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# FCC Test Report

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Report No.: AGC02931240301FR05

**FCC ID** : 2BLTR-AND1  
**APPLICATION PURPOSE** : Original Equipment  
**PRODUCT DESIGNATION** : 4G LTE IP Radio  
**BRAND NAME** : TYTECH  
**MODEL NAME** : IP-66  
**APPLICANT** : Quanzhou RadioBoss Technology Co., Ltd  
**DATE OF ISSUE** : Jan. 16, 2025  
**STANDARD(S)** : FCC Part 15 Subpart E §15.407  
**REPORT VERSION** : V1.0

Attestation of Global Compliance (Shenzhen) Co., Ltd



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**Report Revise Record**

| Report Version | Revise Time | Issued Date   | Valid Version | Notes           |
|----------------|-------------|---------------|---------------|-----------------|
| V1.0           | /           | Jan. 16, 2025 | Valid         | Initial Release |

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## 1. General Information

|                              |                                                                                           |
|------------------------------|-------------------------------------------------------------------------------------------|
| Applicant                    | Quanzhou RadioBoss Technology Co., Ltd                                                    |
| Address                      | No.8, Chuangzao Road, Optoelectronics-information industry base, Nan'an, Quanzhou, Fujian |
| Manufacturer                 | Quanzhou RadioBoss Technology Co., Ltd                                                    |
| Address                      | No.8, Chuangzao Road, Optoelectronics-information industry base, Nan'an, Quanzhou, Fujian |
| Factory                      | Quanzhou RadioBoss Technology Co., Ltd                                                    |
| Address                      | No.8, Chuangzao Road, Optoelectronics-information industry base, Nan'an, Quanzhou, Fujian |
| Product Designation          | 4G LTE IP Radio                                                                           |
| Brand Name                   | TYTECH                                                                                    |
| Test Model                   | IP-66                                                                                     |
| Series Model(s)              | N/A                                                                                       |
| Difference Description       | N/A                                                                                       |
| Date of receipt of test item | Mar. 04, 2024                                                                             |
| Date of Test                 | Mar. 04, 2024~Jan. 16, 2025                                                               |
| Deviation from Standard      | No any deviation from the test method                                                     |
| Condition of Test Sample     | Normal                                                                                    |
| Test Result                  | Pass                                                                                      |
| Test Report Form No          | AGCER-FCC-DFS-V1                                                                          |

Note: The test results of this report relate only to the tested sample identified in this report.

|             |                                                                                     |               |
|-------------|-------------------------------------------------------------------------------------|---------------|
| Prepared By |  |               |
|             | Bibo Zhang<br>(Project Engineer)                                                    | Jan. 16, 2025 |
| Reviewed By |  |               |
|             | Calvin Liu<br>(Reviewer)                                                            | Jan. 16, 2025 |
| Approved By |  |               |
|             | Angela Li<br>(Authorized Officer)                                                   | Jan. 16, 2025 |

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## 2. Product Information

### 2.1 Product Technical Description

|                              |                                                                                                                    |                                                          |
|------------------------------|--------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|
| Frequency Range              | <input checked="" type="checkbox"/> U-NII 2A:5250MHz~5350MHz <input type="checkbox"/> U-NII 2C:5470MHz~5725MHz     |                                                          |
| Channel Bandwidth            | <input checked="" type="checkbox"/> 20MHz <input checked="" type="checkbox"/> 40MHz <input type="checkbox"/> 80MHz |                                                          |
| Hardware Version             | V2.0                                                                                                               |                                                          |
| Software Version             | PU562WAE3C_KT5508_starlight_istar two_V01_20180813                                                                 |                                                          |
| Operating Mode               | <input type="checkbox"/> Master                                                                                    |                                                          |
|                              | <input type="checkbox"/> Client with radar detection                                                               |                                                          |
|                              | <input checked="" type="checkbox"/> Client without radar detection                                                 |                                                          |
| TPC Function                 | <input type="checkbox"/> With TPC                                                                                  | <input type="checkbox"/> Without TPC                     |
| Weather Band                 | <input type="checkbox"/> With 5600~5650MHz                                                                         | <input checked="" type="checkbox"/> Without 5600~5650MHz |
| Data transmission technology | TCP technology (Transmission between client and Master)                                                            |                                                          |
| Type of Modulation           | 802.11a/n:(64-QAM, 16-QAM, QPSK, BPSK) OFDM                                                                        |                                                          |
| Data Rate                    | 802.11a: 6/9/12/18/24/36/48/54Mbps;<br>802.11n: up to 300Mbps;                                                     |                                                          |
| Antenna Designation          | PIFA Antenna                                                                                                       |                                                          |
| Antenna Gain                 | -0.9dBi                                                                                                            |                                                          |
| Power Supply                 | DC 3.7V by battery                                                                                                 |                                                          |

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## 2.2 DFS Band Carrier Frequencies Operation

There are three bandwidth systems.

- For 20MHz bandwidth systems, use Channel 52, 56, 60, 64.
- For 40MHz bandwidth systems, use Channel 54, 62

| Frequency Band                 | Channel No. | Frequency | Channel No. | Frequency |
|--------------------------------|-------------|-----------|-------------|-----------|
| 5250~5350 MHz<br>U-NII Band 2A | 52          | 5260 MHz  | 60          | 5300 MHz  |
|                                | 54          | 5270 MHz  | 62          | 5310 MHz  |
|                                | 56          | 5280 MHz  | 64          | 5320 MHz  |
|                                | 58          | 5290 MHz  | -           | -         |

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## 2.3 Related Submittal(S) / Grant (S)

This submittal(s) (test report) is intended for FCC ID: **2BLTR-AND1**, filing to comply with Part 2, Part 15.407 of the Federal Communication Commission rules.

## 2.4 Test Methodology

The tests were performed according to following standards:

| No. | Identity                  | Document Title                                   |
|-----|---------------------------|--------------------------------------------------|
| 1   | FCC 47 CFR Part 15.407(h) | Dynamic Frequency Selection (DFS).               |
| 2   | KDB 905462                | D02 UNII DFS Compliance Procedures New Rules v02 |

## 2.5 Description of Test Mode

- The tests in this section are run sequentially and the UUT must pass all tests successfully. If the UUT fails any one of the tests it will count as a failure of compliance.
- To show compliance, all tests must be performed with waveforms randomly generated as specified with test results meeting the required percentage of successful detection criteria.
- One frequency will be chosen from the operating Channels of the UUT within the 5250-5350 MHz or 5470-5725 MHz bands.

## 2.6 Summary of Test Result

| Ref Std.Clause     | Description of Test                                                      | Result |
|--------------------|--------------------------------------------------------------------------|--------|
| KDB 905462 7.8.1   | DFS: UNII Detection Bandwidth Measurement                                | N/A    |
| KDB 905462 7.8.2.1 | DFS: Initial Channel Availability Check Time                             | N/A    |
| KDB 905462 7.8.2.2 | DFS: Radar Burst at the Beginning of the Channel Availability Check Time | N/A    |
| KDB 905462 7.8.2.3 | DFS: Radar Burst at the End of the Channel Availability Check Time       | N/A    |
| KDB 905462 7.8.3   | DFS: In-Service Monitoring for Channel Move Time (CMT)                   | Pass   |
| KDB 905462 7.8.3   | DFS: In-Service Monitoring for Channel Closing Transmission Time (CCTT)  | Pass   |
| KDB 905462 7.8.3   | DFS: In-Service Monitoring for Non-Occupancy Period (NOP)                | Pass   |

Note: N/A means not applicable

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## 2.7 Antenna Requirement

| Standard Requirement                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>15.203 requirement:</b><br/>An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.</p> |
| <p><b>EUT Antenna:</b><br/>The non-detachable antenna inside the device cannot be replaced by the user at will. The gain of the antenna is -0.9dBi</p>                                                                                                                                                                                                                                                                                                                                   |

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### 3. Test Environment

#### 3.1 Address of The Test Laboratory

Laboratory: Attestation of Global Compliance (Shenzhen) Co., Ltd.

Address: 1-2/F, Building 19, Junfeng Industrial Park, Chongqing Road, Heping Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China

#### 3.2 Test Facility

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

##### **CNAS-Lab Code: L5488**

Attestation of Global Compliance (Shenzhen) Co., Ltd. has been assessed and proved to follow CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC17025: 2017 General Requirements for the Competence of Testing and Calibration Laboratories).

##### **A2LA-Lab Cert. No.: 5054.02**

Attestation of Global Compliance (Shenzhen) Co., Ltd. EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to follow ISO/IEC 17025: 2017 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

##### **FCC-Registration No.: 975832**

Attestation of Global Compliance (Shenzhen) Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintained in our files with Registration 975832.

##### **IC-Registration No.: 24842 (CAB identifier: CN0063)**

Attestation of Global Compliance (Shenzhen) Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the Certification and Engineering Bureau of Industry Canada. The acceptance letter from the IC is maintained in our files with Registration 24842.

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### 3.3 Environmental Conditions

|                         | Normal Conditions |
|-------------------------|-------------------|
| Temperature range (°C)  | 15 - 35           |
| Relative humidity range | 20 % - 75 %       |
| Pressure range (kPa)    | 86 - 106          |

### 3.4 Measurement Uncertainty

The reported uncertainty of measurement  $y \pm U$ , where expanded uncertainty  $U$  is based on a standard uncertainty multiplied by a coverage factor of  $k=2$ , providing a level of confidence of approximately 95%.

| Item                                                    | Measurement Uncertainty    |
|---------------------------------------------------------|----------------------------|
| Uncertainty of DFS Magnitude Output                     | $U_c = \pm 2.0 \text{ dB}$ |
| Uncertainty of Launch time, stop time, dwell time, etc. | $U_c = \pm 2 \%$           |
| Uncertainty of Occupied Channel Bandwidth               | $U_c = \pm 2.7 \%$         |

### 3.5 List of Equipment Used

| ● RF Conducted Test System          |               |                   |               |             |            |                           |                           |
|-------------------------------------|---------------|-------------------|---------------|-------------|------------|---------------------------|---------------------------|
| Used                                | Equipment No. | Test Equipment    | Manufacturer  | Model No.   | Serial No. | Last Cal. Date (YY-MM-DD) | Next Cal. Date (YY-MM-DD) |
| <input checked="" type="checkbox"/> | AGC-ER-E061   | Spectrum Analyzer | Agilent       | N9020A      | MY52090123 | 2023-06-03                | 2024-06-02                |
| <input checked="" type="checkbox"/> | AGC-ER-E061   | Spectrum Analyzer | Agilent       | N9020A      | MY52090123 | 2024-05-28                | 2025-05-27                |
| <input checked="" type="checkbox"/> | AGC-ER-E059   | Signal Generator  | Agilent       | N5182B      | MY53050647 | 2024-02-01                | 2025-01-31                |
| <input type="checkbox"/>            | AGC-ER-E060   | Signal Generator  | Agilent       | N5171B      | MY53050474 | 2023-06-01                | 2024-05-31                |
| <input type="checkbox"/>            | AGC-ER-E060   | Signal Generator  | Agilent       | N5171B      | MY53050474 | 2024-05-28                | 2025-05-27                |
| <input checked="" type="checkbox"/> | AGC-ER-A003   | Power Splitter    | Mini-Circuits | ZFRSC-183-s | 3122       | 2023-06-01                | 2024-05-31                |
| <input checked="" type="checkbox"/> | AGC-ER-A003   | Power Splitter    | Mini-Circuits | ZFRSC-183-s | 3122       | 2024-05-30                | 2025-05-29                |
| <input type="checkbox"/>            | AGC-ER-A004   | Power Splitter    | Agilent       | 11667B      | N/A        | 2023-06-01                | 2024-05-31                |
| <input type="checkbox"/>            | AGC-ER-A004   | Power Splitter    | Agilent       | 11667B      | N/A        | 2024-05-30                | 2025-05-29                |
| <input checked="" type="checkbox"/> | AGC-ER-A005   | 30dB Attenuator   | Mini-Circuits | 15542       | N/A        | Each time                 | N/A                       |
| <input type="checkbox"/>            | AGC-ER-A006   | 10dB Attenuator   | Mini-Circuits | 15542       | N/A        | Each time                 | N/A                       |
| <input checked="" type="checkbox"/> | AGC-ER-W007   | RF Cable          | Harbour       | SHWCB3000-N | 1#         | Each time                 | N/A                       |
| <input checked="" type="checkbox"/> | AGC-ER-W008   | RF Cable          | Harbour       | SHWCB3000-N | 2#         | Each time                 | N/A                       |

| ● Test Software& Auxiliary Equipment |               |                |              |           |                     |
|--------------------------------------|---------------|----------------|--------------|-----------|---------------------|
| Used                                 | Equipment No. | Test Equipment | Manufacturer | Model No. | Version Information |

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|                                     |             |                                    |          |             |                      |
|-------------------------------------|-------------|------------------------------------|----------|-------------|----------------------|
| <input checked="" type="checkbox"/> | AGC-ER-S017 | DFS Waveform<br>Generator Software | Keysight | N7607       | V2.0.0.0             |
| <input checked="" type="checkbox"/> | AGC-ER-S009 | DFS Data<br>Analyzer Software      | Tonscend | JS1120-3    | 2.6.77.0518          |
| <input checked="" type="checkbox"/> | AGC-EM-A167 | WIFI 6E Router<br>(Master)         | ASUS     | GT-AXE11000 | FCC ID: MSQ-RTAXJF00 |

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## 4. DFS Detection Thresholds and Radar Test Waveforms

### 4.1 Provisions Applicable

The following table from FCC KDB 905462 D02 UNII DFS Compliance Procedures New Rules v02 lists the applicable requirements for the DFS testing.

**Table 3-1: Applicability of DFS Requirements Prior to Use of a Channel**

| Requirement                     | Operational Mode                |                                                                    |                                                      |
|---------------------------------|---------------------------------|--------------------------------------------------------------------|------------------------------------------------------|
|                                 | <input type="checkbox"/> Master | <input checked="" type="checkbox"/> Client without Radar Detection | <input type="checkbox"/> 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 3-2: Applicability of DFS requirements during normal operation**

| Requirement                       | Operational Mode                                                      |                                                                    |
|-----------------------------------|-----------------------------------------------------------------------|--------------------------------------------------------------------|
|                                   | <input type="checkbox"/> Master Device or Client with Radar Detection | <input checked="" type="checkbox"/> 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 | <input type="checkbox"/> Master Device or Client with Radar Detection | <input checked="" type="checkbox"/> 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 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.

## 4.2 DFS Devices Requirements

**Per FCC KDB 905462 D02 UNII DFS Compliance Procedures New Rules v02 the following are the requirements for Client Devices:**

- a) A Client Device will not transmit before having received appropriate control signals from a Master Device.
- b) A Client Device will stop all its transmissions whenever instructed by a Master Device to which it is associated and will meet the Channel Move Time and Channel Closing transmission time requirements. The Client Device will not resume any transmissions until it has again received control signals from a Master Device.
- c) If a Client Device is performing In-Service Monitoring and detects a Radar Waveform above the DFS Detection Threshold, it will inform the Master Device. This is equivalent to the Master Device detecting the Radar Waveform.
- d) Irrespective of Client Device or Master Device detection the Channel Move Time and Channel Closing Transmission Time requirements remain the same.
- e) The client test frequency must be monitored to ensure no transmission of any type has occurred for 30 minutes. Note: If the client moves with the master, the device is considered compliant if nothing appears in the client non-occupancy period test. For devices that shut down (rather than moving channels), no beacons should appear.

 **Channel Move Time and Channel Closing Transmission Time requirements are listed in the following table.**

**Table 3-3: DFS Response Requirements**

| 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. See Notes 1 and 2. |
| <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> |                                                                                                        |

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### 4.3 DFS Detection Threshold Values

The DFS detection thresholds are defined for Master devices and Client Devices with In-service monitoring. These detection thresholds are listed in the following table.

**Table 3-4: 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<br>power spectral density < 10 dBm/MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                       | -62 dBm                          |
| EIRP < 200 milliwatt that do not meet the power<br>spectral density requirement                                                                                                                                                                                                                                                                                                                                                                                                                                       | -64 dBm                          |
| EIRP $\geq$ 200 milliwatt                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | -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> |                                  |

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#### 4.4 Parameters of DFS Test Signals

This section provides the parameters for required test waveforms, minimum percentage of successful detections, and the minimum number of trials that must be used for determining DFS conformance. Step intervals of 0.1 microsecond for Pulse Width, 1 microsecond for PRI, 1 MHz for chirp width and 1 for the number of pulses will be utilized for the random determination of specific test waveforms.

##### ● 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 3-6                                                                  | $\text{Roundup} \left\{ \left( \frac{1}{360} \right) \cdot \left( \frac{19 \cdot 10^6}{\text{PRI}_{\mu\text{sec}}} \right) \right\}$ | 60%                                        | 30                       |
|                                                                                                                                      |                    | Test B: 15 unique PRI values randomly selected within the range of 518-3066μsec, with a minimum increment of 1μsec, excluding PRI values selected in Test A | /                                                                                                                                    |                                            |                          |
| 2                                                                                                                                    | 1-5                | 150-230                                                                                                                                                     | 23-29                                                                                                                                | 60%                                        | 30                       |
| 3                                                                                                                                    | 6-10               | 200-500                                                                                                                                                     | 16-18                                                                                                                                | 60%                                        | 30                       |
| 4                                                                                                                                    | 11-20              | 200-500                                                                                                                                                     | 12-16                                                                                                                                | 60%                                        | 30                       |
| Aggregate (Radar Types 1-4)                                                                                                          |                    |                                                                                                                                                             |                                                                                                                                      | 80%                                        | 120                      |
| Note 1: Short Pulse Radar Type 0 should be used for the detection bandwidth test, channel move time, and channel closing time tests. |                    |                                                                                                                                                             |                                                                                                                                      |                                            |                          |

**Table 3-5: Parameters for Short Pulse Radar Waveforms**

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A minimum of 30 unique waveforms are required for each of the Short Pulse Radar Types 2 through 4. If more than 30 waveforms are used for Short Pulse Radar Types 2 through 4, then each additional waveform must also be unique and not repeated from the previous waveforms.

| 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                                | 1355.0                                         | 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                                | 1139.0                                         | 878                                      |
| 20                                | 1113.6                                         | 898                                      |
| 21                                | 1089.3                                         | 918                                      |
| 22                                | 1066.1                                         | 938                                      |
| 23                                | 326.2                                          | 3066                                     |

**Table 3-6: Pulse Repetition Intervals Values for Test A**

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### ● Long Pulse Radar Test Waveform

| Radar Type | Pulse Width (μsec) | Chirp Width (MHz) | PRI (μsec) | Number of Pulses per Burst | Number of Bursts | Minimum Percentage of Successful Detection | Minimum Number of Trials |
|------------|--------------------|-------------------|------------|----------------------------|------------------|--------------------------------------------|--------------------------|
| 5          | 50-100             | 5-20              | 1000-2000  | 1-3                        | 8 - 20           | 80%                                        | 30                       |

**Table 3-7: Parameters for Long Pulse Radar Waveforms**

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) | Chirp Width (MHz) | PRI (μsec) | Number of Pulses per Burst | Number of Bursts | Minimum Percentage of Successful Detection | Minimum Number of Trials |
|------------|--------------------|-------------------|------------|----------------------------|------------------|--------------------------------------------|--------------------------|
| 6          | 1                  | 333               | 9          | 0.333                      | 300              | 70%                                        | 30                       |

**Table 3-7: Parameters for Long Pulse Radar Waveforms**

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 – 5724MHz. Next, the frequency that was just chosen is removed from the group and a frequency is randomly selected from the remaining 474 frequencies in the group. This process continues until all 475 frequencies are chosen for the set. For selection of a random frequency, the frequencies remaining within the group are always treated as equally likely

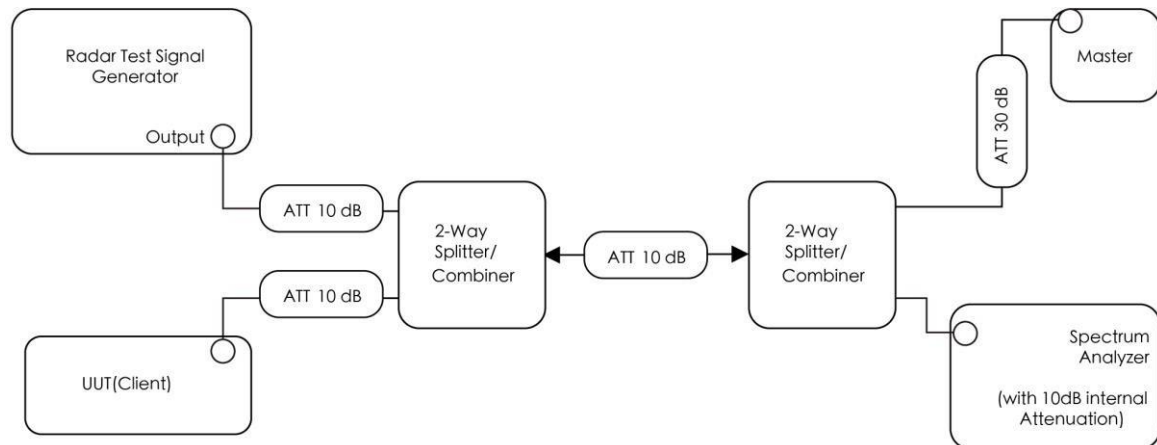
### Radar Type 0

| Trial Id | Radar Type | Pulse Width (us) | PRI (us) | Number of Pulses | Waveform Length (us) |
|----------|------------|------------------|----------|------------------|----------------------|
| 0        | Type 0     | 1.0              | 1428.0   | 18               | 25704.0              |
| 1        | Type 0     | 1.0              | 1428.0   | 18               | 25704.0              |
| 2        | Type 0     | 1.0              | 1428.0   | 18               | 25704.0              |
| 3        | Type 0     | 1.0              | 1428.0   | 18               | 25704.0              |
| 4        | Type 0     | 1.0              | 1428.0   | 18               | 25704.0              |
| 5        | Type 0     | 1.0              | 1428.0   | 18               | 25704.0              |
| 6        | Type 0     | 1.0              | 1428.0   | 18               | 25704.0              |
| 7        | Type 0     | 1.0              | 1428.0   | 18               | 25704.0              |
| 8        | Type 0     | 1.0              | 1428.0   | 18               | 25704.0              |
| 9        | Type 0     | 1.0              | 1428.0   | 18               | 25704.0              |
| 10       | Type 0     | 1.0              | 1428.0   | 18               | 25704.0              |
| 11       | Type 0     | 1.0              | 1428.0   | 18               | 25704.0              |
| 12       | Type 0     | 1.0              | 1428.0   | 18               | 25704.0              |
| 13       | Type 0     | 1.0              | 1428.0   | 18               | 25704.0              |
| 14       | Type 0     | 1.0              | 1428.0   | 18               | 25704.0              |
| 15       | Type 0     | 1.0              | 1428.0   | 18               | 25704.0              |
| 16       | Type 0     | 1.0              | 1428.0   | 18               | 25704.0              |
| 17       | Type 0     | 1.0              | 1428.0   | 18               | 25704.0              |
| 18       | Type 0     | 1.0              | 1428.0   | 18               | 25704.0              |
| 19       | Type 0     | 1.0              | 1428.0   | 18               | 25704.0              |
| 20       | Type 0     | 1.0              | 1428.0   | 18               | 25704.0              |
| 21       | Type 0     | 1.0              | 1428.0   | 18               | 25704.0              |
| 22       | Type 0     | 1.0              | 1428.0   | 18               | 25704.0              |
| 23       | Type 0     | 1.0              | 1428.0   | 18               | 25704.0              |
| 24       | Type 0     | 1.0              | 1428.0   | 18               | 25704.0              |
| 25       | Type 0     | 1.0              | 1428.0   | 18               | 25704.0              |
| 26       | Type 0     | 1.0              | 1428.0   | 18               | 25704.0              |
| 27       | Type 0     | 1.0              | 1428.0   | 18               | 25704.0              |
| 28       | Type 0     | 1.0              | 1428.0   | 18               | 25704.0              |
| 29       | Type 0     | 1.0              | 1428.0   | 18               | 25704.0              |

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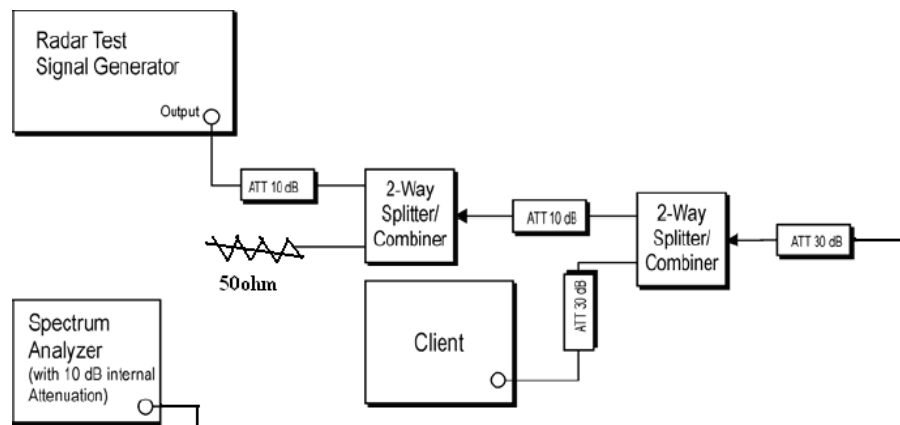
#### 4.5 Measurement Setup (Block Diagram of Configuration)

The FCC KDB 905462 D02 UNII DFS Compliance Procedures New Rules v01 describes a radiated test setup and a conducted test setup. The conducted test setup was used for this testing. Figure 3-1 shows the typical test setup.



**Figure 3-1: Conducted Test Setup where UUT is a Client and Radar Test Waveforms are injected into the Masters**

The conducted test setup was used for this calibration testing. Figure 3-2 shows the typical test setup.



**Figure 3-2: Radar Waveform Calibration Conducted Test Setup**

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#### 4.6 Measurement Procedure

##### Radar Waveform Calibration Measurement

- The Interference Radar Detection Threshold Level is  $(-64\text{dBm}) + (0) [\text{dBi}] + 1 \text{ dB} = -63 \text{ dBm}$  that had been taken into account the output power range and antenna gain.
- The above equipment setup was used to calibrate the conducted Radar Waveform. A vector signal generator was utilized to establish the test signal level for each radar type.
- During this process there were replace 50ohm terminal form Master and Client device and no transmissions by either the Master or Client Device.
- The spectrum analyzer was switched to the zero span (Time Domain) at the frequency of the Radar Waveform generator. Peak detection was used.
- The spectrum analyzer resolution bandwidth (RBW) and video bandwidth (VBW) were set to at least 3MHz. The vector signal generator amplitude was set so that the power level measured at the spectrum analyzer was  $(-64\text{dBm}) + (0) [\text{dBi}] + 1 \text{ dB} = -63\text{dBm}$ .
- Capture the spectrum analyzer plots on short pulse radar types, long pulse radar type and hopping radar waveform.

##### In-Service Monitoring Measurement

- The test should be performed with Radar Type 0. The measurement timing begins at the end of the Radar Type 0.
- When the radar burst with a level equal to the DFS Detection Threshold + 1dB is generated on the Operating Channel of the U-NII device. A U-NII device operating as a Master Device will associate with the Client Device at Channel. Stream the MPEG test file from the Master Device to the Client Device on the selected Channel for the entire period of the test. At time T0 the Radar Waveform generator sends a Burst of pulses for each of the radar types at Detection Threshold + 1dB.
- Observe the transmissions of the EUT at the end of the radar Burst on the Operating Channel. Measure and record the transmissions from the EUT during the observation time (Channel Move Time).
- Measurement of the aggregate duration of the Channel Closing Transmission Time method. with the spectrum analyzer set to zero span tuned to the center frequency of the EUT operating channel at the radar simulated frequency, peak detection, and max hold, the dwell time per bin is given by:  $D_{\text{well}} (1.5\text{ms}) = S (12 \text{ sec}) / B (8000)$ ; where  $D_{\text{well}}$  is the dwell time per spectrum analyzer sampling bin, S is the sweep time and B is the number of spectrum analyzer sampling bins. An upper bound of the aggregate duration of the intermittent control signals of Channel Closing Transmission Time is calculated by:  $80\text{MHz}: C = N \times D_{\text{well}}$ ; where C is the Closing Time, N is the number of spectrum analyzer sampling bins showing a U-NII transmission and  $D_{\text{well}}$  is the dwell time per bin.
- Measure the UUT for more than 30 minutes following the channel close/move time to verify that the UUT does not resume any transmissions on this Channel.

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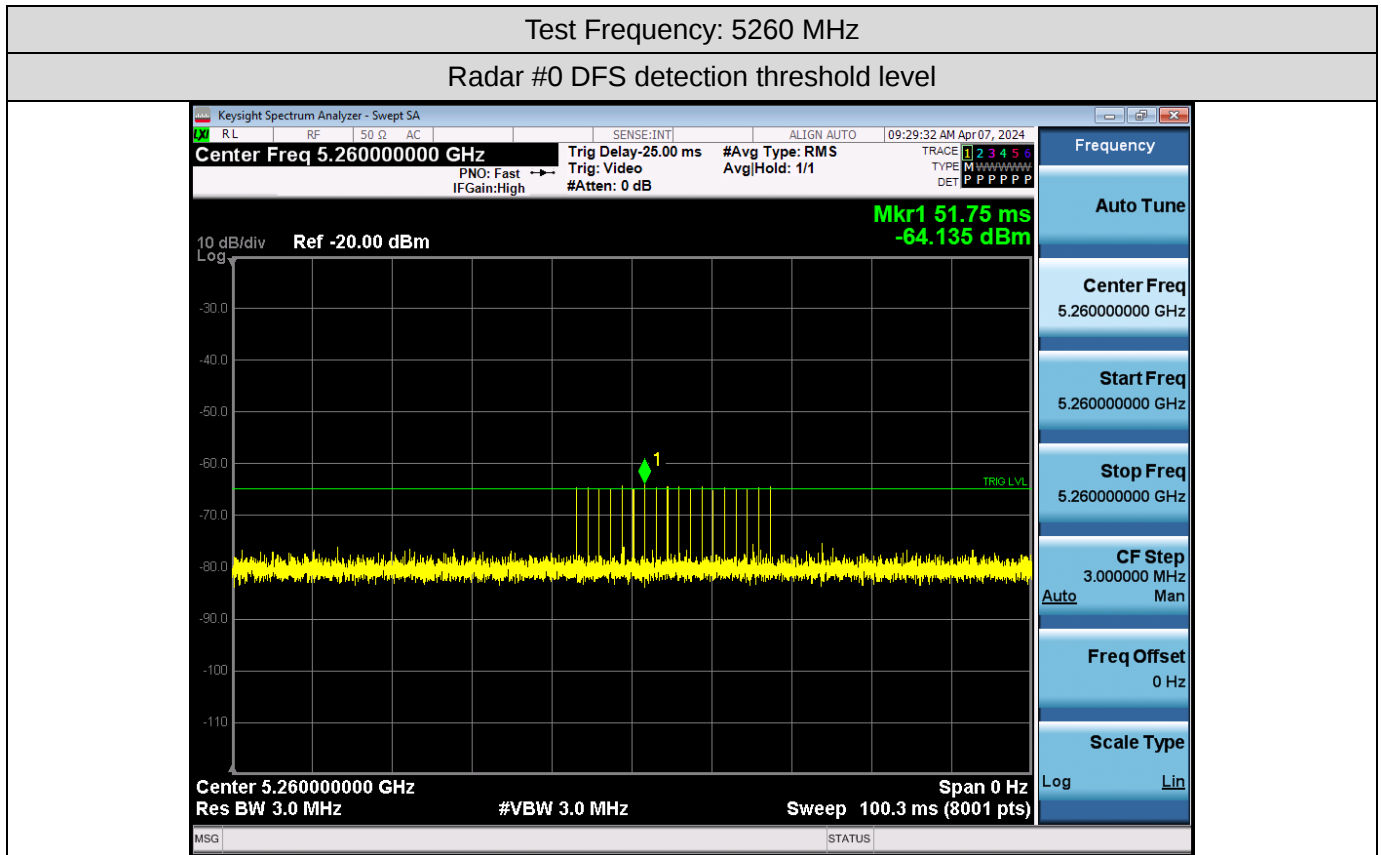
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 **The Following are Specific Test Steps:**

- a) When a Client Device without Radar Detection is the UUT, the Master Device is the Radar Detection Device.
- b) The startup time of the AP (Master device) is recorded as 40s, and the startup time of the Slave device (DUT) is recorded as 10s.
- c) A spectrum analyzer is used to establish the test signal level for each radar type.
- d) During this process, there are no transmissions by either the Master Device or Client Device.
- e) 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.
- f) The measured channels are 5260MHz in 20MHz Bandwidth. The Radar signal was the same as transmitted channels, and injected into the antenna port of AP (master), measured the DFS parameters.
- g) The master transmitted the test data to client, the transmitted duty cycle is 30.8%.

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#### 4.7 Radar Waveform Calibration Plot



#### Calibration:

For a detection threshold level of -64dBm and the antenna gain is -0.9dBi, required detection threshold is -64.9dBm (= -64-0.9).

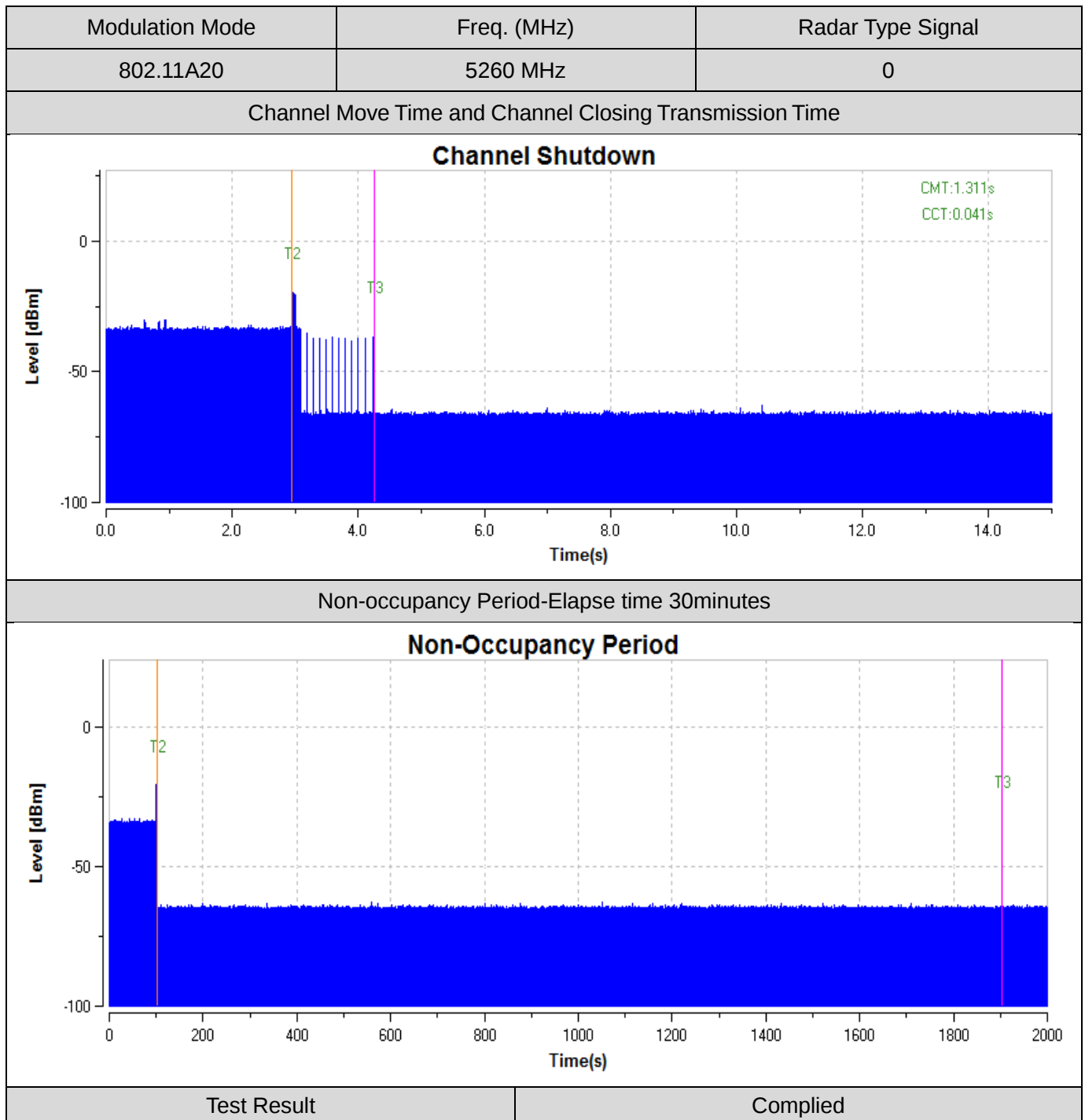
Note: Maximum Transmit Power is greater than 200 milliwatt in this report, so detection threshold level is -64.9dBm

#### 4.8 Measurement Results

##### Channel Move Time and Channel Closing Transmission Time

| Test Mode                 | Requirement                       | Measurement Level | Limit    | Result |
|---------------------------|-----------------------------------|-------------------|----------|--------|
| 802.11ax_a20<br>(5260MHz) | Channel Closing Transmission Time | 0.041s            | ≤0.26s   | Pass   |
|                           | Channel Move Time                 | 1.311s            | ≤10s     | Pass   |
|                           | Non-Occupancy Period (min)        | ≥ 30min           | ≥ 30 min | Pass   |

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### **Appendix I: Photographs of Test Setup**

Refer to the Report No.: AGC02931240301AP01

### **Appendix II: Photographs of Test EUT**

Refer to the Report No.: AGC02931240301AP02

**-----End of Report-----**

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