



# DFS TEST REPORT

**FCC ID** : O6ZHR54R1-500  
**Equipment** : Digital Satellite Receiver  
**Brand Name** : DIRECTV  
**Model Name** : HR54-500  
**Applicant** : Humax Co., Ltd.  
HUMAX BLDG., 2, Yeongmun-ro, Cheoin-gu  
Yongin-si, Gyeonggi-do  
South Korea  
17040  
**Manufacturer** : Humax Co., Ltd.  
HUMAX BLDG., 2, Yeongmun-ro, Cheoin-gu  
Yongin-si, Gyeonggi-do  
South Korea  
17040  
**Standard** : 47 CFR FCC Part 15.407

The product was received on Oct. 25, 2017, and testing was started from Nov. 24, 2017 and completed on Nov. 24, 2017. We, Sporton International Inc. Hsinchu Laboratory, would like to declare that the tested sample has been evaluated in accordance with the procedures given in FCC KDB 905462 D02 UNII DFS Compliance Procedures New Rules v02 and shown compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International Inc. Hsinchu Laboratory, the test report shall not be reproduced except in full.

Approved by: Sam Chen

**Sporton International Inc. Hsinchu Laboratory**

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## History of this test report

TEL : 886-3-656-9065  
FAX : 886-3-656-9085  
Report Template No.: CB-A12\_4 Ver1.1

Page Number : 3 of 24  
Issued Date : Jan. 03, 2024  
Report Version : 01



## Summary of Test Result

| Report Clause                                                                                                                                                                     | Ref Std. Clause      | Test Items                                                              | Result (PASS/FAIL) | Remark |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-------------------------------------------------------------------------|--------------------|--------|
| 3.3                                                                                                                                                                               | FCC KDB 905462 7.8.3 | DFS: In-Service Monitoring for Channel Move Time (CMT)                  | PASS               | -      |
| 3.3                                                                                                                                                                               | FCC KDB 905462 7.8.3 | DFS: In-Service Monitoring for Channel Closing Transmission Time (CCTT) | PASS               | -      |
| 3.3                                                                                                                                                                               | FCC KDB 905462 7.8.3 | DFS: In-Service Monitoring for Non-Occupancy Period (NOP)               | PASS               | -      |
| Note 1: Since the product is client without radar detection function, only Channel Move Time, Channel Closing Transmission Time and Non-Occupancy Period are required to perform. |                      |                                                                         |                    |        |
| Note 2: Reference to Sporton Project No.: 7O2406                                                                                                                                  |                      |                                                                         |                    |        |

### Conformity Assessment Condition:

1. The test results (PASS/FAIL) with all measurement uncertainty excluded are presented against the regulation limits or in accordance with the requirements stipulated by the applicant/manufacture who shall bear all the risks of non-compliance that may potentially occur if measurement uncertainty is taken into account.
2. The measurement uncertainty please refer to each test result in the chapter "Measurement Uncertainty".

### Disclaimer:

The product specifications of the EUT presented in the test report that may affect the test assessments are declared by the manufacturer who shall take full responsibility for the authenticity.

**Reviewed by: Sam Chen**

**Report Producer: Vicky Huang**



# 1 General Description

## 1.1 Information

### 1.1.1 RF General Information

| Specification Items                                                                                                                                                                                                                                      | Description                                                             |                                                          |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|----------------------------------------------------------|
| Frequency Range                                                                                                                                                                                                                                          | 5250 MHz – 5350 MHz<br>5470 MHz – 5725 MHz                              |                                                          |
| Power Type                                                                                                                                                                                                                                               | From power adapter                                                      |                                                          |
| Channel Bandwidth                                                                                                                                                                                                                                        | 20/40 MHz operating channel bandwidth                                   |                                                          |
| Operating Mode                                                                                                                                                                                                                                           | <input type="checkbox"/> Master                                         |                                                          |
|                                                                                                                                                                                                                                                          | <input type="checkbox"/> Client with radar detection                    |                                                          |
|                                                                                                                                                                                                                                                          | <input checked="" type="checkbox"/> Client without radar detection      |                                                          |
| Communication Mode                                                                                                                                                                                                                                       | <input checked="" type="checkbox"/> IP Based (Load Based)               | <input type="checkbox"/> Frame Based                     |
| TPC Function                                                                                                                                                                                                                                             | <input checked="" type="checkbox"/> With TPC                            | <input type="checkbox"/> Without TPC                     |
| Weather Band (5600~5650MHz)                                                                                                                                                                                                                              | <input type="checkbox"/> With 5600~5650MHz                              | <input checked="" type="checkbox"/> Without 5600~5650MHz |
| Channel Puncturing Function                                                                                                                                                                                                                              | <input type="checkbox"/> Supported                                      | <input checked="" type="checkbox"/> Unsupported          |
| Firmware Number                                                                                                                                                                                                                                          | 5.99 RC188.28<br>wl0: Dec 14 2016 12:16:06 version 5.99.188.28 (WLTEST) |                                                          |
| <ul style="list-style-type: none"><li>11a, HT20 and HT40 use a combination of OFDM-BPSK, QPSK, 16QAM, 64QAM modulation.</li><li>EUT employ a TPC mechanism and TPC have the capability to operate at least 6 dB below highest RF output power.</li></ul> |                                                                         |                                                          |

Note: The above information was declared by manufacturer.

### TPC Power Result

| Mode                         | Min Power<br>(dBm) | Max Power<br>(dBm) | Min EIRP<br>(dBm) | Max EIRP<br>(dBm) |
|------------------------------|--------------------|--------------------|-------------------|-------------------|
| 802.11a_Nss1,(6Mbps)_1TX     | -                  | -                  | -                 | -                 |
| 5.25-5.35GHz                 | 17.31              | 23.31              | 21.51             | 27.51             |
| 5.47-5.725GHz                | 17.51              | 23.51              | 21.71             | 27.71             |
| 802.11n HT20_Nss1,(MCS0)_2TX | -                  | -                  | -                 | -                 |
| 5.25-5.35GHz                 | 17.32              | 23.32              | 21.52             | 27.52             |
| 5.47-5.725GHz                | 17.20              | 23.20              | 21.40             | 27.40             |
| 802.11n HT40_Nss1,(MCS0)_2TX | -                  | -                  | -                 | -                 |
| 5.25-5.35GHz                 | 17.38              | 23.38              | 21.58             | 27.58             |
| 5.47-5.725GHz                | 17.10              | 23.10              | 21.30             | 27.30             |

Note: The manufacturer declared that TPC is applied to this equipment. The test result of TPC is equal to RF output power minus 6dBm which is recorded as a reference for the manufacturer.

**1.1.2 Antenna Information**

| Ant. | WLAN 2.4/5GHz Port | Brand   | Model Name     | Antenna Type    | Connector | Gain (dBi) |      |
|------|--------------------|---------|----------------|-----------------|-----------|------------|------|
|      |                    |         |                |                 |           | 2.4GHz     | 5GHz |
| 1    | 2                  | Airgain | N2425HMHRA-290 | PCB Antenna     | I-PEX     | 2.8        | 4.1  |
| 2    | 1                  | Airgain | N2425HMHRD-190 | PCB Antenna     | I-PEX     | 3.8        | 4.2  |
| Ant. | RF4CE Port         | Brand   | Model Name     | Antenna Type    | Connector | Gain (dBi) |      |
| 3    | 1                  | HUMAX   | HR54RF4CE_Ant1 | Printed Antenna | N/A       | 5.2        |      |
| 4    | 2                  | HUMAX   | HR54RF4CE_Ant2 | Printed Antenna | N/A       | 4.8        |      |

Note 1: The above information was declared by manufacturer.

Note 2: The antenna is the cross-polarized antenna; it doesn't need to evaluate array gain.

**<For 2.4GHz function>****For IEEE 802.11b mode <1TX/1RX>:**

Only Port 1 can be used as transmitting/receiving antenna.

**For IEEE 802.11g mode <1TX/1RX>:**

The EUT supports the antenna with TX and RX diversity functions.

Both Port 1 and Port 2 support transmit and receive functions, but only one of them will be used at one time.

The Port 1 generated the worst case, so it was selected to test and record in the report.

**For IEEE 802.11n mode <2TX/2RX>:**

Port 1 and Port 2 will transmit/receive the same signal simultaneously.

Port 1 and Port 2 can be used as transmitting/receiving antennas.

**<For 5GHz function>****For IEEE 802.11a mode <1TX/1RX>:**

The EUT supports the antenna with TX and RX diversity functions.

Both Port 1 and Port 2 support transmit and receive functions, but only one of them will be used at one time.

The Port 1 generated the worst case, so it was selected to test and record in the report.

**For IEEE 802.11n mode <2TX/2RX>:**

Port 1 and Port 2 will transmit/receive the same signal simultaneously.

Port 1 and Port 2 can be used as transmitting/receiving antennas.

**<For RF4CE function>****For RF4CE mode <1TX/1RX>:**

The EUT supports the antenna with TX and RX diversity functions.

Both Port 1 and Port 2 support transmit and receive functions, but only one of them will be used at one time.

The Port 1 generated the worst case, so it was selected to test and record in the report.

### 1.1.3 DFS Band Carrier Frequencies

There are two bandwidth systems.

For 20MHz bandwidth systems, use Channel 52, 56, 60, 64, 100, 104, 108, 112, 116, 132, 136, 140.

For 40MHz bandwidth systems, use Channel 54, 62, 102, 110, 134

| Frequency Band          | Channel No. | Frequency | Channel No. | Frequency |
|-------------------------|-------------|-----------|-------------|-----------|
| 5250~5350 MHz<br>Band 2 | 52          | 5260 MHz  | 60          | 5300 MHz  |
|                         | 54          | 5270 MHz  | 62          | 5310 MHz  |
|                         | 56          | 5280 MHz  | 64          | 5320 MHz  |
| 5470~5725 MHz<br>Band 3 | 100         | 5500 MHz  | 116         | 5580 MHz  |
|                         | 102         | 5510 MHz  | 132         | 5660 MHz  |
|                         | 104         | 5520 MHz  | 134         | 5670 MHz  |
|                         | 108         | 5540 MHz  | 136         | 5680 MHz  |
|                         | 110         | 5550 MHz  | 140         | 5700 MHz  |
|                         | 112         | 5560 MHz  | -           | -         |

## 1.2 Accessories

| Accessories    |            |             |                                                  |
|----------------|------------|-------------|--------------------------------------------------|
| Equipment Name | Brand Name | Model Name  | Rating                                           |
| Adapter        | DIRECTV    | EPS44R3-15  | INPUT: 120V ~ 1.3A, 60Hz<br>OUTPUT: 12V, 4A, 48W |
| Equipment Name | Brand Name | Part Number | Rating                                           |
| Hard Disk      | SEAGATE    | 1SD102-500  | -                                                |

## 1.3 Support Equipment

| Support Equipment |           |            |            |             |
|-------------------|-----------|------------|------------|-------------|
| No.               | Equipment | Brand Name | Model Name | FCC ID      |
| 1                 | NB        | DELL       | E4300      | DoC         |
| 2                 | NB        | DELL       | E4300      | DoC         |
| 3                 | WLAN AP   | D-LINK     | DIR860L    | KA2IR860LA1 |

## 1.4 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- ♦ 47 CFR FCC Part 15.407
- ♦ FCC KDB 905462 D02 UNII DFS Compliance Procedures New Rules v02

## 1.5 Testing Location Information

| Testing Location Information                                    |                                                                                    |
|-----------------------------------------------------------------|------------------------------------------------------------------------------------|
| Test Lab. : Sporton International Inc. Hsinchu Laboratory       |                                                                                    |
| Hsinchu                                                         | ADD: No.8, Ln. 724, Bo'ai St., Zhubei City, Hsinchu County 302010, Taiwan (R.O.C.) |
| (TAF: 3787)                                                     | TEL: 886-3-656-9065 FAX: 886-3-656-9085                                            |
| Test site Designation No. TW3787 with FCC.                      |                                                                                    |
| Conformity Assessment Body Identifier (CABID) TW3787 with ISED. |                                                                                    |

| Test Condition | Test Site No. | Test Engineer | Test Environment<br>(°C / %) | Test Date     |
|----------------|---------------|---------------|------------------------------|---------------|
| DFS Site       | DF01-CB       | Jeff Wu       | 26.1°C / 59%                 | Nov. 24, 2017 |

## 2 Test Configuration of EUT

### 2.1 Test Channel Frequencies Configuration

| Test Channel Frequencies Configuration |                          |
|----------------------------------------|--------------------------|
| IEEE Std.                              | Test Channel Freq. (MHz) |
| 802.11n (HT40)                         | 5510 MHz                 |

### 2.2 The Worst Case Measurement Configuration

| The Worst Case Mode for Following Conformance Tests |                                                                                                                                                                                                                                                                                                                                                                           |
|-----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Tests Item                                          | Dynamic Frequency Selection (DFS)                                                                                                                                                                                                                                                                                                                                         |
| Test Condition                                      | Radiated measurement<br>The EUT shall be configured to operate at the highest transmitter output power setting. If more than one antenna assembly is intended for this power setting, the gain of the antenna assembly with the lowest gain shall be used. The DFS radar test signals have been aligned to the direction corresponding to the EUT's maximum antenna gain. |
| Modulation Mode                                     | 802.11n (HT40)                                                                                                                                                                                                                                                                                                                                                            |



### 3 Dynamic Frequency Selection (DFS) Test Result

#### 3.1 General DFS Information

##### 3.1.1 DFS Parameters

| Table D.1: DFS requirement values                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                       |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|
| Parameter                                                                                                                                                                                                                                                                                                                                                                                                  | Value                                                                                                 |
| Non-occupancy period                                                                                                                                                                                                                                                                                                                                                                                       | Minimum 30 minutes                                                                                    |
| Channel Availability Check Time                                                                                                                                                                                                                                                                                                                                                                            | 60 seconds                                                                                            |
| Channel Move Time                                                                                                                                                                                                                                                                                                                                                                                          | 10 seconds (Note 1).                                                                                  |
| Channel Closing Transmission Time                                                                                                                                                                                                                                                                                                                                                                          | 200 milliseconds + an aggregate of 60 milliseconds over remaining 10 second periods. (Notes 1 and 2). |
| U-NII Detection Bandwidth                                                                                                                                                                                                                                                                                                                                                                                  | Minimum 100% of the 99% power bandwidth (Note 3).                                                     |
| Note 1: Channel Move Time and the Channel Closing Transmission Time should be performed with Radar Type 0. The measurement timing begins at the end of the Radar Type 0 burst.                                                                                                                                                                                                                             |                                                                                                       |
| Note 2: The Channel Closing Transmission Time is comprised of 200 milliseconds starting at the beginning of the Channel Move Time plus any additional intermittent control signals required to facilitate Channel changes (an aggregate of 60 milliseconds) during the remainder of the 10 second period. The aggregate duration of control signals will not count quiet periods in between transmissions. |                                                                                                       |
| Note 3: During the U-NII Detection Bandwidth detection test, radar type 0 is used and for each frequency step the minimum percentage of detection is 90%. Measurements are performed with no data traffic.                                                                                                                                                                                                 |                                                                                                       |

| Table D.2: Interference threshold values                                                                                                                                                                                                                                                         |                  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
| Maximum Transmit Power                                                                                                                                                                                                                                                                           | Value (see note) |
| EIRP $\geq$ 200 mW                                                                                                                                                                                                                                                                               | -64 dBm          |
| EIRP < 200 mW and PSD < 10dBm/MHz                                                                                                                                                                                                                                                                | -62 dBm          |
| EIRP < 200 mW and PSD $\geq$ 10dBm/MHz                                                                                                                                                                                                                                                           | -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. |                  |
| Note3: EIRP is based on the highest antenna gain. For MIMO devices refer to KDB Publication 662911D01.                                                                                                                                                                                           |                  |

**3.1.2 Applicability of DFS Requirements Prior to Use of a Channel**

| Requirement                            | DFS Operational mode |                                |                             |
|----------------------------------------|----------------------|--------------------------------|-----------------------------|
|                                        | Master               | Client without radar detection | Client with radar detection |
| <i>Non-Occupancy Period</i>            | Yes                  | Not required                   | Yes                         |
| <i>DFS Detection Threshold</i>         | Yes                  | Not required                   | Yes                         |
| <i>Channel Availability Check Time</i> | Yes                  | Not required                   | Not required                |
| <i>U-NII Detection Bandwidth</i>       | Yes                  | Not required                   | Yes                         |

**3.1.3 Applicability of DFS Requirements during Normal Operation**

| Requirement                              | DFS Operational mode |                                |                             |
|------------------------------------------|----------------------|--------------------------------|-----------------------------|
|                                          | Master               | Client without radar detection | Client with radar detection |
| <i>DFS Detection Threshold</i>           | Yes                  | Not required                   | Yes                         |
| <i>Channel Closing Transmission Time</i> | Yes                  | Yes                            | Yes                         |
| <i>Channel Move Time</i>                 | Yes                  | Yes                            | Yes                         |
| <i>U-NII Detection Bandwidth</i>         | Yes                  | Not required                   | Yes                         |

| Additional requirements for devices with multiple bandwidth modes | 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.

**3.1.4 Channel Loading/Data Streaming**

|                                     |                                                                                                |
|-------------------------------------|------------------------------------------------------------------------------------------------|
| <input type="checkbox"/>            | The data file (MPEG-4) has been transmitting in a streaming mode.                              |
| <input checked="" type="checkbox"/> | Software to ping the client is permitted to simulate data transfer with random ping intervals. |
| <input checked="" type="checkbox"/> | Minimum channel loading of approximately 17%.                                                  |
| <input type="checkbox"/>            | Unicast protocol has been used.                                                                |

## 3.2 Radar Test Waveform Calibration

### 3.2.1 Short Pulse Radar Test Waveforms

| Radar Type                                                                                                                                  | Pulse Width (μsec) | PRI (μsec)                                      | Number of Pulses                                                                                         | Minimum Percentage of Successful Detection | Minimum Trials |
|---------------------------------------------------------------------------------------------------------------------------------------------|--------------------|-------------------------------------------------|----------------------------------------------------------------------------------------------------------|--------------------------------------------|----------------|
| 0                                                                                                                                           | 1                  | 1428                                            | 18                                                                                                       | See Note 1                                 | See Note 1     |
| 1A                                                                                                                                          | 1                  | 15 unique PRI in KDB 905462 D02 Table 5a        | $\text{Roundup}\left\{\left(\frac{1}{360}\right) \times \left(\frac{19 \times 10^6}{PRI}\right)\right\}$ | 60%                                        | 15             |
| 1B                                                                                                                                          | 1                  | 15 unique PRI within 518-3066, Excluding 1A PRI |                                                                                                          | 60%                                        | 15             |
| 2                                                                                                                                           | 1-5                | 150-230                                         | 23-29                                                                                                    | 60%                                        | 30             |
| 3                                                                                                                                           | 6-10               | 200-500                                         | 16-18                                                                                                    | 60%                                        | 30             |
| 4                                                                                                                                           | 11-20              | 200-500                                         | 12-16                                                                                                    | 60%                                        | 30             |
| Aggregate (Radar Types 1-4)                                                                                                                 |                    |                                                 |                                                                                                          | 80%                                        | 120            |
| <b>Note 1:</b> Short Pulse Radar Type 0 should be used for the detection bandwidth test, channel move time, and channel closing time tests. |                    |                                                 |                                                                                                          |                                            |                |

A minimum of 30 unique waveforms are required for each of the short pulse radar types 1 through 4. If more than 30 waveforms are used for short pulse radar types 1 through 4, then each additional waveform must also be unique and not repeated from the previous waveforms. The aggregate is the average of the percentage of successful detections of short pulse radar types 1-4.

### 3.2.2 Long Pulse Radar Test Waveform

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

Each waveform is defined as follows:

- The transmission period for the Long Pulse Radar test signal is 12 seconds.
- There are a total of 8 to 20 Bursts in the 12 second period, with the number of Bursts being randomly chosen. This number is Burst Count.
- Each Burst consists of 1 to 3 pulses, with the number of pulses being randomly chosen. Each Burst within the 12 second sequence may have a different number of pulses.
- The pulse width is between 50 and 100 microseconds, with the pulse width being randomly chosen. Each pulse within a Burst will have the same pulse width. Pulses in different Bursts may have different pulse widths.
- Each pulse has a linear FM chirp between 5 and 20 MHz, with the chirp width being randomly chosen. Each pulse within a transmission period will have the same chirp width. The chirp is centered on the pulse. For example, with a radar frequency of 5300 MHz and a 20 MHz chirped signal, the chirp starts at 5290 MHz and

ends at 5310 MHz.

- If more than one pulse is present in a Burst, the time between the pulses will be between 1000 and 2000 microseconds, with the time being randomly chosen. If three pulses are present in a Burst, the time between the first and second pulses is chosen independently of the time between the second and third pulses.
- The 12 second transmission period is divided into even intervals. The number of intervals is equal to Burst Count. Each interval is of length  $(12,000,000 / \text{Burst Count})$  microseconds. Each interval contains one Burst. The start time for the Burst, relative to the beginning of the interval, is between 1 and  $[(12,000,000 / \text{Burst Count}) - (\text{Total Burst Length}) + (\text{One Random PRI Interval})]$  microseconds, with the start time being randomly chosen. The step interval for the start time is 1 microsecond. The start time for each Burst is chosen independently.

### 3.2.3 Frequency Hopping Radar Test Waveform

| Radar Type | Pulse Width (μsec) | PRI (μsec) | Pulses per Hop | Hopping Rate (kHz) | Hopping Sequence Length (ms) | Minimum Percentage of Successful Detection | Minimum Trials |
|------------|--------------------|------------|----------------|--------------------|------------------------------|--------------------------------------------|----------------|
| 6          | 1                  | 333        | 9              | 0.333              | 300                          | 70%                                        | 30             |

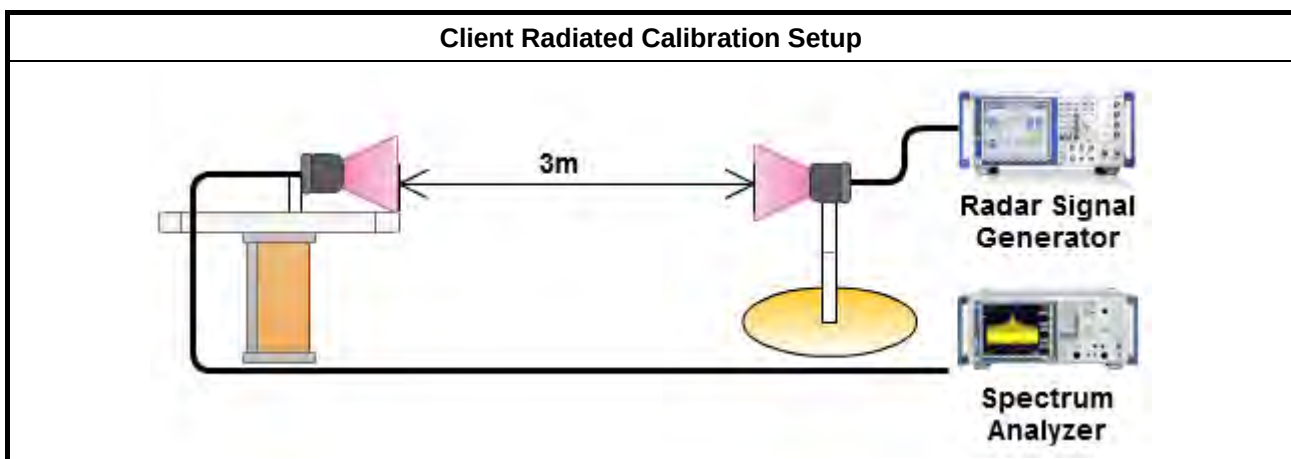
For the Frequency Hopping Radar Type, the same Burst parameters are used for each waveform. The hopping sequence is different for each waveform and a 100-length segment is selected from the hopping sequence defined by the following algorithm:

The first frequency in a hopping sequence is selected randomly from the group of 475 integer frequencies from 5250 – 5724 MHz. Next, the frequency that was just chosen is removed from the group and a frequency is randomly selected from the remaining 474 frequencies in the group.

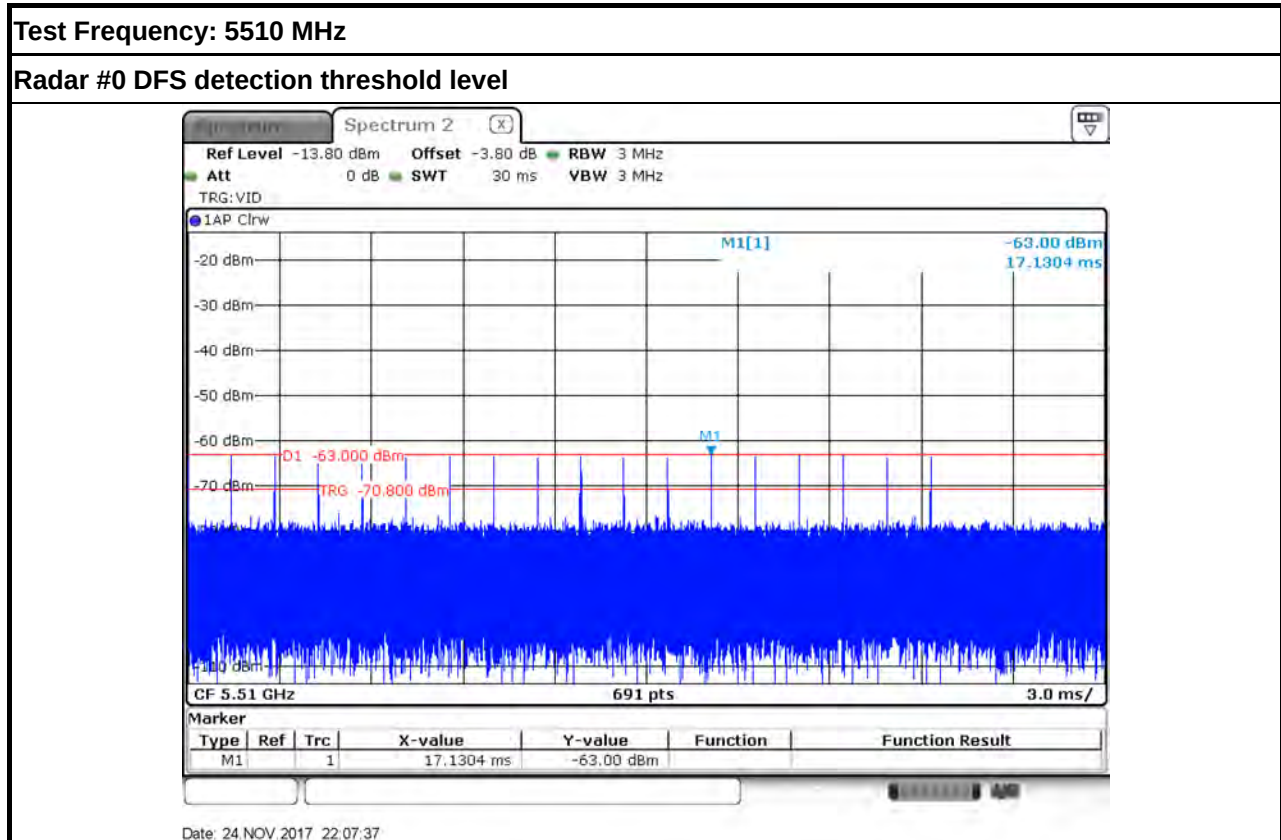
### 3.2.4 DFS Threshold Level

| DFS Threshold Level                                                                                                                                                                                        |                                     |                          |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|--------------------------|
| DFS Threshold level: -63 dBm                                                                                                                                                                               | <input type="checkbox"/>            | at the antenna connector |
|                                                                                                                                                                                                            | <input checked="" type="checkbox"/> | in front of the antenna  |
| The Interference <b>Radar Detection Threshold Level</b> 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. |                                     |                          |

### 3.2.5 Calibration Setup

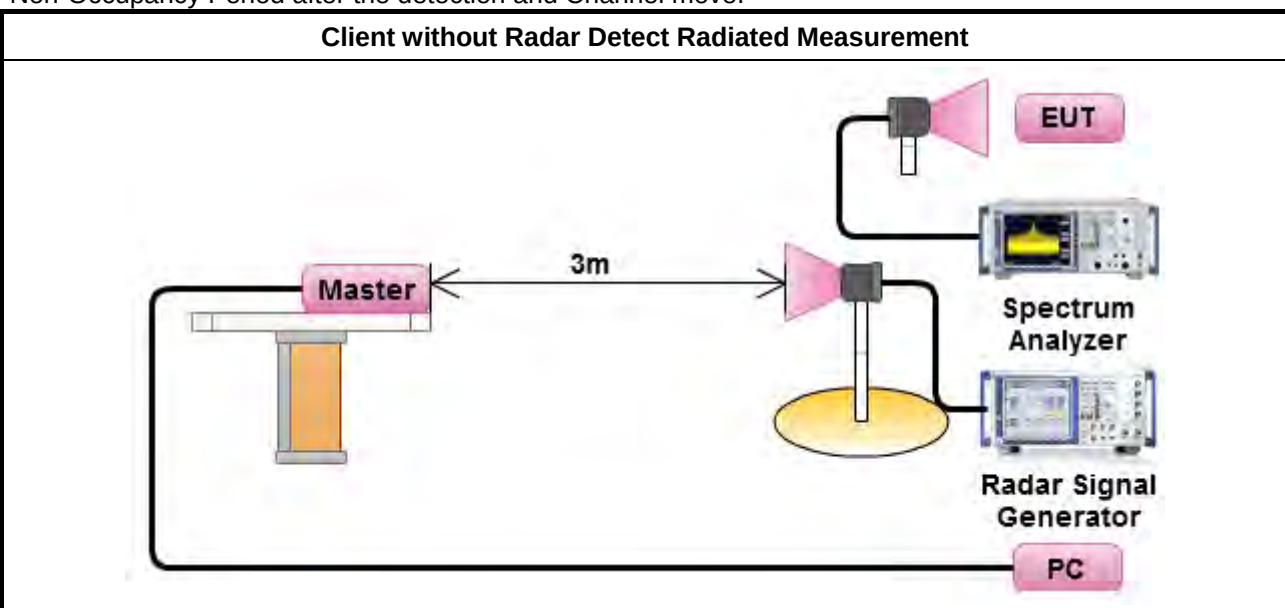


### 3.2.6 Radar Waveform calibration Plot

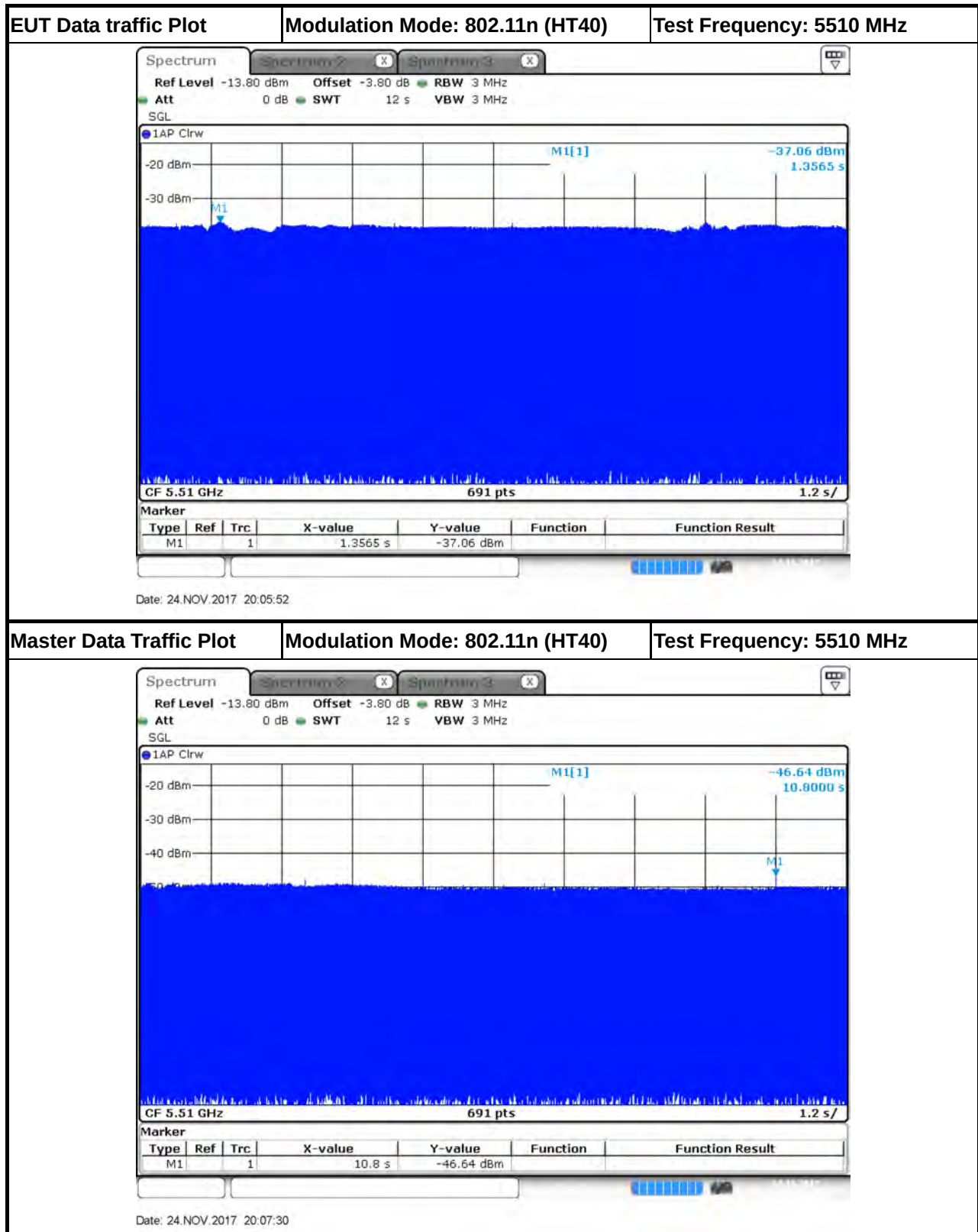


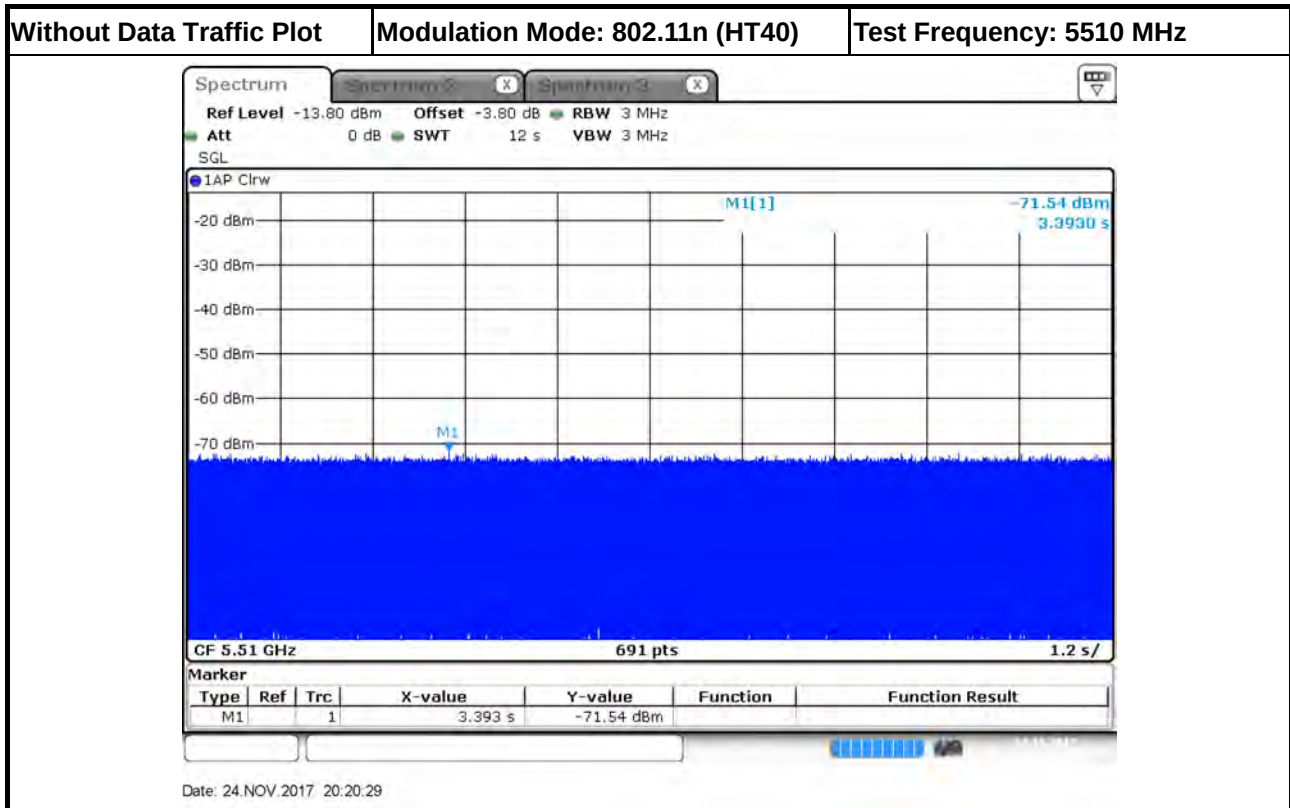
### 3.2.7 Test Setup

A spectrum analyzer is used as a monitor to verify that the EUT has vacated the Channel within the (Channel Closing Transmission Time and Channel Move Time, and does not transmit on a Channel during the Non-Occupancy Period after the detection and Channel move.



### 3.2.8 Data traffic Plot





### 3.3 In-service Monitoring

#### 3.3.1 In-service Monitoring Limit

| In-service Monitoring Limit       |                                                               |
|-----------------------------------|---------------------------------------------------------------|
| Channel Move Time                 | 10 sec                                                        |
| Channel Closing Transmission Time | 200 ms + an aggregate of 60 ms over remaining 10 sec periods. |
| Non-occupancy period              | Minimum 30 minutes                                            |

#### 3.3.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

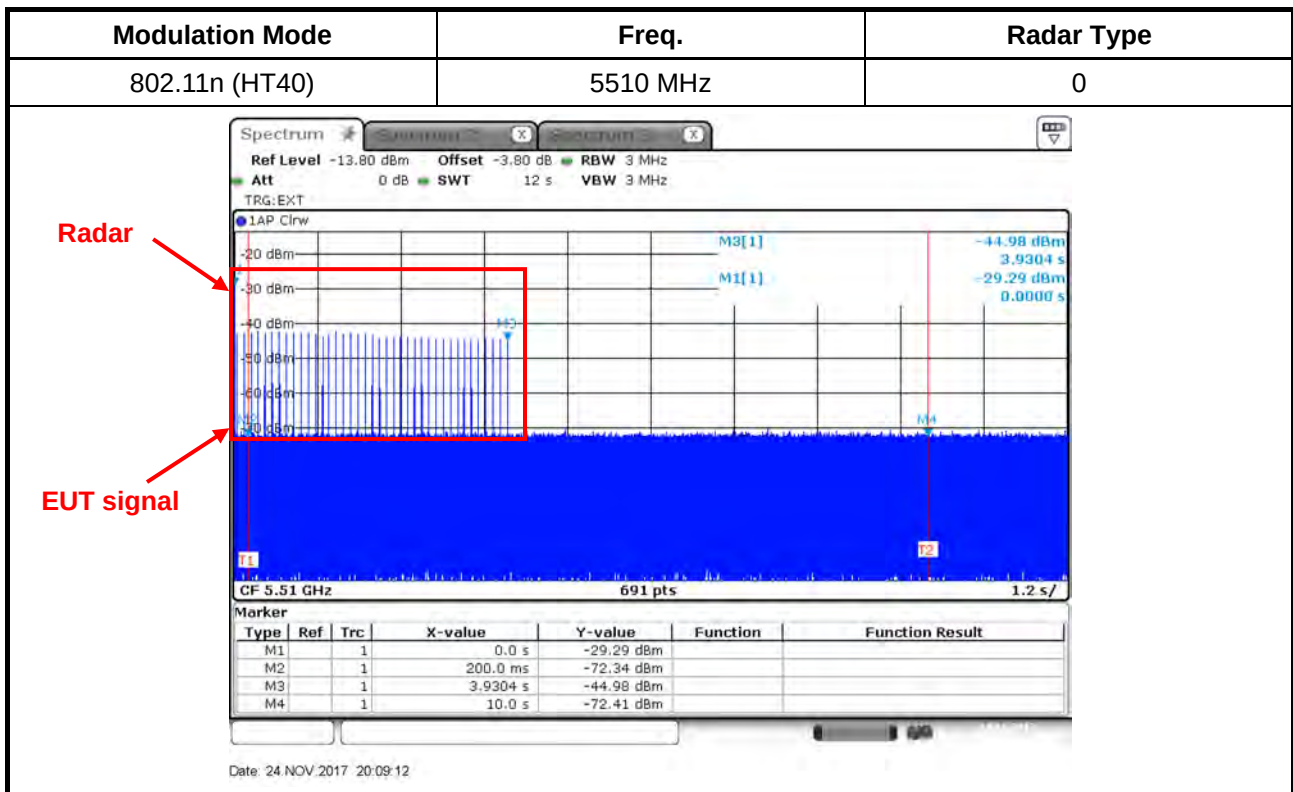
#### 3.3.3 Test Procedures

| Test Method                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <input checked="" type="checkbox"/> | Verified during In-Service Monitoring; Channel Closing Transmission Time, Channel Move Time. Client Device will associate with the EUT. Observe the transmissions of the EUT at the end of the radar Burst on the Operating Channel for duration greater than 10 seconds. Measure and record the transmissions from the EUT during the observation time (Channel Move Time). Compare the Channel Move Time and Channel Closing Transmission Time limits. |
| <input checked="" type="checkbox"/> | Verified during In-Service Monitoring; Channel Closing Transmission Time, Channel Move Time. One 12 sec plot needs to be reported for the Short Pulse Radar Types 0. And zoom-in a 60 ms plot verified channel closing time for the aggregate transmission time starting from 200ms after the end of the radar signal to the completion of the channel move.                                                                                             |
| <input checked="" type="checkbox"/> | Verified during In-Service Monitoring; Non-Occupancy Period. Client Device will associate with the EUT. Observe the transmissions of the EUT at the end of the radar Burst on the Operating Channel for duration greater than 10 seconds. Measure and record the transmissions from the EUT during the observation time (Non-Occupancy Period). Compare the Non-Occupancy Period limits.                                                                 |

### 3.3.4 Test Result of Channel Move Time

Modulation Mode: 802.11n (HT40)

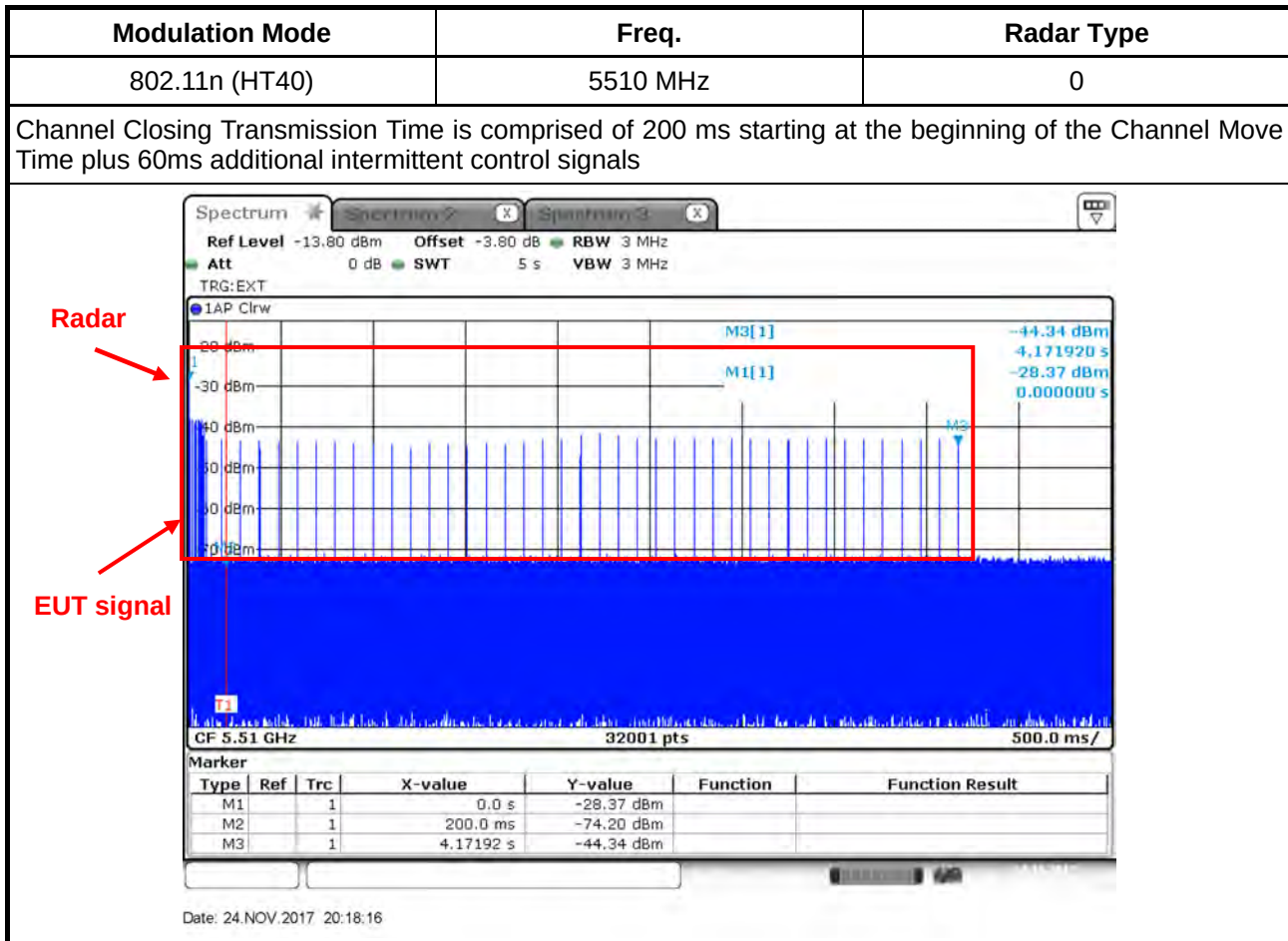
| Parameter                | Test Result | Limit |
|--------------------------|-------------|-------|
|                          | Type 0      |       |
| Test Channel (MHz)       | 5510 MHz    | -     |
| Channel Move Time (sec.) | 3.93        | < 10s |



**3.3.5 Test Result of Channel Closing Transmission Time**

| Modulation Mode: 802.11n (HT40)               | Test Result | Limit  |
|-----------------------------------------------|-------------|--------|
|                                               | Type 0      |        |
| Test Channel (MHz)                            | 5510 MHz    | -      |
| Channel Closing Transmission Time (ms) (Note) | 24.062      | < 60ms |

Note: 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 seconds period. The aggregate duration of control signals will not count quiet periods in between transmissions.



Dwell is the dwell time per spectrum analyzer sampling bin.

S is the sweep time

B is the number of spectrum analyzer sampling bins

C is the intermittent control signals of Channel Closing Transmission Time

N is the number of spectrum analyzer sampling bins (intermittent control signals) showing a U-NII transmission

Dwell (0.156 ms)= S (5000 ms) / B (32001)

C (24.062 ms) = N (154) X Dwell (0.156 ms)

### 3.3.6 Test Result of Non-Occupancy Period

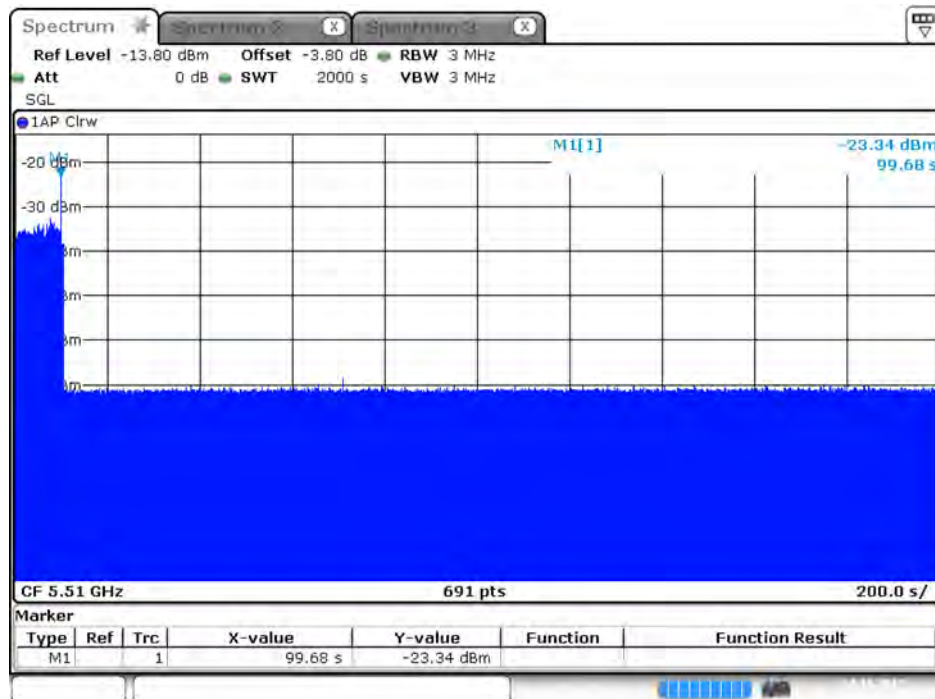
Modulation Mode: 802.11n (HT40)

| Parameter                   | Test Result | Limit         |
|-----------------------------|-------------|---------------|
|                             | Type 0      |               |
| Test Channel (MHz)          | 5510 MHz    | -             |
| Non-Occupancy Period (min.) | $\geq 30$   | $\geq 30$ min |

| Modulation Mode | Freq.    |
|-----------------|----------|
| 802.11n (HT40)  | 5510 MHz |

#### Non-Occupancy Period

During the 30 minutes observation time, UUT did not make any transmissions on a channel after a radar signal was detected on that channel by either the Channel Availability Check or the In-Service Monitoring.



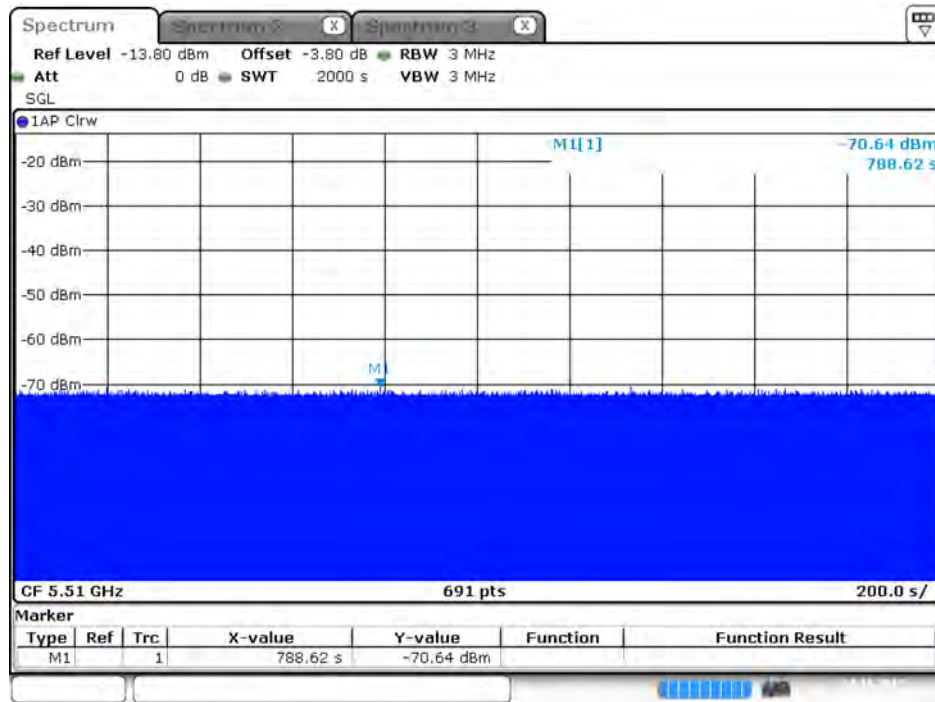
Date: 24.NOV.2017 21:01:58



### Non-associated test

Master was off.

During the 30 minutes observation time, The UUT did not make any transmissions in the DFS band after UUT power up.



Date: 24.NOV.2017 21:45:45



## 4 Test Equipment and Calibration Data

| Instrument              | Brand     | Model No. | Serial No.    | Characteristics | Calibration Date | Calibration Due Date | Remark             |
|-------------------------|-----------|-----------|---------------|-----------------|------------------|----------------------|--------------------|
| Spectrum Analyzer       | R&S       | FSV40     | 101026        | 9kHz~40GHz      | Sep. 19, 2017    | Sep. 18, 2018        | Radiated (DF01-CB) |
| Vector Signal generator | R&S       | SMU200A   | 102782        | 25MHz-6GHz      | Dec. 16, 2016    | Dec. 15, 2017        | Radiated (DF01-CB) |
| Horn Antenna            | COM-POWER | AH-118    | 071187        | 1GHz – 18GHz    | Jul. 06, 2017    | Jul. 05, 2018        | Radiated (DF01-CB) |
| Horn Antenna            | COM-POWER | AH-118    | 071042        | 1GHz – 18GHz    | Dec. 05, 2016    | Dec. 04, 2017        | Radiated (DF01-CB) |
| RF Power Divider        | ANAREN    | 2 Way     | DFS-01-DV-02  | 1GHz ~ 6GHz     | Oct. 11, 2017    | Oct. 10, 2018        | Radiated (DF01-CB) |
| RF Power Divider        | MTJ       | 2 Way     | DFS-01-DV-03  | 1GHz ~ 6GHz     | Oct. 11, 2017    | Oct. 10, 2018        | Radiated (DF01-CB) |
| RF Power Divider        | ANAREN    | 4 Way     | DFS-01-DV-01  | 1GHz ~ 6GHz     | Oct. 11, 2017    | Oct. 10, 2018        | Radiated (DF01-CB) |
| RF Cable-high           | Woken     | RG402     | High Cable-57 | 1 GHz –18 GHz   | Oct. 11, 2017    | Oct. 10, 2018        | Radiated (DF01-CB) |
| RF Cable-high           | Woken     | RG402     | High Cable-58 | 1 GHz –18 GHz   | Oct. 11, 2017    | Oct. 10, 2018        | Radiated (DF01-CB) |

Note: Calibration Interval of instruments listed above is one year.



## 5 Measurement Uncertainty

| Test Items        | Uncertainty | Remark                   |
|-------------------|-------------|--------------------------|
| Radiated Emission | 2.9 dB      | Confidence levels of 95% |