# TEST REPORT
On behalf of

Mettler Toledo (Changzhou) Measurement Technology Co., Ltd

Product Name: Wireless Module

Model No.: MTxP250303ANT1

FCC ID: 2ALAI24MT106

Prepared For: Mettler Toledo (Changzhou) Measurement Technology Co., Ltd
No.111 Taihu West Road Changzhou City,
Jiangsu Province, China.

Prepared By: Audix Technology (Shanghai) Co., Ltd.
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TESTING
NVLAP LAB CODE 200371-0

| | | |
|---|---|---|
| File No. | : | C1D2405011 |
| Report No. | : | ACI-F24102 |
| Date of Test | : | 2023.11.15 |
| Date of Report | : | 2024.06.17 |

The statement is based on a single evaluation of one sample of the above-mentioned products. It does not imply an assessment of the whole production and does not permit the use of the test lab logo.
The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S. Government.

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# TEST REPORT

| | | |
|---|---|---|
| Applicant | : | Mettler Toledo (Changzhou) Measurement Technology Co., Ltd |
| EUT Description | : | Wireless Module |
| | (A) Model No. | : Refer to Sec.2.1 |
| | (B) Power Supply | : DC 3.15-3.45V |
| | (C) Test Voltage | : DC 3.2V (From Li-ion Battery) |

**Test Procedure Used:**

*FCC RULES AND REGULATIONS PART 15 SUBPART E*
*AND KDB 905462 D02*

The device described above is tested by Audix Technology (Shanghai) Co., Ltd. to determine the maximum emission levels emanating from the device. The maximum emission levels are compared to the FCC Part 15 Subpart E limits.

The test results are contained in this test report and Audix Technology (Shanghai) Co., Ltd. is assumed full responsibility for the accuracy and completeness of these measurements. This report also shows that the EUT (M/N: Refer to Sec2.1), which was tested is technically compliance with the FCC limits.

This report applies to above tested Sample only. This report shall not be reproduced in part without written approval of Audix Technology (Shanghai) Co., Ltd.

***The test results for EUT's WIFI (2.4G)/ WIFI (5G) function are contained in No.ACI-F24100, ACI-F24101 report.***

Date of Test : 2023.11.15 Date of Report : 2024.06.17

Producer : Mindy Wang
MINDY WANG / Assistant

Review : Lvy_lv
Lvy_Lv / Deputy Assistant Manager

AUDIX® For and on behalf of
Audix Technology (Shanghai) Co., Ltd.

Signatory : Kamp. Chen.
Authorized Signature(s) KAMP CHEN / Manager

# 1 SUMMARY OF STANDARDS AND RESULTS

## 1.1 Description of Standards and Results

The EUT have been tested according to the applicable standards as referenced below:

| Description / Test Item | | Test Standard | Results | Meets Limit |
|---|---|---|---|---|
| **EMISSION** | | | | |
| DFS | Non-Occupancy Period | FCC RULES AND REGULATIONS PART 15 SUBPART E AND KDB 905462 D02 | N/A | 15.407(h)(2) |
| | DFS Detection Threshold | | N/A | |
| | Channel Availability Check Time | | N/A | |
| | U-NII Detection Bandwidth | | N/A | |
| | DFS Detection Threshold | | N/A | |
| | Channel Closing Transmission Time | | Pass | |
| | Channel Move Time | | Pass | |
| | U-NII Detection Bandwidth | | N/A | |
| N/A is an abbreviation for Not Applicable. | | | | |

# 2 GENERAL INFORMATION

## 2.1 Description of Equipment Under Test

Description : Wireless Module

Type of EUT : ☑ Production ☐ Pre-product ☐ Pro-type

Model Number : MTxP250303ANT1

Radio Tech : IEEE 802.11 a/b/g/n.

Channel Freq. : IEEE 802.11a:
5180MHz—5240MHz; 5260MHz—5320MHz
5500MHz—5700MHz; 5745MHz—5825MHz
IEEE 802.11b: 2412MHz—2462MHz
IEEE 802.11g: 2412MHz—2462MHz
IEEE802.11nHT20:
2412MHz—2462MHz;
5180MHz—5240MHz; 5260MHz—5320MHz
5500MHz—5700MHz; 5745MHz—5825MHz
IEEE802.11nHT40:
5190MHz—5230MHz; 5270MHz—5310MHz
5510MHz—5670MHz; 5755MHz—5795MHz

Modulation : 802.11b: DSSS (CCK, DQPSK, DBPSK);
802.11a/g/n: OFDM (64QAM, 16QAM, QPSK, BPSK).

DFS Info. : Operational Mode:
☐ Master
☑ Client without Radar Detection
☐ Client with Radar Detection

Antenna Info. : Transmit Type: 1T1X;
RF module shipped with two ANT ports, and the use details in EUT list as below:

| ANT Port: | ANT1 | ANT2 |
|---|---|---|
| Connector: | IPEX | IPEX |
| Condition: | In use | No use |

Note : The EUT shipped with one of Antennas provided as below:

| No. | Model | Antenna Type | Range (MHz) | Peak Gain(dBi) |
|---|---|---|---|---|
| 1. | AC-Q24-50ZDB | Dipole | 2400-2483.5 | 2.7 |
| | | | 5150-5250 | -1.3 |
| | | | 5250-5350 | -1.1 |
| | | | 5500-5700 | 1.3 |
| | | | 5700-5825 | 0.8 |
| 2. | AC-Q58-50ZDB | Dipole | 2400-2483.5 | 1.3 |
| | | | 5150-5250 | 4.8 |
| | | | 5250-5350 | 5.0 |
| | | | 5500-5700 | 5.4 |
| | | | 5700-5825 | 5.1 |
| As the Gain showed as above, we select Antenna #1 for the test of Band 2400-2483.5MHz, Antenna #2 for the test of Band UNII-1&2-A&2-C&3. | | | | |

Applicant : Mettler Toledo (Changzhou) Measurement Technology Co., Ltd
No.111 Taihu West Road Changzhou City,
Jiangsu Province, China.

Manufacturer : Mettler Toledo (Changzhou) Measurement Technology Co., Ltd
No.111 Taihu West Road Changzhou City,
Jiangsu Province, China.

Factory#1 : Mettler Toledo (Changzhou) Measurement Technology Co., Ltd
No.111 Taihu West Road Changzhou City,
Jiangsu Province, China.

Factory#2 : Mettler-Toledo (Albstadt) GmbH
Unter dem Malesfelsen 34 D – 72458 Albstadt
Germany

Factory#3 : Mettler-Toledo, LLC
1150 Dearborn Drive Worthington, OH 43085-4766
United States of America

## 2.2 Test Information

The EUT was operation at client mode, the modulation and channel was selected by a Wi-Fi Router.

| Modulation | Test Channel | Frequency (MHz) |
|---|---|---|
| 802.11n-HT40 | 54 | 5270 |
| | 102 | 5510 |

## 2.3 Sample Description

| Test Item | Model Number | Sample Number | Date of receipted |
|---|---|---|---|
| DFS | MTxP250303ANT1 | E20231121274a-01/01 | 2023.10.08 |

## 2.4 Supported Equipment

| | | |
|---|---|---|
| Brand | : | Acer |
| Product Name: | : | Notebook PC |
| Model Name | : | TravelMate P238 series |
| Model Number | : | N15W8 |
| | | |
| Brand | : | ASUS |
| Product Name: | : | AX6000 Dual-band Wi-Fi Router |
| Model Name | : | RT-AX88U |
| Model Number | : | K8ITHP000036 |
| FCC ID | : | MSQ-RTAXHP00 |
| IC: | : | 3568A-RTAXHP00 |

## 2.5 Description of Test Facility

| | | |
|---|---|---|
| Name of Firm | : | Audix Technology (Shanghai) Co., Ltd. |
| Site Location | : | 3F and 4F, 34Bldg, 680 Guiping Rd., Caohejing Hi-Tech Park, Shanghai 200233, China. |
| Accredited by NVLAP, Lab Code | : | 200371-0 |
| FCC Designation Number | : | CN5027 |
| Test Firm Registration Number | : | 954668 |

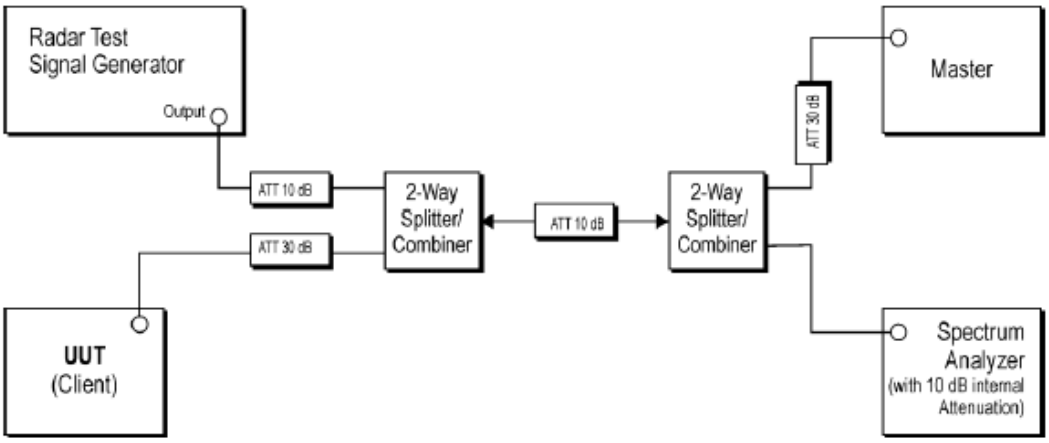
# 3 DFS MEASUREMENT

## 3.1 Test Equipment

The following test equipment was used during the Emission Bandwidth measurement:

| Item | Type | Manufacturer | Model No. | Serial No. | Cal. Date | Cal. Interval |
|---|---|---|---|---|---|---|
| 1. | Spectrum Analyzer | Agilent | N9010A | MY52221182 | 2023.08.09 | 1 Year |
| 2. | MXG Vector Signal Generator | KEYSIGHT | N5182B+N5182BX07 | MY53051937+MY61500126 | 2023.02.22 | 1 Year |
| 3. | DFS Radar Profiles | KEYSIGHT | N7607B Signal Studio | V3.2.0.0 | -- | -- |

## 3.2 Block Diagram of Test Setup




## 3.3 Specification Limits

§15.407(h)(2)(iii):
Channel Move Time. After a radar's presence is detected, all transmissions shall cease on the operating channel within 10 seconds. Transmissions during this period shall consist of normal traffic for a maximum of 200 ms after detection of the radar signal. In addition, intermittent management and control signals can be sent during the remaining time to facilitate vacating the operating channel.

KDB 905462 D02:

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

| Requirement | Operational Mode | | |
|---|---|---|---|
| | Master | Client Without Radar Detection | Client With Radar Detection |
| *Non-Occupancy Period* | Yes | Not required | Yes |
| *DFS Detection Threshold* | Yes | Not required | Yes |
| *Channel Availability Check Time* | Yes | Not required | Not required |
| *U-NII Detection Bandwidth* | Yes | Not required | Yes |

**Table 2: Applicability of DFS requirements during normal operation**

| Requirement | Operational Mode | |
|---|---|---|
| | Master Device or Client with Radar Detection | Client Without Radar Detection |
| *DFS Detection Threshold* | Yes | Not required |
| *Channel Closing Transmission Time* | Yes | Yes |
| *Channel Move Time* | Yes | Yes |
| *U-NII Detection Bandwidth* | Yes | Not required |

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

**Table 3: DFS Detection Thresholds for Master Devices and Client Devices with Radar Detection**

| Maximum Transmit Power | Value (See Notes 1, 2, and 3) |
|---|---|
| EIRP ≥ 200 milliwatt | -64 dBm |
| EIRP < 200 milliwatt and power spectral density < 10 dBm/MHz | -62 dBm |
| EIRP < 200 milliwatt that do not meet the power spectral density requirement | -64 dBm |
| **Note 1:** This is the level at the input of the receiver assuming a 0 dBi receive antenna.<br>**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.<br>**Note3:** EIRP is based on the highest antenna gain. For MIMO devices refer to KDB Publication 662911 D01. | |

**Table 4: DFS Response Requirement Values**

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

## 3.4 Operating Condition of EUT

The EUT operate as client, connect to the Wi-Fi Router.

## 3.5 Test Procedure

The conducted setup shown on Section 3.2 was used to measure the Chanel Closing Transmission Time and Channel Move Time.

For a Client Device without DFS, the Channel Move Time and Channel Closing Transmission Time requirements will be verified with one Short Pulse Radar Type defined in Table 5 of KDB 905462 D02.

The Client Device (EUT) is associated with the Master Device (Wi-Fi Router). The Data Traffic is streamed from the Master Device to the Client Device. Radar waveforms generated with the Vector Signal Generator are injected into the Master Device on the operating channel.

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 UUT during the observation time (Channel Move Time). Measure and record the Channel Move Time and Channel Closing Transmission Time if radar detection occurs.

## 3.6 Threshold Level

Threshold Level = -62dBm + Antenna Gain.

## 3.7 Test Results

**PASSED.**

All the test results are attached in next pages.

(Test Date: 2023.11.15 Temperature: 23℃ Humidity: 51 %)

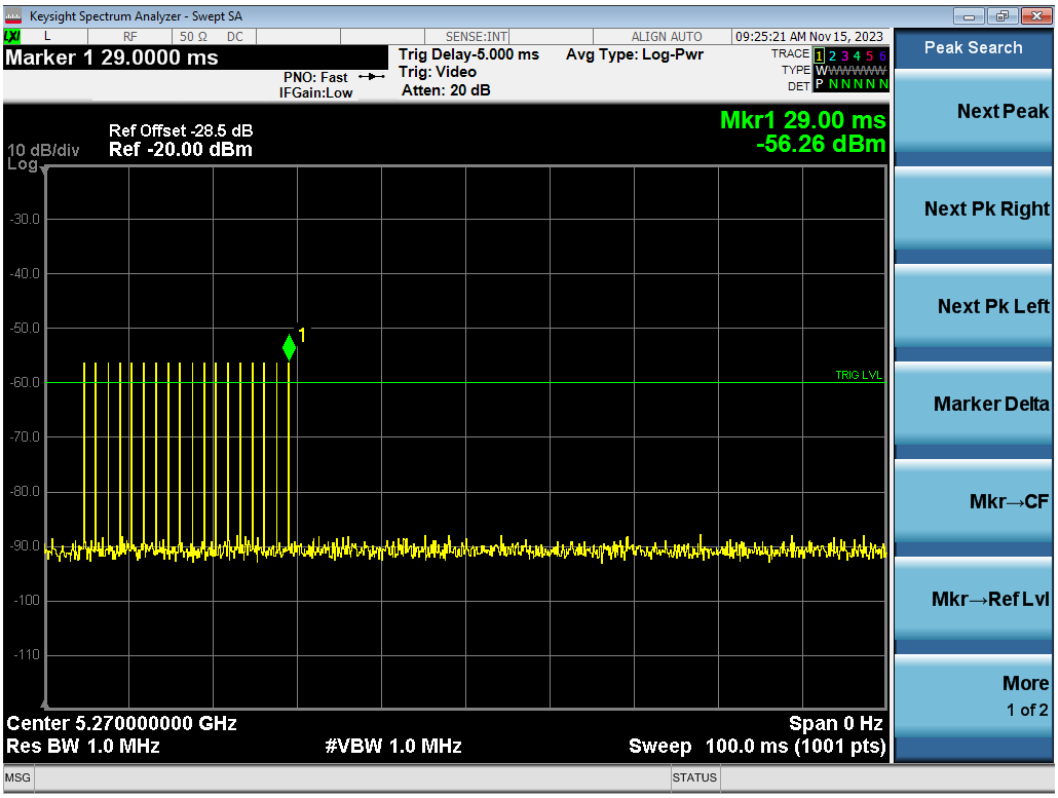
| Modulation | Channel | Frequency (MHz) | Antenna Gain (dBi) | Threshold Level (dBm) |
|---|---|---|---|---|
| 802.11n-HT40 | 54 | 5270 | 5 | -57 |
| | 102 | 5510 | 5.4 | -56.6 |

| Modulation | Channel | Frequency (MHz) | **Channel Move Time (s)** | Limit (s) |
|---|---|---|---|---|
| 802.11n-HT40 | 54 | 5270 | **0** | 10 |
| | 102 | 5510 | **0** | 10 |

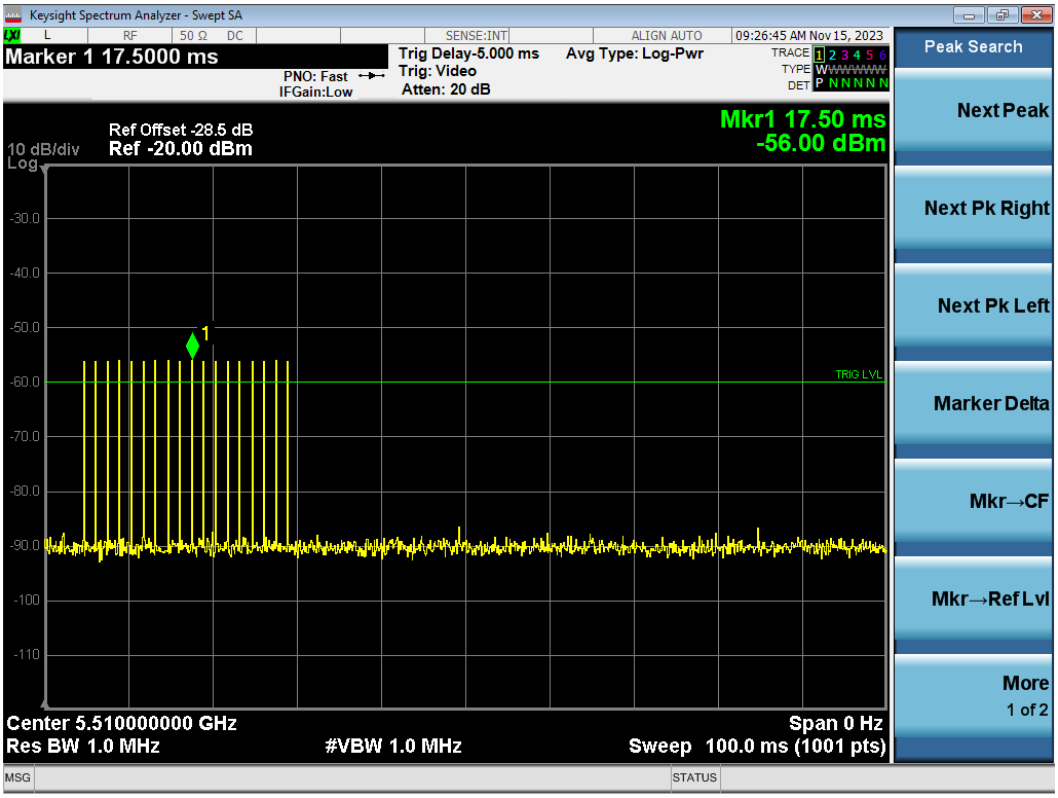
| Modulation | Channel | Frequency (MHz) | **Channel Closing Transmission Time (s)** | Limit (s) |
|---|---|---|---|---|
| 802.11n-HT40 | 54 | 5270 | **0.009009** | 0.2 |
| | 102 | 5510 | **0.009009** | 0.2 |

# Threshold Level:

## 802.11n-HT40 CH5270MHz

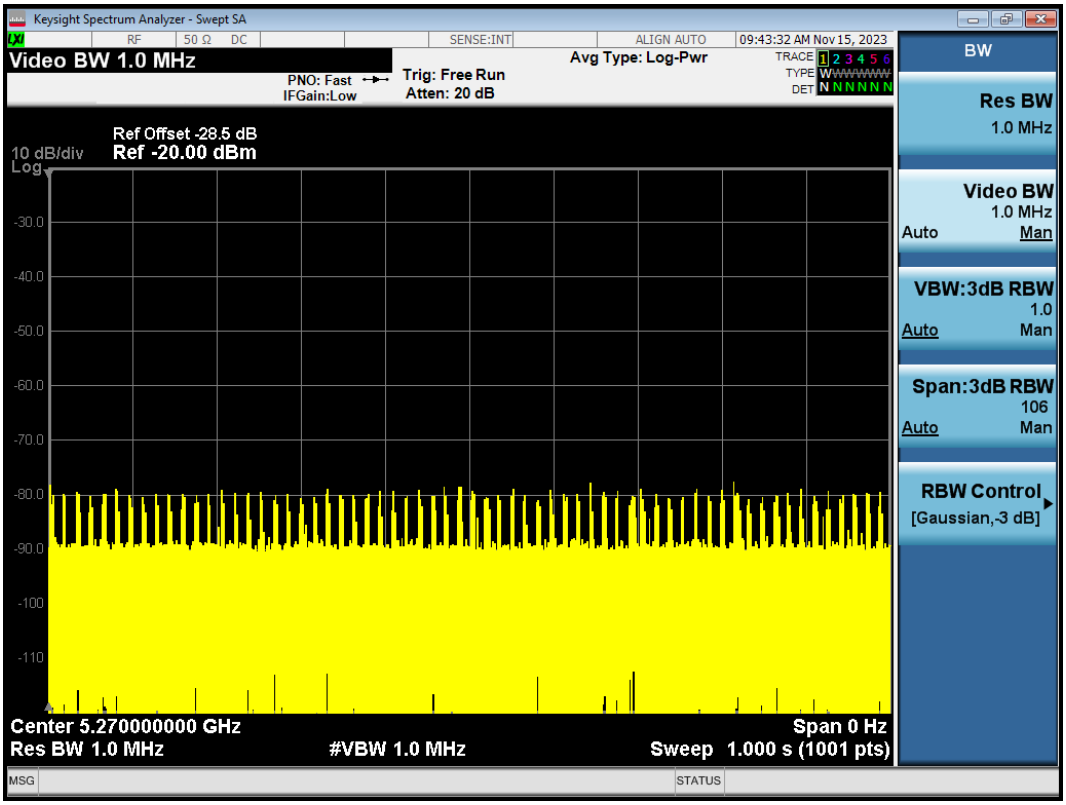



## 802.11n-HT40 CH5510MHz

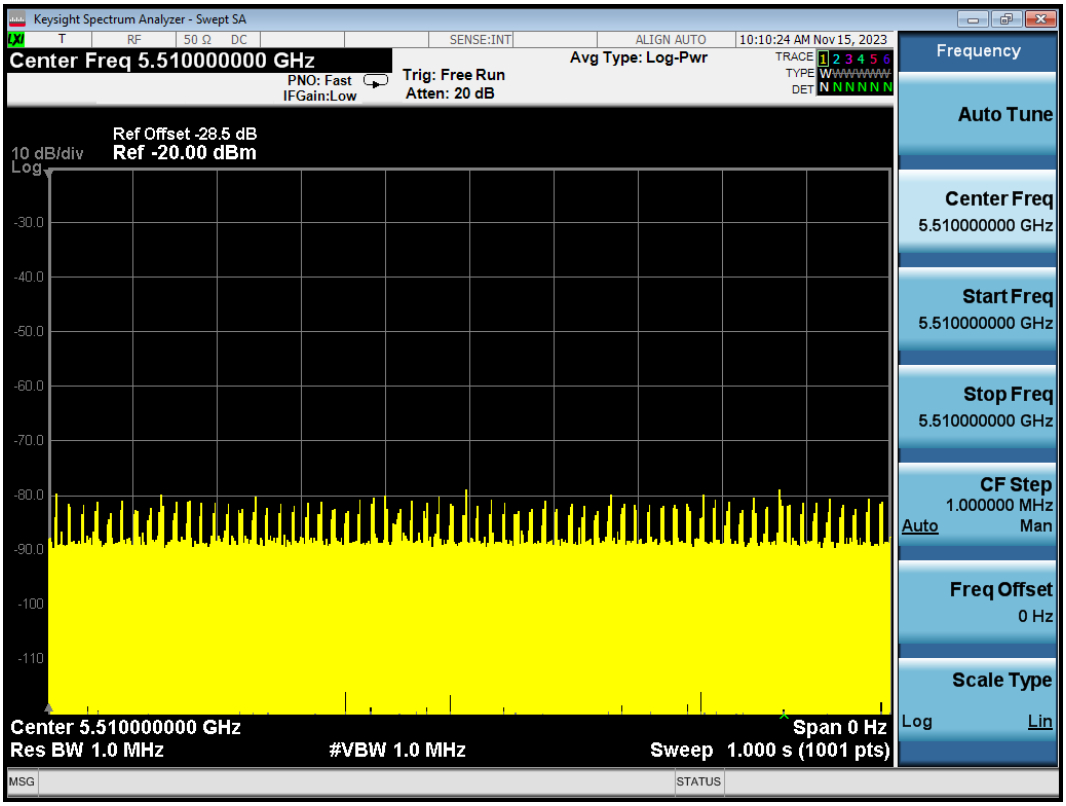


# Data Traffic Plot:

## 802.11n-HT40 CH5270MHz

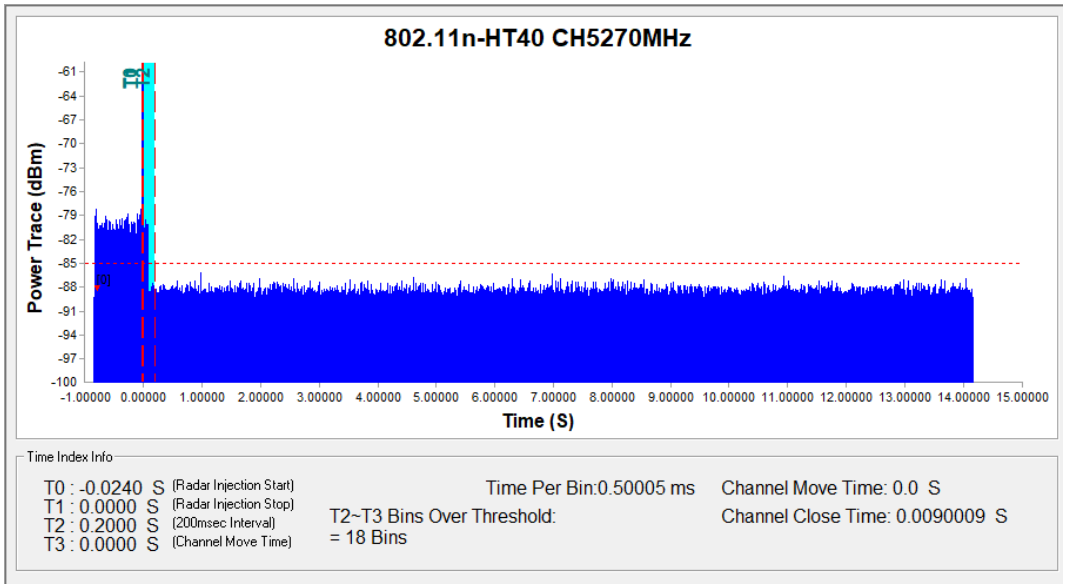



## 802.11n-HT40 CH5510MHz

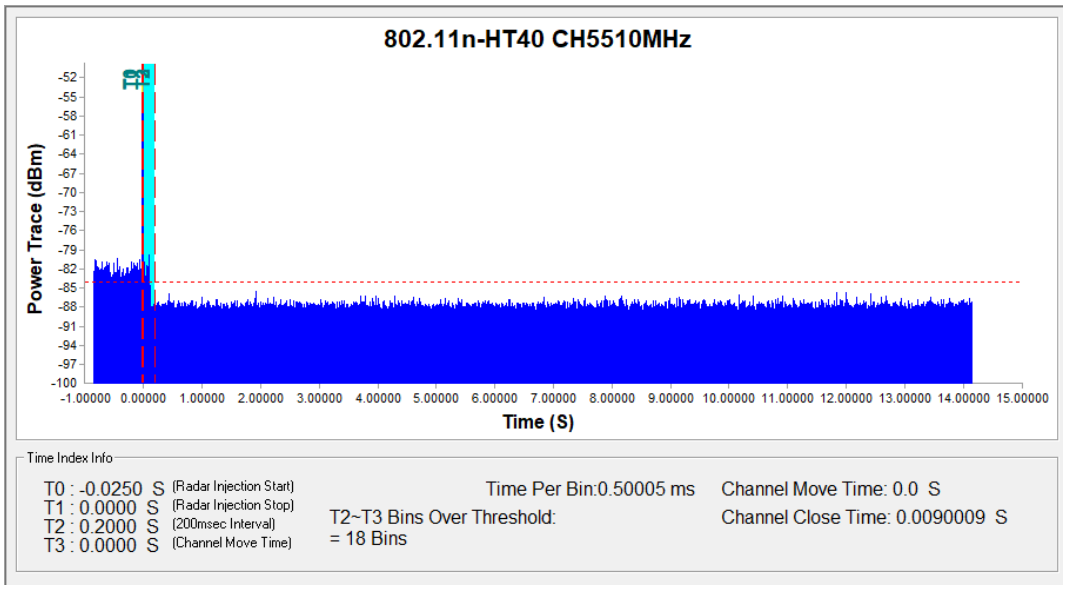


## Channel Move Time & Channel Closing Transmission Time:

### 802.11n-HT40 CH5270MHz




### 802.11n-HT40 CH5510MHz



# 4 DEVIATION TO TEST SPECIFICATIONS

None.

# 5 MEASUREMENT UNCERTAINTY LIST

The measurement uncertainty was estimated for test on the EUT according to CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage of K=2.
The uncertainties value is not used in determining the PASS/FAIL results.

| Test Items/Facilities | Frequency/Equipment/Unit | Uncertainty |
|---|---|---|
| Conducted Emission No.1 Shielded Room | 9kHz~150kHz | ±3.1 dB |
| | 150kHz~30MHz | ±2.6 dB |
| Conducted Emission No.3 Shielded Room | 9kHz~150kHz | ±3.1 dB |
| | 150kHz~30MHz | ±2.6 dB |
| Radiated Emission | 30MHz~200MHz, Horizontal | ±3.8 dB |
| | 30MHz~200MHz, Vertical | ±4.1 dB |
| | 200MHz~1000MHz, Horizontal | ±3.6 dB |
| | 200MHz~1000MHz, Vertical | ±5.1 dB |
| | 1GHz~6GHz | ±5.3 dB |
| | 6GHz~18GHz | ±5.3 dB |
| | 18GHz~40GHz | ±3.5 dB |
| Output Power Test | 50MHz~18GHz | 0.77 dB |
| Power Density Test | 9kHz~6GHz | 1.08 dB |
| RF Frequency Test | 9kHz~40GHz | $6*10^{-4}$ |
| Bandwidth Test | 9kHz~6GHz | $1.5*10^{-3}$ |
| RF Radiated Power Test | 30MHz~1000MHz | 3.06 dB |
| Conducted Output Power Test | 50MHz~18GHz | 0.83 dB |
| AC Voltage(<10kHz) Test | 120V~230V | 0.04 % |
| DC Power Test | 0V~30V | 0.4 % |
| Temperature | -40℃~+100℃ | 0.52 ℃ |
| Humidity | 30%~95% | 2.6 % |