

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

## Prepared and Checked By:

*Roger Ling*

Roger Ling  
EMC Engineer

## Approved By:

*Candy Li*

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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## 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 Output 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

“AuthenticTool” 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
<b>Note:</b> 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><b>Note 1:</b> This is the level at the input of the receiver assuming a 0 dBi receive antenna.</p> <p><b>Note 2:</b> 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><b>Note 3:</b> 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><b>Note 1:</b> <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><b>Note 2:</b> 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</i> 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.</p> <p><b>Note 3:</b> 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 $\left\{ \left( \frac{1}{360} \right) \cdot \left( \frac{19 \cdot 10^6}{\text{PRI}_{\mu\text{SEC}}} \right) \right\}$	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
<b>Note 1:</b> 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  $\text{Roundup} \left\{ \left( \frac{1}{360} \right) \cdot \left( \frac{19 \cdot 10^6}{3066} \right) \right\} = \text{Roundup} \{17.2\} = 18$ .

**Table 5a - Pulse Repetition Intervals Values for Test A**

<b>Pulse Repetition Frequency Number</b>	<b>Pulse Repetition Frequency (Pulses Per Second)</b>	<b>Pulse Repetition Interval (Microseconds)</b>
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.

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

**Table 6 – Long Pulse Radar Test Waveform**

Radar Type	Pulse Width ( $\mu$ sec)	Chirp Width (MHz)	PRI ( $\mu$ sec)	Number of Pulses per <i>Burst</i>	Number of <i>Bursts</i>	Minimum Percentage of Successful Detection	Minimum Number of Trials
5	50-100	5-20	1000-2000	1-3	8-20	80%	30

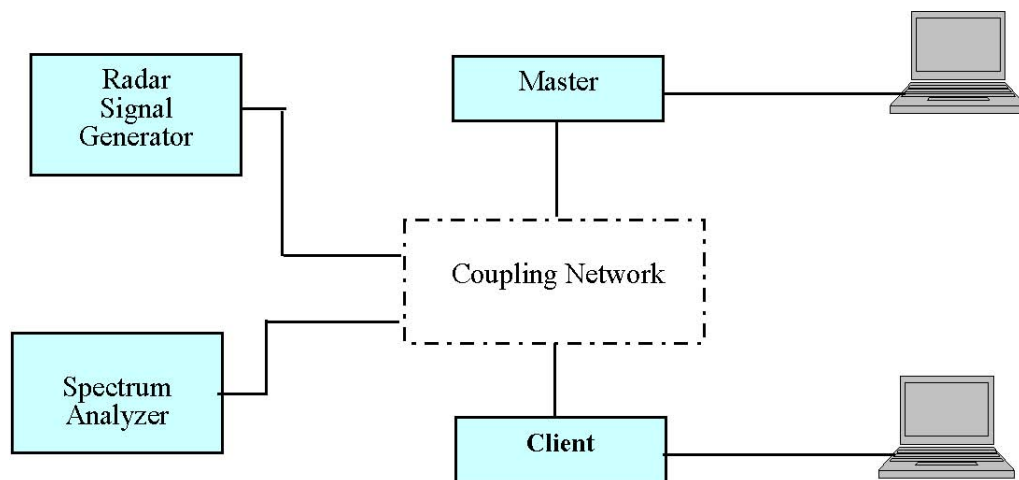
**Table 7 – Frequency Hopping Radar Test Waveform**

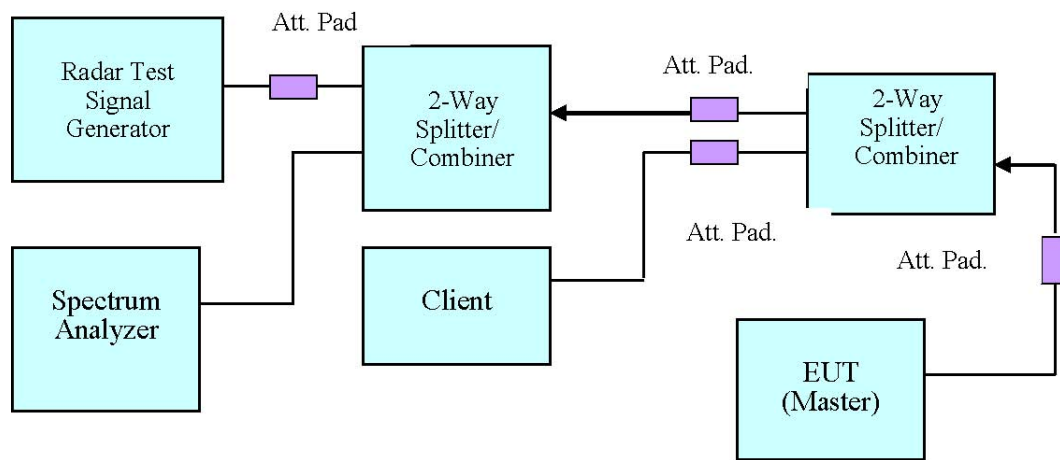
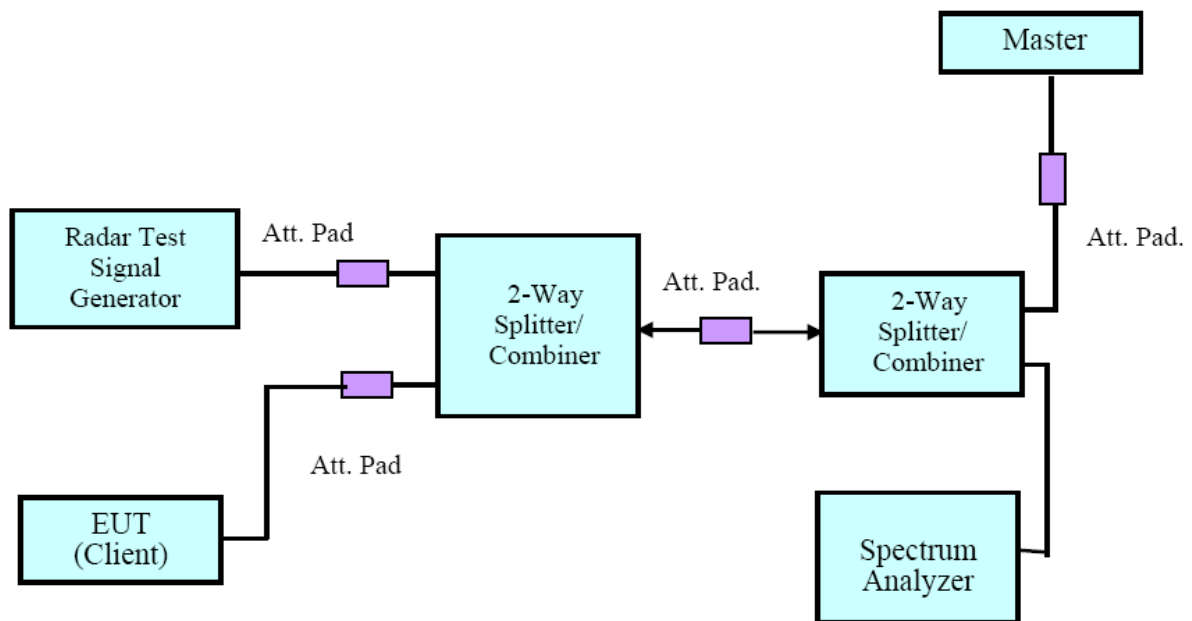
Radar Type	Pulse Width ( $\mu$ sec)	PRI ( $\mu$ sec)	Pulses per Hop	Hopping Rate (kHz)	Hopping Sequence Length (msec)	Minimum Percentage of Successful Detection	Minimum Number of Trials
6	1	333	9	0.333	300	70%	30

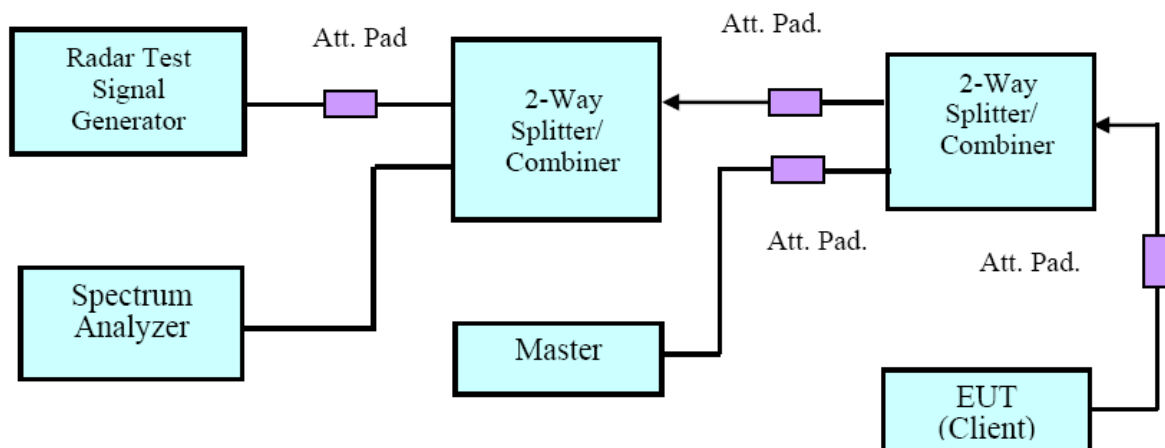
## DFS Measurement System

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

## System Block Diagram

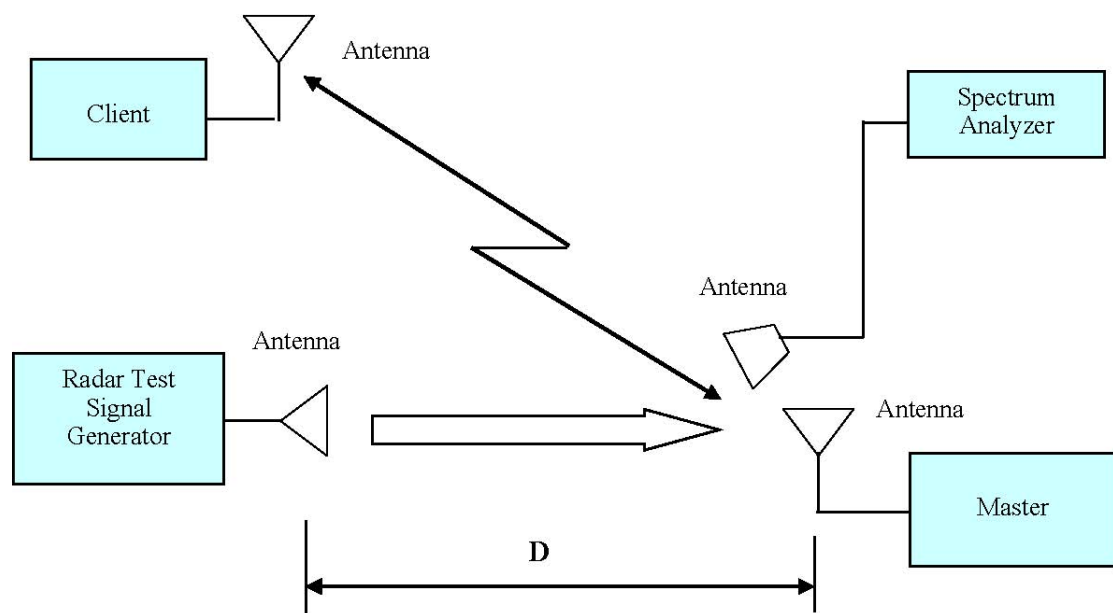


**Conducted Method****Setup for Master with injection at the Master****Setup for Client with injection at the Master**



Setup for Client with injection at the Client

### Radiated Method



### Test Procedure

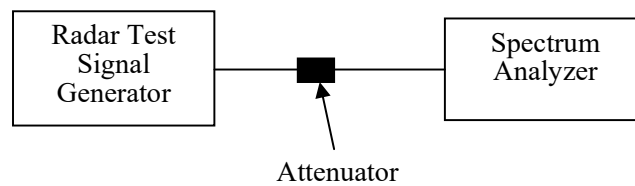
A spectrum analyzer is used as a monitor verifies that the EUT status including Channel Closing Transmission Time and Channel Move Time, and does not transmit on a Channel during the Non-Occupancy Period after the diction and Channel move. It is also used to monitor EUT transmissions during the Channel 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.  $\text{Dwell Time} = S/B$ , 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 very 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**

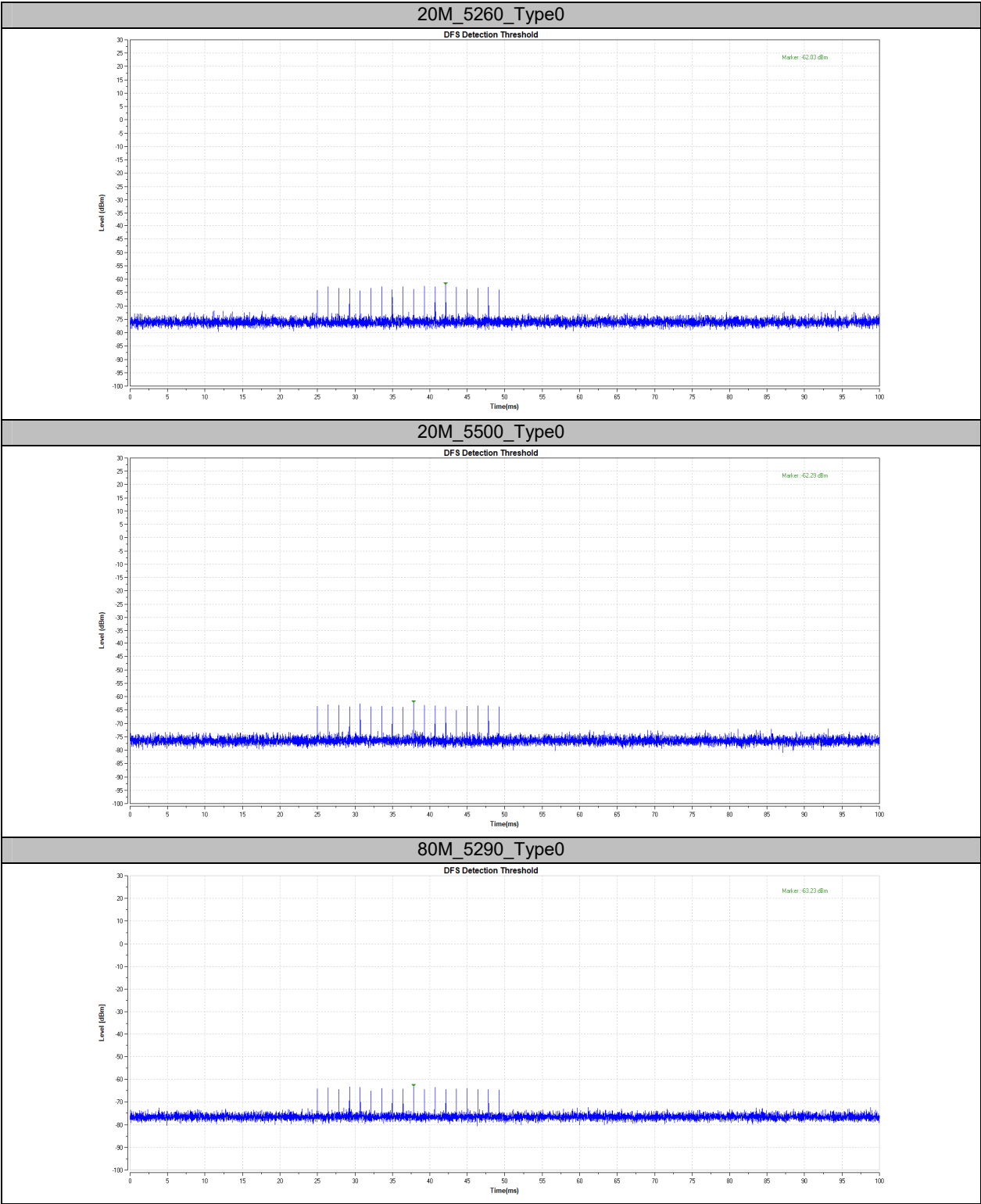
*Please refer to the Appendix.*

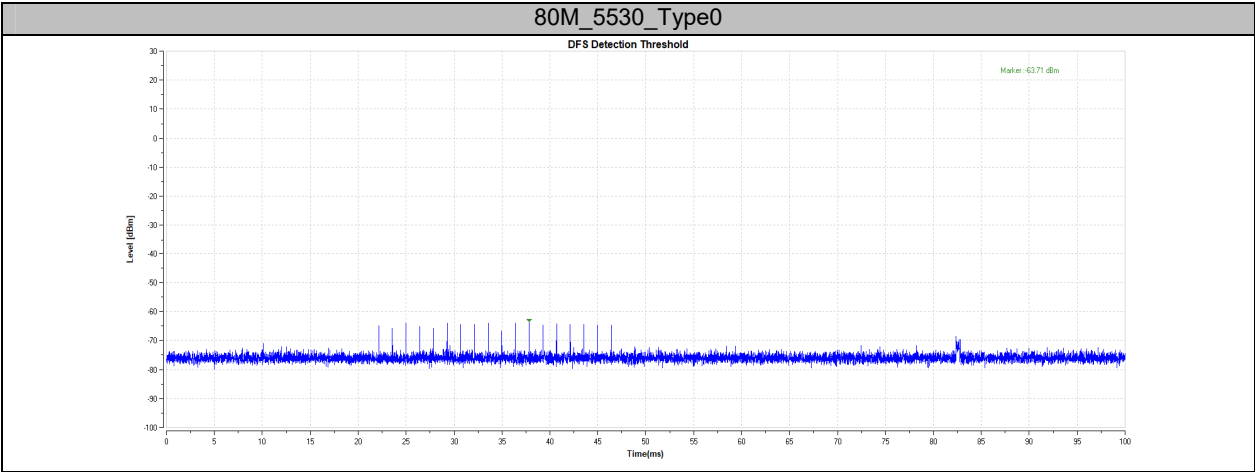
## APPENDIX

### 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

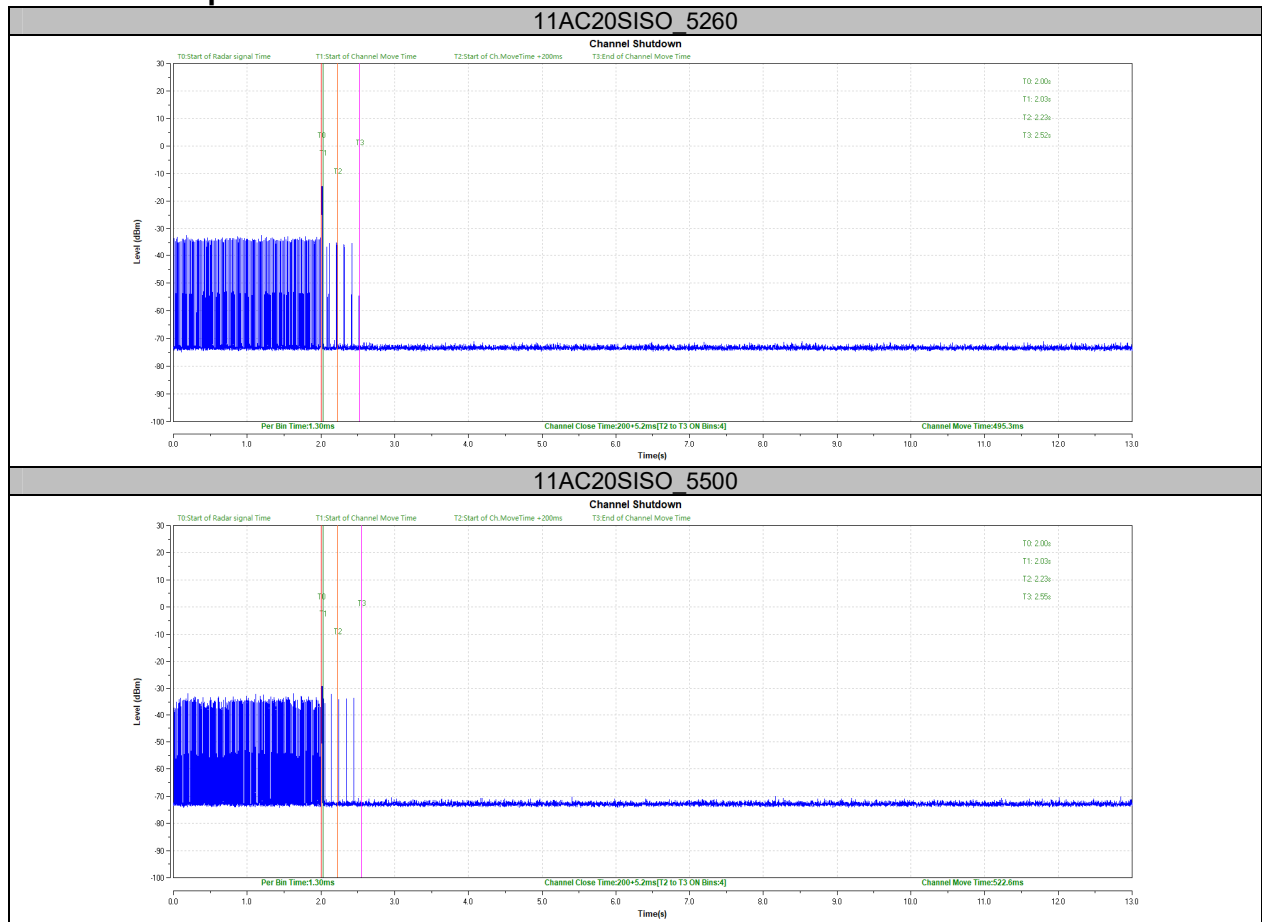


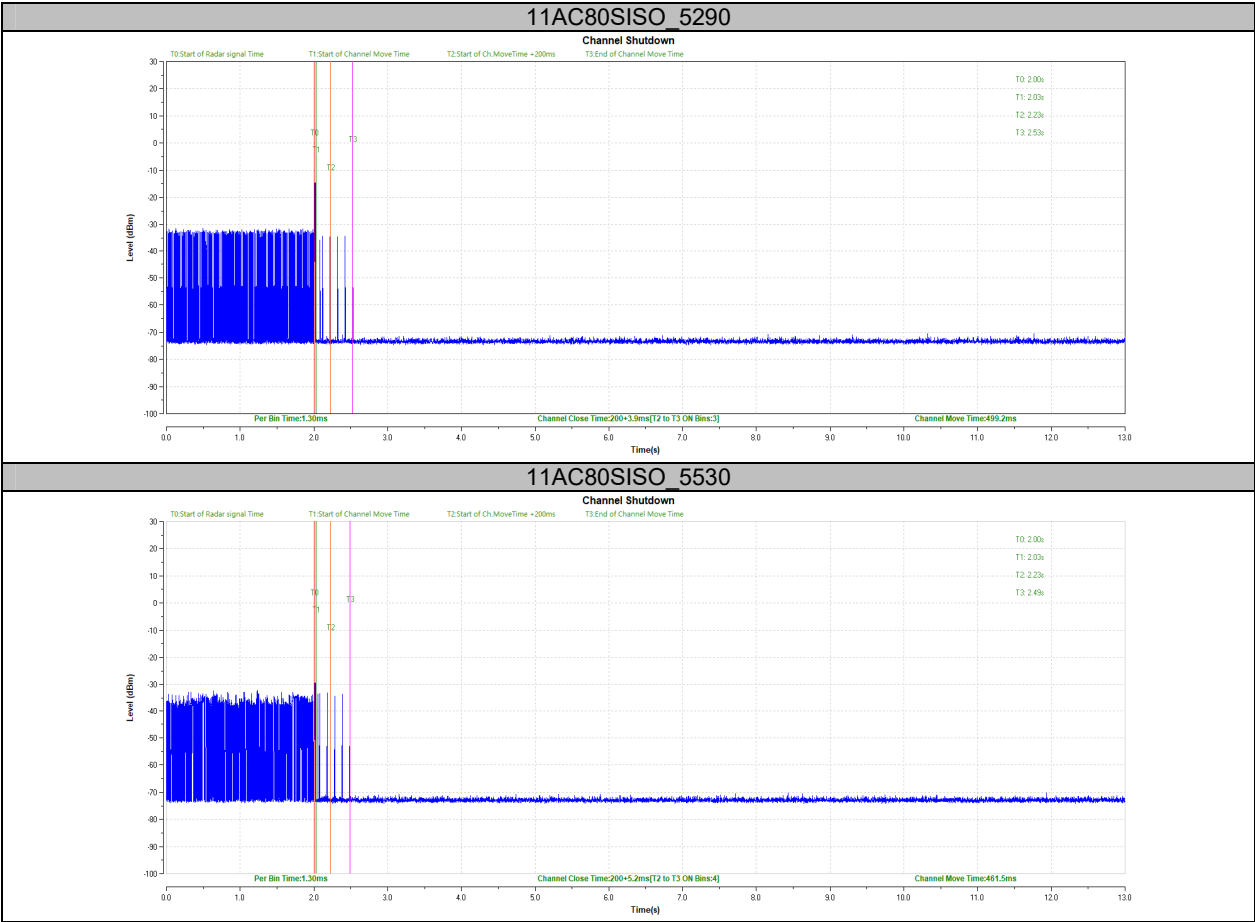


## Appendix B: Channel Move Time and Channel Closing Transmission Time Test Result

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



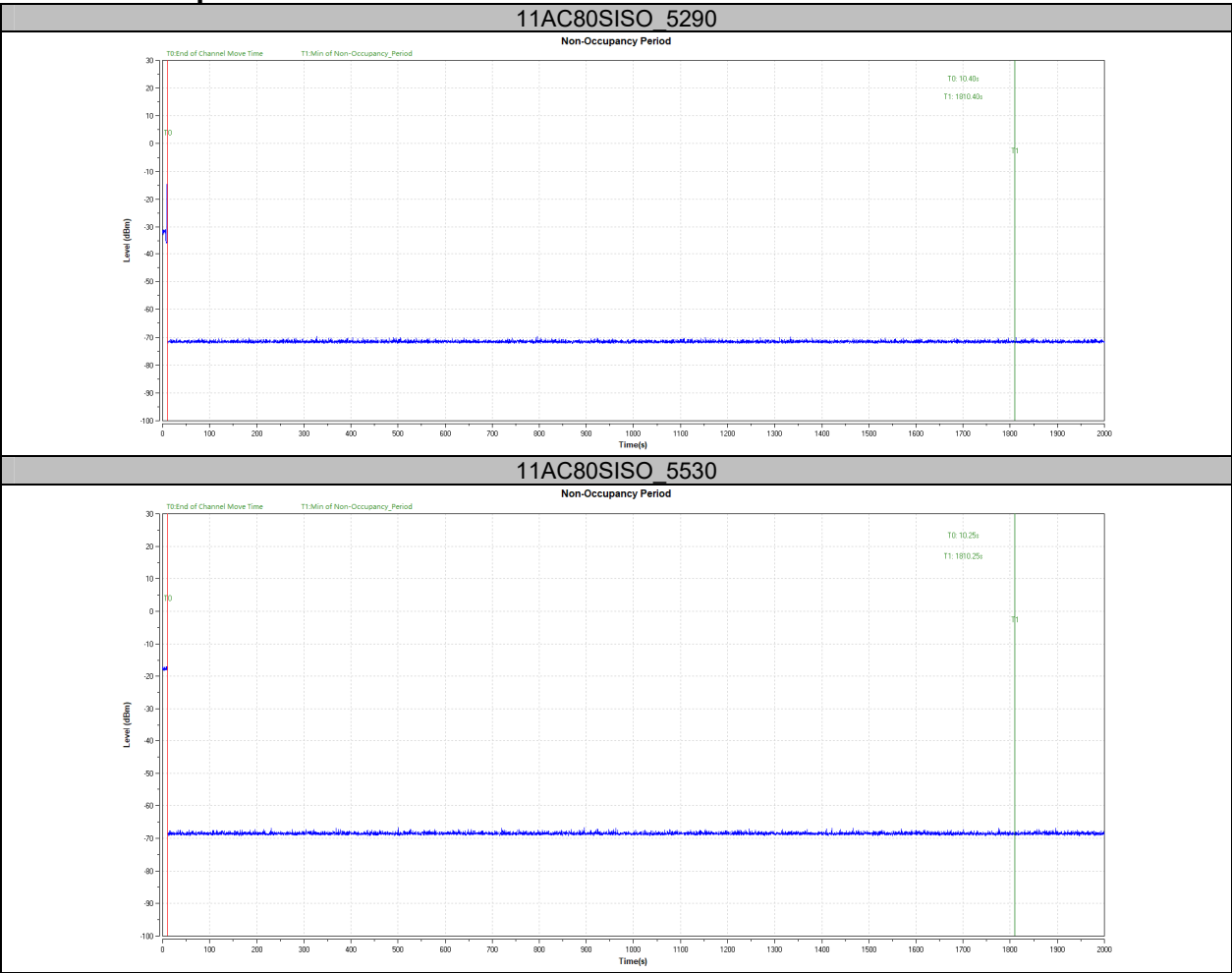


Appendix C: Non-Occupancy Period

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 \*\*\*\*\*