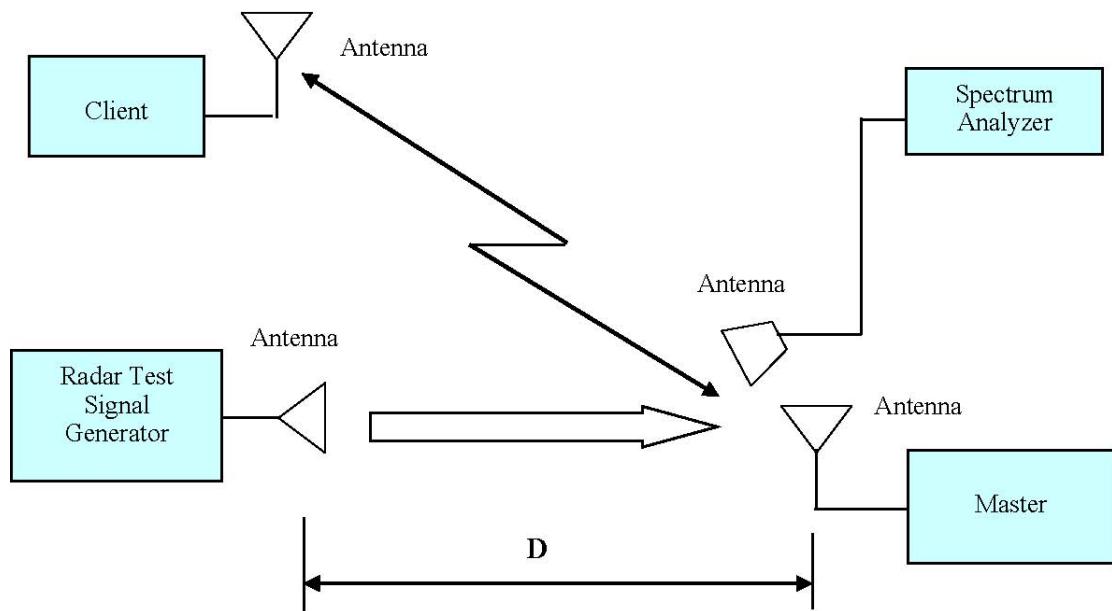


Setup for Client with injection at the Master



Setup for Client with injection at the Client

Radiated Method



Test Procedure

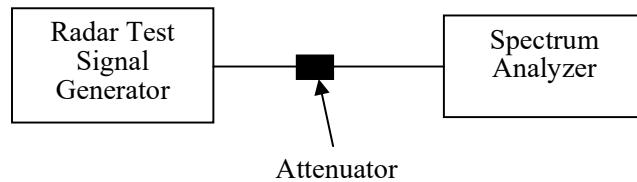
A spectrum analyzer is used as a monitor verifies that the EUT status including Channel Closing Transmission Time and Channel Move Time, and does not transmit on a Channel during the Non-Occupancy Period after the diction and Channel move. It is also used to monitor EUT transmissions during the Channel Availability Check Time.

TEST RESULTS

Description of EUT

The maximum EIRP is less than 200mW. The calibrated radiated DFS detection threshold level is set to -62 dBm.

Radar Waveform Calibration



Test Data

Environmental Conditions

| | |
|--------------------|-----------|
| Temperature: | 24.5 °C |
| Relative Humidity: | 54 % |
| ATM Pressure: | 101.0 kPa |

The testing was performed by Cat Kang on 2022-11-08.

EUT operation mode: Transmitting

Test Result: Pass

Please refer to the Appendix.

CHANNEL MOVE TIME AND CHANNEL CLOSING TRANSMISSION TIME

Test Procedure

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. repeat using a long pulse radar type5 waveform.

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.

The aggregate channel closing transmission time is calculated as follows:

Aggregate Transmission Time = $N \times \text{Dwell Time}$

N is the number of spectrum analyzer bins showing a device transmission Dwell Time is the dwell time per bin (i.e. Dwell Time = S/B , S is the sweep time and B is the number of bin, i.e. 8192)

Test Data

Environmental Conditions

| | |
|--------------------|-----------|
| Temperature: | 24.5 °C |
| Relative Humidity: | 54 % |
| ATM Pressure: | 101.0 kPa |

The testing was performed by Cat Kang on 2022-11-08.

EUT operation mode: Transmitting

Test Result: Pass

Please refer to the Appendix.

NON-OCCUPANCY PERIOD

Test Procedure

Measure the EUT for more than 30 minutes following the channel close.move time to verify that the EUT does not resume any transmissions on this channel. Provide one plot to demonstrate no transmission on the channel for the non-occupancy period (30 minutes observation time)

Test Data

Environmental Conditions

| | |
|---------------------------|-----------|
| Temperature: | 24.5 °C |
| Relative Humidity: | 54 % |
| ATM Pressure: | 101.0 kPa |

The testing was performed by Cat Kang on 2022-11-08.

EUT operation mode: Transmitting

Test Result: Pass

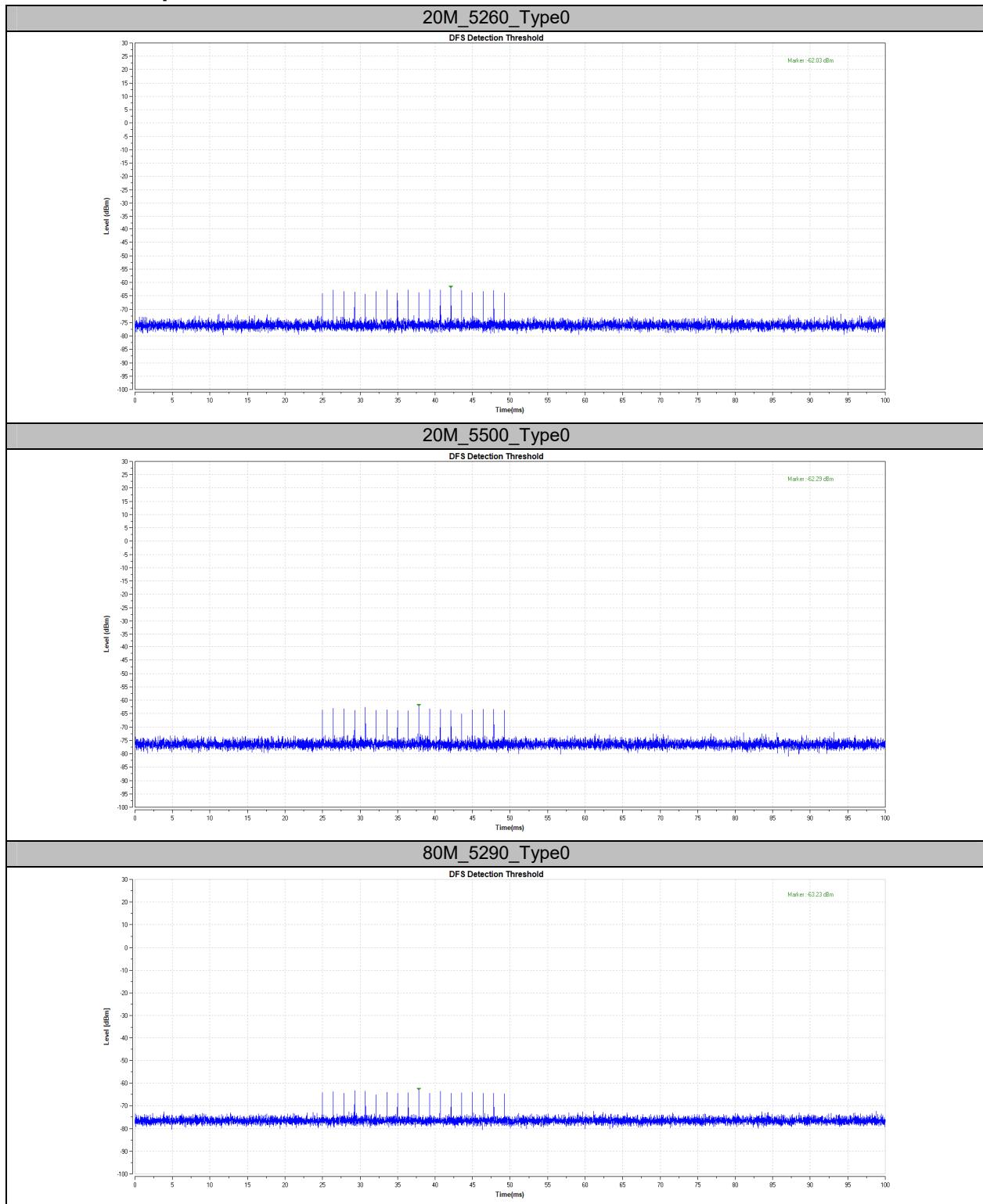
Please refer to the Appendix.

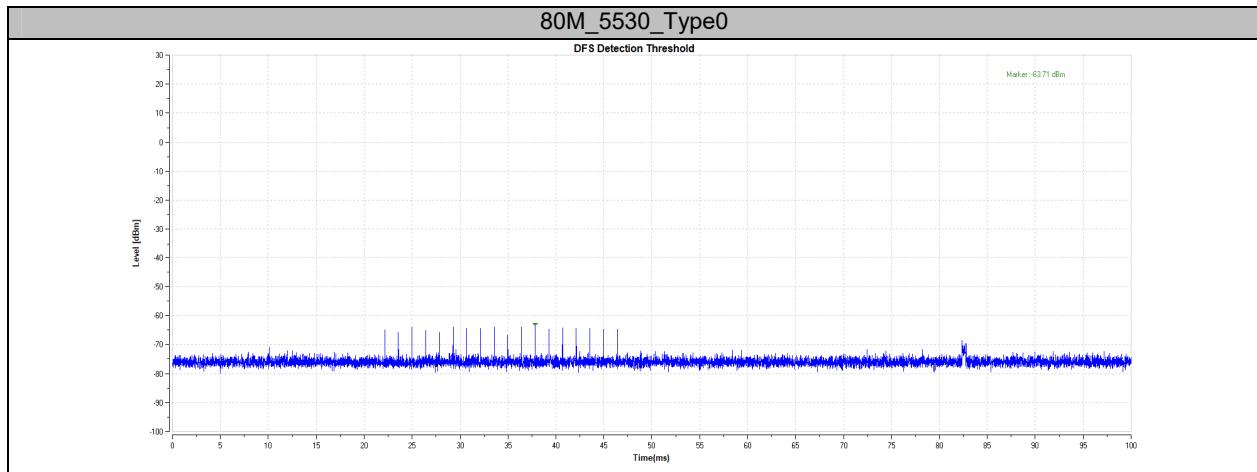
APPENDIX

Appendix A: DFS Detection Thresholds Test Result

| Test Mode | Channel | Radar Type | Result |
|-----------|---------|------------|--------|
| 20M | 5260 | Type0 | -62.03 |
| | 5500 | Type0 | -62.29 |
| 80M | 5290 | Type0 | -63.23 |
| | 5530 | Type0 | -63.71 |

Test Graphs

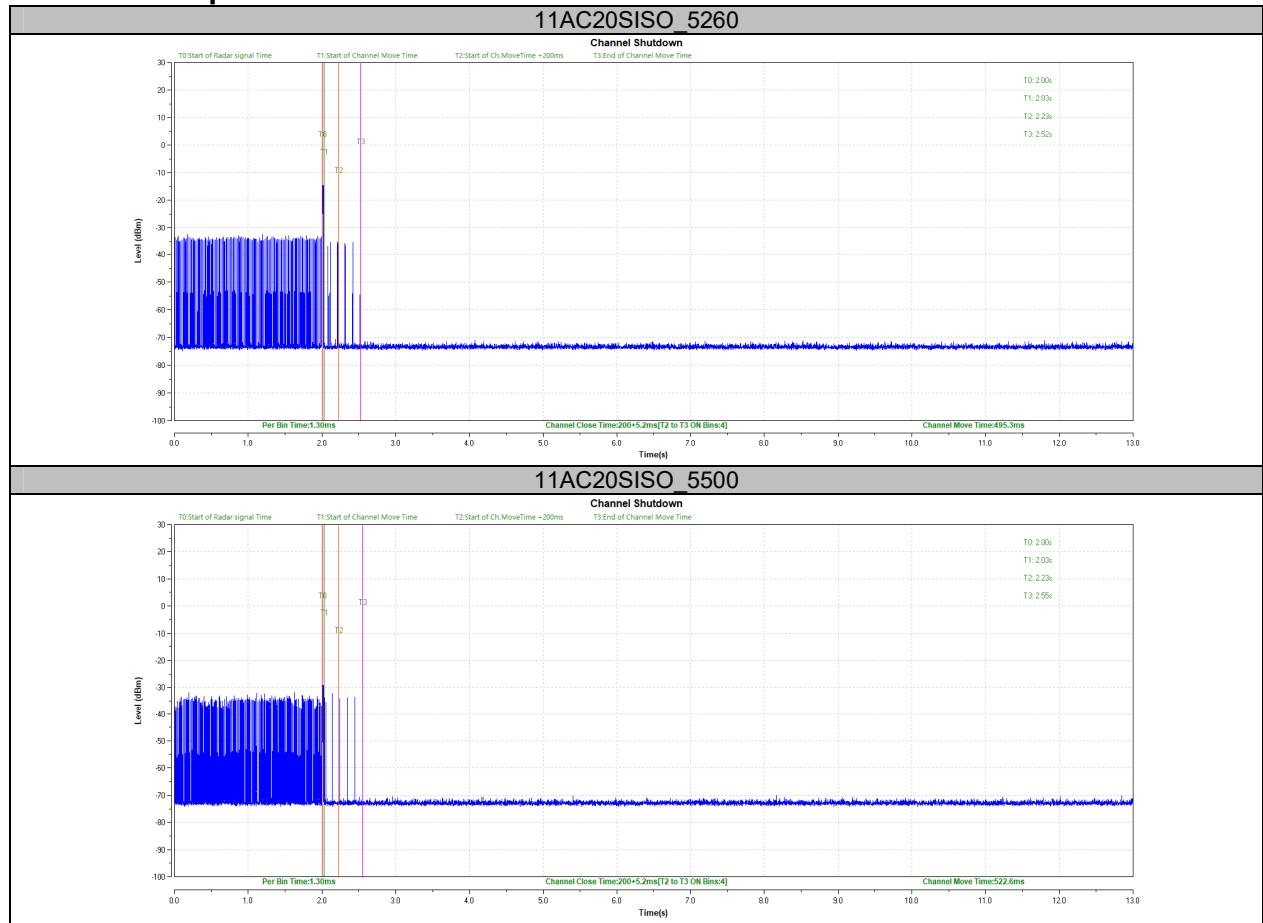


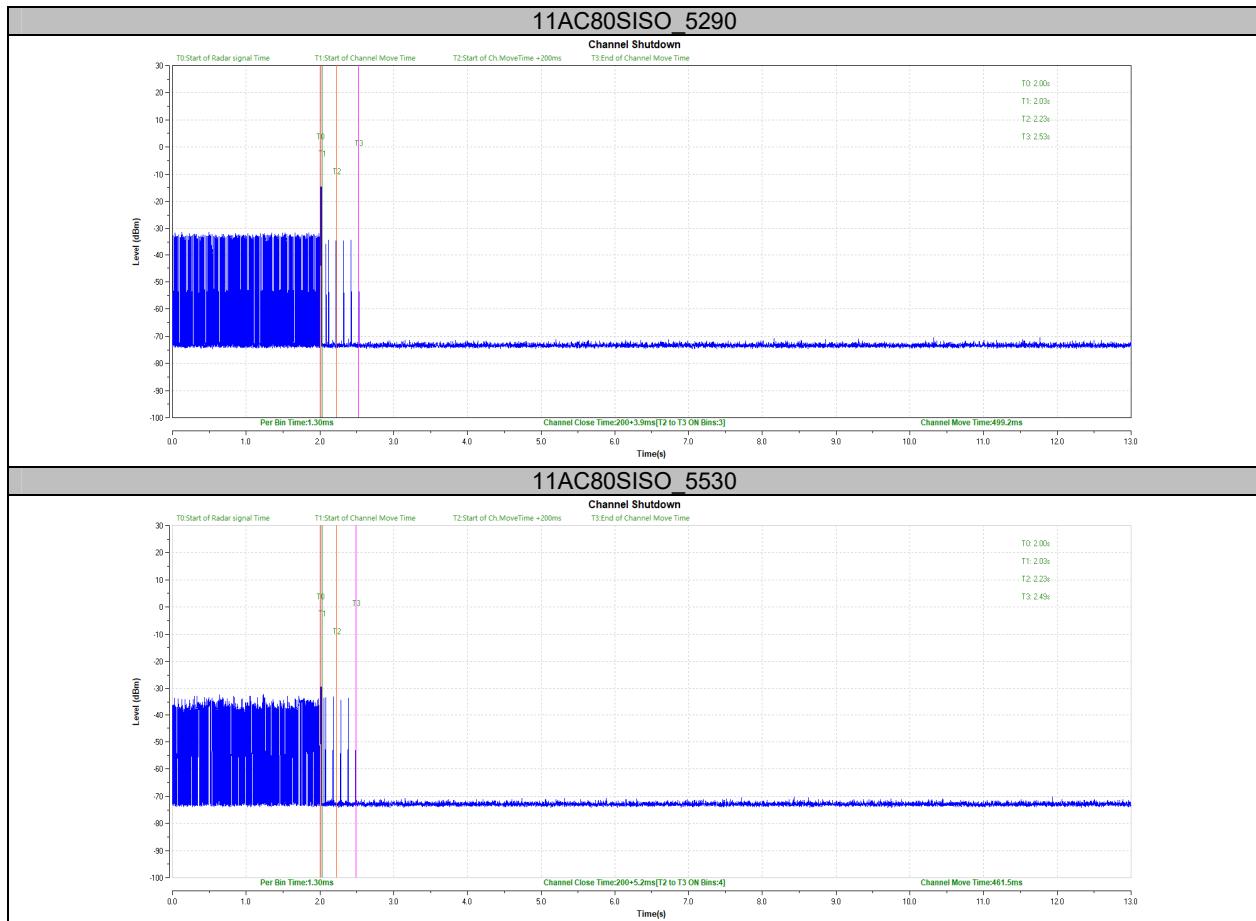


Appendix B: Channel Move Time and Channel Closing Transmission Time Test Result

| Test Mode | Channel | CCT[ms] | Limit[ms] | CMT[ms] | Limit[ms] | Verdict |
|------------|---------|---------|-----------|---------|-----------|---------|
| 11AC20SISO | 5260 | 200+5.2 | 200+60 | 495.3 | 10000 | PASS |
| | 5500 | 200+5.2 | 200+60 | 522.6 | 10000 | PASS |
| 11AC80SISO | 5290 | 200+3.9 | 200+60 | 499.2 | 10000 | PASS |
| | 5530 | 200+5.2 | 200+60 | 461.5 | 10000 | PASS |

Test Graphs



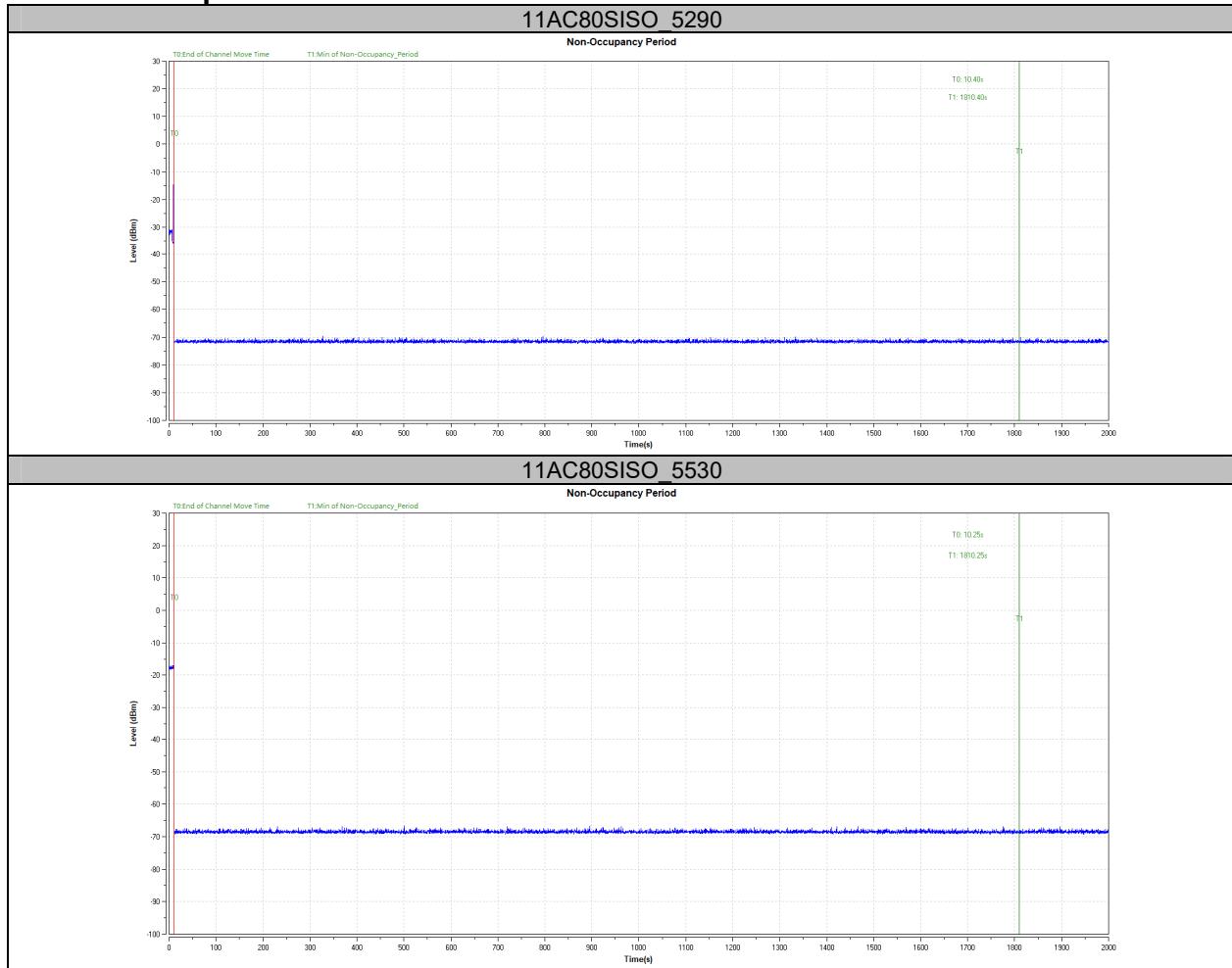


Appendix C: Non-Occupancy Period

Test Result

| Test Mode | Channel | Result | Limit[s] | Verdict |
|------------|---------|----------------|----------|---------|
| 11AC80SISO | 5290 | see test graph | ≥1800 | PASS |
| 11AC80SISO | 5530 | see test graph | ≥1800 | PASS |

Test Graphs



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