



## Industrial Internet Innovation Center (Shanghai) Co.,Ltd.

### SRD TEST REPORT

|             |                                    |
|-------------|------------------------------------|
| PRODUCT     | Smart POS System                   |
| BRAND       | SUNMI                              |
| MODEL       | T6831                              |
| APPLICANT   | Shanghai Sunmi Technology Co.,Ltd. |
| FCC ID      | 2AH25T6831NA                       |
| IC          | 22621-T6831                        |
| ISSUE DATE  | February 26 , 2025                 |
| STANDARD(S) | FCC Part15E, RSS-247 Issue 3       |

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## 1. Summary of Test Report

### 1.1 Test Standard

| No. | Test Standard   | Title                                                                                                                              | Version |
|-----|-----------------|------------------------------------------------------------------------------------------------------------------------------------|---------|
| 1   | FCC Part15E     | Title 47 of the Code of Federal Regulations; Chapter I<br>Part 15 - Radio frequency devices                                        | --      |
| 2   | RSS-247 Issue 3 | Digital Transmission Systems (DTSS), Frequency<br>Hopping Systems (FHSs) and Licence-Exempt Local<br>Area Network (LE-LAN) Devices | 2013    |

### 1.2 Reference Document(s)

| No. | Test Standard                                                     | Title                                                                                                                                                                                                      | Version |
|-----|-------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| 1   | ANSI 63.10                                                        | Methods of Measurement of Radio-Noise Emissions<br>from Low-Voltage Electrical and Electronic Equipment<br>in the Range of 9 kHz to 40 GHz                                                                 | 2013    |
| 2   | KDB 905462 D02 UNII DFS<br>Compliance Procedures<br>New Rules v02 | COMPLIANCE MEASUREMENT PROCEDURES FOR<br>UNLICENSED-NATIONAL INFORMATION<br>INFRASTRUCTURE DEVICES OPERATING IN THE 5250-<br>5350 MHz AND 5470-5725 MHz BANDS<br>INCORPORATING DYNAMIC FREQUENCY SELECTION | --      |

NOTE: The standard of KDB 905462 D02 UNII DFS Compliance Procedures New Rules v02 has not been accredited by A2LA

### 1.3 Summary of Test Results

| No. | Measurement Items                                                      | FCC Rules     | IC Rules    | Verdict |
|-----|------------------------------------------------------------------------|---------------|-------------|---------|
| 1   | U-NII Detection Bandwidth                                              | 15.407(h) (2) | RSS-247 6.3 | N/A     |
| 2   | Initial Channel Availability Check Time                                | 15.407(h) (2) | RSS-247 6.3 | N/A     |
| 3   | Radar Burst at the Beginning of the Channel<br>Availability Check Time | 15.407(h) (2) | RSS-247 6.3 | N/A     |
| 4   | Radar Burst at the Beginning of the Channel<br>Availability Check Time | 15.407(h) (2) | RSS-247 6.3 | N/A     |
| 5   | Channel Move Time                                                      | 15.407(h) (2) | RSS-247 6.3 | Pass    |
| 6   | Channel Closing Transmission Time                                      | 15.407(h) (2) | RSS-247 6.3 | Pass    |
| 7   | Non- Occupancy Period                                                  | 15.407(h) (2) | RSS-247 6.3 | Pass    |
| 8   | Statistical Performance Check                                          | 15.407(h) (2) | RSS-247 6.3 | N/A     |
| 9   | Uniform spreading                                                      | 15.407(h) (2) | RSS-247 6.3 | N/A     |

NOTE:

The T6831 manufactured by Shanghai Sunmi Technology Co.,Ltd. is a new product for testing. Industrial Internet Innovation Center (Shanghai) Co., Ltd. only performed test cases which identified with Pass/Fail/Inc result in section 1.2.

Industrial Internet Innovation Center (Shanghai) Co., Ltd. has verified that the compliance of the tested device specified in section 4 of this test report is successfully evaluated according to the procedure and test methods as defined in type certification requirement listed in section 1 of this test report.

#### 1.4 Data Provided by Applicant

| No. | Item(s)             | Data   |
|-----|---------------------|--------|
| 1   | Antenna gain of EUT | 2.6dBi |

Note: The data of antenna is provided by the Antenna specification may affect the validity of the test results in this report, and the impact and consequences of this shall be undertaken by the customer.



## 2. General Information of The Laboratory

### 2.1 Testing Laboratory

|                      |                                                            |
|----------------------|------------------------------------------------------------|
| Lab Name             | Industrial Internet Innovation Center (Shanghai) Co.,Ltd.  |
| Address              | Building 4, No. 766, Jingang Road, Pudong, Shanghai, China |
| Telephone            | 021-68866880                                               |
| FCC Registration No. | 708870                                                     |
| FCC Designation No.  | CN1364                                                     |

### 2.2 Laboratory Environmental Requirements

|                      |              |
|----------------------|--------------|
| Temperature          | 15°C~35°C    |
| Relative Humidity    | 25%RH~75%RH  |
| Atmospheric Pressure | 86kPa~106kPa |

### 2.3 Project Information

|                 |                                         |
|-----------------|-----------------------------------------|
| Project Manager | Gao Hongning                            |
| Test Date       | February 18, 2025 to February 25 , 2025 |

### 3. General Information of The Customer

#### 3.1 Applicant

|           |                                                                  |
|-----------|------------------------------------------------------------------|
| Company   | Shanghai Sunmi Technology Co.,Ltd.                               |
| Address   | Room 505, No.388 Song Hu Road, Yang Pu District, Shanghai, China |
| Telephone | 18826519551                                                      |

#### 3.2 Manufacturer

|           |                                                                  |
|-----------|------------------------------------------------------------------|
| Company   | Shanghai Sunmi Technology Co.,Ltd.                               |
| Address   | Room 505, No.388 Song Hu Road, Yang Pu District, Shanghai, China |
| Telephone | 18826519551                                                      |



## 4. General Information of The Product

### 4.1 Product Description for Equipment under Test (EUT)

|                                                                                                                                                 |                                                                                                                                                                         |
|-------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Product Name                                                                                                                                    | Smart POS System                                                                                                                                                        |
| Model name                                                                                                                                      | T6831                                                                                                                                                                   |
| Date of Receipt                                                                                                                                 | S01aa /S06aa:February 18,2025                                                                                                                                           |
| EUT ID*                                                                                                                                         | S06aa/S01aa                                                                                                                                                             |
| SN/IMEI                                                                                                                                         | S01aa: 860309070007616'860309070008119<br>S06aa: 860309070007871'860309070008374                                                                                        |
| Supported Radio Technology and Bands                                                                                                            | WCDMA Band II/IV/V<br>LTE Band 2/4/5/7/12/13/14/17/25/26/30/38/41/66/71<br>WLAN 802.11b/g/n<br>WLAN 802.11a/n/ac<br>BT 5.0 BR/EDR/BLE<br>NFC<br>GPS/GLONASS/BDS/Galileo |
| Hardware Version                                                                                                                                | V1.0(NA)                                                                                                                                                                |
| Software Version                                                                                                                                | V3.0.1                                                                                                                                                                  |
| HVIN                                                                                                                                            | T6831                                                                                                                                                                   |
| FCC ID                                                                                                                                          | 2AH25T6831NA                                                                                                                                                            |
| IC                                                                                                                                              | 22621-T6831                                                                                                                                                             |
| NOTE1: EUT ID is the internal identification code of the laboratory.                                                                            |                                                                                                                                                                         |
| NOTE2: Samples in the test report are provided by the customer. The test results are only applicable to the samples received by the laboratory. |                                                                                                                                                                         |

### 4.2 Internal Identification of AE used during the test

| AE ID* | Description | Model              | SN/Remark                                                              |
|--------|-------------|--------------------|------------------------------------------------------------------------|
| CA01   | Adapter     | TPA-141A050200UU01 | Shenzhen Tianyin Electronics Co., Ltd.<br>OUTPUT: 5V 2A                |
| CB01   | Adapter     | TPA-23A050200UU01  | Shenzhen Tianyin Electronics Co., Ltd.<br>OUTPUT: 5V 2A                |
| CC01   | Adapter     | UC13US             | Jiangsu Chenyang Electron Co., Ltd.<br>OUTPUT: 5V 2A                   |
| UA01   | AC Cable    | N/A                | N/A                                                                    |
| BA01   | Battery     | HPPA               | Guangdong Highpower New Energy<br>Technology Co., Ltd.<br>2550mAH 7.7V |

|                                                                     |          |     |                 |
|---------------------------------------------------------------------|----------|-----|-----------------|
| AE1                                                                 | RF cable | N/A | Cable loss: 1dB |
| NOTE: *AE ID is the internal identification code of the laboratory. |          |     |                 |

### 4.3 Additional Information

|                               |                                                        |
|-------------------------------|--------------------------------------------------------|
| DFS Operating Frequency Range | U-NII-2A(5260MHz-5320MHz)<br>U-NII-2C(5500MHz-5700MHz) |
| DFS Operating Mode            | Client Without Radar Detection                         |

Test frequency list

UNII-2A:

|        |             |      |      |      |      |
|--------|-------------|------|------|------|------|
| BW_20M | Channel     | 52   | 56   | 60   | 64   |
|        | Freq. (MHz) | 5260 | 5280 | 5300 | 5320 |
| BW_40M | Channel     | 54   |      | 62   |      |
|        | Freq. (MHz) | 5270 |      | 5310 |      |
| BW_80M | Channel     | 58   |      |      |      |
|        | Freq. (MHz) | 5290 |      |      |      |

UNII-2C:

|        |                |      |      |      |      |      |      |      |      |      |      |      |
|--------|----------------|------|------|------|------|------|------|------|------|------|------|------|
| BW_20M | Channel        | 100  | 104  | 108  | 112  | 116  | 120  | 124  | 128  | 132  | 136  | 140  |
|        | Freq.<br>(MHz) | 5500 | 5520 | 5540 | 5560 | 5580 | 5600 | 5620 | 5640 | 5660 | 5680 | 5700 |
| BW_40M | Channel        | 102  |      | 110  |      | 118  |      | 126  |      | 134  |      | /    |
|        | Freq.<br>(MHz) | 5510 |      | 5550 |      | 5590 |      | 5630 |      | 5670 |      | /    |
| BW_80M | Channel        | 106  |      |      |      | 122  |      |      |      | /    |      |      |
|        | Freq.<br>(MHz) | 5530 |      |      |      | 5610 |      |      |      |      |      |      |

Note: "/" Represents empty

### Maximum Output Power and E.I.R.P.

| Frequency Band (MHz) | Max Output Power (dBm) | Antenna Gain (dBi) | Max. e.i.r.p. (dBm) | Max. e.i.r.p. (mW) |
|----------------------|------------------------|--------------------|---------------------|--------------------|
| 5290                 | 7.12                   | 2.60               | 9.72                | 9.38               |
| 5530                 | 6.93                   | 2.60               | 9.53                | 8.97               |

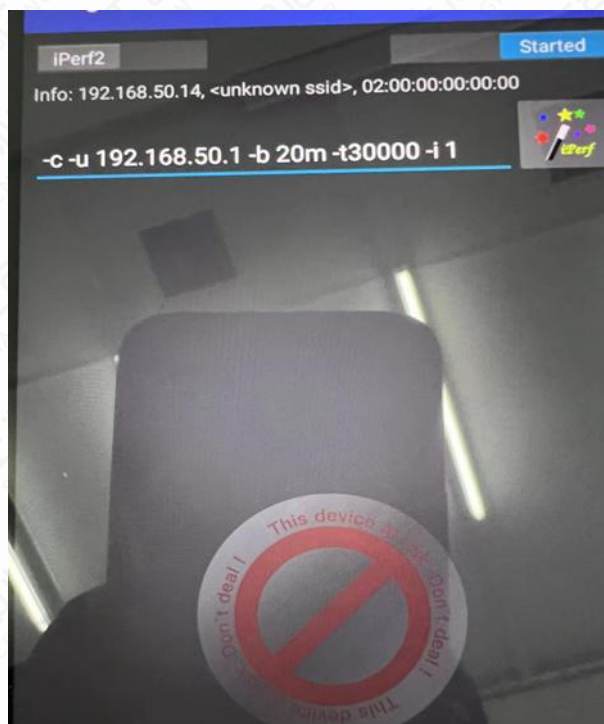
Note:

U-NII devices operating in the 5.25-5.35 GHz band and the 5.47-5.725GHz shall employ a TPC mechanism. A TPC mechanism is not required for systems with an e.i.r.p. of less than 500mW.



#### 4.4 EUT Test RF Configuration

EUT uses iperf.apk working control emission measurement.



## 5. Test Configuration Information

### 5.1 Laboratory Environmental Conditions

#### 5.1.1 Permanent Facilities

|                        |                          |         |         |
|------------------------|--------------------------|---------|---------|
| Relative Humidity      | Min. = 45 %, Max. = 55 % |         |         |
| Atmospheric Pressure   | 101kPa                   |         |         |
| Temperature            | Normal                   | Minimum | Maximum |
|                        | 25°C                     | -10°C   | 50°C    |
| Working Voltage of EUT | Normal                   | Minimum | Maximum |
|                        | 7.7V                     | 6.0V    | 8.8V    |

### 5.2 Test Equipments Utilized

#### 5.2.1 Conducted test system

| N o. | Name                                        | Model         | S/N        | SW Version    | HW Version                               | Manufacturer | Cal. Date  | Cal. Interval |
|------|---------------------------------------------|---------------|------------|---------------|------------------------------------------|--------------|------------|---------------|
| 1    | Test Software                               | TS1120        | 10671      | V3.5.39       | N/A                                      | Tonscend     | N/A        | N/A           |
| 2    | Automatic control unit                      | JS0806-2      | 2218060621 | N/A           | N/A                                      | Tonscend     | 2024-03-25 | N/A           |
| 3    | Wireless communication comprehensive tester | CMW270        | 100919     | V3.5.137      | 1206.3416.00                             | R&S          | 2024-07-25 | 1 Year        |
| 4    | Spectrum Analyzer                           | FSQ           | 200063     | 7.01          | 01 (Firmware: V4.75 SP7 BIOS: V5.1-22-1) | R&S          | 2024-09-29 | 1 Year        |
| 5    | Vector Signal Generator                     | SMU200A       | 104684     | V03.20.286.21 | N/A                                      | R&S          | 2024-07-25 | 1 Year        |
| 6    | Programmable Power Supply                   | Keithley 2303 | 4039070    | N/A           | N/A                                      | Keithley     | 2024-06-07 | 1 Year        |
| 7    | Temperature box                             | B-TF-107C     | BTF107C -  | N/A           | N/A                                      | Boyi         | 2024-06-07 | 1 Year        |



|   |                            |                 |                         |                  |     |      |                |           |
|---|----------------------------|-----------------|-------------------------|------------------|-----|------|----------------|-----------|
|   |                            |                 | 2018041<br>07           |                  |     |      |                |           |
| 8 | Network test<br>unit AP    | GT-<br>AXE11000 | N2IG0X4<br>01637K<br>WF | N/A              | N/A | ASUS | N/A            | N/A       |
| 9 | Vector Signal<br>Generator | SMBV100<br>A    | 257904                  | V4.15.12<br>5.49 | N/A | R&S  | 2024-12-<br>12 | 1<br>Year |

Note: According to the quality management system of our laboratory, the measurement cables used for testing are calibrated every two years. The next calibration is scheduled for 2025-12-04.

### 5.2.2 Test Environment

**Shielding Room1** (6.0 meters×3.0 meters×2.7 meters) did not exceed following limits along the conducted RF performance testing:

|                          |                            |
|--------------------------|----------------------------|
| Temperature              | Min. = 15 °C, Max. = 35 °C |
| Relative humidity        | Min. = 20 %, Max. = 75 %   |
| Shielding effectiveness  | > 100 dB                   |
| Ground system resistance | < 0.5 Ω                    |
| Temperature              | Min. = 15 °C, Max. = 35 °C |

**Control room** did not exceed following limits along the EMC testing:

|                          |                            |
|--------------------------|----------------------------|
| Temperature              | Min. = 15 °C, Max. = 35 °C |
| Relative humidity        | Min. = 30 %, Max. = 60 %   |
| Shielding effectiveness  | > 100 dB                   |
| Electrical insulation    | > 10 kΩ                    |
| Ground system resistance | < 0.5 Ω                    |

**Fully-anechoic chamber1** (9.8 meters×6.7 meters×6.7 meters) did not exceed following limits along the EMC testing:

|                            |                                        |
|----------------------------|----------------------------------------|
| Temperature                | Min. = 15 °C, Max. = 35 °C             |
| Relative humidity          | Min. = 25 %, Max. = 75 %               |
| Shielding effectiveness    | > 100 dB                               |
| Electrical insulation      | > 10 kΩ                                |
| Ground system resistance   | < 0.5 Ω                                |
| VSWR                       | Between 0 and 6 dB, from 1GHz to 18GHz |
| Site Attenuation Deviation | Between -4 and 4 dB, 30MHz to 1GHz     |



### 5.3 Measurement Uncertainty

Measurement Uncertainty of Channel Shutdown:

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor  $K=1.96$ ,  $U=2.69\text{dB}$ .

Measurement Uncertainty of Conduction test

| Measurement Items              | Range        | Confidence Level | Calculated Uncertainty                                            |
|--------------------------------|--------------|------------------|-------------------------------------------------------------------|
| Emission Bandwidth             | 5150-5850MHz | 95%              | $\pm 1.9\%$                                                       |
| Maximum Conduct Output Power   | 5150-5850MHz | 95%              | $\pm 1.18\text{ dB}$                                              |
| Power Spectral Density         | 5150-5850MHz | 95%              | $\pm 0.98\text{ dB}$                                              |
| Band Edge Measurements         | 5150-5850MHz | 95%              | $\pm 1.21\text{dB}$                                               |
| Unwanted Emissions Measurement | 9kHz-40GHz   | 95%              | 9kHz-7GHz: $\pm 1.21\text{dB}$<br>7GHz-40GHz: $\pm 3.31\text{dB}$ |
| Frequency Stability            | 5150-5850MHz | 95%              | $\pm 1.9\%$                                                       |
| DFS                            | 5150-5850MHz | 95%              | $\pm 1.17\%$                                                      |

## 6. Test Requirements

### 6.1 DFS Technical Requirements and Radar Test Waveforms

#### 6.1.1 DFS Overview

Table 6-1 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 6-2 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 modes                                                                                                                                                                                                                                                                     | Master Device or Client with Radar Detection | Client Without Radar Detection                       |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|------------------------------------------------------|
| U-NII Detection Bandwidth                                                                                                                                                                                                                                                                                                             | All BW modes must be tested                  | Not required                                         |
| Statistical Performance Check                                                                                                                                                                                                                                                                                                         | All BW modes must be tested                  | Not required                                         |
| Channel Closing Transmission Time                                                                                                                                                                                                                                                                                                     | Test using widest BW mode available          | Test using the widest BW mode available for the link |
| Channel Move 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 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. |                                              |                                                      |



## 6.1.2 DFS Detection Thresholds

Table 6-3 DFS Detection Thresholds for Master Devices and Client Devices with Radar Detection

| Maximum Transmit Power                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Value<br>(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>Note3: EIRP is based on the highest antenna gain. For MIMO devices refer to KDB Publication 662911 D01.</p> |                                  |

Table 6-4 DFS Response Requirement Values

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

### 6.1.3 Radar Test Waveforms

#### 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<br>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 | Roundup          | 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                       |
| 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. |                    |                                                                                                                                                                                                                                                            |                  |                                            |                          |

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

#### 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.

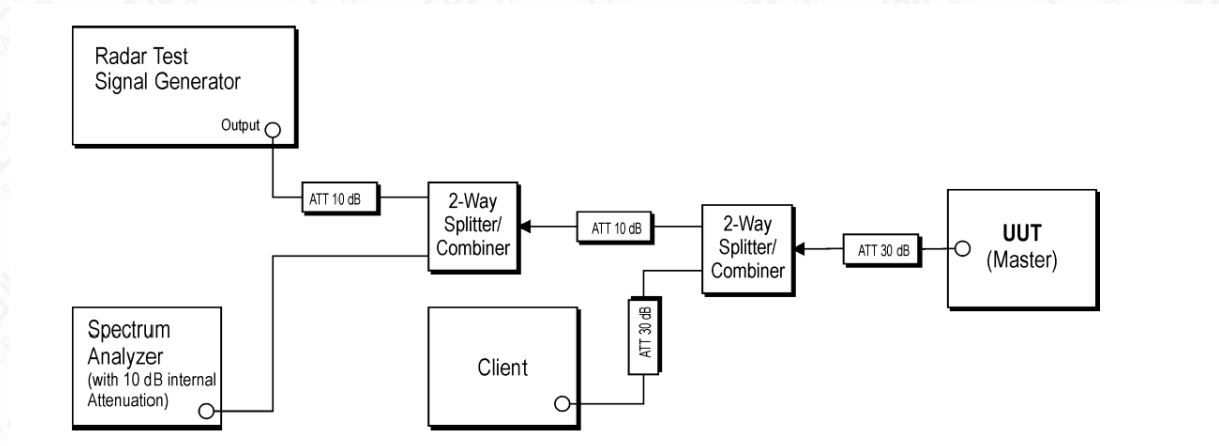
#### Frequency Hopping Radar Test Waveform

| 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.

#### 6.1.4 Set-up

##### Setup for Master with injection at the Master



Pic 6-6: Conducted Setup where UUT is a Master and Radar Test Waveforms are injected into the Master



## 7. Test Results

### 7.1 DFS Detection Thresholds

#### 7.1.1 Method of Measurement

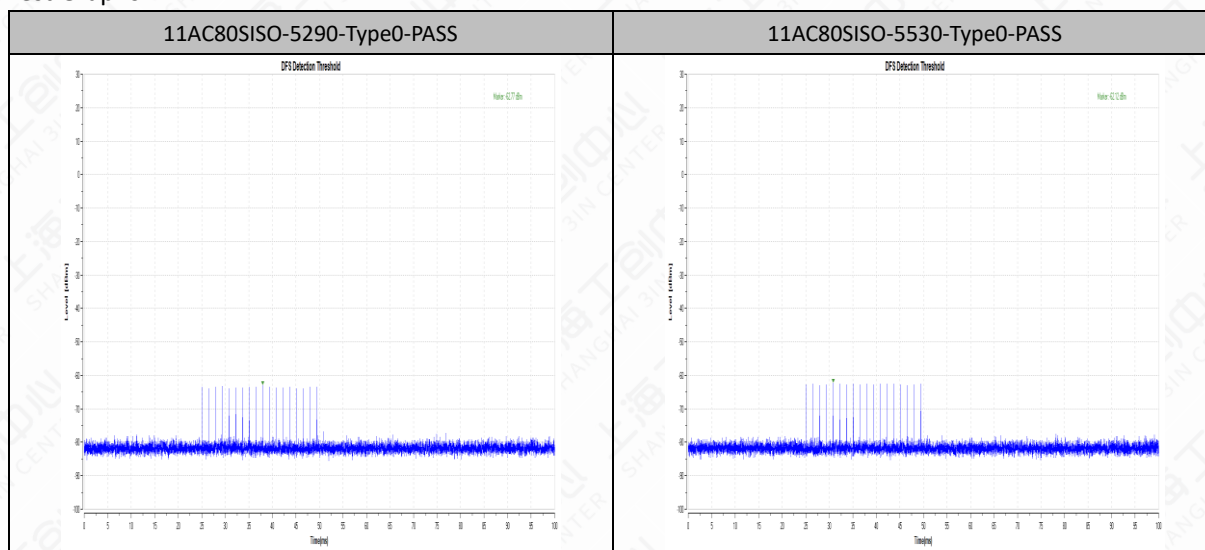
A spectrum analyzer is used to establish the test signal level for each radar type. During this process, there are no transmissions by either the Master Device or Client Device. The spectrum analyzer is switched to the zero span (time domain) mode at the frequency of the Radar Waveform generator. The peak detector function of the spectrum analyzer is utilized. The spectrum analyzer resolution bandwidth (RBW) and video bandwidth (VBW) are set to at least 3 MHz.

The signal generator amplitude and/or step attenuators are set so that the power level measured at the spectrum analyzer is equal to the DFS Detection Threshold that is required for the tests. The signal generator and attenuator settings are recorded for use during the test.

#### 7.1.2 The Calibration is listed below

| TestMode   | Frequency[dbm] | Radar Type | Result | Limit[dbm] | Verdict |
|------------|----------------|------------|--------|------------|---------|
| 11AC80SISO | 5290           | Type0      | -62.77 | -59.40     | PASS    |
| 11AC80SISO | 5530           | Type0      | -62.12 | -59.40     | PASS    |

#### Test Graphs



## 7.2 In-Service Monitoring for Channel Move Time, Channel Closing Transmission Time and Non-Occupancy Period

### 7.2.1 Method of Measurement

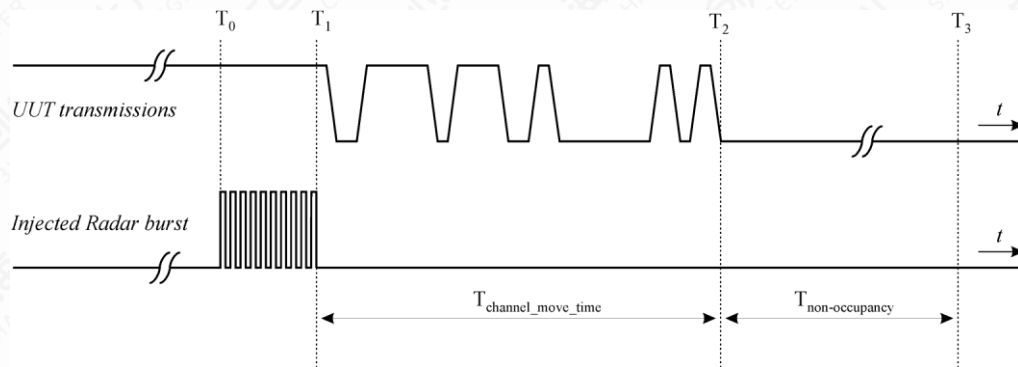
These tests define how the following DFS parameters are verified during In-Service Monitoring;

- Channel Closing Transmission Time
- Channel Move Time
- Non-Occupancy Period

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 EUT 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 EUT 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 EUT (Client device) to Associate with the Master Device. In case the EUT 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 EUT (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.
- c) Vertical polarization is used for testing.
- d) 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.
- e) 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 variation /errors.
- f) Observe the transmissions of the EUT at the end of the radar Burst on the Operating Channel for duration greater than 10 seconds. Measure and record the transmissions from the EUT during the observation time (Channel Move Time). Measure and record the Channel Move Time and Channel Closing Transmission Time if radar detection occurs. Figure 17 illustrates Channel Closing Transmission Time.
- g) When operating as a Master Device, monitor the EUT for more than 30 minutes following instant T2 to verify that the EUT does not resume any transmissions on this Channel. Perform this test once and record the measurement result.
- h) In case the EUT is a U-NII device operating as a Client Device with In-Service Monitoring, perform steps a) to f).





Pic 7-1: Channel Closing Transmission Time, Channel Move Time and Non-Occupancy Period

## 7.2.2 Limits

|                                   |                                           |
|-----------------------------------|-------------------------------------------|
| Channel Move Time                 | ≤10s                                      |
| Channel Closing Transmission Time | ≤200ms + 60ms (over remaining 10s period) |
| Non-Occupancy Period              | ≥30min                                    |

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 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: The Channel Closing Transmission Time is calculated by the computer.

Note 4: A port with a minimum antenna gain was selected for testing. For details, refer to the document "DFS Set-up Photo".

## 7.2.3 Test result of Channel Move Time and Channel Closing Transmission Time

| TestMode   | Frequency[MHz] | CCTT[ms] | Limit[ms] | CMT[ms] | Limit[ms] | Verdict |
|------------|----------------|----------|-----------|---------|-----------|---------|
| 11AC80SISO | 5290           | 200+7.8  | 200+60    | 210     | 10000     | PASS    |
| 11AC80SISO | 5530           | 200+0    | 200+60    | 195.7   | 10000     | PASS    |

Note:

CCTT = 200ms + Per Bin Time \* Number of T2 to T3 ON Bins;

CMT=T3-T1.

\*CCTT: Channel Closing Transmission Time,

\*CMT: Channel Move Time,

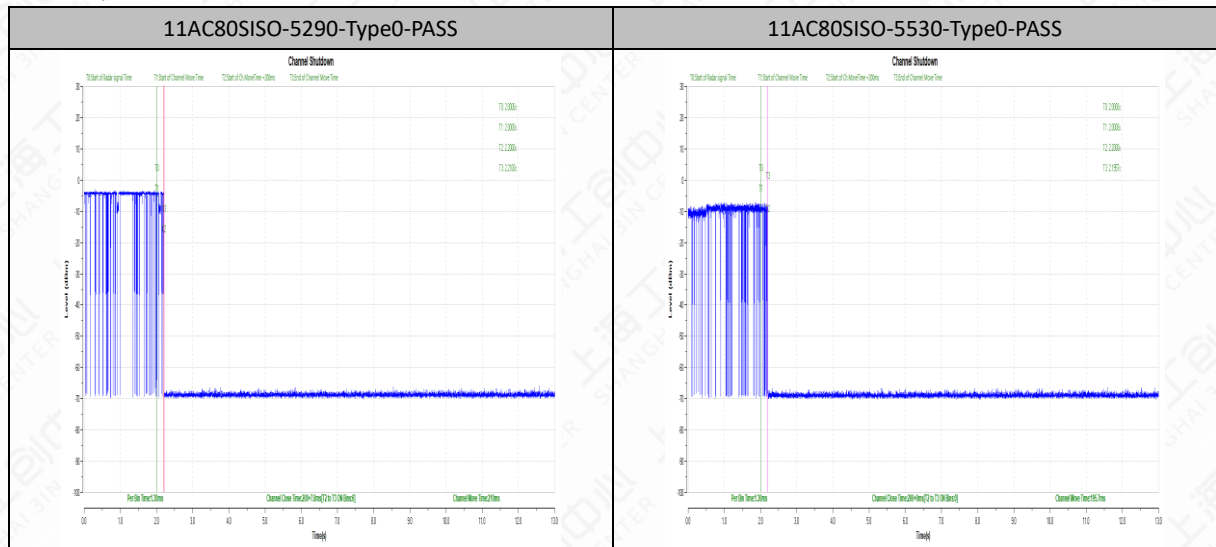
\*T0: Start of Radar signal Time,

\*T1: Start of channel Move Time,

\*T2: Start of channel Move Time + 200ms,

\*T3: End of Channel Move Time.

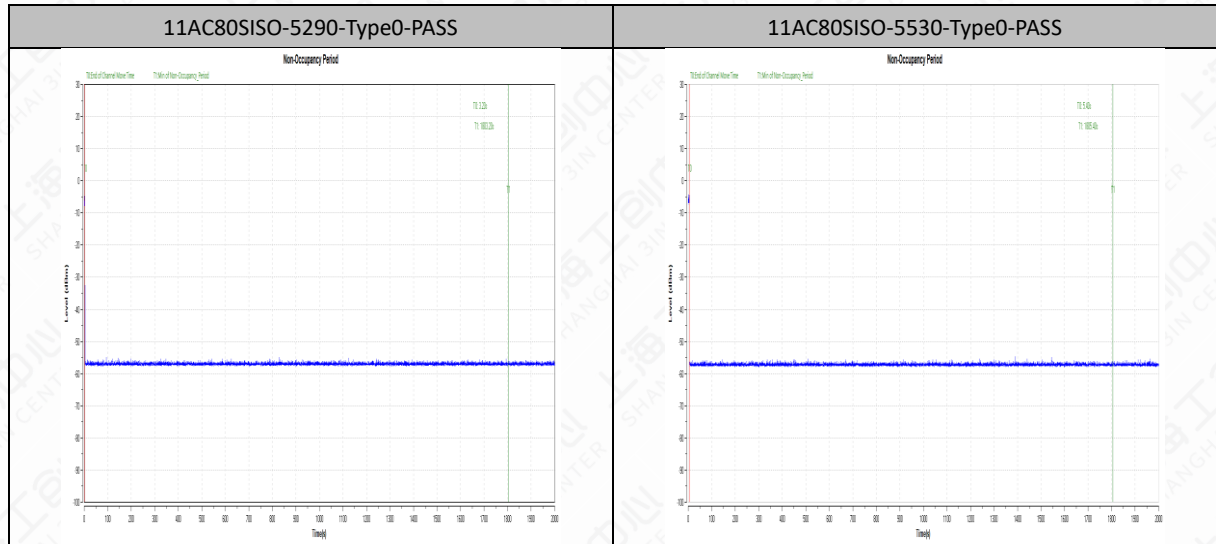
## Test Graphs



## 7.2.4 Test result of Non-Occupancy Period

| TestMode   | Frequency[MHz] | Result         | Limit[s] | Verdict |
|------------|----------------|----------------|----------|---------|
| 11AC80SISO | 5290           | see test graph | ≥1800    | PASS    |
| 11AC80SISO | 5530           | see test graph | ≥1800    | PASS    |

## Test Graphs





## Annex A: Revised History

| Version | Revised Content |
|---------|-----------------|
| V0      | Initial         |

## Annex B: Accreditation Certificate



### Accredited Laboratory

A2LA has accredited

## INDUSTRIAL INTERNET INNOVATION CENTER (SHANGHAI) CO., LTD.

Shanghai, People's Republic of China

for technical competence in the field of

### Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 General requirements for the competence of testing and calibration laboratories. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated April 2017).



Presented this 20<sup>th</sup> day of September 2023.



Mr. Trace McInturf, Vice President, Accreditation Services  
For the Accreditation Council  
Certificate Number 3682.01  
Valid to April 30, 2025  
Revised February 24, 2025

For the tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.

**END OF REPORT**