

# DFS TEST REPORT

**Applicant:** PAX Technology Limited

**Address of Applicant:** Room 2416, 24/F., Sun Hung Kai Centre, 30 Harbour Road,  
Wanchai, Hong Kong

**Equipment Under Test (EUT)**

Product Name: POS Terminal

Model No.: IM30

**Applicable standards:** PAX

**FCC ID:** V5PIM304GBW

**Applicable standards:** FCC CFR Title 47 Part 15 Subpart E Section 15.407

**Date of sample receipt:** 11 Jul., 2019

**Date of Test:** 11 Jul., to 19 Aug., 2019

**Date of report issued:** 20 Aug., 2019

**Test Result:** PASS\*

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

Authorized Signature:



Bruce Zhang

Laboratory Manager

This report details the results of the testing carried out on one sample. The results contained in this test report do not relate to other samples of the same product and does not permit the use of the CCIS product certification mark. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

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## 2 Version

| Version No. | Date          | Description |
|-------------|---------------|-------------|
| 00          | 20 Aug., 2019 | Original    |
|             |               |             |
|             |               |             |
|             |               |             |
|             |               |             |

Tested by:

*Mike.ou*

Test Engineer

Date:

20 Aug., 2019

Reviewed by:

*Winner Zhang*

Project Engineer

Date:

20 Aug., 2019

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## 4 Test Summary

| Test Items                                                           | Limit                                                                                                 | Result |
|----------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|--------|
| Channel Availability Check                                           | > 60 seconds                                                                                          | N/A    |
| UNII Detection Bandwidth                                             | > 100% of the UNII 99% transmission power bandwidth                                                   | N/A    |
| Statistical Performance Check                                        | Radar type 1,2,3,4 $\geq$ 60%<br>Aggregate Radar type 1~4 and 5 $\geq$ 80%<br>Radar type 6 $\geq$ 70% | N/A    |
| Channel Move Time                                                    | < 10 seconds                                                                                          | Pass   |
| Channel Closing Transmission Time                                    | < 20ms + aggregate of 60ms over remaining 10 second period                                            | Pass   |
| Non-Occupancy Period                                                 | > 30 minutes                                                                                          | Pass   |
| Note: "Pass" means meet the requirements, "N/A" means not applicable |                                                                                                       |        |

## 5 General Information

### 5.1 Client Information

|               |                                                                                     |
|---------------|-------------------------------------------------------------------------------------|
| Applicant:    | PAX Technology Limited                                                              |
| Address:      | Room 2416, 24/F., Sun Hung Kai Centre, 30 Harbour Road, Wanchai, Hong Kong          |
| Manufacturer: | PAX Computer Technology(Shenzhen) Co. Ltd.                                          |
| Address:      | 401-402 No.3 Building, Software Park, Nanshan district, Shenzhen, Guangdong, P.R.C. |

### 5.2 General Description of E.U.T.

|                              |                                                                                                                                                                                                      |
|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Product Name:                | POS Terminal                                                                                                                                                                                         |
| Model No.:                   | IM30                                                                                                                                                                                                 |
| Transmitter frequency range: | 5150MHz~5250MHz, 5250MHz~5350MHz<br>5470MHz~5725MHz, 5725MHz~5825MHz                                                                                                                                 |
| Modulation type:             | OFDM                                                                                                                                                                                                 |
| WLAN Function:               | 802.11a/802.11n/802.11ac                                                                                                                                                                             |
| Bandwidth:                   | 20MHz/40MHz/80MHz                                                                                                                                                                                    |
| Antenna Type:                | Internal Antenna                                                                                                                                                                                     |
| Antenna Gain:                | 1.0 dBi                                                                                                                                                                                              |
| DFS Operation Type:          | <input type="checkbox"/> Master Device<br><input type="checkbox"/> Slaver Device with Radar detection function<br><input checked="" type="checkbox"/> Slaver Device without Radar detection function |
| Power supply:                | DC 12V-48V                                                                                                                                                                                           |
| Test Sample Condition:       | The test samples were provided in good working order with no visible defects.                                                                                                                        |

### 5.3 Test Environment and test mode

|                       |                                                  |
|-----------------------|--------------------------------------------------|
| Data Load mode:       | Keep the EUT in normal transmitting mode by WiFi |
| Temperature:          | 20 ~ 25 °C                                       |
| Humidity:             | 60% ~ 65%                                        |
| Atmospheric pressure: | 1012 kPa                                         |

### 5.4 Description of Support Units

| Manufacturer | Description | Model      | Serial Number |
|--------------|-------------|------------|---------------|
| LENOVO       | Laptop      | SL510      | 2847A65       |
| WAVLINK      | WiFi Router | WL-WN575A2 | WL1512260097  |

### 5.5 Related Submittal(s) / Grant (s)

|                                                              |
|--------------------------------------------------------------|
| This is an original grant, no related submittals and grants. |
|--------------------------------------------------------------|

## 5.6 Laboratory Facility

The test facility is recognized, certified, or accredited by the following organizations:

● **FCC - Designation No.: CN1211**

Shenzhen Zhongjian Nanfang Testing Co., Ltd. has been accredited as a testing laboratory by FCC (Federal Communications Commission). The test firm Registration No. is 727551.

● **ISED – CAB identifier.: CN0021**

The 3m Semi-anechoic chamber of Shenzhen Zhongjian Nanfang Testing Co., Ltd. has been Registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 10106A-1.

● **CNAS - Registration No.: CNAS L6048**

Shenzhen Zhongjian Nanfang Testing Co., Ltd. is accredited to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration laboratories for the competence of testing. The Registration No. is CNAS L6048.

● **A2LA - Registration No.: 4346.01**

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 General requirements for the competence of testing and calibration laboratories. The test scope can be found as below link: <https://portal.a2la.org/scopepdf/4346-01.pdf>

## 5.7 Laboratory Location

Shenzhen Zhongjian Nanfang Testing Co., Ltd.

Address: No. B-C, 1/F., Building 2, Laodong No.2 Industrial Park, Xixiang Road, Bao'an District, Shenzhen, Guangdong, China

Tel: +86-755-23118282, Fax: +86-755-23116366

Email: info@ccis-cb.com, Website: <http://www.ccis-cb.com>

## 5.8 Test Instruments list

| Test Equipment          | Manufacturer | Model No. | Serial No.       | Cal. Due date (mm-dd-yy) | Cal. Due date (mm-dd-yy) |
|-------------------------|--------------|-----------|------------------|--------------------------|--------------------------|
| Spectrum Analyzer       | Agilent      | N9020A    | MY50510123       | 11-10-2018               | 11-09-2019               |
| Vector Signal Generator | Agilent      | N5182A    | MY49060014       | 11-10-2018               | 11-09-2019               |
| RF Switch Unit          | Ascentest    | AT890-RFB | --               | --                       | --                       |
| DFS Test Software       | MWRFTTEST    | MTS 8310  | Version: 2.0.0.0 |                          |                          |
| N7607B Signal Studio    | KEYSIGHT     | --        | Version: 2.0.0.1 |                          |                          |

## 6 DFS Technical Requirements

### 6.1 DFS Parameters

| Table D.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                         |

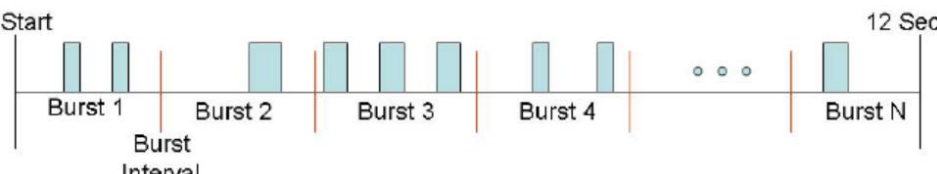
| Table D.2: Applicability of DFS requirements during normal operation |                  |                                |
|----------------------------------------------------------------------|------------------|--------------------------------|
| Requirement                                                          | Operational Mode |                                |
|                                                                      | Master           | 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                                                                                                                                                                                                                                                                                     | Operational Mode                             |                                                      |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|------------------------------------------------------|
|                                                                                                                                                                                                                                                                                                                                                       | Master Device or Client with Radar Detection | Client Without Radar Detection                       |
| U-NII Detection Bandwidth and Statistical Performance Check                                                                                                                                                                                                                                                                                           | All BW modes must be tested                  | Not required                                         |
| Channel Move Time and Channel Closing Transmission Time                                                                                                                                                                                                                                                                                               | Test using widest BW mode available          | Test using the widest BW mode available for the link |
| All other tests                                                                                                                                                                                                                                                                                                                                       | Any single BW mode                           | Not required                                         |
| Note: Frequencies selected for statistical performance check (Section 7.8.4) should include several frequencies within the radar detection bandwidth and frequencies near the edge of the radar detection bandwidth. For 802.11 devices it is suggested to select frequencies in each of the bonded 20 MHz channels and the channel center frequency. |                                              |                                                      |

| Table D.3: DFS Detection Thresholds                                                                                                                                                                                                                                                              |                              |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|
| Maximum Transmit Power                                                                                                                                                                                                                                                                           | Value (See Notes 1,2, and 3) |
| EIRP $\geq$ 200 mW                                                                                                                                                                                                                                                                               | -64 dBm                      |
| EIRP < 200 mW and power spectral density < 10 dBm/MHz                                                                                                                                                                                                                                            | -62 dBm                      |
| EIRP < 200 mW that do not meet the power spectral density requirement                                                                                                                                                                                                                            | -64 dBm                      |
| Note 1: This is the level at the input of the receiver assuming a 0 dBi receive antenna.                                                                                                                                                                                                         |                              |
| Note 2: Throughout these test procedures an additional 1 dB has been added to the amplitude of the test transmission waveforms to account for variations in measurement equipment. This will ensure that the test signal is at or above the detection threshold level to trigger a DFS response. |                              |
| Note 3: EIRP is based on the highest antenna gain. For MIMO devices refer to KDB Publication 662911 D01.                                                                                                                                                                                         |                              |

| Table D.4: DFS requirement values                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                   |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| Parameter                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Value                                                                             |
| Non-occupancy period                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Minimum 30 minutes                                                                |
| Channel Availability Check Time                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 60 seconds                                                                        |
| Channel Move Time                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 10 seconds (See Note 1)                                                           |
| Channel Closing Transmission Time                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 200 ms + an aggregate of 60ms over remaining 10 second period (See Notes 1 and 2) |
| U-NII Detection Bandwidth                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Minimum 100% of the UNII 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> |                                                                                   |

| Table D.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<br>Test B | Roundup $\left\{ \frac{1}{360} \right\}$<br>$\left\{ \frac{19 \cdot 10^6}{PRI_{\mu sec}} \right\}$ | 60%                                        | 30                       |
| 2                                                                                                                                    | 1-5                | 150-230          | 23-29                                                                                              | 60%                                        | 30                       |
| 3                                                                                                                                    | 6-10               | 200-500          | 16-18                                                                                              | 60%                                        | 30                       |
| 4                                                                                                                                    | 11-20              | 200-500          | 12-16                                                                                              | 60%                                        | 30                       |
| 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. |                    |                  |                                                                                                    |                                            |                          |

| Table D.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                       |
| Long Pulse Radar Test Signal Wave form 12 second transmission                        |                    |                   |            |                            |                  |                                            |                          |
|  |                    |                   |            |                            |                  |                                            |                          |

| Table D.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        | 0              | 0.333              | 300                            | 70%                                        | 30                       |

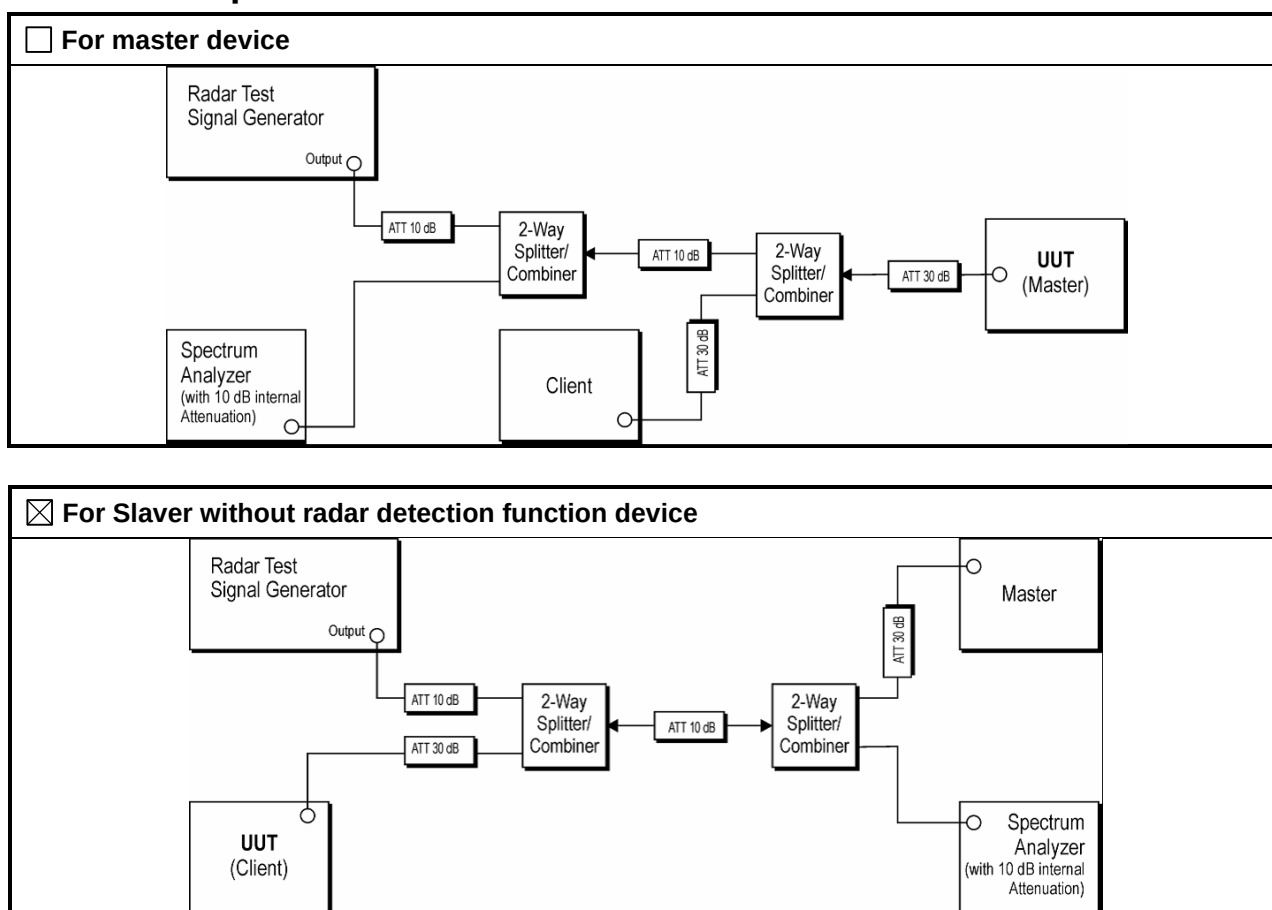
## 6.2 DFS Technical Requirements

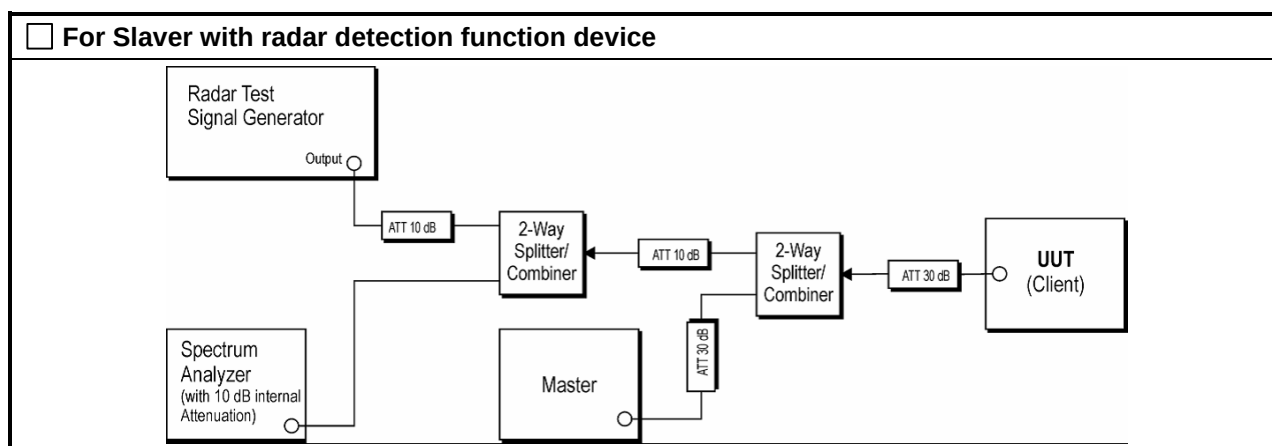
| Requirement                       | DFS Operational mode            |                                                                   |                                                     |
|-----------------------------------|---------------------------------|-------------------------------------------------------------------|-----------------------------------------------------|
|                                   | <input type="checkbox"/> Master | <input checked="" type="checkbox"/> Slave without Radar Detection | <input type="checkbox"/> Slave with Radar Detection |
| Channel Availability Check        | √                               | Not Required                                                      | Not Required                                        |
| UNII Detection Bandwidth          | √                               | Not Required                                                      | √                                                   |
| Statistical Performance Check     | √                               | Not Required                                                      | √                                                   |
| Channel Move Time                 | √                               | √                                                                 | √                                                   |
| Channel Closing Transmission Time | √                               | √                                                                 | √                                                   |
| Non-Occupancy Period              | √                               | √                                                                 | √                                                   |

## 6.3 DFS Threshold Level

| DFS Threshold Level                                          |                             |
|--------------------------------------------------------------|-----------------------------|
| 5250MHz ~ 5350MHz                                            | -62 dBm @ antenna connector |
| 5470MHz ~ 5725MHz                                            | -62 dBm @ antenna connector |
| Note: The worst case level was selected to perform the test. |                             |

## 6.4 Test Setup Block



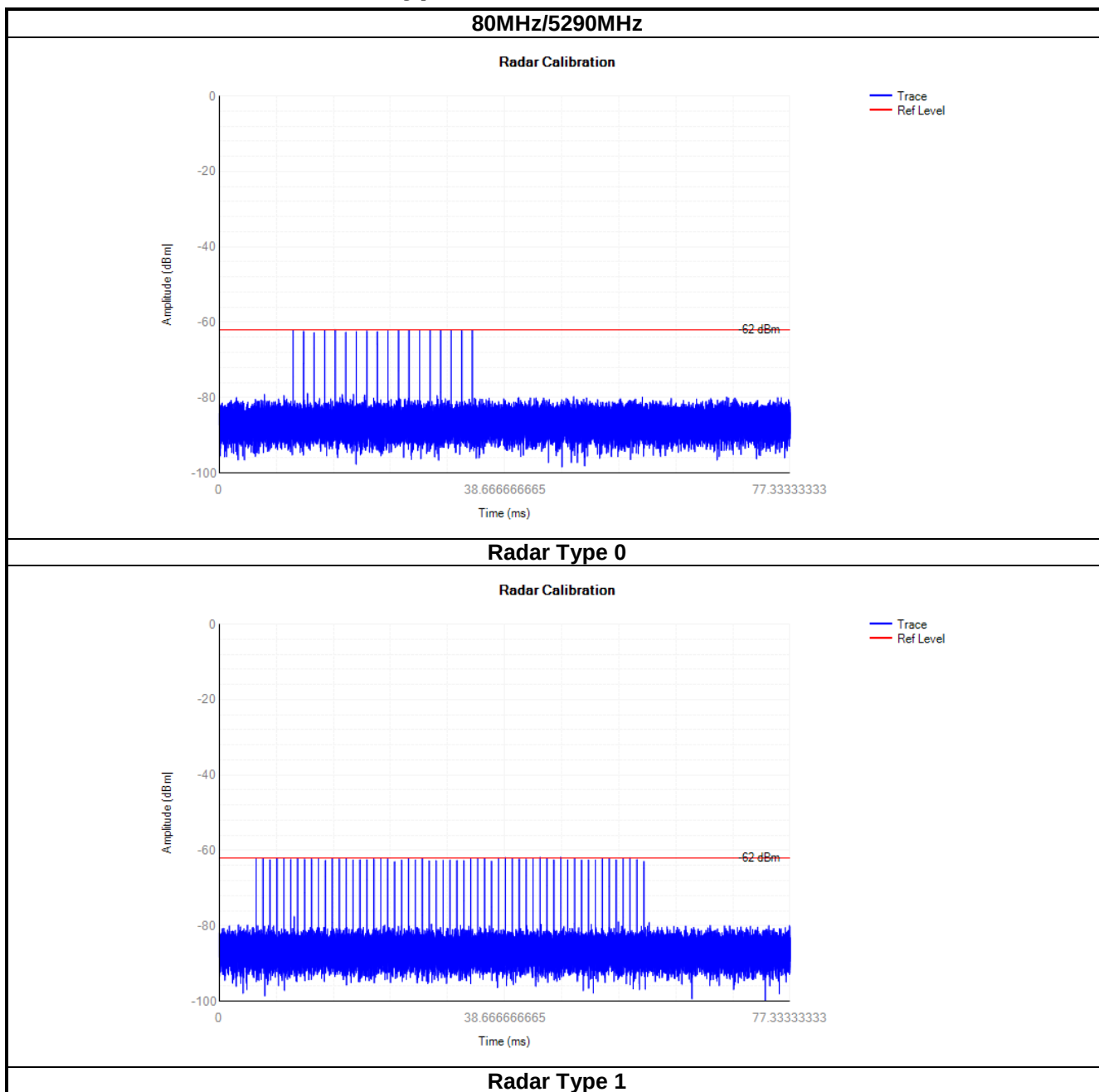


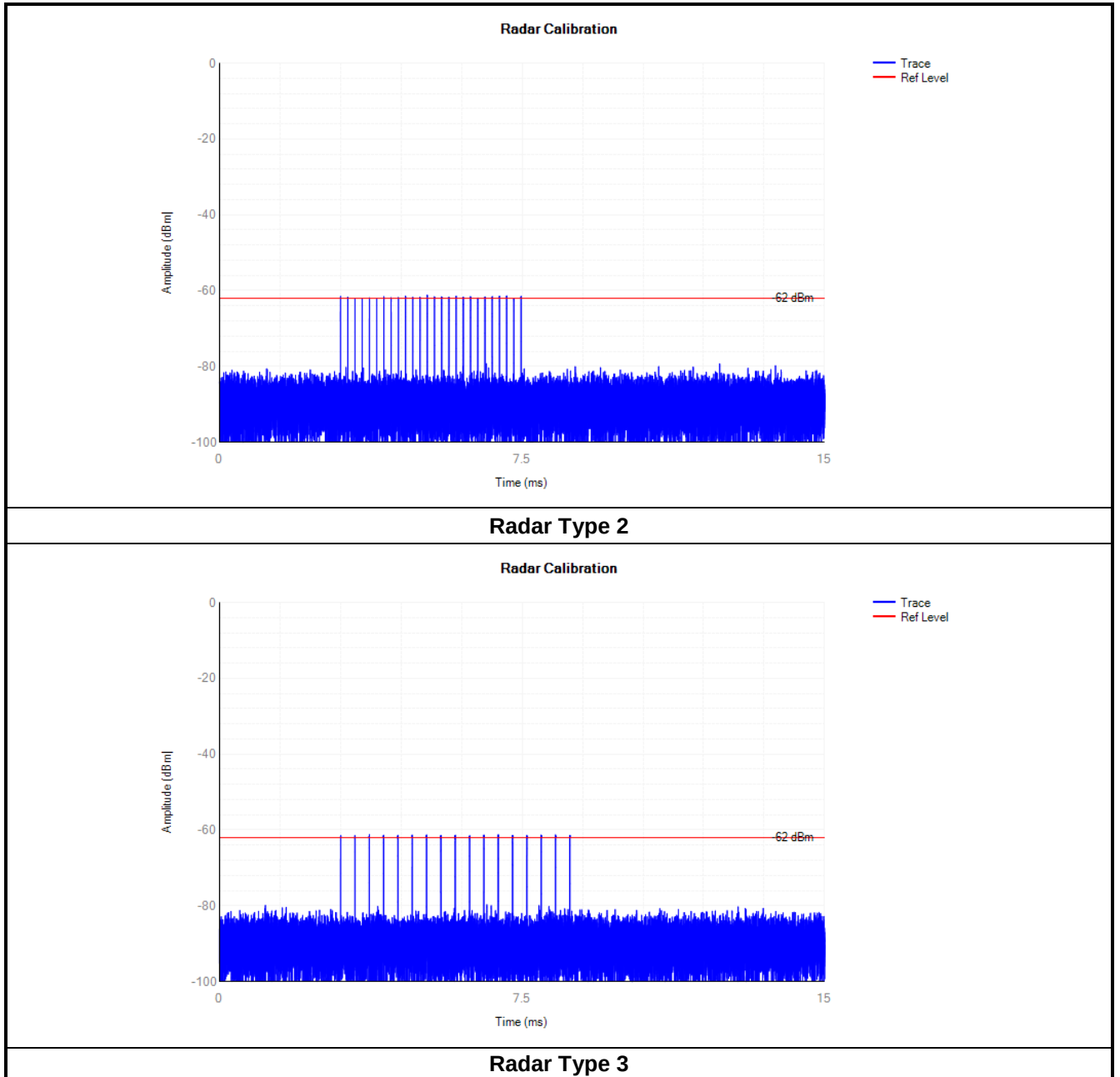
## 6.5 EUT Configuration for DFS Test

| Test Items                        | Channel Frequency |
|-----------------------------------|-------------------|
| Channel Move Time                 | 5290MHz, 5530MHz  |
| Channel Closing Transmission Time | 5290MHz, 5530MHz  |
| Non-Occupancy Period              | 5290MHz, 5530MHz  |

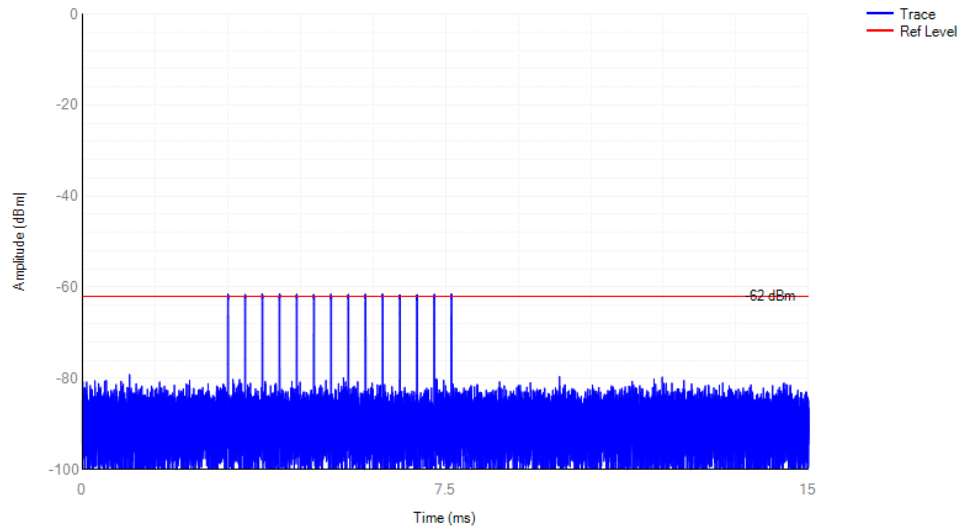
## 7 Test Result

### 7.1 Verification of Radar Type and Level



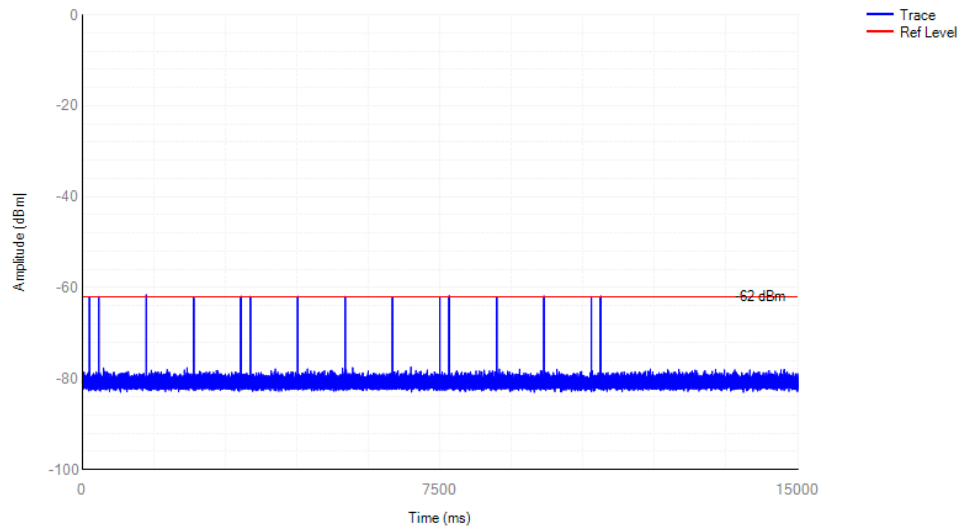


**Radar Calibration**

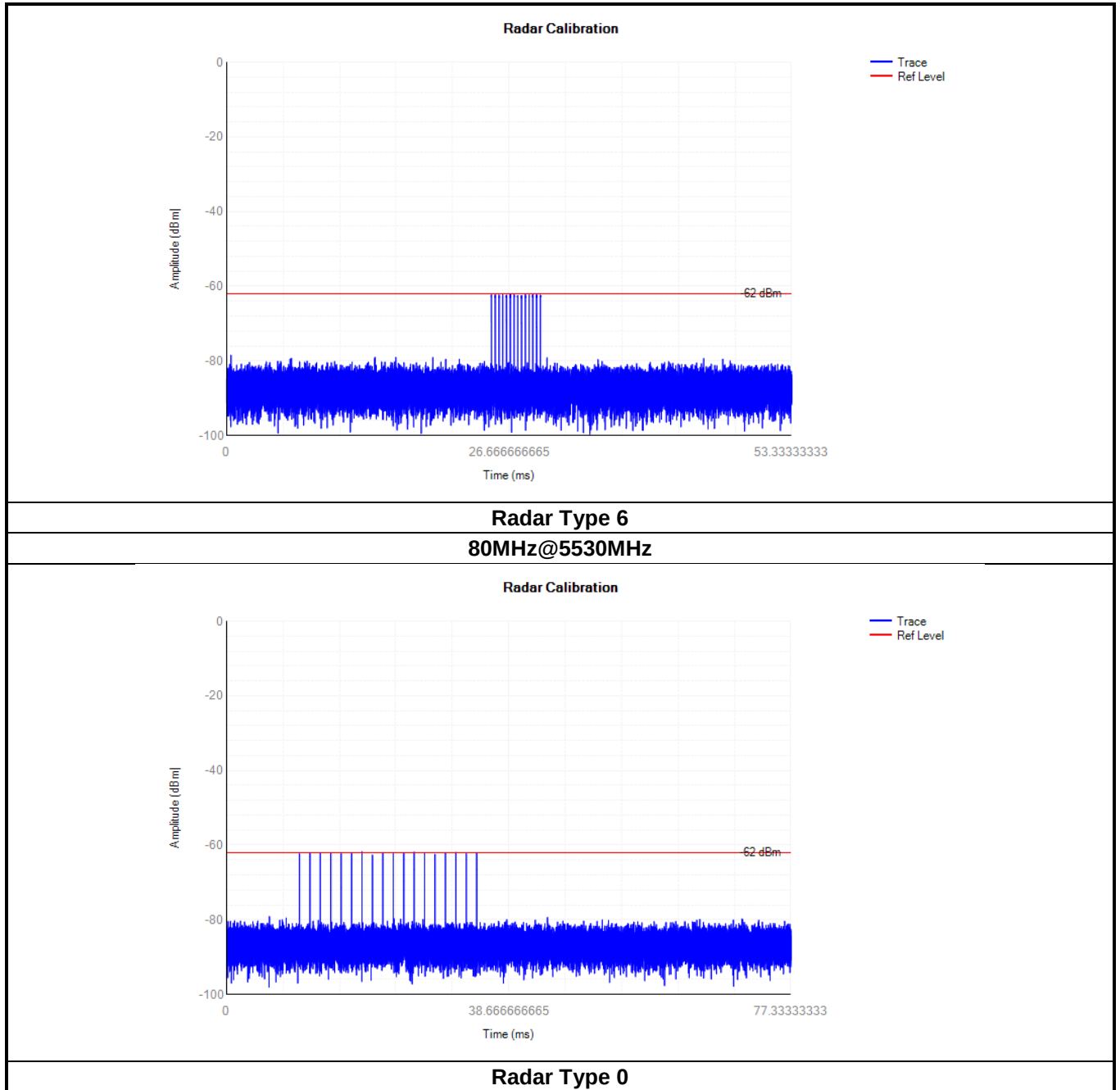


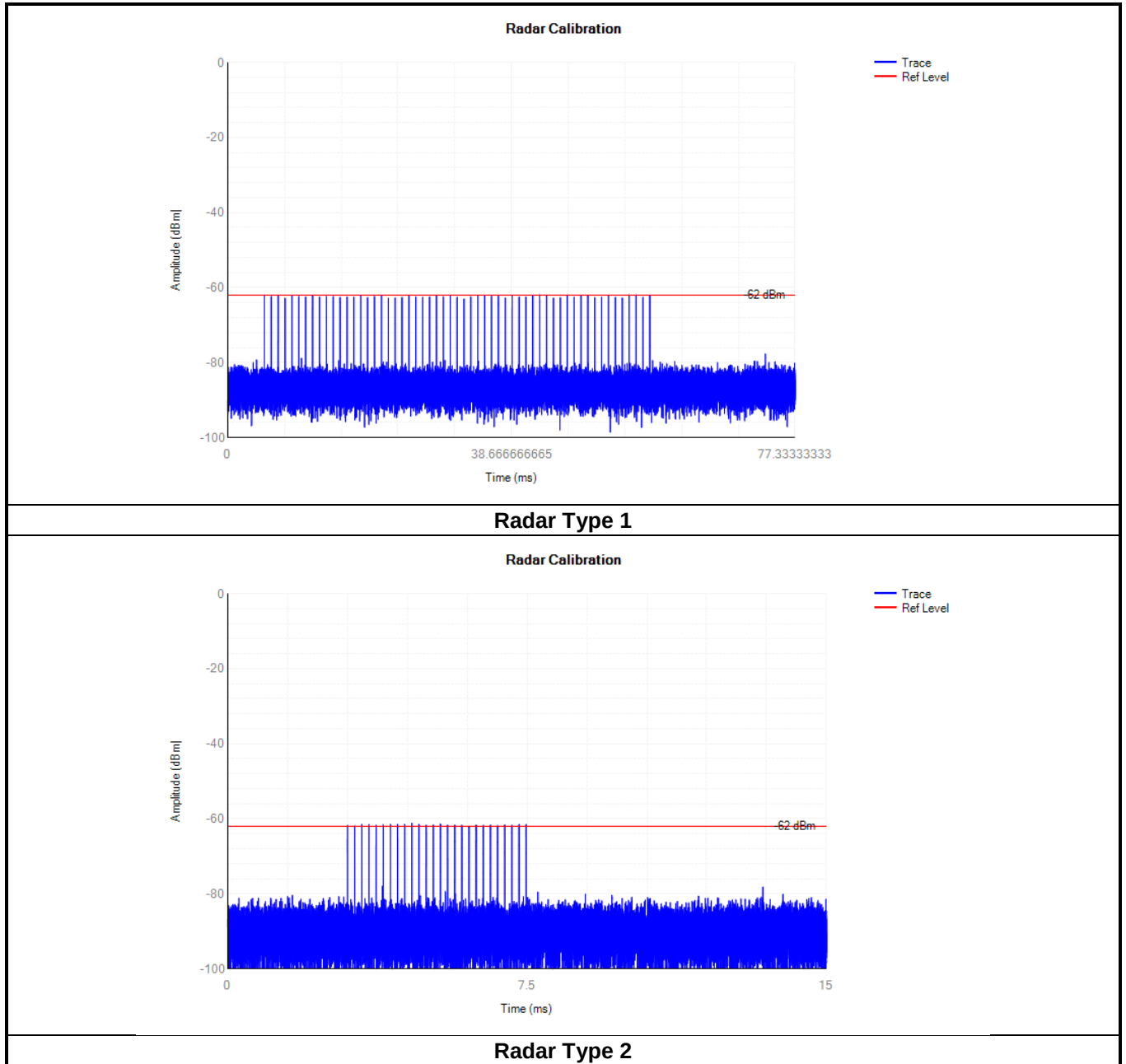
**Radar Type 4**

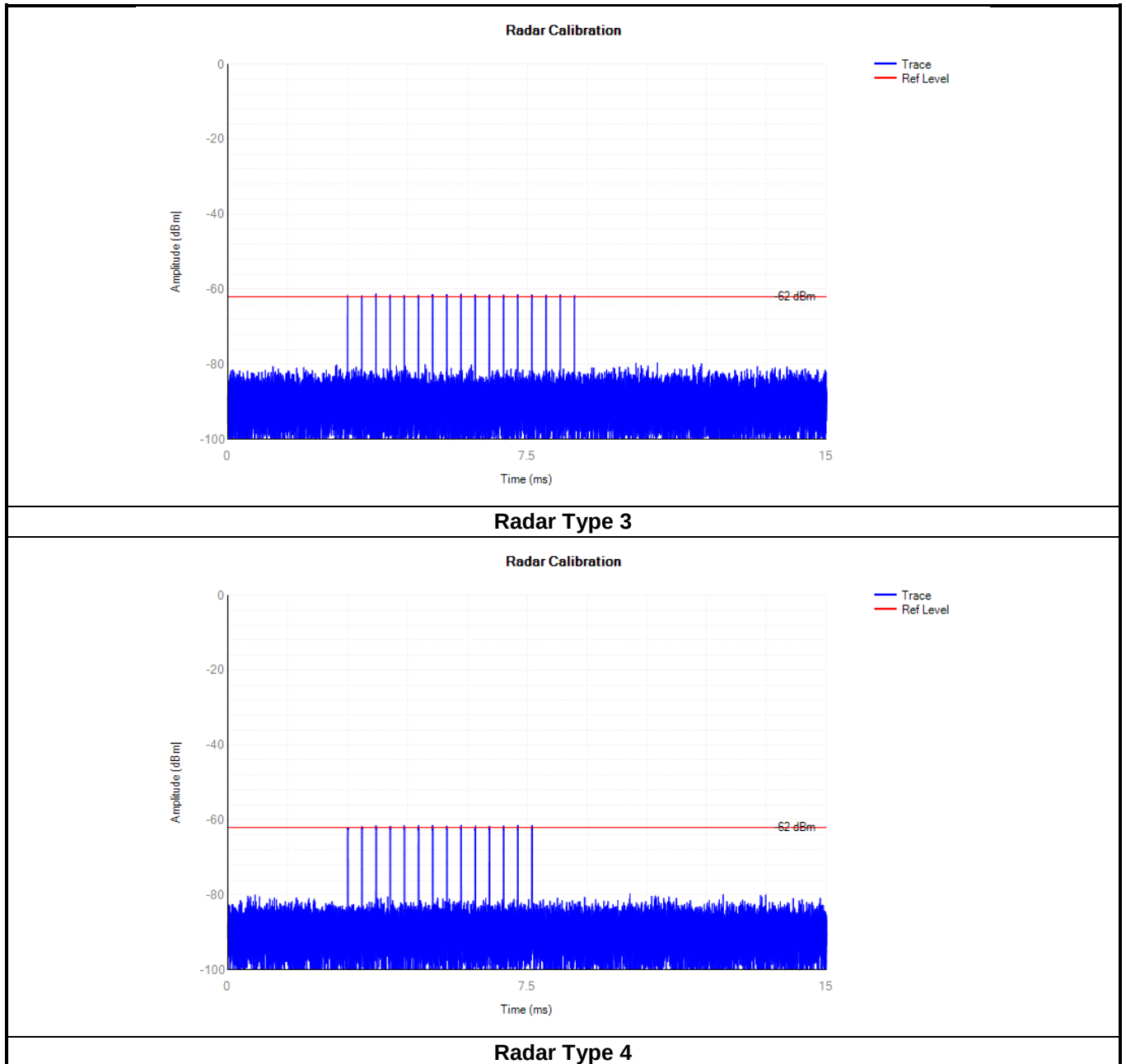
**Radar Calibration**

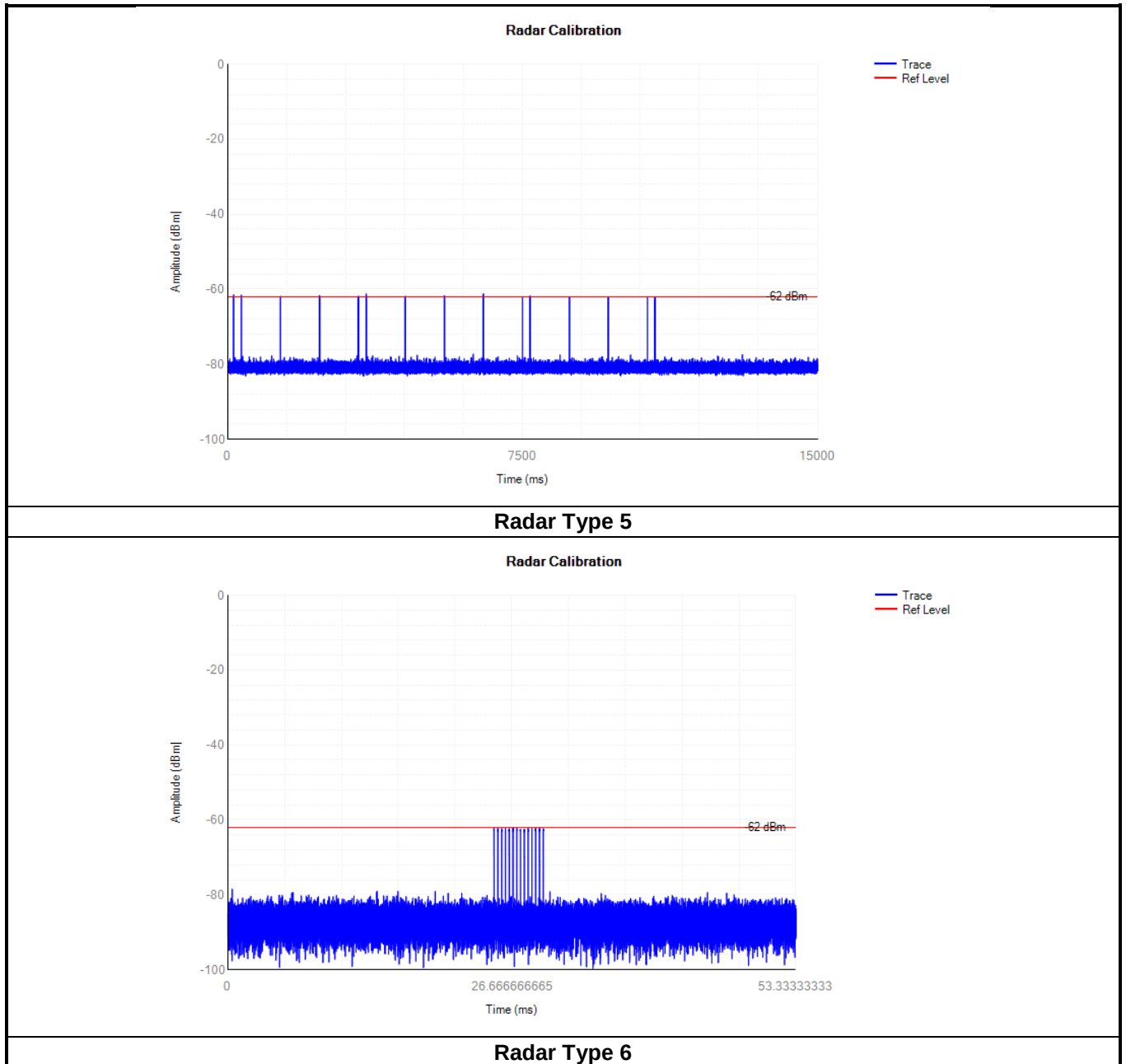


**Radar Type 5**

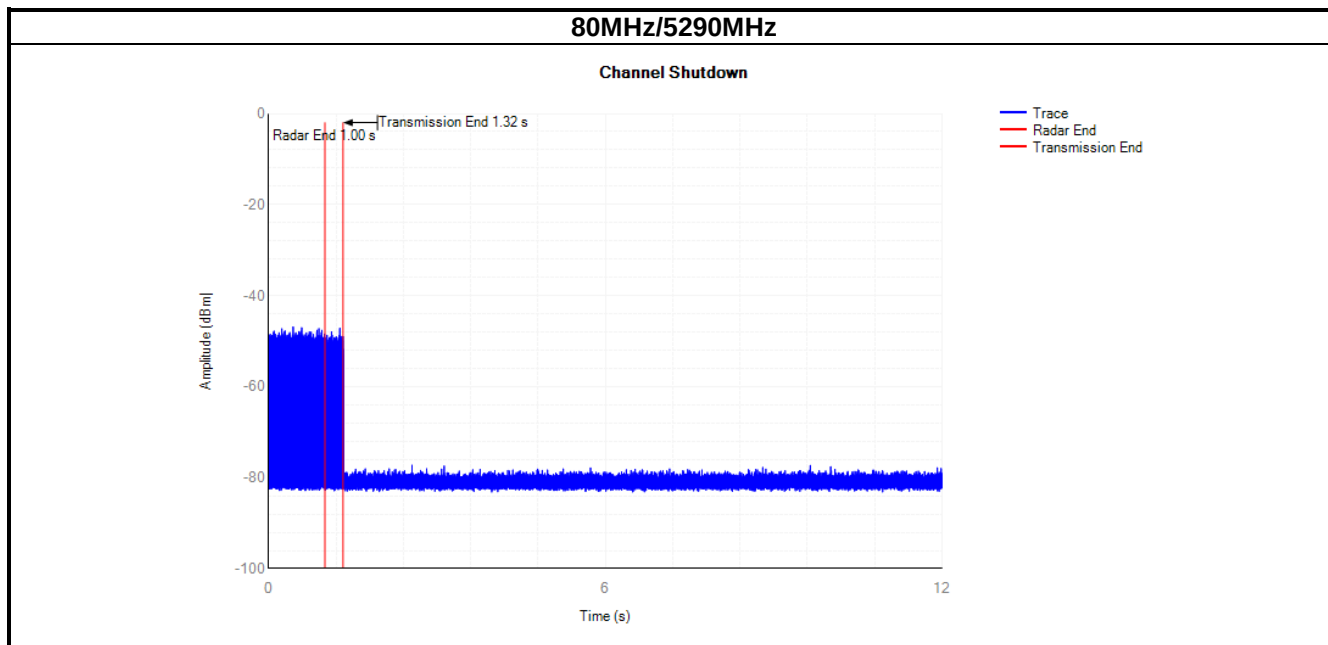




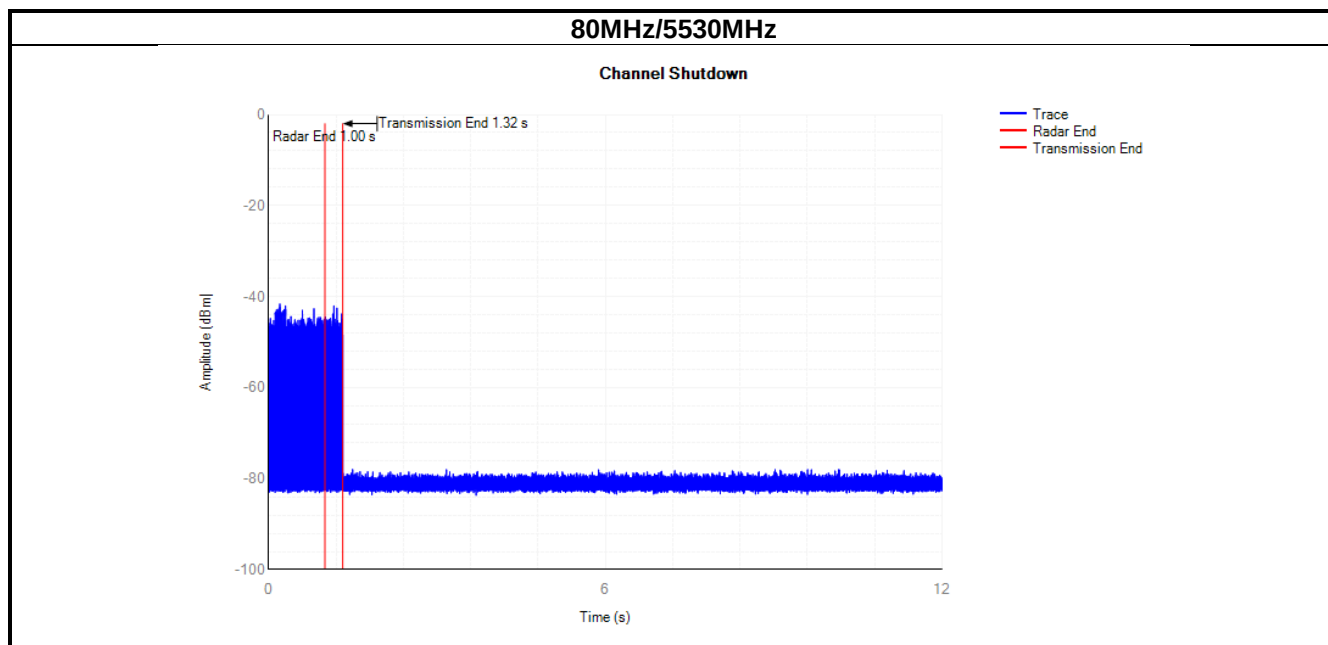




## 7.2 Channel Move Time and Channel Closing Transmission Time



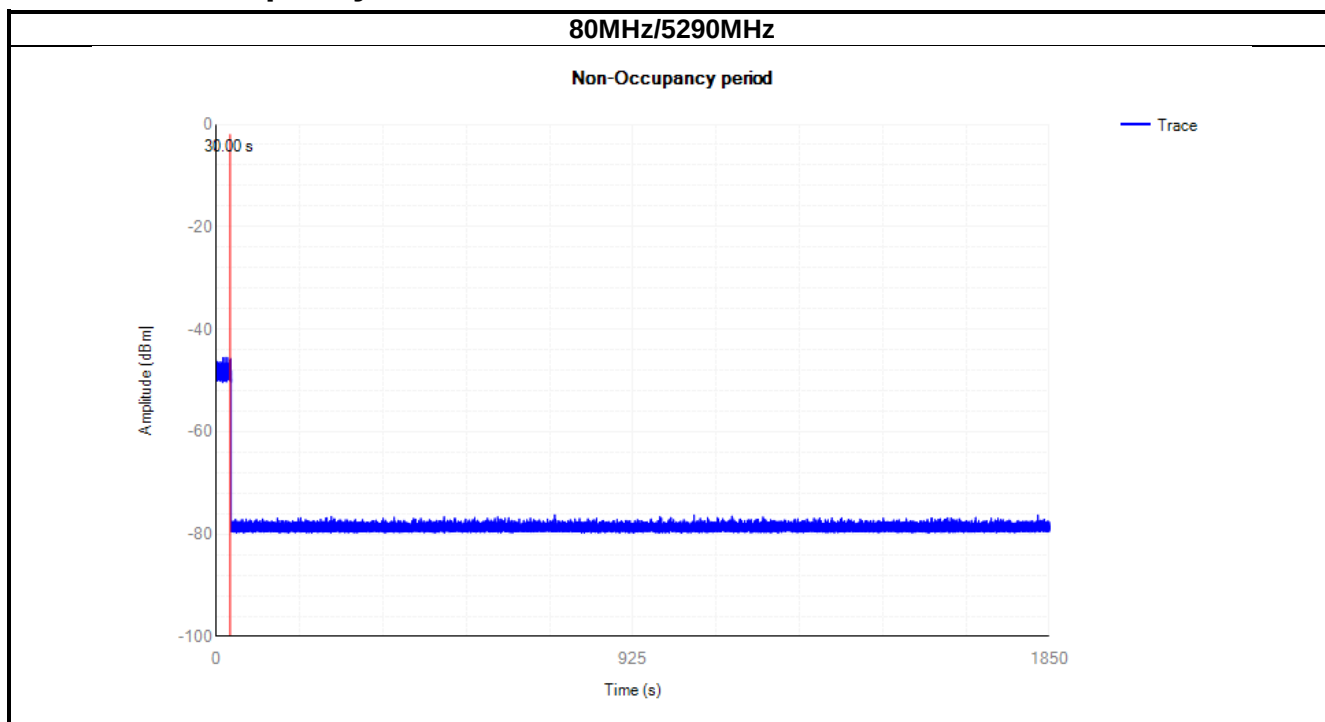
| Test Items                        | Value  | Limit  |
|-----------------------------------|--------|--------|
| Channel Closing Transmission Time | 14 ms  | 260 ms |
| Channel Move Time                 | 323 ms | 10 s   |



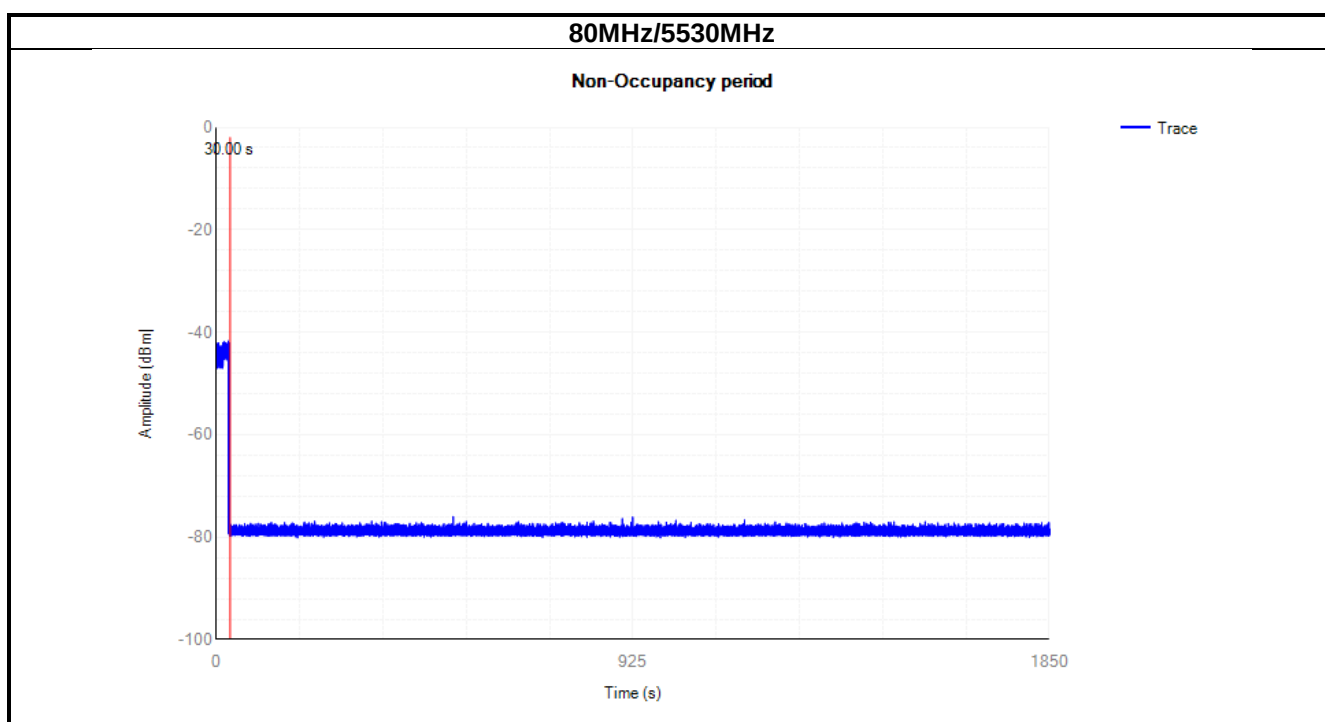
| Test Items                        | Value  | Limit  |
|-----------------------------------|--------|--------|
| Channel Closing Transmission Time | 55 ms  | 260 ms |
| Channel Move Time                 | 318 ms | 10 s   |

**Test Result: Pass**

## 7.3 Non-Occupancy Period



| Test Items           | Value  | Limit               |
|----------------------|--------|---------------------|
| Non-Occupancy Period | 1820 s | 30 minutes (1800 s) |



| Test Items           | Value  | Limit               |
|----------------------|--------|---------------------|
| Non-Occupancy Period | 1820 s | 30 minutes (1800 s) |

**Test Result: Pass**